



MasterLogic-200/R (Hot-Standby System)

Specifications and Technical Data

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Release 202

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Revision History

Revision	Date	Changes
1.0	Sep. 2007	Initial Version
2.0	Jan. 2008	A – Included details on MasterLogic 200R
3.0	Sep. 2008	M – Updated MasterLogic 200R Specifications
4.0	May 2010	D – Removed Experion PKS introduction, Removed Smart IO and Position Control Module A – Included ML200R DC24V power supply
5.0	Dec. 2010	A – Included Profibus DP Remote Interface card, 2MLR-DMMA
6.0	Jul. 2011	A – DeviceNet interface card, CPUs, Redundant CPU rack
7.0	Dec. 2011	A – Expansion Redundancy, Profibus Slave Interface
8.0	May. 2013	A – 2MLI-CPUS/P
9.0	Dec. 2013	A – 8 channel RTD, HART analog input and output, 8 slot rack, CPU for redundant power M – Revised with latest IEC standards

Legend for Change Column:

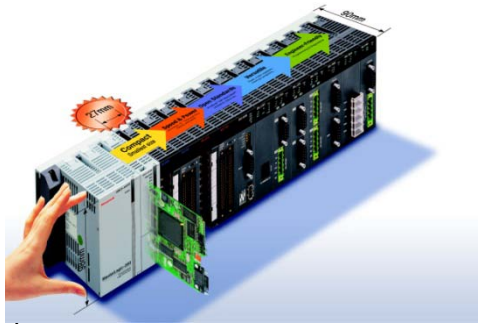
A – Added

D – Deleted

M – Modified

1. Introduction

1.1 Overview



MasterLogic-200, Honeywell's next generation Programmable Logic Controllers (PLC), adds power and robustness to logic-interlock-sequence batch control capabilities of Experion network.

It is state of the art, compact yet powerful & versatile, cost-effective solution ideal for fast logic, sequential, and batch control applications

The highlights of MasterLogic-200 PLC system are:

- Powerful & Versatile CPU (high speed / memory, IEC programming etc)
- Compact footprint (Rack room, cabinet space saver, shipping costs saver)
- Modular options (power supply, range of I/O modules to suit your configuration)
- Flexibility in module assignment – any module can be installed in any slot of any base without any restrictions.
- Open networks (Fast Ethernet, UTP/Fiber-Optic, serial RS232C /422/485)
- Open protocols (Profibus-DP, MODBUS ASCII/RTU/TCP, DeviceNet)
- Peer-to-Peer networks (Dedicated Fast Ethernet on UTP/Fiber-optic)
- Simulation Environment to test control strategies without hardware or process connections.
- Engineer-friendly software (Connection options, easy configuration & trouble-shooting)
- Diagnostics (System/Error Logs, system monitoring, network monitoring, ping test, frame monitor)
- Experion HS/LS Integration (PLC alarm/events, clock synch, etc)
- Redundancy (CPU, Power, I/O network redundancy)

1.2 MasterLogic-200 PLC system architecture

Redundancy options

MasterLogic-200 provides the control system designer with various redundancy architecture options that fits the requirement.

Fully Redundant system

CPU Model: 2MLR-CPUH/# provides a fully redundant system:

- Redundant CPU
- Redundant Power
- Redundant I/O cable (ring topology with single or dual paths)

Non-redundant system

For cost-effective applications, CPU Model: 2MLI-CPU# provides a fully non-redundant system:

- Non-redundant CPU
- Non-redundant Power
- Non-redundant I/O cable

Non-redundant CPU with Redundant Power

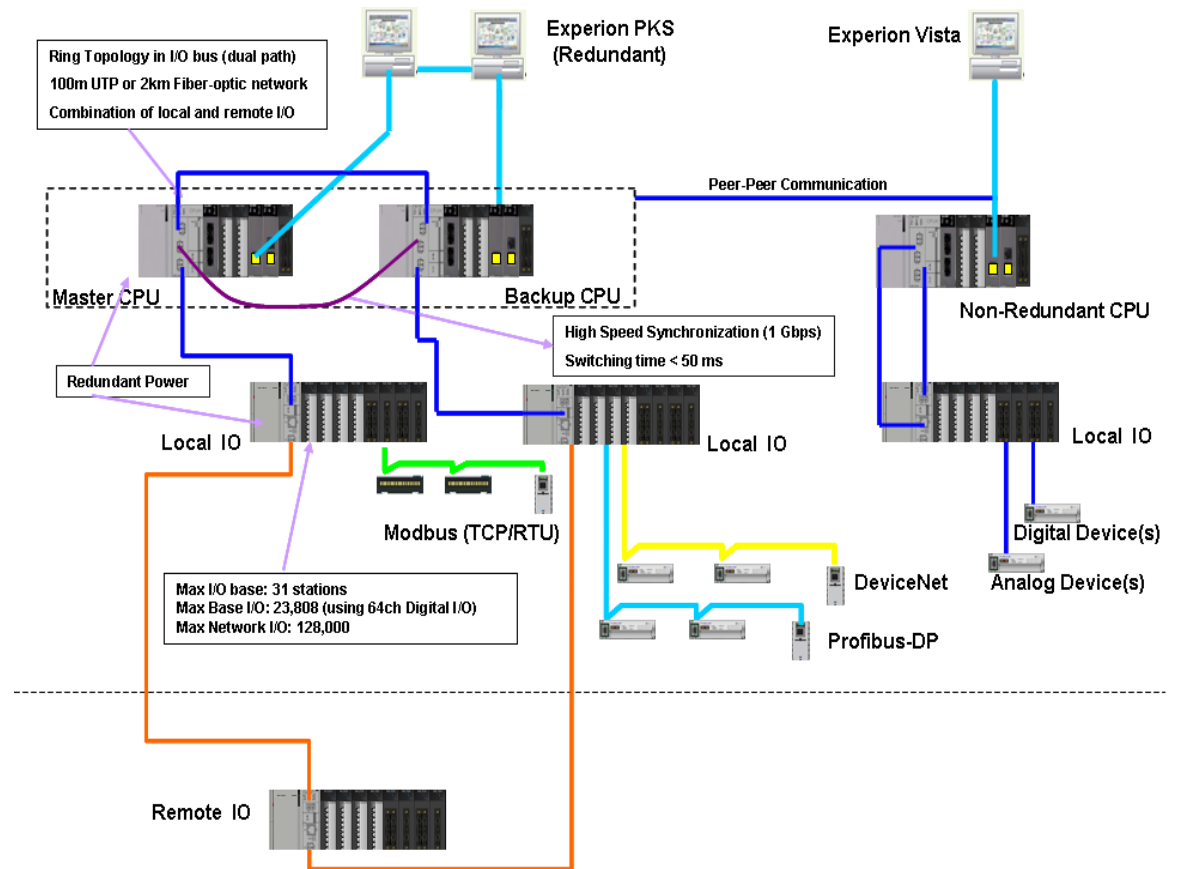
CPU Model: 2MLI-CPUS/P provides a non-redundant CPU with redundant power:

- Non-Redundant CPU
- Redundant Power
- Non-redundant I/O cable

Non-redundant CPU with Redundant Power and I/O cable



A slight variation of the fully redundant architecture with only the master CPU of 2MLR-CPUH/# (excluding the standby CPU) offers the functionality of:

- Non-Redundant CPU
- Redundant Power
- Redundant I/O cable (ring topology with dual paths)



1.3 General Specifications

No.	Item	Specifications				Related Standards
1	Ambient Temp.	0 ~ 55°C				
2	Storage Temp.	-25 ~ +70°C				
3	Ambient humidity	5 ~ 95%RH (Non-condensing)				
4	Storage humidity	5 ~ 95%RH (Non-condensing)				
5	Vibration	Occasional vibration			-	IEC61131-2
		Frequency	Acceleration	Pulse width	Sweep Count	
		10 ≤ f <57Hz	—	0.075mm	10 times each direction (X, Y and Z)	
		57 ≤ f ≤ 150Hz	9.8m/s ² (1G)	—		
		Continuous vibration				
		Frequency	Acceleration	Pulse width		
		10 ≤ f < 57Hz	—	0.035mm		
		57 ≤ f ≤ 150Hz	4.9m/s ² (0.5G)	—		
6	Shocks	<ul style="list-style-type: none">• Peak acceleration: 147m/s²(15G)• Duration: 11ms• Pulse wave type: Half-sine (3 times in each of X, Y and X directions)				IEC61131-2
7	Noise immunity	Square wave impulse noise	±1,500V			
		Electrostatic discharge	Voltage: 4kV (Contact discharge)			IEC61131-2 IEC61000-4-2
		Radiated electromagnetic field noise	27 ~ 500MHz, 10V/m			IEC61131-2, IEC61000-4-3

		Fast transient /Burst noise	Classification	Power supply	Digital/Analog Input/Output, Communication Interface	IEC61131-2 IEC61000- 4-4
			Voltage	2kV	1kV	
8	Atmosphere	Free from corrosive gases and excessive dust				
9	Altitude	Less than 2,000m				
10	Pollution degree	Less than 2				
11	Cooling method	Air-cooling				
12	Agency Certifications	 UL 508 Industrial Control Equipment				
		 2004/108/EC, EMC Directive EN61000-6-4, Emissions, Industrial EN61000-6-2, Immunity, Industrial				

Note:

IEC (International Electrotechnical Commission) – An international civil community that promotes international cooperation for standardization of electric/ electro technology, publishes international standard and operates suitability assessment system related to the above.

Pollution Degree – An index to indicate the pollution degree of used environment that determines the isolation performance of the device. For example, pollution degree 2 means the state to occur the pollution of non-electric conductivity generally, but the state to occur temporary electric conduction according to the formation of dew.

Compliance to European Union Directives. This product has the CE mark and is approved for installation within the European Union and EEA regions. It has been designed and tested to meet the following directives:

EMC Directive. This apparatus is tested to meet Council Directive 2004/108/EC Electromagnetic Compatibility (EMC) using a technical construction file and the following standards, in whole or in part:

- EN61000-6-4 EMC – Generic Emission Standard, Part 2 – Industrial Environment
- EN61000-6-2 EMC – Generic Immunity Standard, Part 2 – Industrial Environment

The product described in this document is intended for use in an industrial environment.

Low Voltage Directive. This product is also designed to meet Council Directive 2006/95/EC Low Voltage, by applying the safety requirements of EN61131-2 Programmable Controllers, Part 2 – Equipment Requirements and Tests.

1.4 CPU Summary Specifications

No.	Item		Specifications	Related Standards
			2MLR-CPUH/# Redundant CPU	
1	Program Execution methods		Cyclic scan, Time-driven interrupts, Internal Memory interrupts	
2	I/O control method		Scan synchronous batch processing I/O (refresh method), Direct I/O method by program instruction	
3	Program language		Ladder Diagram, Sequential Function Chart, Structured Text, Instruction List (view only)	
4	Number of instructions	Operator	18	
		Basic functions	130 + real number operation function	
		Basic function block	41	
		Dedicated function block	Special function blocks, Process function blocks Dedicated communication function blocks (P2P)	
5	Processing speed (Basic instruction)	LD	0.042μs/Step	
		MOV	0.112μs/Step	
		Real number operation	±: 0.602μs (S), 1.078μs (D) ÷: 1.106μs (S), 2.394μs (D) x: 1.134μs (S), 2.660μs (D)	S: Single real number D: Double real number
6	Program memory		7MB	Including Upload & System
7	Max # I/O bases		31	
8	Max # slots		372	
9	Max base I/O	Using 64 ch DI/DO module	23,808 (64ch*372 slots)	
		Using 32 ch DI/DO module	11,904 (32ch*372 slots)	
10	Max I/O expansion distance		100m (UTP cable) 2km (Fiber-optic cable)	
11	Max Network / Remote I/O		128,000	Using network I/O

12	Flash Memory		16 MB		
13	Data Memory Capacity	Symbolic Variable Area (A)	512 KB (Maximum, 256 KB retain settable)		
		Timer	No point limit Time Range: 0.001 ~ 4,294,967.295 seconds (1,193hours)		Occupying 20 bytes of symbolic variable area per point
		Counter	No point limit Coefficient Range : -32,768 ~ +32,767		Occupying 8 bytes of symbolic variable area per point
		Direct Variable	M	512 KB	Fixed Area Variable
			R	64 KB * 2 (%RW0~%RW32767)	File Register (uses flash memory)
			I	16 KB (%IW0.0.0~%IW127.15.3)	Input Image Area
			Q	16 KB (%QW0.0.0~%QW127.15.3)	Output Image Area
			W	128 KB (%WW0~%WW65535)	File Register (uses flash memory)
		Flag Variables	F	4 KB	System Flag
			K	18 KB (PID 256 loops)	PID Flag
			L	22 KB	High Speed Link Flag
			N	42 KB	P2P Flag
			U	32 KB	Analog Refresh Flag as VAR_GLOBAL
14	Program Type Allocation	INIT task	1 max		
		Timer Interrupt tasks	32 max		

