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A Sierra Monitor Company

**Driver Manual**  
**(Supplement to the FieldServer Instruction Manual)**

**FS-8704-06 BACnet/IP**

**APPLICABILITY & EFFECTIVITY**

**Effective for all systems manufactured after September 2008**

<b>Driver Version:</b>	<b>1.16</b>
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**1. BACnet IP Description**

The BACnet/IP driver allows the FieldServer to transfer data to and from devices over Ethernet using BACnet/IP protocol. The FieldServer can emulate either a Server or Client.

The information that follows describes how to expand upon the factory defaults provided in the configuration files included with the FieldServer.

**2. Driver Scope of Supply**

**2.1. Supplied by FieldServer Technologies for this driver**

FieldServer Technologies PART #	Description
FS-8915-10	UTP cable (7 foot) for Ethernet connection <sup>1</sup>

**2.2. Provided by the Supplier of 3<sup>rd</sup> Party Equipment**

**2.2.1. Hardware**

Part #	Description
	Ethernet 10/100 BaseT hub <sup>2</sup>

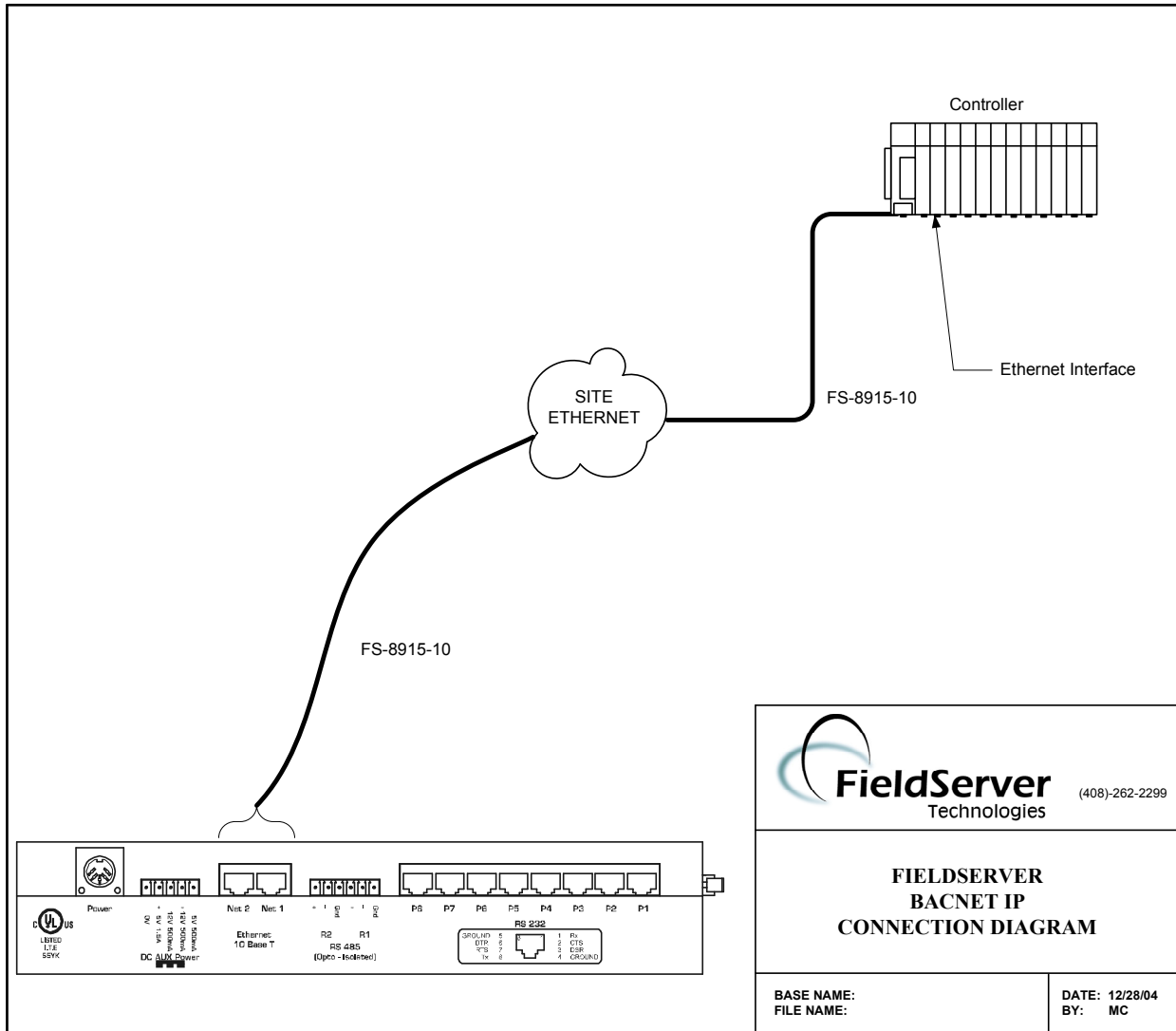
<sup>1</sup> This cable is necessary for connection to the driver. It is shipped with the FieldServer and not separately with the driver.

<sup>2</sup> Not all FieldServer models support 100BaseT. Consult the appropriate instruction manual for details of the Ethernet speed supported by specific hardware.

