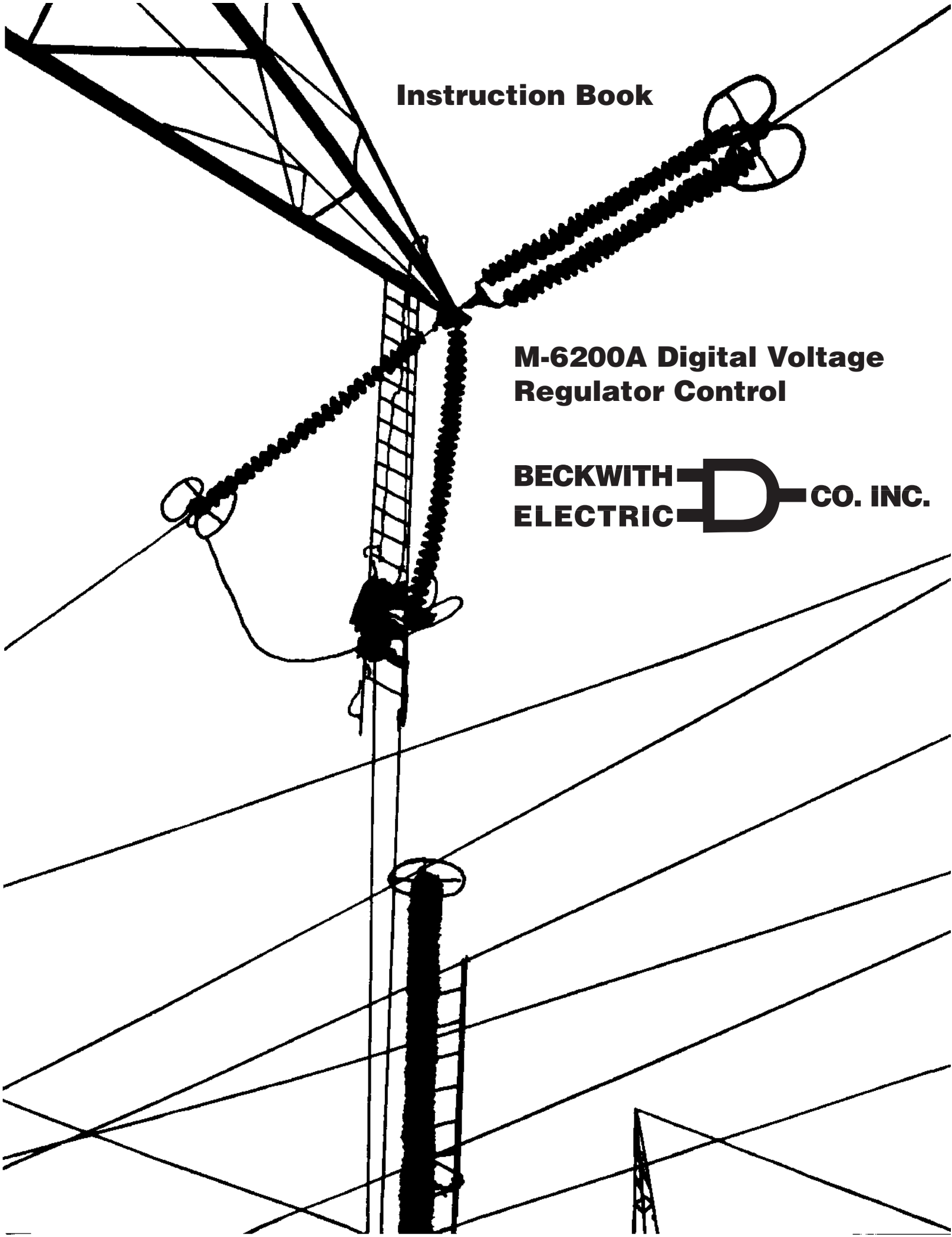


Instruction Book

M-6200A Digital Voltage Regulator Control

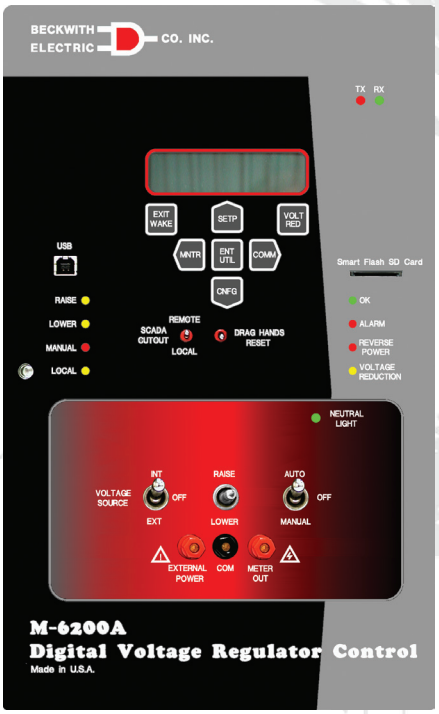
BECKWITH ELECTRIC CO. INC.

BECKWITH ELECTRIC CO. INC.

CONTROLS

Digital Voltage Regulator Control M-6200A

Digital Regulator Control for General Electric, Siemens, Cooper and Howard Regulators



- Maximum Communication Options For Wired or Wireless Networks
- Standard RS-232 or RS-485
- Optional ST or V-Pin Serial Fiber Optic Port
- Embedded Bluetooth®, Class 1 (v2.0), 1Mbps, 128 bit encryption, up to 1/2 mile transmission
- Supports DNP3.0 & MODBUS® Protocols
- DNP mapping templates to match SCADA historical databases
- Time sync via DNP3.0 Set Time Command
- Sequence of Events (SOE) Recording Of Events – Stores 129 events, mSec time-stamped with Graphic Logic Initiate from critical operational factors
- FULL DNP implementation – Including DNP File Transfer, multi-addressing, unsolicited response, source address validation
- TRUE Ethernet – Full 10/100Mbps auto-negotiable concurrent multi-session and multi-protocol support
- DNP+Ethernet – Send/receive DNP configuration files using DNP File Transfer Protocol
- DNP+Ethernet – Device Discovery using TapTalk®
- SCADA HeartBeat – Integrity check of communications media and/or Master. Fully programmable
- Manual HeartBeat Timer
- Quick (10 -15 second) Uploading of Configurations, Settings, Firmware Upgrades
- Assists in locating harmonics adversely affecting customer processes
- Helps mitigation measures to determine corrective filter design and location
- CBEMA Event Recording and Reporting
- Oscillography Capture – Selectable 16, 32, or 64 samples per cycle. Captures sags, swells, CBEMA events and sub-synchronous transients
- Cyber Security – Authentication and Multi Level Access Codes, Smart Flash SD Card serves as Cyber Security Hard-Key with Audit Log
- Data Logging Continuous Recording – Data stored in non-volatile memory requiring no battery backup
- Harmonics Detection, Recording, Protection and Suppression
- Downloading of Event Reports, Oscillography
- No need for battery to back up clock
- Smart Flash SD Card Slot
- Supports Control Cloning

Industry Leader Since 1969
Made in the USA

Features

- Adjustable Bandcenter
- Adjustable Bandwidth
- Line Drop Compensation, R, X and Z Compensation
- Time Delay, Definite and Inverse
- InterTap Time Delay
- Selectable Outputs, Continuous or Pulsed
- Reverse Power Operation for Single-Phase Regulator applications
- Real-Time Metering of measured and calculated parameters
- Demand Metering with selectable time interval
- Drag Hands Operation
- Adjustable Line Overcurrent Tapchange Inhibit
- Voltage Limits
- Tap Position Limits
- Auto Runback (due to overvoltage)
- Three Independent Voltage Reduction Steps
- Sequential and Non-Sequential Operation
- SCADA HeartBeat
- Manual HeartBeat Timer
- VT Ratio Correction
- Tap Position Knowledge by Motor Direct Drive KeepTrack™ method
- Operations Counter
- Resettable Operations Counter
- Harmonic Analysis
- Tap Position Record
- Auto/Off/Manual Switch Status
- A or B Regulator Type Selection
- User Programmable Alarm/Deadman Contact
- SCADA Cutout (Local/Remote) switch allows blocking of write commands from COM1, COM2 or Ethernet
- Control Voltage Input
- Source Side PT Input
- Motor Power Input
- Load Current Input
- Raise Output
- Lower Output
- 20 Character by 2 Row LED backlit LCD Display
- TapTalk® S-6200 Communications Software
- USB (1.1) Communications Port
- Motor Current Profiling
- Up to 30 unique 15 character User Access Codes (Level 1 or Level 2)
- CBEMA monitoring to detect sags and swells within a range of 90 Vac to 180 Vac, and trigger data collection and alarming functions
- VAr Bias
- Smart Flash SD Card Slot supporting SD and SDHC SD cards
- Smart Flash SD Card can be linked to one or multiple controls providing a physical security "Key" which provides User Access Level 2 Access to the control when the SD Card is inserted for settings manipulation
- Sequence of Events (SOE)
- Data Logging
- Oscillography
- External Inhibit of Auto Tapchange
- Front Panel LEDs for Out-of-Band **Raise**, Out-of-Band **Lower**, Reverse Power Flow **Rev Pwr** Detected, CPU **OK**, **MANUAL**, **LOCAL**, Voltage Reduction **V/RED** in Effect, **ALARM** and **TX/RX** COM1 Transmit/Receive
- Voltage Reduction 1 & 2 Inputs (Binary)
- Neutral Position Detect and Counter
- Counter Input (Binary)
- Motor Seal-In Input (Binary)
- Motor Seal-In Failure Alarm and Block
- Non-Sequential Input (Binary)

- COM1, RS-485 (two-wire), RS-232, or Serial Fiber (Specify)
- Communication Protocols include MODBUS® and Secure DNP3.0 (Authentication)
- Control Power Back-Up Input – input (+12 Vdc) for backup of Fiber Optic loop-through communication
- One set (3) of spare fuses are included
- Supports Station and Feeder Level DNP addressing in addition to individual addressing for Smart Grid applications
- One pushbutton access to user configurable Wakeup screen for manual data recording with Smart Flash SD Card saving feature
- Run Through Neutral, Automatic Reversing Switch swiping
- Individual Tap Wear Alarm
- User selectable Tapchanger Type

Optional Features

- SCAMP™ (SCADA Controllable Auto/ Manual Pushbutton)
- COM1, Fiber Optic Port (ST or V-pin connectors available with 62.5 and 200 micro fiber supported)
- COM2, RS-232 Communications Port or Bluetooth®
- Ethernet Port is available through a RJ-45 jack (10/100 Base-T) or Fiber Optic through ST connectors (100 Base-Fx). These ports support DNP over TCP/IP and MODBUS® over TCP/IP

Accessories

- M-2026 AC-DC Control Power Backup Supply
- M-2027 Control Power Backup Supply–AC Only
- B-0920 Control Power Backup Harness
- USB Cable
- SD Card (1 GB) for Smart Flash functions

Bandcenter: Adjustable from 100 V to 135 V in 0.1 V increments.

Bandwidth: Adjustable from 1 V to 10 V in 0.1 V increments.

Line Drop Compensation: R and X compensation. Adjustable from –24 V to +24 V in 1 V increments. Z compensation available with adjustment of voltage raise from 0 V to +24 V, in increments of 1 V.

Time Delay: Definite; adjustable from 1 second to 360 seconds, in 1 second increments. Inverse; adjustable from 1 second to 360 seconds, in 1 second increments.

InterTap Time Delay: Used to introduce time delay between tap operations when control is in sequential mode; adjustable from 0 to 60 seconds in 1.0 second increments. Counter input required.

Selectable Outputs: Continuous or pulsed. Normally, an output (raise or lower) signal is maintained when the voltage remains outside the band. A pulsed output length is programmable from 0.2 to 12 seconds, in increments of 0.1 second.

Reverse Power Operation: If Motor Direct Drive KeepTrack™ is applicable, unit may be set to "Block", "Regulate Forward (Ignore)", "Regulate Reverse", "Return to Neutral", "Regulate Reverse (Measured)" or "Distributed Generation." The Regulate Reverse feature allows separate setpoints and regulation in the reverse direction without the installation of source-side VTs. Distributed Generation allows alternate LDC R and X values to be applied to the control when reverse power is detected. If Motor Direct Drive KeepTrack is disabled, then " Regulate Reverse (Measured)", "Ignore" and "Block" modes are available. Regulate Reverse (Measured) allows the control to switch it's voltage sensing input from a load side VT to a source side VT if one is available and operate in Reverse Power Mode using that input.

Smart Reverse Power (Auto Determination)

For reverse power conditions requiring more than one reverse power mode depending on the cause of the reverse power condition; either Distributed Generation mode or Regulate In Reverse/Regulate in Reverse Measured. The M-6200A provides two new reverse power modes, "Auto Determination" and "Auto Determination Measured" which allow the control to intelligently choose which reverse power mode applies at the time reverse power is sensed.

CT to VT Phasing Correction: Adjustable from 0° to +330° in 30° increments.

Load Overcurrent Tapchange Inhibit: Adjustable from 50 mA to 640 mA of load current for 200 mA CT.

Voltage Limits, Tap Position Limits, and Runback: Overvoltage and Undervoltage limits are independently adjustable from 95 V to 135 V in 0.1 V increments. Upper and lower tap position limits may be set by user, with tap position knowledge active. An adjustable deadband (above the overvoltage limit) of 1 V to 4 V is available, which is used to set the runback limit.

Voltage Reduction: Three independent steps, each adjustable from 0% to 10% in 0.1% increments of the bandcenter setpoint. Voltage Reduction can be disabled locally and remotely if desired.

Normalizing Voltage: A Normalizing Voltage Multiplier with a range of 0.80 to 1.20 is available to be applied to Meter Out Voltage and displayed in real time as Normalizing Voltage. The purpose of the Normalizing Voltage is to allow the user to overcome differences in the ratio of the PT that the Load Voltage input is using versus the PT the end user or other metering methods are using.

Inhibit of Auto Tapchange: Blocks automatic regulator operation in response to external contact closure or software setting.

Sequential or Non-Sequential Operation: Non-sequential operation resets the time delay upon momentary external contact closure at the non-sequential input.

VT Ratio Correction: VT correction from –15 V to +15 V in 0.1 V increments.

User-Programmable Alarm/Self Test Contact: Alerts operator to one or more of the following system conditions:

- Communication Block
- Block Raise (Tap)
- Block Lower (Tap)
- Block Raise (Voltage)
- Block Lower (Voltage)
- Abnormal Tap Position
- Backup Power Fail
- RTN Fail to Operate
- Individual Tap Wear
- Lagging VAr
- Lagging Power Factor
- LDC/LDZ
- Line Current Limit
- Reverse Power
- Self Test (Deadman)
- Voltage Reduction
- Max VAr Bias Duration Lead
- Max VAr Bias Duration Lag
- Op Count Signal
- Leading VAr
- Leading Power Factor
- Low Current Block
- Motor Seal-in Failure

Tap Position Knowledge: In most applications, tap position information can be maintained by means of Motor Direct Drive KeepTrack.

Operations Counter: A software counter increments by one count per either an open/close/open contact operation (X1) or an open/close or close/open contact operation (X2), and is preset by the user. A count window mode registers any activity as a valid input within the count window time setting.

Resettable Operations Counter: A second software counter, similar to the operations counter, which may be reset by the user.

Harmonic Analysis: Provides the total harmonic distortion and the harmonic content of the load voltage and current up to the 31st harmonic.

Tap Position Record: Provides a record of the number of times each tap position has been passed through (using TapTalk®). The tap position record can be reset by the user.

Tap Wear Settings: Provides the capability to determine tap wear in a regulator's tap change mechanism.

AUTO/OFF/MANUAL Switch Status: Provides the user with the Auto/Off/Manual switch position status through the Comm ports.

A or B Regulator Type: Allows the user to select the type of regulator being used to provide a more accurate source voltage calculation.

SCADA HeartBeat: The purpose of the SCADA HeartBeat feature is to have two sets of settings for the control and switch between these two setting sets based on the presence or absence of SCADA communications (utilizing the DNP protocol) to the control. The SCADA HeartBeat feature can be enabled from TapTalk Communications Software. There are two different types of SCADA HeartBeat modes that can be selected:

- SCADA HeartBeat for transformer control applications (LTC)
- SCADA HeartBeat for regulator control applications (Regulator)

Manual HeartBeat Timer: The Manual HeartBeat Timer feature provides a method to place the control in HeartBeat Manual operation (implemented from Comms only) and automatically place the control back in Auto mode based on a Timer setting (settable only via Comms).

Tapchanger Type Selection: Provides the user with the ability to set vendor specific regulator configuration settings in TapTalk.

Monitoring/Metering

Real-Time Metering: The following measured and calculated values are available in real-time:

- Primary Voltage
- Primary Source Voltage
- Primary Current
- Primary Watts
- Primary VArs
- Primary VA
- Average Load Voltage
- Meter Out Voltage
- Average Source Voltage
- Control Load kVA, or MVA
- Average Compensated Voltage
- Normalizing Voltage
- Average Load Current
- Power Factor Load, Lead/Lag
- Frequency
- Tap Position
- Drag Hands
- Raise/Lower Timer
- Intertap Timer
- Operation Counter
- Resettable Counter
- Neutral Counter
- RTN Status
- Counter towards RTN
- RTN Success Counter

Present Demand: The Present Demand feature captures the maximum values during the specified time interval. Time interval can be selected as 5, 10, 15, 30, or 60 minutes.

- Demand Load Voltage
- Primary Watts
- Primary VA
- Demand Primary Current
- Primary VArs

Demand History (Drag Hands Operation):

The following "drag-hand" values are stored with date and time stamping and are averaged over 32 seconds:

- Min Local Voltage
- Max Local Voltage

The following "drag-hand" values are stored with date and time stamping and are calculated over the demand time interval (5, 10, 15, 30, or 60 minutes) as selected by the user:

- Max Primary Current (Amps)
- Max Primary Watts (kW, or MW)
- Power Factor @ Max VA
- Max Primary VArs (kVAr or MVAr)
- Max Primary VA (kVA or MVA)

Energy Metering:

The following measured values are retained in non-volatile memory. A real time clock is utilized to record a date/time stamp for each quantity to indicate when the period of measurement was initiated.

- Watt Hours Forward (kWh)
- Watt Hours Reverse (kWh)
- VAr Hours Forward (kVArh)
- VAr Hours Reverse (kVArh)

Oscillograph:

The Oscillograph Recorder provides comprehensive data recording (voltage, current, and status input/output signals) for all monitored waveforms (at 16, 32 or 64 samples per cycle). Oscillograph data can be downloaded using the communications ports to any Windows™ based personal computer running the TapTalk S-6200 Communications Software. Once downloaded, the waveform data can be examined and printed using M-2829 TapPlot® Analysis Software which is built into TapTalk. The waveform data is also available in COMTRADE file format.

Sequence of Events:

The Sequence of Events Recorder provides comprehensive time tagged data recording of control parameters that include Voltage, Frequency, Tap Position, Current, Counters and Harmonics. The total number of events that can be recorded is 129. The Sequence of Events Recorder is triggered by user selectable programmable parameter logic or manually by the user.

Data Logging:

The Data Logging feature allows the user to record data internally into nonvolatile memory. The Data Log is saved in Comtrade format. The Data Log can be downloaded utilizing either MODBUS® or DNP protocols.

Inputs

Load Voltage Input: Nominal 120 Vac, 60 Hz (50 Hz optional); operates properly from 90 Vac to 140 Vac. If set at 60 Hz, the operating system frequency is from 55 to 65 Hz; if set at 50 Hz, the operating system frequency is from 45 to 55 Hz. The burden imposed on the input is 8 VA or less. The unit should be powered from a voltage transformer connected at the controlled voltage bus. The unit will withstand twice the voltage input for one second and four times the voltage input for one cycle.

Motor Power Input: Nominal 120 Vac or 240 Vac, at up to 6 A as required by the load, with no wiring changes required.

Motor Seal-In Input: Receives an input from the Cooper regulator motor holding switch.

Load Current Input: Line drop compensation is provided by a current transformer input with a 0.2 A full scale rating. A Beckwith Electric model M-0121 (5 A to 0.2 A) or M-0169A (5 A or 8.66 A to 0.2 A) Auxiliary Current Transformer is available when required. The burden imposed on the current source is 0.03 VA or less at 200 mA. The input will withstand 400 mA for two hours and 4 A for 1 second.

Control Power Backup Input: The standard Control Power Backup Input feature sustains operation of the control in the event of a loss of AC input power to the control. Raise and Lower commands are possible if the control's motor power remains energized. A DC power supply is required.

Counter Input: The Counter Input detects tap position changes and updates two counters, one presettable and one resettable.

Neutral Tap Position Detect Input: The Neutral Position Detect Input detects the neutral tap position, which assists the Motor Direct Drive KeepTrack™ tap position function.

Source Voltage Input: Nominal 120 Vac, 60 Hz (50 Hz optional); operates properly from 90 Vac to 140 Vac. If set at 60 Hz, the operating system frequency is from 55 to 65 Hz; if set at 50 Hz, the operating system frequency is from 45 to 55 Hz. The burden imposed on the input is 8 VA or less. The unit should be powered from a voltage transformer connected at the controlled voltage bus. The unit will withstand twice the voltage input for one second and four times the voltage input for one cycle. This input is used with the Reverse Power Measured feature when reverse power operation is desired and a Source Side PT input is available. The control can not display both Load Voltage and Source Voltage at the same time. The measurement of voltage is switched internally to this input when Reverse Power is sensed by the control in Reverse Power Measured mode.

Binary Inputs

Voltage Reduction 1 & 2 Inputs: These inputs provide three levels of programmable voltage reduction which can be manually invoked. The Voltage Reduction Level 2 input can be set to "Aux", and it's status monitored remotely via SCADA.

Non-Sequential/ Auto Tapchanger Inhibit Input: This input provides the means to perform non-sequential operations.

Outputs

Raise Output: Capable of switching 6 A at 120 Vac to 240 Vac motor power.

Lower Output: Capable of switching 6 A at 120 Vac to 240 Vac motor power.

User-Programmable Alarm Output: One Form "C" contact capable of switching 6 A at 125 Vac or 0.2 A at 125 Vdc.

Run Through Neutral

The control includes a Run Through Neutral feature that when enabled counts tapchanger operations and when user settable settings are met drives the tapchanger through the neutral position to swipe the reversing switch to prevent contact buildup and coking.

Front Panel Controls

Menu-driven access to all functions by way of seven pushbuttons and a two-line alphanumeric display. There are two programmable Access Codes available to provide various levels of access to the control functions.

The regulator control offers a 2-line by 20 character backlit LCD display for enhanced viewing in direct sunlight. It also offers a low-level LED backlight for reading in darker environments.

The Front Panel is available in either English or Spanish. The HMI screen display is also available in English or Spanish.

RAISE/LOWER switch allows local manual raise and lower commands to be initiated.

AUTO/OFF/MANUAL switch allows auto operation of the control or manual operation from the panel by using the Raise/Lower toggle switch.

VOLTAGE SOURCE switch disconnects processing power from the unit when selected to the **OFF** position. The **EXT** position allows the control to be powered from the front panel test jacks.

SCADA CUTOUT (LOCAL/REMOTE) switch allows the local blocking of write commands from COM1, COM2 or Ethernet.

DRAG HANDS RESET switch resets the tapchanger position indicator drag hands.

EXTERNAL POWER binding posts allow application of a 120 V RMS nominal voltage to the unit for test procedures.

METER OUT binding posts allow reading of the input voltage when used in conjunction with the **BIAS TEST VOLTAGE** screen.

SCAMP™ (SCADA Controllable Auto/Manual Pushbutton) optional pushbutton allows the Auto/Manual state on the control to be changed by a SCADA command or remotely utilizing TapTalk® Remote Control.

Smart Flash SD Card Slot

Allows the user to perform the following functions:

- Load Setpoints
- Save Setpoints
- Save Data Log
- Save Sequence of Events
- Save Oscillograph Records
- Clone Save
- Clone Load
- Load DNP Config
- Save DNP Config
- Firmware Update
- Save Metering Data
- Save Wake Screen Data
- SD Card User Access (Physical Security Key)
- Quick Capture

LED Indicators

Front panel LED indicators show the following control conditions: Out-of-Band **RAISE**, Out-of-Band **LOWER**, Reverse Power Flow **REV PWR** detected, CPU **OK**, **ALARM**, Voltage Reduction **V/RED** IN EFFECT, **MANUAL, LOCAL**, **NEUTRAL** and **TX/RX** Transmit and Receive.

Voltage Measurement Accuracy

Control accuracy is ±0.3 % when tested in accordance with the ANSI/IEEE C57.15.9-2009 standard over a temperature range of –40° C to +85° C.

Communications

The communication ports provide access to all features, including metering, software updates, and programming of all functions. This is accomplished using a connection from any Windows™ based computer running the TapTalk® S-6200 Communications Software or SCADA communications software.

Protocols: The standard protocols included in the M-6200A are DNP3.0 and MODBUS®. The USB port uses MODBUS for local communications. The optional Ethernet Port supports DNP3.0 and MODBUS protocols simultaneously. DNP Master Source Address Authentication is supported allowing multiple SCADA Masters to coexist on the same communications network.

Communications Via Direct Connection: TapTalk supports direct communication with a Beckwith Electric Digital Regulator Control using the applicable connector (USB cable) for the PC. Standard serial communications port may be specified as either RS-232 or RS-485. Optional serial communications port configurations include: ST-Serial Fiber Optic, V-Pin Serial Fiber Optic, RS-232 and RS-485.

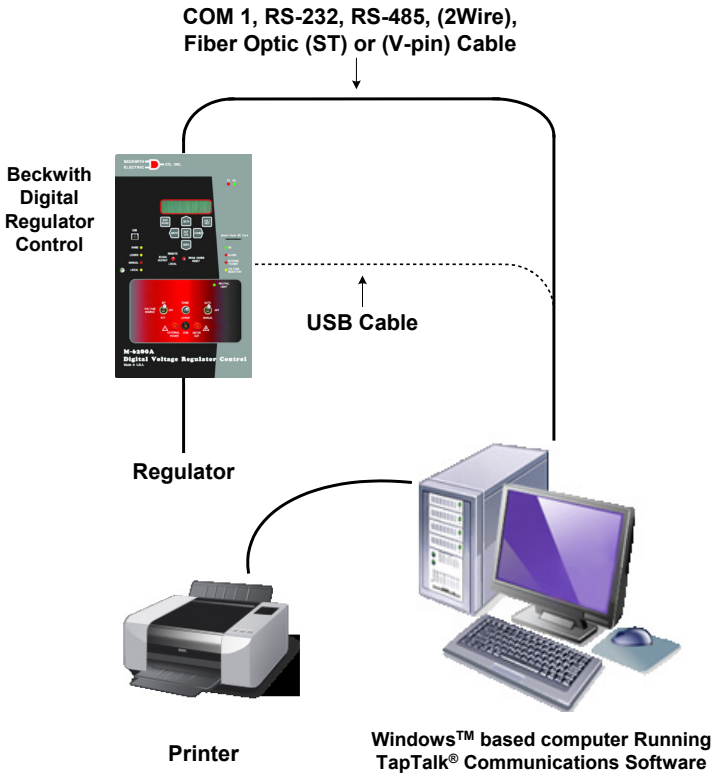


Figure 1 Direct Connection

Optional Ethernet Port: The optional Ethernet Port provides a RJ45 (10/100 Base-T) or a Fiber Optic through ST or SC connectors (100 Base-Fx) interface for ethernet communication to the M-6200A. The protocols supported are: MODBUS over TCP/IP, DNP3.0 over TCP/IP and DNP3.0 over UDP. The port supports up to eight concurrent connections. The maximum number of allowed DNP connections is five. The maximum number of MODBUS connections is eight. The port supports DHCP protocol and also allows manual configuration of the Ethernet port. MODBUS protocol "Port Number" and DNP Protocol "Port Number" are required for manual configuration. DNP Master Source Address Authentication is supported allowing multiple SCADA Masters to coexist on the same communications network.

Communications Using Networking: The addressing capability of the M-6200A allows networking of multiple Beckwith Electric Digital Regulator Controls. Each regulator control can be assigned a Communications Address, Feeder Address or Substation Address ranging from 1 to 65519. Selected commands may be broadcast to all controls on the network. Figures 2, 3 and 4 illustrate typical network configurations. Addresses 1 to 247 can be assigned to MODBUS and 1 to 65519 for DNP3.0.

Optional Bluetooth: The optional Bluetooth® (V2.0 +EDR Class 1 Type) provides wireless access to the M-6200A. With Bluetooth the user is able to configure the control, read status and metering values as well as change setpoints. This option can be field installed. There are two modes of operation for the Bluetooth:

Mode 0 – The device is discoverable and connectable to any client station.

Mode 1 – The device is non-discoverable but it is connectable to any client station who knows the control Bluetooth device address indicated under "**Control BT Device**" in the HMI.

Mode 1 – Has been added to meet CIP requirement. (CIP-0007-4 System Security Management) (R2.3)

Application: Using a PC or wireless modem, the operator has real-time, remote access to all functions of the Digital Regulator Control. The control can act as the monitoring point for all voltage, current, and related power quantities, thereby simplifying operation while avoiding transducers and multiple Remote Terminal Unit (RTU) analog inputs. The protocols implement half-duplex, two-way communications. This allows all functions, which would otherwise require the presence of an operator at the control, to be performed remotely. Communication capabilities include:

- Interrogation and modification of setpoints
- Broadcast of commands, such as tapchange inhibit and voltage reduction (up to three steps) to networked controls
- Recognition of alarm conditions, such as voltage extremes and excessive load
- Selective control of raise and lower tapchange operations
- Re-configuration of the control, such as a change to the demand integration time period or a selection of different alarm parameters
- Unsolicited exception reporting multicast capability using UDP
- DNP file transfer of Data Logging, Oscillography and Sequence of Events records

Unit Identifier: A 2-row by 20-character alphanumeric sequence, set by the user, can be used for unit identification.

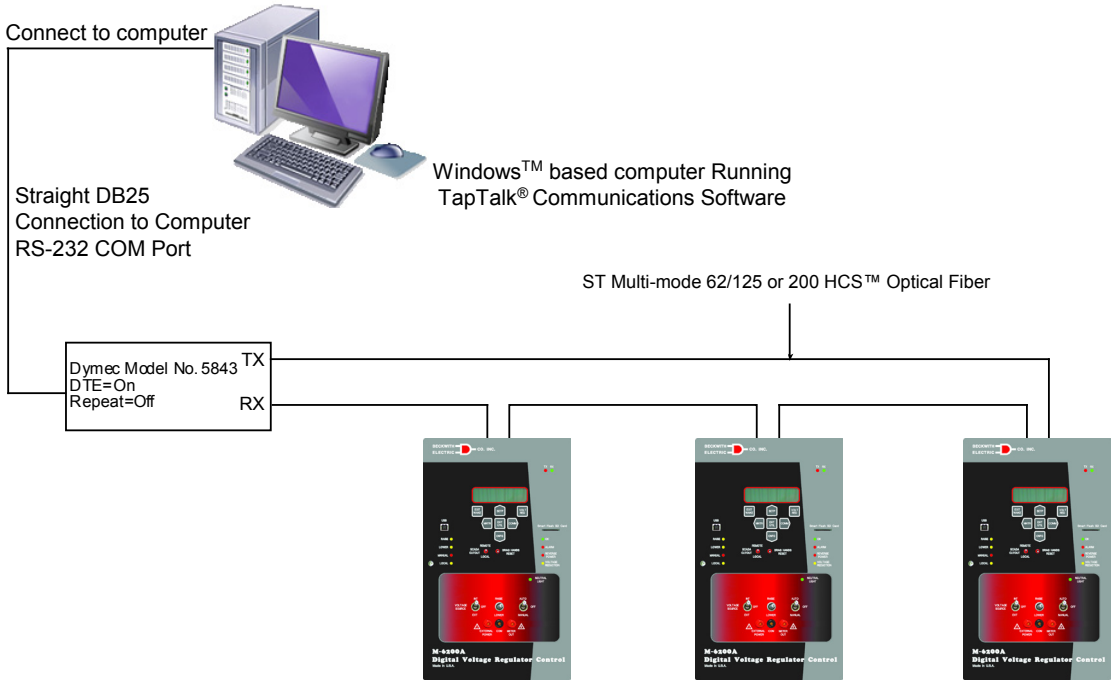


Figure 2 Fiber Optic Connection Loop

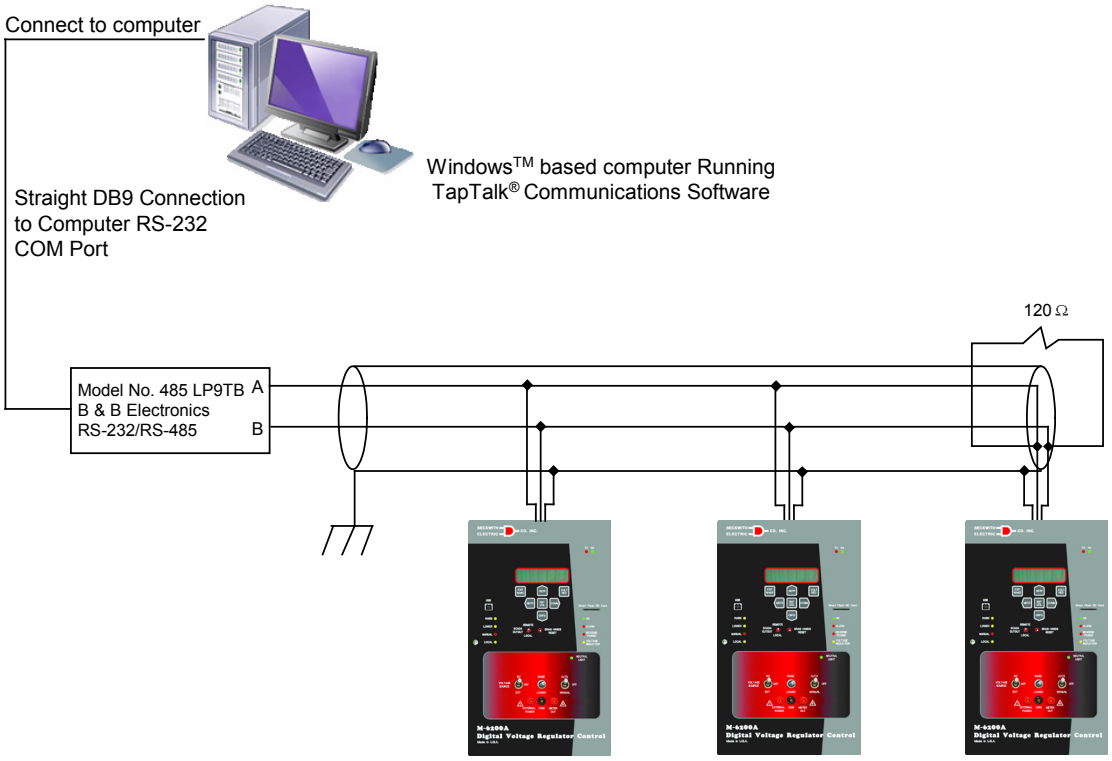


Figure 3 RS-485 Network Connection

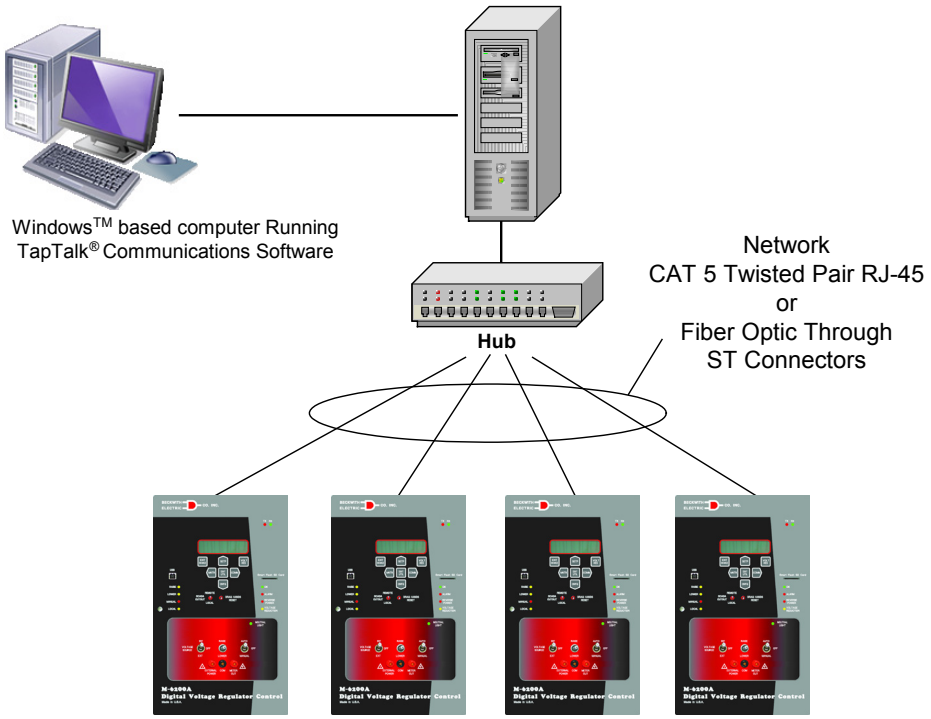


Figure 4 Optional Ethernet Network Connection

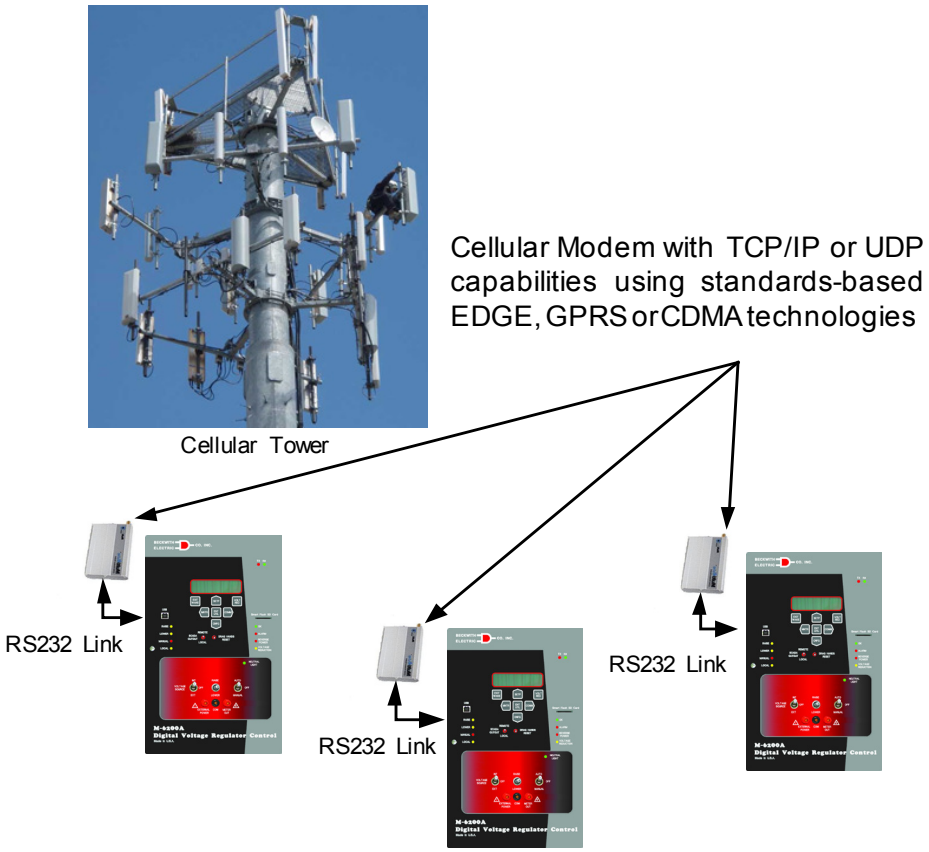


Figure 5 Cellular Modem Network

Environmental

Temperature: Control operates from –40° C to + 85° C.

■ **NOTE**: The LCD display's visible temperature range is –20° C to +70° C.

IEC 60068-2-1	Cold, –40° C
IEC 60068-2-2	Dry Heat, +80° C
IEC 60068-2-78	Damp Heat, +40° C @ 95% RH
IEC 60068-2-30	Damp Heat Condensing cycle 25° C, +55° C @ 95% RH

Transient Protection

High Voltage

All input and output terminals will withstand 2000 Vac rms to chassis or instrument ground for one minute with a leakage current not to exceed 25 mA, for all terminals to ground. Input and output circuits are electrically isolated from each other, from other circuits and from ground.

Surge Withstand Capability

IEEE C37.90.1-2002	2,500 V pk Oscillatory 4,000 V pk Fast Transient Burst
IEEE C37.90.1-1989	2,500 V pk Oscillatory 5,000 V pk Fast Transient

■**NOTE**: Disturbance is applied to digital data circuit (RS-485) ports through capacitive coupling clamp.

Radiated Immunity

IEC 60255-22-3 10 V/M

Fast Transient/Burst Immunity

IEC 60255-22-4-2008

Class A (4 Kv, 2.5 kHz)

■**NOTE**: Disturbance is applied to digital data circuit (RS-485) ports through capacitive coupling clamp.

Electrostatic Discharge

IEC 60255-22-2 (8 Kv) Point contact discharge

IEC 60255-22-2 (15 Kv) Air discharge

Voltage Withstand

Dielectric Withstand

IEC 60255-5 2,000 Vac for 1 minute applied to each independent circuit to earth
2,000 Vac for 1 minute applied between each independent circuit

Impulse Voltage

IEC 60255-5 5,000 V pk, +/- polarity applied to each independent circuit to earth
5,000 V pk, +/- polarity applied between each independent circuit
1.2 µs by 50 µs, 500 ohms impedance, three surges at 1 every 5 seconds

Insulation Resistance

IEC 60255-5 > 100 Megaohms

Surge Immunity

IEC 60255-22-5 ±4,000 V pk; 12 ohms/40 ohms impedance

Voltage Interruptions Immunity

IEC 60255-11-2008

Mechanical Environment

IEC 60255-21-1	Vibration Response Class 1	0.5 g
	Vibration Endurance Class 1	1 g
IEC 60255-21-2	Shock Response Class 1	5 g
	Shock Withstand Class 1	15 g
	Bump Endurance Class 1	10 g

Physical

Size: 9.25” wide x 15.00” high x 3.25” deep (23.5 cm x 38.1 cm x 8.26 cm)

Mounting: Unit mounts directly into General Electric, Siemens, Howard Industries and Cooper Regulator control cabinets with appropriate installation kits.

Approximate Weight: 6 lbs, 5 oz (2.95 kg)

Approximate Shipping Weight: 10 lbs, 5 oz (4.56 kg)

Recommended Storage Parameters

Temperature: 5° C to 40° C.

Humidity: Maximum relative humidity 80% for temperatures up to 31° C, decreasing to 31° C linearly to 50% relative humidity at 40° C.

Environment: Storage area to be free of dust, corrosive gasses, flammable materials, dew, percolating water, rain and solar radiation.

M-2026/M-2027 Control Power Backup Supplies

M-2026 AC-DC Control Power Backup Supply

The M-2026 Control Power Backup Supply will accept either an AC or DC input over the following ranges:

- 21 to 32 V
- 42 to 60 V
- 105 to 145 V

■ **NOTE**: It must be ordered in the input range needed.

The M-2026 will output a regulated +12 Vdc (±0.5 V) output voltage. The unit incorporates a fused input, surge protection, and reverse polarity protection. The M-2026 is capable of up to a 1.5 Ampere output.

M-2027 Control Power Backup Supply-AC Only

The M-2027 will accept an AC (105 to 140 Vac, 50/60 Hz) input and output +12 Vdc (Nominal). The M-2027 is capable of loads up to 1.0 Ampere. The unit incorporates a fused input and surge protection.

The M-2026 and M-2027 units are housed in a non-weathertight enclosure and equipped with screw terminal blocks for input and output connections.

Use of a control power backup supply other than the M-2026 and M-2027 will compromise system reliability if the power supplies chosen do not conform to the specifications listed above.

Patent & Warranty

The Regulator Controls are covered by U.S. Patents 5,315,527 and 5,581,173.

The Regulator Controls, M-2026 AC-DC Control Power Backup Supply and M-2027 Control Power Backup Supply-AC Only are covered by a ten year warranty from date of shipment.

Specification subject to change without notice.

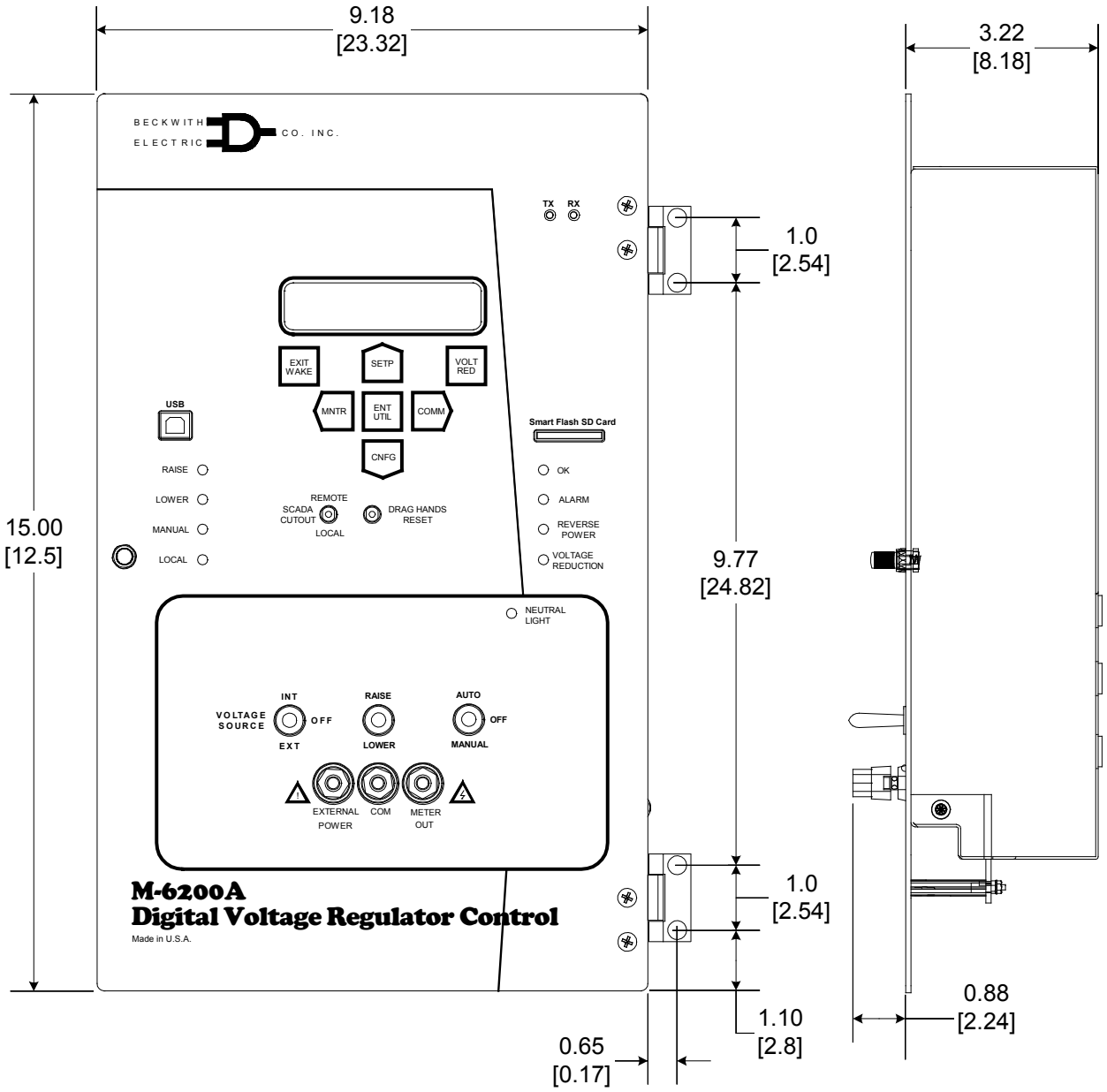


Figure 6 M-6200A Control Outline Dimensions

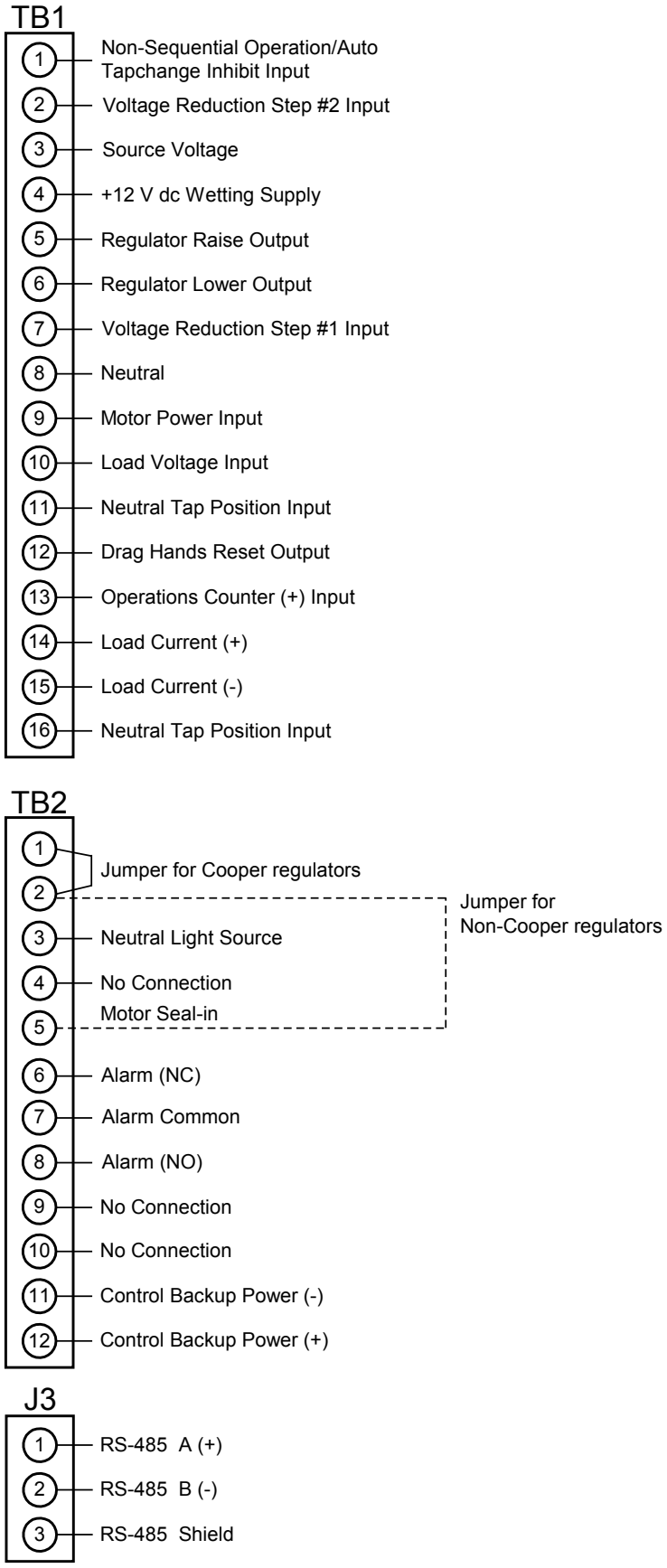


Figure 7 M-6200A External Connections

BECKWITH ELECTRIC CO., INC.
6190 - 118th Avenue North • Largo, Florida 33773-3724 U.S.A.
PHONE (727) 544-2326 • FAX (727) 546-0121
marketing@beckwithelectric.com
www.beckwithelectric.com
ISO 9001:2008

800-6200A-SP-05 10/13

WARNING

DANGEROUS VOLTAGES, capable of causing death or serious injury, are present on the external terminals and inside the equipment. Use extreme caution and follow all safety rules when handling, testing or adjusting the equipment. However, these internal voltage levels are no greater than the voltages applied to the external terminals.

DANGER! HIGH VOLTAGE

– This sign warns that the area is connected to a dangerous high voltage, and you must never touch it.

PERSONNEL SAFETY PRECAUTIONS

The following general rules and other specific warnings throughout the manual must be followed during application, test or repair of this equipment. Failure to do so will violate standards for safety in the design, manufacture, and intended use of the product. Qualified personnel should be the only ones who operate and maintain this equipment. Beckwith Electric Co., Inc. assumes no liability for the customer's failure to comply with these requirements.

– This sign means that you should refer to the corresponding section of the operation manual for important information before proceeding.

Always Ground the Equipment

To avoid possible shock hazard, the chassis must be connected to an electrical ground. When servicing equipment in a test area, the Protective Earth Terminal must be attached to a separate ground securely by use of a tool, since it is not grounded by external connectors.

Do NOT operate in an explosive environment

Do not operate this equipment in the presence of flammable or explosive gases or fumes. To do so would risk a possible fire or explosion.

Keep away from live circuits

Operating personnel must not remove the cover or expose the printed circuit board while power is applied. In no case may components be replaced with power applied. In some instances, dangerous voltages may exist even when power is disconnected. To avoid electrical shock, always disconnect power and discharge circuits before working on the unit.

Exercise care during installation, operation, & maintenance procedures

The equipment described in this manual contains voltages high enough to cause serious injury or death. Only qualified personnel should install, operate, test, and maintain this equipment. Be sure that all personnel safety procedures are carefully followed. Exercise due care when operating or servicing alone.

Do not modify equipment

Do not perform any unauthorized modifications on this instrument. Return of the unit to a Beckwith Electric repair facility is preferred. If authorized modifications are to be attempted, be sure to follow replacement procedures carefully to assure that safety features are maintained.

PRODUCT CAUTIONS

Before attempting any test, calibration, or maintenance procedure, personnel must be completely familiar with the particular circuitry of this unit, and have an adequate understanding of field effect devices. If a component is found to be defective, always follow replacement procedures carefully to that assure safety features are maintained. Always replace components with those of equal or better quality as shown in the Parts List of the Instruction Book.

Avoid static charge

This unit contains MOS circuitry, which can be damaged by improper test or rework procedures. Care should be taken to avoid static charge on work surfaces and service personnel.

Use caution when measuring resistances

Any attempt to measure resistances between points on the printed circuit board, unless otherwise noted in the Instruction Book, is likely to cause damage to the unit.

WARNING

This equipment contains a certified transmitter found to comply with FCC Part 15.247 rules regarding frequency hopping spread spectrum intentional radiators. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Only the antenna provided is authorized for use with the M-6200A. If the antenna is lost or damaged, please contact Beckwith Electric Co., Inc. to secure a replacement antenna.

This product generates, uses, and can radiate radio frequency (RF). If it is not installed and used in accordance with the operating instructions, it can cause harmful interference to communications. If this equipment causes harmful interference to radio or television reception, the user should try and correct the interference by:

- Reorienting or relocating the receiving/transmitting antenna
- Increasing the separation between the equipment and the M-6200A
- Connecting the equipment into an outlet on a different circuit from the M-6200A

If these do not correct the interference, consult an experienced radio/television technician for assistance. Correcting such interference is the responsibility of the user, not the manufacturer.

Changes or modifications not expressly approved by Beckwith Electric Co., Inc. may void the user's authority to operate the equipment.

FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for uncontrolled equipment. This equipment should be installed and operated with a minimum distance of at least 20 cm between the radiator and person's body (excluding extremities) and must not be located or operated with any other antenna or transmitter.

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M-6200A Regulator Control Instruction Book

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Chapter 3 TapTalk® S-6200

Chapter 3 TapTalk® S-6200 (Cont'd.)

Chapter 3 TapTalk® S-6200 (Cont'd.)

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Chapter 4 System Setup and Configuration

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Chapter 4 System Setup and Configuration (Cont'd.)

Chapter 4 System Setup and Configuration (Cont'd.)

Chapter 5 Connections

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Chapter 5 Connections (Cont'd.)

Chapter 6 Testing

Appendix A HMI

Appendix B Setpoint, Configuration and Communication Record Forms

Appendix C DNP Configuration Editor

Printed in U.S.A.

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1 Introduction

1.1 Instruction Book Contents

This instruction book includes six Chapters and five Appendices.

Chapter 1: Introduction

Chapter One introduces the instruction book contents, provides an overview of M-6200A Regulator Control and describes the available accessories.

Chapter 2: Operation

Chapter Two provides the necessary instructions regarding operation of the M-6200A. Operation of the M-6200A is accomplished by utilizing either the unit's front panel controls or through the TapTalk® S-6200 Communications Software.

Chapter 3: TapTalk

Chapter 3 provides a description of each element of the TapTalk S-6200 Communications Software. The TapTalk menu structure and commands are described for each feature and function.

Chapter 4: System Setup and Configuration

Chapter Four is designed for the person(s) responsible for the direct setting and configuration of the control. It describes the procedures for entering all required data into the M-6200A. It also illustrates the definition of system quantities and equipment characteristics required by the M-6200A, and describes the individual control settings.

Chapter 5: Installation

The person or group responsible for the installation of the M-6200A will find herein all mechanical information required for physical installation, equipment ratings, and all external connections in this chapter.

Chapter 6: Testing

This chapter provides step-by-step test procedures for Bench Testing, Check-out, Operational, and In-Service tests.

Appendix A: Human Machine Interface (HMI)

This Appendix provides a graphical representation of the Human Machine Interface (HMI) menu structure. It also includes descriptions of each menu element and their default values.

Appendix B: Setpoint Configuration and Communication Record Forms

This Appendix provides a set of forms to record and document the settings required for the proper operation of the M-6200A.

Appendix C: DNP Configuration Editor

This Appendix includes the DNP Configuration Editor features and functions.

Appendix D: Self-Test Error Codes

This Appendix lists all error codes and their definitions.

Appendix E: Index

This Appendix includes the index for the M-6200A Instruction Book.

1.2 General Overview of M-6200A Regulator Control

The M-6200A Digital Regulator Control is a microprocessor-based step-voltage regulator load tapchanger control.

The control is designed for initial OEM installation on new regulators or to replace a particular manufacturer's regulator control. Figure 1-1 provides an overview of the functional elements of the control. The M-6200A is designed to mechanically and electrically replace an old control, with mounting hardware to facilitate the replacement. See **Chapter 5**, **Installation** for detailed information.

Interrogation of the control and setting changes are made using either the front panel Human Machine Interface (HMI), or through the communications ports (MODBUS® or DNP3.0 protocol) utilizing TapTalk® S-6200 Communications Software. The HMI consists of a 20-character by 2-line backlit LCD display and seven pushbuttons. Two Access Codes are available to the user from the pushbuttons. All setpoints are stored in nonvolatile memory which is unaffected by control voltage disturbances.

Two Tapchange operation counters are provided. One counter may be reset; the other may be preset by a user with appropriate security Access Codes.

Eleven LEDs are used to indicate Tapchanger Band Status, timing for **RAISE** and **LOWER, REV PWR** Reverse Power detection, CPU **OK**, **ALARM**, **V/RED** Voltage Reduction in Effect, **MANUAL**, **LOCAL**, **TX**/**RX** and **NEUTRAL LIGHT** indicator.

The alphanumeric display and seven pushbutton interface provides complete front panel access to the scrolling menu program shown in Appendix A, Figures A-1 through A-5. The control applies to regulators with ±16 taps and one neutral position.

1.3 Accessories

TapTalk® S-6200 Communications Software

TapTalk is a Windows-based communications software program available for remote control and metering of the M-6200A Regulator Control. It is designed to interface with the microprocessor of the control through the standard USB Port (MODBUS®) and all installed communication ports. The TapTalk software displays all pertinent operating information. All operations that can be performed from the front panel user interface of the control can be duplicated remotely, through TapTalk. These operations include:

- Changing setpoint values. This includes those values for normal tapchanger control operation, as well as custom configuration to the site.
- Monitoring values. This includes measured and calculated values of real-time operating parameters.
- Data logging. The control can internally store various parameters at selected intervals. The TapTalk program can download this data into an Excel® spreadsheet and display. Alternatively, the PC can be programmed to poll the control and obtain a pre-selected list of parameters at selected intervals.
- Remote Control. The Remote Control feature allows the user to remotely raise or lower one tap position as well as apply voltage reduction to the target control. Also, the user can configure the control "Block Auto via Communication" and "Save Comm Block at Power Off" features.

Optional Communication Ports

The M-6200A Digital Regulator Control can be equipped with the optional RS-232 Port or Bluetooth® capability (COM2). COM2 is located on the top rear of the unit. COM2 utilizes the DNP3.0 and MODBUS protocols.

The M-6200A can also be equipped with an optional Ethernet Port through a RJ-45 Jack (10/100 Base-T) or Fiber Optic through ST or SC connectors (100 Base-Fx). These ports support DNP over TCP/IP and MODBUS over TCP/IP.

Backup Relay

The M-0329B Backup Relay or the M-5329 Multiphase Backup Relay are available to provide protection against failure of the primary control.

M-2026 AC-DC Control Power Backup Supply

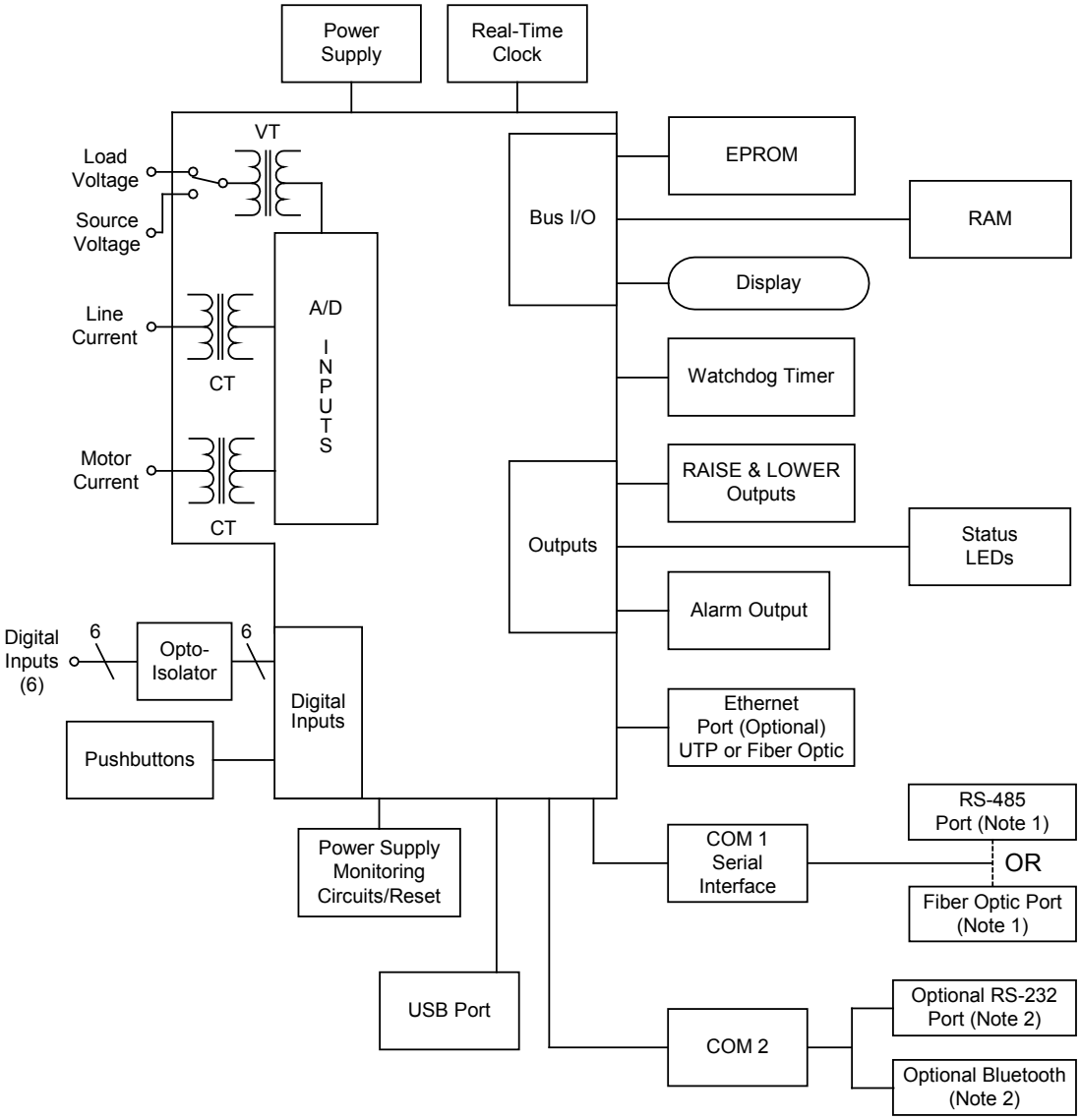
The M-2026 accepts either AC or DC input over a range of 21 to 32, 42 to 60 and 105 to 145 V. The unit will supply a regulated +12 Vdc at up to a 1.5 A output. The unit includes a fused input, surge protection, and reverse polarity protection.

M-2027 Control Power Backup Supply - AC Only

The M-2027 will accept an AC input over a range of 105 to 140 Vac at 50/60 Hz. The unit will supply a +12 Vdc at up to 1.0 A output.

B-0920 Control Power Backup Harness

The B-0920 Control Power Backup Harness provides fused (3A) power to the M-6200A when a M-2026 or M-2027 Control Power Backup Supply is not used.



■**NOTES**:

1. The RS-485 and Fiber Optic ports are standard on COM 1. However, only one can be active at a time.

2. COM 2 is limited to either the optional RS-232 Port or the optional Bluetooth® capability. Only one option can be active on COM 2 at a time.

Figure 1-1 Functional Diagram

2 Operation

The purpose of this chapter is to describe the steps that are necessary to interrogate the M-6200A utilizing either the front panel HMI or a PC running TapTalk® S-6200 Communications Software through any of the available communications ports. These instructions assume that the following conditions exist:

- The unit is energized from an appropriate power supply (Green OK status light is illuminated).

  See **Chapter 5**, **Installation**, Section 5.2, External Connections, for power supply connection details.
- For PC communications, TapTalk is installed on the host PC.

  See **Chapter 5**, **Installation**, Section 5.7, TapTalk S-6200 Communications Software Installation, if TapTalk is not installed.
- For PC communication, initial PC communication has been established with the unit.

If this is the first attempt to establish communications with the unit, then see **Chapter 5**, **Installation**, Section 5.8, Activating Initial Local Communications.

Message Screens and Access Codes

See Chapter 4 for System Setup, Configuration and Setpoint information. M-6200A operation from either TapTalk or HMI is described herein.

2.0 Operations Quick Index

2.1 Front Panel Controls and Indicators Overview

Display and Pushbuttons

The front-panel user interface consists of a Liquid Crystal Display (LCD), directional (Hot Buttons), **EXIT**, **ENT**, and **VR** pushbuttons, and the status indicators as shown in Figure 2-1, M-6200A Front Panel.

The display normally displays the user lines and remains so until the ⬆, ⬇, ➡, ⬅ or **ENT** pushbutton is depressed. Pressing any pushbutton will display the heading corresponding to the "Hot Button" label above the pushbutton (Figure 2-1). The "Hot Buttons" directly access the menu headers and can only be selected from either the user lines or the cycling display.

⬆, ⬇, ⬅ and ➡ Pushbuttons

The directional pushbuttons have three functions.

- They are used to change screens and cycle through selections.
- They are used to enter new values by incrementing or decrementing the displayed value. The new value is not stored until the **ENT** pushbutton is pressed a second time.
- Activate the "Hot Button" feature for the corresponding labels above each pushbutton to jump to that screen.

HMI Menu Structure

The HMI menu structure (Appendix A) consists of three levels: Header, Sub-Header and Data/Data Entry. From the header level (Figure 2-2) the user can navigate to the adjacent headers with the LEFT and RIGHT pushbuttons, go to the sub-header level by pressing ENT or DOWN pushbutton, or clear the screen by pressing the EXIT pushbutton.

From the sub-header level, the user can navigate to the adjacent sub-headers with the LEFT and RIGHT pushbuttons, return to the header level by pressing the EXIT or UP pushbuttons, or enter the data/data entry level by pressing ENT or DOWN. Once in the data/data entry screens, the user can navigate through the list with the UP and DOWN pushbuttons. In this level the list wraps around. To exit the level, the user can press EXIT to return to the corresponding sub-header, or use the LEFT and RIGHT pushbuttons to go to the adjacent sub-header level. To enter data, reset parameters or access data screens, press ENT.

ENT Pushbutton

The **ENT** pushbutton is a hot button for the "Utility Menu". It is also used to perform the following functions:

- Enter the "edit" mode of a screen
- Store a setpoint or condition in memory
- Enter the sub-header or data level
- Reset certain monitoring screens

EXIT Pushbutton

The **EXIT** pushbutton is a hot button for a unit "wakeup", which starts cycling through a series of user selectable metering and tap information screens. The user can move up and down the automatic cycling using the UP and DOWN pushbuttons. Pressing EXIT will stop the cycling on the displayed parameter. The screens for the wakeup sequence can be enabled or disabled from the TapTalk® Communications Software (See **Section 4.1, Unit Setup**).

The **EXIT** pushbutton is also used to perform the following functions:

- Exit a level to the next higher level
- Cancel data entry
- Clear the screen when at the header level

Data Entry Screens

Data entry screens are of three types:

- Alphanumeric
- List
- Bit Mask

For Alphanumeric Data, the LEFT and RIGHT pushbuttons advance the cursor to the digit to be edited and the UP and DOWN pushbuttons change the value. For List Data, the UP and DOWN pushbuttons change the data. For Bit Mask (i.e. Prog Alarm Function) the LEFT and RIGHT pushbuttons move the cursor to the bit and the UP and DOWN pushbuttons change the value. For all screens the ENT pushbutton saves the value and EXIT pushbutton cancels the operation. A "C" indicates the user is in the edit mode.

Power Up Screens

Each time the control is powered up, it will briefly display a series of screens that include:

- User Lines
- Control Firmware Number
- Serial Number
- Date
- Time of Day

Screen Blanking

The display automatically displays the user lines after exiting from any menu, or from any screen after 15 minutes of unattended operation.

LCD Screen Contrast

The LCD screen contrast can be set/reset from the control front panel through the HMI menu item or at any time. Pressing the Right and Left arrow pushbuttons at the same time displays the LCD Contrast screen which cycles from dim to bright. Selecting ENT during the cycle sets the displayed contrast to the value at the time ENT was pressed. The LCD Screen Contrast adjustment menu item is located in the Communication/HMI menu.

"C" CHANGE Prompt

This prompt, in the bottom right corner of a screen, is enabled by initially pressing **Utility/ENT**. This prompt indicates that the user can change a setting using the ⬆ or ⬇ pushbuttons to increment or decrement the settings. Values have factory preset increments, such as 0.1 volt or 1 second. Press **ENT** the second time to execute the setting change.

"ENT" Prompt

When the **"E"** prompt appears in the top right corner of the display window it indicates that the value of the display will reset if the **ENT** pushbutton is pressed.

⬅ and ➡ Prompt

Some setpoints screens include the Left and Right Arrows but do not move to the adjacent sub-header, but instead go to a configuration screen.

Volt Red Pushbutton (Voltage Reduction)

The **VR** pushbutton acts as a "hot" key to allow the user to change the Voltage Reduction status from the front panel. It can only be accessed when the screen displays the user lines, or a cycling message is being displayed on the front panel. The Voltage Reduction pushbutton allows the user to apply 3 steps of voltage reduction.

Optional SCAMP Pushbutton

SCAMP™ (SCADA Controllable Auto/Manual Pushbutton) optional pushbutton allows the Auto/Manual state on the control to be changed by a SCADA command or remotely utilizing the TapTalk® Remote Control "SCAMP Control" feature.

SCAMP Control From TapTalk

To change the SCAMP Auto/Manual mode from TapTalk, proceed as follows:

1. Select **Utility/Remote Control** from the TapTalk toolbar. TapTalk will display the "Remote Control with SCAMP" dialog screen (Figure 2-49).
2. From the "SCAMP Control" section of the dialog screen select either "Manual" or "Auto".

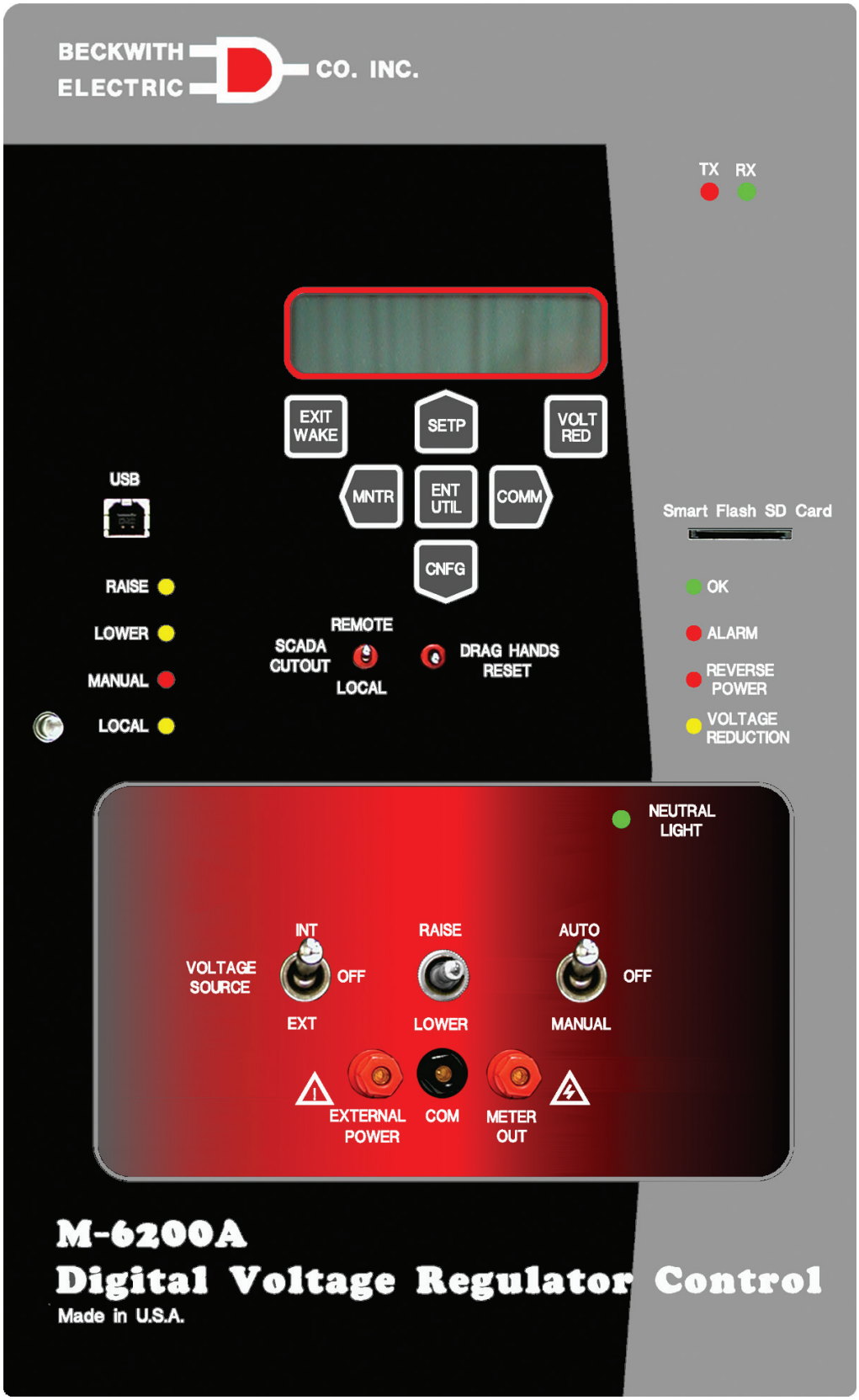


Figure 2-1 M-6200A Front Panel

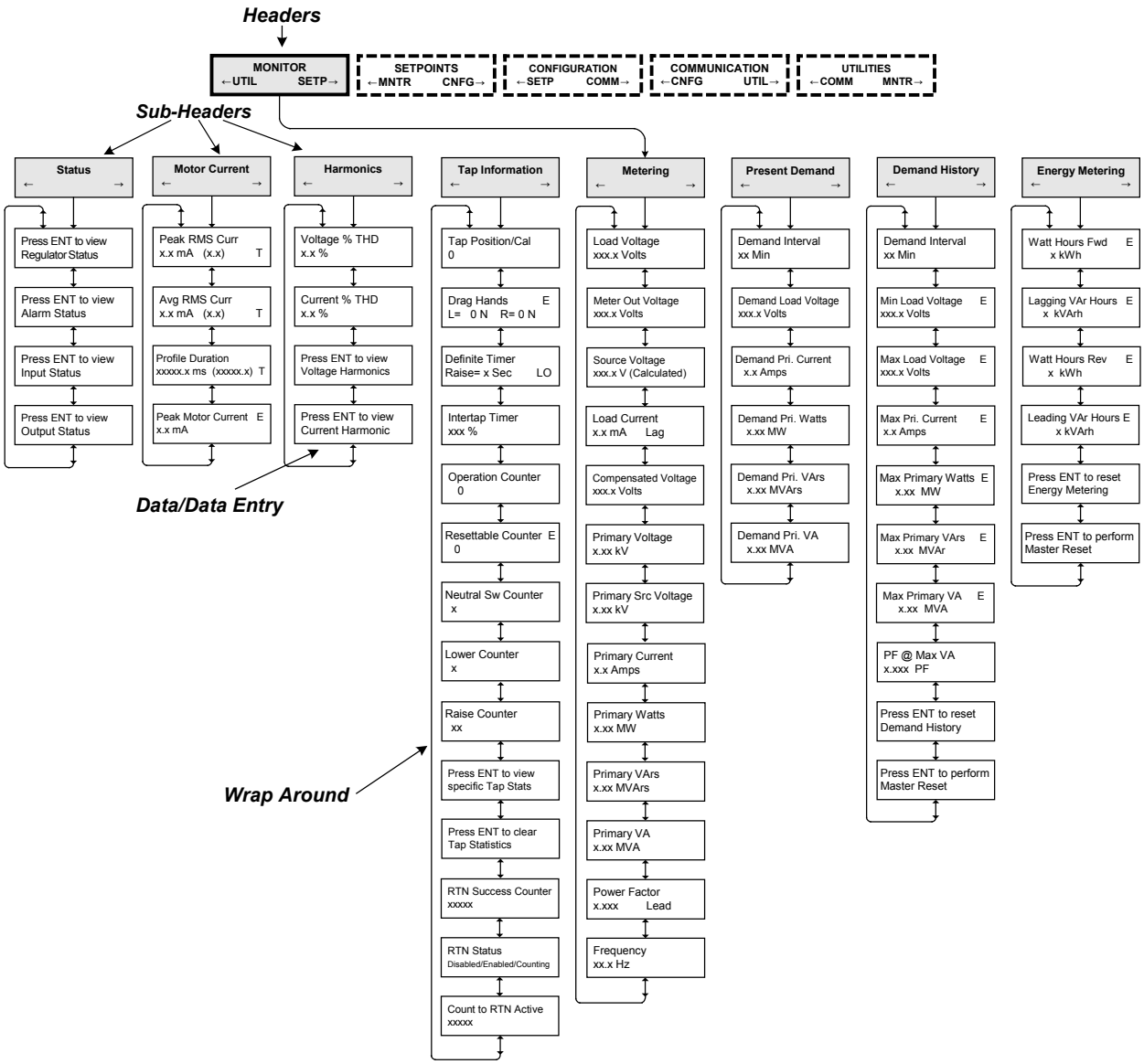


Figure 2-2 Example of HMI Menu Structure, Header, Sub-Header and Data/Data Entry Menus

Status Indicators

RAISE LED

The (yellow) LED illuminates when the voltage is below the lower band edge and the timer has started timing for a tapchanger Raise operation.

LOWER LED

The (yellow) LED illuminates that the voltage is above the upper band edge and the timer has started timing for a tapchanger Lower operation.

REV PWR LED

The (red) LED will illuminate to indicate when the unit detects reverse power flow.

OK LED

The (green) LED will remain illuminated whenever power is applied to the unit and the control is functioning properly. The OK LED will also extinguish when a Motor Seal-in Failure Block is in effect.

ALARM LED

The (red) LED will illuminate when any of the Programmable ALARM Functions set the output relay to true.

V/RED LED

The (yellow) LED will flash corresponding to the level of voltage reduction that has been invoked. This is true for any voltage reduction process whether it came from an external contact, any Comm input or HMI.

- 1 Flash for Level 1 Voltage Reduction
- 2 Flashes for Level 2
- 3 Flashes for Level 3

MANUAL LED

The (red) LED will illuminate when Auto operation of the control has been blocked from any Com port. It will also illuminate when Manual Mode has been selected using the Front Panel Auto/Manual Pushbutton or Toggle switch.

LOCAL LED

The (yellow) LED will illuminate when all SCADA write capability to the control is blocked.

COM1 TX/RX LEDS

The (red) TX and (green) RX LEDs indicate that the control is transmitting and/or receiving through COM1. Also, during the boot-up sequence the TX and RX LEDs will blink indicating that the memory test is in progress. If the memory test is successful, then the TX and RX LEDs will be extinguished. If the memory test fails then both TX and RX LEDs will illuminate.

NEUTRAL LIGHT LED

The (green) Neutral Light illuminates when the regulator is in the neutral tap position.

Control Switches

RAISE/OFF/LOWER

The Raise/Off/Lower switch allows local manual raise and lower commands to be initiated

AUTO/OFF/MANUAL

The Auto/Off/Manual switch allows manual operation of the control.

VOLTAGE SOURCE

The Voltage Source switch disconnects the voltage transformer input and connects the **EXTERNAL POWER** binding posts to the voltage input and motor circuit.

▲ **CAUTION**: Do not reverse the ground and hot wires when connecting an external source. A U_L recognized replaceable fuse, 3 A, 250 Vac, 3 AG fuse is installed to protect the control from damage if these connections are accidentally reversed.

With the **VOLTAGE SOURCE** switch in the **EXT** position, the sensing and motor power circuits are connected to the External Power binding post on the front panel. The unit can be tested using an external 120 V RMS source of proper polarity applied to these terminals. Testing can be accomplished by adjusting the amplitude of the external source.

The **VOLTAGE SOURCE** switch will disconnect all power from the unit when selected to the **EXT** position with no source connected to the front panel voltage inputs.

SCADA CUTOUT (REMOTE/LOCAL)

The SCADA Cutout switch allows local blocking of write commands from COM1, COM2 or Ethernet.

DRAG HANDS RESET

The Drag Hands Reset switch resets the tapchanger position indicator drag hands.

Binding Posts

■ **NOTE:** The expected power consumption of the control (burden) is a maximum of 8 VA at 140 Vac input.

WARNING: Operating personnel MUST NOT connect uninsulated test connections to the binding post as they can create a shock hazard.

EXTERNAL POWER binding posts allow application of a 120 V RMS nominal voltage to the unit for test procedures.

WARNING: A shock hazard exists due to the presence of voltage on the Meter Out Binding Posts.

METER OUT binding posts allow reading of the input voltage.

Smart Flash SD Card Slot

The Smart Flash SD Card Slot allows the user to:

- Quick Capture
- Load and Save Setpoints
- Save Datalog files
- Save Sequence of Events files
- Save Oscillograph records
- Clone Save and Load
- Load and Save DNP files
- Update Firmware
- Save Wake-up Screen parameters
- Save All Metering parameters
- Utilize the SD Card as an Access Code Key

The steps necessary to perform these actions are described later in this chapter.

Fuses

▲ **CAUTION:** Failure to utilize proper replacement fuses will result in damage to the control.

The Voltage Regulator Control back panel provides access to three U_L recognized replaceable fuses.

- Test – 3 A, 250 Vac, 3 AG
  BECO Part No. 420-00826
- Motor Power – 6 A, 250 Vac, 3 AG
  BECO Part No. 420-00871
- Voltage – 0.5 A, 250 Vac, 3 AG
  BECO Part No. 420-00832

Replace using proper type voltage and current rating.

2.2 Operation (HMI/TapTalk)

MESSAGE SCREENS

Default Message Screen

When the M-6200A is energized and unattended, the User Logo lines are displayed.

Local Voltage Reduction Screen

If Local Voltage Reduction is active, the appropriate Voltage Reduction Screen will be displayed. When Local Voltage Reduction is terminated, then the display will return to the User Lines.

Predictive Maintenance Alarm Screen

The Predictive Maintenance Alarm will initiate a cycling display as long as the alarm is active.

Oscillograph Record Triggered Screen

The Oscillograph Record Triggered will initiate a cycling display indicating that there is an oscillograph record available for download. The screen will be displayed until the oscillograph record is cleared.

If the "Oscillograph Scroll Message" feature is enabled (default setting is ENABLED) and the Oscillograph has been triggered, a cycling display indicating that there is an oscillograph record available for download will be displayed. The screen will be displayed until the oscillograph record is cleared or the "Oscillograph Scroll Message" is disabled. However, if the Oscillograph file is not cleared, re-enabling this feature will restart the cycling.

The "Oscillograph Record Triggered" cycling display can be enabled from TapTalk® by navigating to the "Oscillograph Scroll Message" (Setup/Oscillograph/Scroll Message) dialog box (Figure 2-3) and selecting "Enable". It can also be enabled from the HMI by navigating to the "Communication HMI" menu.

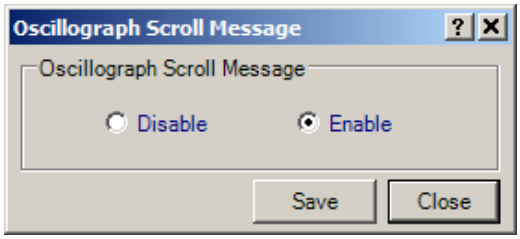


Figure 2-3 Oscillograph Scroll Message Dialog Screen

Wakeup Message Screens

If the "EXIT/WAKE" pushbutton is selected, then control will respond as follows:

- Pressing "EXIT/WAKE" when User Lines are being displayed will initiate a stepped display of the selected Wakeup parameters for a period of 15 minutes and then return to the User Lines display.
- If no Wakeup screens are selected, then nothing will be displayed and the User Lines will blink for a moment.

■ **NOTE:** The Front Panel Drag Hand Reset only resets the Tap position Drag Hands.

- While the stepped parameter display is in effect, when ENT is pressed on any demand metering value, all demand metering Drag Hand parameters will be reset. This is also true for all metering Drag Hand values when ENT is pressed on an energy metering menu.
- The Wakeup stepped display can be stopped on the displayed parameter by selecting EXIT. Select EXIT again to terminate the stepped parameter display and return to the User Lines.

  The Wakeup screen values can be browsed by utilizing the Up and Down arrow pushbuttons. In this mode, if the ENT pushbutton is pressed while on a demand or energy metering value, it will only reset that individual Drag Hand value.
- When there is a Smart Flash SD Card present while in the Wakeup screen menu, an additional Smart Flash SD Card menu item will be present. All Wakeup screen parameters can be saved to the Smart Flash SD Card in *.csv format by pressing ENT which initiates the following sequence of screens.

Wakeup Screen Parameter Save to a Smart Flash SD Card

To save Wakeup screen parameters to a Smart Flash SD Card proceed as follows:

1. Verify that a (FAT) formatted Smart Flash SD Card is inserted into the Smart Flash SD Card slot.
2. Press "WAKE/EXIT" to initiate the Wakeup screen cycling display.
3. When the "Save Wake Data to SD Press ENT to begin" screen is displayed, press the ENT pushbutton. The control will display the following:

```
Enter file name
SNXXXXX (Control Serial No.)
```

4. Utilizing the Up/Down and Left/Right arrow pushbuttons enter the desired "File Name".
5. Press the ENT pushbutton, the control will display the following sequence of screens.

```
Saving CSV...
"File Name"
```

```
Save Wake Data to SD
Press ENT to begin
```

Alarms

If enabled the following alarms will be displayed on the HMI when the alarm condition is active:

- Communication Block
- Block Raise Limit
- Block Lower Limit
- Voltage Reduction
- Reverse Power Flow
- Line Current Limit
- Tap Block Raise
- Tap Block Lower
- Self Test Error Code
- LDC/LDZ
- Abnormal Tap Position
- VAr Bias Lag
- VAr Bias Lead
- Backup Power Fail
- Motor Seal-in Failure
- Low Current Block
- RTN Fail to Operate
- Op Count Signal
- Individual Tap Wear
- Lagging VAr
- Lagging Power Factor
- Leading VAr
- Leading Power Factor

Access Codes

To prevent unauthorized access to the control functions, there are provisions in the software for assigning a Level 1 and/or Level 2 Access Code (up to six characters). A fixed factory assigned Level 3 Access Code is required for changing calibration factors. When Level 1 or Level 2 Access Codes are active, then an additional 30 Level Access Codes (up to 15 characters) can be enabled as either Level 1 or Level 2. The Access Codes can be set in the Communication/HMI Menu or from TapTalk®.

Level Access protection will be automatically reinstated when either of the following conditions are met:

- No HMI menu activity for a period of 15 minutes
- The user exits to the top of the HMI menu for a period of greater than 10 seconds

Access Levels

General access to read setpoints, to monitor status, to reset drag hand parameters and the resettable operations counter do not require an Access Code.

The **Level 1** Access Code, if set, is required to make setpoint changes. If the Level 1 Access Code is set to all zeros, this request for an Access Code will not be seen and changes can be made without an Access Code. The default Level 1 Access Code is 000000.

The **Level 2** Access Code, if set, is required to make changes to the configuration, communication, and utilities. If the Level 2 Access Code is set to all zeros, this request for an Access Code will not be seen and changes can be made without an Access Code. The default Level 2 Access Code is 222222.

The **Level 3** Access Code is required to make changes to calibration settings on the control. Contact Beckwith Electric Customer Service for M-6200A Level 3 Access Codes.

OSCILLOGRAPH RECORDER

Trigger Oscillograph Recorder

The Oscillograph Recorder can be manually triggered by the user from TapTalk®.

To manually trigger the Oscillograph recorder, perform the following:

1. Start TapTalk, then establish communications with the target control.
2. Select **Setup/Oscillograph/Trigger** from the TapTalk toolbar. TapTalk will display an Oscillograph Trigger confirmation dialog screen (Figure 2-4).

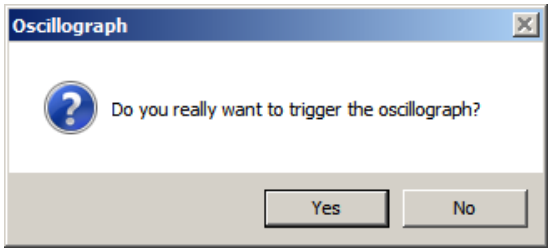


Figure 2-4 Manual Oscillograph Trigger Confirmation Dialog Screen

3. Select **Yes**. TapTalk will display an "Oscillograph was triggered successfully" confirmation screen (Figure 2-5).

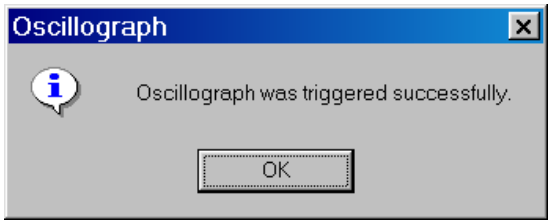


Figure 2-5 Oscillograph Recorder Successfully Triggered Confirmation Dialog Screen

The control will display an "Oscillograph Record Triggered" cycling message indicating that an oscillograph record is available for download. This screen message will continue until the oscillograph record is cleared.

4. Select **OK**. TapTalk will return to the Main screen.

Retrieve Oscillograph Record

Oscillograph data must be retrieved from the control in a Comtrade file (*.cfg) in order to be viewed. S-6200 TapPlot® can be utilized to view the file contents.

To retrieve Oscillograph data, perform the following:

1. Start TapTalk, then establish communications with the target control.
2. Select **Setup/Oscillograph/Retrieve** from the TapTalk toolbar. TapTalk will display a "Retrieve Oscillograph Record" dialog screen (Figure 2-6).

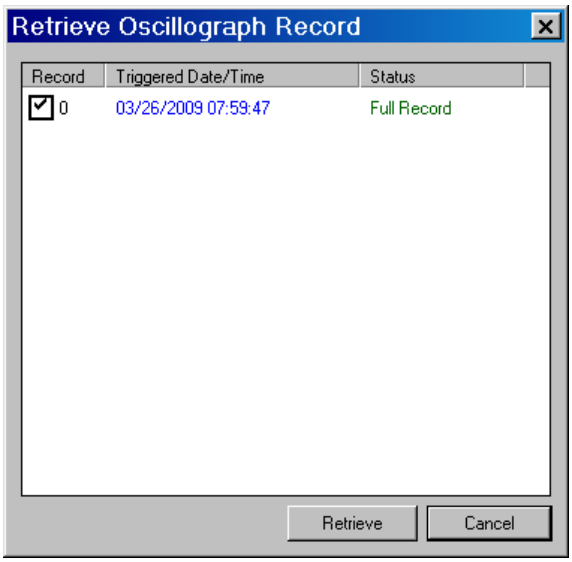


Figure 2-6 Retrieve Oscillograph Record Dialog Screen

3. Select the desired oscillograph record, then select Retrieve. TapTalk will display a Retrieve Oscillograph Record "Save As" dialog screen (Figure 2-7).

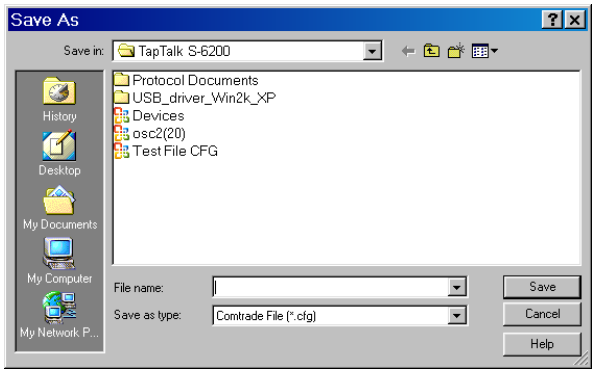


Figure 2-7 Retrieve Oscillograph Record (Save As) Dialog Screen

4. Select a folder to save the file to and the desired file name, then select **Save**, TapTalk® will momentarily display an Initialization status screen (Figure 2-8), then a Retrieving Oscillograph Record status screen (Figure 2-9).

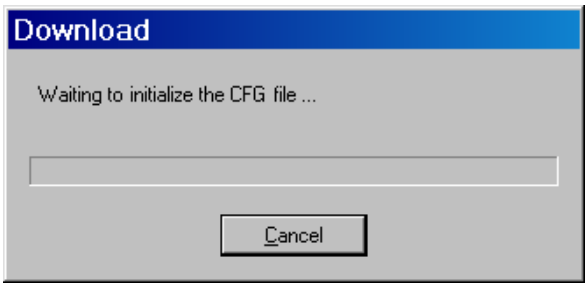


Figure 2-8 Initialize Oscillograph Record Download Screen

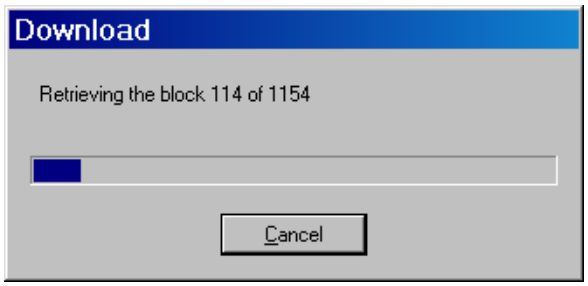


Figure 2-9 Retrieving Oscillograph Record Status Screen

When the oscillograph record has been downloaded, TapTalk will display the following confirmation screen. Also, the cycling display on the control will not stop until the oscillograph records are cleared.

Figure 2-10 Oscillograph Data Records Were Retrieved Confirmation Screen

5. Select **OK**. TapTalk will return to the Main screen.

Clear Oscillograph Records (TapTalk)

To Clear all Oscillograph records in the control, perform the following:

1. Start TapTalk, then establish communications with the target control.
2. Select **Setup/Oscillograph/Clear** from the TapTalk toolbar. TapTalk will display a Clear Oscillograph Record confirmation dialog screen (Figure 2-11).

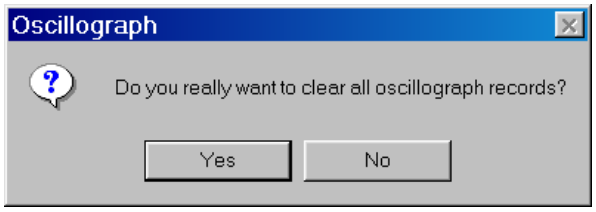


Figure 2-11 Clear Oscillograph Record Confirmation Dialog Screen

3. Select **Yes**. TapTalk will display a confirmation dialog screen (Figure 2-12).

Figure 2-12 Clear Oscillograph Record Confirmation Screen

4. Select **OK**. TapTalk will return to the Main screen. The cycling display will be stopped.

Clear Oscillograph Records From The HMI

To clear Oscillograph Records from the HMI perform the following:

1. Press the Right Arrow (COMM Hot Button) pushbutton to awaken the unit. The menu will advance to either "COMMUNICATION" or if a Memory Card is present in the Smart Flash SD CARD slot "Memory Card".

```
        COMMUNICATION
←CNFG                    UTIL→
```

OR

```
        Memory Card
←                        →
```

2. If the "Communication" menu is displayed, then press the Down Arrow pushbutton once. The unit will display the following:

```
        Comm Settings
←                        →
```

3. From either the "Comm Settings" or "Memory Card" menu, press the Right or Left Arrow pushbutton as necessary until "HMI" is displayed.

```
              HMI
←                        →
```

4. Press the Down Arrow as necessary until the following is displayed.

```
Clear OSC Records
Ready Press ENTER
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, then the following will be displayed. Go to Step 8.

```
Confirm press ENTER
Cancel press EXIT.
```

6. If Level 2 Access is active, then the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS

_
```

■**NOTE**: When entering the Level 2 Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, then the display will briefly flash a confirmation screen and then display the following:

```
Confirm press ENTER
Cancel press EXIT
```

   If not, re-enter a valid code.

8. Press the ENT pushbutton. The following will be displayed:

```
Records Cleared!
Any key to continue
```

SEQUENCE OF EVENTS RECORDER

Trigger Sequence of Events Recorder

The Sequence of Events Recorder can be manually triggered by the user from TapTalk®.

To manually trigger the Sequence of Events recorder, perform the following:

1. Start TapTalk, then establish communications with the target control.
2. Select **Setup/Sequence of Events/ Trigger** from the TapTalk toolbar. TapTalk will display a Sequence of Events Trigger confirmation dialog screen (Figure 2-13).

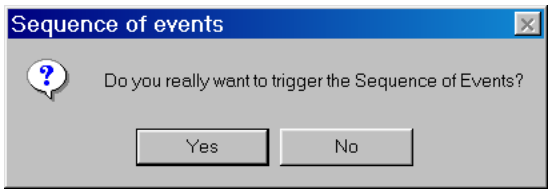


Figure 2-13 Sequence of Events Trigger Confirmation Dialog Screen

3. Select **Yes**. TapTalk will display a "Sequence of Events was triggered successfully" confirmation screen (Figure 2-14).

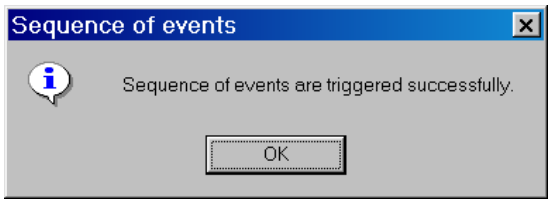


Figure 2-14 Sequence of Events Recorder Successfully Triggered Confirmation Dialog Screen

4. Select **OK**. TapTalk will return to the Main screen.

Retrieve Sequence of Events Record

To retrieve Sequence of Events data, perform the following:

1. Start TapTalk, then establish communications with the target control.
2. Select **Setup/Sequence of Events/ Retrieve** from the TapTalk toolbar. TapTalk will display a Retrieve Sequence of Events Record "Save As" dialog screen (Figure 2-15).

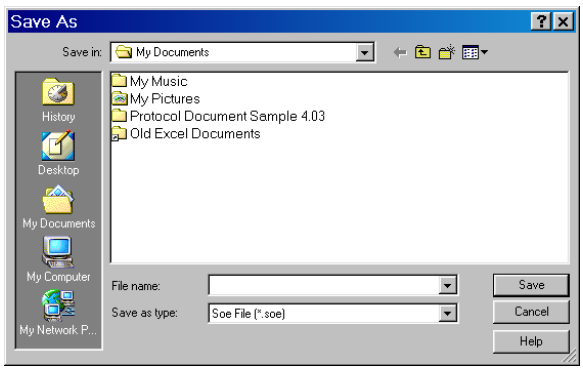


Figure 2-15 Retrieve Sequence of Events Record (Save As) Dialog Screen

3. Select a folder to save the file to and the desired file name, then select **Save**. TapTalk will momentarily display an Initialization status screen (Figure 2-16), then a "Retrieving Sequence of Events Record" status screen (Figure 2-17).

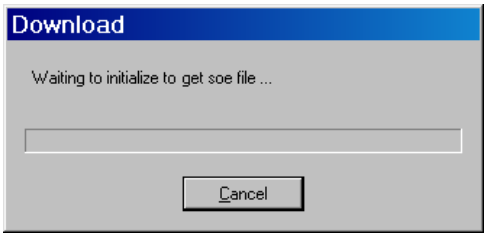


Figure 2-16 Initialize Sequence of Events Record Download Screen

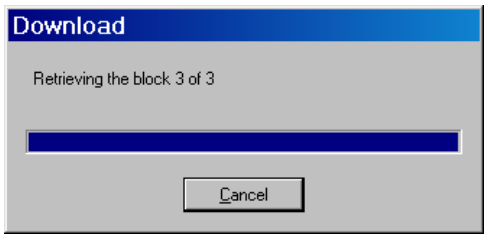


Figure 2-17 Retrieving Sequence of Events Record Status Screen

When the Sequence of Events record has been downloaded TapTalk® will display the following confirmation screen.

Figure 2-18 Sequence of Events Data Records Were Retrieved Confirmation Screen

4. Select **OK**. TapTalk will display Figure 2-19, "View Sequence of Events Record" dialog screen.

View Sequence of Events From TapTalk

To view Sequence of Events records, perform the following:

1. Start TapTalk, then establish communications with the target control.
2. Select **Setup/Sequence of Events/ View** from the TapTalk toolbar. TapTalk will display a "View Sequence of Events Record" dialog screen (Figure 2-19).
3. Select the desired Sequence of Events record to display the captured parameters.

Trigger Status – The "Trigger Status" section of the View Sequence of Events Dialog Screen displays the current trigger status at the instant the Sequence of Events Recorder was triggered. Sequence of Events is monitored at a fixed period of 1 cycle.

Pickup/Dropout – The "Pickup and Dropout" sections of the View Sequence of Events Dialog Screen indicate which signal caused the Sequence of Events recorder to trigger. These sections also include all the signals that changed at the instant that the Sequence of Events Recorder triggered.

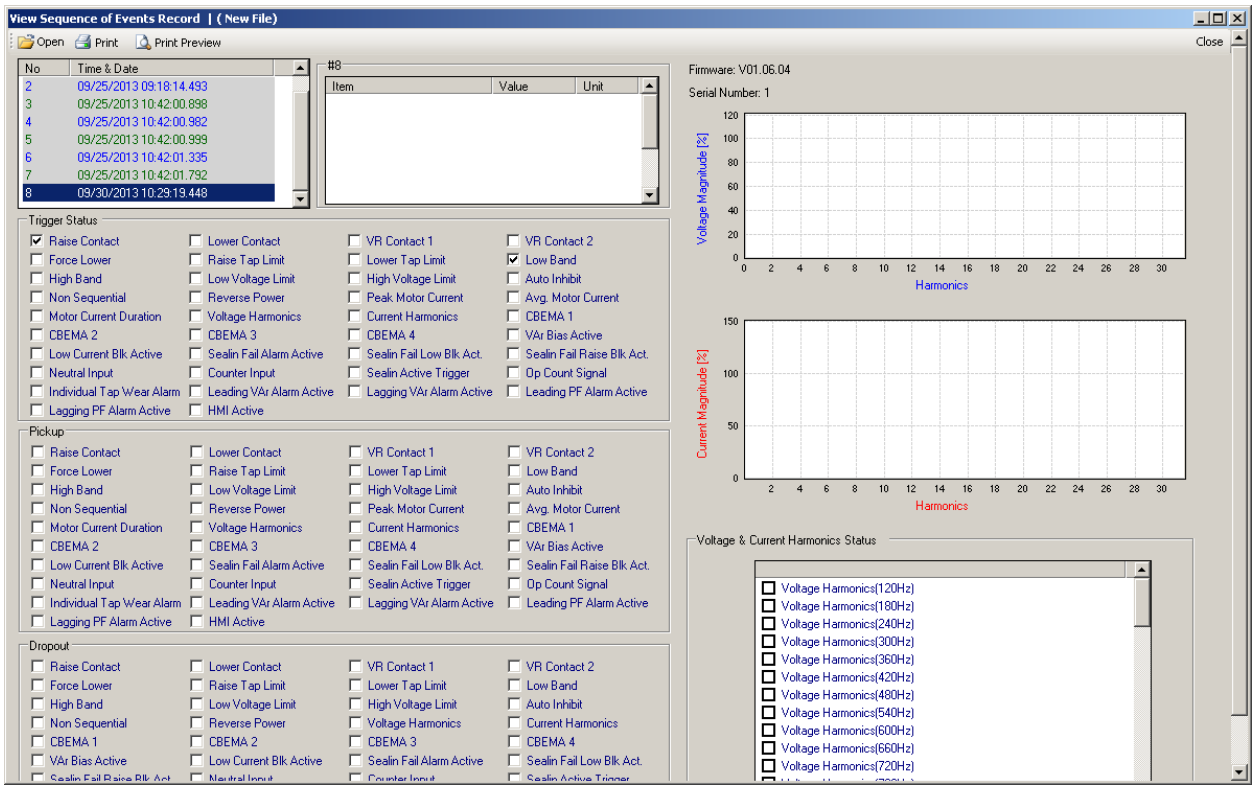


Figure 2-19 View Sequence of Events Record Dialog Screen

Clear Sequence of Events Records

To Clear Sequence of Events records from the control perform the following:

1. Start TapTalk®, then establish communications with the target control.
2. Select **Setup/Sequence of Events/ Clear** from the TapTalk toolbar. TapTalk will display a Clear Sequence of Events Record confirmation screen (Figure 2-20).

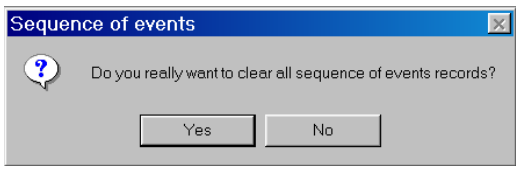


Figure 2-20 Clear Sequence of Events Record Confirmation Screen

3. Select **Yes**. TapTalk will display a "Clear" status screen (Figure 2-21), then a Sequence of Events records cleared successfully confirmation screen (Figure 2-22).

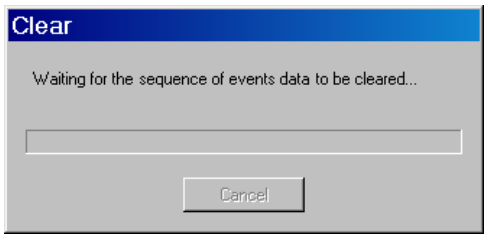


Figure 2-21 Clear Status Screen

Figure 2-22 Clear sequence of Events Record Confirmation Screen

4. Select **OK**. TapTalk will return to the Main screen.

DATA LOGGING

Retrieve Data Logging Data

■ **NOTE:** When Load Voltage, Compensated Voltage, Source Voltage and Load Current are selected, the data to be retrieved will consist of the average, minimum and maximum values over the sampling period.

To retrieve Data Logging data perform the following:

1. Start TapTalk®, then establish communications with the target control.
2. Select **Setup/Data Logging/Retrieve** from the TapTalk toolbar. TapTalk will display a Data Log Download dialog screen (Figure 2-23).

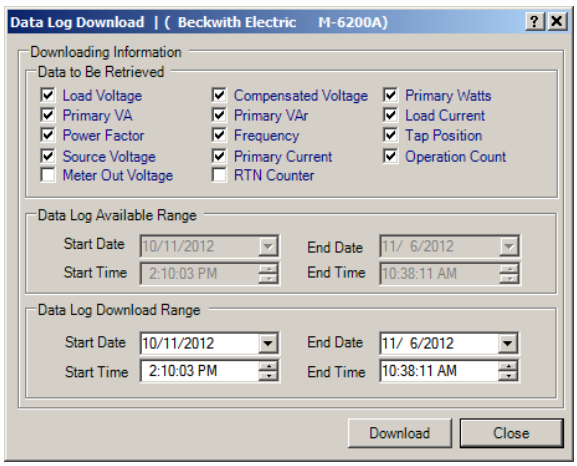


Figure 2-23 Data Log Download Dialog Screen

■ **NOTE**: Load Voltage, Compensated Voltage, Load Current and Source Voltage are the average value during the data logging interval.

3. From the "Data to be retrieved" section of the Data Log Download screen select the desired parameters to be retrieved.
4. From the "Data Log Download Range" section of the Data Log Download screen select the "Start Date", "Start Time", "End Date" and "End Time".
5. Select "Download". TapTalk will display a "Setpoints Successfully written to the control" confirmation screen (Figure 2-24) and then display a "Save As" dialog screen (Figure 2-25).

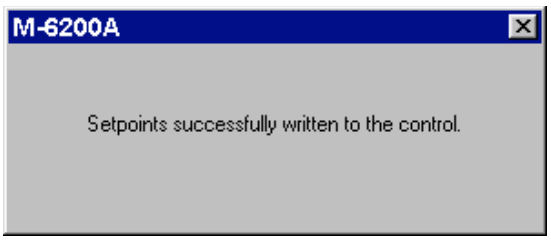


Figure 2-24 Setpoints Successfully Written To Control Confirmation Screen

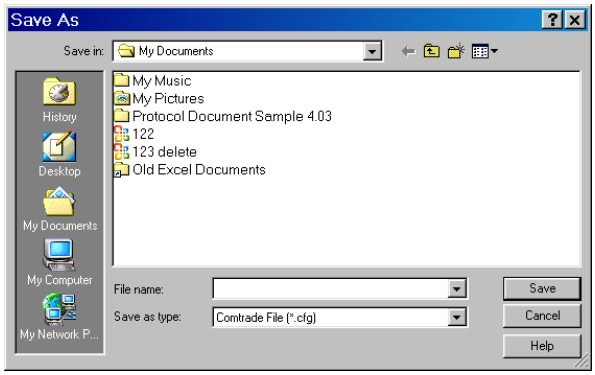


Figure 2-25 Data Log Download (Save As) Dialog Screen

6. Select a folder to save the file to and the desired file name, then select **Save**. TapTalk will momentarily display an Initialization status screen (Figure 2-26), then a Data Log Record Download status screen (Figure 2-27).

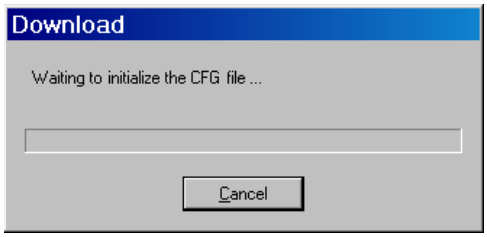


Figure 2-26 Initialize Data Log Record Download Screen

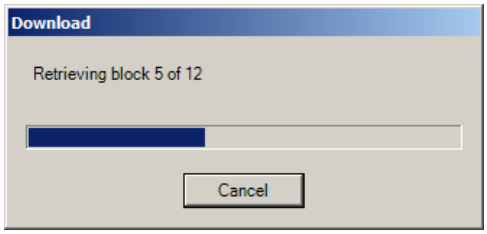


Figure 2-27 Data Log Record Download Status Screen

When the Data Log download is complete TapTalk® will display the following confirmation screen.

Figure 2-28 Data Log Records Were Retrieved Confirmation Screen

7. Select **OK**. TapTalk will return to the Main screen.

Clear Data Log Records

To Clear all Data Log records in the control perform the following:

1. Start TapTalk, then establish communications with the target control.
2. Select **Setup/Data Log/Clear** from the TapTalk toolbar. TapTalk will display a Clear Data Log Record confirmation screen (Figure 2-29).

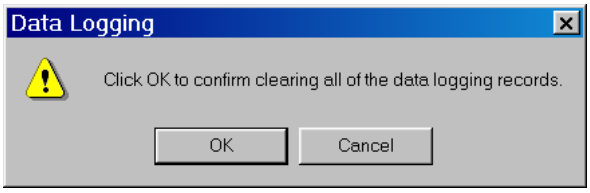


Figure 2-29 Clear Data Log Record Confirmation Screen

3. Select **OK**. TapTalk will display a "Clear" status screen (Figure 2-30) and then a "All of the data logging records were cleared" confirmation screen (Figure 2-31).

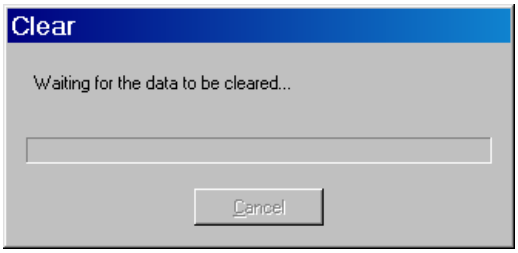


Figure 2-30 Clear Data Log Record Status Screen

Figure 2-31 Clear Data Log Record Confirmation Screen

4. Select **OK**. TapTalk will return to the Main screen.

METERING AND STATUS

Accessing Monitoring Screens

The Monitor menu provides the user with the capability to view the Metering, Status, Tap Information, Present Demand, Demand History, Energy Metering, Harmonics and Motor Current elements of the monitoring screens. The steps necessary to access, view, and where applicable, perform parameter specific operations for each monitoring category are described herein.

Monitor (From Control Front Panel)

The HMI categories/parameters for Monitoring are:

- **Metering**
  Load Voltage
  Meter Out Voltage
  Source Voltage
  Load Current
  Compensated Voltage
  Primary Voltage
  Primary Source Voltage
  Primary Current
  Primary Watts
  Primary VArs
  Primary VA
  Power Factor
  Frequency

- **Tap Information**
  Tap Position/Cal
  Drag Hands (E)
  Timer
  Intertap Timer
  Operation Counter
  Resettable Counter (E)
  Neutral Counter
  Lower Counter
  Raise Counter
  View Specific Tap Statistics
  Clear Tap Statistics
  RTN Success Counter
  RTN Status
  Count to RTN Active
  (E) Indicates Tap Information parameters that can be reset to zero or set to a value.

- **Harmonics**
  Voltage % THD
  Current % THD
  View Voltage Harmonics
  View Current Harmonics

- **Motor Current**
  Peak RMS Curr
  Avg RMS Curr
  Profile Duration
  Peak Motor Current (E)
  (E) Indicates Motor Current parameters that can be reset to zero.

- **Energy Metering**
  Forward Watt Hours (E)
  Lagging VAr Hours (E)
  Reverse Watt Hours (E)
  Leading VAr Hours (E)
  (E) Indicates Energy Metering parameters that can be reset to zero.

- **Status**
  Regulator Status
  Alarm Status
  Input Status
  Output Status

- **Demand History**
  Demand Interval
  Min Load Voltage (E)
  Max Load Voltage (E)
  Max Primary Current (E)
  Max Primary Watts (E)
  Max Primary VArs (E)
  Max Primary VA (E)
  PF @ Max VA
  (E) Indicates Demand History parameters that can be reset to zero.

- **Present Demand**
  Demand Interval
  Demand Load Voltage
  Demand Primary Current
  Demand Primary Watts
  Demand Primary VArs
  Demand Primary VA

Accessing The Metering Screens (HMI)

To access the Metering screens from the control front panel proceed as follows:

1. Press the Left Arrow (MNTR Hot Button) pushbutton to awaken the unit. The menu will advance to "MONITOR".

```
              MONITOR
←UTIL                    SETP→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
              Metering
←                              →
```

Pressing the Down arrow pushbutton will display the first metering parameter (**Load Voltage**). Pressing the Down arrow pushbutton will advance to the following Metering parameters:

Load Voltage
Meter Out Voltage
Source Voltage
Load Current
Compensated Voltage
Primary Voltage
Primary Source Voltage
Primary Current
Primary Watts
Primary VArs
Primary VA
Power Factor
Frequency

Accessing The Status Screens (HMI)

To access the Status screens from the control front panel proceed as follows:

1. Press the Left Arrow (MNTR Hot Button) pushbutton to awaken the unit. The menu will advance to "MONITOR".

```
              MONITOR
←UTIL                    SETP→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
              Metering
←                              →
```

3. Press the Right or Left arrow pushbutton as necessary to navigate to the "Status" screen.

```
               Status
←                              →
```

4. Press the Down arrow pushbutton once. The menu will advance to the first status element (**Regulator Status**) of the Status groups.

The status groups can be accessed by continuing to press the Down pushbutton within the Status menu and then pressing ENT to view.

The Status screens consist of four individual status groups that include:

Regulator Status
Alarm Status
Input Status
Output Status

Details regarding each individual group follow in this chapter.

Accessing The Regulator Status Screens (HMI)

To access the Regulator Status screens from the control front panel proceed as follows:

1. Navigate to the "Regulator Status" screen.

```
Press ENT to view
Regulator Status
```

2. Press the ENT pushbutton. The control will display a summary of the Regulator Status parameters, similar to the following.

```
TAP BDS PWR BLK VRD
 0  lo  fwd --- off
```

TAP = Tap Position

BDS = Band Status

PWR = Power Direction

BLK = Blocks In Effect

VRD = Voltage Reduction

To cycle through each element of the "Regulator Status" display press the Down arrow pushbutton.

```
Tap Position
0
```

The range of displayed values for Tap Position (TAP) are 16L–0–16R.

```
Band Status
Low
```

The range of displayed values for Band Status (BDS) are HIGH, LOW and In Band.

```
Power Direction
Forward
```

The range of displayed values for Power Direction (PWR) are fwd and rev.

```
Blocks in Effect
-- -- -- -- -- -- --
```

Blocks in Effect are indicated from left to right (Position 1 to 7). Multiple blocks may be in effect and therefore the display is prioritized as follows:

■ **NOTE:** Blocks are listed in order of display priority from top to bottom.

Position	Block	Display
1	Line Limit	LL
2	Force Lower	FL
2	Voltage Limit Block Lower	BL
2	Voltage Limit Block Raise	BR
3	Tap Limit Block Lower	TL
3	Tap Limit Block Raise	TR
4	Non-Sequential Block	NS
4	Seal-In Failure Block Raise and Lower	SB
4	Seal-in Failure Block Raise	SR
4	Seal-in Failure Block Lower	SL
4	Low Current Block	IB
5	Comm Block	CB
6	Reverse Power Block	RP
7	SCADA Cutout Local	SC

```
Voltage Reduction
off
```

The range of displayed values for Voltage reduction (VRD) are on and off. Press the Exit pushbutton to return to the "Regulator Status" screen.

Accessing The Alarm Status Screens (HMI)

To access the Alarm Status screens from the control front panel proceed as follows:

1. Navigate to the "Alarm Status" screen.

```
Press ENT to view
Alarm Status
```

2. Press the ENT pushbutton. The control will display a summary of the Alarm Status parameters, similar to the following.

```
A B C D E F G H I J K L M N O P —>
- - 0 0 - - - - - - - - - X - -
```

```
<— Q R S T U V
   - - - - - -
```

Alarm Status Display Key

- - = Disabled/Condition Not Met
1 = ALARM ENABLED/Condition Met
0 = ENABLED/Condition Not Met
X = CONDITION MET/Disabled

To cycle through each element of the Alarm Status display, press the Down arrow pushbutton. The control will display a detailed status screen similar to the example below for each parameter.

```
A: Block Raise Tap
disabled/not met
```

```
B: Block Lower Tap
disabled/not met
```

```
C: Block Raise Volt
ENABLED/not met
```

```
D: Block Lower Volt
ENABLED/not met
```

```
E: Voltage Reduction
disabled/not met
```

```
F: Power Direction
disabled/not met
```

```
G: Current Limit
disabled/not met
```

```
H: Comm Block
disabled/not met
```

```
I: LDC/LDZ
disabled/not met
```

```
J: Selftest
disabled/not met
```

```
K: Seal-in Failure
disabled/not met
```

```
L: VAr Bias Lag
disabled/not met
```

```
M: VAr Bias Lead
disabled/not met
```

```
N: Backup Fail
COND MET/disabled
```

```
O: Abnormal Tap
disabled/not met
```

```
P: Low Current Blk
disabled/not met
```

```
Q: RTN Fail
disabled/not met
```

```
R: Op Count Signal
disabled/not met
```

```
S: Individual Tap Wear
disabled/not met
```

```
T: Leading_VAr
disabled/not met
```

```
U: Lagging_VAr
disabled/not met
```

```
V: Leading_PF
disabled/not met
```

```
W: Lagging_PF
disabled/not met
```

The range of displayed values for each Alarm element are, disabled/not met, ENABLED/not met, COND MET/ disabled and ALARM (Enabled/condition exists).

Press the Exit pushbutton to return to the "Alarm Status" screen.

Accessing The Input Status Screens (HMI)

To access the Input Status screens from the control front panel proceed as follows:

1. Navigate to the "Input Status" screen.

```
Press ENT to view
Input Status
```

2. Press the ENT pushbutton. The control will display a summary of the Input Status parameters, similar to the following.

C	NS	VR	DH	KT	N	MS
0	0	- -	0	RL	0	0

Input Status Parameter Key

C = Counter Contact
NS = Non-Sequential Input
VR = Voltage Reduction 1
Voltage Reduction 2
DH = Drag Hands Reset
KT = KeepTrack™ Lower
KeepTrack Raise
N = Neutral Tap Position
MS = Motor Seal-In

Input Status Display Key

1 = On
0 = Off

For VR

- - = No Voltage Reduction Steps in effect
1 - = Voltage Reduction Step 1 in effect
- 2 = Voltage ReductionStep 2 in effect
1 2 = Voltage Reduction Step 3 in effect

For KT

- - = No Raise or Lower inputs active
R - = Raise Input detected
- L = Lower Input detected
RL = Motor power is not connected or circuit failure.

To cycle through each element of the "Input Status" display press the Down arrow pushbutton. The control will display a detailed status screen similar to the example below for each parameter.

```
Counter Contact
off
```

Accessing The Output Status Screens (HMI)

To access the Output Status screens from the control front panel proceed as follows:

1. Navigate to the "Output Status" screen.

```
Press ENT to view
Output Status
```

2. Press the ENT pushbutton. The control will display a summary of the Output Status parameters, similar to the following.

```
RAISE    LOWER    ALARM
  1        1        0
```

Output Status Parameter Key

RAISE = Raise Output Contact

LOWER = Lower Output Contact

ALARM = Alarm Output Contact

Output Status Display Key

1 = On

0 = Off

To cycle through each element of the "Output Status" display press the Down arrow pushbutton. The control will display a detailed status screen similar to the example below for each parameter.

```
Raise Contact
ON
```

Accessing the Metering & Status Screen (TapTalk)

The control has the capability of displaying measured and calculated secondary quantities and calculated primary quantities. Refer to Figure 2-32.

The Metering & Status Screen, when connected to a control, displays parameter values consistent with the capabilities of the communication system.

To access the Metering and Status screen from the TapTalk® Main Menu, select Monitor/Metering & Status, or the menu bar Metering & Status hot button. TapTalk will display the Metering & Status screen (Figure 2-33).

The Metering Status display colors and text can be set in the Monitor/Set Metering Colors dialog screen (See **Chapter 3 TapTalk S-6200** for details).

■**NOTE**: When changing Metering and Status screen colors you must exit the Metering and Status screen for the color change to take effect.

PRIMARY METERING (SINGLE PHASE)

Voltage

Displays the calculated primary voltage based on the user-selected voltage multiplier, VT corrections, and measured secondary voltage.

Source Voltage

Displays the calculated primary source voltage based on the user-selected source voltage multiplier, source VT corrections and source secondary voltage.

Current

Displays the calculated primary current based on the user-selected current multiplier, and measured secondary current.

Watts

Displays the calculated primary quantity based on the user-selected voltage and current multipliers; VT configuration (line-to-ground), single-phase, and measured secondary voltage and current.

VAr

Displays the calculated primary quantity based on the user-selected voltage and current multipliers, VT configuration (line-to-ground), single-phase, and measured secondary voltage and current.

VA

Displays the calculated primary quantity based on the user-selected voltage and current multipliers, VT configuration (line-to-ground), single-phase, and measured secondary voltage and current.

SECONDARY METERING STATUS

Load Voltage

Displays the real-time measured value of voltage at the regulator and includes any corrections made using the user-selected VT correction voltage.

Meter Out Voltage

Displays the measured voltage at the terminals of the M-6200A without any software modifications. Used as the base for normalizing voltage.

Source Voltage

Displays the real-time calculated source voltage and includes any corrections made using the user-selected source VT correction voltage.

Compensated Voltage

Displays the calculated voltage at the “load center”.

Normalizing Voltage

Displays the result of the Normalizing Multiplier (0.80 to 1.20) times the Meter Out Voltage.

Load Current

Displays the real-time measured value of current.

Power Factor

Displays the real-time calculated value of power factor.

Frequency

Displays the real-time measured frequency value.

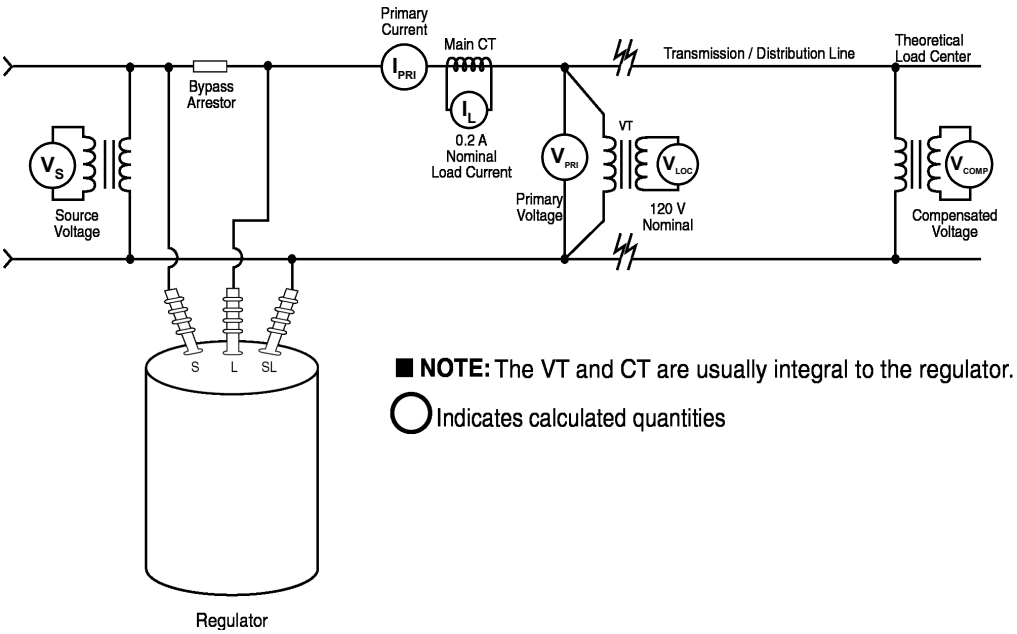


Figure 2-32 Secondary Quantity Metering and Primary Quantity Calculations

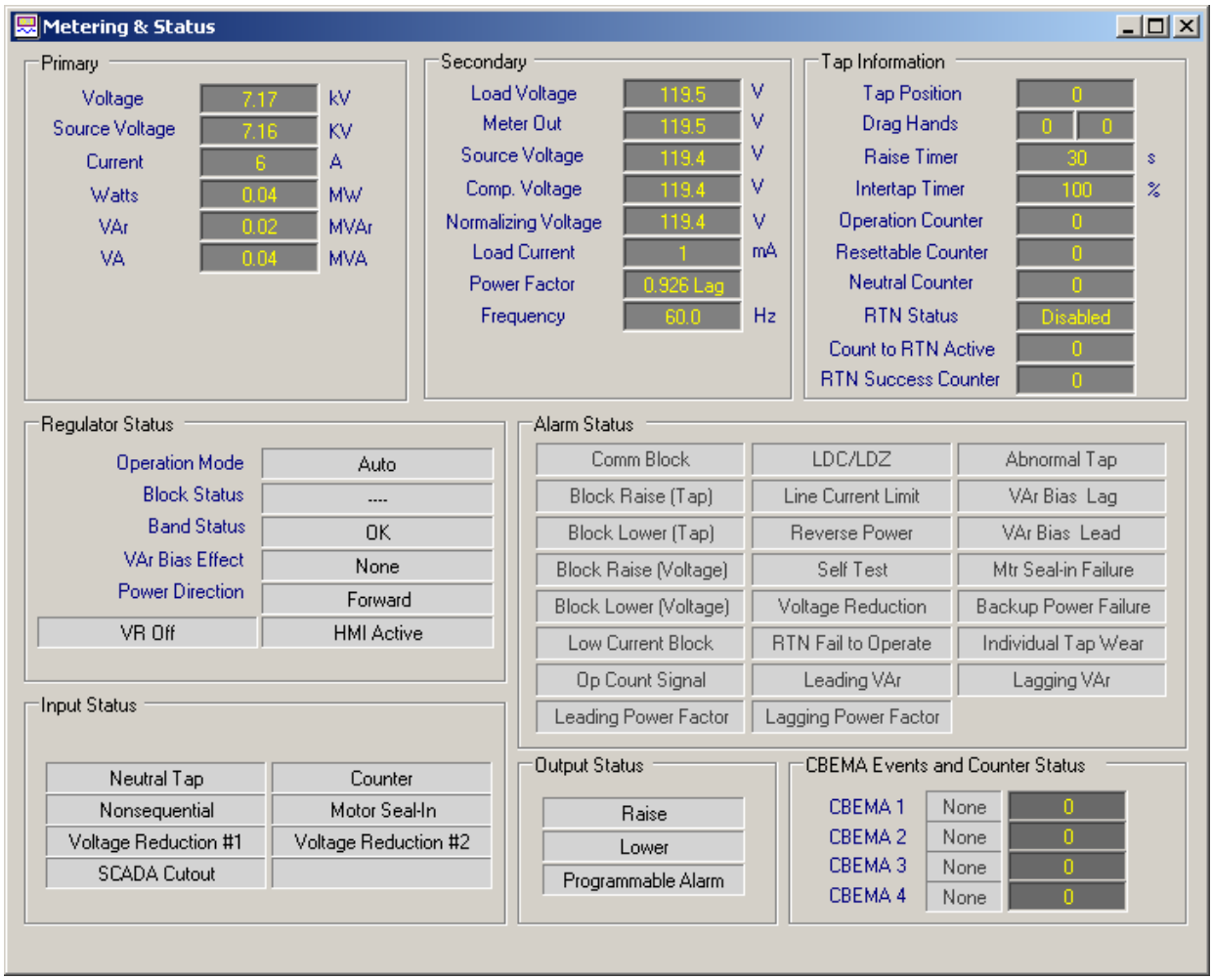


Figure 2-33 Metering & Status Screen

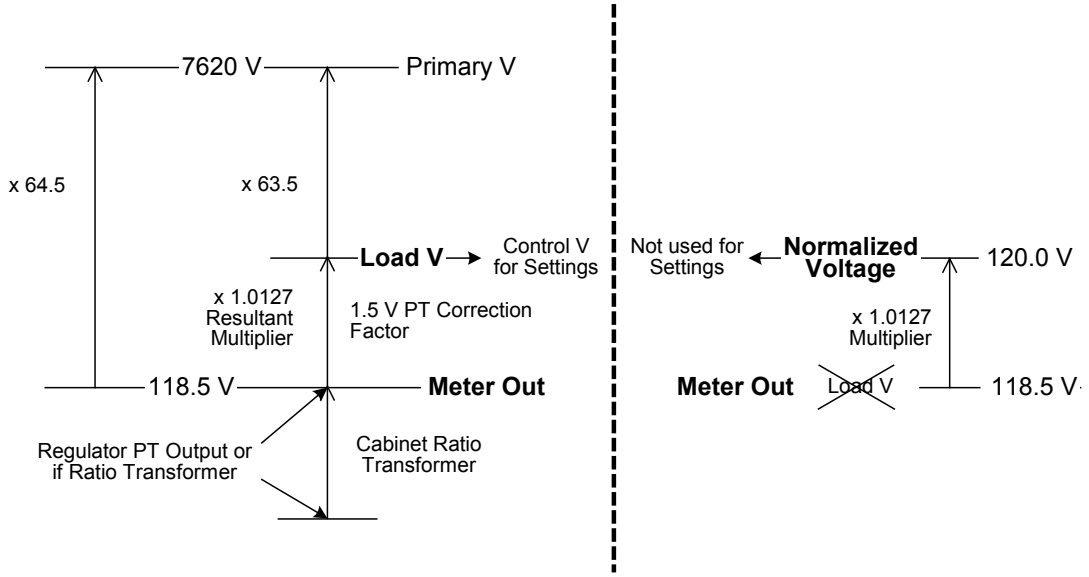


Figure 2-34 Meter Out Voltage Calculation

TAP INFORMATION

Tap Position

Displays the tap position of the tapchanger by internal Motor Direct Drive KeepTrack™ procedure. Recognizes tapchanges commanded via manual, automatic or external (SCADA) means.

Drag Hands

Displays the tap position Drag Hands values for each direction.

Timer (Raise/Lower)

Displays the integrated out-of-band time for a voltage excursion outside the upper/lower band limit up to the value of the time delay setpoint.

Intertap Timer

In the sequential mode of operation, displays the integrated out-of-band time for a voltage excursion and the subsequent tapchange. Adjustable from 0 to 60 seconds, in 1 second increments, with a factory setting of 0 seconds.

Operation Counter

Records the number of raise and lower operations. The operation counter will increment based on the counter configuration, as set by the user. This counter is not resettable.

The counter accommodates 999,999 operation counts and the number of counts stored in memory is not affected by a loss of supply power. Total operation count is displayed in the Status Menu. This counter cannot be reset, but can be preset to any value up to 999,999 in the Configuration menu.

Resettable Operation Counter

The user resets this counter to zero by pressing ENT while viewing the resettable operation counter screen within the Status Menu. No password is required to reset the resettable operations counter.

■**NOTE**: The counter will only increment with a connection to the counter input.

Neutral Counter

Records the number of times the Neutral Input is energized.

The counter accommodates 999,999 operation counts and the number of counts stored in memory is not affected by a loss of supply power. Total operation count is displayed in the Status Menu. This counter cannot be reset, but can be preset to any value up to 999,999 in the Configuration menu.

RTN Status

Displays the "Run Through Neutral" feature status (Enabled or Disabled).

Count to RTN Active

Displays the number of counter operations since the operations between runs setting was set, or since the feature was enabled. The counter will reset to zero if the feature is enabled and successfully runs through neutral.

RTN Success Counter

The RTN Counter will increment after each successful operation of the Run Through Neutral feature.

REGULATOR STATUS

Operation Mode

Indicates the operational mode of the control (Auto, Manual or Off).

Block Status

Indicates blocks that are active. Blocks that can be active include:

- Selftest
- Comm Block
- Line Limit
- Reverse Power
- Over Voltage Runback
- Block Raise (Tap)
- Block Lower (Tap)
- Block Raise (Voltage)
- Block Lower (Voltage
- SCAMP Switch
- Front Panel Switch
- Force Lower
- Non-Sequential
- Seal-in Failure Block Raise
- Seal-in Failure Block Lower
- Seal-in Failure Block Raise and Lower
- Low Current

Band Status

Indicates one of three conditions: **High**, when voltage is out of band high, **Low** when voltage is out of band low, or **OK** when voltage is within band.

VAr Bias Effect

Indicates one of three conditions when enabled. If the control has determined that the absolute reactive power is less than Lead % Banksize Pickup of the Max Cap Bank Setting and the inverse timer has timed out, then the control will increase the effective bandcenter by 1 Volt depending on the direction of the reactive power and will either indicate "Bandcenter Raise" for negative reactive power or "Bandcenter Lower" for positive reactive power. If the absolute power is greater than Lag % Banksize Pickup of the Max Cap Bank Setting then the display will indicate "None".

Power Direction

Indicates one of two power directions: **Forward** (forward power condition) or **Reverse** (reverse power condition).

Voltage Reduction

VR Off indicates voltage reduction is not active, blocked either by non-sequential input, reverse power condition, or by communicated command. **VR Step 1**, **2**, and **3** indicate that voltage reduction is in effect for the stated step value. **VR Step 1**, **2**, and **3** indicate that voltage reduction has been implemented from the control front panel for the stated step value.

HMI Active Mode

Indicates that HMI menu at the control is active. Turns off after 15 minutes of inactivity.

INPUT STATUS

Neutral Tap

Indicates neutral position contact input is closed.

Counter

Indicates operation counter contact input is closed.

Non-Sequential

Indicates Non-sequential contact input is closed. Tapchanger control blocks raise or lower operation on a sustained closed contact.

Motor Seal-In

Indicates when motor power is applied.

Volt Reduction 1

Indicates Step 1 Voltage Reduction contact output is closed.

Volt Reduction 2

Indicates Step 2 Voltage Reduction contact output is closed.

SCADA Cutout

Indicates SCADA (switch) input is closed. Regulator control blocks write commands from COM1, COM2 or Ethernet.

OUTPUT STATUS

Raise

Indicates when a Tap Raise output is active. Limited by tap Block Raise setpoint and tap position limit settings.

Lower

Indicates when a Tap Lower output is active. Limited by tap Block Lower setpoint and tap position limit settings.

Programmable Alarm

Indicates when a Programmable Alarm condition is true.

ALARM STATUS

There are three available states designated by color for each of the Alarm Status elements:

- Gray with Dark Gray Text – Alarm disabled.
- Gray with Black Text – Alarm enable and condition not met
- RED – Alarm enabled and condition exists

Comm Block

The control has had its automatic operation blocked via communications and is now in manual operation mode and the alarm output is on due to this condition.

Block Raise (Tap)

The tap position equals or exceeds the block raise tap limit setting and the alarm output is on due to this condition.

Block Lower (Tap)

The tap position equals or exceeds the block lower tap limit setting and the alarm output is on due to this condition.

Block Raise (Voltage)

The tap position equals or exceeds the block raise voltage limit setting and the alarm output is on due to this condition.

Block Lower (Voltage)

The tap position equals or exceeds the block lower voltage limit setting and the alarm output is on due to this condition.

Low Current Block

When enabled the control determines if Load Current following a tapchange is less than 4 mA, coincident with Tap Delta Voltage being less than 0.4 Vac. When these conditions exist the control will initiate an alarm and block regulation. The Delta Voltage is measured on every tap operation once Load Current is less than 4 mA. If two consecutive tap operations each measure a delta voltage of less than 0.4 Vac, the Low Current Block and Alarm will be in effect. Additionally, a valid counter input for each tap position must be received for the Block and Alarm to initiate. Note that for Cooper regulators, this input is via the Motor Seal-in circuit instead of a dedicated counter.

Op Count Signal

The total number of operations has exceeded the Operations Counter Alarm Limit setting.

LDC/LDZ

Any value other than zero has been set for LDC-LDZ.

Line Current Limit

The load current is exceeding the respective maximum current limit setting and the alarm output is on due to this condition.

Reverse Power

Reverse power is present at the control and the alarm output is on due to this condition.

Self Test

The control has failed the self test.

Voltage Reduction

Any level of voltage reduction is active.

RTN Fail to Operate

The RTN Fail to Operate alarm will actuate when the "Maximum RTN operations before Alarms" has been exceeded.

Abnormal Tap Position

Abnormal Tap Position is indicated when the alarm is enabled, Motor Direct Drive KeepTrack™ is enabled and the neutral input is detected but the present tap position at that instant is neither at minus one nor plus one. The Abnormal Tap Position Alarm will also be activated when the Motor Seal-in Failure detection feature has detected a Motor Seal-in Failure.

VAr Bias Lead or Lag

Indicates when the VAr Bias effect (Lead or Lag) has exceeded the time limit imposed by the Max VAr Bias Duration Setting.

Mtr. Seal-In Failure

Indicates that motor current has not been detected for a period 15 seconds after a Raise or Lower command has been executed. This event must occur two consecutive times for this alarm to occur.

Backup Pwr Failure

Indicates the absence of Backup Power circuiting when Backup Power option has been detected.

Individual Tap Wear

The number of operations on any single tap exceeds the Individual Tap Wear Alarm setting.

Leading VAr

The Leading VAr value has exceeded the Leading VAr Alarm setting and the VAr/PF Alarm Time Delay.

Lagging VAr

The Lagging VAr value has exceeded the Lagging VAr Alarm setting and the VAr/PF Alarm Time Delay.

Leading Power Factor

The Leading Power Factor value has exceeded the Leading Power Factor Alarm setting and the VAr/PF Alarm Time Delay. The load current must also exceed the Minimum Current Threshold for PF Alarms setting before this alarm will actuate.

Lagging Power Factor

The Lagging Power Factor value has exceeded the Lagging Power Factor Alarm setting and the VAr/PF Alarm Time Delay. The load current must also exceed the Minimum Current Threshold for PF Alarms setting before this alarm will actuate.

CBEMA EVENTS AND COUNTER STATUS

When the Load Voltage is sagging or swelling greater than the pickup setting, then a pickup status will be set after a minimum duration, in addition to incrementing a counter.

Up to 4 CBEMA events can be set and enabled allowing the control to trigger a Sequence of Events record when each event occurs. Also, the control will report both the time and duration of each event via DNP. These 4 settings allow the control to be set to record violations of the ITIC curves (formerly known as CBEMA curves).

DEMAND AND ENERGY METERING

Accessing the Present Demand Screens (HMI)

To access the Present Demand screens from the control front panel proceed as follows:

1. Press the Left Arrow (MNTR Hot Button) pushbutton to awaken the unit. The menu will advance to "MONITOR".

```
              MONITOR
←UTIL                    SETP→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
              Metering
←                              →
```

3. Press the Right or Left arrow pushbutton, as necessary, to navigate to the "Present Demand" screen.

```
          Present Demand
←                              →
```

4. Pressing the Down arrow pushbutton once will advance the menu to the first element (**Demand Interval**) of the "Present Demand" screens.

```
Demand Interval
15 Min
```

5. Press the Down arrow pushbutton to access the remaining Present Demand parameter screens.

   Demand Load Voltage
   Demand Primary Current
   Demand Primary Watts
   Demand Primary VArs
   Demand Primary VA

Setting The Demand Interval (HMI)

■**NOTE**: The Demand Interval can be set from either the "Present Demand" menu or the Demand History menu.

