Honeywell

# 4905 Series Conductivity Cells Installation and Maintenance Manual

70-82-25-18
Rev 1
6/99

TotalPlant

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**Revision 1 – 6/99**



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# About This Document

## Abstract

This document is intended to support the installation, operation and maintenance of the 4905 Series of Conductivity Cells.

## Revision Notes

The following list provides notes concerning all revisions of this document.

| Rev. ID | Date | Notes |
|---|---|---|
| 0 | 12/96 | This document is the initial Honeywell release of the L&N manual p/n 177667 Rev. M2. There has been no significant changes made to this manual. The format has been changed to reflect the Honeywell layout. |
| 1 | 6/99 | Edits done to add new Model Selection Guide information and to correct some errors in the text. |

## References

### Honeywell Documents

The following list identifies all Honeywell documents that may be sources of reference for the material discussed in this publication.

| Document Title | ID # |
|---|---|
| 9782 Series Conductivity/Resistivity Analyzer/Controller Operator's Manual | 70-82-25-74 |
| 7079-17 Two-Wire Transmitter for Conductivity/ResistivityOperation and Maintenance Manual | 70-82-25-51 |

### Non-Honeywell Documents

The following list identifies select non-Honeywell documents that may be sources of reference for the material discussed in this publication.

| Title | Author | Publisher | ID/ISDN # |
|---|---|---|---|

## Contacts

The following list identifies important contacts within Honeywell.

| Organization | Telephone | Address |
|---|---|---|
| Honeywell TAC | 1-800-423-9883 Voice | 1100 Virginia Drive<br>Fort Washington, PA 19038 |

# Contents

# Tables



# Figures

# 1. Introduction

## 1.1 Overview

These cells form the sensing network for industrial analyzers and recorders designed to make continuous measurements of electrolytic conductivity. The cells are primarily suited to measurements in effluents of ion-exchangers and distillation columns; but appropriate constants are provided for many other applications, including measurements in micro-electronic component washing and plating-rinse effluents. Universal in mounting, any of the cells can be arranged for immersion, insertion (1" NPT) or flow type sampling. The latter can be achieved by use of a CPVC flow housing, a 1" pipe tee (schedule 40), or 1-1/4" plastic tee (schedule 80) installed in a process line or bypass line as pictured in Fig. 1-1.

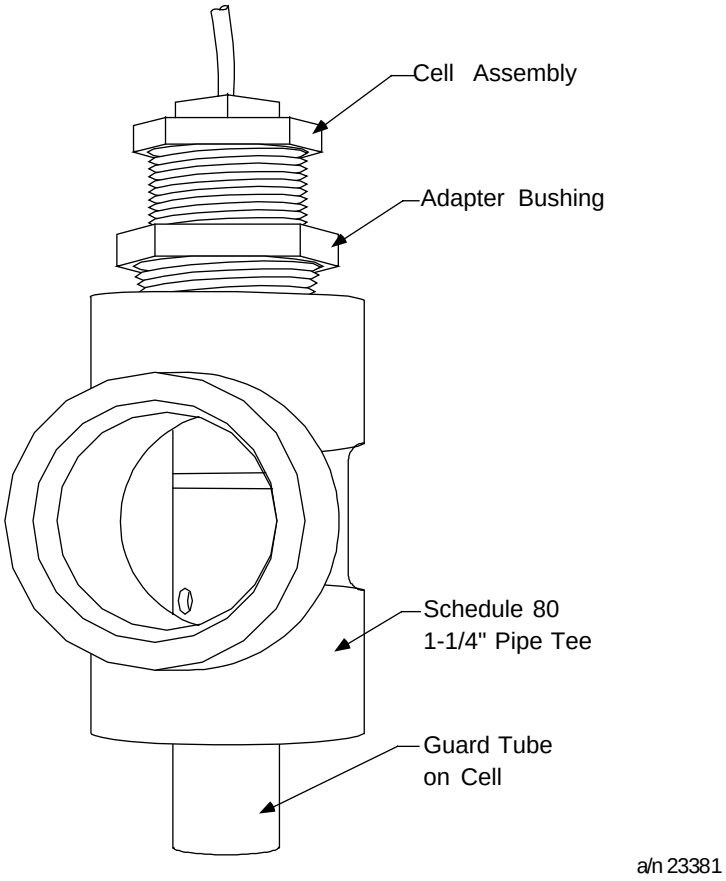



**Figure 1-1 4905 Conductivity Cell Mounted in a 1-1/4" Schedule 80 Tee Using an Adapter Bushing**

ATTENTION

Please note that specific parameters of your process may prohibit the use of nickel elements. For example, use a platinum-element cell (specified 4905--44) if the cell will measure or be exposed to regeneration acids or bases.

The cell constant is selected according to the range of the measuring instrument used and the solution measured. In general, a high-constant cell is used for solutions having low electrical resistance (high conductivity) and a low-constant cell is used for solutions having high electrical resistance (low conductivity). The various cell constants available are listed in Section 2.2, Model Selection Guide. Do not use cell constants of 0.01 to 1 if the measured resistance will be less than 1000ohms. If cells of higher constant cannot be used, it will be necessary to platinize the cell. Automatic Temperature Compensation (ATC) during the measurement is provided by a built-in temperature sensing network located near the cross-channel or guard-tube holes. If fixed or manually adjusted compensation is to be used, this integral compensator is not included. Complete technical data concerning the compensators is not included.

