

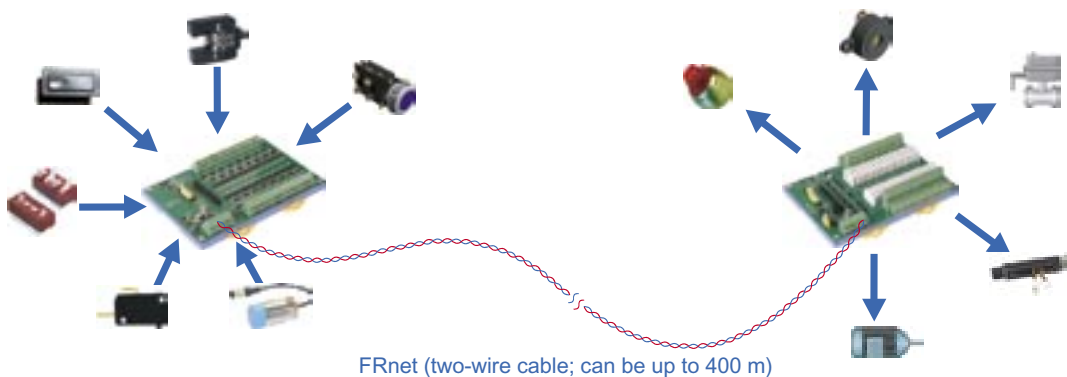
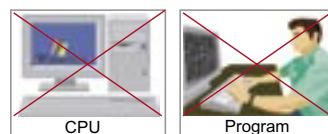
# FRnet & FRnet Products

## Simple is beautiful

FRnet is an innovative industrial field bus that has many special features, such as high-speed deterministic I/O control, real I/O synchronization capabilities, non-protocol communication, and easy programming. If the user finds the complexity of Ethernet, CAN, Profibus or other field bus systems to be difficult, then they should love FRnet. FRnet products can be widely used, from low-end non-CPU I/O systems to high-end control systems, such as PC-based, PLC-based and PAC-based control systems.

## Non-CPU I/O system

Our FR I/O modules can be used to implement a long-distance I/O extension system. Reduced cabling, easy installation, reduced labor costs, and high reliability can be easily achieved. **Refer to the literature related to MagicWire for more detailed information.**



## PC-based system

Since windows is a multi-tasking system, it is very difficult to implement a real-time control system, especially when most of the CPU power is consumed by image and motion cards, and the remainder is not sufficient to handle I/O control. An FRnet control board combined with FRnet I/O modules can help solve the problems faced by system designers. The FRB-200 is an FRnet communication board that can be used as a light-duty controller. For heavy-duty control applications, a BoardPLC would be a better choice. The FRB-200 features an 80186 CPU, 512K SRAM, 512K Flash, and MiniOS7, and allows the user to develop applications using the ISaGRAF softPLC language. The BoardPLC communicates with the PC via dual port RAM, with functions that are very similar to a PLC. Several BoardPLCs can be used in a single PC. **Refer to the literature related to the FRB-200 for more detailed information.**

FRnet Communication Board

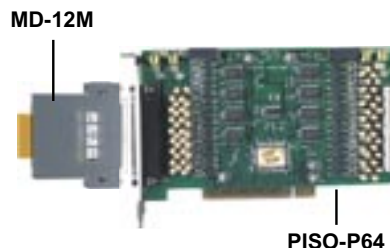


BoardPLC



## MD series MagicWire Module

As a result of the driving limitations of a PC based I/O card, it is impossible to control the I/O from a distance. In this regard, the MD series MagicWire is the best choice for the meeting control requirements in such cases. **Refer to the literature related to the MD series MagicWire for more detailed information.**



# FRnet & FRnet Products

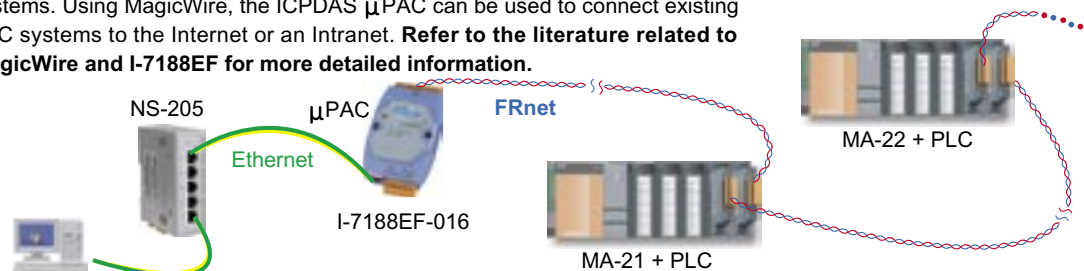
## PAC-based System

A PAC-based System is an alternative choice to a PC-based System. The ICPDAS WinCon-8000, LinCon-8000 and I-8000 series modules are all Programmable Automation Controller (**PAC**) that use an I-8122 FRnet communication module to implement an FRnet network. Therefore an ICPDAS PAC can help to easily achieve high-speed deterministic I/O control. The I-7188EF is a  $\mu$ **PAC** that has a built-in FRnet interface. Instead of using a hard disk, this PAC uses a flash disk and an embedded OS. Optional increased memory can record the status of all I/O events for a greater length of time. All PACs can operate in a wide temperature range and in harsh industrial environments. Compared to traditional PLCs, ICPDAS PACs have better network capabilities, stronger high-speed distributed I/O (FR series I/O), cheaper analog I/O modules, cheaper motion control modules, and richer software tools. **Refer to the literature related to WinCon-8000, LinCon-8000, I-8000, and I-7188 for more detailed information.**



## PLC Networking Solution

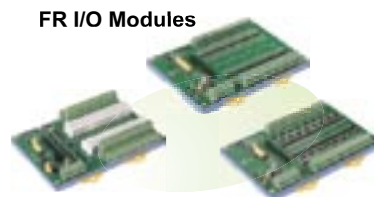
There are millions of PLC systems installed throughout the world. The best approach for networking them to an intranet or the Internet has become a hot topic, and has also become a major challenge facing system integrators. Different machines and equipment use different PLCs, and different PLC languages. Few people really understand the entire system architecture and the diverse control programs. But if the system engineer chooses an ICPDAS MagicWire series product, then it can easily be used to network different PLC systems. Using MagicWire, the ICPDAS  $\mu$ PAC can be used to connect existing PLC systems to the Internet or an Intranet. **Refer to the literature related to MagicWire and I-7188EF for more detailed information.**



## FR I/O module

The FR series I/O module has an FRnet interface, which can be used as a distributed remote I/O module or a MagicWire module. An FR I/O module is set as a remote I/O module by default. The User should select the correct settings to enable it to be used as MagicWire module. The user can then easily daisy chain several FRnet modules together. FRnet modules can work with PC, PAC,  $\mu$ PAC and PLC systems. **Refer to the literature related to FR I/O modules and MagicWire for more detailed information.**

## FR I/O Modules



## MagicWire module

Two major applications for MagicWire modules are long-distance I/O extension and the networking of PLCs, PACs and embedded controllers. MagicWire modules include the MA series, MD series and FR series, and can be widely used, from low-end non-CPU I/O systems to high-end control systems, such as PAC, PC, PLC...etc. **Refer to the literatures related to MagicWire module for more detailed information.**

## MA series



## MD series

# FRB-200/100

## FRnet Communication Board



FRB-200



FRB-100

### Functional Description

PC-based I/O control systems are widely used in measurement and control system applications. But sometimes it is very difficult to meet the demands of critical timing control missions. As a result of the special features of FRnet, such as real I/O synchronization and fixed scan time, FRB boards can be added to PC-based systems to give additional PLC-like control functions, with no need to mix PC-based controllers with PLCs. The FRB-200/100 is an isolated FRnet communication board. The FRB-100 has a single FRnet port, while the FRB-200 has two FRnet ports. Each FRnet port can control a maximum of 16 communication nodes, numbered from 0 to 15. Each single node of the remote I/O module can control a maximum of 16 DI/DO channels. In other words, each FRnet port can control a maximum of 128 DI and 128 DO channels. Traditional high-channel I/O cards occupy several PC slots, such as the ICPDAS PIO-D144 or DIO-144, and the bulky cables can be difficult to handle. Several FRB boards can be combined to work together to control thousands of I/O channels. Reduced cabling, lower labor costs, easy installation and higher reliability are the major advantages of an FRnet solution.

### Applications

- Industrial Automation
- Remote I/O control
- Building Automation
- Parking Lot Management

### Specifications

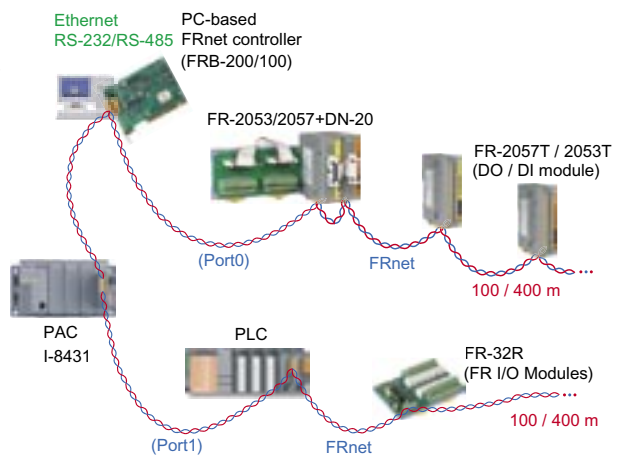
- Communication speed: 250Kbps
- Cyclic Scan time:  
128 input/128 output points@2.88 ms
- Communication distance: 400m max
- Wire cable: (shielded) Twisted-pair cable

### General Specifications

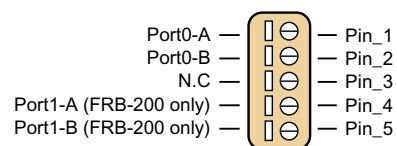
- Power consumption: 5V DC @ 250mA(max)
- Operating temperature: -25°C ~ +75°C
- Operating humidity: 10% ~ 90% RH, non-condensing
- Storage temperature: -30°C ~ +85°C
- Storage humidity: 5% ~ 95% RH, non-condensing
- Dimensions: 120 mm x 90 mm

### Features

- Reduced Wiring two-wire cabling
- Innovative token-stream communication technology
- Real-time I/O synchronization capabilities
- Fixed cyclic scan time for deterministic control
- High speed distributed I/O control capabilities
- Memory-mapping I/O programming
- Easily programmable
- No software overhead for protocol processing
- 5V DC PCI-bus add-on card



### Pin Assignment



### Ordering Information

#### Standard

**FRB-200** : 2-port FRnet communication board

**FRB-100** : 1-port FRnet communication board

#### Related products

**FR-2053**: 16-channel isolated digital input module with 20-pin header

**FR-2053T**: 16-channel isolated digital input module with 20-pin terminal block

**FR-2053S**: 16-channel isolated digital input module

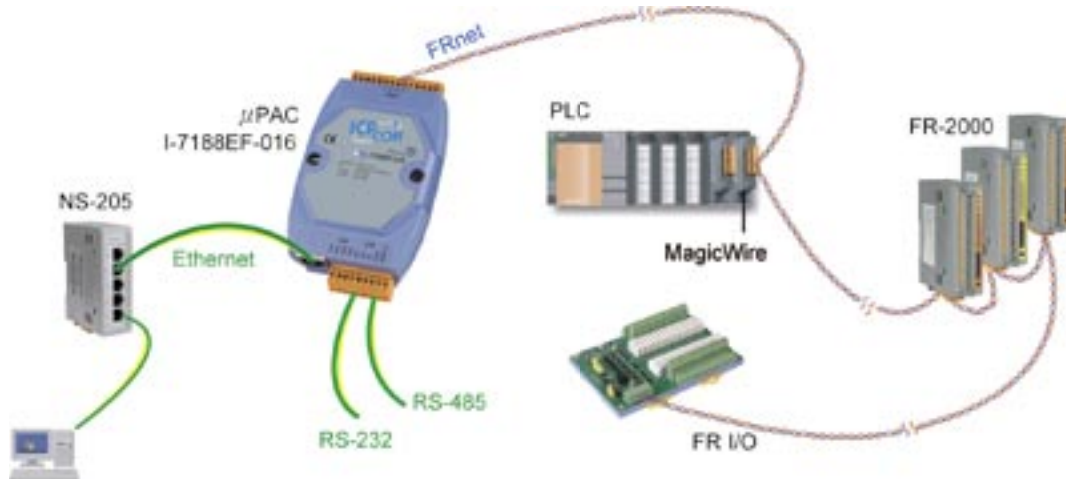
**FR-2057**: 16-channel isolated digital output module with 20-pin header

**FR-2057T**: 16-channel isolated digital output module with 20-pin terminal block

**FR-2057S**: 16-channel isolated digital output module

# I-7188EF-016 / I-7188EFD-016

FRnet  $\mu$ PAC



## Functional Description

The I-7188EF-016 is an  $\mu$ PAC with isolated FRnet, Ethernet, RS-485 and RS-232 ports. MiniOS7 is pre-installed and is ready to run your C software programs. The I-7188EF controls distributed FR-2000 and FR I/O modules via FRnet. Each I-7188EF can control a maximum of with 16 groups, each group having a maximum of 16 I/O channels. In other words, each I-7188EF-016 can control a maximum of 128 digital input channels and 128 digital output.

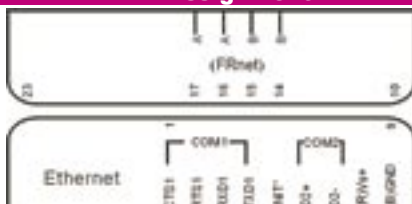
## Advantages of $\mu$ PAC-based Control System

Compared to PC-based and PAC-based FRnet control system, the  $\mu$ PAC I-7188EF, is much smaller and cheaper. AS a result of the special features of FRnet, such as real I/O synchronization and fixed scan time, the I-7188EF includes PLC-like control functions. Because FRnet is so easy to program, users need only take a few minutes to learn FRnet I/O programming. The I-7188EF has an Ethernet port, meaning that all FRnet products can be controlled via an intranet or Internet. It also has an additional RS-485 port to control our I-7000 data acquisition modules. Using the I-7188EF, thousands of I/O control system channels can be easily implemented. the optional extended flash memory of I-7188EF can record all I/O status events for a greater length of. The I-7188EF can operate in a wide temperature range and in harsh industrial environment. Compared to PLCs, traditional the I-7188EF has better network capabilities, strong distributed and high-speed deterministic I/O (FR series I/O), cheaper analog I/O modules, cheaper motion control modules, and richer software tools.

