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.

Applicatoins

Building Automation, Machine Automation, Testing Equipment, etc

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 significiant benefits of FRnet are:

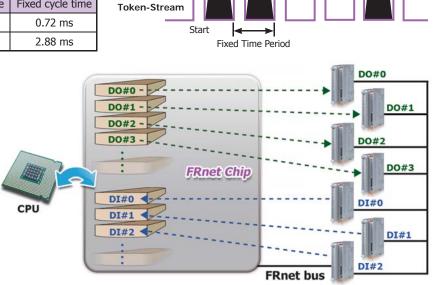
• Fixed cycle time:

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	То
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.



Token Data

0

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



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All basic configurations (address,

speed and input/output range of

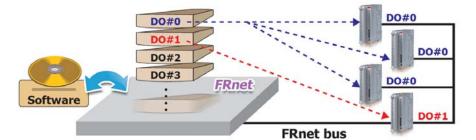
AI/AO modules) are set by DIP

switches. The operator can use only one screwdriver to complete

the configuration.

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.



4. Easy to Configure

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.

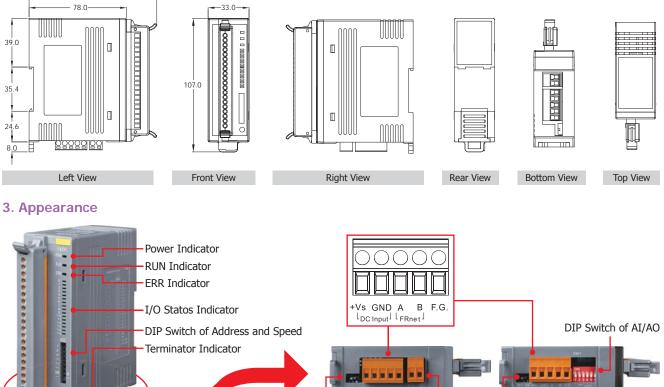
Hardware

1. Installation



DIN-Rail Mounting

2. Dimensions (Units: mm) - 102.0-



DIP Switch of Address and Speed Terminator Indicator

> Common of DI/DO Switch of Terminator



DIP Switch of AI/AO

FRnet Remote I/O Modules

Switch of Terminator



FRnet Remote I/O Modules

4.2. Selection Guide 4.2.1. Analog Input Module

Analog Input Module							
Model Name	9		FR-2017iT				
Pictures			NEW				
Channels			1 or 8/16				
Wiring			Differential/Single-Ended				
Voltage Input R			±150 mV, ± 500 mV, ± 1V, ±5 V, ±10 V				
Current Input R	ange		\pm 20 mA, 0 ~ 20 mA, 4 ~ 20 mA; Requires optional external 125 Ω resistors				
Resolution			16-bit(1 channel) or 12-bit (8/16 channels)				
Accuracy Sampling Rate			\pm 0.1% (1 channel) or \pm 0.5% (8/16 channel) of FSR 10 Hz (1 channel) / 50 Hz (8/16 channels); for total channels				
Input Impedance	· •		$2 M\Omega$ (differential), $1 M\Omega$ (sigle-ended)				
Common Voltag			2 1932 (unreferidar), 1 1932 (sigle-ended) 200 VDC				
	nel Configuration	n	Yes (by software, requires optional CA-0904 cable)				
Overvoltage Pro			240 Vrms (differential), 150 Vrms (single-ended)				
FRnet Commu							
	Update time	2.88 ms					
Normal Speed	Baud rate	250 Kbps	Yes				
	Distance	400 m Max.					
	Update time	0.72 ms					
High Speed	Baud rate	1 Mbps	Yes (default)				
	Distance	100 m Max.					
LED Indicator	s						
Power			1 LED (Yellow)				
Communication	Run		1 LED (Green)				
Communication	Error		1 LED (Red)				
Terminal Resisto	or		1 LED (Yellow)				
Power							
Input range			+10 ~ +30 VDC				
Power Consump	otion		2.4 W				
Environment							
Operating Temp			-25 ~ +75°C				
Storage Temper			-30 ~ +85°C				
Relative Humidity			10 ~ 90 % RH (non-condensing)				
Mechanical							
Installation			DIN-Rail Mounting				
Dimensions (W x H x D) Optional Accessory			33 mm x 107 mm x 102 mm CA-0904				

