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A Sierra Monitor Company

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

**FS-8700-57 Profibus MS**

**APPLICABILITY & EFFECTIVITY**

**Effective for all systems manufactured after May 1, 2001**

<b>Driver Version:</b>	<b>1.01</b>
<b>Document Revision:</b>	<b>7</b>

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## 1. Profibus Multi-Slave Description

The Profibus Multi-Slave driver allows the FieldServer to transfer data to and from a Profibus DP Master using Profibus DP protocol. The SST 5136-PBMS Communications Adapter card is included with the FieldServer. The FieldServer can emulate up to 125 DP Slave units each having an input and output buffer of 244 bytes each. The buffer data can be converted to other FieldServer data-types like Integers and Floating point numbers for seamless data-passing to other protocols. A maximum of 30,500 bytes of input and 30,500 bytes of output data can be transferred.

### Max Nodes Supported

FieldServer Mode	Nodes	Comments
Server	125	1-125 Slaves can be emulated

## 2. Driver Scope of Supply

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

FieldServer Technologies PART #	Description
SST 5136-PBMS	Communication Adapter complete with Phoenix Contact Screw Terminal and DB9 Connector
-	Profibus Tools CD
FS-8700-57	Driver Manual.

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

#### 2.2.1. Required 3<sup>rd</sup> Party Hardware

Part #	Description
-	Profibus Network With Cables And Terminators

#### 2.2.2. Required 3<sup>rd</sup> Party Software

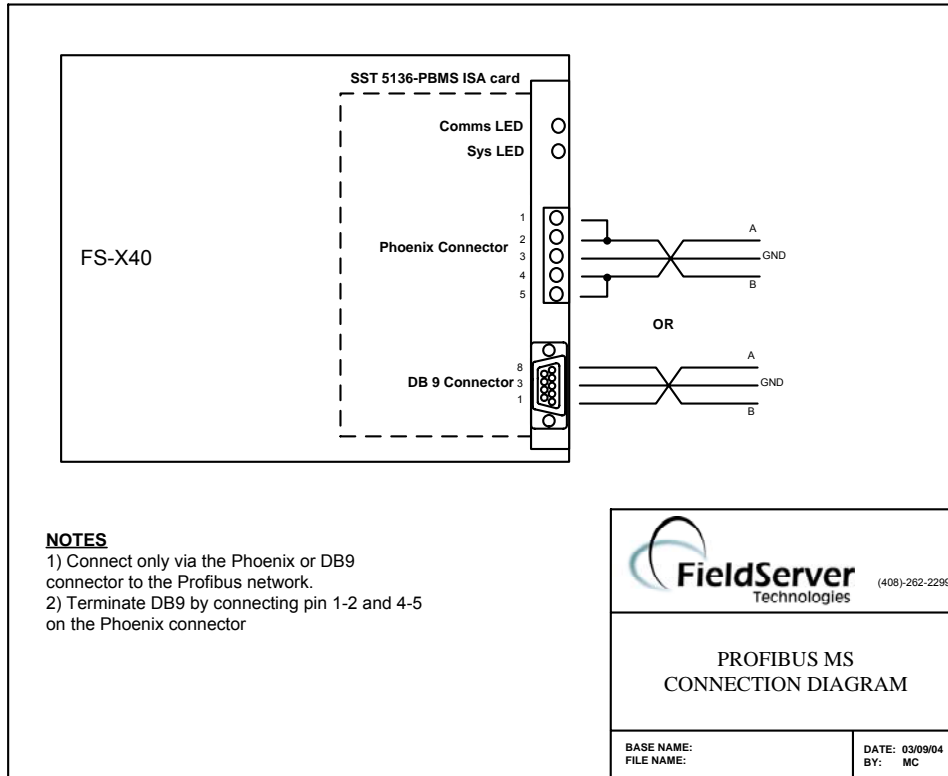
A Profibus Network Configuration Tool if not using the SST Tool supplied on the Profibus Tools CD.

#### 2.2.3. Required 3<sup>rd</sup> Party Configuration

The FieldServer configured as a Profibus Multi-Slave can only transfer data with a configured DP Master on the Profibus network.

### 3. Hardware Connections

The FieldServer is connected to the Profibus network as shown in the connection drawing below:



#### 3.1. Hardware Connection Tips / Hints

See the 5136-PBMS Hardware Manual on the Tools CD for more information on connector pinouts and wiring practices.

