

# Programmable Automation Controllers MasterLogic-200

**Honeywell**

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**Honeywell**



**Honeywell's next generation PACs  
 Powerful, compact, versatile, open network**

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## Overview

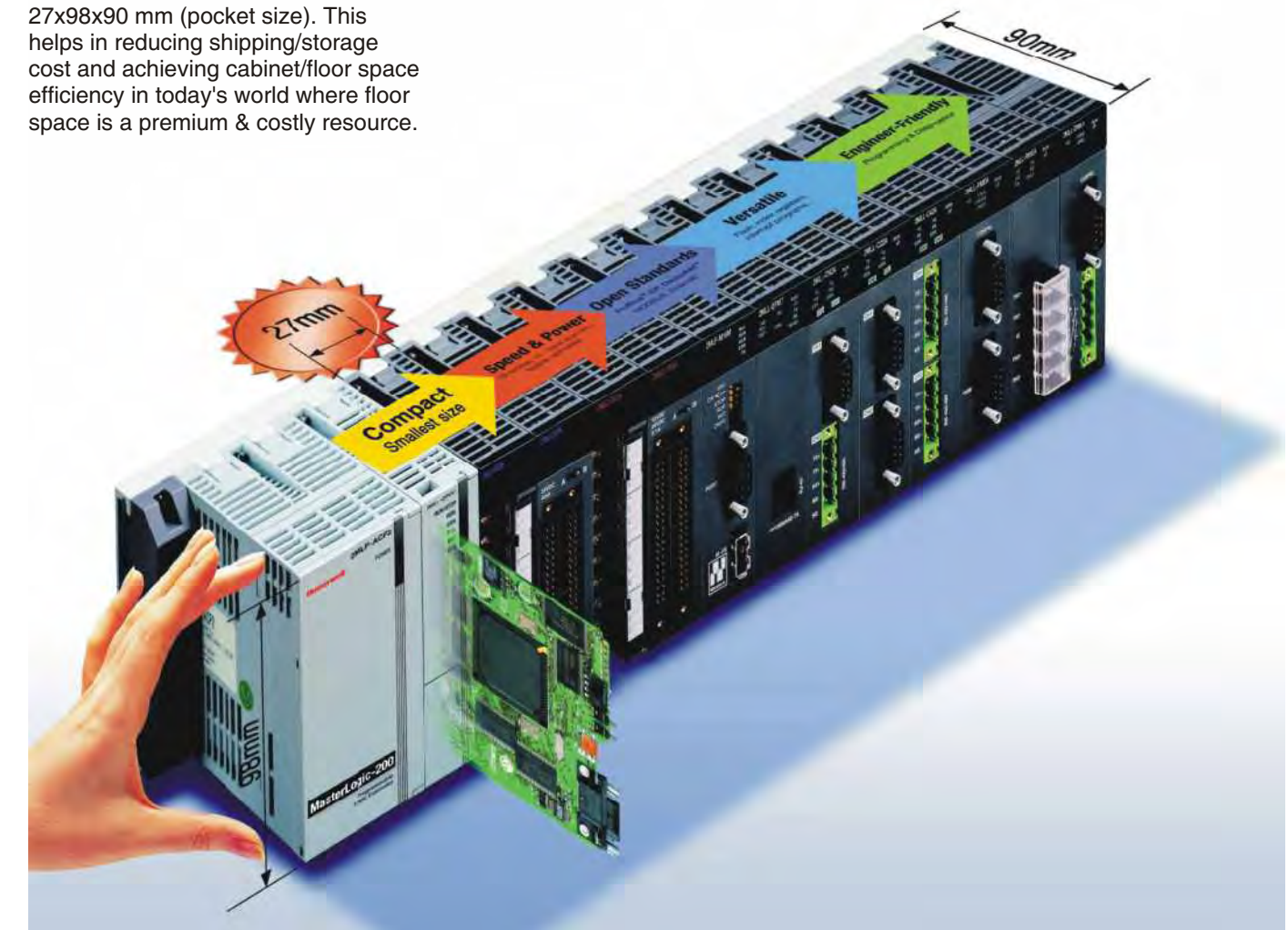
### Key Features

- Powerful & versatile processors - High speed i.e. (28ns/step, flash memory, hot-swapping)
- CPU redundancy - Bumpless switchover to standby CPU within 50ms when master CPU fails
- Power supply redundancy - For both CPU and I/O racks
- Network redundancy - Ring topology providing dual communication paths to I/O racks
- Redundant Link with MMI
- Peer-to-Peer communications - Dedicated Ethernet 100 Mbps
- Compact size - Less rack room & cabinet size space / reduced shipping & storage costs
- Open network protocols - Profibus™DP, DeviceNet™, Modbus ...
- Open communication - Ethernet, Fiber-optic (100Mbps), Serial RS232/RS422
- IEC61131-3 standard programming - LD / SFC / ST language options
- Large I/O capacity
- Wide range I/O modules - Over 50 types: digital/analog, HSC, Position Control, High Speed Counter, Thermocouple
- Smart I/O (based on Profibus-DP, DeviceNet, Modbus)
- Engineer friendly software - Ease of configuration & trouble-shooting
- Integration with Experion PKS & Experion Vista - Diagnostics & SCADA via MLDP protocol
- Integration with third party MMI using Modbus protocol
- Self diagnostics - Network diagnostics, system logs, Auto scan, monitoring system

Size Innovation... **Compact**  
saves cabinet & floor space considerably

### The smallest size

The module size is as small as 27x98x90 mm (pocket size). This helps in reducing shipping/storage cost and achieving cabinet/floor space efficiency in today's world where floor space is a premium & costly resource.

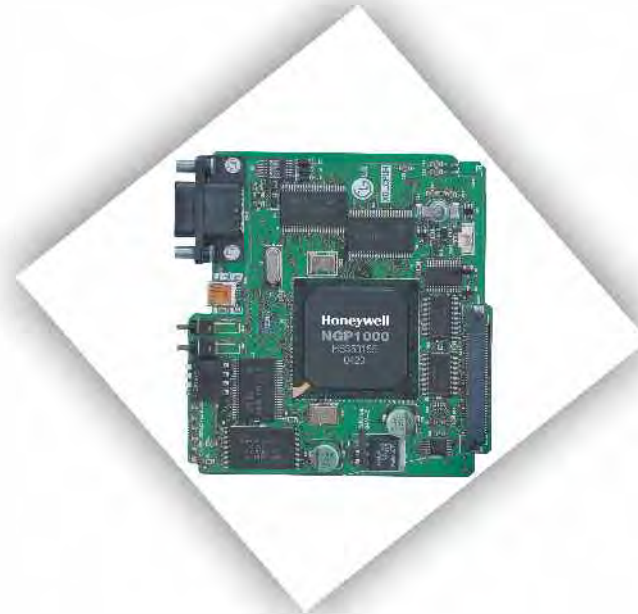


## Speed Innovation. . . Speed & Power

High speed scan (e.g. estimated 15ms for typical large PAC applications, say, 3500 I/Os and program size of 400 Kbytes).

### High Speed Processing

A state of the art processor in the CPU makes it intrinsically powerful. All program instructions are executed at a high speed, thereby enabling even complex instructions to be processed very fast.



### High-Speed dedicated I/O controller

The powerful processor as above (28ns/step) is well-supported by a dedicated I/O bus controller to achieve overall fast scan cycles. This dedicated I/O controller supplements the main processor in I/O refresh and achieves high speed scan.

## Network Innovation...Open Standards

### System Integration with Open Networks

The open communication standards have continuously evolved and so has MasterLogic-200 PAC's capability to interface with them. In addition to Modbus (Ethernet and Serial), MasterLogic-200 supports several open protocols in control industry standards e.g. DeviceNet™, Profibus™-DP etc.



Item	Fast Ethernet	Serial Comm	Profibus-DP	Device Net
Transmission Speed	10/100 Mbps	300 ~ 11.5 Kbps	9.6k-12 Mbps	125/250/500 Kbps
Physical Layer	IEEE802.3U-100 Base Tx (TP) 100 Base Fx (Fiber Optic)	RS232C / RS422 / 485	RS485	CAN
Distance	100m (Switch/Node, UTP/STP) 2Km (Switch/Node, Fiber Optic)	Max 500m (RS422/485)	Max 1.2Km	100 / 250 / 500m
Max No of Nodes	64	32	126(32/segment)	64 (1 master + 63 slave)
Service / Protocol	HSL	Peer-to-Peer	-	Profibus-DP
	MLDP	Experion Interface	-	-
	Modbus slave	Modbus TCP Slave	Modbus RTU / ASCII Slave	-
	P2P	Modbus TCP/User Defined Protocol Master	Modbus/ User Defined Protocol Master	-
	SoftMaster	✓	✓	-
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			

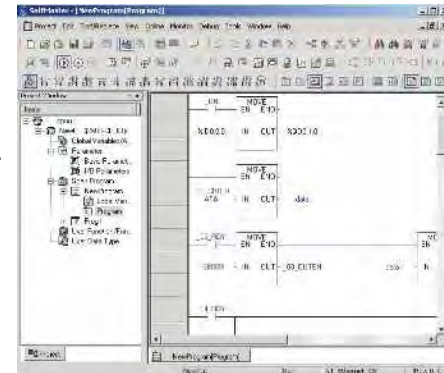
## Software Innovation... Engineer-Friendly

### Integrated Programming & Engineering

SoftMaster software package provides integrated engineering environment from basic programming to different special module settings as well as diagnosis. This package consists of SoftMaster (PAC programming) and SoftMaster-NM (Network Management).

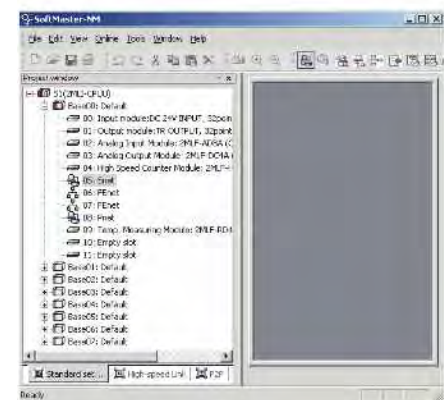
### SoftMaster

- Engineer friendly software (multiple PACs monitored in a single window/project)
- Easy project documentation - programs, variable assignments, comments, etc.
- Import/Export - configuration file can be imported or exported
- Two levels of remote connections
- Online editing & Debugging facility
- A special wizard for hot swapping of modules
- Various trouble-shooting and diagnostic features
- Common configuration tool for MasterLogic-50 and MasterLogic-200



### SoftMaster-NM

- Slot assignment & configuration of all communication modules (Ethernet, Serial, Profibus™-DP, DeviceNet™ etc)
- Peer-to-Peer networking configuration
- Data transfer (transmission & receive) definitions
- Various network diagnostic features (e.g. protocol analysis)



## Engineering & Programming Innovation... Versatile

### Modular and interrupt driven program

MasterLogic-200 allows the engineer to modularize the entire program into several easily manageable components. Also, several device driven programs are supported e.g. timer or process condition driven interrupts. The table summarizes the maximum numbers of programs that are supported.

