X51N·SERIES HIGH DENSITY

Transmitters • Alarm Trips • Transmitter/Alarm Trips

RONAN

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Warranty

Ronan warrants equipment of its own manufacture to be free from defects in material and workmanship under normal conditions of use and service, and will repair or replace any component found to be defective, on its return, transportation charges prepaid, within three years of its original purchase. This warranty carries no liability, either expressed or implied, beyond our obligation to replace the unit which carries the warranty.

X5IN SERIES HIGH DENSITY

The Ronan X5IN Series temperature and process signal conditioners, transmitters, alarm trips and combination transmitter/alarm trips feature the most extensive selection of interface modules, providing high density packaging for the most economical price. The designs incorporate solidly based experience from the many thousands of installed and operating units and offer superior performance based on today's technology and proven design techniques. The high density arrangement of the X5IN Series, most suitable for system application in today's space-limited control rooms, is enhanced with the ultra-high density combination of transmitter and alarm trip contained in the same module. These combination modules provide a unique solution to instrumentation requirements, where previously a transmitter and an alarm trip module occupied twice the space, thus providing an obvious economical advantage.

The X5IN Series modules are supplied in standard 19 inch relay rack mount chassis or surface mount chassis for back panel installation, each providing space for up to twenty modules in any combination of transmitters, alarm trips or transmitter/trips. A panel mount housing for any combination of up to forty modules permits installing the modules at any location inside a control panel.

All modules are constructed to the "Euro Card" specifications based on DIN standards to assure plug-in compatibility with regard to mechanical and electrical features applicable to European Chassis. The circuit card and chassis connectors used are of the shrouded type to assure ease of insertion and excellent electrical connection.

The thermocouple and RTD input modules feature plug-in type sub-modules, allowing field change for range or type of input by simple exchange of the type determining sub-module.

Calibration is made easy by means of front panel access jacks, which allow direct injection of calibration signals, without disconnecting the input signals, and readout of the output signals. A portable calibrator such as the Ronan Model X86 is ideally suited to simultaneously inject the input signal and monitor the output. Calibration is accomplished using readily accessible front panel controls.

All modules are powered from an integral or external 24 VDC power supply. The integral power supply, occupying two module positions, is capable of supplying up to 50 watts. Refer to individual module specifications for power requirements. Rack mounted power supplies for larger systems are available. The DC or AC power connections are made at clearly marked rear panel terminals.

The alarm trip modules offer either two isolated single pole, single throw, or one single pole, double throw contact per setpoint. The contacts are rated for 3 amperes at 240 VAC or 28 VDC. Selection of high/low setpoint, or relay coil status normally energized or de-energized, is made by simply changing the mechanical plug-in sockets.

FEATURES AND BENEFITS

- Full line of RTD, T/C, mV, mA, V input transmitters, alarm trips, combination transmitter/alarm trips and computation transmitters.

  All necessary modules to perform signal conditioning and alarm/shutdown in convenient high density configuration.

- All standard signal conditioners, computation and frequency transmitters, alarm trips and combination transmitter/alarm trips are plug compatible.

  Field change of functions and module types.

- On-board plug-in sub-module facilitates change of range or sensor type.

  Inexpensive method of changing sensor type as system requirements demand.

- Convenient front panel access to span, zero and setpoint controls.

  Provides immediate access to calibration adjustments without removal of modules.

- In-circuit calibration and input monitoring via front panel jacks and controls without disconnecting the input or output wiring.

  Saves valuable calibration and setup time.

- Signal to power supply isolation standard on all modules. Input to output isolation on temperature transmitters.

  Allows use of grounded transducers such as thermocouples and RTDs without interaction.

- Low power consumption.

  Highly efficient design reduces system power requirement.

- Power-ON indicator on all modules.

  Alerts operator that power is delivered to each module.

- Single and dual setpoint alarm trip and combination transmitter/alarm trips.

  Cost effective use of appropriate module to fulfill specific needs.

- Two SPST or one SPDT contact per setpoint. DPDT contacts optional on single setpoint alarm trips.

  Two isolated, selectable Form A or Form B contacts may be used for two independent functions per setpoint. A single Form C contact is also available where applicable.

- 3 ampere rating on alarm trip output contacts at 240 VAC or 28 VDC.

  Permits direct drive of heavy loads eliminating interposing devices.

- Plug and socket selection for relay operation, contact polarity and high or low setpoint.

  Rapid change of relay coil and contact functions without special tools or soldering.

- Calibrated dial for hysteresis control is standard feature on alarm trips.

  Set hysteresis without the need for a board extender.

- Sensor failure detection without shutdown on RTD modules.

  Prevents unnecessary shutdown and loss of production due to a single sensor failure.

- High density mechanical design, 20 modules in a standard 19 inch (48.25 cm) rack mount.

  Saves valuable panel or rack cabinet space.

- Euro Card size plug-in modules with connector and plug chassis interface.

  Meets European standards while offering convenient mechanical design and reliable electrical connections.

- Multipin connectors and cable interface to host system are available.

  Simplified input to supervisory control systems with minimum field wiring of transmitters and alarm devices.

Thermocouple, RTD, mV, mA, V, and Strain Gage Transmitters

- Full Line of RTD, T/C, mV, mA, V, and Strain Gage Transmitters
- Linearized Transmitters Available
- Input to Output to Power Isolation Standard
- In-Circuit Calibration Via Front Panel Jacks
- Front Panel Span and Zero Controls
- Other Inputs and Outputs Available. Consult Factory for Model Numbers
- Non-Interacting Zero and Span Controls
- RFI Protected

Model Number	Description	Input (I)	Output (II)*
X5IN-300-(I)-(II)	RTD Transmitter	9, 10, 100, or 120 ohms**	Select A thru G
X5IN-300L-(I)-(II)	RTD Transmitter, Linearized	9, 10, 100, or 120 ohms**	Select A thru G
X5IN-310-(I)-(II)	T/C Transmitter	E, J, K, T, R, or S**	Select A thru G
X5IN-310L-(I)-(II)	T/C Transmitter, Linearized	E, J, K, T, R, or S**	Select A thru G
X5IN-320-(I)-(II)	mV Transmitter	0-10, 0-25, or 0-50 mV	Select A thru G
X5IN-320L-(I)-(II)	mV Transmitter, Linearized	0-10, 0-25, or 0-50 mV	Select A thru G
X5IN-320-(I)-(II)	V Transmitter	0-5, 1-5, or 2-10 V	Select A thru G
X5IN-320-(I)-(II)	mA Transmitter	1-5, 4-20, or 10-50 mA	Select A thru G
X5IN-340-(I)-(II)	Strain Gage Transmitter	120, 350, or 1000 ohms, 1, 2, or 4 arm	See Next Page
X5IN-438-(I)-(II)	Potentiometer Transmitter	5 ohms to 20 Kohm	Select A thru G

*A=1-5 mA, B=4-20 mA, C=10-50 mA, D=1-5 VDC, E=2-10 VDC, F=0-5 VDC, G=0-10 VDC
**Specify Range when ordering.
Note: 9 ohm RTD is 10 ohms at 25°C. 10 ohm RTD is 10 ohms at 0°C. Input span must be specified at time of order.

Thermocouple, RTD, mV, mA, and V Transmitter Specifications

The Model X5IN Series Transmitters for Thermocouple, RTD, mV, mA and voltage type inputs provide high isolation between input and output and power source and a high common mode rejection to assure the utmost accuracy in temperature and low level voltage and current measuring applications. The 24 VDC powered modules feature industry standard outputs; other special outputs available upon request. Reference junctions for 0°C are included in modules where applicable.

