

## Automatic Transfer Switch FT-10 Network Control Communications Module (CCM-T) Kit 541–0811

### PURPOSE OF KIT

A CCM-T is used to monitor and control an automatic transfer switch. The CCM-T interfaces with the PowerCommand™ FT-10 Network for remote monitoring and control. Relay outputs on the CCM-T provide control of the transfer switch from the network.

This instruction sheet describes mounting a CCM-T to a wall and connecting the monitoring and control leads between the CCM-T and an automatic transfer switch.

This kit must be installed by trained and experienced generator set and transfer switch service personnel only or equipment failure and damage can result.

**⚠ CAUTION** *Electrostatic discharge will damage circuit boards. To prevent damage, do not handle circuit boards unless you are adequately grounded with a wrist strap. Use a protective shipping bag for storing or transporting circuit boards.*

### PRE-INSTALLATION

For transfer switches equipped without meters, a Current Transformer (CT) kit is required to monitor the current and power factor over the network. Contact an authorized parts distributor with the Model and Spec letter of the transfer switch to determine the kit number.

For transfer switches equipped with meters, refer to the part number on the existing CTs. Check Table 1 for the maximum distance between the CCM-T and the CTs. If the distance shown is not adequate or no distance is given, a CT kit is needed. See Table 1. If the part number on the existing CT is unknown, contact an authorized parts distributor with the Model and Spec letter of the transfer switch to determine the CT number.

If a CT kit is needed, install the kit before installing the CCM-T. Refer to the instructions provided with the CT kit.

After installation, the CCM-T will be ready for connection to a PowerCommand network. Refer to the *PowerCommand Network Installation and Operation Manual (900–0529)* for instructions on network wiring, network software installation and connection of the CCM-T to the network.

### GENERAL INFORMATION

#### CCM-T Inputs

The CCM-T has 16 channels of analog input and 32 digital inputs (Figures 7 and 8). Most of the analog channels are configurable for monitoring analog signals such as AC volts, current, temp, pressure, etc. The spare analog inputs are used for signal monitoring (4-20 mA, 0-1 mA, 0-5V). The sensor inputs are used for monitoring temperature or pressure. Temperature inputs accept RTD values between 80 and 2200 ohms. The pressure input can be used generically with any sensor that provides 0-9 VDC.

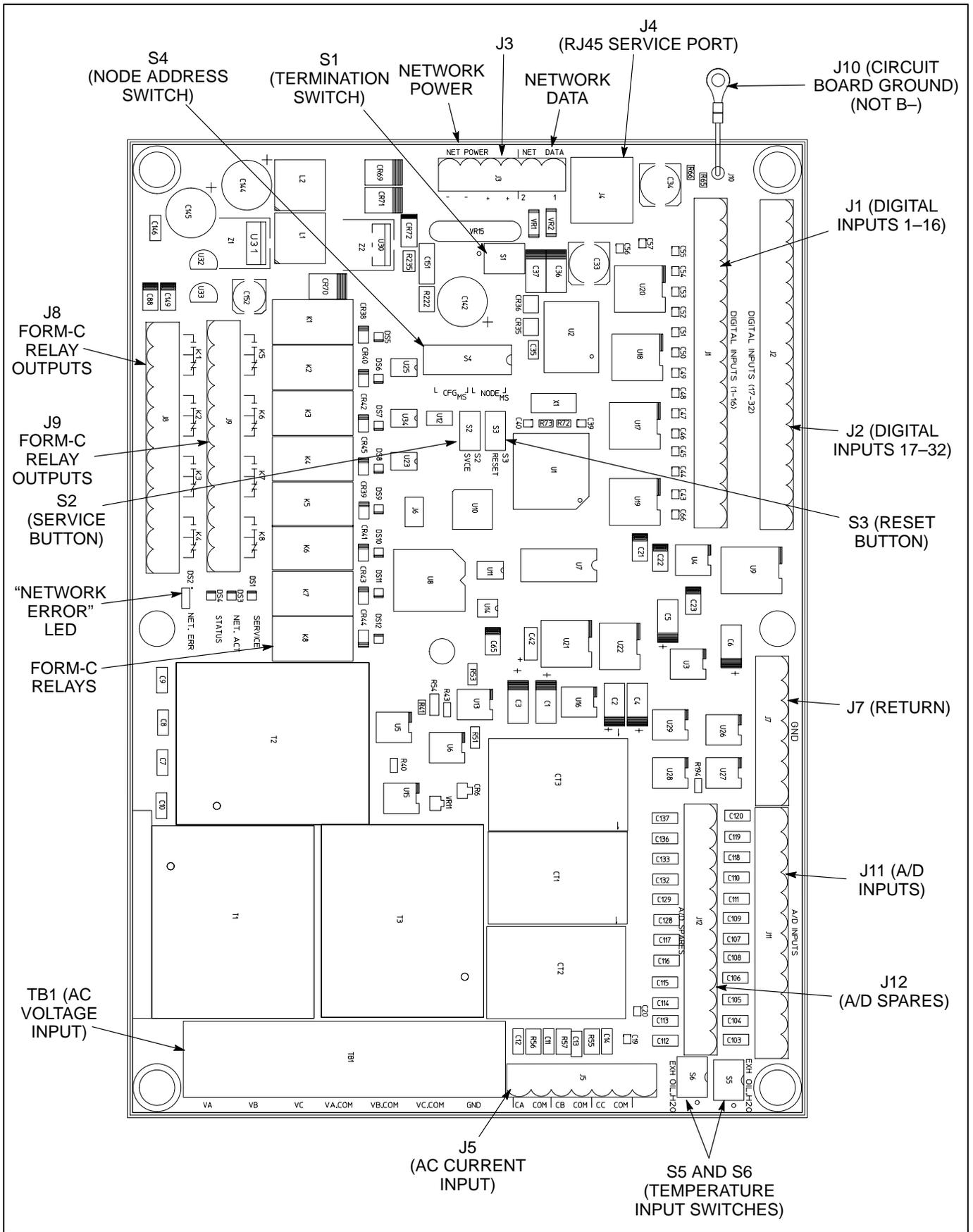
The 32 discrete inputs permit monitoring of numerous status/fault conditions. These inputs must be referenced back to either analog ground (J7) through dry contacts or through a pulldown resistor when the active “OPEN” input is +5 to +36 VDC (see notes 6 and 17 in Figure 10).

The values of the analog and discrete inputs are read from the network.

#### CCM-T Outputs

The CCM-T has eight 250 volt, 3 amp Form-C relay outputs (see Figure 1). The relays are controlled from the network and are used to transmit Remote Test, Transfer Inhibit, Re-Transfer Inhibit, Load Shed control signals, and four customer-defined events.

**External devices that are wired to these relays should be fused appropriately to prevent damage to the CCM-T.**



**FIGURE 1. ATS CONTROL COMMUNICATION MODULE**

## CCM-T Power Supply

The CCM-T power supply consists of a sealed 12-volt battery and a battery charger. These parts are included in the kit and are located inside the CCM-T control box. Supply a 120 VAC, 50 Hz or 60 Hz power source to the battery charger at TB2 (see Figure 2).

The battery should be replaced every two years. Make a note in the Maintenance section of the *ATS Operator's Manual*, or add this information to a master maintenance schedule for the facility. Maintain power to the circuit during battery replacement by connecting the new battery in parallel with the power supply circuit, then disconnect the old battery. If a low battery condition is being monitored, this will prevent a low battery alarm signal.

