TRANSMITTAL

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Rev: 00
Date : June 6th 2022

PROJECT : **Grise Fiord Tank#1 Repair**

CONTRACT/PROJECT N° : **20220-00658**

SUBJECT : **INSTRUMENTATION**

APPROVAL REQUESTED FOR :

SUB-CONTRACTOR: n/a

Address:	
Contact:	
Phone:	E-mail:

SUPPLIER: Miscellaneous

Address:	
Contact:	
Phone:	

MANUFACTURER: Miscellaneous

Address:	
Contact:	
Phone:	

TRADE: MECHANICAL

DRAWINGS REFERENCE:	YGZ04-M200 & M300
TENDER REFERENCE:	YGZ04-M200 & M300
Number of pages (including this page):	

DESIGN-BUILT FIRM APPROVAL (Seal):

SHOP DRAWING

Reviewed by: Rhéa Fauteux, P.Eng.

Date: 07 June, 2022

Reviewed	X
Reviewed as noted	
Resubmit	

Grise Fjord Tank No.1 20220-0065

SIFEC NORTH INC.

Issued by: Date:

ENGINEERING FIRM (Tank) :	**ENGLOBE CORPORATION**
1200, Boulevard Saint-Martin Ouest, Bur. 400, Laval (Qc) H7S 2E4	
David Trudel, Senior Metallurgical Technician	
E-mail :	david.trudel@englobecorp.com

OWNER:	**GOVERNMENT OF NUNAVUT**
Community & Government Services	
P.O. Box 1000, Stn 700	
Gord Marinic	
Office : 867-979-5495	E-mail: gmarinic@gov.nu.ca

CONTRACTOR :	**SIFEC NORTH INC.**
DESIGN-BUILT FIRM (Electrical and Mechanical Only)	
P.O. Box 556, Rankin Inlet, NU, X0C 0G0	
Rhéa Fauteux, P.Eng., Project Manager	
Office : 855-437-4001	E-mail: rhea@sifec.ca

PRODUCT ISSUED:

☒ AS IS ☐ EQUIVALENT ☐ SUBSTITUTION

DOCUMENTATION ISSUED FOR:

☐ VERIFICATION ☒ INFORMATION ☐ COORDINATION

COMMENTS:

SHOP DRAWINGS

Date : 2022-06-06

To: ***Government of Nunavut***
Community and Government Services
Gord Marinic, PM
P.O. Box 1000, Stn 700
Iqaluit, NU, X0A 0H0
T: 867-979-5495
gmarinic@gov.nu.ca

SIFEC NORTH inc.
Electrical & Mechanical Contractor
P.O. Box 556
Rankin Inlet, NU, X0C 0G0
T: 866-437-4001

Project : **Grise Fiord Tank #1 Repair 20220-00658**
Description : **Potable Water System / Heating System Instrumentation**

Tag Number	Make	Model	Description	Supplier	Rev.
CP-TK1	Honeywell	T775R2027	Programmable Thermostat with LCD Display, Analog output, relay output, 24-230 VAC, 60Hz	Wolseley	0
TT-101	Honeywell	T775-SENS-WT	Temperature probe, included with thermostat above	Wolseley	0
MS-1	Allen Bradley	109-C09AD-OLR+198-2SS+198-R240PL+198-SA11	Contactor 1/2HP at 120Volt c/w enclosure, On-Off Selector, Pilot LED Red Light, Auxiliary Contact	Lumen	0
MS-2	Allen Bradley	109-C09AD-OLR+198-2SS+198-R240PL+198-SA11	Contactor 1/2HP at 120Volt c/w enclosure, On-Off Selector, Pilot LED Red Light, Auxiliary Contact	Lumen	0
DS-1	Schneider	MD3304X	Disconnect Switch 30Amp NEMA 4X	CDE	0
DS-2	Schneider	MD3304X	Disconnect Switch 30Amp NEMA 4X	CDE	0
HS-1	Edwards	868STRB-N5	Exterior Strobe Horn 120V Bleu 100dB at 1 meter	Anixter	0
PT-102	E+H	FMX21-CD211KGJ25H+LRPOPS	4-20mA Level/Pressure Transmitter NSF61	E+H	0
PI-120	Winters	PFQ709LF-C1-R14-DRY	Pressure Gauge 4"X1/4" NPT BTM 0/21 mH2O	Flocor	0
TT-201 & TI-201	ProSens	ETS50N-100-1001 + TW04-01 + 7700-14541-S4U1500	Temperature Transmitter Pt100 RTD & Display Loop Powered 24VDC + Thermowel	Automation Direct	0
LEI-1	Precision Digital	PD765-6X5-10	Process & Temperature Digital Display 2 Relays + 4-20mA + 24VDC Supply	Precision Digitale	0
TEI-1	Precision Digital	PD765-6X5-10	Process & Temperature Digital Display 2 Relays + 4-20mA + 24VDC Supply	Precision Digitale	0
	Precision Digital	PDA2302	NEMA 4X Enclosure 2 Cut-Out, 11.8" x 7.9" x 7.0"	Precision Digitale	0
TI-101	Dwyer	STC451	Pipe Mount BiMetal Surface Thermometer -50F to 250F	Dwyer	0
TI-102	Dwyer	STC451	Pipe Mount BiMetal Surface Thermometer -50F to 250F	Dwyer	0
TI-103	Dwyer	STC451	Pipe Mount BiMetal Surface Thermometer -50F to 250F	Dwyer	0
TI-104	Dwyer	STC451	Pipe Mount BiMetal Surface Thermometer -50F to 250F	Dwyer	0

Honeywell

T775 Series 2000 Electronic Stand-Alone Controllers

APPLICATION GUIDE AND CROSS REFERENCE

63-7147—3

IMPORTANT

The T775R is an operating control, not a limit or safety control. If used in applications requiring safety or limit controls, a separate safety or limit control device is required.

TABLE OF CONTENTS

T775 APPLICATION TIPS

Q Does the T775 save programmed values if the power is lost?

A Yes. The T775 has an EEPROM that saves all values entered and restores them once power is reapplied. The date and time settings are retained for 24 hours after a power outage. After a power loss of more than 24 hours, the date and time settings may need to be reentered. All other settings are stored permanently.

Q What is the time constant for the T775?

A The T775 standard sensor (50021579-001) has a time constant of approximately 8 seconds. The T775 samples sensor input every 100 milliseconds and updates the control and display every 1 second.

Q Can sensors be shared by several T775s to simplify installation or provide more stages?

A Each T775 must be wired to its own sensor(s), However, a benefit of the T775 controller's high accuracy is that there is no more than a 2° differential between any two T775 controllers.

Q Can a T775 be powered with dc voltage?

A No. The T775 controllers may be powered with 24 Vac, 120 Vac, or 240 Vac only, and a separate earth ground is required.

Q Is a separate earth ground required?

A Yes. Each T775 controller must have its own earth ground, regardless of the power source (24, 120, or 240 Vac). The earth ground must be connected to the earth ground terminal on the 24 Vac terminal block.

Q Can sensors be series-parallel wired to the T775 to provide an average temperature?

A Yes. Sensors can be series-parallel wired to the T775. In order to maintain control accuracy, the number of sensors wired must be of the n^2 power (i.e. 4, 9, 16, etc.).

Q How do I know that my selection or value has been entered?

A Once you have selected an item from a list or entered a value using the ▲ and ▼ buttons, pressing the ◀ or ▶ or **HOME** button accepts your selection or value and stores it in the controller's memory.

Q What are the T775 Series 2000 Controller specifications?

A Refer to the *T775 Series 2000 Electronic Stand-Alone Controllers - Specification Data* (form 63-1318-01).

COMPATIBLE COMPONENTS

Temperature Sensors[1]

The controller accepts 1,097 Ohms PTC at 77° F (25° C):

- 50021579-001 – Standard sensor (included with all models except T775U2006 and NEMA 4X models)
- T775-SENS-STRAP – Strap on sensor with wiring box
- T775-SENS-WR – Water resistant with 5 foot leads (included with NEMA 4X models)
- T775-SENS-WT – Watertight with 6 foot lead
- T775-SENS-OAT – Outdoor air temperature sensor
- C7031B2005 – 6 inch duct mount with wiring box.
- C7031D2003 – 5 inch immersion sensor with wiring box (use immersion well; P/N 50001774-001)
- C7031J2009 – 12 foot duct averaging sensor with wiring box
- C7046D1008 – 8 inch duct probe with mounting flange
- C7100D1001 – 12 inch fast response, duct averaging sensor with flange
- C7130B1009 – Room mount sensor

Humidity Sensors (T775U only)

The controller accepts 0-10 Vdc or 4-20 mA input with a range of 0-100%

H7625, H7635, and H7655 models (available in 2, 3, and 5% RH accuracy) can be used.

Low Differential Pressure Sensors (T775U only)

P7640A pressure transducer models with selectable pressure ranges can be used.

The controller accepts pressure sensors with a signal output of 0-10 Vdc or 4-20 mA for any output range within the following ranges (the minimum and maximum for the sensor output range can be adjusted within the following limits):

-500 to 500 PSI
-30.0 to 30.0 inches w.c.
-3,000 to 3,000 Pa
-3,000 to 3,000 kPa

Universal Sensors (T775U only)

The controller accepts 0-10 Vdc or 4-20 mA input for temperature, pressure, humidity, etc. C7232 and C7632 CO_2 sensors are also compatible but output is displayed in % instead of ppm. (Refer to Table 2 on page 29 and the T775U installation Instructions, form 62-0255-01.)

Actuators

For more information on compatible actuators or other Honeywell products, such as dampers and valves, go to www.customer.honeywell.com. From the home page select **Product Selection Tool** under **Products**.

- Spring return models: ML6425, ML7425, MS4105, MS4110, MS4120, MS7505, MS7510, MS7520, MS8105, MS8110, MS8120
- Non-spring return models: ML4161, ML6174, ML7161, ML7164, MN1010, MN6105, MN7505, MN8810

[1] See form 62-0265 - *Temperature Sensor for the T775 Series 2000 Stand-alone Controller*

Accessories

- 107324A – Bulb Holder, duct insertion
- 107408 – Heat Conductive Compound, 4 ounce
- 50001774-001 – Immersion Well, stainless steel 304, 1/2 in. threading

FEATURES

In Table 1, a check mark (✓) indicates that the controller model has this feature. A number indicates the quantity (e.g., the T775M2030 has 4 standard SPDT relay outputs), and "n/a" indicates the feature is not applicable to that controller model.

Table 1. T775 Controller Features by Model Number.

Feature	T775A2009	T775B2016	T775B2024	T775B2032	T775B2040	T775L2007	T775M2006	T775M2014	T775M2022	T775M2030	T775M2048	T775P2003	T775R2001	T775R2019	T775R2027	T775R2035	T775R2043	T775U2006	T775S2008
User Interface																			
2x4 inch LCD display with English language display	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	n/a
Keypad lockout	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	n/a
Applications																			
Standard heating/cooling	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Modulating							✓	✓	✓	✓	✓			✓	✓		✓	✓	
Boiler/Chiller	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Reset						✓						✓	✓	✓	✓	✓	✓	✓	✓
Stage (Loop) control of up to 12 relays						✓						✓							✓
Temperature, humidity, pressure, or other application requiring 0-10 Vdc or 4-20 mA input																		✓	
Expansion module (4-relays per module; 2 modules max.)																			✓
Power																			
24 or 120/240 Vac with separate earth ground	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Relay Outputs																			
SPDT	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of standard	1	2	4	2	4	4	0	4	2	4	2	4	4	4	2	2	0	2	4
Number of floating (each floating output eliminates 2 relays)	0	1	2	1	2	0	0	0	0	0	0	0	2	0	0	1	0	0	0
Runtime displayed on relays 1-4 (optional)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	n/a
Configurable minimum off time	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Expandable to 12 relays using T775S expansion modules (4 relays per expansion module)						✓						✓							✓
Warm weather shutdown												✓							n/a
Modulating Outputs																			
Number of outputs	0	0	0	0	0	0	2	2	2	2	2	0	0	2	2	0	2	2	0
Independently selectable for 0-10 Vdc, 2-10 Vdc, 4-20 mA, or Series 90							✓	✓	✓	✓	✓			✓	✓		✓	✓	
Modulating high/low limit control								✓	✓	✓	✓						✓		n/a
Digital Output																			
Number of outputs	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
High, low, and differential alarm												✓							

Table 1. T775 Controller Features by Model Number. (Continued)

Feature	T775A2009	T775B2016	T775B2024	T775B2032	T775B2040	T775L2007	T775M2006	T775M2014	T775M2022	T775M2030	T775M2048	T775P2003	T775R2001	T775R2019	T775R2027	T775R2035	T775R2043	T775U2006	T775S2008
Pump Output (configurable for last relay)																			
Number of outputs	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Prepurge/Postpurge												✓							✓
Pump Exercise												✓							✓
Sensor Inputs																			
Number of sensor inputs	1	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	0
Number of sensors included	1	1	1	1	1	1	1	1	1	1	1	3	2	2	2	2	2	0	n/a
1097 Ohms PTC at 77° F (25° C)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	n/a
0-10 Vdc or 4-20 mA input for temperature, humidity, pressure, etc.																		✓	n/a
Calibration capability ±10° F (±6° C) or for T775U, ±10% of sensor range	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	n/a
1° sensed temperature accuracy	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	n/a
Sensed temperature range from -60° to 270° F (-51° to 132° C)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	n/a
Digital Input																			
Number of inputs	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Setpoints																			
Maximum number of setpoints	1	2	4	2	4	4	2	6	4	6	4	1	4	6	4	2	2	4	n/a
Range -40° to 248° F (-40° to 120° C)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Maximum high setpoint option (irreversible)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	n/a
Integral and Derivative Options																			
Integral time selectable from 0 to 3,600 seconds	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	n/a
Derivative time selectable from 0 to 3,600 seconds	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	n/a
Staging																			
Standard staging						✓						✓							✓
First on, first off												✓							✓
Equalized runtime												✓							✓
On delay and Off delay between stages						✓						✓							✓
Time Clock Scheduler																			
DST option	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	n/a
2 events per day	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	n/a
Selectable for setback, disable, or ignore to control all outputs	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	n/a
Enclosures																			
NEMA 1	✓			✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
NEMA 4X		✓	✓					✓	✓										

T775 OPERATIONS

Integral Action

"Droop" and equipment hunting can be minimized by summing (integrating) the offset errors over time and adding this correction to the output voltage.

A non-zero value for the integral time will allow the controlled temperature to try and reach the setpoint value.

The integral time is factory set for 400 seconds and is similar to the response time to the T775 Series 1000 models. This is a good middle range and should satisfy many applications. The integral time can be increased for applications where sensed response is slow, and can be decreased for applications where sensed response is fast (e.g. discharge air control).

As a starting point, an optimal integral time for discharge air typically ranges from 12 to 200 seconds. An optimal integral time for room control typically ranges from 60 to 2,500 seconds. The purpose of integral action is to reduce or eliminate the offset from setpoint during steady state control that is often seen in proportional-only control.

Keep in mind that the controller is most sensitive to throttling range. Adjust the throttling range first before making any adjustment to integral time. Adjust throttling range to be as wide as possible to start, because this will provide the most stable control. Remember that the integral will eliminate the steady state error so you do not need to have a small throttling range to have accurate control. (Integral action allows for controlling to setpoint even with a wide throttling range.)

Derivative Action

Proportional-integral-derivative (PID) control adds the derivative function to PI control. The derivative function opposes any change and is proportional to the rate of change. The more quickly the control point (actual sensed temperature) changes, the more corrective action the PID system provides.

If the control point moves away from the setpoint, the derivative function outputs a corrective action to bring the control point back more quickly than through integral action alone. If the control point moves toward the setpoint, the derivative function reduces the corrective action to slow down the approach to the setpoint, which reduces the possibility of overshoot. The rate time setting determines the effect of the derivative action. The rate time is the time interval by which the derivative function advances the effect of the proportional action. In T775 controllers, the derivative rate time can range from 0 to 3,600 seconds. The higher the derivative setting, the greater the effect.

For all T775 Series 2000 controllers, the derivative default value is factory set to zero (no derivative control). It is strongly recommended that the derivative remain at zero (0) unless you have a very good reason to adjust it. Derivative control is not needed in the vast majority of HVAC applications.

Differential vs. Throttling Range

Differential is used for relay outputs, and throttling range is used for modulating outputs.

Setpoint and Differential

The following describes the relationship between setpoint and differential for heating and cooling. These settings are programmed for each output relay.

HEATING MODE SETPOINT AND DIFFERENTIAL

In heating mode, the differential is below the setpoint. The relay de-energizes when the temperature rises to the setpoint. As the temperature drops to the setpoint minus the differential, the relay energizes.

COOLING MODE SETPOINT AND DIFFERENTIAL

In cooling mode, the differential is above the setpoint. The relay de-energizes when the temperature falls to the setpoint. As the temperature rises to the setpoint plus the differential, the relay energizes.

Throttling Range

The throttling range brackets the setpoint setting, e.g., if the setpoint is 72° F (22° C) and the throttling range is 10° F (-12° C), then the effective throttling temperature range is 67° to 77° F (19° to 25° C) . This applies to both modulating outputs and floating outputs.

Throttling Range for Modulating High or Low Limit

On models that support this feature, the throttling range for the modulating high or low limit positions the setpoint at the **end** of the throttling range. For example, with a high (Heat) limit at sensor B of 200° F (93° C) and a throttling range of 10° F (-12° C), the modulating output controlling sensor A begins to throttle back at 190° F (88° C), and fully closes at 200° F (93° C). Conversely, the throttling range for the low limit begins above the Cooling setpoint in the same manner.

Setpoint High Limit

You can set an irreversible setpoint high limit maximum value for any single setpoint temperature value. This prevents the user from setting any setpoint above the chosen high setpoint limit, which is useful for meeting some local codes.

Adjust the setpoint (at any output) to the desired maximum setpoint. Then, simultaneously press the **HOME,** ◄, and ► buttons, and continue to press all three buttons for five seconds to set the setpoint high limit maximum to this value.

NOTE: You must press all three buttons at exactly the same time for this action to occur.

IMPORTANT

1. *This action sets the maximum setpoint value of **all** outputs to the setpoint high limit maximum.*
2. *Setting the high limit setpoint maximum is **irreversible**. If you perform the action inadvertently and this setpoint adversely affects the control of your system, you must replace the controller.*

Reset Programming (T775L, T775P, T775R, and T775U models only)

To program an output for reset, refer to the values as shown in the example below and in Fig. 1. Choose your own appropriate values for Sensor A maximum and minimum and Sensor B maximum and minimum.

Reset Example:

- Sensor A is the boiler sensor and sensor B is the outdoor sensor.
- Maximum boiler temperature desired is 210° F (99° C) when the outdoor temperature is 20° F (-7° C).
- Minimum boiler temperature desired is 160° F (71° C) when the outdoor temperature is 70° F (21° C).

With the above settings example, when the outdoor temperature is 50° F (10° C), the effective setpoint is 180° F (82° C).

Setpoint Offset

NOTE: The Setpoint Offset is used for subsequent outputs only.

This value is the number of degrees plus (+) or minus (-) that you want the temperature to be offset from the first output's setpoint. See Fig. 1. For example, If you want the second output setpoint to be 10° F (-12° C) less than the first output setpoint, enter -10° F (-23° C).

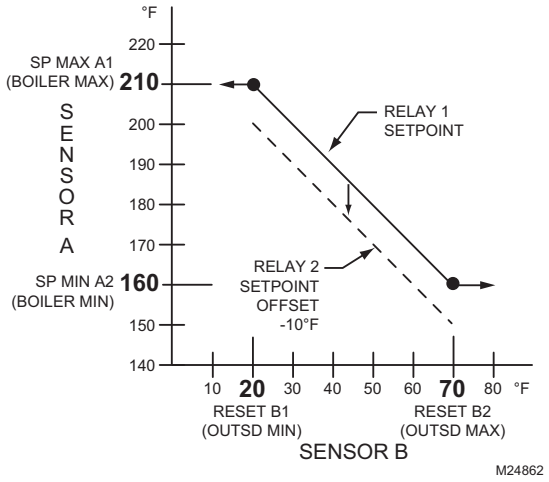


Fig. 1. Reset Curve with Offset for Subsequent Outputs.

The reset curve established when programming the first output (Fig. 1) is then used for **all** subsequent outputs that are configured for Reset = YES, and each of those outputs will be offset from this curve.

Choose Reset = NO for any outputs you do not wish to reset, then press the **HOME** button to record your selection.

NOTES:

1. A single reset curve is programmed for the first output and is used by all outputs setup for Reset.
2. For subsequent outputs, a setpoint *offset* is used if that output is also being Reset.

When Reset is programmed, the home screen conveniently displays the calculated Heat/Cool setpoint(s) for the outputs based on the reset curve.

Setback (Optional) Description

The Setback temperature option is available only if scheduling is enabled or the Digital Input Option is set to Setback.

This value is the number of degrees plus (+) or minus (-) that you want the temperature to be setback (offset) from the setpoint at a predetermined time.

For example, if you want the temperature to be 10° F (-12° C) less than the setpoint during setback mode, enter -10° F (-23° C). See Fig. 2

In normal operations for heating, the offset will be a negative value; for cooling, the offset will be a positive value.

Setback (optional) Example:

- Setback of -10° F (-23° C) is used to drop the temperature at night by 10° F (-12° C).

With the above settings example, when the outdoor temperature is 50° F (10° C), the effective setback setpoint is 170° F (77° C) 180° F (82° C) setpoint minus the 10° F (-12° C) setback).

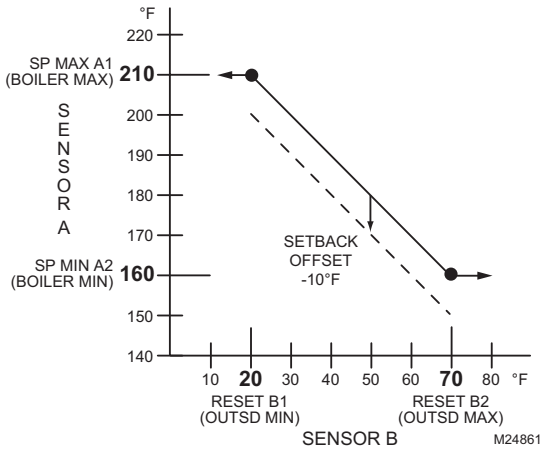


Fig. 2. Reset Curve for First Output with Setback Offset.

Time-based Control of Fan, Pump, etc. – T775 (all models)

Application Description

In this example, the T775B is able to energize a fan, pump, lights, economizer, or other device based on a daily time schedule rather than based on temperature.

Operation

In this example, one relay will energize at 6:00 a.m. and de-energize at 6:00 p.m. daily to operate a fan, pump, or anything at all.

Configuration Example

Place a 1,000 Ohm resistor at Sensor B (to simulate a constant 32° F (0° C) temperature reading).

Wire the device to the normally open contacts on a relay. Relay 1 is used in this example. See Fig. 7

Programming Example

Program in Setup for:

- Outputs
  - Options
    - Use Scheduler = YES

Program in Schedule for:

- Options
  - Set Date = current date[1]
  - Set Time = current time
  - Set Daylight = YES or NO
- Mon-Fri
  - E1 Setpoint = Setpoint
  - E1 Time = 06:00 AM
  - E2 Setpoint = Setback
  - E2 Time = 6:00 PM

Relay 1: Control the device (fan, pump, etc.)
Program for:

- Setpoint = 0° F (-17° C)
- Differential = 1° F (-17° C)
- Sensor = Sensor B
- Setback =100° F (38° C)
- Action = Cool

Now the relay will close at 6:00 a.m. and open at 6:00 p.m., daily.

[1] The Date must be set before the Time is set.

NOTE: Keep in mind that if the scheduler is energized, all relays will follow the time schedule. If you do not want some outputs to go into a setback mode, choose Scheduler = NO for those outputs, or program the setpoint and setback to the same temperature.

IMPORTANT

After the desired value is selected, be sure to press the ◄ *or* ► *or* **HOME** *button in order to save that value in the controller's memory.*

Wiring

All output relays should have a common power wiring source, which may or may not be the same as the T775 power wiring.

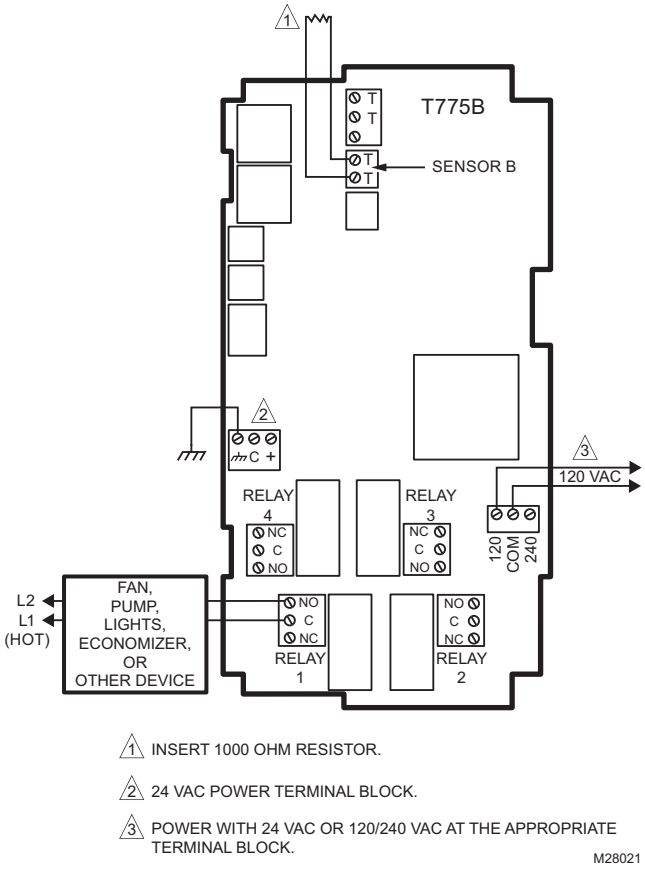


Fig. 7. T775B Wiring for time-based fan, pump or other device.

Damper or Valve Modulation – T775M or T775R

Application Description

In this example, a T775M is controlling an actuator, based on temperature input, to modulate a damper or valve.

Sensor Designation

This device application requires one sensor.

- Sensor A is sensing outside temperature

NOTE: Sensor A or Sensor B can be used in this application.

Programming Example

Program in Setup for:

— Modulating Output (MOD) 1:
Type = 2-10V (or whatever output signal is preferred)
Minimum Output % = 0% (range is 0-100%)

Modulating Output 1:Enable actuator circuit
Program for:

— Setpoint = 120° F (49° C)
— Throttling Range = 10° F (-12° C)
— Sensor = Sensor A
— Heat or Cool

IMPORTANT

After the desired value is selected, be sure to press the ◀ *or* ▶ *or* **HOME** *button in order to save that value in the controller's memory.*

Wiring

See Figures 8-9 for wiring connections for the T775M with examples of an MS75xx actuator and an ML7425 valve actuator.

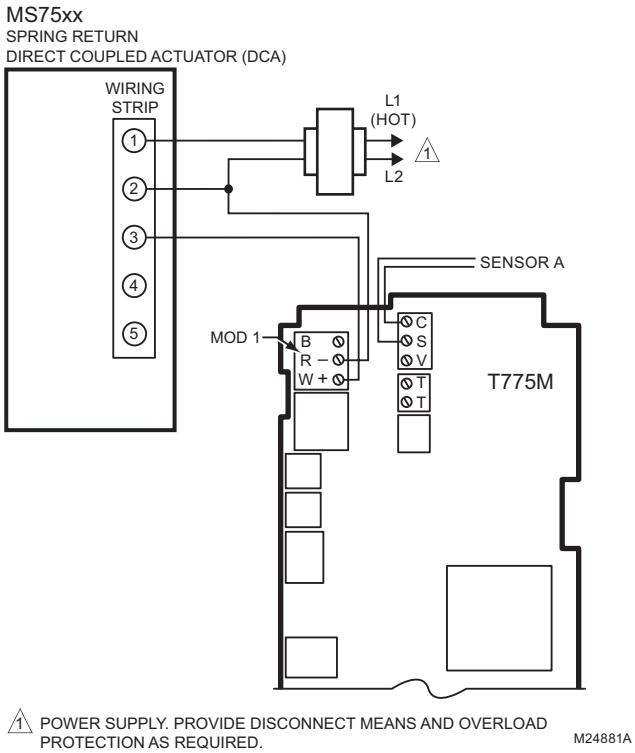


Fig. 8. T775M Wiring - Damper Modulation (2-10 Vdc shown).

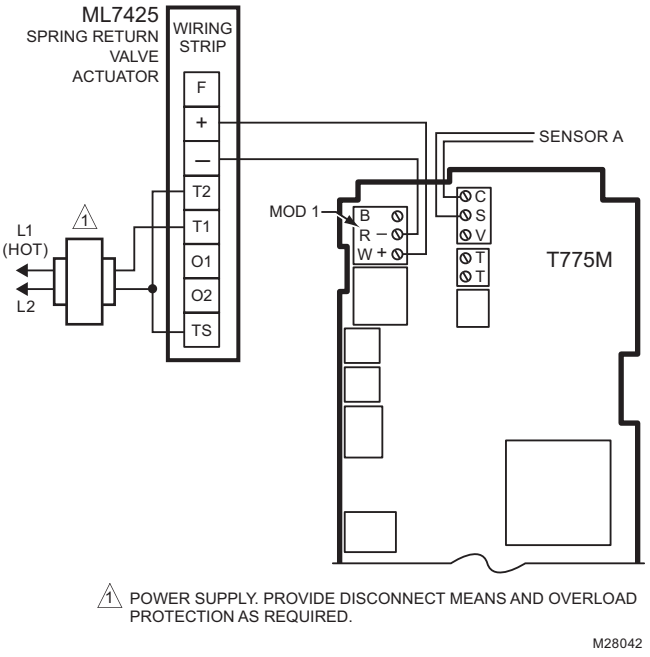


Fig. 9. T775M Wiring - Valve Modulation (2-10 Vdc shown).

Hot Water Reset – T775R

Application Description

The T775R is controlling the boiler water temperature with two stages (relays), based on outside temperature using a reset curve and an offset for relay 2.

Sensor Designation

This device application requires two sensors.

- Sensor A is sensing hot water discharge temperature of the boiler.
- Sensor B is sensing outside air temperature

Operation

In this example, when the outside temperature reaches 70° F (21° C), the desired water temperature of the boiler is 160° F (71° C). Likewise, when the outside temperature drops to 20° F (-7° C), the hot water temperature needs to be 210° F (99° C). See Fig. 10.

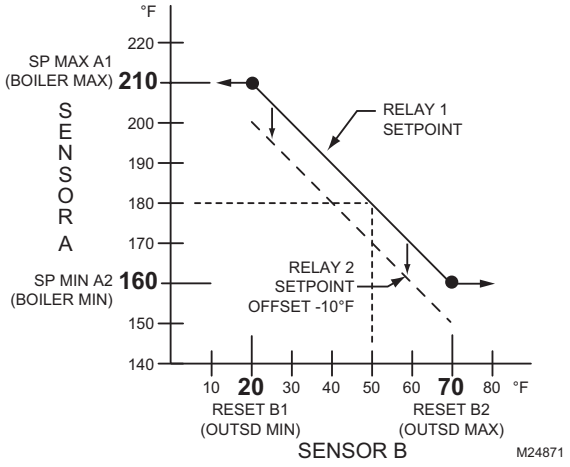


Fig. 10. Hot Water Reset Curve.

Programming Example

Program in Setup:

Press and hold the **MENU** button for 5 seconds to enter Setup mode. Select the Outputs menu, and then select:

- MOD 1 → Reset = YES-BOILER
- # Relays = 2
- Relay 1 → Reset = YES-BOILER
- Relay 2 → Reset = YES-BOILER

Relay 1: Control to the discharge water temperature
Program for: (Refer to the reset curve in Fig. 10.)

- Boiler Max = 210° F (99° C)
- Outside Min = 20° F (-7° C)
- Boiler Min = 160° F (71° C)
- Outside Max = 70° F (21° C)
- Differential = 20° F (-7° C)
- Sensor A
- Heat

Relay 2: Control to the discharge water temperature
Program for:

- Setpoint Offset = -10° F (-12° C) (See Fig. 11)
- Sensor A
- Heat

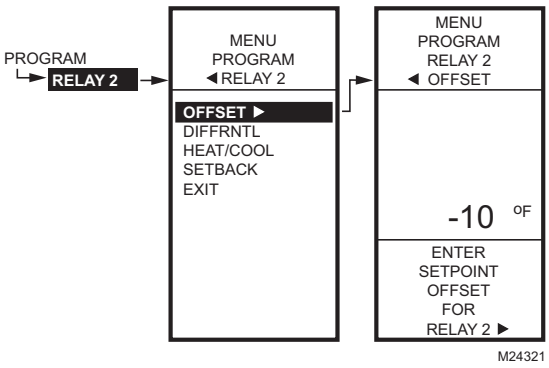


Fig. 11. Program Mode - Relay 2 Offset.