Input Type:
a. Thermocouple: Type E, J, K, T, R, or S
Impedance: >10 Mohm
b. RTD: 2-, or 3-wire 10 to 2,000 ohm spans
Impedance: >100 kohm
c. mV: 10, 15, 25, 40, 50, 75, and 100 mV ranges
Impedance: >10 Mohm
d. V: 1, 4, and 5 V ranges; Impedance: >10 Mohm
e. V: 10 V range; Impedance: >200 kohm
f. 1-5, 4-20, 10-50 mA; Impedance: 100 ohm

Output Types:
a. Current: 1-5 mA (into 0-4 kohm Load)
4-20 mA (into 0-1 kohm Load)
10-50 mA (into 0-350 ohm Load)
b. Voltage: 1-5 VDC (R out=250 ohms)
2-10 VDC (R out=500 ohms)
0-5 VDC (R out=250 ohms)
0-10 VDC (R out=500 ohms)

Output Test Jacks: Front panel mounted jacks allow monitoring of output signal without disturbing field wiring or output current

Input Test Jacks: Front panel mounted jacks allow monitoring of input signals or injection of calibration signal without disconnecting the input wiring

Accuracy: ±0.1%

Span Adjustment: Front panel mounted, multi-turn infinite resolution potentiometer permits ±25% deviation from nominal span

Zero Adjustment: Front panel mounted, multi-turn infinite resolution potentiometer permits ±25% adjustment

Zero Suppression (T/C or mV): −10 mV to +100 mV

Open Input Circuit Response: Upscale drive standard; downscale drive optional

Isolation: 500 VRMS input to output to power

Common Mode Rejection: >120 dB from DC to 60 Hz at 115 VRMS

Common Mode Voltage: 500 VRMS max. without damage

Operating Temperature Range: −5°C to +60°C

Temperature Stability: <±0.03%/°C

RFI Susceptibility: <.5 mV (referred to input) +.2% of span (referred to output) when exposed to 5 W transmitter (frequency range 20 to 450 MHz) at a distance of 4 ft.

Power Requirement: 24 VDC ±10%, 1.3 W (55 mA) at 20 mA output current

Power ON: LED indicates green

Typical Response Time: 100 ms; 125 ms to 10% of final value

Note: Specifications apply at 23° ±2°C unless otherwise indicated. Specifications subject to change without notice.

Strain Gage Transmitter Specifications

The Model X5IN-340 Series Transmitters provide conditioning of strain gage inputs and transmit a standard process signal output. The input/output isolated unit is compatible for use with various strain gages including the 120 ohm, 350 and 1000 ohm type. Completion resistors mounted on the module board provide for 1, 2 or 4 active arm bridge arrangements. Separate remote sensing provisions ensure optimum accuracy of measurement, where voltage excitation is used.

Input:
- Differential: 1, 2 or 4 active arm
- Input impedance: >10 Mohm
- Input current: <0.2 Nano amp

Excitation Voltage:
- 3-15 VDC at 150 mA
- Jumper selectable and adjustable within three ranges

Excitation Current:
- 5-75 mA
- Jumper selectable and adjustable within three ranges

Output Voltage:
a. ±5 VDC
b. ±10 VDC
c. 1-5 VDC
d. 0-10 VDC
- Current: ±5 mA max.
- Impedance: <.1 ohm

Output Current:
a. 1-5 mA
b. 4-20 mA
c. 10-50 mA
- Compliance voltage: 20 VDC
- Impedance: >1 Mohm

Output Test Jacks: Front panel mounted jacks allow monitoring of output signal without disturbing field wiring or output current

Input Test Jacks: Front panel mounted jacks allow monitoring of input signals or injection of calibration signal without disconnecting the input wiring

Accuracy: ±0.1%

Span Adjustment: Front panel selector switch for fixed ranges 10, 25, 100 mV or infinite resolution potentiometer

Balance Adjustment: Front panel mounted multi-turn infinite resolution potentiometer

Isolation: 500 V RMS power to input and power to output

Common Mode Rejection: >100 to 120 dB (depending on gain setting) from DC to 60 Hz

Common Mode Voltage: 30 VDC or peak AC

Operating Temperature Range: −5°C to −60°C

Temperature Stability: <±0.02%/°C

RFI Susceptibility: <.5 mV (referred to input) +.2% of span (referred to output) when exposed to 5 W transmitter (frequency range 20 to 450 MHz) at a distance of 4 ft.

Power Requirement: 24 VDC ±10%, 5 W + excitation power

Power ON: LED indicates green

Note: Specifications apply at 23° ±2°C unless otherwise indicated. Specifications subject to change without notice.

COMPUTATION TRANSMITTERS

- In-Circuit Calibration via Front Panel Jacks and Controls
- Non-Standard Inputs and Outputs Available. Consult Factory for Model Numbers
- Non-Interacting Zero and Span Controls
- RFI Protected

Model Number	Description	Input (I)*	Output (II)*
X5IN-430-(I)-(II)	A÷B Divider Transmitter	Select A thru G	Select A thru G
X5IN-432-(I)-(II)	A×B Multiplier Transmitter	Select A thru G	Select A thru G
X5IN-433-(I)-(II)	A×B÷C 3-Input Multiplier/Divider Transmitter	Select A thru G	Select A thru G
X5IN-434-(I)-(II)	$\sqrt{A}$ Square Root Transmitter	Select A thru G	Select A thru G
X5IN-436-(I)-(II)	A^2 Squaring Transmitter	Select A thru G	Select A thru G
X5IN-440-(I)-(II)	A±B±C±D Adder/Subtracter Transmitter	Select A thru G	Select A thru G

*A=1-5 mA, B=4-20 mA, C=10-50 mA, D=1-5 VDC, E=2-10 VDC, F=0-5 VDC, G=0-10 VDC

Multiplier/Divider Transmitter Specifications

The Model X5IN Series Multiplier and/or Divider Transmitters accept up to three current or voltage input signals and perform multiplication and/or division computation. The basic equation the module solves is $I_O = (A \times B \div C) \bullet K$ where A, B, and C are the input signals and K the adjustable constant for the overall span control. The following specific equations apply to the appropriate computation for a 4-20 mA input/output application.

Transfer Functions:

Divider:

$$I_O = K_S \left[\frac{K_B(I_B - 4) + k_B}{K_C(I_C - 4) + k_C} \right] + 4$$

Multiplier:

$$I_O = K_S[K_A(I_A - 4) + k_A][K_B(I_B - 4) + k_B] + 4$$

Multiplier/Divider:

$$I_O = K_S \left[\frac{[K_A(I_A - 4) + k_A][K_B(I_B - 4) + k_B]}{K_C(I_C - 4) + k_C} \right] + 4$$

where: I_O = Output Current in mA
I_A, I_B, I_C = Input Signals (e.g. 4-20 mA)
K_A, K_B, K_C = Gain Control per Input
k_A, k_B, k_C = Offset Constant per Input
K_S = Span Control

Input:
- Current: 1-5, 4-20, 10-50 mA
- Voltage: 0-5, 1-5, 0-10 and 2-10 V

Number of Inputs: Two or three

Input Impedance:
- Current: 250 ohms
- Voltage: >200 kohms

Output Types:
a. Current: 1-5 mA (into 0-4 kohm Load)
4-20 mA (into 0-1 kohm Load)
10-50 mA (into 0-350 ohm Load)
b. Voltage: 1-5 VDC (R out = 250 ohms)
2-10 VDC (R out = 500 ohms)
0-5 VDC (R out = 250 ohms)
0-10 VDC (R out = 500 ohms)

Output Test Points: Front panel mounted test jacks allow monitoring of the output signal without disturbing field wiring or output current. The milliamp meter used must have 10 ohms or less input resistance.

Accuracy: ±0.25% to ±0.5% of span depending on equation (input C >2% of span)

Response Time: <100 msec

Span Adjustment: Front panel access, multi-turn infinite resolution potentiometer provides ±10% adjustment range

Zero Adjustment: Front panel access, multi-turn infinite resolution potentiometer provides ±15% of span adjustment

Input Zero Adjustment: Internal potentiometer, each input

Isolation:
- Output minus common to input minus
- Input and output isolated from 24 VDC power

Operating Temperature Range: −5°C to +60°C

Temperature Stability: ±0.03%/°C

RFI Susceptibility: <.5 mV (referred to input) +.2% of span (referred to output) when exposed to 5 W transmitter (frequency range 20 to 450 MHz) at a distance of 4 ft.

