Acromag®

User's Manual: Series 350T
AC Voltage Input DC-Powered Transmitters

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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:
350T-Input-Output-Mounting-Certification-Calibration
B. Typical Model Number: 350T-VAC-Y-DIN-NCR-C

Series	-Input	-Out	-Mtg	-Certif	-Calib
350T	-VAC	-Y	-DIN	-NCR	(Blank)
		-V0		Approval[2]	-C[1]
		-V5			

Notes (Table 1):

1. Unit can be ordered with or without factory calibration; if unit is factory calibrated to customer specifications, the model number suffix "-C" will indicate this. 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 350T is a DC-powered, DIN-rail mounted transmitter family. This model conditions AC Voltage with spans from 60V to 150V AC, and converts this signal to a process current or voltage output. Input circuit isolation is standard. The output and power share a common return. The versatile DIN rail mount can accommodate a variety of mounting applications. See Drawing 4501-372 for a simplified schematic.

Series 350T transmitters are designed to be used as functional components that provide the user with a modular approach to the varied applications in the field. Other 350T transmitters are available to condition DC voltage, current, thermocouples, frequency, AC current, slidewire, and RTD inputs. The Series 350T complements the Acromag Series 250T two-wire transmitter line, providing the same input conditioning for three-wire applications. That is, Series 350T transmitters require a separate power supply connection, while the output signal and DC power share a common lead. The small package size, low power requirements, and wide supply range offers maximum flexibility to the system designer. As a three-wired DC powered device, it can also be used in critical applications that require the use of redundant supplies. The Series 350T operates from a single 10V to 36V DC supply and includes reverse polarity protection and current limiting. In applications requiring only a single transmitter, the 350T can use available DC power, or it can be wired to an optional Series 35PS power supply module.

Series 35PS power supply modules receive their power from either 115V AC, 230V AC, or 10-36V DC. Applications requiring multiple transmitters at a single location can more efficiently share a single DC supply. The modular approach of this design and companion Acromag flat-pack modules allow additional transmitters, input modules, isolators, and alarms to be easily integrated, as required.

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

SPECIFICATIONS:

Function: This family of isolated, DC-powered, transmitters condition an AC voltage signal, provide input circuit isolation, and convert the input signal to a process current or voltage output. The output and DC power share a common terminal. Wide-range zero and span adjustments utilize 22-turn potentiometers accessible from the front of the unit. This transmitter is DIN-rail mounted.

MODEL/SERIES: 350T- (Color coded with a white label)

INPUT:

-VAC: AC Voltage, 50/60 Hz; spans 60 to 150V AC, zero offset from 0 to 90V AC, both continuous adjustments. Withstands 2.0 times full-scale continuously. Input impedance 100K ohms, nominal.

Isolation: The input circuit is electrically isolated from the output and power circuits, allowing the input to operate at 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.

OUTPUT: Process Current or Voltage output. The output shares a common with the power supply. Voltage outputs are designed to provide true voltage output, with zero volts included, and to be stable with capacitive loads.

-Y : 4 to 20mA DC (see Load Resistance Range Equation)
-V0: 0 to 10V DC into 10,000 ohms or greater
-V5: 0 to 5V DC into 5,000 ohms or greater

Load Resistance Range Equation (-Y output option): The maximum load resistance for 20mA compliance is a function of input supply voltage as follows:

R-Load (Maximum) = (Minimum VDC supply - 2.5V) / 0.02A
At 10.0V DC supply, R-Load = 0 to 375 ohms
At 12.5V DC supply, R-Load = 0 to 500 ohms
At 15.0V DC supply, R-Load = 0 to 625 ohms
At 24.0V DC supply, R-Load = 0 to 1075 ohms

Output Limiting: Voltage units: 150% of full scale output, nominal; Current units; 125% of full-scale output, nominal.

Output Ripple: Less than ±0.1% of the maximum output span.

