



This document is based on the version of FA-M3 R as of May 2000.
For details about the current version of FA-M3 R, please contact your
nearest distributor or agency.

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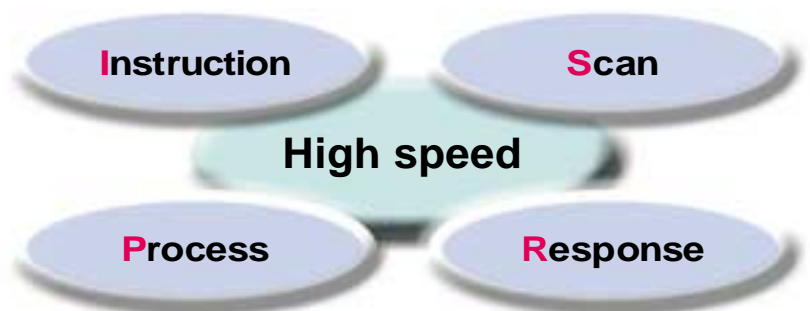
From **EVOLUTION** to **REVOLUTION**

The FA-M3 has reborn as the FA-M3 R,
to revolutionize the users' equipment.

R for **Revolution!**

- ◆ FA-M3 R is a new generic name for FA-M3 controllers containing one or more of the brand new, ultra-fast four CPU modules.
- ◆ FA-M3 R can simply be called the "M3R".
- ◆ FA-M3 R and FA-M3 have upward compatibility.

- The design concept was to increase the speed of the FA-M3. The new high-speed Instruction-Process-Response-Scan, or High-speed IPRS, in the FA-M3 R was designed to achieve this objective. Extensive studies were conducted to meet every requirement including ultra-high-speed control, steady dispersion-free control and improved networking functions including link control. The FA-M3 R is Yokogawa's ideal controller for next-generation equipment, delivering even greater accuracy and productivity.



■ Ultra-fast Processing Speed

20K steps of ladder program scanned per millisecond*
 Minimum scan time of 200 μs
 Sensor control function with constant scan from 200 μs
 Quick response from input to output
 Quick response time 100 μs to an interrupt signal

■ Ultra-compact Size

The compact, 147 (W) x 100 (H) x 88 (D) mm size handles 192 points.

■ Universal I/O Range

Can control up to 8, 192 points and contain devices of up to 310K words per system.
 Capabilities of a high-end PLC at the cost of a low- or mid-range PLC
 In case of 1000-2000 I/O points, the list price becomes one third to a half against other vendor's PLC

■ Outstanding Maintenance Support Functions

Remote OME** function using public phone line and Ethernet
 Diagnostic based on error log and user log
 Diagnostic based on sampling trace
 Common I/O module spares for all system regardless of I/O range

■ Multi-CPU

Tasks can be divided by multiple ladder CPUs
 Data processing by the BASIC CPU
 PC applications run by the AT-compatible CPU

■ FA-M3 Programming Tool WideField

Object ladder, a new programming method succeeding to structured programming
 Blocks and macros can be coded independently, thus drastically increasing reusability.
 Increased efficiency of reuse with improved visibility
 Easy data exchange with Windows-based applications

■ BASIC Programming Tool M3 for Windows

Convenient BASIC program development under the Windows environment

* Indicates the performance when running a program that contains basic instructions and application instructions in average ratios; does not guarantee that all the user's program will run at this speed.

** Acronym of remote **O**peration **M**aintenance and **E**ngineering proposed by Yokogawa Electric Corporation.

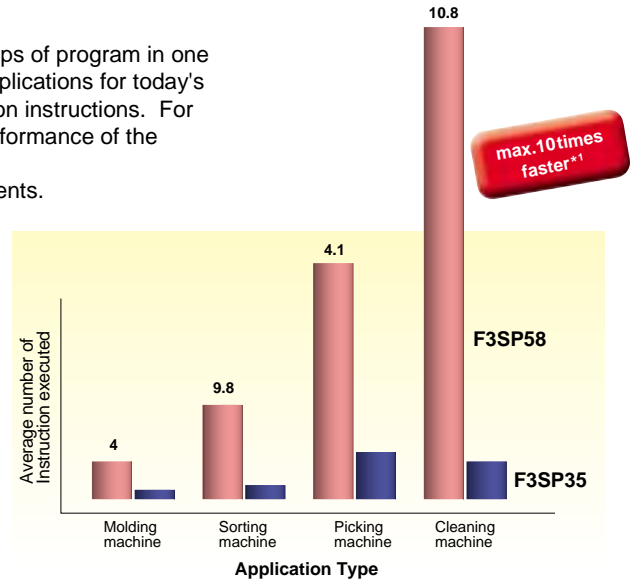
The FA-M3 R outclasses the capabilities of today's PLCs and offers the functionality, performance, a choice of languages and expandability provided by a microcomputer board.

No more tedious quality control of huge variety of boards or discontinuation of parts - the user can concentrate on adding value to equipment.



World's fastest processing speed realized by triple processors.
 20K steps of ladder program scanned per millisecond.
 Minimum scan time of 200 μ s.

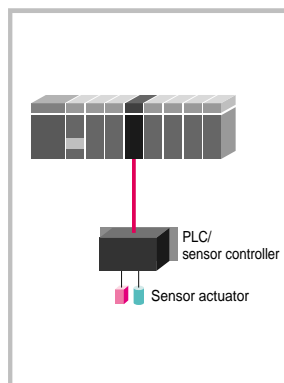
The FA-M3 R delivers high-speed in all aspects, running a 20K steps of program in one millisecond (ratio of application instructions used: 50%). Actual applications for today's functionally-enhanced equipment contain a larger ratio of application instructions. For such applications, the FA-M3 R achieves at least ten times the performance of the former CPU modules for the FA-M3.
 The graph on the right shows examples of performance improvements.



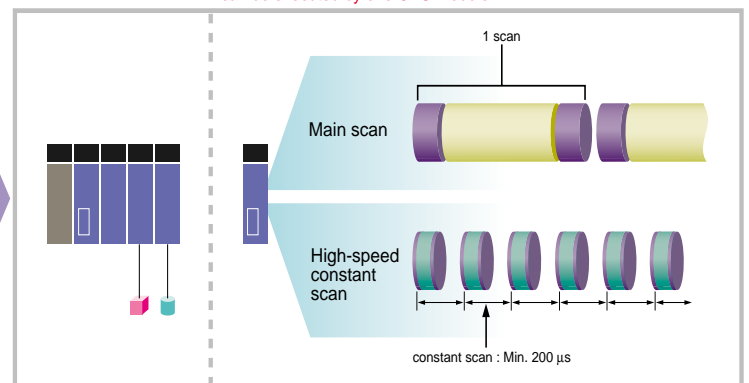
* In comparison to the former CPU module of Yokogawa with the actual applications

*1: Compared with Our Conventional CPU

● With conventional PLC



● With FA-M3 R..... The number of PLC units can be reduced since two ladder programs can be executed by one CPU module.



■ Quick response from input to output

- Ultra-quick response time: 100 μ s
 F3XD08-6F, F3XD16-3F, F3XD32-3F/4F, F3XD64-3F/4F (with 32 input points)
- Ultra-quick response to input: 10 μ s
 F3XD16-3H (when used with the F3SP28, F3SP38, F3SP53 or F3SP58)
- Output shutoff function added:
 F3YD64-3F, F3WD64-3F/4F (with 32 output points)

■ Sensor Control Function

- One CPU can carry out a high-speed constant scan (from 200 μ s) independently besides the normal scan.
- The same CPU also achieves a quick response.

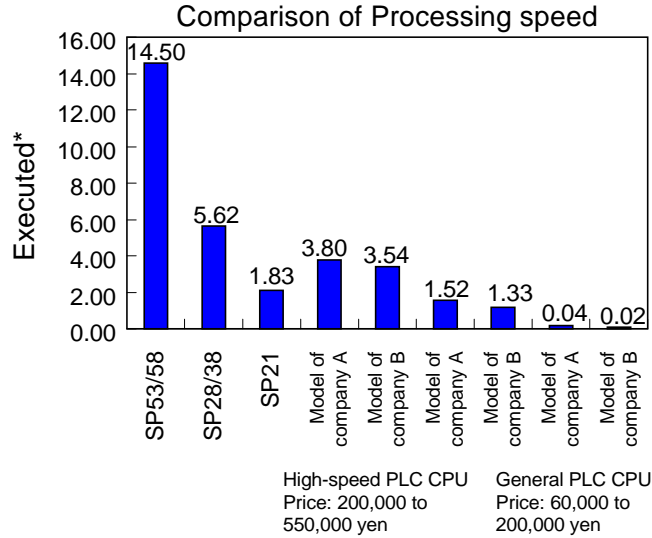
■ Faster Response to Interrupt Signal

- DC input module allows quick response of 100 μ s to an interrupt input
- Swift response to a change in input level to implement instantaneous high-speed control

Due to the ultra-fast processing speed, there's no need to consider the processing time when programming.

Why is high-speed processing necessary?

- To carry out complicated calculations (with application instructions) quickly
- To stabilize mechanical control of higher speed for higher productivity
- To allow human-interface and diagnostic programs to be enhanced, thus providing an easier interface for the operator
- To reduce unstable actions during each scan time by network servicing



* Executed instructions means the average number of instructions executed in 1 μs by PLC.

■ Ultra-fast Execution of Instructions

Basic instruction: Min. 0.0175 μs
 Application instruction: Min 0.070 μs

■ Comparison with Yokogawa's Former CPU Module for Basic Instructions

Instruction	New SP53	Former SP35
LD, AND, OR	17.5 to 35 ns	90 ns
Timer	175 ns	360 ns
Transfer	70 ns	180 ns
Comparison	70 ns	180 ns
Addition, subtraction	105 ns	270 ns
Logic operator	105 ns	270 ns

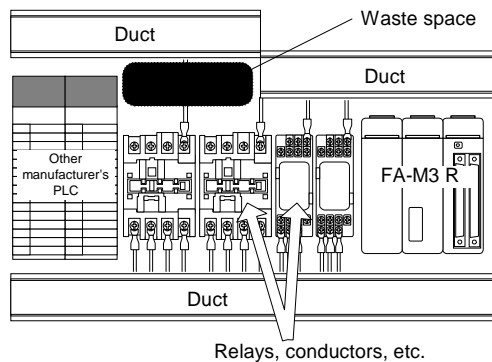
■ Comparison with Yokogawa's Former CPU Module for Application Instructions

Instruction	SP58 vs. SP35
Transfer between file registers	74.1 times faster
Index modification (LD)	10.7 times faster
Index modification (MOV)	30.4 times faster
Read/write	6.4 times faster
Timer update	6.7 times faster
BMOV/BSET	12.8 times faster
FOR-NEXT	7.7 times faster

Postcard-size Controller

Why does a controller need to be smaller?

- To provide ample room for additional modules
- To allow installation of the controllers without affecting the machine design and safety of the user factory (allowing perspective facilities)
- To help standardize control panels
- To reduce the size of the control panel to be minimized regardless of the controller scale
- To reduce costs



■ Design concept: PLC is a substitute for relays

The FA-M3 R is packaged into the size of usual relays and conductors, and is designed for installation in the same row with those inside a panel, thus allowing effective internal design of the panel.

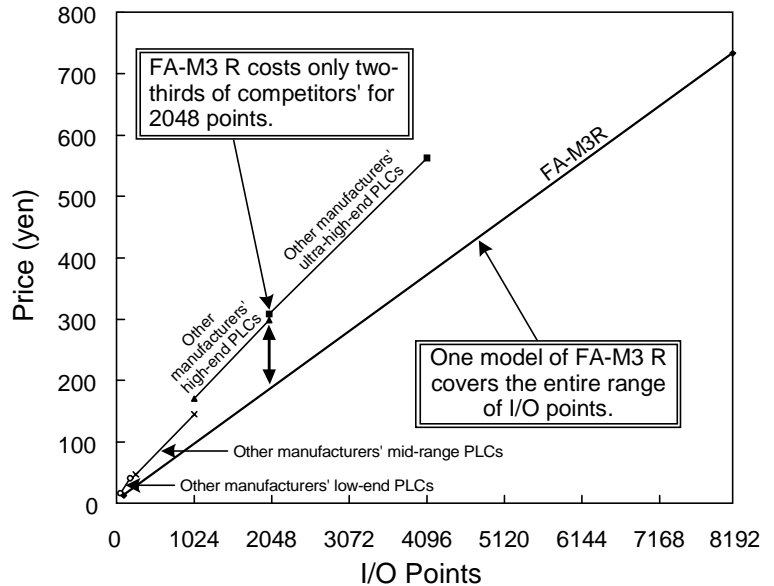
■ Dimensions

Base Module	Slots	Mounting Dimensions (mm)	Depth of Module* (mm)
F3BU04-0N	4	100 x 147	88.5
F3BU06-0N	6	100 x 205	88.5
F3BU09-0N	9	100 x 322	88.5
F3BU13-0N	13	100 x 439	88.5
F3BU16-0N	16	100 x 537	88.5

* Dimensions of a base module with I/O modules installed in it (excluding connectors and terminals blocks)

Whatever the number of I/O points, one PLC covers all.

- Higher functionality than high-end PLC, yet more reasonable cheaper than low-end PLC
- Only one model covers a broad range of I/O points, from small to large
- High expandability independent of scale
- Common modules and parts eliminates need for diverse spares.



■ Flexible Combination of Diverse Types of I/O Modules

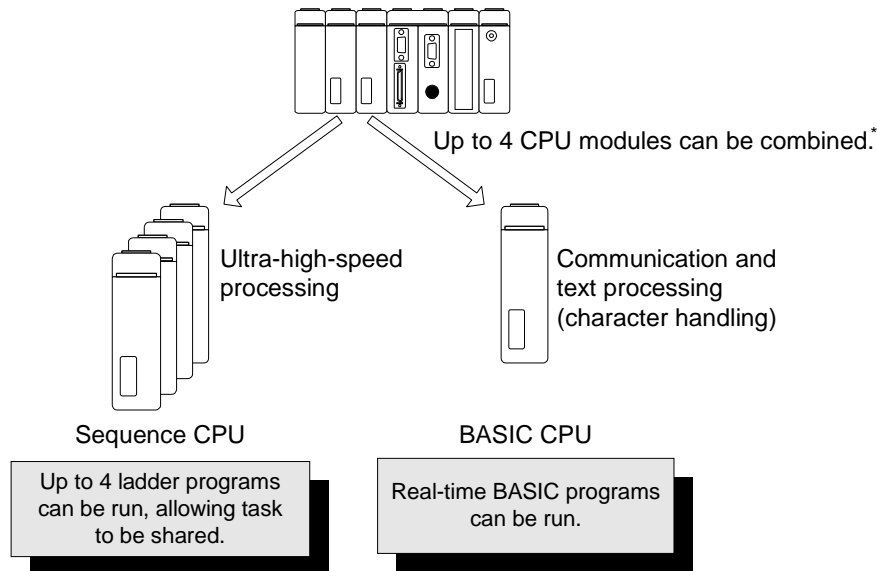
- Offered with various types of I/O modules as used in high-end PLCs
- Simple access to advanced I/O modules

■ Number of I/O Points

- 4 to 288 analog inputs
- 2 to 288 analog outputs
- 1 to 288 axes for positioning
- 4 to 144 pulse inputs
- 1 to 36 serial communication ports (F3RZ□1, F3RS41)
- 2 to 72 serial communication ports (F3RS22)
- 1 to 8 GP-IB communication ports

Note: Shown above are the maximum numbers of points and ports when the corresponding modules are installed for the maximum numbers independently, and do not mean that all these maximums are available at the same time for the same controller. The maximum number for each item depends on the combination of modules actually installed.

- Use any programming language you like.
- Use the optimum language for your applications.
- Combine languages freely.



* Only one BASIC CPU module can be installed per controller.

- Mechanical engineers may prefer a ladder diagram, while production engineers may prefer BASIC.
→ The FA-M3 R allows the programming language to be chosen freely.
- Sequence CPUs are good for tasks requiring high-speed processing, a BASIC CPU for floating-point and character calculations.
→ You can select CPUs to meet your application requirements.

Module	Model	Specifications
Sequence CPU module	F3SP21-0N	Structured ladder language, 10K steps, 0.18 μs/basic instruction
	F3SP28-3N	Object ladder language 30K steps, 0.045 μs/basic instruction
	F3SP38-6N	Object ladder language 120K steps, 0.045 μs/basic instruction
	F3SP53-4H	Object ladder language 56K steps, 0.0175 μs/basic instruction
	F3SP58-6H	Object ladder language 120K steps, 0.0175 μs/basic instruction
	F3FP36-3N	Ladder and SFC language, 40K steps, 0.09 μs/contact or coil instruction
BASIC CPU module	F3BP20-0N	YM-BASIC/FA language, 120KB
	F3BP30-0N	YM-BASIC/FA language, 510KB

- Any CPU can directly access I/O modules.
- Different types of CPU modules can exchange data with each other.
- Without additional module(s), the above mentioned CPU module can achieve function of a controller.

Larger Program Capacity, Device Capacity and Variety of Instructions than for High- end PLCs

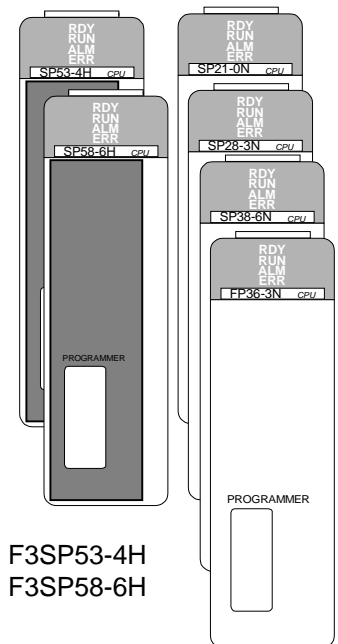
Seven modules to meet various needs.

