Model Q40CT

Conductivity Measurement System

(Toroid Sensor, Blind, 2-Wire)

Home Office
Analytical Technology, Inc.
6 Iron Bridge Drive
Park
Collegeville, PA 19426

Ph: 800-959-0299
610-917-0991
Fax: 610-917-0992
Email: sales@analyticaltechnology.com

European Office
ATI (UK) Limited
Unit 1 & 2 Gatehead Business

Delph New Road, Delph
Saddleworth OL3 5DE
Ph: +44 (0)1457-873-318

Fax: + 44 (0)1457-874-468
Email:sales@atiuk.com

PRODUCT WARRANTY

Analytical Technology, Inc. (Manufacturer) warrants to the Customer that if any part(s) of the Manufacturer's equipment proves to be defective in materials or workmanship within the earlier of 18 months of the date of shipment or 12 months of the date of start-up, such defective parts will be repaired or replaced free of charge. Inspection and repairs to products thought to be defective within the warranty period will be completed at the Manufacturer's facilities in Collegeville, PA. Products on which warranty repairs are required shall be shipped freight prepaid to the Manufacturer. The product(s) will be returned freight prepaid and allowed if it is determined by the manufacturer that the part(s) failed due to defective materials or workmanship.

This warranty does not cover consumable items, batteries, or wear items subject to periodic replacement including lamps and fuses.

Gas sensors carry a 12 months from date of shipment warranty and are subject to inspection for evidence of misuse, abuse, alteration, improper storage, or extended exposure to excessive gas concentrations. Should inspection indicate that sensors have failed due to any of the above, the warranty shall not apply.

The Manufacturer assumes no liability for consequential damages of any kind, and the buyer by acceptance of this equipment will assume all liability for the consequences of its use or misuse by the Customer, his employees, or others. A defect within the meaning of this warranty is any part of any piece of a Manufacturer's product which shall, when such part is capable of being renewed, repaired, or replaced, operate to condemn such piece of equipment.

This warranty is in lieu of all other warranties (including without limiting the generality of the foregoing warranties of merchantability and fitness for a particular purpose), guarantees, obligations or liabilities expressed or implied by the Manufacturer or its representatives and by statute or rule of law.

This warranty is void if the Manufacturer's product(s) has been subject to misuse or abuse, or has not been operated or stored in accordance with instructions, or if the serial number has been removed.

Analytical Technology, Inc. makes no other warranty expressed or implied except as stated above.

Table of Contents

Part 1 - Introduction 5
1.1 General 5
1.2 Features 5
1.3 Q40CT System Specs. 6
1.4 Q40CT Performance Specs.7
Part 2 – Analyzer Mounting 7
2.1 General 8
2.2 Wall or Pipe Mount 10
Part 3 – Sensor Mounting..............12
3.1 General 12
3.2 Tee Mounting 13
3.3 Submersion Mounting 14
3.4 In-Line Installation 15
Part 4 – Electrical Installation 17
4.1 General 17
4.2 Two-Wire 17
4.3 Load Drive 19
4.4 Sensor Wiring....................19
4.5 Direct Sensor Connection..20
4.6 Sensor Junction Box 20
Part 5 – Calibration........................22
5.1 General 22
5.2 User Interface....................22
5.3 Offset Adjustment..............22
5.4 Coarse Span Adjustment ..23
5.5 Fine Span Adjustment 23
5.6 Range Selection 23
5.7 Temperature Compensation Adjustment..........................24
5.8 REV/DIR Switch 24
5.9 Loop Current 24
5.10 Cell Drive...........................24
5.11 Conductivity Calibration.....25
5.12 Reverse Operation 27
Part 6 – System Maintenance....... 28
6.1 General............................. 28
6.2 Transmitter Maintenance .. 28
6.3 Sensor Maintenance......... 28
Part 7 – Service 29
7.1 General............................. 29
7.2 External Sources of Problems............................ 29
7.3 Transmitter Tests.............. 30
7.4 Sensor Tests..................... 30
Spare Parts.................................. 32

Table of Figures

Figure 1 - Q40CT Enclosure Dimensions 9
Figure 2 - Wall or Pipe Mounting Bracket 10
Figure 3 - Wall Mount Diagram 11
Figure 4 - Pipe Mount Diagram 11
Figure 5 - Toroidal Sensor Dimensional 12
Figure 6 - Flow Tee Diagram 13
Figure 7 - Q40CT Submersible Mounting Diagram 14
Figure 8 - In-Line Process Piping Diagram 15
Figure 9 - Flow Tee (Exploded View) 16
Figure 10 - Loop Power Wiring Diagram 18
Figure 11 - Direct Sensor Connection 20
Figure 12 - Junction Box Wiring Diagram 21
Figure 13 - Sensor PCB Layout 22
Figure 14 - PT1000 RTD Table 31

Part 1 - Introduction

1.1 General

The Model Q40CT is a blind, loop-powered monitoring system, designed for the continuous measurement of solution conductivity. The full scale operating range of the transmitter may be user adjusted to any value between 500 uS and 1,000,000 uS using the same sensor. The sensing system will operate on water streams with temperatures from -5°C to 110°C.

1.2 Features

- Special toroidal sensor design greatly minimizes sensor fouling and, therefore, reduces maintenance requirements.
- Standard main module is designed to be a fully isolated, loop powered instrument for 2-wire DC applications.
- Can be user-adjusted for specific application span from 500 uS to 1,000,000 uS using the same sensor.
- Direct/Reverse operation allows 4-20 mA output direction to be flipped.
- Adjustable temperature compensation from 0% to 4% per °C to match solution requirements.
- Loop indicator LED glows to indicate loop current level.
- Instrument supplied in rugged NEMA 4X enclosure with multi-purpose mounting bracket.

1.3 Q40CT System Specs.

Measuring Range	Manual selection of one of the following ranges, 500 to 2,500 uS/cm 2,500 to 15,000 uS/cm 15,000 to 100,000 uS/cm 100,000 to 1,000,000 uS/cm
Enclosure	NEMA 4X, IP66, polycarbonate, stainless steel hardware, weatherproof and corrosion resistant, HWD: 4.4" (112 mm) x 4.4" (112 mm) x 3.5" (89 mm)
Mounting Options	Wall or pipe mount.
Conduit Openings	Standard: 2 - PG-9 openings, 1 - 1" NPT center opening, cordgrips and plug included.
Weight	1 lb. (0.45 kg)
Ambient Temperature	Transmitter Service, -20 to 60 °C (-4 to 140 ºF) Sensor Service, -5 to 110°C (23 to 230 °F)** Storage, -30 to 70 °C (-22 to 158 ºF)
Ambient Humidity	0 to 95%, non-condensing
Altitude	Up to 2000 m (6562 Ft.)
Location	Designed for hazardous and non-hazardous areas
EMI/RFI Influence	Designed to EN 61326-1
Output Isolation	Inherently isolated by sensor design
Temperature Input	Pt1000 RTD with automatic compensation, compensation adjustable from 0.0 to 4.0%/°C.
Sensor	Toroidal electrode Noryl sensor, 150 psig max, ¾" NPT rear process connection, P1000 RTD, 20 feet CPVC integral cable.
Max. Sensor-to-Transmitter	200 feet (61 meters)
Distance **Power**	16-35 VDC
DC Cable Type	Belden twisted-pair, shielded, Maximum length 3000 ft (914 meters)

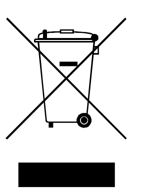
Q25CT Conductivity sensor

Sensor	Toroidal sensor with encapsulated temperature element.
Measuring Range	0.000 to 2.000 S/cm
Temperature Element	Pt1000 RTD
Wetted Materials	Noryl
Optional Flow Tee	Special 2” CPVC tee with alignment slot
Sensor Cable	20 ft. (6 m.) standard.
Pressure Range	0-150 PSIG
Temperature Range	0-105° C
Maximum Flow Rate	10 feet (3 meters) per second
Max. Sensor-Analyzer Distance	200 feet (60 m.)

**** Note – sensor cable limited to 105°C max temperature when dry and 70°C max temperature if submerged.**

1.4 Q40CT Performance Specs.

Repeatability	0.2% of selected range
Sensitivity	0.1% of selected range
Non-linearity	0.5% of selected range
Stability	0.2% of range per 24 hours, non-cumulative
Temperature Drift	0.06% of range/°C, span or zero
Response Time	2 seconds to 90% of full-scale step input



Equipment bearing this marking may not be discarded by traditional methods in the European community after August 12 2005 per EU Directive 2002/96/EC. End users must return old equipment to the manufacturer for proper disposal

Part 2 – Analyzer Mounting

2.1 General

All Q40CT Series instruments offer maximum mounting flexibility. A Bracket is included with each unit that allows mounting to walls or pipes. In All cases, choose a location that is readily accessible for calibrations. Also consider that it may be necessary to utilize a location where solutions can be used during the calibration process.

