FA-M3V
Leading Edge Controller

www.yokogawa.com/itc/
INTRODUCTION

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CONTENTS

Sequence CPU module (F3SP71-4S/F3SP76-7S)
- FA-M3 CPU product history
- Launch of new FA-M3 series; FA-M3V’s design concept
- Features and functions (high-speed, truly range-free, network functions, high-precision and reliability, security, sampling trace function)
- Field application examples
- System migration precautions

FA-M3 Programming Tools
- FA-M3 Programming Tool WideField3
  - FA-M3V (F3SP7□) support, functional enhancements, overview of new functions and improvements
  - Precautions for WideField2 to WideField3 migration
- ToolBox for Temperature Control and Monitoring Modules
- ToolBox for Positioning Modules
- ToolBox for Positioning Modules (for F3YP22, 24 and 28)

List of New Products & User Manuals

Other New Products
- Positioning Modules (with multi-channel pulse output) F3YP22-0P, F3YP24-0P, F3YP28-0P
- Sequence CPU Module (F3SP22-0S)
Sequence CPU Module
New Products Introduction

FA-M3 CPU Product History (positioning of new series)

Since its debut in 1992, the FA-M3 CPU has been the industry leader in PLC concepts.

In 2010, we launch a new CPU series after 4 years of R&D!

Let’s Network! (with network support)

New FA-M3 series!

- Program size 260K steps max.
- Min. scan time 100μs
- Basic instructions from 3.75 ns
- 64-bit integer arithmetic
- Double-precision floating point
- Object ladder
- Multi-CPU
- Network functions
- 100Mb Ethernet
- Enhanced security
- Enhanced security
- 32GB

Debut of FA-M3!

SP10, 20, 30
- Program size 20 K steps max.
- Basic instructions from 90 ns
- Structured ladder
- Multi-CPU

SP21, 25, 35
- Program size 50 K steps max.
- Basic instructions from 90 ns
- Structured ladder
- Multi-CPU

SP28, 38, 53, 58, 59
- Program size 256 K steps max.
- Basic instructions from 17.5 ns
- Object ladder
- Multi-CPU

F3SP66, 67
- Program size 120 K steps max.
- Min. scan time 200μs
- Basic instructions from 17.5 ns
- Object ladder
- Multi-CPU
- Network functions
- 100Mb Ethernet
- SD memory (1GB)

F3SP71, 76
- Program size 260 K steps max.
- Min. scan time 100μs
- Basic instructions from 3.75 ns
- 64-bit integer arithmetic
- Double-precision floating point
- Object ladder
- Multi-CPU
- Network functions
- 100Mb Ethernet
- Enhanced security
- Enhanced security
- 32GB

10Kstep/1ms
20Kstep/1ms

1992
1999
2001
2006
2010
Launch of New FA-M3 Series

Leading-edge controller
The new FA-M3 “V” series!

* The “V” in FA-M3V stands for “vitesse,” which means speed in French.

The FA-M3 is designed and best known for its speed. It’s only natural that the new series be named “Vitesse”, which means speed in French.

FA-M3V’s Design Concept

Stretching the High Speed IPRS design concept

From day one, FA-M3 has relentlessly pursued higher speeds as the most effective means to solving customer challenges.

Over time, this has evolved into the High Speed IPRS (Instruction, Processing, Response and Scan) design concept.

The new FA-M3V series offers extensibility and reliability at incredible speed. It’s the leading edge controller for customers who demand the world’s best.
The controller is powered by two core speed technologies

FA-M3V's two core technologies add stable control at the highest speed to customer systems.

- **FA-M3 “Vitesse Engine” for ladder processing**
  - Supreme processing capability
    - Fastest in the industry! 100K-steps in 1 ms. *As of Nov 2010
    - Basic instructions: 3.75 ns min.
    - Application instructions: 7.5 ns min.
    - Floating-point Add instruction: 37.5 ns
    - Minimum scan time: 100 μs (Resolution: 10 μs when using SCB)

- **New control method (PIPS)**
  - Fast, stable control for achieving high quality production
  - Parallel & Independent Processing System
  - Ladder instruction processing and peripheral processing are carried out independently and in parallel. This ensures fast, stable control under all conditions.

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Creating the Leading Edge Controller

Quadruple Speed Quest

Quadruple speed quest based on High-speed IPRS design concept

- **High-speed Instructions**
  - Basic instructions: 3.75 ns~
  - Application instructions: 7.5 ns~
  - Floating-point Add instruction: 37.5 ns

- **High-speed Processing**
  - Sensor control function allows constant scan at 100 μs~
  - 10 μs resolution when using sensor control block (SCB)

- **High-speed Response**
  - Instantaneous response to interrupts of 85 μs

- **High-speed Scan**
  - Fastest in the industry! 100K steps/1 ms scan time

4.6x faster!
Basic instructions: 17.5 ns → 3.75 ns

2x shorter! 10x better!
Scan time: 200 μs → 100 μs Resolution: 100 μs → 10 μs

1.2x faster!
Interrupt response: 100 μs → 85 μs

5x faster!
20K steps → 100K steps
Solving Customer Problems with Speed

→ **FA-M3V solves development process problems with speed**

From CPU model selection all-the-way to maintenance, the FA-M3V promises stress-free development by enabling development according to design and reducing development effort from ladder program design to engineering.

