F&eIT Series

Isolated Digital Input/Output Module

DIO-16/16(FIT)GY

Isolated Digital Input Module

DI-32(FIT)GY

Isolated Digital Output Module

DO-32(FIT)GY

User's Manual

CONTEC CO.,LTD.

Check Your Package

Thank you for purchasing the CONTEC product.

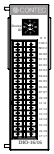
The product consists of the items listed below.

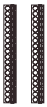
Check, with the following list, that your package is complete. If you discover damaged or missing items, contact your retailer.

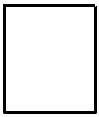
Product Configuration List

- Module (One of the following) ...1
  [DIO-16/16(FIT)GY, DI-32(FIT)GY, or DO-32(FIT)GY]
- First Step Guide … 1
- CD-ROM[F&eIT Series Setup Disk] *1…1
- Interface connector plug ...1

*1 The CD-ROM contains various software and User's Manual (this manual)


Module


Interface connector plug


First step guide


CD-ROM
[F&eIT Series Setup Disk]

Copyright

Trademarks

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1. Before Using the Product

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

About the Module

This product is an expansion module (device module) that adds digital signal I/O interfaces to one of various types of controllers. The product is used in combination with the I/O controller module < CPU-CAxx(FIT)GY > (*1) or microcontroller unit < CPU-SBxx(FIT)GY > (*1) in the F&eIT Series.

The < DIO-16/16(FIT)GY > can perform a maximum of 16 points of opto-isolated input and 16 points of opto-isolated output per module. (Input: 12 - 24 VDC specified, output: 12 - 48 VDC specified)
The < DI-32(FIT)GY > can perform a maximum of 32 points of opto-isolated input per module. (Input: 12 - 24 VDC specified)
The < DO-32(FIT)GY > can perform a maximum of 32 points of opto-isolated output per module. (Output: 12 - 48 VDC specified)

By reading this manual carefully, please build a system by creating applications programs, setting the switches, and connecting the module to external devices.

*1 This module is available in different product models. "x" in each model number represents a blank or one alphanumeric character. This is applicable to the rest of this document.

Features

- A different external power supply can be used for each common pin as it is shared by 16 signal points.
- The < DIO-16/16(FIT)GY > can perform 16-points digital signal input and 16-points digital signal output.
- < DI-32(FIT)GY > can perform 32-points digital signal input.
- < DO-32(FIT)GY > can perform 32-points digital signal output.
- The output section is a high sink current, open collector type using high-capacitance transistors.
  < DIO-16/16(FIT)GY >: 150 mA/24 VDC or 50 mA/48 VDC max. (per channel)
  < DO-32(FIT)GY >: 150 mA/24 VDC or 50 mA/48 VDC max. (per channel))
- Input section is ready to accept both the current sinking output and current source output.
- Isolated I/O operations using an optocoupler improves noise immunity.
- The card has a digital filter to prevent input signals from carrying noise or a chattering.
- A rotary switch allows you to set device IDs, making it easy to keep track of device numbers.
- Like other F&eIT series products, the module has a 35mm DIN rail mounting mechanism as standard. A connection to a controller module can be effected on a lateral, stack basis in a unique configuration, which permits a simple, smart system configuration without the need for a backplane board.
- You can use all of the input signals as interrupt inputs. You can also select the interrupt trigger edge of the input signal.

Functions

Generic I/O functions (data I/O operations that directly access the I/O ports)

- Input

The Module transmits a maximum of 32 points (< DI-32(FIT)GY >) or 16 points (< DIO-16/16(FIT)GY >) of externally supplied digital signals to a controller module that is connected to it. Access to the Module from a controller module is performed through the input port that is specified by means of a Device ID. When an input port is read by the execution of an input command, the buffer gate associated with the input port is opened, and the digital signals supplied from an external device are fetched in groups. During this operation, if the module is the DI-32(FIT)GY, DIO-16/16(FIT)GY, signals that are transmitted to the controller module will be [ON (closed): 1, OFF (open): 0].

- Output

The Module writes a maximum of 32 points (< DO-32(FIT)GY >) or 16 points (< DIO-16/16(FIT)GY >) of digital signals to an external device. Access to the Module from a controller module is performed through the output port that is specified by means of a Device ID. When data is written to the output port by the execution of an output command, the data is held on the latch circuit that is associated with the output port. After being electrically isolated by an optocoupler, if the module is the DO-32(FIT)GY, DIO-16/16(FIT)GY, the digital signals are transmitted to the connected external device through transistors. During this operation, signals that are transmitted to the external device will be [ON (closed): 1, OFF (open): 0].

Output data monitoring function

This function allows you to keep track of the signal data that is being output.

Functions and control method by controller connected

The DIO-16/16(FIT)GY, DI-32(FIT)GY, and DO-32(FIT)GY can be connected to a variety of controllers.

Supported controllers

Microcontroller Unit	: CPU-SBxx(FIT)GY
I/O Controller Module	: CPU-CAxx(FIT)GY
Monitoring & Control Server Unit	: SVR-MMF2(FIT)

Check each controller to which the module can be connected as well as the method of controlling the module when connected to that controller.

Connections to controllers

O: Permitted ×: Not permitted	*CPU-SBxx(FIT)GY*	*CPU-CAxx(FIT)GY*	*SVR-MMF2(FIT)*	*SVR-MMF(FIT)GY*
DIO-16/16(FIT)GY	O	O	O	×
DI-32(FIT)GY	O	O	O	×
DO-32(FIT)GY	O	O	O	×
Device ID setting range	0 - 7	0 - 7	0 - 7	0 - 7

Control method by controller connected

		CPU-SBxx(FIT)GY	CPU-CAxx(FIT)GY	SVR-MMF2(FIT)	SVR-MMF(FIT)GY
Control using the I/O address map		O			
Control using the memory address map			O		
Control via the Windows driver *	FIT Protocol		O		
	API-CAP(W32)		O		
	API-SBP(W32)	O			
	API-USBP(WDM)				
Control over the web (as set from within the browser)				O	

* The API-SBP(W32) is included in the development kit [DTK-SBxx(FIT)GY]; the other drivers are bundled with each controller.

Control using the I/O address map

When connected to the CPU-SBxx(FIT)GY, the module can receive I/O instructions directly from the controller module. For details, see Chapter 4 “Using the I/O Address Map”.

Control using the memory address map

When connected to the CPU-CAxx(FIT)GY, the module can be accessed from the host computer over the network. The module is assigned with its device ID in the memory managed by the controller module. The application running on the host computer controls the module by reading/writing the memory managed by the controller module. For details, see Chapter 5 “Using the Memory Address Map”.

Control via the Windows driver

For the functions and settings available when using the Windows driver, refer to the reference manual and online help for each module.

Control over the web

Control over the web – Connecting to the SVR-MMF2(FIT)

You can monitor collected data and manage the log over the web. You can use your familiar browser to easily make various settings. For details, refer to the reference manual for the SVR-MMF2(FIT).

Customer Support

CONTEC provides the following support services for you to use CONTEC products more efficiently and comfortably.

Web Site

Japanese	http://www.contec.co.jp/
English	http://www.contec.com/
Chinese	http://www.contec.com.cn/

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.

Limited One-Year Warranty

CONTEC F&eIT products are warranted by CONTEC CO., LTD. to be free from defects in material and workmanship for up to one year from the date of purchase by the original purchaser.
Repair will be free of charge only when this device is returned freight prepaid with a copy of the original invoice and a Return Merchandise Authorization to the distributor or the CONTEC group office, from which it was purchased.
This warranty is not applicable for scratches or normal wear, but only for the electronic circuitry and original products. The warranty is not applicable if the device has been tampered with or damaged through abuse, mistreatment, neglect, or unreasonable use, or if the original invoice is not included, in which case repairs will be considered beyond the warranty policy.

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 the 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 modify the module. CONTEC will bear no responsibility for any problems, etc., resulting from modifying this module.
- Do not use or store the module in a hot or cold place, or in a place that is subject to severe temperature changes.
  (Operating temperature range: 0 - 50°C)
- Do not use or store the module in a place subject to direct sunlight or near a heating device, such as a stove.
- Do not use or store the module in a dusty or humid place.
  (Operating humidity range: 10 - 90%RH, No condensation)
- As this module contains precision electronic components, do not use or store it in environments subject to shock or vibration.
- Do not use or store the module near equipment generating a strong magnetic field or radio waves.
- If you notice any strange odor or overheating, please unplug the power cable immediately.
- In the event of an abnormal condition or malfunction, please consult the dealer from whom the module was purchased.
- To avoid electric shock, please do not touch the module with a wet hand.
- Do not open the module casing. CONTEC will disclaim any responsibility for module whose casing has been opened.
- Do not strike or bend the module. Doing so could damage the module.
- 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 connect the device module to the controller module already energized. To avoid malfunction, please be sure to turn off the control module before connecting the device module to it.

FCC PART 15 Class A Notice

NOTE

This equipment has been tested and found to comply with the limits for a Class A 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 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 at his own expense.

WARNING TO USER

Change or modifications not expressly approved the manufacturer can void the user's authority to operate this equipment.

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

Operating humidity

10 - 90%RH (No condensation)

Corrosive gases

None

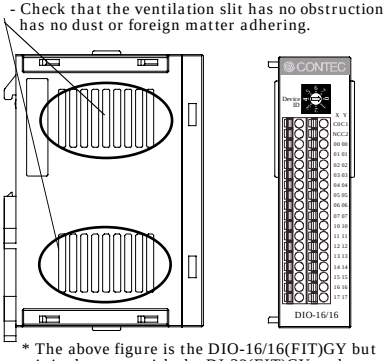
Floating dust particles

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.



* The above figure is the DIO-16/16(FIT)GY but it is the same with the DI-32(FIT)GY and DO-32(FIT)GY.

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.

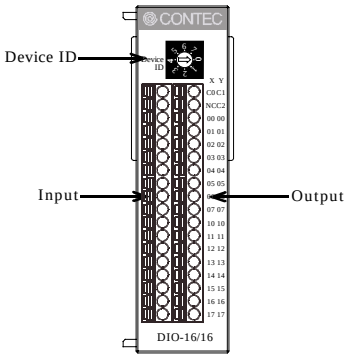
2. Module Nomenclature and Settings

Nomenclature of Module Components

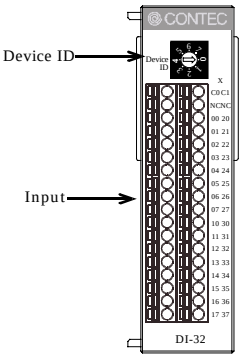
Figure 2.1 shows the names of module components.

In the figure, the indicated switch settings represent factory settings.

DIO-16/16(FIT)GY



DI-32(FIT)GY



DO-32(FIT)GY

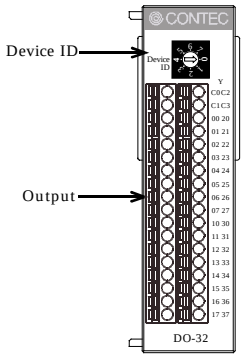


Figure 2.1. Names of Module Components

Setting a Device ID

The controller module distinguishes and keeps track of the modules that are connected to it by assigning device IDs to them. Each module, therefore, should be assigned a unique ID.

A Device ID can be assigned in a 0 - 7 range, so that a maximum of eight modules can be distinguished.

The factory setting for the Device ID is [0].

Setup Method

A Device ID can be set by turning the rotary switch that is located on the module face.
A Device ID can be assigned by turning the switch.

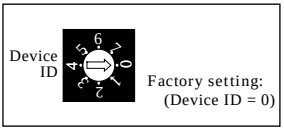


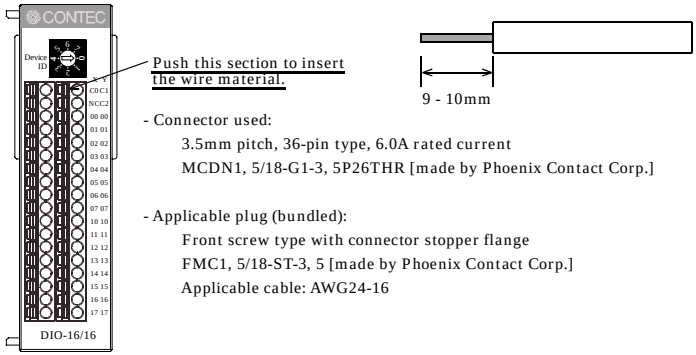
Figure 2.2. Setting a Device ID

3. Connecting to an External Device

Interface Connector

How to Connect an Interface Connector

When connecting the Module to an external device, you can use the supplied connector plug.
When wiring the Module, strip off approximately 9 - 10mm of the covering for the cable, and insert the bare wire by pressing the orange button on the connector plug. Releasing the orange button after the wire is inserted fixes the cable. Compatible wires are AWG 24 - 16.