120 VAC is needed to power the battery charger. If 120 VAC is not available, kits listed in Table 1 are

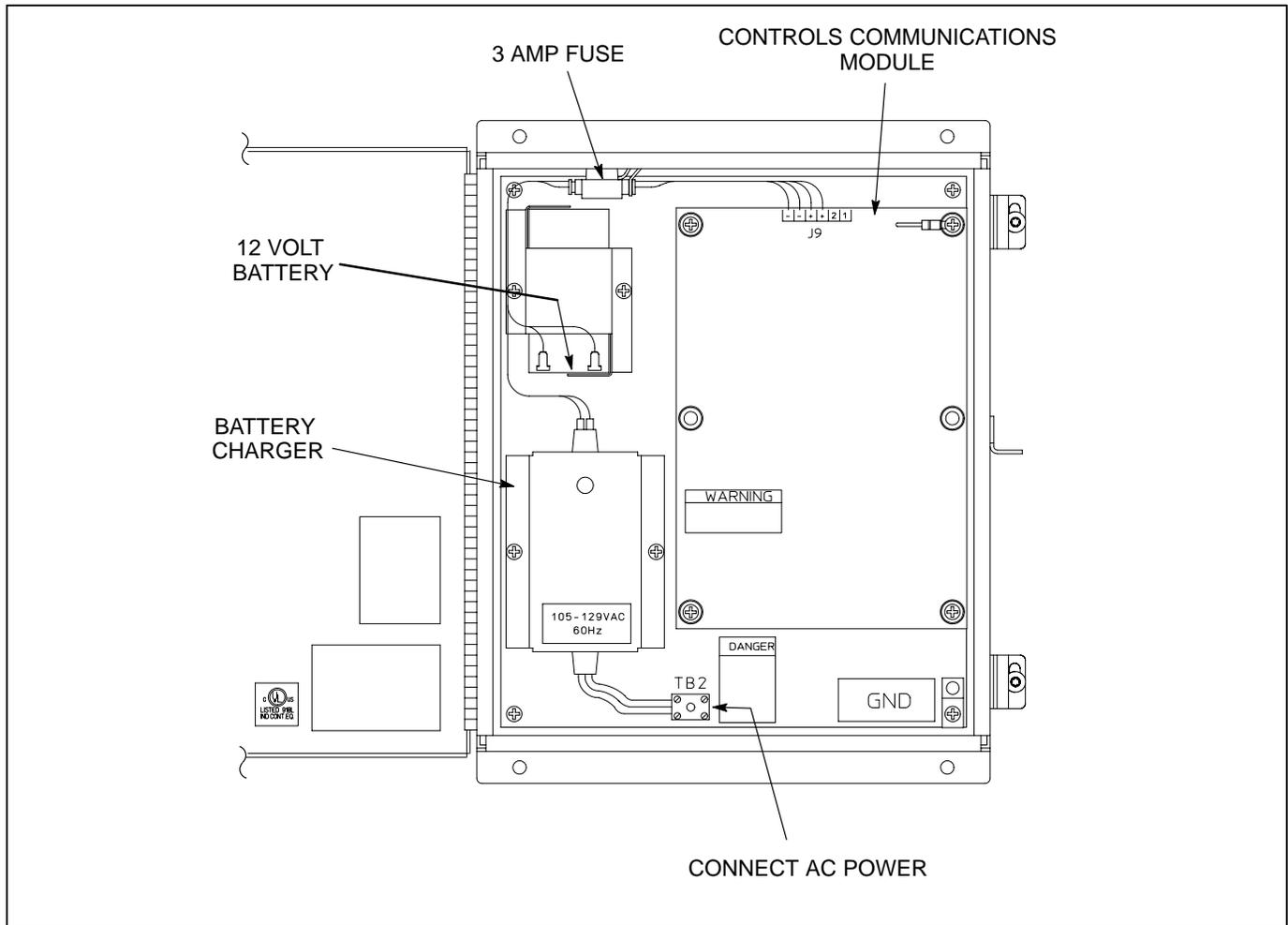
available for obtaining the voltage from the ATS. Install the enclosed 3-amp fuse in the location shown in Figure 2. An arc may occur when the fuse is installed; this is normal.

**TABLE 1. TRANSFORMER KITS**

Kit Number	Voltage
300-4870-01	208V, 240V, 480V
300-4870-02	347V, 380V, 416V
300-4870-03	600V

## Standard Displays

Solid state indicators are provided to aid in diagnosis of module operating status. These include a service LED for the Neuron<sup>®</sup> chip, a running LED on the main processor, and LEDs to show when the relays are activated.



**FIGURE 2. CONTROL COMMUNICATION MODULE FOR ATS APPLICATIONS**



## WIRE AND CONDUIT

Measure the wiring distance, one way, between the CCM-T mounting location and the ATS connection points. Refer to notes 7 and 8 in Figure 5 to determine the appropriate wire gauge for CT, monitor and control wires (see Table 2 for additional CT wire information). Use stranded wire with a minimum insulation rating of 600V and a temperature rating of 105°C.

Run a conduit for the AC wire connections and a separate conduit for the DC wire connections between the CCM-T and the ATS. Round off or cover the ends of the conduit to prevent sharp edges from

cutting the insulation. Use waterproof conduit if the CCM-T installation will be exposed to moisture.

The number of leads pulled through each conduit will be determined by the features available on the ATS and the desired monitor and control features selected. Refer to Figures 5 through 8 for a list of the possible AC and DC connections. Number both ends of each lead for identification before pulling the wire through the conduit.

Grounding must comply with all codes. Use the grounding lug located inside the CCM-T control box.

**TABLE 2. CURRENT TRANSFORMER WIRE SIZE vs. DISTANCE CHART**

EXISTING CTs MAXIMUM DISTANCE BETWEEN CT AND CCM-T (A CT KIT IS REQUIRED IF THE DISTANCE IS BLANK)					
CT LIST	RATIO	AWG 12 FEET (m)	AWG 14 FEET (m)	AWG 16 FEET (m)	NOTES
302-0209	250/5				1-Turn
302-1392	150/5				1-Turn
302-1393	300/5				1-Turn
302-1394	400/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
302-1395	750/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
302-1396	1000/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
302-1809	500/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
302-1810	1200/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
302-1811	200/5				1-Turn
302-1820-13	1500/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
302-1820-15	2000/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
302-1820-16	2500/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
302-1821	50/5				1-Turn
302-1822	75/5				1-Turn
302-1830-04	2000/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
302-1830-05	2500/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
302-1830-06	3000/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
300-4812-05	250/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
300-4812-01	150/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
300-4812-06	300/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
300-4812-04	200/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
300-4812-01	150/5	30 (9.1)	20 (6.1)	14 (4.1)	3-Turns
300-4812-01	150/5	30 (9.1)	20 (6.1)	14 (4.1)	2-Turns

- NOTES:** 1. This table is for copper wire at 50°C (122°F). Derate the distance by 0.4% per °C over 50°C.  
 2. The number of turns in the notes column refers to the number of times a lead passes through the CT. In some cases more than one turn is used to compensate for the difference in the replacement CT ratio. (Example: If 2-turns are required, the lead must pass through the CT once and then loop around the CT and pass through a second time.)

## WIRING CONNECTIONS

Figures 5 through 8 show the interconnect wiring diagram for connecting the ATS to the CCM-T. Refer to the notes on these drawings.

**⚠WARNING** *The transfer switch presents a shock hazard that can cause severe personal injury or death unless all AC power is removed. Disconnect both the Normal and the Emergency power sources from the transfer switch. Be sure to move the generator set operation selector switch to Stop, disconnect the battery charger, disconnect the starting battery (negative [-] lead first), and disconnect AC line power before beginning the installation.*

**⚠WARNING** *Ignition of explosive battery gases can cause severe personal injury. Do not smoke or cause any spark or flame while servicing batteries.*

**⚠CAUTION** *Always disconnect a battery charger from its AC source before disconnecting the battery cables. Otherwise, disconnecting the cables can result in voltage spikes high enough to damage the DC control circuits of the generator set.*

1. Disconnect both the Normal and the Emergency power sources from the transfer switch.
2. If a generator set provides Emergency power, make sure that the generator set cannot be started by moving the selector switch to Stop. The selector switch is located on the generator set control panel on two-wire start systems and inside the transfer switch cabinet door on three-wire start systems. If there is an external battery charger, disconnect it from its AC power source. Then disconnect the set starting battery(ies) (negative [-] lead first).
3. Remove the accessory panel cover on the back of the cabinet door.
4. Refer to the interconnect wiring diagrams (Figures 5 through 8). Note that Figure 5 is for switches without meters and Figure 6 is for switches with meters. Locate the wiring termination points inside the transfer switch. Identify which installed options are available for monitoring and control.
5. Refer to the outline drawing provided with the transfer switch to locate and make knockouts for the wire routing to the CCM-T. Plan the wire routing so the monitor and control leads from

the CCM-T follow the existing harness leads. Provide adequate wire protection at the knockout. Follow standard wiring practices. Wiring must meet all applicable codes.