Power Supply Effect: <±0.02% of range for ±10% change on the 24 VDC supply voltage

Power Requirement: 24 VDC ±10%, 2.4 W max.

Note: Specifications apply at 23° ±2°C unless otherwise indicated. Specifications subject to change without notice.

Adder/Subtracter Transmitter Specifications

The Model X5IN-440 Adder/Subtracter Transmitters accept up to four current or voltage input signals and execute an algebraic sum or difference of the signals. The four input signals can be scaled from 0.25 to 1.25 eliminating the requirement for external scaling devices. The inputs, A, B, C and D may be connected in either add or subtract mode and field selected by a simple jumper change. Front panel mounted test jacks allow monitoring of the output signal without disconnecting the wiring.

Transfer Function (for 4-20 mA Output):

$$I_O = K_S\left[K_A(I_A-4)\pm K_B(I_B-4)\pm K_C(I_C-4) \pm K_D(I_D-4)\right]+4$$

where:

I_O = Output Current
I_A, I_B, I_C, I_D = Input Signals
K_A, K_B, K_C, K_D = Gain Factor per Input
K_S = Span Control

Input:
- Current: 1-5, 4-20, 10-50 mA
- Voltage: 0-5, 1-5, 0-10 and 2-10 V

Number of Inputs: Two, three or four

Input Impedance:
- Current: 250 ohms
- Voltage: >200 kohms

Input Scaling: Internal potentiometer with an adjustment range of 0.25 to 1.25 of each input

Output Types:
a. Current: 1-5 mA (into 0-4 kohm Load)
4-20 mA (into 0-1 kohm Load)
10-50 mA (into 0-350 ohm Load)
b. Voltage: 1-5 VDC (R out=250 ohms)
2-10 VDC (R out=500 ohms)
0-5 VDC (R out=250 ohms)
0-10 VDC (R out=500 ohms)

Output Test Points: Front panel mounted test jacks allow monitoring of the output signal without disturbing field wiring or output current. The milliamp meter used must have 10 ohms or less input resistance

Accuracy: ±0.25% of range

Response Time: 50 msec

Zero Adjustment:
- Internal zero adjustment potentiometer on each input
- Front panel access, output zero control, multi-turn infinite resolution potentiometer permits ±10% of span adjustment

Span Adjustment: Front panel access, multi-turn infinite resolution potentiometer permits ±25% deviation from nominal range

Isolation:
- Output minus common to input minus
- Input and output isolated from 24 VDC power

Operating Temperature Range: −5°C to +60°C

Temperature Stability: ±0.025%/°C

RFI Susceptibility: <.5 mV (referred to input) +.2% of span (referred to output) when exposed to 5 W transmitter (frequency range 20 to 450 MHz) at a distance of 4 ft.

Power Supply Effect: <±0.05% of range for ±10% change on the 24 VDC supply voltage

Power Requirement: 24 VDC ±10%, 1.5 W max.

Note: Specifications apply at 23° ±2°C unless otherwise indicated. Specifications subject to change without notice.

Square Root Extracter/ Squaring Transmitter Specifications

The Model X5IN-434 Square Root Extractor or X5IN-436 Squaring Transmitter accepts a single voltage or current input signal and provides standard outputs representing the square root or square of the input signal.

Transfer Function (for 4-20 mA Output):

Square Root Extractor:

$$I_O = K_S \sqrt{(I_A - 4) + k_A} + 4$$

Squaring:

$$I_O = K_S \left[(I_A - 4) + k_A \right]^2 + 4$$

where:

I_O = Output Current
I_A = Input Signal
K_S = Span Control
k_A = Offset Constant (Normally Zero)

Input:
- Current: 1-5, 4-20, 10-50 mA
- Voltage: 0-5, 1-5, 0-10 and 2-10 V

Input Impedance:
- Current: 250 ohms
- Voltage: >200 kohms

Output Types:
a. Current: 1-5 mA (into 0-4 kohm Load)
4-20 mA (into 0-1 kohm Load)
10-50 mA (into 0-350 ohm Load)
b. Voltage: 1-5 VDC (R out = 250 ohms)
2-10 VDC (R out = 500 ohms)
0-5 VDC (R out = 250 ohms)
0-10 VDC (R out = 500 ohms)

Output Test Points: Front panel mounted test jacks allow monitoring of the output signal without disturbing field wiring or output current. The milliamp meter used must have 10 ohms or less input resistance

Accuracy: ±0.25% of range

Response Time: <100 msec

Span Adjustment: Front panel access, multi-turn infinite resolution potentiometer provides ±10% adjustment of range

Zero Adjustment: Front panel access, multi-turn infinite resolution potentiometer provides ±15% of span adjustment

Isolation:
- Output minus common to input minus
- Input and output isolated from 24 VDC power

Operating Temperature Range: −5°C to +60°C

Temperature Stability: ±0.03%/°C

RFI Susceptibility: <.5 mV (referred to input) +.2% of span (referred to output) when exposed to 5 W transmitter (frequency range 20 to 450 MHz) at a distance of 4 ft.

Power Supply Effect: <±0.02% of range for ±10% change on the 24 VDC supply voltage

Power Requirement: 24 VDC ±10%, 2.4 W max.

Note: Specifications apply at 23° ±2°C unless otherwise indicated. Specifications subject to change without notice.

TRANSMITTER/SPECIAL FUNCTIONS

- All Standard Inputs Available. Engineering Units, Frequency, etc.
- In-Circuit Calibration Front Panel Jacks and Controls
- Complete Range of Standard Inputs and Output Signals
- Non-Standard Inputs and Outputs Available. Consult Factory for Model Numbers
- Non-Interacting Zero and Span Controls
- Input to Output Isolation Available. Contact Factory for Model Numbers
- RFI Protected

Model Number	Description	Input* (I)	Output (II)**
X51N-442-(I)-(II)	Frequency Transmitter	0-30 Hz to 0-10 KHz (Specify Range)	Select A thru G
X51N-445-(I)-(II)	Hi/Lo Signal Selection Transmitter	Select A thru G	Select A thru G
X51N-472-(I)-(II)	Linear Integrating Totalizer	Select A thru G	Pulse Rate and Select A thru G
X51N-492-(I)-(II)	Square Root Integrating Totalizer	Select A thru G	Pulse Rate and Select A thru G
X51N-600-(I)-(II)	AC Current Transmitter	Current Transformer	Select A thru G
X51N-601-(I)-(II)	AC Voltage Transmitter	10-150 VAC or 10-280 VAC	Select A thru G
X51N-610-(I)-(II)	Ramp Buffer Transmitter	Select A thru G	Select A thru G

*A=1-5 mA, B=4-20 mA, C=10-50 mA, D=1-5 VDC, E=2-10 VDC, F=0-5 VDC, G=0-10 VDC

Frequency Transmitter Specifications

The Model X5IN-442 Frequency Transmitter is designed to interface frequency based inputs, such as turbine, flow meter, tachometer, speed, etc. with any standard process control instrument. The module accepts a wide variety of pulse, square or sine wave type inputs with amplitudes of .1 to 200 V peak and provides standard current and voltage outputs totally isolated from input to output and to the power supply.