4-2-1

4.2.2. Analog Output Module

Model Name FR-2024IT Pictures NEW Secondary Vining Secondary Secondary Channels 9 4 Vining Bipolar/Unipolar Voltage Input Range 0 ~ 5V, 45 V, 0 ~ 10 V, 410 V Current Input Range 0 ~ 5V, 45 V, 0 ~ 10 V, 410 V Current Input Range 0 ~ 20 mA, 4 ~ 20 mA Resolution 0 ~ 20 mA, 4 ~ 20 mA Resolution 12-bit Accuracy Output Capacity Secondary Output Slew Rate Immediate Output (default) or 0.052 ~ 103 V Accord (by Software) Inmediate Configuration Yes (by software) Ontput Slew Rate Immediate Output (default) or 0.052 ~ 103 V Accord (by Software) Individual Channel Configuration Yes (by software) Common Voltage Protection - Ore voltage Protection - Ore voltage Protection - Ves (default) Yes (default) Defaunce 10 m Max. LED Indicators 10 m Max. LED Indicators - Prover 1 LED (velow) Communication Error 1 LED (velow) Communication Error 1 LED (velow) Communication Error 1 LED (velow) C				
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WiringBiplar/UnipolarVoltage Input Range0 ~ 5V, ±5 V, 0 ~ 10 V, ±10 VCurrent Input Range0 ~ 20 mA, 4 ~ 20 mAResolution0 ~ 20 mA, 4 ~ 20 mAResolution12-bitAccuracy0 Uput CapacityOutput CapacityVoltage: 10 Voc @ 20 mA Current: Extended AV Voc @ 1050 QOutput Slew RateImmediate/Output (default) or 0.052 ~ 0.024 //second (by Software)Individual Chamel ConfigurationImmediate/Output (default) or 0.012 ~ 0.024 //second (by Software)Individual Chamel IsolatorImmediate/Output (default) or 0.012 ~ 0.024 //second (by Software)Individual Chamel ConfigurationImmediate/Output (default) or 0.012 ~ 0.024 //second (by Software)Individual Chamel IsolatorImmediate/Output (default) or 0.012 ~ 0.024 //second (by Software)Commo Notage Protection-Commo Notage Protection-Commo Notage Protection-Resolution2.88 ms Bad rateIndividual Camel2.88 ms Bad rateIndividual Camel1.00 m MaxHigh Speed1.00 m MaxUpdate time0.22 ms Immediate Soft OpsBaud rate1.00 m MaxItED Indicator-Power1.1ED (Vellow)Communication Ruter-Communication Ruter-Individual Ruter-Power-Individual Ruter-Individual Ruter-Individual Ruter-Individual Ruter-Individual Ruter-Individual Ruter-				
WringUsingImage: Image:				
Voltage Input Range0 ~ SV, ±S V, 0 ~ 10 V, ±10 VCurrert Input Range0 ~ 20 mA, 4 ~ 20 mAResolution0 ~ 20 mA, 4 ~ 20 mAAccuracy±0.1% of FSROutput CapacityStateOutput Slow RateImmediately Output (default) Or 0.625 ~ 1024 V/second (by Software) Immediately Output (default) or 0.125 ~ 2048 mA/second (by Software)Output Slow RateImmediate Output (default) or 0.125 ~ 2048 mA/second (by Software)Individual Channel ConfigurationYes (by software)Channel to Channel I Solation-Corrent I Solation-Corrent Vertextor-Corrent Vertextor+ 15 VbcFreet Common Voltage250 KbpsDistance250 KbpsDistance400 m Max.High Speet0 72 msBaud rate1 MbpsDistance100 m Max.Communication Run10 m Max.Communication Run1 LED (Yellow)Communication Run1 LED (Yellow)Power1 LED (Yellow)Power-Inger Struct-Inger Struct-Inger Struct-Orderust Jernersture-Orderust Jernersture-Output Struct-Output Struct-Output Struct-Output Struct-Output Struct-Output Struct-Output Struct-Distance-Output Struct-Communication Run-Communication Run				
