

7777 Immersion/In-Line Mounting for Durafet[®] II pH Electrodes Installation and Maintenance

70-82-25-86

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About This Document

Abstract

This manual provides immersion and in-line installation instructions for Durafet® II pH Electrodes as part of a 7777 electrode assembly.

Contacts

World Wide Web

The following lists Honeywell's World Wide Web sites that will be of interest to our customers.

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Europe	Honeywell PACE, Brussels, Belgium	[32-2] 728-2111
Latin America	Honeywell, Sunrise, Florida U.S.A.	(854) 845-2600

Symbol Definitions

The following table lists those symbols used in this document to denote certain conditions.

Symbol	Definition
	This CAUTION symbol on the equipment refers the user to the Product Manual for additional information. This symbol appears next to required information in the manual.
	WARNING PERSONAL INJURY: Risk of electrical shock. This symbol warns the user of a potential shock hazard where HAZARDOUS LIVE voltages greater than 30 Vrms, 42.4 Vpeak, or 60 Vdc may be accessible. Failure to comply with these instructions could result in death or serious injury.
	ATTENTION, Electrostatic Discharge (ESD) hazards. Observe precautions for handling electrostatic sensitive devices
	Protective Earth (PE) terminal. Provided for connection of the protective earth (green or green/yellow) supply system conductor.
	Functional earth terminal. Used for non-safety purposes such as noise immunity improvement. NOTE: This connection shall be bonded to protective earth at the source of supply in accordance with national local electrical code requirements.
	Earth Ground. Functional earth connection. NOTE: This connection shall be bonded to Protective earth at the source of supply in accordance with national and local electrical code requirements.
	Chassis Ground. Identifies a connection to the chassis or frame of the equipment shall be bonded to Protective Earth at the source of supply in accordance with national and local electrical code requirements.

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1. Introduction

1.1 Overview

The 7777 Series of electrode mountings enables a user to interface a Durafet® II pH electrode to a process by either submersing the electrode or mounting it into a ¾" threaded connection.

Honeywell's Durafet II Series of industrial electrodes have been designed to provide accurate and stable pH measurements for a wide variety of industrial applications. The Durafet II pH electrode is a non-glass pH electrode. The pH measurement is based in ISFET (Ion Selective Field Effect Transistor) technology, which results in a solid state pH sensing electrode. The Durafet pH electrode is much more rugged than the traditional glass pH electrode. The sturdy pH electrode reduces replacement and inventory costs. The solid state sensing element is packaged in a durable Ryton® body that results in a pH electrode that has extended life in a wide variety of process conditions. The ISFET technology also produces an electrode that is up to 10 times faster than glass electrodes. This fast response improves product quality and provides better process control to optimize chemical usage.

1.2 Description

Durafet II pH electrodes for the 7777 Series are available in a number of options to meet customer application and installation needs. The electrode body is 1" in diameter with ¾" threads at both ends of the electrode. For submersion applications conduit is threaded on to the top of the electrode so that it can be lowered into the process. For in-line applications the electrode is threaded into one leg of a pipe tee. A temperature sensor is mounted internal to the electrode to measure process temperature and provide a temperature signal for automatic (Nernstian) temperature compensation. Three temperature sensors are available: 8550 ohm thermistor, 100 ohm RTD, and 1000 ohm RTD. The electrodes come with either a connector with a separate cable for in-line installations or with an integral cable for submersion applications. Various cable length options are selected based on installation requirements.

The Durafet II pH electrode is compatible with various pH instrumentation:

- Honeywell 7082 and 9782 Series pH Analyzers with either an external or internal preamplifier.
- Honeywell 7082 and 9782 Series pH Analyzers with Cap Adapter.
- Honeywell 7084 Controller with an external preamplifier.
- APT2000 Transmitter with Cap Adapter.
- Non-Honeywell instruments, when connected to a Honeywell interface adapter module. This adapter module can be either AC powered or battery powered.
- Non-Honeywell instruments with Cap Adapter. Consult your Honeywell sales representative for a list of instruments with this compatibility.

1.3 About This Manual

Manual part of a set

This manual is part of a set documenting installation and use of the 7777 Durafet® II pH Electrodes.

The set consists of the following manuals.

- This manual
- Instruction Manual 70-82-25-87 Durafet II Industrial pH Electrode Series
- Instruction Manual 70-82-25-13 Durafet II Models 31079290 and 31084755 Industrial Pre-amplifier Adapter Modules, if applicable

or

Instruction Manual 70-82-25-65 Durafet II Model 31075773 Industrial Pre-amplifier Adapter Module, if applicable

- Instruction manual for the pH instrument.

What this manual contains

This manual contains instructions for the immersion and in-line mounting of the 7777 electrodes and the optional 31079288 pre-amplifier module (for which there is no separate manual). This manual also contains general descriptions of the electrodes and the optional pre-amplifier adapter modules (31075773, 31079290, and 31084755). **More detailed information about installation, use, and maintenance of the electrodes and pre-amplifier adapter modules is provided in the other manuals in the set.**

CAUTION

Read the electrode and pre-amplifier adapter module manuals before installing and using the Durafet II electrodes. Failure to follow the installation instructions could result in damage to the equipment.

2. Specifications

2.1 Physical

Materials in contact with process solution

Electrode: Polyphenylene sulfide (PPS) body, silicon sensor, ethylene propylene monomer (EPM) seal, ceramic junction

Preamplifier Module 31079288: Glass-filled polypropylene housing, EPM seals. (Immersed only with 7777-4-25 option.)

Note: Immersion of the preamplifier module will limit upper temperature of the assembly to 70 °C (158 °F).

Dimensions

Electrode Models: 2.5 cm (1 in.) diameter, 17.1 cm (6.75 in.) long

Preamplifier Module 31079288: See Figure 9-1

Preamplifier Adapter Modules 31075773, 31079290 and 31084755: See manual supplied with adapter module

Junction Box: See Figure 6-1

2.2 Classification

NEMA

External preamplifier 31079288 has a NEMA 4X, NEMA 6 enclosure.

2.3 Pressure and Temperature Limits

Temperature

Electrodes: See manual supplied with the electrodes

Preamplifier Module 31079288: -5 °C to 70 °C (23 °F to 158 °F)

Cap Adapter: 0 °C to 70 °C (32 °F to 158 °F)

Preamplifier Adapter Modules 31075773, 31079290 and 31084755: See manual supplied with adapter module

Pressure

Electrodes: See manual supplied with the electrodes

Cap Adapter: 10 psig

2.4 Catalog Suffix Designations

2.4.1 Durafet II without Cap Adapter

Base Catalog Number
7777

Table I
()

Table II
() ()

Table I – Preamplifier module selection

Preamp, Instrument (Durafet II Electrodes)		
Preamp Module	Instrument	Selection
None (direct electrode to instrument connection)	9782-02, 7082-4_, -76	7
31079288 (includes 31079236 preamp and 31075723, 20' quick disconnect cable for connection to instrument or junction box)	9782-02, 7082-1_, -2_, -5_, -70 7079-11, 7084	4
31079290 Interface Module, 120 volt ac power	Non-Honeywell Analyzers	5
31084755 Interface Module, 240 volt ac power		6
31075773 Interface Module, Battery Powered, CE Compliant		8

Table II – Durafet II combination electrode/cable selection

Mounting, Leads, Temp., Part No. (Durafet II)				
Mounting	Leads	Temperature	Part Number	Selection
Immersion	None	-10 to 110 C	5120554-002	45
	12' Integral		5120554-003	46
	20' Integral		5120554-004	47
	50' Integral		5120554-005	50
	4' Integral		5120554-006	51
	8' Integral		5120554-007	52
In-Line	12' quick disconnect	-10 to 110 C	5120554-001	56
	20' quick disconnect			57
	30' quick disconnect			58
	40' quick disconnect			59
	50' quick disconnect			60

2.4.2 Durafet II with Cap Adapter

Base Catalog Number
7777D

Table I
() ()

Table II
() ()

Table I – Mounting type

Mounting	Temperature Sensor	Electrode Part Number	Selection
Immersion	8550 ohm thermistor	51205554-001	01
	100 ohm RTD	51205554-010	02
	1000 ohm RTD	51205554-011	03
In-Line	8550 ohm thermistor	51205554-002	04
	100 ohm RTD	51205554-008	05
	1000 ohm RTD	51205554-009	06

Table II – Cap Adapter cable length

Cable Length	Cable Part Number	Selection
None	—	00
4 feet	51205965-006	01
8 feet	51205965-007	02
12 feet	51205965-001	03
20 feet	51205965-002	04
50 feet	51205965-005	05

3. General Assembly Instructions

3.1 Selecting Materials of Construction

Preamplifier and electrode

The materials used in the construction of the 31079288 preamplifier module and electrode are listed in the specifications. Materials of wetted parts must be compatible with the process temperature and corrosion conditions.

User-supplied components

Pipe couplings, and tees must be supplied by the user. Select materials that are compatible with the process temperature and corrosion conditions.

3.2 Sealing Pipe Joints

When making pipe joints apply Teflon tape pipe sealant to male threads. Wrap the threads with the tape overlapping by 50% on each wrap. Start the wrap at the end of the pipe and wrap in the direction of the thread at least two turns.

When installing an electrode, apply Teflon tape to the threads, then hand-tighten the electrode in the fitting only until snug. If necessary to stop a leak, a wrench may be applied to the electrode's wrenching flats to further tighten the joint only until the leak has stopped. Always leave at least one thread on the electrode showing outside the fitting.

CAUTION

When tightening an electrode never exceed 15 ft-lb applied torque. Applying too much torque can result in damage to the electrode.

3.3 Durafet II Electrode Preparation

Prepare Durafet II electrode as described in the electrode manual, part number 70-82-25-87.

3.4 Pre-amplifier or Pre-amplifier Adapter Module Preparation

When external preamplifier is supplied

An external preamplifier module 31079288 is supplied when Table I of the 7777 catalog number is specified as 4. The preamp module contains the replaceable preamplifier assembly which is potted and sealed against humidity in a metal can. The can has quick-disconnects on one end for the Durafet II electrode cable input and on the opposite end for the output cable.

When external preamplifier adapter is supplied

One of three external preamplifier adapters is supplied when Table I of the 7777 catalog number is specified as “5” (31079290), “6” (31084755), or “8” (31075773).

Instructions for preparing preamplifier

Prepare external preamplifier module 31079288 by removing both end caps by loosening the threaded connecting rings. Figure 3-1 and Figure 3-2 show the module with the end caps removed.

