



**Series 671T/672T/674T
Process Current
Input Loop-Powered Isolators**

USER'S MANUAL

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Safety Summary - Symbols on equipment:



Means "Caution, refer to this manual for additional information".

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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.

1.0 INTRODUCTION

These instructions cover hardware functionality of the isolator models listed in Table 1. Supplementary sheets are attached for units with special options or features.

Table 1: Models Covered in This Manual

Series/Input/Type	-Options/Output/Enclosure/Approvals ¹
671T ³	-0600
672T ³	-0600
674T ³	-0600

Notes (Table 1):

- Approvals: CE marked, UL and cUL listed.
Hazardous Locations: Class 1; Division 2; Groups A, B, C, D. (See specifications).
- The units are factory calibrated for 4-20mA into a 250Ω load. If your load resistance is different, then a load-trim adjustment may be required upon installation.
- Model 671T provides one isolation channel, 672T provides two channels, and 674T provides four channels. Channels are isolated from each other and operate independent of one another.

DESCRIPTION

Series 67xT Isolators are members of Acromag's vast line of isolators, alarms, and transmitters. These models are simple, low-cost, loop-powered, process current isolators, in single (671T), dual (672T), and four channel (674T) configurations. Units are fully isolated from input to output and channel to channel. Traditional zero and span adjustment is not required, but a load-trim adjustment is provided for different load resistances. Each channel also includes a fault LED indicator for open or failed output loops. These isolators are DIN-rail mounted with removable plug-in type terminal blocks to facilitate ease of installation and replacement, without having to remove wiring. Connectors are an industry standard screw clamp type and accept a wide range of wire sizes.

All 67xT isolator modules are designed to withstand harsh industrial environments. They feature RFI, EMI, ESD, and EFT protection, plus low temperature drift, wide ambient temperature operation, and isolation from input to output and channel to channel. They also have low radiated emissions per CE requirements. The safe, compact, rugged, and reliable design of these isolators makes them an ideal choice for control room or field applications.

Key 67xT Features

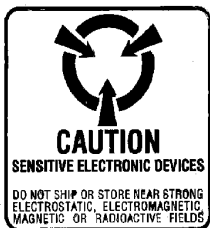
- Fully Isolated** - Galvanic isolation is provided from input to output and between channels for safety and increased noise immunity.
- Convenient Signal Loop Power** - This isolator is powered via the input current with no external power supply required.
- Wide Range Load Resistance** - The current output of this isolator will reliably drive up to 525Ω.
- Output Current Sense Resistor** - Each output channel includes a precision, series-connected, 10Ω resistor that may be used to monitor the output loop current via a DVM, without breaking the loop.
- Wide Ambient Operation** - The unit is designed for reliable operation over a wide ambient temperature range.

Key 67xT Features...continued

- **Hardened For Harsh Environments** - The unit will operate reliably in harsh industrial environments and includes protection from RFI, EMI, ESD, EFT, and surges, plus low radiated emissions per CE requirements.
- **Convenient Mounting, Removal, & Replacement** - The DIN-rail mount and plug-in type terminal blocks make module removal and replacement easy.
- **Loop Fault Indication** - Each channel includes an LED to indicate an open or failed output loop.

2.0 PREPARATION FOR USE**UNPACKING AND INSPECTION**

Upon receipt of this product, inspect the shipping carton for evidence of mishandling during transit. If the shipping carton is badly damaged or water stained, request that the carrier's agent be present when the carton is opened. If the carrier's agent is absent when the carton is opened and the contents of the carton are damaged, keep the carton and packing material for the agent's inspection. For repairs to a product damaged in shipment, refer to the Acromag Service Policy to obtain return instructions. It is suggested that salvageable shipping cartons and packing material be saved for future use in the event the product must be shipped.



This module is physically protected with packing material and electrically protected with an anti-static bag during shipment. However, it is recommended that the module be visually inspected for evidence of mishandling prior to applying power.

This circuit utilizes static sensitive components and should only be handled at a static-safe workstation.

