STARDOM
FCN-RTU
Autonomous Controller
The FCN-RTU, Yokogawa’s STARDOM low power consumption model of autonomous controller FCN, is a robust system that meets the demanding requirements of applications where infrastructure is inadequate and conditions inhospitable and hazardous. The FCN-RTU controller is a reliable platform that keeps you competitive in a rapidly changing market.

**Integration**
- Same look and feel as Yokogawa’s DCS Human Machine Interface (HMI) via gateway station
- OPC, DNP3, and Modbus® support for use with a variety of SCADA Systems
- Asset management via a variety of digital communications

**Network**
- Support of FOUNDATION™ Fieldbus, HART®, Modbus, PROFIBUS-DP®, and CANopen® for field device digital communications
- Communication using several types of networks infrastructure such as GPRS and satellite for SCADA communications

**Reliability**
- Excellent environmental resistance
- Error Correcting Code (ECC) memory
- Durable designs protect the hardware from harsh environments

**Engineering**
- Support of all five IEC 61131-3 programming languages
- Extensive regulatory control libraries cultivated throughout Yokogawa’s DCS history
- Easy to reuse software architecture

**Information**
- Web server embedded in CPU module for remote maintenance
- E-mail alarm notification from/to controllers
- Autonomous features such as data logging and FTP transmission on controllers
Providing seamless operation from field to center while enhancing the benefits of digital communications.

### One Network... but Multiple Media

A TCP/IP based network enables a seamless connection with control and information networks using COTS network components, and also allows the easy adaption of controllers for use with narrow bandwidth network infrastructure including public telephone lines, GSM/GPRS, satellite, and radio.

### One Window... but Multiple Systems

Many applications make combined use of DCS and PLC systems. From a single window on the Yokogawa DCS HMI, operators enjoy seamless and transparent access to all the utilities on these different systems, with complete consolidation of all alarms.

### One Field...Spanning Hundreds of Kilometers

With gas fields, pipelines, and other SCADA applications, field devices are often dispersed over a very wide area, and the annual cost of regularly checking these devices is prohibitively high. By making use of remote device diagnostics, Yokogawa’s plant asset management system enables a much more efficient maintenance approach with dramatic reductions in costs.

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**Connection**

<table>
<thead>
<tr>
<th>Physical layer</th>
<th>Devices (protocols)</th>
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<tr>
<td>Serial (RS-232, RS-422/485)</td>
<td>Other vendor’s SCADA systems (OPC, DNP3, Modbus TCP)</td>
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<tr>
<td>Ethernet</td>
<td>FASTTOOLS (Modbus RTU), other vendor’s SCADA systems (Modbus RTU/ASCII, DNP3)</td>
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<tr>
<td>Serial (RS-232, RS-422/485)</td>
<td>Other vendor’s SCADA systems (Modbus RTU/ASCII, DNP3)</td>
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<tr>
<td>Ethernet</td>
<td>FA-M0 (driver available), MELSEC (driver available), others (Modbus TCP)</td>
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<tr>
<td>Serial (RS-232, RS-422/485)</td>
<td>FA-M0 (driver available), MELSEC (driver available), others (Modbus RTU/ASCII)</td>
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**Fieldbus**

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<tr>
<td>Serial FA-M3 (driver available), MELSEC (driver available), others (Modbus RTU/ASCII)</td>
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</table>

**Other devices**

<table>
<thead>
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<th>Ethernet</th>
<th>Foundation Fieldbus devices</th>
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<tbody>
<tr>
<td>FastTools (Modbus)</td>
<td></td>
</tr>
</tbody>
</table>

**Remote monitoring**

- PSTN, xDSL, and more
- GSM/GPRS, Satellite, RF, and more

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**Diagrams**

- Yokogawa DCS HMI
- Operation and Monitoring
- Optical Fiber Ring
STARDOM FCN-RTU controller can be flexibly configured for a wide range of PLC/RTU applications.

**Reliable and High Speed CPU**

- **High speed control**
  - 50 ms analog control, 10 ms CPU scan time

- **Error correcting code (ECC) memory**
  - Correction of single-bit errors in RAM prevents unexpected malfunctions

- **Time synchronization**
  - Simple network time protocol (SNTP) enables time synchronization as an SNTP client

**Durable Design**

- **Operation in harsh environments**
  - -40°C to +70°C and up to 3,000 m altitude* (depending on the combination of I/O modules)
  - -20°C to +70°C and up to 2,000 m altitude*

- **Failure-proof**
  - Fanless design with excellent heat dissipation
  - IC chips, which have a higher failure rate, are not mounted on the base module

**Easy Maintenance**

- **Quick start after replacing I/O**
  - Hot swappable I/O modules
  - I/O definitions automatically downloaded to I/O modules without use of tools
  - I/O modules can be changed without rewiring
  - Continuous output of values (fallback function) if CPU fails

**Rich Variety of I/O Modules**

- **AI/O modules for process control**
  - AI, AO, mixed AI/O, pulse input, frequency input
  - 4 to 20 mA, 1 to 5 V, -10 to +10 V, RTD, TC/mV
  - Channel isolated, isolated, non-isolated
  - Transmitter power supply from AI/O module

- **DI/O for a diverse range of applications**
  - 32 or 64 channels for 24 V DC on/off or transistor contact signals

**AI/O and DI/O common features**

- Corrosion protection coating (ISA standard G3 option)
- Pressure clamp terminal block and MIL connection with surge absorber (option)

**Low Power Consumption Model FCN-RTU**

- **Best-in-class CPU module: NFCP050**
  - Enables advanced control applications
  - 256MHz, 32 bit RISC processor
  - Error Check and Correct (ECC) memory
  - Power fail-safe file system
  - Low power consumption

- **Short base unit: NFBU050**
  - Fits in small cabinets
  - 28 cm (11 inch)* wide
  - DIN rail mount or screw mount
  - Three expansion I/O Slots

- **Flexible power supply module: NFPW426**
  - Ideal for solar power applications
  - Wide voltage range: 10-30 V DC

- **More communication choices**
  - Suitable for various communication protocols
  - One 100BASE-TX Ethernet port with automatic power saving mode
  - Three Rs232 serial ports (one port up to 115 kbps)
  - One Rs542/485 serial port up to 115 kbps with switchable 1200 terminator
  - Support Modbus protocol

- **Multiple built-in I/O**
  - Reduces your initial installation cost
  - Twelve analog inputs (1-5 V DC)
  - Two analog outputs (4-20 mA)
  - Sixteen digital inputs
  - Two pulse inputs (0-10 kHz)
  - One battery monitoring input (0-32 V DC)

**Please select from the following two types based on your budget and application**

- **Short base type**
- **Long base type**
Enhanced Application Portability through Division of Logical and Physical Layers

A platform independent architecture enhances application portability.

