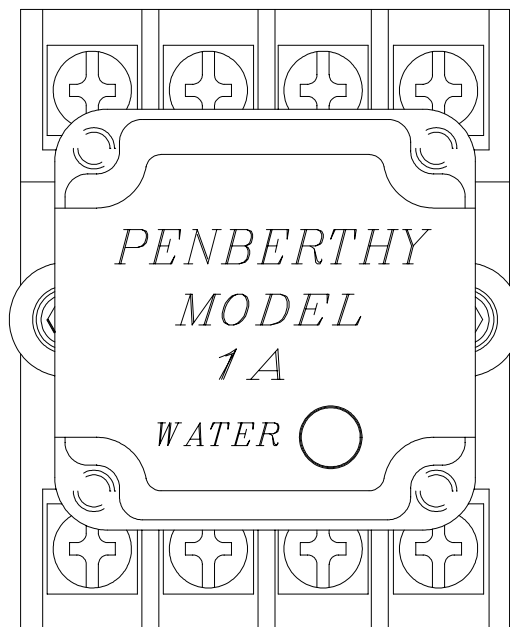


PENBERTHY®

Installation, Operation and Maintenance for Penberthy Electronic Water Level Switch

Model 1A



Installation, Operation and Maintenance
Instructions

TABLE OF CONTENTS

Product Warranty	iii
1.0 Description	1
2.0 Supply & Installation	1
2.1 Packing	1
2.2 Location of Electronics	1
2.3 Water Column	1
2.4 Probes	2
2.5 Probe Housing	2
2.6 Optional Enclosure	3
2.7 Optional Probe Wiring Junction Box	3
2.8 Wiring	3
2.8.1 At The Probes	3
2.8.2 At the Electronic Module	4
2.8.3 Control Output	5
3.0 Startup And Operation	6
3.1 Water Column	6
3.2 Electronic Module Sensitivity Control	6
3.3 Probe Installation	6
4.0 Detection Circuitry	6
5.0 Maintenance	6
5.1 Water Column	6
5.2 Probes.	7
5.3 Electronics.	7
6.0 Spare Parts	7
7.0 Model 1A Specifications.	8
8.0 Troubleshooting	9
9.0 Disposal at End of Useful Life	9
10.0 Telephone Assistance / Factory Repair	10

Table of Figures

Figure # 1 - Probe Assembly	3
Figure # 2 - Ground Connection Location	3
Figure # 3 - Wiring Detail - Electronic Module	4
Figure # 4 - Wiring Detail - 120 Vac Supply	4
Figure # 5 - Wiring Detail - 240 Vac Supply	5
Figure # 6 - Optional NEMA 4X / IP66 Enclosure	11
Figure # 7 - Optional Probe Wiring Junction Box	11

PENBERTHY PRODUCT WARRANTY

Tyco Valves & Controls-Prophetstown warrants its Penberthy products as designed and manufactured by TV&C-Prophetstown to be free of defects in the material and workmanship for a period of one year after the date of installation or eighteen months after the date of manufacture whichever is earliest. TV&C-Prophetstown will, at its option, replace or repair any products which fail during the warranty period due to defective material or workmanship.

Prior to submitting any claim for warranty service, the owner must submit proof of purchase to TV&C-Prophetstown and obtain written authorization to return the product. Thereafter, the product shall be returned to TV&C in Prophetstown, Illinois, with freight paid.

This warranty shall not apply if the product has been disassembled, tampered with, repaired or otherwise altered outside of TV&C-Prophetstown factory, or if it has been subject to misuse, neglect or accident.

The responsibility of TV&C-Prophetstown hereunder is limited to repairing or replacing the product at its expense. TV&C-Prophetstown shall not be liable for loss, damage or expenses related directly or indirectly to the installation or use of its products, or from any other cause or for consequential damages. It is expressly understood that TV&C-Prophetstown is not responsible for damage or injury caused to other products, buildings, personnel or property, by reason of the installation or use of its products.

THIS IS TV&C-PROPHETSTOWN'S SOLE WARRANTY AND IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED WHICH ARE HEREBY EXCLUDED, INCLUDING IN PARTICULAR ALL WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

This document and the warranty contained herein may not be modified and no other warranty, expressed or implied, shall be made by or on behalf of TV&C-Prophetstown unless made in writing and signed by the General Manager or Director of Engineering of TV&C-Prophetstown.

