



A Sierra Monitor Company

Driver Manual
(Supplement to the FieldServer Instruction Manual)

FS-8700-150 M-Bus

APPLICABILITY & EFFECTIVITY

Effective for all systems manufactured after November 2014

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1 M-BUS DESCRIPTION

The M-Bus driver allows the FieldServer to transfer data to and from devices using M-Bus protocol. The Fieldbus connection is included with the FieldServer. The FieldServer can emulate either a Slave or a Master.

The M-Bus QuickServer Gateway is configurable to act as both a Master and a Slave M-Bus device. As an M-Bus Master the number of devices supported is limited to 64 devices since the FieldServer provides power to the M-Bus. The M-Bus Master interrogates the Slave devices as the gateway acts as a Master. It will request information from the Slave devices and receive and process only the expected responses. As an M-Bus Slave the maximum number of devices is limited to the M-Bus standard of 250. The gateway will act as a Slave and will respond only to requests from M-Bus Master devices.

Maximum Nodes Supported

FieldServer Mode	Nodes	Comments
Maximum remote Nodes the driver Master can connect to	64	Maximum Slave number supported by FieldServer Master
Maximum remote Nodes that can connect to the Driver Slave	1	Only one Master on the M-Bus network.
Maximum local Master nodes the driver can emulate on one platform	1	Only one Master on the M-Bus network.
Maximum local Slave Nodes the Driver can emulate on one platform.	250	M-Bus protocol supports only 250 Slave nodes
Capable of Emulating local Master and Slave at the same time?	No	Master and Slave Hardware not interchangeable

2 DRIVER SCOPE OF SUPPLY

2.1 Supplied by FieldServer Technologies for this driver

None

2.2 Provided by Supplier of 3rd Party Equipment

Part #	Description
	Refer to M-Bus wiring specifications for required equipment

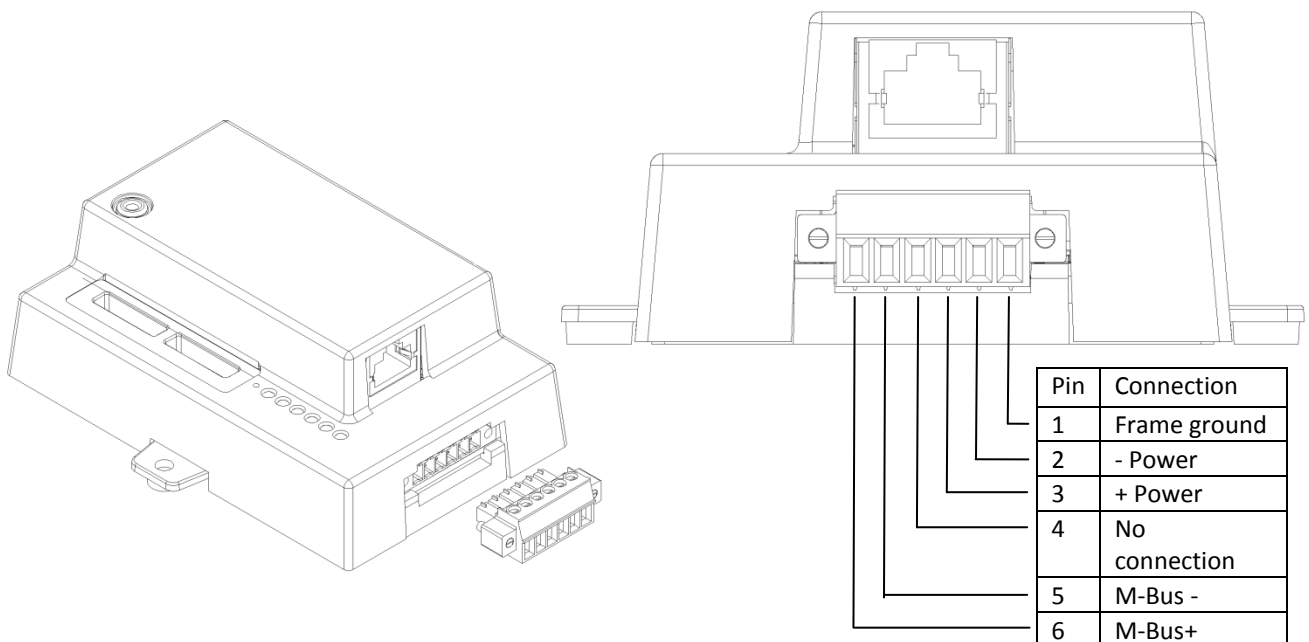
3 HARDWARE CONNECTIONS

3.1 Power Supply requirement

A power supply rated 15W or more is recommended to support 64-Slave devices when the FieldServer is configured as a Master device.