31079288 Preamp Module
Input End Connection

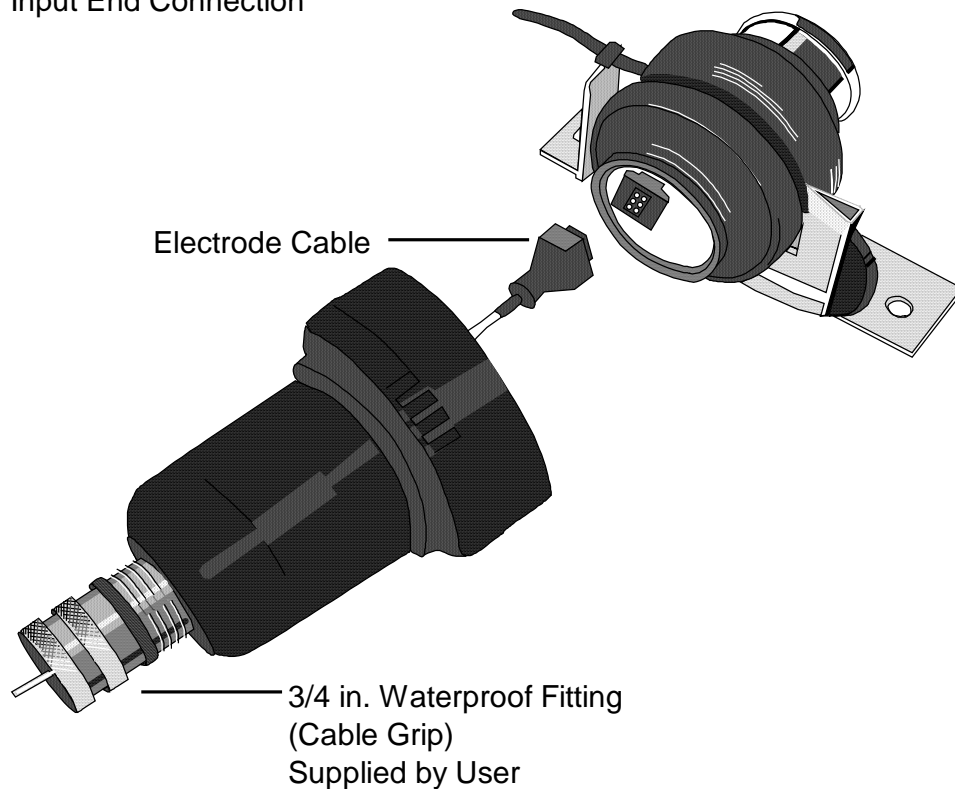


Figure 3-1 External Pre-amplifier Module 31079288 with Input End Cap Removed

31079288 Preamp Module
Output End Connection

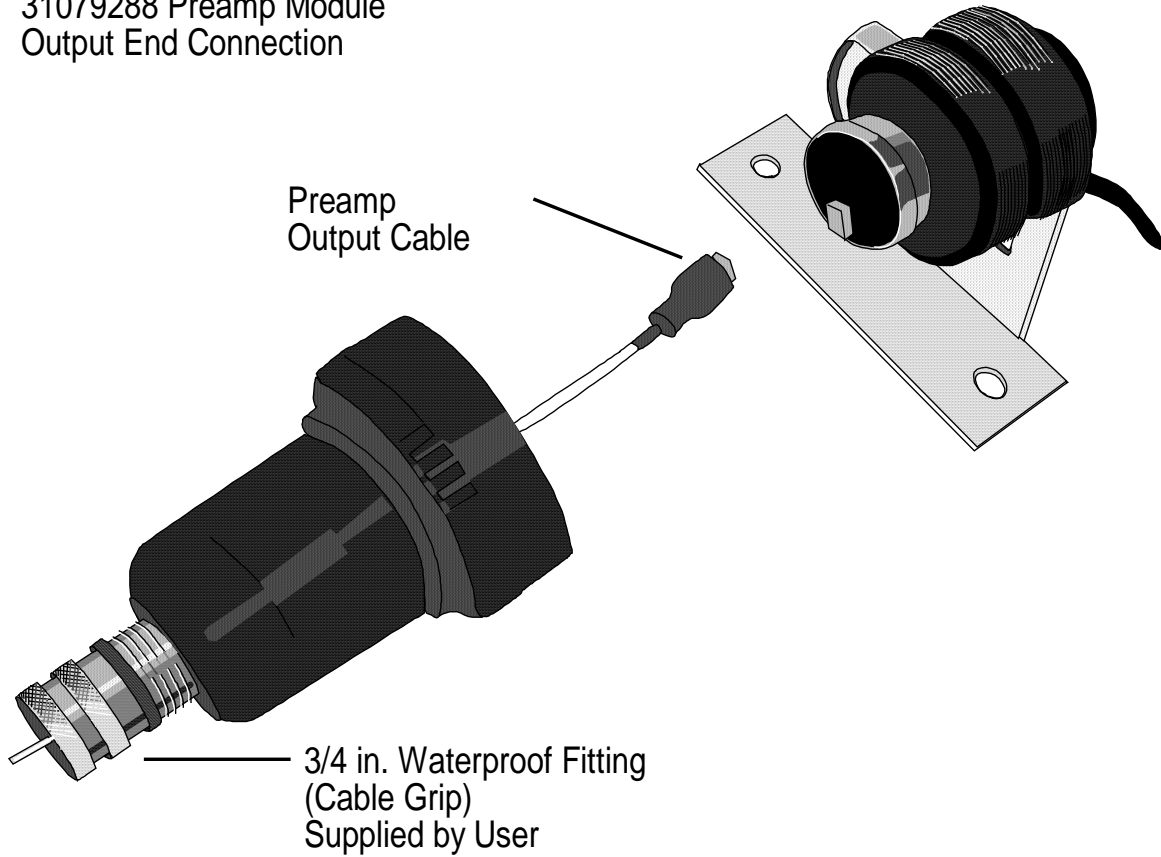


Figure 3-2 External Preamplifier Module 31079288 with Output End Cap Removed

Instructions for preparing the adapter module

Prepare an interface adapter module as described in the manual supplied with the adapter.

3.5 Selecting Location for Preamplifier or for Adapter Module

Preamp local to electrode

The 31079288 preamplifier module can be immersed as described in Section 10.2, or mounted above an immersed electrode as described in Section 10.3.

CAUTION

Do not mount the module where the temperature will be outside the range shown in the specifications. Do not mount the module over or near sources of corrosive vapors which could enter the preamp module during installation or maintenance. Damage to the equipment may result.

Preamp or adapter remote from electrode

In addition, the 31079288 preamplifier module or any of the interface adapter modules can be mounted remote from the electrode. The distance between the electrode and the preamp or adapter is limited only by the length of the electrode cable; the maximum length available is 15.24 m (50 ft).

Allow enough slack between the electrode and the preamp to allow for removal of the electrode for maintenance. The cable from the electrode to the preamp module or adapter should be secured against continuous flexing.

Preamp designed for surface mounting

External preamp module 31079288 is designed for surface mounting. A mounting bracket constructed of nickel-plated steel and a plastic quick release locking strap are provided to facilitate mounting.

Mounting instructions and module dimensions are provided in Section 9.

Adapter modules designed for surface mounting

All three interface adapter modules (31079290, 31084755, and 31075773) can be surface mounted as described in the manual supplied with the adapter.

Pipe mounting of battery-powered adapter

In addition to being surface mounted, the 31075773 battery-powered adapter module can also be pipe mounted.

3.6 Cap Adapter Option for Durafet II Electrodes

The Cap Adapter option for Durafet II electrodes eliminates the need to separately mount a preamplifier. The Cap Adapter is a preamplifier electronics module that is integral with the electrode-to-instrument cable. The preamplifier PCA is molded into the cap of the quick-disconnect connector. The cable has tinned leads that are ready to be wired directly to 9782/7082 Analyzer or APT2000 Transmitter.

The Cap Adapter mounts directly on the Durafet II electrode. The electrode has a key that mates with the keyway in the connector on the cable. The cap is then threaded onto the electrode. The cap should be hand-tightened and engage the O-ring at the top of the electrode. The knurled fitting at the top of the cap should be hand-tightened to seal an internal O-ring around the cable. When properly threaded onto the electrode the connection is waterproof.

3.7 Overview of Assembly

Where assembly instructions are provided

An overview of the order of assembly is in this section.

Instructions for unpacking, preparing, and maintaining the electrodes are in the manual supplied with the electrodes.

Instructions for cabling the electrode directly to the instrument, or to the 31079288 preamplifier module are in Section 5 of this manual.

Instructions for cabling the electrode to one of the preamplifier adapter modules are in the manual supplied with the adapter module.

Instructions for cabling the preamplifier to the instrument, or to a junction box and then to the instrument, are provided in Section 6.

Instructions for connecting a Cap Adapter to an instrument are in Section 7.

Special instructions for use of the 31079288 external preamplifier at sites with high humidity and condensation are in Section 8.

Instructions for assembly and mounting of the 31079288 external preamp module are provided in Section 9.

The recommended configurations for submersed mounting of electrodes are described in Section 10 of this manual.

The recommended configuration for in-line mounting of electrodes is described in Section 11 of this manual.

Installation tasks

Table 3-1 lists the tasks required to install submersed electrodes.

Table 3-1 Installation Tasks for Submersed Electrodes

Step	Action
1	Read the general information about immersion mounting at the beginning of Section 10.
2	Decide which support arrangement is appropriate for your application.
3	Prepare the support arrangement.
4	Determine which subsection in Section 10 describes your intended installation.
5	Obtain the required materials listed for your installation.
6	Assemble the required pipe and pipe coupling(s) in the arrangement pictured for your installation.
7	Thread the electrode cable through the pipe (if any) that will cover the electrode cable.
8	Perform a pressure test as described in Section 4.

Step	Action
9	<p>Connect the electrode cable to the external preamplifier, adapter module, analyzer's internal preamplifier, or to the analyzer input terminals (for Cap Adapter).</p> <ul style="list-style-type: none"> • Instructions for cabling to the external 31079288 preamplifier are provided in Section 5. • Instructions for cabling to a preamp adapter module are provided in Section 5 and in the manual supplied with the adapter module. • Instructions for cabling to the analyzer's internal preamplifier are provided in the manual supplied with the internal preamp kit. • Instructions for cabling to the analyzer with a Cap Adapter are provided in Section 7. <p>Note that special instructions for using the 31079288 external preamplifier in locations with high humidity and condensation are provided in Section 8.</p>
10	<p>If the electrode was not cabled directly to the instrument, complete cabling from the 31079288 external preamp or from one of the adapter modules to the instrument.</p> <ul style="list-style-type: none"> • Instructions for cabling the external preamp to the instrument are provided in Section 6. (If the preamp is more than 200 feet from the instrument, you can use junction box 316260 as described in Section 6.) • Instructions for cabling an adapter module to the instrument are provided in the manual supplied with the adapter.
11	<p>If a preamplifier module is used, complete assembly and mounting of the preamplifier module as described in Section 9.</p> <p>If an adapter module is used, complete assembly and mounting of the adapter module as described in the adapter manual.</p>
12	Mount the unit with the support prepared in Step 3.

Table 3-2 lists the tasks required for in-line mounting of electrodes.

Table 3-2 Installation Tasks for In-Line Electrode

Step	Action
1	Read the general information about in-line mounting at the beginning of Section 11.
2	Select an appropriate location and install the required pipe tee.
3	Obtain the required materials listed in Section 11.2.
4	Insert electrode in pipe tee.
5	Connect the electrode cable to the electrode as described in Section 5.
6	<p>Connect the electrode cable to the external preamplifier or directly to the analyzer (for the Cap Adapter) as described in Section 5, or Section 7 for the Cap Adapter.</p> <p>Note that special instructions for using the 31079288 external preamplifier in locations with high humidity and condensation are provided in Section 8.</p>
7	Complete cabling from the 31079288 external preamp to the instrument as described in Section 6.
8	Complete assembly and mounting of the external preamplifier module as described in Section 9.

4. Pressure Test

When to perform the test

Before submerging an assembly do a low-pressure test to check the various seals made during the assembly operation.

How to perform the test

Table 4-1 lists the steps for pressure testing the assembly.