## Applications

- Factory automation
- Building automation
- Energy management.
- Agriculture automation

## Pin Assignment



## Features

- Innovative token-stream communication technology
- Real I/O synchronization capabilities
- Real deterministic control
- Fixed scan time
- Ultra high speed distributed I/O control capabilities
- Memory-mapping I/O programming
- Easily programmable
- No transmission protocol and no software overhead
- Two-wire cabling
- Built-in MiniOS7

## Specifications

- RDC 80188 compatible CPU
- SRAM: 512Kbytes
- Flash RAM: 512Kbytes
- NVSRAM: 31 bytes
- EPROM: 2048 bytes
- Real time clock
- FRnet Port
  - Communication speed: 250Kbps
  - Communication distance: 400m max
  - Scan time: 128 input/128 output points @ 2.88 mS
  - Cable: CPEV 0.9S (2P Twisted-pair wire)
- Ethernet port: 10 Base-T
- COM1: RS-232 (TXD, RXD, RTS, CTS, GND)
- COM2: RS-485 (D1+, D1-)
- Operating temperature: -25°C ~ +75°C
- Operating humidity: 10% ~ 90% RH, non-condensing
- Storage temperature: -30°C ~ +85°C
- Storage humidity: 5% ~ 95% RH, non-condensing
- Power requirements: 10~30V DC
- Power consumption: max 3.0W
- Dimensions: 123 mm x 72 mm x 33 mm

## Ordering Information

### Standard

I-7188EF-016: FRnet  $\mu$ PAC

I-7188EFD-016: FRnet  $\mu$ PAC with display

# MagicWire Selection Guide

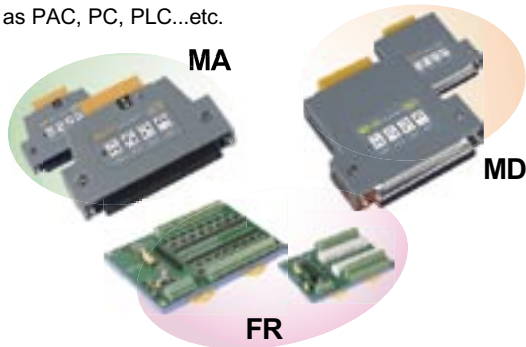
Model	MD-11	MD-12	MD-11M	MD-12M	MA-11	MA-12	MA-21	MA-22	FR I/O module
Long-distance I/O extension									
Mitsubishi compatible PLCs; A1SY71, QY71 compatible	-	-	-	-	Y	-	Y	-	Y
Mitsubishi compatible PLCs; A1SX71, QX71 compatible	-	-	-	-	-	Y	-	Y	Y
Other brand PLCs	-	-	-	-	-	-	-	-	Y (Note1)
PC I/O card ISO-P64, PISO-P64 Compatible	-	-	-	Y	-	-	-	-	Y
PC I/O card ISO-C64, PISO-C64 Compatible	-	-	Y	-	-	-	-	-	Y
I-8000 I-8040, I-87040 Compatible	-	Y	-	-	-	-	-	-	Y
I-8000 I-8041, I-87041 Compatible	Y	-	-	-	-	-	-	-	Y
Networking									
1. Using FRnet to network PLC systems									
Networking Mitsubishi compatible PLCs	-	-	-	-	Y	Y	Y	Y	Y
Networking other brand PLCs	-	-	-	-	-	-	-	-	Y (Note1)
2. Using FRnet to network PC and existing PLC systems									
Networking PC and Mitsubishi compatible PLCs	-	-	Y	Y	Y	Y	Y	Y	Y
Networking PC and other brand PLCs	-	-	Y	Y	-	-	-	-	Y (Note1)
3. Using FRnet to network PAC and existing PLC systems									
Networking PAC (I-8000+I-8040, or I-87040) and Mitsubishi Compatible PLCs	-	Y	-	-	Y	Y	Y	Y	Y
Networking PAC (I-8000+I-8041, or I-87041) and other brand PLCs	Y	-	-	-	Y	Y	Y	Y	Y (Note1)
Availability	Y	Y	-	-	Y	Y	Y	Y	Y
Page	8-9	8-9	8-9	8-9	8-11	8-11	8-11	8-11	8-14
Note1: Different PLCs have different I/O connectors. The user should refer to the literatures related to FR I/O modules for further information.									

# MagicWire

## Introduction

Two major applications for MagicWire modules are long-distance I/O extension and the networking of PLC, PAC and embedded controllers.

MagicWire modules include the **MA** series, **MD** series and **FR** series and it can be widely used from simple non-CPU I/O systems to high-end control systems, such as PAC, PC, PLC...etc.



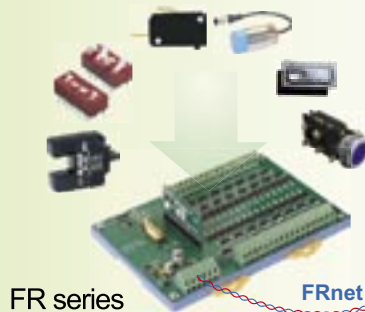
## Solutions for long-distance I/O extension of non-CPU I/O systems

Using an input-type FR series module, non-CPU I/O systems can input a digital signal triggered by either a switches, push buttons, or sensor, then transmit the I/O status to one or several output-type FR series modules via a two-wire cable. The output-type FR series modules then output the digital input data to the corresponding digital output channels, such as a buzzer, lamp, motor, light, or actuator, with a response time of less than 3ms. The control distance for standard module can reach 400m; however, some specially designed models can reach up to 2 Km. It is very simple to use, with even an untrained user able to use it with 5 minutes of training as there is no need to learn any software programming.

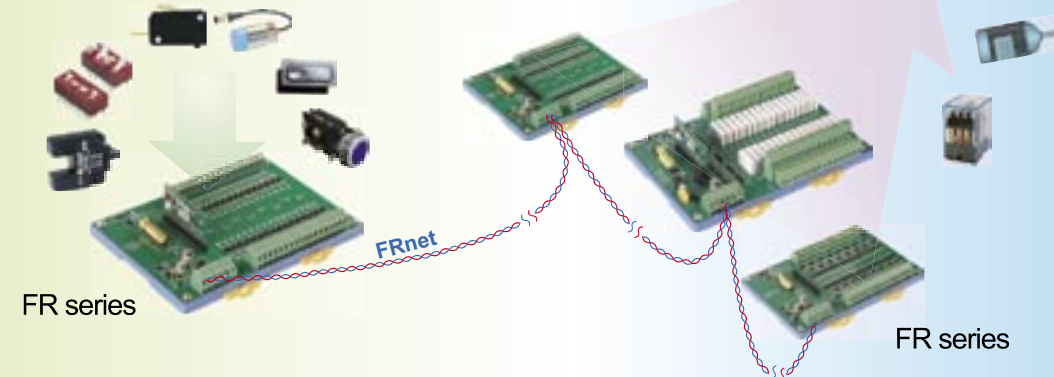
Reduced wiring, easy installation, lower labor costs and higher reliability can be easily achieved.

## Local Site

### One to one configuration



### One to N configuration



## Remote Site



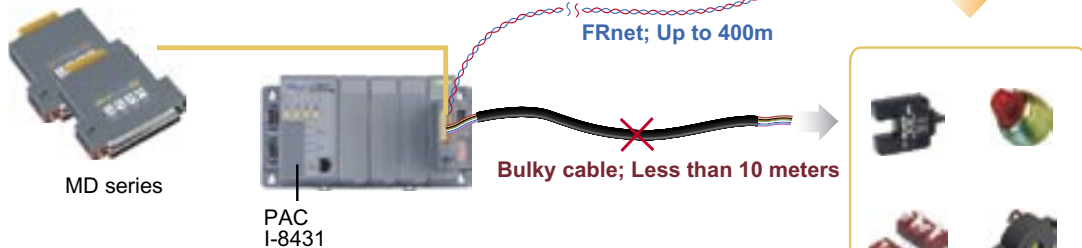
# MagicWire

## Long-distance I/O extension of PAC, PC and PLC

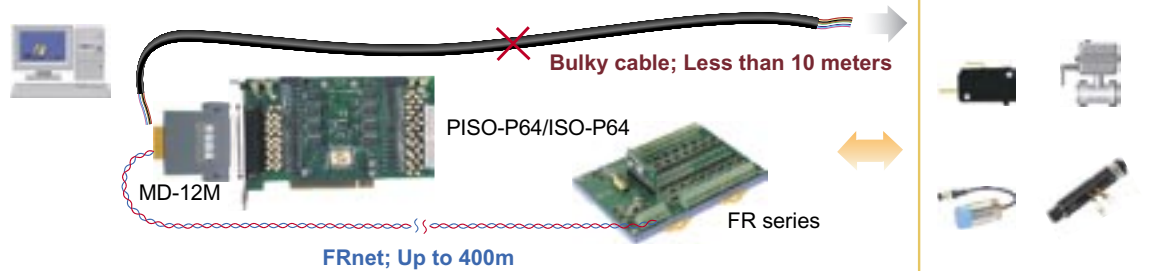
### Solutions for Long-distance I/O extension of PAC, PC and PLC

MagicWire modules can extend the digital I/O channels of a PAC, PC or PLC to a remote site via 2-wire FRnet. By using MagicWire modules, there is no need for the user to modify and debug the software. The extension distance can reach 400m. Some specially designed modules, however, allow it to reach up to 2 Km. The MD series has a 37-pin D-Sub connector and can be used for ICPDAS I/O cards and modules. The MA series has an Fuji 40-pin connector and can be used for Mitsubishi and compatible PLCs. Other types of PLCs or PACs can use an appropriate FR I/O module for long-distance extension of the I/O channels.

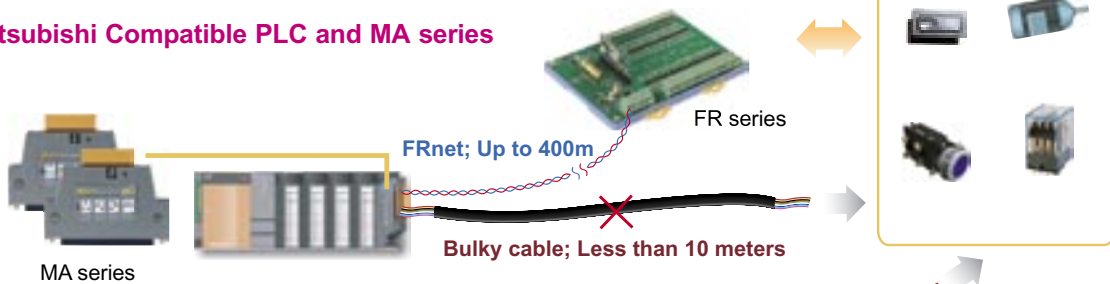
#### PAC & MD series module



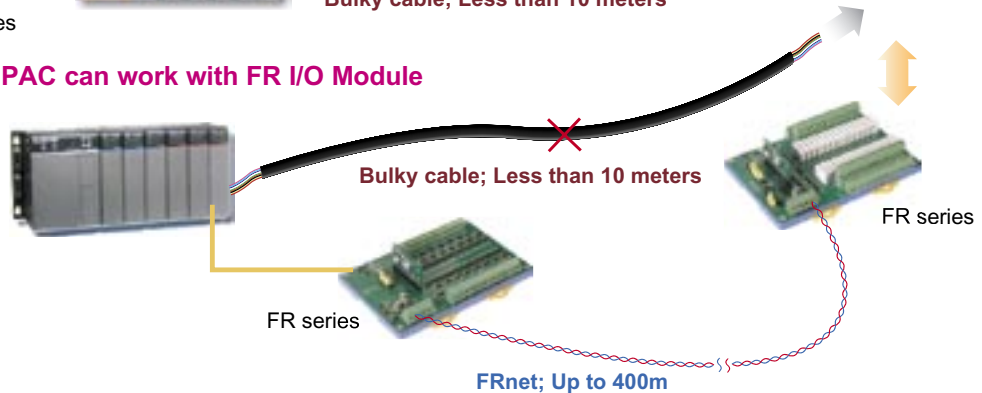
#### PC & MD series module



#### Mitsubishi Compatible PLC and MA series



#### Any PLC or PAC can work with FR I/O Module

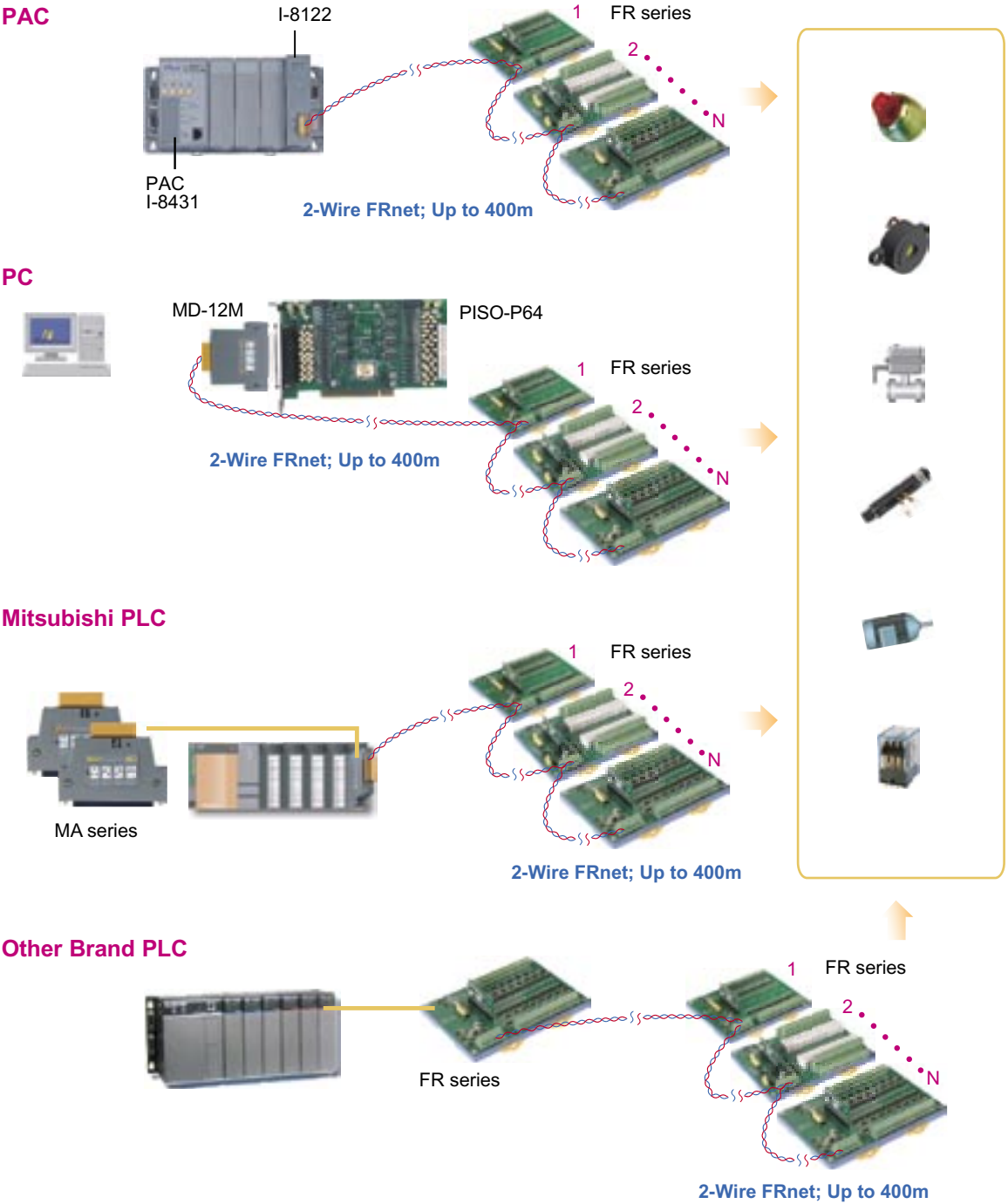


# MagicWire

Long-distance I/O extension of PAC, PC and PLC

Solution for 1 - N configuration

Besides the 1 to 1 connection, MagicWire can also be used to achieve 1 to N connections. The digital output port of a PAC or a PC I/O card or PLC can be extended to several remote sites via a 2-wire FRnet. In this application, all FR modules should use the same node number. This special feature simplifies some I/O control systems.



