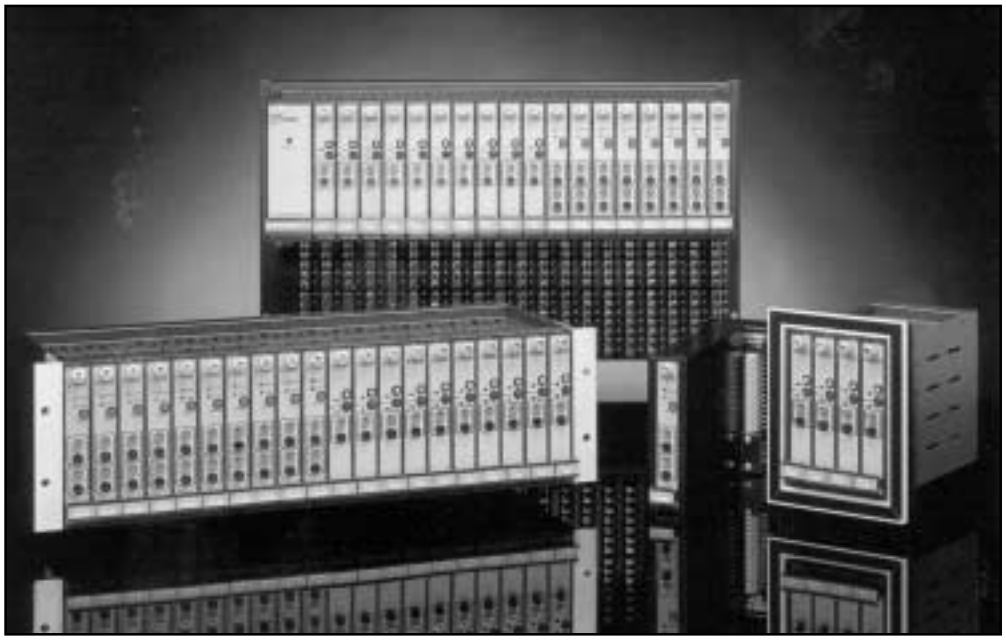
Instructions
and
Operating Manual

SERIES X51

RTD • POTENTIOMETER

Transmitters • Alarm Trips • Transmitter/Alarm Trips



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1.0 GENERAL DESCRIPTION

The Ronan Series X51-300 and -438 transmitters, Series X51-400 and -460 alarm trips and Series X51-500 and -560 transmitter/alarm trips accept inputs from RTD and potentiometer sources, are fully isolated and provide current or voltage outputs. The X51-400 and -460 Series alarm trips is fully isolated and provides two form A or form B contacts (or one form C) per setpoints. The Series X51-500 transmitter/alarm trip combines the features of the -300 and -400 Series in a single module. Test points for monitoring the input and output signals or for injecting a calibration input, without disturbing the field wiring, are provided at the front panel. All of the modules have a power-on indicator at the front panel. The X51 Series of instrumentation modules utilizes power-efficient circuit designs, requiring a minimum amount of power for operation. The Model X51-300 Series transmitters, for example, requires only 1.3 W of power when providing a full-scale output of 20 mA. The input sensor type and/or the temperature range is determined by a plug-in submodule that can be readily changed. The concept of easily configuring the modules is extended in the alarm trip modules to the selection of high or low setpoints, normally energized or normally de-energized relays and normally open or normally closed relay contacts. These options are determined by the positioning of plug-in jumpers.

2.0 SPECIFICATIONS

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

2.1 TRANSMITTERS, ALARM TRIPS AND TRANSMITTER/ALARM TRIPS

2.1.1	INPUTS:	RTD or potentiometer, 2-, 3- or 4-wire, 10-2000 ohm spans.
2.1.2	INPUT IMPEDANCE:	> 100 kohms.
2.1.3	INPUT OPEN-CIRCUIT RESPONSE:	Upscale for transmitters. Sensor failure detection circuit inhibits alarms and illuminates front panel LED on alarm trip modules.
2.1.4	CALIBRATED ACCURACY, INCLUDING LINEARITY:	±0.1% of span.
2.1.5	ISOLATION:	500 VRMS input to output; input and output to power.
2.1.6	COMMON MODE REJECTION:	Greater than 120 dB, dc to 60 Hz, 0-100 VRMS.

2.1.7 COMMON MODE VOLTAGE: 500 VRMS maximum.

2.1.8 TEMPERATURE STABILITY: ±0.025%°C, −5°C to +60°C.

2.1.9 POWER CONSUMPTION:

A. Transmitter, 20 mA Output: 1.3 W maximum.
B. Alarm Trip, Dual Setpoint: 2.6 W maximum.
C. Transmitter/Trip: 20 mA output and both setpoint relays energized 3.4 W maximum.

2.1.10 POWER SUPPLY: 24 Vdc ±10%

The Ronan Power Supply Model No. X51-115-60, -120 or -180 provides 60 W, 120 W and 180 W, respectively, of regulated power in 3.5″ of vertical rack space. Power Supply Model No. X51-115-25 occupies two spaces in a standard X51 rack-mount or panel-mount chassis and provides 25 W of power. Model No. X51-115-25 is unregulated.

2.1.11 INPUT TEST POINTS: Front panel test points are provided to allow the application of a calibration input to the module without disturbing the input field wiring. Alternately, the input signal from the field can be monitored at the input test points through the use of a high-impedance voltmeter (10 megohms or more). See Section 3.0 (Operation) and Section 3.5 (Calibration) for calibration information.

2.1.12 POWER-ON INDICATOR: LED illuminates green when module is energized.

2.1.13 SIZE: Plug-in cards are 3.94″ × 6.30″ (100 mm × 160 mm). Rack mount is 5.25″ high × 19″ wide by 7.7″ deep (132.54 mm × 482.60 mm × 195.58 mm).

2.2 TRANSMITTERS;

2.2.1 FRONT PANEL CONTROLS:

A. Span Adjust: Multi-turn potentiometer provides ±25% adjustment range.
B. Zero Adjust: Multi-turn potentiometer provides ±25% adjustment range.

2.2.2 OUTPUT:

A. 0-1 mA into 0-20 kohm load.
B. 0-5 mA into 0-4000 ohm load.
C. 0-10 mA into 0-2000 ohm load.
D. 0-20 mA into 0-1000 ohm load.
E. 4-20 mA into 0-1000 ohm load.
F. 0-1 Vdc: R out = 50 ohms.
G. 0-5 Vdc, 1 to 5 Vdc: R out = 250 ohms.
H. 0-10 Vdc: R out = 500 ohms.

2.2.3 OUTPUT TEST POINTS:

Front panel test points allow monitoring of output signal from front panel without disturbing field wiring or output current. The mA meter used must have 10 ohms or less input resistance.

2.3 ALARM TRIPS

2.3.1 FRONT PANEL CONTROLS:

A. Setpoint Adjust: Multi-turn potentiometer provides setpoint adjustment over input range.
B. Alarm Indication: Front panel LED for each setpoint illumintates **red** when setpoint is exceeded.
C. Test Points: See Section 2.1.11.

2.3.2 RESPONSE TIME:

100 ms.

2.3.3 HYSTERESIS:

Internal adjustment with graduated scale provides deadband adjustment from approximately 1%-15% of range.

2.3.4 CONTACT OUTPUTS:

Two sets of normally open or normally closed contacts for each setpoint.

2.3.4 CONTACT RATING:

3 amps at 240 Vac or 28 Vdc, resistive.

2.3.6 PLUG-IN COMPONENTS:

Plug-in components select high or low setpoint operation, normally energized or normally de-energized relays, and normally closed contacts.

3.0 OPERATION

3.1 ENCLOSURES AND POWER SUPPLIES

The Series X51 modules plug into a standard 19″ wide × 5.25″ high × 7.7″ deep (482.60 mm × 132.54 mm × 195.58 mm) rack mount. The rack mount holds up to twenty plug-in modules which may be intermixed as required. A four-position, panel-mounted chassis is also available, as are a selection of surface-mount chassis.

The enclosures require 24 Vdc ± 10% for operation of the modules (22 Vdc is recommended for minimum power dissipation and heat-rise inside the chassis). The Ronan Model X51-115-60, -120 or -180 power supplies provide 22 Vdc at 60 W, 120 W and 180 W, respectively. The 24 Vdc power is connected to the rack mount at the position 1 and 2 terminal strips, at the very bottom screw terminals, labeled "24 V−" and "24 V+." The same terminals in terminal strip positions 3 and 4 are connected in parallel to these, are similarly labeled, and may be used to "daisy chain" the power to another chassis.

The Ronan Model X51-115-25 is a small, unregulated plug-in power supply that requires only two module positions in any of the chassis types. It is capable of powering modules with a total power requirement of 25 W or less. The output voltage of the X51-115-25 power supply is available at the back of the chassis and can be used to power other modules as long as the total load power doesn't exceed 25 W.

3.2 INPUT TEST POINTS

The input test points at the front panel of most of the X51 Series of trips and transmitters provide a convenient means of monitoring the field input signal, or of injecting a calibration signal without disturbing the field wiring.

3.2.1 SIMULATED RTD INPUT

A mV signal can be applied to the input "+" and "−" test points, simulating an RTD input value for calibrating an RTD input module. A calibrator with an output impedance of less than 1 ohm should be used to avoid calibration errors. This calibration procedure is only accurate for a properly connected 3-wire RTD. If 2-wire sensors are used, the resistance of the "+" and "−" connecting wires appears in series with the sensor. A calibration voltage equal to 1.0 mV per ohm of input resistance to be simulated should be applied to the input test points.

When measuring the field input at the front panel input test points, an accurate meter with an input impedance of 10 megohms or more should be used. Also, the input current of the calibrator can be a source of error when measuring low-level inputs. A 10 mV measurement error occurs for each five nanoamperes of calibrator input current. The RTD value connected to the module is represented at the input test points as 1 mV per ohm. Again, this measurement can be considered accurate only for a properly connected 3-wire sensor. If a 2-wire sensor is used, the lead wire resistance will be added to the sensor resistance in the measurement.

3.3 OUTPUT TEST POINTS

The output test points are available on modules that have transmitter outputs. The output value is measured by a mA measurement device whose input resistance is 10 ohms or less in the current measuring mode. The mA meter is connected to the "+" and "−" output test points and indicates the output current directly in mA without disturbing the output current to the normal load. If the transmitter provides a voltage output, the output value will still be indicated in mA at the monitored test points. For this case the output voltage can be calculated from the current readings in terms of percentages of full-scale.

$$V_o = \frac{\text{mA at test points} - \text{mA at output span zero}}{16} \times V_o \text{ span} + \text{output voltage span zero}$$

The equation reduces as follows for two common voltage outputs:

$$\text{1-5 V output: } V_o = \frac{\text{mA at test points}}{4}$$

$$\text{0-5 V output: } V_o = \frac{\text{mA at test points}}{16} \times 5 \text{ V}$$

4.0 CIRCUIT DESCRIPTION

4.1 MODEL X51-400, -400D RTD ALARM TRIPS; MODEL X51-460, -460D POTENTIOMETER ALARM TRIPS (SCHEMATIC X51-1010)

The Series X51-400 and -460 RTD or potentiometer alarm trips consist of a transformer coupled dc-to-dc converter power supply circuit, an input signal conditioning amplifier and one or two setpoint circuits. Each setpoint circuit has a front panel SETPOINT control, status-indicating LED and relay output with two sets of normally open or closed contacts per setpoint. Input test points are accessible at the front panel. See Section 3.2 for detailed test point information.