Table 4-1 Instructions for Pressure Test

Step	Action
1	Double back the cable into the immersion pipe.
2	Connect a source of low-pressure air to the immersion pipe. [Approximately 69 kPa (10 psi) will simulate immersion in 6.10 m (20 ft) of water.]
3	Immerse the assembly in a shallow tank of water and look for any indication of air bubbles streaming from the assembly.
4	If the 31079288 preamplifier is included in the assembly, check around the two pipe connections of the preamplifier module and around the two O-ring seals of the preamplifier module connecting rings. Air bubbles indicate a possible leakage point and must be corrected.
5	To seal leaking connections: <ul style="list-style-type: none"> • Use extra Teflon tape on pipe joints. • Use silicone grease on O-ring seals. • Make the connecting rings on the preamplifier snug.

5. Electrode Cable Connections

5.1 Possible System Configurations

Variety of applications

The Durafet II electrode can be cabled to:

- the 31079288 external preamplifier as described in Section 5.2
- a interface adapter module 31079290, 31084755, or 31075773 as described in the manual supplied with the adapter
- an analyzer's internal preamplifier as described in the manual supplied with the internal preamp
- directly to the input terminals of an analyzer or APT2000 transmitter when the Cap adapter is specified.

5.2 Electrode Cables

The Durafet II pH electrode can be supplied with a connector at the electrode top to provide a quick disconnect for easy electrode replacement or with an integral cable.

Cable connectors

The electrode cable terminates with an edge metal connector on one end and a rectangular plastic 8-pin keyed push-on connector on the other end, for preamp (external or internal) use. Cap Adapter cables have tinned leads at the analyzer end.

The edge connector mates with the Durafet II electrode.

The rectangular connector mates with the input side of the preamplifier (regardless of whether the preamplifier module is external or internal to the analyzer) or with a interface adapter module.

Avoid contamination

The connectors are constructed with high resistance insulating material which can be contaminated if exposed to oil and salts from bare hands. Avoid contaminating the internal area of the connectors. Also ensure that the mating half of the connector (located inside the plastic housing on external preamplifier 31079288) is kept clean and dry.

CAUTION

Do not allow liquids or other foreign matter to contact the cable connectors. Save the protective cap supplied with electrodes with connectors and put the cap on the connector whenever the cable is not installed on an electrode.

How to clean the connectors

The connectors can be cleaned by wiping with a cotton swab moistened with isopropyl or grain alcohol. **Allow connectors to dry completely before making connections.**

5.3 Cabling Procedure

Installing cable grips

Cable grips may be needed on the electrode cable. See the figure in Section 10 or 11 that illustrates your system to determine whether cable grips are required. If so, put the cable through the grips before connecting the cable.

To fit the connector on the cable through the grip, remove the grommets from the cable grip and cut one side along the axis. The grommet can be spread to permit cable insertion.

CAUTION

Do not overtighten any fitting into the external preamp module housing. Damage to the preamplifier end caps may result.

How to attach the cable to the electrode (only for electrodes that have the connector option)

Remove the white protective cap from the cable. Loosen the ferrule and slide back the ferrule, small o-ring, and plastic cover to expose the cable connector. Align the cable connector keyway with the electrode key (small black tab on the top of the electrode). Slide the plastic cover over the electrode end and hand-tighten the cover on to the electrode.

ATTENTION

Make sure the o-ring on the electrode is seated on the shoulder of the electrode, below the threads.

CAUTION

Be careful not to cross the threads on the connector.

Slide the o-ring and ferrule down the cable to the back of the cover cap. Hand-tighten the ferrule onto the cover cap.

How to remove cable from electrode (only for electrodes that have the connector option)

Loosen the ferrule from the cover cap and slide the ferrule and o-ring back on the cable. Loosen the cover cap and slide back on the cable. Pull the cable connector off the electrode.

CAUTION

Keep cable connector and edge connector of the electrode clean and free from contamination. Put protective caps that are supplied with the electrode and cable back in place while they are disconnected.

How to attach the cable to the external preamplifier, adapter module, or analyzer internal preamp

The electrode cable's rectangular connector contains a polarizing key to ensure proper orientation.

CAUTION

When plugging the cable's rectangular connector into the receptacle on a preamplifier or adapter module, do not force the connector into the receptacle. Use of too much force can damage the equipment.

Note that, in addition to the rectangular receptacle used for the Durafet II electrode cable, the input side of the 31079288 preamplifier module also contains a circular connector. This connector is not used with 7777 types of installations. Connect the yellow shield wire on the electrode cable to the preamp mounting screw adjacent to the standoff connector (see Figure 12-1).

When connecting to a 9782P-03 analyzer with an internal preamp, connect the yellow shield wire to the ground screw that holds the lower retainer bracket in place.

Additional instructions for connecting the electrode cable to one of the preamp adapter modules are provided in the manual supplied with the adapter module. In the case of the adapter module, connect the yellow shield wire to the earth ground terminal.

What to do with excess electrode cable when the 31079288 preamplifier is mounted local to the electrode

When the 31079288 preamplifier module is installed locally with the electrode (regardless of whether or not the preamp is submersed), excess electrode cable must be coiled within the preamp module.

CAUTION

Do not push excess cable into pipes, pipe coupling, or conduits. Incorrect placement of excess cable can have a undesirable affect on system performance.

6. Connecting an Adapter Module or External Preamp Output to an Instrument

6.1 Preamp Adapter Output

Instructions elsewhere

Instructions for connecting one of the adapter modules to the instrument are provided in the manual supplied with the adapter. Check the manual supplied with the instrument, too, to see if any additional instructions or precautions are provided.

6.2 External 31079288 Preamp Output

Preamplifier output cable

A 6.10 m (20 ft.) cable is provided with the 31079288 preamp. Other lengths up to 200ft are available. See Section 12.3 for these part Numbers. These cables have a 6-pin polarized rectangular connector with a protective rubber boot on one end, and six color-coded wires on the other. The signal carried by each conductor is identified in Table 6-1.

Preamp requires no line-voltage supply

The 31079288 external preamp receives its dc power from the pH instrument through the preamp output cable. The color-coded conductors used for power are identified in Table 6-1.

Installing cable grips

Cable grips may be needed on the output cable. See the figure in Section 10 or 11 that illustrates your system to determine whether cable grips are required. If so, put the cable through the grips before connecting the cable.

To fit the connector on the cable through the grip, remove the grommets from the cable grip and cut one side along the axis. The grommet can be spread to permit cable insertion.

CAUTION

Do not overtighten any fitting into the external preamp module housing. Damage to the preamplifier end caps may result.

Preamp output connection

The rectangular connector on the output cable mates with a connector on the output side of the preamp (see Figure 3-2). The connector is keyed to ensure correct orientation.

When the connector is firmly in place (DO NOT FORCE), slide the protective boot firmly over the connector.

Special instructions for sites with condensing conditions are provided in Section 8.

Securing the output cable

If an immersion pipe will not be coupled to the preamp module, the cable exiting the preamp housing can be secured using a 3/4 in. NPT fitting and a 3/4 in. cable grip.

Connection to instrument or to intermediate junction box

If the measuring instrument is within 6.10 m (20 ft) of the preamplifier module, output cable 31075723 (supplied with the preamp module) can be used for the final connection to the instrument.

For distances greater than 20 feet from preamplifier to instrument, but less than 200 feet, additional cables are available. See Section 12.3 for preamp-to-instrument cable part numbers (50 ft, 100 ft, and 200 ft are available).

If the distance between the external preamp and the instrument is more than 200 feet, connect the output cable to a junction box (part number 31316260), then use cable 31834088 to make the connection from the junction box to the instrument.

Prepare the end of the output cable or extension cable 31834088 to accommodate the terminals at the junction box or instrument. When making connection to the instrument, refer to the instrument manual and to Table 6-1 which shows conductor colors and functions.

Mounting junction box

Figure 6-1 shows the junction box. Note that the junction box can be wall-mounted. Allow enough overhead space for ease of access. Allow enough slack in the output cable to permit servicing.

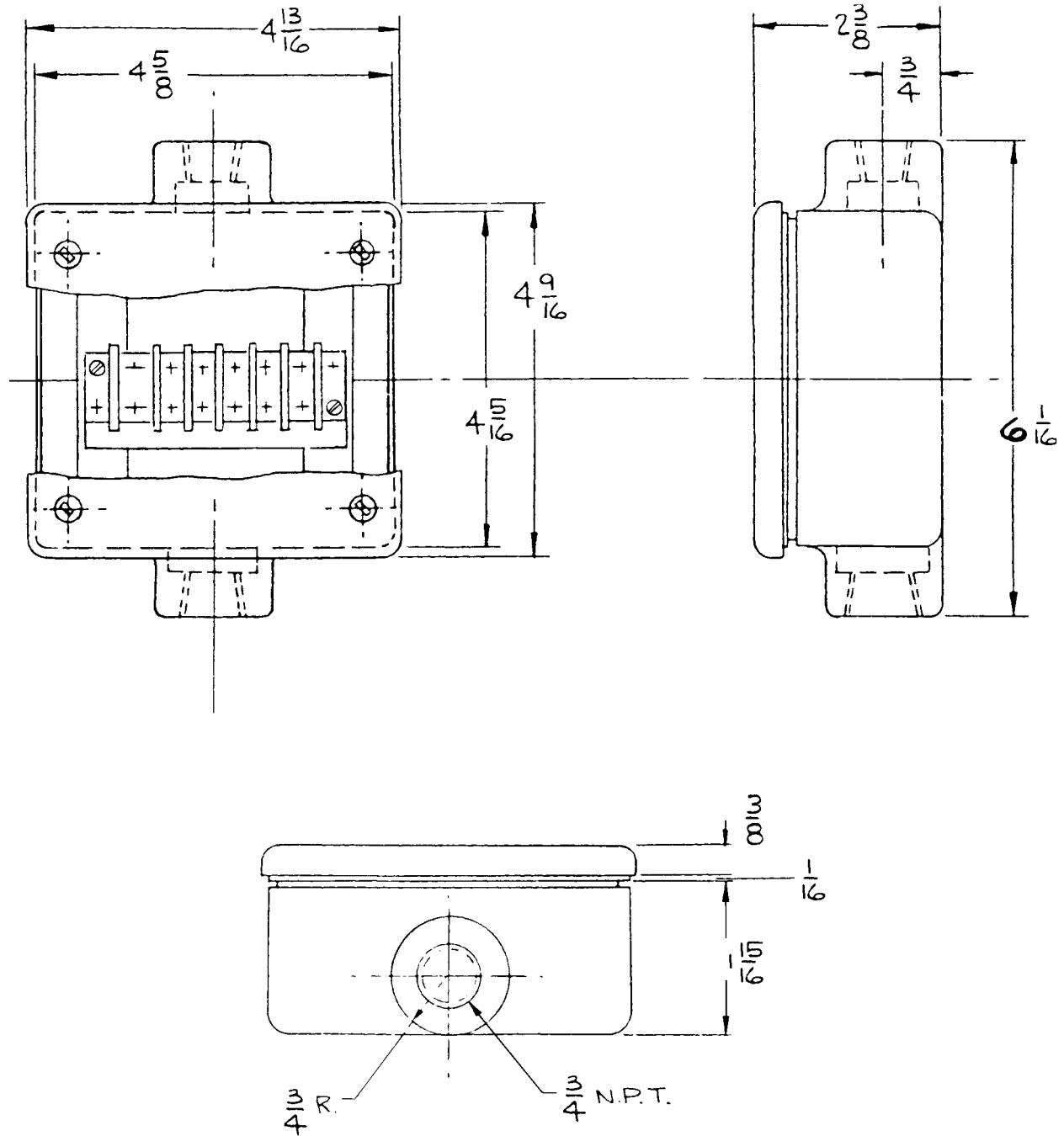


Figure 6-1 Junction Box Outline and Dimensions

Preamplifier output conductor signals

Figure 6-2 illustrates the rectangular connector of preamp output cable. The signal associated with each pin number on the picture, as well as the corresponding output cable conductor color is shown in Table 6-1.