6. Observe minimum wire gauge requirements for CT, monitor and control wiring. Connect the monitor and control wires to the locations shown in Figures 5 and 6. Provide enough wire so that the leads can be secured to the existing harness.

The CT wiring shown in Figure 5 is for transfer switches that do not have meters. If monitoring features require CTs (i.e. current, power factor, etc.), a separate CT kit is required. See Table 1.

7. Set the Temperature Input switches (see Figure 1) to either "EXH" (80–390 ohm exhaust temperature RTD) or "OIL.H2O" (500–2200 ohm oil/water temperature RTD). For more information, see the Controls Communications Module section of the *PowerCommand Network Installation and Operation Manual (900-0529)*.
8. If the CCM-T is terminated, the termination switch S1 must be set (see Figure 1). This is accomplished by moving it to the ON or TERM position.

**NOTE:** For free topology, only one device on each segment must be terminated. Multidrop bus topology requires termination at each end of the bus using multidrop bus terminators (Echelon P/N 44101) or the device terminator switch.

9. Position and secure the accessory panel cover.
10. Close and lock the cabinet door.
11. Connect the data wire to the CCM-T and provide an adequate length of twisted pair wire for future connection to a junction box or other network module. Tighten the tamperproof control box mounting screws securely to prevent tampering.
12. Connect the normal AC power source, connect the generator set starting battery(ies) (negative [-] lead last), and return the generator set control switch to the Remote position. Connect the battery charger, if applicable.
13. The CCM-T is now ready for network wiring. Network wiring must be done by a trained network installer. Refer to the *PowerCommand Network Installation and Operation Manual (900-0529)* for instructions on network and

power wiring the CCM-T and for installation and connection of this module to the network.

## SELF-INSTALLATION

### Requirements

This procedure can be used to logically install the CCM-T when the following requirements are met.

Self-installation is limited to one PowerCommand ATS or CCM-T, one PowerCommand Genset or CCM-G, and no more than four annunciators and five DIMs. The CCM-T can autobind to a genset and be autobound by up to two annunciators and two DIMs, but by no more than a total of three annunciators and DIMs.

With networks containing a genset, the transfer switch CCM-T must be logically installed after the genset is logically installed and before the annunciator(s) and DIMs are logically installed.

If these requirements cannot be met, the system must be installed with LonMaker™. Refer to “Lon-Maker Installation” on Page 8.

### Node Address

Each node on a self-installed network must have a unique address. Switches 1 through 4 of switch S4 are used to set the *Node Address* (see Figure 4). The default node address is 0010, which is a “STATUS” LED pulse rate of 2.

The switches are oriented so that switch S4-1 is the most significant bit (MSB) of the *Node Address*. Thus, S4-1 has a value of “8” when it is ON. S4-2 has a value of 4, S4-3 has a value of 2, and S4-4 has a value of 1. For example, to set the *Node Address* to 9, set switch S4 to 1001 (8+0+0+1=9). See Table 2.

Be sure to assign each node in the network a unique address.

After the device has been installed, the *Node Address* can be verified by counting the number of pulses of the “STATUS” LED (DS4). See Figure 4. Make sure each device has a unique node address.

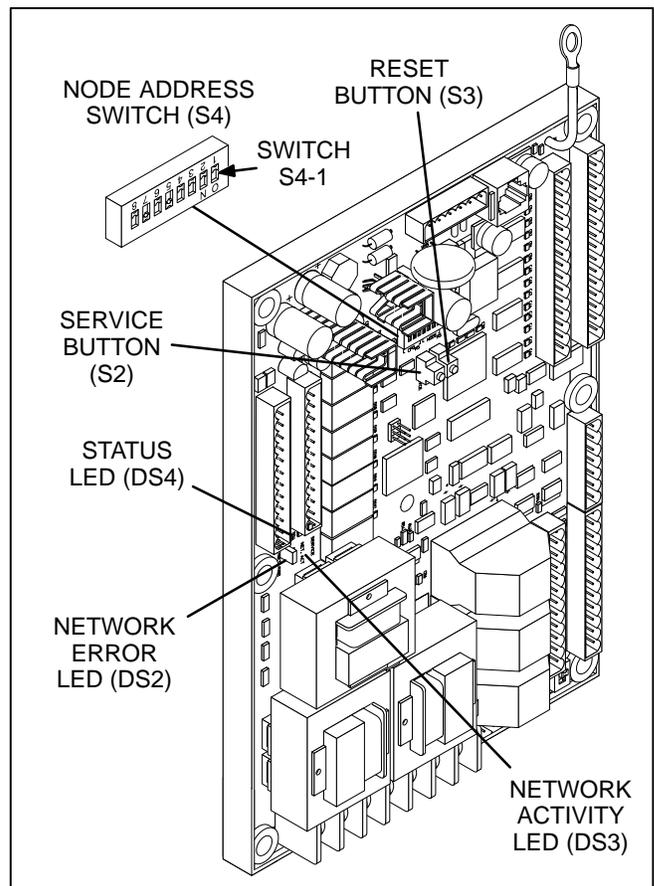


FIGURE 4. NODE ADDRESS SWITCH

TABLE 2. SETTING THE NODE ADDRESS (S4)

S4-1 (8)	S4-2 (4)	S4-3 (2)	S4-4 (1)	Address (binary)	Address (decimal)
OFF	OFF	OFF	OFF	0000	0 <sup>1</sup>
OFF	OFF	OFF	ON	0001	1
OFF	OFF	ON	OFF	0010	2
				↓	↓
ON	ON	ON	ON	1111	15

NOTE1. “0” (zero) is not a valid *Node Address*.

### Logical Installation

After the ATS is *physically* connected to the genset, the CCM-T is ready to be *logically* connected to the genset. Logically connecting to another device is referred to as *binding*. *Binding* may be done at any time once all nodes are installed, connected, and powered.

**NOTE:** The genset and ATS must be FT-10 devices which are able to self-install in the network. Each device on the network must have a unique address.

1. Make sure the genset node is powered, connected to the twisted-pair data bus, and that it has been logically installed **first**.
2. Make sure the CCM-T node is powered and connected to the twisted-pair data bus.
3. Make sure S4-1, S4-2, S4-3, and S4-4 on the CCM-T are configured for the desired address. Each device on the network must have a unique address.
4. Make sure the network bus is terminated.
5. Press and hold the Service button (S2) see (Figure 4), for approximately two seconds until the *Status* LED (DS4) begins flashing.
6. Release the *Service* button.

The CCM-T will install itself and search for a Cummins Power Generation (CPG) FT-10 genset device. If found, the CCM-T will update its node address and bind to the genset *Start Inputs* and *Status*. An FT-10 annunciator or DIM can now install itself and bind to the ATS.

## Binding Sequence

Logically connecting to another device is referred to as *binding*. *Binding* may be done when all the nodes are installed, connected, and powered.

*Binding* the node must occur in the proper sequence. Logically install the genset first, followed by the transfer switch, and then the annunciator(s) and other network accessories.

**NOTE:** The genset module and ATS (CCM-T) must be Cummins Power Generation (CPG) devices which are able to self-install in the network. Each device on the network must have a unique address.

## Verify Binding

To verify the ATS has installed itself properly and is bound to the genset, disconnect the twisted-pair data cable at J30. The “Network Error” LED (DS2) (Figure 4) should turn on (red) within 10 seconds. This indicates communications have failed and that the device was properly bound.

Reconnect the twisted pair cable and confirm that DS2 turns off within 10 seconds.

If no error is produced, use InPower™ to verify the *Test Interval* (located in the LONWORKS folder from

C631

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the Adjustments directory) is set for 10.0 seconds. Also check the wiring and Address of each node. Repeat the Self-Installation steps to re-initiate *binding*.

## Remove Bindings

If unresolved system errors occur, the bindings can be removed and then re-installed to reset the system. The bindings can also be removed if the network is being changed or the device is being moved to another network.

To remove all bindings from the device, change the *Node Address* (S4) to 0 (zero) and logically re-install the device.

The node will remove all bindings at this time, including the genset and annunciator bindings. The “STATUS” LED will not flash when the *Node Address* is 0, nor will it attempt to bind to a genset.

