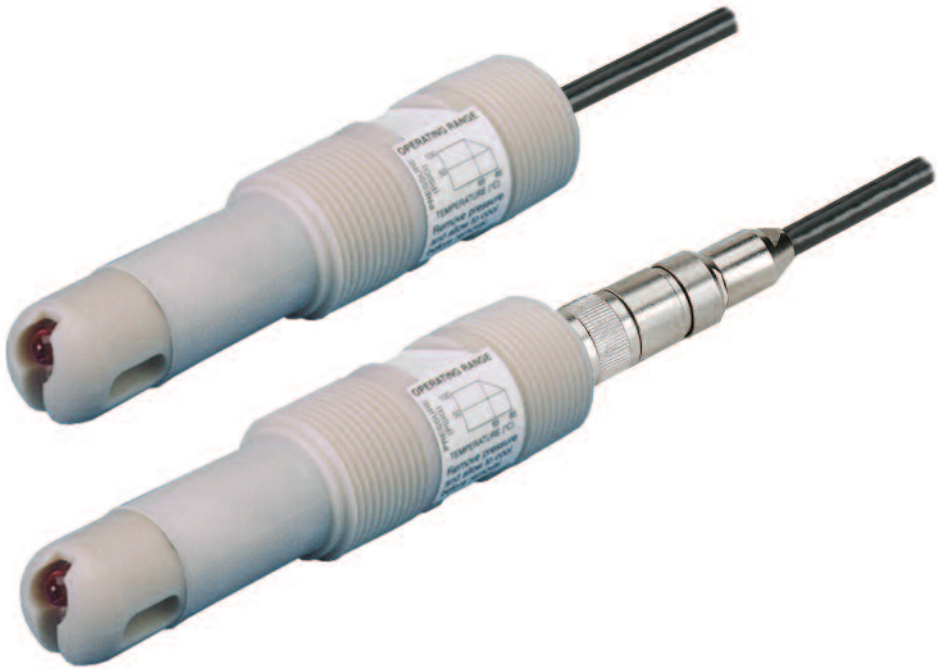
389VP Instruction Manual
PN 51-389VP/rev./F
January 2013

Combination pH/ORP Sensor



ROSEMOUNT® Analytical

EMERSON™ Process Management

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Essential Instructions
Read this page before proceeding

Emerson designs, manufactures, and tests its Rosemount Analytical products to meet many national and international standards. Because these instruments are sophisticated technical products, you must properly install, use, and maintain them to ensure they continue to operate within their normal specifications. The following instructions must be adhered to and integrated into your safety program when installing, using, and maintaining Rosemount Analytical products. Failure to follow the proper instructions may cause any one of the following situations to occur: Loss of life; personal injury; property damage; damage to this instrument; and warranty invalidation.

- Read all instructions prior to installing, operating, and servicing the product. If this Instruction Manual is not the correct manual, telephone 1-800-854-8257 and the requested manual will be provided. Save this Instruction Manual for future reference.
- If you do not understand any of the instructions, contact your Emerson representative for clarification.
- Follow all warnings, cautions, and instructions marked on and supplied with the product.
- Inform and educate your personnel in the proper installation, operation, and maintenance of the product.
- Install your equipment as specified in the Installation Instructions of the appropriate Instruction Manual and per applicable local and national codes. Connect all products to the proper electrical and pressure sources.
- To ensure proper performance, use qualified personnel to install, operate, update, program, and maintain the product.
- When replacement parts are required, ensure that qualified people use replacement parts specified by Rosemount. Unauthorized parts and procedures can affect the product's performance and place the safe operation of your process at risk. Look alike substitutions may result in fire, electrical hazards, or improper operation.
- Ensure that all equipment doors are closed and protective covers are in place, except when maintenance is being performed by qualified persons, to prevent electrical shock and personal injury.

⚠ DANGER: HAZARDOUS AREA INSTALLATION

This sensor is not Intrinsically Safe. or Explosion Proof. Installations near flammable liquids or in hazardous area locations must be carefully evaluated by qualified on site safety personnel.

To secure and maintain an intrinsically safe installation, an appropriate transmitter/safety barrier/sensor combination must be used. The installation system must be in accordance with the governing approval agency (FM, CSA or BASEEFA/CENELEC) hazardous area classification requirements. Consult your analyzer/transmitter instruc tion manual for details.

Proper installation, operation and servicing of this sensor in a Hazardous Area Installation is entirely the responsibility of the user.

⚠ CAUTION: SENSOR/PROCESS APPLICATION COMPATIBILITY

The wetted sensor materials may notbe compatible with process composition and operating conditions. Application compat ibility is entirely the responsibility of the user.

About this document

This manual contains instructions for installation and operation of the Model 1066 Smart Transmitter. The following list provides notes concerning all revisions of this document.

Rev. Level	Date	Notes
A	2/01	This is the initial release of the product manual. The manual has been reformatted to reflect the Emerson documentation style and updated to reflect any changes in the product offering.
B	7/02	Added 1055 wiring diagrams.
C	10/05	Changed PN 9330022 to PN 9320057 on the drawing 400389VP12, page 5 and Table 5-2, page 17.
D	12/08	Updated to add VP
E	3/12	Update pages 23 and 26
F	1/13	Incorporated SMART Sensor technology

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Section 1: Description and Specifications

1.1 Features and Applications

389VP triple-junction sensors are now offered with SMART capabilities. SMART option becomes enabled when use with the 1056, 1057, 1066, 56 instruments and on 6081P wireless transmitter. The pH-loop capabilities include auto-recognition of the SMART sensor, automatic upload of calibration data and associated time stamp, historical recording of pH diagnostics (slope, offset, reference impedance, glass impedance). This trending data allows technicians to predict frequency of maintenance and estimate sensor life for a particular process condition. Additional SMART features include factory calibration, resetting SMART sensor calibration data with user menus without power cycling, and manufacturing information.

The reference junction aids in the sensor's resistance to poisoning ions and helps prolong sensor life. 389VP sensors have a triple junction reference, which protects the reference element from poisoning ions — such as ammonia, chlorine, cyanides, and sulfides — in the process. Both models are made with an outer ceramic junction constructed in an annular design around the pH/ORPsensitive membrane.

The AccuGLASS™ pH glass formulations exceed industry standards. The AccuGlass pH glass is a result of many years of glass research resulting in a formulation which has been found to increase the life of the sensor. Unlike other pH glasses presently on the market, this glass resists cracking especially at higher temperatures and reduces sodium ion error commonly found in high pH applications. Overall, the AccuGlass formulation enhances the sensor performance to measure pH more accurately and have a longer sensor life than ever before.

A choice of pH glass electrodes is available to best meet various application needs. Two types are available: hemi bulb and high pH glass. The ACCUGLASS hemi bulb is the standard glass offered on both models and can be used for most applications. The hemi bulb is also found on the high pH glass option.

The 389VP is offered with a watertight sensor-tocable connector which eliminates re-wiring and cable twisting when replacing sensors. The Variopol VP multiple pin connector is an integral part of each sensor model and uses a mating VP cable. Once the cable is installed and wired to the analyzer, sensors are easily replaced without replacing the cable and without rewiring the analyzer. Also the cable can be disconnected from the sensor before removal from the process which eliminates cable twisting. VP8 cable assembly works both with VP8 and VP6 sensor connector.

The 389VP has a molded Tefzel body with Viton o-rings, making each sensor very robust and chemically resistant. Complete encapsulation eliminates leakage or high humidity problems traditionally found in other pH/ORP designs. The simplified construction, designed with user convenience in mind does not require electrolyte (KCl) replenishment or any high maintenance troubleshooting procedures.

NEW - SMART preamplifier is the standard option. A preamplifier converts the high impedance pH signal into a stable, noise-free signal and must be used with all pH sensors. Our preamplifier method has become the industry standard for pH/ORP measurement reliability.

The 389VP is a combination sensor (pH, reference, and temperature within sensor body) and measures pH or ORP (Oxidation/Reduction Potential) of aqueous solutions in pipelines, open

tanks, or ponds. The 389VP is suitable for virtually all applications and is compatible with Rosemount Analytical and other manufacturers' instruments.

Installation is easily achieved through the wide variety of mounting configurations. 389VP features a 1 inch (MNPT) front and rear facing connections for insertion, submersion, or flow-through pH and ORP applications.

