L ON W ORKS ® I/O Modules

LONWORKS® I/O modules for building automation

LONWORKS is a leading open solution for building and home automation, industrial, transportation and public utility control networks.

IDEC provides a variety of compact LONWORKS communication terminals containing SNVTs to enable cost-effective design and implementation of multi-vendor control systems.

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Terminal Block Style I/O Modules Open Networks for Building Automation Standard Network Variable Type (SNVT)

- Removable finger-safe spring-up terminal blocks protect against electric shocks and save wiring time.
- Compact housing for all modules: 75H x 132W x 48D mm
- 12 different modules designed for general purpose digital control
- I/O signals for specialized applications.
- Digital I/O module is also available for start/stop control with 8 inputs 8 outputs.
- Analog input and Pt100Ω input modules are ideal for air-conditioning temperature control.
- Pulse input module can count input pulse signals.
- Lighting control module is used for illumination control of fluorescent incandescent lamps.
- Standard configuration property type (SCPT) allows for adjusting communi-cation traffic.
- LONMARK compliant.

Illumination
- ON/OFF Control
- Area illumination

Alarm
- Fire, earthquake,gas leakage alarm

HVAC
- Start/stop heaters and air-conditioners

Security
- Sensor signal transmission

Elevator
- ON/OFF control
- Status/alarm signal transmission

Access Control
- ID card scanner data transmission

Energy Control
- Data collection of utility charges for each floor

Building Control
- Control and monitoring from a central control room
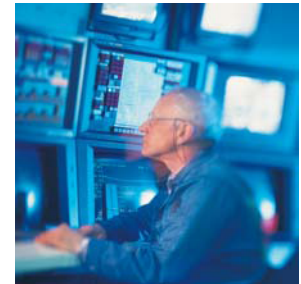
LONWORKS® is the registered trademark of Echelon Corporation.

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Spec Tech Industrial 203 Vest Ave. Valley Park, MO 63088   Phone: 888 SPECTECH
Email: sales@spectechind.com   www.spectechind.com

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Part Numbers

Module Name	Voltage	I/O	Features	Part Number
Digital Input	24V DC	16-point source/sink input	• 16 inputs, 16 outputs, or 8 in/8 out • Start/stop control module is also available with 8 inputs and 8 outputs. • Output and I/O modules contain virtual I/O functional blocks which can be used for Boolean operation (AND, OR, NOT) on bit data and for enabling/disabling output network variables.	SX5L-SBN16B1
Digital Output	24V DC	16-point transistor sink output		SX5L-SBT16K1
		16-point transistor source output		SX5L-SBT16S1
Digital I/O	24V DC	8-point transistor source input 8-point transistor sink output		SX5L-SBM16K1
		8-point transistor source input 8-point transistor sink output (start/stop control)		SX5L-SBM16K2
		8-point transistor sink input 8-point transistor source output		SX5L-SBM16S1
		8-point transistor sink input 8-point transistor source output (start/stop control)		SX5L-SBM16S2
Analog Input	24V AC/DC	4-point, 1 to 5V, 4 to 20mA	• 4 analog input channels for 1 to 5V and 4 to 20mA DC inputs • Network variable models can be changed to meet units of analog input data.	SX5L-SBAN041
Analog Output	24V AC/DC	4-point, 4 to 20mA		SX5L-SBAT04X1
Pt100Ω Input	24V AC/DC	4-point, 3-wire Pt100Ω resistance thermometer, 0 to 50°C	• 4 input channels for room temperature control (0 to +50°C) • 4 input channels for water temperature control (−20 to +80°C)	SX5L-SBPT04X1
		4-point, 3-wire Pt100Ω resistance thermometer, −20 to +80°C		SX5L-SBPT04Y1
Pulse Input	24V AC/DC	8-point pulse input	• 8 inputs for counting input pulses (minimum pulse width 50ms) • Maintains count of current values when power is interrupted. • Counter current values can be changed by input variable.	SX5L-SBCN081
Lighting Control	24V AC	8-point, remote-control relay control	• Controls 8 remote control relays for fluorescent and incandescent lamps. • Remote-control relays on existing illumination systems can also be controlled.	SX5L-SBRR081

Accessories

Name	Part Number
Terminal Block 1	SX9Z-SS1
Terminal Block 2	SX9Z-SS2
Terminal Block 3	SX9Z-SS3
Terminal Block 7	SX9Z-SS7
Terminal Block 9	SX9Z-SS9
Terminal Block 10	SX9Z-SS10
Terminal Block 11	SX9Z-SS11
Terminal Block 12	SX9Z-SS12
Terminal Block 13	SX9Z-SS13
Terminal Block 14	SX9Z-SS14
Terminal Block 16	SX9Z-SS16
DIN Rail (1m long)	BAA1000
	BNDN1000
End Stop	BNL5
Network Interface Connector [1]	SX9Z-CN23
Jumper [2] Ring	BPJ-26B
Jumper [2] Spade	BPJ-26FB

1. Supplied with two mounting screws.
2. For connecting terminals of an unused channel on analog input and Pt100Ω input modules.

Applicable Terminal Blocks/Insertion Pin Positions

SX5L Module Part Number	Terminal Block Position	Terminal Block Part No.	Insertion Pin Positions
SX5L-SBN16B1	Upper	SX9Z-SS10	B D F H
	Lower	SX9Z-SS2	A C F H
SX5L-SBT16K1 SX5L-SBT16S1	Upper	SX9Z-SS1	B C E G
	Lower	SX9Z-SS2	A D F H
SX5L-SBM16K1 SX5L-SBM16K2 SX5L-SBM16S1 SX5L-SBM16S2	Upper	SX9Z-SS1	B C F H
	Lower	SX9Z-SS3	A D E G
SX5L-SBAN041	Upper	SX9Z-SS12	A D E H
	Lower	SX9Z-SS9	B C F G
SX5L-SBPT04X1 SX5L-SBPT04Y1	Upper	SX9Z-SS13	B D E H
	Lower	SX9Z-SS14	A C F G
SX5L-SBCN081	Upper	SX9Z-SS11	A C E H
	Lower	SX9Z-SS7	B C E H
SX5L-SBRR081	Upper	SX9Z-SS11	B D F G
	Lower	SX9Z-SS7	A D F G

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Specifications

General Specifications

Models	SX5L-SBN16B1	SX5L-SBT16*1	SX5L-SBM16**	SX5L-SBAN041	SX5L-SBPT04*1	SX5L-SBCN081	SX5L-SBRR081
Voltage	24V DC			24V AC (50/60Hz) / 24V DC			24V AC (50/60Hz)
Voltage Range	21.6 to 26.4V DC (including 5% ripple)			21.6 to 26.4V AC/DC (including 5% ripple)			21.6 to 26.4V AC (including 5% ripple)
Power Consumption	1.0W (24V DC)	1.2W (24V DC)		3.0 VA (24V AC), 1.8W (24V DC)		2.0 VA (24V AC) 1.0W (24V DC)	1.8 VA (24V AC) (not including power consumption by remote-control relays)
Inrush Current	≥ 3A (24V DC)			≥ 15A (24V AC/DC)			≥ 15A (24V AC)
Allowable Momentary Power Interruption	≥ 10ms (at the rated power voltage)						
Dielectric Strength	1,000V AC, 1 minute between power and FG terminals						
Insulation Resistance	100 MΩ minimum between power and FG terminals (500V DC megger)						
Operating Temperature	0 to 55°C (no freezing)						
Operating Humidity	30 to 90% RH (non-condensing)						
Storage Temperature	−20 to +75°C (no freezing)						
Storage Humidity	30 to 90% RH (non-condensing)						
Pollution Degree	2 (IEC60664)						
Corrosion Immunity	Atmosphere free from corrosive gases						
Altitude	Operation: 0 to 2,000m, Transport: 0 to 3,000m						
Vibration Resistance	10 to 57Hz amplitude 0.075mm, 57 to 150Hz acceleration 9.8 m/s^2 (1G) 2 hours per axis on each of three mutually perpendicular axes						
Shock Resistance	294 m/s^2 (30G), 11-ms sinusoidal half-wave pulse						
Mounting	DIN rail, direct panel mounting (M4 mounting screws)						
Weight (approx.)	240g			250g			

Communication Specifications

Communication System	LON® system	
Transceiver	FTT-10A	
Connection Topology	Bus topology, free topology	
Transmission Speed	78 kbps	
Transmission Distance	Bus Topology	1,400m (when using only FTT-10A transceivers) (Level 4, 22AWG cable)
	Free Topology	500m total, 400m between nodes (Level 4, 22AWG cable)
Neuron Chip	TMPN3120FE5M (Toshiba)	

Communication Status LEDs

Name	Color	Description
PWR	Green	Remains on while power is supplied.
RUN	Green	Goes on when, after powerup, self-diagnosis has completed and application starts.
ERR	Red	Goes on when, after application has started, output network variable update failed. Goes off when output network variable is updated successfully.
RES	—	Reserved (does not go on)
SER	Yellow	Goes on when application program is not configured yet. Flashes when network information is not configured yet.