## Re-Binding

*Re-Binding* the node must occur in the proper sequence. Logically install the genset first, followed by the transfer switch, and then the annunciator(s) and DIMs.

To re-bind an annunciator to the transfer switch node, press and hold the annunciator’s *Silence/Lamp Test* button or service pin for 2 seconds. To re-bind a DIM to the transfer switch, press and hold the service pin for two seconds.

## LONMAKER INSTALLATION

The CCM-T can be installed with LonMaker. The Device Stencil is required. To install using LonMaker:

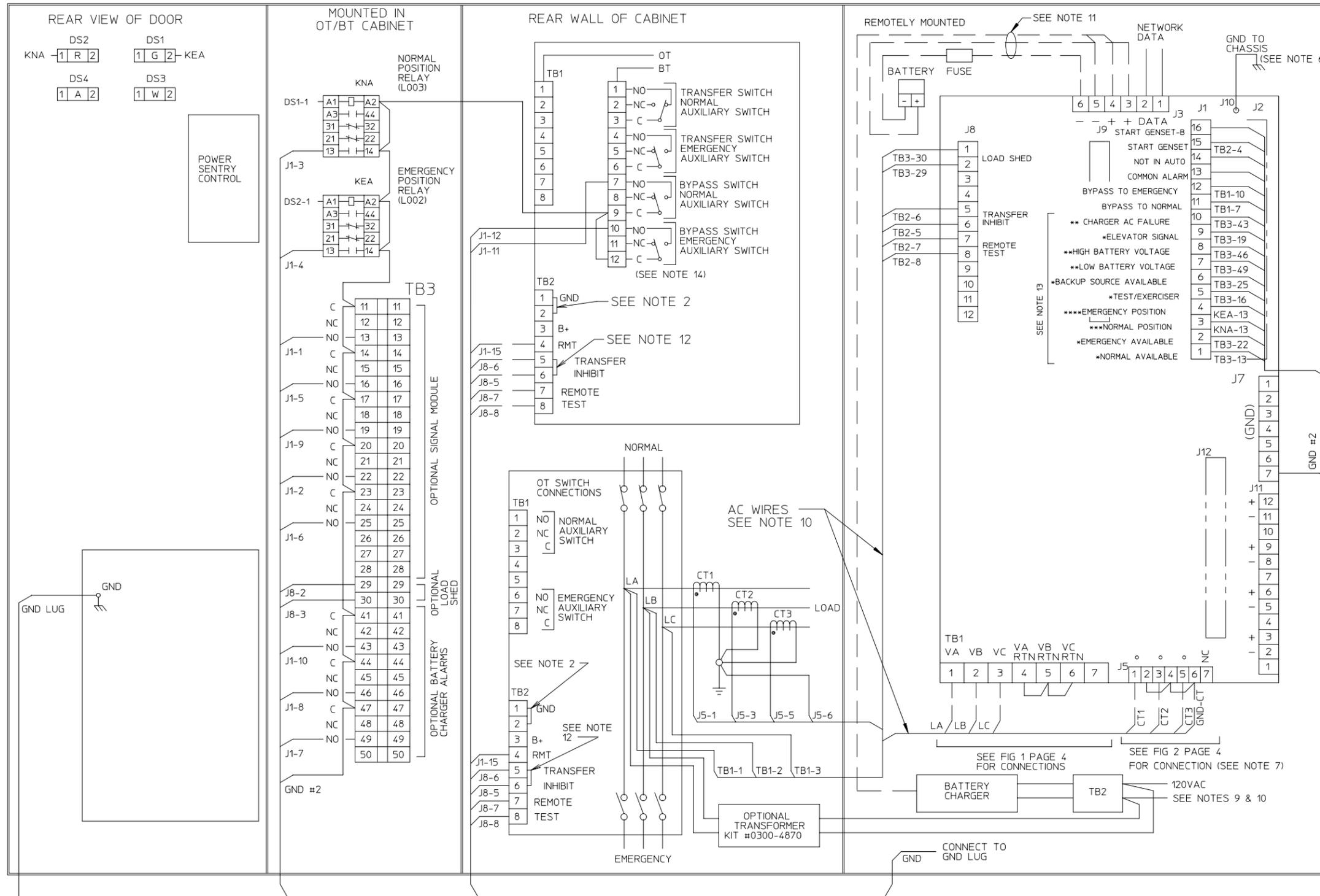
1. Run LonMaker. Refer to the *PowerCommand Network Installation and Operation Manual* (900–0529).
2. Open the Device Stencil.
3. Create a new site (or update an existing site).
4. Define, install and bind devices.
5. Verify system operation.

The CCM-T is defined and installed like any other device in LonMaker where:

Device Type: “CCM ATS”

OT & BT  
UTILITY TO GENSET

NOTES FOR FIGURES 9, 6, 7, AND 8



NOTES:

1. ALL RELAYS ARE SHOWN IN RESET OR DE-ENERGIZED POSITION.
2. WHEN PROVIDING REMOTE START VIA THE NETWORK, PLACE JUMPER BETWEEN TB2-1 AND TB2-2, AND CONNECT TB2-4 TO J1-15.
3. LIST OF OPTIONS SHOWN ON DRAWING  

LOAD SHED	M007
BATTERY CHARGER 10 AMP	K002 OR K003
EMERGENCY AUXILIARY RELAY L002	
NORMAL AUXILIARY RELAY L003	
METERS OR CT KIT	N002 OR KIT
BATTERY CHARGER ALARMS	N002
SIGNAL MODULE	M001
4. REFER TO INTERCONNECTION PRINT (0630-2293) FOR SYSTEM CONNECTION.
5. REFER TO POWER COMMAND NETWORK INSTALLATION AND OPERATION MANUAL (0900-0529).
6. CONNECT J10 RING TERMINAL TO A GOOD EMI EARTH GROUND. USE AN 'EXTERNAL TOOTH' LOCKWASHER BETWEEN TERMINAL AND GROUNDING SURFACE.
7. MAX WIRING DISTANCE FROM CURRENT TRANSFORMER TO CCM (ONE WAY) SEE TABLE ON SHEET 4.
8. MAX WIRING DISTANCE FOR ALL OTHER WIRING IS 1000 FT USING #16 AWG WIRE.
9. CONNECT TO 120VAC-POLARITY INSENSITIVE. IF NOT AVAILABLE USE KIT #0300-4870
10. SEPARATE CONDUIT IS REQUIRED FOR AC WIRING.
11. WIRING HAS BEEN PRE-INSTALLED.
12. FOR NETWORK CONTROL OF TRANSFER INHIBIT REMOVE JUMPER.
13. \* SIGNAL AVAILABLE WHEN SIGNAL MODULE M001 IS INSTALLED.  
 \*\* SIGNAL AVAILABLE WHEN 10 AMP BATTERY CHARGER K2 OR K3 IS INSTALLED ALONG WITH BATTERY CHARGER ALARM N002.  
 \*\*\* SIGNAL AVAILABLE WHEN NORMAL POSITION RELAY (L003) IS INSTALLED.  
 \*\*\*\* SIGNAL AVAILABLE WHEN EMERGENCY POSITION RELAY (L002) IS INSTALLED.  
 L002 AND L003 ARE USED INSTEAD OF THE AUXILIARY SWITCHES ON TRANSFER SWITCH, BECAUSE OF THE LOW CURRENT REQUIREMENTS OF THE CCM.
14. TRANSFER SWITCH SHOWN CLOSED TO NORMAL BYPASS SWITCH SHOWN IN NEUTRAL POSITION.