1.2 Performance and Physical Specifications

Sensor Type: Triple-junction 389VP

Range: pH: ACCUGLASS 0-14*

ORP: -1500 to +1500 mV

***Percent Linearity Over pH Range:**

	Option 10	Option 11
0-2 pH	94%	94%
2-12 pH	99%	97%
12-13 pH	97%	98%
13-14 pH	92%	98%

Temperature Range: 0° to 85°C (32° to 185°F) Automatic temperature compensation 0° to 85°C (32° to 185°F), Temperature compensation is not required for 389 ORP or 389VP ORP when used with 1060, 1023 or 1181 ORP

Maximum Pressure:

790 kPa [abs] (100 psig) at 65°C (150°F) - see Graph A

Materials of Construction: Tefzel, glass, ceramic and Viton

Process Connections: 1 in. MNPT, 2 places

Cable: must use mating VP cable, PN 24281-00

Weight/Shipping Weight: 0.45 kg/0.9 kg (1 lb/2 lb)

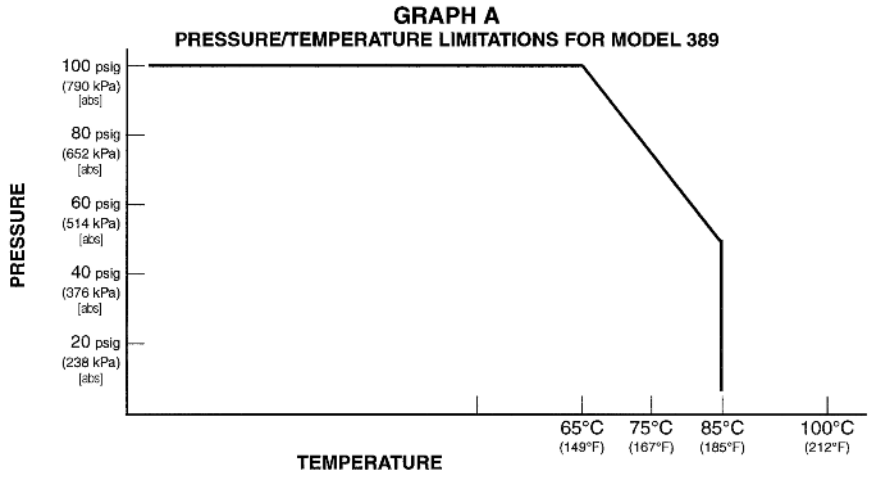
1.3 Ordering Information

The 389VP pH/ORP Sensor is offered with a Variopol (VP) connector and uses a mating VP cable (purchased separately). A remote preamplifier (j-box or instrument) must be used with this sensor, unless (-70) preamplifier option is selected. Model 389VP is SMART enable using option (-70).

A Variopol cable is required for all first-time installations. See below for cable selection. VP8 cable assembly works with VP6 and VP8 sensor connector.

389VP Triple-Junction pH/ORP SENSOR	
Combination Electrode (Required Selection)	
10	General Purpose Low Resistivity, GPLR
11	High pH
12	ORP
Analyzer/TC Compatibility (Required Selection)	
50	For use with 1181
54	For use with 1054A/B, 2081; 54, 54e, 81, 1055, 1056, 3081, 4081, 5081, and Xmt, Code 02 only (Pt 100 TC)
55	For use with 1055, 1056, 1057, 1066, 56, 5081, 6081, XMT (-70 option only)
Optional	
70	SMART preamplifier (available with -55 only)

FIGURE 1. Pressure/Tempeerature Limitations



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Section 2: Installation

2.1 Unpacking and inspection

Inspect the outside of the carton for any damage. If damage is detected, contact the carrier immediately. Inspect the hardware. Make sure all the items in the packing list are present and in good condition. Notify the factory if any part is missing. If the instrument appears to be in satisfactory condition, proceed to Section 2.2, Mounting.

NOTE: Save the original packing cartons and materials as most carriers require proof of damage due to mishandling, etc. Also, if it is necessary to return the instrument to the factory, you must pack the instrument in the same manner as it was received. Refer to Section 6 for return instructions. If the sensor is to be stored, the vinyl boot should be filled with pH buffer solution and replaced on sensor tip until ready for use.

⚠ CAUTION

Buffer solution in the vinyl boot may cause skin or eye irritation.

⚠ WARNING

Glass electrode must be wetted at all times (in storage and in line) to maximize sensor life.

2.2 Mounting

The sensor has been designed to be located in industrial process environments. Temperature and pressure limitations must not be exceeded at any time. A Caution label regarding this matter is attached to the sensor with the cable. Please do not remove the label. See Figure 2-1.

⚠ CAUTION

Internal electrolyte fill may cause skin or eye irritation

Mounting Guidelines:

1. Shake down the sensor to remove any air bubbles that may be present inside the tip of the pH glass.
2. Do not install the sensor on the horizontal. The sensor must be 10° off the horizontal to ensure accuracy.
3. Do not install the sensor upside down.
4. With the standard recessed electrode, air bubbles may become trapped in the sensor end. This problem is most commonly encountered in areas of low flow or during calibration. Shake the probe while immersed in solution to remove bubbles.

In most cases, the pH sensor can simply be installed as shipped, and readings with an accuracy of ± 0.2 pH may be obtained. To obtain greater accuracy or to verify proper operation, the sensor must be calibrated as a loop with its compatible analyzer or transmitter.

2.2.1 Submersion Mounting

The 389 and 389VP Sensor has a 1 in. MNPT process connection at the back of the sensor. Utilizing a standard 1 in. union, the sensor may be mounted to a 1 in. SCH 80 CPVC or PVDF standpipe. Tapered pipe threads in plastic tend to loosen after installation. It is therefore recom mended that Teflon1 tape be used on the threads and that the tightness of the connection be checked frequently to assure that no loosening has occurred. To prevent rain water or condensation from running into the sensor, a weatherproof junction box is recommended (See Figure 2-2). The sensor cable must be run through a protective conduit for isolation from electrical interference or physical abuse from the process. The sensor should be installed within 80° of vertical, with the electrode facing down. The sensor's cable should not be run with power or control wiring.

2.2.2 Flow Through and Insertion Mounting

The 389 and 389VP Sensor also has a 1 in. MNPT process connection at the front of the sensor for mounting into a 1-1/4 in. tee or the process. See Figure 2-3 for instal lation configurations.

NOTE: LARGE PIPE WRENCHES MUST NOT BE USED TO TIGHTEN THE SENSOR INTO A FLANGE OR OTHER TYPE OF MOUNTING.

2.3 Electrical Installation

Figures 2-5 thru 2-22 provide the guidelines for wiring the 389VP sensor to various Analyzer/Transmitter instruments.

To determine which wiring guideline to use, locate the code number of the sensor to be installed. This number is stamped in the body of the sensor.

1. If the cable needs to be extended, use a high quality four conductor shielded instrument cable available from Rosemount Analytical.

NOTE: If the cable is too long, loop up the excess cable. If the cable has to be shortened, splice and terminate each conductor neatly and make sure that the overall (outermost) drain wire is not shorted out with either of the two inner drain wires (shields).

2. Signal cable should be run in a dedicated conduit (preferably an earth grounded metallic conduit) and should be kept away from AC power lines. For your convenience, a spade lug kit is furnished (in a plastic bag wrapped around the cable).