# MagicWire

## MD Series MagicWire



### How to select MD series modules

The MD-11M is an input type module featuring a male 37-pin D-sub connector that works with ISO-C64 or PISO-C64 PCI-based digital I/O boards. The MD-12M is an output type module featuring a male 37-pin D-sub connector that works with ISO-P64 or PISO-P64 PCI-based digital I/O boards. The MD-11 features a female 37-pin D-sub connector and works with I-8041 or I-87041. The MD-12 features a female 37-pin D-sub connector and works with I-8040 or I-87040. The I-8041, I-87041, I-8042, I-87042 are all digital series I-8000 PAC and WinCon-8000.

### An MD series module is used to extend the I/O distance of PC and PAC

Since a PC and PAC have many network adapters, they don't really require an MD series module to implement an FRnet network. Therefore, long-distance I/O extension is the best application for MD series modules.

### Switch Setting

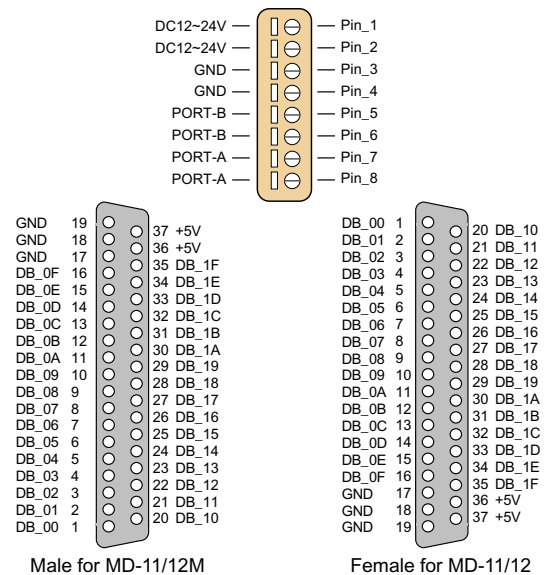
Standard	MD-11	MD-12
Available SA or RA setting values	SA [0,1] 	RA [0,1] 
	SA [2,3] 	RA [2,3] 
	SA [4,5] 	RA [4,5] 
	SA [6,7] 	RA [6,7] 
	SA [8,9] 	RA [8,9] 
	SA [10,11] 	RA [10,11] 
	SA [12,13] 	RA [12,13] 
	SA [14,15] 	RA [14,15] 

● The available address settings in each type of module

### Specifications

- Communication speed: 250K bps
- Communication distance: 400m max
- Digital input channels: 32 (MD-11, MD-11M)
- Digital output channels: 32 (MD-12, MD-12M)
- Connector type:
  - 37-pin D-sub female connector (MD-11, MD-12)
  - 37-pin D-sub male connector (MD-11M, MD-12M)
- Power requirements: 12~24V
- Wire cable: CPEV 0.9S (2P twisted-pair wire)
- Power consumption: 1.2 W
- Dimensions: 120 mm x 90 mm
- Operating temperature: -25°C ~ +75°C
- Operating humidity: 10% ~ 90% RH, non-condensing
- Storage temperature: -30°C ~ +85°C
- Storage humidity: 5% ~ 95% RH, non-condensing
- Dimensions: 76 mm x 73 mm x 15 mm

### Pin Assignment



### Ordering Information

#### Standard

- MD-11 :** Input type MagicWire for I-8000  
**MD-12 :** Output type MagicWire for I-8000  
**MD-11M :** Input type MagicWire for PC I/O card  
**MD-12M :** Output type MagicWire for PC I/O card

#### Options

- PWR-24/110:** Power adapter; 110V AC/60Hz input; 24V DC/200mA output  
**PWR-24/220F:** Power adapter; 220V AC/60Hz input; 24V DC/200mA output  
**PWR-24/230R:** Power adapter; Round type plug; 220V AC/60Hz input; 24V DC/200mA output

# MagicWire

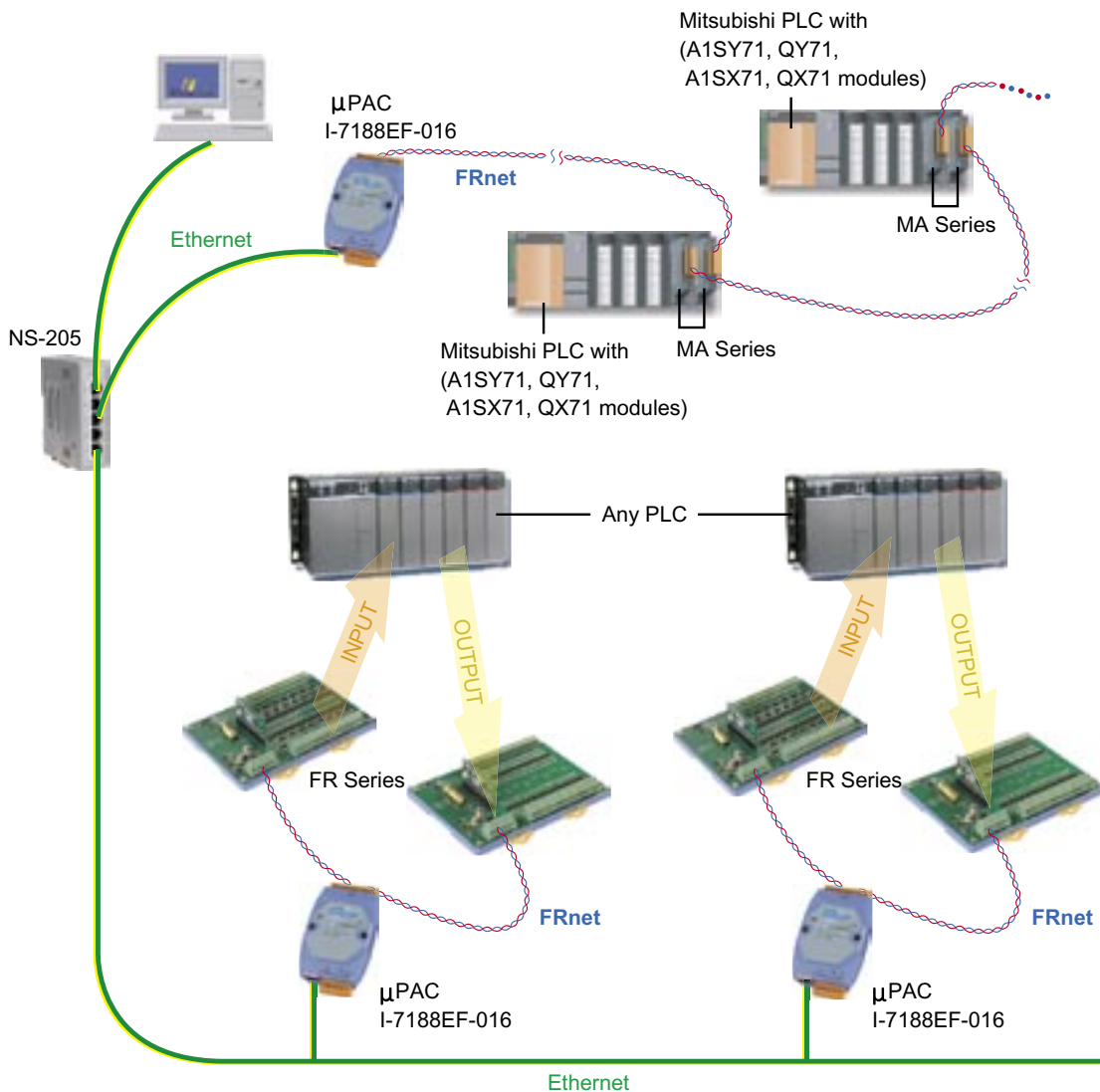
Networking an existing PLC system is not a nightmare

## Networking an existing PLC system is not a nightmare

Networking an existing PLC system is an almost impossible mission. Different machines and equipment use different PLCs and different PLC languages. Very few people really understand the entire system architecture and control programs. However, if a system engineer chooses a Magicwire series product, different PLC systems can be easily networked. The MagicWire modules convert I/O data from parallel to serial, and vice versa, so it is very easy for a PLC programmer to insert a digital I/O program into the original program.

## PAC can connect existing PLC systems to either the Internet or an intranet

Using the C language, our  $\mu$ PAC, I-7188EF, can be used as a gateway for connecting various PLCs to a PC. The I-7188EF is a  $\mu$ PAC (Micro Programmable Automation Controller) that offers high reliability, PC-compatibility, and compactness at a reasonable price. It has one Ethernet port, one RS-232 port, one RS-485 port, and one FRnet port.



# MagicWire

MA series MagicWire can be used for long-distance I/O extension of Mitsubishi compatible PLC systems



## Only one FRnet host-controller is required in an FRnet network

The FRnet network only requires a single host-controller to send a token that activates all FRnet I/O modules. Two host controllers cannot be used in the same FRnet network. The MA-11, MD-11, FRB-100/200, I-7188EF, I-8122 and some FR I/O modules can be used as FRnet host-controllers. When using an MA-11, MD-11 or FR I/O module as a host-controller, the switch or jumper should be set to the A1 position. Refer to the related user's manual or literature for detailed information. When using the FRB-2000, I-7188EF or I-8122, the switch doesn't have to be set.

## Which MA series MagicWire module to select

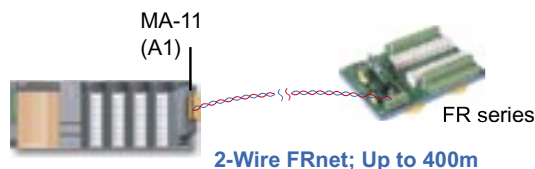
The MA-11 and MA-21 are input type modules that work with output type PLC modules. The MA-12 and MA-22 are output type modules that work with input type PLC modules.

For long-distance digital output extension applications, the user must select an MA-11 and set the jumper switch to the A1 position. The companion module can be either an MA-12 or other appropriate FR module. When the user wishes to input a remote signal, the MA-12 or other appropriate companion module should be selected. The MA-11 or some FR modules can be selected as the companion module. Of course, in accordance with the basic operating principles of FRnet, this FR module or MA-11 should be set as a host-controller.

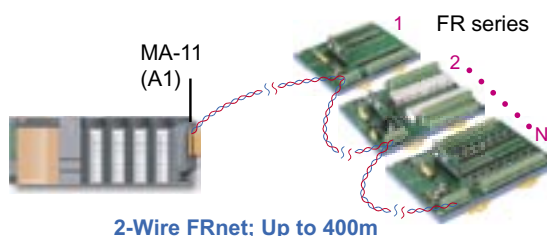
## What is the difference between MA-1X and MA-2X

The MA-1X covers 0-7 low-group I/O areas, while the MA-2X covers 8-15 high-group I/O areas. The MA-2X cannot communicate with the MA-1X in a single FRnet network. The user must choose an MA-1X to network PLCs or implement a long-distance extension system. An MA-2X and MA-12 must be selected when using the FRB-100/200, I-7188EF or I-8122 to network PLC and FR I/O modules. Refer to related user's manual and literature for more detailed information.

## 1-1 configuration Long-distance I/O extension



## 1-N configuration Long-distance I/O extension



## How to achieve 1- N configuration

Several FR output modules can be set to the same address and then modules in the same FRnet network can be connected. In this 1-N hardware configuration, the MA-11 can send the same information to all FR output modules at the same time. The 1-N configuration can be used for several output modules, but cannot be used for several input modules.

## Switch setting

Each MA series module has a two-way switch, which can be used to set 4 different node address sets.

Standard	MA-11	MA-12	MA-21	MA-22
Available SA or RA setting values	SA [0,1] A1	RA [0,1] B1	SA [8,9]	RA [8,9]
	SA [2,3] A2	RA [2,3] B2	SA [10,11]	RA [10,11]
	SA [4,5] A3	RA [4,5] B3	SA [12,13]	RA [12,13]
	SA [6,7] A4	RA [6,7] B4	SA [14,15]	RA [14,15]
● The available address settings in each type of module				

# MagicWire

MA Series MagicWire can network Mitsubishi and its compatible PLC systems

### MA series MagicWire can network Mitsubishi compatible PLC systems

Besides the long-distance I/O extension feature, the MA-1X module can network Mitsubishi compatible PLC systems. The MagicWire modules enable your PLC to talk to each other via DIO ports. Choosing appropriate MagicWire modules, the user can upgrade a non-networking controller to have the networking capability. The MA-2X alone can't be used in this kind application. They should work with a host. Since different PLCs have different connectors and pin-assignments, the user should choose appropriate FR I/O modules.

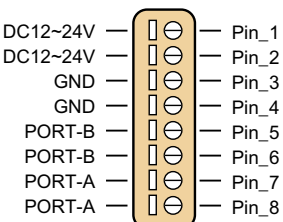
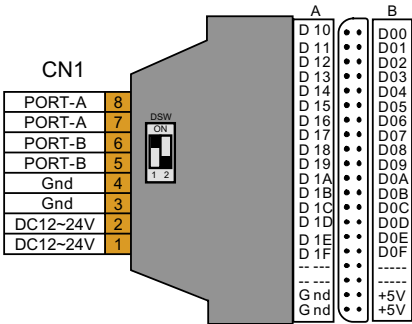
### Networking configurations

The modules with same switch settings belong to the same group. The modules of the same group can have data transmission between them. The modules of different groups can't communicate with each other. But modules of different groups can be connected to the same FRnet bus.

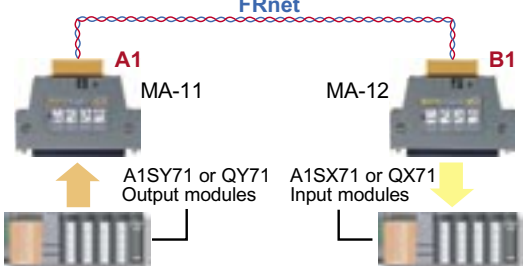
### An <---> Bn; n: Group Number

The user can use one or up to four MA-11 series modules to implement several network configurations, such as 1-1, 1-N, 2-N, 3-N, 4-N. But they should have different address setting, and address SA0 (A1) must exist in this FRnet network. Several output modules can be set to have the same address and used in one FRnet network. Refer to figures on the right-hand side.

