

**mitsubishi electric
automation**

Instruction Manual

FR-A5NM

Modbus Plus Communications

Option Unit

used with

A500(L) Series


Variable Frequency Drive




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NOTES, CAUTIONS AND WARNINGS

NOTE: Notes are used to provide additional detail about a procedure. The Note will always precede the text that the Note refers to.

CAUTION:  Cautions provide additional detail where failure to observe the Caution may result in damage to the equipment or slight injury to the user.


WARNING:  Warnings provide additional information, where failure to observe the Warning may result in death or severe injury

SAFETY INSTRUCTION**1. Electric Shock Prevention**

WARNING:  • Do not open or remove the front cover while the Variable Frequency Drive is running. You may get an electrical shock.

- When necessary to perform inspections or when wiring the unit, switch power off and wait at least 10 minutes and until the bus charge light is off. Check for residual voltage.
- Do not attempt to inspect or wire this unit unless fully competent to perform the work.
- Be sure hands are dry before operating any switches.
- Be sure cables do not have scratches, excessive stress, heavy loads or pinching to prevent electrical shock

2. Injury Prevention

CAUTION:  • Be sure all connections are in accordance with instructions in this manual

- Check that cables are properly connected before turning equipment on.

- After turning equipment off, wait at least 10 minutes and until the bus charge light is off before removing cover. With cover removed, charged components may be exposed.

3. Additional Cautions and Warnings

CAUTION:

- Do not install the option unit if it is damaged or has parts missing
- Check that option unit is securely fastened to the variable frequency drive.
- Do not stand or rest heavy objects on top of unit.
- Do not allow metal fragments, conductive bodies, oil or other flammable substance to enter the variable frequency drive.
- Before starting operation, confirm and adjust the parameters. Failure to do so may cause the machines to make unexpected motions.
- When parameter clear or all parameter clear is performed, each parameter returns to the factory setting. Reset the required parameters before starting operation
- For prevention of damage caused by static buildup, touch a nearby metal object to remove static from your body.
- Dispose of this product as general industrial waste.

WARNING:

- Do not modify this equipment

TABLE OF CONTENTS

1. INTRODUCTION	2
2. INSTALLATION	3
2.1 PRE-INSTALLATION CHECKS	3
2.2 CONNECTING TO THE NETWORK	6
2.3 DIAGNOSTIC LED STATUS INDICATOR.....	9
3. OPERATION	10
3.1 OPERATING MODES.....	10
3.2 SELECTING THE OPERATING MODE	10
3.3 FUNCTIONS AVAILABLE IN THE OPERATING MODES.....	11
3.4 INPUT FROM MODBUS PLUS TO VFD.....	12
4. ACCESSING A500(L) DRIVE DATA.....	13
5. PARAMETER DEFINITIONS.....	14
5.1 INPUT TO VFD FROM MODBUS PLUS.....	16
5.2 OUTPUT FROM VFD TO MODBUS PLUS.....	16
5.3 SYSTEM ENVIRONMENT VARIABLE (SEV) INTERFACE.....	17
5.4 USING THE MODSOFT MSTR BLOCK.....	18
5.5 REAL-TIME MONITOR	18
5.6 INPUT/OUTPUT TERMINAL ASSIGNMENT.....	19
5.7 OPERATION WHEN AN ALARM OCCURS	20
5.8 ALARM HISTORY	21
5.9 ALARM NUMBERS VS. ALARM CODES	21
6. A500(L) PARAMETERS	22
6.1 NORMAL PARAMETER AREA	22
6.2 900F PARAMETER AREA	28
6.3 900 PERCENT PARAMETER AREA	28

6.4 PROG OP TIME (T) COMPONENTS.....	29
6.5 PROG OP DIR. (D) COMPONENTS	30
6.6 PROG OP FREQ. (F) COMPONENTS.....	31
7. SPECIFICATIONS	32
8. REFERENCES.....	33
APPENDIX A : OTHER OPTION-SPECIFIC PARAMETERS.....	34

1. Introduction

GENERAL

Thank you for choosing this option unit for the Mitsubishi FR-A500(L) series transistorized frequency VFDs.

Please read this manual carefully before using this option unit. This instruction manual gives handling information and precautions for use of this product as well as the information required for the transmission of data to and from the VFD via a Modbus Plus network.

It is assumed that the reader of this manual possesses an understanding of the configuration, implementation, and operation of Modbus Plus networks. For details on the Modbus Plus network protocol and/or Modbus Plus network configuration and installation, please refer to the applicable specifications as published by Schneider Automation.

Please forward this manual to the end user.

Modbus Plus Communications Option Unit
(FR-A5NM)

This option unit lets you connect a FR-A500(L) series VFD to a network adhering to the Modbus Plus communications protocol.

Some important features of this option unit include:

- Data rate of 1 M bps
- Support for up to 32 nodes without a repeater (64 nodes with a repeater) on a single network
- Network access to all VFD parameters
- Passed Modicon Conformance Test in March, 1999
- Designed and assembled in the U.S.A.

STRUCTURE

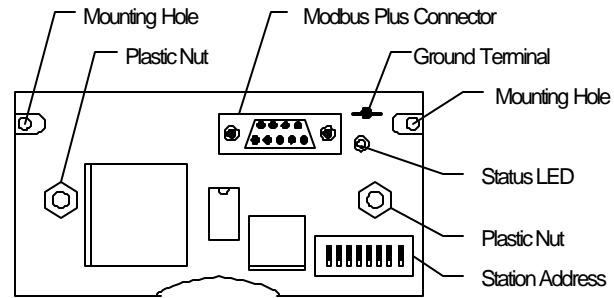


Figure 1: Top view

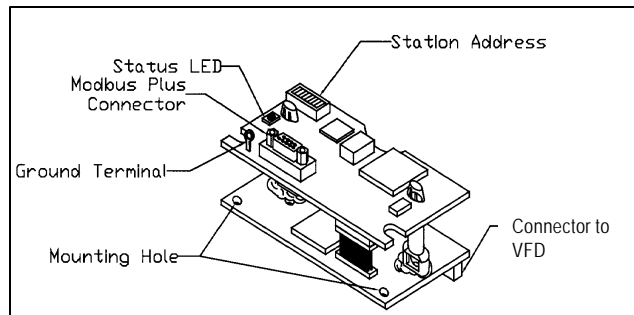


Figure 2: 3-D view

2. Installation

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

2.1 Pre-Installation Checks

1. Check the VFD type.

You may use the option unit only with a FR-A500(L) series VFD. You must not use it with any other series (e.g. A200E, A200, A100, Z and F series).

These other series VFDs have a different option connector to prevent installation; if you force the connector, you may damage the VFD as well as the option unit.

2. Make sure the VFD line power is off.

You may damage the option unit if you install it with the line power connected.

Mounting Procedure



HAZARDOUS VOLTAGE PRESENT

Always isolate power from the VFD 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.

