

FRnet Remote I/O Modules



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4.1. Overview



FRnet is an innovative industrial field bus. It uses twisted pair cable as the transmission medium. Each FRnet port can link up to 128 DI and 128 DO channels. The whole I/O status are updated at a fixed cycle time (0.72 ms or 2.88 ms) no matter how many FRnet I/O modules are connected to the FRnet network. Furthermore, the update is done by the FRnet chip, there is no need for a communication protocol. Using FRnet, the user can easily and quickly implement high-speed distributed I/O control systems.

• Applications

Building Automation, Machine Automation, Testing Equipment, etc

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FRnet Remote I/O Modules

• Features

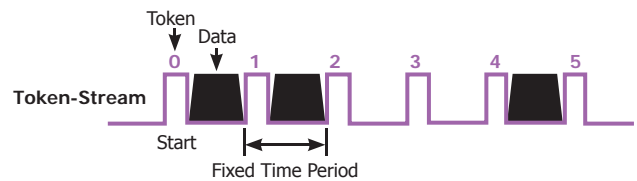
1. Token-Stream Communication

The FRnet chip uses a simple token-stream communication mechanism to provide a fast and fixed cycle time I/O-scanning capability. It doesn't need any special transmission protocol; the chip takes care of the data transfer for every device. The most significant benefits of FRnet are:

• **Fixed cycle time:**

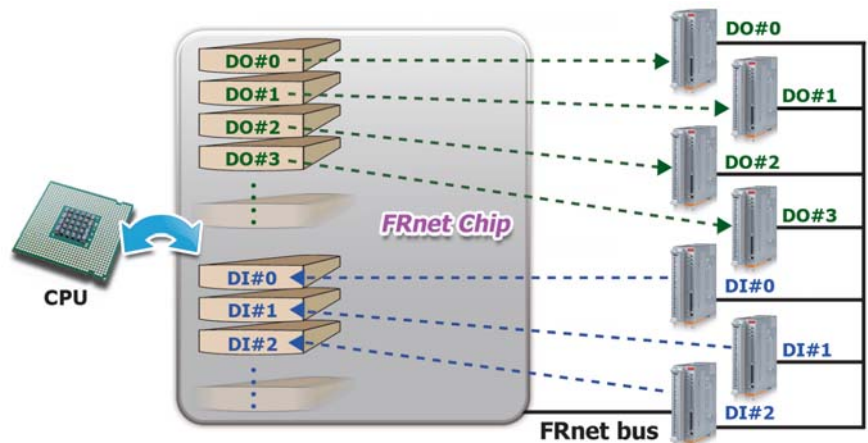
The cycle time is fixed at 2.88/0.72 ms no matter how many devices connected in the network.

	Baudrate	Max. Distance	Fixed cycle time
High Speed	1 Mbps	100 m	0.72 ms
Normal Speed	250 kbps	400 m	2.88 ms



• **Memory-Mapped I/O:**

The data transfer is automatically done by the FRnet chip. The CPU of the host (PC or PAC) doesn't need to take care of the communication protocol. All I/O status are mapped to the memory of the FRnet chip.

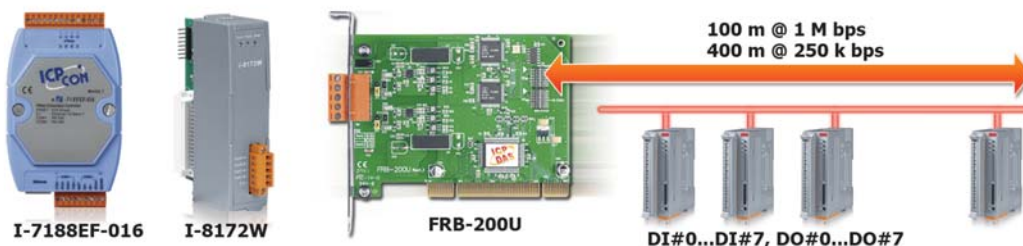


2. Multi-Drop networking

The physical connection is same as the standard RS-485 cabling to implement multi-drop networking. The maximum communication distance is up to 100/400 m at high/normal speed communication.