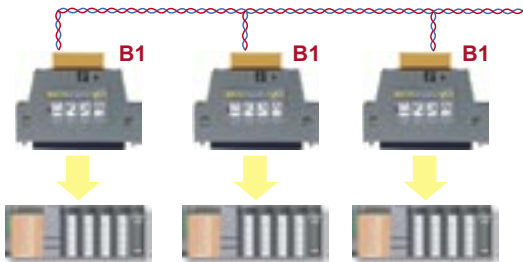
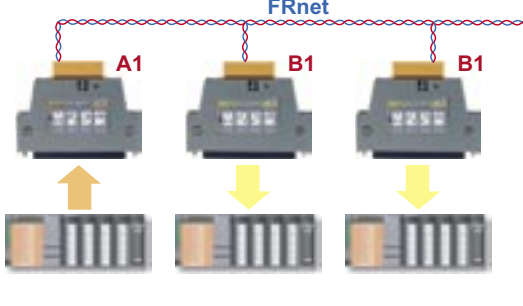
### Pin Assignment



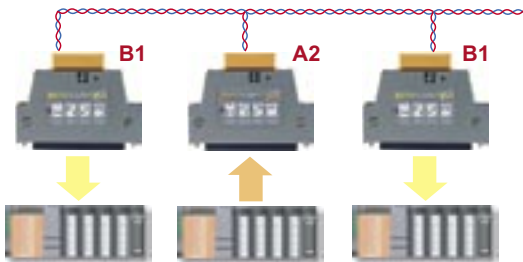
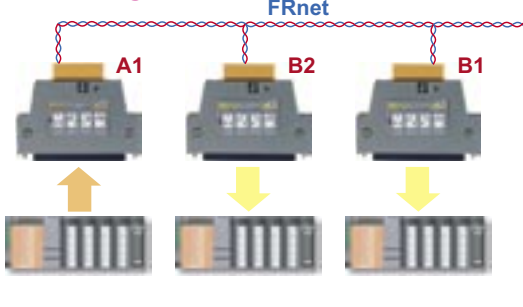
### 1-1 configuration



### 1-N configuration



### 2-N configuration

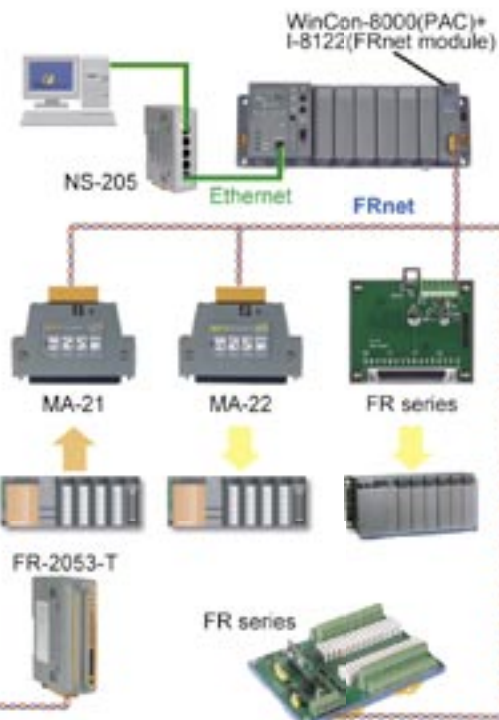
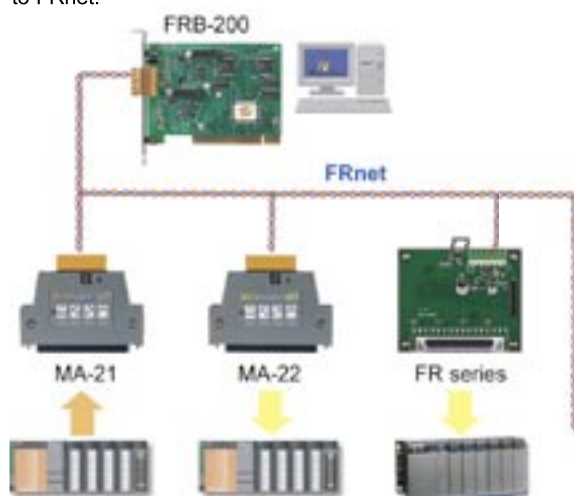


# MagicWire

## MA Series MagicWire can network PC, PAC and PLC

### MagicWire can network PC, PAC, PLC

MagicWire not only can network PLC, but also can network PLC systems to a PC or a PAC. Refer to following figures. In these network configurations, every system needs FRB-100/200 or I-7188EF or I-8122 module as the host controller. The FRB-100/200, I-7188EF and I-8122 must choose MA-12, MA-2X or other appropriate FR I/O modules to network PLC and FR I/O modules. Refer to the user's manual and literature related to FRnet.



### Specifications

- Communication speed: 250K bps
- Communication distance: 400m max
- Digital input channels: 32 ( MA-11, MA-21)  
Input voltage level:  $V_{IL}=1.5V$ ;  $V_{IH}=3.5V$
- Digital output channels: 32 (MA-12, MA-22)  
Output voltage level:  $V_{OL}=0.4V$ ;  $V_{OH}=3.5V$
- Connector: Fuji 40-pin connector (FCN-364J040-AU)
- Power requirement: 12~24V
- Wire cable: CPEV 0.9S (2P twisted-pair wire)
- Power consumption: 1.2W
- Operating temperature:  $-25^{\circ}C \sim +75^{\circ}C$
- Operating humidity: 10% ~ 90% RH, non-condensing
- Storage temperature:  $-30^{\circ}C \sim +85^{\circ}C$
- Storage humidity: 5% ~ 95% RH, non-condensing
- Dimensions: 73 mm x 56 mm x 14 mm

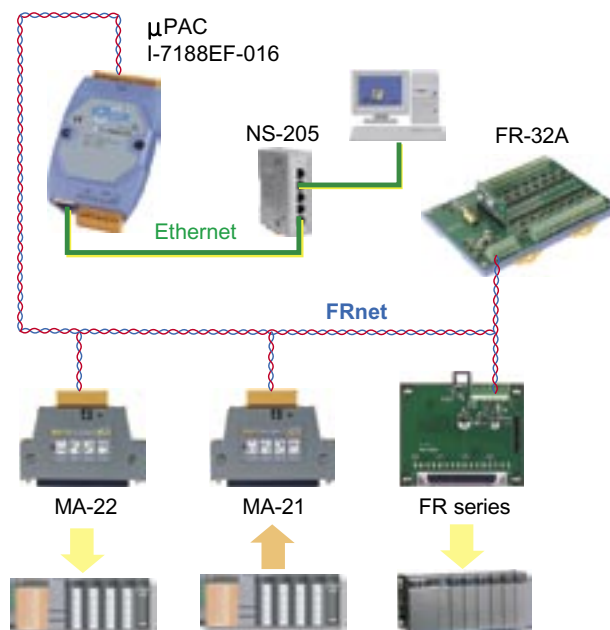
### Ordering Information

#### Standard

- MA-11 : Input type MagicWire for PLC  
 MA-12 : Output type MagicWire for PLC  
 MA-21 : Input type MagicWire for PLC  
 MA-22 : Output type MagicWire for PLC

#### Options

- PWR-24/110: Power adapter; 110VAC/60Hz input; 24VDC/200mA output  
 PWR-24/220F: Power adapter; 220VAC/60Hz input; 24VDC/200mA output  
 PWR-24/230R: Power adapter; Round type plug; 220VAC/60Hz input; 24VDC/200mA output



# FR I/O module Selection Guide

Model	FR-8/16/32P	FR-8/16/32C	FR-8/16/32A	FR-8/16/32R	FR-8/16POR	FR-8/16SSRA	FR-8/16SSRD
Digital Input Channel Number	<ul style="list-style-type: none"> <li>■ 8/16/32</li> <li>■ Input voltage: 3.5V ~30V</li> <li>■ Input Impedance: 3K; 1/4W</li> <li>■ Response time: 1 KHz; max</li> </ul>	-	-	-	-	-	-
Digital Output Channel Number	-	<ul style="list-style-type: none"> <li>■ 8/16/32:</li> <li>■ Current sink</li> <li>■ 100mA/channel</li> <li>External</li> <li>■ power supply :30V</li> <li>■ Response time : 1 KHz</li> </ul>	<ul style="list-style-type: none"> <li>■ 8/16/32:</li> <li>■ Current source</li> <li>■ Operating voltage: 12-45 V</li> <li>■ Current source: 650mA/channel</li> <li>■ Short-circuit protection</li> <li>*Overload protection</li> <li>*Overvoltage protection</li> </ul>	<ul style="list-style-type: none"> <li>■ 8/16/32 Relay</li> <li>■ Nominal load: 3A/125Vdc; 3A/270Vac</li> <li>■ Switching current :5A max</li> <li>■ Mechanical life: 20,000,000 ops.</li> <li>■ Release time: 5ms</li> </ul>	<ul style="list-style-type: none"> <li>■ 8/16 channels</li> <li>Photo-MOS relay Form A</li> <li>■ Turn-on time: 0.7 ms</li> <li>■ Turn-off time: 0.05 ms</li> <li>■ Output on resistance: 23 Ω</li> <li>■ Load voltage: 350V (peak AC)</li> <li>■ Continuous load current :0.13A</li> </ul>	<ul style="list-style-type: none"> <li>■ 8/16 channels</li> <li>SSR AC-type Relay Form A</li> <li>■ "OFF-state" leakage current : 50 mA max</li> <li>■ Surge current: 50A</li> <li>■ Load Voltage: 50-250 VAC</li> <li>■ Load current : 4A max</li> </ul>	<ul style="list-style-type: none"> <li>■ 8/16 channels</li> <li>SSR DC-type Relay Form A</li> <li>■ "OFF-state" leakage current : 1.0 μA max</li> <li>■ Surge current: 50A</li> <li>■ Load Voltage: 3-50 VDC</li> <li>■ Load current : 2A max</li> </ul>
Input Isolation	3750V DC	-	-	-	-	-	-
Output Isolation	-	3750V DC	3750V DC	-	5000V (AC)	-	-
Power consumption	FR-8P 24V@25mA	FR-8C 24V@25mA	FR-8A 24V@25mA	FR-8R 24V@25mA	FR-8POR 24V@50mA	FR-8SSRA 24V@80mA	FR-8SSRD 24V@80mA
	FR-16P 24V@75mA	FR-16C 24V@75mA	FR-16A 24V@75mA	FR-16R 24V@75mA			
	FR-32P 24V@140mA	FR-32C 24V@140mA	FR-32A 24V@140mA	FR-32R 24V@240mA	FR-16POR 24V@75mA	FR-16SSRA 24V@150mA	FR-16SSRD 24V@150mA
Dimensions mm x mm	103 x 86	103 x 86	103 x 86	103 x 86	103 x 86	-	-
	147 x 76	147 x 76	147 x 76	147 x 76	147 x 76	147 x 76	147 x 76
	173 x 117	173 x 117	173 x 117	173 x 117	-	173 x 117	173 x 117
Operating temperature	-25°C ~ +75°C	-25°C ~ +75°C	-25°C ~ +75°C	-25°C ~ +75°C	-25°C ~ +75°C	-25°C ~ +75°C	-25°C ~ +75°C
Storage temperature	-30°C ~ +85°C	-30°C ~ +85°C	-30°C ~ +85°C	-30°C ~ +85°C	-30°C ~ +85°C	-30°C ~ +85°C	-30°C ~ +85°C
Operating Humidity	10 ~ 90% RH non-condensing	10 ~ 90% RH non-condensing	10 ~ 90% RH non-condensing	10 ~ 90% RH non-condensing	10 ~ 90% RH non-condensing	10 ~ 90% RH non-condensing	10 ~ 90% RH non-condensing
Storage Humidity	5 ~ 95% RH non-condensing	5 ~ 95% RH non-condensing	5 ~ 95% RH non-condensing	5 ~ 95% RH non-condensing	5 ~ 95% RH non-condensing	5 ~ 95% RH non-condensing	5 ~ 95% RH non-condensing
Power requirements	10-30V	10-30V	10-30V	12-30V	10-30V	10-30V	10-30V
Case	Y	Y	Y	Y	Y	Y	Y
Din-rail mounting	Y	Y	Y	Y	Y	Y	Y
MagicWire	Y	Y	Y	Y	Y	Y	Y
Availability	Y	Y	Y	Y	N	N	N
Page	8-19	8-20	8-21	8-22	8-25	8-25	8-25

# FR I/O module Selection Guide

Model	FR-4P4R FR-16P16R	FR-4P4C FR-16P16C	FR-4P4A FR-16P16A	FR-4P4POR	FR-4P4SSRA	FR-4P4SSRD
Digital Input Channel Number	<ul style="list-style-type: none"> <li>■ 16/4 Isolated</li> <li>■ Input voltage: 3.5V ~30V</li> <li>■ Input impedance: 3K; 1/4W</li> <li>■ Response time: 10KHz; max</li> </ul>	<ul style="list-style-type: none"> <li>■ 16/4 Isolated</li> <li>■ Input voltage: 3.5V ~30V</li> <li>■ Input impedance: 3K; 1/4W</li> <li>■ Response time: 10KHz; max</li> </ul>	<ul style="list-style-type: none"> <li>■ 16/4 Isolated</li> <li>■ Input voltage: 3.5V ~30V</li> <li>■ Input impedance: 3K; 1/4W</li> <li>■ Response time: 10KHz; max</li> </ul>	<ul style="list-style-type: none"> <li>■ 4 Isolated</li> <li>■ Input voltage: 3.5V ~30V</li> <li>■ Input impedance: 3K; 1/4W</li> <li>■ Response time: 10KHz; max</li> </ul>	<ul style="list-style-type: none"> <li>■ 4 Isolated</li> <li>■ Input voltage: 3.5V ~30V</li> <li>■ Input impedance: 3K; 1/4W</li> <li>■ Response time: 10KHz; max</li> </ul>	<ul style="list-style-type: none"> <li>■ 4 Isolated</li> <li>■ Input voltage: 3.5V ~30V</li> <li>■ Input impedance: 3K; 1/4W</li> <li>■ Response time: 10KHz; max</li> </ul>
Digital Output Channel Number	<ul style="list-style-type: none"> <li>■ 4/16 Relay</li> <li>■ Nominal load: 3A/125Vdc; 3A/270Vac Maxi.</li> <li>■ Switching current: 5A</li> <li>■ Mechanical life: 20,000,000 ops.</li> <li>■ Release time: 5ms</li> </ul>	<ul style="list-style-type: none"> <li>■ 4/16 100mA/ channel</li> <li>■ External power supply: 30V</li> <li>■ Response time: 10 KHz</li> </ul>	<ul style="list-style-type: none"> <li>■ 4/16</li> <li>■ Operating Voltage: 12 ~ 45 V</li> <li>■ Current source: 650mA / each channel</li> <li>■ Short-circuit protection</li> <li>■ Overload protection</li> </ul>	<ul style="list-style-type: none"> <li>■ 4 channels</li> <li>■ Photo Mos relay Form A</li> <li>■ Turn on time: 0.7 ms</li> <li>■ Turn off time: 0.05 ms</li> <li>■ Output on resistance: 23Ω</li> <li>■ Load voltage: 350V (peak AC)</li> <li>■ Continuous load current: 0.13A</li> </ul>	<ul style="list-style-type: none"> <li>■ 4 channels SSR</li> <li>■ AC-type Relay: Form A</li> <li>■ Maxi. : "OFF-state" Leakage current: 50 mA</li> <li>■ Surge current: 50A</li> <li>■ Load Voltage: 50-250 VAC</li> <li>■ Maxi. Load current: 4A</li> </ul>	<ul style="list-style-type: none"> <li>■ 4 channels SSR</li> <li>■ DC-type Relay: Form A</li> <li>■ Maxi. : "OFF-state" Leakage current: 1.0A</li> <li>■ Surge current: 50A</li> <li>■ Load Voltage: 3-50 VDC</li> <li>■ Maxi. Load current: 2A</li> </ul>
Input Isolation	3750V DC	3750V DC	3750V DC	3750V DC	3750V DC	3750V DC
Output Isolation	-	3750V DC	3750V DC	5000V (AC)	-	-
Power consumption	FR-4P4R 24V@25mA	FR-4P4C 24V@25mA	FR-4P4A 24V@25mA	24V@25mA	24V@50mA	24V@50mA
	FR-16P16R 24V@75mA	FR-16P16C 24V@75mA	FR-16P16A 24V@75mA			
Dimensions mm x mm	103 x 86	103 x 86	103 x 86	103 x 86	103 x 86	103 x 86
	173 x 117	173 x 117	173 x 117	-	-	-
Operating temperature	-25°C ~ +75°C	-25°C ~ +75°C	-25°C ~ +75°C	-25°C ~ +75°C	-25°C ~ +75°C	-25°C ~ +75°C
Storage temperature	-30°C ~ +85°C	-30°C ~ +85°C	-30°C ~ +85°C	-30°C ~ +85°C	-30°C ~ +85°C	-30°C ~ +85°C
Operating Humidity	10 ~ 90% RH non-condensing	10 ~ 90% RH non-condensing	10 ~ 90% RH non-condensing	10 ~ 90% RH non-condensing	10 ~ 90% RH non-condensing	10 ~ 90% RH non-condensing
Storage Humidity	5 ~ 95% RH non-condensing	5 ~ 95% RH non-condensing	5 ~ 95% RH non-condensing	5 ~ 95% RH non-condensing	5 ~ 95% RH non-condensing	5 ~ 95% RH non-condensing
Power requirements	12-30V	10-30V	10-30V	10-30V	10-30V	10-30V
Case	Y	Y	Y	Y	Y	Y
Din-rail mounting	Y	Y	Y	Y	Y	Y
MagicWire	N	N	N	N	N	N
Availability	Y	Y	Y	N	N	N
Page	8-26	8-27	8-23	8-24	8-24	8-24