Carefully note conductor colors. When connecting the output cable to the junction box, and when wiring extension cable 31834088, assure that connections are made as shown in Table 6-1 and in the manual supplied with the instrument. Check that the connections match those required by the instrument before applying power to the measuring system.

CAUTION

Do not reverse the blue and green wires (dc voltage supply). Reversal will damage the preamplifier circuit.

Table 6-1 31079288 Preamplifier Output Cable Conductors

Connector Pin Number (see Figure 6-2)	Signal	Output Cable Conductor Color
1	output	orange
2*	positive power supply	blue
3*	negative power supply	green
4	signal common	white
5	power common	black
6	no connection	red

*If the power supply is not connected exactly as defined, irreparable damage to the preamplifier will result.

Figure 6-2 illustrates the connector on the preamplifier end of the output cable.

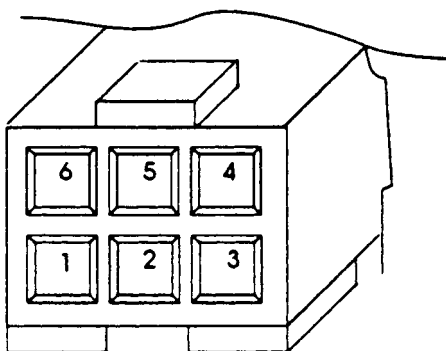
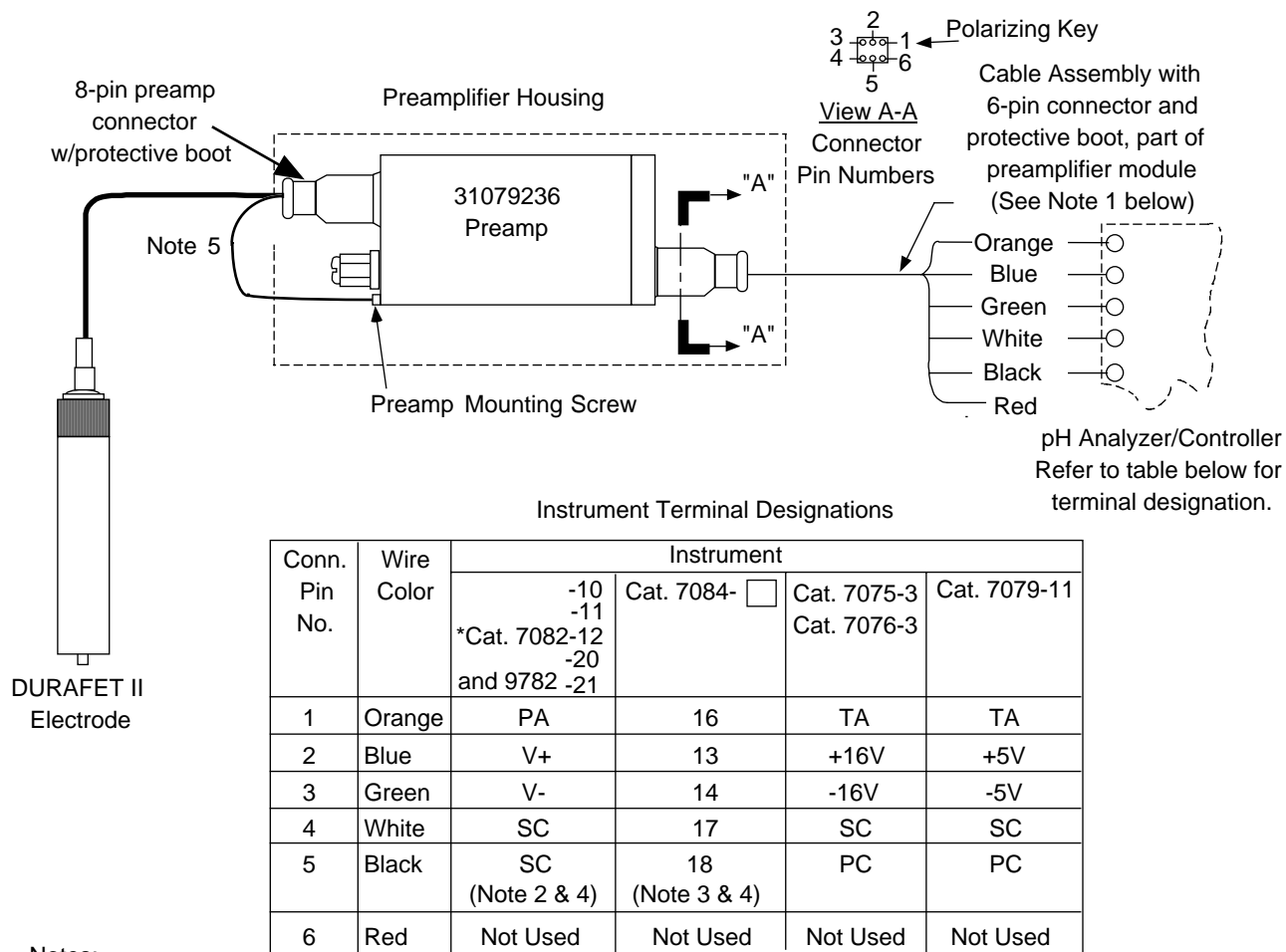


Figure 6-2 31075723 Output Cable Connector, Preamp End



Notes:

1. When distance from preamplifier module to instrument is greater than 200 ft., use 6 conductor #22 Awg cable (P/N 834088 or equivalent) and junction box (P/N 316230).
2. Connect 31233300 resistor (8550Ω) between terminals "TH" & "SC" of Cat. 7082 or 9782.
3. Connect 31233300 resistor (8550Ω) between terminals "15" & "18" of Cat. 7084.
4. A 31233300 resistor is supplied loose with every preamp.
5. Connect yellow shield wire on the electrode cable to the preamp mounting screw adjacent to standoff connector.

* If 9782 utilizes an internal preamplifier kit, follow directions in manual 278578 supplied with kit.

23484

Figure 6-3 Installation Wiring Diagram—External Preamplifier-to-Instrument

7. Connecting a Cap Adapter to an Instrument

7.1 Cap Adapter

The Cap Adapter is an integral part of the electrode cable. It is essentially a preamplifier that does not require separate mounting. The output from the Cap Adapter can be connected directly to a pH instrument. The Cap Adapter and cable for Durafet II electrodes are available in lengths of 4', 8', 12', 20', and 50'. One end of the Cap Adapter cable is the mating connector to the edge connector of the Durafet II electrode. The other end of the cable terminates with tinned leads. The tinned leads connect to the input terminals of the pH instrument as described below.

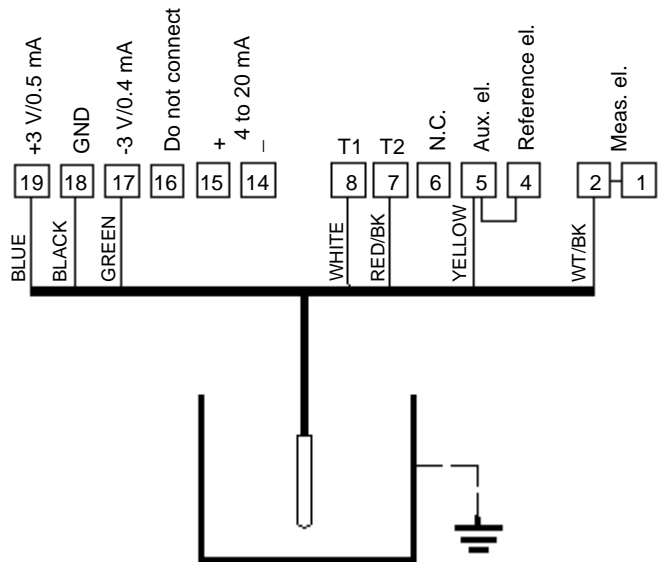
7.2 Connection to a 9782 pH Analyzer

The Cap Adapter is connected to a 9782P-01 analyzer. (*See 9782 Instruction Manual for more detailed description of the 9782.*) Connect the tinned leads of the Cap Adapter cable as follows:

Wire Color	9782 Terminal
Orange	PA
Blue	V+
Green	V-
White	SC
Black	SC
Red	TH
Yellow	Ground Screw
White/Black	Not Used
Red/Black	TH

7.3 Connection to an APT2000 pH Transmitter

The Cap Adapter can be connected to the APT2000 pH Transmitter. (See the APT2000 pH Transmitter Manual, part number 70-82-25-92, for more detailed description of the APT2000.)



NOTE:

Orange and Red wires are not typically connected. These should be clipped and electrically sealed to avoid possible contact with other conductors.

Figure 7-1 Connecting to an APT2000 pH Transmitter

8. Using the 31079288 External Preamp at Sites with High Humidity and Condensation

8.1 Use of Module as Shipped for Non-Condensing Conditions

Relative humidity upper limit

The Durafet II external preamplifier 31079288 is suitable as shipped for relative humidity conditions up to approximately 85 % to 95 % **non-condensing**.

CAUTION

If condensation occurs, it is possible for water to accumulate in the rectangular connectors for input and output cables, causing erratic performance and damage to the connectors. To avoid these problems, take the precautions described in Section 8.2.

8.2 Precautions Against Condensation Problems

Silicone grease on rectangular connectors only

The use of silicone grease provides protection for the preamp rectangular male connectors, and on the mating female connectors on the electrode and preamp output cables. Instructions are provided below.

CAUTION

For electrodes supplied with a connector option.

Do not apply grease to the connector on the end of the electrode cable that connects to the electrode. This connection has a gasket to prevent entry of moisture. Also, do not apply grease to the unused circular standoff connector on the input side of the preamp.

Approved grease

Use high-vacuum silicone grease purchased from Honeywell (part number 31090011 for .3 oz. tube), Dow Corning high-vacuum silicone grease or Dow Corning #4 silicone electrical insulating compound.

Procedure for applying grease

The procedure for applying silicone grease to the rectangular connectors is provided in Table 8-1.

Table 8-1 Procedure for Applying Silicone Grease to Connectors

Step	Action
1	Make sure the connectors are clean and dry. A cotton swab moistened sparingly with isopropyl or grain alcohol may be used to clean the connectors. Allow the connectors to dry completely before applying grease.
2	Hold the opened end of the silicone grease tube against the pins of one of the rectangular male connectors on the preamp and carefully squeeze enough grease into the connector to slightly overfill it.
3	Repeat the procedure to slightly overfill the other rectangular connector on the preamp.
4	Hold the tube of silicone grease tightly against the rectangular female 8-pin connector on the electrode cable and squeeze grease through the small openings until grease is forced out of the small slots in the sides of the connector body. (Initially you will see gold-plated connector contacts through these slots. It is necessary to completely fill the spaces with silicone grease to prevent accumulation of condensed water there.) Repeat the process over the rest of the face of the female connector.
5	Repeat the procedure on the 6-pin female connector on the preamp output cable.
6	Firmly insert the cable connectors into their mates on the preamplifier can, pressing firmly for full insertion, and holding for several seconds to allow excess silicone grease and trapped air to escape.
7	Wipe off all excess grease from the external surfaces of the assembly.