- Connector used:
  3.5mm pitch, 36-pin type, 6.0A rated current
  MCDN1, 5/18-G1-3, 5P26THR [made by Phoenix Contact Corp.]

- Applicable plug (bundled):
  Front screw type with connector stopper flange
  FMC1, 5/18-ST-3, 5 [made by Phoenix Contact Corp.]
  Applicable cable: AWG24-16

Figure 3.1. Connecting an Interface Connector and Connectors That Can Be Used

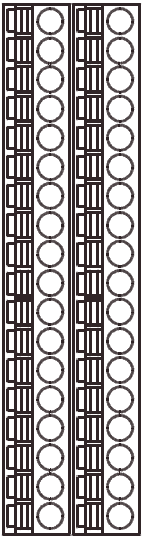
⚠ CAUTION

Removing the connector plug by grasping the cable can break the wire.

Signal Layout on the Interface Connector

The Module can be connected to an external device using two 18-pin connectors that is provided on the Module face.

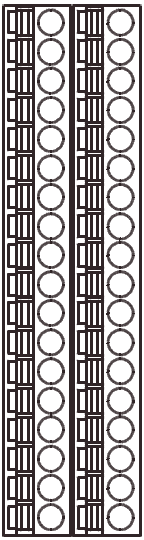
DIO-16/16(FIT)GY



Pin No.	Signal name	Meaning	Pin No.	Signal name	Meaning
X			Y		
C0	COM	Connmon for Input+0, +1 group	C1	COM(+)	Plus connmon for Output+0, +1 group
NC	N.C.	Unconnected	C2	COM(-)	Minus connmon for Output+0, +1 group
00	IN00	Input+0 group	00	OUT00	Output+0 group
01	IN01		01	OUT01	
02	IN02		02	OUT02	
03	IN03		03	OUT03	
04	IN04		04	OUT04	
05	IN05		05	OUT05	
06	IN06		06	OUT06	
07	IN07		07	OUT07	
10	IN10	Input+1 group	10	OUT10	Output+1 group
11	IN11		11	OUT11	
12	IN12		12	OUT12	
13	IN13		13	OUT13	
14	IN14		14	OUT14	
15	IN15		15	OUT15	
16	IN16		16	OUT16	
17	IN17		17	OUT17	

Figure 3.2. Signal Layout on the Interface Connector < DIO-16/16(FIT)GY >

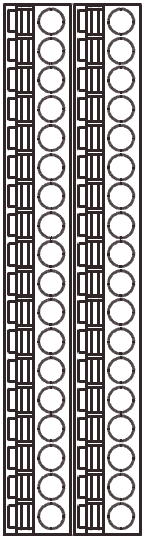
DI-32(FIT)GY



Pin No.	Signal name	Meaning	Pin No.	Signal name	Meaning
X			X		
C0	COM	Connmon for Input+0, +1 group	C1	COM	Connmon for Input+2, +3 group
NC	N.C.	Unconnected	NC	N.C.	Unconnected
00	IN00	Input+0 group	20	IN20	Input+2 group
01	IN01		21	IN21	
02	IN02		22	IN22	
03	IN03		23	IN23	
04	IN04		24	IN24	
05	IN05		25	IN25	
06	IN06		26	IN26	
07	IN07		27	IN27	
10	IN10	Input+1 group	30	IN30	Input+3 group
11	IN11		31	IN31	
12	IN12		32	IN32	
13	IN13		33	IN33	
14	IN14		34	IN34	
15	IN15		35	IN35	
16	IN16		36	IN36	
17	IN17		37	IN37	

Figure 3.3. Signal Layout on the Interface Connector < DI-32(FIT)GY >

DO-32(FIT)GY



Pin No.	Signal name	Meaning	Pin No.	Signal name	Meaning
Y			Y		
C0	COM(+)	Plus connmon for Output+0, +1 group	C2	COM(+)	Plus connmon for Output+2, +3 group
C1	COM(-)	Minus connmon for Output+0, +1 group	C3	COM(-)	Minus connmon for Output+2, +3 group
00	OUT00	Output+0 group	20	OUT20	Output+2 group
01	OUT01		21	OUT21	
02	OUT02		22	OUT22	
03	OUT03		23	OUT23	
04	OUT04		24	OUT24	
05	OUT05		25	OUT25	
06	OUT06		26	OUT26	
07	OUT07		27	OUT27	
10	OUT10	Output+1 group	30	OUT30	Output+3 group
11	OUT11		31	OUT31	
12	OUT12		32	OUT32	
13	OUT13		33	OUT33	
14	OUT14		34	OUT34	
15	OUT15		35	OUT35	
16	OUT16		36	OUT36	
17	OUT17		37	OUT37	

Figure 3.4. Signal Layout on the Interface Connector < DO-32(FIT)GY >

External I/O Circuits

Input section < DIO-16/16(FIT)GY >, < DI-32(FIT)GY >

Figure 3.5 shows the input equivalent circuit for the interface section of the < DIO-16/16(FIT)GY > and < DI-32(FIT)GY >.
The signal input section consists of an opto-isolated input (compatible with both current sink output and current source output). An external power supply is therefore required to drive the input section of this module. The power requirement for the < DIO-16/16(FIT)GY > or < DI-32(FIT)GY > is about 8 mA per input channel at 24 VDC (about 4 mA at 12 VDC).

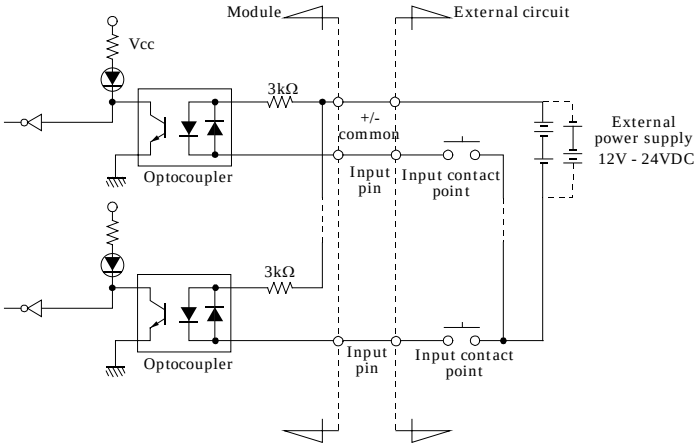


Figure 3.5. Input Circuit < DIO-16/16(FIT)GY >, < DI-32(FIT)GY >

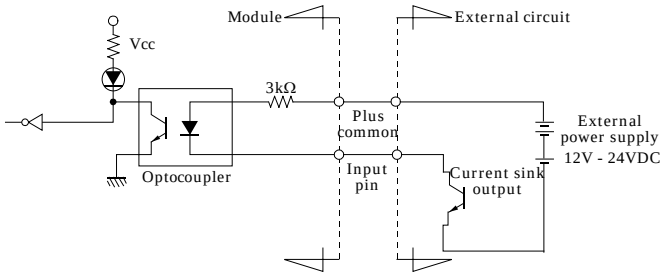


Figure 3.6. Example of a Connection to Current Sink Output < DIO-16/16(FIT)GY >, < DI-32(FIT)GY >

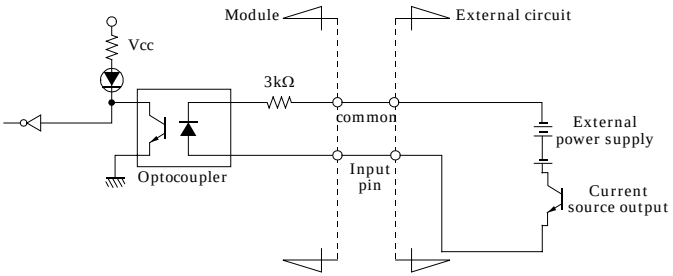


Figure 3.7. Example of a Connection to Current Source Output
< DIO-16/16(FIT)GY >, < DI-32(FIT)GY >

Output section

Figure 3.8 shows the output circuit for the interface section of the < DIO-16/16(FIT)GY > and < DO-32(FIT)GY >. The signal output section consists of an opto-isolated open collector output (current sink type). An external power supply is therefore required to drive the output section of this module.

The maximum output current rating per channel is 150 mA for the < DIO-16/16(FIT)GY > or < DO-32(FIT)GY > (at 12 - 24 VDC) or 50 mA for the < DIO-16/16(FIT)GY > or < DO-32(FIT)GY > (at 36 - 48 VDC). A surge voltage protection circuit (zener diode) is provided for the output transistors of this module. When the module drives relays, lamps, and other induction loads, however, another surge voltage countermeasure should be provided on the load side.

⚠ CAUTION

When the power is turned on, all output will be OFF.

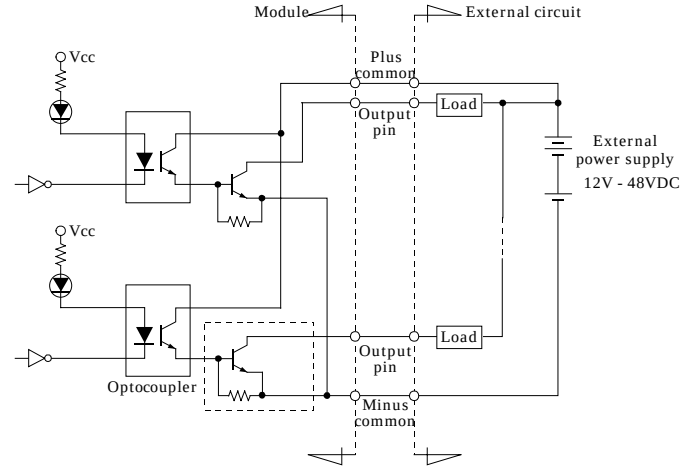


Figure 3.8. Output Circuit < DIO-16/16(FIT)GY >, < DO-32(FIT)GY >

Connection example:

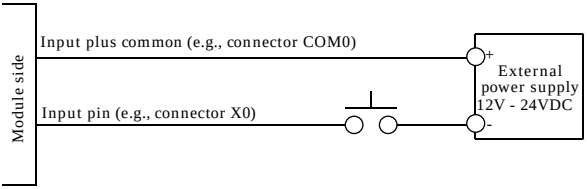


Figure 3.9. Using Inputs X0 < DIO-16/16(FIT)GY >, < DI-32(FIT)GY >

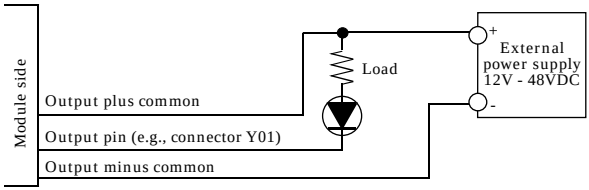


Figure 3.10. Using Outputs Y0 < DIO-16/16(FIT)GY >, < DO-32(FIT)GY >

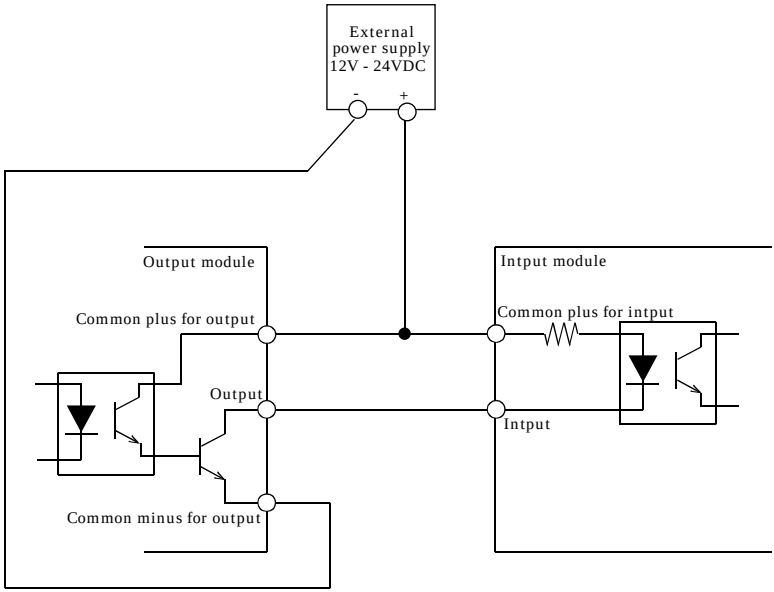


Figure 3.11. Example of Connecting Outputs and Inputs
< DIO-16/16(FIT)GY >, < DI-32(FIT)GY >, < DO-32(FIT)GY >