### 3. Hardware Connections

It is possible to connect a BACnet/IP device using the N1 or the N2<sup>3</sup> network ports. These ports need to be configured for BACnet/IP in the configuration file.

Configure the Controller according to manufacturer's instructions



<sup>3</sup> Not all ports shown are necessarily supported by the hardware. Consult the appropriate Instruction manual for details of the ports available on specific hardware.

#### 4. Configuring the FieldServer as a BACnet IP Client

For a detailed discussion on FieldServer configuration, please refer to the FieldServer Configuration Manual. The information that follows describes how to expand upon the factory defaults provided in the configuration files included with the FieldServer (See “.csv” sample files provided with the FieldServer).

This section documents and describes the parameters necessary for configuring the FieldServer to communicate with a BACnet/IP Server.

##### 4.1. Data Arrays/Descriptors

The configuration file tells the FieldServer about its interfaces, and the routing of data required. In order to enable the FieldServer for BACnet/IP communications, the driver independent FieldServer buffers need to be declared in the “Data Arrays” section, the destination device addresses need to be declared in the “Client Side Nodes” section, and the data required from the Servers needs to be mapped in the “Client Side Map Descriptors” section. Details on how to do this can be found below.

Note that in the tables, \* indicates an optional parameter, with the bold legal value being the default.

Section Title		
Data_Arrays		
Column Title	Function	Legal Values
Data_Array_Name	Provide name for Data Array	Up to 15 alphanumeric characters
Data_Array_Format	Provide data format. Each Data Array can only take on one format.	Float, Bit, Uint16, Uint32, Sint16, Sint32, Packed_Bit, Byte, Packed_Byte, Swapped_Byte
Data_Array_Length	Number of Data Objects. Must be larger than the data storage area required by the Map Descriptors for data placed in this array.	1-10,000

##### Example

```
// Data Arrays
Data_Arrays
Data_Array_Name,      Data_Array_Format,      Data_Array_Length
DA_AI_01,             Float,                   200
DA_AO_01,             Float,                   200
DA_DI_01,             Bit,                     200
DA_DO_01,             Bit,                     200
```

**4.2. Client Side Connection Descriptions**

Section Title		
Adapter		
Column Title	Function	Legal Values
Adapter	Adapter Name	N1, N2 <sup>4</sup>
Protocol	Specify protocol used	BACnet_IP
Poll_Delay*	Time between internal polls	0-32000s; <b>0.25s</b>
IP_Port*	Specify the UDP port that will be used to communicate with other BACnet Client devices.	Any legal IP port value (1 - 65535); <b>47808</b>

**Example**

// Client Side Connections		
Connections		
Adapter, N1,	Protocol, Bacnet_IP,	Poll_Delay 0.500s

**4.3. Client Side Node Descriptors**

Section Title		
Nodes		
Column Title	Function	Legal Values
Node_Name	Provide name for Node	Up to 32 alphanumeric characters
Node_ID	BACnet station address of physical Server node	1 - 4194303
Protocol	Specify protocol used	BACnet_IP
Adapter	Specify port Adapter used	N1, N2 <sup>4</sup>

**Example**

// Client Side Nodes		
Nodes		
Node_Name, BCU_01,	Node_ID, 1,	Protocol, Bacnet_IP, Adapter N1

<sup>4</sup> Not all ports shown are necessarily supported by the hardware. Consult the appropriate Instruction manual for details of the ports available on specific hardware.

**4.4. Client Side Map Descriptors**

**4.4.1. FieldServer Related Map Descriptor Parameters**

Section Title		
Map Descriptors		
Column Title	Function	Legal Values
Map_Descriptor_Name	Name of this Map Descriptor	Up to 32 alphanumeric characters
Data_Array_Name	Name of Data Array where data is to be stored in the FieldServer	One of the Data Array names from "Data Array" section above
Data_Array_Offset	Starting location in Data Array	0 to ("Data_Array_Length" -1)
Function	Function of Client Map Descriptor	Rdbc, Wrbc, Wrbx, Ars

**4.4.2. Driver Related Map Descriptor Parameters**

Section Title		
Map Descriptors		
Column Title	Function	Legal Values
Node_Name	Name of remote Server Node.	One of the Node_Names specified in "Client Side Node Descriptors" above
Data_Type	Data type	AI, AO, AV, BI, BO, BV, MI, MO, MV <sup>5</sup>
Object_ID	Address of the object	0, 1, 2, 3, ...4194303
Property*	The BACnet property to be read	<b>Present_Value</b>
Data_Array_Low_Scale*	Scaling zero in Data Array	-32767 to 32767, <b>0</b>
Data_Array_High_Scale*	Scaling max in Data Array	-32767 to 32767, <b>100</b>
Node_Low_Scale*	Scaling zero in Connected Node	-32767 to 32767, <b>0</b>
Node_High_Scale*	Scaling max in Connected Node	-32767 to 32767, <b>100</b>
Write_Priority*	Allows the driver to specify the write priority used to write an output. See also Appendix B.2	1..16, <b>16</b>
Custom Type	This over-writes the Data_Type with a numerical value for the Data_Type. e.g. Analog Value = 2	1..1023
Custom_Prop	This over-writes the Property with a numerical value for the property. e.g. Present Value = 85	1..4194303

**4.4.3. Timing Parameters**

Section Title		
Map Descriptors		
Column Title	Function	Legal Values
Scan_Interval*	Rate at which data is polled	0-32000s, <b>2s</b>

<sup>5</sup> Refer to Appendix A.1 for further information.

