

**Mitsubishi  
Electric  
Automation  
Instruction Manual**


**FR-A5AC-01**


AC Input Interface Option Unit



## 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 any VFD or option unit unless you are 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 parameter all 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 grounded metal object to remove static from your body.
- Dispose of this product as general industrial waste.

- WARNING:**
- Do not modify this equipment



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## 1. Introduction

Thank you for choosing this AC input interface option unit for the Mitsubishi FR-A500(L) series transistorized frequency VFD's.

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 installation of the FR-A5AC-01 option.

It is assumed that the reader of this manual possesses an understanding of the configuration, implementation, and operation of Mitsubishi FR-A500(L) series VFD's

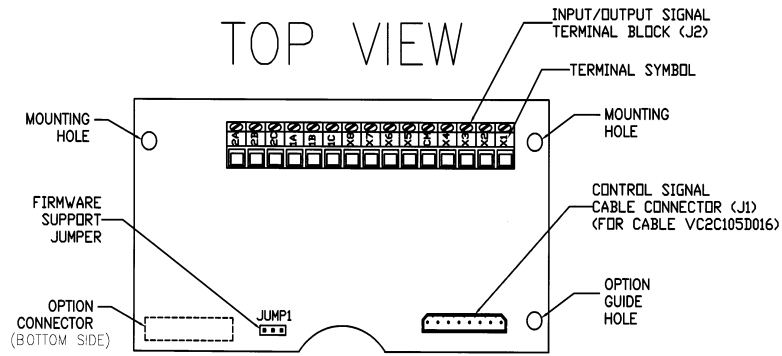
Please forward this manual to the end user.

### AC Input Interface Option Unit (FR-A5AC-01)

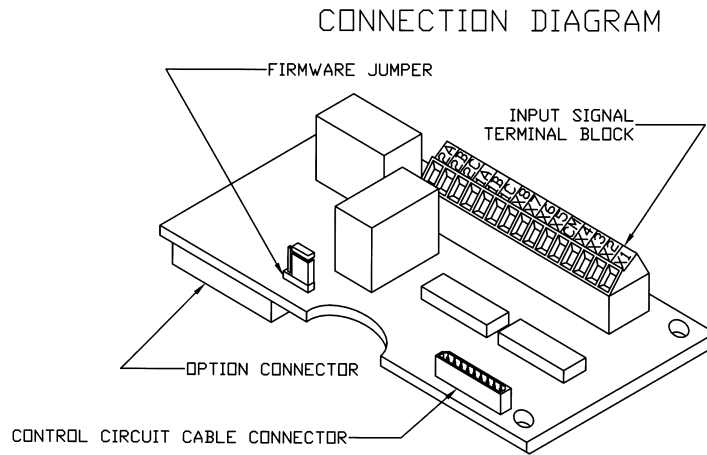
This option unit lets you connect a FR-A500(L) series VFD with up to eight 120 VAC input signals which are then isolated and connected to the FR-A500(L) 24 V signal input terminal block. Some important features of this option unit include:

- All input functions are electrically isolated to 1000 volts from the VFD
- User selectable input functions.
- Can be used with communications options.
- Designed and assembled in the U.S.A.
- UL & C-UL Approved.