Item		F3SP05	F3SP21	F3SP28	F3SP38	F3SP53	F3SP58	F3FP36
Number of inputs/outputs		2,048	2,048	4,096	8,192	4,096	8,192	4,096
Number of instructions	Basic	25	25	33	33	33	33	8
	Application	227	227	312	312	312	312	59
Processing speed per instruction	Basic (µs)	0.18–0.36	0.18–0.36	0.045–0.18	0.045–0.18	0.0175–0.07	0.0175–0.07	0.09–0.18
	Application (µs)	Min. 0.36	Min. 0.36	Min. 0.18	Min. 0.18	Min. 0.07	Min. 0.07	Min. 0.18
Program capacity (steps)		5K	10K	30K	120K	56K	120K	40K*
Number of program blocks		32	32	1,024	1,024	1,024	1,024	1,024**
Devices	Timers***	512	512	2,048	3,072	2,048	3,072	2,048
	Counters***	512	512	2,048	3,072	2,048	3,072	2,048
Relays	Internal	4,096	4,096	16,384	32,768	16,384	32,768	8,192
	Shared	—	2,048	2,048	2,048	2,048	2,048	4,096
	Link	2,048	2,048	8,192	16,384	8,192	16,384	8,192
	Special	2,048	2,048	9,884	9,884	9,884	9,884	9,984
Registers	Data	5,120	5,120	16,384	32,768	16,384	32,768	5,120
	File	—	—	32,768	262,144	32,768	262,144	27,648
	Link	2,048	2,048	8,192	16,384	8,192	16,384	8,192
	Special	512	512	1,024	1,024	1,024	1,024	512
	Index	32	32	256	256	256	256	—
	Shared	—	1,024	1,024	1,024	1,024	1,024	4,096

* Capacity in steps of ladder program
 ** Capacity in steps of sequence function chart (SFC)
 *** Total number of timers and counters

■ F3SP05-0P, F3SP21-0N, F3SP28-3N, F3SP38-6N, F3SP53-4H, F3SP58-6H and F3FP36-3N Sequence CPU Modules

- High-speed execution of instructions easily handles high-speed processing and response. (Scan time of 1 ms for a 20K step program when using an F3SP53 or F3SP58)
- Sensor control function enables quick scan (input → program execution → output) besides normal scan . This allows to have stable input/output response of 400 µs (200 µs x 2). (when using an F3SP28, F3SP38, F3SP53 or F3SP58).
- Inheriting the structured programming, object ladder programming is adopted as a dramatically upgraded programming language that facilitates program development and modification (for the F3SP28, F3SP38, F3SP53 or F3SP58).
- User-defined macro instructions can be created and registered.
- Enriched functions, such as forced set/reset that are not affected by the results of program computations as well as a scan operation, facilitate program debugging and modification.
- The PROGRAMMER port (connection port for programming tool) supports a personal computer link, allowing linkage to upper-level computers and display units without a personal computer link module (at maximum baud rate of 115K bps for the F3SP28, F3SP38, F3SP53 or F3SP58).
- Programs and data can be stored in an optional ROM pack, which is useful when performing program replacement and making many copies of the same program on site.
- Protect function is provided to prevent programs from being read and copied by unauthorized persons.



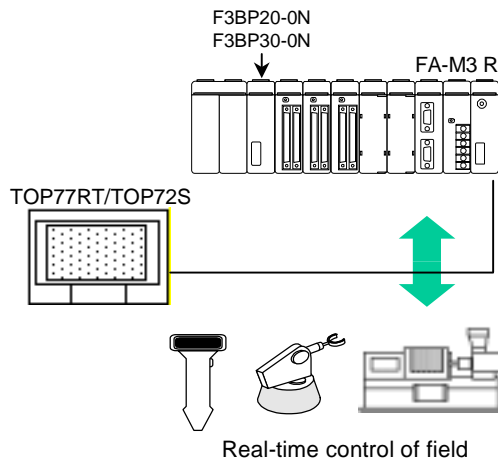
F3SP53-4H
F3SP58-6H

F3SP21-0N
F3SP28-3N
F3SP38-6N
F3FP36-3N

Note: The F3FP36-3N is used for both SFC and ladder programs (ladder programs only is available), and supports neither index modification, scan operation, personal computer link, user log, ROM pack nor program security.

YM-BASIC/FA, the world's fastest BASIC

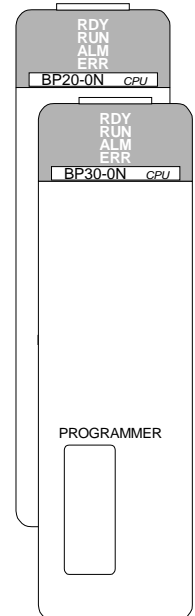
- Incorporates YM-BASIC/FA, a BASIC language for real-time control used in proven Yokogawa YEWMAC500 computer for factory automation.
- Realizes a BASIC program-based controller (no need for a sequence CPU module).
- Can directly access inputs and outputs.
Direct I/O access without a sequence CPU enables field data to be read and written at high speed. (16 I/O points can be accessed within 5.2 ms.)



- Ideal for high-level computations
- Simplifies character and array computations.
- Dedicated interpreter realizes high-speed processing.

■ F3BP20-0N and F3BP30-0N BASIC Modules

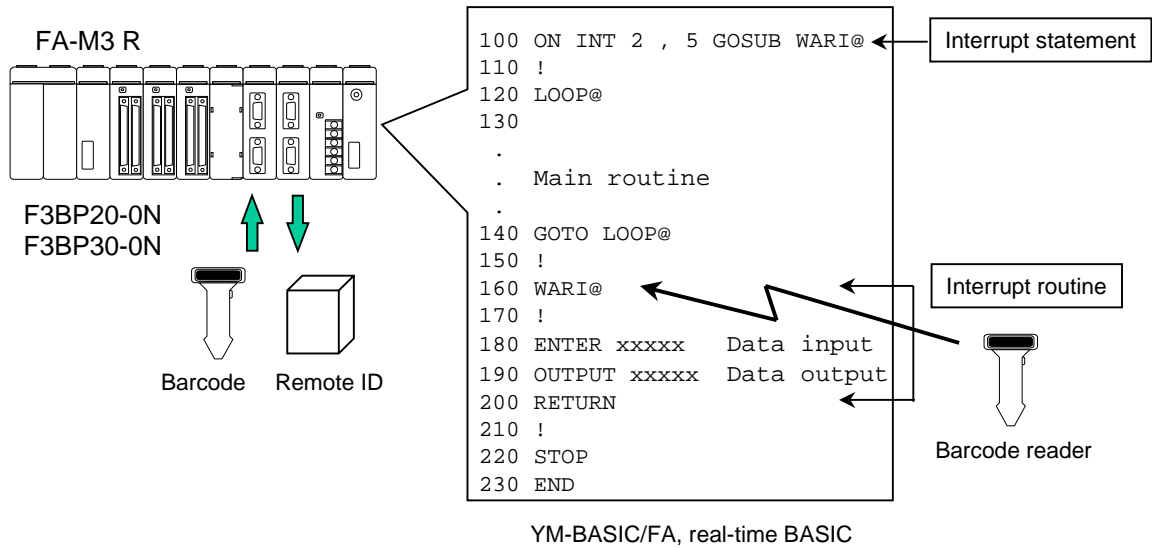
- Useful for communication tasks or high-level computations that are not easily controlled by a ladder program.
- Can configure as a BASIC controller since a BASIC CPU module alone can be used without a sequence CPU module.
- When installed in slots 2 to 4, BASIC CPU modules work as add-on BASIC CPU modules for a sequence CPU module.
- Can directly access input and output modules.
- Can exchange data with ladder programs and synchronize with ladder programs by using events.
- Allows structured programming using subprograms.
- Can access common data with a personal computer link module (can also connect a display unit and access data via Ethernet or modem).
- The PROGRAMMER port (connection port for programming tool) provided with each BASIC CPU module allows programming for each CPU.
- Programs can be developed and debugged on a personal computer.
- By installing an optional ROM pack, programs and common data can be saved and the programs in the ROM pack can be run. The ROM pack is useful when performing program replacement and making many copies of the same program on site.



F3BP20-0N
F3BP30-0N

A statement to start an interrupt routine needs only one line.

F3BP20-0N and F3BP30-0N



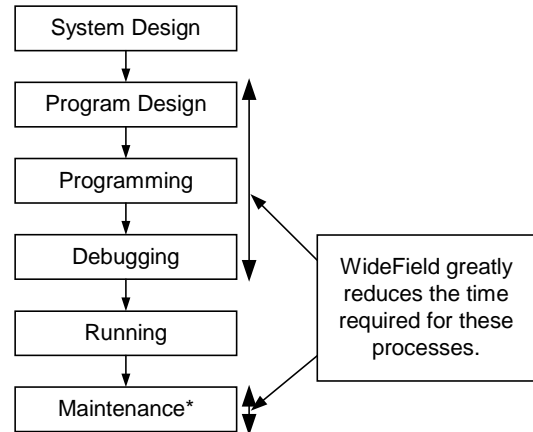
■ YM-BASIC/FA

- On-line real-time processing
 - Supports extensive interrupt methods to enable immediate response of a BASIC program to external events.
 - Facilitates development of on-line real-time programs.
- Modular program structure
 - Can use subprograms.
 - Variables, line numbers and labels in the main and individual subprograms independently, thus it simplifies development and program maintenance, and improving program reusability.
 - The main program and subprograms can be developed separately, and assembled together by using the APPEND command later.
- Combination with sequence programs
 - Variables used in a BASIC program can be combined with shared registers by a common variable statement, thus it facilitates data exchange with sequence CPU module. Synchronization with sequence CPU modules can also be achieved by using SIGNAL, ON SEQVLT, ENTER and OUTPUT statements.
 - Device values in CPU modules can be read and written by using ENTER and OUTPUT statements.
- I/O support
 - Can access various communication modules such as serial communication modules, various digital I/O modules, and various analog I/O modules by using ENTER statements for input and OUTPUT statements for output.

Ultimate program reusability.
WideField dramatically reduces Total Cost of Ownership
 by customization of each machine.

FA-M3 Programming Tool WideField

- | | |
|--------------------------------------|------------------------|
| ■ Object ladder | ■ Enriched help |
| ■ Program Component | ■ Remote OME* |
| ■ Index view | ■ System log* |
| ■ Collective change of I/O positions | ■ User log* |
| ■ Logical design by tag name | ■ Sampling traces* |
| ■ Group tag name | ■ Ethernet connection* |
| ■ Advantages of Windows environment | ■ Modem connection* |
| ■ Flexible operability | |
| ■ Sophisticated debugging functions | |



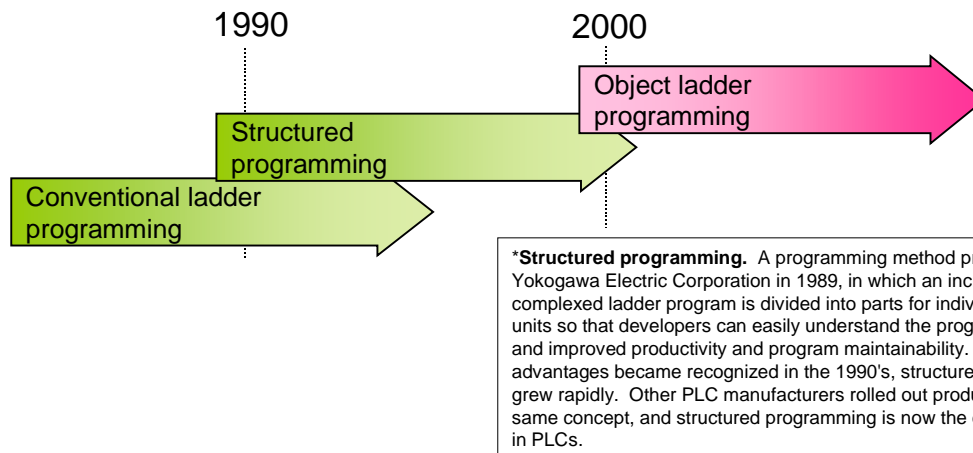
* See the respective pages of these excellent maintenance functions for details.

■ FA-M3 Programming Tool WideField (SF610-E3W)

WideField solves all issues facing user program development. It offers extensive features for greatly increasing the efficiency of program development, such as the clarification of the component structure of programs, improved visibility, under the familiar Windows environment.

- Product concept:
 - Customized program design
 - Operability
 - Reusability
 - Link with other applications
 - Visibility
 - Ease of debugging and maintenance
 - Concurrent development by multiple engineers
 - Improved software quality
 - Shorter development period
- WideField is ready to go simply by installing it in your PC.
- WideField can be run under Windows 95, Windows 98 or Windows NT 4.0.

- ◆ The FA-M3 Programming Tool WideField is a revolutionary application for programming object ladder succeeding to structured ladder programming and created with new concept.
- ◆ An object ladder is a new concept of developing programs. The object in which a piece of program and the related devices are assembled for each functional unit called a block. The blocks are then assembled together to form the entire ladder program. Each block can thus be functionally independent, which improves productivity and program maintainability compared to structured programming*.
- ◆ An object ladder is highly reusable. When customizing an existing machine control program for a particular user, the details of each block need not be checked; blocks are simply added or replaced.



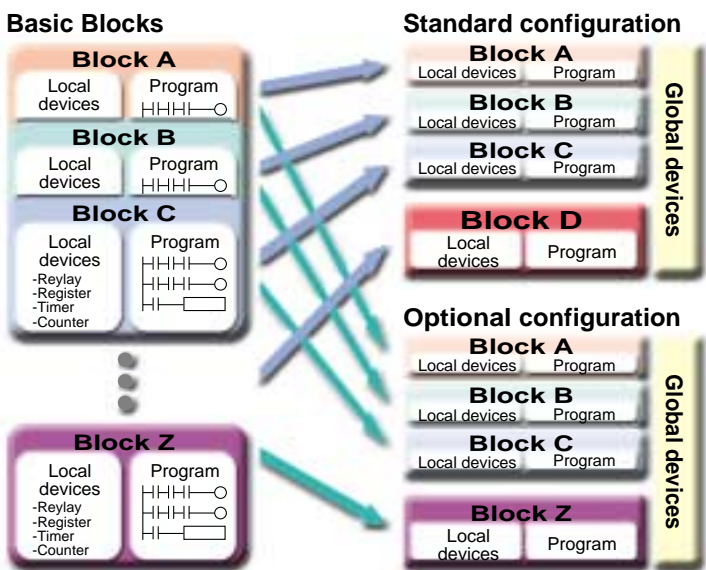
Independence of Blocks and Macros for Enhancing Drastical Reusability.

- Blocks and macros are pieces of program and use common devices as their data. Thus, devices need to be assigned uniquely not to doubly used in different blocks and macros.



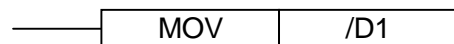
- By using the concept of *local devices* in each block and macro, devices can be handled independently in each block and macro.
- Different macros and blocks can have a local device having the same name since different physical addresses will be assigned to those local devices, thus device conflict can be avoided.

Programs and local devices can be handled as sets so that they can be reused easily as parts.

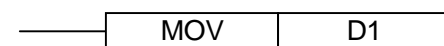


● Address Indication

Local device



Global device



- Local devices and global devices can be used as different devices.
- When reusing a block, device addresses need not to be changed.
- When local devices need to be added in a block, no change to other blocks is needed.

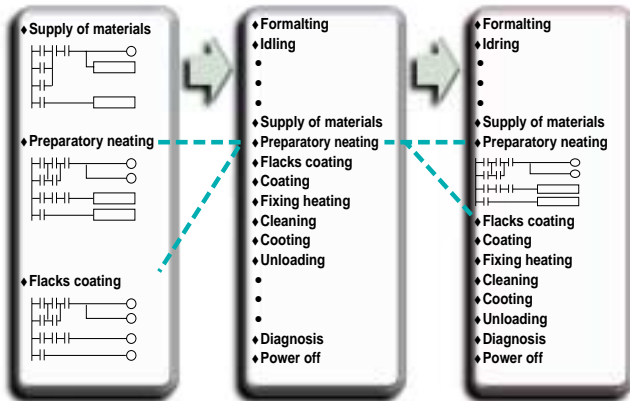
Increased Efficiency of Reuse with Improved Visibility.

- A ladder program is coded as a long strip of diagram, which makes it difficult to grasp the overall flow.

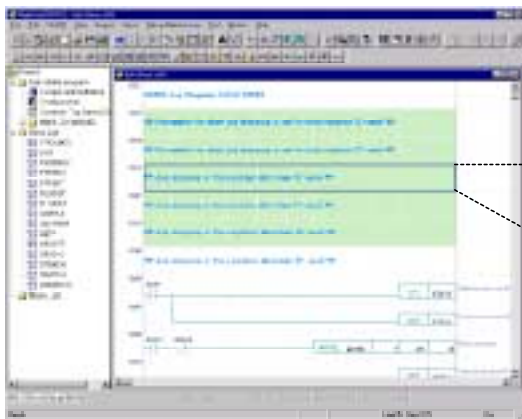


- The entire program structure can be grasped.
- You can hide and show each circuit block under the circuit comment (just like expanding and collapsing the tree) to grasp the entire program structure and go to the corresponding parts.
- Programs written long ago or written by other engineer can be easily modified.