Logic Designer: Control application development tool
- Supports all five IEC 61131-3 languages
- Intuitive look & feel with automated application layout
- Project comparison function for confirming modifications

Resource Configurator: Environment configuration tool for control applications
- Connects control application logical I/O with actual hardware I/O
- Configures hardware settings for IP addresses, serial ports, etc.

IEC 61131-3 Compliant Programming

IEC 61131-3, the de facto PLC programming standard, is platform independent and allows great reusability.

Support of all five IEC 61131-3 languages
- Choose the language best suited to your logic
- Loop and sequential control with the same development tool

IEC 61131-3 Compliant Programming

LD (Ladder Diagram)
SCF (Sequential Function Chart)
ST (Structured Text)

Reusable Programming

Applications programmed with IEC 61131-3 languages are well structured and easily modularized.

Modularized applications
- Easy reuse of modularized applications, user function blocks, and libraries
- Password protection of function blocks holding your industry know-how
- Drag and drop of function blocks to a program sheet

User Function Blocks (FB)
- User logic is encapsulated into user function blocks for reuse in programs
- User libraries
  - Groups of user function blocks can be used as user libraries. They can be protected with a username and password.

Network Template Function

The network template function enables the use of advanced copy features that eliminate the need to reenter variables. In addition to enabling the creation of network templates from your programs, Yokogawa provides a number of network templates for your convenience.

Efficient reusable engineering process

Many skill and utility programs are quite similar. Through modularization, you can have better applications, reduce engineering costs, and speed up commissioning.
Programming and debugging applications without actual controllers reduces engineering hours and increases efficiency.

**Online Download**
Modify your application without interfering with a process.
- No need to stop a controller to modify a control application
- Variables inherited from previous applications

**Parameter Saving**
Through every phase, from debugging to commissioning, you no longer have to worry about losing essential tuning parameters. Essential tuning parameters such as P, I, and D in PID control instruments and critical parameters for applications can be retained in a variety of ways:
- As a default, essential instrument parameters such as P, I, and D are retentive variables
- In Logic Designer, the retentive attribute can be set for an application variable
- Multiple parameter sets can be backed up to a PC

**Industry Quantity Conversion**
The intuitive display of data improves programming efficiency.
- Internal analog data (0% to 100%) is converted to industrial quantity such as °C for easy and intuitive programming and debugging

**Debugging functions for enhanced engineering efficiency**

**Application Debugging on PCs**
Minimize engineering costs by doing both programming and debugging on one PC.
- Simulate control functions
- Program, modify, and debug logic
- Debug both control and SCADA applications

**Software Wiring**
Software wiring function simulates the input and output signals without the actual wiring. This eliminates the need for a signal generator and test switches during loop check and logic debugging.
- Wizard available for easy configuration
- Advanced settings for adjustments to process

**Wiring Check**
Resource Configurator’s loop check (wiring check) tool allows you to check the status of your wiring without having to use a calibrator or test switch.
- Confirm the actual input signals for each channel
- Manually output signals to I/O modules

**Logic Analyzer**
Logic Analyzer saves you time investigating and analyzing software malfunctions.
- Records variables in continuous and cycle modes
- Exports the recorded data to text format files
- Adjusts curve colors and scales/ranges on individual axes

**Extensive Help Files**
Extensive help files for all of your programming questions are included.
- More than 3,500 pages
- From IEC 61131-3 basics to specific information on the use of each library
- Instructions on how to use the engineering tool

**Strengthening system security**
Protecting your system from cyber attacks and ensuring its robustness is a challenge. It can be time-consuming to configure the security with Windows’ security and network settings. To assist you in this, Yokogawa has developed an IT security tool. All you need to do is select the desired security model and the security tool will take care of the rest.
Software Architecture
The combination of reliable control with advanced IT functions that harness the power of the internet gives you greater flexibility in your applications and improves efficiency.

PLC with Advanced IT Functionality

Control and information play in harmony
Duolet functions* manage and transmit information while STARDOM’s control functions ensure your processes run smoothly. With Duolet, control and information play Duet on one controller.

*Duolet functions enable Java applications run on the controller.

Advanced IT functionality
• Web server, FTP server, e-mail, file logging

Duolet enabled
• Co-existence of Duolet applications and control functions on the same platform
• No extra module needed for Duolet applications
• Separation of Duolet and control application areas for guaranteed control performance

Easy and intuitive interface for creation of Duolet applications
• PLC programmers can develop Duolet applications with the InfoWell interface package of application portfolios (APPF)

Maintenance
CPU and I/O module information as well as system logs can be confirmed on a Web browser, dramatically improving maintenance efficiency.

System overview
Memory size, OS version, and IP address can be checked online.

I/O modules and Other Settings
In addition to CPU information, I/O module and other settings can be confirmed on a Web browser, eliminating the need to use special software and handheld terminals for on-site calibration and maintenance.

I/O modules
IO driver

Duolet Virtual Machine

Project (control application) Configuration
Resources (controllers)

Task

Task

Program (POU)

Program (POU)

Global variables

Reliable Control Application Architecture
Applications can be developed in project units. A project consists of one or more configurations (programs) running on several different resources (controllers). Multiple tasks are allowed to run on each controller.