To set the Demand Interval from the "Present Demand" menu or the "Demand History" menu perform the following:

1. Navigate to the desired "Demand Interval" screen (Present Demand or Demand History), then press the ENT pushbutton.

   If Level 2 Access is not active or has been previously input, then a "C" will be displayed. Go to Step 4.

```
Demand Interval
15 Min                         C
```

2. If Level 2 Access is active then the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS

_
```

■**NOTE**: When entering the Level 2 Access code the display will automatically advance the cursor to the next digit when input is momentarily paused.

3. Enter a valid Level 2 Access code, then press the ENT pushbutton.

   If a valid Level 2 Access code was entered, then the display will briefly flash a confirmation screen, then a "C". If not, re-enter a valid code.

4. Utilizing either the Up or Down arrow pushbuttons, select between 5, 10, 15, 30 or 60 minute interval settings, then press the ENT pushbutton.

   The display will return to the "Demand Interval" screen and display the new interval.

Accessing The Demand History Screens (HMI)

To access the Demand History screens from the control front panel proceed as follows:

1. Press the Left Arrow (MNTR Hot Button) pushbutton to awaken the unit. The menu will advance to "MONITOR".

```
              MONITOR
←UTIL                    SETP→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
             Metering
←                              →
```

3. Press the Right or Left arrow pushbutton, as necessary, to navigate to the "Demand History" screen.

```
          Demand History
←                              →
```

4. Press the Down arrow pushbutton once. The menu will advance to the first element (**Demand Interval**) of the "Demand History" screens.

```
Demand Interval
15 Min
```

■**NOTE**: Demand Interval is also included in the "Present Demand" menu. The Demand Interval can be set from either menu. See **Setting the Demand Interval (HMI)** in the previous section for details regarding setting the Demand Interval value.

The remaining "Demand History" screens are accessed by navigating within the "Demand History" menu. When accessed the individual screen displays bottom line will cycle between the Demand History parameter value and the corresponding Date and Time Stamp for that value. "Demand History" screens that include an "E" on the right side of the top display line can be reset.

```
Max Load Voltage              E
XXX.X Volts
```

```
Max Load Voltage              E
01/01/09  06:30:48
```

Resetting Individual Demand History Values (HMI)

The presence of the "E" on the top line of the display indicates that the value can be reset from this menu item. The steps necessary to reset Demand History items are as follows:

1. Navigate to the desired Demand History parameter screen, then press the ENT pushbutton.

   The control will display a "confirmation" screen similar to the following.

```
Min Load Voltage              R
Press ENT to confirm
```

2. Press the ENT pushbutton. The control will reset the Demand History value.

```
Min Load Voltage              E
XXX.X Volts
```

```
Min Load Voltage              E
01/01/09   06:30:48
```

   The screen will return to the target "Demand History" screen and display the new value.

Resetting ALL Demand History Parameter Values (HMI)

All Demand History parameter menu items that include an "E" on the top line of the display can be reset from this menu item. The steps necessary to reset **ALL** Demand History parameter values are as follows:

1. Navigate to the "Reset Demand History" parameter values screen.

```
Press ENT to reset
Demand History
```

2. Press the ENT pushbutton. The control will display a "confirmation" screen similar to the following.

```
Press Ent to confirm
reset Demand History
```

3. Press the ENT pushbutton. The control will reset **ALL** the Demand History values.

   The control will then display the following sequence of screen displays.

```
Demand History
has been reset.
```

```
Press ENT to reset
Demand History
```

4. Press the Exit pushbutton to return to the "Demand History" menu.

Performing a Master Reset of ALL Demand History and Energy Metering Parameter Values (HMI)

The "Demand History" menu includes the capability to initiate a Master Reset of both the Demand History and Energy Metering parameter values. This capability is also included in the "Energy Metering" menu. The steps necessary to reset **ALL** Demand History and Energy Metering parameter values are as follows:

1. Navigate to the "Master Reset" menu item within the "Demand History" or "Energy Metering" menus.

```
Press ENT to perform
Master Reset
```

2. Press the ENT pushbutton. The control will respond with a "confirmation" screen.

```
Press ENT to confirm
Press Exit to cancel
```

3. Press the ENT pushbutton. The control will then display the following sequence of screen displays.

```
Master Reset
is complete.
```

```
Press ENT to perform
Master Reset
```

4. Press the Exit pushbutton to return to either the "Demand History" or "Energy Metering" menu.

Accessing The Energy Metering Screens (HMI)

To access the Energy Metering screens from the control front panel proceed as follows:

1. Press the Left Arrow (MNTR Hot Button) pushbutton to awaken the unit. The menu will advance to "MONITOR".

```
              MONITOR
←UTIL                    SETP→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
            Metering
←                              →
```

3. Press the Right or Left arrow pushbutton, as necessary, to advance to "Energy Metering".

```
        Energy Metering
←                              →
```

4. Press the Down arrow pushbutton once. The menu will advance to the first element (**Watt Hours Fwd**) of the "Energy Metering" screens.

```
Watt Hours Fwd                E
     X kWh
```

The remaining "Energy Metering" screens are accessed by navigating within the "Energy Metering" menu. When accessed, the individual screen displays bottom line will cycle between the Energy Metering parameter value and the corresponding Date and Time Stamp for that value. "Energy Metering" screens that include an "E" on the right side of the top display line can be reset individually or all at one time.

```
Lagging VAr Hours             E
     x  kVArh
```

```
Watts Hours Rev               E
     x  kWh
```

```
Leading VAr Hours             E
     x  kVArh
```

```
Press ENT to reset
Energy Metering
```

```
Press ENT to perform
Master Reset
```

Resetting Individual Energy Metering Values (HMI)

The presence of the "E" on the top line of the display indicates that the value can be reset from this menu item. The steps necessary to reset Energy Metering items are as follows:

1. Navigate to the desired Energy Metering parameter screen, then press the ENT pushbutton.

   The control will display a "confirmation" screen similar to the following.

```
Watt Hours Fwd                R
Press ENT to confirm
```

2. Press the ENT pushbutton. The control will reset the Energy Metering value.

```
Watt Hours Fwd                E
     X kWh
```

```
Watt Hours Fwd                E
01/01/09   06:30:48
```

   The screen will return to the target "Energy Metering" screen and display the new value.

Resetting ALL Energy Metering Parameter Values (HMI)

All Energy Metering parameter menu items that include an "E" on the top line of the display can be reset from this menu item. The steps necessary to reset **ALL** Energy Metering parameter values are as follows:

1. Navigate to the "Reset Energy Metering" parameter values screen.

```
Press ENT to reset
Energy Metering
```

2. Press the ENT pushbutton. The control will display a "confirmation" screen similar to the following.

```
Press Ent to confirm
reset Energy Meter
```

3. Press the ENT pushbutton. The control will reset **ALL** the Energy Metering values.

   The control will then display the following sequence of screen displays.

```
Energy Metering
has been reset.
```

```
Press ENT to reset
Energy Metering
```

4. Press the Exit pushbutton to return to the "Energy Metering" menu.

Performing a Master Reset of ALL Energy Metering and Demand History Parameter Values (HMI)

The "Energy Metering" menu includes the capability to initiate a Master Reset of both the Energy Metering and Demand History parameter values. This capability is also included in the "Demand History" menu. The steps necessary to reset **ALL** Energy Metering and Demand History parameter values is described in the Demand History section of this chapter.

Accessing The Demand & Energy Metering Screen (TapTalk)

To access the Demand & Energy Metering screen from the TapTalk® Main Menu, select Monitor/ Demand & Energy Metering. TapTalk will display the Demand & Energy Metering screen (Figure 2-35).

The Demand & Energy Metering screen, when connected to a control, displays parameter values consistent with the capabilities of the communication system.

Each element of the Demand History and Energy Metering can be reset individually by selecting the desired parameter(s) and then selecting **Reset Selected Items.** When the **Reset** command is issued, the metered value is reset to zero and the time and date are updated.

Select All – Allows the user to select all parameters.

Clear All – Allows the user to reset all parameter values.

Reset Selected Items – Allows the user to reset only the selected parameter values.

Demand Interval – The Demand Interval applies to the Demand Present Primary Current (Amps) parameter and the Demand History parameters. The Demand Interval can be set to 5, 10, 15, 30, and 60 minutes.

The **Demand Present** Primary Current parameter value follows the concept of a lagged demand meter. The demand time interval is selected by the user as 5, 10, 15, 30 or 60 minutes. This is the time it takes for a thermal meter to indicate 90% of a change in load.

Load Voltage – Displays the real-time measured value of voltage at the regulator or transformer.

Primary Current – Displays the calculated primary demand current based on the user-selected current multiplier and measured secondary current.

Primary Watts – Displays the real time demand value base on the user-selected voltage and current multipliers; VT configuration (line-to-ground), single-phase, and measured secondary voltage and current.

Primary VAr – Displays the real time demand value based on the user-selected voltage and current multipliers, VT configuration (line-to-ground), single-phase, and measured secondary voltage and current.

Primary VA – Displays the real time demand value based on the user-selected voltage and current multipliers, VT configuration (line-to-ground), single-phase, and measured secondary voltage and current.

Demand History/Energy Metering

All demand history (single phase) and Energy Metering Values include the date and time at which each occurred. A drag hand value is the maximum or minimum value of a measured quantity recorded since the last reset.

Minimum Load Voltage – Displays minimum local voltage at the regulator or transformer. This value continuously averaged over consecutive 32-second intervals.

Maximum Load Voltage – Displays drag hand maximum local voltage at the regulator or transformer. This value continuously averaged over consecutive 32-second intervals.

Maximum Primary Current – Displays drag hand maximum primary current.

Maximum Primary Watts – Displays drag hand maximum primary watts.

Maximum Primary VAr – Displays drag hand maximum primary VArs.

Maximum Primary VA – Displays drag hand maximum primary VA. Resets automatically when Power Factor at (Max) VA value, below, is reset.

Power Factor @ Max VA – Displays drag hand power factor at time of maximum VA.

Forward Watt Hours – Displays drag hand forward Watt hours.

Reverse Watt Hours – Displays drag hand reverse Watt hours.

Lagging VAr Hours – Displays drag hand Lagging VAr hours.

Leading VAr Hours – Displays drag hand Leading VAr hours.

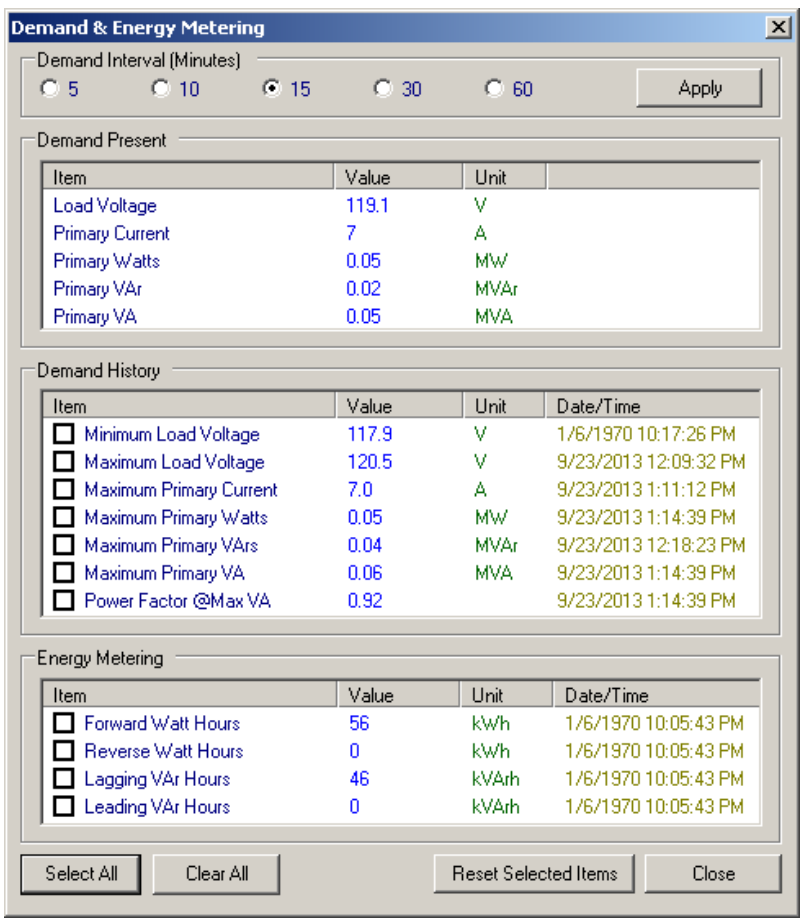


Figure 2-35 Demand & Energy Metering Screen

Real Time Voltage Plot (TapTalk)

The Real Time Voltage Plot feature allows the user to monitor in real time the last 60 seconds of the source voltage value and load voltage. The Voltage Chart freezes the last 30 seconds of the voltage profile and displays the current values.

To access the Real Time Voltage Plot screen from the TapTalk® Main Menu, select **Monitor/Real Time Voltage Plot**. TapTalk will display the Real Time Voltage Plot screen (Figure 2-36).

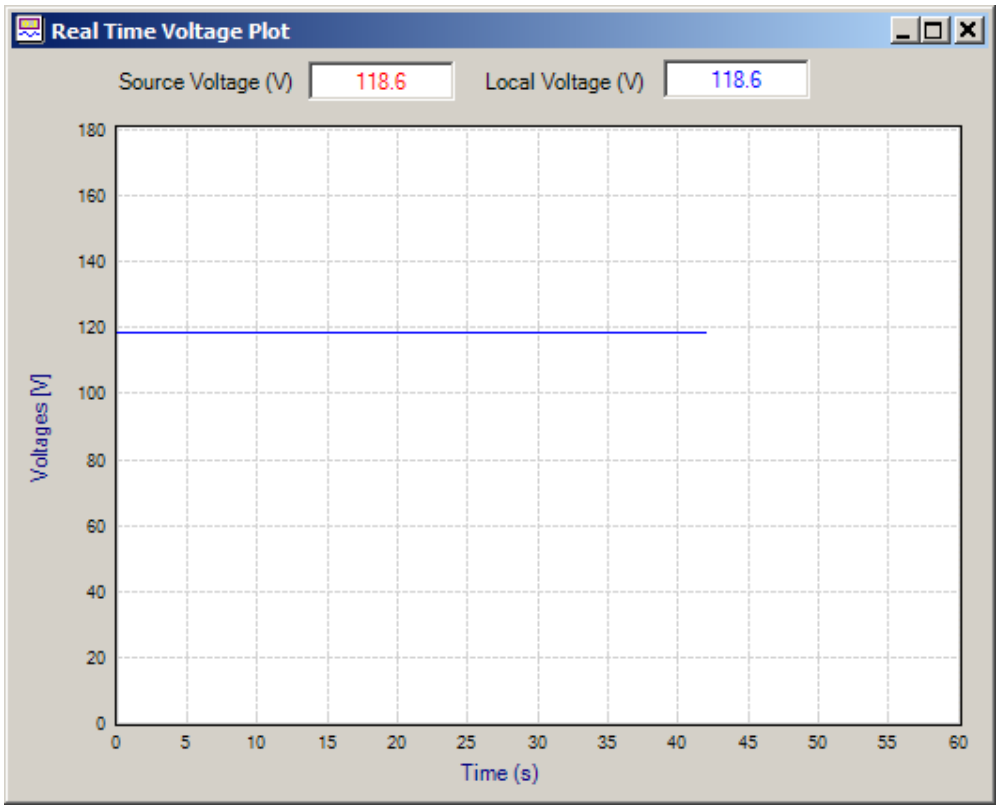


Figure 2-36 Real Time Voltage Chart

Display All Metering

The Display All Metering feature provides the user with a snapshot of all metering parameters. This feature also allows the Display All Metering screen (Figure 2-37) to be printed or saved to a *.HTML file.

All Metering

Print | Print Preview | Save | Refresh

M-6200A All Metering

Software Version: D-0199V02.07.01
Firmware version: D-0228V01.06.04
Serial Number: 1
Beckwith Electric
M-6200A

Metering

Primary			
Voltage:	7.14 (kV)	Source Voltage:	7.14 (kV)
Current:	6 (A)	Watts:	0.04 (MW)
VAr:	0.00 (MVAr)	VA:	0.04 (MVA)
Secondary			
Load Voltage:	119.1 (V)	Meter Out Voltage:	119.1 (V)
Source Voltage:	119.0 (V)	Comp. Voltage:	119.0 (V)
Load Current:	1 (mA)	Power Factor:	0.995 (Lag)
Frequency:	59.9 (Hz)	Normalizing Voltage:	119.0 (V)
Tap Information			
Tap Position:	0		
Drag Hands Lower:	0	Drag Hands Raise:	0
Raise Timer:	28 (s)	Intertap Timer:	100 (%)
Operation Counter:	0	Resettable Counter:	0
Neutral Counter:	0	RTN Status:	Disabled
Count to RTN Active:	0	RTN Success Counter:	0

Status

STATUS			
Regulator			
Operation Mode:	Auto	Block Status:	--
Band Status:	Low	VAr Bias Effect:	None
Power Direction:	Forward	Voltage Reduction:	--
HMI Active Status:	Not Active		
Alarm			
Comm Block:	--	LDC/LDZ:	--
Block Raise (Tap):	--	Line Current Limit:	--
Block Lower (Tap):	--	Reverse Power:	--
Block Raise (Volt):	--	Self Test:	--
Block Lower(Volt):	--	Voltage Reduction:	--
Abnormal Tap Position:	--	Max VAr Bias Dur. -Lead:	--
Max VAr Bias Dur. -Lag:	--	Backup Power Fail:	--
Low Current Block:	--	Motor Seal-in Failure:	--
RTN Fail to Operate:	--	Individual Tap Wear:	--
Op Count Signal:	--	Leading VAr:	--
Lagging VAr:	--	Leading Power Factor:	--
Lagging Power Factor:	--		
Input			
Neutral Tap:	--	Counter:	--

Figure 2-37 Display All Metering Screen

MOTOR CURRENT PROFILE

Accessing The Motor Current Screens (HMI)

To access the Motor Current screens from the control front panel proceed as follows:

1. Press the Left Arrow (MNTR Hot Button) pushbutton to awaken the unit. The menu will advance to "MONITOR".

```
              MONITOR
←UTIL                    SETP→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
              Metering
←                              →
```

3. Press the Right or Left arrow pushbutton, as necessary, to advance to the "Motor Current" screen.

```
          Motor Current
←                              →
```

4. Pressing the Down arrow pushbutton will advance the menu to the first element (**Peak RMS Curr**) of the "Motor Current" screens.

```
Peak RMS Curr
0.0  mA  (0.0)                 T
```

5. Press the Down arrow to access the following "Motor Current" parameter screens.

   Avg RMS Curr

   Profile Duration

   Peak Motor Current

The remaining Motor Current screens are accessed by navigating within the "Motor Current" menu. When accessed, the individual screen displays bottom line will display current values for each parameter. For Peak RMS Current, Average RMS Current and Profile Duration the bottom display line will also include a "T" that indicates the Motor Current Monitoring is in the "Training" mode.

The "Training" mode is used during commissioning of the regulator control. Several tapchange operations are manually performed, then the profile is stored in the EEPROM. The profile is compared with the profile during normal tapchange operation to initiate alarms.

```
Avg RMS Curr
0.0  mA  (0.0)                 T
```

```
Profile Duration
xxxxx.xms  (xxxxx.x)           T
```

```
Peak Motor Current             E
xx.x  mA
```

Initializing Motor Current Values (HMI)

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
          CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Tapchanger Type
←                              →
```

3. Press the Right or Left arrow pushbutton as necessary until "Mtr Current Profile" is displayed.

```
      Mtr Current Profile
←                              →
```

4. Press the Down arrow pushbutton, as necessary, to navigate to the "Init. Motor Current" screen.

```
Init. Motor Current
Press ENT to reset.
```

5. Press the ENT pushbutton. The control will momentarily display the following.

```
Init. Motor Current
Initialization Done.
```

```
Init. Motor Current
Press ENT to reset.
```

Accessing Motor Current Profile Screen, Resetting Training Mode and Peak Motor Current From TapTalk

To access the TapTalk® Motor Current Profile screen perform the following:

1. Start TapTalk, then establish communications with the target control.
2. Select **Monitor/Motor Current Profile** from the TapTalk toolbar. TapTalk will display a "Motor Current Profile" dialog screen (Figure 2-38).

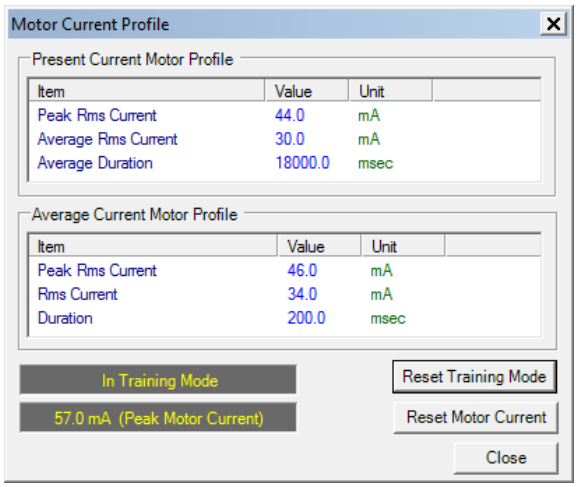


Figure 2-38 Motor Current Profile Dialog Screen

3. To reset the Motor Current Profile to the Training Mode select "Reset Training Mode". TapTalk will display a "Motor Current Profile Reset" confirmation screen (Figure 2-39).

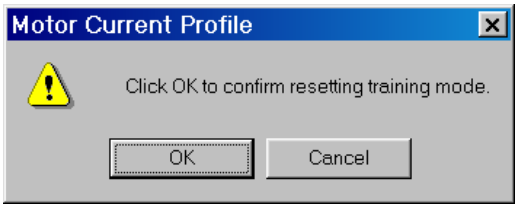


Figure 2-39 Motor Current Profile Training Mode Reset Confirmation Screen

4. Select **OK**. TapTalk will display a Motor Current Profile Reset successfully sent confirmation screen (Figure 2-40).

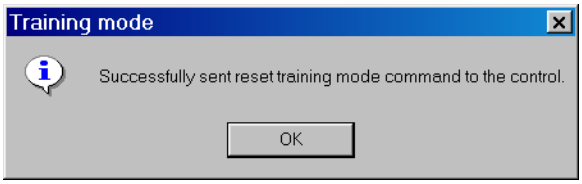


Figure 2-40 Motor Current Profile Reset Training Mode Successfully Sent Confirmation Screen

See **Chapter 4, Motor Current Detection and Monitoring** for details regarding this feature.

5. To reset the Peak Motor Current Value to zero select "Reset Motor Current". TapTalk will display a "Peak Motor Current" reset configuration screen (Figure 2-41).

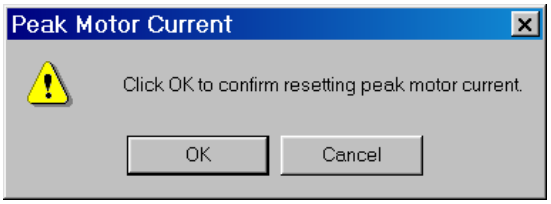


Figure 2-41 Peak Motor Current Profile Reset Confirmation Screen

6. Select **OK**. TapTalk will display a Peak Motor Current reset successfully sent confirmation screen (Figure 2-42).

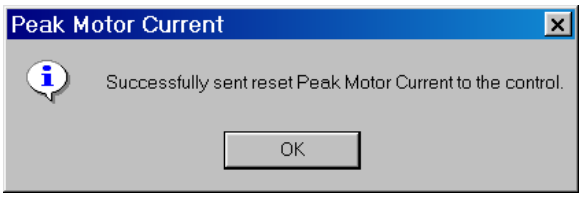


Figure 2-42 Peak Motor Current Profile Reset Successfully Sent Confirmation Screen

7. Select **OK**. TapTalk will return to the Motor Current Profile dialog screen (Figure 2-38).

HARMONIC ANALYSIS

Accessing The Harmonics Screens (HMI)

To access the Harmonics screens from the control front panel proceed as follows:

1. Press the Left Arrow (MNTR Hot Button) pushbutton to awaken the unit. The menu will advance to "MONITOR".

```
              MONITOR
←UTIL                    SETP→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
              Metering
←                              →
```

3. Press the Right or Left arrow pushbutton, as necessary, to advance to the "Harmonics" screen.

```
              Harmonics
←                              →
```

4. Pressing the Down arrow pushbutton will advance the menu to the first element (**Voltage % THD**) of the "Harmonics" screens.

```
Voltage % THD
X.X %
```

5. Press the Down arrow to access the remaining "Harmonics" parameter screens.

   Current % THD
   View Voltage Harmonics
   View Current Harmonics

The remaining "Harmonics" screens are accessed by navigating within the "Harmonics" menu.

Accessing Voltage/Current Harmonics Screens (HMI)

The steps necessary to view "Voltage Harmonics" or "Current Harmonics" screens are as follows:

1. Navigate to the "Voltage" or "Current Harmonics" screen.

```
Press ENT to view
Voltage Harmonics
```

2. Press the ENT pushbutton. The control will display the following screen.

```
Harmonic            Values
   2              0.0V    0.0%
```

or

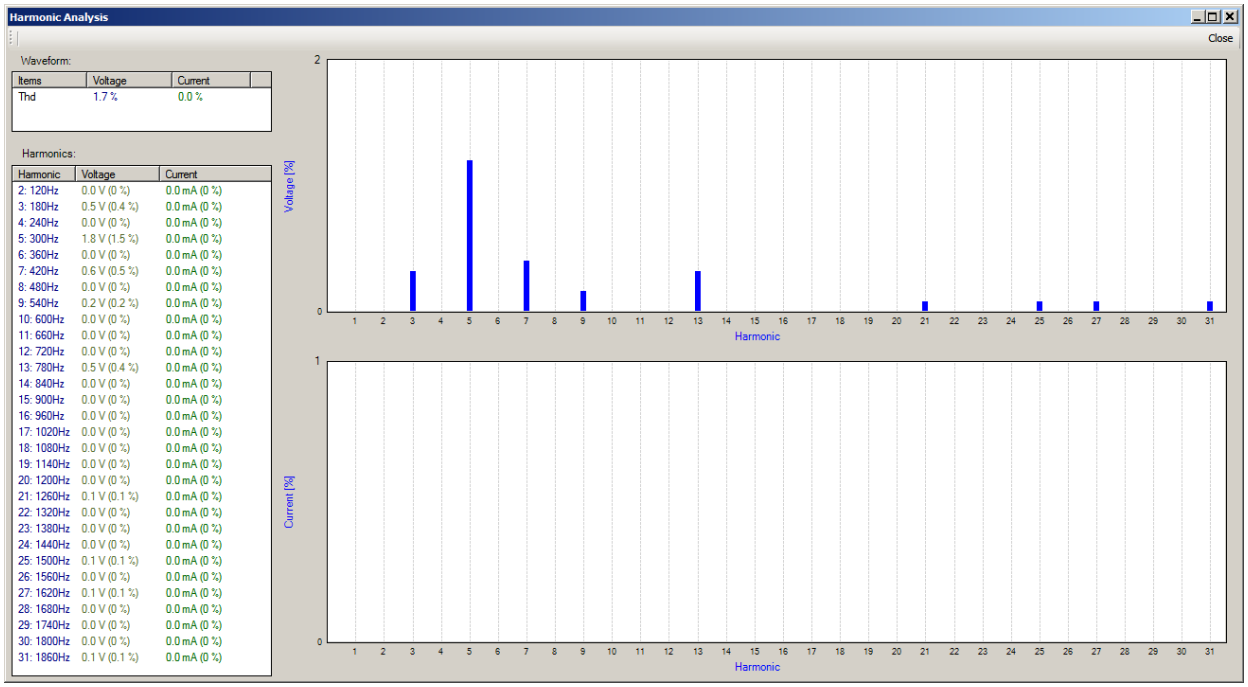
```
Harmonic            Values
   2              0.0mA    0.0%
```

Press the Up or Down arrow pushbutton as necessary to navigate to the desired Harmonic (2-31).

Accessing Harmonic Analysis Screen From TapTalk

To access the Harmonic Analysis screen perform the following:

1. Start TapTalk®, then establish communications with the target control.
2. Select **Monitor/Harmonic Analysis** from the TapTalk toolbar. TapTalk will display a "Harmonic Analysis" screen (Figure 2-43).



■ **NOTE:** Hovering the mouse in the chart area will display the corresponding Harmonic values in a tool tip.

Figure 2-43 Harmonic Analysis Screen

TAP INFORMATION

Accessing The Tap Information Screens (HMI)

To access the Tap Information screens from the control front panel proceed as follows:

1. Press the Left Arrow (MNTR Hot Button) pushbutton to awaken the unit. The menu will advance to "MONITOR".

```
              MONITOR
←UTIL                    SETP→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
             Metering
←                              →
```

3. Press the Left or Right arrow pushbutton, as necessary, to advance to "Tap Information".

```
         Tap Information
←                              →
```

4. Press the Down arrow pushbutton once. The menu will advance to the first element (**Tap Position/Cal**) of the "Tap Information" screens.

```
Tap Position/Cal
     0
```

The remaining "Tap Information" screens are accessed by navigating within the "Tap Information" menu. "Tap Information" screens that include an "E" on the right side of the top display can be reset.

Tap Position/Cal
Drag Hands (Reset)
Definite Timer (Raise Sec. /Lower Sec.)
Intertap Timer (0-100%)
Operation Counter
Resettable (Operation) Counter (reset)
Neutral Switch Counter
Lower Counter
Raise Counter
View Specific Tap Statistics
Clear Specific Tap Statistics
RTN Success Counter
RTN Status
Count to RTN Active

Calibrating Tap Position (HMI)

To Calibrate the Tap Position proceed as follows:

1. Navigate to the "Tap Position/Cal" screen in the Monitor/Tap Information menu.

```
Tap Position/Cal
     0
```

2. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, then a "C" will be displayed. Go to Step 5.

```
Tap Position/Cal
     0                         C
```

3. If Level 2 Access is active then the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS

_
```

■**NOTE**: When entering the Level 2 Access code the display will automatically advance the cursor to the next digit when input is momentarily paused.

4. Enter a valid Level 2 Access code, then press the ENT pushbutton.

   If a valid Level 2 Access code was entered, then the display will briefly flash a confirmation screen, then a "C". If not, reenter a valid code.

5. At the cursor, input the desired Tap Position utilizing arrow pushbuttons, then press the ENT pushbutton. The display will return to the "Tap Position/Cal" screen.

DRAG HANDS

Reset Drag Hands Values (HMI)

To reset Drag Hands values proceed as follows:

1. Navigate to the "Drag Hands" screen in the Monitor/Tap Information menu.

```
Drag Hands                    E
L=  ON              R=  ON
```

The presence of the "E" on the top line of the display indicates that the Drag Hands values can be reset from this menu item.

2. Press the ENT pushbutton. The displayed "E" will change to a flashing "R".
3. Press the ENT pushbutton. The control will display the following:

```
Drag Hands
Press ENT to confirm
```

4. Press the ENT pushbutton. The control will display the following:

```
Drag Hands
L=  ON              R=  ON
```

The Drag Hands values are now reset to the current value.

Reset Drag Hands Values (TapTalk)

To reset Drag Hands values from TapTalk® perform the following:

1. Select **Setup/Tap Settings** from the TapTalk toolbar. TapTalk will display the Tap Settings dialog screen (Figure 4-45).
2. From the "Drag Hands" section of the Tap Settings dialog screen select the "Reset".
3. Select **Save**. TapTalk will display a "Save to Device" confirmation screen (Figure 4-2).
4. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 2-24).
5. The Drag Hands values will be reset to the current value.

OPERATION COUNTER

Reset Operation Counter (HMI)

To reset the Operation Counter proceed as follows:

1. Navigate to the "Resettable Counter" screen in the Monitor/Tap Information menu.

```
Resettable Counter            E
X
```

2. Press the ENT pushbutton. The displayed "E" will change to a flashing "R", then press ENT again.

```
Resettable Counter            R
Press ENT to confirm
```

3. Press the ENT pushbutton. The control will display the following:

```
Resettable Counter
0
```

The Operation Counter is now reset. Press the Exit pushbutton to return to the "Tap Information" screen.

Reset Operation Counter (TapTalk)

To reset the Operation Counter from TapTalk perform the following:

1. Select **Setup/Tap Settings** from the TapTalk toolbar. TapTalk will display the Tap Settings dialog screen (Figure 4-45).
2. From the "Operation Counter" section of the Tap Settings dialog screen select the "Reset" for the "Resettable" parameter.
3. Select **Save**. TapTalk will display a "Save to Device" confirmation screen (Figure 4-2).
4. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 2-24).
5. The Operation Counter value will be reset to zero.

TAP STATISTICS

Viewing Specific Tap Statistics (HMI)

To view tap statistics proceed as follows:

1. Navigate to the View Specific Tap Statistics screen in the Monitor/Tap Information menu.

```
Press ENT to view
specific Tap Stats
```

2. Press the ENT pushbutton. The control will display the number of recorded tapchanges and the Accumulated Primary Current for each individual tap position on the regulator control.

```
Tap            Tap Number
 X              X    X.X         A
```

The Up and Down arrow pushbuttons are utilized to cycle through the tap positions. Press the Exit pushbutton to exit Tap Stats.

Clearing Tap Statistics (HMI)

To clear Tap Statistics proceed as follows:

1. Navigate to the Clear Tap Statistics screen in the Monitor/Tap Information menu.

```
Press ENT to clear
Tap Statistics
```

2. Press the ENT pushbutton. The control will display Clear Tap Stats confirmation display.

```
Press ENT to confirm
clearing Tap Stats
```

3. Press the ENT pushbutton. The control will briefly display the "Tap Statistics have been cleared" confirmation and then return to the previous display.

```
Tap Statistics
have been cleared
```

Press the Exit pushbutton to exit Tap Stats.

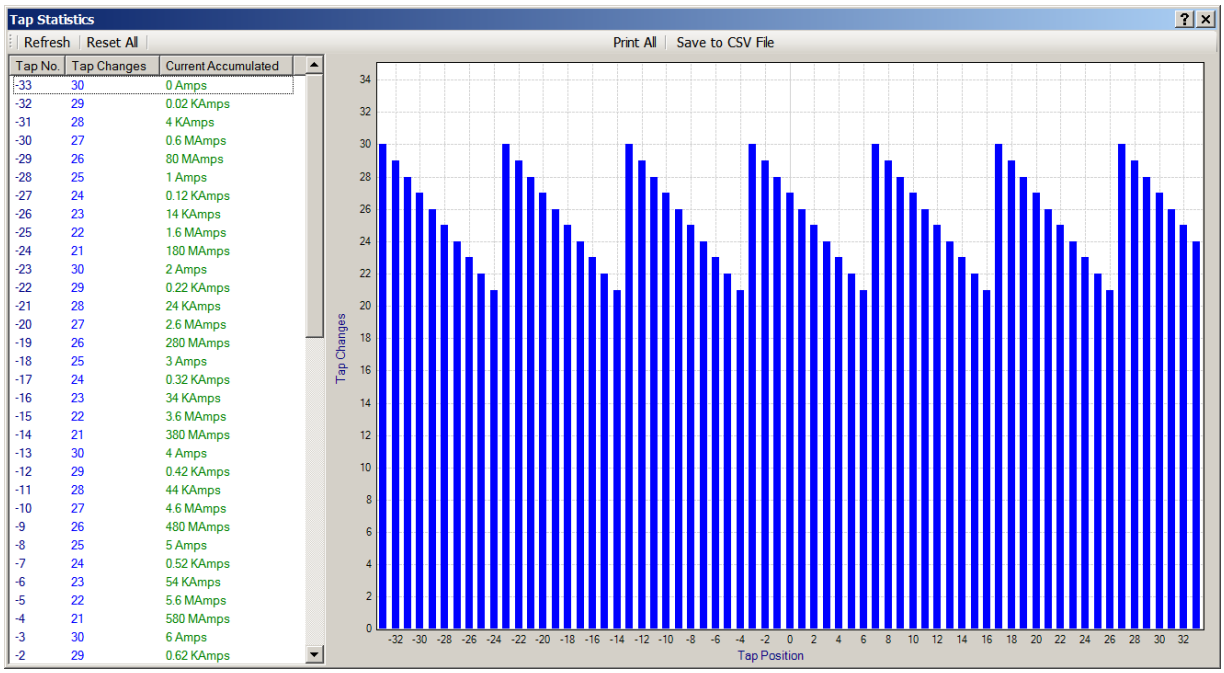
View Tap Statistics From TapTalk

To view Tap Statistics from TapTalk® perform the following:

1. Start TapTalk, then establish communications with the target control.
2. Select **Monitor/Tap Statistics** from the TapTalk toolbar. TapTalk will display a "Tap Statistics" screen (Figure 2-44).

   The "Tap Statistics" screen includes the capability to Refresh the screen display, Reset All displayed values, and save the data to a ".csv" file which can be read by a spreadsheet program.

   Selecting "Reset All" will clear the Individual Tap Wear Alarm in the Metering & Status screen.



Tap No.	Tap Changes	Current Accumulated
-33	30	0 Amps
-32	29	0.02 KAmps
-31	28	4 KAmps
-30	27	0.6 MAmps
-29	26	80 MAmps
-28	25	1 Amps
-27	24	0.12 KAmps
-26	23	14 KAmps
-25	22	1.6 MAmps
-24	21	180 MAmps
-23	30	2 Amps
-22	29	0.22 KAmps
-21	28	24 KAmps
-20	27	2.6 MAmps
-19	26	280 MAmps
-18	25	3 Amps
-17	24	0.32 KAmps
-16	23	34 KAmps
-15	22	3.6 MAmps
-14	21	380 MAmps
-13	30	4 Amps
-12	29	0.42 KAmps
-11	28	44 KAmps
-10	27	4.6 MAmps
-9	26	480 MAmps
-8	25	5 Amps
-7	24	0.52 KAmps
-6	23	54 KAmps
-5	22	5.6 MAmps
-4	21	580 MAmps
-3	30	6 Amps
-2	29	0.62 KAmps

■ **NOTE:** By pointing the mouse to any bar, the corresponding tap statistic will be highlighted as well as displayed in a tool tip.

Figure 2-44 Tap Statistics Screen

SMART FLASH SD CARD

Accessing The Smart Flash SD Card Screens (HMI)

To access the Smart Flash SD Card screens proceed as follows:

▲ **CAUTION**: The "Smart Flash SD Card" menu screens can only be accessed when a properly formatted Smart Flash SD Card or SDHC Card is inserted and seated in the Smart Flash SD Card slot.

1. Verify that a (FAT) formatted Smart Flash SD or SDHC Card is inserted into the Smart Flash SD Card slot.
2. Press the Right Arrow (COMM Hot Button) pushbutton to awaken the unit. The menu will advance to "Memory Card".

```
            Memory Card
←                                   →
```

The Memory Card can now be utilized to:

Quick Capture
Load Setpoints
Save Setpoints
Save Data Log
Save Sequence of Events
Save Oscillograph
Clone Save
Clone Load
Load DNP Config
Save DNP Config
Save Metering Data
Firmware Update
Save Wake-up Screen Parameters
SD Card User Access Code (Physical Security Key)

■**NOTE**: If the Smart Flash SD Card has had a valid Access Level 1 or Access Level 2 code written to it, the control will accept the code and not prompt for an Access Code.

SD Card Quick Capture

The SD Card Quick Capture feature provides the means (in one step) to initiate a save of the following data files to the inserted SD Card (if they exist on the control):

- Control Clone
- Data Logging
- Oscillography
- Sequence of Events
- DNP Map
- Multi-user Access Code
- Multi-user Access Code Log

The SD Card Quick Capture feature requires a Level 2 Access Code to initiate. If any data file other than "Control Clone" does not exist on the control at the time the Quick Capture is initiated, the control will display a "XXX file doesn't exist" message for approximately three seconds before continuing with the Quick Capture process.

Quick Capture File Naming Convention

Since Data Logging and Oscillography files both utilize the same Comtrade format, the Quick Capture feature will name Data Logging files as DSXXXXXX.dat and DSXXXXXX.cfg. Oscillography files will be named as YYXXXXXX.dat and YYXXXXXX.cfg, with YY representing the "Partition" and XXXXXX representing the "Serial Number" of the control. For example, 16009999.dat would be an Oscillography file of the 16th Partition in control Serial Number 9999.

Initiating a Smart Flash SD Card Quick Capture

1. Insert the target Smart Flash SD Card into the control as previously described.
2. Press the Right Arrow (Comm Hot Button) pushbutton. The control will go directly to the "Memory Card" menu.

```
          Memory Card
←                          →
```

3. Press the Down Arrow pushbutton as necessary to navigate to the "SD Quick Capture" menu item.

```
SD Quick Capture
Press ENT to begin
```

4. Press the "ENT" pushbutton. If Level 2 Access is not active or has been previously input, then the following will be displayed. Go to Step 7.

```
Confirm press ENT
Cancel press EXIT.
```

5. If Level 2 Access is active, then the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
_
```

■**NOTE:** When entering the Level 2 Access code the display will automatically advance the cursor to the next digit when input is momentarily paused.

6. Enter a valid Level 2 Access code, then press the "ENT" pushbutton.

   If a valid Level 2 Access code was entered, then the display will briefly flash a confirmation screen and then display the following:

```
Confirm press ENT
Cancel press EXIT
```

   If not, re-enter a valid code.

7. Press the "ENT" pushbutton. The control will cycle through the Quick Capture sequence of displays listed below:

■**NOTE:** If a file is not present (OSC for example) the control will display a "XXX file does not exist" message for approximately three seconds before continuing with the next save item in the Quick Capture sequence.

```
Confirm press ENT
Cancel press EXIT
```

```
Saving...
Clone File
```

```
Saving...
DNP CFG file
```

```
Saving...
SOE file
```

```
Saving...
Data Log file
```

```
Saving data file
......
```

```
Saving...
OSC file
```

```
Saving...
Multi-user Pass.log
```

```
Quick Cap Complete,
Any key to continue
```

Loading Setpoints from a Smart Flash SD Card

1. Insert the target Smart Flash SD Card (that includes the setpoints file) into the control as previously described.

2. Press the Right Arrow (COMM Hot Button) pushbutton to awaken the unit. The menu will advance to "Memory Card".

```
          Memory Card
←                          →
```

3. Press the Down pushbutton arrow as necessary to navigate to the "Load Setpoints" menu item.

```
Load Setpoints
Press ENT to begin
```

4. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, then the following will be displayed. Go to Step 7.

```
Confirm press ENT
Cancel press EXIT.
```

5. If Level 2 Access is active, then the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
_
```

■**NOTE**: When entering the Level 2 Access code the display will automatically advance the cursor to the next digit when input is momentarily paused.

6. Enter a valid Level 2 Access code, then press the ENT pushbutton.

   If a valid Level 2 Access code was entered, then the display will briefly flash a confirmation screen and then display the following:

```
Confirm press ENT
Cancel press EXIT.
```

   If not, re-enter a valid code.

■**NOTE**: If an arrow is displayed on either end of the bottom display line, additional setpoint files are available for selection. Utilize the Right or Left arrow pushbuttons to select the desired file.

7. Press the ENT pushbutton. The control will prompt the user to select the file to be loaded.

```
        File Name.tpt
   MM/DD/YYYYY  hh:mm →
```

8. Utilize the Right or Left arrow pushbutton to select the desired setpoint file (*.tpt) .

▲ **CAUTION**: Setpoint changes are immediately acted upon by the control and may cause undesired control operation.

9. Select ENT. The control will briefly display a progress screen and then display the setpoints loaded screen.

```
Loading file.
Please wait........
```

```
Setpoints loaded.
Any key to continue
```

   The new setpoints are now available to the control.

Saving Setpoints to a Smart Flash SD Card

1. Insert the Smart Flash SD Card (that has adequate space available) into the control as previously described.
2. Press the Right Arrow (COMM Hot Button) pushbutton to awaken the unit. The menu will advance to "Memory Card".

```
            Memory Card
←                                   →
```

3. Press the Down pushbutton arrow as necessary to navigate to the "Save Setpoints" menu item.

```
Save Setpoints
Press ENT to begin
```

4. Press the ENT pushbutton. The control will respond with a "confirmation" message screen.

```
Confirm press ENT
Cancel press EXIT.
```

5. Press the ENT pushbutton. The control will prompt for a file name to be entered.

```
        Enter file name
            A6200SP
```

6. Utilize the arrow pushbuttons to enter the desired file name.
7. Select ENT. The control will briefly display a progress screen and then display the setpoints loaded screen.

```
Saving setpoints
Please wait........
```

```
File saved!
Any key to continue
```

Saving Data Log to a Smart Flash SD Card

1. Insert the Smart Flash SD Card (that has adequate space available) into the control as previously described.
2. Press the Right Arrow (COMM Hot Button) pushbutton to awaken the unit. The menu will advance to "Memory Card".

```
            Memory Card
←                                   →
```

3. Press the Down pushbutton arrow as necessary to navigate to the "Save Data Log" menu item.

```
Save Datalog
Press ENT to begin
```

4. Press the ENT pushbutton. The control will respond with a "confirmation" message screen.

```
Press ENT to view
available data range
```

5. Press the ENT pushbutton. The control will display a range of data.

```
MM/DD/YY            HH:MM:SS
MM/DD/YY            HH:MM:SS
```

6. Press the ENT pushbutton to enter the desired data range. The control will display the following with the cursor located under the far left digit:

```
Enter start time
MM/DD/YY    HH:MM:SS            C
```

7. Utilizing the arrow pushbuttons enter the desired "start" date and time, then press **ENT**. The control will display the following:

```
Enter end time
MM/DD/YY   HH:MM:SS             C
```

8. Utilizing the arrow pushbuttons enter the desired "end" date and time, then press **ENT**. The control will display the following:

```
Enter file name
A6200DLG
```

9. Utilizing the arrow pushbuttons enter the desired "file name", then press **ENT**. The control will briefly display a progress screen and then display the file saved screen.

```
Saving data file.
Please wait........
```

```
File saved!
Any key to continue
```

Saving Sequence of Events to a Smart Flash SD Card

1. Insert the Smart Flash SD Card (that has adequate space available) into the control as previously described.
2. Press the Right Arrow (COMM Hot Button) pushbutton to awaken the unit. The menu will advance to "Memory Card".

```
Memory Card
←                    →
```

3. Press the Down pushbutton arrow as necessary to navigate to the "Save seq. of events" menu item.

```
Save seq. of events
Press ENT to begin
```

4. Press the ENT pushbutton. The control will respond with a "enter file name" prompt screen with the cursor under the far left position.

```
enter file name
A6200
```

5. Utilizing the arrow pushbuttons enter the desired file name, then press **ENT**. The control will display the following confirmation screen:

```
File Saved!
Any key to continue
```

6. Press any key. The display will return to the "Save seq. of events" screen.

Saving Oscillograph Record to a Smart Flash SD Card

1. Verify that the "Oscillograph Record Triggered" message cycling display is present on the control.
2. Insert the Smart Flash SD Card (that has adequate space available) into the control as previously described.
3. Press the Right Arrow (COMM Hot Button) pushbutton to awaken the unit. The menu will advance to "Memory Card".

```
            Memory Card
←                                  →
```

4. Press the Down pushbutton arrow as necessary to navigate to the "Save oscillograph" menu item.

```
Save oscillograph
Press ENT to begin
```

5. Press the ENT pushbutton. The control will respond with a "Select partition#" prompt screen.

```
Select partition:
1   MM/DD/YY   HH:MM:SS
```

6. Utilizing the Up/Down arrow pushbutton select the desired partition, then press **ENT**. The control will respond with a "Enter file name" prompt screen with the cursor under the far left position.

```
         Enter file name
            A62000SC
```

7. Utilizing the arrow pushbuttons enter the desired file name, then press **ENT**. The control will display the following:

```
Saving data file
.......00
```

8. When the file has been saved to the Smart Flash SD Card, then the control will display the following confirmation screen:

```
File Saved!
Any key to continue
```

9. Press any key, the display will return to the "Save oscillograph" screen.

Clone Save and Load

There are two types of "Clone Save" and "Clone Load" features included in the control. The two types are distinguished by the file name that is utilized when initiating a Clone Save or Clone Load.

Clone Save with "DNP Configuration" and "Multi-user Password" files

When the Clone Save feature is initiated, a default file name that includes the control Serial Number is displayed (SNxxxxxx). If the user utilizes the default file name, the control will write the control Settings File, DNP Configuration File and Multi-user Password File (if the DNP and Password files exist on the control) to the Smart Flash SD Card.

If the DNP and/or Password files do not exist on the cloned control, a message stating "DNP CFG file does not exist" or "Multi-user Password file doesn't exist" will be displayed during the Load sequence.

Clone Load with "DNP Configuration" and "Multi-user Password" files

When the Clone Load feature is initiated, the user must enter/select the clone file name that includes the control Serial Number (SNxxxxxx) that was saved with the associated DNP Configuration and Multi-user Password files. When the clone file name is entered, the control will check for DNP and Multi-user Password files named for the serial number of the clone file and will write the found files to the target control.

If the DNP and/or Password files do not exist on the cloned control, a message stating "DNP CFG file does not exist" or "Multi-user Password file doesn't exist" will be displayed during the Load sequence.

Clone Save Without "DNP Configuration" and "Multi-user Password" files

When the Clone Save feature is initiated, a default file name that includes the control Serial Number is displayed (SNxxxxxx). If the user enters a different file name the control will only write the control Settings File to the Smart Flash SD Card.

Clone Save to a Smart Flash SD Card

To save Clone files to the Smart Flash SD Card perform the following:

1. Insert the Smart Flash SD Card (that has adequate space available) into the control as previously described.
2. Press the Right Arrow (COMM Hot Button) pushbutton. The control will display the "Memory Card" menu.

```
          Memory Card
←                          →
```

3. Press the Down pushbutton arrow as necessary to navigate to the "Clone Save" menu item.

```
Clone save
Press ENT to begin
```

4. Press the ENT pushbutton. The control will respond with a "confirmation" screen.

```
Confirm press ENT
Cancel press EXIT.
```

5. Press **ENT**. The control will respond with a "Enter file name" prompt screen with the cursor under the far left position.

```
Enter file name
    SN1
```

6. Determine if any found DNP Configuration and Multi-user Password files are to be included in the Clone Save and proceed as follows:
   a. If found DNP Configuration and Multi-user Password files are to be included in the Clone Save go to Step 10.
   b. If found DNP Configuration and Multi-user Password files are not to be included in the Clone Save go to Step 7.
7. Utilizing the arrow pushbuttons enter the desired file name, then press **ENT**. The control will display the following:

```
Saving data
    SN1
```

8. When the file has been saved to the Smart Flash SD Card, then the control will display the following "confirmation" screen:

```
File Saved!
Any key to continue
```

9. Press any key. The display will return to the "Clone Save" screen. No further action is required.

10. To include found DNP Configuration and/or Multi-user Password files in the Clone Save, **Do Not** change the default file name displayed by the control.

11. Press "ENT". The control will display the following sequence of screens:

```
Saving data
   XXXXXXXXX
```

```
Saving...
DNP CFG File
```

If DNP Configuration file does not exist on the control the following will be displayed:

```
DNP CFG
File doesn't exist!
```

```
Saving...
Multi-user Password
```

If Multi-user Password File file does not exist on the control the following will be displayed:

```
Multi-user Pass File
File doesn't exist!
```

```
File Saved!
Any key to continue
```

12. Press any key, the display will return to the "Clone Save" screen. No further action is required.

Clone Load from a Smart Flash SD Card

To load Clone files to another control which may or may not include DNP Configuration and/or Multi-user Password files proceed as follows.

1. Insert the Smart Flash SD Card (that includes the Clone file) into the control as previously described.

2. Press the Right Arrow (COMM Hot Button) pushbutton. The control will go directly to the "Memory Card" menu.

```
          Memory Card
←                          →
```

3. Press the Down pushbutton arrow as necessary to navigate to the "Clone Load" menu item.

```
Clone load
Press ENT to begin
```

4. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, then the following will be displayed. Go to Step 7.

```
Confirm press ENT
Cancel press EXIT.
```

5. If Level 2 Access is active, then the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
_
```

■**NOTE**: When entering the Level 2 Access code the display will automatically advance the cursor to the next digit when input is momentarily paused.

6. Enter a valid Level 2 Access code, then press the ENT pushbutton.

   If a valid Level 2 Access code was entered, then the display will briefly flash a confirmation screen and then display the following:

```
Confirm press ENT
Cancel press EXIT.
```

   If not, re-enter a valid code.

7. Press **ENT**. The control will display the following:

```
 SN000001.cln
MM/DD/YYYY   HH:MM  →
```

8. Utilizing the arrow pushbuttons select the desired Clone File name, then press **ENT**. The control will display the following:

```
Loading file
Please wait ....
```

```
Loading...
DNP CFG File
```

If DNP Configuration file does not exist on the control the following will be displayed:

```
DNP CFG
File doesn't exist!
```

```
Loading...
Multi-user Password
```

If Multi-user Password File file does not exist on the control the following will be displayed:

```
Multi-user Pass Log
File doesn't exist!
```

9. When the clone file has been loaded the control will display the following "confirmation" screen:

```
Clone loaded
Any key to continue
```

10. Press any key. The display will return to the "Clone load" screen.

Loading DNP Configuration from a Smart Flash SD Card

1. Insert the Smart Flash SD Card (that includes the DNP config file) into the control as previously described.
2. Press the Right Arrow (COMM Hot Button) pushbutton to awaken the unit. The menu will advance to "Memory Card".

```
          Memory Card
←                          →
```

3. Press the Down pushbutton arrow as necessary to navigate to the "Load DNP Config" menu item.

```
Load DNP config
Press ENT to begin
```

4. Press the ENT pushbutton. The control will display the following.

```
        M6200ADNP.xml
     MM/DD/YYYY  HH:MM      →
```

5. Select the desired file name, then press the ENT pushbutton. The control will display the following:

```
File loaded!
Any key to continue
```

The new DNP configuration is now available to the control.

Saving DNP Configuration to a Smart Flash SD Card

1. Insert the Smart Flash SD Card (that has adequate space available) into the control as previously described.
2. Press the Right Arrow (COMM Hot Button) pushbutton to awaken the unit. The menu will advance to "Memory Card".

```
          Memory Card
 ←                          →
```

3. Press the Down pushbutton arrow as necessary to navigate to the "Save DNP Config" menu item.

```
Save DNP config
Press ENT to begin
```

4. Press the ENT pushbutton. The control will display the following:

```
      Enter file name
        M6200ADNP
```

5. Utilizing the arrow pushbuttons enter the desired file name, then press the ENT pushbutton. The control will save the DNP config file and respond with a "confirmation message" screen.

```
File saved!
Any key to continue
```

Saving Metering Data to a Smart Flash SD Card

1. Insert the Smart Flash SD Card (that has adequate space available) into the control as previously described.
2. Press the Right Arrow (COMM Hot Button) pushbutton to awaken the unit. The menu will advance to "Memory Card".

```
          Memory Card
 ←                          →
```

3. Press the Down pushbutton arrow as necessary to navigate to the "Save Metering Data" menu item.

```
Save Metering Data
Press ENT to begin
```

4. Press the ENT pushbutton. The control will display the following:

```
      Enter file name
   MTXXXXXX (Unit Serial No.)
```

5. Utilizing the arrow pushbuttons enter the desired file name, then press the ENT pushbutton. The control will save the Metering Data in a *.csv file and respond with the following sequence of screens:

```
Saving CSV...
MTXXXXXX
```

```
Saving Done...
MTXXXXXX
```

```
Save Metering Data
Press ENT to begin
```

Firmware Update from Smart Flash SD Card

1. Insert the Smart Flash SD Card (that contains the firmware update file) into the control as previously described.
2. Press the Right Arrow (COMM Hot Button) pushbutton to awaken the unit. The menu will advance to "Memory Card".

```
            Memory Card
←                          →
```

3. Press the Down pushbutton arrow as necessary to navigate to the "Firmware Update" menu item.

```
Firmware Update
Press ENT to begin
```

4. Press the ENT pushbutton. The Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
_
```

■**NOTE**: When entering the Level 2 Access code the display will automatically advance the cursor to the next digit when input is momentarily paused.

5. Enter a valid Level 2 Access code, then press the ENT pushbutton. The control will begin the firmware update.

```
Updating From SDCARD
...
```

6. When the firmware update is complete the control will display a "confirmation message" screen.

```
Update Complete
Rebooting...
```

After a firmware update the control setpoints and configuration are unaffected.

Smart Flash SD Card User Access Code

A user Access Code Level 1 or 2 can be written to a Smart Flash SD Card. The user Access Code will be read by the control when the SD Card is inserted into the Smart Flash Card slot on the front of the control. As long as the SD Card is inserted, the control will not prompt for the Level Access Code contained on the SD Card.

To Write a user Access Code to a Smart Flash SD Card proceed as follows:

1. Start the TapTalk® Communications Software on the PC.
2. Open a TapTalk "File" or connect to M-6200A control.
3. Verify that the target Smart Flash SD Card is inserted.
4. Select **Utility/SD Card Access Code**. TapTalk will display the SD Card dialog screen (Figure 2-45).

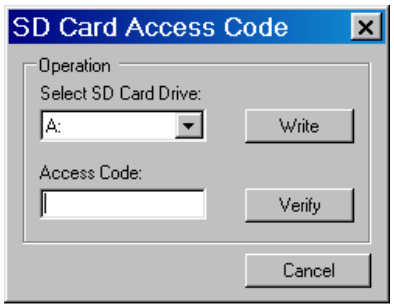


Figure 2-45 SD Card Dialog Screen

5. From the Operation section of the dialog screen select the drive that the SD Card represents in the drop down menu.
6. Enter the desired User Access Code, then select "Write". TapTalk will display a "Write Successfully" confirmation screen (Figure 2-46).

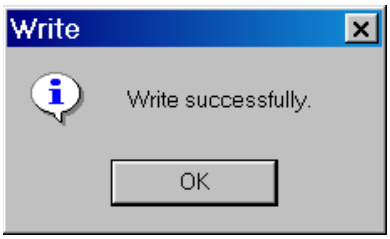


Figure 2-46 SD Card Drive "Write Successful" Confirmation Dialog Screen

7. Select "**OK**", then select "Verify". TapTalk® will display the user Access Code that was written to the SD Card (Figure 2-47).

Figure 2-47 User Access Code Verification Screen

8. Select OK. The SD Card now contains the user Access Code and will be read each time the SD Card is inserted into the control.

Formatting an SD Card in FAT32

To format an SD Card in FAT 32 proceed as follows:

■**NOTE**: This procedure requires an SD Card Slot on the computer running TapTalk.

▲ CAUTION: The contents of the SD Card will be erased when performing this procedure.

1. Select the computer (or My Computer) from the Windows™ "Start" menu.
2. Right click on the SD Card icon and select Format.
3. Select "FAT32" in the File Format box and check "Quick Format" in the Format Options.
4. Click OK. The SD Card will be formatted and Windows will prompt when completed.

Wakeup Screen Parameter Save to a Smart Flash SD Card

The Wakeup Screen Parameter Save feature provides the user with the capability to save all Wakeup Screen Parameters to the Smart Flash SD Card.

1. Insert the Smart Flash SD Card (that has adequate space available) into the control as previously described.
2. Press the Exit (Wake Hot Button) pushbutton to awaken the unit. The menu will advance to "Save Wake Data to SD".

```
Save Wake Data to SD
Press ENT to begin
```

3. Press **ENT**. The control will respond with a "Enter file name" prompt screen with the cursor under the far left position.

```
Enter file name
    SN1
```

4. Utilizing the arrow pushbuttons enter the desired file name, then press **ENT**. The control will display the following:

```
Saving data
SN1
```

5. When the file has been saved to the Smart Flash SD Card, the control will return to the Wakeup Screens.

UTILITY/CALIBRATION

Accessing Utility/Calibration Screens (HMI)

THE FOLLOWING INFORMATION REGARDING CHANGING CALIBRATION PARAMETERS IS INTENDED FOR AUTHORIZED PERSONNEL ONLY. CHANGES TO THESE PARAMETERS CAN RESULT IN PHYSICAL DAMAGE TO THE CONTROL AND THE SYSTEM/COMPONENT THAT IT IS APPLIED TO.

The Utility/Calibration HMI screens provide access to calibration parameters that can be reset by the user as necessary to restore calibration settings to those that were calculated at the factory. Also included are key parameters that are indication only.

The following calibration parameters can be accessed and set by the user:

- Volt Cal Coefficient
- Curr Cal Coefficient
- I Sin Coefficient (phase calibration)
- I Cos Coefficient (phase calibration)
- Mtr Cal. Coefficient
- Mtr Sin Coefficient (phase calibration)
- Mtr Cos Coefficient (phase calibration)
- RMS Voltage Coefficient
- RMS Motor Current Coefficient

Indication only parameters available from the Calibration/Test HMI menus:

- Load Voltage
- Control Load I
- Power Factor
- Motor Current
- X1 Duration

These instructions describe making a change to the "Volt Cal Coefficient" calibration parameter. The other calibration parameters are changed in the same manner.

▲ **CAUTION**: Incorrect calibration parameter settings can result in damage to the control.

1. Press the ENT (UTIL Hot Button) pushbutton to awaken the unit. The menu will advance to "UTILITIES".

```
            UTILITIES
←COMM                    MNTR→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Calibration/Test
←                          →
```

3. Press the Down arrow pushbutton as necessary to navigate to the "Volt Cal Coefficient" calibration parameter screen.

```
Volt Cal Coefficient
32767 X
```

4. Press the ENT pushbutton. The following will be displayed.

```
ENTER LEVEL 3 ACCESS

_
```

■**NOTE**: When entering the Level 3 Access code the display will automatically advance the cursor to the next digit when input is momentarily paused.

5. Enter a valid Level 3 Access code, then press the ENT pushbutton.

   If a valid Level 3 Access code was entered, then the display will briefly flash a confirmation screen, then a "C". If not, reenter a valid code.

6. At the cursor, input the desired Voltage Calibration Coefficient value utilizing the arrow pushbuttons, then press the ENT pushbutton. The display will return to the "Voltage Calibration Coefficient" screen.

```
Volt Cal Coefficient
32767 X
```

   Remove power to the control, then reapply power to the control.

SOURCE VOLTAGE

Changing Source Voltage Input

This feature allows the user to manually switch the sensing voltage source for diagnostic procedures.

To manually switch the Source Voltage input proceed as follows:

1. Press the ENT (UTIL Hot Button) pushbutton to awaken the unit. The menu will advance to "UTILITIES".

```
            UTILITIES
←COMM                    MNTR→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Calibration/Test
←                          →
```

3. Press the Down arrow pushbutton as necessary to navigate to the "Change Src Input" screen.

```
Change Src Input
Press ENTER.
```

4. To toggle between voltage source inputs press the ENT pushbutton. The following will be displayed depending on the source that is selected:

```
Change Src Input
Calculated  XXX.X  V
```

```
Change Src Input
Measured  XXX.X  V
```

WATCHDOG RESETS AND POWER RESETS

This feature provides the user with the ability to determine the number of processor resets that have occurred and also the number of power cycles the control has experienced. Both counters can be reset by the user.

In the event that a "checksum error" occurs this menu will change to "Init Setpoints".

To clear the Watchdog reset and Power Cycle counters proceed as follows:

1. Press the ENT (UTIL Hot Button) pushbutton to awaken the unit. The menu will advance to "UTILITIES".

```
            UTILITIES
←COMM                    MNTR→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Calibration/Test
←                          →
```

3. Press the Down arrow pushbutton as necessary to navigate to the "Clear reset counters" screen.

```
Clear reset counters
Press ENT to begin
```

4. Press the ENT pushbutton. The following will be displayed:

```
Confirm press ENTER
Cancel press EXIT.
```

5. Press ENT. The control will display a "Counters Reset" screen,

```
Counters Reset
```

then return to the following:

```
Clear reset counters
Press ENT to begin
```

CHECKSUM ERROR

■**NOTE**: When a Checksum ERROR occurs the voltage control element of the control is NOT available.

In the event a "checksum error" occurs, then the control will initiate a cycling "Checksum Error" display. In this case the "Clear reset counters" menu item in the Utilities/Configuration/Test menu display will change to "Init setpoints" function. To reinitialize the control setpoints perform the following:

1. Press the ENT (UTIL Hot Button) pushbutton to awaken the unit. The menu will advance to "UTILITIES".

```
            UTILITIES
←COMM                    MNTR→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Calibration/Test
←                          →
```

3. Press the Down arrow pushbutton as necessary to navigate to the "Init setpoints" screen.

```
Init setpoints
Press ENT to begin
```

4. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, then the following will be displayed. Go to Step 8.

```
Confirm press ENT
Cancel press EXIT.
```

5. If Level 2 Access is active, then the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
_
```

■**NOTE**: When entering the Level 2 Access code the display will automatically advance the cursor to the next digit when input is momentarily paused.

6. Enter a valid Level 2 Access code, then press the ENT pushbutton.

   If a valid Level 2 Access code was entered, then the display will briefly flash a confirmation screen and then display the following:

```
Init setpoints
Press ENT to begin
```

   If not, re-enter a valid code.

7. Press the ENT pushbutton. The following will be displayed:

```
Confirm press ENT
Cancel press EXIT.
```

8. Press ENT. The control will display the following sequence of screen displays:

```
Initializing....
```

```
Initialization Done
```

```
Init Setpoints
Press ENT to begin
```

DATALOG FILES

Converting Datalog Files to "*.CSV" Format

This utility converts "*.CFG" datalog files to "*.CSV" files for viewing in Excel. Selecting this utility from the TapTalk® utility drop down menu opens an "Open" file dialog screen. Selecting the target CFG file and then selecting "Open" converts the file and saves the resulting CSV file in the target file directory.

ABOUT SCREENS

Accessing The About Screens (HMI)

The About screens provide the user with unit serial number and firmware version. To access the About screens from the control front panel proceed as follows:

1. Press the ENT (UTIL Hot Button) pushbutton to awaken the unit. The menu will advance to "UTILITIES".

```
                UTILITIES
←COMM                          MNTR→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
          Calibration/Test
←                                  →
```

3. Press the Right or Left arrow pushbutton. The menu will advance to About.

```
                  About
←                                  →
```

4. Press the Down arrow pushbutton as necessary to navigate to the desired screen.

REMOTE CONTROL (TapTalk)

▲ **CAUTION:** This feature should be used with extreme caution.

The **Remote Control** menu item located in the Utility drop down menu displays the applicable **Remote Control** screen (Figure 2-48 or 2-49). Remote Control allows the user to:

- Remotely raise or lower one tap position.
- Apply Voltage Reduction Step 1 or 2 or 3.
- Block Auto Control via Communication (Comm Block).
- When the "SCAMP" option is purchased, the SCAMP Auto/Manual Control setting is available.

Remote Tap Control

■ **NOTE:** If the unit is supplied with DC Power Backup, then all automatic Raise or Lower operations are blocked when the input voltage decreases to less than 85.0 Vdc. Remote initiated Raise or Lower operations will still be initiated if Motor Power is available.

▲ **CAUTION**: The control will not accept a new command unless the previous command is completed.

Lower 1 Tap – Initiates remote Lower in 1 tap increments. Limited by tap Block Lower setpoint and tap position limit settings.

▲ **CAUTION**: If an appropriate pulse width setting is not input, then a misoperation of the tapchanger may occur when a SCADA Manual Raise or Lower is initiated.

Raise 1 Tap – Initiates remote Raise in 1 tap increments. Limited by tap Block Raise setpoint and tap position limit settings.

Remote Voltage Reduction

No Operation – No Voltage Reduction command is sent when **Apply** is selected.

Step #1 – Initiates first step voltage reduction command for addressed control.

Step #2 – Initiates second step voltage reduction command for addressed control.

Step #3 – Initiates third step voltage reduction command for addressed control.

Block Auto Control via Communication

Block – Blocks automatic operation of the addressed control.

Unblock – Initiates automatic operation of the addressed control.

SCAMP Control

The SCAMP Control feature (Figure 2-49) allows the user to remotely observe the status of the SCAMP pushbutton (when equipped). This feature also allows the user to change the state of the SCAMP pushbutton on the Control.

Remote Control/Miscellaneous

Close – Returns to the TapTalk® main screen.

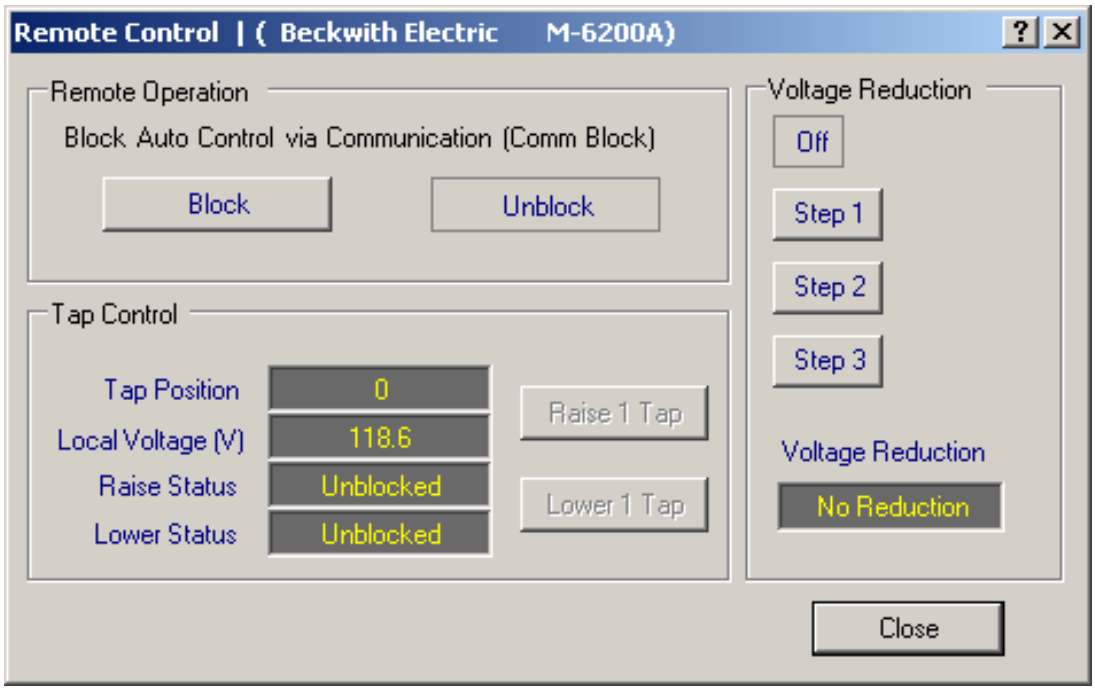


Figure 2-48 Remote Control Screen Without SCAMP

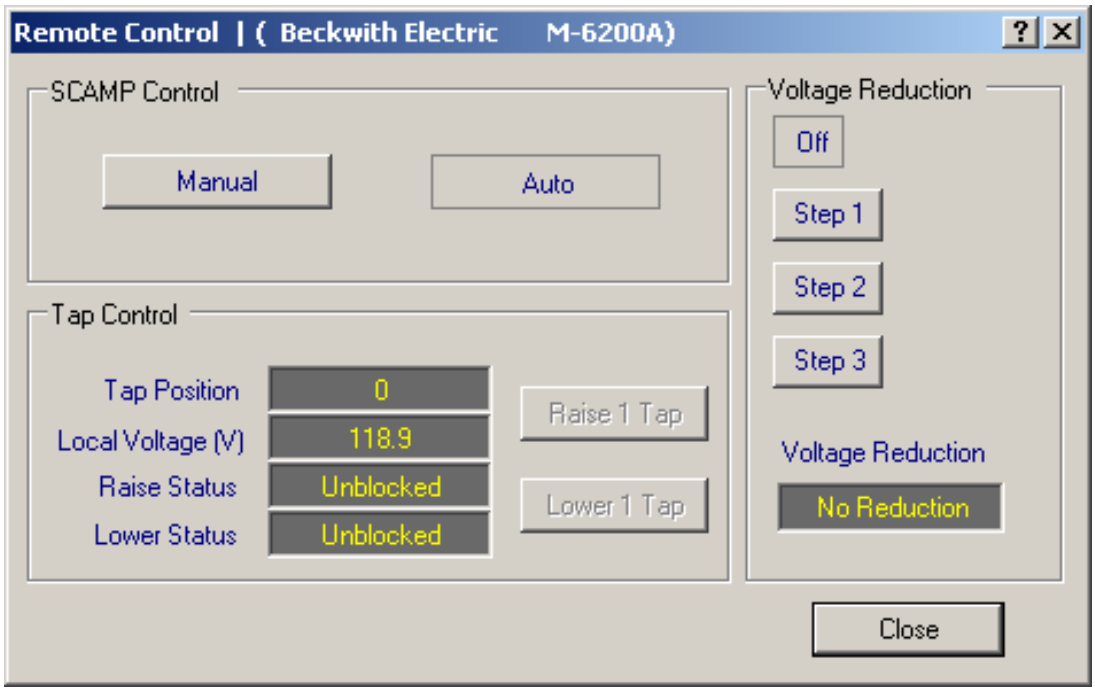


Figure 2-49 Remote Control Screen With SCAMP Option

MOTOR SEAL-IN FAILURE ALARM/BLOCK

When Motor Seal-in is selected in the control the Motor Seal-in Failure Alarm/Block feature and the input to the Abnormal Tap Position alarm are enabled by default. The user may choose to disable the Motor Seal-in Block feature. However, the input to the Abnormal Tap Position alarm and the Motor Seal-in Failure Alarm is always enabled when Motor Seal-in is selected. The feature includes the following:

Abnormal Tap Position Alarm Input - The Motor Seal-in Failure Block feature provides an input to the "Abnormal Tap Position" alarm. This input is actuated on the first occurrence of a tapchange coincident with no motor seal-in current detected for 15 seconds.

Motor Seal-in Failure Alarm - The Motor Seal-in Failure Alarm is actuated on the second occurrence (either direction) of a tapchange coincident with no motor seal-in current detected for 15 seconds. This alarm can be reset by the user from the Human Machine Interface (HMI), from the TapTalk® "Alarms" dialog screen or via SCADA. The alarm is also reset when a successful tapchange operation occurs (motor seal-in current detected) in either direction.

```
Alarm Active
MTR SEAL-IN FAILURE
```

Motor Seal-in Failure Block - The Motor Seal-in Failure Block is actuated on the second occurrence of a tapchange coincident with no motor seal-in current detected for 15 seconds in either direction. The block will be in effect in the direction that produced the second Motor Seal-in Failure occurrence. If a Motor Seal-in Failure is detected in the opposite direction, then operation will be blocked in that direction also.

This Block can be reset by the user from the HMI, from the TapTalk "Alarms" dialog screen or via SCADA. The block is also reset when a successful tapchange operation occurs (motor seal-in current is detected) in the opposite direction.

The internal accumulator that counts the occurrences of failed tapchanges is stored in volatile memory and is set to zero when a loss of power occurs and the unit is not equipped with a backup power supply. This is considered normal operation of the feature.

Resetting Motor Seal-in Failure Alarm/Block From The HMI

To reset the Motor Seal-in Failure Alarm from the HMI, perform the following:

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
        CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Tapchanger Type
←                          →
```

3. Press the Right or Left arrow pushbutton, as necessary, until "Programmable Alarm" is displayed.

```
      Programmable Alarm
←                          →
```

4. Press the Down arrow, as necessary, until the following will be displayed.

```
Clear Sealin Alarm
Ready Press Enter
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Confirm press ENTER
Cancel press EXIT.
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
_
```

■**NOTE**: When entering the Level 2 Access Code, the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and then display the following:

```
Confirm press ENTER
Cancel press EXIT.
```

   If not, re-enter a valid code.

8. Press the ENT pushbutton. The following sequence of screens will be displayed:

```
Confirm press ENTER
Cleared
```

```
Clear Sealin Alarm
Ready Press Enter
```

Resetting Motor Seal-in Failure Alarm/Block From TapTalk

To reset the Motor Seal-in Failure Alarm from TapTalk®, perform the following:

1. Select **Setup/Alarms** from the TapTalk toolbar. TapTalk will display the Programmable Alarms dialog screen (Figure 2-50).
2. From the Motor Seal-in Failure Alarm reset section of the dialog screen select Reset.

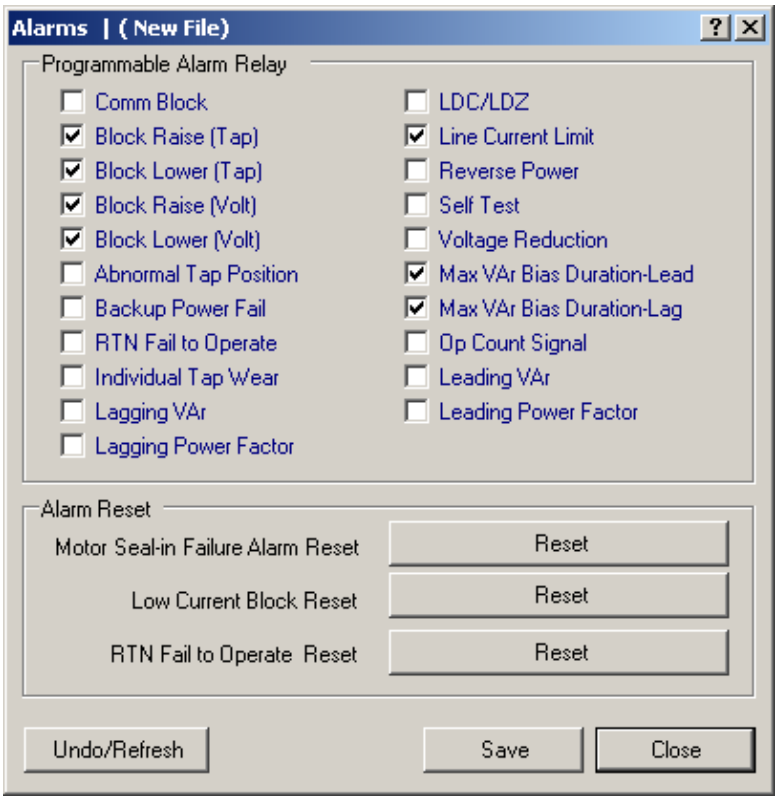


Figure 2-50 Programmable Alarms Dialog Screen

LOW CURRENT ALARM/BLOCK

Clearing Low Current Alarm/Block From The HMI

To clear the Low Current Alarm/Block from the HMI, perform the following:

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
          CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Tapchanger Type
←                          →
```

3. Press the Right or Left arrow pushbutton, as necessary, until "Programmable Alarm" is displayed.

```
      Programmable Alarm
←                          →
```

4. Press the Down arrow, as necessary, until the following will be displayed.

```
Clr Low Current Blk
Ready Press ENTER
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Confirm press ENTER
Cancel press EXIT.
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
_
```

■**NOTE**: When entering the Level 2 Access Code, the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and then display the following:

```
Confirm press ENTER
Cancel press EXIT.
```

   If not, re-enter a valid code.

8. Press the ENT pushbutton. The following sequence of screens will be displayed:

```
Confirm press ENTER
Cleared
```

```
Clr Low Current Blk
Ready Press ENTER
```

Clearing Low Current Alarm/Block From TapTalk

To clear the Low Current Alarm/Block from TapTalk®, perform the following:

1. Select **Setup/Alarms** from the TapTalk toolbar. TapTalk will display the Programmable Alarms dialog screen (Figure 2-50).
2. From the Low Current Block Reset section of the dialog screen select Reset.

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3 TapTalk® S-6200

This chapter describes the TapTalk® S-6200 Communications Software which provides the user with the capability to interrogate Beckwith Electric Digital Regulator Controls using a Windows™ based computer. Firmware version is displayed when power is applied to the control or through the display panel. While the software has been carefully designed for easy use and installation, we suggest that first-time users acquaint themselves with its operation prior to use by carefully reading this chapter.

3.0 Availability

TapTalk® S-6200 Communications Software is available on CD-ROM or from www.beckwithelectric.com. Also included on the CD-ROM is the companion Instruction Book in Adobe® Acrobat™ (*.pdf) format.

3.1 Hardware Requirements

TapTalk will run on any Windows based computer that provides at least the following:

- Microsoft® Windows 2000, XP, Vista or Windows 7
- One CD-ROM drive
- One USB (serial) port

Hardware Required for Direct USB (Serial) Communication

To use TapTalk to communicate with a Beckwith Electric Digital Regulator Control using a direct USB (serial) connection, a USB cable is required.

The M-6200A Digital Regulator Control includes a fiber optic port and RS-485 port. See Section 5.2, **External Connections**, for detailed information regarding the use of these connections.

3.2 Installing TapTalk

The TapTalk S-6200 installation program has been written to overwrite previous versions of TapTalk.

TapTalk runs on Microsoft Windows 2000, XP, Vista or Windows 7 operating system. Familiarity with Windows is important in using TapTalk.

TapTalk will be installed on the host PC's hard disk. While it does not require special installation procedures, an installation utility has been provided to make the process easier.

■ **NOTE:** The installer must have Administrator rights on the computer that TapTalk is being installed on.

To install TapTalk:

1. Insert the TapTalk software into your CD-ROM drive.
2. Select **Run** from the **Start Menu**.
3. In the **Run** dialog box, initiate software installation by typing **D:\Setup.exe** (or other drive designator:\Setup.exe, depending on the letter designation for the CD-ROM drive).
4. The Installation Wizard will prompt the user through the installation process. After installation, the TapTalk program icon (located in the Becoware folder) can be placed on the desktop (Figure 3-1).

Starting TapTalk

1. Select the TapTalk program-item icon from the Becoware group in the Program Manager, or select TapTalk from the program list using the **Start** Menu. The TapTalk Main Screen will be displayed (Figure 3-11).

Figure 3-1 TapTalk S-6200 Program-Item Icon

3.3 Communications Using Direct USB Connection

To use TapTalk® to interrogate, set, or monitor the M-6200A Digital Regulator Control using a direct USB connection, the appropriate driver must be loaded. The driver that is required to be resident in the "windows\inf" folder on the host PC is "beco_usb.inf". The driver is automatically loaded by TapTalk installation software.

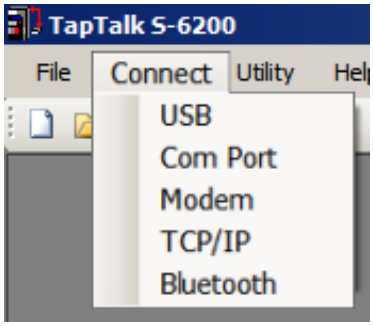
When the control is connected to the PC utilizing a USB cable, Windows will enumerate the control as a serial com device and will assign an unused COM Port to the control.

Direct Communication Using USB (Serial) Connection

1. Ensure the following conditions exist:
   - TapTalk is installed on the host computer
   - The control is energized
2. Plug the USB cable into the host PC USB port.
3. Plug the USB cable into the USB port on the control. The host PC will:
   a. Interrogate the control to determine the type of hardware device it is.

■**NOTE:** If the host PC cannot identify the proper driver for the M-6200A, the driver can be found on the TapTalk software installation disk.

   b. Load any required drivers.
   c. Assign the next available COM port to the USB connection.
4. Start the TapTalk program. TapTalk will display the TapTalk **Main** dialog screen (Figure 3-11).
5. Select **Connect/USB** from the **Connect** drop-down menu.



TapTalk will display the USB Port dialog screen (Figure 3-2).

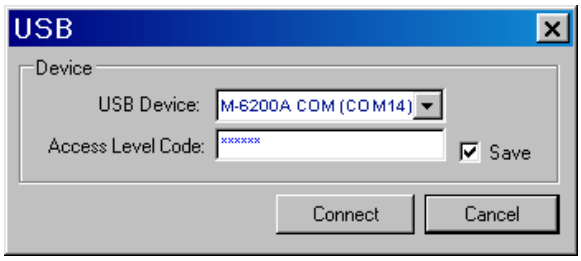


Figure 3-2 USB Port Connection Dialog Screen

6. Ensure that the correct COM port is displayed for the selected USB device.

■**NOTE:** TapTalk will automatically choose the port for the control you just connected to.

7. Enter "Access Level Code" and check "Save" if desired.

   Default Values:

   Level 1 000000 (disabled)

   Level 2 222222
8. Select **Connect**. TapTalk will attempt to connect to the target control.
9. If TapTalk returns a Failed to Connect Error screen (Figure 3-3), then repeat Steps 6, 7 and 8.

Figure 3-3 Failed to Connect Error Screen

10. If Level 1 Access is not active or the proper Level 1 or Level 2 access code was entered, then TapTalk® will briefly display a "Successfully Connected Level 1/Level 2" confirmation screen, then display the connected version of the TapTalk Main Screen (Figure 3-13) with the appropriate Access Level.

11. If Level 1 Access is active and an invalid access code was entered, then TapTalk will display a "Failed to perform Access Code Verification" error message (Figure 3-4).

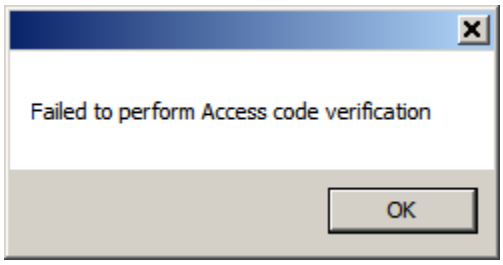


Figure 3-4 Failed to perform Access Code Verification Error Screen

12. Select **OK**. TapTalk will briefly display the "Successfully Connected Read-Only Access" screen (Figure 3-5) and then display the connected version of the TapTalk Main Screen (Figure 3-13) with Read-Only permission.

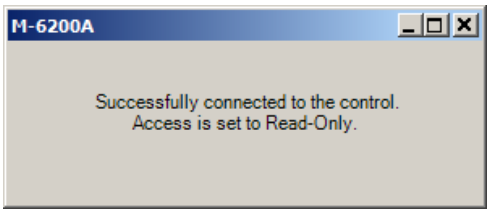


Figure 3-5 Successfully Connected Read-Only Access Screen

3.4 RS-485 Communications

To use TapTalk to interrogate, set, or monitor the M-6200A Digital Regulator Control using a RS-485 connection the following conditions must be met:

- The control is physically connected to a RS-485 network consistent with the hardware and connection requirements of Section 5.2, **External Connections**.
- TapTalk software communication parameters and device parameters must match the control's default RS-485 settings and the selected/default device parameters.

Elements of the control's RS-485 Port communication parameters include the following (default settings):

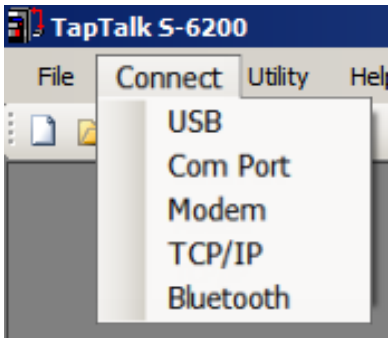
- Baud Rate (9600 bps)
- Sync Time (2 mS)
- Parity (None)
- Stop Bits (1)

Default device parameters that are at the default settings or have been configured locally at the control include (default settings):

- Device (Comm) Address (1)
- Protocol (DNP)
- Echo Cancel (fiber optic) (None)

Communication Using RS-485 Connection

1. Ensure the following conditions exist:
   - The control is physically connected to the RS-485 network
   - TapTalk is installed on the host computer
   - The control is energized
2. Start the TapTalk program. TapTalk will display the TapTalk **Main** dialog screen (Figure 3-11).
3. Select **Connect/Serial Port** from the **Connect** drop-down menu.



TapTalk® will display the Serial Port dialog screen (Figure 3-14).

4. Ensure that the correct COM port is displayed.
5. Ensure that both the Device and Comm settings are consistent with the control's default values.
6. Select **Connect**. TapTalk will attempt to connect to the target control.
7. If TapTalk returns a Failed to Connect Error screen (Figure 3-3), then repeat Steps 4, 5 and 6.
8. If Level 1 Access is not active or the proper Level 1 or Level 2 access code was entered, then TapTalk will briefly display a "Successfully Connected Level 1/Level 2" confirmation screen, then display the connected version of the TapTalk Main Screen (Figure 3-13) with the appropriate Access Level.
9. If Level 1 Access is active and an invalid access code was entered, then TapTalk will display a "Failed to perform Access Code Verification" error message (Figure 3-4). Select **OK**. TapTalk will briefly display the "Successfully Connected Read-Only Access" screen (Figure 3-5) and then display the connected version of the TapTalk Main Screen (Figure 3-13) with Read-Only permission.

3.5 Fiber Optic Communications

The fiber optic interface is connected to the rear COM Port of the device. It can be enabled through the front panel under the Comm setting menu. When fiber optic is selected, the RS-485 is disabled. The fiber optic baud rate is selectable from 300 to 115200 bps.

The echoing of the received data is supported by the hardware. Switch (located to the right of the TX fiber transmitter connection, Figure 5-2 or 5-10) opened, will disable the echoing feature (echo off). Echo ON is primarily used if the control is in a daisy chain network. Disabling the echo transmission is usually done when there is peer to peer communication. If the client software supports echo canceling, as it is the case for TapTalk, then there is no need to disable echo transmission. In this case echo cancel should be enabled on the client software. Physical specification:

- Fiber type: Multimode
- Tested with fiber size 62.5/125 or 200 HCS™

To use TapTalk to interrogate, set, or monitor the M-6200A Digital Regulator Control using a Fiber Optic connection the following conditions must be met:

- The control is physically connected to a Fiber Optic network consistent with the hardware and connection requirements of Section 5.2, **External Connections**.
- TapTalk software communication parameters and device parameters must match the control's default Fiber Optic settings and the selected/default device parameters.

Elements of the control's Fiber Optic Port communication parameters include the following (default settings):

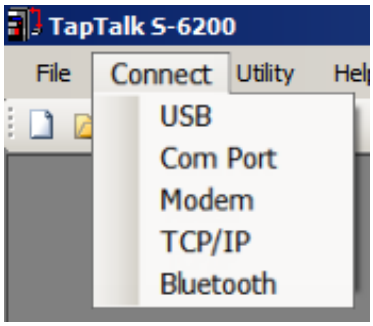
- Baud Rate (115200 bps)
- Sync Time (2 mS)
- Parity (None)
- Stop Bits (1)

Default device parameters that are at the default settings or have been configured locally at the control include (default settings):

- Device (Comm) Address (1)
- Protocol (MODBUS)
- Echo Cancel (fiber optic) (None)

Communication Using Fiber Optic Connection

1. Ensure the following conditions exist:
   - The control is physically connected to the Fiber Optic network
   - TapTalk® is installed on the host computer
   - The control is energized
2. Start the TapTalk program. TapTalk will display the TapTalk **Main** dialog screen (Figure 3-11).
3. Select **Connect/Serial Port** from the **Connect** drop-down menu.



   TapTalk will display the Serial Port dialog screen (Figure 3-14).
4. Ensure that the correct COM port is displayed.
5. Ensure that both the Device and Comm settings are consistent with the control's default values.
6. Select **Connect**. TapTalk will attempt to connect to the target control.
7. If TapTalk returns a Failed to Connect Error screen (Figure 3-3), then repeat Steps 4, 5 and 6.
8. If Level 1 Access is not active or the proper Level 1 or Level 2 access code was entered, then TapTalk will briefly display a "Successfully Connected Level 1/Level 2" confirmation screen, then display the connected version of the TapTalk Main Screen (Figure 3-13) with the appropriate Access Level.
9. If Level 1 Access is active and an invalid access code was entered, then TapTalk will display a "Failed to perform Access Code Verification" error message (Figure 3-4). Select **OK**. TapTalk will briefly display the "Successfully Connected Read-Only Access" screen (Figure 3-5) and then display the connected version of the TapTalk Main Screen (Figure 3-13) with Read-Only permission.

3.6 Ethernet Communications

The optional Ethernet Port can be purchased as either a RJ-45 (10/100 Base-T) interface or Fiber Optic through ST or SC connectors (100 Base-Fx) for Ethernet communication to the M-6200A. The port supports up to eight concurrent connections. The maximum number of allowed DNP connections is five. The maximum number of MODBUS connections is eight. The port supports DHCP protocol and also allows manual configuration of the Ethernet port. MODBUS protocol "Port Number" and DNP Protocol "Port Number" are required for manual configuration.

■**NOTE:** TapTalk can be used through the Ethernet port and may be considered a MODBUS connection for the purpose of determining how many concurrent connections are allowed.

■**NOTE:** Using Fiber Ethernet requires the Auto Negotiate setting in the control be set to Disable to operate correctly.

Communication Using Ethernet Connection

1. Ensure the following conditions exist:
   - The control is physically connected to the Ethernet network
   - TapTalk is installed on the host computer
   - The control is energized
2. Start the TapTalk program. TapTalk will display the TapTalk **Main** dialog screen (Figure 3-11).
3. Select **Connect/ TCP/IP** from the **Connect** drop-down menu. TapTalk will display the TCP/IP Connection Dialog Screen (Figure 3-16).
4. Enter the Device and TCP/IP parameters for the target control or select from the Address Book.
5. Select **Connect**. TapTalk will attempt to connect to the target control.
6. If TapTalk returns a Failed to Connect Error screen (Figure 3-3), then repeat Steps 4 and 5.

7. If Level 1 Access is not active or the proper Level 1 or Level 2 access code was entered, then TapTalk will briefly display a "Successfully Connected Level 1/Level 2" confirmation screen, then display the connected version of the TapTalk Main Screen (Figure 3-13) with the appropriate Access Level.
8. If Level 1 Access is active and an invalid access code was entered, then TapTalk® will display a "Failed to perform Access Code Verification" error message (Figure 3-4). Select **OK**. TapTalk will briefly display the "Successfully Connected Read-Only Access" screen (Figure 3-5) and then display the connected version of the TapTalk Main Screen (Figure 3-13) with Read-Only permission.

If the control is to be connected to a network that does not support DHCP protocol, then the following information must be obtained from the Network Administrator, to be entered locally at the control or remotely utilizing TapTalk:

- IP Address
- Net Mask
- Gateway (may be necessary)

Also, if the network MODBUS Port address is not "502" or the DNP Port address is not "20000", then the MODBUS Port and DNP Port settings must be set.

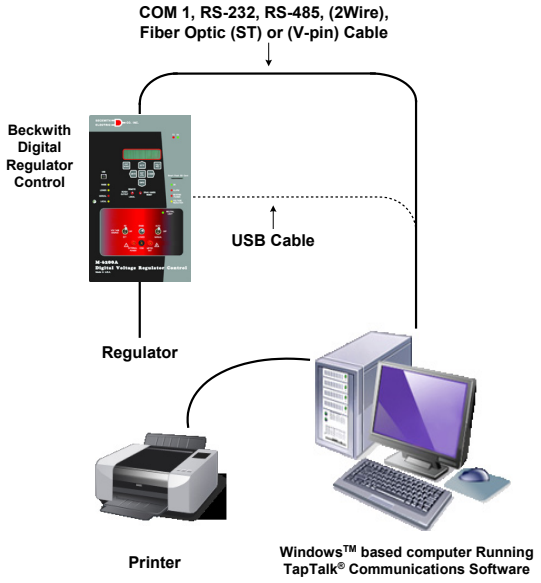


Figure 3-6 Direct Connection

3.7 Bluetooth Communications

Optional Bluetooth

The Bluetooth® option enables wireless access to the M-6200A. Utilizing the Bluetooth wireless feature the user is able to configure the control, read status and metering values, as well as change setpoints.

The Beckwith factory default values for device information are:

- Friendly Name – M-6200A-Serial Number
- Mode of Device – Mode0 (discoverable)
- Internal operation status – Standby
- Authentication: None
- Encryption: None

Communication Using Bluetooth Connection

1. Ensure the following conditions exist:
   - The Bluetooth Factory Option is enabled on the control
   - The Bluetooth Status on the control is "Present" and "Connectable"
   - TapTalk is installed on the host computer
2. Start the TapTalk program. TapTalk will display the TapTalk **Main** dialog screen.
3. Select **Connect/Bluetooth** from the **Connect** drop-down menu. TapTalk will display the Bluetooth Connection Dialog Screen (Figure 3-17).
4. Enter the Bluetooth device parameters for the target control or select from the Address Book.
5. Select **Connect**. TapTalk will attempt to connect to the target control.

   The connection time to the control will depend on the distance between the control and the client device and also on the amount of RF interference present.
6. If TapTalk returns a Failed to Connect Error screen (Figure 3-3), then repeat Steps 4 and 5.

7. If Level 1 Access is not active or the proper Level 1 or Level 2 access code was entered, then TapTalk® will briefly display a "Successfully Connected Level 1/Level 2" confirmation screen, then display the connected version of the TapTalk Main Screen (Figure 3-13) with the appropriate Access Level.
8. If Level 1 Access is active and an invalid access code was entered, then TapTalk will display a "Failed to perform Access Code Verification" error message (Figure 3-4). Select **OK**. TapTalk will briefly display the "Successfully Connected Read-Only Access" screen (Figure 3-5) and then display the connected version of the TapTalk Main Screen (Figure 3-13) with Read-Only permission.

3.8 Communications with Multiple Controls

▲ **CAUTION:** Each control connected to either a direct or modem connection configuration must have a unique communications address. If two or more controls share the same address, corrupted communication will result.

The remote addressing capability of TapTalk and the M-6200A Digital Regulator Control allows multiple controls to share a direct or network connection. A fiber optic loop network (see Figure 3-7, Fiber Optic Connection Loop), RS-485 tree configuration (see Figure 3-8, RS-485 Connection Tree) or Ethernet Network (see Figure 3-9, Optional Ethernet Network Connection) may also be used.

A control address of zero is a "wild card" that will illicit a response from all controls on a shared connection and result in corrupted communication.

With these arrangements, any control can be selected from within TapTalk by specifying it's unique communications address, ranging from 1 to 200. The communications address must have previously been set from the control's front panel.

3.9 Cautions

Control and TapTalk Compatibility

Every attempt has been made to maintain compatibility with previous control software versions. In some cases (most notably, with older controls), compatibility cannot be maintained. However, TapTalk should work correctly with more than one version of the M-6200A Series Digital Regulator Controls on a single bus, provided that the controls are all set to use the same protocol. If there is any question about compatibility, contact the factory.

Control Priority

Control conflicts will not occur as local commands initiated from the front panel receive priority recognition.

Time and Date Stamping

Time and date stamping of events is only as useful as the validity of the control's internal clock. Under the **Configuration/System Clock** menu, the Set Control Date/Time command allows you to manually set the control's clock. For reference, the computer's clock is also displayed.

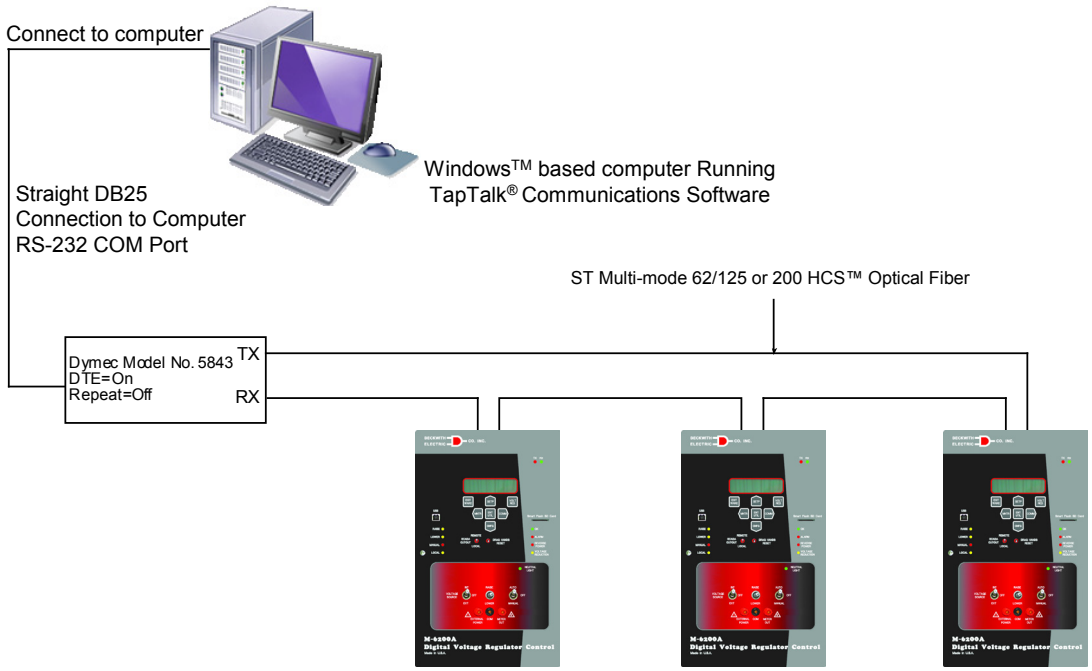


Figure 3-7 Fiber Optic Connection Loop

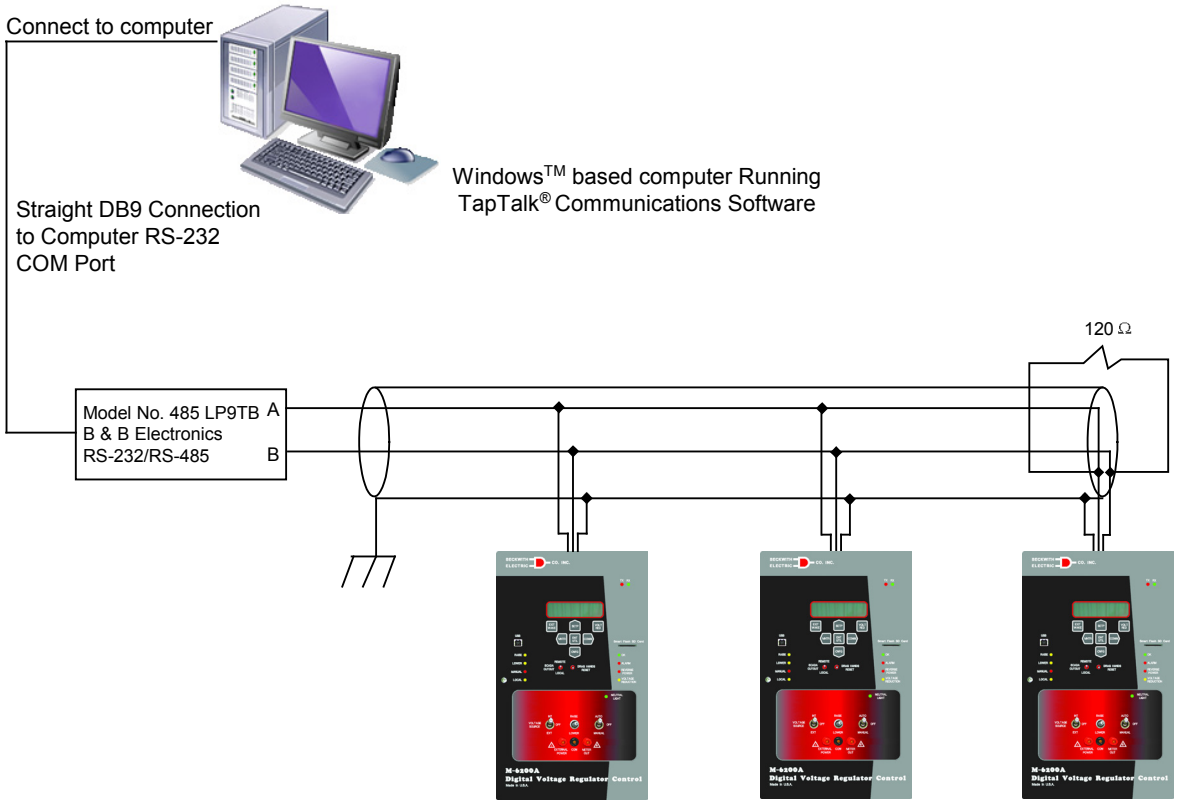


Figure 3-8 RS-485 Connection Tree

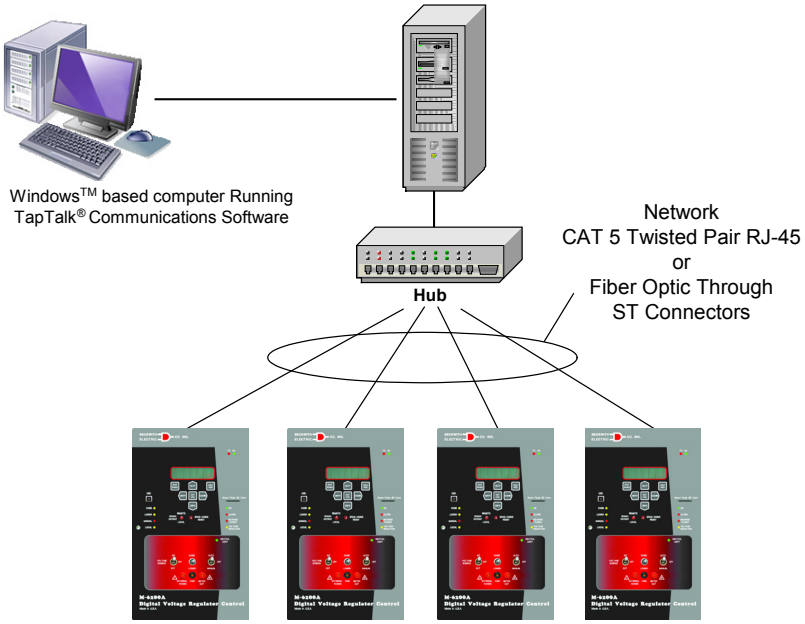


Figure 3-9 Optional Ethernet Network Connection

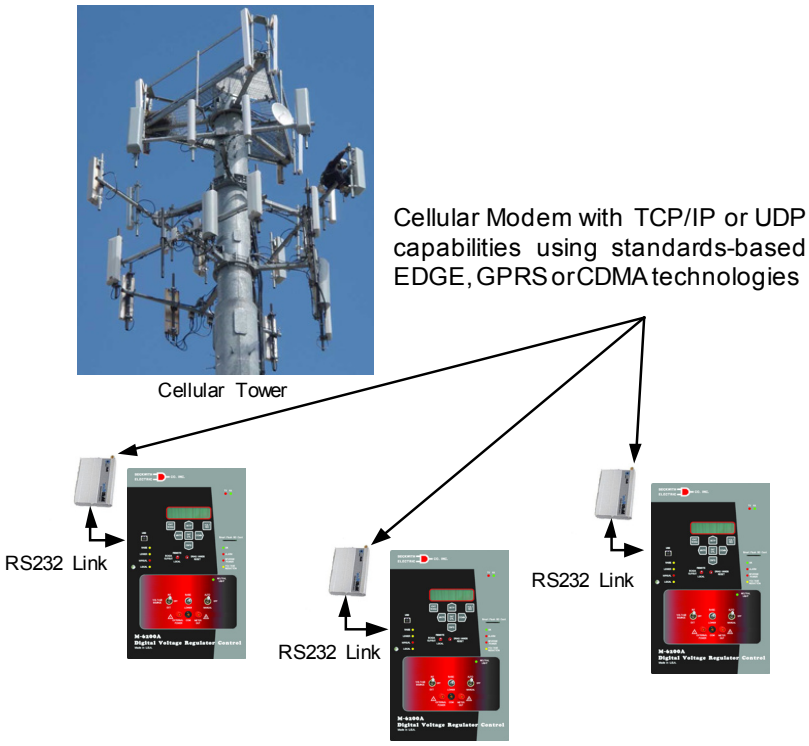


Figure 3-10 Cellular Modem Network

3.10 Overview of Operation

The TapTalk® S-6200 Communications Software can be used to successfully communicate settings and operational commands to the M-6200A as well as access the extensive monitoring and status reporting features. Figure 3-11 represents the TapTalk Main Screen menu structure. TapTalk Main Screen "File Mode" menu structure and TapTalk Main Screen "Connected" menu structure are presented in Figures 3-12 and 3-13 respectively.

This section provides a general description of each TapTalk menu selection and command in the same order as they are displayed in the software program. Those TapTalk features and functions that are covered in other sections of this Instruction Book will be noted and referenced.

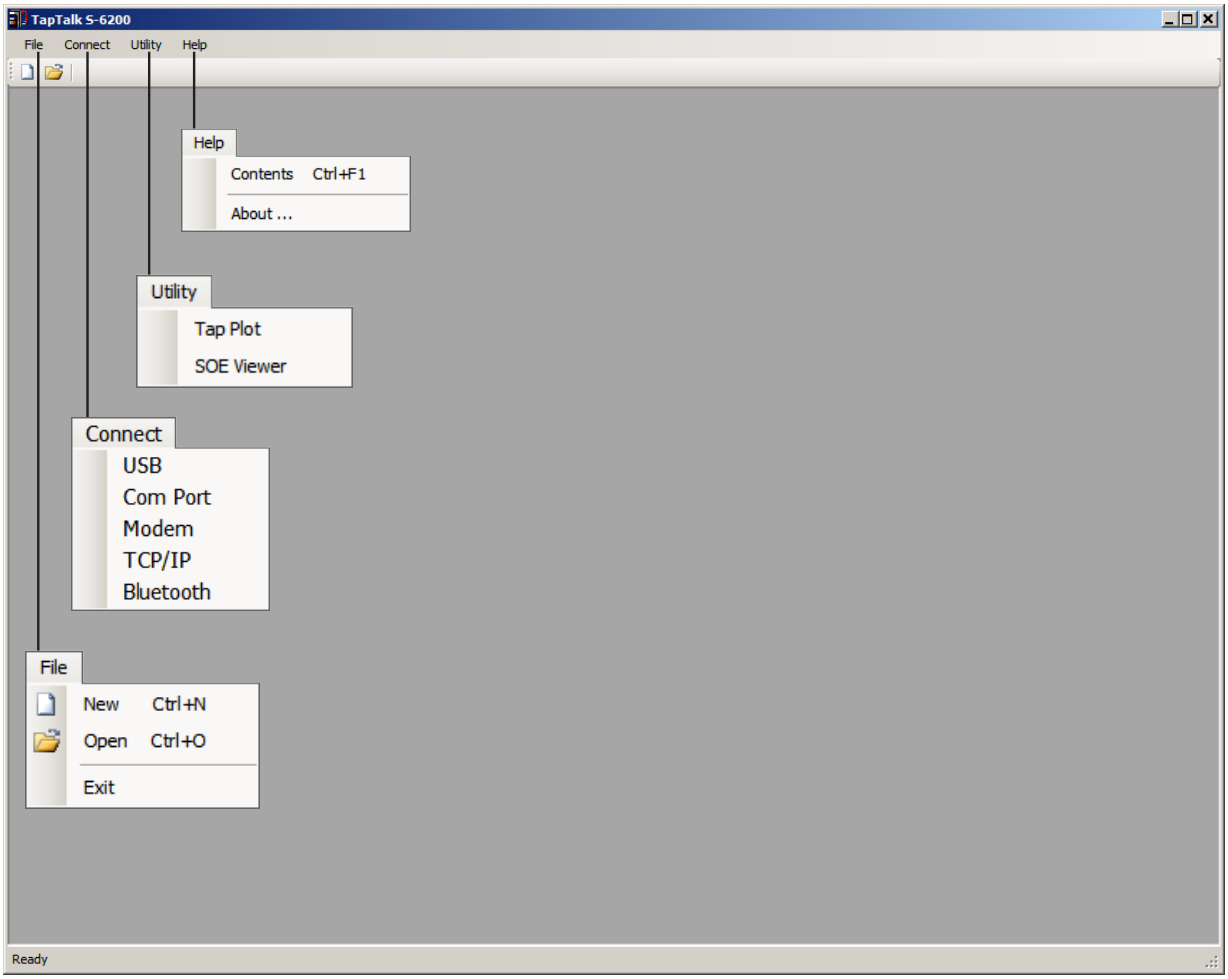


Figure 3-11 TapTalk Main Screen Menu Selections

When in File Mode with a named file open the file name and path to the file are displayed in the top menu bar.

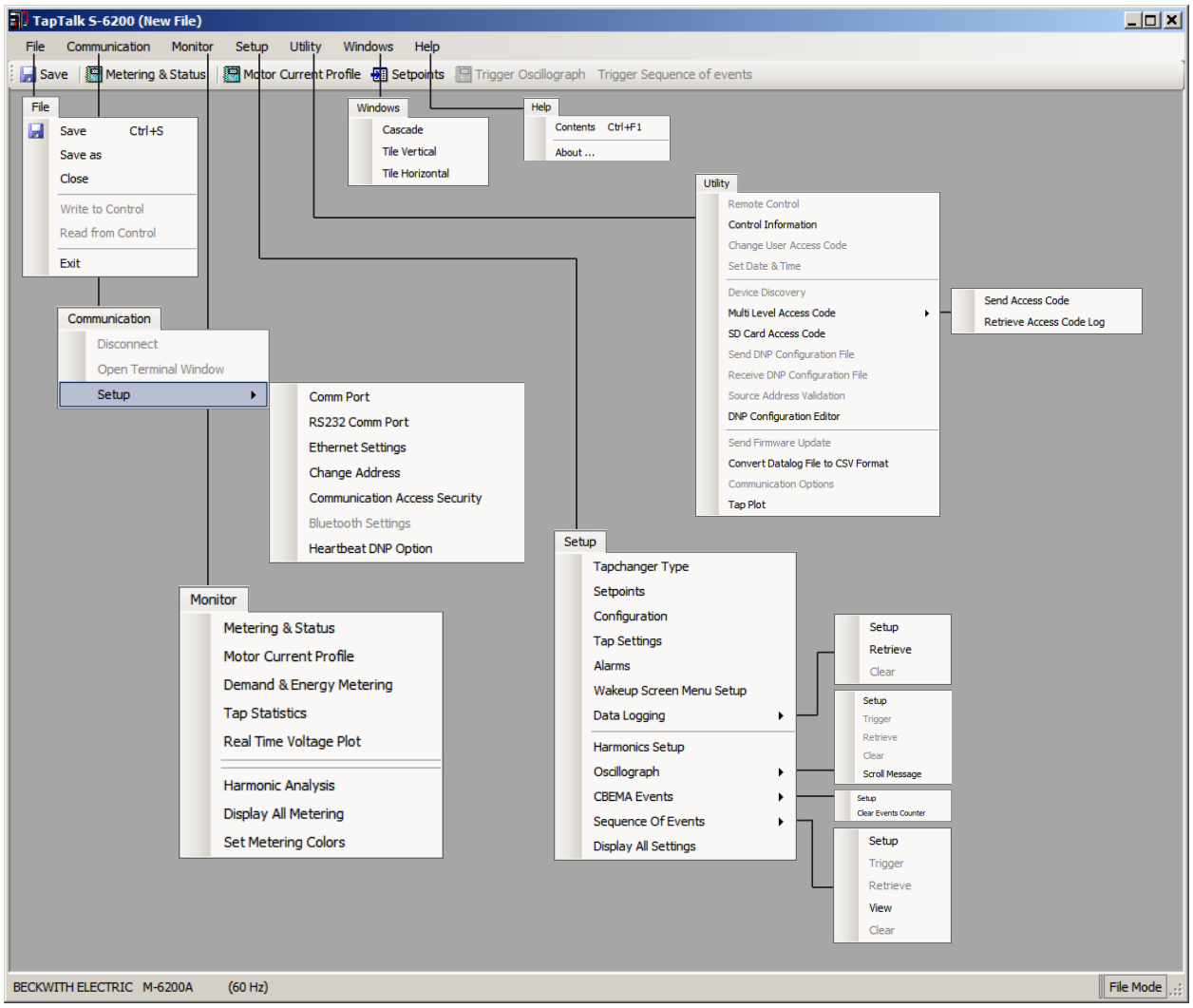


Figure 3-12 TapTalk® Main Screen Menu Selections (File Mode)

The TapTalk® Main Screen "Connected" (Figure 3-13) also displays type of Connection that is in effect (top of menu bar), and on the bottom menu bar the Control Time, Firmware Version and Connection Status.

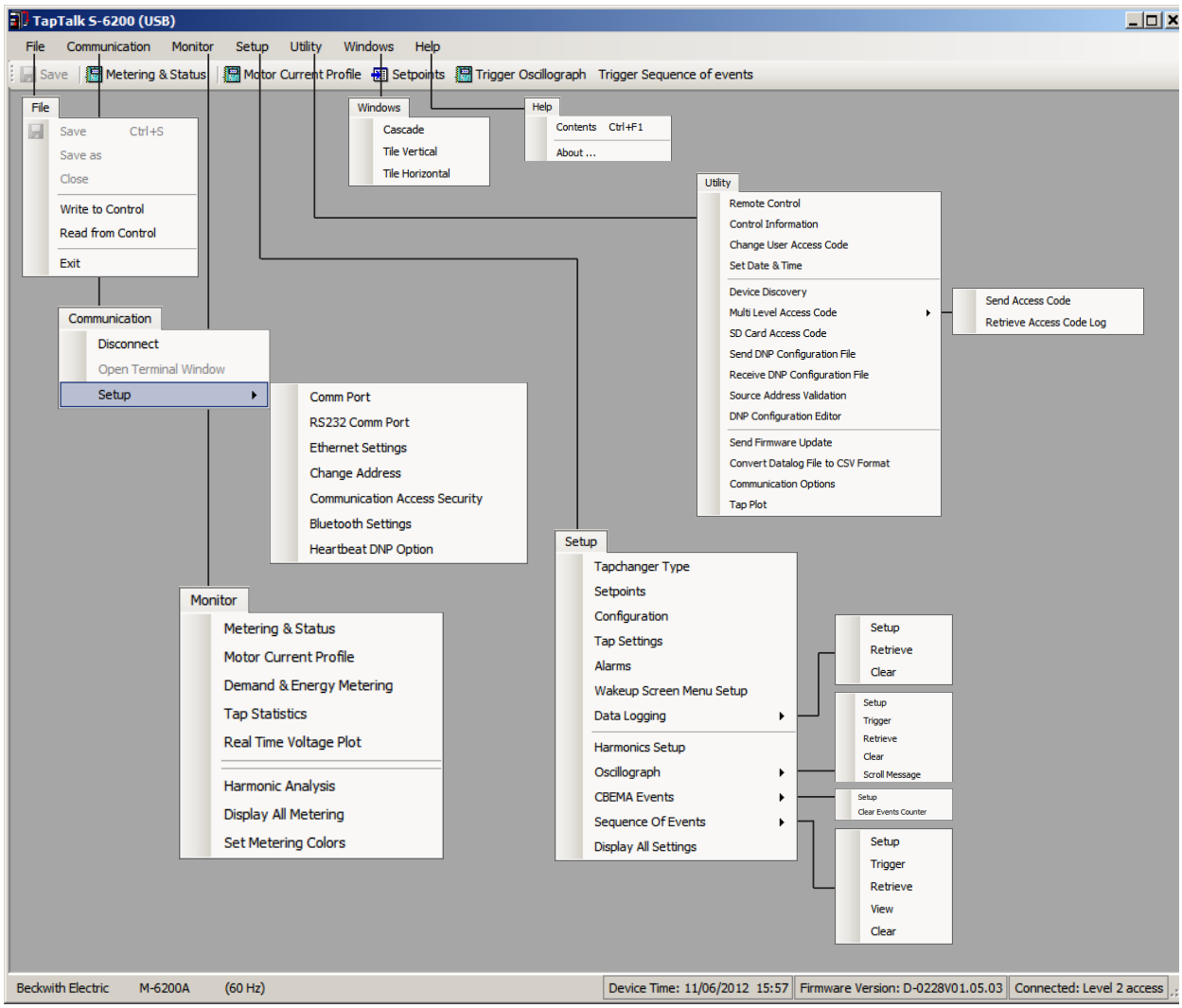


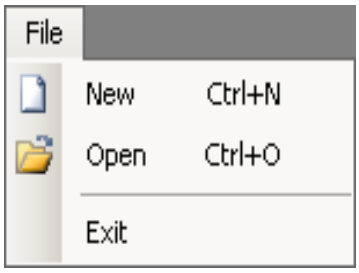
Figure 3-13 TapTalk Main Screen Menu Selections (Connected)

■ **NOTE**: If communication is not established to the unit and no file is open, items relating to settings, utilities, or monitoring are disabled. If not connected but a file is open, monitoring and utilities screens are displayed without data (Tap and Harmonics display simulated data.)

Once installed, the TapTalk® program-item icon is available from the Program Manager and TapTalk can be run like any other Windows™ program. (The installation utility places TapTalk in a Program Manager group named Becoware.) When TapTalk is run, the following screen/menu bar is displayed.

File

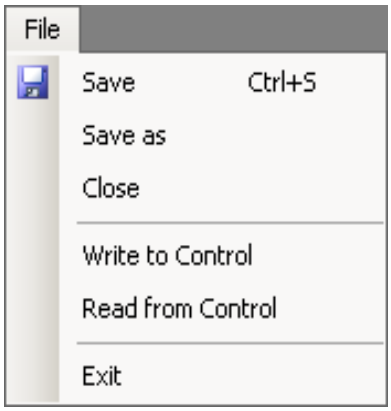
File Not Open or Not Connected Mode



The File drop down menu when TapTalk is not connected to a control or a file is not open provides the following features:

- **New...** Opens the File Information Box to allow the user to select the unit type and nominal frequency.
- **Open...** Opens the file browser window to allow the user to select an existing file. It will not allow the user to create a new file.
- **Exit** – Exits the TapTalk program.

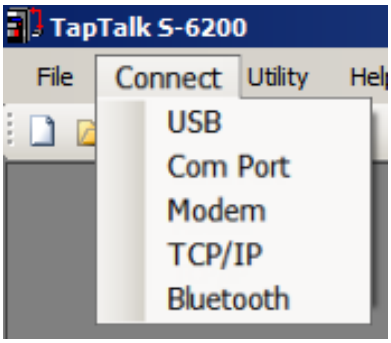
File Open or Connected Mode



The **File** toolbar item when TapTalk is connected to a control or a file is open provides the following features:

- **Save** – Saves the open file.
- **Save As** – Allows the user to save the open file with a different file name.
- **Close** – Closes the open file in the control window.
- **Write to Control** – When connected to a control and no file is previously open, this function allows the user to open a *.cfg file and send the setpoints and configuration to the control in one step.
- **Read from Control** – When connected to a control and no file is previously open, this function allows the user to recall the control profile and save the data to a *.cfg file.
- **Exit** – Exits the TapTalk program.

Connect and Communication



The **Connect** drop down menu is displayed when the unit is not connected to a control. This menu provides the user with access to the screens that are necessary to set TapTalk® communication parameters and connect to the target control. Menu selections include **USB**, **Serial Port**, **Modem, TCP/IP** and **Bluetooth®**.

USB

The USB menu selection initiates the USB dialog screen to connect to the M-6200A USB Port (Figure 3-2). The user is prompted to input the required Device and Access code. The USB/Comm Port selection identifies the PC Comm Port to be utilized for communication.

Serial Port

The **Serial Port** menu selection initiates the **Serial Port** dialog screen (Figure 3-14). The user is prompted to input the necessary communications information to open Serial communications through the selected Comm Port.

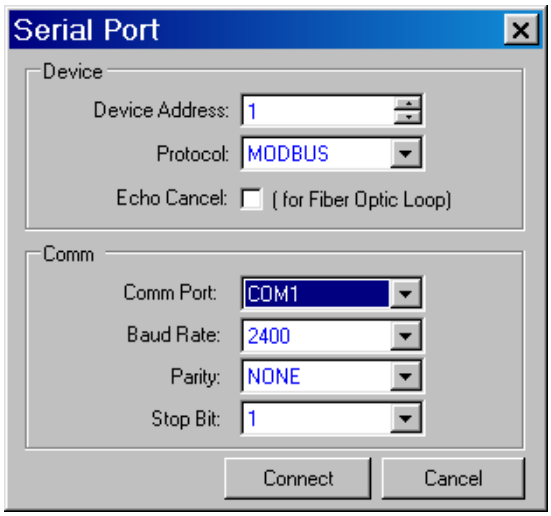


Figure 3-14 Serial Port Connection Dialog Screen

Modem

The Modem menu selection initiates the Modem communication dialog screen (Figure 3-15). This screen contains the Device, Phone, PC Comm Port and Modem parameters that are necessary to setup and communicate with a modem attached to the host PC and the target M-6200A. This screen also contains a phone book, selection of CommPort or modem and a selection for bringing up a terminal window after dialing.

TCP/IP

The TCP/IP menu selection initiates the TCP/IP communication dialog screen (Figure 3-16). This screen contains the parameter settings for communicating with a M-6200A over a network.

Bluetooth

■ NOTE: This menu selection will be available in a future TapTalk version.

The Bluetooth menu selection initiates the Bluetooth communication dialog screen (Figure 3-17). This screen contains the parameter settings for communicating with a M-6200A using the optional Bluetooth feature.

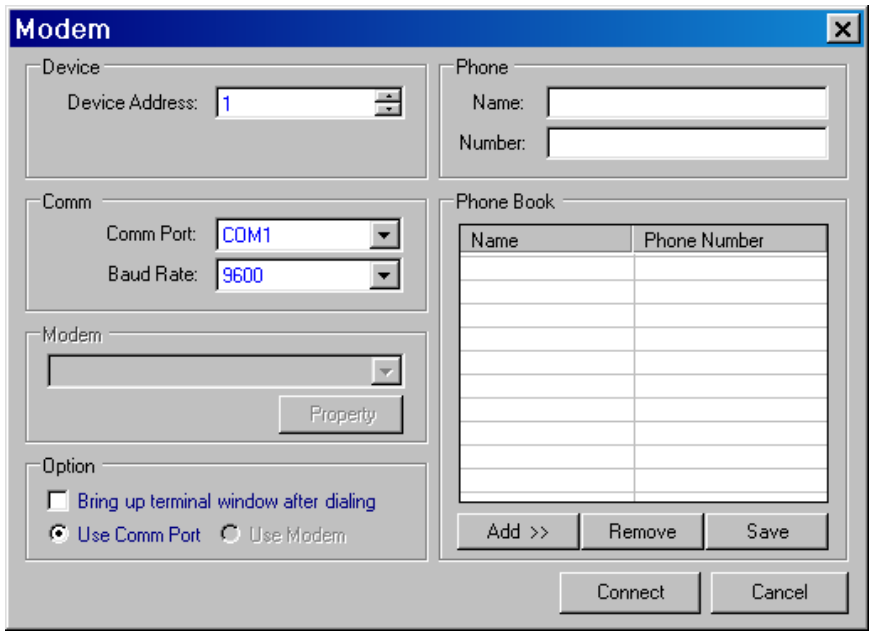


Figure 3-15 Modem Connection Dialog Screen

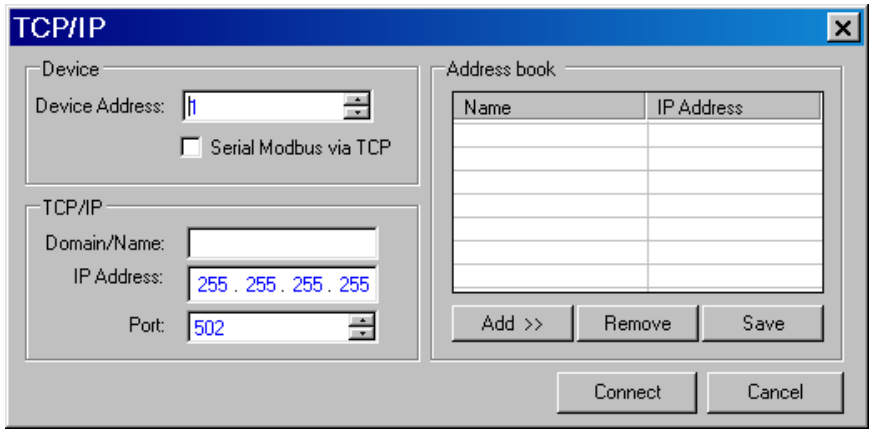
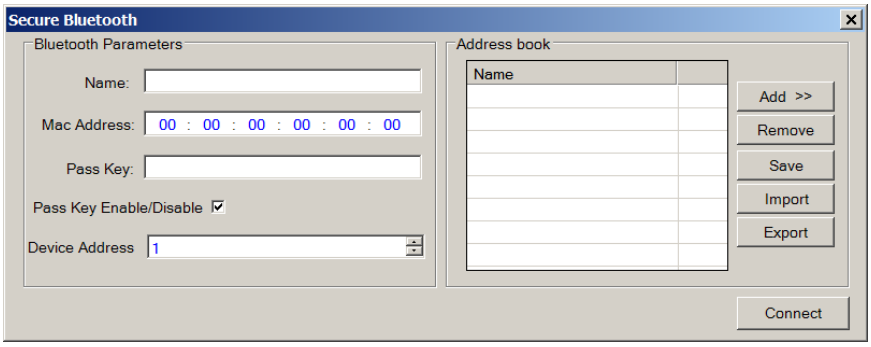


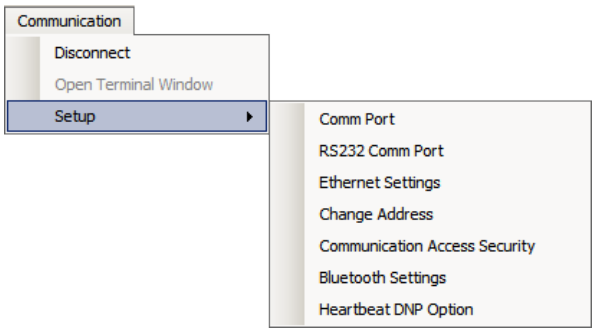
Figure 3-16 TCP/IP Connection Dialog Screen



■ NOTE: This menu screen will be available in a future TapTalk® version.

Figure 3-17 Bluetooth Connection Dialog Screen

Communication



The **Communication** drop down menu is displayed when TapTalk is connected to a control. This menu provides the user with access to the screens that are necessary to **Disconnect** from the target control, initiate the **Open Terminal Window** feature or access the **Setup** menu items.

Disconnect

The Disconnect menu item when selected prompts the user to confirm (Figure 3-18) the disconnect command.

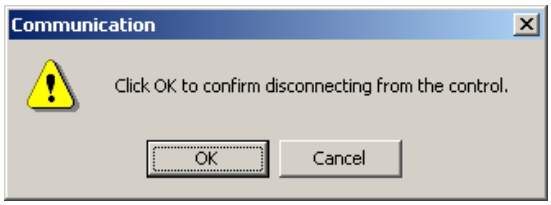


Figure 3-18 Disconnect Command Confirmation Screen

Open Terminal Window

Not Available at this time.

Communication/Setup

The **Setup** submenu provides the user with the capability to setup and configure the standard RS485/Fiber Optic Port. Also, the Setup submenu provides for the setup and configuration of the optional RS-232, Ethernet and Bluetooth® communication features.

The Communication/Setup submenu also provides the user with access to the Change Address, Communication Access Security and DNP HeartBeat settings.

Communication/Setup/Comm Port

See Chapter 4, Section 4.1 Unit Setup for details regarding the selection of Comm Port settings (Figure 3-19) when the RS-485/Fiber Optic rear Comm Port is present.

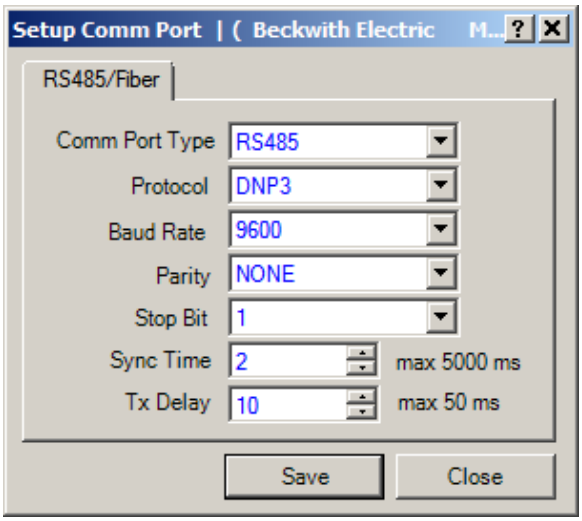


Figure 3-19 Setup Comm Port Dialog Screen

Communication/Setup/RS-232 Comm Port

See Chapter 4, Section 4.1 Unit Setup for details regarding the selection of RS-232 Comm Port Settings (Figure 3-20) when the RS-232 Comm Port is present.

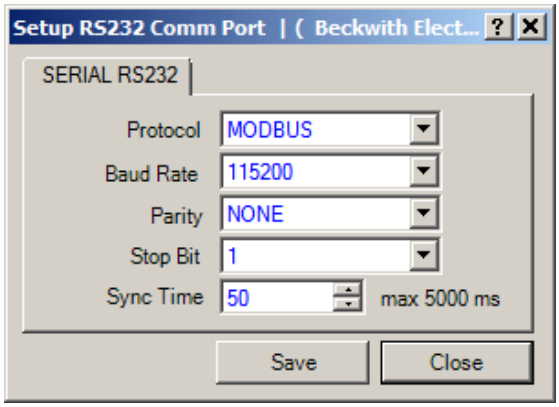


Figure 3-20 Setup RS-232 Comm Port Dialog Screen

Communication/Setup/Ethernet

See Chapter 4, Section 4.1 Unit Setup for detailed information regarding the selection of Ethernet Port Settings when the Ethernet Port is present.

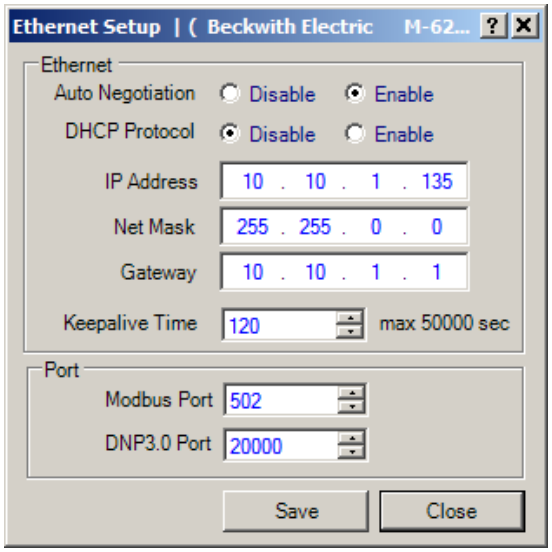


Figure 3-21 Ethernet Setup Dialog Screen

Communication/Setup/Bluetooth Settings

The Bluetooth Information dialog screen provides the user with the capability to setup Bluetooth® communication parameters and also initiate a "Reset" of the Bluetooth module. See Chapter 4, Section 4.1 Unit Setup for detailed information.

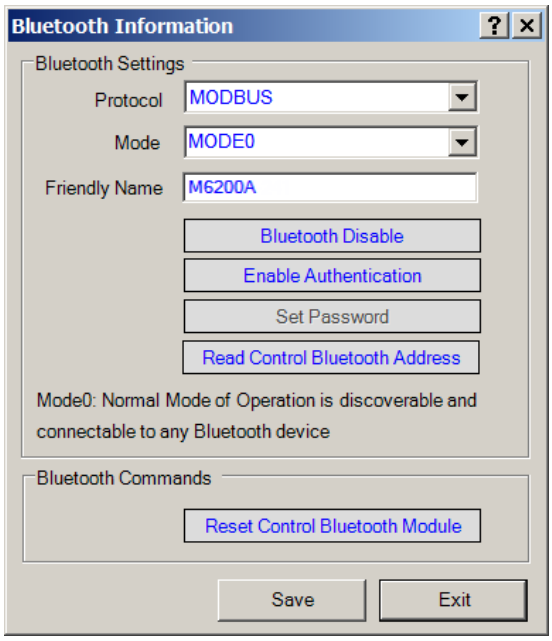


Figure 3-22 Bluetooth Information Dialog Screen

Communication/Setup/Change Address

Multiple Control Addressing

To modify the Control Communication Address, the user can do so from the Change Communication Address screen (Figure 3-23). The Communication Address is used for both MODBUS® and DNP protocols. Substation and Feeder Addresses apply only to DNP protocol (see Substation and Feeder Addresses definition in Chapter 4, Feeder and/or Substation Addressing).

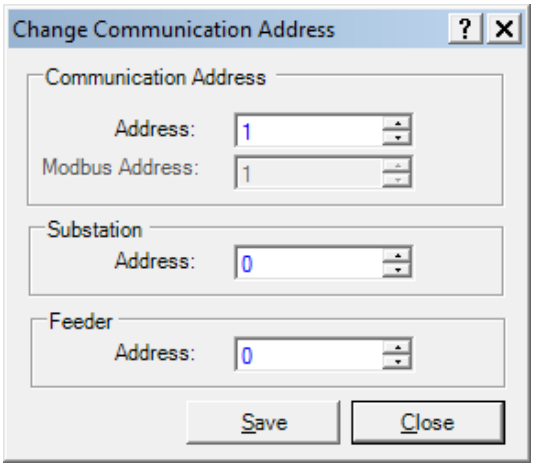


Figure 3-23 Change Communication Address Dialog Screen

When Change Address submenu item is selected, TapTalk will respond with a confirming dialog screen (Figure 3-24), As long as communication to the remote location is maintained, the user can switch between controls.

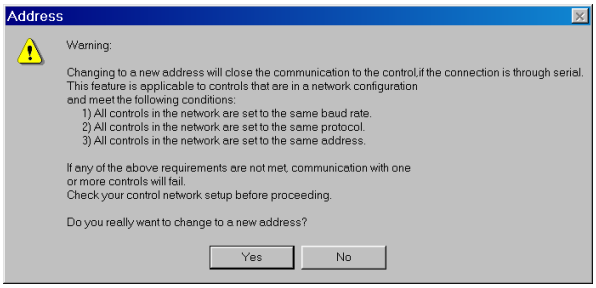


Figure 3-24 Change Address Warning Screen

Communication/Setup/Change Address/ Miscellaneous

Save – The **Save** command saves the Address change to the control when TapTalk is connected to a control.

Close – The **Close** command cancels any Address changes before the changes have been sent to the control.

Communication/Setup/Communication Access Security

When Communication Access Security is enabled it applies only when MODBUS® has been selected regardless of the physical interface. If enabled the user Level Access Code must match either the Level 1 or Level 2 Access Codes in order to be granted the access to control settings ascribed to each Level. See "User Access Codes" earlier in this chapter for detailed information. If an invalid Access Level Code is entered at the connection prompt, then read only access will be granted. TapTalk® must be closed for the timeout period specified (1 to 50,000 seconds) in order for any Access Code changes to take effect when this feature is enabled. The setting range is from 1 to 50,000 seconds. See Section 4.1, Unit Setup for details regarding selection of connection timeout features.

Figure 3-25 Communication Access Security Screen

Communication/Setup/HeartBeat DNP Option

The purpose of the SCADA HeartBeat feature is to have two sets of settings for the control and switch between these two setting sets based on the presence or absence of SCADA communications (utilizing the DNP protocol) to the control. The SCADA HeartBeat feature can be enabled from TapTalk Communications software. There are two different types of SCADA HeartBeat modes that can be selected:

- SCADA HeartBeat for transformer control applications (LTC)
- SCADA HeartBeat for regulator control applications (Regulator)

See Section 4.1 Unit Setup for details regarding Enabling/Disabling and selecting control type.

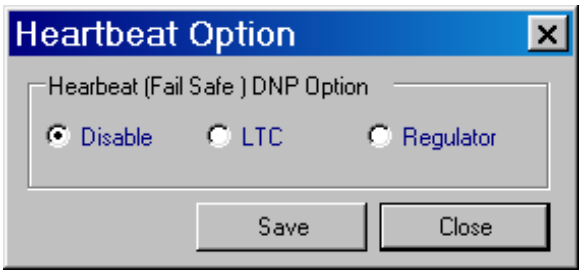
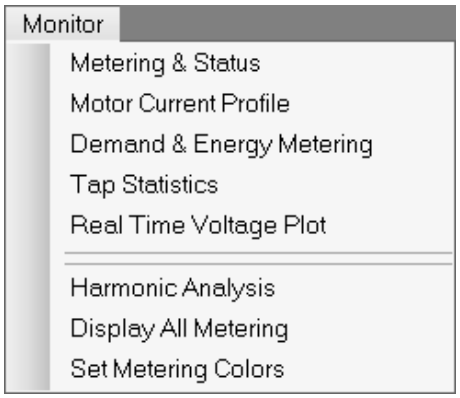


Figure 3-26 HeartBeat DNP Option Screen

MONITOR



The **Monitor** toolbar item provides the user with the means to display the control's **Metering & Status**, **Motor Current Profile, Demand & Energy Metering, Tap Statistics, Real Time Voltage Plot, Harmonic Analysis, Display All Metering** and **Set Metering Colors** screens. The data that is displayed is only available when communication is established between the control and the PC.

MONITOR/METERING & STATUS

The **Metering & Status** submenu item displays the **Metering & Status** Screen (Figure 3-27). Values displayed are updated depending on communication system capabilities.

PRIMARY STATUS (SINGLE PHASE)

Voltage – Displays the calculated primary voltage based on the user-selected voltage multiplier, VT corrections, and measured secondary voltage.

Source Voltage – Displays the calculated primary source voltage based on the user selected source voltage multiplier, source VT corrections and source secondary voltage.

Current – Displays the calculated primary current based on the user-selected current multiplier, and measured secondary current.

Watts – Displays the calculated primary quantity based on the user-selected voltage and current multipliers, single-phase and measured secondary voltage and current.

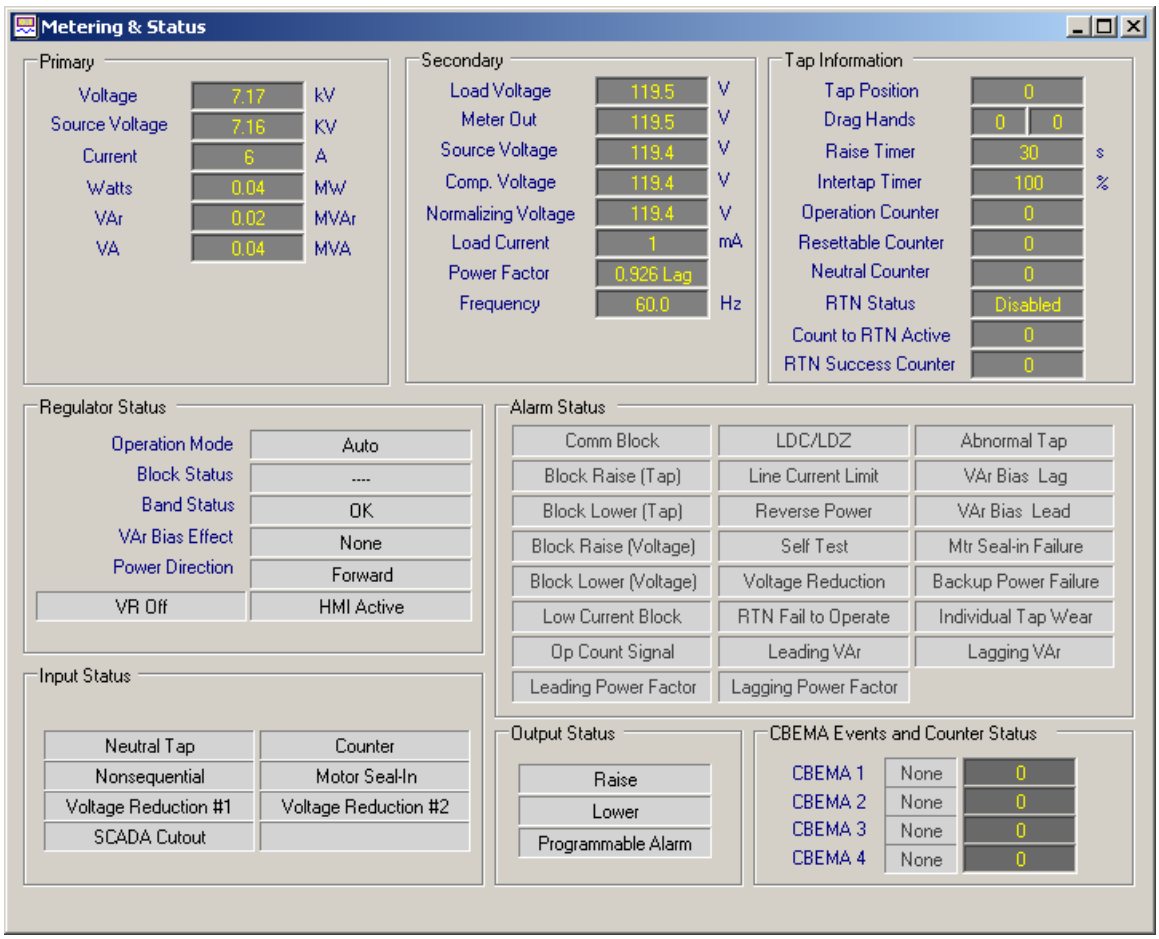


Figure 3-27 Metering and Status Screen

VAr – Displays the calculated primary quantity based on the user-selected voltage and current multipliers, single-phase and measured secondary voltage and current.