Power: An external DC power supply is required between the output (P) and (-) terminals. Transmitter current is for rated supply inputs, full-scale output, and no-load on voltage output units. Diode on transmitter provides reverse polarity protection.

CAUTION: Do not exceed 36V DC peak, or damage to the transmitter may occur.

A. Process Current Output (-Y): +10.0V to 36.0V DC, 30mA (35mA at current limit).
B. Voltage Output (-V0): +12.5V to 36.0V DC, 9mA maximum.
C. Voltage Output (-V5): +10.0V to 36.0V DC, 9mA maximum.

Power Supply Effect:
DC Volts: less than ±0.001% of output span per volt DC, for rated power supply variations. 60/120 Hz ripple: less than ±0.01% of span per volt peak-to-peak of power supply ripple.

Reference Test Conditions: Input: 0-150V AC, 60Hz.; Output (-Y units): 4-20mA DC (500 ohm load); Output (-Vx units): 0-10V DC into 10K ohms or greater; Ambient 77^{O}F (25^{O}C); +15V DC supply.

Accuracy: Better than ±0.5% of calibrated span. The error includes the combined effects of transmitter repeatability, hysteresis, terminal point linearity, and adjustment resolution. Does not include sensor error.

Ambient Temperature Range: -13^{O}F to 185^{O}F (-25^{O}C to 85^{O}C).

Ambient Temperature Effect: Less than ±0.01% of output span per ^{O}F (± 0.018% per ^{O}C) over the ambient temperature range for reference test conditions. Specification includes the combined effects of zero and span over temperature.

Bandwidth: -3dB at 1KHz, typical.

Response Time: For a step input, the output reaches 98% of output span in 300ms, typical.

Noise Rejection:
Common Mode: Better than 85dB at 60 Hz, 100 ohm unbalance, typical. Normal Mode: Not Applicable

RFI Resistance: Less than ±0.5% of output span change with field strengths up to 10V/meter at frequencies of 27, 151 and 467 MHz.

EMI Resistance: Less than ±0.25% of output span effect with switching solenoids or commutator motors.

Surge Withstand Capability (SWC): Input/Output terminations 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:
Circuit Boards: Military grade FR-4 epoxy glass circuit board.
Circuit Board Coating: Fungus resistant acrylic conformal coat.
Terminals: Compression type, wire size 14 AWG maximum.
Mounting Position: Position insensitive.
Case: Self-extinguishing NYLON Type 6.6 polyamide thermoplastic UL94 V-2, color black. General Purpose, NEMA Type 1 enclosure.

MOUNTING:

-DIN: General Purpose Housing, DIN-Rail Mount - "G" & "T" rails. "G" Rail (32mm), Type EN50035; "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 transmitter is packaged in a general purpose enclosure. Use an auxiliary enclosure to protect against unfavorable environments and locations. Maximum operating ambient temperatures should be within -13^{O}F to 185^{O}F (-25 ^{O}C to 85^{O}C) for satisfactory performance. If unit is factory calibrated, it is ready for installation. Connect as shown in the Connection Drawing 4501-372. If the unit is not factory calibrated, refer to the "CALIBRATION" section.

Mounting: Mount transmitter assembly - refer to Drawing 4501-252 for mounting and clearance dimensions.

DIN Rail Mounting: Using suitable fastening hardware, secure the DIN rail to the designated mounting surface. A transmitter, can be mounted to either the "T" or "G" Rail. Installation of the transmitter to the rail depends on the type of DIN rail used (See Drawing 4501-252). Units can be mounted side-by-side on 1.0 inch centers, if required.

Electrical Connections:

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. Output wires should be 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 the output and power wiring be separated from the signal wiring for safety as well as for low noise pickup.