IMPORTANT

After the desired value is selected, be sure to press the ◄ *or* ► *or* **HOME** *button in order to save that value in the controller's memory.*

IMPORTANT

By programming the boiler setpoint at 210° F (99° C) *the T775 has established 210° F* (99° C) *as the highest operating point that will be allowed when the outside temperature falls below 20° F* (-7° C)*. As the outside temperature increases above 20° F* (-7° C)*, the boiler will be reset downward per the reset ratio until it reaches the minimum setpoint, 160° F.*

Assuming an outside temperature of 20° F (-7° C), Fig. 12 describes the actions of relays 1 and 2 to control the boiler temperature. As the boiler temperature falls below 210° F (99° C), relay 1 activates (relay 1 Differential is 20° F (-7° C), so relay closes at 190° F (88° C). If relay 1 cannot raise the boiler temperature and the boiler temperature continues to fall to 180° F °, relay 2 activates (relay 2 Differential is 20° F (-7° C) 180° to 200° F (82° to 93° C) When the boiler is able to reach 200° F (93° C), then relay 2 deactivates and relay 1 remains active until the temperature reaches 210° F (99° C).

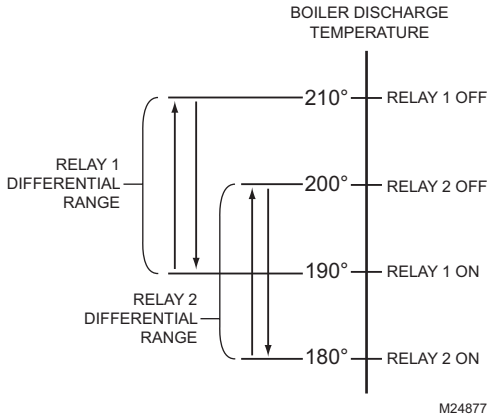


Fig. 12. Relay Actions.

NOTE: The Hot Water Reset application continues on the next page.

Hot Water Reset (continued)

Wiring

All output relays should have a common power wiring source, which may or may not be the same as the T775 power wiring.

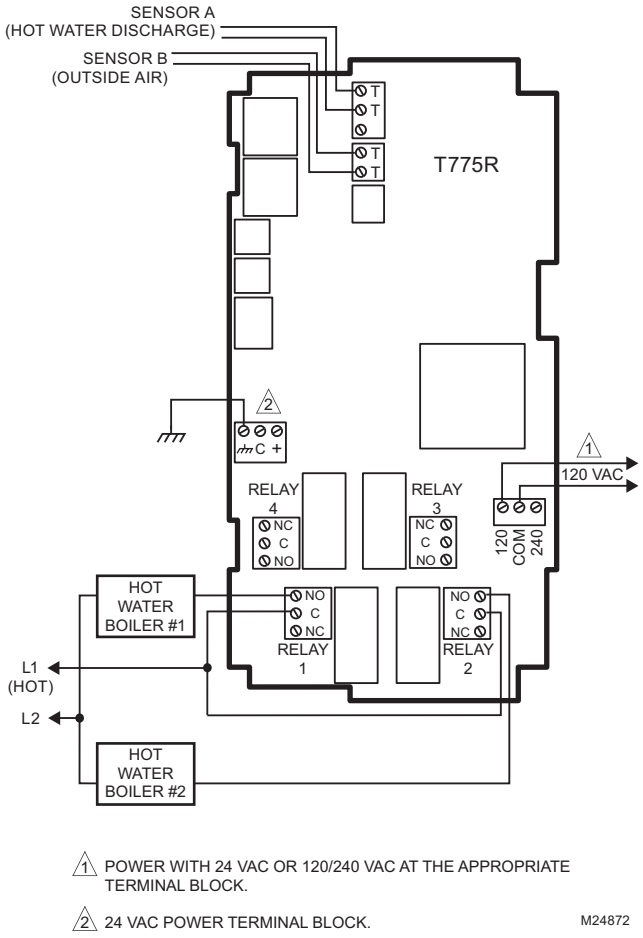


Fig. 13. T775R Wirlng - Hot Water Reset.

Device Checkout

The T775 performance can be checked out to determine if proper operation exists.

For example, when the outside air temperature is at 50° F (10° C), the boiler setpoint temperature should be 180° F (82° C). See Fig. 14. Use the alternate Home screens to check that the effective setpoint is adjusting correctly based on the outside air temperature (sensor B).

NOTE: The alternate Home screens do not show live updates of the sensor temperature. They show the temperature only at the moment the button is pressed.

1. From the Home screen, use the ▶ button to verify the setpoint temperature for each output.
2. Then, press the **HOME** button to view the actual outside air temperature (sensor B).

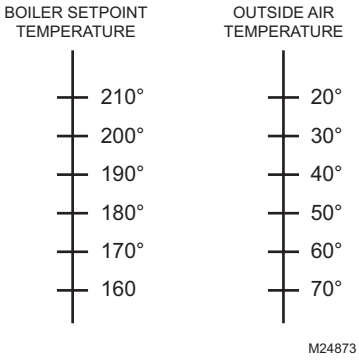


Fig. 14. Boiler Discharge Temperature Setpoint vs. Outside Temperature.

Chilled Water Reset – T775R

Application Description

The T775R is controlling the chiller water temperature, based on outside temperature using a reset curve.

Multiple stages can also be controlled by using an offset from the main setpoint for the subsequent relay outputs. When enabling multiple stages for reset, each stage can have its own programmable offset from relay 1 (stage 1).

Sensor Designation

This device application requires two sensors.

- Sensor A is sensing the water temperature of the chiller.
- Sensor B is sensing outside air temperature.

Operation

In this example, when the outside temperature reaches 90° F (32° C), the desired water temperature of the chiller is 45° F (7° C). Likewise, when the outside temperature drops to 70° F (21° C), the chilled water temperature needs to be 60° F (16° C).

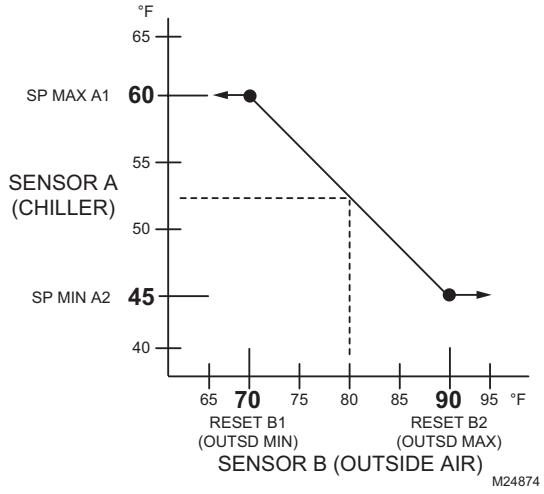


Fig. 15. Chiller Reset Curve.

Programming Example

Program in Setup:

Press and hold the **MENU** button for 5 seconds to enter Setup mode. Select the Outputs menu, and then select:

— MOD 1 → Reset = YES-OTHER
— # Relays = 1
— Relay 1 → Reset = YES-OTHER

Relay 1: Control to the chilled water temperature
Program for: (Refer to the reset curve in Fig. 15.)

— Setpoint Max A1 (Chiller) = 60° F (16° C)
— Reset B1 (Outside Min) = 70° F (21° C)
— Setpoint Min A2 (Chiller) = 45° F (7° C)
— Reset B2 (Outside Max) = 90° F (32° C)
— Differential = 10° F (-12° C)
— Cool

IMPORTANT

After the desired value is selected, be sure to press the ◄ *or* ► *or* **HOME** *button in order to save that value in the controller's memory.*

IMPORTANT

By programming the Chiller setpoint at 45° F (7° C) the T775 has established 45° F (7° C) as the lowest operating control point that will be allowed during reset with the above conditions satisfied.

Wiring

All output relays should have a common power wiring source, which may or may not be the same as the T775 power wiring.

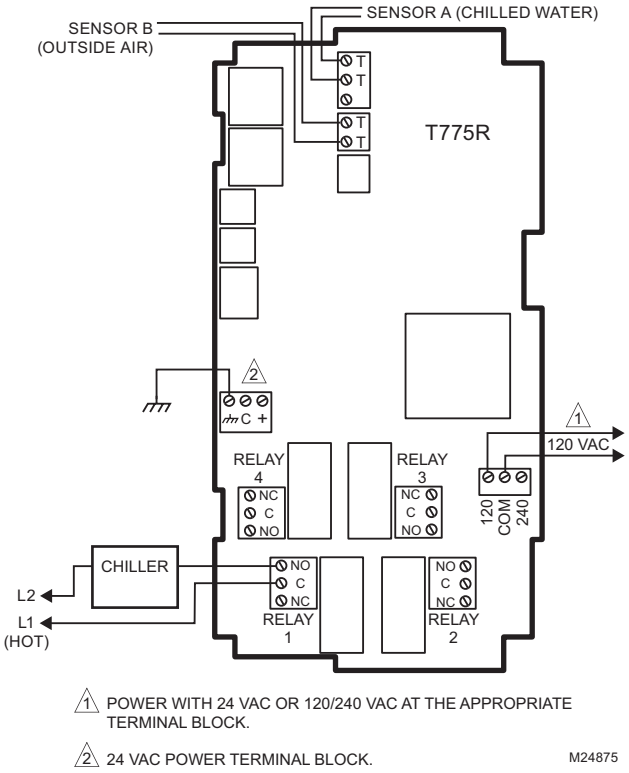


Fig. 16. T775R Wiring - Chilled Water Reset.

NOTE: The Chilled Water Reset application continues on the next page.

Chilled Water Reset (continued)

Device Checkout

The T775 performance can be checked out to determine if proper operation exists.

For example, when the outside air temperature is at 80° F (27° C), the chiller water temperature should be 52.5° F (11° C). See Fig. 17. Use the alternate Home screens to check that the effective setpoint is adjusting correctly based on the outside air temperature (sensor B).

NOTE: The alternate Home screens do not show live updates of the sensor temperature. They show the temperature only at the moment the button is pressed.

1. From the Home screen, use the ▶ button to verify the setpoint temperature for each output.
2. Then, press the **HOME** button to view the actual outside air temperature (sensor B).

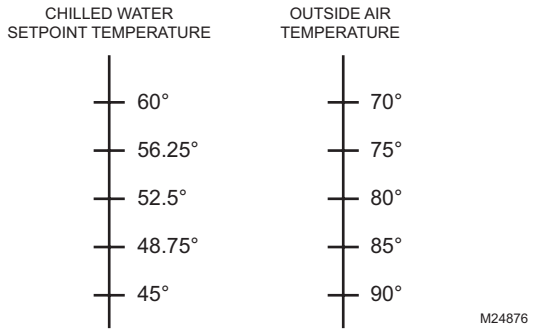


Fig. 17. Chiller Setpoint vs. Outside Temperature.

T775 APPLICATION REPLACEMENT EXAMPLES

This section describes how a T775 Series 2000 Electronic Stand-Alone Controller is wired and programmed to replace various older generation Honeywell devices.

T775M2030 Replacement for W973A Logic Panel

This replacement example illustrates how a T775M2030 is configured to replace a two-stage Heat and two-stage Cool W973A Logic Panel.

- Fig. 34 illustrates the wiring connections for the W973A Logic Panel.
- Fig. 35 and Table 3 on page 31 illustrate the wiring and configuration of the T775M2030 controller.

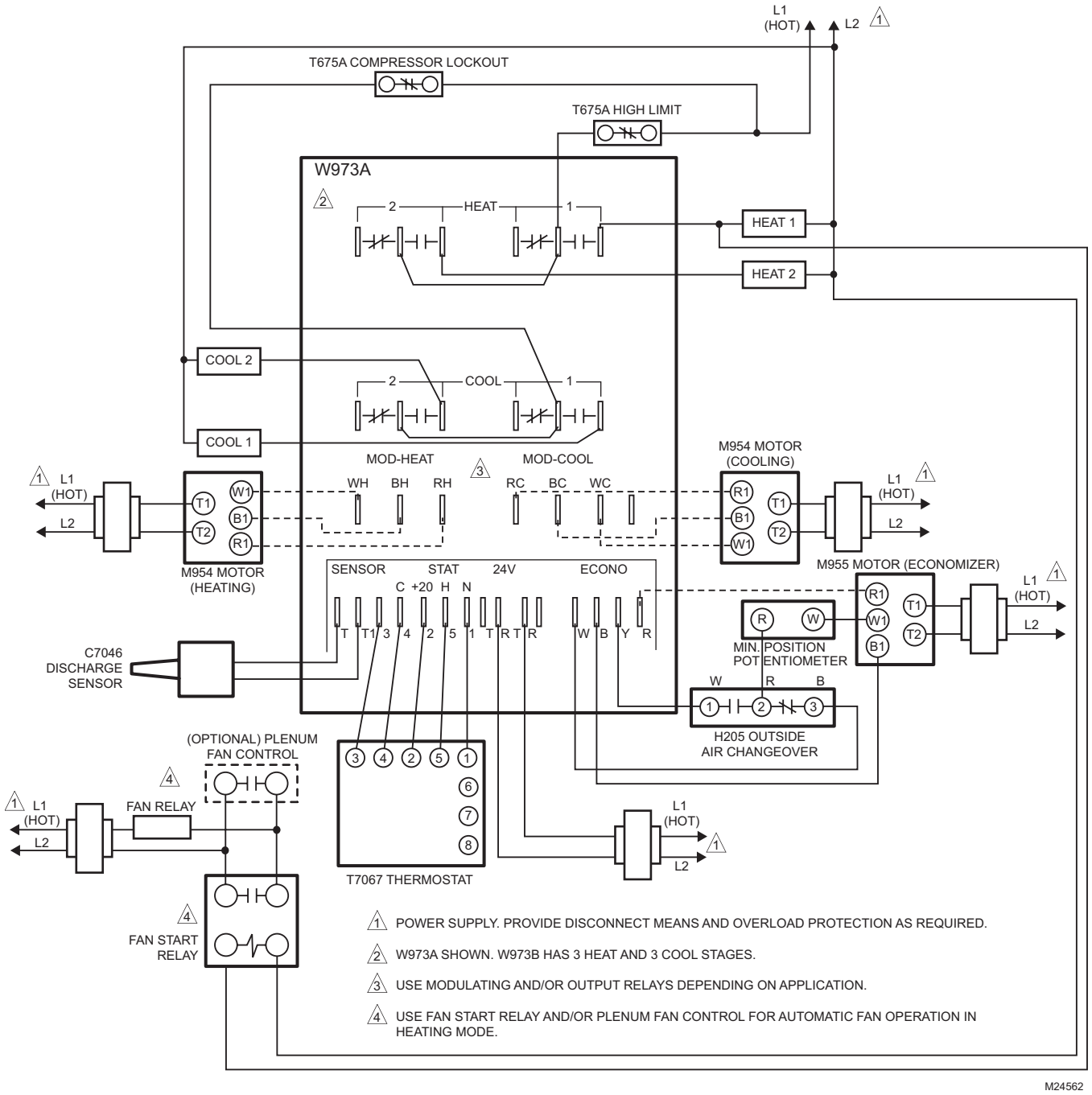
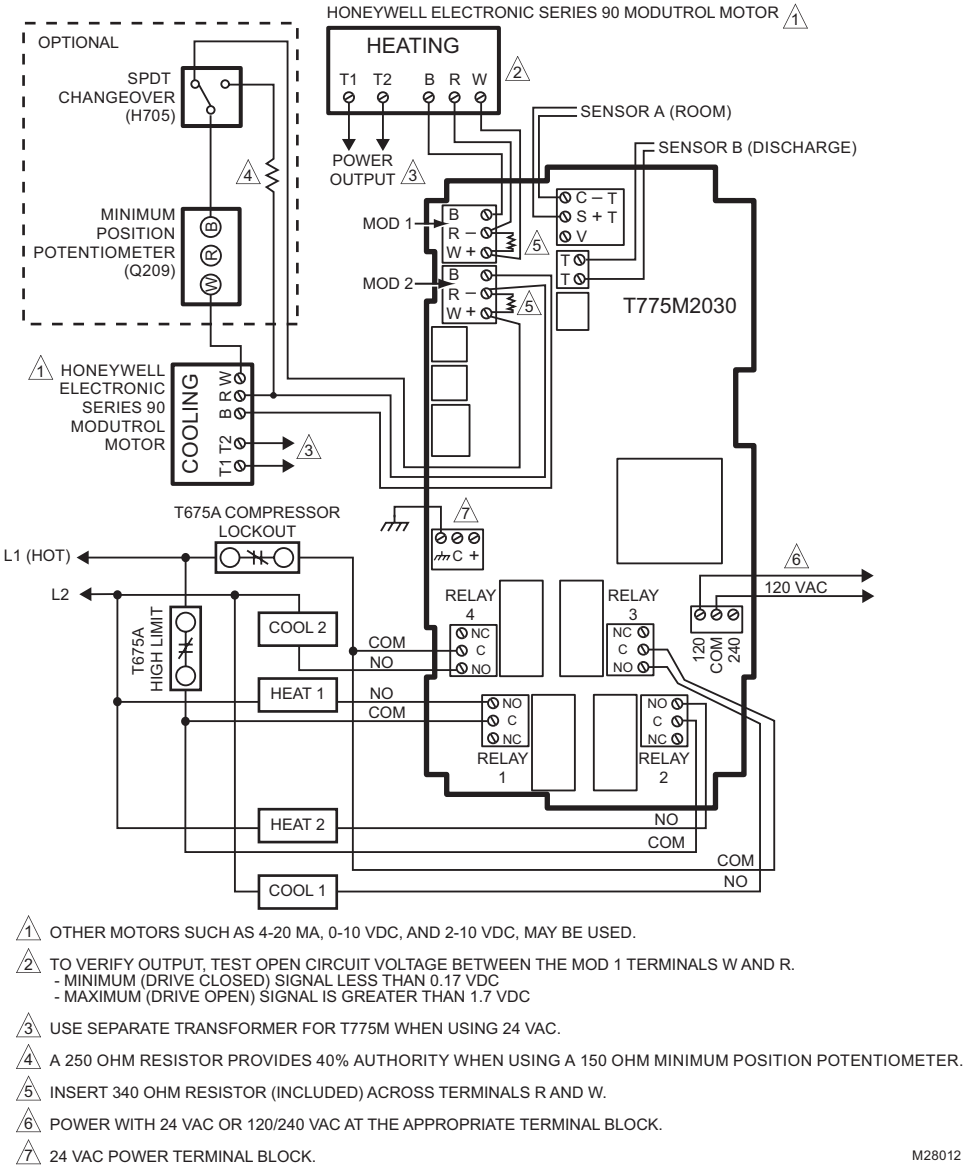


Fig. 34. W973A Wiring Connections (Pre-existing Control).

NOTE: The T775M2030 Replacement for W973A Logic Panel continues on the next page.

T775M2030 Replacement for W973A Logic Panel (continued)

NOTE: Fig. 35 is for wiring purposes only. A thorough review of the existing W973A application is required in order to determine the capability of the T775 controller replacement.



1 OTHER MOTORS SUCH AS 4-20 MA, 0-10 VDC, AND 2-10 VDC, MAY BE USED.

2 TO VERIFY OUTPUT, TEST OPEN CIRCUIT VOLTAGE BETWEEN THE MOD 1 TERMINALS W AND R.
- MINIMUM (DRIVE CLOSED) SIGNAL LESS THAN 0.17 VDC
- MAXIMUM (DRIVE OPEN) SIGNAL IS GREATER THAN 1.7 VDC

3 USE SEPARATE TRANSFORMER FOR T775M WHEN USING 24 VAC.

4 A 250 OHM RESISTOR PROVIDES 40% AUTHORITY WHEN USING A 150 OHM MINIMUM POSITION POTENTIOMETER.

5 INSERT 340 OHM RESISTOR (INCLUDED) ACROSS TERMINALS R AND W.

6 POWER WITH 24 VAC OR 120/240 VAC AT THE APPROPRIATE TERMINAL BLOCK.

7 24 VAC POWER TERMINAL BLOCK.

M28012

Fig. 35. T775M2030 Wiring Connections for Replacing a W973A Logic Panel.

NOTE: The T775M2030 Replacement for W973A Logic Panel continues on the next page.

T775M2030 Replacement for W973A Logic Panel (continued)

In this replacement application, the T775M2030 provides the following, as described in Table 3:

Table 3. T775M2030 Replacement for W973A

Component/Function	W973A Logic Panel	T775M2030 Replacement
Thermostat	T7067	Sensor A (Room) - C7130B1008.
Discharge Sensor	C7046	Sensor B (Discharge) - C7046D1008.
Heating/Cooling Motor	M954	Series 90, 4-20 mA, 0-10 Vdc, or 2-12 Vdc motor may be used.
Fan Start	Fan Start Relay	If a relay is available, it can be used for fan control (e.g., 1 stage Heat and 2 stage Cool using the T775M2030).
Economizer	M955	With the T775M2030 there are two modulating outputs. Therefore, two of the three functions (Heat, Cool, or Economizer) are available to be used. The example in Fig. 35 uses the Heat and Cool functions; no Economizer.
Outside Air Changeover	H205	Optional – SPDT Changeover (H705).

T775R Replacement for W964F Aquatrol Panel with Floating Actuator

This replacement example illustrates how a T77R is configured to replace a W964F Aquatrol Panel.

- Fig. 36 illustrates the wiring connections for the W964F Aquatrol Panel.
- Fig. 37 and Table 4 on page 34 illustrate the wiring and configuration of the T775R controller.

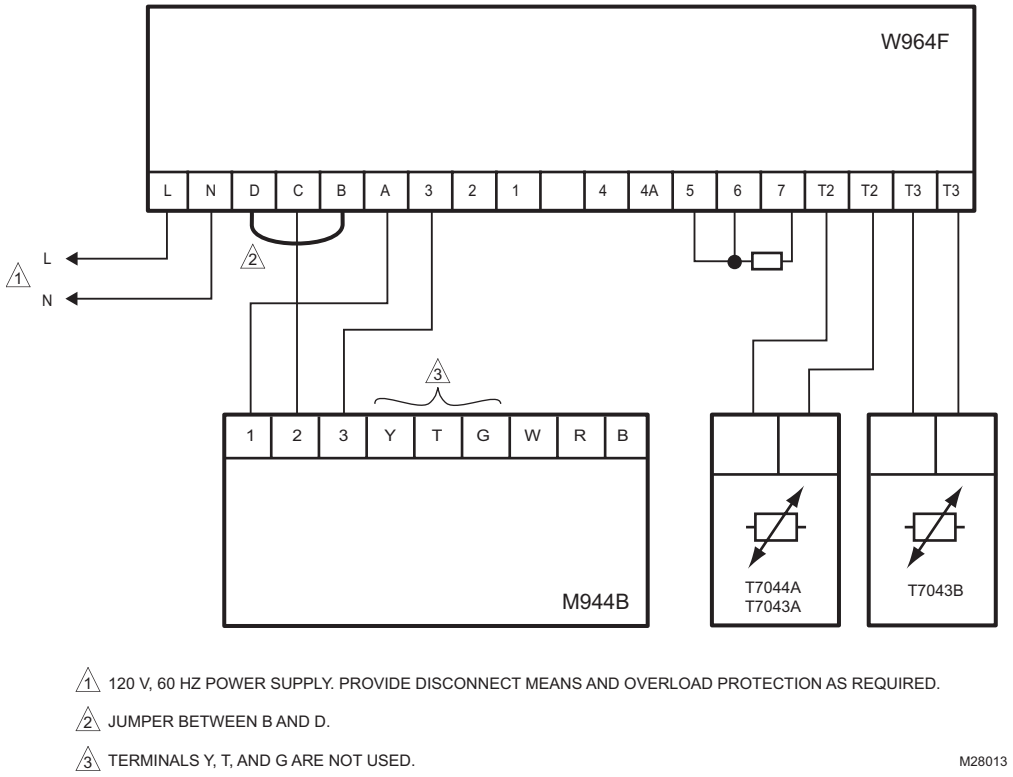
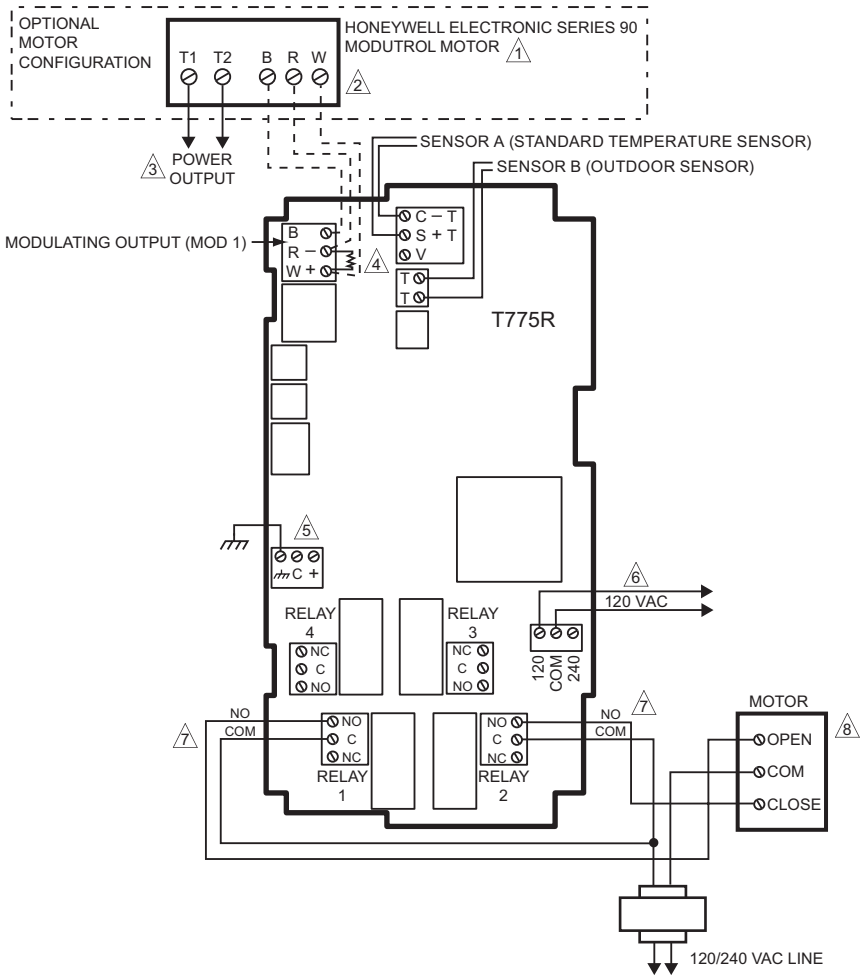


Fig. 36. W964F Wiring Connections (Pre-existing Control).

NOTE: The T775R Replacement for W964F Aquatrol Panel with Floating Actuator continues on the next page.

T775R Replacement for W964F Aquatrol Panel with Floating Actuator (continued)

NOTE: Fig. 37 is for wiring purposes only. A thorough review of the existing W964F application is required in order to determine the capability of the T775 controller replacement.



1 OTHER MOTORS SUCH AS 4-20 MA, 0-10 VDC, AND 2-10 VDC, MAY BE USED ON THE MOD 1 OUTPUT.

2 TO VERIFY OUTPUT, TEST OPEN CIRCUIT VOLTAGE BETWEEN THE MOD 1 TERMINALS W AND R.
- MINIMUM (DRIVE CLOSED) SIGNAL LESS THAN 0.17 VDC
- MAXIMUM (DRIVE OPEN) SIGNAL IS GREATER THAN 1.7 VDC

3 USE SEPARATE TRANSFORMER FOR T775R WHEN USING 24 VAC.

4 INSERT 340 OHM RESISTOR (INCLUDED) ACROSS TERMINALS R AND W.

5 24 VAC POWER TERMINAL BLOCK.

6 POWER WITH 24 VAC OR 120/240 VAC AT THE APPROPRIATE TERMINAL BLOCK.

7 RELAY 1 CLOSES TO DRIVE DEVICE OPEN.
RELAY 2 CLOSES TO DRIVE DEVICE CLOSED.

8 MOTOR CAN BE AN M944B, M644, M6184, ML6984, ML6420, ETC.

M28014

Fig. 37. T775R Wiring Connections for Replacing a W964F Aquatrol Panel.

NOTE: The T775R Replacement for W964F Aquatrol Panel with Floating Actuator continues on the next page.

T775R Replacement for W964F Aquatrol Panel with Floating Actuator (continued)

In this replacement application, the T775R provides the following, as described in Table 4.

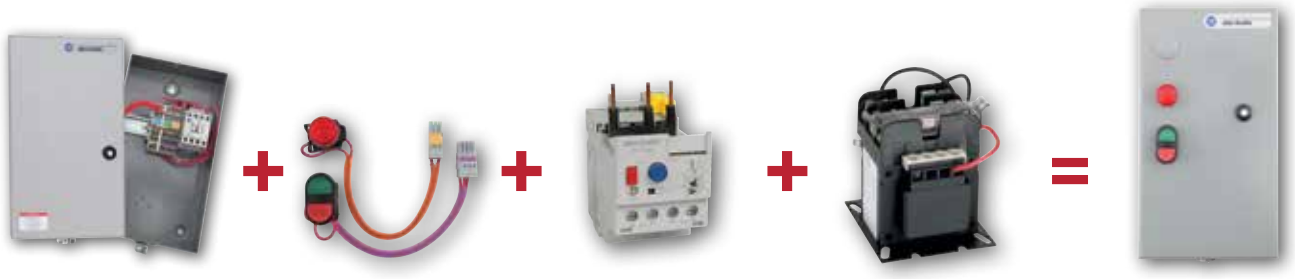
Table 4. T775R Replacement for W964F

Component/Function	W964F Aquatrol	T775R Replacement
Sensors	T7044A or T7043A T7043B	Sensor A - Standard 1097 Ohm temperature sensor. Sensor B - Standard 1097 Ohm temperature sensor. See “Temperature Sensors” on page 3.
Reset ratio and parallel shift	n/a	Reset programming in the T775R provides the reset curve.
On/Off motor control	Jumper terminals 1 and 2 on the W964F	If the W964F provided On/Off motor control, then wire motor to a relay output on the T775R to provide On/Off control.
Actuator motor speed	n/a	Use the Integral Time and Throttling Range to tune the T775R control.
Differential	n/a	Use the Throttling Range to tune the T775R control.
Program setback	n/a	The T775R provides Setback and alternate setpoint programming parameters.
Motor	M944B	Series 90, 4-20 mA, 0-10 Vdc, or 2-12 Vdc motor may be used.

Table of Contents

MS-1
MS-2

Our modular approach to enclosed starter selection and assembly makes it quicker and easier for you to get your application up and running. Build your starter by selecting components from each category, assemble it using our keyed and color-coded snap-together wiring system, and you're ready to go!



1 POWER CENTER **2 COMMAND and INDICATION DEVICES** **3 OVERLOAD RELAYS** **4 TRANSFORMER KITS**

In addition to the user assembled starters available through this Selection Guide (power centers and kits), factory-configured starters are also available through PropsalWorks and the Regional Configuration Centers.