<table-container>Current Input Resolution0 ~ 20 mA, 4 ~ 20 mAResolutionI0 - 20 mA, 4 ~ 20 mAResolution12-bitAccuracy12-bitAccuracyVoltage:10 V/cs 20 mAOutput CapacitVice 20 mAOutput SameImmediately Output (default) or 0.0625 ~ 1024 V/second (by Software) Immediately Output (default) or 0.0625 ~ 1024 V/second (by Software) Immediate Output (default) or 0.0625 ~ 1024 V/second (by Software) Immediate Output (default) or 0.0625 ~ 1024 V/second (by Software) Immediate Output (default) or 0.0625 ~ 1024 V/second (by Software)Individual CharnelConfigurationIndividual CharnelIsobationCommon VoltesFore (by software)Common VoltesFore (by software)Common VoltesVerse (by software)Common Voltes20 MBFreetowVerseFreetow400 m MaxNormal Speet400 m MaxBaud rate2.88 msBaud rate2.90 MBIgendet0.72 msIgendet1.80 MaxOversourceVerse (befault)CommunicationVerseFreetow1.80 MaxImmediate Output Idefault1.80 MaxCommunicationImmediate VerseFreetow1.80 MaxImmediate Verse1.80 MaxImmediate Vers</table-container>				
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Accuracy ±01% of FSR Output Capacity Woltgage: 10 Voc @ 20 mA Current: External 24 Voc @ 1050 Ω Output Slew Rest Immediate Output (default) or 0.025 ~ 1024 VJsecond (by Software) Immediate Output (default) or 0.025 ~ 2048 mA/second (by Software) Individual Chanter Yes (by software) Channe to Chanter - Common Voltage Frotecore - Common Voltage Frotecore - Overvoltage Frotecore - Overvoltage Trobe 488 mS Madrate 258 MS Badrate 258 MS Distance 100 mMax Update time 0.72 mS Update Trobe - Power 10 m Max Instructure - Communicator Frote - Communicator Frote - Power - Communicator Frote - Indicate - Power - Indicate 2.88 MS Gommunicator Frote - Communicator Frote - Power - Evoromer 2.88 MS				
Output CapacityImmediately Output (default) or 0.062 > .1024 V/second (by Software) Immediately Output (default) or 0.0625 > .1024 V/second (by Software) Immediate Output (default) or 0.052 > .2048 M/second (by Software)Individual Channel to ChiguratowYes (by software)Channel to ChiguratowYes (by software)Common Voltage ProtectionCommon Voltage ProtectionOvervoltage ProtectionVervoltage ProtectionVervoltage ProtectionVervoltage ProtectionVervoltage ProtectionNormal SpeedBadar ateInformationNormal SpeedBadar ateInformationNormal SpeedBadar ateInformationNormal SpeedBadar ateInformationNormal SpeedBadar ateInformationNormal SpeedDeverInformationInformationInformationInformationInformationInformationInformationInformationInformationInformationInformationInformationInformationInformationInformationInformation <td></td>				