1. **Power:** Connect DC power supply per Drawing 4501-372. These transmitters operate from DC power supplies only. Power supply voltage is not critical and should be from 10.0V to 36V DC. The supply voltage must not exceed 36 Volts, even instantaneously, and must be adequate to furnish full-scale current or voltage to the load. Variations in power supply voltage, above the minimum required, or variations load resistance have negligible effect on transmitter accuracy. Refer to "POWER" in the preceding SPECIFICATIONS section for current requirements. The minus (-) power supply lead and the minus (-) output lead share a common terminal. This device includes input current limiting and reverse polarity protection.
2. **Output:** Connect output per connection Drawing 4501-372. Load range is a function of the module's output type; refer to "Output" in the preceding "SPECIFICATIONS" section. The output shares a common with the power supply.
3. **Grounding:** The transmitter housing is plastic and does not require an earth ground connection.
4. **Input:** Connect input per Connection Drawing 4501-372. If unit is factory calibrated, the calibration label indicates the input range.

   NOTE: The input circuit is electrically isolated from the output/ power circuit, allowing the input to operate up to 250V AC, or 354V DC, off ground on a continuous basis.

CALIBRATION:

This section provides calibration information. If the unit has been factory calibrated, calibration can be verified per the following Adjustment Procedure.

Adjustment Procedure:

Connect transmitter as shown in the Connection Drawing 4501-372. For best results, the input signal source should be adjustable over the entire input range of the unit, settable to an accuracy of 0.25% or better, and have a source resistance of 100 ohms or less. The output voltage or current must be measured to 0.25% accuracy or better for proper results. The Zero and Span adjustments are accessible on the front panel of the transmitter, see Drawing 4501-372 for their location. The screwdriver blade used to adjust the potentiometers should not be more than 0.1 inch (2.54mm) wide.

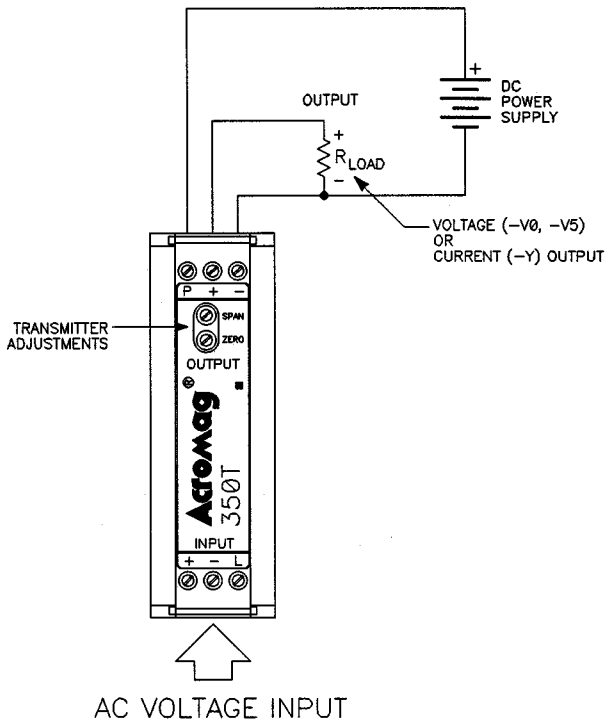
Transmitter - Calibration Example:

MODEL : 350T-VAC-VO-DIN-NCR
Input : 0 to 150V AC.
Output : 0 to 10V DC.