To improve development efficiency, program reuse and programming ease are important. Coding complex arithmetic expressions in ladder programs is a pain!

Computational load increases along with quality control and recipe data. With existing PLCs, processing is prolonged so device fails to operate as expected.

Using password to protect software assets affects operability.

I want to choose a CPU without worrying about processing speed, memory size and cost. Picking the right CPU from so many product models is tough!

Processing is sometimes delayed by data accesses from PCs, etc. I need stable operation under all circumstances!

System upgrade requires a larger program but memory is insufficient and processing is slower.

**FA-M3V offers a stress-free solution**

Truly Range-free Controllers

→ **The FA-M3 family is consolidated into two new CPU models of 60K-step and 260K-step program size to deliver best performance in the industry with incredible cost-performance ratio!**

- **Sequence CPU modules (with network functions)**
  - **F3SP71-4S**  **NEW**
    - 60K ladder steps, basic instruction 3.75 ns min., built-in network functions
  - **F3SP76-7S**  **NEW**
    - 260K ladder steps, basic instruction 3.75 ns min., built-in network functions

* Use F3SP71 and F3SP76 CPUs with FA-M3 Programming Tool WideField3 (SF630-MCW) R1.01 or a later version

<table>
<thead>
<tr>
<th>Item</th>
<th>F3SP71</th>
<th>F3SP76</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Control mode</strong></td>
<td>Stored program, repetitive operation</td>
<td>Stored program, repetitive operation</td>
</tr>
<tr>
<td><strong>I/O control mode</strong></td>
<td>Refreshing method / direct I/O instructions</td>
<td>Refreshing method / direct I/O instructions</td>
</tr>
<tr>
<td><strong>Programming language</strong></td>
<td>Object ladder language</td>
<td>Object ladder language</td>
</tr>
<tr>
<td><strong>Number of instructions</strong></td>
<td>Basic 40 types</td>
<td>Basic 40 types</td>
</tr>
<tr>
<td><strong>Processing speed</strong></td>
<td>Basic 0.00375 μs per instruction</td>
<td>Basic 0.00375 μs per instruction</td>
</tr>
<tr>
<td></td>
<td>Application 0.0075 μs per instruction</td>
<td>Application 0.0075 μs per instruction</td>
</tr>
<tr>
<td><strong>Program size</strong></td>
<td>60K steps</td>
<td>260K steps</td>
</tr>
<tr>
<td><strong>Project size</strong></td>
<td>120K steps max.</td>
<td>520K steps max.</td>
</tr>
<tr>
<td><strong>Number of parameters (including remote I/O)</strong></td>
<td>4096 points max.</td>
<td>8192 points max.</td>
</tr>
<tr>
<td><strong>Device size</strong></td>
<td>Internal relay 16384 points (16K)</td>
<td>Internal relay 65535 points (64K)</td>
</tr>
<tr>
<td></td>
<td>Data register 16384 points (16K)</td>
<td>Data register 65535 points (64K)</td>
</tr>
<tr>
<td></td>
<td>File register 32768 points (32K)</td>
<td>File register 262144 points (256K)</td>
</tr>
<tr>
<td></td>
<td>Cache register 131072 points (128K)</td>
<td>Cache register 524288 points (512K)</td>
</tr>
<tr>
<td><strong>Communication ports</strong></td>
<td>USB2.0 (12 Mbps), Ethernet</td>
<td>USB2.0 (12 Mbps), Ethernet</td>
</tr>
<tr>
<td><strong>Memory card slot</strong></td>
<td>SD memory card (SDHC compatible)</td>
<td>SD memory card (SDHC compatible)</td>
</tr>
</tbody>
</table>
All-in-one CPU Module

Built-in Ethernet network support

The FA-M3V has built-in network support, which enables fast, stable communication, just like the F3SP6□. In addition to space and cost savings, it enables networking without affecting control processing.

Enhanced integration with higher-level systems

Fast communication response is achieved without compromising stable control.

Scaling up for large production data is simple.

- Much higher Ethernet throughput
- Easy storage of large data
  - Large memory and SD memory card (SDHC compliant 32 GB max.)
  - Cache registers (1 MB max.)
    - F3SP71: 0.25 MB (128K words)
    - F3SP76: 1 MB (512K words)
- Modbus/TCP Slave (server) function

Network Functions (Handling of Large Data)

Large production data can be stored in the CPU.