1 POWER CENTER

IEC Reversing and Non-reversing Starters[1]

Amps	Max. Hp Rating						Catalog Number	
	1-Phase		3-Phase				Type 1 (IP42)	
	115V AC	230V AC	200V AC	230V AC	460V AC	575V AC	Non-reversing	Reversing
9	1/2	1/2	2	2	5	7 1/2	109-C09AD-0LR	105-C09AD-0LR
12	1/2	2	3	3	7 1/2	10	109-C12AD-0LR	105-C12AD-0LR
16	1	3	5	5	10	15	109-C16AD-0LR	105-C16AD-0LR
23	2	3	5	7 1/2	15	15	109-C23AD-0LR	105-C23AD-0LR
30	2	5	7 1/2	10	20	25	109-C30AD-0LR	105-C30AD-0LR
37	3	5	10	10	25	30	109-C37AD-0LR	105-C37AD-0LR
43	3	7 1/2	10	15	30	30	109-C43AD-0LR	–
55	5	10	15	20	40	40	109-C55AD-0LR	–

[1] All starters come standard with a 120V AC coil

2 COMMAND and INDICATION DEVICES

Push buttons, selector switches, E-stop and pilot light kits are 22.5 mm

Kit Description	Catalog Number
Push Button, Start-Stop	198-SSPB[2]
Selector Switch, Plastic, On-Off	198-2SS[2]
Selector Switch, Plastic, HOA/FOR	198-3SS
Push Button, For-Rev-Stop	198-FRSPB[3]
Emergency Stop Push Button	198-ESP[3]
Pilot Light, 24…120V AC/DC, Red LED	198-RUPL
Pilot Light, 24…120V AC/DC, Green LED	198-GUPL
Pilot Light, 24…120V AC/DC, White LED	198-WUPL
Pilot Light, 240V AC, Red LED	198-R240PL
Pilot Light, 240V AC, Green LED	198-G240PL
Pilot Light, 240V AC, White LED	198-W240PL
N.O./N.C. Auxiliary contact kit	198-SA11[2]

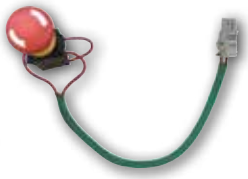
[2] Can only be used with non-reversing starters and contactors

[3] Can only be used with reversing starters

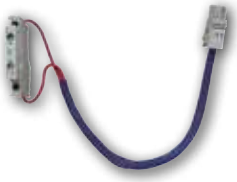
198-SSPB

198-3SS

198-RUPL



198-ESP



198-SA11

Product data sheet

Specifications

DS-1
DS-2

Motor disconnect switch, 3P, 30A, NEMA 1, 3, 3R, 4, 4X and 12 enclosure

MD3304X

Main

Range	MD
Product	Motor Disconnect Switch
Current Rating	30 A
Horsepower Rating	7.5 hp 220/240 V AC 20 hp 440/480 V AC 25 hp 600 V AC
Enclosure Rating	NEMA 4X
Certifications	UL listed

Complementary

Height	6.38 in (162.05 mm)
Width	3.90 in (99.06 mm)
Depth	4.37 in (111.00 mm)
Product Weight	1.50 lb(US) (0.68 kg)

Packing Units

Unit Type of Package 1	PCE
Number of Units in Package 1	1
Package 1 Weight	23.49 oz (666.0 g)
Package 1 Height	4.92 in (12.5 cm)
Package 1 width	5.20 in (13.2 cm)
Package 1 Length	7.17 in (18.2 cm)
Unit Type of Package 2	S04
Number of Units in Package 2	18
Package 2 Weight	29.19 lb(US) (13.24 kg)
Package 2 Height	11.81 in (30 cm)
Package 2 width	15.75 in (40 cm)
Package 2 Length	23.62 in (60 cm)
Unit Type of Package 3	P06
Number of Units in Package 3	72

Package 3 Weight	135.50 lb(US) (61.46 kg)
Package 3 Height	30.31 in (77 cm)
Package 3 width	31.50 in (80 cm)
Package 3 Length	23.62 in (60 cm)

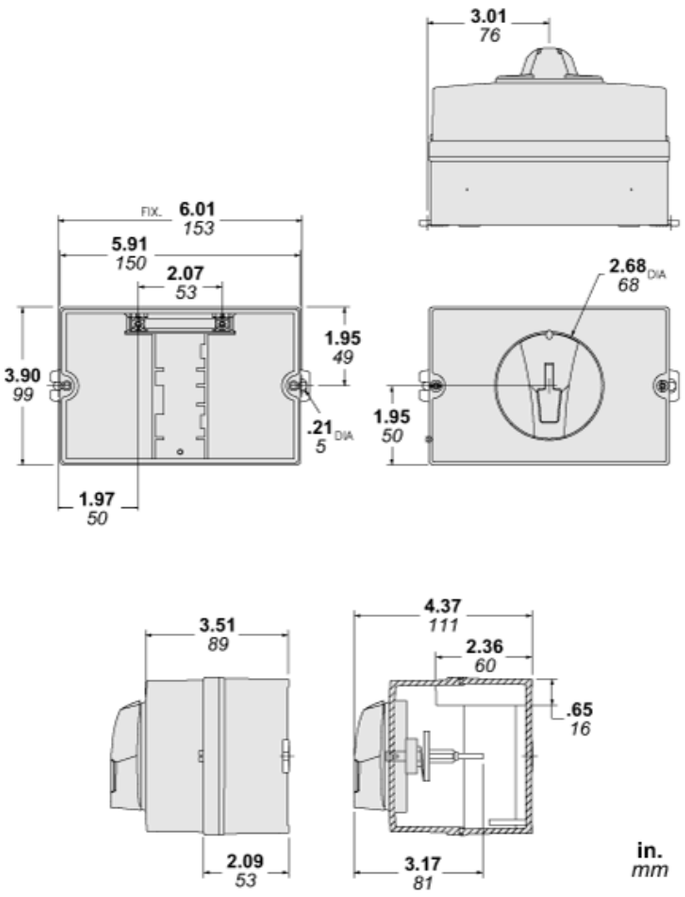
Offer Sustainability

Sustainable offer status	Green Premium product
REACh Regulation	REACh Declaration
REACh free of SVHC	Yes
EU RoHS Directive	Compliant EU RoHS Declaration
Toxic heavy metal free	Yes
Mercury free	Yes
RoHS exemption information	Yes
China RoHS Regulation	China RoHS declaration Pro-active China RoHS declaration (out of China RoHS legal scope)
Environmental Disclosure	Product Environmental Profile

Contractual warranty

Warranty	18 months

Approximate Dimensions



Horn/Strobe
Electronic
860 Series

HS-1

Edwards 860 Series xenon strobe beacons with horns are bright, low current, high decibel, combination signals designed for use where a distinctive visual or audible signal is required. The housing is made of gray, engineered thermo-plastic. The strobe and horn can be operated independently.

The 867STR (indoor) and 868STR (outdoor) Series can be surface mounted on the supplied surface box. The 869STR and 869DSTR Series beacons can be flush mounted. They are designed to mount in a standard 4" (102mm) square electrical box with extension ring (total min. depth of 3" (76mm) not supplied.)

The 869DSTR Series is Diode Polarized for use in electrically supervised circuits.

Features and Specifications

- Xenon strobe light source with horn
- Flash rate 60 fpm
- 100dB at 1 meter/90dB at 10ft. (measured in anechoic chamber)
- Low current draw
- Terminals for easy wiring
- Gray, engineered thermoplastic housing
- Diode Polarized for use in electrically supervised circuits (869DSTR)
- Versions suitable for indoor and outdoor applications
- Operating indoor temperature range: 85% relative humidity at 86°F (30°C), 32°F to 120°F (0 to 49°C) variable ambient temperature.
- Operating outdoor temperature range: 95% relative humidity at 86°F (30°C), -31°F to 150°F (-35°C to 66°C) variable ambient temperature.

Ordering Information

Description	Cat. No.	Operating Voltage[1]	Strobe Current[2]	Horn Current[2]	Lens Color	Effective Light Output UL 1638	Operating Environment
AC - Indoor Rated Surface Mount	**867STRA-N5**	120V AC	0.115 A (RMS)	0.033 A	Amber	90 cd	Indoor: 85% relative humidity at 86°F (30°C); 32°F to 120°F (0° to 49°C) variable ambient
	867STRB-N5	120V AC		0.033 A	Blue	20 cd	
	867STRC-N5	120V AC		0.033 A	Clear	150 cd	
	867STRG-N5	120V AC		0.033 A	Green	70 cd	
	867STRR-N5	120V AC		0.033 A	Red	21 cd	
AC/DC - Indoor Rated Surface Mount	**867STRA-AQ**	24V AC	0.370 A	0.072 A	Amber	90 cd	Indoor: 85% relative humidity at 86°F (30°C); 32°F to 120°F (0° to 49°C) variable ambient
		24V DC	0.390 A	0.022 A			
	867STRB-AQ	24V AC	0.370 A	0.072 A	Blue	20 cd	
		24V DC	0.390 A	0.022 A			
	867STRC-AQ	24V AC	0.370 A	0.072 A	Clear	150 cd	
		24V DC	0.390 A	0.022 A			
	867STRG-AQ	24V AC	0.370 A	0.072 A	Green	70 cd	
		24V DC	0.390 A	0.022 A			
	867STRR-AQ	24V AC	0.370 A	0.072 A	Red	21 cd	
		24V DC	0.390 A	0.022 A			

[1]Operating voltage: -20% to +10% of nominal voltage.
[2]Horn and strobe currents are additive when connected in parallel.

Horn/Strobe
Electronic
860 Series

Ordering Information

Description	Cat. No.	Operating Voltage[1]	Strobe Current[2]	Horn Current[2]	Lens Color	Effective Light Output UL 1638	Operating Environment
AC - Outdoor Rated Surface Mount	**868STRA-N5**	120V AC	0.115 A	0.033 A	Amber	90 cd	Indoor: 85% relative humidity at 86°F (30°C); 32°F to 120°F (0° to 49°C) variable ambient Outdoor: 95% relative humidity at 86°F (30°C) -31°F to 150°F (-35°C to 66°C) variable ambient
	868STRB-N5	120V AC	0.115 A	0.033 A	Blue	20 cd	
	868STRC-N5	120V AC	0.115 A	0.033 A	Clear	150 cd	
	868STRG-N5	120V AC	0.115 A	0.033 A	Green	70 cd	
	868STRR-N5	120V AC	0.115 A	0.033 A	Red	21 cd	
AC/DC - Outdoor Rated Surface Mount	**868STRA-AQ**	24V AC	0.370 A	0.072 A	Amber	90 cd	
		24V DC	0.390 A	0.022 A			
	868STRB-AQ	24V AC	0.370 A	0.072 A	Blue	20 cd	
		24V DC	0.390 A	0.022 A			
	868STRC-AQ	24V AC	0.370 A	0.072 A	Clear	150 cd	
		24V DC	0.390 A	0.022 A			
	868STRG-AQ	24V AC	0.370 A	0.072 A	Green	70 cd	
		24V DC	0.390 A	0.022 A			
	868STRR-AQ	24V AC	0.370 A	0.072 A	Red	21 cd	
		24V DC	0.390 A	0.022 A			
AC - Indoor Rated Flush Mount	**869STRA-N5**	120V AC	0.115 A	0.033 A	Amber	90 cd	Indoor: 85% relative humidity at 86°F (30°C); 32°F to 120°F (0° to 49°C) variable ambient
	869STRB-N5	120V AC	0.115 A	0.033 A	Blue	20 cd	
	869STRC-N5	120V AC	0.115 A	0.033 A	Clear	150 cd	
	869STRG-N5	120V AC	0.115 A	0.033 A	Green	70 cd	
	869STRR-N5	120V AC	0.115 A	0.033 A	Red	21 cd	
AC/DC - Indoor Rated Flush Mount	**869STRA-AQ**	24V AC	0.370 A	0.072 A	Amber	90 cd	
		24V DC	0.390 A	0.022 A			
	869STRB-AQ	24V AC	0.370 A	0.072 A	Blue	20 cd	
		24V DC	0.390 A	0.022 A			
	869STRC-AQ	24V AC	0.370 A	0.072 A	Clear	150 cd	
		24V DC	0.390 A	0.022 A			
	869STRG-AQ	24V AC	0.370 A	0.072 A	Green	70 cd	
		24V DC	0.390 A	0.022 A			
	869STRR-AQ	24V AC	0.370 A	0.072 A	Red	21 cd	
		24V DC	0.390 A	0.022 A			
DC - Diode Polarized Indoor Rated Surface Mount	**869DSTRA-G1**	24V DC	0.320 A	0.048 A	Amber	90 cd	Indoor: 85% relative humidity at 86°F (30°C); 32°F to 120°F (0° to 49°C) variable ambient
	869DSTRB-G1	24V DC	0.320 A	0.048 A	Blue	20 cd	
	869DSTRC-G1	24V DC	0.320 A	0.048 A	Clear	150 cd	
	869DSTRG-G1	24V DC	0.320 A	0.048 A	Green	70 cd	
	869DSTRR-G1	24V DC	0.320 A	0.048 A	Red	21 cd	

[1]Operating voltage: -20% to +10% of nominal voltage.
[2]Horn and strobe currents are additive when connected in parallel.

Horn/Strobe
Electronic
860 Series

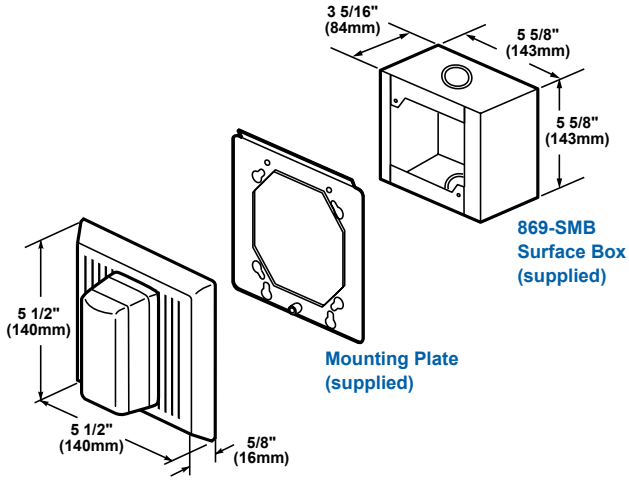
Accessories

Description	Cat. No.
Surface Mount Box, Outdoor Applications	**869-WPB**

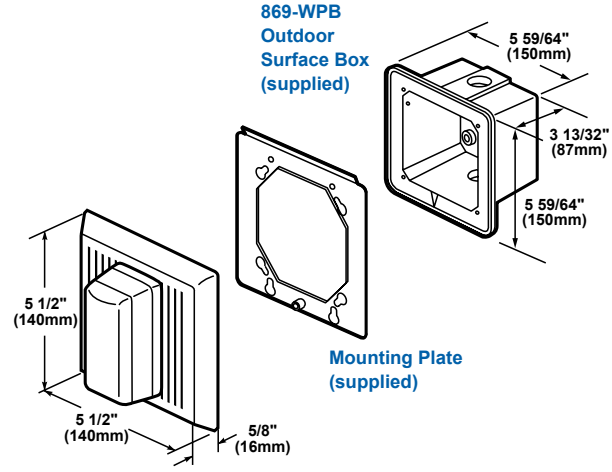
Weights and Dimensions

Cat. No.	Approx. Shipping Weight (lb.)
867STR*-N5	3.90
867STR*-AQ	3.90
868STR*-N5	3.60
868STR*-AQ	3.60
869STR*-N5	1.40
869STR*-AQ	1.40
869DSTR*-G1	1.40
869-WPB	2.10

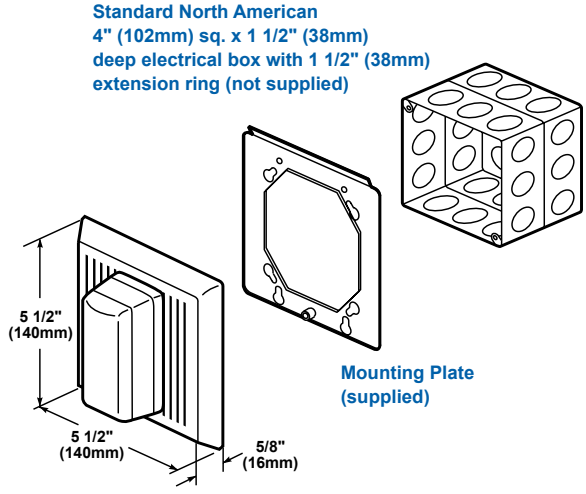
*Letter in this position designates lens color: A - amber, B - blue, C - clear, G - green or R - red



867STR Series



868STR Series



869STR and
869DSTR Series

Quotation

PT-102

Endress+Hauser
People for Process Automation

Monsieur Rhéa Fauteux
Les Entreprises SIFEC Nord Inc.
595, boul. de l'Aeroparc
Lachute QC J8H 3R8

Number	**2002660486**
Dated	17 May 2022
Valid to	16 Jun 2022
Customer No.	42020291

Inside Sales Freddy Gutierrez-Vega
Telephone +1 514 940 2293
freddy.gutierrez-vega@endress.com

Outside Sales Stephane Gervais
stephane.gervais@endress.com

Your Reference	RFQ YGZ04 _FMX21
Dated	17 May 2022

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Summary

Item	Qty	Product	Delivery time	Net value (CAD)
10	1 PC	Waterpilot FMX21 FMX21-41RH1/101 (FMX21-CD211KGJ25H+LRPOPS)	1 week(s)	Unit price

Total prices

Logistic Service

Total without tax (CAD)

Endress+Hauser Canada Ltd
1244 International Blvd.
Burlington, Ontario
Canada L7L 0K2
Telephone (905) 681-9292
Facsimile (905) 681-9444
www.ca.endress.com

Endress+Hauser Canada Ltée
6800 Côte de Liesse, Ste. 100
St. Laurent, Québec
Canada H4T 2A7
Téléphone (514) 733-0254
Télécopieur (514) 733-2924

Endress+Hauser Canada Ltd
9045 - 22 Ave SW
Edmonton, Alberta
Canada T6X 0J9
Telephone (780) 486-3222
Facsimile (780) 486-3466

Endress+Hauser Canada Ltd
Suite 110, 703 – 64th Ave SE
Calgary, Alberta
Canada T2H 2C3
Telephone (403) 777-2252
Facsimile (403) 777-2253

Endress+Hauser
People for Process Automation

Ship-To	Les Entreprises SIFEC Nord Inc. 595, boul. de l'Aeroparc Lachute QC J8H 3R8
Payment term	Net 30 days
Delivery conditions	DAP Delivered at place Customer Site - Incoterms® 2020
Warranty	18 months after delivery
Delivery time	The mentioned delivery times are calculated in calendar weeks and are based on partial, standard delivery service. If you wish complete delivery, please contact your sales representative.

Endress+Hauser
People for Process Automation

Details — Dated 17 May 2022

Item	Qty	Product	Net value (CAD)
10	1 PC	Waterpilot FMX21 FMX21-41RH1/101 (FMX21-CD211KGJ25H+LRPOPS) Level measurement, Hydrostatic. Level probe. Process membrane: CERAPHIRE, dry,rugged. Typ. ref. accuracy +/-0.2% (Platinum 0.1%). :: Integrated overvoltage protection.	Unit price

Delivery time 1 week(s)

Order code description

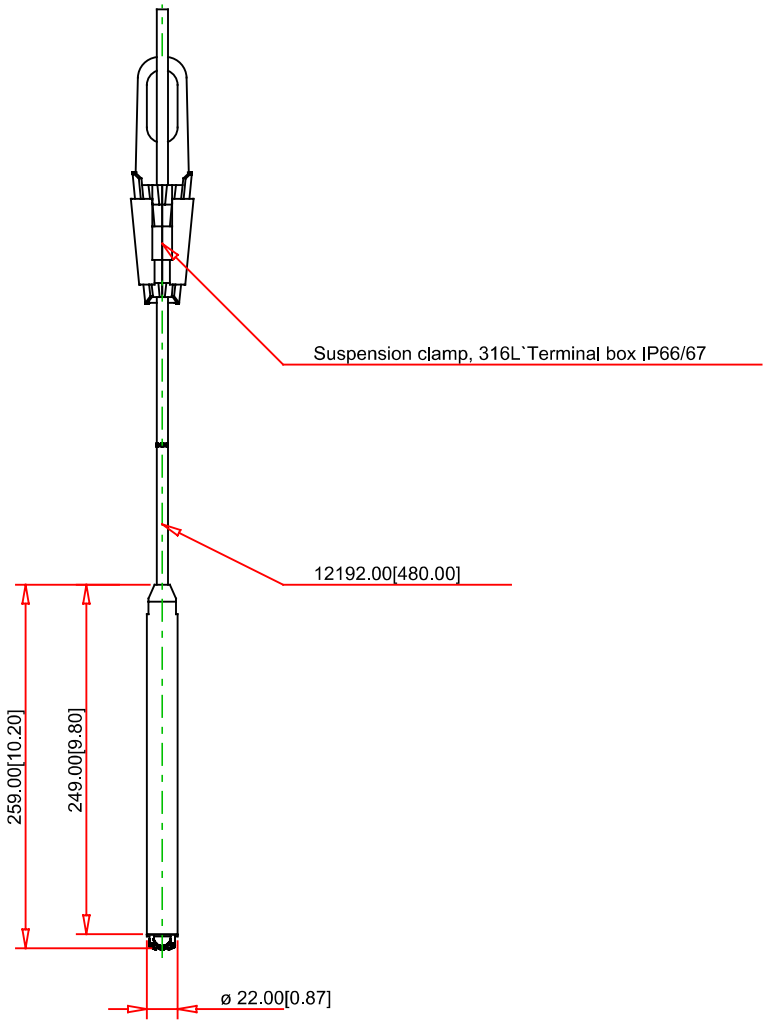
CD	Approval: CSA General Purpose
2	Output: 4-20mA HART
1	Probe Tube: 316L, d=22mm/0.87in
1K	Sensor Range: 2bar/200kPa/30psi gauge, 20mH2O/67ftH2O/800inH2O
G	Reference Accuracy: Standard
J	Calibration; Unit: Customised pressure; see additional spec.
25	Probe Connection: 40.00 ft cable, shortable, PE
H	Seal: EPDM
LR	>>Additional Approval: NSF potable water approval
PO	>>Accessory Enclosed: Suspension clamp, 316L
PS	>>Accessory Enclosed: Terminal box IP66/67

Details

Low range value	0.000 psi
Upper range value	20.000 psi
Damping [s]	2

Country of origin	Country of dispatch	HS-Code
US	US	9026100091

US: Subject to US Export Administration Regulations - EAR99



First Angle Projection XX.X [x.xx] = mm [inch]

Disclaimer:

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Order Code :
FMX21-CD211KGJ25H+LRPOPS

Product Description :
Waterpilot FMX21

www.addresses.endress.com

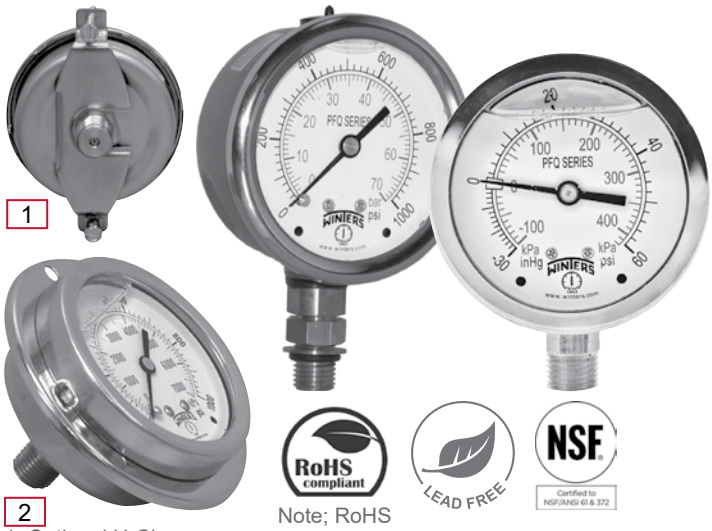
Endress+Hauser

People for Process Automation

Tag : PI-120
PFQ709LF-C1-R14-DRY

Stainless Steel Liquid Filled Gauge, Lead Free Stainless Steel Liquid Filled Gauge

PFQ, PFQ-LF



1. Optional U-Clamp
2. Optional Front Flange

Note; RoHS applies SS internals only

Description & Features:

- Pulsation resistant, liquid filled stainless steel case
- Glycerin filled standard
- Brass or stainless steel internals
- Restricted orifice standard on dual scale
- Ventable plug on 2.5” (63mm) and 4” (100mm) bottom mount (excluding SAE connection)
- Crimp-On bezel
- Single (psi) or dual scale (psi/kPa)/(psi/bar) available
- Optional U-Clamps and front flanges
- Dry case available
- ASME B40.100 compliant (EN837-1 available on 2” (50mm) dial and up)
- CRN registered
- Lead free version NSF-61-372 certified
- 5 year warranty

Applications:

- Ideal for pumps, compressors, hydraulic presses, machinery, pneumatic equipment and motors in harsh environments
- Use where harmful vibration and pulsation are present

Specifications	Stainless Steel Internals	Brass/Lead Free Brass Internals
Dial	1.5” (40mm), 2” (50mm), 2.5” (63mm), 4” (100mm), white aluminum with black and red markings	1.5” (40mm), 2” (50mm), 2.5” (63mm), 4” (100mm), white aluminum with black and red markings
Case	AISI 304 SS	AISI 304 SS
Lens	Polycarbonate	Polycarbonate
Ring	AISI 304 SS, Crimp-On	AISI 304 SS, Crimp-On
Socket	AISI 316 SS with restrictor screw (dual scale only)	OT 58 brass with restricted orifice (dual scale only) or lead free brass with restricted orifice (dual scale only), NSF-61-372 certified
Connection	1/8”, 1/4” or 1/2” NPT	1/8”, 1/4” or 1/2” NPT or 7/16-20 SAE standard with restricted orifice
Fill Liquid	Glycerin	Glycerin
Bourdon Tube	1.5” (40mm), 2” (50mm): SS C or coil shaped 2.5” (63mm), 4” (100mm): AISI 316 SS C or coil shaped	Phosphor bronze C or coil shaped
Movement	SS	PFQ: OT 59 brass PFQ-LF (1.5”, 2”, 2.5”): SS, PFQ-LF (4”): Lead free brass, NSF-61-372 certified
Pointer	Aluminum, anodized black	Aluminum, anodized black
Welding	TIG	Silver alloy
Over-pressure Limit	25% for pressures up to 1,450 psi (9,998 kPa), 15% for pressures over 1,450 psi (9,998 kPa)	25% for pressures up to 1,450 psi (9,998 kPa), 15% for pressures over 1,450 psi (9,998 kPa)
Socket Gasket	Buna N for two-piece internal socket seal	Buna N for two-piece internal socket seal
Fill Plug	Buna N	Buna N
Lens Ring Gasket	Silicone rubber	Silicone rubber
Working Pressure	Maximum 75% of full scale value	Maximum 75% of full scale value
Ambient/Process Temperature	Dry: -40°F to 200°F (-40°C to 93°C) Glycerin Filled: -4°F to 150°F (-20°C to 65°C)	Dry: -40°F to 200°F (-40°C to 93°C) Glycerin Filled: -4°F to 150°F (-20°C to 65°C)
Accuracy	1.5” (40mm), 2” (50mm): ±2.5% of full scale value 2.5” (63mm), 4” (100mm): ±1.5% of full scale value	1.5” (40mm), 2” (50mm): ±2.5% of full scale value 2.5” (63mm), 4” (100mm): ±1.5% of full scale value
Enclosure Rating	IP65	IP65
Warning (brass and lead free brass internals only)	N/A	**WARNING:** This product can expose you to chemicals including lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

PFQ-LF Order Codes (products in bold are normally stock in North America)

Dial Size	4" (100mm)			
Connection	1/4" Bottom	1/4" Back (CB)	1/2" Bottom	1/2" Back (CB)
Socket, Tube	Lead Free Brass			
30" Hg Vac/kPa	**PFQ700LF**	PFQ730LF	PFQ1234LF	PFQ1285LF
30"/0/15 psi/kPa	PFQ701LF	PFQ731LF	PFQ1235LF	PFQ1286LF
30"/0/30 psi/kPa	PFQ702LF	PFQ732LF	PFQ1236LF	PFQ1287LF
30"/0/60 psi/kPa	PFQ703LF	PFQ733LF	PFQ1237LF	PFQ1288LF
30"/0/100 psi/kPa	PFQ704LF	PFQ734LF	PFQ1238LF	PFQ1289LF
30"/0/150 psi/kPa	PFQ705LF	PFQ735LF	PFQ1239LF	PFQ1290LF
30"/0/200 psi/kPa	PFQ706LF	PFQ736LF	PFQ1240LF	PFQ1291LF
30"/0/300 psi/kPa	PFQ707LF	PFQ737LF	PFQ1241LF	PFQ1292LF
0/15 psi/kPa	PFQ708LF	PFQ738LF	PFQ1242LF	PFQ1293LF
0/30 psi/kPa	**PFQ709LF**	PFQ739LF	PFQ1243LF	PFQ1294LF
0/60 psi/kPa	**PFQ710LF**	PFQ740LF	PFQ1244LF	PFQ1295LF
0/100 psi/kPa	**PFQ711LF**	PFQ741LF	PFQ1245LF	PFQ1296LF
0/160 psi/kPa	**PFQ712LF**	PFQ742LF	PFQ1246LF	PFQ1298LF
0/200 psi/kPa	**PFQ713LF**	PFQ743LF	PFQ1247LF	PFQ1524LF
0/300 psi/kPa	**PFQ714LF**	PFQ744LF	PFQ1248LF	PFQ1525LF
0/400 psi/kPa	**PFQ715LF**	PFQ745LF	PFQ1249LF	PFQ1526LF
0/600 psi/kPa	**PFQ716LF**	PFQ746LF	PFQ1250LF	PFQ1527LF
0/1,000 psi/kPa	**PFQ724LF**	PFQ192LF	PFQ717LF	PFQ747LF
0/1,500 psi/kPa	PFQ725LF	PFQ241LF	PFQ718LF	PFQ748LF
0/2,000 psi/kPa	PFQ726LF	PFQ242LF	PFQ719LF	PFQ749LF
0/3,000 psi/kPa	PFQ727LF	PFQ243LF	PFQ720LF	PFQ750LF
0/5,000 psi/kPa	PFQ728LF	PFQ244LF	PFQ721LF	PFQ751LF
0/6,000 psi/kPa	PFQ346LF	PFQ246LF	PFQ784LF	PFQ785LF
0/7,500 psi/kPa	PFQ347LF	PFQ247LF	PFQ786LF	PFQ886LF
0/10,000 psi/kPa	PFQ729LF	PFQ360LF	PFQ722LF	PFQ752LF
0/15,000 psi/kPa	PFQ261LF	PFQ361LF	PFQ723LF	PFQ753LF

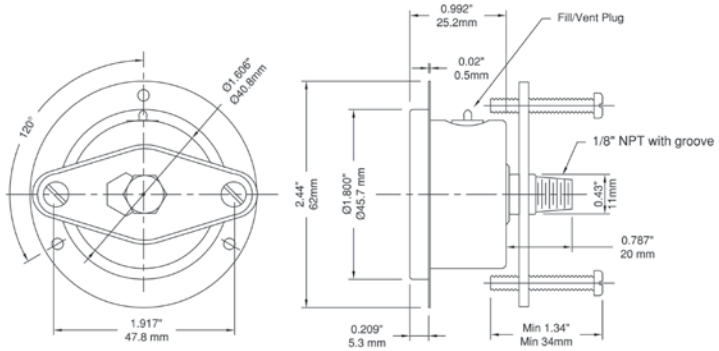
Other ranges and connection sizes available upon request. For scale change, refer to How to Order Guide for scale codes.