Aftercare of treated connectors

After disconnecting connectors that have been treated with silicone grease, it is important to keep foreign matter out of the connectors. Handle all treated parts with care. A small additional application of grease is recommended before they are reconnected.

If there is any uncertainty about whether the connectors are clean, blow the connectors clean using compressed air or inert gas that is free of water and oil. Follow this cleaning with a repeated application of silicone grease as described above.

9. Assembly and Mounting of 31079288 External Preamp Module

9.1 End Cap Assembly

Threaded rings

The 31079288 preamp end caps are secured to the module by means of threaded rings.

O-rings and lubricant required

An O-ring (part number 31075703) must be used with each threaded ring. The O-ring must be lightly lubricated with silicone grease (part number 31090011). See Figure 12-1 for the correct position of the O-rings.

Slack in cable necessary

Before replacing each end cap, push a few inches of cable into the preamplifier module to provide some cable slack for future removal of the end cap.

Keyed for correct assembly

The end caps are slotted and the holder is keyed. A white mark on the covers and holder threads indicates the location of the slots and keys. The mark on each ring must be aligned with the corresponding mark on the holder threads. Once the O-ring is in place and the marks are aligned, hold the cover firmly in position while tightening the connecting ring.

Sealing NPT fittings to the preamplifier

All electrical connections to the preamp must be completed and the 3/4 in. NPT connections in the end caps must be sealed before exposing the unit to corrosive or wet conditions.

CAUTION

Do not overtighten any fitting into the external preamp module housing. Damage to the preamplifier end caps may result.

9.2 Mounting the Module

Designed for surface mounting

The 31079288 preamp module is designed for surface mounting. (Dimensions required for mounting the module are provided in Figure 9-1.) A mounting bracket constructed of nickel-plated steel and a plastic quick release locking strap are provided to facilitate mounting.

Orientation of the preamp module

The module can be mounted in any convenient position in addition to the vertical mounting shown in the Figure 9-1.

CAUTION

Do not mount the module where the temperature will exceed the upper limit shown in the specifications. Do not mount the module over or near sources of corrosive vapors which could enter the preamp module during installation or maintenance. Damage to the equipment may result.

Correct use of bracket and locking strap

The preamp module mounting bracket arrangement must never be used to support the immersion pipe and electrode assembly. The plastic locking strap is designed to secure the preamp module only.

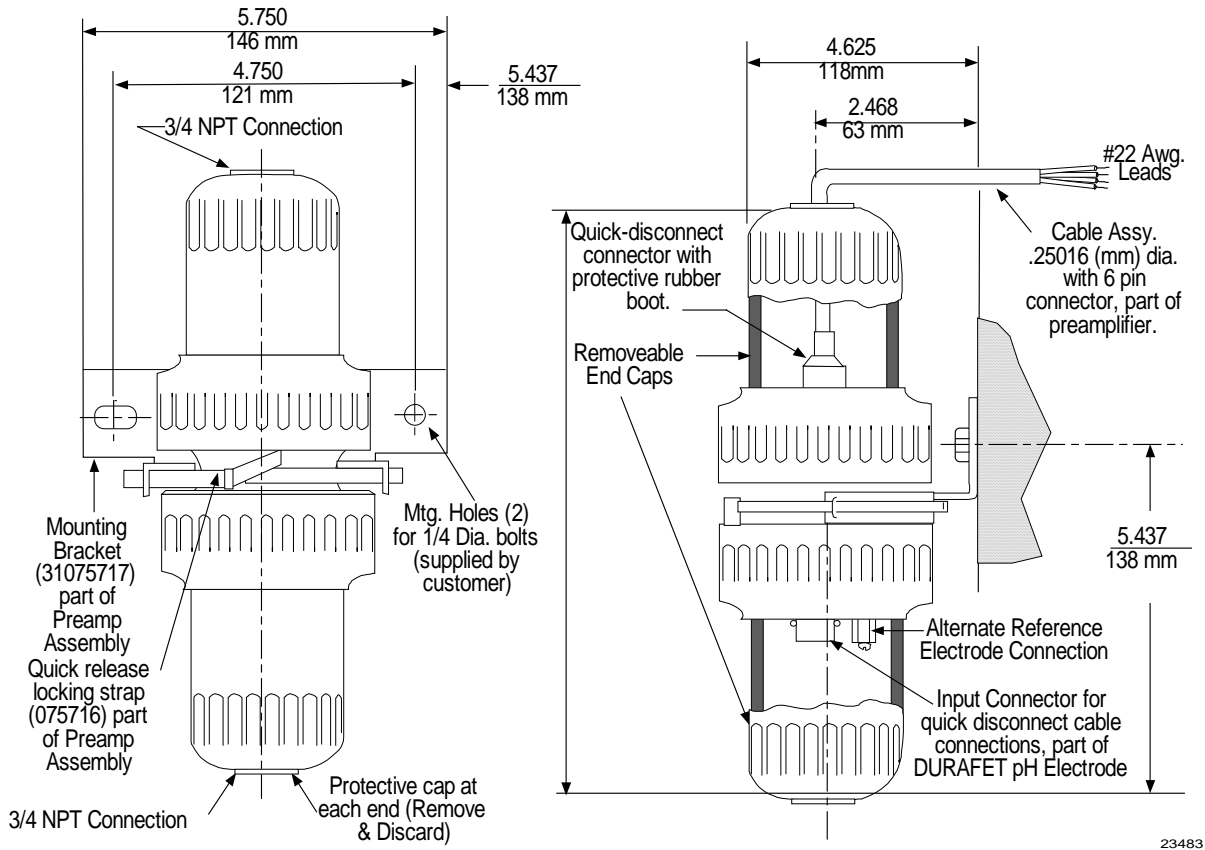


Figure 9-1 31079288 Preamplifier Module Outline and Dimensions

10. Immersion Mounting

10.1 General Information

Intended Use

The system can be used in a variety of configurations to accommodate many techniques for support, immersion, and removal of the electrode or electrode/preamplifier system in a process solution.

A variety of mounting configurations are used according to the process application. By using accessory parts such as pipe, pipe fittings and cable grips, an immersion assembly can be built to suit a specific application.

Figure 10-1 shows some suggested support arrangements.

Figure 10-2 through Figure 10-4 indicate configurations possible for immersion mounting. Either rigid or flexible connections can be used on either side of the preamplifier module or junction box.

Included in assembly

Assemblies vary according to the catalog number configuration. The assembly may include a Durafet II combination electrode with integral cable, a preamplifier module or interface adapter module. The Durafet II catalog suffixes are defined in Section 2.

When Table I of the catalog number is 4, an external 31079288 preamplifier module is provided which serves as an interface between the pH electrode and the Honeywell pH instrument. Section 6 provides instructions for connecting the preamp to the instrument.

When Table I of the catalog number is 5, 6, or 8 an interface adapter module is provided which serves as an interface between the pH electrode and a pH instrument not manufactured by Honeywell. Instructions for connecting the adapter to the instrument are provided in the manual supplied with the adapter.

When Table I of the catalog number is 7, a preamplifier module is not provided because the Durafet II electrode is wired directly to a Honeywell Catalog 7082 or 9782 instrument containing an internal preamplifier.

A manual is supplied with the internal preamp kit.

Minimum immersion depth

In all cases, the electrode body should be immersed a minimum of 5.08 cm (2 in.) into the process liquid to ensure proper temperature compensation.

Two basic measuring systems

Two basic measuring systems are used: one for direct-measuring analyzers designed for a high impedance input directly from the pH electrode, and a second for a low impedance input from the preamplifier module by which the electrode signal can be transmitted long distances using ordinary cable.

Suggested support arrangements

Figure 10-1 illustrates possible support arrangements for immersion mounting of the Durafet II electrode. As described in Section 9, the mounting bracket and locking strap supplied with the 31079288 external preamp module are intended to support the preamp only. Do not rely on them to support the electrode and immersion pipe, too.

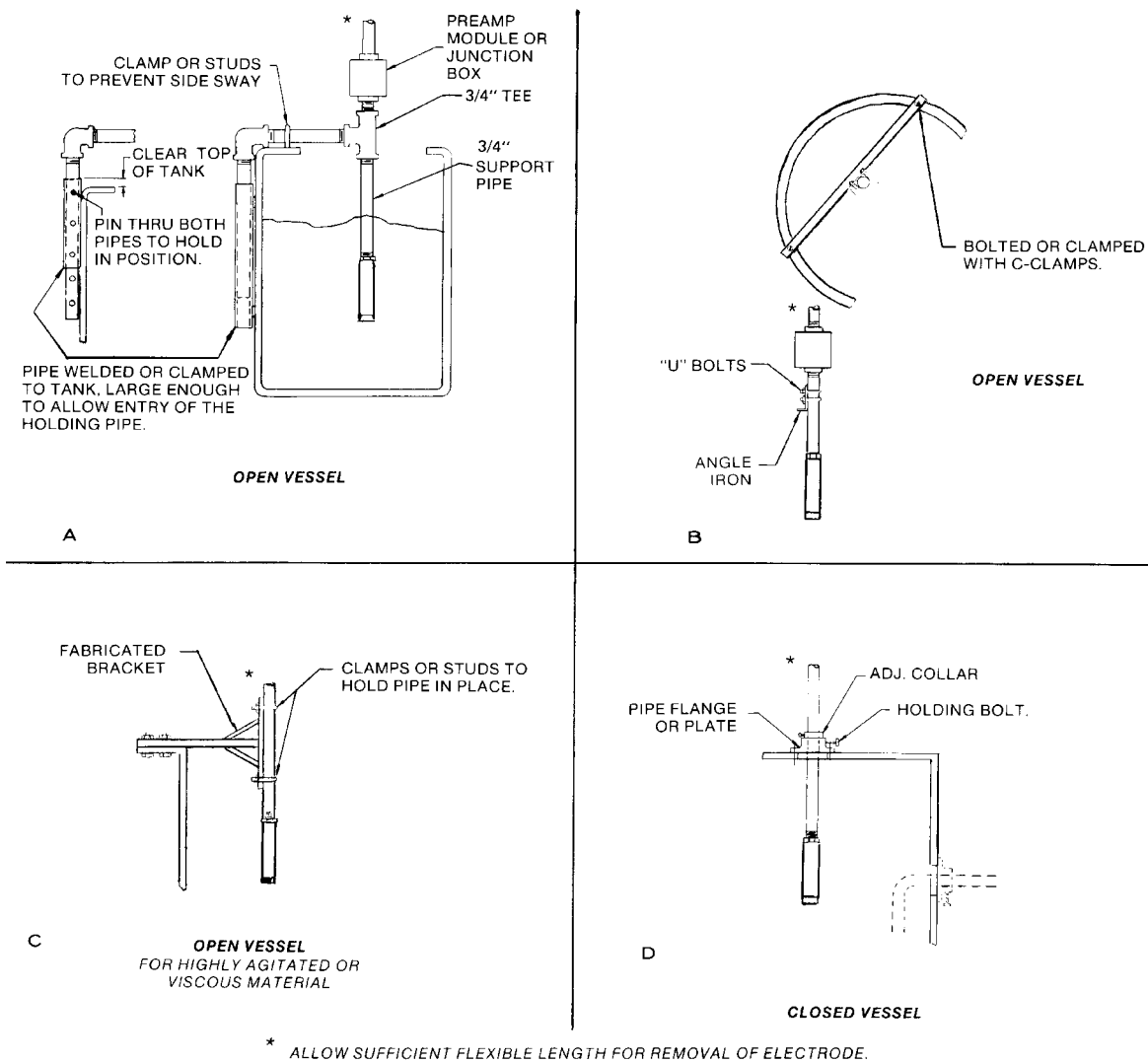


Figure 10-1 Suggested Support Arrangements

10.2 Preamplifier Module Mounted on Immersion Pipe

Application

Figure 10-2 illustrates this configuration. Among the catalog numbers to which it applies are:

7777-4-46
7777-4-47
7777-4-50
7777-4-51
7777-4-52

Materials required

The material supplied with this catalog number is listed below.