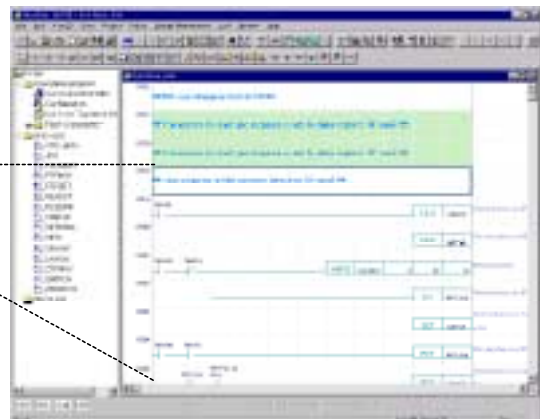
■ Index View



Debugging after grasping the overall flow



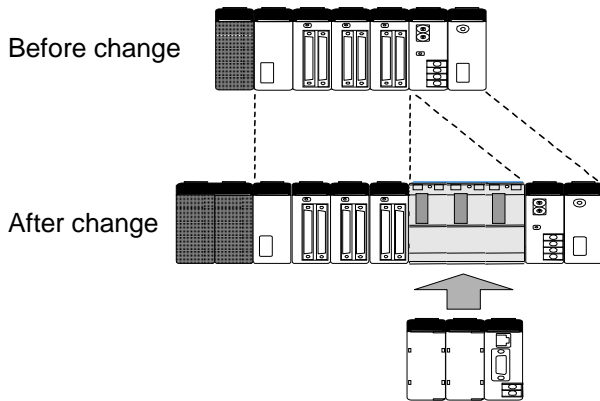
Collapsed View of Circuit



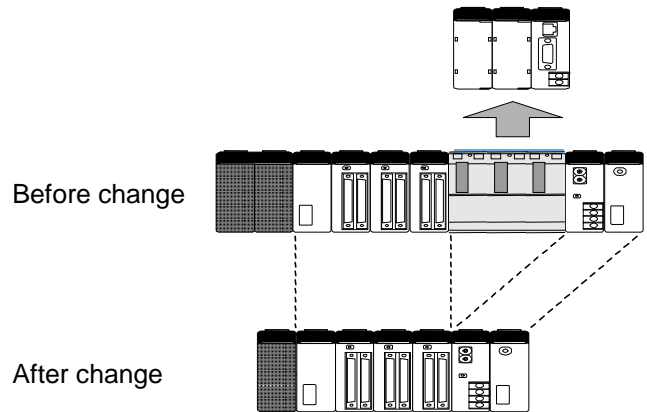
Expanded View of Circuit

Whenever the I/O module allocation is changed, the I/O addresses in the program can be changed instantly.

Addition of I/O Modules

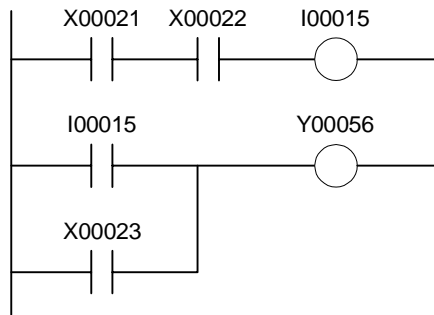


Deletion of I/O Modules

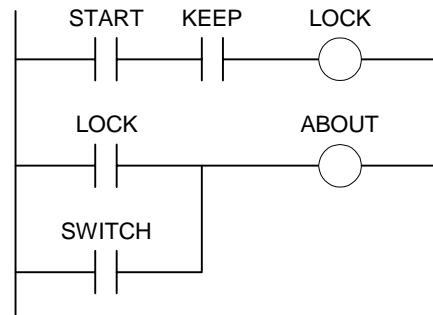


- When a standard machine control program is customized and I/O modules need to be added or their position changed, the I/O addresses in the program can be collectively changed accordingly for each slot.

- ◆ A name suggesting the corresponding action can be assigned to each device to increase maintainability.
- ◆ Arbitrary names for individual devices can be used in the programming before the terminal assignment is decided. The ability to separately determine the logical design and physical design (i.e., program design and terminal assignment) greatly reduces the engineering period.
- ◆ Wiring changes can be accomplished by changing the tag definitions.
- ◆ Use of tag names helps standardize circuits and enables programs to be reused with ease.

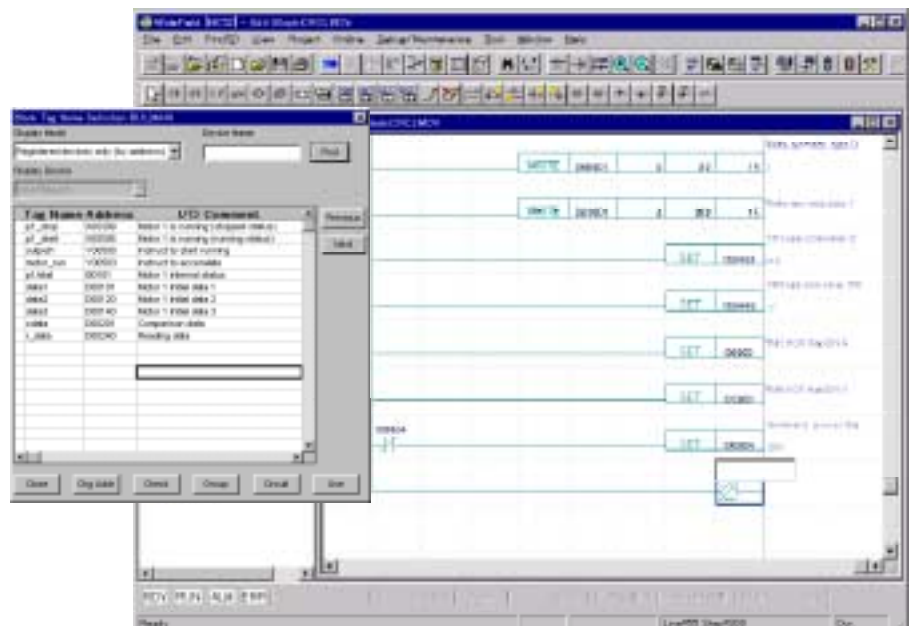


Conventional PLCs require terminal addresses.



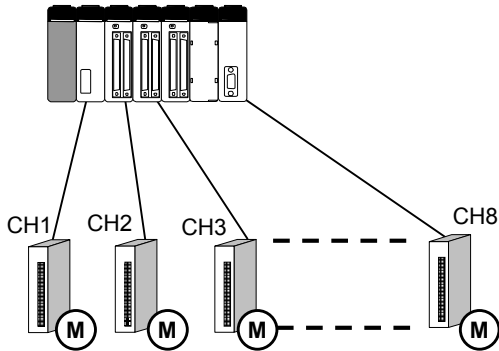
The FA-M3 R allows you to write in logical addresses (tag names).

- Tag names can be set easily (see the figure below right); however, even if the tag names have not yet been set ladder diagrams can be edited using tag names.
 - Even when the terminal assignment has not yet been decided, programs can be developed using signal names.
- Tag names should be up to 8 characters long and begin with 2 alphanumeric characters.



Sets of names can be named to enable data sets to be managed under group names

■ System Configuration
Multi-axis positioning control



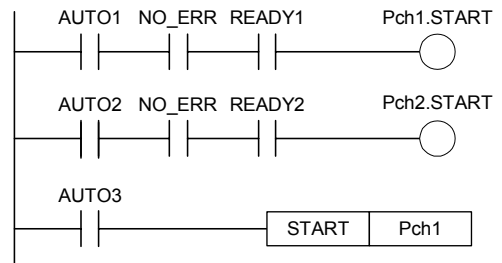
- Intuitive understanding by group presentation
- Efficient programming by group handling of data

■ Group Name Settings

Group name PCH1

Signal Name	Address
START	Y00233
STOP	Y00234
ERROR	X00201
PAUSE	Y00235

■ Programming



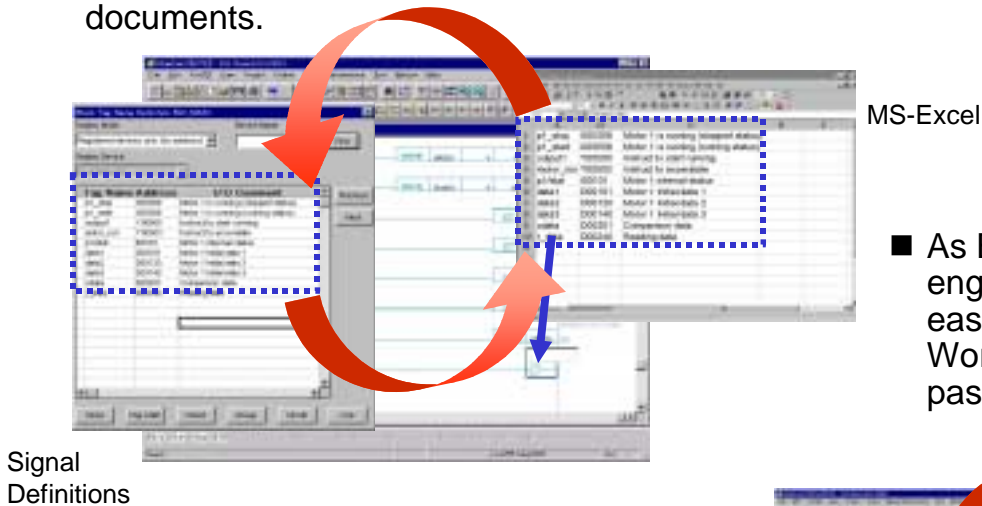
Effortless data exchange with Windows-based applications.

Support for versatile Windows technologies such as OLE.

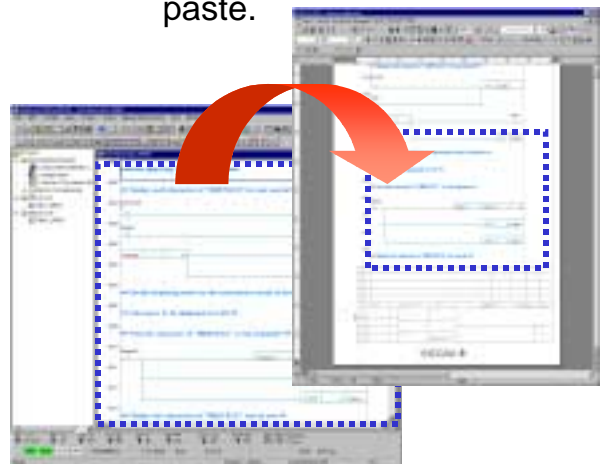
- Tag name definitions set on a Microsoft Excel sheet can be imported into WideField.
- Data in WideField, such as a ladder diagram, can be utilized for the As Built Drawings.
- A Engineering Document can be easily created.

Note: The As Built Drawings and Engineering Document indicate documents prepared using a Windows-based application.

- Practical use of Microsoft Excel
Tag name definitions can be copied and pasted not only between Excel and WideField but also to engineering documents.

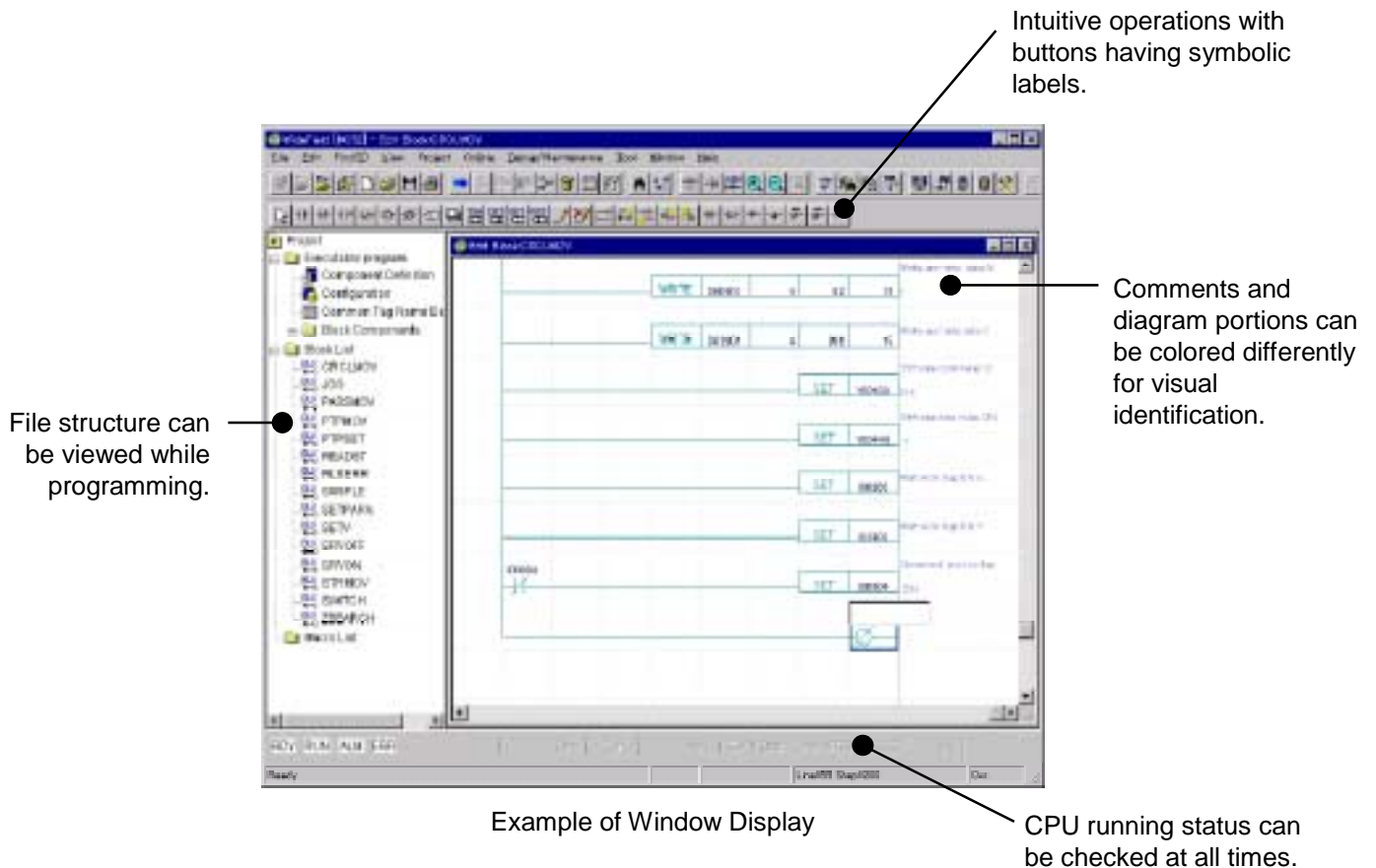


- As Built Drawings and other engineering documents can be easily prepared as Microsoft Word documents using copy and paste.



Ladder diagrams can be modified like editing a document with a word processor.
 Programming problems are minimized and operability maximized.

- ◆ Program modification and monitoring can be done simultaneously by opening multiple windows.
- ◆ Both mouse and key operations are supported.
- ◆ Connection lines can be dawn and deleted by dragging.
- ◆ Shortcut menus displayed by right-clicking provide quick access to commands valid for that screen region or selection.
- ◆ A range of a ladder diagram can be copied and pasted between different programs.
- ◆ From a list of search results, a desired point can be retrieved.
- ◆ All instructions can be entered by typing characters, and automatically converted to the corresponding device on the screen.
- ◆ You can select a device type from the I/O configuration and monitor the statuses of the corresponding devices.



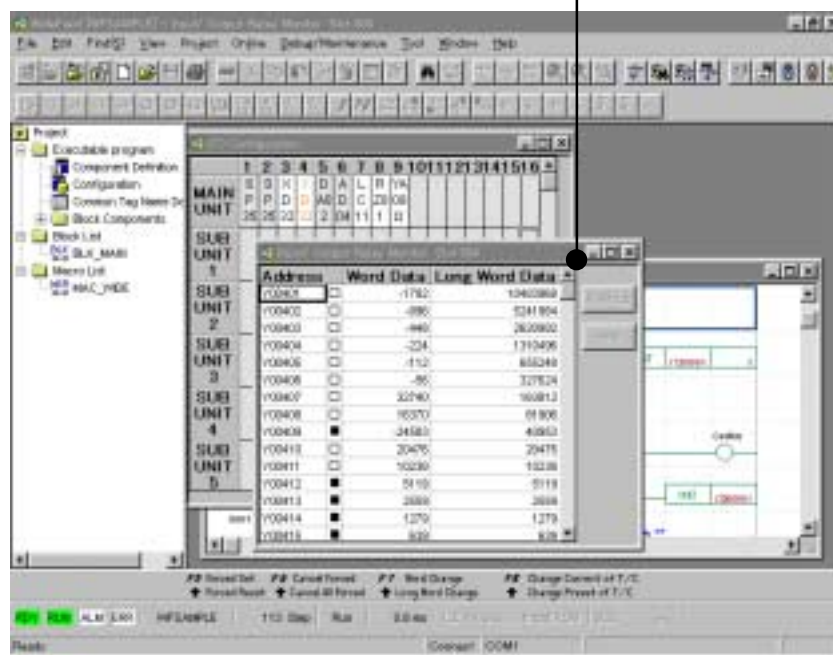
Example of Window Display

Ladder diagrams can be modified while they are running.

User-oriented debugging functions assist program development and modification.

- ◆ The log of CPU-detected errors can be viewed as the System Log, and the trend of the system running status can be managed as the User Log.
- ◆ Multiple parts of a diagram can be changed at once and modified parts can be reverted at once, all while online.
- ◆ Monitoring and debugging can be done via multiple personal computers concurrently.
- ◆ Fast scrolling quickly brings onto the screen in which the part of the diagram you want to monitor.
- ◆ Monitored data values can be displayed as decimal, hexadecimal, binary, character or floating-point values as you choose.
- ◆ Security protection can be set for each program.

Choosing a device type, and monitoring, setting and resetting device values.

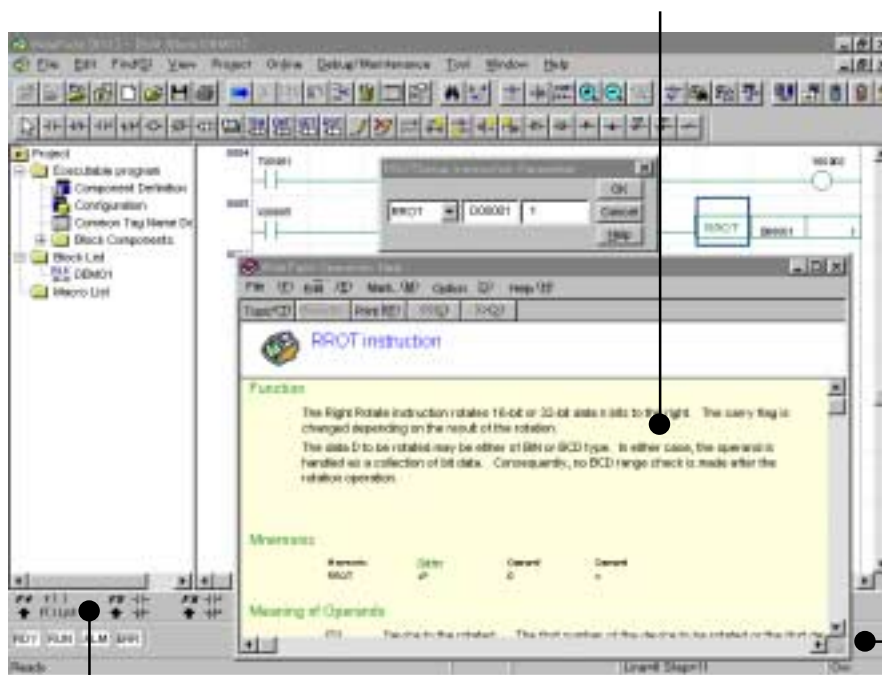


Example of Device Monitor

A description, operands and examples of action are shown for each instruction.