Surge Voltage Countermeasures

When a load that generates surge voltages and inrush currents, such as an induction load (relay coil) or an incandescent light bulb, is connected to the digital output, appropriate protection must be provided in order to prevent damage to the output stage or a malfunction due to noise. The rapid shutoff of a coil, such as in a relay, generates a sudden high-voltage pulse. If this voltage exceeds the withstand voltage of the output transistor, it can cause the transistor to gradually deteriorate, or even completely damage the transistor. Therefore, when driving an induction load, such as a relay coil, you should always connect a surge-absorbing device. The following illustrates a surge voltage countermeasure that can be employed:

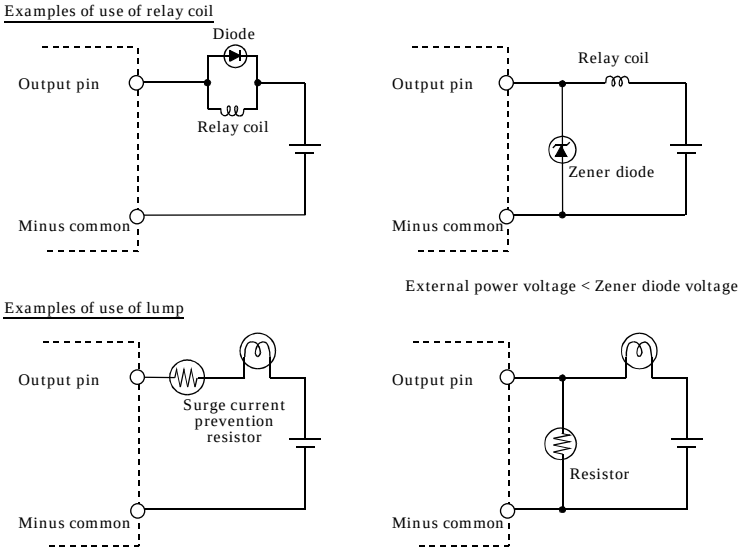


Figure 3.12. Surge Voltage Countermeasure < DIO-16/16(FIT)GY >, < DO-32(FIT)GY >

⚠ CAUTION

In order for a protection circuit to operate effectively, it must be connected within 50cm from a load and a contact point.

4. Using the I/O Address Map

Starting I/O Address

When connected to a CPU-SBxx(FIT)GY, the Module can directly receive I/O commands from the controller module. Depending on how the Device ID is set, the I/O addresses indicated below will be used exclusively by the Module.

Because the address bus on which I/O address space is allocated is not fully decoded in 16 bits, four starting I/O addresses exist for each Device ID.

If the Device ID is set to 0h, one of the four addresses (0800h, 0840h, 0880h, or 08C0h) will be used as a starting I/O address.

Table 4.1. List of Starting I/O Addresses
< DIO-16/16(FIT)GY, DI-32(FIT)GY, DO-32(FIT)GY >

ID No.	Occupied I/O address			
0	0800h - 081Fh(recommended)	0840h - 085Fh	0880h - 089Fh	08C0h - 08DFh
1	1800h - 181Fh(recommended)	1840h - 185Fh	1880h - 189Fh	18C0h - 18DFh
2	2800h - 281Fh(recommended)	2840h - 285Fh	2880h - 289Fh	28C0h - 28DFh
3	3800h - 381Fh(recommended)	3840h - 385Fh	3880h - 389Fh	38C0h - 38DFh
4	4800h - 481Fh(recommended)	4840h - 485Fh	4880h - 489Fh	48C0h - 48DFh
5	5800h - 581Fh(recommended)	5840h - 585Fh	5880h - 589Fh	58C0h - 58DFh
6	6800h - 681Fh(recommended)	6840h - 685Fh	6880h - 689Fh	68C0h - 68DFh
7	7800h - 781Fh(recommended)	7840h - 785Fh	7880h - 789Fh	78C0h - 78DFh

For detailed specifications on the I/O space that is managed by the controller module, see the controller module manual.

List of I/O Address Maps

DIO-16/16(FIT)GY

Starting I/O address	D7	D6	D5	D4	D3	D2	D1	D0
Input	**Products Category**				**Rivision Data**			
+0 (00h)	0	0	0	1	Rivision Data 3	Rivision Data 2	Rivision Data 1	Rivision Data 0
	Products ID Number							
+1 (01h)	0	0	0	0	1	0	0	1
	Interrupt Status							
+2 (02h)	Enable (0)	Status (0)				IRQ 9 (0)	IRQ 7 (0)	IRQ 5 (0)
+3 (03h)	**Digital Filter**							
	0	0	0	ST4	ST3	ST2	ST1	ST0
+4 (04h) to +15 (0Fh)	N/A							
+16 (10h)	**Input Group +0**							
	IN 07	IN 06	IN 05	IN 04	IN 03	IN 02	IN 01	IN 00
+17 (11h)	**Input Group +1**							
	IN 17	IN 16	IN 15	IN 14	IN 13	IN 12	IN 11	IN 10
+18H (11h) to +19 (13h)	N/A							
+20 (14h)	**Output Group +0**							
	OUT 07	OUT 06	OUT 05	OUT 04	OUT 03	OUT 02	OUT 01	OUT 00
+21 (15h)	**Output Group +1**							
	OUT 17	OUT 16	OUT 15	OUT 14	OUT 13	OUT 12	OUT 11	OUT 10
+22 (16h) to +23 (17h)	N/A							
	Interrupt Status 0							
+24 (18h)	IN 07 Status	IN 06 Status	IN 05 Status	IN 04 Status	IN 03 Status	IN 02 Status	IN 01 Status	IN 00 Status
	Interrupt Status 1							
+25 (19h)	IN 17 Status	IN 16 Status	IN 15 Status	IN 14 Status	IN 13 Status	IN 12 Status	IN 11 Status	IN 10 Status

OUTxx is provided for output data read-back purposes.

< Next >

Figure 4.1. Input Port < DIO-16/16(FIT)GY > < 1/2 >

Starting I/O address	D7	D6	D5	D4	D3	D2	D1	D0
+26 (1Ah)	Reserved							
+27 (1Bh)								
	Interrupt Edge Setting Data 0							
+28 (1Ch)	IN 07 Edge	IN 06 Edge	IN 05 Edge	IN 04 Edge	IN 03 Edge	IN 02 Edge	IN 01 Edge	IN 00 Edge
	Interrupt Edge Setting Data 1							
+29 (1Dh)	IN 17 Edge	IN 16 Edge	IN 15 Edge	IN 14 Edge	IN 13 Edge	IN 12 Edge	IN 11 Edge	IN 10 Edge
+30 (1Eh)	Reserved							
+31 (1Fh)								

OUTxx is provided for output data read-back purposes.

Figure 4.1. Input Port < DIO-16/16(FIT)GY > < 2/2 >

Starting I/O address	D7	D6	D5	D4	D3	D2	D1	D0
Output +0 (00h)	N/A							
+1 (01h)								
+2 (02h)	**Interrupt Status**							
	Enable					IRQ 9	IRQ 7	IRQ 5
+3 (03h)	**Digital Filter**							
	0	0	0	ST4	ST3	ST2	ST1	ST0
+4 (04h)	N/A							
+19 (13h)								
+20 (14h)	**Output Group +0**							
	OUT 07	OUT 06	OUT 05	OUT 04	OUT 03	OUT 02	OUT 01	OUT 00
+21 (15h)	**Output Group +1**							
	OUT 17	OUT 16	OUT 15	OUT 14	OUT 13	OUT 12	OUT 11	OUT 10
+22 (16h)	N/A							
+23 (17h)								
+24 (18h)	**Interrupt Mask 0**							
	IN 07 Mask	IN 06 Mask	IN 05 Mask	IN 04 Mask	IN 03 Mask	IN 02 Mask	IN 01 Mask	IN 00 Mask
+25 (19h)	**Interrupt Mask 1**							
	IN 17 Mask	IN 16 Mask	IN 15 Mask	IN 14 Mask	IN 13 Mask	IN 12 Mask	IN 11 Mask	IN 10 Mask
+26 (1Ah)	N/A							
+27 (1Bh)								
+28 (1Ch)	**Interrupt Edge Setting 0**							
	IN 07 Edge	IN 06 Edge	IN 05 Edge	IN 04 Edge	IN 03 Edge	IN 02 Edge	IN 01 Edge	IN 00 Edge
+29 (1Dh)	**Interrupt Edge Setting 1**							
	IN 17 Edge	IN 16 Edge	IN 15 Edge	IN 14 Edge	IN 13 Edge	IN 12 Edge	IN 11 Edge	IN 10 Edge
+30 (1Eh)	N/A							
+31 (1Fh)								

Figure 4.2. Output Port < DIO-16/16(FIT)GY >

DI-32(FIT)GY

Starting I/O address	D7	D6	D5	D4	D3	D2	D1	D0
Input	**Products Category**				**Rivision Data**			
+0 (00h)	0	0	0	1	Rivision Data 3	Rivision Data 2	Rivision Data 1	Rivision Data 0
	Products ID Number							
+1 (01h)	0	0	0	0	1	0	1	0
	Interrupt Status							
+2 (02h)	Enable (0)	Status (0)				IRQ 9 (0)	IRQ 7 (0)	IRQ 5 (0)
+3	**Digital Filter**							
(03h)	0	0	0	ST4	ST3	ST2	ST1	ST0
+4 (04h) +15 (0Fh)	N/A							
+16	**Input Group +0**							
(10h)	IN 07	IN 06	IN 05	IN 04	IN 03	IN 02	IN 01	IN 00
+17	**Input Group +1**							
(11h)	IN 17	IN 16	IN 15	IN 14	IN 13	IN 12	IN 11	IN 10
+18	**Input Group +2**							
(12h)	IN 27	IN 26	IN 25	IN 24	IN 23	IN 22	IN 21	IN 20
+19	**Input Group +3**							
(13h)	IN 37	IN 36	IN 35	IN 34	IN 33	IN 32	IN 31	IN 30
+20H (14h) +23 (17h)	N/A							
	Interrupt Status 0							
+24 (18h)	IN 07 Status	IN 06 Status	IN 05 Status	IN 04 Status	IN 03 Status	IN 02 Status	IN 01 Status	IN 00 Status
	Interrupt Status 1							
+25 (19h)	IN 17 Status	IN 16 Status	IN 15 Status	IN 14 Status	IN 13 Status	IN 12 Status	IN 11 Status	IN 10 Status
	Interrupt Status 2							
+26 (1Ah)	IN 27 Status	IN 26 Status	IN 25 Status	IN 24 Status	IN 23 Status	IN 22 Status	IN 21 Status	IN 20 Status
	Interrupt Status 3							
+27 (1Bh)	IN 37 Status	IN 36 Status	IN 35 Status	IN 34 Status	IN 33 Status	IN 32 Status	IN 31 Status	IN 30 Status
	Interrupt Edge Setting Data 0							
+28 (1Ch)	IN 07 Edge	IN 06 Edge	IN 05 Edge	IN 04 Edge	IN 03 Edge	IN 02 Edge	IN 01 Edge	IN 00 Edge
	Interrupt Edge Setting Data 1							
+29 (1Dh)	IN 17 Edge	IN 16 Edge	IN 15 Edge	IN 14 Edge	IN 13 Edge	IN 12 Edge	IN 11 Edge	IN 10 Edge
	Interrupt Edge Setting Data 2							
+30 (1Eh)	IN 27 Edge	IN 26 Edge	IN 25 Edge	IN 24 Edge	IN 23 Edge	IN 22 Edge	IN 21 Edge	IN 20 Edge
	Interrupt Edge Setting Data 3							
+31 (1Fh)	IN 37 Edge	IN 36 Edge	IN 35 Edge	IN 34 Edge	IN 33 Edge	IN 32 Edge	IN 31 Edge	IN 30 Edge