3. Insert this option unit into the VFD's **OPTION PORT# 3** only.
4. Carefully insert the connector of the option unit into the connector of the VFD. 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 VFD. Make sure that the VFD option is firmly seated in the VFD and the connector is fully plugged in.

(Note) When you insert the option unit to the VFD, please push down the plastic nuts on the top-board. (Please refer to Figure 1)

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

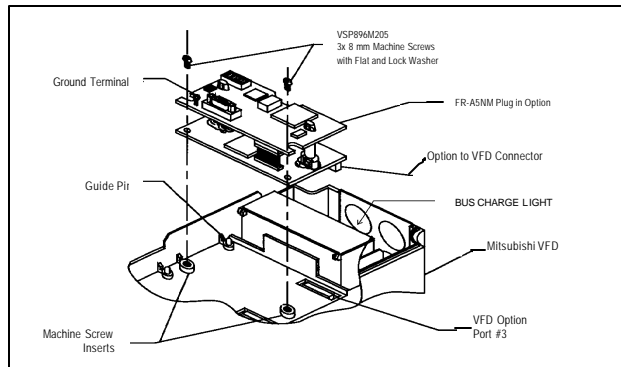


Figure 3: Installation view

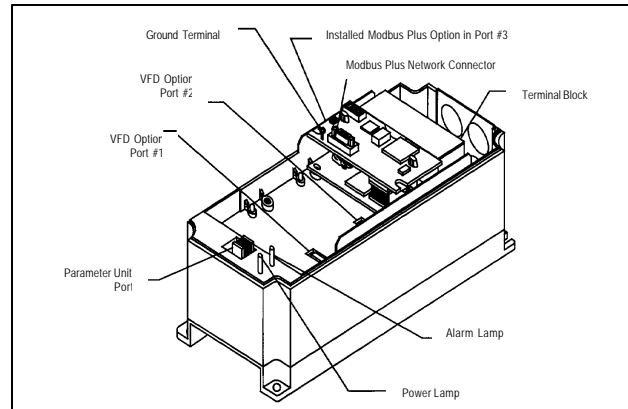


Figure 4: Mitsubishi VFD view

6. To ensure proper Network Grounding, connect a harness (NOT Supplied) from FR-A5NM Ground terminal to VFD Ground terminal. For ease of routing, the harness should be passed between the Top and Bottom board. (Refer to Figure 5).

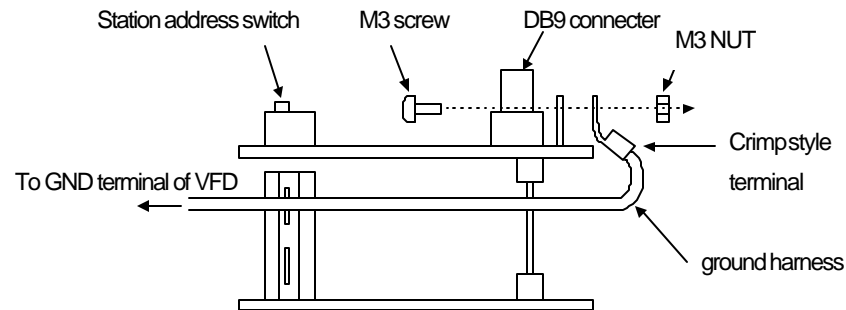


Figure 5 Ground harness connection

7. Set the node address before replacing the cover onto the VFD. (See Sec. 2.2)
8. When making a cable for the Modbus Plus protocol, make sure that each end of the cable is terminated with the A5MBKT185 terminator connectors. For nodes between the termination points, use the in-line connectors (A5MBKT085). The cable should be a Modbus Plus standard cable (490NAA271xxF).

Connect a wire from the ground terminal on the FR-A5NM to the VFD Chassis to ensure proper grounding of the option board.

Makers of DB9 connectors, Schneider Automation:

- End Connector Part#: AS-MBKT-185 (light gray)
- Inline Connector Part#: AS-MBKT-085 (dark gray)

9. Next remove the option data port insert from the VFD cover. Then replace the VFD cover, while making sure that the Modbus Plus connector is aligned with the option data port window. Connect the Modbus Plus cable to the VFD by plugging DB9-style male connector into DB9-style female connector of the option unit, which should be visible in the option port window.
10. Please consult and adhere to standard Modbus Plus documentation and specifications on the wiring and installation of Modbus Plus network hardware, as provided by Schneider Automation.

2.2 Connecting to the Network

1. Make sure that the VFD power is off and the option unit is mounted in the VFD. Connect the Modbus Plus cable you created to the network.
2. When setting the Modbus Plus address on the option board, use the following table. Refer to Figure 1 for the address switch location.

NOTE: A switch setting of 1 indicates the On position, and a switch setting of 0 indicates the Off position.

Decimal Address	Switch Positions							
	1	2	3	4	5	6	7	8
3	1	0	1	1	1	1	1	1
4	0	0	1	1	1	1	1	1
5	1	1	0	1	1	1	1	1
6	0	1	0	1	1	1	1	1
7	1	0	0	1	1	1	1	1
8	0	0	0	1	1	1	1	1
9	1	1	1	0	1	1	1	1
10	0	1	1	0	1	1	1	1
11	1	0	1	0	1	1	1	1
12	0	0	1	0	1	1	1	1
13	1	1	0	0	1	1	1	1
14	0	1	0	0	1	1	1	1
15	1	0	0	0	1	1	1	1
16	0	0	0	0	1	1	1	1

Decimal Address	Switch Positions							
	1	2	3	4	5	6	7	8
17	1	1	1	1	0	1	1	1
18	0	1	1	1	0	1	1	1
19	1	0	1	1	0	1	1	1
20	0	0	1	1	0	1	1	1
21	1	1	0	1	0	1	1	1
22	0	1	0	1	0	1	1	1
23	1	0	0	1	0	1	1	1
24	0	0	0	1	0	1	1	1
25	1	1	1	0	0	1	1	1
26	0	1	1	0	0	1	1	1
27	1	0	1	0	0	1	1	1
28	0	0	1	0	0	1	1	1
29	1	1	0	0	0	1	1	1
30	0	1	0	0	0	1	1	1
31	1	0	0	0	0	1	1	1
32	0	0	0	0	0	1	1	1
33	1	1	1	1	1	0	1	1
34	0	1	1	1	1	0	1	1
35	1	0	1	1	1	0	1	1
36	0	0	1	1	1	0	1	1
37	1	1	0	1	1	0	1	1
38	0	1	0	1	1	0	1	1
39	1	0	0	1	1	0	1	1
40	0	0	0	1	1	0	1	1
41	1	1	1	0	1	0	1	1
42	0	1	1	0	1	0	1	1
43	1	0	1	0	1	0	1	1
44	0	0	1	0	1	0	1	1
45	1	1	0	0	1	0	1	1
46	0	1	0	0	1	0	1	1
47	1	0	0	0	1	0	1	1
48	0	0	0	0	1	0	1	1
49	1	1	1	1	0	0	1	1
50	0	1	1	1	0	0	1	1
51	1	0	1	1	0	0	1	1
52	0	0	1	1	0	0	1	1
53	1	1	0	1	0	0	1	1