Locate the instrument in close proximity to the point of sensor installation - this will allow easy access during calibration. The sensor-to-instrument distance should not exceed 200 feet. To maximize signal-to-noise ratio however, work with the shortest sensor cable possible. The standard cable length of the sensor is 15 feet (4.6 meters).

Refer to Figures 3 and 4 for mounting diagrams for each option.

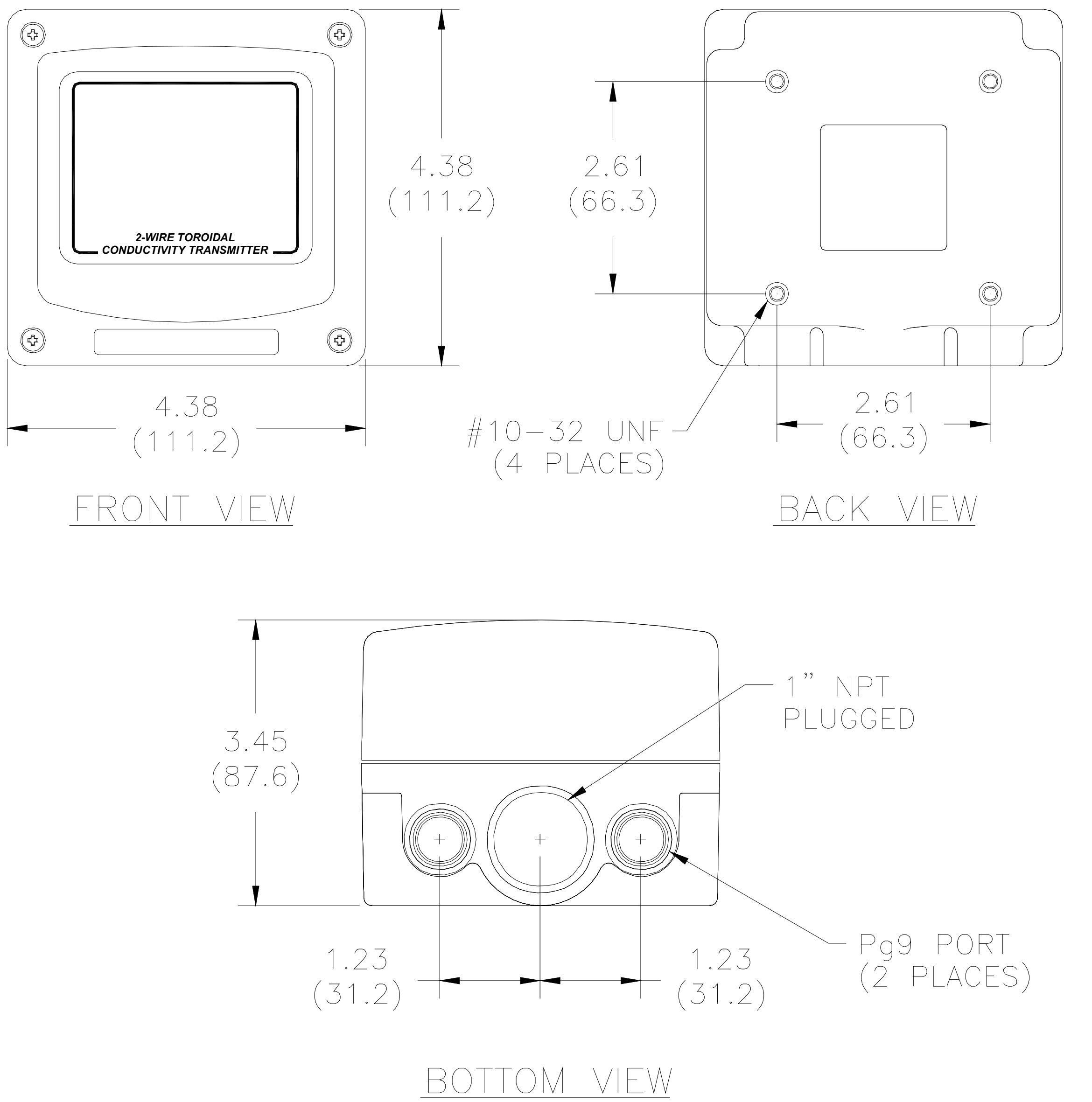


Figure 1 - Q40CT Enclosure Dimensions

2.2 Wall or Pipe Mount

A PVC mounting bracket with attachment screws is supplied with each transmitter. The multi-purpose bracket is attached to the rear of the enclosure using the four flat head screws. The instrument is then attached to the wall using the four outer mounting holes in the bracket. These holes are slotted to accommodate two sizes of u-bolt that may be used to pipe mount the unit. Slots will accommodate u-bolts designed for 1½" or 2" pipe. The actual center to center dimensions for the u-bolts are shown in the drawing. Note that these slots are for u-bolts with ¼-20 threads. The 1½" pipe u-bolt (2" I.D. clearance) is available from ATI in type 304 stainless steel under part number (47-0005).

