Instruction Sheet
PN 51A-396VP/rev.G
January 2011

Models 396VP and 398VP

TUpH™ Submersion/Insertion pH/ORP Sensors

For additional information, please visit our website at *www.emersonprocess.com/raihome/liquid/*.

SPECIFICATIONS:

SPECIFICATIONS	MODEL 396VP	MODEL 398VP
Measurements and Ranges*	pH: 0-14	pH: 0-14; ORP: -1500 to 1500 mV
Available pH AccuGlassTypes	GPHT hemi bulb or GPLR flat bulb	GPHT hemi bulb or GPLR flat bulb
Wetted Materials	316 SST, Polypropylene, EPDM, glass	Titanium, Tefzel®[1], glass, choice of Kalrez®[1], Viton®[1], or EPDM (platinum: ORP only)
Process Connection	None, use 1 in. NPT process connector, PN 23166-00 or 23166-01 (sold separately)	None, use 1 in. NPT process connector PN 23166-00 or 23166-01 (sold separately)
Temperature Range	0-85°C if SMART (-70) is used, 0-100°C (32-212°F)	0-100°C (32-212°F)
Pressure Range - Hemi bulb	100 - 1136 kPa (abs) (0 - 150 psig)	100 - 1825 kPa (abs) (0 - 250 psig)
Pressure Range - Flat bulb	100 - 790 kPa (abs) (0 - 100 psig)	100 - 790 kPa (abs) (0 - 100 psig)
Minimum Conductivity	100 µS/cm, nominal	100 µS/cm, nominal
Preamplifier Options	integral SMART (-70)	No
Solution Ground	No	No
VP8 Cable	PN 24284-00 (more options available)	PN 24281-00 (more options available)

[1] Tefzel, Viton and Kalrez are registered trademarks of DuPont Performance Elastomers.

*PERCENT LINEARITY		
pH range	Hemi bulb GPHT	Flat bulb GPLR
0-2	94%	93%
2-12	99%	98%
12-13	97%	95%
13-14	92%	—

⚠ CAUTION
SENSOR/PROCESS APPLICATION COMPATIBILITY

The wetted sensor materials may not be compatible with process composition and operating conditions. Application compatibility is entirely the responsibility of the user.

⚠ CAUTION

The buffer in the protective boot may cause skin or eye irritation.

ATEX DIRECTIVE

Special Conditions for safe use

1. All pH/ORP sensors have a plastic enclosure which must only be cleaned with a damp cloth to avoid the danger due to a build up of an electrostatic charge.
2. All pH/ORP sensor Models are intended to be in contact with the process fluid and may not meet the 500V r.m.s. a.c. test to earth. This must be taken into consideration at installation.

⚠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!

⚠ DANGER

DO NOT connect sensor to power lines. Serious injury may result.

⚠WARNING

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

ROSEMOUNT® Analytical

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INSTALLATION

For sensor dimensions, see Figure 1.

For sensor orientation, see Figures 2 and 3.

For wiring, see Figures 4 - 22.

ELECTRODE PREPARATION

1. Remove electrode from shipping container.
2. Remove the protective boot covering the electrode bulb.
3. For pH electrode, rinse away salt film with clean water, then shake the electrode so that the internal solution fills the bulb, thus removing any air trapped there.

TWO POINT BUFFER CALIBRATION

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 approximately ± 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 equilibrate to the buffer temperature (to avoid errors due to temperature differences between the buffer solution and sensor temperature) and wait for reading to stabilize. 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 & 2 using the second buffer solution.
4. The theoretical slope value, according to the Nernst equation for calculating pH, is approximately 59.17 mV/pH. Over time the sensor will age, both in the process and in storage, and will result in reduced slope values. To ensure accurate readings, it is recommended that the electrode be replaced when the slope value falls below 47 to 49 mV/pH.

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 analyzer's reading to match that of the known process pH.

MAINTENANCE FOR pH ELECTRODE

Electrodes should respond rapidly. Sluggishness, offsets, and erratic readings are indicators that the electrodes may need cleaning or replacement.

1. To remove oil deposit, clean the electrode with a mild non-abrasive detergent.
2. To remove scale deposits, soak electrodes for 30 to 60 minutes in a 5% hydrochloric acid solution.
3. Temperature effect on life expectancy: If glass electrode life expectancy is 100% @ 25°C (77°F), then it will be approximately 25% @ 80°C (176°F).

ORP CALIBRATION

1. After making an electrical connection between the sensor and the instrument, obtain a standard solution of saturated quinhydrone. This can also be made quite simply by adding a few crystals of quinhydrone to either pH 4 or pH 7 buffer. Quinhydrone is only slightly soluble, therefore only a few crystals will be required.
2. Immerse the sensor in the standard solution. Allow 1-2 minutes for the ORP sensor to stabilize.
3. Adjust the standardize control of the instrument to the solution value shown in the table below. 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 the table below. 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.
4. Remove the sensor from the buffer, rinse, and install in the process.

STORAGE

1. It is recommended that electrodes be stored in their original shipping containers until needed.
2. Do not store at temperatures below -5°C (23°F).
3. Electrodes should be stored with a protective cap containing KCl solution (PN 9210342).
4. For overnight storage, immerse the sensor in tap water or 4 pH buffer solution.
5. A pH glass electrode does have a limited shelf life of one year.

MAINTENANCE FOR ORP ELECTRODE

Electrodes should respond rapidly. Sluggishness, offsets, and erratic readings are indicators that the electrodes may need cleaning or replacement.

1. To remove oil deposit, clean the electrode with a mild non-abrasive detergent.
2. To remove scale deposits, soak electrodes for 30 to 60 minutes in a 5% hydrochloric acid solution.
3. ORP (metallic) electrodes should be polished with moistened baking soda.