Figure 4.3. Input Port < DI-32(FIT)GY >

Starting I/O address	D7	D6	D5	D4	D3	D2	D1	D0
Output +0 (00h)	N/A							
+1 (01h)								
+2 (02h)	**Interrupt Status**							
	Enable (0)					IRQ 9 (0)	IRQ 7 (0)	IRQ 5 (0)
+3 (03h)	**Digital Filter**							
	0	0	0	ST4	ST3	ST2	ST1	ST0
+4 (04h)	N/A							
+23 (17h)								
+24 (18h)	**Interrupt Mask 0**							
	IN 07 Mask	IN 06 Mask	IN 05 Mask	IN 04 Mask	IN 03 Mask	IN 02 Mask	IN 01 Mask	IN 00 Mask
+25 (19h)	**Interrupt Mask 1**							
	IN 17 Mask	IN 16 Mask	IN 15 Mask	IN 14 Mask	IN 13 Mask	IN 12 Mask	IN 11 Mask	IN 10 Mask
+26 (1Ah)	**Interrupt Mask 2**							
	IN 27 Mask	IN 26 Mask	IN 25 Mask	IN 24 Mask	IN 23 Mask	IN 22 Mask	IN 21 Mask	IN 20 Mask
+27 (1Bh)	**Interrupt Mask 3**							
	IN 37 Mask	IN 36 Mask	IN 35 Mask	IN 34 Mask	IN 33 Mask	IN 32 Mask	IN 31 Mask	IN 30 Mask
+28 (1Ch)	**Interrupt Edge Setting 0**							
	IN 07 Edge	IN 06 Edge	IN 05 Edge	IN 04 Edge	IN 03 Edge	IN 02 Edge	IN 01 Edge	IN 00 Edge
+29 (1Dh)	**Interrupt Edge Setting 1**							
	IN 17 Edge	IN 16 Edge	IN 15 Edge	IN 14 Edge	IN 13 Edge	IN 12 Edge	IN 11 Edge	IN 10 Edge
+30 (1Eh)	**Interrupt Edge Setting 2**							
	IN 27 Edge	IN 26 Edge	IN 25 Edge	IN 24 Edge	IN 23 Edge	IN 22 Edge	IN 21 Edge	IN 20 Edge
+31 (1Fh)	**Interrupt Edge Setting 3**							
	IN 37 Edge	IN 36 Edge	IN 35 Edge	IN 34 Edge	IN 33 Edge	IN 32 Edge	IN 31 Edge	IN 30 Edge

Figure 4.4. Output Port < DI-32(FIT)GY >

DO-32(FIT)GY

Starting I/O address Input	D7	D6	D5	D4	D3	D2	D1	D0
	Products Category				**Rivision Data**			
+0 (00h)	0	0	0	1	Rivision Data 3	Rivision Data 2	Rivision Data 1	Rivision Data 0
	Products ID Number							
+1 (01h)	0	0	0	0	1	0	1	1
+2 (02h) to +19 (13h)	Reserved							
+20 (14h)	**Output Group +0**							
	OUT 07	OUT 06	OUT05	OUT 04	OUT 03	OUT 02	OUT 01	OUT 00
+21 (15h)	**Output Group +1**							
	OUT 17	OUT 16	OUT 15	OUT 14	OUT 13	OUT 12	OUT 11	OUT 10
+22 (16h)	**Output Group +2**							
	OUT 27	OUT 26	OUT 25	OUT 24	OUT 23	OUT 22	OUT 21	OUT 20
+23 (17h)	**Output Group +3**							
	OUT 37	OUT 36	OUT 35	OUT 34	OUT 33	OUT 32	OUT 31	OUT 30
+24 (18h) to +31 (1Fh)	Reserved							

OUTxx is provided for output data read-back purposes.

Figure 4.5. Input Port < DO-32(FIT)GY >

Starting I/O address	D7	D6	D5	D4	D3	D2	D1	D0
Output +0	N/A							
+19 (13h)								
+20 (14h)	**Output Group +0**							
	OUT 07	OUT 06	OUT 05	OUT 04	OUT 03	OUT 02	OUT 01	OUT 00
+21 (15h)	**Output Group +1**							
	OUT 17	OUT 16	OUT 15	OUT 14	OUT 13	OUT 12	OUT 11	OUT 10
+22 (16h)	**Output Group +2**							
	OUT 27	OUT 26	OUT 25	OUT 24	OUT 23	OUT 22	OUT 21	OUT 20
+23 (17h)	**Output Group +3**							
	OUT 37	OUT 36	OUT 35	OUT 34	OUT 33	OUT 32	OUT 31	OUT 30
+24 (18h)	N/A							
+31 (1Fh)								

Figure 4.6. Output Port < DO-32(FIT)GY >

Specifications Common to F&eIT Products

The starting I/O address range from +0h to +Fh is mapped commonly to all modules in the F&eIT series.

Product Information

Starting I/O address	D7	D6	D5	D4	D3	D2	D1	D0
Input	**Product Category**				**Rivision Data**			
+0 (00h)	0	0	0	1	Revision Data3	Revision Data2	Revision Data1	Revision Data0
	Product ID Number							
+1 (01h)	0	0	0	0	0	0	0	0
	Interruput Status							
+2 (02h)	Enable(0)	Status(0)	0	0	0	IRQ 9 (0)	IRQ 7 (0)	IRQ 5 (0)

Figure 4.7. Product Information

- Revision Data [D3 - D0]:

  This is product update information, subject to change without notice, that is managed by CONTEC.

- Product Category [D7 - D4]:

  This is a module function classification code. For the DIO-16/16(FIT)GY, DI-32(FIT)GY and DO-32(FIT)GY, the code is "1h".

Table 4.2. Product Category

Code	Function
0	Bus expansion
1	Digital input-output
2	Analog input-output
3	Counter
4	Serial communications
5	GPIB
6-F	Reserved

- Products ID Number [D7 - D0]:

  This is the product ID within the same product category.
  DIO-16/16(FIT)GY : 9h
  DI-32(FIT)GY : Ah
  DO-32(FIT)GY : Bh

Following are examples of initialization coded in high-level languages:

Microsoft C

```
ProductID = inp( ADR+1 );
```

Microsoft QBASIC

```
ProductID = INP( ADR+1 )
```

* ADR is the starting I/O address for the DIO-16/16(FIT)GY, DI-32(FIT)GY and DO-32(FIT)GY.

Interrupt status

This is a common port on which the interrupt status requested by the Module can be verified. Information on interrupt sources varies from module to module.

Starting I/O address	D7	D6	D5	D4	D3	D2	D1	D0
Input	**Interruput Status**							
+2 (02h)	Enable (0)	Status (0)	0	0	0	IRQ 9 (0)	IRQ 7 (0)	IRQ 5 (0)

Figure 4.8. Interrupt Status

- Enable [D7]:

  This bit verifies the interrupt source enabled/disabled status.
  The value "1" indicates that a hardware interrupt on the controller module is enabled.

- Status [D6]:

  This bit indicates an interrupt request status in the module. When an interrupt event has occurred in the module and IRQ5, IRQ7, or IRQ9 is "1", this bit will also be "1".

- IRQ* [D2 - D0]:

  These bits allow you to verify the interrupt level that is currently set. The current interrupt level is indicated as "1".

Setting an interrupt level

Starting I/O address	D7	D6	D5	D4	D3	D2	D1	D0
Output	**Interruput Status**							
+2 (02h)	Enable (0)	Status (0)	0	0	0	IRQ 9 (0)	IRQ 7 (0)	IRQ 5 (0)

Figure 4.9. Setting an interrupt level

- Enable [D7]:

  This bit enables an interrupt source. Setting the bit to “1” enables hardware interrupts to the controller module.

- IRQ* [D2 - D0]:

  The interrupt level used by the module is set in these bits. Setting any of the IRQs to “1” makes the signal on that IRQ active upon reception of an interrupt request.

Interrupt Control Function

All of the input signals can be used as interrupt request signals. (DIO-16/16(FIT)GY: 16 points, DI-32(FIT)GY: 32 points)
When an input signal goes OFF from ON or vice versa, an interrupt request signal can be generated to the controller.

Note that, when a digital filter is used, the input signal passing through the filter generates an interrupt request.

Input Port < DIO-16/16(FIT)GY >

Starting I/O address	D7	D6	D5	D4	D3	D2	D1	D0
	Interrupt Status 0							
+24 (18h)	IN 07 Status	IN 06 Status	IN 05 Status	IN 04 Status	IN 03 Status	IN 02 Status	IN 01 Status	IN 00 Status
	Interrupt Status 1							
+25 (19h)	IN 17 Status	IN 16 Status	IN 15 Status	IN 14 Status	IN 13 Status	IN 12 Status	IN 11 Status	IN 10 Status
	Interrupt Edge Setting Data 0							
+28 (1Ch)	IN 07 Edge	IN 06 Edge	IN 05 Edge	IN 04 Edge	IN 03 Edge	IN 02 Edge	IN 01 Edge	IN 00 Edge
	Interrupt Edge Setting Data 1							
+29 (1Dh)	IN 17 Edge	IN 16 Edge	IN 15 Edge	IN 14 Edge	IN 13 Edge	IN 12 Edge	IN 11 Edge	IN 10 Edge

Figure 4.10. Interrupt Control Function Input Port < DIO-16/16(FIT)GY >

Intput Port < DI-32(FIT)GY >

Starting I/O address	D7	D6	D5	D4	D3	D2	D1	D0
	Interrupt Status 0							
+24 (18h)	IN 07 Status	IN 06 Status	IN 05 Status	IN 04 Status	IN 03 Status	IN 02 Status	IN 01 Status	IN 00 Status
	Interrupt Status 1							
+25 (19h)	IN 17 Status	IN 16 Status	IN 15 Status	IN 14 Status	IN 13 Status	IN 12 Status	IN 11 Status	IN 10 Status
	Interrupt Status 2							
+26 (1Ah)	IN 27 Status	IN 26 Status	IN 25 Status	IN 24 Status	IN 23 Status	IN 22 Status	IN 21 Status	IN 20 Status
	Interrupt Status 3							
+27 (1Bh)	IN 37 Status	IN 36 Status	IN 35 Status	IN 34 Status	IN 33 Status	IN 32 Status	IN 31 Status	IN 30 Status
	Interrupt Edge Setting Data 0							
+28 (1Ch)	IN 07 Edge	IN 06 Edge	IN 05 Edge	IN 04 Edge	IN 03 Edge	IN 02 Edge	IN 01 Edge	IN 00 Edge
	Interrupt Edge Setting Data 1							
+29 (1Dh)	IN 17 Edge	IN 16 Edge	IN 15 Edge	IN 14 Edge	IN 13 Edge	IN 12 Edge	IN 11 Edge	IN 10 Edge
	Interrupt Edge Setting Data 2							
+30 (1Eh)	IN 27 Edge	IN 26 Edge	IN 25 Edge	IN 24 Edge	IN 23 Edge	IN 22 Edge	IN 21 Edge	IN 20 Edge
	Interrupt Edge Setting Data 3							
+31 (1Fh)	IN 37 Edge	IN 36 Edge	IN 35 Edge	IN 34 Edge	IN 33 Edge	IN 32 Edge	IN 31 Edge	IN 30 Edge

Figure 4.11. Interrupt Control Function Input Port < DI-32(FIT)GY >

Output Port < DIO-16/16(FIT)GY >

Starting I/O address	D7	D6	D5	D4	D3	D2	D1	D0
	Interrupt Mask 0							
+24 (18h)	IN 07 Mask	IN 06 Mask	IN 05 Mask	IN 04 Mask	IN 03 Mask	IN 02 Mask	IN 01 Mask	IN 00 Mask
	Interrupt Mask 1							
+25 (19h)	IN 17 Mask	IN 16 Mask	IN 15 Mask	IN 14 Mask	IN 13 Mask	IN 12 Mask	IN 11 Mask	IN 10 Mask
	Interrupt Edge Setting 0							
+28 (1Ch)	IN 07 Edge	IN 06 Edge	IN 05 Edge	IN 04 Edge	IN 03 Edge	IN 02 Edge	IN 01 Edge	IN 00 Edge
	Interrupt Edge Setting 1							
+29 (1Dh)	IN 17 Edge	IN 16 Edge	IN 15 Edge	IN 14 Edge	IN 13 Edge	IN 12 Edge	IN 11 Edge	IN 10 Edge

