

MasterLogic-200
CPU Module

2MLI-CPUU

10310000817 Printed in Korea

For more information on MasterLogic PLCs, contact your nearest Honeywell office

- Australia**
Honeywell Ltd.
Phone : (61) 2-9353-4500
Fax : (61) 2-9353-7677
- Japan**
Honeywell Inc.
Phone: (81)3-5440-1395
Fax: (81)3-5440-1368
- Singapore**
Honeywell Pte Ltd.
Phone: (65) 6355-2828
Fax: (65) 6445-3033
- China**
Honeywell (Tianjin) Ltd. - Beijing
Phone: (86-10) 8458-3280
Fax: (86-10) 8458-3102
- South Korea**
Honeywell Co., Ltd.
Phone : (82) 2-799-6114
Fax : (82) 2-792-9015
- Thailand**
Honeywell Systems Ltd.
Phone: (662) 693-3099
Fax: (662) 693-3085
- Honeywell (Tianjin) Ltd. - Shanghai**
Phone: (86-21) 6237-0237
Fax : (86-21) 6237-3102
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Fax: (886) 2-2245-3241
- Indonesia**
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Phone : (62) 21-535-8833
Fax : (62) 21-5367-1008
- New Zealand**
Honeywell Ltd.
Phone: (64-9) 623-5050
Fax: (64-9) 623-5060
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Fax: (91) 20-5603-9800
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Honeywell Systems Inc.
Phone: (63-2) 633-2830
Fax: (63-2) 638-4013
- For Countries Listed below, call Honeywell India Office**
Bangladesh, Nepal, and Sri Lanka

Honeywell Co., Ltd.

Honeywell Process Solutions

17F, Kukje Center Building, 191 Hangangro-2ga,
Yongsan-gu, Seoul 140-702, Korea
Tel : 82-2-799-6114 / Fax : 82-2-792-9015

Email : MasterLogic_support@honeywell.com

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Safety Precautions

- ▶ Safety Precautions are for using the product safe and correct in order to prevent the accidents and danger, so please go by them.
- ▶ The precautions explained here only apply to the MasterLogic-200 CPU module. For safety precautions on the PLC system, refer to the MasterLogic-200 CPU User's manual.
- ▶ The precautions are divided into 2 sections, 'Warning' and 'Caution'. Each of the meanings is represented as follows.

- Warning** If violated instructions, it may cause death, fatal injury or considerable loss of property.
- Caution** If violated instructions, it may cause a slight injury or slight loss of products
- ▶ The symbols indicated in the PLC and User's Manual mean as follows
- ▶ Gives warnings and cautions to prevent from risk of injury, fire, or malfunction.
- ▶ Gives warnings and cautions to prevent from risk of electric shock.
- ▶ Store this datasheet in a safe place so that you can take out and read whenever necessary. Always forward it to the end user.

Warning

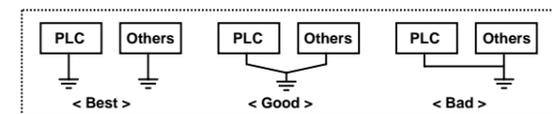
- ▶ **Do not contact the terminals while the power is applied.**
Risk of electric shock and malfunction.
- ▶ **Do not drop or insert any metallic object into the product.**
Risk of fire, electric shock and malfunction.
- ▶ **Do not charge, heat, short, solder and break up the battery.**
Risk of injury and fire by explosion and ignition.

Caution

- ▶ **Before wiring the PLC, ensure to check the rated voltage and terminal arrangement for the module and observe them correctly.**
Risk of fire, electric shock and malfunction.
- ▶ **Tighten up the terminal screw firmly to defined torque when to wire the PLC.**
Risk of fire and electric shock if the terminal screw looses.
- ▶ **Use the PLC in an environment that meets the general specifications contained in this datasheet.**
Risk of electrical shock, fire, erroneous operation and deterioration of the PLC.
- ▶ **Ensure that external load does not exceed the rating of output module.**
Risk of fire and erroneous operation.
- ▶ **Do not use the PLC in the environment of direct vibration**
Risk of electrical shock, fire and erroneous operation.
- ▶ **Do not disassemble, repair or modify the PLC.**
Risk of electrical shock, fire and erroneous operation.
- ▶ **When disposing of PLC and battery, treat it as industrial waste.**
Risk of poisonous pollution or explosion.