		Internal Device Interrupt tasks	32 max	
		Scan program	Balance: 256 minus sum of above	
		Total	256 max	
15	CPU operation mode		RUN, STOP, DEBUG	
16	CPU restart mode		Cold or warm restart	
17	Self-diagnosis		Watchdog timer, memory error, I/O error, battery error, power error, communication error etc.	
18	Built-in Program port	RS-232C(1CH)	Modbus slave supported via RS-232C port	
		USB (1CH) @ 12MBPS		
		Note: Additional program connections via Ethernet & serial communication module (locate or remote)		
19	Data storage method at power off		Retain area configuration via Basic parameters	
20	Current consumption (mA)		1173 (2MLR-CPUH/T) 1360 (2MLR-CPUH/F)	
21	Weight (kg)		0.257 (2MLR-CPUH/T) 0.276 (2MLR-CPUH/F)	
22	Redundancy Feature			
	Watchdog between CPUs		Sync cable and Ring-type I/O Network	
	Data Backup		1Gbps Fiber Optic, max. 200m	
	Synchronization Method		Configured in Redundancy parameter	
	Sync Cable Specification		62.5/125 Multi-mode Fiber Optic LC type connector (Lucent Connector) Return Loss : over 45db	
	Delay time for redundant operation		Varies with data size between CPUs - Default: 8.2ms / max. 80ms	
	Switchover Time		Max. 22ms	
	Operation delay during switchover		Max. time of delay time for redundant operation	

Item		Specifications			Remarks
		2MLI-CPUU	2MLI-CPUH	2MLI-CPUS(/P)	
Operation system		Reiterative operation, fixed cycle operation, constant scan			
I/O Control system		Scan synchronous batch processing system(refresh system), direct system by command			
Program language		Ladder Diagram, SFC (Sequential Function Chart), ST(Structure Text)			
No. of commands	Operator	18			
	Basic function	136 types + real number operation function			
	Basic function block	43			
	Dedicated function block	Dedicated function blocks by special function modules, communication dedicated function block(P2P)			
Operation processing speed (basic command)	Basic	0.028 μ s / step			
	MOVE	0.084 μ s / step			
	Real number operation	\pm : 0.392 μ s (S), 0.924 μ s (D) x : 0.896 μ s (S), 2.240 μ s (D) \div : 0.924 μ s (S), 2.254 μ s (D)			S: Single real number D: Double real number
Program memory capacity		4MB	3.5MB	640KB	
I/O points(installable)		6,144 points		3,072 points	
Max. I/O memory contact		131,072 points		32,768 points	
Data memory	Symbolic variable area(A)	512KB (max. 256KB retain settable)		128KB (max. 64KB retain settable)	
	I variable(I)	16KB		4KB	
	O variable(Q)	16KB		4KB	
	Direct variable	M	256KB (max. 128KB retain settable)	64KB (max. 32KB retain settable)	
		R	64KB * 2 blocks	64KB * 1 block	64KB per block
		W	128KB	64KB	

	Flag variable	F	4KB		System flag
		K	16KB	4KB	PID flag
		L	22KB		Fast link flag
		N	42KB		P2P flag
		U	8KB	4KB	Analogue refresh flag
Flash area		2 MB, 32 blocks			Controllable by R device

1.5 Powerful & Versatile CPU

High Speed

Facilitated by a powerful state of the art processor (NGP1000), MasterLogic-200 CPU provides high speed execution of program instructions and backplane/communication data transfers. In addition, dedicated intelligent communication modules (Ethernet, Serial, Profibus etc) offer co-processing assistance to the main controller CPU.

High Memory

High memory of MasterLogic-200 CPU combined with high speed & huge I/O capacity feature provides a robust platform for efficient performance in large applications.

Summary specification for CPU Models:

Memory Specification	Memory size				Remarks
	2MLR-CPUH	2MLI-CPUU	2MLI-CPUH	2MLI-CPUS(P)	
Total Memory	25 MB	22MB	22.5MB	10.6MB	
Built-in Flash Memory	16 MB	16 MB	16 MB	8MB	For program & data backup
Program Memory (Incl. System Memory)	7 MB	4MB	3.5MB	640KB	For program execution, upload, system parameters, history logs
Data Memory	2 MB	2 MB	2 MB	1MB	Direct variables & Symbolic (named) variables

Free slot assignment

This is good news to engineers handling base/slot assignment. MasterLogic-200 poses no restriction whatsoever. Any module type i.e. digital I/O, analog I/O, HSC (pulse input), RTD, Thermocouple, and even communication modules (i.e. Ethernet, Serial, Profibus-DP, DeviceNet) can be freely assigned to any base/slot irrespective of base #, Slot #.

Without any restriction, any of the above modules (except for Ethernet module) can also be installed in remote I/O bases located far away (by using FO network of 2MLR-CPUH/#).

Large I/O capacity

MasterLogic-200 accommodates a huge I/O capacity through base I/O and remote/network I/O capabilities. The I/O capacity details are tabulated as follows:

Model: 2MLI-CPUU&CPUH (Non-redundant)

Model: 2MLI-CPUU/H	Qty	Remarks	
Max # of bases	8	1 main base + 7 expansion bases	
Max # of slots	96	12 slots * 8 base = 96 slots	
Base I/O	6,144 points	Using 64 ch DI/DO module	96 slots * 64 ch = 6,144 points
	3,072 points	Using 32 ch DI/DO module	96 slots * 32 ch = 3,072 points
Network & Remote I/O (Max I/O memory)	128,000 points	Using network I/O	

Model: 2MLI-CPUS (Non-redundant)

Model: 2MLI-CPUS	Qty	Remarks	
Max # of bases	4	1 main base + 3 expansion bases	
Max # of slots	48	12 slots * 4 base = 48 slots	
Base I/O	3,072 points	Using 64 ch DI/DO module	48 slots * 64 ch = 3,072 points
	1,536 points	Using 32 ch DI/DO module	48 slots * 32 ch = 1,536 points
Network & Remote I/O (Max I/O memory)	32,000 points	Using network I/O	

Model: 2MLR-CPUH/# (Non-redundant or Redundant)

Model: 2MLR-CPUH/#	Qty	Remarks	
Max # of I/O bases	31	On either Ethernet or Fiber-optic networks	
Max # of slots	372	12 slots * 31 base = 372 slots	
Base I/O	23,808 points	Using 64 ch DI/DO module	372 slots * 64 ch = 23,808 points
	11,904 points	Using 32 ch DI/DO module	372 slots * 32 ch = 11,904 points
Network I/O (Max I/O memory)	128,000 points	Using network I/O modules.	

Model: 2MLI-CPUS/P (Non-redundant CPU with redundant power)

Model: 2MLI-CPUS/P	Qty	Remarks	
Max # of bases	1	1 main base	
Max # of slots	12	12 slots * 1 base = 12 slots	
Base I/O	768 points	Using 64 ch DI/DO module	12 slots * 64 ch = 768 points
	384 points	Using 32 ch DI/DO module	12 slots * 32 ch = 384 points
Network & Remote I/O (Max I/O memory)	32,000 points	Using network I/O	

High Speed Synchronization

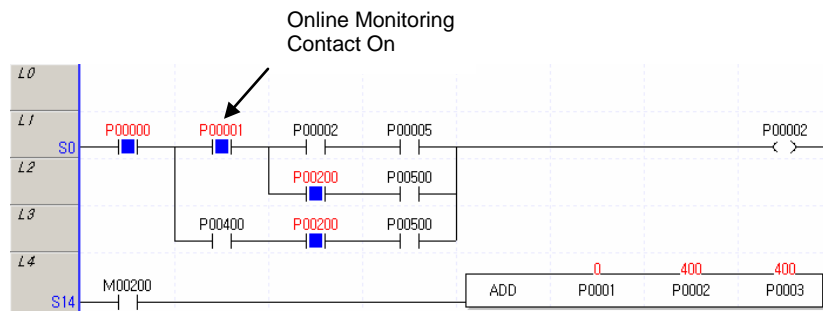
In redundant CPU systems, a dedicated high speed 1Gigabit fiber-optic link between primary and backup CPU ensures efficient synchronization of data and program memory areas. Upon failure of the primary CPU, the control switches over to the backup CPU bumplessly in less than 22 msec.

IEC 61131-3 Standard Programming Languages

MasterLogic-200 PLCs do not restrict the control engineers with a solitary ladder programming (LD) language. Their work is made easier with a choice of IEC standard programming languages. Each of the IEC 61131-3 standard programming language is designed for a specific application.

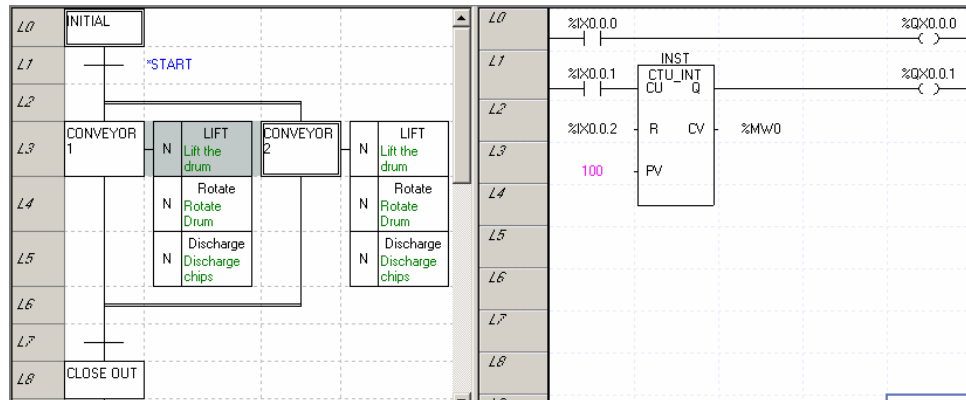
Ladder (LD)

MasterLogic-200 provides a friendly ladder (LD) programming editor, best suited for relay logic / interlocks with timers and counters. The same editor serves as online monitoring display for trouble-shooting situations.



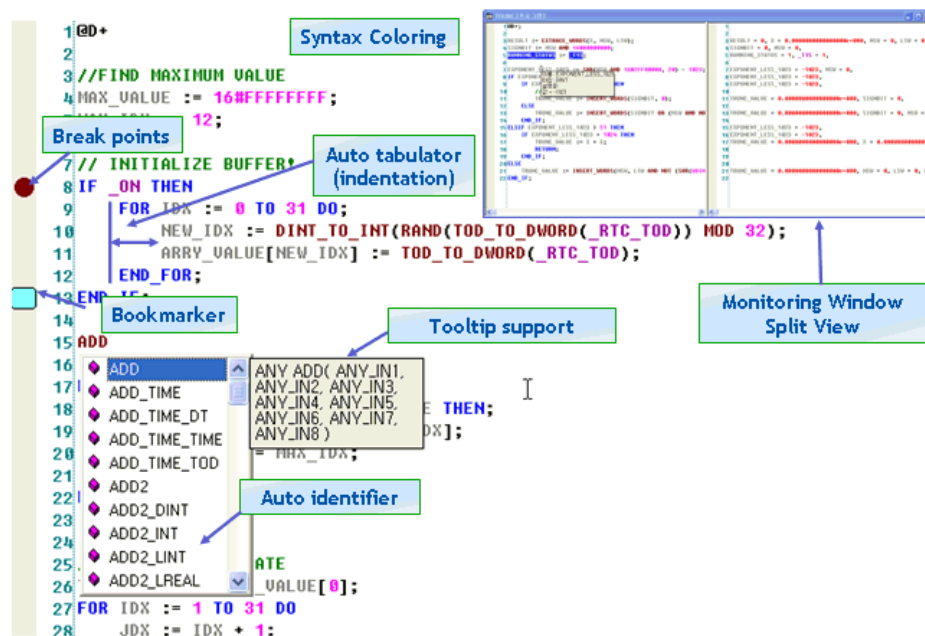
Sequential Function Chart (SFC)

However, ladder would be cumbersome for the engineer to build strategies for sequencing/batching applications with state/transition conditions. Sequential Function Chart (SFC) visual programming editor best suited for that purpose is provided.



Structured Text (ST)

Likewise, so as to build a own library of user-defined function blocks or being accustomed to computer languages like BASIC, PASCAL etc, the engineer would be inclined to pick Structured Text (ST) language as the right choice.



Instruction List (IL – View only mode)

A mnemonic assembly-type programming language (currently in view only mode) to assist to cross-verification of ladder program sequences.