The FA-M3V comes standard with an SD memory card slot and a RAM disk for storing large data required for ever faster and more advanced devices.

- Built-in SD memory card slot
  - Up to 32 GB SDHC memory cards are supported for storing data, programs and log records as files.
  - Compatible with off-the-shelf SD memory cards
  - Redundancy of the file control area (FAT) reduces risk of file system damage due to power outage or card removal during writing.

- Built-in RAM disk
  - 4 MB RAM disk included for storing data and log records as temporary files (volatile memory)

* Comparison with older CPUs based on reading and writing 256K words of data

* • Saving and accumulating large data!

- • Fast access!

- • Accumulating routine data
- • Saving error log
- • Saving reliable raw field data even when the network is down.
FTP client and server functions
StoredProcedure can be transferred between CPU and host PC or server.

- FTP client functions
  Stored data can be transferred from CPU to host PC or server autonomously and collectively with no need of programming. Reduces load on the production line or control system network. Large data can be sent or received in one go.

- FTP server functions
  Easy FTP connection from the host PC by software or from a command line. Virtual directory allows program, data and log files to be loaded or saved using simple file operations.

- FTP server access and response log
  FTP server access and responses are logged for convenience of debugging and access management.

Network Functions ("PC-less" Maintenance)

Card batch file function
"PC-less" maintenance using SD memory card
- Batch commands coded in auto-execute files stored on a SD memory card can be automatically executed in response to various execution triggers (e.g. card insertion or error events, etc.)
- Routine operations such as recipe loading or log acquisition for troubleshooting can be executed automatically simply by inserting an SD memory card.

Rotary switch functions
Maintenance using rotary switch with no need of PC (WideField3)
- Maintenance such as program loading, log file retrieval can be performed simply by turning a rotary switch (MODE switch) and pressing a push button (SET switch) located on the front panel of the module.

List of execution triggers
- Startup (power on or system reset)
- Run program event
- Stop program event
- Mount memory card event
- Error
- Alarm
- FTP (receipt of virtual memory command or card batch file execution command)

Device developer
- Save settings (including programs) on SD card
- Send content of SD card by Email
- Courier SD card

Maintenance personnel
- Insert SD card
- Set rotary switch
- Power on
Network & file processing instructions

Handle large data easily by executing dedicated ladder instructions.

- Socket (TCP/IP, UDP/IP) communications instructions
- FTP client instructions
- File access instructions
- File operation instructions
- Disk operation instructions

Continuous-type application instructions

Time-consuming processing does not affect control processing

Network Functions (Easy Network & File Access)

Constant definition (header file)

Data creation: creation of transmission text and file data made easy

- Constant names can be defined with assigned values separately from programs, and then coded in programs (like tag names).
- Strings, numerical values and contiguous binary data can be defined as constants

M3 escape sequences

Data creation: defining hexadecimal representation codes within strings

- Text messages and control characters (STX, ETX, etc.) can be coded at the same time when creating telegram messages.
- Newline code (CRLF or LF) can be inserted easily into text when creating a text file.
High Precision & Reliability (Enhanced Memory)

High-reliability design reduces failure rate
A measure for ensuring stable system operation

– SRAM hardware error check and correction (ECC)
  • Hardware error check and correction (ECC) within ASIC and external SRAM
  • ECC does not impair performance.
  • Improved reliability through patrol check* (only for backup SRAM)

– Use of flash memory
  Flash memory is used for storing programs.
  This minimizes the impact of memory data loss at power off.

High Precision & Reliability (Hardware ECC)

Corrects single-bit errors; detects multi-bit errors
No memory access cycle time loss (unless error is detected)

• In case of a single-bit error:
  Automatically corrected
  within the same access cycle
  and system operation continues normally.

• In case of a multi-bit error:
  Transit to error handling instantly
  in the cycle immediately following the error.

• In case of multiple single-bit errors:
  To prevent degeneration to multi-bit errors,
  patrol check is executed by hardware
  for the entire external backup SRAM.
High Precision & Reliability
(Data Processing Capabilities, High Reliability Design)

- High-precision calculations
  Operations preserving 32-bit significant digits
  - 64-bit integer arithmetic
    - No need to convert all the way to floating point data for calculation
  - Double-precision floating point operations
    - Built-in floating-point unit (FPU) for floating-point operations
    - No precision loss even if converted to floating-point data for calculations

- Single board design
  - Less components means less failure sources.
  - Efficient natural cooling provides reliability.

Security Functions

Security functions for protecting program assets

- User management function
  - Appropriate access permissions can be defined for administrator, service and user personnel so that better security and work efficiency can be achieved concurrently.

- Operation log function
  - Keeps a history of operations performed on the CPU module.
  - With the use of the user authentication function, the user name of the person performing an operation can also be recorded.

Operations performed on CPU can be checked using operation log.

Operations performed on CPU can be checked using operation log.