Input: Pulse, square, sine, or triangle wave form:
- Voltage: 0.1-200 V peak
- Impedance: >200 kohms
- Frequency Range: 0-30 Hz to 0-10 KHz

Input Signal: Any wave form (positive going edge with a slope >10 V/sec)

Output Types:
a. Current: 1-5 mA (into 0-4 kohm Load)
4-20 mA (into 0-1 kohm Load)
10-50 mA (into 0-350 ohm Load)
b. Voltage: 1-5 VDC (R out=250 ohms)
2-10 VDC (R out=500 ohms)
0-5 VDC (R out=250 ohms)
0-10 VDC (R out=500 ohms)

Output Test Points: Front panel test jacks allow monitoring of the output signal without disturbing the field wiring or output current. The milliamp meter used must have 10 ohms or less input resistance

Accuracy: ±0.25% of range

Response Time:
- 30 Hz to 1 KHz full range 2 sec
- 1 KHz to 10 KHz full range 0.2 sec

Zero Adjustment: Front panel access, multi-turn infinite resolution potentiometer permits ±10% adjustment

Span Adjustment: Front panel access, multi-turn infinite resolution potentiometer permits adjustment of input threshold from 0-1 V

Isolation: Input to output, input and output to power source 500 VRMS

Operating Temperature Range: −5°C to +60°C

Temperature Stability: ±0.03%/°C

RFI Susceptibility: <.5 mV (referred to input) +.2% of span (referred to output) when exposed to 5 W transmitter (frequency range 20 to 450 MHz) at a distance of 4 ft.

Power Supply Effect: <±.02% of range for a change of ±10% power supply change

Power Requirement: 24 VDC ±10%, 1.5 W

Note: Specifications apply at 23° ±2°C unless otherwise indicated. Specifications subject to change without notice.

Linear Integrator/and Square Root Integrator/ Specifications

The Model X5IN-472 Linear and X5IN-492 Square Root Integrator accept standard process current or voltage signals and provide output pulses suitable for driving mechanical counters. The output signal is a pulse whose rate is directly proportional to the analog input signal. The pulse rate is selectable over a wide range providing totalization for virtually any units of measurement. Models X5IN-472 and X5IN-492 provide an analog output to retransmit the input signal in addition to the pulse output, with total isolation from input to ouput and to the power source. Front panel test points allow monitoring of the input and output signals or the injection of a calibration signal without disconnecting the input wiring.

Input:
- Current: 1-5, 4-20, 10-50 mA
- Voltage: 0-5, 1-5, 0-10, and 2-10 V

Input Impedance:
- Current: 100 ohms
- Voltage, 5 V: >10 Mohms
- Voltage, 10 V: >100 kohms

Output (Pulse Rate): Full scale rate 0-60 to 0-60,000 counts per hour in 10 adjustable ranges

Output Pulse: 40 msec duration, 24 VDC into 100 ohm load min.

Output/Analog (X5IN-472 and X5IN-492 only):
a. Current: 1-5 mA (into 0-4 kohm Load)
4-20 mA (into 0-1 kohm Load)
10-50 mA (into 0-350 ohm Load)
b. Voltage: 1-5 VDC (R out=250 ohms)
2-10 VDC (R out=500 ohms)
0-5 VDC (R out=250 ohms)
0-10 VDC (R out=500 ohms)

Accuracy: ±0.25%

Zero Adjustment: Internal potentiometer ±10% of span

Zero Drop Out: Internal potentiometer provides 0-5% of range settability for "zero drop out"

Span Adjustment: Front panel access, multi-turn infinite resolution potentiometer provides 50% of span adjustment

Isolation:
- Output minus common to input minus
- Input and output isolated from 24 VDC power

Operating Temperature Range: −5°C to +60°C

Temperature Stability: ±0.025%/°C

RFI Susceptibility: <.5 mV (referred to input) +.2% of span (referred to output) when exposed to 5 W transmitter (frequency range 20 to 450 MHz) at a distance of 4 ft.

Power Supply Effect: <±0.02% of range for a 10% change on the 24 VDC supply voltage

Power Requirement: 24 VDC ±10%, 1.5 W max. + output load

Note: Specifications apply at 23° ±2°C unless otherwise indicated. Specifications subject to change without notice.

AC Current/AC Voltage Transmitter Specifications

The Model X5IN-600 AC Current and X5IN-601 AC Voltage Transmitters accept AC current or voltage and generate a proportional DC current or voltage compatible with process control instrumentation. Both transmitters utilize remote transformers to provide isolation between the AC parameters to be measured and the output of the module.

Input:
- Current: 0-5 Amp, AC, 50/60 Hz monitored by routing the current-carrying conductor through the Ronan supplied Current Transformer
- Voltage: 10-150 VAC, or 10-280 VAC 50/60 Hz interface via Voltage Transformer

Output Types:
a. Current: 1-5 mA (into 0-4 kohm Load)
4-20 mA (into 0-1 kohm Load)
10-50 mA (into 0-350 ohm Load)
b. Voltage: 1-5 VDC (R out=250 ohms)
2-10 VDC (R out=500 ohms)
0-5 VDC (R out=250 ohms)
0-10 VDC (R out=500 ohms)

Output Test Point: Front panel mounted test jacks allow monitoring of the output signal without disturbing field wiring or output wiring. The milliamp meter used must have 10 ohms or less input resistance

Input Load: 0.05 W max.

Accuracy: ±0.5%

Zero Adjustment: Front panel access, multi-turn infinite resolution potentiometer permits ±10% adjustment

Span Adjustment: Front panel access, multi-turn infinite resolution potentiometer permits ±25% deviation from nominal span

Isolation: Input to output, input and output to power supply. Input transformer provides >500 VRMS input isolation

Operating Temperature Range: −5°C to +60°C

Temperature Stability: <±0.3%/°C

RFI Susceptibility: <.5 mV (referred to input) +.2% of span (referred to output) when exposed to 5 W transmitter (frequency range 20 to 450 MHz) at a distance of 4 ft.

Power Supply Effect: <±0.05% of range for ±10% change on the 24 VDC supply voltage

Power Requirement: 24 VDC ±10%, 3 W nominal

Note: Specifications apply at 23° ±2°C unless otherwise indicated. Specifications subject to change without notice.

High/Low Signal Selector Transmitter Specifications

The Model X5IN-447 High/Low Signal Selector Transmitter provides selection and transmissions of either the highest or lowest of two, three or four input signals. The selection between highest or lowest input signal is made by plug-in jumper in the module. The transmitter's standard process signal output is totally isolated from the input and may be different than the input signal. Front panel access Zero and Span controls allow precise scaling of the output signal.

Input:
- Current: 1-5, 4-20, 10-50 mA
- Voltage: 0-5, 1-5, 0-10 and 2-10 VDC

Input Impedance:
- Current: 250 ohm or 1 kohm
- Voltage: 5 V inputs: >1 Mohm
10 V inputs: >500 kohms

Output Types:
a. Current: 1-5 mA (into 0-4 kohm Load)
4-20 mA (into 0-1 kohm Load)
10-50 mA (into 0-350 ohm Load)
b. Voltage: 1-5 VDC (R out=250 ohms)
2-10 VDC (R out=500 ohms)

Output Test Jacks: Front panel mounted jacks allow monitoring of output signal without disturbing field wiring or output current

Accuracy: ±0.1%

Isolation: 200 VDC or peak AC input to output to power

Operating Temperature Range: −5°C to +60°C

Temperature Stability: <±0.03%/°C

RFI Susceptibility: <.5 mV (referred to input) +.2% of span (referred to output) when exposed to 5 W transmitter (frequency range 20 to 450 MHz) at a distance of 4 ft.

Power Supply Effect: <±0.02% of range for ±10% change on the 24 VDC supply voltage

Power Requirement: 24 VDC ±10%, 1.3 W (55 mA) at 20 mA output current

Power ON: LED indicates green

Note: Specifications apply at 23° ±2°C unless otherwise indicated. Specifications subject to change without notice.

Ramp Buffer Transmitter Specifications

The Model X51N-610 Ramp Buffer Transmitter generates controlled up and down current or voltage ramps. The up and down slope of the ramp is independently adjustable within five selectable time ranges. The output signal of the transmitter will ramp in linear fashion up or down at the preset rate of change as long as the rate of change of the input is greater than the selected output rate of change.