Figure 4.12. Interrupt Control Function Output Port < DIO-16/16(FIT)GY >

Output Port < DI-32(FIT)GY >

Starting I/O address	D7	D6	D5	D4	D3	D2	D1	D0
	Interrupt Mask 0							
+24 (18h)	IN 07 Mask	IN 06 Mask	IN 05 Mask	IN 04 Mask	IN 03 Mask	IN 02 Mask	IN 01 Mask	IN 00 Mask
	Interrupt Mask 1							
+25 (19h)	IN 17 Mask	IN 16 Mask	IN 15 Mask	IN 14 Mask	IN 13 Mask	IN 12 Mask	IN 11 Mask	IN 10 Mask
	Interrupt Mask 2							
+26 (1Ah)	IN 27 Mask	IN 26 Mask	IN 25 Mask	IN 24 Mask	IN 23 Mask	IN 22 Mask	IN 21 Mask	IN 20 Mask
	Interrupt Mask 3							
+27 (1Bh)	IN 37 Mask	IN 36 Mask	IN 35 Mask	IN 34 Mask	IN 33 Mask	IN 32 Mask	IN 31 Mask	IN 30 Mask
	Interrupt Edge Setting 0							
+28 (1Ch)	IN 07 Edge	IN 06 Edge	IN 05 Edge	IN 04 Edge	IN 03 Edge	IN 02 Edge	IN 01 Edge	IN 00 Edge
	Interrupt Edge Setting 1							
+29 (1Dh)	IN 17 Edge	IN 16 Edge	IN 15 Edge	IN 14 Edge	IN 13 Edge	IN 12 Edge	IN 11 Edge	IN 10 Edge
	Interrupt Edge Setting 2							
+30 (1Eh)	IN 27 Edge	IN 26 Edge	IN 25 Edge	IN 24 Edge	IN 23 Edge	IN 22 Edge	IN 21 Edge	IN 20 Edge
	Interrupt Edge Setting 3							
+31 (1Fh)	IN 37 Edge	IN 36 Edge	IN 35 Edge	IN 34 Edge	IN 33 Edge	IN 32 Edge	IN 31 Edge	IN 30 Edge

Figure 4.13. Interrupt Control Function Output Port < DI-32(FIT)GY >

Interrupt signal status

When an input signal goes OFF from ON or vice versa, an interrupt request generates to the controller. The “interrupt status” input port is provided to identify the input signal that requests the interrupt.

Clearing an interrupt signal

Once an interrupt has been generated, the next interrupt request cannot be accepted until the current interrupt signal is cleared. When the interrupt function is used, therefore, the interrupt signal must be cleared within the interrupt handling program. Reading the interrupt status port clears the interrupt signal and the status in the port read at the same time.

Disabling/enabling interrupts

Using the interrupt mask port to, set each bit to enable or disable interrupts.
If you set an interrupt mask bit to “1”, no interrupt occurs even when the input signal of the corresponding bit causes state transition.
To generate an interrupt, set the corresponding interrupt mask bit to “0” to enable interrupts.

Selecting an interrupt trigger edge

Interrupt input logic is set by using the interrupt edge select port.
If you set an interrupt edge select bit to “0”, an interrupt occurs when the input signal of the corresponding bit falls from ON to OFF (upon “0” to “1” transition).
If you set an interrupt edge select bit to “1”, an interrupt occurs when the input signal of the corresponding bit rises from OFF to ON (upon “1” to “0” transition).

Digital Filter (Hardware)

Using this feature, this product can apply a digital filter to every input pin, thereby preventing the input signal from being affected by noise or chattering.

Digital Filter Operation Principle

The digital filter checks the input signal level during the sampling time of 1/4 cycles of digital filter setting time. When the signal level remains the same for the digital filter setting time (four time sampling), the digital filter recognizes that signal as the normal input signal and changes the filter output signal level.

When there will be a change in the signal in the digital filter setting time (sampling four times), the input signal till then is disregarded and it continues the level check again.

If the signal level changes at a frequency shorter than the set time, therefore, the level change is ignored.

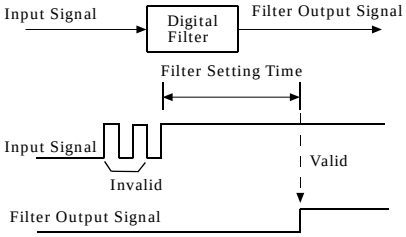


Figure 4.14. Digital Filter Operation Principle

Set Digital Filter Time

Input Port

	D7	D6	D5	D4	D3	D2	D1	D0
	Digital Filter Data							
+3 (03h)	0	0	0	ST4	ST3	ST2	ST1	ST0

Output Port

	D7	D6	D5	D4	D3	D2	D1	D0
	Digital Filter Data							
+3 (03h)	0	0	0	ST4	ST3	ST2	ST1	ST0

Figure 4.15. Set Digital Filter Time

Set Digital Filter Time

Output setting data "ST4 - ST0" to the "time setting" output port to set the digital filter time.

Table 4.3. Digital Filter Time and Setting Data

The table below lists the relationships between digital filter time and setting data.

Digital Filter Time [sec] = 2^n / (8 x 10^6)

n: Setting Data (0 - 20)

Setting Data (n)	Digital Filter Time	Setting Data (n)	Digital Filter Time	Setting Data (n)	Digital Filter Time
0 (00h) *1	Not used	7 (07h)	16µSec	14 (0Eh)	2.048mSec
1 (01h)	0.25µSec	8 (08h)	32µSec	15 (0Fh)	4.096mSec
2 (02h)	0.5µSec	9 (09h)	64µSec	16 (10h)	8.192mSec
3 (03h)	1µSec	10 (0Ah)	128µSec	17 (11h)	16.384mSec
4 (04h)	2µSec	11 (0Bh)	256µSec	18 (12h)	32.768mSec
5 (05h)	4µSec	12 (0Ch)	512µSec	19 (13h)	65.536mSec
6 (06h)	8µSec	13 (0Dh)	1024µSec	20 (14h)	131.072mSec

*1: Factory setting

⚠ CAUTION

- The default value for digital filter setting time is "Not used". The default setting is used when the power is turned on.
- The digital filter applies to all input channels; it cannot apply to specific input pins only.
- Do not set the setting data to any value other than the above. Doing so may result in a malfunction.
- A digital filter doesn't work effectively when the filter time is set in the opto-coupler response time.
- It differs according to the product at the opto-coupler response time. (For more details, refer to the functional specification.)

Data I/O Operations that Directly Access an I/O Port

Data Input

DIO-16/16(FIT)GY

Starting I/O address	D7	D6	D5	D4	D3	D2	D1	D0
Input	**Input Group +0**							
+16 (10h)	IN 07	IN 06	IN 05	IN 04	IN 03	IN 02	IN 01	IN 00
	Input Group +1							
+17 (11h)	IN 17	IN 16	IN 15	IN 14	IN 13	IN 12	IN 11	IN 10

Figure 4.16. Input Port [Starting I/O Address +10h] < DIO-16/16(FIT)GY >

DI-32(FIT)GY

Starting I/O address	D7	D6	D5	D4	D3	D2	D1	D0
Input	**Input Group +0**							
+16 (10h)	IN 07	IN 06	IN 05	IN 04	IN 03	IN 02	IN 01	IN 00
	Input Group +1							
+17 (11h)	IN 17	IN 16	IN 15	IN 14	IN 13	IN 12	IN 11	IN 10
	Input Group +2							
+18 (12h)	IN 27	IN 26	IN 25	IN 24	IN 23	IN 22	IN 21	IN 20
	Input Group +3							
+19 (13h)	IN 37	IN 36	IN 35	IN 34	IN 33	IN 32	IN 31	IN 30

Figure 4.17. Input Port [Starting I/O Address +10h] < DI-32(FIT)GY >

Data can be input by using the input port [starting I/O address + 10h, 11h(< DIO-16/16(FIT)GY >, < DI-32(FIT)GY >) and +12h, 13h(< DI-32(FIT)GY >)].

When input is [ON], the corresponding bit for the input data will be [1]. Conversely, when input is [OFF], the corresponding bit for the input data will be [0].

Data Output

DIO-16/16(FIT)GY

Starting I/O address Output	D7	D6	D5	D4	D3	D2	D1	D0
	Output Group +0							
+20 (14h)	OUT 07	OUT 06	OUT 05	OUT 04	OUT 03	OUT 02	OUT 01	OUT 00
	Output Group +1							
+21 (15h)	OUT 17	OUT 16	OUT 15	OUT 14	OUT 13	OUT 12	OUT 11	OUT 10

Figure 4.18. Output Port [Starting I/O Address +14h] < DIO-16/16(FIT)GY >

DO-32(FIT)GY

Starting I/O address Output	D7	D6	D5	D4	D3	D2	D1	D0
	Output Group +0							
+20 (14h)	OUT 07	OUT 06	OUT 05	OUT 04	OUT 03	OUT 02	OUT 01	OUT 00
	Output Group +1							
+21 (15h)	OUT 17	OUT 16	OUT 15	OUT 14	OUT 13	OUT 12	OUT 11	OUT 10
	Output Group +2							
+22 (16h)	OUT 27	OUT 26	OUT 25	OUT 24	OUT 23	OUT 22	OUT 21	OUT 20
	Output Group +3							
+23 (17h)	OUT 37	OUT 36	OUT 35	OUT 34	OUT 33	OUT 32	OUT 31	OUT 30

Figure 4.19. Output Port [Starting I/O Address +14h] < DO-32(FIT)GY >

Data can be output by using the output port [starting I/O address + 14h, 15h (< DIO-16/16(FIT)GY >,< DO-32(FIT)GY >) and 16h, 17h(< DO-32(FIT)GY >)].

When the value [1] is written to the corresponding bit for the output data, the corresponding transistor will be [ON]. Conversely, when the value [0] is written to the corresponding bit for the output data, the corresponding transistor will be [OFF].

⚠ CAUTION

When the power is turned on, all output ports will be [0].

Monitoring the Output Data

In the < DIO-16/16(FIT)GY > or < DO-32(FIT)GY >, this function allows you to read the status of the current output data without affecting the output data itself.

DIO-16/16(FIT)GY

Starting I/O address Input	D7	D6	D5	D4	D3	D2	D1	D0
	Output Group +0							
+20 (14h)	OUT 07	OUT 06	OUT 05	OUT 04	OUT 03	OUT 02	OUT 01	OUT 00
	Output Group +1							
+21 (15h)	OUT 17	OUT 16	OUT 15	OUT 14	OUT 13	OUT 12	OUT 11	OUT 10

Figure 4.20. Output Data-Monitoring Input Port < DIO-16/16(FIT)GY >

DO-32(FIT)GY

Starting I/O address Input	D7	D6	D5	D4	D3	D2	D1	D0
	Output Group +0							
+20 (14h)	OUT 07	OUT 06	OUT 05	OUT 04	OUT 03	OUT 02	OUT 01	OUT 00
	Output Group +1							
+21 (15h)	OUT 17	OUT 16	OUT 15	OUT 14	OUT 13	OUT 12	OUT 11	OUT 10
	Output Group +2							
+22 (16h)	OUT 27	OUT 26	OUT 25	OUT 24	OUT 23	OUT 22	OUT 21	OUT 20
	Output Group +3							
+23 (17h)	OUT 37	OUT 36	OUT 35	OUT 34	OUT 33	OUT 32	OUT 31	OUT 30

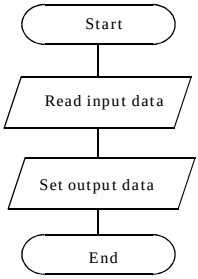
Figure 4.21. Output Data-Monitoring Input Port < DO-32(FIT)GY >

Examples

Software Mode

Flowchart

Following is a description of an example where the DIO-16/16(FIT)GY is installed at device ID: 0.



Address: Reading the address "base I/O address + 10h" obtains digital input data.

Address: Data can be output by writing the digital output data to the address "base I/O address + 14h".

Figure 4.22. Frowchart

Sample program

```
/* ============================================================================
   Sample program 1

   DEVICE ID:      0
   Channel:        Input 1ch/Output 1ch
============================================================================ */
#include  <stdio.h>
#include  <conio.h>

/* ----- Constant ------------------------------------------------------- */
#define   ADR    0x0800       /* I/O address */

/* ----- Prototype ------------------------------------------------------ */
void   main( void );

/* ----- Main ----------------------------------------------------------- */
void   main( void )
{
   unsigned char   inData;
   unsigned char   outData=0xff;

   inData=(unsigned char)inp( ADR+0x10 );
   outp( ADR+0x14, outData );

   printf("Input Data %02x\n", inData);
   printf("Output Data %02x\n", outData);
}
```

5. Using the Memory Address Map

When connected to a CPU-CAxx(FIT)GY, the DIO-16/16(FIT)GY, DI-32(FIT)GY and DO-32(FIT)GY can be accessed by a host computer through a network. In addition, the Module can be allocated to the memory controlled by the Controller Module according to a given Device ID. Applications running on the host computer control the I/O modules by reading/writing the memory that is controlled by the Controller Module.