Removable Finger-safe Terminal Block

Rated Insulation Voltage	250V
Terminal Screw	M3 (on 7.62-mm centers)
No. of Poles	10 poles
Rated Thermal Current	7A
Insertion/Removal Durability	100 times

Network Interface Connector

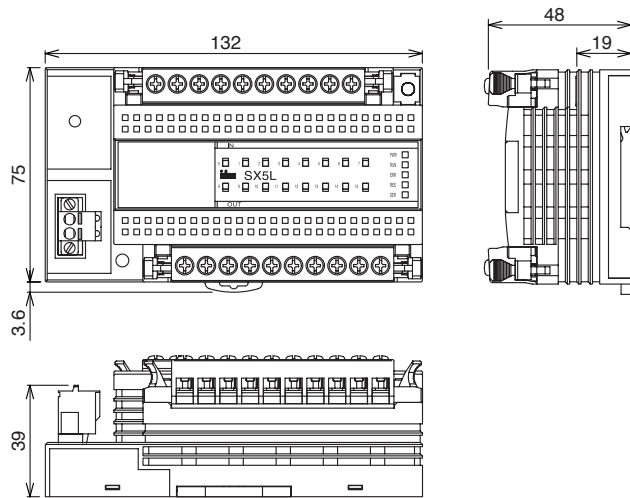|	Receptacle in Module Housing	Connector for Cable
Phoenix Contact Part Numbers	MSTBV2.5/2-GF-5.08	FKC2.5/2-STF-5.08
IDEC Part Numbers	—	SX9Z-CN23
Insertion/Removal Durability	100 times	

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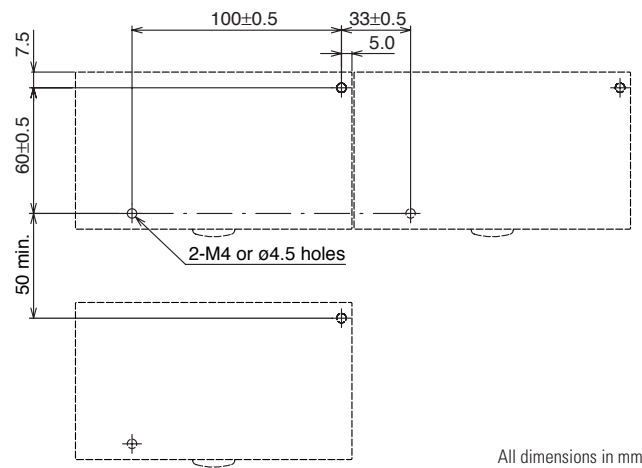Automation Software

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Dimensions

132

48

19

75

3.6

SX5L

39

Mounting Hole Layout

100±0.5   33±0.5

7.5   5.0
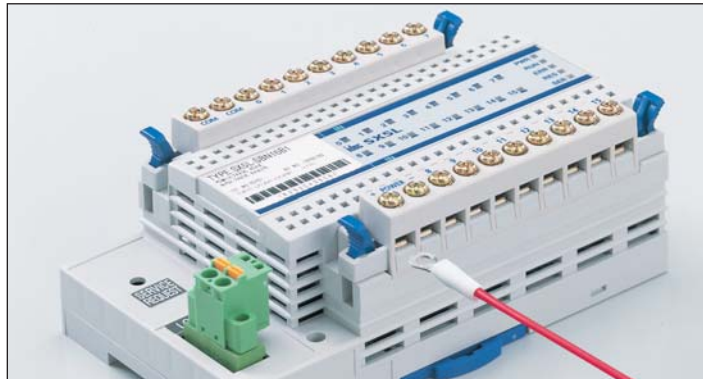
60±0.5

50 min.

2-M4 or ø4.5 holes

All dimensions in mm.

Features

Spring-up Terminals

The spring-loaded screws make installation as easy as pushing down and turn-ing with a screwdriver. Installation time is cut in half since the screws do not need to be backed out to install wiring. Screw terminals accept bare wire, ring or fork connectors.

Finger-safe Terminal Cover

After connecting wires, screw terminals are finger-safe.
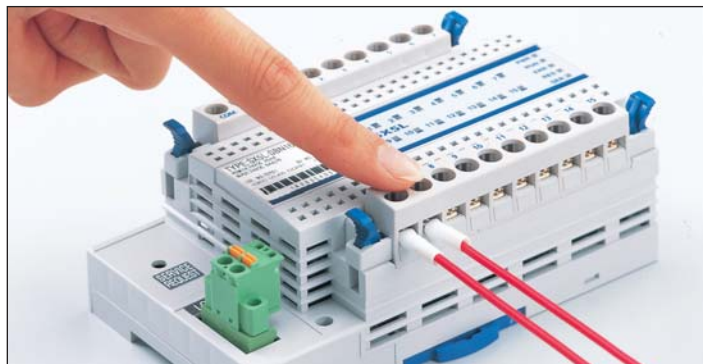
Removable Terminal Block

The terminal block can be removed simply by squeezing both latches on the top of the block inward to unlock the block from the socket. To reattach the terminal block, place the block in the socket with the latches opened and press the block until it snaps.

Wiring can be done with the terminal block removed, so installation in tight spaces is easy.
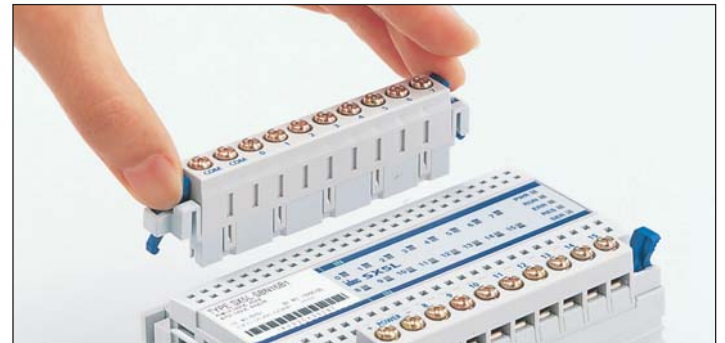
Keyed Terminal Blocks

Insertion pins are positioned on the base of the terminal block and inside the socket to prevent insertion of an incorrect terminal block into the socket. The pins are keyed to ensure correct terminal blocks and sockets, and to prevent swapping of upper and lower terminal blocks.
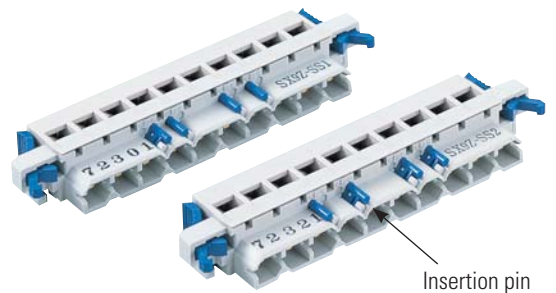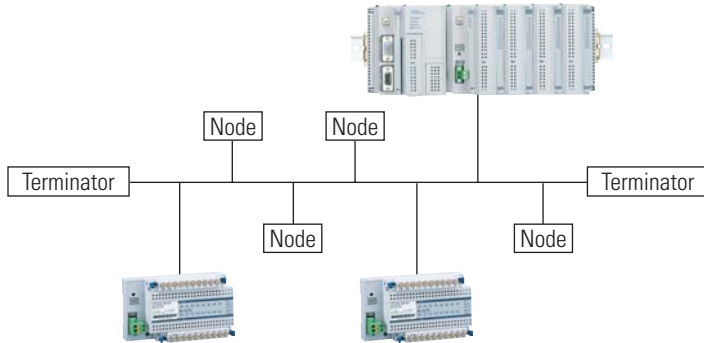
Insertion pin

System Setup Examples

Bus Topology
Nodes are connected to one trunk line. The trunk line can be extended up to 1,400 meters.
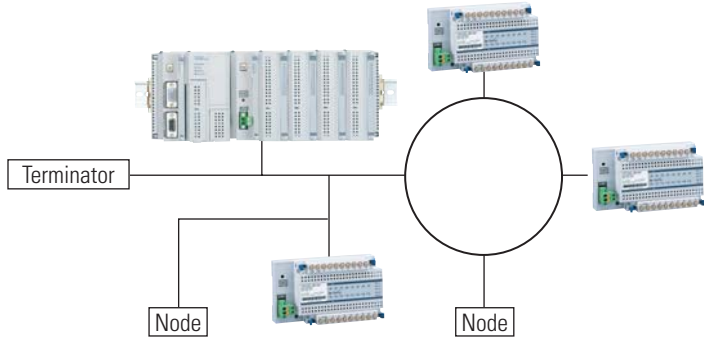
Terminators are needed at both ends of the network.