INSTALLATION

This isolator module is packaged in a general purpose plastic enclosure. Use an auxiliary enclosure to protect the unit in unfavorable environments or vulnerable locations, or to maintain conformance to applicable safety standards. Stay within the specified operating temperature range. As shipped from the factory, the unit is already calibrated for 4-20mA into a 250Ω output load. If your load resistance is different, then a load-trim adjustment will be required (see CALIBRATION section).

WARNING: Applicable IEC Safety Standards may require that this device be mounted within an approved metal enclosure or sub-system, particularly for applications with exposure to voltages greater than or equal to 75VDC or 50VAC.

Mounting

Refer to Enclosure Dimensions Drawing 4501-642 for mounting and clearance dimensions.

DIN Rail Mounting: This module can be mounted on "T" type DIN rails. Use suitable fastening hardware to secure the DIN rail to the mounting surface. Units may be mounted side-by-side on 1-inch centers for limited space applications.

"T" Rail (35mm), Type EN50022: To attach a module 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 a module, first separate the input terminal block(s) from the bottom side of the module to create a clearance to the DIN mounting area. Next, insert a screwdriver into the lower arm of the DIN rail connector and use it as a lever to force the connector down until the unit disengages from the rail.

Electrical Connections

Terminals can accommodate wire from 14-24 AWG, solid or stranded. Since common mode voltages can exist on signal wiring, adequate wire insulation should be used and proper wiring practices followed. Input wiring may be shielded or unshielded twisted-pair. Output wires should be twisted pair. Strip back wire insulation 1/4-inch on each lead before installing into the terminal block. It is recommended that output wiring be separated from the input wiring for safety, as well as for low noise pickup. Note that each channel's terminal block is of a plug-in type that can be easily removed to facilitate module removal or replacement, without removing individual wires. To prevent electric shock, be sure to remove the input signal before unplugging the terminals to uninstall the module or before attempting service. All connections should be made with input signal/power removed.

Power, input, and output I/O wiring must be in accordance with Class 1 Division 2 wiring methods, Article 501-4(b) of the National Electrical Code, NFPA 70, for installations in the U.S., or as specified in Section 18-1J2 of the Canadian Electrical Code for installations within Canada and in accordance with the authority having jurisdiction.

CAUTION: Risk of Electric Shock - More than one disconnect switch may be required to de-energize the equipment before servicing.

WARNING: Explosion Hazard - Substitution of components may impair suitability for Class 1 Division 2.

WARNING: Explosion Hazard - Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

1. **DC Current Input:** Connect input(s) per Drawing 4501-723. Observe proper polarity. Use 14-24 AWG wires rated for at least 90° Celsius. Current is delivered to the "IN+" terminal and returned via the "IN-" terminal. Reverse polarity protection is included.

IMPORTANT: Note that circuit power for this model is derived from the input signal and the corresponding input voltage drop will vary as a function of the output load resistance and loop current. For a 250 Ω output load, the reflected voltage drop at 20mA is about 10.2VDC (4.9VDC + [0.0212A x R-load]). Compute the input voltage requirements for your load and make sure that your input source is capable of handling the reflected voltage burden. Note also that this burden is increased if the output loop is opened (fault LED will light).

Note that input and output circuits are isolated from each other allowing the output circuit to operate with common-mode voltages up to 250VAC, or 354VDC off ground, on a continuous basis.

2. **Output Connections:** Wire output(s) as shown in Electrical Connections Drawing 4501-723. The 4-20mA DC output signal can drive resistive loads from 0 to 525 Ω . Optionally, the signal current may be monitored by connecting a DVM across output the "SNS" and "OUT+" terminals to measure the voltage drop across a built-in, precision 10 Ω resistor connected in series with the OUT+ terminal. Standard units are calibrated at the factory for 250 Ω loads. Different load resistances will require load-trim adjustment. With your load connected, adjust this pot clockwise to increase the full-scale output, and counter-clockwise to reduce the full-scale output. See CALIBRATION below.
3. **Grounding:** See Electrical Connections Drawing 4501-723. The module housing is plastic and does not require an earth ground connection. If the isolator is mounted in a metal housing, a ground wire connection is typically required. Connect the metal enclosure's ground terminal (green screw) to earth ground using suitable wire and per applicable codes.