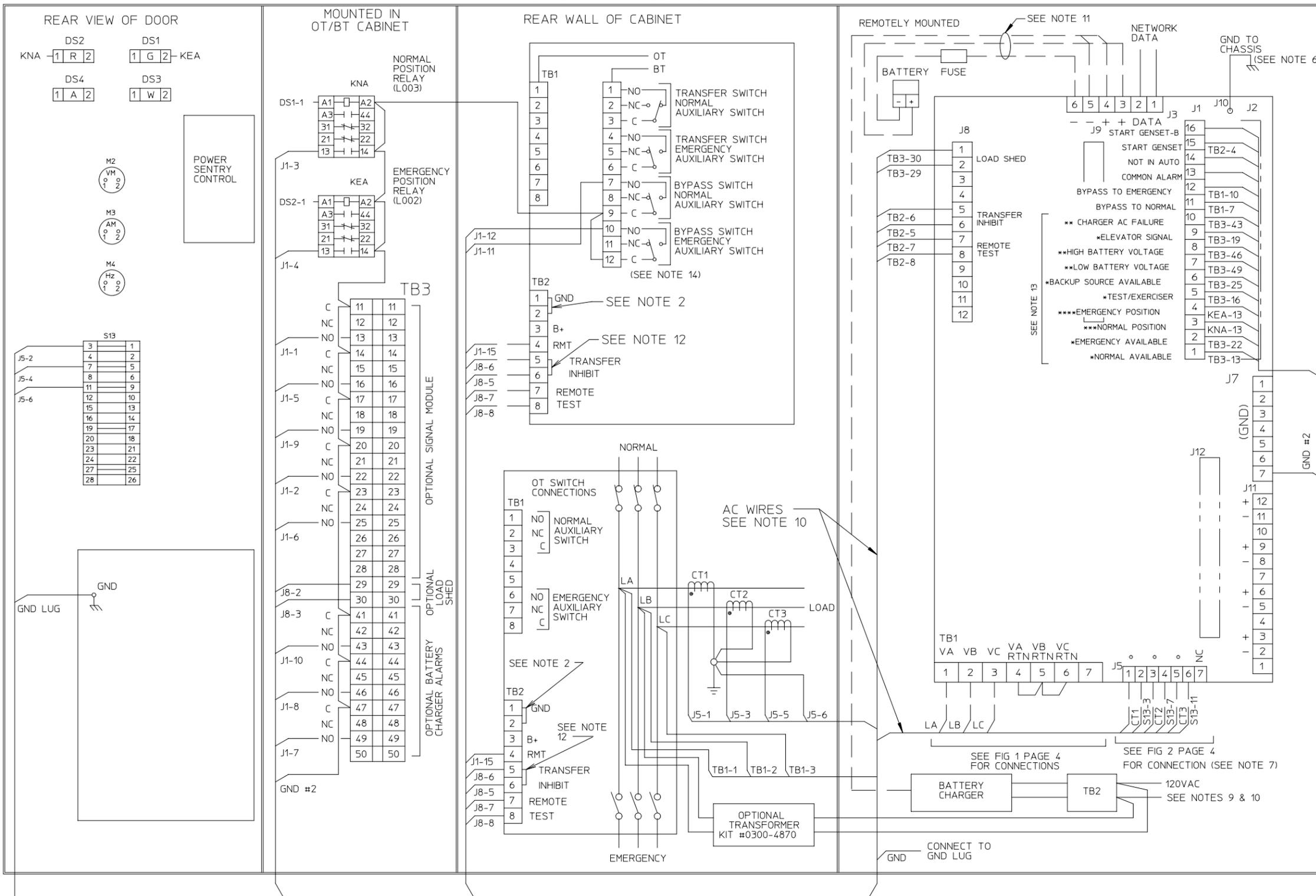
WITHOUT METERS

No. 630-2385 Sh 1 of 4  
 Rev. A Sys: HP  
 Modified 3/02

FIGURE 5. CCM-T ATS INTERCONNECT WIRING DIAGRAM (1 OF 4)

OT & BT  
UTILITY TO GENSET

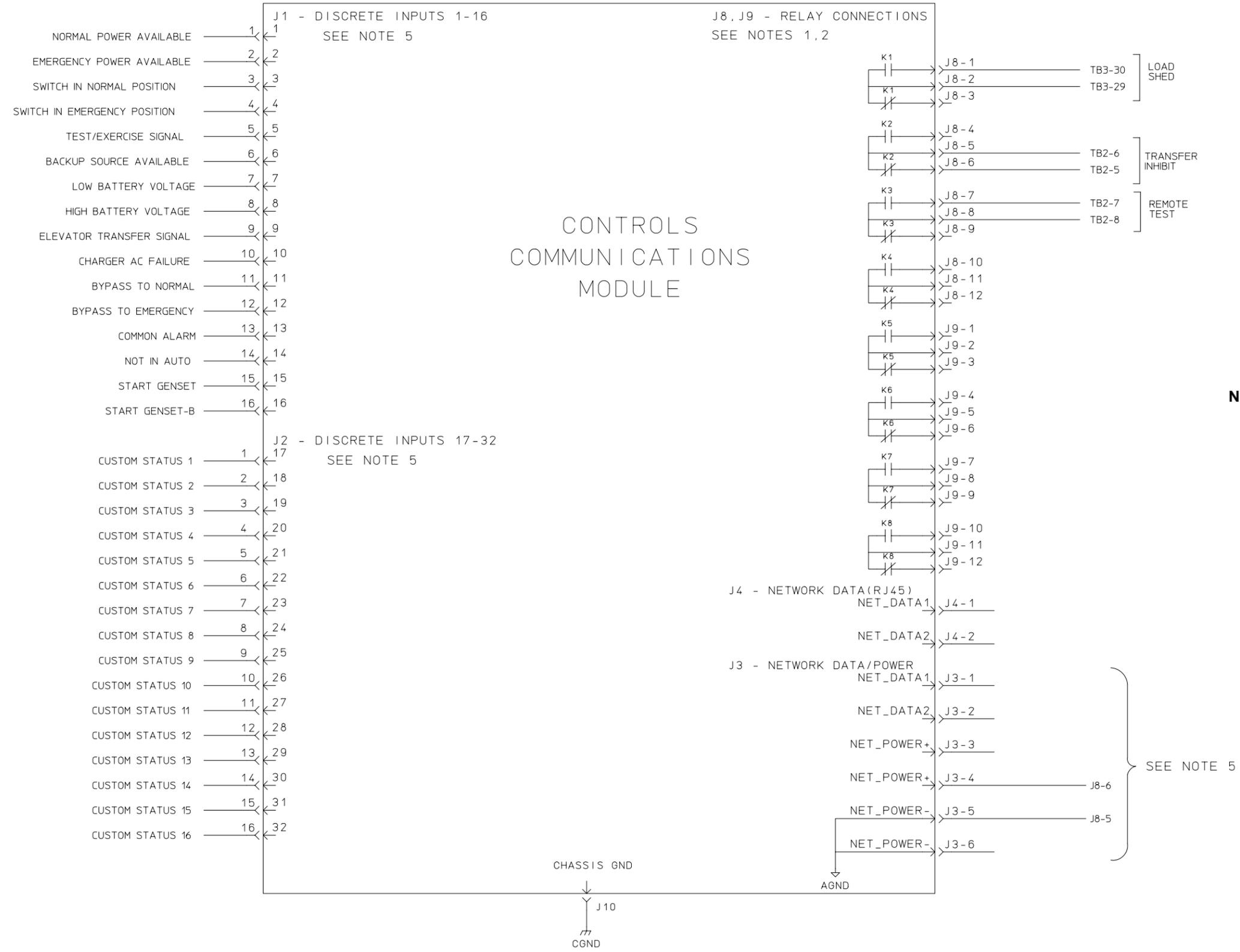
WITH METERS



NOTES: SEE FIGURE 9

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Rev. A Sys: HP  
Modified 3/02

