User's Manual: Series 461A
Model 461A AC-Powered Alarm

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IMPORTANT SAFETY CONSIDERATIONS

It is very important for the user to consider the possible adverse effects of power, wiring, component, sensor, or software failures in designing any type of control or monitoring system. This is especially important where economic property loss or human life is involved. It is important that the user employ satisfactory overall system design. It is agreed between the Buyer and Acromag, that this is the Buyer's responsibility.

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INTRODUCTION:

These instructions cover the model types listed in Table 1 below. Supplementary sheets are attached for units with special options or features.

Table 1: A. Model Number Format:
461A-Input-Output-Power-Mounting-Cert-Calib
B. Typical Model Number: 461A-V5-SMRN-1-DIN-NCR

Series	Input	Output	Pwr	Mtg	Cert.	Calib.
461A	-V1	-SMRN	-1	-DIN	-NCR	Blank
	-V5	-DMRN	-2			-C
	-V0					
	-V50					
	-V100					

Notes (Table 1):
1. The Alarm can be ordered with or without the factory calibration ("-C") option. Consult the selection and ordering guide for more information. Any customer-specified calibration information will be included on a separate calibration label on the unit.
2. Consult the factory for current information on agency (e.g. Canadian Standards Association, etc.) approvals.

DESCRIPTION:

The Series 461A is an AC-powered, DIN-rail mounted alarm family that accepts either a process current, or DC voltage input signal, and provides single or dual alarm output relay contacts. The Series 461A complements an entire family of Acromag flat-pack, DIN-rail transmitters, alarms, and isolators, each designed to be used as functional components that provide the user with a modular solution for a wide range of field applications. The safe, compact, rugged, and reliable design of this alarm allows it to be utilized in either control room or field locations.

The electromechanical relay output provides one SPDT (Form C) relay contact output (single alarm), or two SPDT (Form C) relay contact outputs (dual alarm). The unit can be configured as a HIGH or LOW single alarm, or a HIGH/HIGH, HIGH/LOW, LOW/HIGH or LOW/LOW dual alarm. The operating mode of each relay can be set to Failsafe (Normally Energized), or Non-Failsafe (Normally De-Energized). The term 'Failsafe' refers to the condition that the relay is energized during normal conditions, and de-energized upon alarm or power loss to the unit. The Non-Failsafe mode of operation is primarily used for simple control applications and acts opposite the Failsafe mode--that is, the relay is *energized* during alarm conditions.

Each channel has one pair of LED's (Green and Red) that provide a visual indication of the alarm condition on the front of the unit. When the Green LED is ON, it indicates a Normal condition, and when the Red LED is ON, it indicates an Alarm condition. This applies to both the Failsafe or Non-Failsafe operating mode. Thus, line power status is simply indicated by an illuminated LED.

The alarm setpoints are individually adjustable over the full input range of the unit and the deadband for each setpoint is adjustable from 1 to 100 percent. The setpoint voltage for each channel may be monitored via DVM testpoints accessible from the front of the unit. The deadband adjustment does not affect setpoint adjustment. Rather, it determines the amount the input signal has to return into the normal operating range before the relay contacts will transfer. Deadband is normally used to eliminate false trips or alarm "chatter" caused by fluctuations in the process input near the alarm point.

To implement an AC Current alarm for inputs up to 20A, an optional AC current sensor (Acromag Model 5020-350, ordered separately) is used in conjunction with the 0 to 1V DC (-V1) input type configured for current input (external jumper required). The full-scale output of this transducer is 11.17mA DC. An internal 50Ω shunt resistor installed in the module converts the 0-11.17mA transducer signal to a 0-0.5585V DC input signal. The sensor itself is an insulated, highly accurate toroidal instrument transformer, that outputs a safe, low-level DC milliamp signal to the 461A's analog input terminals. The sensor is intended to be mounted close to the current being measured and the wire connecting the sensor to the 461A's input terminals can be up to 400 feet long (18 gauge wire). The AC current input span is simply determined by the number of primary turns passing through the center of the toroid. Example: a 0 to 20A AC input range requires one turn to pass through the hole in the sensor, while a 0 to 5A AC input range requires four turns. See specifications for other ranges.

The 461A alarm is RFI-protected, operates over a wide temperature range, and features excellent temperature coefficients which minimize the effects from harsh plant environments. It is available for 115V AC, or 230V AC power (for DC power, see the Acromag Series 361A alarms). The versatile DIN rail mount can accomodate a variety of mounting applications. See Drawing 4501-544 for a simplified schematic.

Alarm input and power wiring is inserted at the top of the unit, while output contact wiring is inserted at the bottom of the unit. Screws to secure the wiring are located on the front panel. Connectors are screw-clamp type and accept wire size from 26 to 14 AWG.

Key 461A Features:

- Process Current or Voltage Input
- Green/Red LED Trip/Power Indicators
- Single or Dual Alarm
- 15-turn Setpoint Adjustment
- HIGH/LOW Alarm Operation
- 15-turn Deadband Adjustment
- Failsafe/Non-Failsafe Mode
- Wide Ambient Temperature Range (-25°C to +75°C)
- Mechanical Relay - 5A Contacts
- AC Powered: 115V AC or 230V AC
- Automatic Alarm Reset
- No Point-to-Point Internal Wiring
- Easy Field Jumper Configuration
- Setpoint Voltage Monitor Points

SPECIFICATIONS:

Function: This family of single or dual, DIN-rail mounted, AC-powered alarms, accept either a process current or voltage input signal and provide a single or dual mechanical relay output. Internal jumpers allow the alarm to be field-configured for use as a HIGH or LOW alarm, in either Failsafe or Non-Failsafe operating modes. The unit provides three-way isolation between input, output, and power. Setpoint and Deadband adjustments utilize 15-turn potentiometers. The Setpoint voltage can be monitored via testpoints at the front panel (0-5V represents 0-100% of input voltage span). The Deadband adjustment is a 'blind' adjustment between 1% and 100% of span. Red and green status LED's provide a visual indication of the alarm condition for each channel.

MODEL/SERIES: 461A- (Color coded with a Yellow label)

INPUT: Unit can also be configured at the input terminal block for either current or voltage input (-V1 and -V5 models only), see connection diagram 4501-542. All input circuits utilize a high impedance pull-down resistor (1MΩ for -V1 and -V5 units).

-V1: 0 to 1V DC with 1MΩ minimum input impedance or 4 to 20mA DC into 50Ω shunt resistor (jumper required). This range used with optional AC Current Sensor 5020-350 (see drawings 4501-542 and 4501-546 for details).
-V5: 0 to 5V DC with 1MΩ minimum input impedance or 4 to 20mA DC into 250Ω shunt resistor (jumper required).
-V0: 0 to 10V DC with 100KΩ minimum input impedance.
-V50: 0 to 50V DC with 500KΩ minimum input impedance.
-V100: 0 to 100V DC with 1MΩ minimum input impedance.

IMPORTANT: For the -V1 and -V5 input ranges, the 4-20mA DC input range is selected via the installation of an external jumper between the Input (L) and Input (+) terminals. This connects an internal shunt resistor to the input.

AC Current Sensor (5020-350): Optional - This sensor is a highly accurate toroidal instrument transformer used to convert an AC current signal to a low level DC milliampere signal of 0 to 11.17mA. The input AC current range is a simple function of the number of turns placed on the AC Current Sensor (see Table 2 below). The user configures the AC current sensor with the required number of primary turns to obtain the desired input span.

Table 2: AC Sensor Turns

AC CURRENT INPUT RANGE	PRIMARY TURNS	SENSOR OUTPUT (RED/BLACK WIRES)
0 to 20 Amps AC	1	0 to 11.17mA DC
0 to 10 Amps AC	2	0 to 11.17mA Dc
0 to 5 Amps AC	4	0 to 11.17mA DC
0 to 2 Amps AC	10	0 to 11.17mA DC
0 to 1 Amps AC	20	0 to 11.17mA DC

The output wires of the sensor are polarized: Red is (+) plus and Black is (-) minus. Normally, these wires are attached to one end of a cable (user supplied) and the other end connects to one of the analog input's (+) and (-) terminals.

Input Burden: A function of the wire gauge resistance used for the primary turns.

Input Overload: The AC current sensor can withstand overloads as follows:

- 20 times full-scale for 0.01 second
- 10 times full-scale for 0.1 second
- 5 times full-scale for 1.0 second

AC Current Sensor to Transmitter Wiring Distance: 400 feet maximum for 18 AWG wire gauge. Other wire gauges can be used as long as the resistance of both wires is less than 5.0Ω.

Setpoint Adjust: Adjustable from 0 to 115% of input voltage span. The setpoint adjustments utilize 15-turn potentiometer(s) accessible from the front of the instrument and provide linear and continuous adjustment over the full input range of the unit. Resolution is better than 0.1% of span, continuous. By monitoring the input current and adjusting the setpoint pot, the setpoint may be precisely set to within 0.1% (see Calibration section). Optionally, the setpoint voltage may be monitored via testpoints at the front of the module (0 to 5V represents 0 to 100% of input voltage span). These testpoints will accept up to an 0.080 diameter probe tip (do not insert probe tip more than 0.4 inches deep). The setpoint voltage at these points represents the true setpoint to within 1% of span. For current inputs (Input [+] to Input [L] jumper installed), a setpoint voltage of 1.0V represents 4mA and 5.0V represents 20mA.

Deadband Adjust (Hysteresis): Deadband is adjustable from 1 to 100% of input span for each channel via 15-turn potentiometer(s) accessible from the front of the unit. The alarm deadband adjustments are independent on dual alarm models. The deadband is adjusted with a screwdriver and provides continuous blind adjustment over the full deadband range.