For detailed specifications on the memory controlled by the Controller Module, see the Controller Module manual.

Following is an explanation of the memory areas necessary for the use of this I/O module: the "module area", the "module information area", and the "basic data area".

Module setting area

This area controls the settings and how the module is started.

The module becomes available when the necessary settings are written into this area and the module activation option is set in the [module startup register].

Module information area

The current module settings are stored in this area.

When the Module is started, the contents of the Module Information Area are copied to the Module Information Area. By reading this area, you can verify the current module settings.

Basic I/O data area

Basic I/O data is read and written in this area.

DIO-16/16(FIT)GY

Module Information Area

A module information area, which is a 128-byte (80h) area beginning with address 301000h and corresponding to a given Device ID, is where the settings for the given device are read and written.

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

Starting address = 301000h + 80h x (Device ID)

Table 5.1. Module Information Area

Address(h)	Area	Item	Size	Access type	Initial value(h)	Initial settings
Starting address+00	Module-specific information	Module type (category)	1	R	01	DIO-16/16(FIT)GY
Starting address+01		Module type (serial No.)	1	R	09	
Starting address+02		System-reserved (revision No.)	1	R	None	
Starting address+03		Supported functions	1	R	03	Basic I/O
Starting address+04		Number of basic input channels	1	R	02	2channels
Starting address+05		Basic input data size	1	R	01	1byte
Starting address+06		Number of basic output channels	1	R	02	2channels
Starting address+07		Basic output data size	1	R	01	1byte
Starting address+08		Input channel settings address	1	R	20	20h
Starting address+09		Input channel settings data size	1	R	18	24bytes
Starting address+0A		Output channel settings address	1	R	50	50h
Starting address+0B		Output channel settings data size	1	R	18	24bytes
Starting address+0C - Starting address+0F		Reserved	4	R	None	
Starting address+10	Common to modules	Module startup register	1	R	01	
Starting address+11		Error status	1	R	00	
Starting address+12		Hardware Digital filter setting	1	R/W	00	Not used
Starting address+13 - Starting address+1F		Reserved	13	R	None	
Starting address+20 - Starting address7F	Channel settings	Reserved	96	R	None	

Module-specific information

- Module type (category)

  The DIO-16/16(FIT)GY belongs to the digital module (01h) category.

- Module type (serial No.)

  The DIO-16/16(FIT)GY is a digital module with a serial No. 9 (09h).

- Supported functions

  The DIO-16/16(FIT)GY supports the basic I/O function (03h).

  Basic I/O data takes digital values.

- Number of basic input channels

  The number of basic input channels for the DIO-16/16(FIT)GY is 2 (02h).

  Two digital input channels are provided.

- Basic input data size

  The basic input data size for the DIO-16/16(FIT)GY is 1 (01h) byte.

  This is equal to an 8-bit data area.

- Number of basic output channels

  The number of basic output channels for the DIO-16/16(FIT)GY is 2 (02h).

  Two digital output channels are provided.

- Basic output data size

  The basic output data size for the DIO-16/16(FIT)GY is 1 (01h) byte.

  This is equal to an 8-bit data area.

- Input channel settings address

  The DIO-16/16(FIT)GY does not have channel-specific settings. This field is provided for compatibility with other device modules.

- Input channel settings data size

  The DIO-16/16(FIT)GY does not have channel-specific settings. This field is provided for compatibility with other device modules.

- Output channel settings address

  The DIO-16/16(FIT)GY does not have channel-specific settings. This field is provided for compatibility with other device modules.

- Output channel settings data size

  The DIO-16/16(FIT)GY does not have channel-specific settings. This field is provided for compatibility with other device modules.

Items common to modules

- Module startup register

  The DIO-16/16(FIT)GY does not contain a module shutdown function.

  01h : Module startup

- Error status

  The error status bits, which are not reflected in the module information area, always remain [00h].

  The error status on a module is stored in the module information area.

- Hardware Digital Filter setup

  Set the time for the hardware digital filter. The factory setting is "00h" (digital filter disabled). The other settings available are shown in “Digital Filter (Hardware)”.

Module Information Area

The module information area, which is a 128-byte (80h) area beginning with address 300000h and corresponding to a given Device ID, is the area into which settings are read.
The starting address can be determined according to the following expression:
Starting address = 300000h + 80h x (Device ID)

Table 5.2. Module Information Area

Address(h)	Area	Item	Size	Access type	Initial value (h)
Starting address+00	Module-specific information	Module type (category)	1	R	01
Starting address+01		Module type (serial No.)	1	R	09
Starting address+02		System-reserved (revision No.)	1	R	None
Starting address+03		Supported functions	1	R	03
Starting address+04		Number of basic input channels	1	R	02
Starting address+05		Basic input data size	1	R	01
Starting address+06		Number of basic output channels	1	R	02
Starting address+07		Basic output data size	1	R	01
Starting address+08		Input channel settings address	1	R	20
Starting address+09		Input channel settings data size	1	R	18
Starting address+0A		Output channel settings address	1	R	50
Starting address+0B		Output channel settings data size	1	R	18
Starting address+0C - Starting address+0F		Reserved	4	R	None
Starting address+10	Common to modules	Module startup register	1	R	01
Starting address+11		Error status	1	R	00
Starting address+12		Hardware Digital Filter Setting	1	R	00
Starting address+13 - Starting address+1F		Reserved	13	R	None
Starting address+20 - Starting address7F	Channel settings	Reserved	96	R	None

When the module is started, the contents of the module information area are stored in the module information area, with the exception of the [Module Startup Register] and the [Error Status].

Module startup register

The DIO-16/16(FIT)GY does not contain a module shutdown function.

01h : Module operating

- Error status

This register stores the error status of the module.

The error status register is reset when the module is restarted.

00h : Normal status

Basic I/O Data Area

The basic input data area, which a 128-byte (80h) area beginning with address 304000h, corresponds to a given Device ID.

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

Starting address = 304000h + 80h x (Device ID)

Table 5.3. Basic Input Data Area

Address(h)	Area	Item	Size	Access type
Starting address+00	IN0	Digital input values	1	R
Starting address+01	IN1	Digital input values	1	R
Starting address+02 - Starting address+7F	Reserved		126	None

Digital input values

Input values IN00 - IN07 and IN10 - IN17 are stored as follows:

Table 5.4. Digital Input Values

	D7	D6	D5	D4	D3	D2	D1	D0	
+0h	IN07	IN06	IN05	IN04	IN03	IN02	IN01	IN00	IN0
+1h	IN17	IN16	IN15	IN14	IN13	IN12	IN11	IN10	IN1

The basic output data area, which is a 128-byte (80h) area beginning with address 305000h, corresponds to a given Device ID.

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

Starting address = 305000h + 80h x (Device ID)

Table 5.5. Basic Output Data Area

Address(h)	Area	Item	Size	Access type
Starting address+00	OUT0	Digital output values	1	R/W
Starting address+01	OUT1	Digital output values	1	R/W
Starting address+02 - Starting address+7F	Reserved		126	R

Digital output values

Output values OUT00 - OUT07 and OUT10 - OUT17 are stored as follows:

Table 5.6. Digital Output Values

	D7	D6	D5	D4	D3	D2	D1	D0	
+0h	OUT07	OUT06	OUT05	OUT04	OUT03	OUT02	OUT01	OUT00	OUT0
+1h	OUT17	OUT16	OUT15	OUT14	OUT13	OUT12	OUT11	OUT10	OUT1

DI-32(FIT)GY

Module Information Area

A module information area, which is a 128-byte (80h) area beginning with address 301000h and corresponding to a given Device ID, is where the settings for the given device are read and writen. The starting address can be determined according to the following expression:
Starting address = 301000h + 80h x (Device ID)

Table 5.7. Module Information Area

Address(h)	Area	Item	Size	Access type	Initial value(h)	Initial settings
Starting address+00	Module-specific information	Module type (category)	1	R	01	DI-32(FIT)GY
Starting address+01		Module type (serial No.)	1	R	0A	
Starting address+02		System-reserved (revision No.)	1	R	None	
Starting address+03		Supported functions	1	R	01	Basic Input
Starting address+04		Number of basic input channels	1	R	04	4channels
Starting address+05		Basic input data size	1	R	01	1byte
Starting address+06		Number of basic output channels	1	R	00	0channel
Starting address+07		Basic output data size	1	R	00	0byte
Starting address+08		Input channel settings address	1	R	20	20h
Starting address+09		Input channel settings data size	1	R	18	24bytes
Starting address+0A		Output channel settings address	1	R	50	50h
Starting address+0B		Output channel settings data size	1	R	18	24bytes
Starting address+0C - Starting address+0F		Reserved	4	R	None	
Starting address+10	Common to modules	Module startup register	1	R	01	
Starting address+11		Error status	1	R	00	
Starting address+12		Hardware Digital filter setting	1	R/W	00	Not used
Starting address+13 - Starting address+1F		Reserved	13	R	None	
Starting address+20 - Starting address7F	Channel settings	Reserved	96	R	None	

Module-specific information

- Module type (category)

  The DI-32(FIT)GY belongs to the digital module (01h) category.

- Module type (serial No.)

  The DI-32(FIT)GY is a digital module with a serial No. A (0Ah).

- Supported functions

  The DI-32(FIT)GY supports the basic input function (01h).

  Basic input data takes digital values.

- Number of basic input channels

  The number of basic input channels for the DI-32(FIT)GY is 4 (04h).

  Four digital input channels are provided.

- Basic input data size

  The basic input data size for the DI-32(FIT)GY is 1 (01h) byte.

  This is equal to an 8-bit data area.

- Number of basic output channels

  The number of basic output channels for the DI-32(FIT)GY is 0 (00h).

  No digital output channels are provided.

- Basic output data size

  The basic output data size for the DI-32(FIT)GY is 0 (00h) byte.

- Input channel settings address

  The DI-32(FIT)GY does not have channel-specific settings. This field is provided for compatibility with other device modules.

- Input channel settings data size

  The DI-32(FIT)GY does not have channel-specific settings. This field is provided for compatibility with other device modules.

- Output channel settings address

  The DI-32(FIT)GY does not have channel-specific settings. This field is provided for compatibility with other device modules.

- Output channel settings data size

  The DI-32(FIT)GY does not have channel-specific settings. This field is provided for compatibility with other device modules.

Items common to modules

- Module startup register

  The DI-32(FIT)GY does not contain a module shutdown function.
  01h : Module startup

- Error status

  The error status bits, which are not reflected in the module information area, always remain [00h].

  The error status on a module is stored in the module information area.

- Hardware Digital Filter setup

  Set the time for the hardware digital filter. The factory setting is "00h" (digital filter disabled). The other settings available are shown in “Digital Filter (Hardware)”.

Module Information Area

The module information area, which is a 128-byte (80h) area beginning with address 300000h and corresponding to a given Device ID, is the area into which settings are read.

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

Starting address = 300000h + 80h x (Device ID)

Table 5.8. Module Information Area

Address(h)	Area	Item	Size	Access type	Initial value (h)
Starting address+00	Module-specific information	Module type (category)	1	R	01
Starting address+01		Module type (serial No.)	1	R	0A
Starting address+02		System-reserved (revision No.)	1	R	None
Starting address+03		Supported functions	1	R	01
Starting address+04		Number of basic input channels	1	R	04
Starting address+05		Basic input data size	1	R	01
Starting address+06		Number of basic output channels	1	R	00
Starting address+07		Basic output data size	1	R	00
Starting address+08		Input channel settings address	1	R	20
Starting address+09		Input channel settings data size	1	R	18
Starting address+0A		Output channel settings address	1	R	50
Starting address+0B		Output channel settings data size	1	R	18
Starting address+0C - Starting address+0F		Reserved	4	R	None
Starting address+10	Common to modules	Module startup register	1	R	01
Starting address+11		Error status	1	R	00
Starting address+12		Hardware Digital Filter Setting	1	R	00
Starting address+13 - Starting address+1F		Reserved	13	R	None
Starting address+20 - Starting address7F	Channel settings	Reserved	96	R	None

When the module is started, the contents of the module information area are stored in the module information area, with the exception of the [Module Startup Register] and the [Error Status].

- Module startup register

  The DI-32(FIT)GY does not contain a module shutdown function.
  01h : Module operating

- Error status

  This register stores the error status of the module.