1	LOAD	%IX0.0.0
2	OUT	%QX0.1.0
3	LOAD	%IX0.0.1
4	OUT	%QX0.1.1
5	LOAD	%IX0.0.2
6	OUT	%QX0.1.2

Flexibility to mix & match

MasterLogic-200 empowers the control engineer with flexibility to mix & match different languages in a single CPU with modular programs, each serving a specific requirement typical to industrial process control situations.

Programming Language	Remarks
LD (Ladder)	Relay logic / interlocks
SFC (Sequential Function Chart)	State / Transition diagrams for sequential/batch applications
ST (Structured Text)	BASIC, PASCAL like programming language
FB (Function Block)	To be used / embedded in other programming languages e.g. LD, SFC, ST
IL (Instruction List)	View only mode of LD instructions

Program Types & Modular Programs

MasterLogic-200 allows modularizing the whole control strategy for the PLC into max. 256 easily manageable sub-programs, executed either cyclically once every scan in the order or interrupt driven based on timer or memory conditions.

Program Type	Max #	Task #	When executed?
INIT Program	1		Executed once during PLC startup
Timer Interrupts	32	0~31	Executed when timer interval elapses (configurable @ 1msec resolution)
Device Interrupts	32	64~95	Executed when configured internal memory condition occurs
Scan Programs	Balance		Executed once every scan
Total	256		

Note: Task ID 32~63 reserved for future use (I/O interrupt conditions)

Cold or Warm Restart Options

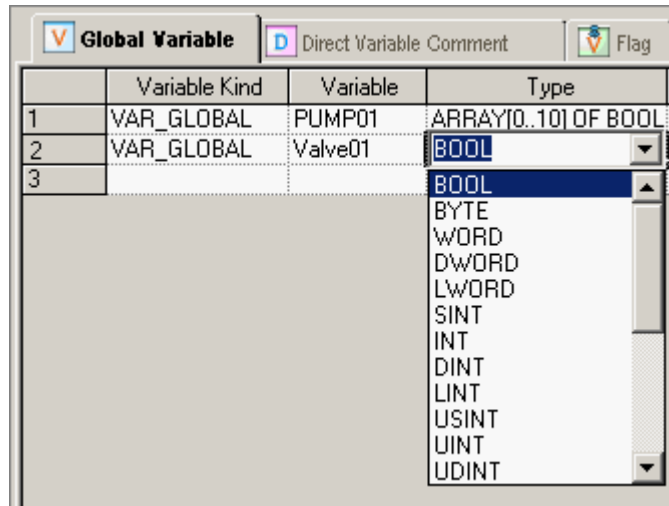
MasterLogic-200 provides two CPU restart modes, cold or warm options to fit the restart circumstances.

Mode Parameter	Cold Restart	Warm Restart
Default	Initializing as '0'	Initializing as '0'
Retain	Initializing as '0'	Maintaining the previous value
Initialization	Initializing as a user-defined value	Initializing as a user-defined value
Retain and initialization	Initializing as a user-defined value	Maintaining the previous value

IEC data types

The following are IEC standard data types supported by MasterLogic-200 programs in accessing direct & symbolic (named) variables. Variables can be defined as local (accessible only within the program) or global variables (accessible across all programs).

Data Category	Data types supported
Bit	BOOL
Byte	BYTE
Word	WORD, DWORD, LWORD
Integer	SINT, INT, DINT, LINT
Unsigned Integer	USINT, UINT, UDINT, ULINT
Real	REAL (Single precision), LREAL (Double precision)
Date & Time	TIME, DATE, TIME_OF_DAY, DATE_AND_TIME
Text Character	STRING
Array	ARRAY (3-dimensional arrays, max array size of 32767 elements)
User-defined data type	STRUCT
Function Block instances	FB_INST



Three-dimensional arrays

Array variables are extremely useful to a programmer to store a series of related data items. For example, an array variable Tank_Level[0..9] can be used to store level values of a max of 10 similar tanks typically using “for loop” command.

	Variable Kind	Variable	Type	AT	Initial Value	Retain	Used	Comment
1	VAR	AVE_HOURLY	ARRAY[0..23] OF WORD			<input type="checkbox"/>	<input type="checkbox"/>	Single Dimensional Array
2	VAR	AVE_DAILY	ARRAY[0..23,0..30] OF WORD			<input type="checkbox"/>	<input type="checkbox"/>	Two Dimensional Array
3	VAR	AVE_MONTHLY	ARRAY[0..23,0..30,0..11] OF WORD			<input type="checkbox"/>	<input type="checkbox"/>	Three Dimensional Array
4						<input type="checkbox"/>	<input type="checkbox"/>	

Function Block & Instruction Library

Drastically reducing engineering time, a vast library of instructions & function blocks is pre-built and packaged with MasterLogic-200 system. Here is an overview of the function block library available for the control engineer.

Function Type	Functions / Function Blocks
Input Contacts ⁺	NC/NO Contact , \pm Transition contacts

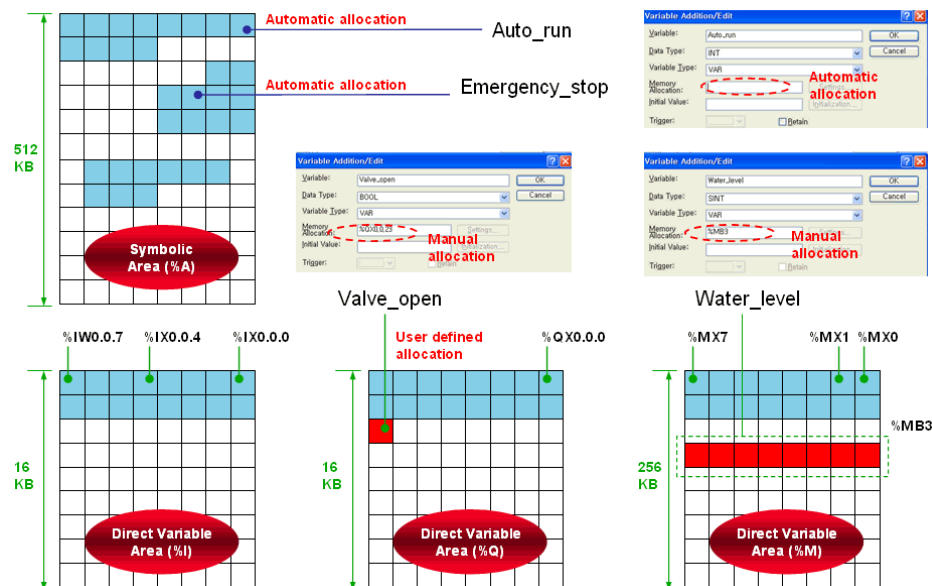
Coils ⁺	Coil/Negated coils, Set/Reset coils (latch), \pm Transition sensing coils
Data type conversions	Bool_to_*, Byte_to_*, Word_to_*, Int*_to_*, UInt*_to_*, Real*_to_*, Time_to_*, Date_to_*, String_to_*, BCD_to_*, *_to_BCD
Bit functions	AND, OR, NOT, XOR, XNR, SHL, SHR, ROL, ROR etc.
ARRAY functions	Move, Rotate, Compare, Fill, Average, Shift etc.
Comparison Functions	GT, EQ, GE, LT, LE, NE
Timer	On Delay, Off Delay, Pulse Timers...
Counter	Count up, Count Down, Count Up/Down...
String Functions	CONCAT, LEFT, RIGHT, MID, INSERT, DELETE, REPLACE...
Process Control	Average, Delay, Limit, Rate, Summer, Totalizer, Analog_Selector, Function Generator, Lead Lag PID with auto tuning, Cascade control , Ratio Control, Alarm, Ramp
Stack Functions	LIFO_***, FIFO_***...
Date & Time functions	Multiply, Subtract, Divide, Add functions on date and time variables
Mathematical functions	Exponential, Degree/Radian, ADD/MUL/DIV/SUB, ABS, MOD, Trigonometric (SIN, COS, TAN...), SQRT, LOG...,
Select Functions	Max, Min, Multiplex...
System Control Functions	SCON, DUTY, STOP, ESTOP, DIREC_IN/O, Watchdog reset, Master Clear, Semaphore etc.

⁺ Basic instructions in ladder program

Symbolic (Named) Variables with auto memory allocation

A significant amount of data memory, as high as 512KB, is allocated for Symbolic variables in MasterLogic-200 CPU. This is equivalent to 50% of the total data memory, thus intensifying the utilization of auto memory allocation.

The control engineers can simply building named variables circumventing the hassles of manual memory allocation and derive the convenience of letting the CPU automatically allocate memory according to the data types. This eliminates human lapses involved in duplicate assignment, unused memory etc.



Retention Memory

Portions of data memory area provide (non-volatile) memory retention function.

- %R (File Register) memory area comprising 2 blocks of 64KB each serving always as non-volatile memory for the engineers. Data stored here will be retained even upon power failure to CPU and during cold or warm restart options. The data in this area can be cleared only by operating the CPU switch D.CLR for > 3 sec or upon battery failure

- Also the control engineer can selectively configure portion of %M memory areas for memory retention in “Basic Parameters”. A max of 128KB can be configured for memory retention in %M area.

Retain area config

☒ M Area retain set(R)

From %M/W 1001 to %M/W 2000

- In addition to the above two, symbolic variables (named variables) occupying 512KB of data memory (local and global) can be individually configured for memory retention during variable declaration phase.

	Variable Kind	Variable	Type	AT	Initial Value	Retain	Used	Comment
1	VAR	AVE_HOURLY	ARRAY[0..23] OF WORD			<input type="checkbox"/>	<input type="checkbox"/>	Single Dimensional Array
2	VAR	AVE_DAILY	ARRAY[0..23,0..30] OF WORD			<input type="checkbox"/>	<input type="checkbox"/>	Two Dimensional Array
3	VAR	AVE_MONTHLY	ARRAY[0..23,0..30,0..11] OF WORD			<input type="checkbox"/>	<input type="checkbox"/>	Three Dimensional Array
4						<input type="checkbox"/>	<input type="checkbox"/>	

Refer to the following table for the maintenance or reset (clear) of the retain area data according to the PLC operation.

Item	Symbolic Variables	M area retain	R area
Reset	Maintaining the previous value	Maintaining the previous value	Maintaining the previous value
Over all reset	Initializing as '0'	Initializing as '0'	Maintaining the previous value
DCLR	Initializing as '0'	Initializing as '0'	Maintaining the previous value
DCLR (3sec)	Initializing as '0'	Initializing as '0'	Initializing as '0'
STOP→RUN*	Warm: Maintaining the previous value	Maintaining the previous value	Maintaining the previous value

	Cold: Initializing as '0'		
--	------------------------------	--	--

* Cold Restart Mode if the program is downloaded

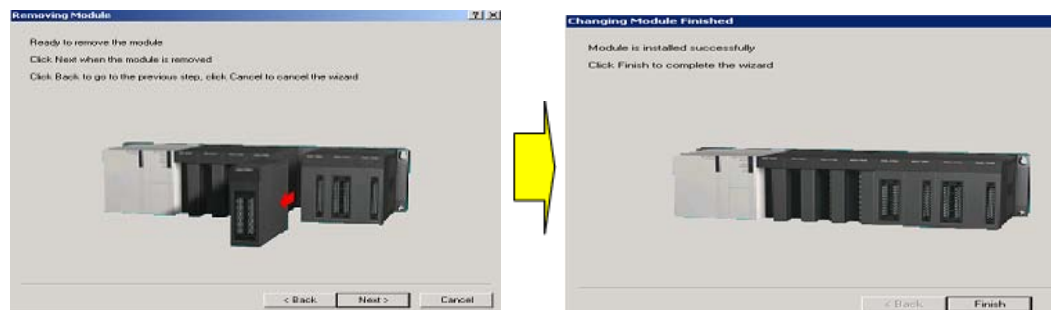
Please refer to [Cold or Warm Restart Options](#) section to know more about memory retention functions.

Online Maintenance Functions

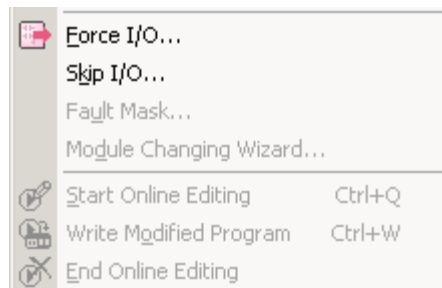
Hot-swapping

Any faulty I/O module can be swapped online with a new one without having to stop a running CPU. There are two methods:

- By operating a switch M.XCHG in CPU module (Available for 2MLI-CPUU only)
- By running a software wizard in SoftMaster



Online Editing



Any part of the PLC program can be edited online when CPU is running & the new program can be downloaded to the CPU without having to stop the CPU.