INSTALLATION, OPERATION and MAINTENANCE MANUAL FOR PENBERTHY MODEL 1A

1.0 Description

The Penberthy Model 1A is an accurate and ultra-reliable instrument for detection of steam/water presence in subcritical pressure steam generators. Prior to performing any work, personnel responsible for the installation of the system should read these instructions and become familiar with the unit.

This manual is intended to give the installation, operating and maintenance instructions for the most commonly supplied components and options of the Model 1A system. It cannot possibly cover every customer-specific application. For these situations, please contact TV & C - Prophetstown.

2.0 Supply & Installation

2.1 Packing

Prior to installing this equipment clean all packing material from around the unit and inspect for any damage that may have occurred during shipment. Any claims for loss or damage must be filed by the purchaser with the carrier. A copy of the bill of lading and freight bill will be supplied on request by TV & C – Prophetstown.

2.2 Location of the Electronics

The section on Startup and Operation, Sensitivity Control (Section 3.2) explains how to set the sensitivity range according to the conductivity of the water in your application. Water with a low conductivity requires a higher sensitivity and consequentially has greater noise susceptibility. The highest sensitivity range (10-100 μS) places an upper limit of 165 ft. [50m] for the shielded cable distance between probe and electronic module. Sensitivity greater than about 50 μS allows the shielded cable distance to be up to 500 ft. [150m]. The coolest, most accessible location for mounting the electronics is preferred, usually in a control cabinet.

2.3 Plumbing

The model 1A is typically supplied with fittings for one of three installation options:


- Type "A" fitting (for HP probe) or half-coupler (for LP probe) - for installation on water column or pressure vessel.
- 1 ½" male SW connector - for installation into a pipe fitting.
- 1 ½" male SW connector welded in a 3000# tee - for installation into existing 1 ½" piping.

The probe can be mounted horizontally, or vertically with the electrical connection up. All welding should be done in accordance with approved welding procedures as required by local authorities. The probe and probe housing must be removed from the supplied fitting before any welding is performed.


If a water column was supplied with the system, refer to the water column manual for complete details.

The metal probe housing should be removed from the probe after it is fully plumbed into the system and remain off until the system is in service and a satisfactory inspection of the probe and the associated wiring is completed.

2.4 Probes



WARNING



The nature of the electronics, the harsh operating environment and the potential hazards associated with live steam require that only qualified personnel install and maintain this equipment. Without adequate qualifications, an operator could allow live steam to escape, which may cause property damage or severe personal injury.

The Model 1A is supplied with either of two probe styles. For applications below 525°F [274°C] / 850 psi [58 bar], an economical probe is available with a PTFE wetted insulator. It can not be used if either parameter (525°F [274°C] or 850 psi [58 bar]) is exceeded.