Program Type Allocation	Program Type	Count
	INIT Program	1 max
	Timer Interrupt Programs	32 max
	Device Interrupt Programs	32 max
	Scan Programs	Balance: 256 minus sum of above
	Total	256 max

### IEC61131-3 Standard Programming languages

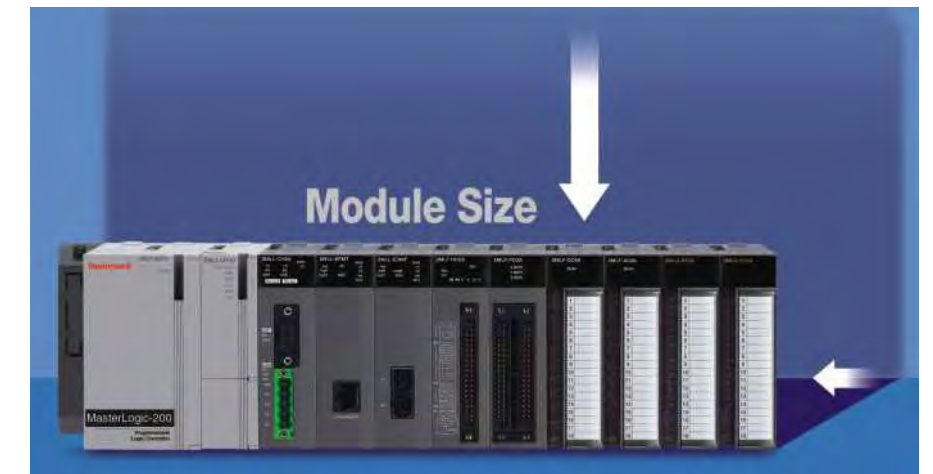
MasterLogic-200 allows an engineer to program in any of the IEC61131-3 Standard Programming languages namely, Ladder Logic, Sequential Function Charts and Structured Text.

## CPU and System Configuration

### Introduction

MasterLogic-200, Honeywell's next generation Programmable Automation Controllers (PAC) 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 PAC system are:

- Powerful & versatile CPU (high speed / memory, IEC programming etc.)
- 32 bit processor for high speed execution
- Redundancy (CPU, Power, I/O network redundancy)
- High speed synchronization of program and data between primary and backup CPU via dedicated fibre-optic line
- 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.
- Built-in twisted-pair of fibre-optic networks for local (100m) and remote I/O (2km) racks on ring topology
- 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 and trouble-shooting)
- Diagnostics (system/error logs, system monitoring, network monitoring, ping test, frame monitor)

### 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/T or 2MLR-CPUH/F provides a fully redundant system:

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

### Non-redundant CPU but redundant Power and I/O cable

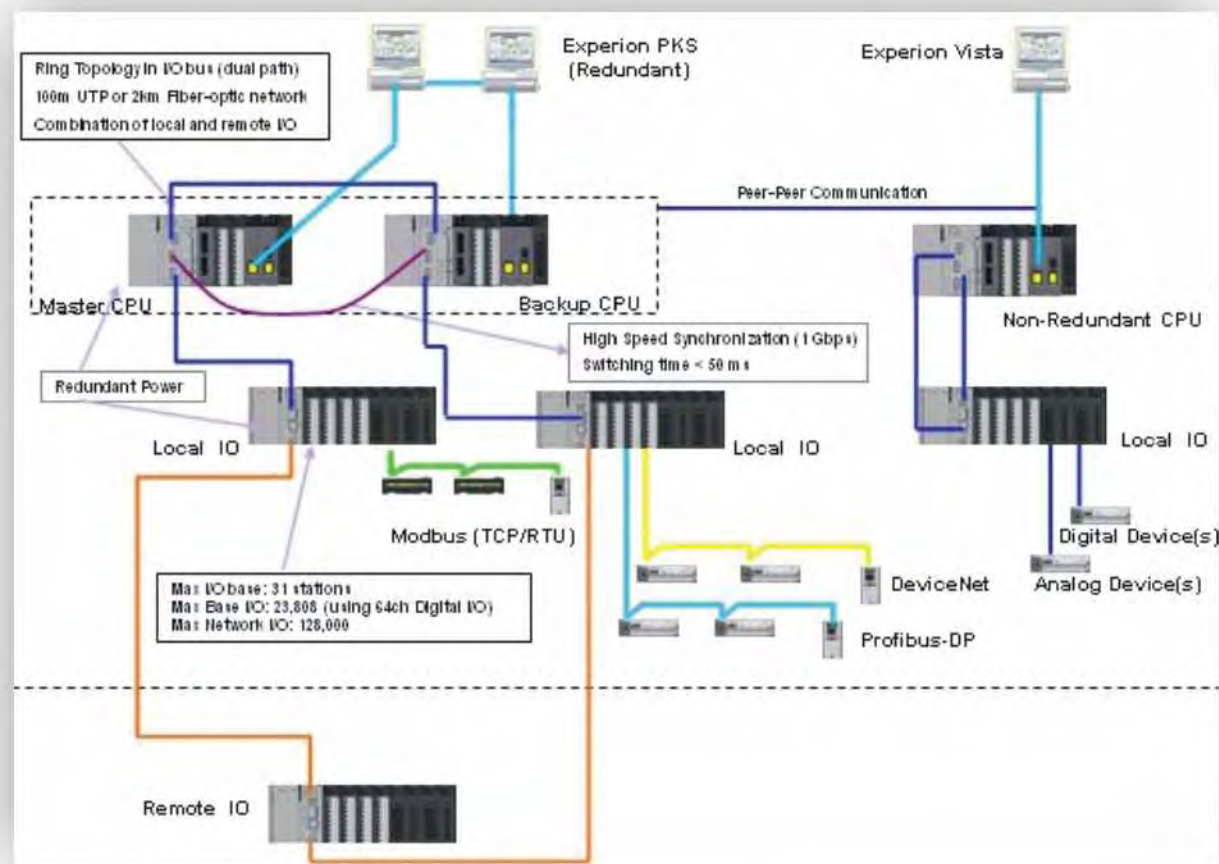
A slight variation of the fully redundant architecture with only the master CPU of 2MLR-CPUH/T or 2MLR-CPUH/F (excluding the standby CPU) offers the functionality of:

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

### Non-redundant system

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

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



System Architecture

### General Specifications

Item	Specifications				Related Standards
Ambient Temp.	0 ~ 55°C				
Storage Temp.	-25 ~ 70°C				
Ambient Humidity	5 ~ 95%RH (Non-condensing)				
Storage Humidity	5 ~ 95%RH (Non-condensing)				
Vibration	Occasional vibration				10 times each direction (X, Y and Z)
	Frequency	Acceleration	Pulse width	Sweep Count	
	$10 \leq f < 57\text{Hz}$	-	0.075mm	-	
	$57 \leq f \leq 150\text{Hz}$	9.8 m/s <sup>2</sup> (1G)	-		
	Continuous vibration				
	Frequency	Acceleration	Pulse width	Sweep Count	
$10 \leq f < 57\text{Hz}$	-	0.035mm	-		
$57 \leq f \leq 150\text{Hz}$	4.9 m/s <sup>2</sup> (0.5G)	-			
Shocks	<ul style="list-style-type: none"> <li>• Peak acceleration: 147m/s<sup>2</sup>(15G)</li> <li>• Duration: 11ms</li> <li>• Pulse wave type: Half-sine (3 times in each of X, Y and X directions)</li> </ul>				IEC61131-2
Noise Immunity	Square wave impulse noise	±1,500V			IEC61131-2 IEC61000-4-2
	Electrostatic discharge	Voltage: 4kV (Contact discharge)			
	Radiated electromagnetic field noise	27 ~ 500MHz, 10V/m			
	Fast transient /Burst noise	Classification	Power supply	Digital/Analog I/O, Communication Interface	
	Voltage	2kV	1kV	IEC61131-2 IEC61000-4-4	
Atmosphere	Free from corrosive gases and excessive dust				
Altitude	Less than 2,000m				
Pollution Degree	Less than 2				
Cooling Method	Air-cooling				
Agency Certifications	<ul style="list-style-type: none"> <li>UL 508 Industrial Control Equipment</li> <li>CE 89/336/EEC, EMC Directive</li> <li>EN 50081-2, Emissions, Industrial</li> <li>EN 50082-2, Immunity, Industrial</li> </ul>				

CPU Specifications

Item		2MLI-CPUU Non-redundant	2MLR-CPUH/T & 2MLR- CPUH/F - Redundant or Non- redundant	Remarks
Program Execution Methods		Cyclic scan, Time-driven interrupts, Internal Memory interrupts		
I/O Control Methods		Scan synchronous batch processing I/O (refresh method), Direct I/O method by program instruction		
Program Languages		Ladder Diagram, Sequential Function Chart, Structured Text, Instruction List (view only)		
Number of Instructions	Operator	18		
	Basic functions	136 + real number operation function	130 + real number operation function	
	Basic function block	43	41	
	Dedicated function block	Dedicated communication function blocks (P2P)		
Processing Speed (Basic instruction)	LD	0.028µs/step	0.042µs/step	
	MOV	0.084µs/step	0.126µs/step	
	Real number operation	±: 0.392µs (S), 0.924µs (D) ÷: 0.924µs (S), 2.254µs (D) x: 0.896µs (S), 2.240µs (D)	±: 0.602µs (S), 1.078µs (D) ÷: 1.134µs (S), 2.66µs (D) x: 1.106µs (S), 2.394µs (D)	
Program Memory Capacity		10 MB		
Max No of I/O Bases		8 (main + 7 extension)	31	
Max No of Slots		96	372	
Max Base I/O	Using 64 ch DI/DO module	6,144 (64ch * 96 slots)	23,808 (64ch*372 slots)	
	Using 32 ch DI/DO module	3,072 (32ch * 96 slots)	11,904 (32ch*372 slots)	
Max I/O Extension Distance		15m (proprietary cable)	100m (UTP cable) 2km (Fiber-optic cable)	
Network / Remote I/O (Max I/O memory)		128,000	128,000	Using Smart I/O modules
Flash Memory		16 MB		
Data Memory Capacity	Symbolic Variable Area (A)	512 KB (Maximum, 256 KB retain settable)		Open standards
	Timer	No point limit Time Range: 0.001 ~ 4,294,967.295 seconds (1,193 hours)		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	256 KB (Maximum, 128 KB retain settable) (%MW0~%MW131071)	Fixed Area Variable
		R	64 KB * 2 (%RW0~%RW32767)	File Register
		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)			

CPU Specifications continued...