VA – Displays the calculated primary quantity based on the user-selected voltage and current multipliers, single-phase and measured secondary voltage and current.

SECONDARY STATUS

Load Voltage – Displays the real-time measured value of voltage at the regulator or transformer and includes any corrections made using the user-selected VT correction voltage.

Meter Out Voltage – Displays the measured voltage at the terminals of the M-6200A without any software modifications. Used as the base for normalizing voltage.

Source Voltage – Displays the real-time calculated source voltage and includes any corrections made using the user-selected VT correction voltage.

Compensated Voltage – Displays the calculated voltage at the "load center".

Normalizing Voltage – A Normalizing Voltage Multiplier with a range of 0.80 to 1.20 is available to be applied to Load Voltage and displayed in real time as Normalizing Voltage.

Load Current – Displays the real-time measured value of current.

Power Factor – Displays the real-time calculated value of power factor.

Frequency – Displays the real-time measured frequency value.

TAP INFORMATION

Tap Position – Displays the tap position of the tapchanger by internal Motor Direct Drive KeepTrack™ procedure. Recognizes tapchanges commanded via manual, automatic or external (SCADA) means.

Drag Hands – Displays the tap position Drag Hands values for each direction.

Raise Timer – Displays the integrated out-of-band time for a voltage excursion greater than the upper band limit up to the value of the time delay setpoint.

Lower Timer – Displays the integrated out-of-band time for a voltage excursion less than the lower band limit up to the value of the time delay setpoint.

Intertap Timer – In the sequential mode of operation, displays the integrated out-of-band time for a voltage excursion and the subsequent tapchange. Adjustable from 0 to 60 seconds, in 1 second increments, with a factory setting of 0 seconds.

Operation Counter – Records the number of raise and lower operations. The operation counter will advance by one or two counts, as set by the user, for each open-close-open contact operations. This counter is not resettable.

The counter accommodates 999,999 operation counts and the number of counts stored in memory is not affected by a loss of supply power. Total operation count is displayed in the Status Menu. This counter cannot be reset, but can be preset to any value up to 999,999 in the Configuration menu.

Resettable Operations Counter

A second, resettable operations counter operates with the method selected by X1/X2/Count Window. The user resets this counter to zero by pressing ENT while viewing the resettable operation counter screen within the Status Menu. No password is required to reset the resettable operations counter.

■ **NOTE**: The counter will only increment with a connection to the counter input.

Neutral Switch Counter

The Neutral Switch Counter is updated each time the neutral input is detected. Neutral Switch Counter can also preset to any value. The Neutral Switch Counter is a software counter that is stored in non-volatile memory and has a maximum value of 1,000,000.

RTN Status

Displays the "Run Through Neutral" feature status (Enabled or Disabled).

Count to RTN Active

Displays the number of counter operations since the operations between runs setting was set, or since the feature is enabled. The counter will reset to zero if the feature is enabled and successfully runs through neutral.

RTN Success Counter

The RTN Success Counter will increment after each successful operation of the Run Through Neutral feature.

REGULATOR STATUS

Operation Mode (Auto)

Gray Background – Indicates that the control is automatic mode of operation.

Yellow Background – Indicates Automatic but some Limits in effect.

Red Background – Indicates Auto Operation Blocked.

Block Status – Indicates blocks that are active.

Band Status – Indicates one of three conditions: **High**, when voltage is out of band high, **Low** when voltage is out of band low, and **OK** when voltage is within band.

VAr Bias Effect

Indicates one of three conditions when enabled. If the control has determined that the absolute reactive power is >¾ of the Max Cap Bank Setting and the inverse timer has timed out, then the control will increase the effective bandcenter by 1 Volt depending on the direction of the reactive power and will either indicate "Bandcenter Raise" for negative reactive power or "Bandcenter Lower" for positive reactive power. If the absolute power is <¾ of the Max Cap Bank Setting then the display will indicate "None".

Whenever VAr Bias is in effect, the control will display the "VAr Bias in effect" message on the display and the appropriate Raise/Lower LED will flash.

Power Direction – Indicates one of two power directions: **Forward** (forward power condition) and **Reverse** (reverse power condition).

Voltage Reduction – VR Off indicates voltage reduction is not active, blocked either by non-sequential input, a reverse power condition, or by communicated command. Steps 1, 2, and 3 indicate that voltage reduction is in effect for the stated step value.

HMI Active Mode – Indicates (Green) that HMI menu at the control is active.

ALARM STATUS

There are three available states designated by color for each of the Alarm Block Status elements:

- Gray with Dark Gray Text – Alarm disabled and condition not met
- Gray with Black Text – Alarm enabled and condition not met
- RED – Alarm enabled and condition exists

Comm Block – The control has had its automatic operation blocked via communications and is now in manual operation mode and the alarm output is on due to this condition.

Block Raise (Tap) – The tap position equals or exceeds the block raise tap limit setting and the alarm output is on due to this condition.

Block Lower (Tap) – The tap position equals or exceeds the block lower tap limit setting and the alarm output is on due to this condition.

Block Raise (Volt) – The tap position equals or exceeds the block raise voltage limit setting and the alarm output is on due to this condition.

Block Lower (Volt) – The tap position equals or exceeds the block lower voltage limit setting and the alarm output is on due to this condition.

Low Current Block – When enabled the control determines if Load Current following a tapchange is less than 4 mA, coincident with Tap Delta Voltage being less than 0.4 Vac. When these conditions exist the control will initiate an alarm and block regulation. The Delta Voltage is measured on every tap operation once Load Current is less than 4 mA. If two consecutive tap operations each measure a delta voltage of less than 0.4 Vac, the Low Current Block and Alarm will be in effect. Additionally, a valid counter input for each tap position must be received for the Block and Alarm to initiate. Note that for Cooper regulators, this input is via the Motor Seal-in circuit instead of a dedicated counter.

Op Count Signal – The total number of operations has exceeded the Operations Counter Alarm Limit setting.

LCD/LDZ – Any value has been set for LDC/LDZ.

Line Current Limit – The line current is exceeding the respective maximum current limit setting and the alarm output is on due to this condition.

Reverse Power – Reverse power is present at the control and the alarm output is on due to this condition.

Self Test – The control has failed the self test.

Voltage Reduction – Any voltage reduction in effect.

RTN Fail to Operate – The RTN Fail to Operate alarm will actuate when the "Maximum RTN operations before Alarms" setting has been exceeded.

Abnormal Tap Indication – Abnormal Tap Position is indicated when the alarm is enabled, Motor Direct Drive KeepTrack™ is enabled and the neutral input is detected but the present tap position at that instant is neither at minus one nor plus one.

The Abnormal Tap Position alarm will also be activated when the Motor Seal-in Failure detection feature has detected a Motor Seal-in Failure.

VAr Bias Dur. Lag/Lead – Indicates when the VAr Bias effect has exceeded the time limit imposed by the Max VAr Bias Duration Setting.

Mtr. Seal-In Failure – Indicates that motor current has not been detected after a Raise or Lower tapchange. If enabled the Motor Seal-in Failure Block will be activated. See Motor Seal-in Failure in Chapter 4 for additional information.

Backup Power Failure – Indicates the absence of Backup Power circuiting when Backup Power option has been detected.

Individual Tap Wear

The number of operations on any single tap exceeds the Individual Tap Wear Alarm setting.

Leading VAr

The Leading VAr value has exceeded the Leading VAr Alarm setting and the VAr/PF Alarm Time Delay.

Lagging VAr

The Lagging VAr value has exceeded the Lagging VAr Alarm setting and the VAr/PF Alarm Time Delay.

Leading Power Factor

The Leading Power Factor value has exceeded the Leading Power Factor Alarm setting and the VAr/PF Alarm Time Delay. The load current must also exceed the Minimum Current Threshold for PF Alarms setting before this alarm will actuate.

Lagging Power Factor

The Lagging Power Factor value has exceeded the Lagging Power Factor Alarm setting and the VAr/PF Alarm Time Delay. The load current must also exceed the Minimum Current Threshold for PF Alarms setting before this alarm will actuate.

INPUT STATUS

Neutral Tap – Indicates (Green) neutral position contact input is closed.

Counter – Indicates (Green) operation counter contact input is closed.

Non-Sequential – Indicates (Green) Non-sequential contact input is closed. Tapchanger control blocks raise or lower operation on a sustained closed contact.

Motor Seal-in – Indicates (Green) when motor hold input is applied.

Volt Reduction 1 – Indicates (Green) Step 1 voltage reduction contact output is closed.

Volt Reduction 2 – Indicates (Green) Step 2 voltage reduction contact output is closed.

SCADA Cutout – Indicates (Green) SCADA (switch) input is closed. Tapchanger control blocks write commands from COM1, COM2 or Ethernet.

OUTPUT STATUS

Raise – Indicates (Green) when a Tap Raise output is active. Limited by tap Block Raise setpoint and tap position limit settings.

Lower – Indicates (Green) when a Tap Lower output is active. Limited by tap Block Lower setpoint and tap position limit settings.

Programmable Alarm – Indicates (Green) when a Programmable Alarm condition is true.

CBEMA EVENTS AND COUNTER STATUS

The CBEMA Events and Counter Status element of the Metering and Status screen provide the user with current CBEMA events and a counter for each event. See **Section 4.2, Configuration** for detailed information regarding CBEMA monitoring setup.

Monitor/Motor Current Profile

The M-6200A Tapchanger Control measures the motor current during tapchange operation. The motor current is sampled at 64 samples per cycle and the total RMS value of the current is computed every cycle (60 Hz or 50 Hz cycle). The dynamic range of the current measurement is from 0 to 10 A.

The tapchange start signal is generated when the motor current exceeds a threshold value (user programmable or fixed at a small value such as 0.1 A). The tapchange operation is considered complete when the counter contact input is generated. If the tapchanger is making multiple tapchanges where the current is not interrupted between tapchanges then the counter contact can be used to decide the completion of one tap before the start of the next tap.

The following parameters are logged for the motor current profile:

- Average RMS value of the motor current (once every cycle for the complete duration of the tapchange)
- Total duration of the tapchange in mS
- Peak RMS value of the motor current

The Sequence of Events Recorder will trigger when any of the following conditions occur:

■**NOTE**: The average RMS current is the average of the RMS current for the tapchange duration.

- Peak RMS current exceeds a certain percent (programmable from 10% to 200%) of the stored peak current which was recorded during the training mode.
- Average RMS current exceeds a certain percent (programmable from 10% to 200%) of the stored average RMS current which was recorded during the training mode.
- Total duration of the tapchange exceeds a certain percent (programmable from 10% to 200%) of the stored value which was recorded during the training mode.

The training mode will be used during the commissioning of the Tapchanger Control. In this mode twenty tapchange operations will be manually conducted and the average profile stored in non-volatile memory. This profile will be compared with the profile during normal tapchange operation to trigger the Sequence of Events Recorder when the above conditions occur.

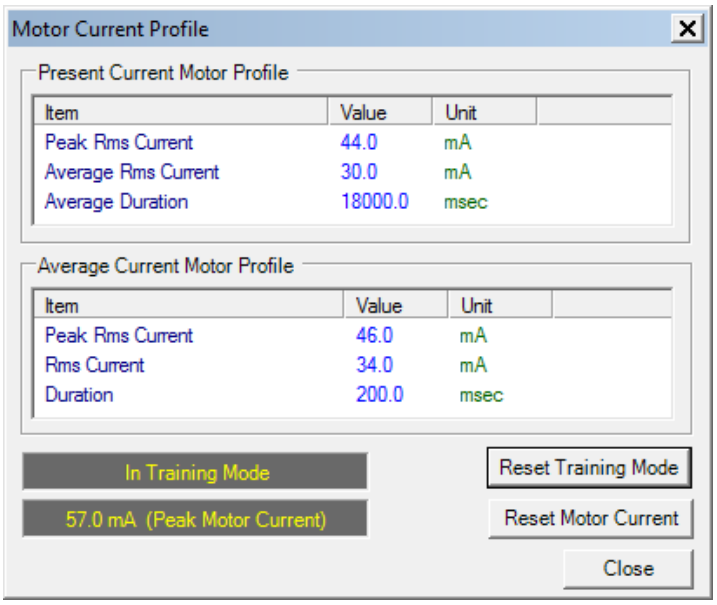


Figure 3-28 Motor Current Profile Dialog Screen

Monitor/Demand & Energy Metering

The **Demand & Energy Metering** submenu item displays the **Demand & Energy Metering** screen (Figure 3-29). Real-time demand metering information can be monitored from an addressed control.

Demand Interval – The Demand Interval applies to the Demand Present Primary Current (Amps) parameter and the Demand History parameters. The Demand Interval can be set to 5, 10, 15, 30, and 60 minutes.

The **Demand Present** Primary Current parameter value follows the concept of a lagged demand meter. The demand time interval is selected by the user as 15, 30 or 60 minutes. This is the time it takes for a thermal meter to indicate 90% of a change in load.

Load Voltage – Displays the real-time measured value of voltage at the regulator or transformer. This value continuously averaged over consecutive 32-second intervals.

Primary Current – Displays the calculated primary demand current based on the user-selected current multiplier and measured secondary current.

Primary Watts – Displays the real time demand value base on the user-selected voltage and current multipliers; VT configuration (line-to-ground), single-phase, and measured secondary voltage and current.

Primary VAr – Displays the real time demand value based on the user-selected voltage and current multipliers, VT configuration (line-to-ground), single-phase, and measured secondary voltage and current.

Primary VA – Displays the real time demand value based on the user-selected voltage and current multipliers, VT configuration (line-to-ground), single-phase, and measured secondary voltage and current.

Demand History

All demand history values (single phase) include the date and time at which each occurred. A drag hand value is the maximum or minimum value of a measured quantity recorded since the last reset.

Minimum Load Voltage – Displays minimum local voltage at the regulator or transformer. This value continuously averaged over consecutive 32-second intervals.

Maximum Load Voltage – Displays drag hand maximum local voltage at the regulator or transformer. This value continuously averaged over consecutive 32-second intervals.

Maximum Primary Current – Displays drag hand maximum primary current.

Maximum Primary Watts – Displays drag hand maximum primary watts.

Maximum Primary VAr – Displays drag hand maximum primary VArs.

Maximum Primary VA – Displays drag hand maximum primary VA. Resets automatically when Power Factor at (Max) VA value, below, is reset.

Power Factor @ Max VA – Displays drag hand power factor at time of maximum VA.

Energy Metering

The **Energy Metering** section of the **Demand & Energy Metering** screen displays the **Energy Metering** parameters. This feature enables the user to review real-time and historical demand metering information (Single Phase). This section includes Forward and Reverse Watt Hours and Forward and Reverse VAr Hours.

Miscellaneous

Each element of the Demand History and Energy Metering can be reset individually by selecting the desired parameter(s) and then selecting **Reset Selected Items.** When the **Reset** command is issued, the metered value is reset to zero and the time and date are updated

Select All – Allows the user to select all parameters.

Clear All – Allows the user to reset all parameter values.

Reset Selected Items – Allows the user to reset only the selected parameter values.

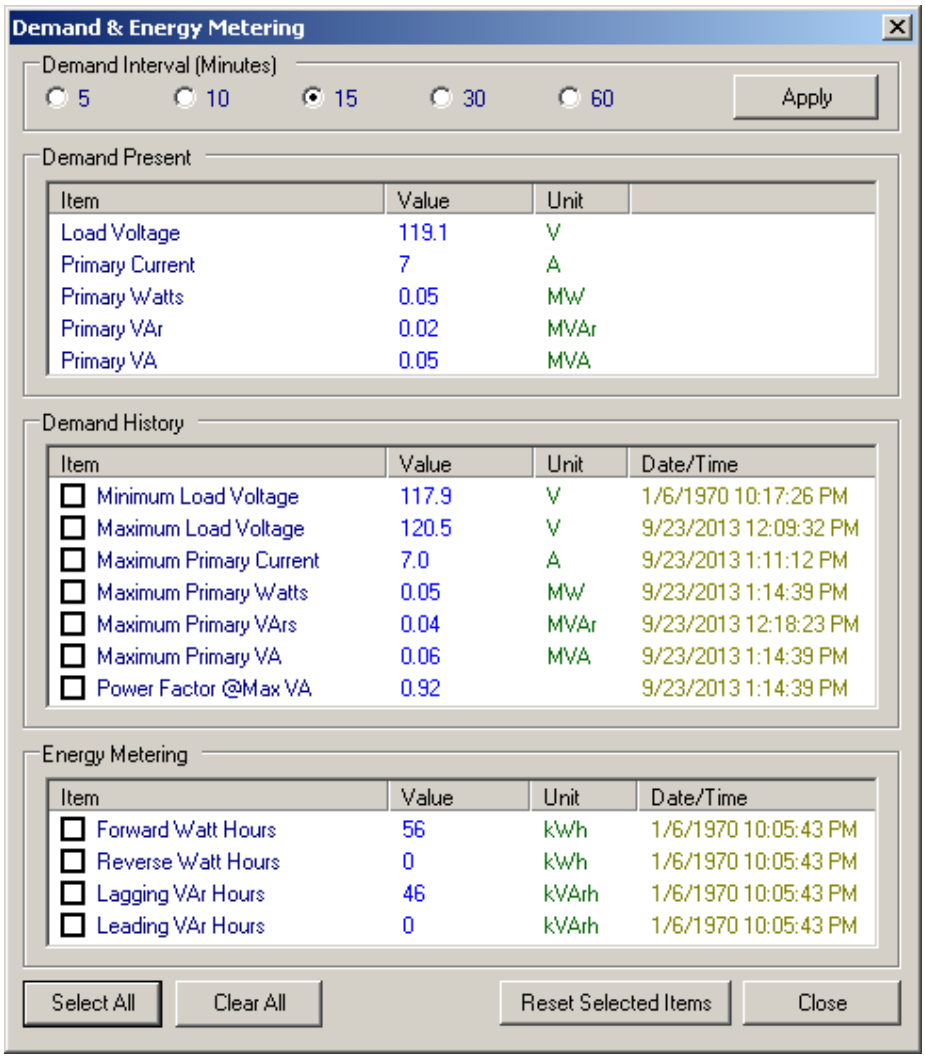
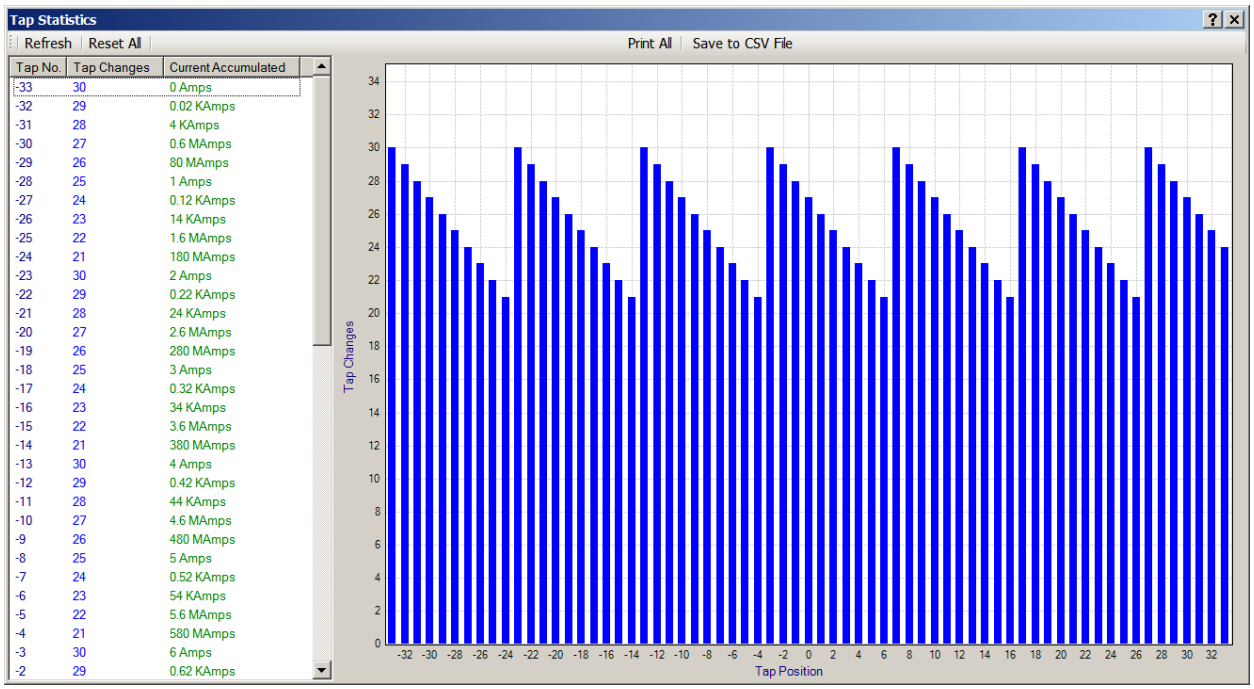


Figure 3-29 Demand & Energy Metering Dialog

Monitor/Tap Statistics

The **Tap Statistics** submenu item displays a statistical representation of the Tapchanger operation (Figure 3-30). The cumulative (since last visit) number of tapchanges and the Accumulated Primary Current for each tap position is displayed both graphically and numerically. Selecting **Refresh** updates tap statistical data. Selecting **Reset All** resets all tap statistic counters to zero and clears the Individual Tap Wear Alarm in the Metering & Status screen. Selecting Save to CSV File allows the user to save the tap statistics as a ".csv" file which can be read by a spreadsheet program.



Tap No.	Tap Changes	Current Accumulated
-33	30	0 Amps
-32	29	0.02 KAmps
-31	28	4 KAmps
-30	27	0.6 MAmps
-29	26	80 MAmps
-28	25	1 Amps
-27	24	0.12 KAmps
-26	23	14 KAmps
-25	22	1.6 MAmps
-24	21	180 MAmps
-23	30	2 Amps
-22	29	0.22 KAmps
-21	28	24 KAmps
-20	27	2.6 MAmps
-19	26	280 MAmps
-18	25	3 Amps
-17	24	0.32 KAmps
-16	23	34 KAmps
-15	22	3.6 MAmps
-14	21	380 MAmps
-13	30	4 Amps
-12	29	0.42 KAmps
-11	28	44 KAmps
-10	27	4.6 MAmps
-9	26	480 MAmps
-8	25	5 Amps
-7	24	0.52 KAmps
-6	23	54 KAmps
-5	22	5.6 MAmps
-4	21	580 MAmps
-3	30	6 Amps
-2	29	0.62 KAmps

■ **NOTE:** By pointing the mouse to any bar, the corresponding tap statistic will be highlighted as well as displayed in a tool tip.

Figure 3-30 Tap Statistics Screen

Monitor/Real Time Voltage Plot

The Real Time Voltage Plot (Figure 3-31) feature allows the user to monitor in real time the last 60 seconds of the source voltage value and load voltage. The Voltage Plot freezes the last 30 seconds of the voltage profile and displays the current values.

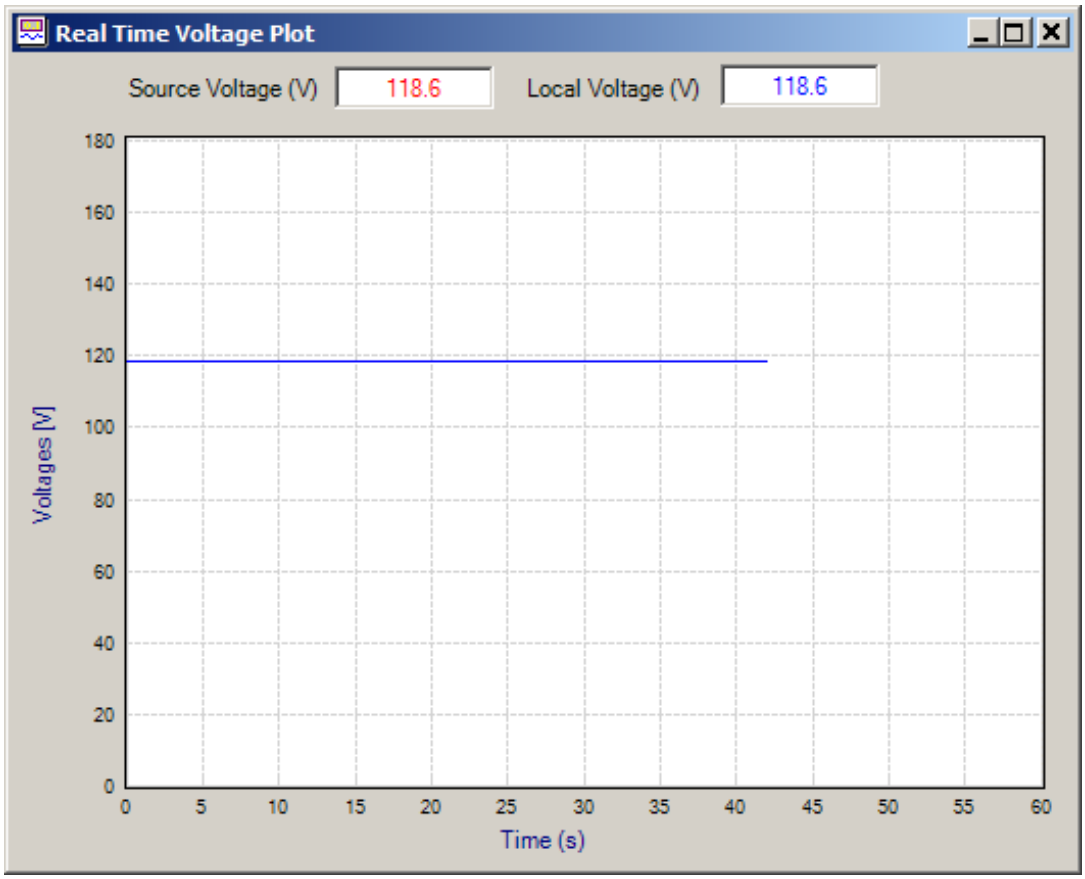


Figure 3-31 Real Time Voltage Plot

Monitor/Display All Metering

The Display All Metering feature provides the user with a snapshot of all metering parameters. This feature also allows the Display All Metering screen to be printed or saved as an HTML file. The menu bar also includes a refresh feature to refresh parameters displayed on the screen.

All Metering

Print | Print Preview | Save | Refresh

M-6200A All Metering

Software Version: D-0199V02.07.01
Firmware version: D-0228V01.06.04
Serial Number: 1
Beckwith Electric
M-6200A

Metering

Primary			
Voltage:	7.14 (kV)	Source Voltage:	7.14 (kV)
Current:	6 (A)	Watts:	0.04 (MW)
VAr:	0.00 (MVAr)	VA:	0.04 (MVA)
Secondary			
Load Voltage:	119.1 (V)	Meter Out Voltage:	119.1 (V)
Source Voltage:	119.0 (V)	Comp. Voltage:	119.0 (V)
Load Current:	1 (mA)	Power Factor:	0.995 (Lag)
Frequency:	59.9 (Hz)	Normalizing Voltage:	119.0 (V)
Tap Information			
Tap Position:	0		
Drag Hands Lower:	0	Drag Hands Raise:	0
Raise Timer:	28 (s)	Intertap Timer:	100 (%)
Operation Counter:	0	Resettable Counter:	0
Neutral Counter:	0	RTN Status:	Disabled
Count to RTN Active:	0	RTN Success Counter:	0

Status

STATUS			
Regulator			
Operation Mode:	Auto	Block Status:	--
Band Status:	Low	VAr Bias Effect:	None
Power Direction:	Forward	Voltage Reduction:	--
HMI Active Status:	Not Active		
Alarm			
Comm Block:	--	LDC/LDZ:	--
Block Raise (Tap):	--	Line Current Limit:	--
Block Lower (Tap):	--	Reverse Power:	--
Block Raise (Volt):	--	Self Test:	--
Block Lower(Volt):	--	Voltage Reduction:	--
Abnormal Tap Position:	--	Max VAr Bias Dur. -Lead:	--
Max VAr Bias Dur. -Lag:	--	Backup Power Fail:	--
Low Current Block:	--	Motor Seal-in Failure:	--
RTN Fail to Operate:	--	Individual Tap Wear:	--
Op Count Signal:	--	Leading VAr:	--
Lagging VAr:	--	Leading Power Factor:	--
Lagging Power Factor:	--		
Input			
Neutral Tap:	--	Counter:	--

Figure 3-32 Display All Metering Screen

Monitor/Set Metering Colors

This feature allows the user to select individual display colors for the Metering & Status screen. The Alarm, Warning, Input, Output and Metering Background text and background colors can be set.

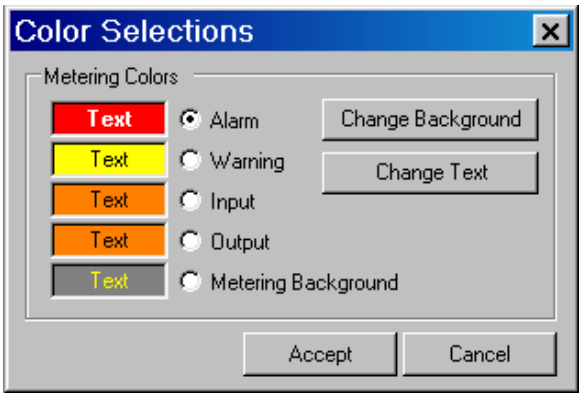


Figure 3-33 Set Metering Colors Screen

Toolbar Editor

The Toolbar Editor feature allows the user to create TapTalk® toolbar menu items that are available from the TapTalk main menu screen. By right clicking on the toolbar TapTalk will display the Toolbar Editor Mode selections "Start Edit Toolbar" and "End Edit Toolbar" (Figure 3-34). To add a Toolbar item simply select "Start Edit Toolbar" and then drag and drop the desired single menu item onto the main toolbar. To remove menu items drag and drop the item on the "Help" menu item. When the Toolbar Editor is active (as displayed in the TapTalk menu top line) no TapTalk functions can be initiated.

By right clicking and selecting "End Edit Toolbar" TapTalk features are accessible.

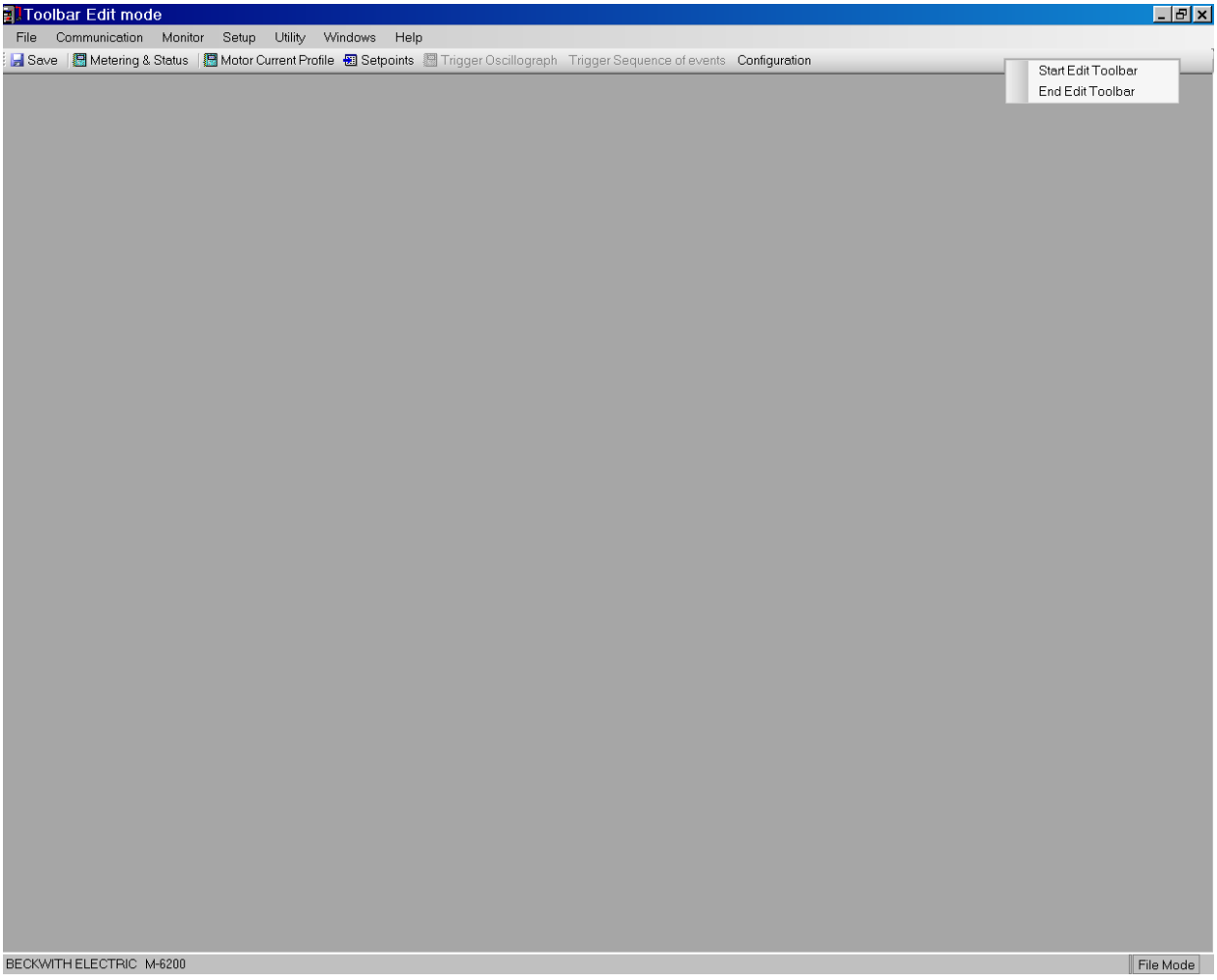


Figure 3-34 TapTalk Main Menu Screen with Toolbar Editor Active

Harmonic Analysis

The input signal is sampled at 64 samples per cycle, giving an overall sampling rate of 3840 samples per second for a 60 Hz system. This provides the ability to reproduce signals of up to 1920 Hz. Therefore, up to the 31st harmonic can be calculated using discrete Fourier transform with a fundamental frequency of 60 Hz. The fundamental for both the Voltage and Current channels is calculated every sample meaning, every 260.41 µs. These voltage and current magnitudes are used in a real-time decision making algorithm and real-time metering.

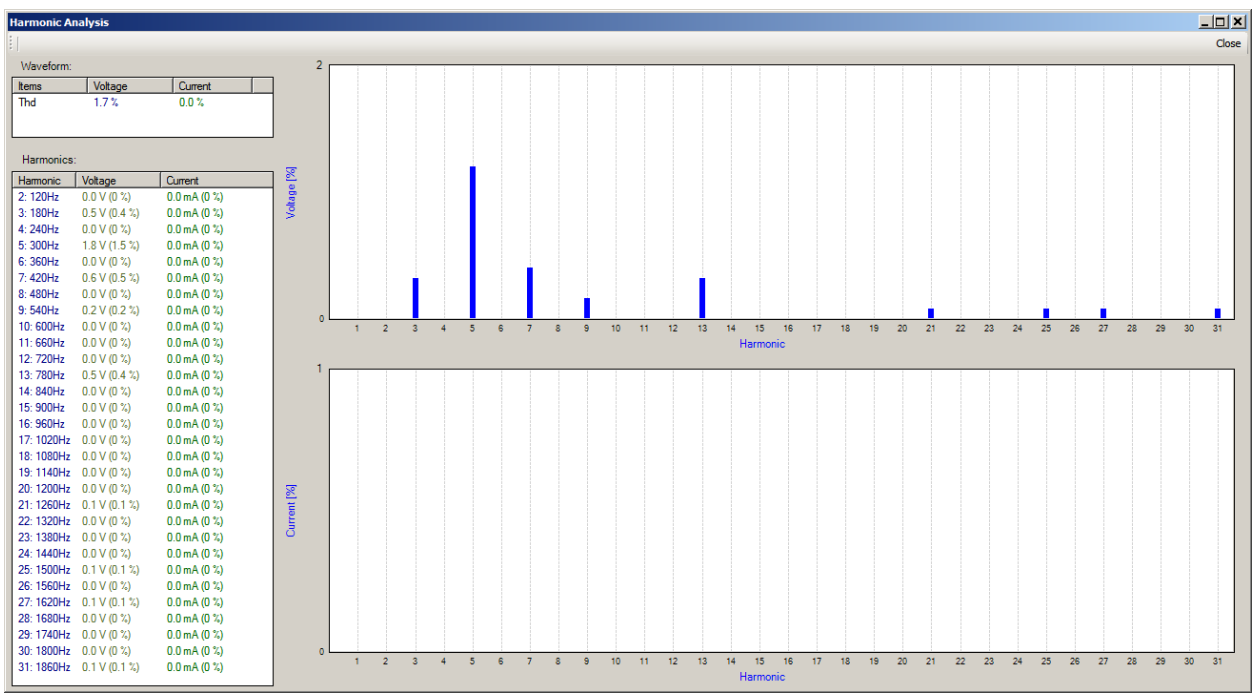
Total Harmonic Distortion (THD) for both voltage and current are calculated and displayed using the following equation:

$$\mathrm{THD} = \frac{\left[\sum_{k=2}^{31} A_k^2\right]}{A_0^2} \qquad k = 2,3....31$$

Where k is the Harmonic number

In addition to Harmonics and THD calculations the secondary task also triggers the Sequence of Event (SOE) recorder whenever any Harmonic selected by the user exceeds a preset threshold level.

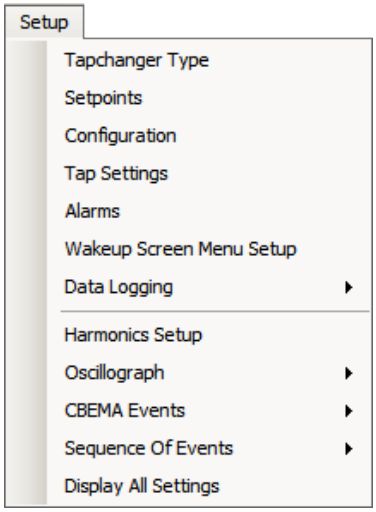
The user is able to select which Harmonic(s) will trigger the SOE function and also set the threshold level, above which the SOE recorder will be initiated and below which the current will be ignored. The threshold level is set as a percentage of the magnitude of the fundamental. The user can also set the threshold level of either the Voltage or the Current Harmonic.



■ **NOTE:** Hovering the mouse in the chart area will display the corresponding Harmonic values in a tool tip.

Figure 3-35 Harmonic Analysis Dialog Screen

Setup



The **Setup** menu item provides the user with access to the **Tapchanger Type, Setpoints**, **Configuration**, **Tap Settings**, **Alarms**, **Wakeup Screens, Data Logging, Harmonics Setup, Oscillograph, CBEMA Events and Sequence of Events** submenu items. The setpoint information displayed on these screens can be from either the control or from an open TapTalk® file.

Also included in the Setup submenu is the **Display All Settings** command which when invoked displays the M-6200A All Setpoints Dialog Screen (Figure 3-59).

Setup/Tapchanger Type

The Tapchanger Type Selection feature (Figure 3-36) provides the user with the ability to set regulator vendor specific configuration settings in the control from TapTalk. See **Chapter 4 Section 4.4 Tap Changer Type Selection.**

Setup/Setpoints

Setpoints/General

Line Drop Compensation – Toggles between two modes of operation: R, X (factory setting), and Z.

Timer Delay Selection – Toggle between two modes of operation: **Definite Time** (factory setting) and **Inverse Time**.

Basic Timer Type – Toggles between **Integrating** and **Instant Reset.**

Power Direction Bias – The Power Direction Bias setpoint feature includes three settings to determine how the control will switch between forward and reverse power operation. The three settings are **None**, **Forward**, and **Reverse**.

Setpoints/Voltage Reduction

Voltage Reduction Enable/Disable

Enable – Allows all voltage reduction levels.

Disable – Voltage Reduction is disabled in TapTalk®, HMI, and Front Panel.

Step 1 – First of three independent steps of voltage reduction adjustable from 0% to 10% in 0.1% increments of the bandcenter setpoint. Factory setting is 2.5%.

Step 2 – Second voltage reduction step, adjustable from 0% to 10% in 0.1% increments of the bandcenter setpoint. Factory setting is 5.0%.

Step 3 – Third voltage reduction step, adjustable from 0% to 10% in 0.1% increments of the bandcenter setpoint. Factory setting is 7.5%.

Setpoints/Limit and Runback

Block Raise – Over voltage limit is adjustable from 95 V to 135 V in 0.1 V increments with a factory setting of 128 V.

Block Lower – Under voltage limit is adjustable from 95 V to 135 V in 0.1 V increments with a factory setting of 114 V.

Dead Band – Adjustable from 1 V to 4 V in 0.1 V increments with a factory setting of 2.0 V.

Current Limit – Adjustable from 50 mA to 640 mA, in increments of 1 mA. If the value of the current exceeds the current limit setpoint, the unit will not permit automatic control in either the raise or lower direction. Factory setting is 640 mA.

Setpoints/Forward Power

Band Center – Adjustable from 100.0 V to 135.0 V in 0.1 V increments with a factory setting of 120 V.

Band Width – Adjustable from 1.0 V to 10.0 V in 0.1 V increments with a factory setting of 2.0 V.

Definite/Inverse Time – Adjustable from 1 sec. to 360 sec. in 1 second increments with a factory setting of 30 seconds.

LDC-Z – Adjustable from 0 V to 24 V in 1 V increments with a factory setting 0 V.

LDC Resistance – Adjustable from –24 V to +24 V in 1 V increments with a factory setting of 0 V.

LDC Reactance – Adjustable from –24 V to +24 V in 1 V increments with a factory setting of 0 V.

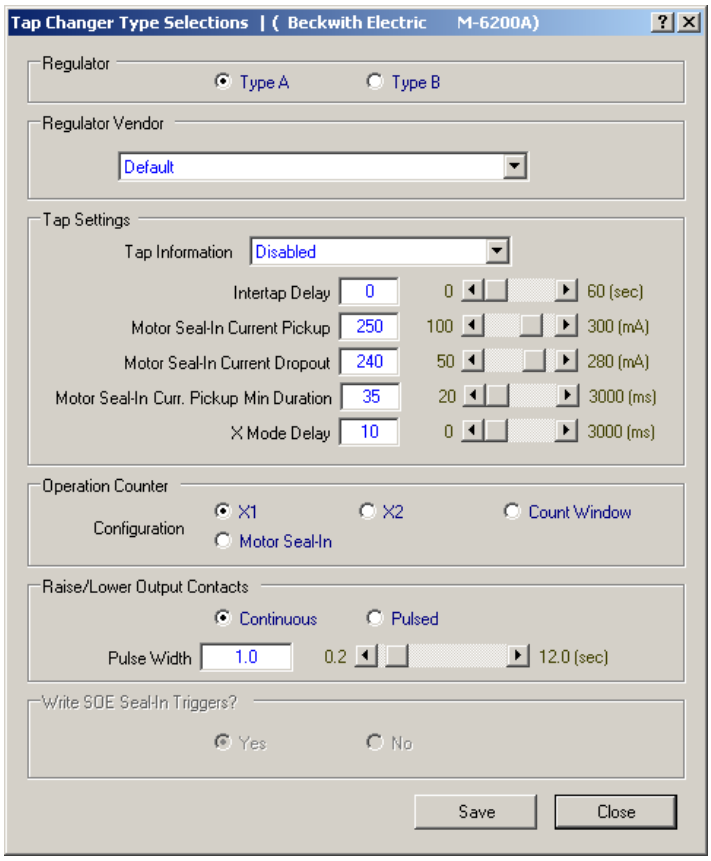


Figure 3-36 Tap Changer Type Selections Dialog Screen

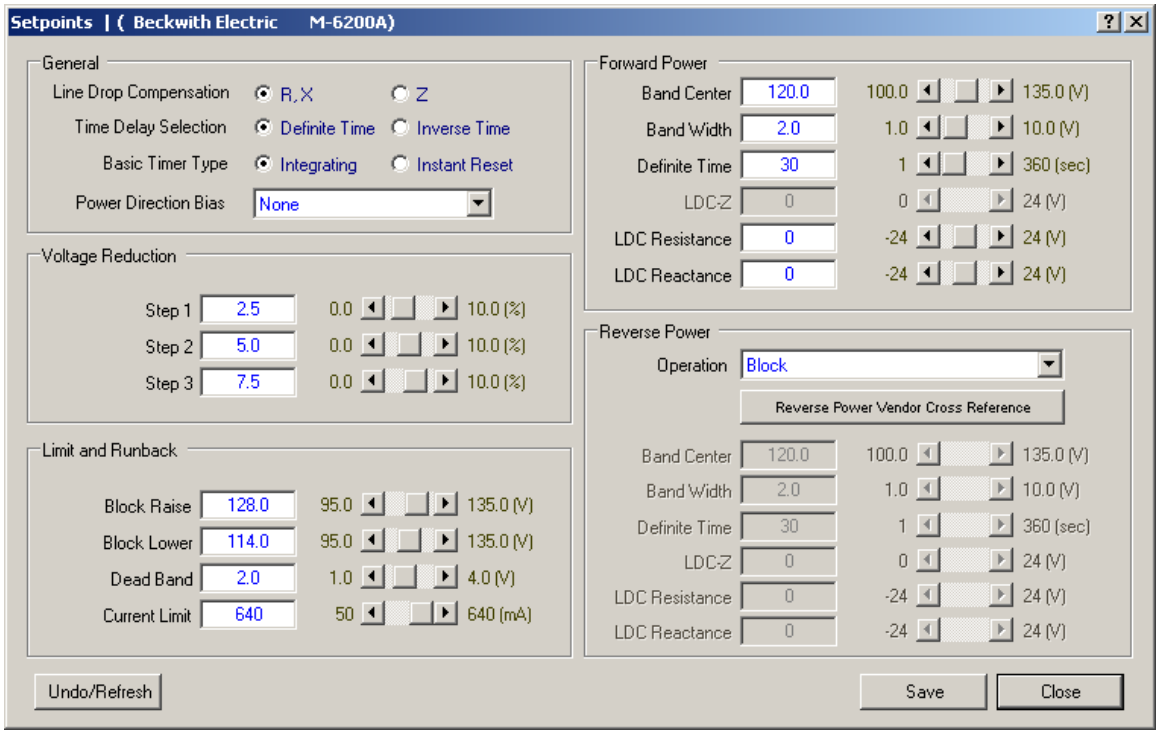


Figure 3-37 Setpoints Dialog Screen

Reverse Power Vendor Cross Reference

Beckwith Reverse Power Mode	Cooper/Siemens Reverse Power Mode
Block	Locked Forward Mode
Regulate Forward (Ignore) *	Reverse Idle Mode
Regulate Reverse	None
Return to Neutral *	Neutral Idle Mode
Regulate in Reverse (Measured) *	Bi-Directional Mode
Distributed Generation	Cogeneration Mode
Auto Determination	None
*Low Current block feature must also be enabled to be equivalent to this Cooper Reverse Power Mode.	

OK

Figure 3-38 Reverse Power Vendor Cross Reference Table

Setpoints/Reverse Power

Operation – Toggles between eight modes of operation:

- **Block** – inhibits automatic tapchange operation.
- **Regulate Forward (Ignore)** – continues unit action as though forward power flow continued to exist.
- **Regulate Reverse** – (calculated voltage or measured voltage) detects a reverse power condition and regulates according to reverse power settings.
- **Return to Neutral** – detects a reverse power operation and drives tap position to neutral and then stops.
- **Regulate Reverse (Measured)** – allows the control to switch it's voltage sensing input from a load side VT to a source side VT if one is available and operate in Reverse Power Mode using that input.
- **Distributed Generation** – allows alternate LDC R and X values to be applied to the control when reverse power is detected.
- **Auto Determination** – allows the control to use the "Smart Reverse Power" feature to choose the applicable reverse power mode, either Distributed Generation or Regulate Reverse.
- **Auto Determination (Measured)** – allows the control to use the "Smart Reverse Power" feature to choose the applicable reverse power mode, either Distributed Generation or Regulate Reverse (Measured).

The Setpoints Reverse Power section also contains a link which displays the "Reverse Power Vendor Cross Reference" table showing Cooper/Siemens reverse power names and their Beckwith Electric equivalents (Figure 3-38).

Band Center – Adjustable from 100.0 V to 135.0 V in 0.1 V increments with a factory setting of 120 V.

Band Width – Adjustable from 1.0 V to 10.0 V in 0.1 V increments with a factory setting of 2.0 V.

Definite/Inverse Time – Adjustable from 1 sec. to 360 sec. in 1 second increments with a factory setting of 30 seconds

LDC-Z – Adjustable from 0 V to 24 V in 1 V increments with a factory setting 0 V.

LDC Resistance – Adjustable from –24 V to +24 V in 1 V increments with a factory setting of 0 V.

LDC Reactance – Adjustable from –24 V to +24 V in 1 V increments with a factory setting of 0 V.

Setpoints/Miscellaneous

Undo/Refresh – The **Undo** command allows the user to undo any setting changes in the Setpoints screen before the settings have been saved to either the Device or Open File. It also refreshes the screen with the data stored in the unit.

Save – The **Save** command saves the setting changes to either the Open File when in File mode or the Device when TapTalk® is connected to a device.

Close – The **Close** command cancels any setting changes before the settings changes have been sent to either the Device or Open File.

Setup/Configuration

Configuration/Primary

Voltage Multiplier – Adjustable from 0.1 to 3260.0 in 0.1 increments with a factory setting of 60. User selection must include knowledge of VT ratio and sensing VT-ratio correction.

Voltage Source Multiplier – Adjustable from 0.1 to 3260.0 in 0.1 increments with a factory setting of 60. User selection must include knowledge of source VT ratio and sensing source VT-ratio correction.

Current Multiplier – Adjustable from 1 to 32600 in 1 increments with a factory setting of 6000. User selection must include knowledge of CT ratio, from primary rating to 0.2 A rating of control.

Configuration/VT-CT (P2)

VT Correction – Adjustable from –15 V to +15 V in 0.1 V increments with a factory setting of 0 V.

CT/VT Phasing – Adjustable from 0° to 330° in 30° increments with a factory setting of 0°.

Normalizing Voltage Multiplier – Enable from 0.80 to 1.20 times the Meter Out Voltage.

Configuration/VT-CT Source (U2)

VT Source Correction – Adjustable from –15.0 V to +15.0 V in 0.1 V increments with a factory setting of 0 V.

CT/VT Source Phasing – Adjustable from 0° to 330° in 30° increments with a factory setting of 0°.

Configuration/VAr Bias

VAr Bias can be enabled or disabled. Use of VAr Bias allows coordination of the M-6200A with M-2501 series and M-6280 series Capacitor Bank Controls.

Max 3 Phase Capacitor Bank Size – Maximum Capacitor Bank size is adjustable from 4 KVAr to 12000 KVAr.

Lead % Bank Size Pickup – Lower negative Var limit in percentage of the Max Cap Bank size below which the control will increase the upper band edge by the amount defined by VAr Bias Voltage Step.

Lag % Bank Size Pickup – Upper positive Var limit in percentage of the Max Cap Bank size above which the control will decrease the lower band edge by the amount defined by VAr Bias Voltage Step.

Configuration | (Beckwith Electric M-6200A)

Primary
Voltage Multiplier 60.0 0.1 3260.0 (X)
Voltage Source Multiplier 60.0 0.1 3260.0 (X)
Current Multiplier 6000 1 32600 (X)

VT/CT (P2)
VT Correction 0.0 -15.0 15.0 (V)
CT/VT Phasing 0 degree
Normalizing Voltage Multiplier 1.00 0.80 1.20 (X)

VT/CT Source (U2)
VT Source Correction 0.0 -15.0 15.0 (V)
CT/VT Source Phasing 0 degree

VAr Bias
Disable Enable
Max 3 Phase Cap Bank Size 12000 4 12000 (KVAr)
Lead % Bank Size Pickup 75 10 100 (%)
Lag % Bank Size Pickup 75 10 100 (%)
VAr Bias Voltage Step 1.0 0.1 2.0 (V)
Max VAr Bias Duration 300 10 1440 (min)

Raise/Lower Output Contacts
Continuous Pulsed
Pulse Width 1.5 0.2 12.0 (sec)

Regulator
Type A Type B

Motor Current Settings
Peak RMS Current 110 10 200 (%)
Average RMS Current 110 10 200 (%)
Average Duration 110 10 200 (%)

Voltage Reduction
Standard VR Disable Enable
Smart VR Disable Enable
Smart VR LDC Disable Enable
Smart VR LDC Settings
R 0 -24 24 (V)
X 0 -24 24 (V)
Z 0 0 24 (V)
VR Turnoff Timer 0 0 999 (min)
Save VR at Power Off Don't Save Save

VAr and Power Factor Alarm Settings
Leading VAr Alarm 300 150 4800 (kVAr)
Lagging VAr Alarm 900 150 4800 (kVAr)
Leading Power Factor Alarm 0.99 0.85 0.99
Lagging Power Factor Alarm 0.95 0.80 0.98
VAr/PF Alarm Time Delay 0 0 3600 (s)
Min Current for Power Factor Alarms 10 5 200 (mA)

Input Selection
VR2 Aux

Low Current Block
Disable Enable

Save Comm Block at Power Off
Don't Save Save

Run Through Neutral
Disable Enable Counter Reset
Maximum Allowed Taps 4 3 7
Tap Operations Between Runs 1000 10 10000
Maximum Load Current 50 1 100 (mA)
Maximum RTN Standby operations 20 1 10000

Undo/Refresh
Save
Close

Figure 3-39 Configuration Dialog Screen

VAr Bias Voltage Step – Amount by which the control will increase or decrease the Upper or Lower band edges when there is a VAr Bias out of band situation.

Max VAr Bias Duration – Maximum allowable time in minutes the control will bias the voltage edge.

Configuration/Raise/Lower Output Contacts

Output Selection – Toggle between two modes of operation: **Continuous** (factory setting) and **Pulsed**.

Pulse Width – Adjustable from 0.2 seconds to 12.0 seconds in 0.1 second increments with a factory setting of 1.0 second. When the output is set to pulse and the control is calling for Raise/Lower (and no non-sequential or counter input is applied), an output will turn on for the preprogrammed time, and then turn off for 0.5 seconds, plus the intertap time delay. A square wave is generated on the output.

■ **NOTE**: This setting is also available in the Setup/Tapchanger Type dialog screen. See **Section 4.4 Tap Changer Type Selections**.

Configuration/Regulator

Regulator Type – Allows the regulator type to be selected as Type A or B for correct source voltage calculation. Factory setting is Type **A**.

■ **NOTE**: This setting is also available in the Setup/Tapchanger Type dialog screen. See **Section 4.4 Tap Changer Type Selections**.

Configuration/Motor Current Settings

Peak RMS Current – Adjustable from 10% to 200% in 1% increments.

Avg RMS Current – Adjustable from 10% to 200% in 1% increments.

Avg Duration – Adjustable from 10% to 200% in 1% increments.

Configuration/Voltage Reduction (VR)

Standard VR – Allows standard Voltage Reduction to be Enabled or Disabled.

Smart VR – Allows Smart Voltage Reduction to be Enabled or Disabled. This setting is only available when Standard VR is Disabled.

Smart VR LDC – Allows Smart Voltage Reduction LDC to be Enabled or Disabled. This setting is only available when Smart VR is Enabled.

Smart VR LDC Settings – When enabled, existing LDC settings are ignored and the Smart VR LDC settings will be used. The choice between R and X, or Z compensation is determined by the LDC setting in the Setpoints screen.

VR Turnoff Timer – Allows Voltage Reduction to be turned off after a prescribed time period from 1 to 999 minutes. A setting of zero disables this feature.

Save VR at Power Off – Save Voltage Reduction at Power Off allows the state of the "Voltage Reduction" communication command to be saved or not saved when power has been lost. The default setting is "Don't Save".

Configuration/VAr and Power Factor Alarm Settings

Leading VAr Alarm – Adjustable from 150 to 4800 kVAr in increments of 1 with a factory setting of 300.

Lagging VAr Alarm – Adjustable from 150 to 4800 kVAr in increments of 1 with a factory setting of 900.

Leading Power Factor Alarm – Adjustable from 0.85 to 0.99 in 0.01 increments with a factory setting of 0.99.

Lagging Power Factor Alarm – Adjustable from 0.80 to 0.98 in 0.01 increments with a factory setting of 0.95.

VAr/PF Alarm Time Delay – Adjustable from 0 to 3600 seconds in 1 s increments with a factory setting of 0 s.

Minimum Current Threshold for Power Factor Alarms – Adjustable from 5 to 200 mA in increments of 1 mA with a factory setting of 10. The measured Load Current must be above this Minimum Current Threshold setting for the power factor alarms to actuate. When the power factor exceeds the alarm settings for Lead or Lag and the measured Load Current is below this value, the alarm will be ignored.

Configuration/Input Selection – The VR2 input can be set to "Aux" and its status remotely monitored via SCADA.

Configuration/Low Current Block – When enabled the control determines if Load Current following a tapchange is less than 4 mA, coincident with Tap Delta Voltage being less than 0.4 Vac. When these conditions exist the control will initiate an alarm and block regulation. The Delta Voltage is measured on every tap operation once Load Current is less than 4 mA. If two consecutive tap operations each measure a delta voltage of less than 0.4 Vac, the Low Current Block and Alarm will be in effect. Additionally, a valid counter input for each tap position must be received for the Block and Alarm to initiate. Note that for Cooper regulators, this input is via the Motor Seal-in circuit instead of a dedicated counter.

Configuration/Save Comm Block at Power Off– Allows the state of the "Block Auto Operation" communication command to be saved or not saved when power has been lost. The default setting is "Don't Save".

Configuration/SCAMP Initialize on Power Up – When the SCAMP option is purchased, when **Last Save** is selected, the SCAMP switch is configured in such a way that upon the control performing a cold power up, the state of the SCAMP switch is initialized to the last saved state of the SCAMP switch prior to the control powering off.

For example, if prior to powering off the control, the SCAMP switch was in Manual, then when the control is powered back on the control will initially go back to the Manual state and vice versa. Now when **Auto Mode** is selected, the control always initializes into the Auto Mode after powering up regardless of the saved state of the control prior to powering off.

Configuration/Run Through Neutral

Enable/Disable – Allows the Run Through Neutral feature to be Enabled and Disabled.

Maximum Allowed Taps – The Maximum Allowed Tap setting provides a user selectable limit for the number of taps that are allowed to be taken to accommodate taking one tap through neutral.

Tap Operations Between Runs – This setting is the number of operations the control will count up to before allowing the Run Through Neutral feature to operate if all pre-conditions are met.

Maximum Load Current – The Run Through Neutral feature will not be allowed to operate when the Maximum Load Current setting is exceeded.

Max RTN Operations Before Alarms – This setting provides the number of attempts to exceed the RTN feature before the "RTN Fail to Operate" Alarm is initiated.

Configuration/Miscellaneous

Undo/Refresh – The **Undo** command allows the user to undo any setting changes in the Configuration screen before the settings have been saved to either the Device or Open File. It also refreshes the screen with the data stored in the unit.

Save – The **Save** command saves the configuration setting changes to either the Open File when in File mode or the Device when TapTalk® is connected to a device.

Close – The **Close** command cancels any configuration setting changes before the configuration settings changes have been sent to either the Device or Open File.

Setup/Tap Settings

Tap Settings/General

Tap Information – Toggles between two modes of operation: **Disabled**, to disable all tap position-related functions; **Regulate Internal (Motor Direct Drive KeepTrack™)**, to use KeepTrack tap position knowledge.

InterTap Delay – Adjustable from 0 to 60 seconds in 1 second increments with a factory setting of 0 seconds. This value must be set less than the count window setting for counter operation.

■ **NOTE**: These settings are also available in the Setup/Tapchanger Type dialog screen. See **Section 4.4 Tap Changer Type Selections**.

Tap Settings/Tap Limits

Enable/Disable – Allows Tap Limits to be enabled or disabled.

Block Raise/Block Lower – When enabled, Block Raise and Block Lower are adjustable from the Tap Maximum configuration point to the Tap Minimum value in 1 step increments (Tap Limit Block Raise cannot be lower than Tap Limit Block Lower +4. Tap Limit Block Lower cannot be higher than Tap Limit Block Raise –4).

Tap Settings/Operation Counter

Configuration – Selects the contact operation sequence that will cause the software counter to increment by one. Open/close/open (X1), open/close or close/open contact operation (X2). The count window mode registers any activity as a valid input within the count window time setting. Factory setting is X1. When a Cooper Regulator is used the "Motor Seal-in" selection must be chosen.

■ **NOTE**: This setting is also available in the Setup/Tapchanger Type dialog screen. See **Section 4.4 Tap Changer Type Selections**.

X Mode Delay – When the control is using X1 or X2 Mode counter contact detection method, the X Mode Delay feature can be used as follows:

Minimum Time Duration for X1/X2 Counter Contact Signal – The X Mode Delay setting in millisecond can be used to define the minimum time duration for the X1(2) counter contact signal. Any signal duration of less than the X Mode Delay will be considered as an invalid counter contact signal. Depending on the condition of the counter contact switch, the X Mode Delay should be set between 10 – 20 mS.

Neutral Position Switch Detection Delay

The X Mode Delay setting in millisecond can be used to delay the detection of the **NEUTRAL** position switch. This is sometimes necessary if the regulator activates the counter contact switch before the neutral switch when moving to the neutral position. The default value is 10 ms.

Extensive field trials indicate that a setting of 10 will allow all regulator types to operate correctly. It should be noted that the utility menu of the control HMI interface under Utility/Calibration/Test/X1 Duration will display a value in msec. that can be monitored during tap operations of the regulator to fine tune the X Mode Delay setting.

Count Window – Operation count will increment by only one count during a set time period or "Count Window". This is true no matter how many counter inputs occur during the count window time period. After a counter input is accepted, the count window timer begins and another count won't be accepted until the count window time period expires. The count window time period can be set from 0.5 to 60.5 seconds. The count window setting must be set greater than the InterTap Delay setting.

Preset (Counter) – Displays the number of operations since the last reset.

Predictive Main. Alarm (Op Count Signal) – Displays the Predictive Maintenance Alarm limit value from 0 to 999,999. This value also sets the trigger for the Programmable Alarm "Op Count Signal" if enabled.

Resettable (Operation Counter) – Displays the number of operations since the last reset. Selecting the **Reset** check box and then selecting **Save** sends a reset command to the control.

Neutral Counter – The Neutral Switch Counter is updated each time the neutral input is detected. Neutral Switch Counter can also preset to any value. The Neutral Switch Counter is a software counter that is stored in non-volatile memory and has a maximum value of 1,000,000.

Tap Settings/Motor Seal-in Settings

Motor Seal-in Failure Block – When Motor Seal-in is selected the Motor Seal-in Failure Block feature and the input to the Abnormal Tap Position alarm are enabled by default. The user may choose to disable the Motor Seal-in Block feature. However, the input to the Abnormal Tap Position alarm is always enabled when Motor Seal-in is selected.

Motor Seal-in Current Pickup – The Motor Seal-in Current Pickup setting determines what level the motor current must exceed to trigger the control to turn off its output and allow the Cooper Motor Seal-in circuit to complete the tap operation. This setting works in conjunction with the Motor Seal-in Current Pickup Minimum Duration setting.

Motor Seal-in Current Dropout – The Motor Seal-in Current Dropout setting determines how low the motor current must drop (after the Motor Seal-in Current Pickup Min Duration has been exceeded) to trigger the control to increment the operations counter and tap position.

Motor Seal-in Current Pickup Min. Duration – The Motor Seal-in Current Pickup Minimum Duration setting determines how long the motor current must be above the Motor Seal-in Current Pickup before the control removes its output and looks for the Motor Seal-in Current Dropout to occur as described above.

Tap Settings/Drag Hands

Drag Hands Lower – Displays the lowest tap since last reset. Selecting the **Reset** check box and then selecting **Save** sends a reset command to the control.

Drag Hands Raise – Displays the highest tap since last reset. Selecting the **Reset** check box and then selecting **Save** sends a reset command to the control.

Tap Settings/Tap Statistics

The Tap Statistics Tap Wear feature provides the user with the capability to determine tap wear in a regulator's tap change mechanism. The Tap Statistics Tap Wear feature records the accumulated primary current on each tapchange using the measured Primary Current just prior to moving off a tap. Primary current is calculated from measured Secondary Load Current times the Primary Current Multiplier. The accumulated Primary Current for each tap position is displayed on the Tap Statistics dialog screen (Figure 3-30) which displays the number of times the regulator has been on each tap. The Tap Statistics are stored in non-volatile memory and will remain intact through power cycle and firmware update, as its value is in its long term indication of mechanism wear.

The Tap Statistics can be downloaded to a CSV file and printed. Tap Statistics can also be downloaded in CSV format to an SD card. The File name defaults to the serial number of the unit but allows for user modification.

The Tap Statistics Tap Wear feature also includes two settings that are located in the TapTalk, Tap Settings dialog screen (Figure 3-40) in the Tap Statistics section and in the HMI under the Configuration/Tap Settings menu. Both settings are considered to generate a Programmable Alarm output "Individual Tap Wear Alarm":

- Maximum Tap Wear setting – The Maximum Tap Wear setting can be set from 1–65534.
- Individual Tap Wear Alarm setting – The Individual Tap Wear Alarm setting is a percentage setting with a range from 1–200% and a default of 1%. This setting is used in conjunction with the Maximum Tap Wear setting to determine when the "Individual Tap Wear Alarm" is triggered.

  The Individual Tap Wear alarm will trigger when the number of operations on any single tap exceeds the Individual Tap Wear Alarm setting. This alarm also triggers SOE and OSC.

Tap Settings/Tap Calibration

Tap Position – Value of actual tap position can be set from -16 to 16 including Neutral.

Tap Settings/Miscellaneous

Undo/Refresh – The **Undo** command allows the user to undo any setting changes in the Tap Settings screen before the settings have been saved to either the Device or Open File. It also refreshes the screen with the data stored in the unit.

Save – The **Save** command saves the Tap Settings changes to either the Open File when in File mode or the Device when TapTalk is connected to a device.

Close – The **Close** command cancels any Tap Settings changes before the changes have been sent to either the Device or Open File.

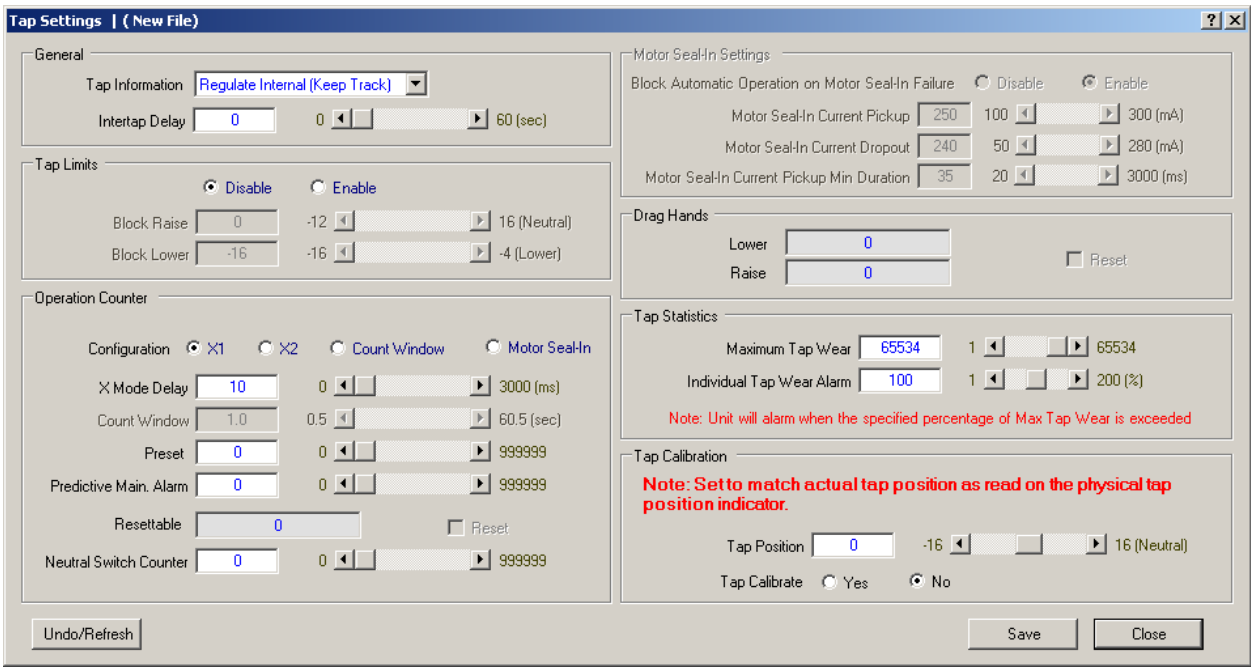


Figure 3-40 Tap Settings Dialog Screen

Setup/Alarms

Programmable Alarm Relay

The programmable alarm relay function (Figure 3-41) provides alarm monitoring for one or more of the following conditions: Comm Block, Block Raise (Tap), Block Lower (Tap), Block Raise (Voltage), Block Lower (Voltage), Abnormal Tap Position, Backup Power Fail, RTN Fail to Operate, Individual Tap Wear Alarm, LDC/LDZ, Line Current Limit, Reverse Power, Self Test (Failure), Voltage Reduction, Max VAr Bias Duration Lead/Lag, Operations Count Signal, Leading VAr, Lagging VAr, Leading Power Factor and Lagging Power Factor. Alarm conditions are continuously displayed in the **Metering & Status** screen (Figure 3-27).

The Alarms Dialog screen also provides the means to reset the Motor Seal-in Failure Alarm/Block, the Low Current Block and the RTN Fail to Operate Alarm.

Alarms/Miscellaneous

Undo/Refresh – The **Undo** command allows the user to undo any setting changes in the Alarms screen before the settings have been saved to either the Device or Open File. It also refreshes the screen with the data stored in the unit.

Save – The **Save** command saves the Alarms settings changes to either the Open File when in File mode or the Device when TapTalk® is connected to a device.

Close – The **Close** command cancels any Alarms setting changes before the changes have been sent to either the Device or Open File.

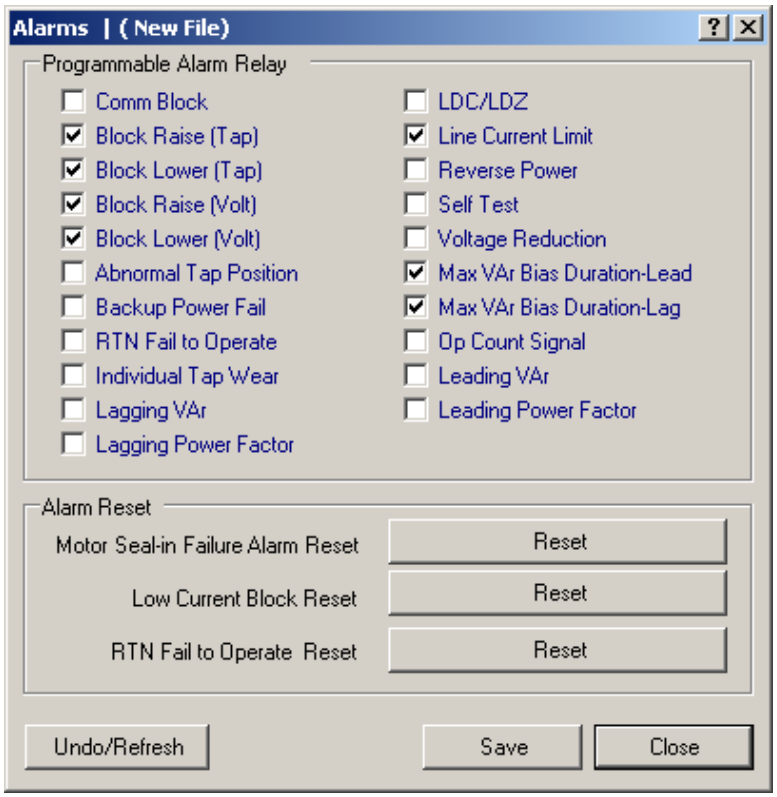


Figure 3-41 Programmable Alarms Dialog Screen

Setup/Wakeup Screens

The Wakeup Screens (Figure 3-42) feature allows the user to select specific control parameters that will be displayed when the control is awakened by depressing the **EXIT/WAKE** pushbutton. When the control is awakened the selected parameters are displayed in a cycling fashion. The display can also be directed to a specific parameter by utilizing the ⬆ or ⬇ pushbuttons. Pressing the **EXIT** pushbutton will stop the cycling display on the displayed parameter. Press **EXIT** again to return to the User Lines screen.

Wakeup Screens/Miscellaneous

Default – The **Default** command allows the user to reset the Wakeup Screens to the default settings.

Save – The **Save** command saves the Wakeup Screen changes to either the Open File when in File mode or the Device when TapTalk® is connected to a device.

Close – The **Close** command cancels any Wakeup Screen changes before the changes have been sent to either the Device or Open File.

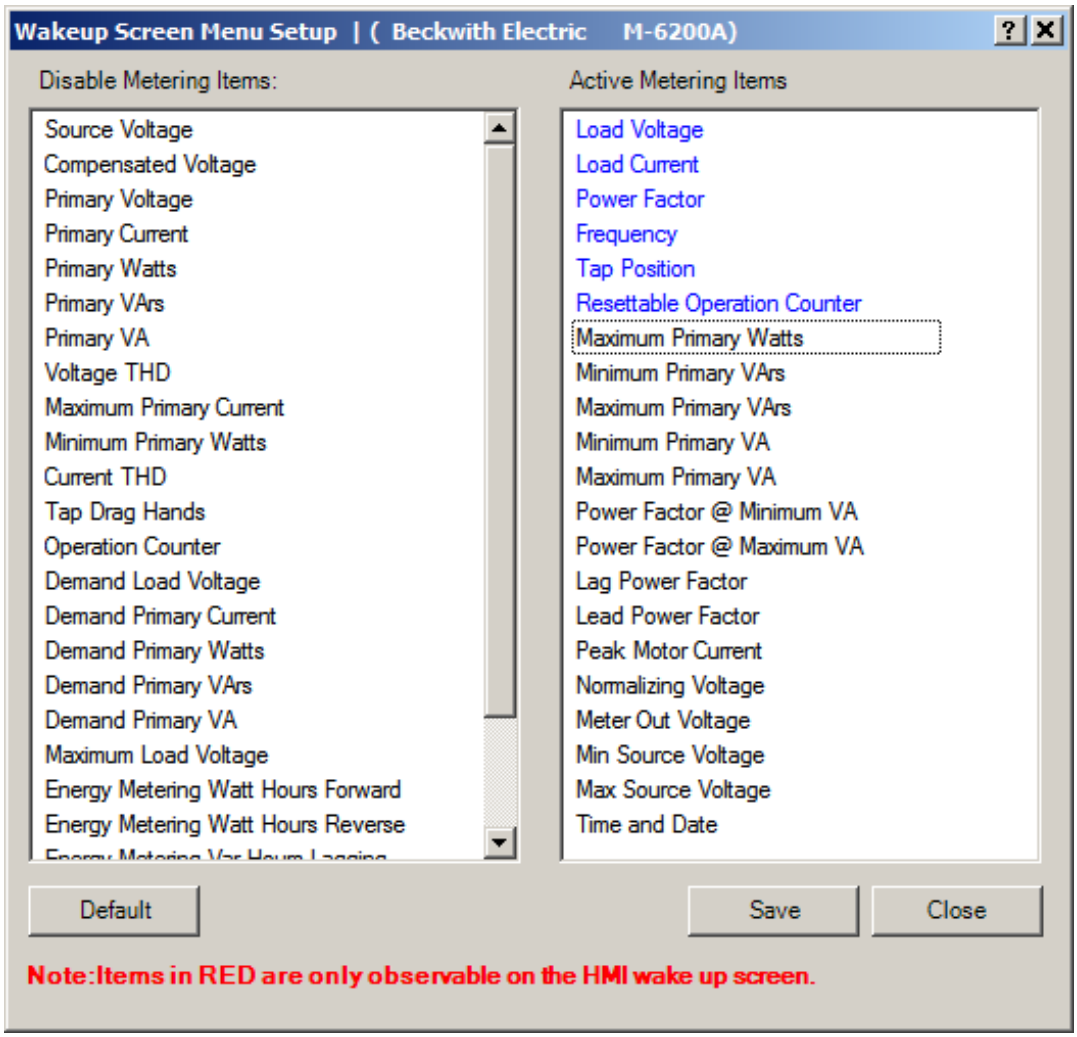


Figure 3-42 Setup Wakeup Screen Dialog Screen

Setup/Data Logging

Data is recorded internally into non volatile memory. The data log is transferred in the Comtrade format. The Comtrade format consist of two files, the configuration file (*.cfg) and the data file (*.dat).

Data logging will continue indefinitely as long as the data Interval is set to a non-zero value. A zero value for the data interval will effectively disable data logging. The data log, can be downloaded using MODBUS® (see M-6200A protocol document) or DNP (using file transfer) protocol. The data can be viewed using any Comtrade compatible viewer. TapTalk® provides such a tool.

Data logging interval ranges from 0 to 120 min with an increment of 1 minute. Once data logging is enabled, the control will store the data in records at the data interval rate. Each record has the following data:

- Load Voltage
- Primary VA
- Power Factor
- Source Voltage
- Compensated Voltage
- Primary VAr
- Frequency
- Primary Watts
- Load Current
- Tap Position
- Primary Current
- Operations Count
- Meter Out Voltage
- RTN Counter

The checksum is used to ensure the integrity of the record stored. The average value is calculated over the data logging interval.

Due to the internal structure of the Comtrade format, time stamping is always performed. A total of 6 Mbytes (200,000 records) of data can be saved in non volatile memory.

When connected to a M-6200A Regulator Control the **Data Logging** feature provides the user with the ability to initiate data logging of all control parameters to the selected control for downloading at a later time.

This feature allows the user to configure the parameters that the control will use to log data, and to download the logged data to a Comtrade (*.cfg) file. This file format can be viewed by a third party Common Format for Transient Data Exchange (COMTRADE) format viewer software.

Setup/Data Logging/Setup

This submenu item displays the **Data Logging Setup** Dialog Screen (Figure 3-43).

In the **Logging Timer** section, the **Sampling Period** allows the user to input the interval in minutes at which the data will be logged.

The parameters that can be downloaded include:

- Load Voltage
- Primary VA
- Power Factor
- Source Voltage
- Compensated Voltage
- Primary VAr
- Frequency
- Primary Watts
- Load Current
- Tap Position
- Primary Current
- Operations Count
- Meter Out Voltage
- RTN Counter

Save – The **Save** command saves the Data Logging Setup changes to either the Open File when in File mode or the Device when TapTalk is connected to a device.

Close – The **Close** command cancels any Data Logging setup changes before the changes have been sent to either the Device or Open File.

■ **NOTE:** When Load Voltage, Compensated Voltage, Source Voltage and Load Current are selected, the data to be retrieved will consist of the average, minimum and maximum values over the sampling period.

Setup/Data Logging/Retrieve

This submenu item when selected, initiates the retrieval of the current data logging file from the control (Figure 3-44).

Setup/Data Logging/Clear

This submenu item when selected, clears the data logging information stored in the control.

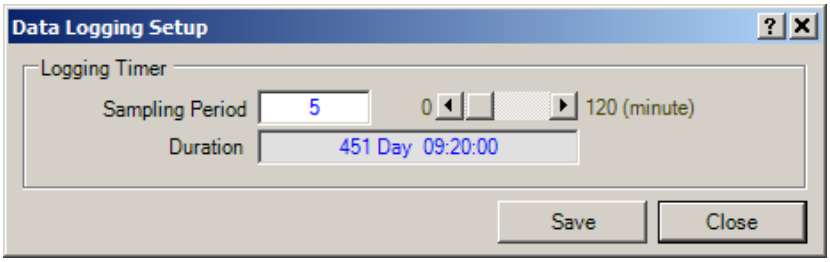


Figure 3-43 Data Logging Setup Dialog Screen

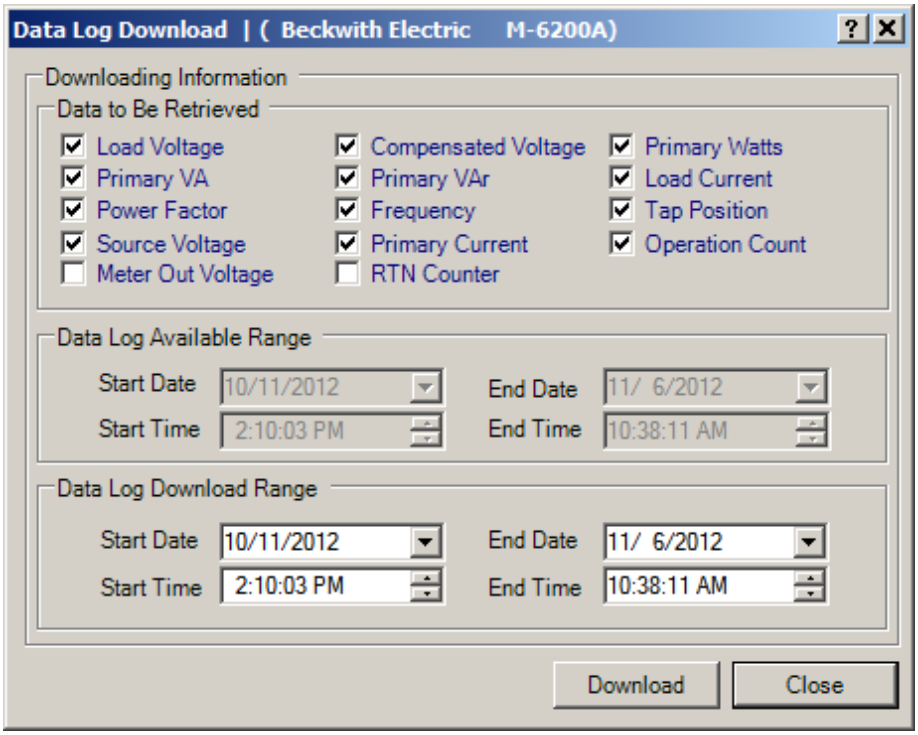


Figure 3-44 Data Log Download Dialog Screen

Setup/Harmonics

The Harmonics Setup dialog screen provides the user with the ability to select Voltage and Current Harmonics for monitoring relative to a Voltage and Current threshold setting. Whenever any selected Voltage or Current Harmonic exceeds their respective threshold if selected in Sequence of Events setup will initiate Sequence of Events recording. The threshold level is set as a percentage of the fundamental. The Minimum Current Threshold setting can be enabled or disabled. If it is enabled, it is the Minimum Load Current (Fundamental) that must exist before Harmonics can trigger Sequence of Events or Oscillograph Recorder.

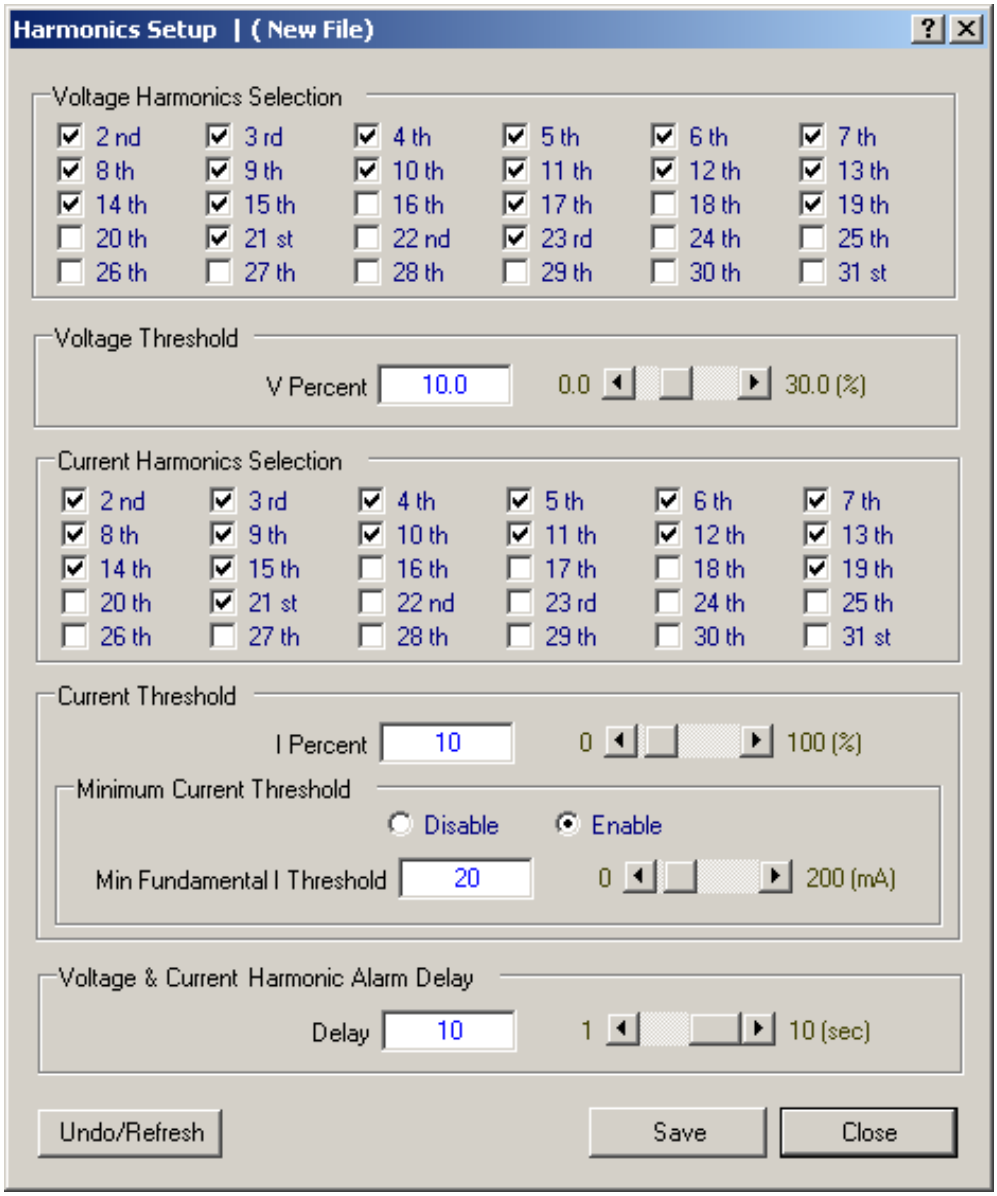


Figure 3-45 Harmonics Setup Dialog Screen

Setup/Oscillograph/Setup

The **Oscillograph Recorder** provides comprehensive data recording (voltage, current and status input/output signals) for all monitored waveforms (at 16 samples per cycle). Oscillograph data can be downloaded using the communications ports to any Windows™ based computer running the S-6200 TapTalk® Communications Software. Once downloaded, the waveform data can be examined and printed using the TapPlot® Oscillograph Data Analysis Software.

The general information required to setup the Oscillograph Recorder (Figure 3-46) includes:

- **Number of Partitions** – When untriggered, the recorder continuously records waveform data, keeping the data in a buffer memory. The recorder's memory may be partitioned into 1 to 16 partitions (Table 3-1).

  When triggered, the time stamp is recorded and the recorder continues recording for a user-defined period. The snapshot of the waveform is stored in memory for later retrieval using S-6200 TapTalk Communications Software.
- **Samples/Cycle** – The number of samples/cycle can be selected to either 16, 32 or 64 samples/cycle.
- **Post-Trigger Delay** – A post-trigger delay of 5% to 95% must be specified. After triggering, the recorder will continue to store data for the programmed portion of the total record before rearming for the next record. For example, a setting of 80% will result in a record with 20% re-trigger data and 80% post-trigger data.

Number of Partitions	Cycles Per Partition
1	1365
2	910
3	682
4	548
5	455
6	390
7	341
8	303
9	278
10	248
11	227
12	210
13	195
14	182
15	170
16	160

Table 3-1 Oscillograph Recorder Partitions and Cycles for 16 Samples/Cycle

Oscillograph Setup | (Beckwith Electric M-6200A)

Number of Partitions: 5 Partitions

Samples/Cycle: 32 Samples/Cycle

Post trigger delay: 50 (5 – 95 (%))

Pickup

☐ Raise Contact	☐ Lower Contact	☐ VR Contact 1	☐ VR Contact 2
☐ Force Lower (Runback)	☐ Raise Tap Limit	☐ Lower Tap Limit	☐ Low Band
☐ High Band	☑ Low Voltage Limit	☑ High Voltage Limit	☐ Auto Inhibit
☐ Non Sequential	☐ Reverse Power	☐ Peak Motor Current	☑ Avg. Motor Current
☑ Motor Current Duration	☐ Voltage Harmonics	☐ Current Harmonics	☑ CBEMA 1
☑ CBEMA 2	☑ CBEMA 3	☑ CBEMA 4	☐ VAr Bias Active
☐ Low Current Blk Active	☑ Sealin Fail Alarm Active	☑ Sealin Fail Low Blk Act.	☑ Sealin Fail Raise Blk Act.
☐ Neutral Input	☐ Counter Input	☐ Sealin Active Trigger	☐ Op Count Signal
☐ Individual Tap Wear Alarm	☐ Leading VAr Alarm Active	☐ Lagging VAr Alarm Active	☐ Leading PF Alarm Active
☐ Lagging PF Alarm Active			

Dropout

☐ Raise Contact	☐ Lower Contact	☐ VR Contact 1	☐ VR Contact 2
☐ Force Lower(Runback)	☐ Raise Tap Limit	☐ Lower Tap Limit	☐ Low Band
☐ High Band	☐ Low Voltage Limit	☐ High Voltage Limit	☐ Auto Inhibit
☐ Non Sequential	☐ Reverse Power	☐ Voltage Harmonics	☐ Current Harmonics
☐ CBEMA 1	☐ CBEMA 2	☐ CBEMA 3	☐ CBEMA 4
☐ VAr Bias Active	☐ Low Current Blk Active	☐ Sealin Fail Alarm Active	☐ Sealin Fail Low Blk Act.
☐ Sealin Fail Raise Blk Act.			
☐ Neutral Input	☐ Counter Input	☐ Sealin Active Trigger	☐ Op Count Signal
☐ Individual Tap Wear Alarm	☐ Leading VAr Alarm Active	☐ Lagging VAr Alarm Active	☐ Leading PF Alarm Active
☐ Lagging PF Alarm Active			

Undo/Refresh Save Close

Figure 3-46 Oscillograph Setup Dialog Screen

Setup/Oscillograph/Trigger

The **Oscillograph Recorder** can be manually triggered by the user. When trigger is selected a confirming dialog screen is displayed. Selecting **Yes** triggers the Oscillograph Recorder and TapTalk® displays a confirming dialog screen.

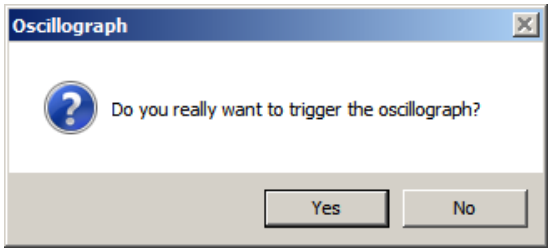


Figure 3-47 Oscillograph Trigger Dialog Screen

Setup/Oscillograph/Retrieve

The **Retrieve** command initiates a sequence of dialog screens (Figures 3-48 and 3-49) to download the Oscillograph data from the currently connected control. Oscillograph data must be retrieved from the control in a Comtrade file (*.cfg) in order to be viewed. TapPlot can be utilized to view the file contents.

Figure 3-48 Retrieve Oscillograph Record Dialog Screen

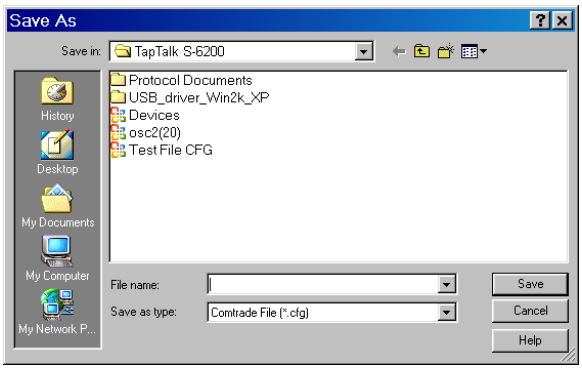


Figure 3-49 Retrieve Oscillograph Record (Save As) Dialog Screen

Setup/Oscillograph/Clear

The **Clear** command clears any Oscillograph records on the connected control.

Setup/Oscillograph/Scroll Message

The "Oscillograph Record Triggered" cycling display can be enabled from the TapTalk Communications Software by navigating to the "Oscillograph Scroll Message" (Setup/Oscillograph/Scroll Message) dialog screen (Figure 3-50) and selecting "Enable". It can also be enabled from the HMI by navigating to the "Communication HMI" menu.

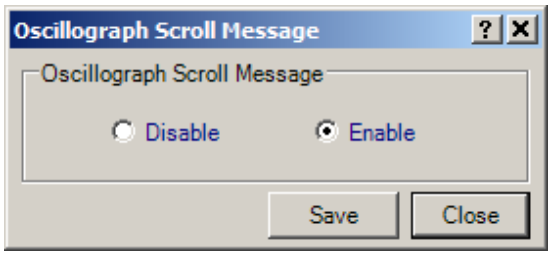


Figure 3-50 Oscillograph Scroll Message Dialog Screen

Setup/CBEMA Events/Setup

The CBEMA Sequence of Events Setup dialog screen (Figure 3-51) provides the user with the capability to establish 4 event monitors which can be set to activate the Sequence of Events and/or Oscillograph Recorder on sagging or swelling load voltage.

The CBEMA counters can also be cleared from the "clear events counter" menu selection.

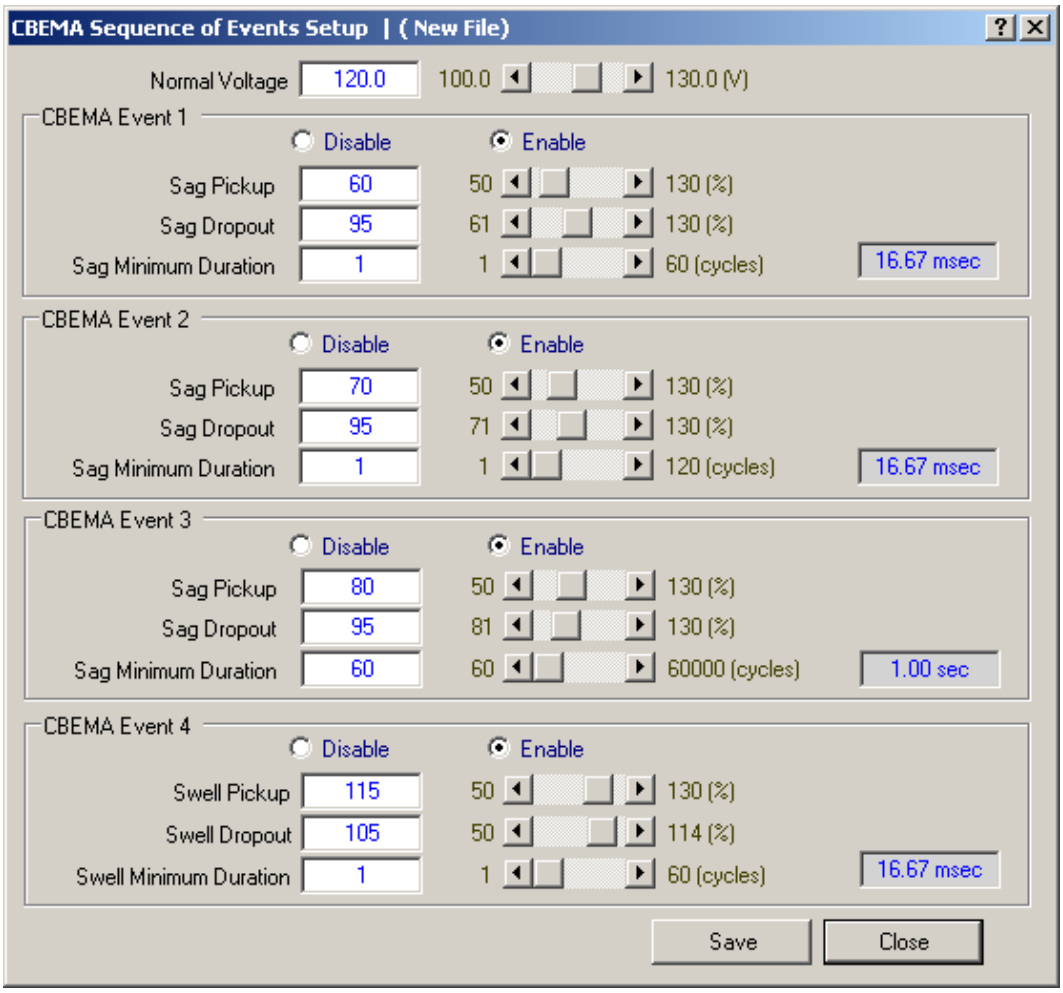


Figure 3-51 CBEMA Sequence of Events Setup Dialog Screen

Setup/Sequence of Events/Setup

The **Sequence of Events Setup** consists of selecting the initiating Pickup and Dropout elements of the control and also setting any logical conditions relative to the Pick and Dropout sequence to trigger the Sequence of Events recorder.

Selecting the OR and AND Trigger elements is accomplished by selecting either OR or AND Gate boxes on Figure 3-52. TapTalk will display the OR Gate or AND Gate Setup Dialog Screen. After selections are made in the OR Gate and AND Gate dialog screens the user must select either OR or AND logic to initiate the Sequence of Events recorder. Selecting SAVE then writes the settings to the control.

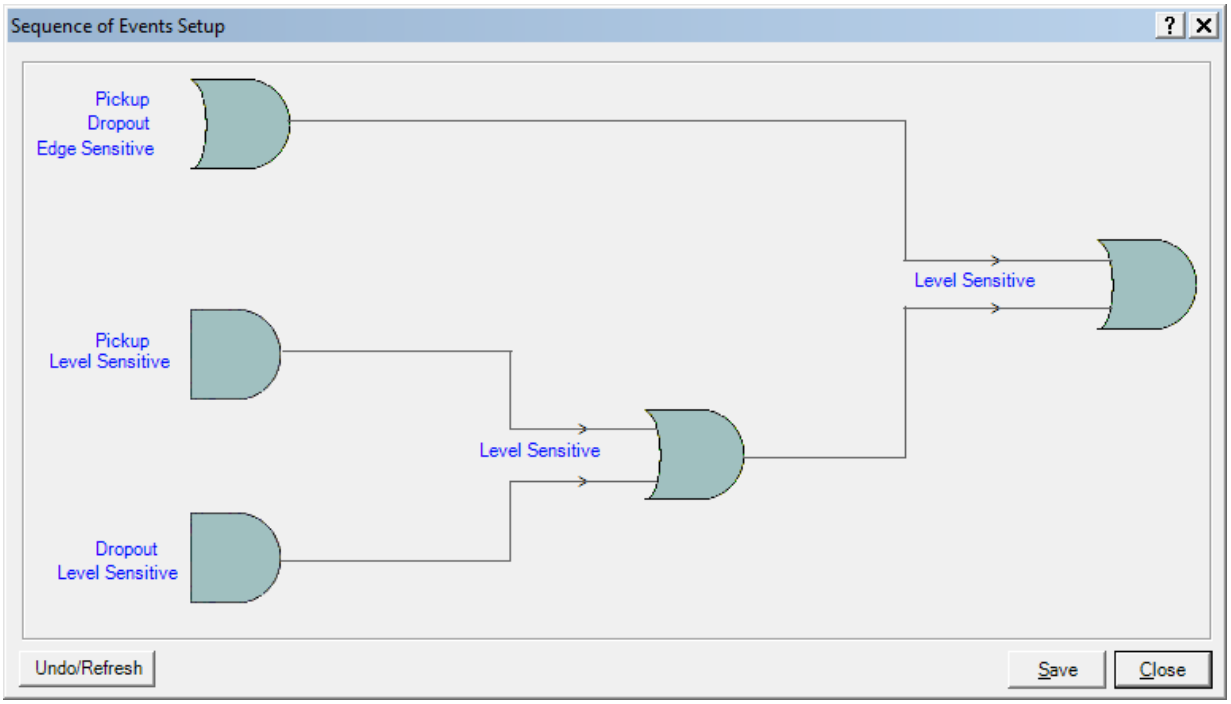


Figure 3-52 Sequence of Events Trigger Logic and Element Selection Dialog Screen

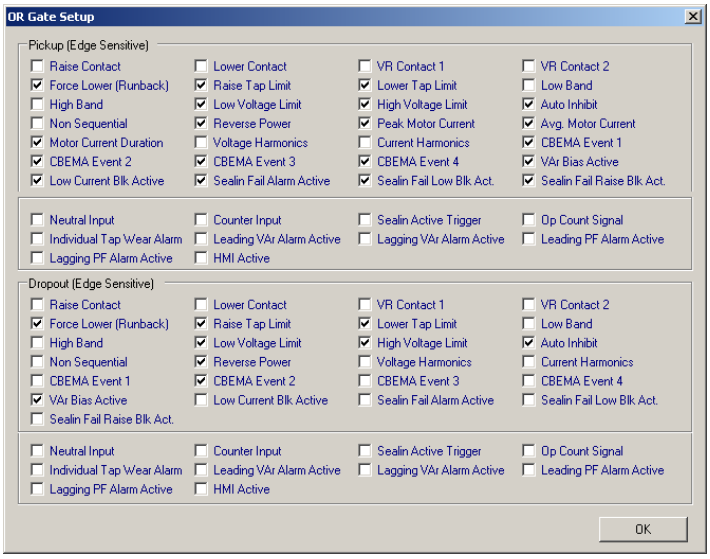


Figure 3-53 Sequence of Events Pickup/Dropout Edge Sensitive OR Gate Setup Dialog Screen

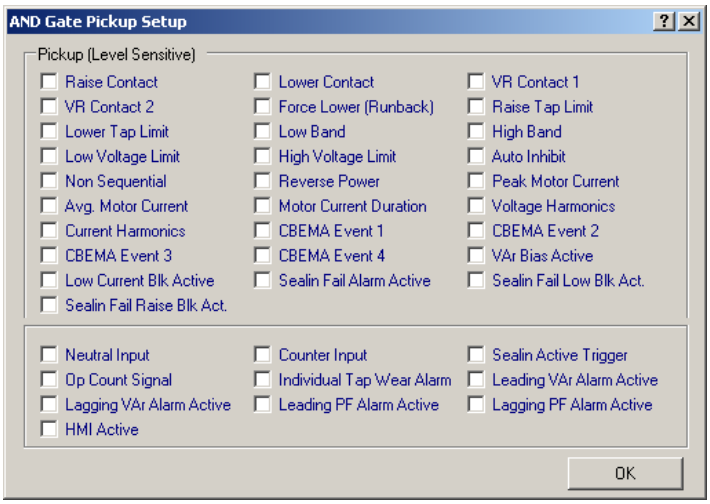


Figure 3-54 Sequence of Events Pickup Level Sensitive AND Gate Setup Dialog Screen

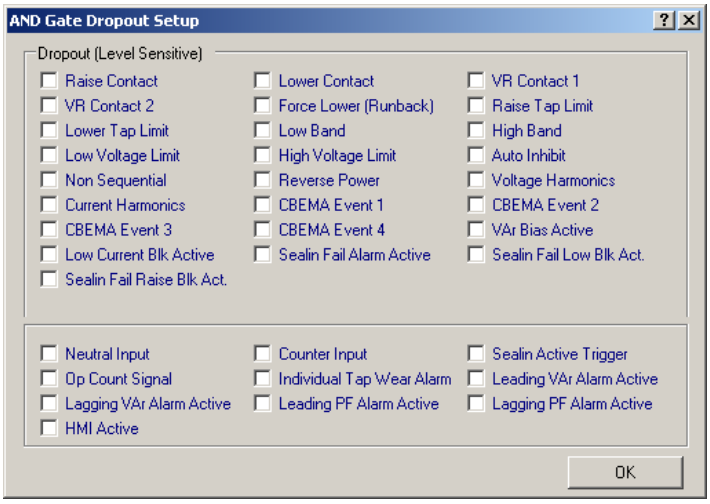


Figure 3-55 Sequence of Events Dropout Level Sensitive AND Gate Setup Dialog Screen

Setup/Sequence of Events/Retrieve

The **Retrieve** command downloads the events from the currently connected control. Events must be retrieved from the control and stored in a file in order to be viewed.

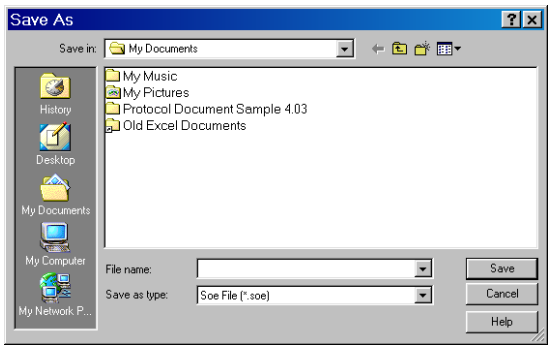


Figure 3-56 Retrieve Sequence of Events File Save As Dialog Screen

Setup/Sequence of Events/View

The **View** command permits the user to display a detailed list of past Sequence of Events and their corresponding captured parameters. (Figure 3-58) The parameters captured in the Sequence of Events file include:

- Local Voltage
- Source Voltage
- Frequency
- Tap Position
- Motor Current
- Load Current
- Resettable Operation Counter
- RMS Voltage
- Meter Out Voltage
- RTN Success Counter
- Time Stamp
- Trigger Status
- Voltage Harmonics (31)
- Current Harmonics (31)
- Leading VAr
- Lagging VAr
- Leading Power Factor
- Lagging Power Factor

Setup/Sequence of Events/Clear

The **Clear** command clears out the Sequence of Events recorder.

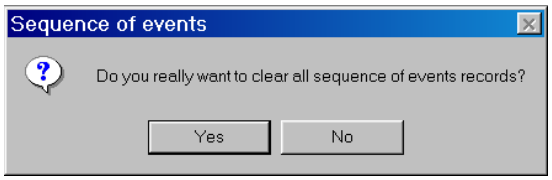


Figure 3-57 Clear Sequence of Events Record Dialog Screen

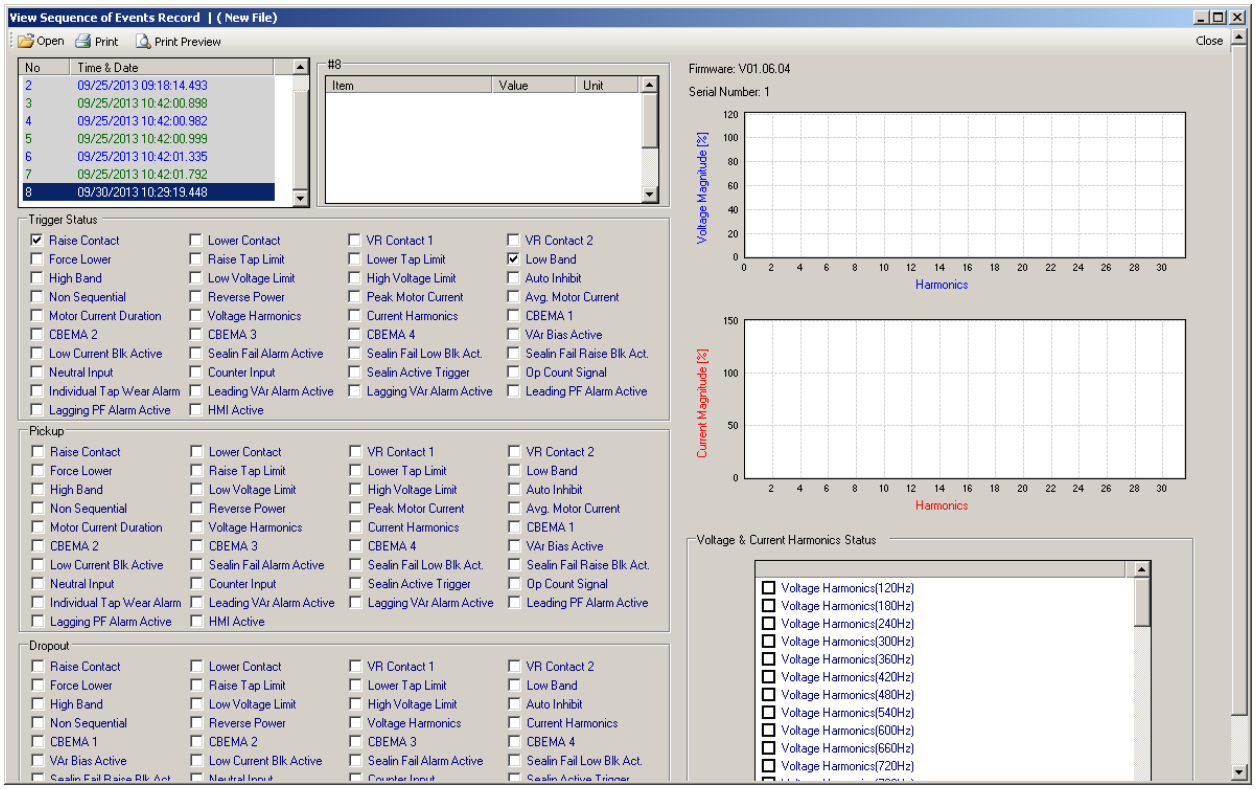


Figure 3-58 View Sequence of Events Record Dialog Screen

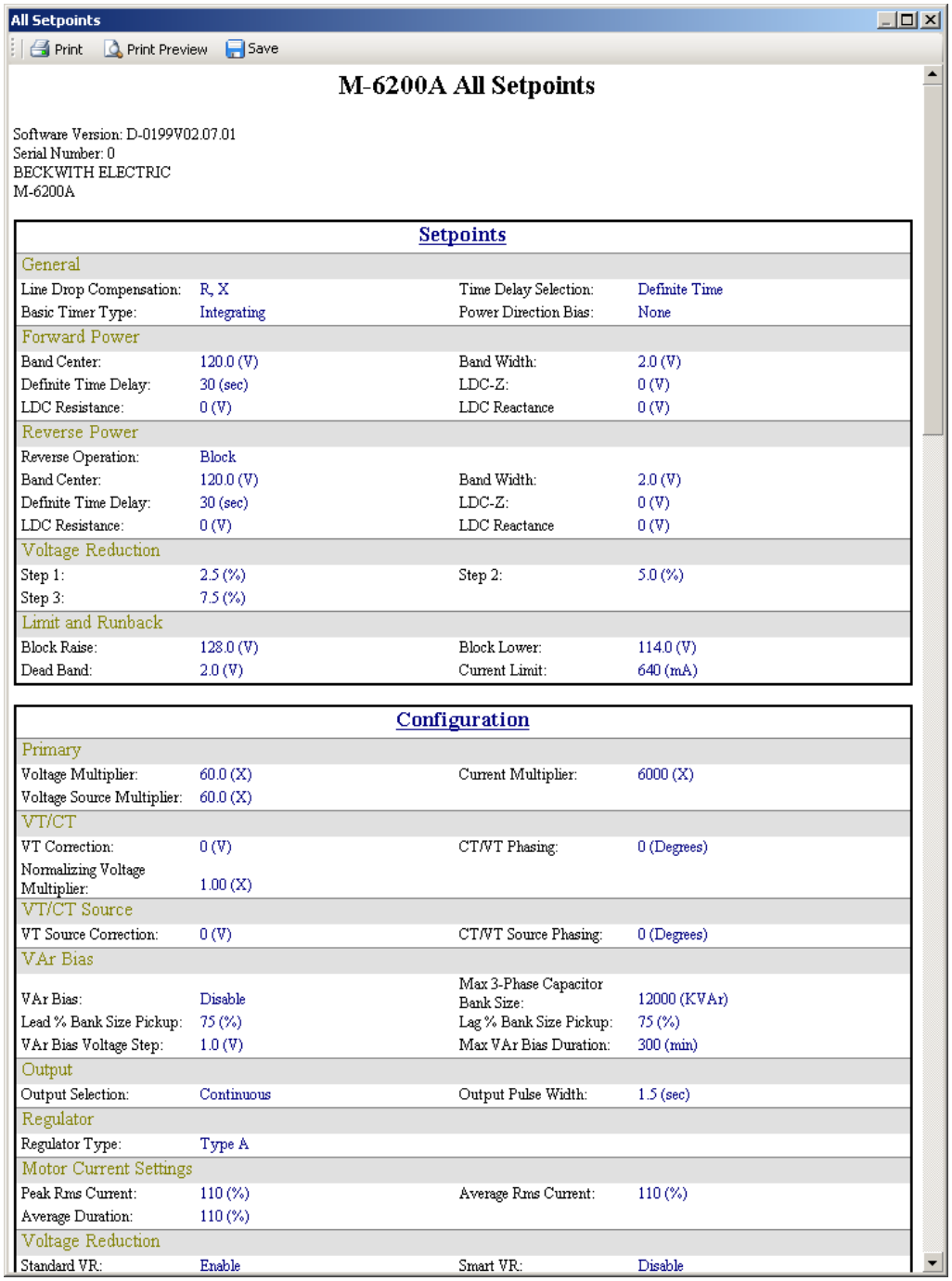
Setup/Display All Settings Command

Selecting **Display All Settings** displays the **All Setpoints** dialog screen (Figure 3-59). This dialog screen contains the settings for each control function within a single window to allow scrolling through all control setpoint and configuration values.

The individual Feature and Function selection buttons are described in the applicable sections.

The All Setpoint Table includes Jump Command Buttons which allow the user to jump from a scrolling dialog screen to an individual control function dialog screen and return to the scrolling dialog screen. All available parameters can be reviewed or changed when jumping to an individual control function dialog screen.

The All Setpoints screen can be printed or saved to a *.HTM file for viewing.



All Setpoints

Print | Print Preview | Save

M-6200A All Setpoints

Software Version: D-0199V02.07.01
Serial Number: 0
BECKWITH ELECTRIC
M-6200A

Setpoints

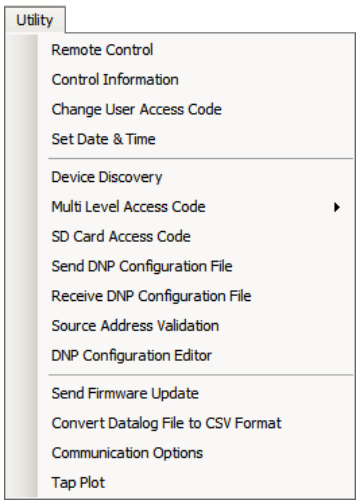
General			
Line Drop Compensation:	R, X	Time Delay Selection:	Definite Time
Basic Timer Type:	Integrating	Power Direction Bias:	None
Forward Power			
Band Center:	120.0 (V)	Band Width:	2.0 (V)
Definite Time Delay:	30 (sec)	LDC-Z:	0 (V)
LDC Resistance:	0 (V)	LDC Reactance	0 (V)
Reverse Power			
Reverse Operation:	Block		
Band Center:	120.0 (V)	Band Width:	2.0 (V)
Definite Time Delay:	30 (sec)	LDC-Z:	0 (V)
LDC Resistance:	0 (V)	LDC Reactance	0 (V)
Voltage Reduction			
Step 1:	2.5 (%)	Step 2:	5.0 (%)
Step 3:	7.5 (%)		
Limit and Runback			
Block Raise:	128.0 (V)	Block Lower:	114.0 (V)
Dead Band:	2.0 (V)	Current Limit:	640 (mA)

Configuration

Primary			
Voltage Multiplier:	60.0 (X)	Current Multiplier:	6000 (X)
Voltage Source Multiplier:	60.0 (X)		
VT/CT			
VT Correction:	0 (V)	CT/VT Phasing:	0 (Degrees)
Normalizing Voltage Multiplier:	1.00 (X)		
VT/CT Source			
VT Source Correction:	0 (V)	CT/VT Source Phasing:	0 (Degrees)
VAr Bias			
VAr Bias:	Disable	Max 3-Phase Capacitor Bank Size:	12000 (KVAr)
Lead % Bank Size Pickup:	75 (%)	Lag % Bank Size Pickup:	75 (%)
VAr Bias Voltage Step:	1.0 (V)	Max VAr Bias Duration:	300 (min)
Output			
Output Selection:	Continuous	Output Pulse Width:	1.5 (sec)
Regulator			
Regulator Type:	Type A		
Motor Current Settings			
Peak Rms Current:	110 (%)	Average Rms Current:	110 (%)
Average Duration:	110 (%)		
Voltage Reduction			
Standard VR:	Enable	Smart VR:	Disable

Figure 3-59 All Setpoints Dialog Screen

UTILITY



The **Utility** menu includes the **Remote Control**, **Control Information, Change User Access Code**, **Set Date & Time, Device Discovery, Multi Level Access Code, SD Card Access Code, Send DNP Configuration File, Receive DNP Configuration File, Source Address Validation, DNP Configuration Editor**, **Send Firmware Update, Convert Datalog File to CSV Format, Communication Options** and **TapPlot®** submenu items.

Utility/Remote Control

▲ **CAUTION:** This feature should be used with extreme caution.

The **Remote Control** menu item displays the applicable **Remote Control** screen (Figure 3-60 or 3-61). Remote Control allows the user to:

- Remotely raise or lower one tap position.
- Apply Voltage Reduction Step 1 or 2 or 3.
- Block Auto Control via Communication (Comm Block).
- When the "SCAMP" option is purchased, the SCAMP Auto/Manual Control setting is available.

Block Auto Control via Communication

Block – Blocks automatic operation of the addressed control.

Unblock – Initiates automatic operation of the addressed control.

Restoring Automatic Operation (Local)

Automatic operation can be restored from the front panel by removing the "Block Auto Control via Communication" through TapTalk® or by performing the following:

1. From the control front panel pushbuttons change the **Comm Block Auto** setting in the **Communication/Comm Settings** menu to **DON'T SAVE**.
2. Remove power to the control, then reapply power to the control. Automatic operation will then be restored.

SCAMP Control

The SCAMP Control feature (Figure 3-61) allows the user to remotely observe the status of the SCAMP pushbutton (when equipped). This feature also allows the user to change the state of the Local SCAMP pushbutton on the Control.

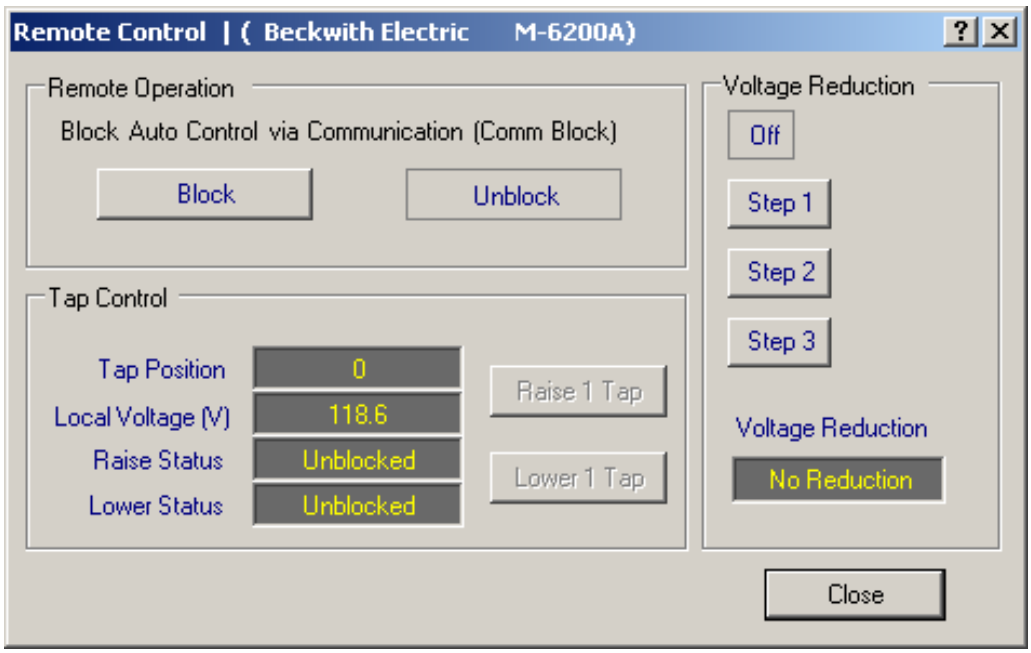


Figure 3-60 Remote Control Screen Without SCAMP

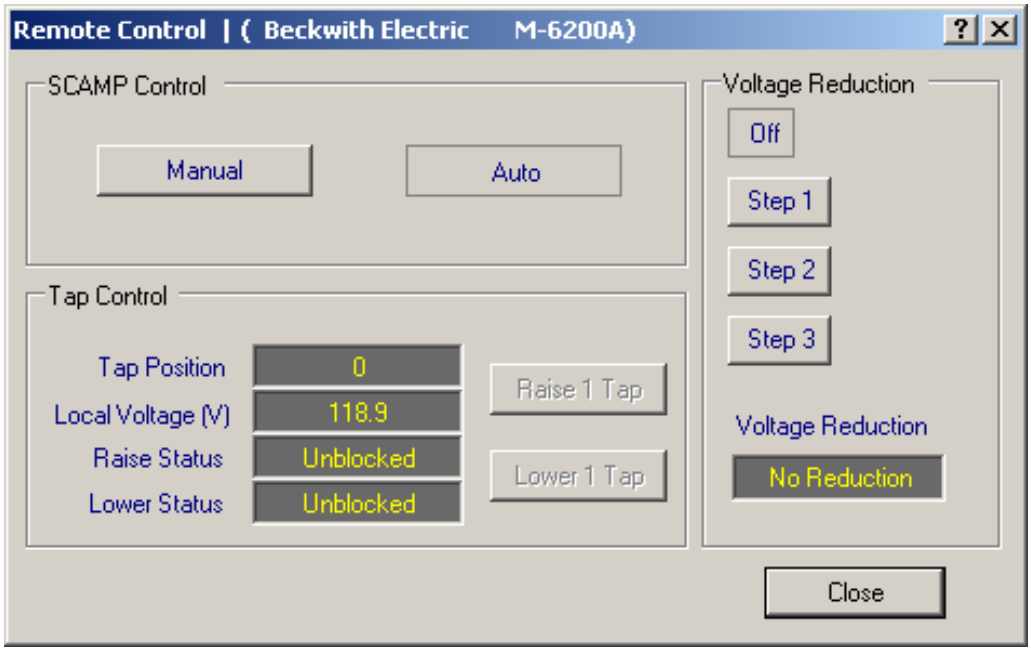


Figure 3-61 Remote Control Screen With SCAMP Option

Utility/Control Information

The **Control Information** submenu item displays the **Control Information** Screen (Figure 3-62). The **Control Information** screen provides specific information about the addressed control. The **Control Information** screen includes the following:

- The addressed control's serial number
- Control's firmware version
- The text currently displayed in the User Lines 1 and 2

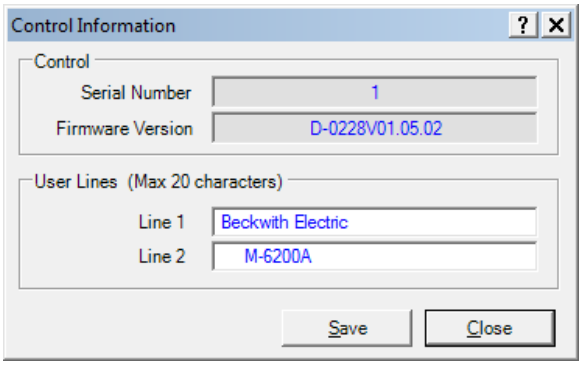


Figure 3-62 Control Information Screen

The Control Information screen also provides the user with the ability to review and change the user lines for the addressed control.

Control Information/Miscellaneous

Save – The **Save** command saves the User Line changes to the control when TapTalk® is connected to a control.

Close – The **Close** command cancels any User Line changes before the changes have been sent to the control.

Utility/Change User Access Code

The User Access Code Level 1 and User Access Code Level 2 protect access to the control from the front keypad and TapTalk.

User Access Code protection, when implemented, is as follows:

Default	View All
Level 1	Change Setpoints, Date/Time
Level 2	Change Setpoints, Configuration, Communication, Set New Access Codes, Start Data Logging, Setup Data Logging, Remote Control, Set User Text Lines, Set Control Date/Time

■ **NOTE:** If additional Access Codes are desired then see Multi Level Access Code later in the Utility section.

To change User Level Access Codes, perform the following:

1. Select **Utility/Communication/Change User Access Code** from the TapTalk toolbar. TapTalk will display the Change User Access Code dialog screen (Figure 3-63).

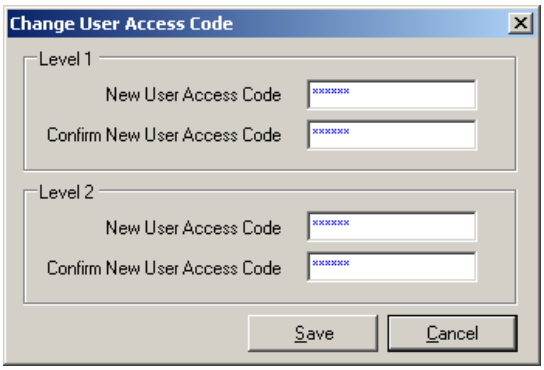


Figure 3-63 Change User Access Code Dialog Screen

2. Input a new Level 1/Level 2 six digit alphanumeric User Access Code.
3. Input the User Access Code from Step 2, in **Confirm New User Access Code**.
4. Select **Save**. TapTalk will display a Save to Device confirmation screen (Figure 4-2).
5. Select **Yes**. TapTalk will return to the Main Screen.

Utility/Set Date & Time

The **Set Date & Time** submenu item enables the user to review the internal clocks for the PC or the addressed control and also allows the selection of daylight saving.

To set control time/date and/or Daylight Saving, perform the following:

1. From the TapTalk® Main Screen Utility drop down menu select **Set Date & Time**. TapTalk will display a warning (Figure 3-64) regarding time stamped values. Select **OK**. TapTalk will display Figure 3-65.

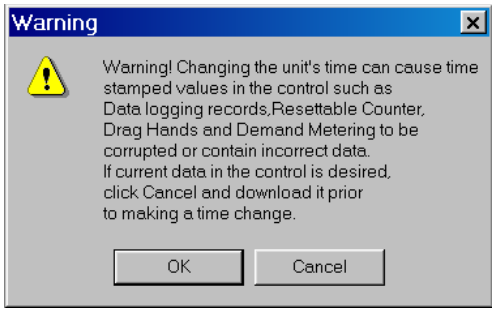


Figure 3-64 Set Date/Time Warning Dialog Screen

2. From the Set Control Date/Time dialog screen (Figure 3-65) select either **Control Clock** or **PC Clock**.

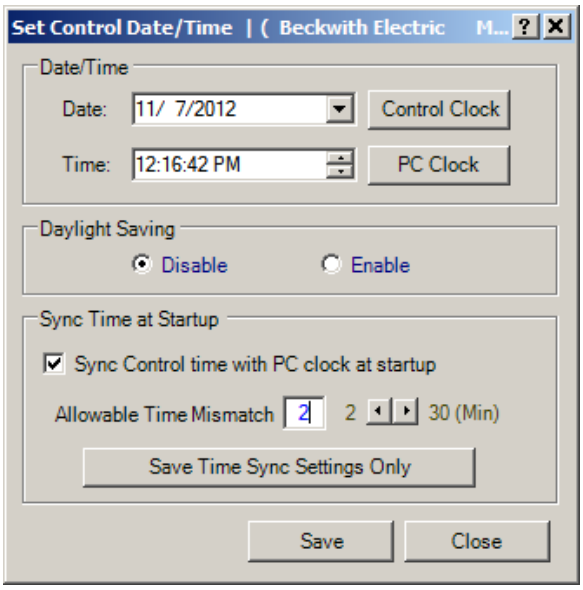


Figure 3-65 Set Control Date/Time Dialog Screen

3. Verify that the desired Daylight Saving setting is selected.
4. If desired select "Sync Time at Startup" and the desired "Allowable time mismatch" value.
5. If PC Clock was selected and the Date/Time of the PC is the desired time to be set in the control, then select **Save**.
6. If Control Clock was selected, then input the desired Date/Time, then select **Save**. TapTalk will respond with a Reset Demand and Energy warning screen (Figure 3-66).

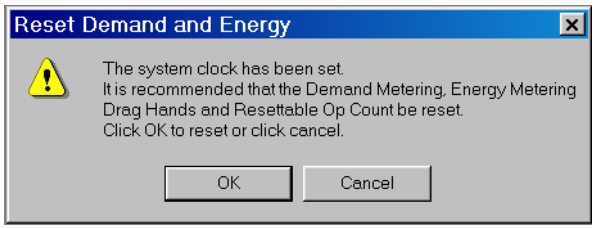


Figure 3-66 Reset Demand and Energy Warning Dialog Screen

▲ **CAUTION**: Whenever the clock is reset and data logging is enabled the data log should be cleared.

7. Select **OK** to reset Demand Metering, Energy Metering, Drag Hands and Resettable Operation Counter or **Cancel** which will not reset these parameters.

   TapTalk will return to the Main Screen.

Utility/ Device Discovery

The **Device Discovery** menu selection can be used when the control exists on an Ethernet network. It allows the user utilizing TapTalk® to discover M-6200A/M-6280A Beckwith Electric products on the network without needing to know the individual IP Addresses of other controls. When a control is found and selected the user can send and receive DNP Configuration files and receive Access Code Log files.

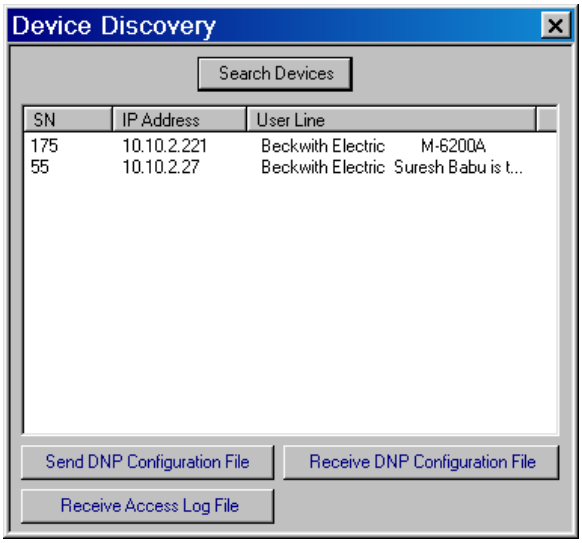


Figure 3-67 Device Discovery Dialog Screen

Utility/Multi Level Access Code

The **Multi Level Access Code** menu selection provides the user with the ability to create up to 30 unique fifteen character Access Codes (Figure 3-68). The list is created in TapTalk and downloaded to the control. Once a control has the list, the user can download a log of date and time each access code was used to access the control as well as when that access was terminated.

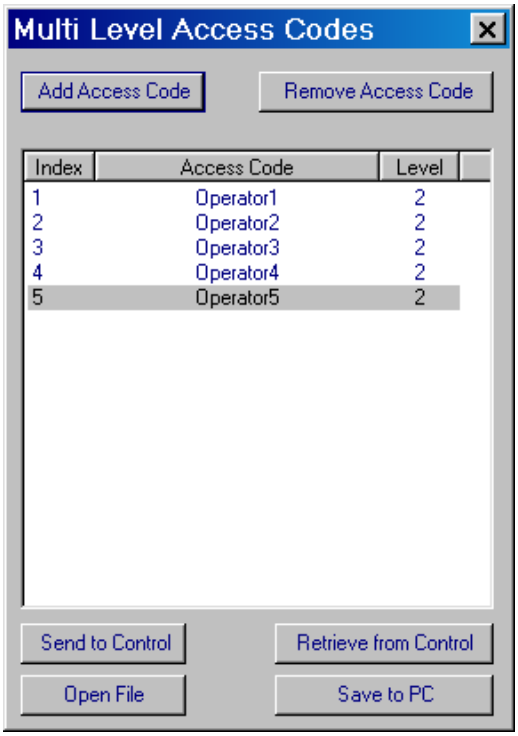


Figure 3-68 Multi Level Access Code Dialog Screen

Utility/SD Card Access Code

This feature allows the user to write a User Access Code Level 1 or 2 to a Smart Flash SD Card. When a User Access Code is present on the SD Card, when inserted, the control reads the User Access Code and does not prompt for the Access Code while the SD Card is inserted.

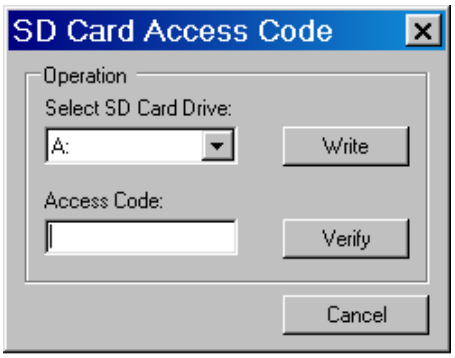


Figure 3-69 SD Card Access Code Dialog Screen

Utility/Send DNP Configuration File

■ **NOTE:** When communicating using Ethernet to a control, the DNP Configuration Utility, Send and Receive functions are not available in TapTalk® and are grayed out.

The **Send DNP Configuration File** menu selection provides the user with the capability to upload a DNP configuration file to the control. To upload a DNP configuration file proceed as follows:

1. From the TapTalk Main Screen select **Utility/Send DNP Configuration File**. TapTalk will display the Authentication Key Generated dialog screen (Figure 3-70).

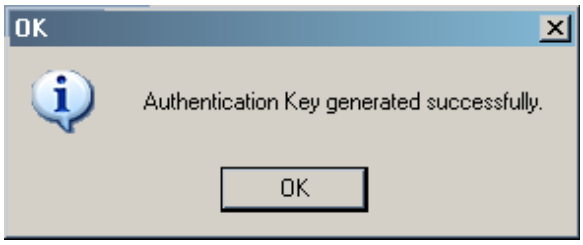


Figure 3-70 Authentication Key Generated Dialog Screen

2. Select **OK**. TapTalk will display the Open File Dialog screen (Figure 3-71) with a default *.xml file extension.

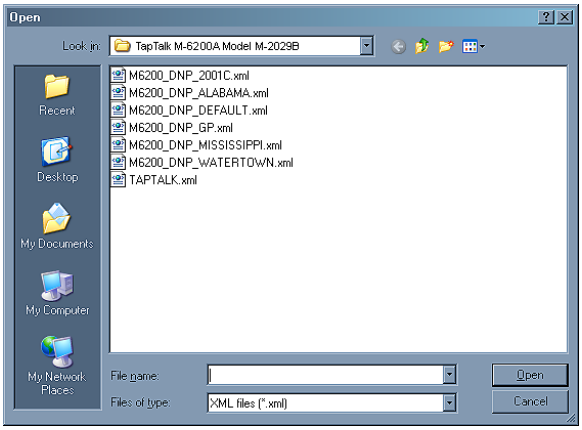


Figure 3-71 Open File Dialog Screen

3. Select the target file, then select **Open**. TapTalk will display the **Send** dialog screen Figure 3-72.

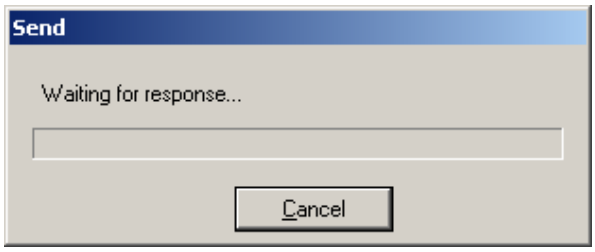


Figure 3-72 Send Dialog Screen

4. When the DNP Configuration file has been uploaded TapTalk will display a confirmation screen (Figure 3-73). Select **OK**. TapTalk will return to the Main Screen.

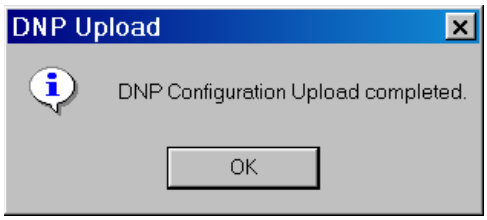


Figure 3-73 Upload Dialog Screen

Utility/Receive DNP Configuration File

■ **NOTE:** When communicating using Ethernet to a control, the DNP Configuration Utility, Send and Receive functions are not available in TapTalk® and are grayed out.

The **Receive DNP Configuration File** menu selection provides the user with the capability to download a DNP configuration file from the control. To download a DNP configuration file proceed as follows:

1. From the TapTalk Main Screen select **Utility/Receive DNP Configuration File**. TapTalk will display the Save As dialog screen (Figure 3-74) with a default *.xml file extension.

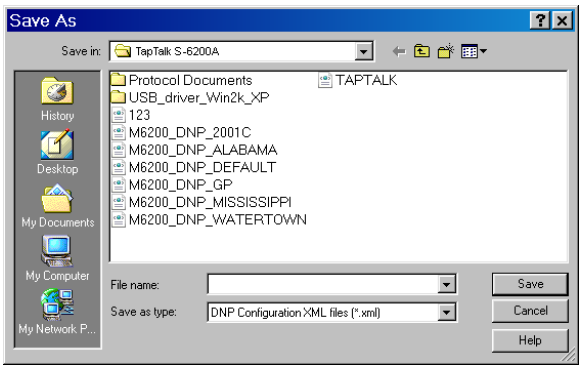


Figure 3-74 Save As File Dialog Screen

2. Select the target file or enter a valid name for the new file, then select **Save**. TapTalk will momentarily display a download status screen.
3. When the DNP Configuration file has been downloaded TapTalk will display a confirmation screen (Figure 3-75). Select **OK**. TapTalk will return to the Main Screen.

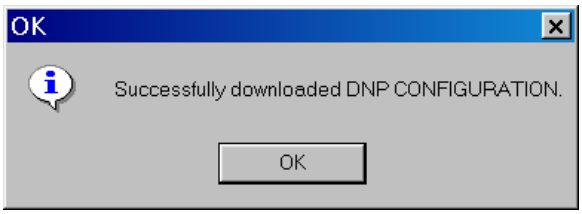


Figure 3-75 Download Complete Dialog Screen

Utility/Source Address Validation

The **Source Address Validation** feature is available from the Utility menu selection. When Source Address Validation is enabled it applies only when DNP3.0 Protocol has been selected regardless of the physical interface. If enabled the client address must match the address set by the user in the DNP Configuration file before accepting the message as a valid one.

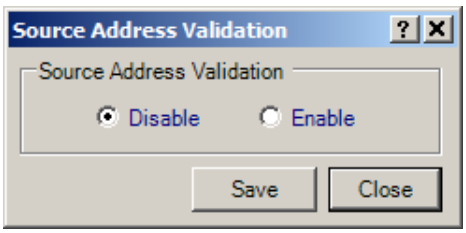


Figure 3-76 Source Address Validation Dialog Screen

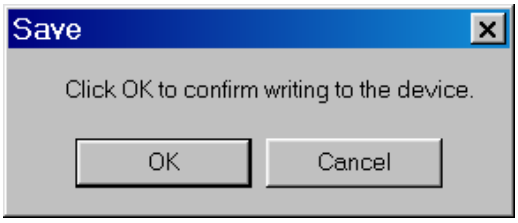


Figure 3-77 Confirm Writing to the Device Dialog Screen

Utility/DNP Configuration Editor

The **DNP Configuration Editor** menu selection opens the **M-6200A DNP Configuration Editor** dialog screen (Figure 3-78) which provides the user with the following capabilities:

- M-6200A and M-2001C default DNP configuration files (*.xml) can be loaded for editing or become the basis for new DNP configuration files.
- Selected DNP configuration files (*.xml) other than M-6200A and M-2001C default files can be loaded for editing or become the basis for new DNP configuration files.
- Binary Inputs, Analog Inputs, Binary/ Control Outputs, Analog Outputs and Counters may be added, edited or deleted. Also, DNP Security Parameters may be enabled/disabled and edited.
- Dummy positions may be added to allow SCADA table matching.
- Variations may also be edited.
- File can be saved to disk or to the connected control.
- Items in the editor can be moved, added and removed by dragging and dropping.
- Enable/Disable unsolicited response.
- Screen can be printed.
- Master Address for unsolicited responses and/or Source Address Validation.
- See Appendix C for detailed information.

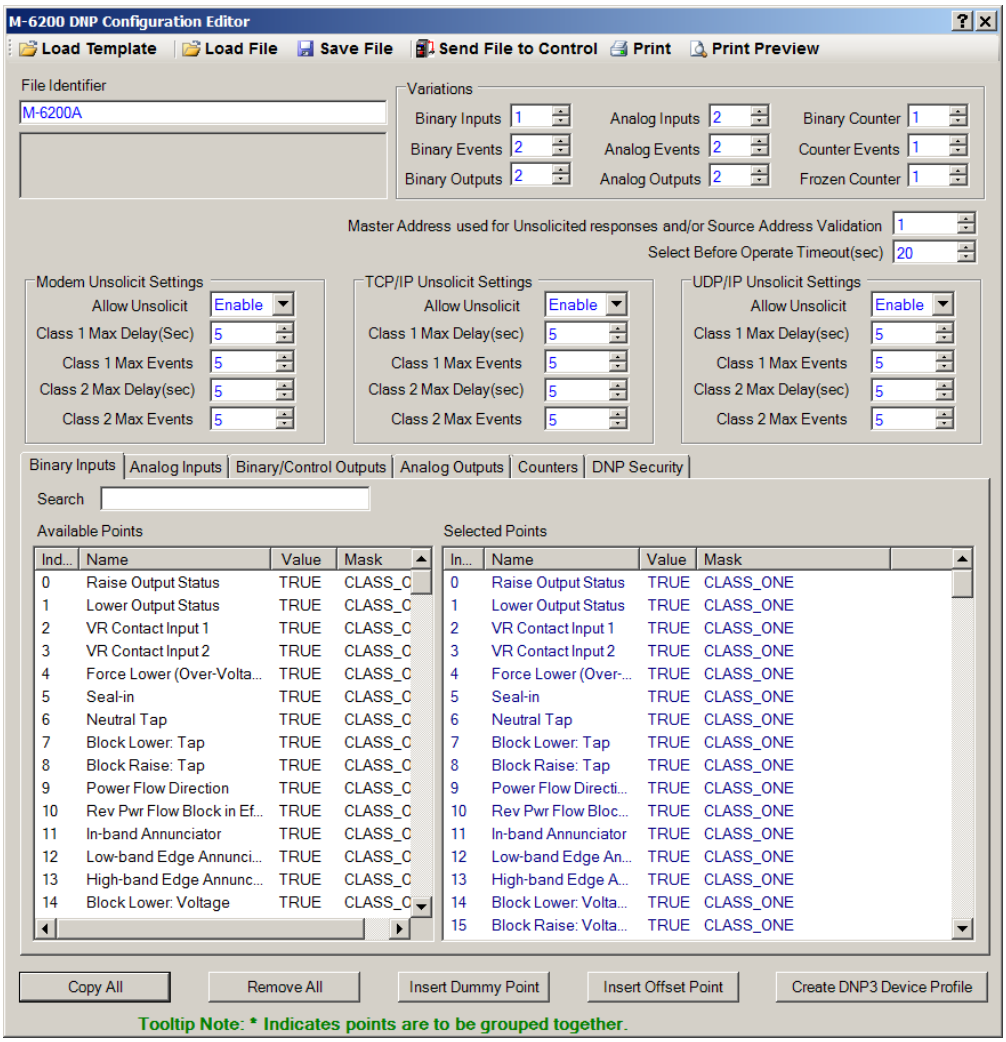


Figure 3-78 M-6200A DNP Configuration Editor Dialog Screen

Utility/Send Firmware Update

The **Send Firmware Update** feature is available from the Utility menu selection. This feature allows the user to upload firmware updates to the control. Firmware updates may be uploaded at any time, as the control settings are not affected. To send a firmware update to the control proceed as follows:

1. Remove the control from service.
2. From the TapTalk® Main Screen select **Utility/Send Firmware Update**. TapTalk will display the Open file dialog screen (Figure 3-79) with a default *.bot file extension.