Precautions for use

- ▶ Do not install in any places other than PLC controlled place.
- ▶ Ensure that the FG terminal is grounded with class 3 grounding which is dedicated to the PLC. Otherwise, it may cause disorder or malfunction of PLC



- ▶ Connect expansion connector correctly when expansion modules are needed.
- ▶ Do not detach PCB from the case of the module and do not modify the module.
- ▶ Turn off the power when attaching or detaching module.
- ▶ Cellular phone or walkie-talkie should be farther than 30cm from the PLC
- ▶ Input signal and communication line should be farther than minimum 100mm from a high-tension line and a power line in order not to be affected by noise and magnetic field.

1. Introduction

This datasheet provides brief information about characteristics, configurations, and usages of MasterLogic-200 CPU module (2MLI-CPUU).

2. General Specifications

No.	Items	Specifications	Standards		
1	Operating temperature	0 to 55°C	-		
2	Storage temperature	-25 to 70°C	-		
3	Operating Humidity	5 to 95%RH, non-condensing	-		
4	Storage humidity	5 to 95%RH, non-condensing	-		
5	Vibration	Occasional vibration		IEC 61131-2	
		Frequency	Acceleration		Amplitude
		10sf ~ 57 Hz	-		0.075 mm
		57 sf ~ 150 Hz	9.8 ms ² {1G}		-
		Continuous vibration			10 times in each direction for X, Y, Z
		Frequency	Acceleration		
10sf ~ 57 Hz	-	0.035 mm			
		57sf ~ 150 Hz	4.9 ms ² {0.5G}		
6	Shocks	Maximum shock acceleration: 147 ms ² {15G}, Duration time: 11 ms Pulse wave: half sine wave pulse (3 times in each of X, Y and Z directions)	IEC 61131-2		
7	Noise immunity	Square wave impulse noise	±1,500 V	-	
		Electrostatic discharge	Voltage :4kV(contact discharge)	IEC 61131-2 IEC 61000-4-2	
		Radiated electromagnetic field	27 to 500 MHz, 10 V/m	IEC 61131-2 IEC 61000-4-3	
		Fast transient burst noise	Severity Level All power modules Digital I/Os Analog I/Os communication I/Os	IEC 61131-2 IEC 61000-4-4	
		Voltage	2 kV	1 kV	
8	Atmosphere	Free from corrosive gases and excessive dust	-		
9	Altitude for use	Up to 2,000m	-		
10	Pollution degree	2 or less	-		
11	Cooling method	Self-cooling	-		

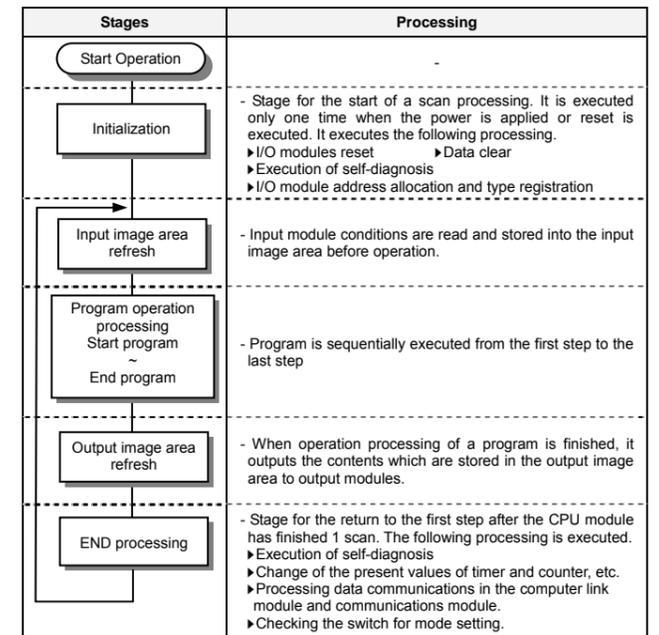
3. Performance Specifications

The performance specifications of CPU module (2MLI-CPUU) are as follows.