Guaranteed control performance
• Application performance can be set based on task priority and schedule
• First priority is given to control applications, which run separately from Duolet applications

Excellent reusability
• Hardware-independent projects can be easily assigned to controllers
• Libraries of independently developed common elements for application development can be easily imported to projects

Page Layout
The diagram of an application can be easily documented in various ways.
• Printing of diagram for entire control applications
• Extensive frame, logo, title, font, and other layout options
• Several design page layout templates

Multiple controllers configuration in a project
Multiple controllers can be assigned to the same application. Once an application is modified and debugged, all the settings can be quickly and easily transferred to the controllers.
• The FCN-RTU controller can be assigned to the same application
• Only those applications that will be used need to be assigned to a controller.
• Any modifications to an application can be downloaded to selected controllers

Multiple controllers configuration in a project

Maintenance

Multiple controllers configuration in a project

I/O modules and Other Settings

Maintenance

Page Layout

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I/O modules and Other Settings

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NPAS POUs

All of Yokogawa’s long experience with distributed control systems (CENTUM series) has gone into the development of the POUs that are included in the new process automation system portfolios (NPAS POUs). These cover a wide range of functions such as regulatory control, mathematical calculations, and sequencing.

### List of NPAS POUs

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<th>POU Name</th>
<th>Description</th>
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<td>Lead/lag</td>
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<td>Lead/lag</td>
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<td>NPAS_MF</td>
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<td>NPAS_MF_S</td>
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<td>NPAS_MF_Z</td>
<td>Moving variance</td>
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<tr>
<td>NPAS_FFWT_STS_F</td>
<td>FF-H1 status data writing</td>
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<tr>
<td>NPAS_FFRD_DINT_F</td>
<td>FF-H1 integer data reading</td>
</tr>
<tr>
<td>NPAS_FFRD_STS_F</td>
<td>FF-H1 status data reading</td>
</tr>
<tr>
<td>NPAS_FFI_ANLG_STS_USINT</td>
<td>FF-H1 analog/status/discrete input</td>
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<tr>
<td>NPAS_DO_WORD</td>
<td>WORD data contact output</td>
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<td>NPAS_DO_STS_PWH</td>
<td>High resolution pulse width output</td>
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<td>NPAS_DO_STS_TP</td>
<td>Time-proportional ON/OFF output</td>
</tr>
<tr>
<td>NPAS_DO_STS</td>
<td>Status output</td>
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<td>NPAS_DI_WORD</td>
<td>WORD data contact input</td>
</tr>
<tr>
<td>NPAS_DI_STS</td>
<td>Status input</td>
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<tr>
<td>NPAS_AO_REAL</td>
<td>Real data output</td>
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<td>NPAS_AO_PCNT</td>
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<td>NPAS_BSET_LW</td>
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<td>NPAS_AI_REAL</td>
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<td>NPAS_AI_PULS_CI</td>
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<td>NPAS_BSET_F</td>
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<td>NPAS_XLMT_S/D</td>
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<td>NPAS_FFTW_SUM(_BL)</td>
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<td>NPAS_FOUT</td>
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<td>NPAS_AS_H/M/L</td>
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<td>NPAS_VELLIM(_PB)</td>
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<td>NPAS_PG_L30(_BP)</td>
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<td>NPAS_RATIO(_RT)</td>
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<td>NPAS_MLD_BT</td>
<td>Manual loader with bias tracking</td>
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<tr>
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<td>NPAS_ONOFF_G</td>
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<tr>
<td>NPAS_PID</td>
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<td>NPAS_BCD_CI16</td>
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<td>NPAS_CDD_DESTR</td>
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<td>NPAS_CDB_STR</td>
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<tr>
<td>NPAS_CT</td>
<td>Counter with preset value</td>
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<td>NPAS_T_CFL</td>
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<td>NPAS_TP_CFL</td>
<td>Temperature and pressure correction</td>
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<td>NPAS_AVE_M</td>
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<td>NPAS_RS8_A/B</td>
<td>8-input resource scheduler</td>
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<td>NPAS_SL2SW_A/B</td>
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<td>NPAS_SUBSW</td>
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<td>NPAS_ADDSW</td>
<td>Addition block</td>
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<tr>
<td>NPAS_DGFLT</td>
<td>Digital filter</td>
</tr>
</tbody>
</table>

### NPAS Features

**Straightforward programming for easy maintenance**

A variety of input, control calculation, and output processing POUs prepared for straightforward programming.

- **Input and output POUs** include routines for the processing of 4-20 mA, RTD, mV, FOUNDATION fieldbus, and other types of input and output signals.
- **Input and output POUs** can be selected based on signal type.
- **Read back (RB)** connections prevent code nesting in feedback control.

**Integrated control processing in a single POU**

Input, alarm, control calculation, and output processing can all be integrated in individual POUs for smooth linking between functions.

- The integration of various types of processing in a single POU simplifies the creation of programs.
- Individuals POUs can be accessed as a tag by an FCN-RTU application or SCADA system.

**Access and engineering parameters**

NPAS POUs have two types of parameters that perform different functions.

- The function of a parameter can be identified by looking at its type.
- Access parameters (PV, SV, MV and others) are set on SCADA during operation phase.

**Engineering parameters** (trading definition, control action switch, bypass switch, and others) are specified during the engineering phase and have initial values.

### Optimization to prevent alarm flooding

Alarms are handled consistently during input and output processing to prevent alarm flooding and ensure that operators focus on the most important control tasks. All of the alarm handling know-how that Yokogawa has acquired working on DCS projects has gone into the development of the FCN-RTU. This includes techniques for the suppression of duplicated and non-essential alarms and the simulation of control data on the controller.

**Example**

Input open alarms (IOP) and output open alarms (OOP) are generated when a sensor wire is disconnected. However IOP and OOP can be ignored during the debugging phase when a wire is disconnected and software wiring is used.