4.1.1 POWER SUPPLY:

The dc voltage (22-24 Vdc) enters the card at connector pins 15 (+) and 16 (−). This voltage is regulated on the card to +18 V by VR1 and applied to the oscillator circuit, IC7, and the transformer driver, IC8. Oscillator IC7 provides an approximate 60 kHz drive signal to the CMOS buffer/driver circuits in IC8. The circuits in IC8 provide complimentary output switches that alternately drive terminals 1 and 2 of transformer T1 to +18 V and V−. The voltages that power the isolated input circuits are derived from windings 5-6 and 7-8, which are connected in parallel. The voltages used are V1+ (approx. +15.5 V), V1− (approx. −15.5 V), +VR (+2.5 V), and −VR (−2.5 V).

4.1.2 INPUT AMPLIFIER:

The input amplifier consists of the dual operational amplifier, IC6-A and -B, and the associated circuit components. The 3-wire input sensor is connected to the card at connector pins 1 (+), 2 (−) and 3 (com.). Two current source circuits, Q4 and Q3, supply 1 mA to the sensor and through the "−" lead for lead resistance compensation. Both currents return to the module through the common lead to connector pin 3. The potentiometer, R48, is used to adjust the current through the sensor to precisely 1.00 mA. The sensor voltage at connector pin 1 is applied to the "+" input of the differential amplifier made up of IC6-A and -B. The voltage at the junction of R39 and the collector of Q4 is applied to the "+" input of the amplifier. The gain of the amplifier, a function of the input range, is determined by the ratio of R38 and R32 (R41's value equals R38's). The amplifier's output voltage range, for standard input ranges, is from approximately 0 V to +4 V. The circuit made up of IC2 and the associated components is a sensor-monitoring circuit that detects an open or shorted RTD and inhibits the "A setpoint" circuit from going into the alarm condition. When this sensor failure circuit is active, the "A setpoint" front panel LED will illuminate in the **red** or **alarm** condition.

4.1.3 SETPOINT CIRCUITS

The "setpoint B" circuits are identical in structure and only the "setpoint A" circuit operation will be explained in the following paragraphs.

The signal from amplifier IC6 is applied to the setpoint circuit(s) through R44 (R44 and R43 for dual setpoint models). The resistors R5 and R44 form a voltage divider between the voltage at the SETPOINT control, R2, and the amplified input voltage at IC6-1. The voltage at the junction of R5 and R44 is applied to the inverting input of the comparator IC1-B and causes the comparator to "trip" when this voltage goes above zero volts (high setpoint operation). For high setpoint operation, the output of IC1-B switches from about +13 V (normal condition) to about −13 V when in the alarm condition. When in the alarm condition, part of the output of IC1-B is fed to the "+" input of IC1-B through CR1, R7, R13 and R6, providing some amount of hysteresis, or deadband. The potentiometer R13 provides for adjustment of the hysteresis, or deadband, from about 1%-15% of the input range. A graduated scale is silkscreened on the printed circuit board at this control which provides calibrated setability.

High or low setpoint operation is selected by placement of two plug-in parts for each system. For high setpoint operation, both jumper plugs are placed in the "A setpoint" HI positions. (For dual setpoint models, the "A" and "B" jumper plugs must be in the desired operating positions.) A jumper plug for each setpoint is provided for normally energized (NE) or normally de-energized (NDE) relays. This jumper functions independently from the HI/LO setpoint selection jumpers. Each relay contact output can be selected for normally open (NO) or normally closed (NC) operation by the placement of a jumper plug for each relay contact. The NO and NC nomenclature on the printed circuit board reads correctly for a normally de-energized relay. If the relay(s) is (are) selected to operate in the normally energized condition, then NO has to be interpreted as NC and vice versa. The front panel alarm indicator, LED 1, is driven by IC1-D and illuminates **red** when the circuit is in the alarm condition independently of the positions of the jumper plugs. The signal which causes the relay switchover is optically coupled from the input circuit voltage domain to the relay drive transistor through the opto-isolator IC4 (Schematic X51-1010). The power to operate the 24 V relay is then obtained from the common system 24 V power supply.

4.2 MODEL X51-300 RTD TRANSMITTER; MODEL X51-438 POTENTIOMETER TRANSMITTER (SCHEMATIC X51-1004)

The Model X51-300, 438 transmitters consist of a transformer coupled dc-to-dc converter power supply circuit, an input signal conditioning amplifier, a signal isolation circuit and an output amplifier. SPAN and ZERO controls are accessible at the front panel as are input and output test points. (See Sections 3.2 and 3.3 for detailed test point information.)

4.2.1 POWER SUPPLY

The dc voltage (22-24 Vdc) enters the card at connector pins 15 (+) and 16 (−). This voltage is regulated on the card to +18 V by VR1 and applied to the oscillator circuit, IC2, and transformer T1. The oscillator circuit of IC2 provides an approximate 80 kHz signal to the VMOS drivers Q3 and Q4 to alternately pull down windings 3 and 1 of transformer T1 to V−. The transformed voltages that power the transmitter circuits are derived from windings 8-9 (isolated input amplifier) and windings 4-5 and 7-6 (output amplifier). The voltages used for the input amplifier are V1+ (+9 V), V1− (−9 V), +VR (+2.5 V), −VR (−2.5 V). The voltages supplied to the output amplifier are V2+ (+25 V) and V2− (−8 V).

4.2.2 INPUT AND OUTPUT AMPLIFIERS

The input amplifier consists of the dual operational amplifier, IC1-A and -B, and the associated circuit components. The 3-wire input sensor is connected to the card at connector pins 1 (+), 2 (−) and 3 (com.). Two current source circuits, Q1 and Q2, supply 1 mA to the sensor and through the "−" lead, for lead resistance compensation. Both currents return to the module through the common lead to connector pin 3. The potentiometer, R9, is used to adjust the current through the sensor to precisely 1.00 mA. The sensor voltage at connector pin 1 is applied to the "+" input of a differential amplifier made up of IC1-A and -B. The voltage at the slider of the ZERO control, R2, is applied to the "−" input of the amplifier. The gain of the amplifier, a function of the input range, is determined by the ratio of R4 and R12. (R7's value equals R4's.) The amplifier's output voltage range, for standard input ranges, is from approximately ϕ V to +4 V.

The signal is coupled across transformer T2 and demodulated and filtered by switches Q2, R25 and C17. The signal is inverted by T2 and is again positive at the input to IC4. The output current is controlled by amplifier IC4 through transistor Q8. The output current path is from +V2, through Q8, D16, the external load, connected between connector pins 5 and 6, and resistors R30 and R31. The voltage developed across R30 and R31 is fed back to the inverting input of IC4 and is controlled by the amplifier circuit so that it is always equal to the signal voltage at the non-inverting input, pin 3 (neglecting the small zero offset voltage of IC4). The output current is then determined by the values of R30 and R31. Transistor Q7 is used to limit the output overrange current to about 35 mA. Refer to Section 3.3 "Output Test Points" for an explanation of the operation of the output test points. Resistor R29 is used to convert the output from current to voltage where voltage output options are used.

4.3 MODEL X51-500, -500D RTD TRANSMITTER/ALARM; MODELS X51-560, -560D POTENTIOMETER TRANSMITTER/ALARM TRIP (SCHEMATIC X51-1006)

The Model X51-500 and -560 transmitter/alarm trip series consists of a transformer coupled dc-to-dc converter power supply circuit, an input signal conditioning amplifier, a signal isolation circuit, a current output amplifier, and one or two setpoint circuits. The power supply and transmitter circuits are identical to those of Section 4.2. Refer to Section 4.2 and Schematic X51-1004 for the description of these circuits. The setpoint circuits are described in Section 4.1.3. See schematic X51-1010 and the text in Section 4.1.3 for a description of the setpoint circuits. The circuits shown on Schematic X51-1006 are identical to these, only the parts designators are different.

5.0 CALIBRATION

Calibration of the Model X51s described in this manual consists of applying a known, accurate signal to the inputs, or input test points, and adjusting the ZERO and SPAN controls for transmitters or the SETPOINT controls for alarm trips. Refer to Sections 3.2 and 3.3 for calibration information when using the test points.

5.1 RTD OR POTENTIOMETER INPUT MODULES

Calibration of the RTD of potentiometer input models may be performed by using a precision resistance box connected as shown in Figure 5-1, or a calibration method as described in Section 3.2.

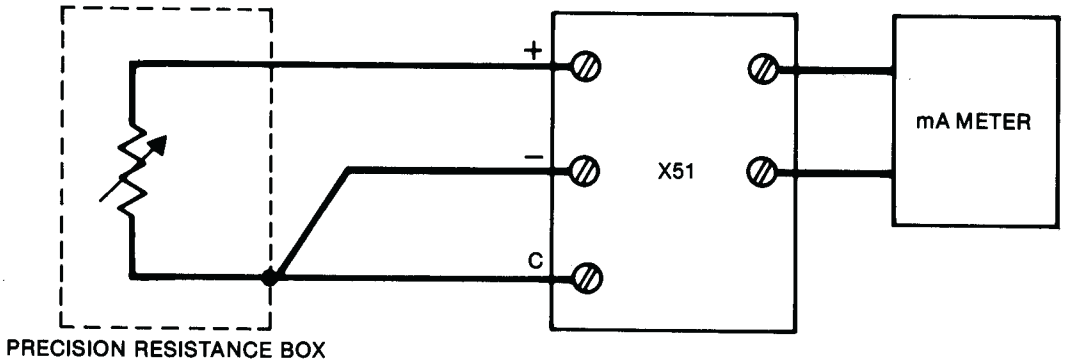

Figure 5-1: Calibration Circuit Using Precision Resistance Box

5.2 MODEL X51-300 RTD; MODEL X51-438 POTENTIOMETER TRANSMITTER (SCHEMATIC X51-1004)

Connect a resistance input as in Figure 5-1 to the input terminals. The input test points may be used as input terminals for the calibration signal per Section 3.2. For laboratory calibration, it is recommended to apply the calibration input between connector pins 1 and 2 or rear enclosure input terminals "+" and "–" terminals.

5.2.1 INTERNAL ZERO ADJUST

5.2.1.1 Set the input to the card under test at its span zero value. The referred-to-output (RTO) zero adjust, R4, is to be calibrated.

5.2.1.2 Monitor the voltage at IC1, pin 6 (junction of R4 and R1) with a 4.5 digit mV meter and adjust the front panel ZERO control, R2, for 0.00 V at IC1, pin 1. Alternately, connect a jumper between IC1, pin 1 and ground 1 (end of R7 or R10).

5.2.1.3 With IC1, pin 1 at 0 V, adjust R3 for 4.00 mA output from the transmitter.

5.2.1.4 Remove the jumper,if any, or meter at IC1, pin 1 and adjust the front panel ZERO control for an output of 4.00 mA (the input is still at span zero).

5.2.1.5 Set the input to the span full-scale value and adjust the front panel SPAN control for a 20.00 mA output. This completes the transmitter calibration.

5.3 MODELS X51-400, -400D RTD; MODELS X51-460, -460D POTENTIOMETER ALARM TRIP (SCHEMATIC X51-1010)

Refer to Sections 5.1 and 5.2 for the calibration signal input hookup.