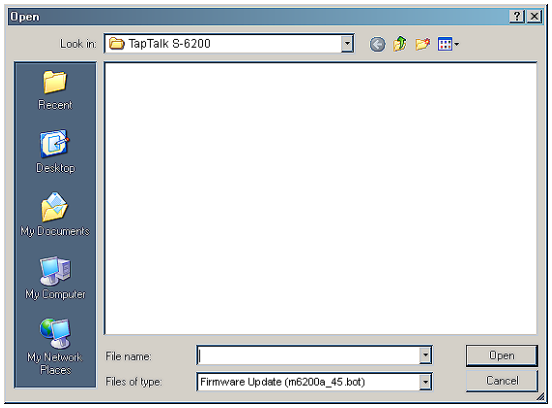


Figure 3-79 Open File Dialog Screen

3. Select the target file, then select **Open**. TapTalk will display the **Firmware Upload** dialog screen Figure 3-80.

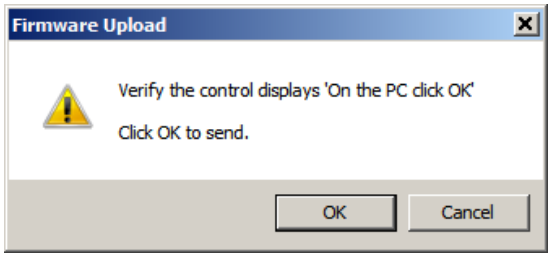


Figure 3-80 Firmware Upload Dialog Screen

The dialog screen contains instructions to verify that the control displays "On the PC click OK" the control will display the following:

```
Firmware Update
← Press ENT to begin
```

4. Press the **ENT** pushbutton, the control will display the following:

```
On the PC
Click OK
```

5. From the **Upload** dialog screen (Figure 3-80) select **OK**. TapTalk will display the Send Status Screen (Figure 3-72).

   When the file transfer has been completed TapTalk will display a Firmware Upload Confirmation screen (Figure 3-81) and close communications.

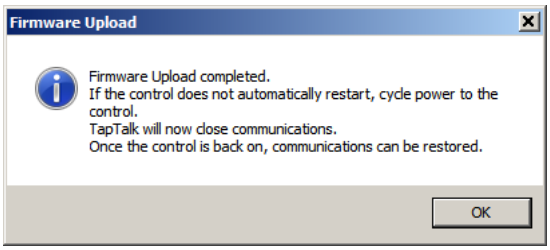


Figure 3-81 Firmware Upload Confirmation Screen

6. When the control displays the following:

```
Update Complete
Rebooting
```

   The control will reboot automatically.

7. Select **OK**. TapTalk will return to the main screen. Communication will need to be reestablished.

Utility/Convert Datalog File to CSV Format

This feature allows Datalog Files created on the M-6200A to be converted to "*.csv" format files that can be opened in any spreadsheet program.

Utility/Communication Options

This feature allows the user to enable the optional RS-232 and Ethernet ports and Bluetooth® module if equipped.

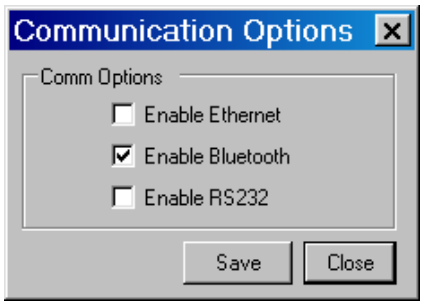
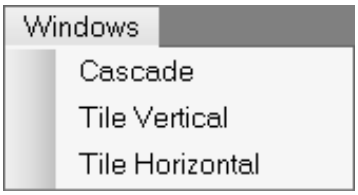


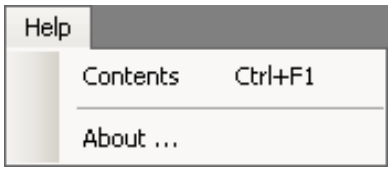
Figure 3-82 Communication Options Dialog Screen

Windows



The **Windows** toolbar item provides the **Cascade** and **Tile** display options. The **Windows** toolbar item also allows the user to select between open TapTalk® windows.

Help



The **Help** toolbar item provides the user with information about the control and the firmware version that is installed in the unit.

Help/Instruction Book

The Instruction Book menu topic has been indexed to its Table of Contents. By selecting the 'Navigator pane' in Adobe Acrobat Reader, the user can directly access selected topics.

Help/About S-6200

The **About** submenu item provides the TapTalk software version number, control firmware version, (if connected), and copyright information.

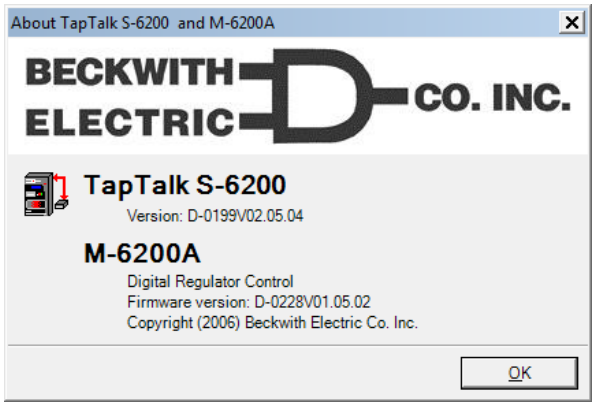


Figure 3-83 About TapTalk

3.11 TapPlot® Analysis Software

The TapPlot Analysis Software operates in conjunction with all TapTalk® Communications Software on any computer running Windows™. TapPlot allows the user to plot and print tap data (*.cfg) retrieved from Beckwith Electric M-6200A series Digital Regulator Controls.

Starting TapPlot

1. Select the TapPlot menu item from the TapTalk Menu. The TapPlot Window and Toolbar is displayed (Figure 3-84).
2. Select File->Open from the menu, and browse for the .cfg file.
3. Open the file. TapPlot should display the saved data, as shown in Figures 3-85 and 3-86.

Overview

TapPlot® is a windows based program for viewing the data that has been retrieved using the Data Logging feature of TapTalk®.

When TapPlot is started, a menu and tool bar are displayed. This section describes each TapPlot menu selection and explains each TapPlot command in the same order that they are displayed in the software program. Figure 3-84 presents the TapPlot Menu and Submenu Callouts.

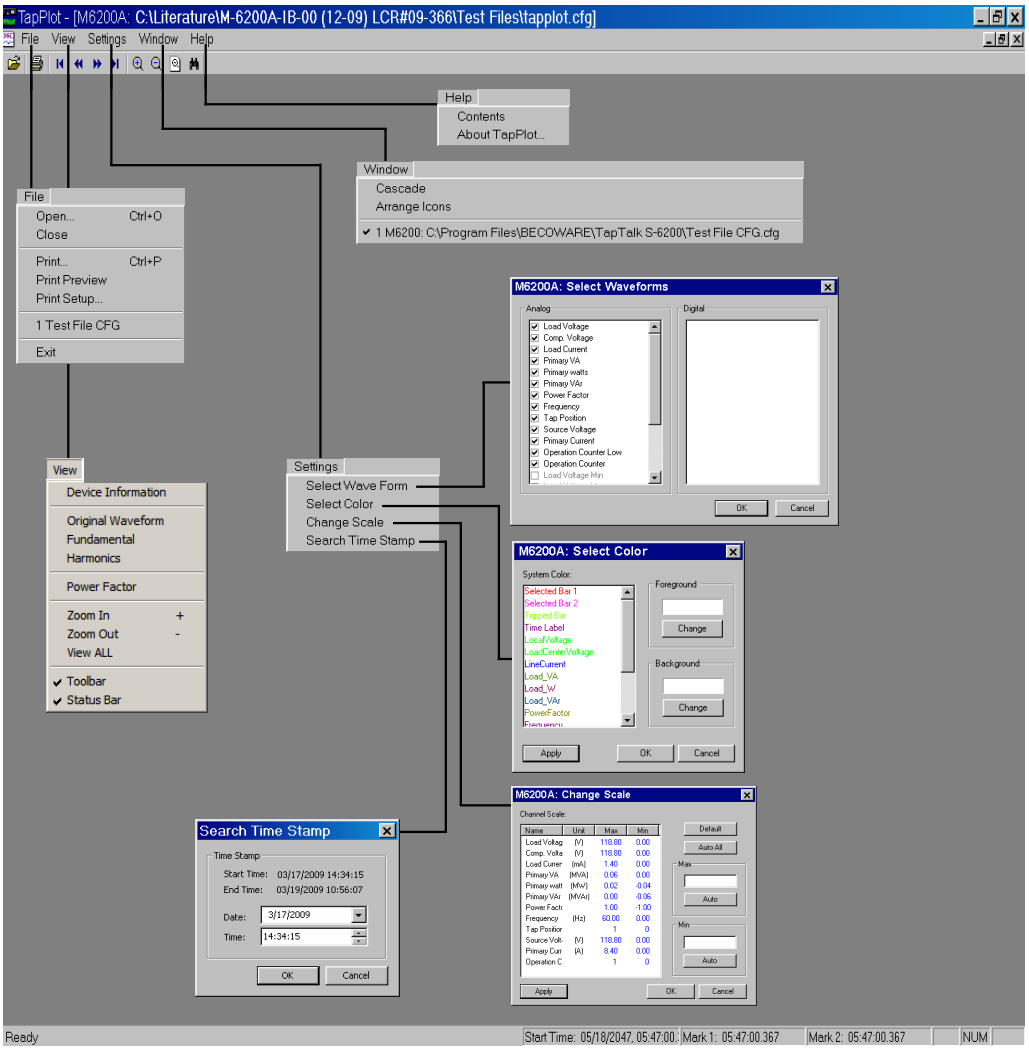


Figure 3-84 TapPlot Submenu Callouts

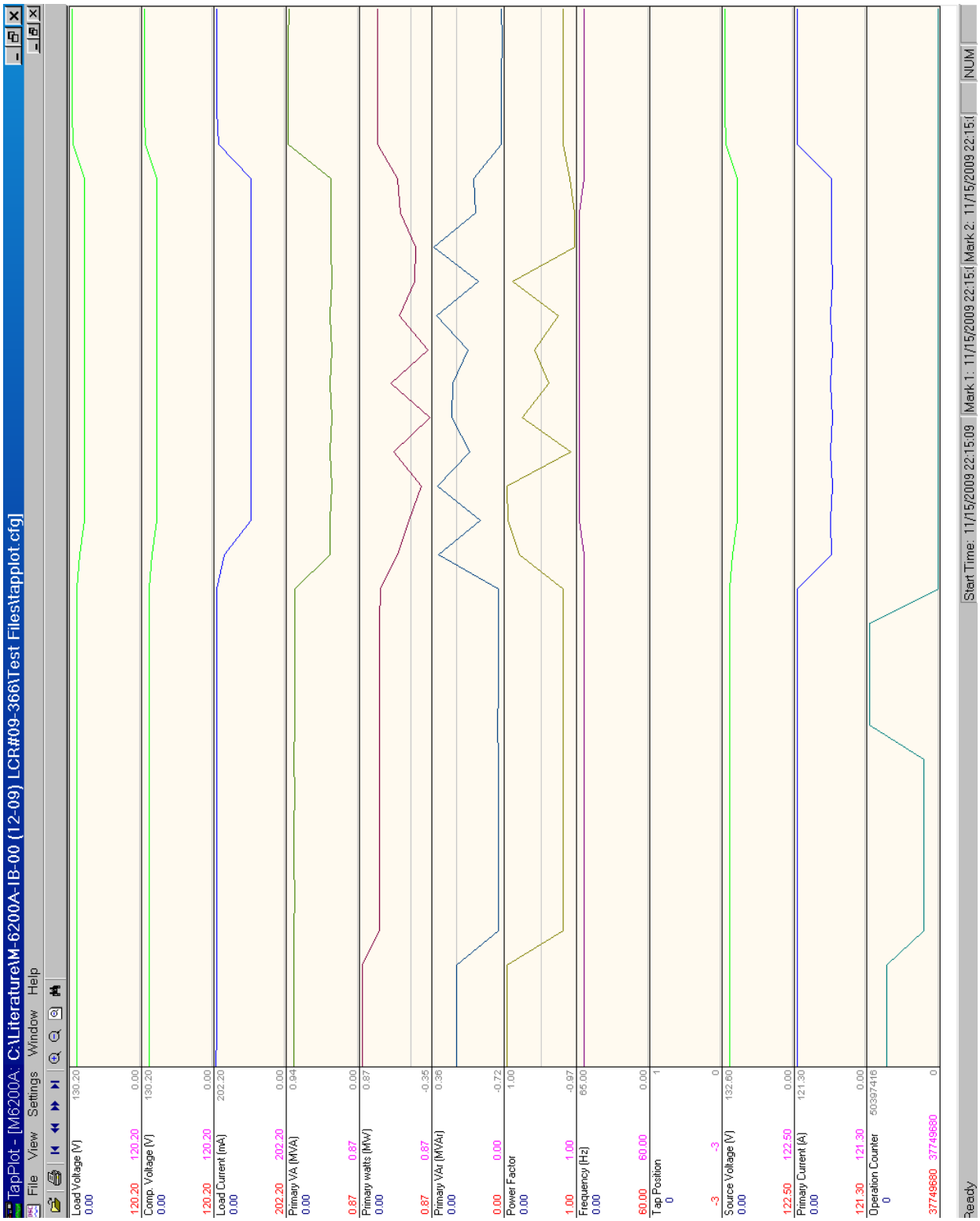


Figure 3-85 TapPlot® Window with Data Logging Data Example

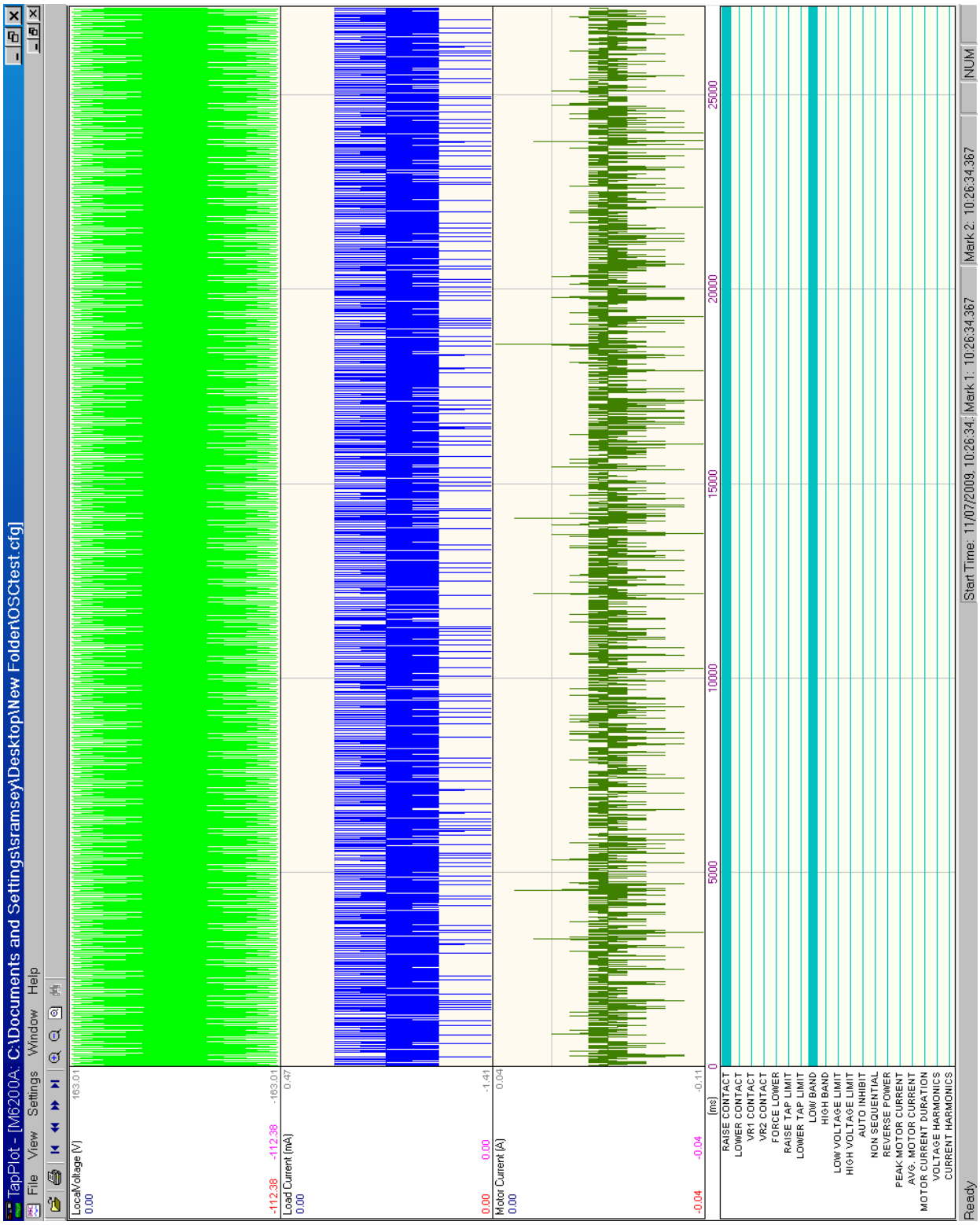


Figure 3-86 TapPlot® Window with Oscillograph Data Example

Markers

TapPlot® includes two user selectable markers. The first is positioned by double clicking on the plotted wave form data. The second is positioned by pressing and holding the **SHIFT** key and then double clicking on the plotted wave form data.

The markers can be dragged by moving the cursor over the marker until the cursor changes to a double-headed arrow ↔, then holding down the Left mouse button and dragging the marker. The first marker can also be moved an interval at a time by pressing the **LEFT** or **RIGHT** arrow key. The second marker can be moved by pressing the Shift key and the Left or Right arrow key.

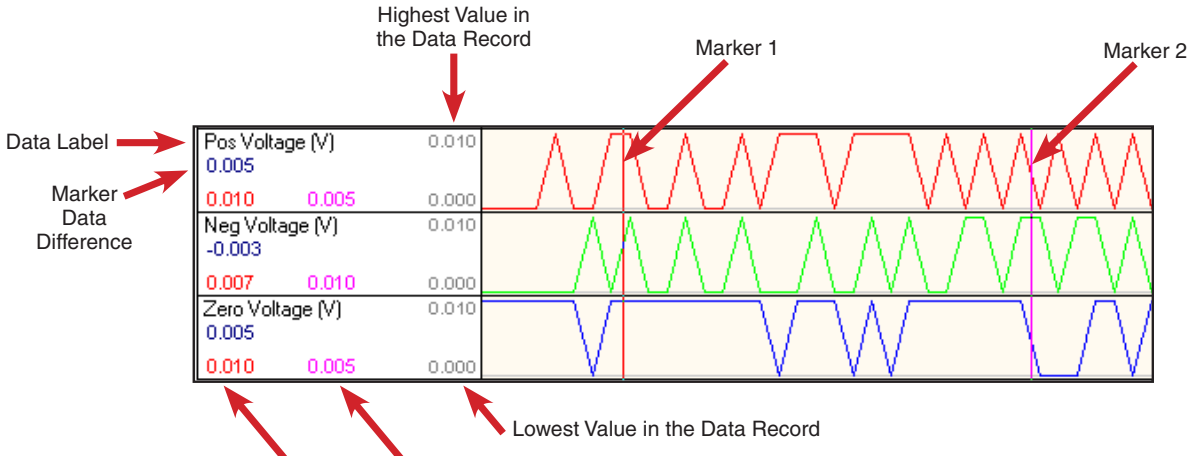


Figure 3-87 TapPlot Screen With Callouts

TapPlot Main Window – Bottom Right Data Display

Figure 3-88 TapPlot Main Screen Data Time Stamp Display

Right-Click Filter Menus

Right-Click menus are available to allow filtering of the data results. Figures 3-89 and 3-90 show the right-click menus available in either a Datalog or Oscillograph file.

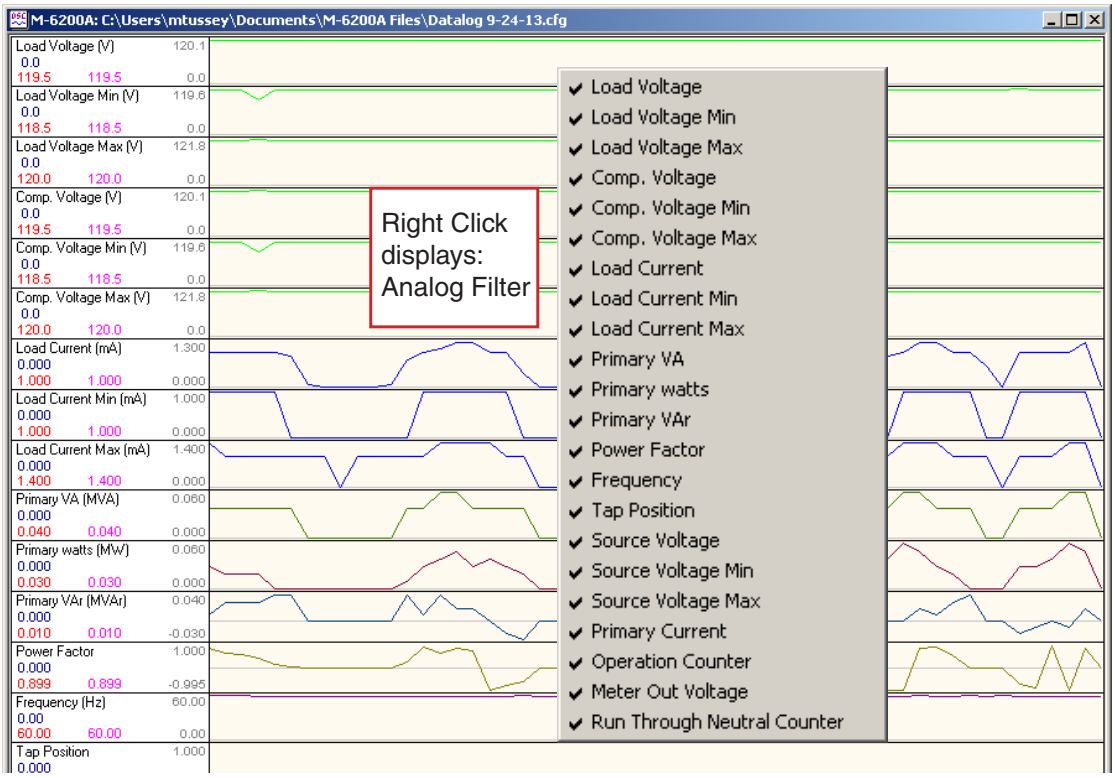


Figure 3-89 Datalog File Right-Click Filter Menu

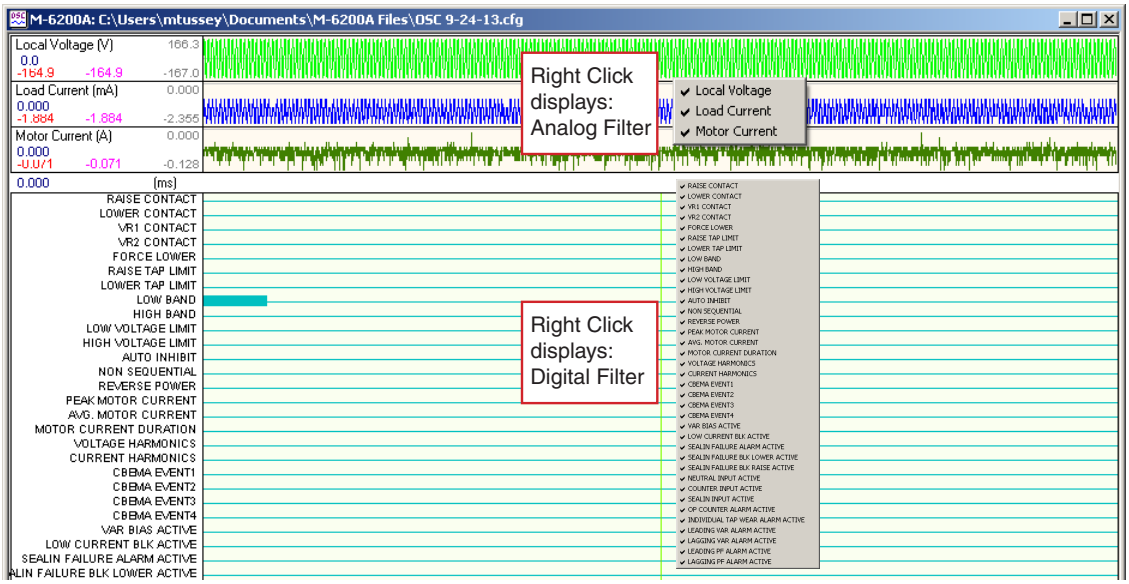
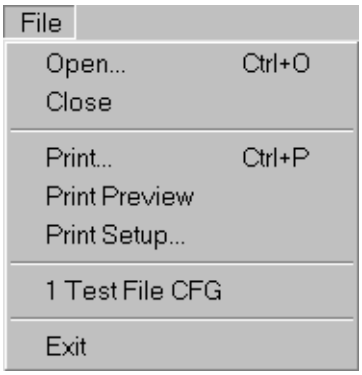


Figure 3-90 Oscillograph File Right-Click Filter Menus

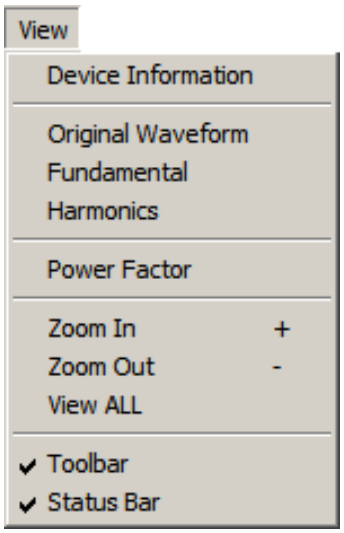
File Menu



The **File** menu allows the user to:

- Open a TapPlot® (.cfg) file previously downloaded by TapTalk®.
- Print the displayed TapPlot data.
- A Print Preview of the displayed TapPlot data.
- Select the printer and printer settings to be used.
- Select from previously viewed .cfg files (the last four files displayed).
- Exit the TapPlot program.

View Menu



The **View** menu allows the user to:

- Display the Device Information (Figure 3-91) for the corresponding TapPlot data file.
- Original Waveform
- Fundamental
- Harmonics
- Power Factor
- Zoom In, increase the resolution of the tap data displayed on the screen.
- Zoom Out, decrease the resolution of the tap data displayed on the screen.
- View ALL, returns the display to include all data within the record.
- Select which Tool Bar (Toolbar/Status Bar) is available on the display window.

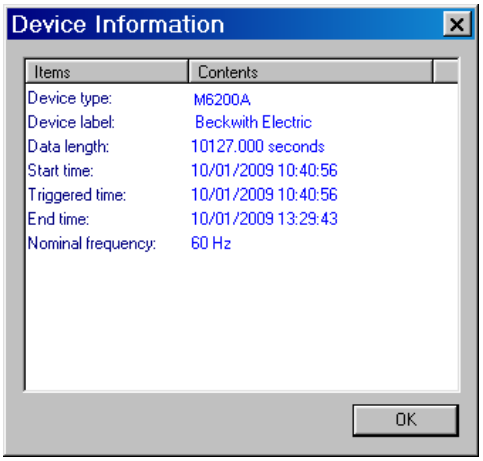
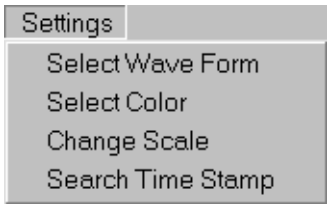


Figure 3-91 Device Information Screen

Settings Menu



The Settings menu allows the selection of the waveforms to be displayed and the format of display colors.

Select Waveform allows the selection of any of the following Tap Parameters to be plotted or printed:

- Load Voltage (V)
- Compensated Voltage (V)
- Primary Watts (W)
- Primary (VA)
- Primary (VAr)
- Load Current (A)
- Power Factor
- Frequency
- Tap Position
- Source Voltage (V)
- Primary Current (A)
- Operation Counter
- Motor Current (A)

The Waveform selections are made from the Select Waveform screen (Figure 3-92).

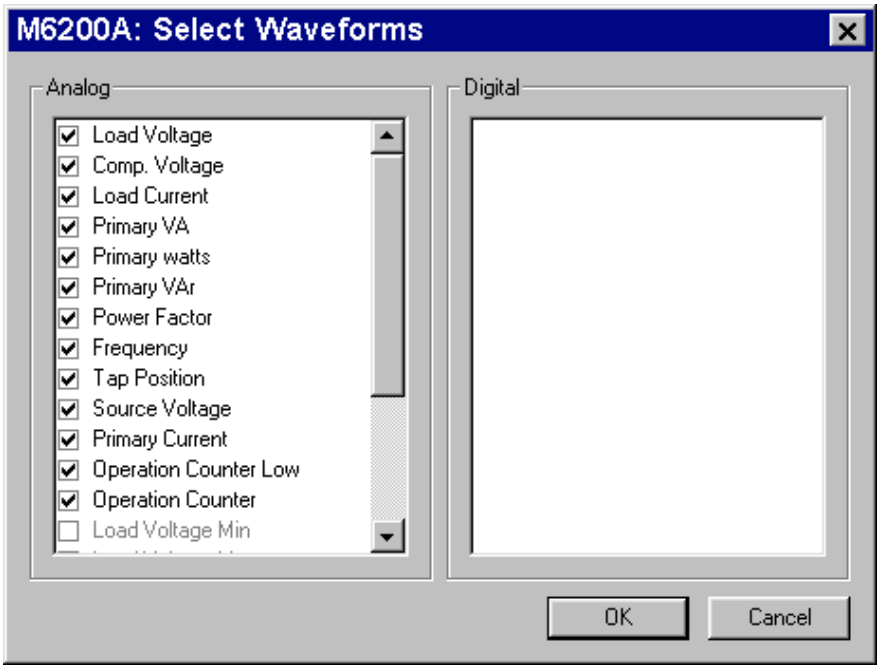


Figure 3-92 Select Waveform Dialog Screen

Select Color provides the user with the capability to change Foreground and Background display color of individual Waveform traces for customized plotting (Figure 3-93).

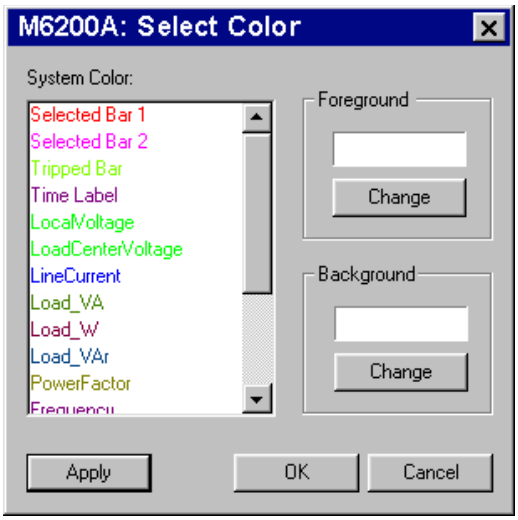


Figure 3-93 Select Color Dialog Screen

Change Scale provides the user with the capability to change the scaling of the displayed parameter (Figure 3-94).

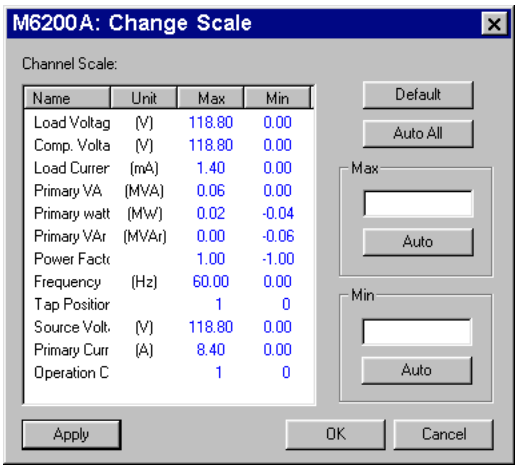


Figure 3-94 Change Scale Screen

Search Time Stamp provides the user with the capability to place the marker exactly at the desired time stamp in the TapPlot® window.

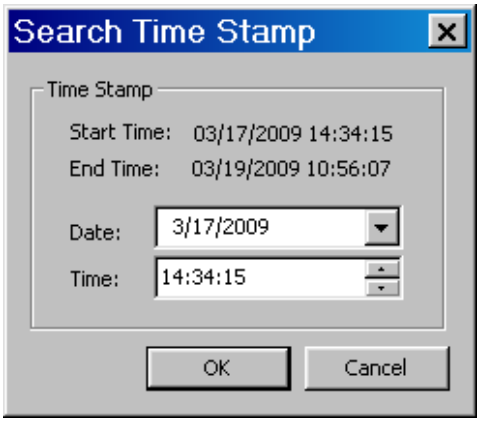


Figure 3-95 Search Time Stamp Screen

Menu/Help Menu

The **Help** menu provides access to the **Quick Guide** which provides basic information about TapPlot menus and commands. The **About** command provides version information for TapPlot.

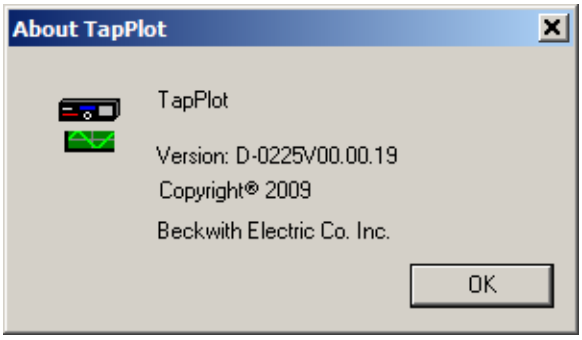


Figure 3-96 About TapPlot Screen

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4 System Setup and Configuration

4.0 Overview and Quick Index

Chapter four is designed for the person or group responsible for the Unit Setup, Configuration and System Setpoints of the M-6200A Digital Regulator Control.

Chapter 4 consists of:

- The Unit Setup, which consists of general unit setup information, Oscillograph setup, Sequence of Events setup and Communications setup.
- The Configuration Section provides the definitions of system quantities and equipment characteristics required by the control which include CT, VT configuration selection and Input and Output assignments.
- The System Setpoints Section, which describes the control settings, features, and functions.
- The Tap Changer Type Selections section, which describes the regulator vendor specific configuration settings.

The selection of the M-6200A Unit Setup, System Setup parameters, and Setpoints is performed using either the TapTalk® S-6200 Communications Software or the control Front Panel Human Machine Interface (HMI). The Tap Changer Type selection is performed using TapTalk and the selection can be viewed, but not changed in the HMI. Instructions for TapTalk and the HMI are provided where applicable.

TapTalk instructions assume that communications have been established with the control.

4.1 Unit Setup

■ **NOTE**: Appendix A includes the HMI menu structure for reference. Appendix B **Setpoint, Configuration and Communication Record Forms** is available to document control settings.

GENERAL UNIT SETUP

The General Unit setup consists of the setup of the following features and functions:

- User Access Codes
- User Lines
- System Clock
- Time and Date

USER ACCESS CODES

To prevent unauthorized access to the control functions, there are provisions in the software for assigning a Level 1 and/or Level 2 Access Code (up to six characters). A fixed factory assigned Level 3 Access Code is required for changing calibration factors. When Level 1 or Level 2 Access Codes are active, then an additional 30 Level Access Codes (up to 15 characters) can be enabled as either Level 1 or Level 2. The Access Codes can be set in the Communication/HMI Menu or from TapTalk®.

Level Access protection will be automatically reinstated when either of the following conditions are met:

- No HMI menu activity for a period of 15 minutes
- The user exits to the top of the HMI menu for a period of greater than 10 seconds

General access to read setpoints, to monitor status, to reset drag hand parameters and the resettable operations counter do not require an Access Code.

The **Level 1** Access Code, if set, is required to make setpoint changes. If the Level 1 Access Code is set to all zeros, this request for an Access Code will not be seen and changes can be made without an Access Code. The default Level 1 Access Code is 000000.

The **Level 2** Access Code, if set, is required to make changes to the configuration, communication, and utilities. If the Level 2 Access Code is set to all zeros, this request for an Access Code will not be seen and changes can be made without an Access Code. The default Level 2 Access Code is 222222.

The **Level 3** Access Code is required to make changes to calibration settings on the control. Contact Beckwith Electric Customer Service for M-6200A Level 3 Access Codes.

■ **NOTE**: Please record all user access codes in a secure location. If the user access code is lost or forgotten, please contact the factory.

Setting Level 1 or Level 2 User Access Codes From The HMI

■ **NOTE**: Level 1 and Level 2 User Access Codes are alphanumeric. The alphabetic characters are upper case only.

When changing an access code, if no key entry is made for approximately 15 minutes, and the screen goes blank, and the digit furthest to the left has not been entered, the user access code will revert to the previous one regardless of digits that have been changed. After a new Level 2 User Access Code has been entered, the new User Access Code must be used to re-enter the **Communications/ HMI** menu. *Be sure to record the new user access code for future use.*

To change User Access Codes from the HMI, perform the following:

1. Press the Right Arrow (COMM Hot Button) pushbutton to awaken the unit. The menu will advance to either "COMMUNICATION" or if a Memory Card is present in the Smart Flash SD CARD slot "Memory Card".

```
        COMMUNICATION
←CNFG                    UTIL→
```

OR

```
        Memory Card
←                          →
```

2. If the "Communication" menu is displayed, then press the Down Arrow pushbutton once. The unit will display the following:

```
        Comm Settings
←                       →
```

3. From either the "Comm Settings" or "Memory Card" menu, press the Right or Left Arrow pushbutton as necessary until "HMI" is displayed.

```
              HMI
←                       →
```

4. Press the Down arrow, as necessary, until the following will be displayed.

```
Level 1 Access Code
Pres ENT to change
```

5. Press the ENT pushbutton. If Level 2 Access is not active, or has been previously input, the following will be displayed. Go to Step 8.

```
Change Access Code
000000
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS

          _
```

■**NOTE**: When entering the Level 2 Access Code, the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Change Access Code
000000
```

   If not, re-enter a valid code.

■**NOTE**: When entering the new user access code the display will automatically advance the cursor to the next digit when input is momentarily paused.

8. Utilizing the arrow pushbuttons, enter the new Level1/Level2 User Access Code, then press the ENT pushbutton. The following will be displayed.

```
Access Code Updated
```

   As soon as new User Access Codes are entered, they will be required to change any setpoint or configuration parameter.

Setting Level 1 or Level 2 User Access Codes From TapTalk

To change User Access Codes from TapTalk®, perform the following:

1. Select **Utility/Change User Access Code** from the TapTalk toolbar. TapTalk will display the "Change User Access Code" dialog screen (Figure 4-1).
2. Input a new Level 1/Level 2 six digit alphanumeric User Access Code.
3. Input the User Access Code from Step 2, in **Confirm New User Access Code**.
4. Select **Save**. TapTalk will display a "Save to Device" confirmation screen (Figure 4-2).

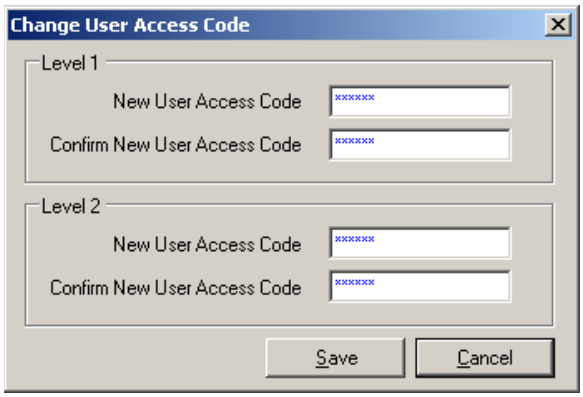


Figure 4-1 Change User Access Code Dialog Screen

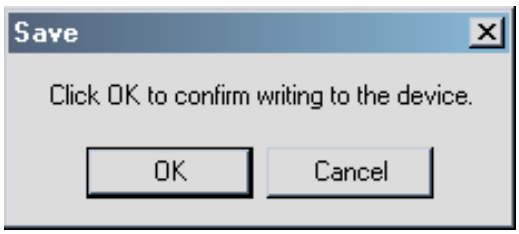


Figure 4-2 Save to Device Confirmation Screen

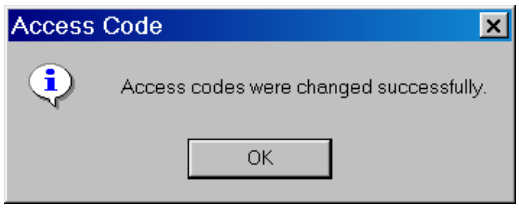


Figure 4-3 Access Codes Were Changed Successfully Dialog Screen

5. Select **OK**. TapTalk will display an "Access Codes Were Changed Successfully" confirmation screen (Figure 4-3).
6. Select **OK**. TapTalk will return to the Main Screen.

   As soon as new User Access Codes are entered, they will be required to change any setpoint or configuration parameter.

Setting Multi Level Access Codes From TapTalk

The Multi Level Access Code feature allows the user to create up to 30 unique Access Codes. Each Access Code can be up to 15 characters in length including spaces. After creating a list of Access Codes, the list can be saved to either the host computer or to the control. The Access Code file is encrypted for security measures.

1. Select **Utility/Multi Level Access Code/Send/Retrieve** from the TapTalk® toolbar. TapTalk will display the "Multi Level Access Code" dialog screen (Figure 4-4).

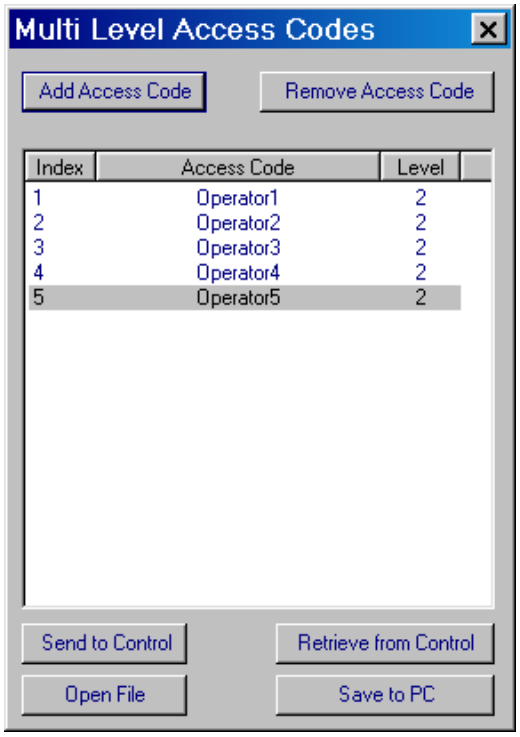
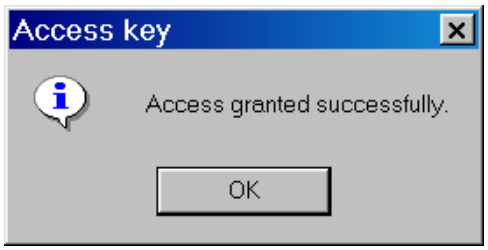


Figure 4-4 Multi Level Access Code Dialog Screen

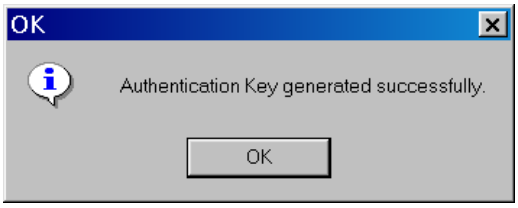
2. Select "Add Access Code". TapTalk will display the next consecutive Access Code Index with a default Level 2 access.
3. Select the desired index (left click), then double left click. TapTalk will display the Access Code entry/edit dialog box.
4. Enter/Edit the Access Code, then click off the Access Code in the dialog screen.
5. Select "Save to PC". TapTalk will display the "Save As" dialog screen with an *.xml default file extension.
6. Enter the desired file name and destination folder, then select "Save".
7. To send the Multi Level Access Code file to the control select "Send to Control". TapTalk will display the "Access Level Code" dialog screen.

8. Enter a valid Level 2 Access Code, then select **OK**.

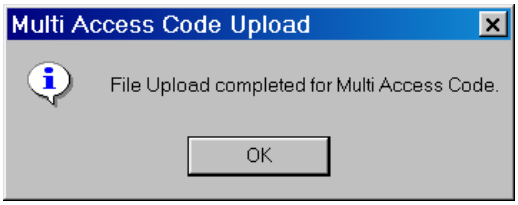
   If a valid Level 2 Access Code was entered, then TapTalk will display the "Access granted successfully" dialog screen. If not, re-enter a valid code.



9. Select **OK**, TapTalk will display the "Authentication Key generated successfully" dialog screen.



10. Select **OK**, TapTalk will display the "Open" dialog screen.
11. Select the Access Code file to be sent to the control, then select "Open". TapTalk will briefly display a status dialog screen followed by a "Multi Access Code Upload" dialog screen.



12. Select **OK**. TapTalk will return to the Multi Level Access Code dialog screen.

USER LINES

The user station identification lines (User Lines) allow the user to uniquely identify the unit. Each line of this display can have up to 20 ASCII characters. User Lines are factory preset with "Beckwith Electric" for Line 1 and "M-6200A" for Line 2.

When **ENT** is pressed at the Communications/HMI/ User Line 1 or User Line 2 menu, an underline cursor is displayed under the left-most digit. Each digit is changed by using the ⬆ and ⬇ pushbuttons to select the ASCII character (the ASCII character list begins with "!"). The ⬅ or ➡ pushbutton is used to move the underline to the next digit. When the **ENT** pushbutton is pressed, the new user line is stored into nonvolatile memory.

Setting User Lines From The HMI

To change User Lines from the HMI, perform the following:

1. Press the Right Arrow (COMM Hot Button) pushbutton to awaken the unit. The menu will advance to either "COMMUNICATION" or if a Memory Card is present in the Smart Flash SD CARD slot "Memory Card".

```
          COMMUNICATION
←CNFG                    UTIL→
```

OR

```
          Memory Card
←                          →
```

2. If the "Communication" menu is displayed, then press the Down Arrow pushbutton once. The unit will display the following:

```
          Comm Settings
←                          →
```

3. From either the "Comm Settings" or "Memory Card" menu, press the Right or Left Arrow pushbutton as necessary until "HMI" is displayed.

```
                HMI
←                          →
```

4. Press the Down arrow as necessary until the following is displayed.

```
User Line 1                E
Beckwith Electric
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
New User Line 1
Beckwith Electric
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS

          _
```

■**NOTE**: When entering the Level 2 Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and then display the following:

```
New User Line 1
Beckwith Electric
```

   If not, re-enter a valid code.

■**NOTE**: When entering the new User Line the display will automatically advance the cursor to the next digit when input is momentarily paused.

8. Utilizing the arrow pushbuttons enter the new Line 1/Line 2 user line(s), then press the ENT pushbutton. The following will be displayed.

```
User Line 1                E
Beckwith Electric
```

Setting User Lines From TapTalk

To change User Lines from TapTalk®, perform the following:

1. Select **Utility/Control Information** from the TapTalk toolbar. TapTalk will display the Control Information dialog screen (Figure 4-5).
2. Input the new Line 1/Line 2 Information.
3. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).

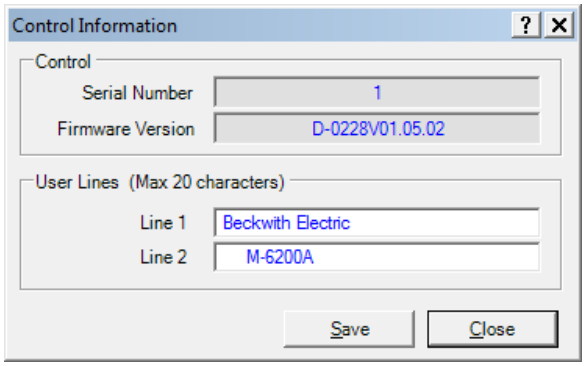


Figure 4-5 Control Information Screen

SYSTEM CLOCK

The control is equipped with a real-time, 24-hour clock which is used with the Demand History feature to record date/time stamp information on quantities saved in memory.

The power source for the clock is maintained for at least 24 hours during a system power outage by a charged capacitor (no battery). If the power outage lasts longer than 24 hours, check the clock and reset if necessary.

The system clock includes the capability to automatically switch to and from daylight savings time.

Setting Time/Date and Daylight Savings From The HMI

To set the Time and Date from the HMI, perform the following:

▲ **CAUTION**: Whenever clock is reset and data logging is enabled, the data log should be cleared.

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
        CONFIGURATION
←SETP                 COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
      Tapchanger Type
←                     →
```

3. Press the Right/Left arrow pushbuttons, as necessary, until the "System Clock" screen is displayed.

```
        System Clock
←                     →
```

4. Press the Down arrow pushbutton, as necessary, until the "Set Date and Time" dialog screen is displayed.

```
Set Date and Time
MM/DD/YY    HH:MM:SS
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Set Date and Time
MM/DD/YY  HH:MM:SS          C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS

          _
```

■**NOTE**: When entering the Level 2 Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Set Date and Time
MM/DD/YY  HH:MM:SS          C
```

   If not, re-enter a valid code.

■**NOTE**: The cursor will be positioned under the far left hand "Month" element of the date. Utilizing the Up/Down arrow pushbuttons will change the Month. Utilizing the Right/Left arrow pushbuttons will move the cursor between each element of the date and time.

8. Utilizing the arrow pushbuttons enter the desired Date and Time, then press the ENT pushbutton. The following will be displayed reflecting the Date and Time settings that were entered.

```
Set Date and Time
XX/XX/XX    XX:XX:XX
```

9. Press the Down arrow pushbutton, as necessary, until the "Daylight Savings" dialog screen is displayed.

```
Daylight Savings
disable
```

10. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 13.

```
Daylight Savings
disable                     C
```

11. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS

          _
```

12. Enter a valid Level 2 Access Code, press the ENT pushbutton.

    If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and then display the following:

```
Daylight Savings
disable                     C
```

    If not, re-enter a valid code.

13. Utilizing the Up/Down arrow pushbuttons select "ENABLE", then press the ENT pushbutton. The following will be displayed:

```
Daylight Savings
ENABLE
```

Setting Date/Time and Daylight Savings From TapTalk

To set the control Date, Time and Daylight Savings from TapTalk®, perform the following:

1. Select **Utility/Set Date & Time** from the TapTalk toolbar. TapTalk will display a Warning (Figure 4-6) regarding time stamped values. Select **OK**. TapTalk will display Figure 4-7.

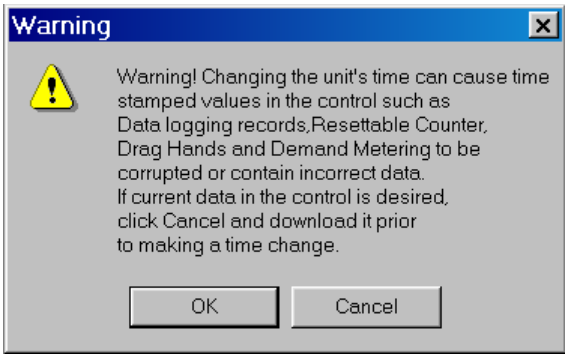


Figure 4-6 Set Date/Time Warning Dialog Screen

2. From the Set Control Date/Time dialog screen (Figure 4-7) select either "Control Clock" or "PC Clock".

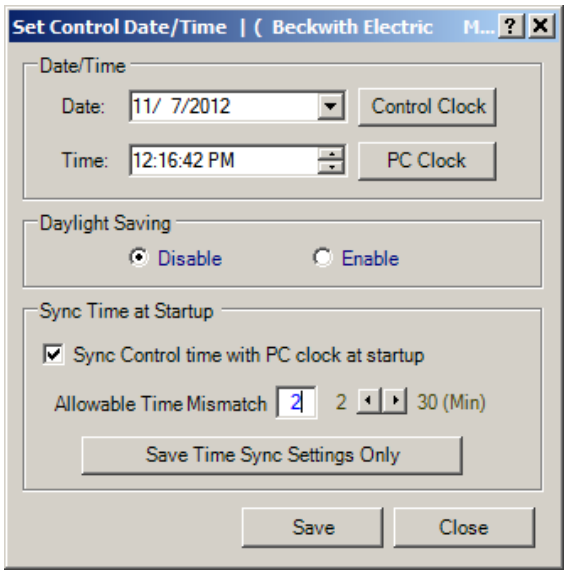


Figure 4-7 Set Control Date/Time Dialog Screen

3. Verify that the desired Daylight Saving setting is selected.
4. If desired, select "Sync Time at Startup" and the desired "Allowable Time Mismatch" value.
5. If "PC Clock" was selected and the Date/Time of the PC is the desired time to be set in the control, then select Save.
6. If "Control Clock" was selected, then input the desired Date/Time, then select Save.

   TapTalk will respond with a Reset Demand and Energy warning screen (Figure 4-8).

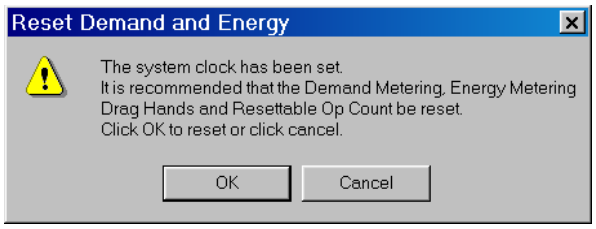


Figure 4-8 Reset Demand and Energy Warning Dialog Screen

▲ **CAUTION:** Whenever the clock is reset and data logging is enabled, the data log should be cleared.

7. Select **OK** to reset Demand Metering, Energy Metering, Drag Hands and Resettable Operation Counter or **Cancel** which will not reset these parameters.

   TapTalk will return to the Main Screen.

OSCILLOGRAPH SETUP

The Oscillograph Recorder provides comprehensive data recording (voltage, current, and status input/output signals) for all monitored waveforms (at 16, 32 or 64 samples per cycle). Oscillograph data can be downloaded using the communications ports to any Windows™ based computer running the TapTalk® S-6200 Communications Software. Once downloaded, the waveform data can be examined and printed using TapPlot® Analysis Software. The waveform data is also available in COMTRADE file format. Oscillograph records are retained if power to the control is interrupted.

The general information required to be input to complete the Oscillograph Setup includes:

- **Number of Partitions** – When untriggered, the recorder continuously records waveform data, keeping the data in a buffer memory. The recorder's memory may be partitioned into 1 to 16 partitions. Table 4-1 illustrates the number of cycles of waveform data per partition.

  When triggered, the time stamp is recorded, and the recorder continues recording for a user-defined period. The snapshot of the waveform is stored in memory for later retrieval using TapPlot Analysis Software.
- **Samples/Cycle** – The number of samples/cycle can be selected to either 16, 32 or 64 samples/cycle.
- **Post-Trigger Delay** – A post-trigger delay of 5% to 95% must be specified. After triggering, the recorder will continue to store data for the programmed portion of the total record before re-arming for the next record. For example, a setting of 80% will result in a record with 20% pretrigger data, and 80% post-trigger data.
- **Inputs and Outputs** – The recorder can be triggered remotely through serial communications using TapTalk, or automatically, using programmed status signals (Figure 4-10).

Number of Partitions	Cycles per Partition
1	1365
2	910
3	682
4	548
5	455
6	390
7	341
8	303
9	278
10	248
11	227
12	210
13	195
14	182
15	170
16	160

Table 4-1 Recorder Partitions and Cycles for 16 Samples/Cycle

Setup Oscillograph Recorder

■ **NOTE**: Communication must be established with the target control for this procedure. When not connected to the control, the Send selection does not save the Oscillograph Recorder settings to an open file.

To setup the Oscillograph Recorder, perform the following:

1. From the TapTalk® Main Screen menu, select **Setup/Oscillograph/Setup**. TapTalk will display the Oscillograph Setup dialog screen (Figure 4-10).
2. Select the **Number of Partitions**.

   The recorder's memory may be partitioned into 1 to 16 partitions. The Oscillograph Recorder memory buffer is fixed and contains room for a finite number of cycles of recorded data. Consider Table 4-1 when determining the number of Oscillograph records. The number of cycles of recorded data is directly related to the number of records selected.
3. Select the number of **Samples/Cycle.**

   The number of Samples/Cycle can be selected to either 16, 32 or 64 Samples/Cycle.
4. Select the **Post Trigger Delay**.

   A post-trigger delay of 5% to 95% must be specified. After triggering, the recorder will continue to store data for the programmed portion of the total record before re-arming for the next record. For example, a setting of 80% will result in a record with 20% pre-trigger data, and 80% post-trigger data.
5. Select the desired **Pickup Trigger(s)** and **Dropout Trigger(s)** (Figure 4-10).

   The recorder can be triggered remotely through serial communications using TapTalk, or automatically, using programmed status inputs or outputs.
6. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
7. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

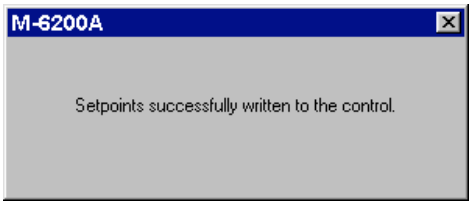


Figure 4-9 Setpoints Successfully Written To The Control Dialog Screen

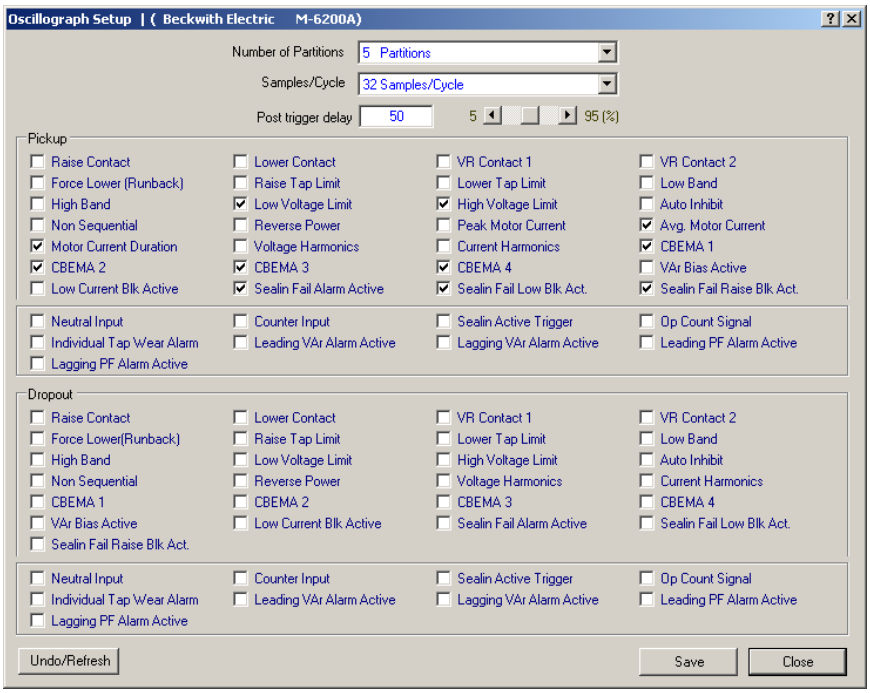


Figure 4-10 Oscillograph Setup Dialog Screen

SEQUENCE OF EVENTS RECORDER

The Sequence of Events recorder provides comprehensive time tagged data recording of the following parameters:

- Time Tag
- Local Voltage
- Source Voltage
- Frequency
- Tap Position
- Motor Current
- Load Current
- Resettable Operation Counter
- RMS Voltage
- Meter Out Voltage
- RTN Success Counter
- Voltage Harmonics Values 2-31
- Current Harmonics Values 2-31
- Voltage Harmonics Status 2-31
- Current Harmonics Status 2-31

The total number of events that can be recorded is 129. Sequence of Events data can be downloaded using the communications ports to any Windows™ based computer running the S-6200 TapTalk® Communications Software. The Sequence of Events Recorder can be triggered by the status change of any of the signals in Table 4-2 or manually by the user from TapTalk.

Sequence of Events Recorder Triggers	State
Raise Command	Initiated
Lower Command	Initiated
VR Contact 1	True
VR Contact 2	True
Force Lower (Runback)	Initiated
Raise Tap Limit	True
Lower Tap Limit	True
Low Band	Exceeded
High Band	Exceeded
Low Voltage Limit	True
High Voltage Limit	True
Auto Inhibit	True
Non-Sequential	Active
Reverse Power	Detected
Peak Motor Current	Exceeded
Average Motor Current	Exceeded
Motor Current Duration	Exceeded
Voltage Harmonics	Exceeded
Current Harmonics	Exceeded
CBEMA Event 1	True
CBEMA Event 2	True
CBEMA Event 3	True
CBEMA Event 4	True
VAr Bias	Active
Low Current Block	Active
Seal-in Failure Alarm	Active
Seal-in Failure Raise Block	Active
Seal-in Failure Lower Block	Active
Neutral Input	Detected
Counter Input	Detected
Seal-in Active Trigger	Active
Op Count Signal	Exceeded
Individual Tap Wear Alarm	Active
HMI Active	True
Leading VAr Alarm	Active
Lagging VAr Alarm	Active
Leading Power Factor Alarm	Active
Lagging Power Factor Alarm	Active

Table 4-2 Sequence of Events Recorder Triggers

Event Logic

Combinations of the trigger signals in Table 4-2 can be AND'ed and OR'ed to produce the desired trigger logic. Figure 4-11 illustrates the trigger logic that can be applied.

The first level of the Event Logic consists of an "AND" gate and an "OR" gate which uses the trigger parameters in Table 4-2 as inputs. The output of the "AND" and "OR" gates are passed to a logic gate that is user selectable as either an "AND" or "OR" gate. When the logic is true, it triggers the Sequence of Events Recorder.

The event will be recorded in volatile SDRAM and transferred to non-volatile flash memory every four cycles. There is a possibility that events can be lost in cases where the control loses power in the middle of a storage cycle.

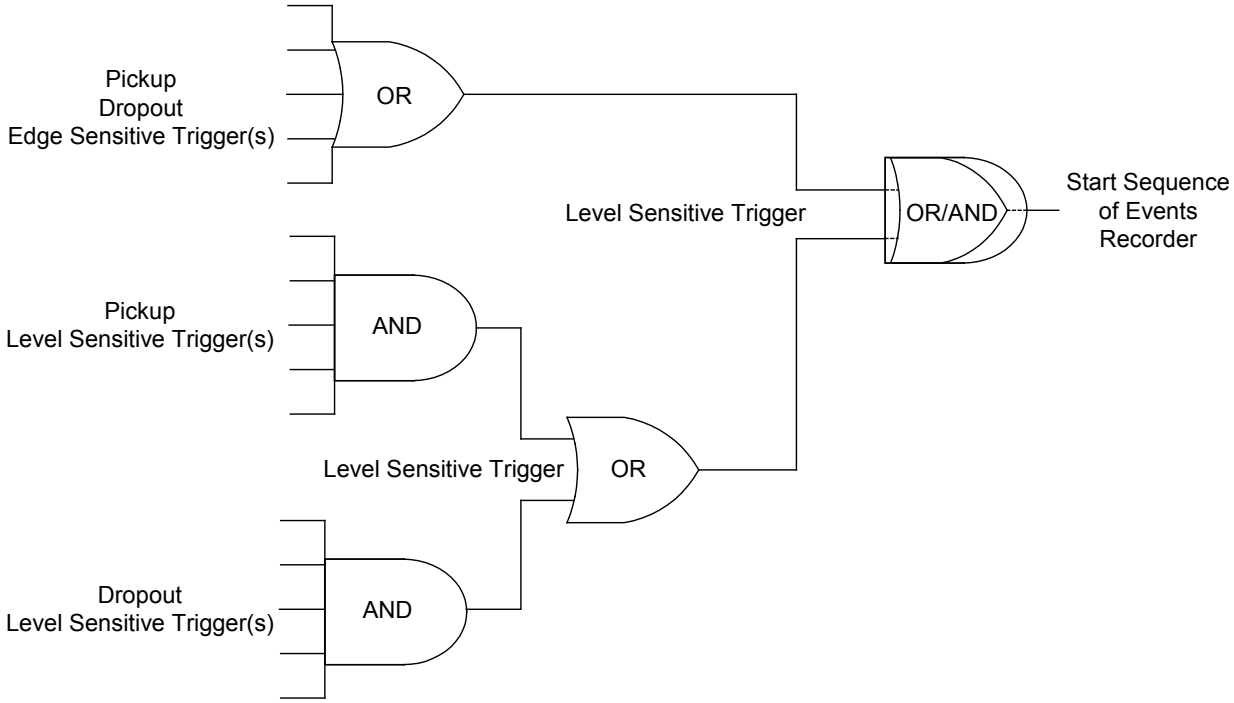


Figure 4-11 Sequence Of Events Recorder Trigger Logic

Setup Sequence of Events Recorder

Pickup or Dropout for each trigger parameter may be selected to trigger the Sequence of Events Recorder.

■ **NOTE**: Communication must be established with the target control for this procedure. When not connected to the control, the Save selection does not save the Sequence of Event settings to the open file.

To setup the Sequence of Events Recorder, perform the following:

1. From the TapTalk Main Screen menu select **Setup/Sequence of Events/Setup**. TapTalk will display the Sequence of Events Setup dialog screen (Figure 4-12).
2. If an "OR" type trigger logic is desired, then select "Pickup Dropout Edge Sensitive" in Figure 4-12. TapTalk will display the "OR gate setup" dialog screen (Figure 4-13).

   Select the desired "OR gate setup", Pickup and/or Dropout trigger parameters, and then select **OK**. TapTalk will return to the Sequence of Events setup dialog screen.
3. If an "AND" type trigger logic is desired, then select the AND "Pickup" or "Dropout" in Figure 4-13. TapTalk will display the "AND gate setup" dialog screen (Figures 4-14 and 4-15).

   Select the desired "AND gate setup" Pickup and/or Dropout trigger parameters, then select **OK**. TapTalk will return to the Sequence of Events setup dialog screen.
4. Select the desired logic gate OR/AND for the "OR" and "AND" gates, then select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
5. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

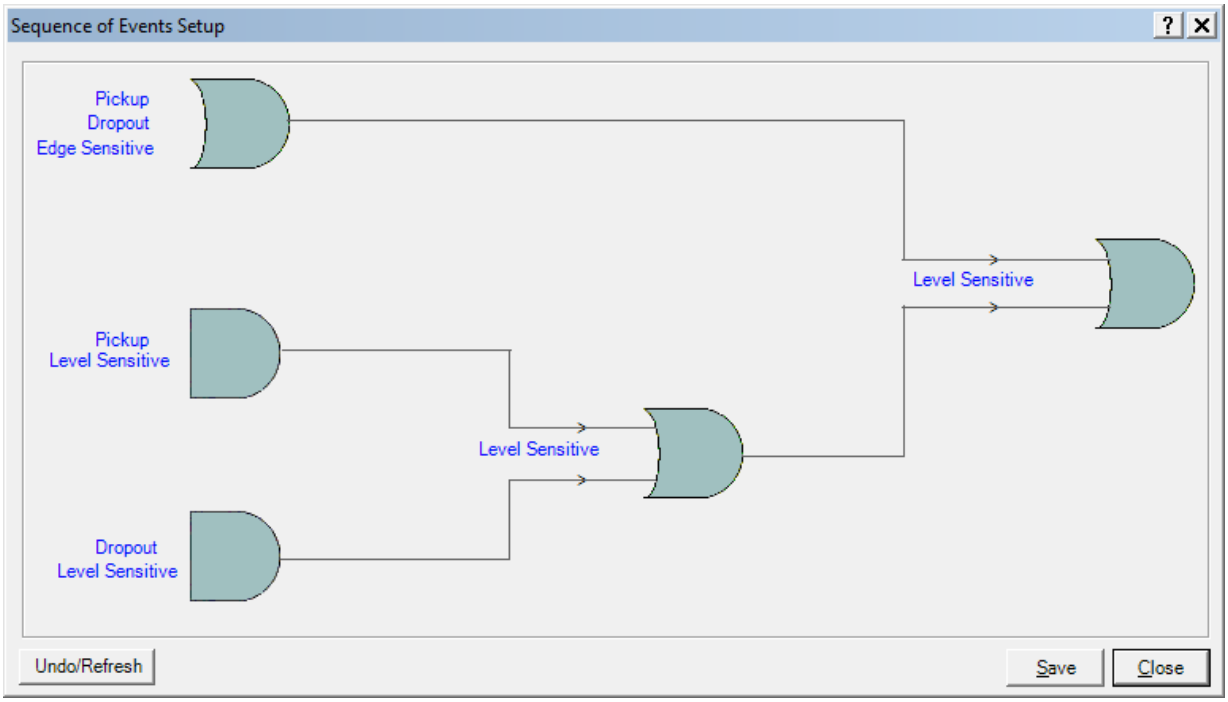


Figure 4-12 Sequence of Events Setup Dialog Screen

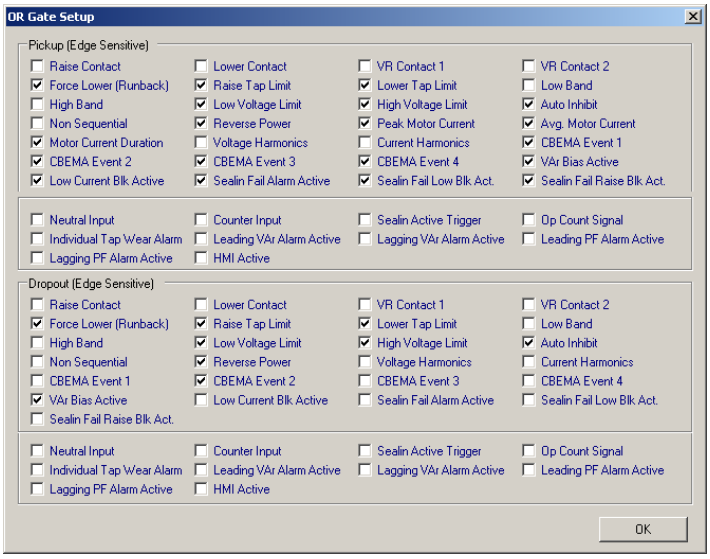


Figure 4-13 Sequence of Events Pickup/Dropout Edge Sensitive OR Gate Setup Dialog Screen

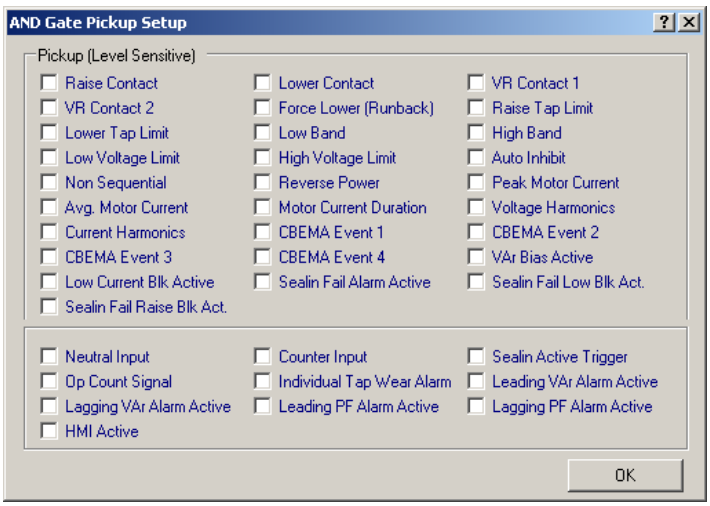


Figure 4-14 Sequence of Events Pickup Level Sensitive AND Gate Pickup Setup Dialog Screen

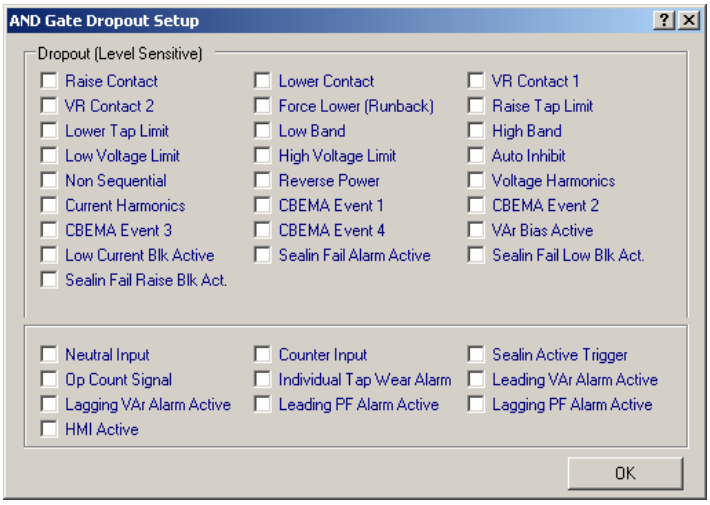


Figure 4-15 Sequence of Events Dropout Level Sensitive AND Gate Dropout Setup Dialog Screen

WAKEUP SCREENS

If the "EXIT/WAKE" pushbutton is selected, then control will respond as follows:

- Pressing "EXIT/WAKE" when User Lines are being displayed will initiate a cycling display of the selected Wakeup parameters for a period of 15 minutes and then return to the User Lines display.
- If no Wakeup screens are selected, then nothing will be displayed and the User Lines will blink for a moment.

■ **NOTE:** The Front Panel Drag Hand Reset only resets the Tap position Drag Hands.

- While cycling is in effect, when ENT is pressed on any demand metering value ("E" displayed on screen), all demand metering Drag Hand parameters will be reset. This is also true for all metering Drag Hand values when ENT is pressed on an energy metering menu.
- The Wakeup stepped display can be stopped on the displayed parameter by pressing EXIT. Press EXIT again to terminate the stepped parameter display and return to the User Lines.

  The Wakeup screen values can be browsed by utilizing the Up and Down arrow pushbuttons. In this mode, if the ENT pushbutton is pressed while on a demand or energy metering value, it will only reset that individual Drag Hand value.
- The Wake screen cycles at a 3 second interval between parameters. While the wake screen menu is cycling, if a parameter is missed while recording, press the up arrow to display it again. This displays the previous parameter and then continues cycling to the next parameter 3 seconds later. Pressing ENT stops the cycling and allows the user to utilize the Up and Down Arrows to view the Wake screen parameters at a user defined pace.
- When there is a Smart Flash SD Card present while in the Wakeup screen menu, an additional Smart Flash SD Card menu item will be present. All Wakeup screen parameters can be saved to the Smart Flash SD Card in *.csv format.

Selecting Wakeup Screen Parameters

To select the wakeup screen parameters perform the following:

1. Select **Setup/Wakeup Screen Menu Setup** from the TapTalk toolbar. TapTalk will display the "Wakeup Screen Menu Setup" dialog screen (Figure 4-16).

■ **NOTE:** The order in which parameters are being displayed can be changed by dragging and dropping items in the active metering window.

2. Select the Wakeup Screen parameters to be displayed by moving, (dragging and dropping), each parameter from the "Disable Metering Items" to the "Active Metering Items" list.
3. Select the Wakeup Screen parameters that are not to be displayed by moving (dragging and dropping) those parameter from the "Active Metering Items" list to the "Disable Metering Items" list.
4. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
5. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

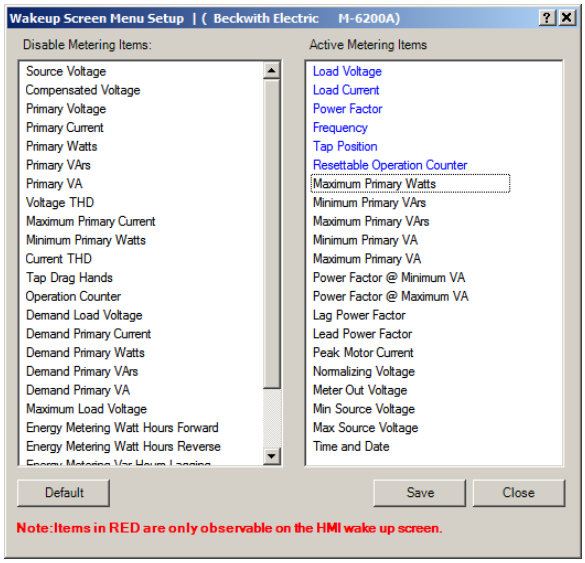


Figure 4-16 Wakeup Screen Menu Setup Dialog Screen

COMMUNICATION

The communication ports provide access to all features, including metering, software updates, and programming of all functions. This is accomplished using a connection from any Windows™ based computer running the TapTalk® S-6200 Communications Software or SCADA communications software.

Using a PC, the operator has real-time, remote access to all functions of the Digital Regulator Control. The control can act as the monitoring point for all voltage, current, and related power quantities. This simplifies operation while avoiding transducers and multiple Remote Terminal Unit (RTU) analog inputs. The protocols implement half-duplex, two-way communications. This allows all functions, which would otherwise require the presence of an operator at the control, to be performed remotely.

Communication capabilities include:

- Interrogation and modification of setpoints
- Broadcast of commands, such as tapchange inhibit and voltage reduction (up to three steps) to networked controls
- Recognition of alarm conditions, such as voltage extremes and excessive load
- Selective control of raise and lower tapchange operations
- Re-configuration of the control, such as a change to the demand integration time period or a selection of different alarm parameters

TapTalk provides the means to enable or disable installed RS-232, Ethernet communication ports, and Bluetooth® modules. This capability is provided by a communication options utility under the Utility menu. Prompts to enable communication hardware are also contained in the individual port setup menus.

Direct Connections

TapTalk® supports direct communication (MODBUS protocol) with a Beckwith Electric Digital Regulator Control using the applicable connector (USB cable) for the PC, Fiber Optic communication using ST standard, two-wire RS-485 or RS-232.

Protocols

The standard protocols included in the M-6200A are DNP3.0 and MODBUS®. The USB port uses MODBUS for local communications. The optional Ethernet Port supports DNP over TCP/IP and UDP, and MODBUS over TCP/IP protocols simultaneously. The user must select the protocol that is to be used with the M-6200A Regulator Control's RS485/Fiber Optic Port.

Detailed descriptions of the data points used for the standard protocols are available from Beckwith Electric upon request, and are available for download from our website, www.beckwithelectric.com. For information regarding Communication Port connections, please see Section 5.2, External Connections.

Communication Access Security and Timeout

When Communication Access Security and Timeout is enabled it applies only when MODBUS has been selected regardless of the physical interface. If enabled the user Level Access Code must match either the Level 1 or Level 2 Access Codes in order to be granted the access to control settings ascribed to each Level. See "User Access Codes" earlier in this chapter for detailed information. If an invalid Access Level Code is entered at the connection prompt, then read only access will be granted. TapTalk must be closed for the timeout period specified (1 to 50,000 seconds) in order for any Access Code changes to take effect when this feature is enabled.

Enabling Communication Access Security and Timeout From The HMI

1. Ensure the control is energized.

■**NOTE**: If password protection has been implemented on the control, then a valid Level 2 Access Code is required to be entered to enable Communication Access Security and set the Timeout.

2. Press the Right Arrow (COMM Hot Button) pushbutton to awaken the unit. The menu will advance to either "COMMUNICATION" or if a Memory Card is present in the Smart Flash SD CARD slot "Memory Card".

```
        COMMUNICATION
←CNFG                 UTIL→
```

OR

```
        Memory Card
←                         →
```

3. If the "Communication" menu is displayed, then press the Down Arrow pushbutton once. The unit will display the following:

```
        Comm Settings
←                         →
```

4. If Memory Card is displayed, then press the Right or Left arrow pushbutton, as necessary, until "Comm Settings" is displayed.

```
        Comm Settings
←                         →
```

5. Press the Down arrow pushbutton, as necessary, until the "Comm Access Security" menu item is displayed.

```
Comm Access security
disable
```

6. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 9.

```
Comm Access security
disable                    C
```

7. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
          _
```

■**NOTE**: When entering the Level 2 Access code the display will automatically advance the cursor to the next digit when input is momentarily paused.

8. Enter a valid Level 2 Access code, then press the ENT pushbutton.

   If a valid Level 2 Access code was entered, the display will briefly flash a confirmation screen, and then display the following:

```
Comm Access security
disable                    C
```

   If not, re-enter a valid code.

9. Utilizing the Up/Down arrow pushbuttons select "ENABLE", then press the ENT pushbutton. The desired Communication Access Security mode will be displayed.

```
Comm Access security
ENABLE or disable
```

10. Press the Down arrow pushbutton, as necessary, until the "Comm Access Timeout" menu item is displayed.

```
Comm Access timeout
   60 Sec
```

11. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 9.

```
Comm Access timeout
   60 Sec                    C
```

12. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS

            _
```

■**NOTE**: When entering the Level 2 Access code the display will automatically advance the cursor to the next digit when input is momentarily paused.

13. Enter a valid Level 2 Access code, then press the ENT pushbutton.

    If a valid Level 2 Access code was entered, the display will briefly flash a confirmation screen, and then display the following:

```
Comm Access timeout
   60 Sec                    C
```

    If not, re-enter a valid code.

14. Utilizing the arrow pushbuttons enter the desired Comm Access timeout value, then press the ENT pushbutton. The desired Comm Access timeout value will be displayed.

```
Comm Access timeout
   XX Sec
```

Enabling Communication Access Security and Setting Timeout From TapTalk

To setup Communication Access Security from TapTalk®, proceed as follows:

1. Select **Communication/Setup/ Communication Access Security** from the TapTalk toolbar. TapTalk will display the "Communication Access Security" dialog screen (Figure 4-17).
2. Select **"ENABLE"**, then enter the desired Communication Access Timeout value from 1 to 50,000 seconds.
3. Select "Save". TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

Figure 4-17 Communication Access Security Setup Dialog Screen

Source Address Validation

When Source Address Validation is enabled it applies only when DNP3.0 Protocol has been selected regardless of the physical interface. If enabled the client address must match the address set by the user in the DNP Configuration file before accepting the message as a valid one.

Enabling Source Address Validation From The HMI

1. Ensure the control is energized.

■**NOTE**: If password protection has been implemented on the control, then a valid Level 2 Access Code is required to be entered to enable Source Address Validation.

2. Press the Right Arrow (COMM Hot Button) pushbutton to awaken the unit. The menu will advance to either "COMMUNICATION" or if a Memory Card is present in the Smart Flash SD CARD slot "Memory Card".

```
          COMMUNICATION
←CNFG                    UTIL→
```

OR

```
          Memory Card
←                          →
```

3. If the "Communication" menu is displayed, then press the Down Arrow pushbutton once. The unit will display the following:

```
          Comm Settings
←                          →
```

4. If Memory Card is displayed, then press the Right or Left arrow pushbutton, as necessary, until "Comm Settings" is displayed.

```
          Comm Settings
←                          →
```

5. Press the Down arrow pushbutton, as necessary, until the "Source Address Validation" menu item is displayed.

```
Src Addr Validation
disable
```

6. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 9.

```
Src Addr Validation
disable                      C
```

7. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
          _
```

■**NOTE**: When entering the Level 2 Access code the display will automatically advance the cursor to the next digit when input is momentarily paused.

8. Enter a valid Level 2 Access code, then press the ENT pushbutton.

   If a valid Level 2 Access code was entered, the display will briefly flash a confirmation screen, and then display the following:

```
Src Addr Validation
disable                      C
```

   If not, re-enter a valid code.

9. Utilizing the Up/Down arrow pushbuttons select "ENABLE", then press the ENT pushbutton. The desired Source Address Validation mode will be displayed.

```
Src Addr Validation
ENABLE or disable
```

Enabling Source Address Validation From TapTalk

To setup Source Address Validation from TapTalk®, proceed as follows:

1. Select **Utility/Source Address Validation** from the TapTalk toolbar. TapTalk will display the "Source Validation" dialog screen (Figure 4-18).
2. Select **"ENABLE"**, then select "Save". TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

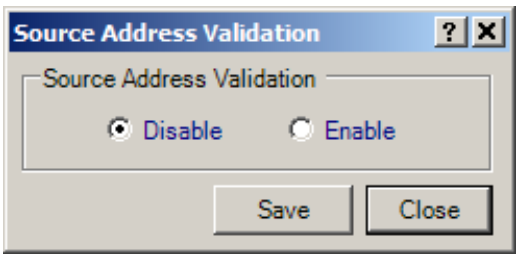


Figure 4-18 Source Address Validation Dialog Screen

Feeder and/or Substation Addressing

Each control has three addresses.

1. Communications address
2. Feeder address
3. Substation address

Any valid DNP command (Figure 4-19) can be used to communicate with individual controls using the **Communications** address. To address a group of controls using the **Feeder** and/or the **Substation** addresses, a DNP command with no acknowledgment shall be used. For example Direct Operate with NO acknowledgment (FC 06). If a command with acknowledgment is sent by the Client, the control will accept the command but will not reply with an acknowledgment.

All addresses range from 0 to 0xFFEF. For feeder and substation addresses, setting the value to zero effectively **Disables** the corresponding address. It is important that there are no duplicate addresses on any device on the network.

In the system depicted in Figure 4-19, there are three substations: S1, S2, and S3. There are a total of 9 feeders, F1-F9, grouped as shown. Each feeder has 3 controls, one for each phase. Each control will have 3 addresses assigned to it.

For example: control D1 on Feeder F4 in substation S2 will have the following.

1. Individual not duplicated device address (0x212)
2. Feeder address = 0x4003
3. Substation address = 0x5001

In order to poll D1 on an individual basis address, 0x212 is used.

To invoke for example, voltage reduction individually on D1, use direct operate with or without acknowledge for address 0x212 on the appropriate point.

To invoke voltage reduction on Feeder F4, use direct operate without acknowledge to address 0x4003 instead of 3 different commands sent to D1, D2 and D3 individually.

Similarly, invoking voltage reduction on an entire substation requires a direct operate command without acknowledge to be sent to that substation address e.g. substation S2 (address 0x5001).

■ **NOTE**: The same concept applies to network configuration (Figure 4-20).

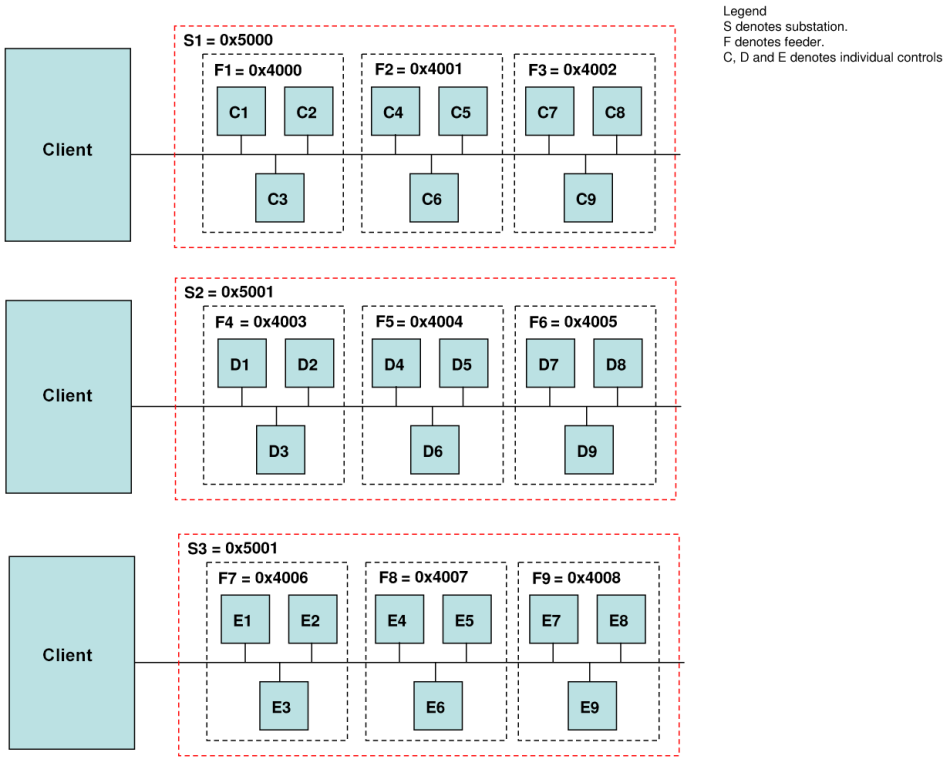


Figure 4-19 Multiple Client, Feeder and/or Substation Addressing

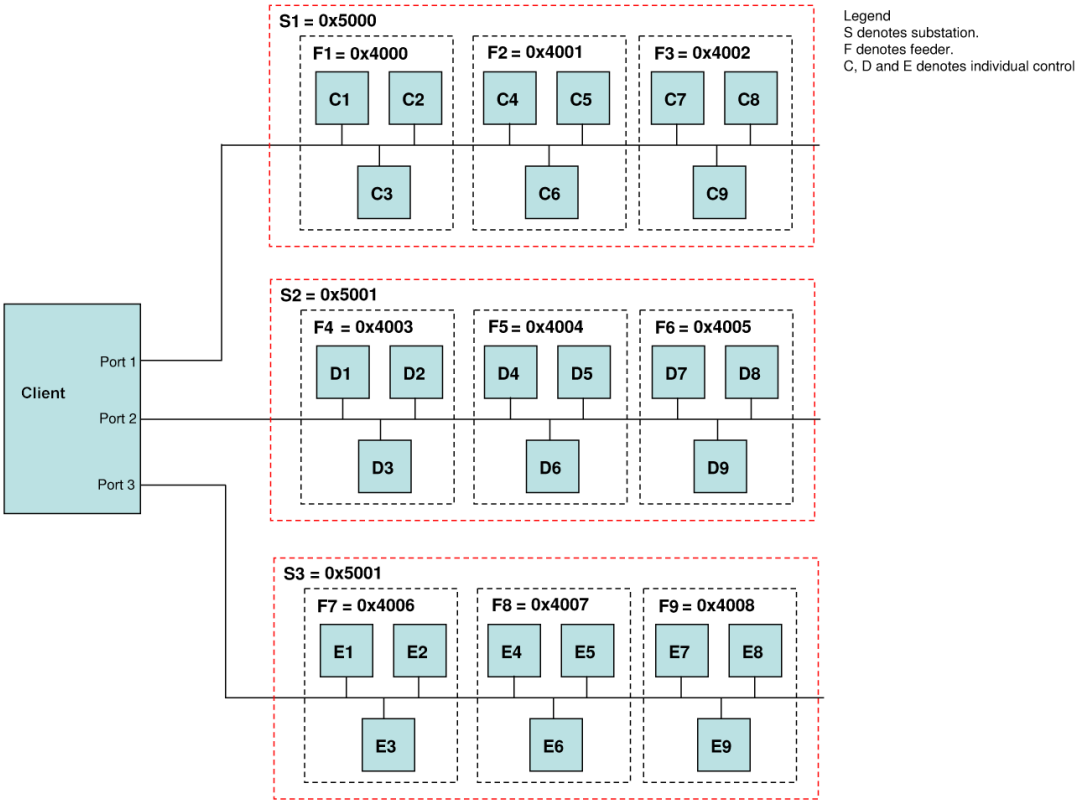


Figure 4-20 Single Client, Feeder and/or Substation Addressing Network Connection

Setting Substation Address From The HMI

1. Ensure the control is energized.

■**NOTE**: If password protection has been implemented on the control, then a valid Level 2 Access Code is required to be entered to set the Substation Address.

2. Press the Right Arrow (COMM Hot Button) pushbutton to awaken the unit. The menu will advance to either "COMMUNICATION" or if a Memory Card is present in the Smart Flash SD CARD slot "Memory Card".

```
        COMMUNICATION
←CNFG                 UTIL→
```

OR

```
        Memory Card
←                         →
```

3. If the "Communication" menu is displayed, then press the Down Arrow pushbutton once. The unit will display the following:

```
        Comm Settings
←                         →
```

4. If Memory Card is displayed, then press the Right or Left arrow pushbutton, as necessary, until "Comm Settings" is displayed.

```
        Comm Settings
←                         →
```

5. Press the Down arrow pushbutton, as necessary, until the "Substation Address" menu item is displayed.

```
Substation Address
  0
```

6. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 9.

```
Substation Address
  0                       C
```

7. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
          _
```

■**NOTE**: When entering the Level 2 Access code the display will automatically advance the cursor to the next digit when input is momentarily paused.

8. Enter a valid Level 2 Access code, then press the ENT pushbutton.

   If a valid Level 2 Access code was entered, the display will briefly flash a confirmation screen, and then display the following:

```
Substation Address
  0                       C
```

   If not, re-enter a valid code.

■**NOTE**: When entering the digital values the display will automatically advance the cursor to the next digit when input is momentarily paused.

9. Utilizing the arrow pushbuttons enter the desired Substation Address, then press the ENT pushbutton. The desired Substation Address will be displayed.

```
Substation Address
   xxxxx
```

Setting Feeder Address From The HMI

1. Ensure the control is energized.

■**NOTE**: If password protection has been implemented on the control, then a valid Level 2 Access Code is required to be entered to set the Substation Address.

2. Press the Right Arrow (COMM Hot Button) pushbutton to awaken the unit. The menu will advance to either "COMMUNICATION" or if a Memory Card is present in the Smart Flash SD CARD slot "Memory Card".

```
        COMMUNICATION
←CNFG                 UTIL→
```

OR

```
        Memory Card
←                         →
```

3. If the "Communication" menu is displayed, then press the Down Arrow pushbutton once. The unit will display the following:

```
        Comm Settings
←                         →
```

4. If Memory Card is displayed, then press the Right or Left arrow pushbutton, as necessary, until "Comm Settings" is displayed.

```
        Comm Settings
←                         →
```

5. Press the Down arrow pushbutton, as necessary, until the "Feeder Address" menu item is displayed.

```
Feeder Address
  0
```

6. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 9.

```
Feeder Address
  0                         C
```

7. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
          _
```

■**NOTE**: When entering the Level 2 Access code the display will automatically advance the cursor to the next digit when input is momentarily paused.

8. Enter a valid Level 2 Access code, then press the ENT pushbutton.

   If a valid Level 2 Access code was entered, the display will briefly flash a confirmation screen, and then display the following:

```
Feeder Address
  0                         C
```

   If not, re-enter a valid code.

■**NOTE**: When entering the digital values the display will automatically advance the cursor to the next digit when input is momentarily paused.

9. Utilizing the arrow pushbuttons enter the desired Feeder Address, then press the ENT pushbutton. The desired Feeder Address will be displayed.

```
Feeder Address
   xxxxx
```

Setting Communication Addresses From TapTalk

To set Communication Addresses from TapTalk®, proceed as follows:

1. Select **Communication/Setup/Change Address** from the TapTalk toolbar. TapTalk will display the "Change Address Warning" screen (Figure 4-21).

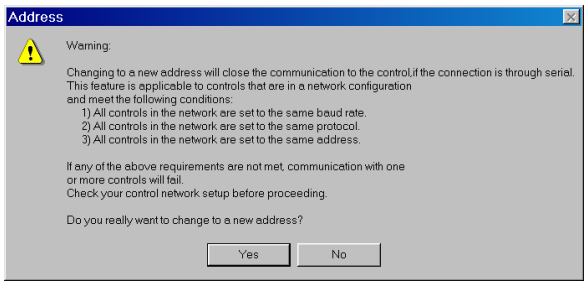


Figure 4-21 Change Address Warning Screen

2. Select **Yes.** TapTalk will display the "Change Communication Address" dialog screen (Figure 4-22).

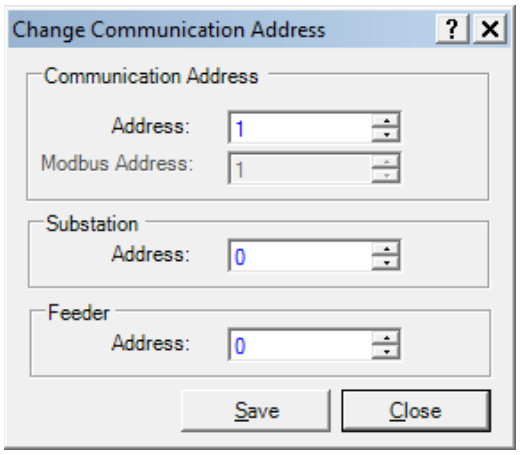


Figure 4-22 Change Communication Address Dialog Screen

3. Enter the desired Communication, Substation or Feeder address, then select "Save". TapTalk will display the "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

Automatic Mode Blocking

The Automatic Mode Blocking feature will cause the control to respond in a predefined manner to either a serial communication interruption or power loss to the control. The Control will respond as follows:

- If Automatic control has been Blocked using TapTalk, then Automatic Control will remain Blocked if serial communication is disrupted or lost.
- If Automatic Control has been Blocked using TapTalk, and the **Save Comm Block at Power Off** selection is **Save**, then the Automatic Control Block will be reinstated at power up.
- If Automatic Control has been Blocked using TapTalk, and the **Save Comm Block at Power Off** selection is **Don't Save**, then the Automatic Control Block will not be reinstated at power up.

Comm Block Auto

Comm Block Auto allows the state of the "Block Auto Operation" communication command to be saved or not saved when power has been lost. The default setting is "DON'T SAVE".

■ **NOTE:** This setting is only available when the SCAMP option is not purchased.

Setting Comm Block Auto From The HMI

To set the Comm Block Auto feature, proceed as follows:

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
          CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Tapchanger Type
←                        →
```

3. Press the Right or Left arrow pushbutton, as necessary, to navigate to the "Nameplate" menu.

```
            Nameplate
←                        →
```

4. Press the Down arrow pushbutton, as necessary, until "Comm Block Auto" is displayed.

```
Comm Block Auto
DON'T SAVE
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Comm Block auto
DON'T SAVE                    C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS

_
```

■ **NOTE**: When entering the Level 2 Access code, the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access code, then press the ENT pushbutton.

   If a valid Level 2 Access code was entered, the display will briefly flash a confirmation screen and display the following:

```
Comm Block auto
DON'T SAVE                    C
```

   If not, re-enter a valid code.

8. Utilizing the Up/Down arrow pushbuttons, select "DON'T SAVE or SAVE", then press the ENT pushbutton. The selected setting will be displayed.

```
Comm Block Auto
(DON'T SAVE or SAVE)
```

Setting Comm Block Auto at Power Off From TapTalk

To set Comm Block Auto at Power Off from TapTalk®, proceed as follows:

■ **NOTE:** This setting is only available when the SCAMP option is not purchased.

1. Select **Setup/Configuration** from the TapTalk toolbar. TapTalk will display the "Configuration" dialog screen (Figure 4-24).
2. From the "Save Comm Block at Power Off" section, select either "Don't Save" or "Save", then select "Save". TapTalk will display the "Save to Device Confirmation Screen" (Figure 4-23).

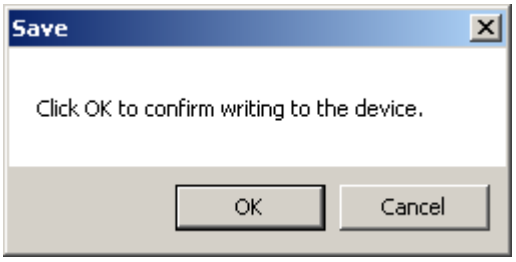


Figure 4-23 Save to Device Confirmation Screen

3. Select "OK". TapTalk will briefly display the "Setpoints successfully written to the control" confirmation screen.

SCAMP Initialize on Power Up

SCAMP Initialize on Power Up – When **Last Save** is selected, the SCAMP switch is configured in such a way that upon the control performing a cold power up, the state of the SCAMP switch is initialized to the last saved state of the SCAMP switch prior to the control powering off.

For example, if prior to powering off the control, the SCAMP switch was in Manual, then when the control is powered back on the control will initially go back to the Manual state and vice versa. Now when **Auto Mode** is selected, the control always initializes into the Auto Mode after powering up regardless of the saved state of the control prior to powering off.

■ **NOTE**: This setting is only available when the SCAMP option is purchased.

Setting SCAMP Initialize on Power Up From The HMI

To set the SCAMP Initialize on Power Up feature, proceed as follows:

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
          CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Tapchanger Type
←                        →
```

3. Press the Right or Left arrow pushbutton, as necessary, to navigate to the "Nameplate" menu.

```
           Nameplate
←                        →
```

4. Press the Down arrow pushbutton, as necessary, until "SCAMP Init Pwrup" is displayed.

```
Scamp Init Pwrup
AUTO
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Scamp Init Pwrup
AUTO                        C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
_
```

■ **NOTE**: When entering the Level 2 Access code, the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access code, then press the ENT pushbutton.

   If a valid Level 2 Access code was entered, the display will briefly flash a confirmation screen and display the following:

```
Scamp Init Pwrup
AUTO                        C
```

   If not, re-enter a valid code.

8. Utilizing the Up/Down arrow pushbuttons, select "Last Save or Auto Mode", then press the ENT pushbutton. The selected setting will be displayed.

```
Scamp Init Pwrup
(AUTO or LAST SAVE)
```

Setting SCAMP Initialize on Power Up From TapTalk

To set SCAMP Initialize on Power Up from TapTalk®, proceed as follows:

■ **NOTE**: This setting is only available when the SCAMP option is purchased.

1. Select **Setup/Configuration** from the TapTalk toolbar. TapTalk will display the "Configuration" dialog screen (Figure 4-25).
2. From the "SCAMP Initialize on Power Up" section, select either "Auto Mode" or "Last Save", then select "Save". TapTalk will display the "Save to Device Confirmation Screen" (Figure 4-23).
3. Select "OK". TapTalk will briefly display the "Setpoints successfully written to the control" confirmation screen.

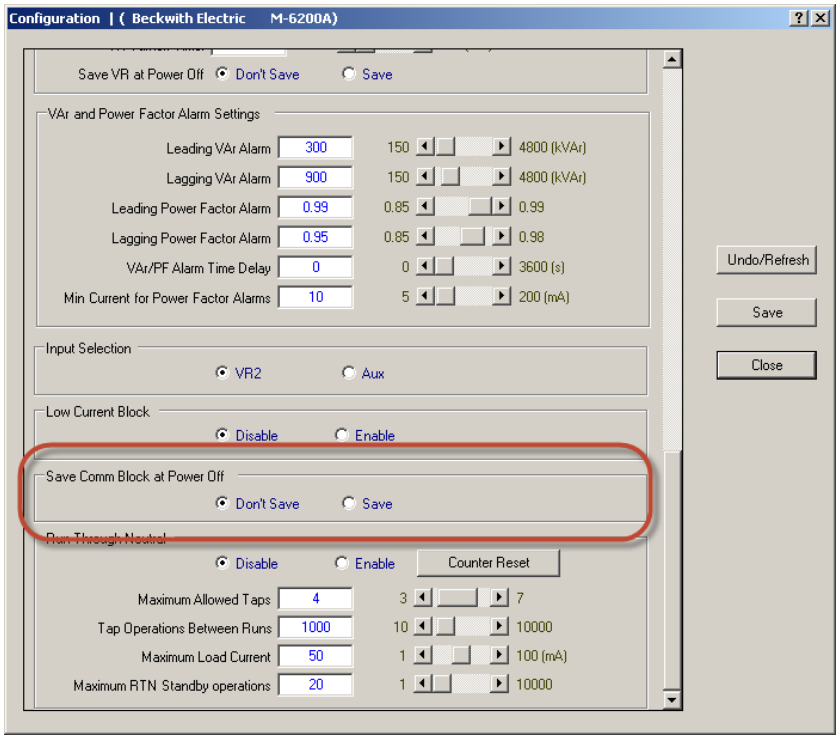


Figure 4-24 Configuration (Save Comm Block at Power Off) Dialog Screen

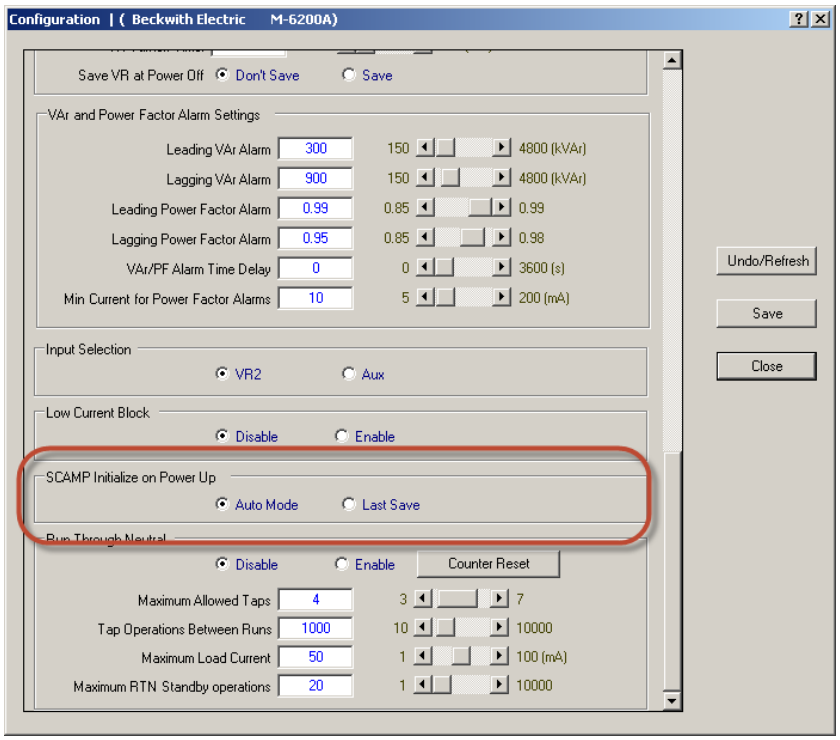


Figure 4-25 Configuration (SCAMP Initialize on Power Up) Dialog Screen

OPTIONAL ETHERNET PORT

The optional Ethernet Port is available through an RJ45 (10/100 Base-T) or a (100 Base-Fx) Fiber Optic interface for ethernet communication to the M-6200A. The port supports up to eight concurrent connections. The maximum number of allowed DNP connections is five. The maximum number of MODBUS® connections is eight. The port supports DHCP protocol and also allows manual configuration of the Ethernet port. MODBUS protocol "Port Number" and DNP Protocol "Port Number" are required for manual configuration.

If no communication activity is detected on a previously open ethernet socket, for the amount of time specified by the "Keepalive Time" setting, the control will then close the socket and make it available for future connection.

■**NOTE** Keepalive Time applies only to Ethernet communication.

Ethernet Port Configuration From TapTalk

■**NOTE:** Manual configuration of the Ethernet Port (not enabling DHCP Protocol) requires that the IP Address, Net Mask and Gateway settings be obtained from the System Administrator.

1. Ensure the following conditions exist:
   - The control is energized
   - TapTalk is installed on the host computer
   - The host computer is physically connected to the target control through either a USB, Serial Port or Modem connection
   - The host computer and the control are physically connected to the target Ethernet network
2. Start the TapTalk program. TapTalk will display the TapTalk **Main** dialog screen (Figure 3-11).
3. Select **Connect/USB, Serial Port or Modem** from the **Connect** drop-down menu. TapTalk will display the appropriate Connection Dialog Screen (Figures 3-2, 3-14 or 3-15).
4. Enter a valid Level 2 Access Code (if enabled), then select **Connect**, TapTalk will attempt to connect to the target control.
5. If TapTalk returns a Failed to Connect Error screen (Figure 3-3), repeat Steps 3 and 4.
6. Level 2 Access if enabled is necessary to complete the Ethernet Port configuration. If an invalid Access Code was entered, TapTalk will display the connected version of the TapTalk main screen with either "Read-Only" or "Level 1" access.

   Disconnect from the control and repeat Step 4.
7. If Level Access is not active or a valid Level 2 Access Code was entered, TapTalk will briefly display the "Successfully Connected Level 2" screen and then display the connected version of the TapTalk Main Screen (Figure 3-13) with Level 2 Access.
8. From the **Communication** drop-down menu, select **Setup/Ethernet Settings**.

   Depending on the status of the Ethernet option in the control, TapTalk will respond as follows:
   - If the Ethernet option is disabled in the control, TapTalk will display the Ethernet Hardware option dialog screen (Figure 4-26).
   - If the Ethernet option is enabled in the control, TapTalk will display the Setup Ethernet dialog screen (Figure 4-27).

Figure 4-26 Ethernet Option Dialog Screen

9. If the Ethernet Hardware option dialog screen (Figure 4-26) is displayed, proceed as follows:
   a. If the Ethernet hardware is present, select "OK" to enable. TapTalk will then display the Setup Ethernet dialog screen (Figure 4-27). Go to Step 10.
   b. If the Ethernet hardware is not present, select "Cancel". TapTalk will return to the Main screen.
10. If the Ethernet network that the target control is connected to supports DHCP Protocol, then perform the following:
   a. From the Setup Ethernet dialog screen (Figure 4-27) select **DHCP Protocol** "Enable"
   b. Select the desired "Keepalive Time" duration.
   c. Select "Save" to save the settings to the target control.
   d. Go to Step 13.
11. If the Ethernet network that the target control is connected to does not support DHCP Protocol, or manual configuration is desired, perform the following:
   a. Select **DHCP Protocol** "Disable".
   b. Enter the IP Address, Net Mask, Gateway and the applicable MODBUS® or DNP3.0 Port settings.
   c. Select the desired "Keepalive Time" duration.
   d. Select "Save" to save the settings to the target control. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

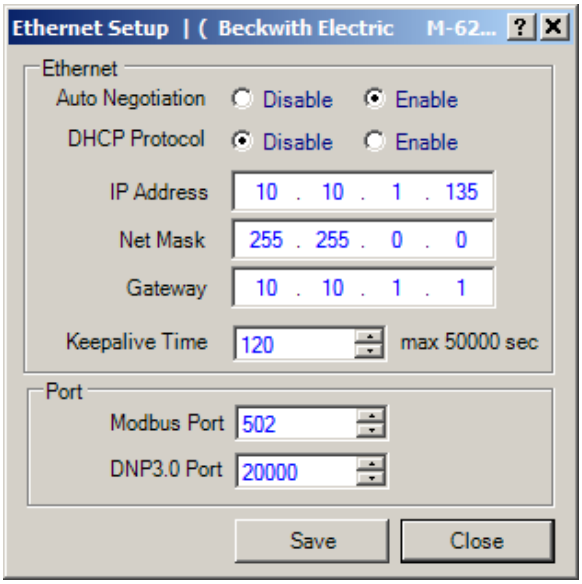


Figure 4-27 Setup Ethernet Dialog Screen

12. If the Network MODBUS Port address is not "502" or the DNP Port address is not "20000", set these parameters to match the target network settings.
13. Verify that removing power to the control will not cause upset operation conditions on the regulator.
14. Remove power to the control, and then reapply power to the control.

The Ethernet option for the control is now enabled. See **Communication Using Ethernet Connection** section of Chapter 3 to connect to the target control through the Ethernet connection. If Source Address Validation is desired, then see "Enabling Source Address Validation" earlier in this section.

HMI Configuration of the Control's Ethernet Port for use on a network that *supports* DHCP Protocol

1. Ensure the control is energized.

■**NOTE**: If Level Access is active on the control, a valid Level 2 Access Code is required to be entered to manually configure each element of the Ethernet port.

2. Press the Right Arrow (COMM Hot Button) pushbutton to awaken the unit. The menu will advance to either "COMMUNICATION" or if a Memory Card is present in the Smart Flash SD CARD slot "Memory Card".

```
        COMMUNICATION
←CNFG                 UTIL→
```

OR

```
        Memory Card
←                         →
```

3. If the "Communication" menu is displayed, then press the Down Arrow pushbutton once. The unit will display the following:

```
        Comm Settings
←                         →
```

4. From either the "Comm Settings" or "Memory Card" menu, press the Right or Left Arrow pushbutton as necessary until "Ethernet" is displayed.

```
          Ethernet
←                         →
```

5. Press the Down arrow pushbutton once. The following will be displayed.

```
DHCP Enable
disable
```

6. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 9.

```
DHCP Enable
disable                   C
```

7. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS

            _
```

■**NOTE**: When entering the Level 2 Access code, the display will automatically advance the cursor to the next digit when input is momentarily paused.

8. Enter a valid Level 2 Access code, then press the ENT pushbutton.

   If a valid Level 2 Access code was entered, the display will briefly flash a confirmation screen and then display the following:

```
DHCP Enable
disable                   C
```

   If not, re-enter a valid code.

9. Utilizing the Up/Down arrow pushbuttons select **ENABLE**, then press the ENT pushbutton. The following will be displayed.

```
DHCP Enable
ENABLE
```

10. Verify that removing power to the control will not cause upset operation conditions on the regulator.

11. Remove power to the control, then reapply power. The control will start the bootup sequence.

12. The control is now addressable from TapTalk® over the target network.

    - Also, if the network MODBUS Port address is not "502" or the DNP Port address is not "20000", go to the MODBUS Port and DNP Port Settings section of this chapter.
    - If Source Address Validation is desired, then see "Enabling Source Address Validation" earlier in this section.

HMI Configuration of the Control's Ethernet Port for use on a network that *does not support* DHCP Protocol

1. Ensure the control is energized.

■**NOTE**: If password protection has been implemented on the control, a valid Level 2 password is required to be entered to manually configure each element of the Ethernet port.

2. Press the Right Arrow (COMM Hot Button) pushbutton to awaken the unit. The menu will advance to either "COMMUNICATION" or if a Memory Card is present in the Smart Flash SD CARD slot "Memory Card".

```
        COMMUNICATION
←CNFG                 UTIL→
```

OR

```
        Memory Card
←                         →
```

3. If the "Communication" menu is displayed, then press the Down Arrow pushbutton once. The unit will display the following:

```
        Comm Settings
←                         →
```

4. From either the "Comm Settings" or "Memory Card" menu, press the Right or Left Arrow pushbutton as necessary until "Ethernet" is displayed.

```
          Ethernet
←                         →
```

5. Press the Down arrow pushbutton once. The following will be displayed.

```
DHCP Enable
ENABLE
```

6. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 9.

```
DHCP Enable
ENABLE                    C
```

7. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
          _
```

■**NOTE**: When entering the Level 2 Access code the display will automatically advance the cursor to the next digit when input is momentarily paused.

8. Enter a valid Level 2 Access code, then press the ENT pushbutton.

   If a valid Level 2 Access code was entered, the display will briefly flash a confirmation screen and then display the following:

```
DHCP Enable
ENABLE                    C
```

   If not, re-enter a valid code.

9. Utilizing the Up/Down arrow pushbuttons, select "disable", then press the ENT pushbutton. The following will be displayed.

```
DHCP Enable
disable
```

10. Press the Down arrow pushbutton once. The following will be displayed.

```
IP Address
0.0.0.0
```

■**NOTE**: When entering the digital values the display will automatically advance the cursor to the next digit when input is momentarily paused.

11. Press the ENT pushbutton. The following will be displayed.

```
IP Address
0.0.0.0                    C
```

12. Utilizing the arrow pushbuttons input the desired IP Address, then press the ENT pushbutton, the desired IP Address will be displayed.
13. Press the Down arrow pushbutton once. The following will be displayed.

```
Net Mask
0.0.0.0
```

14. Press the ENT pushbutton. The following will be displayed.

```
Net Mask
0.0.0.0                    C
```

15. Utilizing the arrow pushbuttons, input the desired Net Mask, then press the ENT pushbutton, the desired Net Mask will be displayed.
16. Press the Down arrow pushbutton once. The following will be displayed.

```
Gateway
0.0.0.0
```

17. Press the ENT pushbutton. The following will be displayed.

```
Gateway
0.0.0.0                    C
```

18. Utilizing the arrow pushbuttons input the desired Gateway, then press the ENT pushbutton, the desired Gateway will be displayed.

■**NOTE**: Auto negotiation is an Ethernet procedure by which two connected devices choose common transmission parameters, such as speed and duplex mode. In this process, the connected devices first share their capabilities as for these parameters and then choose the fastest transmission mode they both support.

19. If the control is connected to a host device which is capable of 10 and 100 mbps transmission rates and handles both half or full duplex modes, then the Ethernet port is now configured to support network communications with the MODBUS® port and DNP port default values. If the network requires specific MODBUS port and DNP port settings, then see the MODBUS Port and DNP Port Setting section in this chapter.

■**NOTE:** Auto Negotiation must be disabled if using Fiber Ethernet.

20. If a fixed speed of 100 mbps is desired as in the case of Fiber Optic mode, utilize the Up/Down arrow pushbuttons to navigate to the "Auto Negotiation" menu item.

```
Auto Negotiation
ENABLE
```

21. Press the ENT pushbutton. The following will be displayed.

```
Auto Negotiation
ENABLE                     C
```

22. Utilizing the Up/Down arrow pushbuttons select "disable", then press the ENT pushbutton. The following will be displayed.

```
Auto Negotiation
disable
```

The Ethernet port is now configured to support network communications with the MODBUS port, DNP port, and Keepalive Time default values. If the network requires specific MODBUS port and DNP port settings, see the MODBUS Port and DNP Port Setting section in this chapter. If a Keepalive Time duration other than 120 seconds is desired, see Keepalive Time section in this chapter.

If Source Address Validation is desired, then see "Enabling Source Address Validation" earlier in this section.

MODBUS Port and DNP Port Settings From The HMI

1. Ensure the control is energized.

■**NOTE**: If password protection has been implemented on the control, then a valid Level 2 Access Code is required to be entered to set MODBUS® port and DNP port settings.

2. Press the Right Arrow (COMM Hot Button) pushbutton to awaken the unit. The menu will advance to either "COMMUNICATION" or if a Memory Card is present in the Smart Flash SD CARD slot "Memory Card".

```
        COMMUNICATION
←CNFG                 UTIL→
```

OR

```
        Memory Card
←                         →
```

3. If the "Communication" menu is displayed, then press the Down Arrow pushbutton once. The unit will display the following:

```
        Comm Settings
←                         →
```

4. From either the "Comm Settings" or "Memory Card" menu, press the Right or Left Arrow pushbutton as necessary until "Ethernet" is displayed.

```
          Ethernet
←                         →
```

5. Press the Down arrow pushbutton, as necessary, until the Enter "MODBUS Port" menu item is displayed.

```
Enter Modbus Port
 502
```

6. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 9.

```
Enter Modbus Port
 502                      C
```

7. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
          _
```

■**NOTE**: When entering the Level 2 Access code the display will automatically advance the cursor to the next digit when input is momentarily paused.

8. Enter a valid Level 2 Access code, then press the ENT pushbutton.

   If a valid Level 2 Access code was entered, the display will briefly flash a confirmation screen, and then display the following:

```
Enter Modbus Port
 502                      C
```

   If not, re-enter a valid code.

■**NOTE**: When entering the digital values the display will automatically advance the cursor to the next digit when input is momentarily paused.

9. Utilizing the arrow pushbuttons enter the desired MODBUS port address, then press the ENT pushbutton. The desired MODBUS port address will be displayed.

10. Press the Down arrow pushbutton once. The following will be displayed.

```
Enter DNP Port
20000
```

11. Press the ENT pushbutton. The following will be displayed.

```
Enter DNP Port
20000                     C
```

12. Utilizing the arrow pushbuttons, input the desired DNP Port address, press the ENT pushbutton, the desired DNP Port address will be displayed.

    The control is now addressable from TapTalk® over the network. Ensure that the MODBUS Port value is the same as the value manually set when attempting to communicate with the control from TapTalk.

Ethernet Keepalive Time Settings From The HMI

1. Ensure the control is energized.

■**NOTE**: If password protection has been implemented on the control, then a valid Level 2 Access Code is required to be entered to set Ethernet Keepalive Time settings.

2. Press the Right Arrow (COMM Hot Button) pushbutton to awaken the unit. The menu will advance to either "COMMUNICATION" or if a Memory Card is present in the Smart Flash SD CARD slot "Memory Card".

```
        COMMUNICATION
←CNFG                 UTIL→
```

OR

```
        Memory Card
←                         →
```

3. If the "Communication" menu is displayed, then press the Down Arrow pushbutton once. The unit will display the following:

```
        Comm Settings
←                         →
```

4. From either the "Comm Settings" or "Memory Card" menu, press the Right or Left Arrow pushbutton as necessary until "Ethernet" is displayed.

```
          Ethernet
←                         →
```

5. Press the Down arrow pushbutton, as necessary, until the "Keepalive Time" menu item is displayed.

```
Keepalive Time
   120 Sec
```

6. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 9.

```
Keepalive Time
   120 Sec                C
```

7. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
          _
```

■**NOTE**: When entering the Level 2 Access code the display will automatically advance the cursor to the next digit when input is momentarily paused.

8. Enter a valid Level 2 Access code, then press the ENT pushbutton.

   If a valid Level 2 Access code was entered, the display will briefly flash a confirmation screen, and then display the following:

```
Keepalive Time
   120 Sec                C
```

   If not, re-enter a valid code.

■**NOTE**: When entering the digital values the display will automatically advance the cursor to the next digit when input is momentarily paused.

9. Utilizing the arrow pushbuttons enter the desired Keepalive Time value, then press the ENT pushbutton. The desired Keepalive Time value will be displayed.

10. Press the Down arrow pushbutton once. The following will be displayed.

```
Keepalive Time
   xxx Sec
```

RS-485/Fiber Optic Port

M-6200A COM Port can be selected for two different configurations: RS-485 or Fiber Optics.

RS-485/Fiber Optic Port Setup From The HMI

This procedure provides the steps necessary to setup all RS-485 and Fiber Optic parameters. Parameter definitions and the default value (default value) for each parameter are included below:

- Comm Protocol – Allows selection between standard protocols, DNP3.0 or MODBUS®. (DNP3.0)
- Comm Address – Configures a three-digit numerical address, from 1 to 200, for remote communications. (1)
- Baud Rate – Selects baud rate for COM1, located on the top of the control. (9600)
- Parity – None, odd or even parity is available. (NONE)
- Stop Bits – One or two stop bits are available. (ONE STOPBIT)
- Sync Time – This time delay improves robust operation when communication lines are intermittent. Communication dead-sync time is the time that the control will wait from the last received character and continue without attempting to resynchronize. (2 mS)
- Echo/Repeat – Selects Echo/Repeat on/off as determined by the user. Selector switch is located on top of unit rear cover adjacent to the Fiber Optic connection and is accessed through the slot in the cover (Figure 5-2 or 5-10). Switch position towards the front of the control is the off position. (OFF)

If the default value for a parameter does not need to be changed, skip the applicable steps.

1. Ensure the control is energized.

■**NOTE**: If Access Code protection has been implemented on the control, a valid Level 2 Access Code is required to be entered to manually configure each element of the RS-485/Fiber Optic port.

2. Press the Right Arrow (COMM Hot Button) pushbutton to awaken the unit. The menu will advance to either "COMMUNICATION" or if a Memory Card is present in the Smart Flash SD CARD slot "Memory Card".

```
        COMMUNICATION
←CNFG                    UTIL→
```

OR

```
        Memory Card
←                            →
```

3. If the "Communication" menu is displayed, then press the Down Arrow pushbutton once. The unit will display the following:

```
        Comm Settings
←                            →
```

4. If Memory Card is displayed, then press the Right or Left arrow pushbutton, as necessary, until “Comm Settings” is displayed.

```
        Comm Settings
←                            →
```

5. Press the Down arrow pushbutton, as necessary, until "Com Port Type" is displayed.

```
Comm Port Type
RS485
```

6. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 9.

```
Comm Port Type
RS485                          C
```

7. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS

          _
```

■**NOTE**: When entering the Level 2 Access code the display will automatically advance the cursor to the next digit when input is momentarily paused.

8. Enter a valid Level 2 Access code, then press the ENT pushbutton.

   If a valid Level 2 Access code was entered, the display will briefly flash a confirmation screen and then display the following:

```
Comm Port Type
RS485                    C
```

   If not, re-enter a valid code.

9. Utilizing the Up/Down arrow pushbuttons select "RS485 or FIBER", then press the ENT pushbutton. The selected port type will be displayed.

```
Comm Port Type
(RS485 or FIBER)
```

10. Press the Up/Down arrow pushbutton, as necessary, until the "Comm Protocol" menu item is displayed.

```
Comm Protocol
DNP3.0
```

■**NOTE**: From this point on in this procedure it is assumed that a valid Access Level 2 Code has been previously entered. If not, a valid Level 2 Access Code will be required to be entered as described in Step 8.

11. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed.

```
Comm Protocol
DNP3.0                   C
```

12. Utilizing the arrow pushbuttons select "DNP3.0 or MODBUS®", then press the ENT pushbutton. The selected protocol will be displayed.

```
Comm Protocol
(DNP3.0 or MODBUS)
```

13. Press the Up/Down arrow pushbutton, as necessary, until the "Comm Address" menu item is displayed.

```
Comm Address
     1
```

14. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed.

```
Comm Address
     1                   C
```

15. Utilizing the Up/Down arrow pushbuttons enter the desired "Comm Address", then press the ENT pushbutton. The entered Comm Address will be displayed.

```
Comm Address
     X
```

16. Press the Up/Down arrow pushbutton, as necessary, until the "Baud Rate" menu item is displayed.

```
Baud Rate
9600
```

17. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed.

```
Baud Rate
9600                     C
```

18. Utilizing the Up/Down arrow pushbuttons, select the desired Baud Rate:
    - 115,200
    - 57,600
    - 38,400
    - 19,200
    - 9,600
    - 4,800
    - 2,400
    - 1,200
    - 600
    - 300

    When the desired Baud Rate has been selected, then press the ENT pushbutton. The selected Baud Rate will be displayed.

```
Baud Rate
XXXXXXX
```

19. Press the Up/Down arrow pushbutton, as necessary, until the "Parity" menu item is displayed.

```
Parity
NONE
```

20. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed.

```
Parity
NONE                          C
```

21. Utilizing the Up/Down arrow pushbuttons select "NONE, EVEN or ODD", then press the ENT pushbutton. The selected Parity setting will be displayed.

```
Parity
(NONE, EVEN or ODD)
```

22. Press the Up/Down arrow pushbutton, as necessary, until the "Stop Bits" menu item is displayed.

```
Stop Bits
ONE STOPBIT
```

23. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed.

```
Stop Bits
ONE STOPBIT                   C
```

24. Utilizing the Up/Down arrow pushbuttons select "ONE STOPBIT or TWO STOPBITS", then press the ENT pushbutton. The selected Stop Bits setting will be displayed.

```
Stop Bits
(ONE STOPBIT or TWO STOPBITS)
```

25. Press the Up/Down arrow pushbutton, as necessary, until the "Sync Time" menu item is displayed.

```
Sync Time
   2 mS
```

26. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed.

```
Sync Time
   2 mS                       C
```

27. Utilizing the arrow pushbuttons, enter the desired Sync Time value (2 to 5,000 mS in 1 mS increments), then press the ENT pushbutton. The entered Sync Time setting will be displayed.

```
Sync Time
XXXX mS
```

28. The RS-485 or Fiber Optic Port is now available for communications.

29. If DNP3.0 was selected in Step 12 and Source Address Validation is desired, then see "Enabling Source Address Validation" earlier in this section.

RS-485/Fiber Optic Port Setup From TapTalk

To setup the RS-485/Fiber Optic from TapTalk®, proceed as follows:

1. Select **Communication/Setup/Comm Port** from the TapTalk toolbar. TapTalk will display the "Setup Comm Port" dialog screen (Figure 4-28).

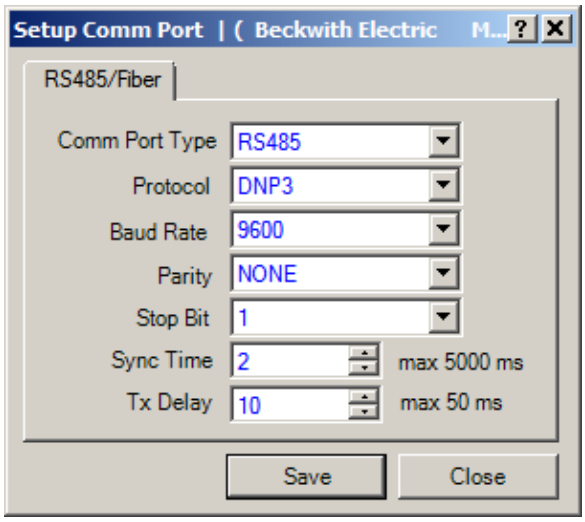


Figure 4-28 Setup Comm Port Dialog Screen

2. Select Comm Port Type "RS-485" or "Fiber".
3. If Echo/Repeat is required then Enable Echo/Repeat by placing the Echo/Repeat on/off switch located adjacent to the Fiber connection on top of the control in the on position towards the rear of the control (Figure 5-2 or 5-10).
4. Enter the desired settings for the following parameters:
   - Protocol
   - Baud Rate
   - Parity
   - Stop Bits
   - Sync Time
   - Tx Delay
5. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
6. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).
7. If DNP3.0 was selected in Step 4 and Source Address Validation is desired, then see "Enabling Source Address Validation" ealier in this section.

Optional RS-232 Port Setup From The HMI

This procedure provides the steps necessary to setup all RS-232 Port parameters. Parameter definitions and the default value (default value) for each parameter are included below:

- Comm Protocol – Allows selection between standard protocols, DNP3.0 or MODBUS®. (MODBUS)
- Baud Rate – Selects baud rate for COM2, located on the top of the control. (115,200)
- Parity – None, odd or even parity is available. (NONE)
- Stop Bits – One or two stop bits are available. (TWO STOPBITS)
- Sync Time – This time delay improves robust operation when communication lines are intermittent. Communication dead-sync time is the time that the control will wait from the last received character and continue without attempting to resynchronize. (50 mS)

If the default value for a parameter does not need to be changed, then skip the applicable steps.

1. Ensure the control is energized.

■**NOTE**: If Access Code protection has been implemented on the control, a valid Level 2 Access Code is required to be entered to manually configure each element of the RS-232 port.

2. Press the Right Arrow (COMM Hot Button) pushbutton to awaken the unit. The menu will advance to either "COMMUNICATION" or if a Memory Card is present in the Smart Flash SD CARD slot "Memory Card".

```
        COMMUNICATION
←CNFG                    UTIL→
```

OR

```
        Memory Card
←                          →
```

3. If the "Communication" menu is displayed, then press the Down Arrow pushbutton once. The unit will display the following:

```
        Comm Settings
←                       →
```

4. From either the "Comm Settings" or "Memory Card" menu, press the Right or Left Arrow pushbutton as necessary until "RS232" is displayed.

```
              RS232
←                       →
```

5. Press the Down arrow pushbutton once. The unit will display the following:

```
Protocol
MODBUS
```

6. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Protocol
MODBUS                  C
```

7. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
          _
```

■**NOTE**: When entering the Level 2 Access code, the display will automatically advance the cursor to the next digit when input is momentarily paused.

8. Enter a valid Level 2 Access code, then press the ENT pushbutton.

   If a valid Level 2 Access code was entered, the display will briefly flash a confirmation screen and display the following:

```
Protocol
MODBUS                  C
```

   If not, re-enter a valid code.

9. Utilizing the Up/Down arrow pushbuttons, select "DNP3.0 or MODBUS®", then press the ENT pushbutton. The selected protocol will be displayed.

```
Protocol
(DNP3.0 or MODBUS)
```

10. Press the Up/Down arrow pushbutton, as necessary, until the "Baud Rate" menu item is displayed.

```
Baud Rate
115200
```

■**NOTE**: From this point on in this procedure it is assumed that a valid Access Level 2 Code has been previously entered. If not, then a valid Level 2 Access Code will be required to be entered as described in Step 8.

11. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed.

```
Baud Rate
115200                  C
```

12. Utilizing the Up/Down arrow pushbuttons select the desired Baud Rate:
    - 115,200
    - 57,600
    - 38,400
    - 19,200
    - 9,600
    - 4,800
    - 2,400
    - 1,200
    - 600
    - 300

    When the desired Baud Rate has been selected, then press the ENT pushbutton. The selected Baud Rate will be displayed.

```
Baud Rate
XXXXXXX
```

13. Press the Up/Down arrow pushbutton as necessary until the "Parity" menu item is displayed.

```
Parity
NONE
```

14. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed.

```
Parity
NONE                          C
```

15. Utilizing the Up/Down arrow pushbuttons, select "NONE, EVEN or ODD", then press the ENT pushbutton. The selected Parity setting will be displayed.

```
Parity
(NONE, EVEN or ODD)
```

16. Press the Up/Down arrow pushbutton, as necessary, until the "Stop Bits" menu item is displayed.

```
Stop Bits
ONE STOPBIT
```

17. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed.

```
Stop Bits
ONE STOPBIT                   C
```

18. Utilizing the Up/Down arrow pushbuttons select "ONE STOPBIT or TWO STOPBITS", then press the ENT pushbutton. The selected Stop Bits setting will be displayed.

```
Stop Bits
(ONE STOPBIT or TWO STOPBITS)
```

19. Press the Up/Down arrow pushbutton, as necessary, until the "Sync Time" menu item is displayed.

```
Sync Time
 50 mS
```

20. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed.

```
Sync Time
 50 mS                        C
```

21. Utilizing the arrow pushbuttons, enter the desired Sync Time value (1 to 5,000 mS in 1 mS increments), then press the ENT pushbutton. The entered Sync Time setting will be displayed.

```
Sync Time
XXXX mS
```

22. If DNP3.0 was selected in Step 9 and Source Address Validation is desired, then see "Enabling Source Address Validation" earlier in this section.

RS-232 Port Setup From TapTalk

To setup the RS-232 Port from TapTalk® proceed as follows:

1. Select **Communication/Setup/RS232 Comm Port** from the TapTalk toolbar.

   Depending on the status of the RS-232 option in the control, TapTalk will respond as follows:

   - If the RS-232 option is disabled in the control, TapTalk will display the RS-232 Hardware option dialog screen (Figure 4-30).
   - If the RS-232 option is enabled in the control, TapTalk will display the Setup RS-232 Comm Port dialog screen (Figure 4-29).

2. If the RS-232 Hardware option dialog screen (Figure 4-30) is displayed, then proceed as follows:

   a. If the RS-232 hardware is present, select "OK" to enable. TapTalk will then display the Setup RS-232 Comm Port dialog screen (Figure 4-29). Go to Step 3.

   b. If the RS-232 hardware is not present, select "Cancel". TapTalk will return to the Main screen.

3. Enter the desired settings for the following parameters:

   - Protocol
   - Baud Rate
   - Parity
   - Stop Bits
   - Sync Time

4. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).

5. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

6. Verify that removing power to the control will not cause upset operation conditions on the regulator.

7. Remove power to the control, and then reapply power to the control.

8. If DNP3.0 was selected in Step 6 and Source Address Validation is desired, then see "Enabling Source Address Validation" earlier in this section.

The RS-232 option for the control is now enabled. See **Communication Using Serial Port** section of Chapter 3 to connect to the target control through the RS-232 connection.

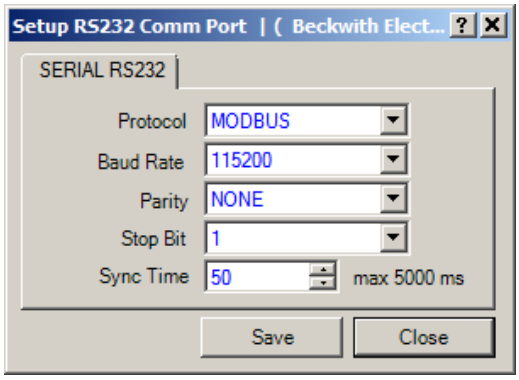


Figure 4-29 Setup RS-232 Comm Port Dialog Screen

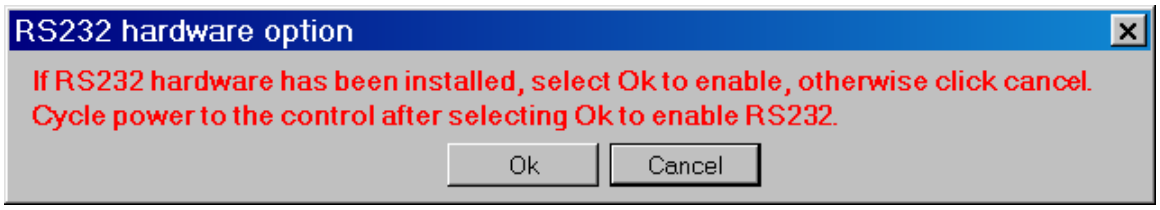


Figure 4-30 RS-232 Comm Port Option Dialog Screen

INSTALLING MODEMS

Using TapTalk® to interrogate, set or monitor the control using a modem requires both a remote modem connected at the controls location and a local modem connected to the computer with TapTalk installed.

■ **NOTE**: Any compatible modem may be used; however, the unit only communicates at 1200 to 9600 baud.

In order to use TapTalk to communicate with the control using a modem, the following must be provided with the control:

- An external modem (1200 baud or higher), capable of understanding standard AT commands.
- Serial modem cable with 9-pin connector for the control and the applicable connector for the modem.

Similarly, the computer running TapTalk must also have access to a compatible internal or external modem.

Connecting the PC Modem

1. If the computer has an external modem, then use a standard straight-through RS-232 modem cable (M-3933) to connect the computer to the modem.
2. If the computer has an internal modem, then refer to the modem's instruction book to determine which communications port should be selected.
3. Verify that the modem is attached to (if external) or assigned to (if internal) the same serial port as assigned in TapTalk.

   While TapTalk can use any of the 255 serial ports (COM1 through COM255), most computers support only COM1 and COM2.
4. Connect the modem to a telephone line, then energize the modem.

Initializing the PC Modem

1. Verify that the modem is connected as described in "Connecting the PC Modem".
2. Open TapTalk, then select the **Connect/ Modem** menu item.
3. TapTalk will display the Modem Connection Dialog screen (Figure 4-31).
4. Enter the required information in the Modem Settings section of the screen, then select **Connect**.

COMMAND BUTTONS

Add Allows you to review and change the user lines (unit identifier), phone number, and communication address of a selected entry.

Remove Deletes a selected entry.

Save Saves any changes to the displayed information

Connect Dials the entry selected from the directory.

Cancel Ends modem communication, allowing the user to dial again.

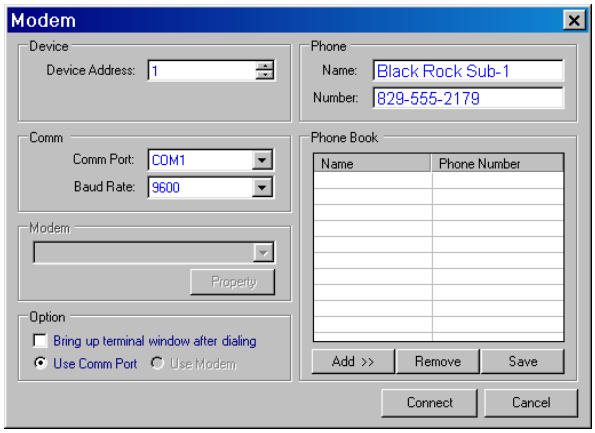


Figure 4-31 Modem Connection Dialog Screen

Connecting the Local Modem to the Control

Setup of the modem attached to the control may be slightly complicated. It involves programming parameters (using the AT command set), and storing this profile in the modem's nonvolatile memory.

After programming, the modem will power up in the proper state for communicating with the control. Programming may be accomplished by using the "Bring Up Terminal Window after dialing" selection (Figure 4-32). Refer to your modem manual for further information.

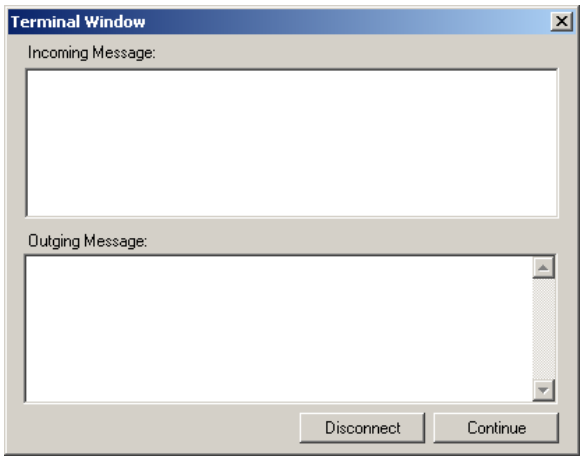


Figure 4-32 Terminal Window

■ **NOTE:** The control does not issue or understand any modem commands. It will not adjust the baud rate and should be considered a "dumb" peripheral. It communicates with 1 start, 8 data, and 0, 1 or 2 stop bits.

Connect the Modem to the control as follows:

1. Connect the unit to an external modem by attaching a standard RS-232 modem cable to the appropriate serial communications port on both the unit and the modem.
2. Connect the modem to a telephone line, then energize the modem.

The modem attached to the control must have the following AT command configuration:

E0	No Echo
Q1	Don't return result code
&D3	On to OFF DTR, hangup and reset
&S0	DSR always on
&C1	DCD ON when detected
S0=2	Answer on second ring

The following commands may also be required at the modem:

&Q6	Constant DTE to DCE
N0	Answer only at specified speed
W	Disable serial data rate adjust
\Q3	Bidirectional RTS/CTS relay
&B1	Fixed serial port rate
S37	Desired line connection speed

When connected to another terminal device, the Terminal Window allows the user to send messages or commands. Outgoing communications are displayed in the top pane and incoming messages are displayed in the bottom two panes, in ASCII text and HEX format.

There are some variations in the AT commands supported by modem manufacturers. Refer to the hardware user documentation for a list of supported AT commands and direction on issuing these commands.

OPTIONAL BLUETOOTH

The Bluetooth® option enables wireless access to the M-6200A. Utilizing the Bluetooth wireless feature the user is able to configure the control, read status and metering values, as well as change setpoints. The following lists the initialization scheme and setpoint options available for Bluetooth.

The M-6200A provides generic serial Bluetooth service. The user must select the generic serial service among any other listed services, if the user's Bluetooth device doesn't automatically recognize the available service.