Quantity	Item
1	Model 31079288 External Preamplifier Module
1	Part number 31075723 Preamp Output Cable
1	Durafet II Electrode with slotted tip and integral cable

Materials supplied by the user are listed below.

Quantity	Item
1	Length of 3/4 in. Sch. 40 pipe, threaded on both ends.
1	3/4 in. NPT pipe coupling
1	3/4 in. NPT cable grip for 1/4 in. diameter cable

Assembly

See Table 3-1 for order of assembly tasks. Assemble the materials as shown in Figure 10-2.

CAUTION

Fittings to the preamp module are to be hand tightened only. Over-tightening may result in damage to the equipment.

Excess electrode cable must be coiled inside the preamp module, not pushed into the immersion pipe or pipe coupling. Incorrect placement of excess cable can have an undesirable effect on system performance.

Dimensions

For mounting dimensions, see Section 2.

Final electrical connections

Make final electrical connections (see Section 6).

Pressure test

Perform a submersible pressure test (see Section 4).

Mounting

Mount the assembly. See Figure 10-1 for mounting suggestions.

Arrangement of components

Figure 10-2 illustrates the configuration of components used for mounting electrode with the preamplifier module not submersed.

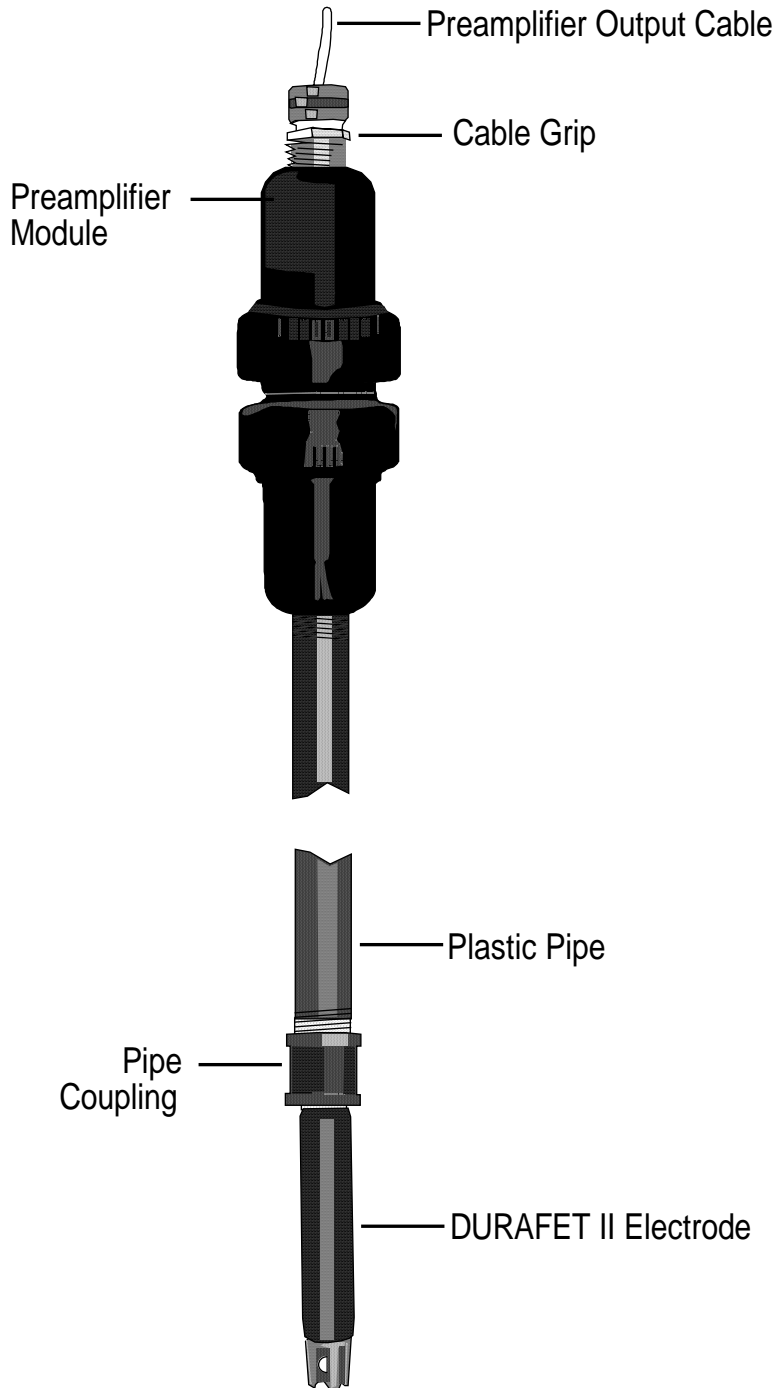


Figure 10-2 External Preamplifier Module Mounted on Immersion Pipe

10.3 Preamp Module Remote Mounted

Application

Figure 10-3 illustrates this configuration. Among the catalog numbers to which it applies are:

7777-4-46
7777-4-47
7777-4-50

Figure 10-3 illustrates an assembly with an external preamplifier module. If an external preamplifier adapter is used instead, the arrangement of components would be the same, but wiring suitable for connecting the preamp adapter to the instrument would be substituted for the preamp output cable. Refer to the manuals supplied with the adapter and the instrument for connection details.

Materials required

The material supplied with this catalog number is listed below.

Quantity	Item
1	Model 31079288 External Preamplifier Module or one of the following External Preamplifier Adapter Module Models: 31079290, 31084755, or 31075773. Unit supplied depends on specified catalog number Table I as shown in Section 2.3.
1	If 31079288 External Preamp is supplied, one 31075723 Preamp Output Cable, 20 ft length, will also be supplied.
1	If 31079288 External Preamp is supplied, one 31075717 mounting bracket will also be supplied.
1	Durafet II Electrode with slotted tip and integral cable

Materials supplied by the user are listed below.

Quantity	Item
1	Length of 3/4 in. Sch. 40 pipe, threaded on both ends. Pipe length to be determined by user. When planning pipe length, allow enough cable between the pipe and the preamp to permit removal for servicing.
2	3/4 in. NPT pipe couplings
1	If an External Adapter Module is used, a length of cable is required to connect preamp adapter to the instrument. Refer to the manual supplied with the instrument for cable specifications.
1	3/4 in. NPT cable grip for 1/4 in. diameter cable
2	3/4 in. NPT cable grip for 1/8 in. diameter cable

Assembly

See Table 3-1 for order of assembly tasks. Assemble the materials as shown in Figure 10-3.

CAUTION

Fittings to the external preamp module are to be hand tightened only. Over-tightening may result in damage to the equipment.

Dimensions

For mounting dimensions, see Section 2.

Final electrical connections

Make final electrical connections (see Section 6).

Pressure test

Perform a submersible pressure test (see Section 4).

Mounting

Mount the assembly. See Figure 10-1 for mounting suggestions.

Arrangement of components

Figure 10-3 illustrates the configuration of components used for mounting electrode and the remotely mounted 31079288 external preamplifier module.

If an external adapter module is used instead of an external preamp, the electrode cable connects to the adapter as described in the adapter manual. The adapter manual also contains a diagram identifying the screw terminals used to connect the adapter to the instrument.

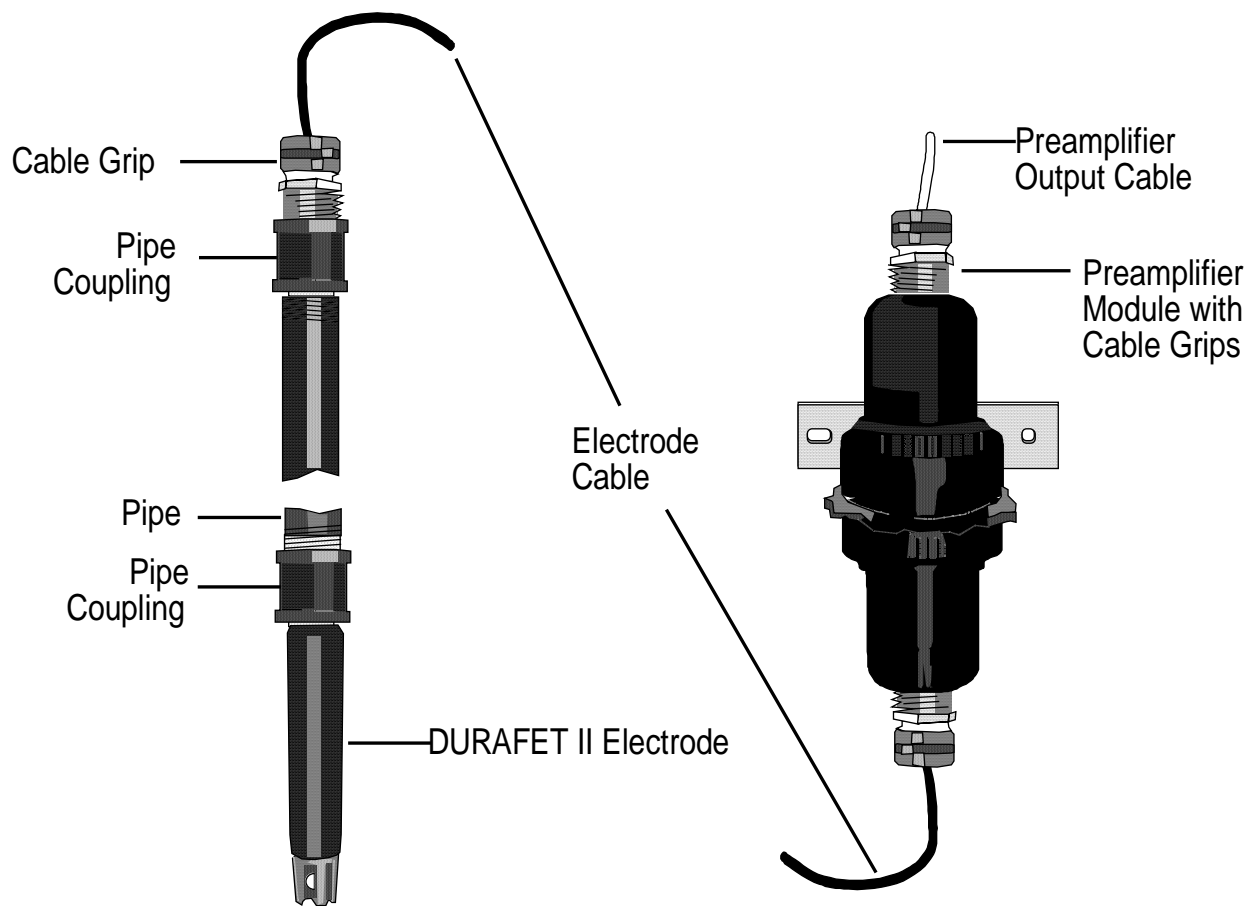


Figure 10-3 Remotely Mounted External Preamplifier Module

10.4 Direct Electrode-to-Instrument Applications (Internal Pre-amplifier or Cap Adapter)

Application

Figure 10-4 illustrates this configuration.