Decimal Address	Switch Positions							
	1	2	3	4	5	6	7	8
54	0	1	0	1	0	0	1	1
55	1	0	0	1	0	0	1	1
56	0	0	0	1	0	0	1	1
57	1	1	1	0	0	0	1	1
58	0	1	1	0	0	0	1	1
59	1	0	1	0	0	0	1	1
60	0	0	1	0	0	0	1	1
61	1	1	0	0	0	0	1	1
62	0	1	0	0	0	0	1	1
63	1	0	0	0	0	0	1	1

Alternate method for setting the switch:

- i. To set the node address to be nn, first subtract 1 from it.
- ii. Convert the result (nn-1) into hexadecimal XXh.
- iii. Then span it into binary format, padding with 0's in the front 00fedcba.
- iv. Finally, take the complement 11nmlkji, if a bit is 0, set the switch to Off position; if a bit is 1, set the switch to On position.

NOTE: the first two leading position switches are not used.

For example, to set the node address to 30, do the following:

- a. Convert the result $29=30-1$ into 1Dh
 - b. Span into 8-bit format 00011101
 - c. Take the complement 11100010
 - d. Set 8 positions according to c
3. It is now safe to apply power to the VFD and run it in PU, external, or net mode, provided that any external VFD control cables in addition to the Modbus Plus network cable are installed correctly.

2.3 Diagnostic LED Status Indicator

The green LED located next to the address DIP switch on the Modbus Plus option top board provides indication of communication status. The LED on the bottom board will be solid green if the option CPU acts correctly.

The following describes the LED on the top board definitions.

Green	State of system
Flash every 160 mSec	Node is working normally. It is successfully receiving and passing the network token.
Flash every 1 Sec	Node is in the MONITOR_OFFLINE state. It monitors the network link every 5 seconds but is not transmitting.
2 flashes, off 2 Secs	Node is in MAC_IDLE state. This node may have a bad transmitter.
3 flashes, off 1.7 Secs	Node is not receiving tokens. This indicates that this node is the only active node on the network or the receiver is bad.
4 flashes, off 1.4 Secs	Duplicate node address seen.

3. Operation

The operation of the A500(L) VFD changes slightly when you install this option unit, as described below.

3.1 Operating Modes

In the PU operating mode, a Parameter Unit (PU) controls the VFD. In the External-operating mode, the VFD is controlled by external signals connected to the VFD's terminal block. In the Network (computer link) operating mode, the VFD is controlled by commands from a Modbus Plus master.

3.2 Selecting the Operating Mode

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

- The VFD is stopped.
- The forward and reverse commands are off.

The following table describes the actions required to change the operating mode.

Mode Change	Action Required
Ext Operation => PU Operation	User presses PU key on Parameter Unit.
PU Operation => Ext Operation	User presses EXT key on Parameter Unit.
Ext Operation => Net Operation	Modbus Plus master writes a 0014h to Register 40010.
Net Operation => Ext Operation	Modbus Plus master writes a 0010h to Register 40010.

For all other mode changes, please refer to the *FR-A500(L) VFD Instruction Manual*.

Pr 340 allows you to select the Network operating mode on power-up and after a drive reset. Once the Network operating mode is initiated, there must be Modbus Plus activity at least once every 3 seconds. If the option unit does not sense valid Modbus Plus activity for 3 seconds or more, the VFD performs an option module alarm stop (E.OP3), and you must reset the VFD to clear this fault.

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
Modbus Plus	Operating Command	Yes ⁽¹⁾	No	No
	Output Frequency Setting	Yes ⁽¹⁾	No	No
	Monitor	Yes	Yes	Yes
	Parameter Write	Yes ⁽²⁾	No ⁽²⁾	No ⁽²⁾
	Parameter Read	Yes	Yes	Yes
	VFD Reset	Yes ⁽³⁾	No	No
External Terminals	Operating Command	Yes ⁽¹⁾	Yes	No
	Output Frequency Setting	Yes ⁽¹⁾	Yes	No
	VFD Reset	Yes	Yes	Yes

(1) Depends on the value of Prs 338 and 339.

(2) Depends on the value set in Pr 77.

Refer to the *FR-A500(L) VFD Instruction Manual* for further information.

(3) If a network communication error has occurred, a manual reset will be required.

3.4 Input From Modbus Plus to VFD

This option unit supports all VFD Control Input Commands.

4. Accessing A500(L) Drive Data

1. This option unit acts as a Modbus Plus slave to a PLC or equivalent controller acting as a Modbus Plus master.

This means that the option unit:

- Acknowledges messages received
 - Transmits messages at the request of a network master.
2. The option unit can also act as a Modbus Plus slave to a Modbus Plus master that can read the drive's I/O values, as well as configure the drive itself.
 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. This option unit does not support any other manufacturer-specific messages or parameters.

5. Parameter Definitions

Depending upon which Modbus Plus master device is being used, data registers may be referenced using a 5-digit(4nnnn) or 6-digit(40nnnn) format. For convenience, this manual uses the 5-digit format. When using the 6-digit format, the last 4 digits of the register remain the same and a zero is inserted between the numeral 4 and the 4-digit register number(nnnn).

The Modbus Plus option card generates error codes when inappropriate operations occur. These codes are stored in register 40020(9C54h)

If a write occurs to the VFD while the VFD is in EXT mode, a 41h will exist in register 40020. If a write occurs to the Real Time Monitor or the Alarm History, 42h will exist in register 40020. 43h will exist in register 40020 if an out of range value is written to any parameter. See more error code listings in the table below:

Error Codes for FR-A5NM

Error codes for FR-A5NM are stored in Extended Error Code Register 40020.

Code	Definition	Explanation
01h	Unsupported Task *a, b, c	You request an unsupported Task.
03h	Invalid Register	You use an undefined register.
04h	DPR Read Failure	You cannot read such data from Dual Port RAM.
05h	Write Cmd Failure	You cannot write data to this register.
41h	Mode Error	e.g. You try to write to the register 41000(Pr.0) while VFD is running.
42h	Instruction Error	e.g. You try to write to Real Time Monitor because it is read only.
43h	Data Range Error	You try to write an out of range data to this register.

Read out data:

FFFEh means No parameter.

FFFDh means parameter Not Available.

*a: Writing invalid data to Op Mode Register 40010 is not allowed and answered "01 unsupported task" in the Error Code Register 40020.

*b: Access to undefined Registers in A5NM is answered "01 unsupported task" in the Error Register 40020.

*c: Reading invalid Monitor data, writing to Pr77, 79 are answered "01 unsupported task" in the Error Register 40020.