For options, attach suffix to end of order code: i.e. PFQ728LF-DRY for DRY CASE

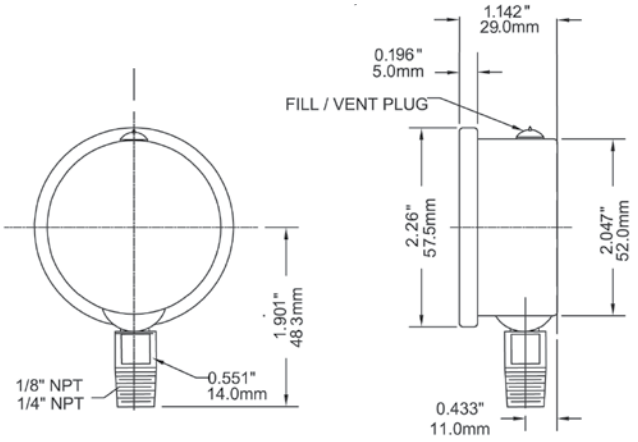
Option suffix:

4BF = 4" (100mm) Back flange
4FF = 4" (100mm) Front flange
4UC-P = 4" (100mm) U-Clamp (for SS movement)
4UC-Q = 4" (100mm) U-Clamp (for brass movement)
DRY = Supply gauge dry
EN = EN837-1 compliant
SF4 = 4" (100mm) Silicone filled

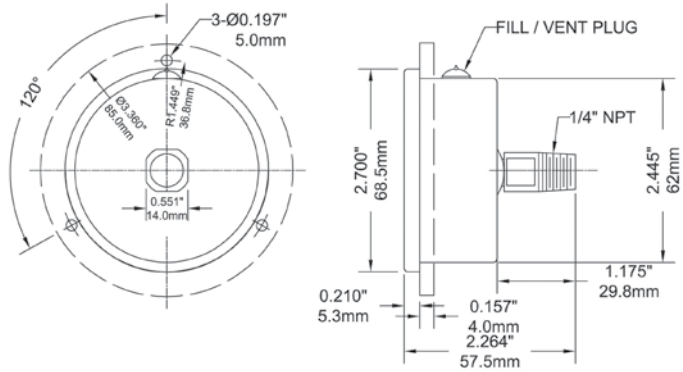
1.5” Back Connection with Front Flange and U-Clamp



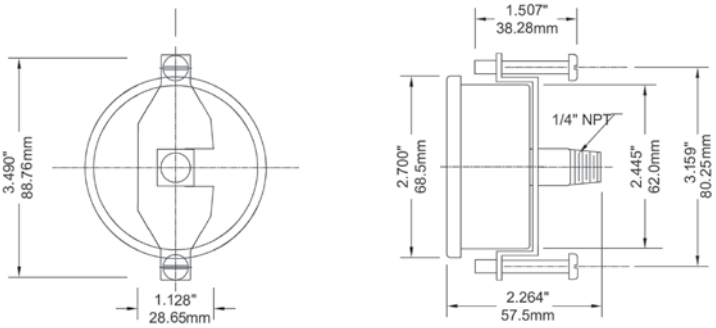
2” Bottom Connection



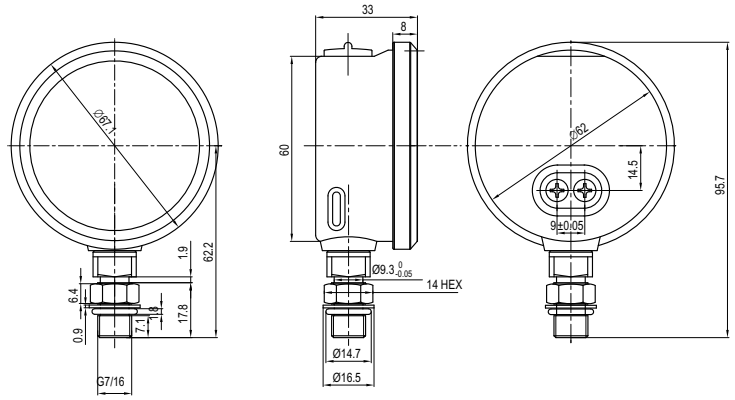
2.5” Back Connection with Front Flange



2.5” Back Connection with U-Clamp

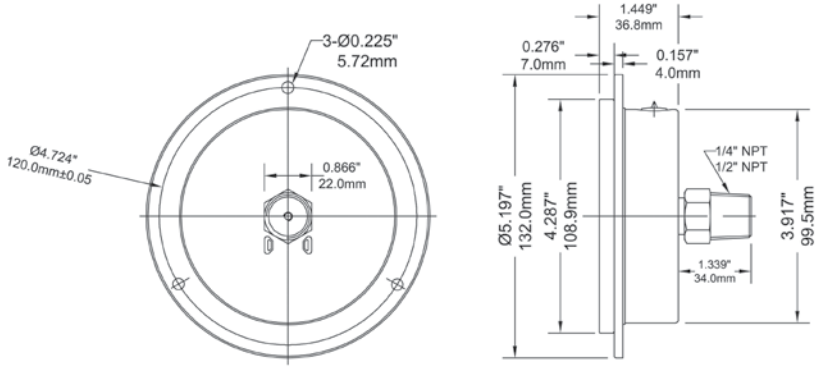


2.5” Bottom Connection SAE



Dimensions in mm

4” Back Connection with Front Flange



ProSense® ETS Series (-1001) Digital Temperature Sensors

TT-201
&
TI-201

Features

- **Outputs:**
  - **2 solid-state switch outputs provide a reliable alternative to mechanical temperature switches**
  - **One output can be configured as a scalable analog 4-20 mA signal, turning the unit into a combination temperature switch and transmitter**
- Ideal for industrial temperature measurement and indication in many applications
- RTD, measuring electronics, and process fitting combined in a single stainless steel probe
- Wide measuring range of -58 to 302°F
- Easily configured with pushbuttons or free ProSense XT-SOFT
- 30, 50, 100 or 150mm probe insertion lengths
- Integral 1/4" NPT or 1/2" NPT male process connection allows for direct installation without requiring extra fittings
- Built-in digital display provides indication of measured temperature and 2 yellow LEDs indicate output status
- The sensor housing can be rotated up to 310° and the digital display can be flipped 180° for installation flexibility
- Stainless steel housing provides a high IP65/IP66 ingress protection rating
- 4-pin M12 quick-disconnect electrical connection

For a variety of cable options see our website www.AutomationDirect.com

ETS Series (-1001) Digital Temperature Sensors				
Part Number	*Description*	*Pcs/Pkg*	*Wt (lb)*	*Price*
ETS50N-30-1001	ProSense digital temperature sensor, 1/2in male NPT process connection, 30mm insertion length, -58 to 302°F, output 1: switch PNP, N.O./N.C. selectable or 4-20 mA, output 2: switch PNP, N.O./N.C. selectable or 4-20 mA, 4-digit display.	1	0.9	$189.00
ETS50N-50-1001	ProSense digital temperature sensor, 1/2in male NPT process connection, 50mm insertion length, -58 to 302°F, output 1: switch PNP, N.O./N.C. selectable or 4-20 mA, output 2: switch PNP, N.O./N.C. selectable or 4-20 mA, 4-digit display.	1	0.9	$190.00
*ETS50N-100-1001**	ProSense digital temperature sensor, 1/2in male NPT process connection, 100mm insertion length, -58 to 302°F, output 1: switch PNP, N.O./N.C. selectable or 4-20 mA, output 2: switch PNP, N.O./N.C. selectable or 4-20 mA, 4-digit display.	1	0.9	$191.00
*ETS50N-150-1001**	ProSense digital temperature sensor, 1/2in male NPT process connection, 150mm insertion length, -58 to 302°F, output 1: switch PNP, N.O./N.C. selectable or 4-20 mA, output 2: switch PNP, N.O./N.C. selectable or 4-20 mA, 4-digit display.	1	0.9	$192.00
ETS25N-30-1001	ProSense digital temperature sensor, 1/4in male NPT process connection, 30mm insertion length, -58 to 302°F, output 1: switch PNP, N.O./N.C. selectable or 4-20 mA, output 2: switch PNP, N.O./N.C. selectable or 4-20 mA, 4-digit display.	1	0.8	$187.00
ETS25N-50-1001	ProSense digital temperature sensor, 1/4in male NPT process connection, 50mm insertion length, -58 to 302°F, output 1: switch PNP, N.O./N.C. selectable or 4-20 mA, output 2: switch PNP, N.O./N.C. selectable or 4-20 mA, 4-digit display.	1	0.8	$188.00

** Thermowells available (see ETS Series Digital Temperature Sensor Accessories)*

NOTE: CHECK THE CHEMICAL COMPATIBILITY OF THE SENSOR'S WETTED PARTS WITH THE MEDIUM TO BE MEASURED

ETS Series (-1001) Digital Temperature Sensors

ProSense ETS (-1001) Series Specifications		
Input		
Measuring Element	Pt100 as per IEC 60751	
Measuring Range	-50 to 150ºC (-58 to +302ºF)	
Min. Span	20K/20°C (36°F)	
Output		
Output Signal	2 x PNP switch outputs or one PNP switch output and 1 x 4 to 20mA output (sourcing)	
Range of Adjustment	Switch output	Switch point (SP) and Switch-back point (RSP) in increments of 0.1°C (0.18°F) Min. distance between SP and RSP: 0.5°C (0.8°F)
	Analog output	Lower range value (LRV) and upper range value (URV) can be set anywhere within the sensor range (min. measuring range 20K (36°F) LRV Factory Setting: 32°F (0°C) URV Factory Setting: 302°F (150°C)
	Damping	0 (no damping) or 9 to 40s in increments of 1 second
	Unit	°C, K, °F
Analog Outputs	Output on Fault	MIN = ≤ 3.6 mA MAX = ≥ 21.0 mA HOLD = last value
	Load	Max. ($V_{power\ supply}$ - 6.5 V) / 0.022A (current output) , 795Ω @ 24VDC
Switch Outputs	Switch status ON	I_a ≤ 250mA
	Switch status OFF	I_a ≤ 1mA
	Switching cycles	> 10,000,000
	Voltage drop PNP	≤ 2V
	Overload protection	Automatic testing of switching current; output is switched off in case of overcurrent, the switching current is tested again every 0.5 s; Max. capacitance load: 14µF for max. supply voltage (without resistive load); Periodic disconnection from a protective circuit in event of overcurrent (f = 2Hz) and indication of "Warning"
	Output on Fault	Switch opens
Inductive Load	Requires transient voltage suppression	
Display	Backlit LCD (7mm)	
Power Supply		
Device Connection	M12 connector	
Supply Voltage	12 to 30VDC (reverse polarity protection)	
Current Consumption	Without load < 60mA, with reverse polarity protection	
Power Supply Failure	Overvoltage	The device works continuously up to 34VDC without damage. No damage is caused to the device from a short-term overvoltage up to 1kV (as per EN 31000-4-5). The specific properties are no longer guaranteed if the supply voltage is exceeded
	Undervoltage	If the supply voltage drops below the minimum value, the device switches off (status as if note supply with power = switch open)
Performance		
Reference conditions	As per DIN IEC 60770or DIN 61003 T = 25ºC (77ºF), relative humidity 45 to 75%, ambient air pressure 860 to 1060kPa (12.47 to 15.37 psi)	
	Supply voltage U	24VDC
Max. Measured Error Switch Point and Display	Electronics	± 0.2 K (0.36ºF)
	Sensor	Total class A as per IEC 60751, -50 to +200°C (-58 to 392°F) Maximum measure error in ºC = ± 0.15 + 0.002 · | T | (| T | = Process temperature in °C without taking sign into account.)
	Total error	Electronics error + sensor error, e.g. for process temperature: -50 to +75°C (-58 to +167°F) ≤ 0.5 K (0.9°F) +75 to +200°C (+167 to 392°F) ≤ 0.75 K (1.35°F)
Non-Repeatability Switch Point	0.1 K (0.18°F) as per EN 61298-2 (without ambient temperature influence)	
Long-Term Drift	≤ 0.1 K (0.18°F) per year under reference operating conditions	

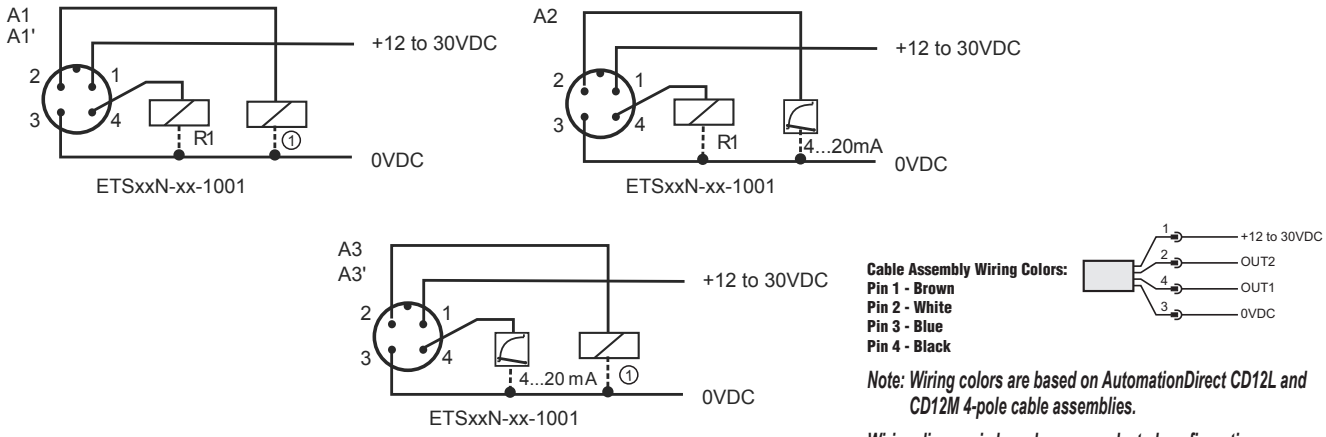
ETS Series (-1001) Digital Temperature Sensors

ProSense ETS (-1001) Series Specifications		
Performance Continued		
Sensor Response Time	Measured as per IEC 60751, in water flowing at 0.4 m/s (1.3 ft/s) t_{50} < 1.0 s t_{90} < 2.8 s	
Influence of Ambient Temperature	Switch output and display	0.00003/K
	Analog output	0.00005/K + influence of switch output and display
Switch Output Response Time	100ms	
Analog Output	Maximum measured error	Switch point error and display error + 0.1%
	Rise time t_{90}	≤ 200ms
	Settling time t_{99}	≤ 500ms
Operating Conditions: Installation		
Installation Instructions	Any orientation Housing can be rotated up to 310°	
Orientation	No restrictions	
Operating Conditions: Environment		
Housing Material	Stainless steel (316L); ethylene propylene diene monomer (EPDM)	
Materials (wetted parts)	Stainless steel (316L)	
Ambient Temperature Range	-40 to +85°C (-40 to +185°F)	
Storage Temperature	-40 to +85°C (-40 to +185°F)	
Degree of Protection	IP65	
Shock Resistance	50g as per DIN IEC 68-2-27 (11ms)	
Vibration Resistance	4g as per German Lloyd GL Guidelines	
Electromagnetic Compatiblity	Interference emission as per IEC 61326 Series, class B electrical equipment Interference immunity as per IEC 61326 Series, appendix A (industrial use) and NAMUR Recommendation NE 21 EMC influence ≤ 0.5%	
Process Temperature Limits	-50 to +150°C (-58 to 302°F), Restrictions depending on process connection and ambient temperature	
	Max. ambient temperature	Max. process temperature
	Up to 25°C (77°F)	No restriction
	Up to 40°C (104°F)	135°C (275°F)
	Up to 60°C (140°F)	120°C (248°F)
	Up to 85°C (185°F)	100°C (212°F)
Process Pressure	100 bar (1450 psig) max.	
Approvals	CULus, File # E311366, CE	

**** To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.***

ETS Series (-1001) Digital Temperature Sensors

ETS Wiring Diagram



Note: Wiring colors are based on AutomationDirect CD12L and CD12M 4-pole cable assemblies.

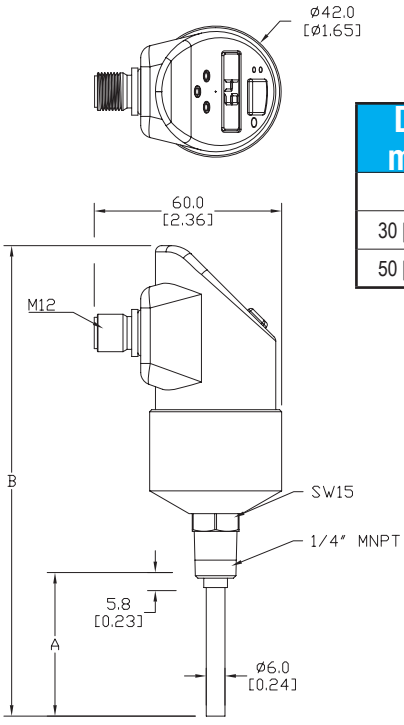
Wiring diagram is based on user selected configuration

A1: 2x PNP switch outputs R1 and ① (R2)
A1': 2x PNP switch outputs R1 and ① (diagnosis/NC contact with "DESINA" setting)
A2: 1x PNP switch output and 1x analog output (4 to 20 mA)
A3: 1x analog output (4 to 20 mA) and 1x PNP switch output ① (R2)
A3': 1x analog output (4 to 20 mA) and 1x PNP switch output ① (diagnosis / NC contact with "DESINA" setting)

For more information about DESINA, see www.desina.de

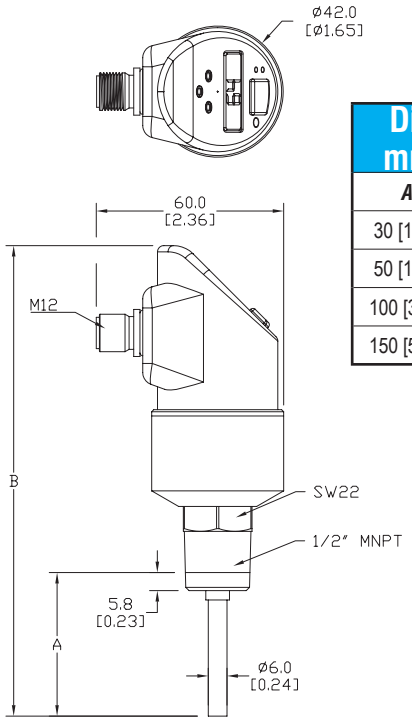
Dimensions

mm [inches]



Dimensions mm [inches]	
A	***B***
30 [1.18]	131 [5.16]
50 [1.97]	151 [5.94]

ETS25



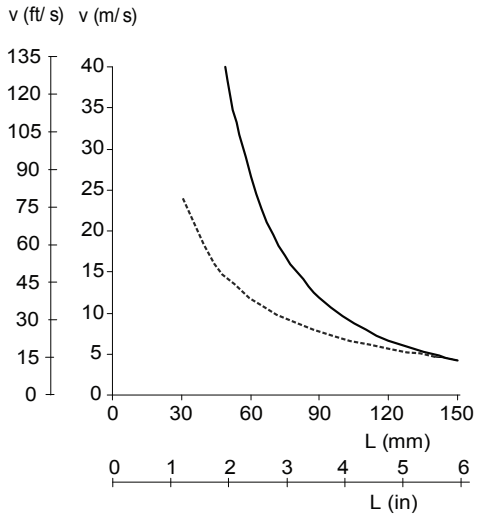
Dimensions mm [inches]	
A	***B***
30 [1.18]	131 [5.16]
50 [1.97]	151 [5.94]
100 [3.94]	204 [8.03]
150 [5.91]	254 [10.00]

ETS50

See our website www.AutomationDirect.com for complete Engineering drawings.

ETS Series (-1001) Digital Temperature Sensors

Maximum Flow Velocity



L = insertion length, during flow
v = flow velocity
Medium: ----- air; - - - - - water

Scan the QR Code above or click to view the ETS Series product insert.

ETS Series Digital Temperature Sensor Accessories

ETS Series Digital Temperature Sensor Accessories

TW06-01

TW06-02

Part No.	Description	Use with Transmitter Probe	Pcs/Pkg	Price
TW04-01	Standard duty threaded thermowell with 1/2 inch NPT male process threads, 304 stainless steel, 4-1/4 inch overall length with 0.260 inch bore diameter, 2-1/2 inch insertion length	ETS50N-100-XXXX	1	$27.00
TW04-02	Standard duty threaded thermowell with 3/4 inch NPT male process threads, 304 stainless steel, 4-1/4 inch overall length with 0.260 inch bore diameter, 2-1/2 inch insertion length		1	$27.00
TW04-03	Standard duty threaded thermowell with 1/2 inch NPT male process threads, 316 stainless steel, 4-1/4 inch overall length with 0.260 inch bore diameter, 2-1/2 inch insertion length		1	$36.50
TW04-04	Standard duty threaded thermowell with 3/4 inch NPT male process threads, 316 stainless steel, 4-1/4 inch overall length with 0.260 inch bore diameter, 2-1/2 inch insertion length		1	$36.50
TW06-01	Standard duty threaded thermowell with 1/2 inch NPT male process threads, 304 stainless steel, 6-1/4 inch overall length with 0.260 inch bore diameter, 4-1/2 inch insertion length	ETS50N-150-XXXX	1	$37.50
TW06-02	Standard duty threaded thermowell with 3/4 inch NPT male process threads, 304 stainless steel, 6-1/4 inch overall length with 0.260 inch bore diameter, 4-1/2 inch insertion length		1	$37.50
TW06-03	Standard duty threaded thermowell with 1/2 inch NPT male process threads, 316 stainless steel, 6-1/4 inch overall length with 0.260 inch bore diameter, 4-1/2 inch insertion length		1	$47.50
TW06-04	Standard duty threaded thermowell with 3/4 inch NPT male process threads, 316 stainless steel, 6-1/4 inch overall length with 0.260 inch bore diameter, 4-1/2 inch insertion length		1	$47.50

MURR ELEKTRONIK
stay connected

Connection Cables - Data

Industrial Ethernet Shielded M12 D-coded to Pigtail Cables

- High flex industrial Ethernet shielded Cat5e cables
- Resistant to welding sparks
- Flame retardant, chemical resistant
- TPE (thermoplastic elastomer) jacket for typical industrial applications

7700-14541-series

Ethernet Shielded M12 D-coded to Pigtail Cables							
Part Number	*Price*	*Poles*	*Connectors*	*Jacket*		*Length*	*Drawing Link*
				Material	*Color*	*m [ft]*	
7700-14541-S4U0060	$16.00	4	Male straight to pigtail	TPE Thermoplastic Elastomer	Teal	0.6 [1.9]	PDF
7700-14541-S4U0100	$17.00					1.0 [3.2]	PDF
7700-14541-S4U0300	$23.00					3.0 [9.8]	PDF
7700-14541-S4U0500	$28.00					5.0 [16.4]	PDF
7700-14541-S4U0750	$35.00					7.5 [24.6]	PDF
7700-14541-S4U1000	$42.00					10 [32.8]	PDF
7700-14541-S4U1500	$58.00					15 [49.2]	PDF

Specifications	
Nominal Voltage	max 60VDC
Max Current	4A
Rated Surge Voltage	1.5 kV
Transfer Parameters	Cat5, Class D (ISO/IEC 11801:2002), (EN 50173-1)
Transfer Rate	100Mbps full duplex
Connection	M12 D-coded
Tightening Torque	0.6 N·m
Locking Material	Zinc die casting, matte nickel plated
Protection Degree	IP65/66K/67
Outer Ø	~ 6.6 mm ±5%
Bend Radius	10 x outer Ø*
Temperature Range	Cable: -40 to +80°C [-40 to +176°F] Connector: -25 to 85°C [13 to 185°F]
Wire Material	Cu wire, tin plated
*Approvals***	cULus File E362618

***For a linear flex application with a bend radius of 10x of the outside diameter of the cable, you can expect a life of 1 million cycles. For a linear flex application with a bend radius of 20x of the outside diameter of the cable, you can expect a life of 10 million cycles.**

****To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.**

Digital Indicator - Precision Digital
PD765-6X5-10
LEI-1
TEI-1

PD765

Trident Series Process & Temperature Meters

c UL us LISTED

CE

PROCESS & TEMP

- 4-20 mA, ± 10 V, TC & RTD Inputs
- 4-Digit Display, 0.56” (14.2 mm) or 1.20” (30.5 mm)
- Type 4X, NEMA 4X, IP65 Front
- 1/8 DIN Shallow Depth Case 3.6” Behind Panel
- Operating Temperature Range of -40°C to 65°C
- Free MeterView® Software - Configuration & Data Acquisition
- Sunlight Readable Display
- Universal Power Supply 85-265 VAC
- 12-36 VDC/12-24 VAC Power Option
- 24 VDC @ 200 mA Transmitter Power Supply Options
- 2 Relays + 4-20 mA Output Options
- Pump Alternation Capability
- USB, RS-232, & RS-485 Serial Communication Options
- Free Modbus® RTU with Serial Adapter Option
- Copy Meter Settings to Other Meters
- Max/Min Display
- High & Low Alarms with Multiple Reset Actions

PD765 Trident Series Process & Temperature Meters

Trident & Trident X2 Displays

UV Resistant
Sunlight Readable Models

Front Panel
NEMA 4X Rated

(Actual Size Digits)

0.56" (14.2 mm) Display

1.2" (30.5 mm) Display

FEATURE RICH & SIMPLE TO USE

The PD765 Trident digital panel meter is one of the most versatile digital panel meters on the market and will satisfy a wide variety of process applications. The Trident can be field programmed to accept process voltage (0-5V, 1-5V, etc) and current (4-20 mA) inputs, 100 Ohm RTDs, and the four most common thermocouples. It is housed in a shallow-depth, 1/8 DIN enclosure that features a NEMA 4X front panel and convenient mounting hardware. There are two power options for the Trident: 85 to 265 VAC or 12-36 VDC and it can provide 24 VDC to power the transmitter if needed. Programming and setup can be performed with the four front panel pushbuttons, free MeterView software, or using the Copy function.

TWO DISPLAY SIZES

The display height on the standard Trident meter is 0.56" (14.2 mm) and on the Trident X2 the display height is an astounding 1.2" (30.5 mm). The Trident X2 can be read easily from distances of up to 30 feet! Both meters are available with all Trident features.

The intensity of the display on both versions of the Trident can be adjusted to compensate for various lighting conditions, including direct sunlight.

VERSATILE OPERATION

Look to the Trident meter for the key features and options you want and don't worry about getting bogged down in a confusing array of things you don't need. The Trident's Max/Min function, 2 relays + 4-20 mA output, serial communication, and Modbus RTU options provide all the utility you need to handle all the common applications.

Maximum/Minimum

To display the maximum and minimum readings since the last reset/ power-up, use the Up arrow/Max button

Powerful Relay Functionality

All relay functions are set up from the front panel or from a PC running MeterView® software.

- Automatic reset only
- Automatic or manual reset
- Latching or non-latching relays
- Pump alternation control
- On and off time delays from 0 to 199 seconds
- Fail-safe operation is user selectable

Isolated 4-20 mA Transmitter Output

The Trident's Isolated 4-20 mA output option converts the Trident into a transmitter with a digital display; perfect for temperature applications!

Serial Communication Adapters & Converters

A wide variety of serial communication adapters and converters are available for the Trident meter. A serial adapter and Precision Digital's free MeterView software allows the Trident to be programmed from a computer and to connect to a PC for data acquisition. Adapters are available for USB, RS-232, and RS-485 communications. Converters are available for isolated and non-isolated RS-232 to RS-422/485 and USB to RS-422/485.

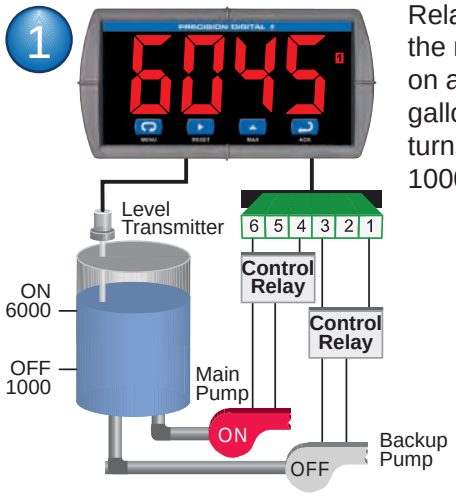
PDA8006 PDA7232 PDA7422

Modbus RTU

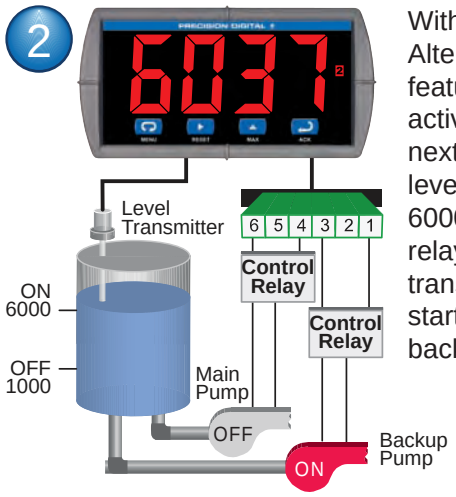
Use the Trident's Modbus RTU communications to connect the Trident to a PLC, SCADA system or other digital device. It is a standard feature on all Trident models.

Pump Alternation

The Trident, in pump alternation mode, will automatically alternate two pumps:



Relay #1 turns the main pump on at 6000 gallons and turns it off at 1000 gallons.



With the Pump Alternation feature activated, the next time the level reaches 6000 gallons, relay #2 transfers and starts the backup pump.

EASY SETUP AND PROGRAMMING

The Trident is easily setup and programmed using the simple four-button programming method. The meter can also be programmed using a PC and Precision Digital's free MeterView software or "cloned" with the Copy function. There is only one switch on the entire meter, no jumpers, and no need to ever open the case.

Programming with Four Front Panel Buttons

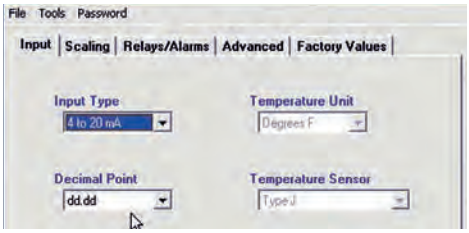
The Trident's four front panel buttons keep the user in control of the programming process. To see how simple it is to program the Trident, check out the Virtual Meter at www.predig.com.

Meter Copy

The Copy function is used to copy (or clone) all the settings from one Trident meter to other Trident meters in less than 10 seconds. The Copy function is a standard feature on all meters. The Copy feature does not require a serial communication adapter, it only requires the optional cable assembly (PDA7420).

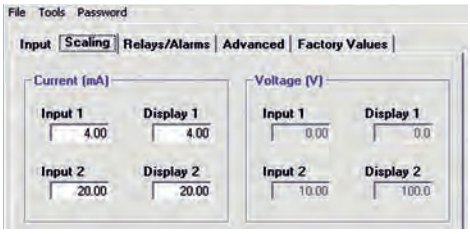
Programming From a PC with MeterView®

Precision Digital's free MeterView® software allows all PD765 Trident setup parameters to be programmed from a PC and to save the configuration settings to a file for reporting or programming other meters. And since the serial adapter is an external device, one serial adapter can program an infinite number of meters!



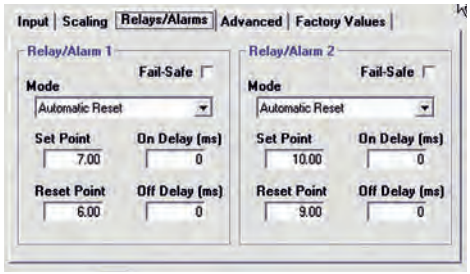
Configure Input

- Input type
- Decimal point
- Temp units
- Sensor type



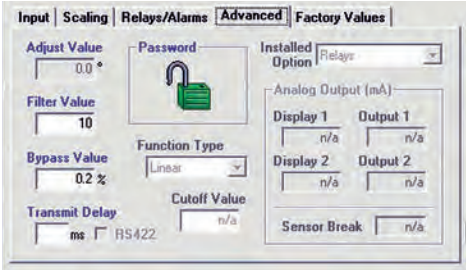
Meter Scaling

- Scale input
- No cryptic codes
- Simple to use



Set Relays/Alarms

- Select mode
- Set/reset points
- Fail-safe operation
- On & off delays



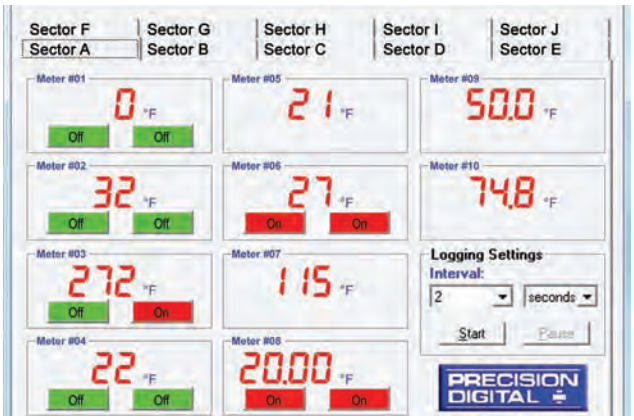
Advanced Settings

- Password
- Filter & bypass
- Transmit delay
- Function type
- Cutoff value

DATA ACQUISITION

Digital panel meters make a great front end to a PC-based data acquisition system. They are easy to set up, can be used for a wide range of inputs, will power the transmitter, and best of all provide a local display of the process. Precision Digital has the perfect package with its Trident Digital Panel Meters, a wide selection of serial adapters and converters and free MeterView software. Data is displayed on the PC and written to a file that could then be imported into a spreadsheet or other application.

Data Logging up to 100 Trident Meters



Sample File Generated by MeterView®

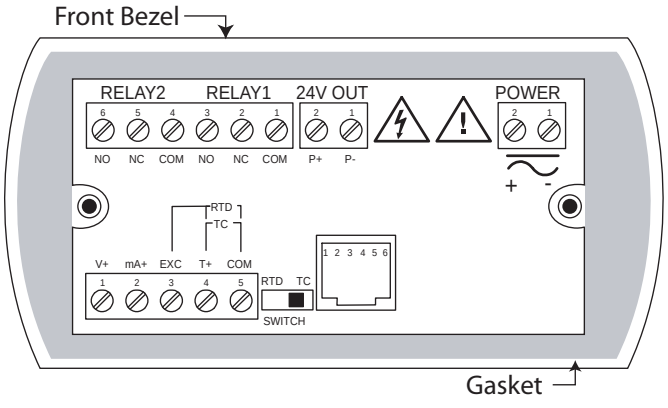
PD765 Log File

Name: C:\MV3logfile.htm **Created:** 1/7/2011 5:34:12 PM

Serial Port:	Connection speed:	Logging rate:
COM 1	2400 Baud	1 update every 10 seconds

Date & Time	Tag Number	Address	Display	Units	Relay 1	Relay 2
1/7/2011 5:34:12 PM	Tank 1 Level	06	17.70	Feet	P1 On	P2 Off
1/7/2011 5:34:12 PM	Tank 2 Level	07	18.18	Feet	P3 Off	P4 Off
1/7/2011 5:34:12 PM	Tank 3 Level	08	20.54	Feet	P5 On	P6 Off
1/7/2011 5:34:12 PM	Tank 1 Temp	09	74	°F	Off	Off
1/7/2011 5:34:12 PM	Tank 2 Temp	10	72	°F	Off	Off
1/7/2011 5:34:12 PM	Tank 3 Temp	11	72	°F	Off	Off
1/7/2011 5:34:22 PM	Tank 1 Level	06	17.58	Feet	P1 On	P2 Off
1/7/2011 5:34:22 PM	Tank 2 Level	07	18.04	Feet	P3 Off	P4 Off
1/7/2011 5:34:22 PM	Tank 3 Level	08	19.79	Feet	P5 Off	P6 Off
1/7/2011 5:34:22 PM	Tank 1 Temp	09	74	°F	Off	Off
1/7/2011 5:34:22 PM	Tank 2 Temp	10	72	°F	Off	Off

CONNECTIONS



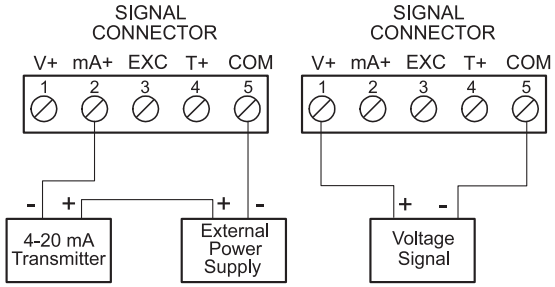
Rear View

PROCESS & TEMPERATURE INPUTS

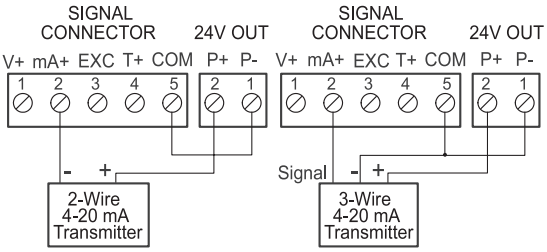
The Trident is factory calibrated to accept 4-20 mA, ±10 VDC, type J, K, T, or E thermocouples and 100 Ω platinum RTDs. Process inputs can be scaled with or without applying an input for virtually any engineering units. Temperature inputs can be programmed to display in degrees Fahrenheit or Celsius and the type K thermocouple can display up to 2300 °F.