# FR I/O module

## Common Features of FR I/O Module

### 2. Switch of Terminator

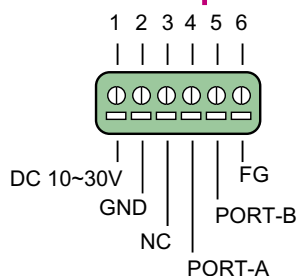
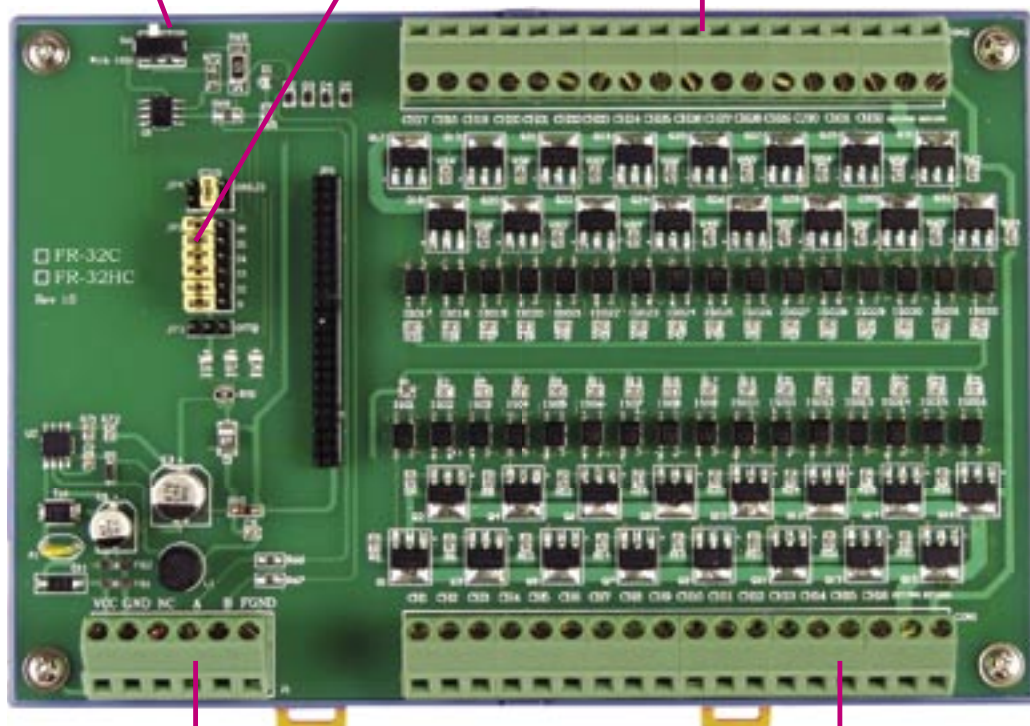
When cable is too long, the FR I/O module need a terminating resistor. The user should push the slide switch to left-hand side.

### 1. JP1, JP2

Each FR I/O module has JP1 and JP2 to select the group number (node address). Detail information of the jumper setting, refer to jumper setting of FR I/O modules.

### 5. CN3

CN3 is also the terminal block of I/O interface. It can be found in high-channel FR I/O module.



### 3. CN1

The CN1 provides a 6-pole terminal block. The Port-A and Port-B are two differential signal lines of the FRnet communication. The DC 10-30V and GND poles are for power input. The F.G. pole is designed for the frame ground.

### 4. CN2

The CN2 is the terminal block of I/O connecting interface.











### 6. DIN-rail mounting

















# FR I/O module









## Jumper Setting Of FR I/O Module

















When an FRnet I/O module is used as a MagicWire module, a host module with mode number SA0 must exist. In one FRnet network, there is one and only one host controller. The FR I/O module can have the jumper set to be SA0 a host controller. Those modules of the same group can have data transmission between them. The modules of different group can't communicate with each other. But different group modules can be connected to the same FRnet network. One FRnet input module can work with one or several FRnet output modules. But those output modules should be set to the same address number. Refer to related literatures of MagicWire MA series for detail information.









When FRnet I/O module is used as remote I/O module, the FRB-100/200 or I-7188EF or I-8122 or MA-11 can be used as the host controller. Any one of them can control FR I/O module via FRnet.



JP1	FR-32P	
Available SA setting values	SA[0/1] 	SA[8/9] 
	SA[2/3] 	SA[10/11] 
	SA[4/5] 	SA[12/13] 
	SA[6/7] 	SA[14/15] 

JP1	FR-16P/8P	
Available SA setting values	SA[0] 	SA[8] 
	SA[1] 	SA[9] 
	SA[2] 	SA[10] 
	SA[3] 	SA[11] 
	SA[4] 	SA[12] 
	SA[5] 	SA[13] 
	SA[6] 	SA[14] 
	SA[7] 	SA[15] 

JP1	FR-32A / FR-32C / FR-32R	
Available setting for RA values	RA[0/1] 	RA[8/9] 
	RA[2/3] 	RA[10/11] 
	RA[4/5] 	RA[12/13] 
	RA[6/7] 	RA[14/15] 

JP1	FR-16A/8A;FR-16C/8C;FR-8R/16R FR-16/8POR;FR-16/8SSRA/SSRD	
Available RA setting values	RA[0] 	RA[8] 
	RA[1] 	RA[9] 
	RA[2] 	RA[10] 
	RA[3] 	RA[11] 
	RA[4] 	RA[12] 
	RA[5] 	RA[13] 
	RA[6] 	RA[14] 
	RA[7] 	RA[15] 

JP1	FR-4P4R/16P16R;FR-4P4C/16P16C;FR-4P4A/16P16A FR-4P4POR;FR-4P4SSRA;FR-4PSSRD	
Available setting for SA and RA values	SA[8] RA[0] 	
	SA[9] RA[1] 	
	SA[10] RA[2] 	
	SA[11] RA[3] 	
	SA[12] RA[4] 	
	SA[13] RA[5] 	
	SA[14] RA[6] 	
	SA[15] RA[7] 	

JP2	Reset	Hold
Output state setting when communication error happens		

# FR I/O module

## Common Features

**Interface Circuit of Photo-Coupler Input**

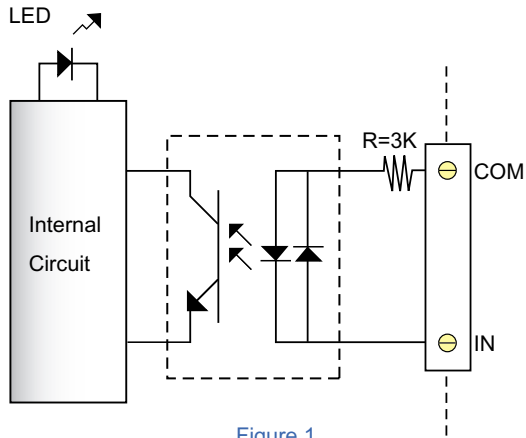


Figure 1

**Interface Circuit of the Relay**

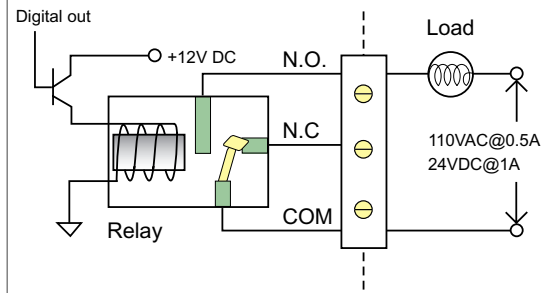


Figure 2

**Interface Circuit of Photo-MOS Relay**

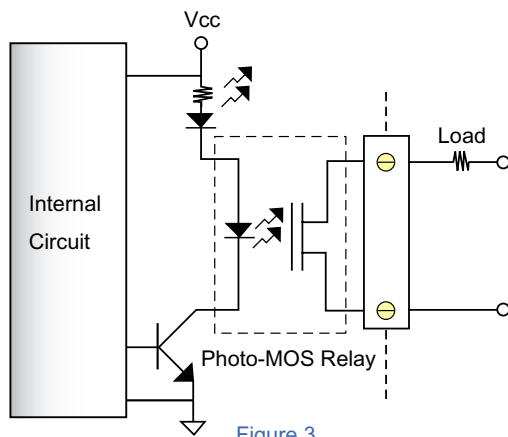


Figure 3

**Interface Circuit of SSR**

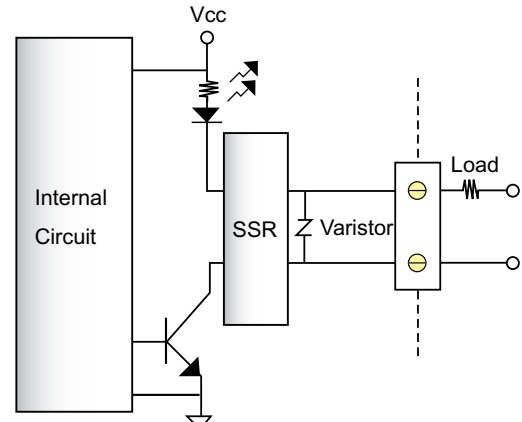


Figure 4

**Interface Circuit of Open Drain**

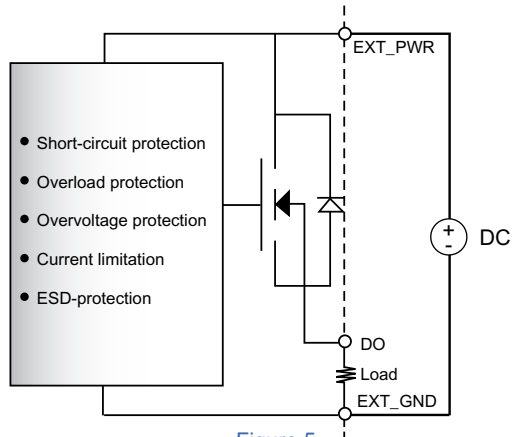


Figure 5

**Interface Circuit of Open Collector**

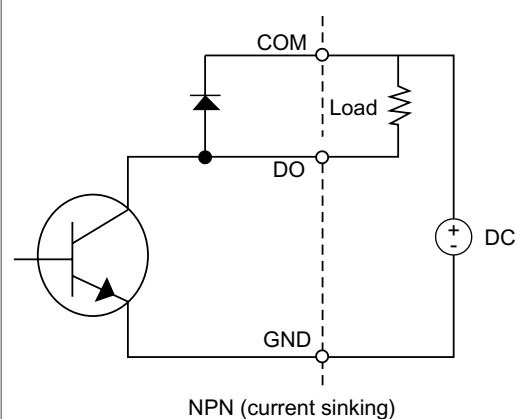


Figure 6

# FR-8/16/32P

## 8/16/32-channel Isolated Digital Input Module

FR-32P



FR-16P



FR-8P

### Features

- Built-in FRnet interface
- Real I/O synchronization
- Innovative token-stream technology
- Support Broadcasting
- Real Deterministic Control
- Fixed Scan time: 256 points @ 2.88 ms
- Each bank consists of 8 input channels and has its own ground reference
- ASIC design without CPU
- Memory-map I/O
- No protocol and no software overhead
- Easy Programming and OS-independent
- Din-rail mounting
- Two-Wire Cabling
- Jumper setting (refer to figure of 8-17)
- Interface circuit (refer to figure of 8-18)

### Functional Description

The FR-8/16/32P has 8/16/32-channel isolated digital input. Not like traditional digital I/O board, the FR series I/O module has an FRnet interface. It can be used as a distributed remote I/O module or a MagicWire module. The user should select the correct setting when using these functions. The user can daisy chain several FRnet modules together. Via FRnet, the FRnet modules can extend the remote I/O of PC, PAC,  $\mu$ PAC and PLC easily. Further information about the networking of FR-8/16/32P, refer to our I-7188EF, I-8122, FRB-100/200.