FIGURE 2-1. Dimensional Drawing

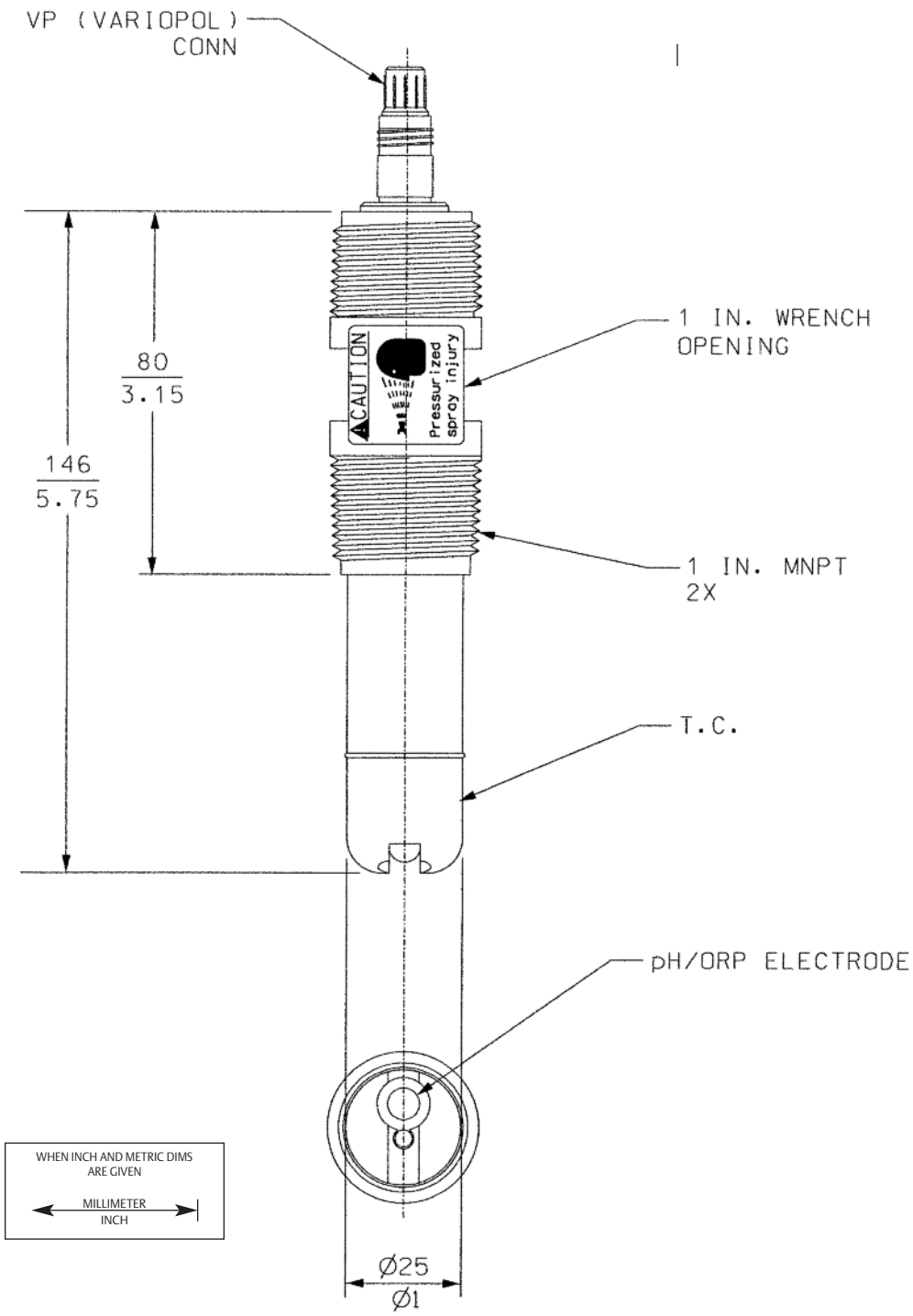


FIGURE 2-2. Submersion Installations

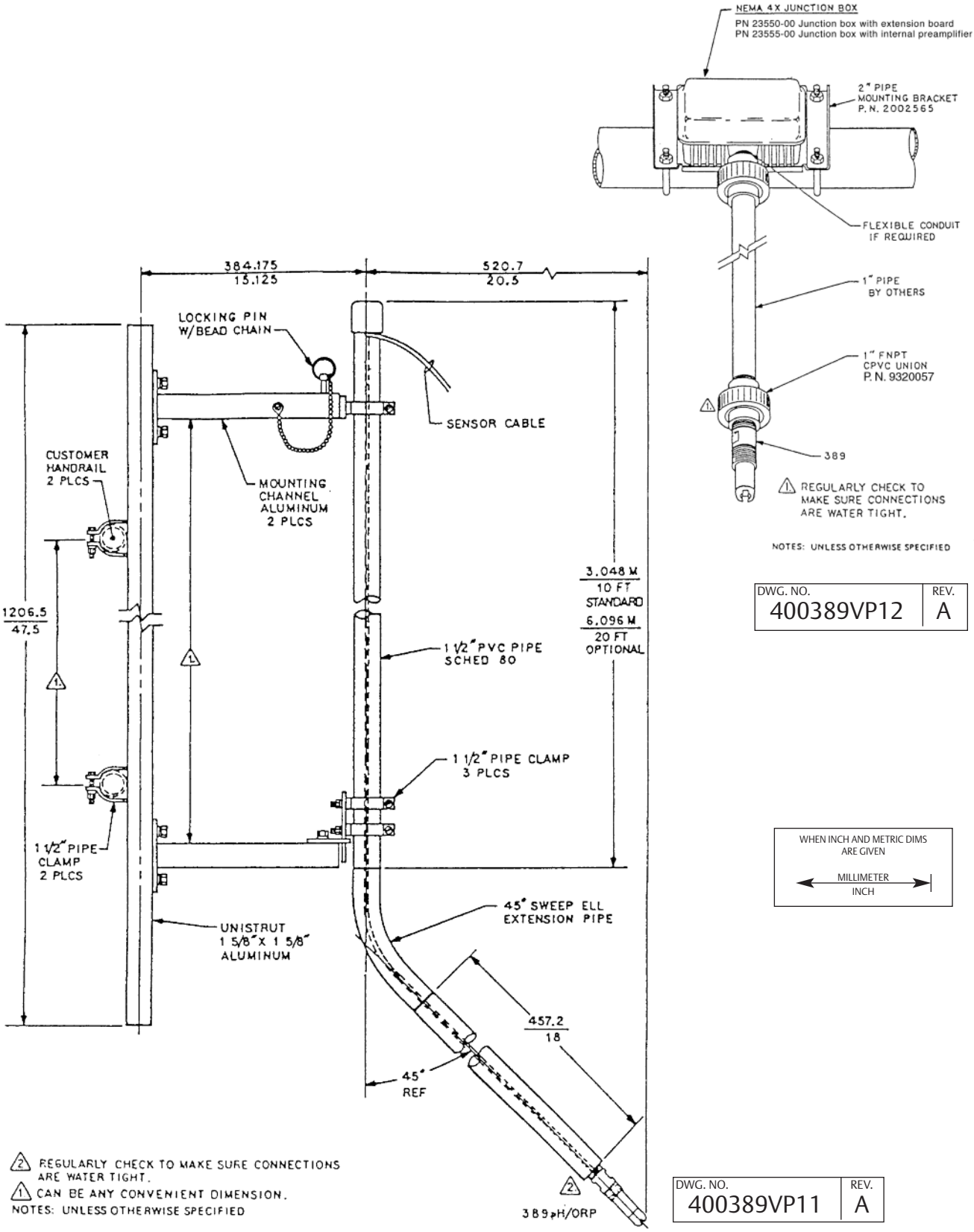
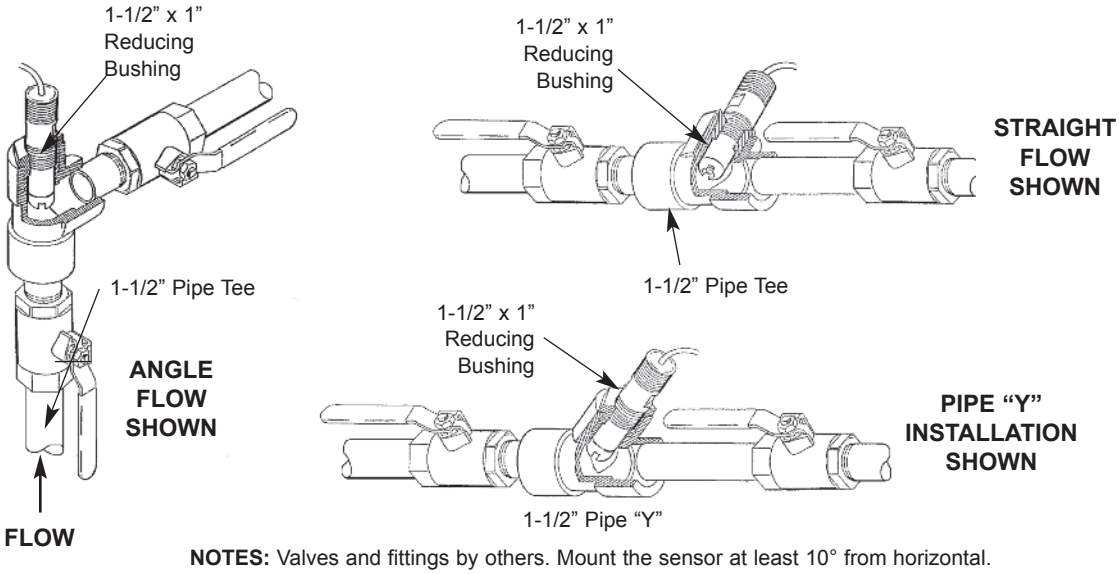


FIGURE 2-3. Flow Through and Insertion Installations



NOTES: Valves and fittings by others. Mount the sensor at least 10° from horizontal.