5.3.1 SETPOINT CALIBRATION

5.3.1.1 Set the hysteresis control R13 (and R21 if dual setpoint) to its maximum counter-clockwise position.

5.3.1.2 Set the input signal to the value required at the alarm-trip setpoint.

5.3.1.3 Adjust the SETPOINT control to be calibrated clockwise until the normal condition is achieved (adjust counter-clockwise for low setpoint calibration). Find the approximate trip position of the SETPOINT control from the normal toward the alarm condition, stopping just at the point where the module "trips" to the alarm condition (the alarm condition is indicated by the illumination of the **red** front panel LED). This calibrates the module to trip at the input value applied for the calibration. Repeat this procedure for the second setpoint, if applicable.

5.3.1.4 Set the hysteresis control, R13 (and R21 for dual setpoint models) to the desired hysteresis value. The hysteresis starts at a base of 1% of input span and adds about 1.5% of span for each clockwise division on the scale.

5.4 MODELS X51-500, -500D RTD; MODELS X51-560, -560D POTENTIOMETER TRANSMITTER/ALARM TRIPS (SCHEMATIC X51-1006)

The Model X51-500, -500D, -560, -560D series combines the transmitter and trip functions of the models discussed in Sections 5.2 and 5.3. Refer to these sections for calibration procedures for the transmitter function (Section 5.2) and the alarm trip function (Section 5.3).

6.0 TROUBLESHOOTING/REPAIR

The Model X51-EXT extender board is recommended as an aid to troubleshooting to allow access to the components while the module is powered-up. Alternately, a bench test or calibration set-up should allow access to the components. Visually inspect the module for any obvious damage to the components or printed circuit board.

The troubleshooting procedure should start with a check of the power supplies. Refer to Sections 4.1.1 and 4.2.1 for descriptions of the power supplies, oscillating frequencies and output voltages. The power supplies must be functioning properly before any further troubleshooting can be performed.

When troubleshooting, always apply an input signal that is within the operating range of the module under test and monitor the output(s) (current output for transmitters and relay status for alarm trips). The input amplifier should provide an output that responds proportionally to variation in the input signal. If the input test points are used, refer to Section 3.1 for information concerning the use of these test points. The input amplifier provides an output from approximately zero to about +4 V when a signal for one of the standard inputs is applied. There may be a deviation from the +4 V level when a unit is calibrated for a "non-standard" input range. Transmitters and the transmitter section of a transmitter alarm trip have a signal-inverting amplifier between the input amplifier and the isolation transformer circuit. The nominal output of this amplifier is from −0.25 V at span zero to −1.25 V at span full-scale. The signal is inverted as it is transformed to the secondary of the signal isolation transformer and appears in the range of approximately +.25 V to +1.25 V at the junction of R25 and C17 (Schematic X51-1004). In general, verify the circuit function as the signal is traced from the input to the output. Utilize the information in Section 4.0, "Circuit Description."

Parts List—MODELS X51-300, -9, -10, -100, -120 RTD TRANSMITTER

Item	Qty.	Code	Part No.	Description	Vendor
1	1		X51-1004B	Printed Circuit Board	Ronan
2	1		X51-C9-5	Front Panel	Ronan
3	1		47-10-202-10	Fastener	Southco
4	1		X51B16	Bracket	Ronan
5	1		X51B6	Handle	Ronan
6	2		3542-2	Pin Jack, Red	Pomona
7	2		3542-0	Pin Jack, Black	Pomona
8					
9	2	R10,18	RC07GF682J	Resistor, 5%, ¼ W, 6.8 k	A.B.
10	3	R14,21,28	RC07GF222J	Resistor, 5%, ¼ W, 2.2 k	A.B.
11	1	R22	RC07GF472J	Resistor, 5%, ¼ W, 4.7 k	A.B.
12	2	R23,24	RC07GF103J	Resistor, 5%, ¼ W, 10 k	A.B.
13	1	R25	RC07GF102J	Resistor, 5%, ¼ W, 1 k	A.B.
14	1	R33	RC20GF182J	Resistor, ¼ W, 1.8 k	A.B.
15	2	R12,17	RN55C1001	Resistor, ¼ W, 1.00 k	Mepco
16	1	R15	RN55C1002	Resistor, ¼ W, 10.0 k	Mepco
17	1	R16	RN55C3092	Resistor, ¼ W, 30.9 k	Mepco
18	1	R19	RN55C3401	Resistor, ¼ W, 3.40 k	Mepco
19	1	R30	RN55C49R9	Resistor, ¼ W, 49.9 k	Mepco
20	1	R31	RN55C13R0	Resistor, ¼ W, 13 ohms	Mepco
21	1	R32	RN55C2942	Resistor, ¼ W, 29.4 k	Mepco
22					
23	1	R1	89PR10K	Trim Potentiometer, 10 k	Beckman
24	1	R2	89PR200	Trim Potentiometer, 200 ohms	Beckman
25	1	R3	89PR5K	Trim Potentiometer, 5 k	Beckman
26	1	R9	72P-100	Trim Potentiometer, 100 ohms	Beckman
27					
28	1	J1		Not Used	
29	6	R4,5,6,7,8,11		See Table 2	
30	1	R29		See Table 1	
31	12	C1,2,3,4,7,8,10, 11,14,15,16,17	685R350T10	Capacitor, Tantalum, 6.8 mfd/35 V	Sprague
32	1	C5	820R501M05	Capacitor, Mica, 82 pFd/500 V	Arco
33	2	C9,12	103A500C20	Capacitor, Ceramic, .1 mfd/50 V	Sprague
34					
35	2	D1,4	LM336Z-2.5	Diode, Reference Voltage	National
36	8	D2,5,6,8,9,10, 11,12	1N4148D	Diode, Signal	Fairchild
37	4	D13,14,15,16	IN0457A	Diode, Low Leakage	Fairchild
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Parts List—MODELS X51-300, -9, -10, -100, -120 RTD TRANSMITTER

Item	Qty.	Code	Part No.	Description	Vendor
39	2	Q1,2	2N4249	Transistor	Fairchild
40	2	Q4,5	VN88AF	FET	Siliconix
41	1	Q7	2N4410	Transistor	National
42	1	Q8	MJE243	Transistor	Motorola
43					
44	1	VR1	A78M18CFL	18 V Regulator	Fairchild
45			226OR	Heat Sink (on VR1)	Thermalloy
46	1	IC1	LM358N	Dual Op Amp	National
47	1	IC2	CD4047BE	Astable Multivibrator	R.C.A.
48	2	IC3,4	LM307N	Op Amp	National
49	1	T1	X51B1	Transformer	SAE
50					
51	1	P1	14-511-11	14-Pin DIP Socket	Aries
52	1		14-600-11	14-Pin DIP Header	Aries
53	1		14-650-10	14-Pin DIP Header Cover	Aries
54					
55	1	LED 1	5082-4950	LED, Green	H.P.
56	1		100-816-053	16-Pin DIP Connector, Male	Panduit
57	1		X51A56	Heat Sink	Thermalloy
			OPTIONAL PARTS FOR ISOLATION		
58	1	R20	RG07GF224J	Resistor, 5%, ¼ W 220 k	
59	1	R26	RC07GF474J	Resisotr, 5%, ¼ W 470 k	A.B.
60	1	R27	RC07GF682J	Resistor, 5%, ¼ W 6.8 k	
61					
62	2	C6,13	200R501M05	Capacitor, Mica 20 pfd/500 V	
63	2	CR7,15	1NO457A	Diode, Low Leakage	Fairchild
64	2	Q3,6	2N4393 or MPF4392	FET	Motorola
65	1	T2	PE2231X	Transformer	Pulse Engr.
66					

If not isolated, install jumper between junction of R19, R20 and closest end of R25.

Parts List—MODELS X51-300, -9, -10, -100, -120 RTD TRANSMITTER

	1-5 V	2-10 V	mA
R29	249 ohm	499 ohm	Not Used

Table 1

	Pt, Ni, RTD (100, 120)	9, 10 CU RTD
R6	2.43 k	464
R11	2.49 k	499
R5	See Table 3	
R8	See Table 3	
R4, R7	See Table 3	

Table 2

$$R5 = \text{RTD at span zero} - (.25 \times \Delta\ \text{RTD})$$

$$R8 = \frac{100 \times \Delta\ \text{RTD}}{200 - .5\ \Delta\ \text{RTD}}$$

	Pt, Ni, RTD	9, 10 CU RTD
R4, R7	$\frac{4 \times 10^6}{\Delta\ \text{RTD}} - 1000$	$\frac{8 \times 10^6}{\Delta\ \text{RTD}} - 1000$

Table 3

Parts List—MODELS X51-400, -400D RTD ALARM TRIP; MODELS X51-460, -460D POTENTIOMETER ALARM TRIP

Item	Qty.	Code	Part No.	Description	Vendor
1	1		X51-1010B	Printed Circuit Board	Ronan
2	1		X51C9-4	Panel (400, -460)	Ronan
3	1		X51C-3	Panel (-400D, -460D)	Ronan
4	1		X51B6	Handle	Ronan
5	1		X51B16	Bracket	Ronan
6	1		3542-2	Pin Jack, Red	Pomona
7	1		3542-0	Pin Jack, Black	Pomona
8	1		100-816-053	16-Pin DIN Connector, Male	Panduit
9					
10	1	R8	RC07GF681J	Resistor, ¼ W, 5% 680 ohm	A.B.
11		R22	RC07GF222J	Resistor, ¼ W, 5% 2.2 k	A.B.
12	1	R11	RC07GF272J	Resistor, ¼ W, 5% 2.7 k	A.B.
13	6	R23,25,26,30 35,36	RC07GF472J	Resistor, ¼ W, 5% 4.7 k	A.B.
14	1	R18	RC07GF332J	Resistor, ¼ W, 5% 3.3 k	A.B.
15	1	R46	RC07GF682J	Resistor, ¼ W, 5% 6.8 k	A.B.
16	3	R27,42,45	RC07GF103J	Resistor, ¼ W, 5% 10 k	A.B.
17	1	R4	RC07GF224J	Resistor, ¼ W, 5% 220 k	A.B.
18					
19	1	R6	RN55C1000	Resistor, 1% M.F. 100 ohms	Mepco
20	1	R15	RN55C3921	Resistor, 1% M.F. 3.92 k	Mepco
21	1	R24	RN55C2000	Resistor, 1% M.F. 200 ohms	Mepco
22	2	R31,32	RN55C1001	Resistor, 1% M.F. 1.0 k	Mepco
23	1	R14	RN55C6041	Resistor, 1% M.F. 6.04 k	Mepco
24					
25	1	R10	RN55C8251	Resistor, 1% M.F. 8.25 k	Mepco
26	1	R5	RN55C1132	Resistor, 1% M.F. 11.3 k	Mepco
27	1	R44	RN55C2002	Resistor, 1% M.F. 20.0 k	Mepco
28	1	R33	RN55C2942	Resistor, 1% M.F. 29.4 k	Mepco
29	1	R7	RN55X1273	Resistor, 1% M.F. 127 k	Mepco
30					
31	1	R2	89PR10K	Potentiometer, 10 k	Beckman
32	1	R13	91B-2K	Potentiometer, 2 k	Beckman
33		R15,24,38,39,40, 41,43,44,47		See Table 1 and Table 2	
34					
35	1	C11	121R501M05	Capacitor, D.M. 120 pFd	Arco
36	1	C1	103R101C20	Capacitor, Ceramic .01/100 V	Sprague
37	1	C15	104A101C20	Capacitor, Ceramic .1/100 V	Unitrode
38	11	C2,3,5,7,8,9,10, 12,13,14,16	685R350T10	Capacitor, Tantalum 6.8/35 V	Sprague