IMPORTANT: Noise and/or jitter on the input signal has the effect of reducing (narrowing) the instrument's deadband and may produce contact chatter. Another long term effect of contact chatter is a reduction in the life of the mechanical relay contacts. To reduce this undesired effect, you should increase the deadband setting.

Automatic Reset: The standard 461A alarm provides momentary alarm action (Non-Latching). That is, the alarm will reset to its non-alarm state as soon as the signal is outside of the selected deadband.

OUTPUT (Electromechanical Relays, fully sealed) - Contact markings on the enclosure label are for a de-energized relay (off the shelf condition). To control a higher amperage device, such as a pump, an interposing relay may be used (see Drawing 4501-541).

Electrical Life - CSA Ratings:
25V DC, 5A, 100,000 operations, resistive.
48V DC, 0.8A, 100,000 operations, resistive.
240V DC, 0.1A, 100,000 operations, resistive.
120V AC, 5A, 30,000 operations, resistive.
240V AC, 5A, 30,000 operations, resistive.
Contact Material : Silver-cadmium oxide.
Breakdown Voltage: Between open contacts: 1000VAC rms, between contacts and coil: 1500VAC rms, 50-60 Hz for one minute.
Mechanical Life: 20 million operations. Note: External relay contact protection is required for use with inductive loads.

-SMRN: Single Alarm (S), one Single-Pole, Double-Throw (SPDT), Form C, electromagmetic (MR), dry-contact sealed relay. Non-Latching (N)
-DMRN: Dual Alarm (D), two Single-Pole, Double Throw (SPDT), Form C, electromagmetic (MR), dry-contact sealed relay. Non-Latching (N).

Alarm Mode: HIGH or LOW Alarm action is field-selectable via internal jumpers (each channel on dual alarms). Can be configured to trip on increasing signal (HIGH Alarm), or decreasing signal (LOW Alarm). Refer to Jumper Configuration Drawing 4501-545.

Relay Operating Mode: Failsafe and Non-Failsafe operation is field-selectable via internal jumpers (each channel of dual alarms).

Failsafe (Normally Energized): The relay is energized (ON) in the normal range of input, and de-energizes (drops out) when the input signal value exceeds the setpoint, or power is lost.

Non-Failsafe (Normally De-energized): The relay is de-energized in the normal range of input and energizes (pulls-in) when the input signal value exceeds the setpoint value.

Alarm LED's: A pair of LED's, one GREEN and one RED, indicate the status of the alarm on a single alarm (two pairs of LED's on dual alarms). The GREEN LED indicates a Normal condition and the RED LED indicates an Alarm condition for both the Failsafe and Non-Failsafe mode of operation. The logic of the alarm is such that the Red LED is ON if the setpoint is exceeded in either mode. Line power status is indicated by an illuminated LED. If the LED(s) are off, check line power and the power connections.

Isolation: Three way isolation; input, contacts, and power are isolated from each other for common-mode voltages up to 250V AC, or 354V DC off ground, on a continuous basis (will withstand 1500V AC dielectric strength test for one minute without breakdown). This complies with test requirements outlined in ANSI/ISA S82.01-1988 for the voltage rating specified.

POWER: -1: 115V AC ±10%, 50 to 60Hz, 0.032A.
-2: 230V AC ±10%, 50 to 60Hz, 0.016A.

Power Supply Effect: Trip-point varies less than ±0.05% of input span for rated supply variations.

Reference Test Conditions: Input: 1 to 5V; 250 ohm resistive source; Setpoint at 5.0V DC; Failsafe High Alarm; Deadband 1%; Ambient 77°F (25°C), 115V AC supply.

Accuracy: Repeatable to better than ±0.1% of input span for reference test conditions.

Ambient Temperature Range: -13°F to 167°F (-25°C to 75°C).

Ambient Temperature Effect: Less than ±0.01% of output span per °F (± 0.018% per °C) over the ambient range for reference test conditions.

Response Time: A built-in fixed time delay of 100 milliseconds typical. That is, the relay will transfer ≤100 milliseconds after the input signal exceeds the setpoint. This delay helps prevent false alarming due to transient interference. The relay will transfer within 50mS after the input passes the deadband region, as it returns into the normal range. The Red LED will light as soon as the input signal exceeds the setpoint, but the relay will not transfer until after the time delay has expired. When calibrating the alarm, the LED's should be observed to indicate proper setpoint position.

Noise Rejection - Common Mode: Better than 100dB at 60 Hz, 250Ω unbalance, typical. Normal Mode: 26dB at 60 Hz, 250Ω source, typical.

RFI Resistance: The unit will not trip under the influence of RFI when the input is ±0.5% of input span from the setpoint voltage for RFI field strengths up to 10V/meter, at frequencies of 27MHz, 151MHz, and 467MHz.

EMI Resistance: Unit will not trip when input is ±0.25% of input span from the setpoint voltage with switching solenoids or commutator motors.

Surge Withstand Capability (SWC): Input/Output terminations are rated per ANSI/IEEE C37.90-1978. Unit is tested to a standardized test waveform that is representative of surges (high frequency transient electrical interference) observed in actual installations.

Construction (Basic Alarm):
Printed Circuit Boards: Military grade FR-4 epoxy glass circuit board, 0.063 inches thick.
Printed Circuit Board Coating: Fungus resistant acrylic conformal coat.
Terminals: Compression type, wire size 14 AWG maximum.
Case: Self-extinguishing black NYLON Type 6.6 polyamide thermoplastic, UL94 V-2. General Purpose, NEMA Type 1 enclosure.
Jumpers: Gold flash over nickel contacts.
Testpoints (Setpoint Voltage): Will accept up to an 0.080" diameter probe tip. Do not insert probe tip more than 0.4" deep.
Mounting Position: Position insensitive.

MOUNTING:

-DIN: General Purpose Housing, DIN-Rail Mount - accepts both "G" Rail (32mm), Type EN50035, or "T" Rail (35mm), Type EN50022. Refer to Drawing 4501-252 for outline and clearance dimensions. Shipping Weight: 1 pound (0.45 Kg) packed.

CERTIFICATION: Consult the factory for current information on the availability of agency (e.g. Canadian Standards Association, Factory Mutual, etc.) approvals.

-NCR: No Certification Required.

INSTALLATION:

The alarm is packaged in a general purpose type of enclosure. Use an auxiliary enclosure to protect against unfavorable environments and locations. Maximum operating ambient temperatures should be within -13 to 167^{O}F (-25 to 75^{O}C) for satisfactory performance. Connect as shown in the Connection Diagram 4501-542. To verify calibration, refer to the "CALIBRATION" section.

Mounting: Mount alarm assembly - refer to Drawing 4501-540 for mounting and clearance dimensions.

DIN Rail Mounting: Use suitable fastening hardware to secure the DIN rail to the designated mounting surface. The alarm is supplied with the DIN Rail mounting option (-DIN) and can be mounted to either a "T" or "G" style rail. Installation of the alarm to the rail depends on the type of DIN rail used. Units can be mounted side by side on 1.6 inch centers, if required.

<u>"T" Rail (35mm), Type EN50022</u>: To attach an alarm to this style of DIN rail, angle the top of the unit towards the rail and locate the top groove of the adapter over the upper lip of the rail. Firmly push the unit towards the rail until it snaps solidly into place. To remove an alarm, insert a screwdriver into the lower arm of the connector and pull downwards while applying outward pressure to the bottom of the unit.

<u>"G" Rail (32mm), Type EN50035</u>: To attach an alarm to this style of DIN rail, angle the unit so that the upper groove of the adapter hooks under the top lip of the rail. Firmly push the unit towards the rail until it snaps solidly into place. To remove an alarm, pull the lower part of the unit outwards until it releases from the rail and lift the unit from rail.

<u>Electrical Connections</u>:

The wire size used to connect the unit to the control system is not critical. All terminal strips can accommodate wire from 14-26 AWG. Strip back wire insulation 1/4-inch on each lead before installing into the terminal block. Input wiring may be shielded or unshielded twisted pair. Since common mode voltages can exist on signal wiring, adequate wire insulation should be used and proper wiring practices followed. It is recommended that input wiring be separated from relay contact wiring for safety, as well as for low noise pickup.

1. **Power (Refer to Drawing 4501-542 for power connections):** The label on the unit specifies the AC power requirements. Connect AC power as shown in Drawing 4501-542. Use suitable wire per applicable codes. For 115VAC units, connect the AC HOT power lead to the (L1) terminal and the AC NEUTRAL power lead to the terminal marked (W). For 230VAC units, connect the AC L1 power lead to the (L1) terminal and AC L2 power lead to the terminal marked (L2). Connect the AC GROUND lead to the (G) terminal (the AC Ground (G) terminal is not connected internally).

2. **Grounding:** The alarm housing is plastic and does not require an earth ground connection. If the alarm is mounted in a metal housing, a ground wire connection is required. Connect the ground terminal of the metal housing (Green Screw) to a suitable earth ground using appropriate wire per applicable codes.

3. **Output Contacts:** Wire contacts as shown in the connection Drawing 4501-542. See label on unit for contact rating. Refer to Drawing 4501-544 for suggestions on relay contact protection.

   Electromechanical Relay Contact Protection: To maximize relay life with inductive loads, external protection is required. For DC inductive loads, place a diode across the load (1N4006 or equivalent) with cathode to (+) and anode to (-), see Drawing 4501-544. For AC inductive loads, place a MOV across the load, see Drawing 4501-544.

   IMPORTANT: Noise and/or jitter on the input signal has the effect of reducing (narrowing) the instrument's deadband and may produce contact chatter. The long term effect of this will reduce the life of mechanical relays contacts. To reduce this undesired effect, increase the deadband setting.

4. **V/mA Input:** Connect input per connection Drawing 4501-535. Observe proper polarity. If the input is a 4 to 20mA signal, a jumper must be installed between the Input (+) and Input (L) terminals. Current is delivered to the Input (+) terminal and returned at the Input (-) terminal. Voltage signals are connected to the Input (+) and (-) terminals.