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

INSTALLATION

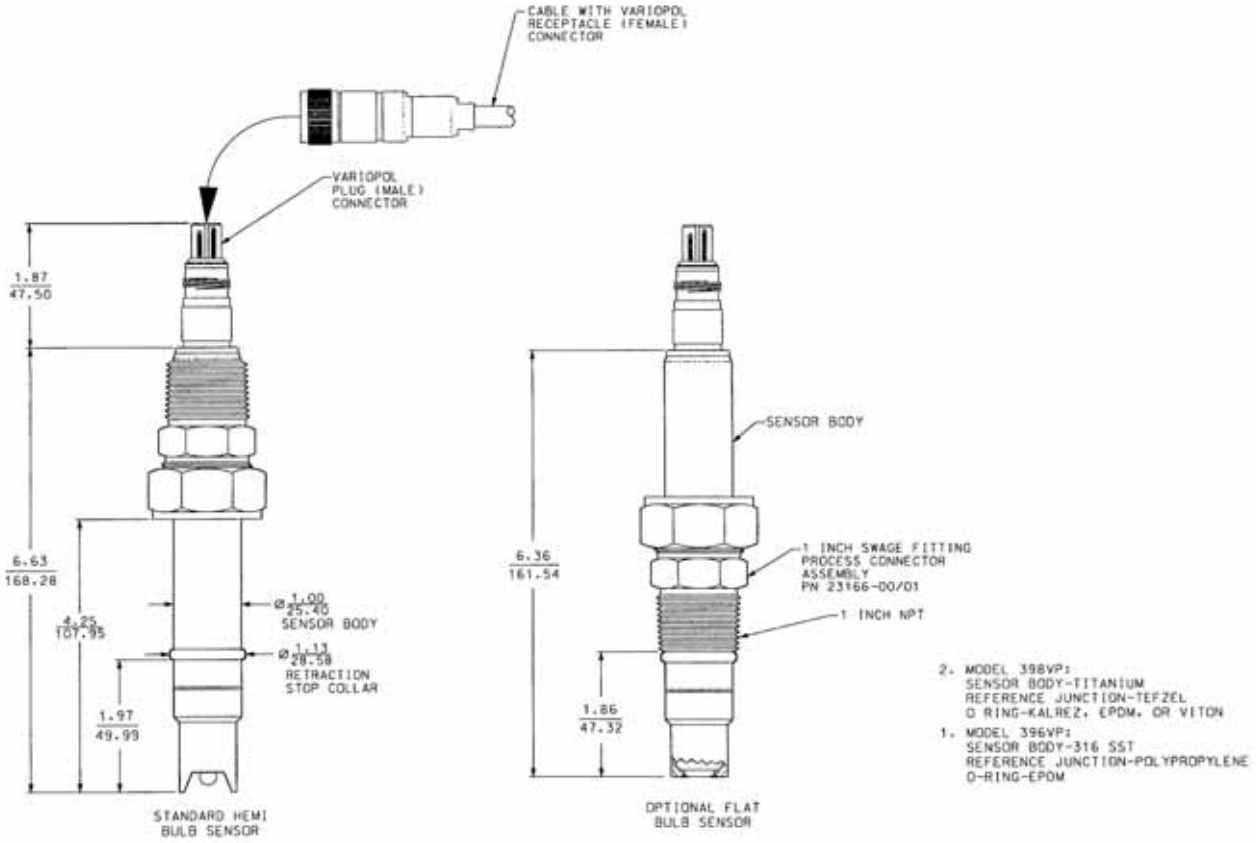

FIGURE 1. Sensor Dimensions

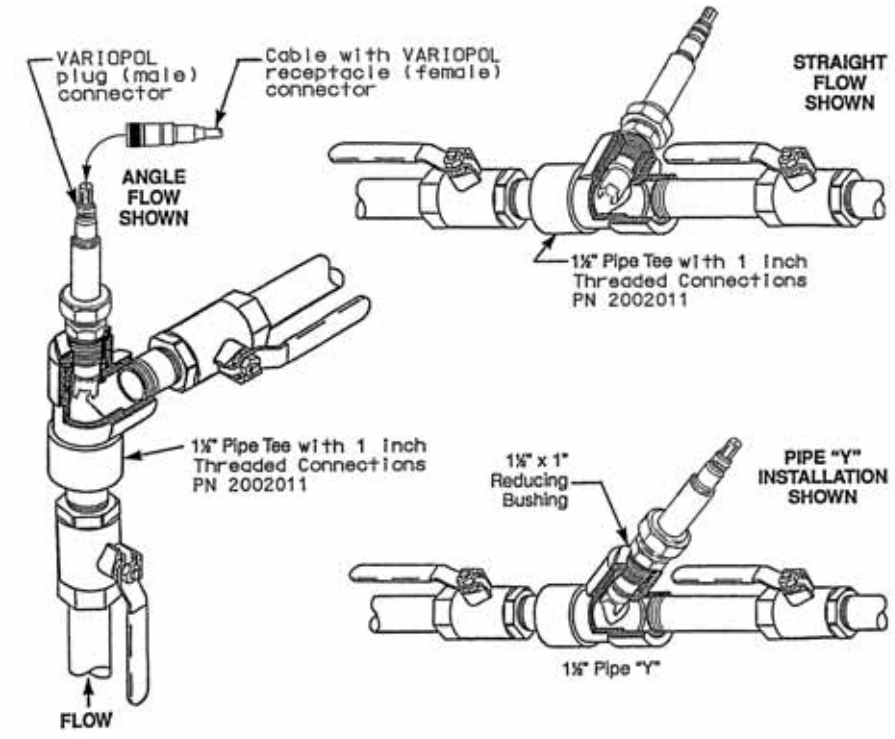

FIGURE 2. Flow Through and Insertion Installation For Models 396VP and 398VP

1-1/2 inch Pipe Tee (PN 2002011) with 1 inch threaded connections.

NOTE: The sensor must be mounted at least 10° above the horizon.

