F&eIT Series

I/O Controller Module

CPU-CA10(FIT)GY
CPU-CA20(FIT)GY

User's Manual

CONTEC CO., LTD.

Check Your Package

Thank you for purchasing the CONTEC product.

The product consists of the items listed below.

Check, with the following list, that your package is complete.   If you discover damaged or missing items, contact your retailer.
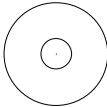
Product Configuration List

    - Module < CPU-CA10(FIT)GY > …1

    - First Step Guide …1

    - Disk [F&eIT Series Setup Disk] *1 …1

    - Power connector …1

    *1 The bundled disk contains various software and User's Manual (this manual)
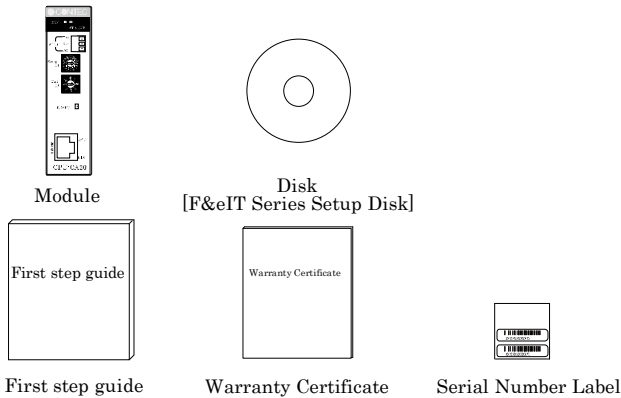
| Module | Disk [F&eIT Series Setup Disk] | Power connector | First step guide |

Product Configuration List

    - Module < CPU-CA20(FIT)GY > …1

    - First Step Guide …1

    - Disk [F&eIT Series Setup Disk] *1 …1

    - Power connector …1

    - Warranty Certificate…1

    - Serial Number Label…1

    *1 The bundled disk contains various software and User's Manual (this manual)

Module

Disk
[F&eIT Series Setup Disk]

First step guide

Warranty Certificate

Serial Number Label

Copyright

Trademarks

Table of Contents

1. Before Using the Product

This chapter provides information you should know before using the product.

About the Module

This product is a controller module for transferring I/O data between a host PC and network. It can be used to process I/O signals from connected F&eIT series device modules. You can connect any combination of digital I/O, analog I/O, counter inputs, or other device modules (up to a maximum of eight modules).

The latest information on which device modules can be used is included in the Readme file on the bundled disk. If updating to the latest firmware, refer to the Readme file for the firmware.

Please read this manual carefully before performing system configuration such as developing application programs, setting switches, or connecting external devices.

Features

- The module does not require a fan as it uses a low power CPU with low heat dissipation. The compact design means it can be installed anywhere.

- The module controls connected device modules such as digital I/O, and transfers monitoring and control data to and from a host PC or server unit via Ethernet.

- The module can be used as part of a web-based system in conjunction with a F&eIT series I/O Assist Server Unit [SVR-IOAx(FIT)GY]*1 and Monitoring and Control Server Unit [SVR-MMFx(FIT)GY]*1.

- The supplied driver library makes it easy to monitor and control external devices via a network from a host PC. Control applications can also be developed on UNIX and other non-Windows operating systems by using standard socket calls.

- As in the case of other members of the F&eIT series, a mechanism for attachment to the 35mm DIN rail is provided in the system unit as a standard item. The system features a unique configuration that enables it to be connected to a module on the side in a stacking manner, which allows you to configure the system simply and elegantly without using backplanes and other connecting devices

*1 The "x" in a model code represents a single digit (or no digit) indicating different products.
(The same convention applies below).

System Configuration Image

This product is an I/O controller module for processing I/O signals from connected device modules and transferring this data via a network to or from a PC or other host device.

When connected to a device module, the I/O Controller Module forms an I/O Controller Unit.

When used in conjunction with an I/O Assist Server Unit (SVR-IOAx(FIT)GY), the I/O Controller Unit can collect data and perform management functions, such as loading data onto the I/O Controller Unit itself.

Multiple I/O controller units and I/O assist server units (a maximum of eight units) can be installed on the same network. In this manner, when connected to an I/O assist server unit, a host controller can input and output signals to and from the devices that are connected to a subordinate I/O controller unit.
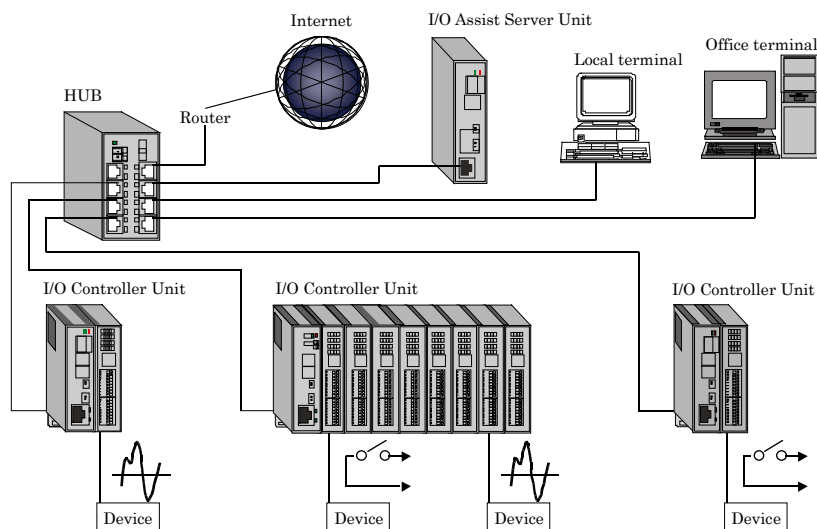
Nomenclature

I/O Assist Server Unit:

The I/O Assist Server Unit supports the management function that enables it to collect data from, and set data to, I/O controller units that belong to the same group as the Group ID that is set by using the Group ID switches of the SVR-IOAxx(FIT)GY ("Assist Server"), which is a CONTEC product. Group IDs can be set in a range of 0 - 7.

By connecting local terminals and office terminals by means of a Web browser, it is possible to monitor the status of the devices that are connected to an I/O controller unit.

I/O Controller Unit:

The I/O Controller Unit is a general term that refers to any combination of this product, the CPU-CAxx(FIT)GY, with device modules.

Each device contains a Group ID SW and a Unit ID SW; these switches must be set so that they are unique within the network. The I/O Controller Unit transmits data collected from the devices to the I/O Assist Server Unit that bears a specified Group ID.

The Group ID for a CPU-CA10(FIT)GY can be set in the range 0 - 8. The Unit ID can be set in the range 0 - 7.

The Group ID for a CPU-CA20(FIT)GY can be set in the range 0 - 8 and A. The Unit ID can be set in the range 0 - 7. If the Group ID is set to A, the Unit ID can be set in the range 0 - 7Fh, permitting up to 128 devices.

Data cannot be sent to an I/O Assist Server if the Group ID is set to 8 or A. Control of the I/O controller unit can be performed directly from a terminal.

Further details on this topic may be found in the respective device module manuals.

HUB:

This is a line concentration device that is used when a LAN is constructed using twisted-pair cables. The F&eIT series includes an 8-port switching HUB unit (SH-8008(FIT)H) that is equipped with a DIN rail mounting mechanism.

Customer Support

CONTEC provides the following support services for you to use CONTEC products more efficiently and comfortably. No driver software is provided with this module. Please download the latest drivers from the CONTEC web site. Documents including important notes on the use of the module are also posted on the web site. Please visit the CONTEC web site before using the module.

Web Site

https://www.contec.com/

Latest product information

CONTEC provides up-to-date information on products.

CONTEC also provides product manuals and various technical documents in the PDF.

Free download

You can download updated driver software and differential files as well as sample programs available in several languages.

Note! For product information

Contact your retailer if you have any technical question about a CONTEC product or need its price, delivery time, or estimate information.

How to Obtain Service

For replacement or repair, return the device freight prepaid, with a copy of the original invoice. Please obtain a Return Merchandise Authorization number (RMA) from the CONTEC group office where you purchased before returning any product.

* No product will be accepted by CONTEC group without the RMA number.

Liability

The obligation of the warrantor is solely to repair or replace the product. In no event will the warrantor be liable for any incidental or consequential damages due to such defect or consequences that arise from inexperienced usage, misuse, or malfunction of this device.

Safety Precautions

Understand the following definitions and precautions to use the product safely.

Safety Information

This document provides safety information using the following symbols to prevent accidents resulting in injury or death and the destruction of equipment and resources. Understand the meanings of these labels to operate the equipment safely.

⚠ DANGER	DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING	WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.

Handling Precautions

⚠ CAUTION

- Do not use or store the equipment in a hot or cold place, or in a place that is subject to severe temperature changes.(Operating temperature range: 0 - 50 ºC)
- Do not use or store the equipment in a place subject to direct sunlight or near a heating device, such as a stove.
- Do not use or store the equipment in a dusty or humid place. (Operating humidity range: 10 - 90%RH, no condensation)
- Do not use or store the product near equipment generating a strong magnetic field or radio waves.
- As this product contains precision electronic components, do not use or store in environments subject to shock or vibration.
- If you notice any strange odor or overheating, please unplug the power cord immediately.
- In the event of an abnormal condition or malfunction, please consult the dealer from whom the equipment was purchased.
- To avoid electric shock, please do not touch the system with a wet hand.
- Do not modify the module. CONTEC will bear no responsibility for any problems, etc., resulting from modifying this module.
- Do not open the module casing. CONTEC will disclaim any responsibility for equipment whose casing has been opened.
- To prevent damage, please do not subject the module to impact or bend it.
- To prevent contact malfunction, please do not touch the metallic pins on the external module connector.
- The module contains switches that need to be properly set. Before using the module, please check its switch settings.

- To avoid malfunction, please do not change the module switch settings in an unauthorized manner.

- Do not operate the device module when the power for the Controller Module is on.
  To avoid malfunction, please be sure to turn off the power for the Controller Module.

- Regarding "CE EMC Directive Notice"
  Please use the STP cable to meet the mentioned standard above.
  The ferrite core must be installed in LAN connecting cable.

Name	Maker	Turn	Quantity	Installation Site
E04SR301334	SEIWA	2	1	on LAN cable at product side
E04SR170730A	SEIWA	1	2	on LAN cable at product side

* Equivalent product can also be used.

Image diagram

Ferrite core

Cable   TURN: 1   TURN: 2   TURN: 3   TURN: 4
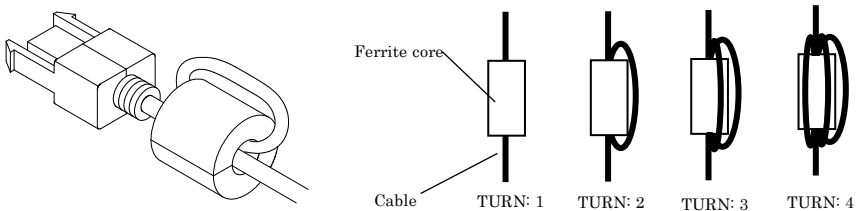
FCC PART 15Class A Notice

NOTE

This equipment has been tested and found to comply with the limits for a ClassA digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC WARNING

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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Security Warning

When connecting to the network, be aware of security-related problems. See the examples of Security measures below and set up the product properly along with the network devices.

[Information security risks]

- Unauthorized access from the outside through a network could cause the system halt, data damage, or exposure to malware * 1.

- Invaded and used as a stepping stone, a device might attack the others through networks.
(a victim becomes an assailant)

- Information might leak without realizing due to the connection to the network.