Any register that does not appear in any entry of the following tables is considered Reserved.

Examples for reading from and writing to parameters:

Operation	Communication Function
Read Parameter 0	Read from Register 41000
Start running forward	Write a 2 Decimal to Register 40009
Stop the drive from running	Write a 0 to Register 40009
Enable Net Mode	Write a 14h to Register 40010
Enable EXT Mode	Write a 10h to Register 40010

5.1 Input to VFD From Modbus Plus

To change the VFD Control Input Cmd, write the word value to Register 40009.

The following table describes the bit-map for the VFD Ctrl Input Cmd word value.

Bit	Definition	Abbreviation
0	Not used and always set to 0	0
1	1 = STF	STF
2	1 = STR	STR
3	1 = RH	RH
4	1 = RM	RM
5	1 = RL	RL
6	Not used and always set to 0	0
7	1 = RT	RT
8	1 = AU	AU
9-15	Not used and always set to 0	0

5.2 Output From VFD to Modbus Plus

To check the VFD status, read the word out from Register 40009.

The following table describes the bit-map for the VFD status word.

Bit	Definition	Abbreviation
0	Special	
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)
8-15	Special	

5.3 System Environment Variable (SEV) Interface

VFD Reg	Definition	Access	WriteVal
40001	UsrClrValSett	WO	0000h
40002	VFDReset *4	WO	XXXXh
40003	PrClr	WO	965Ah
40004	PrAllClr	WO	99AAh
40005	PrUsrClr	WO	5A55h
40006	PrClr(ECP)	WO	5A96h
40007	PrAllClr(ECP)	WO	AA99h
40008	PrUsrClr(ECP)	WO	555Ah
40009	VFDStatus*1/ CtrlInpCmd	RW	00XXh/ 0XXXh
40010	OpMode*2/ VFDConfig	RW	Ext=0010h PU=0011h Net=0014h
40013	f Sett Val	RW	ffggh
40014	Runng f (RAM) *3	RW	ffggh
40015	Runng f (EEPROM) *3	WO	ffggh

WO: Write only, no read.

*1: For VFD Status Read Out, see the table above.

*2: For Op Mode Read Out, Ext=0000h, PU = 0001h, Net = 0004h.

*3: Writing to Register 40014 or 40015 can be read out from Register 40014.

*4 Writing any value to the parameter 40002 resets the VFD.

5.4 Using the Modsoft MSTR Block

The MSTR control register usage is as follows:

PLC Register	Register Value	Value Base	Description
n	1,2	decimal	Commands MSTR function: 1 = write; 2 = read
n+1	xxxx	hexa- decimal	MSTR function error code
n+2	1	decimal	Number of registers to be written/read to/from the VFD
n+3	rrrr	decimal	Specifies the VFD register to write/read to/from. Value represents an offset starting w/register 40000 (i.e. 1 = 40001; 49 = 40049).
n+4, 5, 6, 7	node number	decimal	Routing registers contain Modbus Plus nodes for communication routing. The first register following the register containing the VFD node number must contain a 1 value. Remaining routing registers must contain a 0 value.

5.5 Real-Time Monitor

Register	Definition	Prec.
40201	RTM01 Outp f	0.01Hz
40202	RTM02 Outp I	0.01A
40203	RTM03 Outp V	0.1V
40205	RTM05 f Sett Val	0.01Hz
40206	RTM06 Running Spd	1r/m
40207	RTM07 Motor Torq	0.1%
40208	RTM08 Convrtr Outp V	0.1V
40209	RTM09 Regen Brake Duty	0.1%
40210	RTM10 Electr Overcur Protectn Load Factr	0.1%
40211	RTM11 Outp I Peak	0.01A
40212	RTM12 VFD Peak Outp V	0.1V
40213	RTM13 VFD Input Powr	0.01kW
40214	RTM14 VFD Output Powr	0.01kW
40215	RTM15 Inp Termnl Status	
40216	RTM16 Outp Termnl Status	
40217	RTM17 Load Meter	
40218	RTM18 Motor Excitatn I	0.01A
40219	RTM19 Positive Pulse	
40220	RTM20 Cumulative Energ t	1h

Register	Definition	Prec.
40222	RTM22 Orientain Status	
40223	RTM23 Actl Opt	1h
40224	RTM24 Motor Load Factr	0.1%
40225	RTM25 Cumulative Powr	1kWh

Bit-Map for Register 40215

Input Terminal Monitor:

15.12	11	10	9	8	7	6
0	CS	RES	STOP	MRS	JOG	RH

5	4	3	2	1	0
RM	RL	RT	AU	STR	STF

Bit-Map for Register 40216

Outp Terminal Monitor:

15.6	5	4	3	2	1	0
0	Relay	FU	OL	IPF	SU	RUN

NOTE: The bit-wise data here reflect Prs 190-196; if assignments for terminals are changed, the bit-map may not be the same.

Modbus Plus is a single command machine. Only one command can be sent to the FR-A5NM at a single time. Multiple commands to a single slave is NOT supported. Please send one command for each terminal assignment.

5.6 Input/Output Terminal Assignment



Input/output terminal assignment functions depend upon programmed functions such as brake sequences

5.7 Operation When an Alarm Occurs

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

Fault Type	Item	Net	Ext	PU
VFD ⁽²⁾	VFD Operation	Stop	Stop	Stop
	Network Comm.	Continue	Continue	Continue
Modbus Plus Comm. ⁽³⁾	VFD Operation	Stop	Continue	Continue
	Network Comm	Continue ⁽¹⁾	Continue ⁽¹⁾	Continue ⁽¹⁾

(1) Depends on the type of communication fault.

(2) For example, E.OP3, E.OC3.

(3) For example, Slow blinking LED

5.8 Alarm History

Register	Definition
40501	Alarm 1 ₍₁₎
40502	Alarm 2
40503	Alarm 3
40504	Alarm 4
40505	Alarm 5
40506	Alarm 6
40507	Alarm 7
40508	Alarm 8

(1) Writing any value to parameter 40501 resets the alarm history buffer for all alarms. All other entries in this table are read only.

5.9 Alarm Numbers vs. Alarm Codes

#	Code	#	Code	#	Code	#	Code
10	OC1	80	GF	D1	Osd	F3	E3
11	OC2	81	LF	D2	ECT	F4	E4
12	OC3	90	OHT	D3	Od	F5	E5
20	OV1	A0	OPT	D4	ECA	F6	E6
21	OV2	A1	OP1	D5	Mb1	F7	E7
22	OV3	A2	OP2	D6	Mb2	F8	E8
30	THT	A3	OP3	D7	Mb3	F9	E9
31	THM	B0	PE	D8	Mb4	FA	E10
40	FIN	B1	PUE	D9	Mb5	FB	E11
41	FAN	B2	RET	DA	Mb6	FC	E12
50	IPF	C0	CPU	DB	Mb7	FD	E13
51	UVT	C1	CTE	F0	E0	FE	E14
60	OLT	C2	P24	F1	E1	FF	E15
70	BE	D0	OS	F2	E2		

Please refer to the *FR-A500(L) VFD Instruction Manual* for an explanation of Alarm Codes.