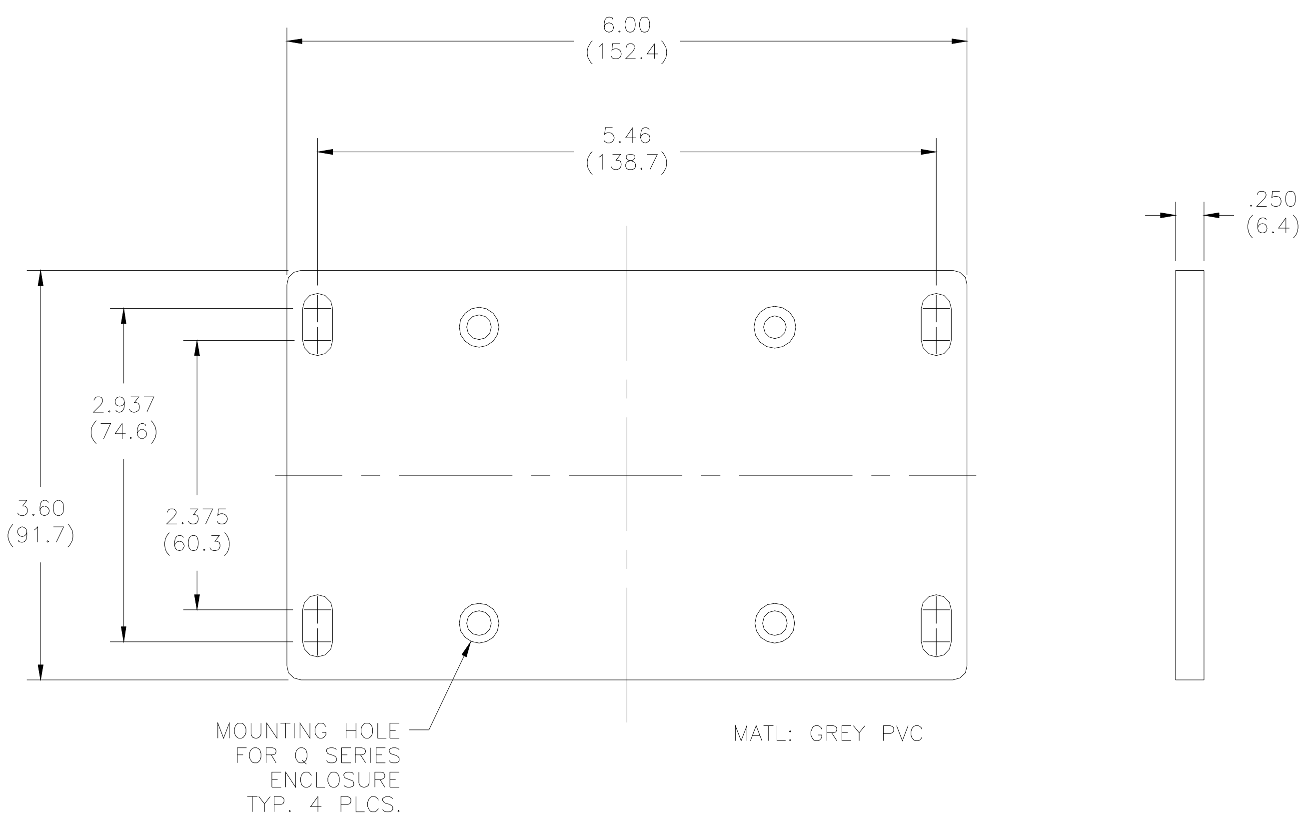


Figure 2 - Wall or Pipe Mounting Bracket

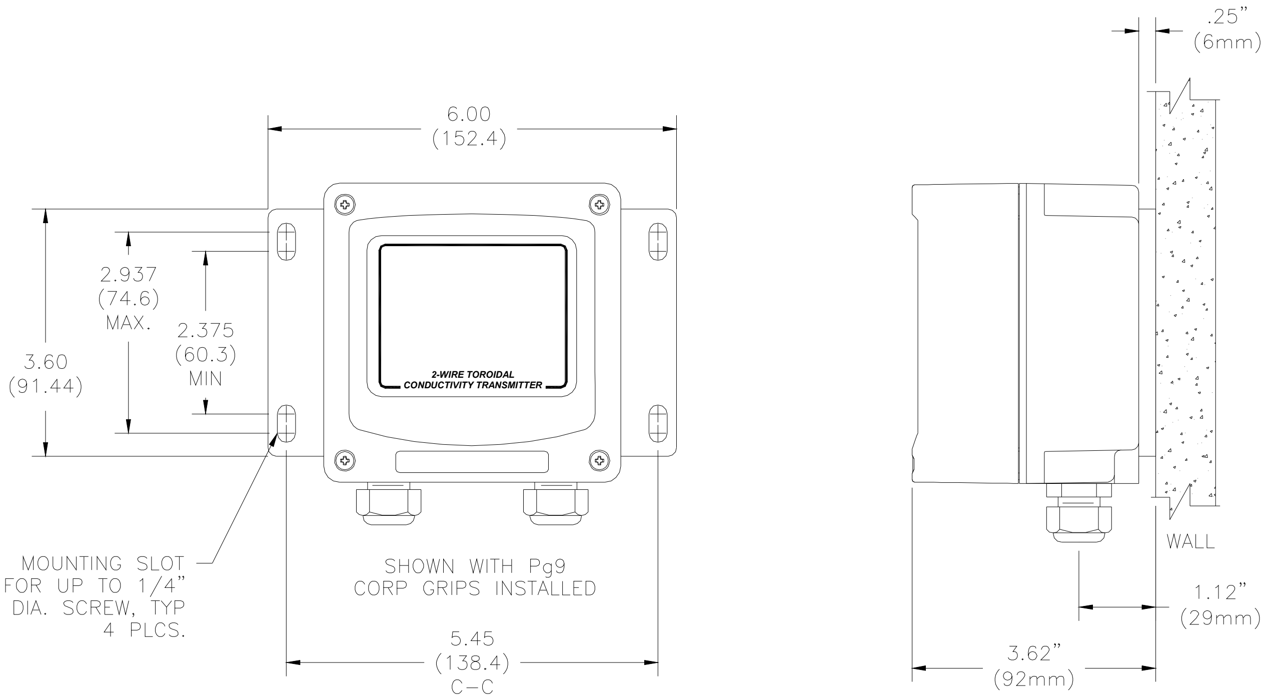


Figure 3 - Wall Mount Diagram

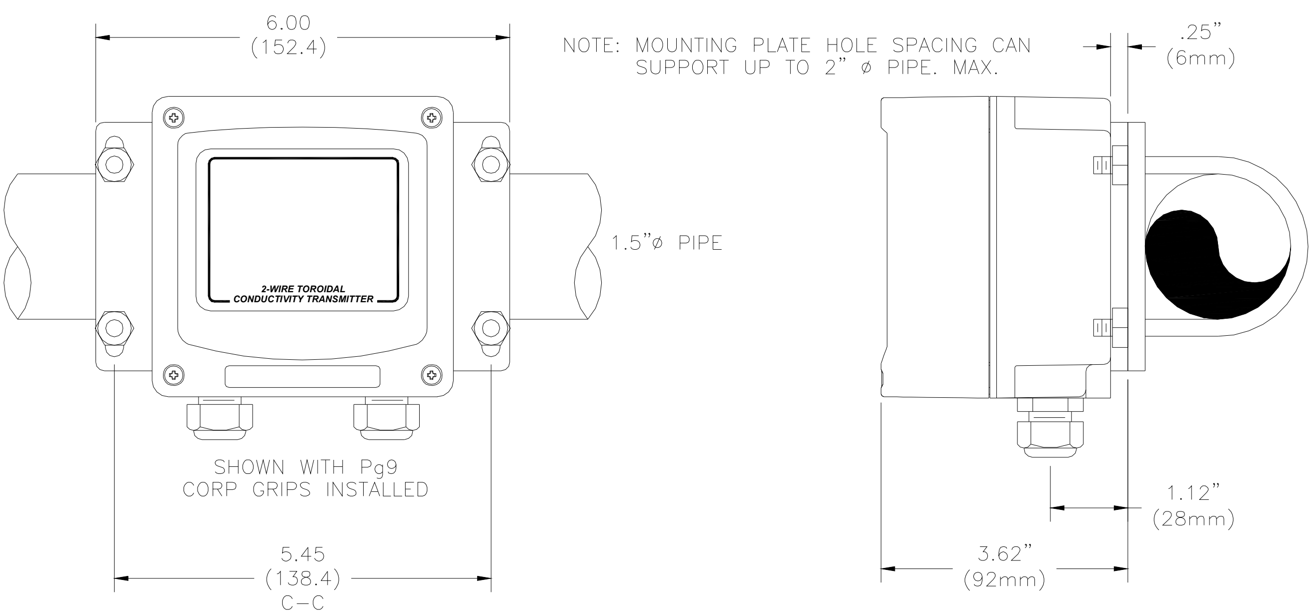


Figure 4 - Pipe Mount Diagram

Part 3 – Sensor Mounting

3.1 General

The Q25CT Conductivity Sensor is designed for industrial and municipal process applications. Mounting options include flow-through or submersion. The sensor-to-analyzer distance must not exceed 200 feet (60 m.).

In submersion applications, there must be a minimum of 2" clearance around and below the toroidal sensor. Placing the sensor close to wall or other objects will result in a loss of accuracy.

Calibrate the sensor before placing it into the process. See **Part 6** of this manual for detailed calibration instructions.

Error! Reference source not found.5 below shows the dimensions of the toroidal sensor.

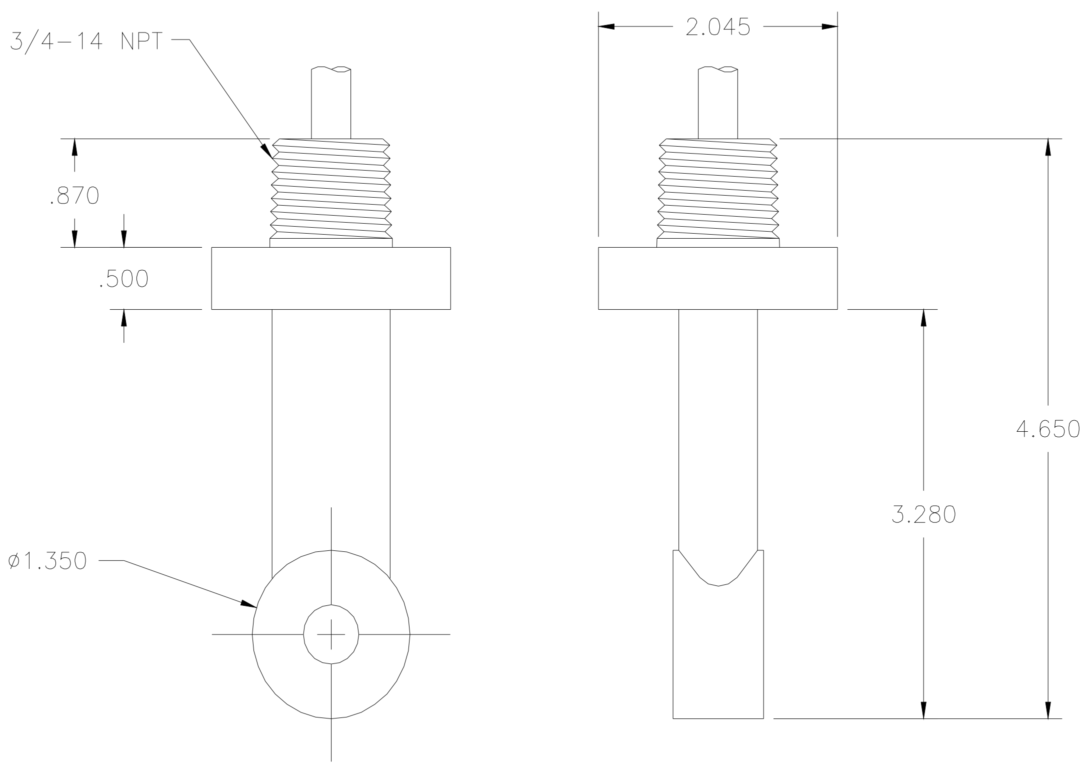


Figure 5 - Toroidal Sensor Dimensional

3.2 Tee Mounting

The toroidal sensors are mounted in a 2" pipe using an optional pipe adapter. The tee fitting is keyed so the sensor is oriented in the process as shown in **Error! Reference source not found.**6, below. The sensor bore opening should be aligned so that flow passes directly through the open sensor bore. A positioning notch is located on the upper sensor collar to aid in this alignment. This orientation is used to ensure a representative sample is being measured and to keep the sensor bore clean.