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IndexAdd m Max.High Speed0.72 msBad rate1 MbpsDistance10 m Max.Yes (default)CommunicationFower10 m Max.Communication1Communication1Former1Communication1Former1Communication1Former1Communication1Former1Communication1Former1Communication1Former1Communication1Former2.88 MComment2.88 MConstruction2.5 ~ +75°CStorage Temper-30 ~ +85°C				
Image Update time 0.72 ms Baud rate 1 Mbps Yes (default) Distance 100 m Max. Yes (default) LED Indicature Power 100 m Max. Opwer Forward LED (Yellow) Communication Fund 1 LED (Yellow) Communication Fund 1 LED (Yellow) Communication Fund 1 LED (Yellow) Terminal Resize 1 Colspan="2">1 Colspan="2" Power Input range				
High Speed Baud rate 1 Mbps Distance 100 m Max. LED Indication Bower Fower Communication Error				
Distance100 m Max.LED IndicatorPowerIPowerICommunicationICommunicationIFromICommunicationIFromIInput rangeIPower ConsumptorIInput rangeIPower ConsumptorIInput rangeIInput rangeIInput rangeIInput rangeIStorage TemperatureIInput rangeIInput				
LED Indicators Power 1 LED (Yellow) Communication Run 1 LED (Green) Communication Error 1 LED (Red) Terminal Resistor 0 1 LED (Yellow) Power 2.88 W Environment -25 ~ +75 °C Storage Temperature -30 ~ +85 °C				
Power1 LED (Yellow)Communication Run1 LED (Green)Communication Error1 LED (Red)Terminal Resistor1 LED (Yellow)PowerInput range-1 LED (Yellow)Power Consumption2.88 WEnvironmentOperating Temperature-25 ~ +75 °CStorage Temperature-30 ~ +85 °C				
Communication Run1 LED (Green)Communication Error1 LED (Red)Terminal Resistor1 LED (Yellow)Power1 LED (Yellow)Input range+10 ~ +30 VDCPower Consumption2.88 WEnvironment-25 ~ +75°COperating Temperature-30 ~ +85°C				
Communication Error1 LED (Red)Terminal Resistor1 LED (Yellow)Power1 LED (Yellow)Input range410 ~ +30 VpcPower Consumption2.88 WEnvironment2000 - 25 ~ +75°COperating Temperature-30 ~ +85°C				
Terminal Resistor 1 LED (Yellow) Power Input range +10 ~ +30 Vpc Power Consumption 2.88 W Environment Operating Temperature -25 ~ +75°C Storage Temperature -30 ~ +85°C				
Power Input range +10 ~ +30 VDC Power Consumption 2.88 W Environment -25 ~ +75°C Operating Temperature -30 ~ +85°C				
Input range +10 ~ +30 VDC Power Consumption 2.88 W Environment Operating Temperature -25 ~ +75 °C Storage Temperature -30 ~ +85 °C				
Power Consumption 2.88 W Environment				
Environment Operating Temperature Storage Temperature				
Operating Temperature -25 ~ +75°C Storage Temperature -30 ~ +85°C				
Storage Temperature -30 ~ +85°C				
Pelative Humidity				
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			
CA-0904				