### Applications

- Factory Automation
- Building automation
- Energy management
- Agriculture automation

### Specifications

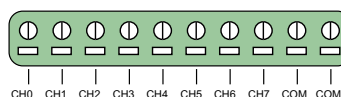
- Communication speed: 250K bps
- Communication distance: 400m max
- Number of channels: 8/16/32 ( FR-8/16/32P)
- Digital Logic Level
  - Input low voltage: 0 ~ +/-1V
  - Input high voltage: 3.5 VDC ~ 30 VDC
  - Input impedance: 3K; 1/4W
  - Response time: 1 KHz max
- Power Requirement: 10~30V
- Wire cable: CPEV 0.9S (2P Twisted-pair wire)
- Power consumption:
  - 24V@25mA(max) ( FR-8P)
  - 24V@75mA(max) ( FR-16P)
  - 24V@140mA(max) ( FR-32P)

- Operating temperature: -25°C ~ +75°C
- Operating humidity: 10% ~ 90% RH, non-condensing
- Storage temperature: -30°C ~ +85°C
- Storage humidity: 5% ~ 95% RH, non-condensing
- Dimensions: 103 mm x 86 mm ( FR-8P)  
147 mm x 76 mm (FR-16P)  
173 mm x 117 mm (FR-32P)

### Pin Assignment

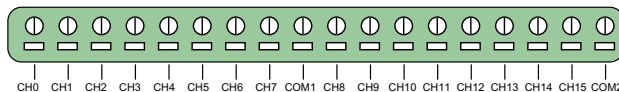
#### FR-8P

##### CN2



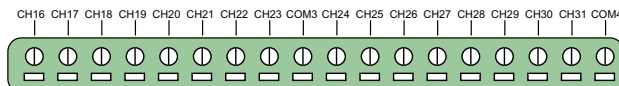
#### FR-16P/32P

##### CN2



#### FR-32P

##### CN3



### Ordering Information

#### Standard

- FR-8P:** 8-channel Digital Input Module
- FR-16P:** 16-channel Digital Input Module
- FR-32P:** 32-channel Digital Input Module

# FR-8/16/32C

## 8/16/32-Channel Open Collector Output Module

FR-32C



FR-16C



FR-8C

### Features

- Built-in FRnet interface
- Real I/O synchronization
- Innovative token-stream technology
- Support Broadcasting
- Real Deterministic Control
- Fixed Scan time: 256 points @ 2.88 ms
- Each bank consists of 8 input channels and has its own ground reference
- ASIC design without CPU
- Memory-map I/O
- No protocol and no software overhead
- Easy Programming and OS-independent
- Din-rail mounting
- Two-Wire Cabling
- Jumper setting (refer to figure of 8-17)
- Interface circuit (refer to figure of 8-18)

### Functional Description

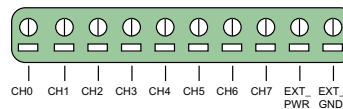
The FR-8/16/32C has 8/16/32-channel open collector output. Not like traditional digital I/O board, the FR series I/O module has an FRnet interface. It can be used as a distributed remote I/O module or a MagicWire module. The user should select the correct setting when using these modules. The user can daisy chain several FRnet modules together. Via FRnet, the FRnet modules can work with PC, PAC,  $\mu$ PAC and PLC easily. Further information about the networking of FR-8/16/32C, refer to our I-7188EF, I-8122, FRB-100/200.

- Storage humidity: 5% ~ 95% RH, non-condensing
- Dimensions: 103 mm x 86 mm ( FR-8C)  
147 mm x 76 mm (FR-16C)  
173 mm x 117 mm (FR-32C)

### Pin Assignment

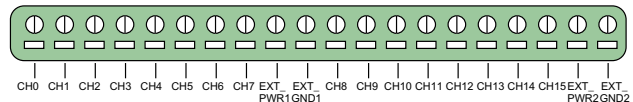
FR-8C

CN2



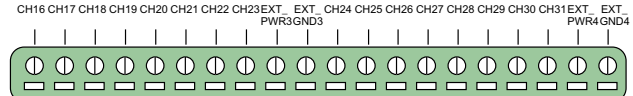
FR-16/32C

CN2



FR-32C

CN3



### Applications

- Factory Automation
- Building automation
- Energy management
- Agriculture automation

### Specifications

- Communication speed: 250K bps
- Communication distance: 400m max
- Number of channels: 8/16/32 ( FR-8/16/32C)
- Open-collector: each chanenl 30V@100mA
- Power Requirement: 10~30V
- Wire cable: CPEV 0.9S (2P Twisted-pair wire)
- Power consumption:
  - 24V@25mA(max) ( FR-8C)
  - 24V@75mA(max) ( FR-16C)
  - 24V@140mA(max) ( FR-32C)
- Operating temperature: -25°C ~ +75°C
- Operating humidity: 10% ~ 90% RH, non-condensing
- Storage temperature: -30°C ~ +85°C

### Ordering Information

#### Standard

- FR-8C:** 8-channel open collector output module
- FR-16C:** 16-channel open collector output module
- FR-32C:** 32-channel open collector output module

# FR-8/16/32A

## 8/16/32-channel open drain output module

FR-32A



FR-16A



FR-8A

### Functional Description

The FR-8/16/32A has 8/16/32-channel open drain output. Not like traditional relay output board, FR series I/O module has an FRnet interface, the FR-8/16/32A can be used as a distributed remote I/O module or a MagicWire module. The user should select the correct setting when using these modules. Refer to jumper setting. The users can daisy chain several FRnet modules together. Via FRnet, the FRnet modules can work with PC, PAC,  $\mu$ PAC and PLC easily. Further information about the networking of FR-8/16/32A; refer to our I-7188EF, I-8122, FRB-100/200.

### Applications

- Factory Automation
- Building automation
- Energy management
- Agriculture automation

### Specifications

- Communication speed: 250K bps
- Communication distance: 400m max
- Number of channels: 8/16/32 ( FR-8/16/32A)
- Operating voltage: 12 ~ 45 V
- Current source: 650mA/channel
- Short-circuit protection
- Overload protection
- Overvoltage protection
- Undervoltage shutdown with auto-restart and hysteresis
- Thermal shutdown with restart
- Current limit
- Switch inductive loads
- Power Requirement: 10~30V
- Wire cable: CPEV 0.9S (2P Twisted-pair wire)

### Features

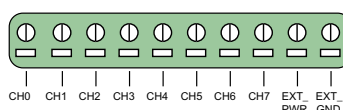
- Built-in FRnet interface
- Real I/O synchronization
- Innovative token-stream technology
- Support Broadcasting
- Real Deterministic Control
- Fixed Scan time: 256 points @ 2.88 ms
- Each bank consists of 8 input channels and has its own ground reference
- ASIC design without CPU
- Memory-map I/O
- No protocol and no software overhead
- Easy Programming and OS-independent
- Din-rail mounting
- Two-Wire Cabling
- Jumper setting (refer to figure of 8-17)
- Interface circuit (refer to figure of 8-18)

- Power consumption:
  - 24V@25mA(max) ( FR-8A)
  - 24V@75mA(max) ( FR-16A)
  - 24V@140mA(max) ( FR-32A)
- Operating temperature: -25°C ~ +75°C
- Operating humidity: 10% ~ 90% RH, non-condensing
- Storage temperature: -30°C ~ +85°C
- Storage humidity: 5% ~ 95% RH, non-condensing
- Dimensions: 103 mm x 86 mm ( FR-8A)
- 147 mm x 76 mm (FR-16A)
- 173 mm x 117 mm (FR-32A)

### Pin Assignment

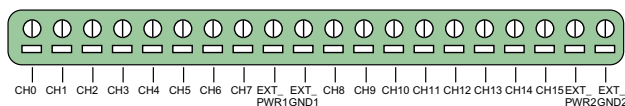
FR-8A

CN2



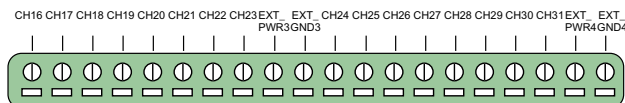
FR-16/32A

CN2



FR-32A

CN3



### Ordering Information

#### Standard

- FR-8A: 8-channel open drain output module
- FR-16A: 16-channel open drain output module
- FR-32A: 32-channel open drain output module

# FR-8/16/32R

## 8/16/32-channel Relay output module

FR-32R



FR-16R



FR-8R

### Functional Description

The FR-32R has 32-channel relay output. Not like traditional relay output board, the FR series I/O module has an FRnet interface. The FR I/O module can be used as a distributed remote I/O module or a MagicWire module. The user should select the correct setting when using these modules. Refer to jumper setting. The user can daisy several FRnet modules together. Via FRnet, the FRnet modules can work with PC, PAC,  $\mu$ PAC and PLC easily. Further information about the networking of FR-8/16/32R; refer to related literatures of I-7188EF, I-8122, FRB-100/200.

### Applications

- Factory Automation
- Building automation
- Energy management
- Agriculture automation

### Specifications

- Communication speed: 250K bps
- Communication distance: 400m max
- Number of channels: 8/16/32 (FR-8/16/32R)
- Form A relay

Type: SPST

Nominal load: 3A/125Vdc, 3A/270Vac

Max switching power: 1250VA, 150W

Max switching voltage: 125Vdc, 270Vac

Max switching current: 5A

Life expectancy: mechanical; electrical

Resistive load:

100,000 ops. min; 250Vac/30Vdc@3A

Mechanically: 20,000,000 ops. at no load.

Release time: 5ms

Control logic: TTL Low, Relay on.

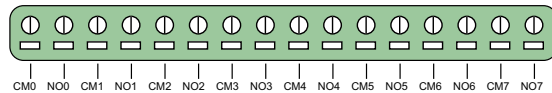
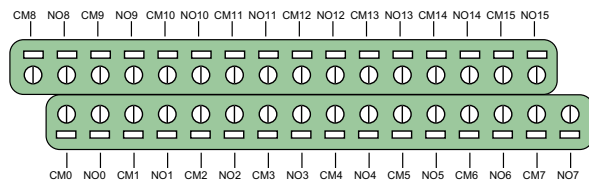
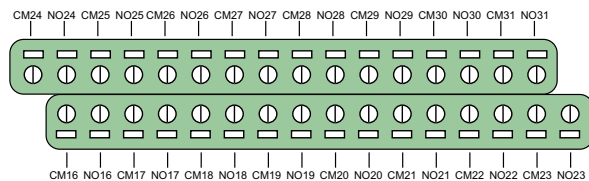
- Power Requirement: 12~30V
- Wire cable: CPEV 0.9S (2P Twisted-pair wire)
- Power consumption:
  - 24V@25mA(max) (FR-8R)
  - 24V@75mA(max) (FR-16R)
  - 24V@240mA(max) (FR-32R)

### Features

- Built-in FRnet interface
- Real I/O synchronization
- Innovative token-stream technology
- Support Broadcasting
- Real Deterministic Control
- Fixed Scan time: 256 points @ 2.88 ms
- Each bank consists of 8 input channels and has its own ground reference
- ASIC design without CPU
- Memory-map I/O
- No protocol and no software overhead
- Easy Programming and OS-independent
- Din-rail mounting
- Two-Wire Cabling
- Jumper setting (refer to figure of 8-17)
- Interface circuit (refer to figure of 8-18)

- Operating temperature: -25°C ~ +75°C
- Operating humidity: 10% ~ 90% RH, non-condensing
- Storage temperature: -30°C ~ +85°C
- Storage humidity: 5% ~ 95% RH, non-condensing
- Dimensions: 147 mm x 76 mm (FR-8R)  
173 mm x 117 mm (FR-16R)  
173 mm x 117 mm (FR-32R)

### Pin Assignment

FR-8R  
CN2FR-16/32R  
CN2FR-32R  
CN3

### Ordering Information

#### Standard

FR-8R: 8-channel Relay Output Module

FR-16R: 16-channel Relay Output Module

FR-32R: 32-channel Relay Output Module

# FR-4P4A / FR-16P16A

## 4 /16 -channel Isolated Digital Input and 4/16 Current Sourcing Output Module

FR-16P16A



FR-4P4A

### Features

- Built-in FRnet interface
- Real I/O synchronization
- Innovative token-stream technology
- Support Broadcasting
- Real Deterministic Control
- Fixed Scan time: 256 points @ 2.88 ms
- Each bank consists of 8 input channels and has its own ground reference
- ASIC design without CPU
- Memory-map I/O
- No protocol and no software overhead
- Easy Programming and OS-independent
- Din-rail mounting
- Two-Wire Cabling
- Jumper setting (refer to figure of 8-17)
- Interface circuit (refer to figure of 8-18)

### Functional Description

The FR-16P16A has 16-channel isolated digital input and 16-channel open drain, while FR-4P4A has 4-channel isolated digital input and 4-channel current sourcing output. Not like traditional digital I/O board, the FR series I/O module has an FRnet interface and can be used as a distributed remote I/O module or a MagicWire module. The users can daisy chain several FRnet modules together. Via FRnet, the FRnet module can work with PC, PAC,  $\mu$ PAC and PLC easily. Further information about the networking of FR-16P16A and FR-4P4A, refer to related literatures of I-7188EF, I-8122 and FRB-100/200.

### Applications

- Factory Automation
- Building automation
- Energy management
- Agriculture automation

### Specifications

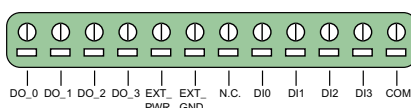
- Communication speed: 250K bps
- Communication distance: 400m max
- Number of input channels: 16 (FR-16P16A); 4 (FR-4P4A); each with its own ground reference; isolated from each other
- Digital Logic Level
  - Input low voltage: 0~ +/- 1V
  - Input high voltage: 3.5 VDC ~ 30 VDC
  - Input impedance: 3K; 1/4W
  - Response time: 1 KHz max
- Number of output channels: 16 (FR-16P16A); 4 (FR-4P4A)
  - Operating voltage: 12-45 V
  - Current source: 650mA/channel
  - Short-circuit protection
  - Current limitation
  - Overload protection
  - Undervoltage shutdown with auto-restart and hysteresis
  - Thermal shutdown with restart
  - Switch inductive loads

- Power Requirement: 10~30V
- Wire cable: CPEV 0.9S (2P Twisted-pair wire)
- Power consumption: 24V@75mA(max) (FR-16P16A)  
24V@25mA(max) (FR-4P4A)
- Operating temperature: -25°C ~ +75°C
- Operating humidity: 10% ~ 90% RH, non-condensing
- Storage temperature: -30°C ~ +85°C
- Storage humidity: 5% ~ 95% RH, non-condensing
- Dimensions: 103 mm x 86 mm (FR-4P4A)  
173 mm x 117 mm (FR-16P16A)

### Pin Assignment

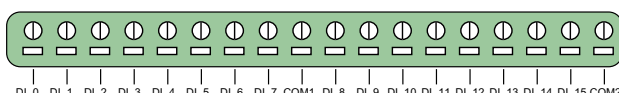
#### FR-4P4A

##### CN2

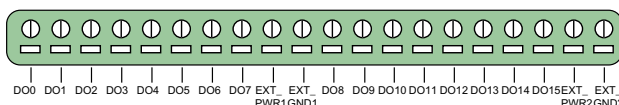


#### FR-16P16A

##### 16P CN2



##### 16A CN3



### Ordering Information

#### Standard

**FR-4P4A:** 4-channel Digital Input and 4-channel Open Drain Output Module

**FR-16P16A:** 16-channel Digital Input and 16-channel Open Drain Output Module

## FR I/O module

### FR-4P4POR

4-channel Isolated Digital Input and 4-channel Photo-MOS Relay output Module

### FR-4P4SSRA / FR-4P4SSRD

4-channel Isolated Digital Input and 4-channel Solid State Relay output Module

FR-4P4POR



FR-4P4SSRA



FR-4P4SSRD

### Features

- Built-in FRnet interface
- Real I/O synchronization
- Innovative token-stream technology
- Support Broadcasting
- Real Deterministic Control
- Fixed Scan time: 256 points @ 2.88 ms
- Each bank consists of 8 input channels and has its own ground reference
- ASIC design without CPU
- Memory-map I/O
- No protocol and no software overhead
- Easy Programming and OS-independent
- Din-rail mounting
- Two-Wire Cabling
- Jumper setting (refer to figure of 8-17)
- Interface circuit (refer to figure of 8-18)

### Functional Description

All of FR-4P4POR, FR-4P4SSRA and FR-4P4SSRD have the same 4-channel isolated digital input. The FR-4P4POR has another 4 photo-MOS relays. The FR-4P4SSRA has 4 AC-type solid-state relays. The FR-4P4SSRD has 4 DC-type solid-state relays. Not like traditional digital I/O board, the FR series I/O module has an FRnet interface and can be used as a distributed remote I/O module or a MagicWire module. The users can daisy chain several FRnet modules together. Via FRnet, the FRnet modules can work with PC, PAC,  $\mu$ PAC and PLC easily. Further information about the networking of FR-4P4POR, FR-4P4SSRA and FR-4P4SSRD; refer to related literatures of I-7188EF, I-8122 and FRB-100/200.