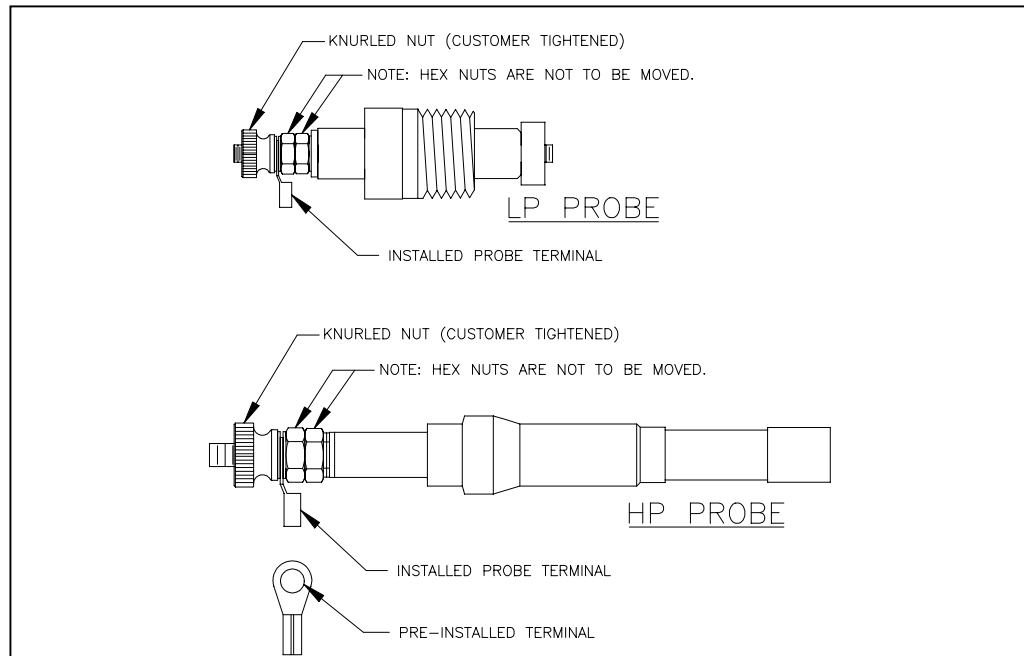


Figure 1 - Probe Assembly

For all other applications, probes with the zirconium oxide (ceramic) insulators must be used. The high pressure (HP) probes are easily recognized by the brazing between the insulator and the body (fig 1). The two styles of probes are not interchangeable and will not fit in a receptacle designed for the other. LP probes use a threaded fitting, the HP a compression fitting. Refer to the Water Column I.O.M. for details on both the HP and LP probes.

2.5 Probe Housing (refer to Fig 2)

The probe housing is a two-piece protective stainless steel enclosure. It is held to the probe / probe fitting by a snap ring supplied with the probe / fitting.

2.6 Optional Enclosure

If the optional NEMA 4X / IP66 enclosure is supplied, refer to Fig 6 for mounting details.

2.7 Optional Probe Wiring Junction Box

If the optional probe wiring junction box is supplied, refer to Fig 7 for mounting details.

2.8 Wiring



CAUTION



Before making any connections, make sure that the power source to be used is isolated by use of the appropriate circuit breakers and switches so that no work is being performed with “live wires”, otherwise personal injury or property damage may result.

All wiring should be enclosed in metallic sheathing, e.g., electrical metallic tubing (EMT) with appropriate drip loops.

Note: All wiring should be in accordance with applicable national and local codes by qualified personnel.

2.8.1 At the Probe (refer to Fig 2)

For proper operation of the electronics, the system must be properly grounded. When a water column is supplied with probe covers, there is a column ground located on the underside of each probe cover upper bracket. When individual probe housings are supplied, each housing has a separate ground connection. Wiring at the probe is via the crimp type eyelet supplied with each probe. If the eyelet is not used intermittent operation may result. At least one ground wire must be connected to the water column ground.