SoftMaster allows an intermediate step of downloading the modified program to CPU and monitor the outcome. The programmer can continue to make changes if required without quitting the session.

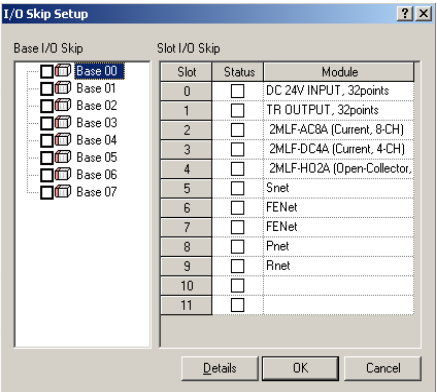
Fault Mask

Fault Mask enables program to continue uninterrupted even if a module error occurs. Fault Mask can be set for any base/slot module either by

- SoftMaster software tool
- Program instruction setting fault mask flag

Only the faulty module stops operating while the overall system continues to operate due to Fault Mask settings. If there is no error in the module, CPU works normally with this setting.

Skip I/O



Skip I/O setting for any base/slot module instructs the CPU to skip processing of specified I/O module(s). The input image (%I) area would not be refreshed for those modules and output image area will not be transferred to the actual module.

Force I/O

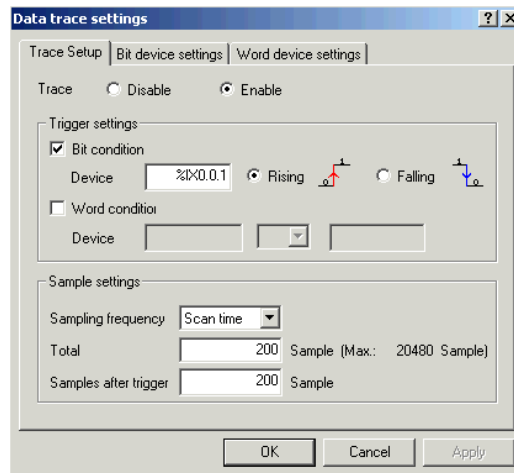


This function enables the control engineer to force either ON or OFF values to digital input or output locations in I/O bit image areas.

Data Trouble-shooting Functions

Data Tracing

This is one of unique features of MasterLogic PLC. Data tracing works at CPU level, quite different from the trend monitoring feature usually available at software level in many PLCs. Configure the trace parameters (trigger condition, trace variables, sampling size) and trouble-shoot the variables in trend graphic or tabular format.



Function	Specification
Data Trace Trigger Condition	Bit variable: Rising, Falling Word variable: <, <=, >, >=, == Also can be manually triggered from SoftMaster
Sampling Frequency options	Scan time, 20ms, 50ms, 100ms, 200ms, 500ms, 1000ms, 2000ms

Total # of samples	Calculated based on trace variable data types
Samples after trigger	Decides whether and how much of samples are needed before or after the trigger
Trace variables	Bit variables: 16 variables max Word variables: 8 variables max
Storage	Trace data will be stored and protected in CPU memory until the trigger condition reoccurs or a new setting is downloaded.
Trace Data Presentation	Optionally in user-friendly graphical tool or tabular data format in MS-Excel



User-defined Custom Events

Configure user-defined custom event settings and download to CPU for logging events in database. Trigger conditions can be any bit variable, direct or symbolic. Also 16 variables (bit, word, real data type) can be associated to the event whose current value will be captured when the event is triggered.

The **Event Settings** dialog box has two tabs: **Basic Settings** and **Associated Device Setup**. In the **Basic Settings** tab, the **Device** is set to **NewProgram**, the **Variable** is **%IX0.0.0**, and the **Event condition** is **Rising** (indicated by a red arrow pointing up). The **Type** is **Information**, and the **Message** is **Base 0, Slot 0, Channel 1**.

Basic Settings Associated Device Setup				
Available 05 (Current) / 16 (Maximum)				
ID	Program	Variable	Device	Type
1	NewProgram		%Mw0	INT
2	NewProgram		%Qx0.0.0	BOOL
3	NewProgram		%Mw2	INT

Custom Event					
Event Settings		Event History			
Number	Type	Event ID	Date	Time	Device
1	Information	3	2005-07-22	11:54:17:267	F00094
2	Information	1	2005-07-22	11:54:18:272	F00095
3	Information	3	2005-07-22	11:54:19:272	F00094

Function	Specification
Max # of variables that can be configured for custom event trigger	10 variables
Associated variables	Max 16 variables (bit, word, real data type) can be associated to the event for current value capture
Max buffer size for custom event capture in CPU	300 events
Variable type for event trigger	Only bit variables
Trigger condition	Rising, Falling, Transition options
Trigger Detection Speed	Scan time (milli-sec time stamping)
Event category	Information, Critical, Alarm
Applications	Trouble-shooting, Limited SOE

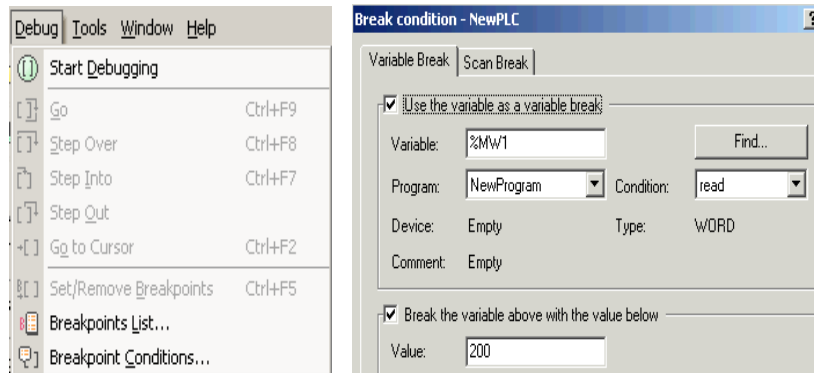
RTC (Real-time Clock)

MasterLogic-200 has a built-in clock (RTC) which runs on battery even in case of power failure. The RTC can be monitored & updated, if necessary, through:

- SoftMaster (manual command from GUI)
- Experion PKS server (auto sync with server clock)
- Programming instructions

All system events, custom events & errors logs are time stamped using RTC.

Debug Modes



MasterLogic-200 program can be optionally started in DEBUG mode for any specific trouble-shooting. Breakpoints can be either:

- Manually set on / removed from any line of the program regardless of the programming language used.
- Set for trigger by internal memory variable or scan cycle count conditions

PLC History - System alarm & events

MasterLogic-200 CPU records four different types of system alarms & events occurring in PLC.

PLC history - NewPLC			
<div> Error Log Mode Log Shut down Log System Log </div>			
Index	Date	Time	Contents
84	2005-08-18	18:41:33.001	Data trace, Use
85	2005-08-18	18:43:32.865	Momently shut-down
86	2005-08-18	18:46:09.001	Data trace, Use
87	2005-08-18	18:57:16.181	USB, OK, Connect
88	2005-08-18	18:57:19.876	USB, OK, Disconnect
89	2005-08-18	18:57:23.541	USB, OK, Connect

Event type	Description	Buffer Size in CPU
Error Log	Any error occurring in system – error code, timestamp, error details	2048 events

System Log	Operation history of key system events with timestamp	2048 events
Mode change Log	CPU mode changes, RUN/STOP/DEBUG with timestamp	1024 events
Power shutdown Log	Power ON/OFF, failure events with timestamp	1024 events

The event buffer in CPU is limited and FIFO cyclic. But all the above 4 types of PLC alarms & events can be archived in Experion and consolidated with Experion system alarms & events display. Please refer to MasterLogic-Experion Integration specification for further details.

1.6 Power Supply Modules (2MLI-CPUU, CPUH, CPUS)

There are four power supply modules with different specifications to choose from, according to the site requirements e.g. flexible voltage input range, DC input power, output voltages and current rating.

Item		2MLP-ACF1	2MLP-ACF2	2MLP-AC23	2MLP-DC42
Input	Rated input voltage	AC 100V – AC 240V		AC 200V – AC 240V	DC 24V
	Input voltage range	AC 85V ~ AC 264V		AC 170V ~ AC 264V	-
	Input frequency	50 / 60 Hz (47 ~ 63 Hz)			-
	Inrush current	20 A _{Peak} or less			80A _{Peak} or less
	Efficiency	65% or more			60% or more
	Input fuse	Built-in (user no change), UL standard (Slow Blow Type)			
	Allowed instantaneous interruption	10 ms and shorter			
Output1	Output voltage	DC 5V (±2%)			DC5V (±2%)
	Output current	3.0A	6.0A	8.5A	6.0A
	Over current protect	3.2A or more	6.6A or more	9.0A or more	6.6A or more
	Over voltage protect	5.5V ~ 6.5V			
Output2	Output voltage	DC 24V (±10%)	-		-
	Output current	0.6A			
	Over current protect	0.7A or more			
	Over voltage protect	None			
Relay Output	Application	RUN contact			
	Rated switching voltage/current	DC 24V, 0.5A			
	Minimum switching load	DC 5V,1 mA			
	Response time	OFF→ON/ ON→OFF: 10 ms or less/12 ms or less			

	Life	Mechanical life: 20 million and more times Electrical life: rated switching current: 100 thousand and more times		
Voltage indicator		Output voltage normal, LED ON		
Cable specification		0.75 ~ 2mm ²		
Compressed terminal		RAV 1.25 - 3.5, RAV 2 - 3.5		
Weight		0.4kg	0.6kg	0.5kg

Battery Specifications

Item	Specifications
Nominal voltage/current	DC 3.0V / 1,800mAh
Backup period without power	5 years (at ambient temperature)
Purpose	Program and data backup, RTC operation when Power-OFF
Specification	Manganese dioxide lithium battery
Outer dimension (mm)	φ 17.0 X 33.5mm

1.7 Power Supply Modules (2MLR-CPUH/#)

There are five power supply modules with different specifications to choose from, according to the site requirements e.g. flexible voltage input range, DC input power, output voltages and current rating.

Item		2MLR-AC12	2MLR-AC22	2MLR-AC13	2MLR-AC23	2MLR-DC42
Input	Rated input voltage	110 VAC	220 VAC	110 VAC	220 VAC	24 VDC
	Input voltage range	85V~132VAC	176V~264VAC	85V~132VAC	176V~264VAC	19.2 ~ 28.8 VDC
	Input frequency	50 / 60 Hz (47 ~ 63 Hz)				-
	Max. input power	110 VA / 42 W		176 VA / 72 W		-
	Inrush current	20A peak and lower (within 8 ms)				80A peak and lower
	Efficiency	65% or higher				
	Input fuse	Built in(not replaceable by a user) - AC power: 250V / 3.15A (Time-lag Type) UL approved - DC power: 125V/10A (Time-lag type) UL approved				
	Allowed instantaneous interruption	Within 20 ms				
Output	Output voltage	5VDC (±2%)				
	Output current	5.5A		8.5A		7.5A
	Output power	27.5W @ 55°C		46.75W @ 55°C		37.5W @ 55°C
	Over current protection	6.0 A ~ 13.0 A		9.3 A ~ 17.0 A		9.0 A~17.0 A
Relay Output	Purpose	RUN contact (refer to 8.2)				
	Rated switching voltage/current	24VDC, 0.5A				
	Min. switching load	5VDC, 1 mA				
	Response time	Off→On/ On→Off: 10 ms and lower/12 ms and lower				
	Life	Mechanical life: 20 million and more times, electrical life: rated switching current: 100 thousand and more times				
Voltage status display		LED On when output voltage is normal				
Specification of cable		0.75 ~ 2 mm ²				
Available clamped terminal		RAV1.25-3.5, RAV2-3.5				
Dimension (W x H x D mm)		55 x 95 x 90		55 x 95 x 110		
Weight		326g	382g	334g	384g	417g
Applied base and install position		Power part of basic/expansion base				

Battery Specifications

Item	Specifications
Nominal voltage/current	DC 3.0V / 1,800mAh
Warranty period	5 years (at ambient temperature)
Purpose	Program and data backup, RTC operation when Power-OFF
Specification	Manganese dioxide lithium battery
Outer dimension (mm)	φ 17.0 X 33.5mm

1.8 Base options (2MLI-CPUU, CPUH, CPUS)

There are four I/O base options to select from: 4 slot, 6 slot, 8 slot & 12 slot bases.