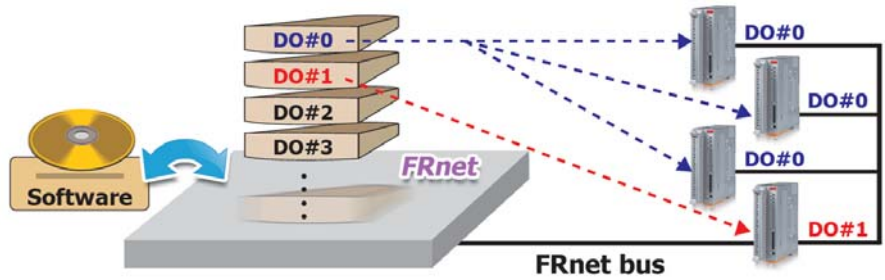
• **I/O expansion up to 128 DI and 128 DO channels**

Each FRnet chip addresses 8 DI and 8 DO groups which each group contains 16 DI or DO channels



• **DO broadcasting**

Due to the broadcasting algorithm adopted, the DO group address is not required to be unique. Therefore, it is easy to build a data delivery from one group (16-bit data) to a multi-group.



3. Easy to Diagnose



There are several LED indicators to diagnose whether FRnet I/O modules work properly. And the built-in FRnet terminator switch can be used to improve communication signal quality.

4. Easy to Configure



All basic configurations (address, speed and input/output range of AI/AO modules) are set by DIP switches. The operator can use only one screwdriver to complete the configuration.