Items	Specifications (2MLI-CPUU)	Remarks	
Operation method	Cyclic, Time-driven, Fixed Period Scan Operation	-	
I/O control method	Scan synchronized batch processing method (Refresh method), Direct method by instruction	-	
Programming Language	Ladder Diagram (LD) SFC (Sequential Function Chart)	-	
Numbers of instructions	Operator	18	
	Basic function	136 + Floating-point Arithmetic Functions	
	Basic function block	43	
	Special function block	Each special modules have their own special function blocks.	
Processing speed(Basic instruction)	LD	0.028 μs/Step	
	MOVE	0.084 μs/Step	
	Floating-point arithmetic	±: 0.392 μs(S), 0.924 μs(D) x : 0.896 μs(S), 2.240 μs(D) + : 0.924 μs(S), 2.254 μs(D)	S: Single real number D: Double real number
Program memory capacity	1M byte(Approx. 128kstep)	-	
Max. I/O points	6,144 points	-	
Max. I/O points memory mapping area	131,072 points	-	
Data memory	Symbolic variable area(A)	512K byte (Max. 256K byte retain setting available)	
	Input variable(I)	16K byte	
	Output variable(Q)	16K byte	
	Direct variable	M 256K byte (Max. 128K byte retain setting available) R 64K byte * 2 blocks	64K byte per 1 block
		W 128K byte	-
		F 4K byte	System flag
		K 16K byte	PID flag
		L 22K byte	High-speed link flag
		N 42K byte	P2P flag
		U 8K byte	Analog refresh flag
Flash area	2 M byte, 32 blocks	Using R device	
Timer	No limit in points Time range: 0.001 ~ 4,294,967.295 s (1,193 hours)	1 timer occupies 20 byte of symbolic variable area	
Counter	No limit in points Counter range: 64 bit range	1 counter occupies 8 byte of symbolic variable area	
Program types	Number of total programs	256	
	Initialization task	1	
	Time driven task	32	
	Internal device task	32	
Operation modes	RUN, STOP, DEBUG	-	
Restart modes	Cold, Warm	-	
Self-diagnostic functions	Watchdog timer, Memory error detection, I/O error detection, Battery error detection, Power supply error detection, etc.	-	
Data protection method at power failure	Set to retain area in basic parameter	-	
Max. extension stages	8	Totally 15 m	
Internal current consumption	960mA	-	
Weight	0.12kg	-	

4. Operation Processing Methods

- 1) **Cyclic operation**
MasterLogic-200 PLC program is sequentially executed from the first step to the last step, which is called scan. This sequential processing is called cyclic operation. Cyclic operation of the PLC is continued as long as conditions are not changed for interrupt processing during program execution. This processing is classified into the following stages.



- 2) **Interrupt operation method (time driven, internal device task)**

In case of a situation which is requested to be urgently processed while executing the PLC program, this operation method discontinues the executed program temporarily and processes the interrupt program immediately. The signal which informs the CPU module of those urgent conditions is called interrupt signal. There is time driven interrupt method which is processed at every pre-set interval. Moreover, there is internal device task program which is processed by states of internal device

- 3) **Fixed period operation method (constant scan)**

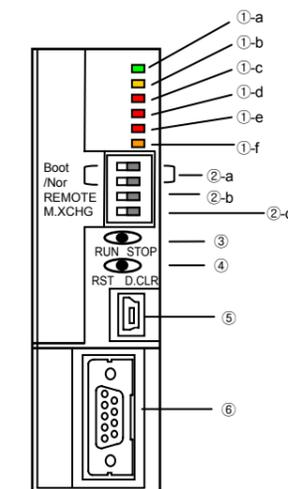
This operation method processes scan program at every pre-set interval. After the process of the scan program is finished, it is on standby, and then it is reactivated at every pre-set interval. With time driven interrupt program, it is different that the process is synchronized with input and output data refresh.

5. Parts Names and Descriptions

① CPU Module

The following describes the names and functions of parts of the CPU module.

- 1) 2MLI-CPUU



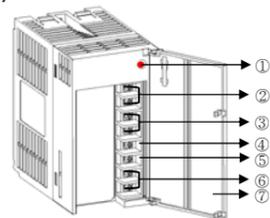
No.	Names
①-a	RUN/STOP LED
①-b	REM LED
①-c	ERR LED
①-d	PS LED (Programmable Status)
①-e	BAT LED
①-f	CHK LED
②-a	Boot/Nor Switch
②-b	REMOTE Mode Switch
②-c	M.XCHG (Module Exchange Switch)
③	RUN/STOP Mode Switch
④	Reset/ D.Clear Switch
⑤	USB Connector
⑥	RS-232C Connector