- Secondary damages such as harmful rumors, liability in damages, social credibility fall, and opportunity loss are expected led by the troubles described above.

*1…Malware (Malicious Software) is software that brings harm to a computer system and performs unintended
 operations.

[Security measures - e.g.]

- Do not keep using the default password. (Refer to the product manual for the password setting).

- Set a strong password.
⇒Combined with upper and lowercase letters, and numbers so that it cannot be easily analogized by others.

- Change the password periodically.

- Disable unnecessary network services and functions.

- Restrict access to the network with network devices. *2

- Restrict ports to be released on the network with network devices.

- Create a closed network connection using such as dedicated network or VPN*3.

*2…Inquire for setting procedure to manufacturers.

*3…VPN (Virtual Private Network): a secured network that wards off unauthorized access by protecting the communication path with authentication and encryption.

Unfortunately, there are no perfect ways to avert unauthorized access or close a security hole that are endlessly found day and night. Please understand that risks are always involved with the Internet connection, and we strongly recommend a user should constantly update information security measures.

Environment

Use this product in the following environment. If used in an unauthorized environment, the module may overheat, malfunction, or cause a failure.

Operating temperature

0 - 50°C

Humidity

10 - 90%RH (No condensation)

Corrosive gases

None

Floating dust particles

Not to be excessive

Inspection

Inspect the product periodically as follows to use it safely.

* Check that the ventilation slit has no obstruction and
has no dust or foreign matter adhering.
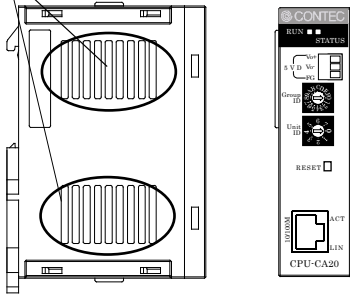
Storage

When storing this product, keep it in its original packing form.

(1) Put the module in the storage bag.

(2) Wrap it in the packing material, then put it in the box.

(3) Store the package at room temperature at a place free from direct sunlight, moisture, shock, vibration, magnetism, and static electricity.

Disposal

When disposing of the product, follow the disposal procedures stipulated under the relevant laws and municipal ordinances.

2. Module Nomenclature and Settings

Nomenclature of Module Components

Figure 2.1 or Figure 2.2 shows the names of module components. In the figure, the indicated switch settings represent factory settings.
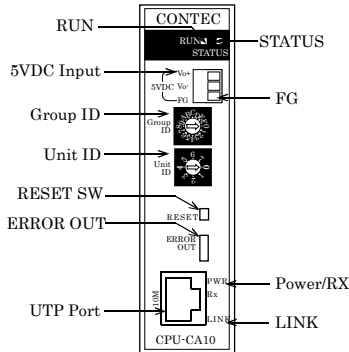
Figure 2.1. Nomenclature of Module Components [CPU-CA10(FIT)GY]
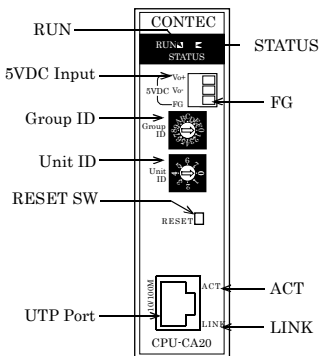
Figure 2.2. Nomenclature of Module Components [CPU-CA20(FIT)GY]

Names and Functions [Common]

Table 2.1. Names and Functions

Name	Function	Settings & Indicator
Status LED	RUN STATUS	Refer to Table 2.2. Operating Modes and Status Indicators
LAN LED	LINK	OFF : Not connected ON : Connected to the LAN
	Power/RX [CPU-CA10(FIT)GY]	OFF : Power off ON : Power on Flashing: Receiving data
	ACT [CPU-CA20(FIT)GY]	OFF : Communication inactive ON : Communication active
Setting switch	Group ID setup :0 - F switch: Unit ID :0 - 7 setup switch:	Group ID : 0 - 8, A *1 0 - 7 : Assist Server connect mode 8 : Stand-alone startup mode A : Stand-alone startup mode *1 9, B - D : Not used E is used for V.UP (upgrading) and system recovery mode. F : Default initialization mode Unit ID : 0 - 7 *1
RESET SW	Manual reset	---
ERROR OUT *2	External output contacts, such as Power OFF and Link disconnection, for abnormal conditions	---
UTP port	10BASE-T LAN connect [CPU-CA10(FIT)GY] 10/100BASE-TX LAN connect [CPU-CA20(FIT)GY]	---

*1 Group ID "A" (standalone boot mode) can only be used on the CPU-CA20(FIT)GY.

    If the Group ID is set to "A", the Unit ID is set in the range 0 - 7Fh by software.

*2 Only on the CPU-CA10(FIT)GY.

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Operating modes and status indicators [Common]

Table 2.2. Operating Modes and Status Indicators

Operating mode	Starting an operation	Condition of Group ID	Status indicator		
			RUN	STATUS	Condition
Normal op. mode	Power ON: Reset switch ON: Remote-reset	Set to 0 - 8 or A	ON	OFF	Normal operation
			Continuous, alternating flashing		Resetting
			OFF	Continuous flashing	Abnormal conditions (e.g., memory check error)
			ON	ON	Abnormal conditions (e.g., start error)
Initialization mode (factory settings)	Power ON: Reset switch ON: Remote-reset: (does not automatically return to normal operating mode)	"F" switch settings	Continuous flashing	Continuous flashing	Initializing
			ON	ON	Initialization complete (To return to normal operating mode, change the GroupID and turn the power on again or press the Reset switch.)
			OFF	Continuous flashing	Error during initialization
			ON	ON	Abnormal conditions (e.g., start error)
Recovery mode & V.UP mode	Power ON: Reset switch ON: Remote-reset: (does not automatically return to normal operating mode)	"E" switch settings	Continuous flashing	OFF	Starting
			Continuous flashing	Continuous flashing	Writing to firmware
			OFF	Continuous flashing	Write error occurred.
			ON	ON	Abnormal conditions (e.g., start error)

Connectors

Table 2.3. Connectors

Name	Specifications / Function
UTP port	Network connection port. Communication speed: 10Mbps auto-detect [CPU-CA10(FIT)GY] 10/100Mbps auto-detect [CPU-CA20(FIT)GY] Communication type: Connected as full duplex or half duplex.
ERROR-OUT *1	Output specs: Open collector output by photocoupler insulation Output ratings: 30VDC(Max.), 10mA(Min.) Response time: 100μsec(Max.)
Power input connector	5VDC±5% 2-piece detachable power input connector, FG pin Dedicated screw-type plug that can be operated from the side (MCS 5/3-ST-3.5 Phoenix Contact-compliant cable: AWG 28 - 16)

*1 Only on the CPU-CA10(FIT)GY.

Error Output [CPU-CA10(FIT)GY only]

Table 2.4. Error Output

Function	Output specs		Error detection
The detection circuit is normally made; when an error is detected, the circuit is broken.	Output specs:	Open collector output by photo-coupler insulation	Power supply off, LINK disconnect, memory check error, and other system errors
	Output ratings:	30VDC (Max.), 10mA (Min.)	
	Response time:	100μsec (Max.)	

Reference equivalent circuit [CPU-CA10(FIT)GY only]
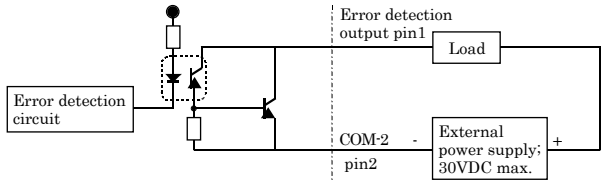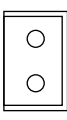
Figure 2.3. Reference Equivalent Circuit

Table 2.5. Error Output Pin Assignments

Item	Model
Connector used	S2B-EH (made by J.S.T. Mfg Co.,Ltd.)
Housing	EHR-2 (made by J.S.T. Mfg Co.,Ltd.)
Contact	SEH-001T-P0.6 (made by J.S.T. Mfg Co.,Ltd.)

UTP port pin assignments [Common]

Table 2.6. UTP Port Pin Assignments

Pin No.	Signal
1	TD+
2	TD-
3	RD+
4	Not used
5	Not used
6	RD-
7	Not used
8	Not used
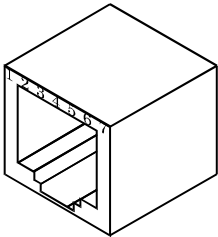
Setting a Group ID

By setting a Group ID, it is possible to manage the various operating modes (e.g., connecting an I/O assist server unit, starting the system on a stand-alone basis, or upgrading the system).

A Group ID can be set in a range of 0 - F.

Setup Method

A Group ID can be set by turning the rotary switch on the module face.

To set a Group ID, turn the switch knob.
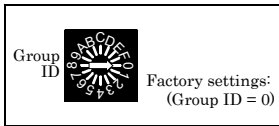
Figure 2.4. Group ID

0 - 7   : I/O Assist Server Unit connection mode

8   : Stand-alone startup mode

A   : Stand-alone startup mode [**CPU-CA20(FIT)GY only**]

9, B - D   : Not used

E   : System recovery and firmware upgrade mode

F   : Initialization mode *1

⚠ CAUTION

A Group ID in the 0 - 7 range must be the same as the Group ID for the I/O Assist Server Unit. When a CPU-CA20(FIT)GY is used with the Group ID set to "A" for standalone boot mode, use the utility software to set the Unit ID.

*1 About Initialization mode

Restore the setting of this product to its factory settings. Set the Group ID to "F" and turn the power on. RUN and STATUS LEDs will start to flash. Once these LEDs stop flashing and grow solid, all settings (IP address etc.) will be initialized and return to its factory settings after next boot.

Setting a Unit ID

By setting a Unit ID, it is possible to manage the units in the same group.

A Unit ID can be set in a range of 0 - 7 (8 possible positions).

Setup Method

A Unit ID can be set by turning the rotary switch on the device face.

To set a Unit ID, turn the switch knob.
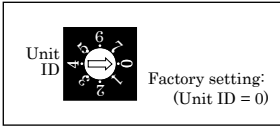
Figure 2.5. Unit ID

⚠ CAUTION ─────────────────────────────

The Unit IDs in the same group must all be unique within the group.

When a CPU-CA20(FIT)GY is used with the Group ID set to "A" for standalone boot mode, use the utility software to set the Unit ID.