FIGURE 2-4. VP8 Cable, sensor end

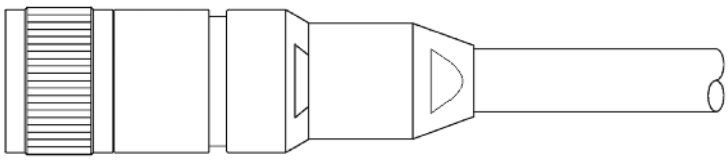


FIGURE 2-5. VP8 Cable, instrument end

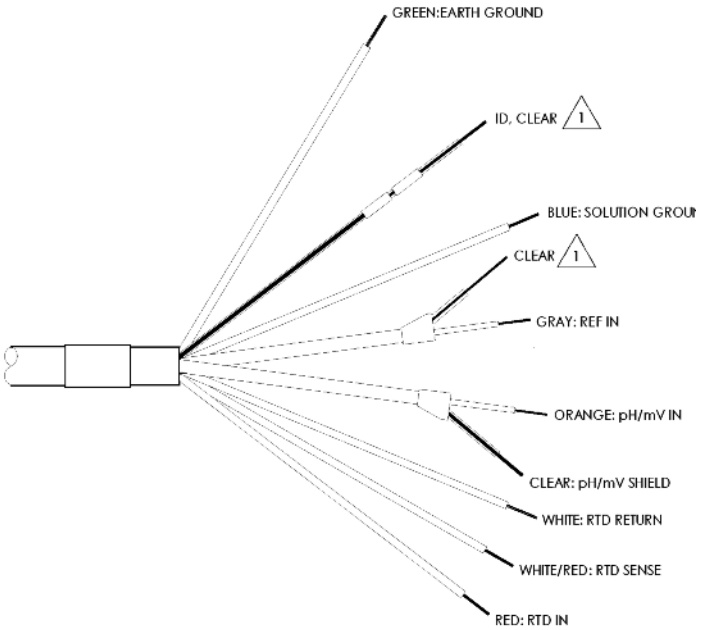


FIGURE 2-6. VP6 81 Wiring

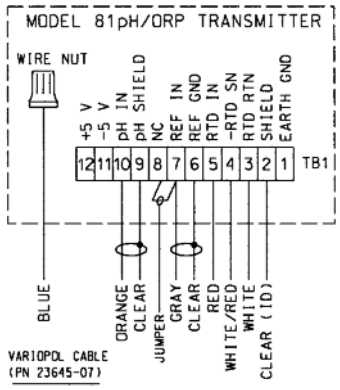


FIGURE 2-7. VP6 1181 Wiring

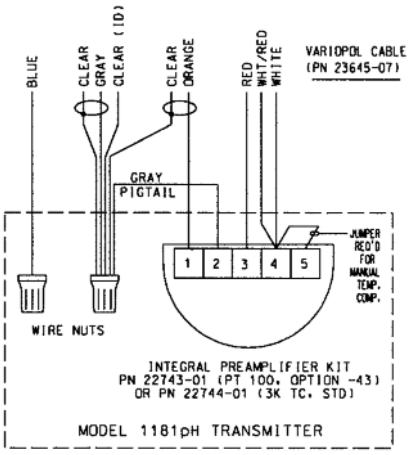


FIGURE 2-8. VP6 54 Wiring through Remote Junction Box

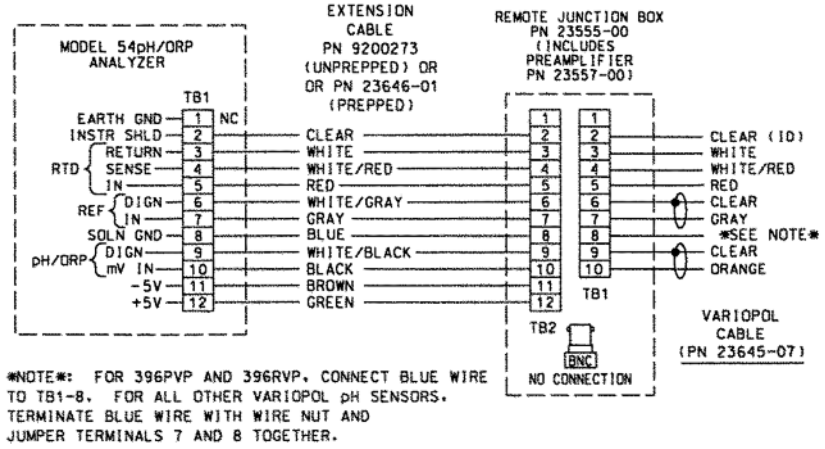


FIGURE 2-9. VP6 54 Wiring

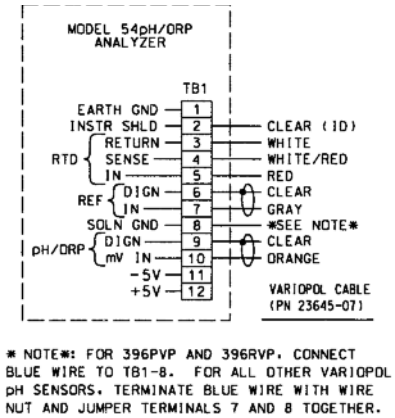


FIGURE 2-10. VP6 2081 Wiring

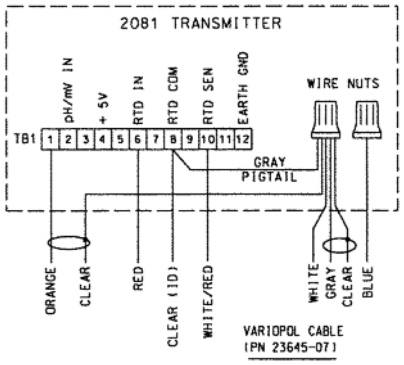


FIGURE 2-11. VP6 1181, 1050/1060, and 1003/1023 Wiring through Remote Junction Box