No.	Name	Description
①-a	RUN/STOP LED	Indicator of CPU operation mode • ON(Green) : 'RUN' mode in normal operation • ON(Red) : 'STOP' mode in normal operation
①-b	REM LED	• ON(Yellow) : Permission of 'REMOTE' mode • OFF(Yellow) : Prohibition of 'REMOTE' mode
①-c	ERR LED	• ON(Red) : Error where operation is impossible • OFF(Red) : Normal operation
①-d	PS LED (Programmable Status)	• ON(Red) ① In case of that 'user defined flag' is 'On' ② In case of that operation is continued in error state when 'Continue running when error occurs' is selected. ③ In case of that module is attached or detached when 'M.XCHG' switch is 'On' • OFF(Red) : Normal operation
①-e	BAT LED	• ON(Red) : In case of that battery voltage is low • OFF(Red) : Normal operation
①-f	CHK LED	• ON(Red) : In case of that setting is not default • OFF(Red) : In case of that setting is default
②-a	Boot/Nor Switch	• ON(Right) : Processing control operation in normal mode • OFF(Left) : O/S download mode (user-handling prohibited) • Caution: Boot/Nor switch must be always set to ON(Right). It can cause malfunction if it is set to OFF(Left).
②-b	REMOTE Mode Switch	It restricts the PLC operation of remote connection. • ON(Right): All functions are allowed. (Remote Mode) • OFF(Left): Remote functions are restricted.
②-c	M.XCHG (Module Exchange Switch)	It is used in case of that module is changed without the system being stopped. • ON(Right) : Module exchange is allowed. • OFF(Left) : Module exchange is finished.
③	RUN/STOP Mode Switch	It sets the operation mode of CPU module. • STOP → RUN : Operation execution of program • RUN → STOP : Operation stop of program
④	Reset/ D.Clear Switch	Reset operation is executed when the switch is set to left and then released. • Set to left → Return to center : RESET operation execution • Set to left → Hold over 3 seconds → Return to center : Overall RESET operation execution Data clear operation is executed when the switch is set to right and then released. • Set to right → Return to center : Clear M, automatic variable retain area and general area data • Set to right → Hold over 3 seconds → Return to center : Clear M, automatic variable retain area, general area data and R area data • Caution: Data clear operation is executed in "STOP" mode.
⑤	USB Connector	USB connector to connect with external device
⑥	RS-232C Connector	RS-232C connector to connect with external device • SoftMaster-200 connection: supported basically • Modbus device connection: Modbus protocol is supported. TX: Pin No. "7", RX: Pin No. "8", GND: Pin No. "5"

2) Specification

Item	2MLP-ACF1	2MLP-ACF2	2MLP-AC23	2MLP-DC42
Rated voltage	100 to 240VAC +10%/-15% (85 to 264VAC)	200 to 240VAC +10%/-15% (170 to 264VAC)	24VDC +20%/-20% (19.2 to 28.8VDC)	
Input frequency	50 / 60 Hz (47 to 63 Hz)			-
Inrush current	20A peak or less			80A peak or less
Efficiency	65% or more			60% or more
Fuse	Built-in (Unchangeable by user), UL certification (Slow Blow Type)			
Permissible instantaneous power failure time	Within 10 ms			
Voltage	5VDC (±2%)			5VDC (±2%)
Current	3 A	6 A	8.5 A	6 A
Overcurrent protection	3.2A or more	6.6 A or more	9A or more	6.6 A or more
Overvoltage protection	5.5V to 6.5V			
Voltage	DC24V (±10%)			
Current	0.6 A			
Overcurrent protection	0.7 A or more			
Overvoltage protection	None			
Application	RUN contact			
Rated switching voltage/current	24VDC, 0.5A			
Minimum switching load	5VDC, 1 mA			
Response time	Off to On: 10 ms max. / On to Off: 12 ms max.			
Life	Mechanical: More than 2 million times Electrical: More than 100 thousand times at rated switching voltage/current			
Operation indication	LED indication (lit at 5VDC output)			
Applicable wire size	0.75 to 2 mm ²			
Applicable crimping terminal	RAV1.25 to 3.5, RAV2 to 3.5			
Weight	0.4 kg	0.6 kg	0.5 kg	

