MITSUBISHI ELECTRIC

TRANSISTORIZED INVERTER

-INSTRUCTION MANUAL-

PROFIBUS DP COMMUNICATION OPTION

FR-A5NP

Thank you for choosing the Mitsubishi transistorized inverter option unit.
This instruction manual gives handling information and precautions for use of this equipment. Incorrect handling might cause an unexpected fault. Before using the equipment, please read this manual carefully to use the equipment to its optimum.

This section is specifically about safety matters

Do not attempt to install, operate, maintain or inspect this product until you have read through this instruction manual and appended documents carefully and can use the equipment correctly. Do not use this product until you have a full knowledge of the equipment, safety information and instructions.
In this instruction manual, the safety instruction levels are classified into "WARNING" and "CAUTION".

⚠ WARNING	**Assumes that incorrect handling may cause hazardous conditions, resulting in death or severe injury.**
⚠ CAUTION	**Assumes that incorrect handling may cause hazardous conditions, resulting in medium or slight injury, or may cause physical damage only.**

Note that the CAUTION level may lead to a serious consequence according to conditions. Please follow the instructions of both levels because they are important to personnel safety.

SAFETY INSTRUCTIONS

1. Electric Shock Prevention

⚠ WARNING

- **While power is on or when the inverter is running, do not open the front cover. You may get an electric shock.**
- **Do not run the inverter with the front cover removed. Otherwise, you may access the exposed high-voltage terminals and charging part and get an electric shock.**
- **If power is off, do not remove the front cover except for wiring or periodic inspection. You may access the charged inverter circuits and get an electric shock.**
- **Before starting wiring or inspection, switch power off, wait for more than 10 minutes, and check for no residual voltage with a tester or the like.**

⚠ WARNING

- **Any person who is involved in the wiring or inspection of this equipment should be fully competent to do the work.**
- **Always install the option unit before wiring. Otherwise, you may get an electric shock or be injured.**
- **Handle this option unit with dry hands to prevent an electric shock.**
- **Do not subject the cables to scratches, excessive stress, heavy loads or pinching. Otherwise, you may get an electric shock.**
- **While power is on, do not move the station number and baud rate setting switches. Doing so can cause an electric shock.**

2. Injury Prevention

⚠ CAUTION
• Apply only the voltage specified in the instruction manual to each terminal to prevent burst, damage, etc. • Ensure that the cables are connected to the correct terminals. Otherwise, burst, damage, etc. may occur. • Always make sure that polarity is correct to prevent burst, damage, etc. • While power is on or for some time after power-off, do not touch the inverter as it is hot and you may get burnt.

3. Additional instructions

Also note the following points to prevent an accidental failure, injury, electric shock, etc.:

(1) Transportation and mounting

⚠ CAUTION
• Do not install or operate the option unit if it is damaged or has parts missing. • Do not stand or rest heavy objects on the product. • Check that the mounting orientation is correct. • Prevent screws, metal fragments or other conductive bodies or oil or other flammable substance from entering the inverter.

(2) Test operation and adjustment

⚠ CAUTION
• Before starting operation, confirm and adjust the parameters. A failure to do so may cause some machines to make unexpected motions.

(3) Usage

⚠ WARNING
• Do not modify the equipment.

⚠ CAUTION
• When parameter clear or all parameter clear is performed, each parameter returns to the factory setting. Re-set the required parameters before starting operation. • For prevention of damage due to static electricity, touch nearby metal before touching this product to eliminate static electricity from your body.

(4) Maintenance, inspection and parts replacement

⚠ CAUTION
• Do not test the equipment with a megger (measure insulation resistance).

(5) Disposal

⚠ CAUTION
• Treat as industrial waste.

(6) General instruction

All illustrations given in this manual may have been drawn with covers or safety guards removed to provide in-depth description. Before starting operation of the product, always return the covers and guards into original positions as specified and operate the equipment in accordance with the manual.

CONTENTS

1. INTRODUCTION

GENERAL

The purpose of this manual is to provide general information, installation, and operation procedures for the FR-A5NP PROFIBUS-DP option, used with the FR-A500(L)/F500(L) inverter, herein after referred to as the inverter. Read this manual completely before installing, operating or servicing the option unit.

This manual is intended for use by qualified personnel. Installation should only be performed by qualified personnel. You must be able to operate and program serial devices to use the equipment.

This option unit lets you connect an FR-A500(L)/F500(L) series inverter to a network adhering to the PROFIBUS-DP communications protocol. PROFIBUS-DP is the performance-optimized version of PROFIBUS for time-critical operations.

Illustrations provided in this manual may have covers or safety guards removed to provide a clear view. Before starting operation of the product be sure to install covers and guards into the original position.

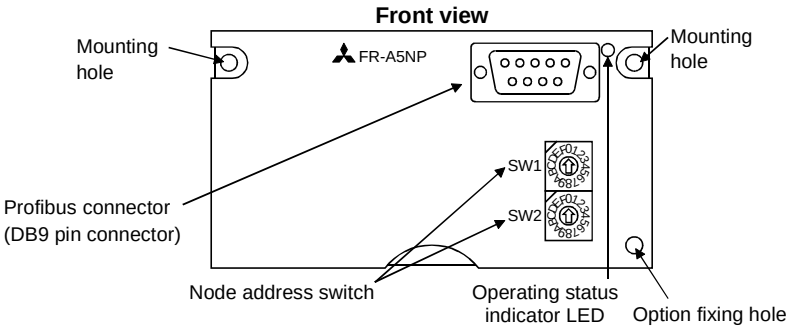
The following is a list of important features for the option unit

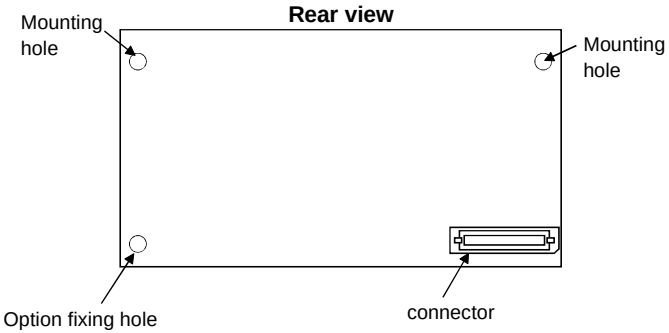
- Data Rates to 12,000,000 bps.
- Up to 126 stations supported on a single network
- Network access to all inverter parameters.
- Certified by PROFIBUS Nutzer Organization in July 1998

- PROFIBUS® is a trademark of PROFIBUS User Organization.
- Other company and product names herein are the trademarks and registered trademarks of their respective owners.

DESCRIPTION

The FR-A5NP option unit consists of two circuit boards. The option unit is mounted in option port #3 on the inverter unit. The inverter top cover must be removed to install the option unit. After installation, the top cover is reinstalled and connection to the PROFIBUS-DP bus is completed through a connector accessible through the top cover. Two station switches, mounted on the top printed circuit board, allow the assigning of station numbers from 0 to 126. A LED status light mounted next to the connector provides status information on the communication link.


Front view
Mounting hole
FR-A5NP
Mounting hole
SW1
SW2
Profibus connector (DB9 pin connector)
Node address switch
Operating status indicator LED
Option fixing hole


Rear view
Mounting hole
Mounting hole
Option fixing hole
connector

2. INSTALLATION

Remove the drive cover following the inverter instruction manual and install the option unit using the following procedure:

2.1 Pre-installation Checks

(1) Check the inverter type.
Use the option unit only with an FR-A500(L)/F500(L) series inverter. Do not use it with any other series (e.g. A200E, A200, A100, Z and F series). These other series inverters have a different option connector to prevent installation. If you force the connector, you may damage the inverter as well as the option unit.

(2) Make sure the inverter input power is off. The option unit can be damaged if installed with the input power on.

(3) Make sure the PLC master (or PROFIBUS-DP master) is properly grounded before continuing.

2.2 Mounting Procedure

⚠ WARNING
⚠ **Hazardous voltage present.** **Always isolate power from the inverter and wait 10 minutes until the bus charge light is off to ensure the charge lamp has gone out before inserting or removing this option unit or touching the terminals.**

(1) Insert this option unit only into the OPTION PORT# 3 of the inverter.

(2) Carefully insert the connector of the option unit into the connector of the inverter as shown in Figure 2-1. Use the two mounting holes and the guide hole to align the bottom board with the matching machine screw inserts and the plastic guide pin on the inverter. Also be sure to fit the unit into the option fixing hook (It is available in Aug., 2000). Make sure that the inverter option is firmly seated in the inverter and the connector is fully plugged in.

(3) Secure the option unit to the inverter with two mounting screws. If the screw holes in the option unit do not line up with the inverter mounting holes, check that the connectors have been fitted correctly.

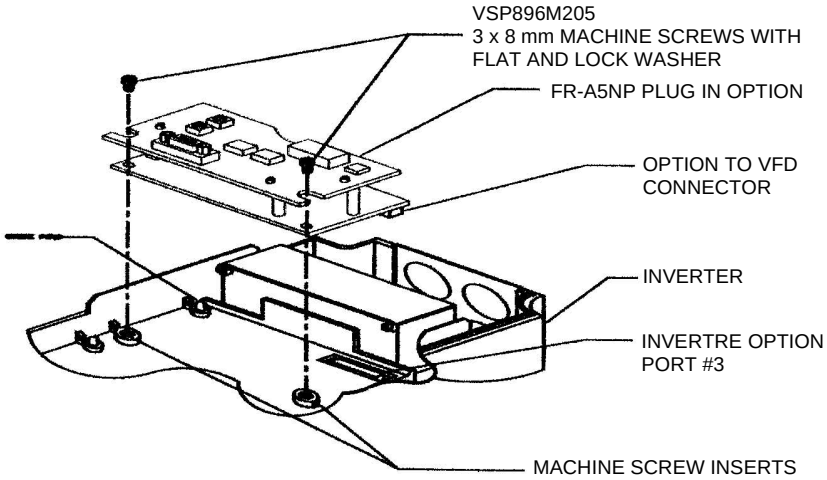


Figure 2-1. Option Unit Aligned with Option Port #3

(4) Option unit is now mechanically installed as shown is Figure 2-2.

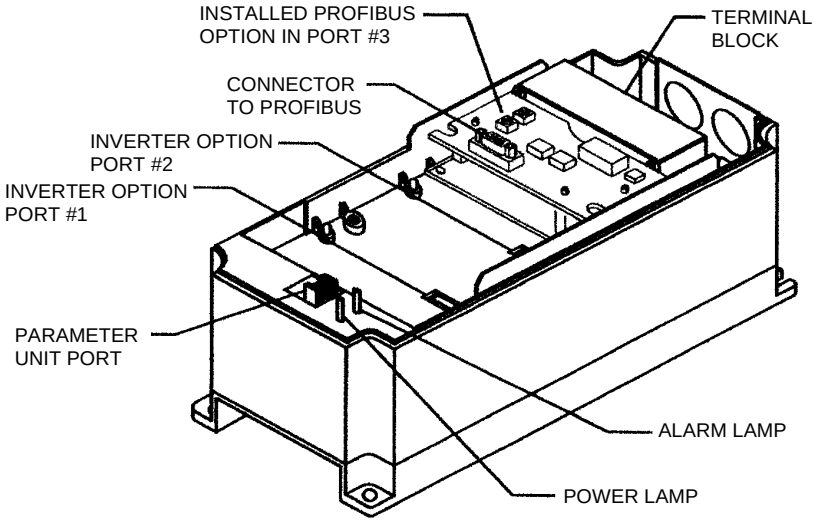


Figure 2-2. Option Unit Installed In Inverter

(5) Construct a short cable to connect the network to the inverter. On one end of the cable, install a connector compatible with the network. On the other end, install a DB9-style male connector. Make sure the cable can support 12.0 Mbps communications (as specified in the EEIA-RS-485 standard). This cables connections are shown in Figure 2-3.