3. Stack Connection between Modules

Mounting the Module

Stack Connection Locking Devices

The module contains locking devices (▲ mark, two units at the top and bottom) for a stack connection to stacking hooks.
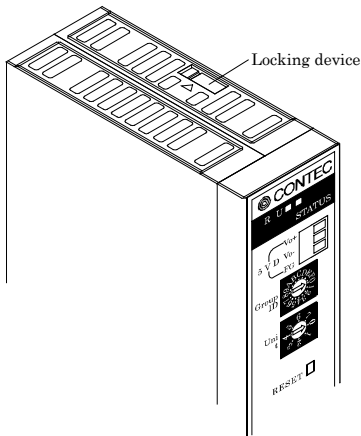
Locking device

How the stack connection locking device works
- Locking
   Push the pawl on the locking device with a tool that has a slender tip downward from above to
   open the spring for the locking device (the groove moves toward you).
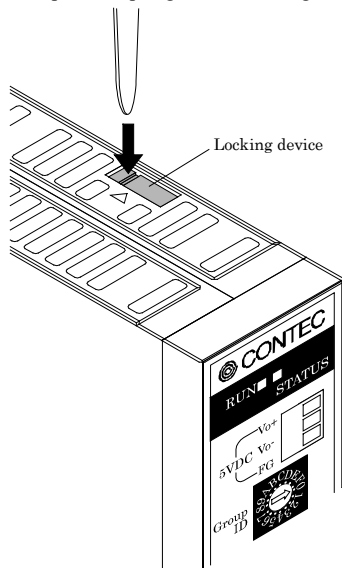
Locking device

- Unlocking
   Push the groove of the locking device with a tool that has a slender tip in the direction of the
   arrow until the device is locked.
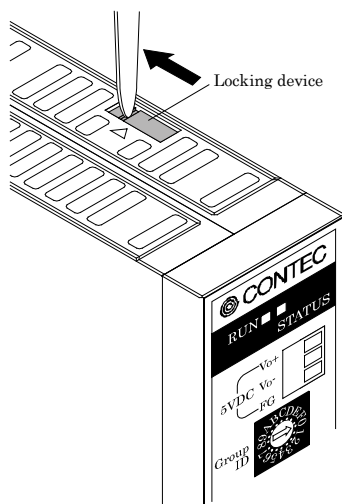
Locking device

Connecting the module

Inserting the stack hook by aligning it with the hook insertion inlet for the other device automatically locks the module.
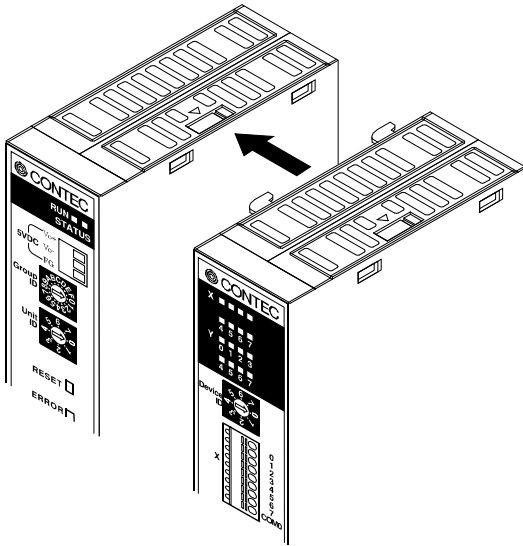
Removing the module

Unlock the locking device at the top and the bottom. Remove the connected module from the hook.
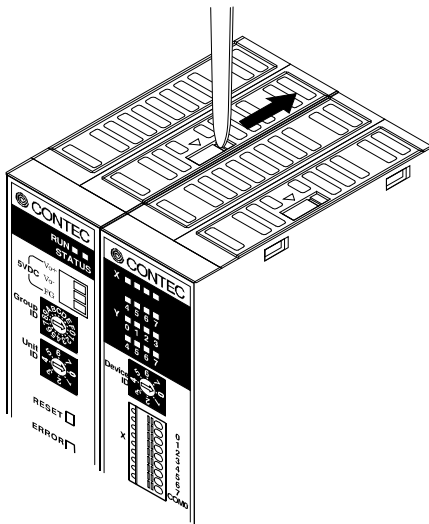
4. Installation and Connection

Installation Method

Mounting on a DIN Rail

Mounting procedure

(1) Pushing the fixing hook with a flat-blade screwdriver renders it into a lock-enabled condition (this operation should be done on all connected modules).

35mmDIN rail

Please here to lift the fixing hook.
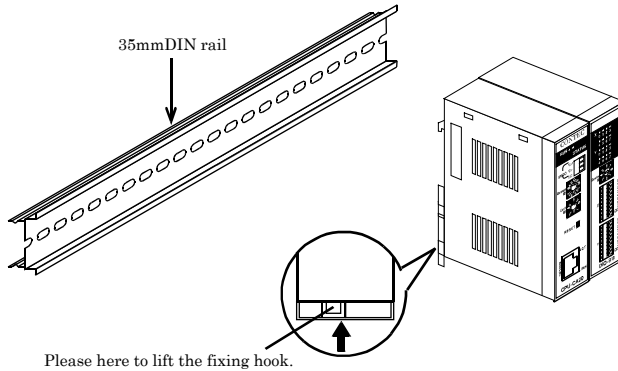
Figure 4.1. Mounting on a DIN Rail < 1 / 3 >

(2) Hook the unit (an object consisting of a controller and a module) from the upper part of the DIN rail, and press the lower part of the unit onto the DIN rail.

Side view
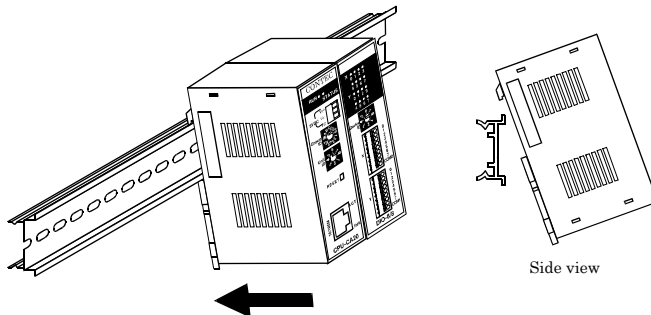
Figure 4.1. Mounting on a DIN Rail < 2 / 3 >

(3) The fixing hook is automatically locked, and the module can be mounted in one-touch.

Fixing hook

Side view
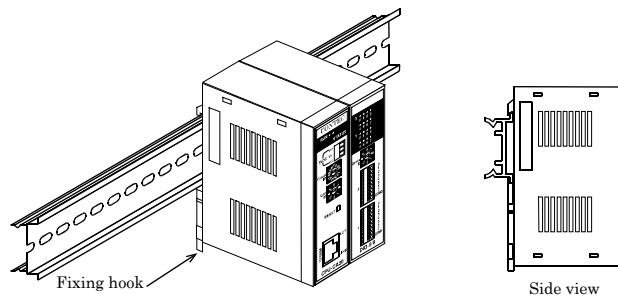
Figure 4.1. Mounting on a DIN Rail < 3 / 3 >

Removal procedure

(1) Lower the fixing hook for the unit to unlock it (this operation should be performed on all connected modules).

35mmDIN rail
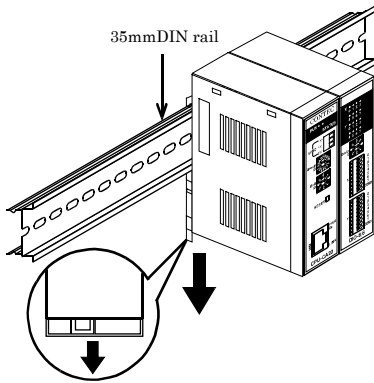
Figure 4.2. Removing the Module from the DIN Rail < 1 / 3 >

(2) With the fixing hook unlocked, pull the lower part of the unit toward you.

Side view
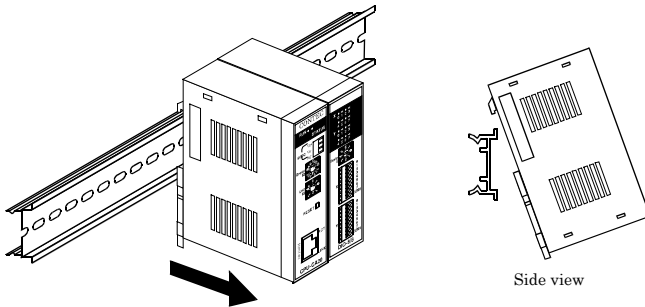
Figure 4.2. Removing the Module from the DIN Rail < 2 / 3 >

(3) By lifting the unit, you can easily remove it from the DIN rail.

Side view
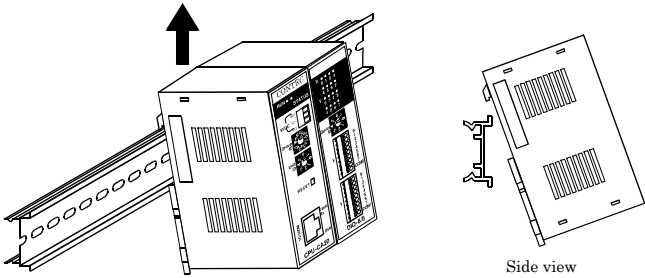
Figure 4.2. Removing the Module from the DIN Rail < 3 / 3 >

⚠ CAUTION

Any operation involving the disconnection of modules in a unit (in which multiple modules are connected) that is attached to a DIN rail should be performed after the unit is removed from the DIN rail.

Connection Method

Supplying the Power to the CPU-CAxx(FIT)GY

The module and the DC-DC power supply (POW-DDxx) can be cable-connected using the detachable connector that is proviced on the unit face. (Compatible cables: AWG28 - 16)

Third-party DC output power supply unit can also be connected in the same way.

⚠ CAUTION

- The power for the device module is supplied from the stack connector.
- As the DC-DC power supply generates heat, provide a gap of at least 2.0cm between the power supply and module to ensure the air vents are not obstructed.
- The power supplied from the stack connector is 5.0VDC 3A. Although a maximum of eight units can be connected, be careful that the sum of the power requirements of the connected units is no greater than 3A.
- Input power requirements of the CPU-CA10(FIT)GY : 5.0VDC±5%, 0.5A (Max.)
  Input power requirements of the CPU-CA20(FIT)GY : 5.0VDC±5%, 0.7A (Max.)
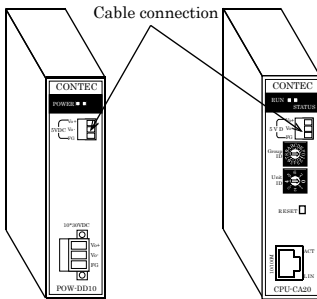
Figure 4.3. Connecting the Controller Module to the DC-DC Power Supply Unit

Table 4.1. Power Consumption

Product type	Module type	Current consumption (5.0VDC)
DIO-8/8(FIT)GY	Isolated digital I/O module (12 - 24VDC)	0.15A
DI-16(FIT)GY	Isolated digital input module (12 - 24VDC)	0.15A
DO-16(FIT)GY	Isolated digital output module (12 - 48VDC)	0.15A
DIO-8/8H(FIT)GY	Isolated digital I/O module (36 - 48VDC)	0.15A
DI-16H(FIT)GY	Isolated digital input module (36 - 48VDC)	0.15A
DIO-4/4(FIT)GY	Isolated digital I/O module (Input:12 - 24VDC, Output:12 - 48VDC)	0.15A
DI-8(FIT)GY	Isolated digital input module (12 - 24VDC)	0.15A
DO-8(FIT)GY	Isolated digital output module (12 - 48VDC)	0.15A
DIO-8D(FIT)GY	Non-isolated buffered bi-directional digital I/O module	0.15A
ADI12-8(FIT)GY	Isolated analog input module	0.35A
ADI16-4(FIT)GY	Isolated high-precision analog input module	0.3A
DAI12-4(FIT)GY	Isolated analog output module	0.40A
DAI16-4(FIT)GY	Isolated high-precision analog output module	0.50A
CNT24-2(FIT)GY	Isolated counter input module	0.15A

* Refer to the Readme file on the supplied CD for the latest information on the available device modules and their power consumption specifications.

Connecting the CPU-CAxx(FIT)GY to the SH-8008(FIT)H

- These units are connected by means of an Ethernet interface.

- In situations where many lower-level groups are used, a hub should be provided between those groups and the CPU-CAxx(FIT)GY.

(CONTEC recommends the use of the switching HUB unit SH-8008(FIT)H in the F&eIT series of products.)