Materials required

The material supplied with this catalog number is listed below.

Quantity	Item
1	Durafet II Electrode with slotted tip and cable

Materials supplied by the user are listed below.

Quantity	Item
1	Length of 3/4 in. Sch. 40 pipe, threaded on both ends. Pipe length to be determined by user. When planning pipe length, allow enough cable between the pipe and the instrument to permit removal for servicing.
2	3/4 in. NPT plastic pipe couplings
1	3/4 in. NPT cable grip for 1/8 in. diameter cable

Assembly

See Table 3-1 for order of assembly tasks. Assemble the materials as shown in Figure 10-4.

CAUTION

Do not push excess electrode cable into the immersion pipe or pipe coupling.

Dimensions

For mounting dimensions, see Section 2.

Cable electrode to instrument

Cable electrode to instrument as described in Section 5.

Pressure test

Perform a submersible pressure test (see Section 4).

Mounting

Mount the assembly. See Figure 10-1 for mounting suggestions.

Arrangement of components

Figure 10-4 illustrates the configuration of components used for direct connection of the electrode to the instrument without an external preamplifier module or external preamp adapter.

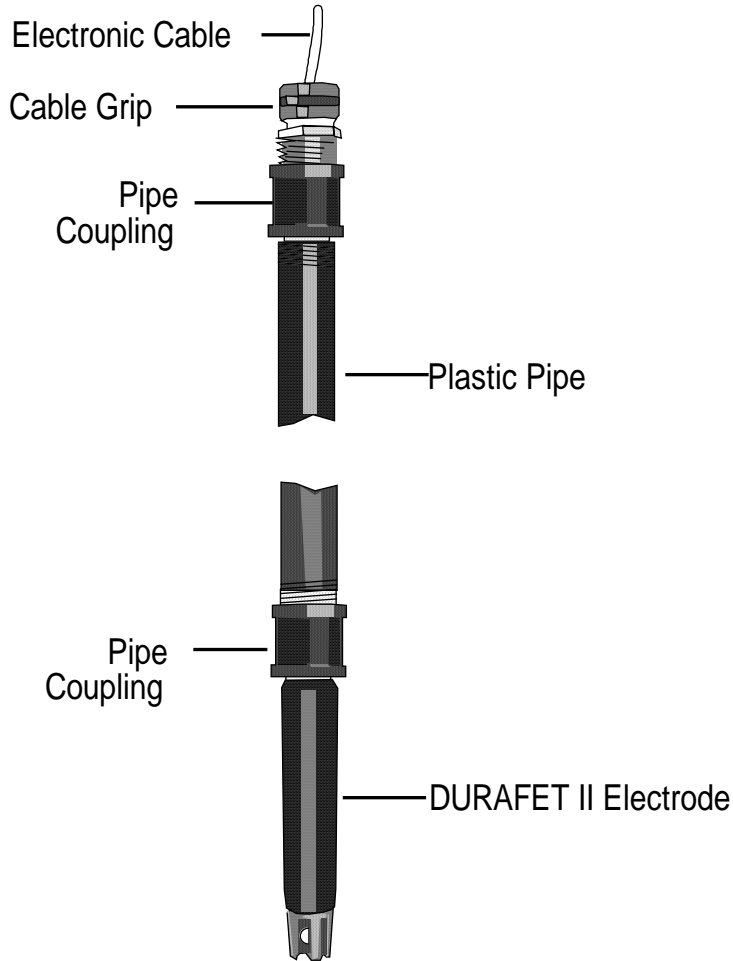


Figure 10-4 Direct Electrode-to-Instrument Connection

11. In-Line Mounting

11.1 General Information

Choice of pipe tee

This mounting allows the electrode body to be inserted directly into a Schedule 40, 3/4 in. NPT metal pipe tee in a pipe line. The electrode will NOT fit into standard **PLASTIC** pipe tees. Use a metal tee or the special Honeywell schedule 80 CPVC 3/4 in. pipe tee, Honeywell part number 31120167.

Avoiding damage to the electrode

The Durafet II electrode for in-line mounting has an exposed sensor. Exercise care when inserting or removing the electrode from the pipe tee to prevent damage to the sensor surface.

Ensuring accurate temperature sensing

When process temperature varies considerably from ambient temperature, insulate the entire Durafet II electrode body to ensure accurate process temperature sensing.

Included in assembly

Assemblies vary according to catalog number configuration ordered, but may include a Durafet II combination electrode, an external preamplifier module or interface adapter module, and connection cables. A description of the Durafet II catalog number is provided in Section 2.

Figure 11-2 illustrates an assembly with an external preamplifier module. If an external preamplifier adapter is used instead, the arrangement of components would be the same, but wiring suitable for connecting the preamp adapter to the instrument would be substituted for the preamp output cable. Refer to the manuals supplied with the adapter and the instrument for connection details.

If no external preamp or adapter is used, the electrode would be cabled directly to the instrument as described in Section 5.

Orientation of electrode

For reliable measurement, the electrode must be immersed in the process fluid. Therefore, orientation of the electrode vertical to the horizon is not recommended, as this orientation may prevent sufficient depth penetration to reliably immerse the sensor. The electrode mounting angle should be at least 45 degrees from vertical as shown in Figure 11-1. If solids are present in the process fluid, avoid angles exceeding 90 degrees from vertical to minimize accumulation of solids around the sensor.

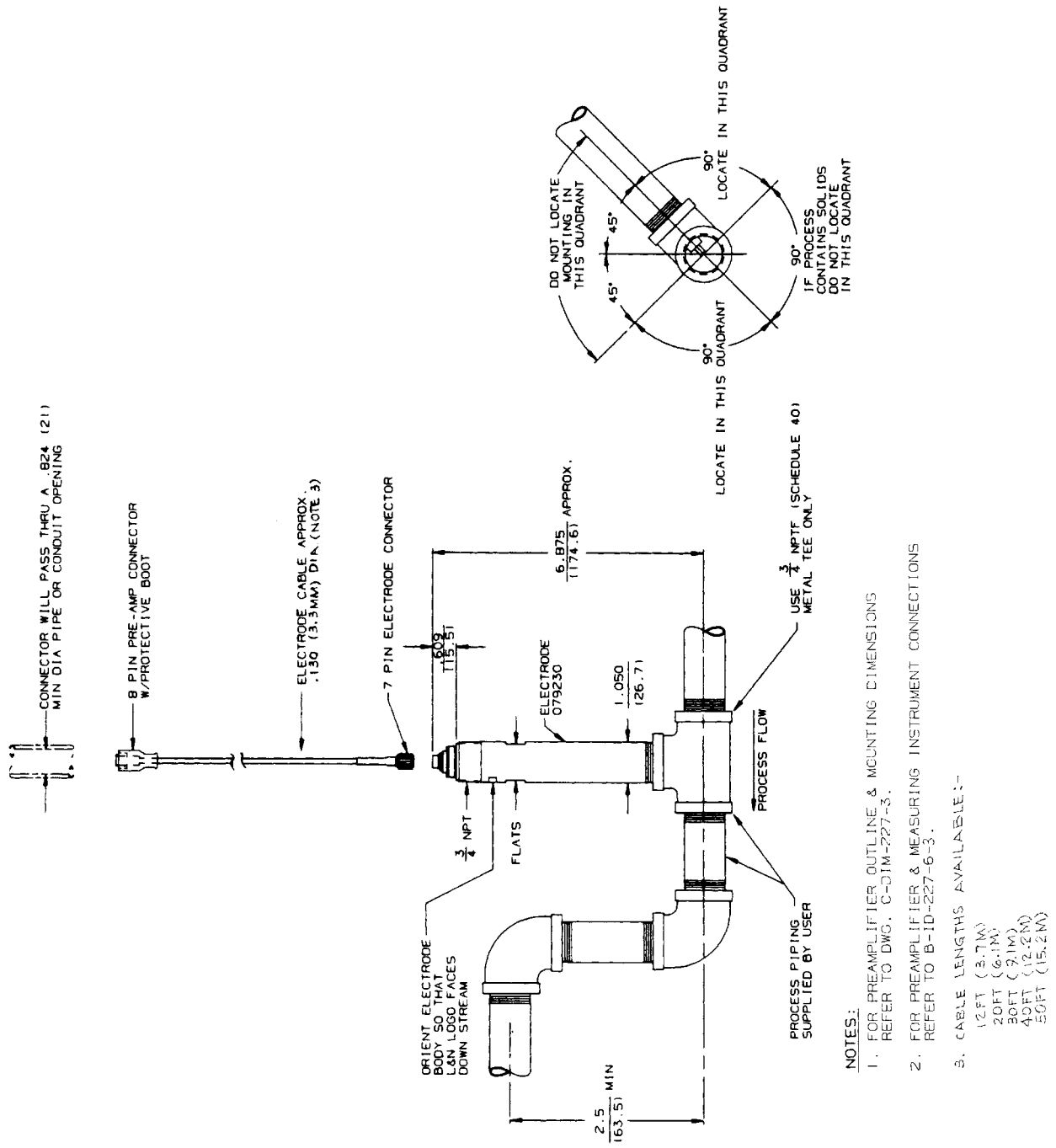


Figure 11-1 Proper Mounting Angle for Electrode

11.2 Preamplifier Module Remotely Mounted

Application

Figure 11-2 illustrates this configuration. It is applicable to catalog numbers:

7777-4-56
7777-4-57
7777-4-58
7777-4-59
7777-4-60

See Section 11.1 for more information about assemblies for in-line mounting of the electrode.

Materials required

The material supplied with these catalog numbers is listed below.

Quantity	Item
1	Model 31079288 External Preamplifier Module
1	Part number 31075723 Preamp Module Output Cable, 20 ft length
1	Part number 075717 mounting bracket for preamp module
1	Durafet II Electrode (no slotted tip guard)
1	Electrode Cable. Length depends on specified catalog number Table II as shown in Section 2.3. Electrode cable part numbers are listed in Section 12.

Materials supplied by the user are listed below.

Quantity	Item
1	3/4 in. NPT Schedule 40 metal pipe tee or special Honeywell plastic pipe tee 31120167 (Electrode will not fit correctly into standard plastic pipe tee.)
1	3/4 in. NPT cable grip for 1/4 in. diameter cable
1	3/4 in. NPT cable grip for 1/8 in. diameter cable

Assembly

See Table 3-1 for order of assembly tasks. Orient the electrode as shown in Figure 11-1. Assemble the materials as shown in Figure 11-2.

Orientation of electrode

The Durafet II electrode must be positioned so that the process solution is in constant contact with both the sensor chip (measuring electrode) and the reference electrode. Orient the Durafet II electrode so the sensor chip faces downstream. Note the relationship between the “H” in Honeywell on the electrode label and the sensor chip. Use this to help you orient the sensor chip downstream. Refer to the electrode manual for additional guidance in handling and positioning the electrode.