Log file can be saved to SD card.
Security Functions

Network filter function
- Connection to CPU can be restricted to IP addresses (16 max.) registered in the CPU properties.
- Subnet mask can be used to grant access to a subnet.
- Unauthorized access attempts are counted in a special register.

CPU properties protection
- In addition to executable program protection, CPU property data such as network settings are can be protected against unauthorized read/write access using a password.

Function Removal
- Selected CPU functions can be disabled (removed).
Functions not to be used by end users can be removed before system delivery.

Removable functions:
- Remote programming service (Access via an external module such as an Ethernet interface module cannot be disabled).
- Higher-level link service
- FTP server
- Rotary switch function
- Virtual directory function
- Card batch file function
**Sampling Trace Function**

### Tool-less maintenance

Sampling trace can be run simply by inserting an SD card pre-stored with a trace settings file (batch file) without need of PC (Windows) or WideField3 operation.

Operator runs sampling trace simply by inserting SD card pre-saved with trace settings file.

Designer sends trace settings file.

- **Automatic trace execution**
  - Can be initiated easily by non-technical personnel.

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**Sampling Trace Function**

### Multi-trace

- Up to 100 successive traces (100x increase) can be run.
- Trace data is stored in SD card or RAM disk.
- Ideal for tracing and trace data comparison over extended period.

- Data is saved to the SD card a specified number of times when the trigger condition is established. Moreover, pre-trigger state can be saved to facilitate failure analysis by specifying a delay.

- Much more data can be saved per trace and up to 100 traces can be run successively. Saving only the required data at the required timings enables easy comparison of saved results and more efficient analysis.

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- **Sample size**
  - No. of samples
  - Sampling time for sampling interval of:
    - **Bit**
      - 1: 87,381 μs
      - 16: 37,449 μs
      - 64: 1,956 μs
    - **Word**
      - 1: 87.3 ms
      - 16: 37.3 ms
      - 64: 1.9 s

  - *Data storage capacity per trace*
  - *Max. sample size is doubled for single-trace.*
- FA-M3V Offers Stress-free Solution for All Systems/Devices -

- Fast, stable control backed by two core technologies
  - The new FA-M3 Vitesse Engine for ladder processing is fastest in the industry.
  - The new Parallel & Independent Processing System (PIPS) control method ensures fast, stable control.

- Formidable computation power
  - High-precision computations for supporting positioning and other applications
  - Built-in cache registers for storing calculation tables for fast access

- Protection of program assets and efficient problem analysis
  - Login control function
  - Operation log function
  - Other security functions

- Truly range-free
  - Only two streamlined models of 60K or 260K program size
  - CPU selection is easy!

- Easy networking with production control systems
  - All models have built-in Ethernet port
  - Fast, stable control even during production data transmission
  - Large memory and SD memory card (SDHC compliant, 32 GB max.)

- User-friendly high-reliability design
  - Hardware error check and correction
  - Use of flash memory
  - Single board design

- Stress-free
  - Relieves all sources of stress from development to maintenance

- System Migration Precautions

Test user applications thoroughly.

- Check application behavior changes accompanying speed increase
  - Timing changes arising from higher processing speed
    - Scan, SD, Ethernet, refresh, etc.
  - Speed and value changes arising from migration to floating point computation by hardware
    - Beware especially for applications that perform comparison and manipulate floating-point values (including constants).

- Precautions when migrating from F3SP2/3/5 to F3SP7
  - F3SP7 uses an internal flash ROM and SD memory card (in place of ROM pack).
  - No more support for discontinued products
  - Application programming changes
    - Socket communications using built-in Ethernet port (F3LE12), file handling and batch file (F3EM01)

- Differences from predecessor CPU modules
  - Partial download → Use Download All instead.

* Refer to user manuals for details before system migration.
Field Application Examples

Harnessing FA-M3V’s Speed to Shorten Scan Time (example 1)

Control application example
- Positioning for discrete motion (semiconductor, electric, and electronic parts handling)

Solution
- Solution to shorten machine tact time

Effect
- FA-M3V
  Positioning command setup time (machine idle time), which is dependent on PLC (controller) is reduced.

Example: Supposing that motor operation time plus motor startup time is 15 ms.
- Average cycle time
  If F3SP53 is used: 15 ms + 7.5 ms (assuming 1.5 scans on average) = 22.50 ms
  If F3SP7 is used: 15 ms + 1.05 ms = 16.05 ms
  Cycle time is reduced by 29% resulting in 40% increase in working efficiency. This translates into productivity increase from 500 to 700 units with no machine upgrade or manpower increase!