3.2 Connection diagrams

- The FieldServer can be either a Master or a Slave device. See section 3.3 for Jumper settings to select the correct hardware setting.
- Most M-Bus Devices are not polarity sensitive, although the diagram shows the polarity, should it be a requirement.
- Configure the M-Bus devices according to the manufacturer's instructions (e.g. Primary address and readout data).
- Note: The M-Bus QuickServer does not need a level converter.



Please Note:

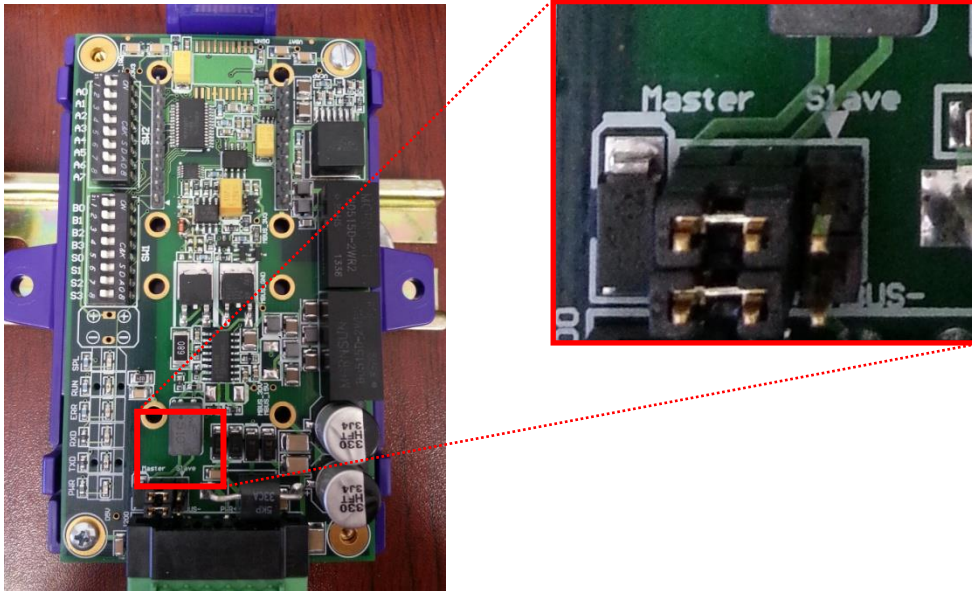
When designing an M-Bus network, only one M-Bus Master can be used with multiple M-Bus Slave devices. Connecting more than one M-Bus Master to the same network could result in the permanent damage to the M-Bus Masters' hardware.

3.3 Jumper Settings

Please ensure that the power supply to the M-Bus connection and the Power connection is switched OFF or unplugged before changing jumper settings.