## 4. Configuring the FieldServer as a Profibus Multi-Slave 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 to communicate with an external Profibus DP Master.

The Profibus Multi-Slave driver builds a list of Slaves from the FieldServer configuration file. The sizes of the input and output buffers are calculated based on the mappings found. The maximum input and output buffer sizes are 244 bytes for each buffer.

Each emulated Slave is connected to the network with the Slave identification set to 0x0857. GS files are available on the Tools CD or obtainable from [www.mysst.com](http://www.mysst.com)

### 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 Profibus Multi-Slave 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 “Server Side Nodes” section, and the data required from the Masters 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.

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, SInt16, 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 the data being placed in this array.	1-10,000

#### Example

// Data Arrays		
Data_Arrays		
Data_Array_Name,	Data_Format,	Data_Array_Length
Float_Input,	Float,	20
Word_Input,	UInt16,	20
Byte_Input,	Byte,	20
Bit_Input,	Bit,	16

**4.2. Server Side Connection Descriptions**

Section Title		
Connections		
Column Title	Function	Legal Values
Adapter	Adapter Name	Prof_DP_MS
Protocol	Specify protocol used	Profibus_MS
Profibus_MS_Baud	Profibus Multi-Slave Network Baudrate	9600, 19200, 93.75K, 187.5K, 500K, 750K, 1.5M, 3M, 6M, 12M

**Example**

```
// Server Side Connections

Connections
Adapter,          Protocol,          Profibus_MS_Baud
Prof_DP_MS,      Profibus_MS,      93.75K
```

**4.3. 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	Slave station number	1-125
Protocol	Specify protocol used	Profibus_MS
Adapter	Adapter Name	Prof_DP_MS

**Example**

```
// Server Side Nodes

Nodes
Node_Name,      Node_ID,      Protocol,      Adapter
SLV01,          1,            Profibus_MS,  Prof_DP_MS
```

#### 4.4. Server Side Map Descriptors

##### 4.4.1. FieldServer Related 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 "Data Array" section above
Data_Array_Offset	Starting location in Data Array	0 to maximum specified in "Data Array" section above
Function	Function of Server Map Descriptor	RDBC, WRBC

##### 4.4.2. 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 "Server Node Descriptor" above
DP_Type	Data type in which buffer data will be arranged	FLOAT, WORD, BYTE, BIT
DP_Buffer	Indicates which Slave buffer to access	INPUT for data sent to the Master, OUTPUT for data received from the Master
Address	Offset from beginning of data buffer	BIT offsets are in bits, other in bytes
Length	Number of DP_Type elements that is mapped to/from the Data Array	FLOAT – 1 .. 61 WORD – 1 .. 122 BYTE – 1 .. 244 BIT – 1 .. 1952

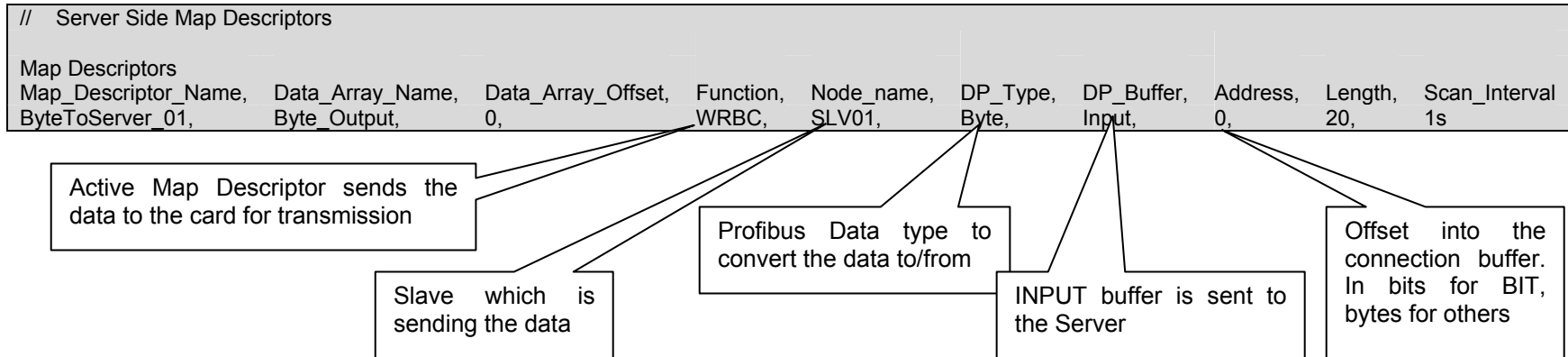
##### 4.4.3. Timing Parameters

Column Title	Function	Legal Values
Scan_Interval	Rate at which data is updated to / from the Multi-Slave buffers	≥0.001s