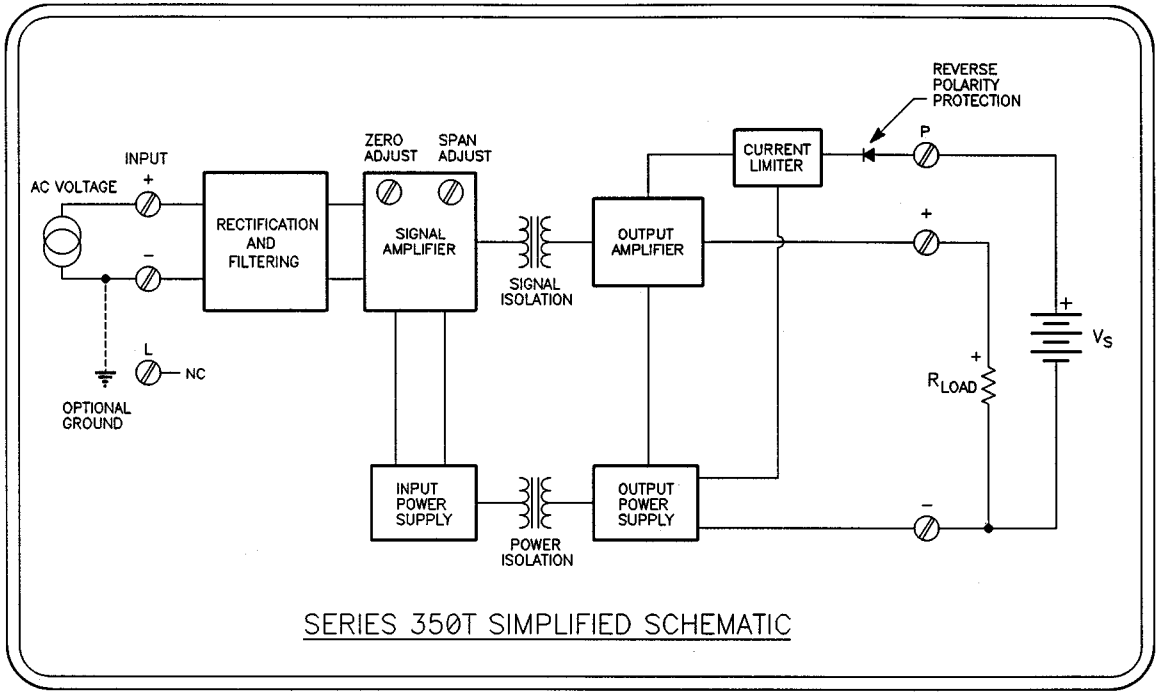
1. Set the input source to 0.00V AC. Adjust the Zero (Z) pot until the output reads 0.000V DC.
2. Set the input source to 150.0V AC. Adjust the Span (S) pot until the output reads 10.000V DC.
3. Repeat steps 1 and 2 above until the readings converge. The instrument is now calibrated. Several mid-point values should also be checked to verify proper operation of the transmitter.

GENERAL MAINTENANCE:

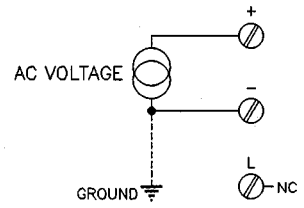
The transmitter contains solid-state components and requires no maintenance, except for periodic cleaning and calibration verification. When a failure is suspected, a convenient method for identifying a faulty transmitter is to exchange it with a known good unit. It is highly recommended that a non-functioning transmitter be returned to Acromag for repair, since Acromag makes use of 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 transmitter.