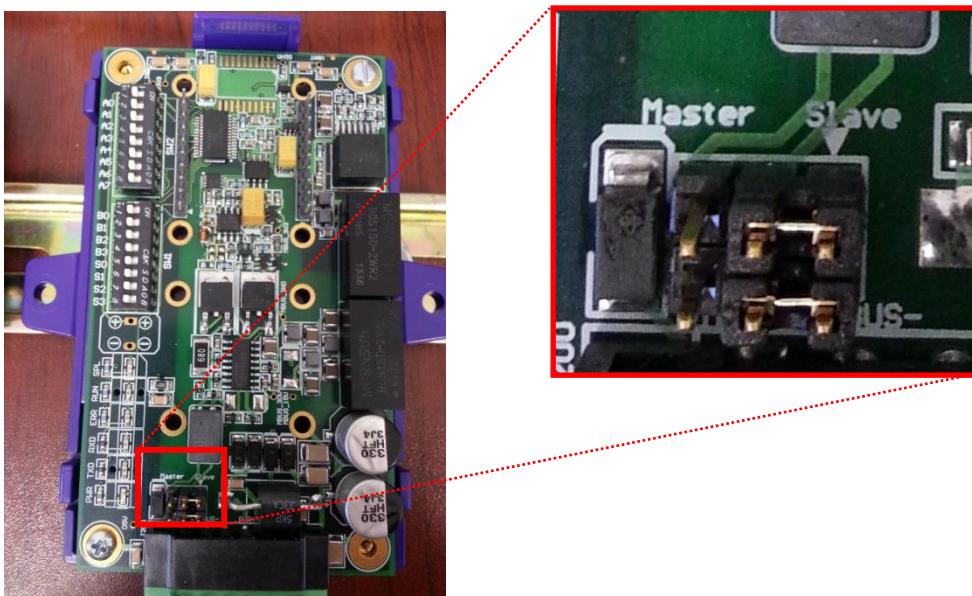
3.3.1 M-Bus Master

Set the two jumpers (oriented in a horizontal position) to the left side marked as “Master” as shown in the figure.



3.3.2 M-Bus Slave

Set the two jumpers (oriented in a horizontal position) to the left side marked as “Slave” as shown in the figure.



4 DATA ARRAY PARAMETERS

Data Arrays are “protocol neutral” data buffers for storage of data to be passed between protocols. It is necessary to declare the data format of each of the Data Arrays to facilitate correct storage of the relevant data.

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, UINT16, SINT16, UINT32, SINT32, BYTE, Bit.
Data_Array_Length	Number of Data Objects. Must be larger than the data storage area required by the Map Descriptors for the data being placed in this array.	1-10,000

Supported Data point Types

M-bus data is divided into two classes: Class-1 alarm protocol (higher priority) and Class-2 general data protocol. Class-1 alarm data is available according to the Slave vendor specific format, and is stored accordingly. Custom data types specified in the VIF, DIF and DIFE are supported.

The following table lists Class 2 general data types and the recommended FieldServer Data Array type to store the data:

Class-2 Data Type	Description	Recommended Data Array Types
Duration types	Time duration in seconds, minutes, hours and days	FLOAT
Energy types	Energy consumption, usually for billing purposes (Watt hour or Joules)	FLOAT
Voltage	Voltage reading of a meter	FLOAT
Current	Current reading of a meter	FLOAT
Temperature types	Temperature reading (°C or °F)	FLOAT
Time types	Time in seconds, minutes, hours and days	FLOAT
Custom types	Custom value, where the data type is specified in the VIF	FLOAT
Power types	Power reading (Watts or Joules/s)	FLOAT
Pressure	Pressure reading in bar.	FLOAT
Mass	Mass scaled value (kg)	FLOAT
Mass flow	Mass flow scaled value (kg/h)	FLOAT
Volume flow types	Volume flow value in litre per minute	FLOAT
Volume type	Volume value in cubic meters	FLOAT
Alarm flags	Volume flow value in litre per second	BYTE
Device ID	The device’s ID/Serial number	UINT32
Medium	The device’s measuring medium	BYTE
Unknown	Any remaining data types are stored	UINT32

Example

```
// Data Arrays
Data_Arrays
Data_Array_Name , Data_Array_Format , Data_Array_Length
DA_MBUS_01 , UINT32 , 50
DA_MBUS_02 , UINT32 , 50
DA_MBUS_03 , BYTE , 50
DA_MBUS_04 , FLOAT , 50
```

5 CONFIGURING THE FIELDSEVER AS AN M-BUS MASTER

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 as an M-Bus Master to communicate with an M-Bus Slave device.

The configuration file tells the FieldServer about its interfaces, and the routing of data required. In order to enable the FieldServer for M-Bus 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 “Master Side Nodes” section, and the data required from the Slaves needs to be mapped in the “Master 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 Master Side Connection Parameters

Section Title		
Connections		
Column Title	Function	Legal Values
Port	Specify which port the device is connected to the FieldServer.	R1-R2
Protocol	Specify protocol used	MBUS
Baud*	Desired Baud Rate to use for the M-Bus Network. See Section 0 for “Auto Baud Discovery”	300, 600, 1200, 2400 , 4800, 9600, 19200, 38400
Auto_Baud_Discovery*	Enables/Disables the discovery feature. See Appendix A2 for description.	Yes , No

Example1

```

// Master Side Connections

Connections
Port      , Protocol  , Baud   , Auto_Baud_Discovery
R2       , MBUS      , 9600   , Yes
```