### 1.1 FR-A5AC-01 Structure



**Figure 1: Top view**

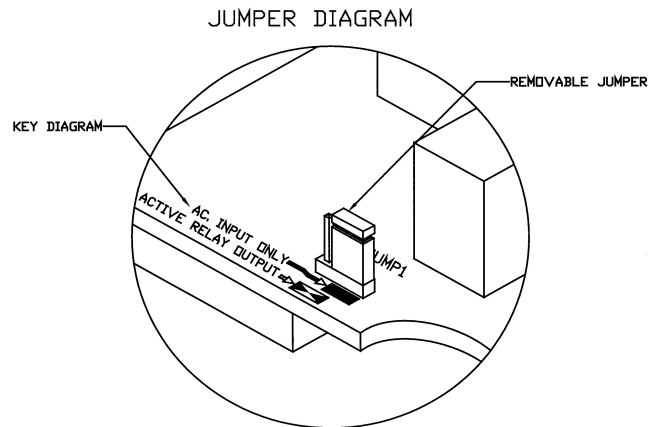


**Figure 2: Connection Diagram**

### 1.2 FR-A5AC-01 Signal Description

Name	Description
FR-A5AC Input Terminal Block (J2)	Eight 120 VAC inputs, X1 – X8, and a common. Terminals 1A,1B,1C & 2A,2B,2C are not available.
FR-A5AC Control Signal Terminal Block Cable (VC2C105A016)	FR-A5AC output signal for the A560(L) VFD's control signal terminal block, Y1 – Y8
FR-A5AC Firmware Support Jumper (Jump1)	This jumper is not used and should be in the AC input only location.

**Table 1: A500(L) Interface Functions**

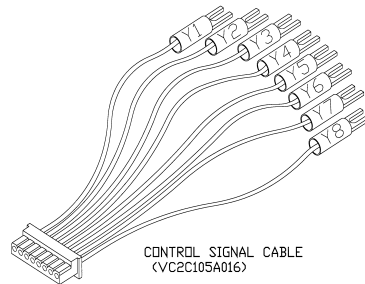


**Figure 3: Jumper Diagram**

## 2. Installation

### 2.1 Unpacking the FR-A5AC-01 Option

1. Check that all required components were received from the factory. The FR-A5AC-01 option should have the following items included.
  - ◆ 1 Instruction Manual  
VC2BNA00031
  - ◆ 1 Option Terminal Block Cable  
VC2C105A016



**Figure 4: Option Cable**

- ◆ 1 FR-A5AC-01 Option in an anti-static bag.  
C2C132U080
  - ◆ 2 3 x 8 mm Machine Screws  
VSP896M205
2. The FR-A5AC-01 option should be left in the anti-static bag until installation to prevent damage caused by ESD.



The option module is sensitive to Electro-static discharge. Proper ESD measures required.

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## 2.2 Pre-Installation Checks

Remove the VFD cover carefully, following the directions given in the VFD instruction manual. Be sure to install the option unit using the following procedure:

**NOTE:** The FR-A5AC-01 jumper “JUMP1” is factory set to the “A.C. INPUT ONLY” position .

## 2.3 Mounting Procedure

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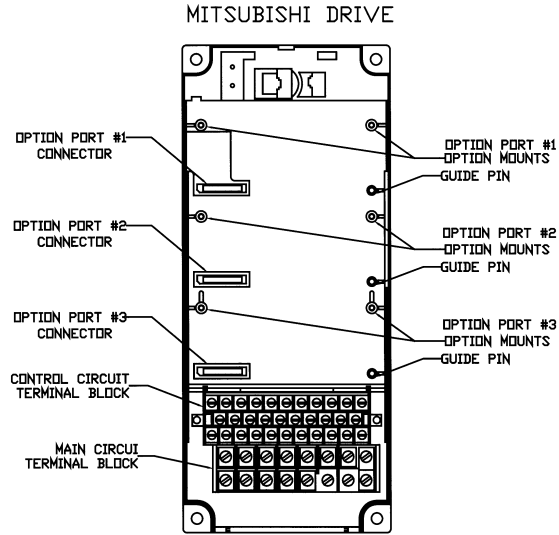


**WARNING**

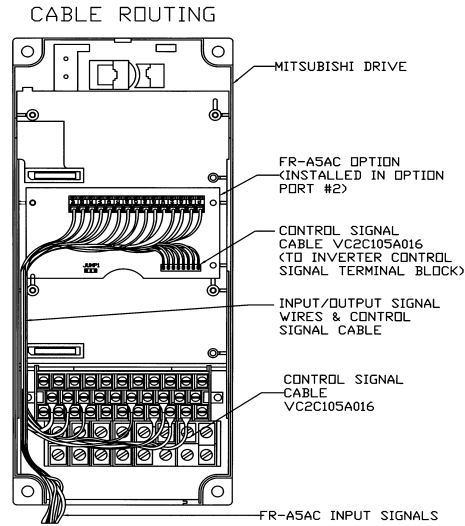
**HAZARDOUS VOLTAGE PRESENT**

Always isolate power from the VFD and wait 10 minutes until the bus charge light is off and check for residual before inserting or removing this option unit or touching the terminals.