Current & Voltage Inputs

Setting up the meter to accept a current or voltage input could not be easier. All setup is performed with the front panel buttons and there are no switches or jumpers to deal with.



Transmitter Powered by External Supply



Transmitter Powered by Internal Supply (optional)

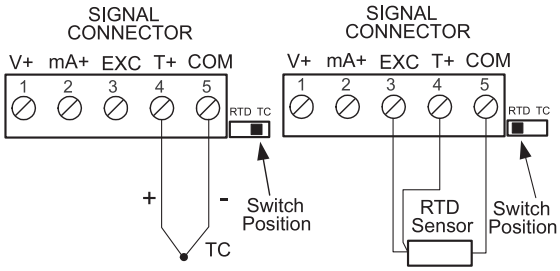
Current Overload Protection

To protect the instrument from unexpected current overload, the current input circuit contains a resettable fuse. The fuse limits the current to a safe level when it detects a fault condition, and automatically resets itself when the fault condition is removed.

Thermocouple & RTD inputs

Setting up the Trident to accept a thermocouple or RTD input is simply a matter of setting a switch at the rear of the case and selecting the input type from the menu.

The meter accepts J, K, T, or E type thermocouples as well as two, three, or four-wire 100 Ω platinum RTDs.



NEMA 4 & 4X ENCLOSURES

Thermoplastic and stainless steel NEMA 4X, and painted steel NEMA 4 enclosures for up to 10 Trident meters are available. Please visit our Enclosure Selection Utility at www.predig.com/esu for an easy way to find the right enclosure.

PROTEX-MAX

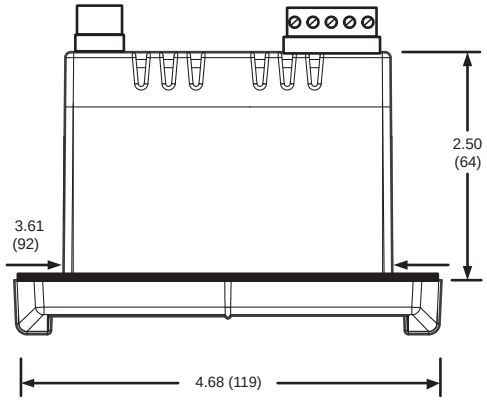
PD8-765
Process & Temperature

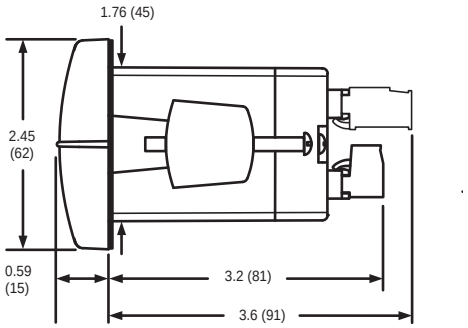
The Trident X2 can now go anywhere as the ProtEX-MAX! The same huge, bright display and features of the Trident X2 are provided in an approved ProtEX-MAX explosion proof enclosure. In addition, RS-485 serial communications for Modbus or MeterView software is standard. All ProtEX-MAX products also come with SafeTouch® through glass buttons, for easy programming and operation in your hazardous area.

QUICK INSTALLATION

The Trident is housed in a shallow-depth case that is designed for easy installation and servicing. The extra large front bezel is rated Type 4X, IP65. The mounting brackets are locked in place to make it easy to mount the meter in the panel. Removable screw terminal connectors make for easy and convenient wiring.

Mounting Dimensions





Notes:

1. Panel cutout required: 1.772 x 3.622 (45 x 92)
2. Panel thickness: 0.040 – 0.250 (1.0 – 6.4)
3. Mounting brackets lock in place for easy mounting

SPECIFICATIONS

Except where noted all specifications apply to operation at +25°C.

General

Display: Trident: 0.56" (14.2 mm);
Trident X2: 1.20" (30.5 mm) red LED,
4 digits (-1999 to 9999)
Display Intensity: Eight user selectable levels
Front Panel: NEMA 4X, IP65; panel gasket provided
Programming Methods: Four front panel buttons, cloning with Copy feature, PC with MeterView software, and Modbus registers.
Noise Filter: Programmable 2 to 199 (0 will disable filter)
Display Update Rate: Process/RTD: 3.7-5/sec; TC: 1.8-2.5/sec
Overrange: Display flashes 9999
Underrange: Display flashes -1999
Recalibration: All inputs are calibrated at the factory; recalibration is recommended at least every 12 months.
Max/Min Display: Stored until reset by user or meter is turned off.
Password: Restricts modification of programmed settings.
Non-Volatile Memory: Settings stored for a minimum of 10 years.
Power Options: 85-265 VAC, 50/60 Hz; 90-265 VDC, 20 W max or 12-36 VDC; 12-24 VAC, 6 W max.
Required Fuse: UL Recognized, 5 A max, slow-blow; up to 6 meters may share one fuse.
Normal Mode Rejection: 64 dB at 50/60 Hz
Isolation: 4 kV input/output-to-power line; 500 V input-to-output or output-to-24 VDC supplies. -6R5 & -6X5 models only: 100 V output-to-24 VDC supply
Operating Temperature: -40 to 65°C (-40 to 149°F)
Storage Temperature: -40 to 85°C (-40 to 185°F)
Relative Humidity: 0 to 90% non-condensing
Connections: Power & Signal: removable screw terminal blocks accept 12 to 22 AWG. Serial: RJ11 header, standard on all meters.
Enclosure: 1/8 DIN, high impact plastic, 94V-0, color; gray
Weight: 9.5 oz (269 g) (including options)
UL File Number: E160849; 508 Industrial Control Equipment
Warranty: 3 years parts & labor

Process Inputs

Inputs: 0-20 mA, 4-20 mA, 1-5 V, ±10 V
Accuracy: ±0.05% FS ±1 count; square root: ±0.1% FS ±2 counts
Function: Linear or square root
Low-Flow Cutoff: 0 to 9999 (0 disables cutoff function)
Decimal Point: Up to 3 decimals.
Calibration: Scale without signal or calibrate with signal source
Calibration Range: User programmable over entire range of meter
Input Impedance: Voltage range: greater than 1 MΩ,
Current range: 50-100 Ω, varies with resettable fuse impedance
Input Overload: Protected by automatically resettable fuse
Temperature Drift:

	0 to 65º C ambient	-40 to 0º C ambient
Current	±0.20% FS (50 PPM/ºC)	±0.80% FS
Voltage	±0.02% FS (1.7 PPM/ºC)	±0.06% FS

Transmitter Supply: Isolated, one or two transmitter supplies
P1: 24 VDC ±10% @ 200 mA max (-10 option)
P1 & P2: 24 VDC ±10% @ 200 mA & 40 mA max (-20 option)

Temperature Inputs

Inputs: Factory calibrated, field selectable: type J, K, T, or E thermocouples and 100 Ω platinum RTD (0.00385 or 0.00392 curve)
Resolution: 1°; type TC & RTD: 1° or 0.1°
Cold Junction Reference: Automatic
Temperature Drift: ±2°C maximum
Offset Adjustment: Programmable to ±19.9°. This parameter allows the user to apply an offset value to the temperature being displayed.
Input Impedance: Greater than 100 kΩ
Sensor Break: All relays and alarm status LEDs go to alarm state.

PD765 Trident Series Process & Temperature Meters

Type	Range	Acc. (0-65ºC)	Acc. (-40-0ºC)
J	-58º to 1382ºF -50º to 750ºC	±2ºF ±1ºC	±5°F ±3°C
K	-58º to 2300ºF -50º to 1260ºC	±2ºF ±1ºC	±4°F ±2°C
T	-292º to 700ºF -180º to 371ºC	±2ºF ±1ºC	±13°F ±7°C
E	-58º to 1700ºF -50º to 927ºC	±2ºF ±1ºC	±11°F ±6°C
RTD	-328º to 1382ºF -200º to 750ºC	±1ºF ±1ºC	±5°F ±3°C

Relays

Rating: 2 Form C (SPDT); rated 3 A @ 30 VDC or 3 A @ 250 VAC resistive load; 1/14 HP
(≈ 50 watts) @ 125/250 VAC for inductive loads such as contactors, solenoids, etc.
Deadband: 0-100% FS, user selectable
High or Low Alarm: User may program any alarm for high or low
Relay Operation:
1. Automatic (non-latching) 2. Latching 3. Pump alternation control
Relay Reset: User selectable via front panel buttons or PC
1. Automatic reset only (non-latching)
2. Automatic plus manual reset at any time (non-latching)
3. Manual reset only, at any time (latching)
4. Manual reset only after alarm condition has cleared (latching)
Automatic Reset: Relays reset when input passes the reset point
Manual Reset: Front panel button, MeterView, Modbus registers
Time Delay: 0 to 199 seconds, on and off delays; programmable
Fail-Safe Operation: Programmable, independent for each relay. Relay coils are energized in non-alarm condition. In case of power failure, relays will go to alarm state.
Auto Initialization: When power is applied to the meter, relays will reflect the state of the input to the meter.

Isolated 4-20 mA Transmitter Output

Scaling Range: 1.00 to 23.00 mA; reverse scaling allowed.
Calibration: Factory calibrated 4.00 to 20.00 mA
Accuracy: ±0.1% FS ±0.004 mA
Temperature Drift: 50 PPM/°C
Note: Analog output drift is separate from input drift
Isolation: 500 V input-to-output or output-to-24 VDC supplies; 4 kV output-to-power line
External Power: 35 VDC maximum
Output Loop Resistance: Loop Resistance

Power Supply	Minimum	Maximum
24 VDC	10 Ω	700 Ω
35 VDC (external)	100 Ω	1200 Ω

Serial Communications

Compatibility: EIA-232, and EIA-485 with PDA7232 and PDA7422 Trident adapters.
Protocol: PDC and Modbus RTU
Meter Address: PDC protocol: 0 to 99, Modbus protocol: 1 to 247
Baud Rate: 300 to 19,200 bps
Transmit Time Delay: Programmable 0 to 199 ms
Data: 8 bit (1 start bit, 1 stop bit)
Parity: None (2 stop bits), even, or odd
(Modbus only; PDC protocol does not use parity)
Byte-to-Byte Timeout: 0.01 to 2.54 seconds (Modbus only)
Turn Around Delay: Less than 2 ms (fixed)
Refer to PDC and Modbus Serial Communications Protocol manuals for details.

ORDERING INFORMATION

Trident X2 PD765 • Large Display Models		
85-265 VAC Model	**12-36 VDC Model**	**Options Installed**
PD765-6X0-00	PD765-7X0-00	None
PD765-6X0-10		24 VDC Supply
PD765-6X2-00	PD765-7X2-00	2 Relays
PD765-6X2-10		2 Relays + 24 VDC Supply
PD765-6X3-00	PD765-7X3-00	4-20 mA Output
PD765-6X3-10		4-20 mA Out + 24 VDC Supply
PD765-6X3-20		4-20 mA Out + Dual 24 VDC Supplies
	PD765-7X5-00	2 Relays + 4-20 mA Output
PD765-6X5-10		2 Relays + 4-20 mA Output + 24 VDC Supply

Trident PD765 • Standard Display Models		
85-265 VAC Model	**12-36 VDC Model**	**Options Installed**
PD765-6R0-00	PD765-7R0-00	None
PD765-6R0-10		24 VDC Supply
PD765-6R2-00	PD765-7R2-00	2 Relays
PD765-6R2-10		2 Relays + 24 VDC Supply
PD765-6R3-00	PD765-7R3-00	4-20 mA Output
PD765-6R3-10		4-20 mA Out + 24 VDC Supply
PD765-6R3-20		4-20 mA Out + Dual 24 VDC Supplies
	PD765-7R5-00	2 Relays + 4-20 mA Output
PD765-6R5-10		2 Relays + 4-20 mA Output + 24 VDC Supply

Accessories	
Model	**Description**
PDA7420	Trident Meter Copy Cable, 7' (2.1 m)
PDA7422	Trident RS-485 Serial Adapter
PDA7232	Trident RS-232 Serial Adapter
PDA7485-I	RS-232 to RS-422/485 Isolated Converter
PDA7485-N	RS-232 to RS-422/485 Non-Isolated Converter
PDA8006	USB Serial Adapter
PDA8232-N	USB to RS-232 Non-Isolated Converter
PDA8485-I	USB to RS-422/485 Isolated Converter
PDA8485-N	USB to RS-422/485 Non-Isolated Converter
PDX6901	Suppressor (snubber): 0.01 µF/470 Ω, 250 VAC

Your Local Distributor is:

Disclaimer

LDS765_O 03/18

PRECISION DIGITAL CORPORATION
233 South Street • Hopkinton MA 01748 USA • Tel (800) 343-1001 • Fax (508) 655-8990
www.predig.com

TRIDENT & TRIDENT X2
MODEL PD765
Instruction Manual

LISTED

- Accepts Current, Voltage, TC, & RTD Inputs
- 4 Digit Display, 0.56" (14 mm) or 1.20" (31 mm)
- Linear or Square Root with Low-Flow Cutoff
- Operating temperature range of between -40°C and 65°C
- Maximum/Minimum Display
- Type 4X, NEMA 4X, IP65 Front
- Universal Power Supply 85-265 VAC
- 12-36 VDC/12-24 VAC Power Option
- Two Relays and 4-20 mA Output Option
- 24 VDC Transmitter Power Supply Options
- USB, RS-232, & RS-485
  Serial Communication Adapters Options
- Free Modbus® RTU Protocol
- Copy Meter Settings to Other Meters
- Free MeterView® Software - Configuration & Data Acquisition

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For an Interactive
Virtual Meter Demo!

INTRODUCTION

The Trident is a multipurpose, easy to use digital panel meter. It accepts current, voltage, thermocouple, and RTD signals. The four front panel buttons make the setup and programming an easy task.

The isolated 24 VDC transmitter power (optional) can be used to power the input transmitter, the 4-20 mA output, or other devices.

The two relays (optional) can be used for alarm indication or process control applications, such as pump alternation control.

Two relays and a 4-20 mA output are available together in the same meter.

The 4-20 mA isolated output and Modbus® RTU serial communication options make the Trident an excellent addition to any system.

ORDERING INFORMATION

Trident

85-265 VAC Model	12-36 VDC Model	Options Installed
PD765-6R0-00	PD765-7R0-00	No options
PD765-6R0-10		24 V transmitter supply
PD765-6R2-00	PD765-7R2-00	2 relays
PD765-6R2-10		2 relays & 24 V transmitter supply
PD765-6R3-00	PD765-7R3-00	4-20 mA output
PD765-6R3-10		4-20 mA output & 24 V supply
PD765-6R3-20		4-20 mA output & dual 24 V supplies
	PD765-7R5-00	2 relays & 4-20 mA output
PD765-6R5-10		2 relays, 4-20 mA output, & 24 V supply

Trident X2

85-265 VAC Model	12-36 VDC Model	Options Installed
PD765-6X0-00	PD765-7X0-00	No options
PD765-6X0-10		24 V transmitter supply
PD765-6X2-00	PD765-7X2-00	2 relays
PD765-6X2-10		2 relays & 24 V transmitter supply
PD765-6X3-00	PD765-7X3-00	4-20 mA output
PD765-6X3-10		4-20 mA output & 24 V supply
PD765-6X3-20		4-20 mA output & dual 24 V supplies
	PD765-7X5-00	2 relays & 4-20 mA output
PD765-6X5-10		2 relays, 4-20 mA output, & 24 V supply

Accessories

Model	Description
PDA7232	RS-232 serial adapter with PDA7420 included
PDA7420	Trident meter copy cable, 7' (2.1 m)
PDA7422	RS-485 serial adapter with PDA7420 included
PDA7485-I	RS-232 to RS-485 isolated converter
PDA7485-N	RS-232 to RS-485 non-isolated converter
PDA8485-I	USB to RS-422/485 isolated converter
PDA8485-N	USB to RS-422/485 non-isolated converter
PDA8006	USB Serial Adapter
MeterView®	Free MeterView® software download at www.predig.com
Enclosures	NEMA 4 & explosion-proof enclosures – See Web site.

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SPECIFICATIONS

Except where noted all specifications apply to operation at +25°C.

General

DISPLAY	Trident: 0.56" (14 mm), Trident X2: 1.20" (31 mm), Four digits (-1999 to 9999), automatic lead zero blanking.
DISPLAY INTENSITY	Eight intensity levels
DISPLAY UPDATE RATE	Process/RTD: 3.7-5/second Thermocouple: 1.8-2.5/second
OVERRANGE	Display flashes 9999
UNDERRANGE	Display flashes -1999
PROGRAMMING METHODS	Four front panel buttons, PC and MeterView® software, or cloning using Copy function
NOISE FILTER	Programmable from 2 to 199 (0 will disable filter)
RECALIBRATION	All ranges are calibrated at the factory. Recalibration is recommended at least every 12 months.
MAX/MIN DISPLAY	Max/min readings reached by the process are stored until reset by the user or until power to the meter is turned off.
PASSWORD	Programmable password restricts modification of settings.
NON-VOLATILE MEMORY	All programmed settings are stored in non-volatile memory for a minimum of ten years if power is lost.
POWER OPTIONS	85-265 VAC, 50/60 Hz 90-265 VDC, 20 W max or 12-36 VDC, 12-24 VAC, 6 W max See table for power consumption (*X: number depends on option)

Model	Watts
PD765-6RX-0*	8
PD765-6RX-1, 2*	20
PD765-7RX-0*	6

FUSE	Required fuse: UL Recognized, 5 A max, slow blow Up to 6 meters may share one 5 A fuse
ISOLATED TRANSMITTER POWER SUPPLY	One or two transmitter power supplies (Optional) P or P1: 24 VDC ± 10% @ 200 mA max. (-1 option) P1 & P2: 24 VDC ± 10% @ 200 mA & 40 mA max. (-2 option)
NORMAL MODE REJECTION	64 dB at 50/60 Hz
ISOLATION	4 kV input/output-to-power line 500 V input-to-output or output-to-P1/P2 supplies -6R5 & -6X5 models only: 100 V output-to-24 VDC supply
OVERVOLTAGE CATEGORY	Installation Overvoltage Category II: Local level with smaller transient overvoltages than Installation Overvoltage Category III.

ENVIRONMENTAL	Operating temperature range: -40 to 65°C Storage temperature range: -40 to 85°C Relative humidity: 0 to 90% non-condensing
CONNECTIONS	Removable screw terminal blocks accept 12 to 22 AWG wire, RJ11 for serial communication adapters
ENCLOSURE	1/8 DIN, high impact plastic, UL 94V-0, color: gray
MOUNTING	1/8 DIN panel cutout required. Two panel mounting bracket assemblies provided
TIGHTENING TORQUE	Screw terminal connectors: 5 lb-in (0.56 Nm)
OVERALL DIMENSIONS	2.45" x 4.68" x 4.19" (62 mm x 119 mm x 106 mm) (H x W x D)
WEIGHT	9.5 oz. (269 g) (including options)
WARRANTY	3 years parts & labor

Process Input

INPUTS	Field selectable: ±20 mADC (0-20, 4-20 mA) and ±10 VDC (0-5, 1-5, 0-10 V)	
ACCURACY	±0.05% of span ±1 count, square root: 10-100% FS	
FUNCTION	Linear or square root	
LOW-FLOW CUTOFF	0-9999 (0 disables cutoff function)	
TEMPERATURE DRIFT	**0 to 65°C ambient**	**-40 to 0°C ambient**
	Current: ±0.20% FS (50 PPM/°C) **Voltage:** ±0.02% FS (1.7 PPM/°C)	**Current:** ±0.80% FS **Voltage:** ±0.06% FS
DECIMAL POINT	Up to three decimal places for process inputs: d.ddd, dd.dd, ddd.d, or dddd	
CALIBRATION RANGE	An *Error* message will appear if input 1 and input 2 signals are too close together.	
	Input Range	**Minimum Span Input 1 & Input 2**
	4-20 mA	0.40 mA
	±10 V	0.20 V
INPUT IMPEDANCE	Voltage ranges: greater than 1 MΩ Current ranges: 50 - 100 Ω (depending on resettable fuse impedance)	
INPUT OVERLOAD	Current input protected by resettable fuse. Fuse resets automatically after fault is removed.	

Temperature Inputs

INPUTS	Field selectable: type J, K, T, or E thermocouples; 100 Ω platinum RTD (0.00385 or 0.00392 curve)
RESOLUTION	1° or 0.1° for all RTD inputs. 1° for all thermocouples. 1° or 0.1° for Type T thermocouple

ACCURACY

Input Type	Range	Accuracy (0 - 65 C)	Accuracy (-40 - 0 C)
Type J	-58° to 1382° F -50° to 750°C	±2°F ±1°C	±5°F ±3°C
Type K	-58° to 2300° F -50° to 1260°C	±2°F ±1°C	±4°F ±2°C
Type T	-292° to 700° F -180° to 371°C	±2°F ±1°C	±13°F ±7°C
Type T 0.1° Res	-199.9° to 700.0° F -180.0° to 371.0°C	±1.8°F ±1.0°C	±13°F ±7.2°C
Type E	-58° to 1578° F -50° to 870°C	±2°F ±1°C	±11°F ±6°C
100 Ω RTD	-328° to 1382°F -200° to 750°C	±1°F ±1°C	±5°F ±3°C

COLD JUNCTION REFERENCE	Automatic, fixed, no user calibration needed
OFFSET ADJUSTMENT	Programmable to ±19.9°. This parameter allows the user to apply an offset value to the temperature being displayed.
INPUT IMPEDANCE	Greater than 100 kΩ
SENSOR BREAK DETECTION	Open TC or RTD sensor indicated by display flashing **oPEn**. All relays and alarm status LEDs go to alarm or non-alarm state, programmable for each relay individually. Analog output goes to the programmed sensor break value.

Relays Option

RATING	2 SPDT (Form C); rated 3 A @ 30 VDC or 3 A @ 250 VAC resistive load; 1/14 HP @ 125/250 VAC (50 watts) for inductive loads
ELECTRICAL NOISE SUPPRESSION	A suppressor (snubber) should be connected to each relay contact switching inductive loads to prevent disruption to the microprocessor's operation. Recommended suppressor value: 0.01 µF/470 Ω, 250 VAC (PDX6901).
DEADBAND	0-100% of full scale, user selectable
HIGH OR LOW ALARM	User may program any alarm for high or low trip point.
RELAY OPERATION	Automatic (non-latching) Latching Pump alternation control
RELAY RESET	User selectable via front panel buttons or PC
	Automatic reset only (non-latching)
	Automatic + manual reset at any time (non-latching)
	Manual reset only, at any time (latching)
	Manual reset only after alarm condition has cleared (latching)
	Automatic reset: Relays will automatically reset when the input passes the reset point.
	Manual reset: Front panel ACK button. Pressing ACK resets all manually resettable relays.
TIME DELAY	0 to 199 seconds, on and off delays Programmable and independent for each relay
FAIL-SAFE OPERATION	Programmable Independent for each relay
AUTO INITIALIZATION	When power is applied to the meter, relays will reflect the state of the input to the meter.

Fail-safe operation: relay coil is energized in non-alarm condition. In case of power failure, relay will go to alarm state.

Isolated 4-20 mA Transmitter Output

OUTPUT RANGE	1.00 to 23.00 mA typical
CALIBRATION	Factory calibrated for 4-20 mA
SCALING RANGE	0.00 to 23.99 mA for any display range, see output range above
ACCURACY	± 0.1% FS ± 0.004 mA
TEMPERATURE DRIFT	0.4 uA/°C from -40 to 65°C ambient Note: Analog output drift is separate from input drift.
ISOLATED TRANSMITTER POWER SUPPLY	One or two transmitter power supplies (Optional) P1: 24 VDC ± 10% @ 200 mA max. (-1 option) P1 & P2: 24 VDC ± 10% @ 200 mA & 40 mA max. (-2 option)
EXTERNAL LOOP POWER SUPPLY	35 VDC maximum

OUTPUT LOOP RESISTANCE

Power supply	Minimum	Maximum
24 VDC	10 Ω	700 Ω
35 VDC (external)	100 Ω	1200 Ω

Serial Communications

METER ADDRESS	PDC protocol: 0 - 99 Modbus protocol: 1 - 247
BAUD RATE	300 – 19,200 bps
TRANSMIT TIME DELAY	Programmable between 0 and 199 ms
DATA	8 bit (1 start bit, 1 stop bit)
PARITY	None (1 or 2 stop bits), even, or odd (Modbus only; PDC protocol does not use parity)
BYTE-TO-BYTE TIMEOUT	0.01 – 2.54 sec (Modbus only)
TURN AROUND DELAY	Less than 2 ms (fixed)

Refer to PDC and Modbus Serial Communication Protocol manuals for details. These can be downloaded from: www.predig.com.

COMPLIANCE INFORMATION

Safety

UL LISTED	USA and Canada UL 508 Industrial Control Equipment
UL FILE NUMBER	E160849
FRONT PANEL	UL Type 4X, NEMA 4X, IP65; panel gasket provided
LOW VOLTAGE DIRECTIVE	EN 61010-1:2010 Safety requirements for measurement, control, and laboratory use

Electromagnetic Compatibility

EMISSIONS	EN 55011:2009 + A1:2010 Group 1 Class A ISM emissions requirements
Radiated Emissions	Class A
AC Mains Conducted Emissions	Class A
IMMUNITY	EN 61326-1:2013 Measurement, control, and laboratory equipment EN 61000-6-2:2005 EMC heavy industrial generic immunity standard
RFI - Amplitude Modulated	80 -1000 MHz 10 V/m 80% AM (1 kHz) 1.4 - 2.0 GHz 3 V/m 80% AM (1 kHz) 2.0 - 2.7 GHz 1 V/m 80% AM (1 kHz)
Electrical Fast Transients	±2kV AC mains, ±1kV other
Electrostatic Discharge	±4kV contact, ±8kV air
RFI - Conducted	10V, 0.15-80 MHz, 1kHz 80% AM
AC Surge	±2kV Common, ±1kV Differential
Surge	1KV (CM)
Power-Frequency Magnetic Field	30 A/m 70%V for 0.5 period
Voltage Dips	40%V for 5 & 50 periods 70%V for 25 periods
Voltage Interruptions	<5%V for 250 periods

Note:

Testing was conducted on Trident Meters installed through the covers of grounded metal enclosures with cable shields grounded at the point of entry representing installations designed to optimize EMC performance.

Declaration of Conformity available at www.predig.com

SAFETY INFORMATION

CAUTION: Read complete instructions prior to installation and operation of the meter.

WARNING: Risk of electric shock.

WARNING

Hazardous voltages exist within enclosure. Installation and service should be performed only by trained service personnel.

INSTALLATION

There is no need to remove the meter from its case to complete the installation, wiring, and setup of the meter.

Unpacking

Remove the meter from box. Inspect the packaging and contents for damage. Report damages, if any, to the carrier.

If any part is missing or the meter malfunctions, please contact your supplier or the factory for assistance.

Panel Mounting

- Prepare a standard 1/8 DIN panel cutout – 3.622" x 1.772" (92 mm x 45 mm). Refer to *MOUNTING DIMENSIONS*, page 64 for more details.
- Clearance: allow at least 4" (102 mm) behind the panel for wiring.
- Panel thickness: 0.04" - 0.25" (1.0 mm - 6.4 mm). Recommended minimum panel thickness to maintain Type 4X rating: 0.06" (1.5 mm) steel panel, 0.16" (4.1 mm) plastic panel.
- Remove the two mounting brackets provided with the meter (back-off the two screws so that there is ¼" (6.4 mm) or less through the bracket. Slide the bracket toward the front of the case and remove).
- Insert meter into the panel cutout.
- Install mounting brackets and tighten the screws against the panel. To achieve a proper seal, tighten the mounting bracket screws evenly until meter is snug to the panel along its short side. DO NOT OVER TIGHTEN, as the rear of the panel may be damaged.

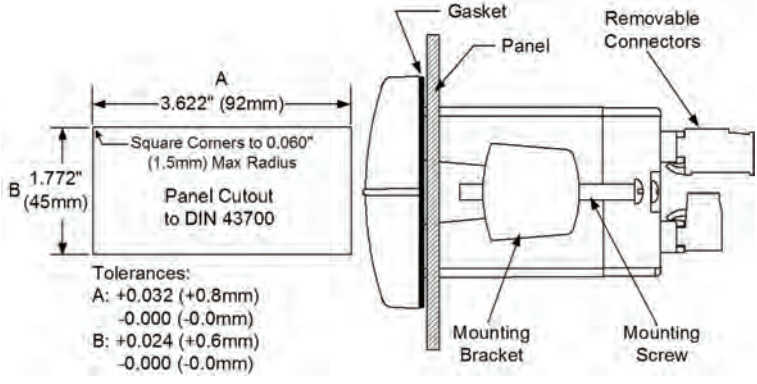


Figure 1. Panel Cutout and Mounting

Connections

All connections are made to removable screw terminal connectors located at the rear of the meter.

> Use copper wire with 60°C or 60/75°C insulation for all line voltage connections. Observe all safety regulations. Electrical wiring should be performed in accordance with all applicable national, state, and local codes to prevent damage to the meter and ensure personnel safety.

Connector Labeling

The connectors label, affixed to the meter, shows the location of all connectors available with requested configuration. It also identifies the location of the RTD/TC selector switch. The below two images are common connector configurations for the PD765. Note that the connector in the upper left of the diagram has two different configurations based on the model.

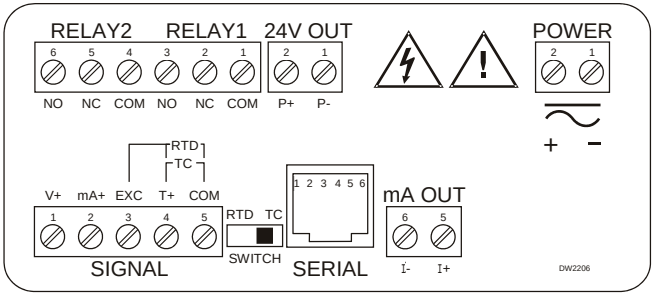


Figure 2. Labeling for 2 Relay, Analog Out, & 24 V Supply Model

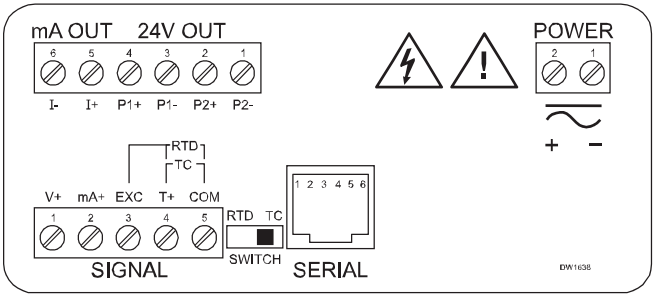


Figure 3. Labeling for Analog Out & Two 24 V Supply Model

Power Connections

Power connections are made to a two-terminal connector labeled POWER on Figure 2. The meter will operate regardless of DC polarity connection. The + and - symbols are only a suggested wiring convention.

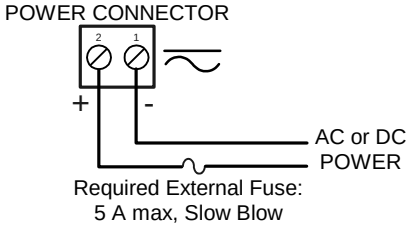


Figure 4. Power Connections

Signal Connections

Signal connections are made to a five-terminal connector labeled SIGNAL on Figure 2. The COM (common) terminal is the return for all types of input signals.

Current and Voltage Connections

The following figures show examples for current and voltage connections.

There are no switches or jumpers to set up for current and voltage inputs. Setup and programming is performed through the front panel buttons.

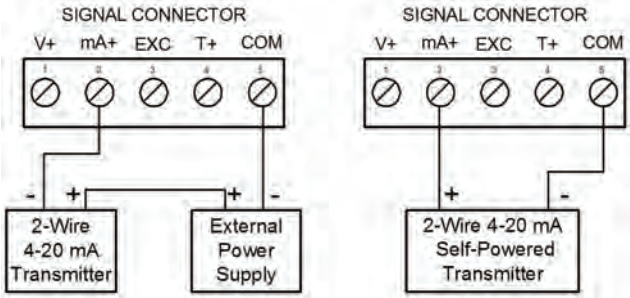


Figure 5. Transmitter Powered by Ext. Supply or Self-Powered

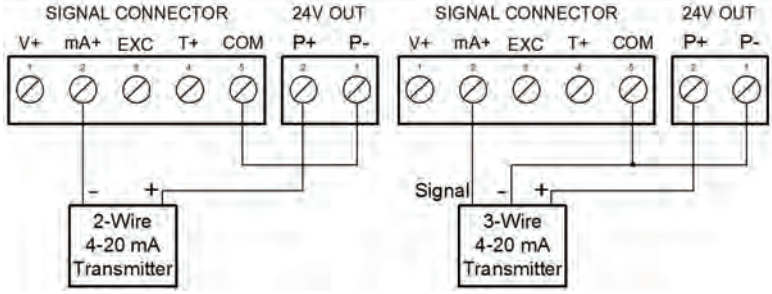


Figure 6. Transmitters Powered by Internal Supply (Optional)

The current input is protected against current overload by a resettable fuse. The display may or may not show a fault condition depending on the nature of the overload.

The fuse limits the current to a safe level when it detects a fault condition, and automatically resets itself when the fault condition is removed.