5.2 Master Side Node Parameters

Section Title		
Nodes		
Column Title	Function	Legal Values
Node_Name	Provide name for Node	Up to 32 alphanumeric characters
Protocol	Specify Protocol used	MBUS
Node_ID	Positive integer number used to identify the Slave device	0-250
Port	Specify which port the device is connected to the FieldServer.	R2,R1
MBus_Mode	Mode 1 is recommended for new devices. Mode 2 is for legacy devices.	1-2
MBus_SND_NKE*	“Open connection” telegram is sent before each poll when set to “Yes”	Yes , No, -

MBus_FCB_Toggle*	FCB-bit is toggled when set to "Yes".	Yes, No, -
MBus_FCB_Inverted*	Inverts FCB-bit when set to "Yes".	Yes, No, -
MBus_IM_Delay*	Inter-message delay value can be changed.	100-2000
MBus_IM_Timeout*	Inter-message timeout value can be changed.	200-2000

Example

```
// Master Side Nodes

Nodes
Node_Name      , Protocol  , Port      , MBus_Mode  , Node_ID
METER_1       , MBUS      , R2       , 1         , 6
```

5.3 Master Side Map Descriptor Parameters**5.3.1 FieldServer Specific Map Descriptor Parameters**

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 Section 0.
Data_Array_Offset	Starting location in Data Array	0 to (Data_Array_Length-1) as specified in Section 0.
Function	Function of Master Map Descriptor	Rdbc, ARS
Length	Number of Data Objects.	Size of data to be read
Scan_Interval	Interval between readings	3 -

5.3.2 All data Request Driver Related Map Descriptor Parameters

Column Title	Function	Legal Values
Node_Name	Name of Node to fetch data from	One of the Node names specified in Section 5.2
MBus_Data_Class	Class 1 – Alarm , Class 2 - Data	Class-1 , Class-2
Linked_Map_Descriptor	If a Group address should be linked to a polling map descriptors data array	One of the Map descriptor names specified in Section 5.23

5.3.3 Specific Data Request Driver Related Map Descriptor Parameters

Column Title	Function	Legal Values
Node_Name	Name of Node to fetch data from	One of the Node names specified in Section 5.2
MBus_Data_Type	Data type	See Appendix A
Object_Instance	Data Offset	1-100
MBus_Data_Format	Override the data format of data received. If not sure what to select, please leave the option blank with "-" as the default data type will be used, as given by the node.	-, NO_DATA, UINT8, UINT16, UINT24, UINT32, REAL32, UINT48, UINT64, READOUT_SELECTION, BCD2, BCD4, BCD6, BCD8, VARIABLE, BCD12, SPECIAL, FLOAT
MBus_Scaling*	If the default scaling of the Slave device must be enabled/disabled.	Yes, No

Mbus_Use_Tariff_Number*	The Master uses the device's tariff number as object instance number to store the data, when enabled. The Master uses the device's data type instance number as object instance number to store the data, when disabled. If unsure, omit the field.	Yes, No
-------------------------	---	----------------

5.4 Map Descriptor Examples.

Example1

The QuickServer is configured to be a Master, and read a Slave energy meter configured as node_id = 6. The QuickServer polls the meter with the Poller, and the response message is linked to the M-Bus data types. The default data format of the meter must be used. The polling frequency has to be 0.1 Hz.

```
// Master Side Map Descriptors

// Polling Map Descriptor
Map_Descriptors
Map_Descriptor_Name , Data_Array_Name , Data_Array_Offset , Function , Node_Name , Length , Scan_Interval , MBus_Data_Class
MBUS_METER_1 , DA_POLLER , 00 , RDBC , METER_1 , 1000 , 10s , Class-2
```

RDBC is the most common function for MBUS Masters, as it will request the values from the node at the given interval

```
// Linked map descriptor example, any store to a linked map descriptor will update the specified M-Bus data type.

Map_Descriptors
Map_Descriptor_Name , Data_Array_Name , Data_Array_Offset , Function , Node_Name , MBus_Data_Type , Object_Instance , MBus_Data_Class , MBus_Data_Format
Energy_Tariff , DA_MBUS1 , 00 , Passive_Client , METER_1 , Energy_Tariff , 1 , Class-2 , -
Voltage , DA_MBUS1 , 01 , Passive_Client , METER_1 , Voltage , 1 , Class-2 , -
```

Map descriptor Energy_Tariff extracts the first instance of Energy in Watt Hour value from the MBUS_METER_1 node, using a linked map descriptor.