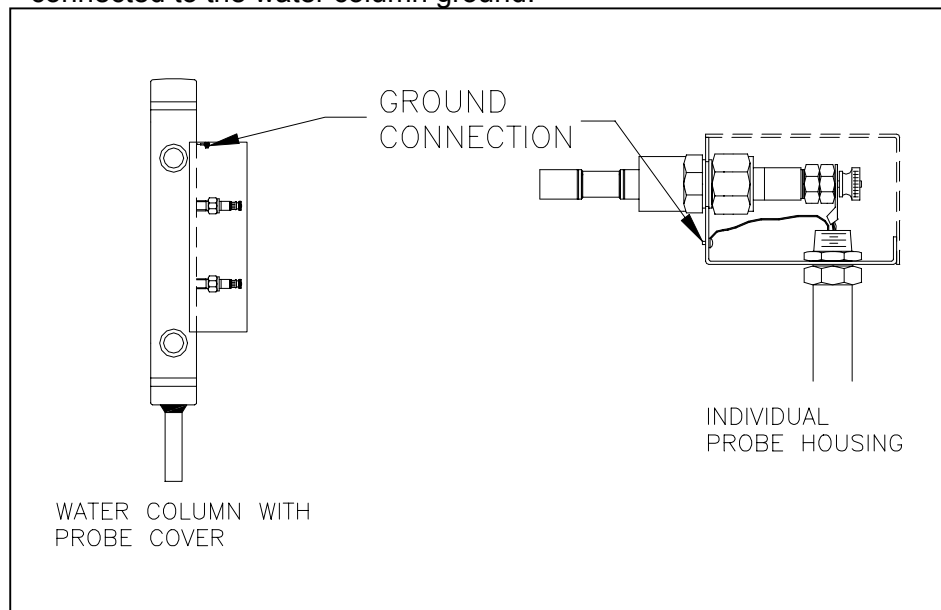


Figure 2 - Ground connection location

2.8.2 At the Electronic Module

No wiring access holes are drilled in the enclosure (if supplied). Access holes may be placed at any convenient point during installation. Use appropriate fittings, consider EMI and RFI, also maintain the NEMA/IP rating of the enclosure. The access hole for the probe wiring should contain only probe wiring. It is recommended that the relay out and power input each have their own access hole although this is not mandatory. Dress all power carrying conductors away from signal wiring.