Free Topology
The network can also be connected in a star, loop, bus, or combination of these configurations. The network can be expanded and modified.

One terminator is needed on the network and it can be located anywhere.

Maximum total cable length:	500 meters
Maximum distance between nodes:	400 meters

Quantity of Nodes (FTT-10A Transceiver Nodes)
A maximum of 64 nodes can be connected to one channel. When connecting more than 64 nodes, a router or repeater is needed.

A router is regarded as one node. Consequently, when using one router, the maximum number of nodes connected to one channel will reduce to 63.
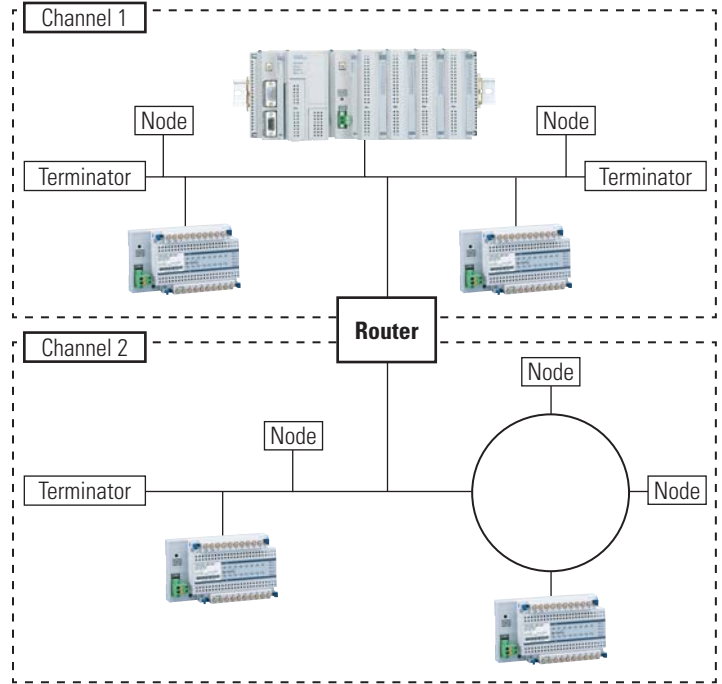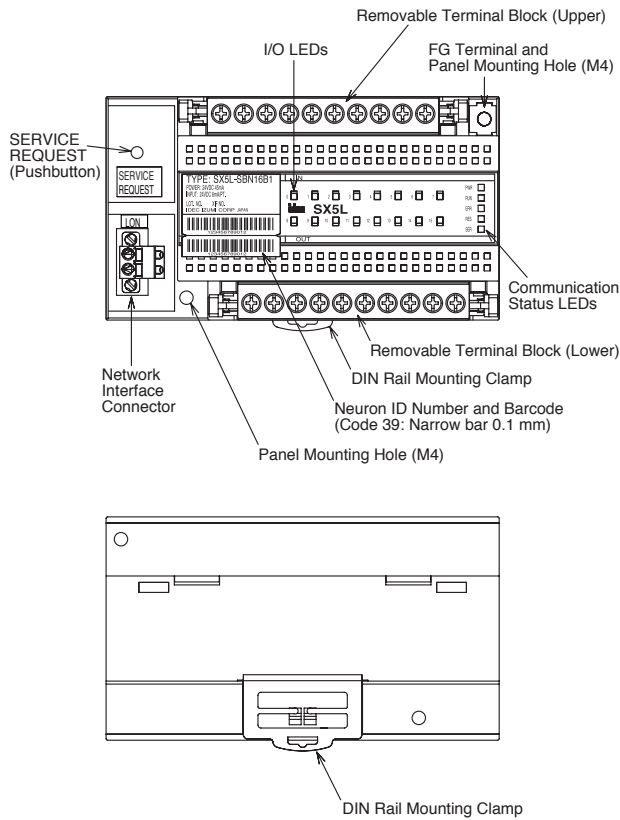
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Parts Description

Removable Terminal Block (Upper)

I/O LEDs

FG Terminal and
Panel Mounting Hole (M4)

SERVICE
REQUEST
(Pushbutton)

Communication
Status LEDs

Network
Interface
Connector

Removable Terminal Block (Lower)

DIN Rail Mounting Clamp

Neuron ID Number and Barcode
(Code 39: Narrow bar 0.1 mm)

Panel Mounting Hole (M4)

DIN Rail Mounting Clamp

Network Interface Connector

The network interface connector features spring-clamp terminals. Push in the orange pin to open the cable hole using a flat screwdriver and insert a cable into the cable hole. LONWORKS network cables can be connected to the two terminals in either polarity.

Orange Pin
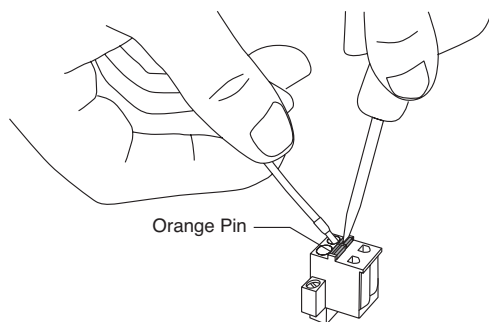
Software Common Specifications

Network Variables

A network variable is data that a particular device application program expects to get from another device on a network (an input network variable) or expects to make available to other devices on a network (an output network variable). Examples are temperature, switch values and actuator position settings.

I/O	Name	Type
Input Network Variable	nviRequest	SNVT_obj_request
Output Network Variable	nvoStatus	SNVT_obj_status

When receiving nviRequest, the SX5L sends out nvoStatus in reply. This functionality makes it possible for the network to confirm that the responding node is in an on-line status.

Configuration Property

Configuration property is a data value used to determine initial values and parameters, such as maximum values, minimum values and time, for a particular LONWORKS device.

	Name	Type
Configuration Property	nciPwrup	SCPTpwrUpDelay
	nciMaxStsSendT	SCPTmaxSndT

The SX5L sends output network variable nvoStatus to the network within 3 seconds after powerup. The delay depends on a random number based on the Neuron ID and differs on each node.

The sending time can be delayed by changing the nciPwrup value. At system startup, if the SX5L sends nvoStatus before the addressee device is ready to receive communication, set the nciPwrup to a larger value.

The preset value for nciPwrup can be between 0 and 60 seconds (0.1-sec increments). The sending time is determined by the sum of the nciPwrup value and a random number.

After the first transmission of output network variable nvoStatus, the SX5L sends nvoStatus repeatedly at intervals designated by nciMaxStsSendT. When the nciMaxStsSendT value is 0, heartbeat transmission is disabled.

The configuration type of nciMaxStsSendT is SNVT_elapsed_tm (day, hour, minute, second, millisecond). When a value over 12 hours is set, the interval is designated as 12 hours 00 minutes 00 seconds.

Network Management Tool

When setting up a LonWorks network system using SX5L modules, a network management tool is needed, such as LonBuilder or LONMAKER.

Digital Input Module SX5L-SBN16B1

- 16 digital inputs can be connected with either negative or positive common wiring.

- Used for transmitting digital signals to the network such as alarm signals from local sensors.

General Specifications

Voltage	24V DC
Voltage Range	21.6 to 26.4V DC (including 5% ripple)
Power Consumption	1.0W (24V DC)
Inrush Current	3A maximum (24V DC)
Weight (approx.)	240g

Digital Input Specifications

| Input Points	16 points
Input	No-voltage input (DC 2-wire sensor, 3-wire sensor, no-voltage contact)
Input Voltage	24V DC
Input Voltage Range	0 to 26.4V DC
Input Impedance	Approx. 4.0 kΩ
Input Current	6mA/point (24V DC)
No. of Common Circuits	1
Input Common Polarity	Positive and Negative common compatible
Input Delay Time	250 ms
Input Turn ON Voltage	15V min. (between input and COM terminals)
Input Turn OFF Voltage	5V max. (between input and COM terminals)
Input OFF Current	1mA maximum
Isolation from Power Line	Photocoupler isolation
Dielectric Strength	500V AC, 1 minute between input and FG or power terminals
Insulation Resistance	100 MΩ minimum between input and FG or power terminals (500V DC megger)

Network Variables

Output Network Variable

Name	Type	Description
nvoDI[0] to [15]	SNVT_switch	Correspond to inputs 0 through 15