Both map descriptors use the same data array (DA_MBUS1), but reference the data at different offsets.

The function should be "Passive_Client" as the poller map descriptor already receives the data, and the linked map descriptor only needs to extract the correct data.

The node name used to poll for the data must be used to link these map descriptors to the poller map descriptor

The data point type must be available in the Server device's message
The valid data types are available in Appendix A

The M-Bus Data Class must be given (Class-1 for Alarm data, and Class-2 for other data)

6 CONFIGURING THE FIELDSEVER AS AN M-BUS SLAVE

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 as an M-Bus Slave to respond to an M-Bus Master.

The configuration file tells the FieldServer about its interfaces, and the routing of data required. In order to enable the FieldServer for M-Bus 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 “Master Side Nodes” section, and the data required from the Slaves needs to be mapped in the “Master 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.

6.1 Slave Side Connection Parameters

Section Title		
Connections		
Column Title	Function	Legal Values
Port	Specify which port the device is connected to the FieldServer	R2,1
Protocol	Specify protocol used	MBUS
Baud*	Desired Baud rate to use for all the M-Bus Slave nodes.	300, 600, 1200, 2400 , 4800, 9600, 19200, 38400

Example1

```
// Slave Side Connection
Connections
Port      , Protocol  , Baud
R2       , MBUS     , 9600
```

6.2 Slave Side Node Parameters

Section Title		
Nodes		
Column Title	Function	Legal Values
Node_Name	Provide name for Node	Up to 32 alphanumeric characters
Protocol	Specify Protocol used	MBUS
Node_ID	Positive integer number used to identify the device	0-250
Mbus_Secondary_Adress	Positive integer number used to identify the device using a secondary address	8-digit number, eg. 12345678
Port	Specify which port the device is connected to the FieldServer.	R2, R1
Mbus_Mode	Mode 1 is recommended for new devices, although Mode 2 support older M-Bus devices, which uses the old M-Bus instruction set.	1-2
Mbus_Multiple_Poll*	The slave will respond with multiple messages only when the Master requests each message as a separate request.	Yes, No, -

Example

```
// Slave Side Nodes

Nodes
Node_Name      , Protocol      , Port      , Mbus_Mode      , Node_Id      , Mbus_Secondary_Adress
Mbus_Meter_1  , MBUS          , R2        , 1              , 7            , 12345678
```

6.3 Slave Side Map Descriptor Parameters

6.3.1 FieldServer Specific Map Descriptor Parameters

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 Section 0.
Data_Array_Offset	Starting location in Data Array	0 to (Data_Array_Length-1) as specified in Section 0.
Function	Function of Slave Map Descriptor	Slave
Length	Number of Data Objects.	1

6.3.2 Driver Related Map Descriptor Parameters

Column Title	Function	Legal Values
Node_Name	Name of Node to make the data available on M-Bus	One of the Node names specified in Section 5.2
MBus_Data_Class	Class 1 – Alarm , Class 2 - Data	Class-1 , Class-2

6.3.3 Specific Data Request Driver Related Map Descriptor Parameters

Column Title	Function	Legal Values
Node_Name	Name of Node to fetch data from	One of the Node names specified in Section 6
MBus_Data_Type	Data type	As per Appendix A
Object_Instance	Data Offset	1-100

6.4 Map Descriptor Examples.

Example1

The QuickServer is configured to be an M-Bus Slave device and have two temperature values available to the Master on M-Bus address 7.

```
// Slave Side Map Descriptors
// These map descriptors will be available to the M-Bus Master at the Slave M-Bus address.
Map_Descriptors
Map_Descriptor_Name , Data_Array_Name , Data_Array_Offset , Function , Node_Name , MBus_Data_Type , Object_Instance , Length , MBus_Data_Class
Meter_1_Temp_Ext , DA_MBUS , 00 , SLAVE , TEMP_METER , Temp_External , 1 , 1 , Class-2
Meter_1_Temp_Flow , DA_MBUS , 01 , SLAVE , TEMP_METER , Temp_Flow , 1 , 1 , Class-2
```

Map descriptor name to describe the M-Bus value

Both map descriptors use the same data array (DA_MBUS), but reference the data at different offsets.