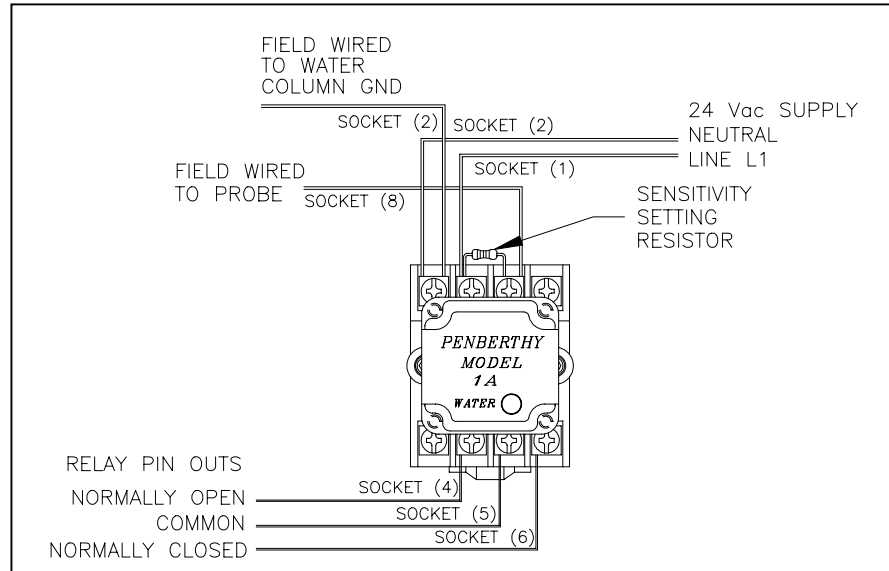


Figure 3 - Wiring detail - Electronic Module

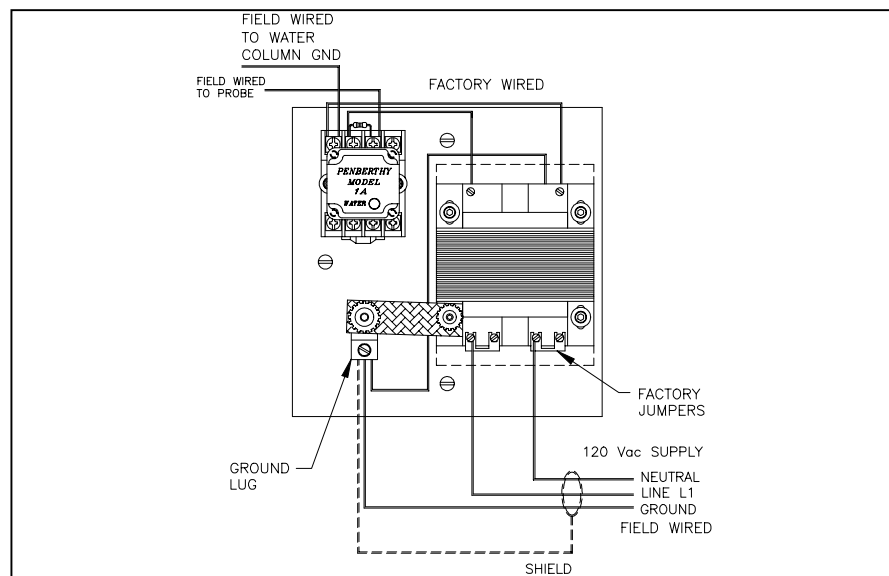


Figure 4 - Wiring detail - 120 Vac supply

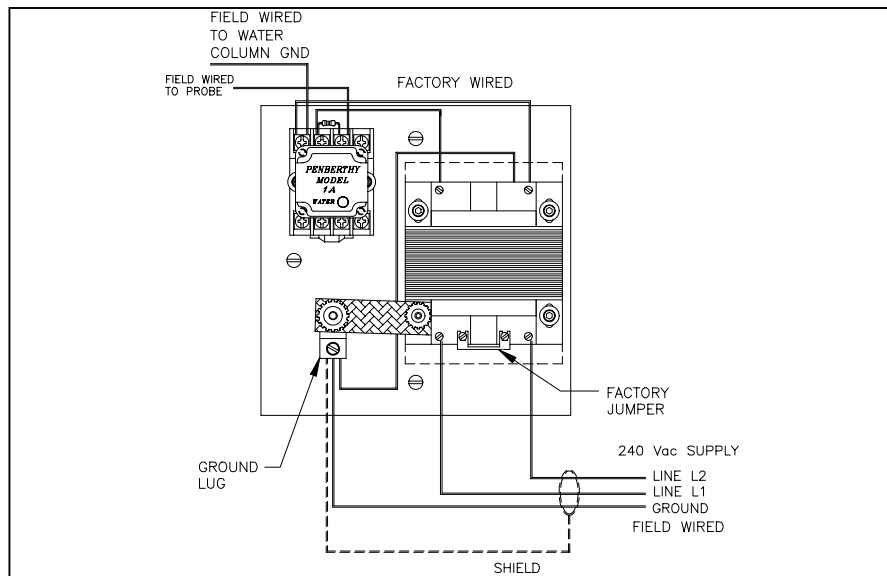


Figure 5 - Wiring detail - 240 Vac supply

For reliable operation, a power source with the following requirements is needed:

- 24, 120 or 240 Vac (120/240 Vac require optional transformer)
- Single Phase, 50/60 Hz
- Less than 1 VA power consumption

If a 24 Vac unit was specified (refer to Fig 3):
Main power is connected to terminals 1 & 2.

If the transformer option was specified:

For 120 Vac operation: Main power connections are made as shown in Fig 4.

For 240 Vac operation: Main power connections are made as shown in Fig 5.

Earth bonding should be to the earthing lug on the mounting plate.

The probe wire is connected to terminal 8.

2.8.3 Control Output (See Fig 3)

An SPDT Form-C contact is provided for the control output. The model 1A is steam fail-safe: the relay coil is de-energized upon steam detection or unit power loss. Contact Rating:

- 5 A @ 30 VDC
- 5 A @ 250 Vac

Careful consideration should be given to the design of the alarm or trip logic. Power loss or vessel blowdown could inadvertently shut down the steam generator or leave the unit without protection.

3.0 Startup and Operation

3.1 Water Column (if supplied)

Please refer to the Water Column I.O.M. for details on water column startup and operation.

3.2 Electronic Module Sensitivity Control

Inspect the module to ensure that all electrical connections are made and properly protected. The sensitivity required for the water conductivity range to be detected should have been specified when the system was ordered, if not, the default sensitivity of 10 μ S was supplied. If the sensitivity is not correct, proper replacement resistors can be obtained by contacting TV&C – Prophetstown with the conductivity of water used. The proper resistor is then connected between terminals 1 & 8. (See Fig 3).

After setting the sensitivity, power may be supplied to the unit by use of the external circuit breaker. The unit is now operational.

3.3 Probe Installation

Please refer to the Water Column I.O.M. for details on probe installation.

4.0 Detection Circuitry

A 24 Vac RMS symmetrical sine wave from the circuit power supply is connected through a resistor to the probe terminal (pin #8 of the socket, see Figure 2) .When the probe tip is immersed in water, a signal current bleed path to ground is completed by the conductivity of the water. This creates sufficient voltage drop to turn a depletion MOSFET transistor “ON”, the red LED turns on indicating water detection and the relay is energized.

5.0 Maintenance

Each boiler installation is subject to varying operating and water conditions. Generally, the higher operating pressure units (>1800 psi [125 bar]) have improved water treatment and, as such, maintenance is minimized.