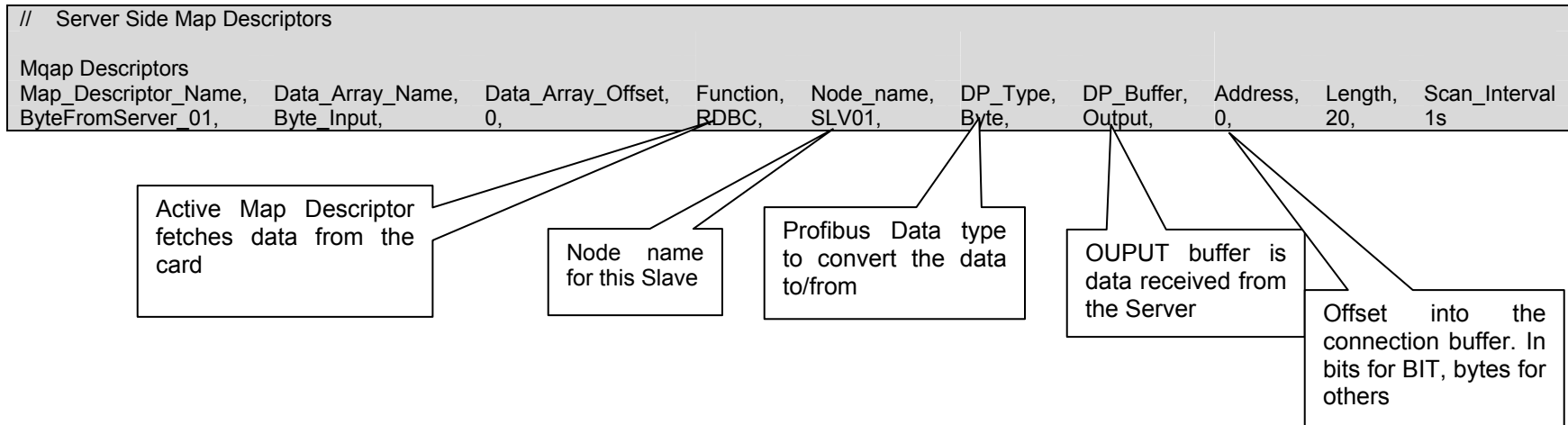


### 4.4.4. Map Descriptor Example.

The following Map Descriptor will produce input data for the Master to read:



The following Map Descriptor will consume output data received from the Master:



**Appendix A. Advanced Topics**

**Appendix A.1. Using more than one Map Descriptor on a buffer**

It is important to correctly calculate Map Descriptor address and length values when using more than one Map Descriptor on a buffer. The driver does not allow overlaps in the address ranges used by Map Descriptors to prevent incorrect data mappings and double-polling of buffer data. The following byte lengths exist for the available DP\_Type data types:

DP_Type	Byte Length
Float	4
Word	2
Byte	1
Bit	Depends on number of bits. 8 bits per byte.

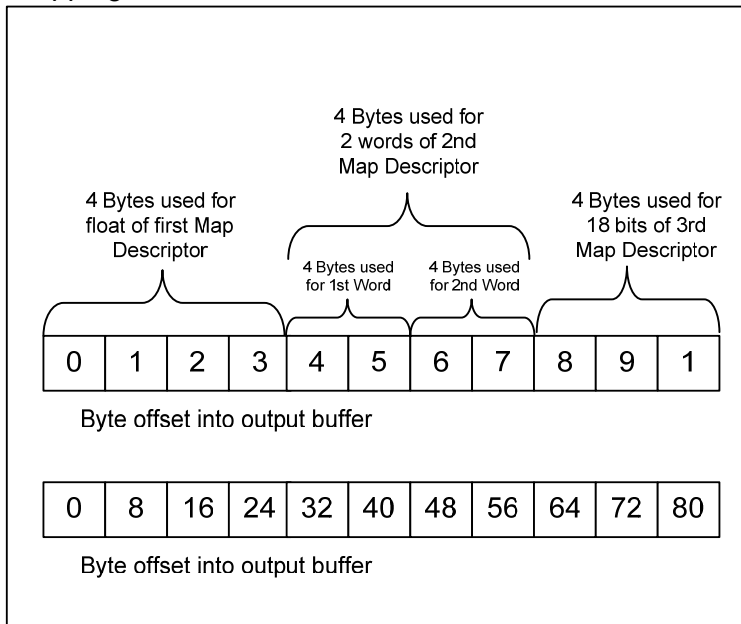
**Example on using three Map Descriptors on the same buffer:**

First Map Descriptor is used to read 1 Float from the start of the Master’s output buffer:  
 Address = 0 (start of buffer); Length = 4 (one float).