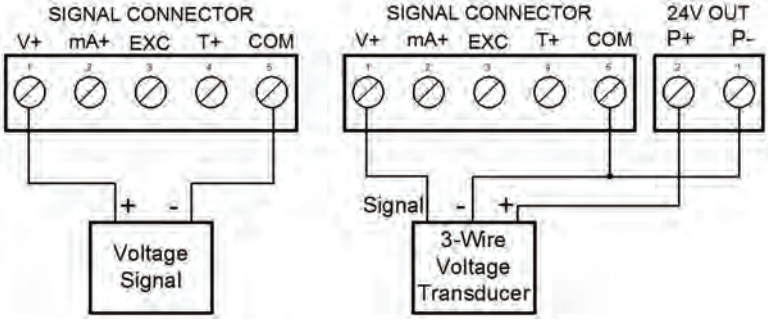


Figure 7. Voltage Input Connections

The meter is capable of accepting any voltage from -10 VDC to +10 VDC.

Thermocouple and RTD Connections

The following figures show examples for thermocouple and RTD connections.

The RTD/TC selector switch must be set to the proper position for the meter to accept the selected temperature input.

The input type is selected using the *Setup* menu.

Selected thermocouple input must correspond to thermocouple sensor and wire type used.

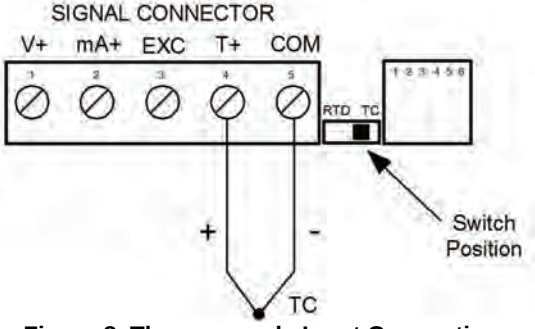


Figure 8. Thermocouple Input Connections

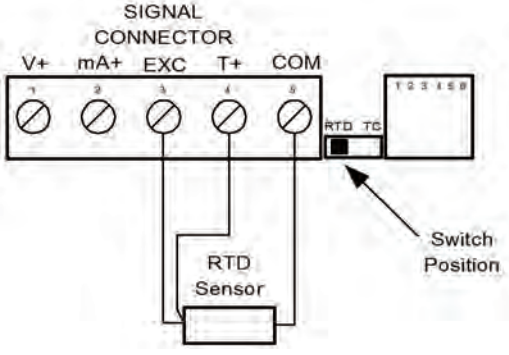


Figure 9. Three-Wire RTD Input Connections

The meter accepts two, three, or four-wire RTDs. The three-wire RTD connection has built-in lead wire compensation.

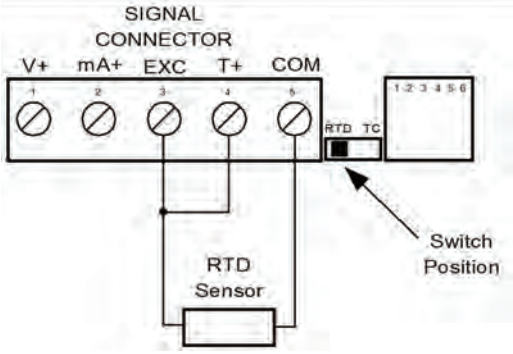


Figure 10. Two-Wire RTD Input Connections

Lead wire compensation for two-wire RTDs can be applied using the *Adjust* menu. See Offset Adjustment (ЯdJ), page 53.

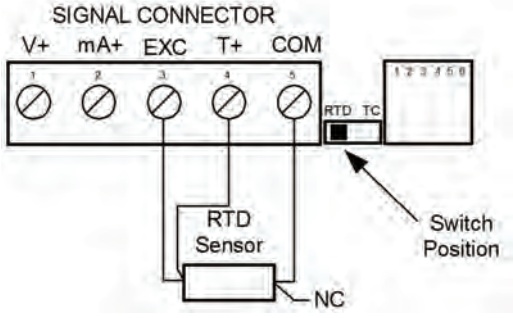


Figure 11. Four-Wire RTD Input Connections

The four-wire RTD connection is similar to the three-wire. One of the leads of a four-wire RTD is not connected, and may be clipped off.

The three-wire connection provides sufficient lead wire compensation to provide accurate readings even with long leads.

Serial Communication

Serial communication connection is made to an RJ11 connector labeled SERIAL on Figure 2. Use PDA7232 for RS-232 interfacing.

Use PDA7422 for RS-485 interfacing.

Use PDA7420 for meter-to-meter interfacing for cloning purposes (*i.e.* copying programmed settings from one meter to other meters).

Relays and 24 V Output Connections

Relay connections are made to a six-terminal connector labeled RELAY1, RELAY2 on Figure 2. The COM (common) terminals of the relays should not be confused with the COM (common) terminal of the SIGNAL connector. The 24 VDC output is available at the connector labeled 24V OUT, next to the relays connector.

Figure 12. Relay & 24 V Output Connections

Switching Inductive Loads

The use of suppressors (snubbers) is strongly recommended when switching inductive loads to prevent disrupting the microprocessor's operation. The suppressors also prolong the life of the relay contacts. Suppression can be obtained with resistor-capacitor (RC) networks assembled by the user or purchased as complete assemblies. Refer to the following circuits for RC network assembly and installation:

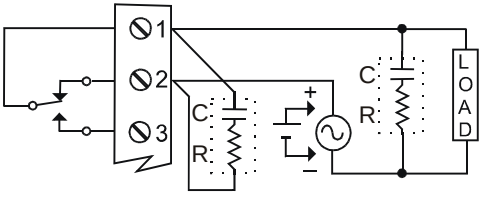


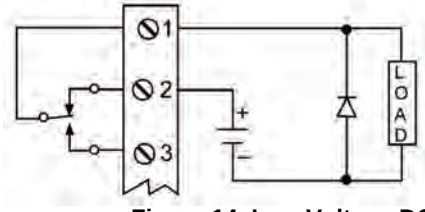
Figure 13. AC and DC Loads Protection

Choose R and C as follows:

R: 0.5 to 1 Ω for each volt across the contacts
C: 0.5 to 1 µF for each amp through closed contacts

Notes:

1. Inductive relay rating is 1/14 HP (50 W) at 115/230 VAC
2. Use capacitors rated for 250 VAC.
3. RC networks may affect load release time of solenoid loads. Check to confirm proper operation.
4. Install the RC network at the meter's relay screw terminals. An RC network may also be installed across the load. Experiment for best results.



Use a diode with a reverse breakdown voltage two to three times the circuit voltage and forward current at least as large as the load current.

Figure 14. Low Voltage DC Loads Protection

RC Networks Available from Precision Digital

RC networks are available from Precision Digital and should be applied to each relay contact switching an inductive load. Part number: PDX6901.

Note: Relays are de-rated to 1/14th HP (50 watts) with an inductive load.

4-20 mA Output & Input Signal Connections

Connections for the 4-20 mA transmitter output are made to the connector terminals labeled “mA OUT, I-, I+”. The 4-20 mA output may be powered from an internal power supply (optional) or from an external power supply.

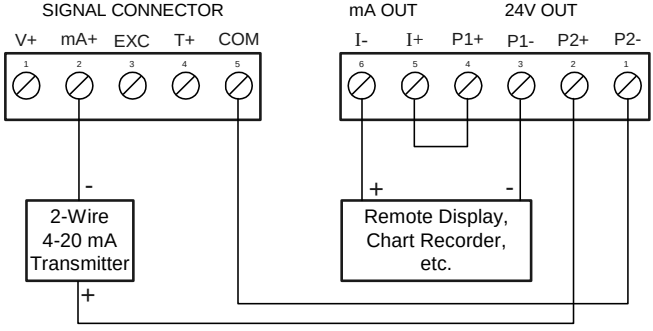


Figure 15. 4-20 mA Output & Input Signal Powered by Meter

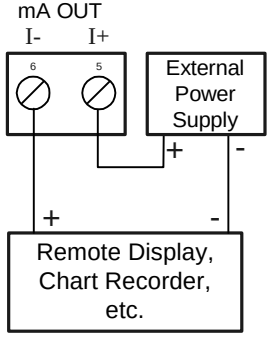
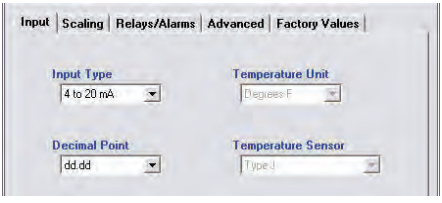


Figure 16. 4-20 mA Output Powered Externally

SETUP AND PROGRAMMING

Programming From a PC with MeterView®

Precision Digital's free MeterView® software allows all PD765 Trident setup parameters to be programmed from a PC (requires PDC protocol selection) and to save the configuration settings to a file for reporting or programming other meters. And since the serial adapter is an external device, one serial adapter can program an infinite number of meters!



The MeterView screen shot above shows how the input is selected. Notice there are tabs for Scaling, Relays/Alarms, Advanced, and Factory Values.

- There is **no need to recalibrate** the meter when first received from the factory.
- The meter is ***factory calibrated*** prior to shipment, for all input types, in milliamps, volts, and degrees respectively. The calibration equipment is certified to NIST standards.

Overview

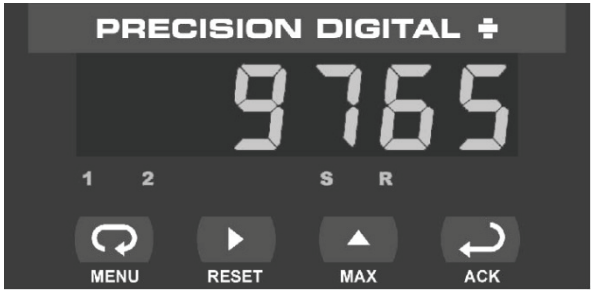
There are no jumpers involved in the setup process of the meter. The RTD/TC selector switch, located between the SIGNAL and SERIAL connectors, must be set accordingly for the meter to accept RTD or thermocouple inputs, Figure 2.

Setup and programming is done through the front panel buttons.

After power and signal connections have been completed and verified, apply power to the meter.

For
QUICK INTERFACE REFERENCE GUIDE go to page 70

Front Panel Buttons and Status LED Indicators



Button Symbol	Description
	Menu
	Right arrow/Reset
	Up arrow/Max
	Enter/Ack

LED	Status
1	Alarm 1
2	Alarm 2
S	Set point indicator
R	Reset point indicator

- Press the **Menu** button to enter or exit the Programming Mode at any time.
- Press the **Right** arrow button to move to the next digit during digit programming.
- Press the **Up** arrow button to scroll through the menus, decimal point, or to increment the value of a digit.
- Press the **Enter/Ack** button to access a menu or to accept a setting.
- Press the **Right** arrow and **Menu** button simultaneously or hold the **Menu** button for approximately 3 seconds to access the *Advanced Features Menu* of the meter.

For *Interactive Virtual Meter Demo* visit **tvm.predig.com**

Display Functions and Messages

The meter displays various functions and messages during setup/programming and operation. The following table shows the displayed functions and messages with their action/setting description.

Display	Parameter	Action/Setting
SEtu	*Setup*	Enter *Setup* menu
inPt	*Input*	Enter *Input* menu
4-20	*4-20 mA*	Set meter for 4-20 mA input
0- 10	*0-10 VDC*	Set meter for ±10 VDC input
rtd	*RTD*	Set meter for RTD input
A385	*Alpha 385*	Set α = 0.00385 European curve 100Ω RTD
A392	*Alpha 392*	Set α = 0.00392 American curve 100Ω RTD
tC	*TC*	Set meter for TC input
0 J	*0 J*	Type J
1 K	*1 K*	Type K
2 t	*2 T*	Type T
3 t.0	*3 T.0*	Type T, 0.1° resolution
4 E	*4 E*	Type E
F C	*°F or °C*	Set temperature scale
°F	*°F*	Set meter to Fahrenheit
°C	*°C*	Set meter to Celsius
dEc.P	*Decimal point*	Set decimal point
Prog	*Program*	Enter the *Program* menu
ScAL	*Scale*	Enter the *Scale* menu
CAL	*Calibrate*	Enter the *Calibrate* menu
inP 1	*Input 1*	Calibrate input 1 signal or program input 1 value
d.S 1	*Display 1*	Program display 1 value
inP2	*Input 2*	Calibrate input 2 signal or program input 2 value

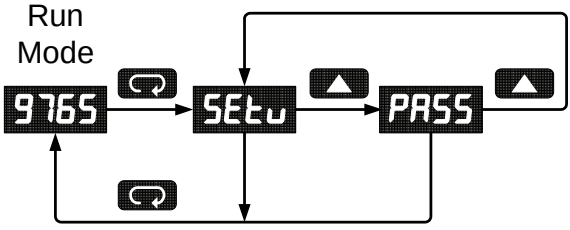
Display	Parameter	Action/Setting
d,52	*Display 2*	Program display 2 value
Err	*Error*	Error, calibration not successful, check signal
rELY	*Relay*	Enter the *Relay* menu
rLY1	*Relay 1*	Relay 1 setup
Act1	*Action 1*	Set relay 1 action (automatic, latching, etc.)
Auto	*Automatic*	Set relay for automatic reset
A-m	*Auto-manual*	Set relay for automatic + manual reset any time
LtCH	*Latching*	Set relay for latching operation
L-CL	*Latching-cleared*	Set relay for latching operation with manual reset only after alarm condition has cleared
ALtr	*Alternate*	Set relays for pump alternation control
oFF	*Off*	Disable relay and front panel status LEDs Disable relay's fail-safe operation
SEt1	*Set 1*	Program set point 1
rSt1	*Reset 1*	Program reset point 1
rLY2	*Relay 2*	Setup relay 2
Act2	*Action 2*	Set relay 2 action (automatic, latching, etc.)
SEt2	*Set 2*	Program set point 2
rSt2	*Reset 2*	Program reset point 2
FLSF	*Fail-safe*	Enter *Fail-safe* menu
FLS1	*Fail-safe1*	Set relay 1 fail-safe operation
on	*On*	Enable fail-safe operation
oFF	*Off*	Disable fail-safe operation
FLS2	*Fail-safe2*	Set relay 2 fail-safe operation
dLAY	*Delay*	Enter *Time Delay* menu
dLY1	*Delay 1*	Enter relay 1 time delay setup
On1	*On 1*	Set relay 1 On time delay
OFF1	*Off 1*	Set relay 1 Off time delay
dLY2	*Delay 2*	Enter relay 2 time delay setup

Display	Parameter	Action/Setting
On2	*On 2*	Set relay 2 On time delay
OFF2	*Off 2*	Set relay 2 Off time delay
brEK	*Break*	Set RTD/TC input break relay behavior
brK1	*Relay 1 Break*	Set relay 1 input break relay behavior
OFF	*Off*	Set relay to non-alarm condition at break
On	*On*	Set relay to alarm condition at break
brK2	*Relay 2 Break*	Set relay 2 input break relay behavior
Aout	*Analog output*	Enter the *Analog output* menu
ScAL	*Scale*	Enter the Scale menu
d.S1	*Display 1*	Program display 1 value
out1	*Output 1*	Program output 1 value (e.g. 4 mA)
d.S2	*Display 2*	Program display 2 value
out2	*Output 2*	Program output 2 value (e.g. 20 mA)
SEbr	*Sensor break*	Program TC or RTD sensor break value for analog out
PASS	*Password*	Enter the *Password* menu
unLC	*Unlocked*	Program password to lock meter
LoCd	*Locked*	Enter password to unlock meter
9999 -1999 oPEn	*Flashing display*	Overrange condition Underrange condition Open TC or RTD sensor

Main Menu

The main menu consists of the most commonly used functions: *Setup* and *Password*.

- Press **Menu** button to enter Programming Mode then press **Up** arrow button to scroll main menu.



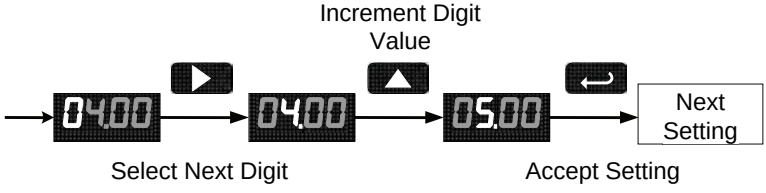
- Press **Menu**, at any time, to exit and return to Run Mode. Changes made to settings prior to pressing **Enter/Ack** are not saved.
- Changes to the settings are saved to memory only after pressing **Enter/Ack**.
- The display moves to the next menu every time a setting is accepted by pressing **Enter/Ack**.

Setting Numeric Values

The numeric values are set using the **Right** and **Up** arrow buttons. Press **Right** arrow to select next digit and **Up** arrow to increment digit value.

The digit being changed is displayed brighter than the rest.

Press the **Enter/Ack** button, at any time, to accept a setting or **Menu** button to exit without saving changes.



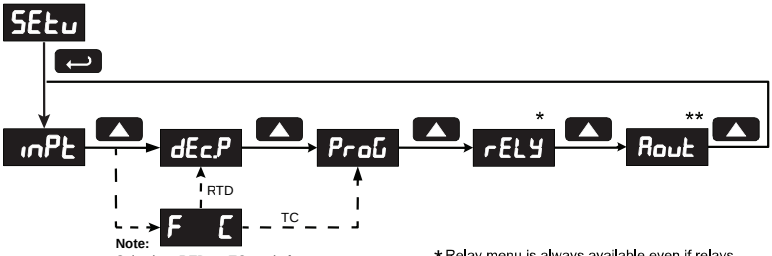
The decimal point is set using the **Up** arrow button in the *Setup-decimal point* menu.

Setting Up the Meter (SEtu)

The *Setup* menu is used to select:

1. Input signal the meter will accept
2. Decimal point position for process inputs
3. Units (°F or °C) for temperature inputs
4. Relay operation
5. 4-20 mA analog output set up

Press the **Enter/Ack** button to access any menu or press **Up** arrow button to scroll through choices. Press the **Menu** button to exit at any time.



Note:
Selecting RTD or TC mode from the Input menu will include the Fahrenheit/Celsius menu in the setup menu structure. RTD will allow the selection of a decimal point location after this menu and TC has a fixed decimal point location and will not allow the selection of a decimal point location.

* Relay menu is always available even if relays option is not installed. Visual alarm indication is available through front panel LEDs and MeterView software.

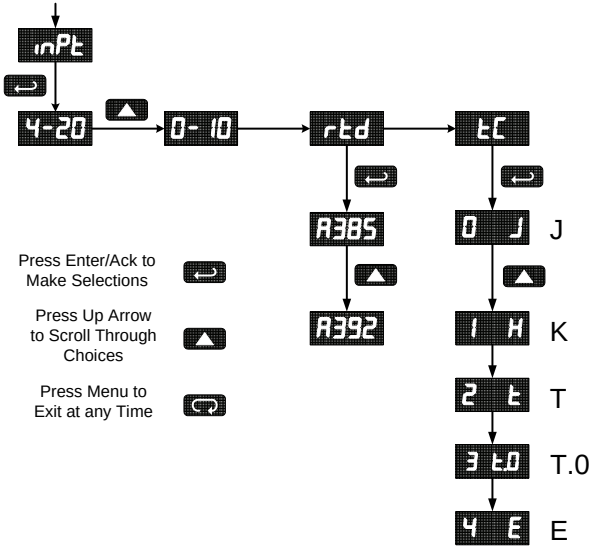
** Analog Output menu is available if selected in the Advanced Features menu. 4-20 mA output option board is installed and set up at the factory.

Setting the Input Signal (inPt)

Enter the *Input* menu to set up the meter to display current (4-20), voltage (0- 10), thermocouple (tC), or RTD (rtd) inputs.

The voltage input is capable of accepting any signal from -10 to +10 VDC. Select voltage input to accept 0-5, 1-5, 0-10, or ±10 VDC signals.

The current input is capable of accepting any signal from -20 to 20 mA. Select current input to accept 0-20 or 4-20 mA signals.



If RTD is selected, the display shows **A385** or **A392**. Select the coefficient to match the RTD sensor, either 0.00385 (**A385**, European curve) or 0.00392 (**A392**, American curve). The display then shows the decimal point menu, **dEcP**. Select the decimal point resolution as shown on page 31.

If TC is selected, scroll through the thermocouple types and select the type matching the TC sensor.

The input signal must be connected to the appropriate input terminals and the RTD/TC selector switch must be set, see Figure 8 on page 18.

For thermocouple inputs, allow at least 30 minutes warm-up time for meter to reach specified accuracy.

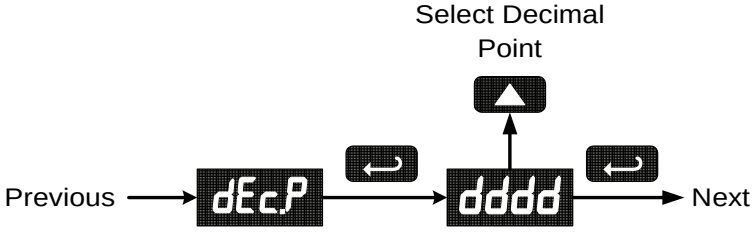
Setting the Decimal Point (dcPt)

Decimal point for process inputs may be set with up to three decimal places or with no decimal point at all.

Decimal point for RTD inputs may be set with 1 decimal place or none.

Decimal point for thermocouple inputs is fixed.

Pressing the **Up** arrow moves the decimal point one place to the right until no decimal point is displayed, it then moves to the leftmost position.

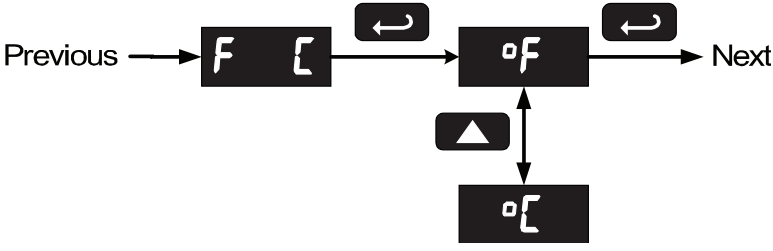


Setting the Temperature Scale (F C)

The meter can be set to display temperature in degrees Fahrenheit or Celsius.

Press **Up** arrow to change selection.

Press **Enter/Ack** to accept.



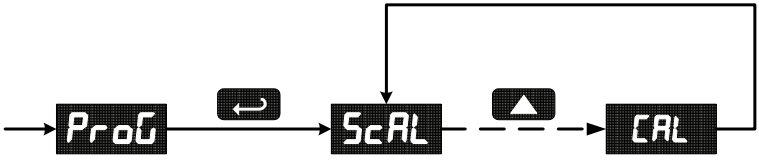
Programming the Meter (PrOG)

It is **very important** to read the following information, before proceeding to program the meter:

- There is **no need to recalibrate** the meter when first received from the factory.
- The meter is ***factory calibrated*** prior to shipment, for all input types, in milliamps, volts, and degrees respectively. The calibration equipment is certified to NIST standards.
- Use the *Scale* menu to scale process inputs (e.g. 4-20 mA). A calibrated signal source is not needed to scale the meter.
- For thermocouple and RTDs, just connect the sensor to the proper terminals and turn the power on. ***No calibration needed!*** (when the meter is first received from the factory).

The *Program* menu contains the *Calibrate* and the *Scale* menus.

Process inputs may be calibrated or scaled to any display within the range of the meter.

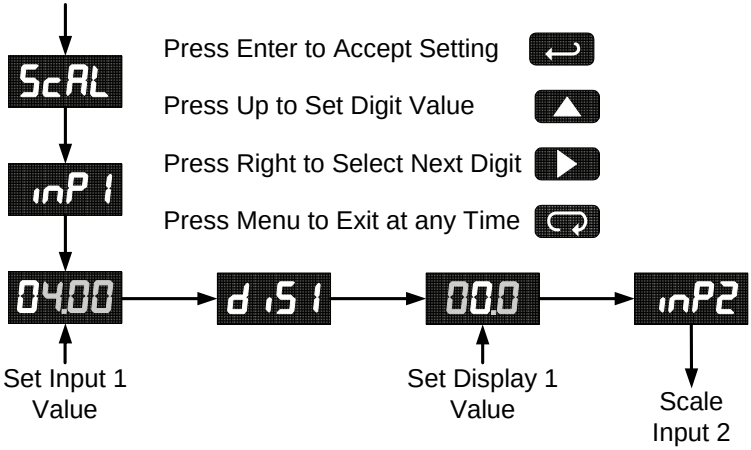


Additional parameters, not needed for most applications, are programmed with the *Advanced Features* menu, see *Advanced Features Menu*, page 50.

Scaling the Meter (ScAL)

The process inputs (4-20 mA and ±10 VDC) can be scaled to display the process in engineering units.

A signal source is not needed to scale the meter; simply program the inputs and corresponding display values.



For instructions on how to program numeric values see *Setting Numeric Values*, page 28.

Note:

The *Scale* menu is not available for temperature inputs.

Error Message (Err)

An error message indicates that the calibration or scaling process was not successful.

After the error message is displayed, the meter reverts to input 1, allowing the appropriate input signals to be applied.

The error message might be caused by any of the following conditions:

1. Input signal is not connected to the proper terminals or it is connected backwards.
2. Wrong signal selection in *Setup* menu.
3. Minimum input span requirements not maintained.
4. Input 1 signal inadvertently applied to calibrate input 2.

Minimum Input Span

The minimum input span is the minimum difference between input 1 and input 2 signals required to complete the calibration or scaling of the meter.

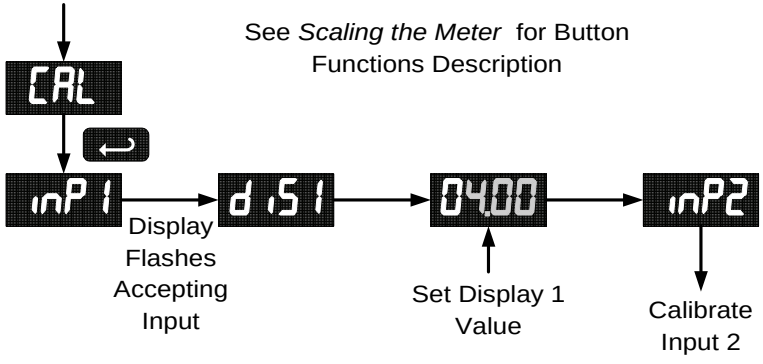
Input range	Input 1 & input 2 span
4-20 mA	0.40 mA
±10 VDC	0.20 VDC
TC	100°F (56°C)
RTD	50°F (28°C)

Calibrating the Meter (CAL)

> To scale the meter without a signal source, refer to Scaling the Meter (ScAL), page 33.

The meter can be calibrated to display the process in engineering units by applying the appropriate input signal and following the calibration procedure.

The use of a calibrated signal source is strongly recommended to calibrate the meter.



Recalibrating Temperature Inputs (CAL)

Remember, the meter is **calibrated** at the factory prior to shipment. Recalibration is recommended at least every twelve months.

The *Calibration* (CAL) menu is used to **recalibrate** the thermocouple and RTD inputs.

> ***Allow at least 30 minutes warm-up time before performing recalibration procedure to ensure specified accuracy.***

Recommended Calibration Points

To recalibrate the meter, it is recommended to use the Fahrenheit scale; this will give a greater degree of accuracy to the calibration. The scale can be changed to the Celsius scale after calibration is completed. The meter will display temperature accurately in any scale. The following table shows the recommended low and high calibration points for all types.

Type of input	Input 1 (Low)	Input 2 (High)	Check (Middle)
Type J T/C	32°F	1182°F	600°F
Type K T/C	32°F	1893°F	960°F
Type T T/C	32°F	693°F	360°F
Type T T/C	32.0°F	693.0°F	360.0°F
Type E T/C	32°F	1652°F	840°F
100 Ω RTD (0.00385)	32°F 100Ω	1148°F 320.12Ω	590°F 215.61Ω
100 Ω RTD (0.00392)	32°F 100Ω	1127°F 320.89Ω	580°F 215.87Ω

Recalibration Procedure for Temperature Inputs

1. Connect signal to the meter using the appropriate wire (e.g. type J thermocouple wire to recalibrate type J input), see page 18.
2. Set up the meter to accept the selected input (e.g. type J T/C), see page 30.
3. Set up the meter to display temperature in degrees Fahrenheit, see page 31.
4. Apply signal corresponding to input 1 (32°F) and program display 1 to 32, see page 35.
5. Apply signal corresponding to input 2 (1182°F for type J) and program display 2 accordingly, see page 35.
6. After the meter accepts input 2, the display flashes the message CJr that indicates the meter is sensing the cold junction reference. This completes the recalibration procedure for the selected input.

Recalibrating Process Inputs (ICAL)

The *Internal Calibration* (ICAL) menu, located in the Advanced features menu, is used to recalibrate the current and voltage inputs. Recalibration is recommended at least every twelve months.

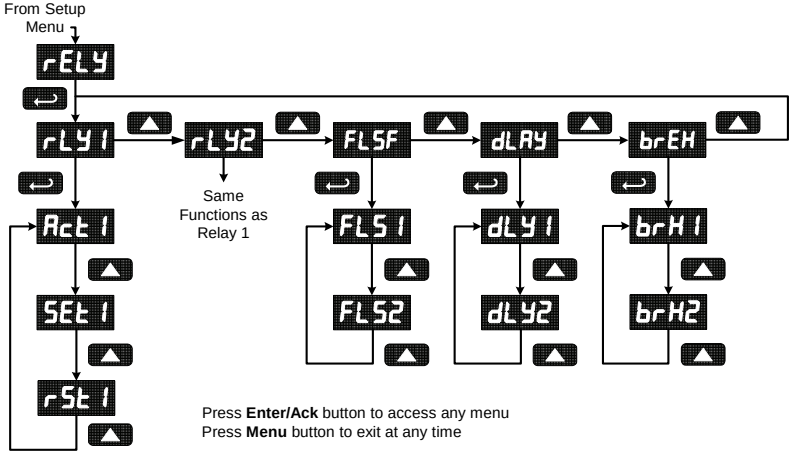
Refer to Internal Calibration (ICal), page 59 for instructions.

Setting the Relay Operation (rELY)

This menu allows you to set up the operation of the relays:

1. Relay action
   a. Automatic reset only (non-latching)
   b. Automatic + manual reset at any time (non-latching)
   c. Latching (manual reset only)
   d. Latching with Clear (manual reset only after alarm condition has cleared)
   e. Pump alternation control (automatic reset only)
   f. Off (relay and status LED disabled)
2. Set point
3. Reset point
4. Fail-safe operation
   a. On (enabled)
   b. Off (disabled)
5. Time delay
   a. On delay (0-199 seconds)
   b. Off delay (0-199 seconds)
6. Break Condition Behavior
   a. Off (non-alarm condition)
   b. On (alarm condition)

Refer to page 25 for a description of *Display Functions and Messages*

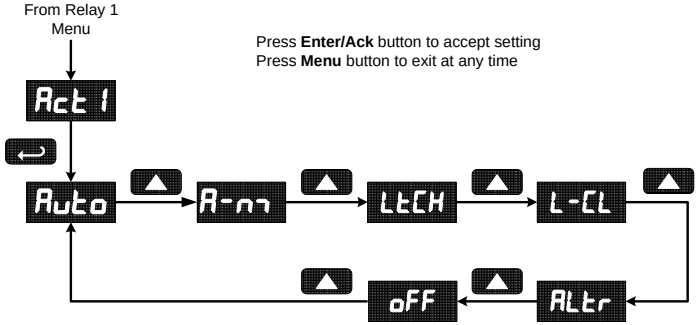


Setting the Relay Action

The relays' *Action* menu allows the user to set up the operation of the relays. The relays may be set up for any of the following modes of operation:

1. Automatic reset (non-latching)
2. Automatic + manual reset at any time (non-latching)
3. Latching (manual reset only, at any time)
4. Latching with Clear (manual reset only after alarm condition has cleared)
5. Pump alternation control (automatic reset only)
6. Off (relay and status LED disabled)

The following graphic shows relay 1 action setup; relay 2 is set up in a similar fashion.

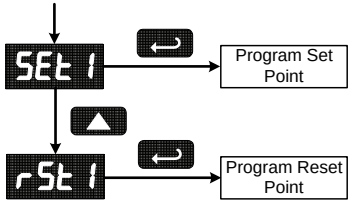


Programming Set and Reset Points

High alarm indication: program set point above reset point.

Low alarm indication: program set point below reset point.

The deadband is determined by the difference between set and reset points. Minimum deadband is one display count. If set and reset points are programmed the same, relay will reset one count below set point.

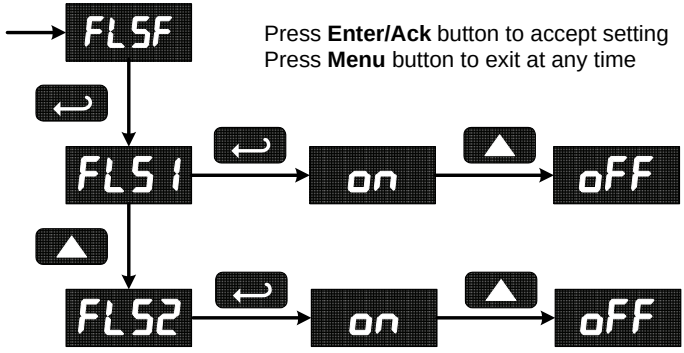


Quick Set Points

Press **Up** arrow and **Menu** at the same time to access set/reset points quickly.