4.2.3. Digital Input/Output Module

$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Digital Input Module										
Digital rightDigital rightDigi	Model Name			FR-2053iT	FR-2053TA	FR-2053HTA	FR-2054T	FR-2057iT	FR-2057TW	FR-32R	
168											
Npic Wet Wet	Digital Input								1	1	
<table-container>Sink/Source (NPN/PN/PP)Image: Sink/Source (NPN/PN/P)Sink/Source (NPN/PN/P)Image: Sink/Source (NPN/PN/PN/P)Image: Sink/Source (NPN/PN/PN/P)Image: Sink/Source (NPN/PN/PN/PN/P)Image: Sink/Source (NPN/PN/PN/PN/PN/P)Image: Sink/Source (NPN/PN/PN/PN/PN/PN/PN/PN/PN/PN/PN/PN/PN/</table-container>	Channels				16		8		-	-	
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<table-container>On Voltage Leve 419 % 30 Voc3.5 % 30 Voc19 % 30 Voc10 % 10 % ME10 % ME<td>Sink/Source (NF</td><td>PN/PNP)</td><td></td><td></td><td>Sink/Source</td><td></td><td>Sink/Source</td><td colspan="2">-</td><td>-</td></table-container>	Sink/Source (NF	PN/PNP)			Sink/Source		Sink/Source	-		-	
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Type-Open CollectorOpen Colle	Digital Output	t		•	•						
$\begin{tabular}{ 0 0 0 0 0 0 0 0 0 0$	Channels				-		8	1	.6	32	
	Туре				-		Open Collector	Open C	Collector	Power Relay (Form A, SPST)	
$\begin{tabular}{ $ Laad Voltage $ Interval $ Interva$	Sink/Source (PN	IP/NPN)			-		Sink (NPN)	Sink (NPN)		-	
Max. Load CurrentImage: Carrent or sector of the sector of t	Isolation				-		3750 Vrms			3000 Vrms	
<table-container>Max. Load CurrerImage: Sector of the sector of</table-container>	Load Voltage				-		5 ~ 30 VDC	5~3	0 VDC	3A/125 VDC.	
$ \begin{tabular}{ c $	Max. Load Curre	ent			-		250 mA	100 mA	250 mA		
Normal SpeedBaid rate250 Kbps 400 m Max.YesYesYesYesYes (default)YesYes (default)Yes 	FRnet Commu	inication		I					1		
$\begin{array}{ c c c } \hline \mbox{Normal Speed} & \mbox{Ide rate } & 250 \mbox{ kps} & \mbox{Normal Mom Max.} \\ \hline \mbox{Ide rate } & I$		Update time	2.88 ms		Yes	-	Yes		Yes		
Index Image: Distance Image: Update time Image: Update time <br< td=""><td>Normal Speed</td><td>Baud rate</td><td>250 Kbps</td><td>Yes</td><td rowspan="2">Yes</td></br<>	Normal Speed	Baud rate	250 Kbps	Yes				Yes			
High SpeedBaud rate1 MbpsYes (default)Y		Distance	400 m Max.								
$\begin{array}{c c c c c c } \hline \begin speed & bad rate & 1 \mbox & (default) $		Update time	0.72 ms							Yes	
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Power1 LED (Yellow)Communication Run1 LED (Green)Communication Error1 LED (Red)Terminal Resistor1 LED (Yellow)I/O Status16 DI LEDs (Green)8 Do LEDs (Red) and 8 DI LEDs (Green)16 DO LEDs (Red)32 DO LEDs (Red)Power10 creation Error10 creation Error10 creation Error32 DO LEDs (Red)Power2.4 W2.4 W2 W2.4 W3.36 WEnvironment		Distance	100 m Max.	(uelduit)							
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Communication ErrorI LED (Red)Terminal Resistor $0 = 1$ 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)PowerInput range $10 = 10 \times 30$ VDC 10×32 VD 2.4 W 3.36 WPower Consumption 2.4 W 2.4 W 2.4 W 2.4 W 3.36 WEnvironment $-25 \sim +75^{\circ}C$ $-25 \sim +75^{\circ}C$ $-30 \sim +85^{\circ}C$ Operating Temperature $0 \approx -30 \sim +85^{\circ}C$ $-30 \sim +85^{\circ}C$ Relative Humidity $10 \approx -90$ W RH (non-condensing)Mechanical				1 LED (Yellow)							
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Input range +10 ~ +30 VDC Power Consumption 2.4 W 2.4 W 2.4 W 3.36 W Environment											
Power Consumption 2.4 W 2.4 W 2.4 W 3.36 W Environment							+10 ~ +30 VDC				
Environment Operating Temperature Storage Temperature Relative Humidity Mechanical				2.4 W 2.4 W			2 W	2.4 W	2.4 W	3.36 W	
Operating Temperature -25 ~ +75°C Storage Temperature -30 ~ +85°C Relative Humidity 10 ~ 90 % RH (non-condensing) Mechanical	Environment			1	1				I		
Storage Temperature -30 ~ +85°C Relative Humidity 10 ~ 90 % RH (non-condensing) Mechanical	Operating Temp	erature		-25 ~ +75°C							
Relative Humidity 10 ~ 90 % RH (non-condensing) Mechanical	Storage Temperature										
Mechanical											
				DIN-Rail Mounting							
Dimensions (W x H x D) 33 mm x 107 mm x 102 mm 173 mm x 177 m						33 mm x 107	-			173 mm x 177 mm	