The following settings will ensure that the generation of an IOP or OOP during normal operations does not interfere with control:

- Set data to 5H, 5L, or previous data
- Suppress totalizing
- Specify that the control mode switches automatically from automatic (AUTO) to manual (MAN)
Communication Portfolios

FCN-RTU controller communicates with other PLCs and SCADA systems using the following communication portfolios:

### Modbus Communication Portfolio
- **Type**: Serial
- **Mode**: ASCII
- **Function**: Master / Slave

### DNP3 Communication Portfolio
- **Type**: Ethernet
- **Mode**: TCP
- **Function**: Client / Server

### FA-M3 Communication Portfolio
- **Type**: Serial
- **Mode**: ASCII
- **Function**: Master / Slave

### MELSEC Communication Portfolio
- **Type**: Ethernet
- **Mode**: TCP
- **Function**: Client

Time Synchronization

Time is synchronized between FCN-RTU using the simple network time protocol (SNTP).

- The FCN-RTU does not support SNTP server functions.

Gas Flow Calculation

Gas flow volume is calculated using the following gas flow calculation POUs:
- AGA 3, 7, 8, 9, 10, 11
- GPA2172
- API21.1 compliant

### FCN/FCJ OPC Server for Windows

FCN/FCJ OPC Server for Windows supports the OPC DA 2.05a and A&E 1.10 compliant interfaces.

Via OPC Server for Windows, FCN-RTU controller can connect with a variety of SCADA systems.

Web-based Supervision

A Web-based HMI is a cost effective solution that provides anytime/anywhere access to the information needed to make quick and timely decisions.

- The Web-based HMI eliminates the need for client software installation and maintenance
- Process and product information can be shared across the enterprise on devices such as notebook PCs and smartphones
- Web security technology on HMI clients ensures that only authorized individuals gain access to data and applications

Scalable and Flexible

At minimum cost, the system can be scaled up to cover applications of any size:
- Capable of handling up to one million I/O points
- Online configuration with no downtime
- Supported OS platforms are:
  - Microsoft Windows, RedHat Linux, HP-UX, and IBM AIX

Reliable Architecture

Continuous operation and zero downtime assured with high availability computing (HAC).
- A HAC package enables the configuration of a standby FAST/TOOLS server
- Real-time data synchronization and watchdog monitoring of system health
- Fast automatic or manual switchover

SCADA integration with controllers

With applications that are distributed over a wide area, GPRS, satellite, and other types of narrow bandwidth wireless communications are often used. However, communications can easily be disrupted and the cost of transferring large amounts of data is often prohibitive. The use of FAST/TOOLS with the FCN-RTU controllers enables the following:
- **Report by exception**: To hold down communications costs, only changed data is sent to FAST/TOOLS.
- **Network fail-over**: With the time stamping of data from the FCN-RTU controllers, a smooth switchover with the recovery of all data is assured in the event of a network failure.
Features and Benefits

**Precious data on rugged hardware at remote side**
- Built-in functionality allowing remote access to data logged securely on rugged controllers

**Minimize Total Cost of Ownership**
- No need for dedicated software or an industrial-purpose PC to control and monitor your applications

**Agile action in utility maintenance**
- E-mail notification of alarms and messages from controllers

---

**Web Application Portfolio**

Data can be displayed in a variety of ways on Internet Explorer to facilitate the monitoring and operation of equipment.

**Graphic Portfolio**

Graphic elements such as numeric boxes and bar charts allow data to be viewed in a number of ways. For the creation of more attractive presentations, photo, and blueprint background images are available.

**Logging Portfolio**

The application data collected and logged on the controller can be viewed either online (via a browser) or offline (by FTP file transfer to a PC). Periodical FTP tool to a PC is preared.

**Easy “Fill in Form” (FIF) Engineering**

1. Select the display type
2. Select the displayed data

---

**E-mail Application Portfolio**

Alarms and messages can be e-mailed automatically by FCN-RTU to mobile phone or PC.

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**Logging & Reporting Function**

The built-in logging portfolio log data and creates daily, monthly, and yearly reports.

Logging of control application data on controller:
- Periodic data logging: High speed (every 1 to 60 seconds) or low speed (every 1 to 60 minutes)
- Batch logging: High speed (every 1 to 60 seconds) or low speed (every 1 to 60 minutes)
- Graphical logging: Continuous or trigger
- SOE logging: 100 msec or longer
- Message logging: Alarm and event messages

Report file generation:
- Report type: Daily, monthly, yearly
- Closing data: Minimum, maximum, average, total

Logging view:
- Logging data can be viewed online using a Web browser or offline using the Logging Viewer
- Trend format: Up to 10 pens can be assigned.
- Tabular format: Up to 40 items can be viewed.

Logging configuration:
- Logging can be configured online or offline using the Logging Configurator tool.

Logging file collection:
- Logging files from multiple controllers can be periodically collected using the Logging File Collector tool.

E-mail:
- Logging and report files are sent as e-mail attachments.
**FCN-RTU CPU Specifications**