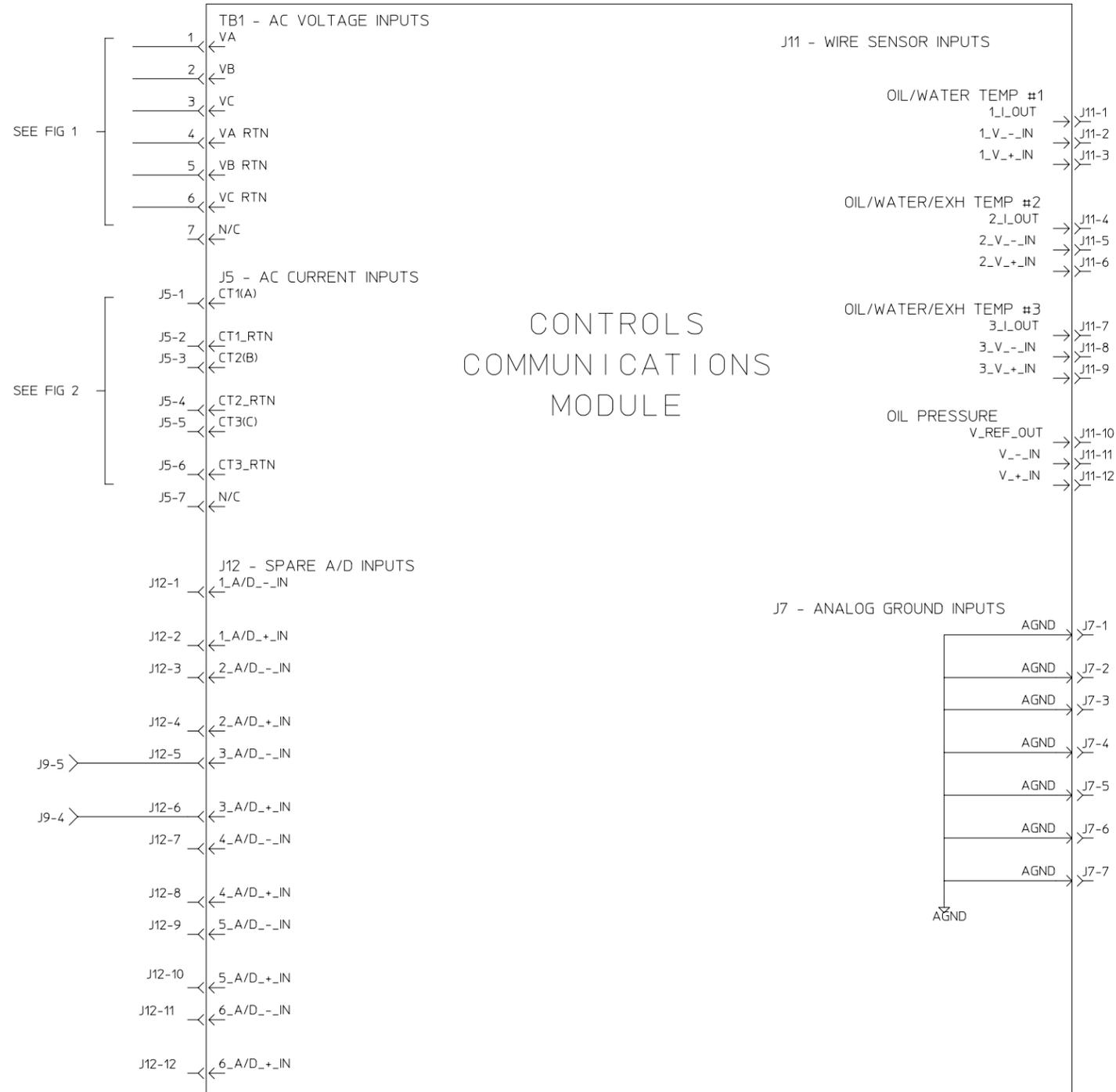
FIGURE 6. CCM-T ATS INTERCONNECT WIRING DIAGRAM (2 OF 4)



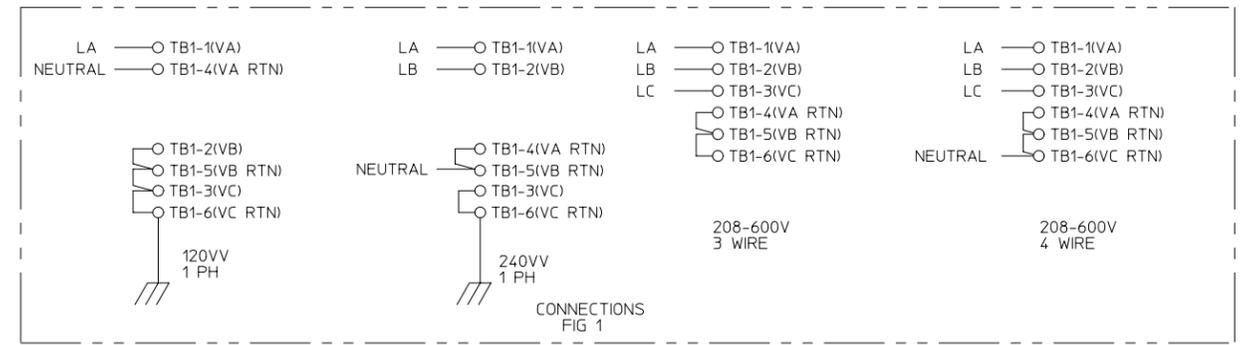
No. 630-2385 Sh 3 of 4  
Rev. A Sys: HP  
Modified 3/2002

**FIGURE 7. CCM-T ATS INTERCONNECT WIRING DIAGRAM (3 OF 4)**

# CONTROLS COMMUNICATIONS MODULE

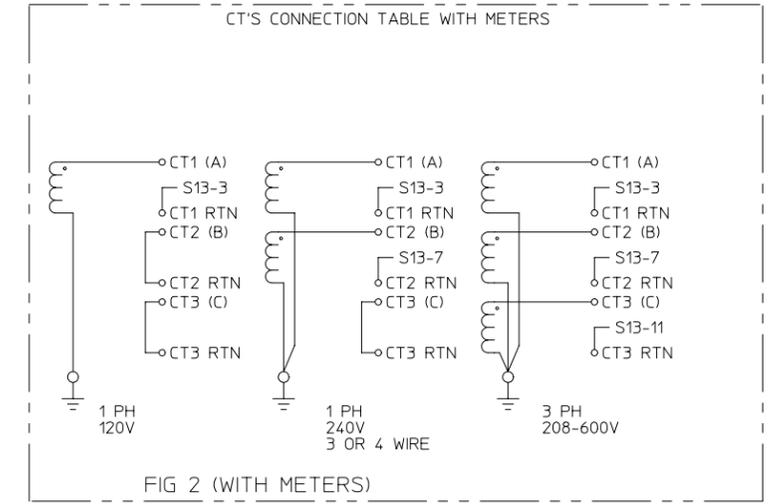
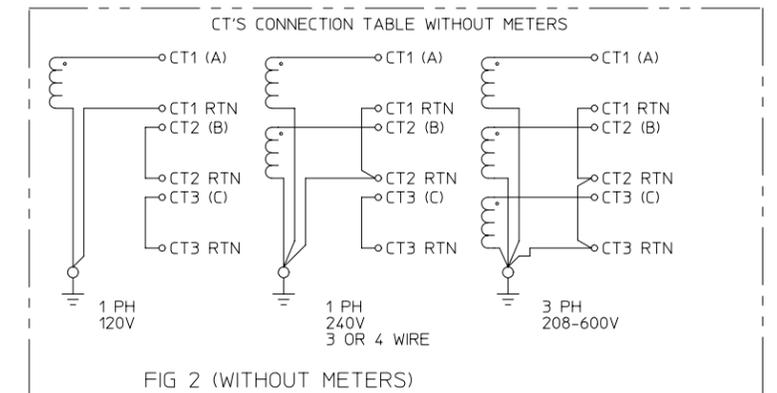