WARNING: For compliance to applicable safety and performance standards, the use of twisted pair wiring is recommended as shown in Drawing 4501-723. Failure to adhere to sound wiring and grounding practices as instructed may compromise safety and performance.

3.0 CALIBRATION

This isolator module does not require traditional zero or span adjustments, but will require a load-trim adjustment at each output channel when different load resistances are used. Units are factory calibrated with a 250 Ω load. If your load resistance is different, then further adjustment may be required. Adjust the load-trim pot as described below.

LOAD-TRIM ADJUSTMENT

Equipment Required

- An accurate input current source adjustable for 4-20mA DC. This source should be accurate beyond the $\pm 0.1\%$ module specification for best results.
- An accurate current or voltage meter is also required to monitor the output level. This meter must be accurate beyond the module specifications for best results.
- A precision load resistance equivalent to your application's load.

Adjustment Procedure

1. Connect the input signal and output load per Electrical Connections Drawing 4501-723 and adjust the input signal to precisely 20.000mA DC.
2. With a DVM placed across your load resistance, measure the full-scale output. If the measured voltage is within $\pm 0.1\%$ of span from full-scale, then a load-trim adjustment is not required. However, if the output voltage is outside of this range, then simply turn the corresponding load-trim pot clockwise to increase the full-scale output value, and counter-clockwise to reduce the full-scale output, as required to bring the measured value within the acceptable range.
3. As a check, adjust the input to precisely 4.000mA and verify the output measurement to within $\pm 0.1\%$ of span as in step 2. If the measured error is greater than $\pm 0.1\%$, then perform step 2 again until rated accuracy is achieved.

4.0 THEORY OF OPERATION

Refer to Simplified Schematic 4501-722 to gain a better understanding of the circuit. These isolators use a center-tapped transformer to isolate from input to output. The transformer is driven in alternating push-pull fashion to couple the input current signal to the output. Current is stepped up slightly at the output of the transformer and a load-trim pot and series resistor is used in parallel with the output to bleed off excess current and provide offset adjustment. The input circuit includes an overvoltage clamp to limit the reflected input burden in the event the output loop is opened. This clamp also drives a "fault" LED to indicate an open output loop. Transient voltage suppressors and other filtering devices are included at the input and output for effective noise filtering and transient suppression. The output includes a precision 10 Ω resistor connected in series with the "OUT+" terminal to facilitate the connection of a DVM from "SNS" to "OUT+" to monitor the output loop current, without breaking the loop.

5.0 SERVICE AND REPAIR

WARNING: To prevent electric shock, be sure to remove the input signal/power and/or disable the load before unplugging the terminals to uninstall the module or before attempting service. All connections should be made with power removed.

SERVICE AND REPAIR ASSISTANCE

This module contains solid-state components and requires no maintenance, except for periodic cleaning and isolator zero and full-scale verification. Since Surface Mounted Technology (SMT) boards are generally difficult to repair, it is highly recommended that a non-functioning module be returned to Acromag for repair. The board can be damaged unless special SMT repair and service tools are used. Further, Acromag has automated test equipment that thoroughly checks and calibrates the performance of each module. Please refer to Acromag's Service Policy Bulletin, or contact Acromag for complete details on how to obtain service parts and repair.

PRELIMINARY SERVICE PROCEDURE

Before beginning repair, be sure that all installation and configuration procedures have been followed. Also be sure that the input source is capable of supporting the reflected voltage burden of this isolator. Make sure your load resistance is connected properly and within the acceptable range. The output sense resistor can be used to monitor the loop current without breaking the loop by connecting a DVM between output SNS and OUT+ and measuring the corresponding voltage drop across 10 Ω . If you continue to have a problem with the unit after making these checks, then an effective and convenient fault diagnosis method is to exchange the questionable module with a known good unit.

Acromag's Application Engineers can provide further technical assistance if required. When needed, complete repair services are available from Acromag.