Setting Fail-Safe Operation

The fail-safe operation is set independently for each relay. Select **on** to enable or select **oFF** to disable fail-safe operation.

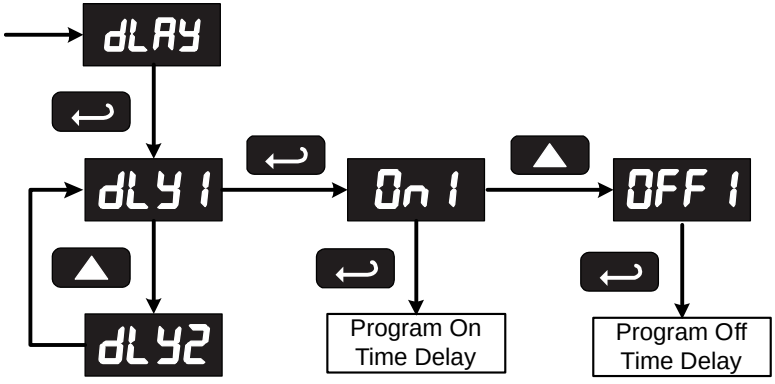


Programming Time Delay

The *On* and *Off* time delays may be programmed for each relay between 0 and 199 seconds. The relays will transfer only after the condition has been maintained for the corresponding time delay.

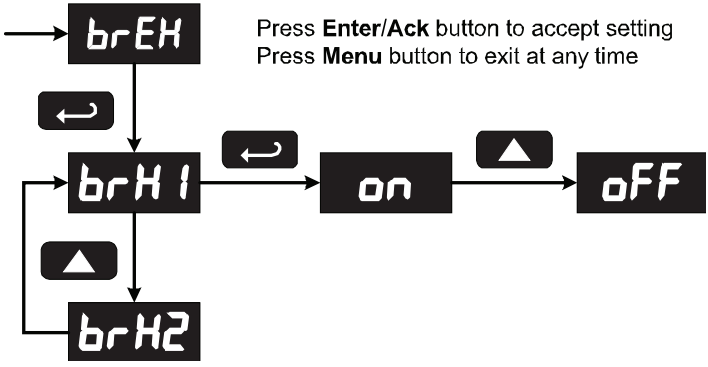
The *On* time delay is associated with the set point.

The *Off* time delay is associated with the reset point.



Setting Sensor Break Condition

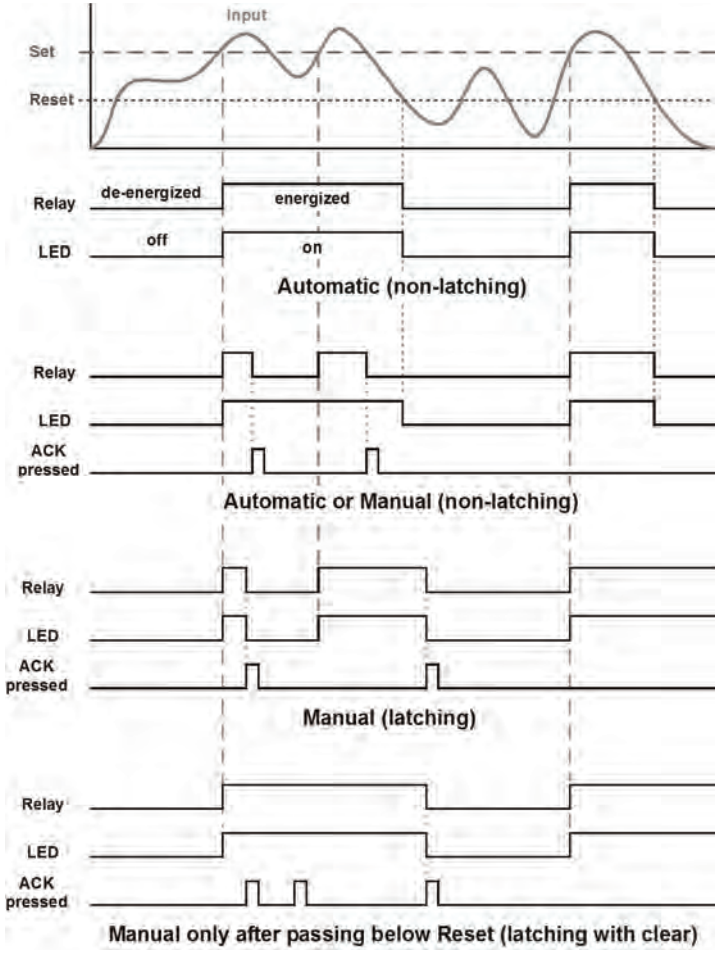
The sensor break relay condition may be programmed for each relay as *On* (alarm) or *Off* (non-alarm). The relays will enter these states when a sensor break is detected for RTD or thermocouple inputs. These settings have no effect when current or voltage inputs are selected.



Relay and Alarm Operation

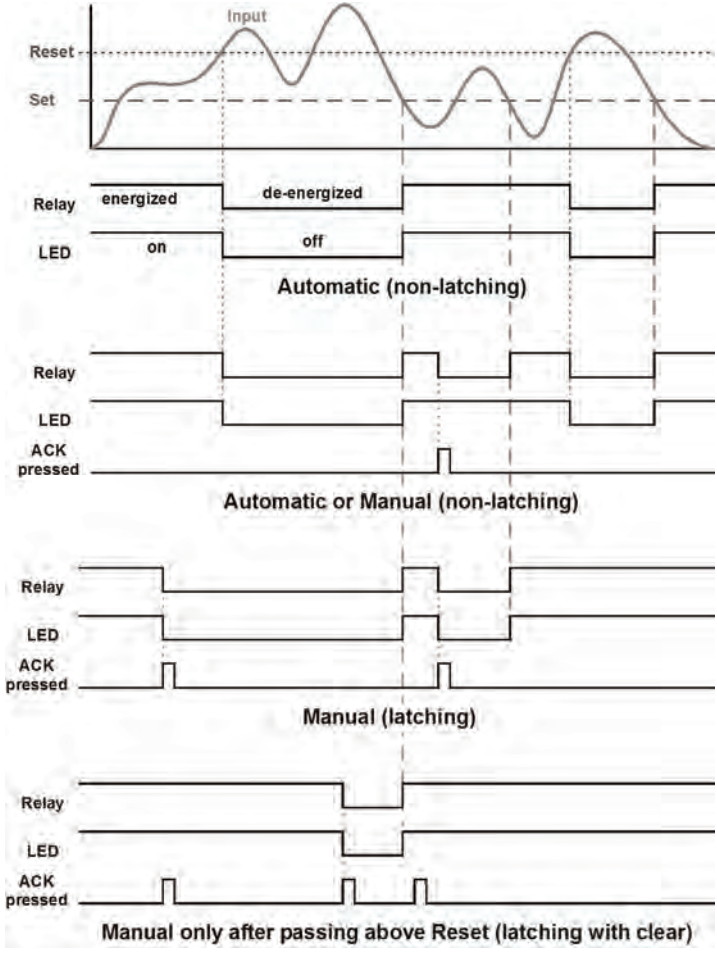
The following graphs illustrate the operation of the relays, status LEDs, and ACK button.

High Alarm Operation (Set > Reset)



For Manual reset mode, ACK can be pressed anytime to turn "off" relay. For relay to turn back "on", signal must go below set point, and then go above it.

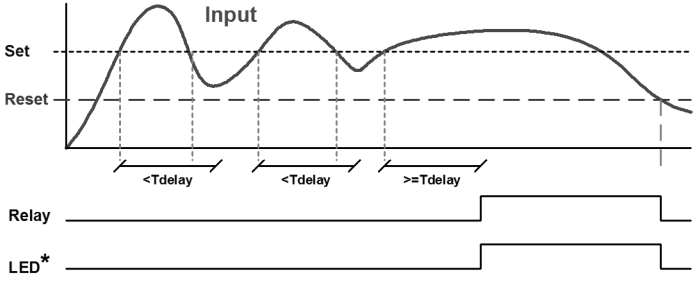
Low Alarm Operation (Set < Reset)



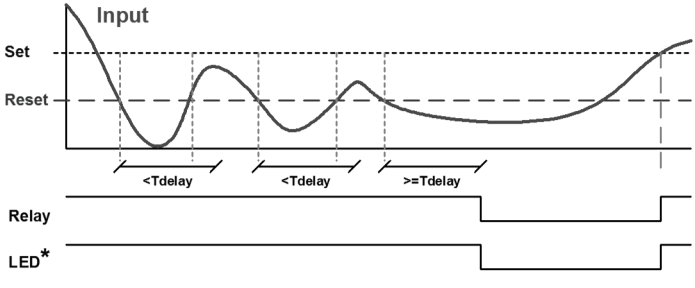
For Manual reset mode, ACK can be pressed anytime to turn "off" relay. For relay to turn back "on", signal must go above set point, and then go below it.

Time Delay Operation

The following graphs show the operation of the time delay function.



On Time Delay

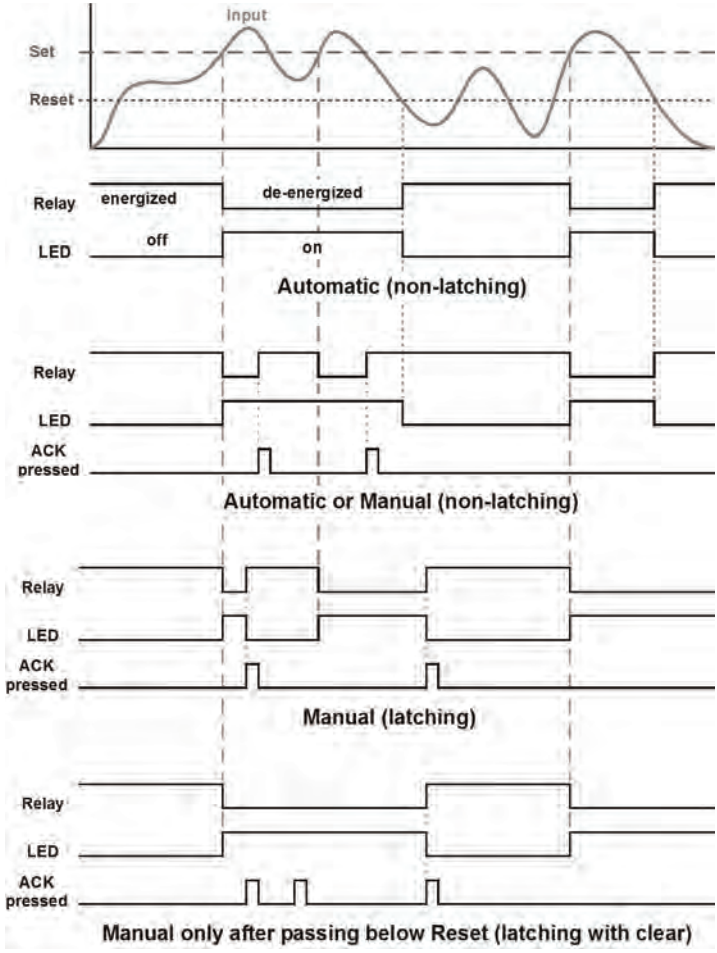


Off Time Delay

If the signal crosses the set point, the *On* time delay timer starts and the relay trips when the time delay has elapsed. If the signal drops below the set point (high alarm) before the time delay has elapsed, the *On* time delay timer resets and the relay does not change state. The same principle applies to the *Off* time delay.

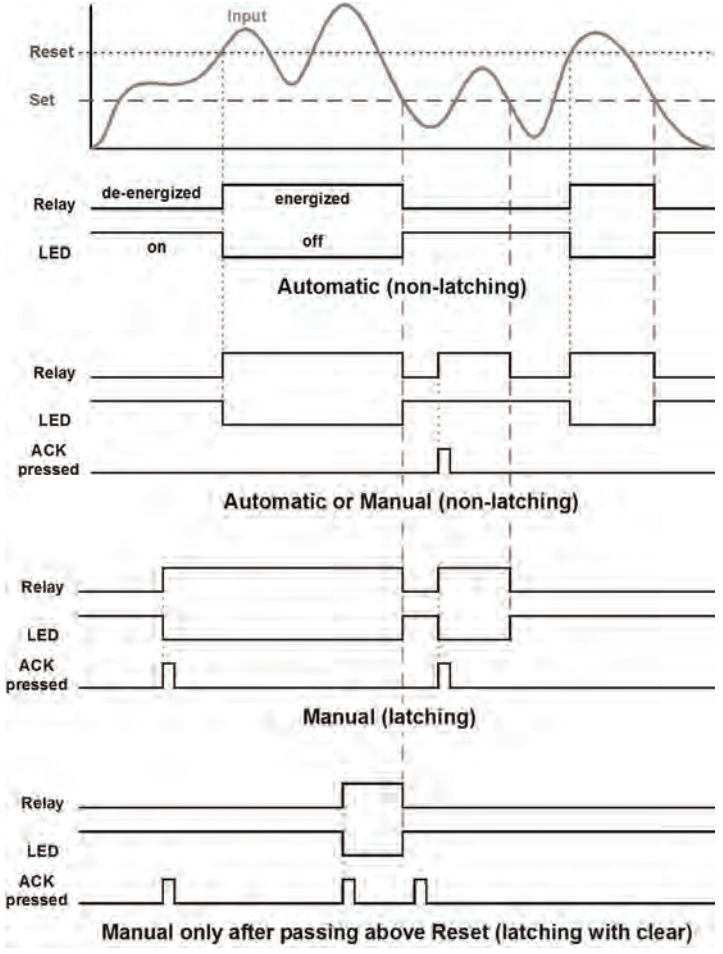
*** Note:** The LED is not affected by Time Delay when *"Automatic or Manual"* reset mode is selected. Rather the LED follows the set and reset points.

High Alarm with Fail-Safe Operation (Set > Reset)



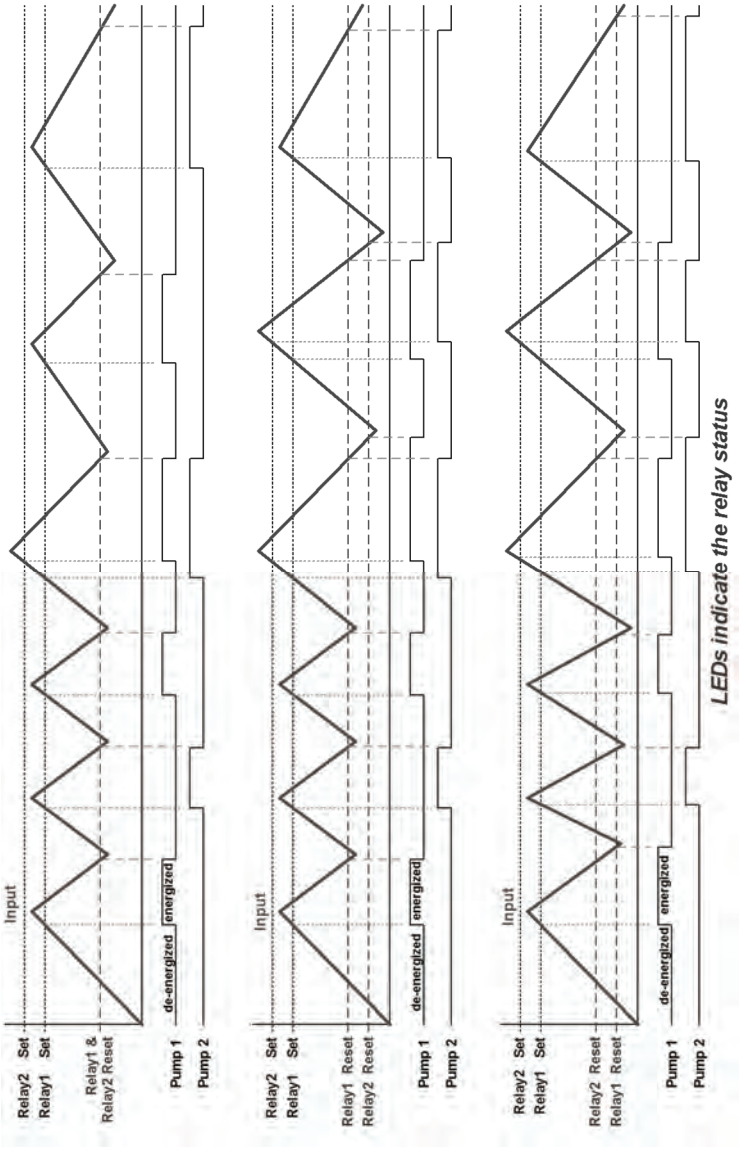
Fail-safe operation: relay coil is energized in non-alarm condition. In case of power failure, relay will go to alarm state.

Low Alarm with Fail-Safe Operation (Set < Reset)



Fail-safe operation: relay coil is energized in non-alarm condition. In case of power failure, relay will go to alarm state.

Pump Alternation Control Operation



Scaling the 4-20 mA Analog Output (Aout)

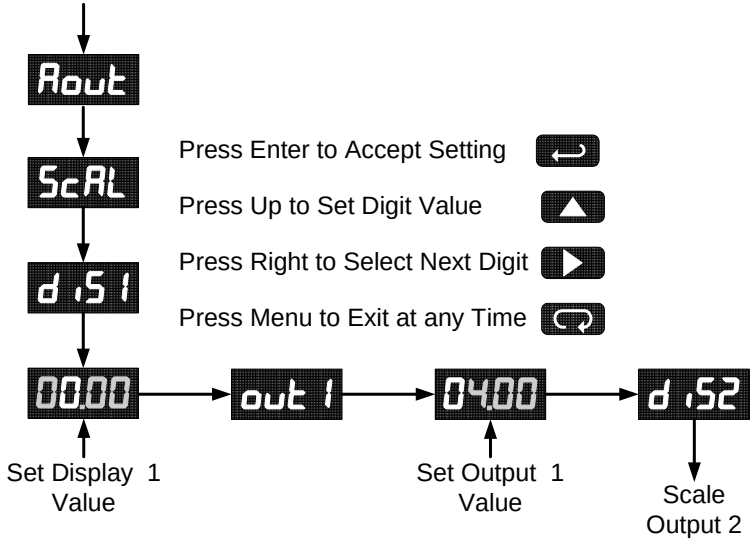
The 4-20 mA analog output can be scaled to provide a 4-20 mA signal for any display range selected.

No equipment is needed to scale the analog output; simply program the display values to the corresponding mA output signal.

Depending on the version of meter purchased, the *Analog Output* menu may not appear in the *Setup* menu. This menu is enabled or disabled at the factory via the *Advanced Features* menu. For more information on the Advanced Features Menu see page 50.

The *Analog Output* menu is used to program:

1. 4-20 mA output based on display values
2. Sensor break value in mA



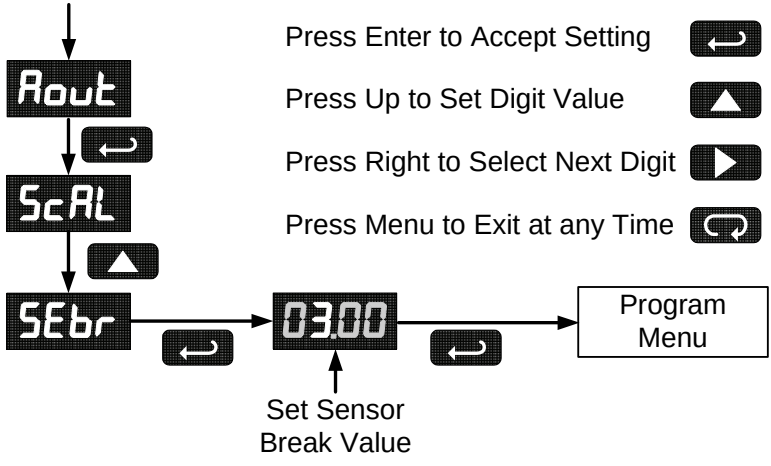
For instructions on how to program numeric values see *Setting Numeric Values*, page 28.

Program the Sensor Break Output Value (SEbr)

The sensor break value corresponds to the output signal generated when the meter detects a sensor break for thermocouple and RTD inputs.

For example if there is an open thermocouple, the meter displays the message "oPEn" and the analog output goes to the programmed sensor break value (e.g. 3.00 mA).

The sensor break value can be programmed from 0.00 to 23.99.
The typical output signal range is 1.00 to 23.00 mA (e.g. If sensor break value is programmed to 0.00, the actual output will not be greater than 1.00 mA).



Analog Output when Display is Out of Range

The analog output reflects the display out of range conditions as follows:

Input Condition	Display	Analog Output
Underrange	Flashing -1999	3.00 mA
Overrange	Flashing 9999	21.00 mA
Open TC or RTD	Flashing oPEn	Sensor break value

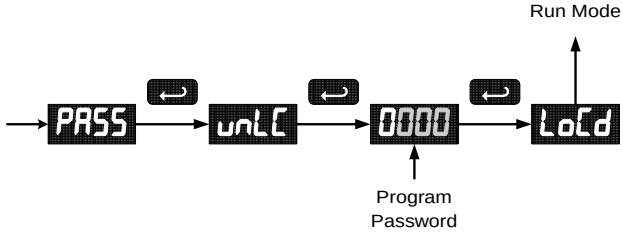
Setting Up the Password (PASS)

The *Password* menu is used to program a four-digit password to prevent unauthorized changes to the programmed parameter settings.

Locking the Meter

Enter the *Password* menu and program a four-digit password.

For instructions on how to program numeric values see Setting Numeric Values, page 28.

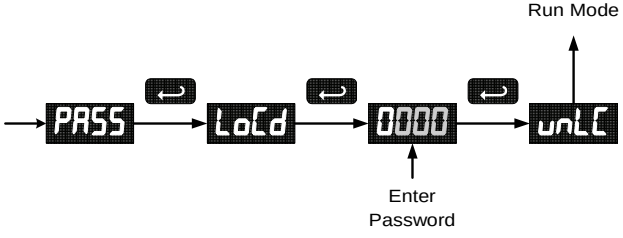


Record the password for future reference. If appropriate, it may be recorded in the space provided.

Model:	
Serial Number:	
Password:	__ __ __ __

Unlocking the Meter

If the meter is password protected, the correct password must be entered in order to make changes to the parameter settings.



Entering the correct four-digit number sets the password to 0000, disabling the protection.

Changes to the programmed parameter settings are allowed only with the password set to 0000.

If the password entered is incorrect, the meter displays LoCd (Locked) for about two seconds, then it returns to Run Mode. To try again, press **Enter/Ack** while the *Locked* message is displayed.

Forgot the Password?

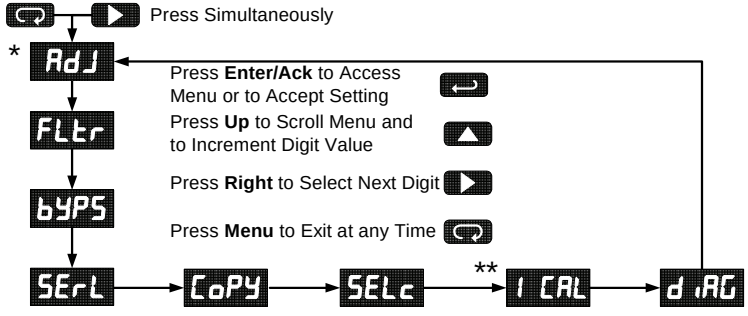
The password may be disabled by the following procedure:

1. Note display reading prior to pressing the Menu button. Ignore decimal point and sign.
2. Access the *Password* menu, add 2 to the noted reading and enter that number as the password (e.g. display reading = -1.23, password = 0125).

Advanced Features Menu

To simplify the setup process, functions not needed for most applications are located in the *Advanced Features* menu.

Press the **Right** arrow and **Menu** button simultaneously or hold the Menu button for approximately 3 seconds to access the *Advanced Features Menu* of the meter.



* Available for temperature inputs only

* * Available for process inputs only

Advanced Features Menu & Display Messages

Display	Parameter	Action/Setting
AdJ	*Adjust*	Set offset adjustment for temperature, not available for process inputs
FLtr	*Filter*	Set noise filter value
byPS	*Bypass*	Set filter bypass value
SErL	*Serial*	Set serial communication parameters
Prot	*Protocol*	Enter the Protocol menu
PdC	*PDC*	Select PDC protocol
rtU bS	*Modbus*	Select Modbus protocol
Addr	*Address*	Set meter address
bAud	*Baud rate*	Select baud rate
trdE	*Transmit delay*	Set transmit delay for serial communication
PrtY	*Parity*	Select none, even, or odd (Modbus only)
tbYt	*Byte-to-byte*	Program byte-to-byte timeout (silent time – Modbus only)
CoPY	*Copy*	Enter copy function
SEnd	*Send*	Send meter settings to another meter
donE	*Done*	Copy function completed
SELc	*Select*	Enter the Select menu (function, cutoff, out)
Func	*Function*	Select linear or square root function
L inr	*Linear*	Set meter for linear function
Sqrt	*Square root*	Set meter for square root extraction
cutF	*Cutoff*	Set low-flow cutoff
out	*Output*	Set meter for either relay or analog output **(factory set only – only included in certain models**
Aout	*Analog output*	Set meter for analog output option
rELY	*Relay*	Set meter for relay option
Aout	*Analog output*	Enable or disable analog output **(factory set only – only included in certain models**
YES	*Yes*	Enable analog output
no	*No*	Disable analog output
IntY	*Intensity*	Select display intensity

Display	Parameter	Action/Setting
iCAL	*Initial calibration*	Enter initial calibration for process inputs
Curr	*Current*	Calibrating current input
I Lo	*I low*	Calibrate low current input
I Hi	*I high*	Calibrate high current input
Volt	*Volt*	Calibrating voltage input
uLo	*V low*	Calibrate low voltage input
uHi	*V high*	Calibrate high voltage input
diAG	*Diagnostics*	Display parameter settings
LEd	*LED*	Test display
CJC	*CJC*	Display cold junction compensation voltage
CFG	*CFG*	Display meter configuration
PtS	*Points*	Display calibration points for process inputs
rELY	*Relays*	Display relay settings
Aout	*Analog output*	Display analog output settings
GoFF	*Gain/offset*	Display gain and offset for process inputs
SErL	*Serial*	Display serial communication settings
inFo	*Information*	Display software version and S/N information

Offset Adjustment (AdJ)

This parameter allows the user to select an offset adjustment to the temperature being displayed. Offset adjustment values can be either positive or negative and can be any number within ±19.9°. The offset adjustment value is programmed through the *Adjust* menu.

The offset adjustment feature can be useful to compensate for errors due to thermocouple junctions or excessive lead wire resistance in RTDs.

The offset adjustment value is automatically reset to zero whenever the type of temperature sensor is changed (*i.e.* Thermocouple type or RTD curve).

Celsius/Fahrenheit conversion of the offset adjustment value is automatic, see note 2 below for important limitations.

Notes:

1. Offset adjustment is available only when TC or RTD input is selected.
2. If adjustment value is greater than 11°C and the temperature scale is changed to Fahrenheit, the maximum applied adjustment will be 19.9°F.

Noise Filter (FLtr)

Most applications do not require changing this parameter. It is intended to help attain a steady display with an unsteady (noisy) input signal.

The field selectable noise filter averages any minor or quick changes in the input signal and displays the reading with greater stability.

Increasing the filter value will help stabilize the display, however this will reduce the display response to changes on the input signal.

The filter level may be set anywhere from 2 to 199.

Setting filter value to zero disables filter function, and bypass setting becomes irrelevant.

Noise Filter Bypass (bYPS)

The meter can be programmed to filter small input changes, but allow larger input changes to be displayed immediately, by setting the bypass value accordingly.

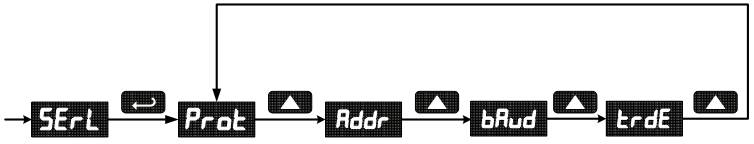
If the input signal goes beyond the bypass value, it will be displayed immediately with no averaging done on it.

The noise filter bypass value may be set anywhere from 0.2 to 99.9. It corresponds to percentage of full scale for process inputs and to degrees Fahrenheit for temperature inputs.

Increasing the bypass value may slow down the display response to changes on the input signal.

Serial Communications (SErL)

The meter is equipped with serial communications capability as a standard feature using PDC Serial Communication Protocol. The Modbus RTU protocol is included on all models after 5/1/2010. To communicate with a computer or other data terminal equipment, an RS-232 or RS-485 adapter option is required; see *Ordering Information* on page 3 for details.



When using more than one meter in a multi-drop mode, each meter must be provided with its own unique address. The address may be programmed from 00 to 99 for PDC protocol and from 1 to 247 for Modbus protocol. The transmit delay may be set between 0 and 199 ms (see Serial Communication Adapter manual for more details).

The Trident can also be connected directly to another Trident meter through a cable assembly (PDA7420). This allows the user to copy all the settings from one meter to another, using the *Copy* function.

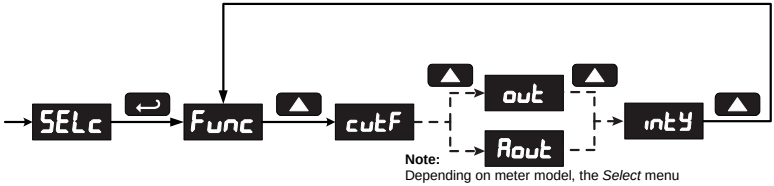
Protocol Selection Menu (Prot)

The Protocol selection menu is used to select either the PDC or the Modbus protocol.

Select Menu (SELc)

The *Select* menu is used to select linear or square root function, display intensity, and low-flow cutoff. Selection for relay or analog output is a factory setting depending on the option installed.

- Output options are installed and set up at the factory.
- Changing the output selection will cause erroneous operation.

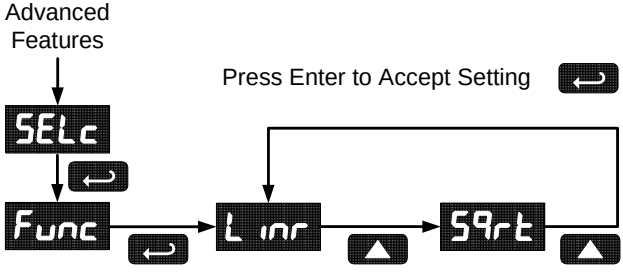


Note:
Depending on meter model, the *Select* menu will display either *out* or *Aout*. In either case, the output selection menu is for factory use only. Do not attempt to change output selection.

Linear or Square Root Function (L inr or Sqrt)

Meters are set up at the factory for linear function. The linear function provides a display that is linear with respect to the input signal.

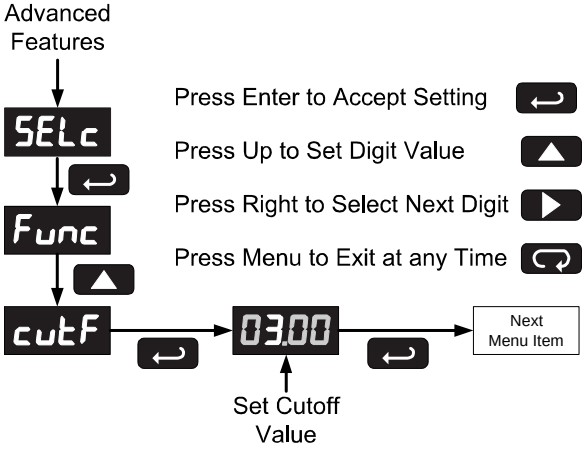
The square root function is used to linearize the signal from a differential pressure transmitter and display flow rate in engineering units.



Low-Flow Cutoff (cutF)

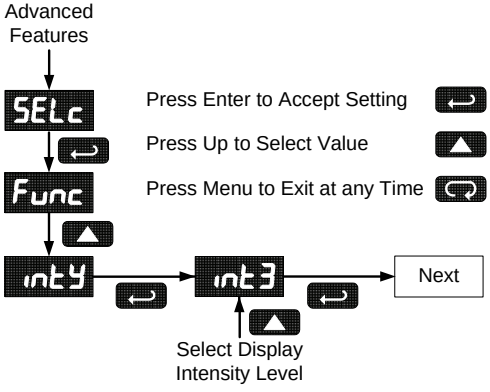
The low-flow cutoff feature allows the meter to be programmed so that the often-unsteady output from a differential pressure transmitter, at low flow rates, always displays zero on the meter.

The cutoff value may be programmed from 0 to 9999. Below the cutoff value, the meter will display zero. Programming the cutoff value to zero disables the cutoff.



Display Intensity (inty)

The Display Intensity function allows the selection of eight levels of intensity for various lighting conditions.



MeterView® Software

Precision Digital's MeterView® software allows the Trident to be programmed from a PC and to act as a data logger.

MeterView® software allows all setup parameters to be saved to a file for reporting, restoring, or programming other meters.

See *Ordering Information*, page 3 to order MeterView® software.

Note: PDC protocol must be selected to communicate with MeterView®.

Meter Copy Function (CoPY)

The *Copy* function is used to copy (or clone) all the settings from one meter to other meters requiring exactly the same setup and programming (*i.e*. type of input, scaling, decimal point, filter, bypass, etc.).