Main CPU base options

Item \ Model	2MLB-M12A	2MLB-M08A	2MLB-M06A	2MLB-M04A
No of Modules	12 modules	8 modules	6 modules	4 modules
Dimension (mm)	426 x 98 x 19	318 x 98 x 19	264 x 98 x 19	210 x 98 x 19
Weight (kg)	0.54	0.42	0.34	0.28

Expansion I/O base options

Item \ Model	2MLB-E12A	2MLB-E08A	2MLB-E06A	2MLB-E04A
No of Modules	12 modules	8 modules	6 modules	4 modules
Dimension (mm)	426 x 98 x 19	318 x 98 x 19	264 x 98 x 19	210 x 98 x 19
Weight (kg)	0.59	0.47	0.39	0.33

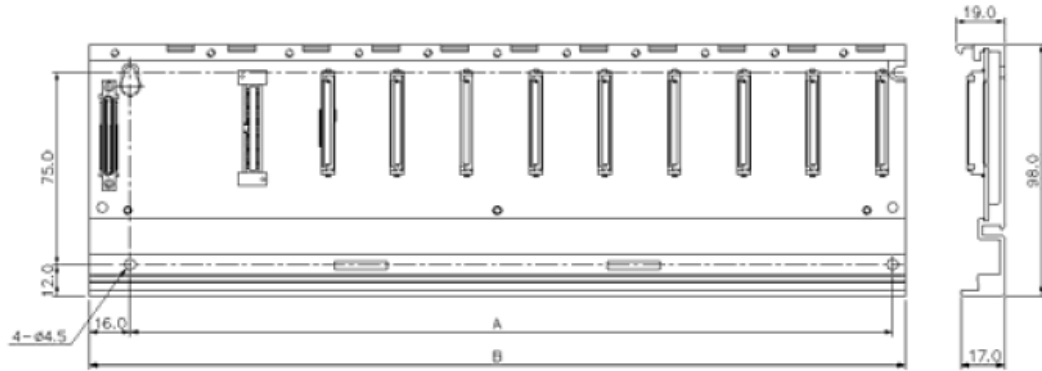
Expansion I/O cable options

<div>Model</div> <div>Item</div>	2MLC- E041	2MLC- E061	2MLC- E121	2MLC- E301	2MLC- E501	2MLC- E102	2MLC- E152
Length (m)	0.40	0.60	1.20	3.00	5.00	10.00	15.0
Weight (kg)	0.15	0.16	0.22	0.39	0.62	1.20	1.80

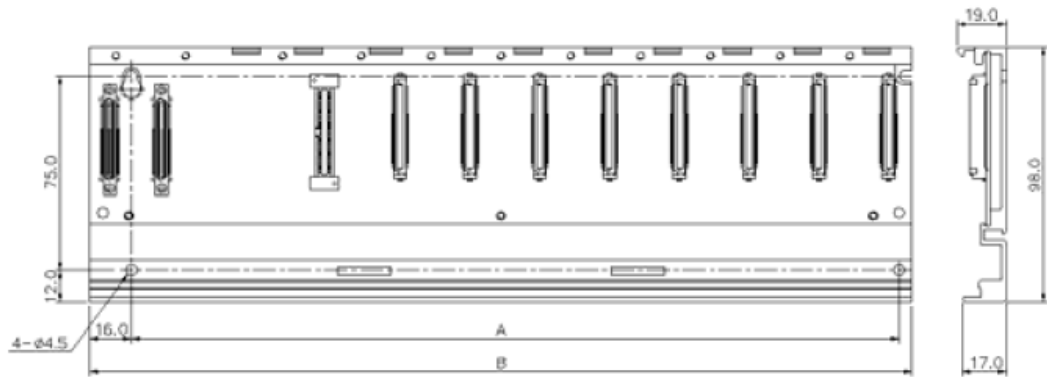
* The total cable length between the CPU and the farthest I/O expansion base should not exceed 15m.

A. Main Base Board

(Unit: mm)

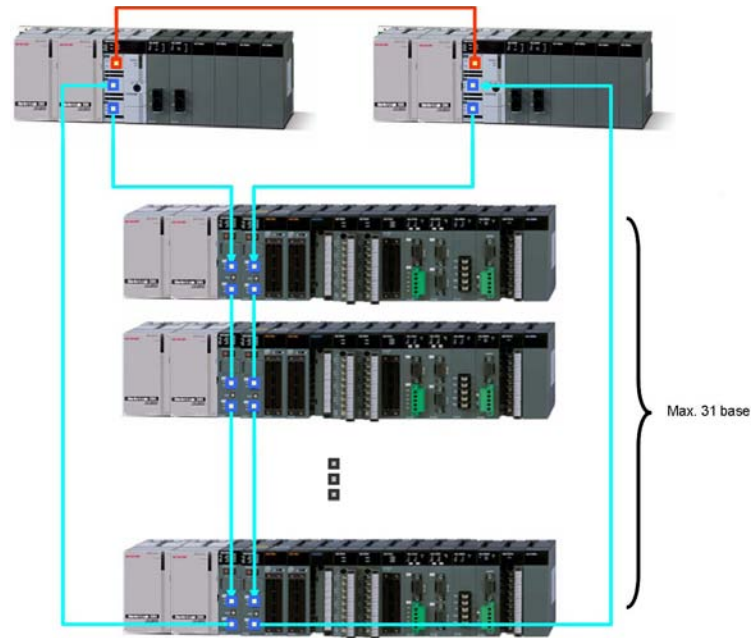
**B. Expansion Base Board**

(Unit: mm)



(Unit: mm)

1.9 Base Options (2MLR-CPUH/#, 2MLI-CPUS/P)



The above diagram demonstrates co-existence of both local I/O base and remote I/O base (i.e. UTP and fiber-optic cables) in a dual link I/O network.

**Please note that only FEnet module can reside on CPU Base.
FEnet module can not be installed on the Expansion base.**

In redundant system employing CPU model: 2MLR-CPUH/#, Local I/O bases can communicate with the CPU via Industrial Ethernet using UTP CAT5 cable traveling up to a max 100m distance.

Remote I/O bases as far as 2km can communicate with the CPU on fiber-optic networks available in both CPU as well I/O base communication slave modules.

Main CPU base options

Item	Model	
	2MLR-M02P	2MLR-M06P
No. of Modules	2 modules	6 modules
Dimension (mm)	238 X 98 X 19	346 X 98 X 19
Current Consumption (mA)	211	211
Weight	0.33 kg	0.5 kg

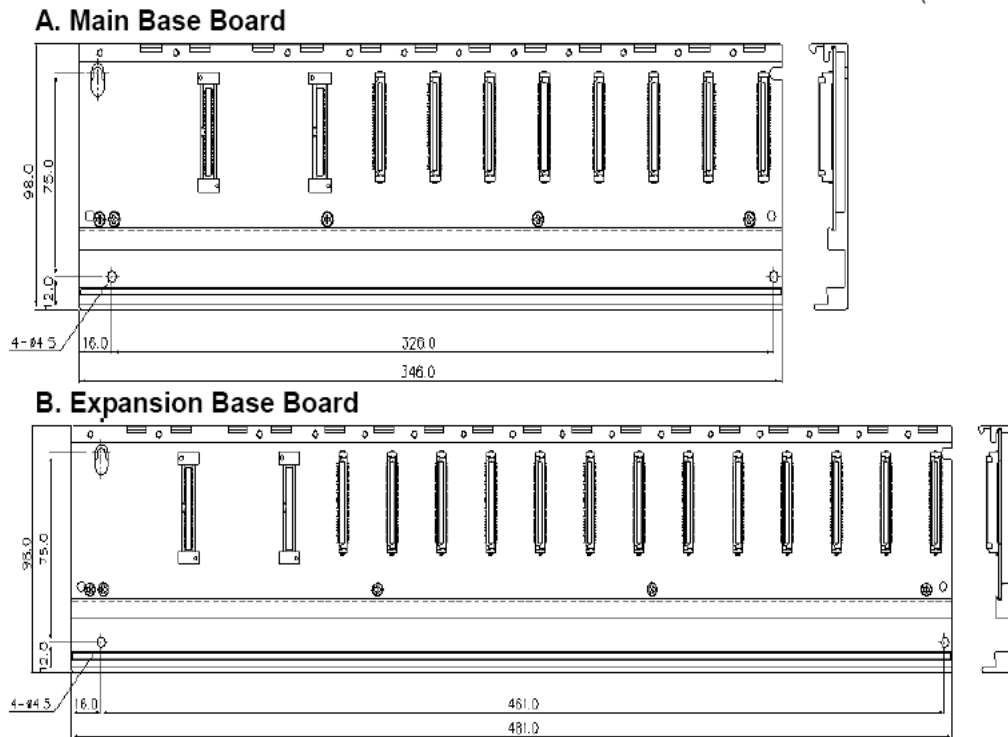
*2MLI-CPUS/P can be installed in the left side of the CPU slot.

Expansion I/O base options

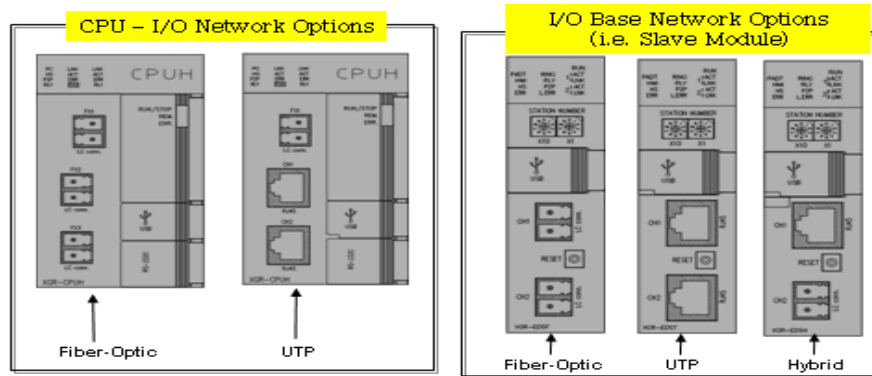
Item	Model	
	2MLR-E12P	2MLR-E12H
No of Modules	12 modules	12 modules
Dimension (mm)	481 X 98 X 19	508 X 98 X 19
Current Consumption (mA)	220	220
Weight	0.7kg	0.71kg

*2MLI-CPUS/P can be installed in the slot of /O interface module.

(Unit: mm)



1.10 I/O Interface Modules (2MLR-DB##)



Item	Specification			Remarks
	2MLR-DBSF/DBDF	2MLR-DBST/DBDT	2MLR-DBSH/DBDH	
Media	Optical	Electrical	Mixed	
Max. distance between Expansion bases	Optical (2km)	Electrical (100m)	Optical (2km)	
			Electrical (100m)	
Cable Spec	62.5/125 Multi-mode Fiber LC type connector (Lucent Connector) Return Loss : over 45db			
Loader connection	Expansion drive USB			
Range of station no.	1 ~ 31 (other number will generate an error)			No.0: not available
Install position	CPU parts(CPU0 connector) in expansion base			
Weight (g)	99	100	102	

2. Open networks

2.1 Network Summary Specifications

A wide range of open networking capability makes adds versatility to MasterLogic-200 PLC's scalable architecture. System engineers have an array of choices and features to design & construct a system architecture that is not just meeting the application but also renders high performance and bandwidth for future expansions.

		Fast Ethernet	Serial Comm	Profibus-DP	DeviceNet
		FEnet	Snet	Pnet	Dnet
Modules		2MLL-EFMT (T.P) 2MLL-EFMF (F.O)	2MLL-CH2A 2MLL-C22A 2MLL-C42A	2MLL-PMEA (Master) 2MLL-PSRA (Remote) 2MLL-PSEA (Slave)	2MLL-DMEA
Transmission Speed		100/10Mbps	300 ~ 11.5kbps	9.6k ~ 12Mbps	125k ~ 500kpbs
Physical Layer		IEEE802.3U - 100baseTx(TP), 100baseFx (Fiber-Optic - Multi Mode)	RS232C / RS422 / 485	RS485	CAN
Distance		100m (Switch/Node, UTP/STP) 2Km (Switch/Node , FiberOptic)	Max 500m (RS422/485)	Max 1.2Km	Max. 500m
Max # of nodes		64	32	126 (32/segment)	64
Service / Protocol	HSL	√ (Peer-to-Peer)	-	√ (Profibus-DP)	√ (DeviceNet)
	MLDP	√ (Experion Interface)	-	-	-
	Modbus slave	√ (MODBUS TCP slave)	√ (MODBUS RTU/ASCII slave)	-	-
	P2P	√ (MODBUS TCP master, User defined Protocol master)	√ (MODBUS RTU/ASCII master, User defined Protocol master)	-	-
	SoftMaster I/F	√	√	-	-
Configuration Software		SoftMaster-NM		SoftMaster-NM & Sycon	
No of communication modules per CPU		Max 24 communication modules per CPU (Max 12 HSL services & 8 P2P services per CPU)			
Network Diagnostics		Auto-scan, Ping Test, Frame Monitor, Link Monitor, Loop back (as applicable)			

HSL Service

High Speed Link can be defined as a communication service that performs bi-directional data transfers between:

- Two or more MasterLogic-200 PLCs (Peer-to-Peer)
- MasterLogic-200 and Profibus-DP devices (Pnet)
- MasterLogic-200 and DeviceNet devices (Dnet)

There can be a maximum of 12 HSL services per MasterLogic-200 CPU. Each HSL service can have a max of 128 blocks (either SEND or RECEIVE) and each block can handle of max of 200 words data size.