Network cable

Cables complying with the following specifications should be used:

Category 3,4 UTP cable (for 10BASE-T)

Category 5 UTP cable (for 100BASE-TX)
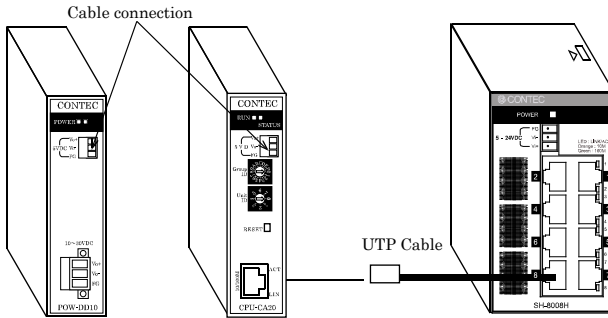
Figure 4.4. Connecting a Network Cable

5. Setup

Setup Procedures

The I/O controller unit and the I/O must be assigned unique IP addresses. The section below explains the "Quick Setup", in which the default IP addresses are used "as is", and the "Custom Setup", in which utility software is used.

Quick Setup

The default factory setting for the IP address of the I/O controller unit and I/O Assist Server unit is set based on the Ethernet MAC address of their LAN controller. The item indicated as "M/A" on the label affixed on the side of the respective unit represents the unit's Ethernet address (MAC address).

An IP address is generated by using the last three digits of an Ethernet address.

Example: MA: "00.80.4C.<u>AA.BB.CC</u>"
        The code "00.80.40" is common to all units.
        The unit's IP address will be "10.<u>170.187.204</u>".
        The network mask is assigned as "255.0.0.0".

(1) Check the Group ID and Unit ID for the controller unit. Also, make sure that the Device ID for the device module is unique.

(2) Connect the power cable and the network cable to the I/O controller unit.

(3) Set the IP address and the network mask so that the host controller belongs to the same network as the I/O controller unit.

    Example: If not devices other than F&eIT series devices are connected, the IP address "10.1.1.1" and the netmask "255.0.0.0" can be assigned to the host controller.

Custom Setup

When installing a F&eIT series device on an existing network, you need to assign an IP address so that it will not conflict with the IP addresses of other network devices.

An IP address can be assigned by using the utility software that is included in the product.

Installing the utility software

(1) Checking the operating environment for the utility software

OS   Windows Vista, XP, 2000, NT 4.0 Service Pack 3 or later, Me, 98 etc.

Hardware   A personal computer with any of the above operating systems running and that can be connected to a TCP/IP network.

 For details, read Help supplied on the CD-ROM.

(2) Preparation before installation

Shut down all the extraneous applications running on the computer on which to install the files for the Module. If a screensaver or virus detection software is up and running, make it inactive temporarily.

(3) Installation

Insert the disc bundled with the Module into the CD-ROM drive.

A menu will be ran and displayed automatically. Follow the on-screen instructions to install the "Development environment" or "Runtime environment" of [API-CAP(W32)].

[Runtime environment]

Install the F&eIT Setting Utility and the library for using programs such as API functions, F&eIT common functions, and F&eIT DDE Server on the PC.

[Development environment]

Install the F&eIT Setting Utility and the library, help files, and sample programs for creating control programs for F&eIT devices on the PC.

The "development environment" installed contains the "runtime environment."

Follow the on-screen instructions to carry out the installation.

When the installation has been completed normally, some programs are registered.

(4) Starting an application and checking some notes

The entry "CONTEC API-CAP(W32)" is added to the Programs list on the Start menu.

Following items are registered in the list.

[When the runtime environment has been installed]

F&eIT Setting Utility   :   This program sets up and diagnoses the I/O Assist Server, I/O Controller, and device module.

FIT_PCSERVER   :   This program stays resident to collect data from the I/O controller unit.

FIT_SVR (DDE SERVER) :   This program is DDE SERVER supporting the I/O Assist Server and I/O controller unit.

FIT_SVR_R(F&eIT GENERIC DDE SERVER)   :

This program is DDE SERVER that can access devices which support the F&eIT protocol using their IP address and virtual address.

[When the development environment has been installed]

The following items are added to those registered [when the runtime environment has been installed].

Pt Folder	:	This folder contains the entries of the program for diagnosing a temperature measurement device and of the sample program for accessing the temperature measurement device using an API.
Aio Folder	:	This folder contains the entries of the program for diagnosing an analog device and of the sample program for accessing the analog device using the API.
Cnt Folder	:	This folder contains the entries of the program for diagnosing a counter device and of the sample program for accessing the counter device using an API.
Dio Folder	:	This folder contains the entries of the program for diagnosing a digital device and of the sample program for accessing the digital device using the API.
API-CAP(W32) HELP	:	Help file for API function library [API-CAP(W32)]
F&eIT Common Functions HELP	:	Help file for F&eIT common functions and Remote I/O functions.

Setting Up a Device

(1) Determine what Group ID and Unit ID are to be used.

The Group ID on the front panel can be selected from a range of 0 to 8.

(Group ID A can also be selected on the CPU-CA20(FIT)GY.)

When using the I/O Assist Server Unit, assign the same group ID as the I/O Assist Server Unit (Group ID 0 to 7).

(2) Connect the power cable and network cable to the I/O controller unit.

Setting the IP address for the I/O controller unit

Open the Start menu, choose "CONTEC API-CAP(W32)," then start the "F&eIT Setup Utility." Specify the IP address and net mask in the setup dialog box.

For details on how to use the setup utility, consult the help file.

Finish setup

When you have finished setting up the I/O controller unit, restart it for the settings to take effect.

Utility Software Operating Procedures

The F&eIT Setting utility can be used to make network settings such as IP addresses, specify device names, and diagnose or set up device modules.

For details on how to use the utility, consult the help file.
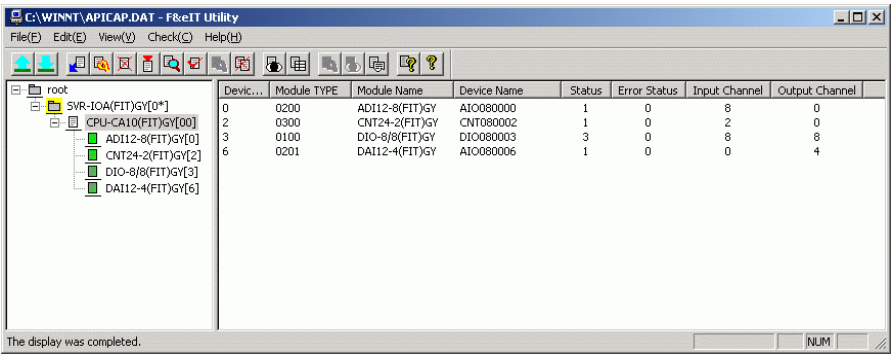
Figure 5.1. Main Menu

6. Access to Devices

This chapter provides information on using API functions [API-CAP(W32)] and DDE Server [FIT_SVR(W32)] to create access applications.

Access using API- CAP(W32)

API-CAP(W32) is a library of functions positioned above F&eIT common functions and RemoteIO functions.

The API-CAP(W32) library is a DLL which provides function interfaces customized for individual categories of devices to be used in connection with the I/O controller unit, such as digital, analog, counter, and temperature measurement devices. The library itself is created based on F&eIT common functions. You can easily control devices connected to the I/O controller unit only by calling specific API-CAP(W32) library functions provided for different categories without paying attention to the virtual address map, F&eIT protocol, and to device-specific control sequences.

For details on how to use API functions, consult the help file.

START	
Initialization	Initialize the device module so that it can be accessed. Call the "xxxInit" function.
Setup	Set up the device module.
Input / output	Process data input from and output to the device module.
Termination	Terminate access to the device module. Call the "xxxExit" function.
END	
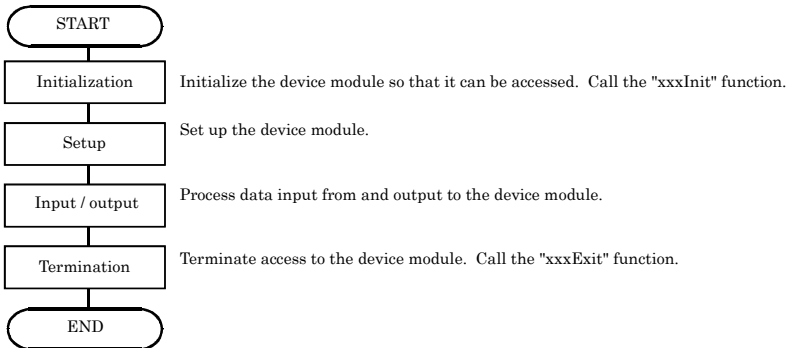
Figure 6.1. API-CAP(W32) Function Calling Sequence

API-CAP(W32) is provided as a group of functions and programs facilitating access to F&eIT device modules. The F&eIT protocol itself remains unchanged as it has been provided. The introduction of API-CAP(W32) has no effect on applications created so far by using F&eIT common functions and RemoteIO functions.

Applications based on conventional F&eIT common functions and RemoteIO functions run normally even in the API-CAP(W32) installed environment.

For details on F&eIT common functions and RemoteIO functions, consult the help file.

Access Using DDE

FIT-SVR(DDE Server) includes a DDE server function.

DDE client applications can access FIT-SVR to retrieve input data from the device.
Refer to FIT-SVR Help for details on how to setup FIT-SVR.

In the case of access by DDE, Topic and Item is defined as follows:

Application	:	FIT_SVR
Topic	:	GRPxx
		Here, GRP is a constant indicating a group. xx is the 2-digit (00 - 08) Group ID.
Item	:	UxxDyyTzz

U		Constant indicating a unit.
xx		Unit ID. Set a 2-digit value. (00 - 07)
D		Constant indicating a device.
yy		Device ID. Set a 2-digit value. (00 - 07)
T		Specify the device data type. The following eight settings are available.

DI_BIT   : Bit input (boolean)
DI_BYTE   : Byte input (integer)
DI_WORD   : Word input (integer)
DO_BIT   : Bit output (boolean)
DO_BYTE   : Byte output (integer)
DO_WORD : Word output (integer)
ADI   : Analog input (real)
DAI   : Analog output (real)
CNT   : Counter input (integer)
* Integers are 32-bit.

zz   Channel number. Set a 2-digit value. (Prefix with 0 if value is between 0 and 9.)

⚠ CAUTION

When a CPU-CA20(FIT)GY is used with Group ID set to "A" for standalone boot mode, set topic = GRP0A and item = Uxx (xx is in the range 00 - 7Fh).

For Example; Getting the data into Microsoft Excel

A numerical formula bar
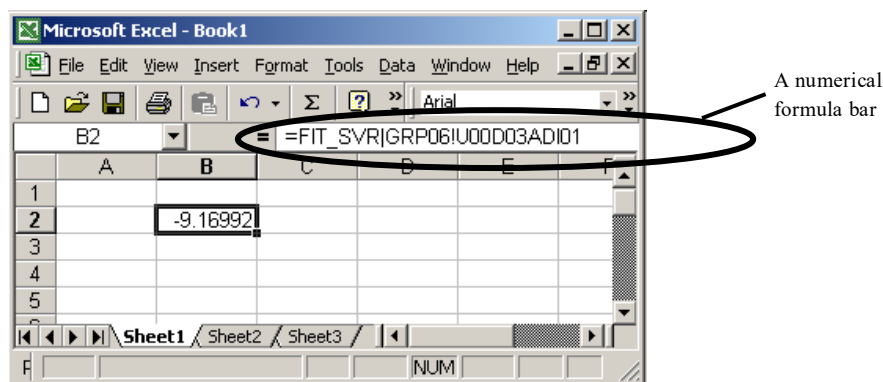
You can retrieve device data in Excel by specifying =<application name>|<topic name>!<item name> in the numeric formula bar.