### Applications

- Factory Automation
- Building automation
- Energy management
- Agriculture automation

### Specifications

- Communication speed: 250K bps
- Communication distance: 400m max
- Number of input channels: each with its own ground reference; isolated from each other
- Digital Logic Level
  - Input low voltage: 0~ +/- 1V
  - Input high voltage: 3.5V DC ~ 30V DC
  - Input impedance: 3K; 1/4W
  - Response time: 1 KHz max
- Number of output channels: 4

#### FR-4P4POR

Photo-MOS relay; Form A  
Turn on time: 0.7 ms; Turn-off time: 0.05 ms  
Output: on resistance: 23  $\Omega$   
Load voltage: 350V (peak AC)  
Continuous load current: 0.13A Nominal load

#### FR-4P4SSRA

AC-type SSR Form A  
"OFF-state" leakage current: 50 mA max  
Surge current: 50A; Load Voltage: 50-250 VAC  
Load current: 4A max

#### FR-4P4SSRD

DC-type SSR Form A  
"OFF-state" leakage current: 1.0  $\mu$  A max  
Surge current: 50A  
Load Voltage: 3-50 VDC  
Load current: 2A max  
Control logic: TTL Low, Relay on.

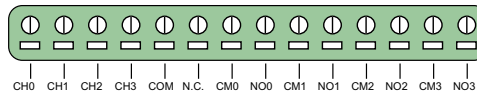
- Power Requirement: 10~30V
- Wire cable: CPEV 0.9S (2P Twisted-pair wire)
- Power consumption:
  - 24V@25mA(max) (FR-4P4POR)
  - 24V@50mA(max) (FR-4P4SSRA/SSRD)
- Operating temperature: -25°C ~ +75°C
- Operating humidity: 10% ~ 90% RH, non-condensing
- Storage temperature: -30°C ~ +85°C
- Storage humidity: 5% ~ 95% RH, non-condensing
- Dimensions: 103 mm x 86 mm

### Pin Assignment

#### FR-4P4POR

#### FR-4P4SSRA / FR-4P4SSRD

#### CN2



### Ordering Information

#### Standard

**FR-4P4POR:** 4-channel Isolated Digital Input and 4-channel Photo-MOS Relay Output Module

**FR-4P4SSRA:** 4-channel Isolated Digital Input and 4-channel AC-type Solid State Relay Output Module

**FR-4P4SSRD:** 4-channel Isolated Digital Input and 4-channel DC-type Solid State Relay Output Module

**FR-8/16 POR**

8/16 -channel Photo-MOS Relay output Module

**FR- 8/16SSRA/ SSRD**

8/16 Solid State Relay output Module

**FR-8POR****FR-8SSRA/SSRD****FR-16POR****FR-16SSRA/SSRD****Functional Description**

The FR-8/16POR has 8/16-channel photo-MOS relay output. The FR-8/16SSRA/SSRD has 8/16 solid-state relays. Not like traditional relay output board, the FR I/O module has an FRnet interface. It can be used as a distributed remote I/O module or a MagicWire module. The user should select the correct setting when using these modules. Refer to jumper setting. The user can daisy chain several FRnet modules together. Via FRnet, the FRnet modules can work with PC, PAC,  $\mu$ PAC and PLC easily. Further information about the networking of FR- 8/16POR, FR-8/16SSRA and FR-8/16SSRD; refer to related literatures of I-7188EF, I-8122, FRB-100/200.

**Applications**

- Factory Automation
- Building automation
- Energy management
- Agriculture automation

**Specifications**

- Communication speed: 250K bps
- Communication distance: 400m max
- Output:

**FR-8/16POR**

Channels: 8/16

Photo-MOS relay; Form A

Turn on time: 0.7 ms; Turn off time: 0.05 ms

Output: on resistance:  $23\ \Omega$ 

Load voltage: 350V (peak AC)

Continuous load current: 0.13A Nominal load

**FR-8/16SSRA**

Channels: 8/16

AC-type SSR Form A

"OFF-state" leakage current: 50 mA max

Surge current: 50A; Load Voltage: 50-250 VAC

Load current: 4A max

**FR-8/16SSRD**

Channels: 8/16

DC-type SSR Form A

"OFF-state" leakage current:  $1.0\ \mu\text{A}$  max

Surge current: 50A

Load Voltage: 3-50 VDC

Surge current: 50A

**Features**

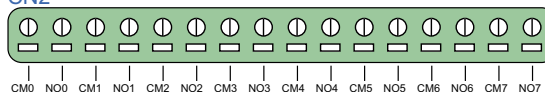
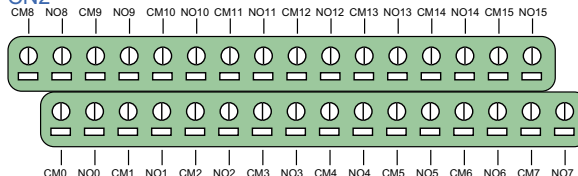
- Built-in FRnet interface
- Real I/O synchronization
- Innovative token-stream technology
- Support Broadcasting
- Real Deterministic Control
- Fixed Scan time: 256 points @ 2.88 ms
- Each bank consists of 8 input channels and has its own ground reference
- ASIC design without CPU
- Memory-map I/O
- No protocol and no software overhead
- Easy Programming and OS-independent
- Din-rail mounting
- Two-Wire Cabling
- Jumper setting (refer to figure of 8-17)
- Interface circuit (refer to figure of 8-18)

Load Voltage: 3-50 VDC

Load current: 2A max

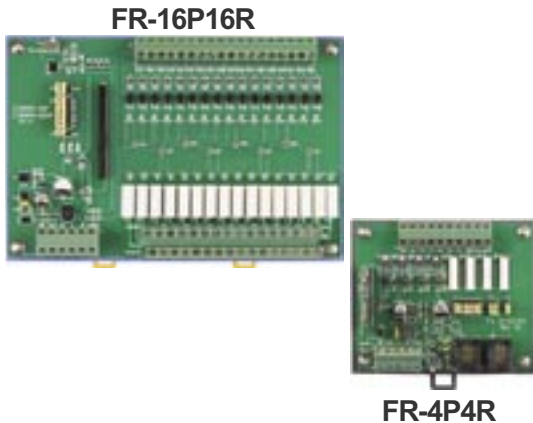
Control logic: TTL Low, Relay on.

- Power Requirement: 10~30V
- Wire cable: CPEV 0.9S (2P Twisted-pair wire)
- Power consumption:
  - 24V@50mA(max) (FR-8POR)
  - 24V@75mA(max) (FR-16POR)
  - 24V@80mA(max) (FR-8SSRA/SSRD)
  - 24V@150mA(max) (FR-16SSRA/SSRD)
- Operating temperature:  $-25^{\circ}\text{C} \sim +75^{\circ}\text{C}$
- Operating humidity: 10% ~ 90% RH, non-condensing
- Storage temperature:  $-30^{\circ}\text{C} \sim +85^{\circ}\text{C}$
- Storage humidity: 5% ~ 95% RH, non-condensing
- Dimensions:
  - 103 mm x 86 mm (FR-8POR)
  - 147 mm x 76 mm (FR-16POR, FR-8SSRA, FR-8SSRD)
  - 173 mm x 117 mm (FR-16SSRA, FR-16SSRD)

**Pin Assignment****FR-8POR/8SSRA/8SSRD****CN2****FR-16POR/16SSRA/16SSRD****CN2****Ordering Information****Standard****FR-8POR:** 8-channel photo-MOS Relay Output Module**FR-16POR:** 16-channel photo-MOS Relay Output Module**FR-8SSRA:** 8-channel AC-type Solid State Relay Output Module**FR-16SSRA:** 16-channel AC-type Solid State Relay Output Module**FR-8SSRD:** 8-channel DC-type Solid State Relay Output Module**FR-16SSRD:** 16-channel DC-type Solid State Relay Output Module

# FR-4P4R / FR-16P16R

## 4 /16-channel Isolated Digital Input and 4/16 relay output Module



### Functional Description

The FR-16P16R has 16-channel isolated digital input and 16-channel relay output, while FR-4P4R has 4-channel isolated digital input and 4-channel relay output. Not like traditional digital I/O board, the FR series I/O module has an FRnet interface and can be used as a distributed remote I/O module or a MagicWire module. The user can daisy chain several FRnet modules together. Via FRnet, the FRnet modules can work with PC, PAC,  $\mu$ PAC and PLC easily. Further information about the networking of FR-16P16R and FR-4P4R, refer to related literatures of I-7188EF, I-8122 and FRB-100/200.

### Applications

- Factory Automation
- Building automation
- Energy management
- Agriculture automation

### Specifications

- Communication speed: 250K bps
- Communication distance: 400m max
- Number of input channels: 16 (FR-16P16R); 4 (FR-4P4R); each with its own ground reference; isolated from each other
- Digital Logic Level:
  - Input low voltage: 0 ~ 1V
  - Input high voltage: 3.5 ~ 30 VDC
  - Input impedance: 3K; 1/4W
  - Response time: 1 KHz max
- Number of output channels: 16 (FR-16P16R); 4 (FR-4P4R)
  - Nominal load: 3A/125Vdc, 3A/270Vac
  - Switching power: 1250VA, 150W
  - Switching voltage: 125Vdc, 270Vac
  - Switching current: 5A
  - Life expectancy: mechanical; electrical
  - Resistive load: 100,000 ops. min; 250Vac/30Vdc@3A
  - Mechanically: 20,000,000 ops. at no load
  - Release time: 5ms
  - Control logic: TTL Low, Relay on
- Power Requirement: 12~30V
- Wire cable: CPEV 0.9S (2P Twisted-pair wire)

### Features

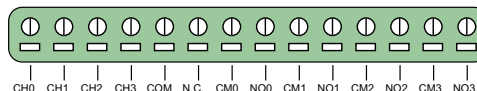
- Built-in FRnet interface
- Real I/O synchronization
- Innovative token-stream technology
- Support Broadcasting
- Real Deterministic Control
- Fixed Scan time: 256 points @ 2.88 ms
- Each bank consists of 8 input channels and has its own ground reference
- ASIC design without CPU
- Memory-map I/O
- No protocol and no software overhead
- Easy Programming and OS-independent
- Din-rail mounting
- Two-Wire Cabling
- Jumper setting (refer to figure of 8-17)
- Interface circuit (refer to figure of 8-18)

- Power consumption: 24V@75mA(max) (FR-16P16R)  
24V@25mA(max) (FR-4P4R)
- Operating temperature: -25°C ~ +75°C
- Operating humidity: 10% ~ 90% RH, non-condensing
- Storage temperature: -30°C ~ +85°C
- Storage humidity: 5% ~ 95% RH, non-condensing
- Dimensions: 103 mm x 86 mm (FR-4P4R)  
173 mm x 117 mm (FR-16P16R)

### Pin Assignment

#### FR-4P4R

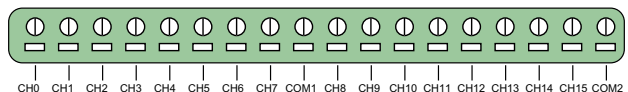
##### CN2



#### FR-16P16R

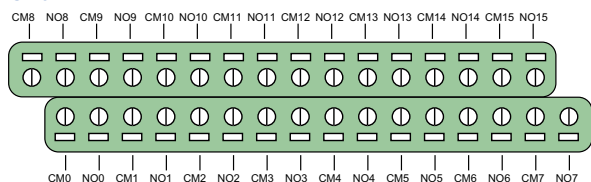
##### 16P

##### CN2



##### 16R

##### CN3



### Ordering Information

#### Standard

**FR-4P4R:** 4-channel Digital Input and 4-channel Relay Output Module

**FR-16P16R:** 16-channel Digital Input and 16-channel Relay Output Module

# FR-4P4C / FR-16P16C

4 /16 -channel Isolated Digital Input and 4/16 Open Collector Output Module

FR-16P16C



FR-4P4C

## Features

- Built-in FRnet interface
- Real I/O synchronization
- Innovative token-stream technology
- Support Broadcasting
- Real Deterministic Control
- Fixed Scan time: 256 points @ 2.88 ms
- Each bank consists of 8 input channels and has its own ground reference
- ASIC design without CPU
- Memory-map I/O
- No protocol and no software overhead
- Easy Programming and OS-independent
- Din-rail mounting
- Two-Wire Cabling
- Jumper setting (refer to figure of 8-17)
- Interface circuit (refer to figure of 8-18)

## Functional Description

The FR-16P16R has 16-channel isolated digital input and 16-channel relay output, while FR-4P4R has 4-channel isolated digital input and 4-channel relay output. Not like traditional digital I/O board, the FR series I/O module has an FRnet interface and can be used as a distributed remote I/O module or a MagicWire module. The user can daisy chain several FRnet modules together. Via FRnet, the FRnet modules can work with PC, PAC,  $\mu$ PAC and PLC easily. Further information about the networking of FR-16P16R and FR-4P4R, refer to related literatures of I-7188EF, I-8122 and FRB-100/200.