REMARKS

Option unit Pins 6 and 5 supply +5Vdc (rated at 100 mA). Connection of Pins 6 and 5 is optional. Pin 4 may not be required for your master. Connection of Pin 4 is also optional. Refer to the user's manual of your PROFIBUS-DP master.

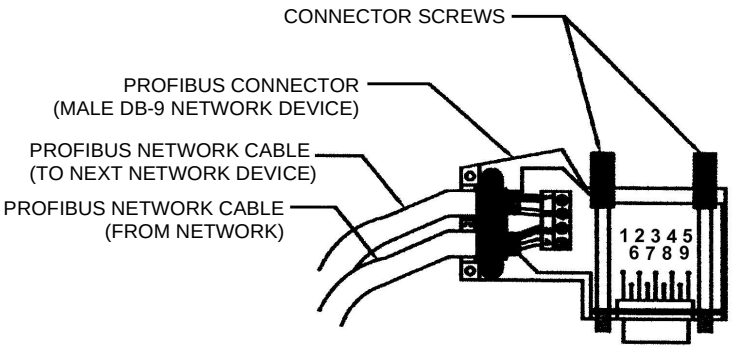


Figure 2-3. Connection Cable

REMARKS

The DB9 pinout described in the table below is defined by the PROFIBUS Standard DIN-19-245 Part 1.The two data signals are named RXD/TXD+ and RXD/TXD-. However, manufacturers of RS-485 driver ICs typically refer to these signals as A and B'. The PROFIBUS signal RXD/TXD+ is typically assigned to the RS-485 signal A and the RXD/TXD- to B'. Some PROFIBUS-DP implementations confuse these two signals. If you are having trouble establishing communications from the FR-A5NP to your PROFIBUS-DP master, verify that the proper data signal assignments are made. It may be necessary to swap these two signal lines.

DB-9 Pin	A5NP Internal Signal Name	PROFIBUS-DP Signal Name	Comments
1	NC		No Connection
2	NC	RP	Reserved for Module Power
3	A	RxD/TxD+	Receive/Transmit-Data+
4	RTS	CNTR+	Control+ (Request to Send)
5	Isolated GND	DGND (V-)	Data Ground
6	Isolated +5Vdc Supply	V+	(+5Vdc) Voltage+
7	NC		No Connection
8	B'	RxD/TxD-	Receive/Transmit-Data-
9	NC	RP	Reserved for Module Power

NC — No Connection

(6) To terminate the network at the option unit, install termination resistors at the terminal block as shown in Figure 2-5. Each PROFIBUS network has two ends. Units at both of those ends must be properly terminated.

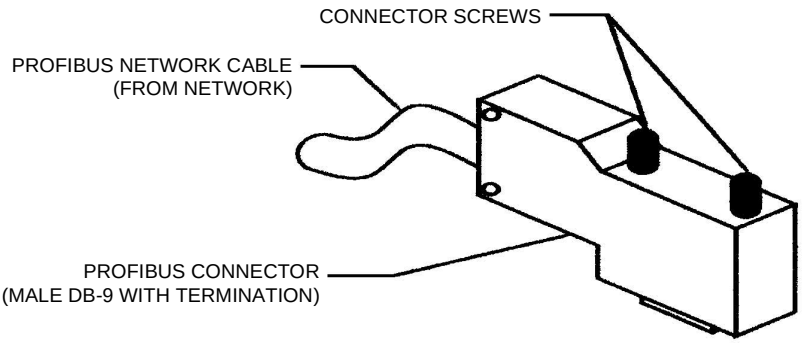


Figure 2-5. Connector with Termination Resistors

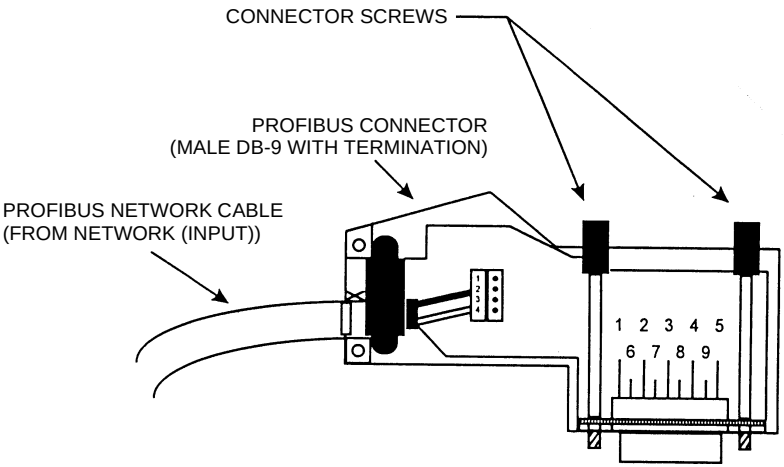
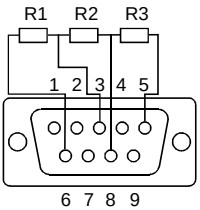


Figure 2-6. Connectors with Cover Removed



R1=390Ω±2% 1/4W
R2=220Ω±2% 1/4W
R3=390Ω±2% 1/4W

Figure 2-7. Termination Resistor Connections

REMARKS

The option unit may be connected to a DB-9 connector that has these termination resistors built in.

(7) Remove the option data port insert from the inverter cover.

(8) Set the node address using the two rotary switches on the option unit. The valid addresses can range from 03 through 7B hex (123 decimal). The node address must be set to the value as configured when setting up your PROFIBUS master. The master must be aware of the node addresses assigned to the FR-A5NP or communications will not be established. Refer to user documentation for master details.

⚠ WARNING

⚠ Do NOT set the address from 7C to FF. If you do, the option unit and inverter will not operate correctly.

CAUTION

Do NOT set more than one station to the same address on a single PROFIBUS-DP network.

SW1 is nearest to the LED and sets the most significant digit. For example, to set the node address to 7B hex (123 decimal), set SW1 to 7 and SW2 to B.

(9) Replace the inverter cover, while making sure that the PROFIBUS connector is aligned with the option data port window.

(10) Connect the PROFIBUS cable to the inverter by plugging the DB9-style male connector into DB9-style female connector of the option unit, which should be visible in the option port window.

2.3 Connecting To The Network

(1) Make sure the inverter is at rest with power off and the option unit is mounted in the inverter. Connect the PROFIBUS cable created in section 2.2 to the network.

(2) It is now safe to apply power to the inverter and run it in PU, external, or net mode, provided that any external inverter control cables in addition to the PROFIBUS network cable are installed correctly.

2.4 LED Status Indicator

After connecting the option unit to an active network, note the condition of the Operating Status Indicator LED. After power-up or reset, the LED can assume the following states:

2.5 Installing MEAU0865.GSD

Green	State Of System
Off	Module Is Not Powered Or Module Has Not Completed Power-up Sequence Or Module Is NOT In Data Exchange Mode Or Network Connectivity Is Time-out.
On	Module Is Operating Normally, Ready In Data Exchange Mode.

All setup, management, or configuration software programs for PROFIBUS-DP require the use of a Device Data Base (GSD) file MEAU0865.GSD, please install MEAU0865.GSD properly before using any of the setup, management, or configuration software programs.

Refer to page 37 for more details.

3. OPERATION

The operation of the inverter changes slightly when this option unit is installed. These changes are described in the following paragraphs.

3.1 Operating Modes

In the PU operating mode, the inverter is controlled by a Parameter Unit (FR-PU04) or operation panel.

In the External operating mode, the inverter is controlled by external signals connected to the inverters terminal block.

In the Network (computer link) operating mode, the inverter is controlled by commands from a PROFIBUS master.

3.2 Selecting the Operating Mode

The following table describes the actions required to change the operating mode. The FR-A5NP option may be used to monitor all data in the inverter in any operating mode. The inverter must, however, be in "Net Operation" mode for network control to be enabled. Net Operation mode is active when Pr.79=0 (factory default “normal mode”) or when Pr.79=6 (“switchover mode”). (For details of Pr. 79, refer to the inverter manual.)

Mode Change	Action Required
Ext Operation → PU Operation	Select the PU operation mode from the operation panel or press PU key on the parameter unit.
PU Operation → Ext Operation	Select the EXT operation mode from the operation panel or press EXT key on the parameter unit.
Ext Operation → Net Operation	PROFIBUS master writes 0014h to PNU 00Bh (IND=0100h).
Net Operation → Ext Operation	PROFIBUS master writes 0010h to PNU 00Bh (IND=0100h)
Net Operation → PU Operation	PROFIBUS master writes 0011h to PNU 00Bh (IND=0100h)

The following conditions must also be met before you can change the operating mode:

- the inverter is stopped
- the forward and reverse commands are off

PNU 128h (IND=2) allows you to select the Network operating mode on power-up and after a drive reset.

Once the Network operating mode is started, there must be PROFIBUS activity at least once every 5s. If the option unit does not sense valid PROFIBUS activity for 5s or more, it performs an option module alarm stop, the inverter display unit shows “E.OP3”, and you must reset the inverter to clear this fault.

One way to ensure activity is to configure the PROFIBUS master to enable response monitoring. Alternatively, you can have the PROFIBUS master issue a null command (Command Word 1 = 0) or any other command. Refer to Section 5.

3.3 Functions Available in the Operating Modes

The functions available to the drive depend on the operating mode. The following table indicates the command types available according to the operating mode:

Control Type	Command Type	Net	Ext	PU
PROFIBUS	Operating Command	Yes(*1)	No	No
	Output Freq. Set.	Yes(*1)	No	No
	Monitor	Yes	Yes	Yes
	Parameter Write	Yes(*3)(*4)	No(*3)	No(*3)
	Parameter Read	Yes	Yes	Yes
	Inverter Reset	Yes(*2)	No	No
External Terminals	Operating Command	Yes(*1)	Yes	No
	Output Freq. Set.	Yes(*1)	Yes	No
	Inverter Reset	Yes	Yes	Yes

*1 Depends on value of PNU 126h and 127h.
*2 Inverter cant be reset if a PROFIBUS comm. error occurred.
*3 As set in PNU 4Dh.
*4 While stopped.

3.4 Input From PROFIBUS to Inverter

This option unit supports all Control Input Commands.

The output frequency setting may range from 0 to 400 Hz in increments of 0.01 Hz.

You can reset the inverter by having the PROFIBUS master write a 0000h to PNU 001h (IND=0100h).

For parameter writing, all standard and special parameters are supported.

3.5 Output From Inverter to PROFIBUS

You can monitor the following items:
Availability of monitor depends on the inverter. Refer to the inverter manual for details.

- Output Frequency
- Output Current
- Output Voltage
- Frequency Setting
- Running Speed (r/min)
- Motor Torque
- Converter Output Voltage
- Regenerative Brake Duty
- Electronic Overcurrent Protection Load Factor
- Output current peak value
- Peak Voltage
- Input Power
- Output Power
- Input Terminal
- Output Terminal
- Load Meter
- Motor Excite Current
- Position Pulse
- Cumulative Energy Time
- Orientation Status
- Actual Operation Time
- Motor Load Factor
- Cumulative Power

Refer to page 21 for more details.

For parameter reading, all standard and special parameters are supported.

All available parameters are readable all the time, regardless of special settings that may be needed to read parameters using the PU or other communications option cards (e.g., PNU 3Dh to 40h and C9h to E6h).

3.6 Operation When an Alarm Occurs.

The following table shows the behavior of the inverter and network when an alarm occurs:

Fault Type	Item	Net	Ext	PU
Inverter (*2)	Inverter Operation	Stop	Stop	Stop
	Network Comm.	Continue	Continue	Continue
PROFIBUS Comm.	Inverter Operation	Stop	Continue	Continue
	Network Comm.	Continue (*1)	Continue (*1)	Continue (*1)

*1 Depends on the type of communication fault.
*2 For examples, E.OP3, E.OC1.