Item		2MLI-CPUU Non-redundant	2MLR-CPUH/T & 2MLR- CPUH/F - Redundant or Non-redundant	Remarks	
Data Memory Capacity	Flag Variables	F	4KB	System Flag	
		K	16KB	PID Flag	
		L	22KB	High Speed Link Flag	
		N	42KB	P2P Flag	
		U	8KB	Analog refresh flag as VAR_GLOBAL	
Program Type Allocation	INIT Program	1 max			
	Timer Interrupt	32 max			
	Internal Device Interrupt Programs	32 max			
	Scan Programs	Balance: 256 minus sum of above			
Total		256 max			
CPU Operation Mode		RUN, STOP, DEBUG			
CPU Restart Mode		Cold or warm restart			
Self-diagnosis		Watchdog timer, memory error, I/O error, battery error, power error, communication error etc.			
Built-in Program Port		RS232C(1CH)			Modbus slave supported via RS232C port
		USB (1CH) @ 12 Mbps			
		Note: Additional program connections via Ethernet & serial communication module (locate or remote)			
Data Storage Method at power off		Retain area configuration via Basic parameters			
Current Consumption		960mA			
Weight		0.12kg			
Switchover Time		NA	Less than 50 ms		

Highlights

High Speed

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

High Memory

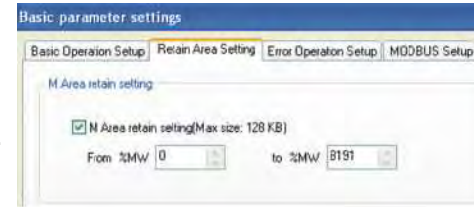
High memory of MasterLogic-200 CPU combined with high speed & huge I/O capacity feature provides a robust platform for efficient performance in large applications.

Specification	Size	Remarks
Program Memory	10 MB	For program execution
Built-in Flash Memory	16 MB	For program & data backup
Data Memory	2 MB	Direct Variables
		Symbolic (named) Variables
System Memory	2 MB	For history logs (audit trail)

### 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. The data stored here will be retained even upon CPU power failure 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.
- 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.
- 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.



### 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, Position Control and even communication modules (i.e. Ethernet, Serial, Profibus-DP, DeviceNet) can be freely assigned to any base/slot irrespective of base number, slot number.

Without any restriction, any module can also be installed in remote I/O bases located far away (by using FO network of 2MLR-CPUH/F or 2MLR-CPUH/T).

### Large I/O capacity

MasterLogic-200 accommodates a huge I/O capacity through base I/O and remote I/O capabilities. I/O capacity details are tabulated below.

Model: 2MLI-CPUU	Qty	Remarks
Max No of Bases	8	1 main base + 7 extension bases
Max No of Slots	96	12 slots * 8 base = 96 slots
Max No of 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
Max No of Network & Remote I/O	128,000 points	Using Smart I/O modules on Profibus-DP etc

Model: 2MLR-CPUH/T & 2MLR-CPUH/F	Qty	Remarks
Max No of Bases	31	On either Ethernet or Fiber-optic networks
Max No of Slots	372	12 slots * 31 base = 372 slots
Max No of 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
Max No of Network & Remote I/O	128,000 points	Using Smart I/O modules on Profibus etc

### High Speed Synchronization

In redundant CPU systems, a dedicated high speed 1 gigabit fiber-optic link between primary and secondary 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 50 ms.

### 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. 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 the industrial process control situations.

Programming Languages	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

### 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, Latch, Valve, Data Conversion, Wave, Variance, Deadband etc
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.
Position Control functions	Functions for APM module

## Network

### Introduction

The open communication standards have continuously evolved and so has MasterLogic-200 capability to interface with the outside world.

In addition to Modbus (TCP-IP Ethernet and Serial), MasterLogic-200 supports several open control industry standards protocols e.g. DeviceNet™, Profibus™-DP etc.



#### Fast Ethernet (FEnet)

- 10/100Mbps support, industrial-use high speed Ethernet
- 10/100Base-TX, 100Base-FX (fiber-optic)
- High reliability and performance with 32-bit processor
- Connectivity to HMI S/W (e.g. Experion PKS)

#### Serial Communication (Snet)

- RS232C/485/422 communication
- Long distance communication via modem connection
  - Connectivity to HMI S/W
  - User-defined communication support
- Convenient P2P master (Modbus master)



#### Profibus-DP (Pnet)

- Low cost network appropriate to field level
- Allows communication between master device and distributed slave I/O devices
- Fast slave communication omitting application layer
- Long communication distance: Maximum 1200m
- Convenient parameter setting through SyCon/HS link parameter

#### DeviceNet (Dnet)

- Connectable to other PACs and control device
  - Compliance to ODVA standard
- Flexible communication speed settings: 125, 250, 500Kbps
  - Multi-drop and T-branch connection
  - Long communication distance: Maximum 500m
- Convenient parameter setting through SyCon/HS link parameter



### Fast Ethernet (FEnet)

#### Overview

Open standard (IEEE802.3U) high speed Fast ethernet (FEnet) modules facilitate inter-connecting MasterLogic PACs with either higher level computers or other peer PACs 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 PACs
- 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 PACs, 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

Item	Fast Ethernet(FEnet)	
Modules	2MLL-EFMT	2MLL-EFMF
Ethernet Standard	IEEE802.3U	
Protocol	TCP-IP, UDP-IP	
Network Control Protocol	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	
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 No of Nodes	64	
Service / Protocol	HSL	(Peer-to-Peer High Speed Link with other MasterLogic PACs)
	HSL Send/Receive blocks	200 words / block, (Max. 128 blocks)
	Modbus TCP slave	(MODBUS TCP slave protocol)
	P2P	Modbus TCP master, User defined Protocol master)
	SoftMaster I/F	✓
MLDP	✓ (Experion Interface – MasterLogic Dedicated Protocol)	
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



## 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 PACs with a wide range of serial devices i.e. RTU, panels, weigh bridges, barcode readers, high level computers or even other PACs.

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

- 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

Item	Serial Interface (Snet)		
Modules	2MLL-C22A	2MLL-C42A	2MLL-CH2A
Interface Standard	RS232C – 2 ch	RS422/485 – 2 ch	1 ch–RS232C , 1 ch–RS422/485
Modem connection with remote devices	✓	-	✓ (only on RS232C port)
Communication Settings	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

## Profibus-DP (Pnet)

### Overview

Pnet module is one of the communication modules of MasterLogic-200 PAC 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, 12Mbps



### Specifications

Item	Profibus-DP (Pnet)	
Module Type	Master	
Network Type	Profibus-DP	
Standard	EN50170/DIN19245	
Interface	Rs485 (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. No of Stations per Profibus Network	126	
Max. No 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. No of Profibus-DP Master Modules per CPU	12	
Configuration Tool	SoftMaster-NM, SyCon	
Current Consumption (mA)	550	
Weight (g)	114	

## DeviceNet (Dnet)

### Overview

DeviceNet module has the following features:

- 1 master module can control 63 slave modules with the maximum. 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
- Master and slave can be set through configuration tool (SyCon), and communication control is available through SoftMaster-NM
- Auto scan is available for the modules which exist in the network
- Less setup time and installation cost of the system due to reduced wiring



### Specifications

Item		DeviceNet (Dnet)	
Transmission Specifications	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(ohm)	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	Trunk/Drop line, Power/Signal cable inside the identical network cable	
	Bus Type	Multi-slave/Multi-casting, Peer-to-Peer type, Poll type	
	Max. number of nodes	Up to 64 (including master) MAC IDs (MAC Identifier)	
	Operation Voltage	DC 24V	
	Diagnosis Function	Module: Checks duplicated station/ Checks CRC error SyCon: Detects defective station/Checks Bus Off/Auto-scan SoftMaster-NM: Monitors High-speed link	
Master/Slave Operation	Available only in master mode		
Parameter Settings		SyCon (CONFIG Port of Dnet I/F) Setting to High Speed Link of SoftMaster-NM (RS232C of CPU module or USB port)	
SoftMaster-NM (High-speed link)	Data Process Unit	Byte	
	Send/Receive Period	Select among 20ms, 50ms, 100ms, 200ms, 500ms, 1s, 5s and 10s Default : 50ms	
	Max. Communication Point	Send 28672 points, Receive 28672 points, 3584 bytes respectively	
	Max. Block Number	63 (Setting range: 0~62)	
Basic Specifications	Max. Point Number per Block	2040 points (255 bytes)	
	Max. Modules Installed	Up to 12 (available on basic base and added base)	
	Current Consumption(mA)	440	
Weight (g)	110		

## Input/Output Modules

MasterLogic-200 Programmable Automation Controllers features Analog and Digital I/O Modules along with special modules like High Speed Counter Module, Position Control Module and Smart I/O Modules.

### Digital I/O Modules

#### Digital Input Modules Features

- Available in 8, 16, 32 and 64 channels
- 110V AC DI cards (16 channels) available
- 220V AC DI cards (8 channels) available
- LED for channel status indication
- 24V DC Input Modules (8,16,32 and 64 channels) in sink/source or source only type available
- Photocoupler isolation
- Easy maintenance – Terminal block type

#### Digital Input Modules Specifications

Item	DC Input*						AC Input		
	2MLI-D21A	2MLI-D22A	2MLI-D22B	2MLI-D24A	2MLI-D24B	2MLI-D28A	2MLI-D28B	2MLI-A12A	2MLI-A21A
Type									
Input Points	8	16		32		64		16	8
Rated Input Voltage	DC 24V						AC100~120V (50/60Hz)	AC100~240V (50/60Hz)	
Rated Input Current	4mA						8mA(AC100,60Hz) 7mA(AC100,50Hz)	17mA(AC200,60Hz) 14mA(AC200,50Hz) 7mA(AC100,50H)	
ON Voltage/Current	DC19V or higher/ 3mA or higher						AC80V or higher/5 mA or higher (50Hz, 60Hz)		
OFF Voltage / Current	DC11V or lower/1.7mA or lower						AC30V or higher / 1 mA or lower (50Hz, 60Hz)		
Response Time	Off-> On	1ms/3ms/5ms/10ms/20ms/70ms/100ms : Default:3ms						15ms or less	
	On-> Off	1ms/3ms/5ms/10ms/20ms/70ms/100ms : Default:3ms						25ms or less	
Common (COM)	8 points/Com	16 points/Com		32 points/Com		64 points/Com		16 points/Com	8 points/Com
Insolation Method	Photocoupler Isolation								
Current Consumption (mA)	20	30		50		60		30	20
Weight(Kg)	0.1	0.12		0.1		0.15		0.13	0.13

\* Suffix A indicates Source/Sink type, Suffix B indicates Source type.