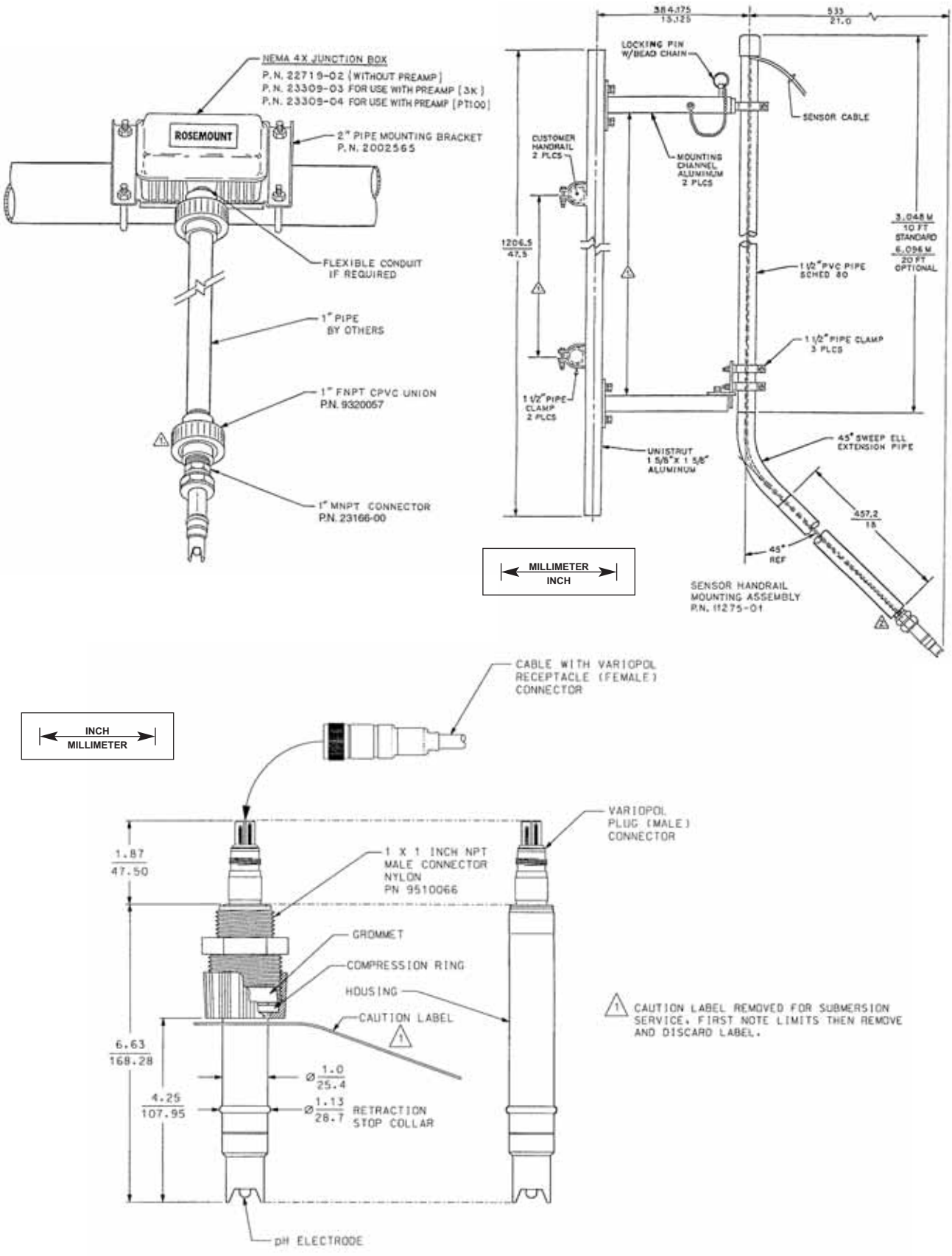

FIGURE 3. Typical Submersion Installations for Models 396VP and 398VP

WIRING

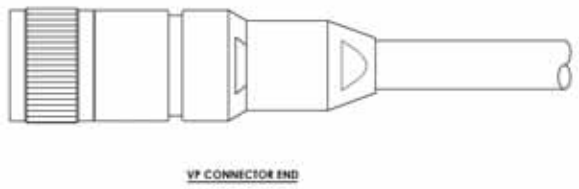

FIGURE 4. VP8 Cable, sensor end

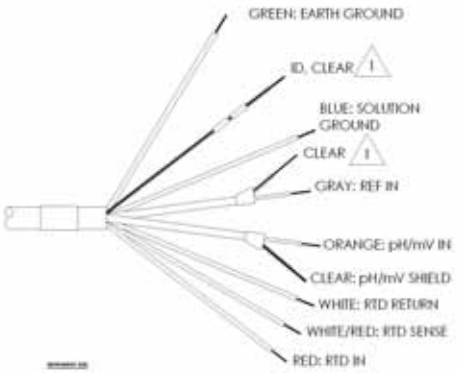

FIGURE 5. VP8 Cable, instrument end

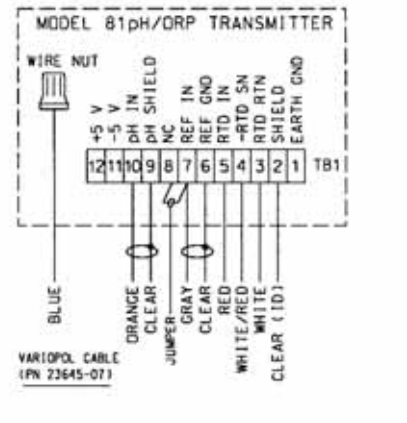

FIGURE 6. Model 81 Wiring

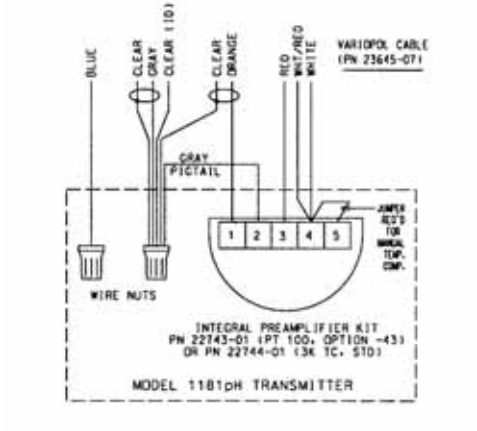

FIGURE 7. Model 1181 Wiring

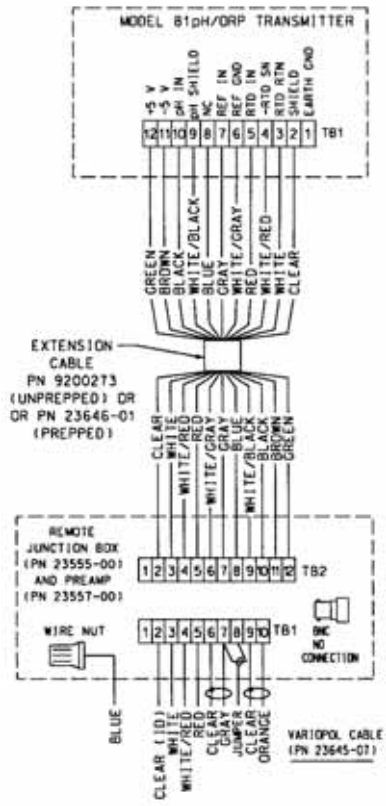

FIGURE 8. Model 81 Wiring through Remote Junction Box

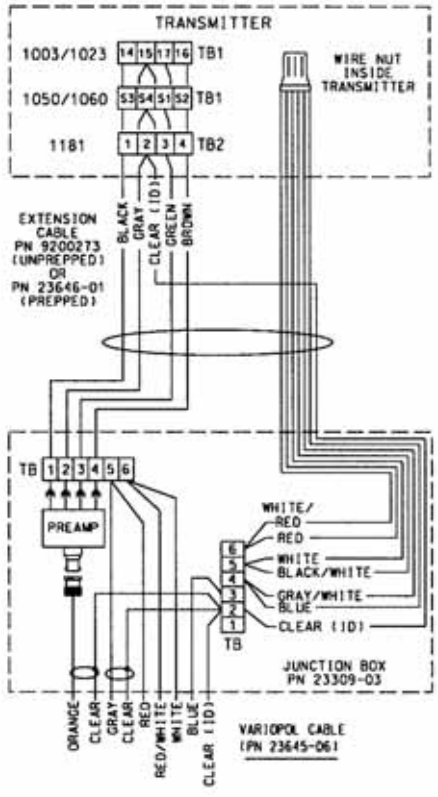

FIGURE 9. Model 1181, 1050/1060, & 1003/1023 Wiring through Remote Junction Box