⚠ CAUTION

⚠ **PROFIBUS-DP communication routines should check the " acknowledge bits (PKE-AK) returned by slave device to verify successful transmission of the command and acceptance by slave device. See page 51 for details.**

⚠ **For your safety, the output frequency of the inverter should always be monitored via Profibus. The actual frequency of the inverter should match the frequency setting issued by the master. If the output frequency of the inverter is less than the frequency (RFR) set by the master, a STOP command has been issued.**

4. PROFIBUS DEVICE DATA

The network master's configuration software uses a device data file to identify features and functionality of a PROFIBUS-DP device. The file (named MEAU0865.GSD) is an ASCII file that can be downloaded from the PROFIBUS International web site or obtained from your sales representative. (Refer to page 37.) Comments are not included in the ASCII file itself.

Parameter	Value	Comments
#Profibus_DP		File Header
Vendor_Name	= "Mitsubishi Electric Automation, Inc."	(*3)
Model_Name	= "FR-A5NP"	Inverter Option FR-A5NP
Ident_Number	= 0x0865	= 2149 Decimal
Revision	= "Revision #.##"	See HW & SW Release
Protocol_Ident	= 0	PROFIBUS-DP
Station_Type	= 0	
FMS_Supp	= 0	
Hardware_Release	= "Series **"	
Software Release	= "Revision #.##"	
9.6_supp	= 1	9600 bps supported
19.2_supp	= 1	19.2K bps supported
93.75_supp	= 1	93.75K bps supported
187.5_supp	= 1	187.5K bps supported
500_supp	= 1	500K bps supported
1.5M_supp	= 1	1.5M bps supported
3M_supp	= 1	3M bps supported
6M_supp	= 1	6M bps supported
12M_supp	= 1	12M bps supported
MaxTsdr_9.6	= 60	60 bit times
MaxTsdr_19.2	= 60	60 bit times
MaxTsdr_93.75	= 60	60 bit times
MaxTsdr_187.5	= 60	60 bit times
MaxTsdr_500	= 100	100 bit times
MaxTsdr_1.5M	= 150	150 bit times
MaxTsdr_3M	= 250	250 bit times
MaxTsdr_6M	= 450	450 bit times
MaxTsdr_12M	= 800	800 bit times
Redundancy	= 0	No redundancy
Repeater_Ctrl_Sig	= 2	Ctrl-P is TTL-Level
24V_Pins	= 0	Net 24VDC not connected
Freeze_Mode_supp	= 1	Freeze supported
Sync_Mode_supp	= 1	Sync mode supported

Parameter	Value	Comments
Auto_Baud_supp	= 1	Auto Baud Detect supported
Set_Slave_Add_supp	= 0	Set Slave Address not supported
User_Prm_Data_Len	= 0	No user parameter data
Min_Slave_Interval	= 1	
Modular_Station	= 0	No Modular unit (*1)
Max_Module	= 1	1 ID Byte
Max_Input_Len	= 12	12 Input bytes
Max_Output_Len	= 12	12 Output bytes
Max_Data_Len	= 24	12+12 = 24
Module	= “6 Word Input/6 Word Output” 0x75	Code=117=0x75 for 6w I/O’s (*2)
EndModule		

*1 Some master PLC’s require that Modular_Station=1 &/Min_Slave_Intervall=20.
*2 0x75 = 117: code automatically generated for I/O’s = 6W by COM ET 200.
*3 Some master devices require that vendor_name is at most 10 characters long, please use “Mitsubishi” in that case.

5. INVERTER PROFIBUS DATA WORD DEFINITION

This chapter describes the basic structure of the PROFIBUS-DP data word and how it is implemented within the inverter. For examples of commonly used commands and how they may be implemented, please refer to page 38 in this manual.

(1) This option unit acts as a PROFIBUS-DP slave to a PLC or equivalent controller acting as a PROFIBUS-DP master class 1 on an RS-485 network.
This means that the option unit:

- acknowledges messages received, and
- transmits messages at the request of a network master.

(2) The option unit can also act as a PROFIBUS-DP slave to a PROFIBUS-DP master, which can read the drive's I/O values, as well as configure the drive itself. Please refer to PROFIBUS Specifications.

(3) The option unit cannot send messages on its own, and it has no bus access rights. It also cannot simultaneously act as a slave to network master and as a lead drive (master) to follower drives (slaves).

(4) To provide access to inverter operation data, this option unit uses a manufacturer-specific PROFIBUS Profile (data buffer). This Profile consists of the following 6 words (12 bytes):

Word	Id	Definition
1	PKE	Parameter Number (PNU) and Task or response Id (AK)
2	IND	Parameter Index (category)
3	PWE1	Not used and must be set to 0
4	PWE2	Parameter Value
5	ZSW1	Inverter Status word. Used for slave-to-master messages only. For master-to-slave messages, this word is not used and must be set to 0.
6	HIW	Not used and must be set to 0

REMARKS

Messages from Master to Slave are called Command Requests.
Messages from Slave to Master are called Command Responses.

(5) Some Master devices, such as the Mitsubishi A1SJ71PB92D Programmable Controller will require that this data be sent to the inverter in a “byte-swapped” configuration. In this case, the position of the high-order byte and the low-order byte are switched in the data string.

The FR-A5NP communications buffer memory map is illustrated in the following tables:

	Parameter Id		(PKE)	Word #1
Bit No:	15 12	11	10 0	
	AK	SPM	PNU	

	Parameter Index	(IND)	Word #2
Bit No:	15 8	7 0	
	Index	Value (PP)	

	Parameter Value	(PWE)	
Bit No:	15	0	
	Parameter Value HIGH	(PWE1)	Word #3
	Parameter Value LOW	(PWE2)	Word #4

	Process Data			
Bit No:	15 8	7 0		
	Command Count	Status	(ZSW1)	Word #5
	Reserved	(HIW)		Word #6

AK : Task or Response Id

SPM : Toggle bit for processing the parameter change report. (Not supported, should always be zero.)

PNU : Parameter number

(6) These 6 words (described in following subsections) are how the network master and slave (the option unit) communicate via the PROFIBUS-DP protocol. It is through this addressing scheme that the sender indicates which data word within the drive is being accessed and what that access is.

(7) This option unit does not support any other manufacturer-specific messages/parameters.

5.1 Word 1 (PKE)

Bits	Id	Definition
0-10	PNU	Parameter Number (PNU). Together, the PNU and the IND (word 2 of the PROFIBUS Profile) define which data word is being accessed. Parameters that can be accessed are listed on page 24.
11		Not used and must be set to 0.
12-15	AK	Task or response Id value. For task telegrams from the network master to the slave, i.e. Cmd_Req, the AK can assume the following values: 0h = no task 1h = request parameter value, read 2h = change parameter value (word), write 3h~Fh = not supported For task telegrams from the slave to the network master, i.e. Cmd_Rsp, the AK can assume the following values: 0h = inverter busy. No data returned by inverter 1h = inverter ready to accept data transmission 2h~6h = not supported 7h = task cannot be executed (error number placed in PWE, word 4 of the PROFIBUS Profile) 8h = no operation change rights 9h~Fh = not supported

REMARKS

See page 51 for more information regarding communication coordination.

5.2 Word 2 (IND)

Bits	Id	Definition
0-7	pp	Page Index. Some special parameters require a page Index. If it is not needed it should be set to 0. If IND = 01, for system environment variables, the following cases specify different blocks of SEV's: 0 = sev_I, block I 1 = sev_II, block II, alarm history 2 = sev_III, block III
8-15	IND	Parameter Index. Specifies the area from which the Specific Parameter Number (PNU) is being accessed (see page 21): 0h = real-time monitor area 1h = system environment variable area (3 blocks) 2h = normal parameter area 3h = 900f parameter area 4h = 900% parameter area 6h = Time/Prog Settings (frequency component) 7h = Time/Prog Settings (direction component) 8h = Time/Prog Settings (time component)

5.3 Word 3 (PWE1)

Bits	Id	Definition
0-15	PWE1	Reserved and should be set to 0

5.4 Word 4 (PWE2)

Bits	Id	Definition
0-15	PWE2	Parameter Value. The actual data transferred in a telegram. If a task could not be executed (AK response Id = 7), the PWE indicates the type of error detected: 0h = no error 1h = unsupported task (including busy writing state) 2h = invalid Index (IND) 3h = invalid Parameter Number (PNU) 4h = dual-port read failure 5h = dual-port write failure 6h = invalid page 41h = mode error 42h = instruction code error 43h = data range error

5.5 Word 5 (ZSW1)

For slave-to-master messages. Word 5 of the PROFIBUS Profile is used to pass the inverter status word:

Bits	Definition
0	1 = running (RUN)
1	1 = forward running (FWD)
2	1 = reverse running (REV)
3	1 = up to frequency (SU)
4	1 = overload (OL)
5	1 = instantaneous power failure (IPF)
6	1 = frequency detection (FU)
7	1 = alarm (ABC)
8-14	Command count. The command count is an optional feature maintained by the PROFIBUS master and can range from 00H-7FH. The option unit copies the command count from the command it receives to the same byte offset in the response it sends. The master may use this to synchronize commands and responses.
15	Reserved, must be 0.

REMARKS

For master-to-slave messages, Bits 0-7 are not used and must be set to 0. The bit-wise data here do not reflect Pr. 190 to Pr. 195.

5.6 Word 6 (HIW)

Bits	Id	Definition
0-15	HIW	Reserved and should be set to 0

6. PARAMETER DEFINITIONS

6.1 IND = 0000h, Real-Time Monitor Area

PNU	Definition	Minimum Setting Increments	
		A500/F500	A500L/F500L
0h	Output frequency	0.01Hz	0.01Hz
1h	Output Current	0.01A	0.1A
2h	Output Voltage	0.1V	0.1V
4h	Frequency Setting	0.01Hz	0.01Hz
5h	Running Speed	1 r/min	1 r/min
6h	Motor Torque (0.1%)	0.01%	0.01%
7h	Converter Output Voltage	0.1V	0.1V
8h	Regenerative Brake Duty	0.1%	0.1%
9h	Electronic Overcurrent Protection Load Factor	0.1%	0.1%
Ah	Output Current Peak Value	0.01A	0.1A
Bh	Peak Voltage	0.1V	0.1V
Ch	Input Power	0.01kW	0.1kW
Dh	Output Power	0.01kW	0.1kW
Eh	Input Terminal (*1)		
Fh	Output Terminal (*2)		
10h	Load Meter		
11h	Motor Excite Current	0.01A	0.1A
12h	Position Pulse		
13h	Cumulative Energy Time	1 h	1 h
15h	Orientation Status		
16h	Actual Operation Time	1 h	1 h
17h	Motor Load Factor	0.1%	0.1%
18h	Cumulative Power	1kWh	1kWh

*1 Bit-Map for PNU = Eh Input Terminal Monitor:

15-12	11	10	9	8	7	6	5	4	3	2	1	0
0	CS	RES	STOP	MRS	JOG	RH	RM	RL	RT	AU	STR	STF

*2 Bit-Map for PNU = Fh Output Terminal Monitor:

15-6	5	4	3	2	1	0
0	Relay	FU	OL	IPF	SU	RUN

The bit-wise data here reflect Pr.190 to Pr.195. If the assignments for the terminals are changed, the bit-map may not be the same.

6.2 IND = 01pph, System Environment Variable Area

6.2.1 IND = 0100h, pp = 00, SEV_I, Block I, SEV Interface

PNU		Definition
0h		UsrClrValSet
1h		WO:Inverter Reset
2h		WO:PrClr, WriteVal = 965Ah
3h		WO:PrAllClr, WriteVal = 99AAh
4h		WO:PrUsrClr, WriteVal = 5A55h
5h		WO:PrClr (*4), WrtieVal = 5A96h
6h		WO:PrAllClr (*4), WriteVal = AA99h
7h		WO:PrUsrClr (*4), WriteVal = 555Ah
Ah	BIT 0 1 2 3 4 5 6 7 8 9 10 11-15	Inverter Status/CtrlInpCmd, WriteVal = XXh Inverter Status_ Word, see page 20 for details Ctrl_Inp_Cmd_ Word (*1) Reserved. Must be set to 0 1 = STF 1 = STR 1 = RH 1 = RM 1 = RL 1 = JOG 1 = RT 1 = AU 1 = CS 1 = MRS Not used and always set to 0 See page 38 for examples.
Bh		OpMode/InverterConfig(Ext10h/Net14h), WriteVal = 1Xh
Dh		Running frequency (RAM) (*2)
Eh		WO:Running frequency (E^2PROM) (*2 & 3)

WO: Write only, No Read.