For Example:

GroupID:06 UnitID:00 DeviceID:03 (In the case that ADI12-8(FIT)GY is used)
In the case getting the data of Channel:01 into a cell,

=FIT_SVR|GRP06!U00D03ADI01 is inputted into a cell.

7. Virtual Address Map

This chapter explains the virtual address map that is provided on the I/O Controller Module. The virtual address map allows the system to exchange information with the I/O Controller Unit by using any of the functions described above.

Virtual Address Space

In the I/O Controller Module, virtual space is defined as indicated below. For the mapping of module-specific detailed information (I/O space, memory space, and so forth), please refer to the manual that is supplied with the Module.

00000000h	Device information	4KB
00001000h	Settings	4KB
00002000h	Statistics	4KB
00003000h	Reserved	1012KB

00000000h	Information common to devices	(1MB)
00100000h	Device-specific information	(1MB)
00200000h	Definition of device-specific information	(1MB)
00300000h	I/O space	1MB
00400000h	Reserved	(1MB)
FFE00000h	Firmware update area	2MB

00300000h	Module virtual memory	64KB
00310000h	Reserved	448KB
00380000h	I/O data storage area	64KB
00390000h	Reserved	448KB

Figure 7.1. Virtual Address

Common device information	:	Information common to the F&eIT series of devices. Holds version, IP address, and send/receive frame information.
Device-specific information	:	Holds the startup status of the connected device module.
Def. of device-specific info	:	Provides an explanation of device-specific information in the text format.
I/O space	:	Holds the startup status of the connected module, its settings, and I/O data.
Firmware update area	:	The area in which the firmware of this device can be updated.

Common Device Information (00000000h)

This virtual address space is the same for all devices.

Device information

The 4Kbytes (1000h) area starting from address 00000000h is used for reading the device information.

Table 7.1. Virtual Address Space

Address (h)	Area	Parameter	Size	Access type	Remarks
00000000	Device information	Vendor name	32	R	"CONTEC CO.,LTD."
		Model	32	R	*1
		Equipment version	2	R	1.0
		Firmware version	2	R	1.0
		MAC address	6	R	00804C******
		Installed functions	2	R	Bit 0: I/O space
					Bit 1: Memory space
					Bit 2: Trap function
					Bit 3: Message send
					Bit 4: Reset function
					Bit 5 and higher: reserved
		IP address	4	R	
		Product type	2	R	*2
		Reserved	4	R	
		F&eIT protocol version	2	R	
		Reserved	4008	R	

*1 CPU-CA10(FIT)GY : "CPU-CA10(FIT)GY", CPU-CA20(FIT)GY : "CPU-CA20(FIT)GY" (string) are set.

*2 CPU-CA10(FIT)GY:6 and CPU-CA20(FIT)GY:18 (decimal) are set.

Settings

The 4Kbytes (1000h) area starting from address 00001000h is used to store the settings required for communications. Area for reading and writing settings. Settings can only be written via communications with an ID that matches the privilege ID.

Table 7.2. Settings

Address (h)	Area	Parameter	Size	Access type	Remarks
00001000	Settings	Read-privilege ID	8	W	*1 (Initial value: 00h)
		Read/Write privilege ID	8	W	*1 (Initial value: 00h)
		IP address	4	R/W	Example: 192.168.132.31
		Subnet mask	4	R/W	Example: 255.255.255.0
		Default gateway	4	R/W	Example: 192.168.132.1
		Trop-to IP address	4	R/W	*2 Example: 192.168.132.21
		Effective multicast	4	R/W	0 - 4 (Initial value = 0)
		Multicast IP1	4	R/W	*3 Indicates a Group 3 address, to
		Multicast IP2	4	R/W	be used for multicasting
		Multicast IP3	4	R/W	
		Multicast IP4	4	R/W	
		UDP port	2	R/W	5007h (initial value)
		Reserved	4042	R	

*1 For security purposes, the type of the ID is distinguished, and whether the data can be read/written is determined. (Because this is a read-disabled area, if the settings are unknown, you may need to initialize the area and perform a setup from scratch.)

*2 Trap-to IP address: If the host with a specified IP address is started, the device-specific information will be transmitted to it.

*3 Multicast IP1 - 4: Registers the multicast group that receives simultaneous communications by multicasting.

Statistical information

The 4Kbytes (1000h) area starting from address 00002000h is used to read the statistical data for the device.

Table 7.3. Statistics

Address (h)	Area	Parameter	Size	Access type	Remarks
00002000	Statistics	Elapsed time	4	R	Seconds
		Total number of transmitted frames	4	R	Counter
		Total number of transmitted bytes	4	R	Counter
		Total number of received frames	4	R	Counter
		Total number of received bytes	4	R	Counter
		Total number of errors sent	4	R	Counter
		Total number of errors received	4	R	Counter
		Reserved	4068	R	

Device-Specific Information (00100000h)

In the I/O Controller Module, data with the same format as the startup-time trap information is defined as device-specific information.

Table 7.4. Device-Specific Information

Address (h)	Area	Parameter		Size	Access type	Remarks
00100000		Vendor name		32	R	"CONTEC CO.,LTD."
		Model		32	R	*1
		Equipment version		2	R	1.0
		Firmware version		2	R	1.0
		MAC address		6	R	00804C******
		Installed functions		2	R	*2 Installation function indicated by Bit 1 (see "Device parameter").
		IP address		4	R	
		Product type		2	R	*3
		Group ID		2	R	
		Unit ID		2	R (RW*3)	*4
		F&eIT protocol version		2	R	
00100058	Device–specific information	Terminal operating status		4	R	Each set of 4 bits indicates the status of a slot: bit0 - 3:Device ID=0 bit4 - 7:Device ID=1 ... bits28 - 31:Device ID=7 Value: bit0:0:Not existing, 1:Existing bit1:0:Not operating, 1:Operating
		Device information	Device ID 0	4	R	*5
			Device ID 1	4	R	*5
			Device ID 2	4	R	*5
			Device ID 3	4	R	*5
			Device ID 4	4	R	*5
			Device ID 5	4	R	*5
			Device ID 6	4	R	*5
			Device ID 7	4	R	*5
		Reserved		1048452	R	

*1 CPU-CA10(FIT)GY : "CPU-CA10(FIT)GY", CPU-CA20(FIT)GY : "CPU-CA20(FIT)GY" (string) are set.

*2 Installation function: Because the I/O device module has an I/O space, a trap function, and a reset function, the values 0x19 and 0x00 are set in this area.

*3 CPU-CA10(FIT)GY:6 and CPU-CA20(FIT)GY:18 (decimal) are set.

*4 The Unit ID can only be set in the range 00h - 7Fh when the CPU-CA20(FIT)GY Group ID is set to "A".

*5 Device type (category, serial No.)

Table 7.5. Device-ID detailed Information

Parameter	Size	Access type
Device type (category)	1	R
Device type (serial No.)	1	R
System-reserved (revision No.)	1	R
Reserved	1	R

Table 7.6. Module Type

Module type		Model	Function
Category	Serial No.		
0x01	0x00	DIO-8/8(FIT)GY	8 ch digital input, 8 ch digital output
0x01	0x01	DI-16(FIT)GY	16 ch digital input
0x01	0x02	DO-16(FIT)GY	16 ch digital output
0x01	0x03	DIO-8/8H(FIT)GY	8 ch digital input, 8 ch digital output
0x01	0x04	DI-16H(FIT)GY	16 ch digital input
0x01	0x05	DIO-4/4(FIT)GY	4 ch digital input, 4 ch digital output
0x01	0x06	DI-8(FIT)GY	8 ch digital input
0x01	0x07	DO-8(FIT)GY	8 ch digital output
0x01	0x08	DIO-8D(FIT)GY	8 ch digital I/O
0x02	0x00	ADI12-8(FIT)GY	8 ch analog input
0x02	0x01	DAI12-4(FIT)GY	4 ch analog output
0x02	0x02	ADI16-4(FIT)GY	4 ch analog input
0x02	0x03	DAI16-4(FIT)GY	4 ch digital output
0x03	0x00	CNT24-2(FIT)GY	2 ch counter input

Definition of Device-Specific Information (00200000h)

Provides the definition of device-specific information in the text format.

I/O space (00300000h)

This space, which is used by either the I/O Assist Server Unit or a higher host for data collection and updating, is defined as a structure common to I/O control devices. The 64K device module virtual memory space is partitioned into a basic function and expanded function (reserved) areas. The I/O data storage area, which consolidates the I/O data components, is used to update all I/O data.

00300000h	Module virtual memory	64KB		00300000h	Basic functions	32KB
00310000h	Reserved	448KB		00308000h	Expanded functions (reserved)	32KB
00380000h	I/O data storage area	64KB				
00390000h	Reserved	448KB				
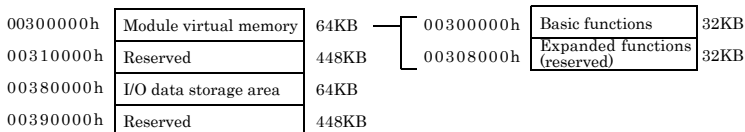
Figure 7.2. I/O Space

Module Virtual Memory

Basic function

Each area is split into 128-byte spaces by device module.
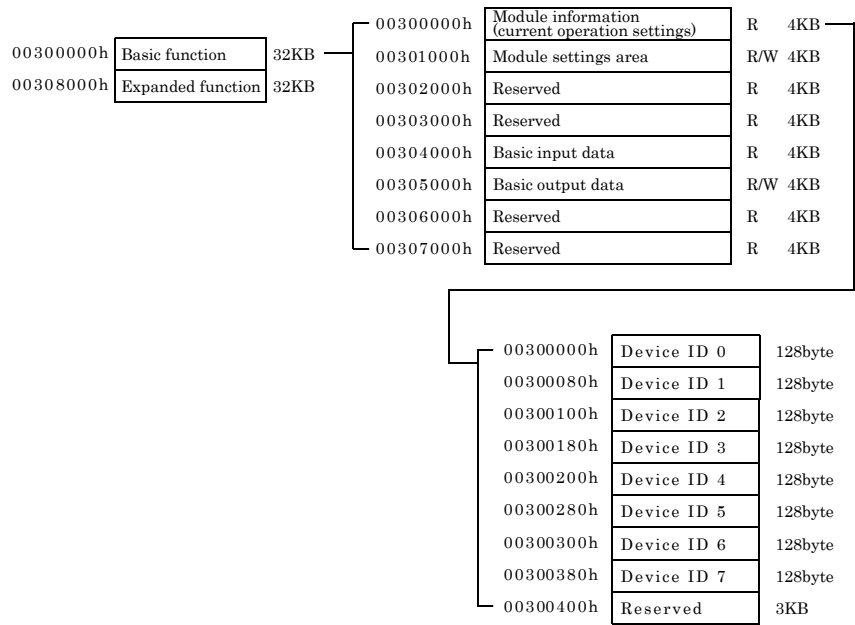
Figure 7.3. Basic Functions

- Module information (00300000h)

The module information includes device-specific information, module settings, and channel settings. Device-specific information contains module-specific information with a format that is common to all modules. Module settings contain settings that are common to all modules with a module-dependent format (with a common module-startup register and error status positions). Channel settings contain chennel-specific settings with a module-dependent format. Further details may be found in the module manuals.