P2P Service (point to point)

P2P service can be defined as a communication service that performs:

- MasterLogic acting as MODBUS master and third-party open devices as MODBUS slave (MODBUS RTU/ASCII master on serial or MODBUS TCP master on Ethernet)
- MasterLogic acting as User-Defined Communication master and third-party proprietary devices as slave (both serial and Ethernet TCP-IP)

There can be a maximum of 8 P2P services per MasterLogic-200 CPU. Each P2P service can have a max of 64 blocks (either READ or WRITE).

2.2 Fast Ethernet (FEnet)



Overview

Open standard (IEEE802.3U) high speed Ethernet (FEnet) modules facilitate inter-connecting MasterLogic PLCs with either higher level computers or other peer PLCs on industrial Ethernet network. Network control uses industry standard Carrier Sense Multiple Access with Collision Detection (CSMA/CD) protocol. Two types of modules are available to choose depending on the distance and cabling philosophy.

- Twisted pair (UTP/STP-CAT5) media with RJ45 connector (100m)
- Fiber-optic (x62.5/125um, Multi-mode) media with SC connector (2km)

They provide a variety of services / functions / protocols:

- Peer-to-Peer integration with other MasterLogic PLCs
- Experion integration via special MasterLogic Dedicated Protocol (MLDP)
- MODBUS TCP-IP master / slave protocols
- SoftMaster Interface
- User-defined Protocol for interfacing with third-party devices

Concurrent services

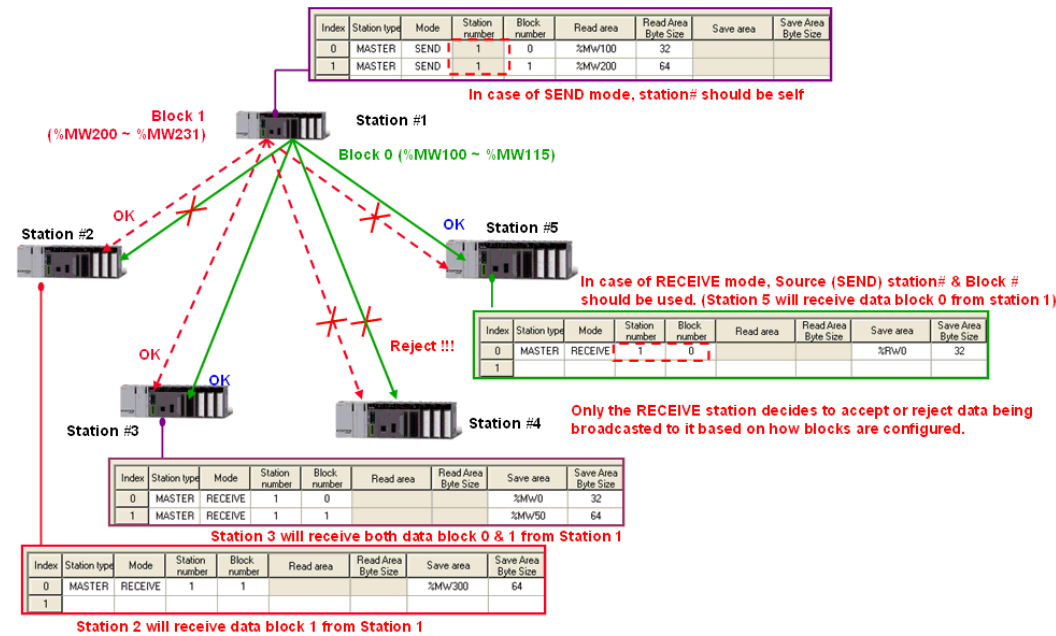
The above services are based on TCP-IP & UDP-IP protocols and thus many of the above processes can be concurrent, i.e. running at the same time in a single FEnet module. For example, a single FEnet module can be used for a) peer-to-peer integration with other PLCs, b) Experion integration c) MODBUS TCP-IP

master protocol d) SoftMaster I/F all at the same time. However, performance could be limited depending on the load.

Specifications

		Fast Ethernet	
Modules		2MLL-EFMT	2MLL-EFMF
Ethernet Standard		IEEE802.3U	
Protocol		TCP-IP, UDP-IP	
Network Control Protocol (Access Method)		CSMA/CD	
Software Firewall		IP address settings in SoftMaster-NM	
Public Network Access		DNS server and Gateway IP address setting	
Dynamic IP address for ADSL		DHCP protocol	
Highway Topology (Transmission Method)		Baseband	
Transmission Speed		10/100 Mbps	100 Mbps
Physical Layer		100baseTx (T.P)	100baseFx (Fiber-Optic)
Media		UTP/STP, CAT5 (RJ45 connector)	x62.5/125um, Multi-mode, SC connector
Transmission Distance		100m (Switch/Node , UTP/STP)	2Km (Switch/Node , Fiber Optic)
Max # of nodes		64	
Service / Protocol	HSL	√ (Peer-to-Peer High Speed Link with other MasterLogic PLCs)	
	HSL Send/Receive blocks	200 words / block, (Max. 128 blocks)	
	MLDP	√ (Experion Interface – MasterLogic Dedicated Protocol)	
	Modbus TCP slave	√ (MODBUS TCP slave protocol)	
	P2P	√ (MODBUS TCP master, User defined Protocol master)	
	SoftMaster I/F	√	
Configuration Software		SoftMaster-NM	
LEDs		RUN, I/F, HS, P2P, PADT, PC, ERR, TX, RX, 10/100	
Network Diagnostics		Auto-scan, Ping Test, Frame Monitor, Link Monitor	
Current Consumption (mA)		410	630
Weight (g)		105	120

HSL Service - Peer-to-Peer network of MasterLogic-200 PLCs



High Speed Link (HSL) services in Fast Ethernet module (FEnet) ensures efficient and reliable peer-to-peer networking of MasterLogic-200 PLCs.

In the above example, there are five PLCs (Station#1 ~ 5) configured for peer-to-peer network. Station#1 is configured with 2 “send” blocks which are broadcasted to rest of all the stations in the network. Only the station with “receive” blocks decides to accept or reject the broadcast packet based on parameters.

Read and Write parameters define the memory areas & size of data transfer for each block. Thus the engineer can configure and get peer-to-peer function working within a few minutes by few clicks and keys.

A max of 128 blocks can be configured in each HSL service and each block can handle of max of 200 words data size. Out of 128, a max of 64 blocks can be configured as “send” and the rest as “receive” blocks. A max of 64 MasterLogic

PLCs (stations) can be connected in a single network for peer-to-peer functionality.

MasterLogic Dedicated Protocol (MLDP) - Experion Integration

The high speed Ethernet communication modules (FEnet) of MasterLogic-200 system can reside on FTE network providing a high-level interface with Experion PKS servers.

MLDP (MasterLogic Dedicated Protocol) server embedded in these modules offer Experion servers, a special proprietary access on TCP-IP layer to various memory variables of the CPU. For more details on this interface, please refer to MasterLogic-Experion Integration section.

MODBUS TCP-IP Slave Protocol

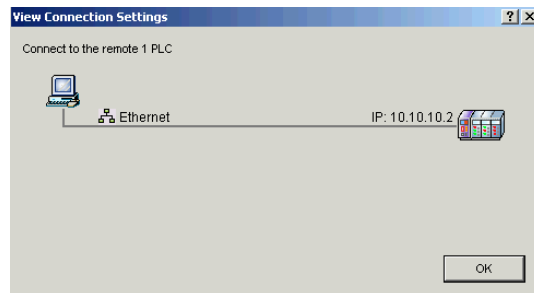
Instead of proprietary MLDP server protocol as above, the FEnet module can be configured to serve open standard MODBUS TCP-IP slave protocol for allowing any third-party controllers / HMI / SCADA to communicate with MasterLogic PLCs.

MODBUS Settings (read / write addresses) can be configured as per requirements.

Function Code	Description	Modbus Address	Remarks	Response size*
01	Output Contact Status Read (Read Coil Status)	0XXXX (bit-output)	Bit read	2000 coils
02	Input Contact Status Read (Read Input Status)	1XXXX (bit-input)	Bit read	2000 coils
03	Output Register Read (Read Holding Registers)	4XXXX (word-output)	Word Read	125 registers
04	Input Registers Read (Read Input Registers).	3XXXX (word-input)	Word Read	125 registers

05	Output Contact 1 Bit Write (Force Single Coil)	0XXXX (bit-output)	Bit write	1 coil
06	Output Register 1 Word Write (Preset Single Register)	4XXXX (word-output)	Word Write	1 register
15	Output Contact Continuous Write (Force Multiple Coils)	0XXXX (bit-output)	Bit Write	1600 coils
16	Output Register Continuous Write (Preset Multiple Register)	4XXXX (word-output)	Word Write	100 registers

SoftMaster I/F Service



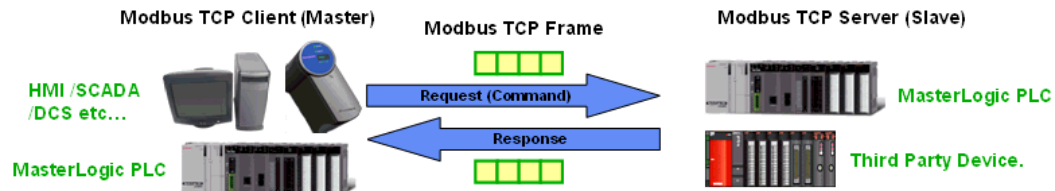
Every FEnet module has a ready built-in service for SoftMaster using TCP-IP Port 2002. This service is automatic and can be in the background along with other services.

Any SoftMaster application (programming software) can connect to the PLC via any of its FEnet module at any time

irrespective of other functions already being performed by the FEnet module.

P2P Service – MODBUS TCP-IP master

The same FEnet module can act as MODBUS TCP-IP master communicating with other third-party MODBUS TCP-IP slave devices, controllers, RTUs etc. In this architecture, MasterLogic PLC would be the master initiating read/write commands with other MODBUS TCP slave devices using TCP-IP port 502.



P2P Service – User-Defined Protocol

This is another unique feature in MasterLogic PLC. Some devices do not support open standard protocols such as MODBUS-TCP but only proprietary protocols providing access to special data areas / functions within the device.

MasterLogic PLC engineers do not fret during such situations. The FENet module allows configuring user-defined protocol using simple “Frame Editor” techniques to communicate with any third-party devices on special protocols.

Using “SoftMaster-NM” utility, “Send” and “Receive” frames can be configured with following options:

- Header, Data and Tail sections
- Numeric and String Constants
- Data frame with Fixed size & varying size variables
- Automatic BCC calculation
- Hex or ASCII conversions
- Transmitting frame controlled by user condition or system clock (100ms, 200ms, 1sec...)
- Receiving frame & writing to memory variable area is automatic

2.3 Serial Communication (Snet)



Overview

Like Ethernet, Serial Communication (Snet) modules add versatility and openness to MasterLogic architecture. Open standard RS232C/ RS422 / RS485 modules facilitate communication of MasterLogic PLCs with a wide range of serial devices i.e. RTU, panels, weigh bridges, barcode readers, high level computers or even other PLCs.

Three types of modules are available to choose depending on the distance and the partner device.