*1 Bits 3, 4, 5, 6, 7, 8, and 9 can also be accessed from Pr 182, 181, 180, 185, 183, 184, and 186 respectively.

*2 Writing to Pnu=Dh or Pnu=Eh can be read out from Pnu=Dh.

*3 Due to the data write operation limits inherent to E^2PROM, it is recommended that running frequency be written to RAM whenever possible.

*4 Communication parameters (Pr. 117 to Pr. 124, Pr. 331 to Pr. 342) are not cleared.

6.2.2 IND = 0101h, pp = 01, SEV_II, Block II, Alarm History

PNU	Definition
0h	Alarm 1 (*1)
1h	Alarm 2
2h	Alarm 3
3h	Alarm 4
4h	Alarm 5
5h	Alarm 6
6h	Alarm 7
7h	Alarm 8

*1 Writing a value of 0000h to this parameter resets alarm history buffer for all alarms. All other parameters at this index are read only.

Read value and alarm definitions

#	Definition	#	Definition	#	Definition	#	Definition
10h	OC1	80h	GF	D1h	OSd	F3h	E3
11h	OC2	81h	LF	D2h	ECT	F4h	E4
12h	OC3	90h	OHT	D3h	Od	F5h	E5
20h	OV1	A0h	OPT	D4h	ECA	F6h	E6
21h	OV2	A1h	OP1	D5h	Mb1	F7h	E7
22h	OV3	A2h	OP2	D6h	Mb2	F8h	E8
30h	THT	A3h	OP3	D7h	Mb3	F9h	E9
31h	THM	B0h	PE	D8h	Mb4	FAh	E10
40h	FIN	B1h	PUE	D9h	Mb5	FBh	E11
41h	FAN	B2h	RET	DAh	Mb6	FCh	E12
50h	IPF	C0h	CPU	DBh	Mb7	FDh	E13
51h	UVT	C1h	CTE	F0h	E0	FEh	E14
60h	OLT	C2h	P24	F1h	E1	FFh	E15
70h	BE	D0h	OS	F2h	E2		

REMARKS

1. Refer to inverter Instruction Manual for details of alarm definitions.
2. Alarm # FFh / Code E15 is valid for FR-A500L only.

6.3 IND = 0200h, Normal Parameter Area

Parameter definition differs according to the inverter. Refer to the inverter manual for details of parameter definition, setting range, or the like.

Parameter	PNU	Definition
Pr0	0h	Torque Boost (Manual)
Pr1	1h	Max frequency Limit
Pr2	2h	Min frequency Limit
Pr3	3h	Base frequency Limit
Pr4	4h	MultiSpeed Set (HiSpeed)
Pr5	5h	MultiSpeed Set (MiSpeed)
Pr6	6h	MultiSpeed Set (LoSpeed)
Pr7	7h	Acc t
Pr8	8h	Dec t
Pr9	9h	Electr Therml O/L Relay
Pr10	Ah	DC Inj Brake Op f
Pr11	Bh	DC Inj Brake Op t
Pr12	Ch	DC Inj Brake V
Pr13	Dh	Startg frequency
Pr14	Eh	Applied Load Pattern
Pr15	Fh	Jog frequency
Pr16	10h	Jog Acc/Dec t
Pr17	11h	MRS Input Selection
Pr18	12h	HiSpeed Max frequency Limit
Pr19	13h	Base frequency V
Pr20	14h	Acc/Dec Ref frequency
Pr21	15h	Acc/Dec time Increments
Pr22	16h	Pr22 Stall Prevention Op Level
Pr23	17h	Stall Prevention Op Level At DoubleSpeed
Pr24	18h	MultiSpeed Set (Speed4)
Pr25	19h	MultiSpeed Set (Speed5)
Pr26	1Ah	MultiSpeed Set (Speed6)
Pr27	1Bh	MultiSpeed Set (Speed7)
Pr28	1Ch	MultiSpeed Input Compensation
Pr29	1Dh	Acc/Dec Pattern
Pr30	1Eh	Regen Brake Duty Change
Pr31	1Fh	Frequency Jump 1A
Pr32	20h	Frequency Jump 1B
Pr33	21h	Frequency Jump 2A
Pr34	22h	Frequency Jump 2B
Pr35	23h	Frequency Jump 3A
Pr36	24h	Frequency Jump 3B
Pr37	25h	Speed Display
Pr38	26h	Special
Pr39	27h	Special
Pr40	28h	Special
Pr41	29h	Up-To- Frequency Sensitivity
Pr42	2Ah	Output Frequency Detection
Pr43	2Bh	Output Frequency Detection At REV rotation
Pr44	2Ch	2nd Acc/Dec time

Parameter	PNU	Definition
Pr45	2Dh	2nd Dec time
Pr46	2Eh	2nd Torque Boost
Pr47	2Fh	2nd V/F (Base frequency)
Pr48	30h	2nd Stall Prevention Op I
Pr49	31h	2nd Stall Prevention Op frequency
Pr50	32h	2nd Outp frequency Detection
Pr51	33h	Special
Pr52	34h	PU Main Display Data Selection
Pr53	35h	PU Level Display Data Selection
Pr54	36h	FM Termnl Func Selection
Pr55	37h	frequency Monitoring Ref
Pr56	38h	Current Monitorg Ref
Pr57	39h	Restart Coasting Time
Pr58	3Ah	Restart Cushion Time
Pr59	3Bh	Remote Setting Function Selection
Pr60	3Ch	Intellgent Mode Selection
Pr61	3Dh	Ref Current For Intellgent Mode
Pr62	3Eh	Ref Current For Intellgent Mode Acc
Pr63	3Fh	Ref Current For Intellgent Mode Dec
Pr64	40h	Starting frequency For Elevator Mode
Pr65	41h	Retry Selection
Pr66	42h	Stall Prevention Op Reduction Starting frequency
Pr67	43h	No. Of Retries At Alarm Occur
Pr68	44h	Retry Waiting Time
Pr69	45h	Retry Count Display Erasure
Pr70	46h	Special Regen Brake Duty
Pr71	47h	Applied Motor
Pr72	48h	PWM Frequency Selection
Pr73	49h	0 to 5V, 0 to 10V Selection
Pr74	4Ah	Response Time For Analog Signal
Pr75	4Bh	Reset/Disconnectd PU Detection/PU Stop Selection
Pr76	4Ch	Alarm Code Output Selection
Pr77	4Dh	Pr Write Disable Selection
Pr78	4Eh	REV Rotation Prevention Selection
Pr79	4Fh	Operating Mode Selection
Pr80	50h	Motor Capacity
Pr81	51h	No. Of Motor Poles
Pr82	52h	Excitation Current
Pr83	53h	Rated Motor Voltage
Pr84	54h	Rated Motor Frequency
Pr85	55h	Special
Pr86	56h	Special
Pr87	57h	Special
Pr88	58h	Special
Pr89	59h	Speed Control Gain
Pr90	5Ah	Motor Constant R1
Pr91	5Bh	Motor Constant R2
Pr92	5Ch	Motor Constant L1
Pr93	5Dh	Motor Constant L2

Parameter	PNU	Definition
Pr94	5Eh	Motor Constant X
Pr95	5Fh	Online Auto Tuning
Pr96	60h	Autotuning Set/State
Pr97	61h	Special
Pr98	62h	Special
Pr99	63h	Special
Pr100	64h	V/F 1 (1st Frequency)
Pr101	65h	V/F 1 (1st Frequency Voltage)
Pr102	66h	V/F 2 (2nd Frequency)
Pr103	67h	V/F 2 (2nd Frequency Voltage)
Pr104	68h	V/F 3 (3rd Frequency)
Pr105	69h	V/F 3 (3rd Frequency Voltage)
Pr106	6Ah	V/F 4 (4th Frequency)
Pr107	6Bh	V/F 4 (4th Frequency Voltage)
Pr108	6Ch	V/F 5 (5th Frequency)
Pr109	6Dh	V/F 5 (5th Frequency Voltage)
Pr110	6Eh	3rd Acc/Dec Time
Pr111	6Fh	3rd Dec Time
Pr112	70h	3rd Torque Boost
Pr113	71h	3rd V/F (Base Frequency)
Pr114	72h	3rd Stall Prevention Op Current
Pr115	73h	3rd Stall Preventn Op Frequency
Pr116	74h	3rd Outp Frequency Detection
Pr117	75h	Station No.
Pr118	76h	Comms Speed
Pr119	77h	Stop Bit Length
Pr120	78h	Parity Check Presence / Absence
Pr121	79h	No. Of Comms Retries
Pr122	7Ah	Comms Chk Time Interval
Pr123	7Bh	Waiting Time Setting
Pr124	7Ch	CR,LF Presence/Absence Selection
Pr125	7Dh	Special
Pr126	7Eh	Special
Pr127	7Fh	Special
Pr128	80h	PID Actn Selection
Pr129	81h	PID Proportionl Band
Pr130	82h	PID Integral Time
Pr131	83h	PID Upper Limit
Pr132	84h	PID Lower Limit
Pr133	85h	PID Actn Set Point For PU Op
Pr134	86h	PID Differentl Time
Pr135	87h	CPS-INV Switch-Over Sequence Output terminal Selection
Pr136	88h	MC Switch-Over Interlock Time
Pr137	89h	Starting Waiting Time
Pr138	8Ah	CPS-INV Switch-Over Selection at Alarm Occur
Pr139	8Bh	Auto INV-CPS Switch-Over Frequency
Pr140	8Ch	Backlash Acc Stopping Frequency
Pr141	8Dh	Backlash Acc Stopping Time
Pr142	8Eh	Backlash Dec Stopping Frequency

Parameter	PNU	Definition
Pr143	8Fh	Backlash Dec Stopping Time
Pr144	90h	Speed Setting Switch-Over
Pr145	91h	PU Language Switch
Pr146	92h	Special
Pr147	93h	Special
Pr148	94h	Stall Prevention Level At 0V Input
Pr149	95h	Stall Prevention Level At 10V Input
Pr150	96h	Output Current Detection Level
Pr151	97h	Output Current Detection Period
Pr152	98h	0-I Detection Level
Pr153	99h	0-I Detection Period
Pr154	9Ah	Voltage Reduction Selection During Stall Prevention Op
Pr155	9Bh	RT Activatd Condition
Pr156	9Ch	Stall Prevention Op Selection
Pr157	9Dh	OL Signal Waiting Timet
Pr158	9Eh	AM Terminal Funtion Selection
Pr159	9Fh	Special
Pr160	A0h	Usr Group Read Selection
Pr161	A1h	Special
Pr162	A2h	Auto Restart After IPF Selection
Pr163	A3h	1st Cushion Time For Restart
Pr164	A4h	1st Cushion Voltage For Restart
Pr165	A5h	Restart Stall Prevention Op Level
Pr166	A6h	Special
Pr167	A7h	Special
Pr168	A8h	Special
Pr169	A9h	Special
Pr170	AAh	Watt-Hr Meter Clear
Pr171	ABh	Actl Op Hr Meter Clear
Pr172	ACh	Special
Pr173	ADh	Usr Group 1
Pr174	AEh	Usr Group 1 Deletn
Pr175	AFh	Usr Group 2
Pr176	B0h	Usr Group 2 Deletn
Pr177	B1h	Special
Pr178	B2h	Special
Pr179	B3h	Special
Pr180	B4h	RL Termnl Funct Select
Pr181	B5h	RM Termnl Func Selectn
Pr182	B6h	RH Termnl Func Select
Pr183	B7h	RT Termnl Func Select
Pr184	B8h	AU Termnl Func Select
Pr185	B9h	JOG Termnl Func Select
Pr186	BAh	CS Termnl Func Select
Pr187	BBh	Special
Pr188	BCh	Special
Pr189	BDh	Special
Pr190	BEh	RUN Termnl Func Select
Pr191	BFh	SU Termnl Func Select