5.1 Water Column (if supplied)

A specific maintenance program is difficult to detail but the following outlines the minimum required:

- (1) The water column should be blown down periodically and visually inspected for leaks every 3 months.
- (2) The operating range of the Model 1A should be verified at this time by allowing the water column to fill with condensate (see Water Column I.O.M. Startup and Operation).

5.2 Probes



WARNING



Before servicing the probes, ensure that the water column is properly isolated from the system, all pressure has been relieved and the unit cooled to an acceptable level, otherwise severe personal injury and property damage may occur.

Please refer to the Water Column I.O.M. for details on probe installation.

5.3 Electronic Module

No maintenance is required.

6.0 Spare Parts

The following spare parts are recommended as a minimum set for stocking by the user:

- 1 Probe
- 1 Electronic module
- A copy of this I.O.M.

Probes are available only as complete new assemblies.
Consult your Tyco or Penberthy distributor or TV&C-Prophetstown
for replacement Electronic Modules.

7.0 Model 1A Specifications *

Standard Sensitivity:	≥10μSiemens
Input Voltage:	24 Vac 105-130 Vac with optional transformer 210-260 Vac with optional transformer
Frequency:	50-60 Hz
Power (max):	less than 1 VA
Output Voltage:	
Probes:	24 Vac RMS maximum, resistor isolated
Relay Contact:	5 AMP @ 30 VDC 5 AMP @ 250 Vac (resistive)
Operating Temperature:	
Electronics:	32 – 160°F [0°C –70°C] 121°F [50°C] MAXIMUM AMBIENT
Standard Enclosure Rating:	Octal base relay socket NEMA 4X [IP66] optional
Dimensions/Weights:	Electronic Module 2" [5 cm] H x 1.5" [4 cm] W x 3" [8 cm] D 1 lb [0.5 kg] With Transformer & enclosure 7" [18 cm] H x 7" [18 cm] W x 4.4" [11 cm] D 5 lbs [2 kg]
Manufacturing Standards:	
Electronics:	CSA 22.2 NFPA-70 (NEC)

Standard Options:

- Type "A" connector (HP probe) or half-coupler (LP probe)
- 1-1/2" Male SW connector
- 1-1/2" connector welded in 1-1/2" Class 3000 Tee
- 120/240Vac Transformer
- NEMA 4X / IP66 enclosure

*Specifications and descriptions are subject to change without notice.

8.0 Troubleshooting

Water Column:	Refer to section 2.3, 3.1 and 5.1
Sensitivity/Conductivity:	Refer to sections 3.2
Probes:	Refer to sections 2.4 and 5.2
Probe Wiring:	Refer to sections 2.2, 2.8.1 and 2.8.2
Line Power:	Refer to section 2.8.2 and Figures 3, 4 and 5
S/W discrimination:	Refer to section 4.0
Control Relay:	Refer to section 2.5.3 and Figure 2

The electronics module is potted into the octal relay case. Field repair is not practical except for replacement of module.

9.0 Disposal at End of Useful Life

The Model 1A may be used in a variety of fluid applications. By following the appropriate national and industry regulations, the user must determine the extent of preparation and treatment the Model 1A must incur before its disposal. A Material Safety Data Sheet (MSDS) may be required before disposal services accept certain components.

Metal, glass and polymers should be recycled whenever possible. Refer to order and TV&C - Prophetstown Material Specification sheets for materials of construction.

RIGHT TO KNOW LAWS AND OSHA STANDARD 29CFR (1910.1200)
Material Safety Data Sheets on the following Penberthy product:
Model 1A

The OSHA Hazard Communication Standard 29CFR 1910.1200, states that the standard does not apply to "articles". The standard defines an article as:

*A manufactured item formed to a specific shape or design for a particular use which does not release or otherwise expose an employee to a hazardous chemical under normal conditions of use".

The above named products fall within the definition of an "article", no Material Safety Data Sheets are available or are required. Our product is manufactured as an "end product".

If the product is a weld end the following applies.

WARNING: Materials used in manufacture of Penberthy products are considered in a stable condition when shipped. However, under certain conditions purchasers could create potential hazardous conditions by their future operations.

Caution: Welding, cutting, burning, machining or grinding of this product can generate toxic dust and fumes of potentially hazardous ingredients.

