

# PROFIBUS-DP<sup>®</sup> Option Technical Manual



# Warnings and Cautions

This Section provides warnings and cautions pertinent to this product, that if not heeded, may result in personal injury, fatality, or equipment damage. Yaskawa is not responsible for consequences of ignoring these instructions.



YASKAWA manufactures component parts that can be used in a wide variety of industrial applications. The selection and application of YASKAWA products remain the responsibility of the equipment designer or end user. YASKAWA accepts no responsibility for the way its products are incorporated into the final system design. Under no circumstances should any YASKAWA product be incorporated into any product or design as the exclusive or sole safety control. Without exception, all controls should be designed to detect faults dynamically and to fail safely under all circumstances. All products designed to incorporate a component part manufactured by YASKAWA must be supplied to the end user with appropriate warnings and instructions as to that part's safe use and operation. Any warnings provided by YASKAWA must be promptly provided to the end user. YASKAWA offers an express warranty only as to the quality of its products in conforming to standards and specifications published in the YASKAWA manual. NO OTHER WARRANTY, EXPRESS OR IMPLIED, IS OFFERED. YASKAWA assumes no liability for any personal injury, property damage, losses, or claims arising from misapplication of its products.



- Read and understand this manual before installing, operating, or servicing this drive. All warnings, cautions, and instructions must be followed. All activity must be performed by qualified personnel. The drive must be installed according to this manual and local codes.
- Do not connect or disconnect wiring while the power is on. Do not remove covers or touch circuit boards while the power is on. Do not remove or insert the digital operator while power is on.
- Before servicing, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. Status indicator LEDs and Digital Operator display will be extinguished when the DC bus voltage is below 50 VDC. To prevent electric shock, wait at least 5 minutes after all indicators are OFF and measure the DC bus voltage level to confirm that it is at a safe level.
- Do not perform a withstand voltage test on any part of the unit. This equipment uses sensitive devices and may be damaged by high voltage.
- The drive is not suitable for circuits capable of delivering more than the specified RMS symmetrical amperes. Install adequate branch short circuit protection per applicable codes. Refer to the specification. Failure to do so may result in equipment damage and/or personal injury.
- Do not connect unapproved LC or RC interference suppression filters, capacitors, or over voltage protection devices to the output of the drive. Capacitors may generate peak currents that exceed drive specifications.
- To avoid unnecessary fault displays, caused by contactors or output switches placed between drive and motor, auxiliary contacts must be properly integrated into the control logic circuit.
- YASKAWA is not responsible for any modification of the product made by the user, doing so will void the warranty. This product must not be modified.
- Verify that the rated voltage of the drive matches the voltage of the incoming power supply before applying power.
- To meet CE directives, proper line filters and proper installation are required.
- Some drawings in this manual may be shown with protective covers or shields removed, to describe details. These must be replaced before operation.
- Observe Electrostatic Discharge Procedures when handling the drive and drive components to prevent ESD damage.
- The attached equipment may start unexpectedly upon application of power to the drive. Clear all personnel from the drive, motor and machine area prior to applying power. Secure covers, couplings, shaft keys, machine beds and all safety equipment before energizing the drive.

## Introduction

This manual explains the specifications and handling of the Yaskawa *PROFIBUS-DP Option* for the Yaskawa models GPD515/G5, F7 and G7 drives. The *PROFIBUS-DP Option* connects the drive to a PROFIBUS-DP network and facilitates the exchange of data. In this document, the word "inverter", "ac drive" and "drive" may be used interchangeably.

To ensure proper operation of this product, read and understand this manual. For details on installation and operation of the drive, refer to the appropriate drive technical manual. For details on specific parameters, refer to the appropriate drive MODBUS<sup>®</sup> technical manual. All technical manuals and support files can be found on the CD that came with the drive, CD.4005, and are available for download at www.drives.com.

For information on PROFIBUS-DP contact the PROFIBUS Organization at www.profibus.org.

GPD515/G5 Technical Manual document reference TM 4515

G5 HHP Technical Manual document reference TM.G5HHP.01

F7 Technical Manual document reference TM.F7.01

G7 Technical Manual document reference TM.G7.01

GPD515/G5 MODBUS® Technical Manual document reference TM 4025

F7 MODBUS<sup>®</sup> Technical Manual document reference TM.F7.11

G7 MODBUS<sup>®</sup> Technical Manual document reference TM.G7.11

#### PROFIBUS-DP Technical Manual document reference TM.AFD.12

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# Chapter 1 Installation

This chapter describes how to install and setup the PROFIBUS-DP Option

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### **Installation Check Sheet**

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The following is a quick reference guide to install and configure the *PROFIBUS-DP Option*. Make a copy of this page and check-off each item as it is completed. For detailed information please refer to the detailed sections that follow.

1:	Unpack the <i>PROFIBUS-DP Option</i> and verify that all components are present and undamaged. Refer to <i>Figure 1.1 – PROFIBUS-DP Option</i> and <i>Table 1.1 – Product Parts List</i> .
2:	Connect power to the drive and verify that the drive functions correctly. This includes running the drive from the operator keypad. Refer to the appropriate drive technical manual for information on connecting and operating the drive.
3:	Remove power from the drive and wait for the charge lamp to be completely extinguished. Wait at least five additional minutes for the drive to be completely discharged. Measure the DC bus voltage level to confirm that it is at a safe level.
4:	Install the PROFIBUS-DP Option on the drive.
	<b>4.1:</b> Remove the operator keypad and all drive covers.
	<b>4.2:</b> Mount the <i>PROFIBUS-DP Option</i> onto the drive. Refer to <i>Figure 1.2 – Mount the PROFIBUS-DP Option</i> .
5:	Connect the drive to the PROFIBUS-DP communication network. Refer to <i>Figure 1.3 – PROFIBUS-DP Option Connections</i> and <i>Table 1.2 - PROFIBUS-DP Cable Connections</i>
6:	Set the node address for the drive. Refer to Figure 1.4 – Setting the PROFIBUS-DP Option Node Address.
7:	If this unit is either the first or the last device on the network, including PLCs and PROFIBUS-DP Masters, and active termination is not used, set the termination resistor switch to ON. If this device is not the first or last device on the network or active termination is used, set the termination resistor switch to OFF. Refer to <i>Figure 1.5 – Termination Switch</i> .
8:	Configure the PROFIBUS network for the drive. Refer to the documentation included with the PROFIBUS configuration utility supplied with the PROFIBUS-DP Master controller.
9:	Apply power to the drive. And verify that the diagnostic LEDs on the front of the <i>PROFIBUS-DP Option</i> are in their correct state. Refer to <i>Table 1.3 – Diagnostic LED Status</i> .
10:	Remove power from the drive and wait for the charge lamp to be completely extinguished. Wait at least five additional minutes for the drive to be completely discharged. Measure the DC bus voltage level to confirm that it is at a safe level.
11:	Reinstall the operator keypad and drive covers.

12: Set parameters B1-01 and B1-02 to their appropriate values. Refer to Table 1.4 – Option Specific Parameter Settings.

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## **Unpack and Inspect**

Prior to unpacking, check the package label and verify that the product received matches the product ordered. Unpack the option and verify that the following items are included in the product package and are undamaged.



Figure 1.1 – PROFIBUS-DP Option

Table 1.1 – Product Parts List				
Part	Qty.			
PROFIBUS-DP Option	1			
Installation Guide	1			

### **Installation and Wiring**

The following describes the installation and configuration of the *PROFIBUS-DP Option*. For detailed information about the drive or the PROFIBUS-DP option, please refer to the appropriate sections of this manual or the appropriate drive technical manual.

#### Verify Drive Operation

- Connect power to the drive and verify that the drive functions properly. This includes running the drive from the operator keypad. Refer to the appropriate drive technical manual, for information on connecting and operating the drive.
- Remove power from the drive and wait for the charge lamp to be completely extinguished. Wait at least five additional minutes for the drive to be completely discharged. Measure the DC BUS voltage and verify that it is at a safe level.
- Remove the operator keypad and terminal cover.

#### Mount the PROFIBUS-DP Option

Mount the PROFIBUS-DP Option onto the drive by following the instructions below.



Figure 1.2 – Mount the PROFIBUS-DP Option

- Align the CN2 connector on the back of the option with its mating CN2, labeled 2CN on the GPD515/G5 drive, connector on the front of the drive.
- Simultaneously align the two stand-offs on the drive control board with their respective holes on the *PROFIBUS-DP Option*.
- Press the option and the drive together until the CN2 connector is firmly seated and the stand-offs are locked through their associated mounting holes.
- Connect the option ground wire to terminal FE on the F7 and G7 control boards and terminal E on the GPD515/G5 control board.

#### Connect The Drive To The PROFIBUS-DP Communications Network.

- Determine the type of connector on the *PROFIBUS-DP Option*. Connector Style A is a modified Phoenix pluggable connector. The modification can be seen on the back of the connector as a small circuit board. Connector Style B is a standard Phoenix pluggable connector without modification.
- Connect the PROFIBUS-DP network cable to the *PROFIBUS-DP Option*. Refer to the appropriate connection drawing in Figure 1.3 below for your connector style.
- Use standard PROFIBUS-DP cable as specified by the PROFIBUS Organization <u>www.profibus.org</u>. Refer to *Appendix C Troubleshooting* for more information on network cabling.
- Tie the PROFIBUS-DP cable to a point near the connector to provide strain relief for the connector and cable connection.



Figure 1.3 – PROFIBUS-DP Option Connections

	Table 1.2 – PROFIBUS-DP Cable Connections – Style A						
	Connector Style A						
Pin	Name	Function					
1	A In-(Green)	Negative Input RxD/TxD (Connected to the previous device)					
2	B-In (Red)	Positive Input RxD/TxD (Connected to the previous device)					
3	A Out-(Green)	Negative Output RxD/TxD (Connected to the next device)					
4	B-Out (Red)	Positive Output RxD/TxD (Connected to the next device)					
5	Shield	BUS cable shield (Connected to PE internally on the communication option)					
6	Reserved						

	Table 1.3 – PROFIBUS-DP Cable Connections – Style B					
	Connector Style B					
Pin	Name	Function				
1	Reserved					
2	Reserved					
3	A In/ Out-(Green)	Negative Input/Output RxD/TxD (Connected to the previous device)				
4	B-In/Out (Red)	Positive Input/Output RxD/TxD (Connected to the next device)				
5	Shield	BUS cable shield (Connected to PE internally on the communication option)				
6	Reserved					

#### Set Node Address

Set the network node address by setting the address's 10's digit with S2 and the 1's digit with S1. All devices on the network must have unique node addresses. Check the network layout to verify that the node address selected is unique, matches the master device configuration for that device and falls between 3 - 99. Node addresses 0 and 1 are typically reserved for master devices, while node address 2 is reserved for diagnostic equipment.



Figure 1.4 – Setting the PROFIBUS-DP Option Node Address

#### Set Network Termination

If this unit is either the first or the last device on the network, including any PLC and/or PROFIBUS-DP Master, and active termination is not used, set the termination resistor switch to ON. If this device is not the first or last device on the network or active termination is used, set the termination resistor switch to OFF. Active termination is the recommended termination method and is required for networks operating above 1.5Mbps. Active termination will eliminate the possibility of network failure due to the removal of a terminated device. The Siemens Active terminator Module part number is 6ES7 972-0DA00-0AA0.



Figure 1.5 – Termination Switch

#### Verify PROFIBUS-DP Option Operation

- Apply power to the drive.
- Verify that the diagnostic LEDs on the front of the *PROFIBUS-DP Option* are in their correct state.

Table 1.4 –Diagnostic LED States							
LED Display				Contont	State		
PWR	PWR COM ERR WD		Contone	Oldie			
Solid Green Solid Green OFF Flashing Green				Normal	Normal communication.		

Remove power from the drive and wait for the charge lamp to be completely extinguished. Wait at least five additional minutes for the drive to be completely discharged. Measure the DC BUS voltage and verify that it is at a safe level.

Install the operator keypad and all drive covers.

### Run/Stop and Frequency Reference Command Source Selection

The run/stop and frequency reference commands can originate from serial communication, the operator keypad, external terminals, or the PROFIBUS-DP Option. Parameter B1-02 (Operation Method Selection) allows the selection of the origin of the run/stop commands. Parameter B1-01 (Reference Selection) allows the selection of the origin of the frequency reference. The run/stop and frequency reference commands may have different origins. For example, the run/stop command may be set to External Terminals (B1-02 = 1) while the Frequency Reference may be set to Option PCB (PROFIBUS-DP Option) (B1-01 = 3).

Table 1.5 – – Frequency Reference Source Selection					
B1-01	Frequency Reference Selection				
0	Operator keypad				
1	External Terminals				
2	Serial Communication				
3	Option PCB (PROFIBUS-DP Option)				
4	Pulse input				

Table 1.6 Operation Method Selection				
B1-02	Operation Method Selection (Run/Stop)			
0	Operator keypad			
1	External Terminals			
2	Serial Communication			
3	Option PCB (PROFIBUS-DP Option)			

## **Option LEDs**

The PROFIBUS-DP Option Unit is equipped with four indication LEDs for module and PROFIBUS-DP status indication. The LEDs are located on the unit according to the figure below.



Figure 1.6 – PROFIBUS-DP LED Locations

#### LED Indicators

The following LEDs indicate the PROFIBUS-DP status.

Table 1.5 – Communication LEDs						
LED Color Indication/Function						
COMM	Green	Lit during data exchange with the PROFIBUS-DP Master				
ERR Red Lit when no data exchange is taken place.						

#### Module Status Indicators

The following LEDs indicates the status of the PROFIBUS-DP Option.

Table 1.6 – Diagnostic LEDs						
LED	Color	Indication/Function				
PWR	Green	Lit when the +5V power to the PROFIBUS-DP Option is supplied. Turned off if the +5V is below +4.5V (min)				
WD	Red/Green	Indicates the module status				
		OFF	Communication Option CPU not running.			
		Solid Green:	Initialization			
		Flashing green:	Normal operation.			
		Solid Red:	Internal Communication Option error.			
		Flashing red:	error detected.			
		Other indication	Unspecified, Communication Option error			

### ♦ LED Diagnostics

The following table presents the faults displayed by the LEDs on the communication option, their causes, and solutions.

Table 1.7 – LED Diagnostics								
LED Display				Content	Cause	Solutions		
PWR	COM	ERR	WD	Content	Cause	Controlls		
					Power is not being supplied from the drive.	<ul><li>Check the main circuit wiring on the drive.</li><li>Cycle drive power.</li></ul>		
OFF	OFF	OFF	OFF	Power OFF	Power is not being supplied to the option unit due to poor option unit connection.	<ul> <li>Turn of the drive power.</li> <li>Check the PORFIBUS-DP Option connection to the drive CN2 connector, labeled 2CN on the GPD515/G5.</li> <li>Cycle drive power.</li> </ul>		
Solid Green	OFF	Solid Red	Solid Red	CPU Error	Option unit CPU error.	<ul> <li>Cycle drive power.</li> <li>Replace PORFIBUS-DP Option if fault persists.</li> </ul>		
Solid Green	OFF	Solid Red	Flashing Red	Drive Error	Error in Drive unit.	<ul> <li>Cycle drive power.</li> <li>Replace PORFIBUS-DP Option if fault persists.</li> <li>Replace drive if fault persists.</li> </ul>		
Solid Green	OFF	Flashing Red	Solid Green	C om Error	A fault has occurred rendering communication impossible.	<ul> <li>Check whether the address set in the PROFIBUS-DP Master differs from the address of the option unit.</li> <li>Check that the master is functioning properly.</li> <li>Check that the termination resistor is correctly connected to the communication line.</li> <li>Check whether the communication line is correctly connected (disconnected or poor connection).</li> <li>Check that the communication line is separated from the main power line.</li> </ul>		
Solid Green	Solid Green	Flashing Red	Solid Green	Com Error	A fault has occurred rendering communication impossible.	• Check whether the address is duplicated with any other devices on the PROFIBUS- DP network.		
Solid Green	Solid Green	OFF	Solid Green	CPU Init	Option unit under initialization	• Wait until WD LED is flashing		
Solid Green	Solid Green	OFF	Flashing Green	Normal	Normal communication possible.			

### **Drive Faults**

The following is a table of faults that could be caused by the *PROFIBUS-DP Option* that will be displayed on the Operator Keypad, their causes, and possible solutions. For any fault displayed on the operator that is not listed in the following table, please see the appropriate drive technical manual.

		Table 1.8 – Drive Faults	
Fault	Content	Cause	Solution
BUS	Option PCB communications error	Communication is not established between PROFIBUS-DP Master and the drive.	Check PROFIBUS-DP communication LED display.
EF0	Option PCB external fault	Drive received an external fault command from the Option PCB	<ul> <li>Check multi-function input settings</li> <li>Check PLC or controller program</li> <li>Eliminate cause of fault (machine device in fault state)</li> </ul>
OPE05	Command selection fault	Parameter B1-01 is set to Option PCB and no card is detected	<ul> <li>Install Option PCB</li> <li>Reprogram B1-01</li> <li>Replace the Option PCB</li> </ul>
OPE06	Control mode selection fault	Parameter B1-02 is set to Option PCB and no card is detected	<ul><li>Install Option PCB</li><li>Reprogram B1-02</li><li>Replace the Option PCB</li></ul>
CPF20	Option PCB fault	Faulty CN2 connection	<ul> <li>Power cycle the drive</li> <li>Reseat the Option PCB</li> <li>Replace the Option PCB</li> <li>Replace the inverter</li> </ul>
CPF21	Option PCB self-diagnostics fault		
CPF22	Option PCB ID code fault	Faulty Option PCB	Replace the Option PCB
CPF23	Watch dog timer fault		

## Chapter 2 Network Configuration

This chapter provides an example configuration using the **COM PROFIBUS** configuration utility from Siemens. It also explains the differences between the three station configurations.

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GSD File	2 - 6

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## Configuration

Once the *PROFIBUS-DP Option* has been installed and the drive parameters set appropriately, it is necessary to add the drive to the PROFIBUS-DP network through the use of a configuration tool. This tool is usually supplied by the vendor that supplied the PROFIBUS-DP Master controller. This section provides a general overview of how to select the appropriate drive configuration. The Siemens *COM PROFIBUS* configuration tool is used in the examples below. The examples and descriptions below assume familiarity with both PROFIBUS-DP network and setting up a PROFIBUS-DP Master for the devices on that network.

The PROFIBUS-DP Communication Option can be configured as one of three possible input/output messages; 16 word input/output, 6 word input/output and 3 word I/Os, combined input/output, messages. The structure of each message is described in *Chapter 3 – Network Communications*.

#### Configure Master Device

Copy the GSD file from the CD that came with the PROFIBUS-DP Option to the GSD sub-directory under the COM PROFIBUS directory. The GSD file may also be downloaded from <u>http://www.drives.com</u>

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- Open COM PROFIBUS and configure the Master device. A Siemens 545-1104 is used in this example.
- Select the DRIVES block from the list of available devices. The cursor should change to the icon representing the Master device and press the left mouse button.





#### Select Drive Address

A list box will appear displaying the available addresses for the drive. Select an address for the drive and click on the OK button. The address selected must match the address switch setting on the PROFIBUS-DP Option. Refer to the engineering documentation or network schematic to determine which address is applicable for the drive selected.

and a low on the second statement of the	in River
Description : PROFIDIS	
The later la	ET THE
Tidis Decemb	SEARTH
1040	SWITCHE
2	A84
1 2	NC.
3	ENCODER

Figure 2.2 – Select Address

### Select Station Type

Select the appropriate station type from the list displayed. The *PROFIBUS-DP Option* is listed as **PROFIBUS-DP INTER**. Highlight the selection and click on the **Configure** button.

-	Une Ararates		A REAL PROPERTY AND INCOME.	et al
an Der	Earling: S	tation Type:	Order Number	Summer Ma
Real De	ET 2000 21 1	HOLED PERMIT		OR
100	ET 206M			Cancel
1	ET 200x			Configure
	Dires 1			Community
	Destripfiet:			0.0
	T. Barrens March			-
_	Fare firmather	1200	PHONEOUS AGENUE: 3	
	These Film	CITU.	# 25/61 - day	

Figure 2.3 – Select Station Type

#### Station Configuration

Select the configuration desired. **Basic Data** consists of 3 word I/Os, combined input/output, message (3 input words and 3 output words). **Extended Data 1** consists of 16 input words and 16 output words. **Extended Data 2** consists of 6 input words and 6 output words.

Dan Dat Best Da	Evenity: ET 280 Clambo ET 280 Clambo ET 280 E Clambo E Cla	Darlien Type: Deservation deal Darles 1 deal Darles 2	Order Han	etp	OK Carcol Carolyper Pairweater Brie
	F Ba Ence-Report F Base	ne un renu	F(1)111.4 F(1)11.4		

Figure 2.4 – Select Configuration

The Basic Data configuration consists of 3 words of combined inputs and outputs, 3 input words and 3 output words. Refer to 3 Word I/O Message section of Chapter 3 for a detailed description of the Basic Data configuration.

-		ID	Reports	EAdds.	O Adds.	0.
	1	114		-		Canad
100	4			_	_	
1				-		Distriction
44	1			-	_	ID.
-				_		STO HARMON
- 1	1			1		Beserve
- 1					Contraction of the local division of the loc	TANKARA
- 1				C		Ballata
- 18	10					Dese.
	11				_	Asterna
	12			1	0	- TOHME
	13					and the second

Figure 2.5 – Basic Data Configuration

The Extended Data 1 configuration consists of 16 input words and 16 output words. Refer to 16 Word Input/Output Message section of Chapter 3 for a detailed description of the Extended Data 1 configuration. This configuration is also used on those PROFIBUS-DP Options that have an Option Name SI-P/or Code Numbers prior to 73606-7110. The Option Name and Code Number are located on the right side of the option.

	ID	Remarks	LAAN.	O ANN	*
4	16AI		P990	1.	Contract 1
2	164.0		10000	F988	- CREW
3					C DOMESSION
. 4			_	-	The second second
	-		_	-	THE OWNER WHEN
1			_		
÷					1100000000
					Auto Addr.
10				1	Deleta-
11					Addresses
11	8			1	- CEDEDREAM
11	0			-	
14				1 5	Ibela

Figure 2.6 – Extended Data 1 Configuration

The Extended Data 2 configuration consists of 6 input words and 6 output words. Refer to 6 Word Input/Output Message section of Chapter 3 for a detailed description of the Extended Data 2 configuration. This configuration is also used on those PROFIBUS-DP Options previously released as Profibus II.

di.	Fernance:	LAND.	DAM.	-
1 64				- Parter
# \$M0		1		
8		-		distress.
100		-		1D.,
				1.544
1				Besory
8				- SHORN
2		_		Delete.
11		-		Advente
17		1	-	CONTRACT
10.00				

Figure 2.6 – Extended Data 2 Configuration

### **GSD** File

The listing of the current GSD file is shown below. The GSD file name is YASK00CA.GSD. The file is listed for information purposes only. Do not attempt to modify the GSD file in any way.