The following features on the M-6200A are available to the user:

- Enable/Disable – The user can enable or disable Bluetooth functionality.
- Reset – The Bluetooth can be reset to Beckwith factory default values.
- Authentication – The device can be authenticated for security purposes, if enabled, the user can select a passkey to connect to the device.
- Passkey – If authentication is enabled, the customer can assign up to a maximum of 16 alphanumeric characters as a passkey.
- Friendly Name – The user can give the Bluetooth his/her preferred name, which can be a maximum of 20 characters, including alphanumerals as well as the '_' and '-' characters.
- Mode – The following configurations are available for the Bluetooth Mode:
  - Mode 0, the device is discoverable and connectable to any client station.
  - Mode 1, the device is non-discoverable but it is connectable to any client station that knows the control Bluetooth device address indicated under "Control BT Device" in the HMI menu.
- Protocol – MODBUS® or DNP.

Bluetooth Module Initialization

■ **NOTE**: For first time Bluetooth module use, the Bluetooth module needs to be reset to ensure that the Bluetooth module functions according to the Beckwith factory values. See "Resetting Bluetooth Module" later in this section.

Bluetooth Initialization Overview

Following a control power cycle, the M-6200A hardware is checked for Bluetooth by sending an AT command and waiting for an 'OK' response. If no response is received, a 'Bluetooth not present' message will be displayed on the HMI. If an 'ERROR' message is received, Bluetooth is reset to factory default values and the hardware is checked again.

The Bluetooth device information, i.e., BD address, friendly name, mode of device, internal operation state and status of authentication and encryption features will be retrieved, if an 'OK' message is received during the control bootup.

The Beckwith factory default values for device information are:

- Friendly Name – M6200A-Serial Number
- Mode of Device – Mode0
- Internal operation status – Standby
- Authentication: None
- Encryption: None

The retrieved Bluetooth device information is compared to the factory defaults, if they are not the same; they are forced to the default values. If internal operation status is not standby, an AT+BTCANCEL command is issued to force standby status. The mode is set by issuing a AT+BTMODE command. The friendly name is set by AT+BTNAME. The device is now in connectable mode, hence the user can use the Bluetooth device to connect to the M-6200A using the generic serial service.

Bluetooth Setup From the HMI

In order to setup the Bluetooth feature on the M-6200A from the HMI the following conditions must be present:

- The Bluetooth Factory Option must be enabled on the control
- The Bluetooth Status on the control must be "Present" and "Connectable"

To verify that these conditions are present on the control, observe the display while applying power to the control. The following sequence of messages will be displayed during the control bootup:

```
Factory Options
BLUETOOTH
```

```
Bluetooth Status
BLUETOOTH PRESENT
```

```
Bluetooth Status
CONNECTABLE
```

If the unit display messages are consistent with the above, the unit is physically ready to be setup for wireless communication.

■**NOTE**: If it becomes necessary to reset the Bluetooth module during the performance of this procedure, navigate to the Bluetooth Reset menu item and select ENT. See "Resetting Bluetooth Module" later in this section.

To setup the M-6200A Bluetooth module from the HMI, proceed as follows:

1. Press the Right Arrow (COMM Hot Button) pushbutton to awaken the unit. The menu will advance to either "COMMUNICATION" or if a Memory Card is present in the Smart Flash SD CARD slot "Memory Card".

```
        COMMUNICATION
←CNFG                 UTIL→
```

OR

```
        Memory Card
←                         →
```

2. If the "Communication" menu is displayed, then press the Down Arrow pushbutton once. The unit will display the following:

```
        Comm Settings
←                         →
```

3. From either the "Comm Settings" or "Memory Card" menu, press the Right or Left Arrow pushbutton as necessary until "Bluetooth®" is displayed.

```
          Bluetooth
←                         →
```

4. Press the Down arrow pushbutton once. The unit will display the following:

```
Bluetooth Enable
disable
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Bluetooth Enable
disable                   C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS

          _
```

■**NOTE**: When entering the Level 2 Access code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access code, then press the ENT pushbutton.

   If a valid Level 2 Access code was entered, the display will briefly flash a confirmation screen and display the following:

```
Bluetooth Enable
disable                   C
```

   If not, re-enter a valid code.

8. Utilizing the Up/Down arrow pushbuttons, select "ENABLE", then press the ENT pushbutton. The following will be displayed.

```
Bluetooth Enable
ENABLE
```

9. Press the Up/Down arrow pushbutton, as necessary, until the "Bluetooth Protocol" menu item is displayed.

```
Bluetooth Protocol
MODBUS
```

■**NOTE**: From this point on in this procedure it is assumed that a valid Access Level 2 Code has been previously entered. If not, then a valid Level 2 Access Code will be required to be entered as described in Step 7.

10. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed.

```
Bluetooth Protocol
MODBUS                    C
```

11. Utilizing the Up/Down arrow pushbuttons select "MODBUS® or DNP3.0", then press the ENT pushbutton. The selected Protocol setting will be displayed.

```
Bluetooth Protocol
MODBUS or DNP3.0
```

12. Press the Up/Down arrow pushbutton, as necessary, until the "Authentication" menu item is displayed.

```
Authentication
disable
```

13. If "Authentication" is to be ENABLED, press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed.

```
Authentication
disable                   C
```

14. Utilizing the Up/Down arrow pushbuttons select "ENABLE", then press the ENT pushbutton. The following will be displayed.

```
Please Enter Passkey
_
```

15. Utilizing the arrow pushbuttons enter the desired Passkey (up to 16 characters), then press ENT. The following sequence of screens will be displayed:

```
Please Enter Passkey
Please -WAIT-
```

```
Please Enter Passkey
-DONE-
```

```
Authentication
ENABLE
```

16. Press the Up/Down arrow pushbutton, as necessary, until the "Friendly Name" menu item is displayed.

```
Friendly Name
M6200A-XXXX (Unit Serial #)
```

17. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed.

```
Enter New Name
_
```

18. Utilizing the arrow pushbuttons, enter the desired Friendly Name value (up to 21 characters), then press the ENT pushbutton. The entered Friendly Name that was entered will be displayed.

```
Friendly Name
M6200A-XXXX (Unit Serial #)
```

The Bluetooth "Device Address" is available by pressing the Down arrow once,

```
Control BT Device
xx:xx:xx:xx:xx:xx
```

19. Press the Up/Down arrow pushbutton, as necessary, until the "Bluetooth® Mode" menu item is displayed.

```
Bluetooth Mode
Mode0
```

20. Press the "ENT" pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed.

```
Bluetooth Mode
Mode0                    C
```

21. Utilizing the arrow pushbuttons, select the desired Bluetooth Mode (0 or 1), then press the "ENT" pushbutton. The selected Bluetooth Mode will be displayed.

```
Bluetooth Mode
ModeX
```

The Bluetooth feature is now available for use.

22. If DNP3.0 was selected in Step 11 and Source Address Validation is desired, then see "Enabling Source Address Validation" earlier in this section.

Bluetooth Setup From TapTalk

In order to setup the Bluetooth feature on the M-6200A, the following conditions must be present:

- The Bluetooth Factory Option must be enabled on the control
- The Bluetooth Status on the control must be "Present" and "Connectable"

To verify that these conditions are present on the control, observe the display while applying power to the control. The following sequence of messages will be displayed during the control bootup:

```
Factory Options
BLUETOOTH
```

```
Bluetooth Status
BLUETOOTH PRESENT
```

```
Bluetooth Status
CONNECTABLE
```

If the unit HMI display messages are consistent with the above, the unit is physically ready to be setup for wireless communication.

■**NOTE**: If it becomes necessary to reset the Bluetooth module during the performance of this procedure, see "Resetting Bluetooth Module" later in this section.

To setup Bluetooth wireless communication from TapTalk®, proceed as follows:

1. Select **Communication/Setup/ Bluetooth Settings** from the TapTalk toolbar.

   Depending on the status of the Bluetooth option in the control, TapTalk will respond as follows:

   - If the Bluetooth option is disabled in the control, TapTalk will display the Bluetooth Hardware option dialog screen (Figure 4-34).
   - If the Bluetooth option is enabled in the control, TapTalk will display the Bluetooth Information dialog screen (Figure 4-33).

2. If the Bluetooth Hardware option dialog screen (Figure 4-34) is displayed, proceed as follows:

   a. If the Bluetooth hardware is present, then select "OK" to enable. TapTalk will then display the Bluetooth Information dialog screen (Figure 4-33). Go to Step 3.

   b. If the Bluetooth hardware is not present, then select "Cancel". TapTalk will return to the Main screen.

■ **NOTE:** The Bluetooth "Mode" feature will be available in a future TapTalk version.

3. Enter the desired settings for the following parameters:

   - Protocol (MODBUS® or DNP3.0)
   - Mode (0 or 1)
   - Friendly Name (20 characters max)
   - Bluetooth (Enable or Disable)
   - Authentication (Enable or Disable)
   - Set Password (16 characters max) if Authentication is "Enabled"

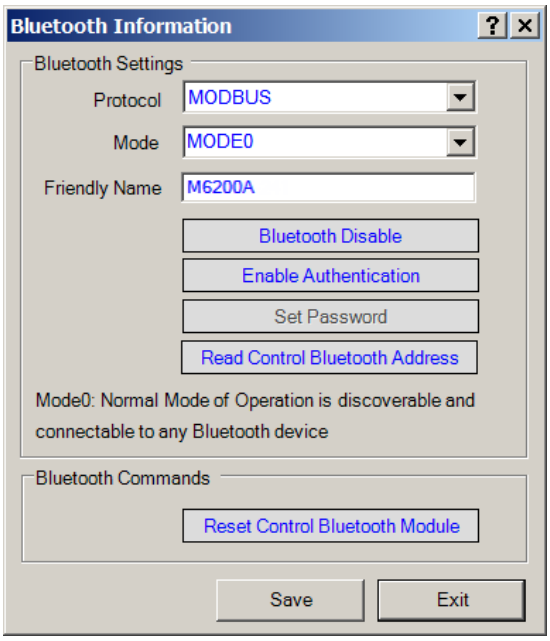


Figure 4-33 Bluetooth Information Dialog Screen

4. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

5. Verify that removing power to the control will not cause upset operation conditions on the regulator.

6. Remove power to the control, and then reapply power to the control.

   The Bluetooth feature is now available for use. Consult the Bluetooth wireless device documentation that is to be used to communicate with the M-6200A for setup information.

7. If DNP3.0 was selected in Step 3 and Source Address Validation is desired, then see "Enabling Source Address Validation" earlier in this section.

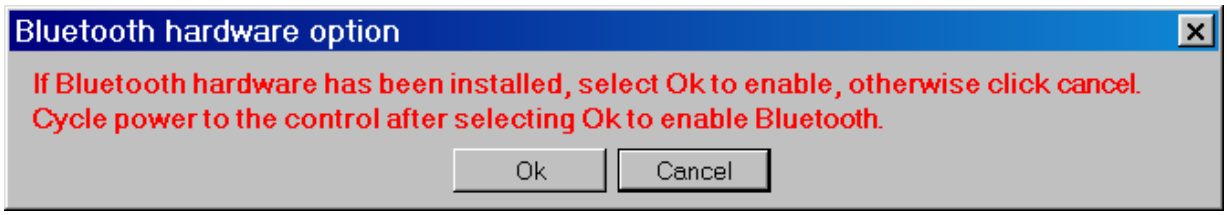


Figure 4-34 Bluetooth Option Dialog Screen

Bluetooth MODE1 Setup (TapTalk)

■ **NOTE:** The Bluetooth "Mode" feature will be available in a future TapTalk version.

When the control's Bluetooth module is set to MODE1, the only way to connect to the control is to use the Secure Non-Discoverable connection method.

1. Select **Connect/Bluetooth** from the TapTalk® toolbar. TapTalk will display the "Secure Bluetooth" dialog screen (Figure 4-35).
2. Enter the Control Name, the control MAC Address, Pass Key if needed and the Device Address.

   The user can create a Bluetooth session and save it to an address book. The session must contain a name unique to the address book, the MAC address, Pass Key and Device address.

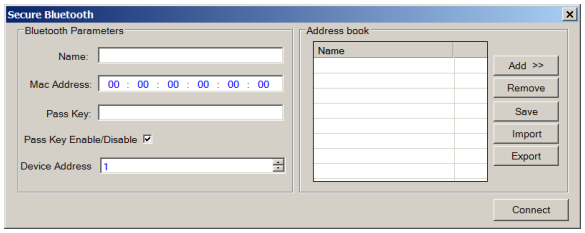


Figure 4-35 Secure Bluetooth Setup Screen

Resetting Bluetooth Module (HMI)

The Bluetooth Module can be reset to Beckwith factory values if necessary.

To reset the Bluetooth Module from the HMI proceed as follows:

1. Press the Right Arrow (COMM Hot Button) pushbutton to awaken the unit. The menu will advance to either "COMMUNICATION" or if a Memory Card is present in the Smart Flash SD CARD slot "Memory Card".

```
        COMMUNICATION
←CNFG                    UTIL→
```

OR

```
        Memory Card
←                          →
```

2. If the "Communication" menu is displayed, then press the Down Arrow pushbutton once. The unit will display the following:

```
        Comm Settings
←                          →
```

3. From either the "Comm Settings" or "Memory Card" menu, press the Right or Left Arrow pushbutton as necessary until "Bluetooth" is displayed.

```
          Bluetooth
←                          →
```

4. Press the Down arrow pushbutton as necessary to navigate to the "Bluetooth Reset" menu item.

```
Bluetooth Reset
Ready Press ENTER
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, then the following will be displayed. Go to Step 8.

```
CONFIRM PRESS ENTER
Cancel press EXIT.
```

6. If Level 2 Access is active, then the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS

_
```

■**NOTE**: When entering the Level 2 Access code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access code, then press the ENT pushbutton.

   If a valid Level 2 Access code was entered, then the display will briefly flash a confirmation screen and then display the following:

```
CONFIRM PRESS ENTER
Cancel press EXIT.
```

   If not, re-enter a valid code.

8. Press the ENT pushbutton. The following sequence of screens will be displayed:

```
Bluetooth Reset
Resetting -WAIT-
```

```
Bluetooth Reset
-DONE-
```

Resetting Bluetooth Module (TapTalk)

The Bluetooth Module can be reset to Beckwith factory values if necessary.

To reset the Bluetooth Module from TapTalk® proceed as follows:

1. Select **Communication/Setup/ Bluetooth Settings** from the TapTalk toolbar. TapTalk will display the "Bluetooth Information" dialog screen (Figure 4-33).
2. Select "Reset Control Bluetooth Module". TapTalk will respond with a "Bluetooth Reset Command Sent Successfully" confirmation screen (Figure 4-36).

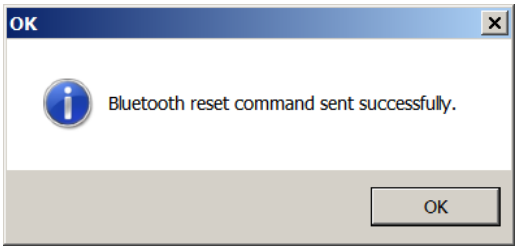


Figure 4-36 Bluetooth Reset Command Sent Confirmation Screen

3. Select "OK". TapTalk will send the "reset" command to the control and display a "Waiting for Bluetooth to Reset" status screen (Figure 4-37).

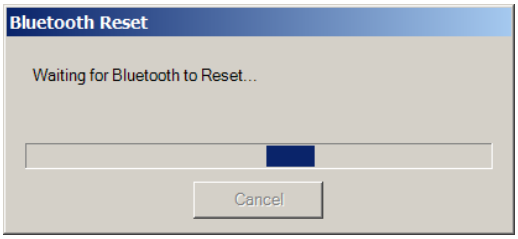


Figure 4-37 Bluetooth Reset Status Screen

When the Bluetooth Module has been reset, TapTalk will display "Bluetooth has been reset successfully" message (Figure 4-38).

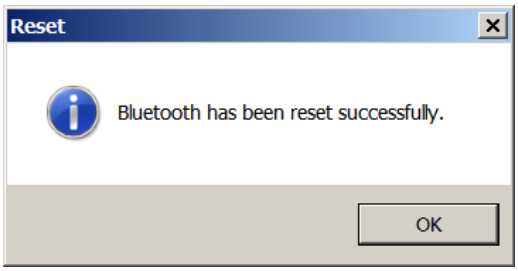


Figure 4-38 Bluetooth Reset Confirmation Screen

4. Select "OK". TapTalk will return to the "Bluetooth Information" Dialog Screen (Figure 4-33).

Resetting Bluetooth Passkey (HMI)

The Bluetooth Passkey can be reset to default conditions (no Passkey and Authentication Disabled) if necessary.

To reset the Bluetooth Passkey from the HMI proceed as follows:

1. Press the Right Arrow (COMM Hot Button) pushbutton to awaken the unit. The menu will advance to either "COMMUNICATION" or if a Memory Card is present in the Smart Flash SD CARD slot "Memory Card".

```
        COMMUNICATION
←CNFG                 UTIL→
```

OR

```
        Memory Card
←                         →
```

2. If the "Communication" menu is displayed, then press the Down Arrow pushbutton once. The unit will display the following:

```
        Comm Settings
←                         →
```

3. From either the "Comm Settings" or "Memory Card" menu, press the Right or Left Arrow pushbutton as necessary until "Bluetooth" is displayed.

```
          Bluetooth
←                         →
```

4. Press the Down arrow pushbutton as necessary to navigate to the "Bluetooth Pass Reset" menu item.

```
Bluetooth Pass Reset
Ready Press ENTER
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, then the following will be displayed. Go to Step 8.

```
CONFIRM PRESS ENTER
Cancel press EXIT.
```

6. If Level 2 Access is active, then the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS

          _
```

■**NOTE**: When entering the Level 2 Access code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access code, then press the ENT pushbutton.

   If a valid Level 2 Access code was entered, then the display will briefly flash a confirmation screen and then display the following:

```
CONFIRM PRESS ENTER
Cancel press EXIT.
```

   If not, re-enter a valid code.

8. Press the ENT pushbutton. The following sequence of screens will be displayed:

```
Bluetooth Pass Reset
Resetting -WAIT-
```

```
Bluetooth Pass Reset
-DONE-
```

```
Bluetooth Pass Reset
Ready Press ENTER
```

   The Passkey is now set to NONE and Authentication is disabled.

9. To assign a NEW Passkey, press the Up/Down arrow pushbutton, as necessary, until the "Authentication" menu item is displayed.

```
Authentication
disable
```

10. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, then the following will be displayed. Go to Step 13.

```
Authentication
disable                    C
```

11 If Level 2 Access is active, then the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS

_
```

■**NOTE**: When entering the Level 2 Access code the display will automatically advance the cursor to the next digit when input is momentarily paused.

12. Enter a valid Level 2 Access code, then press the ENT pushbutton.

    If a valid Level 2 Access code was entered, then the display will briefly flash a confirmation screen and then display the following:

```
Authentication
disable                    C
```

    If not, re-enter a valid code.

13. Utilizing the Up/Down arrow pusbuttons select "ENABLE", then press the ENT pushbutton. The following will be displayed:

```
Please Enter Passkey

_
```

14. Utilizing the arrow pushbuttons enter the desired Passkey (up to 16 characters), then press ENT. The following sequence of screens will be displayed:

```
Bluetooth Pass Reset
Resetting -WAIT-
```

```
Bluetooth Pass Reset
-DONE-
```

```
Bluetooth Pass Reset
Ready Press ENTER
```

Resetting Bluetooth Passkey (TapTalk)

The Bluetooth Passkey can be reset if necessary.

To reset the Bluetooth Passkey from TapTalk® proceed as follows:

1. Select **Communication/Setup/ Bluetooth Settings** from the TapTalk toolbar. TapTalk will display the "Bluetooth Information" dialog screen (Figure 4-33).
2. Select "Set Password". TapTalk will display the "Bluetooth Authentication Password" dialog screen (Figure 4-39).

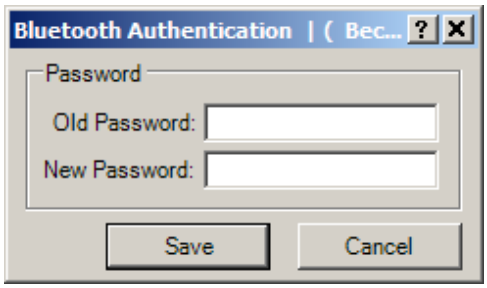


Figure 4-39 Bluetooth Authentication Password Dialog Screen

3. Enter the "Old" Password and then enter the desired "New" Password (up to 16 characters).
4. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
5. Select **OK**. TapTalk will display a "New Password written successfully" confirmation screen (Figure 4-40).

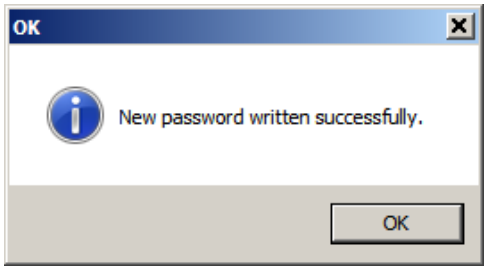


Figure 4-40 New Bluetooth Password Written Successfully Screen

6. Select **OK**. TapTalk will return to the "Bluetooth Information" Dialog screen (Figure 4-33).

SCADA HeartBeat

The purpose of the SCADA HeartBeat feature is to have sets of settings for the control and switch between these settings sets based on the presence or absence of SCADA communications to the control. In order to determine if the SCADA communications is present a HeartBeat detection algorithm is implemented.

There are three different types of SCADA HeartBeat modes:

- SCADA HeartBeat for transformer control applications (LTC)
- SCADA HeartBeat for regulator control applications (Regulator)
- Manual HeartBeat Mode

The LTC or Regulator mode has to be selected using TapTalk® Communications software or from the HMI, for these modes to be operational. But the Manual HeartBeat Mode does not need to be selected for operation.

SCADA HeartBeat for LTC and Regulator

SCADA HeartBeat, when enabled, provides an additional set of control settings called HeartBeat DNP points (HBBandcenter (Forward), HBBandwidth (Forward), etc), that are only accessible through communications utilizing the DNP protocol. Although LTC and Regulator modes are mutually inclusive (meaning if one of the options is selected, the other selection is also available), the selection is still required due to a difference in the physical input requirement. In LTC mode, the non sequential input is used as a counter input, and hence an object 10 point "Non Sequential" is made available to activate non sequential through communication. For the Regulator mode, the "Non Sequential" and "Counter" inputs are used as they are named. When SCADA HeartBeat is active, HeartBeat DNP points are used as a second set of settings.

The HeartBeat DNP points (applicable only for forward power settings) include:

- Bandcenter
- Bandwidth
- Time Delay
- LDC R
- LDC X
- Block Lower Voltage
- Block Raise Voltage
- Intertap Time Delay
- Sequential or Non-Sequential
- HeartBeat Timer Period
- Voltage Reduction 1
- Voltage Reduction 2
- Voltage Reduction 3

In order to determine the actively used settings a third group of DNP points called the Active DNP points ("Active Bandcenter (Forward)", "Active Bandwidth (Forward)" etc), can be used. Reading the Active DNP points gives the current settings used by the control, but writing always changes the Standard Non HeartBeat settings.

The SCADA HeartBeat DNP3.0 Protocol sequence for LTC and Regulator are provided in Figure 4-42. Also, Object 40 point "Write HB" is mapped by default to Point 195, "HeartBeat Timer" mapped to 159, "Direct Heartbeat" mapped to 211 and "VRed Turnoff Time" mapped to 212.

HeartBeat Manual Mode

The purpose of the Manual HeartBeat Mode feature is to provide a method to place the control in Manual operation and automatically place the control back in Auto mode based on a HeartBeat Timer setting (settable only via DNP communication). The HeartBeat Timer setting is Object 40 "Remote Manual Timer".

The Manual HeartBeat Timer is settable from 0 to 999 Minutes. When the timer is set to a non zero value it will place the control in HeartBeat Manual Mode (Auto operation blocked). If the timer expires the control is placed back in auto mode. If the timer is refreshed before it expires, the control stays in HeartBeat Manual mode.

The DNP status point (binary input Object 1) that shows if the control is in the HeartBeat Manual Mode is: "Manual HeartBeat Status". This point will be set to 1 when placed in manual using the Manual HeartBeat Timer only and not by any other means.

The HeartBeat Manual Mode is separate from the original comm block manual mode. They both perform the same function, but use a different method and DNP point to activate auto or Manual mode. When the control is in Comm Blk Manual, the Manual LED will turn on steady as before, but when in the HeartBeat Manual mode it will flash. The HeartBeat manual method can only be activated via the new HeartBeat timer setting point while the old comm blk method can be activated via comms or the SCAMP pushbutton as before.

The Comm Blk mode has priority over the HeartBeat Manual mode regardless of how it is enabled (through communication or SCAMP pushbutton). When in HeartBeat Manual mode the tap/voltage limit blocks are active just as before with comm blk mode, but in HeartBeat manual the runback due to high Voltage will also be enabled. If the control is in HeartBeat Manual mode and the comm blk manual is also turned on (via comms or SCAMP pushbutton), then the HeartBeat timer will continue to count down. If Comm Blk is turned off, then it will go back to HeartBeat Manual mode unless the HeartBeat manual timer has reached 0.

Setting SCADA HeartBeat Option

1. Select **Communication/Setup/ Heartbeat DNP Option** from the TapTalk toolbar. TapTalk will display the Heartbeat option dialog screen (Figure 4-41).

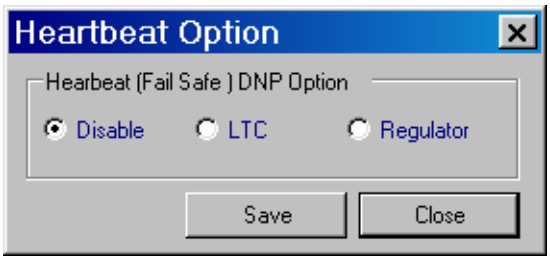


Figure 4-41 HeartBeat Dialog Screen

2. Select either "Disable", "LTC" or "Regulator".
3. Select "Save". TapTalk will momentarily display a "Setpoints Successfully written to control" confirmation screen (Figure 4-9).

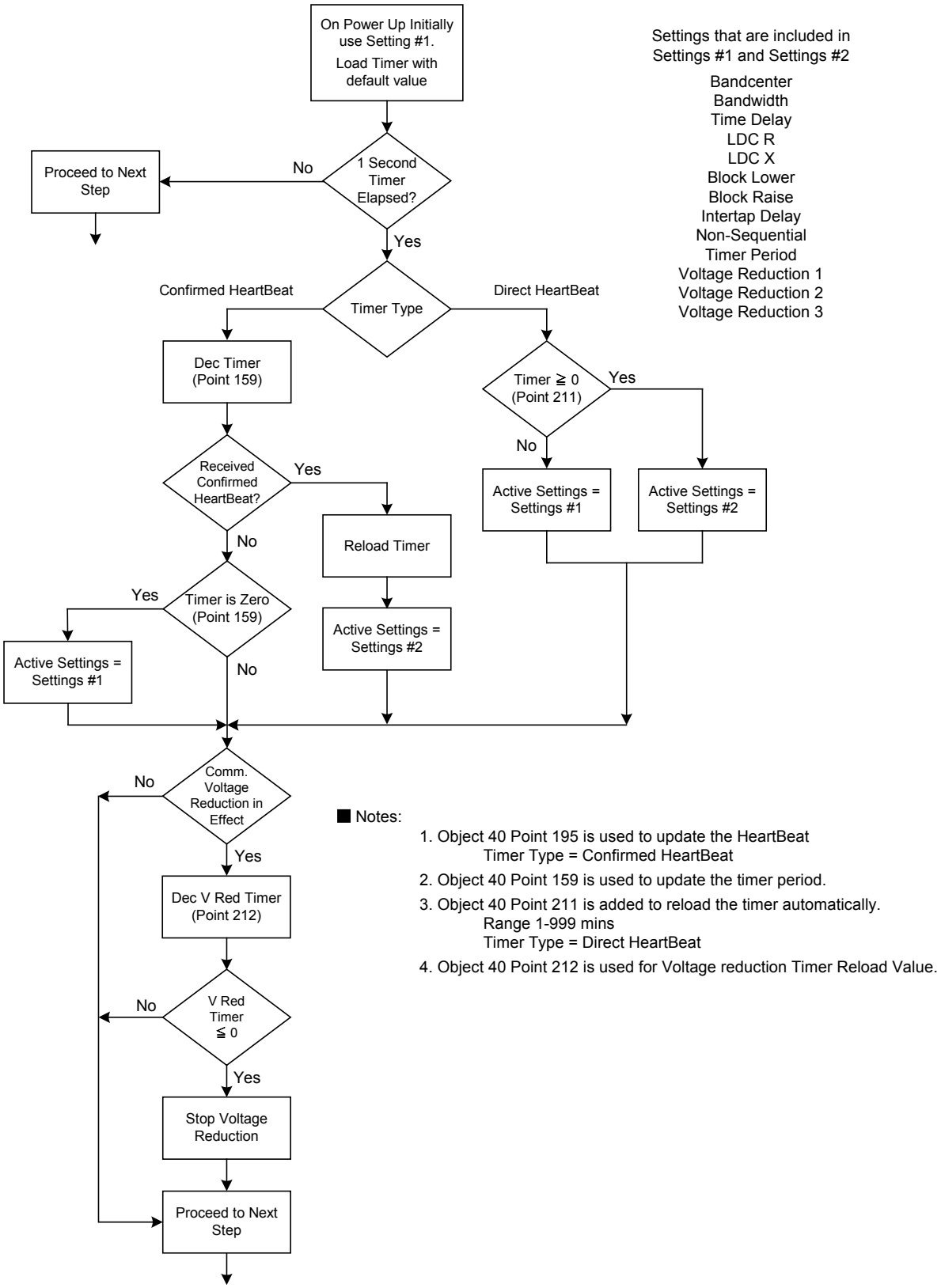


Figure 4-42 SCADA HeartBeat DNP 3.0 Protocol Sequence

4.2 Configuration

USER PROGRAMMABLE ALARM RELAY

The User Programmable Alarm Relay (Form c) is a non-latching relay that is capable of switching 6 A at 125 Vac or 0.2 A at 125 Vdc and is user-programmable to indicate one or more of the following conditions:

- Block Comm is in effect
- Block-Raise Voltage Limit exceeded
- Block-Lower Voltage Limit exceeded
- Voltage Reduction of any step is invoked
- Reverse Power Flow condition is detected
- Line Current Limit/Limit exceeded
- Tap Block Raise/Lower is in effect
- Self Test Alarm, if a Self Test failure is detected
- LDC/LDZ is in effect

  When activated, the LDC/LDZ programmable alarm will initiate when any non-zero setting has been entered as LDC Fwd resistance or reactance, or LDC-Z. It will also alarm when any non-zero setting has been entered as LDC Rev resistance or reactance with the "Reverse Power Operation" configuration set to "Regulate in Reverse" and the control in reverse power mode.
- Abnormal Tap position detected
- VAr Bias Lead Limit Exceeded
- VAr Bias Lag Limit Exceeded
- Backup Power Fail
- Motor Seal-in Failure

  The Motor Seal-in Alarm is automatically selected as an initiating input to the user programmable alarm relay when the counter configuration is set to Motor Seal-in and does not appear on the Alarm Setting dialog screen in TapTalk® or the HMI menus.
- RTN Fail to Operate/Failure detected
- Op Count Signal Limit Exceeded
- Individual Tap Wear Limit Exceeded
- Leading VAr Limit Exceeded
- Lagging VAr Limit Exceeded
- Leading Power Factor Limit Exceeded
- Lagging Power Factor Limit Exceeded

The Alarm Relay will de-energize and generate an output without any of the conditions being enabled when power to the unit is lost.

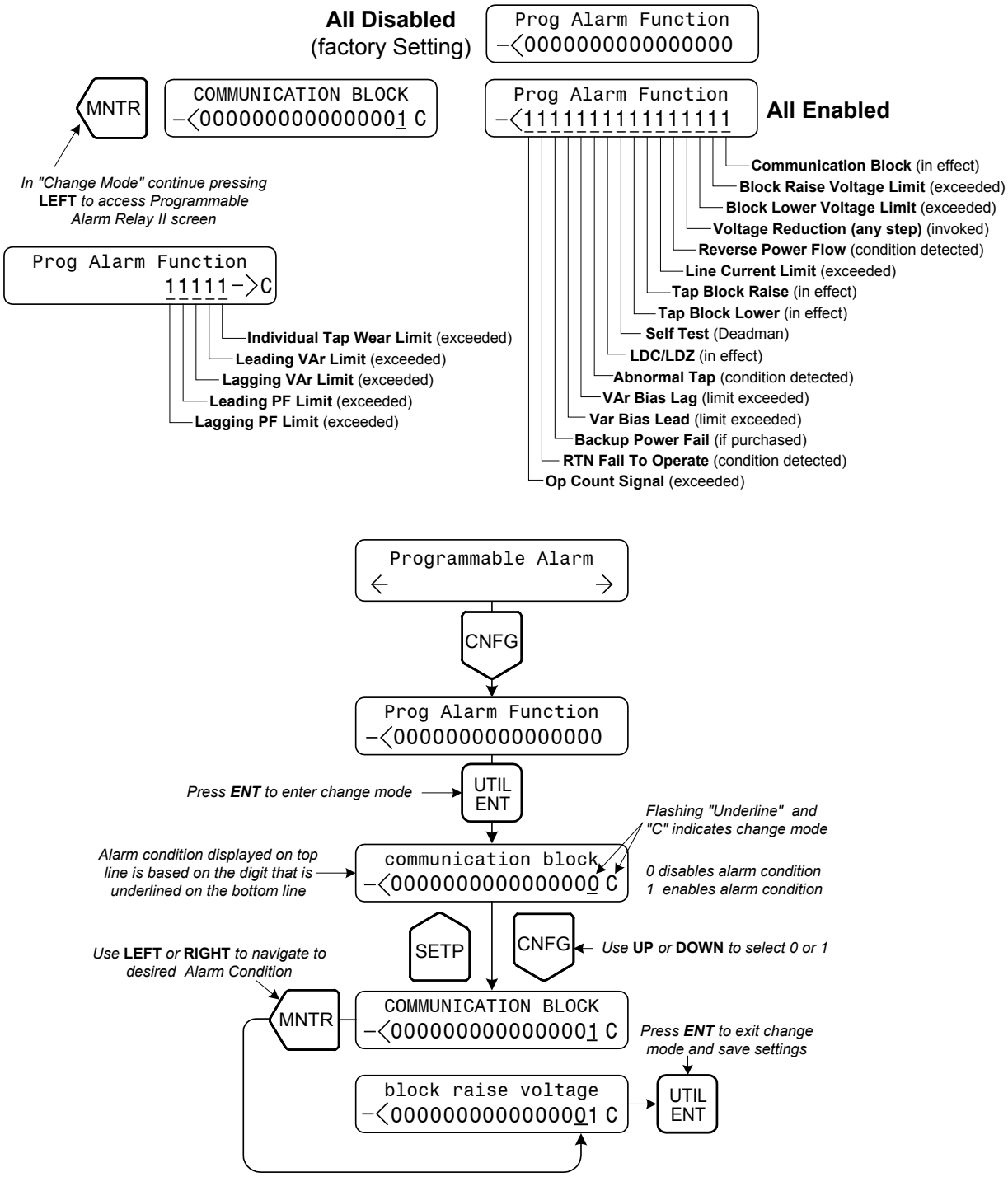


Figure 4-43 Programmable Alarm Function Programming

Setting Programmable Alarm Relay Inputs From The HMI

Each alarm condition (Figure 4-43) corresponds to one of the digits on the bottom line of the display: a "0" indicates that the alarm condition is disabled; a "1" indicates that the alarm condition is enabled.

To set the Programmable Alarm, perform the following:

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
          CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Tapchanger Type
←                        →
```

3. Press the Right or Left arrow pushbutton, as necessary, until "Programmable Alarm" is displayed.

```
      Programmable Alarm
←                        →
```

4. Press the Down arrow, as necessary, until the following is displayed.

```
Prog Alarm Function
–<0000000000000000
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
communication block
–<00000000000000000          C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS

          –
```

■**NOTE**: When entering the Level 2 Access Code, the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and then display the following:

```
communication block
–<00000000000000000          C
```

   If not, re-enter a valid code.

■**NOTE**: See Figure 4-43 for the index of alarm functions.

8. Utilizing the arrow pushbuttons, enter a "1" for those Alarm Functions to be activated and a "0" for those that are to be disabled, then press the ENT pushbutton. The following will be displayed reflecting the selections that were made.

```
Prog Alarm Function
–<0000000000000000
```

Setting Programmable Alarm Relay Inputs From TapTalk

To set the Programmable Alarm Relay from TapTalk® perform the following:

1. Select **Setup/Alarms** from the TapTalk toolbar. TapTalk will display the Alarms dialog screen (Figure 4-44).
2. Select the desired Programmable Alarm relay inputs.
3. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
4. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

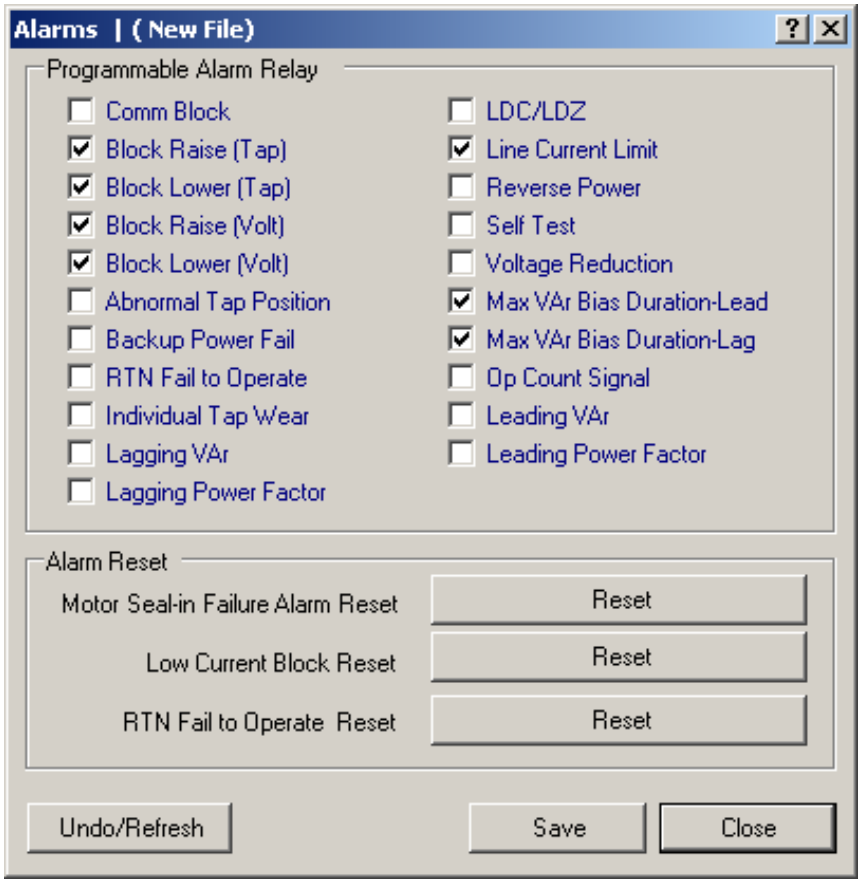


Figure 4-44 Programmable Alarm Relay Setting Dialog Screen

VAR AND POWER FACTOR ALARMS

With the advent of Integrated Volt VAr Control (IVVC), utilities are starting to monitor and control the voltage and power factor to reduce load and line losses. Power factor can only be controlled to the resolution of the smallest switched capacitor bank on the circuit. For instance, if a utility has 600 kVAr switched banks on a feeder and enough of them are in service, then the power factor should always be between 600 kVar Lead and 600 kVAr Lag. If the power factor is outside this range for any length of time, then one of the following conditions is occurring:

- When the power factor is lagging more than 600 kVAr the circuit probably needs more capacitor banks.
- When the circuit is more than 600 kVAr lagging and one or more banks are not closed, then there is an issue with the control scheme (whether it is a central control or local control).
- An existing bank may be out of service. By having the controls measure the power factor ranges at different locations on the grid, one can be alarmed if the control algorithm is not functioning properly or if the controls or capacitors of neighboring cap banks are out of service.

This can also be caused by improper settings. A capacitor bank may need to close to provide VArs under a lagging power factor but may be blocked due to an out of range delta voltage or due to harmonics. This will further alarm the remote users as to the local conditions.

Setting VAr and Power Factor Alarm Settings From The HMI

■**NOTE**: The following sequence of steps are for setting the Leading VAr Alarm. The steps used to set the Lagging VAr Alarm, Leading Power Factor Alarm and Lagging Power Factor Alarm are the same.

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
        CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Tapchanger Type
←                        →
```

3. Press the Right or Left arrow pushbutton, as necessary, until "Nameplate" is displayed.

```
          Nameplate
←                        →
```

4. Press the Down arrow, as necessary, until the following is displayed.

```
Leading VAr Alarm
  300 kVAr
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Leading VAr Alarm
  300 kVAr                 C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
          _
```

■**NOTE**: When entering the Level 2 Access Code, the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and then display the following:

```
Leading VAr Alarm
  300 kVAr                 C
```

   If not, re-enter a valid code.

8. Utilizing the Up/Down arrow pushbuttons enter the desired Leading VAr Alarm value from 150 to 4800 kVAr, then press the ENT pushbutton. The following will be displayed reflecting the Leading VAr Alarm value that was entered.

```
Leading VAr Alarm
  xxx kVAr
```

Setting VAr/Power Factor Alarm Time Delay From The HMI

To set the VAr/Power Factor Alarm Time Delay, perform the following:

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
        CONFIGURATION
←SETP                  COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
       Tapchanger Type
←                        →
```

3. Press the Right or Left arrow pushbutton, as necessary, until "Nameplate" is displayed.

```
          Nameplate
←                        →
```

4. Press the Down arrow, as necessary, until the following is displayed.

```
VAr/PF Alrm Time Dly
    0 Sec
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
VAr/PF Alrm Time Dly
    0 Sec                C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
          _
```

■**NOTE**: When entering the Level 2 Access Code, the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and then display the following:

```
VAr/PF Alrm Time Dly
    0 Sec                C
```

   If not, re-enter a valid code.

8. Utilizing the Up/Down arrow pushbuttons enter the desired VAr/PF Alarm Time Delay value from 0 to 3600 seconds, then press the ENT pushbutton. The following will be displayed reflecting the VAr/PF Alarm Time Delay value that was entered.

```
VAr/PF Alrm Time Dly
    x Sec
```

Setting Minimum Current for Power Factor Alarms From The HMI

To set the Minimum Current for Power Factor Alarms, perform the following:

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
        CONFIGURATION
←SETP                  COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
       Tapchanger Type
←                        →
```

3. Press the Right or Left arrow pushbutton, as necessary, until "Nameplate" is displayed.

```
            Nameplate
←                                  →
```

4. Press the Down arrow, as necessary, until the following is displayed.

```
Min I for PF Alarms
  10 mA
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Min I for PF Alarms
  10 mA                          C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
          _
```

■**NOTE**: When entering the Level 2 Access Code, the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and then display the following:

```
Min I for PF Alarms
  10 mA                          C
```

   If not, re-enter a valid code.

8. Utilizing the Up/Down arrow pushbuttons enter the desired Minimum Current for Power Factor Alarms value from 5 to 200 mA, then press the ENT pushbutton. The following will be displayed reflecting the value that was entered.

```
Min I for PF Alarms
  xx mA
```

Setting VAr and Power Factor Alarm Settings From TapTalk

To select the Leading/Lagging VAr Alarm, Leading/Lagging Power Factor Alarm settings, the VAr/PF Alarm Time Delay and the Minimum Current for Power Factor Alarms perform the following:

1. Select **Setup/Configuration** from the TapTalk® toolbar. TapTalk will display the Configuration dialog screen (Figure 4-47).
2. From the "VAr and Power Factor Alarms Settings" section of the dialog screen select the desired Leading VAr Alarm setting (150 to 4800 kVAr).
3. Select the desired Lagging VAr Alarm setting (150 to 4800 kVAr).
4. Select the desired Leading Power Factor Alarm setting (0.85 to 0.99).
5. Select the desired Lagging Power Factor Alarm setting (0.80 to 0.98)
6. Select the desired VAr/PF Alarm Time Delay setting (0 to 3600 seconds)
7. Select the desired Minimum Current for Power Factor Alarms setting (5 to 200 mA)
8. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
9. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

PREDICTIVE MAINTENANCE ALARM

The Predictive Maintenance Alarm feature provides the user with the ability to set a predefined alarm point for the number of tap changes initiated by the control. When the predefined alarm setting is exceeded, the following alarm message will be displayed on the HMI screen:

```
Pred. Maint. Alarm
Rst Op Count  XXX
```

Setting Predictive Maintenance Alarm From The HMI

To set the Predictive Maintenance Alarm, perform the following:

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
Tapchanger Type
←                        →
```

3. Press the Right or Left arrow pushbutton, as necessary, until "Programmable Alarm" is displayed.

```
Programmable Alarm
←                        →
```

4. Press the Down arrow, as necessary, until the following is displayed.

```
Pred. Maint. Alarm
        0
```

5. Press the ENT pushbutton. If Level 2 Access is not active, or has been previously input, the following will be displayed. Go to Step 8.

```
Pred. Maint. Alarm
        0                C
```

6. If Level 2 Access is active, then the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
        _
```

■**NOTE**: When entering the Level 2 Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Pred. Maint. Alarm
        0                C
```

   If not, re-enter a valid code.

8. Utilizing the Up/Down arrow pushbuttons enter the desired alarm value, then press the ENT pushbutton. The following will be displayed reflecting the selections that were made.

```
Pred. Maint. Alarm
        X
```

Setting Predictive Maintenance Alarm From TapTalk

To set the Predictive Maintenance Alarm from TapTalk® perform the following:

1. Select **Setup/Tap Settings** from the TapTalk toolbar. TapTalk will display the Tap Settings dialog screen (Figure 4-45).
2. From the "Operation Counter" section of the Tap Settings screen select the desired Predictive Maintenance Alarm setpoint. This setting also determines the trigger for the "Op Count Signal" Programmable Alarm if enabled.
3. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
4. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

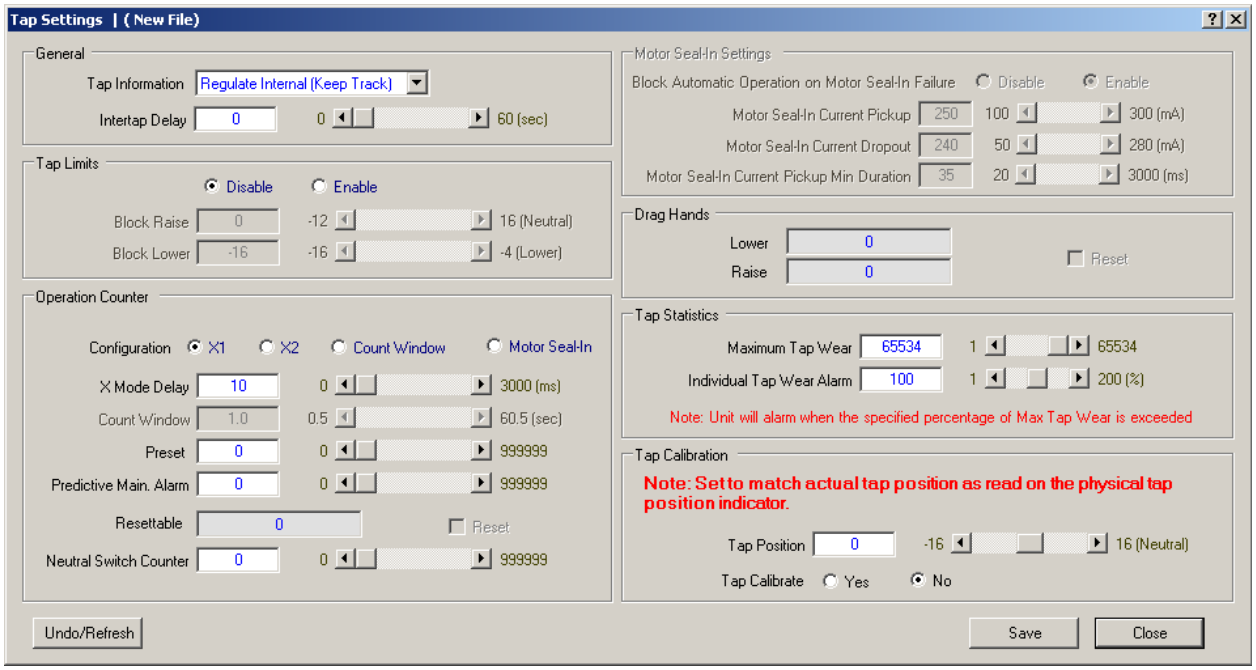


Figure 4-45 Tap Settings Dialog Screen

HARMONICS SETUP

The Harmonics Calculation feature provides the user with the ability to set predefined harmonic voltage and current thresholds (individual, voltage percent from 0 to 30%, current percent from 0 to 100%) for the selected harmonics. Current Threshold includes a minimum Current Threshold setting from 0 to 200 mA. Also, a common delay setting from 1 to 10 seconds is available.

The Harmonic voltage and/or current threshold Pickup and Dropout can be selected as inputs to trigger the Oscillograph Recorder. The Harmonic voltage/current Pickup or the voltage/current Dropout can be selected to trigger the Sequence of Events Recorder.

Setting the Active Harmonics Inputs to the Oscillograph and Sequence of Events Recorders From The HMI

To set the Voltage and Current Harmonics Inputs, perform the following:

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
          CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Tapchanger Type
←                        →
```

3. Press the Right or Left arrow pushbutton, as necessary, until "Harmonics Setup" is displayed.

```
        Harmonics Setup
←                        →
```

4. Press the Down arrow pushbutton, as necessary, until the desired Harmonic setting screen is displayed. In this example the "V 2-16 Har. Alarm" will be setup.

```
V 2-16 Har. Alarm
 011111111111111
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
HARMONIC  2
 011111111111111            C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS

          _
```

■**NOTE**: When entering the Level 2 Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and then display the following:

```
HARMONIC  2
 011111111111111            C
```

   If not, re-enter a valid code.

■**NOTE**: The cursor will be positioned under the far right hand zero which corresponds to Harmonic 2. The remaining Harmonic selections are displayed by moving the cursor to the left.

8. Utilizing the Up/Down arrow pushbuttons enter a "1" for those Harmonics to be activated and a "0" for those that are to be disabled, then press the ENT pushbutton. The following will be displayed reflecting the selections that were made.

```
V 2-16 Har. Alarm
 XXXXXXXXXXXXXXX
```

9. If additional Harmonic Inputs to the Oscillograph and Sequence of Events recorders are to be setup, navigate to the desired harmonic screen within the "Harmonics Setup" menu, then repeat Steps 4 through 8.

10. If all Harmonic inputs have been selected, proceed to the Voltage Alarm Threshold, Current Alarm Threshold and Harmonic Alarm Delay settings in this section.

Setting the Harmonic Voltage, Current Threshold and Minimum Current Threshold setting(s) From The HMI

■**NOTE**: The following sequence of steps are for setting the Voltage Alarm threshold. The steps used to set the Current Alarm Threshold and Minimum Current Threshold are the same.

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
          CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Tapchanger Type
←                        →
```

3. Press the Right or Left arrow pushbutton, as necessary, until "Harmonics Setup" is displayed.

```
        Harmonics Setup
←                        →
```

4. Press the Down arrow pushbutton, as necessary, until the desired "Alarm Threshold" setting screen is displayed. In this example the Voltage Alarm Threshold will be setup.

```
V Alarm Threshold
  10.0 %
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
V Alarm Threshold
  10.0 %                    C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
          _
```

■**NOTE**: When entering the Level 2 Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and then display the following:

```
V Alarm Threshold
  10.0 %                    C
```

   If not, re-enter a valid code.

8. Utilizing the Up/Down arrow pushbuttons enter the desired Voltage Alarm Threshold value from 1 to 30%, press the ENT pushbutton. The following will be displayed reflecting the Voltage Alarm Threshold value that was entered.

```
V Alarm Threshold
  XX.X %
```

Setting the Harmonic Voltage and Current Threshold Delay from the HMI

To set the Voltage Threshold and Current Threshold delay setting, perform the following:

■**NOTE**: This delay setting applies to both the Voltage Threshold and the Current Threshold.

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
          CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Tapchanger Type
←                        →
```

3. Press the Right or Left arrow pushbutton, as necessary, until "Harmonics Setup" is displayed.

```
        Harmonics Setup
←                        →
```

4. Press the Down arrow pushbutton, as necessary, until the "Harmonic Alarm Delay" setting screen is displayed.

```
Harmonic Alarm Delay
 10 s
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Harmonic Alarm Delay
 10 s                     C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS

          _
```

■**NOTE**: When entering the Level 2 Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and then display the following:

```
Harmonic Alarm Delay
 10 s                     C
```

   If not, re-enter a valid code.

8. Utilizing the Up/Down arrow pushbuttons, enter the desired Threshold Delay value from 1 to 10 Seconds, then press the ENT pushbutton. The following will be displayed reflecting the Harmonic Alarm Delay value that was entered.

```
Harmonic Delay
 XX s
```

Setting the Active Harmonics Inputs to the Oscillograph and Sequence of Events Recorders From TapTalk

To select the Voltage and Current Inputs, Voltage and Current Threshold settings and the Voltage/Current Delay perform the following:

1. Select **Setup/Harmonics Setup** from the TapTalk® toolbar. TapTalk will display the Harmonics Setup dialog screen (Figure 4-46).
2. Select the desired Voltage Harmonics and Voltage Threshold setting.
3. Select the desired Current Harmonics, Current Threshold and Minimum Current Threshold setting.
4. Select the desired Voltage & Current Delay setting.
5. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
6. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

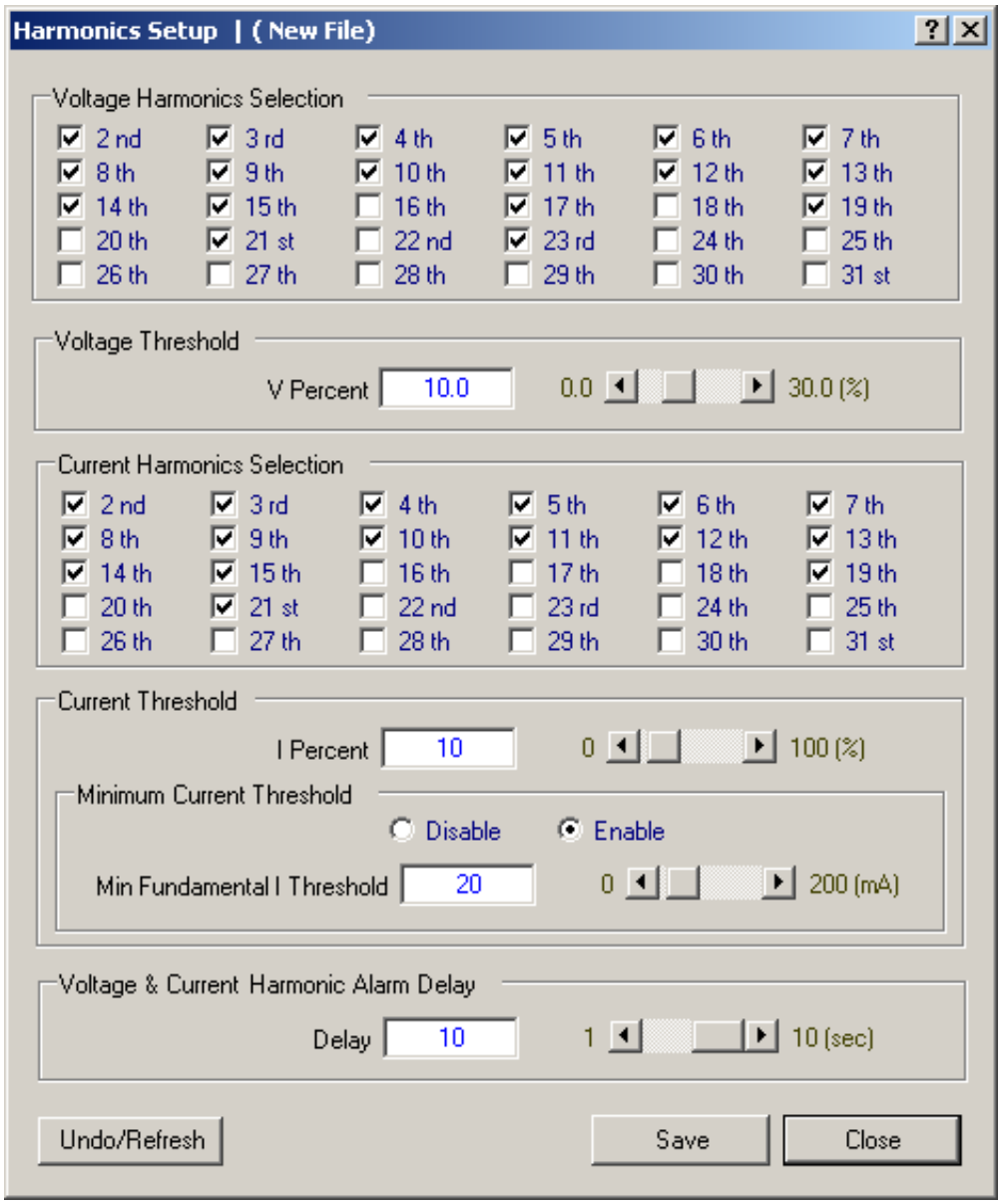


Figure 4-46 Harmonics Setup Dialog Screen

COUNTERS

Operation Counter

The user must select the method of counting tapchanger operations consistent with the tapchanger. Cooper Regulators do not provide a counter contact. Therefore, the "Motor Seal-In" feature must be enabled. See "Enable/Disable Motor Seal-In" in this section.

X1 – Operation count will increment by one with an open-close-open state change on the tapchanger counter switch. The closed state must be present for at least 20 ms. The open state may be present indefinitely.

X Mode Delay – When the control is using X1 or X2 Mode counter contact detection method, the X Mode Delay feature can be used as follows:

Minimum Time Duration for X1/X2 Counter Contact Signal – The X Mode Delay setting in millisecond can be used to define the minimum time duration for the X1(2) counter contact signal. Any signal duration of less than the X Mode Delay will be considered as an invalid counter contact signal. Depending on the condition of the counter contact switch, the X Mode Delay should be set between 10–20 mS.

Neutral Position Switch Detection Delay – The X Mode Delay setting in millisecond can be used to delay the detection of the **NEUTRAL** position switch. This is sometimes necessary if the regulator activates the counter contact switch before the neutral switch when moving to the neutral position. The default value is 10 ms.

For greater noise immunity a debounce window of 160 ms exists after valid count operation.

X2 – Operation count will increment by one with either an open-close or a close-open state change of the tapchanger operation counter switch. Both the closed and open states may exist indefinitely.

When the control is in X2 Mode detection, the X Mode Delay setting is used to delay the detection and processing of the next X2 counter contact signal. This is necessary especially in the case where the neutral signal starts before the next counter contact signal when the voltage regulator is moving to neutral.

Extensive field trials indicate that a setting of 10 will allow all regulator types to operate correctly. It should be noted that the utility menu of the control HMI interface under Utility -> Calibration/Test -> X1 Duration will display a value in ms that can be monitored during tap operations of the regulator to fine tune the X mode delay setting.

▲ **CAUTION**: The Count Window setting should not be set to a value greater than the Intertap Delay when in pulsed or continuous mode. Also, it should not be set greater than the Pulse Width setting, if Pulsed mode is used.

Count Window – Operation count will increment by only one count during a set time period of "Count Window". This is true no matter how many counter inputs occur during the count window time. After a counter input is accepted, the count window timer begins and another count won't be accepted until the count window time expires. The count window time can be set from 0.5 to 60.5 seconds.

The Operation Counter accommodates 999,999 operation counts. The number of counts are stored in non-volatile memory and are not affected by a loss of supply power to the control. The total number of operation counts is displayed in the Status Menu. The Operation Counter can be preset to any value up to 999,999.

Neutral Switch Counter – The Neutral Switch Counter is updated each time the neutral input is detected. Neutral Switch Counter can also preset to any value. The Neutral Switch Counter is a software counter that is stored in non-volatile memory and has a maximum value of 999,999.

Setup the Operation Counter Configuration From The HMI

To setup the Operation Counter Configuration, perform the following:

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
          CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Tapchanger Type
←                        →
```

3. Press the Right or Left arrow pushbutton, as necessary, until "Tap Settings" is displayed.

```
          Tap Settings
←                        →
```

4. Press the Down arrow pushbutton, as necessary, until the "Operation Counter Configuration" screen is displayed.

```
Op Counter Config
    1 X
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Op Counter Config
    1 X                  C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS

          _
```

■**NOTE**: When entering the Level 2 Access Code, the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and then display the following:

```
Op Counter Config
    1 X                  C
```

   If not, re-enter a valid code.

8. Utilizing the Up/Down arrow pushbuttons, select the desired counter configuration for the application (1 X, 2 X or COUNT WINDOW), then press the ENT pushbutton. The following will be displayed reflecting the counter configuration that was entered.

```
Op Counter Config
    1 X, 2 X or COUNT WINDOW
```

9. Depending on the Operation Counter configuration that was selected in Step 8, proceed as follows to complete the Operation Counter configuration:
   - If the "1 X" or "2 X" counter configuration was selected, proceed to the "Setting the Operations X Mode Delay from the HMI" section of this chapter and ensure that a setting of 10 ms is entered.
   - If the "COUNT WINDOW" counter configuration was selected, proceed to the "Setting the Operation Counter Time Window" section of this chapter.

Setting Operation X Mode Delay From The HMI

To set the Operation X Mode Delay, perform the following:

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
        CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Tapchanger Type
←                        →
```

3. Press the Right or Left arrow pushbutton, as necessary, until "Tap Settings" is displayed.

```
        Tap Settings
←                        →
```

4. Press the Down arrow pushbutton, as necessary, until the "X Mode Delay" screen is displayed.

```
X Mode Delay
  10 ms
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
X Mode Delay
  10 ms                  C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
          _
```

■**NOTE**: When entering the Level 2 Access Code, the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and then display the following:

```
X Mode Delay
  10 ms                  C
```

   If not, re-enter a valid code.

8. Utilizing the Up/Down arrow pushbuttons select the desired X Mode Delay value for the application (0 to 3000 mS), then press the ENT pushbutton. The following will be displayed reflecting the X Mode Delay setting that was entered.

```
X Mode Delay
10 mS
```

Setting Operation Counter Time Window From The HMI

To set the Operation Counter Time Window, perform the following:

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
        CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Tapchanger Type
←                        →
```

3. Press the Right or Left arrow pushbutton, as necessary, until "Tap Settings" is displayed.

```
        Tap Settings
←                        →
```

4. Press the Down arrow pushbutton, as necessary, until the "Counter Time Window" screen is displayed.

```
Counter Time Window
   0.5 Sec
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Counter Time Window
   0.5 Sec                    C
```

6. If Level 2 Access is active, then the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
          _
```

■ **NOTE**: When entering the Level 2 Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and then display the following:

```
Counter Time Window
   0.5 Sec                    C
```

   If not, re-enter a valid code.

8. Utilizing the arrow pushbuttons select the desired "Counter Time Window" value for the application (0.5 to 60.5 Seconds), then press the ENT pushbutton. The following will be displayed reflecting the Counter Time Window setting that was entered.

```
Counter Time Window
   X.X Sec
```

Configuring the Operation Counter From TapTalk

To configure the Operation Counter, perform the following:

1. Select **Setup/Tap Settings** from the TapTalk® toolbar. TapTalk will display the Tap Settings dialog screen (Figure 4-45).
2. Select the desired Operation Counter configuration (X1, X2, Count Window or Motor Seal-In).
3. If "X1, X2 or Motor Seal-In" configuration was selected in Step 2, enter the desired "X Mode or Seal-In Delay" setting (0 to 3000 mS).
4. If "Count Window" configuration was selected in Step 2, enter the desired "Count Window" setting (0.5 to 60.5 seconds).
5. Select **Save**. TapTalk will display a "Save to Device" confirmation screen (Figure 4-2).
6. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

■ **NOTE**: This setting is also available in the Setup/Tapchanger Type dialog screen. See **Section 4.4 Tap Changer Type Selections**.

MOTOR SEAL-IN SETTINGS

Motor Seal-in Failure Block

The Motor Seal-in Failure Block feature addresses the following scenarios that can occur on Cooper regulators which can result in incorrect tap position, a failure of the regulator to regulate voltage, or both conditions simultaneously.

- Failing or open motor capacitor (Stalled Tapchanger). If the motor capacitor degrades over time, it will result in a motor that does not always have enough torque to operate correctly. Eventually, it will degrade enough to prevent any operation of the motor. The result of this scenario is a regulator that intermittently and eventually permanently fails to regulate voltage and cannot track tap position accurately.
  - — The Motor Seal-in Failure Block feature will block the regulator from operating and actuate an alarm to alert the user to this malfunction. If the motor capacitor is not open but degraded, then input voltage affects the motor's ability to operate. For this reason, instead of blocking the regulator operation permanently, it will only block in the direction it was moving when the Motor Seal-in Failure Block feature was triggered.
- Low motor voltage (Stalled Tapchanger), for example a brown out condition, could result in a motor temporarily not having enough torque to operate correctly. The result of this scenario is a regulator that intermittently fails to regulate voltage and cannot track tap position accurately.
  - — In this scenario, the motor also does not have enough torque to execute a tapchange. The Motor Seal-in Failure Block feature will operate the same as it does for a failing or open motor capacitor except that once voltage is restored, the control will operate normally. The alarm will alert the user to the low voltage condition and its effect on the regulator.
- The Motor Seal-in Switch in the Cooper regulator may malfunction in either one direction or both. The result of this condition is a regulator that cannot track tap position accurately.
  - — In this scenario, the motor is capable of turning, but tap position will be inaccurate as the circuit's proper operation is the only method of tracking tap position accurately. Since it is possible for the motor Seal-in switch to fail in only one direction, the blocking function of the Motor Seal-in Failure feature is designed to be unidirectional such that it will allow the regulator to operate in the opposite direction that caused the block to occur.
  - — The Motor Seal-in Failure Block feature actuates an alarm to alert the user to the problem. The operation block would not be needed in this scenario as loss of accurate KeepTrack™ is the only negative consequence of the malfunction. Since the unit cannot detect the difference between this failure and the Stalled Tapchanger scenario, the block must be in effect. The block function of this feature can be disabled by the user if it is desired to continue operating the regulator with this failure until it can be repaired. The alarm however, will remain in effect as long as the failure conditions exist.
- Reaching a Physical Tap Limit as set in the regulator. When the tap limit is reached, motor power is physically disconnected from the raise or lower motor windings in the direction of the tap limit and operation in that direction cannot occur.
  - — This scenario removes motor power from the raise or lower motor winding when the associated physical tap limit is reached. There is no negative consequence of this occurring when the Motor Seal-in Failure Block feature is disabled. With the Motor Seal-in Failure Block feature enabled however, the control cannot detect the difference between Reaching a Physical Tap Limit and a Motor Seal-in Switch failure, so it must block and alarm.

— The unidirectional nature of the block is designed for this scenario as well as a Motor Seal-in Switch failure to allow operation of the regulator in the opposite direction when needed. Alarming in this condition can provide the user with information that there may be a settings error or an upstream Fixed Tap Transformer may be tapped incorrectly as a regulator should not normally need to issue a raise or lower command when at its physical limit.

When Motor Seal-in is selected in the control the Motor Seal-in Failure Block feature and the input to the Abnormal Tap Position alarm are enabled by default. The user may choose to disable the Motor Seal-in Block feature. However, the input to the Abnormal Tap Position alarm is always enabled when Motor Seal-in is selected. The feature includes the following:

Abnormal Tap Position Alarm Input - The Motor Seal-in Failure Block feature provides an input to the "Abnormal Tap Position" alarm. This input is actuated on the first occurrence of a tapchange coincident with no motor seal-in current detected for 15 seconds.

Motor Seal-in Failure Alarm - The Motor Seal-in Failure Alarm is actuated on the second occurrence (either direction) of a tapchange coincident with no motor seal-in current detected for 15 seconds. This alarm can be reset by the user from the Human Machine Interface (HMI), from the TapTalk "Alarms" dialog screen or via SCADA. The alarm is also reset when a successful tapchange operation occurs (motor seal-in current detected) in either direction.

Motor Seal-in Failure Block - The Motor Seal-in Failure Block is actuated on the second occurrence of a tapchange coincident with no motor seal-in current detected for 15 seconds in either direction. The block will be in effect in the direction that produced the second Motor Seal-in Failure occurrence. If a Motor Seal-in Failure is detected in the opposite direction, then operation will be blocked in that direction also.

This Block can be reset by the user from the HMI, from the TapTalk "Alarms" dialog screen or via SCADA. The block is also reset when a successful tapchange operation occurs (motor seal-in current is detected) in the opposite direction.

The internal accumulator that counts the occurrences of failed tapchanges is stored in volatile memory and is set to zero when a loss of power occurs and the unit is not equipped with a backup power supply. This is considered normal operation of the feature.

Motor Seal-in Current Pickup

The Motor Seal-in Current Pickup setting determines what level the motor current must exceed to trigger the control to turn off its output and allow the Cooper Motor Seal-in circuit to complete the tap operation. This setting works in conjunction with the Motor Seal-in Current Pickup Minimum Duration setting.

Motor Seal-in Current Dropout

The Motor Seal-in Current Dropout setting determines how low the motor current must drop (after the Motor Seal-in Current Pickup Min Duration has been exceeded) to trigger the control to increment the operations counter and tap position.

Motor Seal-in Current Pickup Min. Duration

The Motor Seal-in Current Pickup Minimum Duration setting determines how long the motor current must be above the Motor Seal-in Current Pickup before the control removes its output and looks for the Motor Seal-in Current Dropout to occur as described above.

Enable/Disable Motor Seal-In From The HMI

To Enable/Disable Motor Seal-In and set the Motor Seal-In Delay from the HMI, proceed as follows:

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
          CONFIGURATION
←SETP                          COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Tapchanger Type
←                       →
```

3. Press the Right or Left arrow pushbutton, as necessary, until "Tap Settings" is displayed.

```
         Tap Settings
←                       →
```

4. Press the Down arrow pushbutton, as necessary, until the "Motor Seal-In" screen is displayed.

```
Motor Seal-In
disable
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Motor Seal-In
disable                    C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
          _
```

■**NOTE**: When entering the Level 2 Access Code, the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and then display the following:

```
Motor Seal-In
disable                    C
```

   If not, re-enter a valid code.

8. Utilizing the Up/Down arrow pushbuttons, select either "ENABLE or disable", then press the ENT pushbutton. The following will be displayed reflecting the mode that was selected.

```
Motor Seal-In
ENABLE or disable
```

9. Press the Down arrow pushbutton, as necessary, until "Motor Seal-In Delay" screen is displayed.

```
Motor Seal-In Delay
   10 ms
```

10. Press the ENT pushbutton. A "C" will be displayed on the bottom line indicating that the Delay can be edited.

```
Motor Seal-In Delay
   10 ms                   C
```

11. Utilizing the arrow pushbuttons, enter the desired Motor Seal-In Delay, then press the ENT pushbutton. The following will be displayed reflecting the value that was entered.

```
Motor Seal-In Delay
   XX ms
```

Enable/Disable Motor Seal-In From TapTalk

To Enable/Disable Motor Seal-In and set the Motor Seal-In Delay from TapTalk®, proceed as follows:

1. Select **Setup/Tap Settings** from the TapTalk toolbar. TapTalk will display the Tap Settings dialog screen (Figure 4-45).
2. From the "Operation Counter" section of the dialog screen select "Motor Seal-In". The X Mode Delay setting will become the "Seal-In Delay" setting.
3. Enter the desired Seal-In Delay value, then select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
4. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

Setting Motor Seal-in Failure Alarm/Block and Current Pickup/Dropout/Duration From The HMI

To set the Motor Seal-in Failure Alarm and Current Pickup/Dropout/Duration, perform the following:

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
          CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Tapchanger Type
←                          →
```

3. Press the Right or Left arrow pushbutton, as necessary, until "Tap Settings" is displayed.

```
          Tap Settings
←                          →
```

4. Press the Down arrow, as necessary, until the following is displayed.

```
Seal-in Fail Block
ENABLE
```

5. Press the ENT pushbutton. If Level 2 Access is not active, or has been previously input, the following will be displayed. Go to Step 8.

```
Seal-in Fail Block
ENABLE                       C
```

6. If Level 2 Access is active, then the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
          _
```

■**NOTE**: When entering the Level 2 Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Seal-in Fail Block
ENABLE                       C
```

   If not, re-enter a valid code.

8. Utilizing the Up/Down arrow pushbuttons select enable, then press the ENT pushbutton. The following will be displayed reflecting the selections that were made.

```
Seal-in Fail Block
ENABLE or disable
```

9. Depending on the selection in Step 8, proceed as follows to complete the Motor Seal-in Fail Block setup:
   - If Seal-in Fail Block was "ENABLED", proceed to Step 10.
   - If Seal-in Fail Block was "DISABLED", no further action is required.

10. Press the Down arrow pushbutton, as necessary, until the "MS Current Pickup" screen is displayed.

```
MS Current Pickup

 250 mA
```

11. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 14.

```
MS Current Pickup
 250 mA                      C
```

12. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS

          _
```

■**NOTE**: When entering the Level 2 Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

13. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

    If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
MS Current Pickup
 250 mA                    C
```

    If not, re-enter a valid code.

14. Utilizing the arrow pushbuttons, enter the desired "Motor Seal-in Current Pickup" (100 to 300 mA), then press the ENT pushbutton. The following will be displayed reflecting the Motor Seal-in Current Pickup value that was entered.

```
MS Current Pickup

 XXX mA
```

■**NOTE**: From this point on in this procedure, it is assumed that a valid Access Level 2 Code has been previously entered. If not, then a valid Level 2 Access Code will be required to be entered as described in Step 13.

15. Press the Down arrow pushbutton, as necessary, until the "MS Current Dropout" screen is displayed.

```
MS Current Dropout

 240 mA
```

16. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed.

```
MS Current Dropout
 240 mA                    C
```

17. Utilizing the arrow pushbuttons, enter the desired "Motor Seal-in Current Dropout" (50 to 280 mA), then press the ENT pushbutton. The following will be displayed reflecting the Motor Seal-in Current Dropout value that was entered.

```
MS Current Dropout

 XXX mA
```

18. Press the Down arrow pushbutton, as necessary, until the "MS Current Duration" screen is displayed.

```
MS Current Duration

  35 ms
```

19. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed.

```
MS Current Duration
  35 ms                    C
```

20. Utilizing the arrow pushbuttons, enter the desired "Motor Seal-in Current Pickup Minimum Duration" (20 to 3000 ms), then press the ENT pushbutton. The following will be displayed reflecting the Motor Seal-in Current Pickup Minimum Duration value that was entered.

```
MS Current Duration

  XX ms
```

Setting Motor Seal-in Settings From TapTalk

To set the Motor Seal-in Settings from TapTalk® perform the following:

1. Select **Setup/Tap Settings** from the TapTalk toolbar. TapTalk will display the Tap Settings dialog screen (Figure 4-45).
2. From the "Operation Counter" section of the Tap Settings screen verify that "Motor Seal-in" is selected.
3. From the "Motor Seal-in Settings" section of the Tap Settings screen select "Enable" or "Disable".
4. Enter the desired Motor Seal-in Current Pickup value (100 to 300 mA).
5. Enter the desired Motor Seal-in Current Dropout value (50 to 280 mA).
6. Enter the desired Motor Seal-in Current Pickup Minimum Duration value (20 to 3000 ms).
7. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
8. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

Resettable Operation Counter

The resettable operation counter operates with the method selected by X1/X2/Count Window. This counter can be reset to zero.

To reset this counter to zero, perform the following:

1. Press the Left Arrow (MNTR Hot Button) pushbutton to awaken the unit. The menu will advance to "MONITOR".

```
                MONITOR
  ←UTIL                          SETP→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
               Metering
  ←                                  →
```

3. Press the Left arrow pushbutton once. The menu will advance to "Tap Information".

```
           Tap Information
  ←                                  →
```

4. Press the Down arrow pushbutton, as necessary, to navigate to the "Resettable Counter" menu.

```
  Resettable Counter              E
   0
```

5. Press **ENT**, a flashing "R" will be displayed. Press **ENT** again to reset the Operation Counter.

Resetting the Resettable Operation Counter From TapTalk

To reset the Operation Counter from TapTalk®, perform the following:

1. Select **Setup/Tap Settings** from the TapTalk toolbar. TapTalk will display the Tap Settings dialog screen (Figure 4-45).
2. Select the "Reset" check box located next to the "Resettable" counter located in the Operation Counter section of the dialog screen.
3. Select **Save**. TapTalk will display a "Save to Device" confirmation screen (Figure 4-2).
4. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

Presettable Operation Counters (Operation, Neutral)

The Operation and Neutral Counters operate with the selected count method (X1/X2/Count Window). It provides the user with the ability to preset a value up to 999,999. The counters will increment from the preset value based on the selected count method.

Presetting the Operation Counter is described. The steps to set the Neutral Counter are similar.

To preset the Operation Counter from the HMI proceed as follows:

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
            CONFIGURATION
  ←SETP                          COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Tapchanger Type
←                          →
```

3. Press the Right or Left arrow pushbutton, as necessary, until "Tap Settings" is displayed.

```
          Tap Settings
←                          →
```

4. Press the Down arrow pushbutton, as necessary, until the "Op Counter Preset" screen is displayed.

```
Op Counter Preset
000000
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Op Counter Preset
000000                     C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
          _
```

■**NOTE**: When entering the Level 2 Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and then display the following:

```
Op Counter Preset
000000                     C
```

   If not, re-enter a valid code.

8. Utilizing the arrow pushbuttons enter the desired Operation Counter Preset value from 0 to 999,999, then press the ENT pushbutton. The following will be displayed reflecting the Operation Counter value that was entered.

```
Op Counter Preset
XXXXXX
```

Presetting the Operation Counter From TapTalk

To Preset the Operation Counter from TapTalk®, perform the following:

1. Select **Setup/Tap Settings** from the TapTalk toolbar. TapTalk will display the Tap Settings dialog screen (Figure 4-45).
2. Enter the Operation Counter Preset value located in the Operation Counter section of the dialog screen.
3. Select **Save**. TapTalk will display a "Save to Device" confirmation screen (Figure 4-2).
4. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

Presetting the Neutral Counter From TapTalk

To Preset the Neutral Switch Counter from TapTalk, perform the following:

1. Select **Setup/Tap Settings** from the TapTalk toolbar. TapTalk will display the Tap Settings dialog screen (Figure 4-45).
2. Enter the Neutral Counter Preset value located in the Neutral Counter section of the dialog screen.
3. Select **Save**. TapTalk will display a "Save to Device" confirmation screen (Figure 4-2).
4. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

CORRECTION FACTORS

VT Ratio Correction

The operation of some regulators is such that the internal VT does not provide the desired voltage ratio. In these cases, it is desirable to correct the VT secondary voltage to a 120 Vac reference base. This change is easily made in software, eliminating the need for a multi-tap sensing transformer.

The correction is derived from information provided by the regulator original equipment manufacturer (OEM). The numerical value of the correction is the value, in volts, required to adjust the VT nominal secondary voltage to 120.0 volts. The correction range is ±15 volts in 0.1 volt increments.

■**NOTE**: The maximum allowable continuous VT secondary voltage is 140 volts. The correction is made only in software. As a result, the value of V_{Load} read on the control display will differ from that measured at the voltmeter test terminals by the percent of the correction voltage.

Setting Load VT Correction Factor

To set the Load VT Correction Factor from the HMI, proceed as follows:

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
          CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Tapchanger Type
←                        →
```

3. Press the Right or Left arrow pushbutton, as necessary, to navigate to the "Nameplate" menu.

```
            Nameplate
←                        →
```

4. Press the Down arrow pushbutton, as necessary, until the "Load VT Correction" screen is displayed.

```
Load VT Correction
   0.0 Volts
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Load VT Correction
   0.0 Volts                C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
          _
```

■**NOTE**: When entering the Level 2 Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and then display the following:

```
Load VT Correction
   0.0 Volts                C
```

   If not, re-enter a valid code.

8. Utilizing the arrow pushbuttons, enter the desired Load VT Correction value from -15.0 to +15.0 Volts, then press the ENT pushbutton. The following will be displayed reflecting the Load VT Correction value that was entered.

```
Load VT Correction
   X.X Volts
```

Setting Source VT Correction Factor

To set the Source VT Correction Factor from the HMI, proceed as follows:

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
          CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Tapchanger Type
←                        →
```

3. Press the Right or Left arrow pushbutton, as necessary, to navigate to the "Nameplate" menu.

```
           Nameplate
←                        →
```

4. Press the Down arrow pushbutton, as necessary, until the "Source VT Correction" screen is displayed.

```
Source VT Correction
   0.0 Volts
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Source VT Correction
   0.0 Volts                C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
          _
```

■**NOTE**: When entering the Level 2 Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and then display the following:

```
Source VT Correction
   0.0 Volts                C
```

   If not, re-enter a valid code.

8. Utilizing the arrow pushbuttons, enter the desired Source VT Correction value from -15.0 to +15.0 Volts, then press the ENT pushbutton. The following will be displayed reflecting the Source VT Correction value that was entered.

```
Source VT Correction
   X.X Volts
```

Setting Load and/or Source VT Correction Factors From TapTalk

To set either the Load or Source VT Correction Factors from TapTalk®, perform the following:

1. Select **Setup/Configuration** from the TapTalk toolbar. TapTalk will display the Configuration dialog screen (Figure 4-47).
2. Enter the Load and/or Source VT Correction Factor value(s) (–15.0 to +15.0 Volts).
3. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
4. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

Configuration | (Beckwith Electric M-6200A)

Primary
Voltage Multiplier 60.0 0.1 3260.0 (X)
Voltage Source Multiplier 60.0 0.1 3260.0 (X)
Current Multiplier 6000 1 32600 (X)

VT/CT (P2)
VT Correction 0.0 -15.0 15.0 (V)
CT/VT Phasing 0 degree
Normalizing Voltage Multiplier 1.00 0.80 1.20 (X)

VT/CT Source (U2)
VT Source Correction 0.0 -15.0 15.0 (V)
CT/VT Source Phasing 0 degree

VAr Bias
Disable Enable
Max 3 Phase Cap Bank Size 12000 4 12000 (KVAr)
Lead % Bank Size Pickup 75 10 100 (%)
Lag % Bank Size Pickup 75 10 100 (%)
VAr Bias Voltage Step 1.0 0.1 2.0 (V)
Max VAr Bias Duration 300 10 1440 (min)

Raise/Lower Output Contacts
Continuous Pulsed
Pulse Width 1.5 0.2 12.0 (sec)

Regulator
Type A Type B

Motor Current Settings
Peak RMS Current 110 10 200 (%)
Average RMS Current 110 10 200 (%)
Average Duration 110 10 200 (%)

Voltage Reduction
Standard VR Disable Enable
Smart VR Disable Enable
Smart VR LDC Disable Enable
Smart VR LDC Settings
R 0 -24 24 (V)
X 0 -24 24 (V)
Z 0 0 24 (V)
VR Turnoff Timer 0 0 999 (min)
Save VR at Power Off Don't Save Save

VAr and Power Factor Alarm Settings
Leading VAr Alarm 300 150 4800 (kVAr)
Lagging VAr Alarm 900 150 4800 (kVAr)
Leading Power Factor Alarm 0.99 0.85 0.99
Lagging Power Factor Alarm 0.95 0.80 0.98
VAr/PF Alarm Time Delay 0 0 3600 (s)
Min Current for Power Factor Alarms 10 5 200 (mA)

Input Selection
VR2 Aux

Low Current Block
Disable Enable

Save Comm Block at Power Off
Don't Save Save

Run Through Neutral
Disable Enable Counter Reset
Maximum Allowed Taps 4 3 7
Tap Operations Between Runs 1000 10 10000
Maximum Load Current 50 1 100 (mA)
Maximum RTN Standby operations 20 1 10000

Undo/Refresh
Save
Close

Figure 4-47 Configuration Dialog Screen

CT/VT Phase Shift

The control will recognize forward and reverse power flow to the load. With the CT and VT (reference) signals in-phase for unity power flow to the load, it will properly calculate line drop compensation.

Depending on the connection of the CT and VT, the phasors may not be in-phase. If this is the case, the phase shift can be corrected in software. The usual characteristics of three phase systems only allow multiples of 30° phase shifts. The control, therefore, has a range of 0° to 330° in 30° increments.

By comparing system operating conditions with power flow direction and power factor as shown on the M-6200A Regulator Control, improper phase shift can be determined. An incorrect connection may be resolved using well-known phasor methods. The following procedure may be useful to check the choice of correction or even to determine the correction by trial and error:

1. Place the regulator in manual control.
2. Determine the Watts and VArs load on the regulator from other metering.
3. Read the Watts and VArs indicated by the control, and make certain that they are of the same sign and ratio of magnitudes as obtained from the external readings.
4. If not, change the correction in 30° increments until the control and external readings are in best agreement.

When two single-phase regulators are connected in open delta, the current signals will be out-of-phase with the voltage signals. For one regulator, the current will lead the voltage by 30° and is called the "leading" regulator. For the "lagging" regulator, the current will lag the voltage by 30°.

Contact Beckwith Electric for **Application Note #17** for more information on VT and CT connections.

■**NOTE:** Source Side parameters are used when operation mode is Regulate Reverse (Measured) and the system is in reverse power.

Setting CT/Load and/or CT/Source Phase Shift Quantities From The HMI

To set the CT/Load and/or CT/Source Phase Shift quantities from the HMI, proceed as follows:

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
        CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
      Tapchanger Type
←                        →
```

3. Press the Right or Left arrow pushbutton, as necessary, to navigate to the "Nameplate" menu.

```
          Nameplate
←                        →
```

■**NOTE:** The following sequence of steps provide direction for setting the CT/Load VT Phasing quantities. The steps necessary to set the CT/Source VT Phasing are similar.

4. Press the Down arrow pushbutton, as necessary, until the "CT/Load VT Phasing" screen is displayed.

```
CT/Load VT Phasing
0     Deg
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
CT/Load VT Phasing
0     Deg                    C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS

          _
```

■**NOTE**: When entering the Level 2 Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a "Confirmation" screen and display the following:

```
CT/Load VT Phasing
0     Deg                    C
```

   If not, re-enter a valid code.

8. Utilizing the arrow pushbuttons, enter the desired CT/Load VT Phasing value from 0 to 330 Degrees (30 Degree increments), then press the ENT pushbutton. The following will be displayed reflecting the CT/Load VT Phasing value that was entered.

```
CT/Load VT Phasing
X     Deg
```

Setting CT/Load and/or CT/Source Phase Shift Quantities From TapTalk

To set the CT/Load and/or CT/Source Phase Shift quantities from TapTalk®, proceed as follows:

1. Select **Setup/Configuration** from the TapTalk toolbar. TapTalk will display the Configuration dialog screen (Figure 4-47).
2. Enter the CT/Load or CT/Source Phase Shift Quantities (0 to 330 Degrees, in 30 Degree Increments).
3. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
4. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

RATIO MULTIPLIERS

Voltage and Current Multipliers

■**NOTE:** The voltage and current multipliers do not affect the regulation of the control. They are only used in the calculation of primary values.

▲ **CAUTION**: The use of a voltage correction factor is incorporated in the calculation of primary quantities in the control. Although the control operation is not affected, erroneous values will be displayed and recorded if the VT correction factor is not included in the PT multiplier.

Primary quantities are displayed when voltage and current multipliers are set in the control. The voltage multiplier is:

$$V_{mult} = V_{pri}/(V_{sec} + V_{corr})$$

For a VT ratio of 7620/117 V and a voltage correction of 3 V, the multiplier is:

$V_{mult} = 7620/(117 + 3) = 63.5$

The voltage multiplier setting range is from 0.1 to 3260.0 in 0.1 steps.

The current multiplier is the value of the line CT primary rating divided by 0.2 A. For a CT primary rating of 1000 A, the multiplier is:

$CT_{mult} = 1000/0.2 = 5000$

The current multiplier setting range is from 1 to 32600 in 1 step increments.

Normalizing Voltage Multiplier

A Normalizing Voltage Multiplier with a range of 0.80 to 1.20 is available to be applied to Meter Out Voltage and displayed in real time as Normalizing Voltage. The purpose of the Normalizing Voltage Multiplier is to allow the user to overcome differences in the ratio of the PT that the Meter Out Voltage input is using versus the PT the end user or other metering methods are using.

Setting The Voltage and Current Multipliers From The HMI

▲ **CAUTION**: The current input to the control is rated at 0.2 A continuous, 0.4 A for two hours, and 4.0 A for 1 second.

■**NOTE:** The CT Multiplier selection in the Configuration/CT and VT menu only changes the scaling factor for current reading and setting.

To set the Voltage and Current Multipliers from the HMI, proceed as follows:

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
        CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
      Tapchanger Type
←                        →
```

3. Press the Right or Left arrow pushbutton, as necessary, to navigate to the "Nameplate" menu.

```
          Nameplate
←                        →
```

■**NOTE:** The following sequence of steps provide direction for setting the Current Multiplier. The steps necessary to set the Voltage, Voltage Source and Normalizing Voltage multipliers are similar.

4. Press the Down arrow pushbutton, as necessary, until the "Current Multiplier" screen is displayed.

```
CT Multiplier
   6000  X
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
CT Multiplier
   6000  X                    C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS

          _
```

■**NOTE**: When entering the Level 2 Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
CT Multiplier
   6000  X                    C
```

   If not, re-enter a valid code.

8. Utilizing the arrow pushbuttons enter the desired Current Multiplier value from 1 to 32600, then press the ENT pushbutton. The following will be displayed reflecting the Current Multiplier value that was entered.

```
CT Multiplier
   XXXXXX  X
```

Setting The Voltage and Current Multipliers From TapTalk

To set the Current, Voltage and Voltage Source and Normalizing Voltage Multipliers from TapTalk®, proceed as follows:

1. Select **Setup/Configuration** from the TapTalk toolbar. TapTalk will display the Configuration dialog screen (Figure 4-47).
2. Enter the Current, Voltage and Voltage Source Multipliers.
3. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
4. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

TAP INFORMATION

Motor Direct Drive KeepTrack™ Tap Position

▲ **CAUTION:** This feature is applicable to single-phase regulators only.

▲ **CAUTION**: This feature is only applicable for ±16 tap ranges with neutral tap and neutral indicator. The source voltage will only be applicable with a tap range of ±16 taps.

This feature allows the control to keep track of the present tap position. The "INTERNAL KEEPTRACK" setting is selected for this method.

● **WARNING: Do not rely on the tap position indication on the M-6200A Regulator Control display for neutral position when bypassing voltage regulators.**

The motor power source for the manual, automatic, or external (SCADA) initiated tapchanges must be the same as the motor power input to the control. The operations counter and neutral light circuit should be operational. The counter input and power source is required for detecting tapchanges and determining direction of the tapchange. Connecting a regulator neutral tap position indicating contact to the control will reset the tap position to neutral each time the tap goes through the neutral position. It is recommended that the indicated tap position be compared to the mechanical tap position indicator at regular intervals, and that the indicated value be corrected, if necessary.

The tap position stored in memory is not affected by a loss of power. The tap position record is checked and corrected to neutral, if necessary, with the closure of a neutral contact (when the neutral tap position contact is connected to the controls).

▲ **CAUTION**: When the Motor Direct Drive KeepTrack "INTERNAL KEEPTRACK" tap position method is used, it must be calibrated for proper voltage control with reverse power operation.

If desired, the Motor Direct Drive KeepTrack "INTERNAL KEEPTRACK" feature can be disabled in which case the screen will indicate "**Disabled**".

The user initializes the control at a given, known, tap position upon installation, by selecting "INTERNAL KEEPTRACK" in the Tap Information screen in the Configuration Menu and following the steps described later in this section. See "Initializing Tap Position When Motor Direct Drive KeepTrack 'INTERNAL KEEPTRACK' is Active" for detailed steps for entering the tap position using the HMI or TapTalk®.

Or, if the neutral tap position contact is connected to the control, run the regulator to neutral as shown by the tap position indicator on the regulator. The control will recognize the neutral light signal and set the tap position accordingly.

The Motor Direct Drive KeepTrack "INTERNAL KEEPTRACK" procedure recognizes tapchanges commanded via **manual, automatic or external (SCADA)** contacts. The power source for the manual- or SCADA-initiated tapchanges must be the same as the motor power source used for the automatic tapchangers.

The Motor Direct Drive KeepTrack "INTERNAL KEEPTRACK" position knowledge is based on the detection of a closed switch (manual or automatic), and feedback from the operation counter input.

The method by which Motor Direct Drive KeepTrack "INTERNAL KEEPTRACK" is achieved is as follows:

The control includes two Zero Voltage Detection (ZVD) circuits. These circuits individually monitor the AC voltage across the internal raise and lower triacs. This is done since any external raise or lower contacts or manual switches have to be placed in parallel with the triacs to run the tapchanger motor. When the triacs (or any contact paralleled across the triacs) closes, the voltage measure decreases to almost zero. When a counter input event is received while the raise circuit is activated, the Motor Direct Drive KeepTrack "INTERNAL KEEPTRACK" will increment the tap count by one. When a counter input event is received while the lower circuit is activated, the Motor Direct Drive KeepTrack "INTERNAL KEEPTRACK" will decrement the tap count by one.

If the tapchanger reaches the mechanical tap limits of operation, (±16), limit switches open up the appropriate circuit so the control cannot force a raise above +16, or force a lower below –16. This is potentially confusing to the ZVD circuits, since they can see zero voltage on the output with a closed triac and also see zero voltage on the other output due to an open limit switch. When this condition is encountered, the control can only make a best guess of which operation really occurs and moves one step in the direction of neutral, which should be away from the side with the open limit switch.

An additional feature is the neutral zero feature. When a regulator passes through the neutral position, a neutral contact closes. This is most often used to drive a neutral light that is an indicator that the mechanism is in the neutral position, and it is safe to bridge the input and output of the regulator because they are at the same voltage. Upon detection of a neutral circuit closure, Motor Direct Drive KeepTrack "INTERNAL KEEPTRACK" resets the tap position to neutral to resynchronize the circuit.

Enable/Disable Motor Direct Drive KeepTrack "INTERNAL KEEPTRACK" From The HMI

To Enable or Disable the Motor Direct Drive KeepTrack™ method of tapchange position monitoring, perform the following:

▲ **CAUTION**: When the Motor Direct Drive KeepTrack tap position method is used, it must be calibrated for proper voltage control with Reverse Power Operation.

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
        CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Tapchanger Type
←                        →
```

3. Press the Right or Left arrow pushbutton, as necessary, until "Tap Settings" is displayed.

```
         Tap Settings
←                        →
```

4. Press the Down arrow as necessary until the "Tap Information" screen is displayed.

```
Tap Information
INTERNAL KEEPTRACK
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Tap Information
INTERNAL KEEPTRACK          C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS

          _
```

■**NOTE**: When entering the Level 2 Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Tap Information
INTERNAL KEEPTRACK          C
```

   If not, re-enter a valid code.

8. Utilizing the Up/Down arrow pushbuttons, select "disable" or "INTERNAL KEEPTRACK", then press the ENT pushbutton. The following will be displayed reflecting the Tap Information selection that was entered.

```
Tap Information
INTERNAL KEEPTRACK or disable
```

9. If "INTERNAL KEEPTRACK" was selected in Step 8, then proceed to "Initializing Tap Position When Motor Direct Drive KeepTrack is Active" in this section.

Enable/Disable Motor Direct Drive KeepTrack From TapTalk

To Enable/Disable Motor Direct Drive KeepTrack™ from TapTalk®, perform the following:

1. Select **Setup/Tap Settings** from the TapTalk toolbar. TapTalk will display the Tap Settings dialog screen (Figure 4-45).
2. Select either "Disabled" or "Regulate Internal (KeepTrack)" from the "General" section of the dialog screen.
3. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
4. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).
5. If "Regulate Internal (KeepTrack)" was selected, then proceed to "Initializing Tap Position When Motor Direct Drive KeepTrack is Active" in this section.

■ **NOTE**: This setting is also available in the Setup/Tapchanger Type dialog screen. See **Section 4.4 Tap Changer Type Selections**.

Initializing Tap Position When Motor Direct Drive KeepTrack "INTERNAL KEEPTRACK" is Active From The HMI

▲ **CAUTION**: When the Motor Direct Drive KeepTrack tap position method is used, it must be calibrated for proper voltage control with Reverse Power Operation.

To initialize the control when Motor Direct Drive KeepTrack method of tap position knowledge is active, perform the following:

1. Initialize the control at a given, known, tap position upon installation.
2. Enable **INTERNAL KEEPTRACK** method of tap knowledge as described in this section.
3. Determine the actual tap position from the external tap position indicator on the regulator.
4. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
        CONFIGURATION
←SETP                    COMM→
```

5. Press the Down Arrow pushbutton once. The unit will display the following:

```
      Tapchanger Type
←                          →
```

6. Press the Right or Left arrow pushbutton, as necessary, until "Tap Settings" is displayed.

```
        Tap Settings
←                          →
```

7. Press the Down arrow pushbutton, as necessary, until the "Tap Position/Cal" screen is displayed.

```
Tap Position/Cal
  0
```

8. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 11.

```
Tap Position/Cal
  0                          C
```

9. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
          _
```

■ **NOTE**: When entering the Level 2 Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

10. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

    If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Tap Position/Cal
  0                          C
```

    If not, re-enter a valid code.

11. Utilizing the Up/Down arrow pushbuttons, enter the tap position determined in Step 3, then press the ENT pushbutton. The following will be displayed reflecting the tap position that was entered.

```
Tap Position/Cal
  X
```

12. If a neutral tap position contact is connected to the control, run the regulator to the neutral tap position as indicated on the regulator.

    The control will recognize the neutral contact/light signal and set the tap position accordingly.

Initializing Tap Position When Motor Direct Drive KeepTrack is Active From TapTalk

▲ **CAUTION**: When the Motor Direct Drive KeepTrack™ tap position method is used, it must be calibrated for proper voltage control with Reverse Power Operation.

To initialize the control when Motor Direct Drive KeepTrack method of tap position knowledge is active, perform the following:

1. Select **Setup/Tap Settings** from the TapTalk® toolbar. TapTalk will display the Tap Settings dialog screen (Figure 4-45).
2. Verify that "Regulate Internal (KeepTrack)" is selected in the "General" section of the dialog screen.
3. Determine the actual tap position from the external tap position indicator on the regulator.
4. In the Tap Calibration section of the dialog screen enter the tap position determined in Step 3, then select "Yes" for Tap Calibrate.
5. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
6. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).
7. If a neutral tap position contact is connected to the control, run the regulator to the neutral tap position as indicated on the regulator.

   The control will recognize the neutral contact/light signal and set the tap position accordingly.

INTERTAP TIME DELAY

The intertap time delay may be used in conjunction with sequential operation or pulsed output. The normal operation of this delay timer occurs once a tapchange command is initiated, when there would normally be a continuous command (raise or lower) to run the tapchanger until the voltage has returned to within the band setting, there is now an intertap time delay initiated between tapchanges. When the intertap time delay is set to zero, it is disabled.

The intertap time delay will:

- Recognize that a tapchange has occurred, indicated by the counter contact input or motor hold input.
- Remove the output signal and wait for the intertap time delay, even though the voltage remains outside the designated voltage band.
- Command another tapchange after the intertap time delay has expired, without regard to the basic time delay setting, if the voltage remains out of band in the same direction as the previous tapchange.

If the intertap time delay is enabled on a control where non-sequential operation is enabled, the intertap time delay setpoint is disregarded. The basic time delay setting prevails for subsequent tapchange commands in the non-sequential mode.

■**NOTE**: The intertap time delay is similar in operation to non-sequential operation, but the two should not be confused. The intertap time delay applies a short delay after every tapchange. The non-sequential operation time delay will be the same as that of the Basic User-Selected Time Delay as described in this chapter. For application with pulsed output, see **Output Pulse** in this chapter.

Sequential/Non-Sequential/Blocking

The control normally operates in Sequential Mode. In this mode, the tapchange output is initiated after the time delay timer has timed out. The tapchange output will remain "on" until the control senses that the voltage has returned in-band. This permits successive tapchanges to be made in a "sequential" mode with no delay between tapchanges.

If a delay between successive tapchanges is desired, an intertap time delay may be used. The value is set from 0 to 60 seconds and will interrupt tapchange outputs for the preset time after a counter-contact closure or motor hold input is detected by the control's operations counter input #1.

If the full initial time delay is desired, the control may be used in the "non-sequential" mode. This mode is selected by applying a momentary contact closure to the control's non-sequential operation/auto tapchanger inhibit input from the counter-contact circuit or an auxiliary relay contact.

If the closed contact supplied to the non-sequential input is maintained, instead of momentary, the initial timer will not time out for the duration of the maintained contact, and the outputs of the control will be effectively blocked.

Setting The Intertap Delay From The HMI

1. Press the Up Arrow (SETP Hot Button) pushbutton to awaken the unit. The menu will advance to "SETPOINTS".

```
            SETPOINTS
←MNTR                    CNFG→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Common Settings
←                          →
```

3. Press the Down arrow pushbutton, as necessary, to navigate to the "Intertap Delay" menu item.

```
Intertap Delay
   0  Sec
```

4. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed. Go to Step 7.

```
Intertap Delay
   0  Sec                    C
```

5. If Level Access is active, the Level Access prompt will be displayed.

```
ENTER LEVEL ACCESS

          _
```

■ **NOTE**: When entering the Level Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

6. Enter a valid Level Access Code, then press the ENT pushbutton.

   If a valid Level Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Intertap Delay
   0  Sec                    C
```

   If not, re-enter a valid code.

7. Utilizing the arrow pushbuttons enter the desired Intertap Time Delay value (0 to 60 seconds in 1 second increments), then press the ENT pushbutton. The following will be displayed reflecting the Intertap Time Delay that was entered.

```
Intertap Delay
   X  Sec
```

Setting Intertap Time Delay From TapTalk

1. Select **Setup/Tap Settings** from the TapTalk® toolbar. TapTalk will display the Tap Settings dialog screen (Figure 4-45).
2. From the General section of the Tap Settings dialog screen enter the desired Intertap Time Delay (0 to 60 seconds in 1 second increments).
3. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
4. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

■ **NOTE**: This setting is also available in the Setup/Tapchanger Type dialog screen. See **Section 4.4 Tap Changer Type Selections**.

OUTPUT SELECTION

Output Pulse

▲ **CAUTION**: If an appropriate pulse width setting is not entered, then a misoperation of the tapchanger may occur when a SCADA Manual Raise or Lower is initiated.

When the output selection is "Pulsed", the pulse width can be programmed from 0.2 to 12 seconds, in increments of 0.1 seconds. An initiated pulse will continue until the pulse time has been reached or a counter contact or motor hold input operates.

Under normal conditions, when the output is set to "Pulsed" and the control is calling for Raise/Lower, an output will turn on for the preprogrammed time, or until a counter contact or motor hold input operates, and then turn off the output for a time period of 0.5 seconds plus the intertap time delay setting value. When the control is calling for a Raise/Lower and no non-sequential or counter input or motor hold input is applied, the output will activate for the full preprogrammed time and deactivate for 0.5 seconds, plus the intertap time delay.

When a counter input or motor hold input is applied, and there is an intertap delay, the pulse will cease immediately with counter contact closure for the intertap time delay. After the counter contact or motor hold input opens, the intertap timer will start at the end of the time delay. If there is still a Raise/Lower condition, another pulse will start.

When the non-sequential input is applied, the Raise/Lower timers will reset with the contact closure, and a timer count will start again, if a Raise/Lower condition is still present, the pulse will start once more.

SCADA INITIATED Manual Raise/Lower

When the control is placed in Manual via SCADA, to perform a Manual Raise/Lower, the control will switch to the "Pulsed" output mode until the control is returned to "Auto". This will allow only a single Raise/Lower operation to take place each time a SCADA Raise/Lower command is sent. When the control is returned to "Auto," the control will revert back to the output selection setting. Therefore, an appropriate "Pulsed" output time setting should be set if SCADA initiated Manual Raise/Lower operations are performed.

Continuous

The output is continuous until the voltage returns into the bandwidth.

Setting Output Configuration From The HMI

To set Output Selection from the HMI, proceed as follows:

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
          CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Tapchanger Type
←                        →
```

3. Press the Right or Left arrow pushbutton, as necessary, to navigate to the "Nameplate" menu.

```
            Nameplate
←                        →
```

4. Press the Down arrow pushbutton, as necessary, until the "Output Selection" screen is displayed.

```
Output Selection
CONTINUOUS
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Output Selection
CONTINUOUS                   C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS

          _
```

■ **NOTE**: When entering the Level 2 Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Output Selection
CONTINUOUS                    C
```

   If not, re-enter a valid code.

8. Utilizing the Up/Down arrow pushbuttons, select the desired Output configuration (CONTINUOUS or PULSED), then press the ENT pushbutton. The following will be displayed reflecting the Output configuration that was entered.

```
Output Selection
CONTINUOUS
```

9. Depending on the Output configuration that was selected in Step 8, proceed as follows to complete the Output configuration:
   - If a "PULSED" Output configuration was selected, proceed to Step 10.
   - If the "CONTINUOUS" Output configuration was selected, the Output configuration is complete.

10. Press the Down arrow pushbutton, as necessary, until the "Output Pulse" screen is displayed.

```
Output Pulse
   1.5 Sec
```

11. Press the ENT pushbutton. The following will be displayed:

```
Output Pulse
   1.5 Sec                    C
```

12. Utilizing the arrow pushbuttons, enter the desired "Output Pulse" (0.2 to 12.0 Sec) duration, then press the ENT pushbutton. The following will be displayed reflecting the Output Pulse value that was entered.

```
Output Pulse
   X.X Sec
```

Setting Output Configuration From TapTalk

To set the Output Configuration from TapTalk®, proceed as follows:

1. Select **Setup/Configuration** from the TapTalk toolbar. TapTalk will display the Configuration dialog screen (Figure 4-47).
2. From the "Raise/Lower Output Contacts" section of the dialog screen select either "Continuous" or "Pulsed", then proceed as follows:
   - If "Continuous" was selected, go to Step 3.
   - If "Pulsed " was selected, enter a "Pulse Width" value (0.2 to 12.0 seconds)
3. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
4. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

■ **NOTE**: This setting is also available in the Setup/Tapchanger Type dialog screen. See **Section 4.4 Tap Changer Type Selections**.

REGULATOR TYPE

Regulator Type A or B can be selected. This will allow the source voltage to be calculated correctly for either type of regulator (see Figure 4-48). It will also allow the control to operate more accurately when in the "regulate in reverse power" mode.

General Electric VR-1 voltage regulators are available in two winding configurations; Type "A" non-inverted configuration and type "B" inverted configuration. These types refer to the internal power component connections. See Figure 4-48.

The Type "A" non-inverted configuration regulator includes a wire jumper on the NN terminal block for Potential Transformer tap selection.

On the older regulator controls (those not having power disconnect and CT shorting knife switches), the PT tap selection jumper is usually connected between terminals NN-9 and NN-20, NN-21 or NN-22. On newer regulator controls, (those with power disconnect and CT shorting knife switches), the PT tap selection jumper is usually connected between terminals NN-8 and NN-20, NN-21 or NN-22. There are special cases when a PT ratio correcting transformer is supplied and the jumper position is different. **In all cases please consult the regulator tank nameplate for the proper jumper connections.**

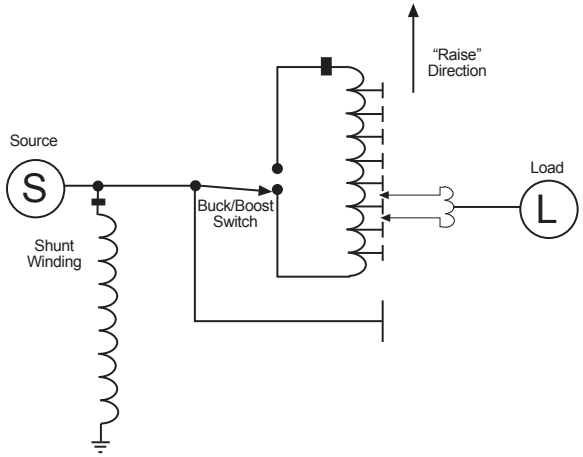
The Type "B" inverted configuration regulator is supplied from the factory with a standard 0.75 ohm resistor installed on the NN terminal block in addition to the PT tap selection jumper. This series resistor limits short circuit currents in the event of an external fault.

On the older regulator controls (those not having a power disconnect and CT shorting knife switches), the resistor is usually connected between terminals NN-9 and NN-22. The PT tap selection jumper is usually connected between terminals NN-22 and NN-20 or NN-21. On newer regulator controls, (those with power disconnect and CT shorting knife switches) the resistor is usually connected between terminals NN-8 and NN-22. The PT tap selection jumper is usually connected between terminals NN-22 and NN-20 or NN-21. **In all cases, please consult the regulator tank nameplate for the proper jumper connections.**

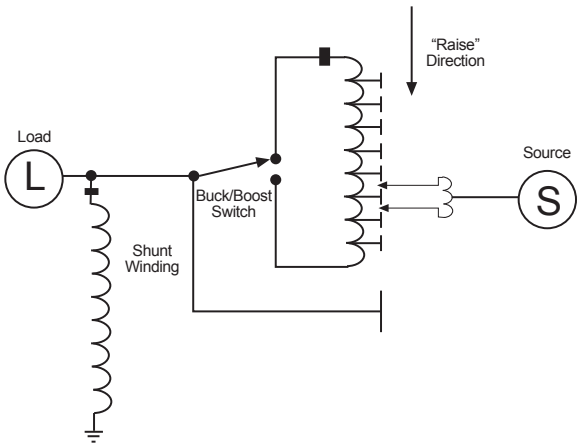
▲ **CAUTION:** The control can be damaged if the PT tap selection jumper is not connected properly when the regulator is energized.

The control is not powered if either the PT tap selection jumper or resistor is missing or open.

The user should always verify proper connections by **consulting the nameplate on the regulator tank.** The user is cautioned that the nameplate on the control cabinet could possibly be incorrect if the control has ever been replaced. If the serial number on the control cabinet matches the serial number on the regulator tank or nameplate, the control cabinet nameplate may be consulted for proper jumper configuration.



Schematic Diagram;
Single-Phase, Type A Step-voltage



Schematic Diagram;
Single-Phase, Type B Step-voltage

Figure 4-48 Regulator Type

Setting Regulator Type From The HMI

To set Regulator Type from the HMI, proceed as follows:

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
          CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Tapchanger Type
←                          →
```

3. Press the Right or Left arrow pushbutton, as necessary, to navigate to the "Nameplate" menu.

```
           Nameplate
←                          →
```

4. Press the Down arrow pushbutton, as necessary, until the "Regulator Type" screen is displayed.

```
Regulator Type
TYPE A
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Regulator Type
TYPE A                       C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
          _
```

■ **NOTE**: When entering the Level 2 Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Regulator Type
TYPE A                       C
```

   If not, re-enter a valid code.

8. Utilizing the Up/Down arrow pushbuttons, select the desired Regulator Type (Type A or Type B), then press the ENT pushbutton. The following will be displayed reflecting the Regulator Type that was selected.

```
Regulator Type
TYPE X
```

Setting Regulator Type From TapTalk

To set the Regulator Type from TapTalk®, proceed as follows:

1. Select **Setup/Configuration** from the TapTalk toolbar. TapTalk will display the Configuration dialog screen (Figure 4-47).
2. From the "Regulator "section of the dialog screen select either "Type A" or "Type B".
3. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
4. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

■ **NOTE**: This setting is also available in the Setup/Tapchanger Type dialog screen. See **Section 4.4 Tap Changer Type Selections**.

MOTOR CURRENT DETECTION AND MONITORING

The M-6200A includes a tapchanger Motor Current Measurement and Recording feature. The M-6200A tapchanger control measures the motor current during tapchange operations. The motor current is sampled at 64 samples per cycle and the total RMS value of the current is computed every cycle (60 Hz or 50 Hz cycle). The dynamic range of the current measurement is from 0 to 10 A.

The tapchange start signal is generated when the control begins a Raise or Lower operation. The tapchange operation is considered complete when the counter contact input is generated. If the tapchanger is making multiple tapchanges where the current is not interrupted between tapchanges then the counter contact can be used to decide the completion of one tap before the start of the next tap.

The Motor Current Monitor feature also includes a Training Mode which will be used during the commissioning of the tapchanger control. In this mode several tapchange operations will be manually conducted and the profile stored. This profile will be compared with the profile during normal tapchange operation to generate alarm signals.

Based on the type of regulator, the counter contact signal will be different:

- **GE:** Counter pulse is used to indicate the completion of the tapchange
- **SIEMENS and Howard:** State change of the counter contact is used to detect the tapchange (X2 setting)
- **Cooper:** Motor Seal-in current is used to detect the tapchange operation. See "Counters" section of this chapter for instructions for Enabling/Disabling "Motor Seal-In".

The following parameters are logged for the motor current profile and are stored in battery backed-up RAM for each tapchange:

- Peak RMS Current

$$\sqrt{\frac{1}{i}\sum_{i=1}^{Totalprofiles} PeakRMSCurrent_i^2}$$

- Average RMS Current

$$\sqrt{\frac{1}{i}\sum_{i=1}^{Totalprofiles} AverageRMSCurrent_i^2}$$

- Average Duration

$$\frac{1}{i}\sum_{i=1}^{Totalprofiles} Duration_i$$

Where i is the training profile number and $Totalprofiles$ is the total number of training profiles (fixed to 20 training operations).

An alarm will be generated when any of the following conditions occur:

- Peak RMS current exceeds a defined percent (programmable from 10% to 200%) of the stored Peak RMS Current which was recorded during the Training Mode.
- Average RMS Current exceeds a certain percent (programmable from 10% to 200%) of the stored Average RMS Current which was recorded during the Training Mode.

  The Average RMS Current is the average of the RMS current for the tapchange duration.
- The Average Duration of the tapchange exceeds a certain percent (programmable from 10% to 200%) of the stored value which was recorded during the Training Mode.

Setting the Motor Current Detection Settings From The HMI

To set the Peak RMS Current Percent Change, Average RMS Percent Change or Average Duration Percent Change setting, perform the following:

■**NOTE**: The steps necessary to set the Peak RMS Current Percent Change setting are described here. The steps to set the Average RMS Percent Change and Average Duration Percent Change are similar.

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
          CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Tapchanger Type
←                        →
```

3. Press the Right or Left arrow pushbutton, as necessary, to navigate to the "Mtr Current Profile" menu.

```
      Mtr Current Profile
←                        →
```

4. Press the Down arrow pushbutton, as necessary, to navigate to the "Peak RMS % Change" (Average RMS Current % Change or Average Duration % Change) settings dialog screen.

```
Peak RMS % Change
    110
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Peak RMS % Change
    110                  C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
          _
```

■**NOTE**: When entering the Level 2 Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Peak RMS % Change
    110                  C
```

   If not, re-enter a valid code.

8. Utilizing the arrow pushbuttons enter the desired Peak RMS Current % Change value (10% to 200%), then press the ENT pushbutton. The following will be displayed reflecting the Peak RMS Current % Change value that was entered.

```
Peak RMS % Change
    XXX
```

9. Repeat Steps 4 through 8 for the Average RMS Current % Change and Average Duration % Change settings.

Setting the Motor Current Detection Settings From TapTalk

To set the Peak RMS Current Percent Change, Average RMS Percent Change or Average Duration Percent Change Setting, perform the following:

1. Select **Setup/Configuration** from the TapTalk® toolbar. TapTalk will display the Configuration dialog screen (Figure 4-47).
2. From the "Motor Current Settings" section of the dialog screen enter the desired Peak RMS Current, Average RMS Current and Average Duration settings (10% to 200%).
3. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
4. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

VAr BIAS

This feature is intended for but not restricted to use with distribution feeders which have switched capacitor banks controlled by Beckwith Electric Autodaptive® M-2501 Series Capacitor Controls.

The use of VAr Bias allows the M-6200A Regulator Control to coordinate its operation with the M-2501 Autodaptive Series Capacitor Control devices on the distribution system in order to minimize losses, subsequent voltage variations, and equipment capacity requirements of transmitting VArs. This function is enabled through TapTalk® Communications Software or from the control HMI.

VAr Bias Setpoints

Largest 3 Phase Cap Bank: Adjustable from 4 to 12000 KVAr.

Lead % Bank Size Pickup: Defines a Lower negative VAr limit in percentage of the Max Cap Bank size below which the control will increase the upper band edge by the amount defined by VAr Bias Voltage Step.

Lag % Bank Size Pickup: Defines an Upper positive VAr limit in percentage of the Max Cap Bank size above which the control will decrease the lower band edge by the amount defined by VAr Bias Voltage Step.

VAr Bias Voltage Step: Amount by which the control will increase or decrease the Upper or Lower band edges when there is a VAr Bias out of band situation.

Max VAr Bias Duration: Maximum allowable time in minutes the control will bias the voltage edge.

Overview

When the control determines that the reactive power is lower or greater than the limits defined by the Lead or Lag % pickup setting, the control will start an inverse VAr Bias Pickup Trigger timer. After the inverse time expires, the control will either increase or decrease the effective bandcenter by the amount defined by the VAr Bias Step Voltage setting depending on the direction of the reactive power. At this moment VAr Bias becomes active. The use of an inverse timer is to avoid jittering in the VAr Bias detection and also to provide a faster response as the difference between the Upper or Lower VAr Bias band edge and the measure VArs increase. For example, suppose the system is highly inductive (positive VArs) the load voltage will tend to decrease, when VAr Bias is in effect, the control will automatically reduce the lower band edge and thus the control will be back in band, allowing the downstream cap controls to operate.

The longest allowable time delay before VAr Bias comes into effect is 10 seconds. The inverse timer follows the following equation:

Time delay = 10 *(Upper or Lower VAr Limit)/IVAr measured.

Upper VAr limit is defined as Lag % Bank Size Pickup multiply by a third of Max Cap Bank size.

Lower VAr limit is defined as Lead % Bank Size Pickup multiply by a third of Max Cap Bank size.

The VAr Bias Pickup trigger timer will instantly reset to ZERO if the reactive power measurement returns within the allowable band before VAr Bias becomes active.

Once VAr Bias is active, the control will remove the VAr Bias condition for the following situations.

1. When Max VAr Bias Duration is exceeded (see below description).
2. When reactive power returns back in band within 90% of the VAr limits set by Lag or Lead % Bank Size Pickup settings.

   For example, if the Upper VAr limit is 75 % of 12000 KVAr bank then the level below which the control will return in band after going out above the Upper VAr limit is 9*3000/10 = 2700 KVAr. Similarly if the Lower VAr limit is at -3000 then the in band limit is -2700 KVAr.

The application of both the M-6200A Regulator Control and the Autodaptive Capacitor Control(s) on a circuit provides for an interaction between the devices that provides for faster response in times of rapidly changing conditions on the distribution system. For example, if one regulator is serving 6 feeders, with each feeder using 1200 KVAr pole-top feeder capacitor banks, and if each feeder is correctly compensating to within 400 KVAr, all feeder bank controls would be considered to be operating correctly. However the regulator would still be transforming up to 2400 KVAr (six feeders times 400 KVAr) from the transmission system. The M-6200A Control on the regulator would detect this condition and affect additional line capacitor operation by making a temporary voltage level setting change. By effectively lowering its setting (delaying a voltage tap RAISE for a short time),

line capacitor bank control could be biased into operation sooner by the tapchanger control. This would reduce losses of the circuit, provide a better voltage profile and reduce the number of tapchanges.

In effect, when enabled user sets VAr Bias setting values at which bandcenter/bandwidth is shifted to influence downstream Capacitor Control(s) into operation. Shifted bandcenter/bandwidth returns to prior settings after measured VAr level returns within band. If Max VAr bias Duration is exceeded, the shifted bandcenter/bandwidth returns to prior setting and an ALARM is activated if configured to do so. The alarm will also have corresponding communication events reported. When VAr Bias is active the OSC and SOE may be triggered if selected.

Enable/Disable VAr Bias From The HMI

To Enable/Disable VAr Bias from the HMI, proceed as follows:

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
        CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Tapchanger Type
←                        →
```

3. Press the Right or Left arrow pushbutton, as necessary, to navigate to the "Nameplate" menu.

```
            Nameplate
←                        →
```

4. Press the Down arrow pushbutton, as necessary, until the "Enable VAr Bias" screen is displayed.

```
Enable VAr Bias
disable
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Enable VAr Bias
disable                      C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
          _
```

■**NOTE**: When entering the Level 2 Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Enable VAr Bias
disable                      C
```

   If not, re-enter a valid code.

8. Utilizing the Up/Down arrow pushbuttons, select either "ENABLE or disable", then press the ENT pushbutton. The following will be displayed reflecting the mode that was selected.

```
Enable VAr Bias
ENABLE or disable
```

9. Depending on what mode was selected in Step 8, proceed as follows to complete the VAr Bias setup:
   - If VAr Bias was "ENABLED", proceed to Step 10.
   - If VAr Bias was "DISABLED", no further action is required.

10. Press the Up/Down arrow pushbuttons, as necessary, to navigate to the "Max Cap Bank Size" menu item within the "Nameplate" menu.

```
Max Cap Bank Size

12000 KVAr
```

11. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 14.

```
Max Cap Bank Size
12000 KVAr                    C
```

12. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
          _
```

■**NOTE**: When entering the Level 2 Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

13. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

    If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Max Cap Bank Size
12000 KVAr                    C
```

    If not, re-enter a valid code.

14. Utilizing the arrow pushbuttons, enter the desired "Max Cap Bank Size" (4 to 12,000 kVAr), then press the ENT pushbutton. The following will be displayed reflecting the Max Cap Bank Size that was entered.

```
Max Cap Bank Size

XXXXX KVAr
```

■**NOTE**: From this point on in this procedure, it is assumed that a valid Access Level 2 Code has been previously entered. If not, then a valid Level 2 Access Code will be required to be entered as described in Step 13.

15. Press the Up/Down arrow pushbuttons, as necessary, to navigate to the "Lead % Pickup" menu item within the "Nameplate" menu.

```
Lead % Pickup
  75
```

16. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed.

```
Lead % Pickup
  75                          C
```

17. Utilizing the Up/Down arrow pushbuttons enter the desired "Lead % Pickup" value, then press the ENT pushbutton. The entered setting will be displayed.

```
Lead % Pickup
  XX
```

18. Press the Up/Down arrow pushbuttons, as necessary, to navigate to the "Lag % Pickup" menu item within the "Nameplate" menu.

```
Lag % Pickup
  75
```

19. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed.

```
Lag % Pickup
  75                          C
```

20. Utilizing the Up/Down arrow pushbuttons enter the desired "Lag % Pickup" value, then press the ENT pushbutton. The entered setting will be displayed.

```
Lag % Pickup
  XX
```

21. Press the Up/Down arrow pushbuttons, as necessary, to navigate to the "VAr Bias Volt Step" menu item within the "Nameplate" menu.

```
VAr Bias Volt Step
1.0 Volts
```

22. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed.

```
VAr Bias Volt Step
1.0 Volts                    C
```

23. Utilizing the Up/Down arrow pushbuttons enter the desired "VAr Bias Volt Step" value, then press the ENT pushbutton. The entered setting will be displayed.

```
VAr Bias Volt Step
X.X Volts
```

24. Press the Up/Down arrow pushbuttons, as necessary, to navigate to the "Max VAr Bias Time" menu item within the "Nameplate" menu.

```
Max VAr Bias Time
   300 mins
```

25. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed.

```
Max VAr Bias Time
   300 mins                  C
```

26. Utilizing the Up/Down arrow pushbuttons enter the desired "Max VAr Bias Time" value, then press the ENT pushbutton. The entered setting will be displayed.

```
Max VAr Bias Time
   XXX mins
```

Setting VAr Bias From TapTalk

To enable VAr Bias and establish the Maximum Capacitor Bank Size from TapTalk®, proceed as follows:

1. Select **Setup/Configuration** from the TapTalk toolbar. TapTalk will display the Configuration dialog screen (Figure 4-47).
2. From the VAr Bias section of the dialog screen select "Enable".
3. Enter the desired settings for the following:
   - Enter a Maximum Capacitor Bank Size (4 to 12,000 kVAr)
   - Lead % Bank Size Pickup (10 to 100%)
   - Lag % Bank Size Pickup (10 to 100%)
   - VAr Bias Voltage Step (0.1 to 2.0 V)
   - Max VAr Bias Duration (10 to 1440 min)
4. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
5. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

VOLTAGE REDUCTION

The M-6200A allows the selection of either Standard Voltage Reduction or Smart Voltage Reduction. Standard Voltage Reduction lowers the Bandcenter based on a percentage of the existing Bandcenter setting. When initiated, the control immediately begins Lower operations to reduce the voltage until it reaches the new upper band edge (Bandcenter plus ½ the Bandwidth setting). Smart Voltage Reduction will further reduce voltage using a variety of methods detailed in the "Smart Voltage Reduction" section later in this Chapter.

Standard Voltage Reduction

The control allows three steps of voltage reduction initiated by external dry contacts, front panel pushbutton or SCADA. The percentage of voltage reduction at each step is adjustable from 0 to 10% in 0.1% increments. When one or more contacts are closed, the effect is to shift the bandcenter setpoint lower thus causing the control to lower the voltage.

In addition, voltage reduction functionality can be enabled or disabled using Communication MODBUS® and DNP protocols.

The Voltage Reduction feature can be turned off by the Voltage Reduction Turnoff Timer (0 to 999 min). A setting of zero disables the Turnoff Timer.

Recognize that the "effective" bandcenter may have been raised by line drop compensator action when the voltage reduction is initiated and that the resultant voltage setting will be the combination of the two effects. Note also that the undervoltage block setting may limit the lowering of voltage, especially if there is little raising of the local voltage due to LDC action.

When first initiated, or when a subsequent step of voltage reduction is needed, the control will respond immediately to the voltage reduction command without regard to either the intertap time delay setting or the control time delay setting. After the desired voltage reduction, operation will revert back to normal operation with the time delay. Refer to **Section 5.2, External Connections** for contact connections.

When Voltage Reduction is enabled the front panel pushbutton, wired SCADA dry contacts, RS-485, Fiber Optic port or Ethernet connection can be used to provide stepped voltage reduction as described earlier.

Also, the state of the "Voltage Reduction" communications command can be saved or not saved when power has been lost. The default setting is "DON'T SAVE".

Enabling/Disabling Standard Voltage Reduction From The HMI

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
        CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
      Tapchanger Type
←                        →
```

3. Press the Right or Left Arrow pushbuttons as necessary until the following is displayed:

```
          Nameplate
←                        →
```

4. Press the Down Arrow pushbutton as necessary to navigate to the "Standard Voltage Reduction" menu item.

```
Standard VR
ENABLE
```

5. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Standard VR
ENABLE                       C
```

6. If Level Access is active, the Level Access prompt will be displayed

```
ENTER LEVEL ACCESS

_
```

■**NOTE**: When entering the Level Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level Access Code, then press the ENT pushbutton.

   If a valid Level Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Standard VR
ENABLE                    C
```

   If not, re-enter a valid code.

8. Utilizing the Up/Down arrow pushbuttons, select either "ENABLE" or Disable", then press the ENT pushbutton. The following will be displayed reflecting the selection that was entered.

```
Standard VR
ENABLE or disable
```

Smart Voltage Reduction

Smart Voltage Reduction, when enabled, will lower voltage to between the new Bandcenter setting and the lower band edge instead of stopping at the upper band edge. It will also disable VAr Bias if it is in effect. When "Smart VR LDC" is enabled, the control will ignore existing LDC settings and instead use the "Smart VR LDC" R and X or Z settings to apply LDC while the Voltage Reduction is in effect. The intent of this is to allow a utility to apply positive compensation such that if capacitor banks are on the feeder, the control will compensate for the result of closed capacitor banks increasing voltage downstream and allow greater voltage drop at the source while keeping end of line customer voltage within acceptable limits.

■**NOTE**: When Smart VR with Smart VR LDC is enabled and the unit goes into Reverse Power operation, the control will apply the selected Reverse Power mode Standard LDC settings and stop using the Smart VR LDC settings.

Enabling/Disabling and Setting Smart Voltage Reduction From The HMI

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
        CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Tapchanger Type
←                         →
```

3. Press the Right or Left Arrow pushbuttons as necessary until the following is displayed:

```
            Nameplate
←                         →
```

4. Press the Down Arrow pushbutton as necessary to navigate to the "Smart Voltage Reduction" menu item.

```
Smart VR
disable
```

5. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Smart VR
disable                   C
```

6. If Level Access is active, the Level Access prompt will be displayed

```
ENTER LEVEL ACCESS
_
```

■**NOTE**: When entering the Level Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level Access Code, then press the ENT pushbutton.

   If a valid Level Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Smart VR
disable                   C
```

   If not, re-enter a valid code.

8. Utilizing the Up/Down arrow pushbuttons, select either "ENABLE" or Disable", then press the ENT pushbutton. The following will be displayed reflecting the selection that was entered.

```
Smart VR
ENABLE or disable
```

9. Depending on the selection in Step 8, proceed as follows to complete the Smart Voltage Reduction setup:
   - If Smart Voltage Reduction was "ENABLED", proceed to Step 10.
   - If Smart Voltage Reduction was "DISABLED", no further action is required.

■**NOTE**: From this point on in this procedure it is assumed that a valid Level 2 Access Code has been previously entered. If not, a valid Level 2 Access Code will be required to be entered as described in Step 7.

10. Press the Down arrow pushbutton, as necessary, until the "Smart VR LDC" screen is displayed.

```
Smart VR LDC
disable
```

11. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed.

```
Smart VR LDC
disable                    C
```

12. Utilizing the Up/Down arrow pushbuttons, select either "ENABLE" or Disable", then press the ENT pushbutton. The following will be displayed reflecting the selection that was entered.

```
Smart VR LDC
ENABLE or disable
```

13. If "Smart VR LDC" was enabled, press the Down arrow pushbutton, as necessary, until the "Smart VR LDC R" screen is displayed.

```
Smart VR LDC R
   0 Volts
```

■**NOTE:** The following sequence of steps provide direction for the Smart VR LDC R setting. The steps necessary to set the Smart VR LDC X or (if applicable) Z settings are similar.

14. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed.

```
Smart VR LDC R
   0 Volts                 C
```

15. Utilizing the arrow pushbuttons, enter the desired Smart VR LDC R setting (–72 to 72 V), then press the ENT pushbutton. The following will be displayed reflecting the Smart VR LDC R (X or Z) value that was entered.

```
Smart VR LDC R
   X Volts
```

Enabling/Disabling and Setting Standard or Smart Voltage Reduction From TapTalk

1. Select **Setup/Configuration** from the TapTalk® toolbar. TapTalk will display the Configuration dialog screen (Figure 4-47).
2. From the "Voltage Reduction" section of the Configuration dialog screen select "Standard VR" Enable or "Smart VR" Enable. Only one voltage reduction method can be enabled.
3. If "Smart VR" is enabled, "Smart VR LDC" may also be enabled.
4. Enter the "Smart VR LDC" desired settings.
5. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
6. Select OK. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

Save Voltage Reduction at Power Off

Save Voltage Reduction at Power Off allows the state of the "Voltage Reduction" communication command to be saved or not saved when power has been lost. The default setting is "DON'T SAVE".

Setting Save Voltage Reduction at Power Off From The HMI

To set the Save Voltage Reduction at Power Off feature, proceed as follows:

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
        CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
      Tapchanger Type
←                          →
```

3. Press the Right or Left Arrow pushbuttons as necessary until the following is displayed:

```
          Nameplate
←                          →
```

4. Press the Down Arrow pushbutton as necessary to navigate to the "Save VR at Power Off" menu item.

```
Save VR at Power Off
DON'T SAVE
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Save VR at Power Off
DON'T SAVE                   C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS

_
```

■**NOTE**: When entering the Level 2 Access code, the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access code, then press the ENT pushbutton.

   If a valid Level 2 Access code was entered, the display will briefly flash a confirmation screen and display the following:

```
Save VR at Power Off
DON'T SAVE                   C
```

   If not, re-enter a valid code.

8. Utilizing the Up/Down arrow pushbuttons, select "DON'T SAVE or SAVE", then press the ENT pushbutton. The selected setting will be displayed.

```
Save VR at Power Off
(DON'T SAVE or SAVE)
```

Selecting Save Voltage Reduction at Power Off From TapTalk

1. Select **Setup/Configuration** from the TapTalk® toolbar. TapTalk will display the Configuration dialog screen (Figure 4-47).
2. From the "Voltage Reduction" section of the Configuration dialog screen select Save for the "Save VR at Power Off" option.
3. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
4. Select OK. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

Setting Voltage Reduction Turnoff Timer From The HMI

To set the Voltage Reduction Turnoff Timer from the HMI, proceed as follows:

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
          CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Tapchanger Type
←                        →
```

3. Press the Right or Left arrow pushbutton, as necessary, to navigate to the "Nameplate" menu.

```
           Nameplate
←                        →
```

4. Press the Down arrow pushbutton, as necessary, until the "Voltage Reduction Turnoff Timer " screen is displayed.

```
VRed Turnoff Time
   0 Min
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
VRed Turnoff Time
   0 Min                  C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
_
```

■**NOTE**: When entering the Level 2 Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and then display the following:

```
VRed Turnoff Time
   0 Min                  C
```

   If not, re-enter a valid code.

8. Utilizing the arrow pushbuttons, select the desired Voltage Reduction Turnoff Timer value (0 to 999 min), then press the ENT pushbutton. The following will be displayed reflecting the selection that was entered.

```
VRed Turnoff Time
   0 to 999 Min
```

Setting Voltage Reduction Turnoff Timer From TapTalk

1. Select **Setup/Configuration** from the TapTalk® toolbar. TapTalk will display the Configuration dialog screen (Figure 4-47).

■**NOTE**: Entering a value of zero disables the Voltage Reduction Turnoff Timer.

2. From the Voltage Reduction section of the dialog screen enter the desired time period (1 to 999 minutes).
3. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
4. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

DATA LOGGING

▲ **CAUTION**: Whenever the M-6200A clock is reset and data logging is enabled, the data log should be cleared.

The Data Logging feature allows the user to record data internally into non volatile memory. The data log is transferred in the Comtrade format. The Comtrade format consists of two files, the configuration file (*.cfg) and the data file (*.dat).

Data logging will continue indefinitely as long as the data Interval is set to a non-zero value. A zero value for the data interval will effectively disable data logging. The data log can be downloaded using MODBUS® (see M-6200A Protocol document) or DNP (using file transfer) protocol. The data can be viewed using any Comtrade compatible viewer.

Data logging interval ranges from 0 to 120 min with an increment of 1 minute. Once data logging is enabled, the control will store the data in a data record at the selected interval. Each data record includes the following data:

- Load Voltage*
- Compensated Voltage*
- Primary W
- Primary VA
- Primary VAr
- Load Current*
- Power Factor
- Frequency
- Tap Position
- Time Stamp
- Calculated Checksum
- Operation Count
- Primary Current
- Source Voltage*
- Meter Out Voltage
- RTN Counter

■ **NOTE**: * Load Voltage, Compensated Voltage, Load Current and Source Voltage are the average, maximum and minimum value during the data logging interval.

The Checksum is used to ensure the integrity of the record stored.

Data mask is used to mask off data that the user does not want to retrieve.

Due to the internal structure of the Comtrade format, time stamping is always performed. A total of 200,000 data records can be saved in non volatile memory.

Data Logging Setup From The HMI

To setup Data Logging from the HMI, proceed as follows:

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
        CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
      Tapchanger Type
←                        →
```

3. Press the Right or Left arrow pushbutton, as necessary, to navigate to the "Data Logging" menu.

```
        Data Logging
←                        →
```

4. Press the Down arrow pushbutton, as necessary, until the "Data Log Select" screen is displayed.

```
Data Log Select
  00111111111111
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
LOAD VOLTAGE
  00111111111111            C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
          _
```

■**NOTE**: When entering the Level 2 Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
LOAD VOLTAGE
  00111111111111              C
```

   If not, re-enter a valid code.

■**NOTE**: The cursor will be positioned under the far right hand zero which corresponds to LOAD VOLTAGE. The remaining Data Log parameter selections are displayed by moving the cursor to the left.

8. Utilizing the arrow pushbuttons enter a "1" for those Data Log parameters to be activated and a "0" for those that are to be disabled, then press the ENT pushbutton. The following will be displayed reflecting the selections that were made.

```
Data Log Select
  XXXXXXXXXXXXXX
```

9. Press the Down arrow pushbutton, as necessary, until the "Data Log Interval" screen is displayed.

```
Data Log Interval
      5 mins
```

10. Utilizing the arrow pushbuttons, enter the desired "Data Log Interval" (0 to 120 minutes in 1 minute increments), then press the ENT pushbutton. The following will be displayed reflecting the Data Log Interval that was entered.

```
Data Log Interval
      XXX mins
```

Data Logging Setup From TapTalk

To select the data to be logged and the interval between logs from TapTalk®, proceed as follows:

1. Select **Setup/Data Logging/Setup** from the TapTalk toolbar. TapTalk will display the Data Logging Setup dialog screen (Figure 4-49).

■**NOTE**: The Data Logging Setup dialog screen contains a self calculating Duration parameter that represents the number of Days and the specific time when the data logging buffer will be full. The number of parameters selected to log and the Sampling Period are considered in this calculation.

2. Enter a Sampling Period (0 to 120 minutes).
3. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
4. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

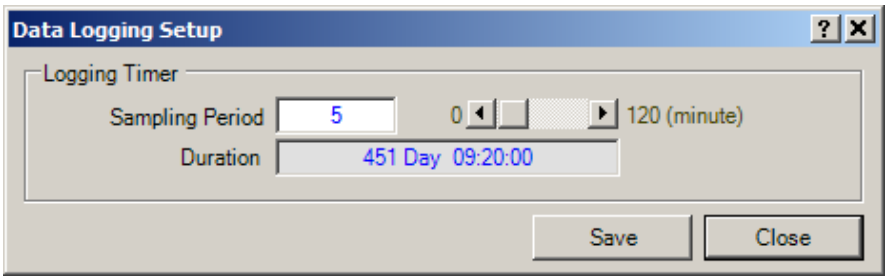


Figure 4-49 Data Logging Setup Dialog Screen

Input Selection (VR2 or Aux)

The Voltage Reduction 2 input can be configured to become an auxiliary input that can be read as a DNP point. The default configuration setting is Voltage Reduction 2.

Setting Input Selection (VR2/Aux) From The HMI

To set the Input Selection (VR2/Aux) from the HMI, proceed as follows:

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
        CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
       Tapchanger Type
←                        →
```

3. Press the Right or Left arrow pushbutton, as necessary, to navigate to the "Nameplate" menu.

```
          Nameplate
←                        →
```

4. Press the Down arrow pushbutton, as necessary, until the "Input Selection" screen is displayed.

```
Input Selection
VOLTAGE RED 2
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Input Selection
VOLTAGE RED 2                C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS

          _
```

■**NOTE**: When entering the Level 2 Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and then display the following:

```
Input Selection
VOLTAGE RED 2                C
```

   If not, re-enter a valid code.

8. Utilizing the arrow pushbuttons, select the desired Input Selection (VR2/AUX INPUT), then press the ENT pushbutton. The following will be displayed reflecting the selection that was entered.

```
Input Selection
VOLTAGE RED 2 or AUX INPUT
```

Setting Input Selection From TapTalk

1. Select **Setup/Configuration** from the TapTalk® toolbar. TapTalk will display the Configuration dialog screen (Figure 4-47).
2. From the "Voltage Reduction" section of the dialog screen select either "VR2" or "Aux".
3. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
4. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

LOW CURRENT BLOCK

When enabled the control determines if Load Current following a tapchange is less than 4 mA, coincident with Tap Delta Voltage being less than 0.4 Vac. When these conditions exist the control will initiate an alarm and block regulation. The Delta Voltage is measured on every tap operation once Load Current is less than 4 mA. If two consecutive tap operations each measure a delta voltage of less than 0.4 Vac, the Low Current Block and Alarm will be in effect. Additionally, a valid counter input for each tap position must be received for the Block and Alarm to initiate. Note that for Cooper regulators, this input is via the Motor Seal-in circuit instead of a dedicated counter.

Regulation will be blocked until one of the following conditions exists:

- Power to the control is cycled
- The control is switched to Manual remotely
- The control is switched to Manual via the Auto/Manual switch on the control front panel
- The Low Current Alarm is cleared/reset
- Load Current measurement is greater than or equal to 4 mA for 1 second

The Alarm Reset is located in the "Programmable Alarm" dialog screen in TapTalk® and in the HMI "Configuration/Programmable Alarm/Clr Low Current Blk.

Enabling/Disabling The Low Current Block/ Alarm From The HMI

■**NOTE**: Enabling the Low Current Block feature also enables the Low Current Block/ Alarm.

To enable/disable the Low Current Block/Alarm from the HMI, proceed as follows:

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
        CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
      Tapchanger Type
←                        →
```

3. Press the Right or Left arrow pushbutton, as necessary, to navigate to the "Nameplate" menu.

```
          Nameplate
←                        →
```

4. Press the Down arrow pushbutton, as necessary, until the "Low Current Block" screen is displayed.

```
Low Current Block
disable
```

5. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Low Current Block
disable                    C
```

6. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS

          _
```

■**NOTE**: When entering the Level 2 Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access Code, then press the ENT pushbutton.

   If a valid Level 2 Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Low Current Block
disable                    C
```

   If not, re-enter a valid code.

8. Utilizing the arrow pushbuttons select ENABLE or Disable, then press the ENT pushbutton. The following will be displayed reflecting selection that was entered.

```
Low Current Block
ENABLE or Disable
```

Enabling/Disabling The Low Current Block/ Alarm From TapTalk

To set the Low Current Block/Alarm from TapTalk®, proceed as follows:

■**NOTE**: Enabling the Low Current Block feature also enables the Low Current Block/ Alarm.

1. Select **Setup/Configuration** from the TapTalk toolbar. TapTalk will display the Configuration dialog screen (Figure 4-47).
2. From the "Low Current Block" section of the configuration dialog screen select "Enable or Disable".
3. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
4. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

TAP LIMITS

Tap Limits can be set if the "Regulate Internal (KeepTrack™)" tap position method is selected. Tap Limits, when enabled, include "Block Raise" and "Block Lower" limits which are adjustable from the Tap Maximum configuration point to the Tap Minimum value in 1 step increments.

Enabling/Disabling and Setting Tap Limits From The HMI

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
        CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
      Tapchanger Type
←                          →
```

3. Press the Right or Left arrow pushbutton, as necessary, until "Tap Settings" is displayed.

```
        Tap Settings
←                          →
```

4. Press the Down arrow pushbutton, as necessary, until the "Tap Limits" screen is displayed.

```
Tap Limits
ENABLE
```

5. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Tap Limits
ENABLE                     C
```

6. If Level Access is active, the Level Access prompt will be displayed.

```
ENTER LEVEL ACCESS

          _
```

■**NOTE**: When entering the Level Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level Access Code, then press the ENT pushbutton.