  The error status register is reset when the module is restarted.

  00h : Normal status

Basic I/O Data Area

The basic I/O data area, which a 128-byte (80h) area beginning with address 304000h, corresponds to a given Device ID.

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

Starting address = 304000h + 80h x (Device ID)

Table 5.9. Basic I/O Data Area

Address(h)	Area	Item	Size	Access type
Starting address+00	IN0	Digital input values	1	R
Starting address+01	IN1	Digital input values	1	R
Starting address+02	IN2	Digital input values	1	R
Starting address+03	IN3	Digital input values	1	R
Starting address+04 - Starting address+7F	Reserved		124	R

Digital input values

Input values IN00 - IN07, IN10 - IN17 and IN20 - IN27, IN30 - IN37 are stored as follows:

Table 5.10. Digital Input Values

	D7	D6	D5	D4	D3	D2	D1	D0	
+0h	IN07	IN06	IN05	IN04	IN03	IN02	IN01	IN00	IN0
+1h	IN17	IN16	IN15	IN14	IN13	IN12	IN11	IN10	IN1
+2h	IN27	IN26	IN25	IN24	IN23	IN22	IN21	IN20	IN2
+3h	IN37	IN36	IN35	IN34	IN33	IN32	IN31	IN30	IN3

DO-32(FIT)GY

Module Information Area

A module information area, which is a 128-byte (80h) area beginning with address 301000h and corresponding to a given Device ID, is where the settings for the given device are read and written.

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

Starting address = 301000h + 80h x (Device ID)

Table 5.11. Module Information Area

Address(h)	Area	Item	Size	Access type	Initial value(h)	Initial settings
Starting address+00	Module-specific information	Module type (category)	1	R	01	DO-32(FIT)GY
Starting address+01		Module type (serial No.)	1	R	0B	
Starting address+02		System-reserved (revision No.)	1	R	None	
Starting address+03		Supported functions	1	R	02	Basic output
Starting address+04		Number of basic input channels	1	R	00	0channel
Starting address+05		Basic input data size	1	R	00	0byte
Starting address+06		Number of basic output channels	1	R	04	4channels
Starting address+07		Basic output data size	1	R	01	1byte
Starting address+08		Input channel settings address	1	R	20	20h
Starting address+09		Input channel settings data size	1	R	18	24bytes
Starting address+0A		Output channel settings address	1	R	50	50h
Starting address+0B		Output channel settings data size	1	R	18	24bytes
Starting address+0C - Starting address+0F		Reserved	4	R	None	
Starting address+10	Common to modules	Module startup register	1	R	01	
Starting address+11		Error status	1	R	00	
Starting address+12		Hardware Digital filter setting	1	R/W	00	Not used
Starting address+13 - Starting address+1F		Reserved	13	R	None	
Starting address+20 - Starting address7F	Channel settings	Reserved	96	R	None	

Module-specific information

- Module type (category)

  The DO-32(FIT)GY belongs to the digital module (01h) category.

- Module type (serial No.)

  The DO-32(FIT)GY is a digital module with a serial No. B (0Bh).

- Supported functions

  The DO-32(FIT)GY supports the basic output function (02h).

  Basic output data takes digital values.

- Number of basic input channels

  The number of basic input channels for the DO-32(FIT)GY is 0 (00h).

  No digital input channels are provided.

- Basic input data size

  The basic input data size for the DO-32(FIT)GY is 0 (00h) byte.

- Number of basic output channels

  The number of basic output channels for the DO-32(FIT)GY is 4 (04h).

  Four digital output channels are provided.

- Basic output data size

  The basic output data size for the DO-32(FIT)GY is 1 (01h) byte.

- Input channel settings address

  The DO-32(FIT)GY does not have channel-specific settings. This field is provided for compatibility with other device modules.

- Input channel settings data size

  The DO-32(FIT)GY does not have channel-specific settings. This field is provided for compatibility with other device modules.

- Output channel settings address

  The DO-32(FIT)GY does not have channel-specific settings. This field is provided for compatibility with other device modules.

- Output channel settings data size

  The DO-32(FIT)GY does not have channel-specific settings. This field is provided for compatibility with other device modules.

Items common to modules

- Module startup register

  The DO-32(FIT)GY does not contain a module shutdown function.
  01h : Module startup

- Error status

  The error status bits, which are not reflected in the module information area, always remain [00h].

  The error status on a module is stored in the module information area.

Chanel settings

The DO-32(FIT)GY does not have channel-specific settings. This field is provided for compatibility with other device modules.

Module Information Area

The module information area, which is a 128-byte (80h) area beginning with address 300000h and corresponding to a given Device ID, is the area into which settings are read.

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

Starting address = 300000h + 80h x (Device ID)

Table 5.12. Module Information Area

Address(h)	Area	Item	Size	Access type	Initial value (h)
Starting address+00	Module-specific information	Module type (category)	1	R	01
Starting address+01		Module type (serial No.)	1	R	0B
Starting address+02		System-reserved (revision No.)	1	R	None
Starting address+03		Supported functions	1	R	02
Starting address+04		Number of basic input channels	1	R	00
Starting address+05		Basic input data size	1	R	00
Starting address+06		Number of basic output channels	1	R	04
Starting address+07		Basic output data size	1	R	01
Starting address+08		Input channel settings address	1	R	20
Starting address+09		Input channel settings data size	1	R	18
Starting address+0A		Output channel settings address	1	R	50
Starting address+0B		Output channel settings data size	1	R	18
Starting address+0C - Starting address+0F		Reserved	4	R	None
Starting address+10	Common to modules	Module startup register	1	R	01
Starting address+11		Error status	1	R	00
Starting address+12		Hardware Digital filter setting	1	R	00
Starting address+13 - Starting address+1F		Reserved	13	R	None
Starting address+20 - Starting address7F	Channel settings	Reserved	96	R	None

When the module is started, the contents of the module information area are stored in the module information area, with the exception of the [Module Startup Register] and the [Error Status].

- Module startup register
  The DO-32(FIT)GY does not contain a module shutdown function.
  01h : Module operating
- Error status
  This register stores the error status of the module.
  The error status register is reset when the module is restarted.
  00h : Normal status

Basic I/O Data Area

The basic I/O data area, which a 128-byte (80h) area beginning with address 305000h, corresponds to a given Device ID.

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

Starting address = 305000h + 80h x (Device ID)

Table 5.13. Basic I/O Data Area

Address(h)	Area	Item	Size	Access type
Starting address+00	OUT0	Digital output values	1	R/W
Starting address+01	OUT1	Digital output values	1	R/W
Starting address+02	OUT2	Digital output values	1	R/W
Starting address+03	OUT3	Digital output values	1	R/W
Starting address+04 - Starting address+7F	Reserved		124	R

Digital output values

Output values OUT00 - OUT07, OUT10 - OUY17 and OUT20 - OUT27, OUT30 - OUT37 are stored as follows:

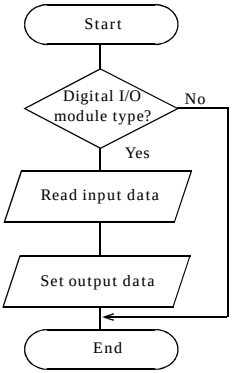
Table 5.14. Digital Output Values

	D7	D6	D5	D4	D3	D2	D1	D0	
+0h	OUT 07	OUT 06	OUT 05	OUT 04	OUT 03	OUT 02	OUT 01	OUT 00	OUT0
+1h	OUT 17	OUT 16	OUT 15	OUT 14	OUT 13	OUT 12	OUT 11	OUT 10	OUT1
+2h	OUT 27	OUT 26	OUT 25	OUT 24	OUT 23	OUT 22	OUT 21	OUT 20	OUT2
+3h	OUT 37	OUT 36	OUT 35	OUT 34	OUT 33	OUT 32	OUT 31	OUT 30	OUT3

Examples

Flowchart

The following flowchart illustrates an example where the DIO-16/16(FIT)GY is installed at device ID: 0.



Address: Reading the address 301000h identifies the module type (category).
If the module is a digital I/O module, the module type (category) will be [01h].
This operation also determines the existence of a module.
(If no modules are found, the result will be [00h].)

Address: Reading the address 304000h obtains digital input data.

Address: Writing the digital output data to 35000h enables output the digital data.

Figure 5.1. Frowchart

Sample program

```
/*=========================================================================

   F&eIT I/F Sample Program

   DEVICE ID:      0

========================================================================= */

#include <windows.h>
#include <stdio.h>
#include <stdlib.h>
#include <conio.h>
#include "Fit.h"


/* Address(common) */
#define   FIT_IO                        (0x00300000)
#define   FIT_IO_DEVICE_INFOR           (0x0000)
#define   FIT_IO_DEVICE_CONFIG          (0x1000)
#define   FIT_IO_INPUT                  (0x4000)
#define   FIT_IO_OUTPUT                 (0x5000)

#define   FIT_IO_DEVICE_SIZE            (0x0080)

#define   FIT_PRODUCT_CATEGORY          (0x00)
#define   FIT_INPUT_CHANNELS            (0x04)
#define   FIT_OUTPUT_CHANNELS           (0x06)
```

```
#define   FIT_MODULE_START             (0x10)
#define   FIT_ERROR_STATUS             (0x11)

/* Information(Common) */
#define   FIT_PRODUCT_DIGITAL          (0x01)
#define   FIT_PRODUCT_ANALOG           (0x02)
#define   FIT_PRODUCT_COUNTER          (0x03)

#define   FIT_MODULE_START_OFF         (0x00)
#define   FIT_MODULE_START_ON          (0x01)

/* Sample */
#define   FIT_SAMPLE_IP_ADDRESS        "192.168.132.211"
#define   FIT_SAMPLE_PORT              (0x5007)
#define   FIT_SAMPLE_DEVICE_ID         (0)

int main(void)
{
   DWORD  dwIpAddress;
   DWORD  dwVaBase;
   DWORD  dwVaOffset;
   WORD   hHandle;
   WORD   wStatus;
   BYTE   byCategory;
   BYTE   byInputChannels;
   BYTE   byOutputChannels;
   BYTE   byData[0x80];
   BYTE   byChCount;

   /* Open  */
   dwIpAddress = FIT_IpChenge((BYTE *)FIT_SAMPLE_IP_ADDRESS);
   hHandle = FIT_Open((BYTE *)&dwIpAddress, FIT_SAMPLE_PORT, NULL);

   if (hHandle == 0) {
      printf("Error! FIT_Open = %04X(H)\n", hHandle);
      return 1;
   }

   /* Offset Address  */
   dwVaOffset = FIT_IO_DEVICE_SIZE * FIT_SAMPLE_DEVICE_ID;

   /* Read 'Category' */
   dwVaBase = FIT_IO + FIT_IO_DEVICE_CONFIG;
   wStatus = FIT_Read(hHandle, dwVaBase + dwVaOffset + FIT_PRODUCT_CATEGORY, 1,
byCategory);
```

```
if (wStatus != 0) {
   printf("Error! FIT_Read = %04X(H)\n", wStatus);
   return 1;
}
if (byCategory != FIT_PRODUCT_DIGITAL) {
   printf("Error! Category = %02X(H)\n", byCategory);
   return 1;
}

/* Read 'Input Channels'  */
wStatus = FIT_Read(hHandle, dwVaBase + dwVaOffset + FIT_INPUT_CHANNELS,
            1, &byInputChannels);
if (wStatus != 0) {
   printf("Error! FIT_Read = %04X(H)\n", wStatus);
   return 1;
}

/* Read 'Output Channels' */
wStatus = FIT_Read(hHandle, dwVaBase + dwVaOffset + FIT_OUTPUT_CHANNELS,
            1, &byOutputChannels);
if (wStatus != 0) {
   printf("Error! FIT_Read = %04X(H)\n", wStatus);
   return 1;
}

/* Read 'Input Data'   */
dwVaBase = FIT_IO + FIT_IO_INPUT;
wStatus = FIT_Read(hHandle, dwVaBase + dwVaOffset, byInputChannels,
            &byData[0]);
if (wStatus != 0) {
   printf("Error! FIT_Read = %04X(H)\n", wStatus);
   return 1;
}
for (byChCount = 0; byChCount < byInputChannels; byChCount++) {
   printf("Input CH%d Data:%02X(H)\n", byChCount, byData[byChCount]);
}

/* Write 'Output Data' */
for (byChCount = 0; byChCount < byOutputChannels; byChCount++) {
   byData[byChCount] =  0x55;
   printf("Output CH%d Data:%02X(H)\n", byChCount, byData[byChCount]);
}
dwVaBase = FIT_IO + FIT_IO_OUTPUT;
wStatus = FIT_Write(hHandle, dwVaBase + dwVaOffset, byOutputChannels,
            &byData[0]);
```

```
    if (wStatus != 0) {
        printf("Error! FIT_Write = %04X(H)\n", wStatus);
        return 1;
    }

    /* Close */
    FIT_Close(hHandle);

    return 0;
}
```