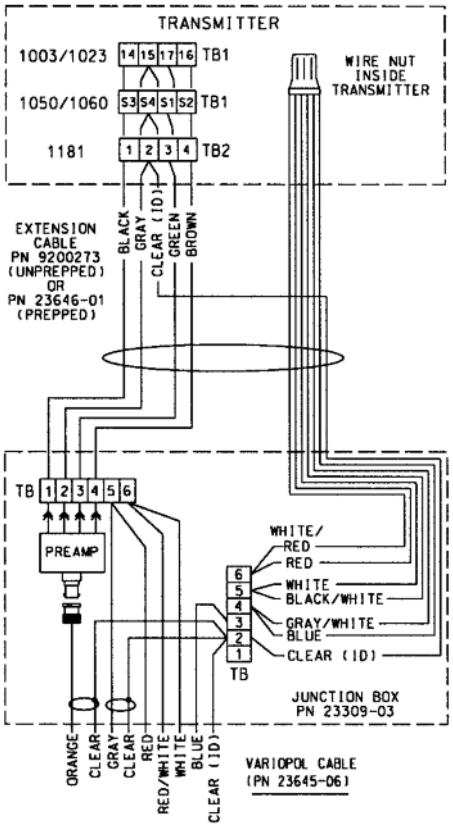


FIGURE 2-12. VP6 2081 Wiring through Remote Junction Box

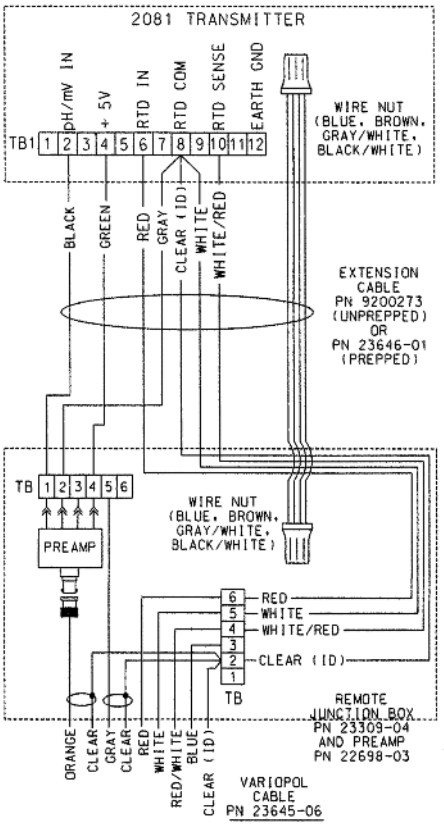


FIGURE 2-13. VP6 1055-22-32 Wiring

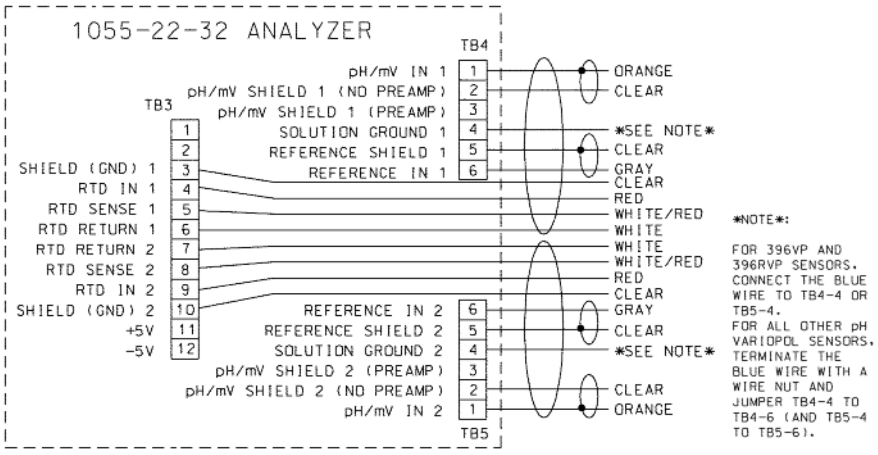


FIGURE 2-14. VP6 3081 & 4081 Wiring

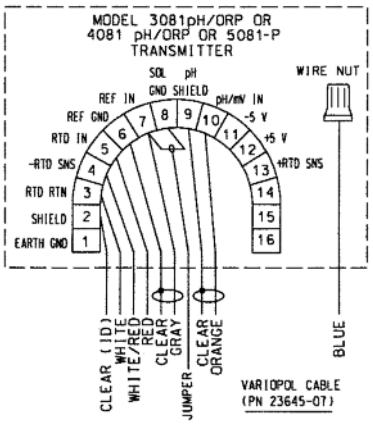


FIGURE 2-15. VP6 81 Wiring through Remote Junction Box

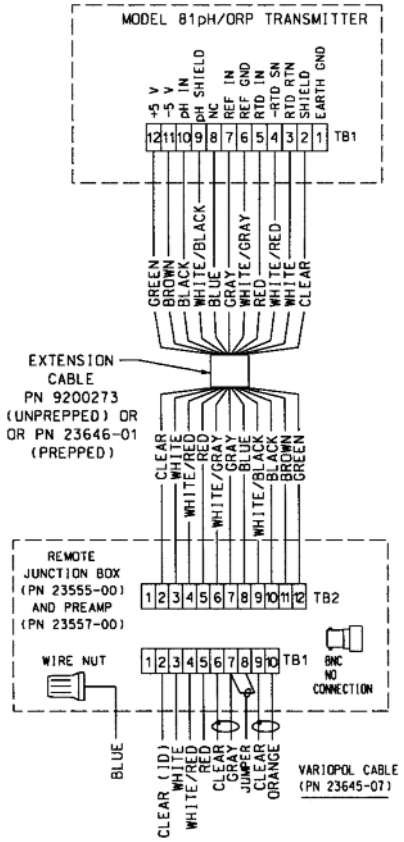


FIGURE 2-16. VP6 3081 & 4081 Wiring through Remote Junction Box

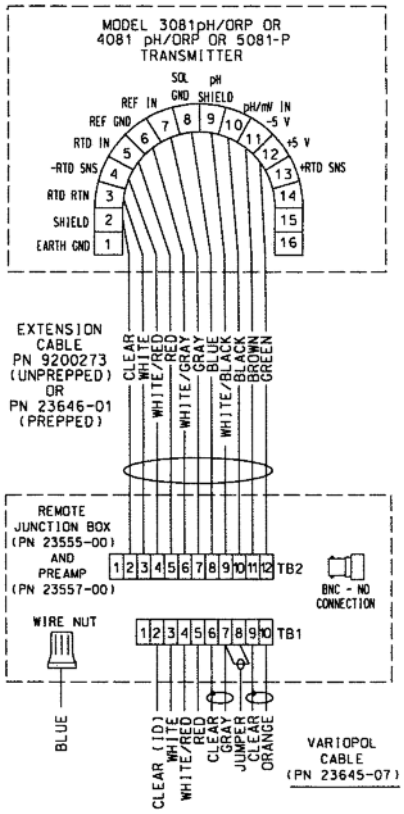


FIGURE 2-17. VP6 1054 Wiring

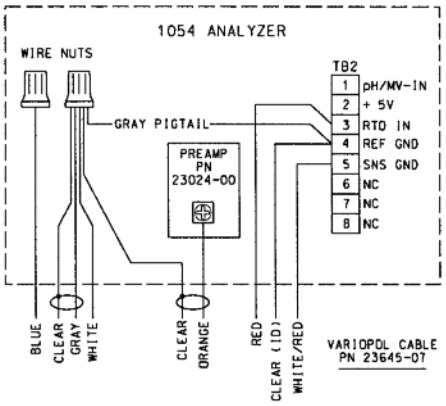


FIGURE 2-18. VP6 1054A/B and 2054 Wiring

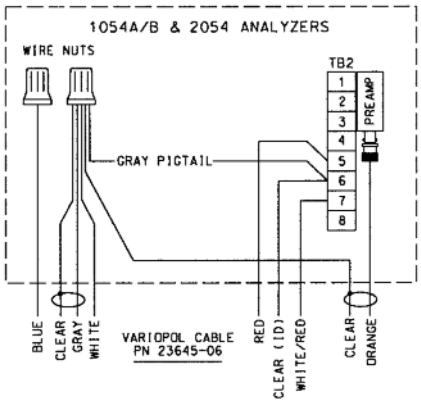


FIGURE 2-19. CAS Installation, label information

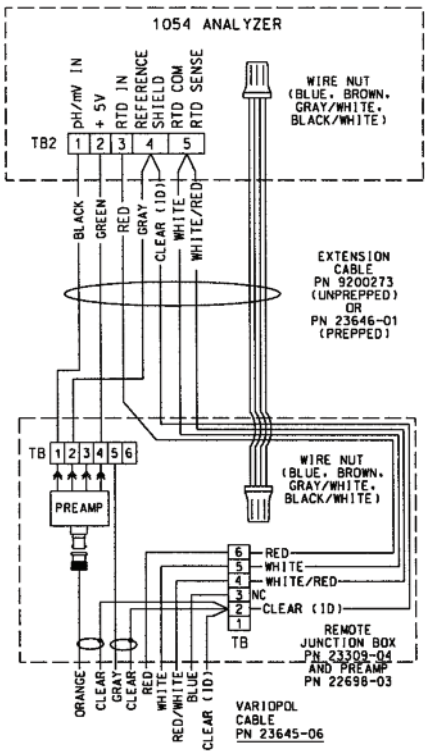


FIGURE 2-20. 1054A/B & 2054 VP6 Wiring through a Remote Junction Box

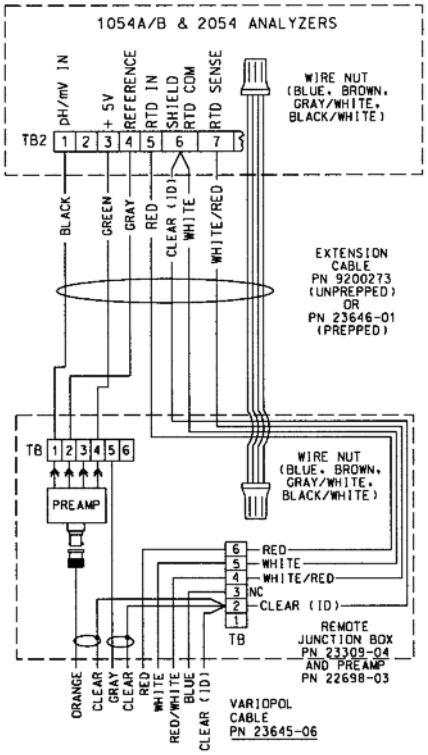


FIGURE 2-21. 1055-22-32 VP6 Wiring through Remote Junction Boxes

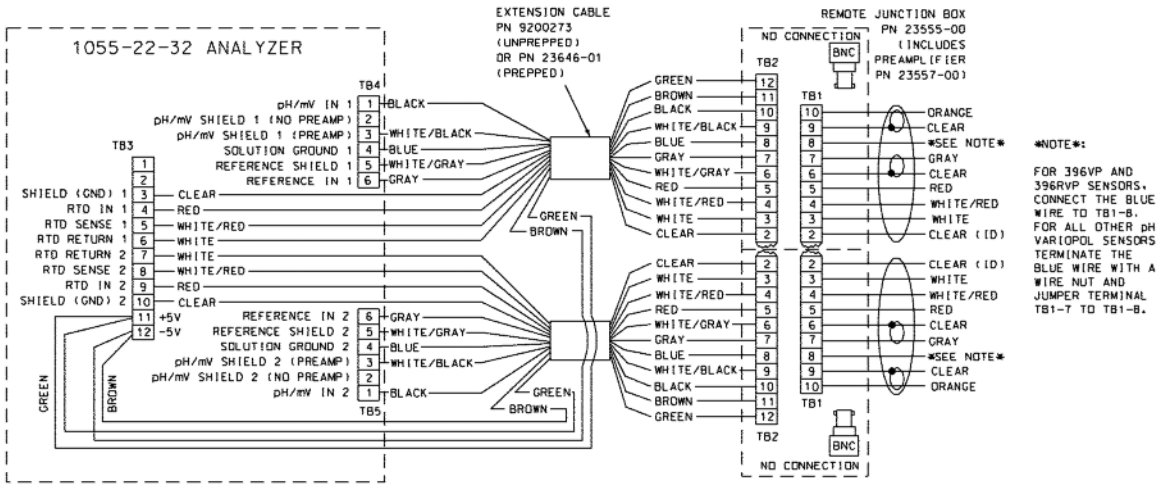


FIGURE 2-22. SCL-(P/Q) Wiring

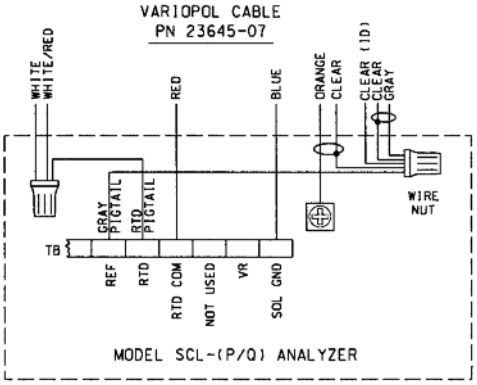


FIGURE 2-23. 2700 Wiring

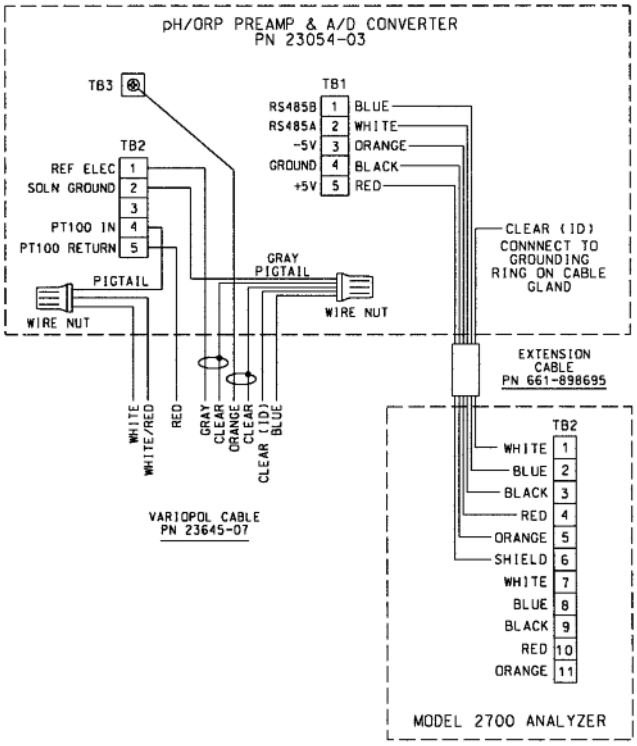


FIGURE 2-23. 54e pH/ORP Wiring. This is the standard VP8 cable wiring. VP8 cable assembly works both with VP6 and VP8 sensor connector

