OPERATING INSTRUCTION MANUAL

MODEL P/R60 & P/R65
DIFFERENTIAL PH & ORP PROBES

REV. 8.0

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1.0 GENERAL INFORMATION

This manual covers all AquaMetrix P60, P65, R60 and R65 Series differential measurement pH and ORP probes.

All mounting configurations are described.

Both those probes with encapsulated preamplifiers and those with encapsulated two-wire transmitters are covered. If your probe has five wires it has an encapsulated preamplifier (P60 and R60). If your probe has two wires, or in the case of an ORP probe four wires, it has an encapsulated two-wire transmitter (P65 and R65).

The output from a two-wire transmitter type is non-isolated and un-calibrated. The system must provide 24 Vdc, with “low” isolated from earth ground, and a means of calibrating for offset and span.

2.0 SPECIFICATIONS

MEASURING RANGES:
pH: 0 to 14.00 pH
ORP: R60: ±1000 mV
R65: 0-1000 mV / ±500 mV field selectable

FLOW RATE:
10 ft./sec max. Flow should be as low as possible in low conductivity water and in solutions with high suspended solids

WETTED MATERIALS:
P60C/P65C: CPVC, ceramic, glass, titanium palladium alloy and EPDM
R60/R65: CPVC, ceramic, glass, titanium palladium alloy, EPDM, and platinum

TRANSMISSION DISTANCE:
5-wire Probes: 900 meters (3000 ft.)
2-wire Probes: Limited only by cable resistance and voltage of power supply

SENSITIVITY: pH: Less than 0.005 pH
ORP: Less than 0.1mV

STABILITY: 0.03 pH / 2mV per day, non-cumulative

PRESSURE LIMIT: 100 psig

TEMPERATURE LIMITS: 95°C (203°F)

PROBE CABLE: 15 ft. (4.6 m)

AUTOMATIC TEMPERATURE COMPENSATION:
-5 to 95°C (23 to 203°F)

P65C:
OUTPUT SPAN: 1.14mA / pH
OUTPUT OFFSET: 12mA @ 7pH ±1.14mA
MAX LOAD: 450 Ohms

R65C: OUTPUT SPAN:
0-1000mV: 1.6mA / 100mV
±500mV: 1.6mA / 100mV
OUTPUT OFFSET:
0-1000mV: 12mA @ 500mV ±1mA
±500mV: 12mA @ 0mV ±1mA
MAX LOAD: 450 Ohms

3.0 INSTALLATION

3.1 General Instructions

3.1.1 Specific instructions for each type of probe are given in the following pages. Common to all probes are the following instructions:

a) If the distance between the probe and the instrument is such that a direct connection is not possible, the probe cable should be routed to a junction box with a terminal strip (AquaMetrix Part No. JB1). Refer to DWG N106-34. The box should be well sealed and away from corrosion danger. Be sure that you have sufficient slack cable to allow for probe removal for calibration and servicing.

b) Route the interconnect cable from the junction box to the instrument, preferably in metal conduit. Do not run the power cable or control cables in the same conduit with the probe interconnect cable.

c) Remove the protective plastic caps from the end of the probe before placing in service.

d) For best results probes should always be mounted vertically with electrodes down. If this is not possible, the probe must be at least 15° above horizontal.

3.2 ORP 4-20 mA Probes, R65

3.2.1 a) ORP 4-20 mA probes have four wires; black, red, green and white. The red wire is to be connected to the +24 Vdc terminal and the back wire to the 24 Vdc common terminal via the load in the loop.

b) For an instrument with a range of 0 to 1000 mV the green and white wires are to be shorted.

c) For an instrument with a range of –500 to 500 mV the green and white wires are to be isolated from each other.

3.3 Submersion Mounting Series 8 Differential Probes Refer to Dwg# N105-62

3.3.1 a) A submersion mounting kit, STC60L is available from AquaMetrix which includes 4 ft. of 1” pipe, 1-1/2” x 1” reducer, a strain relief fitting and wire mounting bracket. Proceed as follows, either with the kit or with your own hardware.

b) Apply a thread sealant to the thread on the cable end of the probe and screw a 1-1/2” x 1” NPT reducer onto the probe. Route the sensor cable through an appropriate length of 1” pipe and using thread sealant, screw the pipe into the reducer. The cable end of the probe should not be exposed to the process. A cable strain relief fitting should be used on the upper end of the pipe. In the kits a wire bracket is provided to aid in supporting the assembly.