Note that sensor must be zero-calibrated before final mounting in tee.

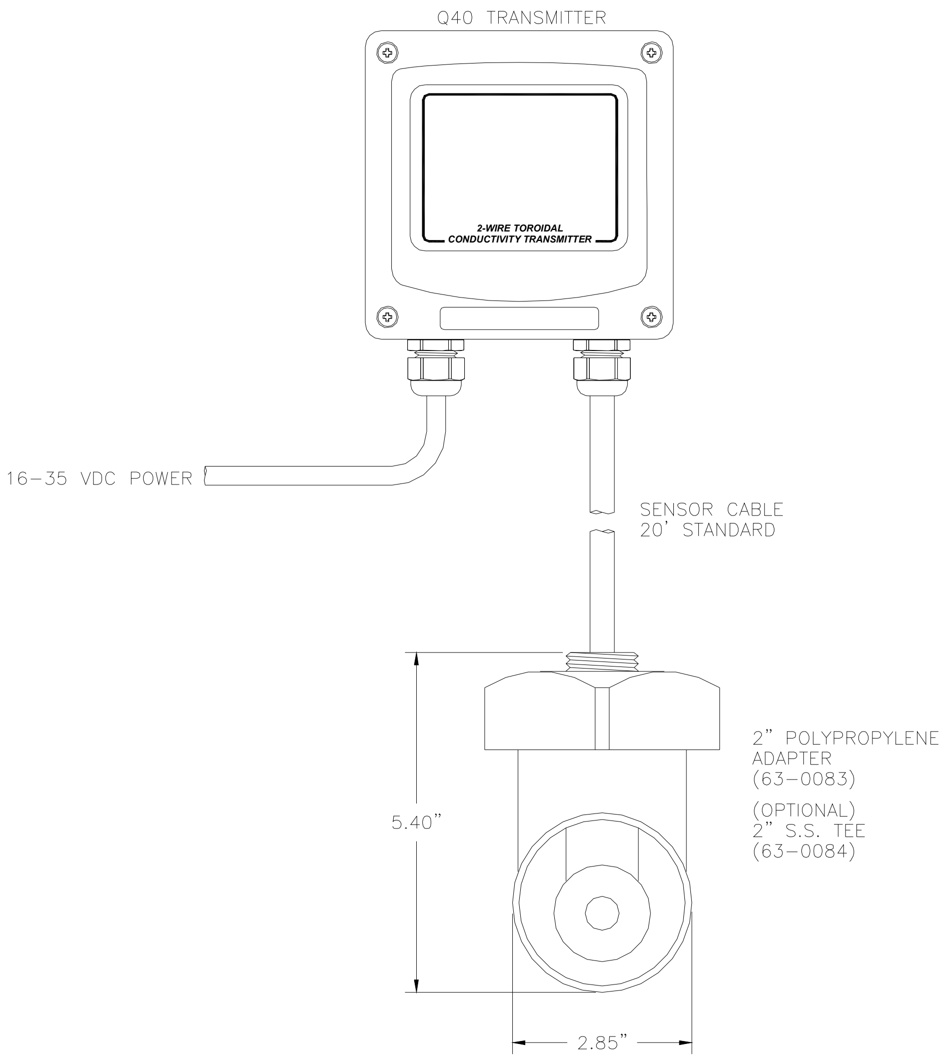


Figure 6 - Flow Tee Diagram

3.3 Submersion Mounting

When using this conductivity sensor for submersion applications, mount the sensor to the end of a 1" mounting pipe using a 1" coupling. ATI's (00-0628) mounting assembly shown in 11 is available for submersible applications. This assembly is designed to mount to standard handrails and facilitates insertion and removal of the sensor.

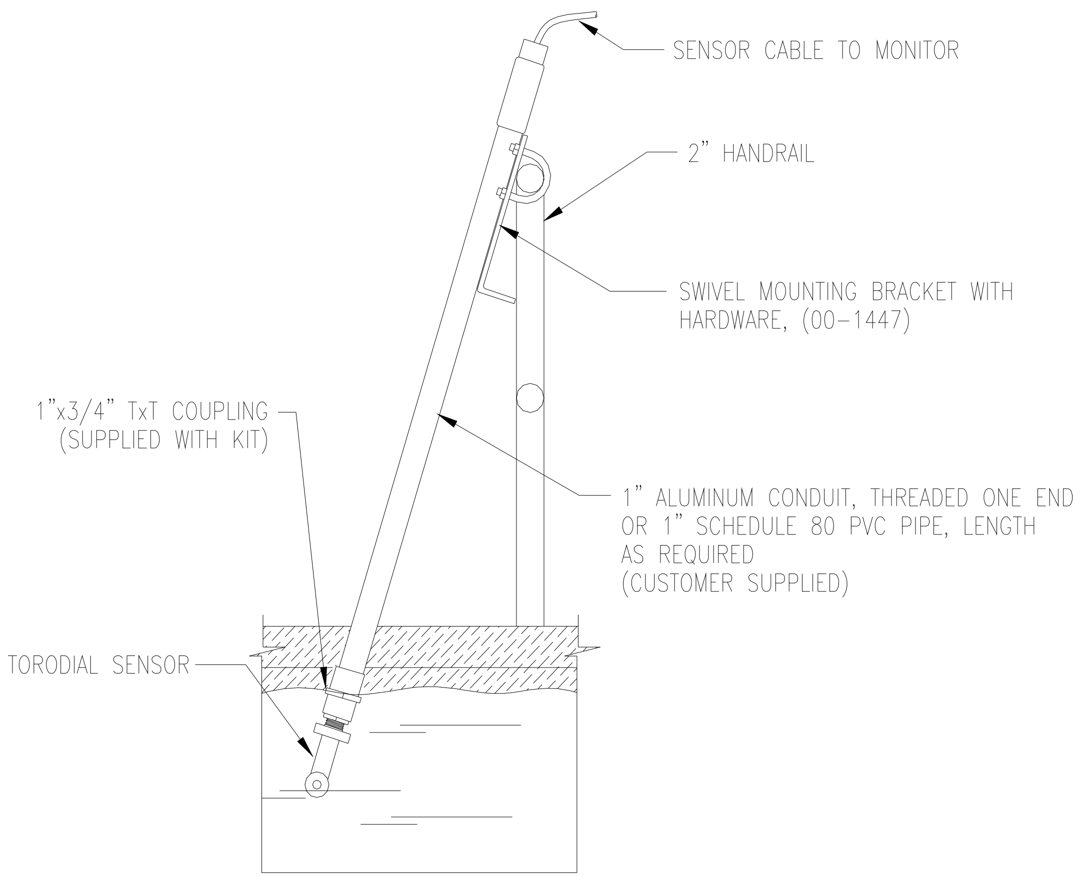


Figure 7 - Q40CT Submersible Mounting Diagram

3.4 In-Line Installation

Toroidal Conductivity sensors may be installed directly into a flowing pipe system provided that the water does not contain a lot of entrained air. A 2” flow tee assembly is available for this purpose. It is best to install the sensor in a vertical pipe section with water flowing upward. This assures that air pockets cannot develop at the sensor. If installed in a horizontal run of pipe, place the sensor at the 3 or 9 o’clock position. Never mount the sensor on the top or bottom of the pipe. It is also good practice to install a bypass system around the sensor for maintenance and calibration purposes.