; Device description file according to DIN 19245 Part 3 (PROFIBUS-DP) ;; FILENAME YASK00CA\_Rev1YEA.GSD DEVICENAME : PROFIBUS-DP INTERFACE CARD SI-P1 PROTOCOL PROFIBUS-DP slave VENDOR : Yaskawa Electric DATE : 06 June 2001 MODIFICATIONS : 06 June 2001, rev. 3.0 Created 08 April 2002, TW, rev 3.3 Revised for customer compatibility \_\_\_\_\_ #PROFIBUS DP GSD\_Revision = 1 Vendor\_Name = "YASKAWA ELECTRIC" Model\_Name = "PROFIBUS-DP INTERFACE CARD SI-P1" Revision = "Version 3.3" ldent\_Number = 0x00CA Protocol\_ldent = 0 Station\_Type = 0 FMS\_supp = 0 Hardware\_Release = "Version 1.3" Software\_Release = "Version 3.3" 9.6\_supp = 1 19.2\_supp = 1 45.45\_supp = 1 93.75\_supp = 1 187.5\_supp = 1 
 107.5\_supp
 = 1

 500\_supp
 = 1

 1.5M\_supp
 = 1

 3M\_supp
 = 1

 6M\_supp
 = 1

 12M\_supp
 = 1

 12M\_supp
 = 1

 MaxTsdr\_9.6
 = 60

 MaxTsdr\_19.2
 = 60

 MaxTsdr\_45.45
 = 250

  $MaxTsdr_{93.75} = 60$  $MaxTsdr_{187.5} = 60$ MaxTsdr\_500 = 100 MaxTsdr\_500 = 100 MaxTsdr\_15M = 150 MaxTsdr\_3M = 250 MaxTsdr\_6M = 450 MaxTsdr\_12M = 800 Redundancy = 0Repeater\_Ctrl\_Sig = 2 24V\_Pins = 0 Implementation Type = "SPC3" Freeze\_Mode\_supp = 1 Sync\_Mode\_supp = 1 Auto\_Baud\_supp = 1 Set\_Slave\_Add\_supp = 0 Min\_Slave\_Intervall = 1 Modular\_Station = 1 Max\_Module = 1 Max\_Input\_Len = 32 Max\_Output\_Len = 32 Max\_Data\_Len = 64 Modul\_Offset = 1 Fail\_Safe = 0 Slave\_Family = 1 Max\_Diag\_Data\_Len = 6 Module = "Basic data" 0x72 EndModule Module = "Extended Data 1" 0x5F, 0x6F EndModule Module = "Extended Data 2" 0x55, 0x65 EndModule

# **Chapter 3 Network Communications**

This chapter describes in detail the composition of the three station types.

16 Word Input/Output Messages	3 - 3
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3 Word I/Os Messages	3 - 10
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Handshaking	3 - 13

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## 16 Word Input/Output Message

The *PROFIBUS-DP Option* can be configured as one of three possible I/O messages; 16 word input/output message, 6 word input/output message and 3 word I/Os messages. The 16 word input/output message structure is described in this section.

The 16 word input and output messages are divided into two areas. The first 16 bytes of each message is fixed. This is the most frequently used data and is referred to as the fast I/O data. The remaining 16 bytes of each message are used for reading from and writing to all other drive parameters and is referred to as parameter data. All command, monitor, and parameter data in the drive is accessible via the parameter access portion of the message.

		Table 3.1 – PROFIBUS-DP 1	6 W	Word Input/Output Message Table				
	Output	t Data (PROFIBUS-DP Master-> Drive)			Input	Data (Drive -> PROFIBUS-DP Master)		
	Byte	Function			Byte	Function		
	0	RUN Operation Command MSB			0	Drive Status MSB		
	1	RUN Operation Command LSB			1	Drive Status LSB		
	2	Frequency Reference MSB			2	Motor Speed MSB		
	3	Frequency Reference LSB			3	Motor Speed LSB		
	4	Torque Reference/Limit MSB (Flux Vector Mode)			4	Torque Reference/Limit MSB (Flux Vector Mode)		
	5	Torque Reference/Limit LSB (Flux Vector Mode)			5	Torque Reference/Limit LSB (Flux Vector Mode)		
ea	6	Torque Compensation MSB (Flux Vector Mode)		ea	6	Speed Detection PG Count MSB (w/PG)		
Ā	7	Torque Compensation LSB (Flux Vector Mode)		IA O	7	Speed Detection PG Count LSB (w/ PG)		
τĭ	8	Reserved		ţ	8	Frequency Reference MSB		
as	9	Reserved		as	9	Frequency Reference LSB		
	10	AO Ch1 (Terminal 21, 22) MSB			10	Output Frequency MSB		
	11	AO Ch1 (Terminal 21,22) LSB			11	Output Frequency LSB		
	12	AO Ch2 (Terminal 23,22) MSB			12	Output Current MSB		
	13	AO Ch2 (Terminal 23,22) LSB			13	Output Current LSB		
	14	Multifunction Digital Output MSB			14	AI (Terminal 14) MSB		
	15	Multifunction Digital Output LSB			15	AI (Terminal 14) LSB		
	16	Function Code			16	Function Code		
	17	Starting Address MSB			17	Starting Address MSB		
	18	Starting Address LSB			18	Starting Address LSB		
	19	Data Length (2, 4, 6 or 8bytes of data)			19	Data Length (2, 4, 6 or 8bytes of data)		
ŋ	20	Data 1 MSB		σ	20	Data 1 MSB		
Are	21	Data 1 LSB		Are	21	Data 1 LSB		
SS	22	Data 2 MSB		SS	22	Data 2 MSB		
SCC6	23	Data 2 LSB		UCC	23	Data 2 LSB		
er A	24	Data 3 MSB		er A	24	Data 3 MSB		
nete	25	Data 3 LSB		nete	25	Data 3 LSB		
ıran	26	Data 4 MSB		ıran	26	Data 4 MSB		
Ъ	27	Data 4 LSB		Ъ	27	Data 4 LSB		
	28	Reserved			28	Reserved		
	29	Reserved	1		29	Reserved		
	30	Reserved	1		30	Reserved		
	31	Handshake Register	1		31	Handshake Register		

### Fast I/O Output Data

The fast I/O output data area is used to transfer parameter data directly to the drive via a dual port RAM interface. The following table details the functions of the fast I/O output data (Bytes 0 to 15) For detailed explanation of the terminal and multi-function inputs and outputs, refer to the appropriate drive technical manual.

		Tab	ole 3.2 – 16 Word In	put/Output Message Fast I/O Output Data		
			Fast I/O Output Da	ata (PROFIBUS-DP Master -> Drive)		
Byte	Function	Bit		Note		
		0	Fwd Run/Stop	1 = RUN Forward (Enabled when B1-02 is set to 3)		
		1	Rev Run/Stop	1 = RUN Reverse (Enabled when B1-02 is set to 3)		
		2	Terminal 3	1 = Close (terminal function dependent on setting of parameter H1-01)		
0		3	Terminal 4	1 = Close (terminal function dependent on setting of parameter H1-02)		
0	C 1	4	Terminal 5	1 = Close (terminal function dependent on setting of parameter H1-03)		
	Reference	5	Terminal 6	1 = Close (terminal function dependent on setting of parameter H1-04)		
		6	Terminal 7	1 = Close (terminal function dependent on setting of parameter H1-05)		
		7	Terminal 8	1 = Close (terminal function dependent on setting of parameter H1-06)		
		8	External Fault	1 = External Error		
1		9	Fault Reset	1 = Reset Fault		
		Ah - Fh	Reserved			
2	Frequency	Frequency	Reference MSB	1 = 0.01 Hz		
3	Reference	Frequency	Reference LS	scaling is dependent on the setting of parameter o1-03		
4	Torque	Torque Re	ference/Limit MSB	0.1%		
5	Reference/Limit	Torque Re	ference/Limit LSB	Flux Vector mode only		
6	Torque	Torque Compensation MSB		0.1% Flux Vector mode only		
7	Compensation	Torque Compensation LSB				
8	Reserved					
9	Reserved					
10	AO Ch1	Analog Output Ch1 MSB		$H_{4-01} = 1Eb$		
11	NO CIT	Analog Ou	itput Ch1 LSB			
12	AO Ch2	O Ch2 Analog Output Ch2 MSB Analog Output Ch2 LSB		- H4-02 = 1Fh		
13	NO CH2					
		0	Terminal MA-MB	1 = Close (H2-01 = 0Fh)		
		1	Terminal P1-PC	1 = Close(H2-02 = 0Fh)		
		2	Terminal P2-PC	1 = Close (H2-03 = 0Fh)		
14	Multi-Function	3	Reserved			
14	Output	4	Reserved			
		5	Reserved			
		6	Fault Contact Enable			
		7	Fault Contact State	Available when bit $6 = 1$		
15	Reserved					

### Fast I/O Input Data

The fast I/O input data area is used to transfer parameter data directly from the drive via a dual port RAM interface. The following table details the functions of the fast I/O input data (Bytes 0 to 15). For detailed explanation of the terminal and multi-function inputs and outputs, refer to the appropriate drive technical manual.

			Table 3.3 – 16 Word Input/C	Dutput Message Fast I/O Input Data					
			Fast I/O Input Data (Dr	ive -> PROFIBUS-DP Master )					
Byte	Function	Bit		Note					
		0	Running						
		1	@ Zero Speed						
		2	@ Reverse						
0		3	Reset Signal						
Ū		4	@ Frequency Agree	@ Frequency Agree					
		5	Drive Ready (Rdy)						
		6	Minor Fault (Alarm)	Minor Fault (Alarm)					
	Drive	7	Major Fault	Aajor Fault					
	Status	8	OPE Error	PE Error					
		9	Fault Restart						
		10	Local/Remote						
1		11	Terminal MA-MB	1 = Close					
1		12	Terminal P1-PC	1 = Close					
		13	Terminal P2-PC	1 = Close					
		14	Reserved						
		15	Reserved	-					
2	Motor Sneed	Motor	Speed MSB	0.1Hz					
3	wietor speed	Motor	Speed LSB	scaling is dependent on the setting of parameter o1-03					
4	Torque	Torque	e Reference MSB	Flux Vector mode					
5	Reference	Torque	e Reference LSB						
6	Speed Detection	Speed	Detection PG Count MSB	PG Option must be installed					
7	PG Count	Speed	Detection PG Count LSB						
8	Frequency	Freque	ency Reference MSB	0.1Hz					
9	Reference	Freque	ency Reference LSB	scaling is dependent on the setting of parameter o1-03					
10	Output	Outpu	t Frequency MSB	0.1Hz					
11	Frequency	Outpu	t Frequency LSB	scaling is dependent on the setting of parameter o1-03					
12	Output	Outpu	t Current MSB	Scaled Value					
13	Current	Outpu	t Current LSB	Output current(Drive rating/8192)					
14	AI	Analo	g Input @ Terminal 14 MSB	$\pm 10 \text{vdc} = \pm 100\%$					
15		Analo	g Input @ Terminal 14 LSB						

#### Parameter Access Area

This area is used to read and write parameter data from and to the drive. The PROFIBUS-DP Master completes the Parameter Access command (output) message and waits for and then processes the data returned in the Parameter Access response (input) message. These messages may contain 1 - 4 words of data. The handshaking byte is used to synchronize the communications between the PROFIBUS-DP Master and the drive. This is necessary due to the additional time required for the drive to process the message. Refer to the *Handshaking* section of this chapter for more information on handshaking. **Note**: Care must be taken when writing certain parameters to the drive as other parameters may be dependent on them. Control method, A1-02, maximum Frequency, E1-04, and Acc/Dec Scale Time, C1-10, are just a few. Refer to the appropriate drive MODBUS<sup>®</sup> technical manual for more information.

#### Parameter Access Command Message Structure

Two command, output, functions are available, read parameter data, 03h, and write parameter data, 10h. If no parameter access communications is desired, use 00h as the function code. These function codes are programmed in byte 16 of the 16 word input/output message. Bytes 17 and 18 contain the parameter access address of the parameter to be accessed. Byte 19 contains the number of data bytes to be read from or written to the drive. Since each parameter consists of two bytes, this value is incremented by two for each parameter accessed. Bytes 19 through 27 contain the data to be written to the selected parameter. If the command is to read parameter data, bytes 19 through 27 must be set to 0.

	Table 3.4 – 16 Wo	rd Input/Output Message Parameter Access Command Structure				
	Output Data – Parameter Access Command Message (PROFIBUS-DP Master -> Drive)					
Byte	Name	Function				
16	Function Code	Parameter Access Command Code (Read data = 03h, Write data = 10h)				
17	Starting Address MSB	The first register to be read or written				
18	Starting Address LSB					
19	Data Quantity	Bytes of data (2 x Number of parameters to be read or written)				
20	Data 1 MSB	of data to write to the drive parameter Starting Address				
21	Data 1 LSB	value of data to write to the drive parameter starting Address				
22	Data 2 MSB	Value of data to write to the drive parameter <b>Starting Address</b> $+ 1$				
23	Data 2 LSB	value of data to write to the drive parameter starting Address + 1				
24	Data 3 MSB	Value of data to write to the drive parameter <b>Starting Address</b> $+ 2$				
25	Data 3 LSB	value of data to write to the drive parameter starting Address + 2				
26	Data 4 MSB	Value of data to write to the drive parameter Starting Address $\pm 3$				
27	Data 4 LSB	value of data to write to the drive parameter starting Address + 5				
28	Reserved					
29	Reserved					
30	Reserved					
31	Handshaking Register	Synchronizes drive communication with PROFIBUS-DP Master				

#### Parameter Access Response Message Structure

The standard Parameter Access response structure is described below. In a non-erroneous response, the Function Code, Starting Register and Data Quantity are identical to the command message. If the command function code is 03h, read data, the data bytes will contain the values of the requested parameters. If the command function code is 10h, write data, the data bytes will contain 0 and should be ignored.

	Table 3.5 – 16 Word Input/Output Message Parameter Access Response Structure					
	Input Data – Parameter Access Response Message (Drive -> PROFIBUS-DP Master)					
Byte	Name	Function				
16	Function Code	Parameter Access Response Code (Command code or command code & 80h for error)				
17	Starting Address MSB	The first register to be read or written				
18	Starting Address LSB					
19	Data Quantity	Bytes of data (2 x Number of parameters to be read or written)				
20	Data 1 MSB	Value of data read from the drive parameter Starting Address				
21	Data 1 LSB	value of data read nom the drive parameter starting Address				
22	Data 2 MSB	Value of data read from the drive parameter Starting Address + 1				
23	Data 2 LSB	Value of data read nom the drive parameter starting Address ( )				
24	Data 3 MSB	Value of data read from the drive parameter Starting Address + 2				
25	Data 3 LSB	Value of data read nom the drive parameter starting Address + 2				
26	Data 4 MSB	Value of data read from the drive parameter Storting Address + 3				
27	Data 4 LSB	value of data read nom the drive parameter starting Address ( 5				
28	Reserved					
29	Reserved					
30	Reserved					
31	Handshaking Register	Synchronizes drive communication with PROFIBUS-DP Master				

## 6 Word Input/Output Message

The 6 word input and output messages are divided into two areas. The first 4 bytes of each message is fixed. This is the most frequently used data and is referred to as the fast I/O data. The remaining 8 bytes of each message are used for reading from and writing to all other drive registers and is referred to as parameter data. All command, monitor, and parameter data in the drive is accessible via the Parameter Access portion of the message. **Note:** Care must be taken when writing certain parameters to the drive as other parameters may be dependent on them. Control method, A1-02, maximum Frequency, E1-04, and Acc/Dec Scale Time, C1-10, are just a few. Refer to the appropriate drive MODBUS<sup>®</sup> technical manual for more information.

The 6 word input and output messages was designed for situations where processor memory may be a factor in the number of PROFIBUS-DP devices resident on the network.

	Table 3.7 – PROFIBUS-DP 6 Word Input/Output Message I/O Table							
	Output	Data (PROFIBUS-DP Master -> Drive)		Input Data (Drive -> PROFIBUS-DP Master)				
	Byte	Function			Byte	Function		
0	0	RUN Operation Command MSB		0	0	Drive Status MSB		
0/1	1	RUN Operation Command LSB		Ň	1	Drive Status LSB		
ast	2	Frequency Reference MSB		ast	2	Frequency Feedback MSB		
ш	3	Frequency Reference LSB		ш	3	Frequency Feedback LSB		
	4	Function Code			4	Function Code		
s	5	Starting Address MSB		sess	5	Starting Address MSB		
ses	6	Starting Address LSB			6	Starting Address LSB		
Act	7	Data Length (always 2)		Act	7	Data Length (always 2)		
ter	8	Data 1 MSB		ter	8	Data 1 MSB		
me	9	Data 1 LSB		me	9	Data 1 LSB		
ara	10	Reserved		ara	10	Reserved		
Ъ	11	Reserved		٩	11	Reserved		
	12	Handshake Register			12	Handshake Register		

#### Fast I/O Output Data

The fast I/O output data area is used to transfer parameter data directly to the drive via a dual port RAM interface. The following table details the functions of the fast I/O output data (Bytes 0 to 3) For detailed explanation of the terminal and multi-function inputs and outputs, refer to the appropriate drive technical manual.

	Table 3.8 – 6 Word Input/Output Message Fast I/O Output Data					
	Fast I/O Output Data (PROFIBUS-DP Master -> Drive)					
Byte	Function	Bit		Note		
		0	Fwd Run/Stop	1 = RUN Forward (Enabled when B1-02 is set to 3)		
		1	Rev Run/Stop	1 = RUN Reverse (Enabled when B1-02 is set to 3)		
		2	Terminal 3	1 = Close (terminal function dependent on setting of parameter H1-01)		
0	Command Reference	3	Terminal 4	1 = Close (terminal function dependent on setting of parameter H1-02)		
v		4	Terminal 5	1 = Close (terminal function dependent on setting of parameter H1-03)		
		5	Terminal 6	1 = Close (terminal function dependent on setting of parameter H1-04)		
		6	Terminal 7	1 = Close (terminal function dependent on setting of parameter H1-05)		
		7	Terminal 8	1 = Close (terminal function dependent on setting of parameter H1-06)		
		8	External Fault	1 = External Error		
1		9	Fault Reset	1 = Reset Fault		
		Ah – Fh	Reserved			
2	Frequency	Frequency	Reference MSB	0.1Hz		
3 Reference Frequency Reference LSB		Reference LSB	scaling is dependent on the setting of parameter o1-03			

### Fast I/O Input Data

The fast I/O input data area is used to transfer parameter data directly from the drive via a dual port RAM interface. The following table details the functions of the fast I/O input data (Bytes 0 to 3) For detailed explanation of the terminal and multi-function inputs and outputs, refer to the appropriate drive technical manual.

Table 3.9 – 6 Word input/Output Message Fast I/O Input Data								
	Fast I/O Input Data (Drive -> PROFIBUS-DP Master )							
Byte	Function	Bit		Note				
		0	Running					
		1	@ Zero Speed					
		2	@ Reverse					
0		3	Reset Signal					
Ū		4	@ Frequency Agree	@ Frequency Agree				
		5	Drive Ready (Rdy)	Drive Ready (Rdy)				
		6	Minor Fault (Alarm)					
	Drive	7	Major Fault					
	Status	8	OPE Error					
		9	Fault Restart					
		10	Local/Remote					
1		11	Terminal MA-MB	1 = Close				
1		12	Terminal P1-PC	1 = Close				
		13	Terminal P2-PC	1 = Close				
		14	Reserved					
		15	Reserved					
2	Frequency	Freque	ency Reference MSB	0.1Hz				
3	Reference Frequency Reference LSB		ency Reference LSB	scaling is dependent on the setting of parameter o1-03				

#### Parameter Access Area

This area is used to read and write parameter data from and to the drive. The PROFIBUS-DP Master completes the Parameter Access command (output) message and waits for and then processes the data returned in the response (input) message. These messages may contain 1 - 4 words of data. The handshaking byte is used to synchronize the communications between the PROFIBUS-DP Master and the drive. This is necessary due to the additional time required for the drive to process the message.

#### Parameter Access Command Message Structure

Two command, output, functions are available, read parameter data, 03h, and write parameter data, 10h. If no Parameter Access communications is desired, use 00h as the function code. These function codes are programmed in byte 4 of the 6 word input/output message. Bytes 5 and 6 contain the address of the parameter to be accessed. Byte 7 contains the number of data bytes to be read from or written to the drive. Since only one parameter may be accessed at a time, this value must always be set to 2. Bytes 8 and 9 contain the data to be written to the selected parameter. If the command is to read parameter data, bytes 8 and 9 must be set to 0.

	Table 3.10 – 6 Word Input/Output Message Parameter Access Command Messages				
	Output Data – Parameter Access Command Message (PROFIBUS-DP Master -> Drive)				
Byte	Byte Name Function				
4	Function Code	Parameter Access Command Code (Read data = 03h, Write data = 10h)			
5	Starting Address MSB	The first register to be read or written			
6	Starting Address LSB				
7	Data Quantity	Bytes of data (2 x Number of parameters to be read or written)			
8	Data 1 MSB	Value of data to write to the drive parameter Starting Address			
9	Data 1 LSB	value of data to write to ute drive parameter starting Address			
10	Reserved				
11	Reserved				
12	Handshaking Register	Synchronizes drive communication with PROFIBUS-DP Master			

#### Parameter Access Response Message Structure

The standard Parameter Access response structure is described below. In a non-erroneous response, the Function Code, Starting Address and Data Quantity are identical to the command message. If the command function code is 03h, read data, the data bytes will contain the values of the requested registers. If the command function code is 10h, write data, the data bytes will contain 0 and should be ignored.

	Table 3.11 – 6 Word Input/Output Message Parameter Access Response Structure				
	Input Data – Parameter Access Response Message (Drive -> PROFIBUS-DP Master )				
Byte	Name	Function			
4	Function Code	Parameter Access Response Code (Command code or command code & 80h for error)			
5	Starting Address MSB	The first register to be read or written			
6	Starting Address LSB	The first register to be read of written			
7	Data Quantity	Bytes of data (2 x Number of parameters to be read or written) (always 2)			
8	Data 1 MSB	Value of data read from the drive parameter <b>Starting Address</b>			
9	Data 1 LSB	value of data read from the drive parameter starting Address			
10	Reserved				
11	Reserved				
12	Handshaking Register	Synchronizes drive communication with PROFIBUS-DP Master			

## 3 Word I/Os Message

The 3 word I/Os, combined input/output, messages have only one fixed area. This is the most frequently used data and is referred to as the fast I/O data. 3 Word messages are used when processor memory is a critical factor in the network design. As shown below, the 3 word I/Os message contains only the minimum drive data.

	Table 3.12 – PROFIBUS-DP 3 Word Message I/O Table							
	OUTPUT	DATA PROFIBUS-DP Master -> Drive			Drive IN	NPUT DATA -> PROFIBUS-DP Master		
	Byte	Function			Byte	Function		
	0	RUN Operation Command MSB			0	Drive Status MSB		
	1	RUN Operation Command LSB			1	Drive Status LSB		
Ň	2	Frequency Reference MSB	11	Ň	2	Frequency Feedback MSB		
ast	3	Frequency Reference LSB         Torque Reference MSB         Torque Reference LSB		ast	3	Frequency Feedback LSB		
ш	4			ш.	4	Output Current MSB		
	5				5	Output Current LSB		

#### Fast I/O Output Data

The fast I/O output data area is used to transfer parameter data directly to the drive via a dual port RAM interface. The following table details the functions of the fast I/O output data (Bytes 0 to 5) For detailed explanation of the terminal and multi-function inputs and outputs, refer to the appropriate drive technical manual.