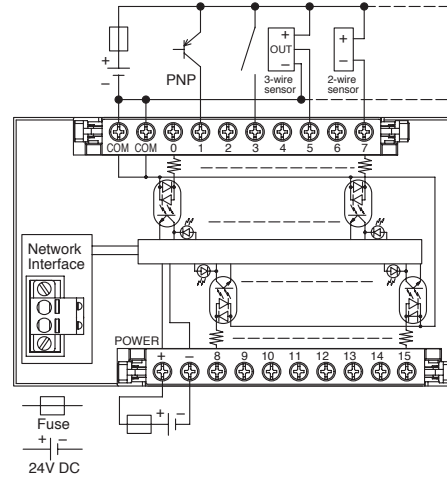Configuration Property

Name	Type	Description
nciMaxStsSendT1 [0] to [15]	SCPTmaxSndT	nvoDI[0] to [15] heartbeat transmission interval

Wiring Diagram and Internal Circuit

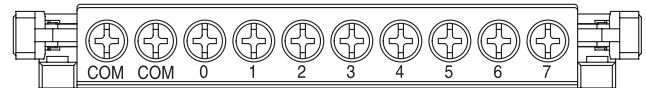Negative Common Wiring
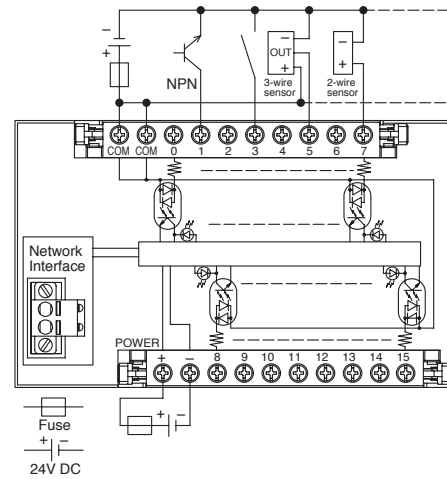
Positive Common Wiring

Terminal Arrangement

Upper Terminal Block (SX9Z-SS10)

Marking	COM	COM	0	1	2
Name	Input Common		Input 0	Input 1	Input 2

Marking	3	4	5	6	7
Name	Input 3	Input 4	Input 5	Input 6	Input 7

Lower Terminal Block (SX9Z-SS2)

Marking	POWER+	POWER–	8	9	10
Name	Power Terminals		Input 8	Input 9	Input 10
	24V DC	0V			

Marking	11	12	13	14	15
Name	Input 11	Input 12	Input 13	Input 14	Input 15

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Digital Output Modules SX5L-SBT16K1/SX5L-SBT16S1

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- 16 transistor outputs for either negative or positive common wiring.

- Each module contains 6 virtual I/O functional blocks with 2 input and 2 output network variables.

General Specifications

Voltage	24V DC
Voltage Range	21.6 to 26.4V DC (including 5% ripple)
Power Consumption	1.2W (24V DC)
Inrush Current	3A maximum (24V DC)
Weight (approx.)	240g

Transistor Output Specifications

Models	SX5L-SBT16K1	SX5L-SBT16S1
Output Points	16 points	
Output	N-MOS open drain (NPN transistor output)	P-MOS open drain (PNP transistor output)
Load Voltage	24V DC	
Load Voltage Range	21.6 to 26.4V DC	
Maximum Load Current	500mA per point, 6A per common line	
Output Common Polarity	Positive common	Negative common
Voltage Drop (ON Voltage)	0.8V maximum (voltage between power – terminal and output terminals when output is on)	0.8V maximum (voltage between power + terminal and output terminals when output is on)
Leakage Current	1mA maximum	
Isolation from Power Line	Photocoupler isolation	
Dielectric Strength	500V AC, 1 minute between output and FG or power terminals	
Insulation Resistance	100 MΩ minimum between output and FG or power terminals (500V DC megger)	

Network Variables
Output Network Variable

Name	Type	Description
nvoDI[0] to [15]	SNVT_switch	Correspond to inputs 0 through 15

For details about network variables and virtual I/O functional block, see user's manual SX9Z-B901.

Virtual I/O Functional Block

Two output network variables (nvoSWA[0] to [5], nvoSWB[0] to [5]) can be programmed to generate results of inversion, AND, or OR operation of two input network variables (nviSWA[0] to [5], nviSWB[0] to [5]) by changing configuration properties (nciAndOr[0] to [5].
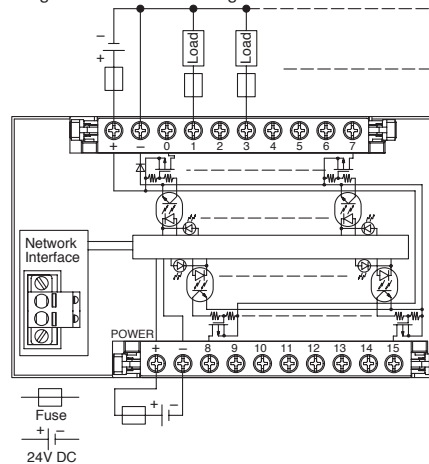

Wiring Diagram and Internal Circuit
SX5L-SBT16K1: Positive Common Wiring

SX5L-SBT16S1: Negative Common Wiring

Terminal Arrangement
Upper Terminal Block (SX9Z-SS1)

Marking	+	–	0	1	2
Name	Load Power 24V DC	0V	Output 0	Output 1	Output 2

Marking	3	4	5	6	7
Name	Output 3	Output 4	Output 5	Output 6	Output 7
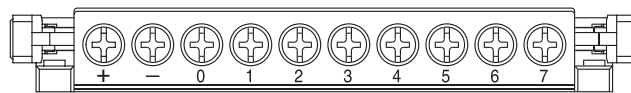
Lower Terminal Block (SX9Z-SS2)

Marking	POWER+	POWER–	8	9	10
Name	Power Terminals 24V DC	0V	Output 8	Output 9	Output 10

Marking	11	12	13	14	15
Name	Output 11	Output 12	Output 13	Output 14	Output 15

Digital I/O Modules SX5L-SBM16K1, -SBM16K2, -SBM16S1, -SBM16S2

- 8 digital inputs and 8 transistor outputs for either negative or positive common wiring.

- SX5L-SBM16K1 and -SBM16S1 contain 3 virtual I/O functional blocks with 2 input and 2 output network variables.

- SX5L-SBM16K2 and -SBM16S2 are designed for start/stop control of 4 channels.

General Specifications

Voltage	24V DC
Voltage Range	21.6 to 26.4V DC (including 5% ripple)
Power Consumption	1.2W (24V DC)
Inrush Current	3A maximum (24V DC)
Weight (approx.)	240g

Transistor Output Specifications

Models	SX5L-SBM16K1 SX5L-SBM16K2 (NPN Input Type)	SX5L-SBM16S1 SX5L-SBM16S2 (PNP Input Type)
Input Points	8 points	
Input Type	No-voltage input (DC 2-wire sensor, 3-wire sensor, no-voltage contact)	
Input Voltage	24V DC	
Input Voltage Range	0 to 26.4V DC	
Input Impedance	Approx. 4.0 kΩ	
Input Current	6mA/point (24V DC)	
No. of Common Circuits	1	
Input Common Polarity	Positive common	Negative common
Input Delay Time	250 ms	
Input Turn ON Voltage	15V min. (between input and COM terminals)	
Input Turn OFF Voltage	5V max. (between input and COM terminals)	
Input OFF Current	1mA maximum	
Isolation from Power Line	Photocoupler isolation	
Dielectric Strength	500V AC, 1 minute between input and FG or power terminals	
Insulation Resistance	100 MΩ minimum between input and FG or power terminals (500V DC megger)	

Network Variables

Input Network Variable

Name	Type	Description
nviDO[0] to [7]	SNVT_switch	Correspond to outputs 0 through 7

Output Network Variable

Name	Type	Description
nvoDI[0] to [7]	SNVT_switch	Correspond to inputs 0 through 7

Configuration Property

Name	Type	Description
nciMaxStsSendT1 [0] to [7]	SNVT_switch	nvoDI[0] to [7] heartbeat transmission interval

For details about network variables and virtual I/O functional block, see user's manual SX9Z-B801.
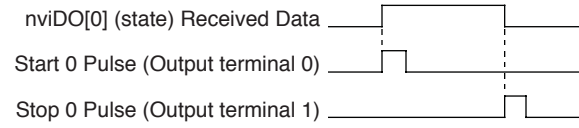
Transistor Output Specifications