Digital Input and Digital Output Modules

### Digital Output Modules Features

- Available in 8, 16, 32 and 64 channels
- Relay, Traic and Transistor modules (sink or source type)
- LED for channel status indication
- Photocoupler isolation
- Easy maintenance – Terminal block type
- Thermal protection

### Digital Output Modules Specifications

Item	Relay*			Transistor*						Triac
	2MLQ-RY1A	2MLQ-RY2A	2MLQ-RY2B	2MLQ-TR2A	2MLQ-TR2B	2MLQ-TR4A	2MLQ-TR4B	2MLQ-TR8A	2MLQ-TR8B	
Output Points	8	16		16		32		64		16
Rated Load Voltage/Current	DC24V 2A (resistive load) AC220V 2A			DC12/24V						AC100-240V (50/60Hz)
Response Time	Off->On	10ms or less			1ms or less			1ms or less		
	On->Off	12ms or less			1ms or less			0.5 cycle +1ms or less		
Common (COM)	1point/Com	16 points/Com		16 points/Com		32 points/Com		16 points/Com		
Isolation Method	Relay			Photocoupler Isolation						
Current Consumption(mA)	260	500		70		130		230		300
Weight(Kg)	0.13	0.17	0.19	0.11	0.12	0.1		0.15		0.2
*Suffix A indicates Sink type, Suffix B indicates Source type										
*Suffix A indicates Sink type, Suffix B indicates Surge Absorber type										

### Position Control Modules

#### Position Control Modules Features

- High reliable position control with ASIC embedded controller
- High speed motor control (Max. Pulse Output: 1 Mbps)
- Arc/Linear interpolation, separate/synchronous operation
- Trapezoidal and S-curve acceleration/deceleration
- High speed processing of commands (4 ms)
- Encoder input support
- Monitoring, Tracking and Simulation available
- Easy to set positioning parameters (windows)
- Real time information and solution for each error
- Excel editing of parameters
- Self diagnostics



Position Control Modules

### Analog I/O Modules

#### Analog Input Modules Features

- High speed A/D conversion and processing (250 μs / channel)
- 16 bit high resolution
- 8 channels voltage and current modules
- 4 channels isolated AI card (Voltage and Current)
- LED for module RUN status indication
- Channel input signal disconnection status
- Each channel can be individually disabled/enabled



Analog Input Modules

#### Analog Input Modules Specifications

Item	2MLF-AV8A (Voltage Input Type)	2MLF-AC8A (Current Input Type)			
Analog Input	DC 1 ~ 5 V DC 0 ~ 5 V DC 0 ~ 10 V DC -10 ~ 10 V (Input Resistance: 1000 kOhm)	DC 4 ~ 20 mA DC 0 ~ 20 mA (Input Resistance 0.25 kOhm)			
Digital Output	(1) Voltage Type				
	Analog input				
	Digital output	1 ~ 5 V	0 ~ 5 V	0 ~ 10V	-10 ~ 10V
	Unsigned value	0 ~ 16000			
	Signed value	-8000 ~ 8000			
	Precise value	1000 ~ 5000	0 ~ 5000	0 ~ 10000	-10000 ~ 10000
	Percentile value	0 ~ 10000			
	(2) Current Type				
	Analog input				
	Digital output	4 ~ 20mA		0 ~ 20mA	
	Unsigned value	0 ~ 16000			
	Signed value	-8000 ~ 8000			
	Precise value	4000 ~ 20000		0 ~ 20000	
	Percentile value	0 ~ 10000			
16-bit binary value (data: 14 bits) Format of digital output data can be individually set for each channel either through user program or user-friendly GUI [I/O parameter] function in SoftMaster.					
Accuracy	± 0.2% or less {when ambient temperature is 25(±5)°C} ± 0.3% or less {when ambient temperature is 0~55°C}				
Max. Conversion Speed	250 μs/channel				
Input Channels	8 channels/1module				
Isolation Method	Photocoupler isolation between input terminal and PAC power (no isolation between channels)				
Current Consumption	DC 5 V: 420mA				
Weight(Kg)	0.14				

### Analog Input Modules Features

Item	2MLF-AD4S (Voltage Input)		2MLF-AD4S (Current Input)		
Analog Input Range	DC 1 ~ 5 V DC 0 ~ 5 V DC 0 ~ 10 V DC -10 ~ 10 V (Input Resistance: 1000 kOhm)		DC 4 ~ 20 mA DC 0 ~ 20 mA (Input Resistance 0.25 kOhm)		
Digital Output	(1) Voltage Type				
	Analog input	1 ~ 5 V	0 ~ 5 V	0 ~ 10V	-10 ~10V
	Digital output				
	Signed value	-32000 ~ 32000			
	Precise value	1000 ~ 5000	0 ~ 5000	0 ~ 10000	-10000 ~ 10000
	Percentile value	0 ~ 10000			
	(2) Current Type				
	Analog input	4 ~20mA		0 ~20mA	
	Digital output				
	Signed value	-32000 ~ 32000			
Precise value	4000 ~ 20000		0 ~ 20000		
Percentile value	0 ~ 10000				
	16-bit binary value (-32768 ~ 32767)				
	Format of digital output data can be set through user program or [I/O Parameter setting] respectively based on channels. 0				
Accuracy	± 0.05% or less (when ambient temperature is 25 C)				
Max. Conversion Speed	10ms / module				
Input Channels	4 channels/1module				
Isolation Specifications	Photocoupler isolation between input terminal and PAC power (no isolation between channels)				
	Item	Isolation method	Isolation voltage immunity	Isolation resistance	
	Between channels	Transformer	500V AC, 50/60 Hz, 1min, Leakage current less than 10mA	500V DC, over than 10000 kOhm	
	Between input terminal and PAC power	Photocoupler			
Current Consumption	DC 5V: 610mA				
Weight(Kg)	0.14				

### Analog Output Modules Features

- High speed D/A conversion and processing
- 16 bit high resolution
- 8 channels voltage and current modules
- 4 channels isolated AO card (Voltage and Current)
- LED for module RUN status indication
- Each channel can be individually disabled/enabled



Analog Output Modules

### Analog Output Modules Specifications

Item	2MLF-DV4A (Voltage Output Type)	2MLF-DV8A (Voltage Output Type)	2MLF-DC4A (Current Output Type)	2MLF-DC8A (Current Output Type)	
Analog Output	DC 1 ~ 5V DC 0 ~ 5V DC 0 ~ 10V DC -10 ~ 10V Load resistance: 1 kOhm or more		DC 4 ~ 20mA DC 0 ~ 20mA Load resistance:0.6 kOhm or less Load resistance:0.55 kOhm or less		
	Output range can be selected through applicable program or parameters (for respective channels)				
Digital Input	Signed 16-bit binary value (data: 14 bits) Format of input data can be set through applicable program or parameters (for respective channels)				
	Analog output	1 ~ 5 V	0 ~ 5 V	0 ~ 10V	-10 ~10V
	Digital input				
	Unsigned value	0 ~ 16000			
	Signed value	-8000 ~ 8000			
	Precise value	100 ~ 5000	0 ~ 5000	0 ~ 10000	-10000 ~ 10000
	Percentile value	0 ~ 10000			
	Analog output	4 ~ 20mA		0 ~ 20mA	
	Digital input				
	Unsigned value	0 ~ 16000			
Signed value	-8000 ~ 8000				
Precise value	4000 ~ 20000		0 ~ 20000		
Percentile value	0 ~ 10000	0			
Accuracy	± 0.2% or less (when ambient temperature is 25 C) ± 0.3% or less (when range is within operational temperature)				
Max. Conversion Speed	250 μs/channel				
No. of Output Channels	4 channels/ 1 module	8 channels/ 1 module	4 channels/ 1 module	8 channels/ 1 module	
Isolation Method	Photocoupler isolation between input terminal and PAC power (no isolation between channels)				
Current Consumption	DC5V : 190 mA DC24V : 140 mA	DC5V : 190 mA DC24V : 180 mA	DC5V : 190 mA DC24V : 210 mA	DC5V : 190 mA DC24V : 300 mA	
Weight(Kg)	0.15				

## Analog Output Modules Specifications

Item	2MLF-DC4S (Isolated Current Output Type)				
Analog Output	DC 4 ~ 20mA Load resistance : 0.6 kOhm or less				
	DC 0 ~ 20mA				
	Output range can be selected through applicable program or parameters (for respective channels)				
Digital Input	Signed 16-bit binary value (data: 14 bits) Format of input data can be set through applicable program or parameters (for respective channels)				
		Analog output			
	Digital input	1 ~ 5 V	0 ~ 5 V	0 ~ 10V	-10 ~10V
	Unsigned value	0 ~ 16000			
	Signed value	-8000 ~ 8000			
	Precise value	1000 ~ 5000	0 ~ 5000	0 ~ 10000	-10000 ~ 10000
	Percentile value	0 ~ 10000			
		Analog output			
	Digital input	4 ~ 20mA		0 ~ 20mA	
	Unsigned value	0 ~ 16000			
Signed value	-8000 ~ 8000				
Precise value	4000 ~ 20000		0 ~ 20000		
Percentile value	0 ~ 10000				
Accuracy	± 0.1% or less (when ambient temperature is 25 °C)				
Max. Conversion Speed	10ms/4 channels				
No. of Output Channels	4 channels / 1 module				
Isolation Method	Photocoupler isolation between input terminal and PAC power (no isolation between channels)				
Current Consumption	Internal	DC5V : 200mA			
	External	DC24V : 220 mA			
Weight(Kg)	0.15				

## Smart I/O(s)

### Smart I/O Modules Features

- Remote I/O application
- Reduction of wiring costs and hassles
- Easy to install and implement
- Real time monitoring & control of distributed I/O
- Various I/O (DC/TR/Relay) modules with the unit of 16/32 points
- Supports open networks like DeviceNet, Profibus-DP, Modbus (RS422/485)



Smart I/Os

## Thermocouple Module

### Thermocouple Module Features

- Isolation between channels (4 channels)
- High accuracy of ±0.1% (25°C)
- Support various input sensors (C-type sensor)
- Additional features like average, alarm, filter, min/max indication
- Monitoring and parameter settings with SoftMaster
- LED for module RUN status indication
- Channel input signal disconnection status