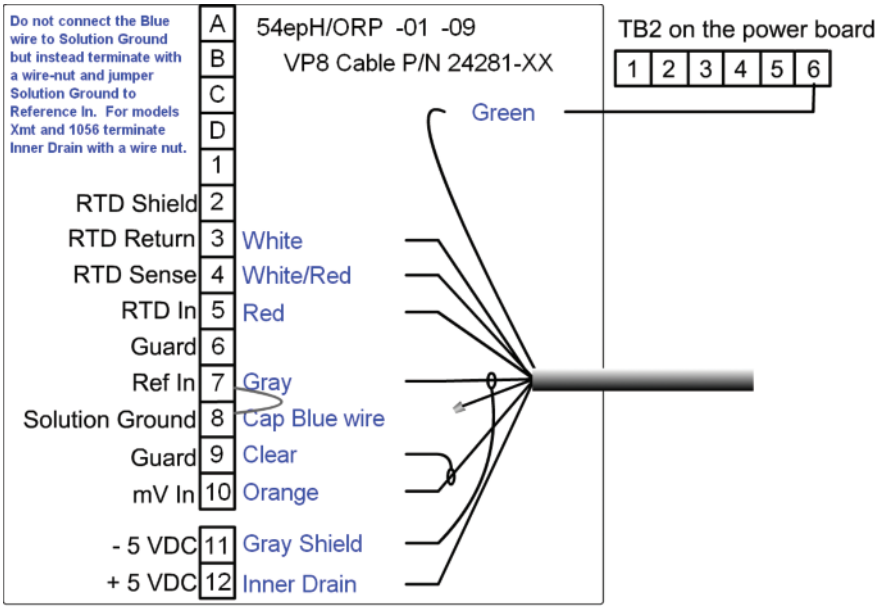


FIGURE 2-25. Xmt VP8 Wiring. This is the standard VP8 cable wiring. VP8 cable assembly works both with VP6 and VP8 sensor connector

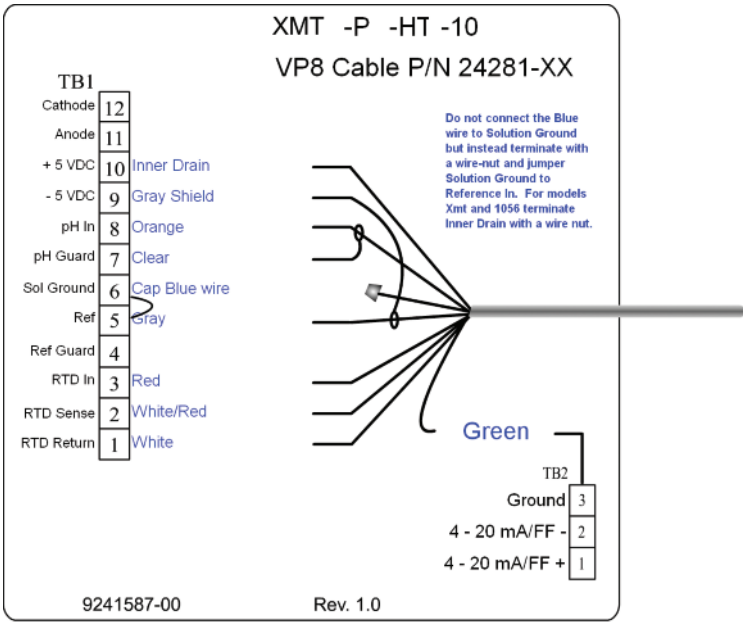


FIGURE 2-26. 1056 VP8 Wiring. This is the standard VP8 cable wiring. VP8 cable assembly works both with VP6 and VP8 sensor connector

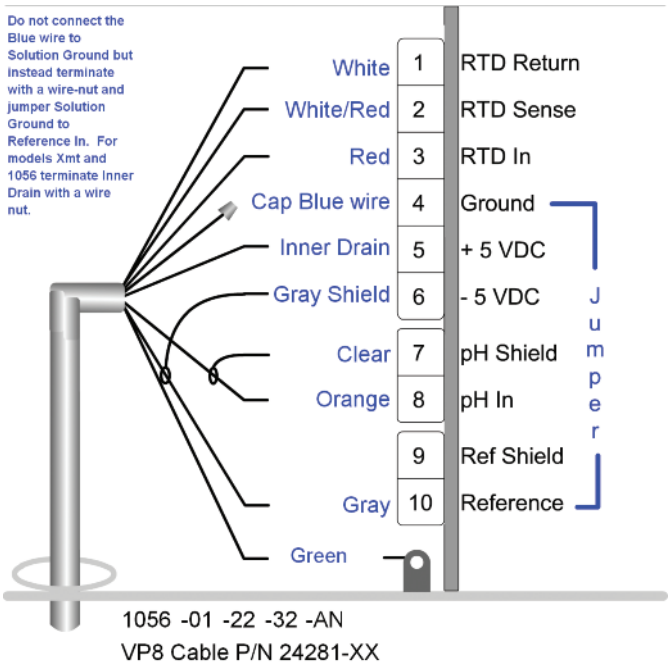
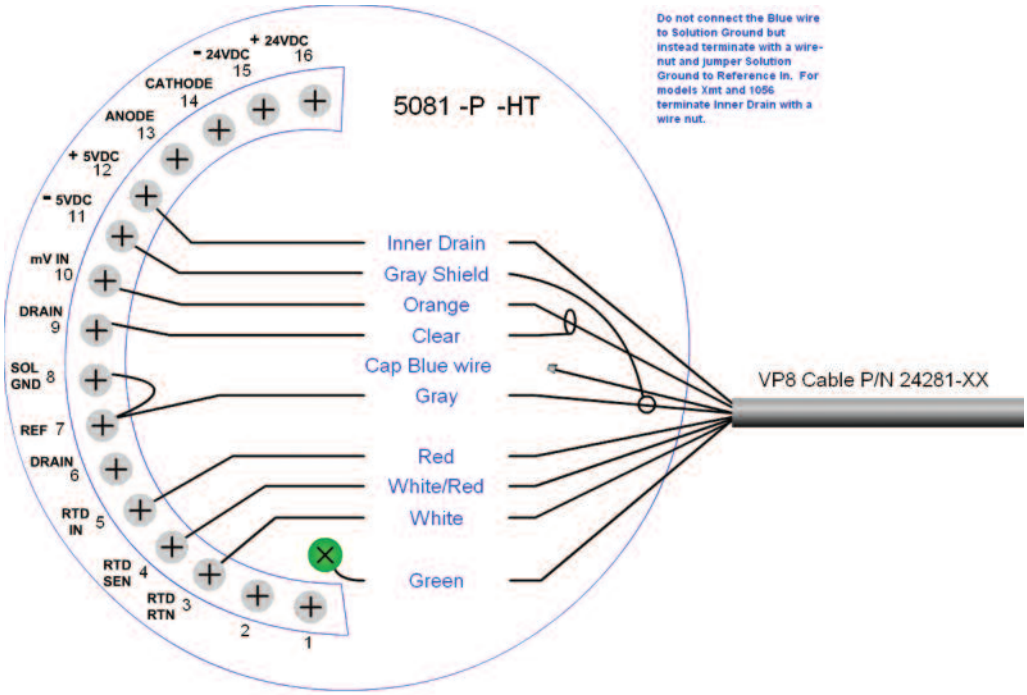


FIGURE 2-27. 5081 VP8 Wiring. This is the standard VP8 cable wiring. VP8 cable assembly works both with VP6 and VP8 sensor connector



Section 3: Start-up and Calibration

3.1 Sensor Preparation

Shake down the sensor to remove any air bubbles that may be present at the tip of the pH glass bulb. In most cases, the pH sensor can simply be installed as shipped and readings with an accuracy of ± 0.2 pH may be obtained. To obtain greater accuracy or to verify proper operation, the sensor must be calibrated as a loop with its compatible analyzer or transmitter.

3.2 389VP pH Calibration

1. After a temporary connection is established between the sensor and the instrument, a buffer calibration may be performed.
2. Consult appropriate pH/ORP analyzer or transmitter instruction manual for specific calibration and standardization procedures, or see below for recommended two point buffer calibration procedure.