Input:
- Current: 1-5, 4-20, 10-50 mA
- Voltage: 0-5, 1-5, 0-10, 2-10 V

Input Impedance:
- Current: 250 ohms
- Voltage: >200 kohms

Output Types:
a. Current: 1-5 mA (into 0-4 kohm Load)
4-20 mA (into 0-1 kohm Load)
10-50 mA (into 0-350 ohm Load)
b. Voltage: 1-5 VDC (R out=250 ohms)
2-10 VDC (R out=500 ohms)
0-5 VDC (R out=250 ohms)
0-10 VDC (R out=500 ohms)

Output Test Points: Front panel mounted test jacks allow monitoring of the output signal without disturbing field wiring or output current. The milliamp meter used must have 10 ohms or less input impedance

Accuracy: ±0.1% of range

Zero Adjustment: Front panel access, multi-turn infinite resolution potentiometer permits ±10% of span adjustment

Span Adjustment: Front panel access, multi-turn infinite resolution potentiometer permits ±20% deviation from normal span

Isolation:
- Output minus common to input minus
- Input and output isolated from 24 VDC power

Operating Temperature Range: −5°C to +60°C

Temperature Stability: ±0.025%/°C

RFI Susceptibility: <.5 mV (referred to input) +.2% of span (referred to output) when exposed to 5 W transmitter (frequency range 20 to 450 MHz) at a distance of 4 ft.

Power Supply Effect: <±0.02% of range for ±10% change on the 24 VDC supply voltage

Power Requirement: 24 VDC ±10%, 1.7 W max.

Ramp Ranges: Up and down ramp slopes are independently selectable and adjustable over the following ranges:
a. 50-400 msec
b. .4-3.2 sec
c. 3.2-25.6 sec
d. 25.6 sec-3.4 min
e. 3.4-27 min

Slope Adjustment: Front panel access, multi-turn infinite resolution potentiometer:
- UP: provides adjustment for output ramp slope with increasing input over the selected ramp span
- DN: provides adjustment for output ramp slope with decreasing input over the selected ramp span

Note: Specifications apply at 23° ±2°C unless otherwise indicated. Specifications subject to change without notice.

ALARM TRIPS

- All Standard Inputs Signals
- Front Panel Span, Zero and Setpoint Controls
- Alarm Contact Rating: 3 Amp Contacts at 240 VAC or 28 VDC (Resistive)
- Single and Dual Setpoint Modules
- Two SPST or one SPDT Contact Set per Setpoint
- Select Coil (Fail-Safe or Normally De-Energized) and Contacts (NO or NC) with Jumpers and Sockets
- In-Circuit Calibration via Front Panel Jacks
- High/Low Setpoint Selection
- RFI Protected

Model Number	Description	Input (I)
X5IN-400 (*)-(I)	RTD Alarm Trip Single or Dual Setpoint	9, 10, 100, or 120 ohms
X5IN-410 (*)-(I)	T/C Alarm Trip Single or Dual Setpoint	E, J, K, T, R, or S T/C
X5IN-420 (*)-(I)	mV/V Alarm Trip Single or Dual Setpoint	0-10, 0-25, 0-50 mV, 0-5, 1-5, 2-10 V
X5IN-420 (*)-(I)	mA Alarm Trip Single or Dual Setpoint	1-5, 4-20, 10-50 mA
X5IN-422 (*)-(I)	mA Alarm Trip Single or Dual Setpoint and Power Supply**	1-5, 4-20, 10-50 mA
X5IN-450 (*)-(I)	Frequency Alarm Trip Single or Dual Setpoint	0-30 Hz to 0-10 KHz
X5IN-460 (*)-(1)	Potentiometer Input Single or Dual Setpoint	10 to 20 kohms
X5IN-602 (*)-(I)	AC Current Trip Single or Dual Setpoint	Current Transformer
X5IN-604 (*)-(I)	AC Voltage Trip Single or Dual Setpoint	Voltage Transformer

*Insert the letter "D" for dual setpoint requirements.
**With integral loop power supply for two wire transmitters, 24 VDC at 20 mA.
Note: Output contacts can be configured as SPDT (Form C) by use of an external jumper. Two Form A or B contacts are standard on single setpoint modules and four Form A or B contacts are standard on dual setpoint modules.
Note: 9 ohm RTD is 10 ohms at 25°C. Input span must be specified at time of order.

Thermocouple, RTD, mV, mA, and V Alarm Trip Specifications

The Model X51N Series Alarm Trips for Thermocouple, RTD, mV, mA and voltage type inputs feature state of the art integrated circuit technology providing high accuracy and excellent repeatability. High input impedance for input devices other than the current loop ensure minimum input signal errors. The alarm trips provide single or dual setpoint with either two single pole, single throw, or one single pole, double throw contact per setpoint. Adjustable hysteresis (deadband) controls are standard features in all modules. Front panel mounted input jacks allow calibration of the setpoint or reading of the input value without disconnecting the input wiring.

Input Type:

a. Thermocouple: Type E, J, K, T, R, or S
   Impedance: >10 Mohm
b. RTD: 2-, 3-, or 4-wire 10-2,000 ohm spans
   Impedance: >100 kohm
c. mV: 10, 15, 25, 40, 50, 75, and 100 mV ranges
   Impedance: >10 Mohm
d. V: 1, 4, and 5 V ranges
   Impedance: >10 Mohm
e. V: 10 V range
   Impedance: >200 kohm
f. mA: 1-5, 4-20, 10-50 mA
   Impedance: 100 ohm

Setpoint Adjustment: Multi-turn potentiometer per setpoint provides adjustment over the entire input range

Repeatability: ±0.1% of span

Setpoint Selection: Plug-in component selects high or low setpoint

Response Time: 100 msec

Hysteresis (Deadband): Internal adjustment with graduated scale for each setpoint allows deadband adjustment from <1% to 15% of range

Isolation: 500 VRMS input to power

Common Mode Rejection: >120 dB from DC to 60 Hz at 115 VRMS

Common Mode Voltage: 500 VRMS max. without damage

Operating Temperature Range: −5°C to +60°C

Temperature Stability: ±0.03%/°C

RFI Susceptibility: <.5 mV (referred to input) +.2% of span (referred to output) when exposed to 5 W transmitter (frequency range 20 to 450 MHz) at a distance of 4 ft.

Power Requirement: 24 VDC ±10%, 2.6 W (110 mA), both setpoint relays energized and alarm LED illuminated

Power ON: LED indicator glows green for normal condition, glows red during alarm condition

Alarm Indication: Front panel LED for each setpoint indicates alarm condition

Shutdown Inhibit:

- RTD Inputs: Sensor malfunction detection circuit inhibits setpoint A relay from switching and illuminates front panel LED
- T/C Inputs: Selection of upscale or downscale failure indication

Contact Outputs: Two sets of isolated SPST or one set of SPDT contacts per setpoint. Optionally, one sets of DPDT contacts for single setpoint unit. Plug-in jumpers select normally-open or normally-closed contacts and normally energized or normally de-energized relay coils

Contact Rating: 5 A at 250 VAC or 28 VDC resistive

Note: Specifications apply at 23° ±2°C unless otherwise indicated. Specifications subject to change without notice.

TRANSMITTER/ALARM TRIPS

- Integral Transmitter and Alarm Trip on Same Module
- All Standard Input Signals
- Front Panel Span, Zero and Setpoint Controls
- Alarm Contact Rating: 3 Amp Contacts at 240 VAC or 28 VDC (Resistive)
- Single and Dual Setpoint Modules
- Two SPST or One SPDT Contact Set per Setpoint
- Change Relay Coil, High/Low Setpoint Operation, and Contact Operation with Plugs and Sockets
- In-Circuit Calibration via Front Panel Jacks
- Complete Range of Output Signals
- Adjust Transmitter Zero and Span with No Affect on Trip Setpoint
- Non-Interacting Zero and Span Controls
- RFI Protected

For Specifications See Transmitter and Trips.

