



A Sierra Monitor Company

Driver Manual
(Supplement to the FieldServer Instruction Manual)

FS-8700-02 Modbus Plus

APPLICABILITY & EFFECTIVITY

Effective for all systems manufactured after January 2010

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1 MODBUS PLUS DESCRIPTION

The Modbus Plus driver allows the FieldServer to transfer data to and from devices using Modbus Plus protocol. The driver was developed for Modbus Application Protocol Specification V1.1a" from Modbus-IDA. The specification can be found at www.modbus.org. 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-8915-01 (Single Port) OR FS-8915-19 (Dual Port)	Adapter Card.
Config.csv	Template loaded if no custom configuration ordered, otherwise Custom configuration loaded.
mbphost.sys	Used to initialize the SA85 card. Card will not initialise without it.
config.sys	Must call mbphost.sys to ensure card initialization

2.2 Provided by the Supplier of 3rd Party Equipment

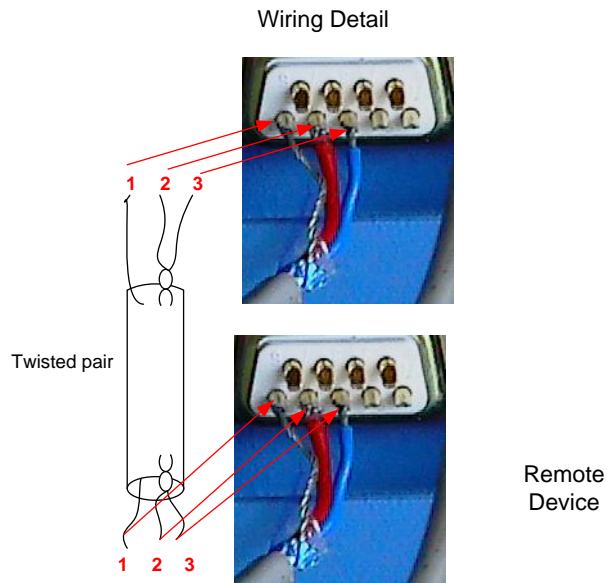
PART #	DESCRIPTION
	Modbus Plus cables and connectors, including termination connectors as documented by Group Schneider/Modicon
	Modbus Plus Device ¹
	Modbus Plus Client, e.g. Wonderware, Intellution FIX, GE Cimplicity etc ² .

¹ If FieldServer used as Modbus Plus Client

² If FieldServer used as Plus Server

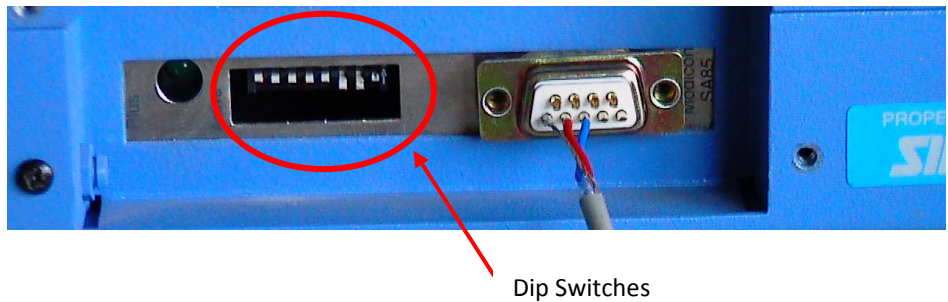
3 HARDWARE CONNECTIONS

Connect the FieldServers to the Remote Device using a shielded twisted pair cable as shown in the following photograph.



3.1 Connection Notes

Set the dip switches on the Modbus card. The DIP switch is set to one less than the actual address. Refer to Appendix C.1.



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.	INT16, INT32, Bit, Float
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

Example

```
// Data Arrays
Data_Arrays
Data_Array_Name , Data_Array_Format , Data_Array_Length
DA_AI_01        , Float              , 20
DA_AO_01        , Float              , 20
DA_DI_01        , Bit                , 20
DA_DO_01        , Bit                , 20
```

5 CONFIGURING THE FIELDSEVER AS A MODBUS PLUS 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 Modbus Plus Server

The configuration file tells the FieldServer about its interfaces, and the routing of data required. In order to enable the FieldServer for Modbus Plus 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.