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor</td>
<td>SH-4A (SH7730) 256 MHz</td>
</tr>
<tr>
<td>Memory</td>
<td>128MB with ECC</td>
</tr>
<tr>
<td>RAM</td>
<td>512MB with ECC, battery backup</td>
</tr>
<tr>
<td>System</td>
<td>1GB on-board flash memory</td>
</tr>
<tr>
<td>Serial</td>
<td>2 ports, RS-232: 1, 2, 4, 6, 8, 16, 14, 19, 20, 28, 38, 56, 112, 144, 192, 288, 384, 576, 1152 kbps</td>
</tr>
<tr>
<td>Synchronization</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>Basic rate</td>
<td>9600, 19200, 38400, 57600, 115200, 230400, 460800 Baud</td>
</tr>
<tr>
<td>Terminating resistance</td>
<td>120 Ohm (built-in)</td>
</tr>
<tr>
<td>Interface</td>
<td>1 Ethernet port: 100/10 Mbps, 10BASE-T or 100BASE-TX, RJ45 with network power switch (ON/OFF)</td>
</tr>
<tr>
<td>Network port</td>
<td>3 RS-232 ports (SERIAL: 1, 2, 3), non-isolated, RJ45, 1 RS-422/485 port (NOE-M210: 1 RS-422/485, NOE-M215: 2 RS-422/485)</td>
</tr>
<tr>
<td>System card</td>
<td>128MB on-board flash memory</td>
</tr>
<tr>
<td>Power Supply</td>
<td>1.16 to 2.30 W</td>
</tr>
<tr>
<td>Slot Occupy</td>
<td>2 slots</td>
</tr>
<tr>
<td>Power consumption</td>
<td>1.16 to 2.30 W</td>
</tr>
<tr>
<td>Dimensions (W/H/D)</td>
<td>65.8 x 130 x 142.5 mm</td>
</tr>
<tr>
<td>Main</td>
<td>128MB with ECC, battery backup</td>
</tr>
<tr>
<td>RS-422/RS-485: 120 Ohm built-in, ON/OFF (DIP switch settings)</td>
<td></td>
</tr>
<tr>
<td>Baud rate</td>
<td>SERIAL1,4: 1.2, 2.4, 4.8, 9.6, 14.4, 19.2, 28.8, 38.4, 57.6, 115.2 kbps</td>
</tr>
<tr>
<td>Synchronization</td>
<td>Asynchronous</td>
</tr>
<tr>
<td>Processor</td>
<td>SH-4A (SH7730) 256 MHz</td>
</tr>
<tr>
<td>Memory</td>
<td>128MB with ECC, battery backup</td>
</tr>
</tbody>
</table>

**CPU Function Specification**

**Common CPU Specifications**

- **Execution Speed**: Approx. 50 Ksteps/sec in IL language
- **Task Priority**: Possible in 16 levels
- **Task Execution Code**: 10 or more (by 10 msec. increments)
- **Data Area**: Max. 128 KB
- **Reserved Area**: Max. 40KB
- **Bus Timing**: BUSF: 2.0 ns, BUSP: 2.0 ns
- **Bus width**: 32 bits
- **Bus and Control Address**: 32 bits
- **Bus access time**: 1.6 to 3.3 μsec

**Guideline of Control Application Capacity**

- **Total number of VDS, FCN/FCJ OPC Server and FAST/TOOLS**: (approx. 360 Ksteps in an IL language) (*3)
- **Function blocks (POUs)**: Up to 512
- **Sequence program**: Up to 180 kilosteps in Ladder
- **Regulator control blocks (e.g., indicator blocks, controller blocks, and manual loaders)**: Up to 128

**Network (Ethernet) Specification**

- **Duplex configuration**: Possible
- **Hot-Swap**: Not applicable
- **Rated output**: + 5.1 V DC, 7.8 A
- **Analog field power supply input**: 24 V DC ± 10%, 4 A, Duplexed (matching diode)
- **LED**: SYS (5 V system power output ON), FLD (24 V field power supply ON)
- **Checking terminals**: + 5 V, + 24 V
- **Weight**: 0.6 kg
- **Rated output**: + 5.1 V DC, 7.8 A
- **Operation temperature**: 0˚C to 70˚C
- **Power consumption**: 1.6 W to 2.9 W depending on network and embedded I/O configuration

**FCN-RTU Module Specifications**

**Digital I/O Modules**

- **NFPW444**: Power supply module (12 V DC input) or (24 V DC input)
  - **Duplex configuration**: Possible
  - **Hot-Swap**: Not applicable
  - **Rated output**: + 5.1 V DC, 7.8 A
  - **Analog field power supply input**: 24 V DC ± 10%, 4 A, Duplexed (matching diode)
  - **LED**: SYS (5 V system power output ON), FLD (24 V field power supply ON)
  - **Checking terminals**: + 5 V, + 24 V
  - **Weight**: 0.61 kg
  - **Operation temperature**: 0˚C to 70˚C
  - **Power consumption**: 1.6 W to 2.9 W depending on network and embedded I/O configuration

- **NFPW44A**: Power supply module (24 V DC input)
  - **Duplex configuration**: Possible
  - **Hot-Swap**: Not applicable
  - **Rated output**: + 5.1 V DC, 7.8 A
  - **Analog field power supply input**: 24 V DC ± 10%, 4 A, Duplexed (matching diode)
  - **LED**: SYS (5 V system power output ON), FLD (24 V field power supply ON)
  - **Checking terminals**: + 5 V, + 24 V
  - **Weight**: 0.58 kg
  - **Operation temperature**: 0˚C to 70˚C
  - **Power consumption**: 1.6 W to 2.9 W depending on network and embedded I/O configuration

**Base Modules**

- **NFBU200-S1**: Short base module (DIN rail-mounted)
  - **Duplex configuration**: Not applicable
  - **Hot-Swap**: Possible
  - **Rated output**: + 5.1 V DC, 7.8 A
  - **Analog field power supply input**: 24 V DC ± 10%, 4 A, Duplexed (matching diode)
  - **LED**: SYS (5 V system power output ON), FLD (24 V field power supply ON)
  - **Checking terminals**: + 5 V, + 24 V
  - **Weight**: 0.61 kg
  - **Operation temperature**: 0˚C to 70˚C
  - **Power consumption**: 1.6 W to 2.9 W depending on network and embedded I/O configuration

- **NFBU200-S0**: Base module (DIN rail-mounted)
  - **Duplex configuration**: Not applicable
  - **Hot-Swap**: Possible
  - **Rated output**: + 5.1 V DC, 7.8 A
  - **Analog field power supply input**: 24 V DC ± 10%, 4 A, Duplexed (matching diode)
  - **LED**: SYS (5 V system power output ON), FLD (24 V field power supply ON)
  - **Checking terminals**: + 5 V, + 24 V
  - **Weight**: 0.57 kg
  - **Operation temperature**: 0˚C to 70˚C
  - **Power consumption**: 1.6 W to 2.9 W depending on network and embedded I/O configuration