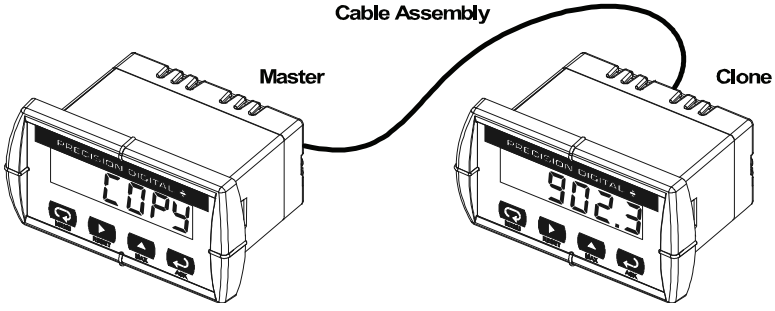


Figure 17. Meter Copy Connection

Copy Function Requirements

To successfully copy settings from one meter to another, both meters must have:

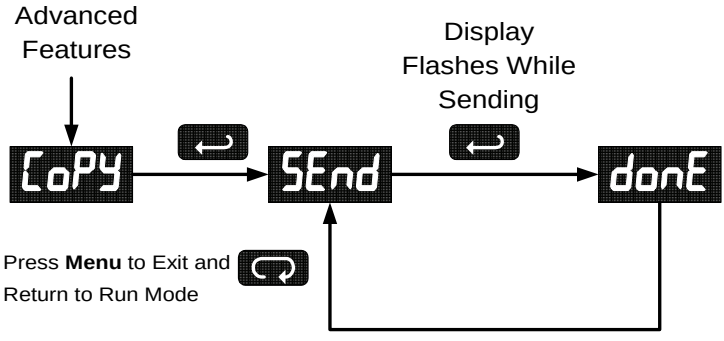
1. *Same software version*
2. *Same baud rate setting*
3. *PDC protocol selected*

See *Determining Software Version*, page 65 for instructions.

Meter Cloning Instructions

> **NOTICE!** *Do not connect the two meters to the same 4-20 mA loop while cloning. Internal calibration may be affected.*

1. Connect the two meters using cable assembly PDA7420 or equivalent (*e.g.* Digi-Key P/N H1663-07-ND). Cable should not exceed 7' (2.1 m).
2. Power up both meters. Leave Clone meter in Run Mode.
3. Enter the *Advanced Features Menu* of the Master meter, see *Advanced Features Menu*, page 50.
4. Scroll to *Copy* function using **Up** arrow button then press **Enter/Ack**.
5. The meter displays the message SEnd. Press **Enter/Ack**, the display flashes while sending data. The message donE is displayed when copying is completed.



6. The Clone meter displays the memory address being programmed then the message donE when copying is completed. The meter initializes and returns to Run Mode using the same settings as the Master.
7. If meter to be cloned does not respond to the data being sent, refer to ***Copy Function Requirements*** above.

Internal Calibration (iCAL)

- There is **no need to recalibrate** the meter when first received from the factory.
- The meter is ***factory calibrated*** prior to shipment, for all input types, in milliamps, volts, and degrees respectively. The calibration equipment is certified to NIST standards.

The internal calibration allows the user to scale the meter without applying a signal. This menu is not available if the meter is set up for TC or RTD inputs.

The use of calibrated signal sources is necessary to perform the internal calibration of the meter.

Check calibration of the meter at least every 12 months. Each input type must be recalibrated separately, if meter will be used with all input types.

Notes:

- If meter is in operation and it is intended to accept only one input type (e.g. 4-20 mA), recalibration of other inputs is not necessary.
- Allow the meter to warm up for at least 15 minutes before performing the internal calibration procedure.

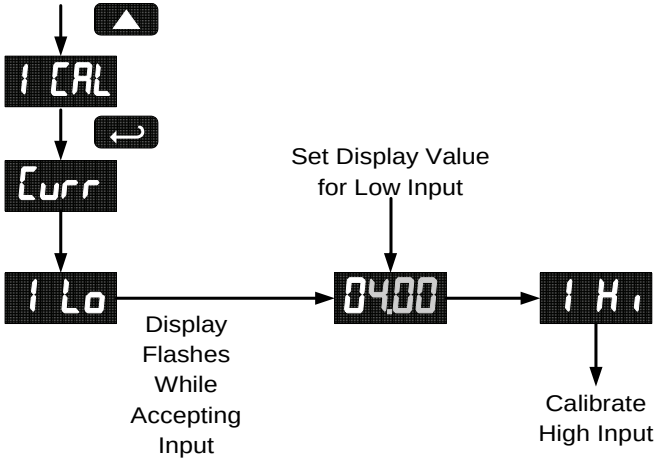
The *Internal calibration* menu is part of the *Advanced Features Menu*.

1. Press the Right arrow **and** Menu button simultaneously **or** hold the Menu button for approximately 3 seconds to access the *Advanced Features Menu* of the meter.
2. Press the **Up** arrow button to scroll to the *Internal calibration* menu and press **Enter/Ack**.
3. The meter displays either current (Curr) or voltage (Volt), according to the meter input setup. Press **Enter/Ack** to start the calibration process.

Example for current input internal calibration:

4. The meter displays *Low* input current (I Lo). Apply the low input signal and press **Enter/Ack**. The display flashes for a moment while meter is accepting the low input.
5. After the display stops flashing, a number is displayed with the left-most digit brighter than the rest. The bright digit is the active digit that can be changed by pressing the **Up** arrow button. Press the **Right** arrow button to move to the next digit.
6. Set the display value to correspond to the input signal being calibrated.
7. The display moves to the high input calibration (I Hi). Apply the high input signal and press **Enter/Ack**.
8. Set the display for the high input calibration in the same way as it was set for the low input calibration.

For instructions on how to program numeric values see Setting Numeric Values, page 28.



The graphic above shows the calibration of the current input. The voltage input is calibrated in a similar way.

Tips:

- Low and high input signals can be any valid values within the range of the meter.
- Observe minimum input span requirements between input 1 and input 2.
- Low input must be less than high input signal.

Error Message (Err)

An error message indicates that the calibration or scaling process was not successful.

After the error message is displayed, the meter reverts to input 1, allowing the appropriate input signals to be applied.

The error message might be caused by any of the following conditions:

1. Input signal is not connected to the proper terminals, or it is connected backwards.
2. Wrong signal selection in *Setup* menu.
3. Minimum input span requirements not maintained.

Minimum Input Span

The minimum input span is the minimum difference between input 1 and input 2 signals required to complete the calibration or scaling of the meter.

Input range	Input 1 & input 2 span
4-20 mA	0.40 mA
±10 VDC	0.20 VDC

OPERATION

For process inputs, the meter is capable of accepting positive and negative signals and displaying these signals in engineering units from -1999 to 9999 (*e.g.* a signal from -10 to +10 VDC could be displayed as -10.00 to 10.00).

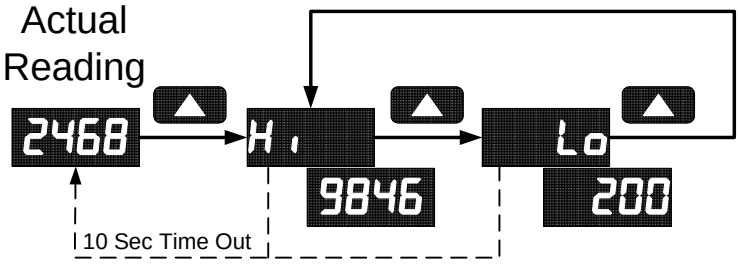
The temperature inputs are displayed according to the input type and temperature units (°F or °C) selected. RTD and Type T thermocouple inputs can be displayed with either 1° or 0.1° resolution.

Front Panel Buttons Operation

Button Symbol	Description
	Press to enter or exit Programming Mode, view settings, or exit Max/Min readings Hold to enter *Advanced* features menu.
	Press to reset Max/Min readings
	Press to display Max/Min readings alternately
	Press to display Max/Min reading indefinitely while displaying Max/Min Press ACK to acknowledge relays

Maximum/Minimum Readings

The main function of the front panel buttons during operation is to display the maximum and minimum readings reached by the process or temperature inputs.



Press **Up** to Display and to Toggle Between Max & Min

Press **Enter** to Hold Max/Min

Press **Right** to Reset Max/Min

Press **Menu** to Exit Max/Min

1. Press **Up** arrow/**Max** button to display maximum reading since the last reset/power-up.
2. Press **Up** arrow/**Max** again to display the minimum reading since the last reset/power-up.
3. Press **Enter/Ack** to hold Max/Min display reading, the meter will continue to track new Max/Min readings.
4. If **Enter/Ack** is not pressed, the Max/Min display reading will time out after ten seconds and the meter will return to display the actual reading.
5. Press **Right** arrow/**Reset** button to reset Max/Min while reading is being displayed. Max/Min display readings are reset to actual reading.

MOUNTING DIMENSIONS

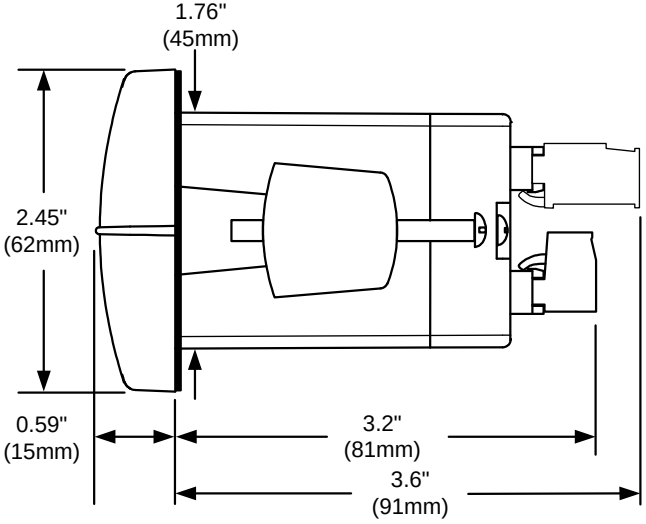


Figure 18. Meter Dimensions – Side View

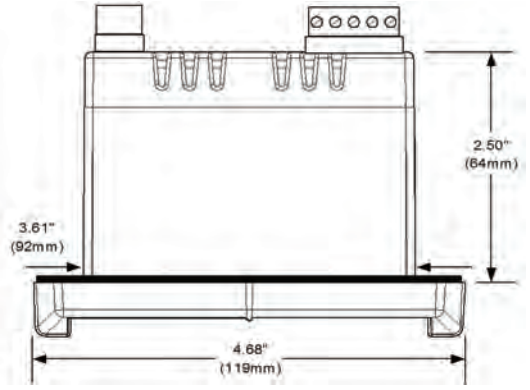


Figure 19. Case Dimensions – Top View

TROUBLESHOOTING

For an *Interactive Virtual Meter Demo* visit
tvm.predig.com

Due to the many features and functions of the meter, it's possible that the setup of the meter does not agree with what an operator expects to see. If the meter is not working as expected, refer to the *Diagnostics* menu and consult the recommendations described below.

Diagnostics Menu (diAG)

The *Diagnostics* menu is located in the *Advanced Features Menu*, to access *Diagnostics* menu see *Advanced Features Menu*, page 50.

It provides an easy way to view the programmed parameter settings for troubleshooting purposes. Press the **Enter/Ack** button to view the settings and the **Menu** button to exit at any time.

For a description of the diagnostics messages *see* Advanced Features Menu & Display Messages, page 51.

Determining Software Version

To determine the software version of a meter:

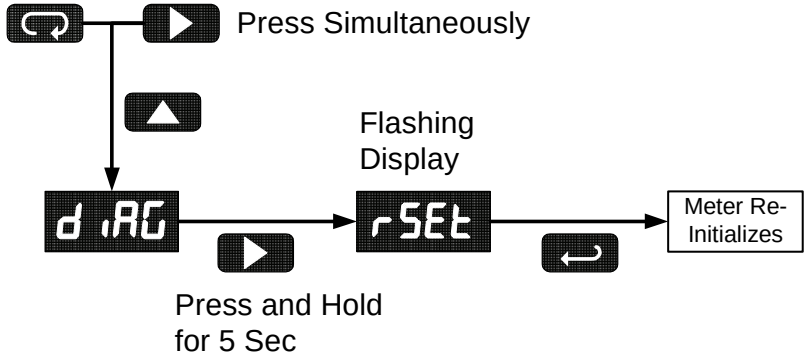
1. Go to the *Diagnostics* menu (diAG) and press **Enter/Ack** button.
2. Press **Up** arrow/**Max** button and scroll to Information menu (InFo).
3. Press **Enter/Ack** to access the software number (SFt), version (UEr). Write down the information as it is displayed. Continue pressing **Enter/Ack** until all the information is displayed.

Reset Meter to Factory Defaults

When the parameters have been changed in a way that is difficult to determine what's happening, it might be better to start the setup process from the factory defaults.

Instructions to load factory defaults:

1. Enter the *Advanced Features Menu*. See *Advanced Features Menu*, page 50.
2. Press **Up** arrow to go to *Diagnostics* menu
3. Press and hold **Right** arrow/Reset for five seconds, press **Enter/Ack** when display flashes rESEt.
   Note: If **Enter/Ack** is not pressed within three seconds, display returns to *Diagnostics* menu.
4. The meter goes through an initialization sequence (same as on power-up), and loads the factory default settings.



Factory Defaults & User Settings

The following table shows the factory setting for most of the programmable parameters on the meter. Next to the factory setting, the user may record the new setting for the particular application. MeterView® software allows the saving of all meter parameters to a file for restoring meter settings, reporting, and copying settings to other meters.

Model: _____ S/N: _____ Date: _____

Parameter	Display	Default Setting	User Setting
Input type	inPt	4-20 mA	
Decimal point	dddd	2 places	
Programming	ProG		
Input 1	inP 1	4.00 mA	
Display 1	d iS 1	4.00	
Input 2	inP2	20.00 mA	
Display 2	d iS2	20.00	
Relay 1	rLY 1		
Action 1	Act 1	Automatic	
Set 1	SEt 1	7.00	
Reset 1	rSt 1	6.00	
Relay 2	rLY2		
Action 2	Act2	Automatic	
Set 2	SEt2	10.00	
Reset 2	rSt2	9.00	
Fail-safe	FLSF		
Fail-safe 1	FLS 1	Off	
Fail-safe 2	FLS2	Off	
Time delay	dLAY		
On delay 1	On 1	0 sec	
Off delay 1	OFF 1	0 sec	

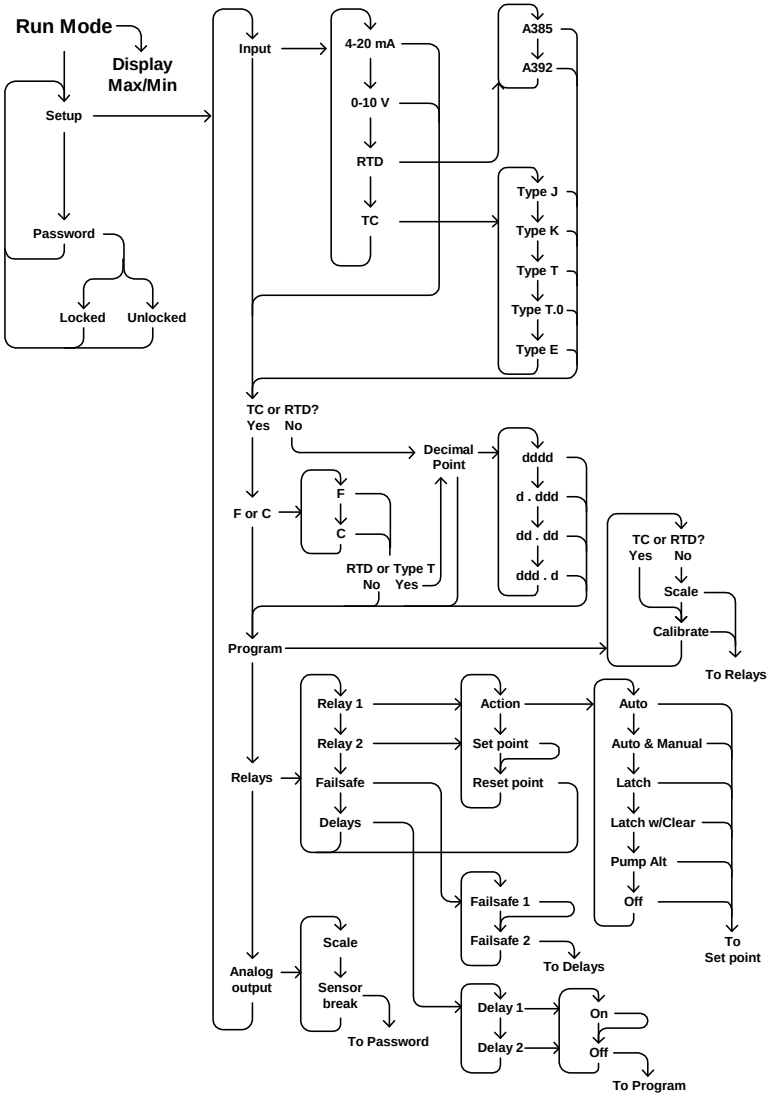
Parameter	Display	Default Setting	User Setting
On delay 2	On2	0 sec	
Off delay 2	OFF2	0 sec	
Break 1	brH1	Off	
Break 2	brH2	Off	
Password	PASS	0000 (unlocked)	
Advanced Features	N/A		
Adjust	AdJ	0.0° (temp only)	
Filter	FLtr	10	
Bypass	bYPS	0.2	
Serial settings	SErL		
Protocol	PdC	PDC protocol	
Address	Addr	00	
Baud rate	bAud	2400	
Trans delay	trdE	10 ms	
Function	Func	Linear	
Cutoff value	CutF	0.00 (disabled)	
Output option	out/Aout	Factory set only	
Display intensity	inty	Level 8	
Modbus defaults	N/A		
Address	Addr	247	
Parity	PrtY	Even	
Byte-to-byte timeout*	tbYt	0.01 sec	

**Note:*
The byte-to-byte timeout setting might be updated automatically depending on the baud rate selected and the previous timeout setting. The minimum timeout allowed is saved to memory if a lower value is entered (e.g. If user enters 0.00 with a baud rate of 300, 0.06 is saved).

Troubleshooting Tips

Symptom	Check/Action
No display at all	Check power at power connector
Not able to change setup or programming, LoCd is displayed	Meter is locked, enter correct four-digit password to unlock
Meter displays error message during calibration (Err)	Check: 1. Signal connections 2. Input selected in *Setup* menu 3. Minimum input span requirements
Meter displays • oPEn • 9999 • -1999 • Displays negative number, not responding to RTD.	Check: 1. Input selected in *Setup* menu 2. TC/RTD Switch position 3. Corresponding signal at Signal connector
Display alternates between 1. Hi and a number 2. Lo and a number	Press **Menu** to exit Max/Min display readings.
Display response is too slow	Check filter and bypass values
Inaccurate temperature reading	Check: 1. Temperature units (°F or °C) 2. TC type or RTD curve selected 3. Offset adjustment 4. TC wire used 5. Calibration
If the display locks up or the meter does not respond at all	Cycle the power to restart the microprocessor.
Relay operation is reversed	Check: 1. Fail-safe in *Setup* menu 2. Wiring of relay contacts
Relay and status LED do not respond to signal	Check: 1. Relay action in *Setup* menu 2. Set and reset points
Meter not communicating with MeterView® or other programs	Check: 1. Serial adapter and cable 2. Serial protocol selected 3. Meter address and baud rate 4. MeterView address and baud rate
Other symptoms not described above	Call Technical Support for assistance.

QUICK INTERFACE REFERENCE GUIDE



Pushbutton	**Function**
Menu	Go to Programming Mode or leave Programming, Advanced Features, and Max/Min Modes.
Right Arrow	Move to next digit.
Up Arrow	Move to next selection or increment digit.
Enter/Ack	Accept selection/value and move to next selection.

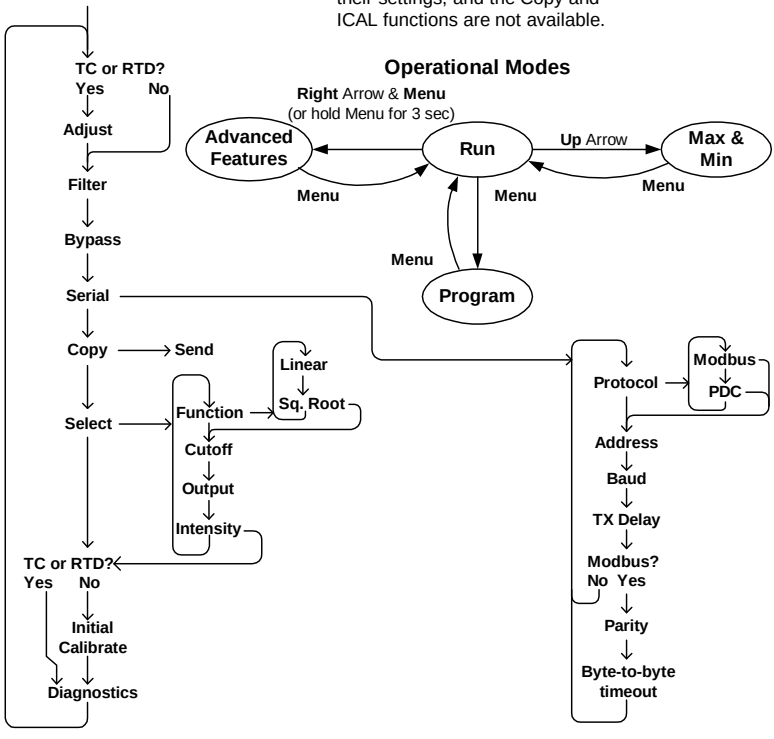
Right Arrow & **Menu** simultaneously enters Advanced Features

Max/Min Mode

While in Run Mode, pressing **Up** Arrow will initiate Max/Min Mode. **Up** Arrow toggles between Max & Min displays, and **Right** Arrow resets the Max/Min to the current value. Press **Menu** or wait 10 seconds to return to Run Mode. Pressing **Enter/Ack** will disable the 10 second timeout and continuously display Max or Min.

Press **Right** arrow and **Menu** to access Advanced Features Menu

When the meter is locked, Adjust, Filter and Bypass can only display their settings, and the Copy and ICAL functions are not available.



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EU DECLARATION OF CONFORMITY

Issued in accordance with ISO/IEC 17050-1:2004.

We,

Precision Digital Corporation
233 South Street
Hopkinton, MA 01748 USA

as the manufacturer, declare under our sole responsibility that the product(s),

Model PD765 Trident Process and Temperature Meter

to which this declaration relates, is in conformity with the European Union Directives shown below:

2014/35/EU	**Low Voltage Directive**
2014/30/EU	**EMC Directive**
2011/65/EU	**RoHS Directive**

This conformity is based on compliance with the application of harmonized or applicable technical standards and, when applicable or required, a European Union notified body certification.

Standards:

EN 55011:1998
EN 61000-6-2:2001
EN 61010-1:1995
EN 61326:2006

The standards EN 55011:1998, EN 61000-6-2:2001, EN 61010-1:1995, and EN 61326:2006 are no longer harmonized. The requirements of these standards have been checked against the harmonized standards EN 55011:2009+A1:2010, EN 61000-6-2:2005, EN 61010-1:2010, and EN 61326:2013 and there were no major technical changes affecting the latest technical knowledge for the products listed above.

Product Markings: CE

Signed for and on behalf of Precision Digital Corporation:

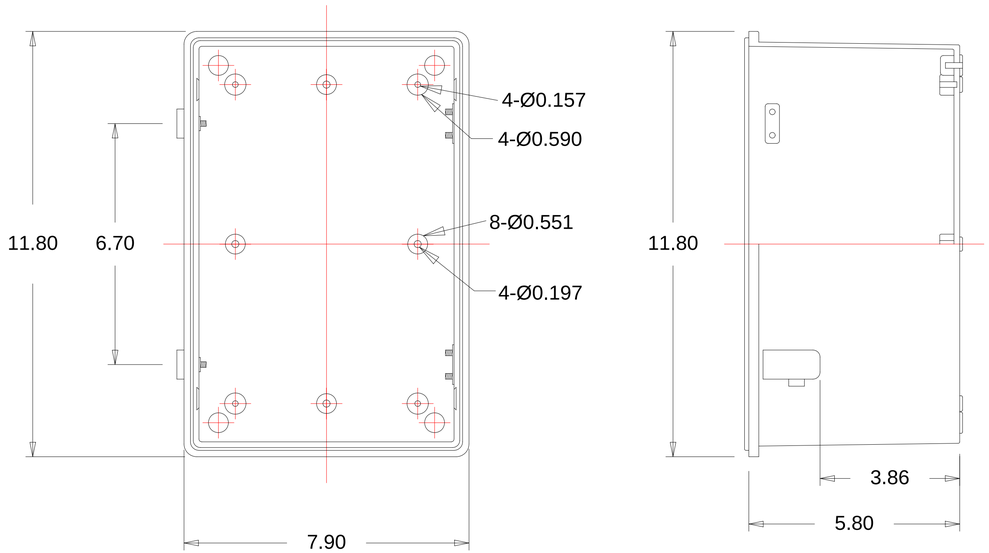
Name: Jeffrey Peters
Company: Precision Digital Corporation
Title: President
Date: 04/20/2016

Document No: DoC PD765 {042016}

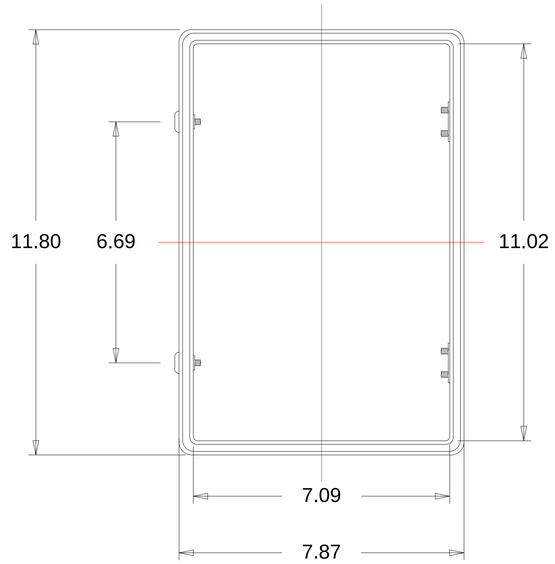
How to Contact Precision Digital

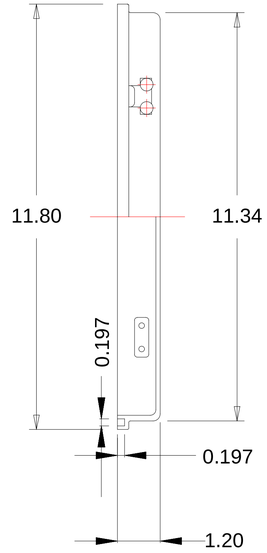
- For Technical Support please
  Call: (800) 610-5239 or (508) 655-7300
  Fax: (508) 655-8990
  Email: support@predig.com
- For Sales Support or to place an order please
  Call: (800) 343-1001 or (508) 655-7300
  Fax: (508) 655-8990
  Email: sales@predig.com
- For the latest version of this manual please visit **www.predig.com**
- For an *Interactive Virtual Meter Demo* please visit **tvm.predig.com**

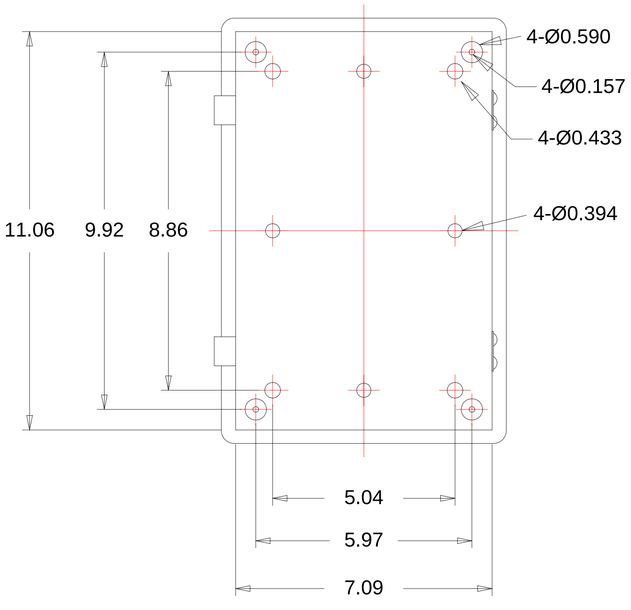
BODY



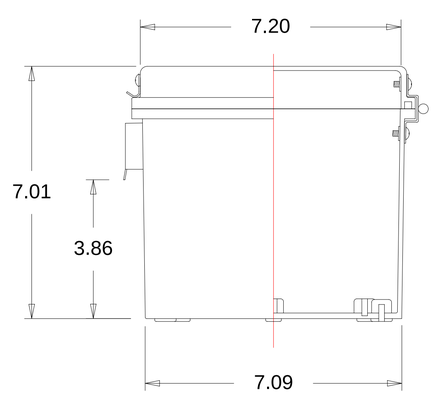
COVER

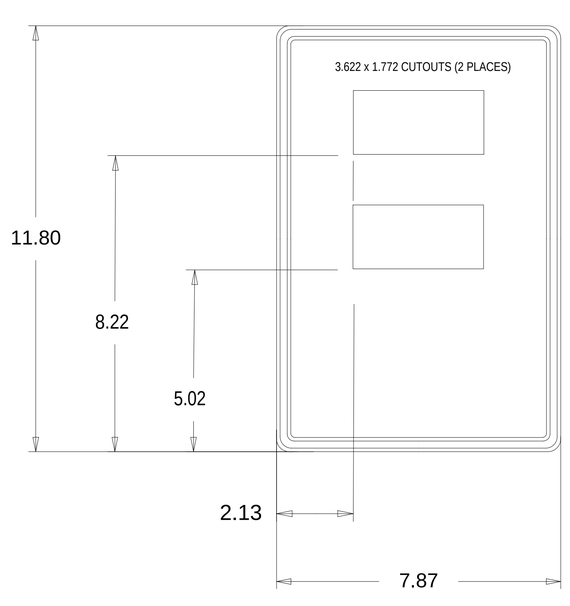






BOTTOM VIEW





CUTOUT VIEW

NOTE: ALL DIMENSIONS SHOWN ARE IN INCHES.

PRECISION DIGITAL CORPORATION
HOLLISTON, MASSACHUSETTS 01746

DRAWN
V. Ciampolillo
05/29/09

PDA2302 ENCLOSURE
CAD DRAWING FILE

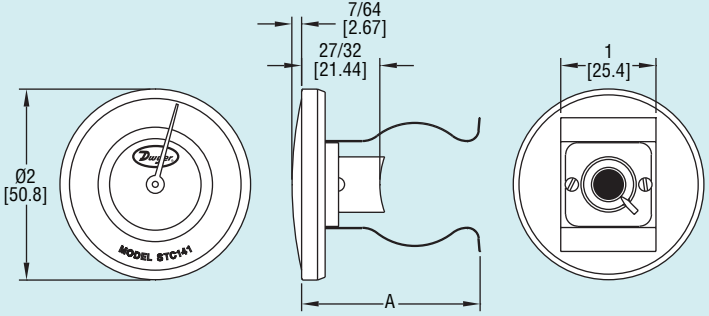
SCALE 1:2 | SIZE D (34 x 22) | SHEET 1 OF 1

Series
STC

Pipe-Mount Bimetal Surface Thermometer

Fits Pipe Sizes from 3/4″ to 2-3/8″, Clip-on Mount

Clip Size	Dim. A
3/4 to 7/8	1-5/8 [41.28]
1 to 1-5/8	1-7/8 [47.63]
1-5/8 to 2-3/8	2-1/2 [63.5]



Scan here to watch product video

The Series STC Pipe-Mount Bimetal Surface Thermometers are designed to accurately measure the surface temperature of 3/4″ to 2-3/8″ pipe sizes. The STC series is available in three different clip sizes and feature a bimetal spiral spring sensing element that provides quick temperature readings. Pipe mount thermometers are perfect for temporary installations and applications that require non-intrusive temperature measurements.

Model	Range	Pipe Size
STC151	-50 to 250°F	3/4″ to 7/8″
STC141	0 to 150°F	3/4″ to 7/8″
STC161	70 to 370°F	3/4″ to 7/8″
STC152	-40 to 120°C	3/4″ to 7/8″
STC162	20 to 180°C	3/4″ to 7/8″
STC172	20 to 260°C	3/4″ to 7/8″
STC351	-50 to 250°F	1″ to 1-5/8″
STC341	0 to 150°F	1″ to 1-5/8″
STC361	70 to 370°F	1″ to 1-5/8″
STC371	70 to 500°F	1″ to 1-5/8″
STC372	20 to 260°C	1″ to 1-5/8″
STC451	-50 to 250°F	1-5/8″ to 2-3/8″
STC441	0 to 150°F	1-5/8″ to 2-3/8″
STC461	70 to 370°F	1-5/8″ to 2-3/8″
STC462	20 to 180°C	1-5/8″ to 2-3/8″
STC472	20 to 260°C	1-5/8″ to 2-3/8″

SPECIFICATIONS

Housing Material: Steel.
Lens: Glass.
Accuracy: ±2%.
Resolution: Less than 4% of scale.
Temperature Limits: Ambient: 14 to 302°F (-10 to 150°C).
Dial Size: 2″.
Mounting: Clip.
Weight: 3.4 oz (95 g).

TURE