- Two ports of RS232C
- Two ports of RS422/485
- One RS232C port and one RS422/485 port

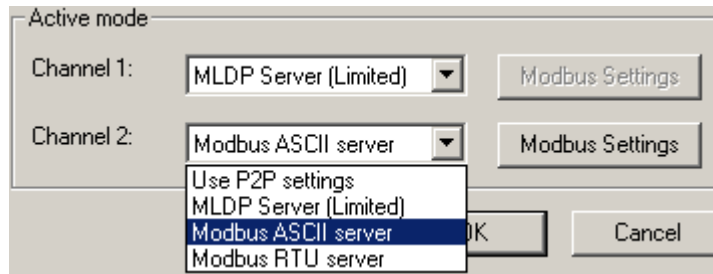
They provide a variety of services / functions / protocols:

- MODBUS RTU/ASCII master / slave protocols
- SoftMaster Interface
- User-defined Protocol for interfacing with third-party devices

Specifications

		Serial Interface (Snet)		
Modules		2MLL-C22A	2MLL-C42A	2MLL-CH2A
Interface Standard		RS232C – 2ch	RS422/485 – 2ch	1ch – RS232C 1ch – RS422/485
Modem connection with remote devices		√	-	√ (only on RS232C port)
Communication Settings (SoftMaster-NM)	Start Bit	1		
	#Data Bits	7 or 8		
	Stop Bits	1 or 2		
	Parity	Odd/Even/None		
	Baud rate	Options: 300 / 600 / 1200 / 2400 / 4800 / 9600 / 19200 / 38400 / 57600 / 115200 bps		
Synchronization		Asynchronous		
Transmission Distance		15m (extendable by modem / phone line)	500m max	RS232C - 15m (extendable by modem) RS422 - 500m max
Network Configuration		1:1	1:1, 1:N, N:M	RS232C - 1:1 RS422 - 1:1, 1:N, N:M
Station No Setting		Setting range : 0-31 (Max. station No. available : 32 stations)		
Service / Protocol	Modbus RTU / ASCII slave	√		
	P2P	√ (MODBUS RTU/ASCII master, User defined Protocol master)		
	SoftMaster I/F	√		
Configuration Software		SoftMaster-NM		
LEDs		RUN, I/F, TX, RX, ERR		
Network Diagnostics		Auto-scan, Frame Monitor, Link Monitor, Loop back		
Current Consumption (mA)		310	300	310
Weight (g)		121	116	119

MODBUS RTU / ASCII Slave Protocol



The Snet module can be configured to serve open standard MODBUS RTU or ASCII slave protocol for allowing any third-party controllers / HMI / SCADA to communicate with MasterLogic PLCs.

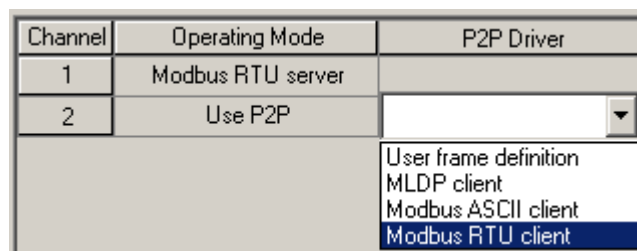
MODBUS Settings (read / write addresses) can be configured as per requirements.

SoftMaster I/F Service

Every Snet module has a ready built-in service for SoftMaster software to connect to the PLC for program download / upload functions.

P2P Service – MODBUS RTU / ASCII master

The same Snet module can act as MODBUS RTU / ASCII master communicating with other third-party MODBUS slave devices, controllers, RTUs etc. In this architecture, MasterLogic PLC would be the master initiating read/write commands with other MODBUS slave devices.



P2P Service – User-Defined Protocol

This is another unique feature in MasterLogic PLC. Some serial devices do not support open standard protocols such as MODBUS but only proprietary protocols providing access to special data areas / functions within the device.

Like the FEnet module, the Snet module allows configuring user-defined protocol using simple “Frame Editor” techniques to communicate with any third-party devices on special protocols.

Using “SoftMaster-NM” utility, “Send” and “Receive” frames can be configured with following options:

- Header, Data and Tail sections
- Numeric and String Constants
- Data frame with Fixed size & varying size variables
- Automatic BCC calculation
- Hex or ASCII conversions
- Transmitting frame controlled by user condition or system clock (100ms, 200ms, 1sec...)
- Receiving frame & writing to memory variable area is automatic

2.4 Profibus-DP (Pnet)

Overview

Pnet I/F module is one of the communication modules of MasterLogic-200 PLC system. It uses token ring topology to control the communication and configure the network. Pnet I/F module uses a shielded Twisted Pair Copper Cable to control the fieldbus.

This module has the following characteristics

- Conforms to the international standard of EN 50170
- Supports Auto Baud Rate Detect
- Supports Sync/Freeze mode
- Communication speed: 9.6K, 19.2K, 93.7K, 187.5K, 500K, 1.5M, 3M, 6M, 12M

Specifications

Profibus-DP (Pnet) Master		
Module Type	Master (2MLL-PMEA)	
Network Type	Profibus-DP	
Standard	EN50170/DIN19245	
Interface	RS-485 (Electric)	
Transmission Route	Bus type	
Modulation Type	NRZ	
MAC	Local Token Ring	
Max. Distance & Transmission Speed	Distance (m)	Transmission Speed (bps)
	1,200	9.6K/19.2K/93.7K/187.5K
	400	500K

	200	1.5M
	100	3M/6M/12M
Max. number of stations per Profibus network	126	
Max. number of stations per segment	32 (including master & repeater)	
Cable used	Electric-twist shielded pair cable	
Max. communication size	7 Kbytes	
Max. size per slave	244 bytes	
Max. number of Profibus-DP Master Modules per CPU	12	
Configuration Tool	SoftMaster-NM, SyCon	
Current Consumption (mA)	550	
Weight (g)	114	

Specifications

Profibus-DP (Pnet) Remote & Slave	
Module Type	Remote (2MLL-PSRA) & Slave (2MLL-PSEA)
Network Type	Profibus-DP
Standard	EN50170/DIN19245
Interface	RS-485 (Electric)
Transmission Route	Bus type
Modulation Type	NRZ

MAC	Local Token Ring	
Max. Distance & Transmission Speed	Distance (m)	Transmission Speed (bps)
	1,200	9.6K/19.2K/93.7K/187.5K
	400	500K
	200	1.5M
	100	3M/6M/12M
Max. number of stations per Profibus network	100	
Max. number of stations per segment	32 (including master & repeater)	
Cable used	Electric-twist shielded pair cable	
Max. communication size	7 Kbytes	
Max. size per slave	TX/RX each 244 bytes	
Configuration Tool	SoftMaster-NM, SyCon	
Current Consumption (mA)	2MLL-PSRA : 600 2MLL-PSEA : 410	
Weight (g)	2MLL-PSRA : 114 2MLL-PSEA : 103	

2.5 DeviceNet (Dnet)

Overview

DeviceNet is an application layer which is used as a communication link to interconnect control devices for data exchange. It uses Controller Area Network as the backbone technology and defines an application later to cover a range of device profiles. Typical applications that use Dnet are industrial devices of limit switch, photo-electronic sensor, motor controller, inverter, bar code reader, and apnel display to the network.

This module has the following characteristics;

- 1 master module can control 63 slave modules with the max. 28,000 points of I/O control available.
- Multi-drop and T-diverged connection is available allowing the system to be extended and changed easily with flexible system operation function provided.
- Open network available to connect with other company's various slave modules.
- Master and slave can be set through Configuration Tool (SyCon), and communication control is available through SM-NM.
- Automatic setting, in other words, Auto scan is available for the modules (which exist) in the network.
- Configuration Tool (SyCon)
- Station number (MAC ID) can be specified (0 ~ 63) through Configuration Tool (SyCon).
- Communication speed can be specified (125/250/500 kbps) through Configuration Tool (SyCon).
- Out of 4 communication types (Poll, Bit strobe, COS, Cyclic), one DeviceNet can be selected through Configuration Tool (SyCon).
- Setup time and installation cost of the system will be saved from reduced connections and wiring works by using a single cable for communication power(24V) and communication signal line.

- Network setting and various diagnoses can be simply arranged through SyCon and SM-NM, in other words, diagnosis of the whole network or each slave is available.
- Real-time control over I/O devices in the lowest level of the network system is available. In addition, connection to various slaves I/O is available.

Specifications

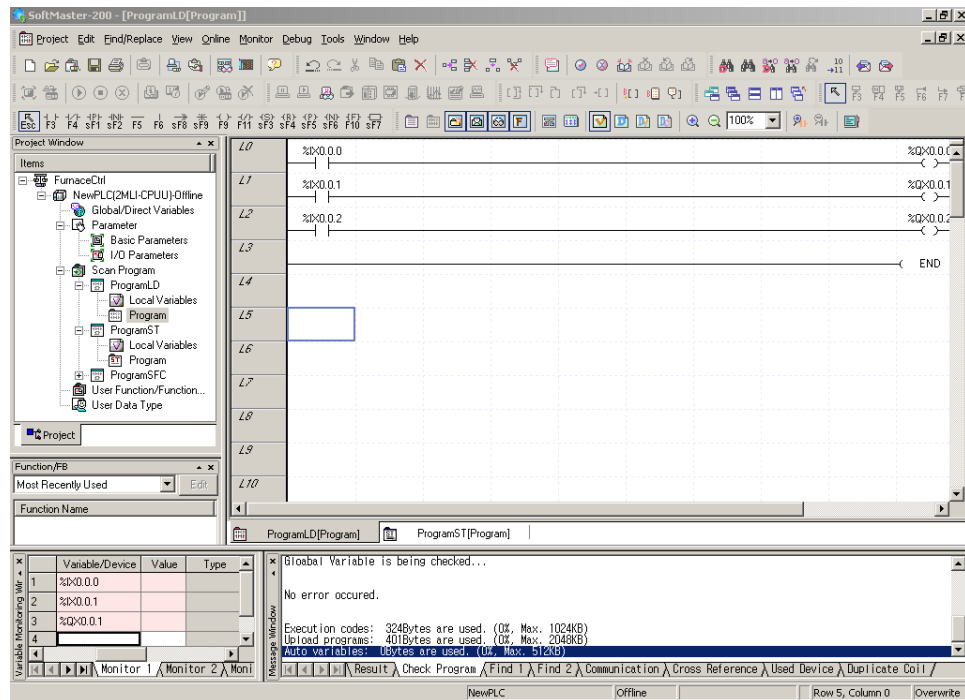
Item			Performance Specifications
Transmission Specification	Transmission Speed (kbps)		125/250/500
	Transmission Type		Poll, Bit strobe, COS, Cyclic
	Communication distance(m)	Thick Cable	500 (125kbps)/250 (250kbps)/100 (500kbps)
		Thin Cable	100 (125/250/500kbps)
	Terminal resistance (Ω)		121 (1%, 1/4W)
	Max. drop length(m)	125 kbps	6 (Max. extended length 156)
		250 kbps	6 (Max. extended length 78)
		500 kbps	6 (Max. extended length 39)
	Data Packet		0~8 Bytes
	Message Access Control		CSMA/NBA
	Network Structure		<ul style="list-style-type: none"> • Trunk/drop line • Power/Signal cable inside the identical network cable
	Bus Type		<ul style="list-style-type: none"> • Poll type
	Max. number of nodes		Up to 64 (including master) MAC IDs (MAC Identifier)
	System Features		Insertion and removal of node available in voltage On status
	Operation Voltage		DC 24V

	Diagnosis Function	Module: Checks duplicated station/ Checks CRC error n: Detects defective station/Checks BusOff/Auto-scan function SM-NM: Monitors High-speed link
	Master/Slave Operation	Available only in master
Parameter setting		1) SyCon (CONFIG Port of Dnet I/F) 2) Setting to High-speed link of SM-NM (RS-232C of CPU module or USB port)
SM-NM (High-speed link)	Data process unit	Byte
	Send/Receive period	Select among 20ms, 50ms, 100ms, 200ms, 500ms, 1s, 5s and 10s - Default : 20ms
	Max. communication point	Send 28672points, Receive 28672 points, 3584 bytes respectively
	Max. block number	63 (Setting range: 0~62)
	Max. point number per block	2048 points (256 bytes)
Basic Specification	Max. modules installed	Up to 12 (available on basic base and added base)
	Internal-consumed current (mA)	440
	Weight (g)	110

3. SoftMaster

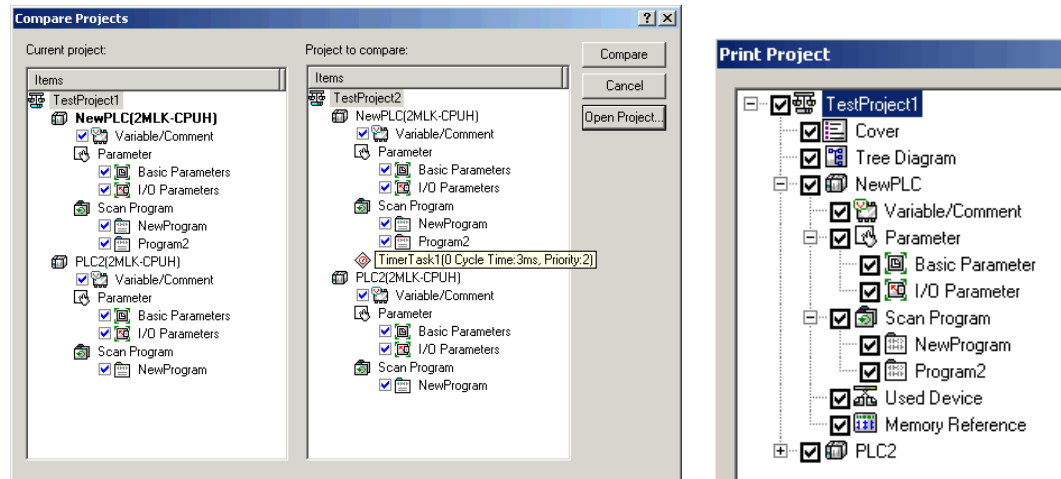
Overview

SoftMaster is a software tool designed to program and debug MasterLogic-200. It provides integrated PLC programming environment.