NOTE: An optional protective shroud, Part No. PROTECTOR-3 should be used on the electrode end of the probe to protect the electrodes from accidental contact with the tank bottom, sides or objects in the process.

3.4 Submersion Mounting Series 6 Differential Probes
Refer to Dwg# N105-63

3.4.1 a) A submersion mounting kit, STC60-6 is available from AquaMetrix which includes 4 ft. of 1" pipe, 1-1/2" x 1" reducer and a strain relief fitting. Proceed as follows, either with the kit or with your own hardware:

b) Install the optional protective shroud, Part No. PROTECTOR-6 on the probe by threading the probe cable through it. The shroud will contact the shoulder on the probe.

c) Install the compression fitting components on the probe in the order shown in the drawing below so that the pipe thread is towards the cable end of the probe. If you are concerned that the shroud may get pushed up and expose the electrodes you can lock it down by the positioning of the fittings.

d) Snug up the nut of the compression fitting to locate it in the desired position. Hand tighten as much as possible, then turn 1/2 turn with a wrench.

e) Apply a thread sealant to the pipe thread portion of the compression fitting and screw a 1-1/4" x 1" NPT reducer to it.

f) Route the sensor cable through an appropriate length of 1" pipe and using thread sealant, screw the pipe into the reducer on the probe. The cable end of the probe should not be exposed to the process.

3.5 Flow-through tee mounting Series 8 Differential Probes
Refer to Dwg# N105-62

3.5.1 a) Apply pipe sealant to the electrode end of the probe and screw it into a standard 1-1/2" NPT tee.

3.6 Flow-through tee mounting Series 6 Differential Probes
Refer to Dwg# N105-63

3.6.1 a) Take the compression fitting apart. Apply pipe sealant to the 1-1/4" NPT thread and screw this part into a 1-1/4" tee. A larger tee with an appropriate reducer may be used.

b) Put the compression fitting components on the probe in the order shown in the drawing below. They should be in such a position that the electrodes will be in the pipe stream but not touching the opposite side of the tee.

c) Remove the protective cap from the probe and place the probe in the tee. Now tighten the nut by hand as much as possible, then turn 1/2 turn with a wrench.

3.7 Sanitary Probe P60S, P65S, R60S, R65S

3.7.1 The P60S is designed with a stainless steel flange to mate with a Tri-Clover ferrule TL14AM7-2-1/2.

A mounting kit is available, STC69S, consisting of a mating ferrule, clamp, gasket, junction box and 50 feet of cable. (A flow-through chamber for a sample line also available. Part No. SFT69S.)

4.0 SERVICE AND MAINTENANCE

4.1 Probe Cleaning

4.4.1 a) The probe should be kept reasonably clean to avoid measurement errors. Frequency of cleaning can only be determined by experience. To clean proceed as follows:

b) Rinse with clean warm water.

c) Soak the end of the probe in warm water and dish detergent for 3 or 4 minutes.

d) Brush the end of the probe, particularly the three electrodes with a soft bristle brush such as a tooth brush. Take care not to scratch the glass electrode.

e) If the probe is still not clean, it may have to be cleaned with acid. *CAUTION: Do not acid clean probes used in processes containing cyanide solutions.* Some experimentation may be required to determine the most suitable acid for your process. Use the most dilute acid which is effective. Normally 10 parts of water to one part muriatic acid is sufficient. *Do not use hydrofluoric acid.*

f) Soak the probe for not more than 5 minutes in the chosen acid; then rinse thoroughly with clean warm water and soak in water for 3-5 minutes.

g) Calibrate the system in accordance with the instrument instruction manual.

4.2 Replacement of Salt Bridge

4.2.1 a) If the system can't be calibrated after cleaning the probe, it may be necessary to replace the standard cell solution. A kit is available from AquaMetrix for this purpose (Part No. A35-17). Proceed as follows: Refer to DWG N106-60.

b) Hold the probe vertically electrodes up. Insert long nose pliers in the blind holes in the salt bridge and turn counter-clockwise taking care not to damage the glass electrode. Discard the used salt bridge.

c) Up-end the probe and pour out the contents of the standard electrode chamber. Flush the chamber with a small amount of pH 7 buffer or clean water.

d) Refill the chamber with 7pH buffer solution, up to the tip of the electrode, inside the chamber. DO NOT OVERFILL. It is important to leave space for the salt bridge thread and a small amount of air.

e) Screw the new salt bridge into the cavity until finger tight. Now turn 1/4 turn with long nose pliers. The front face of the saltbridge should be flush with the front of the probe.