3.2.1 Recommended two point buffer calibration procedure

Select two stable buffer solutions, preferably pH 4.0 and 10.0 (pH buffers other than pH 4.0 and pH 10.0 can be used as long as the pH values are at least two pH units apart).

NOTE: A pH 7 buffer solution reads a mV value of approx. zero, and pH buffers read approx. +/- 59.1 mV for each pH unit above or below pH 7. Check the pH buffer manufacturer specifications for millivolt values at various temperatures since it may affect the actual value of the buffer solution mV/pH value.

1. Immerse sensor in the first buffer solution. Allow sensor to adjust to the buffer temperature (to avoid errors due to temperature differences between the buffer solution and sensor temperature) and wait for reading to stabilize. The value of buffer can now be acknowledged by analyzer/transmitter.
2. Once the first buffer has been acknowledged by the analyzer/transmitter, rinse the buffer solution off of the sensor with distilled or deionized water.
3. Repeat steps 1 and 2 using the second buffer solution.
4. Once the analyzer/transmitter has acknowledged both buffer solutions, a sensor slope (mV/pH) is established (the slope value can be found within the analyzer/transmitter).
5. The slope value should read about 59.1 mV/pH for a new sensor and will decrease over time to approximately 47 - 49 mV/pH. Once the slope reads below the 47-49 mV/pH range, a new sensor should be installed to maintain accurate readings.

3.2.2 Recommended pH Sensor Standardization

For maximum accuracy, the sensor can be standardized on-line or with a process grab sample after a buffer calibration has been performed and the sensor has been conditioned to the process. Standardization accounts for the sensor junction potential and other interferences. Standardization will not change the sensor's slope but will simply adjust the analyzers reading to match that of the known process pH.

1. While obtaining a process solution sample (it is recommended that the sample is taken close to the sensor), record the pH value that is shown on the analyzer/transmitter display.

2. Measure and record the pH of the process solution sample with a another temperature compensated, calibrated pH instrument. For best results, standardization should be performed at the process temperature.
3. Adjust the analyzer/transmitter value to the standardized value.

3.3 389VP ORP

Most industrial applications have a number of ORP reactions occurring in sequence or simultaneously. There can be several components that are oxidized or reduced by the reagents that are used. Theoretically, the ORP potential is absolute because it is the result of the oxidationreduction equilibrium. However, the actual measured potential is dependent on many factors, including the condition of the surface of the ORP platinum electrode. Therefore, the sensor should be allowed 1-2 hours to become “conditioned” to the stream when first set-up or after being cleaned.

3.3.1 Calibration

⚠ CAUTION

The solution used during the following check is an acid and should be handled with care. Follow the directions of the acid manufacturer. Wear the proper protective equipment. Do not let the solution come in contact with skin or clothing. If contact with skin is made, immediately rinse with clean water.

1. Make a temporary electrical connection between the sensor and the instrument.
2. Obtain a standard solution of saturated quinhydrone (PN R508-160Z). This can be made quite simply by adding a few crystals of quinhydrone to either pH 4 or pH 7 buffer. Quinhydrone is only slightly soluble, but only a few crystals will be required (refer to Section 4.3.1 for an alternate ORP standard solution).
3. Immerse the sensor in the standard solution. Allow 1-2 minutes for the ORP sensor to stabilize.
4. Adjust the standardize control of the transmitter to the solution value shown in Table 3-1. The resulting potentials, measured with a clean platinum electrode and saturated KCl/AgCl reference electrode, should be within ±20 millivolts of the value shown in Table 3-1. Solution temperature must be noted to ensure accurate interpretation of results. The ORP value of saturated quinhydrone solution is not stable over long periods of time. Therefore, these standards should be made up fresh each time they are used.

TABLE 3-1. ORP of Saturated Quinhydrone Solution (millivolts)

	pH 4 Solution			pH 7 Solution		
Temp °C	20	25	30	20	25	30
mV Potential	268	264	260	94	87	80

5. Remove the sensor from the buffer, rinse, and install in the process.

Section 4: Maintenance

The 389VP Sensor requires minimum maintenance. The sensor should be kept clean and free of debris and sediment at all times. The frequency of cleaning by wiping or brushing with a soft cloth or brush is determined by the nature of the solution being measured. The sensor should be removed from the process periodically and checked in buffer solutions.

⚠ WARNING

BEFORE REMOVING THE SENSOR, be absolutely certain that the process pressure is reduced to 0 psig and the process temperature is lowered to a safe level!

If the sensor will not calibrate, refer to your analyzer/transmitter instruction manual for proper test procedures. If it is determined that the sensor has failed, it should be discarded and replaced.

4.1 Electrode Cleaning

If the electrode is coated or dirty, clean as follows:

1. Remove the sensor from process.
2. Wipe the glass bulb with a soft, clean, lint free cloth or tissue. If this does not remove the dirt or coating, go to Step 3 (detergents clean oil and grease; acids remove scale.)
3. Wash the glass bulb in a strong detergent solution, and rinse it in clean water. If this does not clean the glass bulb, go to Step 4.

⚠ CAUTION

The solution used during the following check is an acid and should be handled with care. Follow the directions of the acid manufacturer. Wear the proper protective equipment. Do not let the solution come in contact with skin or clothing. If contact with skin is made, immediately rinse with clean water.

4. Wash the glass bulb in a dilute 5% hydro chloric acid solution, and rinse with clean water. Soaking the sensor overnight in the acid solution can improve cleaning action.

Replace the sensor if it cannot be cleaned.

4.2 Automatic Temperature Compensator

The temperature compensator element is a temperature sensitive resistor and can be checked with an ohmmeter. Resistance increases with temperature.

The 3K element will read 3000 ohms ± 1% at 25°C (77°F), and a Pt100 will read 110 ohms. Resistance varies with temperature for a 3K and Pt-100 element and can be determined according to Table 4-2 or the following formula:

$R_T = R_O [1 + R_1 (T-20)]$

Where R_t = Resistance

T = Temperature in °C

Refer to Table 4-1 for R_O and R_1 values.

TABLE 4-1. R_O and R_1 values for temperature compensation elements

Temperature Compensation Element	R_O	R_1
3K	2934	.0045
PT-100	107.7	.00385

TABLE 4-2. Temperature vs. Resistance of auto T.C. elements

Temperature °C	Resistance (Ohms) ±1%	
	3K	**PT-100**
0	2670	100.0
10	2802	103.8
20	2934	107.7
25	3000	109.6
30	3066	111.5
40	3198	115.4
50	3330	119.2
60	3462	123.1
70	3594	126.9
80	3726	130.8
90	3858	134.6
100	3990	138.5

4.3 389VP ORP

4.3.1 Platinum Electrode Check

The platinum electrode may be checked as follows. There are two types of standard solutions which may be used to check the ORP electrode/transmitter system:

Type 1: One type of commonly used ORP standard solution is the saturated quinhydrone solution (PN R508-160Z). Refer to Section 3.3.

⚠ CAUTION

The solution used during the following check is an acid and should be handled with care. Follow the directions of the acid manufacturer. Wear the proper protective equipment. If contact with skin of clothing is made, immediately rinse with plenty of clean water.

Type 2: A second ORP standard solution can be prepared from the following recipe: Dissolve 39.2 grams of reagent grade ferrous ammonium sulfate, $Fe(NH_4)_2\ (SO_4)_2 \bullet 6H_2O$ and 48.2 grams of reagent grade ferric ammonium sulfate, $FeNH_4(SO_4)_2 \bullet 12H_2O$, in approximately 700 milliliters of water (distilled water is preferred, but tap water is acceptable). Slowly and carefully add 56.2 milliliters of concentrated sulfuric acid. Add sufficient water to bring the total solution volume up to 1000 ml. This standard ORP solution, although not as simple to prepare as the quinhydrone recipe, is much more stable, and will maintain its millivolt value for approximately one year when stored in glass containers. This solution (ferric/ferrous ammonium sulfate) will produce a nominal ORP of

476 +20 mV at 25°C when used with a saturated KCl/AgCl reference electrode and platinum measuring electrode. Some tolerance in mV values is to be expected due to the rather large liquid reference junction potentials that can arise when measuring this strongly acidic and concentrated solution. However, if the measuring electrodes are kept clean and in good operating condition, consistently repeatable calibrations can be carried out using this standard solution.

4.3.2 Cleaning Platinum Electrode

The electrode can be restored to normal operation by simply cleaning the platinum electrode with baking soda. Polish it by rubbing it with a damp paper towel and baking soda until a bright, shiny appearance is attained.