- ◆ The appropriate help for each situation can be called.
- ◆ Details on how to use an instruction and its action can be referenced.
- ◆ An outline of a function and how to use it can be referenced.
- ◆ Potential causes and countermeasures for an error can be referenced.
- ◆ Items can be looked up by entering a key word.
- ◆ The help for an instruction can be called by choosing the instruction from a list of instructions.

A description, operands and examples of action are shown for an instruction.



Example of Help

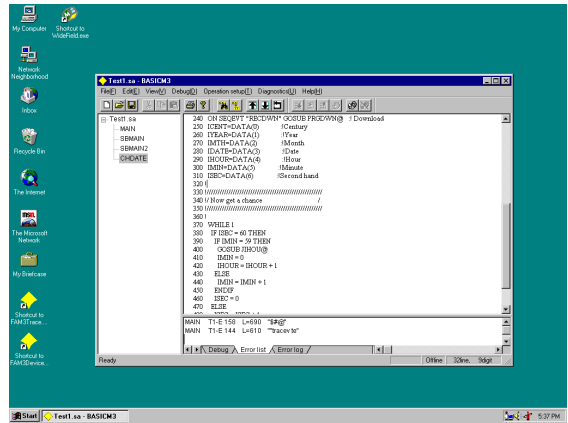
Easy key operations in the field.

CPU running status can be checked at all times.

Convenient BASIC program development under Windows environment.

Features:

- ◆ Runs under Windows 95, Windows 98 or Windows NT.
- ◆ Sophisticated debugging functions:
 - On-line program modification
 - Variable data trace
 - Break actions
 - Step run
- ◆ CPU self-diagnostics:
 - Ref Check of various CPU settings and shared data settings erence to CPU error log
- ◆ Help:
 - Online help for functions, statements and commands
 - Help for errors and countermeasures



■ BASIC Programming Tool M3 for Windows (SF560)

BASIC Programming Tool M3 for Windows (SF560) is a Windows-based application for programming and debugging applications for the BASIC CPU modules (F3BP20/30) as well as for setting up those CPU modules. SF560 can perform all engineering, including programming, debugging and maintenance.

- ◆ Supports remote OME* via Ethernet or Public Phone Line with modem.
- ◆ Allows the operation status to be checked and failures to be analyzed with reference to the Error Log and User Log.
- ◆ Allows complex failures and rare failures to be analyzed using the sampling trace function.
- ◆ Allows modules to be replaced easily even when installed inside a panel or machine because they are detachable from the front.
- ◆ Reduces maintenance and spare parts because parts can be stocked in common for all systems regardless of scale. Maintenance parts no longer need to be stocked separately for each system scale or model.

* Acronym of remote Operation Maintenance and Engineering proposed by Yokogawa Electric Corporation.

- The memory backup batteries for all CPU modules are maintenance-free and have a shelf-life of at least 10 years and a service life of at least 30 years under normal operating conditions (ambient temperature of 30, and operating time of 12 hours/day)

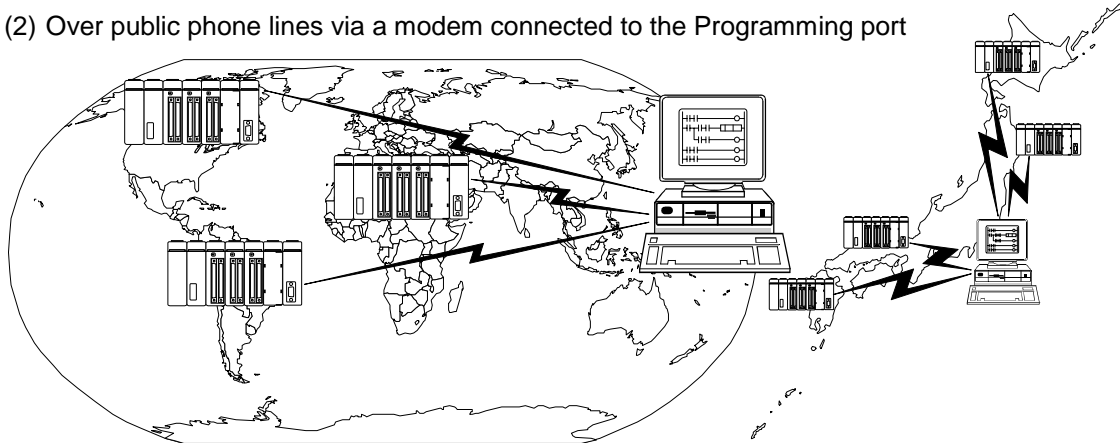
The FA-M3 R supports remote equipment maintenance, called "Remote OME. "

Remote OME involves performing the following remotely:

- Operation: Operation and monitoring
- Maintenance: Troubleshooting
- Engineering: Program modification and debugging

Remote OME is achieved:

- (1) Over a local area network via Ethernet, whereby OME requests are connected using a readily available dial-up router to a public phone line
- (2) Over public phone lines via a modem connected to the Programming port

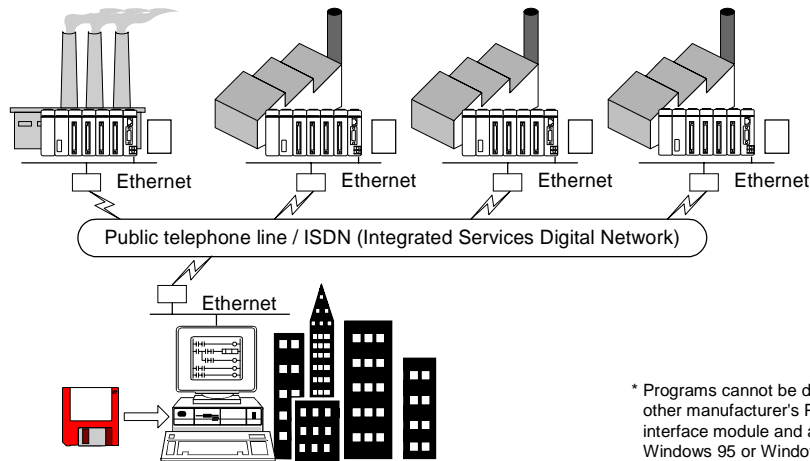


- For an FA-M3 R incorporated in a system, the following can be done from a personal computer at a distant place:
 - Machine maintenance and inspections using the device monitoring and diagnostics functions
 - Check of machine operating statuses by monitoring the FA-M3 R's devices online, and machine operation test by changing the device values
 - Troubleshooting and failure analyses for machine using the FA-M3 R's diagnostics functions, namely, such as to the error log, user log and sampling traces
 - Improvement of machine operation by adding, modifying and debugging a ladder diagram.
- There are two methods of remote OME:
 - Via Ethernet (remote maintenance camera is available)
 - Via public telephone lines

The FA-M3 R is the world's first* PLC that supports remote maintenance of multiple pieces of machines installed in distant locations, via Ethernet. Using a remote maintenance camera, remote maintenance can be performed while actually monitoring the equipment.

The following can be performed remotely with the standard features of WideField:

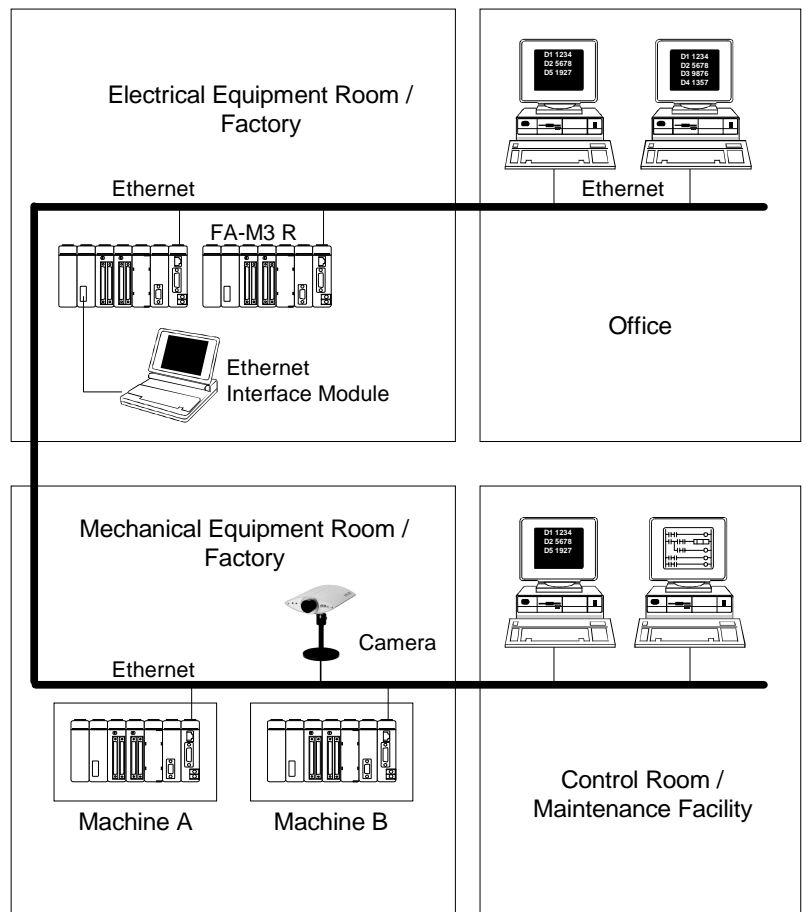
- Editing/loading/saving programs, monitoring ladder diagrams, monitoring devices, monitoring operation statuses and reading various data. The personal computer link feature can also be used.
- System log, user log and sampling traces that fully support remote OME



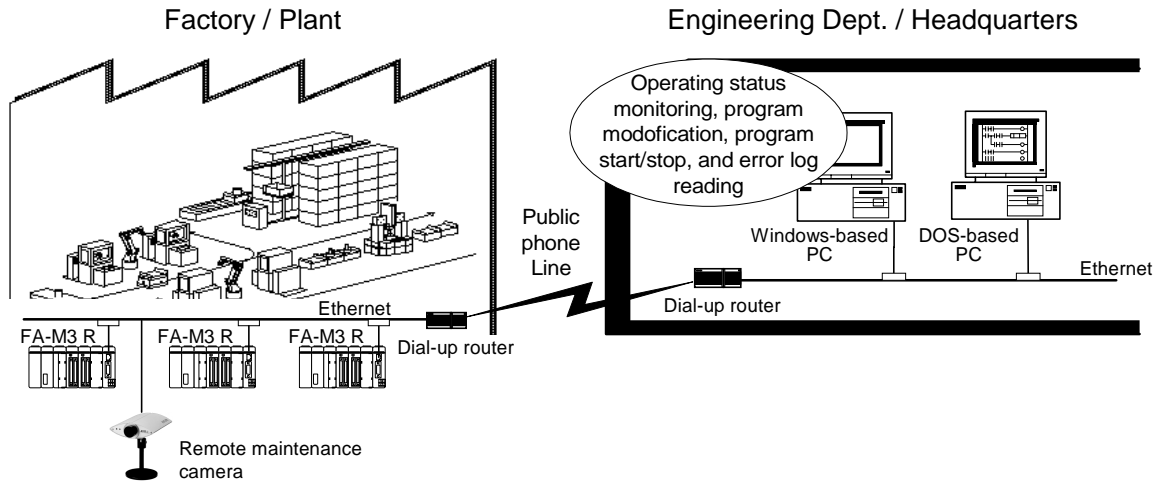
* Programs cannot be developed or modified with any other manufacturer's PLC. An F3LE01-5T Ethernet interface module and a personal computer running Windows 95 or Windows NT are required.

- Remote OME via Ethernet
- By connecting all the FA-M3 R controllers incorporated in equipment at a plant, via Ethernet all the machine statuses can be viewed from a personal computer in an office or control room.
- All functions of WideField can be used for the FA-M3 R controllers remotely.
- Monitoring and data modification of one FA-M3 R controller can be performed simultaneously from multiple personal computers via Ethernet.

However, WideField cannot run simultaneously on two or more computers on the network.



● Remote OME via Ethernet and Dial-up Router



- Remote OME is made available in various facilities at plants via Ethernet. Moreover, by using a public phone line with dial-up routers as shown in the figure above, remote OME of equipment from headquarters is possible through the FA-M3 R controllers connected to the Ethernet network inside respective plants, even if they are located abroad.

● Remote Maintenance Camera*

- Ethernet is fast enough to transmit large amounts of data such as images and sounds. By installing a network camera and sound interface, you can perform remote OME while monitoring live images of the equipment status captured by the camera.

Features of the remote maintenance camera:

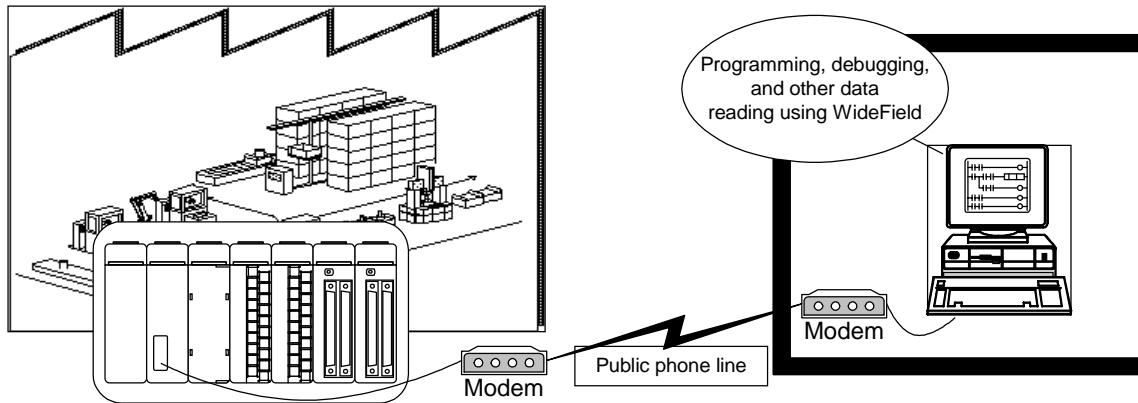
- Nothing else needed for connection to Ethernet, as web sever capabilities are built in.
- The captured image can be viewed using general browsers including Netscape Navigator and Internet Explorer.
- Manufactured by Axis Communications.

Image Viewing via Ethernet
Network Camera for Remote Maintenance

AXIS 200 + Camera Server
 The AXIS 200 full-color, digital network camera and the Camera Server from AXIS Communications bring you a real-time view of the remote location.

An FA-M3 R installed in a distant location can be maintained via a public telephone line.

The following can be performed remotely with the standard features of WideField:
 Editing/loading/saving programs, monitoring ladder diagrams, monitoring devices, monitoring operation statuses, viewing system log, reading various data, and more.



For connection, you need to do the following:

- Modem for the personal computer
 - Set the communications protocol (baud rate, data length, etc.) using AT commands.
- FA-M3 programming Tool WideField.
 - Set up the modem connection:
 Tool → Setup Environment → Setup Communication.
- FA-M3 R
 - In the configuration settings, set the CPU communication port as follows:
 - 9600 bps without parity check
 - Use the personal computer link

The program in which the above configuration is set up needs to be downloaded in advance. When downloading a program via a public telephone line, make sure that the program configuration is set as above.

- Modem for the FA-M3 R
 - Switch on the automatic terminal mode.
 - Set the communications protocol using AT commands.



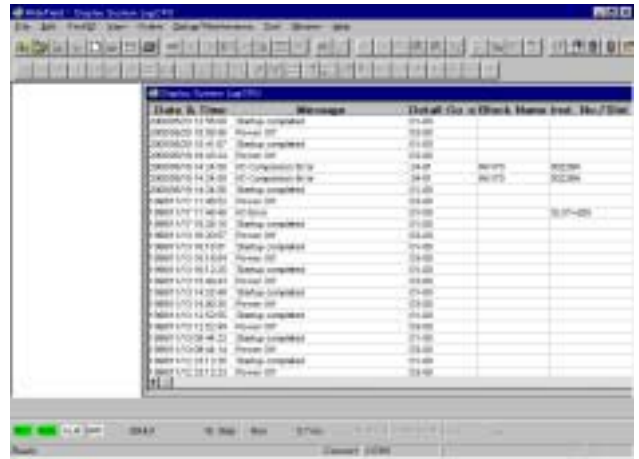
Status changes, failures and errors during operation of an FA-M3 R can be recorded.

- The system log lists the date, time and message of each event to allow you to grasp the past operation log and analyze changes in the system status and the results of program failures.
- The information displayed as the system log can also be printed and saved to a file, which can then be opened and printed later.

Date and Time	Message	Detail Code	Block Name	Instruction/Slot No.
11/07/1999 15:12:15	Startup Completed	01-00		
10/29/1999 15:11:03	Power Off	03-00		
10/29/1999 15:10:50	I/O Check Error	24-01	ACT3	00013N
10/29/1999 15:09:20	I/O Check Error	24-01	ACT3	00013N
10/29/1999 15:08:05	I/O Check Error	24-01	ACT3	00013N
10/29/1999 15:07:55	I/O Check Error	24-01	ACT3	00013N
10/29/1999 15:07:20	I/O Check Error	24-01	ACT3	00013N
10/29/1999 15:06:22	I/O Check Error	24-01	ACT3	00013N
10/29/1999 15:05:33	I/O Check Error	24-01	ACT3	00013N
10/29/1999 14:04:45	Subunit Communication Error	06-00		SLOT=1607
10/29/1999 12:43:51	I/O Check Error	24-02	READST	00012N

- **Display**
System status changes (power-on/off), failures and errors occurring in the past are displayed in chronological order with the latest event at the top. A maximum of 70 to 150 of such events (the number depends on the contents of the event data) can be stored. When the stored event data reaches the storage capacity, the latest event data overwrites the oldest event data.
- **Printout**
The displayed log can be printed in the same format.
- **Storage and retrieval**
The displayed log can be saved to a file and the saved file can be opened.