5.0 TROUBLESHOOTING AND SERVICE

5.1 Checking 5-wire Differential Probes P60 and R60

The probe can be checked by a few simple measurements. Two pH buffer solutions, 7 pH and either 4 pH or 10 pH, and a multimeter are required. For ORP probes two calibration solutions, 200 and 600 mV, are required. Millivolt solutions may be ±20% of nominal value. Actual value is noted on the bottle.

5.1.1 P60C pH probes

a) Clean the probe as described in Section 4.1. If the system cannot be calibrated, replace the salt bridge and 7pH buffer solution as described in 4.2. If the system still can't be calibrated check the probe as follows:

b) Disconnect red, green, yellow and black wires at the junction box. If you are not using a junction box, disconnect at the instrument after shutting off the power.

c) Place the probe in 7 pH buffer. Allow enough time for the temperature of the probe and buffer to stabilize at room temperature.

d) Measure the resistance between the yellow and black wires to check the probe's temperature compensator. The resistance should be between 250 and 350 ohms at 25°C. If the resistance is within specifications the probes thermistor is functioning correctly.

e) Reconnect the yellow and black wires and restore power to the instrument.

f) Measure the voltage between the red and green wires. If it is not within –50 to +50 millivolts with the probe in 7 pH buffer, the probe is defective. If the voltage is OK proceed to the next step.

g) Rinse the probe and place it in 4 pH or 10 pH buffer. Allow it to stabilize then check the voltage again between the red and green wires. If the voltage is between 100 and 230 millivolts (negative in 10 pH buffer, positive in 4 pH buffer) the probe is within specifications.

5.1.2 ORP Probes R60

a) Rinse the probe and place it in 200 mV solution. The reading should be between 160 and 240 mV.

b) Repeat the above in a 600 mV solution. The reading should be between 560 mV and 640 mV.

5.2 Checking Probes P65 and R65 (4-20 mA output)

The operation of the 2-wire, 4-20 mA, probe can be checked by a few simple measurements. Two pH buffer solutions, 7 pH and either 4 pH or 10 pH, and a dc milliammeter are required.

5.2.1 P65C pH Probe

a) Disconnect the red wire at the instrument or power supply and connect it to the milliammeter (-) black.

b) Connect the milliammeter (+) red to the instrument or power supply red wire output terminal.

c) Rinse the probe and place it in 7 pH buffer. Allow the temperature of the buffer and probe to stabilize at room temperature.

d) Check the offset of the probe by reading the milliammeter. The reading should be between 11 and 13 mA. If not the probe is defective. If the offset is OK, note the exact reading and proceed to the next step.

e) Rinse the probe and place it in 4 pH or 10 pH buffer. Allow the temperature of the probe and buffer to stabilize at room temperature. Now check the span of the probe by reading the milliammeter. If the probe is in 4 pH buffer, the reading should be between 2.85 and 3.99 lower than the reading obtained in (d).
If the probe is in 10 pH buffer, the reading should be between 2.85 and 3.99 higher than the reading obtained in (d).
If this test is not satisfied the probe is defective.
If you wish to check the temperature compensator proceed to step (f).

If the span of the probe drops below 2.85mA than the probe still can be used adjustments will have to be made to the receiving device to compensate for the low span.

f) To check the operation of the temperature sensor in the probe, heat the buffer used in step (e) with the probe in it to about 50°C. The milliammeter reading should be within ±0.15 mA of the reading observed in step (e).

5.2.2 ORP Probes R65

a) Disconnect the red wire at the instrument or power supply and connect it to the milliammeter (-) black. Connect the milliammeter (+) red to the instrument or power supply red wire output terminal.

b) For a probe with range of –500 to 500 mV: (white and green wire open). Rinse the probe and place it in the 200 mV solution. The milliammeter should read between 14.4 and 16.0 mA.

Rinse the probe and place it in the 600 mV solution. The meter should read between 19.55 and 20.45 mA.

c) For a probe with range of 0 to 1000 mV: (white and green wire joined). Rinse the probe and place it in the 200 mV solution. The milliammeter should read between 6.4 and 8.0 mA.

Rinse the probe and place it in the 600 mV solution. The meter should read between 12.8 and 14.4ma.

5.3 Customer Service

5.3.1 If a problem has not been resolved with the above procedures, a telephone consultation with your AquaMetrix representative, or directly with AquaMetrix will provide the answer.