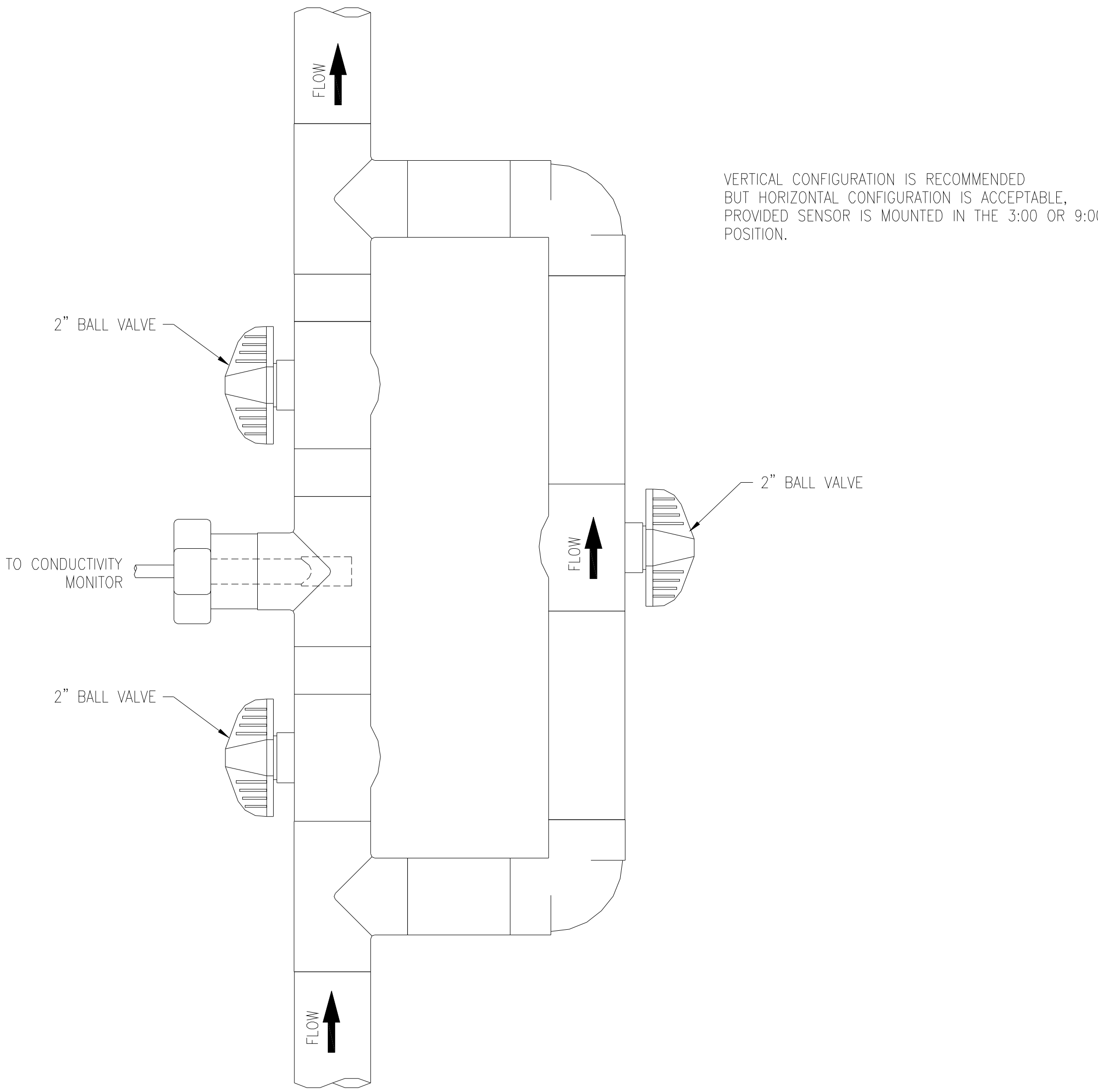


Figure 8 - In-Line Process Piping Diagram

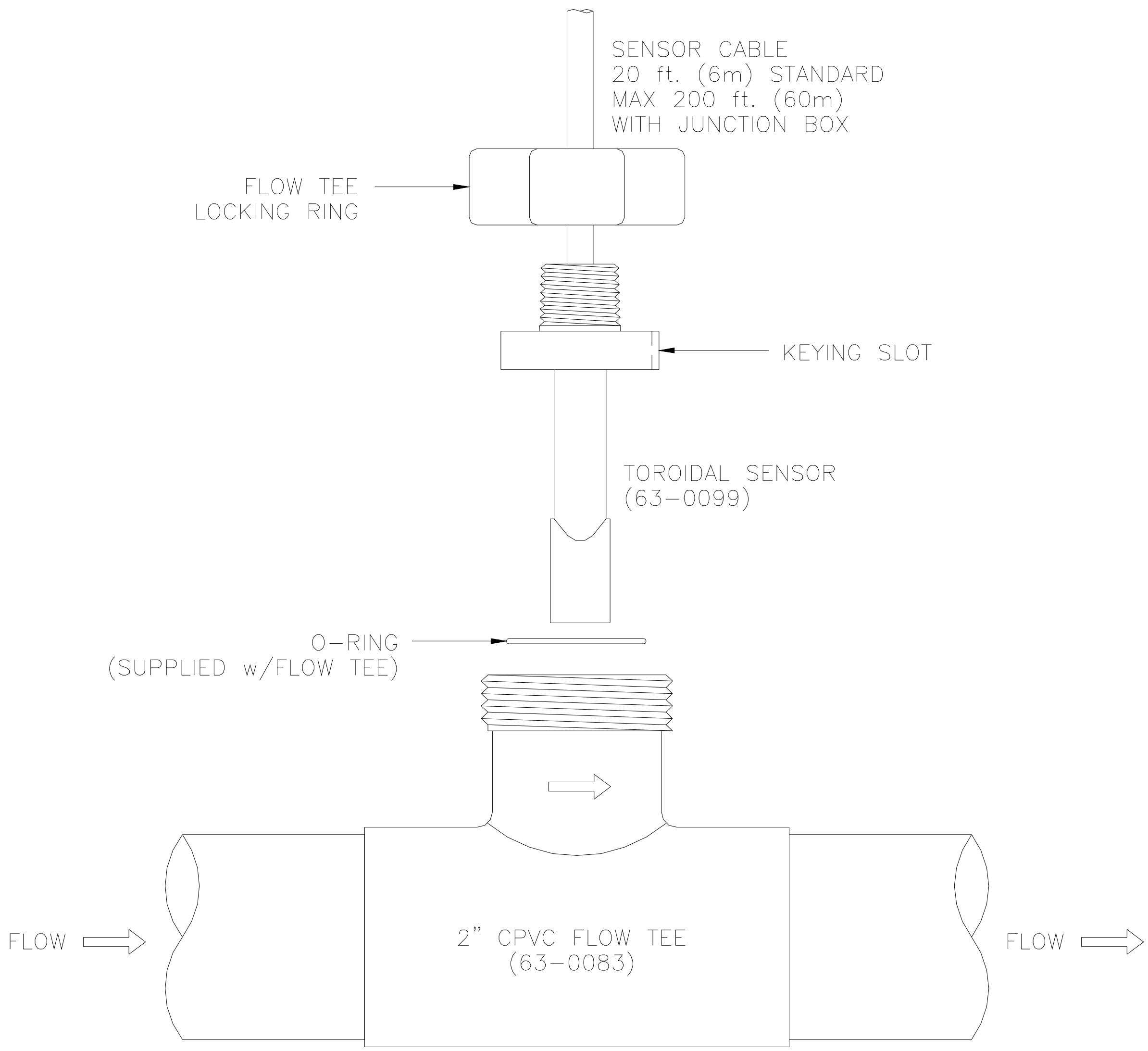


Figure 9 - Flow Tee (Exploded View)

Part 4 – Electrical Installation

4.1 General

The Q40CT loop-powered instrument is a 16-35 VDC powered transmitter.

WARNING: Do not connect AC line power to the 2-wire module. Severe damage will result.

Important Notes:

1. Use wiring practices that conform to all national, state and local electrical codes.
2. Do NOT run sensor cables or instrument 4-20 mA output wiring in the same conduit that contains AC power wiring. AC power wiring should be run in a dedicated conduit to prevent electrical noise from coupling with the instrumentation signals.

4.2 Two-Wire Power

A DC power supply must be used to power the instrument. The exact connection of this power supply is dependent on the control system into which the instrument will connect. See Figure 4-1 for further details. Any general twisted pair shielded cable can be used for connection of the instrument to the power supply. Route signal cable away from AC power lines, adjustable frequency drives, motors, or other noisy electrical signal lines. Do not run sensor or signal cables in conduit that contains AC power lines or motor leads.