Thermocouple Module

### Thermocouple Module Specifications

Item	2MLF-TC4S	
No of Input Channels	4 Channels	
Type of Input Sensor	K,J,E,T,B,R,S,N,C	JIS C1602-1995 , ITS-90
Range of Input Temperature	K	-250 ~ 1350 °C
	J	-200 ~ 1200 °C
	E	-250 ~ 1000 °C
	T	-250 ~ 400 °C
	B	400 ~ 1800 °C
	R	-50 ~ 1750 °C
	S	-50 ~ 1750 °C
	N	-270 ~ 1300 °C
Digital Output	Temp. display(unit of 0.1)	Displaying down to one decimal place (0.1 °C)
	Scaling display (user-defined scaling)	0 ~ 65535      -32768 ~32767
Conversion Velocity	40ms / channel	
Isolation Method	Channel to Channel	Isolation
	Terminal to PAC power	Isolation (Photocoupler)
Function	Averaging function	Time average (320~64000 ms)
		Frequency average (2~64000 times)
		Moving average (2~100)
	Alarm function	Process alarm
		Gradient alarm
		Disconnection detection
Filter function	Digital filter (160~64000 ms)	
Max./Min. display	Display Max./Min.	
Current Consumption	5V: 610mA	
Weight (Kg)	0.15	

## RTD Module

### RTD Module Features

- Support various features (average, alarm, filter)
- Monitoring and parameter settings with SoftMaster
- Digital conversion, temperature indication and user defined scaling features
- LED for module RUN status indication
- Channel input signal disconnection status



RTD Module

### RTD Module Specifications

Item	2MLF-RD4A	
No. of Input Channels	4 Channels	
Input Sensor Type	Pt100	JIS C1604-1997
	Jpt100	JIS C1604-1981, KS C1603-1991
Temperature Input Range	Pt100	-200.0 ~ 850.0 °C
	Jpt100	-200.0 ~ 640.0 °C
Digital output	Temperature display (unit: 0.1)	Pt100 -200.0 ~ 850.0 °C / -328.0 ~ 1562.0 °F
		Jpt100 -200.0 ~ 640.0 °C / -328.0 ~ 1184.0 °F
	Scaling display (Customize)	0 ~ 65535 -32768 ~ 32767
Conversion Speed	40ms / channel	
Isolation	Channel to Channel	Non-isolation
	Terminal to PAC Power	Photocoupler
Function	Average	Time average (320-64000ms)
		Counting average (2-64000 count)
		Moving average (2-100 samples)
	Alarm	Process alarm
		Input changing rate alarm
Disconnection detection		
Filtering	Digital filter (160-64000 ms)	
Current Consumption	5V: 450mA	
Weight(Kg)	0.15	

## High Speed Counter Modules

### High Speed Counter Modules Features

- Voltage input (Open Connector) and differential input (Line Drive) type available each with 2 channels
- Supports various pulse input ranges (5V,12V,24V)
- Incremental encoder available
- Various multiplication factors for 1-phase and 2-phase pulse input
- Function to prevent from counting external signals
- Supporting HTL-level incremental encoder in the line-drive input type
- Preset or Gate function by program
- LED status displays for input, output and module ready condition



High Speed Counter Modules

### High Speed Counter Modules Specifications

Item	2MLF-H02A	2MLF-HD2A
Count Input Signal	Signal	A-phase, B-phase
	Input Type	Voltage Input (Open Collector) / Differential Input (Line Drive)
	Signal Level	DC 5/12/24V / RS422A Line Drive/HTL Level line drive
Maximum Coefficient Speed	200kpps	500kpps(HTL Input is 250 kpps)
Number of Channels	2	
Coefficient Range	Signed 32-bit (-2,147,483,648 ~ 2,147,483,647)	
Count Type (program setting)	Linear Count with Carry/Borrow when 32-bit range is exceeded, maximum/minimum count	
	Ring Count (repeated count within setting range)	
Input Mode (program setting)	1-phase input	
	2-phase input	
	CW/CCW input	
Signal Type	Voltage	
Count Up/Count Down Setting	1-phase input	Increase or Decrease of count by B-phase input
	2-phase input	Increase or Decrease of count by program
	CW/CCW	Automatic setting by difference in phase
Multiplication Function	1-phase input	A-phase input: increasing operation
	2-phase input	B-phase input: decreasing operation
	CW/CCW	1-multiplication
Current Consumption	270mA	330mA
Weight (Kg)	0.09	

## Software

### Key Features

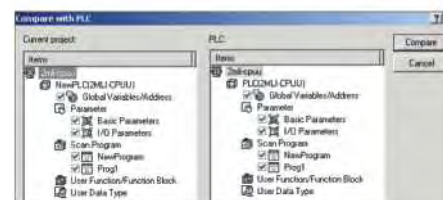
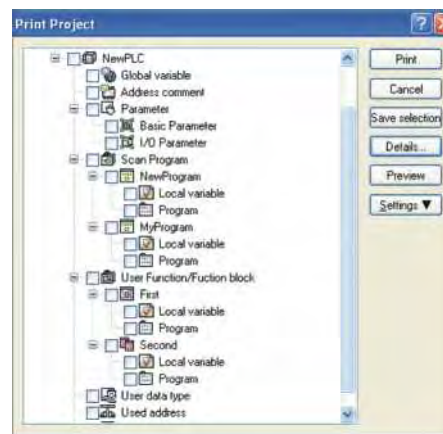
SoftMaster provides the engineer with an integrated PAC engineering environment - all in one window such as ladder programming, configuration/setup of CPU or communication modules, debugging, monitoring, trouble-shooting, documentation and maintenance etc.

SoftMaster is Microsoft Windows XP based software with standard and very user-friendly GUI features like:

- Drag and drop
- Short-cut keys & toolbar icons
- Microsoft excel-like cell input
- Auto-fill, export/import
- Undo and Redo options
- Context sensitive menu enabling/disabling
- Customizable views, colors, fonts
- Find, Replace

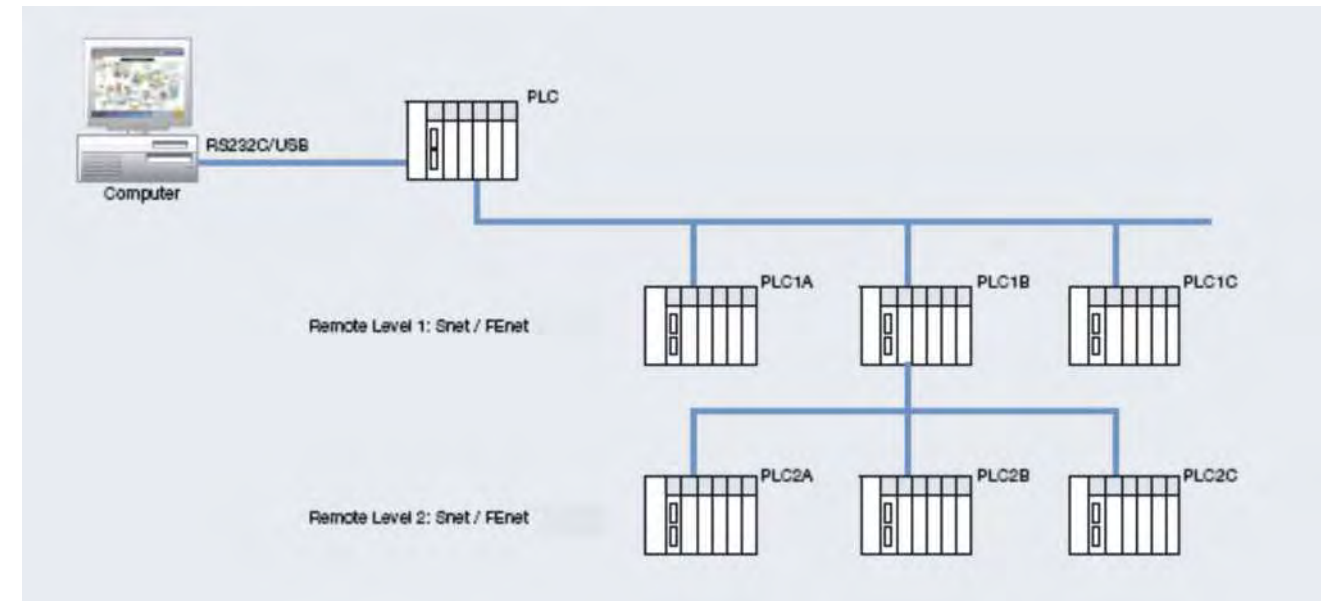
### Project Management

- SoftMaster helps managing multiple PACs through a single window. One project file (.xgp) can encompass multiple PACs of the site. Also, this file will serve as a central storage of all details related to each PAC like:
  - Scan programs & interrupt programs
  - I/O module configuration & special module settings
  - Communication module settings
  - Variable names, comments, descriptions
  - Flash memory / data retention settings
  - Other PAC settings
- There is no limit on number of PACs that can be included in one project file.
- Project files can be compared automatically.
- Export/Import entire PAC data into/from a single file (.pac) or selectively on each category (variable/comments -.cmt, programs -prg, basic PAC configuration -.bsp, I/O module settings -.iop etc.)
- Flexible documentation: Print the entire project documentation at the click of a button e.g. customizable cover page, header/footer, variable/comments, normal scan programs, task interrupt



### Online Functions

- Connection to PAC: SoftMaster supports 4 methods of connection:
  - RS232C port of computer and built-in RS232C port of CPU (direct) or Snet module in the PAC.
  - USB port of computer and the built-in USB port of CPU
  - Ethernet port of computer and Ethernet port of FEnet module
  - Modem via RS232C and telephone connections (as in first option)
- Two levels of remoteconnection: This facility helps when your computer is not directly connected to a PAC as it can be programmed to through another PAC which is connected to the computer



- CPU mode RUN/STOP/DEBUG can be switched remotely from the program. In DEBUG mode, multiple breakpoints can be set in the program and run step by step for critical trouble-shooting. Breakpoints also can be automatic based on a device condition
- READ/WRITE with the online PAC can be done selectively
- Compare with PAC: The project opened in computer can be compared with the project in online PAC for an automatic report on similarities and differences
- Configuring the use of flash memory on whether the program can be backed on to flash memory after every download or online editing
- Online editing of ladder program while it is being executed

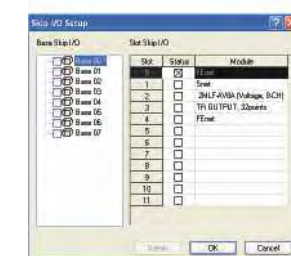
### Maintenance and Troubleshooting

Force I/O: I/O refresh memory can be forced manually to any specific value for maintenance, trouble-shooting or simulation purposes. Both input and output (bit or word data) image area can be forced to a value.

Skip I/O: For any maintenance purpose, an entire I/O base including all its slots or any selective slot (module) can be set for I/O skip through the software. The CPU ignores that I/O base or the particular slot during its operation.