Model Number	Description	Input (I)	Output (II)**
X5IN-500 (*)-(I)-(II)	RTD Transmitter/Alarm Trip Single or Dual Setpoint	9, 10, 100, or 120 ohms	Select A thru G
X5IN-510 (*)-(I)-(II)	T/C Transmitter/Alarm Trip Single or Dual Setpoint	E, J, K, T, R, or S T/C (10, 25, or 50 mV)	Select A thru G
X5IN-520 (*)-(I)-(II)	mV/V Transmitter/Alarm Trip Single or Dual Setpoint	0-10, 0-25, 0-50 mV, 0-5, 1-5, 2-10 V	Select A thru G
X5IN-520 (*)-(I)-(II)	mA Transmitter/Alarm Trip Single or Dual Setpoint	1-5, 4-20, 10-50 mA	Select A thru G
X5IN-550-(I)-(II)	Frequency Transmitter/ Alarm Trip, Single Setpoint	0-30 Hz to 0-10 KHz (Specify Range)	Select A thru G
X5IN-560 (*)-(I)-(II)	Potentiometer Transmitter/ Alarm Trip, Single or Dual Setpoint	10 ohms to 20 kohms	Select A thru G
X5IN-603 (*)-(I)-(II)	AC Current Transmitter/Trip Single or Dual Setpoint	Current Transformer	Select A thru G
X5IN-605 (*)-(I)-(II)	AC Voltage Transmitter/Trip Single or Dual Setpoint	Voltage Transformer	Select A thru G

*Insert the letter "D" for dual setpoint requirements.
**A=1-5 mA, B=4-20 mA, C=10-50 mA, D=1-5 VDC, E=2-10 VDC, F=0-5 VDC, G=0-10 VDC
Note: Output contacts can be configured as SPDT (Form C) by use of an external jumper. Two Form A or B contacts are standard on single setpoint modules and four Form A or B contacts are standard on dual setpoint modules. Input span must be specified at time of order.

POWER SUPPLIES

A broad range of power supplies is available for operation of the Series X51N Transmitter, Trip and Transmitter/Trip units. The supply voltage does not require close regulation since each module is equipped with an on-board regulator. To reduce heat dissipation in the high density package, such as the twenty module rack or surface mounted chassis, it is recommended to supply the systems with nominal 22 VDC.

Rack Mounted and Surface Mounted Power Supplies

Model Number	Output Power	Diode Gating	Power Failure Monitor
X51-115/230-60-RM	60 W	No	No
X51-115/230-120-RM	120 W	No	No
X51-115/230-180-RM	180 W	No	No
X51-115/230-120-DA/PFM-RM	120 W*	Yes	Yes
X51-115/230-180-DA/PFM-RM	180 W*	Yes	Yes
X51-115/230-120-DA/PFM-SM	120 W*	Yes	Yes
X51-115/230-180-DA/PFM-SM	180 W*	Yes	Yes
X51-115/230-60-DA/PFM-SM	60 W	Yes	Yes

RM = Rack Mount SM = Surface Mount DA = Diode Gated PFM = Power Failure Monitor Relay

*These supplies are constructed using one or more 60 watt units which are diode gated to the output terminals. Use these units for redundant power supply backup on systems with loads of 60 watts or less.

Specifications

AC Input: 100/120/220/230-240 VAC ±10%, 47-63 Hz. See chassis AC connection table for jumper requirements. Derate output current 10% for 50 Hz operation

DC Output: 22 VDC nominal

Line Regulation: ±.05% for a 10% line change

Load Regulation: ±.05% for a 50% load change

Transient Response: 50 μsec for 50% load change

Output Ripple: .02% load change

Short Circuit and Overload Protection: Automatic current limit/foldback

Efficiency (typical): 60%

Stability: ±.3% for 24-hour period after 1-hour warm up

Temperature Rating: 0°C to 50°C full rated, derated linearly to 40% at 70°C

Temperature Coefficient: ±0.3% max.

Contact Rating (PFM units only): 3 A at 115 VAC or 24 VDC

Note: Specifications subject to change without notice.

Integral Power Supply

The Model X5IN-115/230-50 DA integral power supply occupies any two positions in any X5IN Series chassis. The 50 watt capacity, integral mounted module is capable of powering the transmitters, alarm trips and transmitter/alarm trips located in the same enclosure, in most cases. The total power requirements may be calculated from the power requirements shown in the individual specifications.

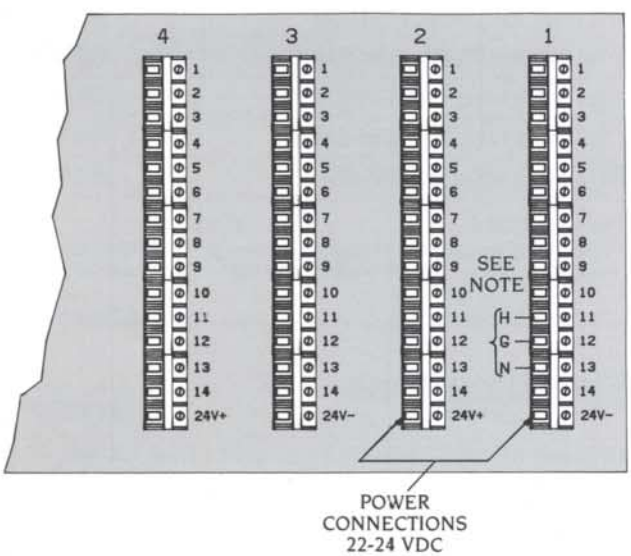
Model Number	Rated Output Power
X5IN-115AC-25	25 W
X5IN-230AC-25	25 W
X5IN-115-AC-50DA	50 W
X5IN-230AC-50DA	50 W
X5IN-125DC-50DA	50 W

Input Voltage

Size:
5.25 in. (133.35 mm) high × 1.75 in. (44.45 mm) wide
6.75 in. (171.45 mm) deep

Module Face Size:
Single: 5.25 in. (133.35 mm) high × 0.85 in. (21.59 mm) wide
Double: 5.25 in. (133.35 mm) high × 1.75 in. (44.45 mm) wide

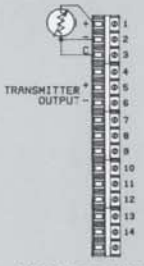
Weight:
Module: 6 oz.
Power Supply: 2 lbs., 14 oz.
19″ Rack Mount Chassis: 9 lbs., 14 oz.



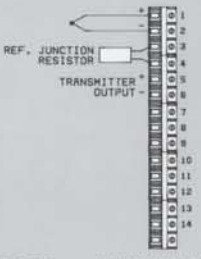
***Note:** The integral power supply may be plugged into any two chassis positions with the AC power to be connected as shown at the lowest numbered slot being occupied (i.e. number one above).