For machines with short cycle time, reducing setup time (sequence CPU processing time) is key to reducing machine idle time and increasing productivity.
Harnessing FA-M3V’s Speed to Shorten Scan Time (example 2)

**Control application example**
- Positioning for continuous motion (sheet cutter for cutting paper, film, etc.)

**Solution**
- **Solution to improve yield**

**Effect**
- **Predecessor CPU**
  Cutting starts within 1 or 2 scans after a sensor detects the edge of running paper or film. If cutting fails to start within 1 scan, cutting will be delayed by 1 scan time, resulting in dimensional error.
  \[ \text{Error} = V \times \text{scan time} \]

- **FA-M3V**
  Scan time is **about 5 times** shorter, translating approximately into **5 times** more accurate product dimension, as well as **5 times** faster running speed and thus **5 times** higher productivity.

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Harnessing FA-M3V’s Speed to Shorten Scan Time (example 3)

**Control application example**
- Inspection application (for inspecting semiconductor, electric, and electronic parts)

**Solution**
- **Solution to improve yield**

**Effect**
- **Predecessor CPU**
  A PC accepts or rejects products based on information from an inspection PLC. When the PLC fails to respond in time due to, say, prolonged interrupt processing, the PC may wrongly reject a good product.

- **FA-M3V**
  FA-M3V rarely fails to respond in time thanks to shorter response time (due to shorter scan time). False rejects are significantly reduced.
Harnessing FA-M3V’s Functions (Sampling Trace)

- The PC is too slow for sampling high-speed machine monitoring data. The high-speed FA-M3V CPU module enables such high-speed data to be sampled using the sampling trace function’s SOE (Sequence On Event) feature. Additional sampled data facilitates machine failure cause analysis.

- Sampling & analysis of small control data variation using FA-M3V
  - Sample size: 64 points of bit data or 128 points of word data
  - Sampling capacity: 3,956 to 209,715 samples (dependent on specified sample size and approx. halved for multi-trace)
    - 209,715 samples for 1-bit samples;
    - 80,659 samples for 16-bit and 4-word samples;
    - 3971 samples for 64-bit, 64-word and 8-long-word samples
  - Trace data can be converted into CSV files for easier analysis.

- Acquires required data only easily
  - Tool-less maintenance
    - Sampling trace initiated simply by inserting SD card containing batch file.
  - Multi-trace
    - Runs up to 100 successive traces. More data can be sampled per trace. Results stored on SD card or RAM disk. Enables tracing and results comparison over extended period.

Example of data sampling using Sampling Trace:
More sampled data facilities problem analysis.

Harnessing FA-M3V’s Functions for Efficient Maintenance

- Fast system information gathering is crucial for recovery from system problems. Unfortunately, ease of information gathering and security are often trade-offs. The FA-M3V enables easy system information gathering without sacrificing security.

- SD card improves maintenance efficiency
  - Ladder programs can be loaded or saved.
  - System log and other system information can be retrieved.
  - Operation log can be retrieved
  - Sampling trace settings and results can be retrieved.

- FA-M3V Defender ensures information security
  - Operation permissions are defined by the login control function.
  - Operation history is automatically saved as operational log.

- Hardware reliability is improved
  - Single board design means fewer components.
  - SRAM features hardware ECC. Nonrecurring problems due to single-bit errors are reduced.
FA-M3 Programming Tools
New Products Introduction

Software Product Lineup

- FA-M3 Programming Tool WideField3
  SF630-MCW R2
- ToolBox for Temperature Control and Monitoring Modules
  SF661-MCW R6
- ToolBox for Positioning Modules (for F3NC32/34)
  SF662-MCW R4
- ToolBox for Positioning Modules (for F3YP22/24/28)
  SF663-MCW
FA-M3 Programming Tool WideField3 (SF630-MCW R2)

-3 5-

• FA-M3 Programming Tool WideField3 is a new product, which needs to be purchased for existing WideField2 users.
• Registered WideField3 R1 users may, however, download the free upgrade patch from the Users Page on the FA-M3 website (www.yokogawa.com/itc).

WideField3 supports the new FA-M3V (F3SP7□), which is the fastest CPU in the industry today, and has enhanced functionality to meet customer requirements.

WideField2 design assets can be migrated to WideField3 without modification.
  - Both ladder programs created using WideField2 and older CPU module models (F3SP2□/3□/5□/6□) used to create these programs can be used as-is with WideField3.

  * Project data created using WideField2, when opened in WideField3, will be automatically converted to WideField3 format.
  * If necessary, you can either select [Downgrade & Save] in WideField3 to resave an existing project created using WideField2 or back up the WideField2 project before migration.
Harness the full power of the new CPU!

WideField3 is developed alongside the new FA-M3V sequence CPU module and is designed to fully support all functions of the new CPU.

- Model name recognition, environment support and configuration of new CPU.
  - Supports 64-bit integer arithmetic instructions and devices in circuit edit.
  - Supports double-precision floating-point arithmetic instructions and devices in circuit edit.
  - Support for 64-bit and double-precision floating-point data in all monitor windows.
  - Control of environment settings display mode.
  - Long-word index modification in circuit edit.
  - Enhanced initialization data definition during configuration.
  - Circuit comment out function during online edit.
  - Sampling trace enhanced to support functions specific to new CPU.
  - Operation log display.
  - Support for sensor control function in configuration.