Force I/O

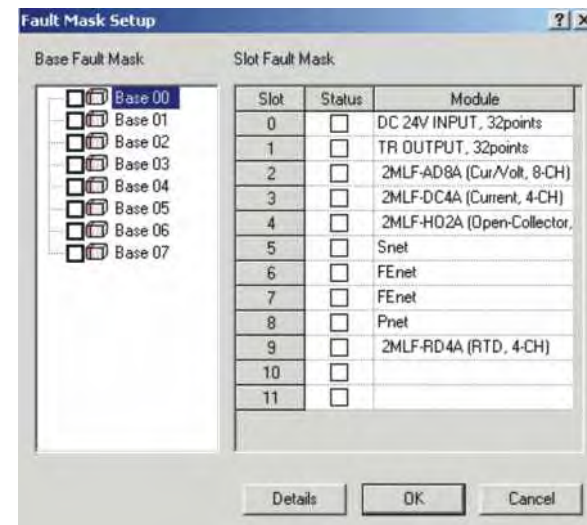


Skip I/O

**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

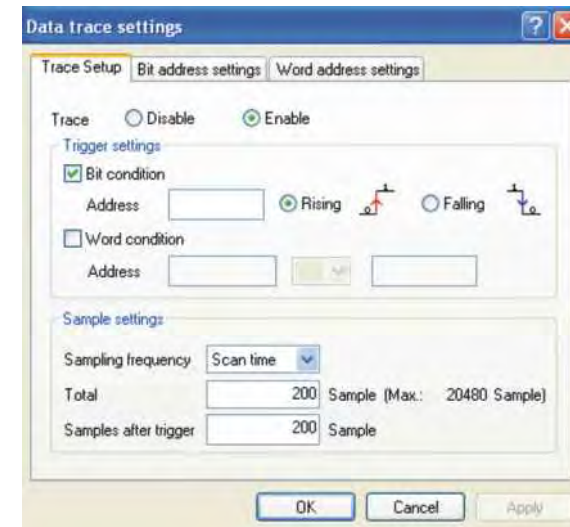
- SoftMaster software tool
- Program instruction setting fault mask flag

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.



Fault Mask

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

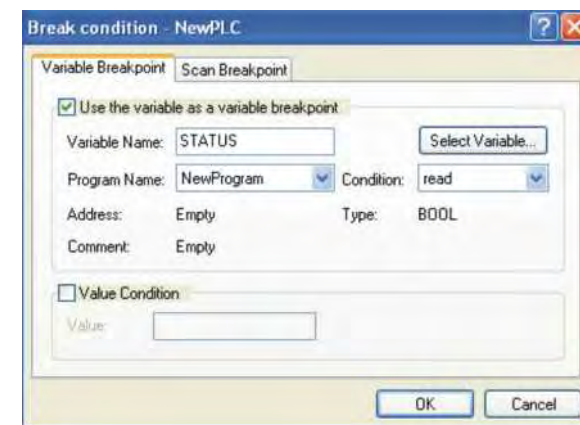


Data Traces

**RTC (Real-time Clock):** MasterLogic-200 has a built-in clock (RTC) which runs on battery even in case of power failure. 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

**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

**Module exchange wizard:** A software wizard guides the engineer through the steps involved in exchanging a module safely during CPU run mode. Errors detected, if any are displayed to the user

In addition to the wizard, the engineer can also exchange the module (hot-swapping) by setting the M-XCHG dip switch in CPU to ON.



Module exchange wizard

**User-defined Event Recording (SOE):** Any bit data device (digital I/O, memory flags etc) can be configured for event recording when the device condition turns on (rising) or off (falling) or any change of state. SoftMaster allows an event list to be configured and managed with add/edit/delete functions. Each event can be prioritized into three categories: a) alarm message b) warning message c) information

The events can be recorded at millisecond resolution. CPU also maintains the event history in its memory.

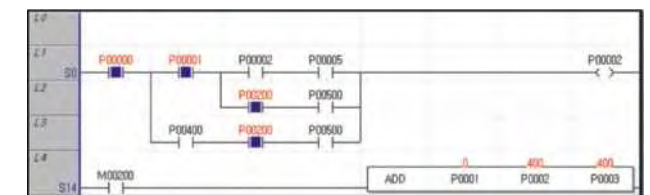
This functionality enables an engineer to program the PAC for Sequential Event Recording (SER) or Sequence of Events (SOE) functionality.



Custom Event

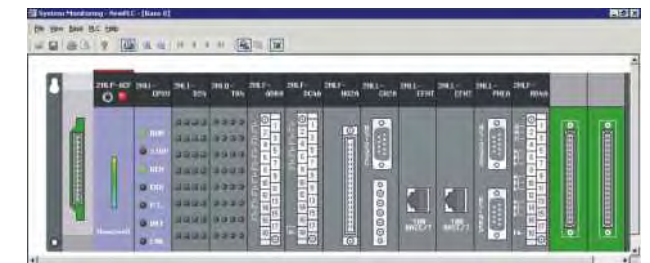
## Monitoring

**Ladder Monitor:** Ladder monitor for online status of program execution. Force I/O setting can also be done from here directly.



Ladder Monitoring

**System Monitoring:** This tool empowers the PAC support engineer to connect to any PAC and monitor the overall system status in a single window i.e. base, slot and I/O module configuration, device status of I/O channels etc. Each I/O base can be individually traversed back and forth for monitoring.



System Monitoring

**Variable Monitoring:** Variable monitoring related devices (I/O addresses and other data memory) can be grouped and monitored together in a single window for context sensitive trouble-shooting.

These variables are not restricted to one PAC but can be spread across multiple PACs.

PLC	Program	Variable	Value	Type
1	NewPLC	NewProgram	_RUN	On BOOL
2	NewPLC	NewProgram	_STOP	On BOOL
3	NewPLC	NewProgram	%MW200	0 WORD
4	NewPLC	NewProgram	%IW126.16.3	
5	NewPLC	NewProgram	%RW300	0 WORD
6	NewPLC	NewProgram	%W300	16#0000 WORD

Variable Monitoring

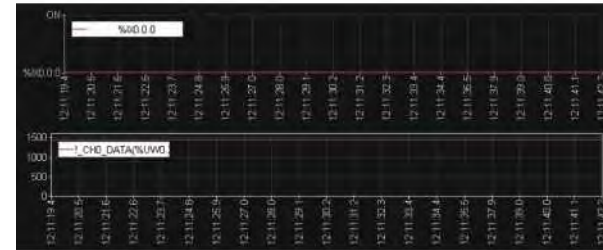


**Special Module Monitoring:** Special modules such as Analog Input/Output modules, High Speed Counter (HSC) modules are monitored through this tool.



Special Module Monitoring

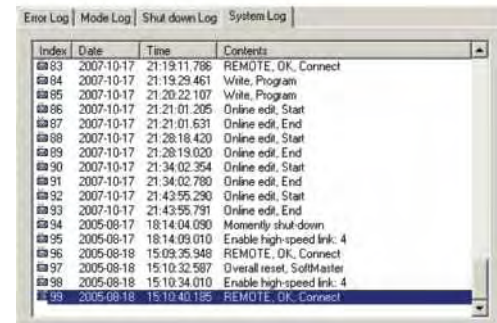
**Trend Monitoring:** Various analog and digital devices (data type such as BIT, WORD, DWORD, REAL etc) from I/O and other memory devices can be trended together on a single window for context sensitive trouble-shooting. Sampling speed, X and Y-axis range (time and data value) also can be adjusted to the needs.



Trend Monitor

**PAC Event History**

MasterLogic-200 CPU stores four types of event history for monitoring, diagnostics and trouble-shooting purposes. The event details are stored in CPU until they are reviewed and deleted from SoftMaster software.



Event History

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

**Program Navigation and Editing**

SoftMaster has numerous ways to assist the engineer in navigation through the programs.

- Variable name and comment/description for each device address
- Find and replace via variable name, device address and comment
- GOTO commands, bookmarks
- Breakpoints in online debug mode

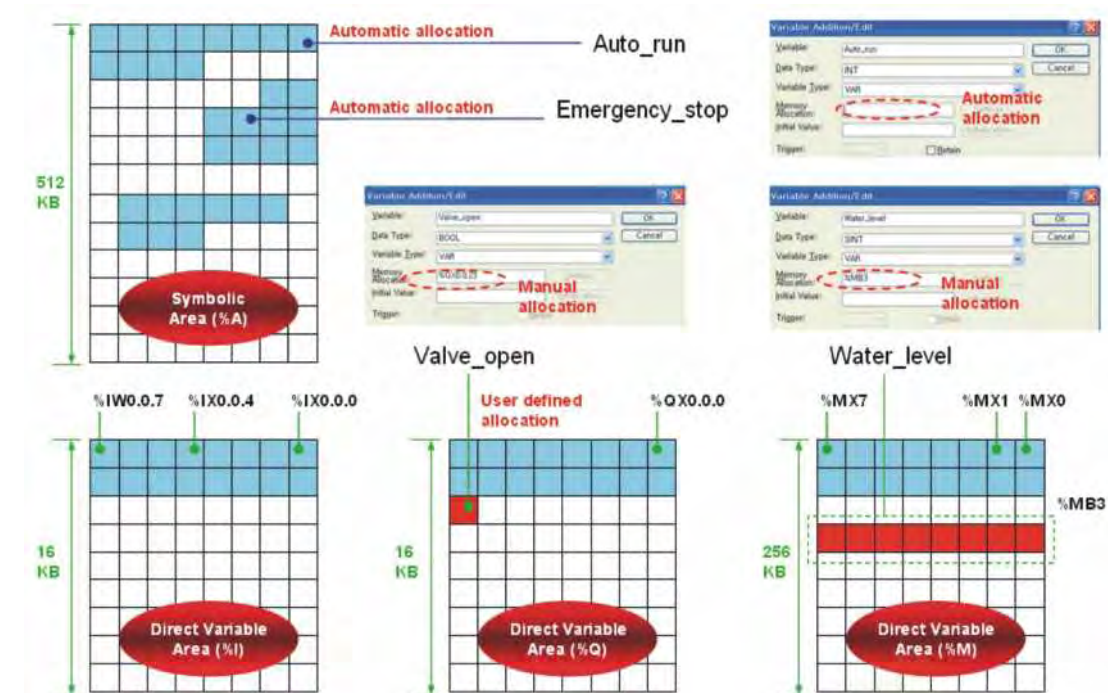
**Program Ease**

**User defined function blocks:** SoftMaster 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.

**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. This is equivalent to 50% of the total data memory, thus intensifying the utilization of auto memory allocation.

The control engineers can simply build 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.