The starting address can be determined according to the following expression:

Starting address = 00300000h + 80h x (Device ID)

Table 7.7. Device Information

Address (h)	Area	Size	Parameter	Size	Remarks
Starting address +0000	Device–specific information	16	Module type (category)	1	See the hardware specs.
			Module type (serial No.)	1	See the hardware specs.
			System-reserved (revision No.)	1	
			Supported functions – supported functions are indicated by bits (0: off; 1: on)	1	When the expanded functions are supported (D2 = on), the host checks the expanded function parameters in the expanded function area and gets their detailed information.
			D0: Basic input		
			D1: Basic output		
			D2: Expanded function		
			D3: Reserved		
			D4: Continuous input		
			D5: Continuous output		
			D6: Reserved		
			D7: Reserved		
			Number of basic input channels	1	0 - 16
			Basic input data size (input data size per channel)	1	0 - 128
			Number of basic output channels	1	0 - 16
			Basic output data size (output data size per channel)	1	0 - 128
			Input channel setup address	1	Fixed at 0x20
			Input channel setup data size	1	Data size set for each channel
			Output channel setup address	1	Stores the starting position for output channel settings.
			Output channel setup data size	1	Setup data size for each channel
			Reserved	4	
Starting address +0010	Module settings	16	Module startup register	1	0 : off, 1 : on D0 : Device started/stopped
			Error status	1	0 : normal operation Non-zero : error (Principally, a module setup startup error is stored here.)
			Module-dependent	14	
Starting address +0020	Channel settings	96	Module-dependent	96	

- **Module settings area (00301000h)**

    The module settings area contains a 128-byte image that is the same as the module information for each module. Settings are written into the module settings area by a higher host. Assigning the value 0x01 to the module startup register causes the module to start up according to the settings provided in the module settings area, and this value is reflected in the module information when the module activation instruction is asserted.

    Example: Analog I/O terminal

Module information

Device ID
Number of basic input channels = 1
Number of basic output channels = 1
Module startup register
Error status
Analog input resolution = 12
Analog input range = ±10V
Analog output resolution = 12
Analog output range = ±5V

Reset

Device-specific information

Device ID
Number of basic input channels = 1
Number of basic output channels = 1
Analog input resolution = 12
Analog output resolution = 12

Module started

Module settings area

Module startup register
Analog input range = ±10V
Analog output range = ±5V

Written by a higher host via communications (this value is saved and reflected in the system when the system is restarted).

Figure 7.4. Analog I/O Terminal

Remarks

When the module is successfully started, the value 0x01 is stored in the module startup register for module information and the value 0x00 in the error status. If an error is found in the settings parameter, the value 0x00 is stored in the module startup register for module information and an error status other than 0x00 in the error status register.

If the module startup instruction is asserted when the module is already operating (module startup register = 0x01), the settings that are provided in the module settings area will be reflected in the operation of the module.

The startup of the module by means of the module startup register is executed upon completion of virtual address access to the I/O unit. This structure takes into account the fact that the host may simultaneously access both the settings data and the module startup register.

- **Basic input data (00304000h)**

    Basic input data is stored in the Little Endian. Details on the number of channels for stored data and the data size for each channel may be found in the respective device module manuals.

00300000h	Basic function	32KB		
00308000h	Expanded function	32KB		

00300000h	Module information (current operation settings)	R	4KB
00301000h	Module settings area	R/W	4KB
00302000h	Reserved	R	4KB
00303000h	Reserved	R	4KB
00304000h	Basic input data	R	4KB
00305000h	Basic output data	R/W	4KB
00306000h	Reserved	R	4KB
00307000h	Reserved	R	4KB

00304000h	Device ID 0	128byte
00304080h	Device ID 1	128byte
00304100h	Device ID 2	128byte
00304180h	Device ID 3	128byte
00304200h	Device ID 4	128byte
00304280h	Device ID 5	128byte
00304300h	Device ID 6	128byte
00304380h	Device ID 7	128byte
00304400h	Reserved	3KB

Figure 7.5. Basic Input Data

- **Basic output data (00305000h)**

    Basic output data is stored in the Little Endian. Details on the number of channels for stored data and the data size for each channel may be found in the respective device module manuals.

00300000h	Basic function	32KB	00300000h	Module information (current operation settings)	R	4KB	
00308000h	Expanded function	32KB	00301000h	Module settings area	R/W	4KB	
			00302000h	Reserved	R	4KB	
			00303000h	Reserved	R	4KB	
			00304000h	Basic input data	R	4KB	
			00305000h	Basic output data	R/W	4KB	
			00306000h	Reserved	R	4KB	
			00307000h	Reserved	R	4KB	

00305000h	Device ID 0	128byte
00305080h	Device ID 1	128byte
00305100h	Device ID 2	128byte
00305180h	Device ID 3	128byte
00305200h	Device ID 4	128byte
00305280h	Device ID 5	128byte
00305300h	Device ID 6	128byte
00305380h	Device ID 7	128byte
00305400h	Reserved	3KB

Figure 7.6. Basic Output Data

I/O data storage area

The I/O data storage area is a central storage of the I/O components for the various modules.

00300000h	Module virtual memory	64KB
00310000h	Reserved	448KB
00380000h	I/O data management area	64KB
00390000h	Reserved	448KB

00380000h	Device status	16byte
00380010h	Device ID I/O data	128byte
00380090h	Reserved	65392byte

Figure 7.7. I/O data Storage Area

- Module status information is comprised of mirrored information on the module startup register and the error status register as part of the module information stored in the basic function area.
- The I/O module I/O data is comprised of the basic input data in the basic function area and the mirrored information that is equivalent to the upper 16 bytes of the basic output data.

The starting address can be determined according to the following expression:

Starting address = 00380000h

Table 7.8. I/O Data Storage Area

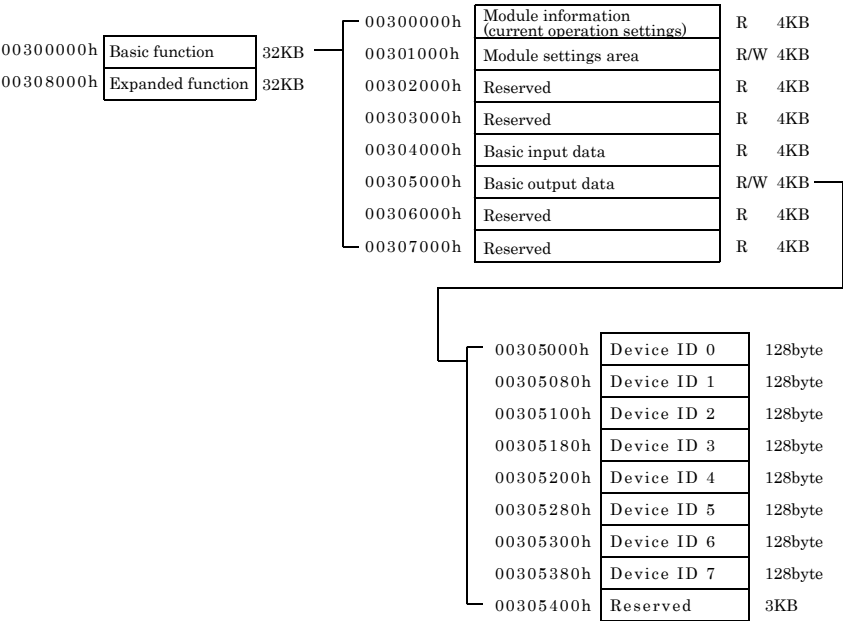| Address (h)	Area	Size	Parameter		Size	Remarks
Starting ddress+00 - Starting address+01	Device status	16	Device ID 0	device startup status	1	R
				error status	1	
Starting address+02 - Starting address+03			Device ID 1	device startup status	1	
				error status	1	
Starting address+04 - Starting address+05			Device ID 2	device startup status	1	
				error status	1	
Starting address+06 - Starting address+07			Device ID 3	device startup status	1	
				error status	1	
Starting address+08 - Starting address+09			Device ID 4	device startup status	1	
				error status	1	
Starting address+0A - Starting address+0B			Device ID 5	device startup status	1	
				error status	1	
Starting address+0C - Starting address+0D			Device ID 6	device startup status	1	
				error status	1	
Starting address+0E - Starting address+0F			Device ID 7	device startup status	1	
				error status	1	
Starting address+10 - Starting address+1F	Device ID I/O data	128	Device ID 0 I/O data		16	R/W
Starting address+20 - Starting address+2F			Device ID 1 I/O data		16	
Starting address+30 - Starting address+3F			Device ID 2 I/O data		16	
Starting address+40 - Starting address+4F			Device ID 3 I/O data		16	
Starting address+50 - Starting address+5F			Device ID 4 I/O data		16	
Starting address+60 - Starting address+6F			Device ID 5 I/O data		16	
Starting address+70 - Starting address+7F			Device ID 6 I/O data		16	
Starting address+80 - Starting address+8F			Device ID 7 I/O data		16	

Firmware Update Area (FFE00000h)

By accessing this area, you can read and write the firmware.

Table 7.9. Firmware Update Area

Address (h)	Area	Parameter	Size	Access type	Remarks
FFE00000 -FFFFFFFF	Firmware update area	Firmware	2M max	R/W	

[Notes on performing firmware access]

Read/write operations are performed by shifting the offset.

1st operation:

Offset = 0x00000000, number of data pieces = 1024

2nd operation:

Offset = 0x00000400, number of data pieces = 1024

3rd operation:

Offset = 0x00000800, number of data pieces = 1024

.

.

.

Detection of the End of File

Read operation :   The EOF is reached when the response packet has a normal status and the access size is [0].

Write operation :   The EOF is reached when the access size of the requesting packet is [0].

8. System Reference

Product Specifications

CPU-CA10(FIT)GY

Table 8.1. Product Specifications [CPU-CA10(FIT)GY]

Item	Specs
CPU	SH3 60MHz
Memory	Flash ROM: 512Kbyte(4Mbit) EDO DRAM : 2Mbyte(16Mbit)
LAN controller	Realtek 10Base controller RTL8019AS Built-in 16K byte SRAM Full duplex-capable NE2000-compatible registers
Interface (host side)	10BASE-T(IEEE802.3)
Interface (device side)	CONTEC original 8-bit bus
Number of connectable devices	8 units max. *1
Module connection method	Device units are directly connected to the right side of the system. Connection mechanisms are provided on the system unit as standard items.
Power supply voltage	Power is supplied by means of a 2-piece power input connector (detachable), 5VDC ±5%, on the front side. Use of a F&eIT series power supply unit or an off-the-shelf stabilized power supply unit is recommended.
Power supply voltage	0.5A(Max.) *2 (Exclusive of any power that is supplied to the device module)
FG pin	Power supply connector equipped with a FG pin.
External dimensions (mm)	25.2(W)×64.7(D)×94.0(H) (exclusive of any protrusions)
Weight	100g
Installation method	One-touch installation on a 35-mm DIN rail.The module includes a DIN rail mounting mechanism as a standard feature.

*1   The sum of maximum current requirements of the units may not exceed the rated output current for the power supply unit.
*2   The power for the device modules is supplied by means of a stack connector. The maximum allowable current on the stack connector is 3.0 A.