**Power Supply Modules**

- **NFBU050-S1**: Short base module (19-inch rack-mounted)
  - **Duplex configuration**: Not applicable
  - **Hot-Swap**: Possible
  - **Rated output**: + 5.1 V DC, 7.8 A
  - **Analog field power supply input**: 24 V DC ± 10%, 4 A, Duplexed (matching diode)
  - **LED**: SYS (5 V system power output ON), FLD (24 V field power supply ON)
  - **Checking terminals**: + 5 V, + 24 V
  - **Weight**: 1.06 kg
  - **Operation temperature**: 0˚C to 70˚C
  - **Power consumption**: 1.6 W to 2.9 W depending on network and embedded I/O configuration

**Basic Module**

- **NFBU050-S1**: Short base module (19-inch rack-mounted)
  - **Duplex configuration**: Not applicable
  - **Hot-Swap**: Possible
  - **Rated output**: + 5.1 V DC, 7.8 A
  - **Analog field power supply input**: 24 V DC ± 10%, 4 A, Duplexed (matching diode)
  - **LED**: SYS (5 V system power output ON), FLD (24 V field power supply ON)
  - **Checking terminals**: + 5 V, + 24 V
  - **Weight**: 1.06 kg
  - **Operation temperature**: 0˚C to 70˚C
  - **Power consumption**: 1.6 W to 2.9 W depending on network and embedded I/O configuration

**FCN-RTU Module Specifications**

**Digital I/O Modules**

- **NFRDU30-00**: Base module (24 V DC input)
  - **Duplex configuration**: Possible
  - **Hot-Swap**: Not applicable
  - **Rated output**: 5.1 V DC, 2.4 A
  - **Analog field power supply input**: 24 V DC ± 10%, 4 A
  - **LED**: SYS (5 V system power output ON), FLD (24 V field power supply ON)
  - **Checking terminals**: + 5 V, + 24 V
  - **Weight**: 1.02 kg
  - **Operation temperature**: 0˚C to 70˚C
  - **Power consumption**: 1.6 W to 2.9 W depending on network and embedded I/O configuration

- **NFRDU50-01**: Base module (24 V DC input)
  - **Duplex configuration**: Possible
  - **Hot-Swap**: Not applicable
  - **Rated output**: 5.1 V DC, 2.4 A
  - **Analog field power supply input**: 24 V DC ± 10%, 4 A
  - **LED**: SYS (5 V system power output ON), FLD (24 V field power supply ON)
  - **Checking terminals**: + 5 V, + 24 V
  - **Weight**: 1.02 kg
  - **Operation temperature**: 0˚C to 70˚C
  - **Power consumption**: 1.6 W to 2.9 W depending on network and embedded I/O configuration
### FCN-RTU Module Specifications

#### Analog I/O Modules

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>WTR</th>
<th>HRT</th>
<th>BLI</th>
<th>Basic Specification</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFAR181</td>
<td>Analog Input</td>
<td>4 to 20 mA</td>
<td>8 ch.</td>
<td>Isolated ch.</td>
<td>Withstanding voltage: 500 V AC between input and system, 500 V AC between ch./ch.</td>
<td>±0.1 % of full scale, Data refresh cycle: 10 ms, Input step response time: 100 ms, Temperature drift: Max. ±0.01 °C</td>
</tr>
<tr>
<td>NFAR182</td>
<td>Analog Input</td>
<td>4 to 20 mA</td>
<td>16 ch.</td>
<td>Isolated ch.</td>
<td>Withstanding voltage: 500 V AC between input and system, 500 V AC between ch./ch.</td>
<td>±0.1 % of full scale, Data refresh cycle: 10 ms, Input step response time: 100 ms, Temperature drift: Max. ±0.01 °C</td>
</tr>
<tr>
<td>NFAR183</td>
<td>Analog Input</td>
<td>4 to 20 mA</td>
<td>0 to 10 kHz</td>
<td>Non-Isolated</td>
<td>Withstanding voltage: 500 V AC between input and system, 500 V AC between ch./ch.</td>
<td>±0.1 % of full scale, Data refresh cycle: 10 ms, Input step response time: 100 ms, Temperature drift: Max. ±0.01 °C</td>
</tr>
<tr>
<td>NFAR184</td>
<td>Analog Input</td>
<td>4 to 20 mA</td>
<td>16 ch.</td>
<td>Isolated ch.</td>
<td>Withstanding voltage: 500 V AC between input and system, 500 V AC between ch./ch.</td>
<td>±0.1 % of full scale, Data refresh cycle: 10 ms, Input step response time: 100 ms, Temperature drift: Max. ±0.01 °C</td>
</tr>
<tr>
<td>NFAB181</td>
<td>Analog Input</td>
<td>1 to 5 V</td>
<td>8 ch.</td>
<td>Non-Isolated</td>
<td>Withstanding voltage: 500 V AC between input and system</td>
<td>±0.1 % of full scale, Data refresh cycle: 10 ms, Input step response time: 100 ms, Temperature drift: Max. ±0.01 °C</td>
</tr>
<tr>
<td>NFAB182</td>
<td>Analog Input</td>
<td>1 to 5 V</td>
<td>16 ch.</td>
<td>Non-Isolated</td>
<td>Withstanding voltage: 500 V AC between input and system</td>
<td>±0.1 % of full scale, Data refresh cycle: 10 ms, Input step response time: 100 ms, Temperature drift: Max. ±0.01 °C</td>
</tr>
<tr>
<td>NFAB183</td>
<td>Analog Input</td>
<td>0 to 10 V</td>
<td>4 ch.</td>
<td>Output</td>
<td>Withstanding voltage: 500 V AC between input/output and system, 500 V AC between ch./ch.</td>
<td>±0.1 % of full scale, Data refresh cycle: 10 ms, Input step response time: 100 ms, Temperature drift: Max. ±0.01 °C</td>
</tr>
<tr>
<td>NFAB184</td>
<td>Analog Input</td>
<td>0 to 10 V</td>
<td>8 ch.</td>
<td>Output</td>
<td>Withstanding voltage: 500 V AC between input/output and system, 500 V AC between ch./ch.</td>
<td>±0.1 % of full scale, Data refresh cycle: 10 ms, Input step response time: 100 ms, Temperature drift: Max. ±0.01 °C</td>
</tr>
<tr>
<td>NFAB185</td>
<td>Analog Input</td>
<td>0 to 10 V</td>
<td>16 ch.</td>
<td>Output</td>
<td>Withstanding voltage: 500 V AC between input/output and system, 500 V AC between ch./ch.</td>
<td>±0.1 % of full scale, Data refresh cycle: 10 ms, Input step response time: 100 ms, Temperature drift: Max. ±0.01 °C</td>
</tr>
</tbody>
</table>