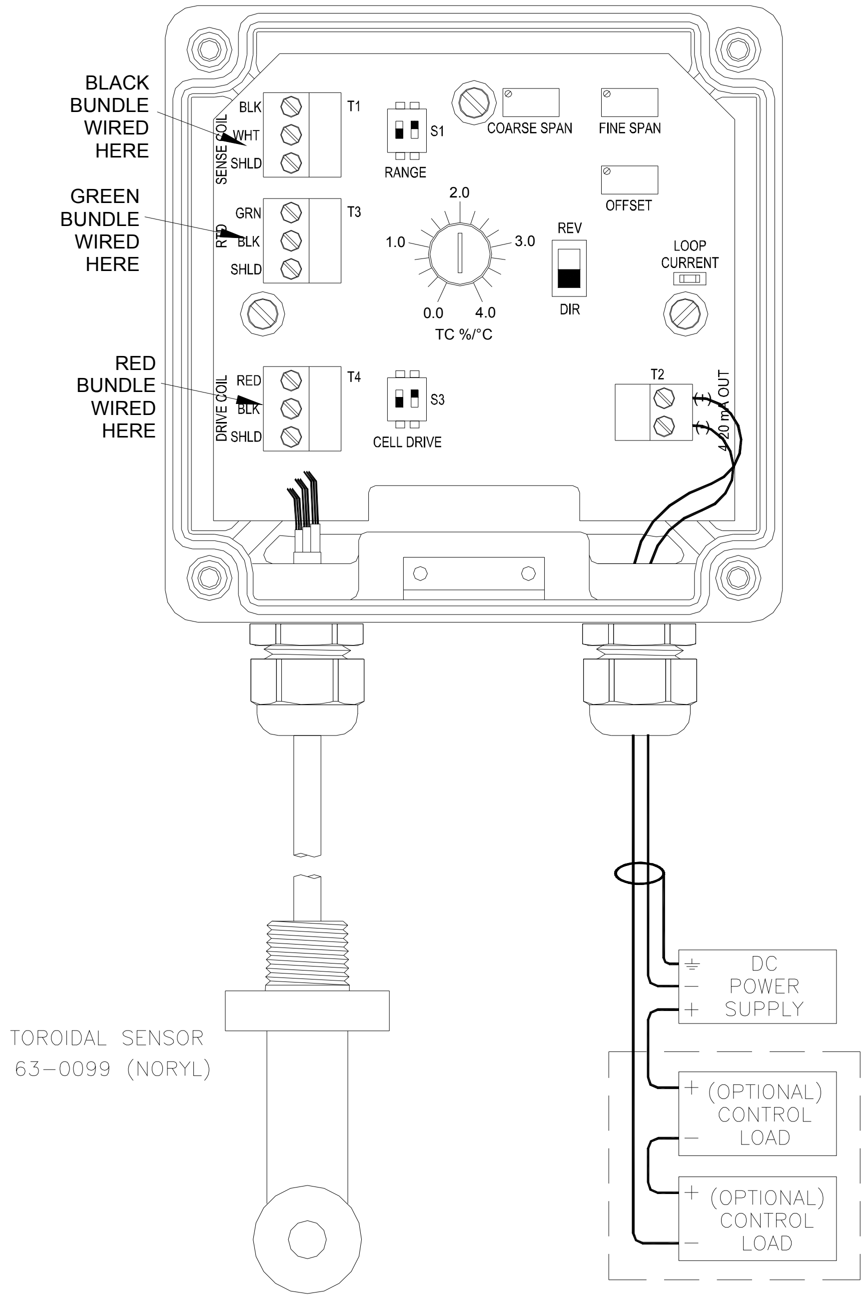


Figure 10 - Loop Power Wiring Diagram

Notes:

1. Voltage between Terminals 10 and 11 MUST be between 18 and 35 VDC.

2. Earth ground into Terminal 13 is HIGHLY recommended. This connection can greatly improve stability in electrically noisy environments.

4.3 Load Drive

The two-wire instrument can operate on a power supply voltage of Between 16 and 35 VDC. The available load drive capability can be calculated by applying the formula V/I=R, where V=load drive voltage, I=maximum loop current (in Amperes), and R=maximum resistance load (in Ohms).

To find the load drive voltage of the two-wire Q40CT, subtract 16 VDC from the actual power supply voltage being used (the 16 VDC represents insertion loss). For example, if a 24 VDC power supply is being used, the load drive voltage is 8 VDC.

The maximum loop current of the two-wire Q45 is always 20.00 mA, or .02 A. Therefore,

$$\frac{\text{(Power Supply Voltage - 16)}}{.02} = R_{MAX}$$

For example, if the power supply voltage is 24 VDC, first subtract 16 VDC, then divide the remainder by .02. 8/.02 = 400; therefore, a 400 Ohm maximum load can be inserted into the loop with a 24 VDC power supply.

Similarly, the following values can be calculated:

Power Supply Voltage (VDC)	Total Load (Ohms)
16.0	0
20.0	200
24.0	400
30.0	700
35.0	950

4.4 Sensor Wiring

The sensor cable can be quickly connected to the Q40CT terminal strip by matching the wire colors on the cable conductors. A junction box is also available to provide a quick-disconnect point for the sensor, or a break point for very long sensor cable runs. Route signal cable away from AC power lines, adjustable frequency drives, motors, or other noisy electrical signal lines. Do not run sensor or signal cables in conduit that contains AC power lines or motor leads.

4.5 Direct Sensor Connection

The sensor cable can be routed into the enclosure through one of the provided cord-grip retainers, or through a properly sized conduit connection. Adapters are available to convert the PG-11 type opening into a 1/2" NPT type opening. If the cord-grip devices are used for sealing the cable, make sure the cord-grips are snugly tightened after electrical connections have been made to prevent moisture incursion. When stripping cables, leave adequate length for connections in the transmitter enclosure, as shown below.

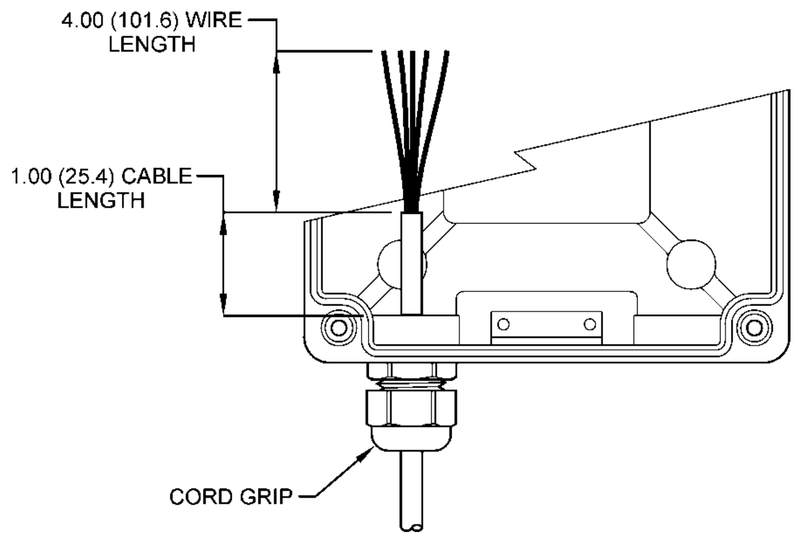


Figure 11 - Direct Sensor Connection

Once inside the enclosure, the individual colored sensor sensor cable leads can be connected directly to the SENSOR connection terminals by matching the wire colors.

4.6 Sensor Junction Box

When sensor separation from the monitor is needed and to be greater Than 20 feet, the sensor junction box is required (07-0100). Wire according to **Error! Reference source not found.** with 3 paired, individually shielded 22 AWG cable (31-0068).

CAUTION: When using a junction box and sensor interconnect cable, the RED SHIELD must be isolated from the WHITE and GREEN SHIELDS. Failure to maintain isolation with the RED SHIELD will result in measurement instability.