Parts List—MODELS X51-400, -400D RTD ALARM TRIP; MODELS X51-460, -460D POTENTIOMETER ALARM TRIP

Item	Qty.	Code	Part No.	Description	Vendor
39					
40	3	CR10,11,13	1N4148D	Diode, Signal	Motorola
41	1	CR14	1N4005D	Diode, Rectifier	Motorola
42	5	CR1,2,3,4,5	1N0457A	Diode, Low Leakage	Fairchild
43	3	CR8,9,12	LM336Z-2.5	Diode, Zener 2.5 V	National
44					
45	1	T1	PE2231X	Transformer	Pulse Eng.
46	1	VR1	UA78M18C	Regulator, 18 V	Fairchild
47	1	IC7	CD4047BE	Astable Multivibrator	R.C.A.
48	1		226OR	Heat Sink (on VR1)	Thermalloy
49	1	IC8	CD4041UB	Quad Trip/Comp. Buffer	R.C.A. only
50					
51	1	IC2	LM393N	Dual Comparator	National
52	1	IC6	LM358AN	Dual Op-Amp	National
53	1	IC1	LM324N	Quad Op-Amp	National
54	1	LED1	200-RG	Light-Emitting Diode, Red/Green	Data Display Products
55	1	IC4	MCA255	Opto-Isolator	Monsanto
56	1	K1	G4D-212P-US-TV2	Relay	Omron
57					
58	1	Q1	2N6725	Transistor	National
59	2	Q3,4	2N4249	Transistor	Fairchild
60	1		14-600-11	14-Pin Header	Aries
61	1		14-650-10	Header Cover	Aries
62	1		14-511-11	14-Pin Socket, DIP	Aries
63	5		360-0017-01-03-00	Jumper Plugs	Cambion
64	15		450-3572-01-03-00	Pin Jacks	Cambion
65	1		450-3572-01-06-00 47-01-202-10	Fastener	Southco
			X51-400D, -460D DUAL SETPOINT OPTION		
66					
67	3	R29,34,37	RC07GF472J	Resistor, ¼ W, 5% 4.7 k	A.B.
68	2	R12,16	RC07GF682	Resistor, ¼ W, 5% 6.8 k	A.B.
69	1	R28	RC07GF103J	Resistor, ¼ W, 5% 10.0 k	A.B.
70	1	R19	RN55C1000	Resistor, 1% M.F. 100 ohms	Mepco
71	1	R9	RN55C8251	Resistor, 1% M.F. 8.25 k	Mepco
72	1	R17	RN55C1132	Resistor, 1% M.F. 11.3 k	Mepco
73	1	R20	RN55C1273	Resistor, 1% M.F. 127 k	Mepco
74	1	R43	RN55C2002	Resistor, 1% M.F. 20.0 k	Mepco
75	1	R3	89PR-10K	Potentiometer 10 k	Beckman
76	1	R21	91B-2K	Potentiometer 2 k	Beckman
77					

Parts List—MODELS X51-400, -400D RTD ALARM TRIP; MODELS X51-460, -460D POTENTIOMETER ALARM TRIP

Item	Qty.	Code	Part No.	Description	Vendor
78	1	C4	103R101C25	Capacitor, Ceramic .01/100	Sprague
79	1	C6	685R350T10	Capacitor, Tantalum 6.8/35	Sprague
80	2	CR6,7	1N0457A	Diode, Low Leakage	Fairchild
81	1	CR15	1N4005D	Diode, Rectifier	Motorola
82	1	LED2	5082-4650	Light-Emitting Diode, Red	H.P.
83					
84	1	K2	G4D-212P-US-TV2	Relay	Omron
85	1	IC3	LM324N	Quad Op-Amp	National
86	1	IC5	MCA255	Opto-Isolators	Monsanto
87	1	Q2	2N6725	Transistor, NPN	National
88	5		360-0017-01-03-00	Jumper Plugs	Cambion
89	15		450-3752-01-03-00 OR 450-3752-01-06-00	Pin Jacks	Cambion

	100,120 ohm RTD	9,10 ohm CU RTD	0-2,000 Ohm Pot.	2,000 Ohm to 10 k Pot. Input
R40	2.43 k	464	2.43 k	12.1 k
R47	2.49 k	499	2.49 k	12.1 k
R48	100 ohm, 72P-100	100 ohm 72P-100	100 ohm 72P-100	1 k, 72P-1 k
R39*				
R38, 41**				

*R39 = RTD at span zero.

Table 1

	100, 120 ohm RTD	9, 10 CU RTD	0-2,000 Ohm Pot.	2,000 Ohm-10 k Pot. Input
** R38,41	$\frac{4\times10^6}{\Delta\,\text{RTD}} - 1000$	$\frac{8\times10^5}{\Delta\,\text{RTD}} - 1000$	$\frac{4\times10^6}{\Delta\,\text{R-POT}} - 1000$	$\frac{20\times10^6}{\Delta\,\text{R-POT}} - 1000$

Δ RTD = RTD at full-scale minus RTD at span zero.

Table 2

Parts List—MODELS X51-500, -500D RTD; MODELS X51-9, -10, -100, -120 TRANSMITTER TRIP

Item	Qty.	Code	Part No.	Description	Vendor
1	1		X51-1006B	Printed Circuit Board	Ronan
2	1		47-10-202-10	Fastener	Southco
3	1		X51B16	Bracket	Ronan
4	1		X51C9-1	Front Panel (-500D)	Ronan
5	1		X51C9-2	Front Panel (-500)	Ronan
6	1		X51B6	Handle	Ronan
7	1	R55	RC07GF102J	Resistor, ¼ W, 5% 1 k	A.B.
8	4	R35,36,51,60	RC07GF222J	Resistor, ¼ W, 5% 2.2 k	A.B.
9	1	R52	RC07GF472J	Resistor, ¼ W, 5% 4.7 k	A.B.
10	3	R25,33,57	RC07GF682J	Resistor, ¼ W, 5% 6.8 k	A.B.
11	3	R58,59,64	RC07GF103J	Resistor, ¼ W, 5% 10 k	A.B.
12	3	R54,56	RC07GF224J	Resistor, ¼ W, 5% 220 k	A.B.
13					
14	1	R63	RN55C13R0	Resistor, ¼ W M.F. 13 ohms	Mepco
15	1	R62	RN55C49R9	Resistor, ¼ W M.F. 49.9 ohms	Mepco
16	1	R17	RN55C2000	Resistor, ¼ W M.F. 200 ohms	Mepco
17	2	R44,45	RN55C1001	Resistor, ¼ W M.F. 1.0 k	Mepco
18	1	R14	RN55C3921	Resistor, ¼ W M.F. 3.92 k	Mepco
19	1	R53	RN55C3401	Resistor, ¼ W M.F. 3.40 k	Mepco
20	1	R18	RN55C6041	Resistor, 1% M.F. 6.04 k	Mepco
21	1	R43	RN55C2002	Resistor, 1% M.F. 10.0 k	Mepco
22	2	R31,32	RN55C2002	Resistor, 1% M.F. 20.0 k	Mepco
23	1	R46	RN55C2942	Resistor, 1% M.F. 29.4 k	Mepco
24					
25	1	R34	72P-200	Potentiometer, 1T 200 ohms	Beckman
26	1	R2	89PR200	Potentiometer, 15T 200 ohms	Beckman
27	1	R41	89P-5K	Potentiometer, 15T 5 k	Mepco
28	1	R1	89P-10K	Potentiometer, 15T 10 k	Mepco
29	5	R26,27,28,29,30		See Resistance Table	
30					
31	2	C12,19	200R501M05	Capacitor DM 20 pFd	Arco
32	1	C10	104A101C20	Capacitor, Ceramic 1 mfd	
33	2	C15,18	104A101C20	Capacitor, Ceramic 1 mfd	
34	12	C7,9,11,13,14,16, 17,20,21,22,23,24	685R350T20	Capacitor, Tantalum 6.8/35	Sprague
35	1	C8		Not Used	
36					

Parts List—MODELS X51-500, -500D RTD; MODELS X51-9, -10, -100, -120 TRANSMITTER TRIP

Item	Qty.	Code	Part No.	Description	Vendor
37	3	CR6,10,11	LM336Z-2.5	Diode, Zener 2.5 V	National
38	8	CR7,12,13,15,16 17,18,19	1N4148D	Diode, Signal	Motorola
39	5	D14,20,21,22,25	1N457A	Diode, Low Leakage	Fairchild (only)
40					
41	1	Q10	MJE243	Transistor, NPN	Motorola
42	2	Q1,2	2N4249	Transistor, PNP	Fairchild
43	2	Q6,7	X51A57 (mod. VN66AF)	Transistor, V-MOS	Siliconix
44	2	Q5,8	2N4393 OR MPF 4393	Transistor, N-Ch FET	Motorola
45	1	Q9	2N4410	Transistor	Fairchild
46					
47	1	VR1	UA78M18CFC	Voltage Regulator, 18 V	Fairchild
48	1	IC7	CD4047BE	Multivibrator	R.C.A.
49	1	IC1	LM393N	Dual Comparator	National
50	1	IC6	LM358N	Dual Op-Amp	National
51	2	IC8,9	LM307N	Op-Amp	National
52	1		14600-11	14-Pin Header	Aries
53	1		14-650-10	Header Cover	
54					
55	1	T1	X51B1	Transformer	Axtec
56	1	T2	PE2231X	Transformer	Pulse Eng.
57	1		226OR	Heat Sink (install OR VR1)	Thermalloy
58	2	TP1,2 "+"	3542-2	Test Point, Red	Pomona
59	2	TP1,2 "–"	3542-0	Test Point, Black	Pomona
60	1	P1	14-511-11	14-Pin DIP Socket	Aries
61	1		100-816-053	14-Pin din Connector, Male	Panduit
62	1		X51A56	Heat Sink (on Q10)	Thermalloy
63	2			2-56 × 3/3 Pan Head Slot Screw	
64	2			#2 Lock Washer	
65	2			#2 Hex Nut (on parts side of board)	
66					