5.1 FieldServer Parameters

Section Title	FieldServer	
Column Title	Function	Legal Values
System_Node_ID	This parameter should be set to the address of the dip switches on the Modbus Plus card. Refer to Appendix C.1.	1-64, 11

- The FieldServer is shipped with the switches set to a default address (Node_ID) of 11. Please consult the documentation shipped with the FieldServer for the actual settings.
- Set the Modbus Plus address switches 1--6 to the address in your application. Switches 7 and 8 are not used.
- Switch 1 is the least significant bit of the address. Switch 6 is the most significant bit. The address will be one higher than the binary value set into the switches.

Example

```
// FieldServer

FieldServer
Title          , System_Node_ID
Modbus Plus    , 5
```

5.2 Client Side Connection Parameters

Section Title		
Connections		
Column Title	Function	Legal Values
Adapter	Adapter name	MBP
Protocol	Specify protocol used	Modbus_Plus, Modbus+
Poll Delay*	Time between internal polls	0-32000 s, 1 s

Example

```
// Client Side Connections

Adapters
Adapter      , Protocol      , Poll_Delay
MBP          , Modbus+       , 0.100s
```

5.3 Client Side Node Parameters

Section Title		
Nodes		
Column Title	Function	Legal Values
Node_Name	Provide name for node	Up to 32 alphanumeric characters
Route	Modbus Plus Path	The route must be specified as: "<Target_Mac_address> <Internal_Path>". For instance "11 1". The most commonly used Routes are " 1 0 " or " 2 0" where the first digit is the address of the remote Modbus Plus device.
Protocol	Specify protocol used	Modbus_Plus, Modbus+
Adapter	Adapter name	MBP

Example

```
Client Side Nodes

Nodes
Node_Name      , Node_ID  , Protocol  , Adapter
MBP_Srv_11    , 11 1    , Modbus+  , MBP
```

5.4 Client Side 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 Section 4
Data_Array_Offset	Starting location in Data Array	0 to (Data_Array_Length -1) as specified in Section 4)
Function	Function of Client Map Descriptor	Rdbc Wrbx Wrbc
Node_Name	Name of Node to fetch data from	One of the node names specified in Section 5.3.
Address	Starting address of read block	40001, 30001, etc
Length	Number of items to read	1 - 125
Data_Array_Low_Scale*	Scaling zero in Data Array	-32767 to 32767, 0
Data_Array_High_Scale*	Scaling max in Data Array	-32767 to 32767, 100
Node_Low_Scale*	Scaling zero in Connected Node	-32767 to 32767, 0
Node_High_Scale*	Scaling max in Connected Node	-32767 to 32767, 100

5.4.1 Map Descriptor Example

```
// Client Side Map Descriptors

Map_Descriptors
Map_Descriptor_Name , Data_Array_Name , Data_Array_Offset , Function , Node_Name, , Address , Length , Scan_Interval
CMD_AI1 , DA_AI , 0 , Rdbc , PLC 11 , 30001 , 20 , 2.0s
CMD_AO1 , DA_AO , 0 , Rdbc , PLC 11 , 40001 , 20 , 2.0s
```

6 CONFIGURING THE FIELDSEVER AS A MODBUS PLUS SERVER

6.1 Server Side Connection Parameters

Section Title		
Connections		
Column Title	Function	Legal Values
Adapter	Adapter name	MBP
Internal Path	Modbus Plus data path	1 - 8
Protocol	Specify protocol used	Modbus_Plus, Modbus+

Example

```

// ServerSide Connections

Adapters
Adapter      , Protocol      , Internal_Path
MBP          , Modbus+        , 1
    
```

If multiple Clients need to access the FieldServer, each Client needs a new internal path to be created. This example allows the connection of 2 Client Nodes to the FieldServer

6.2 Server Side Node Parameters

Section Title		
Nodes		
Column Title	Function	Legal Values
Node_Name	Provide name for node	Up to 32 alphanumeric characters
Node_ID	Node ID of virtual Server node	1 – 255 ³
Protocol	Specify protocol used	Modbus_Plus, Modbus+

Example

```

Client Side Nodes

Nodes
Node_Name      , Node_ID  , Protocol
MBP_Srv_11    , 11      , Modbus+
    
```

³ The Node_ID setting of the Server FieldServer must always match the MAC_address of the card.