The dust or fumes can cause irritation of the respiratory tract, nose, throat, skin and eyes. It may cause temporary or permanent respiratory disease in a small percentage of exposed individuals. Use moderate ventilation when grinding or welding. Avoid breathing dust, fumes or mist. Avoid prolonged skin contact with dust or mist. Maintain dust levels below OSHA and ACGIH levels. Use protective devices. Wash hands thoroughly after contact with dust before eating or smoking.

For emergency information contact:
Tyco Valves & Controls, L.P. Prophetstown
320 Locust St., Prophetstown, Illinois 61277
Phone: 815-537-2311
Fax: 815-537-5365
E-mail:boilertrimteam@tycovalves.com

10.0 Telephone Assistance / Factory Repair

If you are having difficulty with your Model 1A, contact your local Tyco / Penberthy distributor. You may also contact the factory direct at (815) 537-2311 and ask for an applications engineer. So that we may assist you more effectively, please have as much of the following information available when you call:

- Model #
- Serial #
- Name of the company from whom you purchased the Model 1A
- Invoice # and date
- Process conditions (pressure, temperature, cycle rate, etc.)
- A brief description of the problem
- Troubleshooting procedures that failed

If attempts to solve your problem fail, you may request to return your Model 1A to the factory for intensive testing. You must obtain a Return Authorization (R.A.) number from TV&C - Prophetstown before returning anything. Failure to do so will result in the unit being returned to you without being tested, freight collect. To obtain an R.A. number, the following information (in addition to that above) is needed:

- Reason for return
- Person to contact at your company
- "Ship To" address

There is a minimum charge of \$75.00 for evaluation of non-warranty units. You will be contacted before any repairs are initiated should the cost exceed the minimum charge. If you return a unit under warranty, but is not defective, the minimum charge will apply.