Parts List—MODELS X51-500, -500D RTD; MODELS X51-9, -10, -100, -120 TRANSMITTER TRIP

Item	Qty.	Code	Part No.	Description	Vendor
67	1	R5	RC07GF681J	Resistor, ¼ W, 5% 680 ohms	A.B.
68		R6	RC07GF222J	Resistor, ¼ W, 5% 2.2 k	A.B.
69	1	R7	RC07GF272J	Resistor, ¼ W, 5% 2.7 k	A.B.
70	3	R39,48,49	RC07GF472J	Resistor, ¼ W, 5% 4.7 k	A.B.
71	1	R37	RC07GF822J	Resistor, ¼ W, 5% 8.2 k	A.B.
72	1	R9	RC07GF224J	Resistor, ¼ W, 5% 220 k	A.B.
73					
74	1	R11	RN55C1000	Resistor, 1% M.F. 100 ohms	Mepco
75	1	R16	RN55C825	Resistor, 1% M.F. 8.25 k	Mepco
76	1	R10	RN55C1132	Resistor, 1% M.F. 11.3 k	Mepco
77	1	R32*	RN55C2002	Resistor, 1% M.F. 20.0 k	Mepco
78	1	R12	RN55C6342	Resistor, 1% M.F. 63.4 k	Mepco
79					
80	1	R13	91B-2K	Potentiometer, 1T 2 k	Beckman
81	1	R3	89PR-10K	Potentiometer, 15T 10 k	Beckman
82	15		450-3752-01-03-00 450-3752-01-06-00	Pin Jacks	Cambion
83	5		360-0017-01-03-00	Jumper Plug See Table 1 for placement.	Cambion
84					
85	1	C1	103R101C25	Capacitor, Ceramci .01 mfd	Sprague
86	3	C2,3,5	685R350T20	Capacitor, Tantalum 6.8/35	Sprague
87	1	D23	1N4005D	Diode	Motorola
88	5	D1,2,3,4,5	1N0457	Diode, Low Leakage	Fairchild (only)
89	1	LED1	200-RG	Light-Emitting Diode, Red/Grn.	Data Display Prod.
90					
91	1	IC2	LM324N	Quad Op-Amp	National
92	1	IC4	MCA255	Opto-Isolator	Monsanto
93	1	Q3	2N6725	Transistor, NPN	National
94	1	K1	G4D-212P-US-TV2-24VDC	Relay	Omron
95					

Parts List—MODELS X51-500, -500D RTD; MODELS X51-9, -10, -100, -120 TRANSMITTER TRIP

Item	Qty.	Code	Part No.	Description	Vendor
96	1	R5	RC07GF681J	Resistor, ¼ W, 5% 680 k	A.B.
97	1	R6	RC07GF222J	Resistor, ¼ W, 5% 2.2 k	A.B.
98	8	R8,19,39,40,47 48,49,50	RC07GF472J	Resistor, ¼ W, 5% 4.7 k	A.B.
99	1	R7	RC07GF272J	Resistor, ¼ W, 5% 2.7 k	A.B.
100	2	R37,38	RC07GF822J	Resistor, ¼ W, 5% 8.2 k	A.B.
101	1	R9	RC07GF224J	Resistor, ¼ W, 5% 220 k	A.B.
102					
103	2	R11,21	RN55C1000	Resistor, 1% M.F. 100 ohms	Mepco
104	2	R15,16	RN55C8251	Resistor, 1% M.F. 8.25 k	Mepco
105	2	R10,20	RN55C1132	Resistor, 1% M.F. 11.3 k	Mepco
106	2	R31,32	RN55C2002	Resistor, 1% M.F. 20.0 k	Mepco
107	2	R12,22	RN55C6342	Resistor, 1% M.F. 63.4 k	Mepco
108					
109	2	R13,23	91B-2K	Potentiometer, 1T 2 k	Beckman
110	2	R3,4	89P-10K	Potentiometer, 15T 10 k	Beckman
111					
112	2	C1,4	103R101C25	Capacitor, Ceramic .01 mfd	Sprague
113	4	C2,3,5,6	685R350T20	Capacitor, Tantalum 6.8/35	Sprague
114					
115	2	D23,24	1N4005D	Diode	Motorola
116	7	D1,2,3,4,5,8,9	1N457A	Diode, Low Leakage	Fairchild (only)
117					
118	1	LED1	200-RG	Light-Emitting Diode, Red/Grn.	Data Display Prod.
119	1	LED2	5082-4650	Light-Emitting Diode, Red	H.P.
120					
121	2	Q3,4	2N6725	Transistor, NPN	National
122	2	K1,2	G4D-212P-US-TV2-24VDC	Relay	Omron
123	15		450-3752-01-06-00 OR 450-3752-01-03-00	Pin Jacks	Cambion
124	10		360-0017-01-03-00	Jumper Plugs See Table 1 for placement.	Cambion
125	1	IC2,3	LM324N	Quad Op-Amp	National
126	1	IC4,5	MCA255	Opto-Isolator	Monsanto

A Setpoint	A Relays	
A HI, 2 each	LOW, 2 each NE NDE	NO, 2 each NC, 2 each

B Setpoint	B Relays	
B HI, 2 each LOW, 2 each	NE NDE	NO, 2 each NC, 2 each

Table 1: Placement of jumper plugs.

	1-5 V	2-10 V	mA
R61	249 ohm	499 ohm	Not Used

Table 2

	Pt, Ni, RTD	9, 10 CU RTD
R28	2.37 k	464 ohm
R24	2.49 k	499 ohm
R27		
R30		
R26, R29		

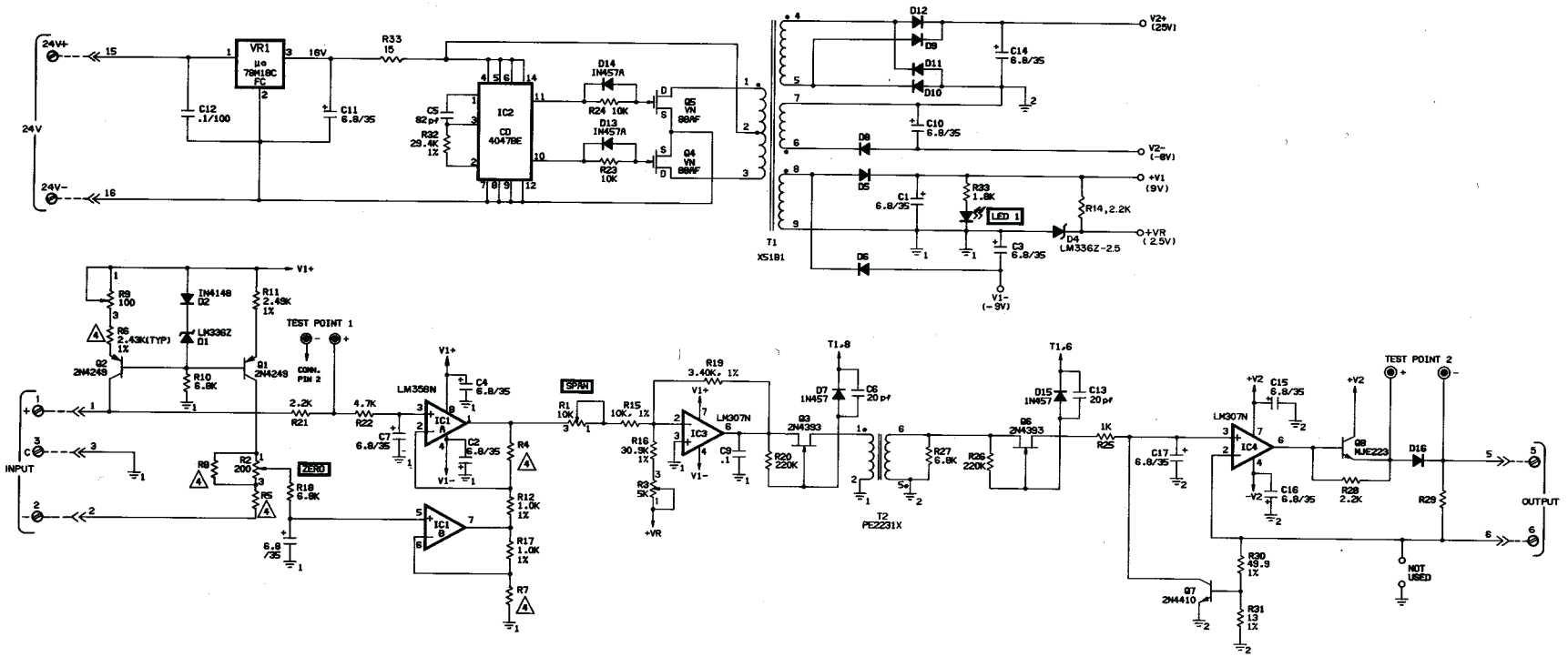
Table 3

$$R27 = \text{RTD at span zero} - (.25 \times \Delta\ \text{RTD})$$

$$R30 = \frac{100 \times \Delta\ \text{RTD}}{200 - .5 \times \Delta\ \text{RTD}}$$

	Pt, Ni, RTD(100, 120)	9, 10 CU RTD
R26, R29	$\frac{4 \times 10^6}{\Delta\ \text{RTD}} - 1000$	$\frac{8 \times 10^5}{\Delta\ \text{RTD}} - 1000$

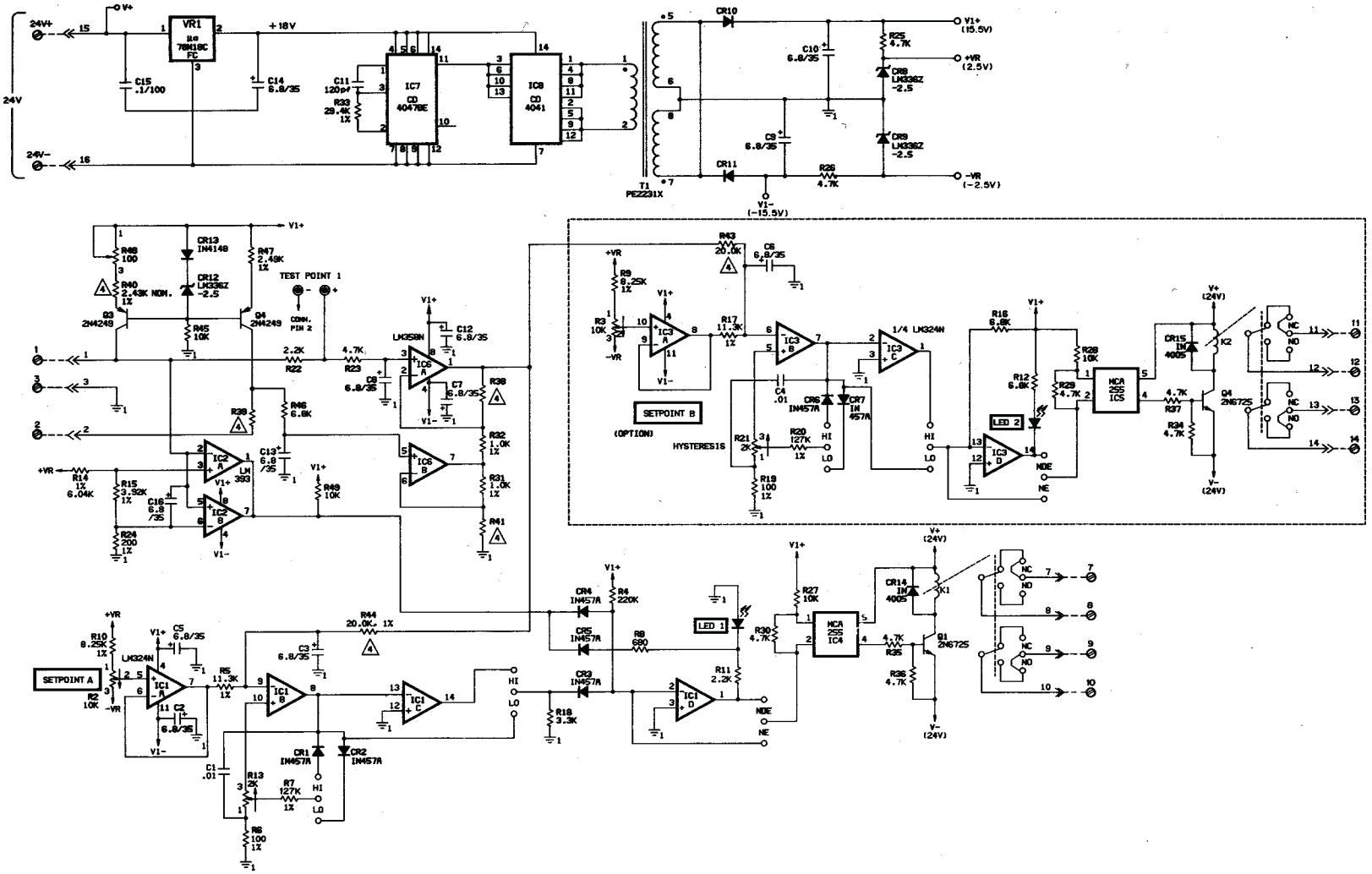
Table 4



5. ALL DIODES ARE 1N4148'S.
4. ⚠4 COMPONENTS DETERMINED BY INPUT TYPE. MOUNTED ON PLUG-IN ASSY.
3. RESISTOR VALUES ARE IN OHMS.
2. CAPACITOR VALUES ARE IN MICROFARADS.
1. ALL RESISTORS ARE 1/4W, 5%.