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5.4 Parts and Accessories

Description	*Part #*
Mounting Kit for P60C-3 and P60D-3 submersion	STC60L
Mounting Kit for P60C-6 Submersion	STC60-6
500 mL pH 7 Buffer Solution	A35-14
4L pH 7 Buffer Solution	A35-118
500 mL pH 4 Buffer Solution	A35-13
4L pH 4 Buffer Solution	A35-117
500 mL pH 10 Buffer Solution	A35-24
20 L pH 10 Buffer Solution	A35-119
500mL 200mV Buffer Solution	A35-40
500 mL 600mV Buffer Soltion	A35-41
Salt bridge kit, package of 3,incl. new salt bridge and standard cell solution for P60 probes	C35-17
Junction box with terminal strip	JB-1
Protective shroud for P60C-3 submersion mounting	PROTECTOR-3
Protective shroud for P60C-6 submersion mounting	PROTECTOR-6
50 ft. 5-wire Interconnect cable dressed both ends	C42-5P-050

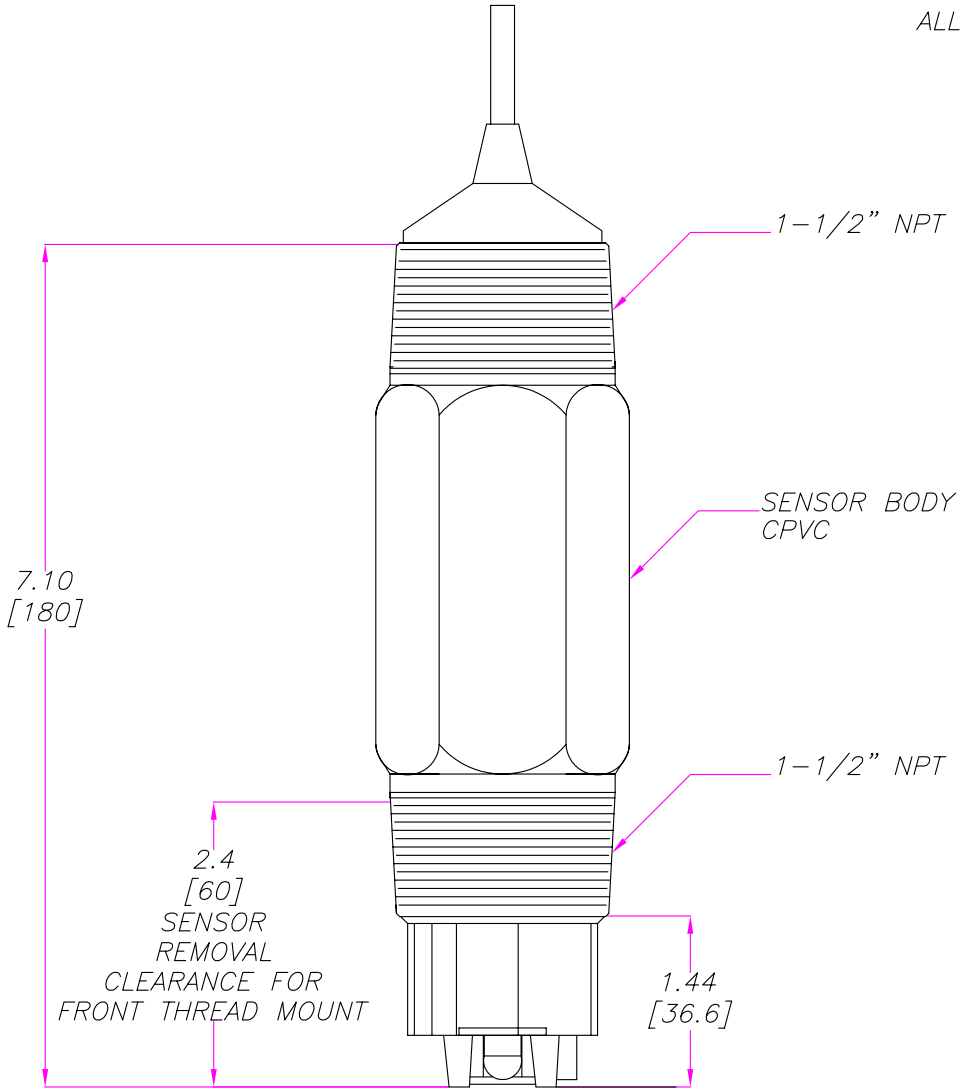
5.5 Probe Return

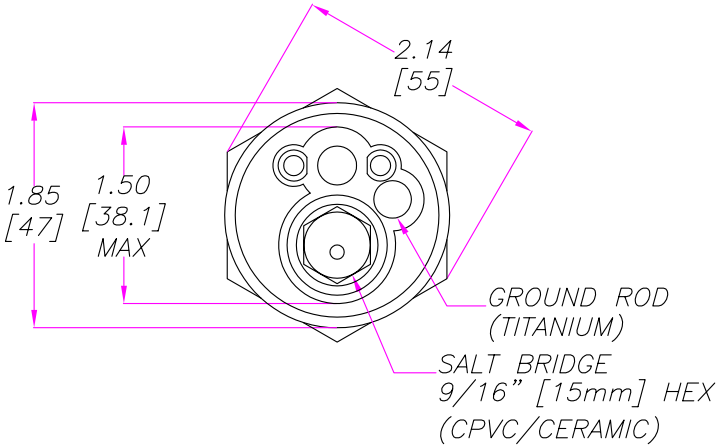
5.5.1 If you are returning a probe for inspection enclose description of the problem. Pack the probe adequately to avoid damage to the glass electrode and ensure that it will not be exposed to temperatures below –5°C. AquaMetrix cannot be responsible for shipping damage nor for damage due to frozen electrodes.

For safety reasons, AquaMetrix cannot accept probes which have not been thoroughly cleaned to remove all process material.

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2	MODIFIED DRAWING LAYOUT	24JUL03	PMCLEAN

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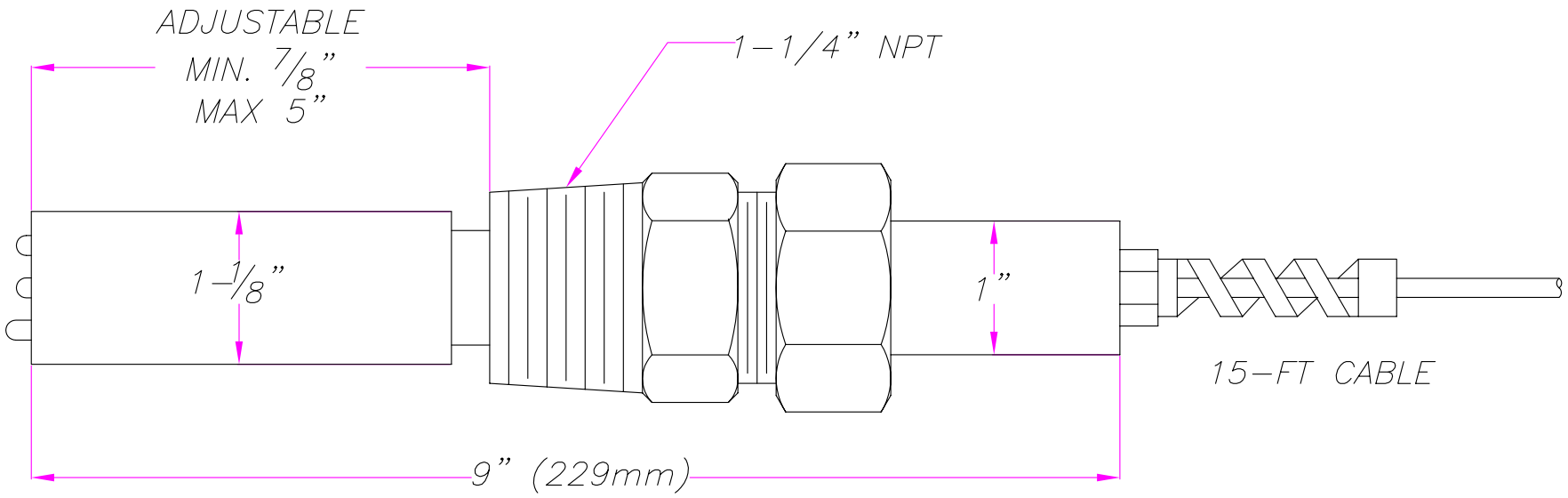
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Industrial and Environmental Controls