6.0 SPECIFICATIONS

671T-0600, Single Process Current I/O Isolation Channel

672T-0600, Dual Process Current I/O Isolation Channel

674T-0600, Quad Process Current I/O Isolation Channel

General: The Series 67xT Isolators accept 4 to 20mA process current input signal(s), provide input-to-output and channel-to-channel isolation, and generate 4 to 20mA output signal(s). These isolators are input loop-powered. Full galvanic isolation is provided between input and output. Channels operate independently and are also isolated from each other. The isolator is DIN-rail mounted with plug-in type terminal blocks. The unit is factory calibrated for 250 Ω loads. Traditional zero and span adjustment is not required, but a load-trim adjustment is required for different load resistances.

MODEL NUMBER DEFINITION

Transmitter/isolators are color coded with a white label. The prefix "6" denotes Series 600 Isolators, "7" denotes input loop-powered versions, "X" denotes "1", "2", or "4" isolation channels, the "T" suffix specifies that this device is a transmitter/isolator.

67XT: Loop-powered, single (671T), dual (672T), or four channel (674T) isolator for process current I/O.

-0600: The four digits of this model suffix represent the following options, respectively:

0 = Option specifier - no option;

6 = Output is DC current;

0 = Enclosure is DIN rail mounted;

0 = Approvals: CE marked, UL and cUL listed.

Hazardous Locations: Class 1; Division 2; Groups A, B, C, D.

INPUT SPECIFICATIONS

The following paragraphs summarize this model's input type and ranges, plus applicable specifications.

DC (Process) Current: 4 to 20mA DC, 2 to 21mA range typical.

Reference Test Conditions: 4 to 20mA input/output current; R-load = 250 Ω , Ambient temperature = 25°C.

Input Overvoltage Protection: Bipolar Transient Voltage Suppressors (TVS), 22V breakdown, 40V clamp level typical.

Input Voltage Drop: The input voltage drop is a function of input current and load resistance and is computed as follows (computed at 20mA): V-drop = (4.9VDC + [0.0212 x R-load]).

General Input Specifications

Input/Output Accuracy: Typically better than $\pm 0.1\%$ of full scale ($\pm 20\mu\text{A}$). This error includes the combined effects of isolator repeatability, hysteresis, terminal point linearity, and adjustment resolution.

Accuracy Versus Temperature: Better than $\pm 0.01\%$ of input span per °F ($\pm 0.018\%$ per °C) over the ambient temperature range for reference test conditions. This specification includes the combined effects of zero and span drift over temperature.

Noise Rejection (Common Mode): Better than 110dB at 60Hz, typical.

Input Bandwidth: -3dB at 2.2Hz, typical.

OUTPUT SPECIFICATIONS

DC Process Current Output Specifications:

Output Range: 4 to 20mA DC, 2 to 21mA range typical.

Output Accuracy: see Input/Output Accuracy.

Output Ripple: Less than $\pm 0.1\%$ of output span.

Output Compliance: 13V typical.

Output Load Resistance Range: 0 to 525 Ω . Units are factory calibrated with 250 Ω loads. Load-trim adjustment will be required for different load resistances.

General Output Specifications:

Output Load Resistance Effect: Less than $\pm 0.5\%$ of output span effect as load is varied $\pm 25\Omega$ from nominal calibration. Unit is factory calibrated for 250Ω loads. Adjust the load-trim pot to precisely set the full-scale output for other load resistance values.

Output Response Time: Less than 300ms, typical, to 98% of final value into 250Ω , for a step change in the input.

Output Current Sense Resistor: A built-in precision 10Ω resistor ($\pm 0.1\%$, $\pm 25\text{ppm}/^\circ\text{C}$) is connected in series with the output "OUT+" terminal for convenient output loop current monitoring with a DVM. Connect a DVM between output "SNS" and "OUT+" to measure the corresponding voltage drop across 10Ω , without breaking the loop. Thus, a measurement of 40mV to 200mV represents 4 to 20mA in this mode.

ENCLOSURE/PHYSICAL SPECIFICATIONS

Unit is packaged in a general purpose plastic enclosure that is DIN rail mountable for flexible, high density (approximately 1" wide per unit) mounting. See Enclosure Dimensions Drawing 4501-724 for details.

Dimensions: Width = 1.05 inches, Height = 4.68 inches, Depth = 4.35 inches (see Drawing 4501-724).