NOTES: UNLESS OTHERWISE SPECIFIED.

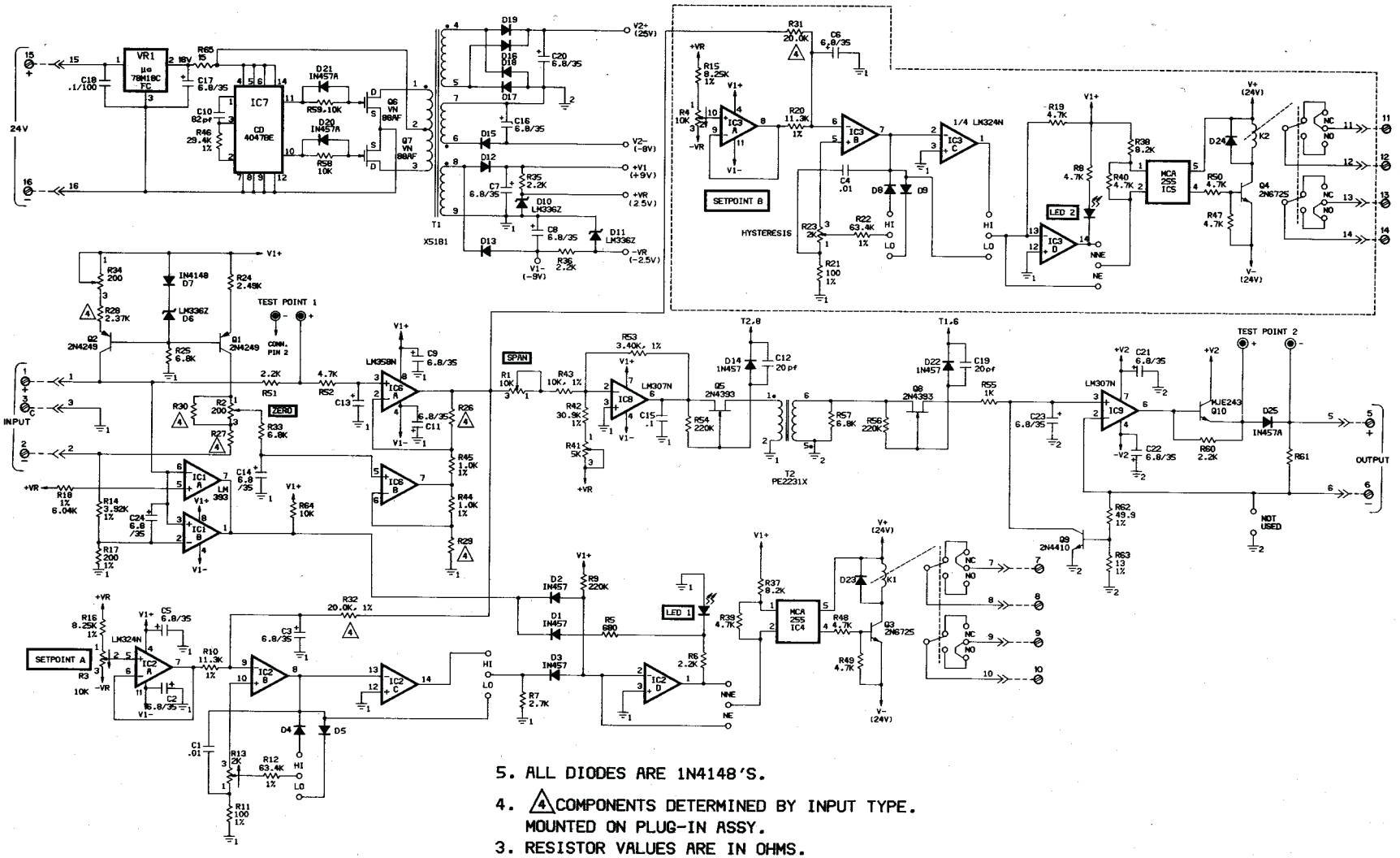
SCHEMATIC RTD TRANSMITTER	RONAN	
	DRAWING NO. X51-1004	REV. 3



5. ALL DIODES ARE 1N4148'S.
4. ⚠4 COMPONENTS DETERMINED BY INPUT TYPE. MOUNTED ON PLUG-IN ASSY.
3. RESISTOR VALUES ARE IN OHMS.
2. CAPACITOR VALUES ARE IN MICROFARADS.
1. ALL RESISTORS ARE 1/4W, 5%.

NOTES: UNLESS OTHERWISE SPECIFIED.

SCHEMATIC RTD ALARM TRIP SINGLE/DUAL SETPOINT	RONAN	
	DRAWING NO. X51-1010	REV. 3



5. ALL DIODES ARE 1N4148'S.
4. ⚠4 COMPONENTS DETERMINED BY INPUT TYPE. MOUNTED ON PLUG-IN ASSY.
3. RESISTOR VALUES ARE IN OHMS.
2. CAPACITOR VALUES ARE IN MICROFARADS.
1. ALL RESISTORS ARE 1/4W, 5%.

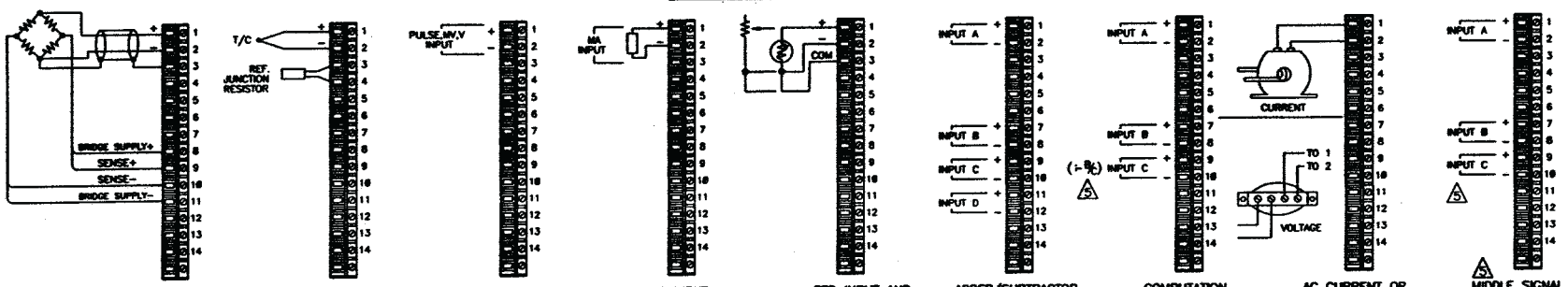
NOTES: UNLESS OTHERWISE SPECIFIED.

SCHEMATIC RTD TRANSMITTER/ ALARM TRIP SINGLE/DUAL SETPOINT	RONAN	
	DRAWING NO. X51-1006	REV. 3

REV.	DESCRIPTION	DATE	BY	ENGR	APPR	CUST
7	INCORPORATED REV 7, DELETED REV 6.	12.16.88	KSP	JM	RP	AG
8	ADDED X51N-471 & 491					
9	REVISED PER ECO #2421.					
10	REDRAWN PER ECO #7447.					
11	REVISED PER ECO#8373	11-17-98	RP			

REV.	DESCRIPTION	DATE	BY	ENGR	APPR	CUST
1	REDRAWN & REVISED	4.10.85	KSP	JM	RP	AG
2	CHANGED NOTE 2	9.1.87	KSP	JM	RP	AG
3	ADDED HI/LO SIGNAL, STRAIN GAGE & REDRAWN (HP)	1.27.88	KSP	JM	RP	AG
4	REVISED NOTE 2	2.22.88	KSP	JM	RP	AG
5	REVISIONS	4.08.88	KSP	JM	RP	AG
6	INCORPORATED REV 6	6.13.88	KSP	JM	RP	AG

MODEL X51 SERIES INPUT CONNECTIONS



STRAIN GAGE INPUT

THERMOCOUPLE INPUT

MV,V,FREQUENCY,PULSE INPUT

MA INPUT

RTD INPUT AND POTENTIOMETER

ADDER/SUBTRACTOR OR FOUR INPUT SIGNAL SELECTOR (mV,V)

NOTE: FOR TWO INPUTS ONLY USE A AND B INPUTS.

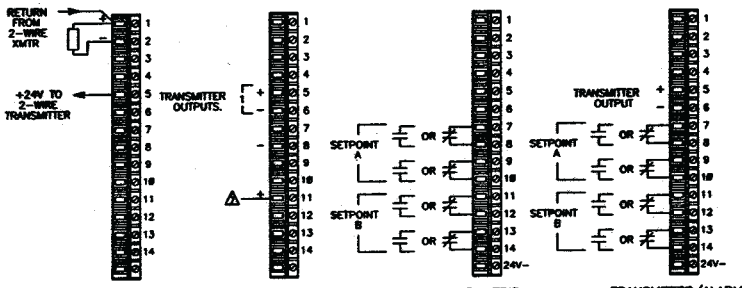
COMPUTATION TRANSMITTERS

NOTE: FOR SINGLE INPUT USE "B" INPUT

AC CURRENT OR VOLTAGE TRANSMITTER

MIDDLE SIGNAL SELECTOR

MODEL X51 SERIES OUTPUT CONNECTIONS



24 VDC TO POWER 2-WIRE TRANSMITTER (X51N-422/422D)

TRANSMITTER OUTPUTS

TERMINAL 11 USED ON MODEL X51-325 FOR 2-WIRE TRANSMITTER POWER SUPPLY +. (RETURN IS TO TERMINAL 1 WITH LOOP RESISTOR PER mA INPUTS.)