   NOTE: The Input, Output, and Power circuits are isolated from each other, allowing the input circuit to operate with common mode voltages up to 250V AC, or 354V DC, off ground, on a continuous basis.

5. **AC Current Input:** The AC Current Sensor is isolated and can be used in AC circuits up to 250V AC, 50 or 60 Hz. It is designed to be mounted at the source of the AC current to be measured. The sensor outputs a low-level DC milliampere signal, allowing the transmitter to be mounted remote from the AC signal using small gauge wire. The sensor's output (Red/Black) wires can be shorted, open-circuited, or removed from the transmitter’s input terminals, without hazard to personnel or to the AC Current Sensor.

   AC Current Sensor: Per the Input Range chart in the Specifications Section, loop the required number of turns through the toroid for the full-scale range that you need in your application. Use the cable tie provided to mechanically secure the sensor. Refer to Drawing 4501-546.

   DANGER: If the AC Current Sensor is used with an AC Current Transformer (C.T.), disconnect power to the C.T., or short the output of the C.T., before removing the wire going through the AC Current Sensor. If this is not done, an open circuited C.T. will generate high voltages (hazardous) and possible C.T. damage.

   The sensor output wires should be connected to the extension cable (wires) using wire nuts, or equivalent. Sensor output wires are color coded RED (+) and BLACK (-), proper polarity must be observed.

CALIBRATION:

This section provides information for unit configuration and calibration. If the unit was factory calibrated, jumpers have been placed in their proper positions and verification of the calibration can be made per the Adjustment Procedure. If the calibration of the unit is to be changed, first go to the "Shunt Block Configuration Procedure", before going to the Alarm Adjustment Procedure."

Alarm - Shunt Block Configuration Procedure:

The Series 461A Alarm is quite universal in that it can be configured as a HIGH (HI) or LOW (LO) alarm and can operate in the Failsafe or Non-Failsafe mode. Before the adjustment procedure can proceed, the jumpers must be configured for the requirements of the application (refer to Drawing 4501-545 for details). To gain access to the configuration jumpers, first remove the alarm from the installation. Second, remove the circuit boards from the plastic enclosure as described in the following Disassembly Procedure (refer to Drawing 4501-545). Third, configure the jumpers (shunt blocks) as described in the Jumper Configuration procedure below. Fourth, install the circuit board into the plastic enclosure as described in the Assembly Procedure.

Disassembly Procedure for the 461A Plastic Housing:

The plastic housing has no screws, it "snaps" together. A flat-head screwdriver (Acromag 5021-216 or equivalent) is needed to pry the housing apart as described in the following steps.

CAUTION: Do not push the screwdriver blade into the housing more than approximately 0.1 inches while prying it apart. Handling of the printed circuit board should only be done at a static-free workstation, otherwise, damage to the electronics could result.

1. To begin disassembly (refer to Drawing 4501-545) place the screwdriver at point A (left side of the alarm). While pressing the blade into the seam, use a twisting motion to separate the sides slightly. Repeat this operation at point B.
2. Now that the two pieces have been partially separated, use the screwdriver blade to work the left side of the package loose by working around the alarm and carefully prying the sides further apart. Repeat this action until it is easy to remove the left side from the plastic pins holding the pieces together.
3. Repeat this operation for the right side starting at points C & D.

CAUTION: If the two PC boards become separated while taking the package apart, re-align the boards making sure that both interconnection headers are aligned with their mating sockets and carefully push the boards back together.

Jumper Configuration (Shunt Blocks):

Shunt blocks are provided to accommodate in-field configuration changes. In case of misplacement, additional shunt blocks may be ordered from the factory. When ordering additional shunt blocks, refer to Acromag Part Number 1004-332.

1. HIGH (HI) or LOW (LO) Alarm action: Refer to table on Drawing 4501-545 for proper jumper (shunt) position.
2. Failsafe or Non-Failsafe Mode: Refer to table on Drawing 4501-545 for proper jumper (shunt) position.
3. IMPORTANT: Mark the Alarm's Configuration on the calibration label located on the enclosure. Example: CH1, HI, FS or CH2, LO, NFS.

4. After programming the jumpers, install the alarm circuit boards back into their case as described in the assembly procedure below.

Assembly Procedure for the 461A Plastic Housing:

1. Refer to drawing 4501-545 and line up the left plastic side with the board and terminal assembly. Carefully press the pieces together.
2. Align the pins of the center section with the side and press the pieces together.
3. Now line up the right side of the housing with the left side and center assembly and carefully press the pieces together.

Alarm - Adjustment Procedure:

Connect the alarm as shown in Calibration Connection Drawing 4501-543. For best results, the input source must be adjustable over the entire range of the unit and settable to an accuray of 0.1% or better. The alarm status LED's can be used to indicate relay action. The RED LED will turn ON when the relay changes state from a non-alarm to an alarm condition, at the same time the GREEN LED will turn OFF.

The setpoint and deadband potentiometers are accessible from the front panel of the alarm (refer to Drawing 4501-543). The screwdriver blade used to adjust the potentiometers should not be more than 0.1 inch (2.54mm) wide.

Alarm - Calibration Example:

MODEL:	461A-V1-SMRN-1-DIN-NCR (Single Alarm)
Input:	4 to 20mA - Install a jumper between the Input (+) and Input (L) terminals for current input.
Setpoint:	12mA
Alarm Action:	High (HI) Alarm
Alarm Type:	Failsafe
Output:	DPDT Relay Contacts

A. Adjustment Procedure (High and Low Alarms):

Notes (Adjustment Procedure):
1. The adjustment procedure is similar for other inputs.
2. The adjustment procedure is the the same for both Failsafe and Non-Failsafe operation.
3. When the RED LED is ON, it indicates an alarm condition for both the Failsafe and Non-Failsafe mode of operation. The GREEN LED is ON when the signal is in the Normal operating range.
4. If unit is a dual alarm (-DMRN models), repeat this procedure for the second channel using the SP2 and DB2 adjustments (SetPoint 2 and DeadBand 2).
5. Noise and/or jitter on the input signal has the effect of reducing (narrowing) the instrument's deadband and may produce contact chatter. To reduce this undesired effect, increase the deadband setting.

HIGH ALARMS:
1. Set the deadband adjustment pot DB1 fully counter-clockwise for minimum deadband (approximately 0.5% for a pure DC signal).
2. Adjust the input source for 12.000mA DC (value desired for alarm setting in this example).
3. For High Alarms, turn the setpoint potentiometer (SP1) clockwise, just until the relay changes states and the RED LED turns OFF. If the RED LED is already off, proceed to step 4.
4. Now, turn the setpoint potentiometer (SP1) counter-clockwise very slowly, just until the relay changes states and the alarm RED LED turns ON. The setpoint is now calibrated. Check your calibration as noted in step 5 below.
5. For High Alarms, check the setpoint by reducing the input current until the relay changes states and the alarm RED LED turns OFF. Then slowly increase the input current until the alarm just trips (RED LED turns ON). The input current should be within ±0.1% (±0.016mA) of the desired trip point. If not, perform steps 1 through 4 again.
6. If increased deadband is required, turn DB1 control clockwise. Vary the input signal near the trip point and determine the input values for pull-in and drop-out of the relay. The difference between these values is the amount of deadband. Note that readjusting the deadband potentiometer does not affect the setpoint adjustment.

LOW ALARMS:
1. Set the deadband adjustment pot DB1 fully counter-clockwise for minimum deadband (approximately 0.5% for a pure DC signal).
2. Adjust the input source for 12.000mA DC (value desired for alarm setting in this example).
3. For LOW Alarms, turn the setpoint pot (SP1) counter-clockwise until the relay changes state and the RED LED turns OFF.
4. Now, turn the setpoint potentiometer (SP1) clockwise very slowly, just until the relay changes states and the RED LED turns ON. The setpoint is now calibrated. Check your calibration as noted in step 5 below.
5. For LOW Alarms, check the setpoint by raising the input current until the relay changes states and the RED alarm LED turns OFF. Then slowly decrease the input current until the alarm just trips (RED LED turns ON). The input current should be within ±0.1% (±0.016mA) of the desired trip point. If not, perform steps 1 through 4 again.
6. If increased deadband is required, turn DB1 control clockwise. Vary the input signal near the trip point and determine the input values for the pull-in and drop-out of the relay. The difference between these values is the amount of deadband. Note that readjusting the deadband potentiometer does not affect the setpoint adjustment.