6. System Reference

Circuit Block Diagram < DIO-16/16(FIT)GY >

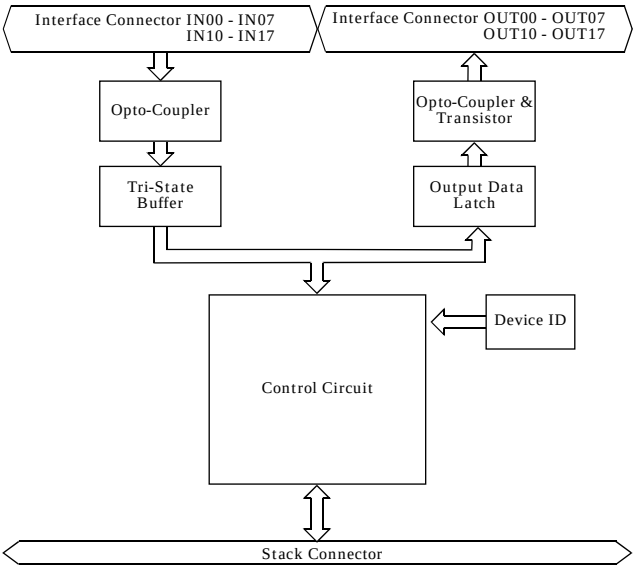


Figure 6.1. Circuit Block Diagram < DIO-16/16(FIT)GY >

Specifications < DIO-16/16(FIT)GY >

Table 6.1. Specifications

Item			Specifications
			DIO-16/16(FIT)GY
Input section			
	Input format		Opto-isolated input (compatible with current sink output and current source output)
	Input resistance		3kΩ
	Input ON current		3.4 mA or more
	Input OFF current		0.16 mA or less
	Number of input signal points		16 points (16 points/common)
	Response time		Within 1msec
	External circuit power supply		12 - 24 VDC (±15%) (4 mA/12V - 8 mA/24V per channel)
Output section			
	Output format		Opto-isolated open collector output (current sink type)
	Ratings	Output voltage	12 - 48 VDC (±15%)
		Output current	150 mA (12 - 24V) (per channel) (Max.) 50 mA (36 - 48V) (per channel) (Max.)
	Number of output signal points		16 points (16 points/common)
	Response time		Within 1msec
	External circuit power supply		12 to 48 VDC (±15%)
Common section			
	Interrupt level		Using CPU-SBxx(FIT)GY: IRQ 5, 7, or 9
	Internal current consumption		5 VDC(±5%) 150 mA(Max.) *1
	Allowable distance of signal extension		Approx. 50m (depending on wiring environment)
	External dimensions (mm)		25.2(W) x 64.7(D) x 94.0(H) (exclusive of protrusions)
	Weight of the module itself		100g
	Module connection method		Stack connection by means of a connection mechanism standard with the system.
	Module installation method		One-touch connection to 35mm DIN rails (standard connection mechanism provided in the system)
	Applicable wire		AWG24 - 16
	Applicable plug		FMC 1,5/18-ST-3,5(made by Phoenix Contact Corp.)

*1 The stack connector accepts currents of up to 3.0A (Max.).

Table 6.2. Installation Environment Requirements

Item		Requirement description
Operating temperature		0 - 50°C
Storage temperature		-10 - 60°C
Operating humidity		10 - 90%RH (No condensation)
Floating dust particles		Not to be excessive
Corrosive gases		None
Noise immunity	Line-noise *1	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 C0041-compliant, IEC68-2-27-compliant)

*1 When using a POW-AD22GY

⚠ CAUTION

When connecting one of the modules to a controller module, the internal current consumption should be taken into account. If the total current exceeds the capacity of the power supply unit, the integrity of the operation cannot be guaranteed. For further details, please see the Controller Module manual.

Circuit Block Diagram < DI-32(FIT)GY >

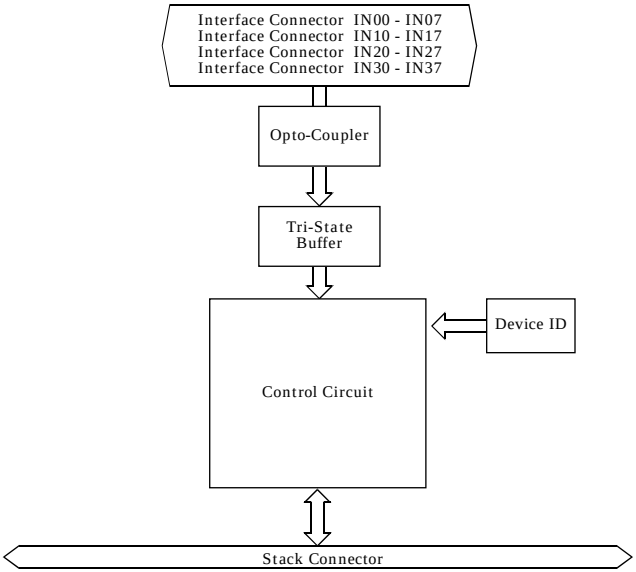


Figure 6.2. Circuit Block

Specifications < DI-32(FIT)GY >

Table 6.3. Specifications

Item	Specifications DI-32(FIT)GY
Input section	
Input format	Opto-isolated input (compatible with current sink output and current source output)
Input resistance	3kΩ
Input ON current	3.4 mA or more
Input OFF current	0.16 mA or less
Number of input signal points	32 points (16 points/common)
Response time	Within 1msec
External circuit power supply	12 - 24 VDC (±15%) (4 mA/12V - 8 mA/24V per channel)
Common section	
Interrupt level	Using CPU-SBxx(FIT)GY: IRQ 5, 7, or 9
External circuit power supply	12 - 24 VDC (±15%)
Internal current consumption	5 VDC(±5%) 150 mA(Max.) *1
Allowable distance of signal extension	Approx. 50m (depending on wiring environment)
External dimensions (mm)	25.2(W) x 64.7(D) x 94.0(H) (exclusive of protrusions)
Weight of the module itself	100g
Module connection method	Stack connection by means of a connection mechanism standard with the system
Module installation method	One-touch connection to 35mm DIN rails (standard connection mechanism provided in the system)
Applicable wire	AWG24 - 16
Applicable plug	FMC 1,5/18-ST-3,5(made by Phoenix Contact Corp.)

*1 The stack connector accepts currents of up to 3.0A (Max.).

Table 6.4. Installation Environment Requirements

Item		Requirement description
Operating temperature		0 - 50°C
Storage temperature		-10 - 60°C
Operating humidity		10 - 90%RH (No condensation)
Floating dust particles		Not to be excessive
Corrosive gases		None
Noise immunity	Line-noise *1	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 C0041-compliant, IEC68-2-27-compliant)

*1 When using a POW-AD22GY

⚠ CAUTION

When connecting one of the modules to a controller module, the internal current consumption should be taken into account. If the total current exceeds the capacity of the power supply unit, the integrity of the operation cannot be guaranteed. For further details, please see the Controller Module manual.

Circuit Block Diagram < DO-32(FIT)GY >

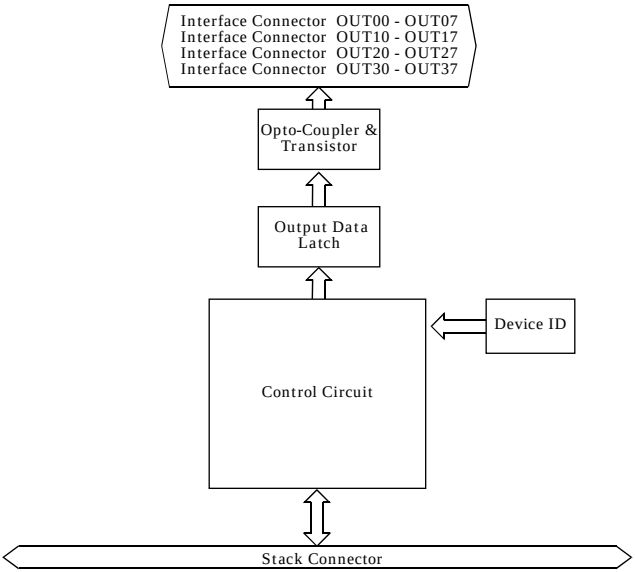


Figure 6.3. Circuit Block Diagram

Specifications < DO-32(FIT)GY >

Table 6.5. Specifications

Item		Specifications
		DO-32(FIT)GY
Output section		
Output format		Opto-isolated open collector output (current sink type)
Ratings	Output voltage	12 - 48 VDC (±15%)
	Output current	150 mA (12 - 24V) (per channel) (Max.) 50 mA (36 - 48V) (per channel) (Max.)
Number of output signal points		32 points (16 points/common)
Response time		Within 1msec
Common section		
External circuit power supply		12 - 48 VDC (±15%)
Internal current consumption		5 VDC(±5%) 150 mA(Max.) *1
Allowable distance of signal extension		Approx. 50m (depending on wiring environment)
External dimensions (mm)		25.2(W) x 64.7(D) x 94.0(H) (exclusive of protrusions)
Weight of the module itself		100g
Module connection method		Stack connection by means of a connection mechanism standard with the system
Module installation method		One-touch connection to 35mm DIN rails (standard connection mechanism provided in the system)
Applicable wire		AWG28 - 16
Applicable plug		FMC 1,5/18-ST-3,5(made by Phoenix Contact Corp.)

*1 The stack connector accepts currents of up to 3.0A (Max.).

Table 6.6. Installation Environment Requirements

Item		Requirement description
Operating temperature		0 - 50°C
Storage temperature		-10 - 60°C
Operating humidity		10 - 90%RH (No condensation)
Floating dust particles		Not to be excessive
Corrosive gases		None
Noise immunity	Line-noise *1	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 C0041-compliant, IEC68-2-27-compliant)

*1 When using a POW-AD22GY

⚠ CAUTION

When connecting one of the modules to a controller module, the internal current consumption should be taken into account. If the total current exceeds the capacity of the power supply unit, the integrity of the operation cannot be guaranteed. For further details, please see the Controller Module manual.

External Dimensions

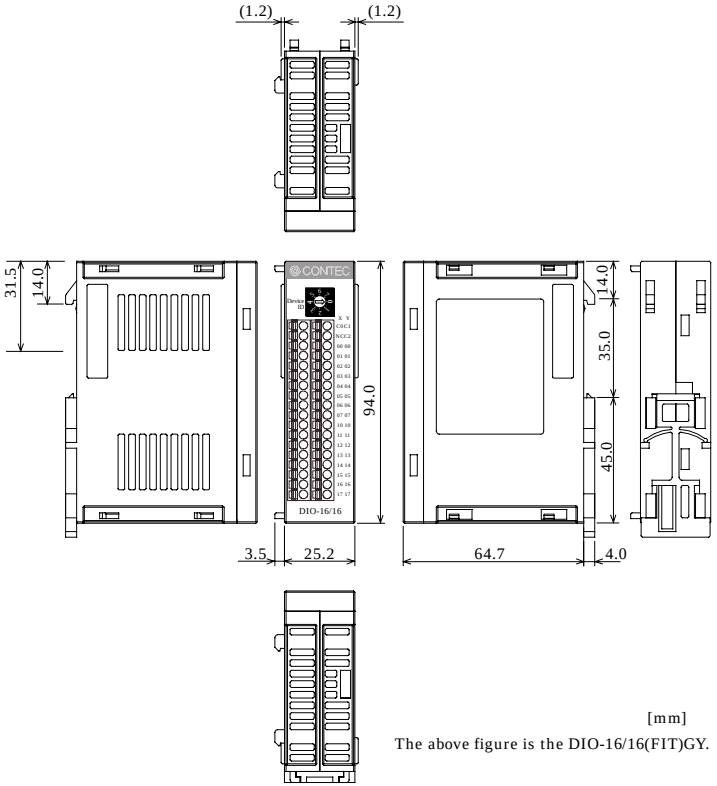


Figure 6.4. External Dimensions

DIO-16/16(FIT)GY
DI-32(FIT)GY
DO-32(FIT)GY
User's Manual

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