6. A500(L) PARAMETERS

6.1 Normal Parameter Area

Pr	Reg	Definition	Range	Hex	Factory setting
Pr0	41000	Torque Boost	0-30	0-12C	Note1
Pr1	41001	Maximum frequency	0-120	0-2EE0	120Hz
Pr2	41002	Minimum frequency	0-120	0-2EE0	0Hz
Pr3	41003	Base frequency	0-400	0-9C40	60Hz
Pr4	41004	Multi-speed setting (high speed)	0-400	0-9C40	60Hz
Pr5	41005	Multi-speed setting (middle speed)	0-400	0-9C40	30Hz
Pr6	41006	Multi-speed setting (low speed)	0-400	0-9C40	10Hz
Pr7	41007	Acceleration time	0-3600/ 0-360	0-8CA0 /0-168	5s/15s
Pr8	41008	Deceleration time	0-3600/ 0-360	0-8CA0 /0-168	5s/15s
Pr9	41009	Electronic thermal O/L Relay	0-500	0-C350	Note1
Pr10	41010	DC junction brake operation frequency	0-120,9999	0-2EE0,FFFF	3Hz
Pr11	41011	DC junction brake operation time	0-10,8888	0-64,FFF0	0.5s
Pr12	41012	DC junction brake voltage	0-30	0-12C	Note1
Pr13	41013	Starting frequency	0-60	0-1770	0.5Hz
Pr14	41014	Load pattern selection	0-5	0-5	0
Pr15	41015	Jog frequency	0-400	0-9C40	5Hz
Pr16	41016	Jog acceleration / deceleration time	0-3600/ 0-360	0-8CA0	0.5s
Pr17	41017	MRS Input Selection	0-2	0-2	0
Pr18	41018	High-speed maximum frequency	120-400	2EE0-9C40	120Hz
Pr19	41019	Base frequency voltage	0-1000,9999	0-2710,FFFF	9999
Pr20	41020	acceleration / deceleration reference frequency	1-400	1-9C40	60Hz
Pr21	41021	acceleration / deceleration time increments	0-1	0-1	0
Pr22	41022	Stall Prevention operation level	0-200,9999	0-7D0, FFFF	150%
Pr23	41023	Stall Prevention operation level at double speed	0-200,9999	0-7D0, FFFF	9999
Pr24	41024	Multi-speed setting (speed 4)	0-400,9999	0-9C40, FFFF	9999
Pr25	41025	Multi-speed setting (speed 5)	0-400,9999	0-9C40, FFFF	9999
Pr26	41026	Multi-speed setting (speed 6)	0-400,9999	0-9C40, FFFF	9999
Pr27	41027	Multi-speed setting (speed 7)	0-400,9999	0-9C40, FFFF	9999
Pr28	41028	Multi-speed input compensation	0-1	0-1	0
Pr29	41029	acceleration / deceleration pattern	0-3	0-3	0
Pr30	41030	Regenerative function selection	0-2	0-2	0
Pr31	41031	frequency Jump 1A	0-400,9999	0-9C40, FFFF	9999
Pr32	41032	frequency Jump 1B	0-400,9999	0-9C40, FFFF	9999
Pr33	41033	frequency Jump 2A	0-400,9999	0-9C40, FFFF	9999
Pr34	41034	frequency Jump 2B	0-400,9999	0-9C40, FFFF	9999
Pr35	41035	frequency Jump 3A	0-400,9999	0-9C40, FFFF	9999
Pr36	41036	frequency Jump 3B	0-400,9999	0-9C40, FFFF	9999
Pr37	41037	Speed display	0,1-9998	0,1-270E	0
Pr41	41041	Up-To-frequency sensitivity	0-100	0-3E8	10%

FR-A5NM

Modbus Plus Communications Option Unit

Pr	Reg	Definition	Range	Hex	Factory setting
Pr42	41042	Output frequency detection	0-400	0-9C40	6Hz
Pr43	41043	Output frequency detection for reverse rotation	0-400,9999	0-9C40,FFFF	9999
Pr44	41044	2nd acceleration/deceleration time	0-3600/ 0-360	0-8CA0 /0-168	5s
Pr45	41045	2nd deceleration time	0-3600/ 0-360,9999	0-8CA0 /0-168,FFFF	9999
Pr46	41046	2nd torque boost	0-30,9999	0-12C, FFFF	9999
Pr47	41047	2nd V/F (Base frequency)	0-400,9999	0-9C40, FFFF	9999
Pr48	41048	2nd stall prevention operation current	0-200	0-7D0	150%
Pr49	41049	2nd stall prevention operation frequency	0-400,9999	0-9C40, FFFF	0Hz
Pr50	41050	2nd Output frequency detection	0-400	0-9C40	30Hz
Pr52	41052	DUPU main display data selection	0-20,22- 25,100	0-18,16-19,64	0
Pr53	41053	PU level display data selection	0-18	0-12	1
Pr54	41054	FIM terminal functions selection	1-21	1-15	1
Pr55	41055	Frequency monitoring reference	0-400	0-9C40	60Hz
Pr56	41056	Current monitoring reference	0-500	0-C350	Note1
Pr57	41057	Restart coasting time	0-5,9999	0-32, FFFF	9999
Pr58	41058	Restart cushion time	0-60	0-3C	1.0s
Pr59	41059	Remote setting function selection	0-2	0-2	0
Pr60	41060	Intelligent mode selection	0-8	0-8	0
Pr61	41061	Reference I for intelligent mode	0-500,9999	0-C350, FFFF	9999
Pr62	41062	Reference I for intelligent mode acceleration	0-200,9999	0-7D0, FFFF	9999
Pr63	41063	Reference I for intelligent mode deceleration	0-200,9999	0-7D0, FFFF	9999
Pr64	41064	Starting frequency for elevator mode	0-10,9999	0-3E8, FFFF	9999
Pr65	41065	Retry selection	0-5	0-5	0
Pr66	41066	Stall Prevention operation level reduction starting frequency	0-400	0-9C40	60Hz
Pr67	41067	Number of retries at alarm occurrence	0-10,101- 110	0-A,65-6E	0
Pr68	41068	Retry waiting time	0-10	0-64	1s
Pr69	41069	Retry count display erasure	0	0	0
Pr70	41070	Special regenerative brake duty	0-30	0-12C	0%
Pr71	41071	Applied motor	0-24	0-18	0
Pr72	41072	PWM frequency selection	0-15	0-F	2
Pr73	41073	0 to 5V, 0 to 10V selection	0-15	0-F	1
Pr74	41074	Filter time constant	0-8	0-8	1
Pr75	41075	Reset selection/ Disconnected PU detection/ PU stop selection	0-17	0-11	14
Pr76	41076	Alarm code output selection	0-3	0-3	0
Pr77 ^a	41077	Parameter write disable selection	0-2	0-2	0
Pr78	41078	Reverse rotation prevention selection	0-1	0-2	0
Pr79 ^b	41079	Operation modes selection	0-8	0-8	0
Pr80	41080	Motor capacity	0.4-55,9999	28-157C, FFFF	9999
Pr81	41081	Number of motor poles	2-16,9999	2-10, FFFF	9999
Pr82	41082	Motor excitation current	0-9999	0-FFFF	9999