WIRING INFORMATION

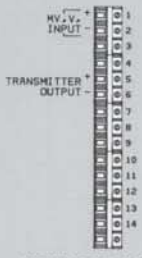
Transmitters and Computation Transmitters



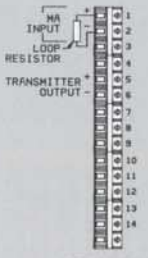
X5IN-300,300L,338
RTD INPUT



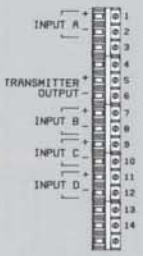
X5IN-310,310L
THERMOCOUPLE
INPUT



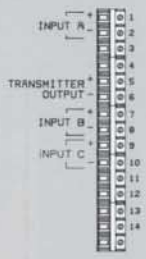
X5IN-320,442,610
mV, V FREQUENCY
INPUT



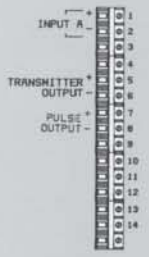
X5IN-320
mA INPUT



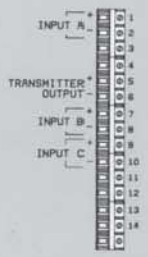
X5IN-440
ADDER/SUBTRACTER
mA, V INPUT



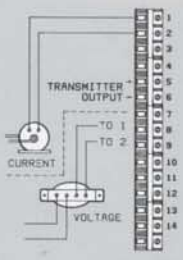
X5IN-430,432,
434,436
COMPUTATION



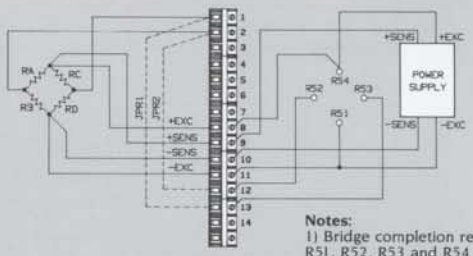
X5IN-472,492
INTEGRATOR/
TOTALIZER



X5IN-433
3 INPUT COMPUTATION



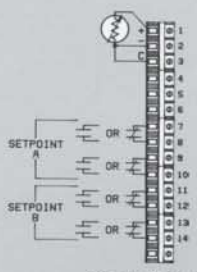
X5IN-600,601
AC CURRENT OR
AC VOLTAGE



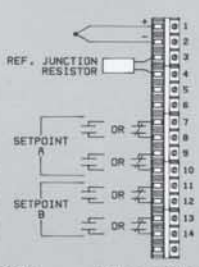
X5IN-340
STRAIN GAGE

Notes:
1) Bridge completion resistors R51, R52, R53 and R54 installed as required.
2) Jumpers JPR1 and/or JPR2 required if bridge completion resistors are used.
3) Diagram shows constant voltage excitation wiring, where ± SENSE leads are used.
4) If remote sensing is not required, jumper terminals 8 to 9 and 10 to 11.

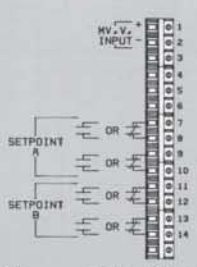
Alarm Trips



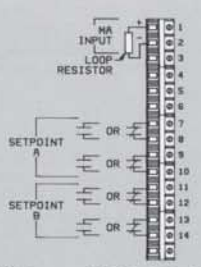
X5IN-400,400D
RTD INPUT



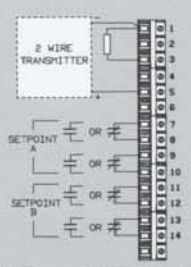
X5IN-410,410D
THERMOCOUPLE
INPUT



X5IN-420,420D,
450, 450D
mV, V FREQUENCY
INPUT

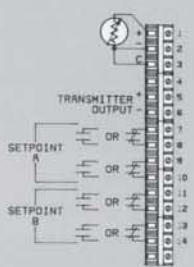


X5IN-420,420D
mA INPUT

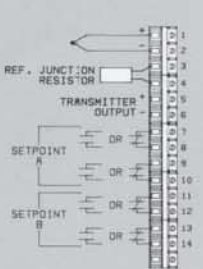


X5IN-422,422D
mA INPUT
WITH POWER SUPPLY

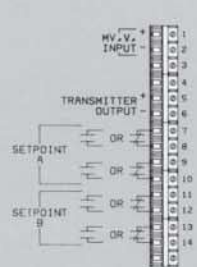
Transmitter/Alarm Trips



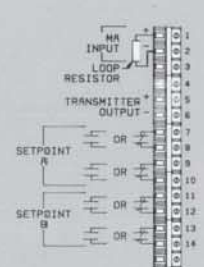
X5IN-500,500D,560,
560D RTD INPUT
POTENTIOMETER