DIN Rail Mounting (-xx0x): DIN rail mount, Type EN50022; "T" rail (35mm).

Connectors: Removable plug-in type terminal blocks; Current/Voltage Ratings: 15A/300V; Wire Range: AWG #14-24, solid or stranded; Separate terminal blocks are provided for each I/O channel.

Case Material: Self-extinguishing NYLON type 6.6 polyamide thermoplastic, UL94 V-2, color beige; general purpose NEMA Type 1 enclosure.

Printed Circuit Boards: Military grade FR-4 epoxy glass.

Visual "Fault" Indicator: A yellow LED (labeled "FLT") for each channel provides visual status indication of when the output loop is opened, or the load resistance is excessive.

Shipping Weight: 1 pound (0.45 Kg) packed.

APPROVALS (-xxx0)

0: CE marked
UL Listed (UL508 and UL1604)
cUL listed (Canada Standard C22.2, 142-M1987 and 213-M1987).
Hazardous Location: Class 1; Division 2; Groups A, B, C, D.

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature: -25°C to $+70^\circ\text{C}$ (-13°F to $+158^\circ\text{F}$).

Storage Temperature: -40°C to $+85^\circ\text{C}$ (-40°F to $+185^\circ\text{F}$).

Relative Humidity: 5 to 95%, non-condensing.

Isolation: Inputs, outputs, and channels are isolated from each other for common-mode voltages up to 250VAC, or 354V DC off DC power ground, on a continuous basis (will withstand 1500VAC dielectric strength test for one minute without breakdown). This complies with test requirements outlined in ANSI/ISA-82.01-1988 for the voltage rating specified.

Installation Category: Designed to operate in an Installation Category (Overvoltage Category) II environment per IEC 1010-1 (1990).

Radiated Field Immunity (RFI): Designed to comply with IEC1000-4-3 Level 3 (10V/M, 80 to 1000MHz AM & 900MHz keyed) and European Norm EN50082-1.

Electromagnetic Interference Immunity (EMI): No output shift will occur beyond $\pm 0.25\%$ of span, under the influence of EMI from switching solenoids, commutator motors, and drill motors.

Electrical Fast Transient Immunity (EFT): Complies with IEC1000-4-4 Level 3 (2KV) and European Norm EN50082-1.

Electrostatic Discharge (ESD) Immunity: Complies with IEC1000-4-2, Level 3 (8KV/4KV air/direct discharge) to the enclosure port and European Norm EN50082-1.

Radiated Emissions: Meets or exceeds European Norm EN50081-1 for class B equipment.

IMPORTANT: Power, input, and output (I/O) wiring must be in accordance with Class I, Division 2 wiring methods Article 501-4(b) of the National Electrical Code, NFPA 70 for installations in the U.S., or as specified in section 18-1J2 of the Canadian Electrical Code for installations within Canada and in accordance with the authority having jurisdiction.

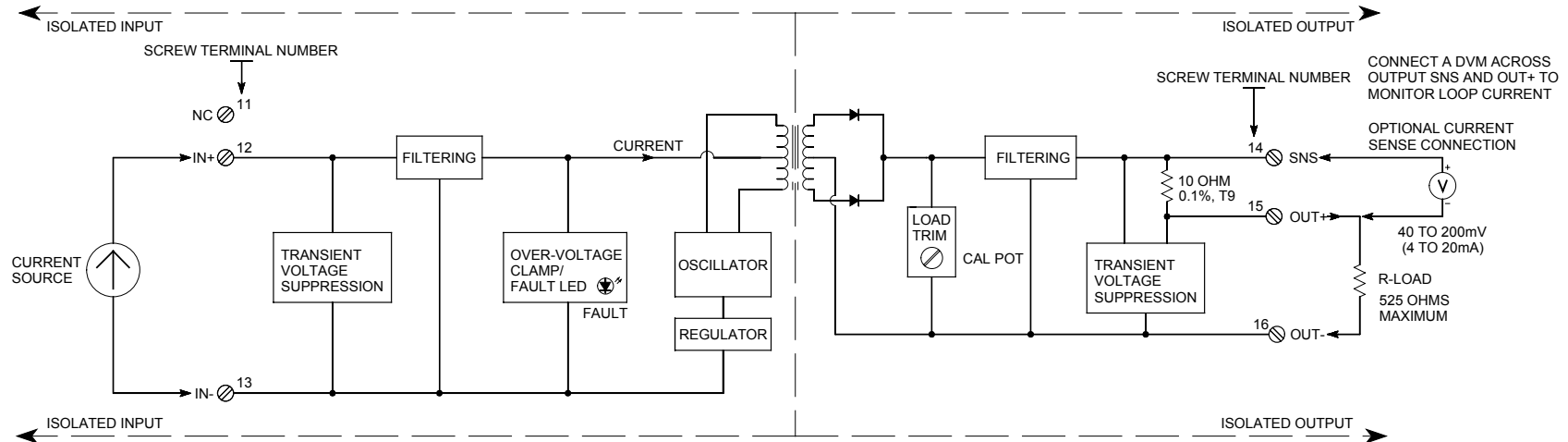
This equipment is suitable for use in Class I, Division 2, Groups A, B, C, and D, or non-hazardous locations only.