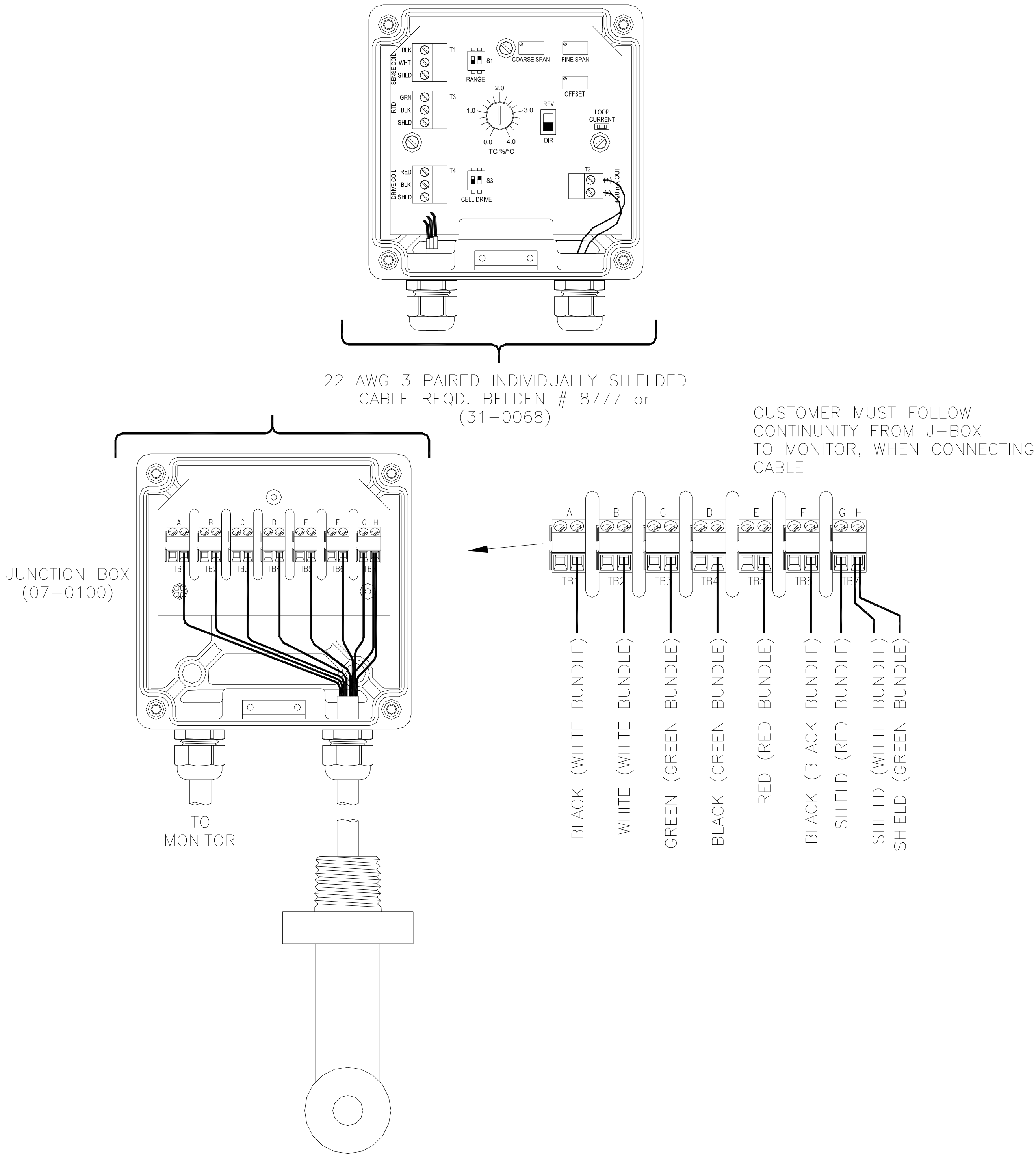


Figure 12 - Junction Box Wiring Diagram

Part 5 – Calibration

5.1 General

The transmitter is factory calibrated in a default range of 0-10,000 uS/cm (0-10 ms). The transmitter must be re-calibrated with the actual sensor for optimum accuracy using the procedures in this section.

5.2 User Controls

The user controls for the transmitter are quite simple, and they are shown below below.

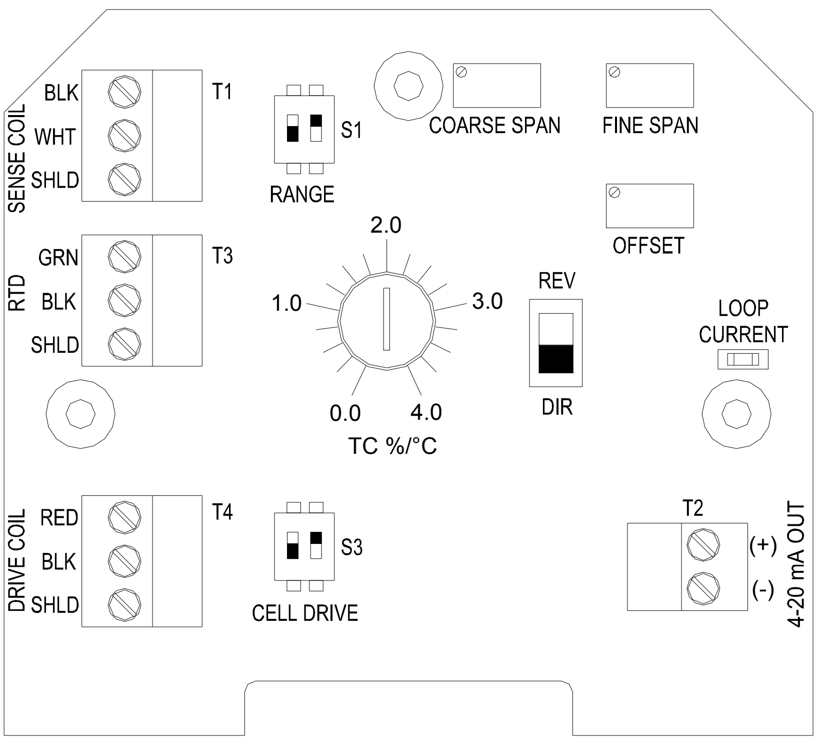


Figure 13 - Sensor PCB Layout

5.3 Range Selection

This dipswitch selects the general range of operation for the transmitter. Pick the range to be larger than the maximum operating conductivity value of the transmitter.

Minimum Span	Maximum Span	Range Switch	Cell Drive Switch
0-500 uS	0-2500 uS	1-ON, 2-ON	1-ON, 2-OFF
0-2500 uS	0-15,000 uS	1-ON, 2-OFF	1-ON, 2-OFF
0-15 mS	0-100 mS	1-OFF, 2-OFF	1-ON, 2-OFF
0-100 mS	0-1000 mS	1-OFF, 2-OFF	1-OFF, 2-ON

Due to the nature of the sensor design, it is recommended to use the largest range possible for the application. The higher instrument ranges are easier to user calibrate, as they require less back-and-forth zero/span adjustments. Note that the minimum sensitivity of the system will be about 0.5% of the selected range. For example, the sensitivity for a 0-2500 uS range is about 13 uS. This sensitivity is also limited at the low end by the fact that the sensor readings below 10 uS are not reliable.

5.4 Offset Adjustment

The offset adjustment sets the 4 mA output current for the system. It is the equivalent of a zero adjustment. This adjustment is made after the proper range has been selected. The offset is adjusted to 4 mA with the sensor held in air.

5.5 Coarse Span Adjustment

The coarse span adjustment sets the initial 20 mA output current point for the system. This adjustment is used to make the initial rough adjustment on the sensor span.

5.6 Fine Span Adjustment

The fine span adjustment sets the final 20 mA output current point for the system. This adjustment is used to make the final, precise, adjustment on the sensor span.

5.7 Temperature Compensation Adjustment

The TC % PER C adjustment sets the specific linear temperature compensation factor for the measured solution. The range of adjustment if from 0-4%/C. Since the majority of aqueous solutions are compensated at approximately 2%/C, leave this setting at the default 2%/C setting if the exact compensation requirement is not known. The following list contains some common factor settings:

1.9	Sodium Hydroxide
1.5	Hydrochloric Acid
1.5	Sulfuric Acid
1.5	Nitric Acid
1.1	Phosphoric Acid
2.1	Sodium Chloride
2.4	Sodium Sulfate
2.2	Sodium Nitrate
2.0	Potassium Chloride

5.8 REV/DIR Switch

This switch sets the direction of output change for the system. In the direct mode (DIR), the output current will increase to 20 mA as the conductivity increases. In the reverse mode (REV), the output current will decrease to 4 mA as conductivity increases.

5.9 Loop Current

This indicator glows when the transmitter is powered and operating correctly. The intensity of the light will increase with increasing output current.

5.10 Cell Drive

This switch sets the sensor drive potential and is used to set the Instrument range of operation (see section 6.24.)

5.11 Conductivity Calibration

This section details the procedure which should be used to change the factory calibration of the transmitter.