SERIES 8 DIFFERENTIAL PROBES

CODE IDENT NO.	SIZE	AQUAMETRIX DRAWING NO.	REV.
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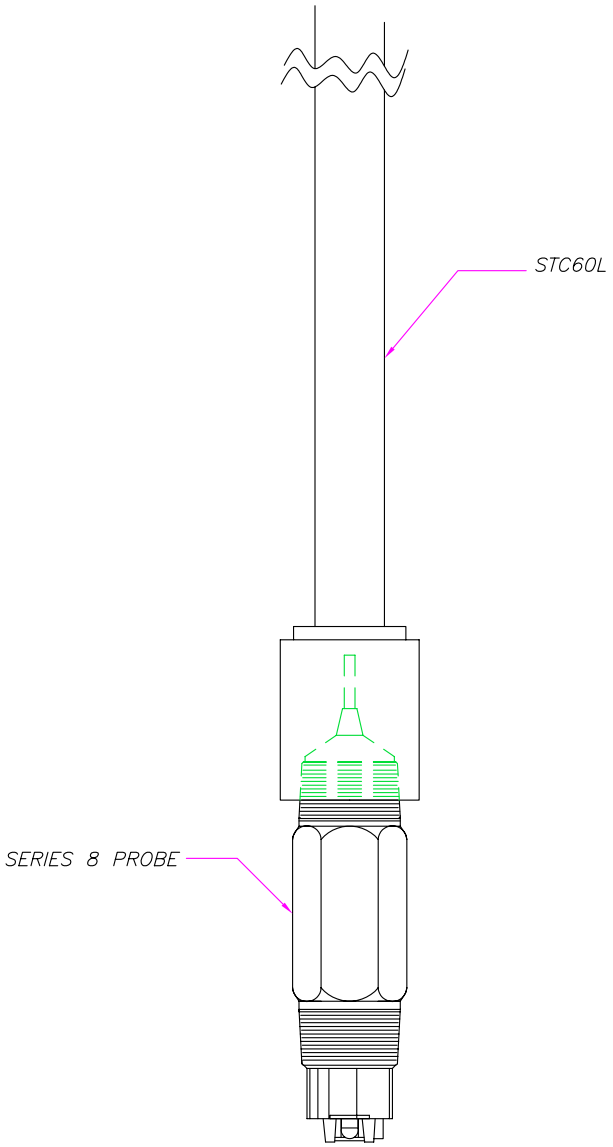
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SERIES 6 DIFFERENTIAL PROBES

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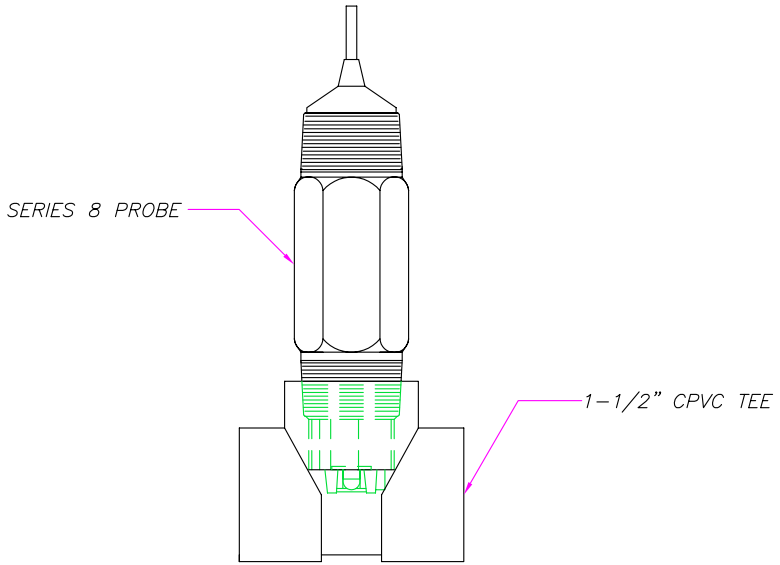


SERIES 8 PROBE
SUBMERSION MOUNT
WITH STC60L

NOTES:

SUBMERSION MOUNT INSTALLATION
1. RUN CABLE THRU STC60L
2. WRAP SERIES 8 PROBE THREADS WITH SEALING TAPE
2. SCREW SERIES 8 PROBE INTO 1-1/2" THREAD ON STC60L