6.3 Server Side 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 Section 4
Data_Array_Offset	Starting location in Data Array	0 to (Data_Array_Length -1) as specified in Section 4.
Function	Function of Client Map Descriptor	Passive
Node_Name	Name of Node to fetch data from	One of the Node names specified in Section 5.3.
Address	Starting address of read block	40001, 30001, etc
Length	Number of items to read	1 - 125
Data_Array_Low_Scale*	Scaling zero in Data Array	-32767 to 32767, 0
Data_Array_High_Scale*	Scaling max in Data Array	-32767 to 32767, 100
Node_Low_Scale*	Scaling zero in Connected Node	-32767 to 32767, 0
Node_High_Scale*	Scaling max in Connected Node	-32767 to 32767, 100

6.3.1 Map Descriptor Example

```
// Server Side Map Descriptors

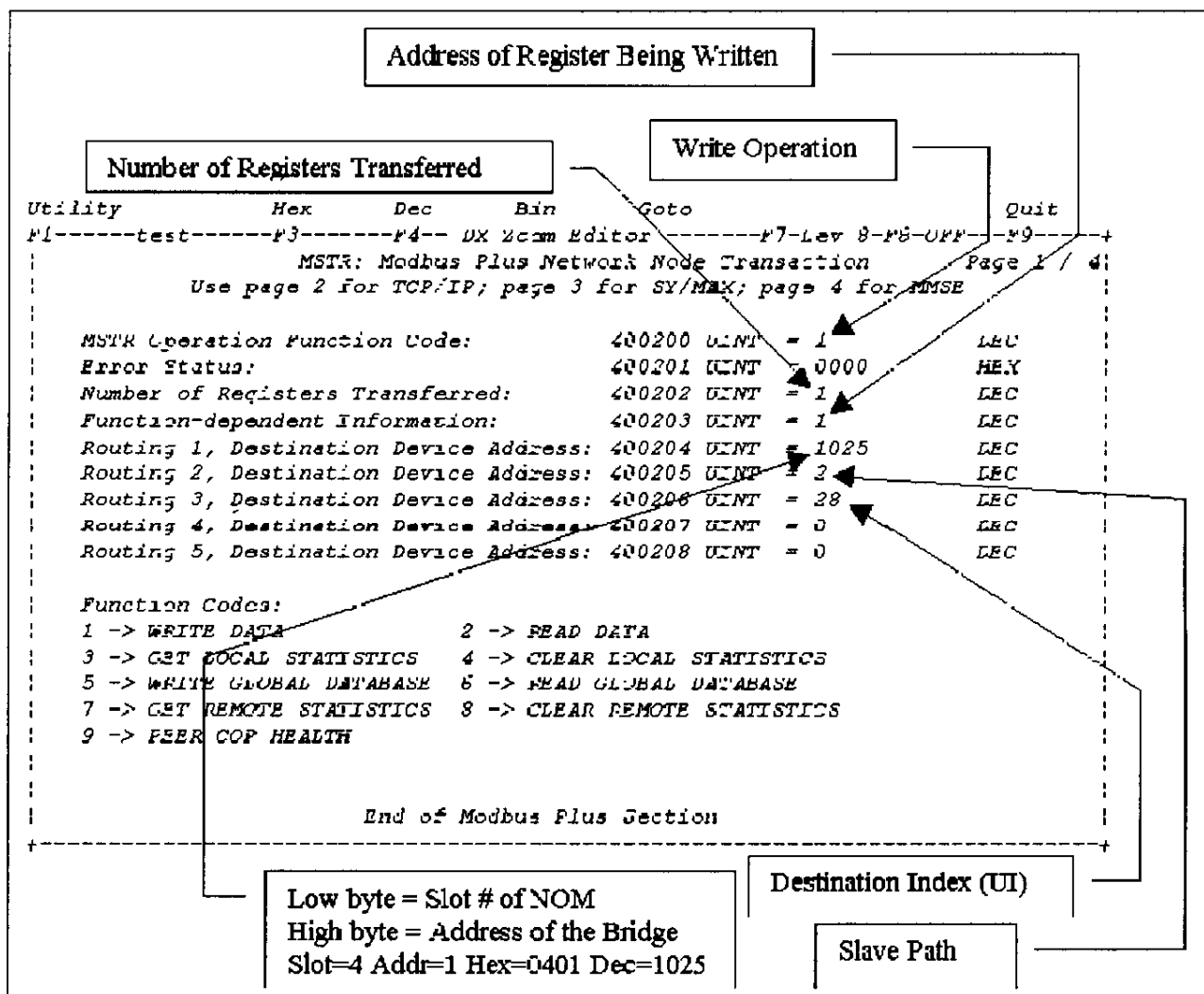
Map_Descriptors
Map_Descriptor_Name , Data_Array_Name , Data_Array_Offset , Function , Node_Name , Address , Length , Data_Array_Low_Scale , Data_Array_High_Scale , Node_Low_Scale , Node_High_Scale
SMD_AI_01          , DA_AI_01          , 0              , Passive , MBP_Srv_13 , 30001 , 20 , 0 , 100 , 0 , 10000
SMD_AO_01          , DA_AO_01          , 0              , Passive , MBP_Srv_13 , 40001 , 20 , 0 , 100 , 0 , 10000

SMD_DI1           , DA_DI_01          , 0              , Passive , MBP_Srv_11 , 10001 , 20
SMD_DO1           , DA_DO_01          , 0              , Passive , MBP_Srv_11 , 1 , 20
```