**NOTES: SEE FIGURE 9**



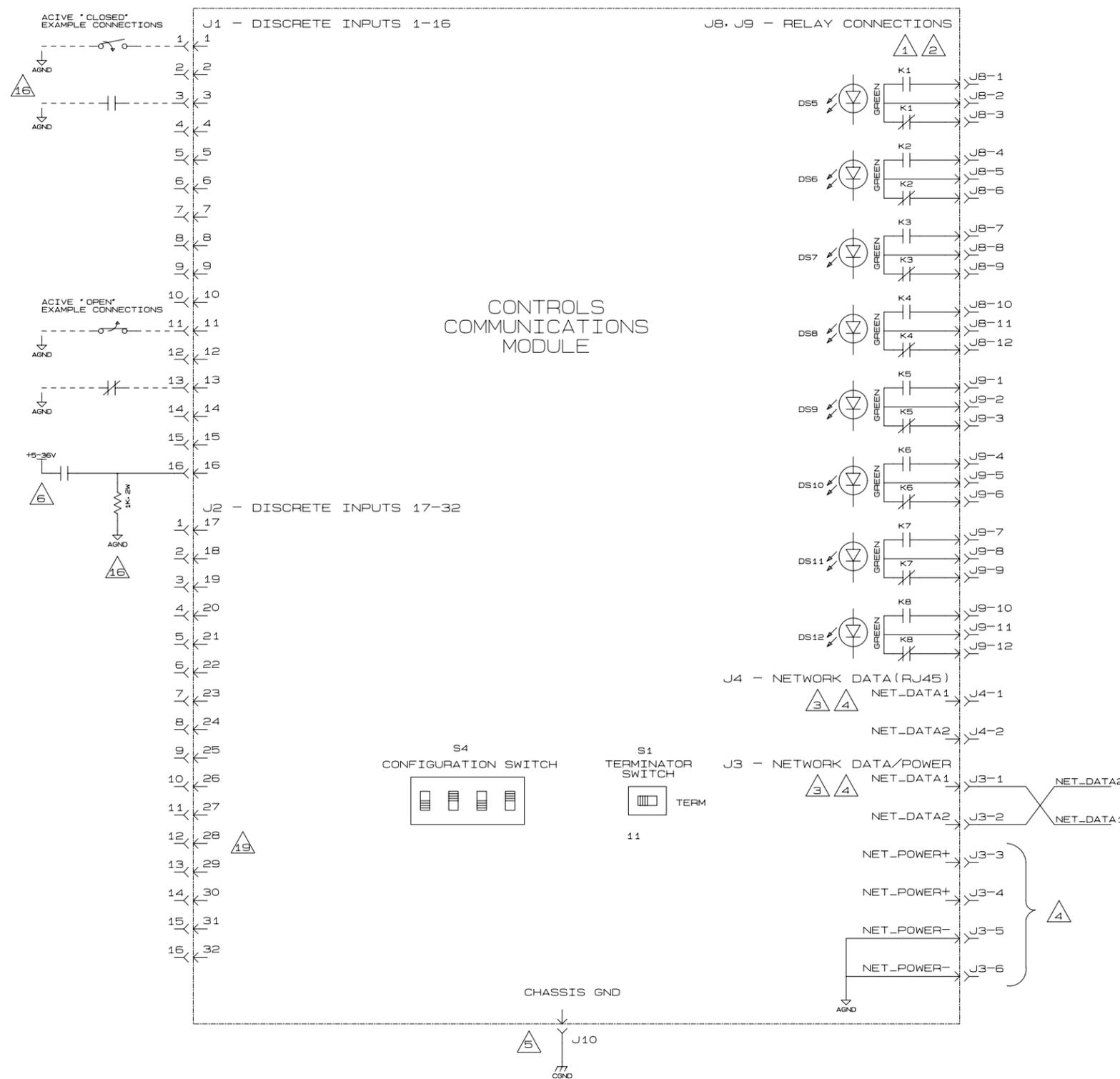
WIRE SIZE	DISTANCE IN FEET ONE WAY			
	A	B	B	C
AWG	12/24V	12 VOLT	24 VOLT	
24	500	---	---	---
22	700	---	---	---
18	1500	20	175	---
16	3000	35	250	14
14	---	55	400	20
12	---	90	650	30