Note: The system log can be monitored from a remote location via Ethernet.



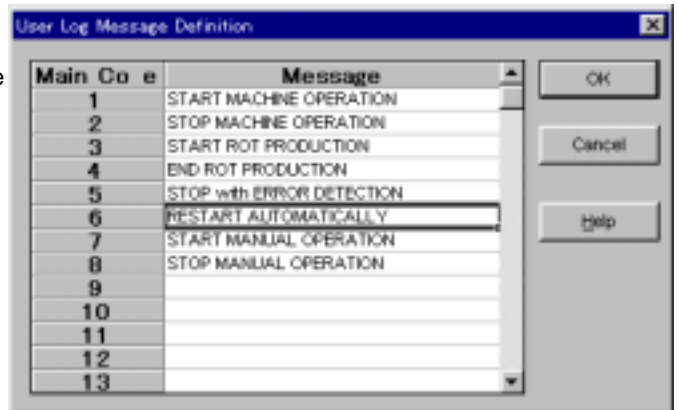
Example of System Log

Alarms, events and errors for equipment and machines (controlled by an FA-M3 R) occurring during operation can be logged.

- In addition to the system log, user-defined messages can be recorded (for up to 64 messages per CPU) as the user log.
- The user log lists the date, time and message of each event to allow you to grasp the past operation log and analyze changes in the system status and the results of improper equipment/machine operations.
- The information displayed as the user log can also be printed and saved to a file, which can then be opened and printed later.

Date and Time		Message No./Parameter/Message Text		
09/28/1999	11:59:09	main= 18	sub= 1	Heater Failure
09/28/1999	10:34:48	main= 14	sub= 1	Run Out Of Material
09/28/1999	08:30:32	main= 1	sub= 1	Machine Start
09/27/1999	17:34:27	main= 2	sub= 1	Machine Stop
09/27/1999	17:05:40	main= 6	sub= 1	Lot End
09/27/1999	17:00:10	main= 4	sub= 1	Product Departure
09/27/1999	16:05:32	main= 40	sub= 5	Alarm On
09/27/1999	15:59:58	main= 12	sub= 1	Limiter Off
09/27/1999	15:57:24	main= 11	sub= 1	Limiter On
09/27/1999	08:55:32	main= 3	sub= 1	Product Entry
09/27/1999	08:45:40	main= 5	sub= 1	Lot End
09/27/1999	08:30:51	main= 1	sub= 1	Machine Start

Define messages in the dialog box shown right, and carry out ULOG instructions in the ladder diagram. Then, the specified main code, subcode, and the time and date of occurrence for each will be stored in the user log data storage area. You can also send user log information to other equipment by using the ULOGR instruction.



- Other related instructions and devices
 - UCLR instruction: Clears the user log.
 - Z105 register: Special register for the number of user log messages to be stored
- Display

User log messages occurring in the past are displayed in chronological order with the latest event at the top.

Up to 64 messages corresponding to the main codes can be stored per CPU. When the stored message data reaches the storage capacity, the latest message data overwrites the oldest message data.
- Printout

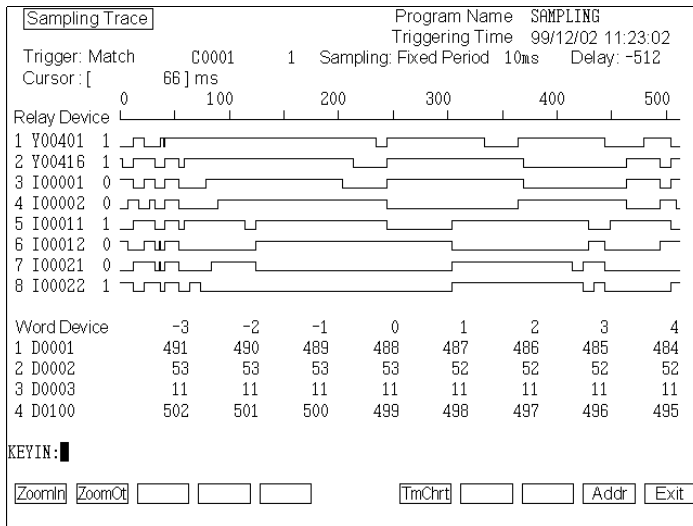
The displayed log can be printed in the same format.
- Storage and retrieval

The displayed log can be saved to a file and the saved file can be opened.



Note: The user log can be monitored from a remote location via Ethernet or a public phone line.

- You can trace device values while running a program.
- You can also record device values before the trigger condition is established.
- You can use sampling traces not only while debugging but also during operation for troubleshooting and failure analyses (no other manufacturer's PLC provides this function).
- Use of the sampling trace function does not affect the scan time.
- Sampling traces are very useful for capturing phenomena that seldom occur, such as once a week or month.



Specifications

Number of sampling points: 16 relays / 4 registers.

Sampling timing:

- Whenever a TRC instruction is carried out
- At specified intervals (10 to 2000 ms)
- At the end of every 1 to 1000 scan intervals

Number of traces: 1024

Trigger condition:

- Specified relay
- Data matching for the specified device

* The sampling trace function is available in the SP25 and SP35.

By configuring the trigger condition with the ladder program, you can attain traces of the values of the desired devices when complicated conditions including status transitions are met. Sampling traces can be attained without affecting the scan time of the ladder program.

→ Non-conformities occurring at irregular times can be detected.

- There are two setting methods:
 - Add the setting in the configuration of the user program.
 - Make settings at any time you want during operation.
- Display
 Sampling traces can be displayed in a time chart format together with the relay statuses and register values sampled.
- Settings in configuration prior to runtime
 You can make sampling trace settings previously in the configuration so that sampling traces are obtained during normal operation.
- Settings on demand
 You can make sampling trace settings at any time you want.
- Storage and retrieval
 The obtained sampling traces can be saved to a file and the saved file can be opened.



Making Sampling Trace Settings

High-speed Conversion, High Precision and High Noise Tolerance

Combined with a high-speed CPU module, high-speed analog input and output control system can be built.

(1) Analog Input Modules

F3AD04-0N: 4 analog inputs

F3AD08-1N: 8 analog inputs

- Input signal range: -10 to 10 V DC, 0 to 5 V DC, 1 to 5 V DC
- Accuracy: 0.2% of full scan (at 23 °C ± 2 °C) or 0.5% of full scan (at 0 to 55°C)
- Conversion period: 1 ms/channel
- Other features: Filtering, scaling and channel skip functions as well as a noise-resistant conversion system

(2) Analog Output Modules

F3DA02-0N: 2 analog outputs

F3DA04-1N: 4 analog outputs

F3DA08-5N: 8 analog outputs (voltage output only)

- Output signal range: -10 to 10 V DC or 4 to 20 mA DC
- Accuracy: 0.2% of full scan (at 23 °C ± 2 °C) or 0.5% of full scan (at 0 to 55°C)
- Conversion period: 2 ms (fixed) for F3DA02-0N, 4 ms (fixed) for F3DA04-1N and F3DA08-5N
- Other features: Output upon error occurrence

F3DA02-0N: Holds the output levels.

F3DA04-1N: Holds the output levels or sets to the preset level, as specified.

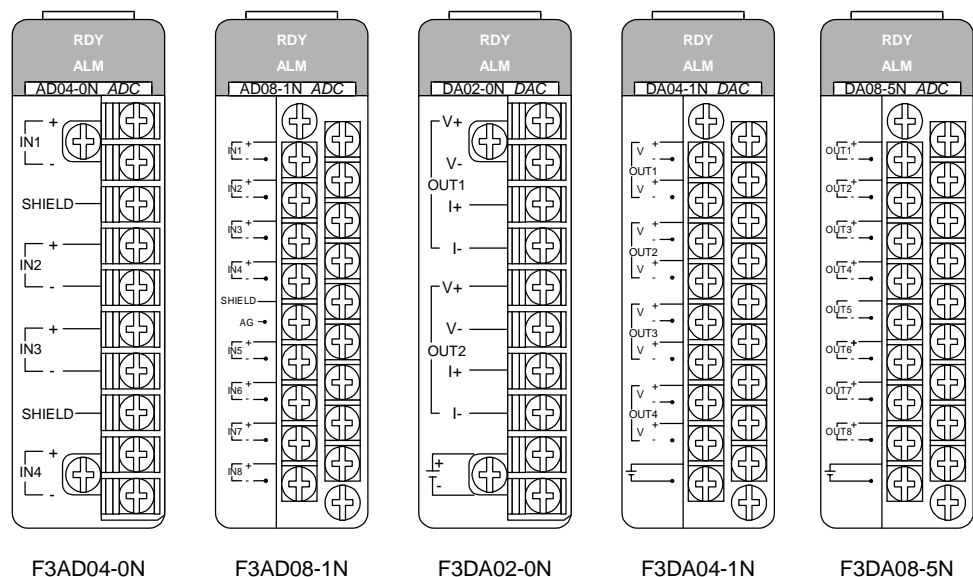
F3DA08-5N: Holds the output levels or sets to the preset level, as specified.

For all five types of modules, the module's internal circuit is isolated by photocouplers from the field.

● Channel skip

In analog input modules, A/D conversion for unused channels can be stopped, and data is not updated for a channel specified to be skipped. This speeds up the conversion period for all channels.

The conversion period is expressed as: 1 ms × number of channels used



Four Temperature Controllers in One Compact FA-M 3 R Module

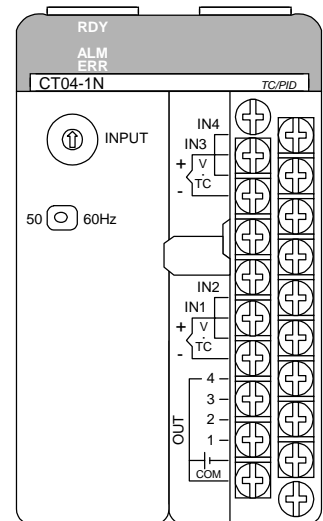
Wide range of temperature controller module lineups for all types of inputs and outputs.

- ◆ Selectable speed of control span according to the application requirement: 500 ms/4 channels, 250 ms/2 channels, 125 ms/channel
- ◆ Auto/manual mode switching useful for sequence maintenance at machine startup.
- ◆ PID control for heating/cooling
- ◆ Overshoot protection feature
- ◆ Cascade control using multiple channels

Module name	Model		Input Type			Output Type		
			TC/mV	RTD Pt100Ω	DC Voltage	Time-proportional Open Collector	Time-proportional Voltage Pulse	4-20 mA Continuous
Temperature control and monitoring	F3CT04	-0N	4			4	4	
		-1N	4			4	4	4
	F3CR04	-0N		4		4	4	
		-1N		4		4	4	4
PID control	F3CV04	-1N			4	4	4	

F3CT04-0N and F3CT04-1N Temperature Control and Monitoring Modules for Thermocouple input

- One module can control and monitor up to 4 thermocouples or 4 mv input loops.
- Provided with the multi-range input system, the input ranges of all 4 channels can be set by a rotary switch.
- The universal control output system enables the output type for each channel to be selected between time-proportional PID output (open collector or voltage pulse) and continuous PID output (4-20 mA). However, a continuous PID output is only available on the F3CT04-1N module.
- Can be used as a heating/cooling controller, though a different output module is required for the cooling output.
- Multiloop control using multiple channels, such as cascade control, can be performed using ladder and BASIC programs.
- Loop-back feature facilitates system debugging.
- Auto tuning function as well as overshoot suppression function, which uses fuzzy logic and is called the "SUPER" function, are provided as standard for optimum control.

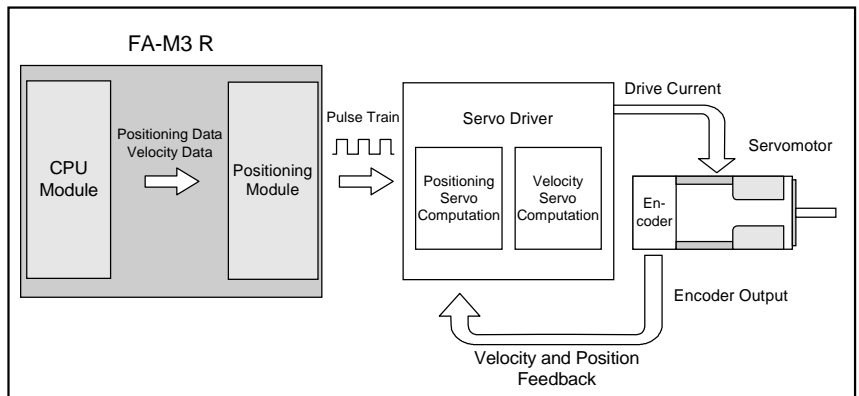


F3CT04-1N

Module	Features	Applicable Motor
F3NC11 F3NC12	<ul style="list-style-type: none"> ● Open-loop control ● Good controllability <ul style="list-style-type: none"> • Max. 6 ms high speed startup time • On-route action, control mode switching by an external trigger signal • Biaxial arc interpolation; acceleration/deceleration method: trapezoidal drive ● Position control, velocity control, switching over between position and velocity control 	Pulse motor
F3YP04 F3YP08	<ul style="list-style-type: none"> ● Open-loop control ● Control of up to 8 axes (up to 288 axes per system) <ul style="list-style-type: none"> • Max. 6 ms high speed startup time • Acceleration/deceleration method: trapezoidal drive 	Servomotor DD motor
F3NC51 F3NC52	<ul style="list-style-type: none"> ● Closed-loop control ● Good controllability <ul style="list-style-type: none"> • Max. 6 ms high speed startup time • On-route action, control mode switching by an external trigger signal • Biaxial arc interpolation; acceleration/deceleration method: trapezoidal drive ● Position control, velocity control, switching over between position and velocity control 	
F3DA□□	<ul style="list-style-type: none"> ● Velocity control in combination with an inverter 	Induction motor

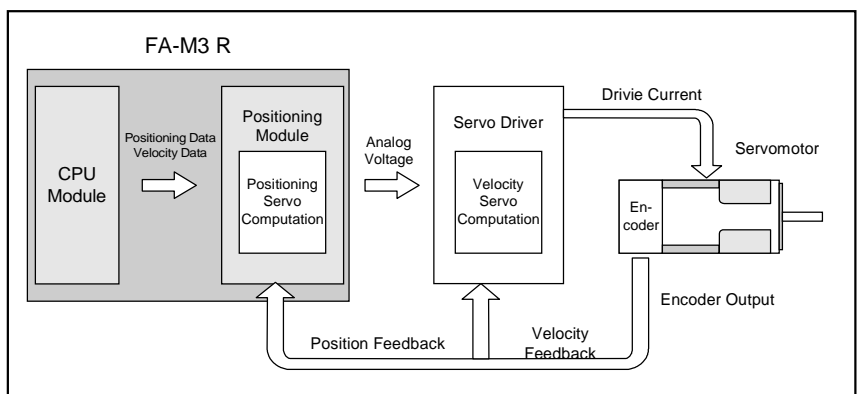
● Open-loop control (F3NC11-0N, F3NC12-0N, F3YP04-0N and F3YP08-0N)

According to the instructions sent from a CPU module, the positioning module computes the positioning command values and output them as pulse trains.



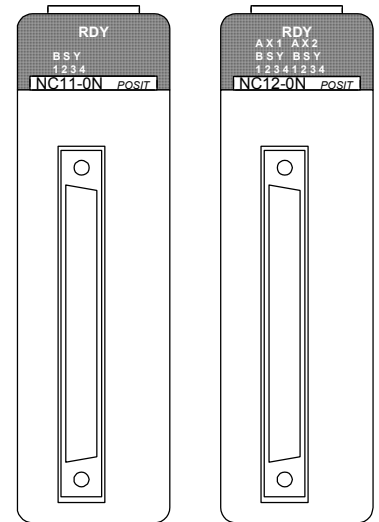
● Closed-loop control (F3NC51-0N and F3NC52-0N)

According to the instructions sent from a CPU module, the positioning module performs the position servo computation based on the position feedback signal input from the external position sensor, and outputs the velocity command as an analog voltage signal.



F3NC11-0N and F3NC12-0N Advanced model Positioning Modules with Positioning Pulse Output

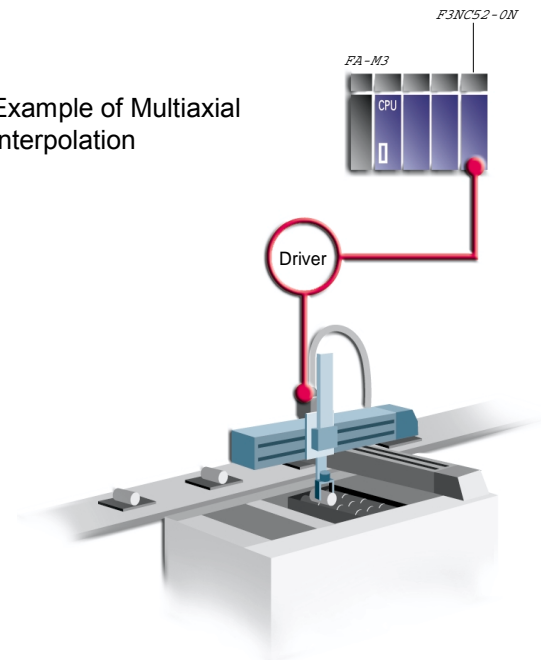
- For motor control on either 1 or 2 axes per module. Best suited to position-instructed servomotors and servo drivers as well as pulse motors and drivers.
- Max. 6 ms high speed response to activate the output pulse.
- A variety of actions are available, including on-route action and control mode switching by an external trigger signal.
- Various changes are possible during movement such as:
 - Velocity change
 - Target position change
 - Target position change associated with a change in direction of action
- Capable of switching the control mode from velocity control to position control and vice versa
- Biaxial arc interpolation is possible.
- Multiaxial linear interpolation is possible.
- Both line-driver and open-collector pulse outputs are available. The maximum output pulse rate is as high as 250 kpps (when using a line driver).