The instrument may be calibrated using a reference instrument, using pre-mixed calibration solutions, or by mixing NaCl calibration solutions for the application. In any of these cases, use a calibration solution that is close to the maximum operating level of the process.

To prepare a specific conductivity solution for an application, use the following table to determine the amount of sodium chloride to be added to distilled water.

CONDUCTIVITY REFERENCE SOLUTIONS

Desired Cond.	**NaCl Added (grams)**
2,000 uS	1.01
5,000 uS	2.61
10,000 uS	5.56
20,000 uS	11.59
50,000 uS	31.95
100,000 uS	72.71

Once calibration solution is available, and instrument is properly connected and powered, use the following procedure to complete calibration.

1. Set range switches (RANGE and CELL DRIVE). Switches are set depending on the span for which the transmitter is to be used. Refer to the range table in section 5.3 for settings.

   Note: Due to the nature of the sensor design, it is recommended to use the largest range setting possible for the application when using the 500-2,500 uS range. The higher instrument ranges are easier to user calibrate, as they require less back-and-forth zero/span adjustments. For example, even though the instrument can be calibrated from 0-500 uS over 4-20ma, the instrument calibration will be easier if the span is 0-1000 uS or 0-2000 uS over the 4-20 ma span.

2. Set these initial settings on other controls:

   OFFSET – leave at current position
   COARSE SPAN – FULL CCW
   FINE SPAN – MID SCALE*
   TC %/°C – ADJUST FOR SOLUTION (see 6.25)
   REV/DIR - DIR

   ** Note- control pots are 25 turn. To get to mid position, turn full CCW until a "clicking" sound is heard, then rotate CW 12 turns.*

3. Hold the sensor in air away from any nearby objects. Sensor should be clean. Adjust the OFFSET control until the output current from the transmitter is 4.00 mA.

4. Place the sensor in solution and allow the sensor to temperature equilibrate. To minimize error, it is best if solution is as close as possible to room temperature. Allow the system to operate undisturbed for 15-30 minutes to allow for temperature element to stabilize. The sensor must sit in the center of the beaker containing the conductivity reference solution, without touching the sides or bottom. Maintain at least 2" clearance on all sides of the round sensing portion of the sensor to prevent errors. When first placing the sensor into solution, swirl slightly and then rap gently to dislodge any bubbles from the sensor .

5. Adjust ROUGH SPAN until output current is 20 mA ± 0.5 mA.

6. While still in solution, adjust the FINE SPAN to exactly 20.0 mA.

7. Pull sensor back into air, rinse, and gently shake off solution. Re-adjust 4 mA point with OFFSET control if necessary. Repeat steps 6-7 with FINE SPAN and OFFSET, going back into solution and back out, until no additional adjustment is necessary. Do not adjust the ROUGH SPAN during this final process.

5.12 Reverse Operation

If reverse operation is desired (output current falls to 4 mA as conductivity increases), complete the following procedure after calibration steps are performed from 6.3.

1. Place the REV/DIR switch in the REV position.

2. Hold sensor in air away from any nearby objects. Sensor should be clean and dry. Adjust the OFFSET control until the output current from the transmitter is exactly 20.0 mA.

3. Place the sensor in solution and allow the sensor to temperature equilibrate. To minimize error, it is best if solution is as close to possible to room temperature. Allow the system to operate undisturbed for 15-30 minutes. The sensor must sit in the center of the beaker containing the conductivity reference solution, without touching the sides or bottom. Maintain at least 2" clearance on all sides of the round sensing portion of the sensor to prevent errors.

4. Adjust FINE SPAN until output current is exactly 4.00 mA. Repeat steps 2-4 until no additional adjustment is necessary.

Part 6 – System Maintenance

6.1 General

The Q40CT/Q25CT Conductivity System will generally provide unattended operation over long periods of time. With proper care, the system should continue to provide measurements indefinitely. For reliable operation, some minimal level of maintenance on the system must be done on a regular schedule.

6.2 Transmitter Maintenance

No unusual maintenance of the analyzer is required if installed according to the guidelines of this operating manual. If the enclosure door is frequently opened and closed, it would be wise to periodically inspect the enclosure sealing gasket for breaks or tears.

6.3 Sensor Maintenance

Sensor maintenance required is very minimal due to the nature of the sensor design. From time-to-time, the sensor should be inspected for any material which may have built up – particularly in the sensor bore. If cleaning is required, simply wash off with soapy water to clean sensor.

Part 7 – Troubleshooting

7.1 General

The information included in this section is intended to be used in an attempt to quickly resolve an operational problem with the system. During any troubleshooting process, it will save the most time if the operator can first determine if the problem is related to the transmitter, sensor, or some external source. Therefore, this section is organized from the approach of excluding any likely external sources, isolating the transmitter, and finally isolating the sensor. If these procedures still do not resolve the operational problems, any results the operator may have noted here will be very helpful when discussing the problem with the factory technical support group.

7.2 External Sources of Problems

To begin this process, review the connections of the system to all external connections.

1. Verify the proper power input is present (16-35Vdc).

2. Verify the loads on any 4-20 mA outputs do not exceed the limits in the Instrument Specifications (see also section 4.3.) During troubleshooting, it is many times helpful to disconnect all these outputs and place wire-shorts across the terminals in the instrument to isolate the system and evaluate any problems which may be coming down the analog output connections.

3. Do not run sensor cables or analog output wiring in the same conduits as power wiring. If low voltage signal cables must come near power wiring, cross them at 90° to minimize coupling.

4. If rigid conduit has been run directly to the enclosure, check for signs that moisture has followed conduit into the enclosure.

5. Check for possible ground loops. Although the sensor is electrically isolated from the process water, high frequency sources of electrical noise may still cause erratic behavior in extreme conditions. If readings are very erratic after wiring has been checked, check for a possible AC ground loop by temporarily moving the sensor to a sample of solution in a beaker or other container.

6. Carefully examine any junction box connections for loose wiring or bad wire stripping. If possible, connect the sensor directly to the analyzer for testing.

7. Check sensor bore for excessive fouling. Look closely for signs of grease or oil which may be present. Clean if necessary.

8. Verify the sensor has the proper minimum 2” clearance to any nearby objects. Objects 2” or closer can affect the electrical field of the sensor and cause shifts in readings.

9. Note that the thermal response of the sensor can be quite slow, therefore, time must be given to allow the sensor to fully temperature equilibrate during thermal changes. Rapid temperature changes can result in measurement errors if insufficient stabilization time is not allowed.

7.3 Transmitter Tests

1. When powered and operating, verify loop current LED is glowing. If not, double check polarity of wiring and verify output loop is not open somewhere. Verify loop-load is within specifications for the power supply used.

7.4 Sensor Tests

1. Toroidal sensors can be tested with a digital voltmeter (DVM) to determine if a major sensor problem exists. Follow the steps below to verify sensor integrity:

A. Disconnect the nine sensor wires from the terminal strip on the transmitter.

B. Connect a DVM between the RED and BLACK wires in the red jacket pair. With the DVM set to measure resistance, you should measure between 0.5 and 2.0 Ohms.

C. Connect a DVM between the WHITE and BLACK wires in the white jacket pair. With the DVM set to measure resistance, you should measure between 0.5 and 2.0 Ohms.

D. Connect a DVM between the WHITE wire from the in the white jacket pair, and the RED wire from the red jacket pair. With the DVM set to measure resistance, you should measure an open circuit.

E. Connect a DVM between the GREEN and BLACK wires in the green jacket pair. These are the RTD leads, and you should find a resistance value that depends on the temperature. The table below lists the resistance values for various temperatures.

Temperature °C	Resistance Ω
0	1000
5	1019
10	1039
15	1058
20	1078
25	1097
30	1117
35	1136
40	1155
45	1175
50	1194

Figure 14 - PT1000 RTD Table

Spare Parts

PART NO.	DESCRIPTION
Spare Electronics	
07-0022	Complete Q40CT conductivity transmitter
Spare Sensors	
63-0080	Toroidal Conductivity Sensor 20 ft., Polypropylene
63-0099	Toroidal Conductivity Sensor 20 ft., Noryl
Sensor Flowcells	
63-0083	2” Flow Tee
Misc Components	
07-0100	Junction box
31-0068	Sensor interconnect cable
44-0260	Pg9 Cord Grip (each)
09-0047	Conductivity Standard - 447 microSiemens, 500 mL
09-0048	Conductivity Standard - 1,500 microSiemens, 500 mL
09-0049	Conductivity Standard – 8,974 microSiemens, 500 mL
09-0050	Conductivity Standard - 80,000 microSiemens, 500 mL