INLINE MOUNT
1. WRAP SERIES 8 PROBE THREADS WITH SEALING TAPE AND SCREW INTO 1-1/2" TEE



SERIES 8 PROBE
INLINE MOUNT

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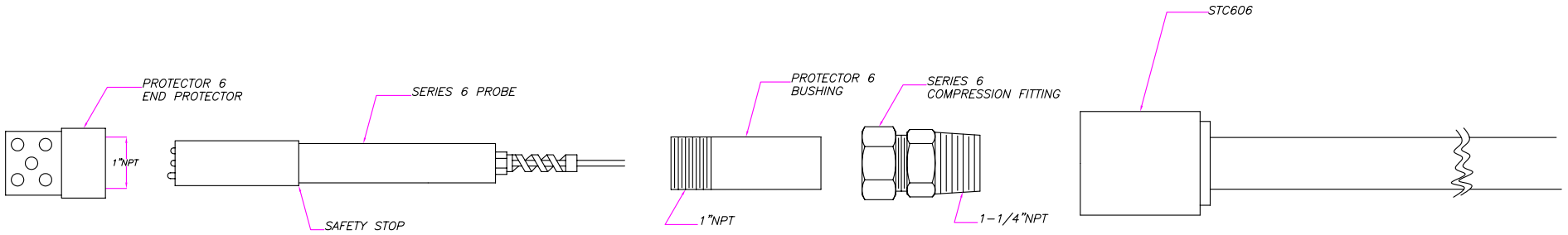
INSTALLATION OF SERIES 8 DIFFERENTIAL PROBE

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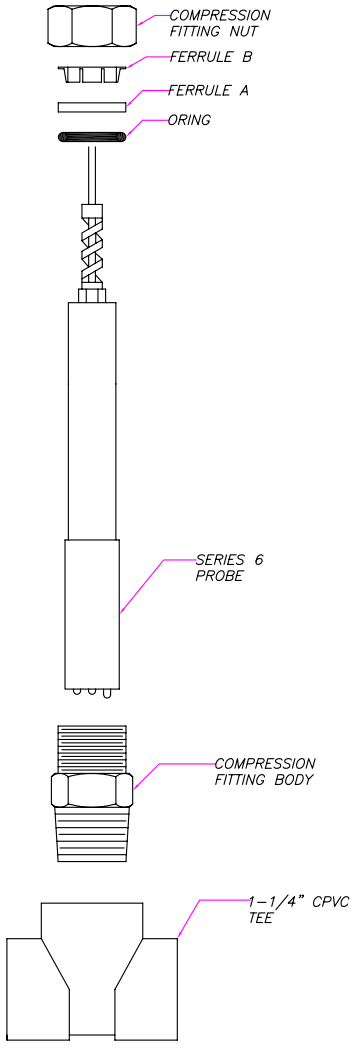
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INSTALLIATION OF A SERIES 6 PROBE WITH STC606 AND PROTECTOR 6 HARDWARE



INSTALLIATION OF A SERIES 6 PROBE WITH INLINE WITH A 1-1/4" TEE

NOTES:

SUBMERSION MOUNT INSTALLATION
1. RUN CABLE THRU PROTECTOR 6 BUSHING AND SLIDE ONTO BODY OF SERIES 6 PROBE
2. SCREW PROTECTOR 6 END PROTECTOR ONTO 1" THREAD ON PROTECTOR 6 BUSHING
3. INSTALL SERIES 6 COMPRESSION FITTING ONTO SERIES 6 PROBE
4. WRAP COMPRESSION FITTING THREADS WITH SEALING TAPE AND TREAD INTO STC606

INLINE MOUNT
1. WRAP COMPRESSION FITTING THREADS WITH SEALING TAPE AND SCREW INTO 1-1/4" TEE
2. SLIDE ORING, FERRULES A & B, AND NUT OVER PROBE AS SHOWN
3. INSERT PROBE INTO THE COMPRESSION FITTING BODY & TIGHTEN NUT TO SECURE PROBE