WARNING – EXPLOSION HAZARD – Substitution of components may impair suitability for Class I, Division 2.

WARNING – EXPLOSION HAZARD – Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

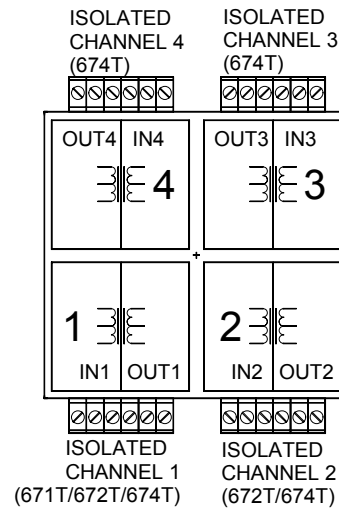
Notes:

ISOLATED CHANNEL 1 OF 4



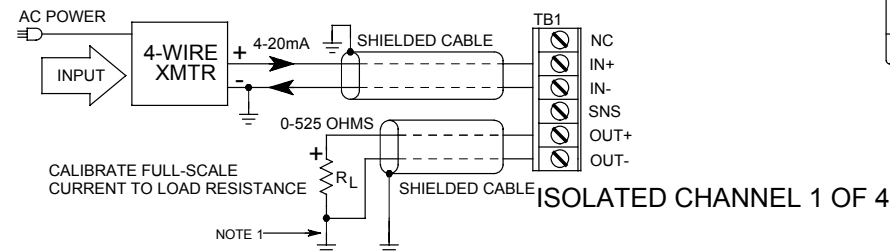
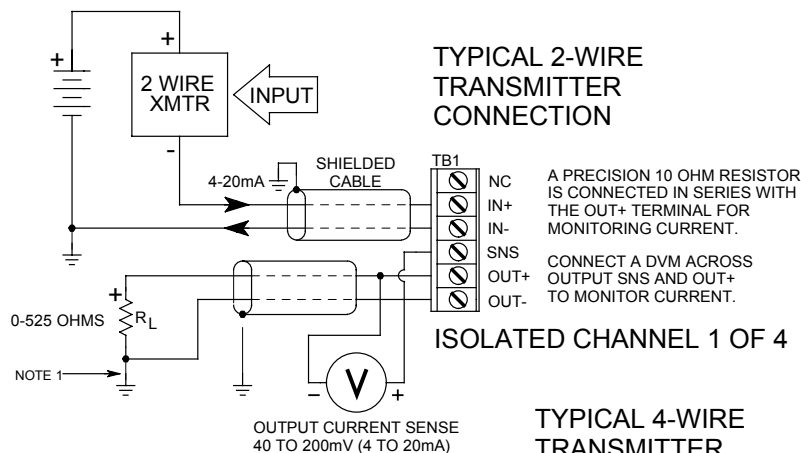
SERIES 674T SIMPLIFIED SCHEMATIC (ISOLATION CHANNEL 1 OF 4)

671T UNITS HAVE A SINGLE CHANNEL AS SHOWN.
 672T UNITS HAVE TWO CHANNELS, EACH AS SHOWN.
 674T UNITS HAVE FOUR CHANNELS, EACH AS SHOWN.
 ALL UNITS ARE ISOLATED FROM INPUT TO OUTPUT
 AND CHANNEL TO CHANNEL.