**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.

## Simulation

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

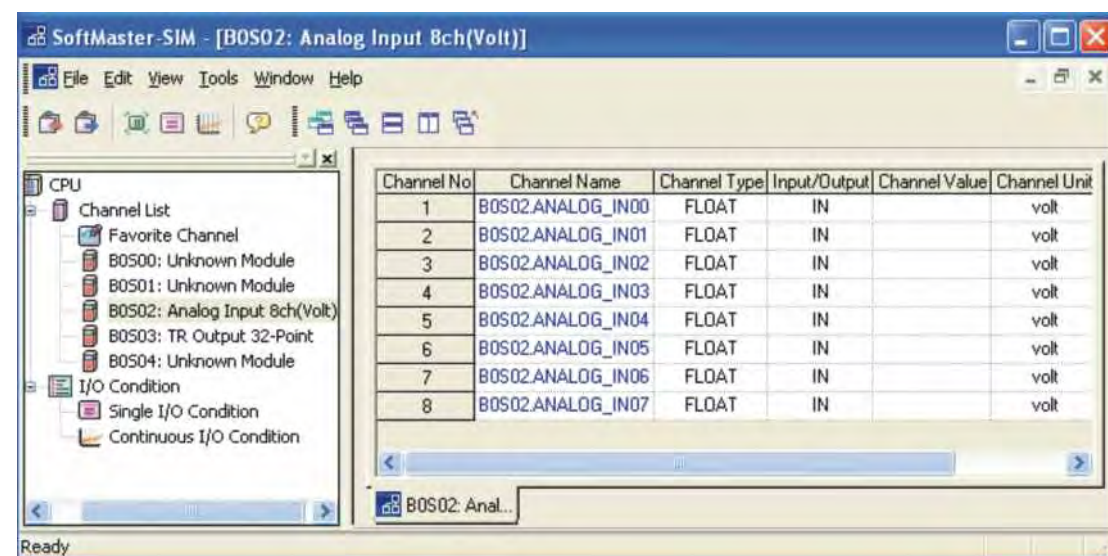
The following features are supported by the simulation environment:

**Program simulation:** The program written in LD/SFC/ST can be simulated. Online editing and debugging is supported by the simulation environment.

**PAC online function:** The program monitoring and online diagnostic functions (e.g. system monitoring / device monitoring) can be used during simulation.

**Module simulation:** Digital I/O module, Analog I/O module, High Speed Counter module, Temperature Control module, Position Control module can be simulated.

**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	2.0 GHz Pentium IV or faster
RAM	128 MB
Video Resolution	1024 x 768
Hard Drive	10 GB
Operating System	Windows XP + Service Pack 2
External Interface	RS232 Serial or USB

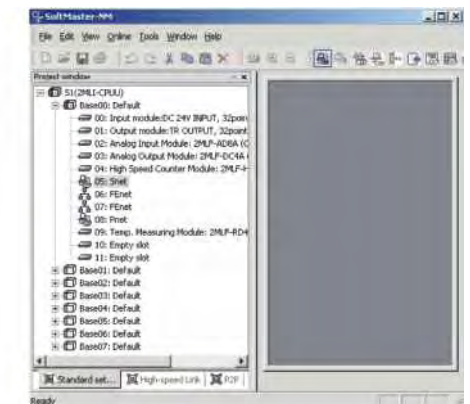
## SoftMaster-NM (Network setup & diagnostics)

### Features

- Manages all communication modules (FEnet, Snet, Pnet, Dnet )
- Easy setup of network configuration and associated communication param (IP address, serial port etc)
- Configuration of HSL (high speed link) service (send data, receive data, pa size etc)
- Configuration of P2P (point to point) service (channel, block settings etc)
- Extended monitoring and diagnostics of communication modules
- Simple and easy connection using MLDP (MasterLogic dedicated protocol) other driver (Modbus)
- Various built-in diagnostics functions
- Ability to define and communicate using user-defined protocols

### Various network diagnostics and monitoring

- Auto Scan: Searching and displaying each node connected to network
- Link Monitor: Monitoring status of high-speed link communication of each station
- Frame Monitor: Collecting and displaying sending/receiving frame in real time



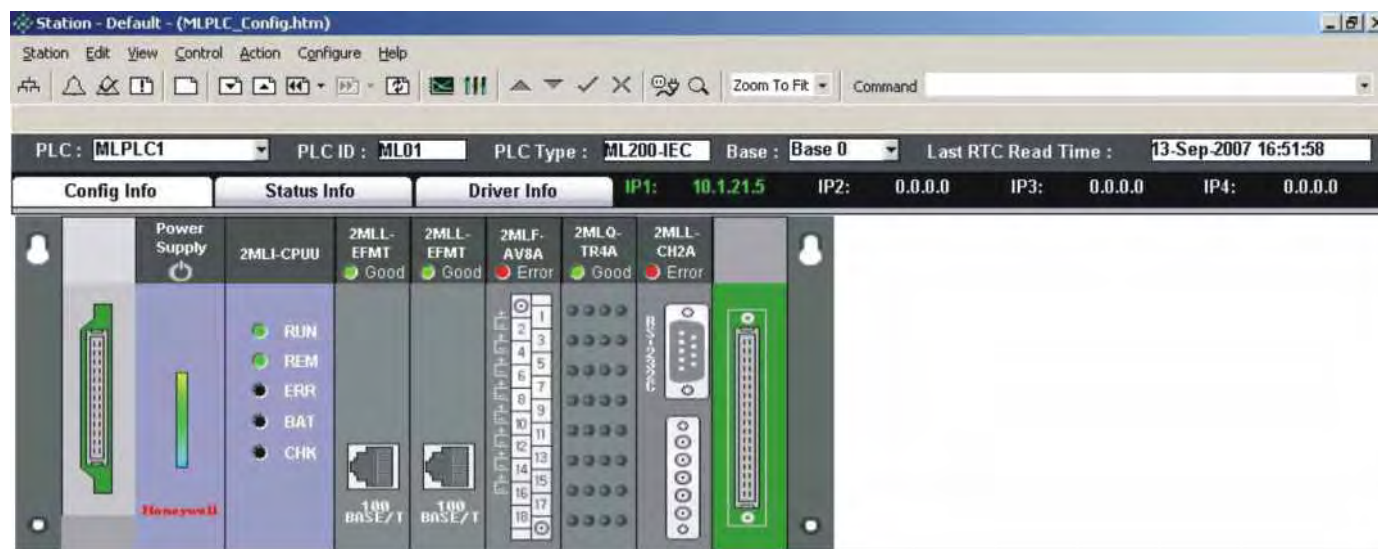
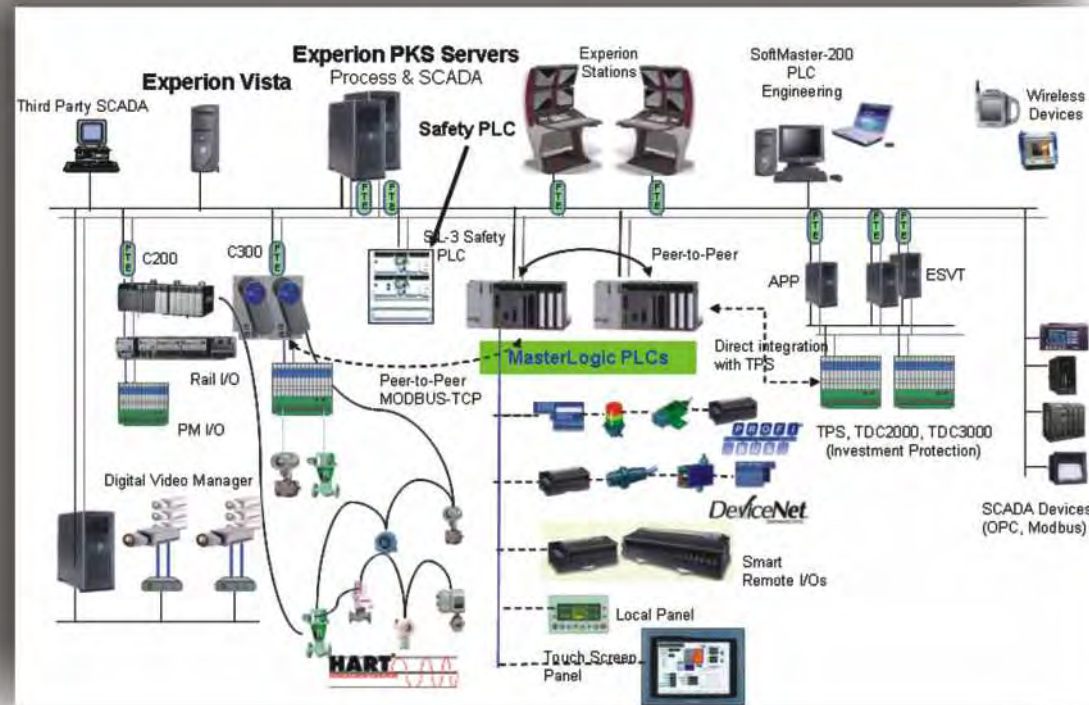
Product	FEnet	Snet	Pnet	Dnet
Auto Scan	•	•	•	•
Link Monitor	•	•	•	•
Frame Monitor	•	•	-	•

## Special Interface

### Special Interface with Experion PKS & Experion Vista

MasterLogic-200 PACs are tightly integrated with Experion PKS architecture. They directly reside on Experion PKS network averting the need for any intermediate gateway equipment.