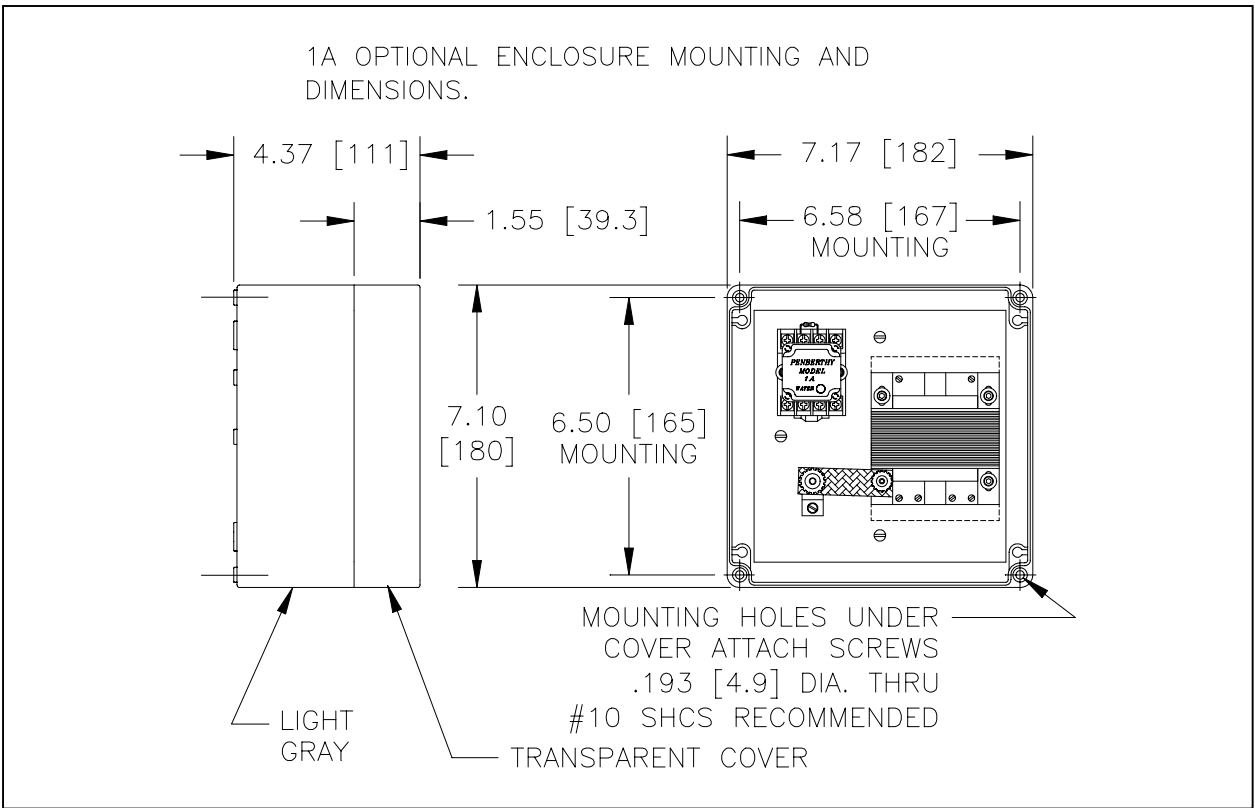


Figure 6 - Optional NEMA 4X / IP66 Enclosure

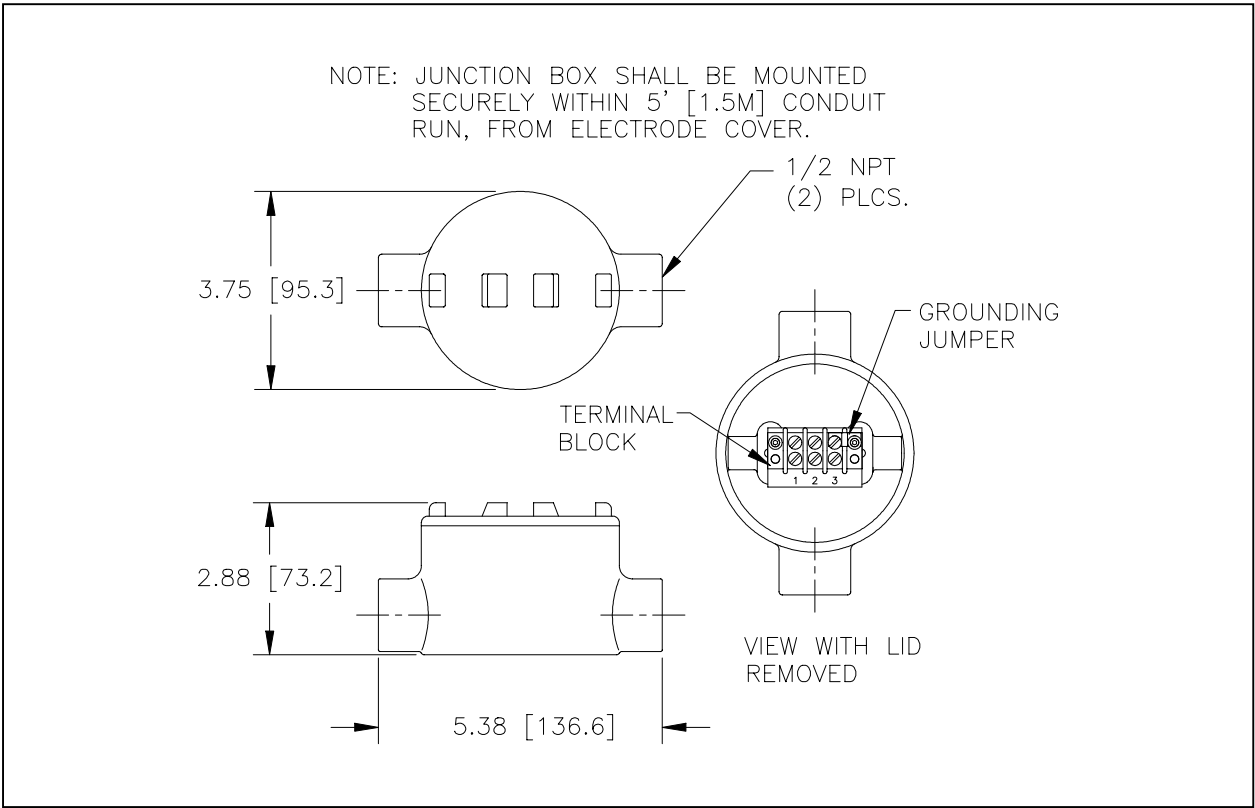


Figure 7 - Optional Probe Wiring Junction Box

Notes



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