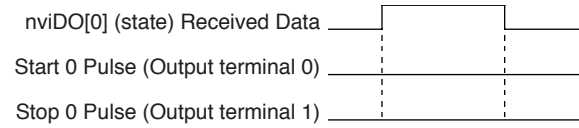| Models	SX5L-SBM16K1 SX5L-SBM16K2 (NPN Output Type)	SX5L-SBM16S1 SX5L-SBM16S2 (PNP Output Type)
Output Points	8 points	
Output Type	N-MOS open drain (NPN transistor output)	P-MOS open drain (PNP transistor output)
Load Voltage	24V DC	
Load Voltage Range	21.6 to 26.4V DC	
Maximum Load Current	500mA per point, 4A per common line	
Output Common Polarity	Positive common	Negative common
Voltage Drop (ON Voltage)	0.8V maximum (voltage between power – terminal and output terminals when output is on)	0.8V maximum (voltage between power + terminal and output terminals when output is on)
Leakage Current	1mA maximum	
Isolation from Power Line	Photocoupler isolation	
Dielectric Strength	500V AC, 1 minute between output and FG or power terminals	
Insulation Resistance	100 MΩ minimum between output and FG or power terminals (500V DC megger)	

Start/Stop Control

SX5L-SBM16K2 / SX5L-SBM16S2

Depending on the statuses of input variables nviDO and nviOVR, a start or stop output pulse isgenerated or suppressed. For DIO[0] as an example, the following charts summarize the relationships of input variables nviDO[0] and nviOVR[0] with start or stop output pulsegeneration (pulse widths 1 sec) from output terminal 0 or 1, respectively.
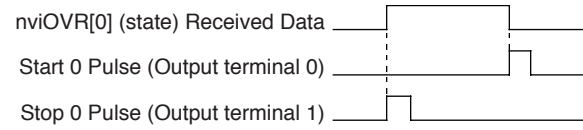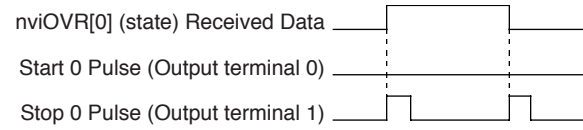
While nviOVR[0] is off

nviDO[0] (state) Received Data

Start 0 Pulse (Output terminal 0)

Stop 0 Pulse (Output terminal 1)

While nviOVR[0] is on

nviDO[0] (state) Received Data

Start 0 Pulse (Output terminal 0)

Stop 0 Pulse (Output terminal 1)

While nviDO[0] is on

nviOVR[0] (state) Received Data

Start 0 Pulse (Output terminal 0)

Stop 0 Pulse (Output terminal 1)

While nviDO[0] is off

nviOVR[0] (state) Received Data

Start 0 Pulse (Output terminal 0)

Stop 0 Pulse (Output terminal 1)

Virtual I/O Functional Block

SX5L-SBM16K1 / SX5L-SBM16S1

Two output network variables (nvoSWA[0] to [2], nvoSWB[0] to [2]) can be programmed togenerate results of inversion, AND, or OR operation of two input network variables (nviSWA[0] to [2], nviSWB[0] to [2]) by changing configuration properties (nciAndOr[0] to [2]).

nviSWA[0] nvoSWA[0]
nviSWB[0] nvoSWB[0]

VIO

Network Variables
SX5L-SBM16K2 / SX5L-SBM16S2
Input Network Variables

| Name	Type	Description
nviDO[0]	SNVT_switch	Sends start/stop pulses from Start 0 and Stop 0 (output terminals 0 and 1)
nviDO[1]	SNVT_switch	Sends start/stop pulses from Start 1 and Stop 1 (output terminals 2 and 3)
nviDO[2]	SNVT_switch	Sends start/stop pulses from Start 2 and Stop 2 (output terminals 4 and 5)
nviDO[3]	SNVT_switch	Sends start/stop pulses from Start 3 and Stop 3 (output terminals 6 and 7)
nviOVR[0] to [3]	SNVT_switch	Sends stop pulses from Stop 0 to Stop 3 (output terminals 1, 3, 5, 7) and disables nviDO[0] to [3]

Input Network Variables

Name	Type	Description
nvoDI[0], [2], [4], [6]	SNVT_switch	Sends Status 0, 1, 2 and 3 to the network
nvoDI[1], [3], [5], [7]	SNVT_switch	Sends Alarm 0, 1, 2 and 3 to the network
nvoOVR[0] to [3]	SNVT_switch	Sends the received nviOVR[0] to [3] values to the network

Input Network Variables

| Name	Type	Description
nciMaxStsSendT1[0]	SCPTmaxSndT	nvoDI[0] and [1] heartbeat transmission interval
nciMaxStsSendT1[1]	SCPTmaxSndT	nvoDI[2] and [3] heartbeat transmission interval
nciMaxStsSendT1[2]	SCPTmaxSndT	nvoDI[4] and [5] heartbeat transmission interval
nciMaxStsSendT1[3]	SCPTmaxSndT	nvoDI[6] and [7] heartbeat transmission interval

Wiring Diagram and Internal Circuit
SX5L-SBM16K1 / SX5L-SBM16K2
Input: Negative Common Wiring
Output: Positive Common Wiring
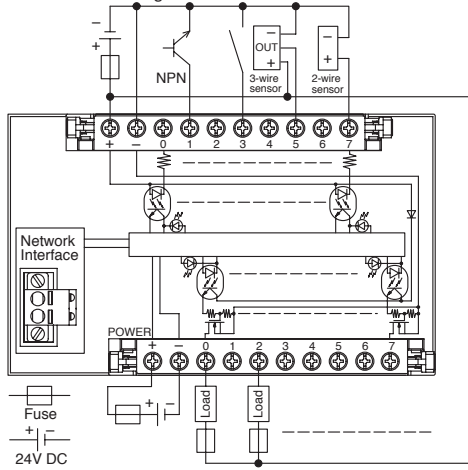
SX5L-SBM16S1 / SX5L-SBM16S2
Input: Positive Common Wiring
Output: Negative Common Wiring
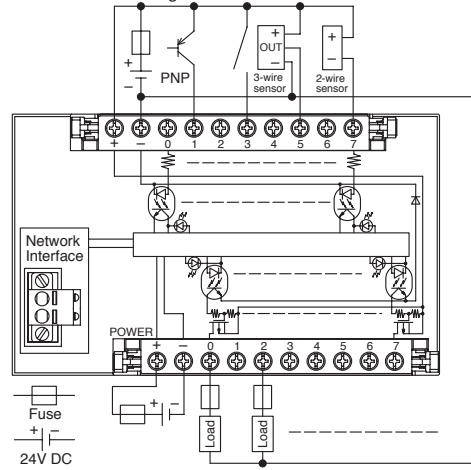
Terminal Arrangement

Upper Terminal Block (SX9Z-SS1)

Marking	+	−
Name	Input Common / Load Power	
SBM16K1	24V DC	0V (Input COM)
SBM16S1	24V DC (Input COM)	0V
SBM16K2	24V DC	0V (Input COM)
SBM16S2	24V DC (Input COM)	0V

Marking	0	1	2	3
SBM16*1	Input 0	Input 1	Input 2	Input 3
SBM16*2	Status 0	Alarm 0	Status 1	Alarm 1

Marking	4	5	6	7
SBM16*1	Input 4	Input 5	Input 6	Input 7
SBM16*2	Status 2	Alarm 2	Status 3	Alarm 3
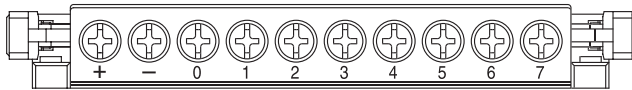
Lower Terminal Block (SX9Z-SS3)

Marking	POWER +	POWER −	0	1	2
SBM16*1	Power 24V DC	Power 0V	Output 0	Output 1	Output 2
SBM16*2			Start 0	Stop 0	Start 1

Marking	3	4	5	6	7
SBM16*1	Output 3	Output 4	Output 5	Output 6	Output 7
SBM16*2	Stop 1	Start 2	Stop 2	Start 3	Stop 3
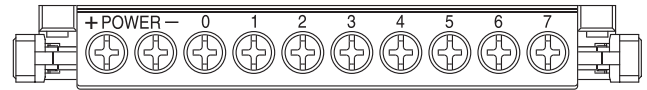
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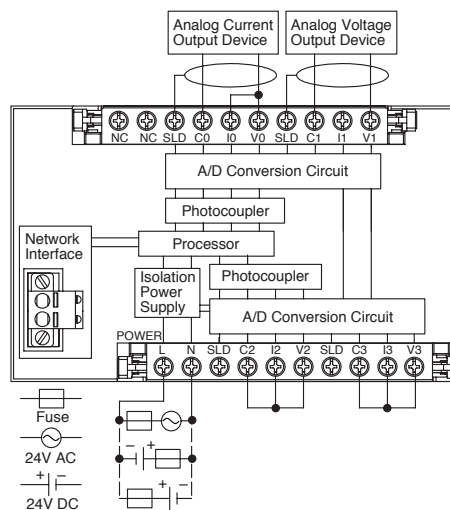Communication & Networking

Analog Input Module SX5L-SBAN041

- 4 analog input channels

- The types of network variables for processing analog data can be changed to meet the control requirements.