F3NC11-0N

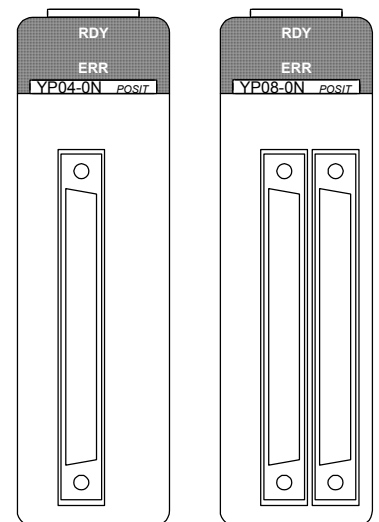
F3NC12-0N

Example of Multiaxial Interpolation



F3YP04-0N and F3YP08-0N Positioning Modules with Multi-channel Pulse Output

- For motor control on either 4 or 8 axes per module. Best suited to position-instructed servomotors and servo drivers as well as pulse motors and drivers.
- Max. 6 ms high speed response to activate the output pulse.
- Multiaxial linear interpolation is possible.
- Line-driver pulse outputs (differential signals conforming to RS-422) at the output pulse rate of as high as 250 kpps.

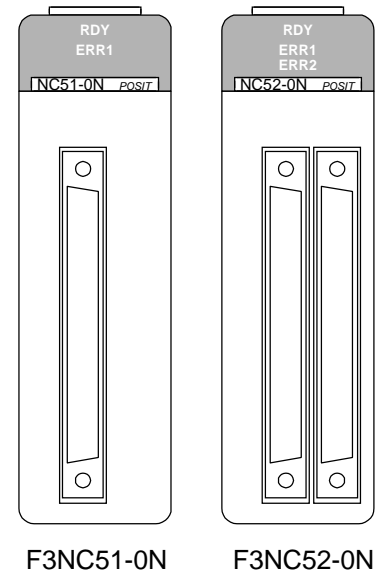


F3YP04-0N

F3YP08-0N

F3NC51-0N and F3NC52-0N Positioning Modules with Analog Voltage Output

- For motor control on either 1 or 2 axes per module. Outputs the velocity command value to servomotors and servo drivers based on the feedback signal from an external position sensor (encoder).
- Max. 6 ms high speed response to activate the output pulse
- Applicable to various encoders:
 - Incremental encoders, including:
 - General-purpose two-phase rotary encoders
 - Absolute encoders, including:
 - Yaskawa Electric serial absolute encoder
 - Sanyo Denki serial absolute encoders and their compatibles
- Motor control at a maximum speed of 2 Mpps in quad-speed mode
 - Can control a motor axis of 8000 pulses/rotation at 12000 rpm (corresponding to 1.6 Mpps).
- A variety of available functions include:
 - Switching between velocity control and position control, target position changes, linear interpolation, arc interpolation and on-route action
- Trapezoidal, two-line segment and three-step S-shaped drives are available in both the acceleration and deceleration modes.
 - No mechanical shock to transported goods
 - No mechanical stress to machines



Comparison of Positioning Modules

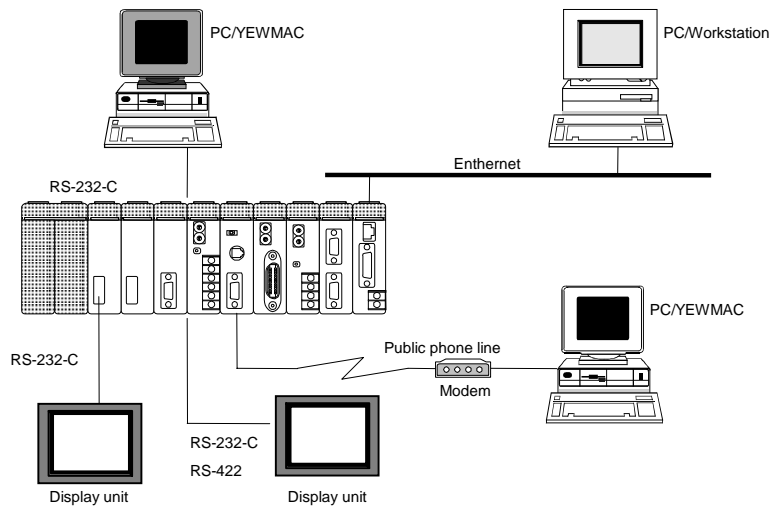
Item	F3NC11/F3NC12	F3NC51/F3NC52	F3YP04/F3YP08
Axes/module	1 or 2	1 or 2	4 or 8
Axes/system	36 or 72	36 or 72	144 or 288
Control method	Open-loop control	Feedback control	Open-loop control
Control output	RS-422A-compliant differential pulse output or open collector pulse output	-10 to 10 V DC	RS-422A-compliant differential pulse output
Control mode	Position control Velocity control Position-velocity control switching	Position control Velocity control Position-velocity control switching	Position control
Interpolation	Axis-by-axis independent interpolation Multiaxial linear interpolation Biaxial arc interpolation	Axis-by-axis independent interpolation Multiaxial linear interpolation Biaxial arc interpolation	-
Position command	-8,388,608 to 8,388,608 pulses	-134,217,728 to 134,217,727 pulses	-134,217,728 to 134,217,727 pulses
Velocity command	0.1 to 249,750 pulses/s	0.1 to 2,000,000 pulses/s	0.1 to 250,000 pulses/s
Functions	On-route action Change in target position during movement Change in velocity during movement	On-route action Change in target position during movement Change in velocity during movement Absolute and relative position designations Axis feed by manual pulser	Absolute and relative position designations
Acceleration and deceleration method	Trapezoidal	Trapezoidal, two-line segment, three-line segment	Trapezoidal
Acceleration and deceleration time	0 to 32,767 ms set individually for acceleration and deceleration	0 to 32,767 ms set individually for acceleration and deceleration	0 to 32,767 ms set individually for acceleration and deceleration

The personal computer link:

- (1) Is a communication link that is dedicated for the FA-M3 R and allows the device data within sequence CPUs to be read or written from other equipment (personal computers, display units, etc.) without intervention of a sequence program, and also allows a sequence program to notify events.
- (2) Allows you to select the network hardware specification from RS-232-C, RS-422, and Ethernet as required.
- (3) Allows use of display units from various manufacturers that support the FA-M3 R-specific personal computer link protocol.

Communication Specification	Module Name
RS-232-C	F3LC11-1□
	F3LC12-1F
	F3SP□□-□□*
RS-422/485	F3LC11-2F
Ethernet	F3LE01-5T

* The PROGRAMMER port on the CPU module is used.
(F3SP05/21/28/38/53/58)

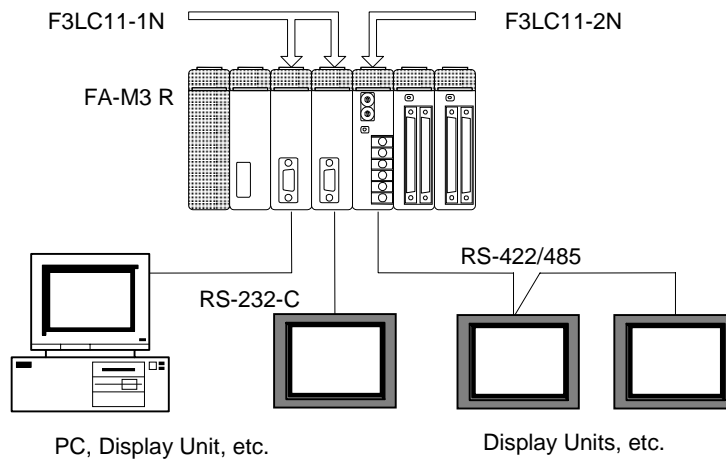


Modules that support personal computer link commands:

- F3LC11-□N personal computer link module
- F3LC12-1F personal computer link module
- F3SP□□-□□ sequence CPU module
- F3LE01-1N Ethernet interface module
- Differences in personal computer link between Ethernet interface module and other modules:
All modules support ASCII-coded commands and responses, but only the Ethernet interface module supports binary-coded commands and responses. Note that the Ethernet interface module uses different header and termination codes in ASCII mode from those of other modules.

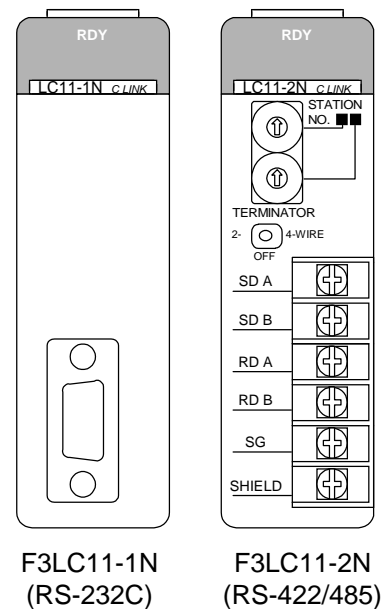
A personal computer link module provides the FA-M3 R with the personal computer link feature via RS-232-C or RS-422/485.

The built-in communications protocol allows connections to be made to other equipment that supports the same protocol without requiring any program, and facilitates system configuration. A personal computer link module is typically used to connect display units.

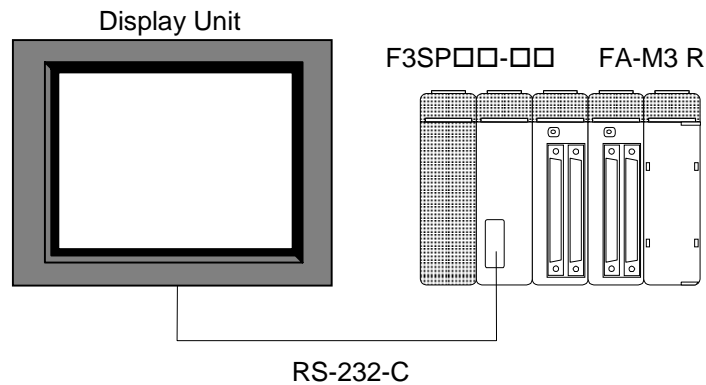


F3LC11-1□, F3LC11-2N and F3LC12-1F Personal Computer Link Modules

- Read/Write all devices in sequence CPU modules
- Read/Write common variables in the BASIC CPU module
- User program for data transmission not needed
- Direct connection to a display unit having a programmable controller interface
- Run/Stop a sequence CPU module remotely
- Load/Save a sequence program
- Read sequence program information such as program names, program size and block names, as well as error logs and user logs



A personal computer or display unit can be connected to the programming port of a sequence CPU module, providing an instant and low-cost personal computer link.



The same commands are used for personal computer link modules are sequence CPU modules.

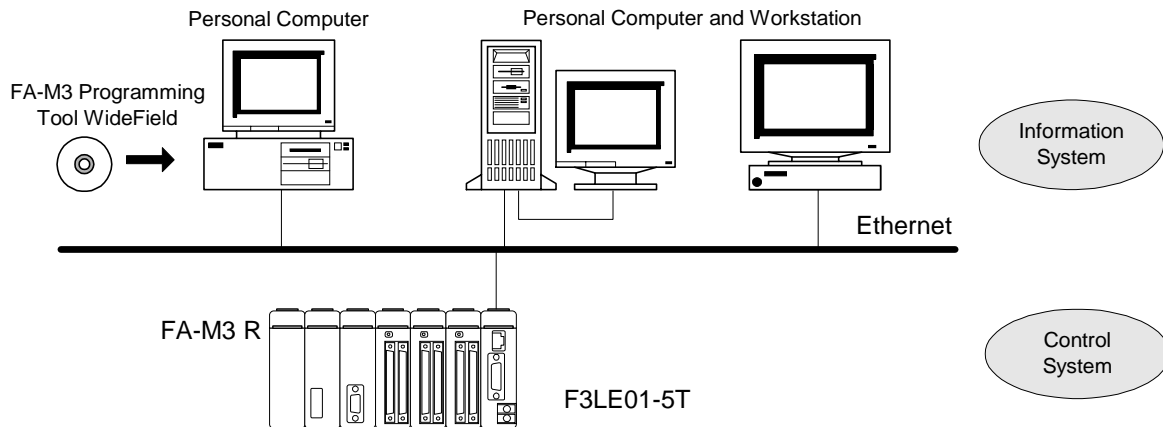
Note: The following cables are available for connection from Yokogawa.

- Model: KM11-2T, -3T or -4T
- Specification: D-sub 9-pin female; approx. 3, 5, or 10 meters long, respectively
- Model : KM10C-0C
- Specification : D-sub 9-pin female; approx. 0.5 meter long

Note: For details, see the General Specifications, FA-M3 CPU Port Cables (GS 34M6C91-01E).

The Ethernet interface module enables the FA-M3 R's data to be accessed via Ethernet as one style of personal computer link. Using this Module, the FA-M3 R's data can be accessed directly from personal computers and workstations, thus allowing an information system and control system to be directly linked.

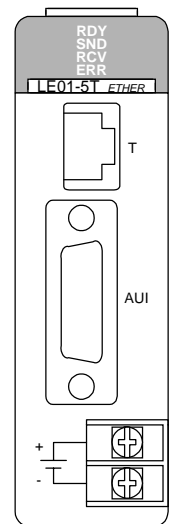
*Remote OME (see pages 29 to 32) is possible from a personal computer using WideField.



F3LE01-5T Ethernet Interface Module

The Ethernet interface module provides an IEEE802.3-compliant network connection port (10Base5/10Base-T), and performs the same functions as those performed by personal computer link modules (n:n communication) via serial communication.

- Remote OME
You can create and modify programs using WideField from a personal computer on the same network.
- Personal Computer Link (access through another node)
Through a node, you can:
 - Monitor and write devices in sequence CPUs from another node on the same network.
 - Download, upload, start and stop programs.
 - Read/write common variables in the BASIC CPU module.
 None of these requires a user program for communication. Both binary-coded and ASCII-coded commands and responses are supported, allowing for high-speed data transmission.
- Event transmission (access to another nodes)
The Ethernet module enables events to be transmitted to another nodes on the same network.



F3LE01-5T

Note: 10Base-T requires no external power supply.
When a 10Base5 network is used and the connected Ethernet device requires power to be supplied to its AUI connector, a 12 V DC power supply must be connected to the Ethernet module.

High-speed data transmission between FA-M3 R controllers for data sharing (4 times faster than the conventional FA link)

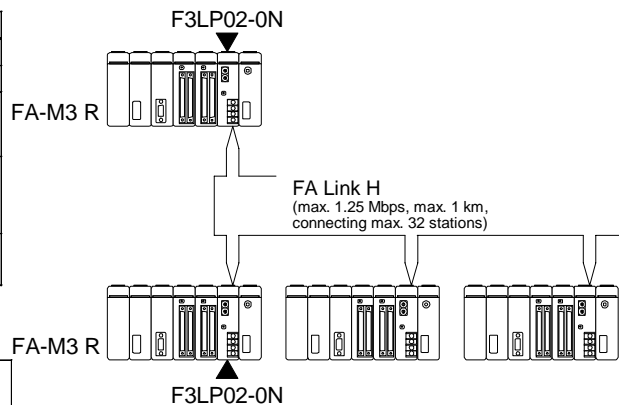
Conventional FA Link (F3LP01-0N) 250 Kbps → FA Link H (F3LP02-0N) 1.25 Mbps

F3LP02-0N

Item	Specification
Link relays	Up to 8192 (up to 2048 per link)
Link registers	Up to 8192 (up to 2048 per link)
Transmission speed	Max. 1.25 Mbps (can be selected from 125 Kbps, 250 Kbps, 625 Kbps, and 1.25 Mbps).
Maximum transmission distance	1 km, 500 m, 200 m or 100 m depending on the transmission speed (see the table below).
Transmission media	Shielded twist-pair cable

Transmission Speed vs. Transmission Distance

Transmission speed	125 Kbps	250 Kbps	625 Kbps	1.25 Mbps
Maximum transmission distance	1 km	500 m	200 m	100 m

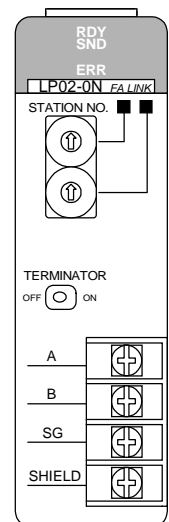


F3LP02-0N FA Link H Module

FA link H is a high-speed network for data exchange between FA-M3 R controllers. Up to 32 stations, where one station corresponds to one FA link H module, can be linked together for data sharing.

- Up to 8 FA link H modules can be installed in an FA-M3 R main unit (for the SP28, SP38, SP53 or SP58; up to 2 modules for the SP21) to allow data links to be structured hierarchically.
- The numbers of link devices can be set arbitrarily for each CPU.
- There are two operation modes for each FA link H: normal mode and high-speed mode. In the normal mode, up to 2048 link relays and 2048 link registers can be used per module. In the high-speed mode, up to 1024 link relays and 1024 link registers can be used per module.
- The transmission speed can be selected from 125 Kbps, 250 Kbps, 625 Kbps and 1.25 Mbps. The transmission speed setting determines the maximum transmission distance as 1 km, 500 m, 200 m and 100 m, respectively.
- The bus-like multi-drop network topology facilitates expansion of the link.
- Modules can be easily connected to each other with shielded twist-pair cables.

Note: When connecting to an FA500 use the F3LP01-0N FA link module.