4.4.4. Map Descriptor Example

```
// Client Side Map Descriptors

Map_Descriptors
Map_Descriptor_Name, Data_Array_Name, Data_Array_Offset, Function, Node_Name, Data_Type, Object_ID, Property, Scan_Interval
CMD_AI_01, DA_AI_01, 0, Rdbc, BCU_01, AI, 1, Present_Value, 20.000s
CMD_AI_02, DA_AI_01, 1, Rdbc, BCU_01, AI, 2, Present_Value, 20.000s
CMD_AI_03, DA_AI_01, 2, Rdbc, BCU_01, AI, 3, Present_Value, 20.000s
CMD_AO_01, DA_AO_01, 0, Rdbc, BCU_01, AO, 1, Present_Value, 30.000s
CMD_AO_02, DA_AO_01, 1, Rdbc, BCU_01, AO, 2, Present_Value, 30.000s
CMD_AO_03, DA_AO_01, 2, Rdbc, BCU_01, AO, 3, Present_Value, 30.000s

Map_Descriptors
Map_Descriptor_Name, Data_Array_Name, Data_Array_Offset, Function, Node_Name, Data_Type, Object_ID, Property, Scan_Interval
CMD_DI_01, DA_DI_01, 0, Rdbc, BCU_01, DI, 1, Present_Value, 15.000s
CMD_DI_02, DA_DI_01, 1, Rdbc, BCU_01, DI, 2, Present_Value, 15.000s
CMD_DI_03, DA_DI_01, 2, Rdbc, BCU_01, DI, 3, Present_Value, 15.000s
CMD_DO_01, DA_DO_01, 0, Rdbc, BCU_01, DO, 1, Present_Value, 30.000s
CMD_DO_02, DA_DO_01, 1, Rdbc, BCU_01, DO, 2, Present_Value, 30.000s
CMD_DO_03, DA_DO_01, 2, Rdbc, BCU_01, DO, 3, Present_Value, 30.000s
```



## 5. Configuring the FieldServer as a BACnet IP Server

For a detailed discussion on FieldServer configuration, please refer to the FieldServer Configuration Manual. The information that follows describes how to expand upon the factory defaults provided in the configuration files included with the FieldServer (See “.csv” files provided with the FieldServer).

This section documents and describes the parameters necessary for configuring the FieldServer to communicate with a BACnet/IP Client.

The configuration file tells the FieldServer about its interfaces, and the routing of data required. In order to enable the FieldServer for BACnet/IP communications, the driver independent FieldServer buffers need to be declared in the “Data Arrays” section, the FieldServer virtual node(s) needs to be declared in the “Server Side Nodes” section, and the data to be provided to the Clients needs to be mapped in the “Server Side Map Descriptors” section. Details on how to do this can be found below.

Note that in the tables, \* indicates an optional parameter, with the bold legal value being the default.

### 5.1. Driver Specific FieldServer Parameters

Section Title		
Bridge		
Column Title	Function	Legal Values
Title	FieldServer name	Text
Network_number*	Specify a unique network number if there are multiple virtual Server nodes.	1-65535 <b>5</b>

#### Example

// FieldServer Driver specific parameters		
Bridge		
Title,	Network_Number	
BACnet Server,	6	

### 5.2. Server Side Connection Descriptors

Section Title		
Connections		
Column Title	Function	Legal Values
Adapter	Adapter Name	N1, N2 <sup>6</sup>
Protocol	Specify protocol used	BACnet_IP
Connection_Type* <sup>7</sup>	Specify if this Connection should act as a BBMD Server on the network. Refer to Appendix B.5 for more information.	<b>BBMD</b>
IP_Port*	Specify the UDP port that will be used to communicate with other BACnet Client devices.	Any legal IP port value (1 - 65535); <b>47808</b>

#### Example

// Server Side Connections		
Connections		
Adapter,	Protocol,	Connection_Type
N1,	Bacnet_IP,	BBMD

<sup>6</sup> Not all ports shown are necessarily supported by the hardware. Consult the appropriate Instruction manual for details of the ports available on specific hardware.

<sup>7</sup> BBMD only runs on N1 on an X30.

**5.3. Server Side Node Descriptors**

Section Title		
Nodes		
Column Title	Function	Legal Values
Node_Name	Provide name for node	Up to 32 alphanumeric characters
Node_ID	BACnet station address of physical Server node	1 - 4194303
Protocol	Specify protocol used	BACnet_IP

**Example**

// Server Side Nodes			
Nodes			
Node_Name,	Node_ID,	Protocol	8
Virtual_BCU_11,	11,	Bacnet_IP	

**5.4. Server Side Map Descriptors**

**5.4.1. FieldServer Specific Map Descriptor Parameters**

Section Title		
Map Descriptors		
Column Title	Function	Legal Values
Map_Descriptor_Name	Name of this Map Descriptor	Up to 32 alphanumeric characters
Data_Array_Name	Name of Data Array where data is to be stored in the FieldServer	One of the Data Array names from "Data Arrays" section above
Data_Array_Offset	Starting location in Data Array	0 to ("Data_Array_Length" -1)
Function	Function of Server Map Descriptor	Server

<sup>8</sup> Note that adapter is not declared under Server Side Nodes.