FOR CT'S USE COLUMN C  
FOR B+, GND USE COLUMN B  
FOR ALL ELSE USE COLUMN A  
SEE NOTE 7



No. 630-2385 Sh 4 of 4  
Rev. A Sys: HP  
Modified 3/2002

**FIGURE 8. CCM-T ATS INTERCONNECT WIRING DIAGRAM (4 OF 4)**

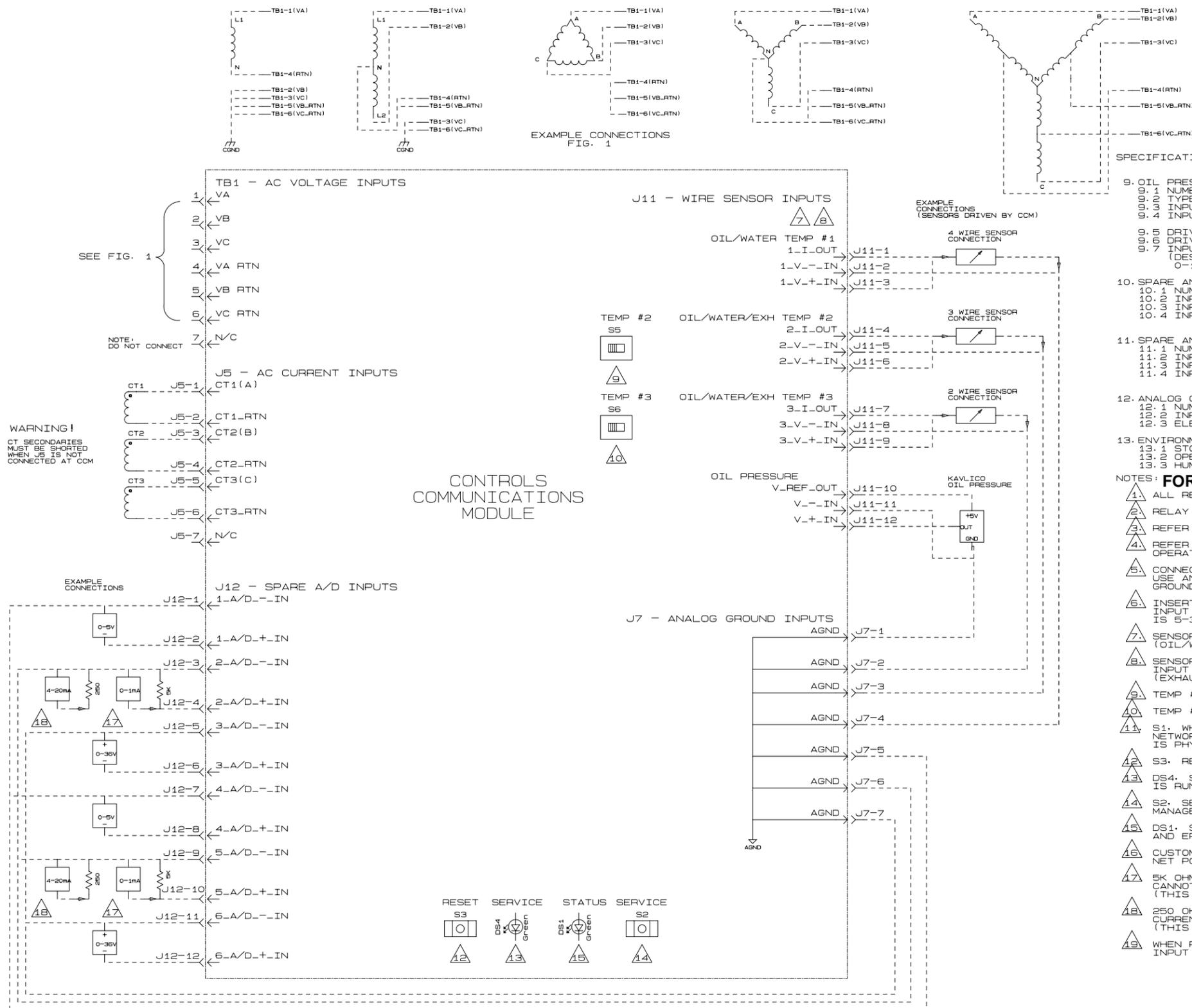


**NOTES: SEE FIGURE 10**

**SPECIFICATIONS**

1. NET POWER
  - 1.1 INPUT VOLTAGE = 5-36VDC (OPERATING RANGE)
  - 1.2 INPUT CURRENT = 150mA @ 36VDC  
200mA @ 24VDC  
400mA @ 12VDC  
1.25A @ 5VDC
  - 1.3 INPUT CURRENT (MAX) = 2.4A @ 3.5VDC
  - 1.4 INPUT CONNECTIONS = J3-3, 4 (NET POWER+)  
J3-5, 6 (NET POWER-)
2. NET DATA
  - 2.1 TYPE = ECHELON LONTALK  
FT10
  - 2.2 INPUT CONNECTIONS = J3-1 (NET DATA1)  
J3-2 (NET DATA2)  
J4-1 (RJ45-NET DATA1)  
J4-2 (RJ45-NET DATA2)  
(J4 (RJ45), SERVICE/INSTALLATION USE ONLY)
3. DISCRETE INPUTS
  - 3.1 TYPE = DISCRETE
  - 3.2 NUMBER = 32  
CONNECT TO DRY CONTACTS ONLY  
RETURN TO ANALOG GROUND (J7)
  - 3.3 OUTPUT CURRENT = 0.5mA SOURCE (INPUTS 1-24, CLOSED)  
0.05mA SOURCE (INPUTS 25-32, CLOSED)
  - 3.4 VOLTAGE THRESHOLDS (TO ACTIVATE) = 4V (FOR ACTIVE "CLOSED")  
4V (FOR ACTIVE "OPEN")
  - 3.5 INPUT CONNECTIONS = J1 (INPUT 1-16)  
J2 (INPUT 17-32)  
J7 (ANALOG GROUND)
4. RELAY OUTPUTS
  - 4.1 TYPE = NON-LATCHING
  - 4.2 NUMBER = 8 (K1, K2, K3, K4, K5, K6, K7, K8)
  - 4.3 CONTACTS = 1 FORM C  
3A @ 30VDC  
3A @ 250VAC
  - 4.4 OUTPUT CONNECTIONS = J8, 9-3, 6, 9, 12 (N/C CONTACTS)  
J8, 9-2, 5, 8, 11 (COMMON)  
J8, 9-1, 4, 7, 10 (N/O CONTACTS)
5. 3 PHASE VOLTAGE INPUTS
  - 5.1 INPUT VOLTAGE = 0-600VAC (LINE-TO-LINE) OR 0-347VAC (LINE-TO-NEUTRAL)
  - 5.2 INPUT CONNECTIONS = TB1-1, 2, 3 (VA, VB, VC)  
TB1-4, 5, 6 (VA RTN, VB RTN, VC RTN)  
TB1-7 (DO NOT CONNECT)
  - 5.3 MAXIMUM VOLTAGE BETWEEN ANY LINE (TB1-1 TO 6)  
AND CHASSIS GND (J10) = 0-600VAC
6. 3 PHASE CURRENT INPUTS
  - 6.1 INPUT CURRENT = 0-5A AC
  - 6.2 INPUT CONNECTIONS = J5-1, 3, 5 (CT1, CT2, CT3)  
J5-2, 4, 6 (CT1 RTN, CT2 RTN, CT3 RTN)  
J5-7 (DO NOT CONNECT)
  - 6.3 BURDEN = 1.1 VA
7. RTD TEMPERATURE INPUTS
  - 7.1 NUMBER = 3
  - 7.2 TYPE = 1 FIXED, 2 SWITCH SELECTABLE
  - 7.3 INPUT VOLTAGE RANGE (READ) = 0-9VDC
  - 7.4 DRIVE CURRENT = 2mA OR 8mA
  - 7.5 INPUT CONNECTIONS (READ) = J11-2, 5, 8 (V-IN)  
J11-3, 6, 9 (V+IN)
  - 7.6 INPUT CONNECTIONS (DRIVE) = J11-1, 4, 7 (IOUT)

**FIGURE 9. CCM-T INTERCONNECT WIRING DIAGRAM (1 OF 2)**



**SPECIFICATIONS**

- 9. OIL PRESSURE INPUT
  - 9.1 NUMBER = 1
  - 9.2 TYPE = FIXED
  - 9.3 INPUT VOLTAGE RANGE(READ) = 0-9VDC
  - 9.4 INPUT CONNECTIONS(READ) = J11-11(V-IN)
  - 9.5 DRIVE VOLTAGE = 5VDC
  - 9.6 DRIVE CURRENT = 8mA(MAX)
  - 9.7 INPUT CONNECTIONS(DRIVE) = J11-10(VOUT)
  - (DESIGNED FOR USE WITH KAVLICO CAPACITIVE SENSOR, 0-100 PSIG, 0.5-4.5VDC)
- 10. SPARE ANALOG INPUTS(1,2,4,5)
  - 10.1 NUMBER = 4
  - 10.2 INPUT VOLTAGE = 0-5VDC
  - 10.3 INPUT CURRENT = 0-1mA OR 4-20mA(WITH EXTERNAL RESISTOR)
  - 10.4 INPUT CONNECTIONS = J12-1,3,7,8(A/D-IN)
  - J12-2,4,8,10(A/D+IN)
- 11. SPARE ANALOG INPUT(3,6)
  - 11.1 NUMBER = 2
  - 11.2 INPUT VOLTAGE = 0-36VDC
  - 11.3 INPUT CURRENT = 0-1mA OR 4-20mA(WITH EXTERNAL RESISTOR)
  - 11.4 INPUT CONNECTIONS = J12-5,11(A/D-IN)
  - J12-6,12(A/D+IN)
- 12. ANALOG GROUND INPUTS
  - 12.1 NUMBER = 7
  - 12.2 INPUT CONNECTIONS = J7-1-7
  - 12.3 ELECTRICALLY COMMON WITH J3-5,6
- 13. ENVIRONMENTAL
  - 13.1 STORAGE TEMPERATURE = -40 TO 85 C
  - 13.2 OPERATING TEMPERATURE = -40 TO 70 C
  - 13.3 HUMIDITY = 95% RH (NON-CONDENSING)

**NOTES: FOR FIGURES 9 AND 10**

- 1. ALL RELAYS ARE SHOWN IN RESET OR DE-ENERGIZED POSITION.
- 2. RELAY OUTPUTS ARE CONTROLLED VIA THE NETWORK.
- 3. REFER TO INTERCONNECTION PRINT(0630-2293).
- 4. REFER TO POWERCOMMAND NETWORK INSTALLATION AND OPERATION MANUAL(0900-0529).
- 5. CONNECT J10 RING TERMINAL TO A GOOD EMI EARTH GROUND. USE AN "EXTERNAL TOOTH" LOCKWASHER BETWEEN RING AND GROUNDING SURFACE.
- 6. INSERT 1K OHM(2W) "PULLDOWN" RESISTOR BETWEEN INPUT TERMINAL AND J7(GND) WHEN ACTIVE "OPEN" INPUT IS 5-36VDC.
- 7. SENSOR #4 FIXED FOR A 500-2200 OHM RTD INPUT (OIL/WATER TEMP, 2mA).
- 8. SENSOR #2 & #3 SWITCH SELECTABLE FOR A 500-2200 OHM RTD INPUT (OIL/WATER TEMP, 2mA) OR A 80-390 OHM RTD INPUT (EXHAUST TEMP, 8mA).
- 9. TEMP #2 SELECT SWITCH(500-2200 OHM OR 80-390 RTD INPUT).
- 10. TEMP #3 SELECT SWITCH(500-2200 OHM OR 80-390 RTD INPUT).
- 11. S1. WHEN SET TO TERMINATE, WILL TERMINATE THE TWISTED PAIR NETWORK BUS. DATA LINES MUST BE TERMINATED WHEN THE CCM IS PHYSICALLY LOCATED AT THE END OF THE NETWORK BUS.
- 12. S3. RESET PUSH-BUTTON SWITCH. WILL MANUALLY RESET THE CCM.
- 13. DS4. STATUS LED(GREEN). INDICATES INDICATES CCM PROCESSOR IS RUNNING.
- 14. S2. SERVICE PUSH-BUTTON SWITCH. USED TO GENERATE NETWORK MANAGEMENT MESSAGE FOR NODE LOGICAL INSTALLATION.
- 15. DS1. SERVICE STATUS LED(AMBER). INDICATES INSTALLATION AND ERROR STATUS.
- 16. CUSTOMER INPUT RETURN CONNECTED TO J7(ANALOG GROUND) OR NET POWER-.
- 17. 5K OHM YIELDS 0-5VDC. LOWER RESISTANCE IF CURRENT SOURCE CANNOT DRIVE TO THIS VOLTAGE (THIS WILL REDUCE SENSOR RESOLUTION).
- 18. 250 OHM YIELDS 5VDC FULL SCALE. LOWER RESISTANCE IF CURRENT SOURCE CANNOT DRIVE TO THIS VOLTAGE (THIS WILL REDUCE SENSOR RESOLUTION).
- 19. WHEN RUNNING CCM-G CODE (0541-0811), J2-12 (DISCRETE INPUT 28). GENSET RUNNING SIGNAL MUST BE GROUNDING

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**FIGURE 10. CCM-T INTERCONNECT WIRING DIAGRAM (2 of 2)**