“SLAVE” is the function for MBUS Slaves, as it will only respond to reads from the Master.

The Node name defined must be used to link the map descriptor to the M-Bus address

The associated M-Bus data offset for the map descriptor is specified in this field.

The data length is always 1.

The M-Bus Data Class must be given (Class-1 for Alarm data, and Class-2 for other data)

Appendix A. TROUBLESHOOTING

Appendix A.1. Driver Error Messages

Error #	Msg Screen	Screen message	Meaning	Suggested Solution
1	ERROR	DRV->MBUS: #1 Not enough space to store %u items in da %s	Data array too short	Increase data array length to store the specified length of data elements.
2	ERROR	DRV->MBUS: #2 Out of memory	FieldServer ran out of memory	Too many data points used, reduce configuration size.
3	DRIVER	DRV->MBUS: #3 The Slave does not support message type	Informational message to notify the message was processed, but not supported. When the FieldServer is defined as a slave device, and will provide this message when a master tries read its EEPROM data.	No action required.
4	DRIVER	DRV->MBUS: #4 The Master requests node %u to use %u baud	The slave default baud is changed to the desired baud rate by the master. Information message to indicate the master's current action.	No action required.
5	DRIVER	DRV->MBUS: #5 Node %u baud rate fixed to %u baud	Informational message to indicate that the master failed to change the baud rate. When the slave default baud is fixed, and cannot be changed to the master	The master will still communicate to the slave in its fixed buad rate, therefore no action is required.
6	DRIVER	DRV->MBUS: #6 Node %u Online, AutoBaudDiscovery Off	Informational message to indicate the master found a node, and is turning the Auto_Baud_Discovery off. This feature is enabled by the connection parameter Auto_Baud_Discovery specified as "Yes".	This feature is enabled by the connection parameter Auto_Baud_Discovery specified as "Yes". No further action required
7	DRIVER	DRV->MBUS: #7 Node %u Offline, AutoBaudDiscovery On	Informational message to indicate the master doesn't get a response from the node, and is turning the Auto_Baud_Discovery on. This feature is enabled by the connection parameter Auto_Baud_Discovery specified as "Yes".	This feature is enabled by the connection parameter Auto_Baud_Discovery specified as "Yes". No further action required
8	DRIVER	DRV->MBUS: #8 Offline Node %u didn't respond on %u baud	Informational message to indicate the node did not respond to the master using the specified baud rate.	No further action as the Auto_Baud_Discovery feature will search for a node on other baud rates automatically. The connection parameter Auto_Baud_Discovery specified as "Yes" enables this feature.
9	DRIVER	DRV->MBUS: #9 The Master searches for node %u on %u baud	Informational message printed when Auto_Baud_Discovery is enabled, showing the current baud rate the master is using to discover a node	No further action after the feature is enabled by the connection parameter Auto_Baud_Discovery specified as "Yes".

10	DRIVER	DRV->MBUS: #10 The Master baud rate %u is undefined	Occurs when a master is asked to request a slave to change its baud rate to an undefined value. Neither the master nor the slave will accept the request, and baud rate will default to 2400 baud.	The baud rate on the MBUS connection should be set to one of the following baud rates: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400.
11	DRIVER	DRV->MBUS: #11 Unsupported MBUS data array element size, cannot get DIF %u	Unsupported data format, the data will not get stored for the specific data record	Contact support if the specific record's value is required.
12	DRIVER	DRV->MBUS: #12 Unsupported MBUS data type, cannot get DIFE	Unsupported DIFE, the DIFE will be ignored	Contact support if the specific record's DIFE is required.
13	DRIVER	DRV->MBUS: #13 Unsupported VIF in Slave Message %d %x - vif record	Unsupported VIF in the slave response	The data will be available under Mbus_Data_Type "Unknown"
14	DRIVER	DRV->MBUS: #14 Unsupported MBUS data type, cannot get VIFE	Unsupported VIFE, the VIFE will be ignored	Contact support if the specific record's VIFE is required.
15	DRIVER	DRV->MBUS: #15 Corrupted Slave Message	The slave response contains an error. This is not expected to happen too often, only with noise on the physical layer	Check the physical MBUS connection
16	DRIVER	DRV->MBUS: #16 Warning - MBUS packet not standard length	Information message to indicate the slave response packet length differs from the protocol standard. The response will still be processed.	No action required, if all the data is processed correctly.
20	DRIVER	DRV->MBUS: #20 Unsupported MBUS data array element format %d	Unsupported data format, the data will not get stored for the specific data record	Contact support if the specific record's value is required.
18	DRIVER	DRV->MBUS: #18 The Slave now uses the new baud rate of %u baud	Informational message to indicate the new baud rate. This is the case where the FieldServer is defined as a slave device, and a master changed the baud rate.	No action is required
19	DRIVER	DRV->MBUS: #19 Undefined Slave baud rate %u requested	Informational message to indicate the new baud rate. This is the case where the FieldServer is defined as a slave device, and a master changed the baud rate.	The slave ignores the request and continues to use its current baud rate. No action is required.