3) Names of Parts



No.	Name	Description
1	Power LED	LED indicator for 5VDC power
2	24VDC terminal 24VDCG terminal	Supply 24VDC power to the other modules (2MLP-ACF1 only) ▶ No connection (2MLP-ACF2, 2MLP-AC23)
3	RUN terminal	CPU module operating status output ▶ Relay switched off at an error stop of CPU module ▶ Relay switched off at an CPU mode change to STOP
4	FG terminal	Frame ground terminal
5	LG terminal	Line ground terminal
6	Power input terminal	Power input terminal ▶ 2MLP-ACF1, 2MLP-ACF2: connect 100 to 240VAC ▶ 2MLP-AC23: connect 200 to 240VAC ▶ 2MLP-DC42: connect 24VDC
7	Terminal cover	Cover for protection of terminal

7. Base Units

1) Main Base Board

Item	Type	2MLB-M12A	2MLB-M08A	2MLB-M06A	2MLB-M04A
Number of I/O modules mounted		12	8	6	4
External dimensions (mm)		426 X 98 X 19	318 X 98 X 19	264 X 98 X 19	210 X 98 X 19
Panel installation hole dimensions (mm)		406 X 75	298 X 75	244 X 75	190 X 75
Panel installation hole size		φ 4.5 (for M4 screw)			
FG terminal connection screws specification		(+JPHM 3 X 6 washer(φ 5)			
Weight (kg)		0.6	0.5	0.4	0.3

2) Expansion Base Board

Item	Type	2MLB-E12A	2MLB-E08A	2MLB-E06A	2MLB-E04A
Number of I/O modules mounted		12	8	6	4
External dimensions (mm)		426 X 98 X 19	318 X 98 X 19	264 X 98 X 19	210 X 98 X 19
Panel installation hole dimensions (mm)		406 X 75	298 X 75	244 X 75	190 X 75
Panel installation hole size		φ 4.5 (for M4 screw)			
FG terminal connection screws specification		(+JPHM 3 X 6 washer(φ 5)			
Weight (kg)		0.6	0.5	0.4	0.3

8. Troubleshooting

The following explains contents, diagnosis and corrective actions for various errors that can occur during system operation.

8.1 Basic Procedures of Troubleshooting

System reliability not only depends on reliable equipment but also on short downtimes in the event of faults. The short discovery and corrective action is needed for speedy operation of system. The following shows the basic instructions for troubleshooting.

1) Visual checks

Check the following points

- Machine operating condition (in stop and operating status)
- Power On/Off
- Status of I/O devices
- Condition of wiring (I/O wires, extension and communications cables)
- Display states of various indicators (such as POWER LED, RUN LED, ERR. LED and I/O LED). After checking them, connect peripheral devices and check the operation status of the PLC and the program contents.

2) Trouble Check

Observe any change in the error conditions during the following.

- Switch to the STOP position, and then turn the power on and off.

3) Range limitation

According to above procedures, assume the cause of faults as follows.

- Is it caused by PLC or External Environment?
- Is it caused by I/O modules or others?
- Is it caused by programming mistakes?

8.2 Troubleshooting

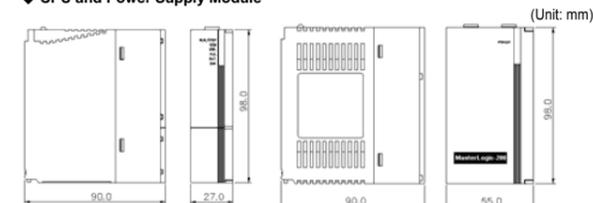
Refer to MasterLogic-2001 CPU User's Manual in order to understand error contents, diagnosis and corrective actions in details.