	Table 3.13 – 3 Word Input/Output Message Fast I/O Output Data				
	Fast I/O Output Data (PROFIBUS-DP Master -> Drive)				
Byte	Function	Bit		Note	
		0	Fwd Run/Stop	1 = RUN Forward (Enabled when B 1-02 is set to 3)	
		1	Rev Run/Stop	1 = RUN Reverse (Enabled when B1-02 is set to 3)	
		2	Terminal 3	1 = Close (terminal function dependent on setting of parameter H1-01)	
0		3	Terminal 4	1 = Close (terminal function dependent on setting of parameter H1-02)	
Ū	Command Reference	4	Terminal 5	1 = Close (terminal function dependent on setting of parameter H1-03)	
		5	Terminal 6	1 = Close (terminal function dependent on setting of parameter H1-04)	
		6	Terminal 7	1 = Close (terminal function dependent on setting of parameter H1-05)	
		7	Terminal 8	1 = Close (terminal function dependent on setting of parameter H1-06)	
		8	External Fault	1 = External Error	
1		9	Fault Reset	1 = Reset Fault	
		Ah – Fh	Reserved		
2	Frequency	Frequency Reference MSB		0.1Hz	
3	Reference	Frequency	Reference LSB	scaling is dependent on the setting of parameter o1-03	
4	Torque	Torque Reference MSB		Flux Vector Mode	
5	5 Reference Torque Reference LSB		ference LSB		

### Fast I/O Input Data

This area is used to transfer parameter data directly from the drive dual port RAM interface. The following tables detail the functions of the fast I/O input data (Bytes 0 to 5)

	Table 3.14 – 3 Word input/Output Message Fast I/O Input Data					
	Fast I/O Input Data (Drive -> PROFIBUS-DP Master )					
Byte	Function	Bit		Note		
		0	Running			
	l	1	@ Zero Speed			
		2	@ Reverse			
0	l	3	Reset Signal			
v	l	4	@ Frequency Agree			
		5	Drive Ready (Rdy)			
		6	Minor Fault (Alarm)			
	Drive	7	Major Fault			
	Status	8	OPE Error			
		9	Fault Restart			
		10	Local/Remote			
1		11	Terminal MA-MB	1 = Close		
1		12	Terminal P1-PC	1 = Close		
		13	Terminal P2-PC	1 = Close		
		14	Reserved			
		15	Reserved			
2	Frequency	Freque	ency Reference MSB	0.1Hz		
3	Reference	Freque	ency Reference LSB	scaling is dependent on the setting of parameter o1-03		
2	Output Current	Outpu	t Current MSB	Calculated value		
3	output current	Outpu	t Current LSB	Drive Current(Drive Rating/8192)		

### **Parameter Access Error Messages**

Whenever there is an invalid parameter access message, the drive will respond with an error message containing the fault code for that particular error. Parameter access pertains only to16 Word and 6 word messages.

#### ◆ 16 Word Input/Output Message

If an erroneous Parameter Access message is sent to the drive, the drive will respond with a fault message. The MSB of byte 16 of the fault response will be set. If the fault is a read parameter data fault, byte 16 of the response message will contain 83h, read parameter function code 03h with the MSB set. If the fault is a write parameter data fault, byte 16 of the response message will contain 90h, write parameter function code 10h with the MSB set. Byte 19 will contain 2 and byte 21 will contain the specific error code. Refer to Table 3.15 below for description of the possible error codes.

#### ♦ 6 Word Input/Output Message

If an erroneous Parameter Access message is sent to the drive, the drive will respond with a fault message. The MSB of byte 4 of the fault response will be set. If the fault is a read parameter data fault, byte 4 of the response message will contain 83h, read parameter function code 03h with the MSB set. If the fault is a write parameter data fault, byte 4 of the response message will contain 90h, write parameter function code 10h with the MSB set. Byte 7 will contain 2 and byte 9 will contain the specific error code. Refer to Table 3.15 below for description of the possible error codes.

	Table 3.15 – Parameter Access Fault Message Response				
Error Code	Error Name	Details			
01h	Function Error	Invalid function code			
02h	Address Error	Parameter starting address greater than 600h			
03h	Amount of Data Fault	Read or Write less than 2 words or more than 4 words			
21h	Data Content Fault	Parameter exceeds upper and lower limits			
22h	Write Fault	<ul> <li>Parameter change during running or under-voltage</li> <li>ENTER command was written during running</li> <li>Write attempted to read-only data or during under-voltage</li> <li>Write attempted during parameter data storage</li> </ul>			

## Handshaking

The handshaking register is necessary to synchronize the send/receive timing of parameter access message data between the PROFIBUS-DP Master and the *PROFIBUS-DP Option*. One register (byte 32 of the 16 word input/output message or byte 12 of the 6 word input/output message) in the input and output parameter access message areas is dedicated to handshaking. The data set in the output area of the master becomes enabled in the *PROFIBUS-DP Option* when the status of the **HS** bit, bit 7, is changed.

#### • Command Handshaking Register PROFIBUS-DP Master To Drive

	Table 3.16 – Handshaking Output Register Bit Definitions				
Bit	Bit Name Function				
7	HS	Handshaking bit. Used to synchronize the data exchange. Toggled when a new command is transmitted. This bit must be cleared after power-up or re-initialization by the Master program.			
6 - 0		Not used.			

#### ◆ Response Handshake Register Drive To PROFIBUS-DP Master

	Table 3.17 – Handshaking Input Register Bit Definitions			
Bit	Name	Function		
7	HS	Handshaking bit. Used to synchronize the data exchange. Toggled when a new response is transmitted		
6 - 5	STATUS	Status of data exchanged between Communication Option and drive. 00H: Idle 01H: Sending parameter access message to drive 10H: Waiting for parameter access response from drive 11H: Response received from drive		
4 - 1	WD	Watch Dog Counter, incremented approximately every 64 ms.		
0		Not used		

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# **Appendix A Product Specification**

This appendix describes the specification for the PROFIBUS-DP Option interface card

Table A.1 – Product Specification			
	PROFIBUS-DP Option		
Ambient Temperature	-10 to +45°C (14 to 113°F)		
Storage Temperature	$-20 \text{ to } +60^{\circ}\text{C} (-4 \text{ to } 140^{\circ}\text{F})$		
Relative Humidity	Not to exceed 90% RH (non-condensing)		
Altitude	Not to exceed 1000m (3280ft)		
Vibration	1G (9.8m/s <sup>2</sup> ) at 10 to 20Hz. 0.2G (2m/s <sup>2</sup> ) at 20 to 50Hz.		
PROFIBUS-DP Specification	PROFIBUS-DP Slave- EN 50170		
PROFIBUS-DP Profile	Vendor-Specific, PNO-approved		
Connector Type	6-pin open-style screw connector		
Physical Layer Type	Isolated Physical Layer (RS485 transceiver + photo-coupler)		
Node Address Setting	2 Decimal Rotary Switches: address 1 to 99		
Baud Rate	Auto-configure: 9600 bps to 12 Mbps		
ASIC Implementation	SPC 3		
Feature Support	Freeze Mode, Sync Mode, Auto Baud		

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# **Appendix B Cable Specification**

This appendix describes in detail the PROFIBUS-DP cable specification and minimum and maximum allowable cable lengths.

PROFIBUS-DP Cable Specification	В-3
PROFIBUS-DP Cable Length Limits	B - 3
PROFIBUS-DP Stub Length Limits	B - 3

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### **PROFIBUS-DP Cable Specification**

The cable used by the PROFIBUS-DP network is specified by PROFIBUS European Standard EN50170. It is a shielded, twisted pair cable with the following specifications. In order for the cable to fit the currently available PROFIBUS-DP standard connectors, the surrounding diameter must be 8.0 mm (+/- 0.5 mm).

Table B.1 – PROFIBUS-DP Cable Specifications				
Parameter	PROFIBUS-DP Cable Requirements			
Impedance	135 to 165 Ohm / 3 to 20Mhz			
Capacitance	< 30 pF / m			
Resistance	< 110 Ohm / Km			
Wire Gauge	> 0.64 mm			
Conductor Area	$> 0.34 \text{ mm}^2$			
Shield Density	Greater than 80%			

### **PROFIBUS-DP Cable Length Limits**

Both data rate and cable type affect the total allowable length of the network. The total amount of measured linear cable allowed between any two points on the network segment must be within the following table's specification. Also, the total amount of network length, allowed through segment repeaters must be less than the Maximum Network Length in the following table. **The minimum cable length between device connections is one (1) meter.** 

Table B.2 – PROFIBUS-DP Cable Length Specifications				
Baud Rate	Maximum Segment Length	Maximum Network Length		
9.6 Kbps	1,200 Meters	10,000 Meters		
187.5 Kbps	1,000 Meters	10,000 Meters		
500.0 Kbps	400 Meters	4,000 Meters		
1.5 Mbps	200 Meters	2,000 Meters		
3.0 Mbps	100 Meters	1,000 Meters		
6.0 Mbps	100 Meters	1,000 Meters		
12.0 Mbps	100 Meters	1,000 Meters		

## **PROFIBUS-DP Stub Length Limits**

The total amount of measured linear cable allowed between the point of the stub connection (from the main PROFIBUS-DP cable) to the node connection on the line, along with the cumulative total or sum of all stub cable length(s) must not exceed the maximum specified. When calculating stub lengths, include stub in the device itself. Use 1cm for each drive. The following table and diagram specifies the stub length requirements. **DO NOT use stubs when the PROFIBUS-DP network is configured to operate at baud rates above 1.5Mbps** 

Table B.3 – PROFIBUS-DP Stub Length Specifications					
Baud Rate	Total Capacitance for all Stubs	Total Stub Length			
9.6 Kbps	15.0 nF	500 Meters			
187.5 Kbps	3.0 nF	100 Meters			
500.0 Kbps	1.0 nF	33 Meters			
1.5 Mbps	0.6 nF	20 Meters			
3.0 Mbps	0.2 nF	Approx. 0			
6.0 Mbps	Stubs Not Allowed	Approx. 0			
12.0 Mbps	Stubs Not Allowed	Approx. 0			

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# **Appendix C Parameter Access**

This appendix describes in detail how to read and write parameter data to and from the drive.

Parameter Access Overview	C - 3
Read Drive Data Example	C - 5
Read Drive Data Error Example	C - 6
Write Drive Data Example	C - 7
Write Drive Data Error Example	C - 8

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### **Parameter Access Overview**

Parameter access allows the reading and writing of drive parameters. For a detailed description of the drive parameters refer to the appropriate drive User's manual or MODBUS<sup>®</sup> technical manual.

#### Initialize Data Structures

Prior to setting the command message, insure that the command message handshake byte **HS**, bit 7, bit matches the **HS** bit, bit 7, of the response message.

#### Set PROFIBUS-DP Master Command Message

- Function Code: Enter 03h (0000 0011) to read data from the drive or 10h (1010 0000) to write data to the drive. If no parameter access messaging is required, enter 00h as the function code.
- Addressing: All register addresses consist of two (2) bytes. The most significant byte, the upper half, is entered as the Starting Address MSB. The least significant byte, the lower half, is entered as the Starting Address LSB. If more than one register is to be accessed, only valid with 16 word input/output messages, the registers must be consecutive beginning with the register at the starting address.
  - Starting Address MSB: Enter the upper half of the starting address. For address 1234h, enter 12h.
  - Starting Address LSB: Enter the lower half of the starting address. For address 1234h, enter 34h.
- **Data Quantity:** Enter the quantity of data to either read or write. Each register contains 2 data bytes. To read or write 1 register, enter 2. To read or write 2 registers, enter 4. For 6 word input/output messages, 2 is the only valid entry.
- Data: All drive register data consists of 2 bytes. The most significant byte, the upper half, of the value is contained in Data # MSB. The least significant byte, the lower half, is contained in Data # LSB. For reading data from the drive, these registers must be set to 0. For writing data to the drive, enter the data in the order that it is to be written to the drive at consecutive addresses starting with the address entered as the Starting Address. For 16 word input/output messages, if data is to be written to 2 registers, enter the appropriate values into Data 1 and Data 2. Data 3 and Data 4 must contain 0.
  - **Data # MSB:** To read drive data, set this value to 0. To write data, enter the most significant byte, the upper half, of the data to be written. To write data 5678h, enter 56h. To write more than one register, valid for 16 word input/output messages only, the registers must be consecutive starting with the address entered as the Starting Address.
  - **Data # LSB:** To read drive data, set this value to 0. To write data, enter the least significant byte, the lower half, of the data to be written. To write data 5678h, enter 78h. To write more than one register, valid for 16 word input/output messages only, the registers must be consecutive starting with the address entered as the Starting Address.
- **Handshaking**: Set the **HS** bit, the MSB, bit 7, of the command message handshaking byte to the same state as the **HS** bit, the MSB, bit 7, of the response message handshaking byte.

#### Toggle the PROFIBUS-DP Master Handshake Bit

Toggle the command message Handshake MSB, the most significant bit, bit 7, to signal the drive that the command message contains a valid Parameter Access message. Make sure that all data has been entered into the command message before setting this bit. It is advisable to insert at least one processor scan between setting the command message and setting the handshake bit. Maintain the state of the HS bit until another command is to be sent to the drive.

#### ◆ Message Received By PROFIBUS-DP Option - Ignore All Response Data

To signify the receipt of the command message, the PROFIBUS-DP Option will set the response message handshaking **HS** bit to match the state of the command message handshaking **HS** bit. Depending on the scan time of the PROFIBUS-DP Master and the interval between reviewing response messages, the PROFIBUS-DP Master may not see this response.

#### Message Sent To Drive - Ignore All Response Data

The PROFIBUS-DP Option formats the Parameter Access command message and transmits it to the drive, setting bit 5 of the response message handshake. Depending on the scan time of the PROFIBUS-DP Master and the interval between reviewing response messages, the PROFIBUS-DP Master may not see this response.

#### Wait For Drive Response - Ignore All Response Data.

Upon receiving the Parameter Access message from the PROFIBUS-DP Option, the drive processes the message, setting bit 6 and resetting bit 5 of the response message handshake. This processing typically takes 10ms to 15ms dependant on the state of the drive at the time of receiving the message. Depending on the scan time of the PROFIBUS-DP Master and the interval between reviewing response messages, the PROFIBUS-DP Master may not see this response.

#### Process Response – Store And Process Data

The response message handshake byte bits 5 and 6 are set to signal that the drive has completed processing the Parameter Access message. If the command message was to read drive data, the data bytes will now contain valid data. If the command message was to write drive data, the data has been successfully written.