Second Map Descriptor is used to read 2 Words from the next available space in the Master’s output buffer:  
 Address = 4 ( start of buffer ) + 1 \* 4 ( byte length of first Map Descriptor ) = 4; Length = 4 ( ten words ).

Third Map Descriptor used to read 18 Bits from the next available space:  
 (Note: Address has to be specified as a bit offset now)  
 Address = 8 ( start of buffer ) \* 8 ( bits per byte ) + 1 \* 4 \* 8 ( bit length of first Map Descriptor ) + 2 \* 2 \* 8 ( bit length of second Map Descriptor ) = 64 bits  
 Length = 18 ( eighteen bits ).

Mapping of the buffer is shown below:



### Appendix A.2. Understanding buffer types and Map Descriptor functions

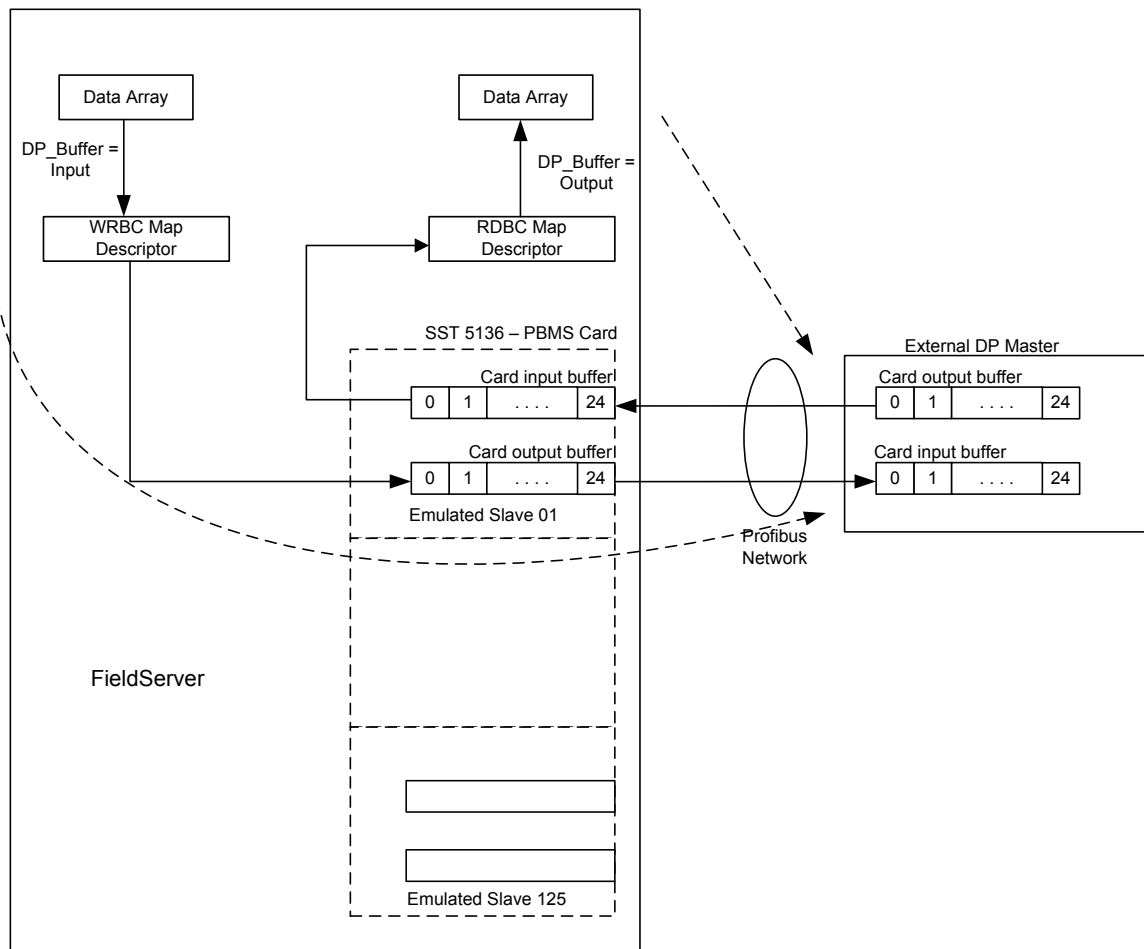
The following DP\_Buffer types and Map Descriptor functions are normally used together:

DP_Buffer	Function
Output	RDBC
Input	WRBC

The diagram below explains the data flows for both buffers.