WideField3 includes useful functional enhancements based on client feedback.

- Advanced programming support functions
  - Enhanced file comparison.
  - Support for device list.
  - Scripting.

- Programming convenience functions
  - Circuit comment height setting.
  - Improved project settings.
  - Improved find menu.

- Efficiency functions
  - Enhanced resume function restores window edit position.
  - Improved context menus.
  - Improved circuit comment function.

- Other convenience functions
  - Improved advanced module monitor/registered device monitor.
  - Improved user interface.
Advanced Programming Support Functions

Computations and text manipulations not easily coded using ladder language can now be coded easily using intuitive expressions.

- Example: calculating the area of a trapezium

**Ladder program code:**
```
D0001 = D0001 + D0002
D0002 = D0001 + D0003
D0101 = D0002 / 2
```

**Script code:**
```
W.D0101 = ((W.D0001 + W.D0002) * W.D0003) / 2
```

Script code is converted automatically into ladder code before execution.

Example: Integer arithmetic
```
D00001 = D00002 + D00003
→ CAL D00001 D00002 + D00003
```

Example: Byte swap
```
HSWAP(D00001)
→ BSET P 0 /D00001 2
PMOVX P D00001 8 /D00001
MOV P D00001 /D00002
LSFT P /D00002 8
CAL P D00001 /D00001 | /D00002
```
Script Coding and Monitoring Function

New

Supported scripting language
- 2 basic functions (LDU, LDD)
- 18 arithmetic functions (SUM, MAX, POW, etc.)
- 31 data processing functions (byte handling, etc.)
- 20 string manipulation functions (replacement, etc.)

Monitoring scripting
- Allows in-script monitoring

Control statement scripting
- IF ~ THEN ~ ELSE/SELECT ~ CASE
- FOR ~ NEXT (up to 8 levels of nesting)

Comments & indentation
- Readable script

Script monitoring (industry-first)
- Devices can be inserted into script for monitoring purposes

Sampling Trace Function
New

Advanced analysis environment with oscilloscope-like view
- Supports Sampling Trace function of FA-M3V.
- Enables efficient debugging and timely troubleshooting!

Advanced analysis environment with oscilloscope-like view
- Supports Sampling Trace function of FA-M3V.
- Enables efficient debugging and timely troubleshooting!

Supports advanced, flexible configuration with intuitive representation!

Analysis convenience functions:
- Inter-point analysis
- Range zooming
- Filter settings

Complex configuration is made easy using software wizards!

Supports loading of past data for combined display, as well as CSV and image output, enabling effective use of analysis assets!

Easy report creation!
Device list gives an overview of used and unused devices within a project.

Display range options:
- global devices
- local devices
- macro devices
- all devices

Each cell shows whether the device at the corresponding address is used within the project.

Cross references can be generated from a displayed device.

Other Advanced Programming Support Functions

Split window display
- Split block edit window

File comparison
- Enhanced comparison!

Even files having different names can be compared according to their order in the configuration!
Efficiency Functions

Cross Reference Function

- Cut debug man-hours! Prevent regressive programming
  - Real-time display of devices used in a project!
  - Search used devices easily! Prevent missing amendments in programming.

- Cross reference search object
  - Address, tag name, constant definition, structure name (including structure member names), label block, macro name

- Improve search operability!
- Output window “Cross Reference Tab”
- Eliminate duplicate use of devices!
- Search results are displayed by tab for better readability!
- Jump to found circuit with one click!
Other Efficiency Functions

Copy and paste  Improved

An offline circuit can be copied and pasted to an online edit window.

Supports copying and pasting during online edit.

When you copy a circuit...

...tag name definitions are automatically copied too.

Resume function  Improved

The state of a displayed window is saved and can be restored upon reopening.

Reopening a window restores its last edit position (line/cursor position) for better efficiency!

Monitoring during online edit

Values of contacts and devices can be displayed in online-edit windows for monitoring purposes.

New

Programming Convenience Functions
Balloon Comment and Monitor Function

Balloon comments and monitors can be placed onto ladder programs like post-it notes.
- Operation history and handover memos can be written and even devices can be monitored within comments.

Balloon comments can be displayed anywhere on circuits in any font, color and size, even transparently so that underlying circuits are visible.

Up to 32 lines of 128 characters can be defined for each balloon.

A device can be specified within a comment so that its data can be monitored at any preferred location.

Individual balloons on the balloon list can be defined as visible or hidden.

Programming Convenience Functions

Find Function

More powerful Find function!
- More search object options and search condition options are available.

Search object options: tag name or address, circuit comment, subcomment, Block or macro name, label, I/O comment

Search condition options: component blocks, all project blocks, all project macros, all project blocks and macros

More search object options!
More search condition options!