**5.4.2. Driver Specific Map Descriptor Parameters**

Section Title		
Map Descriptors		
Column Title	Function	Legal Values
Node_Name	Name of Node to fetch data from	One of the Node Names specified in “Server Side Node Descriptors” above
Data_Type	Data type in Controller	AI, AO, AV, BI, BO, BV, MI, MO, MV <sup>9</sup>
Object_ID	Address of the object	0, 1, 2, 3, ...4194303
Property	The object property to read	Present_Value
Units*	The object units	Refer to Appendix D, <b>No-Units</b>
Data_Array_Low_Scale*	Scaling zero in Data Array	-32767 to 32767, <b>0</b>
Data_Array_High_Scale*	Scaling max in Data Array	-32767 to 32767, <b>100</b>
Node_Low_Scale*	Scaling zero in Connected Node	-32767 to 32767, <b>0</b>
Node_High_Scale*	Scaling max in Connected Node	-32767 to 32767, <b>100</b>
Active_Text <sup>10</sup>	Specify the Active Text property of the Object	Any legal BACnet Ascii string
Inactive_Text <sup>10</sup>	Specify the Inactive Text property of the Object	Any legal BACnet Ascii string
Relinquish_Default <sup>10</sup>	Specify the startup Relinquish_Default Property value for this Object	Any Float value
Custom_Type	This over-writes the Data_Type with a numerical value for the Data_Type. e.g. Analog Value = 2	1..1023
Custom_Prop	This over-writes the Property with a numerical value for the property. e.g. Present Value = 85	1..4194303

<sup>9</sup> Refer to Appendix A.1 for further information.

<sup>10</sup> See the BACnet DFS to determine if a particular object supports this property

5.5. Map Descriptor Example

```
// Server Side Map Descriptors
```

Map_Descriptors	Map_Descriptor_Name,	Data_Array_Name,	Data_Array_Offset,	Function,	Node_Name,	Object_Type,	Object_Instance	Property,	Units
SMD_AI_01,	DA_AI_01,	0,	Server,	Virtual_BCU_11,	AI,	1,	Present_Value,	Degrees-Fahrenheit	
SMD_AI_02,	DA_AI_01,	1,	Server,	Virtual_BCU_11,	AI,	2,	Present_Value,	Degrees-Fahrenheit	
SMD_AI_03,	DA_AI_01,	2,	Server,	Virtual_BCU_11,	AI,	3,	Present_Value,	Degrees-Fahrenheit	
SMD_AO_01,	DA_AO_01,	0,	Server,	Virtual_BCU_11,	AO,	1,	Present_Value,	percent-relative-humidity	
SMD_AO_02,	DA_AO_01,	1,	Server,	Virtual_BCU_11,	AO,	2,	Present_Value,	percent-relative-humidity	
SMD_AO_03,	DA_AO_01,	2,	Server,	Virtual_BCU_11,	AO,	3,	Present_Value,	percent-relative-humidity	

Map_Descriptors	Map_Descriptor_Name,	Data_Array_Name,	Data_Array_Offset,	Function,	Node_Name,	Object_Type,	Object_Instance,	Property
SMD_DI_01,	DA_DI_01,	0,	Server,	Virtual_BCU_11,	DI,	1,	Present_Value	
SMD_DI_02,	DA_DI_01,	1,	Server,	Virtual_BCU_11,	DI,	2,	Present_Value	
SMD_DI_03,	DA_DI_01,	2,	Server,	Virtual_BCU_11,	DI,	3,	Present_Value	
SMD_DO_01,	DA_DO_01,	0,	Server,	Virtual_BCU_11,	DO,	1,	Present_Value	
SMD_DO_02,	DA_DO_01,	1,	Server,	Virtual_BCU_11,	DO,	2,	Present_Value	
SMD_DO_03,	DA_DO_01,	2,	Server,	Virtual_BCU_11,	DO,	3,	Present_Value	

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**Appendix A. Driver Notes**

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***Appendix A.1. Data\_Type Legal Values – Abbreviation Descriptions***

**AI** Analog\_Input  
**AO** Analog\_Output  
**AV** Analog\_Value  
**BI** Binary\_Input  
**BV** Binary\_Value  
**MI** Multi\_State\_Input  
**MO** Multi\_State\_Output  
**MV** Multi\_State\_Value

**Appendix B. Advanced Topics**

**Appendix B.1. BACnet object names**

When an external BACnet Client builds a list of Object Names, the BACnet Server Map Descriptor names determine the BACnet Object Name. If the Map Descriptor length is greater than 1, the Object Name will be suffixed with the index into the Map Descriptor. For example, if the Map Descriptor name is SMD\_AI\_01 and the length 3, then the Object Names will be SMD\_AI\_01[0], SMD\_AI\_01[1] and SMD\_AI\_01[2].

**Appendix B.2. BACnet Priority Arrays**

**FieldServer implementation of BACnet priority Arrays**

When BACnet Output objects are written to the Server side of the FieldServer, an associated write priority is given to each write value. When the FieldServer receives the write value, it stores it to the Map Descriptor Priority Array Table at the specified priority. The Priority Array Table is then scanned and the value with the highest priority is stored to the Data Array location specified by the Map Descriptor.