Parameter	PNU	Definition
Pr192	C0h	IPF Termnl Func Select
Pr193	C1h	OL Termnl Func Select
Pr194	C2h	FU Termnl Func Select
Pr195	C3h	ABC Termnl Func Select
Pr196	C4h	Special
Pr197	C5h	Special
Pr198	C6h	Special
Pr199	C7h	Usrs Initl Val Sett
Pr232	E8h	MultiSpd Sett (Spd8)
Pr233	E9h	MultiSpd Sett (Spd9)
Pr234	EAh	MultiSpd Sett (Spd10)
Pr235	EBh	MultiSpd Sett (Spd11)
Pr236	ECh	MultiSpd Sett (Spd12)
Pr237	EDh	MultiSpd Sett (Spd13)
Pr238	EEh	MultiSpd Sett (Spd14)
Pr239	EFh	MultiSpd Sett (Spd15)
Pr240	F0h	Special
Pr241	F1h	Special
Pr242	F2h	Special
Pr243	F3h	Special
Pr244	F4h	Special
Pr245	F5h	Special
Pr246	F6h	Special
Pr247	F7h	Special
Pr248	F8h	Special
Pr249	F9h	Special
Pr250	FAh	Special
Pr251	FBh	Special
Pr252	FCh	Special
Pr253	FDh	Special
Pr254	FEh	Special
Pr255	FFh	Special
Pr256	100h	Special
Pr257	101h	Special
Pr258	102h	Special
Pr259	103h	Special
Pr260	104h	Special
Pr261	105h	Power Failure Stop Func
Pr262	106h	Subtracted Frequency At Dec Start
Pr263	107h	Subtractn Starting Frequency
Pr264	108h	Power-Failure Dec Time 1
Pr265	109h	Power Failure Dec Time 2
Pr266	10Ah	Power Failure Dec Time Swc-Over f
Pr267	10Bh	Special
Pr268	10Ch	Special
Pr269	10Dh	Special
Pr270	10Eh	Stop-On-Contact/Load Torque HiSpeed Ctrl Selectn
Pr271	10Fh	HiSpeed Sett Max Current
Pr272	110h	HiSpeed Sett Min Current

Parameter	PNU	Definition
Pr273	111h	Current Avg Range
Pr274	112h	Current Avg Filter Constant
Pr275	113h	Stop-On-Contact Excitg Current LoSpeed Multiplier Factor
Pr276	114h	Stop-On-Contact PWM Carrier Frequency
Pr277	115h	Special
Pr278	116h	Brake Openg Frequency
Pr279	117h	Brake Openg Current
Pr280	118h	Brake Openg Current Detect Time
Pr281	119h	Brake Op Time At Start
Pr282	11Ah	Brake Closg Frequency
Pr293	11Bh	Brake Op Time At Stop
Pr284	11Ch	Dec Detectn Func Selectn
Pr285	11Dh	Overspd Detectn Frequency
Pr330	11Eh	Special
Pr331	11Fh	Special
Pr332	120h	Special
Pr333	121h	Special
Pr334	122h	Special
Pr335	123h	Special
Pr336	124h	Special
Pr337	125h	Special
Pr338	126h	Op Cmd Source
Pr339	127h	Spd Cmd Source
Pr340	128h	Link Startup Mode Selectn
Pr341	129h	Special
Pr342	12Ah	Special
Pr360	13Ch	Special
Pr361	13Dh	Special
Pr362	13Eh	Special
Pr363	13Fh	Special
Pr364	140h	Special
Pr365	141h	Special
Pr366	142h	Special
Pr367	143h	Special
Pr368	144h	Special

REMARKS

1. When setting parameters from the network, set 65520 (FFF0h) as "8888" and 65535 (FFFFh) as "9999".
2. Write to Pr. 77 and Pr. 79 is not allowed from the network with the FR-A5NP. (Read is allowed.)

R-A5AP Parameter List
IND=0200h, Normal Parameter Area

Refer to the FR-A5AP manual for details of parameter definition, setting range, or the like.

Parameter	PNU	Definition
350	306	Stop position command selection
351	307	Orientation speed
352	308	Creep speed
353	309	Creep select position
354	310	Position loop select position
355	311	DC dynamic braking start position
356	312	Internal stop position command
357	313	In-position zone
358	314	Servo torque selection
359	315	PLG rotation direction
360	316	12-bit data selection
361	317	Position shift
362	318	Position loop gain
363	319	In-position signal output delay time
364	320	PLG stop check time
365	321	Orientation time limit
366	322	Recheck time
367	323	Speed feedback range
368	324	Feedback gain
369	325	PLG pulse count
370	326	Control mode selection
371	343	Torque characteristic selection
372	344	Speed control P gain
373	345	Speed control I gain
374	346	Overspeed detection level
375	347	Servo lock gain
376	348	-
377	349	-
378	350	-
379	351	-
380	352	Acceleration S pattern 1
381	353	Deceleration S pattern 1
382	354	Acceleration S pattern 2
383	355	Deceleration S pattern 2
384	356	Input pulse frequency division ratio
385	357	Zero-input pulse frequency
386	358	Maximum-input pulse frequency

REMARKS

*1 When setting parameters from the network, set 65520 (FFF0h) as "8888" and 65535 (FFFFh) as "9999".
*2 For parameter details, refer to the FR-A5AP instruction manual.

6.4 IND = 0300h, 900f Parameter Area

Parameter	PNU	Definition
Pr900	147h	FM Terminal Calibration
Pr901	148h	AM Terminal Calibration
Pr902f	149h	Frequency Setting Voltage Bias, Frequency Component (f)
Pr903f	14Ah	Frequency Setting Voltage Gain, Frequency Component (f)
Pr904f	14Bh	Frequency Setting Current Bias, Frequency Component (f)
Pr905f	14Ch	Frequency Setting Current Gain, Frequency Component (f)

6.5 IND = 0400h, 900% Parameter Area

Parameter	PNU	Definition
Pr902%	2h	Frequency Setting Voltage Bias, Percent Of Full Scale (%)
Pr903%	3h	Frequency Setting Voltage Gain, Percent Of Full Scale (%)
Pr904%	4h	Frequency Setting Current Bias, Percent Of Full Scale (%)
Pr905%	5h	Frequency Setting Current Gain, Percent Of Full Scale (%)

6.6 Time/Program Settings: Frequency (f) Components (IND = 0600h)

Parameter	PNU	Definition
Pr201f	0h	Program Setting 1 (Frequency)
Pr202f	1h	Program Setting 2 (Frequency)
Pr203f	2h	Program Setting 3 (Frequency)
Pr204f	3h	Program Setting 4 (Frequency)
Pr205f	4h	Program Setting 5 (Frequency)
Pr206f	5h	Program Setting 6 (Frequency)
Pr207f	6h	Program Setting 7 (Frequency)
Pr208f	7h	Program Setting 8 (Frequency)
Pr209f	8h	Program Setting 9 (Frequency)
Pr210f	9h	Program Setting 10 (Frequency)
Pr211f	Ah	Program Setting 11 (Frequency)
Pr212f	Bh	Program Setting 12 (Frequency)
Pr213f	Ch	Program Setting 13 (Frequency)
Pr214f	Dh	Program Setting 14 (Frequency)
Pr215f	Eh	Program Setting 15 (Frequency)
Pr216f	Fh	Program Setting 16 (Frequency)
Pr217f	10h	Program Setting 17 (Frequency)
Pr218f	11h	Program Setting 18 (Frequency)
Pr219f	12h	Program Setting 19 (Frequency)
Pr220f	13h	Program Setting 20 (Frequency)
Prr21f	14h	Program Setting 21 (Frequency)
Pr222f	15h	Program Setting 22 (Frequency)
Pr223f	16h	Program Setting 23 (Frequency)
Pr224f	17h	Program Setting 24 (Frequency)
Pr225f	18h	Program Setting 25 (Frequency)
Pr226f	19h	Program Setting 26 (Frequency)
Pr227f	1Ah	Program Setting 27 (Frequency)
Pr228f	1Bh	Program Setting 28 (Frequency)
Pr229f	1Ch	Program Setting 29 (Frequency)
Pr230f	1Dh	Program Setting 30 (Frequency)

REMARKS

The minimal increment is 0.1Hz for all entries.
Pr201f to Pr230f range from 0 to 400, or 9999

6.7 Time/Program Settings: Motor Run Direction (D) Components (IND = 0700h)

Parameter	PNU	Definition
Pr201D	0h	Program Setting 1 (Direction)
Pr202D	1h	Program Setting 2 (Direction)
Pr203D	2h	Program Setting 3 (Direction)
Pr204D	3h	Program Setting 4 (Direction)
Pr205D	4h	Program Setting 5 (Direction)
Pr206D	5h	Program Setting 6 (Direction)
Pr207D	6h	Program Setting 7 (Direction)
Pr208D	7h	Program Setting 8 (Direction)
Pr209D	8h	Program Setting 9 (Direction)
Pr210D	9h	Program Setting 10 (Direction)
Pr211D	Ah	Program Setting 11 (Direction)
Pr212D	Bh	Program Setting 12 (Direction)
Pr213D	Ch	Program Setting 13 (Direction)
Pr214D	Dh	Program Setting 14 (Direction)
Pr215D	Eh	Program Setting 15 (Direction)
Pr216D	Fh	Program Setting 16 (Direction)
Pr217D	10h	Program Setting 17 (Direction)
Pr218D	11h	Program Setting 18 (Direction)
Pr219D	12h	Program Setting 19 (Direction)
Pr220D	13h	Program Setting 20 (Direction)
Pr221D	14h	Program Setting 21 (Direction)
Pr222D	15h	Program Setting 22 (Direction)
Pr223D	16h	Program Setting 23 (Direction)
Pr224D	17h	Program Setting 24 (Direction)
Pr225D	18h	Program Setting 25 (Direction)
Pr226D	19h	Program Setting 26 (Direction)
Pr227D	1Ah	Program Setting 27 (Direction)
Pr228D	1Bh	Program Setting 28 (Direction)
Pr229D	1Ch	Program Setting 29 (Direction)
Pr230D	1Dh	Program Setting 30 (Direction)

REMARKS

The minimal increment is 1 decimal
For Pr201d to Pr230d: 0 = STOP, 1 = Forward Rotation, and 3 = Reverse

6.8 Time/Prog Settings Time (t) Components (IND = 0800h)

Please refer to FR-A500(L) inverter manuals for further information

Parameter	PNU	Definition
Pr200	C8h	Program Min/Sec Select
Pr201t	C9h	Program Setting 1 (Time)
Pr202t	CAh	Program Setting 2 (Time)
Pr203t	CBh	Program Setting 3 (Time)
Pr204t	CCh	Program Setting 4 (Time)
Pr205t	CDh	Program Setting 5 (Time)
Pr206t	CEh	Program Setting 6 (Time)
Pr207t	CFh	Program Setting 7 (Time)
Pr208t	D0h	Program Setting 8 (Time)
Pr209t	D1h	Program Setting 9 (Time)
Pr210t	D2h	Program Setting 10 (Time)
Pr211t	D3h	Program Setting 11 (Time)
Pr212t	D4h	Program Setting 12 (Time)
Pr213t	D5h	Program Setting 13 (Time)
Pr214t	D6h	Program Setting 14 (Time)
Pr215t	D7h	Program Setting 15 (Time)
Pr216t	D8h	Program Setting 16 (Time)
Pr217t	D9h	Program Setting 17 (Time)
Pr218t	DAh	Program Setting 18 (Time)
Pr219t	DBh	Program Setting 19 (Time)
Pr220t	DCh	Program Setting 20 (Time)
Pr221t	DDh	Program Setting 21 (Time)
Pr222t	DEh	Program Setting 22 (Time)
Pr223t	DFh	Program Setting 23 (Time)
Pr224t	E1h	Program Setting 24 (Time)
Pr225t	E2h	Program Setting 25 (Time)
Pr226t	E3h	Program Setting 26 (Time)
Pr227t	E4h	Program Setting 27 (Time)
Pr228t	E5h	Program Setting 28 (Time)
Pr229t	E6h	Program Setting 29 (Time)
Pr230t	E7h	Program Setting 30 (Time)
Pr231	E8h	Program Setting 31 (Time)

REMARKS

The minimal increment is 1 decimal
Pr200, Pr201t to Pr230t, and Pr231 range from 0 to 9959

7. TROUBLESHOOTING

If a fault occurs and the inverter fails to operate properly, locate the cause of the fault and take proper corrective action by referring to the troubleshooting below. If the corresponding information is not found in the table, the inverter has problem, or the component parts are damaged, contact the nearest service representative.