4501-722A

ELECTRICAL CONNECTIONS



NOTE 1: THIS GROUND CONNECTION IS RECOMMENDED FOR BEST RESULTS. IF SENSORS ARE INHERENTLY CONNECTED TO GROUND, USE CAUTION AND AVOID MAKING ADDITIONAL GROUND CONNECTIONS WHICH COULD GENERATE GROUND LOOPS AND MEASUREMENT ERROR.

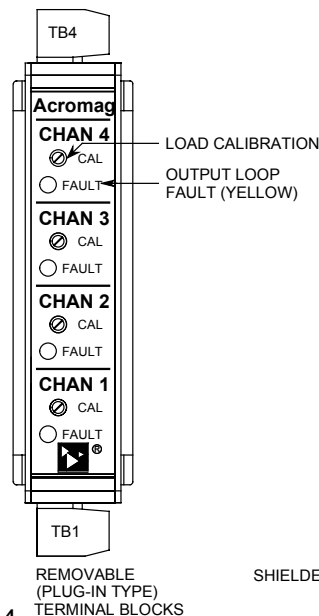
MODULE CONTAINS ONE, TWO, OR FOUR ISOLATED CHANNELS.

MODEL 67xT INPUT CONNECTIONS AT CHANNEL 1 OF 4 (674T-0600)

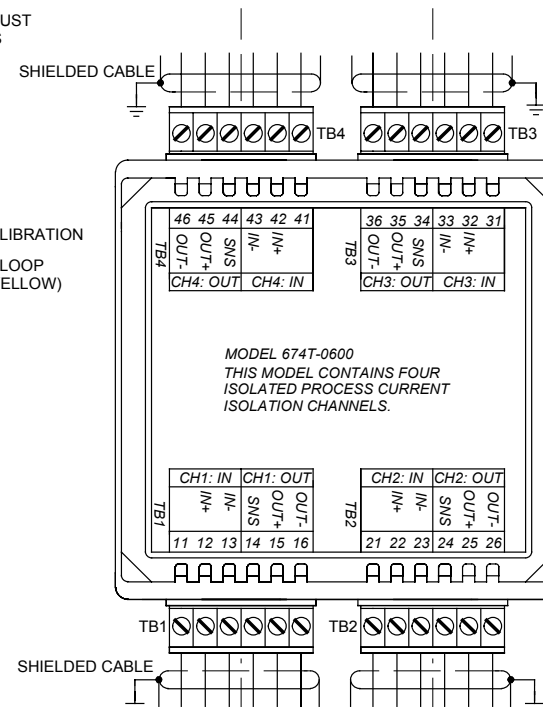
WARNING:
FOR COMPLIANCE TO APPLICABLE SAFETY AND PERFORMANCE STANDARDS, THE USE OF SHIELDED CABLE IS RECOMMENDED AS SHOWN. ADDITIONALLY, THE APPLICATION OF EARTH GROUND MUST BE IN PLACE AS SHOWN IN THIS DRAWING. FAILURE TO ADHERE TO SOUND WIRING AND GROUNDING PRACTICES MAY COMPROMISE SAFETY AND PERFORMANCE.

SAFETY GUIDELINES MAY REQUIRE THAT THIS DEVICE BE HOUSED IN AN APPROVED METAL ENCLOSURE OR SUB-SYSTEM, PARTICULARLY FOR APPLICATIONS WITH VOLTAGES GREATER THAN OR EQUAL TO 75VDC/50VAC.

CALIBRATION NOTE: ADJUST CAL POT FOR LOAD RESISTANCE TO BE USED. SET INPUT TO FULL-SCALE (20mA) AND ADJUST CAL UNTIL LOAD VOLTAGE IS EQUAL TO $0.020 \times R_{LOAD}$.