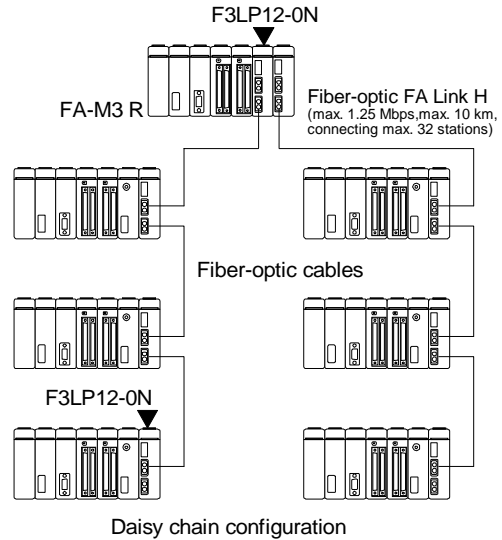


F3LP02-0N

High-speed data transmission between FA-M3 R controllers for data sharing, Fiber-optic cable

F3LP12-0N

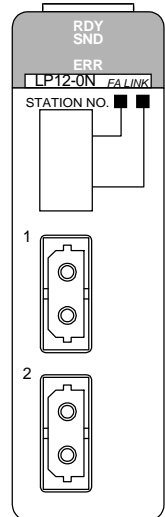
Item	Specification
Link relays	Up to 8192 (up to 2048 per system)
Link registers	Up to 8192 (up to 2048 per system)
Transmission speed	Max. 1.25 Mbps
Maximum transmission distance	1 km between units 10 km of total extension
Network topology	Daisy chain
Transmission media	Two-core fiber-optic cable



F3LP12-0N Fiber-optic FA Link H Module

Fiber-optic FA link H is a high-speed fiber-optic network for data exchange between FA-M3 R controllers. Up to 32 stations, where one station corresponds to one FA link H module, can be linked together for data sharing.

- Up to 8 fiber-optic FA link H modules can be installed in an FA-M3 R main unit (for the SP28, SP38, SP53 or SP58; up to 2 modules for the SP21) to allow data links to be structured hierarchically.
- The numbers of link devices can be set arbitrarily for each CPU.
- There are two operation modes for each FA link H: normal mode and high-speed mode. In the normal mode, up to 2048 link relays and 2048 link registers can be used per module. In the high-speed mode, up to 1024 link relays and 1024 link registers can be used per module.
- High noise immunity of fiber-optic cables allows a transmission speed of as fast as 1.25 Mbps over maximum inter-station distances of 1 km and the total extension of 10 km.
- The network topology is daisy chain.

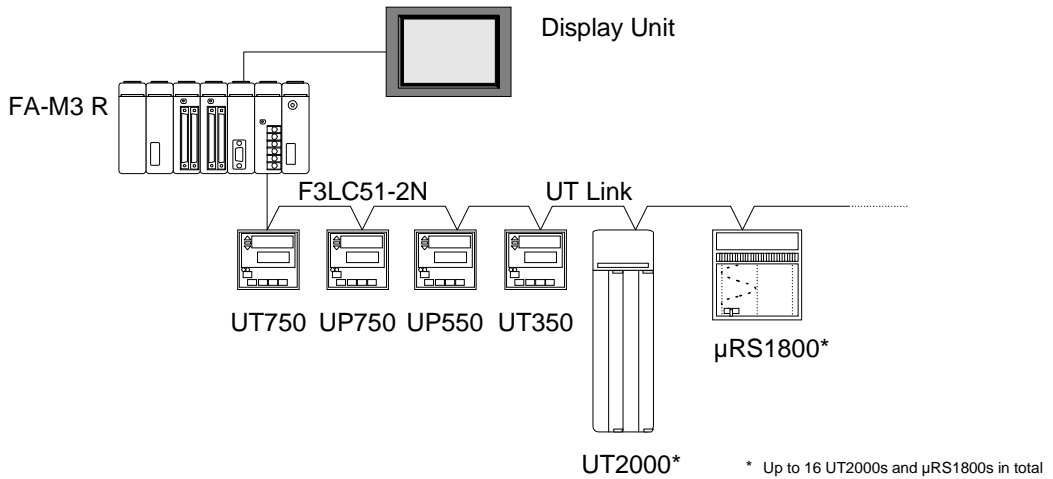


F3LP12-0N

Easy Monitoring and Setting of UT Series Temperature Controllers

Features:

- (1) Data access from ladder programs without considering communications. Data can be acquired with just a READ instruction.
- (2) Up to a total of 31 UT series temperature controllers (UT750, UP750, UP550, UT350 and UT2000*) and μ RS1800* recorders can be connected.
- (3) Field data from the above instruments can be acquired and stored to data registers via hardware connections only, thus allowing field data to be accessed by accessing the data registers.

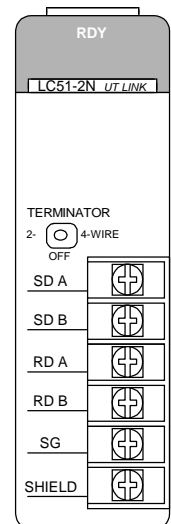


F3LC51-2N UT Link Module

The UT link module achieves simple connections between an FA-M3 R controller and external instruments, such as temperature controllers, that support the protocol and commands of the personal computer link.

- The module continuously refreshes the data of the linked external instruments. Without a user program for communication, data exchange with external instruments can be performed by accessing the registers of the module. Data access can also be performed upon occurrence of a specified event.
- A total of up to 31 UT temperature controllers and μ R1800* recorders can be connected per UT link module over the maximum cable extension of 1200 m (for RS-485).

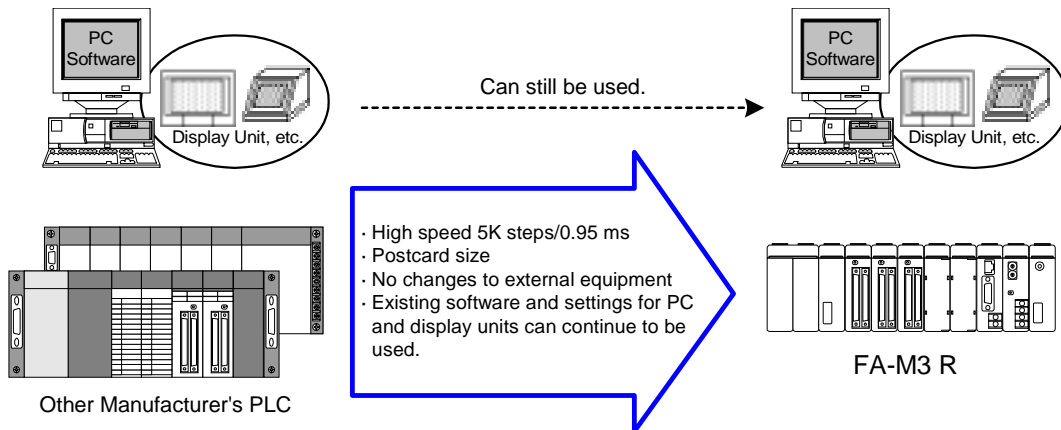
Note: The UT350, UT550, UT750, UP750 and UT2000 are products Yokogawa M&C corporation.



F3LC51-2N

Easy replacement of other manufacturer's PLC to FA-M3 R allowing the use of existing user-developed resources

- ◆ Where a personal computer is connected to another manufacturer's* PLC, the PLC can be replaced by the FA-M3 R and the existing PC applications can still be used.
- ◆ The existing equipment that supports other PLC's* protocol can access the FA-M3 R.



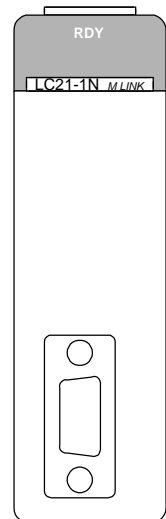
* The current version of the F3LC21-1N multi-link module only supports of PLCs from Mitsubishi Electric Corporation and OMRON Corporation.
 ● The company names appearing in this document are registered trademarks of their respective holders.
 ● For details on models whose connection has been verified, consult your nearest Yokogawa representative or sales office.

F3LC21-1N Multi-link Module

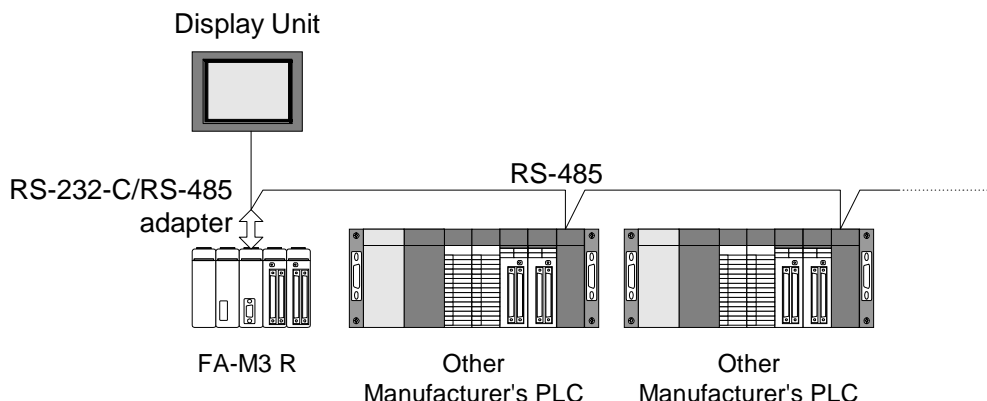
The multi-link module is a communication module for connecting to a higher level computer such as a personal computer or FA computer, or a display unit via an RS-232-C interface on a point-to-point** basis.

- Supports the computer link commands of Mitsubishi Electric Corporation's PLCs and high-level link commands of OMRON Corporation's PLCs, enabling connection to external equipment that can connect these PLCs.
- Can read and write devices.
- No need for ladder program for communication.
- Read/write from/to devices even the respective ladder programs are not running
- Run/stop FA-M3 R remotely.

** Using an RS-232-C/RS-485 adapter enables the FA-M3 R controller to be allocated on the same communication line as another PLCs (where the station number is fixed to 00).

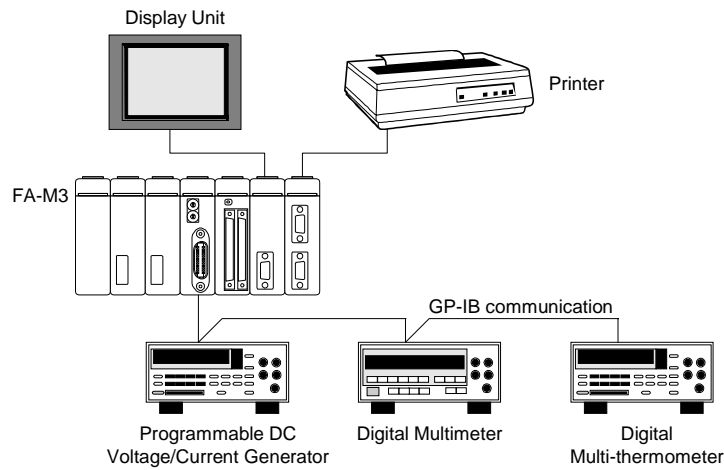


F3LC21-1N



High-speed Communication with Testing and Measuring Instruments as Well as Various Signal Generators

- ◆ Accessible from ladder and BASIC programs
- ◆ Enables waveform generators, digital multimeters, LCR meters, etc. to be connected, their signal generation conditions to be set, and the measured data to be read easily via GP-IB, thus reducing the leadtime of testing and inspections.

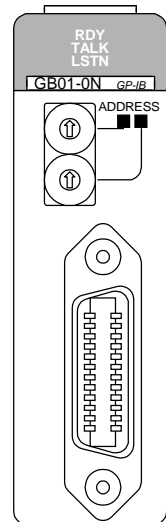


F3GB01-0N GP-IB Communication Module

The GP-IB communication module connects the FA-M3 R to instruments having a GP-IB interface, such as testing and measuring instruments.

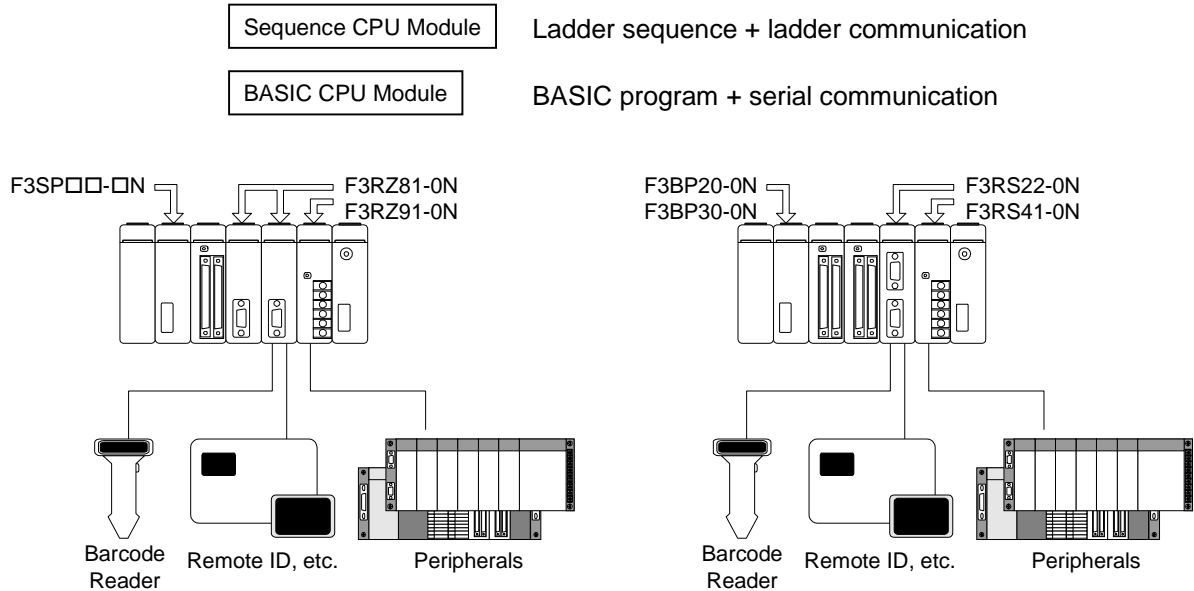
- Has one GP-IB port.
- Supports GP-IB controller functions for transmission of interface messages.

Note: Conforms to ANSI/IEEE standard 488.



F3GB01-0N

Access from Ladder and BASIC Programs to Field Instruments via RS-232-C or RS-422/485 Interface

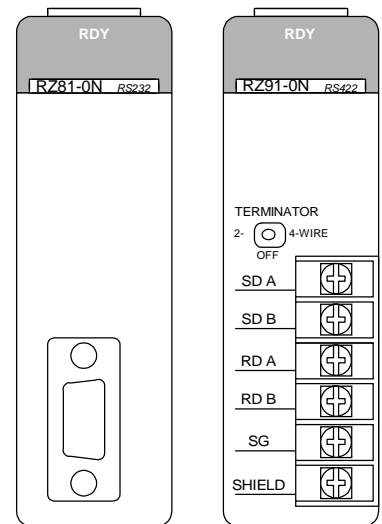


Ladder Sequence + Ladder Communication
F3RZ81-0N RS-232-C Communication Module

- The F3RZ81-0N module is used to carry out RS-232-C communication from ladder program inside a sequence CPU module.
- The module has one RS-232-C port with a D-sub 9-pin connector and allows the maximum transmission distance of 15 meters.

F3RZ91-0N RS-422 Communication Module

- The F3RZ91-0N module is used to carry out RS-422 or RS-485 communication from a ladder program inside a sequence CPU module.
- The module has screw terminals for RS-422/485 port and allows the maximum transmission distance of 1200 meters.

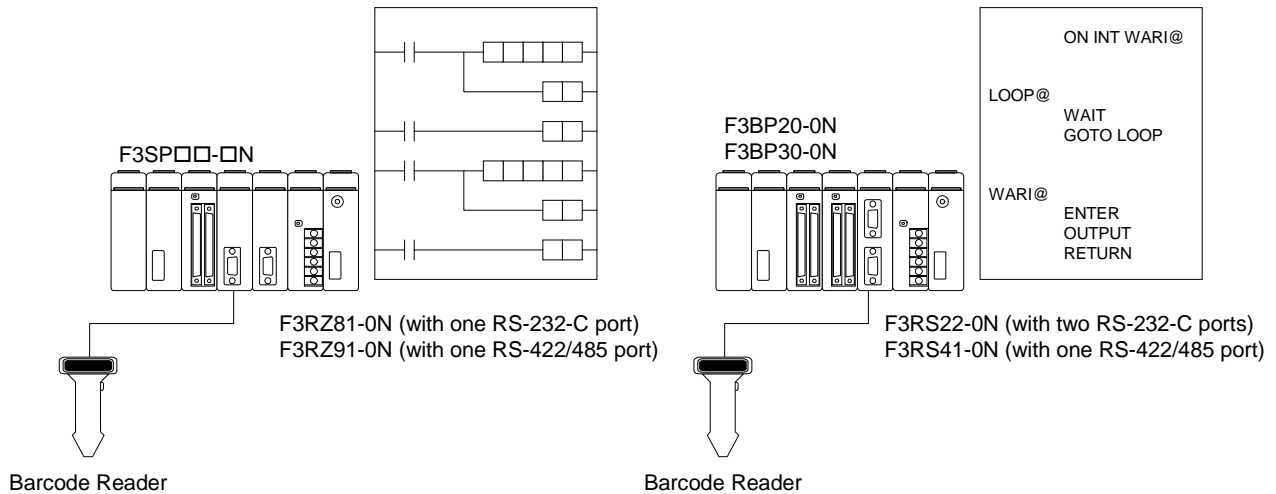


F3RZ81-0N

F3RZ91-0N

- Access from a Ladder Sequence Program by Combination of a Sequence CPU Module and a Ladder Communication Module

- Access from BASIC Program by Combination of a BASIC CPU Module and a Serial Communication Module



BASIC Program + Serial Communication
F3RS22-0N RS-232-C Communication Module

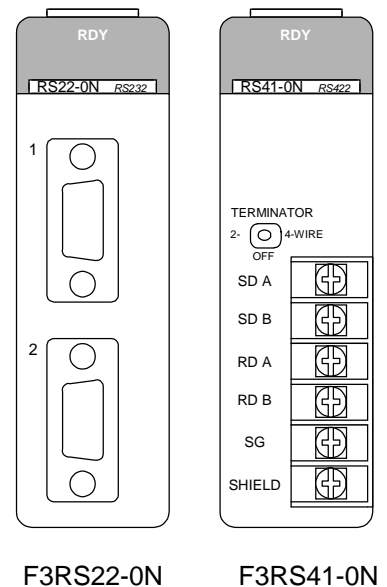
- The F3RS22-0N module is used with a BASIC CPU module to carry out RS-232-C communication.
- The module has two RS-232-C ports with D-sub 9-pin connectors and allows the maximum transmission distance of 15 meters.
- BASIC statements for transmission and reception to/from communication lines are provided.