8.3 Error Code List

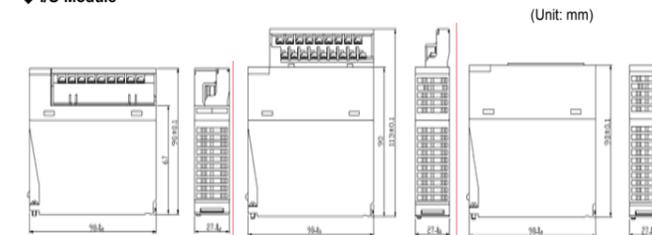
Error code	Cause	Corrective Action (Solution)	Operation status	LED status	Diagnosis timing
02	Data bus error	Contact the service center if it reactively occurs when the power is re-applied.	Defect	All LEDs flicker sequentially	When power is applied
03	Data RAM error	Contact the service center if it reactively occurs when the power is re-applied.	Defect	All LEDs flicker sequentially	When power is applied
04	RTC fault	Contact the service center if it reactively occurs when the power is re-applied.	Defect	ERR: On	When power is applied
06	Program memory error	Contact the service center if it reactively occurs when the power is re-applied.	Defect	ERR: On	When power is applied
10	USB IC error	Contact the service center if it reactively occurs when the power is re-applied.	Defect	ERR: On	When power is applied
11	Backup RAM error	Contact the service center if it reactively occurs when the power is re-applied.	Defect	ERR: On	When power is applied
12	Backup Flash memory error	Contact the service center if it reactively occurs when the power is re-applied.	Defect	ERR: On	When power is applied
13	Base information error	Contact the service center if it reactively occurs when the power is re-applied.	STOP	ERR: On	When power is applied, change into the RUN mode
22	Program error of backup flash memory	Correct the memory module program and re-operate the system	Defect	ERR: On	Reset and change into the RUN mode.
23	Abnormal program	1.Re-load program and start it. 2.Replace battery if it gets trouble. 3.Replace CPU module if it gets trouble after the program re-loading.	STOP	ERR: On	Reset and change into the RUN mode.
24	I/O parameter error	1.Re-load basic parameter and start it. 2.Replace battery if it gets trouble. 3.Replace CPU module if it gets trouble after the I/O parameter re-loading.	STOP	ERR: On	Reset and change into the RUN mode.
25	Basic parameter error	1.Re-load basic parameter and start it. 2.Replace battery if it gets trouble. 3.Replace CPU module if it gets trouble after the basic parameter re-loading.	STOP	ERR: On	Reset and change into the RUN mode.
30	Inconsistency between the specified modules by parameters and the loaded modules	Module type inconsistency error. Check the incorrect slot by SoftMaster-200, and correct it and then re-start the system.	STOP (RUN)	ERR: On (PS: On)	Change into the RUN mode.
31	Module dismantling or additional mounting during run	Module mounting/dismounting error. Check the incorrect slot by SoftMaster-200, and correct it and then re-start the system.	STOP (RUN)	ERR: On (PS: On)	When scan is completed
32	Fuse disconnection of output module during run	Check fuse LED of output module and replace the module.	STOP (RUN)	ERR: On (PS: On)	When scan is completed
33	Abnormal I/O module data access during run	I/O module read/write error. Check the incorrect slot by SoftMaster-200, and replace the module and then re-start the system.	STOP (RUN)	ERR: On (PS: On)	When scan is completed
34	Abnormal special/ link module data access during run	Special/ link module interface error. Check the incorrect slot by SoftMaster-200, and replace the module and then re-start the system.	STOP (RUN)	ERR: On (PS: On)	When scan is completed
39	Abnormal PLC CPU completion or fault	Contact the service center if it reactively occurs when the power is re-applied.	STOP	RUN: On ERR: On	Always
40	During run, Scan time over than the scan delay time specified by parameters	Check the scan delay time specified by parameters and correct the parameters of the program, and then re-start the system.	STOP	RUN: On ERR: On	During execution of program
41	Operating error in the user program	Correct the operating error and re-load the program and then restart the system. -STOP: Check the details of the operating error using SoftMaster-200 and correct the program. -RUN: Check the error step in F area.	STOP	RUN: On ERR: On	During execution of program
42	Stack overflow during execution of program	Re-start the system.	STOP	RUN: On ERR: On	During execution of program
44	Timer index error	Correct timer index program and re-load program and then re-start the system.	STOP (RUN)	RUN: On ERR: On	When scan is completed
50	External device fatal error	Refer to the external device fatal error flag and correct the fault devices and then re-start the system.	STOP (RUN)	ERR: On (PS: On)	When scan is completed
60	The "E-STOP" function has been executed	Correct the program so that the error elements that invoked the "E_STOP" function can be eliminated in the program and re-start the system	STOP	RUN: On ERR: On	During execution of program
500	Data memory backup error	If the battery has no error, re-apply the power. It is changed to STOP mode in the remote mode.	STOP	ERR: On	Reset
501	RTC data error	If the battery has no error, re-set the time using SoftMaster-200	-	CHK: On	Always
502	Lower battery voltage	Replace the battery when the power is applied	-	BAT: On	Always