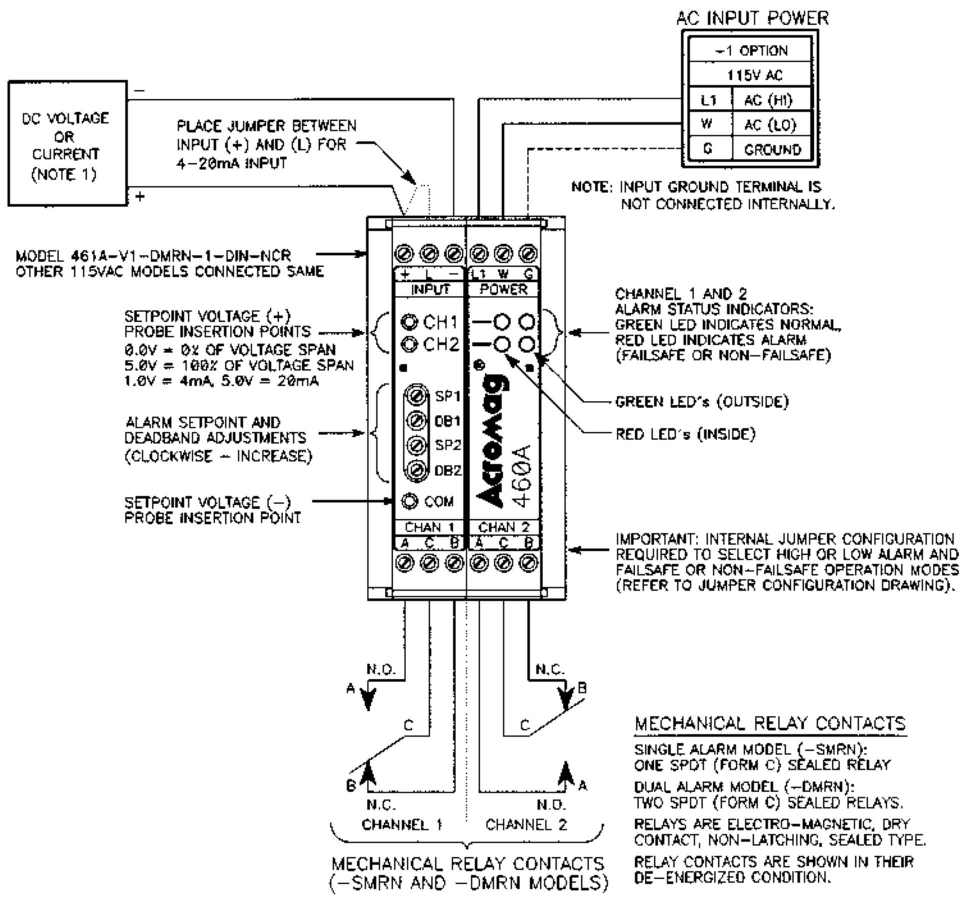
   NOTE: Optionally, the setpoint may be adjusted by connecting a DVM to the setpoint voltage testpoints on the front of the alarm. The voltage measured here is 0 to 5V, corresponding to 0 to 100% of input voltage span. For current inputs, a setpoint voltage of 1 to 5V corresponds to 4 to 20mA of input current. This setpoint voltage represents the true setpoint to within 1% of input span and is a more convenient method of setpoint adjustment where high precision is not required. These test points will accept up to an 0.080 inch diameter probe tip (do not insert probe tip more than 0.4 inches deep).

GENERAL MAINTENANCE:

This alarm contains solid-state components and requires no maintenance except for periodic cleaning and calibration verification. When a failure is suspected, a convenient method for identifying a faulty alarm is to exchange it with a known good unit. It is highly recommended that a non-functioning alarm be returned to Acromag for repair, since Acromag uses tested and burned-in parts, and in some cases, parts that have been selected for characteristics beyond that specified by the manufacturer. Further, Acromag has automated test equipment that thoroughly checks the performance of each alarm.

FIGURE A: 115 VAC CONNECTIONS

(–1) POWER OPTION MODELS ONLY



MECHANICAL RELAY CONTACTS

SINGLE ALARM MODEL (–SMRN):
ONE SPDT (FORM C) SEALED RELAY

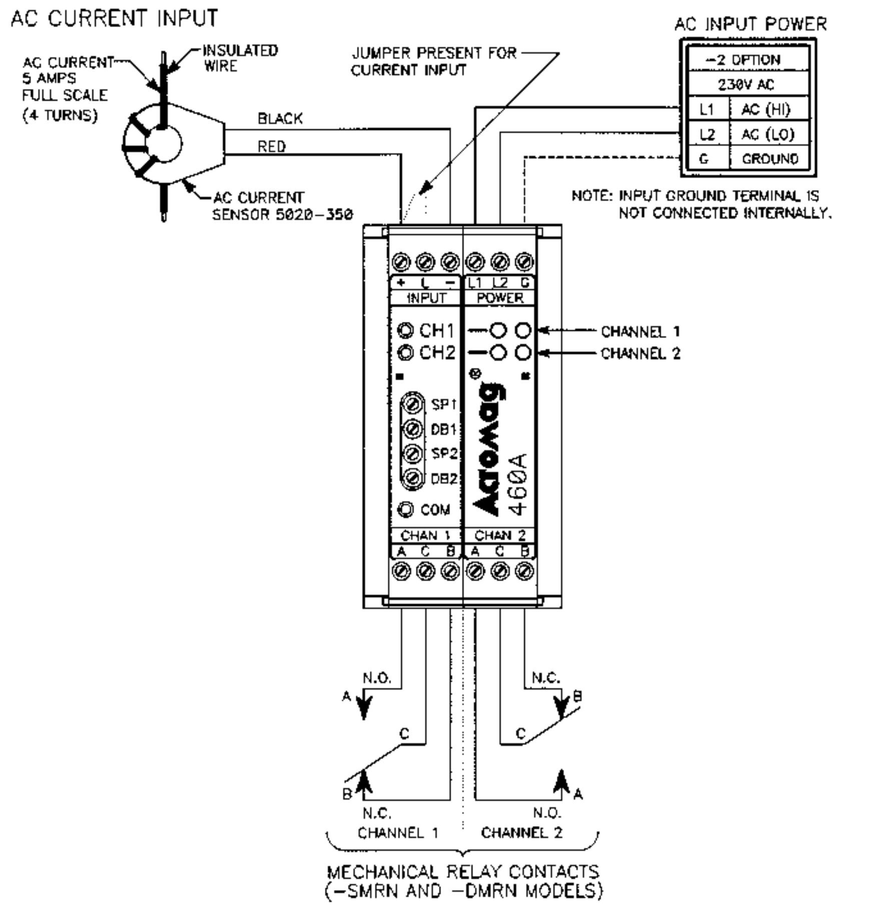
DUAL ALARM MODEL (–DMRN):
TWO SPDT (FORM C) SEALED RELAYS.

RELAYS ARE ELECTRO–MAGNETIC, DRY CONTACT, NON–LATCHING, SEALED TYPE.

RELAY CONTACTS ARE SHOWN IN THEIR DE–ENERGIZED CONDITION.

FIGURE B: 230 VAC CONNECTIONS

(–2) POWER OPTION MODELS ONLY



SERIES 461A ELECTRICAL CONNECTIONS

NOTE:

1. ON (–V1) AND (–V5) INPUT MODELS, THE INPUT CAN BE CONFIGURED FOR 4–20mA VIA THE INSTALLATION OF AN EXTERNAL JUMPER BETWEEN THE INPUT (+) AND (L) TERMINALS. SEE LABEL ON UNIT FOR INPUT RANGE.

Acromag® WIXOM, MICH.

02 AUG 95 | A | —— | TAV | BC | BC
DATE | REV | ECN | DR | ENG | CHK

TITLE SERIES 461A ELECTRICAL CONNECTIONS

D | SERIES 461A | 1 of 1 | DWG NO. 4501–542 | A

FIGURE A
VOLTAGE INPUTS

(-V1) INPUT TYPES: 0 TO 1V
(-V5) INPUT TYPES: 0 TO 5V
(-V0) INPUT TYPES: 0 TO 10V
(-V50) INPUT TYPES: 0 TO 50V
(-V100) INPUT TYPES: 0 TO 100V

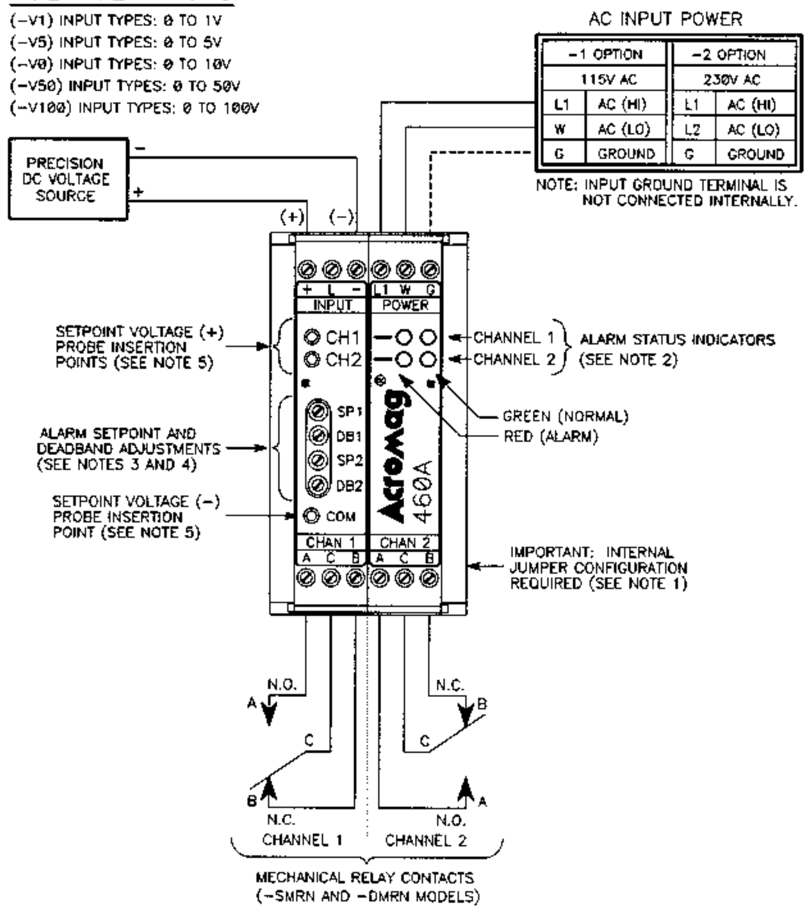
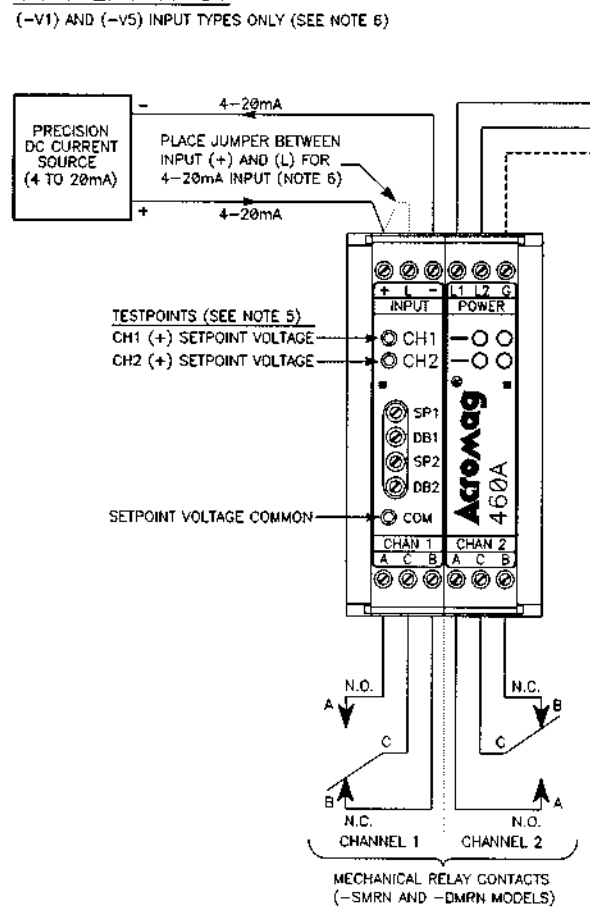