When a Write “Relinquished” command is received, the value is removed from the Priority Array Table and the next highest value from the Priority Array Table is stored to the Data Array.

If all values have been “Relinquished” from the Priority Array Table, then the Map Descriptors “Relinquish Default” value will be stored to the Data Array.

**Accessing Priority Array information**

The Priority Array table and its “In\_Use” (or Not Relinquished) state are stored internally to every Map Descriptor, and cannot be accessed directly. If the following data arrays are specified, however, they will maintain an exact copy of the Priority Array Table for the Map Descriptor. Thus the Priority Array Table can be accessed.

Section Title		
Map_Descriptors		
Column Title	Function	Legal Values
DA_Pri_Array	Name of Data Array where the Priority Array Table will be stored. Location 0 is the Relinquish Default value and locations 1 to 16 the different entries of the Priority Array Table.	Up to 16 alphanumeric characters
DA_Pri_Array_Offset*	Starting location in Data Array.	1-65535, 0
DA_Pri_In_Use	Name of Data Array that indicates if a particular Priority Value is in use. Location 0 indicates whether the Relinquish Default has been set and locations 1 to 16 indicate whether the index is in use (1), or Relinquished (0).	Up to 16 alphanumeric characters
DA_Pri_In_Use_Offset*	Starting location in Data Array.	1-65535, 0

**Appendix B.3. Limitations of the BACnet Read\_Property\_Multiple service.**

The BACnet PTP client driver can read multiple BACnet objects using the Read\_Property\_Multiple service under the following conditions:

- The number of objects to be read must not exceed 29.
- No gaps must exist in the range of object to be read.
- The Map Descriptor function must be of the Read type. (e.g. Rdbc)

- The Map Descriptor property must be Present\_Value.

**Appendix B.4. IP Address Issues related to BACnet IP**

It is not necessary to configure the IP address of the Server node in the Client Side Node Descriptor in the configuration file since the BACnet Client will automatically discover the IP address based on the Node\_ID supplied. It is still necessary for the FieldServer itself to have a valid IP address, however. Please refer to the FieldServer Utilities Manual for instructions on changing the FieldServer IP address.

**Appendix B.5. Network number**

The default Network number of a FieldServer is 5. In order to ensure communication between the BACnet Client and all Servers on a BACnet network, however, it may be necessary to assign a unique network number to each FieldServer.

A unique network number will need to be assigned if *both* of the following conditions are true:

- The FieldServer has multiple BACnet Server nodes.
- There is more than one FieldServer on a network which includes multiple BACnet nodes.

To override the FieldServer’s default network number 5, refer to Section 5.1

**Appendix B.6. Using BBMD**

BACnet/IP requires that a BBMD be defined on every subnet for cross-router communications. The FieldServer can act as a BBMD for the subnet that it resides on. Setting the Connection\_Type to BBMD will enable this functionality on the FieldServer. Note that BBMD operation is not required if there is already another BBMD on the network.

**Setting up a Broadcast Distribution Table (BDT)**

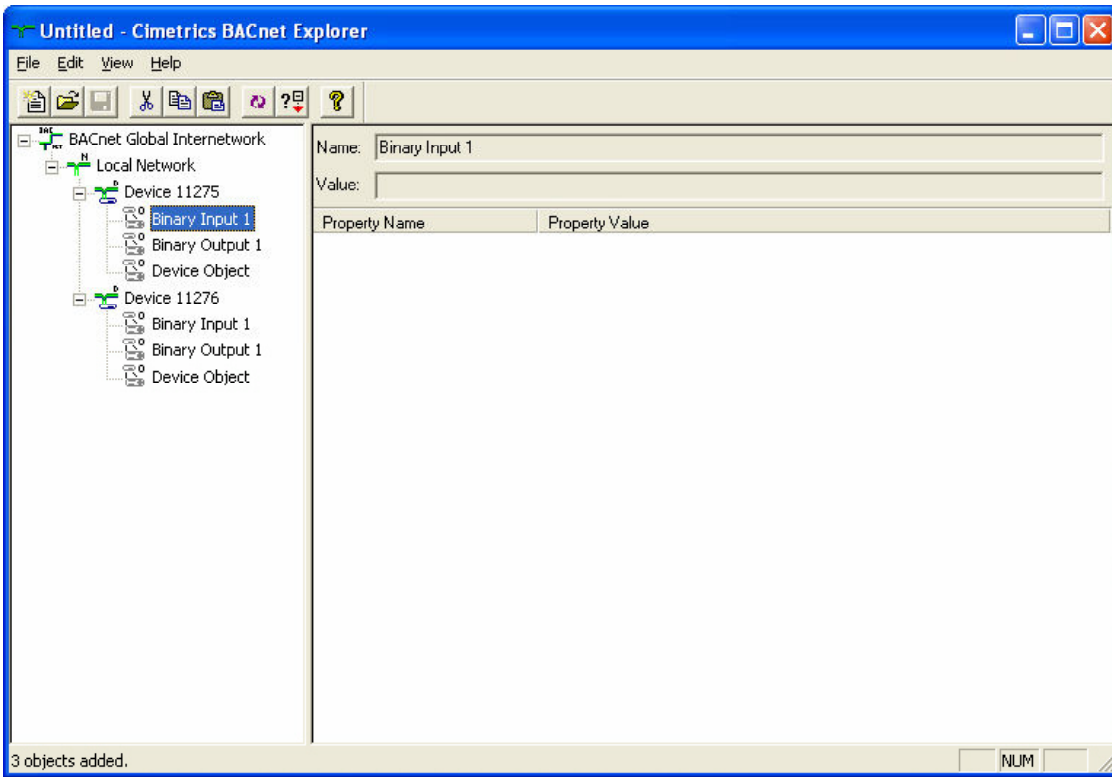
The FieldServer supports two methods of updating its internal broadcast distribution table.