- 
1. Make sure the VFD input line power is off and the charge light on the VFD shows that the VFD is not storing an electrical charge, always check for residual voltage. Refer to the VFD instruction manual if necessary. You may damage the option unit if you install it with the line power connected.
  2. Insert the FR-A5AC-01 option unit into VFD's option port #2 or option port #3 (option port #1 is not recommended for easy wiring when installed). 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 option with the matching machine screw inserts and the plastic guide pin on the VFD. Make sure that the FR-A5AC-01 option is firmly seated in the VFD and the connector is completely plugged in and secured.



**Figure 5: Drive View**



**Figure 6: Cable Routing View**

3. 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.
4. Route the 120 VAC signal cables and the control signal terminal block cable along the side of the VFD case as shown in figure 6.

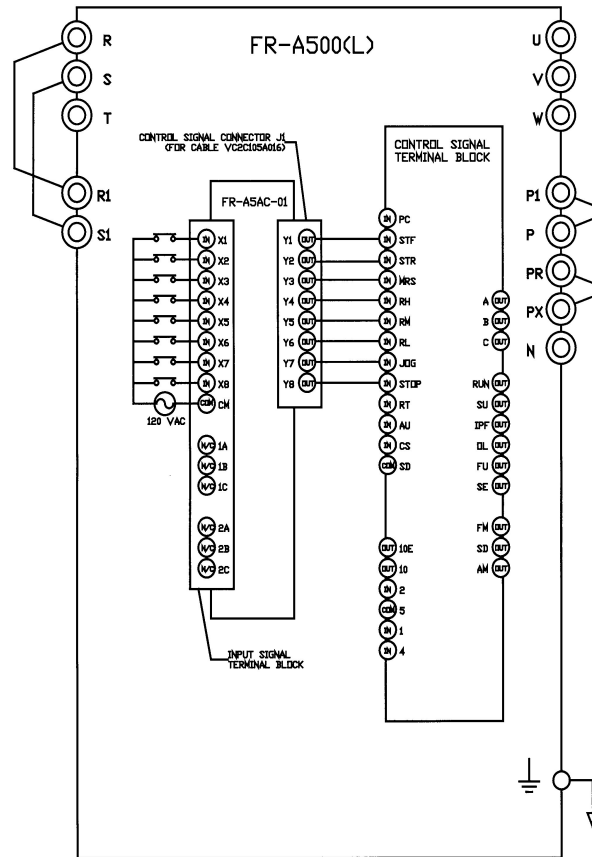


Figure 7: Wiring Diagram

5. When wiring the option follow local electrical codes concerning proper wire gauge and circuit protection.
6. All external signals are connected to the option through the options terminal block labeled for signal Identification. The terminal block is UL & CSA approved for 28-16 AWG wire.
7. The 120VAC inputs are located at terminals X1 to X8 with common CM. The corresponding isolated outputs are the terminals labeled Y1 to Y8 and are designed to be connected directly to the VFD terminal block control input terminals via the FR-A5AC-01 control signal cable. The FR-A5AC-01 control signal cable can be connected to any 8 of the 11 standard input signals.
8. Any unused terminals from the cable should be removed or properly insulated to prevent accidental shorting.



Insulate or remove any unused terminals from the terminal block cable to prevent accidental shorting.

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9. After connecting the terminal block cable to the VFD, plug the connector on the other end into the socket J1 on the FR-A5AC-01 AC Input Interface option.
10. Finally replace the VFD cover, while making sure that the signal wires are not caught or pinched between the cover and the chassis.