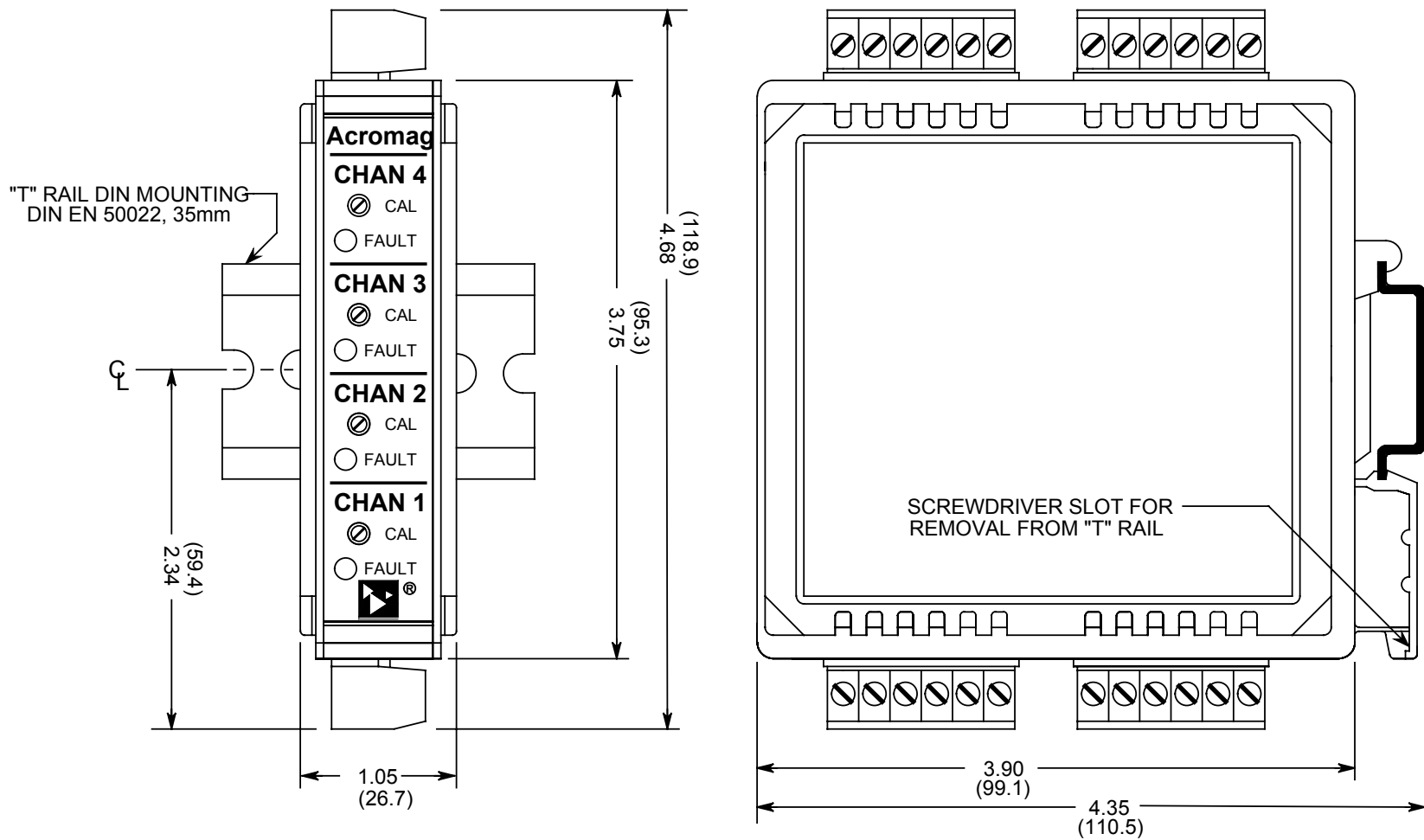


I/O CONNECTIONS (SEE I/O CONNECTIONS AT LEFT)



I/O CONNECTIONS (SEE I/O CONNECTIONS AT LEFT)

4501-723A



NOTE: ALL DIMENSION ARE IN INCHES (MILLIMETERS)

67XT ISOLATOR ENCLOSURE DIMENSIONS

4501-724A