## Applications

- Factory Automation
- Building automation
- Energy management
- Agriculture automation

## Specifications

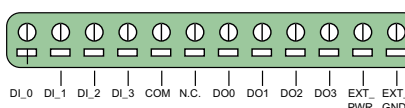
- Communication speed: 250K bps
- Communication distance: 400m max
- Number of input channels: 16 (FR-16P16C); 4 (FR-4P4C); each with its own ground reference; isolated from each other
- Digital Logic Level:
  - Input low voltage: 0 ~ 1V
  - Input high voltage: 3.5 ~ 30 V DC
  - Input impedance: 3K; 1/4W
  - Response time: 1 KHz max
- Number of output channels: 16 (FR-16P16C); 4 (FR-4P4C)
  - Type: Isolated open collector:
  - 30V@100 mA per cahnnel
  - External supply voltage: 30V max
  - Response time: 10 KHz max
  - Power requirement: 5V /600mA (typical)

- Power Requirement: 10~30V
- Wire cable: CPEV 0.9S (2P Twisted-pair wire)
- Power consumption:
  - 24V@75mA(max) (FR-16P16C)
  - 24V@25mA(max) (FR-4P4C)
- Operating temperature: -25°C ~ +75°C
- Operating humidity: 10% ~ 90% RH, non-condensing
- Storage temperature: -30°C ~ +85°C
- Storage humidity: 5% ~ 95% RH, non-condensing
- Dimensions: 103 mm x 86 mm (FR-4P4C)
- 173 mm x 117 mm (FR-16P16C)

## Pin Assignment

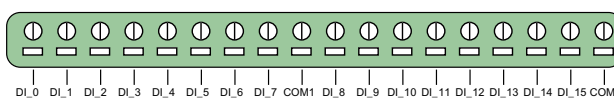
### FR-4P4C

#### CN2

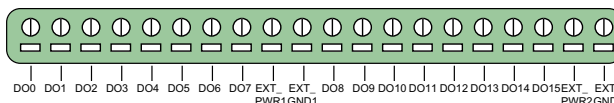


### FR-16P16C

#### CN2



#### CN3



## Ordering Information

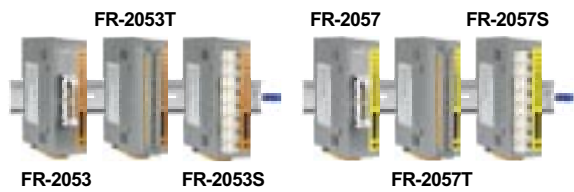
### Standard

**FR-4P4C:** 4-channel Digital Input and 4-channel Open Collector Output Module

**FR-16P16C:** 16-channel Digital Input and 16-channel Open Collector Output Module

FRnet Distributed I/O Modules

**FR-2053/2053T/2053S**  
Distributed I/O module with 16-points isolated digital input  
**FR-2057/2057T/2057S**  
Distributed I/O module with 16-points isolated digital output



Functional Description

The FR-2053/2053T/2053S has 16-channel isolated photo-coupler input, while the FR-2057/2057T/2057S has 16-channel isolated photo-coupler output. The default signal connector of FR-2053 and FR-2057 is a 20-pin header. The "T" stands for screw terminal connector and the "S" stands for 3-pin shroud connector. Each 3-pin connector has one Vcc pin, one ground and one signal pin. According to different applications, the users can choose suitable modules. The FR-2000 I/O module has an FRnet interface. The users can daisy chain several FR-2000 modules together. Via FRnet, the FR-2000 modules can extend the remote I/O control of PC, PAC,  $\mu$ PAC and PLC easily. Further information about the networking of FR-2053/2057; refer to literature related to I-7188EF, I-8122, FRB-100/200.

Applications

- Industrial Automation
- Remote I/O control
- Wire-saving application
- Signal transmitter

Specifications

- 2-wire cabling: CPEV 0.9S (2P twisted-pair cable), When different cables are used, the transmission distance may change.
- Power consumption: 2.0 W max
- Operating temperature: -25°C ~ +75°C
- Operating humidity: 10% ~ 90% RH, non-ondensing
- Storage temperature: -30°C ~ +85°C

Features

- Built-in Wire-saving FRnet DI/DO control
- High-speed transmission reliability
- Simple synchronization mechanism
- No software overhead and no protocol processing
- Supporting broadcasting (1:n data transmission)
- Duplicating output easily
- Fixed I/O scan-time and I/O synchronization
- DIN-Rail mountable

- Storage humidity: 5% ~ 95% RH, non-condensing
- Weight: approximately 120g
- Dimensions: 99 mm x 32 mm x 83 mm

For FR-2053, FR-2053T, FR-2053S

- Input points: 16 points
- Input current: less than 6mA/channel
- Input impedance: approximately 4.1K $\Omega$
- Digital Level 0: 3V max
- Digital Level 1: 24 +/-10%
- On delay time: less than 1.0ms
- Off delay time: less than 1.0ms

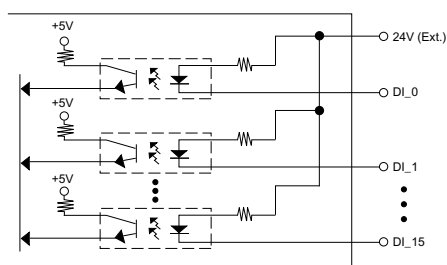
For FR-2057, FR-2057T, FR-2057S

- Output method: Isolated type NPN transistor open collector
- Output points: 16 points
- Output current: less than 30V@100mA/channel
- Load voltage: 24V max
- Turn-on delay time: less than 1.0ms
- Turn-off delay time: less than 1.5ms
- Transmission:

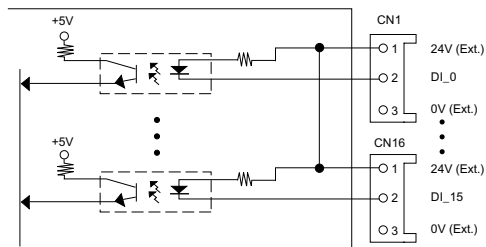
	FR-2053, FR-2053T, FR-2053S
	FR-2057, FR-2057T, FR-2057S
Transfer speed	250Kbps
Cyclic scan time	2.88ms
Transfer distance	max 400m

Interface circuits

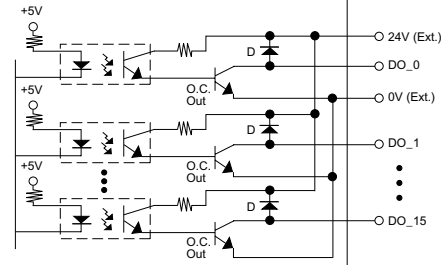
FR-2053 / 2053T



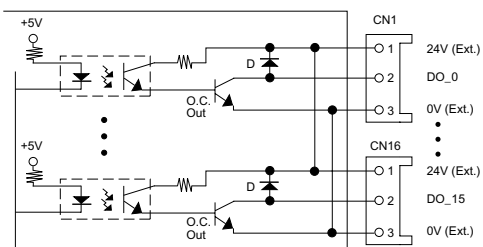
FR-2053S



FR-2057 / 2057T

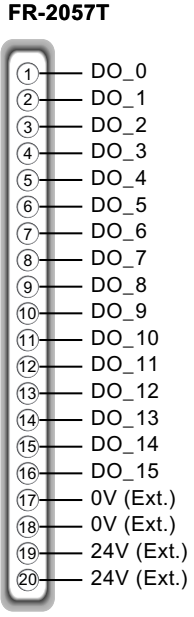
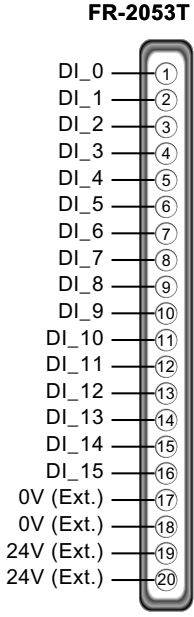
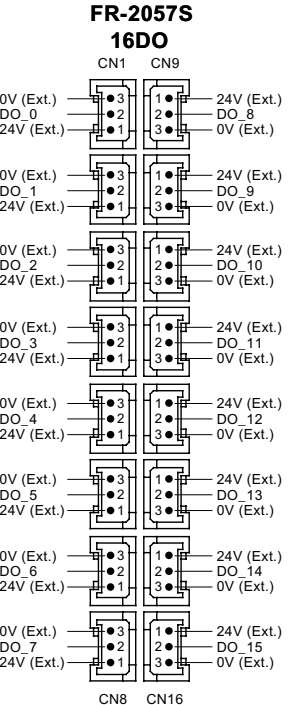
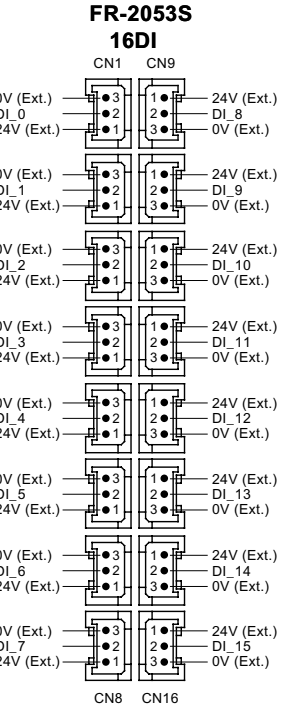
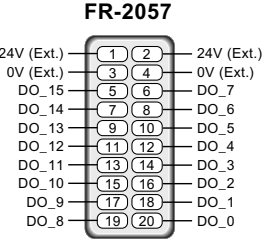
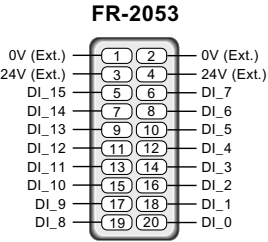


FR-2057S

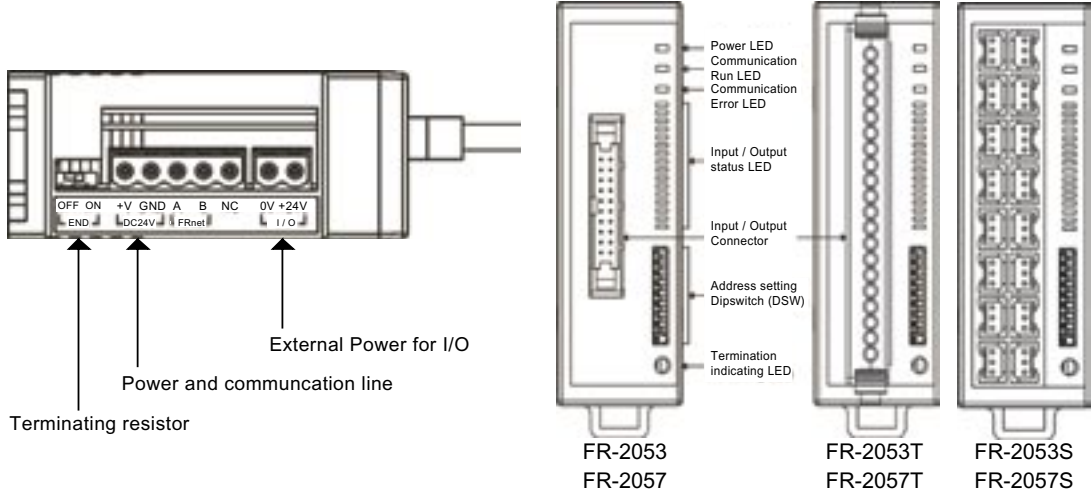


**FR-2053/2053T/2053S**  
Distributed I/O module with 16-points isolated digital input  
**FR-2057/2057T/2057S**  
Distributed I/O module with 16-points isolated digital output

## Pin Assignment



## FR-2053 / 2057 Block Diagram



# FRnet Distributed I/O Modules

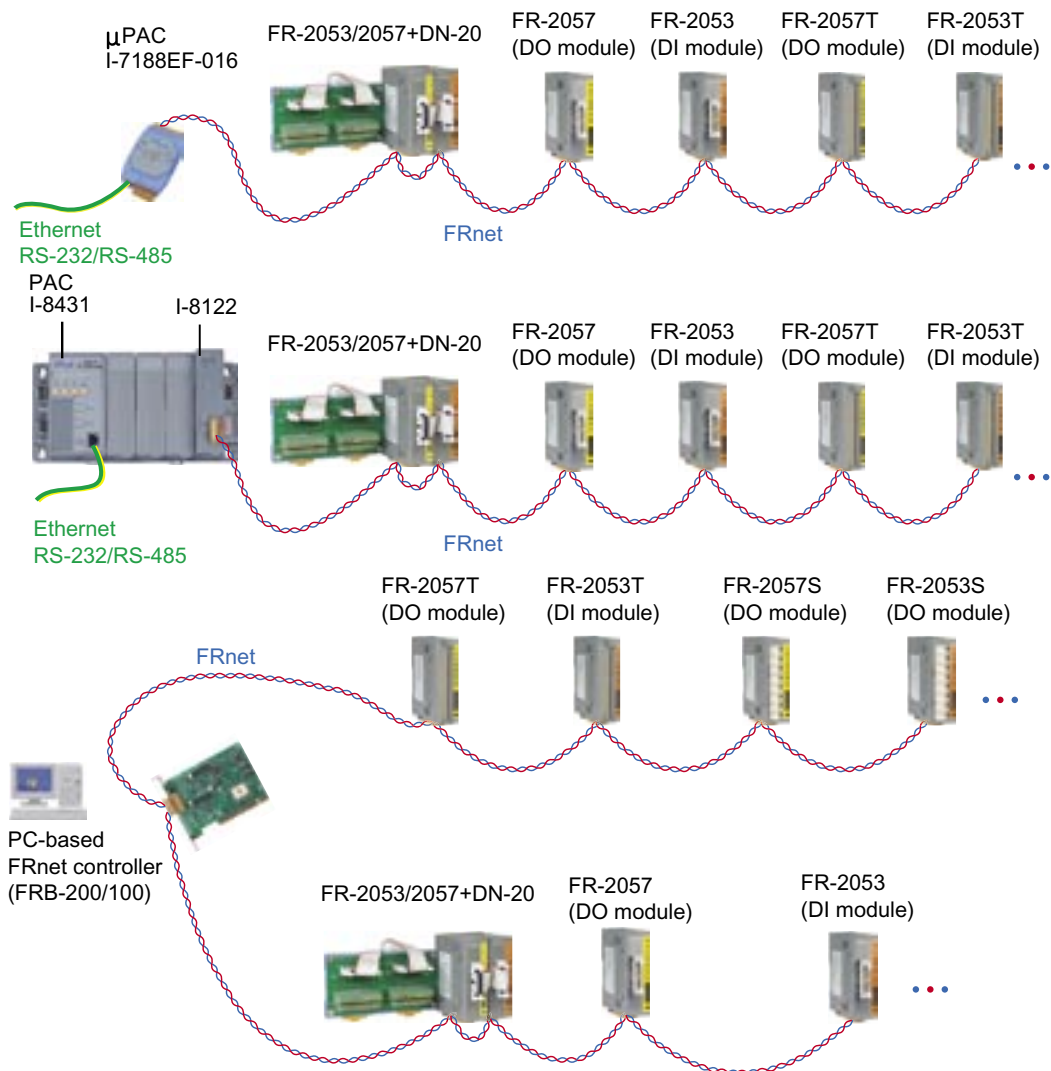
## FR-2053/2053T/2053S

Distributed I/O module with 16-points isolated digital input

## FR-2057/2057T/2057S

Distributed I/O module with 16-points isolated digital output

### FR-2053 / 2057 Applications



### Ordering Information

#### Standard

- FR-2053T:** 16-channel isolated digital input module with 20-pin screw terminal connector
- FR-2057T:** 16-channel isolated digital output module with 20-pin screw terminal connector
- FR-2053:** 16-channel isolated digital input with 20-pin header
- FR-2057:** 16-channel isolated digital output with 20-pin header
- FR-2053S:** 16-channel isolated digital input with 3-pin shroud connector
- FR-2057S:** 16-channel isolated digital output with 3-pin shroud connector

#### Optional

- DN-20:** DIN-rail mounting terminal board with two CA-2010 cable, 1m (Pitch:5.08 mm)
- DN-20-381:** DIN-rail mounting terminal board with two CA-2010 cable, 1m (Pitch:3.81 mm)