AC VOLTAGE INPUT



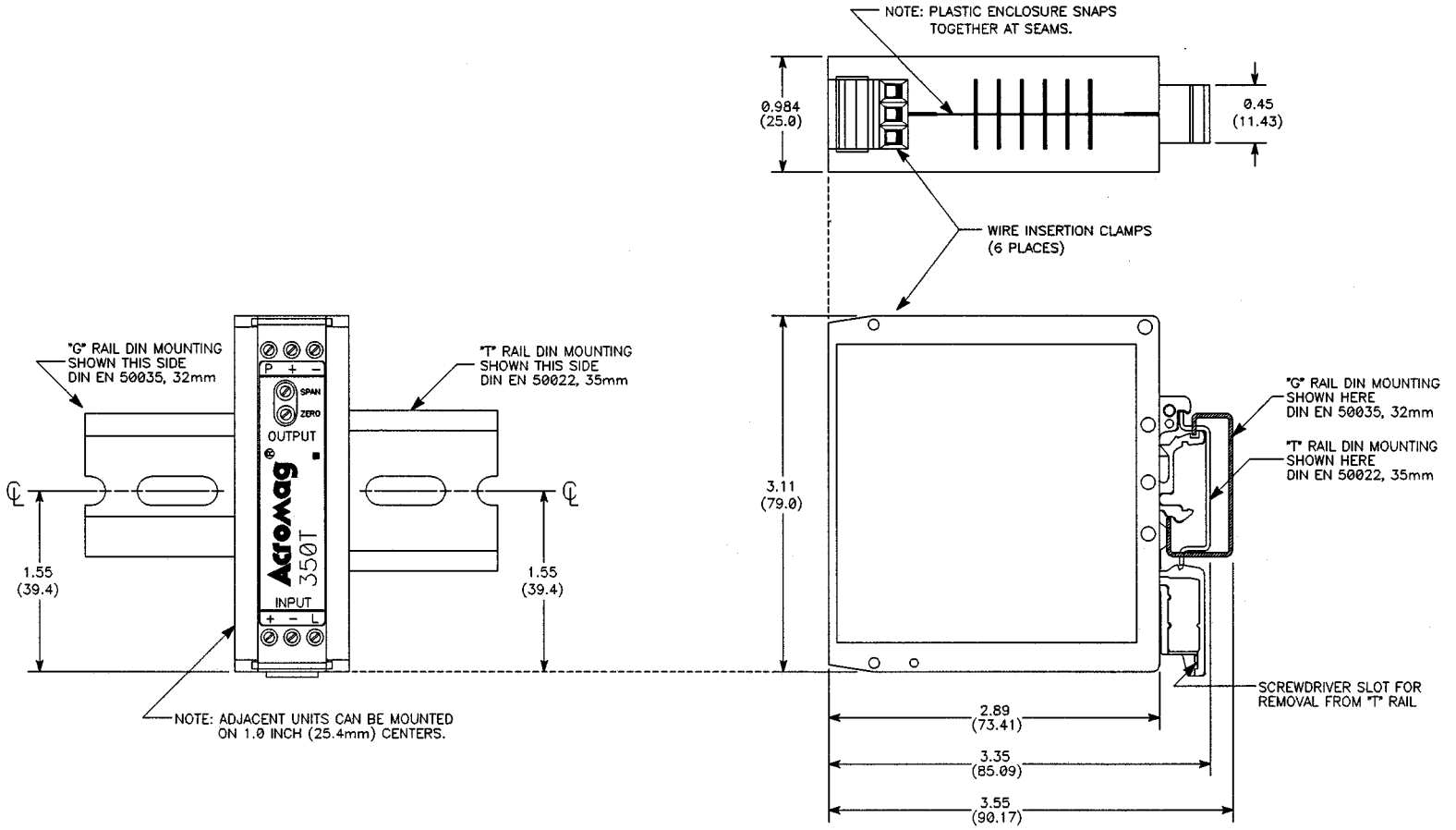
SERIES 350T SIMPLIFIED SCHEMATIC



INPUT CONNECTIONS

SERIES 350T AC VOLTAGE INPUT ELECTRICAL CONNECTIONS

Acromag WIXOM, MICH.								
	07-DEC-93	A	———	BC	BC	BC		
	DATE	REV	ECN	DR	ENG	CLP		
TITLE: SERIES 350T VAC INPUT CONNECTIONS								
D	SERIES: 350T		1 or 1	DWG NO. 4501-372			A REV	



ENCLOSURE DIMENSIONS FOR DIN RAIL MOUNTING

NOTE: ALL DIMENSIONS ARE IN INCHES (MILLIMETERS).

Acromag WIXOM, MICH.	DATE	REV	ECN	DR	ENG	CLP
	12-FEB-93	B	93801	BC	BC	TH
	27-JAN-93	A	———	BC	BC	

TITLE: 350T HOUSING: DIN RAIL MOUNT

SIZE	SERIES		DWG NO.	REV
D	350T	1 OF 1	4501-252	B