Jump to a found location from the search results window!
**Print Function**

Revamped Print function!
- An image of the ladder edit window can be printed.

- Color printout is available with a color printer!
- All pages can be previewed!
- Flexible and detailed print setup is available!
- Optimized print layout reduces paper wastage!

**Other Programming Convenience Functions**

Optimized online project tree
- Installed modules are displayed in the online project window. Selecting a module displays its I/O relay monitor window and advanced module register monitor window!
Other Convenience Functions

**Display of paired instructions** New
- Paired instructions (IL-ILC, SUB-RET, FOR-NEXT, etc.) can be displayed to improve readability.

**Find function** Improved
- The Find dialog window can be opened from Find or Project menu.

**[Save As...] function** Improved
- Opens project saved with new name.

Common user interface for [Find] and [Find in Project]
Other Functions

⇒ Circuit comment-out
- Selected instructions or circuits can be connected or made non-executable temporarily.

⇒ Support for double float & double long word data

⇒ Operation access control & operation log

A project created in WideField2 (SF620) will be automatically upgraded to WideField3-compatible format when opened in WideField3 (SF630).

⇒ If necessary, you can either select [Downgrade & Save] in WideField3 to resave an existing project created in WideField2 (SF620) or back up the WideField2 project before migration.

⇒ For project data compatibility reason, do not install both WideField2 (SF620) and WideField3 (SF630) on the same PC.

⇒ When migrating to WideField3 (SF630), you should also upgrade the ToolBox (SF661/SF662) software. The ToolBox upgrade patch can be downloaded from the FA-M3 website (www.yokogawa.com/itc) free of cost.

⇒ When using FL-net communications, beware that tighter OS security control may affect online connection based on the FL-net protocol using WideField3 (SF630) so additional OS configuration may be required, just as for WideField2 (SF620) previously.

⇒ The programming tool cable (KM13-1S) has been upgraded to support Windows 7. The latest cable driver software can be downloaded from the FA-M3 website (www.yokogawa.com/itc) free of cost.
ToolBox for Temperature Control and Monitoring Modules SF661-MCW R6
ToolBox for Positioning Modules (for F3NC32/34) SF662-MCW R4
ToolBox for Positioning Modules (for F3YP22/24/28) SF663-MCW

- Upgrade improvements (SF661-MCW, SF662-MCW)
  - Support for FA-M3V (F3SP7)
  - Support for multiple online connections.

* Existing users may download the free upgrade patch from the FA-M3 website (www.yokogawa.com/itc).

List of New Products & User Manuals
List of New Products

**Hardware**

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Model</th>
<th>Suffix code</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sequence CPU module (with network functions)</td>
<td>F3SP71</td>
<td>-4S</td>
<td>Ladder 60K steps, basic instruction 3.75 ns or longer, with network (USB 2.0 (12 Mbps), Ethernet) and Modbus/TCP slave (server) functions</td>
</tr>
<tr>
<td></td>
<td>F3SP76</td>
<td>-7S</td>
<td>Ladder 260K steps, basic instruction 3.75 ns or longer, with network (USB 2.0 (12 Mbps), Ethernet) and Modbus/TCP slave (server) functions</td>
</tr>
</tbody>
</table>

*1: When using F3SP71 or F3SP76 sequence CPU module, use SF630-MCW R2 or a later version.

**Software**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>FA-M3 Programming Tool WideField3 *2</td>
<td>SF630</td>
<td>-MCW</td>
<td>Windows 2000, XP, Vista, 7 compatible, multi-lingual version, CD-ROM</td>
</tr>
<tr>
<td>Toolbox for Temperature Control and Monitoring Modules *3</td>
<td>SF661</td>
<td>-ECW</td>
<td>Windows 2000, XP, Vista, 7 compatible, multi-lingual version, CD-ROM</td>
</tr>
<tr>
<td>ToolBox for Positioning Modules (for F3NC32/34) *3</td>
<td>SF662</td>
<td>-ECW</td>
<td>Windows 2000, XP, Vista, 7 compatible, multi-lingual version, CD-ROM</td>
</tr>
<tr>
<td>ToolBox for Positioning Modules (for F3YP22/24/28) *3</td>
<td>SF663</td>
<td>-ECW</td>
<td>Windows 2000, XP, Vista, 7 compatible, multi-lingual version, CD-ROM</td>
</tr>
</tbody>
</table>

*2: FA-M3 Programming Tool WideField3 is a new product, which needs to be purchased for existing WideField2 users.
*3: Existing WideField3 R1 users may download the upgrade patch from the FA-M3 website (www.yokogawa.com/itc) free of cost.

**Peripheral Devices**

<table>
<thead>
<tr>
<th>Product Name</th>
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<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable for programming tool *4</td>
<td>KM13</td>
<td>-1S</td>
<td>USB 1.1 compliant USB-serial converter, cable length approx. 3 m, Windows 98SE, Me, 2000, XP, Vista, 7 compatible</td>
</tr>
</tbody>
</table>

*4: The programming tool cable (KM13-1S) has been upgraded to support Windows 7. The latest cable driver software can be downloaded from the FA-M3 website (www.yokogawa.com/itc) free of cost.