   If a valid Level Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Tap Limits
ENABLE                    C
```

   If not, re-enter a valid code.

8. Utilizing the Up/Down arrow pushbuttons, select either "ENABLE" or "disable", then press the ENT pushbutton. The following will be displayed reflecting the selection that was entered.

```
Tap Limits
ENABLE or disable
```

9. Depending on what mode was selected in Step 8, proceed as follows to complete the Tap Limits setup:
   - If Tap Limits were "ENABLED", proceed to Step 10.
   - If Tap Limits were "DISABLED", no further action is required.

10. Press the EXIT pushbutton to exit the "Tap Limits" menu, then press the EXIT pushbutton again to Exit the "Tap Settings" Menu. The following will be displayed:

```
        CONFIGURATION
←SETP                  COMM→
```

11. Press the Right or Left arrow pushbutton, as necessary, to navigate to the "Setpoints" menu, then press the Down arrow pushbutton once. The unit will display the following:

```
      Common Settings
←                        →
```

12. Press the Right or Left arrow pushbutton, as necessary, to navigate to the "Limits" menu.

```
        LIMITS
←                        →
```

13. Press the Down arrow pushbutton, as necessary, until the "Tap Block Raise" screen is displayed.

```
Tap Block Raise
16
```

14. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed. Go to Step 17.

```
Tap Block Raise
16                        C
```

15. If Level Access is active, the Level Access prompt will be displayed.

```
ENTER LEVEL ACCESS
          _
```

■**NOTE**: When entering the Level Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

16. Enter a valid Level Access Code, then press the ENT pushbutton.

    If a valid Level Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Tap Block Raise
16                        C
```

    If not, re-enter a valid code.

17. Utilizing the arrow pushbuttons, enter the desired Tap Block Raise limit (–12 to +16), then press the ENT pushbutton. The following will be displayed reflecting the Tap Block Raise limit that was selected.

```
Tap Block Raise
  XX
```

18. Press the Down arrow once, the "Tap Block Lower" screen is displayed.

```
Tap Block Lower
 –16
```

19. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed. Go to Step 22.

```
Tap Block Lower
 –16                    C
```

20. If Level Access is active, the Level Access prompt will be displayed.

```
ENTER LEVEL ACCESS
          _
```

■**NOTE**: When entering the Level Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

21. Enter a valid Level Access Code, then press the ENT pushbutton.

    If a valid Level Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Tap Block Lower
 –16                    C
```

    If not, re-enter a valid code.

22. Utilizing the arrow pushbuttons, enter the desired Tap Block Lower limit (–16 to +12), then press the ENT pushbutton. The following will be displayed reflecting the Tap Block Lower limit that was selected.

```
Tap Block Lower
  XX
```

Enabling/Disabling and Setting Tap Limits From TapTalk

To Enable and Set Tap Limits from TapTalk®, proceed as follows:

1. Select **Setup/Tap Settings** from the TapTalk toolbar. TapTalk will display the Tap Settings dialog screen (Figure 4-45).
2. Select "Enable" from the Tap Limits section of the dialog screen.
3. Enter the desired Block Raise and Block Lower limits.
4. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
5. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

CBEMA FUNCTIONALITY

CBEMA monitoring detects sags and swells within a range of 90 Vac to 180 Vac, and triggers data collection and alarming functions

Setpoints

Normal Voltage
CBEMA Event Enable
CBEMA Event Pickup
CBEMA Event Dropout
CBEMA Minimum Duration

Outputs

CBEMA Pickup Status
CBEMA Counters

Triggers

Oscillography
Sequence of Events

Operation

There are a total of 4 Event Monitors in CBEMA (Computer Business Equipment Manufacturers Association). Each CBEMA event monitor has a different minimum duration limit: Event 1, 1 – 60 cycles; Event 2, 1 – 120 cycles; Event 3, 60 – 60000 cycles and Event 4, 1 – 60 cycles. When Pickup is set to less than 100% it operates as a sag (under voltage) function, and when it is greater than 100% it operates as a swell (over voltage) function.

The following rules need to be followed when setting up CBEMA Setpoints:

- The Dropout should always be greater than Pickup in the Sag case
- The Dropout should be fixed to 100% in the Swell case
- The Pickup cannot be 100%

If any of the above rules are violated, an ERROR message will scroll across the HMI and the error can also be read using DNP.

When the load voltage is sagging or swelling greater than the pickup setting, then a pickup status will be set after the set minimum duration, in addition to incrementing the counter. When the load voltage is back to the dropout level, the status is cleared. Any or all of the Event Pickup statuses can be used to trigger Sequence of Events and/or Oscillography. The CBEMA counters are cleared after it reaches 10,000 counts, or it can also be cleared through the TapTalk® Communication Software or the HMI.

Each of the CBEMA Events has a Binary Input DNP point associated with it that will indicate the status of the event, as well as an Analog Input that will indicate the duration in cycles of the most recent event.

CBEMA Setup From The HMI

Setting CBEMA Normal Voltage, enabling Event 1, and entering Event 1 parameters are described in this procedure. Enabling Events 2, 3 and 4 and entering their respective settings is similar.

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
        CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
      Tapchanger Type
←                          →
```

3. Press the Right or Left Arrow pushbuttons, as necessary until the "CBEMA Setup" screen is displayed.

```
         CBEMA Setup
←                          →
```

4. Press the Down arrow pushbutton, as necessary, to navigate to the "Normal Voltage" screen.

```
Normal Voltage
   120.0  Volts
```

5. Press the ENT pushbutton, if Level Access is not active or has been previously input, the following will displayed. Go to Step 8.

```
Normal Voltage
   120.0 Volts              C
```

6. If Level Access is active, the Level Access prompt will be displayed.

```
ENTER LEVEL ACCESS
_
```

■**NOTE**: When entering the Level 2 Access code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level 2 Access code, then press the ENT pushbutton.

   If a valid Level 2 Access code was entered, then the display will briefly flash a confirmation screen and then display the following:

```
Normal Voltage
   120.0 Volts                C
```

   If not, re-enter a valid code.

8. Utilizing the Up/Down arrow pushbuttons, enter the desired "Normal Voltage" (100.0 to 130.0 Volts) value, then press the ENT pushbutton. The following will be displayed reflecting the Normal Voltage value that was entered.

```
Normal Voltage
   XXX.X Volts
```

■**NOTE**: From this point on in this procedure it is assumed that a valid Level 2 Access Code has been previously entered. If not, a valid Level 2 Access Code will be required to be entered as described in Step 7.

9. Press the Down arrow pushbutton, as necessary, to navigate to the "Event 1" screen.

```
Event 1
ENABLE
```

10. Press the ENT pushbutton, if Level Access is not active or has been previously input, the following will displayed.

```
Event 1
ENABLE                        C
```

11. Utilizing the Up/Down arrow pushbuttons, select "disable" or "ENABLE", then press the ENT pushbutton. The following will be displayed:

```
Event1
ENABLE or disable
```

12. Press the Down arrow pushbutton, as necessary, to navigate to the "Event1 Sag Pickup" screen.

```
Event1 Sag Pickup
   60 %
```

13. Press the ENT pushbutton, if Level Access is not active or has been previously input, the following will displayed.

```
Event1 Sag Pickup
   60 %                       C
```

14. Utilizing the Up/Down arrow pushbuttons, enter the desired "Event 1 Sag Pickup" (50 to 130 %) value, then press the ENT pushbutton. The following will be displayed reflecting the Event 1 Sag Pickup value that was entered.

```
Event1 Sag Pickup
   XX %
```

15. Press the Down arrow pushbutton, as necessary, to navigate to the "Event1 Sag Dropout" screen.

```
Event1 Sag Dropout
   95 %
```

16. Press the ENT pushbutton, if Level Access is not active or has been previously input, the following will displayed.

```
Event1 Sag Dropout
   95 %                       C
```

17. Utilizing the Up/Down arrow pushbuttons, enter the desired "Event 1 Sag Dropout" (61 to 130 %) value, then press the ENT pushbutton. The following will be displayed reflecting the Event 1 Sag Dropout value that was entered.

```
Event1 Sag Dropout
   XX %
```

18. Press the Down arrow pushbutton, as necessary, to navigate to the "Event 1 Sag Minimum Duration" screen.

```
Event1 Sag Min Dur
   1 Cycles  (17ms)
```

19. Press the ENT pushbutton, if Level Access is not active or has been previously input, the following will displayed.

```
Event1 Sag Min Dur
   1 Cycles                C
```

20. Utilizing the Up/Down arrow pushbuttons, enter the desired "Event 1 Sag Minimum Duration" (1 to 60 Cycles) value, then press the ENT pushbutton. The following will be displayed reflecting the Event 1 Sag Minimum Duration value that was entered.

```
Event1 Sag Min Dur
   X Cycles  (XXms)
```

CBEMA Setup From TapTalk

1. Select **Setup/CBEMA Events/Setup** from the TapTalk® toolbar, TapTalk will display the CBEMA Sequence of Events Setup dialog screen (Figure 4-51).
2. Enter the desired "Normal Voltage" (100.0 to 130.0 Volts) value
3. From the "CBEMA Event 1" section of the dialog screen enter the following CBEMA Event 1 settings;
   - Event 1 Sag Pickup (50 to 130 %)
   - Event 1 Sag Dropout (61 to 130 %)
   - Event 1 Sag Minimum Duration (1 to 60 Cycles)
4. From the "CBEMA Event 2" section of the dialog screen enter the following CBEMA Event 2 settings;
   - Event 2 Sag Pickup (50 to 130 %)
   - Event 2 Sag Dropout (71 to 130 %)
   - Event 2 Sag Minimum Duration (1 to 120 Cycles)
5. From the "CBEMA Event 3" section of the dialog screen enter the following CBEMA Event 3 settings;
   - Event 3 Sag Pickup (50 to 130 %)
   - Event 3 Sag Dropout (81 to 130 %)
   - Event 3 Sag Minimum Duration (60 to 60,000 Cycles)
6. From the "CBEMA Event 4" section of the dialog screen enter the following CBEMA Event 4 settings;
   - Event 4 Sag Pickup (50 to 130 %)
   - Event 4 Sag Dropout (50 to 114 %)
   - Event 4 Sag Minimum Duration (1 to 60 Cycles)

7. Select **Save**, TapTalk® will display a "Do you want to enable CBEMA Sequence of events?" confirmation screen (Figure 4-50).

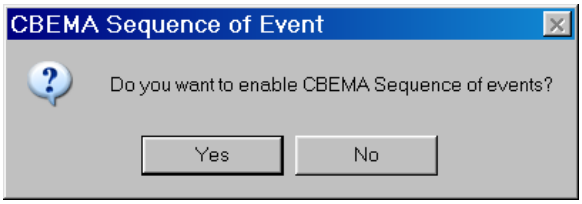


Figure 4-50 CBEMA Sequence of Event Enable Confirmation Screen

8. If CBEMA Events are to be used to trigger the Sequence of Events recorder, then select "Yes". TapTalk will display the Sequence of Events Setup dialog screen (Figure 4-12). **See Sequence of Events Recorder** earlier in this chapter, for additional information regarding Sequence of Events Recorder/CBEMA trigger settings.

■**NOTE**: CBEMA Event and counter status can be observed on the Metering and Status screen (Figure 3-27).

9. If CBEMA Events are *Not* to be used to trigger the Sequence of Events recorder, then select "No". TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

10. If desired, CBEMA Events can be used to trigger the Oscillograph Recorder. **See Setup Oscillograph Recorder** earlier in this chapter, for additional information regarding Oscillograph Recorder/ CBEMA trigger settings.

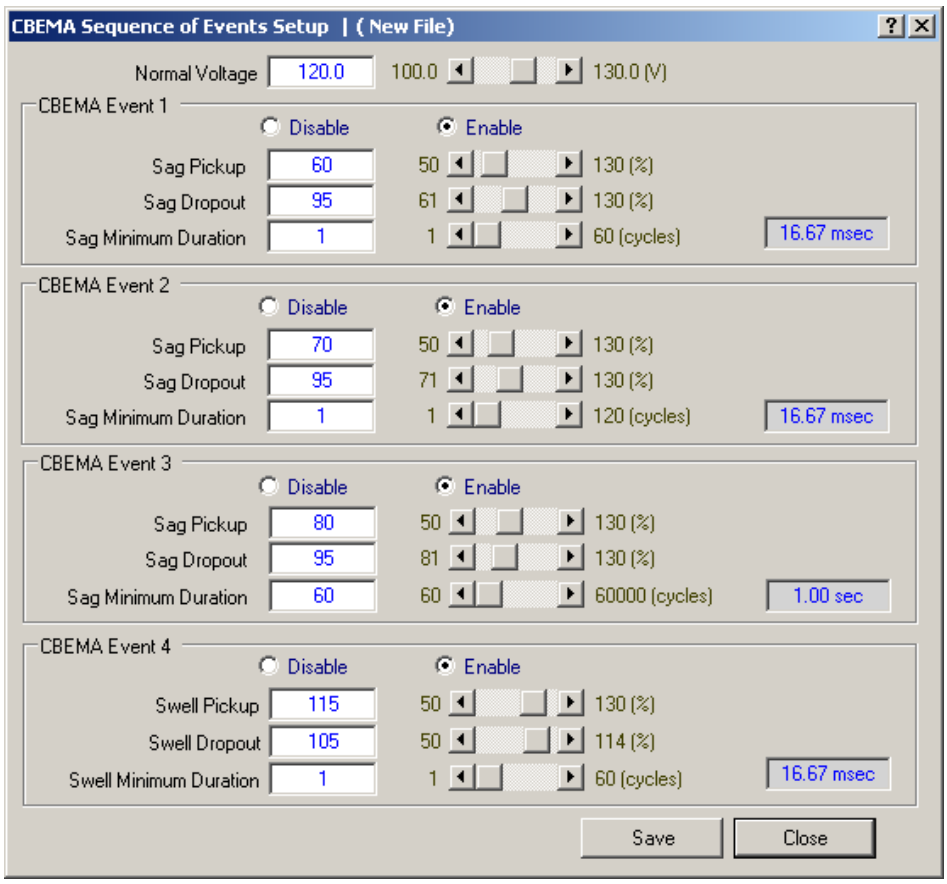


Figure 4-51 CBEMA Setting Dialog Screen

RUN THROUGH NEUTRAL

The Run Through Neutral feature allows the reversing switch of a regulator to be exercised periodically to prevent contact buildup and coking. The Run Through Neutral feature considers regulator operating parameters to periodically run the regulator through neutral. The frequency is primarily based on the Operations Between Runs setting value. However, in addition to the Operations Between Runs setting, the following regulator operating parameters are also considered and must all be within prescribed limits before the feature will be activated.

- The regulator must be within 2-6 taps of neutral (Actual value based on a Maximum Allowed taps setting). The Run Through Neutral feature will require the control to take one tap in the same direction it was moving once a Neutral input is received to accomplish the swipe of the reversing switch.
- Measured load current is below the user set Maximum Load Current setting.
- The feature will not operate the regulator if its operation would cause the control to exceed any voltage or tap limits. (If tap limits are enabled.)
- The feature will not operate if any of the Motor Current settings are exceeded.

The control also considers the following conditions during operation of the Run Through Neutral feature:

- If detected tap position is determined to be incorrect during the feature's operation, the control will attempt to find neutral within an allowed number of operations, and trigger an Abnormal Tap Position alarm if it is unsuccessful.
- If the control initiates the feature and does not receive a neutral input by the time it reaches the Maximum Allowed Taps setting, it will initiate operations in the opposite direction not to exceed the original starting position, plus the Maximum Allowed Taps setting.

For example, if the Maximum Allowed Taps setting is 4, and Tap Position starts at 3R, the control will move 4 taps towards what it thinks is neutral, and if the Neutral input is not energized, then 7 taps in the opposite direction. It will not take the eighth tap as that is reserved for exercising the reversing switch by passing through neutral).

If Neutral indication is not sensed during this process, the Abnormal Tap Position alarm will be activated and will not reset until the tap position has been re-calibrated.

If Neutral is "found" during this process, but the feature cannot complete the reversing switch swipe successfully due to the Maximum Allowed Taps setting, then the Run Through Neutral feature will standby until the conditions that are necessary to run are met and it can complete.

After the feature has completed successfully, the control will return to regulation and take any taps necessary to satisfy its settings requirements.

Enabling/Disabling and Setting Run Through Neutral From The HMI

1. Press the Down Arrow (CNFG Hot Button) pushbutton to awaken the unit. The menu will advance to "CONFIGURATION".

```
        CONFIGURATION
←SETP                    COMM→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
      Tapchanger Type
←                          →
```

3. Press the Right or Left arrow pushbutton, as necessary, until the "Run Through Neutral" screen is displayed.

```
     Run Through Neutral
←                          →
```

4. Press the Down Arrow pushbutton once. The unit will display the following:

```
Enable/Disable
disable
```

5. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Enable/Disable
disable                    C
```

6. If Level Access is active, the Level Access prompt will be displayed.

```
ENTER LEVEL ACCESS
_
```

■**NOTE**: When entering the Level Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level Access Code, then press the ENT pushbutton.

   If a valid Level Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Enable/Disable
disable                    C
```

   If not, re-enter a valid code.

8. Utilizing the Up/Down arrow pushbuttons, select either "Enable" or Disable", then press the ENT pushbutton. The following will be displayed reflecting the selection that was entered.

```
Enable/Disable
ENABLE or disable
```

9. Depending on the selection in Step 8, proceed as follows to complete the Run Through Neutral setup:
   - If Run Through Neutral was "ENABLED", proceed to Step 10.
   - If Run Through Neutral was "DISABLED", no further action is required.

■**NOTE**: From this point on in this procedure it is assumed that a valid Level 2 Access Code has been previously entered. If not, a valid Level 2 Access Code will be required to be entered as described in Step 7.

10. Press the Down arrow pushbutton, as necessary, until the "Max Allowed Taps" screen is displayed.

```
Max Allowed Taps
 4
```

11. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed.

```
Max Allowed Taps
 4                         C
```

12. Utilizing the arrow pushbuttons, enter the desired Max Allowed Taps (3 to 7), then press the ENT pushbutton. The following will be displayed reflecting the Max Allowed Taps value that was entered.

```
Max Allowed Taps
 X
```

13. Press the Down arrow once, the "Taps Between Runs" screen is displayed.

```
Taps Between Runs
 1000
```

14. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed.

```
Taps Between Runs
 1000                      C
```

15. Utilizing the arrow pushbuttons, enter the desired Taps Operations Between Runs (10 to 10000), then press the ENT pushbutton. The following will be displayed reflecting the Taps Operations Between Runs setting that was selected.

```
Taps Between Runs
 XXXXX
```

16. Press the Down arrow once, the "Max Load Current" screen is displayed.

```
Max Load Current
  50 mA
```

17. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed.

```
Max Load Current
  50 mA                    C
```

18. Utilizing the arrow pushbuttons, enter the desired Max Load Current (1 to 100 mA), then press the ENT pushbutton. The following will be displayed reflecting the Max Load Current setting that was entered.

```
Max Load Current
  XX mA
```

19. Press the Down arrow once, the "Max RTN Standby Ops" screen is displayed.

```
Max RTN Standby Ops
  20
```

20. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed.

```
Max RTN Standby Ops
  20                       C
```

21. Utilizing the arrow pushbuttons, enter the desired Max RTN Standby Ops (1 to 10000), then press the ENT pushbutton. The following will be displayed reflecting the Max RTN Standby Ops setting that was entered.

```
Max RTN Standby Ops
  XXXXX
```

Enabling/Disabling and Setting Run Through Neutral From TapTalk

To Enable or Disable the Run Through Neutral feature from TapTalk®, proceed as follows:

1. Select **Setup/Configuration** from the TapTalk toolbar. TapTalk will display the Configuration dialog screen (Figure 4-47).
2. Select "Enable" or "Disable" from the Run Through Neutral section of the dialog screen.
3. Depending on the selection in Step 2, proceed as follows to complete the Run Through Neutral setup:
   - If Run Through Neutral was "ENABLED", proceed to Step 4.
   - If Run Through Neutral was "DISABLED", no further action is required.
4. Enter the following Run Through Neutral settings:
   - Maximum Allowed Taps (3 to 7)
   - Tap Operations Between Runs (10 to 10000)
   - Maximum Load Current (1 to 100 mA)
   - Max RTN operations before Alarms (1 to 10000)
5. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
6. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

4.3 System Setpoints

REGULATION LIMITS

Overvoltage Limit and Voltage Runback

Setpoints are available to establish a block raise limit and voltage runback. The overvoltage limit is adjustable from 95.0 V to 135.0 V in 0.1 V increments. The overvoltage limit must be set above the upper control band limit. This limit is one portion of the First Customer Protector to limit overvoltage from line drop compensation action during heavy loading.

The voltage runback level is the Block Raise setting plus the Dead Band setting (this establishes the First Customer Protection Level.) This dead band should not be confused with the control dead band above and below the center voltage setpoint, which is generally called the control "bandwidth".

The voltage runback dead band is used to assure that the runback setting is sufficiently above the upper voltage limit setting to limit hunting. It is adjustable from 1.0 to 4.0 V in 0.1 V increments, and must be set greater than the voltage change of one single tapchange, or hunting will occur. It is suggested that it be set at approximately twice the voltage change of one tap.

If the voltage exceeds the runback limit, as might be caused by combinations of LDC action and load shifts or by a system disturbance without LDC action, the control will immediately call for an "automatic" lower without any time delay. The lower command will continue until the voltage is reduced below the runback voltage limit. After this occurs, the timer will reset. If the voltage is still high, normal control action will bring the voltage down to within the normal control band.

Overvoltage block can be effectively disabled by setting it to 135 V. By setting the runback dead band to 4 V, the runback voltage becomes 139 V which effectively disables the feature. All automatic raise/lower operations are blocked when the input voltage decreases to less than 85.0 V. Manual tapchanges can be initiated if Motor Power is available.

Undervoltage Block

This limit is adjustable from 95.0 V to 135.0 V in 0.1 V increments. This limit can be set to limit low customer voltage to safe limits and will block voltage reduction action that could cause motor stalling and other undesirable low voltage effects. Undervoltage block can be effectively disabled by setting it to 95 volts. If the voltage is below the Block Lower setpoint, the control will not respond to further lower commands. Raise commands are not affected. Operation of the overvoltage limit, voltage runback and undervoltage block is illustrated in Figure 4-52.

All automatic raise/lower operations are blocked when the input voltage decreases to less than 85.0 V. Manual tapchanges can be initiated if Motor Power is available.

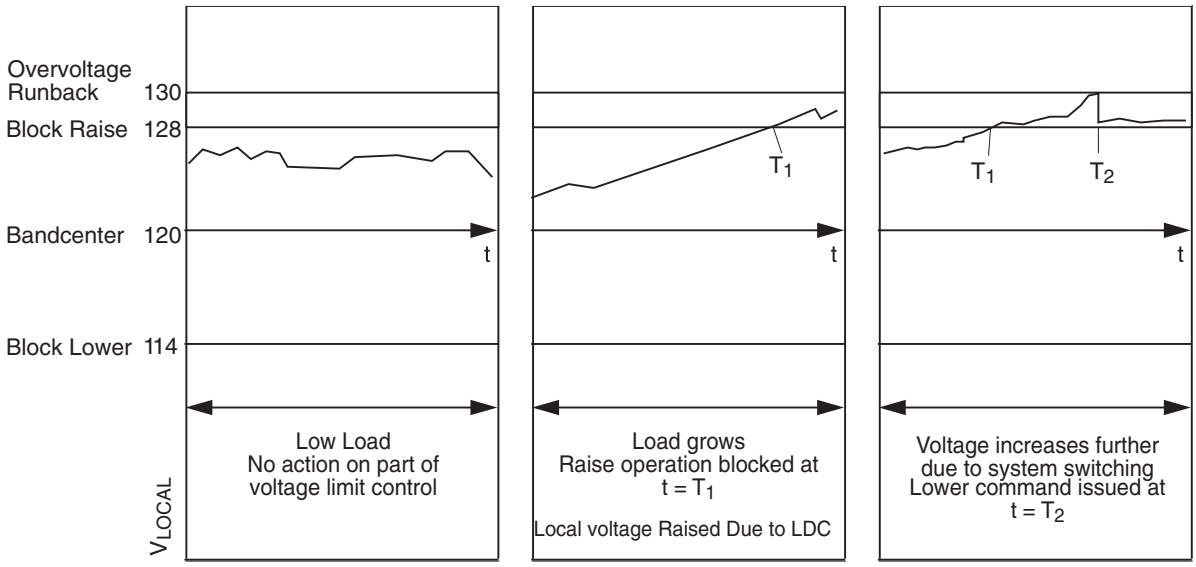


Figure 4-52 Local Voltage as Function of Load Current When Using Line Drop Compensation/Action of Overvoltage and Overvoltage Runback Control

Overcurrent Block Operation

▲ **CAUTION**: The current input to the control is rated at 0.2 A continuous, 0.4 A for two hours, and 4.0 A for 1 second.

The Current Block Limit setpoint is available to block operation whenever the current exceeds the setting. The setting is adjustable from 50 to 640 mA in 1 mA increments.

This feature can be used to protect the tapchanger switch during periods of excessive current. This feature can be effectively disabled by setting the blocking current to 640 mA.

Setting the Overvoltage Block Raise Limit From The HMI

1. Press the Up Arrow (SETP Hot Button) pushbutton to awaken the unit. The menu will advance to "SETPOINTS".

```
            SETPOINTS
←MNTR                    CNFG→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Common Settings
←                          →
```

3. Press the Right or Left arrow pushbutton, as necessary, to navigate to the "Limits" menu.

```
              LIMITS
←                          →
```

4. Press the Down arrow pushbutton once. The unit will display the following:

```
Block Raise Voltage
128.0 Volts
```

5. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Block Raise Voltage
128.0 Volts                C
```

6. If Level Access is active, the Level Access prompt will be displayed.

```
ENTER LEVEL ACCESS

          _
```

■**NOTE**: When entering the Level Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level Access Code, then press the ENT pushbutton.

   If a valid Level Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Block Raise Voltage
128.0 Volts                C
```

   If not, re-enter a valid code.

8. Utilizing the arrow pushbuttons, enter the desired Block Raise Voltage Limit (95 to 135 Volts in 0.1 increments), then press the ENT pushbutton. The following will be displayed reflecting the Block Raise Voltage Limit that was entered.

```
Block Raise Voltage
XXX.X Volts
```

Setting the Undervoltage Block Lower Limit From The HMI

1. Press the Up Arrow (SETP Hot Button) pushbutton to awaken the unit. The menu will advance to "SETPOINTS".

```
            SETPOINTS
←MNTR                    CNFG→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Common Settings
←                          →
```

3. Press the Right or Left arrow pushbutton, as necessary, to navigate to the "Limits" menu.

```
            LIMITS
←                          →
```

4. Press the Down arrow pushbutton, as necessary, until the following is displayed:

```
Block Lower Voltage
114.0 Volts
```

5. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Block Lower Voltage
114.0 Volts                C
```

6. If Level Access is active, the Level Access prompt will be displayed.

```
ENTER LEVEL ACCESS
          _
```

■**NOTE**: When entering the Level Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level Access Code, then press the ENT pushbutton.

   If a valid Level Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Block Lower Voltage
114.0 Volts                C
```

   If not, re-enter a valid code.

8. Utilizing the arrow pushbuttons, enter the desired Block Lower Voltage Limit (95 to 135 Volts in 0.1 increments), then press the ENT pushbutton. The following will be displayed reflecting the Block Lower Voltage Limit that was entered.

```
Block Lower Voltage
XXX.X Volts
```

Setting the Voltage Runback Dead Band From The HMI

1. Press the Up Arrow (SETP Hot Button) pushbutton to awaken the unit. The menu will advance to "SETPOINTS".

```
          SETPOINTS
←MNTR                    CNFG→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
       Common Settings
←                          →
```

3. Press the Right or Left arrow pushbutton, as necessary, to navigate to the "Limits" menu.

```
            LIMITS
←                          →
```

4. Press the Down arrow pushbutton, as necessary, until the following is displayed:

```
Dead Band
2.0 Volts
```

5. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Dead Band
2.0 Volts                  C
```

6. If Level Access is active, the Level Access prompt will be displayed.

```
ENTER LEVEL ACCESS

          _
```

■**NOTE**: When entering the Level Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level Access Code, then press the ENT pushbutton.

   If a valid Level Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Dead Band
2.0 Volts                    C
```

   If not, re-enter a valid code.

8. Utilizing the arrow pushbuttons, enter the desired Dead Band (1 to 4 Volts in 0.1 increments), then press the ENT pushbutton. The following will be displayed reflecting the Dead Band value that was entered.

```
Dead Band
X.X Volts
```

Setting the Current Block Limit From The HMI

1. Press the Up Arrow (SETP Hot Button) pushbutton to awaken the unit. The menu will advance to "SETPOINTS".

```
            SETPOINTS
←MNTR                      CNFG→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Common Settings
←                          →
```

3. Press the Right or Left arrow pushbutton, as necessary, to navigate to the "Limits" menu.

```
            LIMITS
←                          →
```

4. Press the Down arrow pushbutton, until the unit displays the following:

```
Current Block Limit
640 mA
```

5. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Current Block Limit
640 mA                       C
```

6. If Level Access is active, the Level Access prompt will be displayed.

```
ENTER LEVEL ACCESS

          _
```

■**NOTE**: When entering the Level Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level Access Code, then press the ENT pushbutton.

   If a valid Level Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Current Block Limit
640 mA                       C
```

   If not, re-enter a valid code.

8. Utilize the arrow pushbuttons, to enter the desired Current Block Limit (50 to 640 mA in 1 mA increments), then press the ENT pushbutton. The following will be displayed reflecting the Current Block Limit that was entered.

```
Current Block Limit
XXX mA
```

Setting Block Raise Limit, Block Lower Limit, Dead Band and Current Block Limit From TapTalk

1. Select **Setup/Setpoints** from the TapTalk® toolbar. TapTalk will display the Setpoints dialog screen (Figure 4-53).
2. From the "Limit and Runback" section of the Setpoints dialog screen enter the desired settings for the following:
   - Block Raise
   - Block Lower
   - Dead Band
   - Current Limit
3. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
4. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

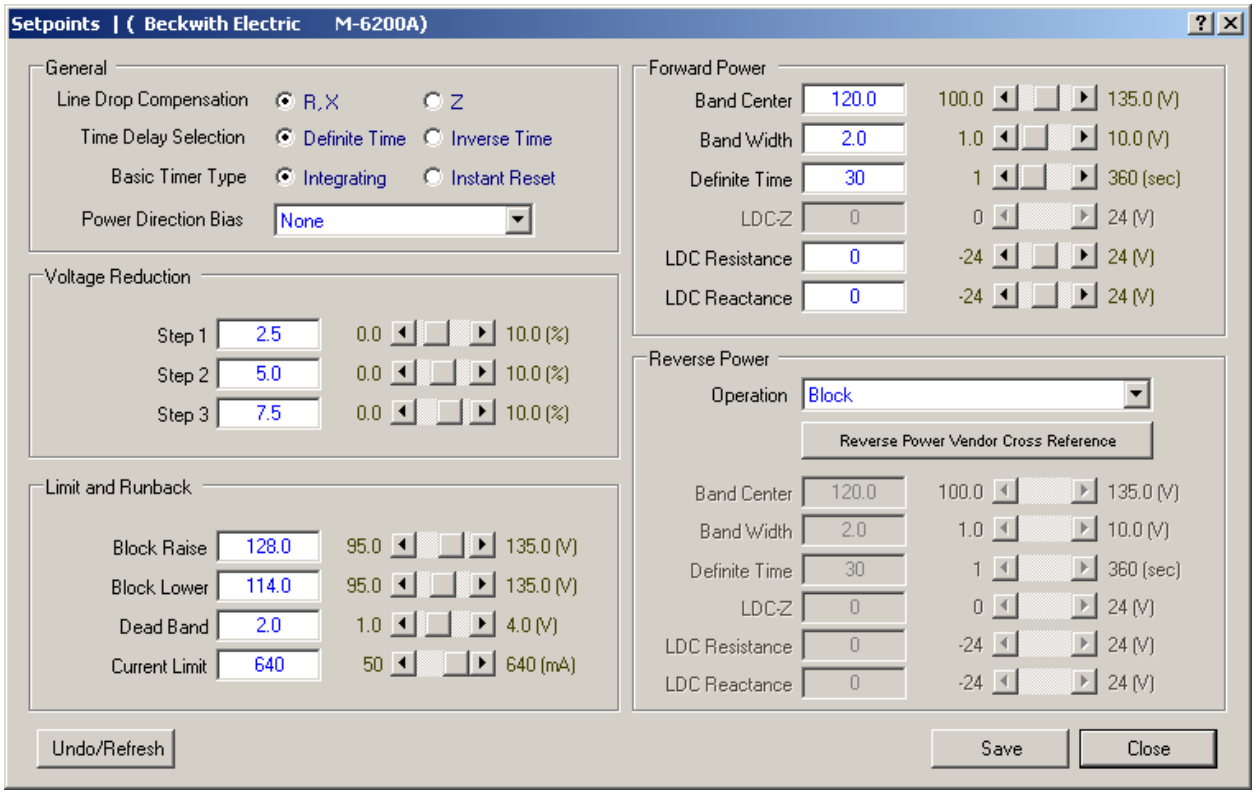


Figure 4-53 Setpoints Dialog Screen

VOLTAGE REDUCTION

The M-6200A allows the selection of either Standard Voltage Reduction or Smart Voltage Reduction. Standard Voltage Reduction lowers the Bandcenter based on a percentage of the existing Bandcenter setting. When initiated, the control immediately begins Lower operations to reduce the voltage until it reaches the new upper band edge (Bandcenter plus ½ the Bandwidth setting). Smart Voltage Reduction will further reduce voltage using several methods detailed in **Section 4.2, Configuration,"Smart Voltage Reduction"**.

The control allows three steps of voltage reduction initiated by external dry contacts, front panel pushbutton or SCADA. The percentage voltage reduction at each step is adjustable from 0 to 10% in 0.1% increments. When one or more contacts are closed, the effect is to shift the bandcenter setpoint lower thus causing the control to lower the voltage.

In addition, voltage reduction functionality can be enabled or disabled using Communication MODBUS® and DNP protocols.

The Voltage Reduction feature can be turned off by the Voltage Reduction Turnoff Timer (0 to 999 min). A setting of zero disables the Turnoff Timer.

Recognize that the "effective" bandcenter may have been raised by line drop compensator action when the voltage reduction is initiated and that the resultant voltage setting will be the combination of the two effects. Note also that the undervoltage block setting may limit the lowering of voltage, especially if there is little raising of the local voltage due to LDC action.

When first initiated, or when a subsequent step of voltage reduction is needed, the control will respond immediately to the voltage reduction command without regard to either the intertap time delay setting or the control time delay setting. After the desired voltage reduction, operation will revert back to normal operation with the time delay. Refer to **Section 5.2, External Connections** for contact connections.

When Voltage Reduction is enabled the front panel pushbutton, wired SCADA dry contacts, RS-485, Fiber Optic port or Ethernet connection can be used to provide stepped voltage reduction as described earlier.

Also, the state of the "Voltage Reduction" communications command can be saved or not saved when power has been lost. The default setting is "DON'T SAVE".

Enabling and Setting Voltage Reduction Steps 1, 2 and 3 From The HMI

1. Press the Up Arrow (SETP Hot Button) pushbutton to awaken the unit. The menu will advance to "SETPOINTS".

```
          SETPOINTS
←MNTR                    CNFG→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
      Common Settings
←                          →
```

■**NOTE**: The following sequence of steps are for enabling Voltage Reduction and setting Voltage Reduction Step 1. The steps used to set the Voltage Reduction Steps 2 and 3 are similar.

3. Press the Down arrow pushbutton, as necessary, to navigate to the "Reduction Step 1 %" (or Step 2 or 3) menu item.

```
Reduction Step 1 %
2.5
```

4. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed. Go to Step 7.

```
Reduction Step 1 %
 2.5                        C
```

5. If Level Access is active, the Level Access prompt will be displayed

```
ENTER LEVEL ACCESS

          _
```

■**NOTE**: When entering the Level Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

6. Enter a valid Level Access Code, then press the ENT pushbutton.

   If a valid Level Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Reduction Step 1 %
 2.5                        C
```

   If not, re-enter a valid code.

7. Utilize the arrow pushbuttons to enter the desired Voltage Reduction (0.0 to 10.0 % in 0.1 % increments), then press the ENT pushbutton. The following will be displayed reflecting the Voltage Reduction Step #1 Value that was entered.

```
Reduction Step 1 %
 X.X
```

Enabling and Setting Voltage Reduction Steps 1, 2 and 3 From TapTalk

1. Select **Setup/Setpoints** from the TapTalk® toolbar. TapTalk will display the Setpoints dialog screen (Figure 4-53).
2. From the "Voltage Reduction" section of the Setpoints dialog screen select "Enable".
3. From the "Voltage Reduction" section of the Setpoints dialog screen enter the desired Voltage Reduction settings (0.0 to 10.0 % in 0.1 % increments) for the following:
   - Step 1
   - Step 2
   - Step 3
4. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
5. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

LINE DROP COMPENSATION

Voltage Regulation Without LDC

When the control is just used to regulate the voltage on the regulator low-side bus, the only input required is voltage from a line-to-line or line-to-ground VT with a nominal 120 Vac secondary.

Voltage Regulation With LDC

When it is desirable to regulate the voltage at some distance from the voltage regulator, or in general to raise the voltage during high load conditions, the Line Drop Compensation (LDC) feature is used.

Two different LDC methods are available in the M-6200A Digital Regulator Control. A selection in the Setpoints/Power Flow Forward (Reverse) allows the user to select from either Resistance/Reactance (R/X) or LDC-Z.

The Bandcenter, Bandwidth, and Time Delay functions are set the same as if LDC were not used.

LDC R/X

A classical approach can be used to determine the R/X settings for the LDC, however this assumes a load center point and is usually not applicable to the typical distribution feeder. For more information, contact Beckwith Electric for **Application Note #17**.

A simpler method, which will work for most applications, is recommended. This involves looking at the lines leaving the station and determining the resistance/reactance (R/X) ratio for the main line. The resistive and reactive line drop compensation setpoints should then be entered in this same R/X ratio.

If the CT and VT phasing corrections have been made to compensate for any phase angles between measured voltage and load current, only positive values of R and X compensation need to be used.

Table 4-3 gives the R/X ratio for various wire sizes and typical conductor spacings.

ACSR		Copper	
MCM	R/X	MCM	R/X
795	4.0	750	6.0
477	2.5	500	4.5
336	2.0	350	3.3
266	1.5	250	2.4
AWG	R/X	AWG	R/X
4/0	1.2	4/0	2.0
2/0	1.0	2/0	1.5
2	0.5	2	0.7
6	.02	6	0.3

Table 4-3 Approximate Ratio of Line Resistance to Reactance (R/X) of Typical Distribution Circuits

By knowing the ratio of the maximum expected load to the present load, the amount of voltage compensation needed is found as shown in the following example.

Example

Desired

local voltage @ min load = 120 volts

local voltage @ max load = 124 volts

Using the following assumptions:

Desired Bandcenter = 120 volts

Desired Bandwidth = 2 volts

The device being controlled is 50% loaded

Setting

Start with R=0 and X=0 and increase both values using the ratio shown in the table for the feeder conductor. Keeping the R/X ratio, increase R_{set} and X_{set} until the difference between the compensated voltage and the local voltage is 2.0 volts.

This example would let the voltage vary from 119 V at no load to 125 V at maximum load taking into account the bandwidth.

With this simplified method of LDC setting, the first customer's voltage will be limited by the upper voltage limit at the highest daily load, depending on the accuracy of the daily load projection. At the same time, the furthest customer will receive the highest voltage possible under the line and loading conditions. The first customer protection can be set on the control. Refer to the **Regulation Limits** section of this chapter.

Since the daily load projections will likely have a seasonal variation, the best balance of first customer to furthest customer voltage may require seasonal adjustment of the LDC settings. Note that the settings of R and X compensation are proportional to the peak load projection and that new settings can be scaled from the first setting obtained by the experimental process just described.

LDC-Z

The second available compensation method is called Z-compensation (LDC-Z). LDC-Z must be selected in the control setpoint portion of the menu or software and the **VOLTAGE RAISE** (V_R) setpoint must be set in order for this feature to be implemented. The LDC-Z application is especially useful on systems where several lines exist with different load centers where the proper compensation is not related to any single R & X values as set in R & X compensation.

Basically, LDC-Z compensation consists of designating a target bus voltage increase (line drop compensation) that correlates to the **magnitude** of the control current rather than to the calculation of input R & X line drop at control current magnitude and angle values.

The setting, (V_R), is the calculated load voltage drop (at maximum load) in the circuit or line that has the ratio of the highest voltage drop at maximum load condition compared to the rated CT output (200 mA).

V_R = 0 to 24 volts in increments of 1 volt.

Example:

- Calculated voltage drop = 5 volts at load level of 150 mA control current.
- V_R setting = 200/150 X 5 = 6.7 volts (rounded) = 7 volts

To calculate the line drop compensation at any given control current level (I):

- V = I/200 X 7 (setting):

  If I = 50 mA; V = 50/200 X 7 = 1.75 volts

As with R & X compensation applications, the "block raise" and "dead band" settings are used for first house protection on all circuits or lines.

■**NOTE**: For additional information about LDC-Z applications, contact Beckwith Electric to obtain Distributech Paper 1/27/05, "*Maximizing Automatic Reverse Power Operations with LTC Transformers and Regulators*."

Function	Setpoint Range	Increment	Default Setting
Bandcenter	100.0 V to 135.0 V	0.1 V	120.0 V
Bandwidth	1.0 V to 10.0 V	0.1 V	2.0 V
Definite Delay	1 Second to 360 Seconds	1 Second	30 Seconds
Inverse Delay	1 Second to 360 Seconds	1 Second	30 Seconds
LDC Resistance	–24 V to +24 V	1 V	0 V
LCD Reactance	–24 V to +24 V	1 V	0 V
LDC-Z	0 to V to 24 V	1 V	0 V

Table 4-4 Line Drop Compensation Setpoint Ranges

Selecting Line Drop Compensation Type and Settings From The HMI

1. Press the Up Arrow (SETP Hot Button) pushbutton to awaken the unit. The menu will advance to "SETPOINTS".

```
            SETPOINTS
←MNTR                    CNFG→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Common Settings
←                          →
```

3. Press the Down arrow pushbutton, as necessary, to navigate to the "LDC Selection" menu item.

```
LDC Selection
RX
```

4. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed. Go to Step 7.

```
LDC Selection
RX                          C
```

5. If Level Access is active, the Level Access prompt will be displayed.

```
ENTER LEVEL ACCESS

          _
```

■**NOTE**: When entering the Level Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

6. Enter a valid Level Access Code, then press the ENT pushbutton.

   If a valid Level Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
LDC Selection
RX                          C
```

   If not, re-enter a valid code.

7. Utilizing the Up/Down arrow pushbuttons, select the desired type of Line Drop Compensation (RX or Z), then press the ENT pushbutton. The following will be displayed reflecting the Line Drop Compensation Type that was selected.

```
LDC Selection
RX  or  Z
```

8. Depending on the type of Line Drop Compensation that was selected in Step 7, proceed as follows to complete the Line Drop Compensation setup:
   - If "RX" Line Drop Compensation was selected, proceed to "Setting LDC Resistance (R) and Reactance (X) Values" in this chapter.
   - If "Z" Line Drop Compensation was selected, proceed to "Setting LDC-Z" in this chapter.

Setting Power Flow Forward and Power Flow Reverse LDC Resistance (R) and Reactance (X) Values From The HMI

■**NOTE**: The steps necessary to set the Power Flow Forward LDC Resistance (R) and Reactance (X) values are described here. The steps to set the Power Flow Reverse LDC Resistance (R) and Reactance (X) are similar.

1. Press the Up Arrow (SETP Hot Button) pushbutton to awaken the unit. The menu will advance to "SETPOINTS".

```
            SETPOINTS
←MNTR                    CNFG→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Common Settings
←                        →
```

3. Press the Right or Left arrow pushbutton, as necessary, to navigate to the "Power Flow Forward" menu.

```
      Power Flow Forward
←                        →
```

4. Press the Down arrow pushbutton, as necessary, to navigate to the "LDC R Fwd" (or LDC R Rev) menu item.

```
LDC R Fwd                ←→
   0 Volts
```

5. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
LDC R Fwd
   0 Volts                C
```

6. If Level Access is active, the Level Access prompt will be displayed.

```
ENTER LEVEL ACCESS

          _
```

■**NOTE**: When entering the Level Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level Access Code, then press the ENT pushbutton.

   If a valid Level Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
LDC R Fwd
   0 Volts                C
```

   If not, re-enter a valid code.

■**NOTE**: The double directional arrows in the display indicate that by pressing Right or Left arrow pushbuttons the display will jump to the LDC Selection display in the Common Settings menu. Pressing any other pushbutton except ENT will then jump back to the LDC R(X) Fwd(Rev) display.

8. Utilize the arrow pushbuttons to enter the desired LDC R value (–24 to 24 in 1 Volt increments), then press the ENT pushbutton. The display will advance to the LDC X Fwd display.

```
LDC X Fwd
   0 Volts
```

9. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed. Go to Step 12.

```
LDC X Fwd
   0 Volts                C
```

10. If Level Access is active, the Level Access prompt will be displayed.

```
ENTER LEVEL ACCESS

          _
```

■**NOTE**: When entering the Level Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

11. Enter a valid Level Access Code, then press the ENT pushbutton.

    If a valid Level Access Code was entered, the display will briefly flash a confirmation screen and then display the following:

```
LDC X Fwd
  0 Volts                    C
```

    If not, re-enter a valid code.

■**NOTE**: The double directional arrows in the display indicate that by pressing Right or Left arrow pushbuttons the display will jump to the LDC Selection display in the Common Settings menu. Pressing any other pushbutton except ENT will then jump back to the LDC R(X) Fwd(Rev) display.

12. Utilize the arrow pushbuttons to enter the desired LDC X value (–24 to +24 in 1 Volt increments), then press the ENT pushbutton. The display will advance to the LDC R Fwd display.

```
LDC R Fwd                    ←→
  0 Volts
```

Setting Power Flow Forward and Power Flow Reverse LDC Z Values From The HMI

■**NOTE**: The steps necessary to set the Power Flow Forward LDC Z value is described here. The steps to set the Power Flow Reverse LDC Z value are similar.

1. Press the Up Arrow (SETP Hot Button) pushbutton to awaken the unit. The menu will advance to "SETPOINTS".

```
          SETPOINTS
←MNTR                      CNFG→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
       Common Settings
←                            →
```

3. Press the Right or Left arrow pushbutton, as necessary, to navigate to the "Power Flow Forward" menu.

```
      Power Flow Forward
←                            →
```

4. Press the Down arrow pushbutton, as necessary, to navigate to the "LDC Z Fwd" (or LDC Z Rev) menu item.

```
LDC Z Fwd                    ←→
  0 Volts
```

5. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
LDC Z Fwd
  0 Volts                    C
```

6. If Level Access is active, the Level Access prompt will be displayed.

```
ENTER LEVEL ACCESS
          _
```

■**NOTE**: When entering the Level Access Code, the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level Access Code, then press the ENT pushbutton.

   If a valid Level Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
LDC Z Fwd
  0 Volts                    C
```

   If not, re-enter a valid code.

■**NOTE**: The double directional arrows in the display indicate that by pressing Right or Left arrow pushbuttons the display will jump to the LDC Selection display in the Common Settings menu. Pressing any other pushbutton except ENT will then jump back to the LDC Z Fwd(Rev) display.

8. Utilize the arrow pushbuttons to enter the desired LDC Z value (0 to 24 in 1 Volt increments), then press the ENT pushbutton. The display will advance to the LDC Z Fwd display.

```
LDC Z Fwd                    ←→
  X Volts
```

Setting Line Drop Compensation From TapTalk

1. Select **Setup/Setpoints** from the TapTalk toolbar. TapTalk will display the Setpoints dialog screen (Figure 4-53).
2. From the "General" section of the Setpoints dialog screen, select the desired type of Line Drop Compensation (R, X or Z).
3. From the "Forward Power" section of the Setpoints dialog screen, enter the desired LDC R, X or Z for Forward Power settings for the following:
   - R, X (–24 to +24 in 1 Volt increments)
   - Z (0 to 24 in 1 Volt increments)

   If Reverse Power Flow settings are required, enter the desired LDC R, X or Z values in the "Reverse Power" section of the Setpoints dialog screen.
4. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
5. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

BASIC TIME DELAY

The Basic Time Delay setting is required to inhibit the tapchanger from unnecessary operations on temporary voltage excursions and is commonly set at 30 to 60 seconds. The timer includes two selectable elements "Definite/Inverse" and "Integrating/Instant Reset".

The control will only respond to an out-of-band voltage excursion after the Basic Time Delay has timed out. The Basic Time Delay can be set as an integrating timer or an instantaneous reset timer upon the voltage return to an in-band condition. As an integrating timer, it increments during time out-of-band and decrements during time in-band, but not below zero.

The Basic Time Delay can be set to either a Definite or Inverse delay. Both types of delay will work in Forward or Reverse Power Flow. The inverse time delay will follow the curve in Figure 4-54, Inverse Time Delay Curve.

Inverse Time Example

Bandcenter 120 V

Bandwidth 3 V

Inverse Time Delay Setting 120 s

ΔV = (Bandwidth/2) = 1.5 V

V_{in} = 123 V

Voltage deviation in multiples of ΔV

= $[V_{in}$ – Bandcenter$]/\Delta V$

= (123 – 120)/1.5

= 2

Time delay from Figure 4-54

= 50% of Inverse Time Delay setting

= 60 sec

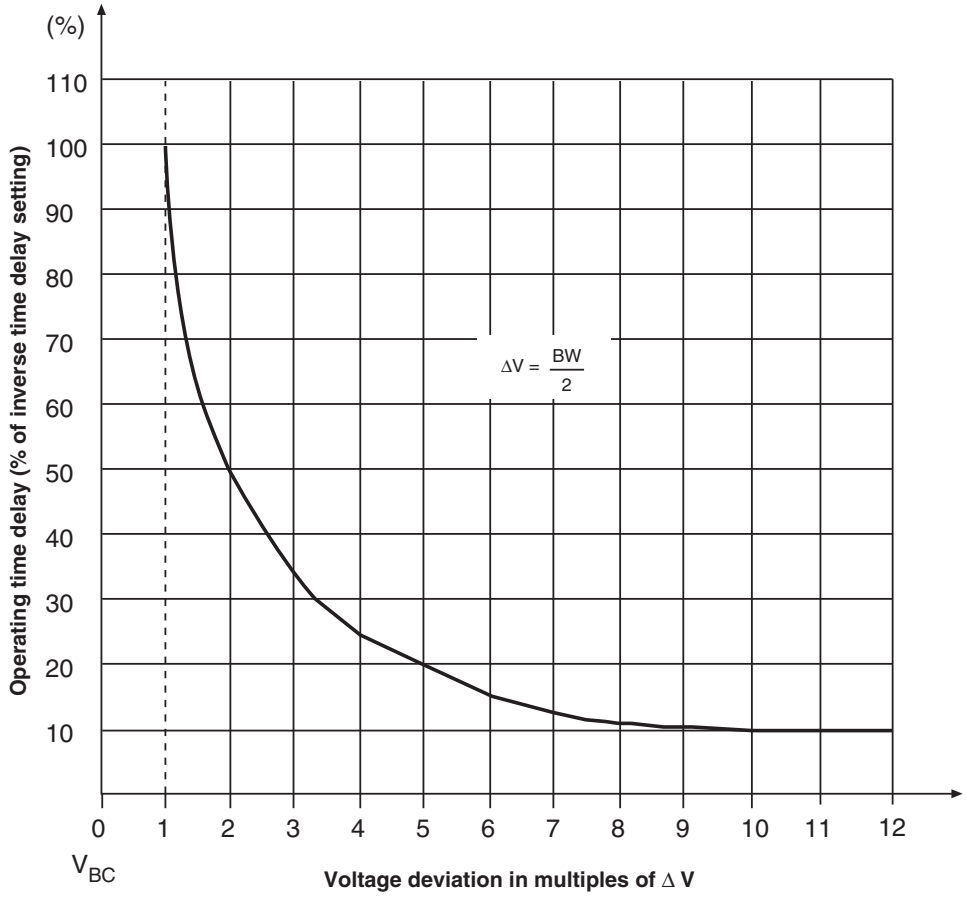


Figure 4-54 Inverse Time Delay Curve

Setting Basic Time Delay Timer Characteristic and Type From The HMI

1. Press the Up Arrow (SETP Hot Button) pushbutton to awaken the unit. The menu will advance to "SETPOINTS".

```
            SETPOINTS
←MNTR                    CNFG→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Common Settings
←                          →
```

3. Press the Down arrow pushbutton, as necessary, to navigate to the "Timer Characteristic" menu item.

```
Timer Characteristic
DEFINITE
```

4. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed. Go to Step 7.

```
Timer Characteristic
DEFINITE                    C
```

5. If Level Access is active, the Level Access prompt will be displayed.

```
ENTER LEVEL ACCESS

          _
```

■**NOTE**: When entering the Level Access Code the display will automatically advance the cursor to the next digit when input is momentarily paused.

6. Enter a valid Level Access Code, then press the ENT pushbutton.

   If a valid Level Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Timer Characteristic
DEFINITE                    C
```

   If not, re-enter a valid code.

7. Utilizing the arrow pushbuttons, select the desired Timer Characteristic (DEFINITE or INVERSE), then press the ENT pushbutton. The following will be displayed reflecting the Timer Characteristic that was selected.

```
Timer Characteristic
DEFINITE or INVERSE
```

8. Press the Down arrow pushbutton, as necessary, to navigate to the "Timer Reset" menu item.

```
Timer Reset
INTEGRATING
```

9. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed. Go to Step 12.

```
Timer Reset
INTEGRATING                 C
```

10. If Level Access is active, the Level Access prompt will be displayed.

```
ENTER LEVEL ACCESS

          _
```

■**NOTE**: When entering the Level Access Code, the display will automatically advance the cursor to the next digit when input is momentarily paused.

11. Enter a valid Level Access Code, then press the ENT pushbutton.

    If a valid Level Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Timer Reset
INTEGRATING                    C
```

    If not, re-enter a valid code.

12. Utilizing the arrow pushbuttons, select the desired Timer Reset (INTEGRATING or INSTANT RESET), then press the ENT pushbutton. The following will be displayed reflecting the Timer Reset type that was selected.

```
Timer Reset
INTEGRATING or INSTANT RESET
```

Setting Basic Time Delay Timer Characteristic and Type From TapTalk

1. Select **Setup/Setpoints** from the TapTalk® toolbar. TapTalk will display the Setpoints dialog screen (Figure 4-53).
2. From the "General" section of the Setpoints dialog screen select the desired User Selectable Time Delay type (Definite or Inverse).
3. From the "General" section of the Setpoints dialog screen select the desired User Selectable Time Delay timer type (Integrating or Instant Reset).
4. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
5. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

REVERSE POWER OPERATION

The importance of the correct operation of the counter extends beyond mere counting operations. One additional feature of the control is distinct "reverse power" operations depending on power flow direction. In addition to normal configurations of "block" or "ignore" during automatic reverse power detection, the control may be configured to "regulate in reverse direction" or "return to the neutral position." The control includes a power direction function for detecting the reversal of power flow in the regulator or transformer. The active power direction is based on the flow of real power and is not confused by reactive power flow in either direction.

The directional operation of the control will be reversed whenever the power flow reverses to as little as 2% (4 mA) of the nominal 200 mA rating of the control. For example, to change from a normal forward power to reverse operation, 4 mA of the real component of the load current must be detected in the reverse direction. To then revert back to the normal forward direction operation, 4 mA of the real component must be detected in the forward direction. This establishes an 8 mA "hysteresis" effect.

Additionally, the control can be "biased" in either the forward or reverse direction depending on circuit or system configuration. This essentially removes the 2% requirement from the change to the biased direction. For example, a control biased in the forward direction will change to the reverse direction as described above. It will require only that the power flow be in the forward direction to change back to forward operation. This biasing reduces the "hysteresis" effect to 4 mA from the original 8 mA.

In order for the "regulate in reverse direction" or "return to the neutral position" to implement properly, two prerequisites are required. The first is Tap Position Knowledge. Without knowledge of the tap position it would be impossible for the control to run the tapchanger to the neutral position. The second is source side voltage. Without knowledge of the source side voltage, it would be impossible to regulate it.

Detecting Reverse Power

Reverse power flow exists whenever the real component of the load current changes direction from forward and remains until another reversal to forward power flow occurs. The control reliably determines power direction with as little as 2% of the real component of the nominal 200 mA load current (4.0 mA). A LED on the front panel will illuminate whenever the control senses a reverse power condition.

Power Direction Bias Setpoints

Power Direction Bias includes three settings to determine how the control will switch between forward and reverse power operation. The three settings are **None**, **Forward Bias**, and **Reverse Bias**.

"None" Setting

When the Power Direction Bias function is set to "None", the control applies an 8 mA hysteresis band with a bandcenter of 0 load current (+4 mA to –4 mA) to switch between forward and reverse power. The control will switch from forward power to reverse power when the load current exceeds –4 mA (reverse direction). The control will switch from reverse power to forward power when the load current exceeds +4 mA (forward direction).

"Forward Bias" Setting

When the Power Direction Bias function is set to "Forward Bias", the control applies a 0 mA to –4 mA hysteresis band to switch between forward and reverse power. The control will switch from reverse power to forward power when load current is ≥ 0 mA (forward direction). The control will switch from forward power to reverse power when the load current exceeds –4 mA (reverse direction).

"Reverse Bias" Setting

When the Power Direction Bias function is set to "Reverse Bias", the control applies a 0 mA to +4 mA hysteresis band to switch between forward and reverse power. The control will switch from forward power to reverse power when load current is ≤ 0 mA (reverse direction). The control will switch from reverse power to forward power when the load current exceeds +4 mA (forward direction).

Reverse Power Operation Mode

Upon detection of power reversal, after a 5 second delay, the control will operate in the selected mode. The operating mode is selected from the following options:

Block – Inhibits automatic tapchange operation. This locks the tapchanger on the tap position in use at the time reverse power flow is detected. It is the recommended setting for independent power producers or in situations when reverse power flow is not expected. The control will revert to normal operation when forward power flow resumes.

Regulate Forward (Ignore) – The control will take no different action than in the forward direction. It essentially does not use the power direction in the control decisions. This is the same as a control which does not have power direction knowledge.

Regulate Reverse and Regulate Reverse Measured –The control will detect reverse power flow and regulate according to reverse power settings as selected in the Setpoint Menu. With tap position knowledge, the control calculates the source-side potential without the use of a source side VT. This feature is designed for use with feeder voltage regulators which continue to operate in a radial mode after system switching causes the power flow reversal.

For Regulate Reverse the source voltage is calculated by knowing the local voltage, the load current, and the tap position using a presumed regulator impedance. That impedance is a function of the tap position. The calculated source voltage is only valid with a 5/8 % step-voltage regulator.

When Reverse power is detected and the Operation Mode is in "Regulate Reverse Measured", the control will energize an internal contact that will switch the input to the VT from Load side to Source side. After a 4 cycle delay, the source side voltage will be measured, the load voltage at this instant will be displayed as zero. In forward power direction, the control will switch the input back to the load side voltage.

With the control recognizing reverse power flow, the following occurs:

- The **REV PWR** LED is illuminated.
- Reverse power setpoints are used.
- Source voltage is calculated in case of Regulate Reverse and measured in case of Regulate Reverse Measured and motor output commands are reversed. For example, when the voltage is high, the control raises the tap thereby lowering the voltage and a lower is indicated on the front panel LEDs.

Return to Neutral – To use this feature, a counter input must be provided, and Motor Direct Drive KeepTrack™ tap information mode must be enabled.

The Return to Neutral feature will cause the tap position to be driven to neutral when reverse power is detected. Tap position will be driven to neutral regardless of the voltage or currents present at the control. Once neutral is reached, the tap position will remain unchanged as long as reverse power is present. Normal operation will resume when forward power is detected.

This mode is intended as a safe response to a power reversal on a system which can have conflicting situations. As described earlier, a radially operating system with reverse power should be set to "Regulate Reverse Measured" However, if a DG causes a power reversal, the proper setting is usually "Ignore". In an application where both conditions are possible and it is not possible for the control to determine the cause of power reversal, the proper setting of "Return to Neutral" is advised.

Distributed Generation – Distributed Generation allows alternate LDC R and X values to be applied to the control when reverse power is detected. The factory setting is BLOCK. This mode is intended for use on distribution systems that have the possibility of power reversal because of distributed generation (DG) on the feeders. In these applications, the DG usually does not have the capacity to control the voltage with the more powerful system intact.

The condition required for DG to control the voltage is the generation and transmission of large amounts of VArs through the line impedance back towards the system source. Usually two items prohibit this action:

- The ability of the DG to generate those amounts of VArs.
- The contractual obligations enforced by many utilities that the DG only affect KWs on the system.

Smart Reverse Power (Auto Determination)

Due to the increased use and larger capacities of Distributed Generation, it is possible for a regulator to see a reverse power condition requiring more than one reverse power mode depending on the cause of the reverse power condition; either Distributed Generation mode or Regulate In Reverse/Regulate in Reverse Measured. The M-6200A provides two new reverse power modes, "Auto Determination" and "Auto Determination Measured" which allow the control to intelligently choose which reverse power mode applies at the time reverse power is sensed.

Auto Determination and Auto Determination Measured – This feature performs the following sequence when reverse power is detected:

1. Distributed Generation Mode will be applied initially.
2. On the next tap operation, Load Voltage will be measured before and one second after the tap (defined as 1 second after the operation counter has incremented either due to a counter input or motor hold). The absolute magnitude value of this difference is stored internally as the Tap Delta Voltage.
   a. If the Tap Delta Voltage is greater than 0.4 Vac, the control stays in Distributed Generation Mode and will behave normally in this mode with no further measurements of Load Voltage needed.
   b. If the Tap Delta Voltage is less than or equal to 0.4 Vac, the control increments an internal counter designed to keep track of how many times the Tap Delta Voltage is less than 0.4 Vac. The next tap operation will again measure Load Voltage in the same manner. If the control sees two consecutive Tap Delta Voltage measurements less than or equal to 0.4 Vac, the control changes from Distributed Generation Mode to either Regulate Reverse if "Auto Determination" has been selected, or Regulate Reverse Measured if "Auto Determination Measured" has been selected.

c. If Tap Delta Voltage is greater than 0.4 Vac on the second tap operation, the control does not increment the internal counter, and stays in Distributed Generation Mode. The control will then measure Tap Delta Voltage on the next tap. If that third tap has a Tap Delta Voltage greater than 0.4 Vac, then the control remains in Distributed Generation Mode and the internal counter is cleared. If the third tap has a Tap Delta Voltage less than or equal to 0.4 Vac, the condition meets the requirements of 2b above and the control will respond accordingly.

3. Once the control has determined which Reverse Power mode to apply using the method described above, it will operate in that mode as long as Reverse Power is detected.

TapTalk Reverse Power Vendor Cross Reference

The Reverse Power section of the TapTalk Setpoints screen also contains a link which displays the "Reverse Power Vendor Cross Reference" table showing Cooper/Siemens reverse power names and their Beckwith Electric equivalents (Figure 4-55).

Reverse Power Vendor Cross Reference

Beckwith Reverse Power Mode	Cooper/Siemens Reverse Power Mode
Block	Locked Forward Mode
Regulate Forward (Ignore) *	Reverse Idle Mode
Regulate Reverse	None
Return to Neutral *	Neutral Idle Mode
Regulate in Reverse (Measured) *	Bi-Directional Mode
Distributed Generation	Cogeneration Mode
Auto Determination	None
*Low Current block feature must also be enabled to be equivalent to this Cooper Reverse Power Mode.	

OK

Figure 4-55 TapTalk Reverse Power Vendor Cross Reference Table

Setting Reverse Power Operation and Power Direction Bias Mode From The HMI

1. Press the Up Arrow (SETP Hot Button) pushbutton to awaken the unit. The menu will advance to "SETPOINTS".

```
            SETPOINTS
←MNTR                    CNFG→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Common Settings
←                          →
```

3. Press the Down arrow pushbutton, as necessary, to navigate to the "Rev Power Operation" menu item.

```
Rev Power Operation
BLOCK
```

4. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed. Go to Step 7.

```
Rev Power Operation
BLOCK                      C
```

5. If Level Access is active, the Level Access prompt will be displayed.

```
ENTER LEVEL ACCESS

          _
```

■**NOTE**: When entering the Level Access Code, the display will automatically advance the cursor to the next digit when input is momentarily paused.

6. Enter a valid Level Access Code, then press the ENT pushbutton.

   If a valid Level Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Rev Power Operation
BLOCK                      C
```

   If not, re-enter a valid code.

7. Utilizing the arrow pushbuttons select the desired Rev Power Operation mode:
   - BLOCK
   - IGNORE
   - REGULATE REVERSE
   - RETURN TO NEUTRAL
   - REG. R MEASURED SRCC
   - DG Mode
   - AUTO DETERMINE
   - AUTO DETERMINE M

   Press the ENT pushbutton. The following will be displayed reflecting the Rev Power Operation mode type that was selected.

```
Rev Power Operation
XXXXX
```

8. Press the Down arrow pushbutton, as necessary, to navigate to the "Power Direction Bias" menu item.

```
Power Direction Bias
NONE
```

9. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed. Go to Step 12.

```
Power Direction Bias
NONE                       C
```

10. If Level Access is active, the Level Access prompt will be displayed.

```
ENTER LEVEL ACCESS

          _
```

■**NOTE**: When entering the Level Access Code, the display will automatically advance the cursor to the next digit when input is momentarily paused.

11. Enter a valid Level Access Code, then press the ENT pushbutton.

If a valid Level Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Power Direction Bias
NONE                          C
```

If not, re-enter a valid code.

12. Utilizing the arrow pushbuttons select the desired Power Direction Bias mode (NONE, FWD BIAS or REV BIAS), then press the ENT pushbutton. The following will be displayed reflecting the Power Direction Bias mode that was selected.

```
Power Direction Bias
NONE, FWD BIAS or REV BIAS
```

Setting Reverse Power Operation and Power Direction Bias Mode From TapTalk

1. Select **Setup/Setpoints** from the TapTalk® toolbar. TapTalk will display the Setpoints dialog screen (Figure 4-53).
2. From the "General" section of the Setpoints dialog screen select the desired Power Direction Bias mode (None, Forward or Reverse).
3. From the "General" section of the Setpoints dialog screen select the desired Reverse Power Operation mode:
   - Block
   - Regulate Forward (Ignore)
   - Regulate Reverse
   - Return to Neutral
   - Regulate Reverse (Measured)
   - Distributed Generation
   - Auto Determination
   - Auto Determination (Measured)
4. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
5. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

POWER FLOW SETTINGS

Bandcenter

The center of the voltage band is adjustable from 100 to 135 Vac in 0.1 volt increments (for example, 120 Vac).

Bandwidth

The regulator uses discrete steps and the Bandwidth must have a width that allows at least one tapchange position where the control remains satisfied. To minimize excessive operations on the regulator, this bandwidth is usually set to include two or three in-band tap operation positions.

The range is settable from 1 to 10 volts in 0.1 volt increments, and 2 volts minimum is recommended. This setting is the total bandwidth.

Setting Bandcenter and Bandwidth From The HMI

1. Press the Up Arrow (SETP Hot Button) pushbutton to awaken the unit. The menu will advance to "SETPOINTS".

```
            SETPOINTS
←MNTR                    CNFG→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Common Settings
←                          →
```

3. Press the Right or Left arrow pushbutton, as necessary, to navigate to the "Power Flow Forward" menu item.

```
         Power Flow Fwd
←                          →
```

■**NOTE**: The steps necessary to set Bandcenter Forward are described here. The steps to set Bandcenter Reverse are similar.

4. Press the Down arrow pushbutton, as necessary, to navigate to the "Bandcenter Fwd" menu item.

```
Bandcenter Fwd
   120.0 Volts
```

5. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Bandcenter Fwd
   120.0 Volts                C
```

6. If Level Access is active, the Level Access prompt will be displayed.

```
ENTER LEVEL ACCESS

          _
```

■**NOTE**: When entering the Level Access Code, the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level Access Code, then press the ENT pushbutton.

   If a valid Level Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Bandcenter Fwd
   120.0 Volts                C
```

   If not, re-enter a valid code.

8. Utilizing the arrow pushbuttons enter the desired Bandcenter Fwd value (100.0 to 135.0 in 0.1 Volt increments), then press the ENT pushbutton. The following will be displayed reflecting the Bandcenter Fwd value that was entered.

```
Bandcenter Fwd
   XXX.X  Volts
```

9. Press the Down arrow pushbutton, as necessary, to navigate to the "Bandwidth Fwd" menu item.

```
Bandwidth Fwd
   2.0 Volts
```

10. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed. Go to Step 13.

```
Bandwidth Fwd
   2.0 Volts                C
```

11. If Level Access is active, the Level Access prompt will be displayed.

```
ENTER LEVEL ACCESS
          _
```

■**NOTE**: When entering the Level Access Code, the display will automatically advance the cursor to the next digit when input is momentarily paused.

12. Enter a valid Level Access Code, then press the ENT pushbutton.

    If a valid Level Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Bandwidth Fwd
   2.0 Volts                C
```

    If not, re-enter a valid code.

13. Utilizing the arrow pushbuttons enter the desired Bandwidth Fwd value (1.0 to 10.0 Volts in 0.1 Volt increments), then press the ENT pushbutton. The following will be displayed reflecting the Bandwidth Fwd value that was entered.

```
Bandwidth Fwd
   X.X Volts
```

Setting Bandcenter and Bandwidth From TapTalk

1. Select **Setup/Setpoints** from the TapTalk® toolbar. TapTalk will display the Setpoints dialog screen (Figure 4-53).
2. From the "Forward Power" or "Reverse Power" section of the Setpoints dialog screen enter the desired Bandcenter value (100.0 to 135.0 in 0.1 Volt increments).
3. From the "Forward Power" or "Reverse Power" section of the Setpoints dialog screen enter the desired Bandwidth value (1.0 to 10.0 Volts in 0.1 Volt increments).
4. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
5. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

Setting The Definite or Inverse Delay From The HMI

1. Press the Up Arrow (SETP Hot Button) pushbutton to awaken the unit. The menu will advance to "SETPOINTS".

```
            SETPOINTS
←MNTR                    CNFG→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
        Common Settings
←                        →
```

3. Press the Right or Left arrow pushbutton, as necessary, to navigate to the "Power Flow Forward" menu item.

```
        Power Flow Fwd
←                        →
```

■**NOTE**: The steps necessary to set Power Flow, Forward Definite (Inverse) Delay are described here. The steps to set Power Flow Reverse Definite (Inverse) Delay are similar.

4. Press the Down arrow pushbutton, as necessary, to navigate to the "Definite (Inverse) Delay Fwd" menu item.

```
Definite Delay Fwd        ←→
   30 Sec
```

5. Press the ENT pushbutton. If Level Access is not active or has been previously input, the following will be displayed. Go to Step 8.

```
Definite Delay Fwd        ←→
   30 Sec                  C
```

6. If Level Access is active, the Level Access prompt will be displayed.

```
ENTER LEVEL ACCESS

          _
```

■**NOTE**: When entering the Level Access Code, the display will automatically advance the cursor to the next digit when input is momentarily paused.

7. Enter a valid Level Access Code, then press the ENT pushbutton.

   If a valid Level Access Code was entered, the display will briefly flash a confirmation screen and display the following:

```
Definite Delay Fwd        ←→
   30 Sec                  C
```

   If not, re-enter a valid code.

■**NOTE**: The double directional arrows in the display indicate that by pressing Right or Left arrow pushbuttons the display will jump to the Timer Characteristic Selection display in the Common Settings menu. Pressing any other pushbutton except ENT will then jump back to the Definite Delay Fwd (Rev) display.

8. Utilizing the arrow pushbuttons, enter the desired Definite (Inverse) Delay Fwd value (1 to 360 Seconds in 1 Second increments), then press the ENT pushbutton. The following will be displayed reflecting the Definite (Inverse) Delay Fwd value that was entered.