FIGURE B
CURRENT INPUT

(-V1) AND (-V5) INPUT TYPES ONLY (SEE NOTE 6)



NOTES:

1. IMPORTANT: INTERNAL JUMPERS MUST BE SET TO SELECT HIGH OR LOW ALARM AND FAILSAFE OR NON-FAILSAFE OPERATING MODES. REFER TO JUMPER CONFIGURATION DRAWING 4501-545.
2. THE RED LED INDICATES ALARM, THE GREEN LED INDICATES NORMAL. THIS APPLIES TO BOTH THE FAILSAFE AND NON-FAILSAFE OPERATING MODES.
3. TURN THE SETPOINT POTS CLOCKWISE TO INCREASE THE SETPOINT, COUNTER-CLOCKWISE TO REDUCE THE SETPOINT.
4. TURN THE DEADBAND POTS FULLY COUNTER-CLOCKWISE FOR MINIMUM DEADBAND (1%), OR FULLY CLOCKWISE FOR MAXIMUM DEADBAND GREATER THAN 100%.
5. A DVM MAY BE CONNECTED TO THE SETPOINT PROBE INSERTION POINTS ON THE FRONT PANEL. THE VOLTAGE MEASURED HERE IS 0 TO 5 VOLTS, CORRESPONDING TO 0 TO 100% OF INPUT VOLTAGE SPAN. FOR CURRENT INPUTS, 1.0V = 4mA AND 5.0V = 20mA. THIS VOLTAGE INDICATES TRUE SETPOINT WITHIN 0.5% OF SPAN. THESE TEST-POINTS WILL ACCEPT UP TO AN 0.080 INCH DIAMETER PROBE. DO NOT INSERT PROBE TIP MORE THAN 0.4 INCHES DEEP.
6. THE (-V1) AND (-V5) INPUT TYPES CAN SUPPORT 4-20mA CURRENT INPUT BY PLACING A JUMPER WIRE BETWEEN THE INPUT (+) AND (L) TERMINALS (FIGURE B).
7. RELAY CONTACTS ARE SHOWN IN THEIR DE-ENERGIZED CONDITION.

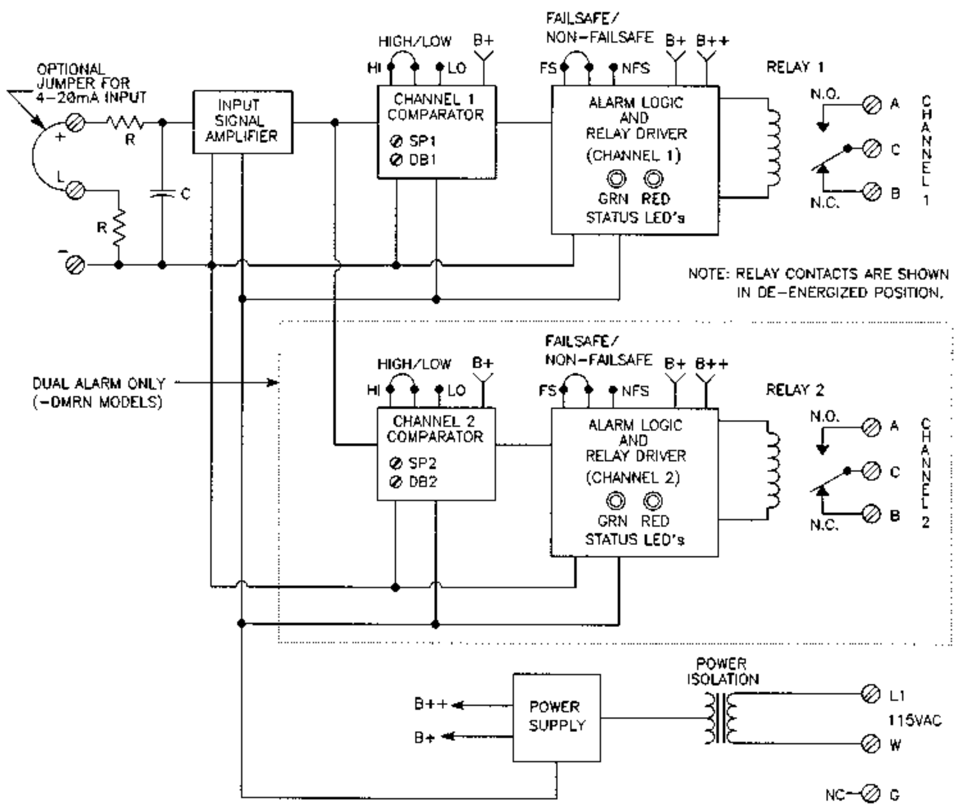
SERIES 461A CALIBRATION CONNECTIONS

Acromag® WIXOM, MICH.

02 AUG 95 | A | ---- | TAV | BC | BC
DATE | REV | ECN | DR | CHK | CVP

TITLE: SERIES 461A CALIBRATION CONNECTIONS

D | SERIES 461A | 1 of 1 | DWG NO. 4501-543 | A



SERIES 461A SIMPLIFIED SCHEMATIC

FIGURE A: DC INDUCTIVE LOADS

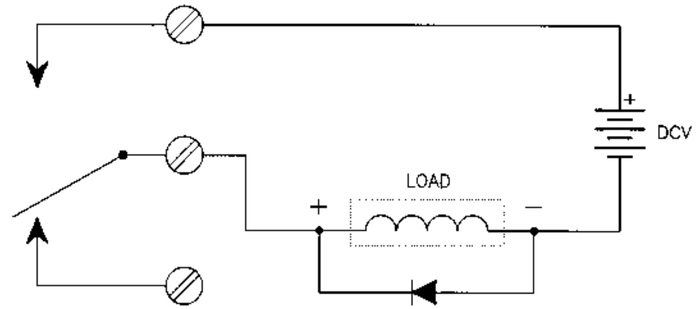
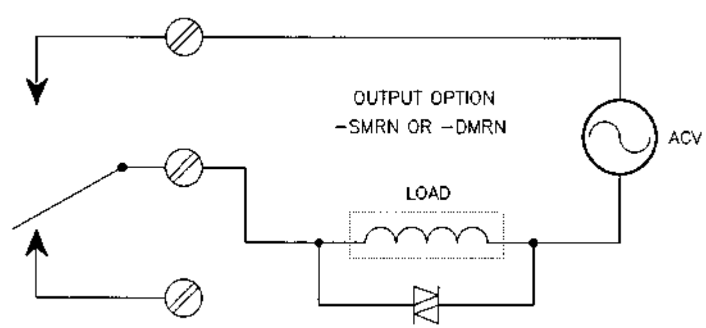