9. Dimension (mm)

◆ CPU and Power Supply Module

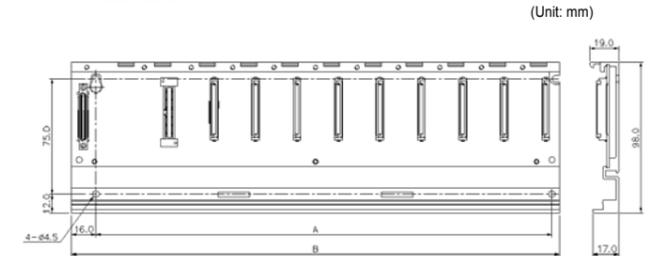


◆ I/O Module

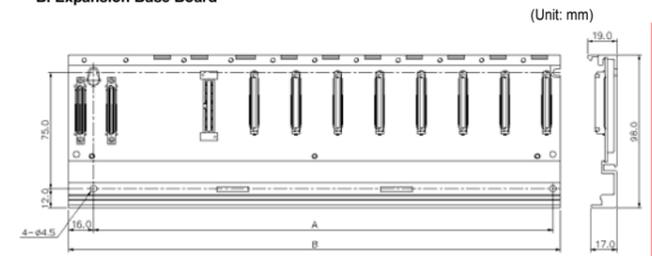


◆ Base Units

A. Main Base Board



B. Expansion Base Board



Type	A	B
2MLB-M04A / 2MLB-E04A	190	210
2MLB-M06A / 2MLB-E06A	244	264
2MLB-M08A / 2MLB-E08A	298	318
2MLB-M12A / 2MLB-E12A	406	426

6. Power Supply Modules

This chapter describes the selection method, type and specification of the power supply modules.

1) Selection of power supply module

Selection of the power supply module is determined by the total current consumption of digital input/output modules, special modules and communication modules, etc. whose powers are supplied by the power supply module.

If total load overruns the rated output capacity, the system will not normally operate.

When configuring a system, select a power supply module with due consideration of current consumption of each module.

Internal current consumption of MasterLogic-2001 series modules(5VDC) (Unit: mA)

Type	Module	Current Consumption	Type	Module	Current Consumption	
CPU	2MLI-CPUU	960	Analog Input	2MLF-AV8A	420	
	2MLI-D21A	20		2MLF-AC8A	420	
	2MLI-D22A	30		2MLF-AD8A	560	
	2MLI-D22B	30		2MLF-DV4A	190(140)	
	2MLI-D24A	50		2MLF-DC4A	190(210)	
	2MLI-D24B	50		2MLF-DV8A	190(180)	
	2MLI-D28A	60		2MLF-DC8A	190(300)	
110VAC Input	2MLI-A12A	30	Thermocouple Input	2MLF-TC4S	610	
	2MLI-A21A	20		2MLF-HO2A	270	
220VAC Input	2MLQ-RY1A	250	High-speed Counter	2MLF-HD2A	330	
	2MLQ-RY2A	500		2MLF-PO3A	400	
Relay Output	2MLQ-RY2B	500	Positioning	2MLF-PO2A	360	
	2MLQ-TR2A	70		2MLF-PO1A	336	
	2MLQ-TR2B	70		2MLF-PD3A	860	
	2MLQ-TR4A	130		2MLF-PD2A	790	
	2MLQ-TR4B	130		2MLF-PD1A	510	
Transistor Output	2MLQ-TR4B	130	RTD Input	2MLF-RD4A	490	
	2MLQ-TR8A	230		Channel-Isolated Analog Input	2MLF-AD4S	610
	2MLQ-TR8B	230			Channel-Isolated Analog Output	2MLF-DC4S
TRIAC Output	2MLQ-SS2A	300	FENet I/F Module	2MLL-EF4S		200(150)
	2MLL-C22A	330		2MLL-EF2A	650	
	2MLL-C42A	300		2MLL-EF1A	420	
Snet I/F Module	2MLL-CH2A	340	FDEnet I/F Module (Master)	2MLL-EDMF	650	
	2MLL-RMEA	410		2MLL-EDMT	420	
Rnet I/F Module	2MLL-PMEA	560	Fiber Optic Ring Switch Module	2MLL-ESHF	1,200	
Pnet I/F Module	2MLL-DMEA	440				

() indicates current consumption of external 24VDC.