```
Definite Delay Fwd        ←→
   xxx Sec
```

Setting The Definite or Inverse Delay From TapTalk

1. Select **Setup/Setpoints** from the TapTalk® toolbar. TapTalk will display the Setpoints dialog screen (Figure 4-53).
2. From the "Forward Power" or "Reverse Power" section of the Setpoints dialog screen enter the desired Define (Inverse) Delay Fwd (Rev) value (1 to 360 Seconds in 1 Second increments).
3. Select **Save**. TapTalk will display a "Confirm Writing to Device" confirmation screen (Figure 4-2).
4. Select **OK**. TapTalk will display a "Setpoints Successfully Written to Control" confirmation screen (Figure 4-9).

4.4 Tap Changer Type Selections

The Tap Changer Type Selection feature provides the user with the ability to set vendor specific regulator configuration settings in the control from TapTalk®. These settings can be accessed through the traditional settings screens or from the Tap Changer Type Selections dialog screen Figure 4-56 located in the Setup dropdown menu. The selectable settings are available for the following vendor regulator models:

- Siemens
- Howard
- General Electric
- Cooper Spring Drive
- Cooper Direct Drive
- Cooper QD-3
- Cooper QD-5
- Cooper QD-8

The Tap Changer Type Selection feature allows the user to easily select the Vendor of the Regulator the control is being installed on and populate the settings specific to that Vendor Regulator type in a single menu. This menu will always display Beckwith recommended settings by default for each vendor when opening it, but the interface allows the user to make changes if desired, and save them to the control or settings file. Once this menu is saved, these settings are written to the control or settings file and can be viewed in their appropriate locations.

Table 4-5 includes the vendor specific settings that are available for each vendor specific regulator.

The Tap Changer "Type" (A or B) and "Regulator Vendor" selection settings can be observed in the HMI in the CONFIGURATION menu "Tapchanger Type" submenu. These settings however, cannot be changed from the HMI.

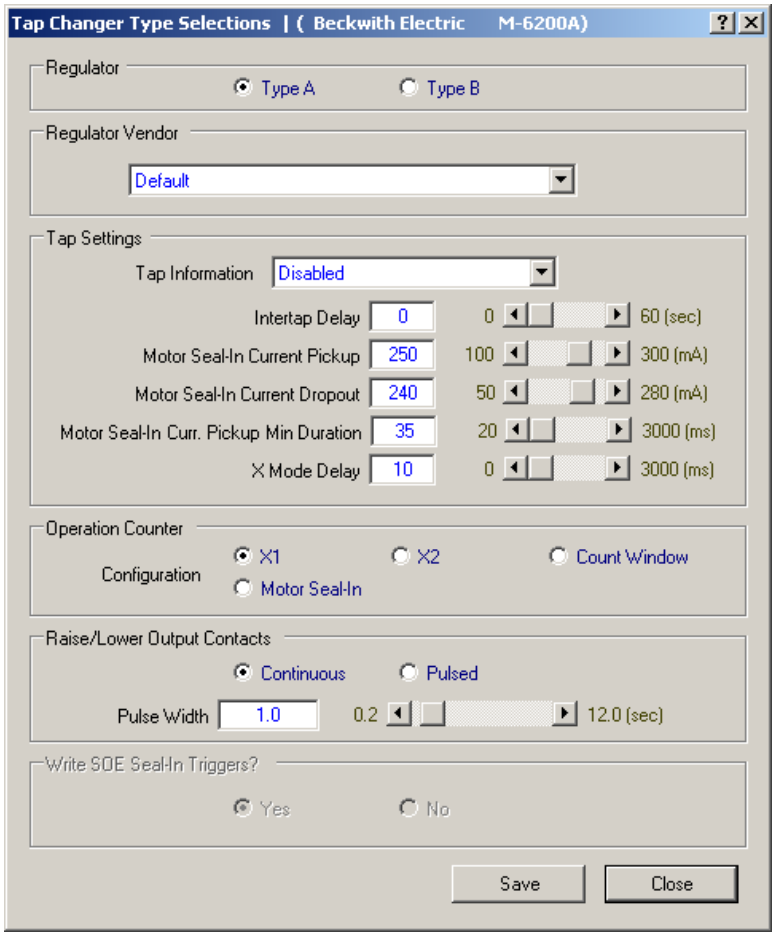


Figure 4-56 Tap Changer Type Selections Dialog Screen

Tap Changer Type Selections – Vendor Recommended Settings									
Vendor	Default	Siemens	Howard	General Electric	Cooper Spring Drive	Cooper Direct Drive	Cooper QD-3	Cooper QD-5	Cooper QD-8
Regulator Type	A	A	A	A	A	A	A	A	A
Tap Information (Enabled = Motor Direct Drive KeepTrack)	Disabled	Enabled	Enabled	Enabled	Enabled	Enabled	Enabled	Enabled	Enabled
Intertap Delay	0	1 Sec	1 Sec	1 Sec	1 Sec	1 Sec	1 Sec	1 Sec	1 Sec
Motor Seal-in Current Pickup	250	250	250	250	250	250	300	300	300
Motor Seal-in Current Dropout	240	240	240	240	240	240	250	200	250
Motor Seal-in Current Pickup Min Duration	35	35	35	35	35	35	100	50	40
X-Mode Delay	10	10	10	10	0	0	0	0	0
Operation Counter Configuration	X1	X2	X2	X1	Motor Seal-in	Motor Seal-in	Motor Seal-in	Motor Seal-in	Motor Seal-in
Raise/Lower Output Contacts Configuration	Continuous	Pulsed	Pulsed	Pulsed	Pulsed	Pulsed	Pulsed	Pulsed	Pulsed
Raise/Lower Output Contacts Pulse Width	1.0 Sec	8.0 Sec	8.0 Sec	8.0 Sec	3.0 Sec	0.5 Sec.	0.3 Sec	0.3 Sec	0.3 Sec
Write SOE Triggers?	N/A	N/A	N/A	N/A	Yes	Yes	Yes	Yes	Yes

Table 4-5 Vendor Specific Regulator Settings

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5 Connections

5.0 Overview of Installation Chapter

This Chapter is intended for those personnel that are responsible for the installation of the M-6200A Digital Regulator Control. This Chapter provides the mechanical orientation of inputs and outputs as well as physical dimensions of the control. External connections to the control are detailed to assist installation personnel with various applications of the control.

Detailed instructions are provided for those specific applications where the M-6200A is directly replacing specific Siemens, General Electric, Howard Industries and Cooper controls.

Also provided in this Chapter are instructions for the installation of TapTalk® S-6200 Communications Software and establishing initial local communications with the target control.

5.1 Mechanical/Physical Information

The M-6200A Regulator Control physical dimensions are illustrated in Figure 5-1. General Layout of the M-6200A features are provided in Figure 5-2.

Do not position the M-6200A in such a manner as to make it difficult to operate the control disconnect device.

The M-6200A through the use of hinge brackets and a latch bracket where required and a unit specific wiring harness allow the unit to directly replace specific Siemens, GE, Cooper and Howard Industries regulator controls.

The following is a brief summary of specifications that may be required for installation.

Voltage withstand:

140 V continuous
240 V for one second
480 V for one cycle
Voltage measurement linear to 140 V

Current withstand:

Load Current:
0.2 amps continuous
0.4 amps for 2 hours
4.0 amps for one second

Output raise and lower circuits:
6 amps AC

Alarm contacts:

Programmable Alarm/Selftest (Deadman)
6.0 amps AC, 125 V
0.2 amps DC, 125 V

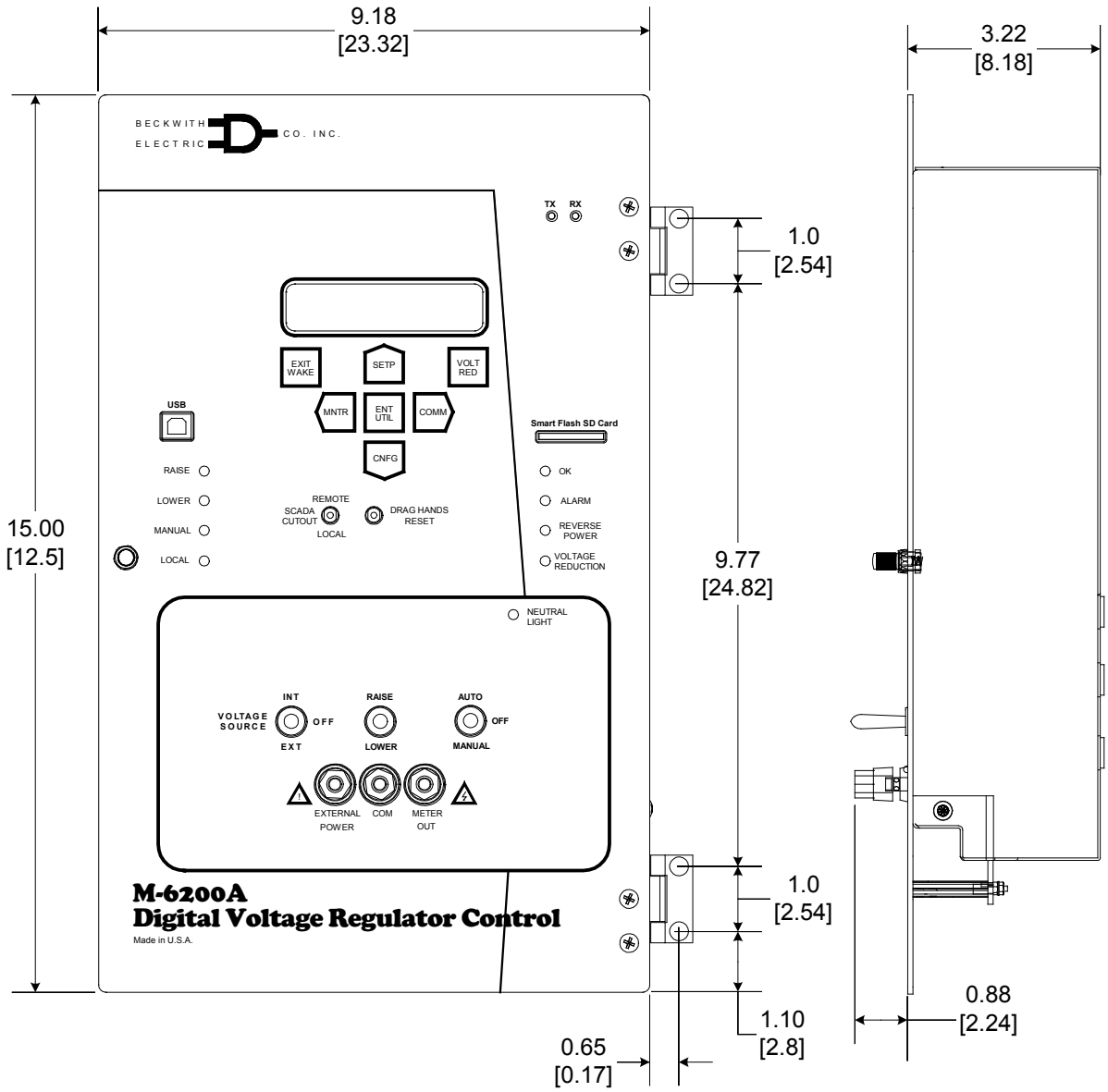
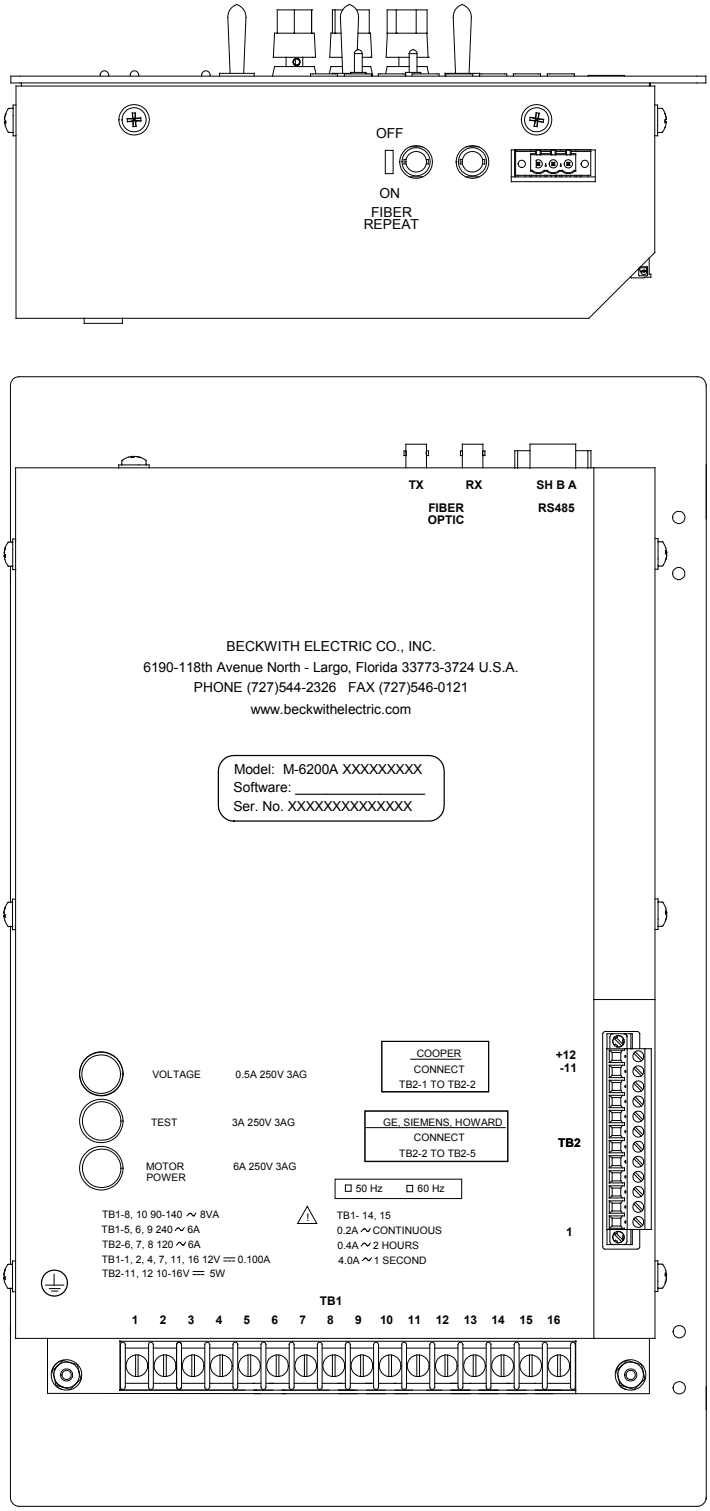


Figure 5-1 M-6200A Outline Dimensions



■ **NOTE:** ⚠ See Section 5.1, Mechanical/Physical Information

Figure 5-2 M-6200A Rear Layout

5.2 External Connections

Terminal Block Assignments

The external connections to the control are made to the two terminal blocks located on the rear of the control, see Figure 5-3. Table 5-1, Terminal Block Assignments provides an overview of each terminal assignment. For example, if external dry contacts are being used to control the Voltage Reduction Step #1 function, connections for these contacts may be made between TB1-4 and T1-7 as shown in Figure 5-4. The dry contact inputs for non-sequential input, voltage reduction must be “wetted” by connecting to terminal TB1-4. See Table 5-2.

Typical Connections

Figure 5-4 illustrates typical connections for a regulator control. Motor Power and sensing voltage can be obtained from a common source or from an independent source having a nominal 120 Vac output. Normally, this is line-to-neutral voltage, although line-to-line voltage can be used if recognition is made of any phase shift between the voltage and current signals when using line drop compensation.

▲ **CAUTION:** The current input to the M-6200A is rated at 0.2 A continuous, 0.4 A for two hours, and 4.0 A for 1 second.

Load current must be reduced by an appropriate auxiliary transformer to 0.2 A "full scale" before connecting to the regulator current inputs. Refer to information specific to your regulator application included in this chapter.

Grounding

WARNING: The protective earth grounding terminal must be connected to the installation earth ground anytime external connections have been made to the unit.

Ground the control by connecting a 14 AWG, 300 V min., 105° C green insulated wire inserted in an Amp 51864-8 or equivalent ring connector wire to the marked protective earth terminal located adjacent to either side of TB1. Connect to the installation ground.

Unit Isolation

Sensing inputs should be equipped with test switches and shorting devices where necessary to isolate the unit from external potential or current sources.

A switch or circuit breaker for the M-6200A's power shall be included in the building installation, and shall be in close proximity to the control and within easy reach of the operator, and shall be plainly marked as being the power disconnect device for the control.

Torque Requirements

Terminals TB1-1-16 & TB2-1-12: 7.5 in-lbs, minimum and 8.0 in-lbs, maximum.

Control Power Backup Input Connection

The Control Power Backup Input (Figure 5-5) is designed to sustain communication port operation in the event of the loss of AC control power. In the event of a loss of AC input power to the control, this feature permits uninterrupted operation of the control by supplying +12 Vdc to the control. In addition, the control retains functionality with the exception of the actual operation of the tapchanger mechanism.

When the AC input voltage drops below approximately 85 Vrms, the Control Power Backup Input will activate and all automatic tapchange operations will then be suspended. If Motor Power is available, manual tapchanges may be initiated.

When the control is being powered only by the backup DC input the Auto/Manual switch status and the Local/Remote switch status are functional. When a control is being supplied by both AC and DC via the backup power input and the backup DC input is lost the unit will report it via DNP.

When the control is being powered from the Control Power Backup Input, it will continue to read any input voltage present.

The control retains full functionality, and if the control's Motor Power remains energized then Raise and Lower commands from SCADA are possible. Fiber-Optic port operation is maintained. All communication ports, data-logging, status monitoring, configuration, and setpoint capability are also maintained.

Beckwith Electric offers two Control Power Backup supplies for use with the M-6200A. The M-2026 AC-DC Control Power Backup Supply is a fused, surge protected and reverse polarity protected AC-DC Control Power Supply that accepts an AC or DC input (21 to 32, 42 to 60 and 105 to 145 V) and outputs regulated +12 Vdc at up to 1.5 Amp.

The M-2027 Control Power Backup Supply - AC Only is a fused and surge protected Control Power Backup Supply that will accept an AC input range of 105 to 140 Vac, 50/60 Hz and output +12 Vdc to 1 A.

Both the M-2026 and M-2027 are housed in non-weathertight enclosures and are equipped with screw terminal blocks for both input and output connections.

Backup Power Requirements

The Control Power Backup Input that does not utilize the M-2026 or M-2027 should only be used with the optional (B-0920) 3-Wire Harness. The harness (Figure 5-6), includes a 3 Amp fast-blow fuse, and connects to TB2-11 (–) and TB2-12 (+) of the control.

▲ **CAUTION**: Use of Non-Beckwith Electric converters to provide +12 V to the Control Power Backup Input may compromise system integrity due to a lack of adequate protection of the power converter. For reliability of the M-6200A, the power converter must meet the following requirements:

Temperature: –40° C to +85° C

IEC 60068-2-1 Cold, –40° C

IEC 60068-2-2 Dry Heat, +80° C

IEC 60068-2-78 Damp Heat, +40° C @ 95% RH

IEC 60068-2-30 Damp Heat Condensing cycle 25° C, +55° C @ 95% RH

Transient Protection

High Voltage – All input and output terminals will withstand 2000 Vac rms to chassis or instrument ground for one minute with a leakage current not to exceed 25 mA, for all terminals to ground. Input and output circuits are electrically isolated from each other, from other circuits and from ground.

Surge Withstand Capability

IEEE C37.90.1-2002	2,500 V pk Oscillatory 4,000 V pk Fast Transient Burst
IEEE C37.90.1-1989	2,500 V pk Oscillatory 5,000 V pk Fast Transient

Radiated Electromagnetic Withstand Capability – All units are protected against electromagnetic radiated interference from portable communications transceivers.

Electrostatic Discharge Test

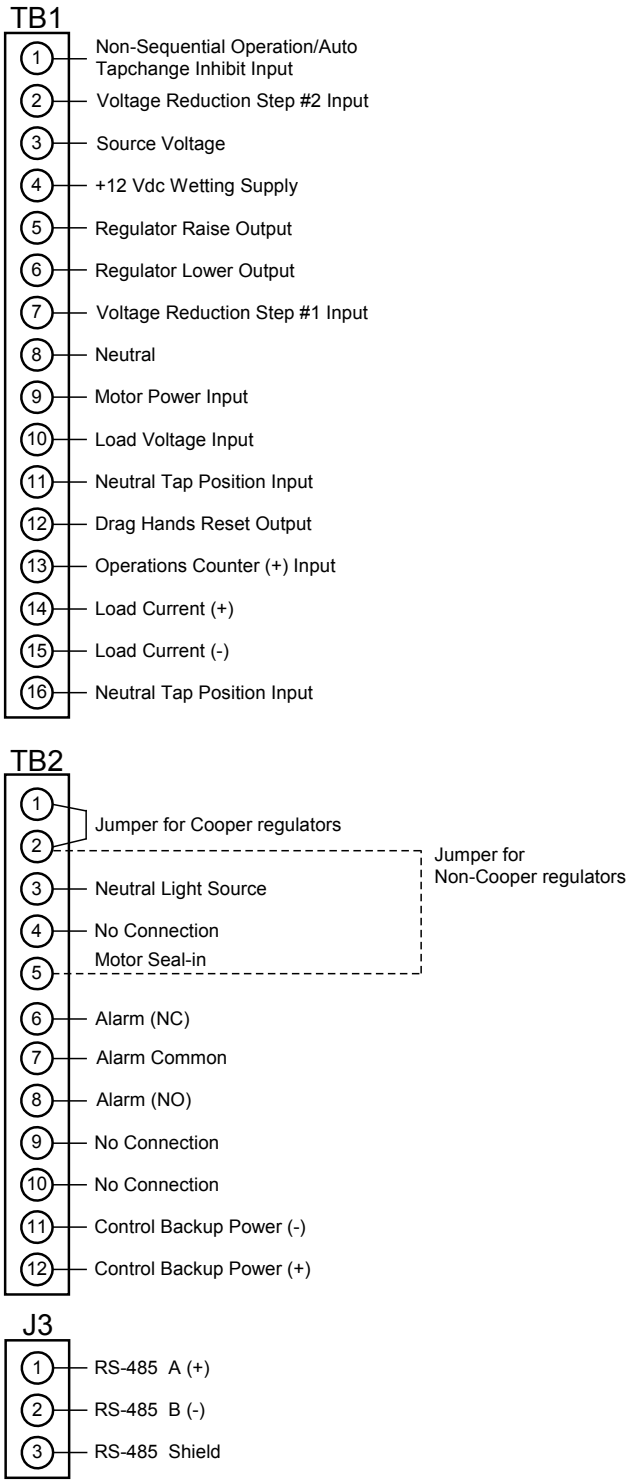
IEC 60255-22-2 (8 Kv) – Point Contact Discharge

IEC 60255-22-2 (15 Kv) – Air Discharge

Fast Transient/Burst Immunity Test

IEC 60255-22-4-2008

Class A (4 Kv, 5 kHz)



WARNING: Open CT secondary will result in high voltage at CT terminals. Death, severe injury or damage to equipment can occur.

▲ CAUTION: Do not operate with CT secondary open. Short circuit or apply burden at CT secondary during operation.

Figure 5-3 External Connections

TERMINAL BLOCK ASSIGNMENTS	
TERMINAL	**DESCRIPTION**
TB1-1	**Non-Sequential Operation/Auto Tapchange Inhibit** **Non-Sequential Operation** ▲ **CAUTION: Voltage applied through dry contacts to actuate non-sequential input and voltage reduction inputs must be nominal +12 Vdc obtained from TB1-4 of the M-6200A Regulator Control. The use of 120 Vac will result in damage to the M-6200A.** The operation of the control can be interrupted during tapchanger operation by applying the “wetting” voltage of TB1-4 to TB1-1 (timer reset for non-sequential operation input) on the control through an external contact. This causes the output to de-energize and reinitialize the time delay circuit when the reset signal is removed. This function can be used to cause the Regulator, if so equipped, to wait for the unit to time out between tapchanges. Non-sequential operation is invoked by momentarily connecting this input to the nominal +12 Vdc wetting source (TB1-4) through an external Form “a” dry contact. When this function is enabled, the tapchanger control times out with the Time Delay setting between every tapchange. **Auto Tapchange Inhibit** Auto tapchange inhibit is invoked by closing and maintaining a Form “a” dry contact connected to this input and to the nominal +12 Vdc wetting source (TB1-4). As long as this contact is closed, the tapchanger will not time out, thereby prohibiting raise and lower commands.
TB1-2	**Voltage Reduction Step #2 and TB1-7 Voltage Reduction Step #1** ▲ **CAUTION: Voltage applied through dry contacts to actuate non-sequential input and voltage reduction inputs must be nominal +12 Vdc obtained from TB1-4 of the M-6200A Regulator Control. The use of 120 Vac will result in damage to the control.** On the M-6200A Digital Regulator Control, TB1-2 and TB1-7 are used together to provide up to three levels of voltage reduction. The external connections to achieve these steps are shown in Table 5-2. Voltage reduction amounts are set within the M-6200A Digital Regulator Control software. If these voltage reduction steps are instituted by communications, the contacts are not being used simultaneously. ■ **NOTE:** Enabling both voltage reduction Step #1 and Step #2 inputs simultaneously will result in the level of voltage reduction as specified on the voltage reduction Step #3 screen of the control. These digital inputs are typically enabled by connecting it to the nominal +12 Vdc wetting source (TB1-4), through an external Form "a" dry contact. The amount of voltage reduction implemented is determined by the setting.
TB1-3	***No Connection or Source Voltage*** Siemens Harness B-1258 TB1-3 to U2 Siemens Harness B-1136 TB1-3 to TB1-9

Table 5-1 Terminal Block Assignments (1 of 3)

Voltage Reduction Setpoint: Multiplier Range	Apply "Wetting Voltage" From TB1-4 to TB #
Voltage Reduction Setpoint #1: 0 to 10%	TB1-7
Voltage Reduction Setpoint #2: 0 to 10%	TB1-2
Voltage Reduction Setpoint #3: 0 to10%	TB1-7 and TB1-2

Table 5-2 Multi-Step Voltage Reduction External Connections

TERMINAL BLOCK ASSIGNMENTS	
TERMINAL	**DESCRIPTION**
TB1-4	**+12 Vdc Wetting Voltage** This is the output of an unregulated dc power supply internal to the control. It is referenced to neutral and can supply up to 100 mA. It is used for powering the digital inputs of the control through external dry contacts. Depending on the voltage supplied to TB1-10 and loading, its output can vary from +10 to +18 Vdc. The output is current limited with a 1 ohm resister.
TB1-5	**Regulator Raise Output** This switched output connects the tapchanger raise winding to the source of motor power. When the control calls for a raise, it is capable of switching up to 6 A at 120/240 Vac.
TB1-6	**Regulator Lower Output** This switched output connects the tapchanger lower winding to the source of motor power. When the control calls for a lower, it is capable of switching up to 6 A at 120/240 Vac.
TB1-8	**Neutral** This is the return for the nominal +12 Vdc “wetting” voltage (TB1-4) and the voltage input (TB1-10).
TB1-9	**Motor Power Input** The source for powering the tapchanger motor is connected here. It may have a maximum voltage of 240 Vac.
TB1-10	**Load Voltage Input** This input accepts nominal 120 Vac, 60 Hz (or 50, Hz as ordered) to operate the control's power supply and voltage sensing input. The acceptable voltage range for proper control operation is from 90–140 Vac. Power consumption is less than 8 VA. The input voltage is referenced to line neutral (TB1-8).
TB1-11 & TB1-16	**Neutral Tap Position Inputs** This digital input registers neutral position switch closures on regulators. The pins are isolated from neutral to permit connection of the input based on regulator configuration.
TB1-12	**Drag Hands Reset** The drag hand reset output (TB1-12) connection is commonly used to reset the drag hand on the regulator. When the Drag hand switch on the M-6200A is activated, this will cause the unit to output 120 V to TB12. This voltage can be used to energize the drag hand circuitry on the regulator.

Table 5-1 Terminal Block Assignments (2 of 3)

TERMINAL BLOCK ASSIGNMENTS	
TERMINAL	**DESCRIPTION**
TB1-13	**Operations Counter Input** This digital input registers the counter contact closure. The operations counter will increment when TB1-13 is grounded by way of the regulator dry operation count switch. This contact is needed for using the intertap time delay. Once a valid counter input is detected, the intertap time delay will begin counting down.
TB1-14	**Load Current (+)** ▲**CAUTION:** The current input to the M-6200A is rated at 0.2 A continuous, 0.4 A for two hours, and 4.0 A for 1 second. The line current input range is 0–640 mA (200 mA continuous) with 200 mA representing the 1.0 per-unit value. The measured current value is used for line drop compensation and metering calculation.
TB1-15	**Load Current (-)** This is the non-polarity input to the load current measuring transformer. The companion polarity input is TB1-14. The line current transformer input is isolated from other pins.
TB2-1	Jumper TB2-1 to TB2-2 for Cooper regulators.
TB2-2	Jumper TB2-2 to TB2-5 for all regulators except Cooper.
TB2-3	**Neutral Light Source**
TB2-4	**No Connection**
TB2-5	**Motor Seal-in** Receives an Input from the Cooper Regulator Motor Cam Switch. Hardware Jumper TB2-2 to TB2-5 for all other regulators except Cooper.
TB2-6, TB2-7 & TB2-8	**User-Programmable Alarm** This set of terminals is a Form "C" alarm relay contact rated for 6 A at 120 Vac, or 100 mA at 120 Vdc. This alarm indicates when any of the programmable alarm conditions are detected. Refer to the Chapter 4, Figure 4-44.
TB2-9 & TB2-10	**No Connection**
TB2-11 & TB2-12	**Control Power Backup Input** This input allows connection of external 12 Vdc control power backup power. The control retains functionality with the exception of the actual operation of the tapchanger mechanism.

Table 5-1 Terminal Block Assignments (3 of 3)

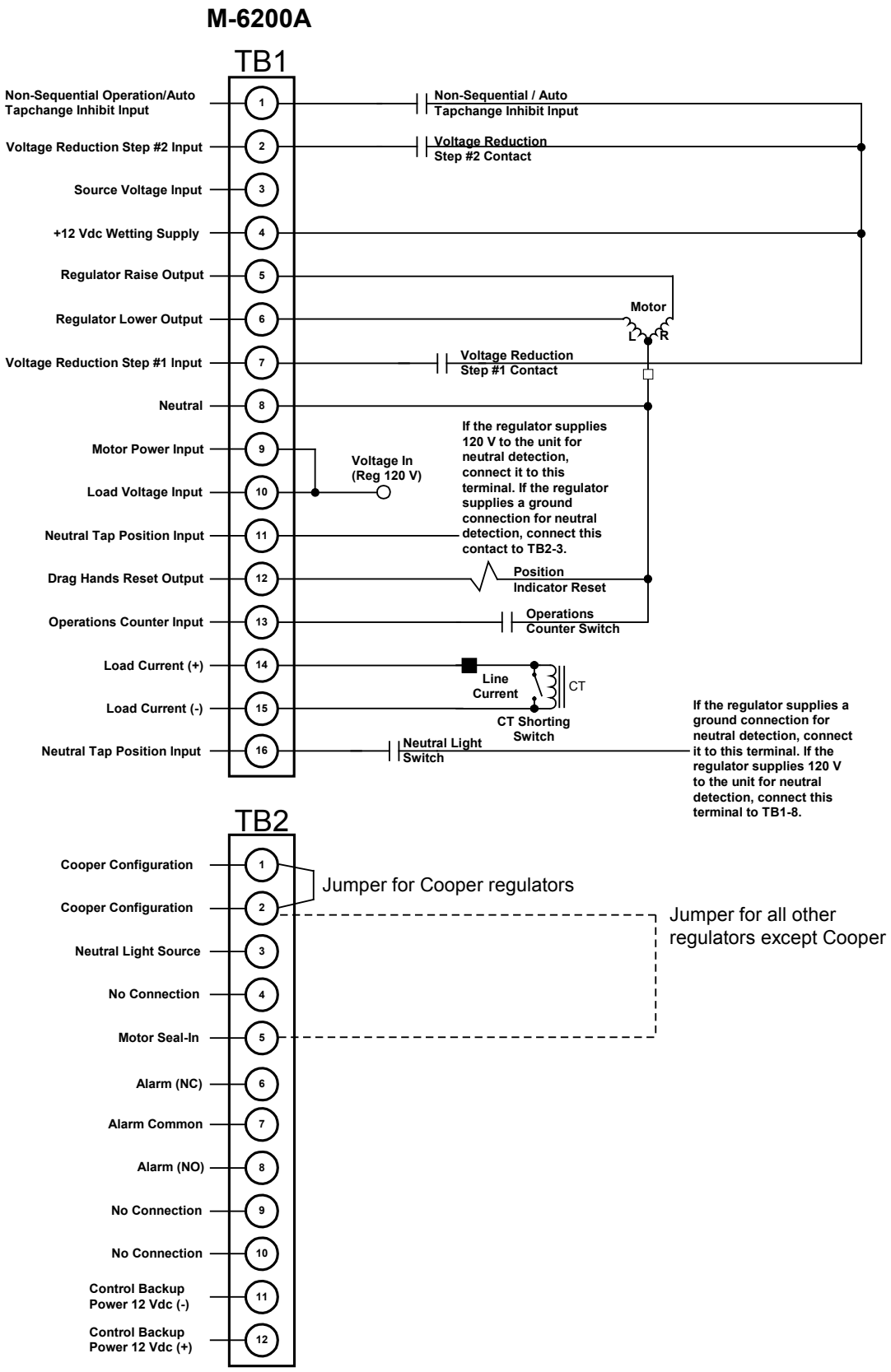


Figure 5-4 M-6200A and Regulator Control Typical Connections

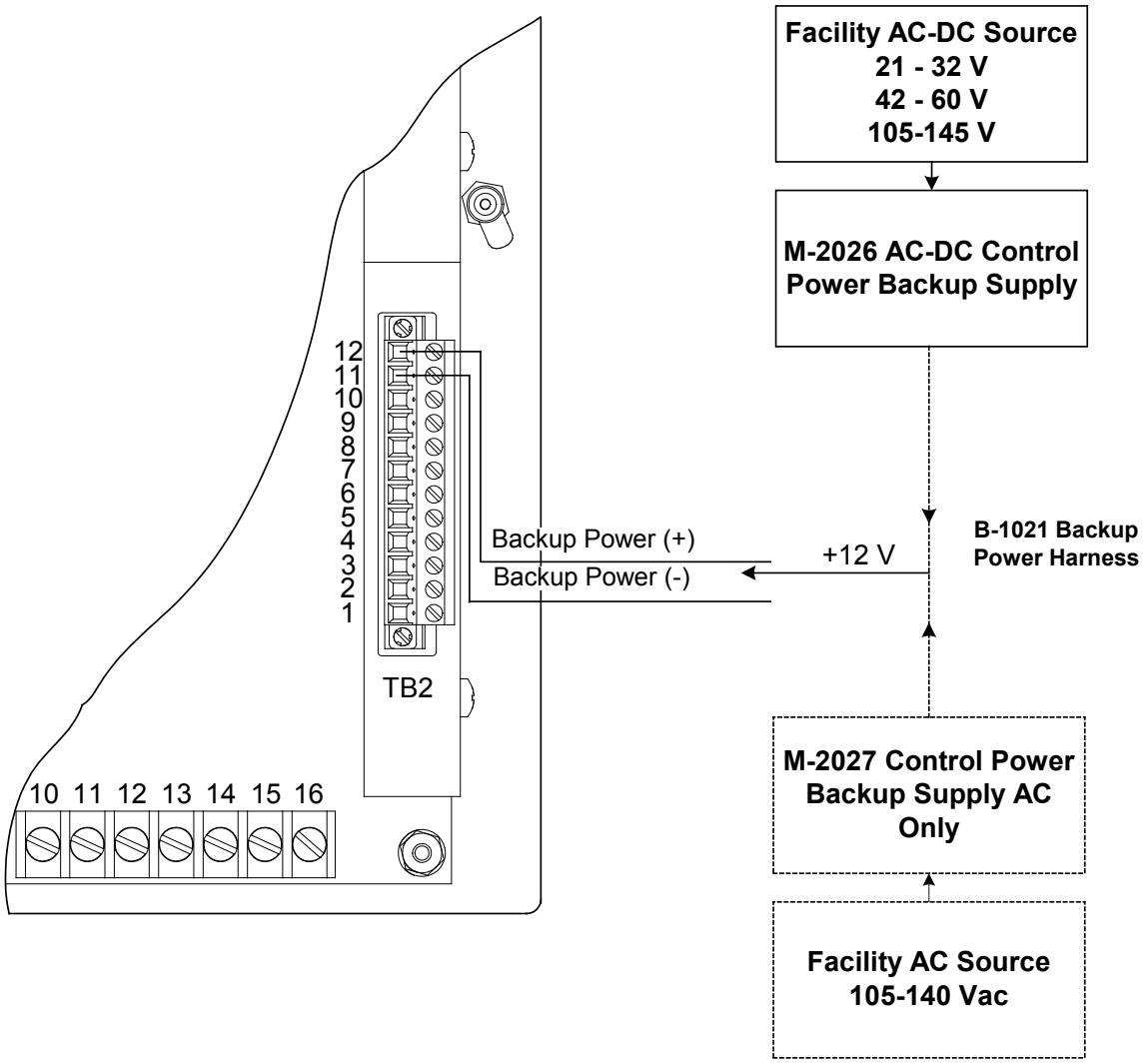


Figure 5-5 Typical Control Power Backup Connection for M-6200A Utilizing M-2026 or M-2027 Supply

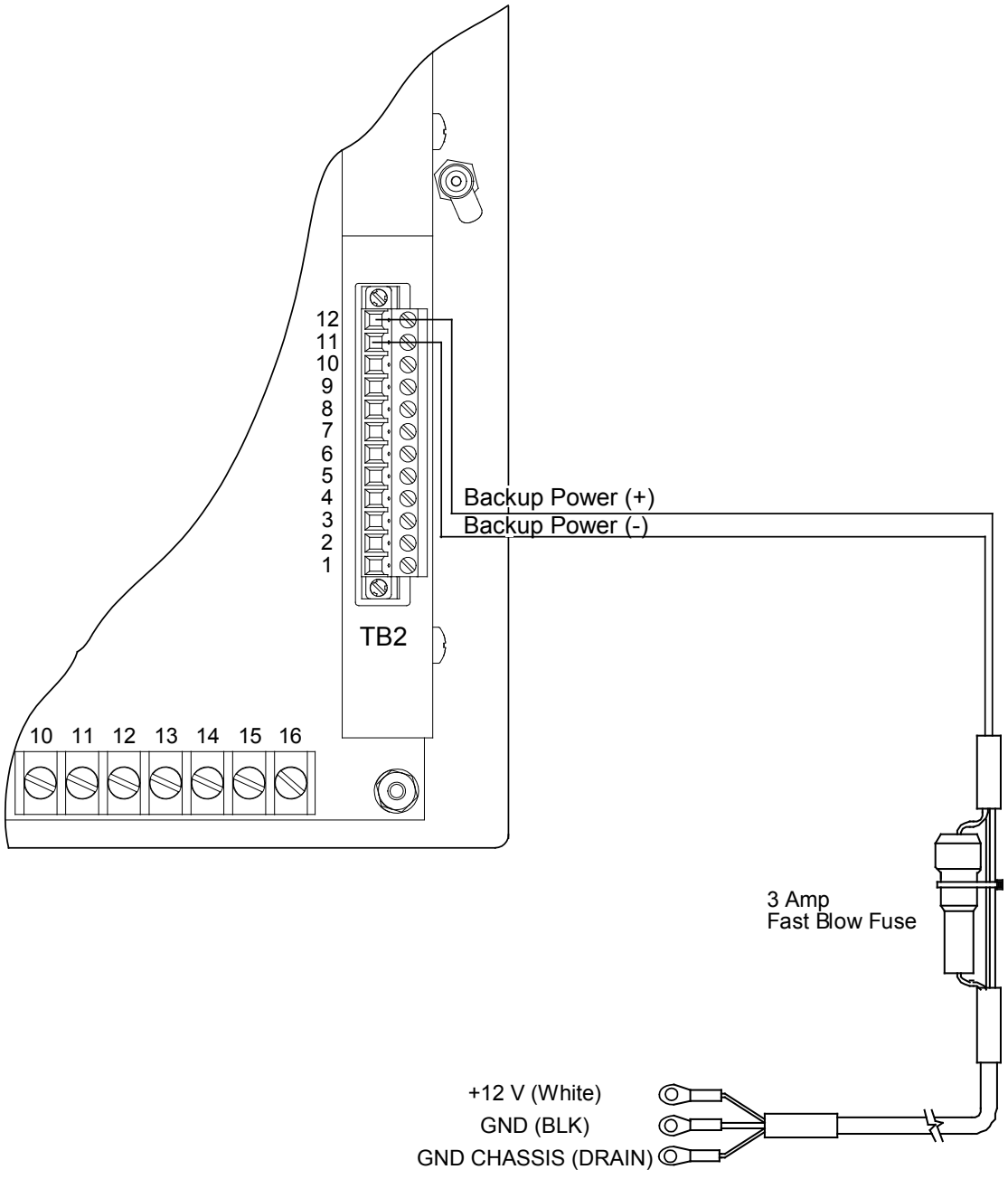


Figure 5-6 B-0920 Control Power Backup Input 3-Wire Harness

Communication Ports

The control includes a standard USB Port (front), RS-485/fiber optic port (top) and optional Ethernet port (top) if equipped (RJ45, ST connector). USB is an internal port, and supports only MODBUS® protocol and software updates. Top COM Ports support MODBUS and DNP3.0 protocols.

Fiber Optic Interface

The fiber optic interface is connected to COM1 of the M-6200A. It can be enabled through the front panel under the Comm Settings menu. When fiber optic is selected, the RS485 is disabled. The fiber optic baud rate is selectable from 300 to 115200.

The echoing of the received data is supported by the hardware. Switch (located to the right of the TX Fiber Transmitter Connection Figure 5-2 or 5-10) opened, will disable echoing feature (echo off). Echo ON is primarily used if the control is in a daisy chain network. If the client software supports echo cancelling, as it is the case for TapTalk®, there is no need to disable echo transmission. In this case, echo cancel should be enabled on the client software.

The fiber optic feature was tested with a clad fiber of 62.5 micron diameter with 125 micron diameter cladding (62.5/125). A manufacturer of this product is Amphenol Corporation. A typical part number tested by Beckwith Electric is 943-32255-10030 from Amphenol Corporation, Lisle, Illinois. This is a dual-fiber with a total of four ST connectors. See Figure 5-7 for Amphenol part number selection.

RS-485 Interface

The communication protocols, MODBUS and DNP3.0 are a 2-wire, half duplex RS-485 link of the M-6200A top COM Port.

A port-powered converter made by B & B Electronics of Ottawa, IL (Model 485LP9TB) was used to test the two-wire RS-485 link. This converter is available in commercial and extended temperature ranges. When connecting the RS-485, a 120 Ohm resistor (See Figure 3 in specification) should be connected at the last control connector across A/B. However, in some cases such as short links, the resistor may not be needed. The two-wire RS-485 port assigns Pin (+) and Pin (–). The SH connection on the RS-485 plug should be connected to the cable shield. The shield should only be connected to ground on one end of the RS-485 cable. If more than one M-6200A control is connected via RS-485, only one shield/SH connection should be made. The top COM Port should be set to RS-485. When selecting RS-485 transmission lines, there are cables specifically made for this purpose. These cables have a shunt capacitance of 16 pF or less per foot, and are usually solid wire. Plenum-rated cabling is recommended. The RS-485 connector is designed to accommodate 12 to 24 AWG wire. Multiple M-6200A controls connected to RS-485 should be connected in daisy chain fashion, not star.

Optional Ethernet Port

The optional Ethernet Port can be purchased as either a RJ45 (10/100 Base-T) interface or Fiber Optic through ST connectors (100 Base-Fx) for Ethernet communication to the M-6200A. The port supports up to eight concurrent connections. The maximum number of allowed DNP connections is five. The maximum number of MODBUS connections is eight. The port supports DHCP protocol and also allows manual configuration of the Ethernet port. MODBUS protocol “Port Number” and DNP Protocol “Port Number” are required for manual configuration.

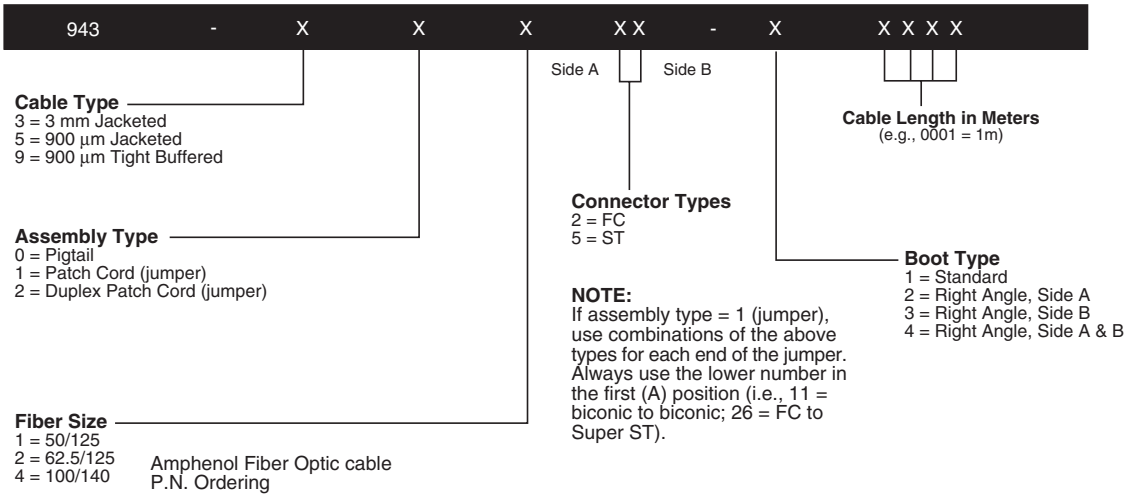


Figure 5-7 Communication Connections

5.3 Siemens (Allis-Chalmers) MJ-1A, MJ-2A, MJ-3, MJ-3A, MJ-X; IJ-2, IJ-2A; SJ-4, SJ-5, SJ-6; UJ-2, UJ-4, UJ-5, UJ-5C Regulator Control Replacement

Introduction

The Beckwith Electric M-6200A Digital Regulator control directly replaces Siemens (Allis-Chalmers) MJ-1A, MJ-2A, MJ-3, MJ-3A, MJ-X; IJ-2, IJ-2A; SJ-4, SJ-5, SJ-6; UJ-2, UJ-4, UJ-5, UJ-5C Regulator Controls.

The contents of the kits provide the means to install the M-6200A in existing Siemens (Allis-Chalmers) cabinets. The B-2271-S1, B-2271-S2, B-2271-S3 and B-2271-S4 are available separately from the factory for field installation.

The M-6200A may be purchased with the factory installed hardware kits:

- B-2271-S1
- B-2271-S2
- B-2271-S3
- B-2271-S4

The difference between the B-2271-S1 and B-2271-S2, B-2271-S3 and B-2271-S4 hardware kits is the B-2271-S2 and B-2271-S4 include the male half of the CT shorting plug.

Application

Typical Connections

In general, the tapchanger motor must be operated from a different transformer than the VT used to measure regulated voltage. If this is not done, hunting at the upper band edge may result. As soon as the motor starts, and before it is sealed in, the motor current can drop the voltage within the band and reset the control. Some motor seal-in schemes are fast enough to prevent this, but others are not.

Pulsed output can be used on the M-6200A (see **Section 4.2 Configuration, Output Pulse**).

Typical connections for the M-6200A are shown in Figure 5-8. Connections are simplified and may not show all functions required in a typical regulator control scheme – for example, limit switches, etc.

Typical Connections for Siemens Step-Voltage Regulators

■ **NOTE**: Step-voltage regulators produced by Siemens Energy and Automation follow the same basic procedures as those earlier produced by Siemens-Allis, Inc., and Allis-Chalmers Manufacturing Co.

Siemens produces regulators in two basic configurations which must be recognized and considered when applying the M-6200A. To determine the type of regulator, check the following points against the nameplate electrical diagram.

1. Characteristics of a Type A or "Straight" Design Regulator
   a. The "S" (source) bushing is connected to the tapchanger reversing switch and to one end of the shunt (exciting) winding.
   b. The "L" (load) bushing is connected via the preventative autotransformer to the moving contacts of the tapchanger.
2. Characteristics of a Type-B, or "Inverted" Design Regulator
   a. The "S" (source) bushing is connected via the preventative autotransformer to the moving contacts of the tapchanger.
   b. The "L" (load) bushing is connected to the tapchanger reversing switch and to one end of the shunt (exciting) winding.

Connections for a Type-A, or "Straight" Design Regulator – A Type-A step-voltage regulator (referred to by Siemens as "straight") in which there is a voltage transformer connected at the load terminal to provide the regulated 120 V voltage source. A second voltage source, the tertiary winding, provides power for the control and tapchanger drive motor. Typical connections are shown in Figure 5-8. Connections are simplified and may not show all functions required.

Connections for a Type-B, or "Inverted" Design Regulator – A Type-B step-voltage regulator (referred to by Siemens as "inverted") in which no VT is required at the load terminal to provide a regulated voltage source for the control. Instead, the regulated voltage is derived from the same source as the power circuits, the tertiary winding, but this voltage may vary by as much as ±7.0 V from the 120 V required by the control sensing circuits for the normal voltage reference. Typical connections are shown in Figure 5-8. Again, connections are simplified and may not show all functions required.

Lightning Protection

▲ **CAUTION**: For proper protection against system surges, chassis ground must be connected to earth ground.

It has been determined that transient voltages in excess of 1500 Vac RMS can exist on the “ground” lead normally tied to TB1-8. In the regulator controls, these voltages are suppressed by varistors which still permit the unit to pass a 1500 Vac hi-pot test for one minute, with a leakage of approximately 15 mA, all terminals to ground.

Multiple VT grounds far apart must be avoided, since a varying difference in ground voltage could add or subtract from the effective voltage, and cause variation in the tapchanger control’s bandcenter voltage setpoint.

Operations Counter Input

▲ **CAUTION**: Do not apply any voltage to this terminal.

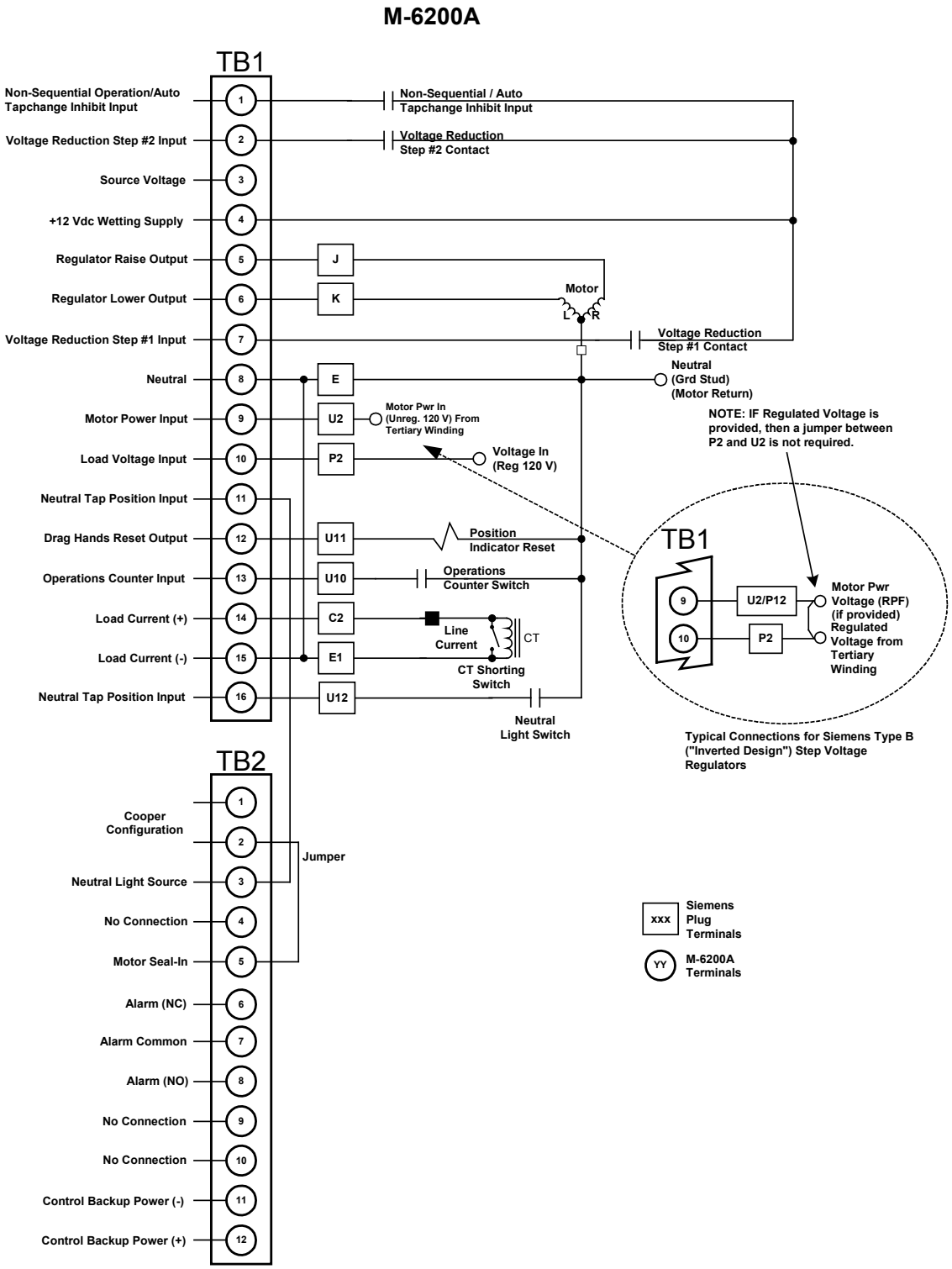
An operations count is registered by momentarily grounding TB1-13 through an external dry contact from the load tapchanger. The input is level-sensitive. Ensure that any “wetting” voltages are removed from the counter contacts before installing the M-6200A Regulator Control.

An Operations Counter setting of "X2" is recommended for Siemens Regulator Controls. See **Section 4.2 Configuration, Counters** for more information.

Multi-Step Voltage Reduction

▲ **CAUTION:** Voltage applied through dry contacts to actuate Voltage Reduction Steps 1, 2, and 3 *must* be +12 Vdc obtained from pin TB1-4.

TB1-2 and TB1-7 are used together to provide up to three levels of voltage reduction. The external connections to achieve these steps are shown in Table 5-1 and Figure 5-8. Voltage reduction amounts are set within the M-6200A Regulator Control software.



WARNING: In no case should the line current circuit be interrupted with the regulator or transformer energized. Do not remove auxiliary current transformers without shorting the current inputs. Death or severe electrical shock can occur.

Figure 5-8 Typical Connections for Siemens Type A ("Straight Design") and Type B ("Inverted") Design Step-Voltage Regulators

External Connections

Power and voltage sensing are obtained either from a common source or from independent sources having a nominal 120 V ac output. Normally, this is line-to-neutral voltage, although line-to-line voltage can also be used if recognition is made of any phase shift between the voltage and current signals when using line drop compensation.

Removal of the Siemens Control

WARNING: In no case should the line current circuit be interrupted with the regulator or transformer energized. Do not remove auxiliary current transformers without shorting the current inputs. Death or severe electrical shock can occur.

1. Verify that the regulator control is in a safe condition that will allow it's removal from the control cabinet.
   - The control is de-energized and isolated from any potential safety hazards.
   - All local Safety Tagging rules have been applied as necessary.
2. Open the cabinet door of the Siemens control.
3. Remove and save the wing nuts from the quick disconnect shorting plug (Item #1, Figure 5-9), then pull down on the male connector portion of the plug to disconnect it.
4. Swing the panel outward, then lift the panel off of its hinges (Item #2, Figure 5-9).

■ **NOTE**: The quick disconnect shorting plug and Jumper between "E" and "E1" must be saved from the original control if the replacement panel does NOT include the B-2271-S2 or B-2271-S4 hardware kit.

5. If required, remove the male connector and Jumper portion of the plug by unscrewing its connections to the Siemens control's wiring harness.
6. If the M-6200A was purchased with the B-2271-S1, B-2271-S2, B-2271-S3 or B-2271-S4 hardware kit factory installed, proceed to M-6200A installation.
7. If the M-6200A was not purchased with the B-2271-S1, B-2271-S2, B-2271-S3 or B-2271-S4 hardware kit factory installed, or the M-6200A is not configured for Siemens application then go to B-2271-S1/B-2271-S2 or B-2271-S3/B-2271-S4 Hardware Kit Configuration in this section.

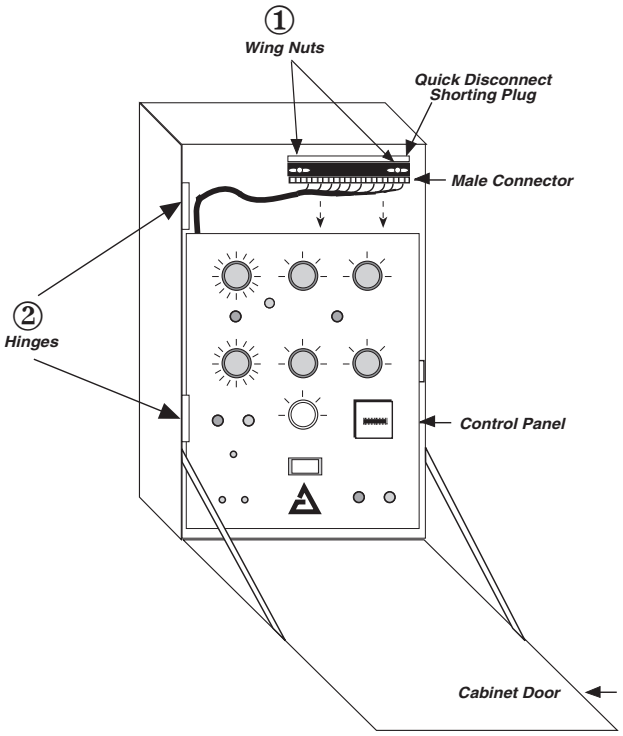


Figure 5-9 Siemens Control in Cabinet

Installing the M-6200A in a Siemens Regulator

The hinge leaves on the M-6200A are oriented to match the existing hinge leaves of the Siemens control cabinet.

If Bench Testing of the M-6200A is required, refer to Chapter 6, **Testing.**

WARNING: In no case should the line current circuit be interrupted with the regulator or transformer energized. Do not remove auxiliary current transformers without shorting the current inputs. Death or severe electrical shock can occur.

1. Verify that the regulator control wiring is in a safe condition that will allow installation of the M-6200A in the control cabinet.
   - The control wiring is de-energized and isolated from any potential safety hazards.
   - All local Safety Tagging rules have been applied as necessary.
2. Mount the M-6200A control panel onto Siemens Cabinet Hinges.
3. If the M-6200A Replacement Panel was not purchased with the B-2271-S2 or B-2271-S4 hardware kit, then connect the wiring harness and Jumper to the male connector half saved from the original control (Figure 5-9).
4. Reconnect the male connector to the quick disconnect plug, then reinstall the wing nuts (Item #1, on Figure 5-9).

■ **NOTE**: The magnet attached to the M-6200A side bracket can be adjusted up or down to accommodate any obstructions in the control cabinet.

5. Swing the M-6200A Regulator Control panel closed. The magnet at the back of the panel will keep the control panel affixed to the cabinet.
6. Set the **AUTO/MANUAL** toggle switch to the **Manual** position.
7. Energize the control.
8. Set up the desired configuration. See **Chapter 4**, **System Setup and Configuration**.
9. Refer to **Chapter 6**, **Testing** for testing requirements.

B-2271-S1/B-2271-S2 Hardware Kit Configuration

1. If the M-6200A to be configured has existing mounting hardware installed, then perform the following:
   a. Remove all hinges, latches, brackets, wiring harnesses and jumpers.
   b. Save/capture all removed hardware for future use.
2. Verify the contents of the B-2271-S1/ B-2271-S2 Hardware Kit includes the items in Table 5-3:

Qty	Description	Beco Part #
1	Top Hinge, P-2384, Male	440-00916
1	Bottom Hinge, P-2383, Male	440-00915
1	Bracket, P-2529	441-41432
1	Magnet, Round w/Chrome	440-00368
1	Screws, PHMS, 8-32 X 1/2	470-00621
1	Nut, Lock, Nylon-Insert #8	480-00828
6	Screws, Fillister, 8-32 X 7/16	440-00830
1	Wire Harness	B-1136
1*	Term BLK 9 Pos Pin Half (Male) with Jumper	B-1118
1	#8 Flat Washer	480-00503
* Included in B-2271-S2 Hardware Kit		

Table 5-3 B-2271-S1/B-2271-S2 Hardware Kit

3. Remove pre-cut label material from the four left side hinge mounting holes and the four right side latch bracket mounting holes as viewed from the front of the M-6200A panel.

■ **NOTE**: Refer to Figure 5-10 for location and orientation of hardware kit items.

4. Mount the Bottom Hinge to the lower left side of the M-6200A panel with the hinge pin pointing down, then secure the hinge utilizing 8-32 X $^{7}/_{16}$ screws inserted into the captured fasteners.
5. Mount the Top Hinge to the upper left side of the M-6200A panel with the hinge pin pointing down utilizing 8-32 X $^{7}/_{16}$ screws inserted into the captured fasteners.
6. Estimate the position of the Magnet that is necessary to make adequate contact with the rear of the control cabinet when the control is swung into the cabinet.
7. Install (hand tight) the magnet on the latch bracket utilizing an 8-32 X ½ screw and #8 nylon inserted lock nut.
8. Mount (hand tight) the Latch Bracket to the right side of the M-6200A panel utilizing 8-32 X $^{7}/_{16}$ screws.
9. Connect wiring harness B-1136 to TB1 Terminal Block as indicated in Figure 5-11. See terminal block torque requirements in this chapter.
10. Verify that a jumper is installed between TB2-2 and TB2-5.
11. Mount the M-6200A control panel onto the Siemens Cabinet hinges.
12. If the B-2271-S2 hardware kit was not purchased, then connect the M-6200A wiring harness (B-1136) to the male connector and Jumper saved from the original control (Figure 5-11).
13. Reconnect the male connector to the quick disconnect plug, then reinstall the wing nuts (Item #1, on Figure 5-9).
14. Verify that the magnet latching device makes adequate contact to hold the control panel in by swinging the M-6200A Regulator Control panel to the closed position.
15. If the magnet is positioned properly, secure the magnet and latch bracket, then go to Step 17.
16. If the magnet requires repositioning, reposition as necessary and secure the magnet and latch bracket.
17. Set the **AUTO/MANUAL** toggle switch to the **Manual** position.
18. Energize the control.
19. Set up the desired configuration. See **Chapter 4**, **System Setup and Configuration**.
20. Refer to **Chapter 6**, **Testing** for testing requirements.

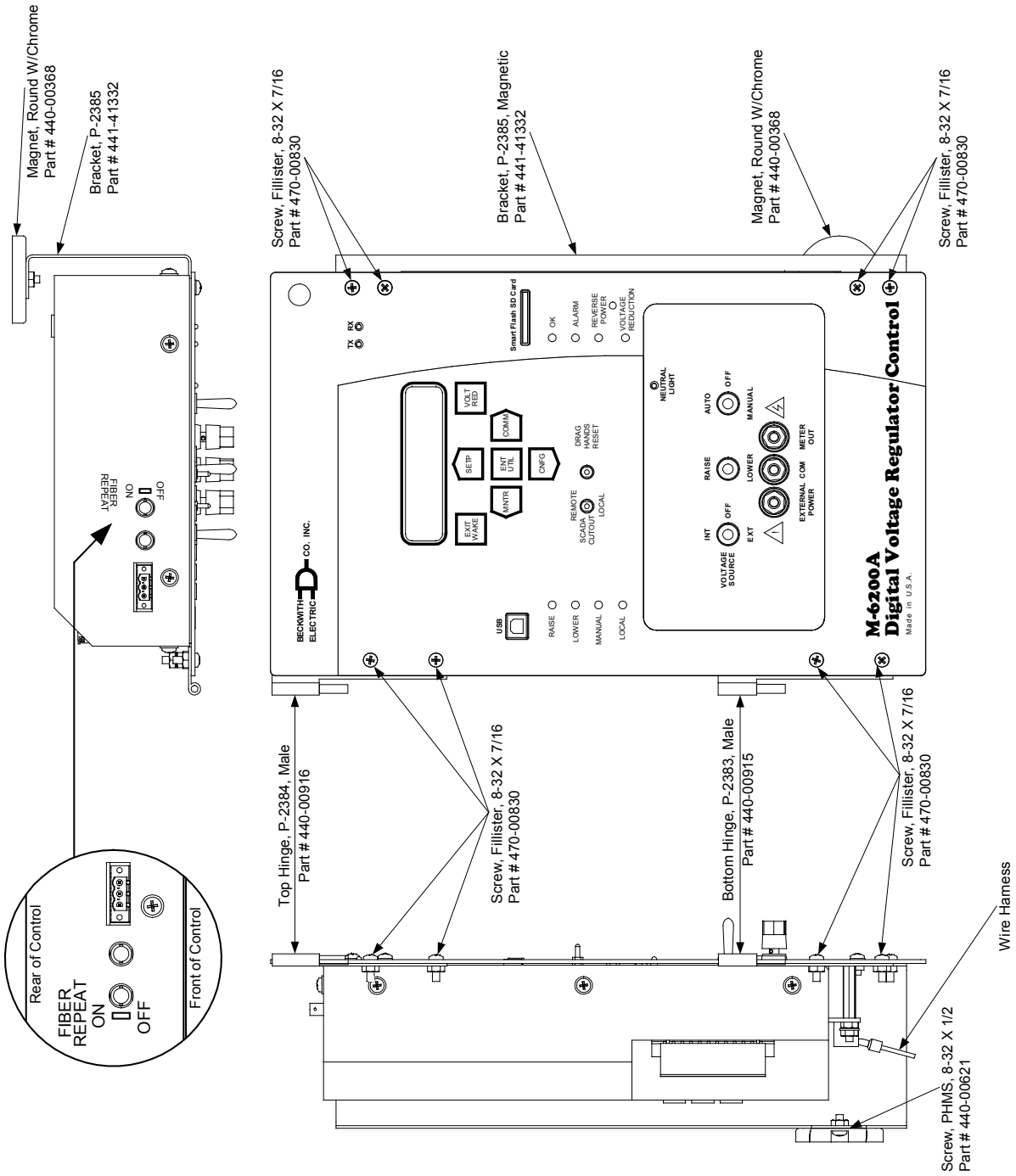
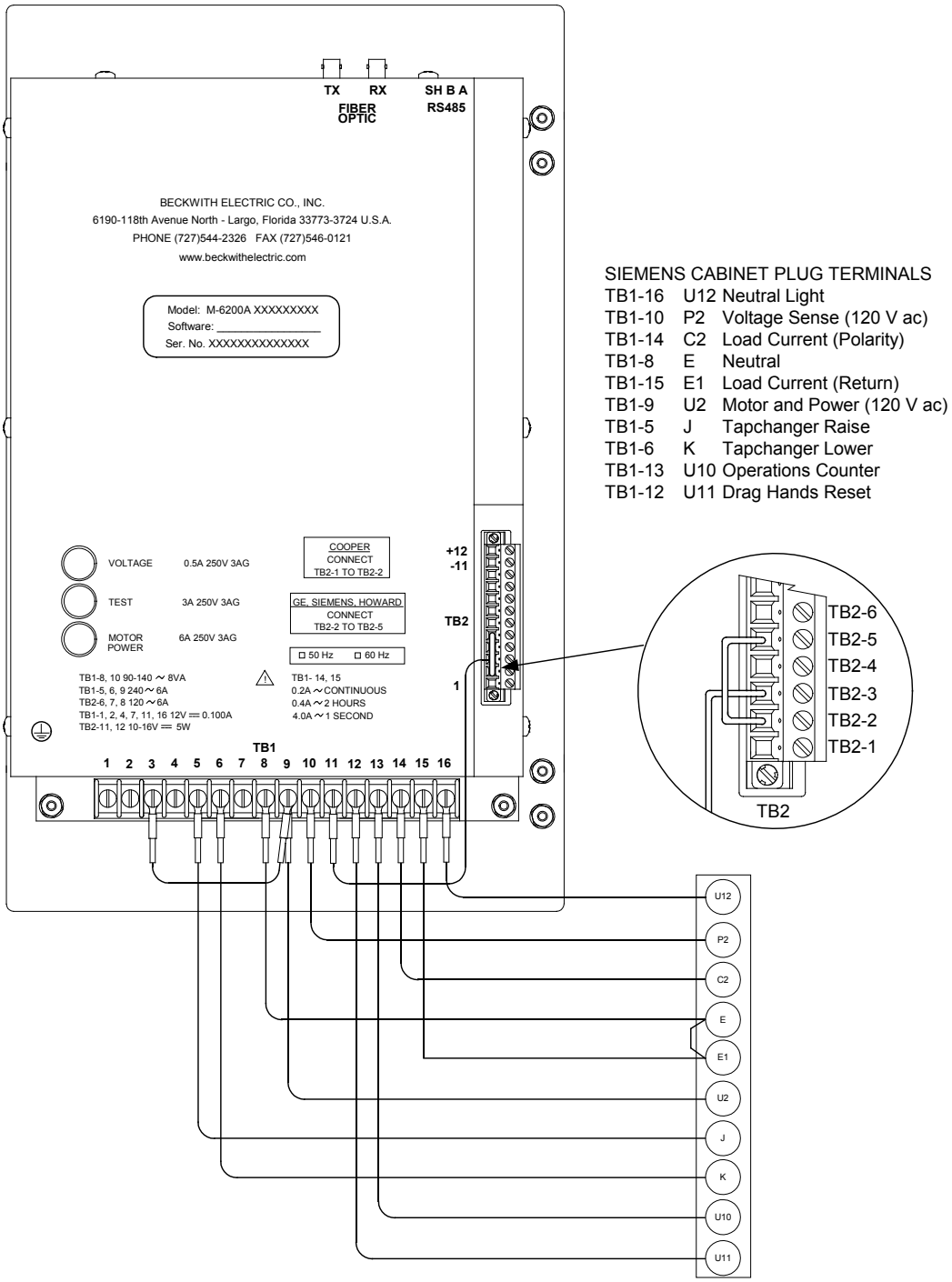


Figure 5-10 B-2271-S1/B-2271-S2, B-2271-S3/B-2271-S4 Hardware Kit Orientation



WARNING: In no case should the line current circuit be interrupted with the regulator or transformer energized. Do not remove auxiliary current transformers without shorting the current inputs. Death or severe electrical shock can occur.

■ **NOTE:** ⚠ See Section 5.1, Mechanical/Physical Information

Figure 5-11 B-2271-S1 (B-1136) Siemens Wiring Harness

B-2271-S3/B-2271-S4 Hardware Kit Configuration

1. If the M-6200A to be configured has existing mounting hardware installed, then perform the following:
   a. Remove all hinges, latches, brackets, wiring harnesses and jumpers.
   b. Save/capture all removed hardware for future use.
2. Verify the contents of the B-2271-S3/ B-2271-S4 Hardware Kit includes the items in Table 5-4:

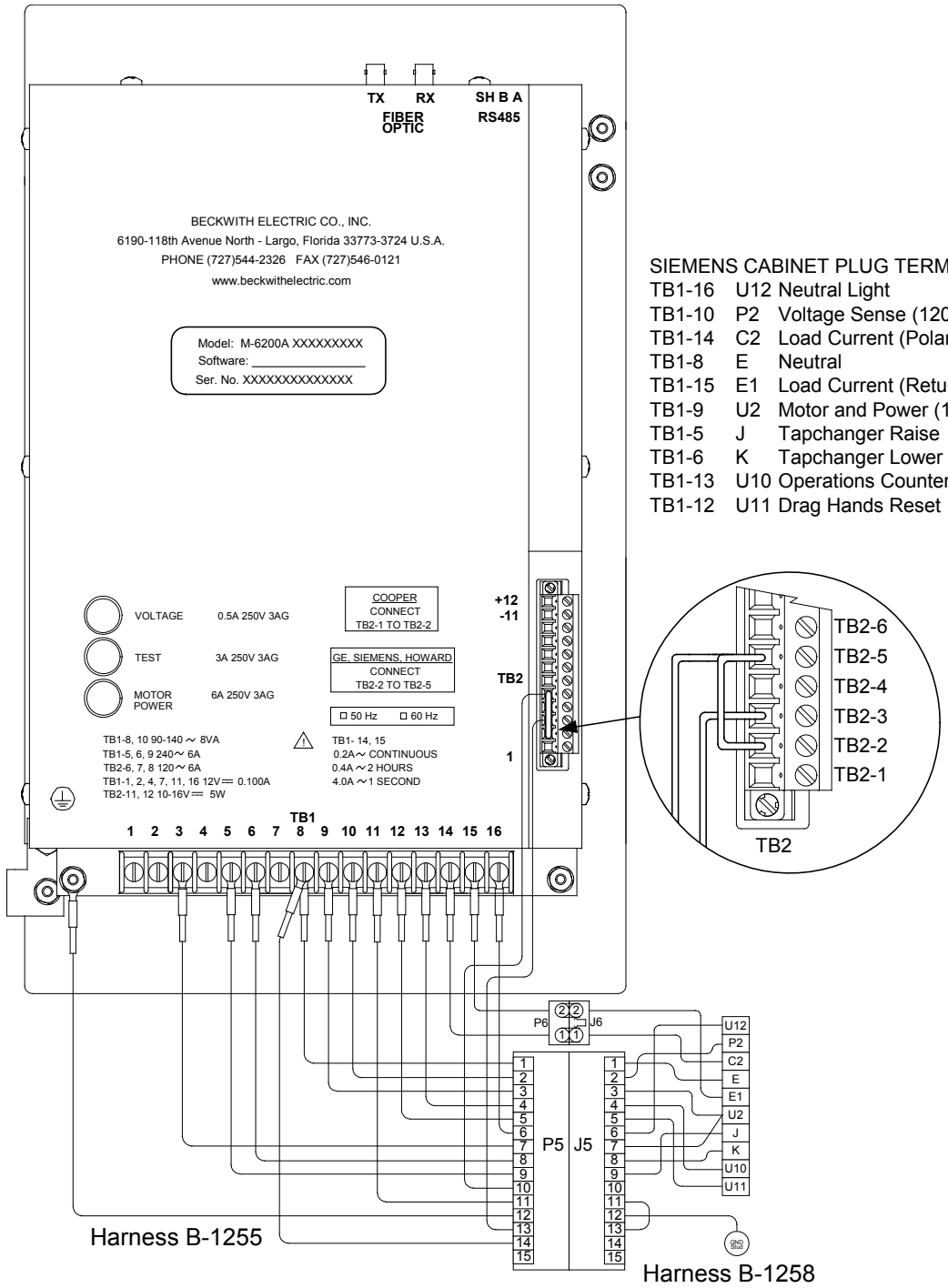
Qty	Description	Beco Part #
1	Top Hinge, P-2384, Male	440-00916
1	Bottom Hinge, P-2383, Male	440-00915
1	Bracket, P-2529	441-41432
1	Magnet, Round w/Chrome	440-00368
1	Screws, PHMS, 8-32 X 1/2	470-00621
1	Nut, Lock, Nylon-Insert #8	480-00828
6	Screws, Fillister, 8-32 X 7/16	440-00830
1	Wire Harness	B-1258
1*	Term BLK 9 Pos Pin Half (Male) with Jumper	B-1118
1	#8 Flat Washer	480-00503
* Included in B-2271-S4 Hardware Kit		

Table 5-4 B-2271-S3/B-2271-S4 Hardware Kit

3. Remove pre-cut label material from the four left side hinge mounting holes and the four right side latch bracket mounting holes as viewed from the front of the M-6200A panel.

■ **NOTE**: Refer to Figure 5-10 for location and orientation of hardware kit items.

4. Mount the Bottom Hinge to the lower left side of the M-6200A panel with the hinge pin pointing down, then secure the hinge utilizing 8-32 X $^{7}/_{16}$ screws inserted into the captured fasteners.
5. Mount the Top Hinge to the upper left side of the M-6200A panel with the hinge pin pointing down utilizing 8-32 X $^{7}/_{16}$ screws inserted into the captured fasteners.
6. Estimate the position of the Magnet that is necessary to make adequate contact with the rear of the control cabinet when the control is swung into the cabinet.
7. Install (hand tight) the magnet on the latch bracket utilizing an 8-32 X ½ screw and #8 nylon inserted lock nut.
8. Mount (hand tight) the Latch Bracket to the right side of the M-6200A panel utilizing 8-32 X $^{7}/_{16}$ screws.
9. Determine if the control is equipped with a B-1255 Universal Wiring Harness and proceed as follows:
   a. If the control has a B-1255 Universal Wiring Harness installed on TB1 and TB2, then go to Step 10.
   b. If the control ***does not*** have a B-1255 Universal Wiring Harness installed on TB1 and TB2, then connect the B-1255 harness to TB1 and TB2 as indicated in Figure 5-12. (See terminal block torque requirements in **Section 5.2, External Connections**). Go to Step 10.
10. Connect wiring harness B-1258 to Universal Wiring Harness B-1255 P-5 and P-6 connectors as indicated in Figure 5-12.
11. Verify that a jumper is installed between TB2-2 and TB2-5.
12. Mount the M-6200A control panel onto the Siemens Cabinet hinges.
13. If the B-2271-S4 hardware kit was not purchased, then connect the M-6200A wiring harness (B-1258) to the male connector and Jumper saved from the original control (Figure 5-12).
14. Reconnect the male connector to the quick disconnect plug, then reinstall the wing nuts (Item #1, on Figure 5-9).
15. Verify that the magnet latching device makes adequate contact to hold the control panel in by swinging the M-6200A Regulator Control panel to the closed position.
16. If the magnet is positioned properly, secure the magnet and latch bracket, then go to Step 18.
17. If the magnet requires repositioning, reposition as necessary and secure the magnet and latch bracket.
18. Set the **AUTO/MANUAL** toggle switch to the **Manual** position.
19. Energize the control.
20. Set up the desired configuration. See **Chapter 4**, **System Setup and Configuration**.
21. Refer to **Chapter 6**, **Testing** for testing requirements.



SIEMENS CABINET PLUG TERMINALS

TB1-16	U12	Neutral Light
TB1-10	P2	Voltage Sense (120 V ac)
TB1-14	C2	Load Current (Polarity)
TB1-8	E	Neutral
TB1-15	E1	Load Current (Return)
TB1-9	U2	Motor and Power (120 V ac)
TB1-5	J	Tapchanger Raise
TB1-6	K	Tapchanger Lower
TB1-13	U10	Operations Counter
TB1-12	U11	Drag Hands Reset

WARNING: In no case should the line current circuit be interrupted with the regulator or transformer energized. Do not remove auxiliary current transformers without shorting the current inputs. Death or severe electrical shock can occur.

■ **NOTE:** ⚠ See Section 5.1, Mechanical/Physical Information

Figure 5-12 B-2271-S3 (B-1255 and B-1258) Siemens Wiring Harness

5.4 General Electric ML-32 and VR-1 Regulators, and SM-1, SM-2, SM-2A and SM-3 Regulator Control Replacement

The Beckwith Electric M-6200A Digital Regulator Control directly replaces the General Electric ML-32 and VR-1 Regulators, and SM-1, SM-2, SM-2A and SM-3 Regulator Controls.

The contents of the hardware kits provide the means to install the M-6200A in the existing General Electric cabinet. The B-2293-G1, B-2293-G2, B-2293-G3 and B-2293-G4 are available separately from the factory for field installation.

The M-6200A may be purchased with the factory installed hardware kits:

- B-2293-G1
- B-2293-G2 (SM-3)
- B-2293-G3
- B-2293-G4 (SM-3)

Application

Typical Connections

In general, the tapchanger motor must be operated from a different transformer than the VT used to measure regulated voltage. If this is not done, hunting at the upper band edge may result. As soon as the motor starts, and before it is sealed in, the motor current can drop the voltage within the band and reset the control. Some motor seal-in schemes are fast enough to prevent this, but others are not.

Pulsed output can be used on the M-6200A (see **Section 4.2 Configuration, Output Pulse**).

Typical connections for the M-6200A are illustrated in Figures 5-13 and 5-14. Connections are simplified and may not show all functions required in a typical regulator control scheme – for example, limit switches, etc.

External Connections

The external connections for the M-6200A are made to terminal blocks TB1 and TB2 on the rear of the control panel.

Power and voltage sensing are obtained either from a common source or from independent sources having a nominal 120 Vac output. Normally, this is line-to-neutral voltage, although line-to-line voltage can also be used if recognition is made of any phase shift between the voltage and current signals when using line drop compensation.

Lightning Protection

▲ **CAUTION**: For proper protection against system surges, chassis ground must be connected to earth ground.

It has been determined that transient voltages in excess of 1500 Vac RMS can exist on the “ground” lead normally tied to TB1-8. In the regulator controls, these voltages are suppressed by varistors which still permit the unit to pass a 1500 Vac hi-pot test for one minute, with a leakage of approximately 15 mA, all terminals to ground.

Multiple VT grounds far apart must be avoided, since a varying difference in ground voltage could add or subtract from the effective voltage, and cause variation in the tapchanger control’s bandcenter voltage setpoint.

Non-Sequential Operation

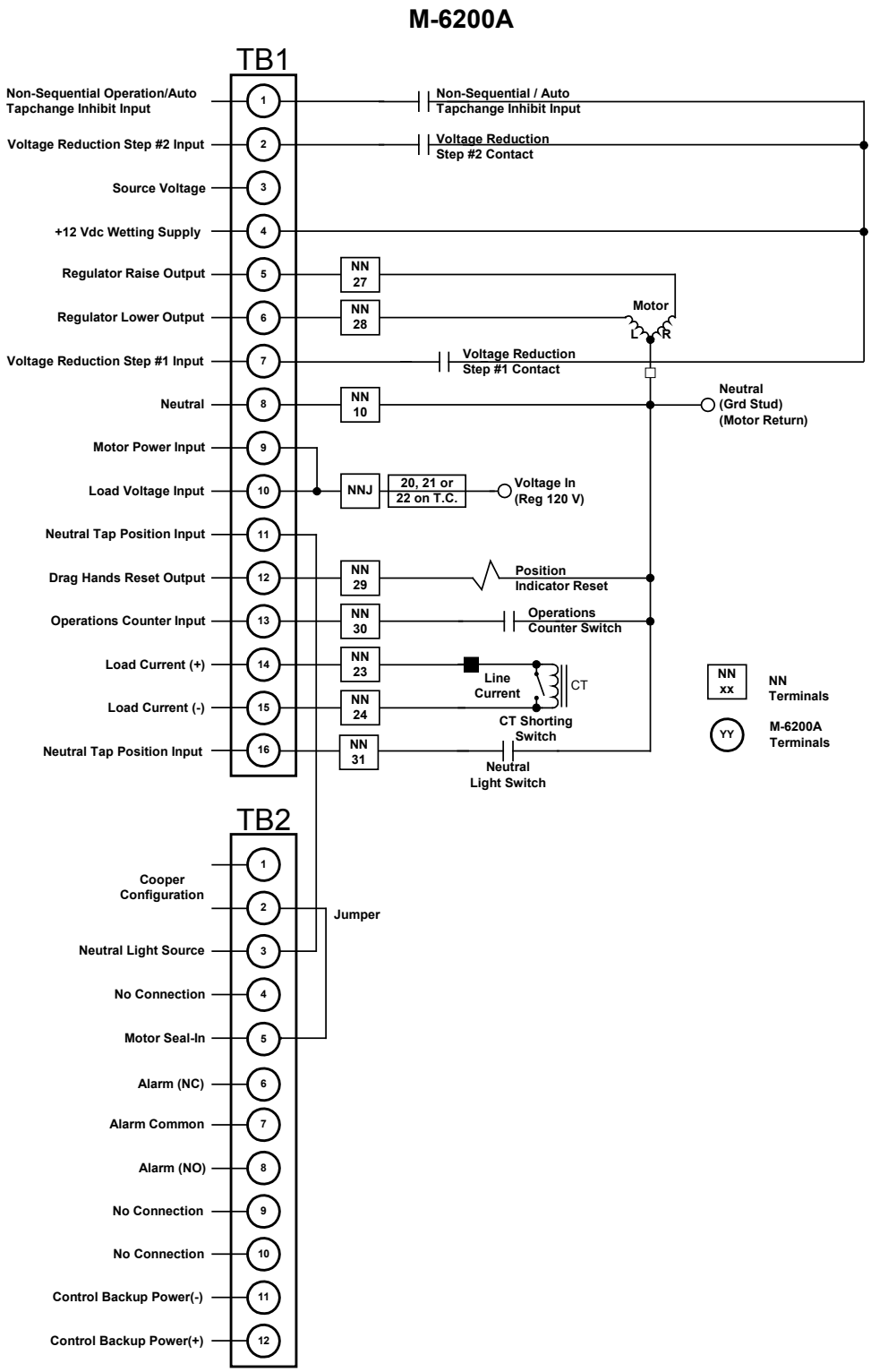
▲ **CAUTION:** Voltage applied through dry contacts to actuate non-sequential input *must* be +12 Vdc obtained from terminal TB1-4.

The operation of the control can be interrupted during tapchanger operation by applying the “wetting” voltage of terminals TB1-4 to TB1-1 (timer reset for non-sequential operation input). This causes the output to de-energize and re-initialize the time delay circuit when the reset signal is removed. This function can be used to cause the regulator, if so equipped, to wait for the unit to time out between tapchanges.

Operations Counter Input

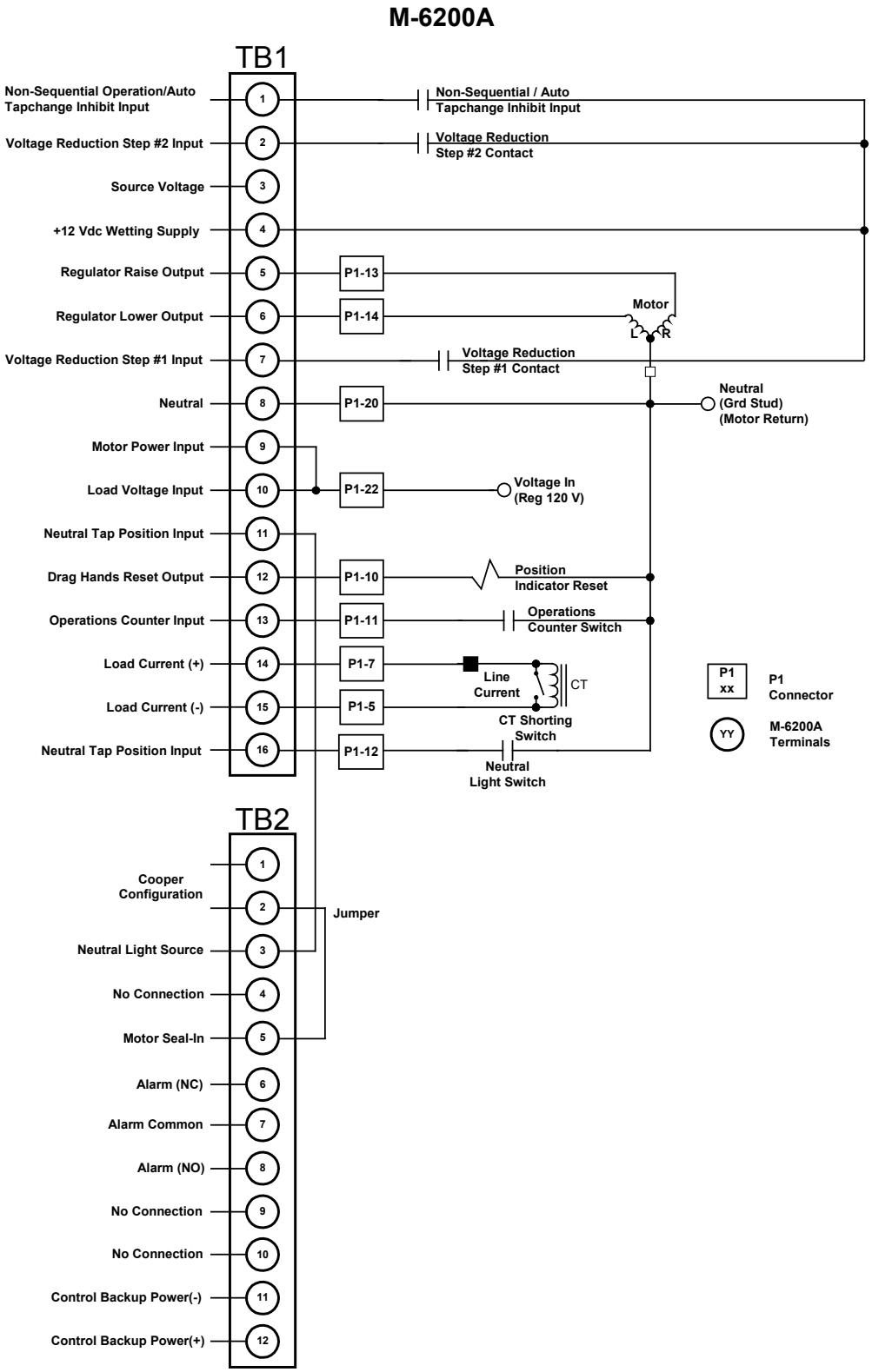
▲ **CAUTION**: Do not apply any voltage to this terminal.

An operations count is registered by momentarily grounding terminal TB1-13 through an external dry contact from the load tapchanger. The input is level-sensitive. Ensure that any “wetting” voltages are removed from the counter contacts before installing the M-6200A Regulator Control.



WARNING: In no case should the line current circuit be interrupted with the regulator or transformer energized. Do not remove auxiliary current transformers without shorting the current inputs. Death or severe electrical shock can occur.

Figure 5-13 Typical Connections for General Electric ML-32, VR-1 Regulators and SM-1, SM-2 and SM-2A Regulator Controls



WARNING: In no case should the line current circuit be interrupted with the regulator or transformer energized. Do not remove auxiliary current transformers without shorting the current inputs. Death or severe electrical shock can occur.

Figure 5-14 Typical Connections for General Electric SM-3 Regulator Controls

Multi-Step Voltage Reduction

▲ **CAUTION:** Voltage applied through dry contacts to actuate Voltage Reduction Steps 1, 2, and 3 *must* be +12 Vdc obtained from terminal TB1-4 of the M-6200A Regulator Control.

The M-6200A uses terminals TB1-2 and TB1-7 together to provide up to three levels of voltage reduction. The external connections to achieve these steps are shown in Table 5-1 and typical connection diagrams. Voltage reduction amounts are set within the M-6200A Regulator Control software.

Removal of the ML-32, VR-1, SM-1, SM-2 or SM-2A General Electric Control

WARNING: In no case should the line current circuit be interrupted with the regulator or transformer energized. Do not remove auxiliary current transformers without shorting the current inputs. Death or severe electrical shock can occur.

1. Verify that the regulator control wiring is in a safe condition that will allow removal of the GE Control from the control cabinet.
   - The control wiring is de-energized and isolated from any potential safety hazards.
   - All local Safety Tagging rules have been applied as necessary.
2. Open the cabinet door of the General Electric control.
3. Loosen the two thumbscrews at the interface of the control cable plug (Item #1, Figure 5-15) and the tap position indicator on the regulator, then pull down on the plug to disconnect it.
4. Turn the knob on the control panel (Item #2, Figure 5-15), then swing the panel outward.
5. Disconnect the three plugs that connect the wiring harness of the front panel to the component board.
6. Remove all connections from the component board to the NN terminal blocks.
7. Using a screwdriver or other appropriate tool, remove the component board.
8. While supporting the panel, remove and save the two hinges pins (Item #3, Figure 5-15), then lift the panel off the hinges.
9. If the M-6200A was purchased with the B-2293-G1 or B-2293-G3 hardware kit factory installed, then proceed to installing the M-6200A in the ML-32, VR-1, SM-1, SM-2 or SM-2A control cabinet.
10. If the M-6200A was not purchased with the B-2293-G1 or B-2293-G3 hardware kit factory installed, or the M-6200A is not configured for GE application, then go to B-2293-G1/B-2293-G2 or B-2293-G3/ B-2293-G4 Hardware Kit Configuration.

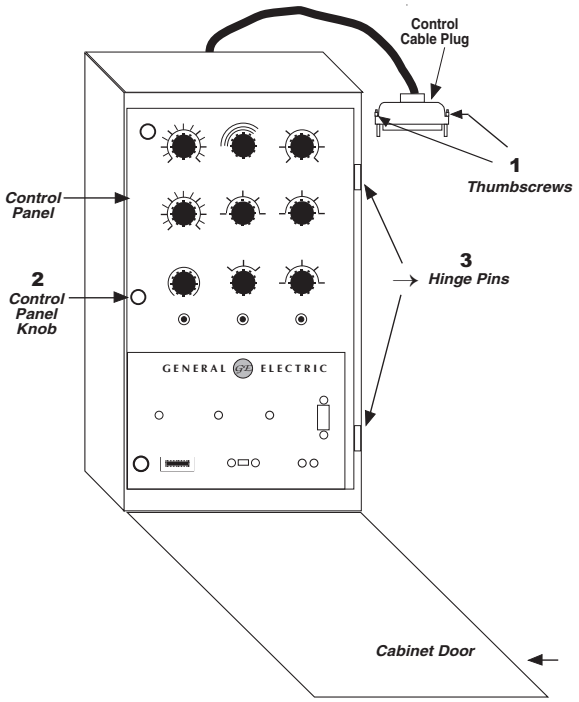


Figure 5-15 ML-32, VR-1, SM-1, SM-2 or SM-2A General Electric Control in Cabinet

Installing the M-6200A in the ML-32, VR-1, SM-1, SM-2 or SM-2A Control Cabinet

The hinge leaves on the M-6200A are oriented to match the existing hinge leaves of the General Electric control cabinet.

If Bench Testing of the M-6200A is required, then refer to **Chapter 6, Testing.**

WARNING: In no case should the line current circuit be interrupted with the regulator or transformer energized. Do not remove auxiliary current transformers without shorting the current inputs. Death or severe electrical shock can occur.

1. Verify that the regulator control wiring is in a safe condition that will allow installation of the M-6200A in the control cabinet.
   - The control wiring is de-energized and isolated from any potential safety hazards.
   - All local Safety Tagging rules have been applied as necessary.
2. Mount the M-6200A regulator control onto the enclosure hinges, then insert hinge pins.
3. Connect the B-1321 or B-1256 wiring harness to the NN terminal blocks (refer to Figures 5-19 and 5-20.
4. Swing the M-6200A control in and secure the control panel thumb screw latch.
5. Reconnect control cable plug to tap position indicator (Item #1, on Figure 5-15).
6. Set the toggle switch to the **Manual** position.
7. Energize the control.
8. Set up the desired configuration. See **Chapter 4**, **System Setup and Configuration**.
9. Refer to **Chapter 6**, **Testing** for testing requirements.

Removal of the SM-3 General Electric Control

1. Verify that the regulator control wiring is in a safe condition that will allow installation of the M-6200A in the control cabinet.
   - The control wiring is de-energized and isolated from any potential safety hazards.
   - All local Safety Tagging rules have been applied as necessary.
2. Release the SM-3 control panel thumb screw latch, then swing the control panel out to access the rear of the enclosure.
3. Remove the power disconnect circuit board from the holder by pressing the ejection ears on the circuit board (Item #1, Figure 5-16).
4. Disconnect the 24-pin connector from the power disconnect circuit board (Item #2, Figure 5-16).
5. Disconnect the 2-pin ground connector (Item #3, Figure 5-17).
6. While supporting the control panel, remove the control panel hinge pins (2), then remove the control panel from the enclosure. Save hinge pins.

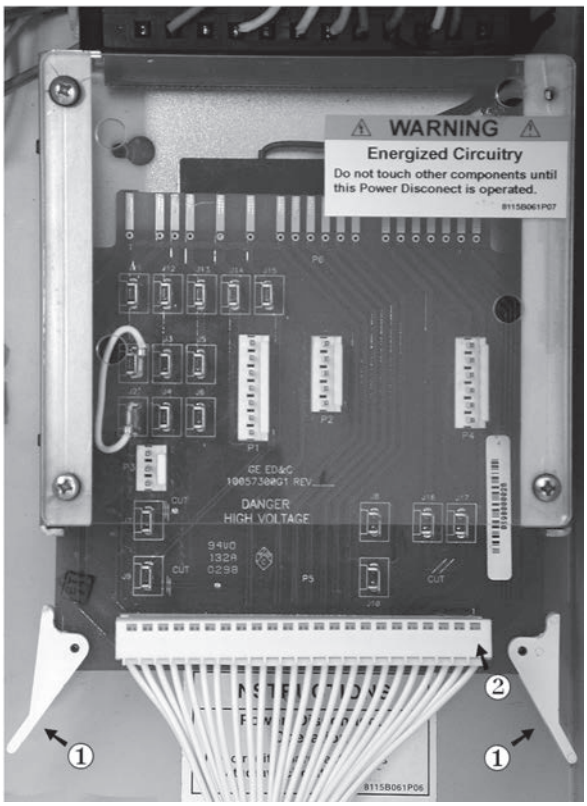


Figure 5-16 Power Disconnect Circuit Board

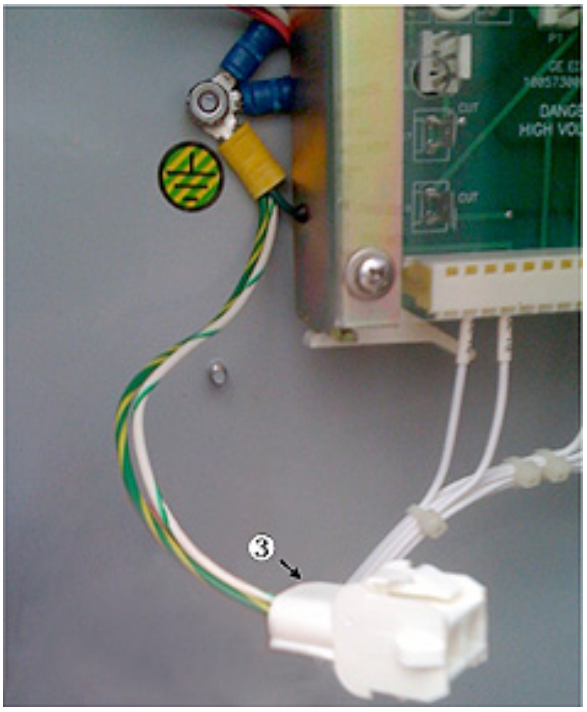


Figure 5-17 2-Pin Ground Connector

Installing the M-6200A in the SM-3 Control Cabinet

1. Verify that the regulator control wiring is in a safe condition that will allow installation of the M-6200A in the control cabinet.
   - The control wiring is de-energized and isolated from any potential safety hazards.
   - All local Safety Tagging rules have been applied as necessary.
2. Place the M-6200A panel onto the enclosure hinges, then insert hinge pins.
3. Connect the 24-pin connector to the power disconnect circuit board (Item #2, Figure 5-16).
4. Connect the M-6200A grounding plug P-2 to the enclosure ground plug (Item #3, Figure 5-17).
5. Connect the power disconnect circuit board to the holder (Item #1, Figure 5-16).
6. Secure the M-6200A control panel thumb screw latch.
7. Set the toggle switch to the **Manual** position.
8. Energize the control.
9. Set up the desired configuration. See **Chapter 4**, **System Setup and Configuration**.
10. Refer to **Chapter 6**, **Testing** for testing requirements.

B-2293-G1/2293-G3 Hardware Kit Configuration

1. If the M-6200A to be configured has existing mounting hardware installed, then perform the following:
   a. Remove all hinges, latches, brackets, wiring harnesses and jumpers.
   b. Save/capture all removed hardware for future use.
2. Verify the contents of the B-2293-G1/ B-2293-G3 Hardware Kit includes the items in Table 5-5:

Qty	Description	Beco Part #
1	Top Hinge, Half-Female	440-00909
1	Bottom Hinge Half-Female	470-00910
1	Latch, Adjustable Grip	440-00876
4	Screw, Fillister, 8-32 x 7/16	470-00830
2	Hair Pin	440-00998
1	Wire Harness, B-2293-G1 (B-2293-G3)	B-1321 (B-1256)

Table 5-5 B-2293-G1/B-2293-G3 Hardware Kit

3. Remove pre-cut label material from the four right side hinge mounting holes and the center left side latch mounting hole as viewed from the front of the M-6200A panel.

■ **NOTE**: Refer to Figure 5-18 for location and orientation of hardware kit items.

4. Mount the Bottom Hinge to the lower right side of the M-6200A panel with the hinge half up, and secure (hand tight) the hinge utilizing an 8-32 X $^{7}/_{16}$ screw inserted into the captured fastener in the top hole.
5. Complete the Bottom Hinge installation with an 8-32 X $^{7}/_{16}$ screw inserted into the captured fastener in the bottom hole, then tighten both the screws.
6. Mount the Top Hinge to the upper right side of the M-6200A panel utilizing 8-32 X $^{7}/_{16}$ screws inserted into the captured fasteners.
7. Mount the Latch to the left side of the M-6200A panel.
8. If configuring the B-2293-G1 hardware kit, then connect wiring harness B-1321 to TB1 Terminal Block as indicated in Figure 5-19. See terminal block torque requirements in this chapter. Go to Step 11.
9. If configuring the B-2293-G3 hardware kit, then determine if the control is equipped with a B-1255 Universal Wiring Harness and proceed as follows:
   a. If the control has a B-1255 Universal Wiring Harness installed on TB1 and TB2, then go to Step 10.
   b. If the control ***does not*** have a B-1255 Universal Wiring Harness installed on TB1 and TB2, then connect the B-1255 harness to TB1 and TB2 as indicated in Figure 5-20. (See terminal block torque requirements in **Section 5.2, External Connections**). Go to Step 10.
10. Connect wiring harness B-1256 to Universal Wiring Harness B-1255 P-5 and P-6 connectors as indicated in Figure 5-20.
11. Verify that a jumper is installed between TB2-2 and TB2-5.

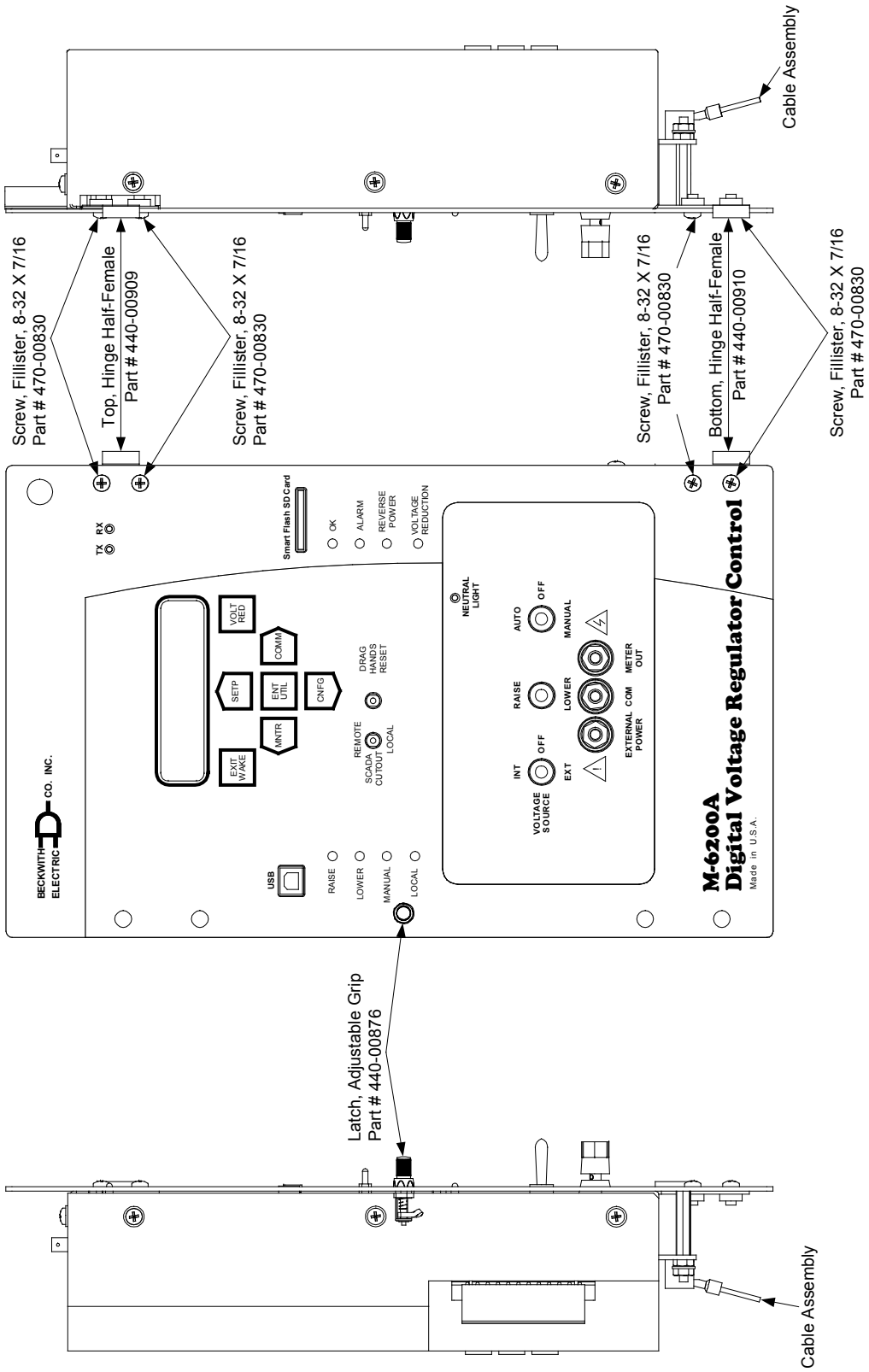
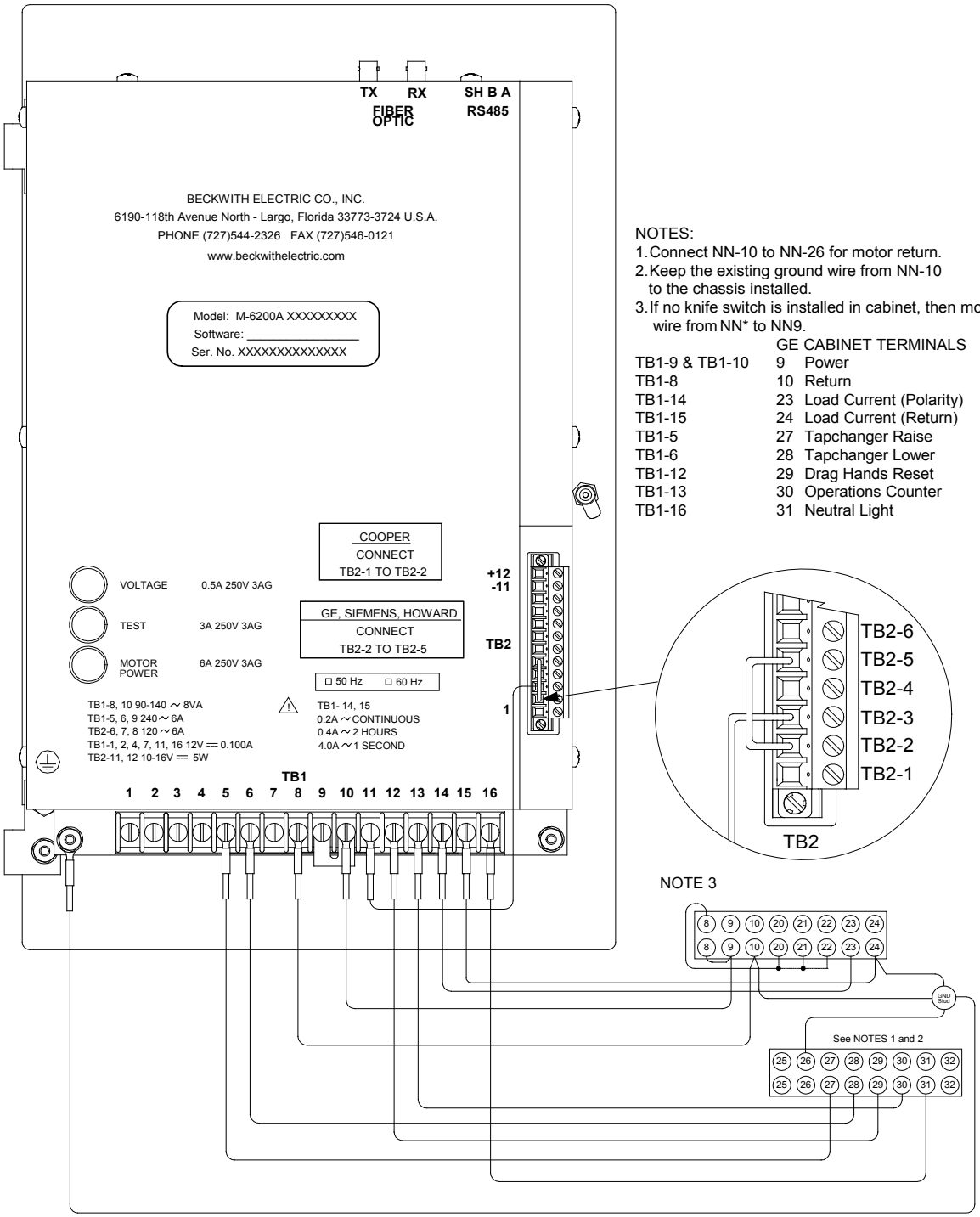


Figure 5-18 B-2293-G1/B-2293-G2, B-2293-G3/B-2293-G4 Hardware Kit Orientation



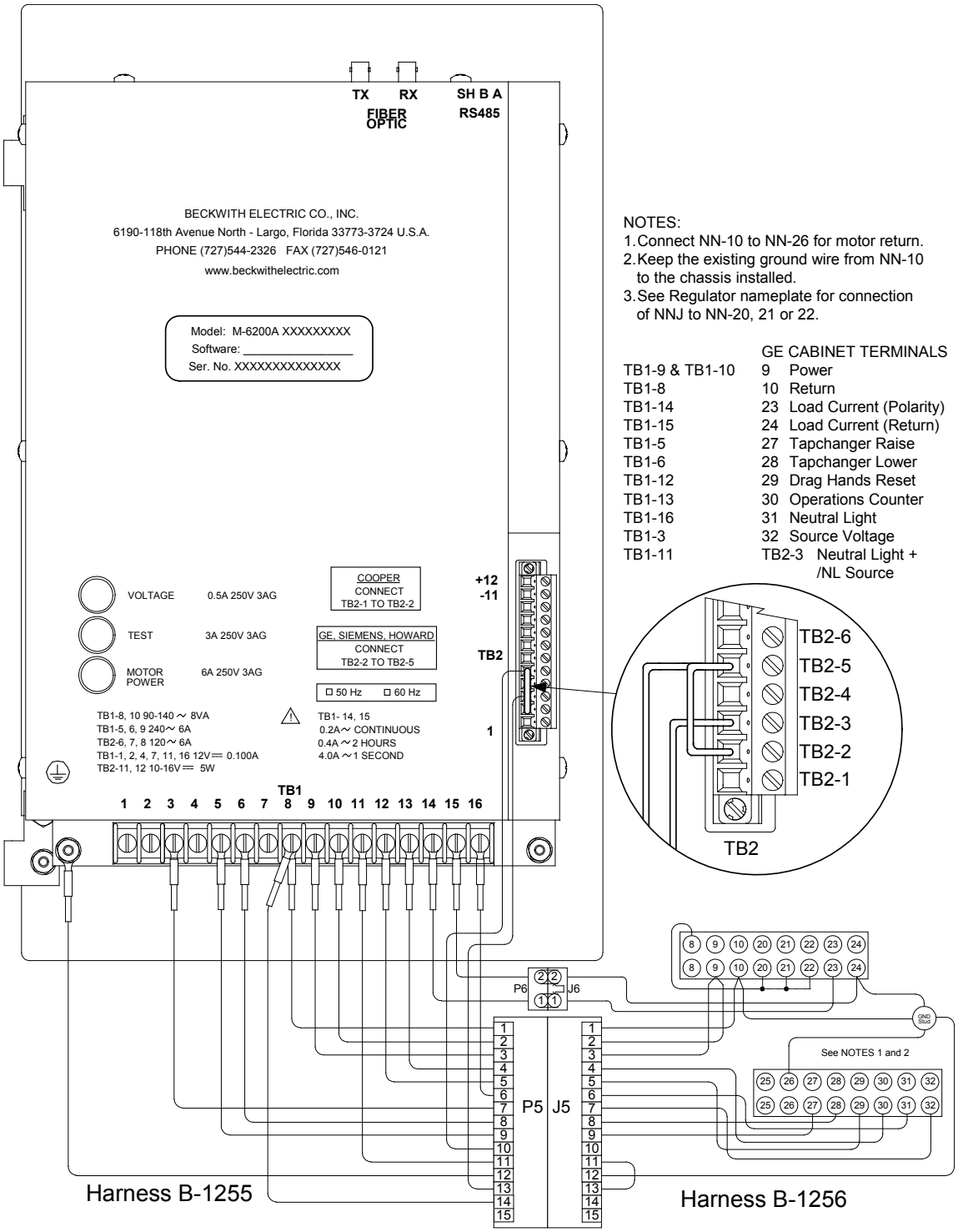
NOTES:
1. Connect NN-10 to NN-26 for motor return.
2. Keep the existing ground wire from NN-10 to the chassis installed.
3. If no knife switch is installed in cabinet, then move wire from NN* to NN9.

	GE CABINET TERMINALS	
TB1-9 & TB1-10	9	Power
TB1-8	10	Return
TB1-14	23	Load Current (Polarity)
TB1-15	24	Load Current (Return)
TB1-5	27	Tapchanger Raise
TB1-6	28	Tapchanger Lower
TB1-12	29	Drag Hands Reset
TB1-13	30	Operations Counter
TB1-16	31	Neutral Light

WARNING: In no case should the line current circuit be interrupted with the regulator or transformer energized. Do not remove auxiliary current transformers without shorting the current inputs. Death or severe electrical shock can occur.

■ **NOTE:** ⚠ See Section 5.1, Mechanical/Physical Information

Figure 5-19 B-2293-G1 (B-1321) GE Wiring Harness



NOTES:
1. Connect NN-10 to NN-26 for motor return.
2. Keep the existing ground wire from NN-10 to the chassis installed.
3. See Regulator nameplate for connection of NNJ to NN-20, 21 or 22.

	GE CABINET TERMINALS
TB1-9 & TB1-10	9 Power
TB1-8	10 Return
TB1-14	23 Load Current (Polarity)
TB1-15	24 Load Current (Return)
TB1-5	27 Tapchanger Raise
TB1-6	28 Tapchanger Lower
TB1-12	29 Drag Hands Reset
TB1-13	30 Operations Counter
TB1-16	31 Neutral Light
TB1-3	32 Source Voltage
TB1-11	TB2-3 Neutral Light + /NL Source

WARNING: In no case should the line current circuit be interrupted with the regulator or transformer energized. Do not remove auxiliary current transformers without shorting the current inputs. Death or severe electrical shock can occur.

■ **NOTE:** ⚠ See Section 5.1, Mechanical/Physical Information

Figure 5-20 B-2293-G3 (B-1255/B-1256) GE Wiring Harness

B-2293-G2/2293-G4 Hardware Kit Configuration

1. If the M-6200A to be configured has existing mounting hardware installed, then perform the following:
   a. Remove all hinges, latches, brackets, wiring harnesses and jumpers.
   b. Save/capture all removed hardware for future use.
2. Verify the contents of the B-2293-G2/ B-2293-G4 Hardware Kit includes the items in Table 5-6:

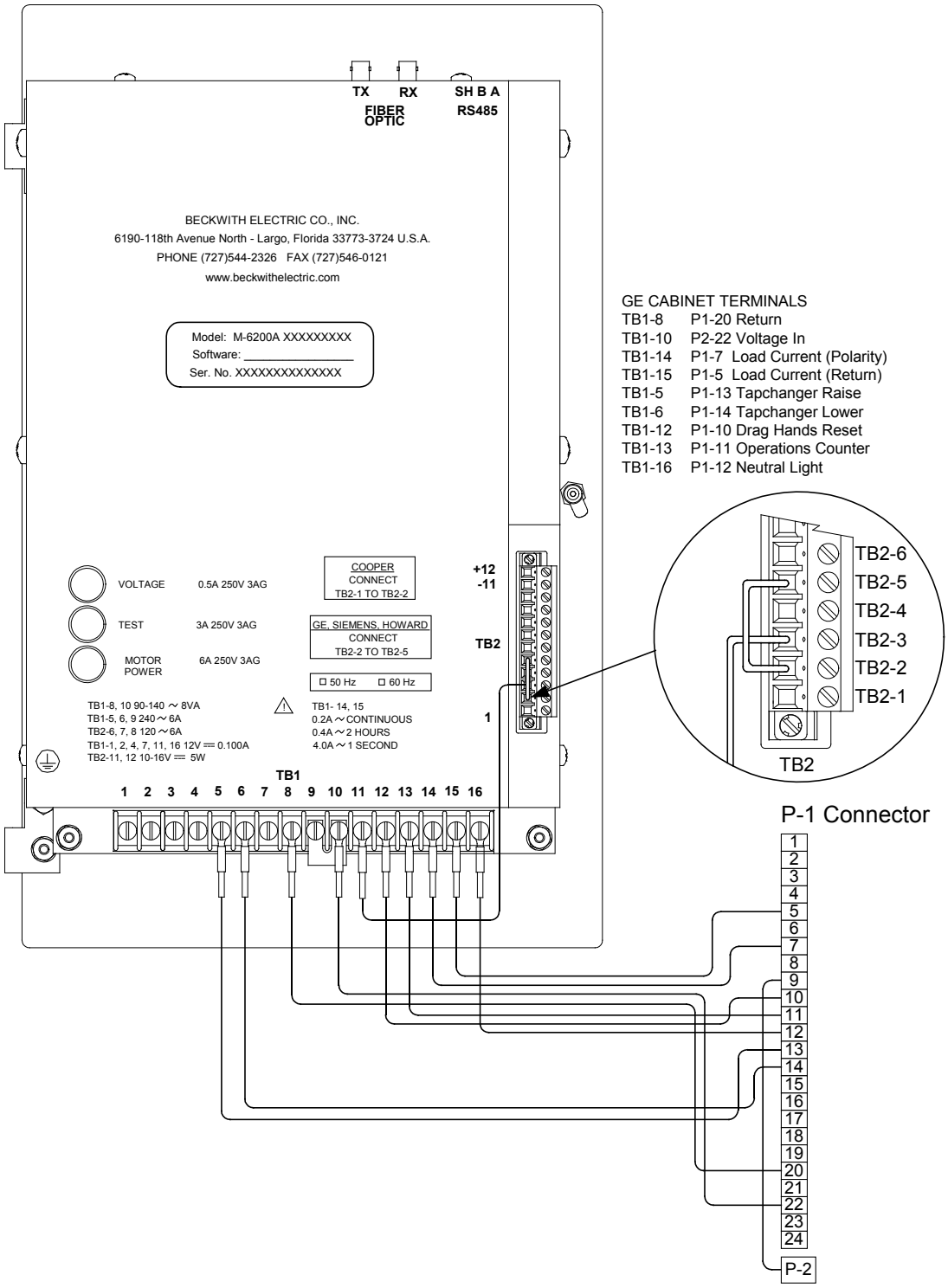
Qty	Description	Beco Part #
1	Top Hinge, Half-Female	440-00909
1	Bottom Hinge Half-Female	470-00910
1	Latch, Adjustable Grip	440-00876
4	Screw, Fillister, 8-32 x 7/16	470-00830
2	Hair Pin	440-00998
1	Wire Harness, B-2293-G2 (B-2293-G4)	B-1133 (B-1257)

Table 5-6 B-2293-G2/B-2293-G4 Hardware Kit

3. Remove pre-cut label material from the four right side hinge mounting holes and the center left side latch mounting hole as viewed from the front of the M-6200A panel.

■ **NOTE**: Refer to Figure 5-18 for location and orientation of hardware kit items.

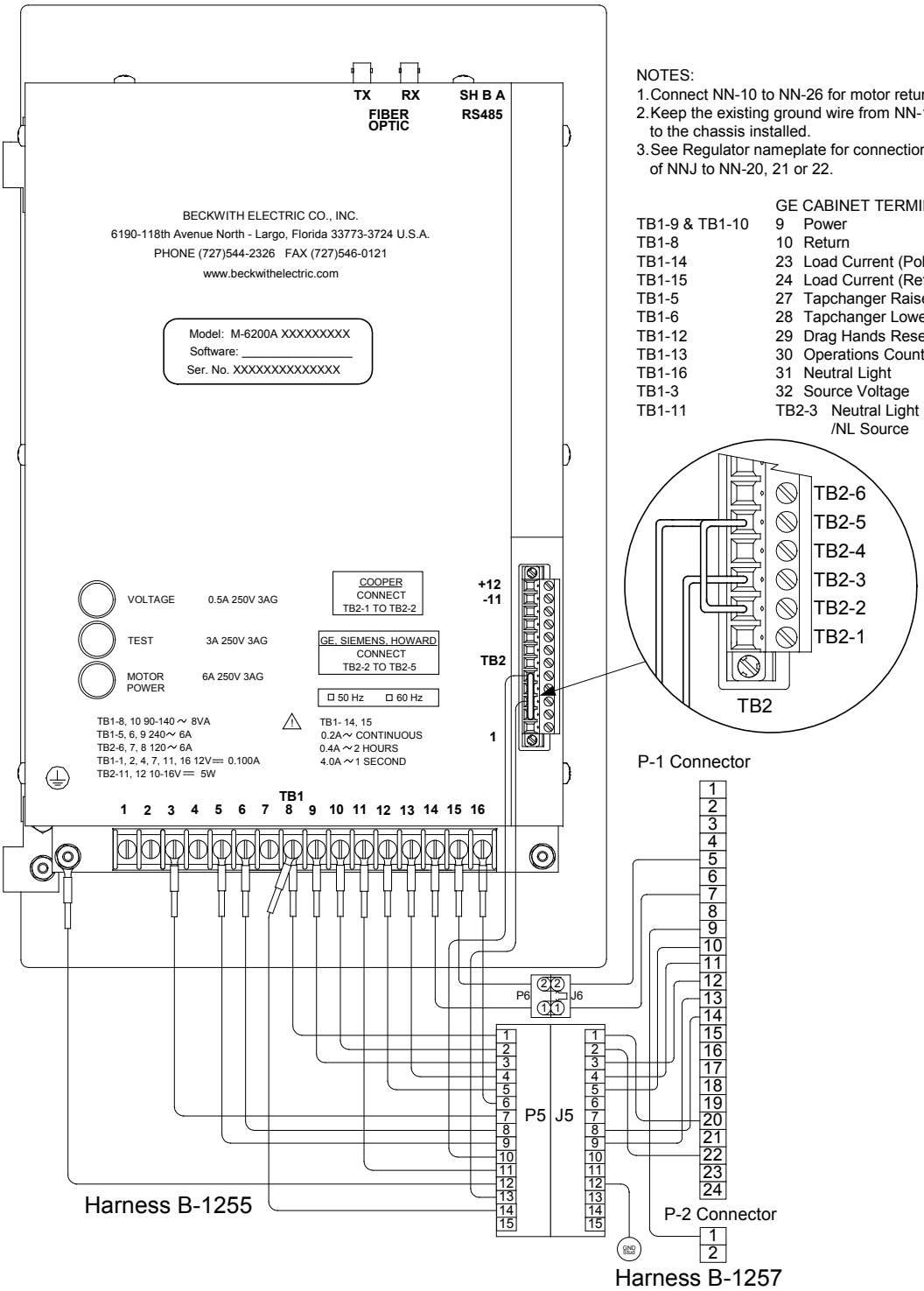
4. Mount the Bottom Hinge to the lower right side of the M-6200A panel with the hinge half up, and secure (hand tight) the hinge utilizing an 8-32 X $^{7}/_{16}$ screw inserted into the captured fastener in the top hole.
5. Complete the Bottom Hinge installation with an 8-32 X $^{7}/_{16}$ screw inserted into the captured fastener in the bottom hole, then tighten both the screws.
6. Mount the Top Hinge to the upper right side of the M-6200A panel utilizing 8-32 X $^{7}/_{16}$ screws inserted into the captured fasteners.
7. Mount the Latch to the left side of the M-6200A panel.
8. If configuring the B-2293-G2 hardware kit, connect wiring harness B-1133 to TB1 Terminal Block as indicated in Figure 5-21. See terminal block torque requirements in this chapter. Go to Step 11.
9. If configuring the B-2293-G4 hardware kit, then determine if the control is equipped with a B-1255 Universal Wiring Harness and proceed as follows:
   a. If the control has a B-1255 Universal Wiring Harness installed on TB1 and TB2, then go to Step 10.
   b. If the control ***does not*** have a B-1255 Universal Wiring Harness installed on TB1 and TB2, then connect the B-1255 harness to TB1 and TB2 as indicated in Figure 5-22. (See terminal block torque requirements in **Section 5.2, External Connections**). Go to Step 10.
10. Connect wiring harness B-1257 to Universal Wiring Harness B-1255 P-5 and P-6 connectors as indicated in Figure 5-22.
11. Verify that a jumper is installed between TB2-2 and TB2-5.



WARNING: In no case should the line current circuit be interrupted with the regulator or transformer energized. Do not remove auxiliary current transformers without shorting the current inputs. Death or severe electrical shock can occur.

■ **NOTE:** ⚠ See Section 5.1, Mechanical/Physical Information

Figure 5-21 B-2293-G2 (B-1133) GE SM-3 Wiring Harness



WARNING: In no case should the line current circuit be interrupted with the regulator or transformer energized. Do not remove auxiliary current transformers without shorting the current inputs. Death or severe electrical shock can occur.

■ **NOTE:** ⚠ See Section 5.1, Mechanical/Physical Information

Figure 5-22 B-2293-G4 (B-1255/B-1257) GE SM-3 Wiring Harness

5.5 Howard Industries SVR-1 Regulator Control Replacement

The Beckwith Electric M-6200A Digital Regulator control directly replaces Howard Industries SVR-1 Regulator Controls.

The contents of the hardware kits provide the means to install the M-6200A in the existing Howard Industries cabinet. The B-2203-H1, B-2203-H2, B-2203-H3 and B-2203-H4 kits are available separately from the factory for field installation.

The M-6200A may be purchased with the factory installed hardware kits:

- B-2203-H1
- B-2203-H2
- B-2203-H3
- B-2203-H4

The difference between the B-2203-H1 and B-2203-H2, B-2203-H3 and B-2203-H4 hardware kits is the B-2203-H2 and B-2203-H4 includes the male half of the CT Shorting Plug.

Application

Typical Connections

In general, the tapchanger motor must be operated from a different transformer than the VT used to measure regulated voltage. If this is not done, hunting at the upper band edge may result. As soon as the motor starts, and before it is sealed in, the motor current can drop the voltage within the band and reset the control. Some motor seal-in schemes are fast enough to prevent this, but others are not.

Pulsed output can be used on the M-6200A (see **Section 4.2 Configuration, Output Pulse**).

Connections are simplified and may not show all functions required in a typical regulator control scheme – for example, limit switches, etc.

External Connections

Power and voltage sensing are obtained either from a common source or from independent sources having a nominal 120 Vac output. Normally, this is line-to-neutral voltage, although line-to-line voltage can also be used if recognition is made of any phase shift between the voltage and current signals when using line drop compensation.

The external connections for the M-6200A are made to terminal blocks TB1 and TB2 on the rear of the control panel. Typical external connections for the M-6200A are shown in Figure 5-23.

Lightning Protection

▲ **CAUTION**: For proper protection against system surges, chassis ground must be connected to earth ground.

It has been determined that transient voltages in excess of 1500 Vac RMS can exist on the “ground” lead normally tied to TB1-8. In the regulator controls, these voltages are which still permit the unit to pass a 1500 Vac hi-pot test for one minute, with a leakage of approximately 15 mA, all terminals to ground.

Multiple VT grounds far apart must be avoided, since a varying difference in ground voltage could add or subtract from the effective voltage, and cause variation in the tapchanger control’s bandcenter voltage setpoint.

Non-Sequential Operation

▲ **CAUTION:** Voltage applied through dry contacts to actuate non-sequential input *must* be +12 Vdc obtained from pin TB1-4.

The operation of the regulator control can be interrupted during tapchanger operation by applying the “wetting” voltage of terminal TB1-4 to terminal TB1-1 (timer reset for non-sequential operation input) through an external contact. This causes the output to de-energize and re-initialize the time delay circuit when the reset signal is removed. This function can be used to cause the regulator, if so equipped, to wait for the unit to time out between tapchanges.

Operations Counter Input

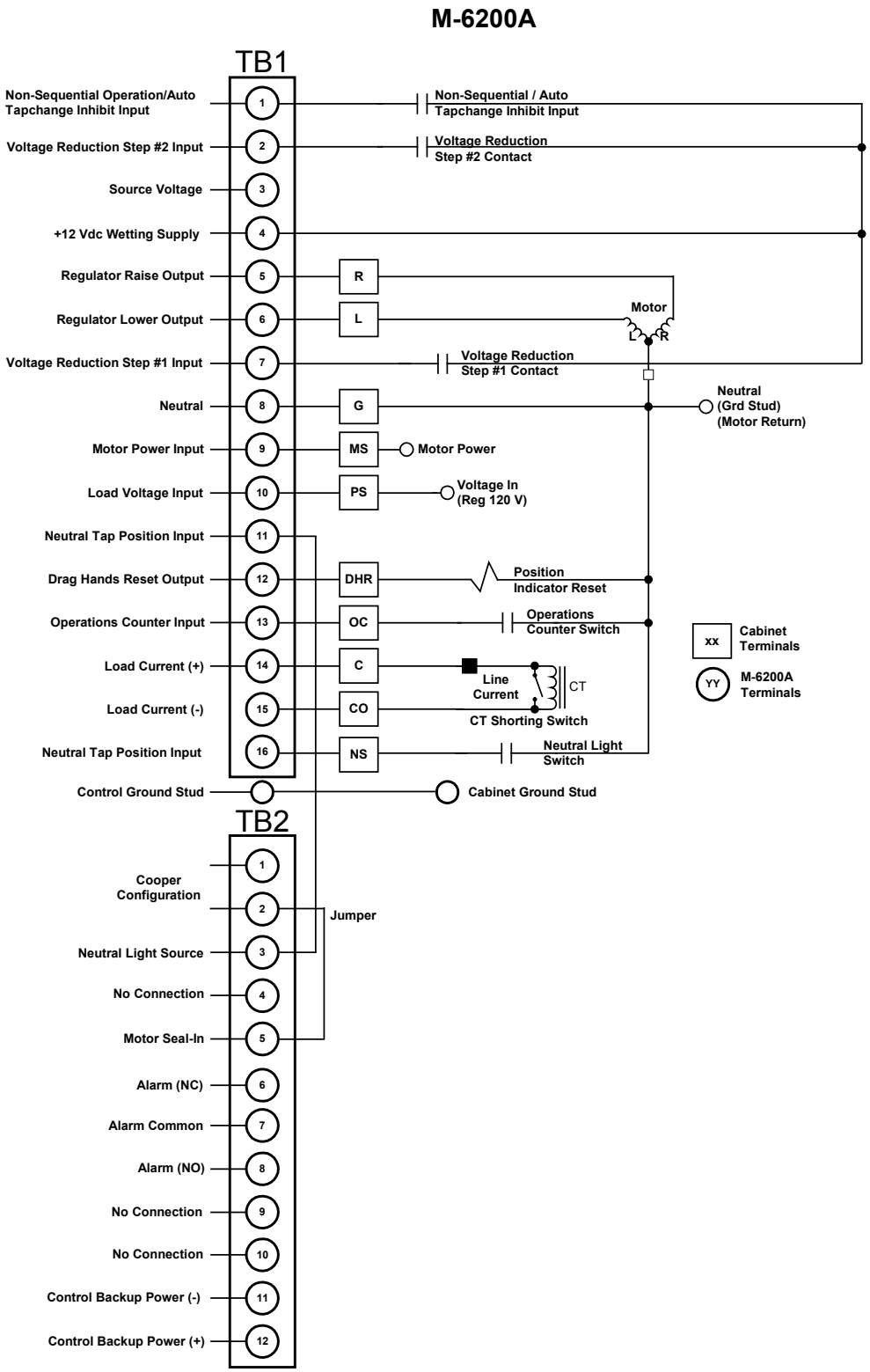
▲ **CAUTION**: Do not apply any voltage to this terminal.

An operations count is registered by momentarily grounding terminal TB1-13 through an external dry contact from the load tapchanger. The input is level-sensitive. Make sure that any “wetting” voltages are removed from the counter contacts before installing the M-6200A Regulator Control.

Multi-Step Voltage Reduction

▲ **CAUTION:** Voltage applied through dry contacts to actuate Voltage Reduction Steps 1, 2, and 3 *must* be +12 Vdc obtained from terminal TB1-4 of the M-6200A Regulator Control.

The M-6200A uses terminals TB1-2 and TB1-7 together to provide up to three levels of voltage reduction. The external connections to achieve these steps are shown in Table 5-1 and Figure 5-23. Voltage reduction amounts are set within the M-6200A Regulator Control software.



WARNING: In no case should the line current circuit be interrupted with the regulator or transformer energized. Do not remove auxiliary current transformers without shorting the current inputs. Death or severe electrical shock can occur.

Figure 5-23 Typical Connections for Howard Industries SVR-1 Regulator Controls

Removal of the Howard Industries Control

WARNING: In no case should the line current circuit be interrupted with the regulator or transformer energized. Do not remove auxiliary current transformers without shorting the current inputs. Death or severe electrical shock can occur.

1. Verify that the regulator control wiring is in a safe condition that will allow removal of the Howard Industries Control from the control cabinet.
   - The control wiring is de-energized and isolated from any potential safety hazards.
   - All local Safety Tagging rules have been applied as necessary.
2. Open the cabinet door of the Howard Industries control.
3. Remove and save the wing nuts from the quick disconnect shorting plug (Item #1, Figure 5-24), then pull down on the male connector portion of the plug to disconnect it.
4. Swing the panel outward, then lift panel off of its hinges (Item #2, Figure 5-24).

NOTE: The quick disconnect shorting plug must be saved from the original control if the replacement panel does not include the B-2203-H2 or B-2203-H4 hardware kit.

5. If required, remove the male connector portion of the plug by unscrewing its connections to the control's wiring harness.
6. If the M-6200A was purchased with the B-2203-H1, B-2203-H2, B-2203-H3 or B-2203-H4 hardware kit factory installed, proceed to M-6200A installation.
7. If the M-6200A was not purchased with the B-2203-H1, B-2203-H2, B-2203-H3 or B-2203-H4 hardware kit or the M-6200A is not configured for a Howard Industries application, go to B-2203-H1/B-2203-H2 or B-2203-H3/B-2203-H4 hardware kit configuration.

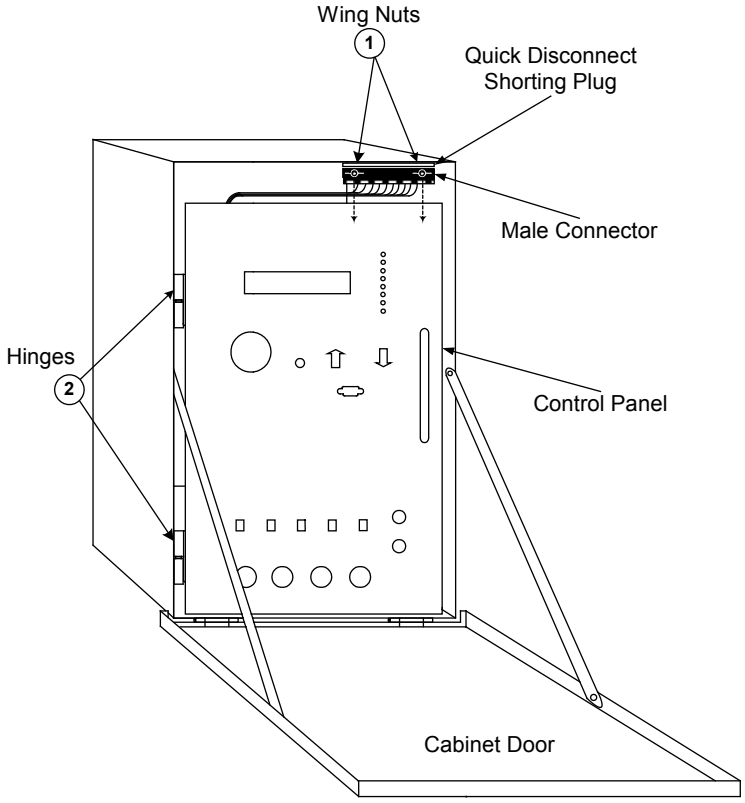


Figure 5-24 Howard Industries Control in Cabinet

Installing the M-6200A in a Howard Industries Regulator

The hinge leaves on the M-6200A are oriented to match the existing hinge leaves and latch of the Howard Industries control cabinet.

If Bench Testing of the M-6200A is required, refer to **Chapter 6**, **Testing.**

WARNING: In no case should the line current circuit be interrupted with the regulator or transformer energized. Do not remove auxiliary current transformers without shorting the current inputs. Death or severe electrical shock can occur.

1. Verify that the regulator control wiring is in a safe condition that will allow installation of the M-6200A in the control cabinet.
   - The control wiring is de-energized and isolated from any potential safety hazards.
   - All local Safety Tagging rules have been applied as necessary.
2. Place the M-6200A panel onto the enclosure hinges, then insert hinge pins.
3. Connect the B-1212 Ground Wire to the Cabinet Ground Stud.
4. If the M-6200A replacement panel was not purchased with the B-2203-H2 or B-2203-H4 hardware kit, connect the wiring harness to the male connector half saved from the original control (Figure 5-24).
5. Reconnect the male half of the quick disconnect plug, then reinstall the wing nuts (Item #1, on Figure 5-24).
6. Secure the M-6200A control panel thumb screw latch.
7. Set the toggle switch to the **Manual** position.
8. Energize the control.
9. Set up the desired configuration. See **Chapter 4**, **System Setup and Configuration**.
10. Refer to **Chapter 6**, **Testing** for testing requirements.

B-2203-H1/B-2203-H2 Hardware Kit Configuration

1. If the M-6200A to be configured has existing mounting hardware installed, perform the following:
   a. Remove all hinges, latches, brackets, wiring harnesses and jumpers.
   b. Save/capture all removed hardware for future use.
2. Verify the contents of the B-2203-H1/ B-2203-H2 Hardware Kit includes the items in Table 5-7:

Qty	Description	Beco Part #
1	Hinge Half, P2386 Female	440-00917
4	Screw, Fillister, 8-32 x 7/16	470-00830
1	Hinge Half, P2391 Female	440-00922
1	Captive Screw Knurled	440-00856
1	Retainer Nylon, Med	440-00855
1	Bracket, P2121, M2301	441-41130
1	Wire Harness	B-1134
1*	Term BLK 9 Pos Pin Half (Male)	421-00251
1	Ground Wire	B-1212
* Included in B-2203-H2 Hardware Kit		

Table 5-7 B-2203-H1/2203-H2 Hardware Kit

3. Remove pre-cut label material from the four left side hinge mounting holes and upper right captured screw hole as viewed from the front of the M-6200A panel.

■ **NOTE**: Refer to Figure 5-25 for location and orientation of hardware kit items.

4. Mount the Bottom Hinge to the lower left side of the M-6200A panel, then secure (hand tight) the hinge utilizing an 8-32 X 7/16 screw into the captured fastener inserted lock nut in the top hole.
5. Complete the Bottom Hinge installation with an 8-32 X 7/16 screw into the captured fastener inserted in the bottom hole, then tighten the top and bottom screws.
6. Mount the Top Hinge to the upper left side of the M-6200A panel utilizing 8-32 X 7/16 screws inserted into the captured fasteners.
7. Install the captured screw latch as follows:
   a. Insert captured screw into panel.
   b. Place bracket onto captured screw.
   c. Install nylon retainer onto captured screw to secure bracket.
8. Connect the B-1212 Ground Wire from the Control Ground Stud to the Cabinet Ground Stud.
9. Connect wiring harness B-1134 to TB1 Terminal Block as indicated in Figure 5-26. See terminal block torque requirements in this chapter. Verify that a jumper is installed between TB2-2 and TB2-5.
10. Mount the M-6200A control panel onto the Howard Cabinet hinges.
11. If the B-2203-H2 hardware kit was not purchased then connect the M-6200A wiring harness to the male connector saved from the original control (Figure 5-26).
12. Reconnect the male connector to the quick disconnect plug, then reinstall the wing nuts (Item #1, on Figure 5-24).
13. Swing the control panel to the closed position and secure with captured screw.
14. Set the **AUTO/MANUAL** toggle switch to the **Manual** position.
15. Energize the control.
16. Set up the desired configuration. See **Chapter 4**, **System Setup and Configuration**.
17. Refer to **Chapter 6**, **Testing** for testing requirements.

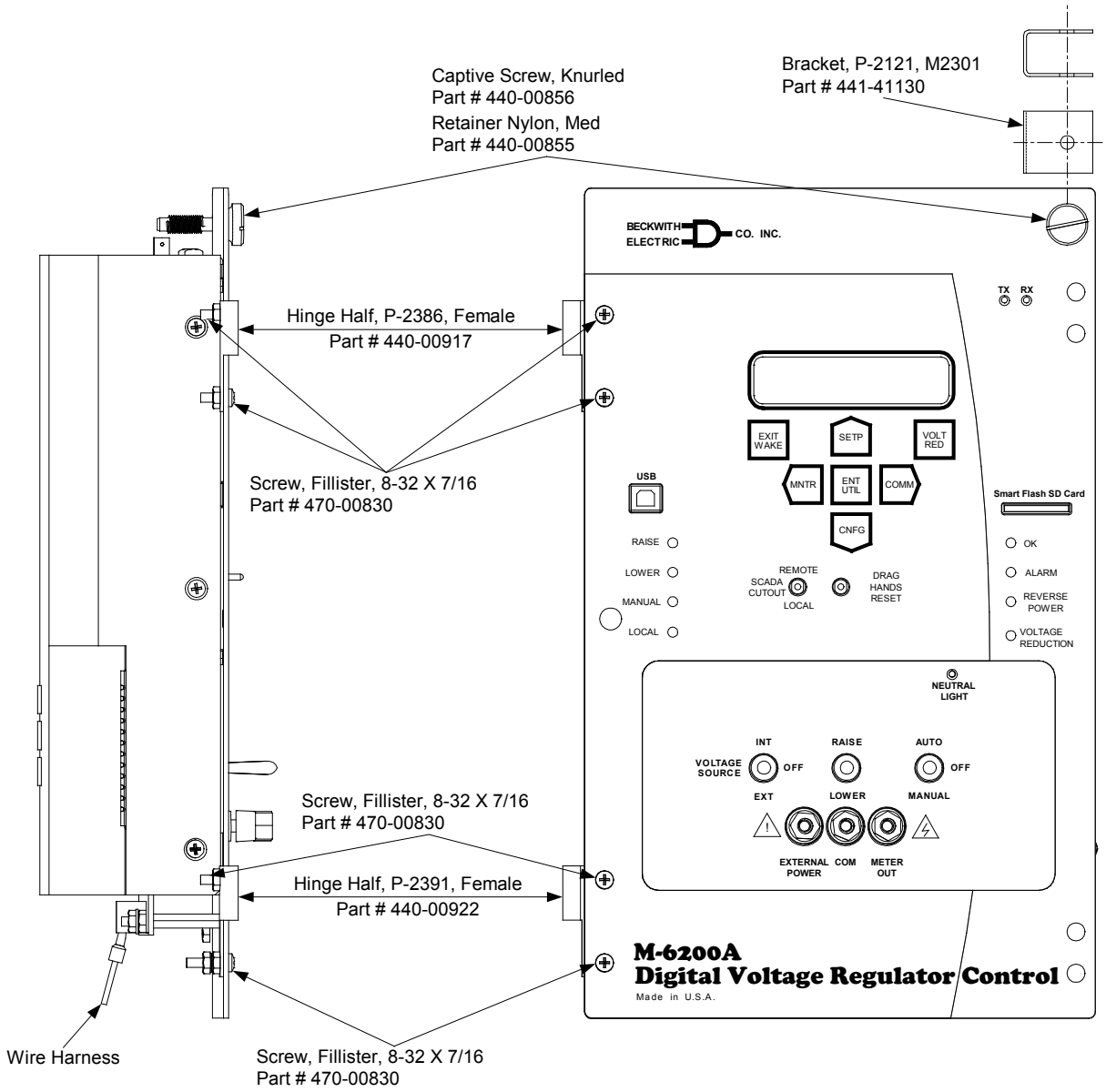
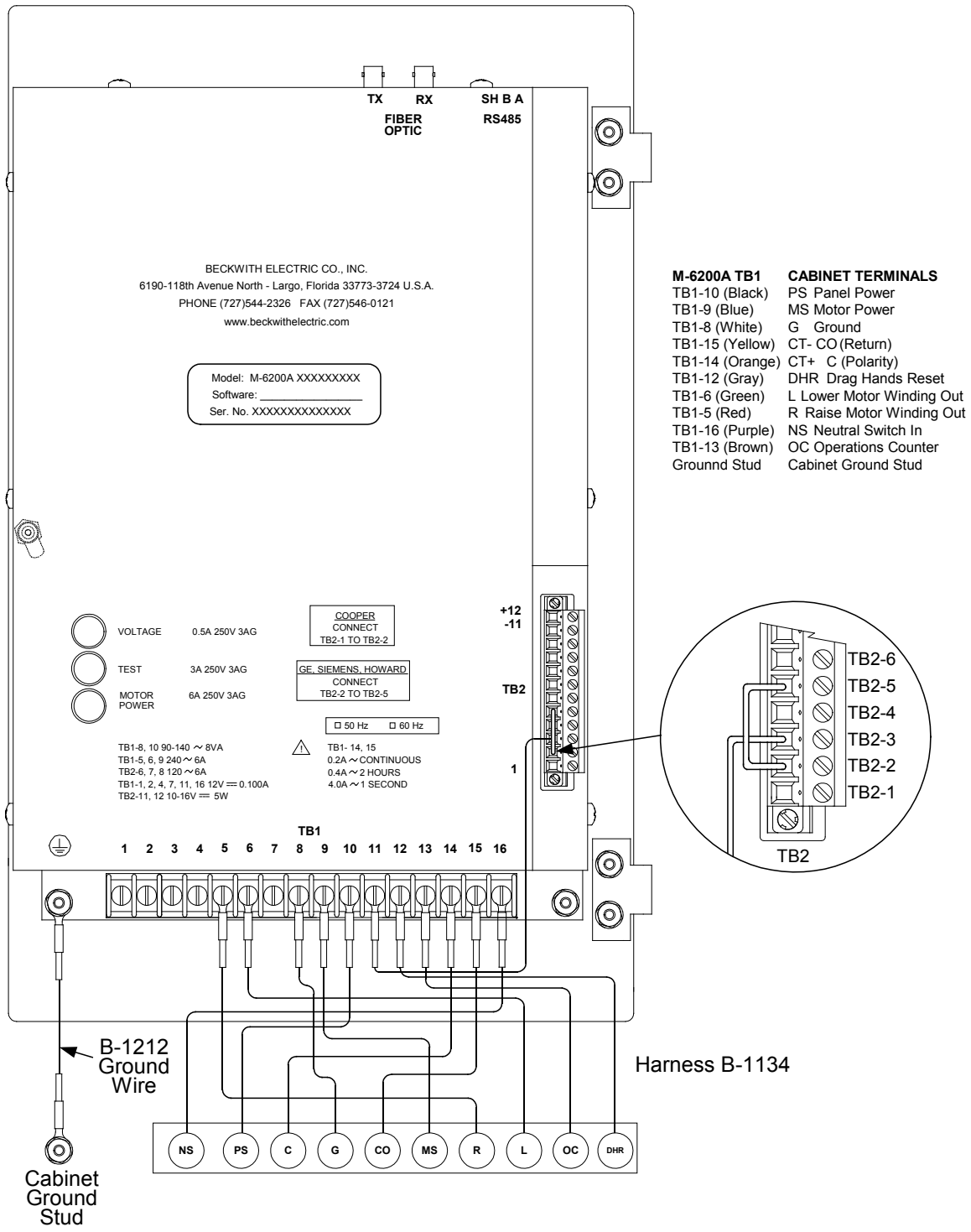


Figure 5-25 B-2203-H1/B-2203-H2, B-2203-H3/B-2203-H4 Hardware Kit Orientation



WARNING: In no case should the line current circuit be interrupted with the regulator or transformer energized. Do not remove auxiliary current transformers without shorting the current inputs. Death or severe electrical shock can occur.

■ **NOTE:** ⚠ See Section 5.1, Mechanical/Physical Information

Figure 5-26 M-6200A Howard Industries B-1134 Wiring Harness and B-1212 Ground Wire

B-2203-H3/B-2203-H4 Hardware Kit Configuration

1. If the M-6200A to be configured has existing mounting hardware installed, perform the following:
   a. Remove all hinges, latches, brackets, wiring harnesses and jumpers.
   b. Save/capture all removed hardware for future use.
2. Verify the contents of the B-2203-H3/ B-2203-H4 Hardware Kit includes the items in Table 5-8:

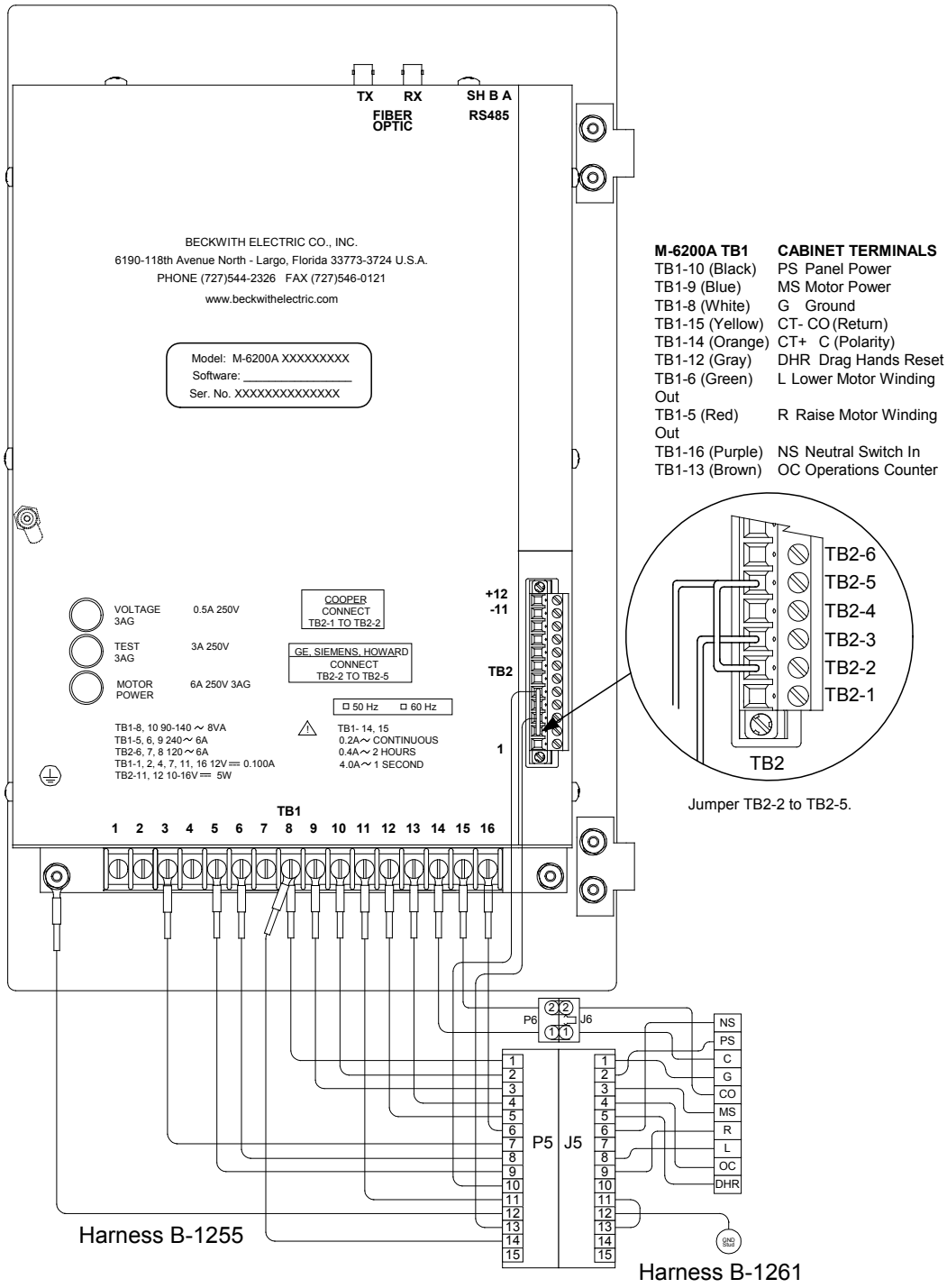
Qty	Description	Beco Part #
1	Hinge Half, P2386 Female	440-00917
4	Screw, Fillister, 8-32 x 7/16	470-00830
1	Hinge Half, P2391 Female	440-00922
1	Captive Screw Knurled	440-00856
1	Retainer Nylon, Med	440-00855
1	Bracket, P2121, M2301	441-41130
1	Wire Harness	B-1261
1*	Term BLK 9 Pos Pin Half (Male)	421-00251
* Included in B-2203-H4 Hardware Kit		

Table 5-8 B-2203-H3/2203-H4 Hardware Kit

3. Remove pre-cut label material from the four left side hinge mounting holes and upper right captured screw hole as viewed from the front of the M-6200A panel.

■ **NOTE**: Refer to Figure 5-25 for location and orientation of hardware kit items.

4. Mount the Bottom Hinge to the lower left side of the M-6200A panel, then secure (hand tight) the hinge utilizing an 8-32 X $^{7}/_{16}$ screw into the captured fastener inserted lock nut in the top hole.
5. Complete the Bottom Hinge installation with an 8-32 X $^{7}/_{16}$ screw into the captured fastener inserted in the bottom hole, then tighten the top and bottom screws.
6. Mount the Top Hinge to the upper left side of the M-6200A panel utilizing 8-32 X $^{7}/_{16}$ screws inserted into the captured fasteners.
7. Install the captured screw latch as follows:
   a. Insert captured screw into panel.
   b. Place bracket onto captured screw.
   c. Install nylon retainer onto captured screw to secure bracket.
8. Determine if the control is equipped with a B-1255 Universal Wiring Harness and proceed as follows:
   a. If the control has a B-1255 Universal Wiring Harness installed on TB1 and TB2, then go to Step 9.
   b. If the control ***does not*** have a B-1255 Universal Wiring Harness installed on TB1 and TB2, then connect the B-1255 harness to TB1 and TB2 as indicated in Figure 5-27. (See terminal block torque requirements in **Section 5.2, External Connections**).
9. Connect wiring harness B-1261 to Universal Wiring Harness B-1255 P-5 and P-6 connectors as indicated in Figure 5-27.
10. Mount the M-6200A control panel onto the Howard Cabinet hinges.
11. If the B-2203-H4 hardware kit was not purchased then connect the M-6200A wiring harness to the male connector saved from the original control (Figure 5-27).
12. Reconnect the male connector to the quick disconnect plug, then reinstall the wing nuts (Item #1, on Figure 5-24).
13. Swing the control panel to the closed position and secure with captured screw.
14. Set the **AUTO/MANUAL** toggle switch to the **Manual** position.
15. Energize the control.
16. Set up the desired configuration. See **Chapter 4**, **System Setup and Configuration**.
17. Refer to **Chapter 6**, **Testing** for testing requirements.



WARNING: In no case should the line current circuit be interrupted with the regulator or transformer energized. Do not remove auxiliary current transformers without shorting the current inputs. Death or severe electrical shock can occur.

■ **NOTE:** ⚠ See Section 5.1, Mechanical/Physical Information

Figure 5-27 B-2203-H3 (B-1255 and B-1261) Howard Wiring Harness

5.6 Cooper CL-2, CL-2A, CL-4A, CL-4B, CL-4C, CL-5 and CL-6 Regulator Controls Replacement

The Beckwith Electric M-6200A Digital Regulator control directly replaces Cooper CL-2, CL-2A, CL-4A, CL-4B, CL-4C, CL-5 and CL-6 Regulator Controls.

The M-6200A may be purchased with the factory installed hardware kits:

- B-2355-C1 CL-2 through CL-5
- B-2355-C2 CL-6
- B-2355-C3 CL-2 through CL-5
- B-2355-C4 CL-6

The contents of the hardware kits provide the means to install the M-6200A in the existing Cooper Regulator Control cabinet. The B-2355-C1, B-2355-C2, B-2355-C3, B-2355-C4 are available separately from the factory for field installation.

The difference between the B-2355-C1/B-2355-C3 and B-2355-C2/B-2355-C4 hardware kits is the B-2355-C1/B-2355-C3 contains the harnesses for CL-2 through CL-5 control replacement and the B-2355-C2/B-2355-C4 contain the harnesses for CL-6 control replacement. The remaining kit contents are the same.

Application

Typical Connections

In general, the tapchanger motor must be operated from a different transformer than the VT used to measure regulated voltage. If this is not done, hunting at the upper band edge may result. As soon as the motor starts, and before it is sealed in, the motor current can drop the voltage within the band and reset the control. Some motor seal-in schemes are fast enough to prevent this, but others are not.

Pulsed output can be used on the M-6200A (see **Section 4.2 Configuration, Output Pulse**).

Typical connections for the M-6200A are illustrated in Figure 5-28. Connections are simplified and may not show all functions required in a typical regulator control scheme – for example, limit switches, etc.

External Connections

Power and voltage sensing are obtained either from a common source or from independent sources having a nominal 120 Vac output. Normally, this is line-to-neutral voltage, although line-to-line voltage can also be used if recognition is made of any phase shift between the voltage and current signals when using line drop compensation.

The external connections for the M-6200A are made to terminal blocks TB1 and TB2 on the rear of the control panel. The wiring harness and external connections for the M-6200A are shown in Figures 5-31, 5-32, 5-33 and 5-34.

Lightning Protection

▲ **CAUTION**: For proper protection against system surges, chassis ground must be connected to earth ground.

It has been determined that transient voltages in excess of 1500 Vac RMS can exist on the “ground” lead normally tied to TB1-8. In the regulator controls, these voltages are suppressed by varistors which still permit the unit to pass a 1500 Vac hi-pot test for one minute, with a leakage of approximately 15 mA, all terminals to ground.

Multiple VT grounds far apart must be avoided, since a varying difference in ground voltage could add or subtract from the effective voltage, and cause variation in the tapchanger control’s bandcenter voltage setpoint.

Non-Sequential Operation

Non-Sequential operation is not normally used with Cooper Regulators.

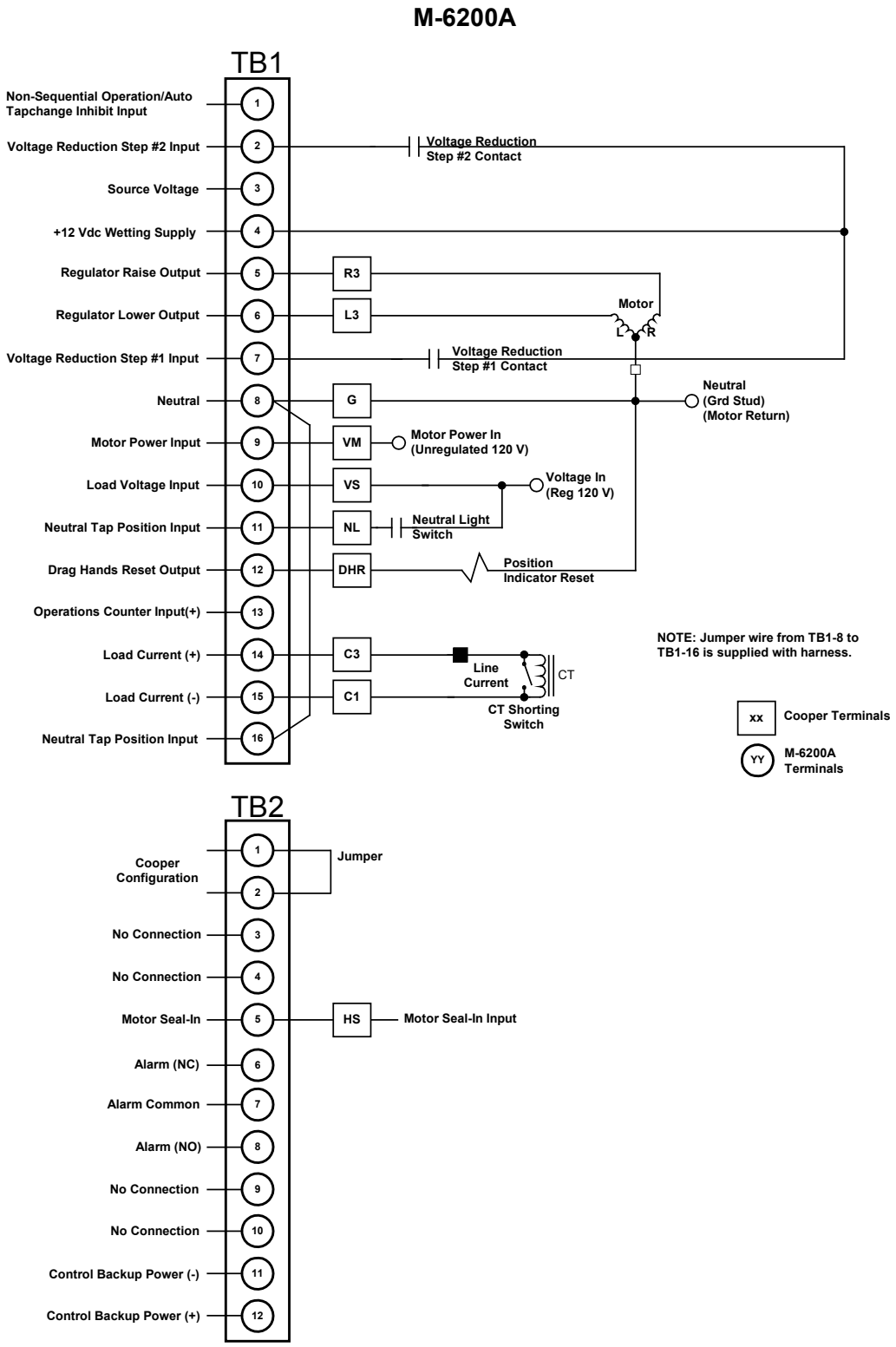
Counter Input

Counter Input is not normally used with Cooper Regulators.

Multi-Step Voltage Reduction

▲ **CAUTION:** Voltage applied through dry contacts to actuate Voltage Reduction Steps 1, 2, and 3 *must* be +12 Vdc obtained from terminal TB1-4 of the M-6200A Regulator Control.

The M-6200A uses terminals TB1-2 and TB1-7 together to provide up to three levels of voltage reduction. The external connections to achieve these steps are shown in Table 5-1 and Figure 5-28, External Connections. Voltage reduction amounts are set within the M-6200A Regulator Control software.



WARNING: In no case should the line current circuit be interrupted with the regulator or transformer energized. Do not remove auxiliary current transformers without shorting the current inputs. Death or severe electrical shock can occur.

Figure 5-28 Typical Connections for Cooper CL-2, CL-2A, CL-4A, CL-4B, CL-4C, CL-5 and CL-6 Regulator Controls

Installation

Removal of the Cooper Control

WARNING: In no case should the line current circuit be interrupted with the regulator or transformer energized. Do not remove auxiliary current transformers without shorting the current inputs. Death or severe electrical shock can occur.

1. Verify that the regulator control wiring is in a safe condition that will allow removal of the Cooper Regulator Control from the control cabinet.
   - The control wiring is de-energized and isolated from any potential safety hazards.
   - All local Safety Tagging rules have been applied as necessary.
2. Open the cabinet door of Cooper control.
3. Loosen the thumb screws on the control panel (Figure 5-29), and swing the panel outward.

WARNING: In no case should the line current circuit be interrupted with the regulator or transformer energized. Do not remove auxiliary current transformers without shorting the current inputs. Death or severe electrical shock can occur.

4. De-energize the control by opening the VT disconnect switch and placing the CT switch in the shorting position. Ensure that the CT in the regulator has been properly shorted.
5. Loosen the screws on the spreader bar terminal block at the bottom of the cabinet, then pull down on the spreader bar to disconnect it.

NOTE: The two hinge pins *must be saved* from the original control.

6. Remove and save the two hinge pins, then lift the panel off of the hinges and remove it from the cabinet.

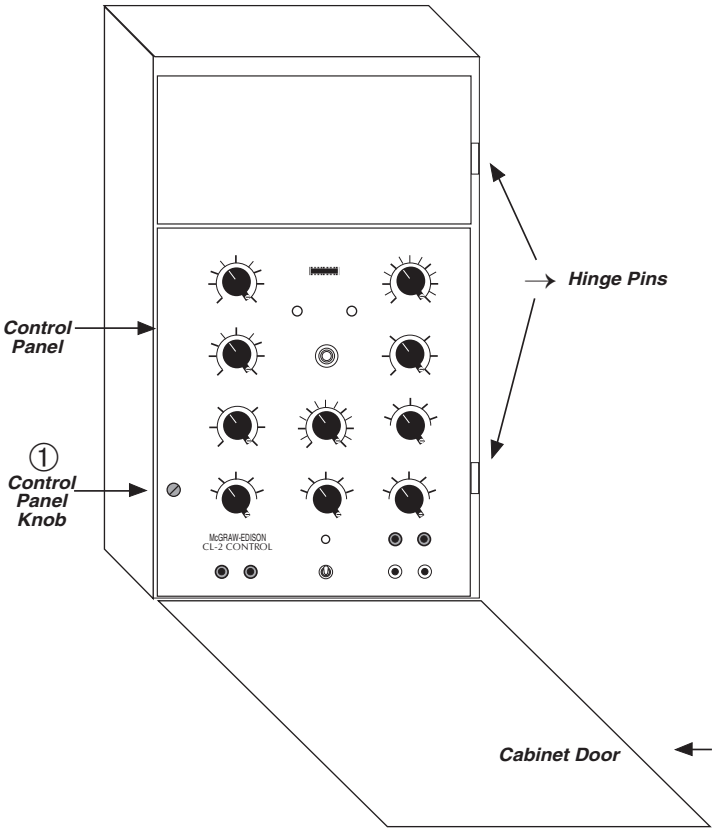


Figure 5-29 Cooper Control in Cabinet

Installing the M-6200A in a Cooper Regulator

The hinge leaves and latch bracket mechanism are oriented to match the existing hinge leaves and latch of the Cooper control cabinet.

If Bench Testing of the M-6200A is required, then refer to **Chapter 6**, **Testing.**

WARNING: In no case should the line current circuit be interrupted with the regulator or transformer energized. Do not remove auxiliary current transformers without shorting the current inputs. Death or severe electrical shock can occur.

1. Verify that the regulator control wiring is in a safe condition that will allow installation of the M-6200A in the control cabinet.
   - The control wiring is de-energized and isolated from any potential safety hazards.
   - All local Safety Tagging rules have been applied as necessary.
2. Mount the M-6200A Regulator Control onto the hinges in the control cabinet (Figure 5-29), then install the two hinge pins saved from the original control. Leave the panel in the open position so that the back of the panel is accessible.
3. If the frame that the latch bracket is mounted to requires the use of longer panel thumbscrews, then replace the two panel thumbscrews with the longer versions provided in the cloth bag.
4. Connect the M-6200A's wiring harness to the terminal block at the bottom of the cabinet. Refer to Figures 5-31, 5-32, 5-33 and 5-34.
5. Set the toggle switch to the **Manual** position.
6. To re-energize the control perform the following:
   a. Open the CT switch, removing the CT shorting circuit.
   b. Close the VT disconnect switch.
   c. Swing the adapter panel closed and turn thumbscrews to latch securely.
7. Set up the desired configuration. See **Chapter 4**, **System Setup and Configuration**.
8. Refer to **Chapter 6**, **Testing** for testing requirements.

B-2355-C1/B-2355-C2 Hardware Kit Configuration

1. If the M-6200A to be configured has existing mounting hardware installed, then perform the following:
   a. Remove all hinges, latches, brackets, wiring harnesses and jumpers.
   b. Save/capture all removed hardware for future use.
2. Verify the contents of the B-2355-C1/ B2355-C2 Hardware Kit includes the items in Table 5-9:

Qty	Description	Beco Part #
1	Top Hinge Half-Female P2393	440-40923
1	Bottom Hinge Half-Female P2373	440-40913
1	Bracket P-2372 Panel Adap	441-41323
6	Screw, Fillister, 8-32 x 7/16	470-00830
1	Wire Harness, B-2355 (B-2355-1)	B-1128 (B-1157)
2	Fast Lead Screw	441-00385
2	Fastener, Screw, Retainer	440-00855
2	U-Clip	441-00386

Table 5-9 B-2235-C1 and B-2355-C2 Hardware Kit

3. Remove pre-cut label material from the four right side hinge mounting holes and the first and fourth (from top) left side hinge mounting holes as viewed from the front of the M-6200A panel.

■ **NOTE**: Refer to Figure 5-30 for location and orientation of hardware kit items.

4. Mount the Bottom Hinge to the lower right side of the M-6200A, then secure (hand tight) the hinge utilizing an 8-32 X $^{7}/_{16}$ screw inserted into the captured fastener in the top hole.
5. Complete the Bottom Hinge installation with an 8-32 X $^{7}/_{16}$ screw inserted into the captured fastener in the bottom hole, then tighten the top screw.
6. Mount the Top Hinge to the upper right side of the M-6200A panel utilizing 8-32 X $^{7}/_{16}$ screws inserted into the captured fasteners.
7. Mount the Latch Bracket to the left side of the M-6200A panel utilizing 8-32 X $^{7}/_{16}$ screws inserted into the captured fasteners in the first and fourth hinge holes from the top.
8. Connect the applicable wiring harness B-1128 for B-2355-C1 or B-1157 for B-2355-C2 to TB1 Terminal Block as indicated in Figures 5-31 or 5-32. See terminal block torque requirements in this chapter.

   Verify that a jumper is installed between TB2-1 and TB2-2.
9. Proceed to the M-6200A Installation procedure.

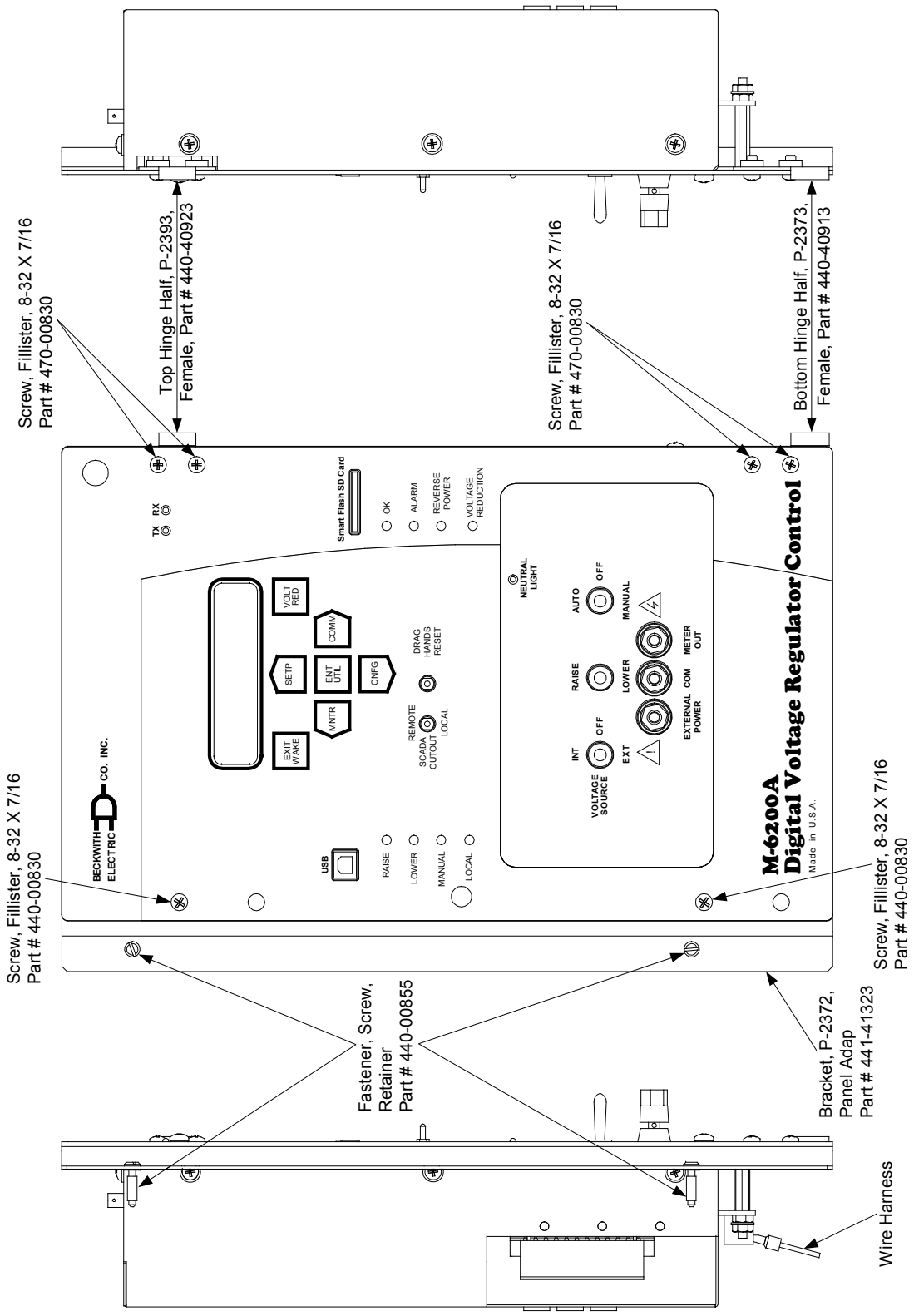
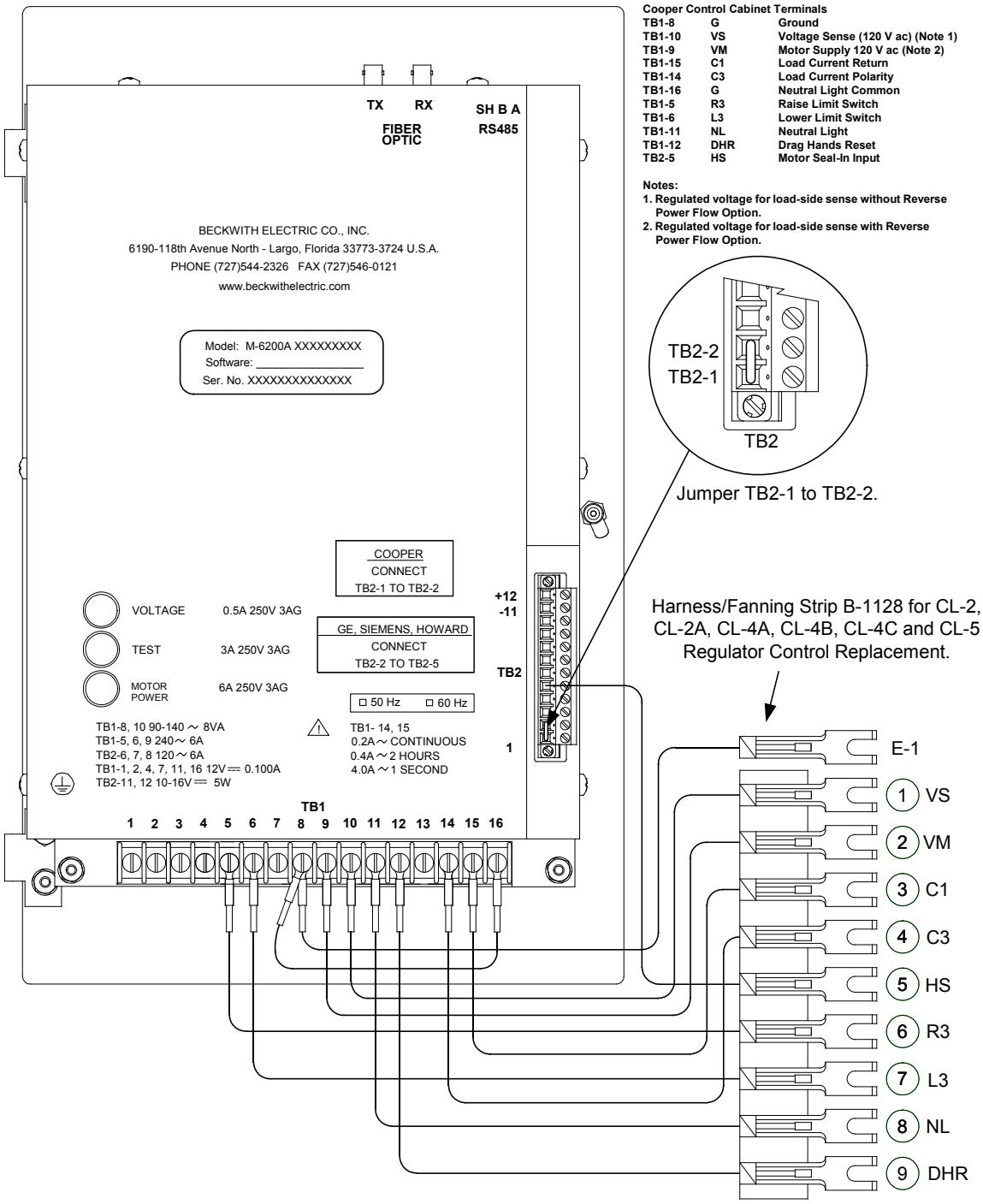


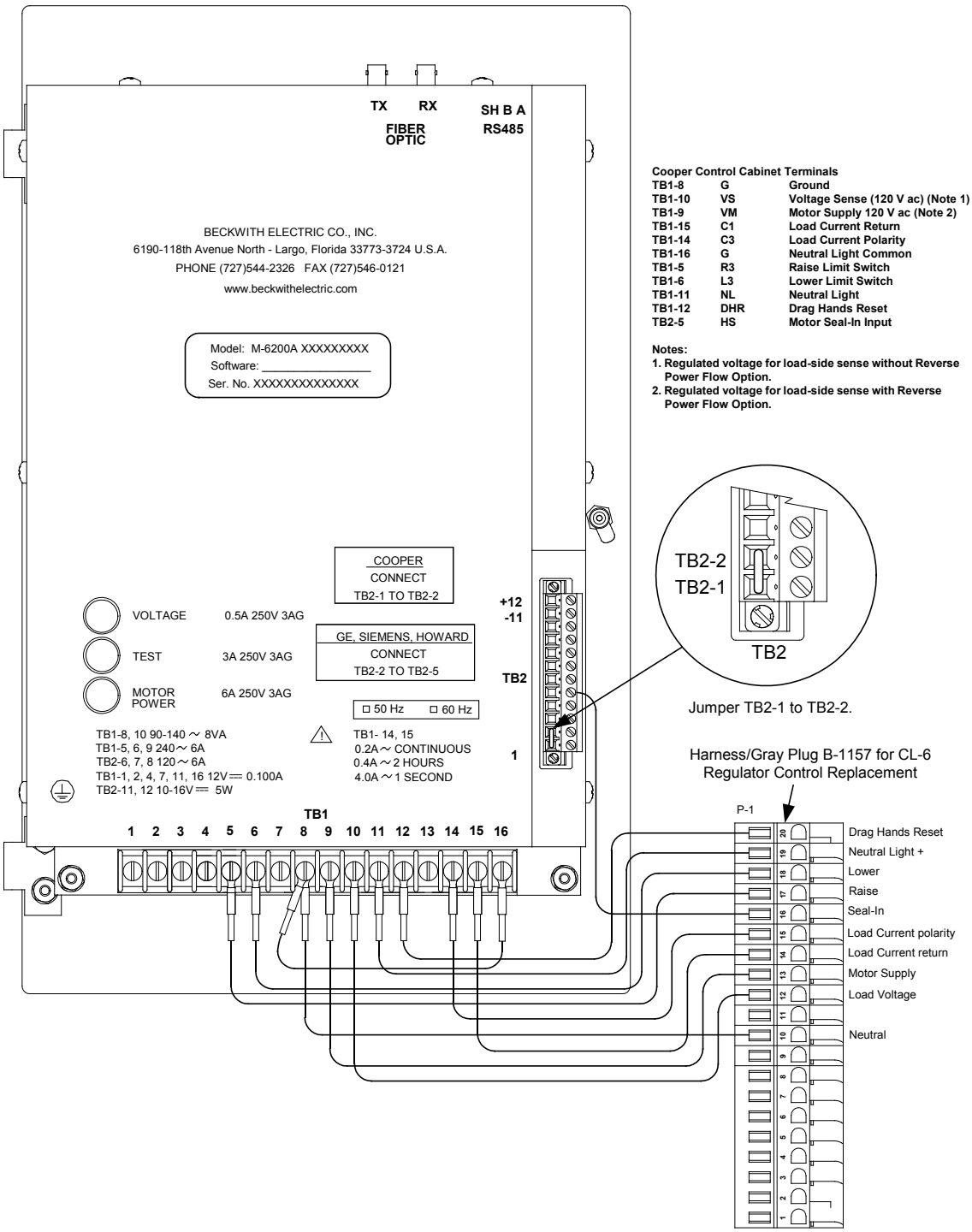
Figure 5-30 B-2355-C1/B-2355-C2, B-2355-C3/B-2355-C4 Hardware Kit Orientation



WARNING: In no case should the line current circuit be interrupted with the regulator or transformer energized. Do not remove auxiliary current transformers without shorting the current inputs. Death or severe electrical shock can occur.

■ **NOTE:** ⚠ See Section 5.1, Mechanical/Physical Information

Figure 5-31 M-6200A (B-1128) Cooper Wiring Harness/Fanning Strip



WARNING: In no case should the line current circuit be interrupted with the regulator or transformer energized. Do not remove auxiliary current transformers without shorting the current inputs. Death or severe electrical shock can occur.

■ **NOTE:** ⚠ See Section 5.1, Mechanical/Physical Information

Figure 5-32 M-6200A (B-1157) Cooper Wiring Harness with Gray Plug

B-2355-C3/B-2355-C4 Hardware Kit Configuration

1. If the M-6200A to be configured has existing mounting hardware installed, then perform the following:
   a. Remove all hinges, latches, brackets, wiring harnesses and jumpers.
   b. Save/capture all removed hardware for future use.
2. Verify the contents of the B-2355-C3/ B2355-C4 Hardware Kit includes the items in Table 5-10:

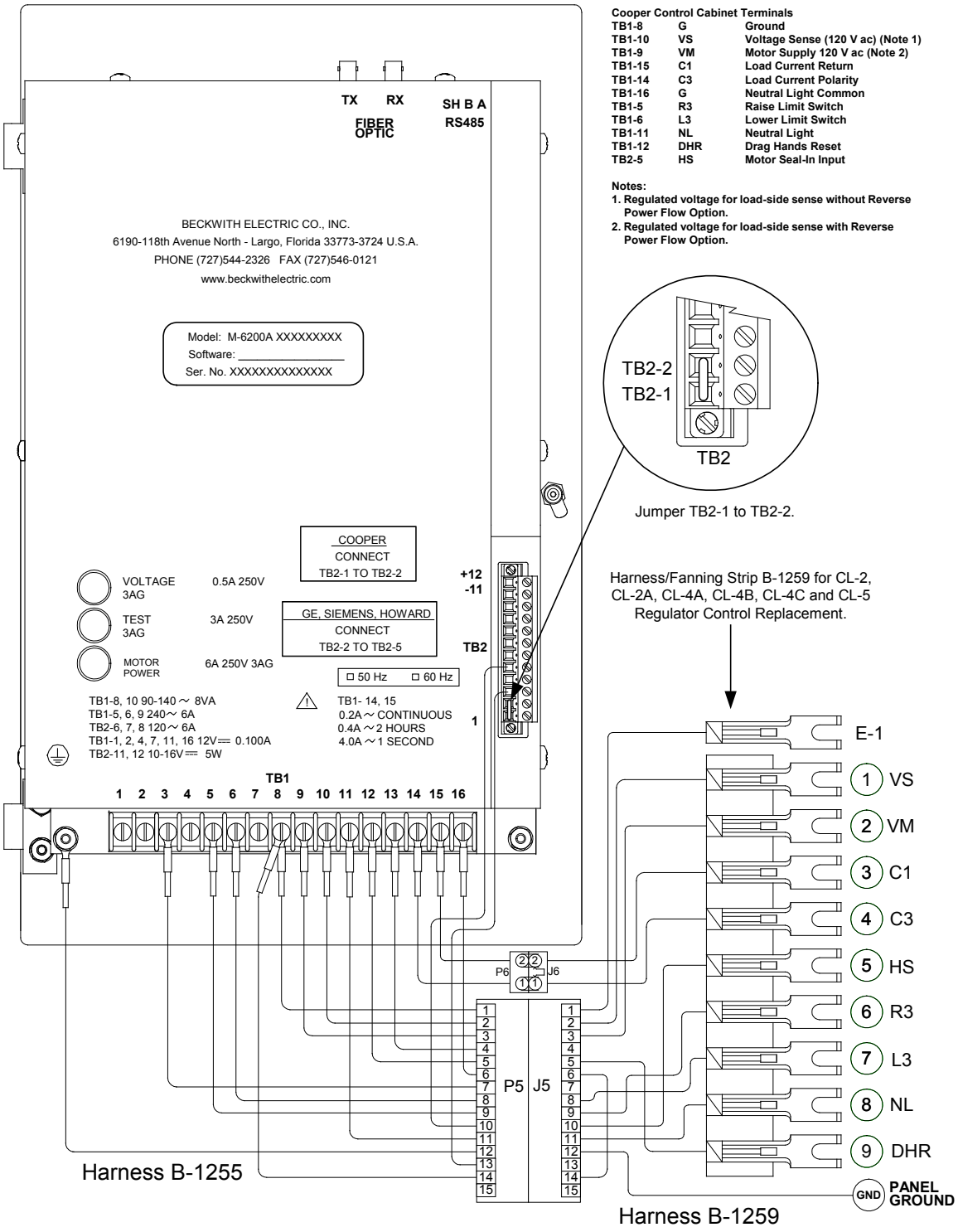
Qty	Description	Beco Part #
1	Top Hinge Half-Female P2393	440-40923
1	Bottom Hinge Half-Female P2373	440-40913
1	Bracket P-2372 Panel Adap	441-41323
6	Screw, Fillister, 8-32 x 7/16	470-00830
1	Wire Harness, B-2355 (B-2355-1)	B-1259 (B-1260)
2	Fast Lead Screw	441-00385
2	Fastener, Screw, Retainer	440-00855
2	U-Clip	441-00386

Table 5-10 B-2235-C3 and B-2355-C4 Hardware Kit

3. Remove pre-cut label material from the four right side hinge mounting holes and the first and fourth (from top) left side hinge mounting holes as viewed from the front of the M-6200A panel.

■ **NOTE**: Refer to Figure 5-30 for location and orientation of hardware kit items.

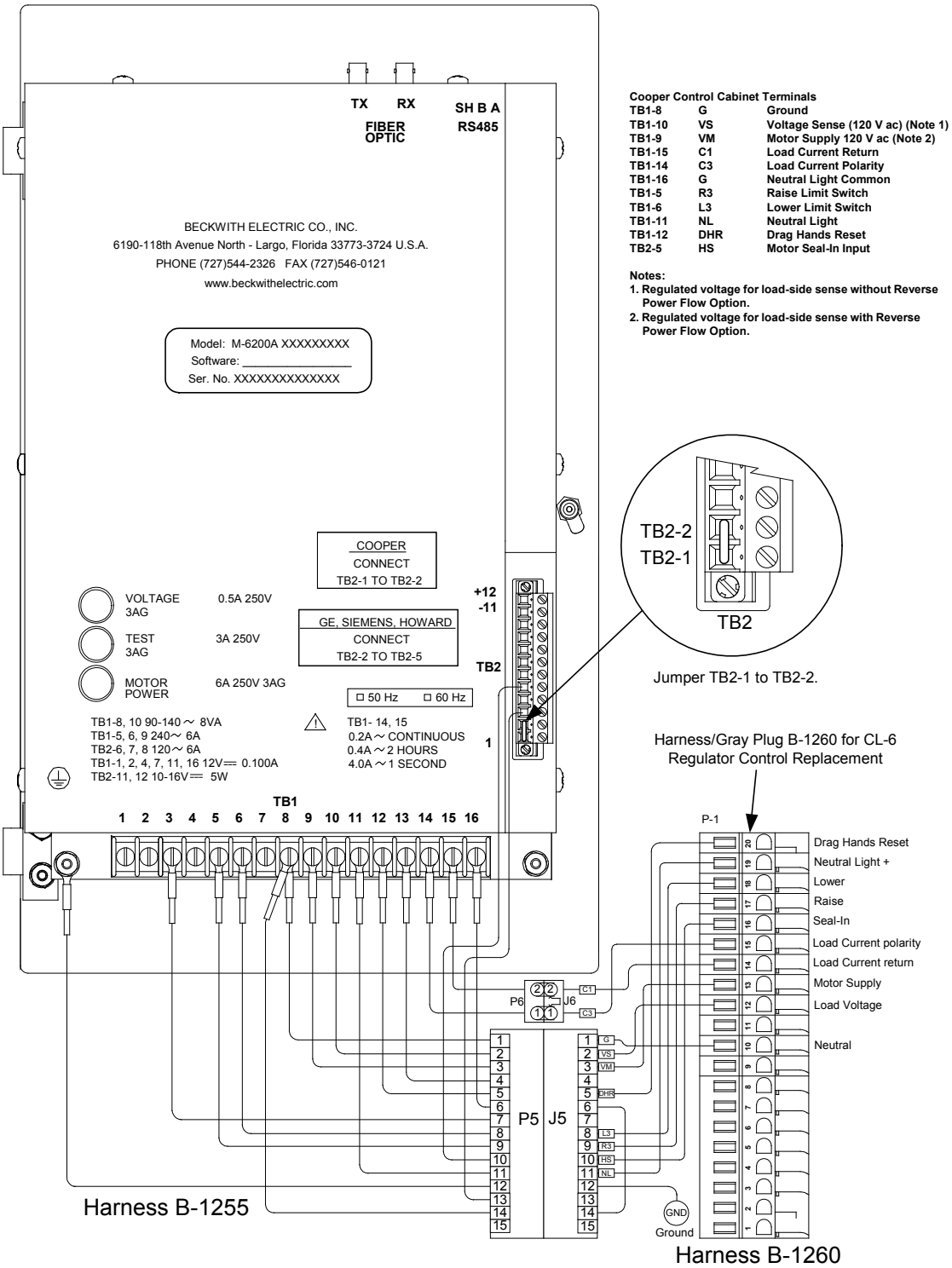
4. Mount the Bottom Hinge to the lower right side of the M-6200A, then secure (hand tight) the hinge utilizing an 8-32 X $^{7}/_{16}$ screw inserted into the captured fastener in the top hole.
5. Complete the Bottom Hinge installation with an 8-32 X $^{7}/_{16}$ screw inserted into the captured fastener in the bottom hole, then tighten the top screw.
6. Mount the Top Hinge to the upper right side of the M-6200A panel utilizing 8-32 X $^{7}/_{16}$ screws inserted into the captured fasteners.
7. Mount the Latch Bracket to the left side of the M-6200A panel utilizing 8-32 X $^{7}/_{16}$ screws inserted into the captured fasteners in the first and fourth hinge holes from the top.
8. Determine if the control is equipped with a B-1255 Universal Wiring Harness and proceed as follows:
   a. If the control has a B-1255 Universal Wiring Harness installed on TB1 and TB2, then go to Step 9.
   b. If the control ***does not*** have a B-1255 Universal Wiring Harness installed on TB1 and TB2, then connect the B-1255 harness to TB1 and TB2 as indicated in Figure 5-33. (See terminal block torque requirements in **Section 5.2, External Connections**). Go to Step 9.
9. Connect the applicable wiring harness B-1259 for B-2355-C3 or B-1260 for B-2355-C4 to P-5 and P-6 connectors as indicated in Figures 5-33 and 5-34.
10. Verify that a jumper is installed between TB2-1 and TB2-2.
11. Proceed to the M-6200A Installation procedure.



WARNING: In no case should the line current circuit be interrupted with the regulator or transformer energized. Do not remove auxiliary current transformers without shorting the current inputs. Death or severe electrical shock can occur.

■ **NOTE:** ⚠ See Section 5.1, Mechanical/Physical Information

Figure 5-33 B-2355-C3 (B-1255 and B-1259) Cooper Wiring Harness



WARNING: In no case should the line current circuit be interrupted with the regulator or transformer energized. Do not remove auxiliary current transformers without shorting the current inputs. Death or severe electrical shock can occur.

■ **NOTE:** ⚠ See Section 5.1, Mechanical/Physical Information

Figure 5-34 B-2355-C4 (B-1255 and B-1260) Cooper Wiring Harness

5.7 TapTalk S-6200 Communications Software Installation

The TapTalk® S-6200A installation program has been written to overwrite previous versions of TapTalk.

TapTalk runs on Windows 2000®, Windows XP®, Windows Vista® or Windows 7® operating system. Familiarity with Windows™ is important in using TapTalk.

TapTalk will be installed on the host PC's hard disk. While it does not require special installation procedures, an installation utility has been provided to make the process easier.

■**NOTE:** The installer must have Administrator rights on the computer that TapTalk is being installed on.

To install TapTalk:

1. Insert the TapTalk software into your CD-ROM drive.
2. Select **Run** from the **Start Menu**.
3. In the **Run** dialog box, initiate software installation by typing **D:\Setup.exe** (or other drive designator:\Setup.exe, depending on the letter designation for the CD-ROM drive).
4. The Installation Wizard will prompt the user through the installation process. After installation, the TapTalk program icon (located in the Becoware folder) can be placed on the desktop (Figure 5-35).

Starting TapTalk

1. Select the TapTalk program-item icon from the Becoware group in the Program Manager, or select TapTalk from the program list using the **Start** Menu. The TapTalk Main Screen will be displayed (Figure 3-11).

Figure 5-35 S-6200 TapTalk Program-Item Icon

5.8 Activating Initial Local Communications

The M-6200A and TapTalk S-6200 Communications Software are shipped from the factory with the same default communication parameters. Therefore, it may not be necessary to setup communication parameters.

To use TapTalk to interrogate, set, or monitor the M-6200A Digital Regulator Control using a direct USB connection, the appropriate driver must be loaded. The driver that is required to be resident in the "windows\inf" folder on the host PC is "beco_usb.inf". The driver is automatically loaded by the TapTalk installation software.

When the control is connected to the PC utilizing a USB cable, Windows will enumerate the control as a serial com device and will assign an unused COM Port to the control.

Refer to Section 4.1 Unit Setup, Protocols and Figure A-4, Communication Menu Flow Screens, for additional setup information.

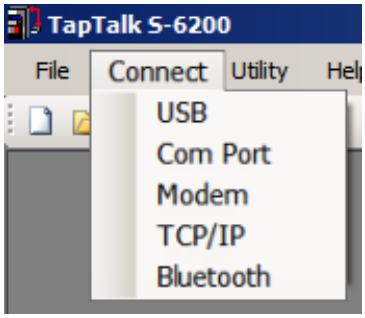
Activating Initial Communication using USB (Serial) Connection and Default Communication parameters is accomplished as follows:

1. Ensure the following conditions exist:
   - TapTalk is installed on the host computer
   - The control is energized
2. Plug the USB cable into the host PC USB port.
3. Plug the USB cable into the USB port on the control. The host PC will:
   a. Interrogate the control to determine the type of hardware device it is.

■**NOTE:** If the host PC cannot identify the proper driver for the M-6200A, the driver can be found on the TapTalk software installation disk.

   b. Load any required drivers.
   c. Assign the next available COM port to the USB connection.
4. Start the TapTalk program, TapTalk will display the TapTalk **Main** dialog screen (Figure 3-11).

5. Select **Connect/USB** from the **Connect** drop-down menu.



TapTalk will display the USB Port dialog screen (Figure 5-36).

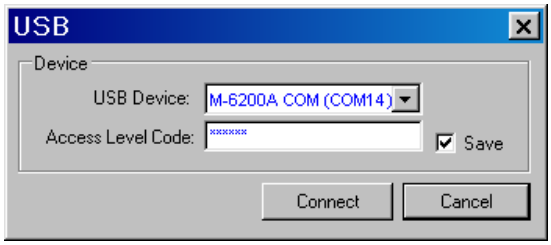


Figure 5-36 USB Port Connection Dialog Screen

6. Ensure that the correct COM port is displayed for the selected USB device.

■**NOTE:** TapTalk will automatically choose the port for the control you just connected to.

7. Enter “Access Level Code” and check “Save” if desired.

   Default Values:

   Level 1 000000 (Disabled)

   Level 2 222222

8. Select **Connect**, TapTalk will attempt to connect to the target control.

9. If TapTalk returns a Failed to Connect Error screen (Figure 5-37), then repeat Steps 6, 7 and 8.

Figure 5-37 Failed to Connect Error Screen

10. If Level 1 Access is not active or the proper Level 1 or Level 2 access code was entered, then TapTalk will briefly display a "Successfully Connected Level 1/Level 2" confirmation screen, then display the connected version of the TapTalk Main Screen (Figure 3-13) with the appropriate Access Level.

11. If Level 1 Access is active and an invalid access code was entered, then TapTalk will display a "Failed to perform Access Code Verification" error message (Figure 5-38).

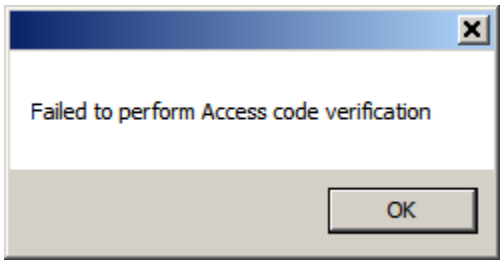


Figure 5-38 Failed to perform Access Code Verification Error Screen

12. Select **OK**. TapTalk will briefly display the "Successfully Connected Read-Only Access" screen (Figure 5-39) and then display the connected version of the TapTalk Main Screen (Figure 3-13) with Read-Only permission.

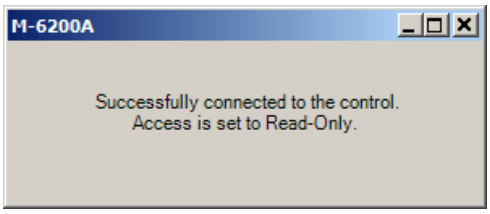


Figure 5-39 Successfully Connected Read-Only Access Screen

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6 Testing

6.0 Testing Related Control Switches and Binding Posts

VOLTAGE SOURCE

The Voltage Source switch disconnects the voltage transformer input and connects the **EXTERNAL POWER** binding posts to the voltage input and motor circuit.

▲ **CAUTION**: Do not reverse the ground and hot wires when connecting an external source. A UL recognized replaceable fuse, 3A, 250 Vac, 3 AG fuse is installed to protect the control from damage if these connections are accidentally reversed.

With the **VOLTAGE SOURCE** switch in the **EXT** position, the sensing and motor power circuits are connected to the External Power binding post on the front panel. The unit can be tested using an external 120 V RMS source of proper polarity applied to these terminals. Testing can be accomplished by adjusting the amplitude of the external source.

The **VOLTAGE SOURCE** switch will disconnect all power from the unit when selected to the **EXT** position with no source connected to the front panel voltage inputs.

Binding Posts

■ **NOTE:** The expected power consumption of the control (burden) is a maximum of 8 VA at 140 Vac input.

WARNING: Operating personnel MUST NOT connect uninsulated test connections to the binding post as they can create a shock hazard.

EXTERNAL POWER binding posts allow application of a 120 V RMS nominal voltage to the unit for test procedures.

WARNING: A shock hazard exists due to the presence of voltage on the Meter Out Binding Posts.

METER OUT binding posts allow reading of the input voltage.

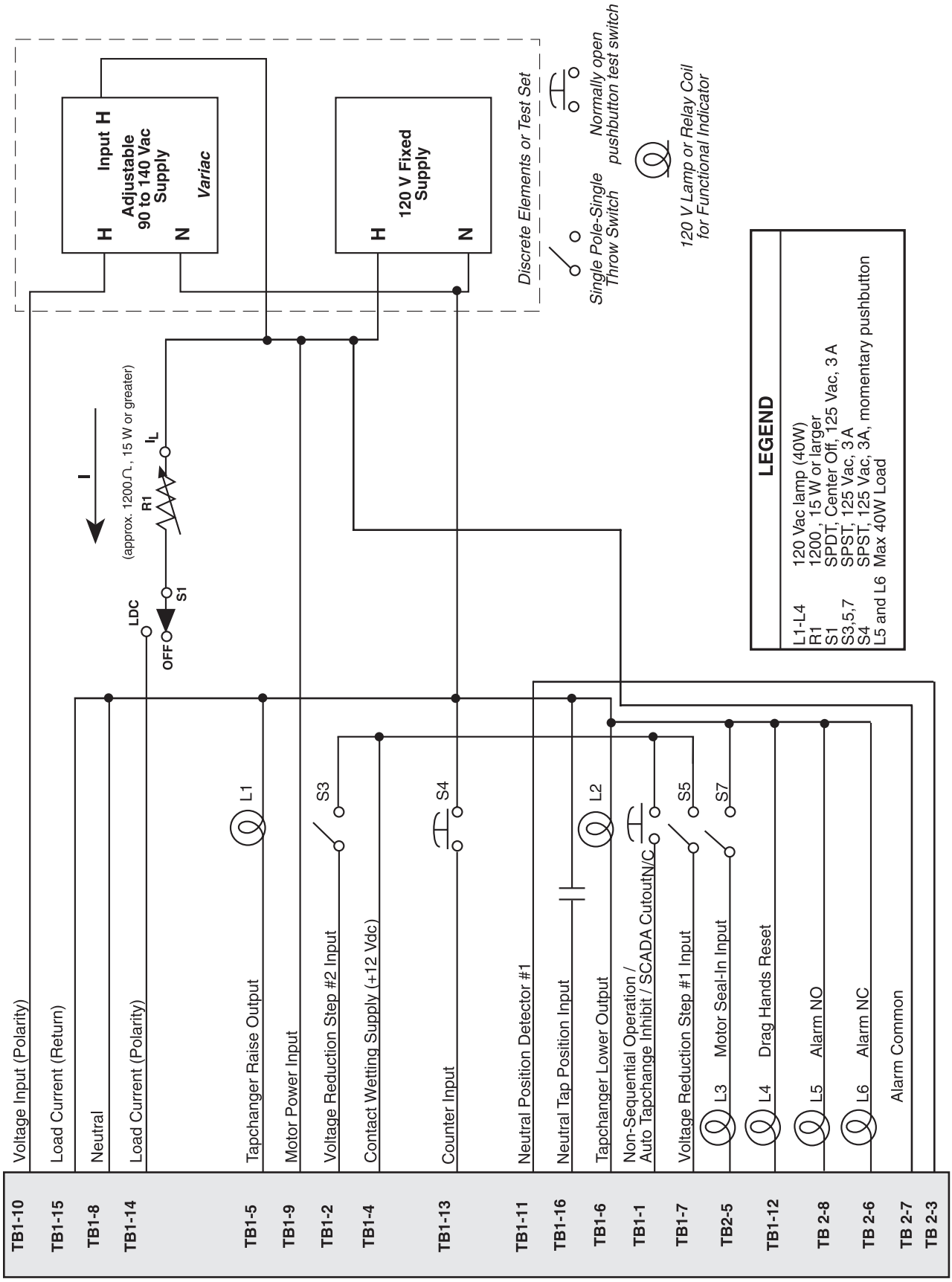

Figure 6-1 External Connections for Test Procedure

6.1 Bench Test

Equipment List

▲ **CAUTION**: The current input to the M-6200A is rated at 0.2 A continuous, 0.4 A for two hours, and 4.0 A for 1 second.

- 0–200 mA current supply with phase angle settings of 0° to +90°
- 90–145 Vac voltage source at 60 Hz
- High impedance true RMS voltmeter with accuracy on ac of at least ±0.2% of reading
- Accurate stop watch

Setup Procedure

1. Make electrical connections as shown in Figure 6-1, External Connections for Test Procedure.

■ **NOTE:** Refer to the Appendix, Figures A-1 through A-5, for the locations of screens within the software.

■ **NOTE:** There is a one-second delay between the out-of-band condition and panel LED indication.

2. Enter initial settings:

Function	Initial Setting
Bandcenter	120.0 V
Bandwidth	2.0 V
LDC Resistance	0.0 V
LDC Reactance	0.0 V
Block Raise	135.0 V
Block Lower	105.0 V
Deadband	2.0 V
Time Delay	5.0 Seconds

Table 6-1 Initial Settings

Bench Test

▲ **CAUTION:** Do not reverse the ground and hot wires when connecting an external source.

1. Apply 120 Vac from power source. The display of the M-6200A will automatically advance through several screens and then Blank.
2. Increase voltage to 121.2. The **LOWER** LED should illuminate.
3. Decrease voltage to 118.8. The **RAISE** LED should illuminate.
4. Set the input voltage to 120.0 Vac. Wait for **RAISE** and **LOWER** LEDs to extinguish.
5. Increase voltage to 122.0 Vac, then start timing when voltage passes 121.0 V.
6. Stop timing when the lamp connected to the **LOWER** output illuminates (should be approximately 5 seconds).

Resistance

1. Apply a 100.0 mA inphase current to TB1-14 (load current-polarity) and TB1-15 (load current-return).
2. Set S_1 to LDC.
3. Set LDC Resistance to 24.0 V. The **RAISE** LED should illuminate.
4. Increase the input voltage to 132.0 Vac. The **RAISE** and **LOWER** LEDs should be extinguished.
5. Set the LDC Resistance to –24.0 V. The **LOWER** LED should light.
6. Decrease the input voltage to 108.0 Vac. Both **RAISE** and **LOWER** LEDs should extinguish.
7. Set the LDC Resistance to 0.0 V.
8. Decrease the input voltage to 120 Vac.

Reactance

1. Apply 100.0 mA 90° leading current to TB1-14 (load current-polarity) and TB1-15 (load current-return).
2. Set S_1 to LDC.
3. Set LDC Reactance to 24.0 V. The **LOWER** LED should illuminate.
4. Decrease the input voltage to 108.0 Vac. The **RAISE** and **LOWER** LEDs should be extinguished.
5. Set LDC Reactance to –24.0 V; the **RAISE** LED should illuminate.
6. Increase input voltage to 132.0 Vac. Both **RAISE** and **LOWER** LEDs should be extinguished.
7. Set the LDC Reactance to 0.0 V.
8. Decrease the input voltage to 120 Vac.

Voltage Reduction

1. Set Voltage Reduction Step #1 to 2.5% (default setting).
2. Close S_5 to enable Voltage Reduction Step #1. The **LOWER** and **V/RED** LEDs should illuminate.
3. Decrease the voltage to 117.0 Vac. The **LOWER** LED should be extinguished.
4. Open S_5 and decrease the input voltage to 120.0 V.
5. Set Voltage Reduction Step #2 to 5% (default setting).
6. Close S_3 to enable Voltage Reduction step #2. The **LOWER** and **V/RED** LEDs should illuminate.
7. Decrease voltage to 114.0 Vac. The **LOWER** LED should extinguish.
8. Open S_3 and decrease the input voltage to 120.0 Vac.

Counter

1. Set the M-6200A Digital Regulator Control to display the Operations Count screen.
2. Verify counter operation by depressing S4 wired to TB1-13 (counter in).
3. The operations counter should increment.

Block Raise/Block Lower/Dead band

1. Set Block Raise to 126.0 V.
2. Set Block Lower to 114.0 V.
3. Set the unit to display the Bias Voltage screen.
4. Press **ENT**.
5. Increase voltage to 126.5 V. BR should be displayed on the screen.
6. Increase voltage to 128.5 V. FL is displayed on the screen.
7. Decrease voltage to 113.5 V. BL is displayed on the screen.

Drag Hands Reset

1. Connect a lamp or ac relay between TB1-12 (drag hands reset) and TB1-8 (neutral) of the adapter panel.
2. Depress the **Drag Hands Reset** switch. The connected lamp or ac relay should operate.

Motor Seal-In

1. Set input voltage to 122.0 V
2. Allow the lamp connected to the **LOWER** output to illuminate.
3. Press and hold (for approximately 2 seconds) the switch connected to TB2-5; the lamp connected to the **LOWER** output should extinguish.
4. Release switch; after a one- to two-second delay, the lamp connected to the **LOWER** output should illuminate.

—Bench Test Complete—

6.2 Check-out Procedure

■ **NOTE:** All Beckwith Electric units are fully calibrated at the factory. There is no need to recalibrate the units before initial installation.

Applying Power

1. Remove any external connection between TB1-10 (voltage input) and TB1-9 (motor power input).
2. Using a voltmeter, ensure that the voltage applied to TB1-10 is nominal 120 Vac with respect to TB1-8 (neutral).

▲ **CAUTION:** Do not reverse the ground and hot wires when connecting an external source.

3. Apply motor auxiliary voltage to TB1-9 (motor power input) and TB1-8 (neutral).
4. Verify that the motor runs in the proper direction when conditions of sensed voltage result in activation of Raise and Lower outputs.

● **WARNING: In no case should the load current circuit be interrupted with the regulator or transformer energized.**

● **WARNING: Do not remove auxiliary current transformers without shorting the current inputs. Death or severe electrical shock can occur.**

5. As shown in Figure 6-2, Setup for Current Checkout Procedures, temporarily place a shorting device across the LDC-CT secondary to short the line drop compensator circuit.
6. Insert an ammeter between the polarity input and TB1-14.
7. Open the load current shorting device and with a known load on the transformer or regulator, measure the current in the load current circuit to ensure that this current is correct for 0.2 A full load.

▲ **CAUTION:** The current input to the control is rated at 0.2 A continuous, 0.4 A for two hours, and 4.0 A for 1 second.

8. Replace the shorting device across the load current input and remove the ammeter.
9. Reconnect polarity to the unit and remove both jumpers. The Line Drop Compensator will be activated. Correct CT polarity can be checked by simply incorporating sufficient +R compensation. The regulator should time out and run so as to raise the output voltage.

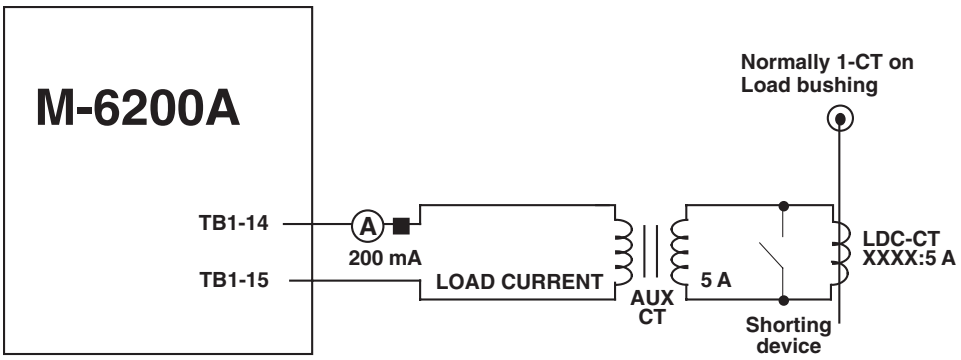

Figure 6-2 Setup for Current Checkout Procedure

6.3 Operational Test

1. Set VT Ratio Correction = 0 V; CT/VT phasing = 0° from the appropriate screen in the software.
2. Return to the Local Voltage screen.
3. Apply 120.0 Vac to TB1-10 (hot) and TB1-8 (neutral) of the control panel.
4. Verify local voltage = input voltage ±0.3 V.
5. Apply 100.0 mA inphase current to TB1-14 (load current-polarity) and TB1-15 (load current-return).
6. Verify Control Load I =100 mA and Power Factor =1.0 ±0.02 from the appropriate software screens.
7. Verify the ⬆, ⬇, ⬅, ➡, **EXT** and **ENT** pushbuttons function properly.
8. De-energize the current source.

—Checkout Procedure Complete—

6.4 In-Service Test

1. Set the M-6200A Regulator Control to display the Bias Voltage screen.
2. Press **ENT**.
3. Use the ⬆ and ⬇ pushbuttons to cause **RAISE** and **LOWER** outputs.

   If either output is blocked, verify that the unit is not at the maximum tap position.
4. Press **ENT** to return to the Local Voltage screen.
5. If data logging will be used, perform the following.

   a. Set the System Clock to the proper time.

   b. Clear data logging.

An incorrectly set clock or uncleared data logging buffer can result in corrupted data being stored in the control.

—In-Service Test Complete—

6.5 Bias Voltage Status/Test Mode

This convenient feature permits entering a bias voltage for simulating the raising or lowering of the sensed input voltage. This exercises the control as if the input voltage were being changed. The contacts actually operate.

This feature is valuable in the rapid determination of operating quantities present to influence the normal operation of the control. Items that will block operations or change setpoints are described here and illustrated by LEDs on the face of the control.

The Test Mode/Status screen displays control status information that includes:

- Output Status
- Compensated Voltage
- Band Status
- Runback/Blocking Status
- Voltage Reduction Status

This feature automatically resets on exit or in 15 minutes if not exited.

Bias Voltage Testing

To apply a bias voltage to test the control proceed as follows:

1. Press the ENT (UTIL Hot Button) pushbutton to awaken the unit. The menu will advance to "UTILITIES".

```
          UTILITIES
←COMM                    MNTR→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
      Calibration/Test
←                        →
```

3. Press the Down arrow pushbutton as necessary to navigate to the "Bias Voltage Status Test Mode" menu item.