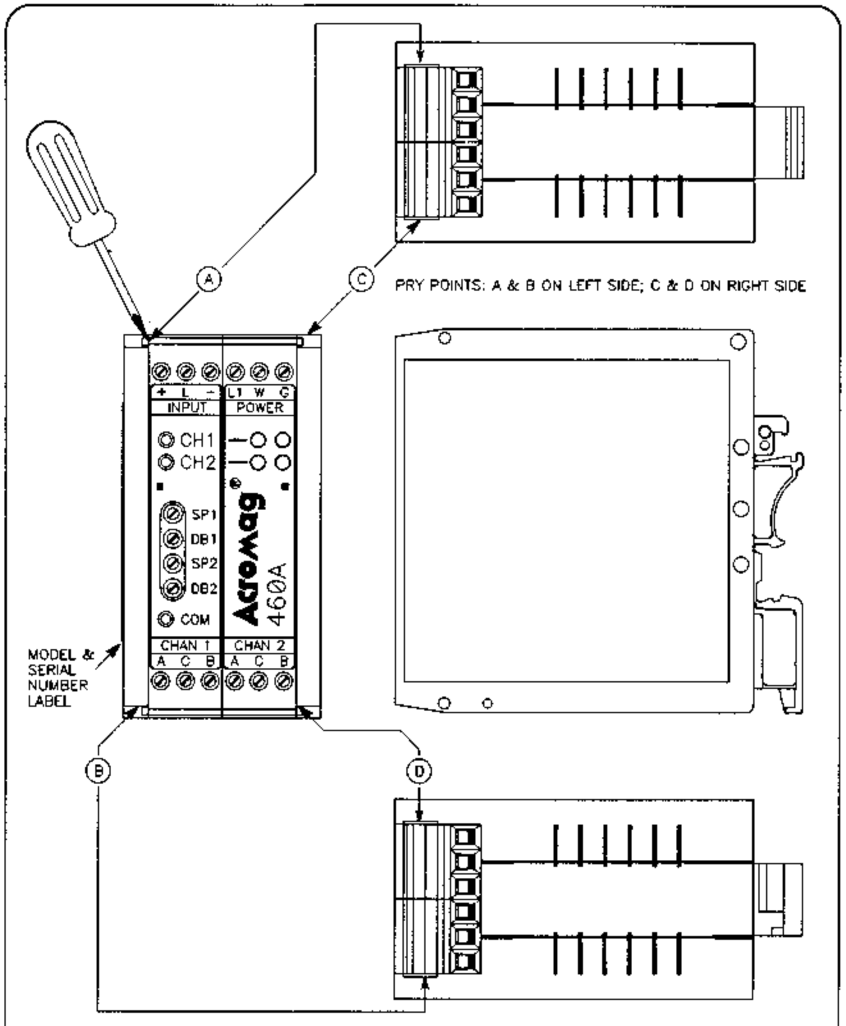
FIGURE B: AC INDUCTIVE LOADS



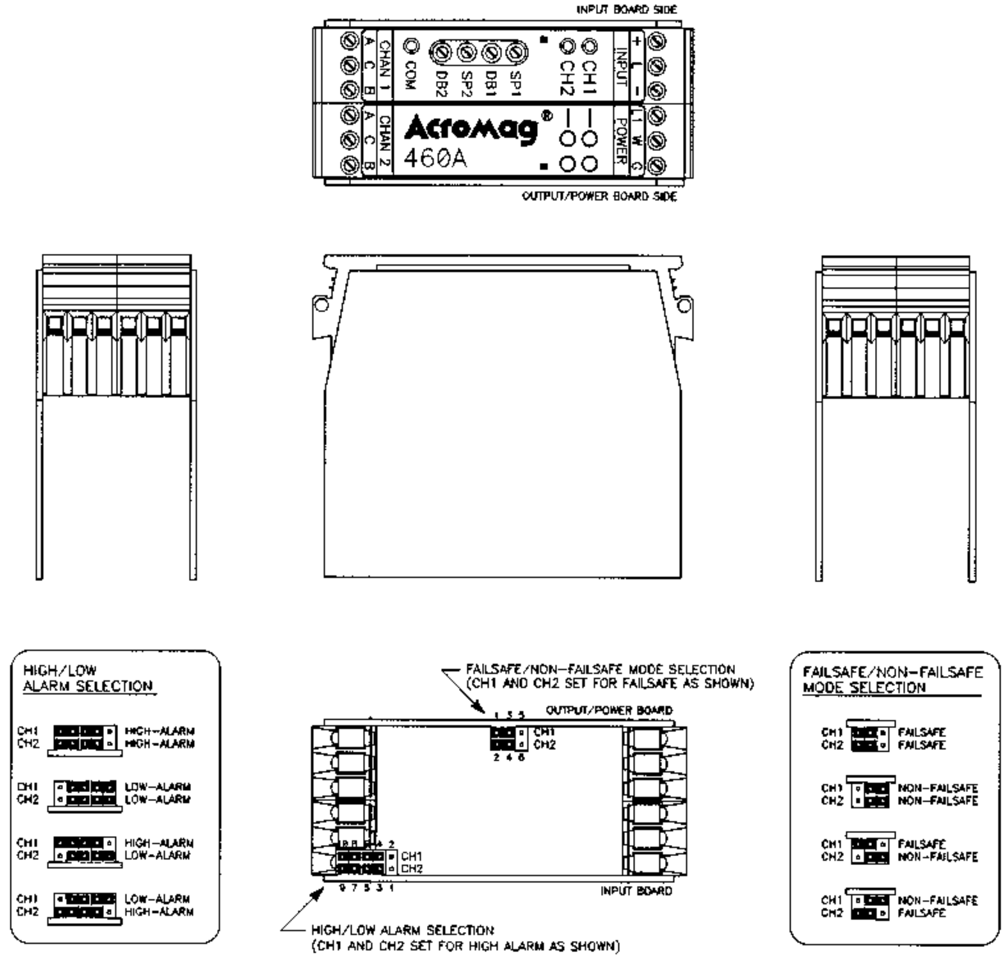
RELAY CONTACT PROTECTION

SERIES 461A SIMPLIFIED SCHEMATIC AND RELAY CONTACT PROTECTION

Acromag
02 AUG 95 | A
SERIES 461A SIMPLIFIED SCHEMATIC
D | SERIES 461A | 1 of 1 | DWG NO. 4501-544 | A



DISASSEMBLY (SEE NOTE 1)



JUMPER CONFIGURATION

SERIES 461A ALARM JUMPER CONFIGURATION

NOTE: 1. REFER TO THE CALIBRATION SECTION OF THE MANUAL FOR DETAILED INSTRUCTIONS.

Acromag WIXOM, MICH

02 AUG 95 | A | TAV | BC | BC

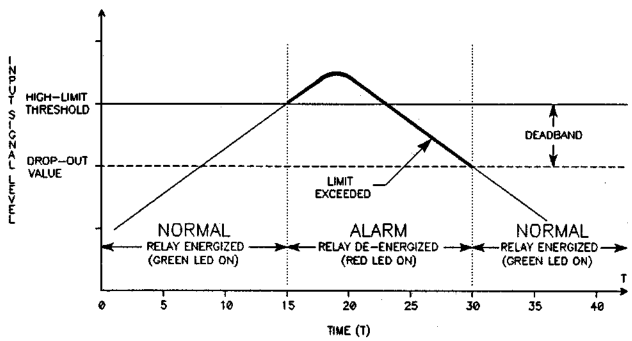
TITLE: 461A ALARM JUMPER CONFIGURATION

D | SERIES 461A | 1 of 1 | DWG NO. 4501-545 | A

FAILSAFE
HIGH ALARM
(NON-LATCHING, MOMENTARY)

DRAWING SHOWS LIMIT EXCEEDED AT TIME = 15. LIMIT REMAINS EXCEEDED UNTIL TIME = 30.

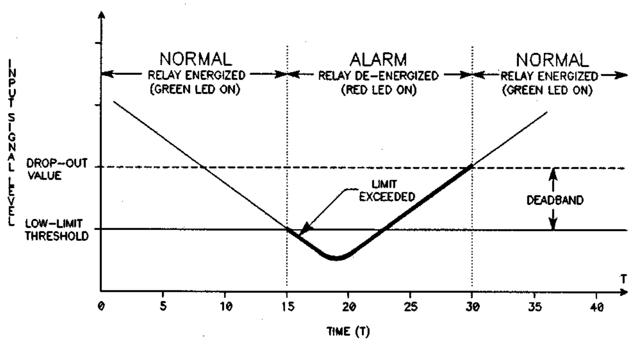
LIMIT EXCEEDED
SIGNAL WITHIN LIMITS



FAILSAFE
LOW ALARM
(NON-LATCHING, MOMENTARY)

DRAWING SHOWS LIMIT EXCEEDED AT TIME = 15. LIMIT REMAINS EXCEEDED UNTIL TIME = 30.

LIMIT EXCEEDED
SIGNAL WITHIN LIMITS



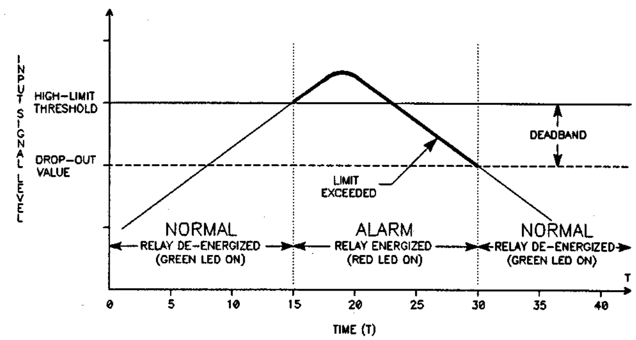
ALARM TYPE	CONDITION	RED LED	GREEN LED	RELAY CONTACTS
HIGH	NORMAL	OFF	ON	ENERGIZED
HIGH	ALARM	ON	OFF	DE-ENERGIZED
LOW	NORMAL	OFF	ON	ENERGIZED
LOW	ALARM	ON	OFF	DE-ENERGIZED

FAILSAFE ALARM CONDITIONS
(RELAY NORMALLY ENERGIZED)

NON-FAILSAFE
HIGH ALARM
(NON-LATCHING, MOMENTARY)

DRAWING SHOWS LIMIT EXCEEDED AT TIME = 15. LIMIT REMAINS EXCEEDED UNTIL TIME = 30.

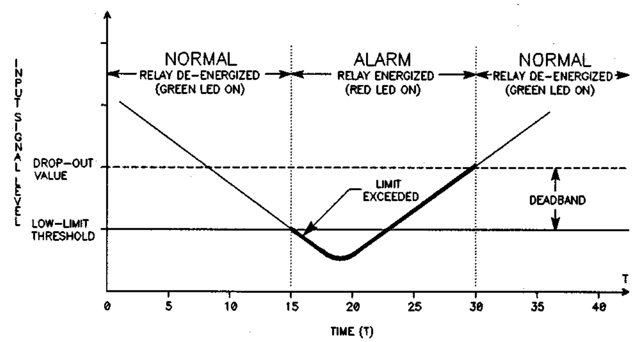
LIMIT EXCEEDED
SIGNAL WITHIN LIMITS



NON-FAILSAFE
LOW ALARM
(NON-LATCHING, MOMENTARY)

DRAWING SHOWS LIMIT EXCEEDED AT TIME = 15. LIMIT REMAINS EXCEEDED UNTIL TIME = 30.