7.1 Inspecting Display On Parameter Unit And Status LED On A5NP

Inverter Display	LED on A5NP	Possible Causes	Corrective Actions
0.00	Off	FR-A5NP option module not functioning	Check proper installation of option module. Refer to page 3.
			Reset inverter / option module by cycling power to inverter
			Reset inverter to factory default settings via AllPrClr function and cycle power to inverter
		Network integrity compromised	Verify proper network cable connection
			Check network cable terminations
			Verify network configuration using PROFIBUS-DP network configuration software tool such as Mitsubishi MELSEC Profimap
			Check for network errors on other nodes
			Verify network cable continuity between nodes
		Network Master does not exist or is malfunctioning	Verify connection and operation of PROFIBUS-DP Master
E.XXX	Off/On	Inverter is in fault mode-check inverter display	Refer to the Troubleshooting section in the inverter manual.

In response to the occurrence of a fault, the display unit of the inverter automatically displays the code of the detected fault and the Status LED on A5NP shows the status of the detected fault.

8. SPECIFICATIONS

(1) Current Consumption	From inverter drive: • 300 mA typ. @5 Vdc • 15 mA typ. @24 Vdc unloaded • 55 mA typ. @24 Vdc with 130 mA Load off +5 Vdc source to network Provided to PROFIBUS network: • 100 mA @5 Vdc
(2) Backplane Isolation	• 500 Vdc min.
(3) Supported Data Rates	• ← 1200 m: 9,600 bps; 19,200 bps; 93,750 bps • ← 600 m: 187,500 bps • ← 200 m: 500,000 bps; 1,500,000 bps • ←100 m: 3,000,000 bps; 6,000,000 bps; 12,000,000 bps
(4) Operating Temperature	• -10 to 60°C
(5) Storage Temperature	• -20 to 65°C
(6) Relative Humidity	• ← 90% @60°C, non-condensing
(7) Dimension	• 96 x 49 x 33 mm

Appendix. A Instruction For MEAU0865.GSD

MEAU0865.GSD package:

This package contains a Device Data Base(GSD) file for use with various PROFIBUS network configuration software tools such as MELSEC Profimap. It allows the user to configure their PROFIBUS-DP master to communicate with the inverter drive via the FR-A5NP option. The purpose of the MEAU0865.GSD is to provide information on an external disk about configurable attributes and functionality for a PROFIBUS-DP device. The GSD file MEAU0865.GSD may only be used with Mitsubishi FR-A500(L)/ F500(L) inverter models.

MELSEC ProfiMap software is a product of Mitsubishi Electric Corp. that serves as a central point for configuring and managing devices and monitoring device diagnostics.

Contact your Mitsubishi sales representative for more details. Please refer to the manual of the PROFIBUS-DP configuration software tool for instructions on the installation of the Mitsubishi GSD file.

The file MEAU0865.GSD may be purchased on floppy disk from your authorized Mitsubishi distributor. The file is also available for download, free of charge from the PROFIBUS Trade Organization web site:

http://www.profibus.com

REMARKS

ISP charges and connect time fees may apply.

Appendix. B Commonly used PROFIBUS-DP commands

The inverter can easily be controlled and monitored using a PROFIBUS-DP master. The controller sends a 6 word message string to the inverter. The inverter will respond to each message with a 6 word string. Depending on the command sent, the inverter will respond with either a AK (word #1) and inverter status (word #5) or AK (word #1), response to message (word #4 - i.e. output current) and inverter status (word #5).

To enable PROFIBUS-DP communication with the inverter, no parameter needs to be set, however, the first 6 word message sent from the controller must be the command to switch the inverter to NETWORK (NET) mode. Failure to do so will prevent communication between the inverter and the network master.

The following examples show how common messages are constructed. Please be aware that some PROFIBUS-DP masters or Programmable Logic Controllers (PLC) use high byte / low byte swapping when sending and receiving messages.

Mitsubishi's A1SJ71PB92D is an example that does implement byte swapping. Care must be taken when constructing and reading messages. These examples show constructed messages with and without byte swapping.

Parameter Id		(PKE)	
15 12	11	10 0	Bit No:
AK	SPM	PNU	

Parameter Index (IND)		
15 8	7 0	Bit No:
Page Index	Parameter Value	

Parameter Value (PWE)	
15 0	Bit No:
Parameter Value HIGH (PWE1)	Word #3
Parameter Value LOW (PWE2)	Word #4

Process Data		
15 8	7 0	Bit No:
Command Count	Status (ZSW1)	Word #5
Reserved (HIW)		Word #6

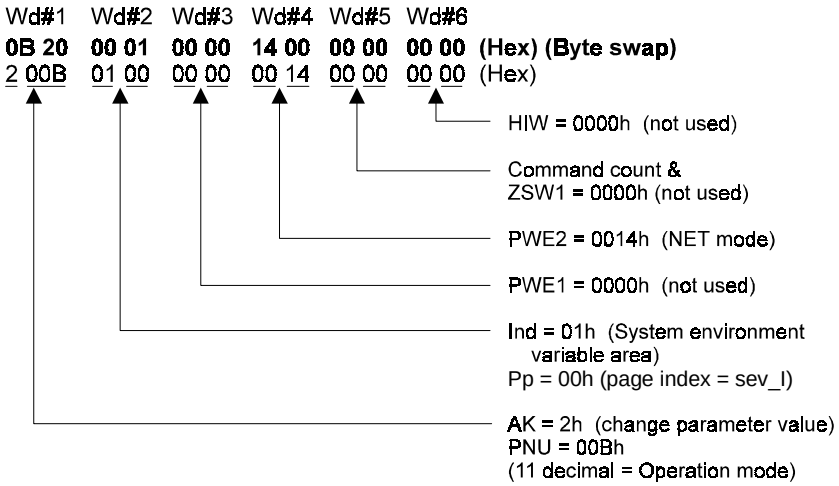
AK: Task or Response Id
SPM: Toggle bit for processing the parameter change report. (Not supported, should always be zero.)
PNU: Parameter Number

1. Set inverter to NET Mode

REMARKS

Bold indicates byte swapping code required for ladder logic using AISJ71PB92 module.

A) Set inverter to Net Mode:

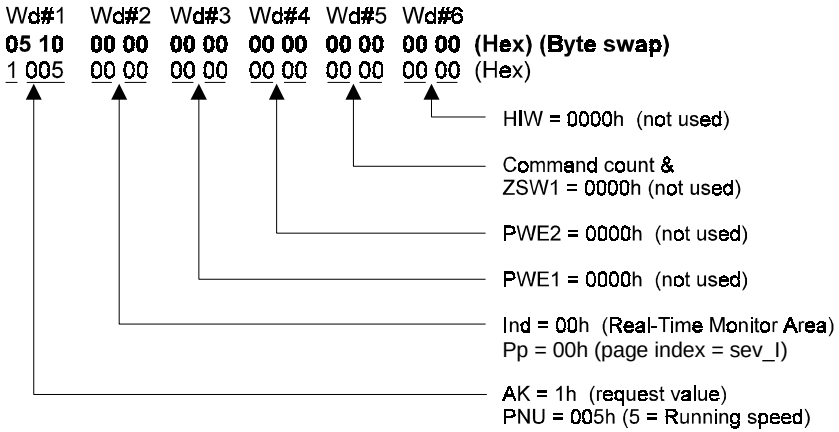


2. Real-Time Monitor

REMARKS

Bold indicates byte swapping code required for ladder logic using AISJ71PB92 module.

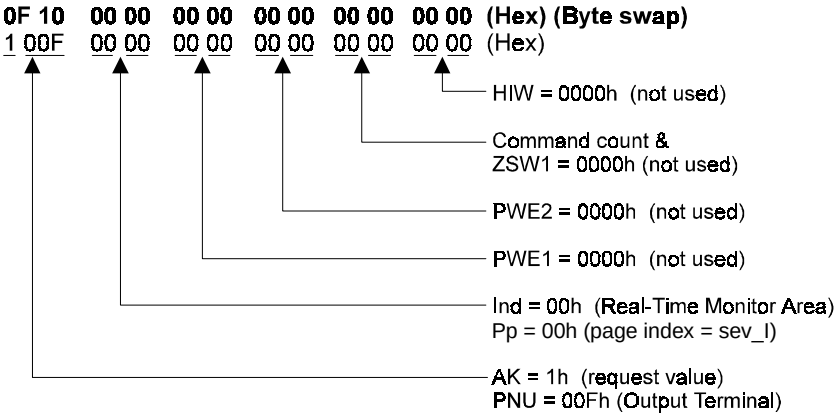
A) Set to read Running Speed:



Returned value will be in Hex located in WORD #4 and byte swapped.

Example: Return value = 0807h
Byte swap = 0708h
0708h = 1800 decimal (r/min)

B) Set to read Output Status:

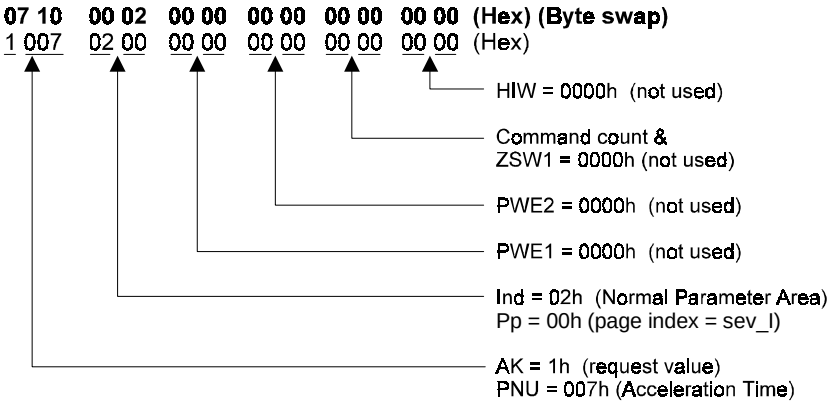


15...6	5	4	3	2	1	0
Not used	Relay	FU	OL	IPF	SU	RUN
0	0	1	0	0	1	1

Returned value will be in Hex located in WORD #4 and byte swapped.

Example: Return value = 1300h
Byte swap = 0013h RUN=ON, SU=ON, FU=ON

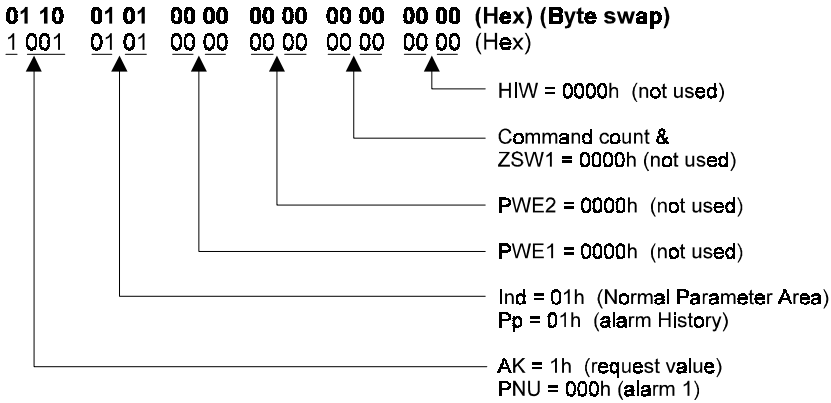
C) Set to read Acceleration Time (Pr. 7):



Returned value will be in Hex located in WORD #4 and byte swapped.