Note: This module is dedicated for use with a BASIC CPU module.

F3RS41-0N RS-422 Communication Module

- The F3RS41-0N module is used with a BASIC CPU module to carry out RS-422 or RS-485 communication.
- The module has screw terminals for one RS-422/485 port and allows maximum transmission distance of 1200 meters.
- BASIC statements for data transmission and reception to/from the communication lines are provided.

Note: This module is dedicated for use with a BASIC CPU module.



FA-M3's extensive functions and unrivaled performance come at an economic price. A special set of CPU, power supply and I/O modules is offered at a discount price as a value pack

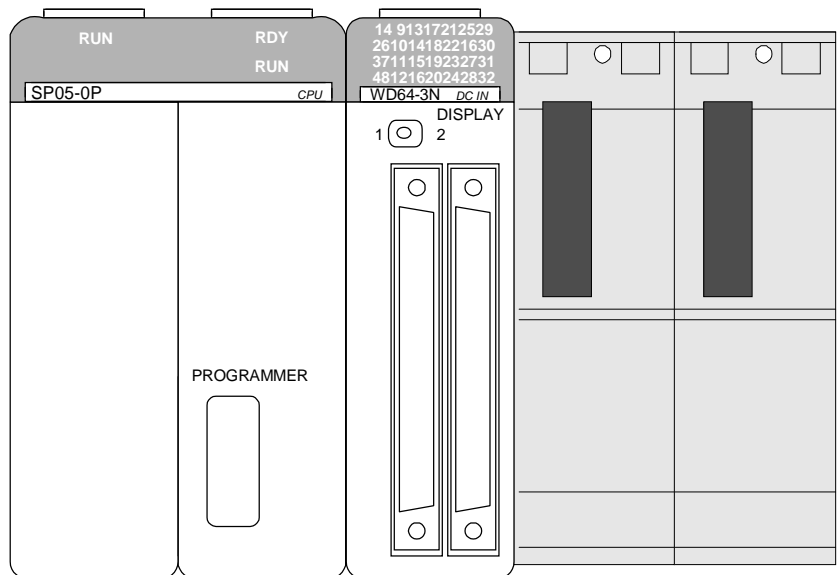
The FA-M3 value pack, F3SC21-1N, is a compact controller composed of:

- ◆ An F3BU04-0N four-slot base module
- ◆ An F3SP05-0P sequence CPU module with power supply unit and memory
- ◆ An F3WD64-3N input/output module with 32 input and 32 outputs

Item		Specification
F3BU04-0N base module	Number of slots	4 (available spare slots: 2)
	Power supply unit	Input power supply voltage: 100-240 V AC, single phase, 50/60 Hz Rated output: 5 V DC, 2.0 A Others: The same as F3PU10-0N
F3SP05-0P sequence CPU module	Sequence CPU	Programming language: Structured ladder, mnemonic
		Instructions: BASIC instructions: 25 kinds; application instructions: 227 kinds
		Program capacity: 5K steps (can be saved to a ROM)
		Number of I/O points: Max. 2048
	Others: The same as F3SP21-0N	
F3WD64-3N input/output module	Input	32 DC voltage inputs, rated voltage: 24 VDC
	Output	32 transistor contacts (sink); rated voltage: 24 VDC

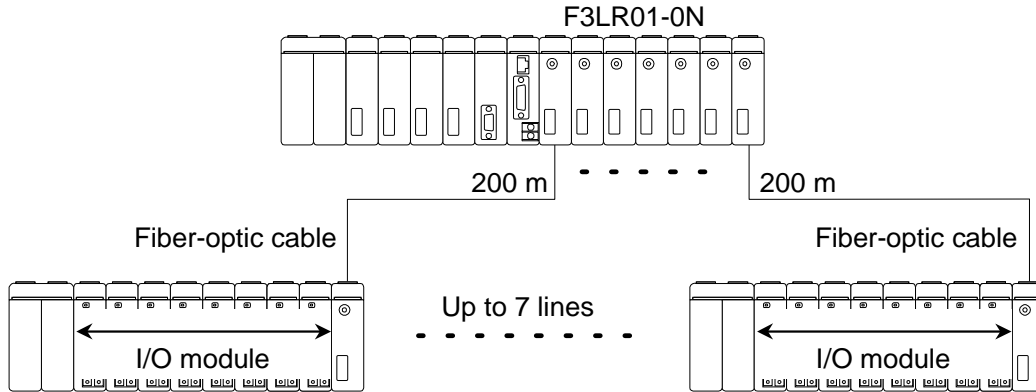
F3SC21-1N Value Pack

- Ultra-compact to save space inside the panel.
- The sequence CPU module can receive a universal power supply voltage ranging from 100 to 240 V AC, so the power supply need not be considered.
- High-speed execution of instructions facilitates development of applications with a fast response.
- Installing an optional ROM pack allows programs and data to be saved.



F3SC21-1N

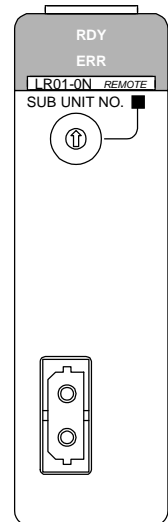
- ◆ The fiber-optic FA-bus module enables data to be sent as high-speed as 10 Mbps. Modules in subunits can be handled like those in the main unit with no effect on the scan time. (Data refresh rate: 1 ms for 1024 devices)
- ◆ No transmission delay by direct access to I/O devices
- ◆ Not only digital I/O modules but also almost all the modules including analog I/O, temperature controller and pulse input modules installed in a subunit can be handled.
- ◆ Up to 7 fiber-optic FA-bus modules (for up to 7 subunits) can be installed in main unit for the maximum number of I/O points allowed for the CPU module used.



F3LR01-0N Fiber-optic FA-bus Module

The fiber-optic FA-bus module is an interface module used to configure a fiber-optic FA-bus system to perform distributed control. To build the ideal remote I/O system, simply install fiber-optic FA-bus modules in an FA-M3 R main unit and in subunits, and connect them with fiber-optic FA-bus cables.

- Many advanced modules can be installed in subunits, and the modules can be accessed in the same way as the modules in the main unit. (The FA link, FA link H, fiber-optic FA link H and Ethernet interface modules are exceptions.)
- No specific configuration settings are required for remote I/O.
- Fiber-optic data transmission eliminates being affected by noise.

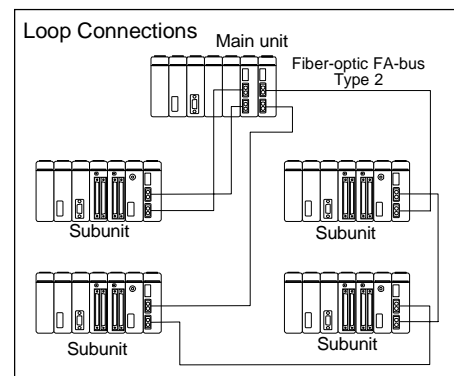
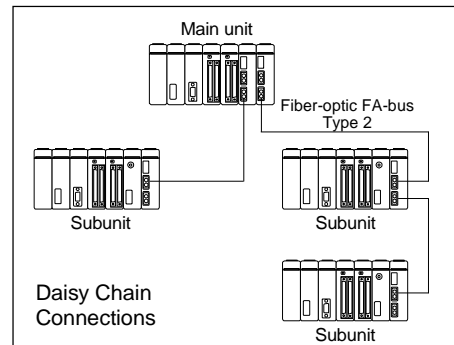


F3LR01-0N

Multi-station remote I/O system with high-speed transmission over a long distance

F3LR02-0N

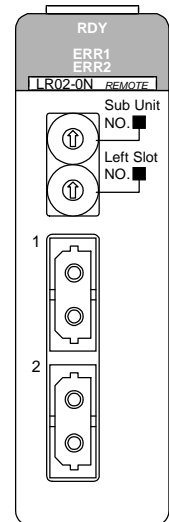
Item	Specification
Transmission speed	10 Mbps
Transmission media	Two-core fiber optic cable
Transmission distance	Between stations : 500 m Total extension : 1.4 km
Maximum number of subunits	56 (32 per line)
Network topology	Daisy chain or loop



F3LR02-0N Fiber-optic FA-bus Type 2 Module

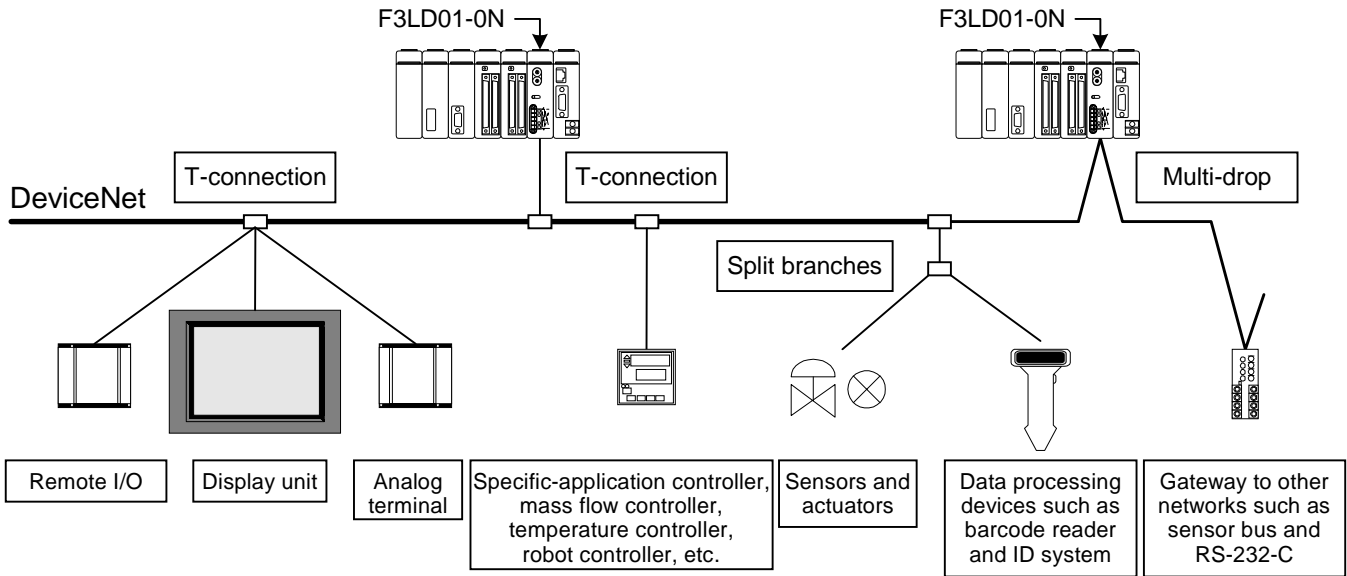
The fiber-optic FA-bus type 2 module is an interface module used to configure a system for which high distribution of I/O units is required. To build the ideal, highly distributed remote I/O system, simply install fiber-optic FA-bus type 2 modules in an FA-M3 R main unit and in subunits, and connect them with fiber-optic FA-bus cables.

- Many advanced modules can be installed in subunits, and the modules can be accessed in the same way as the modules in the main unit. (The FA link, FA link H, fiber-optic FA link H and Ethernet interface modules are exceptions.)
- A subunit can be distributed to up to 8 subunits.
- Each module has 2 pairs of transmission and reception ports to allow daisy chain connections.
- If the network is configured by loop connections, it is switched to two daisy chain networks when there is a line breakage, thus enhancing reliability.
- No specific configuration settings are required for remote I/O.
- Fiber-optic data transmission eliminates being affected by noise.
- For point-to-point connections, use lower-priced F3LR01-0N fiber-optic FA-bus modules.



F3LR02-0N

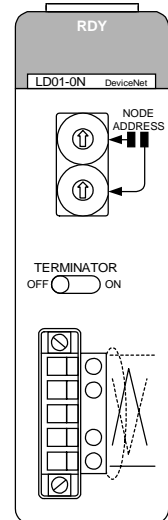
De Facto Standard, Reduced-cabling System



F3LDO1-0N DeviceNet* Interface Module

The DeviceNet* interface module is used to connect to DeviceNet.*

- World-standard open field network
 - Field-proven worldwide
 - Connectable to various devices sold around the world
- Adopted as the standard sensor bus by SEMI **
 - Ideal for semiconductor manufacturing equipment
- Flexible connections
 - Multi-drop connection with T-connectors allows flexible cabling and network expansion and modification.
- Various applications supported
 - Extension distance: Max. 500 m (when using a thick cable with a transmission speed of 125 kbps)
 - Transmission speed: Max. 500 kbps (with the cable extension distance of 100 m or less)
 - Number of devices connected: Up to 64 (including the master device)
- Extensive transmission data
 - Up to 8000 inputs and 8000 outputs, a total of up to 16,000 input/output points



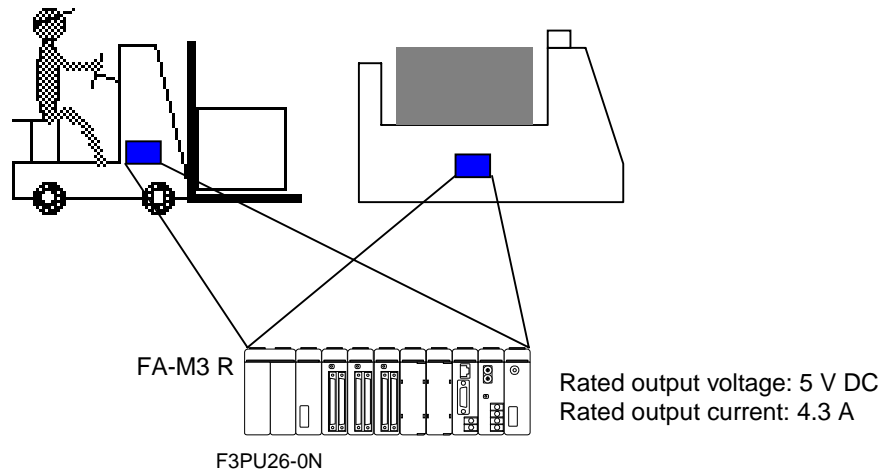
F3LD01-0N

* DeviceNet is a registered trademark of Open DeviceNet Vendor Association.

** Acronym of Semiconductor Equipment and Materials International

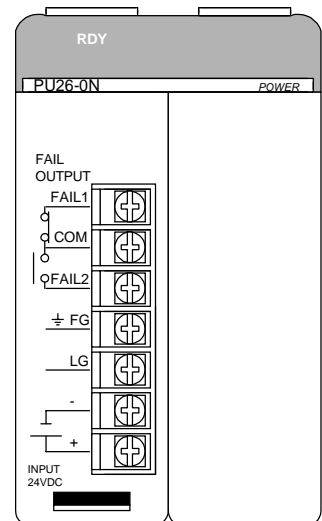
DC Power Supply Module Added to Lineup

- ◆ The DC power supply module makes full use of the FA-M3 R's features of compactness, light-weight, and low power consumption. It is ideal for installing an FA-M3 R controller inside battery-driven equipment such as an automatic guided vehicle (AGV).
- ◆ A wide range of allowable power supply voltage fluctuations from 15.6 to 31.2 V



F3PU26-0N Power Supply Module

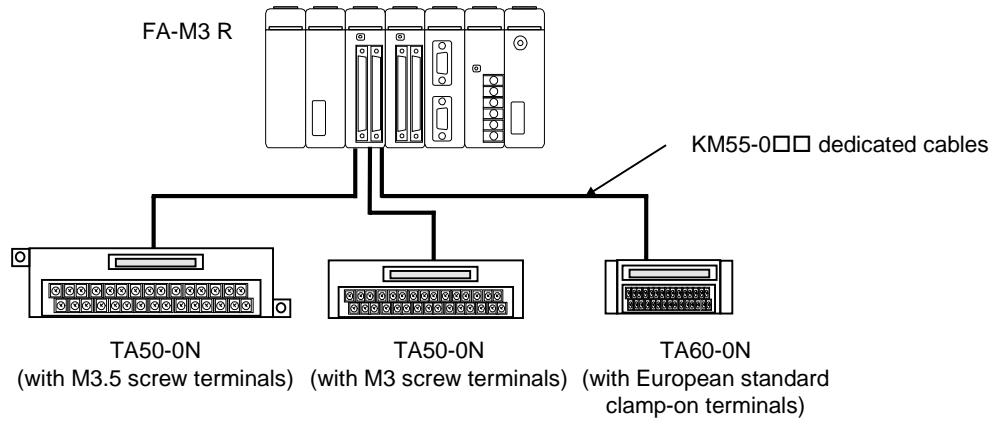
Item	Specification
Supply voltage	24 V DC
Allowable supply voltage fluctuations	15.6 to 31.2 V DC
Maximum power consumption	33.1 W
Rated output voltage	5 V DC
Rated output current	4.3 A
Insulation resistance	At least 5 MΩ at 500 V DC between DC input terminals and FG (frame ground) terminal
Withstanding voltage	1500 V AC for 1 minute between DC input terminals and FG (frame ground) terminal
Insensitive instantaneous power failure time	20 ms
Noise immunity	Withstands noise of 1500 Vp-p for 1 μs with the rise time of 1 ns at frequencies of 25 to 60 Hz (tested using a noise simulator).



F3PU26-0N Module

The FA-M3 R employs market standard connectors for its 32-and 64-point I/O modules, so a huge range of cables and terminal blocks from other vendors can be used.

Of course, the FA-M3 R offers terminal blocks with a connector and dedicated connector cables.



TAS0-0N, TA50-1N and TA60-0N Terminal Blocks
 KM-50-0□□ Dedicated Cables

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