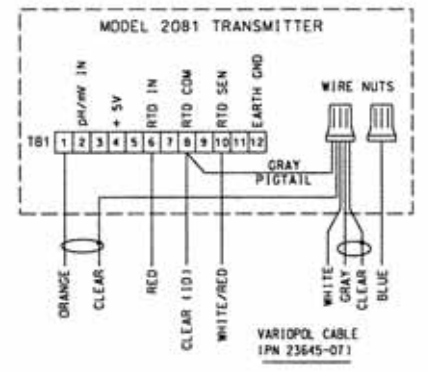

FIGURE 10. Model 2081 Wiring

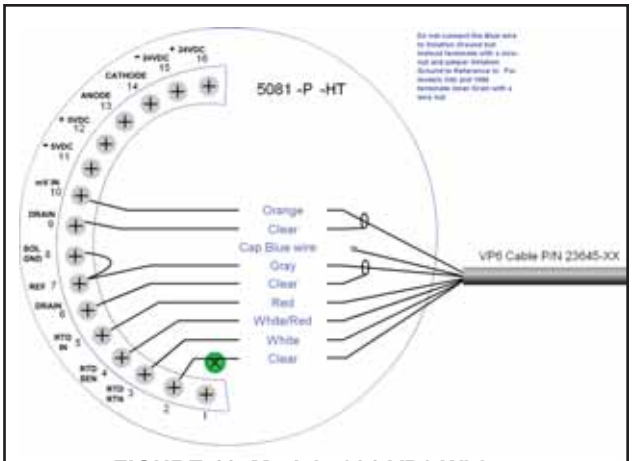

FIGURE 11. Model 5081 VP6 Wiring

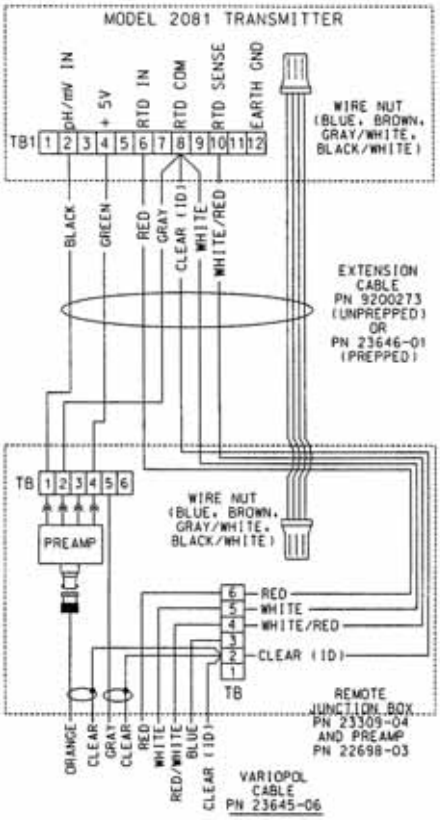

FIGURE 12. Model 2081 Wiring through Remote Junction Box

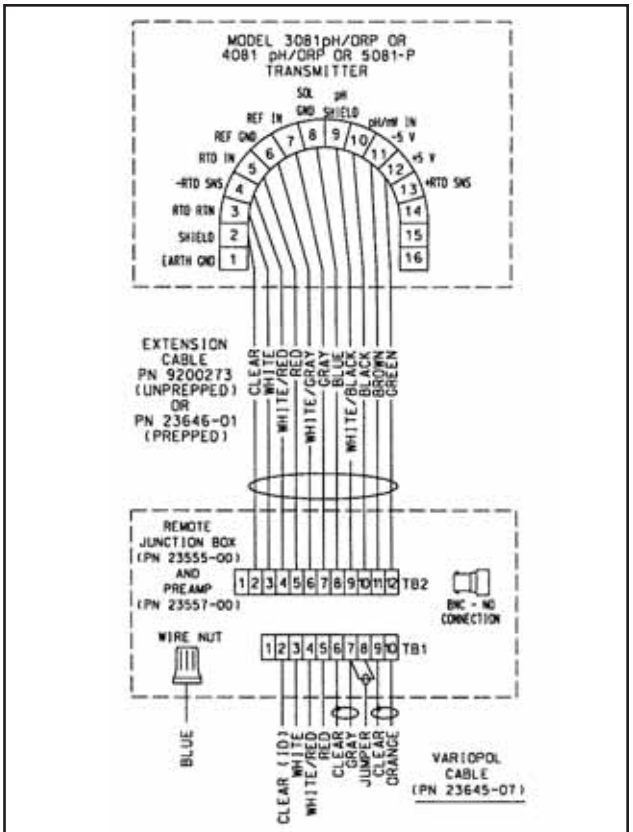

FIGURE 13. Model 3081, 4081, & 5081 Wiring through Remote Junction Box

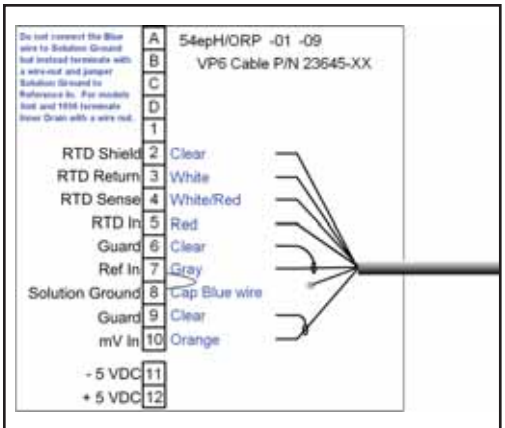

FIGURE 14. Model 54e VP6 Wiring

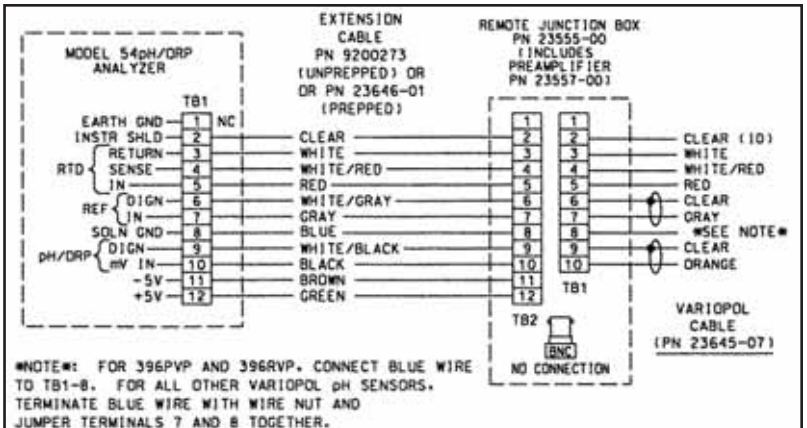

FIGURE 15. Model 54e Wiring through Remote Junction Box

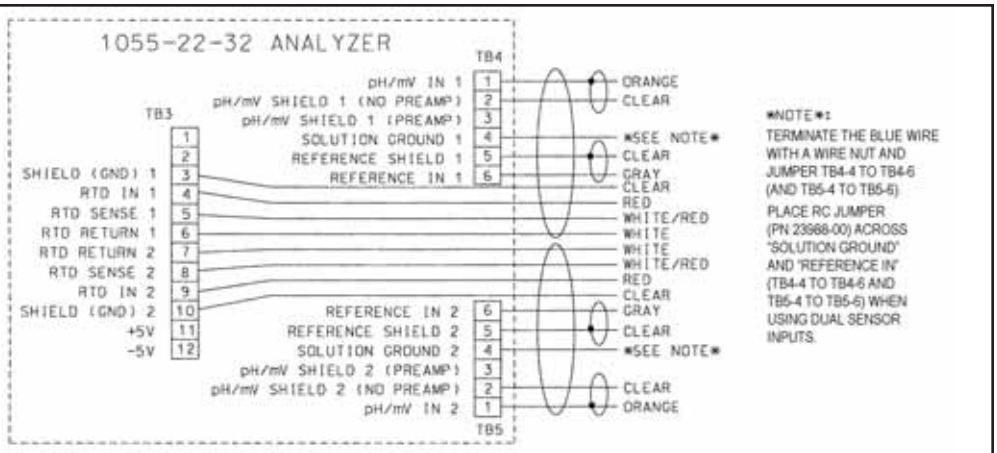

FIGURE 16. Model 1055-22-32 Wiring