Pr	Reg	Definition	Range	Hex	Factory setting
Pr83	41083	Rated motor voltage	0-1000	0-2710	200/400V
Pr84	41084	Rated motor frequency	50-120	1388-2EE0	60Hz
Pr89	41089	Speed control gain	0-200	0-C8	100%
Pr90	41090	Motor Constant R1	0-,9999	0-,FFFF	9999
Pr91	41091	Motor Constant R2	0-,9999	0-,FFFF	9999
Pr92	41092	Motor Constant L1	0-,9999	0-,FFFF	9999
Pr93	41093	Motor Constant L2	0-,9999	0-,FFFF	9999
Pr94	41094	Motor Constant X	0-,9999	0-,FFFF	9999
Pr95	41095	Online auto tuning selection	0-1	0-1	0
Pr96	41096	Auto tuning setting/status	0-101	0-65	0
Pr100	41100	V/F 1 (1st frequency)	0-400,9999	0-9C40, FFFF	9999
Pr101	41101	V/F 1 (1st frequency Voltage)	0-1000	0-2710	0
Pr102	41102	V/F 2 (2nd frequency)	0-400,9999	0-9C40, FFFF	9999
Pr103	41103	V/F 2 (2nd frequency Voltage)	0-1000	0-2710	0
Pr104	41104	V/F 3 (3rd frequency)	0-400,9999	0-9C40, FFFF	9999
Pr105	41105	V/F 3 (3rd frequency Voltage)	0-1000	0-2710	0
Pr106	41106	V/F 4 (4th frequency)	0-400,9999	0-9C40, FFFF	9999
Pr107	41107	V/F 4 (4th frequency Voltage)	0-1000	0-2710	0
Pr108	41108	V/F 5 (5th frequency)	0-400,9999	0-9C40, FFFF	9999
Pr109	41109	V/F 5 (5th frequency Voltage)	0-1000	0-2710	0
Pr110	41110	3rd acceleration/deceleration time	0-3600,9999	0-8CA0, FFFF	9999
Pr111	41111	3rd deceleration time	0-3600,9999	0-8CA0, FFFF	9999
Pr112	41112	3rd torque boost	0-30,9999	0-12C, FFFF	9999
Pr113	41113	3rd V/F (base frequency)	0-400,9999	0-9C40, FFFF	9999
Pr114	41114	3rd stall prevention operation current	0-200	0-7D0	150%
Pr115	41115	3rd stall prevention operation frequency	0-400	0-9C40	0
Pr116	41116	3rd output frequency detection	0-400,9999	0-9C40, FFFF	9999
Pr117	41117	Station number	0-31	0-1F	0
Pr118	41118	Communication speed	48-192	30-C0	192
Pr119	41119	Stop bit length/data length	0-11	0-B	1
Pr120	41120	Parity check presence/absence	0-2	0-2	2
Pr121	41121	Number of communication retries	0-10,9999	0-A, FFFF	1
Pr122	41122	Communication check time interval	0-999,89999	0-270E, FFFF	0
Pr123	41123	Waiting time setting	0-150,9999	0-96, FFFF	9999
Pr124	41124	CR,LF presence/absence selection	0-2	0-2	1
Pr128	41128	PID action selection	10-21	A-15	10
Pr129	41129	PID proportional band	0-1000,9999	0-2710, FFFF	100%
Pr130	41130	PID Integral time	0.1-3600,9999	1-8CA0, FFFF	1s
Pr131	41131	PID Upper Limit	0-100,9999	0-3E8, FFFF	9999
Pr132	41132	PID Lower Limit	0-100,9999	0-3E8, FFFF	9999
Pr133	41133	PID action set point for PU operation	0-100	0-3E8	0%
Pr134	41134	PID differential time	0.01-10,9999	1-3E8, FFFF	9999
Pr135	41135	Commercial power supply inverter switch-over sequence output terminal selection	0-1	0-1	0
Pr136	41136	MC switch-over interlock time	0-100	0-3E8	1.0s
Pr137	41137	Start waiting time	0-100	0-3E8	0.5s

Pr	Reg	Definition	Range	Hex	Factory setting
Pr138	41138	Commercial power supply inverter switch-over selection at alarm occurrence	0-1	0-1	0
Pr139	41139	Automatic inverter-commercial power supply switch-over frequency	0-60,9999	0-1770,FFFF	9999
Pr140	41140	Backlash acceleration stopping frequency	0-400	0-9C40	1.00Hz
Pr141	41141	Backlash acceleration stopping time	0-360	0-E10	0.5s
Pr142	41142	Backlash deceleration stopping frequency	0-400	0-9C40	1.00Hz
Pr143	41143	Backlash deceleration stopping time	0-360	0-E10	0.5s
Pr144	41144	Speed setting switch-over	0-110	0-6E	4
Pr148	41148	Stall prevention level at 0V input	0-200	0-7D0	150%
Pr149	41149	Stall prevention Level at 10V input	0-200	0-7D0	200%
Pr150	41150	Output current detection level	0-200	0-7D0	150%
Pr151	41151	Output current detection period	0-10	0-64	0s
Pr152	41152	Zero current detection level	0-200	0-7D0	5%
Pr153	41153	Zero current detection period	0-1	0-64	0.5s
Pr154	41154	Voltage reduction selection during stall prevention operation	0-1	0-1	1
Pr155	41155	RT activate condition	0-10	0-A	0
Pr156	41156	Stall prevention operation selection	0-100	0-64	0
Pr157	41157	OL signal waiting time	0-25,9999	0-FA,FFFF	0s
Pr158	41158	AM terminal function selection	1-21	1-15	1
Pr160	41160	User group read selection	0-11	0-B	0
Pr162	41162	Automatic restart after instantaneous power failure selection	0-1	0-1	0
Pr163	41163	1st cushion time for restart	0-20	0-C8	0s
Pr164	41164	1st cushion voltage for restart	0-100	0-3E8	0.1s
Pr165	41165	Restart stall prevention operation level	0-200	0-7D0	0%
Pr170	41170	Wait hour meter clear	0	0	0
Pr171	41171	Actual operation hour meter clear	0	0	0
Pr173	41173	User group 1 registration	0-999	0-3E7	0
Pr174	41174	User group 1 deletion	0-999,9999	0-3E7,FFFF	0
Pr175	41175	User group 2 registration	0-999	0-3E7	0
Pr176	41176	User group 2 deletion	0-999,9999	0-3E7,FFFF	0
Pr180	41180	RL terminal function selection	0-99,9999	0-63,FFFF	0
Pr181	41181	RM terminal function selection	0-99,9999	0-63,FFFF	1
Pr182	41182	RH terminal function selection	0-99,9999	0-63,FFFF	2
Pr183	41183	RT terminal function selection	0-99,9999	0-63,FFFF	3
Pr184	41184	AU terminal function selection	0-99,9999	0-63,FFFF	4
Pr185	41185	JOG terminal function selection	0-99,9999	0-63,FFFF	5
Pr186	41186	CS terminal function selection	0-99,9999	0-63,FFFF	6
Pr190	41190	RUN terminal function selection	0-199,9999	0-63,FFFF	0
Pr191	41191	SU terminal function selection	0-199,9999	0-63,FFFF	1
Pr192	41192	IPF terminal function selection	0-199,9999	0-63,FFFF	2
Pr193	41193	OL terminal function selection	0-199,9999	0-63,FFFF	3
Pr194	41194	FU terminal function selection	0-199,9999	0-63,FFFF	4
Pr195	41195	ABC terminal function selection	0-199,9999	0-63,FFFF	99
Pr199	41199	User's initial value setting	0-999,9999	0-63,FFFF	0
Pr232	41232	Multi-speed setting (Speed 8)	0-400,9999	0-9C40,FFFF	9999