- The interface is simple to configure MasterLogic PAC channels, controllers and points just like any other SCADA interface
- For efficient communication optimization, the integration supports both synchronous (timer based subscription of real time data) and asynchronous (report by exception) communication methods
- All PAC clocks are synchronized with Experion PKS server clock
- PAC system alarms and events (e.g. battery fail, CPU stop/reset/error) are automatically cascaded to Experion PKS summary page
- PAC system status (graphical display) can be monitored from all Experion PKS stations
- Integration with third party MMI using Modbus protocol



MasterLogic-200 configuration status

## Other Related Products

### MasterLogic-50

- Max I/O Capacity : 480
- Very compact size
- CPU speed : 160ns / step
- 7 expansion modules (snap-on)
- Max. program capacity : 10Ksteps
- CPU Built-in functions
  - RS232C/RS485 communications
  - Built-in 2-axis position control
  - Built-in High speed counter
  - PID control (cascade control)
  - Pulse catch / input filter



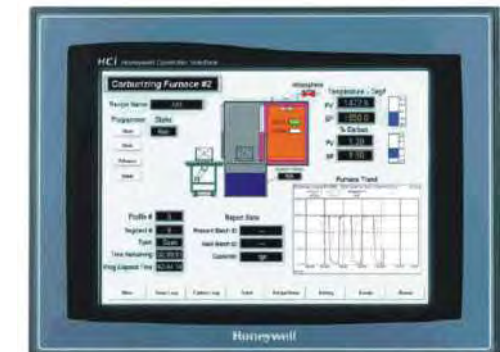
### Master Panel

- 192 x 64 dot graphic LCD
- Compact size (160W x 90H x 30D mm)
- Built-in 256K flash memory (Screen and Font)
- DC24V supply or optional 5V (from PAC) through RS232C loader port
- Multi-Language support : English, Chinese, Russian, Korean
- Graphic editing tool with bitmap and tag support
- User-definable function keys (F1 ~ F4, 4 arrow keys)
- Built-in RTC
- Two separate channels: RS232C and RS422/485, configurable as loader port or MODBUS (master/slave - ASCII/RTU) or other manufacturer PACs



### HCiX Series

- Color TFT - LCD (256 colors) - 3 sizes 10.4", 12.1", 15.0" models
- Touch Screen Operation
- 32 bit RISC CPU Processor
- CE/UL/FCC Approved
- IP65 Front Face Enclosure
- Graphic Design Software (HCi Designer)
- Multi-Language Display (English, Chinese, Korean)



## Product List

### CPU Module

Product	Model	Description
CPU Module	2MLI-CPUU	High speed CPU module ( Non- Redundant system) (Max. I/O point: 6,144 points)
	2MLR-CPUH/T	High speed CPU module (Non Redundant or Redundant system), Master, TP/CAT5 (Max. I/O point : 23,808 points)
	2MLR-CPUH/F	High speed CPU module (Non Redundant or and Redundant system), Master, Fiber Optic (Max. I/O point: 23,808 points)

### I/O Base, Cables (2MLI-CPUU)

Product	Model	Description
Main CPU Base (only for 2MLI-CPUU)	2MLB-M04A	For 4 modules installation
	2MLB-M06A	For 6 modules installation
	2MLB-M08A	For 8 modules installation
	2MLB-M12A	For 12 modules installation
Expansion I/O Base (only for 2MLI-CPUU)	2MLB-E04A	For 4 modules installation
	2MLB-E06A	For 6 modules installation
	2MLB-E08A	For 8 modules installation
	2MLB-E12A	For 12 modules installation
Power module (only for 2MLI-CPUU)	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 (only for 2MLI-CPUU)	2MLC-E041	Length: 0.4m
	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

### I/O Base, I/O Interface Modules, Cables (2MLR-CPUH/T & 2MLR-CPUH/F)

Product	Model	Description
Main CPU Base (for 2MLR-CPUH/T, 2MLR- CPUH/F)	2MLR-M06P	CPU base for 6 module installation
Expansion I/O Base (for 2MLR-CPUH/T, 2MLR-CPUH/F)	2MLR-E12P	I/O Base for 12 module installation
Power modules	2MLR-AC13	8.5A, Voltage (110V)
	2MLR-AC23	8.5A, Voltage (220V)
	2MLR-AC12	5.5A, Voltage (110V)
	2MLR-AC22	5.5A, Voltage (220V)
I/O interface modules (for 2MLR-CPUH/T, 2MLR-CPUH/F)	2MLR-DBSF	I/O Interface Module, Fiber Optic
	2MLR-DBST	I/O Interface Module, TP/CAT5
	2MLR-DBSH	I/O Interface Module, Hybrid (Fiber Optic & TP/CAT5)

### Communication Modules

Product	Model	Description
FEnet Modules	2MLL-EFMF	<ul style="list-style-type: none"> <li>Fast Ethernet (multi-mode fiber-optic media), Master</li> <li>10/100 Mbps support</li> </ul>
	2MLL-EFMT	<ul style="list-style-type: none"> <li>Fast Ethernet (CAT 5 media), Master</li> <li>10/100 Mbps support</li> </ul>
Snet modules	2MLL-C22A	<ul style="list-style-type: none"> <li>Serial communication</li> <li>RS232C, 2 channels</li> </ul>
	2MLL-C42A	<ul style="list-style-type: none"> <li>Serial communication</li> <li>Rs422 (485), 2 channels</li> </ul>
	2MLL-CH2A	<ul style="list-style-type: none"> <li>Serial communication</li> <li>RS232C 1 Channel / RS422 (485) 1 Channel</li> </ul>
Profibus-DP Module	2MLL-PMEA	Profibus-DP Master Module
DeviceNet Module	2MLL-DMEA	DeviceNet Master Module

Digital I/O Modules

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

Analog I/O, HSC, Position Control Modules

Product	Model	Description
Analog Input Modules	2MLF-AV8A	<ul style="list-style-type: none"> <li>Voltage Input: 8 channels</li> <li>DC 1 ~ 5V / 0 ~ 5V / 0 ~ 10V / -10 ~ +10V</li> </ul>
	2MLF-AC8A	<ul style="list-style-type: none"> <li>Current Input: 8 channels</li> <li>DC 4 ~ 20mA / 0 ~ 20mA</li> </ul>
	2MLF-AD8A	<ul style="list-style-type: none"> <li>Voltage/Current Input: 8 channels</li> </ul>
	2MLF-AD4S	<ul style="list-style-type: none"> <li>Voltage/Current Input: 4 channels</li> <li>Isolation between channels</li> </ul>
Analog Output Modules	2MLF-DV4A	<ul style="list-style-type: none"> <li>Voltage Output: 4 channels</li> <li>DC 1 ~ 5V / 0 ~ 5V / 0 ~ 10V / -10 ~ +10V</li> </ul>
	2MLF-DC4A	<ul style="list-style-type: none"> <li>Current Output: 4 channels</li> <li>DC 4 ~ 20mA / 0 ~ 20mA</li> </ul>
	2MLF-DC4S	<ul style="list-style-type: none"> <li>Current Output: 4 channels</li> <li>Isolation between channels</li> </ul>
	2MLF-DV8A	<ul style="list-style-type: none"> <li>Voltage Output: 8 channels</li> <li>DC 1 ~ 5V / 0 ~ 5V / 0 ~ 10V / -10 ~ +10V</li> </ul>
2MLF-DC8A	<ul style="list-style-type: none"> <li>Current Output: 8 channels</li> <li>DC 4 ~ 20mA / 0 ~ 20mA</li> </ul>	
Thermocouple Input Module	2MLF-TC4S	<ul style="list-style-type: none"> <li>Temperature (T/C) Input, 4 channels</li> <li>Isolation between channels</li> </ul>
RTD Input Module	2MLF-RD4A	Temperature (RTD) Input, 4 channels
High speed Counter Module	2MLF-HO2A	<ul style="list-style-type: none"> <li>Voltage Input type (Open Collector type)</li> <li>200 kHz, 2 channels</li> </ul>
	2MLF-HD2A	<ul style="list-style-type: none"> <li>Differential Input type (Line Driver type)</li> <li>500 kHz, 2 channels</li> </ul>
Position Control Module	2MLF-PO3A	Pulse output (Open Collector type), 3 axes
	2MLF-PO2A	Pulse output (Open Collector type), 2 axes
	2MLF-PO1A	Pulse output (Open Collector type), 1 axis
	2MLF-PD3A	Pulse output (Line Driver type), 3 axes
	2MLF-PD2A	Pulse output (Line Driver type), 2 axes
	2MLF-PD1A	Pulse output (Line Driver type), 1 axis

### Smart I/O Modules

Product	Model	Description
Profibus-DP Smart IOs	MPL-AC8C	Analog Current Input, 8 Channels
	MPL-AV8C	Analog Voltage Input, 8 Channels
	MPL-D22C	DC Input 16 Points
	MPL-D24C	DC Input 32 Points
	MPL-DT4C1	DC Input 16 Points / TR Output 16 Points(0.5A, Sink)
	MPL-DC4C	Analog Current Output, 4 Channels
	MPL-DT4C	DC Input 16Points / TR Output 16 Points(0.5A, Source)
	MPL-DV4C	Analog Voltage Output, 4 Channels
	MPL-RY2C	Relay Output 16 Points
	MPL-TR2C	TR Output 16 Points (0.5A, Source)
	MPL-TR2C1	TR Output 16 Points (0.5A, Sink)
	MPL-TR4C	TR Output 32 Points (0.5A, Source)
	MPL-TR4C1	TR Output 32 Points (0.5A, Sink)
	DeviceNet Smart IOs	MDL-D22C
MDL-D24C		DC Input 32 Points
MDL-DT4C		DC Input 16 Points / TR Output 16Points (0.5A, Source)
MDL-DT4C1		DC Input 16 Points / TR Output 16Points (0.5A, Sink)
MDL-RY2C		Relay Output 16 Points
MDL-TR2C		TR Output 16 Points (0.5A, Source)
MDL-TR2C1		TR Output 16 Points (0.5A, Sink)
MDL-TR4C		TR Output 32 Points (0.5A, Source)
Modbus Smart IOs	MSL-D22A	DC Input 16 Points
	MSL-D24A	DC Input 32 Points
	MSL-TR2A	TR Output 16 Points (0.1A, Sink)
	MSL-TR4A	TR Output 32 Points (0.1A, Sink)
	MSL-RY2A	Relay Output 16 Points
	MSL-DT4A	DC Input 16 Points / TR Output 16 Points (0.1A, Sink)

### Software Environment

Product	Model	Description
SoftMaster	SSS-MLPT	Programming tool for MasterLogic PAC
Experion Interface Driver	SSS-MLEP-250	Driver for 250 points integration with Experion PKS
	SSS-MLEP-500	Driver for 500 points integration with Experion PKS
	SSS-MLEP-1000	Driver for 1000 points integration with Experion PKS
	SSS-MLEP-1500	Driver for 1500 points integration with Experion PKS
	SSS-MLEP-2000	Driver for 2000 points integration with Experion PKS
	SSS-MLEP-3000	Driver for 3000 points integration with Experion PKS
	SSS-MLEP-XXXX	Driver for unlimited points integration with Experion PKS (limited by performance constraints only)

### Programming Cables

Product	Model	Description
USB cable	USB-301A	Programming cable for USB port
RS232C cable	KIC-50A	Programming cable for RS232C port (CPU, Snet module)

### Others

Product	Model	Description
Terminator	2MLT-TERA	Must use for base expansion
Dummy module	2MLT-DMMA	Dust protection module for unused slot
Master Panel	MXP10BKB/DC	4.1", Mono, RS-232C,RS-422/485
	MXP10BKB/DC	4.1", Mono, RS-232C,RS-422/485, RTC
	MasterPanel-Editor	Master Panel Editor Software Package
HCiX Series	HCiX 10 - T	10.4" Color TFT LCD (256 colors) Touch Screen (Analog/Resistive Type)
	HCiX 12 - T	12.1" Color TFT LCD (256 colors) Touch Screen (Analog/Resistive Type)
	HCiX 15 - T	15.0" Color TFT LCD (256 colors) Touch Screen (Analog/Resistive Type)