#### Communication Modules

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>WTR</th>
<th>HRT</th>
<th>BLI</th>
<th>Basic Specification</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFRL115</td>
<td>Control/review function communication module</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Max current consumption: 600 mA</td>
<td>0.3 kg, Data refresh cycle: 10 ms, Input step response time: 100 ms, Temperature drift: Max. ±0.01 °C</td>
</tr>
<tr>
<td>NFRL121</td>
<td>PROBUS-DP communication module</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Max current consumption: 600 mA</td>
<td>0.3 kg, Data refresh cycle: 10 ms, Input step response time: 100 ms, Temperature drift: Max. ±0.01 °C</td>
</tr>
<tr>
<td>NFRL131</td>
<td>CANopen communication module</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Max current consumption: 600 mA</td>
<td>0.3 kg, Data refresh cycle: 10 ms, Input step response time: 100 ms, Temperature drift: Max. ±0.01 °C</td>
</tr>
</tbody>
</table>
FCN-RTU
(Long base type, DIN rail-mounted)

FCN-RTU
(Long base type, 19 inch rack-mounted)

FCN-RTU
(Short base type, DIN rail-mounted)

CPU Module
FCN-RTU model: NFCP050

Power Supply Module
Model: NFPW444/NFPW426

Analog I/O Module
Model: NFA1135/NFA1141/NFA1143/NFAV141/
NFAV144/NFAV141/NFA1811/NFA135/
NFA1835/NFA841/NFA841/NFA1543

Digital I/O Module
Model: NFDV151/NFDV551

Terminal Block
Model: NFT45/NFT45/NFT85/
NFT85/NFT55/NFT135

Model: NFT315
Model: NFTC45
Model: NFCCC01
**Software Selection**

<table>
<thead>
<tr>
<th>Name</th>
<th>Model</th>
<th>Suffix Codes/Option Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCN/FCJ Software Media</td>
<td>NT203AJ</td>
<td>PC11E</td>
</tr>
<tr>
<td>FCN/FCJ APPF Software Media</td>
<td>NT205AJ</td>
<td>PC11E</td>
</tr>
</tbody>
</table>

**Embedded Software**

<table>
<thead>
<tr>
<th>Name</th>
<th>Model</th>
<th>Suffix Codes/Option Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAS portfolio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Web application portfolio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E-mail application portfolio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graphic portfolio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logging portfolio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA-M3 communication portfolio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MELSEC communication portfolio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modbus communication portfolio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CANopen communication portfolio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas flow calculation portfolio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquid flow calculation portfolio</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**FCN/FCJ Engineering Tool Linense**

<table>
<thead>
<tr>
<th>Name</th>
<th>Model</th>
<th>Suffix Codes/Option Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logic Designer License</td>
<td>NT751FJ</td>
<td>LW11A</td>
</tr>
<tr>
<td>FCN/FCJ Simulator License</td>
<td>NT752AJ</td>
<td>LW11A</td>
</tr>
<tr>
<td>FCN/FCJ Duolet AP Development Kit License</td>
<td>NT750FJ</td>
<td>LW11A</td>
</tr>
</tbody>
</table>

**FCN/FCJ OPC Server License**

<table>
<thead>
<tr>
<th>Name</th>
<th>Model</th>
<th>Suffix Codes/Option Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCN/FCJ OPC Server for Windows</td>
<td>NT781AJ</td>
<td>LW11A</td>
</tr>
</tbody>
</table>
## Hardware Selection

### FCN-RTU Common Modules

<table>
<thead>
<tr>
<th>Name</th>
<th>Model</th>
<th>Suffix Code/Options Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Type</td>
<td>Standard</td>
<td>with ISA standard G3 option</td>
</tr>
<tr>
<td>CPU module for FCN-RTU</td>
<td>NECP50D</td>
<td>S15 S16</td>
</tr>
<tr>
<td>Power supply module</td>
<td>NFPW425</td>
<td>S0 S1</td>
</tr>
<tr>
<td>Power supply module</td>
<td>NFPW444</td>
<td>S0 S1</td>
</tr>
</tbody>
</table>

### Input/Output Modules (**1)**

<table>
<thead>
<tr>
<th>Name</th>
<th>Model</th>
<th>Suffix Code/Options Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Output module</td>
<td>NFDV551</td>
<td>S9105FA</td>
</tr>
<tr>
<td>Analog Output module</td>
<td>NFAB841</td>
<td>S50/A4S10 S50/CCC01 S51/A4S10 S51/CCC01</td>
</tr>
<tr>
<td>Analog Input module</td>
<td>NFAB841</td>
<td>S50/A4S10 S50/CCC01 S51/A4S10 S51/CCC01</td>
</tr>
<tr>
<td>Analog I/O module</td>
<td>NFAI835</td>
<td>S50/13S00 S50/13S10 S50/CCC01 S51/13S00 S51/13S10 S51/CCC01</td>
</tr>
<tr>
<td>Analog I/O module</td>
<td>NFAI141</td>
<td>S50/A4S00 S50/A4S10 S50/CCC01 S51/A4S00 S51/A4S10 S51/CCC01</td>
</tr>
<tr>
<td>Analog I/O module</td>
<td>NFAI143</td>
<td>S50/A4S00 S50/A4S10 S50/CCC01 S51/A4S00 S51/A4S10 S51/CCC01</td>
</tr>
<tr>
<td>Analog I/O module</td>
<td>NFAI145</td>
<td>S50/A4S00 S50/A4S10 S50/CCC01 S51/A4S00 S51/A4S10 S51/CCC01</td>
</tr>
<tr>
<td>Terminal Block (Non-Isolated)</td>
<td>NFAV141</td>
<td>S50/A4S00 S50/A4S10 S50/CCC01 S51/A4S00 S51/A4S10 S51/CCC01</td>
</tr>
<tr>
<td>Terminal Block (Isolated)</td>
<td>NFAV143</td>
<td>S50/A4S00 S50/A4S10 S50/CCC01 S51/A4S00 S51/A4S10 S51/CCC01</td>
</tr>
<tr>
<td>Terminal Block (Non-Isolated)</td>
<td>NFAV145</td>
<td>S50/A4S00 S50/A4S10 S50/CCC01 S51/A4S00 S51/A4S10 S51/CCC01</td>
</tr>
<tr>
<td>Terminal Block (Isolated)</td>
<td>NFAV147</td>
<td>S50/A4S00 S50/A4S10 S50/CCC01 S51/A4S00 S51/A4S10 S51/CCC01</td>
</tr>
</tbody>
</table>