## **Read Drive Data Example**

IRONG INS.OF Mater ConversionInitialize Data Stratury.Initialize Data Str	PRODUBUS-DP Master CommundInitialize Data StructuresDeption Code0.0.1Starting Address NSB006Starting Address NSB0060.0.1	Table C.2 – Read Drive Data Example				
Function Code         00h           Starting Address NBB         00h           Starting Address NBB         00h           Dara Quantity         00h           Dara MNR         00h           Dara MNR         00h           Dara MNR         00h           Dara MNR         00h           Data MNR         00h           Data MNR         00h           Data JNR         00h           Data JNR         00h           Handhaking (1000 00h)         8h           Proteino Code         00h           Starting Address NBB         00h           Starting Address MSB         00h           Data JNSB         00h <th>Function Code Starting Address NSR         00h Starting Address NSR         5et the command in estage handshake byte HS bit to the same state at hi response message handshake HS bit         Function Code Starting Address NSR         00h Data UNING           Data UNING         00h Data UNING         00h Data UNING         00h Data UNING         00h Data UNING         00h Data UNING         00h           PROFIBES-DP Master Command         Set PROFIBUS-DP Master Command Message         Drive Response         00h           Starting Address NSB         00h         Set the Period Code, Starting Address, and Data Quantity. Itis Starting Address NSB         TimeSchelling (110) 4006         00h           Starting Address NSB         00h         Set the Period Code, Starting Address, and Data Quantity. Itis Starting Address NSB         TimeSchelling (110) 4006         00h           Starting Address NSB         00h         Transface Advaces NSB         00h         Starting Address NSB         00h           Starting Address NSB         00h         Transface Advaces NSB         00h         Starting Address NSB         00h           Starting Address NSB         00h         Transface Advaces NSB         00h         Starting Address NSB         00h           Starting Address NSB         00h         Transface Advaces NSB         00h         Starting Advaces NSB         00h         Starting Advaces NSB         00h</th> <th>PROFIBUS-DP Master Com</th> <th>mand</th> <th>Initialize Data Structures</th> <th>Drive Response</th> <th></th>	Function Code Starting Address NSR         00h Starting Address NSR         5et the command in estage handshake byte HS bit to the same state at hi response message handshake HS bit         Function Code Starting Address NSR         00h Data UNING           Data UNING         00h Data UNING         00h Data UNING         00h Data UNING         00h Data UNING         00h Data UNING         00h           PROFIBES-DP Master Command         Set PROFIBUS-DP Master Command Message         Drive Response         00h           Starting Address NSB         00h         Set the Period Code, Starting Address, and Data Quantity. Itis Starting Address NSB         TimeSchelling (110) 4006         00h           Starting Address NSB         00h         Set the Period Code, Starting Address, and Data Quantity. Itis Starting Address NSB         TimeSchelling (110) 4006         00h           Starting Address NSB         00h         Transface Advaces NSB         00h         Starting Address NSB         00h           Starting Address NSB         00h         Transface Advaces NSB         00h         Starting Address NSB         00h           Starting Address NSB         00h         Transface Advaces NSB         00h         Starting Address NSB         00h           Starting Address NSB         00h         Transface Advaces NSB         00h         Starting Advaces NSB         00h         Starting Advaces NSB         00h	PROFIBUS-DP Master Com	mand	Initialize Data Structures	Drive Response	
Starting Address NSB         Oth           Data (Audress MSB         Oth           Data (Mass)         Oth           PROFIBUS-DP Master Command         Set the Function Code, Sarting Address, MNB         Oth           Starting Address MNB         Oth         Sarting Address MNB         Oth           Starting Address MNB         Oth         Set the Function Code, Sarting Address, and Data Quantity. This         Starting Address MNB         Oth           Starting Address MNB         Oth         Set the Function Code, Sarting Address MNB         Oth           Data (Mass)         Oth         Tesper tespe starting Address MNB         Oth           Data (Mass)         Oth         Tesper tespe starting Address MNB         Oth           Data (Mass)         Oth         Tesper tespe starting Address MNB         Oth           Data (Mass)         Oth         Tesper tespe starting Address MNB         Oth           Data (Mass)         Oth         Tespe starting Address MNB         Ot	Starting Address MSB         006         Set the command message handshake byte HS bit to the same state as the first of the command message handshake byte HS bit to the same state as the first of the command message handshake HS bit.         Starting Address MSB         001           Data 1 LSB         006         Data 1 LSB         006           Data 1 LSB         006         Data 1 LSB         006           Hardbalking (100 0060)         866         Data 1 LSB         006           PKOF HBUS-DP Master Command         Set PROFIBUS-DP Master Command Message         Data 1 LSB         006           Parache Code         37h         Set the Function Code, Starting Address and Data Quantity. This complex configures the command message to the command message comman	Function Code	00h		Function Code	03h
Starting Address 15B         Offi         Set the command message handshake byte IIS bit to the same state as the family to the family of the command message handshake IIS bit.         Starting Address 15B         Offi           Data I MNI         Oth         Pressions message handshake IIS bit.         Oth         Data I ANB         Oth           Data I LSB         Oth         Data I LSB         Oth         Data I LSB         Oth           Handshaking (1000 0000)         Shit         Set PROFIBUS-DP Master Command         Set PROFIBUS-DP Master Command         Preveneed           Starting Address ISB         70h         Example Calify, Output Power, For dataBid information of thire registers for to the <i>Echnical Manual</i> and the <i>MODBES</i> <sup>20</sup> Function Code         03h           Data I MSB         Oth         Fade hashing (1100 0000)         Fibh         Data I MSB         Oth           Data I MSB         Oth         Febrical Manual         Manual         Mater Starting Address MSB         Dith           Data I MSB         Oth         After the data his have hear ect, toggle the HS bit, 0; 7, of the command message networks phanoloback by the start to handshake Bit         Drive Response           Protection Code         Dith         After the data his have hear ect, toggle the HS bit, 0; of the command message, their the advanting the start to haddress MSB         Data I MSB         Data I MSB         Data I MSB	Starting Address I SN         Oth         Set the command message handshake byte HS bit in the same state as the part Quantity         Starting Address I SN         Other Quantity         Other Quantity <t< td=""><td>Starting Address MSB</td><td>00h</td><td></td><td>Starting Address MSB</td><td>01h</td></t<>	Starting Address MSB	00h		Starting Address MSB	01h
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Data I MSP         Opin         Provide intressing industriate in Soft.         Data I MSP         Data I MSP         Data I LSB         Opin           Data I MSP         Opin         Itadbaking (1000 0000)         With         Data I LSB         Opin         Data I LSB         Opin           PROFIBUS-DP Matter Command         Set the Function Code, Starting Address, and Data Quantity, This         Starting Address MSB         Opin         Starting Address ASB         Opin         Toget the PROFIBI S-DP Master Command         Toget the PROFIBI S-DP Master Baddress MSB         Opin         Taba I MSB <td< td=""><td>Data 1 MSB         Oth         Composition of Sage Remoted and the segment of the segment message and runwaits and the segment of the segment mes</td><td>Data Quantity</td><td>00h</td><td>Data Quantity</td><td>02h</td></td<>	Data 1 MSB         Oth         Composition of Sage Remoted and the segment of the segment message and runwaits and the segment of the segment mes	Data Quantity	00h		Data Quantity	02h
Data         LSB         0th           Handshaking (1000 0000)         80th         Data         LSB         0th           PROFIBUS-DP Master Command         Set PROFIBUS-DP Master Command Message         Drive Response         Data         0th           Starting Address MSB         0th         Set the Function Code, Starting Address, and Data Quantity. This         Starting Address LSB         Dift         Starting Address LSB         0th         Data         Nth SB         0th         Data         Nth SB         0th         Data         Nth SB         0th         Data         Nth SB         0th         Handshaking (1100 0000)         80th         Technical Manual and the AUDDBLS"         Data         Nth SB         0th         Handshaking (1100 0000)         EDD         Data         Nth SB         0th         Handshaking (1100 0000)         EDD         Data         Nth SB         0th         Handshaking (110 0000)         EDD         Data         Nth SB         0th         Handshaking (110 0000)         EDD         Starting Address MSB         0th         Handshaking (110 0000)         EDD         Starting Address LSB	Data         Data <thdata< th="">         Data         Data         <thd< td=""><td>Data 1 MSB</td><td>00h</td><td>response message nandsnake <b>H</b>3 bit.</td><td>Data 1 MSB</td><td>00h</td></thd<></thdata<>	Data 1 MSB	00h	response message nandsnake <b>H</b> 3 bit.	Data 1 MSB	00h
Handshaking (1000 0000)     80h     Handshaking (110 0000)     F0h       FROFIBUS-DP Master Command     From the command message to criticly and the second provided second	Handshaking (1000 0000)     80h       PROFIBUS-DP Master Command     Set PROFIBUS-DP Master Command Message     Drive Response       Function Code     02h       Sturing Address MSB     00h       Sturing Address MSB     00h       Data Quanity     02h       Data Quanity     02h       Trenchica Quanty     02h       Data Quanity     02h       Data I M3B     00h       Trenchica Quanty     02h       PROFIBUS-DP Master Command     Tegets the PROFIBUS-DP Master Command       PROFIBUS-DP Master Command     Tegets the PROFIBUS-DP Master Command       Function Code     02h       Starting Address MSB     00h       Paratient SLS     77h       ProfIBUS-DP Master Command     Tegets the PROFIBUS-DP Master Command       Function Code     02h       Starting Address MSB     00h       Parater Command     Tegets the PROFIBUS-DP Master Command       Prometion Code     02h       Parater Hash io th command message and mashes by ta hist in the short the command message and mashes by ta hist in the command message and mashes by ta hist in the short the command message and transmit in table and table and table and table by ta hist in the terpense message and transmit in table and table a	Data 1 LSB	00h		Data 1 LSB	00h
PROFIBUS-DP Master Command         Set PROFIBUS-DP Master Command Message         Drive Response           Function Code         0.3h         Set the Function Code Starting Address, and Data Quantity, This         Starting Address MSB         00h           Data Quantity         0.2h         Carping Address MSB         00h           Data Quantity         0.2h         Carping Address MSB         00h           Data Quantity         0.2h         Carping Address MSB         00h           Data I LSB         00h         Gree registers refer to the Technical Manual and the MODBLS*         Data Quantity         0.2h           Data I LSB         00h         Gree registers refer to the Technical Manual and the MODBLS*         Data I LSB         00h           Barning Address MSB         00h         Mantify         Data I LSB         00h         Data I LSB         00h           Starting Address MSB         00h         Mantify Address I LSB         Data I MSB	PROF IBUS-DP Master Command Function Code         Set PROF IBUS-DP Master Command Message         Drive Response           Function Code         0.3h Starting, Address MSB         00h         Set the Function Code, Starting Address, and Data Quantity. This Starting Address MSB         Starting Address MSB         00h           Data Quantity         0.2h         creating configures the command accesson to retrieve dua fit ond information of drive register at address 0137h. Organ Power for datalied information of the receptise that information of the receptise the reception of the command message command on sease the receptise the reception of the command message parameter Access command On recepting the response message frand Address by the is store that the simular Address ISB         Data Quantity         Data Quant	Handshaking (1000 0000)	80h		Handshaking (1110 0000)	E0h
PROFIBUS-DP Master Command         Set PROFIBUS-DP Master Command Message         Drive Response           Function Code         0.3h         Set the Function Code, Starring Address, and Data Quantity. This         Starting Address MSB         0.0h           Data Quantity         0.2h         register at address 0.3K         0.0h         Starting Address MSB         0.0h           Data Quantity         0.2h         register at address 0.3K         0.0h         Data Quantity         0.2h           Data I MSB         0.0h         register at address 0.3K         Quantity         0.2h           Data I MSB         0.0h         Technical Manual.         Data Quantity         0.2h           Data I MSB         0.0h         Technical Manual.         Data I MSB         0.0h           Data I MSB         0.0h         Technical Manual.         Data Quantity         0.2h           Data I MSB         0.0h         Termeter Access command On receipt of the command message contains a Mandshake by to signal the drive that the command message, the same part of the command message, the same part of the command message of the same part of the response message madshake by the same part of	PROFIBUS-DP Master Command         Set PROFIBUS-DP Master Command Message         Drive Response           Function Code         0.3h         Starting Address MSB         00h           Starting Address MSB         0.0h         Starting Address MSB         0.0h           Data Quantity         0.2b         Starting Address MSB         0.0h           Data MSB         0.0h         registers and address 0037. Dourp Power, For detailed information         Data Quantity         0.2b           Data I MSB         0.0h         drive registers refer to the <i>Technical Manual</i> and the MODBUS <sup>or</sup> Data Quantity         0.2b           PROFIBUS-DP Master Command         Toggle the PROFIBUS-DP Master Handshake Bit         Drive Response         Function Code         0.3h           Starting Address MSB         0.0h         After the data bits have heren set, toggle the HS bit, bit 7, of the command message motion and message mate contain a bit of the command message handshake byt c. bit spin all the data bits have heren set, toggle the HS bit, bit 7, of the command message mate contain a bit of the command message handshake byt c. bit and the data, bits 7, of the response message         Data Quantity         Data Quantity           Data Quantity         0.2h         Handshaking (0.000 0.00h         Data Quantity         Data Quantity         Data Quantity           Data Quantity         0.2h         The PROFIBUS-DP Master Command         Matif for Response <td></td> <td></td> <td></td> <td></td> <td></td>					
Punction Cade         0.3h         Set the Function Code, Starring Address, and Data Quantity. This           Starring Address LSB         0.0h         Set the Function Code, Starring Address, and Data Quantity. This         Starring Address LSB         0.0h           Data Quantity         0.2h         complexes to configures the command message or certixe data far ond drive         Starring Address LSB         0.0h           Data I LSB         0.0h         Data I LSB         0.0h         Data I LSB         0.0h           Handshaking (1000 0000)         80h         Technical Manual         Manual         Data I MSB         0.0h           Punction Code         0.3h         Starring Address MSB         0.0h         Thardshak by to cignal the drive that the command message contains a brain MsB by thi 7, of the response message handshake byte to signal the drive that the command message contains and that by BMB         Thardshak by EMB         Thardshaks BMB         Thardshaks <td< th=""><th>Function Code     0.3h     Set the Function Code, Starting Address, and Data Quantity. This     Function Code     0.3h       Starting Address ISB     0.0h     Set the Function Code, Starting Address, and Data Quantity. This     Starting Address MSB     0.0h       Data Quantity     0.2h     register at address 0.037h, Output Power, For detailed information of drive register set for to the Technical Manual and the MODBUS.<sup>47</sup>     Data Quantity     0.2h       Data 1 MSB     0.0h     Technical Manual.     Technical Manual.     0.0h       Handshaking (1000 0000)     8th     Toggle the PROFIBUS-DP Master Command     Difference     Difference       PROFIBUS-DP Master Command     Toggle the PROFIBUS-DP Master Command     Difference     Difference       Starting Address MSB     0.0h     Hirs Nb, ib, ib, 7, of the command message, and Adaka by Evis. As the presponse message and Adaka by Evis. As the presponse message mang contain invalid data, ignere all response message and Manufak. By Ev. As the presponse message mang contain invalid data, ignere all response message and Manufak. By Ev. As the presponse message mang contain invalid data, ignere all response message m</th><th>PROFIBUS-DP Master Com</th><th>mand</th><th>Set PROFIBUS-DP Master Command Message</th><th>Drive Response</th><th></th></td<>	Function Code     0.3h     Set the Function Code, Starting Address, and Data Quantity. This     Function Code     0.3h       Starting Address ISB     0.0h     Set the Function Code, Starting Address, and Data Quantity. This     Starting Address MSB     0.0h       Data Quantity     0.2h     register at address 0.037h, Output Power, For detailed information of drive register set for to the Technical Manual and the MODBUS. <sup>47</sup> Data Quantity     0.2h       Data 1 MSB     0.0h     Technical Manual.     Technical Manual.     0.0h       Handshaking (1000 0000)     8th     Toggle the PROFIBUS-DP Master Command     Difference     Difference       PROFIBUS-DP Master Command     Toggle the PROFIBUS-DP Master Command     Difference     Difference       Starting Address MSB     0.0h     Hirs Nb, ib, ib, 7, of the command message, and Adaka by Evis. As the presponse message and Adaka by Evis. As the presponse message mang contain invalid data, ignere all response message and Manufak. By Ev. As the presponse message mang contain invalid data, ignere all response message and Manufak. By Ev. As the presponse message mang contain invalid data, ignere all response message m	PROFIBUS-DP Master Com	mand	Set PROFIBUS-DP Master Command Message	Drive Response	
Starting Address MSB         Oth Starting Address MSB         Starting Address MS	Starting Address MSB     00h     Set the Function Code, Starting Address, and Data Quantify. This     Marting Address MSB     01h       Starting Address LSB     37h     crample configures the command message to retrieve duat form drive registers refer to the <i>Technical Manual</i> and the <i>MODBUS</i> <sup>®</sup> Data 1 MSB     00h       Data 1 LSB     00h     Technical Manual     Technical Manual     02h     Data 1 MSB     00h       PHOF1BJ-S-DP Master Command     Toggle the PROF1BJS-DP Master Handshake Bt     Drive Response     Function Code     Starting Address LSB     00h       Starting Address LSB     00h     The data bits have been set, toggle the 1S bit, bit 7, of the command message contains to start in Address LSB     Data Quantity     Encel to any address LSB     Encel to any address LSB     Data Quantity     Encel to any address LSB     Encel to any ad	Function Code	0.3h		Function Code	03h
Starting Address LSB         String Address LSB         String Address LSB         Obs           Data (Mass)         Obs         String Address LSB         0h           Data (Mass)         Obs         Green mand ressage to retrieve data from drive poster of data infom drive data infom drive poster of data	Starting Address LSB     370     Set the Function Code, Starting Address, and Data Quantity. Inits     Starting Address LSB     000.       Data (Ass)     600     Frequency or figures the command message to critizive data ford drive register at address 00370, Cutput Power. For detailed information of Data Quantity     021.     Data (Ass)     000.       Data (LSB)     00h     drive register ster to the the <i>Technical Manual</i> and the MODBUS"     Data (MSB)     00h.       PROFIBUS-DP Master Command     Toggle the PROFIBUS-DP Master Handshake Bt     Drive Response     Drive Response       Function Code     03h     After the data bits have been set, toggle the IS bit, bit 7, of the command message, the Jand Ghashe byte to sign and be vipt of att the drive that the command message, the Jand Ghashe byte (S) att 11.     Torice Address MSB     Data Quantity     Data (MSB)	Starting Address MSB	00h		Starting Address MSB	0.1h
Data Quantity         Other         Compose of early of a data set of 0.03 PL comput Powers: For detailed information of a data committion of a data committee of the response message may contain invalid data, ignore all response message and transmits data Quantity         Data (LSB         Other           PROFIBUS-DP Master Command         Toggle the PROFIBUS-DP Master Handshake Bit         Drive Response         Function Code         Starting Address MSB         Other           Starting Address MSB         00h         After the data bits have been set, toggle the HS bit, bit 7, of the command message, the Data Quantity         Data (LSB         Starting Address MSB	Data Quantity         Oth         Instruction         Oth           Data Quantity         Oth         Instruction         Data I MSB         Oth         Handshake byte to signal the drive hat the command message contains a signal model with the command message contains a signal model with the command message contains a signal model with the command message contains and matery is set to the same is a massed, the Data Quantity	Starting Address LSB	37h	Set the Function Code, Starting Address, and Data Quantity. This example configures the command message to retrieve data from drive	Starting Address LSB	00h
Data I MSB         Other Section         Data I MSB         Other Section I MSB         Data I MSB         Other Section I MSC I M	Data I MSB         Oth         drive registers refer to the Technical Manual and the MODBUS <sup>®</sup> Data I MSB         Oth           Data I LSB         Oth         drive registers refer to the Technical Manual and the MODBUS <sup>®</sup> Data I MSB         Oth           PROFIBUS-DP Master Command         Toggle the PROFIBUS-DP Master Handshake Bit         Data I MSB         Oth           Function Code         0.3h         After the data bits have been set, toggle the HS bit, bit 7, of the command message contains a         Function Code         Starting Address ISB         Starting Address ISB         Starting Address ISB         Data I MSB	Data Quantity	02h	register at address 0037h. Output Power. For detailed information of	Data Quantity	02h
Data 11.58         Data 11.58         Data 11.58         Data 11.58         Oth           Handshaking (1000 0000)         80h         Toggle the PROFIBUS-DP Master Handshake Bit         Data 11.58         Oth           PROFIBUS-DP Master Command         Toggle the PROFIBUS-DP Master Handshake Bit         Drive Response         Starting Address MSB         Oth           Starting Address LSB         37h         Parameter Access command On receipt of the command message, the Data 1LSB         Starting Address LSB         Starting Address LSB <td>Data 11.SB         Oth         Technical Manual.         Data 11.SB         Oth           Handshaking (1000 0000)         80h         Technical Manual.         Data 11.SB         0th           PROFIBI(S-DP Master Command         Togle the PROFIBI(S-DP Master Handshake Bit         Drive Response         Function Code         Starting Address NSB         0th           Starting Address ISB         0th         After the data bits have been set, togle the HS bit, bit 7, of the command message, onthals by to is starting Address MSB         Startin</td> <td>Data 1 MSB</td> <td>00h</td> <td>drive registers refer to the <i>Technical Manual</i> and the <i>MODBUS</i>®</td> <td>Data 1 MSB</td> <td>00h</td>	Data 11.SB         Oth         Technical Manual.         Data 11.SB         Oth           Handshaking (1000 0000)         80h         Technical Manual.         Data 11.SB         0th           PROFIBI(S-DP Master Command         Togle the PROFIBI(S-DP Master Handshake Bit         Drive Response         Function Code         Starting Address NSB         0th           Starting Address ISB         0th         After the data bits have been set, togle the HS bit, bit 7, of the command message, onthals by to is starting Address MSB         Startin	Data 1 MSB	00h	drive registers refer to the <i>Technical Manual</i> and the <i>MODBUS</i> ®	Data 1 MSB	00h
Data PLOD         Data	Data         Data <thdata< th="">         Data         Data         <thd< td=""><td>Data 1 LSB</td><td>00h</td><td>Technical Manual.</td><td>Data 1 LSB</td><td>0.0h</td></thd<></thdata<>	Data 1 LSB	00h	Technical Manual.	Data 1 LSB	0.0h
PROFIBUS-DP Master Command         Toggle the PROFIBUS-DP Master Handshake Bit         Drive Response           Function Code         0.3h         After the data bits have been set, toggle the HS bit, bit 7, of the response message contains a Starting Address MSB         Function Code         Starting Address MSB         Starting Addres	PROFIBUS-DP Master Command         Toggle the PROFIBUS-DP Master Handshake Bit         Drive Response           Function Code         03h         After the data bits have been set, toggle the HS bit, bit 7, of the command         Starting Address MSB         Ohn           Jata Quantity         02h         After the data bits have been set, toggle the HS bit, bit 7, of the command message continuand         Starting Address MSB         Starting Address MSB <t< td=""><td>Handshaking (1000 0000)</td><td>80h</td><td></td><td>Handshaking (1110,0000)</td><td>F0h</td></t<>	Handshaking (1000 0000)	80h		Handshaking (1110,0000)	F0h
PROFIBUS-DP Master Command         Toggle the PROFIBUS-DP Master Handshake Bit         Drive Response           Function Code         03h         After the data bits have been set, toggle the HS bit, bit 7, of the command message, toggle the HS bit, bit 7, of the command message, the data bits have been set, toggle the HS bit, bit 7, of the command message, the data bits have been set; toggle the HS bit, bit 7, of the response message handshake byte is set to be same tate as the HS bit, bit 7, of the response message handshake byte is set to be same tate as the HS bit of the command message handshake byte is set to be same tate as the HS bit of the command message handshake byte is set to be same tate as the HS bit of the command message handshake byte is set to be same tate as the HS bit of the command message handshake byte. As the Data 1.LSB	PROFIBUS-DP Master Command         Toggle the PROFIBUS-DP Master Handshake Bit         Drive Response           Function Code         0.3h         After the data bits have been set, toggle the HS bit, bit 7, of the command message, the handshake byte to signal the drive that the command message, the HS bit, bit 7, of the response message handshake byte is set to the same training Address LSB         Imating Address LSB         Imatins LSB         Imating Address LSB         Ima	Trandshaking (1000 0000)	001		mandshaking (1110 0000)	Lon
The Profile Code       Other the data bits have been set, toggle the HIS bit, bit 7, of the command message contains a starting Address LSB       Function Code       Starting Address LSB       Function Code         Data Quantiy       02h       HS bit, bit 7, of the response message handshake byte is set to the same state as the HS bit of the command message contains and message contains and message contains and message contains and the command message bandshake byte is set to the same bata LSB       Function Code         Data JLSB       00h       other response message may contain invalid data, ignore all response message data.       Data Quantiy       Data Quantiy         PROFIBUS-DP Master Command       Wait for Response       Drive Response       Function Code       Starting Address LSB       Data Quantiy         Data Quantiy       02h       TSB       The PROFIBUS-DP Option formats the command message and transmits       Starting Address LSB       Starting Address LSB       Starting Address LSB       Data Quantiy         Data Quantiy       02h       response message may contain invalid data, ignore all response message data.       Starting Address LSB       Data LLSB         Data Quantiy       02h       response message may contain invalid data, ignore all response message data.       Data Quantiy       Data Quantiy         Data Quantiy       02h       response message data. <th>Function Code         OB         After the data bits have been set, toggle the HS bit, bit 7, of the command message contains 3         Function Code         Data (Junity           Data Quantity         2D         HS bit, bit 7, of the command message contains at a set as the HS bit of the command message contains at a set as the HS bit of the command message contains at a set as the HS bit of the command message handshake byte is set to the same state as the HS bit of the command message handshake byte is set to the same data.         Data Quantity         Data Quantity           Parameter Access command 0. Treeptor the command message handshake byte. As the tas as the HS bit of the command message handshake byte. As the tas as the HS bit of the command message handshake byte. As the tas been set to the same data.         Data Quantity         Data 1 MSB           Data (Junity)         00h         The PROFIBUS-DP Master Command         Wait for Response         Drive Response         Data Quantity           Para 1 MSB         00h         The PROFIBUS-DP Option formats the command message and transmit it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message         Data Quantity         Data Quantity           Data 1 MSB         00h         data.         Starting Address MSB         Starting Address MSB</th> <th>PROFIBUS-DP Master Com</th> <th>mand</th> <th>Toggle the PROFIRIS DP Master Handshake Bit</th> <th>Drive Response</th> <th></th>	Function Code         OB         After the data bits have been set, toggle the HS bit, bit 7, of the command message contains 3         Function Code         Data (Junity           Data Quantity         2D         HS bit, bit 7, of the command message contains at a set as the HS bit of the command message contains at a set as the HS bit of the command message contains at a set as the HS bit of the command message handshake byte is set to the same state as the HS bit of the command message handshake byte is set to the same data.         Data Quantity         Data Quantity           Parameter Access command 0. Treeptor the command message handshake byte. As the tas as the HS bit of the command message handshake byte. As the tas as the HS bit of the command message handshake byte. As the tas been set to the same data.         Data Quantity         Data 1 MSB           Data (Junity)         00h         The PROFIBUS-DP Master Command         Wait for Response         Drive Response         Data Quantity           Para 1 MSB         00h         The PROFIBUS-DP Option formats the command message and transmit it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message         Data Quantity         Data Quantity           Data 1 MSB         00h         data.         Starting Address MSB	PROFIBUS-DP Master Com	mand	Toggle the PROFIRIS DP Master Handshake Bit	Drive Response	