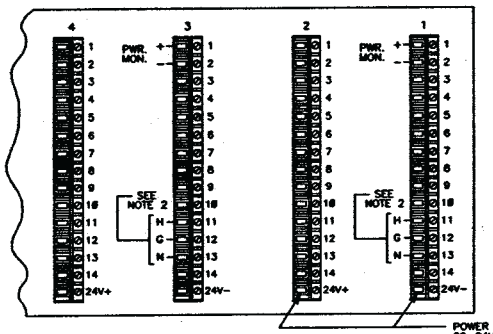
ALARM TRIP OUTPUTS

TRANSMITTER/ALARM TRIP OUTPUTS

INTEGRATING TOTALIZER OUTPUT (MA OUTPUT OPTIONAL) X51N-472 & 492

INTEGRATING TOTALIZER OUTPUT X51N-471 & 491

POWER INPUT CONNECTIONS



RELAY RACK AND PANEL MOUNT CHASSIS (SEE NOTE 2 FOR POWER SUPPLY INFO FOR THESE AND SURFACE MOUNT CHASSIS)

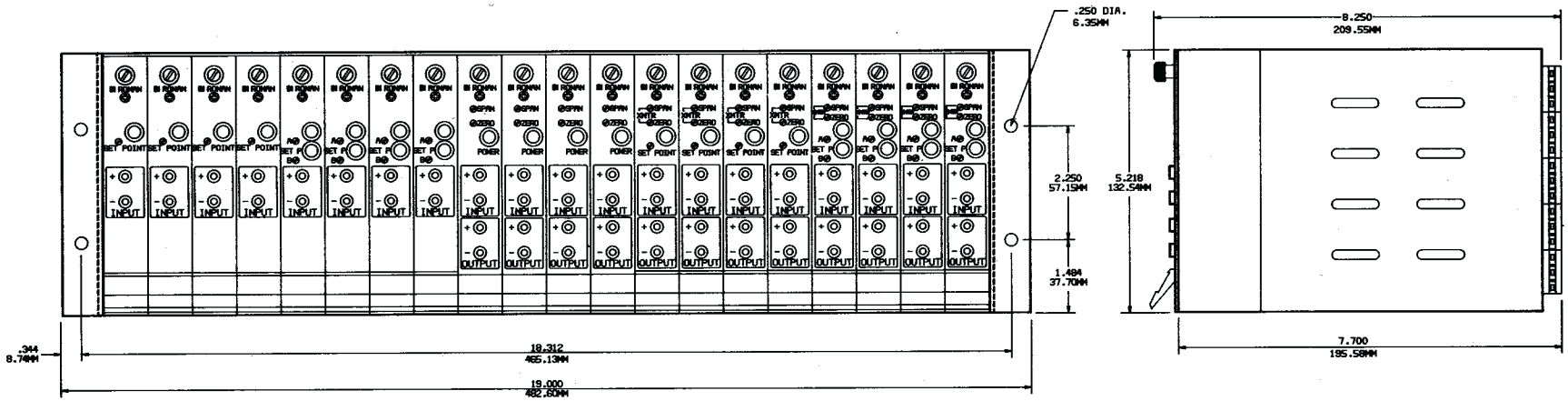
POWER CONNECTIONS 22-24VDC

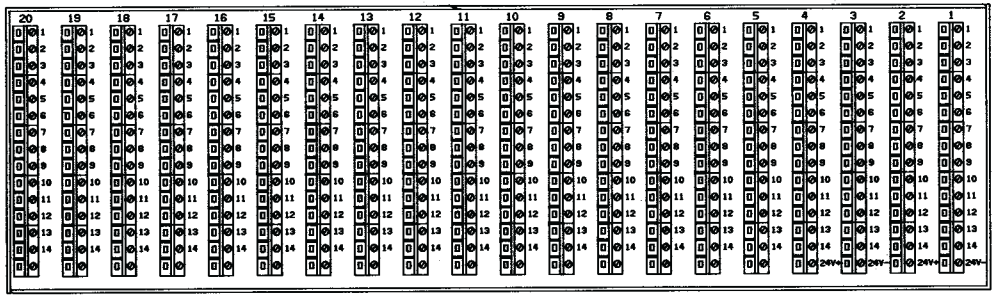
NOTES: UNLESS OTHERWISE SPECIFIED

1. "24V+" AND "24V-" AT CONNECTOR POSITIONS 4 AND 3 ARE CONNECTED ON THE P.C. BOARD TO THE CONNECTORS AT POSITION 2 AND POSITION 1. THESE MAY BE USED FOR CONNECTING TWO OR MORE CHASSIS TOGETHER
2. IF INTEGRAL POWER SUPPLY (S) IS (ARE) PLUGGED INTO CHASSIS, THEN 115 OR 220VAC, 50/60HZ.* MUST BE WIRED TO CONNECTOR PINS 11 (HOT), 12 (GND) AND 13 (NEUTRAL). THE POWER SUPPLY (S) MAY BE PLUGGED INTO ANY TWO CHASSIS POSITIONS. THE POWER INPUT IS WIRED TO THE LOWEST POSITION CONNECTOR (S) OF THE POSITIONS OCCUPIED BY THE POWER SUPPLY (S).*WIRE 125VDC TO PINS 11(+) AND 13(-).

ITEM NO.	QTY	DWG / PART NUMBER	DESCRIPTION	SPEC
			LIST OF MATERIALS	

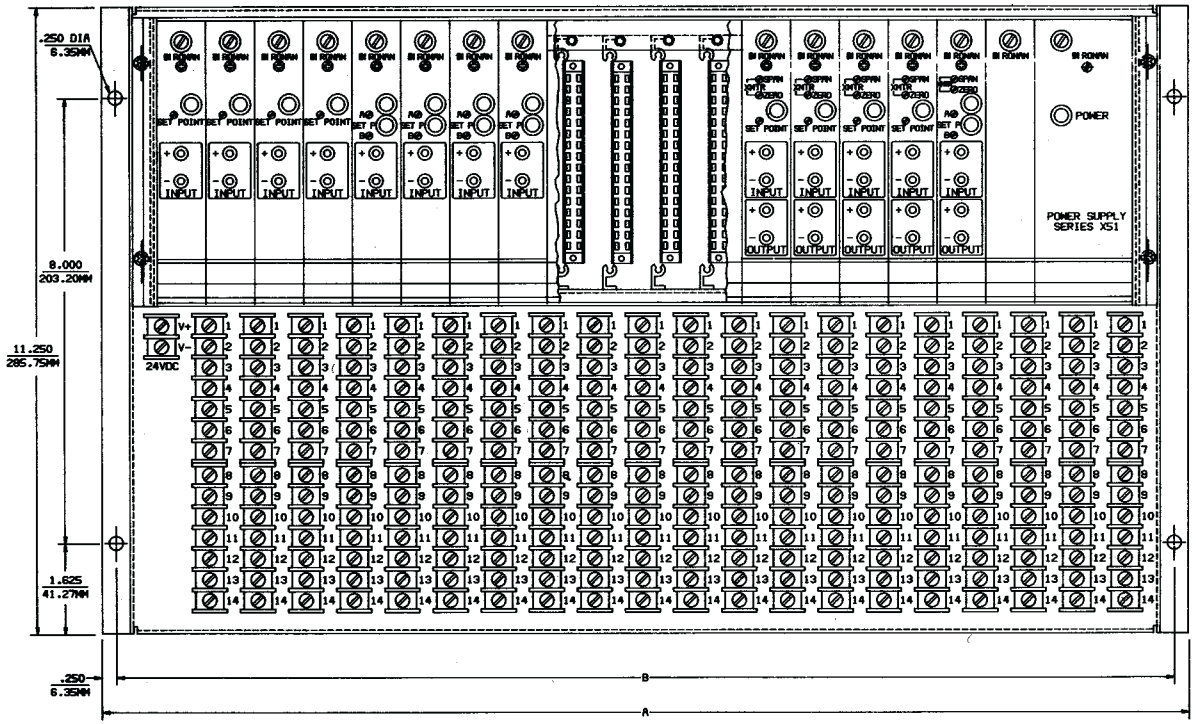
NEXT ASSY	USED ON	TERMINAL ARRANGEMENTS MODEL X51 SERIES	RONAN WOODLAND HILLS, CALIFORNIA
APPLICATION	DO NOT SCALE DRAWING		X51D52 REV 11

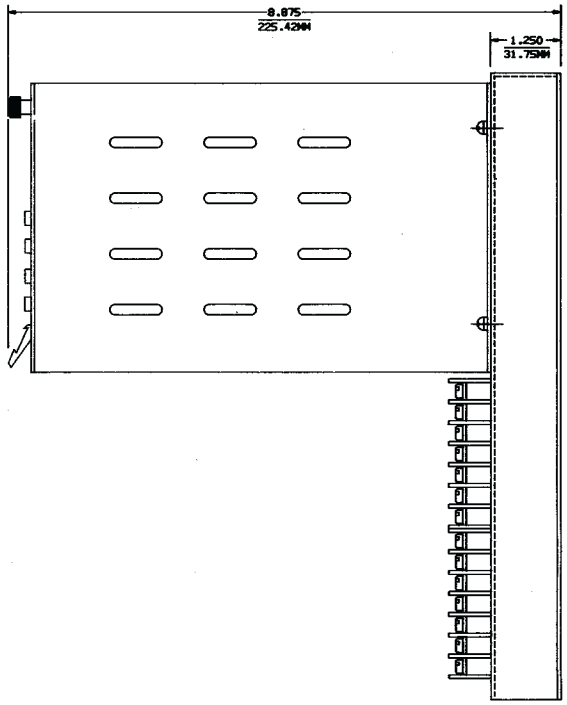




REAR TERMINAL ARRANGEMENT

OUTLINE DRAWING X51RR-20 CHASSIS RELAY RACK MOUNT	RONAN	
	DRAWING NO. X51D39	REV. 2





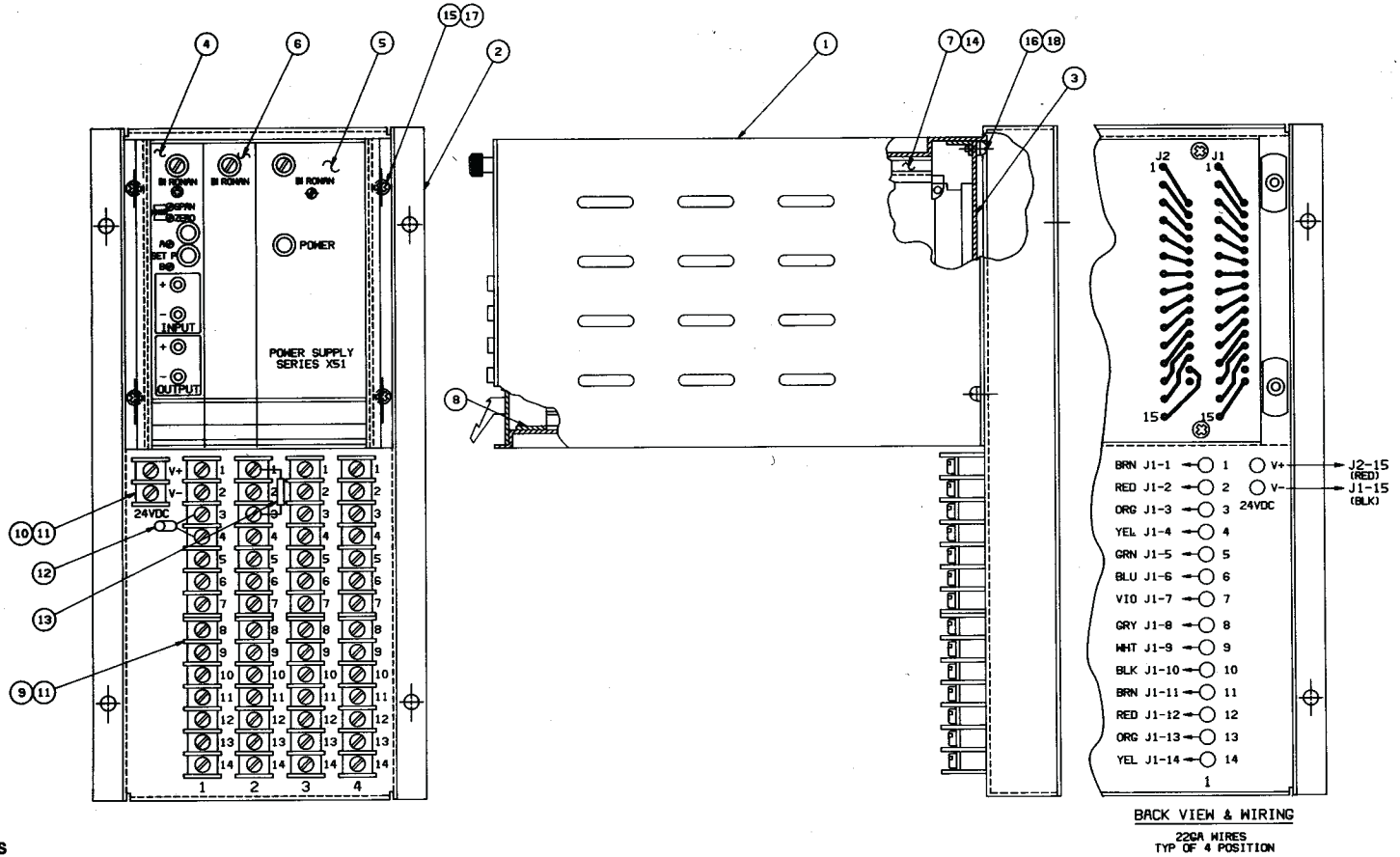
MODEL	ASSY. DWG.#	A		B	
		INCH	MM	INCH	MM
X51SM-20	X51D59	19.500	495.30	19.000	482.60
X51SM-10	X51D63	10.875	276.22	10.375	263.52
X51SM-4	X51D67	5.750	146.05	5.250	133.35