- Ideal for heating, ventilation and air-conditioning (HVAC) and other analog control applications.

- Voltage: 24V AC (50/60 Hz) / 24V DC compatible

General Specifications

Voltage	24V AC (50/60 Hz) / 24V DC
Voltage Range	21.6 to 26.4V AC/DC (including 5% ripple)
Power Consumption	3.0 VA (24V AC), 1.8W (24V DC)
Inrush Current	15A maximum (24V AC/DC)
Weight (approx.)	250g

Analog Input Specifications

Input Points	4 points	
Input	Voltage input:	1 to 5V DC
	Current input:	4 to 20mA DC
Input Impedance	Voltage input:	1 MΩ
	Current input:	250Ω
Digital Resolution	12 bits	
A/D Conversion Time	80 ms per point	
Sample Duration Time	300 ms per point	
Error	±0.6% (at 25°C) ±1.0% (over the operating temperature range)	
Isolation between Input Channels	No isolation	
Dielectric Strength	500V AC, 1 minute between input and FG or power terminals	
Insulation Resistance	100 MΩ minimum between input and FG or power terminals (500V DC megger)	

Network Variables
Output Network Variables

| Name	Type	Description
nvoAI0	SNVT_lev_percent	Corresponds to channel 0
nvoAI1	SNVT_lev_percent	Corresponds to channel 1
nvoAI2	SNVT_lev_percent	Corresponds to channel 2
nvoAI3	SNVT_lev_percent	Corresponds to channel 3

Configuration Property

Name	Type	Description
nciMaxStsSendT1	SCPTmaxSndT	nvoAI0 to nvoAI3 heartbeat transmission interval
nciMinSendT1	SCPTminSndT	nvoAI0 to nvoAI3 minimum transmission interval
nciMaxRng[0]	SCPTmaxRnge	Designates nvoAI0 maximum value
nciMaxRng[1]	SCPTmaxRnge	Designates nvoAI1 maximum value
nciMaxRng[2]	SCPTmaxRnge	Designates nvoAI2 maximum value
nciMaxRng[3]	SCPTmaxRnge	Designates nvoAI3 maximum value
nciMinRng[0]	SCPTminRnge	Designates nvoAI0 minimum value
nciMinRng[1]	SCPTminRnge	Designates nvoAI1 minimum value
nciMinRng[2]	SCPTminRnge	Designates nvoAI2 minimum value
nciMinRng[3]	SCPTminRnge	Designates nvoAI3 minimum value
nciMinDelta[0]	SCPTsndDelta	Minimum change to send nvoAI0
nciMinDelta[1]	SCPTsndDelta	Minimum change to send nvoAI1
nciMinDelta[2]	SCPTsndDelta	Minimum change to send nvoAI2
nciMinDelta[3]	SCPTsndDelta	Minimum change to send nvoAI3

Transistor Output Specifications

The type of output network variables nvoAI0 through nvoAI3 can be changed. To change the type of the output network variable, use LonMaker Browser. Among the Standard Network Variable Types (SNVT) approved by the LonMark Interoperability Association, a total of 99 SNVTs can be used for SX5L analog input modules. When changing the output network variable types, designate the configuration properties as shown in the example below:

Index	Type	nciMinRng[0] to nciMinRng[3]	nciMaxRng[0] to nciMaxRng[3]
2	SVNT_amp_mil	4	20
44	SVNT_volt	1	5

Wiring Diagram and Internal Circuit

Note: Connect the terminals of an unused channel using an optional jumper BPJ-26B (ring type) or BPJ-26FB (spade type) or using wires.

Terminal Arrangement

Upper Terminal Block (SX9Z-SS12)

Marking	NC	NC
Name	No Connection	

Marking	SLD	C0	I0	V0
Name	Shield	Channel 0		
		Common	Current Input	Voltage Input

Marking	SLD	C1	I1	V1
Name	Shield	Channel 1		
		Common	Current Input	Voltage Input
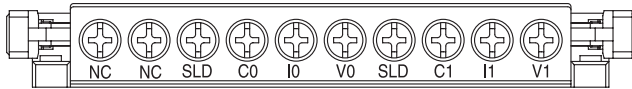
Lower Terminal Block (SX9Z-SS9)

Marking	POWER L	POWER N
Name	Power Terminals	

Marking	SLD	C2	I2	V2
Name	Shield	Channel 2		
		Common	Current Input	Voltage Input

Marking	SLD	C3	I3	V3
Name	Shield	Channel 3		
		Common	Current Input	Voltage Input
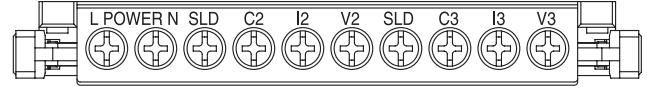
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Analog Output Module SX5L-SBAT04X1

- Used for transmitting analog signals to a network.

- 4 ouput analog channels

General Specifications

|	
Voltage	24V AC (50/60Hz) 24V DC
Voltage Range	21.6 to 26.4V AC/DC (including 5% ripple)
Power Consumption	4.5W (24V DC)/7.0VA (24V AC)
Weight (approx.)	240g

Analog Output Specifications

| Part Number	SX5L-SBT04X1
Output Points	4 points
Output	Current output: 4 - 20mA
Output Max Load Impedance	600Ω
Analog Resolution	12bit
Sampling Cycle	300ms 1 point
Tolerance	±0.5%
Isolation from Output	No isolation
Isolation from Power	Photocoupler isolation
Dielectric Strength	500V AC 1 minutes (between output and FG terminal) 500V AC 1 minutes (between output and power terminal)
Insulation Resistance	100 MΩ minimum (between output and FG terminal) 100 MΩ minimum (between output and power terminal)

Terminal Arrangement
Upper Terminal Block (SX9Z-SS15)

Terminal	NC	NC	SLD	C0	I0	NC	SLD	C1	I1	NC
Description	No Connection		Shield	CH0 Common	CH0 Current Output	NC	Shield	CH1 Common	CH1 Current Output	NC
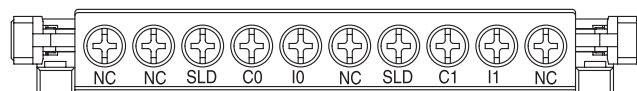
Lower Terminal Block (SX9Z-SS16)

Terminal	Power L	Power N	SLD	C2	I2	NC	SLD	C3	I3	NC
Description	Power		Shield	CH2 Common	CH2 Current Output	NC	Shield	CH3 Common	CH3 Current Output	NC
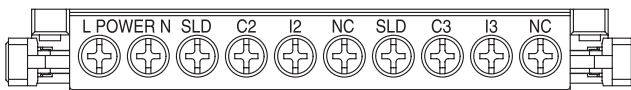
ℹ NC = No connection.

Pt100Ω Input Modules SX5L-SBPT04X1 / SX5L-SBPT04Y1

- 4 input channels for air conditioning and other temperature control applications

- Two temperature ranges are available:

- 0 to +50°C and −20 to +80°C

- Voltage: 24V AC (50/60 Hz) / 24V DC compatible

General Specifications

Voltage	24V AC (50/60 Hz) / 24V DC
Voltage Range	21.6 to 26.4V AC/DC (including 5% ripple)
Power Consumption	3.0 VA (24V AC), 1.8W (24V DC)
Inrush Current	15A maximum (24V AC/DC)
Weight (approx.)	250g

Pt100Ω Input Specifications

Part Numbers	SX5L-SBPT04X1	SX5L-SBPT04Y1
Input Points	4 points	
Input Type	3-wire Pt100Ω resistance thermometer	
Temperature Measurement Range	0 to +50°C	−20 to +80°C
Analog Resolution	12 bits	
Input Detection Current	1.0mA maximum	
A/D Conversion Time	80 ms per point	
Sample Duration Time	1 sec	
Allowable Conductor Resistance	100Ω maximum (3 wires must have the same resistance)	
Burnout	Yes (data: +327.67°C)	
Error	±0.4% (full scale)	
Isolation between Input Channels	No isolation	
Dielectric Strength	500V AC, 1 minute between input and FG or power terminals	
Insulation Resistance	100 MΩ minimum between input and FG or power terminals (500V DC megger)	

Network Variables
Output Network Variables

Name	Type	Description
nvoPT[0]	SNVT_temp_p	Corresponds to channel 0
nvoPT[1]	SNVT_temp_p	Corresponds to channel 1
nvoPT[2]	SNVT_temp_p	Corresponds to channel 2
nvoPT[3]	SNVT_temp_p	Corresponds to channel 3