### 3. FR-A5AC-01 Operation

The operation of the A500(L) VFD does not change when you install the FR-A5AC-01 option unit. The option features an eight input 120 VAC interface function. The eight 120 VAC inputs are converted to be used with the VFD's control signal terminal block to enter the command signals.

#### 3.1 AC Interface Operation

By using the 120VAC inputs to enter command signals, any terminal block functions can be implemented including running a motor in the forward or reverse rotation direction. The 120VAC inputs are isolated and entered into the VFD as open collector signals.

Signal	Name	Description
X1,X2,X3,X4, X5,X6,X7,X8	120 VAC control input Signal	120VAC Input signals
CM (Note 1)	120 VAC control input Signal Common	Common terminal to X1- X8 (Isolated from VFD Control Circuit)
Y1,Y2,Y3,Y4, Y5,Y6,Y7,Y8	Open Collector Output	Output signals corresponding to X1 – X8 as open collector signals. Connect to the control input terminals of the VFD. Common terminal handled internally.

**Table 2: AC I/O Terminal Description**

Note: sink logic must be used on the VFD's control signal terminal block, see the A500(L) instruction manual for more details.

### 3.1.1 VFD terminal block control input terminals

The FR-A5AC-01 outputs, Y1-Y8, can be connected to the following VFD control signal terminal block terminals.

1. STF: When the input signal is asserted into the STF terminal, the motor rotates in the forward direction. When the signal is removed, a stop command is given.
2. STR: When the input signal is asserted into the STR terminal, the motor rotates in the reverse direction. When the signal is removed, a stop command is given.
3. STOP: When the input signal is asserted into the STOP terminal, the self holding feature is enabled.
4. RH, RM, & RL: When the input signal is asserted into the RH, RM, or RL terminal respectively, and the appropriate multiple speed functions are enabled.
5. JOG: When the input signal is asserted into the JOG terminal, the JOG operation can be performed with the STF or STR signal.
6. RT: When the input signal is asserted into the RT terminal, the second acceleration / deceleration times are enabled. The second torque boost and second base frequency can also be selected with this function when set correctly.
7. MRS: When the input signal is asserted into the MRS terminal for 20 ms or longer, the stop command is given to the motor and the motor is stopped by the magnetic brake.
8. RES: When the input signal is asserted into the RES terminal for 0.1 s or longer, and then removed, the VFD will reset.
9. CS: When the input signal is asserted into the CS terminal, the VFD will restart after an instantaneous power failure. Note that this

feature requires that the restart parameters be set. When the VFD is shipped from the factory it is set with this feature disabled.

10. AU: This terminal should not be used by the FR-A5AC-01 option.

### 3.1.2 User Selectable Terminal Functions

Several of the terminals listed above are user selectable to implement different functions when the signal to that terminal is asserted. The RL, RM, RH, RT, AU, JOG, & CS terminals are of this type and are set with the A500(L) parameters 180-186. See the A500(L) instruction manual for more details.

### 3.1.3 Parameter Functions

The following parameters are used to change the VFD control signal terminal blocks functions. The terminals listed below can be changed by the user, and can implement any one of several functions. The valid value range for parameters 180-186 are 0 to 99, & 9999.

Parameter Number	Terminal Symbol	Factory Setting	Factory Setting Terminal Function
180	RL	0	Low Speed Operation Command
181	RM	1	Medium Speed Operation Command
182	RH	2	High Speed Operation Command
183	RT	3	Second Function Selection
184	AU	4	Current Input Selection
185	JOG	5	Jog Operation Selection

Parameter Number	Terminal Symbol	Factory Setting	Factory Setting Terminal Function
186	CS	6	Automatic Restart After Instantaneous Power Failure

**Table 3: Control Signal Parameters**

### 3.1.4 Parameter Settings

Use the following list for setting parameters, Pr. 180 - 186.