- Trane’s Tracer Summit IP Validation utility can be used directly to upload and download a Broadcast Distribution Table.
- The Broadcast Distribution Table can be configured using the bdt.ini file. The following file must be created and downloaded to the FieldServer using the Ruinet “Download Configuration” command.

//		
BBMD IP_Address,	BBMD port,	BBMD subnet Mask
24.90.48.179,	47808,	255.255.255.255
64.80.115.156,	47808,	255.255.255.255

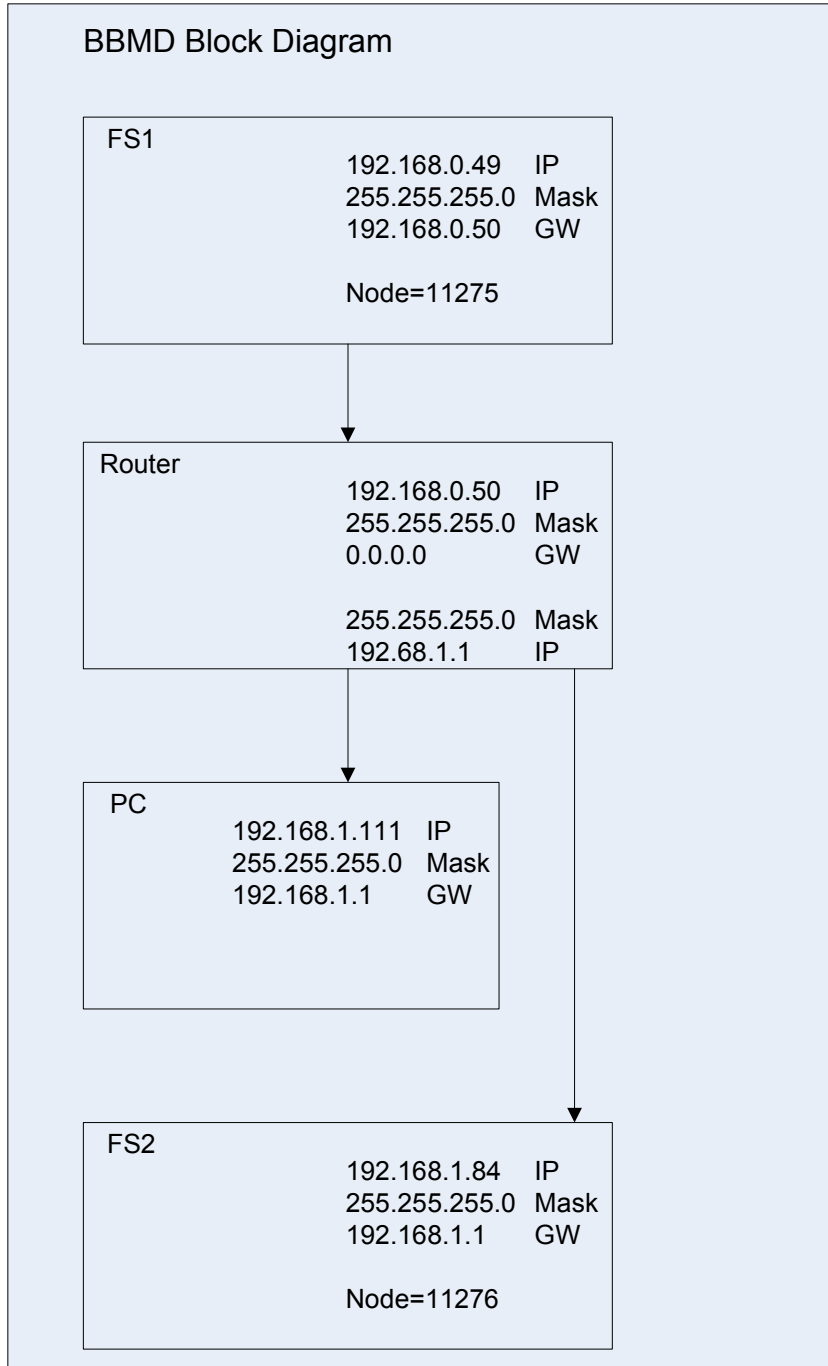
**BBMD Configuration Example**

Using the following configuration, a PC using BACnet explorer is able to browse and display the contents of two FieldServers. The following image shows the BACnet explorer screen.



The following diagram shows the layout of the connections between the FieldServers and the PC via a router.





bdt.ini		
BBMD IP_Address,	BBMD port,	BBMD subnet Mask
192.168.1.84,	47808,	255.255.255.255
192.168.0.49,	47808,	255.255.255.255

Configuration of the FieldServers is shown in the following examples.