Table 8.2. Installation Environment Requirements [CPU-CA10(FIT)GY]

Parameter		Requirement description
Operating temperature		0 - 50 °C
Storage temperature		-10 - 60°C
Humidity		10 - 80%RH (No condensation)
Floating dust particles		Not to be excessive
Corrosive gases		None
Line-Noise resistance	Line-noise *3	AC line/2kV, Signal line/1kV (IEC1000-4-4Level 3, EN61000-4-4Level 3)
	Static electricity resistance	Contact discharge/4kV (IEC1000-4-2Level 2, EN61000-4-2Level 2)
		Atmospheric discharge/8kV (IEC1000-4-2Level 3, EN61000-4-2Level 3)
Vibration resistance	Sweep resistance	10 - 57Hz/semi-amplitude 0.15mm, 57 - 150Hz/2.0G
		80minutes each in X, Y, and Z directions (JIS C0040-compliant, IEC68-2-6-compliant)
Impact resistance		15G, half-sine shock for 11ms in X, Y, and Z directions (JIS C004-compliant, IEC68-2-27-compliant)
Grounding		Class D grounding (previous class 3 grounding)
Standard		VCCI Class A, FCC Class A, CE Marking (EMC Directive Class A, RoHS Directive)

*3   When POW-AD22GY used

CPU-CA20(FIT)GY

Table 8.3. Product Specifications [CPU-CA20(FIT)GY]

Item	Specs
CPU	SH4 240MHz
Memory	Flash ROM: 4Mbyte(32Mbit) SDRAM : 32Mbyte(256Mbit)
LAN controller	National Semiconductor DP83815 10/100BASE-TX controller Internal send (2KByte) and receive (2KByte) buffers Full duplex-capable
Interface (host side)	10/100BASE-TX(IEEE802.3u)
Interface (device side)	CONTEC original 8-bit bus
Number of connectable devices	8 units max. *1
Module connection method	Device units are directly connected to the right side of the system. Connection mechanisms are provided on the system unit as standard items.
Power supply voltage	Power is supplied by means of a 2-piece power input connector (detachable), 5VDC ±5%, on the front side. Use of a F&eIT series power supply unit or an off-the-shelf stabilized power supply unit is recommended.
Power consumption-current	0.7A(Max.) *2 (Exclusive of any power that is supplied to the device module)
FG pin	Power supply connector equipped with a FG pin.
External dimensions (mm)	25.2(W)×64.7(D)×94.0(H) (exclusive of any protrusions)
Weight	100g
Installation method	One-touch installation on a 35-mm DIN rail.The module includes a DIN rail mounting mechanism as a standard feature.

*1 The sum of maximum current requirements of the units may not exceed the rated output current for the power supply unit.
*2 The power for the device modules is supplied by means of a stack connector. The maximum allowable current on the stack connector is 3.0 A.

Table 8.4. Installation Environment Requirements [CPU-CA20(FIT)GY]

Parameter		Requirement description
Operating temperature		0 - 50 °C
Storage temperature		-10 - 60°C
Humidity		10 - 80%RH (No condensation)
Floating dust particles		Not to be excessive
Corrosive gases		None
Line-Noise resistance	Line-noise *3	AC line/2kV, Signal line/1kV (IEC1000-4-4Level 3, EN61000-4-4Level 3)
	Static electricity resistance	Contact discharge/4kV (IEC1000-4-2Level 2, EN61000-4-2Level 2)
		Atmospheric discharge/8kV (IEC1000-4-2Level 3, EN61000-4-2Level 3)
Impact resistance	Sweep resistance	10 - 57Hz/semi-amplitude 0.15mm, 57 - 150Hz/2.0G
		80minutes each in X, Y, and Z directions (JIS C0040-compliant, IEC68-2-6-compliant)
Impact resistance		15G, half-sine shock for 11ms in X, Y, and Z directions (JIS C004-compliant, IEC68-2-27-compliant)
Grounding		Class D grounding (previous class 3 grounding)
Standard		VCCI Class A, FCC Class A, CE Marking (EMC Directive Class A, RoHS Directive)

*3 When POW-AD22GY used

External Dimensions
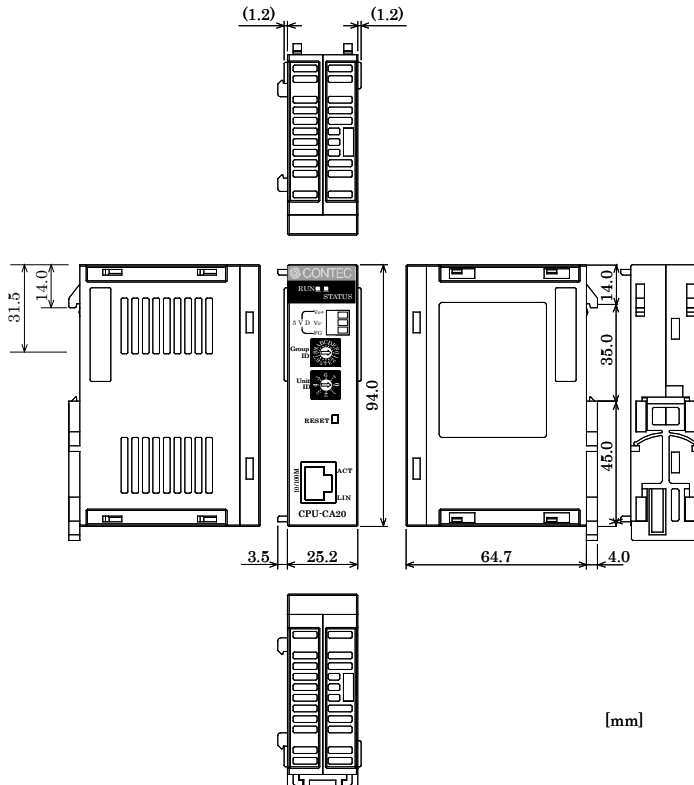
The figure shows the CPU-CA20(FIT)GY. The CPU-CA10(FIT)GY is similar.

Figure 8.1. External Dimensions

F&eIT Protocol Specifications

The sudden spread of the Internet has resulted in networks springing up in a wide range of fields. This, in turn, has resulted in the appearance of many information devices that make use of this infrastructure. Yet, it is a fact that interconnectivity - the greatest advantage of networks - is not being used to its fullest. CONTEC sees networks as a prime part of the system bus concept and has developed distributed monitor & control networks that organically integrate various applications from corporate offices through to field applications.
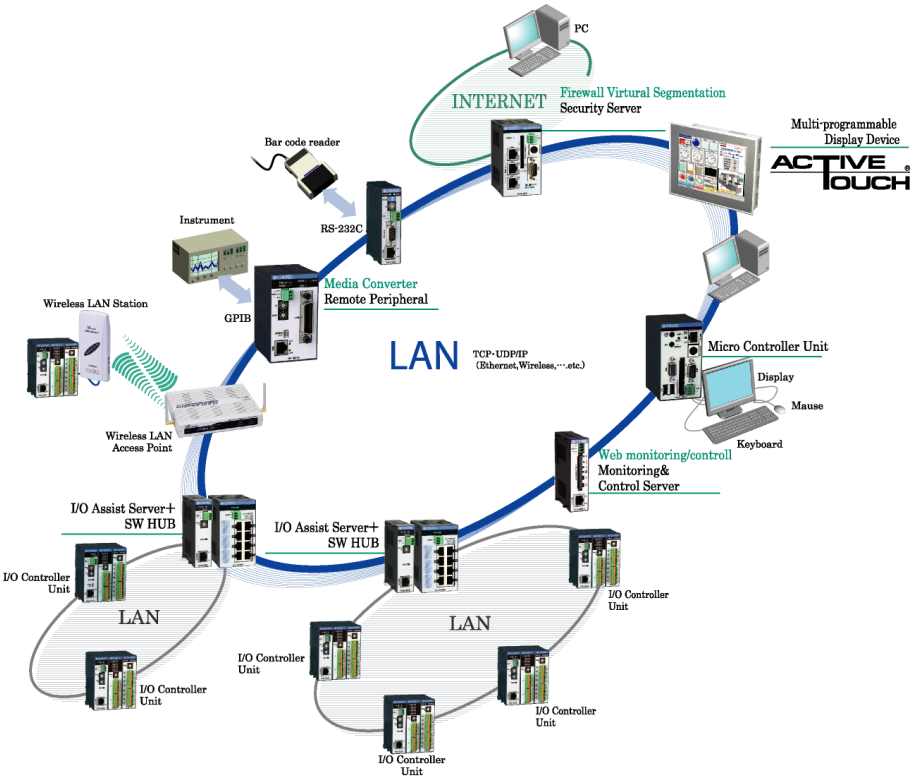
Figure 8.2. Communications Server Concept-Overall Diagram

The following defines the common protocol layers that will be provided in all products based upon the communications server concept. Such products, complying with the communications server specifications, will be able to access device information using the same protocol.

The role of the F&eIT Protocol

The F&eIT Protocol defines the following protocol layers.

Table 8.5. Table of Protocol Levels

Application layer	ACX, DLL, etc
Device-dependent control layer	
F&eIT protocol layer	F&eIT protocol specifications
Transport layer	UDP, ICMP
Network layer	IP, ARP
Data link layer	Ethernet(IEEE802.3), etc
Physical layer	

Basic Specifications

Concepts

The F&eIT Protocol assigns all device resources (including information) to virtual space so that any access to a device will be performed by specifying a virtual address. The virtual space is divided into information common to devices, device-specific information, I/O space, and memory space. The specific location in the virtual space where information is stored and the method by which information is stored is completely transparent to where or how information is stored in actual physical resources.

Table 8.6. Basic Specifications

00000000h - 000FFFFFh	Information common to devices (1M byte)
00100000h - 001FFFFFh	Device-specific information (1M byte)
00200000h - 002FFFFFh	Definition of device-specific information (1M byte)
00300000h - 003FFFFFh	I/O space (1M byte)
00400000h - 004FFFFFFh	Memory space (1M byte)
FFE00000h - FFFFFFFFh	Firmware update area (1M byte)

Data Communications Protocol

The F&eIT Protocol has two access procedures on the connectionless UPD/IP: response-type access and trap-type access.

(Response-type)
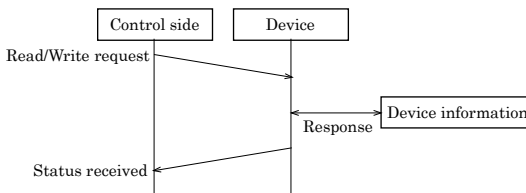
(Trap-type)
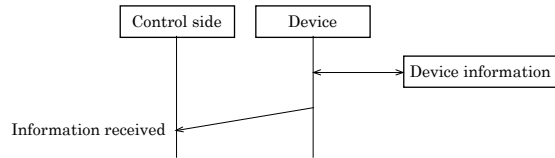
Figure 8.3. Communications Protocol

Frame format

Using the UDP/IP port address 5007h, the F&eIT Protocol is installed in the data section.

The frame structure takes the format described below. Due to the header byte order conventions, the Ethernet, IP, and UDP are treated as Big Endians; all other entities are treated as Little Endians, for which controls exerted by an x86 CPU hold priority.