LIMIT EXCEEDED
SIGNAL WITHIN LIMITS

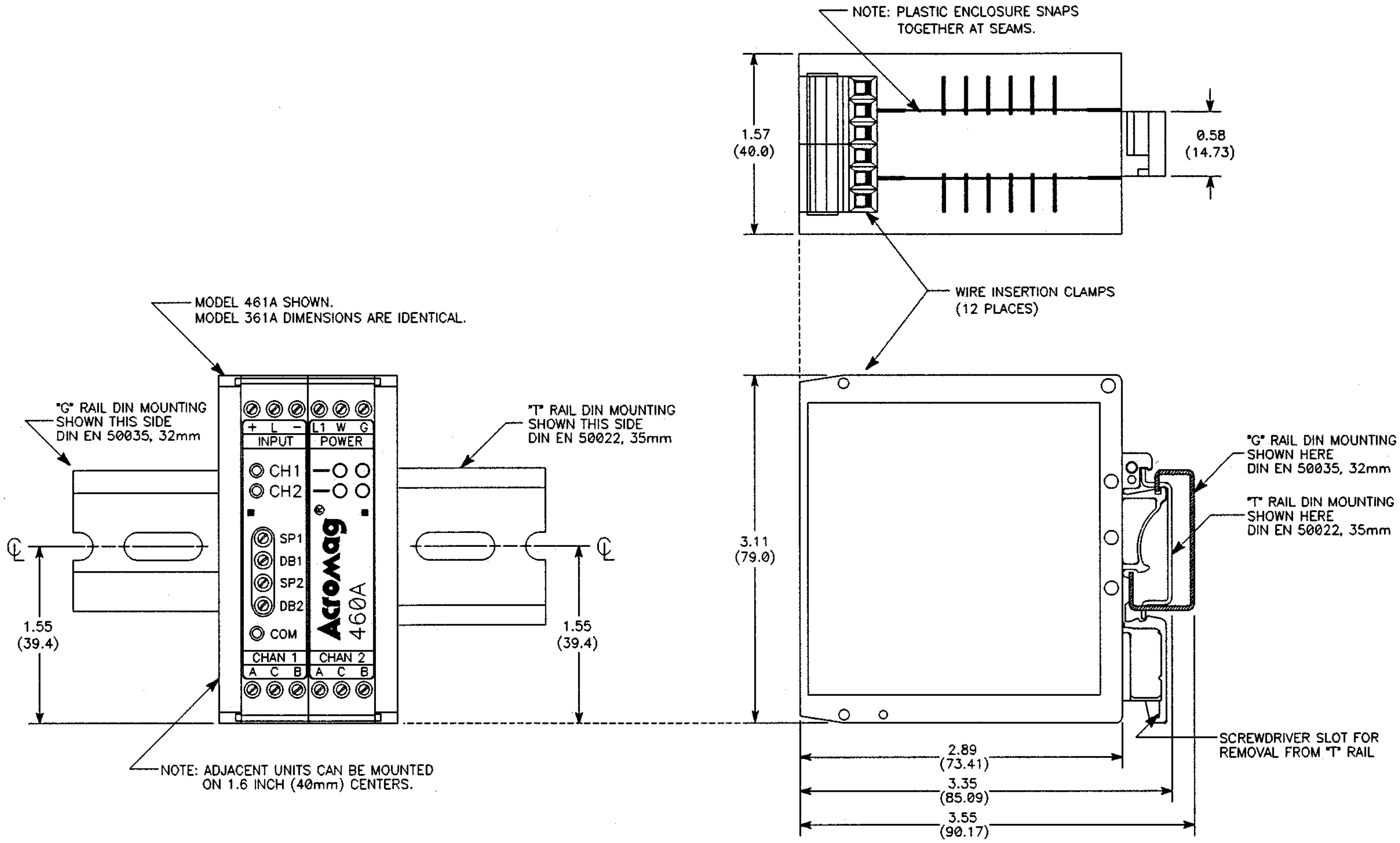


ALARM TYPE	CONDITION	RED LED	GREEN LED	RELAY CONTACTS
HIGH	NORMAL	OFF	ON	DE-ENERGIZED
HIGH	ALARM	ON	OFF	ENERGIZED
LOW	NORMAL	OFF	ON	DE-ENERGIZED
LOW	ALARM	ON	OFF	ENERGIZED

NON-FAILSAFE ALARM CONDITIONS
(RELAY NORMALLY DE-ENERGIZED)

SERIES 361A/461A ALARM CONDITIONS

Acromag® WIXOM, MICH.
02 AUG 95 | A | — | TAV | BC | BC
DATE | REV | ECN | DR | ENG | CLP
TITLE SERIES 361A/461A ALARM CONDITIONS
D | SERIES 361A/461A | 1 of 1 | DWG NO. 4501-539 | A REV

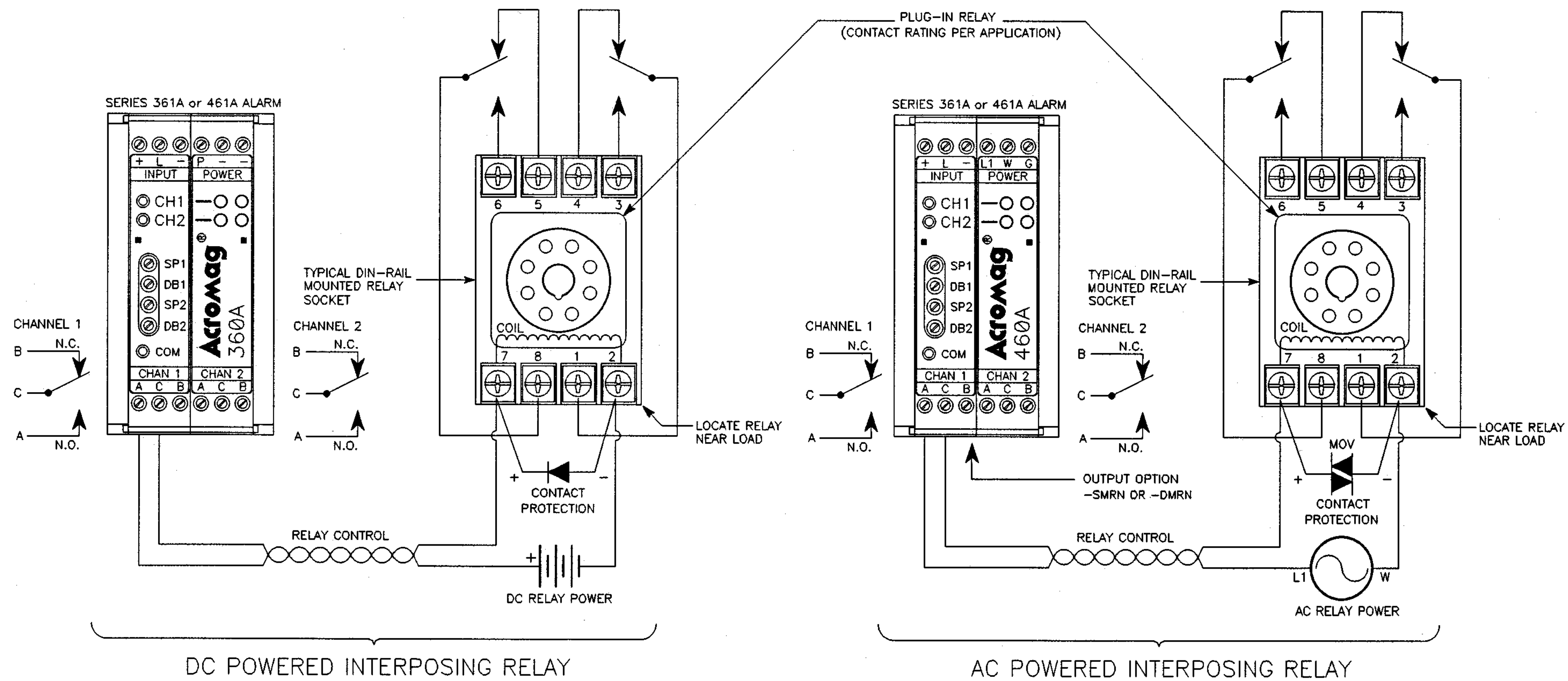


ENCLOSURE DIMENSIONS FOR DIN RAIL MOUNTING

NOTE: ALL DIMENSIONS ARE IN INCHES (MILLIMETERS).