Note that for the Output buffer, the data is coming from the external DP Master and is transferred into the Multi-Slave card's internal input buffer. The Map Descriptor being of the RDBC function (Read Data Block Continuous) transfers the data from the card buffer into the FieldServer's Data Array packing it correctly according to the specified DP\_Type.

For the Input buffer, the data is written from the FieldServer's Data Array by the WRBC function Map Descriptor (Write Data Block Continuous) into the Multi-Slave card's internal output buffer from where it is transferred across the Profibus network to the DP Master's input buffer.



### **Appendix A.3. Write-Throughs**

Some FieldServer drivers support “write-throughs” which is simply defined as the ability of a Read Map Descriptor to automatically create a temporary write Map Descriptor to update the value of an external R/W (Read or Write) memory location. Since the Profibus DP Master contains separate Read-Only (Output) and Write-Only (Input) Buffers, write-throughs are disabled and not implemented on the Profibus Multi-Slave driver.

### **Appendix A.4. Map Descriptor Scan Interval affecting FieldServer performance**

Note that the Map Descriptor scan interval simply sets the rate at which data is moved to or from the Data Arrays and the Profibus Multi-Slave’s local card buffers. The Profibus Network baudrate as set on the Connection under Profibus\_MS\_Baud determines the speed at which data is transmitted on the Profibus network itself. Very low scan intervals ( less than one second ) on multiple Map Descriptors of full buffer length are permitted although it could affect overall FieldServer performance significantly, even more so when using Bit Data Arrays. Generally, 1 second scan intervals are sufficient on Map Descriptors for monitoring and open loop control functions. Lower scan intervals may be more appropriate for closed loop control functions.

### **Appendix A.5. The SST-5136 Profibus Multi-Slave Identification Number**

The SST-5136 Profibus Multi-Slave’s Identification Number is 0x0857.

### **Appendix A.6. Profibus Network Station limits**

The Profibus Multi-Slave driver does not allow station address zero or station address 126 to be used for an emulated Slave. Station zero is reserved for a DP Master and station 126 is reserved for special systems. Station addresses from 1 to 125 are allowed.

### **Appendix A.7. Interpreting Driver Connection Stats**

When viewing the connection stats with Ruinet, it is important to note that the transmit (Tx) stats on the Connection simply reflect messages that have been submitted to the Profibus card for transmission on the network. They do not necessarily indicate actual transmissions to a Profibus Master.

If the messages reach a Master and it communicates correctly with the FieldServer, the receive (Rx) stats are indicative of polls from a connected Profibus Master.

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## Appendix B. Troubleshooting tips

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### Appendix B.1. FieldServer as a Profibus Slave

If no communications is being experienced between a Profibus Master and a FieldServer Profibus Slave, check for the following most common issues:

- The baud rate for this driver must be specified in the Connections section of the configuration.
- Baud rate must match the baud rate being used on the network.
- The Node\_ID must match the System\_Station\_Address in the configuration - this tells the FieldServer that the buffer referenced in the Node\_ID refers to the buffers in the Profibus card attached to the FieldServer.
- The gse file must match the FieldServer hardware being used
  - FieldServer offers several hardware platforms that support Profibus. Each hardware platform requires its own gse file. Make sure that the gse file being used is the correct file for the hardware platform in use.
  - The gse file can be opened with a text editor. The Vendor and model name can be checked in this file. For the FieldServer X40 Profibus Master/Slave, the Vendor is "SST", and the Model Name is "5136-PFB-ISA". The current revision is 1.9, which uses Hardware revision 1.0 and software release 1.8.
- The byte count for the gse profile must match the byte count configured in the FieldServer
  - The gse being used is either going to allow the Slave (via the network configuration tool) to select the bytes to be used, or the byte make-up will be fixed and specified in the gse. Either way, the largest byte offset used by the Slave must match the largest byte offset configured in the FieldServer.
  - When selecting byte count with a network configuration tool, the total amount of bytes/words/bits setup per Input/Output buffer in the FieldServer configuration Map Descriptors must match those selected in the network configuration tool otherwise a connection length mismatch will occur and connection will not be established. The FieldServer shows the connection size it expects on the F (driver message) screen in the RUI utility in order that this value may be checked against the network configuration tool.
- The FieldServer may have bridge.bss loaded, which will configure it as a Master
  - The bridge.bss file is loaded by default when FieldServers ships with the default Profibus Master Configuration. This file must not exist in applications where FieldServer is being used as a Slave.
  - To check for the file, try uploading the file from the FieldServer using the RUI Utility. If it uploads successfully, then it will need to be deleted. See the FieldServer Utilities manual for instructions on how to do this.
- The FieldServer may be missing the pfbdp.ss1 file
  - This file is compulsory for all SST Profibus applications, and may be missing for some reason.
  - To check for the file, try uploading the file from the FieldServer using the RUI Utility. If it uploads successfully, then this is not the problem.
- The direction of the communications (Input/Output Buffer) may be incorrectly configured.
  - Buffer names can be confusing, especially when looking at the Slave. The buffers are named according to their direction of communication in the Master.