Appendix B. REFERENCE

Appendix B.1. M-Bus Data Types

Data Type Name	Data Type Description	Recommended Data Array Value
Duration_Avg_Sec	Averaged duration timer value seconds.	FLOAT
Duration_Avg_Min	Averaged duration timer value minutes.	FLOAT
Duration_Avg_Hrs	Averaged duration timer value hours.	FLOAT
Duration_Avg_Days	Averaged duration timer value days.	FLOAT
Duration_Act_Sec	Actual duration timer value seconds.	FLOAT
Duration_Act_Min	Actual duration timer value minutes.	FLOAT
Duration_Act_Hrs	Actual duration timer value hours.	FLOAT
Duration_Act_Days	Actual duration timer value days.	FLOAT
Energy_Wh	Energy tariff in Watt Hour.	FLOAT
Energy_J	Energy tariff in Joules.	FLOAT
Volume	Volume reading	FLOAT
Voltage	Voltage reading.	FLOAT
Current	Current reading.	FLOAT
Temp_External	External temperature reading (°C or °F).	FLOAT
Temp_Flow	Flow temperature reading (°C or °F).	FLOAT
Temp_Return	Return temperature reading (°C or °F).	FLOAT
Temp_Difference	Temperature difference reading (°C or °F).	FLOAT
Time_Sec	Current time seconds.	FLOAT
Time_Min	Current time minutes.	FLOAT
Time_Hrs	Current time hours.	FLOAT
Time_Days	Current time days.	FLOAT
Time_Operating_Sec	Time since start up seconds.	FLOAT
Time_Operating_Min	Time since start up minutes.	FLOAT
Time_Operating_Hrs	Time since start up hours.	FLOAT
Time_Operating_Days	Time since start up days.	FLOAT
Custom	Custom value, where the data type is specified in the VIF.	FLOAT
Power_W	Power reading in Watts.	FLOAT
Power_Jh	Power reading in Joules per hour.	FLOAT
Pressure	Pressure reading in bar.	FLOAT
Mass	Mass scaled value (kg).	FLOAT
Mass_Flow	Mass flow scaled value (kg/h).	FLOAT
Volume_Flow_L_M	Volume flow value in litre per minute.	FLOAT
Volume_Flow_L_H	Volume flow value in litre per hour.	FLOAT
Volume_Flow_L_S	Volume flow value in litre per second.	FLOAT
Volume_Flow_ML_S	Volume flow value in millilitre per second.	FLOAT
Alarm_Flags	Alarm flags according to device Class -1 data.	BYTE
Device_ID	Device ID/ Serial Number	FLOAT
Medium	Device's measuring medium	BYTE
Unknown	Unknown data type (use this to reach unsupported data types)	FLOAT

Appendix B.2. Auto Baud Discovery

The FieldServer configured as an M-Bus Master device has the ability to change each Slave to a desired standard M-Bus baud rate automatically. The FieldServer configured as an M-Bus Slave device has the ability to change its own baud to a desired standard M-Bus baud rate if requested by the Master.

Most M-Bus devices are set to start up at 2400 Baud, although some older devices have 300 Baud as their default Baud rate. The Auto Baud Discovery feature cycles through all the baud rates, and sets the device's baud rate to the desired baud rate (as specified in the connection parameter section), as soon as it finds each device's default baud rate, individually.

The Auto Baud Discovery tool automatically tries to establish a connection to the Slave device using the desired baud rate specified. If the node is offline, the tool tries to discover the node using automated search and sends a request to the device to change to the desired baud rate.

Please note that most M-Bus devices only support up to 9600 baud. Please make sure that the device connected to the FieldServer supports the desired baud rate.