Configuration Property

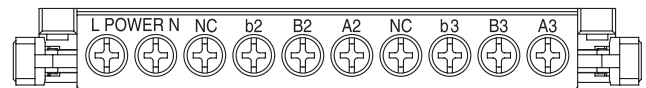| Name	Type	Description
nciMaxStsSendT1	SCPTmaxSndT	nvoPT[0] to nvoPT[3] heartbeat transmission interval
nciMinSendT1	SCPTminSndT	nvoPT[0] to nvoPT[3] minimum transmission interval
nciMinDelta[0]	SCPTsndDelta	Minimum change to send nvoPT[0]
nciMinDelta[1]	SCPTsndDelta	Minimum change to send nvoPT[1]
nciMinDelta[2]	SCPTsndDelta	Minimum change to send nvoPT[2]
nciMinDelta[3]	SCPTsndDelta	Minimum change to send nvoPT[3]

Wiring Diagram and Internal Circuit
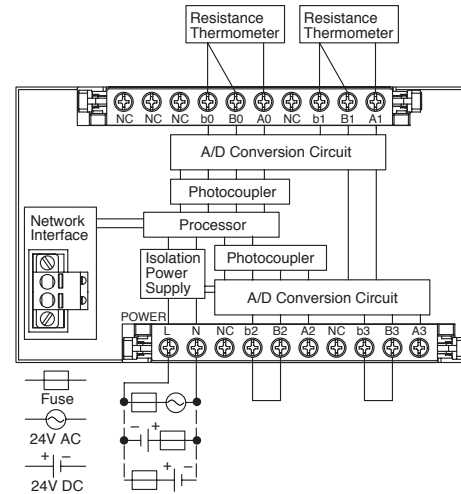
Connect the terminals of an unused channel using an optional jumper BPJ-26B (ring type) or BPJ-26FB (spade type) or using wires.

Terminal Arrangement
Upper Terminal Block (SX9Z-SS13)

Marking	NC	NC	NC	b0	B0
Name	No Connection			Channel 0 Pt100Ω Input	

Marking	A0		NC	b1	B1	A1
Name	Channel 0 Pt100Ω Input		No Connection	Channel 1 Pt100Ω Input		

Lower Terminal Block (SX9Z-SS14)

Marking	POWER L	POWER N	NC	b2	B2
Name	Power Terminals		No Connection	Channel 2 Pt100Ω Input	

Marking	A2		NC	b3	B3	A3
Name	Channel 2 Pt100Ω Input		No Connection	Channel 3 Pt100Ω Input		

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Pulse Input Module SX5L-SBCN081

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- 8 input terminals to count pulse inputs at 8 Hz up to a maximum of 9,999,999. Inputs can be connected in either negative or positive common wiring.

- Maximum counter current values can be designated using the configuration property. Counter current values are stored at power interruption.

- Applicable for counting pulse inputs from watthour meters.

- Voltage: 24V AC (50/60 Hz) / 24V DC compatible

General Specifications

| Voltage	24V AC (50/60 Hz) / 24V DC
Voltage Range	21.6 to 26.4V AC/DC (including 5% ripple)
Power Consumption	2.0 VA (24V AC), 1.0W (24V DC)
Inrush Current	15A maximum (24V AC/DC)
Weight (approx.)	250g

Pulse Input Specifications

Input Points	8 points
Input Voltage	24V DC
Voltage Range	0 to 26.4V DC
Minimum Pulse Width	ON duration: 50ms OFF duration: 50ms
Maximum Frequency Response	8 Hz
Input Impedance	Approx. 3.4 kΩ
Input Current	7mA/point (24V DC)
No. of Common Circuits	1 common circuit/point
Input Common Polarity	Positive and negative common compatible
Input Turn ON Voltage	15V min. (between input and COM terminals)
Input Turn OFF Voltage	5V max. (between input and COM terminals)
Isolation from Power Line	Photocoupler isolation
Dielectric Strength	500V AC, 1 minute between input and FG, power, or input terminals
Insulation Resistance	100 MΩ minimum between input and FG, power, or input terminals (500V DC megger)
Current Value Backup Times	10,000 times of current value storage into the built-in EEPROM during power interruption

Network Variables

Input Network Variables

Name	Type	Description
nviPreset[0] to [7]	SNVT_count_f	Receives counter new current value

Output Network Variables

Name	Type	Description
nvoCount[0] to [7]	SNVT_count_f	Sends counter current value

Configuration Property

Name	Type	Description
nciMaxStsSendT1	SCPTmaxSndT	Heartbeat transmission interval
nciMinSendT1	SCPTminSndT	Minimum transmission interval
nciDefaults	SCPTdefltBehave	Enable event-driven transmission
nciMaxRng [0] to [7]	SCPTmaxRnge	Maximum counter values

Wiring Diagram and Internal Circuit

Negative Common Wiring

Positive Common Wiring

Terminal Arrangement

Upper Terminal Block (SX9Z-SS11)

Marking	NC	NC	0	C0	1
Name	No Connection		Input 0	COM 0	Input 1

Marking	C1	2	C2	3	C3
Name	COM 1	Input 2	COM 2	Input 3	COM 3
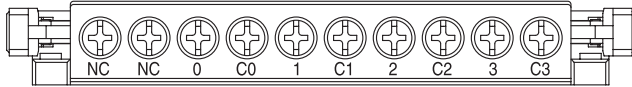
Lower Terminal Block (SX9Z-SS7)

Marking	POWER L	POWER N	4	C4	5
Name	Power Terminals		Input 4	COM 4	Input 5

Marking	C5	6	C6	7	C7
Name	COM 5	Input 6	COM 6	Input 7	COM 7

Remote-control Relay Control Module SX5L-SBRR081

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- 8 output channels to turn on and off remote control relays for illumination control.

- Remote-control relay status is fed back to the network.

- Voltage: 24V AC (50/60 Hz) supplied from a remote-control transformer

General Specifications

Voltage	24V AC (50/60 Hz) supplied from a remote-control transformer
Voltage Range	21.6 to 26.4V AC (including 5% ripple)
Power Consumption	1.8 VA (24V AC) not including power consumption by remote-control relay
Inrush Current	15A maximum (24V DC)
Weight (approx.)	250g

Remote-control Relay Control Specifications

Input Points	8 points
Input	Feedback input from remote control relays through output signal lines
Output	Remote-control relay output
Output Pulse ON Width	100 ms
Applicable Remote-control Relay	BR-12D, BR-22D, BR-1 (Mitsubishi Electric) WR6165 (Matsushita Electric Works)
Applicable Remote-control Transformer	BRT-10B, BRT-20B, BRT-1 (Mitsubishi Electric) WR2301 (Matsushita Electric Works)
Isolation from Power Line	Photocoupler isolation
Dielectric Strength	500V AC, 1 minute between remote-control relay control terminal and FG terminal
Insulation Resistance	100 MΩ minimum between remote-control relay control terminal and FG terminal (500V DC megger)

Network Variables

Input Network Variables

Name	Type	Description
nviLampValue[0] to [7]	SNVT_switch	Controls remote-control relay

Output Network Variable

Name	Type	Description
nvoLampValueFb[0] to [7]	SCPTmaxSndT	Sends feedback signal

Configuration Property

Name	Type	Description
nciMaxStsSendT1	SCPTmaxSndT	Heartbeat transmission interval
nciDefaults	SCPTdefltBehave	Enable event-driven transmission

Wiring Diagram and Internal Circuit

> **Note:** Common terminals C0 through C7 and the POWER N terminal are connected together internally.
> Only one remote-control relay can be connected to each output circuit.

Terminal Arrangement

Upper Terminal Block (SX9Z-SS11)

Marking	NC	NC	0	C0	1
Name	No Connection		Output 0	COM 0	Output 1

Marking	C1	2	C2	3	C3
Name	COM 1	Output 2	COM 2	Output 3	COM 3

Lower Terminal Block (SX9Z-SS7)

Marking	POWER L	POWER N	4	C4	5
Name	Power Terminals		Output 4	COM 4	Output 5

Marking	C5	6	C6	7	C7
Name	COM 5	Output 6	COM 6	Output 7	COM 7

SX5L Series Smart I/O (General Information)

Wiring SX5L
Cable Connector

• For wiring the communication cable connector on the SX5L, use a cable of 24 AWG to 14 AWG (0.2 to 2.5mm²). Strip the cable 7mm from the end as shown below. Each communication terminal can accommodate up to two cables.

7mm
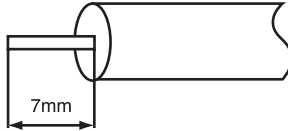
• When connecting two cables to one terminal, use cables of 24 AWG to 16 AWG (0.2 to 1.5mm²).

• Do not solder the cable end for connection.

• Tighten terminal screws on the communication cable connector to a torque of 0.5 to 0.6 N-m.

• Tighten mounting screws on the communication cable connector to a torque of 0.3 to 0.5 N-m.