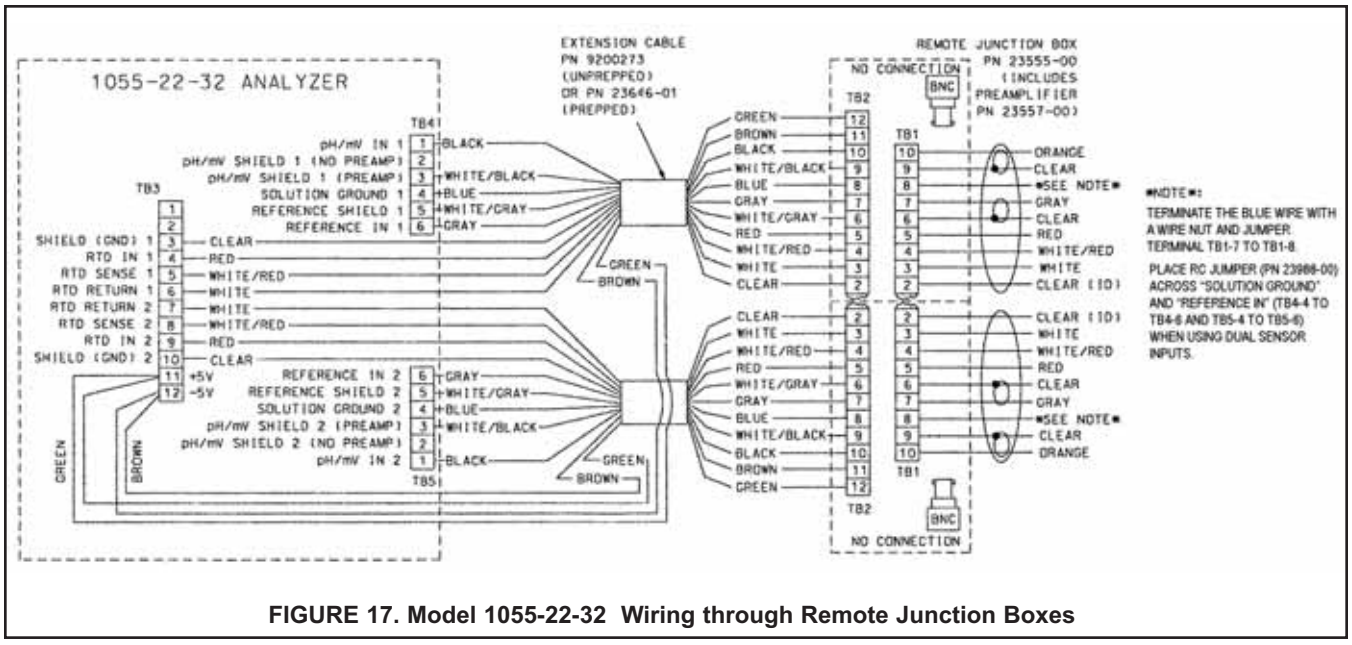

FIGURE 17. Model 1055-22-32 Wiring through Remote Junction Boxes

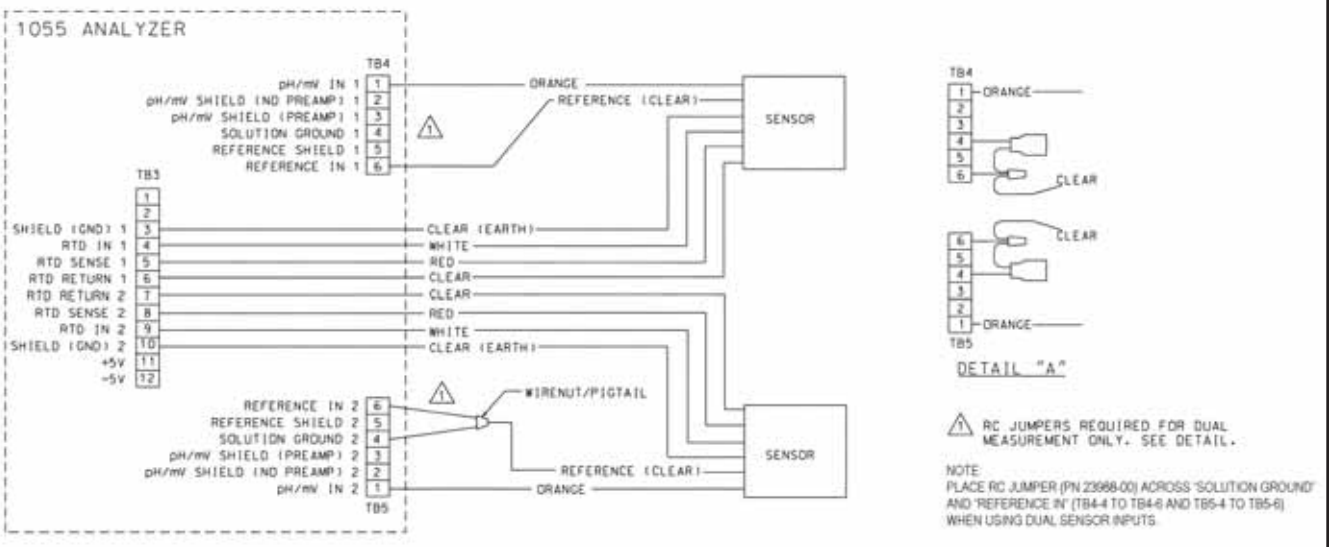

FIGURE 18. Model 1055-10-22-32 Wiring

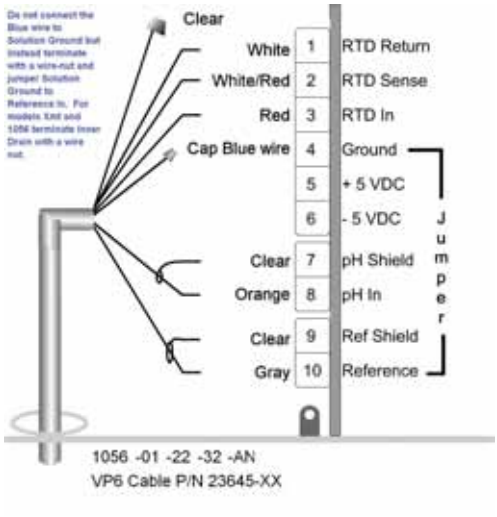

FIGURE 19. Model 1056 VP6 Wiring

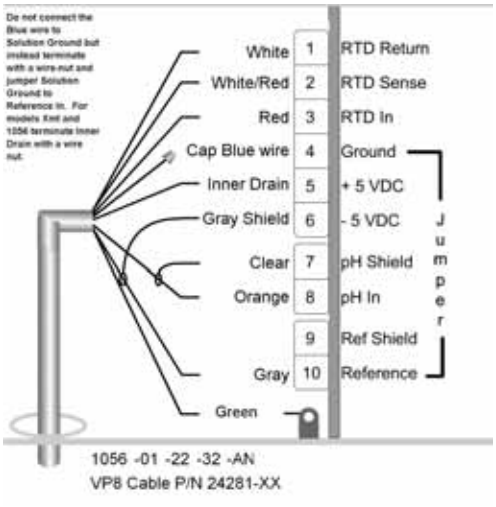

FIGURE 20. Model 1056 VP8 Wiring
Standard VP8 wiring to 1056

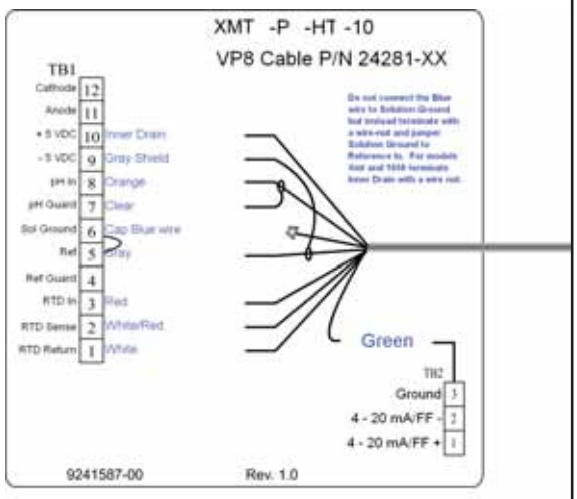

FIGURE 21. Model Xmt VP8 Wiring

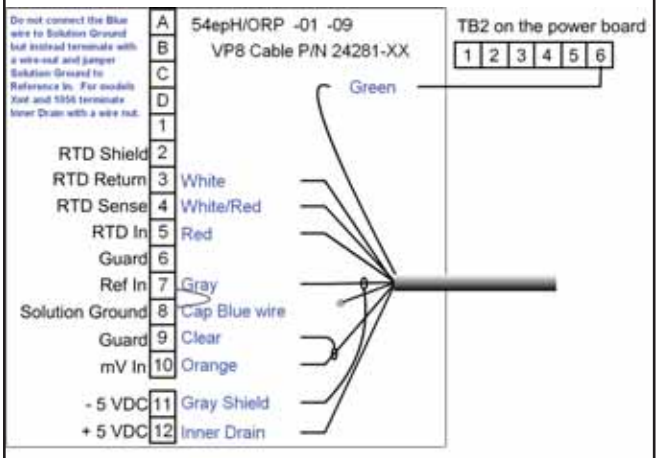

FIGURE 22. Model 54e VP8 Wiring
Standard VP8 wiring to 54e

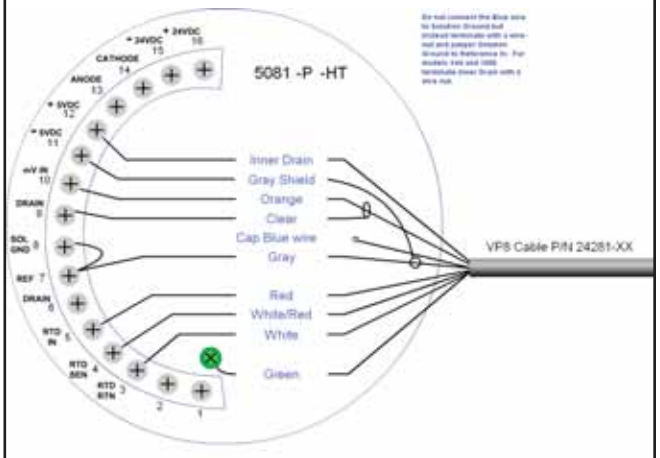