Setting = 0	Signal Name: RL
<b>Function:</b> <u>When PR 59 = 0</u> , Low speed operation command, see the A500(L) manual for more details.	
<b>Relevant Parameters:</b> PR 4 to PR 6, PR 24 to 27, PR 232 to PR 239	
<b>Function:</b> <u>When PR 59 = 1,2 *</u> , Remote Setting (acceleration)	
<b>Relevant Parameters:</b> PR 59,	
<b>Function:</b> <u>When PR 79 = 5 *</u> , Programmed operation group selection.	
<b>Relevant Parameters:</b> PR 79, PR 200, PR 201, PR 210, PR 211, PR 220, PR 221, PR 230, PR 231	
<b>Function:</b> <u>When PR 270 = 1,3 *</u> , Stop on contact selection 0.	
<b>Relevant Parameters:</b> PR 270, PR 275, PR 276	



<b>Setting = 1</b>	<b>Signal Name: RM</b>
<b>Function:</b> <u>When PR 59 = 0</u> , Middle speed operation command.	
<b>Relevant Parameters:</b> PR 4 to PR 6, PR 24 to 27, PR 232 to PR 239	
<b>Function:</b> <u>When PR 59 = 1,2 *</u> , Remote Setting (deceleration)	
<b>Relevant Parameters:</b> PR 59,	
<b>Function:</b> <u>When PR 79 = 5 *</u> , Programmed operation group selection.	
<b>Relevant Parameters:</b> PR 79, PR 200, PR 201, PR 210, PR 211, PR 220, PR 221, PR 230, PR 231	

<b>Setting = 2</b>	<b>Signal Name: RH</b>
<b>Function:</b> <u>When PR 59 = 0</u> , High speed operation command.	
<b>Relevant Parameters:</b> PR 4 to PR 6, PR 24 to 27, PR 232 to PR 239	
<b>Function:</b> <u>When PR 59 = 1,2 *</u> , Remote Setting (setting clear)	
<b>Relevant Parameters:</b> PR 59,	
<b>Function:</b> <u>When PR 79 = 5 *</u> , Programmed operation group selection.	
<b>Relevant Parameters:</b> PR 79, PR 200, PR 201, PR 210, PR 211, PR 220, PR 221, PR 230, PR 231	

<b>Setting = 3</b>	<b>Signal Name: RT</b>
<b>Function:</b> Second function selection	
<b>Relevant Parameters:</b> PR 44 to PR 50,	
<b>Function:</b> <u>When PR 270 = 1,3 *</u> , Stop on contact selection 1	
<b>Relevant Parameters:</b> PR 270, PR 275, PR 276	

<b>Setting = 4</b>	<b>Signal Name: AU</b>
<b>Function:</b> Current input selection.	
<b>Relevant Parameters:</b>	

<b>Setting = 5</b>	<b>Signal Name: JOG</b>
<b>Function:</b> JOG operation selection.	
<b>Relevant Parameters:</b> PR 15, PR 16,	

<b>Setting = 6</b>	<b>Signal Name: CS</b>
<b>Function:</b> Automatic restart after an instantaneous power failure selection.	
<b>Relevant Parameters:</b> PR 57, PR 58, PR 162 to PR 165	

<b>Setting = 7</b>	<b>Signal Name: OH</b>
<b>Function:</b> External thermal relay input** The externally provided overheat protection thermal relay, motor embedded temperature relay or the like is operated to stop the VFD.	
<b>Relevant Parameters:</b>	

<b>Setting = 8</b>	<b>Signal Name: REX</b>
<b>Function:</b> 15 Speed selection (in combination with RL, RM, & RH)	
<b>Relevant Parameters:</b> PR 4 to 6, PR 24 to 27, PR 232 to PR 239	

<b>Setting = 9</b>	<b>Signal Name: X9</b>
<b>Function:</b> Third Function	
<b>Relevant Parameters:</b> PR 110 to 116	

<b>Setting = 10</b>	<b>Signal Name: X10</b>
<b>Function:</b> FR-HC connection (VFD operation enable)	
<b>Relevant Parameters:</b> PR 30, PR 70	

<b>Setting = 11</b>	<b>Signal Name: X11</b>
<b>Function:</b> FR-HC connection (instantaneous power failure detection)	
<b>Relevant Parameters:</b> PR 30, PR 70	