### Communication Modules (**2)**

<table>
<thead>
<tr>
<th>Name</th>
<th>Model</th>
<th>Suffix Code/Options Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation Fieldbus module</td>
<td>NFCP050</td>
<td>S0 S15 S0 S16</td>
</tr>
<tr>
<td>CANopen communication module</td>
<td>NFCP050</td>
<td>S0 S15 S0 S16</td>
</tr>
</tbody>
</table>

### MIL Connector Cables

<table>
<thead>
<tr>
<th>Name</th>
<th>Model</th>
<th>Suffix Code/Options Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIL connector cable</td>
<td>KM505</td>
<td>0.05 0.10 0.15 0.20 0.25 0.30</td>
</tr>
</tbody>
</table>

### MIL Connector Terminal Blocks

<table>
<thead>
<tr>
<th>Name</th>
<th>Model</th>
<th>Suffix Code/Options Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIL connector terminal block for Analog I/O modules</td>
<td>KMS505</td>
<td>0.05 0.10 0.15 0.20 0.25 0.30</td>
</tr>
</tbody>
</table>

### Pressure Clamp Terminal Blocks

<table>
<thead>
<tr>
<th>Name</th>
<th>Model</th>
<th>Suffix Code/Options Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure clamp terminal block for Analog I/O modules</td>
<td>NTAI45</td>
<td>00 10</td>
</tr>
<tr>
<td>Pressure clamp terminal block for Analog I/O modules except for NFAR181 and NFCP050 (with 16 channels)</td>
<td>NTAI45</td>
<td>00 10</td>
</tr>
</tbody>
</table>

### Test Switch and Lamp

<table>
<thead>
<tr>
<th>Name</th>
<th>Model</th>
<th>Suffix Code/Options Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test switch for FCN digital input module</td>
<td>CDC101</td>
<td></td>
</tr>
<tr>
<td>Test switch for FCN digital output module</td>
<td>CDC102</td>
<td></td>
</tr>
<tr>
<td>MIL cable connector cover</td>
<td>NFTC01</td>
<td></td>
</tr>
</tbody>
</table>

---

**Notes:**
- **(*1)**: Suffix Code for the following HART module is changed from “S” to “H”.
- **(*2)**: Suffix code for extended temperature model.
- **(*3)**: NFDR541 is not compliant with RoHS directive and will not be compliant with CE marking from July 22, 2017.
- **(*4)**: MIL input is only applicable for KMS40.
- **(*5)**: Cable length to 25.0m is available.
- **(*6)**: It can be directly mounted or connected with cable (A1417WL).
# Hardware Selection

## FCN-RTU Common Module

<table>
<thead>
<tr>
<th>Name</th>
<th>Model</th>
<th>Suffix Codes</th>
<th>Options Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Type</td>
<td></td>
<td>Standard</td>
<td>with ISA standard G3 option</td>
</tr>
<tr>
<td>CPU module for FCN-RTU</td>
<td>NCFP060</td>
<td>S1E</td>
<td>S1F</td>
</tr>
<tr>
<td>Power supply module</td>
<td>10-30VDC</td>
<td>00</td>
<td>00</td>
</tr>
<tr>
<td>Power supply module</td>
<td>24VDC</td>
<td>00</td>
<td>01</td>
</tr>
</tbody>
</table>

## Communication Modules

<table>
<thead>
<tr>
<th>Name</th>
<th>Model</th>
<th>Suffix Codes</th>
<th>Options Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td></td>
<td>with ISA standard G3 option</td>
<td></td>
</tr>
</tbody>
</table>

- **Foundation Fieldbus communication module (4 ports)**: NFLF111
  - End Suffix Code: S1F
  - Cable Length: 0.5m to 25.0m available. Can be ordered by the one meter.

## MIL Connector Cables

<table>
<thead>
<tr>
<th>Name</th>
<th>Model</th>
<th>Cable Length</th>
<th>Suffix Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIL connector cable</td>
<td>NFDV151</td>
<td>0.5m to 2.0m</td>
<td>00, 01, 015, 020, 025, 030</td>
</tr>
<tr>
<td>MIL connector cable</td>
<td>NFDV551</td>
<td>0.5m to 2.0m</td>
<td>00, 01, 015, 020, 025, 030</td>
</tr>
</tbody>
</table>

## Pressure Clamp Terminal Blocks

<table>
<thead>
<tr>
<th>Name</th>
<th>Model</th>
<th>Suffix Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIL connector terminal block for analog I/O modules except for NFA1141, NFA1431, NFA1541, NFA1841, NFA2441, NFA2841, NFA4341, NFA4841, NFA5341, NFA5841</td>
<td>TAC40-</td>
<td>DN</td>
</tr>
<tr>
<td>MIL connector terminal block for digital I/O modules (50 pole plug types, M3.5)</td>
<td>TAC50-</td>
<td>DN</td>
</tr>
</tbody>
</table>

## Cover

- Dummy cover for I/O module slots: NFCDC01
- Dummy cover for power supply module slots: NFDC100