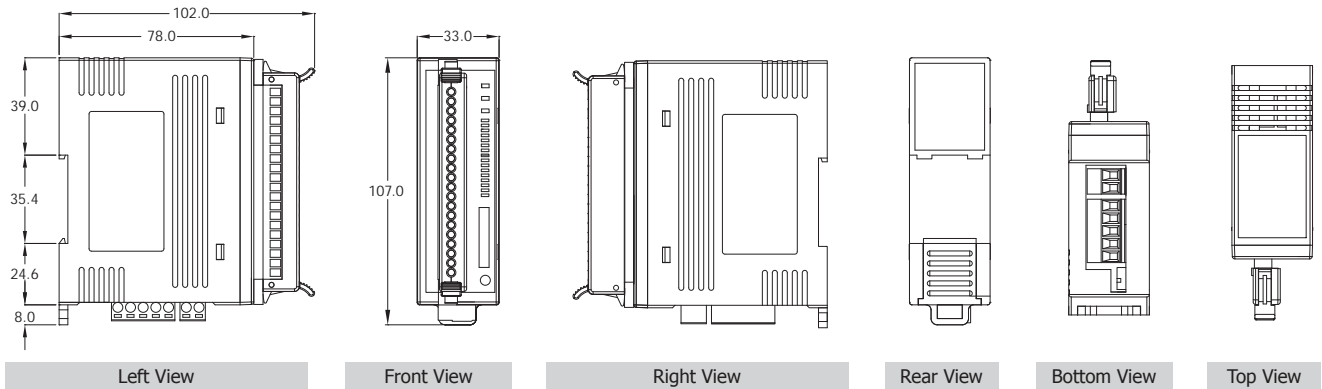
• **Hardware**

1. Installation

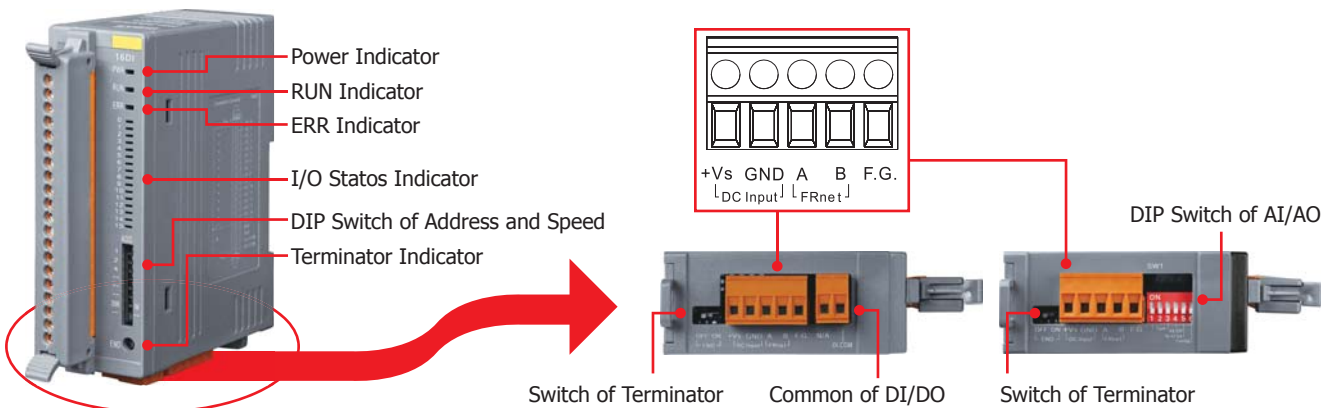


DIN-Rail Mounting

2. Dimensions (Units: mm)



3. Appearance





4.2. Selection Guide

4.2.1. Analog Input Module



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FRnet Remote I/O Modules

Analog Input Module			
Model Name		FR-2017iT	
Pictures			
Channels		1 or 8/16	
Wiring		Differential/Single-Ended	
Voltage Input Range		$\pm 150\text{ mV}$, $\pm 500\text{ mV}$, $\pm 1\text{V}$, $\pm 5\text{V}$, $\pm 10\text{V}$	
Current Input Range		$\pm 20\text{ mA}$, $0 \sim 20\text{ mA}$, $4 \sim 20\text{ mA}$; Requires optional external $125\ \Omega$ resistors	
Resolution		16-bit(1 channel) or 12-bit (8/16 channels)	
Accuracy		$\pm 0.1\%$ (1 channel) or $\pm 0.5\%$ (8/16 channel) of FSR	
Sampling Rate		10 Hz (1 channel) / 50 Hz (8/16 channels); for total channels	
Input Impedance		2 M Ω (differential), 1 M Ω (single-ended)	
Common Voltage Protection		200 Vdc	
Individual Channel Configuration		Yes (by software, requires optional CA-0904 cable)	
Overvoltage Protection		240 Vrms (differential), 150 Vrms (single-ended)	
FRnet Communication			
Normal Speed	Update time	2.88 ms	Yes
	Baud rate	250 Kbps	
	Distance	400 m Max.	
High Speed	Update time	0.72 ms	Yes (default)
	Baud rate	1 Mbps	
	Distance	100 m Max.	
LED Indicators			
Power		1 LED (Yellow)	
Communication Run		1 LED (Green)	
Communication Error		1 LED (Red)	
Terminal Resistor		1 LED (Yellow)	
Power			
Input range		$+10 \sim +30\text{ VDC}$	
Power Consumption		2.4 W	
Environment			
Operating Temperature		$-25 \sim +75^\circ\text{C}$	
Storage Temperature		$-30 \sim +85^\circ\text{C}$	
Relative Humidity		10 ~ 90 % RH (non-condensing)	
Mechanical			
Installation		DIN-Rail Mounting	
Dimensions (W x H x D)		33 mm x 107 mm x 102 mm	
Optional Accessory		CA-0904	
			