User Manuals

These user manuals are revised or newly issued with the new products.

**Hardware**

<table>
<thead>
<tr>
<th>New/Revised</th>
<th>Document Number</th>
<th>Document Name</th>
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<tbody>
<tr>
<td>Revised</td>
<td>IM 34M06C11-01E</td>
<td>Hardware Manual</td>
<td>FA-M3</td>
</tr>
<tr>
<td>Revised</td>
<td>IM 34M06P12-03E</td>
<td>Sequence CPU – Instructions</td>
<td>F3SP06</td>
</tr>
<tr>
<td>Revised</td>
<td>IM 34M06P13-01E</td>
<td>Sequence CPU – Functions (for F3SP22-0S, F3SP28-3N/3S, F3SP38-6N/6S, F3SP53-4H/4S, F3SP58-6H/6S and F3SP59-7S)</td>
<td>F3SP22</td>
</tr>
<tr>
<td>Revised</td>
<td>IM 34M06P15-01E-T01</td>
<td>Sequence CPU – Functions (for F3SP71-□N, F3SP76-□S)</td>
<td>F3SP71</td>
</tr>
<tr>
<td>Revised</td>
<td>IM 34M06P15-02E</td>
<td>Sequence CPU – Network Functions (for F3SP71-□N, F3SP76-□S)</td>
<td>F3SP71</td>
</tr>
<tr>
<td>Revised</td>
<td>IM 34M06P15-03E-T01</td>
<td>Sequence CPU – Modbus/TCP Slave Function</td>
<td>F3SP71</td>
</tr>
<tr>
<td>Revised</td>
<td>IM 34M06P41-01E</td>
<td>Personal Computer Link Commands</td>
<td>F3LE12-0T</td>
</tr>
</tbody>
</table>

**Software**

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<tbody>
<tr>
<td>Revised</td>
<td>IM 34M06C16-01E</td>
<td>FA-M3 Programming Tool WideField3 – Introduction and Troubleshooting</td>
<td>SF630</td>
</tr>
<tr>
<td>Revised</td>
<td>IM 34M06C16-02E</td>
<td>FA-M3 Programming Tool WideField3 – Offline Functions</td>
<td>SF630</td>
</tr>
<tr>
<td>Revised</td>
<td>IM 34M06C16-03E</td>
<td>FA-M3 Programming Tool WideField3 – Online Functions</td>
<td>SF630</td>
</tr>
<tr>
<td>New</td>
<td>IM 34M06C16-04E</td>
<td>FA-M3 Programming Tool WideField3 – Script Functions</td>
<td>SF630</td>
</tr>
<tr>
<td>Revised</td>
<td>IM 34M06C30-01E</td>
<td>FA-M3 ToolBox Manual</td>
<td>SF660</td>
</tr>
<tr>
<td>Revised</td>
<td>IM 34M06C31-02E</td>
<td>FA-M3 ToolBox for Temperature Control and Monitoring Modules</td>
<td>SF661</td>
</tr>
<tr>
<td>Revised</td>
<td>IM 34M06C31-01E</td>
<td>FA-M3 ToolBox for Positioning Modules (for F3NC32/34)</td>
<td>SF662</td>
</tr>
<tr>
<td>New</td>
<td>IM 34M06C31-02E</td>
<td>FA-M3 ToolBox for Positioning Modules (for F3YP22/24/28)</td>
<td>SF663</td>
</tr>
</tbody>
</table>

*1: These documents are supplied with the software package as PDF files. Please procure paper documentation separately if required.
Other New Products

Positioning Modules (with multi-channel pulse output)

- F3YP22-0P (2 axes) **NEW**
- F3YP24-0P (4 axes) **NEW**
- F3YP28-0P (8 axes) **NEW**

Cutting time loss in positioning control!

- Industry’s fastest control cycle of 0.125 ms. Even smoother positioning control
- Industry’s highest output pulse rate of 7,996 Mpps max. Controls hi-speed, hi-precision linear motors and DDM
- Industry’s highest input pulse rate 8 Mpps max. High-speed pulse counter included Supports a wide range of applications
- Industry’s top-of-class startup time from 40 μs. Cuts time loss before positioning begins
- Ideal for use with FA-M3V (F3SP71/F3SP76) Support for fast scans
A high-speed version of the F3SP28 (with 10K ladder steps) sequence CPU module is added to the FA-M3 product family.

- **F3SP22-0S Sequence CPU module**
  10K ladder steps, basic instruction 45 ns min., with memory

- Higher processing speed (from 45 ns for basic instructions) at the same price
- More instructions available (37 basic instructions and 324 application instructions)