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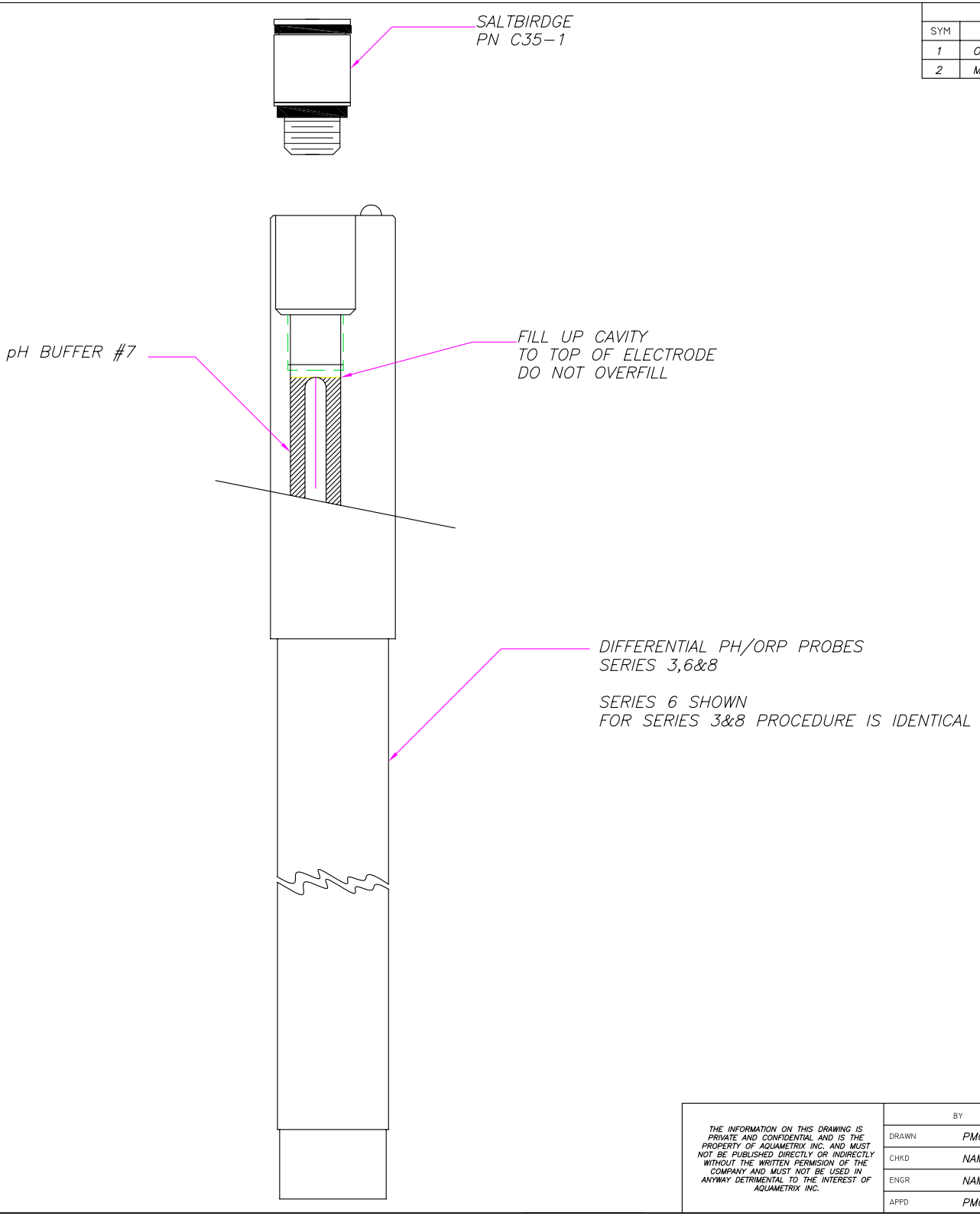
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INSTALLATION OF SERIES 6 DIFFERENTIAL PROBES

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INSTALLATION OF SALT BRIDGE IN A DIFFERENTIAL PROBE

CODE IDENT NO.	SIZE	AQUAMETRIX DRAWING NO.	REV.
	A	N106-60	2

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30-MONTH AQUAMETRIX DIFFERENTIAL SENSOR WARRANTY REPLACEMENT PLAN

AquaMetrix , Inc. will replace or repair any AquaMetrix Differential Sensor that fails due to defects in material or workmanship for a period of up to 12 months from the date of shipment from our facility. In this case, the following condition applies:

0-12 months old .....Sensor is replaced free.
13-30 months old .....Sensor is replaced at approx. 2/3 the current list price.

Each sensor is identified with a unique serial number that is used by AquaMetrix , Inc. to validate the month and year of shipment. A warranty claim will not be honored if defects are not reported within the warranty period, or if AquaMetrix determines that defects or damages are due to normal wear, misapplication, lack of maintenance, abuse, improper installation, alteration, or abnormal conditions. AquaMetrix' s obligation under this warranty shall be limited to, at its option, replacement or repair of this product. The product must be returned to AquaMetrix Inc , freight prepaid, for examination. The product must be accompanied with an MSDS for all the process chemicals used, must be thoroughly cleaned and any process chemicals removed before it will be accepted for replacement or repair. AquaMetrix liability shall not exceed the cost of the product. Under no circumstances will AquaMetrix be liable for any incidental or consequential damages, whether to person or property. AquaMetrix will not be liable for any other loss, damage or expense of any kind, including loss of profits, resulting from the installation, use, or inability to use this product.