6.3.2 MSTR Example: Modbus Plus Node

This example shows a Modicon Modsoft screen for an MSTR function in a Modbus Plus node. It writes one register of data to a virtual node in the FieldServer.

- The MSTR Function Code specifies a Write operation
- One register of data is to be transferred
- The destination register is 40000 (addressed as register 1).
- The FieldServer's node address is 1. Note that the decimal value 1025 equals 0401 hexadecimal, addressing a Modbus Plus Network Option Module (NOM) in backplane slot 04 and a node at address 01.
- The destination index is 28. The FieldServer will forward the message to the TCP node whose IP address is in this location in the FieldServer's TCP Mapping table.



Appendix A. Useful Features

Appendix A.1. Modbus Plus Card Indicators

The Modbus Plus card has an indicator that flashes a repetitive pattern to show its network communication status, plus two indicators which identify communication errors on the two Modbus Plus cable paths. Note that one error indicator will be lit normally in single-cable installations, showing that a second cable does not exist.

Appendix A.1.1. Modbus Plus Active Indicator Patterns

Indicator Pattern (Green)	Status
Six flashes/second	Normal operating state. All nodes on a healthy network flash this pattern
One flash/second	The node is off-line. After being in this state for 5 seconds, the node attempts to go to its normal operating state.
Two flashes, then OFF for 2 seconds	The node detects the network token being passed among other nodes, but it never receives the token.
Three flashes, then OFF for 1.7 seconds	The node does not detect any token passing on the network.
Four flashes, then OFF for 1.4 seconds	The node has detected another node using the same address.

Appendix B. Troubleshooting

Appendix B.1. Modbus Plus Connection Statistics

Statistic Name	Description
MB+ Link Control	The remote Modbus Plus device on the network is not responding to communications from the Modbus Plus card installed in the FieldServer." This is a low level communications failure statistic that could mean that the remote device does not exist, is not connected properly to the network, or is incorrectly configured.

Appendix C. Reference

Appendix C.1. Modbus Plus Addresses and Switch Settings

Address	Switches 6--1	Address	Switches 6--1	Address	Switches 6--1
1	000000	23	010110	45	101100
2	000001	24	010111	46	101101
3	000010	25	011000	47	101110
4	000011	26	011001	48	101111
5	000100	27	011010	49	110000
6	000101	28	011011	50	110001
7	000110	29	011100	51	110010
8	000111	30	011101	52	110011
9	001000	31	011110	53	110100
10	001001	32	011111	54	110101
11*	001010	33	100000	55	110110
12	001011	34	100001	56	110111
13	001100	35	100010	57	111000
14	001101	36	100011	58	111001
15	001110	37	100100	59	111010
16	001111	38	100101	60	111011
17	010000	39	100110	61	111100
18	010001	40	100111	62	111101
19	010010	41	101000	63	111110
20	010011	42	101001	64	111111
21	010100	43	101010		
22	010101	44	101011		* = default

Appendix C.2. Summary of Modbus Data Access Commands

Function Code (Decimal)	Command Name
1	Read Discrete Output Status (0xxxx)
2	Read Discrete Input Status (1xxxx)
3	Read Output Register (4xxxx)
4	Read Input Register (3xxxx)
5	Force Single Coil (0xxxx)
6	Preset Single Register (4xxxx)
15	Force Multiple Coils (0xxxx)
16	Preset Multiple Registers (4xxxx)