- Hence, an Input buffer in the Slave will write data to the Master, and data will be received from the Master in the output buffer.
  - Remember that as a Slave, the FieldServer will have to write data into the input buffer (function=wrbc), and read data from the output buffer (function=rdbc).
- The Profibus card may be faulty.
  - If this is the case, then there will be an error message in the FieldServer RUI error screen indicating that the card could not be reached. Check for this message. If it is there, try opening up the FieldServer and re-seating the card. If this does not help, contact FieldServer Technical support for jumper settings on the card, and further possible troubleshooting or return authorization.

```

C:\WINDOWS\system32\cmd.exe - rn 20
System Errors
20 I05> File : config.csv, line 93
21 I05> Line : BYTE_IN_01 , DA_BI_01 , 0 , Passive_Client, PDP_01 , BYTE , Inpu
22 I05>
23 I05> ----- Configuration File Error -----
24 I05> Desc : Could not create map descriptor; Prof_DP adapter not initialized
25 I05> Error: 66
26 I05> File : config.csv, line 94
27 I05> Line : BIT_IN_01 , DA_DI_01 , 0 , Passive_Client, PDP_01 , BIT , Input
28 I05>
29 I05> ----- Configuration File Error -----
30 I05> Desc : Could not create map descriptor; Prof_DP adapter not initialized
31 I05> Error: 66
32 I05> File : config.csv, line 95
33 I05> Line : BYTE_IN_01 , DA_BI_01 , 20 , Passive_Client, PDP_01 , BYTE , Inp
34 I05>
35 I05> DRU-> PDP : Warning, FLOAT_OUT_01 writing to DP master's output buffer.
36 I05> DRU-> PDP : Be sure this is what you want to do.
37 I05> ----- Configuration File Error -----
38 I05> Desc : Could not create map descriptor; Prof_DP adapter not initialized
39 I05> Error: 66
Keys: <R>reset Display <U>ersion <ESC>
      <Page Down> Next Page <Page Up> Previous Page
  
```

- The Data Type/Offset/Length combination may be incorrectly set up
  - In the FieldServer configuration, the Offset Parameter almost always refers to the buffer offset in bytes (starting at 0), regardless of data type. The only exception is the BIT data type which specifies offset in bits to allow for offsets that are not a multiple of 8. The Length parameter always refers to length in items, which means Float data will be the number of float values, Word data will be the number of words, etc.

**Appendix B.2. Connection Tips & Hints**

The SST 5136-PBMS card contains a SYS and a COM LED. The SYS LED indicates the card's system status as follows:

SYS state	LED	Meaning	Status / Remedy
Clear / OFF		Card is Offline	The DP Master is not online
Red		Card error, network Error or disconnected from network	Check network wiring

Green	Card is Online	Card is functioning OK
Alternating Red / Green	Every time an emulated Slave is in error the LED goes Red.	Network configuration on DP Master may be scanning buffer data not defined in Master. Slave not defined in CSV file.
Yellow	Some of the emulated Slaves are scanned in stop mode	Card is functioning OK

The COM LED is Green when the card transmits on the network. A Red COM LED indicates a reception error occurred. Make sure both ends of the network is terminated. Also make sure your choice and length of network cable supports the baud rate used. Please refer to the 5136-PBMS Hardware Guide on the Tools CD for more information on network cable types.

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