**FieldServer # 1**

```
// Common Information,
Bridge,
Title, System_Address
Server-1 Pumping Package #1, 1
```

```
//// Data Arrays,
//
Data_Arrays
Data_Array_Name, Data_Format, Data_Array_Length
DA_AI, UINT16, 200
DA_AO, UINT16, 200
DA_DI, Bit, 200
DA_DO, Bit, 200
```

```
Connections,
Adapter, Protocol, Connection_Type, IP_Port
N1, Bacnet_IP, BBMD, 47808
```

```
Nodes,
Node_Name, Node_ID, Protocol,
Server-1, 11275, Bacnet_IP
```

Map Descriptors, Map_Descriptor_Name, SCHWRemoteCall, SCHWCommonAlarm,	Data_Array_Name, DA_DO, DA_DI,	Data_Array_Offset, 0, 0,	Function, Server, Server,	Node_Name, Server-1, Server-1,	Data_Type, BO, BI,	Object_ID, 1, 1,	Property, Present_Value, Present_Value,	Units, No-Units, No-Units,	Relinquish_Default 0 -
---	--------------------------------------	--------------------------------	---------------------------------	--------------------------------------	--------------------------	------------------------	---	----------------------------------	------------------------------

**FieldServer # 2**

```
// Common Information,
Bridge,
Title, System_Address
Server-1 Pumping Package #2, 1
```

```
//// Data Arrays,
//
Data_Arrays
Data_Array_Name, Data_Format, Data_Array_Length
DA_AI, UINT16, 200
DA_AO, UINT16, 200
DA_DI, Bit, 200
DA_DO, Bit, 200
```

```
Connections
Adapter, Protocol, Connection_Type, IP_Port
N1, Bacnet_IP, BBMD, 47808
```

```
Nodes
Node_Name, Node_ID, Protocol,
Server-1, 11276, Bacnet_IP
```

Map_Descriptors,	Data_Array_Name,	Data_Array_Offset,	Function,	Node_Name,	Data_Type,	Object_ID,	Property,	Units,	Relinquish_Default
Map_Descriptor_Name,	DA_DO,	0,	Server,	Server-1,	BO,	1,	Present_Value,	No-Units,	0
HWRemoteCall,	DA_DI,	0,	Server,	Server-1,	Bl,	1,	Present_Value,	No-Units,	-
HWCommonAlarm,									

**Appendix B.7. BACnet State Text Preload**

Method 1 – Using a Single Data Array:

```
Data_Arrays
Data_Array_Name, Data_Format, Data_Array_Length
DA_MI_01,      UINT16,      100
DA_STATE_TXT, BYTE,      200
```

```
Preloads
Data_Array_Name, Preload_Data_Value, Preload_Data_Format, Preload_Data_Index
DA_STATE_TXT,   MyState1 MyState2 MyState3 MyState4 MyState5 MyState6, String, 0
```

```
Map_Descriptors
Map_Descriptor_Name, Data_Type, Object_ID, Function, Data_Array_Name, Data_Array_Index, Node_Name, Length, State_Text_Array
CMD_MI_01,          MI,          1,          Server, DA_MI_01, 0, N1 11, 1, Da_State_Txt
```

Method 2 – Using an Offset/User Table:

```
//set up a look up table
Offset_Table,
Offset_Table_Name, Table_String, Table_Index_Value
FIRE_ALARM_TEXT,  SYSTEM READY, 0
FIRE_ALARM_TEXT,  ALARM, 1
FIRE_ALARM_TEXT,  MAINTENANCE, 2
FIRE_ALARM_TEXT,  OFF-LINE, 3
FIRE_ALARM_TEXT,  IN SERVICE, 4
FIRE_ALARM_TEXT,  OTHER, 5
```

```
Data_Arrays
Data_Array_Name, Data_Format, Data_Array_Length
DA_MI_01,      UINT16,      100
```

```
Map_Descriptors
Map_Descriptor_Name, Data_Type, Object_ID, Function, Data_Array_Name, Data_Array_Index, Node_Name, Length, State_Text_Array
CMD_MI_01,          MI,          1,          Server, DA_MI_01, 1, N1 11, 1, Fire_Alm_Text
```

**Appendix C. Troubleshooting Tips**

**Appendix C.1. Debugging a BACnet connection**

- If duplicate object instances are accidentally configured in the FieldServer, the second call of the instance will overwrite the first one. This may cause a BACnet Object to be “lost.”
  - If “Virtual\_BCU\_...” is not being indicated as the device description for the FieldServer on the BACnet SCADA system, then the FieldServer is not communicating with the SCADA system. If the Present\_Value’s name is being indicated, but the Present\_Value shows question marks, then it is most likely that the Client side of the FieldServer is not communicating.
  - Polling BACnet addresses that are not configured for **Liebert** systems may cause the connection to fail in older versions of Liebert. Please contact your Liebert supplier for more information.
  - Some of the BACnet IP features result in the creation of files (priarray.ini; desc.ini; alarms.ini) on the FieldServer. Sometimes updates of firmware can result in these files becoming outdated. Deleting these files will restore configuration defaults and may assist with configuration errors.
  - Extra memory is required to store Map Descriptors that have the active/inactive text parameters specified. If the defaults are appropriate, do not specify these parameters. This will save memory and allow more Map Descriptors to be created
  - **McQuay Units** are shipped with a default Device instance of the last 6 digits of the McQuay Serial number.
- Trane Specific Tips**
- When new points are added to the FieldServer it is important to restart Summit Workstation or BCU, otherwise these new points may not be seen by the FieldServer.
  - Disconnect the FieldServer from the BACnet network when transferring images to the BCU.