Jank Work Code     0.0h       After the data bits have been set, toggle the HS bit, bit 7, of the command     Starting Address MSB       Starting Address LSB     37h       Data 1 MSB     00h       Data 1 MSB     00h       Handshake byte to signal the drive that the command message chandshake byte. As the response message may contain invalid data, ignore all response message data.     Starting Address MSB       PROFIBUS-DP Master Command     Wait for Response     Drive Response       Function Code     0.3h     The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message     Function Code       Data Quantity     02h     1 MSB     00h       PROFIBUS-DP Master Command     Wait for Response     Drive Response       Function Code     0.3h     Starting Address LSB     Starting Address LSB       Data 1 LSB     00h     00h     Data 1 LSB     00h       Data 1 MSB     00h     Function Code     Starting Address LSB     Starting Address LSB       Data 1 LSB     00h     Ob     Data 1 LSB     Data 1 LSB       Data 1 LSB     00h     Data 1 LSB     Data 1 LSB       Data 1 MSB     00h     Data 1 LSB     Data 1 LSB       Data 1 LSB     00h     Bit 5 is reset and bit 6 set of the re	After the data bits have been set, toggle the HS bit, bit 7, of the command message contains a       Starting Address MSB       Starting Address MSB         Starting Address LSB       37h       Parameter Access command On receipt of the command message contains a       Starting Address LSB       Starting Address MSB         Data Quantity       02h       HS bit of the command message handshake byte As the       Data I MSB       Data I MSB </td <td>Function Code</td> <td>03h</td> <td>loggie the likelihos bi Mastel Handshake bit</td> <td>Function Code</td> <td></td>	Function Code	03h	loggie the likelihos bi Mastel Handshake bit	Function Code	
Outcome       Description       Analysis       Data Mathe       Processing the drive that the command message contains a starting Address LSB       Data Mathe       Starting Address LSB       Data Mathe       Starting Address LSB       Data Mathe       Data Quantity       Data Mathe       Data Mathe       Data Mathe       Data Quantity       Data Mathe       Data Mathe       Data Mathe       Data Quantity       Data Mathe       Data Mathe       Data Mathe       Data Mathe       Data Quantity       Data Mathe       Data Quantity       Data Mathe	Tarting Address LSB       Other Signal the drive that the command message. Address LSB       Data (Januarity         Data Quantity       QD       HS bit, bit 7, of the response message handshake byte is set to the same that as the HS bit to the command message handshake byte. As the tas the tas bit as the HS bit to the command message handshake byte. As the tas as the HS bit data.       Data 1 LSB       Data 1 LSB         Handshake group of the command message handshake byte is set to as the HS bit to the command message handshake byte. As the tas as the HS bit to the command message handshake byte. As the Handshaking (0000 0000)       Data 1 LSB       Data 1 LSB         Function Code       Q3h       The PROFIBUS-DP Master Command       Vait for Response       Drive Response         Function Code       Q3h       The PROFIBUS-DP Option formats the command message and transmits       Starting Address LSB       Starting Address LSB       Starting Address LSB         Data 1 LSB       00h       to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message       Data 2 Master Starting Address LSB       St	Starting Address MSB	0.0h	After the data bits have been set, toggle the <b>HS</b> bit, bit 7, of the command	Starting Address MSB	
Starting Address LSD       27h       Parameter Access command. On Peceptr of the command message, the Data (Juntify)       Data	Shading Audicss LDD       2011       Parameter Access command. On receipt of the command message, the offshe byte is set to the same processing thandshade byte. As the byte is set to the same processing thandshade byte. As the byte is set to the same processing thandshade byte. As the frandshading (0000 0000)       Data (LSB	Starting Address I SB	37h	handshake byte to signal the drive that the command message contains a	Starting Address ISB	
Data J MSB       Oth       First as we first bit of the command message nature and what bit is bit of the command message nature and what have byte. As the response message may contain invalid data, ignore all response message data.       Data J MSB       Data J MSB         Data J LSB       00h       response message may contain invalid data, ignore all response message data.       Data J MSB       Data J	Data Quantity       Out       For each or other or other ot	Data Quantity	02h	HS hit hit 7 of the response message handshake byte is set to the same	Data Quantity	
Data I LSB       Oth       response message may contain invalid data, ignore all response message       Data I LSB       Data I LSB         PROFIBUS-DP Master Command       Wait for Response       Drive Response       Function Code       03h         Starting Address MSB       00h       The PROFIBUS-DP Option formats the command message and transmit to the drive, setting bit 5 of the response handshake byte. As the response message       Function Code       Starting Address LSB       Starting Address LSB       Data I LSB	Data 1 LSB     Oth     response message may contain invalid data, ignore all response message     Data 1 LSB       Handshaking (0000 0000)     00h       PROFIBUS-DP Master Command     Wait for Response       Function Code     03h       Starting Address MSB     00h       Starting Address LSB     37h       The PROFIBUS-DP Master Command     The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message       Data 1 LSB     00h       Handshaking (0000 0000)     00h       Bit 5 is reset and bit 6 set of the response message may contain invalid data, ignore all response message data.       PROFIBUS-DP Master Command     Wait for Response       Function Code     03h       Starting Address LSB     00h       Data 1 LSB     00h       Data 1 LSB     00h       Handshaking (0000 0000)	Data Quality	0211	state as the <b>HS</b> bit of the command message handshake byte. As the	Data Qualitity	
Data I LSB     Oth Handshaking (0000 0000)     data.       PROFIBUS-DP Master Command     Wait for Response     Drive Response       Function Code     03h       Starting Address LSB     00h       Data 1 LSB     00h       Data 1 LSB     00h       Data 1 LSB     00h       Data 2 Januity     02h       Data 1 LSB     00h       Handshaking (0000 0000)     00h       PROFIBUS-DP Master Command     Wait for Response       Function Code     03h       Starting Address LSB     00h       Data 1 MSB     00h       Data 1 MSB     00h       Data 1 MSB     00h <td>Data 1 LSB     Oth     data.     Data 1 LSB     Data 1 LSB       Handshaking (0000 0000)     00h     Handshaking (0000 0000)     00h       PROFIBUS-DP Master Command     Wait for Response     Price Response       Function Code     03h       Starting Address MSB     00h       Starting Address LSB     37h       The PROFIBUS-DP Master Command     The PROFIBUS-DP Option formats the command message and transmits       Data 1 LSB     00h       Data 1 LSB     00h       Handshaking (0000 0000)     00h       Handshaking (0000 00000)     00h</td> <td></td> <td>0.01</td> <td>response message may contain invalid data, ignore all response message</td> <td></td> <td></td>	Data 1 LSB     Oth     data.     Data 1 LSB     Data 1 LSB       Handshaking (0000 0000)     00h     Handshaking (0000 0000)     00h       PROFIBUS-DP Master Command     Wait for Response     Price Response       Function Code     03h       Starting Address MSB     00h       Starting Address LSB     37h       The PROFIBUS-DP Master Command     The PROFIBUS-DP Option formats the command message and transmits       Data 1 LSB     00h       Data 1 LSB     00h       Handshaking (0000 0000)     00h       Handshaking (0000 00000)     00h		0.01	response message may contain invalid data, ignore all response message		
Prantismaring (0000 0000)       Oth       Prantismaring (0000 0000)       Oth         PROFIBUS-DP Master Command       Wait for Response       Drive Response         Function Code       03h       Starting Address MSB       00h         Starting Address LSB       37h       The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.       Starting Address LSB       Data Quantity         Data 1 LSB       00h       Address LSB       The response message may contain invalid data, ignore all response message       Data 1 MSB       Data 1 MSB       Data 1 MSB       Data 1 LSB       The response handshake byte when the message has been received by the drive and that the drive has begun processing the message has been received by the drive and that the drive has begun processing the message as the response message may contain invalid data, ignore all response message may contain invalid data, ignore all response message data.       Function Code       Starting Address LSB       Starting Address LSB       Data 1 MSB       Data 1 MSB <td>Handsniking (0000 0000)       Oth       Handsniking (0000 0000)       Oth         PROFIBUS-DP Master Command       Wait for Response       Drive Response         Function Code       03h       Starting Address MSB       00h         Starting Address LSB       37h       The PROFIBUS-DP Option formats the command message and transmits       Starting Address MSB       Imade and the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message       Function Code       Starting Address LSB       Imade and the drive and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.       Function Code       Starting Address LSB       Imade and the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.       Function Code       Starting Address LSB       Imade and the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.       Function Code       Starting Address LSB       Imade and the drive has begun processing the message data.       Function Code       Starting Address LSB       Imade and the drive has begun processing the message data.       Imade and the drive has begun processing the message data.       Imade and the drive has begun processing the message data.       Imade and the drive has begun data (1LSB)       Imad a Quantify       Imad a Quantify</td> <td>Data TLSB</td> <td>000</td> <td>data.</td> <td>Data I LSB</td> <td>0.01-</td>	Handsniking (0000 0000)       Oth       Handsniking (0000 0000)       Oth         PROFIBUS-DP Master Command       Wait for Response       Drive Response         Function Code       03h       Starting Address MSB       00h         Starting Address LSB       37h       The PROFIBUS-DP Option formats the command message and transmits       Starting Address MSB       Imade and the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message       Function Code       Starting Address LSB       Imade and the drive and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.       Function Code       Starting Address LSB       Imade and the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.       Function Code       Starting Address LSB       Imade and the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.       Function Code       Starting Address LSB       Imade and the drive has begun processing the message data.       Function Code       Starting Address LSB       Imade and the drive has begun processing the message data.       Imade and the drive has begun processing the message data.       Imade and the drive has begun processing the message data.       Imade and the drive has begun data (1LSB)       Imad a Quantify       Imad a Quantify	Data TLSB	000	data.	Data I LSB	0.01-
PROFIBUS-DP Master Command       Wait for Response         Function Code       03h         Starting Address MSB       00h         Starting Address LSB       37h         Data Quantity       02h         Data Quantity       02h         data       00h         Address LSB       00h         Data 1 MSB       00h         Data 1 LSB       00h         Handshaking (0000 0000)       00h         PROFIBUS-DP Master Command       Wait for Response message may contain invalid data, ignore all response message         Function Code       03h         Starting Address LSB       00h         Starting Address LSB       37h         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message data.         Data 1 LSB       00h         Bata 1 LSB       00h         Bata 1 LSB       00h         Handshaking (0000 0000)       00h         Handshaking (0000 0000)       00h         Bata 1 LSB       00h </td <td>PROFIBUS-DP Master Command         Wait for Response         Drive Response           Function Code         03h         Function Code         03h           Starting Address MSB         00h         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message         Starting Address LSB         Imadshaking (0000 0000)         Oth           Data 1 LSB         00h         Data 1 LSB         Data 1 LSB         Data 1 LSB         Imadshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.         Function Code         Starting Address LSB         Starting Address LSB         Imadshaking (0000 0000)         20h           PROFIBUS-DP Master Command         Wait for Response         Drive Response         Function Code         Starting Address LSB         Imadshaking (0010 0000)         20h           Starting Address LSB         37h         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.         Starting Address LSB         Imadshaking (0100 0000)         40h           Data 1 LSB         00h         Handshaking (0100 0000)         Handshaking (0100 0000)         <td< td=""><td>Handshaking (0000 0000)</td><td>UUN</td><td></td><td>Handshaking (0000 0000)</td><td>000</td></td<></td>	PROFIBUS-DP Master Command         Wait for Response         Drive Response           Function Code         03h         Function Code         03h           Starting Address MSB         00h         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message         Starting Address LSB         Imadshaking (0000 0000)         Oth           Data 1 LSB         00h         Data 1 LSB         Data 1 LSB         Data 1 LSB         Imadshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.         Function Code         Starting Address LSB         Starting Address LSB         Imadshaking (0000 0000)         20h           PROFIBUS-DP Master Command         Wait for Response         Drive Response         Function Code         Starting Address LSB         Imadshaking (0010 0000)         20h           Starting Address LSB         37h         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.         Starting Address LSB         Imadshaking (0100 0000)         40h           Data 1 LSB         00h         Handshaking (0100 0000)         Handshaking (0100 0000) <td< td=""><td>Handshaking (0000 0000)</td><td>UUN</td><td></td><td>Handshaking (0000 0000)</td><td>000</td></td<>	Handshaking (0000 0000)	UUN		Handshaking (0000 0000)	000
Function Code     03h       Starting Address LSB     37h       Data Quantity     02h       Data 1 LSB     00h       Handshaking (0000 0000)     00h       Starting Address LSB     37h       The PROFIBUS-DP Option formats the command message and transmitities to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.     Starting Address LSB       PROFIBUS-DP Master Command     Wait for Response       Function Code     03h       Starting Address LSB     00h       Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.     Function Code       Starting Address LSB     00h       Bata 1 LSB     00h       Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.     Starting Address LSB       Data 1 LSB     00h       Handshaking (0000 0000)     00h       Handshaking (0000 0000)     00h       Bata 1 LSB     00h       Handshaking (0000 0000)     00h       Handshaking (0000 0000)     00h       Handshaking (0000 0000)     Bit 5 and 6 of	First Commande         Wait for Response         Function Code           Starting Address MSB         00h         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message         Function Code         Starting Address LSB         Image: Starting Address L					
Punction Code       0.5n         Starting Address MSB       00h         Starting Address LSB       37h         Data Quantity       02h         Data 1 LSB       00h         Handshaking (0000 0000)       00h         PROFIBUS-DP Master Command       Wait for Response handshake byte. As the response message may contain invalid data, ignore all response message data.       Data 1 LSB         PROFIBUS-DP Master Command       Wait for Response       Data 1 LSB         Function Code       03h       Function Code       Starting Address MSB         Starting Address LSB       37h       It's is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.       Starting Address LSB         Data 1 LSB       00h         Starting Address LSB       37h         Bata 1 LSB       00h         Starting Address LSB       37h         Bata 1 LSB       00h         Bata 1 LSB       00h         Bata 1 LSB       00h         Bata 1 LSB       00h         Handshaking (0000 0000)       00h         Handshaking (0000 0000)       00h         Handshaking (0000 0000)       00h <t< th=""><th>Function Code       0.5h         Starting Address MSB       00h         Starting Address LSB       37h         Data Quantity       02h         Data 1 MSB       00h         Handshaking (0000 000)       00h         Handshaking (0000 000)       00h         Handshaking (0000 000)       00h         Handshaking (0000 000)       00h         Function Code       03h         Starting Address MSB       00h         Handshaking (0000 000)       00h         Handshaking (0000 000)       00h         PROFIBUS-DP Master Command       Wait for Response         Function Code       03h         Starting Address MSB       00h         Data 1 MSB       00h         Data 1 MSB       00h         Data 1 ISB       00h         Handshaking (0000 000)       00h         Data 1 LSB       00h         Handshaking (0000 0000)       00h         PROFIBUS-DP Master Command       Process Response         Function Code       03h</th><th>DDOELDUS DD Mester Com</th><th>mand</th><th>Wait for Decourse</th><th>Drive Desponse</th><th></th></t<>	Function Code       0.5h         Starting Address MSB       00h         Starting Address LSB       37h         Data Quantity       02h         Data 1 MSB       00h         Handshaking (0000 000)       00h         Handshaking (0000 000)       00h         Handshaking (0000 000)       00h         Handshaking (0000 000)       00h         Function Code       03h         Starting Address MSB       00h         Handshaking (0000 000)       00h         Handshaking (0000 000)       00h         PROFIBUS-DP Master Command       Wait for Response         Function Code       03h         Starting Address MSB       00h         Data 1 MSB       00h         Data 1 MSB       00h         Data 1 ISB       00h         Handshaking (0000 000)       00h         Data 1 LSB       00h         Handshaking (0000 0000)       00h         PROFIBUS-DP Master Command       Process Response         Function Code       03h	DDOELDUS DD Mester Com	mand	Wait for Decourse	Drive Desponse	
Starting Address MSB       001         Starting Address LSB       37h         The PROFIBUS-DP Option formats the command message and transmit it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.       Starting Address LSB       Starting Address LSB         Data 1 MSB       00h         Handshaking (0000 0000)       00h       Wait for Response       Data 1 MSB         PROFIBUS-DP Master Command       Wait for Response       Drive Response         Function Code       03h         Starting Address MSB       00h         Starting Address MSB       00h         Starting Address LSB       37h         Data 1 MSB       00h         Starting Address MSB       00h         Starting Address LSB       37h         Data 1 LSB       00h         Starting Address MSB       00h         Starting Address MSB       00h         Data 1 LSB       00h         Data 1 LSB       00h         S	Starting Address MSB       000       Starting Address LSB       37h       The PROFIBUS-DP Option formats the command message and transmits       Starting Address LSB       Starting Address MSB	PROFIBUS-DP Master Com	mand	Wait for Response	Drive Response	
Starting Address LSB       37h       it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message       Starting Address LSB       Data Quantity         Data 1 MSB       00h       data.       Data 1 MSB       Data 1 MSB       Data 1 MSB         Data 1 LSB       00h       data.       The response message may contain invalid data, ignore all response message       Data 1 MSB       Data 1 MSB         PROFIBUS-DP Master Command       Wait for Response       Drive Response         Function Code       03h       Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.       Function Code       Starting Address LSB         Data 1 LSB       00h       data, ignore all response message data.       Function Code       Starting Address LSB         Data 1 LSB       00h       data, ignore all response message data.       Data 1 LSB       Data 1 LSB         PROFIBUS-DP Master Command       Process Response       Drive Response       Data 1 LSB         Data 1 LSB       00h       data, ignore all response message data.       Data 1 LSB       Data 1 LSB         PROFIBUS-DP Master Command       Process Response       Drive Response       Data 1 LSB       Data 1 LS	Starting Address LSB       37h       it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message       Starting Address LSB       Data Quantity         Data 1 LSB       00h       data.       Data 1 MSB       Data 1 MSB       Data 1 MSB       Data 1 MSB       Data 1 LSB       Data 1 MSB       Data 1 LSB       Data 2 Quantity       Data 2 Quantity       Data 2 Quantity       Data 1 LSB       D	PROFIBUS-DP Master Com Function Code	mand 03h	Wait for Response	Drive Response Function Code	
Data Quantity     Ozh otat     response message may contain invalid data, ignore all response message data.     Data Quantity     Data I MSB       Data 1 LSB     00h     00h     Data 1 LSB     Data 1 LSB     Data 1 LSB       PROFIBUS-DP Master Command     Wait for Response     Drive Response       Function Code     03h       Starting Address LSB     37h       Data 1 LSB     00h       Data 1 LSB     00h       Data 1 MSB     00h       Starting Address LSB     37h       Data 1 LSB     00h       Data 1 LSB     00h       Data 1 MSB     00h       Data 1 MSB     00h       Data 1 MSB     00h       Data 1 LSB     00h       Data 1 LSB     00h       Data 1 MSB     00h       Data 1 LSB     00h       Data 1 LSB     00h       Data 1 LSB     00h       Handshaking (0000 0000)     00h       PROFIBUS-DP Master Command     Process Response       Process Response     Drive Response       Function Code     03h       Starting Address LSB     37h       Bits 5 and 6 of the response byte handshake are both set when the processing has been completed and the response message contains validi       Function Code     03h       Starting Addre	Data Quantity       02h       response message may contain invalid data, ignore all response message       Data 1 MSB         Data 1 LSB       00h       Data 1 LSB       Data 1 LSB       Data 1 LSB       Data 1 LSB         Handshaking (0000 0000)       00h       Oh       PROFIBUS-DP Master Command       Wait for Response       Drive Response         Function Code       03h       Starting Address LSB       37h       Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message data.       Function Code       Starting Address LSB       Imadebaking (0000 0000)       40h         Data 1 LSB       00h       data, ignore all response message data.       Data 1 MSB       Data 1 MSB       Imadebaking (0100 0000)       40h         Data 1 LSB       00h       Oh       Process Response       Drive Response       Data 1 MSB       Imadebaking (0100 0000)       40h         Handshaking (0000 0000)       00h       Bits 5 and 6 of the response byte handshake are both set when the processing has been completed and the response message contains valid data.       Starting Address LSB       Imadebaking (0100 0000)       40h         Handshaking (0000 0000)       00h       Bits 5 and 6 of the response byte handshake are both set when the processing has been completed and the response message contains valid data.       Starting Address	PROFIBUS-DP Master Com Function Code Starting Address MSB	mand 03h 00h	Wait for Response	Drive Response Function Code Starting Address MSB	
Data 1 MSB     00h     data.     Data 1 LSB     00h       Handshaking (0000 0000)     00h     00h     Data 1 LSB     Data 1 LSB     Data 1 LSB       PROFIBUS-DP Master Command     Wait for Response       Function Code     03h       Starting Address MSB     00h       Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.     Starting Address LSB       Data 1 LSB     00h       Handshaking (0000 0000)     00h       Handshaking (0000 0000)     00h       PROFIBUS-DP Master Command     Process Response       PROFIBUS-DP Master Command     Process Response       Function Code     03h       Starting Address LSB     37h       Bits 5 and 6 of the response byte handshake are both set when the process MSB     00h       Starting Address LSB     37h       Function Code     03h       Starting Address LSB     37h       Function Code     03h       Starting Addres	Data 1 MSB       00n       data.       Data 1 LSB       Data 1 MSB       Data 1 LSB       Data 1 LSB <td< td=""><td>PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB</td><td>mand 03h 00h 37h</td><td>Wait for Response           The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the</td><td>Drive Response Function Code Starting Address MSB Starting Address LSB</td><td></td></td<>	PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB	mand 03h 00h 37h	Wait for Response           The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the	Drive Response Function Code Starting Address MSB Starting Address LSB	
Data 1 LSB       Ooh       Data 1 LSB       Data 1 LSB       Data 1 LSB         Handshaking (0000 0000)       00h       Handshaking (0010 0000)       20h         PROFIBUS-DP Master Command       Drive Response         Function Code       03h       Function Code       03h         Starting Address MSB       00h       Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.       Function Code       Starting Address LSB       Data 1 LSB	Data FLSB     Oon     Data FLSB     Data FLSB       Handshaking (0000 0000)     Oth     Handshaking (0010 0000)     20h       PROFIBUS-DP Master Command     Wait for Response     Drive Response       Function Code     03h     Starting Address MSB     00h       Starting Address MSB     00h     Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.     Starting Address LSB     Data Quantity       Data 1 LSB     00h     data, ignore all response byte handshake are both set when the mostage Contain Invalid data, ignore all response byte handshake are both set when the process Response     Drive Response       PROFIBUS-DP Master Command     Process Response     Drive Response       Prunction Code     03h     Starting Address LSB     Imade the response byte handshake are both set when the process Ing has been completed and the response message contains valid data.     Function Code     03h       Starting Address LSB     37h     Bits 5 and 6 of the response byte handshake are both set when the process Ing has been completed and the response message contains valid data.     Starting Address LSB     37h       Data 1 MSB     00h     data.     Starting Address LSB     37h       Data 1 MSB     00h     Starting Address LSB     15h       Data 1 MSB	PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity	mand 03h 00h 37h 02h	Wait for Response           The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message	Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity	
Handshaking (0000 0000)       Oth       Handshaking (0010 0000)       20h         PROFIBUS-DP Master Command       Wait for Response       Drive Response         Function Code       03h       Starting Address MSB       00h         Starting Address LSB       37h       Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.       Starting Address LSB       Image: Command Process Response         PROFIBUS-DP Master Command       Process Response       Data 1 MSB       Image: Command Process Response       Data 1 MSB       Image: Command Process Response       Data 1 MSB       Image: Command Process Response       Data 1 MSB       Image: Command Process Response       Data 1 MSB       Image: Command Process Response       Data 1 MSB       Image: Command Process Response       Data 1 LSB       Image: Command Process Response       Drive Response       Starting Address MSB       Image: Command Process Response       Function Code       03h       Starting Address MSB       Image: Command Process Response       Function Code       03h       Starting Address MSB       Image: Command Process Response       Function Code       03h       Starting Address MSB       Image: Command Process Response       Function Code       03h       Starting Address MSB       Image: Command Process Response	Handshaking (0000 0000)       On       Pandshaking (0010 0000)       Zun         PROFIBUS-DP Master Command       Wait for Response       Drive Response         Function Code       03h       Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.       Function Code       Starting Address LSB         Data 1 MSB       00h       data, ignore all response message data.       Data 1 MSB       Data 1 MSB       Data 1 MSB         PROFIBUS-DP Master Command       Process Response       Process Response       Drive Response         PROFIBUS-DP Master Command       Process Response       Drive Response         Function Code       03h       Starting Address MSB       00h         Starting Address LSB       37h       Bits 5 and 6 of the response byte handshake are both set when the processing has been completed and the response message contains valid data.       Function Code       03h         Starting Address LSB       37h       Bits 5 and 6 of the response byte handshake are both set when the processing has been completed and the response message contains valid data.       Starting Address LSB       00h         Starting Address LSB       00h       Starting Address LSB       00h       Starting Address LSB       15h         Data 1 MSB	PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB	mand 03h 00h 37h 02h 00h	Wait for Response           The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.	Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB	