Pr	Reg	Definition	Range	Hex	Factory setting
Pr233	41233	Multi-speed setting (Speed 9)	0-400,9999	0-9C40, FFFF	9999
Pr234	41234	Multi-speed setting (Speed 10)	0-400,9999	0-9C40, FFFF	9999
Pr235	41235	Multi-speed setting (Speed 11)	0-400,9999	0-9C40, FFFF	9999
Pr236	41236	Multi-speed setting (Speed 12)	0-400,9999	0-9C40, FFFF	9999
Pr237	41237	Multi-speed setting (Speed 13)	0-400,9999	0-9C40, FFFF	9999
Pr238	41238	Multi-speed setting (Speed 14)	0-400,9999	0-9C40, FFFF	9999
Pr239	41239	Multi-speed setting (Speed 15)	0-400,9999	0-9C40, FFFF	9999
Pr240	41240	Soft-PWM setting	0,1	0,1	1
Pr244	41244	Cooling fan operation selection	0,1	0,1	0
Pr250	41250	Stop selection	0-100,9999	0-64, FFFF	9999
Pr261	41261	Power failure stop selection	0-1	0-1	0
Pr262	41262	Subtracted frequency at deceleration start	0-20	0-7D0	3Hz
Pr263	41263	Subtraction starting frequency	0-120,9999	0-2EE0, FFFF	60Hz
Pr264	41264	Power-failure deceleration time 1	0-3600 /0-360	0-8CA0 /0-168	5s
Pr265	41265	Power-failure deceleration time 2	0-3600 /0-360	0-8CA0 /0-168	9999
Pr266	41266	Power-failure deceleration time switch-over frequency	0-400	0-9C40	60Hz
Pr270	41270	Stop-on-contact/ load torque high-speed frequency control selection	0-3	0-3	0
Pr271	41271	High speed setting maximum current	0-200	0-7D0	50%
Pr272	41272	Mid speed setting minimum current	0-200	0-7D0	100%
Pr273	41273	Current average range	0-400,9999	0-9C40, FFFF	9999
Pr274	41274	Current average filter constant	1-4000	1-FA0	16
Pr275	41275	Stop-on-contact exciting current low-speed multiplying factor	0-1000,9999	0-3E8, FFFF	9999
Pr276	41276	Stop-on-contact PWM carrier frequency	0-15,9999	0-F, FFFF	9999
Pr278	41278	Brake opening frequency	0-30	0-BB8	3Hz
Pr279	41279	Brake opening current	0-200	0-7D0	130%
Pr280	41280	Brake opening current detection time	0-2	0-14	0.3s
Pr281	41281	Brake operation time at start	0-5	0-32	0.3s
Pr282	41282	Brake operation frequency	0-30	0-BB8	6Hz
Pr283	41283	Brake operation time at stop	0-5	0-32	0.3s
Pr284	41284	Deceleration detection function selection	0-1	0-1	0
Pr285	41285	Over speed detection frequency	0-30,9999	0-BB8, FFFF	9999
Pr286	41286	Droop gain	0-100	0-64	0%
Pr287	41287	Droop filter constant	0.00-1.00	0-64	0.3sec
Pr338	41338	Operation Command Source	0-1	0-1	1
Pr339	41339	Speed Command Source	0-1	0-1	1
Pr340	41340	Link startup mode selection	0-2	0-2	1
Pr367	41367	Speedfeed back range	0-400	0-9C40	0.01Hz
Pr368	41368	Feedback gain	0-100	0-64	1

Notes:

1. Some default values depend on the rating of the VFD.
2. Please refer to the *FR-A500(L) VFD Instruction Manual* for more details.

*a: Pr77 (41077) is Read-Only from MBP, it cannot be written from network.

*b: Pr79 (41079) is Read-Only from MBP, it cannot be written from network. Pr79 = 6 is switch over mode.

6.2 900f Parameter Area

Register	Definition	
41902	Pr902f	Pr902f Frequency Setting Voltage Bias, Frequency Component (f)
41903	Pr903f	Frequency Setting Voltage Gain, Frequency Component (f)
41904	Pr904f	Frequency Setting Current Bias, Frequency Component (f)
41905	Pr905f	Frequency Setting Current Gain, Frequency Component (f)

6.3 900% Parameter Area

Register	Definition	
42092	Pr902%	Frequency Setting Voltage Bias Percent Of Full Scale (%)
42093	Pr903%	Frequency Setting Voltage Gain, Percent Of Full Scale (%)
42094	Pr904%	Frequency Setting Current Bias, Percent Of Full Scale (%)
42095	Pr905%	Frequency Setting Current Gain, Percent Of Full Scale (%)