Acromag WIXOM, MICH.	02 AUG 95	A	—	TAV	BC	BC	
	DATE	REV	ECN	DR	ENG	CLP	
TITLE 361A/461A HOUSING: DIN RAIL MOUNT							
D	SERIES 361A/461A	1 of 1	DWG NO. 4501-540	A			

SERIES 361A/461A INTERPOSING RELAY CONNECTIONS



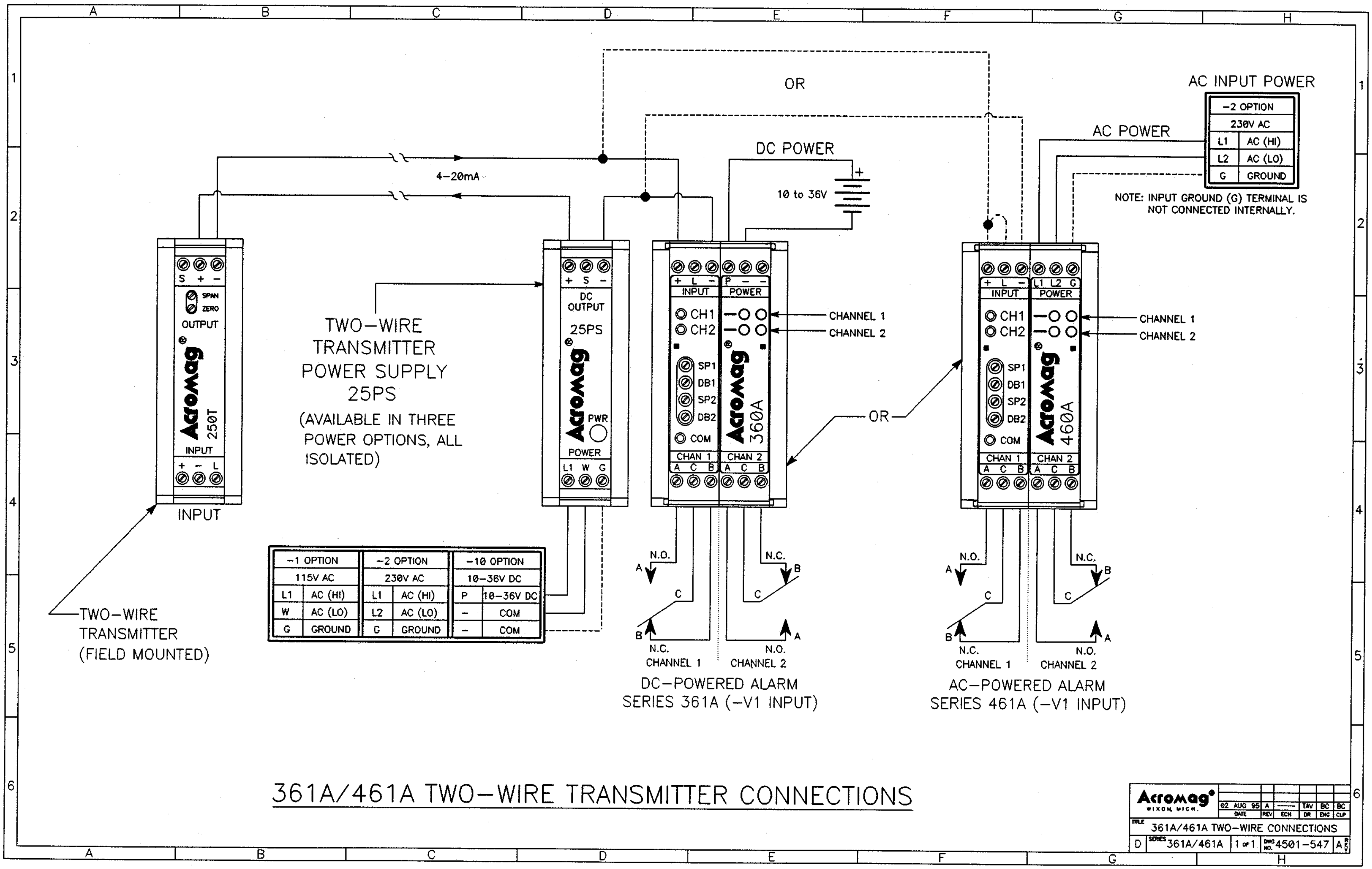
NOTE:
1. A DPDT RELAY IS SHOWN, OTHER RELAY TYPES MAY BE USED.
2. ALL RELAY CONTACTS SHOWN IN DE-ENERGIZED CONDITION.

Acromag® WIXOM, MICH.

DATE	REV	ECN	DR	ENG	CLP
02 AUG 95	A	——	TAV	BC	BC

TITLE 361A/461A INTERPOSING RELAY CONNECTIONS

D | SERIES 361A/461A | 1 of 1 | DWG NO. 4501-541 | REV A


OR
AC INPUT POWER
-2 OPTION
230V AC
L1 AC (HI)
L2 AC (LO)
G GROUND
AC POWER
DC POWER
4-20mA
10 to 36V
NOTE: INPUT GROUND (G) TERMINAL IS NOT CONNECTED INTERNALLY.
S + -
SPAN
ZERO
OUTPUT
Acromag
250T
INPUT
+ - L
INPUT
+ S -
DC OUTPUT
25PS
PWR
POWER
L1 W G
TWO-WIRE TRANSMITTER POWER SUPPLY 25PS
(AVAILABLE IN THREE POWER OPTIONS, ALL ISOLATED)
+ L - P - -
INPUT POWER
CH1
CH2
SP1
DB1
SP2
DB2
COM
360A
CHAN 1 CHAN 2
A C B A C B
CHANNEL 1
CHANNEL 2
OR
+ L - L1 L2 G
460A
-1 OPTION
115V AC
L1 AC (HI)
W AC (LO)
G GROUND
-2 OPTION
230V AC
L1 AC (HI)
L2 AC (LO)
G GROUND
-10 OPTION
10-36V DC
P 10-36V DC
- COM
- COM
TWO-WIRE TRANSMITTER (FIELD MOUNTED)
N.O.
N.C.
A
B
C
CHANNEL 1
CHANNEL 2
DC-POWERED ALARM SERIES 361A (-V1 INPUT)
AC-POWERED ALARM SERIES 461A (-V1 INPUT)
361A/461A TWO-WIRE TRANSMITTER CONNECTIONS
Acromag WIXOM, MICH.
02 AUG 95 A TAV BC BC
DATE REV ECN DR ENG CLP
TITLE 361A/461A TWO-WIRE CONNECTIONS
D SERIES 361A/461A 1 of 1 DWG NO. 4501-547 A

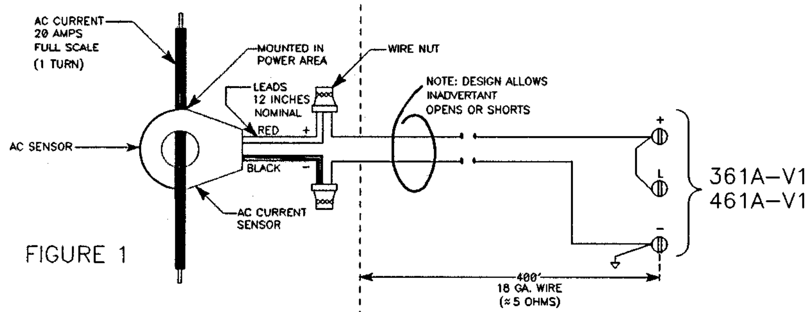


FIGURE 1

CAUTION: DO NOT CONNECT AC CURRENT DIRECTLY TO TRANSMITTER INPUT TERMINALS.

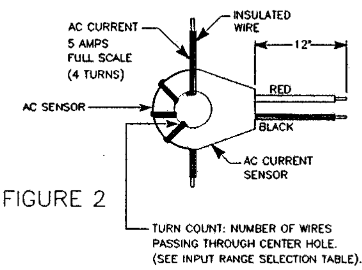


FIGURE 2

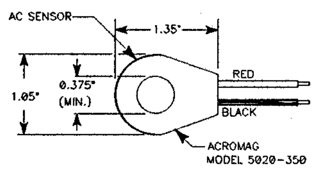
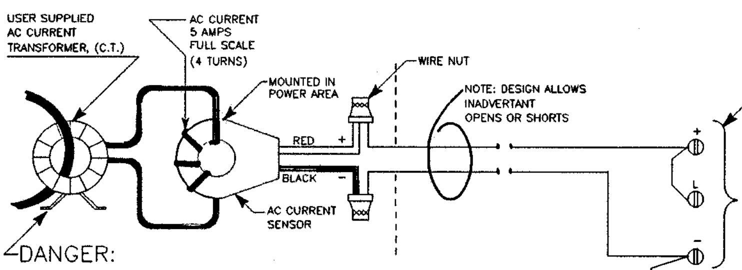


TABLE 1: TURNS CHART

INPUT RANGE SELECTION	
INPUT RANGE (RMS)	TURNS
0 TO 20A	1
0 TO 10A	2
0 TO 5A	4
0 TO 2A	10
0 TO 1A	20

AC CURRENT SENSOR CONNECTIONS

APPLICATION EXAMPLE A: AC CURRENT TRANSFORMER (C.T.)



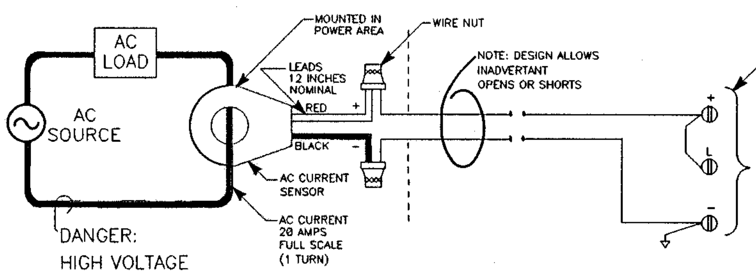
361A–V1
461A–V1
INPUT CONNECTIONS

CAUTION: CONNECT TO AC CURRENT SENSOR ONLY.

DO NOT CONNECT AC CURRENT DIRECTLY TO INPUT TERMINALS.

DANGER:
AC CURRENT TRANSFORMER (C.T.) CONNECTIONS: DISCONNECT POWER TO C.T. OR SHORT OUTPUT OF C.T. BEFORE REMOVING INPUT CONNECTIONS TO AC CURRENT SENSOR. IF THIS PROCEDURE IS NOT FOLLOWED, AN OPEN CIRCUIT C.T. WILL GENERATE HIGH VOLTAGES AND POSSIBLE C.T. DAMAGE WILL RESULT.

APPLICATION EXAMPLE B: 115V/230VAC ELECTRICAL CIRCUIT



361A–V1
461A–V1
INPUT CONNECTIONS

CAUTION: CONNECT TO AC CURRENT SENSOR ONLY.

DO NOT CONNECT AC CURRENT DIRECTLY TO INPUT TERMINALS.

Acromag® WIXOM, MICH.
TITLE: AC CURRENT INPUT ELEC. CONNECTIONS
D | SERIES 361A/461A | 1 OF 1 | DWG NO. 4501-546 | REV A
01 AUG 95 | A