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Section 5: Troubleshooting

TABLE 5-1. Troubleshooting

Trouble	Probable Cause	Remedy
Meter reads off scale (Display reads overrange).	Defective preamplifier.	Replace preamplifier (for code 02 sensors). For code 01, replace sensor.
	T.C. element shorted.	Check T.C. element as instructed in Section 4.2 and replace sensor if defective.
	Sensor not in process or sample stream is low.	Make sure sensor is in process with sufficient sample stream (refer to Section 2.0 for installation details).
	Open glass electrode.	Replace sensor.
	Reference element open - no contact.	Replace sensor.
Display reads between 3 and 6 pH regardless of actual pH of solution or sample.	Electrode cracked.	Replace sensor.
Meter or display indication swings or jumps widely in AUTO T.C. Mode.	T.C. element shorted	Check T.C. element as instructed in Section 4.2 and replace sensor if defective.
Span between buffers extremely short in AUTO T.C. Mode.	T.C. element shorted	Check T.C. element as instructed in Section 4.2 and replace sensor if defective.
Sluggish or slow meter indication for real changes in pH level.	Electrode cracked.	Clean sensor as instructed in Sections 4.1 or 4.3.2. Replace sensor if cracked.
	Electrode defective.	Replace sensor.
Transmitter cannot be standardized.	Electrode coated or cracked.	Clean Sensor as instructed in Sections 4.1 or 4.3.2 and, if cracked, replace sensor.
	Defective preamplifier.	Replace preamplifier.
Transmitter short spans between two different buffer values.	Old glass electrode or high temperature exposure.	Replace sensor.
	Coated glass.	Clean Sensor as instructed in Sections 4.1 or 4.3.2. Replace sensor if cracked.

ACCESSORIES	
PART	DESCRIPTION
24281-00	15 ft. VP8 cable
24281-01	25 ft. VP8 cable
24281-02	2.5 ft. VP8 cable
24281-03	50 ft. VP8 cable
24281-04	100 ft. VP8 cable
24281-05	4 ft. VP8 cable
24281-06	10 ft. VP8 cable
24281-07	20 ft. VP8 cable
24281-08	30 ft. VP8 cable
23645-06	15 ft. cable with mating VP6 connector, prepped with BNC on instrument end
23645-07	15 ft. cable with mating VP6 connector, prepped without BNC on instrument end

Section 6: Return of Material

6.1 General

To expedite the repair and return of instruments, proper communication between the customer and the factory is important. A return material authorization number is required. Call 1-800-654-7768 or (949) 757-8500. The "Return of Materials Request" form is provided for you to copy and use in case the situation arises. The accuracy and completeness of this form will affect the processing time of your materials.

6.2 Warranty Repair

The following is the procedure for returning products still under warranty.

1. Contact the factory for authorization.
2. Complete a copy of the "Return of Materials Request" form as completely and accurately as possible.
3. To verify warranty, supply the factory sales order number or the original purchase order number. In the case of individual parts or sub-assemblies, the serial number on the unit must be supplied.
4. Carefully package the materials and enclose your "Letter of Transmittal" and the completed copy of the "Return of Materials Request" form. If possible, pack the materials in the same manner as it was received.

IMPORTANT

Please see second section of "Return of Materials Request Form". Compliance to the OSHA requirements is mandatory for the safety of all personnel. MSDS forms and a certification that the instruments have been disinfected or detoxified are required.

5. Send the package prepaid to:
   Rosemount Analytical Inc.
   2400 Barranca Parkway
   Irvine, CA 92606
   Attn: Factory Repair
   Mark the package: Returned for Repair RMA No. _____
   Model No. _____

6.3 Non-Warranty Repair

1. Contact the factory for authorization.
2. Fill out a copy of the "Return of Materials Request" form as completely and accurately as possible.
3. Include a purchase order number and make sure to include the name and telephone number of the right individual to be contacted should additional information be needed.
4. Do Steps 4 and 5 of Section 6.2.

NOTE

Consult the factory for additional information regarding service or repair.

RETURN OF MATERIALS REQUEST

• **IMPORTANT!**
This form must be completed to ensure expedient factory service.

RETURNED BY: BILL TO:

_____ _____ _____

_____ _____ _____

_____ _____ _____

NOTICE TO SENDER: CUSTOMER/USER MUST SUBMIT MATERIAL SAFETY SHEET (MSDS) or complete stream composition, and/or letter certifying the materials have been disinfected and/or detoxified when returning any product, sample or material that have been exposed to or used in an environment or process that contains a hazardous material any of the above that is submitted to rosemount analytical without the msds will be returned to sender c.o.d. fo9r the safety and health of our employees. we thank you in advance for compliance to this subject.

SENSOR OR CIRCUIT BOARD ONLY:
(Please reference where from in MODEL / SER. NO. Column)

1. PART NO. _____ 1. MODEL _____ 1. SER. NO. _____
2. PART NO. _____ 2. MODEL _____ 2. SER. NO. _____
3. PART NO. _____ 3. MODEL _____ 3. SER. NO. _____
4. PART NO. _____ 4. MODEL _____ 4. SER. NO. _____

REASON FOR RETURN
PLEASE CHECK ONE:

☐ REPAIR AND CALIBRATE
☐ EVALUATION
☐ REPLACEMENT REQUIRED? ☐ YES ☐ NO
☐ DEMO EQUIPMENT NO. _____
☐ OTHER (EXPLAIN) _____
_____

DESCRIPTION OF MALFUNCTION:

_____

_____

_____

WARRANTY REPAIR REQUESTED:

☐ YES. REFERENCE ORIGINAL ROSEMOUNT ANALYTICAL ORDER NO. _____
CUSTOMER PURCHASE ORDER NO. _____
☐ NO. PROCEED WITH REPAIRS-INVOICE AGAINST P.O. NO. _____
☐ NO. CONTACT WITH ESTIMATE OF REPAIR CHARGES: BY LETTER ☐ OR BY PHONE ☐

NAME _____ PHONE _____

ADDRESS _____

_____ ZIP _____

RETURN AUTHORITY FOR CREDIT ADJUSTMENT [Please check appropriate box(s)]

☐ WRONG PART RECEIVED
☐ DUPLICATE SHIPMENT
☐ RETURN FOR CREDIT
☐ REPLACEMENT RECEIVED
REFERENCE ROSEMOUNT ANALYTICAL SALES ORDER NO. _____
RETURN AUTHORIZED BY: _____

WARRANTY DEFECT _____

24-6047

WARRANTY

Seller warrants that the firmware will execute the programming instructions provided by Seller, and that the Goods manufactured or Services provided by Seller will be free from defects in materials or workmanship under normal use and care until the expiration of the applicable warranty period. Goods are warranted for twelve (12) months from the date of initial installation or eighteen (18) months from the date of shipment by Seller, whichever period expires first. **Consumables, such as glass electrodes, membranes, liquid junctions, electrolyte, o-rings, catalytic beads, etc., and Services are warranted for a period of 90 days from the date of shipment or provision.**

Products purchased by Seller from a third party for resale to Buyer ("Resale Products") shall carry only the warranty extended by the original manufacturer. Buyer agrees that Seller has no liability for Resale Products beyond making a reasonable commercial effort to arrange for procurement and shipping of the Resale Products.

If Buyer discovers any warranty defects and notifies Seller thereof in writing during the applicable warranty period, Seller shall, at its option, promptly correct any errors that are found by Seller in the firmware or Services, or repair or replace F.O.B. point of manufacture that portion of the Goods or firmware found by Seller to be defective, or refund the purchase price of the defective portion of the Goods/Services.

All replacements or repairs necessitated by inadequate maintenance, normal wear and usage, unsuitable power sources, unsuitable environmental conditions, accident, misuse, improper installation, modification, repair, storage or handling, or any other cause not the fault of Seller are not covered by this limited warranty, and shall be at Buyer's expense. Seller shall not be obligated to pay any costs or charges incurred by Buyer or any other party except as may be agreed upon in writing in advance by an authorized Seller representative. All costs of dismantling, reinstallation and freight and the time and expenses of Seller's personnel for site travel and diagnosis under this warranty clause shall be borne by Buyer unless accepted in writing by Seller.

Goods repaired and parts replaced during the warranty period shall be in warranty for the remainder of the original warranty period or ninety (90) days, whichever is longer. This limited warranty is the only warranty made by Seller and can be amended only in a writing signed by an authorized representative of Seller. Except as otherwise expressly provided in the Agreement, THERE ARE NO REPRESENTATIONS OR WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, AS TO MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE, OR ANY OTHER MATTER WITH RESPECT TO ANY OF THE GOODS OR SERVICES.

RETURN OF MATERIAL

Material returned for repair, whether in or out of warranty, should be shipped prepaid to:

Emerson Process Management
Liquid Division
2400 Barranca Parkway
Irvine, CA 92606

The shipping container should be marked:

RETURN FOR REPAIR

Model _____

The returned material should be accompanied by a letter of transmittal which should include the following information (make a copy of the "Return of Materials Request" found on the last page of the Manual and provide the following thereon):

1. Location type of service, and length of time of service of the device.
2. Description of the faulty operation of the device and the circumstances of the failure.
3. Name and telephone number of the person to contact if there are questions about the returned material.
4. Statement as to whether warranty or non-warranty service is requested.
5. Complete shipping instructions for return of the material.

Adherence to these procedures will expedite handling of the returned material and will prevent unnecessary additional charges for inspection and testing to determine the problem with the device.

If the material is returned for out-of-warranty repairs, a purchase order for repairs should be enclosed.

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youtube.com/user/RosemountAnalytical

Credit Cards for U.S. Purchases Only.

Emerson Process Management

2400 Barranca Parkway
Irvine, CA 92606 USA
Tel: (949) 757-8500
Fax: (949) 474-7250

rosemountanalytical.com

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