**Appendix C.2. BACnet Specific Statistics**

Stat	Description	Resolution
Link Control	A “who-is” link control message was send or received.	It is normal to receive a few link control messages. If the number is higher than the transmit/receive messages, however, there may be a problem with lost communications..
Unsupported Properties	A request for an unsupported property was received	This is not an error. BACnet clients often poll all properties of a particular object to determine which properties are supported.
Segmentation Not Supported	Data was requested but the response would have exceeded the maximum size of the APDU and could not be sent using an un-segmented message.	This is not an error - the BACnet client will use a different method to read data from the FieldServer.
Sequence Error	Invoke ID of a reply did not match the Invoke ID of the poll.	You should not see this message. It normally indicates a configuration error.
Write Access Denied	A write to an object was denied.	This typically happens when trying to write to an Input Object that is not Out-Of-Service. It is not possible to write to Input Objects.
Exception Errors	A BACnet Service was denied because it is not supported	This may be a problem on the Client system. Consult the PIC statement to determine what services are supported.

**Appendix D. Units**

Unit	Variation 1	Variation 2	Variation 3
Amperes	Amps	A	
Bars			
BTUs			
BTUs-per-hour			
btus-per-pound			
btus-per-pound-dry-air			
centimeters			
centimeters-of-mercury			
centimeters-of-water			
cubic-feet			
cubic-feet-per-minute			
cubic-feet-per-seconds			
cubic-meters			
cubic-meters-per-hour			
cubic-meters-per-seconds			
Currency1			
Currency2			
Currency3			
Currency4			
Currency5			
Currency6			
Currency7			
Currency8			
Currency9			
Currency10			
cycles-per-hour			
cycles-per-minute			
days			
degrees-angular			
Degrees-Celsius	Deg-C	Deg_C	
degrees-Celsius-per-hour			
degrees-Celsius-per-minute			
Degrees-days-Celsius			
Degrees-days-Fahrenheit			
Degrees-Fahrenheit	Deg-F	Deg_F	
degrees-Fahrenheit-per-hour			
degrees-Fahrenheit-per-minute			
Degrees-Kelvin	Deg-K	Deg_K	
degrees-phase			
delta-degrees-Fahrenheit			
delta-degrees-Kelvin			
feet			
feet-per-minute			
feet-per-second			
foot-candles			
grams-water-per-kg-dry-air			
hectopascals			
Hertz	Hz		
Horsepower	HP		
hours			

Unit	Variation 1	Variation 2	Variation 3
imperial-gallons			
imperial-gallons-per-min			
inches			
inches-of-mercury			
inches-of-water			
Joules			
joules-per-degree-kelvin			
joules-per-kilogram-degree-kelvin			
joules-per-kilogram-dry-air			
Kilograms	Kg		
kilograms-per-hour			
kilograms-per-minute			
kilograms-per-second			
Kilohertz	KHz		
kilohms			
Kilojoules			
kilojoules-per-kilogram			
kilometers-per-hour			
Kilopascals	KPa		
kilovolt-amperes	kilovolt-amps	KVA	
kilovolt-amperes-reactive	KVAR		
kilovolts			
kilowatt-hour-per-square-foot			
kilowatt-hour-per-square-meter			
kilowatt-hours	KWh		
kilowatts	KW		
liters			
liters-per-hour			
liters-per-minute			
liters-per-second			
lumens			
luxes			
Megahertz	MHz		
megajoules			
megajoules-per-square-foot			
megajoules-per-square-meter			
megavolt-amperes	megavolt-amps		
Megavolt-amperes-reactive	MVAR		
megavolts			
megawatts	MW		
megohms			
meters			
meters-per-second			
miles-per-hour			
milliamperes	milliamps		
millibars			
millimeters			
millimeters-of-mercury			
Millivolts			
Milliwatts			
minutes			
months			

Unit	Variation 1	Variation 2	Variation 3
No-Units	No Units	No_Units	None
ohms			
parts-per-billion			
parts-per-million			
Pascals			
Percent			
percent-obscuration-per-foot			
percent-obscuration-per-meter			
percent-per-second			
percent-relative-humidity	% RH; %RH	Percent RH;	PercentRH
Per-hour			
per-minute			
per-second			
pounds-force-per-square-inch	PSI	pounds-force-per-sq-inch	
Pounds-mass			
pounds-mass-per-hour			
pounds-mass-per-minute			
pounds-mass-per-second			
Power-Factor	PF		
psi-per-degrees-fahrenheit			
radians			
revolutions-per-minute			
seconds	Secs	S	
square-centimeters			
square-feet			
square-inches			
square-meters			
Therms			
ton-hours			
Tons			
Tons-refrigeration			
US-gallons	Gallons		
us-gallons-per-minute	GPM		
Volt-Amperes	Volt-Amps	VA	
volt-amperes-reactive	VAR		
Volts	Voltage		
watt-hours	Wh		
Watts	W		
watts-per-square-foot			
watts-per-square-meter			
watts-per-square-meter-degrees-kelvin			
weeks			
years			