FIGURE 23. Model 5081 VP8 Wiring
Standard VP8 wiring to 5081

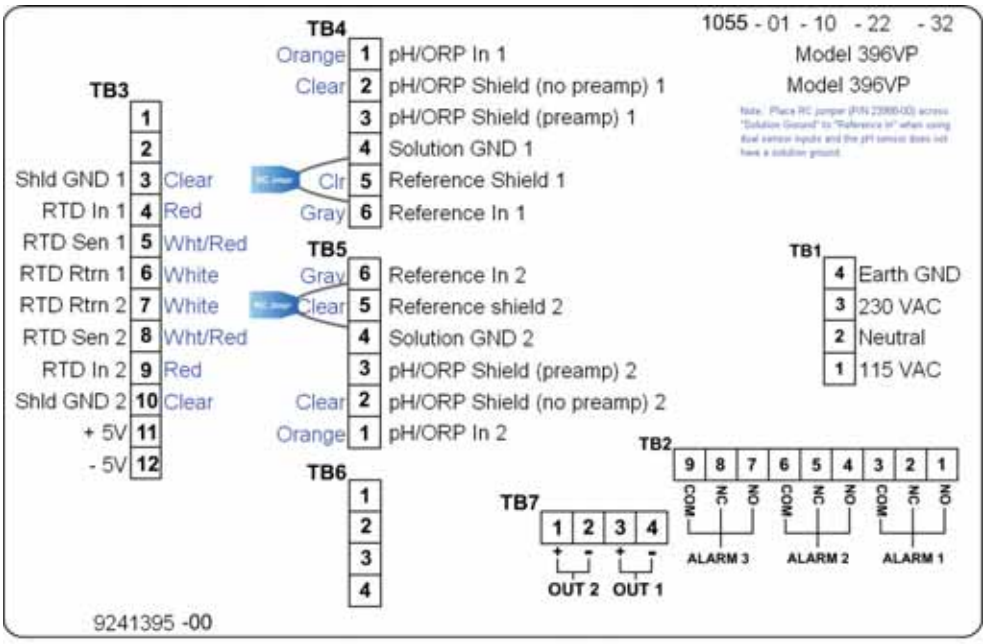

FIGURE 24. Model 1055 VP8 Wiring

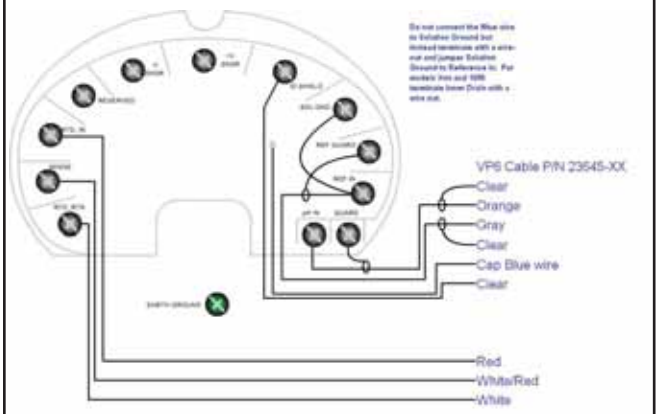

FIGURE 25. Model 6081 VP6 Wiring

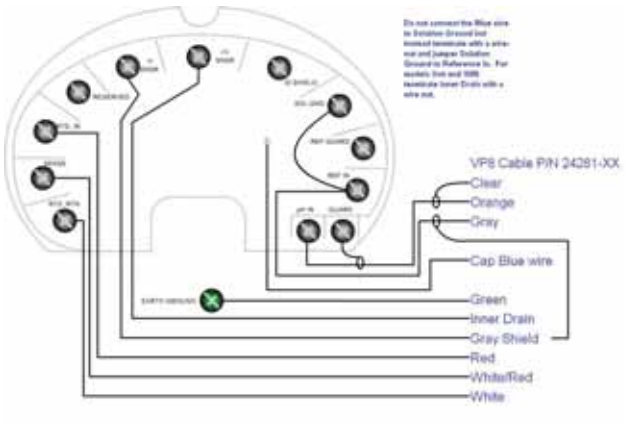

FIGURE 26. Model 6081 VP8 Wiring
Standard VP8 wiring to wireless 6081

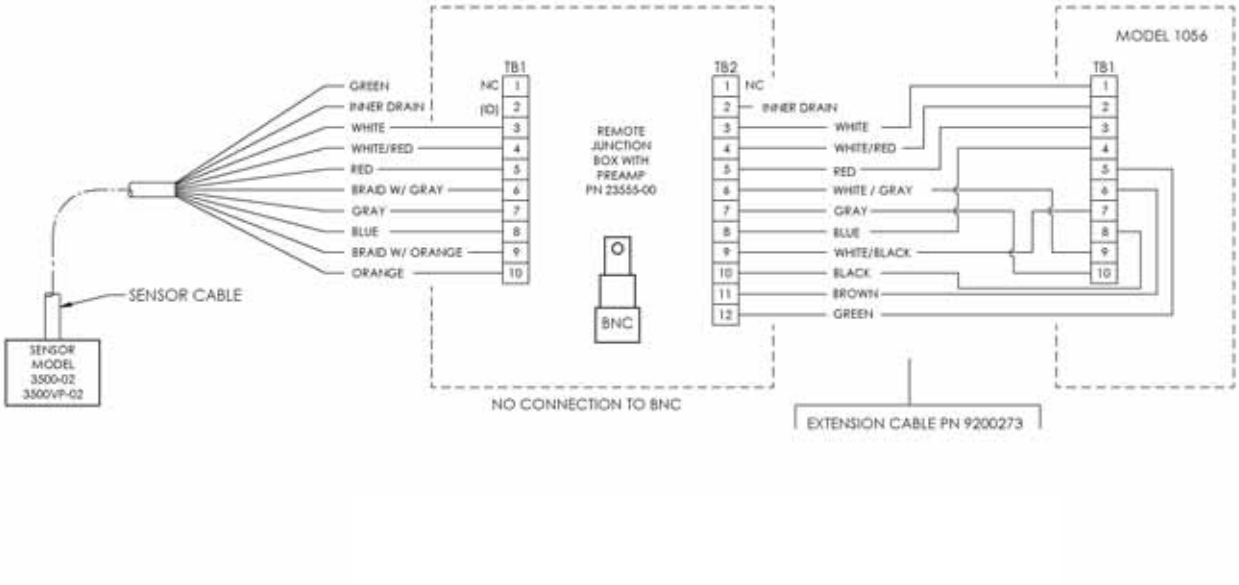

FIGURE 27. Model 1056 Wiring through a j-box

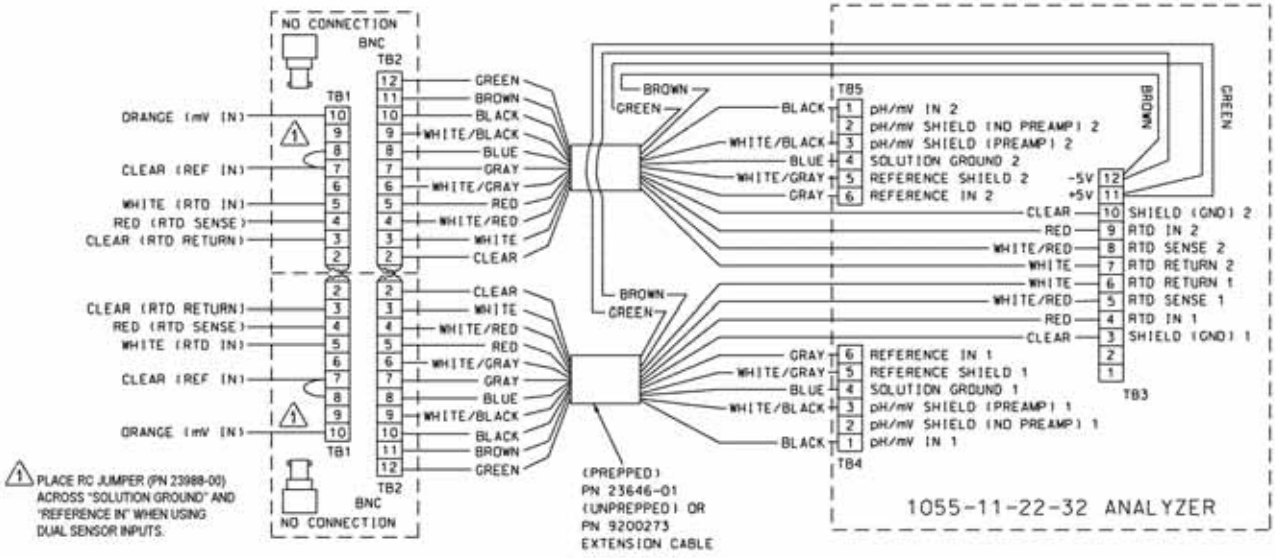

FIGURE 28. Model 1055-11-22-32 Wiring Through Remote Junction Boxes

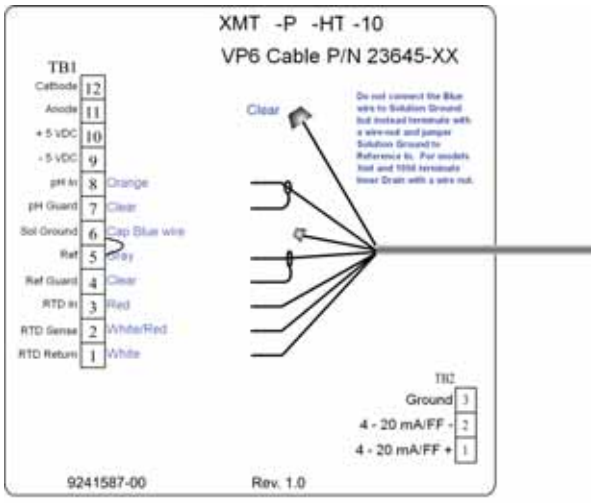

FIGURE 29. Model Xmt-P-HT VP6 Wiring

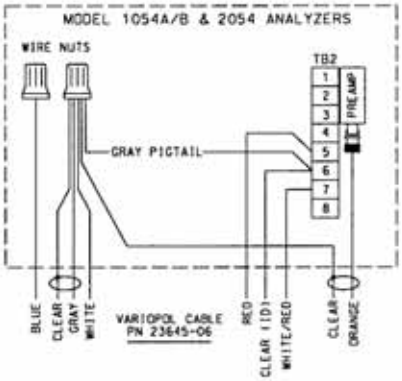