OUTLINE DRAWING
X51SM
CHASSIS
SURFACE MOUNT

RONAN

DRAWING NO. X51D58

REV. 0



LIST OF MATERIALS

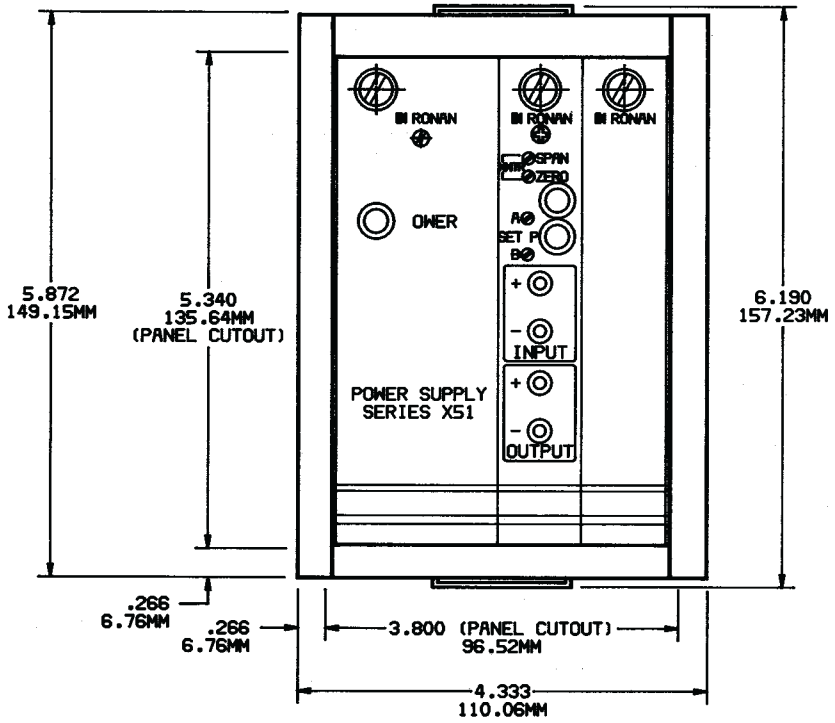
ITEM	QTY.	PART NO.	DESCRIPTION	SPEC.
18	4		#4 INTER TOOTH LKWR	
17	4		#6 INTER TOOTH LKWR	
16	4		4-40 X 1/4" PH RD HD MS	
15	4		6-32 X 1/4" PH RD HD MS	
14	16	AD42BS	RIVET	
13	AS REQ'D	RN65C2500R	M.F. RESISTER 0.1%	DALE
12	AS REQ'D	X80A209	REF. JUNCTION RISITOR	ELLIOT IND
11	10	1599SN	SPEED NUT	KULKA
10	1	3599A-2	TERMINAL BLOCK	KULKA
9	8	3599A-7	TERMINAL BLOCK	KULKA
8	1	X51C72-3	I.D. STRIP	RONAN
7	8	X51C19	CARD GUIDE	RONAN
6	AS REQ'D	X51B50	FRONT PANEL, BLANK ASSY	RONAN
5	AS REQ'D	X51C44	POWER SUPPLY ASSY	RONAN
4	AS REQ'D	AS REQ'D	MODULE	RONAN
3	1	X51C71	MOTHER PCB ASSY	RONAN
2	1	X51D69	CHASSIS	RONAN
1	1	X51D68	CARD RACK	RONAN

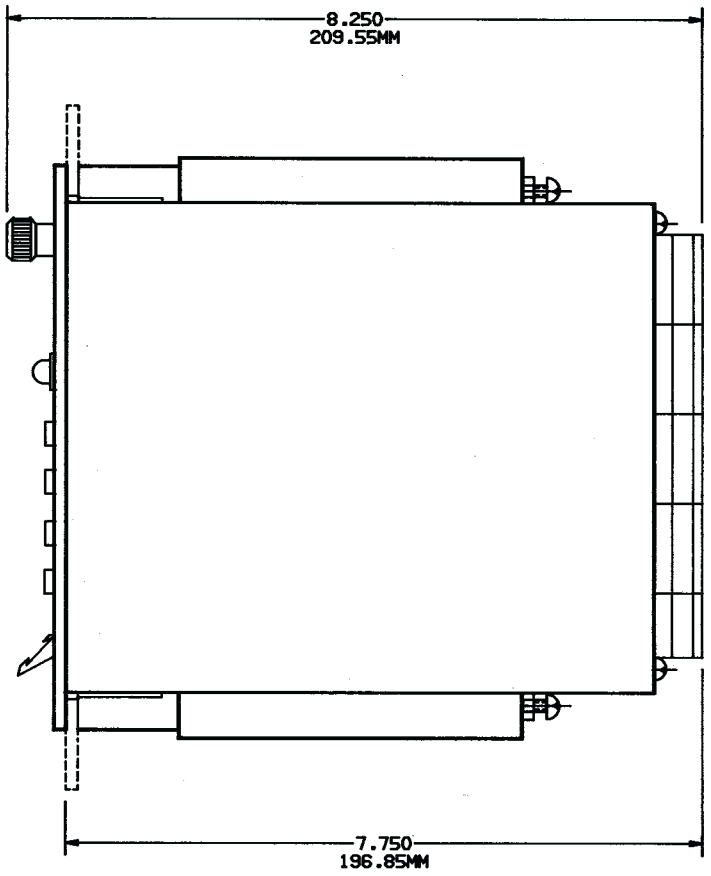
OUTLINE DRAWING
X51SM-4
CHASSIS
SURFACE MOUNT

RONAN

DRAWING NO. X51D67

REV. 0

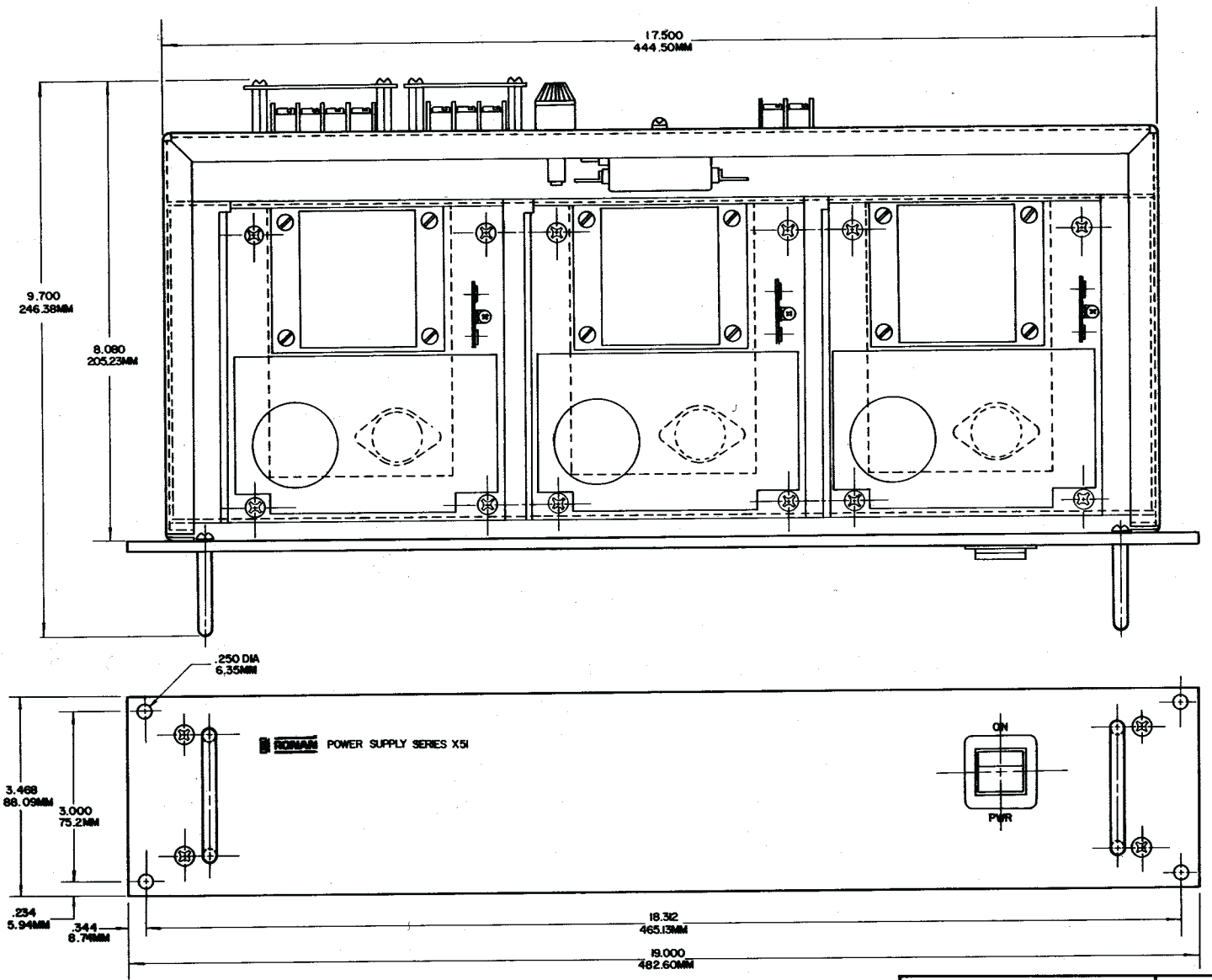




OUTLINE DRAWING
X51PM-4
CHASSIS
PANEL MOUNT

RONAN

DRAWING NO.	REV.
X51C47	0



* MODEL: X5I-( )-( )
VOLTAGE: 115, 230
WATTAGE: 60, 120, 180

OUTLINE DRAWING
X51 POWER SUPPLY

RONAN

DRAWING NO.	REV.
X51D38	0

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