CA-0904			

4.2.2. Analog Output Module

Analog Output Module			
Model Name		FR-2024iT	
Pictures			
Channels		4	
Wiring		Bipolar/Unipolar	
Voltage Input Range		0 ~ 5V, ±5 V, 0 ~ 10 V, ±10 V	
Current Input Range		0 ~ 20 mA, 4 ~ 20 mA	
Resolution		12-bit	
Accuracy		±0.1% of FSR	
Output Capacity		Voltage: 10 Vdc @ 20 mA Current: External 24 Vdc @ 1050 Ω	
Output Slew Rate		Immediately Output (default) or 0.0625 ~ 1024 V/second (by Software) Immediate Output (default) or 0.125 ~ 2048 mA/second (by Software)	
Individual Channel Configuration		Yes (by software)	
Channel to Channel Isolation		-	
Common Voltage Protection		-	
Overvoltage Protection		±15 Vdc	
FRnet Communication			
Normal Speed	Update time	2.88 ms	Yes
	Baud rate	250 Kbps	
	Distance	400 m Max.	
High Speed	Update time	0.72 ms	Yes (default)
	Baud rate	1 Mbps	
	Distance	100 m Max.	
LED Indicators			
Power		1 LED (Yellow)	
Communication Run		1 LED (Green)	
Communication Error		1 LED (Red)	
Terminal Resistor		1 LED (Yellow)	
Power			
Input range		+10 ~ +30 Vdc	
Power Consumption		2.88 W	
Environment			
Operating Temperature		-25 ~ +75°C	
Storage Temperature		-30 ~ +85°C	
Relative Humidity		10 ~ 90 % RH (non-condensing)	
Mechanical			
Installation		DIN-Rail Mounting	
Dimensions (W x H x D)		33 mm x 107 mm x 102 mm	
Optional Accessory		CA-0904	
			
CA-0904			

4.2.3. Digital Input/Output Module

Digital Input Module														
Model Name	FR-2053IT		FR-2053TA		FR-2053HTA		FR-2054T		FR-2057IT		FR-2057TW		FR-32R	
Pictures														
Digital Input														
Channels	16				8				-		-		-	
Type	Wet				Wet				-		-		-	
Sink/Source (NPN/PNP)	Sink/Source				Sink/Source				-		-		-	
Isolation	3750 Vrms				3750 Vrms				-		-		-	
On Voltage Level	19 ~ 30 Vdc		3.5 ~ 30 Vdc		19 ~ 30 Vdc		-		-		-		-	
Off Voltage Level	11 Vdc Max.		1 Vdc Max.		11 Vdc Max.		-		-		-		-	
Input Impedance	3.25 KΩ		3 KΩ		3.25 KΩ		-		-		-		-	
Digital Output														
Channels	-				8				16		32		-	
Type	-				Open Collector				Open Collector		Power Relay (Form A, SPST)		-	
Sink/Source (PNP/NPN)	-				Sink (NPN)				Sink (NPN)		-		-	
Isolation	-				3750 Vrms				3750 Vrms		3000 Vrms		-	
Load Voltage	-				5 ~ 30 Vdc				5 ~ 30 Vdc		-		-	
Max. Load Current	-				250 mA				100 mA		250 mA		3A/125 Vdc, 3A/270 VAC	
FRnet Communication														
Normal Speed	Update time	2.88 ms		Yes	Yes	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes (default)
	Baud rate	250 Kbps												
	Distance	400 m Max.												
High Speed	Update time	0.72 ms		Yes (default)	-	Yes	Yes (default)	Yes (default)	Yes (default)	Yes (default)	Yes (default)	Yes (default)	Yes	Yes
	Baud rate	1 Mbps												
	Distance	100 m Max.												
LED Indicators														
Power					1 LED (Yellow)									
Communication Run					1 LED (Green)									
Communication Error					1 LED (Red)									
Terminal Resistor					1 LED (Yellow)									
I/O Status	16 DI LEDs (Green)				8 DO LEDs (Red) and 8 DI LEDs (Green)				16 DO LEDs (Red)		16 DO LEDs (Red)		32 DO LEDs (Red)	
Power														
Input range					+10 ~ +30 Vdc									
Power Consumption	2.4 W		2.4 W		2 W		2.4 W		2.4 W		2.4 W		3.36 W	
Environment														
Operating Temperature					-25 ~ +75°C									
Storage Temperature					-30 ~ +85°C									
Relative Humidity					10 ~ 90 % RH (non-condensing)									
Mechanical														
Installation					DIN-Rail Mounting									
Dimensions (W x H x D)					33 mm x 107 mm x 102 mm								173 mm x 177 mm	