Example: Return value = 3200h (0032h byte swapped), which is 500 decimal or 5.00s (scaling for acceleraton time is 0.01s) 0032h = 5.0s (decimal) (note: scaling for acceleration time is in 0.1s)

D) Set to read Alarm History:



Returned value will be in Hex located in WORD #4 and byte swapped.

Example: Return value = A300h = OP3 ALARM (00A3 byte swapped)

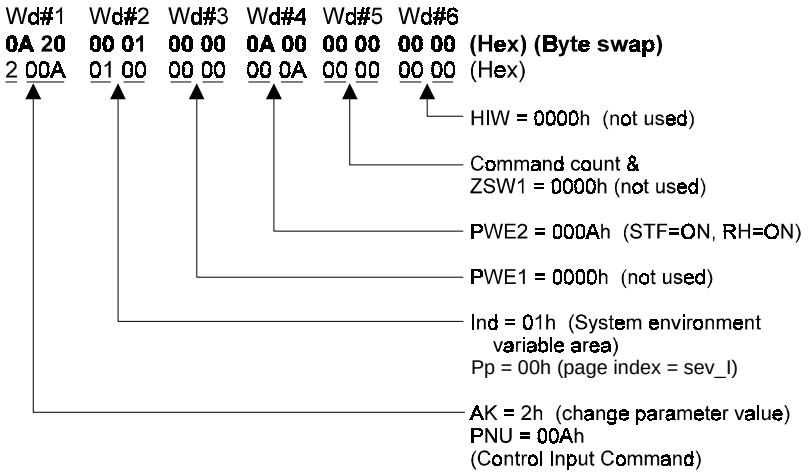
See page 23 for error code descriptions.

3. Operation Command

REMARKS

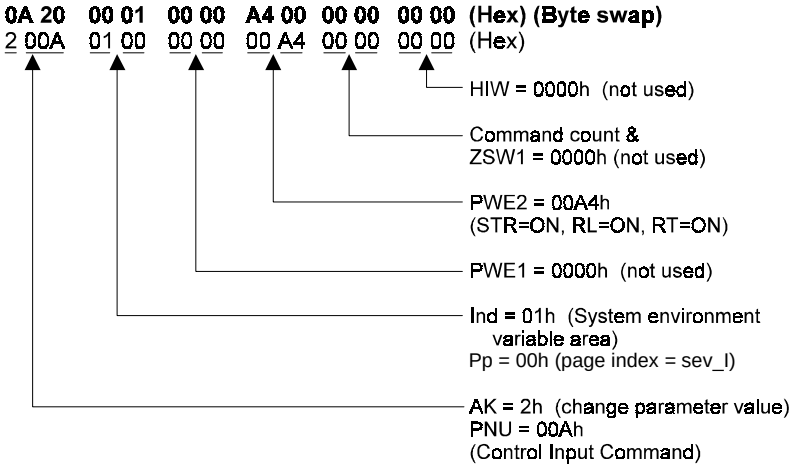
Bold indicates byte swapping code required for ladder logic using AISJ71PB92 module.

A) High speed forward running (STF, RH):



Not used					MRS	CS	AU	RT	JOG	RL	RM	RH	STR	STF	Not used	Description
0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0=off, 1=on
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Bit #2
0					0			0				A				Hex Code

B) Low speed reverse rotation using the second acceleration/deceleration (STR, RL, RT):



Not used					MRS	CS	AU	RT	JOG	RL	RM	RH	STR	STF	Not used	Description
0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0=off, 1=on
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Bit #2
0				0				A				4				Hex Code

C) Forward at Middle Speed:

0A 20 00 01 00 00 12 00 00 00 00 00 (Hex) (Byte swap)
2 00A 01 00 00 00 00 12 00 00 00 00 (Hex)

D) Forward at Low Speed:

0A 20 00 01 00 00 22 00 00 00 00 00 (Hex) (Byte swap)
2 00A 01 00 00 00 00 22 00 00 00 00 (Hex)

E) Reverse at High Speed:

0A 20 00 01 00 00 0C 00 00 00 00 00 (Hex) (Byte swap)
2 00A 01 00 00 00 00 0C 00 00 00 00 (Hex)

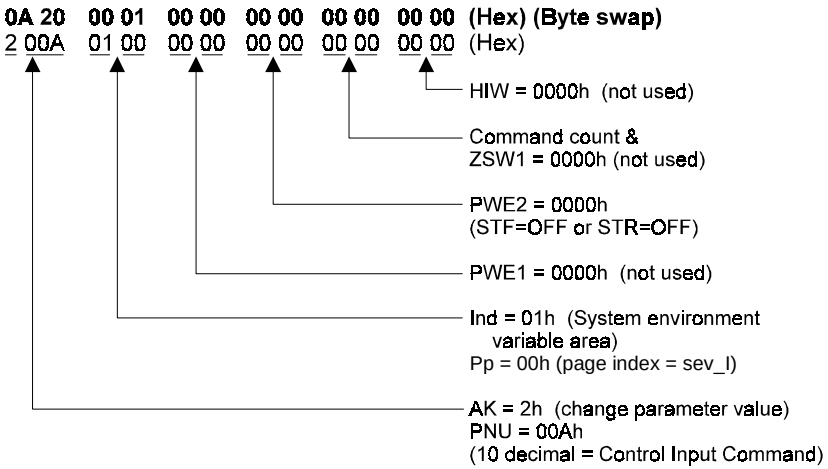
F) Reverse at Middle Speed:

0A 20 00 01 00 00 14 00 00 00 00 00 (Hex) (Byte swap)
2 00A 01 00 00 00 00 14 00 00 00 00 (Hex)

G) Reverse at Low Speed:

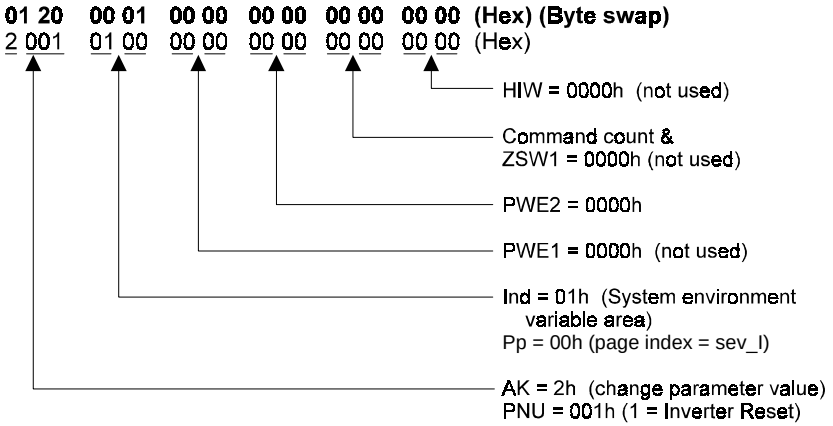
0A 20 00 01 00 00 24 00 00 00 00 00 (Hex) (Byte swap)
2 00A 01 00 00 00 00 24 00 00 00 00 (Hex)

H) Stop command:



Not used					MRS	CS	AU	RT	JOG	RL	RM	RH	STR	STF	Not used	Description
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0=off, 1=on
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Bit #2
0					0			0				0				Hex Code

I) Inverter reset:

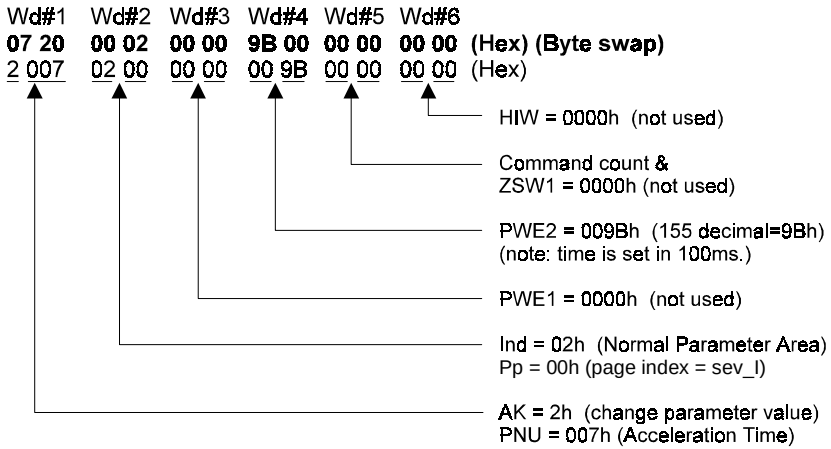


4. Writing to Parameters

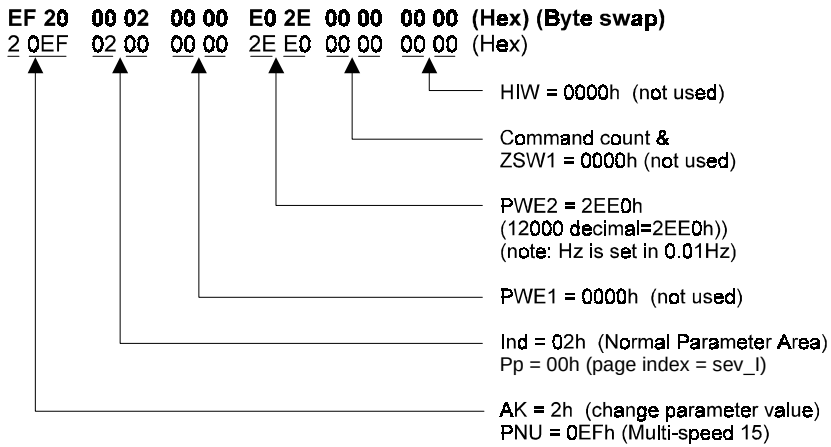
REMARKS

Bold indicates byte swapping code required for ladder logic using AISJ71PB92 module.

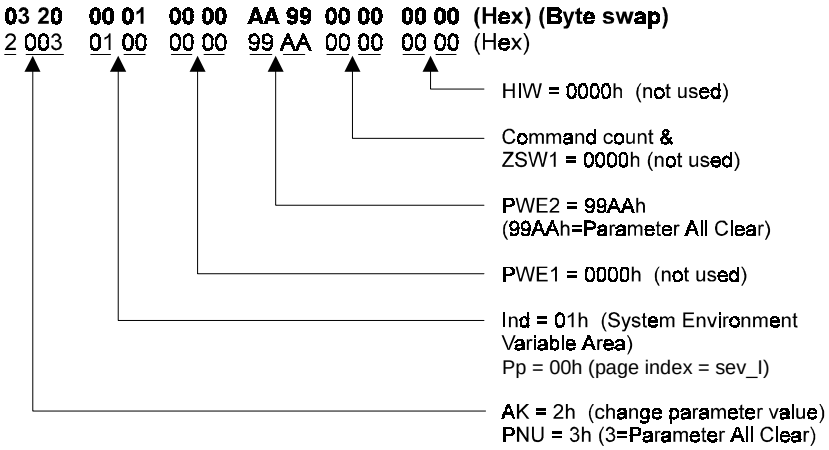
A) Set Acceleration Time (Pr. 7) to 15.5s:



B) Set Multi-speed 15 (Pr. 239) to 120Hz:



C) Parameter All Clear:



5. Response back from inverter

REMARKS

Bold indicates byte swapping code required for ladder logic using AISJ71PB92 module.