• When tightening the screws on the cable connector, use a thin, flat screwdriver.

Insertion Pin Positions

When purchasing terminal blocks separately, set the insertion pins as shown below.
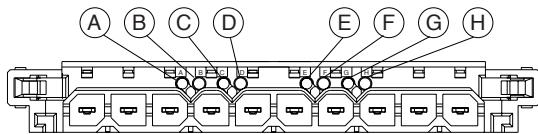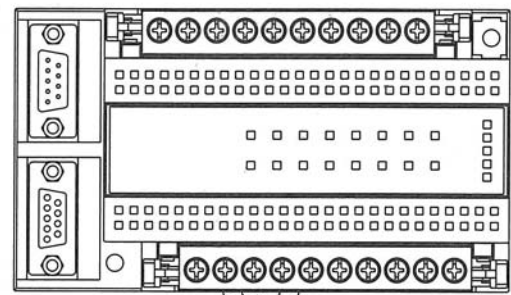

SX5L Part No.	Terminal Block	Type No.	Pin Positions
SX5*-SBN16*	Upper	SX9Z-SS1	B D F H
	Lower	SX9Z-SS2	A C E G
SX5*-SBR08	Upper	SX9Z-SS4	B D E G
	Lower	SX9Z-SS5	A C F H
SX5*-SBT16*	Upper	SX9Z-SS1	B C E G
	Lower	SX9Z-SS2	A D F H
SX5*-SBM16*	Upper	SX9Z-SS1	B C F H
	Lower	SX9Z-SS3	A D E G

Safety Precautions

• Turn power off to the SX5L communication terminals before installation, removal, wiring, maintenance and inspection of the SX5. Failure to turn power off may cause electrical shocks or fire hazard.

• Wire the SX5L correctly. Improper wiring may cause malfunction, abnormal heat and fire.

• Use wires of a proper size to meet voltage and current requirements. Tighten the terminal screws to a proper tightening torque. A loose screw may cause abnormal heat and fire. Check periodically to see if the screws are tightened securely.

• All SX5L communication terminals are manufactured under IDEC's rigorous quality control system, but users must add a backup or fail safe provision to the control system using a SX5L communication terminal in applications where heavy damage or personal injury might result should the SX5L fail.
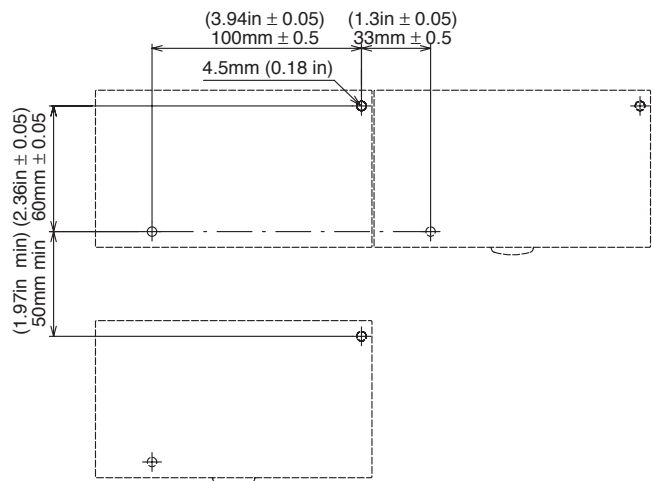
Terminal Symbols

Mounting Hole Layout (Top view)

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Input/Output Requirements

- When connecting DC two-wire sensors to the SX5, the sensors must meet the following specifications.

  Operating voltage: 12 to 24V DC
  Leakage current: 1mA maximum
  Residual voltage: 6V maximum
  ON output current: 5.5mA minimum (at 24V DC)

  The sensor must have an ON output current of 4mA at the minimum. If the sensor does not meet this lower limit, connect a bleeder resistor as shown below. But if the residual voltage is 6V or less, the sensor can still be used although the ON output may be less than 3.5mA.


Source Input Type   Sink Input Type
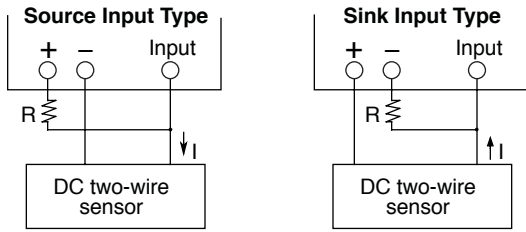
- Use the following formula for calculating the bleeder resistance if needed.

$$R \ (k\Omega) = \frac{Vcc - 6}{I - 4}$$

Vcc: Power voltage
I: Lower limit of DC two-wire sensor ON output (mA)

- Do not apply DC power voltage to the output circuit without connecting a load, otherwise internal elements will be damaged.

- When an overload or short circuit occurs, the protected source output shuts down the output immediately to protect the internal elements from permanent damage. When the cause of the overload or short circuit is removed, the SX5L will restore normal operation automatically.

- When the capacity of main power supply is small, the overcurrent protection of the main supply may reduce power supply to the SX5, then the SX5L will stop operation, causing a network error.

- When using the relay output in environments where extraneous noises exist or inductive loads are switched frequently,generating high back emf, connect contact protection elements to the output terminals and across the load as shown below.

Varistor   Diode and Zener Diode

• For both AC and DC power voltages   • For DC power voltage only
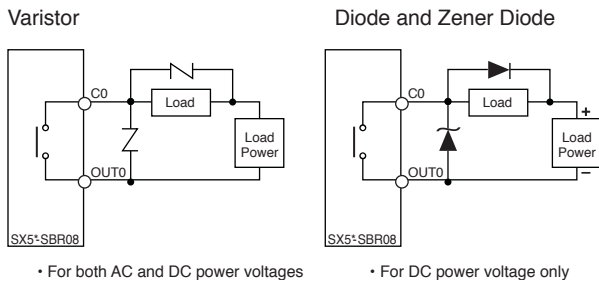
Response Time

The response time of the SX5L system varies greatly depending on such factors as the quantity of modules and cable length. Response time can be confirmed on the actual network system.

Terminators

LonWorks networks require terminators. For details about the terminators, see publications on LonWorks.

Operating Instructions
Installation and Wiring (All SX5L Modules)

- Turn power off to the SX5L before installing or removing the connector or the removable terminal block.

- Tighten the terminal screws to a torque of 0.6 to 1.0 N-m.

- When mounting the SX5L on a panel, tighten the mounting screws to a torque of 1.0 to 1.3 N-m. Recommended mounting screw: M4

- When mounting the SX5L on a DIN rail, put the SX5L on the DIN rail and press the SX5L towards the rail to lock. To remove, pull out the latch from the bottom of the module using a screwdriver and release the SX5. To re-attach, push back the latch into place and snap on the SX5L.

- The upper-right mounting hole has a FG terminal. Connect the FG terminal and control box. Use a wire of 4mm² at the minimum to connect the relay terminal block with the safety ground. When mounting on a DIN rail, a steel DIN rail is recommended for easy grounding.

Mounting on Aluminum IDEC DIN Rail Part Number BNDN1000

- The upper-right mounting hole has a FG terminal. When mounting the SX5L on an aluminum DIN rail, connect the FG terminal to the panel using the attached M4 screw and nut, and connect the panel to a proper ground.

Panel Mounting

- When mounting the SX5L on a panel surface, attach a crimping terminal of a ground wire to the FG terminal on the upper-right mounting hole of the SX5 and insert a screw through the mounting hole. Connect the ground wire to the panel and connect the panel to a proper ground.

- **Note:** For secure electrical connection, remove any coating from the ground area on the panel.

Terminal Block

The SX5L uses removable terminal blocks. To remove and attach the terminal block, follow the procedures below:

- To remove the terminal block, squeeze both latches on top of the block inward to unlock the block from the socket.

- To reattach the terminal block, place the block in the socket with the latches opened and press the block until it bottoms in the socket, then the latches snap outward to lock the terminal block.

- Insertion pins are positioned on the base of the terminal block and inside the socket to prevent insertion of invalid blocks into the socket. The pins are keyed to ensure correct matching of block and socket, and prevent swapping of upper and lower blocks.

- When the block does not fit into the socket properly, check to see if the pin positions on the block agree with the pin-slot arrangement in the socket. If the pins and the pin slots are in matching positions, check for any wire fragments and obstacles in the socket.

- When cutting cables or wires, keep the SX5L out of the way to prevent ingress of wire fragments.

- When wiring the screw terminals using crimping terminals, use crimping terminals of the dimensions shown below. Each screw terminal can accommodate up to two crimping terminals.

ø3.2 min.
6 max.
3.0 max.   5.2 min.
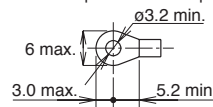
Note: Fork crimping terminals can also be used.
(Dimensions are in mm)