Dimensions

For mounting dimensions, see Section 2.

Final electrical connections

Make final electrical connections (see Section 6).

Arrangement of components

Figure 11-2 illustrates the configuration of components used for mounting electrode in-line with the 31079288 external preamplifier module remotely mounted.

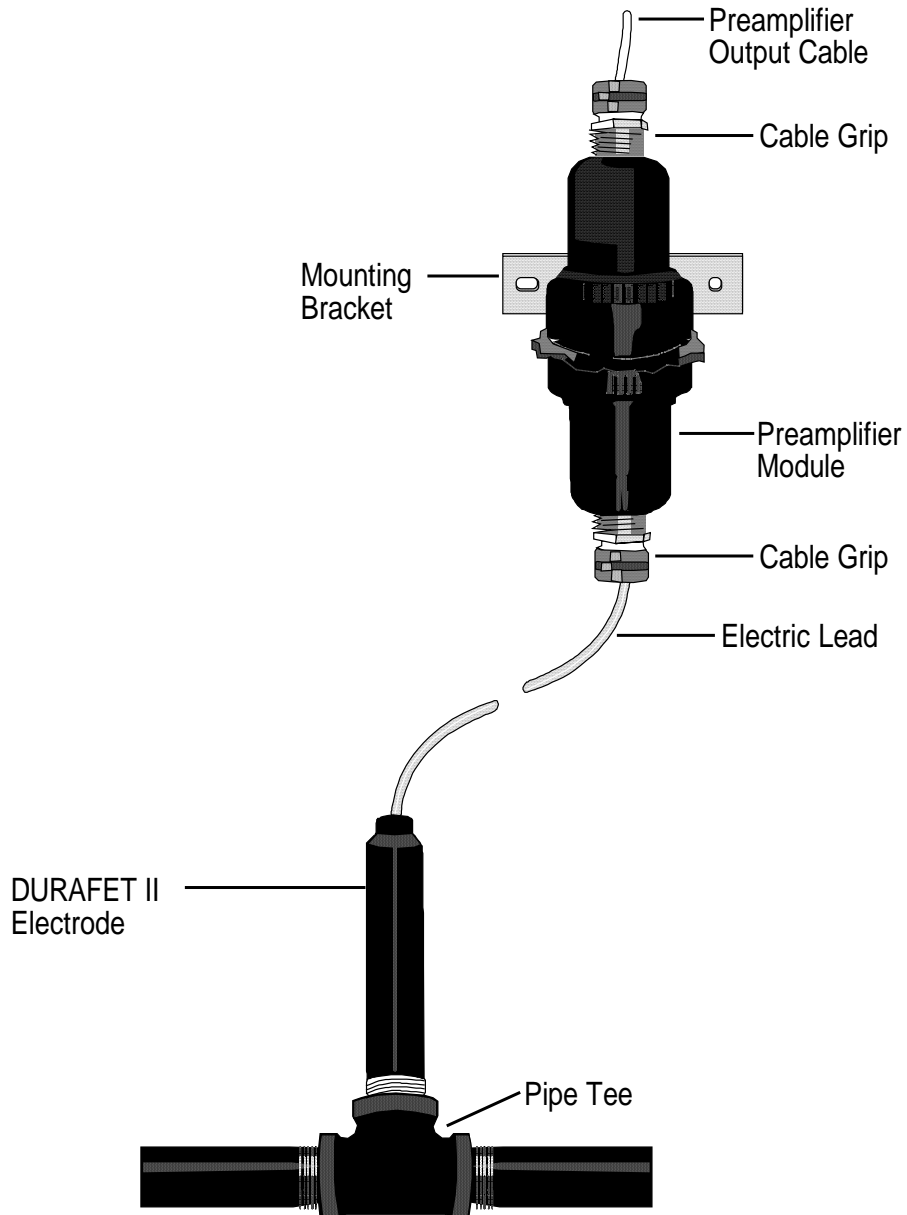


Figure 11-2 In-Line Mounting of Electrode with Remotely Mounted Preamplifier Module

12. Maintenance, Standardization, and Replacement Parts

12.1 Maintenance

Keeping electrode moist

When an electrode is removed from the process for any reason, assure that it does not become dry and remain dry for more than a short period of time. The electrode may require more frequent maintenance if used in a batch treatment installation which leaves the electrode dry between batches, or if it is exposed to process fluids that leave a deposit on the surface of the sensor chip (measuring electrode) and reference electrode. The manual supplied with the electrode contains instructions for cleaning the electrode. Thoroughly rinse the electrode with water after any type of cleaning.

In addition to periodic cleaning, other electrode maintenance includes electrode performance checks, and treatment for a clogged junction or severely dry electrode.

CAUTION

Read the manual (part number 70-82-25-87) supplied with the electrode before attempting any maintenance procedures.

Improper handling of the electrode can result in damage that will affect accuracy.

12.2 Standardization

In addition to electrode maintenance, successful pH measurement relies on periodic standardizing of the measurement instrument and its electrode system. (This is required because all electrodes do not produce exactly the same potential in a solution of known pH. A periodic corrective adjustment eliminates any deviation from the standard value.) Establish regular intervals for standardizing according to conditions and experience. Procedures for standardizing are given in the measuring instrument instructions.

12.3 Replacement and Accessory Parts

Description	Part Number
Durafet II electrode	<i>See the electrode manual (part number 70-82-25-87).</i>
External preamplifier module	31079288 (see Figure 12-1 for numbers of component parts)
Internal preamplifier kit.	080239
Adapter module to provide standard pH electrode signal to a pH analyzer not manufactured by Honeywell. Analyzer must have manually adjustable temperature compensation, or fixed compensation at 25 °C (77 °F).	31079290, 120 Vac 31084775, 240 Vac 31075773, battery-powered
Standard Durafet II cables	
electrode cable, 3.66 m (12 ft) length	51204782-001
electrode cable, 6.10 m (20 ft) length	51204782-002
electrode cable, 9.14 m (30 ft) length	51204782-003
electrode cable, 12.19 m (40 ft) length	51204782-004
electrode cable, 15.24 m (50 ft) length	51204782-005
Cap Adapter Durafet II cables	
1.22 m (4 ft) length	51205965-006
2.44 m (8 ft) length	51205965-007
3.66 m (12 ft) length	51205965-001
6.10 m (20 ft) length	51205965-002
15.24 m (50 ft) length	51205965-005
Silicone grease (0.3 oz tube)	31090011 (<i>supplied with every 31079288 preamp module</i>)
Teflon tape, 1/2 in. x 260 in. roll	31811069 (<i>provided with every Catalog 7777</i>)
Junction box, six-terminal Required if external preamp is more than 200 ft from the instrument.	31316260
Cable grip, 3/4 in. NPT aluminum for 1/4 in. diameter cable (preamp to instrument cable)	31074354
Cable grip, 3/4 in. NPT aluminum for 1/8 in. diameter cable (electrode to preamp cable)	31084760
Preamp to instrument cable, 50 ft	51309677-001
Preamp to instrument cable, 100 ft	51309677-002
Preamp to instrument cable, 200 ft	51309677-003
Output extension cable for use with 31079288 preamp module and junction box Contains six conductors	31834088 (<i>specify length</i>); commercially available equivalent cables: Alpha A1176 or Belden 9430, brown wire not used
CPVC pipe tee, special dimension 3/4 in. NPT for in-line mounting	31120167

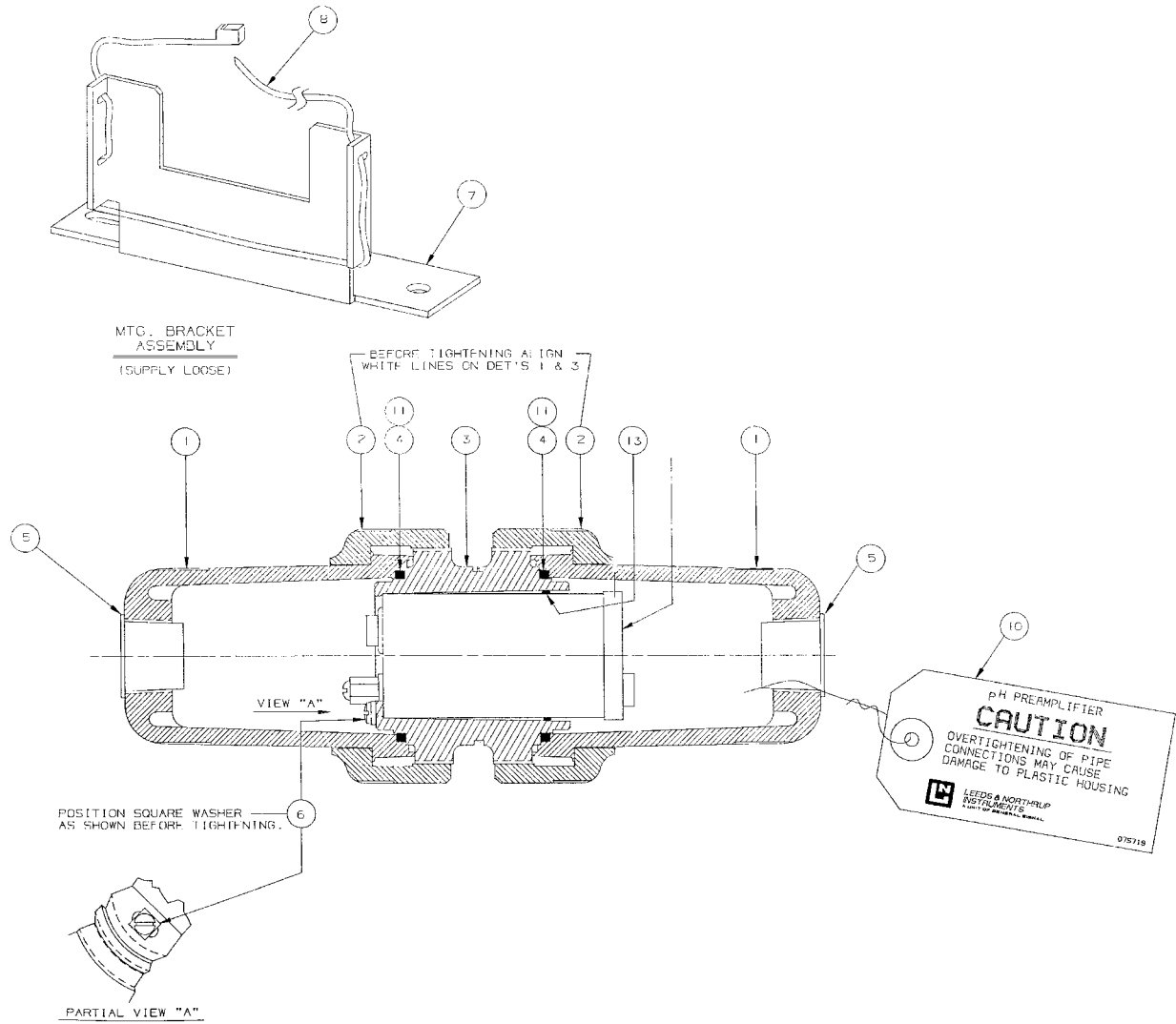


Figure 12-1 Replacement Parts for Preamplifier Module 31079288 (Table I = 4)

Honeywell

Sensing and Control
Honeywell
11 West Spring Street
Freeport, IL 61032