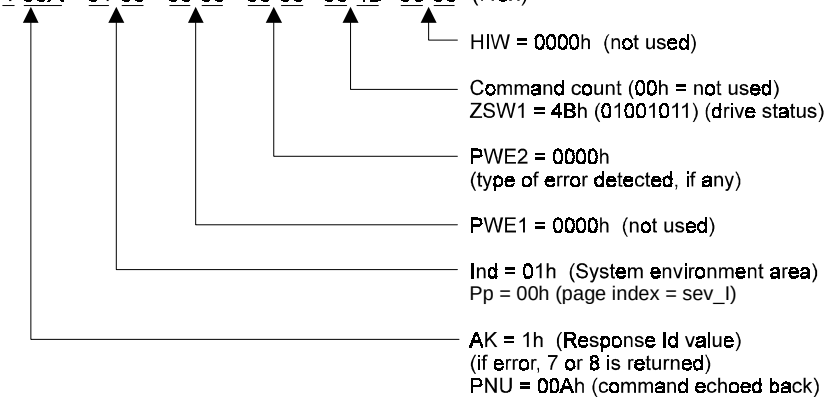
A) Response from a message of STF and RH:

(1) Sent data: high speed forward rotation commnad

Wd#1	Wd#2	Wd#3	Wd#4	Wd#5	Wd#6	
0A 20	**00 01**	**00 00**	**0A 00**	**00 00**	**00 00**	**(Hex) (Byte swap)**
2 00A	01 00	00 00	00 0A	00 00	00 00	(Hex)

(2) Response data to the above sent data

0A 10 00 01 00 00 00 00 4B 00 00 00 (Hex) (Byte swap)
1 00A 01 00 00 00 00 00 00 4B 00 00 (Hex)



Bits	Definition	For the Above Case
0	1 = running (RUN)	1
1	1 = forward (FWD)	1
2	1 = reverse (REV)	0
3	1 = up to frequency (SU)	1
4	1 = overload (OL)	0
5	1 = instantaneous power failure (IPF)	0
6	1 = frequency detection (FU)	1
7	1 = alarm (ABC)	0
8-14	Command count 0-126 dec. (00h-7Fh)	0

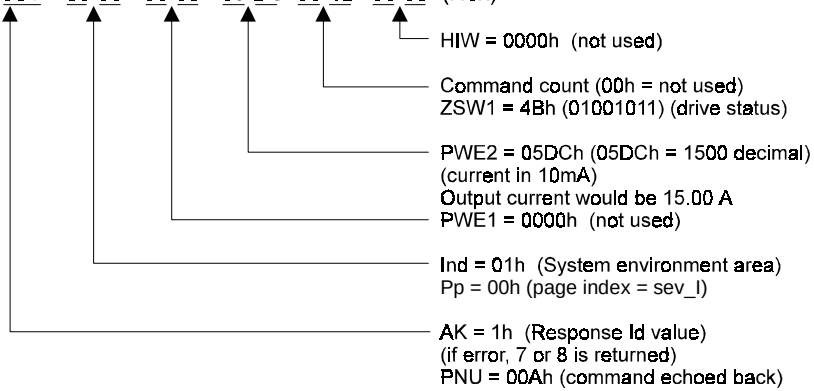
B) Response from a request to read output current:

(1) Sent data: request to read output current

01 10 00 00 00 00 00 00 00 00 00 00 (Hex) (Byte swap)
1 001 00 00 00 00 00 00 00 00 00 00 (Hex)

(2) Response data to the above sent data

01 10 00 00 00 00 DC 05 4B 00 00 00 (Hex) (Byte swap)
1 001 00 00 00 00 05 DC 00 4B 00 00 (Hex)



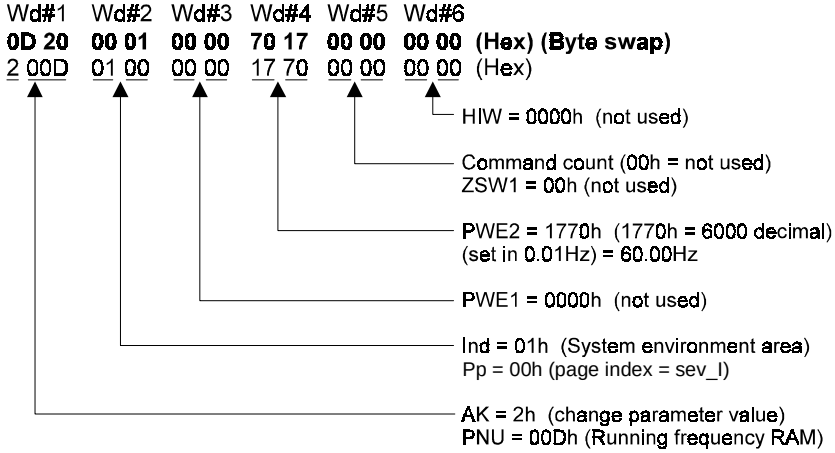
Bits	Definition	For the Above Case
0	1 = running (RUN)	1
1	1 = forward (FWD)	1
2	1 = reverse (REV)	0
3	1 = up to frequency (SU)	1
4	1 = overload (OL)	0
5	1 = instantaneous power failure (IPF)	0
6	1 = frequency detection (FU)	1
7	1 = alarm (ABC)	0
8-14	Command count 0-126 dec. (00h-7Fh)	0

6. Using RAM Frequency as running speed

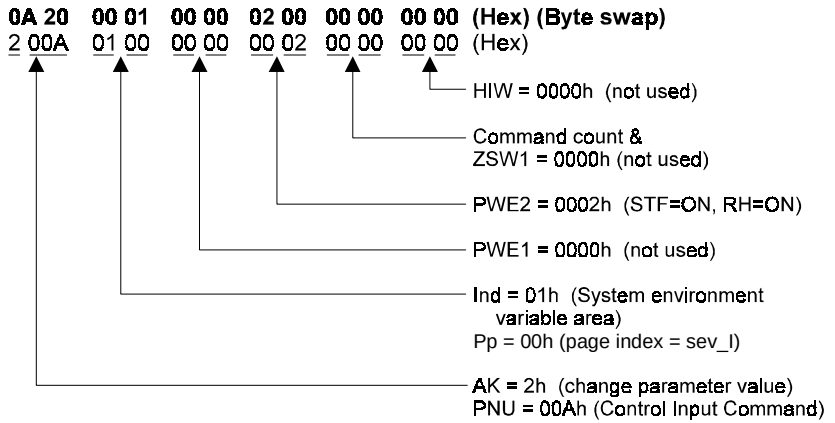
REMARKS

Bold indicates byte swapping code required for ladder logic using AISJ71PB92 module.

A) Setting desired output frequency to 60Hz:



Next, Set Inverter to Run Forward (STF):



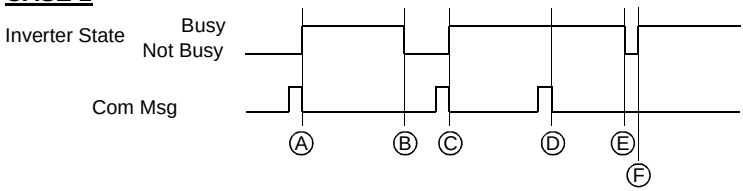
Not used					MRS	CS	AU	RT	JOG	RL	RM	RH	STR	STF	Not used	Description
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0=off, 1=on
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Bit #2
0					0			0				2				Hex Code

Appendix. C Network Communication Coordination using the FR-A5NP PROFIBUS-DP Option Module.

When a command message is sent to the inverter via the FR-A5NP, the inverter enters a “busy” mode while the command is executed. When a command message is sent while the inverter is in “busy” mode, that command is stored in a queue in the FR-A5NP until the inverter finishes execution of the current command and exits “busy” mode. At that time, the queued command is issued to the inverter.

If however, a second command message is sent before the queued command message is accepted by the inverter, the queued message will be replaced by the succeeding message. In this way, it is possible to “lose” command messages during network communication. Refer to the following diagrams for further clarification.

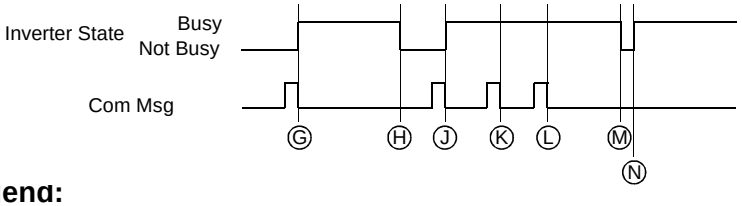
CASE 1



Legend:

A. Inverter ready, Command Message 1 received, inverter begins executing Command 1 and enters busy mode.
B. Inverter completes execution of Command 1 and exits busy mode.
C. Command Message 2 received, inverter begins executing Command 2 and enters busy mode.
D. Inverter in busy mode, Command Message 3 received and buffered by FR-A5NP module.
E. Inverter completes execution of Command 2 and exits busy mode.
F. Inverter accepts buffered Command 3, begins execution and enters busy mode.

CASE 2



Legend:

G. Inverter ready, Command Message 1 received, inverter begins executing Command 1 and enters busy mode.
H. Inverter completes execution of Command 1 and exits busy mode.
I. Command Message 2 received, inverter begins executing Command 2 and enters busy mode.
J. Inverter in busy mode, Command Message 3 received and buffered by FR-A5NP module.
K. Inverter in busy mode, Command Message 4 received and buffered by FR-A5NP module. Command Message 3 is overwritten and, therefore, lost.
L. Inverter completes execution of Command 2 and exits busy mode.
M. Inverter accepts buffered Command 4, begins execution and enters busy mode.

To avoid losing data in this manner, it is recommended that the user take advantage of the “Inverter Ready / Busy” message built into the FR-A5NP PROFIBUS-DP option module. Communication coordination is accomplished using a “Inverter Busy” signal available via data word number 1, designated “PKE word,” as defined in the PROFIBUS-DP network protocol. The user should design the process control such that inverter commands are not sent while this signal indicates that the inverter is in busy mode.

The length of time the inverter remains in “busy” mode is dependent entirely upon the amount of time required to completely execute a given command. This period, therefore, is dependent upon the complexity of the command sent to the inverter.

The inverter’s communication state can be determined by reading PKE word. PKE-AK (PROFIBUS-DP Word 1, bits 12-15) will contain status data as described below:

PKE-AK (Word 1, Bits 12-15) VALUE	INVERTER COMMUNICATION STATE	NOTES
0h	Inverter Busy	Inverter is executing a previous command and is unable to accept additional commands and/or data.
1h	Inverter Ready	Inverter is prepared to receive data.
7h	Command Error	Inverter received invalid command. May be due to command syntax error or communication handshaking error.

Appendix. D Other Option Specific Parameters

The following tabel lists 3 paraameters, specific to the option, which are used for external or network control of direction or speed references in the inverter.

Parameter Number	Function	Setting Range	Minimum Increment	Default Setting
338	Operation Control Command Source	0, 1	1	0
339	Speed Command Source	0, 1	1	0
340	Link Start Up Mode Selection	0, 1	1	0

Parameter		Functions											
Pr. 338 Control	Pr. 339 Speed	STF	STR	STOP	JOG	RT	Freq	RH-RM-RL	AU	RES	MRS	OH	CS
0	0	P	P	P	-	-	P	-	-	both	both	E	E
0	1	P	P	P	-	-	E	E	E	both	both	E	E
1	0	E	E	E	E	E	P	-	-	both	E	E	E
1	1	E	E	E	E	E	E	E	E	both	E	E	E

P = PROFIBUS
E = External
"-" = Control is Niether from PROFIBUS-DP or External Mode
both = Control is either from PROFIBUS-DP or External Mode

The following table explains the value settings for parameter 340.

Value	Function
0	The inverter operates in the external operation mode after power-up or inverter reset.
1	The inverter operates in the network operation mode after power-up or inverter reset.
2	The inverter operates in the network operation mode after power-up or inverter reset. However, it will resume the pre-instatntaneous power failure operation mode after an instantaneous power failure occurs.

REVISIONS

*The manual number is given on the bottom left of the back cover.

Print Date	*Manual Number	Revision
Mar., 2003	IB(NA)-0600148E-A	First edition