X5IN-510,510D
THERMOCOUPLE
INPUT



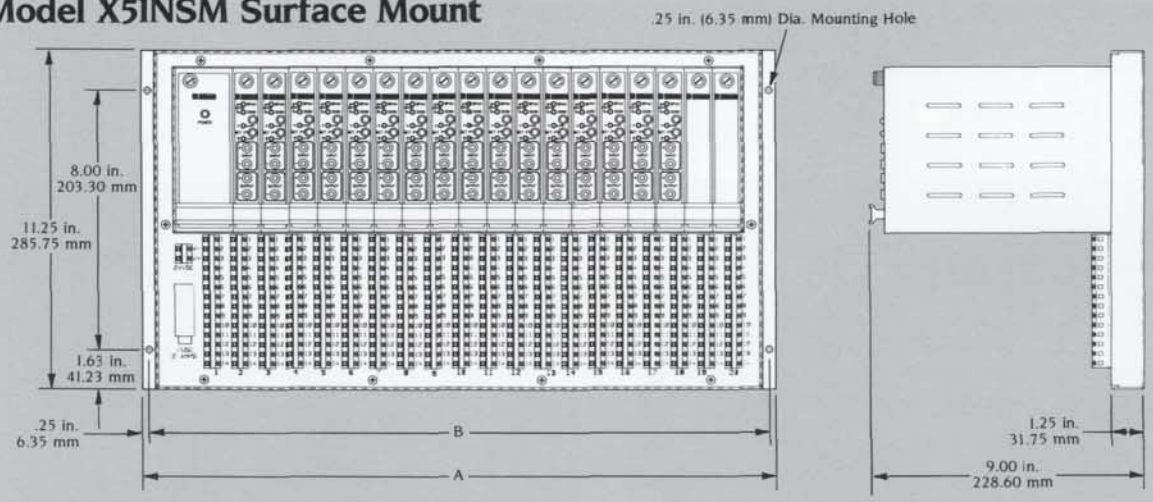
X5IN-520,520D,550
mV, V FREQUENCY
INPUT



X5IN-520,520D
mA INPUT

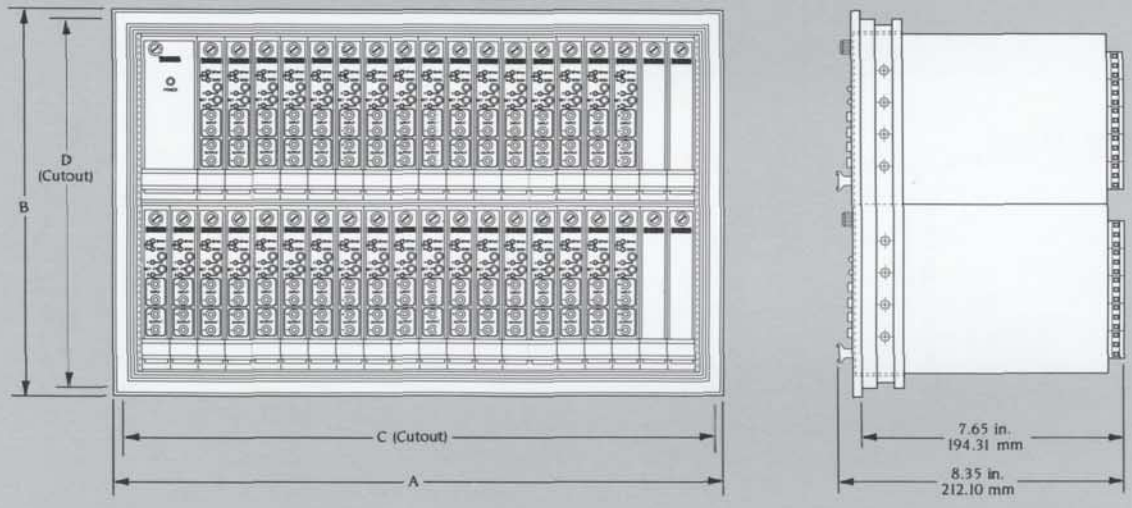
MECHANICAL SPECIFICATIONS

Model X5INSM Surface Mount



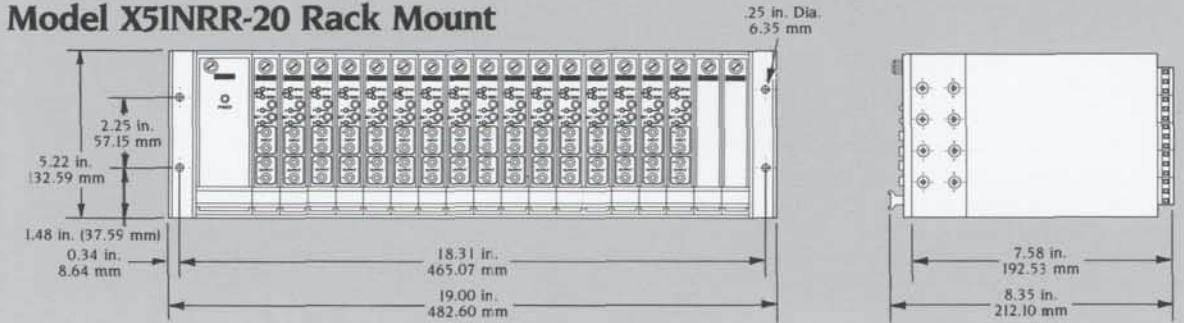
Model Number	Assembly Drawing	A	B
X5INSM-20	X5IND59	19.500 in. (495.30 mm)	19.000 in. (482.60 mm)
X5INSM-10	X5IND63	10.875 in. (276.22 mm)	10.375 in. (263.53 mm)
X5INSM-4	X5IND67	5.750 in. (146.05 mm)	5.250 in. (133.35 mm)

Model X5INPM Panel Mount

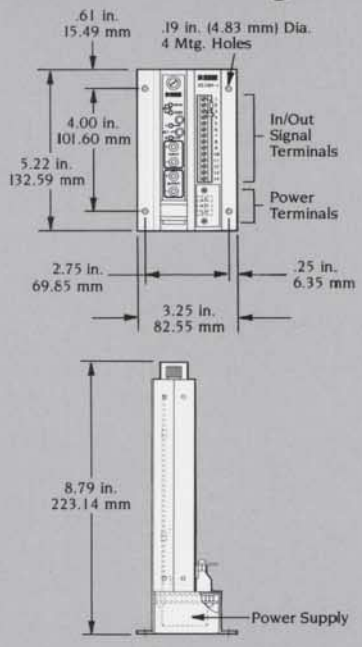


Model Number	A	B	C	D
X5INPM-40	18.88 in. (479.55 mm)	11.84 in. (300.74 mm)	18.32 in. (465.33 mm)	11.28 in. (286.51 mm)
X5INPM-20L	18.88 in. (479.55 mm)	6.62 in. (168.15 mm)	18.32 in. (465.33 mm)	6.06 in. (153.92 mm)
X5INPM-20H	10.25 in. (260.35 mm)	11.84 in. (300.74 mm)	9.69 in. (246.13 mm)	11.28 in. (286.51 mm)
X5INPM-10	10.25 in. (260.35 mm)	6.62 in. (168.15 mm)	9.69 in. (246.13 mm)	6.06 in. (153.92 mm)
X5INPM-4	5.08 in. (129.03 mm)	6.62 in. (168.15 mm)	4.53 in. (115.05 mm)	6.06 in. (153.92 mm)

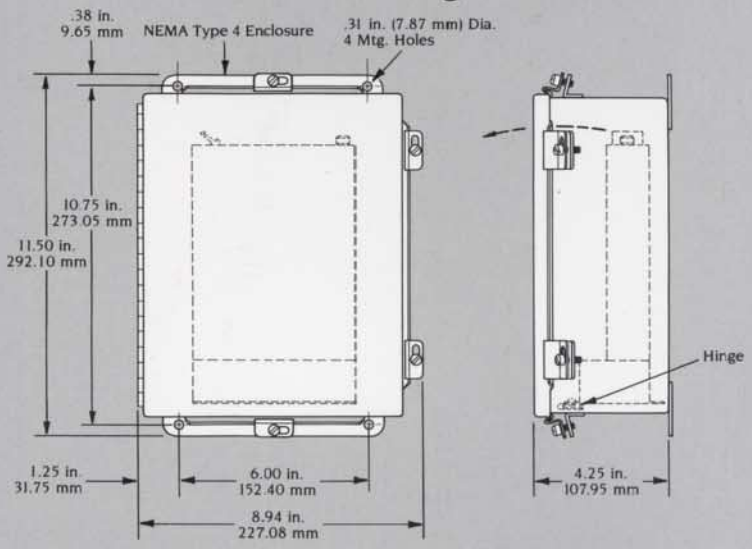
Model X5INRR-20 Rack Mount

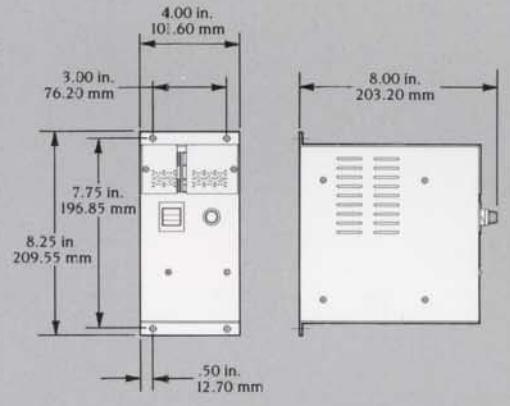


Model X5INSM-1-24VDC
Model X5INSM-1-115/230VAC
Surface Mount/Single Module



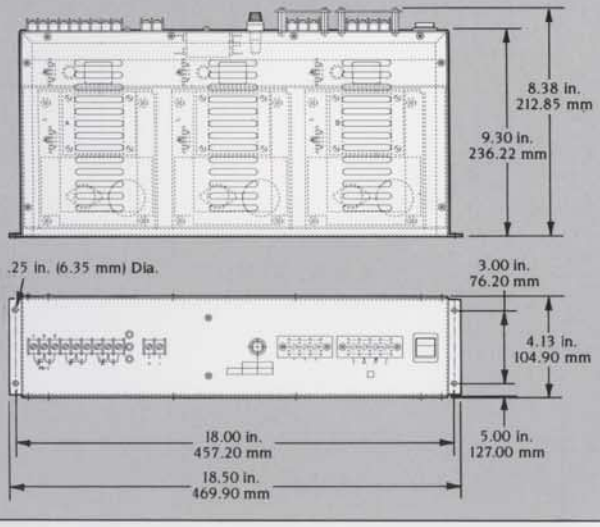
Model X5INSM-1-24-N4
Model X5INSM-1-115/230-N4 (NEMA-4)
Surface Mount/Single Module



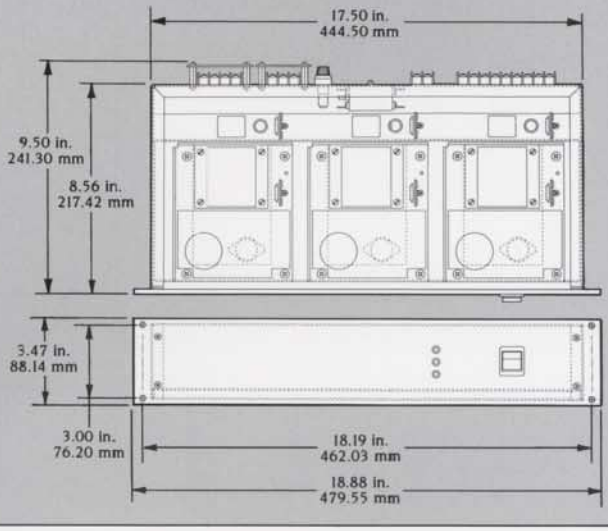


Model X51-115/ 230-60-DA/PFM SM Power Supply

Model X51-115/230-120/180DA/PFM SM Power Supply



Model X51-115/230-60/120/180RM Power Supply



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