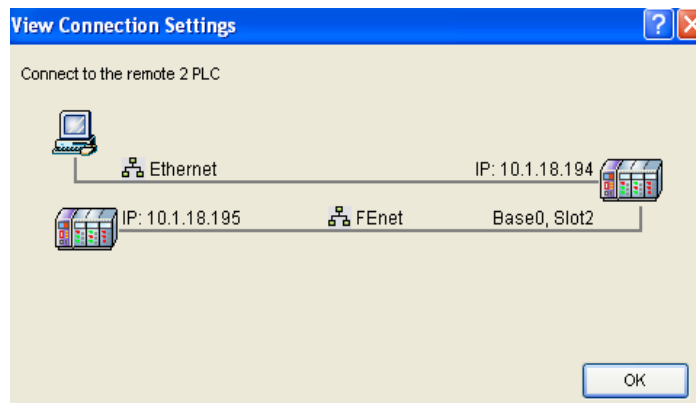
Project Management

- Program multiple PLCs through a single window
- One project file (.xgp) as central storage for complete PLC info
- Compare project files to detect minor differences
- Import / Export entire PLC or selectively individual component
- Flexible documentation – entire PLC data or selectively



Options to connect to PLCs

- USB, RS232C, Ethernet (TP or Fiber-optic)
- Direct connection to PLC or two levels of remote connection to PLC via a communication module



User defined function blocks

SoftMaster in association with MasterLogic-200 CPU allows the creation of password protected user defined function blocks. A user can build the custom

logic & strategies in these function blocks using configurable input and output parameters & data types. These user defined function blocks can be password protected for security and copyright purposes

User defined data types

SoftMaster allows the creation of user defined data types in addition to the standard IEC data types.

Monitoring

When SoftMaster is in connected mode, it allows monitoring of the below functions:

1. Program Monitoring
2. Variable Monitoring
3. System Monitoring
4. Address Monitoring
5. Special Module Monitoring
6. Trend Monitoring
7. Data Traces

Debugging

SoftMaster allows program debugging with advanced features like Step Over, Step Into, Step Out and Conditional Breakpoints.

Online

SoftMaster provides the following features when it is connected with PLC:

1. Online Editing
2. Write programs to PLC
3. Read programs from PLC
4. Change Operation Mode (RUN/STOP/DEBUG)
5. Reset / Clear PLC
6. View PLC information / history / errors and warnings
7. Specify Flash Memory Setting

8. Forced I/O / Skip I/O Setting
9. Fault Mask Setting
10. Online Module Replacement

Simulation

Simulation allows an engineer to programs without PLC, or debug program by using input condition setting or module simulation function.

The following features are supported by the simulation environment:

1. Program simulation
The program written in LD/SFC/ST can be simulated. Online editing and debugging is supported by the simulation environment.
2. PLC online function
The program monitoring and online diagnostic functions (e.g. system monitoring / device monitoring) can be used during simulation.
3. Module simulation
Digital I/O module, A/D conversion module, D/A conversion module, High counter, Temperature control module can be simulated.
4. I/O input condition setting
Simulation environment supports setting device value or channel value of the I/O module as an input condition.

System Requirements

System Configuration	Minimum
Processor	2.0GHz Pentium IV or faster
RAM	128 MB
Video Resolution	1024 x 768
Hard Drive	10 GB

Operating System	Windows XP/SP2, Windows Vista, Windows 7
External Interface	RS232 Serial or USB

4. Model Numbers

4.1 CPU modules

Product	Model	Description
CPU	2MLI-CPUS	High speed CPU module (Fully Non-redundant system), Standard (Max. I/O point: 3,072 points)
	2MLI-CPUH	High speed CPU module (Fully Non-redundant system), High Performance (Max. I/O point: 6,144 points)
	2MLI-CPUU	High speed CPU module (Fully Non-redundant system), Enhanced (Max. I/O point: 6,144 points)
	2MLI-CPUS/P	High speed CPU module (Non-redundant CPU with redundant power), Standard (Max. I/O point: 768 points)
	2MLR-CPUH/T	High speed CPU module (Fully Redundant system), Master, TP/CAT5 (Max. I/O point: 23,808 points)
	2MLR-CPUH/F	High speed CPU module (Fully Redundant system), Master, Fiber Optic (Max. I/O point: 23,808 points)

4.2 I/O base & Power & Cables (2MLI-CPUU, CPUH, CPUS)

Product	Model	Description	Remarks
Main CPU Base	2MLB-M04A	For 4 module installation	
	2MLB-M06A	For 6 module installation	
	2MLB-M08A	For 8 module installation	
	2MLB-M12A	For 12 module installation	
Expansion I/O Base	2MLB-E04A	For 4 module installation	
	2MLB-E06A	For 6 module installation	
	2MLB-E08A	For 8 module installation	
	2MLB-E12A	For 12 module installation	
Power Supply	2MLP-ACF1	AC 100V~240V input, DC 5V: 3A, DC 24V: 0.6A	
	2MLP-ACF2	AC 100V~240V input, DC 5V: 6A	
	2MLP-AC23	AC 100V~240V input, DC 5V: 8.5A	
	2MLP-DC42	DC 24V Input, DC 5V: 6A	
Expansion I/O cable	2MLC-E041	Length: 0.4m	Total expansion distance should not exceed 15m
	2MLC-E061	Length: 0.6m	
	2MLC-E121	Length: 1.2m	
	2MLC-E301	Length: 3.0m	
	2MLC-E501	Length: 5.0m	
	2MLC-E102	Length: 10.0m	
	2MLC-E152	Length: 15.0m	

4.3 I/O base & Expansion Drive & Power & Cables (2MLR-CPUH/#)

Product	Model	Description	Remarks
Main CPU Base	2MLR-M02P	CPU base for 2 module installation	
	2MLR-M06P	CPU base for 6 module installation	
Expansion I/O Base	2MLR-E08P	I/O Base for 8 module installation	
	2MLR-E12P	I/O Base for 12 module installation	
	2MLR-E12H	I/O Base for 12 module installation & redundant Expansion Drive	
Power Supply	2MLR-AC13	Power Module, 8.5A, Voltage (AC110V)	
	2MLR-AC23	Power Module, 8.5A, Voltage (AC220V)	
	2MLR-AC12	Power Module, 5.5A, Voltage (AC110V)	
	2MLR-AC22	Power Module, 5.5A, Voltage (AC220V)	
	2MLR-DC42	Power Module, 7.5A, Voltage (DC24V)	
Expansion Drive	2MLR-DBSF	I/O Interface Module, Fiber Optic	
	2MLR-DBST	I/O Interface Module, TP/CAT5	
	2MLR-DBSH	I/O Interface Module, Hybrid	
	2MLR-DBDF	I/O Interface Module, Fiber Optic	
	2MLR-DBDT	I/O Interface Module, TP/CAT5	
	2MLR-DBDH	I/O Interface Module, Hybrid	

4.4 Base & Power (2MLI-CPUS/P)

Product	Model	Description
Base	2MLR-M02P	Base for 2 module installation
	2MLR-M06P	Base for 6 module installation
	2MLR-E08P	Base for 8 module installation
	2MLR-E12P	Base for 12 module installation
Power Supply	2MLR-AC13	Power Module, 8.5A, Voltage (AC110V)
	2MLR-AC23	Power Module, 8.5A, Voltage (AC220V)
	2MLR-AC12	Power Module, 5.5A, Voltage (AC110V)
	2MLR-AC22	Power Module, 5.5A, Voltage (AC220V)
	2MLR-DC42	Power Module, 7.5A, Voltage (DC24V)

*No expansion rack is available for 2MLI-CPUS/P

4.5 Digital I/O modules

Product	Model	Description	Remarks
Digital Input	2MLI-D21A	DC 24V Input, 8 point (Current source/sink input)	
	2MLI-D22A	DC 24V Input, 16 point (Current source/sink input)	
	2MLI-D24A	DC 24V Input, 32 point (Current source/sink input)	
	2MLI-D28A	DC 24V Input, 64 point (Current source/sink input)	
	2MLI-D22B	DC 24V Input, 16 point (Current source input)	
	2MLI-D24B	DC 24V Input, 32 point (Current source input)	
	2MLI-D28B	DC 24V Input, 64 point (Current source input)	
	2MLI-A12A	AC 110V input, 16 point	
	2MLI-A21A	AC 220V input, 8 point	
	2MLI-A21C	AC110-220V, 8 point, isolated	
Digital Output	2MLQ-RY1A	Relay output, 8 point (for 2A, single COM.)	
	2MLQ-RY2A	Relay output, 16 point (for 2A)	
	2MLQ-RY2B	Relay output, 16 point (for 2A), Varistor included	
	2MLQ-TR1C	Transistor output, 8 points (2A per point, Sink output, Isolated)	
	2MLQ-TR2A	Transistor output, 16 point (for 0.5A, Sink output)	
	2MLQ-TR4A	Transistor output, 32 point (for 0.1A, Sink output)	
	2MLQ-TR8A	Transistor output, 64 point (for 0.1A, Sink output)	
	2MLQ-TR2B	Transistor output 16 point (for 0.5A, Source output)	
	2MLQ-TR4B	Transistor output 32 point (for 0.1A, Source output)	
	2MLQ-TR8B	Transistor output 64 point (for 0.1A, Source output)	
	2MLQ-SS2A	Triac output, 16 point (for 0.6A)	

4.6 Analog I/O, High Speed Counter & Event Input Modules

Product	Model	Description	Remarks
Analog Input modules	2MLF-AV8A	Voltage Input: 8 channels	
	2MLF-AC8A	Current Input: 8 channels	
	2MLF-AD8A	Voltage/Current Input: 8 channels	
	2MLF-AD16A	Voltage/Current Input: 16 Channels	
	2MLF-AD4S	Voltage/Current Input: 4 channels	
	2MLF-AC4H	Current Input: 4 channels, HART	
Analog Output modules	2MLF-DV4A	Voltage Output: 4 channels	
	2MLF-DC4A	Current Output: 4 channels	
	2MLF-DC4S	Current Output: 4 channels, Isolation between channels	
	2MLF-DV8A	Voltage Output: 8 channels	
	2MLF-DC8A	Current Output: 8 channels	
	2MLF-DC4H	Current Output: 4 channels, HART	
Thermocouple Input	2MLF-TC4S	Temperature (T/C) Input, 4 channels, Isolation between channels	
RTD Input	2MLF-RD4A	Temperature (RTD) Input, 4 channels	
	2MLF-RD8A	Temperature (RTD) Input, 8 channels	
High speed Counter	2MLF-HO2A	Voltage Input type (Open Collector type) 200 kHz, 2 channel	
	2MLF-HD2A	Differential Input type (Line Driver type) 500 kHz, 2 channel	
Event Input	2MLF-SOEA	SOE input, 32 channel	

4.7 Communication Modules

Product	Model	Description
Fast Ethernet	2MLL-EFMF	Fast Ethernet (multi-mode fiber-optic media), Master, 100/10Mbps support
	2MLL-EFMT	Fast Ethernet (CAT 5 media), Master, 100/10Mbps support
Serial Interface	2MLL-C22A	Serial communication, RS-232C, 2channels
	2MLL-C42A	Serial communication, RS-422/485, 2channels
	2MLL-CH2A	Serial communication, RS-232C 1 Channel / RS-422/485 1 Channel
Profibus-DP	2MLL-PMEA	Profibus-DP Master module
	2MLL-PSRA	Profibus-DP Remote Interface module (Slave)
	2MLL-PSEA	Profibus-DP Slave Interface module
DeviceNet	2MLL-DMEA	DeviceNet Master module

4.8 Programming Cables

Product	Model	Description
USB cable	USB-301A	Programming cable for USB port

4.9 Others

Product	Model	Description
Terminator	2MLT-TERA	Must use for non redundant base expansion
Dummy module	2MLT-DMMA	Dust protection module for unused slot
	2MLR-DMMA	Dust protection module for unused Power slot

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Automation & Control Solutions

Process Solutions
Honeywell
2500 W. Union Hills Dr.
Phoenix, AZ 85027
Tel: 877.466.3993 or 602.313.6665

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