PROFIBUS-DP Master Command       Wait for Response       Drive Response         Function Code       03h       Function Code       03h         Starting Address MSB       00h       Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.       Starting Address LSB       Starting Address LSB       Image: Command Comparison of Commanian Comparison of Commanian Comparison of Commanian Commani Commanian Commanian Commanian Commanian Commanian Commanian Comm	PROFIBUS-DP Master CommandWait for ResponseDrive ResponseFunction Code03hStarting Address MSB00hStarting Address LSB37hData Quantity02hData 1 MSB00hHandshaking (0000 0000)00hStarting Address LSB37hBit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.Data 1 LSB00hHandshaking (0000 0000)00hPROFIBUS-DP Master CommandProcess ResponseFunction Code03hStarting Address LSB37hBits 5 and 6 of the response byte handshake are both set when the processing has been completed and the response message contains valid data.Function Code03hStarting Address LSB37hData 1 LSB00hStarting Address LSB37hData 1 LSB00hStarting Address LSB37hData 1 LSB00hStarting Address LSB37hData 1 LSB00hAta 1 LSB00hData 1 LSB15h	PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB	mand 03h 00h 37h 02h 00h 00h	Wait for Response           The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.	Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB	201
PROFIBUS-DP Master Command         Wait for Response         Drive Response           Function Code         03h         Starting Address MSB         00h         Starting Address MSB         Starting Address MSB         Starting Address LSB         37h           Data Quantity         02h         processing the message. As the response message may contain invalid data, ignore all response message data.         Starting Address LSB         Data 1 MSB         Data 1 MSB         Data 1 LSB         Data 1 LSB <th>PROFIBUS-DP Master CommandWait for ResponseDrive ResponseFunction Code03hStarting Address MSB00hStarting Address LSB37hData Quantity02hData 1 MSB00hHandshaking (0000 0000)00hHandshaking (0000 0000)00hStarting Address LSB37hBit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.Data 1 LSB00hHandshaking (0000 0000)00hPROFIBUS-DP Master CommandProcess ResponseFunction Code03hStarting Address LSB37hBits 5 and 6 of the response byte handshake are both set when the processing has been completed and the response message contains valid data.Data 1 MSB00hData 1 MSB00hData 1 LSB00hData 1 LSB01hData 1 LSB01hData 1 LSB01hData 1 LSB01hData 1 LSB01hData 1 LSB</th> <th>PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (0000 0000)</th> <th>mand           03h           00h           37h           02h           00h           00h           00h</th> <th>Wait for Response           The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.</th> <th>Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (0010 0000)</th> <th>20h</th>	PROFIBUS-DP Master CommandWait for ResponseDrive ResponseFunction Code03hStarting Address MSB00hStarting Address LSB37hData Quantity02hData 1 MSB00hHandshaking (0000 0000)00hHandshaking (0000 0000)00hStarting Address LSB37hBit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.Data 1 LSB00hHandshaking (0000 0000)00hPROFIBUS-DP Master CommandProcess ResponseFunction Code03hStarting Address LSB37hBits 5 and 6 of the response byte handshake are both set when the processing has been completed and the response message contains valid data.Data 1 MSB00hData 1 MSB00hData 1 LSB00hData 1 LSB01hData 1 LSB01hData 1 LSB01hData 1 LSB01hData 1 LSB01hData 1 LSB	PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (0000 0000)	mand           03h           00h           37h           02h           00h           00h           00h	Wait for Response           The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.	Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (0010 0000)	20h
Function Code       0.5h         Starting Address MSB       00h         Starting Address LSB       37h         Data Quantity       02h         Data 1 MSB       00h         Data 1 LSB       00h         Handshaking (0000 0000)       00h         PROFIBUS-DP Master Command       Process Response         Process Response       Drive Response         Function Code       03h         Starting Address LSB       37h         Bits 5 and 6 of the response byte handshake are both set when the processing has been completed and the response message contains valid       Starting Address LSB         Part 1 LSB       00h         Handshaking (0000 0000)       00h	Function Code03nStarting Address MSB00hStarting Address LSB37hData Quantity02hData 1 MSB00hHandshaking (0000 0000)00hHandshaking (0000 0000)00hPROFIBUS-DP Master CommandProcess ng ha been response byte handshake are both set when the processing has been completed and the response message contains valid data.Function Code03hStarting Address LSB37hBits 5 and 6 of the response byte handshake are both set when the processing has been completed and the response message contains valid data.Data 1 MSB00hStarting Address LSB37hData 1 MSB00hStarting Address LSB37hData 1 MSB00hStarting Address LSB37hData 1 MSB00hData 1 LSB00hData 1 LSB00hData 1 LSB00hData 1 MSB00hData 1 MSB00hData 1 MSB00hData 1 LSB00hData 1 LSB00hData 1 LSB00hData 1 LSB00hData 1 LSB00hData 1 LSB00hData 1	PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (0000 0000)	mand 03h 00h 37h 02h 00h 00h 00h	Wait for Response           The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.	Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (0010 0000)	20h
Starting Address MSB       00h       Starting Address MSB       00h         Starting Address LSB       37h       Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.       Starting Address LSB       Starting Address LSB       Data Quantity       Data 1 MSB       Doth         Data 1 LSB       00h       Mandshaking (0000 0000)       00h       Data 1 LSB       Data 2 LSB       Da	Starting Address MSB00hStarting Address LSB37hData Quantity02hData Quantity02hData 1 MSB00hHandshaking (0000 0000)00hPROFIBUS-DP Master CommandProcess ResponseFunction Code03hStarting Address LSB37hBits 5 and 6 of the response byte handshake are both set when the processing has been completed and the response message contains valid data.Data 1 LSB00hHandshaking (0000 0000)00h	PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (0000 0000) PROFIBUS-DP Master Com	mand 03h 00h 37h 02h 00h 00h 00h 00h	Wait for Response           The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.           Wait for Response	Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (0010 0000) Drive Response	20h
Starting Address LSB       3/h       Bits 5 and 6 of the response byte handshake are both set when the drive has been version of the response message contains valid data.       Starting Address LSB       Starting Address LSB         Data Quantity       02h       message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.       Data Quantity       Data 1 MSB       Data 1 MSB       Data 1 MSB       Data 1 LSB       Data 2 LSB	Starting Address LSB3/hBits 5 and 6 of the response byte handshake are both set when the processing has been completed and the response message contains valid data.Starting Address LSBStarting Address LSBData Quantity02hData 1 LSB00hData 1 LSBData 1 LSBData 1 LSBPROFIBUS-DP Master CommandProcess ResponseDrive ResponseBits 5Function Code03hStarting Address LSB00hStarting Address LSB37hBits 5 and 6 of the response byte handshake are both set when the processing has been completed and the response message contains valid data.Function Code03hData 1 LSB00hBits 5 and 6 of the response byte handshake are both set when the processing has been completed and the response message contains valid data.Starting Address LSB37hData 1 LSB00hData 1 LSB00hStarting Address LSB37hData 1 LSB00hData 1 LSB00hData 1 LSB00hHandshaking (0000 0000)00h00hData 1 LSB00hData 1 LSB00hData 1 LSB00hData 1 LSB00hData 1 LSB00hData 1 LSB00hData 1 LSB15hHandshaking (0000 0000)00h00h60h	PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (0000 0000) PROFIBUS-DP Master Com Function Code	mand           03h           00h           37h           02h           00h	Wait for Response           The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.           Wait for Response	Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (0010 0000) Drive Response Function Code Starting Address MSB	20h
Data Quantity     02h     processing the message. As the response message may contain invalid data, ignore all response message data.     Data 1 MSB     Data 1 MSB       Data 1 LSB     00h     00h     Data 1 LSB     Data 1 LSB     Data 1 LSB       Handshaking (0000 0000)     00h     00h     Handshaking (0100 0000)     40h       Function Code     03h     Starting Address MSB     00h       Starting Address LSB     37h     Bits 5 and 6 of the response byte handshake are both set when the processing has been completed and the response message contains valid     Starting Address LSB     37h       Data Quantity     02h     processing has been completed and the response message contains valid     Data Quantity     02h	Data Quantity       02h       processing the message. As the response message may contain invalid data, ignore all response message data.       Data 1 MSB       Data 1 MSB       Data 1 MSB       Data 1 MSB       Data 1 LSB       Doth         Function Code       03h       Starting Address MSB       00h         Starting Address LSB       37h         Data 1 MSB       00h       Data 1 MSB       00h       Starting Address LSB       37h       Data 2 Quantity       02h       Data 1 MSB       00h	PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (0000 0000) PROFIBUS-DP Master Com Function Code Starting Address MSB	mand           03h           00h           37h           02h           00h           03h           00h           02h	Wait for Response         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.         Wait for Response         Bit 5 is reset and bit 6 set of the response handshake byte, when the	Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (0010 0000) Drive Response Function Code Starting Address MSB	20h
Data 1 MSB     00h     data, ignore all response message data.     Data 1 MSB     Data 1 MSB       Data 1 LSB     00h     Data 1 LSB     Data 1 LSB     Data 1 LSB       Handshaking (0000 0000)     00h     Handshaking (0100 0000)     40h       PROFIBUS-DP Master Command     Process Response       Function Code     03h       Starting Address MSB     00h       Starting Address LSB     37h       Bits 5 and 6 of the response byte handshake are both set when the Data Quantity     Data Quantity       02h     processing has been completed and the response message contains valid       Data Quantity     02h	Data 1 MSB       00h       data, ignore all response message data.       Data 1 MSB       Data 1 MSB         Data 1 LSB       00h       00h       Data 1 LSB       Data 1 MSB       00h       Starting Address LSB       37h       Start of 6 of the response byte handshake are both set when the processing has been completed and the response message contains valid data.       Starting Address LSB       37h         Data 1 LSB       00h       Data 1 LSB       00h       Data 1 LSB       00h       Data 1 LSB       00h         Handshaking (0000 0000)       00h       00h       00h       Data 1 LSB       00h       00h	PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (0000 0000) PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB	mand           03h           00h           37h           02h           00h           37h	Wait for Response         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.         Wait for Response         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun	Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (0010 0000)  Drive Response Function Code Starting Address MSB Starting Address LSB	20h
Data 1 LSB     00h       Handshaking (0000 0000)     00h       PROFIBUS-DP Master Command     Process Response       Function Code     03h       Starting Address MSB     00h       Starting Address LSB     37h       Bits 5 and 6 of the response byte handshake are both set when the Data Quantity     Starting Address LSB       Other Data Quantity     02h       Processing has been completed and the response message contains valid     Data Quantity       Other Data Quantity     02h	Data 1 LSB       00h       Data 1 LSB       Data 1 LSB         Handshaking (0000 0000)       00h       Handshaking (0100 0000)       40h         PROFIBUS-DP Master Command       Process Response       Drive Response         Function Code       03h       Function Code       03h         Starting Address MSB       00h       Bits 5 and 6 of the response byte handshake are both set when the processing has been completed and the response message contains valid data.       Function Code       03h         Data 1 MSB       00h       Data 1 LSB       00h       Data 1 LSB       00h         Handshaking (0000 0000)       00h       00h       Data 1 LSB       15h	PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (0000 0000) PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Prove LSB	mand           03h           00h           37h           02h           00h           03h           00h           37h           02h           02h	Wait for Response         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.         Wait for Response         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid	Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (0010 0000)  Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity	20h
Handshaking (0000 0000)     00h     Handshaking (0100 0000)     40h       PROFIBUS-DP Master Command     Process Response     Drive Response       Function Code     03h     5tarting Address MSB     00h       Starting Address LSB     37h     Bits 5 and 6 of the response byte handshake are both set when the processing has been completed and the response message contains valid     Starting Address LSB     37h       Data Quantity     02h     data     Data Quantity     02h	Handshaking (0000 0000)       00h       Handshaking (0100 0000)       40h         Handshaking (0100 0000)       00h       40h         PROFIBUS-DP Master Command       Process Response       Drive Response         Function Code       03h       5tarting Address MSB       00h         Starting Address LSB       37h       Bits 5 and 6 of the response byte handshake are both set when the processing has been completed and the response message contains valid data.       Starting Address LSB       37h         Data 1 MSB       00h       Data 1 LSB       00h       Data 1 LSB       00h         Handshaking (0000 0000)       00h       00h       Data 1 LSB       15h	PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (0000 0000) PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB	mand           03h           00h           37h           02h           00h           03h           00h           37h           02h           02h           02h	Wait for Response         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.         Wait for Response         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.	Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (0010 0000)  Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Tere to referee	20h
PROFIBUS-DP Master Commund         Process Response         Drive Response           Function Code         03h         Function Code         03h           Starting Address MSB         00h         Starting Address MSB         00h           Starting Address LSB         37h         Bits 5 and 6 of the response byte handshake are both set when the processing has been completed and the response message contains valid         Starting Address LSB         37h           Data Quantity         02h         processing has been completed and the response message contains valid         Data Quantity         02h	PROFIBUS-DP Master Command       Process Response       Drive Response         Function Code       03h       5	PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (0000 0000) PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB	mand           03h           00h           37h           02h           00h           03h           00h           37h           02h           00h           02h           00h	Wait for Response         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.         Wait for Response         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.	Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (0010 0000)  Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB	20h
PROFIBUS-DP Master Command         Process Response         Drive Response           Function Code         03h         Starting Address MSB         00h           Starting Address LSB         37h         Bits 5 and 6 of the response byte handshake are both set when the processing has been completed and the response message contains valid         Starting Address LSB         37h           Data Quantity         02h         processing has been completed and the response message contains valid         Data Quantity         02h	PROFIBUS-DP Master CommandProcess ResponseDrive ResponseFunction Code03hStarting Address MSB00hStarting Address LSB37hData Quantity02hData 1 MSB00hData 1 LSB00hHandshaking (0000 0000)00h	PROFIBUS-DP Master Com         Function Code         Starting Address MSB         Starting Address LSB         Data Quantity         Data 1 MSB         Data 1 LSB         Handshaking (0000 0000)         PROFIBUS-DP Master Com         Function Code         Starting Address MSB         Starting Address MSB         Starting Address LSB         Data Quantity         Data 1 MSB         Data 1 MSB         Data 1 LSB         Handshaking (0000 0000)	mand           03h           00h           37h           02h           00h	Wait for Response         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.         Wait for Response         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.	Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (0010 0000)  Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (0100 0000)	20h
Function Code       03h         Starting Address MSB       00h         Starting Address LSB       37h         Bits 5 and 6 of the response byte handshake are both set when the processing has been completed and the response message contains valid       Starting Address LSB       37h         Data Quantity       02h       processing has been completed and the response message contains valid       Data Quantity       02h	Function Code03hStarting Address MSB00hStarting Address LSB37hData Quantity02hData 1 MSB00hData 1 LSB00hHandsbaking (0000 0000)00h	PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (0000 0000) PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (0000 0000) 	mand           03h           00h           37h           02h           00h           03h           00h           37h           02h           00h           00h           00h           00h	Wait for Response         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.         Wait for Response         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.	Drive ResponseFunction CodeStarting Address MSBStarting Address LSBData QuantityData 1 MSBData 1 LSBHandshaking (0010 0000)Drive ResponseFunction CodeStarting Address MSBStarting Address LSBData QuantityData QuantityData 1 MSBData 1 MSBData 1 MSBData 1 LSBHandshaking (0100 0000)	20h
Starting Address MSB     00h     Starting Address MSB     00h       Starting Address LSB     37h     Bits 5 and 6 of the response byte handshake are both set when the processing has been completed and the response message contains valid     Starting Address LSB     37h       Data Quantity     02h     processing has been completed and the response message contains valid     Data Quantity     02h	Starting Address MSB00hStarting Address MSB00hStarting Address LSB37hBits 5 and 6 of the response byte handshake are both set when the processing has been completed and the response message contains validStarting Address LSB37hData 1 MSB00hData 1 LSB00hData 1 LSB00hHandsbaking (0000 0000)00h00h5h	PROFIBUS-DP Master Com         Function Code         Starting Address MSB         Starting Address LSB         Data Quantity         Data 1 MSB         Data 1 LSB         Handshaking (0000 0000)         PROFIBUS-DP Master Com         Function Code         Starting Address MSB         Starting Address MSB         Starting Address LSB         Data 1 MSB         Data 1 MSB         Data 1 LSB         Handshaking (0000 0000)	mand           03h           00h           37h           02h           00h	Wait for Response         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.         Wait for Response         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.         Process Response	Drive Response         Function Code         Starting Address MSB         Starting Address LSB         Data Quantity         Data 1 MSB         Data 1 LSB         Handshaking (0010 0000)         Prive Response         Function Code         Starting Address MSB         Starting Address MSB         Starting Address MSB         Data Quantity         Data Quantity         Data 1 MSB         Data Quantity         Data 1 MSB         Data 1 LSB         Handshaking (0100 0000)	20h
Starting Address LSB       37h       Bits 5 and 6 of the response byte handshake are both set when the processing has been completed and the response message contains valid       Starting Address LSB       37h         Data Quantity       02h       processing has been completed and the response message contains valid       Data Quantity       02h	Starting Address LSB     37h     Bits 5 and 6 of the response byte handshake are both set when the processing has been completed and the response message contains valid     Starting Address LSB     37h       Data Quantity     02h     Data 1 MSB     00h     Data 1 LSB     00h       Handshaking (0000 0000)     00h     00h     15h	PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (0000 0000) PROFIBUS-DP Master Com Function Code Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (0000 0000) PROFIBUS-DP Master Com Function Code	mand           03h           00h           37h           02h           00h	Wait for Response         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.         Wait for Response         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.         Process Response	Drive Response         Function Code         Starting Address MSB         Starting Address LSB         Data Quantity         Data 1 MSB         Data 1 LSB         Handshaking (0010 0000) <b>Drive Response</b> Function Code         Starting Address MSB         Starting Address LSB         Data 1 MSB         Data Quantity         Data Quantity         Data 1 MSB         Data 1 MSB         Data 1 LSB         Handshaking (0100 0000)	20h
Data Quantity         02h         processing has been completed and the response message contains valid         Data Quantity         02h           Data Quantity         data	Data Quantity     02h     processing has been completed and the response message contains valid     Data Quantity     02h       Data 1 MSB     00h       Data 1 LSB     00h       Handsbaking (0000 0000)     00h	PROFIBUS-DP Master Com         Function Code         Starting Address MSB         Starting Address LSB         Data Quantity         Data 1 MSB         Data 1 LSB         Handshaking (0000 0000)         PROFIBUS-DP Master Com         Function Code         Starting Address MSB         Starting Address LSB         Data 1 MSB         Data 1 MSB         Data 2 Quantity         Data 1 MSB         Data 1 LSB         Handshaking (0000 0000)         PROFIBUS-DP Master Com         Function Code         Starting Address MSB         Starting Address MSB	mand           03h           00h           37h           02h           00h	Wait for Response         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.         Wait for Response         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.         Process Response	Drive ResponseFunction CodeStarting Address MSBStarting Address LSBData QuantityData 1 MSBData 1 LSBHandshaking (0010 0000)Drive ResponseFunction CodeStarting Address MSBStarting Address LSBData 1 MSBData 1 MSBData 1 MSBData 1 MSBData 1 MSBData 1 Colspan="2">Data 1 MSBData 1 MSBData 1 MSBData 1 MSBData 1 MSBMandshaking (0100 0000)CodeStarting Address MSB	20h 20h 40h
	Data 1 MSB     00h       Data 1 LSB     00h       Handsbaking (0000 0000)     00h	PROFIBUS-DP Master Com         Function Code         Starting Address MSB         Starting Address LSB         Data Quantity         Data 1 MSB         Data 1 LSB         Handshaking (0000 0000)         PROFIBUS-DP Master Com         Function Code         Starting Address MSB         Starting Address LSB         Data 1 MSB         Data 2 Quantity         Data 1 MSB         Data 1 LSB         Handshaking (0000 0000)         PROFIBUS-DP Master Com         Function Code         Starting Address LSB         Data 1 LSB         Handshaking (0000 0000)         PROFIBUS-DP Master Com         Function Code         Starting Address MSB         Starting Address LSB	mand           03h           00h           37h           02h           00h	Wait for Response         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.         Wait for Response         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.         Process Response         Bits 5 and 6 of the response byte handshake are both set when the	Drive ResponseFunction CodeStarting Address MSBStarting Address LSBData QuantityData 1 MSBData 1 LSBHandshaking (0010 0000)Drive ResponseFunction CodeStarting Address MSBStarting Address LSBData 1 LSBData QuantityData 1 MSBData 1 LSBHandshaking (0100 0000)Pinet CodeStarting Address LSBData 1 LSBHandshaking (0100 0000)Function CodeStarting Address MSBStarting Address MSBStarting Address LSB	20h 20h 40h
Data 1 MSB 00h Out	Data 1 LSB     00h       Handsbaking (0000 0000)     00b	PROFIBUS-DP Master Com         Function Code         Starting Address MSB         Starting Address LSB         Data Quantity         Data 1 MSB         Data 1 LSB         Handshaking (0000 0000)         PROFIBUS-DP Master Com         Function Code         Starting Address MSB         Starting Address LSB         Data 1 LSB         Handshaking (0000 0000)         PROFIBUS-DP Master Com         Function Code         Starting Address LSB         Data 1 LSB         Handshaking (0000 0000)         PROFIBUS-DP Master Com         Function Code         Starting Address MSB         Starting Address MSB         Starting Address LSB         Data Quantity	mand           03h           00h           37h           02h           00h           01h           02h	Wait for Response         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.         Wait for Response         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.         Process Response         Bits 5 and 6 of the response byte handshake are both set when the processing has been completed and the response message contains valid data.	Drive ResponseFunction CodeStarting Address MSBStarting Address LSBData QuantityData 1 MSBData 1 LSBHandshaking (0010 0000)Drive ResponseFunction CodeStarting Address MSBStarting Address LSBData 1 LSBData 2 QuantityData 2 Mdress LSBData 1 LSBHandshaking (0100 0000)Drive ResponseFunction CodeStarting Address LSBData 1 LSBHandshaking (0100 0000)Colspan="2">Drive ResponseFunction CodeStarting Address MSBStarting Address LSBData QuantityData QuantityData QuantityData QuantityData QuantityData QuantityData QuantityData Quantity	20h 20h 40h 03h 02h
Data 1 LSB 00h Data 1 LSB 15h	Handshaking (0000, 000) 100b 60b	PROFIBUS-DP Master Com         Function Code         Starting Address MSB         Starting Address LSB         Data Quantity         Data 1 MSB         Data 1 LSB         Handshaking (0000 0000)         PROFIBUS-DP Master Com         Function Code         Starting Address MSB         Starting Address LSB         Data 1 MSB         Data Quantity         Data 1 MSB         Data 1 LSB         Handshaking (0000 0000)         PROFIBUS-DP Master Com         Function Code         Starting Address LSB         Data 1 LSB         Handshaking (0000 0000)         PROFIBUS-DP Master Com         Function Code         Starting Address MSB         Starting Address LSB         Data Quantity         Data Quantity         Data Address MSB         Starting Address LSB         Data Quantity         Data 1 MSB	mand           03h           00h           37h           02h           00h	Wait for Response         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.         Wait for Response         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.         Process Response         Bits 5 and 6 of the response byte handshake are both set when the processing has been completed and the response message contains valid data.	Drive ResponseFunction CodeStarting Address MSBStarting Address LSBData QuantityData 1 MSBData 1 LSBHandshaking (0010 0000)Prive ResponseFunction CodeStarting Address MSBStarting Address LSBData 1 LSBData QuantityData 2 QuantityData 1 MSBData 1 LSBHandshaking (0100 0000)Prive ResponseFunction CodeStarting Address LSBData 1 LSBHandshaking (0100 0000)Prive ResponseFunction CodeStarting Address MSBStarting Address MSBData QuantityData QuantityData QuantityData 1 MSBData 1 MSB	20h 20h 20h 40h 37h 02h 00h
	manusnaking (0000 000) 001 100000 001	PROFIBUS-DP Master Com         Function Code         Starting Address MSB         Starting Address LSB         Data Quantity         Data 1 MSB         Data 1 LSB         Handshaking (0000 0000)         PROFIBUS-DP Master Com         Function Code         Starting Address MSB         Starting Address MSB         Starting Address LSB         Data Quantity         Data 1 MSB         Data 1 MSB         Data 2 Quantity         Data 1 LSB         Handshaking (0000 0000)         PROFIBUS-DP Master Com         Function Code         Starting Address MSB         Starting Address MSB         Starting Address LSB         Data 1 LSB         Pata Quantity         Data Quantity         Data Quantity         Data Quantity         Data Quantity         Data I MSB         Data 1 MSB         Data 1 MSB         Data 1 LSB         Data 1 LSB	mand           03h           00h           37h           02h           00h           00h	Wait for Response         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.         Wait for Response         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.         Bits 5 and 6 of the response byte handshake are both set when the processing has been completed and the response message contains valid data.	Drive ResponseFunction CodeStarting Address MSBStarting Address LSBData QuantityData 1 MSBData 1 LSBHandshaking (0010 0000)Drive ResponseFunction CodeStarting Address MSBStarting Address LSBData 1 MSBData 1 MSBData 1 MSBData 1 MSBData 1 LSBHandshaking (0100 0000)Prive ResponseFunction CodeStarting Address MSBStarting Address MSBData 1 MSBData 2 QuantityData 2 CodeStarting Address MSBStarting Address LSBData QuantityData 1 MSBData 1 LSB	20h 20h 20h 40h 37h 02h 00h 15h