6.4 Prog Op Time (t) Components

Register	Definition
41200	Pr200 Program time unit (Min/Sec) Select
41201	Pr201t Program Setting 1 (t)
41202	Pr202t Program Setting 2 (t)
41203	Pr203t Program Setting 3 (t)
41204	Pr204t Program Setting 4 (t)
41205	Pr205t Program Setting 5 (t)
41206	Pr206t Program Setting 6 (t)
41207	Pr207t Program Setting 7 (t)
41208	Pr208t Program Setting 8 (t)
41209	Pr209t Program Setting 9 (t)
41210	Pr210t Program Setting 10 (t)
41211	Pr211t Program Setting 11 (t)
41212	Pr212t Program Setting 12 (t)
41213	Pr213t Program Setting 13 (t)
41214	Pr214t Program Setting 14 (t)
41215	Pr215t Program Setting 15 (t)
41216	Pr216t Program Setting 16 (t)
41217	Pr217t Program Setting 17 (t)
41218	Pr218t Program Setting 18 (t)
41219	Pr219t Program Setting 19 (t)
41220	Pr220t Program Setting 20 (t)
41221	Pr221t Program Setting 21 (t)
41222	Pr222t Program Setting 22 (t)
41223	Pr223t Program Setting 23 (t)
41224	Pr224t Program Setting 24 (t)
41225	Pr225t Program Setting 25 (t)
41226	Pr226t Program Setting 26 (t)
41227	Pr227t Program Setting 27 (t)
41228	Pr228t Program Setting 28 (t)
41229	Pr229t Program Setting 29 (t)
41230	Pr230t Program Setting 30 (t)
41231	Pr231 Time Of Day

Note : Time Register Format

When Pr.200=0, 2 : Minutes -> High Byte (HB), Seconds -> Low Byte (LB)

When Pr.200=1, 3 : Hours -> High Byte (HB), Minutes -> Low Byte (LB)

ex. To enter a time of 10 minutes 20 seconds (Pr.200=0):

HB = 10 = 0Ah, LB = 20 = 14h -> Register value : 0A14h

6.5 Prog Op Dir. (D) Components

Reg	Definition
42001	Pr201D Program Setting 1 (D)
42002	Pr202D Program Setting 2 (D)
42003	Pr203D Program Setting 3 (D)
42004	Pr204D Program Setting 4 (D)
42005	Pr205D Program Setting 5 (D)
42006	Pr206D Program Setting 6 (D)
42007	Pr207D Program Setting 7 (D)
42008	Pr208D Program Setting 8 (D)
42009	Pr209D Program Setting 9 (D)
42010	Pr210D Program Setting 10 (D)
42011	Pr211D Program Setting 11 (D)
42012	Pr212D Program Setting 12 (D)
42013	Pr213D Program Setting 13 (D)
42014	Pr214D Program Setting 14 (D)
42015	Pr215D Program Setting 15 (D)
42016	Pr216D Program Setting 16 (D)
42017	Pr217D Program Setting 17 (D)
42018	Pr218D Program Setting 18 (D)
42019	Pr219D Program Setting 19 (D)
42020	Pr220D Program Setting 20 (D)
42021	Pr221D Program Setting 21 (D)
42022	Pr222D Program Setting 22 (D)
42023	Pr223D Program Setting 23 (D)
42024	Pr224D Program Setting 24 (D)
42025	Pr225D Program Setting 25 (D)
42026	Pr226D Program Setting 26 (D)
42027	Pr227D Program Setting 27 (D)
42028	Pr228D Program Setting 28 (D)
42029	Pr229D Program Setting 29 (D)
42030	Pr230D Program Setting 30 (D)

6.6 Prog Op Freq. (f) Components

Reg	Definition
42031	Pr201f Program Setting 1 (f)
42032	Pr202f Program Setting 2 (f)
42033	Pr203f Program Setting 3 (f)
42034	Pr204f Program Setting 4 (f)
42035	Pr205f Program Setting 5 (f)
42036	Pr206f Program Setting 6 (f)
42037	Pr207f Program Setting 7 (f)
42038	Pr208f Program Setting 8 (f)
42039	Pr209f Program Setting 9 (f)
42040	Pr210f Program Setting 10 (f)
42041	Pr211f Program Setting 11 (f)
42042	Pr212f Program Setting 12 (f)
42043	Pr213f Program Setting 13 (f)
42044	Pr214f Program Setting 14 (f)
42045	Pr215f Program Setting 15 (f)
42046	Pr216f Program Setting 16 (f)
42047	Pr217f Program Setting 17 (f)
42048	Pr218f Program Setting 18 (f)
42049	Pr219f Program Setting 19 (f)
42050	Pr220f Program Setting 20 (f)
42051	Pr21f Program Setting 21 (f)
42052	Pr222f Program Setting 22 (f)
42053	Pr223f Program Setting 23 (f)
42054	Pr224f Program Setting 24 (f)
42055	Pr225f Program Setting 25 (f)
42056	Pr226f Program Setting 26 (f)
42057	Pr227f Program Setting 27 (f)
42058	Pr228f Program Setting 28 (f)
42059	Pr229f Program Setting 29 (f)
42060	Pr230f Program Setting 30 (f)

7. Specifications

Current Consumption	From A500(L) drive: 300 mA typ. @5 Vdc Provided to Modbus Plus network: 100 mA @5 Vdc
Backplane Isolation	500 Vdc min.
Supported Data Rates	<= 450 m: 1 Mbps, no repeater; <= 1800 m: 1 Mbps, repeaters Maximum distance between nodes is 450 meters.
Operating Temperature	-10 to 50 °C
Storage Temperature ⁽¹⁾	-20 to 65 °C
Relative Humidity	<= 90% @50 °C, non-condensing
Dimensions	96 x 49 x 33 mm

(1) This refers to a short period of time such as during transportation.

8. References

Mitsubishi Electric

FR-A500(L) VFD Instruction Manual

Schneider Automation

*Modicon Modbus Plus Network Planning and Installation Guide, 890
USE 100 00 Version 3.0, April 1996*

*Modicon Modbus Protocol Reference Guide, PI-MBUS-300 Rev.
J, June 1996*

Appendix A : Other Option-Specific parameters

The following table identifies option-specific parameters which are used for the A5NM.

Pr. #	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	0,1,2	1	0

A. Definition for Pr.338 and Pr.339

Control Source Slection		Function													
Pr.	Pr.	STF	STR	ST OP	JO G	RT	2	4	1	RH, RM, RL	AJ	RE S	MRS	OH	CS
338	339														
0	0	Net	Net	Net	-	Net	Net	Net	Net	Net	-	Both	Ext	Ext	Ext
0	1	Net	Net	Net	-	Net	Ext	Ext	Ext	Ext	Ext	Both	Ext	Ext	Ext
1	0	Ext	Ext	Ext	Ext	Ext	Net	Net	Net	Net	-	Both	Ext	Ext	Ext
1	1	Ext	Ext	Ext	Ext	Ext	Ext	Ext	Ext	Ext	Ext	Ext	Ext	Ext	Ext

Note : Ext : Control is via input to external terminal

Net : Control is via Modbus Plus.

Both : Control is via either external terminal or Modbus Plus.

‘-‘ : Control is via neither external nor Modbus Plus.

B. Definition for mPr.340

Value	Function
0	The VFD always goes to Ext-mode after power-up or INV Reset
1	The VFD always goes to Net-mode after power-up or INV Reset
2	The VFD always goes to Net-mode and keeps previous f setting value automatically after IPF.

NOTE

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