```
Bias Voltage
Status/Test Mode
```

4. Press the ENT pushbutton. TapTalk will then display the following:

```
Bias Voltage     0.0
-- XXX.X --
```

The upper line of the display will initially indicate "0.0" bias volts.

The second line will display the sequence of parameters indicated in Figure 6-3. By increasing/decreasing the applied bias voltage the control will respond based on the settings entered into the control.

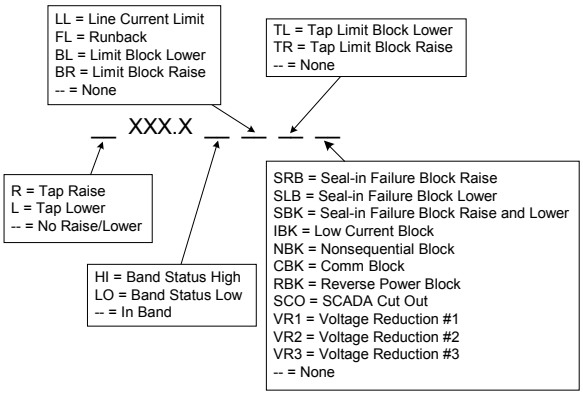

Figure 6-3 Bias Voltage Test Index

6.6 LED Scroll Test

To test the control front panel LEDs proceed as follows:

1. Press the ENT (UTIL Hot Button) pushbutton to awaken the unit. The menu will advance to "UTILITIES".

```
          UTILITIES
←COMM                    MNTR→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
      Calibration/Test
←                        →
```

3. Press the Down arrow pushbutton, as necessary, to navigate to the LED Scroll Test menu item.

```
LED Scroll Test
Press ENT to begin
```

4. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 7.

```
LED Scroll Test
Test in Progress...
```

5. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
          _
```

■**NOTE**: When entering the Level 2 Access code the display will automatically advance the cursor to the next digit when input is momentarily paused.

6. Enter a valid Level 2 Access code, then press the ENT pushbutton.

   If a valid Level 2 Access code was entered, the display will briefly flash a confirmation screen and display the following:

```
LED Scroll Test
Test in Progress...
```

   If not, re-enter a valid code.

7. The control will illuminate each of the eight LEDs. To stop the LED test press the EXIT pushbutton.

6.7 Input Test

To test the control inputs proceed as follows:

1. Press the ENT (UTIL Hot Button) pushbutton to awaken the unit. The menu will advance to "UTILITIES".

```
          UTILITIES
←COMM                    MNTR→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
      Calibration/Test
←                        →
```

3. Press the Down arrow pushbutton, as necessary, to navigate to the Input Test menu item.

```
Input Test
Press ENT to begin
```

4. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 7.

```
Input Test
      10000000
```

5. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
          _
```

■**NOTE**: When entering the Level 2 Access code the display will automatically advance the cursor to the next digit when input is momentarily paused.

6. Enter a valid Level 2 Access code, then press the ENT pushbutton.

   If a valid Level 2 Access code was entered, the display will briefly flash a confirmation screen and display the following:

```
Input Test
      10000000
```

   If not, re-enter a valid code.

7. Determine the inputs to be tested and the corresponding position (from right to left) in the input test screen.
   - Position #1, Voltage Reduction #1
   - Position #2, Voltage Reduction #2
   - Position #3, Non-Sequential Input
   - Position #4, Operations Counter Contact
   - Position #5, Neutral Light Switch
   - Position #6, Lower Status
   - Position #7, Raise Status
   - Position #8, Drag Hands

   As each input is activated the corresponding indicator will change from a "0" to a "1" to indicate that the control has read the input.

8. Verify that the control is in a configuration that supports input testing, then proceed as follows based on control status:
   - If the control is not connected to field connections, then utilize Figure 6-1 to connect test equipment and test the desired inputs.
   - If the control is connected to field connections, then determine the necessary test method(s) for testing the desired input.

     Drag hands, Lower and Raise status can be tested by utilizing the corresponding front panel switches.

9. When all input testing has been completed, restore the control back to pre-test conditions.

6.8 Output Test

To test the control outputs proceed as follows:

1. Press the ENT (UTIL Hot Button) pushbutton to awaken the unit. The menu will advance to "UTILITIES".

```
          UTILITIES
←COMM                    MNTR→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
      Calibration/Test
←                        →
```

3. Press the Down arrow pushbutton, as necessary, to navigate to the LED Scroll Test menu item.

```
Output Test
Press ENT to begin
```

4. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 7.

```
alarm contact
          00_0
```

5. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS
          _
```

■**NOTE**: When entering the Level 2 Access code the display will automatically advance the cursor to the next digit when input is momentarily paused.

6. Enter a valid Level 2 Access code, then press the ENT pushbutton.

   If a valid Level 2 Access code was entered, the display will briefly flash a confirmation screen and display the following:

```
alarm contact
          00_0
```

   If not, re-enter a valid code.

7. The cursor will be located under the far right zero which corresponds to the control "Alarm Contact". Position 2 is the "Raise Contact" and the far left position is the "Lower Contact" To test output contacts proceed as follows for the desired output:

   a. Verify that the control is in a configuration that supports output contact testing.
   b. Utilizing the Up/Down arrow pushbutton for the desired output contact set the value to "1". The contact output will be active. Verify that the desired output is activated.
   c. Utilizing the Up/Down arrow pushbutton for the desired output contact set the value to "0". The contact output will be deactivated. Verify that the desired output is deactivated.
   d. Repeat for the remaining outputs.

6.9 Button Test

Front Panel Pushbutton Testing

To test the control front panel pushbuttons, proceed as follows:

1. Press the ENT (UTIL Hot Button) pushbutton to awaken the unit. The menu will advance to "UTILITIES".

```
          UTILITIES
←COMM                    MNTR→
```

2. Press the Down Arrow pushbutton once. The unit will display the following:

```
      Calibration/Test
←                        →
```

3. Press the Down arrow pushbutton, as necessary, to navigate to the Button Input Test menu item.

```
Button Input Test
Press ENT to Begin
```

4. Press the ENT pushbutton. If Level 2 Access is not active or has been previously input, the following will be displayed. Go to Step 7.

```
Button Input Test
      00000000
```

5. If Level 2 Access is active, the Level 2 Access prompt will be displayed.

```
ENTER LEVEL 2 ACCESS

          _
```

■**NOTE**: When entering the Level 2 Access code the display will automatically advance the cursor to the next digit when input is momentarily paused.

6. Enter a valid Level 2 Access code, then press the ENT pushbutton.

   If a valid Level 2 Access code was entered, the display will briefly flash a confirmation screen and display the following:

```
Button Input Test
      00000000
```

   If not, re-enter a valid code.

■**NOTE**: The following key identifies each pushbutton position from left to right:

Position	Pushbutton
1	VR
2	SCAMP
3	UTIL/ENT
4	➡/COMM
5	⬇/CNFG
6	⬆/SETP
7	⬅/MNTR
8	WAKE/EXIT

7. Test the desired pushbutton by pressing and holding the pushbutton. The display will change from a "0" to "1" if the pushbutton is working correctly.

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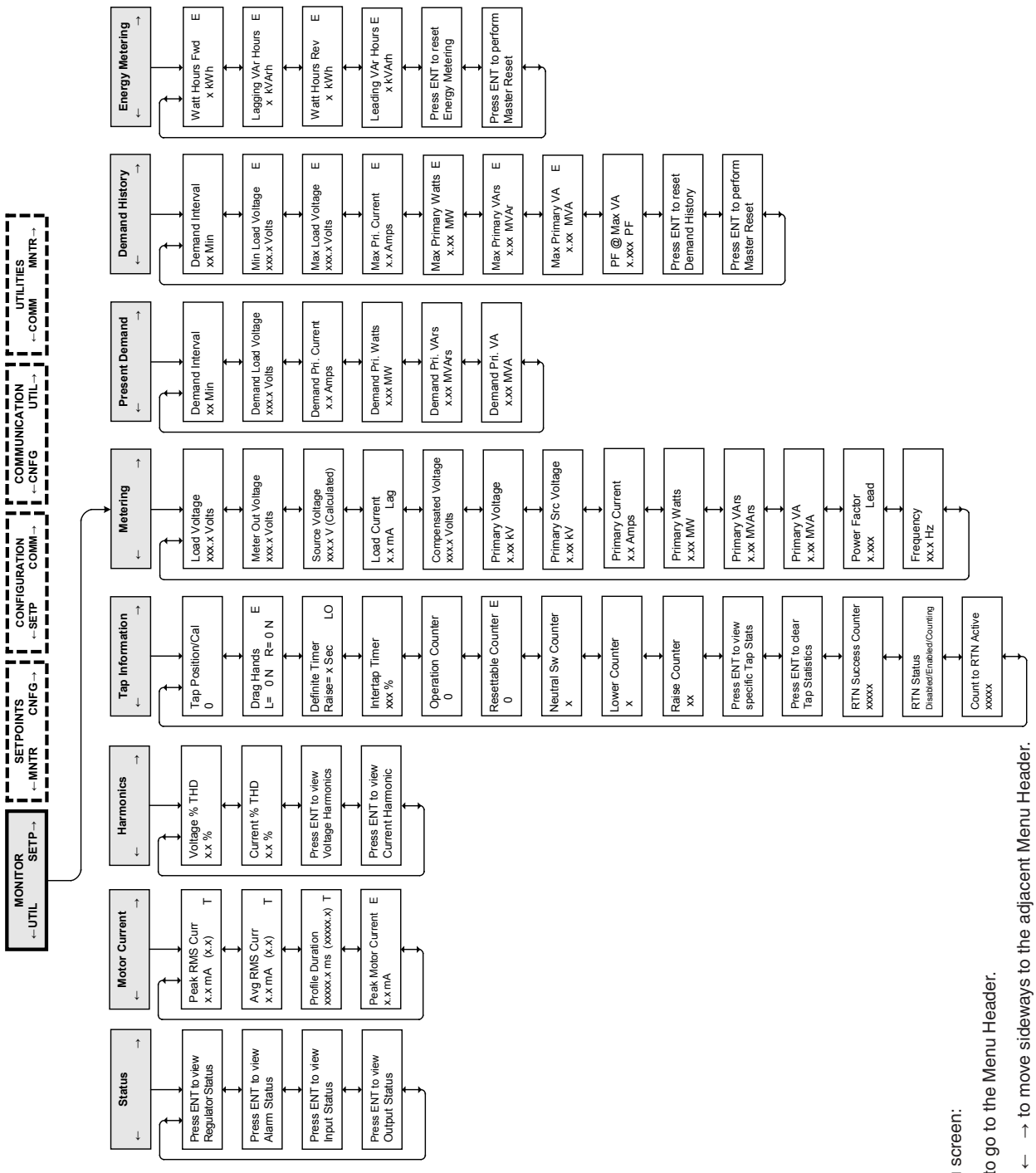
A Appendix

A.1 HMI Menu Flow



At any menu screen:

Press EXIT to go to the Menu Header.

Press either ← → to move sideways to the adjacent Menu Header.

Figure A-1 Monitor Menu Flow

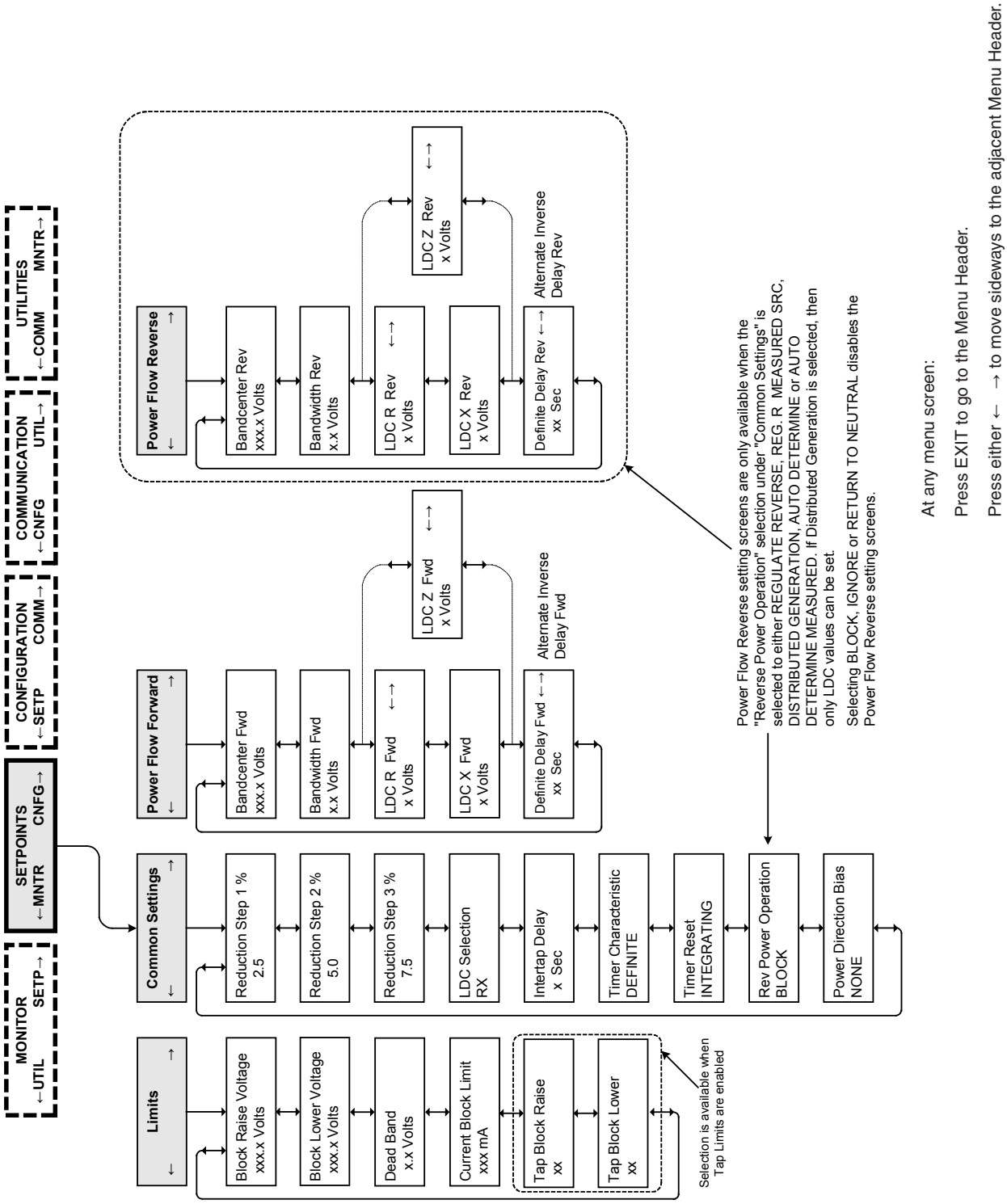
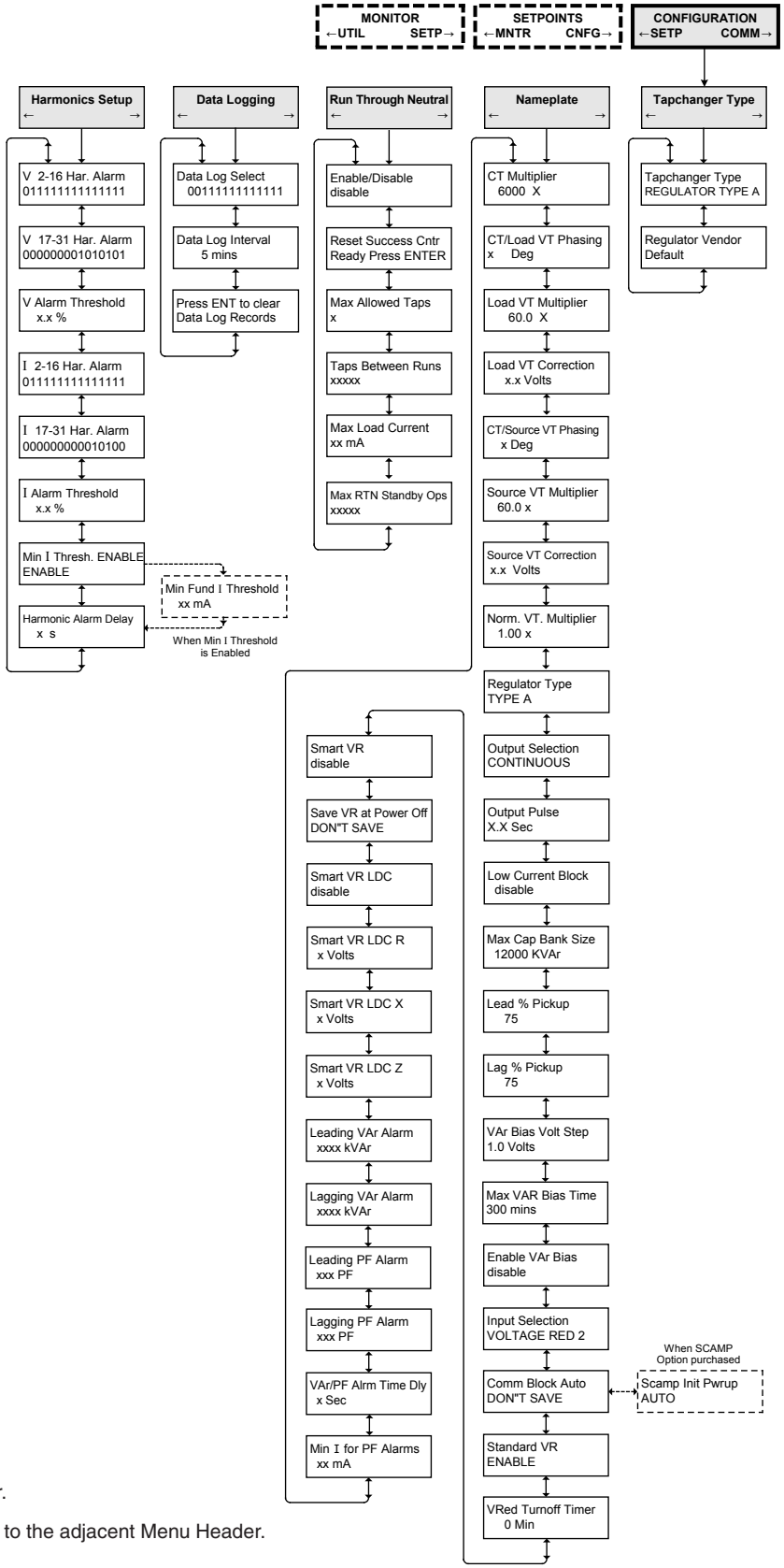


Figure A-2 Setpoints Menu Flow

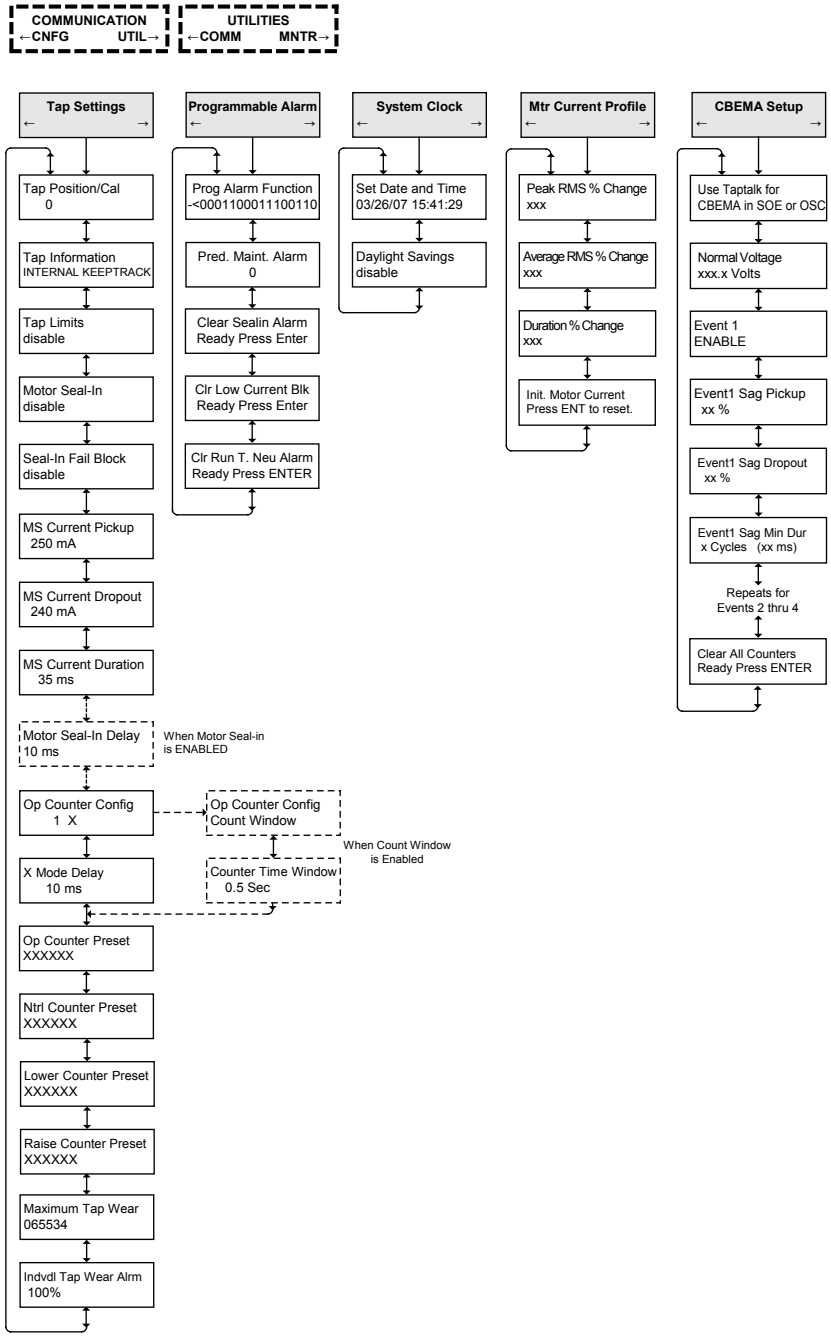


At any menu screen:

Press EXIT to go to the Menu Header.

Press either ← → to move sideways to the adjacent Menu Header.

Figure A-3 Configuration Menu Flow (1 of 2)

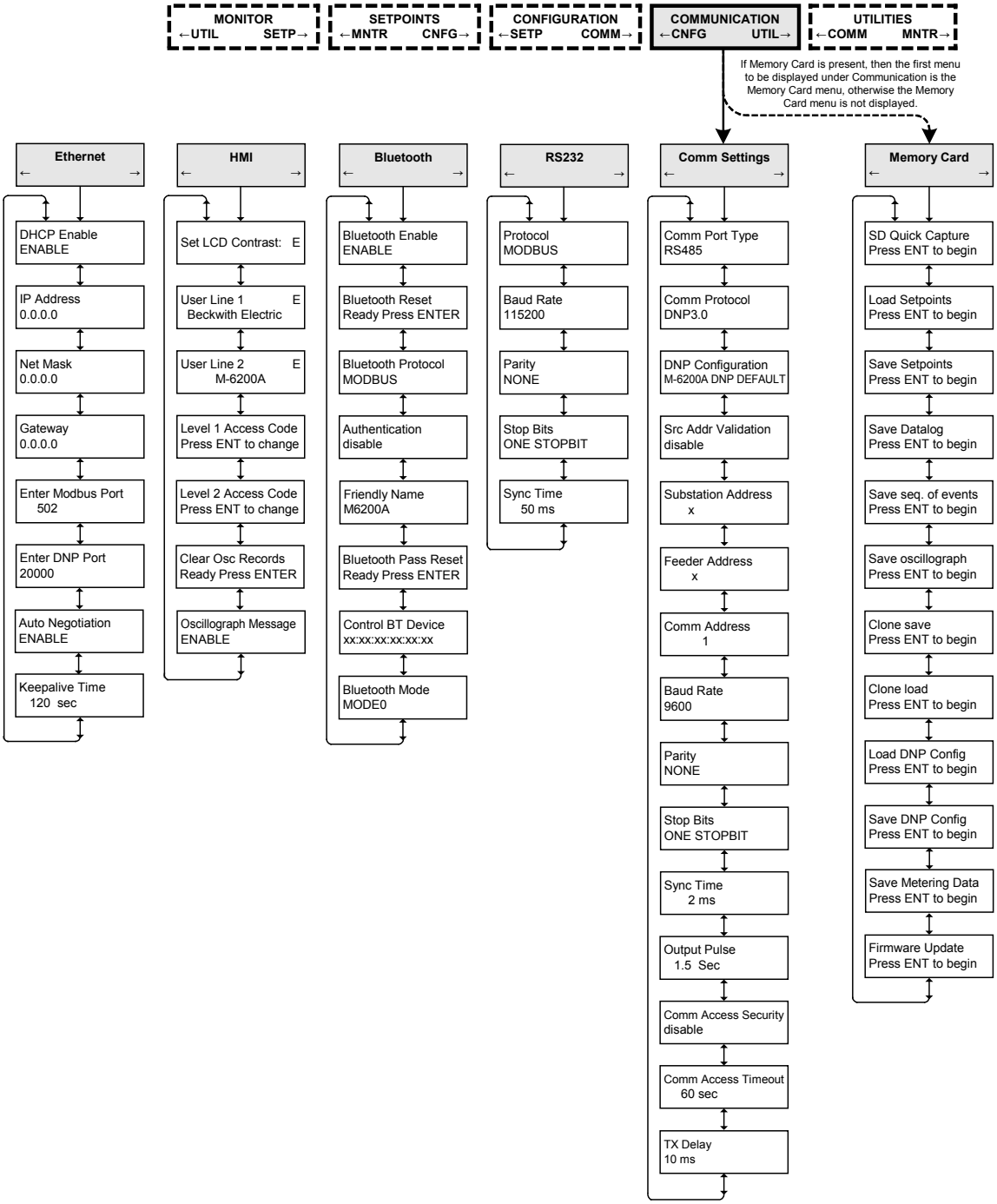


At any menu screen:

Press EXIT to go to the Menu Header.

Press either ← → to move sideways to the adjacent Menu Header.

Figure A-3 Configuration Menu Flow (2 of 2)

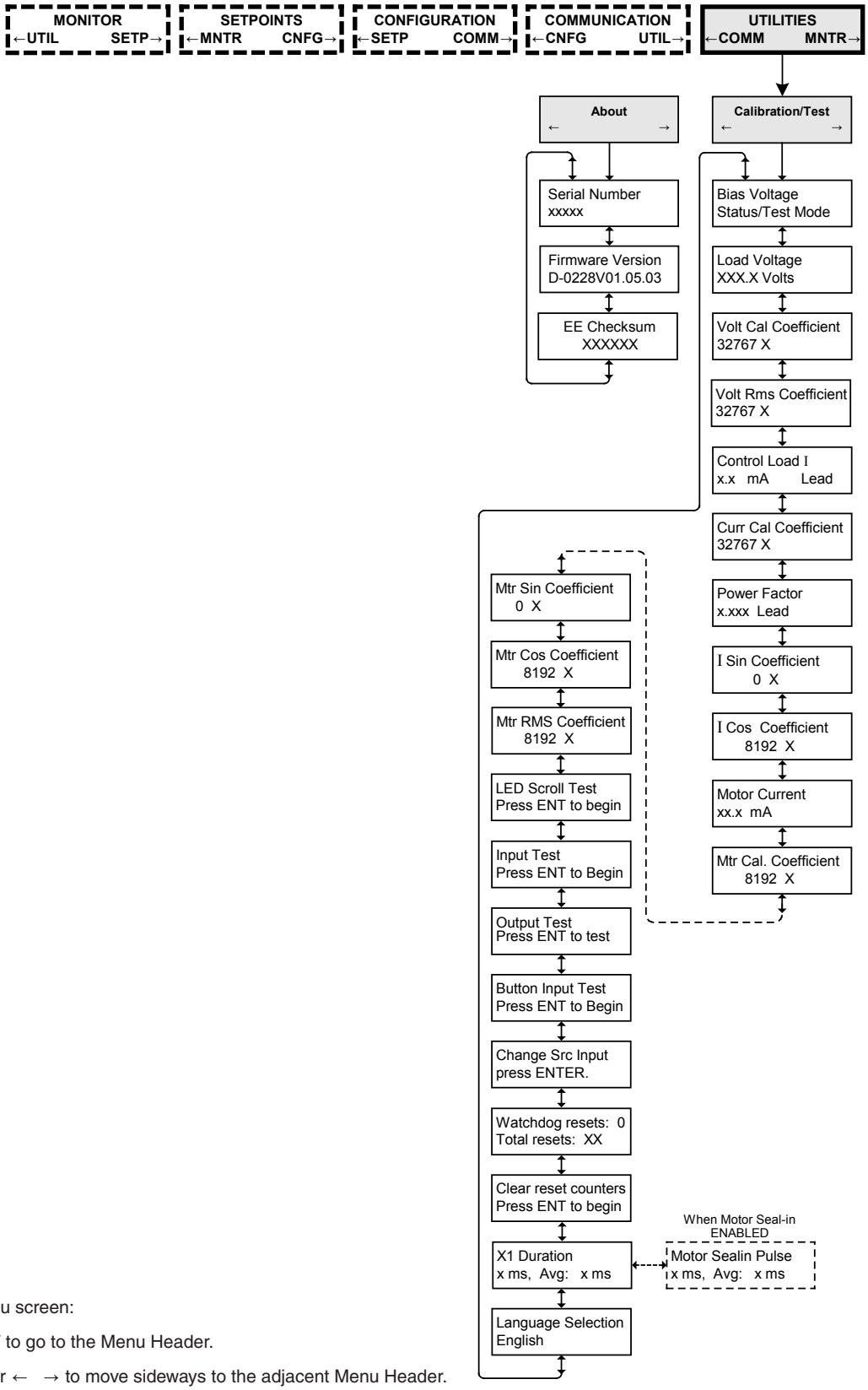


At any menu screen:

Press EXIT to go to the Menu Header.

Press either ← → to move sideways to the adjacent Menu Header.

Figure A-4 Communication Menu Flow



At any menu screen:

Press EXIT to go to the Menu Header.

Press either ← → to move sideways to the adjacent Menu Header.

Figure A-5 Utilities Menu Flow

A.2 HMI Screen Review

Monitor/Metering

```
Load Voltage
XXX.X Volts
```

Displays the real-time measured value of voltage at the regulator or the transformer, including the voltage reduction if applicable and any corrections made using the user-selected VT correction voltage.

```
Meter Out Voltage
XXX.X Volts
```

Displays the measured voltage at the terminals of the M-6200A without any software modifications. Used as the base for normalizing voltage.

```
Source Voltage
XXX.X V (Calculated)
```

Displays the real-time calculated source voltage-only applicable in regulator control applications and includes any corrections made using the user-selected VT correction voltage.

```
Load Current
X.X mA        Lag
```

Displays the real-time measured value of load current related to the scaling factor Current Transformer of 200 mA.

```
Compensated Voltage
XXX.X Volts
```

Displays the calculated voltage at the "load center," based on load current and the LDC settings.

```
Primary Voltage
X.XX kV
```

Displays the calculated primary voltage based on the user-selected voltage multiplier and measured secondary voltage.

```
Primary Src Voltage
X.XX kV
```

Displays Primary Source Voltage based on the user-selected Source VT Correction.

```
Primary Current
X.X Amps
```

Displays the calculated primary current based on the user-selected current multiplier and measured secondary current.

```
Primary Watts
X.XX MW
```

Displays the calculated primary quantity based on the user-selected multipliers and measured secondary voltage and current.

```
Primary VArs
X.XX MVArs
```

Displays the calculated primary quantity based on the user-selected multipliers and measured secondary voltage and current.

```
Primary VA
X.XX MVA
```

Displays the calculated primary quantity based on the user-selected multipliers and measured secondary voltage and current.

```
Power Factor
  X.XXX   Lead
```

Displays the real-time calculated value of power factor.

```
Frequency
XX.X Hz
```

Displays the line frequency.

Figure A-6 Monitor Screens (page 1 of 7)

Monitor/Present Demand

```
Demand Interval
XX Min
```

Toggles between 5, 10, 15, 30 and 60 minute interval with a factory setting of 15 minutes. The time interval is the amount of time it takes for a thermal meter to indicate 90% of a change of load.

```
Demand Load Voltage
XXX.X Volts
```

Displays the real-time measured value of voltage at the regulator or transformer. This value continuously averaged over consecutive 32-second intervals.

```
Demand Pri. Current
X.X Amps
```

Displays the calculated primary demand current based on the user-selected current multiplier and measured secondary current.

```
Demand Pri. Watts
X.XX MW
```

Displays the demand value base on the user-selected voltage and current multipliers or secondary voltage and current.

```
Demand Pri. VArs
X.XX MVArs
```

Displays the demand value based on the user-selected voltage and current multipliers and measured secondary voltage and current.

```
Demand Pri. VA
X.XX MVA
```

Displays the demand value based on the user-selected voltage and current multipliers and measured secondary voltage and current.

Monitor/Demand History

```
Demand Interval
XX Min
```

Toggles between 5, 10, 15, 30 and 60 minute interval with a factory setting of 15 minutes. The time interval is the amount of time it takes for a thermal meter to indicate 90% of a change of load.

```
Min Load Voltage     E
XXX.X Volts
```

Displays minimum local voltage at the regulator or transformer. Bottom line toggles between date/time/Volts.

```
Max Load Voltage     E
XXX.X Volts
```

Displays maximum local voltage at the regulator or transformer. Bottom line toggles between date/time/Volts.

```
Max Pri. Current      E
X.X Amps
```

Displays maximum primary current. Bottom line toggles between date/time/Amps.

```
Max Primary Watts    E
     X.XX  MW
```

Displays maximum Watts. Bottom line toggles between date/time/W.

```
Max Primary VArs     E
     X.XX  MVAr
```

Displays maximum VAr. Bottom line toggles between date/time/VAr.

Figure A-6 Monitor Screens (page 2 of 7)

Monitor/Demand History (Cont.'d)

```
Max Primary VA          E
     X.XX  MVA
```

Displays maximum VA. Bottom line toggles between date/time/VA.

```
PF @ Max VA
X.XXX  PF
```

Displays power factor at time of maximum VA. Resets automatically when MAX VA screen, below, is reset.

```
Press ENT to reset
Demand History
```

```
Press ENT to perform
Master Reset
```

Monitor/Energy Metering

```
Watt Hours Fwd          E
       X kWh
```

Displays total forward WHr. Bottom line toggles between date/time/WHr.

```
Lagging VAr Hours       E
      X kVArh
```

Displays total forward VArHr. Bottom line toggles between date/time/VArHr.

```
Watt Hours Rev          E
       X kWh
```

Displays total reverse WHr. Bottom line toggles between date/time/WHr.

```
Leading VAr Hours       E
      X kVArh
```

Displays total reverse VArHr. Bottom line toggles between date/time/VArHr.

```
Press ENT to reset
Energy Metering
```

```
Press ENT to perform
Master Reset
```

Figure A-6 Monitor Screens (page 3 of 7)

Monitor/Status

```
Press ENT to view
Regulator Status
```

```
TAP    BDS    PWR    BLK    VRD
1      OK     fwd    blk    Off
```

TAP	Tap Position
BDS	Band Status (Lo, Hi, In Band)
PWR	Power Direction (Fwd, Rev)
BLK	Blocks in Effect
VRD	Voltage Reduction (Off, 1, 2, 3)

The following screens can be viewed for additional information by depressing the Down Arrow pushbutton,

```
Tap Position
        0
```

```
Band Status
In Band, High, Low
```

```
Power Direction
Forward, Reverse
```

```
Blocks in Effect
-- -- -- -- -- -- --
```

Blocks in Effect are indicated from left to right (Position 1 to 7). Multiple blocks may be in effect and therefore the display is prioritized as follows:

■ **NOTE:** Blocks are listed in order of display priority from top to bottom.

Position	Block	Display
1	Line Limit	LL
2	Force Lower	FL
2	Voltage Limit Block Lower	BL
2	Voltage Limit Block Raise	BR
3	Tap Limit Block Lower	TL
3	Tap Limit Block Raise	TR
4	Non-Sequential Block	NS
4	Seal-in Failure Block Raise and Lower	SB
4	Seal-in Failure Block Raise	SR
4	Seal-in Failure Block Lower	SL
4	Low Current Block	IB
5	Comm Block	CB
6	Reverse Power Block	RP
7	SCADA Cutout Local	SC

```
Voltage Reduction
Off, 1, 2, 3
```

```
Press ENT to view
Alarm Status
```

```
A B C D E F G H I J K L M N O P –>
0 0 0 0 – – 0 – – – – 0 0 X – –
```

```
<– Q R S T U V W
   – – – – – – –
```

A = Block Raise Tap
B = Block Lower Tap
C = Block Raise Voltage
D = Block Lower Voltage

Figure A-6 Monitor Screens (page 4 of 7)

Monitor/Status (Cont'd.)

E = Voltage Reduction
F = Power Direction
G = Current Limit
H = Comm Block
I = LDC/LDZ
J = Selftest
K = Seal-in Failure
L = VAr Bias Lag
M = VAr Bias Lead
N = Backup Fail
O = Abnormal Tap Position
P = Low Current Blk
Q = RTN Fail
R = Op Count Signal
S = Individual Tap Wear
T = Leading VAr
U = Lagging VAr
V = Leading PF
W = Lagging PF

Alarm Status Key

1 Alarm Enabled/Condition Met

0 Alarm Enabled/Condition Not Met

X Alarm Disabled/Condition Met

– Alarm Disabled/Condition Not Met

```
Press ENT to view
Input Status
```

C	NS	VR	DH	KT	N	MS
0	0	--	0	RL	0	0

C = Counter Contact
NS = Non-Sequential Input
VR = Voltage Reduction Inputs 1 and 2
DH = Drag Hands Reset Input
KT = KeepTrack™ Lower and Raise Input
N = Neutral Input
MS = Motor Seal-In Input

Key
1 = True (on)
0 = False (off)

For VR

- - = No Voltage Reduction Steps in effect
1 - = Voltage Reduction Step 1 in effect
- 2 = Voltage ReductionStep 2 in effect
1 2 = Voltage Reduction Step 3 in effect

For KT

- - = No Raise or Lower inputs active
R - = Raise Input detected
- L = Lower Input detected
RL = Motor power is not connected or circuit failure.

```
Press ENT to view
Output Status
```

RAISE	LOWER	ALARM
1	0	0

RAISE Raise Output Contact
LOWER Lower Output Contact
ALARM Alarm Output Contact

Key
1 = True (on)
0 = False (off)

Figure A-6 Monitor Screens (page 5 of 7)

Monitor/Motor Current

```
Peak RMS Curr
X.X mA (X.X)            T
```

Displays the Peak RMS Current of the last operation (profile). Also displays the average Peak RMS Current from the Training Mode ( ). If a "T" is present, the Training Mode is active.

```
Avg RMS Curr
X.X mA (X.X)            T
```

Displays the Average RMS Current of the last operation (profile). Also displays the average of the Average RMS Current from the Training Mode ( ). If a "T" is present, the Training Mode is active.

```
Profile Duration
XXXXX.X ms (XXXXX.X)    T
```

Displays the Profile Duration of the last operation (profile). Also displays the average of the Profile Duration from the Training Mode ( ). If a "T" is present, the Training Mode is active.

```
Peak Motor Current    E
X.X mA
```

Displays the Peak Motor Current recorded. This parameter is the highest Peak Motor Current recorded by the control. This parameter is independent of the Peak RMS Current in the Motor Current Profile.

Monitor/Harmonics

```
Voltage % THD
X.X %
```

Displays the percent of Voltage THD.

```
Current % THD
X.X %
```

Displays the percent of Current THD.

```
Press ENT to view
Voltage Harmonics
```

Allows the user to view individual Voltage Harmonic Values (2-31).

```
Press ENT to view
Current Harmonic
```

Allows the user to view individual Current Harmonic Values (2-31).

Monitor/Tap Information

```
Tap Position/Cal
        0
```

Displays the tap position of the tapchanger. Recognizes tapchanges commanded via manual, automatic or external (SCADA) means, if tap position is not disabled. The tap position can be calibrated by selecting ENT, then setting the tap position using the ⬆/⬇ pushbuttons and selecting ENT to confirm the new tap position.

```
Drag Hands              E
L=   0 N    R= 0 N
```

Displays minimum and maximum values of tap position since reset. (Section 2.2)

Figure A-6 Monitor Screens (page 6 of 7)

Monitor/Tap Information (Cont'd.)

```
Definite Timer
Raise= X Sec          LO
```

Displays the status of the raise and lower timers; inverse or linear.

```
Intertap Timer
XXX %
```

Displays the status of the intertap timer.

```
Operation Counter
        0
```

Records the total number of raise and lower operations. The operation counter will advance by one or two counts, as set by user, for each open-close-open contact operation. This counter is not resettable, but can be preset to any value between 0 and 999,999.

```
Resettable Counter    E
  0
```

Records the total number of raise and lower operations as does the total operations counter, discussed above. This counter is reset by pressing **ENT** at this screen. This counter can be used to monitor the number of tapchanges since the last time it was checked.

```
Neutral Sw Counter
  x
```

The Neutral Switch Counter is updated each time the neutral input is detected. Neutral Switch Counter can also preset to any value. The Neutral Switch Counter is a software counter that is stored in non-volatile memory and has a maximum value of 999,999.

```
Lower Counter
  x
```

Records the number of Lower operations, can be Preset/Reset in Configuration/Tap Settings.

```
Raise Counter
  xx
```

Records the number of Raise operations, can be Preset/Reset in Configuration/Tap Settings.

```
Press ENT to view
specific Tap Stats
```

```
Tap      Tap Number
 X        X    X.X      A
```

TAP = Tap Position

TAP Number = The number of tapchanges and the Accumulated Primary Current at this position.

```
Press ENT to clear
Tap Statistics
```

Press ENT to confirm clearing tap statistics.

```
RTN Success Counter
xxxxx
```

The RTN Success counter increments after each successful operation of the Run Through Neutral feature.

```
RTN Status
Disabled/Enabled/Counting
```

Displays the status of the Run Through Neutral Feature.

```
Count To RTN Active
xxxxx
```

Displays the number of counter operations since the operations between runs setting was set, or since the feature was enabled. The counter will reset to zero if the feature is enabled and successfully runs through neutral.

Figure A-6 Monitor Screens (page 7 of 7)

Setpoints/Common Settings

```
Reduction Step 1 %
     2.5
```

Voltage reduction can be achieved by contact or communication methods. First of three independent steps of voltage reduction adjustable from 0% to 10% in 0.1% increments of the bandcenter setpoint. Factory setting is 2.5% .

```
Reduction Step 2 %
     5.0
```

Voltage reduction can be achieved by contact or communication methods. Second voltage reduction step. Factory setting is 5.0%.

```
Reduction Step 3 %
     7.5
```

Voltage reduction can be achieved by contact or communication methods. Third voltage reduction step. Factory setting is 7.5%.

```
LDC Selection
RX
```

Allows the user to select between Line Drop Compensation Resistance/Reactance or Z.

```
Intertap Delay
   X Sec
```

Adjustable from 0 to 60 Seconds in 1.0 second increments with a factory setting of 0 seconds.

```
Timer Characteristic
DEFINITE
```

Allows setting control timer for Definite or Inverse time. There are four setpoints associated with this selection: Time Delay F/R, and Inverse Time F/R.

```
Timer Reset
INTEGRATING
```

Toggles between integrating timer and instantaneous reset (INST_RESET) timer upon voltage return to in-band condition.

```
Rev Power Operation
 BLOCK
```

Toggles between eight modes of operation:

- BLOCK – to inhibit automatic tapchange operation (Factory Setting)
- REGULATE REVERSE/
  REG. R MEASURED SRC – to detect a reverse power condition and regulate according to reverse power settings
- RETURN TO NEUTRAL – to drive the tap position to Neutral
- IGNORE – to continue unit action as though Forward Power Flow continued to exist
- DG Mode (Distributed Generation) – when distribution systems have the possibility of power reversal to control voltage
- AUTO DETERMINE/
  AUTO DETERMINE M – to allow the control to intelligently choose which reverse power mode applies at the time reverse power is sensed, either Distributed Generation mode or Regulate In Reverse/ Regulate in Reverse Measured

```
Power Direction Bias
 NONE
```

Allows one of three methods to be used for the control to switch between forward/reverse power operation. The three settings are None, Forward Bias, and Reverse Bias.

Figure A-7 Setpoints Screens (page 1 of 4)

Setpoints/Power Flow Forward

```
Bandcenter Fwd
XXX.X Volts
```

Forward power bandcenter is adjustable from 100.0 V to 135.0 V in 0.1 V increments with a factory setting of 120.0 V.

```
Bandwidth Fwd
X.X Volts
```

Forward power bandwidth is adjustable from 1.0 V to 10.0 V in 0.1 V increments with a factory setting of 2.0 V.

LDC RES-REAC

```
LDC R Fwd        ←→
  X Volts
```

Forward power Line Drop Compensation resistance is adjustable from -24 V to +24 V in 1 V increments with a factory setting of 0 V.

```
LDC X Fwd
  X Volts
```

Forward power Line Drop Compensation reactance is adjustable from -24 V to +24 V in 1 V increments with a factory setting of 0 V.

LDC-Z

```
LDC-Z Fwd        ←→
  X Volts
```

Adjustable from 0 to 24 volts in 1 volt increments.

DEFINITE DELAY

```
Definite Delay Fwd  ←→
   XX Sec
```

Forward power time delay for a tapchange is adjustable from 1 sec. to 360 sec. in 1 second increments with a factory setting of 30 sec.

INVERSE DELAY

```
Inverse Delay Fwd  ←→
   XX Sec
```

Forward power inverse delay for a tapchange is adjustable from 1 sec. to 360 sec. in 1 second increments with a factory setting of 30 sec.

Figure A-7 Setpoints Screens (page 2 of 4)

Setpoints/Power Flow Reverse

```
Bandcenter Rev
XXX.X Volts
```

Reverse power bandcenter is adjustable from 100.0 V to 135.0 V in 0.1 V increments with a factory setting of 120.0 V.

```
Bandwidth Rev
X.X Volts
```

Reverse power bandwidth is adjustable from 1.0 V to 10.0 V in 0.1 V increments with a factory setting of 2.0 V.

LDC RES-REAC

```
LDC R Rev        ←→
  X Volts
```

Reverse power Line Drop Compensation resistance is adjustable from -24 V to +24 V in 1 V increments with a factory setting of 0 V.

```
LDC X Rev
  X Volts
```

Reverse power Line Drop Compensation reactance is adjustable from -24 V to +24 V in 1 V increments with a factory setting of 0 V.

LDC-Z

```
LDC-Z Rev        ←→
  X Volts
```

Adjustable from 0 to 24 volts in 1 volt increments.

DEFINITE DELAY

```
Definite Delay Rev  ←→
   XX Sec
```

Reverse power time delay for a tapchange is adjustable from 1 sec. to 360 sec. in 1 second increments with a factory setting of 30 sec.

INVERSE DELAY

```
Inverse Delay Rev  ←→
   XX Sec
```

Reverse power inverse delay for a tapchange is adjustable from 1 sec. to 360 sec. in 1 second increments with a factory setting of 30 sec.

Figure A-7 Setpoints Screens (page 3 of 4)

Setpoints/Limits

```
Block Raise Voltage
  XXX.X Volts
```

Overvoltage limit is adjustable form 95.0 V to 135.0 V in 0.1 V increments with a factory setting of 128.0 V. The Block Raise setpoint should always be set above the Block Lower setpoint and above the upper band limit (the bandcenter plus one-half of the bandwidth) for the control to operate. All automatic Raise/Lower tap operations are blocked, when input voltage is less than 85.0 V dc.

```
Block Lower Voltage
  XXX.X Volts
```

Undervoltage limit is adjustable from 95.0 V to 135.0 V in 0.1 V increments with a factory setting of 114.0 V. The Block Lower setpoint should always be set below the Block Raise setpoint and below the lower band limit (the bandcenter minus one-half of the bandwidth) for the control to operate. All automatic Raise/Lower tap operations are blocked, when input voltage is less than 85.0 V dc.

```
Dead Band
    X.X Volts
```

Dead band is adjustable from 1.0 V to 4.0 V in 0.1 V increments with a factory setting of 2.0 V.

```
Current Block Limit
   XXX mA
```

Current Block Limit is adjustable from 50 mA to 640 mA in 1 mA increments with a factory setting of 400 mA with hysteresis of 5 mA. If the value of the current exceeds the Current Block Limit setpoint, the unit will not permit automatic control.

```
Tap Block Raise
   XX
```

When enabled the Tap Block Raise Limit is adjustable from –12 to +16 which includes a neutral tap position. Default setting is "0" neutral.

```
Tap Block Lower
   XX
```

When enabled the Tap Block Lower Limit is adjustable from –16 to +12. Default setting is –16.

Figure A-7 Setpoints Screens (page 4 of 4)

Configuration/Tapchanger Type

```
Tapchanger Type
REGULATOR TYPE A
```

```
Regulator Vendor
Default
```

Displays the vendor specific regulator configuration selected in TapTalk®. See Section 4.4 Tap Changer Type Selections.

Configuration/Tap Settings

```
Tap Position/Cal
        0
```

Allows input of known tap position to calibrate the unit tap position. This function is disabled when Tap Information is disabled.

```
Tap Information
INTERNAL KEEPTRACK
```

Toggles between Motor Direct Drive KeepTrack™ and disable.

```
Tap Limits
disable
```

Allows the tap position limits to be enabled/disabled. When enabled see Setpoints/Limits for Tap Block Raise and Lower setting screens.

```
Motor Seal-In
disable
```

Motor Seal-In must be enabled for Cooper applications to determine tap position. When enabled a Motor Seal-In Delay setting in ms is available. When Motor Seal-in is enabled the Motor Seal-in Failure Block and Alarm are also enabled by default.

```
Seal-in Fail Block
ENABLE
```

When enabled the operation of the regulator is blocked when the control determines that a motor seal-in failure has occurred.

```
MS Current Pickup
 250 mA
```

Motor Seal-in Current Pickup is adjustable from 100 to 300 mA. This setting determines what level the motor current must exceed to trigger the control to turn off its output and allow the Cooper Motor Seal-in circuit to complete the tap operation. This setting works in conjunction with the Motor Seal-in Current Pickup Minimum Duration setting.

```
MS Current Dropout
 240 mA
```

Motor Seal-in Current Dropout is adjustable from 50 to 280 mA. This setting determines how low the motor current must drop (after the Motor Seal-in Current Pickup Min Duration has been exceeded) to trigger the control to increment the operations counter and tap position.

```
MS Current Duration
   35 ms
```

Motor Seal-in Current Pickup Minimum Duration is adjustable from 20 to 3000 ms. This setting determines how long the motor current must be above the Motor Seal-in Current Pickup before the control removes its output and looks for the Motor Seal-in Current Dropout to occur.

Figure A-8 Configuration Screens (page 1 of 8)

Configuration/Tap Settings (Cont'd.)

```
Op Counter Config
       1  X
```

Selects the contact operation sequence that will cause the software counter to increment by one. Open/close/open (X1), open/close or close/open contact operation (X2). The count window mode registers any activity as a valid input within the count window time setting.

```
X Mode Delay (or Motor Seal-in Delay)
   10 ms
```

This menu item is dependent upon weather Motor Seal-in is enabled or disabled. If Motor Seal-in is enabled, then this menu item will be "Motor Seal-in Delay". If Motor Seal-in is disabled, then the menu item will be "X Mode Delay".

When the control is using 1X or X2 Mode counter contact detection method, the X Mode Delay setting in milliseconds can be used to delay the detection of the NEUTRAL position switch or the minimum time duration for X1 counter contact signal.

```
Op Counter Preset
XXXXXX
```

The counter cannot be reset, but can be preset to any value up to 999,999 in the Configuration menu.

```
Ntrl Counter Preset
XXXXXX
```

Provides the user with the capability to preset the Neutral Counter to any value up to 999,999.

```
Lower Counter Preset
XXXXXX
```

The Lower Counter Preset allows the user to either preset or reset the lower counter.

```
Raise Counter Preset
XXXXXX
```

The Raise Counter Preset allows the user to either preset or reset the raise counter.

```
Maximum Tap Wear
065534
```

Allows the user to set a value from 1 to 65534 for the maximum number of times the regulator has been on each tap before an alarm occurs.

```
Indvdl Tap Wear Alrm
 100 %
```

A percentage setting with a range from 1 to 200% which is used in conjunction with the Maximum Tap Wear setting to determine when the Individual Tap Wear Alarm is triggered. Default setting is 100%.

Configuration/Programmable Alarm

```
Prog Alarm Function
–<0001100011100110
```

Provides alarm for one or more of the following user-selected conditions: Communication Block, Block Raise (TAP) Limit exceeded, Block Lower (TAP) Limit exceeded, Block Raise Voltage Limit exceeded, Block Lower Voltage Limit exceeded, Voltage Reduction (any step) invoked, Reverse Power Flow condition detected, Line Limit Current exceeded, LDC/LDZ, Abnormal Tap Position, Backup Power Fail, Self Test, Max VAr Bias Duration Lead, Max VAr Bias Duration Lag in effect, Run Through Neutral Fail, Operation Count Signal Limit exceeded, Leading VAr limit exceeded, Lagging VAr limit exceeded, Leading Power Factor limit exceeded and Lagging Power Factor limit exceeded. See Figure 4-43.

Figure A-8 Configuration Screens (page 2 of 8)

Configuration/Programmable Alarm (Cont'd.)

```
Pred. Maint. Alarm
        0
```

When the resettable operations counter matches the Pred. Maint. Alarm Setting, the control will display a message that the Pred. Maint. Alarm Setting has been exceeded.

```
Clear Sealin Alarm
Ready Press Enter
```

Allows the user to clear the Motor Seal-In Failure Block and Alarm.

```
Clr Low Current Blk
Ready Press Enter
```

Allows the user to clear the Low Current Block Alarm and Block. Alarm and Block occurs when the control determines that load current is less than 4 mA and Tap Delta Voltage is less than .4 VAC.

```
Clr Run T. Neu Alarm
Ready Press Enter
```

Allows the user to clear the Run Through Neutral Alarm.

Configuration/System Clock

```
Set Date and Time
03/26/07 15:41:29
```

Displays and allows resetting of the time and date. Press **ENT** to set date; change mode indicated by flashing C. Used in conjunction with drag hands memories where the date/time stamp will be recorded for each drag hand quantity.

```
Daylight Savings
disable
```

Allows automatic Daylight Savings time adjustment to be enabled or disabled.

Configuration/Mtr Current Profile

```
Peak RMS % Change
  xxx
```

Setting for Peak RMS current programmable from 10% to 200% of the stored Peak RMS current to activate an alarm.

```
Average RMS % Change
  xxx
```

Setting for Average RMS current programmable from 10% to 200% of the stored Average RMS current to activate an alarm.

```
Duration % Change
  xxx
```

Setting for Duration current programmable from 10% to 200% of the stored Duration current to activate an alarm.

```
Init. Motor Current
Press ENT to reset.
```

Allows the user to reset all Motor Current Profiles and initiate the "Training Mode".

Configuration/CBEMA Setup

```
Normal Voltage
xxx.x Volts
```

This parameter establishes the target voltage around which the Event settings determine "Sag" or "Swell" conditions.

```
Event 1 (2,3,4)
ENABLE
```

Enables/Disables CBEMA Event 1, 2, 3 or 4.

Figure A-8 Configuration Screens (page 3 of 8)

Configuration/CBEMA Setup (Cont'd.)

```
Event 1(2,3,4) Sag(Swell)Pickup
  xx %
```

When pickup is set to less than 100% it operates as a Sag (undervoltage), greater than 100% it operates as a Swell (overvoltage).

```
Event 1(2,3,4) Sag(Swell)Dropout
  xx %
```

Sag Dropout is always set greater than Sag Pickup. Swell Dropout is fixed at 100%.

```
Event 1(2,3,4) Sag(Swell)Min Dur
  x Cycles   (xx ms)
```

Establishes the minimum duration that Sag or Swell condition exists before an Event is registered.

```
Clear All Counters
Ready Press ENTER
```

Clears all CBEMA Event Counters.

Configuration/Harmonics Setup

```
V 2-16 Har. Alarm
011111111111111
```

Provides the user with the means to select active harmonics for voltage alarm 2-16.

```
V 17-31 Har. Alarm
000000001010101
```

Provides the user with the means to select active harmonics for voltage alarm 17-31.

```
V Alarm Threshold
  10.0 %
```

Configuration/Harmonics Setup (Cont'd.)

Allows the user to select the Harmonic Voltage Alarm Threshold value.

```
I 2-16 Har. Alarm
011111111111111
```

Provides the user with the means to select active harmonics for current alarm 2-16.

```
I 17-31 Har. Alarm
000000000010100
```

Provides the user with the means to select active harmonics for current alarm 17-31.

```
I Alarm Threshold
  10 %
```

Provides Current Alarm Threshold value input.

```
Min I Thresh. ENABLE
ENABLE
```

Enables/Disables Minimum Current Threshold feature.

```
Min Fund I Threshold
   20 mA
```

Establishes minimum fundamental Current Threshold for Current Harmonics 0 to 200 mA.

```
Harmonic Alarm Delay
   10 s
```

Allows Harmonic Alarm Delay setting which is applicable to both Voltage and Current Threshold settings.

Figure A-8 Configuration Screens (page 4 of 8)

Configuration/Data Logging

```
Data Log Select
00111111111111
```

Position From Right

1. Load Voltage
2. Compensated Voltage
3. Primary Watts
4. Primary VA
5. Primary VAr
6. Load Current
7. Power Factor
8. Frequency
9. Tap Position
10. Source Voltage
11. Primary Current
12. Operation Counter
13. Meter Out Voltage
14. RTN Counter

Key
1 = Enabled for Logging
0 = Logging Disabled

```
Data Log Interval
      5 mins
```

```
Press ENT to clear
Data Log Records
```

Configuration/Nameplate

```
CT Multiplier
    6000  X
```

Adjustable from 1 to 32600 in 1 increments with a factory setting of 6000. User selection must include knowledge of CT ratio, from primary rating to 0.2 A rating of control.

```
CT/Load VT Phasing
x     Deg
```

CT/VT phasing correction is adjustable from 0° to 330° in 30° increments with a factory setting of 0°. This setting will advance the current phasor by the indicated value.

```
Load VT Multiplier
     60.0  X
```

Adjustable from 0.1 to 3260.0 in 0.1 increments with a factory setting of 60.0. User selection must include knowledge of VT ratio, sensing VT ratio correction.

```
Load VT Correction
     x.x Volts
```

VT ratio correction is adjustable from –15 V to +15 V in 0.1 V increments with a factory setting of 0 V.

```
CT/Source VT Phasing
     x Deg
```

CT/VT phasing correction is adjustable from 0° to 330° in 30° increments with a factory setting of 0°. This setting will advance the current phasor by the indicated value.

```
Source VT Multiplier
     60.0 X
```

Adjustable from 0.1 to 3260.0 in 0.1 increments with a factory setting of 60.0. User selection must include knowledge of Source VT Ratio and sensing Source VT Ratio correction.

Figure A-8 Configuration Screens (page 5 of 8)

Configuration/Nameplate (Cont'd.)

```
Source VT Correction
     x.x Volts
```

VT ratio correction is adjustable from –15 V to +15 V in 0.1 V increments with a factory setting of 0 V.

```
Norm. VT. Multiplier
     1.00 X
```

Normalizing Voltage Multiplier 0.80 to 1.20 times the Compensating Voltage.

```
Regulator Type
TYPE A
```

Allows the regulator type to be selected as Type A or B for correct source voltage calculation. Factory setting is Type A.

```
Output Selection
CONTINUOUS
```

Allows choice of output at tapchanger Raise/Lower output terminal. Choices are continuous or pulsed. For continuous, the control must wait to be in band or counter input valid for output to become disabled. For pulsed, an adjustable pulse width will be applied to the output triacs of 0.2 to 12 seconds.

```
Output Pulse
x.x Sec
```

Adjustable from 0.2 to 12 seconds in 0.1 second increments. Factory set at 1.5 seconds.

```
Low Current Block
disable
```

Enables and disables the Low Current Block and Alarm feature. When enabled allows the control to determine when load current is less than 4 mA and Tap Delta Voltage is less than .4 VAC to block regulation and initiate the Low Current Block alarm.

```
Max Cap Bank Size
 12000 KVAr
```

When VAr Bias is enabled provides the user with the ability to set the largest capacitor bank size from 4 to 12,000 KVAr.

```
Lead % Pickup
75
```

Defines a Lower negative VAr limit in percentage of the Max Cap Bank size below which the control will increase the upper band edge by the amount defined by VAr Bias Voltage Step.

```
Lag % Pickup
75
```

Defines an Upper positive VAr limit in percentage of the Max Cap Bank size above which the control will decrease the lower band edge by the amount defined by VAr Bias Voltage Step.

```
VAr Bias Volt Step
1.0 Volts
```

Amount by which the control will increase or decrease the Upper or Lower band edges when there is a VAr Bias out of band situation.

```
Max VAR Bias Time
300 mins
```

Maximum allowable time in minutes the control will bias the voltage edge.

```
Enable VAr Bias
disable
```

Enables and disables the VAr Bias feature.

Figure A-8 Configuration Screens (page 6 of 8)

Configuration/Nameplate (Cont'd.)

```
Input Selection
VOLTAGE RED 2
```

The Voltage Reduction 2 input can be configured to become an auxiliary input that can be read as a DNP point. The default configuration setting is Voltage Reduction 2.

```
Comm Block Auto
DON'T SAVE
```

Allow the state of the "Block Auto Operation" communication command to be saved or not saved when power has been lost.

```
SCAMP Init Pwrup
AUTO
```

When the SCAMP option is purchased, AUTO or LAST SAVE is available. Allows the state of the SCAMP switch to be initialized to the last saved state or Auto Mode when power has been lost.

```
Standard VR
ENABLE
```

Allows the user to enable or disable the Standard Voltage Reduction feature.

```
VRed Turnoff Timer
0 min
```

The Voltage Reduction feature can be turned off after a time period of 1 to 999 minutes. A setting of zero disables the Voltage Reduction Turnoff Timer.

```
Smart VR
disable
```

Allows the user to Enable or Disable Smart Voltage Reduction on the Control. Smart Voltage Reduction, when enabled, lowers voltage to between the Bandcenter setting and the lower band edge instead of stopping at the upper band edge. It also disablesVAr Bias if it is in effect.

```
Save VR at Power Off
DON'T SAVE
```

Allows any Voltage Reduction command communicated to the control to be saved or not saved at power down.

```
Smart VR LDC
disable
```

Allows the user to Enable or Disable Smart Voltage Reduction LDC on the Control. When "Smart VR LDC" is enabled, the control ignores existing LDC settings and instead uses the "Smart VR LDC" R and X or Z settings to apply LDC while the Voltage Reduction is in effect.

```
Smart VR LDC R
   x Volts
```

Smart VR Line Drop Compensation resistance is adjustable from –24 V to +24 V in 1 V increments with a factory setting of 0 V.

```
Smart VR LDC X
   x Volts
```

Smart VR Line Drop Compensation reactance is adjustable from –24 V to +24 V in 1 V increments with a factory setting of 0 V.

```
Smart VR LDC Z
   x Volts
```

Adjustable from 0 to 24 volts in 1 volt increments.

```
Leading VAr Alarm
  xxxx kVAr
```

Adjustable from 150 to 4800 kVAr in increments of 1 with a factory setting of 300.

Figure A-8 Configuration Screens (page 7 of 8)

Configuration/Nameplate (Cont'd.)

```
Lagging VAr Alarm
  xxxx kVAr
```

Adjustable from 150 to 4800 kVAr in increments of 1 with a factory setting of 900.

```
Leading PF Alarm
  xxx PF
```

Adjustable from 0.85 to 0.99 in 0.01 increments with a factory setting of 0.99.

```
Lagging PF Alarm
  xxx PF
```

Adjustable from 0.80 to 0.98 in 0.01 increments with a factory setting of 0.95.

```
VAr/PF Alrm Time Dly
  x Sec
```

Adjustable from 0 to 3600 seconds in 1 s increments with a factory setting of 0 s.

```
Min I for PF Alarms
  xx mA
```

Adjustable from 5 to 200 mA in increments of 1 mA with a factory setting of 10. The measured Load Current must be above this Minimum Current Threshold setting for the power factor alarms to actuate. When the power factor exceeds the alarm settings for Lead or Lag and the measured Load Current is below this value, the alarm will be ignored.

Configuration/Run Through Neutral

```
Enable/Disable
disable
```

Enables and Disables the Run Through Neutral Feature.

```
Reset Success Counter
Ready Press ENTER
```

Resets the Run Through Neutral Success Counter.

```
Max Allowed Taps
x
```

The Maximum Allowed Taps Setting (3 to 7) determines the maximum number of taps that can be taken to swipe the reversing switch.

```
Taps Between Runs
xxxxx
```

This setting (10 to 10000) establishes the number of taps that must be taken before the Run Through Neutral Feature is activated.

```
Max Load Current
xx mA
```

Establishes the Maximum Measured Load current value (1 to 100 mA) that Load Current must be less than to allow the Run Through Neutral feature to activate.

```
Max RTN Standby Ops
xxxxx
```

The RTN Standby Ops setting (1 to 10000) is the number of Tap Operations that when exceeded initiates the "RTN Fail to Operate" alarm.

Figure A-8 Configuration Screens (page 8 of 8)

Communication/Comm Settings

Comm Port Type
RS485

M-6200A Comm Port can be selected for two different configurations: RS-485 or Fiber Optics.

Comm Protocol
DNP3.0

Allows selection between standard protocols, DNP3.0 or MODBUS®.

DNP Configuration
M6200A DNP DEFAULT

Displays the current DNP configuration. If no DNP configuration is present, then "File doesn't exist" will be displayed.

Src Addr Validation
disable

Enables or Disables Source Address Validation in the DNP3.0 protocol.

Substation Address
x

The Substation Address is utilized to set a specific communication identification for network addressing. If set to zero the address is not in effect. The address can be set from 1 to 65519.

Feeder Address
x

The Feeder Address is utilized to set a specific communication identification for network addressing. If set to zero the address is not in effect. The address can be set from 1 to 65519.

Comm Address
1

Configures a three-digit numerical address, from 1 to 200, for remote communications. The factory setting is 1.

Baud Rate
9600

Selects baud rate for COM1, located on the top of the control.

Parity
NONE

None, odd or even parity is available.

Stop Bits
ONE STOPBIT

One or two stop bits are available.

Sync Time
2 mS

This time delay improves robust operation when communication lines are intermittent. Communication dead-sync time is the time that the control will wait from the last received character and continue without attempting to resynchronize. Factory setting is 50 msec; range is 0-32000 msec.

Output Pulse
1.5 Sec

Adjustable from 0.2 to 12 seconds in 0.1 second increments. Factory set at 1.5 seconds.

Figure A-9 Communication Screens (page 1 of 5)

Communication/Comm Settings (Cont'd.)

```
Comm Access Security
disable
```

The Comm Access Security feature when enabled allows the user to establish Level Access security for MODBUS® communications regardless of physical connection.

```
Comm Access Timeout
   60 sec
```

Establishes the duration at which time communications will be closed with the control when no communication activity is sensed.

```
Tx Delay
   10 ms
```

Provides the means to delay transmission of a response on a serial bus (RS-232, RS-485 or Fiber Optic).

Communication/Memory Card

```
SD Quick Capture
Press ENT to begin
```

The SD Card Quick Capture feature provides the means (in one step) to initiate a save of the following data files to the inserted SD Card (if they exist on the control).

- Control Clone
- Data Logging
- Oscillography
- Sequence of Events
- DNP Map
- Multi-user Access Code
- Multi-user Access Code Log

```
Load Setpoints
Press ENT to begin
```

Provides the user with the ability to load setpoint files (Unit or Master) from a Smart Flash SD Card into the unit.

```
Save Setpoints
Press ENT to begin
```

Provides the user with the ability to save setpoint files (Unit or Master) to a Smart Flash SD Card from the unit.

```
Save Datalog
Press ENT to begin
```

Provides the user with the ability to save data log files to a Smart Flash SD Card from the unit.

```
Save seq. of events
Press ENT to begin
```

Provides the user with the ability to save Sequence of Events files to a Smart Flash SD Card from the unit.

```
Save oscillograph
Press ENT to begin
```

Provides the user with the ability to save Oscillograph files to a Smart Flash SD Card from the unit.

```
Clone save
Press ENT to begin
```

Provides the user with the ability to save the entire control settings to a Smart Flash SD Card with the exception of the serial number.

```
Clone load
Press ENT to begin
```

Provides the user with the ability to load a clone file on to a control to duplicate settings. Does not overwrite serial number of the target control.

Figure A-9 Communication Screens (page 2 of 5)

Communication/Comm Settings (Cont'd.)

```
Load DNP Config
Press ENT to begin
```

Provides the user with the ability to load DNP configuration files from an Smart Flash SD Card into the unit.

```
Save DNP Config
Press ENT to begin
```

Provides the user with the ability to save DNP configuration files from the unit.

```
DNP Config
File doesn't exist
```

If a DNP Config file is not loaded on the Smart Flash SD Card or the control this menu will display "file doesn't exist". If a file is present it will display the file name.

```
Save Metering Data
Press ENT to begin
```

Provides the user with the capability to save all metering data to a Smart Flash SD Card.

```
Firmware Update
Press ENT to begin
```

Provides the user with the ability to update the unit firmware.

Communication/Ethernet

```
DHCP Enable
ENABLE
```

Allows DHCP Protocol to be enabled or disabled.

```
IP Address
0.0.0.0
```

Either displays the assigned IP Address when DHCP is enabled or allows the IP Address to be manually assigned.

```
Net Mask
0.0.0.0
```

Either displays the assigned Net Mask when DHCP is enabled or allows the Net Mask to be manually assigned.

```
Gateway
0.0.0.0
```

Either displays the assigned Gateway when DHCP is enabled or allows the Gateway to be manually assigned.

```
Enter Modbus Port
   502
```

Allows the MODBUS® port ID to be set. Default value is "502".

```
Enter DNP Port
20000
```

Allows the DNP port ID to be set. Default value is "20000".

```
Auto Negotiation
ENABLE
```

When enabled allows the user to set the Ethernet Port to a fixed speed of 100 mbps.

Figure A-9 Communication Screens (page 3 of 6)

Communication/Ethernet (Cont.'d)

```
Keepalive Time
   120 sec
```

The Keepalive Time feature applies only to the Ethernet connection. If no communication activity is detected on a previously open Ethernet socket longer than the timeout setting the control will close the socket and make it available for connection. The setting range is from 1 to 50,000 seconds.

Communication/HMI

```
Set LCD Contrast:      E
```

Allows contrast to be adjusted from +10 (lightest) to –10 (darkest). Factory setting is 0, which provides a neutral contrast.

```
User Line 1            E
Beckwith Electric
```

Allows input of 20 ASCII characters to configure a unit locator or description. If not configured, a row of 15 asterisks will appear in top row of User Line #1 screen.

```
User Line 2            E
M-6200A
```

Allows input of 20 ASCII characters to configure a unit locator or description. If not configured, a row of 15 asterisks will appear in bottom row of User Line #2 screen.

```
Level 1 Access Code
Press ENT to change
```

Configures a six-digit alpha/numerical Access Code for Level 1. Factory setting is 000000 (disabled).

Communication/HMI (Cont'd.)

```
Level 2 Access Code
Press ENT to change
```

Configures a six-digit alpha/numerical Access Code for Level 2. Factory setting is 222222.

```
Clear Osc Records
Ready Press ENTER
```

Allows the user to clear Oscillograph records from the HMI.

```
Oscillograph Message
ENABLE
```

Feature enables or disables the OSC Triggered Message to be scrolled on the unit display when an OSC record is available.

Communication/Bluetooth

```
Bluetooth Enable
ENABLE
```

Enables or disables the Bluetooth feature when installed on the control.

```
Bluetooth Reset
Ready Press ENTER
```

Allows the user to reset the Bluetooth Module to "Beckwith" factory default settings.

```
Bluetooth Protocol
MODBUS
```

Provides the ability to select either MODBUS® or DNP3.0 protocol.

Figure A-9 Communication Screens (page 4 of 5)

Communication/Bluetooth (Cont'd.)

```
Authentication
disable
```

Enables or disables Authentication and provides the means to enter a Pass Key when set (1 to 16 characters).

```
Friendly Name
M6200A
```

Allows the user to name the unit (maximum of 32 characters).

```
Bluetooth Pass Reset
Ready Press ENTER
```

The Bluetooth Passkey can be reset to default conditions (no Passkey and Authentication Disabled) if necessary.

```
Control BT Device
XX:XX:XX:XX:XX:XX
```

Displays the Bluetooth MAC address of the control.

```
Bluetooth Mode
MODE0
```

The Bluetooth mode can be set to Mode0 in which the control is discoverable and connectable to any client station, or Mode1 in which the control is non-discoverable but is connectable to any client station that knows the control Bluetooth device address.

Communication/RS232

```
Protocol
MODBUS
```

Allows selection between standard protocols, DNP3.0 or MODBUS®.

```
Baud Rate
115200
```

Selects Baud Rate for the RS232 port.

```
Parity
NONE
```

None, odd or even parity is available.

```
Stop Bits
ONE STOPBIT
```

One or Two Stop Bits are available.

```
Sync Time
   XX mS
```

This time delay improves robust operation when communication lines are intermittent. Communication dead-sync time is the time that the control will wait from the last received character and continue without attempting to resynchronize. Factory setting is 50 msec; range is 0-32000 msec.

Figure A-9 Communication Screens (page 5 of 5)

Utilities/Calibration-Test

```
Bias Voltage
Status/Test Mode
```

When **ENT** is pressed, the control status can be checked, and a bias test voltage can be entered to test the control's automatic operation (see Chapter 6, Section 6.5, Bias Voltage Status/Test Mode, Figure 6-3).

```
Load Voltage
XXX.X Volts
```

Displays the real-time measured value of voltage at the regulator or the transformer, including the voltage reduction if applicable and any corrections made using the user-selected VT correction voltage.

```
Volt Cal Coefficient
32767 X
```

Voltage calibration factor. Requires Level 3 Access to change.

```
Volt RMS Coefficient
32767 X
```

Voltage RMS calibration factor. Requires Level 3 Access to change.

```
Control Load I
x.x  mA   Lead
```

Displays the real-time measured value of load current related to the scaling factor Current Transformer of 200 mA, 1 A or 5A.

```
Curr Cal Coefficient
32767 X
```

Current calibration factor. Requires Level 3 Access to change.

```
Power Factor
x.xxx       Lead
```

Provides the user with the real-time Power Factor value.

```
I Sin Coefficient
    0 X
```

Current Sine Coefficient calibration factor. Requires Level 3 Access to change.

```
I Cos Coefficient
   8192 X
```

Displays the PF Factor Cosine correction factor as determined by Autocal. Can also be manually set. However, Beckwith Electric does not recommend manual setting of this parameter.

```
Motor Current
x.xx  mA
```

Displays the real-time measured value of motor current.

```
Mtr Cal. Coefficient
   8192 X
```

Motor Calibration Coefficient calibration factor. Requires Level 3 Access to change.

```
Mtr Sin Coefficient
   0 X
```

Motor Sine Coefficient calibration factor. Requires Level 3 Access to change.

```
Mtr Cos Coefficient
   8192 X
```

Motor Cosine Coefficient calibration factor. Requires Level 3 Access to change.

Figure A-10 Utilities Screens (page 1 of 3)

Utilities/Calibration-Test (Cont'd.)

```
Mtr RMS Coefficient
   8192 X
```

Motor RMS Coefficient calibration factor. Requires Level 3 Access to change.

```
LED Scroll Test
Press ENT to begin
```

Momentarily illuminates each LED on the control panel. Push EXIT to stop.

```
Input Test
Press ENT to Begin
```

Provides the means to test all external inputs to the control.

```
Output Test
Press ENT to test
```

Provides the means to test all outputs from the control.

```
Button Input Test
Press ENT to Begin
```

Provides the means to verify proper operation of each front panel pushbutton from the HMI.

```
Change Src Input
press ENTER.
```

Pressing Enter will cause the source side PT voltage to be measured instead of being calculated. The second line on the LCD screen will display

Measured XXXXX V

Pressing Enter will toggle to the calculated source side voltage and the second line on the LCD screen will display

Calculated XXXX V

```
Watchdog resets: 0
Total resets: xx
```

This shows the total number of watchdog resets and total resets which include Power down and watchdog resets.

```
Clear reset counters
Press ENT to begin
```

This clears Watchdog Resets and Total Resets counters.

```
X1 Duration (or Motor Seal-in Pulse)
0 ms,     Avg: 0 ms
```

When the Operation Counter is configured as X1, the X1 duration is the instantaneous measure of the X1 pulse generated by the counter contact switch. It also displays the average X1 pulse duration over the last 8 tap operations. The user can use this measurement to set the X mode Delay.

When the Operation Counter is configured as Motor Seal-In, the LCD will then display "Motor Seal-In Pulse" and the values indicate the instantaneous and the average (over the last 8 tap operations) duration of the Motor Current Pulse.

```
Language Selection
English
```

Allows the user to select English or Spanish version of HMI menus.

Figure A-10 Utilities Screens (page 2 of 3)

Utilities/About

```
Serial Number
XXXXX
```

Displays the unit serial number.

```
Firmware Version
D-0228V01.05.03
```

Displays the firmware version that is loaded onto the control.

```
EE Checksum
XXXXXX
```

Displays EE Prom Checksum value.

Figure A-10 Utilities Screens (page 3 of 3)

B Appendix
Setpoint, Configuration and Communication Record Forms

Tapchanger Type

Regulator

❏ Type A [Type A] ❏ Type B

Regulator Vendor

❏ Default [Default] ❏ Siemens ❏ Howard

❏ General Electric ❏ Cooper Spring Drive ❏ Cooper Direct Drive

❏ Cooper QD-3 ❏ Cooper QD-5 ❏ Cooper QD-8

Tap Settings

Tap Information ❏ Disabled [Disabled] ❏ Regulate Internal (Motor Direct Drive KeepTrack™)

Intertap Delay	0 to 60 (sec) [0]	(_____)
Motor Seal-in Current Pickup	100 to 300 (mA) [250]	(_____)
Motor Seal-in Current Dropout	50 to 280 (mA) [240]	(_____)
Motor Seal-in Current Pickup Minimum Duration	20 to 3000 (ms) [35]	(_____)
X Mode Delay	0 to 3000 (ms) [10]	(_____)

Operation Counter

Configuration ❏ X1 [X1] ❏ X2 ❏ Count Window ❏ Motor Seal-In

Raise/Lower Output Contacts

❏ Continuous [Continuous] ❏ Pulsed

Pulse Width 0.2 to 12.0 (sec) [1.0] (_____)

Write SOE Seal-in Triggers

❏ Yes [Yes] ❏ No

■ **NOTE**: [ ] Default Setting

Figure B-1 Tapchanger Type Record Form

Setpoints

Forward Power

Band Center	100.0 to 135.0 (V) [120.0]	(_____)
Band Width	1.0 to 10.0 (V) [2.0]	(_____)
Definite Time	1 to 360 (sec) [30]	(_____)
LDC-Z	0 to 24 (V) [0]	(_____)
LDC Resistance	–24 to +24 (V) [0]	(_____)
LDC Reactance	–24 to +24 (V) [0]	(_____)

Reverse Power

Operation

❑ Block [Block] ❑ Regulate Forward (Ignore)
❑ Regulate Reverse ❑ Return to Neutral
❑ Regulate Reverse (Measured) ❑ Distributed Generation
❑ Auto Determination ❑ Auto Determination (Measured)

Band Center	100.0 to 135.0 (V [120.0]	(_____)
Band Width	1.0 to 10.0 (V) [2.0]	(_____)
Definite Time	1 to 360 (sec) [30]	(_____)
LDC-Z	0 to 24 (V) [0]	(_____)
LDC Resistance	–24 to +24 (V) [0]	(_____)
LDC Reactance	–24 to +24 (V) [0]	(_____)

General

Line Drop Compensation	❑ R, X [R,X]		❑ Z
Time Delay Selection	❑ Definite Time [Definite Time]		❑ Inverse Time
Basic Timer Type	❑ Integrating [Integrating]		❑ Instant Reset
Power Direction Bias	❑ None [None]	❑ Forward	❑ Reverse

■ **NOTE**: [ ] Default Setting

Figure B-2 Setpoints Record Form (1 of 2)

Setpoints (Cont'd)

Voltage Reduction ❑ Disable ❑ Enable [Enable]

Step 1	0.0 to 10.0 (%) of Bandcenter Setpoint [2.5]	(_____)
Step 2	0.0 to 10.0 (%) of Bandcenter Setpoint [5.0]	(_____)
Step 3	0.0 to 10.0 (%) of Bandcenter Setpoint [7.5]	(_____)

Limit and Runback

Block Raise	95.0 to 135.0 (V) [128.0]	(_____)
Block Lower	95.0 to 135.0 (V) [114.0]	(_____)
Dead Band	1.0 to 4.0 (V) [2.0]	(_____)
Current Limit	50 to 640 (mA) [640]	(_____)

■ **NOTE**: [ ] Default Setting

Figure B-2 Setpoints Record Form (2 of 2)

Configuration

Primary

Voltage Multiplier	0.1 to 3260.0 (X) [60.0]	(_____)
Voltage Source Multiplier	0.1 to 3260.0 (X) [60.0]	(_____)
Current Multiplier	1 to 32600 (X) [6000]	(_____)

VT/CT (P2)

VT Correction	–15.0 to +15.0 (V) [0.0]	(_____)
CT/VT Phasing	❑ 0 degree [0 degree]	❑ 30 degrees
	❑ 60 degrees	❑ 90 degrees
	❑ 120 degrees	❑ 150 degrees
	❑ 180 degrees	❑ 210 degrees
	❑ 240 degrees	❑ 270 degrees
	❑ 300 degrees	❑ 330 degrees
Normalizing Voltage Multiplier	0.80 to 1.20 (X) [1.00]	(_____)

VT/CT Source (U2)

VT Source Correction	–15.0 to +15.0 (V) [0.0]	(_____)
CT/VT Source Phasing	❑ 0 degree [0 degree]	❑ 30 degrees
	❑ 60 degrees	❑ 90 degrees
	❑ 120 degrees	❑ 150 degrees
	❑ 180 degrees	❑ 210 degrees
	❑ 240 degrees	❑ 270 degrees
	❑ 300 degrees	❑ 330 degrees

VarBias

	❑ Disable [Disable]	❑ Enable
Max Capacitor Bank Size	4 to 12000 (KVAr) [12000]	(_____)
Lead % Bank Size Pickup	10 to 100% [75]	(_____)
Lag % Bank Size Pickup	10 to 100% [75]	(_____)
VAr Bias Voltage Step	0.1 to 2.0 (V) [1.0]	(_____)
Max VAr Bias Duration	10 to 1440 (min) [300]	(_____)

■ **NOTE**: [ ] Default Setting

Figure B-3 Configuration Record Form (1 of 3)

Configuration (Cont'd)

Raise/Lower Output Contacts

	❑ Continuous [Continuous]	❑ Pulsed
Pulse Width	0.2 to 12.0 (sec) [1.5]	(_____)

Regulator

	❑ Type A [Type A]	❑ Type B

Motor Current Settings

Peak Rms Current	10 to 200 (%) [110]	(_____)
Average Rms Current	10 to 200 (%) [110]	(_____)
Average Duration	10 to 200 (%) [110]	(_____)

Voltage Reduction (VR)

Standard Voltage Reduction	❑ Disable	❑ Enable [Enable]
Smart Voltage Reduction	❑ Disable [Disable]	❑ Enable
Smart VR LDC	❑ Disable [Disable]	❑ Enable
Smart VR LDC Resistance	–24 to +24 (V) [0]	(_____)
Smart VR LDC Reactance	–24 to +24 (V) [0]	(_____)
Smart VR LDC-Z	0 to 24 (V) [0]	(_____)
VR Turnoff Timer	0 to 999 (Min) [0]	(_____)
Save VR at Power Off	❑ Don't Save [Don't Save]	❑ Save

VAr and Power Factor Alarm Settings

Leading VAr Alarm	150 to 4800 (kVAr) [300]	(_____)
Lagging VAr Alarm	150 to 4800 (kVAr) [900]	(_____)
Leading Power Factor Alarm	0.85 to 0.99 (PF) [0.99]	(_____)
Lagging Power Factor Alarm	0.80 to 0.98 (PF) [0.95]	(_____)
VAr/PF Alarm Time Delay	0 to 3600 (Sec) [0]	(_____)
Min Current for PF Alarms	5 to 200 (mA) [10]	(_____)

■ **NOTE**: [ ] Default Setting

Figure B-3 Configuration Record Form (2 of 3)

Configuration (Cont'd)

Input Selection

❏ VR2 [VR2] ❏ Aux

Low Current Block

❏ Disable [Disable] ❏ Enable

Save Comm Block at Power Off

❏ Don't Save [Don't Save] ❏ Save

SCAMP Initialize on Power Up (when purchased)

❏ Last Save [Last Save] ❏ Auto Mode

Run Through Neutral

❏ Disable [Disable] ❏ Enable

Maximum Allowed Taps	3 to 7 [4]	(_____)
Tap Operations Between Runs	10 to 10000 [1000]	(_____)
Maximum Load Current	1 to 100 (mA) [50]	(_____)
Maximum RTN Standby Operations	1 to 10000 [20]	(_____)

Figure B-3 Configuration Record Form (3 of 3)

Tap Settings

General

Tap Information	❑ Disabled	❑ Regulate Internal (Motor Direct Drive KeepTrack™) [Regulate Internal (Motor Direct Drive KeepTrack)]	
Intertap Delay		0 to 60 (sec) [0]	(_____)

Tap Limits

❑ Disable [Disable] ❑ Enable

Block Raise	–12 to +16 (Raise) [+16]	(_____)
Block Lower	–16 to +12 (Lower) [–16]	(_____)

Operation Counter

Configuration ❑ X1 [X1] ❑ X2 ❑ Count Window ❑ Motor Seal-In

X Mode Delay	0 to 3000 (mS) [10]	(_____)
Motor Seal-in Delay	0 to 3000 (mS) [10]	(_____)
Count Window	0.5 to 60.5 (sec) [1.0]	(_____)
Preset	0 to 999999 [0]	(_____)
Predictive Maintenance Alarm	0 to 999999 [0]	(_____)
Neutral Switch Counter	0 to 999999 [0]	(_____)

Motor Seal-in Settings

Motor Seal-in Failure Block ❑ Disable ❑ Enable [Enabled when Motor Seal-in is selected]

Motor Seal-in Current Pickup	100 to 300 (mA) [250]	(_____)
Motor Seal-in Current Dropout	50 to 280 (mA) [240]	(_____)
Motor Seal-in Current Pickup Minimum Duration	20 to 3000 (mS) [35]	(_____)

■ **NOTE**: [ ] Default Setting

Figure B-4 Tap Settings Record Form (1 of 2)

Tap Settings

Drag Hands

	Lower [0]	(_____)
	Raise [0]	(_____)

Tap Statistics

Maximum Tap Wear	1 to 65534 [65534]	(_____)
Individual Tap Wear Alarm	1 to 200% [100%]	(_____)

Tap Calibration

■**NOTE**: Set to match actual tap position as read on the physical tap position indicator.

Tap Position	–16 to +16 (Neutral) [0]	(_____)

Tap Calibrate ❑ Yes ❑ No [No]

■**NOTE**: [ ] Default Setting

Figure B-4 Tap Settings Record Form (2 of 2)

Alarms

Programmable Alarm Relay (☑ Default Selection)

- ❑ Comm Block
- ☑ Block Raise (Tap)
- ☑ Block Lower (Tap)
- ☑ Block Raise (Volt)
- ☑ Block Lower (Volt)
- ❑ Abnormal Tap Position
- ❑ Backup Power Fail
- ❑ RTN Fail to Operate
- ❑ Individual Tap Wear Alarm
- ❑ Lagging VAr
- ❑ Lagging Power Factor
- ❑ LDC/LDZ
- ☑ Line Current Limit
- ❑ Reverse Power
- ❑ Self Test
- ❑ Voltage Reduction
- ☑ Max VAr Bias Duration-Lead
- ☑ Max VAr Bias Duration-Lag
- ❑ Op Count Signal
- ❑ Leading VAr
- ❑ Leading Power Factor

Wakeup Screens

- ❑ Load Voltage
- ❑ Source Voltage
- ❑ Load Current
- ❑ Compensated Voltage
- ❑ Primary Voltage
- ❑ Primary Current
- ❑ Primary Watts
- ❑ Primary VArs
- ❑ Primary VA
- ❑ Power Factor
- ❑ Frequency
- ❑ Voltage % THD
- ❑ Current % THD
- ❑ Tap Position
- ❑ Tap Drag Hands
- ❑ Operation Counter
- ❑ Resettable Op Counter
- ❑ Demand Load Voltage
- ❑ Demand Primary Current
- ❑ Demand Primary Watts
- ❑ Demand Primary VArs
- ❑ Demand Primary VA
- ❑ Energy Metering Watt Hrs Fwd
- ❑ Energy Metering Watt Hrs Rev
- ❑ Energy Metering VAr Hrs Lag
- ❑ Energy Metering VAr Hrs Lead
- ❑ Minimum Load Voltage
- ❑ Maximum Load Voltage
- ❑ Minimum Primary Current
- ❑ Maximum Primary Current
- ❑ Minimum Primary Watts
- ❑ Minimum Primary VArs
- ❑ Maximum Primary VArs
- ❑ Minimum Primary VA
- ❑ Maximum Primary VA
- ❑ Power Factor @Minimum VA
- ❑ Power Factor @Maximum VA
- ❑ Lag Power Factor
- ❑ Lead Power Factor
- ❑ Peak Motor Current
- ❑ Normalizing Voltage
- ❑ Meter Out Voltage
- ❑ Min Source Voltage
- ❑ Max Source Voltage
- ❑ Time and Date

Data Logging

Logging Timer

Sampling Period	0 to 120 (minute) [5]	(_____)
Duration	[451 Day 09:20:00]	(_____)

■ **NOTE**: [ ] Default Setting

Figure B-5 Alarms, Wakeup Screens and Data Logging Record Form

Harmonics Setup

Voltage Harmonics Selection (☑ Default Selection)

☑ 2nd ☑ 3rd ☑ 4th ☑ 5th ☑ 6th ☑ 7th ☑ 8th ☑ 9th

☑ 10th ☑ 11th ☑ 12th ☑ 13th ☑ 14th ☑ 15th ❑ 16th ☑ 17th

❑ 18th ☑ 19th ❑ 20th ☑ 21st ❑ 22nd ☑ 23rd ❑ 24th ❑ 25th

❑ 26th ❑ 27th ❑ 28th ❑ 29th ❑ 30th ❑ 31st

Voltage Alarm Threshold V Percent 0.0 to 30.0 % [0.0] (_____)

Current Harmonics Selection (☑ Default Selection)

☑ 2nd ☑ 3rd ☑ 4th ☑ 5th ☑ 6th ☑ 7th ☑ 8th ☑ 9th

☑ 10th ☑ 11th ☑ 12th ☑ 13th ☑ 14th ☑ 15th ❑ 16th ❑ 17th

❑ 18th ☑ 19th ❑ 20th ☑ 21st ❑ 22nd ❑ 23rd ❑ 24th ❑ 25th

❑ 26th ❑ 27th ❑ 28th ❑ 29th ❑ 30th ❑ 31st

Current Alarm Threshold I Percent 0 to 100 % [10] (_____)

Minimum Fundamental Current Threshold ❑ Disable ❑ Enable [Enable]

Min Fund I Threshold 0 to 200 mA [20] (_____)

Delay 1 to 10 Sec. [10] (_____)

■**NOTE**: [ ] Default Setting

Figure B-6 Harmonics Setup Record Form

Oscillograph Setup

Number of Partitions	1 to 16 [5]	(_____)
Samples/Cycle	16, 32, 64 [32]	(_____)
Post Trigger Delay	5 to 95 % [50]	(_____)
Front Panel Message	❑ Enable [Enable]	❑ Disable

Pickup (☑ Default Selection)

❑ Raise Contact	❑ Lower Contact	❑ VR Contact 1	❑ VR Contact 2
❑ Force Lower (Runback)	❑ Raise Tap Limit	❑ Lower Tap Limit	❑ Low Band
❑ High Band	☑ Low Voltage Limit	☑ High Voltage Limit	❑ Auto Inhibit
❑ Non Sequential	❑ Reverse Power	❑ Peak Motor Current	☑ Avg. Motor Curent
☑ Motor Current Duration	❑ Voltage Harmonics	❑ Current Harmonics	☑ CBEMA 1
☑ CBEMA 2	☑ CBEMA 3	☑ CBEMA 4	❑ VAr Bias Active
❑ Low Current Blk Active	☑ Sealin Fail Alarm Active	☑ Sealin Fail Low Blk Act.	☑ Sealin Fail Raise Blk Act.
❑ Neutral Input	❑ Counter Input	❑ Sealin Active Trigger	❑ Op Count Signal
❑ Individual Tap Wear Alrm	❑ Leading VAr Alrm Active	❑ Lagging VAr Alarm Active	❑ Leading PF Alarm Active
❑ Lagging PF Alarm Active			

Dropout

❑ Raise Contact	❑ Lower Contact	❑ VR Contact 1	❑ VR Contact 2
❑ Force Lower (Runback)	❑ Raise Tap Limit	❑ Lower Tap Limit	❑ Low Band
❑ High Band	❑ Low Voltage Limit	❑ High Voltage Limit	❑ Auto Inhibit
❑ Non Sequential	❑ Reverse Power	❑ Voltage Harmonics	❑ Current Harmonics
❑ CBEMA 1	❑ CBEMA 2	❑ CBEMA 3	❑ CBEMA 4
❑ VAr Bias Active	❑ Low Current Blk Act.	❑ Sealin Fail Alarm Act.	❑ Sealin Fail Low Blk Act.
❑ Sealin Fail Raise Blk Act			
❑ Neutral Input	❑ Counter Input	❑ Sealin Active Trigger	❑ Op Count Signal
❑ Individual Tap Wear Alrm	❑ Leading VAr Alrm Active	❑ Lagging VAr Alarm Active	❑ Leading PF Alarm Active
❑ Lagging PF Alarm Active			

■**NOTE**: [ ] Default Setting

Figure B-7 Oscillograph Setup Record Form

Sequence Of Events Setup

OR Gate Setup

Pickup (Edge Sensitive) **(☑ Default Selection)**

❑ Raise Contact	❑ Lower Contact	❑ VR Contact 1	❑ VR Contact 2
☑ Force Lower (Runback)	☑ Raise Tap Limit	☑ Lower Tap Limit	❑ Low Band
❑ High Band	☑ Low Voltage Limit	☑ High Voltage Limit	☑ Auto Inhibit
❑ Non Sequential	☑ Reverse Power	☑ Peak Motor Current	☑ Avg. Motor Curent
☑ Motor Current Duration	❑ Voltage Harmonics	❑ Current Harmonics	☑ CBEMA Event 1
☑ CBEMA Event 2	☑ CBEMA Event 3	☑ CBEMA Event 4	☑ VAr Bias Active
☑ Low Current Blk Active	☑ Sealin Fail Alarm Active	☑ Sealin Fail Low Blk Act.	☑ Sealin Fail Raise Blk Act.
❑ Neutral Input	❑ Counter Input	❑ Sealin Active Trigger	❑ Op Count Signal
❑ Individual Tap Wear Alarm	❑ Leading VAr Alrm Active	❑ Lagging VAr Alarm Active	❑ Leading PF Alarm Active
❑ Lagging PF Alarm Active	❑ HMI Active		

Dropout (Edge Sensitive) **(☑ Default Selection)**

❑ Raise Contact	❑ Lower Contact	❑ VR Contact 1	❑ VR Contact 2
☑ Force Lower (Runback)	☑ Raise Tap Limit	☑ Lower Tap Limit	❑ Low Band
❑ High Band	☑ Low Voltage Limit	☑ High Voltage Limit	☑ Auto Inhibit
❑ Non Sequential	☑ Reverse Power	❑ Voltage Harmonics	❑ Current Harmonics
❑ CBEMA Event 1	☑ CBEMA Event 2	❑ CBEMA Event 3	❑ CBEMA Event 4
☑ VAr Bias Active	❑ Low Current Blk Active	❑ Sealin Fail Alarm Active	❑ Sealin Fail Low Blk Act.
❑ Sealin Fail Raise Blk Act.			
❑ Neutral Input	❑ Counter Input	❑ Sealin Active Trigger	❑ Op Count Signal
❑ Individual Tap Wear Alarm	❑ Leading VAr Alrm Active	❑ Lagging VAr Alarm Active	❑ Leading PF Alarm Active
❑ Lagging PF Alarm Active	❑ HMI Active		

■**NOTE**: [ ] Default Setting

Figure B-8 Sequence of Events Setup Record Form (1 of 2)

Sequence Of Events Setup

AND Gate Setup

Pickup (Level Sensitive)

❏ Raise Contact	❏ Lower Contact	❏ VR Contact 1	❏ VR Contact 2
❏ Force Lower (Runback)	❏ Raise Tap Limit	❏ Lower Tap Limit	❏ Low Band
❏ High Band	❏ Low Voltage Limit	❏ High Voltage Limit	❏ Auto Inhibit
❏ Non Sequential	❏ Reverse Power	❏ Peak Motor Current	❏ Avg. Motor Curent
❏ Motor Current Duration	❏ Voltage Harmonics	❏ Current Harmonics	❏ CBEMA Event 1
❏ CBEMA Event 2	❏ CBEMA Event 3	❏ CBEMA Event 4	❏ VAr Bias Active
❏ Low Current Blk Active	❏ Sealin Fail Alarm Active	❏ Sealin Fail Low Blk Act.	❏ Sealin Fail Raise Blk Act.
❏ Neutral Input	❏ Counter Input	❏ Sealin Active Trigger	❏ Op Count Signal
❏ Individual Tap Wear Alarm	❏ Leading VAr Alrm Active	❏ Lagging VAr Alarm Active	❏ Leading PF Alarm Active
❏ Lagging PF Alarm Active	❏ HMI Active		

Dropout (Level Sensitive)

❏ Raise Contact	❏ Lower Contact	❏ VR Contact 1	❏ VR Contact 2
❏ Force Lower (Runback)	❏ Raise Tap Limit	❏ Lower Tap Limit	❏ Low Band
❏ High Band	❏ Low Voltage Limit	❏ High Voltage Limit	❏ Auto Inhibit
❏ Non Sequential	❏ Reverse Power	❏ Voltage Harmonics	❏ Current Harmonics
❏ CBEMA Event 1	❏ CBEMA Event 2	❏ CBEMA Event 3	❏ CBEMA Event 4
❏ VAr Bias Active	❏ Low Current Blk Active	❏ Sealin Fail Alarm Active	❏ Sealin Fail Low Blk Act.
❏ Sealin Fail Raise Blk Act.			
❏ Neutral Input	❏ Counter Input	❏ Sealin Active Trigger	❏ Op Count Signal
❏ Individual Tap Wear Alarm	❏ Leading VAr Alrm Active	❏ Lagging VAr Alarm Active	❏ Leading PF Alarm Active
❏ Lagging PF Alarm Active	❏ HMI Active		

SOE Final Gate ❏ OR [OR] ❏ And

■**NOTE**: [ ] Default Setting

Figure B-8 Sequence of Events Setup Record Form (2 of 2)

CBEMA Settings			
Normal Voltage	100.0 to 130.0 V [120.0]	(_____)	
CBEMA Event 1	❑ Disable ❑ Enable [Enable]		
SAG Pickup	50 to 130% [60]	(_____)	
SAG Dropout	61 to 130% [95]	(_____)	
SAG Minimum Duration	1 to 60 Cycles [1]	(_____)	(16.67 msec)
CBEMA Event 2	❑ Disable ❑ Enable [Enable]		
SAG Pickup	50 to 130% [70]	(_____)	
SAG Dropout	71 to 130% [95]	(_____)	
SAG Minimum Duration	1 to 120 Cycles [1]	(_____)	(16.67 msec)
CBEMA Event 3	❑ Disable ❑ Enable [Enable]		
SAG Pickup	50 to 130% [80]	(_____)	
SAG Dropout	81 to 130% [95]	(_____)	
SAG Minimum Duration	60 to 60000 Cycles [60]	(_____)	(1.00 msec)
CBEMA Event 4	❑ Disable ❑ Enable [Enable]		
SAG Pickup	50 to 130% [115]	(_____)	
SAG Dropout	50 to 114% [105]	(_____)	
SAG Minimum Duration	1 to 60 Cycles [1]	(_____)	(16.67 msec)

■**NOTE**: [ ] Default Setting

Figure B-9 CBEMA Settings Record Form

Comm Settings

Ethernet

Auto Negotiation	❏ Disable	❏ Enable [Enable]	
DHCP Protocol	❏ Disable	❏ Enable [Enable]	
IP Address	[0.0.0.0]		(_____)
Net Mask	[0.0.0.0]		(_____)
Gateway	[0.0.0.0]		(_____)
Keepalive Time	1 to 50,000 (Sec) [120]		(_____)
Port			
MODBUS Port	0 to 65,535 [502]		(_____)
DNP3.0 Port	0 to 65,535 [20000]		(_____)

Bluetooth®

Protocol	❏ MODBUS® [MODBUS]	❏ DNP3
Friendly Name [M6200A]	(_____)	
❏ Bluetooth Enable [Enable]	❏ Bluetooth Disable	
❏ Enable Authentication	❏ Disable Authentication [disable]	
Bluetooth Passkey	(_____)	
Bluetooth Device Address	(_____)	
Bluetooth Mode	❏ Mode 0 [Mode 0]	❏ Mode 1

■**NOTE**: [ ] Default Setting

Figure B-10 Comm Settings Record Form (page 1 of 2)

Comm Settings (Cont'd)

RS485/Fiber

Comm Port Type	❑ RS485 [RS485]		❑ Fiber
Protocol	❑ DNP3 [DNP3]		❑ MODBUS
Baud Rate	❑ 300		❑ 600
	❑ 1200		❑ 2400
	❑ 4800		❑ 9600 [9600]
	❑ 19200		❑ 38400
	❑ 57600		❑ 115200
Parity	❑ NONE [NONE]	❑ EVEN	❑ ODD
Stop Bit	❑ 1 [1]	❑ 2	
Sync Time	1 to 5000 [2] max 5000ms	(_____)	
Tx Delay	1 to 50 [10] max 50 ms	(_____)	

Serial RS232

Protocol	❑ MODBUS [MODBUS]		❑ DNP3
Baud Rate	❑ 300		❑ 600
	❑ 1200		❑ 2400
	❑ 4800		❑ 9600
	❑ 19200		❑ 38400
	❑ 57600		❑ 115200 [115200]
Parity	❑ NONE [NONE]	❑ EVEN	❑ ODD
Stop Bit	❑ 1 [1]	❑ 2	
Sync Time	1 to 5000 [50] max 5000ms	(_____)	

■**NOTE**: [ ] Default Setting

Figure B-10 Comm Settings Record Form (page 2 of 2)

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C Appendix
Utilizing the DNP Configuration Editor

The DNP Configuration Editor includes the following features and functions (Figure C-1):

Variations – The variation of an object gives a different representation of the same data point, such as the size of the object or whether or not the object has flag information. Accordingly, the **Variations** section will configure listed objects with the desired and supported variations.

Master Address used for Unsolicited responses and/or Source Address Validation – This address will be used as the address to send unsolicited responses and/or Source Address Validation.

Modem Unsolicit Setting – Applies to RS-232 interface connected to an Ethernet Modem. TCP/IP and UDP/IP unsolicit settings are used when DNP is being deployed over an Ethernet network. The setting elements are described below:

- Allow Unsolicit: Determines whether unsolicited null responses will be sent when session comes online. If enabled, subsequent unsolicited responses will be enabled through function code 0x14 (Enable unsolicited responses) and disabled through function code 0x15 (Disable unsolicited responses). If "Allow Unsolicit" is disabled, then function codes 0x14 and 0x15 will be responded to with an error.
- Class 1 Max Delay (Sec): If unsolicited responses are enabled, this parameter specifies the maximum amount of time after an event in the corresponding class is received before an unsolicited response will be generated.
- Class 1 Max Events: If unsolicited responses are enabled, the parameter specifies the maximum number of events in the corresponding class to be allowed before an unsolicited response will be generated.
- Class 2 Max Delay (Sec): If unsolicited responses are enabled, this parameter specifies the maximum amount of time after an event in the corresponding class is received before an unsolicited response will be generated.
- Class 2 Max Events: If unsolicited responses are enabled, the parameter specifies the maximum number of events in the corresponding class to be allowed before an unsolicited response will be generated.

Choosing Points – The Available Points window is populated when a DNP source file is opened. The selection of points from the Binary Inputs, Analog Inputs, Binary/Control Outputs and Analog Outputs tabs can be accomplished by either individually selecting, dragging and dropping points in the Selected Points window or utilizing the "Copy All" feature. The Copy All feature only copies the points in the open tab to the Selected Points window. The "Remove All" feature removes all the points displayed in the Selected Points window for the tab that is open.

M-6200 DNP Configuration Editor

Load Template | Load File | Save File | Send File to Control | Print | Print Preview

File Identifier: M-6200A

Variations

Binary Inputs	1	Analog Inputs	2	Binary Counter	1
Binary Events	2	Analog Events	2	Counter Events	1
Binary Outputs	2	Analog Outputs	2	Frozen Counter	1

Master Address used for Unsolicited responses and/or Source Address Validation: 1

Select Before Operate Timeout(sec): 20

Modem Unsolicit Settings		TCP/IP Unsolicit Settings		UDP/IP Unsolicit Settings	
Allow Unsolicit	Enable	Allow Unsolicit	Enable	Allow Unsolicit	Enable
Class 1 Max Delay(Sec)	5	Class 1 Max Delay(sec)	5	Class 1 Max Delay(sec)	5
Class 1 Max Events	5	Class 1 Max Events	5	Class 1 Max Events	5
Class 2 Max Delay(sec)	5	Class 2 Max Delay(sec)	5	Class 2 Max Delay(sec)	5
Class 2 Max Events	5	Class 2 Max Events	5	Class 2 Max Events	5

Binary Inputs | Analog Inputs | Binary/Control Outputs | Analog Outputs | Counters | DNP Security

Search

Available Points

Ind...	Name	Value	Mask
0	Raise Output Status	TRUE	CLASS_C
1	Lower Output Status	TRUE	CLASS_C
2	VR Contact Input 1	TRUE	CLASS_C
3	VR Contact Input 2	TRUE	CLASS_C
4	Force Lower (Over-Volta...	TRUE	CLASS_C
5	Seal-in	TRUE	CLASS_C
6	Neutral Tap	TRUE	CLASS_C
7	Block Lower: Tap	TRUE	CLASS_C
8	Block Raise: Tap	TRUE	CLASS_C
9	Power Flow Direction	TRUE	CLASS_C
10	Rev Pwr Flow Block in Ef...	TRUE	CLASS_C
11	In-band Annunciator	TRUE	CLASS_C
12	Low-band Edge Annunci...	TRUE	CLASS_C
13	High-band Edge Annunc...	TRUE	CLASS_C
14	Block Lower: Voltage	TRUE	CLASS_C

Selected Points

In...	Name	Value	Mask
0	Raise Output Status	TRUE	CLASS_ONE
1	Lower Output Status	TRUE	CLASS_ONE
2	VR Contact Input 1	TRUE	CLASS_ONE
3	VR Contact Input 2	TRUE	CLASS_ONE
4	Force Lower (Over-...	TRUE	CLASS_ONE
5	Seal-in	TRUE	CLASS_ONE
6	Neutral Tap	TRUE	CLASS_ONE
7	Block Lower: Tap	TRUE	CLASS_ONE
8	Block Raise: Tap	TRUE	CLASS_ONE
9	Power Flow Directi...	TRUE	CLASS_ONE
10	Rev Pwr Flow Bloc...	TRUE	CLASS_ONE
11	In-band Annunciator	TRUE	CLASS_ONE
12	Low-band Edge An...	TRUE	CLASS_ONE
13	High-band Edge A...	TRUE	CLASS_ONE
14	Block Lower: Volta...	TRUE	CLASS_ONE
15	Block Raise: Volta...	TRUE	CLASS_ONE

Copy All | Remove All | Insert Dummy Point | Insert Offset Point | Create DNP3 Device Profile

Tooltip Note: * Indicates points are to be grouped together.

Figure C-1 DNP Configuration Editor Dialog Screen

Ordering Selected Points – Selected points can be reordered to match the users SCADA, RTU or Master setup by selecting, dragging and dropping the desired point within the Selected Points window.

Adding Dummy Points – The purpose of the Dummy Point is to allow the user to match other device DNP maps that contain points that are not supported in the control. This feature allows the user to communicate with the M-6200A control when it is connected to an RTU that contains other brands of controls and eliminates the need to re-configure the RTU or the other controls.

To insert a Dummy point, select "Insert Dummy". The Dummy Point will be inserted at the end of the Selected Points list. To move the Dummy Point, select, drag and drop the point at the desired location in the Selected Points list. The Dummy point will assume the Index Position and the remaining Selected Points will be modified to accommodate the Dummy Point.

Insert Offset – This allows an offset to be created in the DNP map without the point number being transmitted, thus providing the ability to construct a DNP profile that has non-consecutive point numbers within a group.

Additional Mask Values – Four new mask categories have been added.

CLASS_NONE: If a point is defined as CLASS_NONE, then it will not be sent during any CLASS polling although the point is present in the DNP map. The only mean to access this point is by querying the point individually.

CLASS_ONE_NOTCLASS0: If a point is defined as CLASS_ONE_NOTCLASS0, it will be present in a CLASS 1 poll but not an integrity CLASS 0 poll.

CLASS_TWO_NOTCLASS0: If a point is defined as CLASS_TWO_NOTCLASS0, it will be present in a CLASS 2 poll but not an integrity CLASS 0 poll.

CLASS_THREE_NOTCLASS0: If a point is defined as CLASS_THREE_NOTCLASS0, it will be present in a CLASS 3 poll but not an integrity CLASS 0 poll.

Editing Binary Input Points – The Binary Input "Value" and "Mask" values can be edited by double left clicking on the desired point Value or Mask elements. The default value for Value is TRUE, which means that the point will return a High or True when the item being monitored is active in the control. It can be changed to "FALSE" to match a SCADA Master if necessary. The "Mask" value defaults to "CLASS ONE" and defines what polling class type the point is mapped to. The Mask value can also be set to CLASS TWO, CLASS THREE, CLASS NONE, CLASS ONE NOT CLASS 0, CLASS TWO NOT CLASS 0 or CLASS THREE NOT CLASS 0 by double left clicking on the desired point Mask element.

Editing Analog Input Points – The Analog Input "Deadband" and "Mask" values can be edited by double left clicking on the desired point Deadband or Mask elements. The Deadband can be set to define when the point will report by exception under the class type in the Mask setting. When the point change exceeds the deadband value, it will initiate a report by exception to the master. The "Mask" value defaults to "CLASS TWO" and defines what polling class type the point is mapped to. The Mask value can also be set to CLASS ONE, CLASS THREE, CLASS NONE, CLASS ONE NOT CLASS 0, CLASS TWO NOT CLASS 0 or CLASS THREE NOT CLASS 0 by double left clicking on the desired point Mask element.

Editing Binary/Control Output Points – The Binary/Control Output Point "Crob", "Mask" and "Inverse" values can be edited by double left clicking on the desired point Crob, Mask or Inverse elements. The Crob (Control Relay Output Block) setting is used to define what control method will be used to operate the point. The possible settings for "Crob" are listed below:

- Latch On
- Latch Off
- Latch OnOff
- Latch OnOff_TC
- Pulse On
- Pulse Off
- Pulse OnOff
- Pulse OnOff_TC
- Paired Close
- Paired Trip
- Paired TripClose

The "Mask" value defaults to "CLASS ZERO" and defines what polling class type the point is mapped to. The Mask value can also be set to CLASS NONE by double left clicking on the desired point Mask element.

Inverse defines whether the command to be sent would be inverted, meaning that when TRUE is selected, sending a Trip, Close, etc will have the opposite effect. This was implemented due to variations seen in RTU manufacturer's implementation of direct control with DNP to allow full compatibility the widest possible number of RTU's.

The Binary/Control Outputs Tab includes a help selection. When selected TapTalk® will launch two pdf documents (Figures C-6 and C-7) which provide an explanation of each individual Binary point with respect to different CROB.

Editing Analog Output Points – The Analog Output "Mask" value can be edited by double left clicking on the desired point Mask element. The "Mask" value defaults to "CLASS ZERO" and defines what polling class type the point is mapped to. The Mask value can also be set to CLASS NONE by double left clicking on the desired point Mask element.

Editing Counters – The Counters "Mask" value can be edited by double left clicking on the desired point Mask element. The "Mask" value defaults to "CLASS THREE" and defines what polling class type the point is mapped to. The Mask value can also be set to CLASS ONE, CLASS TWO, CLASS NONE, CLASS ONE NOT CLASS 0, CLASS TWO NOT CLASS 0 or CLASS THREE NOT CLASS 0 by double left clicking on the desired point Mask element.

■**NOTE**: For security reason, DNP Security tab will only be active when TapTalk is connected to a control with an Access Code of Level 2, otherwise it will be grayed out.

DNP Security – DNP authentication is now available and can be independently enabled in the DNP security tab for either serial or Ethernet (both TCP or UDP) interfaces.

The concepts of the Hashed Message Authentication Code (HMAC) and challenge-response as defined in the DNP3 specification for Secure Authenticate Version 2.0 document is employed.

When authentication is enabled, the following settings should be selected:

- HMAC Algorithm and Update key
- Challenge Response timeout
- Duration of session key
- Aggressive Mode
- Critical Request Function Codes

■**NOTE**: Before TapTalk allows a user to change the Update key, the user has to enter the old update key.

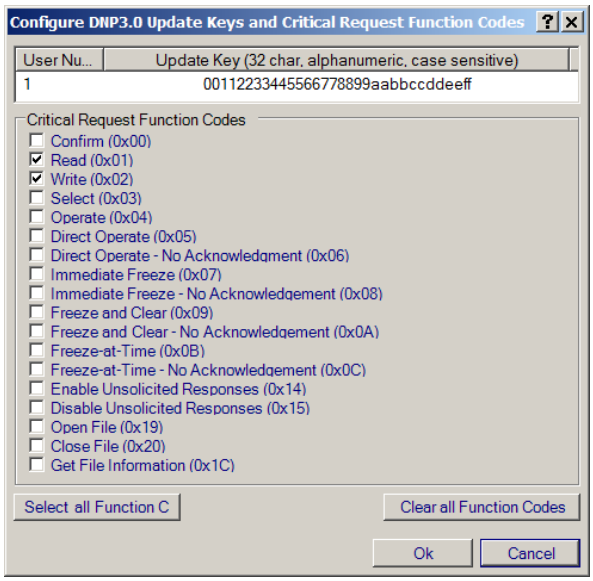

Figure C-2 Configure Update Keys and Critical Request Function Codes Dialog Screen

HMAC Algorithm and Update Key – The HMAC algorithm is either SHA1 (4 OCT) or SHA1(10OCT). An Update key is necessary to provide secure SESSION key negotiation. Once a SESSION key is obtained any subsequent challenge/ response session will employ that session key. The Update key can be up to 32 hex characters (0123456789ABCDF) (128 bits).

Challenge Response Timeout – The range is from 0-100 seconds. This is the response time within which the control is expecting a response to a challenge.

Duration of Session Key – This duration must be configured in minutes (0-100) and in count 0-65535. This duration represents the maximum time or the maximum number of challenges a particular session key is used before key negotiation is again performed.

Aggressive Mode – Full challenge/response exchanges increase the number messages in the protocol, which affects throughput performance. Therefore, DNP Secure Authentication provides an aggressive mode in which the data from a single challenge can be used to authenticate many subsequent messages. The sender of the critical message includes the HMAC at the end of the critical message without having to be challenged. At least one challenge must occur, however, before aggressive mode can be used.

Critical Request Function Codes – This represents the function codes that will require authentication if selected. If none is selected, authentication will not be performed on any function code although authentication has been enabled.

Example of DNP Configuration Editor Use – The following sequence of steps provides an example of utilizing the DNP Configuration Editor.

1. From the TapTalk® S-6200 Main Screen (Figure 3-12) select **Utility/ DNP Configuration Editor**. TapTalk will display the DNP Configuration Editor dialog screen (Figure C-1).

■ **NOTE:** The M-6200A default file contains points that are unique to the M-2001 product line. It should be used if installing the control in a communications network where the same RTU is communicating with both M-2001C and M-6200A controls.

2. Select **Load Template/ M-6200A Default** from the DNP Configurator menu bar. The Binary Inputs tab is displayed. The Available Points list for each DNP Points Group tab will also be populated.
3. Select the Binary Input points you wish to include in the DNP map by selecting Copy All or dragging the desired point(s) to the Selected Points window.
4. Edit the Selected Points for each tab as necessary to match your SCADA, RTU or Master setup.
5. Select **Save File** from the DNP Configurator menu bar. TapTalk will display a **Save As** dialog screen with a *.xml file extension.
6. Name the file and then select **Save**.
7. If TapTalk is connected to the target control then the **Send to Control** menu feature can be used as follows:
   a. Select **Send to Control**. TapTalk will display the “Authentication Key generated successfully” (Figure C-3).

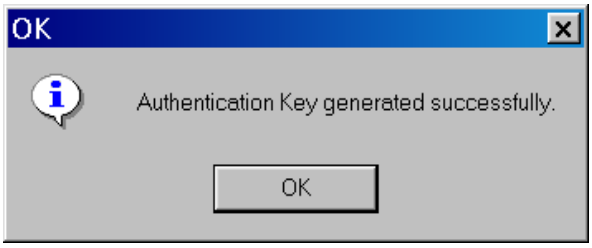

Figure C-3 Authentication Key Generated Successfully Confirmation Screen

   b. Select **OK**. TapTalk will display the “Open File” dialog screen with a *.xml file extension.
   c. Select the file to be opened, then select Open. TapTalk will initiate the file transfer as indicated by the “Send” dialog screen (Figure C-4), followed by a “DNP Upload” confirmation screen (Figure C-5).

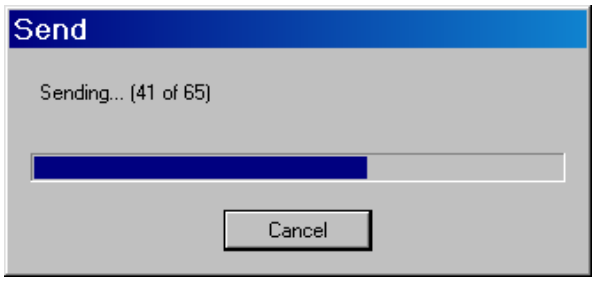

Figure C-4 Send Dialog Screen

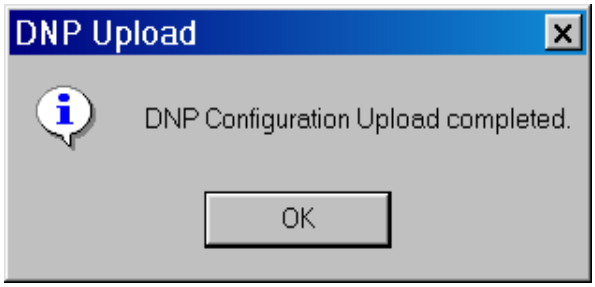

Figure C-5 DNP Upload Confirmation Screen

Point	Latch On	Latch Off	Latch ON/OFF	Trip	Close	Trip/Close
Manual Raise 1 Tap,	Lon -does nothing	Loff - raise	Lon -Does nothing, Loff -Raise	Trip - Does nothing	Close -Raise	Trip - Does nothing, close - Raise
Manual Lower 1 Tap	Lon-Does nothing	Loff - Lower	Lon -Does nothing, Loff -Lower	Trip - does nothing	Close - Lower	Trip - Does nothing, close - Lower
Block Automatic Control via Comm	Lon - UnBlock	Loff - block	Lon -UnBlock, Loff- block	Trip - UnBlock	Close - Block	Trip - UnBlock, close -block
Voltage Reduction Step 1	Lon-VR0ff	Loff- VR1	Lon-VROff, Loff-VR1	Trip - VROff	Close - VR1	Trip - VROff, close -VR1
Voltage Reduction Step 2	Lon-VR0ff	Loff- VR2	Lon-VROff, Loff-VR2	Trip - VROff	Close - VR2	Trip - VROff, close -VR2
Voltage Reduction Step 3	Lon-VR0ff	Loff- VR3	Lon-VROff, Loff-VR3	Trip - VROff	Close - VR3	Trip - VROff, close -VR3
Reset Counter to Zero	Lon - fails	Loff - RST	Lon - fail, Loff - RST	Trip - fail	Close - RST	Trip - fail, close - RST
Remote Auto/Manual	Lon- Auto	Loff - Man	Lon - Auto, Loff - Man	Trip- Auto	Close- Man	Trip - Auto, close - Man
Fwd Voltage Level	Lon- dec 0.1	Loff - incr 0.1	Lon - dec 0.1, Loff - inc 0.1	Trip -dec 0.1	Close - inc 0.1	Trip - dec 0.1, Close - inc 0.1
Bandwidth Voltage	Lon - dec 0.1	Loff - incr 0.1	Lon - dec 0.1, Loff - inc 0.1	Trip - dec 0.1	Close - inc 0.1	Trip - dec 0.1, Close - inc 0.1
Fwd Time Delay	Lon - dec 5	Loff - incr 5	Lon - dec 5, Loff - inc 0.1	Trip - dec 5	Close - inc 5	Trip - dec 5, Close - inc 5
Fwd Reactive Comp	Lon -dec 1	Loff - incr 1	Lon - dec 1, Loff - inc 1	Trip - dec 1	Close - inc 1	Trip - dec 1, Close - inc 1
Level 1Voltage Reduction	Lon-VR0ff	Loff- VR1	Lon-VROff, Loff-VR1	Trip - VROff	Close - VR1	Trip - VROff, close -VR1
Level 2Voltage Reduction	Lon-VR0ff	Loff- VR2	Lon-VROff, Loff-VR2	Trip - VROff	Close - VR2	Trip - VROff, close -VR2
Local Voltage Reduction	Lon -dec step1 0.5	Loff -inc step1 0.5	Lon-dec step1 0.5, Loff-inc step1 0.5	Trip - dec step1 0.5	Close - inc step1 0.5	Trip-dec step1 0.5, Close-inc step1 0.5
Remote Voltage Reduction	Lon -dec step2 0.5	Loff -inc step2 0.5	Lon-dec step2 0.5, Loff-inc step2 0.5	Trip - dec step2 0.5	Close - inc step2 0.5	Trip-dec step2 0.5, Close-inc step2 0.5
Fwd Resistive Comp	Lon - decr 1	Loff - incr 1	Lon - dec 1, Loff - inc 1	Trip - dec 1	Close - inc 1	Trip - dec 1, Close - inc 1
Reset Demands	Lon - fails	Loff - RST	Lon - fail, Loff - RST	Trip - fail	Close - RST	Trip - fail, close - RST
Reset Energies	Lon - fails	Loff - RST	Lon - fail, Loff - RST	Trip - fail	Close - RST	Trip - fail, close - RST
Manual Raise/Lower 1 Tap	Lon -Rise	Loff- Lower	Lon - Raise, Loff - Lower	Trip - Raise	Close- Lower	Trip - Raise, Close - Lower
Scamp Switch	Lon - Man	Loff - Auto	Lon - Man, Loff - Auto	Trip - Man	Close - Auto, rest fail	Trip - Man, Close - Auto
Voltage Reduction Enable	Lon -Disable	Loff - Enable	Lon - Disable, Loff - Enable	Trip - Disable	Close - Enable, rest fail	Trip - Disable, Close - Enable
Non-Sequential	Lon -Disable	Loff - Enable	Lon - Disable, Loff - Enable	Trip - Disable	Close - Enable, rest fail	Trip - Disable, Close - Enable
Clear Sealin Failure Alarm	Lon - fails	Loff - Clear	Lon - Fails, Loff - Clear	Trip - Fails	Close - Clear	Trip - Fails, Close - Clear
Clear Low Current Block Alarm	Lon - fails	Loff - Clear	Lon - Fails, Loff - Clear	Trip - Fails	Close - Clear	Trip - Fails, Close - Clear

Point	Pulse on	Pulse off	Pulse onoff	Latch onoff TC	Pulse onoff TC
Manual Raise 1 Tap,	Pon - Does nothing	Poff - Raise	Pon - Does nothing, Poff- Raise	Latch Onoff and TC work	Pulse onoff and TC work
Manual Lower 1 Tap	Pon - Does nothing	Poff - Lower	Pon - Does nothing, Poff- Lower	Latch Onoff and TC work	Pulse onoff and TC work
Block Automatic Control via Comm	Pon - UnBlock	Poff - block	Pon - UnBlock, Poff - block	Latch Onoff and TC work	Pulse onoff and TC work
Voltage Reduction Step 1	Pon - VR0ff	Poff - VR1	Pon -VRoff, Poff - VR1	Latch Onoff and TC work	Pulse onoff and TC work
Voltage Reduction Step 2	Pon - VR0ff	Poff - VR2	Pon -VRoff, Poff - VR2	Latch Onoff and TC work	Pulse onoff and TC work
Voltage Reduction Step 3	Pon - VR0ff	Poff - VR3	Pon -VRoff, Poff - VR3	Latch Onoff and TC work	Pulse onoff and TC work
Reset Counter to Zero	Pon - fail	Poff - RST	Pon - fail, Poff - RST	Latch off Close work	Pulse off and close work
Remote Auto/Manual	Pon - Auto	Poff - Man	Pon - Auto, Poff - Man	Latch Onoff and TC work	Pulse onoff and TC work
Fwd Voltage Level	Pon -dec 0.1	Poff- inc 0.1	Pon - dec 0.1, Poff- inc 0.1	Latch Onoff and TC work	Pulse onoff and TC work
Bandwidth Voltage	Pon -dec 0.1	Poff- inc 0.1	Pon - dec 0.1, Poff- inc 0.1	Latch Onoff and TC work	Pulse onoff and TC work
Fwd Time Delay	Pon - dec 5	Poff- inc 5	Pon - dec 5, Poff- inc 5	Latch Onoff and TC work	Pulse onoff and TC work
Fwd Reactive Comp	Pon - dec 1	Poff- inc 1	Pon - dec 1, Poff- inc 1	Latch Onoff and TC work	Pulse onoff and TC work
Level 1Voltage Reduction	Pon - VR0ff	Poff - VR1	Pon -VRoff, Poff - VR1	Latch Onoff and TC work	Pulse onoff and TC work
Level 2Voltage Reduction	Pon - VR0ff	Poff - VR2	Pon -VRoff, Poff - VR2	Latch Onoff and TC work	Pulse onoff and TC work
Local Voltage Reduction	Pon - dec step1 0.5	Poff - inc step1 0.5	Pon- dec step1 0.5, Poff - inc step1 0.5	Latch Onoff and TC work	Pulse onoff and TC work
Remote Voltage Reduction	Pon - dec step2 0.5	Poff - inc step2 0.5	Pon- dec step2 0.5, Poff - inc step2 0.5	Latch Onoff and TC work	Pulse onoff and TC work
Fwd Resistive Comp	Pon - dec 1	Poff- inc 1	Pon -dec 1, Poff- inc 1	Latch Onoff and TC work	Pulse onoff and TC work
Reset Demands	Pon - fail	Poff - RST	Pon - fail, Poff - RST	Latch off Close work	Pulse off and close work
Reset Energies	Pon - fail	Poff - RST	Pon - fail, Poff - RST	Latch off Close work	Pulse off and close work
Manual Raise/Lower 1 Tap	Pon - Raise	Poff - Lower	Pon - Raise, Poff- Lower	Latch Onoff and TC work	Pulse onoff and TC work
Scamp Switch	Pon - Man	Poff - Auto	Pon - Man, Poff- Auto	Latch Onoff and TC work	Pulse onoff and TC work
Voltage Reduction Enable	Pon - Disable	Poff - Enable	Pon - Disable, Poff- Enable	Latch Onoff and TC work	Pulse onoff and TC work
Non-Sequential	Pon - Disable	Poff - Enable	Pon - Disable, Poff- Enable	Latch Onoff and TC work	Pulse onoff and TC work
Clear Sealin Failure Alarm	Pon - Fails	Poff - Clear	Pon - Fails, Poff- Clear	Latch off Close work	Pulse off and close work

Figure C-6 Inverse CROB

Point	Latch On	Latch Off	Latch ON/OFF	Trip	Close	Trip/Close
Manual Raise 1 Tap,	Lon - raise	Loff - does nothing	Lon - raise, Loff -Does nothing	Trip - Raise	Close - Does nothing	Trip - Raise, close - Does Nothing
Manual Lower 1 Tap	Lon-lower	Loff - does nothing	Lon - Lower, Loff -Does nothing	Trip - Lower	Close - Does nothing	Trip - Raise, close - Does Nothing
Block Automatic Control via Comm	Lon - Block	Loff - Unblock	Lon -Block, Loff- Unblock	Trip - Block	Close - UnBlock	Trip - Block, close -Unblock
Voltage Reduction Step 1	Lon-VR1	Loff- VRoff	Lon-VR1, Loff-VRoff	Trip - VR1	Close - VROff	Trip - VR1, close -VR off
Voltage Reduction Step 2	Lon-VR2	Loff- VRoff	Lon-VR2, Loff-VRoff	Trip - VR2	Close - VR2	Trip - VR2, close -VR off
Voltage Reduction Step 3	Lon-VR3	Loff- VRoff	Lon-VR3, Loff-VRoff	Trip - VR3	Close - VR3	Trip - VR3, close -VR off
Reset Counter to Zero	Lon -RST	Loff - fails	Lon - RST, Loff - fail	Trip - RST	Close - fail	Trip - RST, close - fail
Remote Auto/Manual	Lon-Man	Loff - Auto	Lon - Man, Loff - Auto	Trip- Man	Close- Auto	Trip - Man, close - Auto
Fwd Voltage Level	Lon- incr 0.1	Loff - decr 0.1	Lon - inc 0.1, Loff - dec 0.1	Trip - inc 0.1	Close - dec 0.1	Trip - inc 0.1, Close - dec 0.1
Bandwidth Voltage	Lon - incr 0.1	Loff - decr 0.1	Lon - inc 0.1, Loff - dec 0.1	Trip - inc 0.1	Close - dec 0.1	Trip - inc 0.1, Close - dec 0.1
Fwd Time Delay	Lon - incr 5	Loff - decr 5	Lon - inc 5, Loff - dec 0.1	Trip - inc 5	Close - dec 5	Trip - inc 5, Close - dec 5
Fwd Reactive Comp	Lon - incr 1	Loff - decr 1	Lon - inc 1, Loff - dec 1	Trip - inc 1	Close - dec 1	Trip - inc 1, Close - dec 1
Level 1Voltage Reduction	Lon- VR1	Loff- VRoff	Lon-VR1, Loff-VRoff	Trip - VR1	Close - VR1	Trip - VR1, close -VR off
Level 2Voltage Reduction	Lon - VR2	Loff- VRoff	Lon-VR2, Loff-VRoff	Trip - VR2	Close - VR2	Trip - VR2, close -VR off
Local Voltage Reduction	Lon -inc step1 0.5	Loff -dec step1 0.5	Lon-inc step1 0.5, Loff-dec step1 0.5	Trip - inc step1 0.5	Close - dec step1 0.5	Trip-inc step1 0.5, Close-dec step1 0.5
Remote Voltage Reduction	Lon -inc step2 0.5	Loff -dec step2 0.5	Lon-inc step2 0.5, Loff-dec step2 0.5	Trip - inc step2 0.5	Close - dec step2 0.5	Trip-inc step2 0.5, Close-dec step2 0.5
Fwd Resistive Comp	Lon - incr 1	Loff - decr 1	Lon - inc 1, Loff - dec 1	Trip - inc 1	Close - dec 1	Trip - inc 1, Close - dec 1
Reset Demands	Lon -RST	Loff - fails	Lon - RST, Loff - fail	Trip - RST	Close - fail	Trip - RST, close - fail
Reset Energies	Lon -RST	Loff - fails	Lon - RST, Loff - fail	Trip - RST	Close - fail	Trip - RST, close - fail
Manual Raise/Lower 1 Tap	Lon - Lower	Loff- Raise	Lon - Lower, Loff -Raise	Trip - Lower	Close- Raise	Trip - Lower, Close - Raise
Scamp Switch	Lon - Auto	Loff - Manual	Lon - Auto, Loff - Manual	Trip - Auto	Close - Manual, rest fail	Trip - Auto, Close - Manual
Voltage Reduction Enable	Lon - Enable	Loff - Disable	Lon - Enable, Loff - Disable	Trip - Enable	Close - Disable, rest fail	Trip - Enable, Close - Disable
Non-Sequential	Lon - Enable	Loff - Disable	Lon - Enable, Loff - Disable	Trip - Enable	Close - Disable, rest fail	Trip - Enable, Close - Disable
Clear Sealin Failure Alarm	Lon - Clear	Loff - Fails	Lon - Clear, Loff - Fails	Trip - Clear	Close - fail	Trip - Clear, Close - Fail
Clear Low Current Block Alarm	Lon - Clear	Loff - Fails	Lon - Clear, Loff - Fails	Trip - Clear	Close - fail	Trip - Clear, Close - Fail

Point	Pulse on	Pulse off	Pulse onoff	Latch onoff TC	Pulse onoff TC
Manual Raise 1 Tap,	Pon - Raise	Poff - Does Nothing	Pon - Raise, Poff- Does nothing	Latch Onoff and TC work	Pulse onoff and TC work
Manual Lower 1 Tap	Pon- Lower	Poff- Does Nothing	Pon - Lower, Poff- Does nothing	Latch Onoff and TC work	Pulse onoff and TC work
Block Automatic Control via Comm	Pon - Block	Poff - Unblock	Pon - Block, Poff - Unblock	Latch Onoff and TC work	Pulse onoff and TC work
Voltage Reduction Step 1	Pon - VR1	Poff - VRoff	Pon -VR1, Poff - VRoff	Latch Onoff and TC work	Pulse onoff and TC work
Voltage Reduction Step 2	Pon - VR2	Poff - VRoff	Pon -VR2, Poff - VRoff	Latch Onoff and TC work	Pulse onoff and TC work
Voltage Reduction Step 3	Pon - VR3	Poff - VRoff	Pon -VR3, Poff - VRoff	Latch Onoff and TC work	Pulse onoff and TC work
Reset Counter to Zero	Pon - RST	Poff - fail	Pon - RST, Poff -fail	Latch On Trip work	Pulse on and Trip work
Remote Auto/Manual	Pon - Man	Poff - Auto	Pon - Man, Poff - Auto	Latch Onoff and TC work	Pulse onoff and TC work
Fwd Voltage Level	Pon - inc 0.1	Poff- dec 0.1	Pon - inc 0.1, Poff- dec 0.1	Latch Onoff and TC work	Pulse onoff and TC work
Bandwidth Voltage	Pon - inc 0.1	Poff- dec 0.1	Pon - inc 0.1, Poff- dec 0.1	Latch Onoff and TC work	Pulse onoff and TC work
Fwd Time Delay	Pon - inc 5	Poff- dec 5	Pon - inc 5, Poff- dec 5	Latch Onoff and TC work	Pulse onoff and TC work
Fwd Reactive Comp	Pon - inc 1	Poff- dec 1	Pon - inc 1, Poff- dec 1	Latch Onoff and TC work	Pulse onoff and TC work
Level 1Voltage Reduction	Pon - VR1	Poff - VRoff	Pon -VR1, Poff - VRoff	Latch Onoff and TC work	Pulse onoff and TC work
Level 2Voltage Reduction	Pon - VR2	Poff - VRoff	Pon -VR2, Poff - VRoff	Latch Onoff and TC work	Pulse onoff and TC work
Local Voltage Reduction	Pon - inc step1 0.5	Poff - dec step1 0.5	Pon- inc step1 0.5, Poff - dec step1 0.5	Latch Onoff and TC work	Pulse onoff and TC work
Remote Voltage Reduction	Pon - inc step2 0.5	Poff - dec step2 0.5	Pon- inc step2 0.5, Poff - dec step2 0.5	Latch Onoff and TC work	Pulse onoff and TC work
Fwd Resistive Comp	Pon - inc 1	Poff- dec 1	Pon - inc 1, Poff- dec 1	Latch Onoff and TC work	Pulse onoff and TC work
Reset Demands	Pon - RST	Poff - fail	Pon - RST, Poff -fail	Latch On Trip work	Pulse on and Trip work
Reset Energies	Pon - RST	Poff - fail	Pon - RST, Poff -fail	Latch On Trip work	Pulse on and Trip work
Manual Raise/Lower 1 Tap	Pon - Lower	Poff - raise	Pon - Lower, Poff- Raise	Latch Onoff and TC work	Pulse onoff and TC work
Scamp Switch	Pon - Auto	Poff - Manual	Pon Auto, Poff- Manual	Latch Onoff and TC work	Pulse onoff and TC work
Voltage Reduction Enable	Pon - Enable	Poff - Disable	Pon - Enable, Poff- Disable	Latch Onoff and TC work	Pulse onoff and TC work
Non-Sequential	Pon - Enable	Poff - Disable	Pon - Enable, Poff- Disable	Latch Onoff and TC work	Pulse onoff and TC work
Clear Sealin Failure Alarm	Pon - Clear	Poff - Fails	Pon - Clear, Poff- Fail	Latch On Trip work	Pulse on and Trip work
Clear Low Current Block Alarm	Pon - Clear	Poff - Fails	Pon - Clear, Poff- Fail	Latch On Trip work	Pulse on and Trip work

Figure C-7 Individual Binary Points and Different CROB

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D Appendix
Self-Test Error Codes

8100 ERROR_EE_WR_BYTE

This code is displayed when:

- Writing to EEPROM takes more than 10 ms
- OS failed to lock eeprom_semaphore
- No ack from eeprom while it's being accessed

8101 ERROR_EE_WR_WORD

This code is displayed when:

- Writing to EEPROM takes more than 10 ms
- No ack from eeprom while it's being accessed

8102 ERROR_EE_WR_LONG

This code is displayed when:

- Writing to EEPROM takes more than 10 ms
- No ack from eeprom while it's being accessed

8103 ERROR_EE_RD_BYTE

This code is displayed when:

- No ack from eeprom while it's being accessed

8104 ERROR_EE_RD_WORD

This code is displayed when:

- No ack from eeprom while it's being accessed

8105 ERROR_EE_RD_LONG

This code is displayed when:

- No ack from eeprom while it's being accessed

8106 ERROR_EE_WR_OUT_OF_MEM

Error code indicates that the buffer used for temporary storage of the eeprom data before it is actually written is full.

8107 ERROR_EE_WR_MSG_CREATE

Error code indicates that eeprom write command message creation has failed (possibly too many writes were done prior to it and buffer got full).

8108 ERROR_EE_WR_PAGE

This code is displayed when:

- Page Writing to EEPROM takes more than 10 ms
- No ack from eeprom while it's being accessed

8109 ERROR_EE_RD_PAGE

This code is displayed when:

- No ack from eeprom while it's being accessed

8198 ERROR_VREF

Reference voltage error

2200 ERROR_SDCARD_SPI_TIMEOUT

Error code indicates that OS has failed to lock the spi semaphore.

2300 ERROR_DAT_REC_CURRUPT

Error code indicates that data logging record is corrupted (this error code appears when data log records are being retrieved via communication or being saved to sd card).

2301 ERROR_DAT_REC_STORE

Error code indicates that verification of data log record stored in flash has failed.

2302 ERROR_DAT_REC_BUFF_OVERFLOW

Error code indicates that temporary data log buffer allocated in ram is full and no more records can be saved.

2351 ERROR_SOE_REC_STORE

Error code indicates that verification of SOE record stored in flash has failed.

2352 ERROR_SOE_RECSIZE_UNDEF

Error code indicates that number of SOE events per flash page is not defined (error appears immediately during boot up process if code is not properly configured).

2353 ERROR_SOE_TEMPREC_ERROR

SOE temp buffer is not big enough (error appears immediately during boot up process if code is not properly configured).

2354 ERROR_SOE_REC_PER_PAGE_ ERROR

Incorrect number of SOE events per flash page (error appears immediately during boot up process if code is not properly configured).

2355 ERROR_SOE_RECSIZE_ERROR

Not enough space to store temp SOE events in one page (error appears immediately during boot up process if code is not properly configured).

2356 ERROR_SOE_TOTLEN_ERROR

Not enough space to store all the events in the flash section allocated for SOE storage (error appears immediately during boot up process if code is not properly configured).

2401 ERROR_FLASH_WRONG_PG_SIZE

Flash page size in the configuration table is not valid (error appears immediately during boot up process if code is not properly configured).

2402 ERROR_FLASH_ACCESS_TIMEOUT

The response for get flash id command was never received (error appears immediately during boot up process if code is not properly configured).

2403 ERROR_FLASH_CFG_MISSING

Flash chip installed on the board is not supported in configuration table (error appears immediately during boot up process if code is not properly configured).

2404 ERROR_FLASH_WRONG_CFG_FLG

Flash configuration flag is not valid (error appears immediately during boot up process if code is not properly configured).

2405 ERROR_FLASH_SECTION_MISSING

The requested flash section ID is not defined in the configuration table (error appears immediately during boot up process if code is not properly configured).

2406 ERROR_FLASH_SECTION_RANGE

The requested read/write address in particular section of flash is exceeding the section's size.

2407 ERROR_FLASH_SECTION_OUT_OF_ MEM

Not enough space for particular section in the flash configuration table (error appears immediately during boot up process if code is not properly configured).

2408 ERROR_FLASH_CONFIG

Error occurs during firmware update if the program flash is not set to 1024 bytes.

2409 ERROR_FLASH_OUT_OF_MEMORY

Error occurs during firmware update if there is not enough space in RAM for firmware storage.

2500 ERROR_FFS_OUT_OF_MEM_INIT

There is not enough space in flash file system table to hold particular file (error appears immediately during boot up process if code is not properly configured).

2501 ERROR_RECEIVE_FAILED

Error occurs during firmware update if received firmware file doesn't pass certain checks (file length, crc error).

2502 ERROR_PROGRAM_FLASH

Error occurs during firmware update if verification of programmed flash fails.

2503 ERROR_ACCESSING_FLASH

Error occurs if during the firmware update flash memory was accessed by another process.

2600 ERROR_TERM_FLASH_BUFF_ERR

Error occurs in the terminal mode if the allocated temp ram buffer can't fit one page of flash memory.

2700 ERROR_XML_SP_OUT_OF_MEM

Error occurs during setpoint file or password file xml parsing if there is not enough space in ram for parser.

2710 ERROR_TAP_STAT_SIZE

Tap statistic structure has incorrect size.

2800 ERROR_XML_DNPCFG_OUT_OF_ MEM

Error occurs during dnp config file xml parsing if there is not enough space in ram for parser.

9020 ERROR_UNAUTH_PROG_FL_ACCESS 9000

Error occurs if unauthorized read/write access from/to program flash memory is detected (during normal operation).

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