### **Read Drive Data Error Example**

Table C.3 – Read Drive Data Error Example				
PROFIBUS-DP Master Com	mand	Initialize Data Structures	Drive Response	
Function Code	00h		Function Code	03h
Starting Address MSB	00h		Starting Address MSB	01h
Starting Address LSB	00h		Starting Address LSB	00h
Data Quantity	00h	Set the command message handshake byte $\mathbf{HS}$ bit to the same state as the esponse message handshake $\mathbf{HS}$ bit.	Data Quantity	02h
Data 1 MSB	00h		Data 1 MSB	00h
Data 1 LSB	00h		Data 1 LSB	00h
Handshaking (0000 0000)	00h		Handshaking (0110 0000)	60h
			•	
PROFIBUS-DP Master Com	mand	Set PROFIBUS-DP Master Command Message	Drive Response	
Function Code	03h		Function Code	03h
Starting Address MSB	10h	Set the Function Code, Starting Address, and Data Quantity. This	Starting Address MSB	01h
Starting Address LSB	00h	example configures the command message to retrieve data from drive	Starting Address LSB	00h
Data Quantity	02h	register at address 0037h, Output Power. For detailed information of	Data Quantity	02h
Data 1 MSB	00h	<i>Technical Manual</i> For the nurposes of this example an invalid Starting	Data 1 MSB	00h
Data 1 LSB	00h	Address was entered.	Data 1 LSB	00h
Handshaking (0000 0000)	00h		Handshaking (0110 0000)	60h
PROFIBUS-DP Master Com	mand	Toggle the PROFIBUS-DP Master Handshake Bit	Drive Response	
Function Code	03h		Function Code	
Starting Address MSB	10h	After the data bits have been set, toggle the <b>HS</b> bit, bit 7, of the command	Starting Address MSB	
Starting Address LSB	00h	Parameter Access command. On receipt of the command message the	Starting Address LSB	
Data Quantity	02h	<b>HS</b> bit, bit 7, of the response message handshake byte is set to the same	Data Ouantity	
Data 1 MSB	00h	state as the <b>HS</b> bit of the command message handshake byte. As the	Data 1 MSB	
Data 1 LSB	00h	response message may contain invalid data, ignore all response message	Data 1 LSB	
Handshaking (1000 0000)	80h		Handshaking (1000 0000)	80h
5( )			5( )	
PROFIBUS-DP Master Com	mand	Wait for Response	Drive Response	
Function Code	03h	L L L L L L L L L L L L L L L L L L L	Function Code	
Starting Address MSB	10h		Starting Address MSB	
Starting Address LSB	00h	The PROFIBUS-DP Option formats the command message and transmits	Starting Address LSB	
Data Quantity	02h	it to the drive, setting bit 5 of the response handshake byte. As the	Data Ouantity	
Data 1 MSB	00h	data data	Data 1 MSB	
Data 1 LSB	00h		Data 1 LSB	
Handshaking (1000 0000)	80h		Handshaking (1010 0000)	A0h
PROFIBUS-DP Master Com	mand	Wait for Response	Drive Response	
Function Code	03h		Function Code	
Starting Address MSB	10h		Starting Address MSB	
Starting Address LSB	00h	Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.	Starting Address LSB	
Data Quantity	02h		Data Quantity	
Data 1 MSB	00h		Data 1 MSB	
Data 1 LSB	00h		Data 1 LSB	
Handshaking (1000 0000)	80h		Handshaking (1100 0000)	C0h
		1		
PROFIBUS-DP Master Com	mand	Process Response	Drive Response	
Function Code	03h	Trocess Response	Function Code	83h
Starting Address MSR	10h		Starting Address MSR	0.0h
Starting Address I SR	00h	Bits 5 and 6 of the response handshake byte are both set when the	Starting Address I SR	00h
	1 0 0 11	T DECESSING HAS DEED COMPLETED AND THE LESDONSE MESSAGE CONTAINS VAND		0.011

data. The MSB of the function code signifies an error response and Data

1 LSB contains the error code. Refer to Parameter Access Error

Messages section of Chapter 3

Data Quantity

Data 1 MSB

Data 1 LSB

Handshaking (1110 0000)

02h

00h

02h

E0h

Data Quantity

Data 1 MSB

Data 1 LSB

Handshaking (1000 0000)

02h

00h

00h

80h

## Write Drive Data Example

Table C.4 – Write Drive Data Example				
PROFIBUS-DP Master Com	mand	Initialize Data Structures	Drive Response	
Function Code	00h		Function Code	03h
Starting Address MSB	00h		Starting Address MSB	01h
Starting Address LSB	00h	Set the command message handshake byte <b>HS</b> bit to the same state as the	Starting Address LSB	00h
Data Quantity	00h		Data Quantity	02h
Data 1 MSB	00h	response message nandsnake mis on.	Data 1 MSB	00h
Data 1 LSB	00h		Data 1 LSB	00h
Handshaking (1000 0000)	00h		Handshaking (0110 0000)	60h
PROFIBUS-DP Master Com	mand	Set PROFIBUS-DP Master Command Message	Drive Response	
Function Code	10h		Function Code	03h
Starting Address MSB	01h	Set the Function Code Starting Address and Data Quantity. This	Starting Address MSB	01h
Starting Address LSB	05h	example configures the command message to retrieve data from drive	Starting Address LSB	00h
Data Quantity	02h	register at address 0037h, Output Power. For detailed information of	Data Quantity	02h
Data 1 MSB	00h	drive registers refer to the <i>Technical Manual</i> and the <i>MODBUS</i> ®	Data 1 MSB	00h
Data 1 LSB	01h	Technical Manual.	Data 1 LSB	00h
Handshaking (0000 0000)	00h		Handshaking (0000 0000)	00h
PROFIBUS-DP Master Com	mand	Toggle the PROFIBUS-DP Master Handshake Bit	Drive Response	
Function Code	10h		Function Code	
Starting Address MSB	01h	After the data bits have been set, toggle the HS bit, bit /, of the command handshake byte to signal the drive that the command message contains a	Starting Address MSB	
Starting Address LSB	05h	Parameter Access command. On receipt of the command message contains a	Starting Address LSB	
Data Quantity	02h	HS bit, bit 7, of the response message handshake byte is set to the same	Data Quantity	
Data 1 MSB	00h	state as the <b>HS</b> bit of the command message handshake byte. As the	Data 1 MSB	
Data 1 LSB	01h	response message may contain invalid data, ignore all response message	Data 1 LSB	
Handshaking (1000 0000)	80h	uuu.	Handshaking (1000 0000)	80h
PROFIBUS-DP Master Com	mand	Wait for Response	Drive Response	
<b>PROFIBUS-DP Master Com</b> Function Code	mand 10h	Wait for Response	Drive Response Function Code	
PROFIBUS-DP Master Com Function Code Starting Address MSB	<b>mand</b> 10h 01h	Wait for Response	Drive Response Function Code Starting Address MSB	
PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB	mand 10h 01h 05h	Wait for Response           The PROFIBUS-DP Option formats the command message and transmits           it to the drive, setting bit 5 of the response handsheld bute. As the	Drive Response Function Code Starting Address MSB Starting Address LSB	
PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity	mand 10h 01h 05h 02h	Wait for Response           The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message	Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity	
PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB	mand 10h 01h 05h 02h 00h	Wait for Response The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.	Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB	
PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB	mand 10h 01h 05h 02h 00h 01h	Wait for Response           The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.	Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB	
PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1000 0000)	mand 10h 01h 05h 02h 00h 01h 80h	Wait for Response           The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.	Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1010 0000)	A0h
PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1000 0000)	mand 10h 01h 05h 02h 00h 01h 80h	Wait for Response           The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.	Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1010 0000)	A0h
PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1000 0000) PROFIBUS-DP Master Com	mand 10h 01h 05h 02h 00h 01h 80h mand	Wait for Response           The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.           Wait for Response	Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1010 0000) Drive Response	A0h
PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1000 0000) PROFIBUS-DP Master Com Function Code	mand 10h 01h 05h 02h 00h 01h 80h mand 10h	Wait for Response           The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.           Wait for Response	Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1010 0000) Drive Response Function Code	A0h
PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1000 0000) PROFIBUS-DP Master Com Function Code Starting Address MSB	mand           10h           01h           05h           02h           00h           01h           80h           mand           10h           01h	Wait for Response         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.         Wait for Response         Did5.in the dbit (or the fit or the black byte or the black byt	Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1010 0000) Drive Response Function Code Starting Address MSB	A0h
PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1000 0000) PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB	mand           10h           01h           05h           02h           00h           01h           80h             10h           01h           00h           01h           00h	Wait for Response         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.         Wait for Response         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has been	Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1010 0000) Drive Response Function Code Starting Address MSB Starting Address LSB	A0h
PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1000 0000) PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity	mand           10h           01h           05h           02h           00h           01h           80h   mand           10h           01h           80h	Wait for Response         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.         Wait for Response         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid	Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1010 0000) Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity	A0h
PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1000 0000) PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB	mand 10h 01h 02h 02h 00h 01h 80h mand 10h 01h 05h 02h 02h 02h	Wait for Response         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.         Wait for Response         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.	Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1010 0000) Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB	A0h
PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1000 0000) PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB	mand           10h           01h           05h           02h           00h           01h           80h           mand           10h           01h           00h           01h           80h           01h           02h           01h	Wait for Response         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.         Wait for Response         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.	Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1010 0000) Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 MSB Data 1 LSB	A0h
PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1000 0000) PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1000 0000)	mand           10h           01h           05h           02h           00h           01h           80h             mand           10h           01h           80h             02h           00h           01h           80h	Wait for Response         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.         Wait for Response         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.	Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1010 0000) Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1100 0000)	A0h
PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1000 0000) PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1000 0000) L	mand           10h           01h           05h           02h           00h           01h           80h             10h           01h           00h           01h           00h           01h           00h           01h           02h           02h           02h           02h           02h           02h           01h           80h	Wait for Response         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.         Wait for Response         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.	Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1010 0000) Drive Response Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1100 0000)	A0h
PROFIBUS-DP Master Com         Function Code         Starting Address MSB         Starting Address LSB         Data Quantity         Data 1 MSB         Data 1 LSB         Handshaking (1000 0000)         PROFIBUS-DP Master Com         Function Code         Starting Address MSB         Starting Address MSB         Starting Address LSB         Data Quantity         Data 1 MSB         Data 1 MSB         Data 1 MSB         Data 1 LSB         Handshaking (1000 0000)	mand         10h         01h         05h         02h         00h         01h         80h	Wait for Response         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.         Wait for Response         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.         Process Response	Drive Response         Function Code         Starting Address MSB         Starting Address LSB         Data Quantity         Data 1 MSB         Data 1 LSB         Handshaking (1010 0000)         Drive Response         Function Code         Starting Address MSB         Starting Address MSB         Starting Address MSB         Data Quantity         Data Quantity         Data 1 MSB         Data 1 LSB         Handshaking (1100 0000)	A0h
PROFIBUS-DP Master Com         Function Code         Starting Address MSB         Starting Address LSB         Data Quantity         Data 1 MSB         Data 1 LSB         Handshaking (1000 0000)         PROFIBUS-DP Master Com         Function Code         Starting Address LSB         Data Quantity         Data Address MSB         Starting Address LSB         Data Quantity         Data 1 MSB         Data 1 MSB         Data 1 LSB         Handshaking (1000 0000)         PROFIBUS-DP Master Com         Function Code         Function Code	mand           10h           01h           05h           02h           00h           01h           80h             mand           10h           05h           02h           01h           80h           02h           01h           05h           02h           00h           01h           80h           01h           80h           mand           10h	Wait for Response         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.         Wait for Response         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.         Process Response	Drive Response         Function Code         Starting Address MSB         Starting Address LSB         Data Quantity         Data 1 MSB         Data 1 LSB         Handshaking (1010 0000)         Drive Response         Function Code         Starting Address MSB         Starting Address LSB         Data Quantity         Data Quantity         Data Quantity         Data 1 MSB         Data 1 MSB         Data 1 LSB         Handshaking (1100 0000)	A0h C0h
PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1000 0000) PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data 1 LSB Data 1 LSB Handshaking (1000 0000) PROFIBUS-DP Master Com Function Code Starting Address MSB	mand           10h           01h           02h           00h           01h           80h             mand           10h           01h           00h           01h           80h           02h           00h           01h           05h           02h           00h           01h           80h           01h           80h           01h           01h           01h           01h           01h	Wait for Response         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.         Wait for Response         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.         Process Response	Drive Response         Function Code         Starting Address MSB         Starting Address LSB         Data Quantity         Data 1 MSB         Data 1 LSB         Handshaking (1010 0000)         Drive Response         Function Code         Starting Address MSB         Starting Address LSB         Data Quantity         Data Quantity         Data Quantity         Data 1 MSB         Data 1 MSB         Data 1 LSB         Handshaking (1100 0000)         Drive Response         Function Code         Starting Address MSB         Starting Address MSB	A0h A0h C0h
PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1000 0000) PROFIBUS-DP Master Com Function Code Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1000 0000) PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address MSB Handshaking (1000 0000)	mand           10h           01h           02h           02h           00h           01h           80h           mand           10h           01h           80h           01h           01h           01h           01h           01h           02h           01h           02h           01h           02h           01h           01h	Wait for Response         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.         Wait for Response         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.         Process Response         Bits 5 and 6 of the response handshake byte are both set when the	Drive ResponseFunction CodeStarting Address MSBStarting Address LSBData QuantityData 1 MSBData 1 LSBHandshaking (1010 0000)Drive ResponseFunction CodeStarting Address MSBStarting Address LSBData 1 MSBData 2 QuantityData 1 MSBData 1 MSBData 1 LSBHandshaking (1100 0000)Prive ResponseFunction CodeStarting Address LSBData 1 LSBHandshaking (1100 0000)Prive ResponseFunction CodeStarting Address MSBStarting Address LSB	A0h A0h C0h
PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1000 0000) PROFIBUS-DP Master Com Function Code Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1000 0000) PROFIBUS-DP Master Com Function Code Starting Address LSB Data 1 LSB Handshaking (1000 0000) PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB	mand           10h           01h           02h           02h           00h           01h           80h           mand           10h           01h           80h           02h           00h           01h           80h           02h           00h           01h           02h           00h           01h           02h           00h           01h           02h           02h           02h           02h           02h           02h           02h           02h           02h	Wait for Response         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.         Wait for Response         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.         Process Response         Bits 5 and 6 of the response handshake byte are both set when the processing has been completed and the response message contains valid data.	Drive Response         Function Code         Starting Address MSB         Starting Address LSB         Data Quantity         Data 1 MSB         Data 1 LSB         Handshaking (1010 0000)         Drive Response         Function Code         Starting Address LSB         Data Quantity         Data Quantity         Data Quantity         Data 1 MSB         Data Quantity         Data 1 MSB         Data 1 LSB         Handshaking (1100 0000)         Prive Response         Function Code         Starting Address MSB         Starting Address MSB         Data 1 LSB         Handshaking (1100 0000)         Drive Response         Function Code         Starting Address MSB         Starting Address MSB         Starting Address MSB         Data Quantity	A0h A0h C0h C0h
PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1000 0000) PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 LSB Handshaking (1000 0000) PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address MSB Starting Address MSB Starting Address MSB Starting Address MSB Starting Address LSB Data Quantity Data I MSB Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB	mand           10h           01h           02h           00h           01h           80h             mand           10h           01h           80h   mand           10h           02h           00h           01h           80h   mand           10h           01h           80h   mand           10h           01h           05h           02h           00h	Wait for Response         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.         Wait for Response         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.         Process Response         Bits 5 and 6 of the response handshake byte are both set when the processing has been completed and the response message contains valid data.	Drive Response         Function Code         Starting Address MSB         Starting Address LSB         Data Quantity         Data 1 MSB         Data 1 LSB         Handshaking (1010 0000)         Drive Response         Function Code         Starting Address MSB         Starting Address LSB         Data Quantity         Data 1 MSB         Data Quantity         Data 1 LSB         Handshaking (1100 0000)         Prive Response         Function Code         Starting Address MSB         Data 1 LSB         Handshaking (1100 0000)         Prive Response         Function Code         Starting Address MSB         Starting Address MSB         Starting Address LSB         Data Quantity         Data Quantity         Data Quantity         Data Quantity         Data 1 MSB         Data 1 MSB	A0h
PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1000 0000) PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 LSB Handshaking (1000 0000) PROFIBUS-DP Master Com Function Code Starting Address MSB Starting Address LSB Data Quantity Data 1 MSB Data 1 MSB Data 1 LSB	mand           10h           01h           05h           02h           00h           01h           80h           mand           10h           01h           80h           mand           10h           01h           02h           00h           01h           05h           02h           00h           01h           80h           mand           10h           01h           05h           02h           02h           02h           02h           02h	Wait for Response         The PROFIBUS-DP Option formats the command message and transmits it to the drive, setting bit 5 of the response handshake byte. As the response message may contain invalid data, ignore all response message data.         Wait for Response         Wait for Response         Bit 5 is reset and bit 6 set of the response handshake byte when the message has been received by the drive and that the drive has begun processing the message. As the response message may contain invalid data, ignore all response message data.         Process Response         Bits 5 and 6 of the response handshake byte are both set when the processing has been completed and the response message contains valid data.	Drive Response         Function Code         Starting Address MSB         Starting Address LSB         Data Quantity         Data 1 MSB         Data 1 LSB         Handshaking (1010 0000)         Drive Response         Function Code         Starting Address MSB         Starting Address LSB         Data Quantity         Data 1 LSB         Data Quantity         Data 1 LSB         Handshaking (1100 0000)         Starting Address LSB         Data 1 LSB         Handshaking (1100 0000)         Data Quantity         Data 1 LSB         Function Code         Starting Address MSB         Starting Address LSB         Data Quantity         Data Quantity         Data Quantity         Data I LSB         Data 1 MSB         Data 1 MSB         Data 1 LSB	A0h A0h A0h C0h 10h 01h 05h 02h 00h 00h

## Write Drive Data Error Example

PROF IBUS-DP Master Command         Initialize Data Structures         Drive Response           Starting Address NSB         00h           Starting Address NSB         00h           Data Quantity         00h           Data Quantity         00h           Data ILSB         00h           Data ILSB         00h           Data ILSB         00h           Barting Address NSB         00h           Starting Address NSB         10h           Data I.NSB         00h           Technical Manual For the purposes of this example an invalid Starting         10h           Data I.NSB         00h
Punction Code         Offa         Set the command message hundshale byte HS bit to the same state at the function Code         Punction Code         Offa         Punction Code         Punction Code         Punction Code         Punction Code         Punction Code         Punction Code
Starting Address MSB         00h         Starting Address MSB         00h           Data Quantiy         00h         response message handshake ItS bit         00h         02h         02h <t< td=""></t<>
Starting Address LS8         00h         Set the command message handshake byte IIS bit to the same state as bit frequency in sage handshake byte IIS bit to the same state as bit frequency in the same state as bit LS8         State (Address LS8         00h           Data (MS8         00h         Data (MS8         00h         Data (MS8         00h           Data (LS8         00h         Handshake (IIS bit)         02h         Data (MS8         00h           PROFIBUS-DP Master Command         Set PROFIBUS-DP Master Command Message         Drive Response         Precision Code         03h           Starting Address LS8         00h         Set PROFIBUS-DP Master Command Message         Drive Response         Set report of the same of configures the command message to the AUODEVS         Starting Address MS8         00h           Data (LS8)         01h         Set PROFIBUS-DP Master Command Message         Drive Response         Starting Address LS8         07h           Data (LS8)         01h         Set PROFIBUS-DP Master Command Message Control to the AUODEVS         Data (LS8)         00h           Data (MS8)         00h         Tearlist at address W38 used.         Data (LS8)         02h         Data (MS8)         Data
Data Quantiy     0(h)     Over Chine Chine Marka Baske and Marka Dyle The On the din Sain's Safe Also The Data MASIA     Data Quantiy     02b       Data I MSB     0(h)     Texporse me sage handshake Di N Dit.     Data I MSB     0(h)       Data I MSB     0(h)     Root PROFIBUS-DP Master Command     Set PROFIBUS-DP Master Command Message     Drive Response     Drive Response       PROFIBUS-DP Master Command     Set PROFIBUS-DP Master Command Message in Chine Out Soft of the Chin Out Soft of the Chine Out Soft of the Chine Out Soft of t
Data       LNSB       Oth         Data       LNSB       Oth         Handshaking (1000 0000)       80h       Data       LNSB       Oth         PROFIBUS-DP Matter Command       Set PROFIBUS-DP Matter Command Message       Drive Response         Function Code       10h       Set the Function Code, Starting Address, and Data Quantity. This       Starting Address MSB       Oth         Data       LNSB       Oth       Set the Function Code, Starting Address, and Data Quantity. This       Starting Address MSB       Oth         Data       LNSB       Oth       Set the Function Code, Starting Address, and Data Quantity. This       Starting Address LSB       Oth         Data       LNSB       Oth       Function Code, Starting Address VSB       Oth       Starting Address LSB       Oth         Data       LNSB       Oth       Address was used       Function Code       Starting Address LSB       Oth         Function Code       10h       After the data bits have been set, toggle the IS bit, bit 7, of the command message, the Jata Quantity       Oth       Tarting Address LSB       Oth         Data Quantity       Oth       HS bit, bit 7, of the command message, the State as the IS bit for 1, of the command message, the Jata LSB       Data LSB       Data LSB       Data LSB       Data LSB       Data LSB       Data
Data         LSB         Oth           Handshaking (1100 0000)         50h         Data         LSB         00h           PROFIBUS-DP Master Command         Set PROFIBUS-DP Master Command         Function Code         03h           Starting Address MSB         10h         Starting Address MSB         00h         Function Code         03h           Data         LSB         00h         Function Code         03h         Starting Address MSB         00h           Data         LSB         00h         Function Code         03h         Starting Address MSB         00h           Data         LSB         00h         Febrical Manual, Fort be purposes of this example an invalid Starting         Data         LSB         00h           Data         LSB         01h         Address vas used         Data         LSB         00h           PROFIBUS-DP Master Command         Toggle the PROFIBUS-DP Master Handshake Bit         Drive Response         Data         LSB         00h           Starting Address ISB         00h         Address was used         Handshake Bit         Divita         LSB         Data         LSB         Data         LSB         Data         LSB         Data         LSB         Data         LSB         Data         LSB
Handshaking (1000 0000)     80h     Handshaking (010 0000)     60h       PROFIBUS-DP Master Command     Set PROFIBUS-DP Master Command Message     Drive Response       Function Code     10h     Set the Function Code, Sarring Address, and Data Quantity. This     Function Code     03h       Starring Address LSB     00h     Set the Function Code, Sarring Address, LSB     03h     Starring Address LSB     03h       Data LMSB     00h     Febrical Manual For the purposes of this example an availed Starting     Data Quantity     02h       Data LLSB     01h     Adress was used.     Part ILSB     00h       Handshaking (1000 0000)     80h     After the data bits have been set, toggle the IIS bit, bit 7, of the command message, the Starting Address LSB     Data Quantity     Data Quantity       Parting Address LSB     00h     After the data bits have been set, toggle the IIS bit, bit 7, of the command message, the Data ILSB     Starting Address LSB     Instains Address LSB     Data Quantity     Data Quantity       Data ILSB     00h     After the data bits have been set, toggle the IIS bit, bit 7, of the command message, the Data Mash be the command message, the Data Address LSB     Data Quantity     Data Quantity <td< td=""></td<>
PROFIBUS-DP Master Command         Set PROFIBUS-DP Master Command Message         Drive Response           Function Code         10h         Set the Function Code, Starting Address, and Data Quantity. This Starting Address MSB         10h         Set the Function Code, Starting Address, and Data Quantity. This Data Quantity         Function Code         03h           Data Quantity         02h         respirate rat address 0037h, Output Power. For detailed information of the registers ref to the them and with MODELS®         Data Quantity         02h           Data I. LSB         01h         Address was used.         Data Quantity         02h         Data Quantity         02h           PROFIBUS-DP Master Command         Toggle the PROFIBUS-DP Master Handshake Bit         Drive Response         Function Code         Marting Address MSB         10h           Starting Address I.SB         00h         Address MSB         10h         Address MSB         Inhershake byte to signal the drive that the command message thandshake byte is set to the same Takes the Data Quantity         The response message handshake byte is set to the same Takes the Data I.SB
PROFIBUS-DP Master Command         Set PROFIBUS-DP Master Command Message         Function Code         Obs           Function Code         10h         Set the Function Code, Starting Address, and Data Quantity. This starting Address MSB         00h         Function Code         02h           Starting Address LSB         00h         registers at daress 02h, Output Power for the or for detailed information of drive registers refer to the <i>Technical Manual</i> and the MODBUS'         Starting Address LSB         37h           Data 1 MSB         01h         Address was used.         Data 1 MSB         00h           PROFIBUS-DP Master Command         Toggle the PROFIBUS-DP Master Handshake Bit         Data 1 MSB         00h           Function Code         10h         Address was used.         Data 1 MSB         Data 1 MSB         00h           Starting Address MSB         10h         Address was used.         Data 1 MSB         Data 1
Function Code         10h         Set the Function Code, Starting Address, and Data Quantity. This         Function Code         0.3h           Sturting Address MSB         10h         Set the Function Code, Starting Address, and Data Quantity. This         Starting Address MSB         00h           Data Quantity         02h         drive register set of to the <i>Cechnical Manual</i> and the MODBCS <sup>45</sup> Data Quantity         02h           Data ILSB         00h         Technical Manual. For the purposes of this example an invalid Starting         Data 1 MSB         00h           Bata ILSB         10h         Address was used.         Data 1 MSB         00h           Function Code         10h         Address was used.         Data 1 LSB         01h           Function Code         10h         Address was used.         Encition Code         Data 1 LSB         00h           Starting Address LSB         10h         Andret the data bits have been set, toggle the HS bit, bit 7, of the command message to to the somand message thandbake byte is set to the somand messag
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PROFIBUS-DP Master Command         Process Response         Drive Response           Function Code         10h         Function Code         90h
PROFIBUS-DP Master Command         Process Response         Drive Response           Function Code         10h         Function Code         90h
Function Code     10h     Function Code     90h
Starting Address MSB         10h         Bits 5 and 6 of the response handshake byte are both set when the         Starting Address MSB         00h
Starting Address LSB         00h         processing has been completed and the response message contains valid         Starting Address LSB         00h
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Data 1 M5B VOI section of Chapter for error code description VOI
Data 1 MSB     001       Data 1 MSB     001       Data 1 LSB     01h   section of Chapter for error code description.