FIGURE30. Model 1054A/B & 2054 Wiring

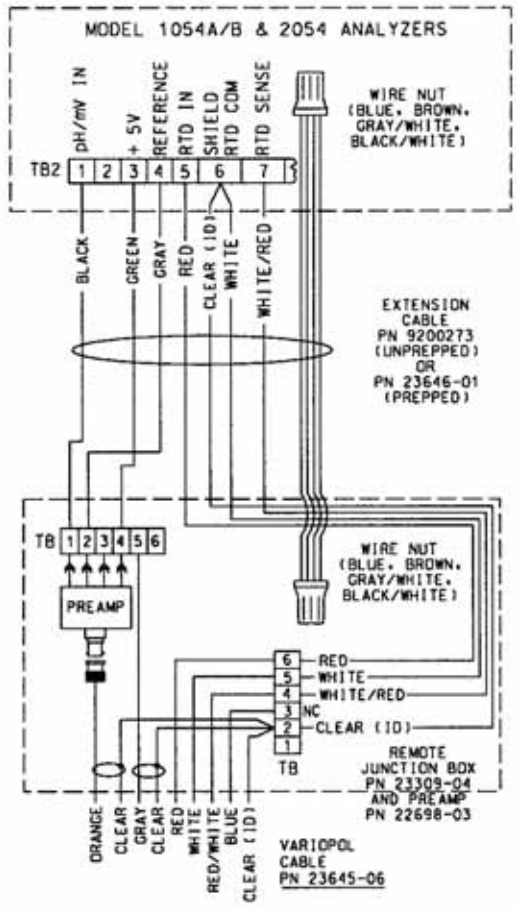

FIGURE 31. Model 1054A/B & 2054 Wiring through a Remote Junction Box

ACCESSORIES

PART NUMBER	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
22698-00	Preamplifier plug-in for junction box, for Model 1003
22698-02	Preamplifier plug-in for junction box, for Models 1181, 1050
22698-03	Preamplifier plug-in for junction box, for Models 1054A/B, 2054, 2081
22743-01	Pt100 preamplifier for Model 1181
22744-01	3K Preamplifier for Model 1181
23557-00	Preamplifier for junction box for Models 54, 3081, 81, 4081
33046-00	Ferrule, 1 in., split 316SS
9310096	Nut, swage, 1 in. 316SST
9210012	Buffer solution, 4.01 pH, 16 oz
9210013	Buffer solution, 6.86 pH, 16 oz
9210014	Buffer solution, 9.18 pH, 16oz
R508-160Z	ORP solution, 460 mv ± 10 at 20°C
9550167	EPDM O-ring for Process Connector (PN 23166-00 or 23166-01)
12707-00	Jet Spray Cleaner

NOTE: All accessories above can be used with the Models 396VP, 396RVP, 398VP and 398RVP.
[1] Kynar is a registered trademark of Elf Atochem North American, Inc.
[2] Teflon is a registered trademark of E.I. du Pont de Nemours and Company.

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