Table 8.7. Frame Structure

	Header name	Side (byte)	Remarks
Ethernet section	Destination Address	6	Remote MAC address
	Source Address	6	Local MAC address
	Type Field	2	Ethernet II
IP section	IP Ver4 Header	20	Fragment disabled
UDP section	UDP Header	8	Check sum disabled
Communication server section	Identifier	2	"SV"
	Version	1	Version of the header structure
	Command	1	Command and the ACK flag
	Sequence number	2	Frame Id
	Response ID	2	Identifies the sender.
	Virtual address	4	Specifies a virtual address space.
	Access size	2	1436 bytes maximum
	Status	2	Result of command execution
	Access ID	8	Identifies the Read/Write privilege
	Remote MAC address	6	Specifies a remote MAC address when using IP multicasting.
	Reserved	6	Reserved for future use
	Data section	1436	Data area

[Description of communications server headers]

(1) Identifier --- Identifies the frame as a F&eIT Protocol frame.

(2) Version --- Indicates the frame version.

(3) Command --- The virtual address access command.

(4) Sequence no. --- A counter that prevents the occurrence of duplicate frames, wherein the sequence number is incremented each time a packet is transmitted.

(5) Response ID --- When a response-type command is transmitted, the contents of the response ID are copied to the response ID for the response frame.

(6) Virtual address --- Specifies the virtual address being accessed, e.g., device information can be read by specifying the address 0000h.

(7) Access size --- Specifies the size of the data to be accessed, from 1 to a maximum of 1436 bytes.

(8) Status --- Stores status information after the command is executed.

(9) Access ID --- This is an ID for virtual address access control.

(10) Remote MAC address --- When data is read/written using IP Multicast, the MAC address of the remote device is set in this header. When data is to be sent to all devices on the network, the value ALL[F] is set in this header. (For Unicast: "ALL [0]")

Commands in detail

The following command is set in the command section (Offset = 4 in the F&eIT Protocol header section):

7	6	5	4	3	2	1	0
ACK	Command (1 - 127)						

Figure 8.4. Command Structure

Bits 0 to 6 represent the command; the MSB indicates a response frame (ACK).

Bit 7 =   0: command request

1: command response

Table 8.8. Commands in Detail

Command number	Command description	Type	Remarks
1	Reads from a virtual address.	Response	Reads device information by specifying a virtual address.
2	Writes to a virtual address.	Response	Updates device information by specifying a virtual address.
3	Transmits messages.	Response	Exchanges messages between devices.
4	Trap	Trap	Transmits trap information from a device, based on various events.
5	Reset	Response	Resets a device after returning a response frame.
7 to 127	Reserved	Undefined	Undefined

Command-issuing procedure

- Read a virtual address (command = 1)

A virtual address and its size are specified, and the frame is transmitted to the target device. The result is received as a response frame with data. (Example: reading a vendor name)

Command generation (transmitted data)

Identifier	= "SV"
Version	= 1
Command	= 1h
Sequence number	= 1
Response ID	= 1234
Virtual address	= 0000h
Access size	= 32
Access ID	= Read ID

READ request

For the read operation, either "Read ID" or "Read/Write ID" is used.

Device

Response frame (received data)

Identifier	= "SV"
Version	= 1
Command	= 81h
Sequence number	= 1
Response ID	= 1234
Virtual address	= 0000h
Access size	= 32
Status	= 0000h
Data = "CONTEC CO.,LTD."	

Response

Copies the contents of the transmission header response ID. When multiple commands are simultaneously issued, the response ID in the response frame is referenced in order to validate it with the command that was issued.

Figure 8.5. Read Procedures

- Writing to a virtual address (command = 2)

A virtual address and its size are specified, and the frame is transmitted to the target device. The result is received as a response frame status. (Example: setting an IP address)

Command generation (transmitted data)

Identifier	= "SV"
Version	= 1
Command	= 2h
Sequence number	= 1
Response ID	= 1234
Virtual address	= 1008h
(refer to [Control Information] on the details)	
Access size	= 4
Access ID = R/W ID	
Data = 192.168.132.31	

WRITE request

For the write operation, "Read/Write ID" is used.

Device

Response frame (received data)

Identifier	= "SV"
Version	= 1
Command	= 82h
Sequence number	= 1
Response ID	= 1234
Virtual address	= 1008h
Access size	= 4
Status	= 0000h

Response

Figure 8.6. Write Procedures

- Message transmission (command = 3)

    Writes the message to be transmitted into the data section. The result is received as a response frame status. The maximum data size that can be transmitted per command is 1436 bytes. (Example: data transmission)

Command generation (transmitted data)

Identifier	= "SV"
Version	= 1
Command	= 3h
Sequence number	= 1
Response ID	= 1234
Access size	= 10
Access ID	= R/W ID
Data = 0, 1, 2, 3, 4, 5, 6, 7, 8, 9	

Message SEND

Device

Response frame (received data)

Identifier	= "SV"
Version	= 1
Command	= 83h
Sequence number	= 1
Response ID	= 1234
Access size	= 10
Status	= 0000h

Response

Figure 8.7. Message Transmission

- Trap transmission (command = 4)

    This command is used by devices to send a signal to the controller when a trap event occurs (an interval timer event or a pre-set event). If a response is required, the MSB in the command is set to 0.
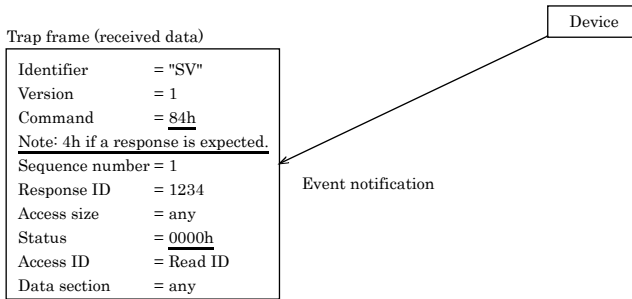
Trap frame (received data)

Identifier	= "SV"
Version	= 1
Command	= 84h
Note: 4h if a response is expected.	
Sequence number = 1	
Response ID	= 1234
Access size	= any
Status	= 0000h
Access ID	= Read ID
Data section	= any

Device

Event notification

Figure 8.8. Trap Transmission

- Reset (command = 5)

    This command resets a given device. Before resetting itself, the device will return a response frame.
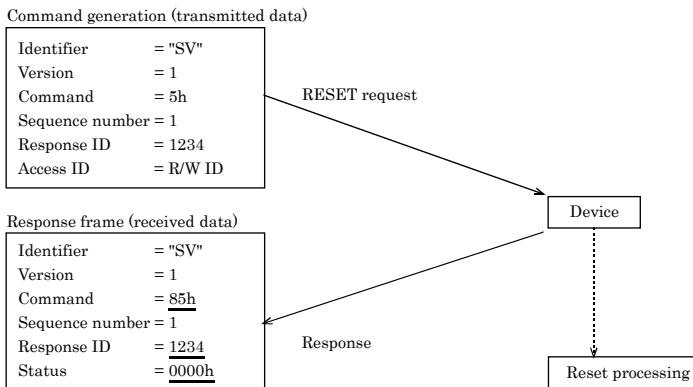
Command generation (transmitted data)

Identifier	= "SV"
Version	= 1
Command	= 5h
Sequence number = 1	
Response ID	= 1234
Access ID	= R/W ID

RESET request

Device

Response frame (received data)

Identifier	= "SV"
Version	= 1
Command	= 85h
Sequence number = 1	
Response ID	= 1234
Status	= 0000h

Response

Reset processing

Figure 8.9. Reset Transmission

Response status

Following is a table of status information that is returned by response-type commands:

Table 8.9. Status Table

Code	Description	Remarks
0000h	Normal termination	
0001h	Access violation	An attempt was made to write to a Read-only area.
0002h	Area error	Access was made to an area not defined on the device.
0003h	Access size error	An access request greater than 1436 bytes was made.
0004h	Parameter error	Invalid parameter contents, such as receipt of a non-supported command.
0005h	Length error	Invalid transmission length, such as an inconsistent data size with the number of data items calculated from the UDP/IP.
0006h	Insufficient resources	Too many tasks are waiting for ACK data, causing a resource shortfall. The resources can be released by a timeout.

Control Information

The F&eIT Protocol assigns all resources that are disclosed outside the devices to 32-bit virtual space. Following is a table of correspondence between virtual addresses and device information. The bytes are ordered in Little Endians.

Information common to devices
The following types of information are provided in all F&eIT Protocol-compliant devices:

Table 8.10. Information Common to Devices <Example> <1/2>

Address	Size	Access Type	Description	Remarks	
0000h -0FFFh	32	R	Vendor name	"CONTEC CO.,LTD."	
	32	R	Model	"CPU-CAxx(FIT)GY"	
	2	R	Equipment version	1.0	
	2	R	Firmware version	1.0	
	6	R	MAC address	00804C******	
	2	R	Installation function	Bit 0: I/O space Bit 1: Memory space Bit 2: Trap function Bit 3: Message send Bit 4: Reset function Bits 5 and higher: reserved	
	4	R	IP address		
	2	R	Product type		
	4	R	Reserved		
	2	R	F&eIT protocol version		
	4008	R	Reserved		
1000h -1FFFh	8	W	Read privilege ID	(Initial value: 00h)	
	8	W	Read/Write privilege ID	(Initial value: 00h)	
	4	R/W	IP address	(Example) 192.168.132.31	
	4	R/W	Subnet mask	(Example) 255.255.255.0	
	4	R/W	Default gateway	(Example) 192.168.132.1	
	4	R/W	Trap-to IP address	(Example) 192.168.132.21	
	4	R/W	Number of effective multicast devices	0 - 4 (Initial value=0)	
	4	R/W	Number of effective multicast devices	Indicates the group address for multicast communications.	
	4	R/W	Multicast IP 2		
	4	R/W	Multicast IP 3		
	4	R/W	Multicast IP 4		
	2	R/W	UDP port	5007h (Initial value)	
	2		Reserved		
	32	R/W	Device name	User-defined	*1
	32	R/W	Device physical position	User-defined	*1
	32	R/W	Contact point	User-defined	*1
	4	R/W	SNMP trap-to address		*1
	32	R/W	Community name		*1
	4	R/W	Access right	0:Read Only 1:Read/Write	*1
	3904	R	Reserved		

*1 Because the CPU-CAxx(FIT)GY is not equipped with an SNMP agent, this section is not used.

Table 8.10. Information Common to Devices <Example> <2/2>

Address	Size	Access Type	Description	Remarks
2000h -	4	R	Elapsed time after the system is started	sec
	4	R	Total number of transmitted frames	counter
	4	R	Total number of transmitted bytes	counter
	4	R	Total number of received frames	counter
	4	R	Total number of received bytes	counter
	4	R	Total number of transmission errors	counter
	4	R	Total number of reception errors	counter

Device-specific information

Table 8.11. Device-Specific Information <Example>

Address	Size	Access Type	Description	Remarks
100000h - 1FFFFFh	1M	R	Device-specific information	Defines device-specific information.
200000h - 2FFFFFh	1M	R	Explanation of device-specific information	Defines device-specific information in text. Kanji characters are not allowed; characters that can be viewed on Windows Notepad can be used.

Information common to devices - 2

Table 8.12. Information Common to Devices - 2 <Example>

Address	Size	Access Type	Description	Remarks
300000h - 3FFFFFh	1M max	Arbitrary	I/O space	Assigns the I/O resource to be disclosed.
400000h - 4FFFFFh	1M max	Arbitrary	Memory space	Assigns the memory resource to be disclosed.
500000h - FFDFFFFFh			Reserved	
FFE00000h - FFFFFFFFh	2M max	Arbitrary	Firmware	Optional

In the above table, the entries in the "size" column are in bytes.

R   :   Read-only area

W   :   Write-only area

R/W   :   Read/Write area

For details on this product, see the "Virtual Address Map".

CPU-CA10(FIT)GY
CPU-CA20(FIT)GY
User's Manual

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