<b>Setting = 12</b>	<b>Signal Name: X12</b>
<b>Function:</b> PU operation external interlock	
<b>Relevant Parameters:</b> PR 79	

<b>Setting = 13</b>	<b>Signal Name: X13</b>
<b>Function:</b> External DC dynamic breaking start	
<b>Relevant Parameters:</b> PR 10 to PR 12	

<b>Setting = 14</b>	<b>Signal Name: X14</b>
<b>Function:</b> PID control valid terminal	
<b>Relevant Parameters:</b> PR 128 to 134	

<b>Setting = 15</b>	<b>Signal Name: BRI</b>
<b>Function:</b> Brake opening completion signal	
<b>Relevant Parameters:</b> PR 278 to 285	
<b>Setting = 16</b>	<b>Signal Name: X16</b>
<b>Function:</b> PU-external operation switch-over	
<b>Relevant Parameters:</b> PR 79	
<b>Setting = 17</b>	<b>Signal Name: X17</b>
<b>Function:</b> Load pattern selection forward/reverse rotation boost	
<b>Relevant Parameters:</b> PR 14	
<b>Setting = 18</b>	<b>Signal Name: X18</b>
<b>Function:</b> Advanced magnetic flux vector-V/F switch-over	
<b>Relevant Parameters:</b> PR 80, PR 81, PR 89	
<b>Setting = 19</b>	<b>Signal Name: X19</b>
<b>Function:</b> Load torque high-speed frequency	
<b>Relevant Parameters:</b> PR 271 to 274	
<b>Setting = 9999</b>	<b>Signal Name:</b>
<b>Function:</b> NO function	

**Table 4: Control Signal Parameter Settings**

\*: When PR 59 = "1 or 2", PR 79 = "5", and PR 270 = "1 or 3", the functions of the RL, RM, RH, & RT signals change as listed above.

\*\* : Operated when the relay contact "opens"

### 3.1.5 Parameter Setting Notes

1. One function can be assigned to two or more terminals. In this case, the terminal inputs are OR'Ed together.
2. The speed command priorities are higher in order of JOG, and then multi speed setting RH, RM, and RL.
3. When HC connection (VFD operation enable signal) is not selected, the MRS terminal shares this function.
4. When advanced magnetic flux vector-V/F switchover and load pattern selection forward/reverse rotation boost are not selected, the second functions (RT) share these functions.
5. Use common terminals to assign programmed operation group selection, multi-speeds (7 speeds) and remote setting. They cannot be set individually.
6. Stop-on-contact control section PR 270 = "1 or 3", shares RT with multi speed setting (low speed), and its allocation cannot be changed.
7. When FR-HC connection VFD operation enable (X10) signal is not assigned, the MRS terminal shares this function.
8. When PR 79 = "7" and the PU operation external interlock (x12)signal is not assigned, the MRS signal acts as this function.
9. When the load pattern selection forward/reverse rotation boost (X17) signal is not assigned, the RT signal shares this function.
10. When advanced magnetic flux vector-V/F switchover (X18) signal is not assigned, the RT signal shares this function.

#### 4. FR-A5AC-01 Specifications

1. AC Input Voltage: 90 – 132 VAC
2. Operating Temperature –10° ~ 50° C
3. Storage Temperature(1) -20° ~ 56° C
4. Relative Humidity <= 90% @ 50° C, non-condensing.
5. Dimensions 96 x 49 x 18 mm

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

#### 5. References

**Mitsubishi Electric**

*FR-A500(L) VFD Instruction Manual*

**Technical Support Number**

800-950-7781

#### 6. Revisions

Print Date	Manual Number	Revision
June 2000	VC2BNA000031 REV A	Original Version

## 7. User Note's Section





Mitsubishi VFD Instruction Manual  
FR-A5AC-01

2000 Mitsubishi Electric Automation, Inc.

FR-A5AC-01 Auxiliary Control Option Unit  
VC2BNA00031 Revision A • June 2000