# Appendix D Troubleshooting

This chapter is a basic troubleshooting guide. For detailed information on the drive refer to the Technical Manual. Detailed information on PROFIBUS-DP can be obtained from www.profibus.com.

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## **Troubleshooting Check List**

	1:	The drive operates correctly without the PROFIBUS-DP Option installed Drive model number
	2:	The PROFIBUS-DP Option is correctly and securely installed on the drive PROFIBUS-DP Option Code number
		PROFIBUS-DP Option version
	3:	All network devices have unique addresses and drives are addressed between 1 and 99 Drive address
		\$1 \$2
	4:	The Run/Stop command source parameter, B1-02, is set correctly B1-02
	5:	The Frequency Reference command source parameter, B1-01, is set correctly B1-01
	6:	The correct cable type is used. Mfg PN
	7:	All cable connections are correct per device schematic and are secure
	8:	All cables have been checked for continuity. There are no breaks or shorts.
	9:	Cable length between nodes is at least 1 meter
	10:	Maximum segment and maximum network lengths do not exceed the maximum allowed
	11:	The total stub lengths do not exceed the maximum allowed
	12:	There are no more than 32 devices on each segment, including repeaters and controllers. There are no more than 31 devices on each segment if no repeaters are used.
$\square$	13.	The network is correctly terminated on each end and only at each end
	14.	The dealed in contrast of the second and only at each end.
	14:	The smeld is continuous throughout the network and is properly grounded on each end.
	15:	The network cable is routed away from any high voltage cable(s) or source(s).
	16:	The correct GSD file is used. GSD file nameGSD
	17:	The controller scan list is configured to send and receive the correct amount of data.
	18:	The PROFIBUS-DP LEDs are in their correct on/off states.
	19:	All network devices have been tested for conformance with the PROFIBUS-DP specification

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## Installing The PROFIBUS-DP Option

The following is a short guide to troubleshooting the *PROFIBUS-DP Option* installation. It highlights some of the most common issues faced when diagnosing and correcting issues associated with the startup and operation of a drive with a PROFIBUS-DP industrial network. Further information on the features of each interface can be found in the **PROFIBUS-DP Option Technical Manual**. While most of the information is centered on the application of the drive, the guidelines presented are applicable in most PROFIBUS-DP Networks.

Diagnosis of network fault issues will typically fall into three categories: installation of the PROFIBUS-DP option, wiring and cabling issues, and network configuration/diagnostics. Each of these areas will be discussed below to help resolve common problems associated in PROFIBUS-DP network troubleshooting.

#### Drive Operates Correctly Without Network Option Installed

Before installing any drive option, **verify that the drive functions properly without the option installed**. Refer to the appropriate drive technical manual for information on the drive's installation and operation.

#### The PROFIBUS-DP Option Is Properly Installed.

Verify that the connection between CN2 on the *PROFIBUS-DP Option* is securely connected to CN2, labeled 2CN on the GPD515/G5, on the drive and that all stand-offs are locked in their associated mounting holes.

#### • Verify And Write Down The Code Number Of The PROFIBUS-DP Option.

The Code Number can be found on the front of the *PROFIBUS-DP Option* and specifies the firmware version of the interface unit. The version number can be found on the label of the socketed EPROM. The Code Number and version number are necessary to select the proper GSD file. It will also be useful if technical support should become necessary.

#### Network Cable Is Connected Correctly

- Determine the type of connector on the *PROFIBUS-DP Option*. Connector Style A is an extended Phoenix connector. The extension can be seen on the back of the connector as a small circuit board. Connector Style B is a standard phoenix connector without any modifications.
- Connect the PROFIBUS-DP network cable to the *PROFIBUS-DP Option*. Refer to the appropriate connection drawing in Figure C.2 below for your connector style.
- Use standard PROFIBUS-DP cable as specified by the PROFIBUS Organization.



Figure D.1 - PROFIBUS-DP Option Connections

#### Run/Stop Operation Parameter Is Set Correctly.

Parameter B1-02 needs to be set to the source of the drive's Run/Stop command. If the receives the Run/Stop command from the PROFIBUS-DP network, parameter B1-02 must be set to "3 – Option PCB". Refer to the appropriate drive technical manual for further explanation of this parameter.

Table D.1 - Run/Stop Reference Source				
Parameter Value Description				
	0	Operator Keypad		
D1.02	1	External Terminals		
B 1-02	2	Serial Communications		
	3	Option PCB (PROFIBUS-DP Communications)		

#### Frequency Reference Parameter Is Set Correctly

Parameter B1-01 needs to be set to the source of the drive's frequency reference command. If the receives its frequency reference from the PROFIBUS-DP network, parameter B1-01 must be set to "3 - Option PCB". Refer to the appropriate drive technical manual for further explanation of this parameter.

Table D.2 - Frequency Reference Source					
Parameter Value Description					
	0	Operator keypad			
	1	Terminals			
B1-01	2	Serial Communications			
	3	Option PCB (PROFIBUS-DP Communications)			
	4	Pulse input			

#### • The Network Address Correct And Unique.

Each device on the network must have a unique address. Valid addresses are 1 through 99 with 1 typically reserved for the PROFIBUS-DP Master and 2 reserved for diagnostic equipment. Set the network address via rotary switches S1(x1) and S2(x10). To set a to address 15, set S2 to 1 and S1 to 5.



Figure D.2 – PROFIBUS-DP Option Addressing

## Wiring And Cabling

Several serial communications troubleshooting issues can be traced to cabling and grounding. The PROFIBUS-DP Option is based on RS485 differential line technology, and specifies the cable to be used, i.e. cable length requirements, termination requirements, number of nodes allowed per segment, etc. The following lists and describes the items that should be checked during the network installation to verify correct cabling and grounding. Failure to follow the following guidelines could result in total or intermittent communications failure.

#### • The Network Cable Is The Correct Type.

The cable used by the PROFIBUS-DP network is specified by PROFIBUS European Standard EN50170. It is a shielded, twisted pair cable with the following specifications. In order for the cable to fit the currently available PROFIBUS-DP standard connectors, the surrounding diameter must be 8.0 mm (+/- 0.5 mm).

Table D.3 – PROFIBUS-DP Cable Specifications				
Parameter PROFIBUS-DP Cable Requirements				
Impedance	135 to 165 Ohm / 3 to 20Mhz			
Capacitance	< 30 pF / m			
Resistance	< 110 Ohm / Km			
Wire Gauge	> 0.64 mm			
Conductor Area	$> 0.34 \text{ mm}^2$			
Shield Density	Greater than 80%			

#### Cable Is Correctly And Securely Connected

Check for shorts, broken wires, loose connections, and that the signal and shield wires are connected to the correct pin on the option connector. See *Figure C.1 – PROFIBUS-DP Option Connections* above for required wiring.

#### Cable Lengths Are Within Specified Limits

Both data rate and cable type affect the total allowable length of the network. The total amount of measured linear cable allowed between any two points on the network segment must be within the following table's specification. Also, the total amount of network length, allowed through segment repeaters must be less than the Maximum Network Length in the following table. The minimum distance of cable that is required between device connections to the PROFIBUS-DP physical media is a distance of one (1) meter.

Table D.4 – PROFIBUS-DP Cable Length Specifications					
Baud Rate	Maximum Segment Length	Maximum Network Length			
9.6 Kbps	1,200 Meters	10,000 Meters			
187.5 Kbps	1,000 Meters	10,000 Meters			
500.0 Kbps	400 Meters	4,000 Meters			
1.5 Mbps	200 Meters	2,000 Meters			
3.0 Mbps	100 Meters	1,000 Meters			
6.0 Mbps	100 Meters	1,000 Meters			
12.0 Mbps	100 Meters	1,000 Meters			

#### Stub Lengths Are Within Specified Limits

The total amount of measured linear cable allowed between the point of the stub connection (from the main PROFIBUS-DP cable) to the node connection on the line, along with the cumulative total or sum of all stub cable length(s) must not exceed the maximum specified. When calculating stub lengths, include stub in the device itself. Use 1cm for each drive. The following table and diagram specifies the stub length requirements. **DO NOT use stubs when the PROFIBUS-DP network is configured to operate at baud rates above 1.5Mbps** 

Table D.5 – PROFIBUS-DP Stub Length Specifications					
Baud Rate	Total Capacitance for all Stubs	Total Stub Length			
9.6 Kbps	15.0 nF	500 Meters			
187.5 Kbps	3.0 nF	100 Meters			
500.0 Kbps	1.0 nF	33 Meters			
1.5 Mbps	0.6 nF	20 Meters			
3.0 Mbps	0.2 nF	Approx. 0			
6.0 Mbps	Stubs Not Allowed	Approx. 0			
12.0 Mbps	Stubs Not Allowed	Approx. 0			

#### There Are No More Than 32 Total Devices On Each Network Segment.

This means that only 31 physical devices can be connected on one PROFIBUS-DP network segment without a repeater. Verify that there are no more than 31 physical nodes on the network segment, which includes all Master/PLC connections, slave devices, and configuration nodes for all connections. If there are more than 31 devices, you must add a repeater between the network segments to separate the devices into two separate copper buses. Note, the reason for using RS485 repeaters is for allowing more than 32 devices to talk to one Master PLC port, or there is a need to operate bus segments as ungrounded with reference to each other, or the network segment exceeds the maximum length per the operating baud rate. Up to nine (9) RS485 repeaters can be used in cascade (in-line).

#### The Network Is Terminated Correctly.

A PROFIBUS-DP network copper bus segment is based on an RS485 standard and requires two (2) and only two (2), termination resistors of 120 ohms, <sup>1</sup>/<sub>4</sub> watt, at each of the furthest ends of the PROFIBUS-DP cabling. Typically, a good place for the termination resistors to be ON is at the PLC connector (only, if the network segment starts at that point) and, at the last device on the network segment. This is to keep transmission signal distortion to a minimum along all sections of the network bus.

If the last device on the network is a drive, the termination switch on the *PROFIBUS-DP Option* may be used. Set the switch to the ON position. Active Termination Devices are the preferred method of terminating the network. They must be continually powered to function correctly and must be used for transmission rates above 1.5 Mbps. The Siemens P/N for the Active Terminator Module is 6ES7 972-0DA00-0AA0.



Figure D.3 – PROFIBUS-DP Option Termination Settings

#### • Common Mode Voltage Between Any Two Points Is Less Than 7vdc.

RS485 requires that the common mode voltage be less than 7vdc. Large voltage potential differences between points on the network, may cause equalization current flow in the shield. This interferes with the PROFIBUS-DP signal quality. If common mode voltage is greater than 7vdc, a separate ground conductor must connect the network devices to a central ground point, typically at the start of the segment.

#### Shield Is Continuous And Both Ends Of The Shield Are Grounded.

The cable shields, between all nodes of the network segment shall be connected, to form a single conduction path throughout the segment. The shield must then be grounded at each endpoint

#### Cable Is Routed Correctly

The PROFIBUS-DP network cable must not run parallel to or close to any high power or high frequency cables. A minimum clearance of  $4^{\circ} - 10^{\circ}$  is required, depending on the level of voltage or signals in the cables. If network cables must cross high power or frequency cables, they must do so at a 90 deg angle.

### **PROFIBUS-DP** Configuration

In order for the drive with the *PROFIBUS-DP Option* to operate in a PROFIBUS-DP networked system, the PROFIBUS-DP master must be configured to recognize the drive on the network. Typically, the master scan list is setup and modified with a PROFIBUS-DP configuration utility, such as *COM PROFIBUS* from Siemens. The configuration utility is typically provided by the vendor supplying the PROFIBUS-DP master.

The drive is a slave device and requires a master PROFIBUS-DP scanner to communicate on a PRFIBUS-DP network. The drive configuration entered into the master scan list, via the configuration utility, must match exactly the configuration built into the *PROFIBUS-DP Option*. The drive has diagnostic LEDs to annunciate the state of the PROFIBUS-DP network.

#### • Correct GSD file is used.

The configuration utility uses the GSD file to set certain parameters, including the Identification Number, the number of Input and Output words, the supported baud rates, etc. The GSD file is stored in the GSD sub-directory under the directory where *COM PROFIBUS* was originally installed. The "Scan GSD Files" option under the "File" menu can be used to load the GSD file information in *COM PROFIBUS*, for example, the Station Type **PROFIBUS INTER** selects the PROFIBUS-DP Option.

The filename of the current version of the GSD file, that is used for the *PROFIBUS-DP Option* is, "YASK00CA.GSD". This GSD file can be found at <u>www.drives.com</u>.

#### Master Scan List Is Setup Correctly

Verify that the PROFIBUS-DP Master scan list is configured to send and receive the correct amount of data to each node on the PROFIBUS-DP network and that the PROFIBUS-DP Master has the devices correctly mapped in memory. There are several PROFIBUS-DP scanners on the market today. Some support the configuration tools mentioned above and some have their own configuration tools. Refer to the manufacturer's documentation for determining how to verify and program the scan list settings in the PROFIBUS-DP Master.

The size and type of information expected from the PROFIBUS-DP Master scanner must match exactly (per the GSD file) the device configuration. Determine that the PROFIBUS-DP Master operational words to and from the PROFIBUS-DP device are mapped into the I/O space of the PROFIBUS-DP Master. For each specific PROFIBUS-DP Master, this I/O mapping may be different. Consult the PROFIBUS-DP Master documentation to insure correct I/O mapping.

### PROFIBUS-DP Option Configuration

With **PROFIBUS-DP INTER** selected as the Station Type, three configuration selections will be displayed. Select the configuration applicable to the particular application. **Basic Data** consists of 3 word I/Os, combined input/output, message. **Extended Data 1** consists of 16 input words and 16 output words. **Extended Data 2** consists of 6 input words and 6 output words.

- The Basic Data configuration consists of 3 words of combined I/O, 3 input words and 3 output words. Refer to 3 Word I/O Message section of Chapter 3 for a detailed description of the Basic Data configuration.
- The Extended Data 1 configuration consists of 16 input words and 16 output words. Refer to 16 Word Input/Output Message section of Chapter 3 for a detailed description of the Extended Data 1 configuration. This configuration is also used on those PROFIBUS-DP Options that have an Option Name SI-P/or Part Numbers prior to 73606-7110. The Option Name and Code Number are located on the right side of the option.
- The Extended Data 2 configuration consists of 6 input words and 6 output words. Refer to 6 Word Input/Output Message section of Chapter 3 for a detailed description of the Extended Data 2 configuration. This configuration is also used on those PROFIBUS-DP Options previously released as Profibus II.

### **PROFIBUS-DP Option Diagnostics**

### The PROFIBUS-DP Option Is Operating Correctly

Verify that the PROFIBUS-DP interface unit on the drive is operating correctly, by reporting the state of the LEDs on the Interface Unit. The drawing below shows the indication LEDs as they appear on the PROFIBUS-DP interface unit.



Figure D.4 – PROFIBUS-DP LED Locations

#### LED Indicators

The following LEDs indicates the PROFIBUS-DP status.

Table D.6 – Communication LEDs					
LED	LED Color Indication/Function				
COMM	Green	Lit during data exchange with the PROFIBUS-DP Master			
ERR	Red	Lit when no data exchange is taken place.			

#### ♦ Module Status Indicators

The following LEDs indicates the status of the PROFIBUS-DP Option.

Table D.7 – Diagnostic LEDs							
LED	Color	Indication/Function					
PWR	Green	Lit when the +5V power to the electronics is OK. Turned off if the +5V is below +4.5V (min)					
WD	Red/Green	Indicates the module status					
OFF		OFF	Communication Option CPU not running.				
		Solid Green:	Initialization.				
						Flashing green:	Normal operation.
		Solid Red:	Internal Communication Option error.				
		Flashing red:	error detected.				
		Other indication	Unspecified, Communication Option error				

### ◆ LED Diagnostics

The following table presents the faults displayed by the LEDs on the PROFIBUS-DP Option, their causes, and corrections.

Table D.8 – LED Diagnostics						
LED Display				Content	Causa	Corrective Action
PWR	COM	ERR	WD	Content	Cause	Conective Action
					Power is not being supplied from the drive.	<ul><li>Check the main circuit wiring on the drive.</li><li>Cycle drive power.</li></ul>
OFF	OFF	OFF	OFF	Power OFF	Power is not being supplied to the option unit due to poor option unit connection.	<ul> <li>Turn of the drive power.</li> <li>Check the option unit connection to the drive.</li> <li>Cycle drive power.</li> </ul>
Solid Green	OFF	Solid Red	Solid Red	CPU Error	Option unit CPU error.	<ul><li>Cycle drive power.</li><li>Replace option unit if fault persists.</li></ul>
Solid Green	OFF	Solid Red	Flashing Red	Dr ive Error	Error in Drive unit.	<ul><li>Cycle drive power.</li><li>Replace drive if fault persists.</li></ul>
Solid Green	OFF	Flashing Red	Solid Green	C om Error	A fault has occurred rendering communication impossible.	<ul> <li>Check whether the address set in the PROFIBUS-DP Master differs from the address of the option unit.</li> <li>Check that the master is functioning properly.</li> <li>Check that the termination resistor is correctly connected to the communication line.</li> <li>Check whether the communication line is correctly connected (disconnected or poor connection).</li> <li>Check that the communication line is separated from the main power line.</li> </ul>
Solid Green	Solid Green	Flashing Red	Solid Green	Com Error	A fault has occurred rendering communication impossible.	• Check whether the address is duplicated with any other devices within the PROFIBUS-DP network.
Solid Green	Solid Green	OFF	Solid Green	CPU Init	Option unit under initialization	• Wait until the WD LED is flashing
Solid Green	Solid Green	OFF	Flashing Green	Normal	Normal communication possible.	

#### ♦ Drive Faults

The following is a table of drive faults that could be caused by the *PROFIBUS-DP Option* that will be displayed on the Operator Keypad, their causes, and possible solutions. For any fault displayed on the operator that is not listed in the following table, please see the appropriate drive technical manual for further information on drive faults.

Table D.9 – Drive Faults						
Fault	Content	Cause	Solution			
BUS	Option PCB communications error	Communication is not established between PROFIBUS-DP Master and the drive.	Check PROFIBUS-DP communication LED display.			
EF0	Option PCB external fault	Drive received an external fault command from the Option PCB	<ul> <li>Check multi-function input settings</li> <li>Check PLC or controller program</li> <li>Eliminate cause of fault (machine device in fault state)</li> </ul>			
OPE05	Command selection fault	Parameter B1-01 is set to Option PCB and no card is detected	<ul> <li>Install Option PCB</li> <li>Reprogram B1-01</li> <li>Replace the Option PCB</li> </ul>			
OPE06	Control mode selection fault	Parameter B1-02 is set to Option PCB and no card is detected	<ul><li>Install Option PCB</li><li>Reprogram B1-02</li><li>Replace the Option PCB</li></ul>			
CPF20	Option PCB fault	Faulty CN2 connection	<ul> <li>Power cycle the drive</li> <li>Reseat the Option PCB</li> <li>Replace the Option PCB</li> <li>Replace the inverter</li> </ul>			
CPF21	Option PCB self-diagnostics fault					
CPF22	Option PCB ID code fault	Faulty Option PCB	Replace the Option PCB			
CPF23	Watch dog timer fault					

# **PROFIBUS-DP<sup>®</sup>** Option



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