The cells are molded from Polyethersulfone (PES) which is resistant to most corrosive chemicals over a wide range of temperatures. (A common exception is chlorinated hydrocarbons.) Sample solutions come into contact only with the above plastic and the platinum or nickel electrode surface. Any cell can be supplied with either electrode material.

# 2. Specifications and Model Selection Guide

## 2.1 Specifications

**Cell Constant -** 0.01, 0.1, 1.0, 5, 10, 20, 25 and 50 cm-1 as specified.

**Electrode Material -** Nickel or platinum as specified.

**Maximum Pressure Limit -** 250 psig (1724 kPa) @ 140°C (284°F).

**Maximum Continuous Temperature Limit -** 140°C (284°F) (refer to automatic temperature compensator when specified, for upper temperature limit).

### Mounting

**Insertion-** 1" NPT male, Schedule 40.

**Flow Chamber -** Inlet - 3/4" NPT Male. Outlet: 3/4" NPT Female.

**Insertion Depth -** 5" to 7" (127 to 178 mm) depending on cell constant.

**Overall Length -** Approximately 6 to 8" (152 to 203 mm) or 10 to 12-1/4" (254 to 311 mm) if universal head is used.

**Materials of Construction**

**(Wetted Parts) -** Cell mounting: PES (Polyethersulfone).
Electrodes: nickel or platinum.

**Leadwire-** Tefzel-covered 18 gage cable, 0.177" (4.55 mm) OD at lengths listed.

**Weight -** Approximately 1 lb (0.45 kg) or 3 lb (1.35 kg) if universal head is used.

### Specifications for 276127 Flow Chamber

**Max. Flow -** 2 gpm @ 40 psig and atmospheric discharge.

**Max. Pressure -** 200 psig at 25°C.

**Max. Temperature -** 140°C (284°F) at atmospheric pressure.

**Dimensions -** 1-1/2" (3.8 cm) octagon x 8-3/4" (22.2 cm) long. Sample inlet: 3/4" NPT male. Sample outlet: 3/4" NPT female. Cell inlet: 1" NPT female.

**Material -** Polyethersulfone (PES)

# 2.2 Model Selection Guide

**Instructions**

- Consult Steps to Selecting Appropriate Conductivity Instrumentation and Cells before making selections below.
- Select the desired key number. The arrow to the right marks the selection available.
- Make one selection from each Table using the colum below the proper arrow. A dot denotes unrestricted availability.

| Key Number | | I | | II | | III | | IV | | V | | VI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| _ _ _ _ _ | - | _ _ _ | - | _ _ | - | _ _ _ | - | _ _ | - | _ _ _ | - | _ _ _ |

**KEY NUMBER**

| Description | Selection | Availability |
|---|---|---|
| 04905 Conductivity Cell | 04905 | ↓ |

**TABLE I**

| | | | |
|---|---|---|---|
| Cell Constant | 0.01 | 001 | • |
| | 0.1 | X01 | • |
| | 1 | XX1 | • |
| | 5 | XX5 | d |
| | 10 | X10 | • |
| | 20 | X20 | d |
| | 25 | X25 | • |
| | 50 | X50 | • |

**TABLE II**

| | | | |
|---|---|---|---|
| Electrode Material | Nickel | 33 | • |
| | Platinum | 44 | • |

**TABLE III**

| | | | |
|---|---|---|---|
| Automatic Temperature Compensator (ATC) | | | |
| No Temperature Compensator | | 000 | • |
| Available for 9782 and 7082 Only | | 333 | c |
| Available for 7079C Transmitter or already withdrawn analytical instrumentation. (Refer to Tables 1 and 6 under Steps to Selecting Appropriate Conductivity Instrumentation & Cells for available Temp. Compensator/Conductivity range.) | | 009 | • |
| | | 013 | • |
| | | 014 | • |
| | | 071 | • |
| | | 072 | • |
| | | 073 | • |
| | | 074 | • |
| | | 088 | • |
| | | 090 | • |
| | | 091 | • |
| | | 093 | • |
| | | 113 | • |
| | | 114 | • |
| | | 160 | • |
| | | 164 | • |
| | | 168 | • |

**TABLE IV**

| | | Selection | Availability |
|---|---|---|---|
| Leadwire Length | 7 ft Leadwire | X7 | • |
| | 20 ft Leadwire | 20 | • |
| | Universal Head (Aluminum) | X1 | • |

**TABLE V**

| | | | |
|---|---|---|---|
| Special Insertion Length | None | 000 | • |
| | 4.4" extra | 910 | • |
| | 8.8" extra | 920 | • |

**TABLE VI - OPTIONS**

| | | | |
|---|---|---|---|
| Tagging | None | 0_ _ | • |
| | Linen | L_ _ | • |
| | Stainless Steel | S_ _ | • |
| Certificate of Calibration | No | _0_ | • |
| | Yes | _ 1 _ | • |
| Future | | _ _0 | • |

**RESTRICTIONS**

| Restriction Letter | Available Only With | | | Not Available With | |
|---|---|---|---|---|---|
| | Table | Selection | | Table | Selection |
| **c** | III | For 9782 and 7082 Analyzers only | | | |
| **d** | | | | III | 333 |

# 3. Installation

## 3.1 Overview

The conductivity cell is secured permanently to the 1" N.P.T. bushing which is used for all types of mountings. The three types of mountings are illustrated in Fig. 3-1. Although the physical appearance of the various cells is the same (except for length), the cell construction differs according to the constant. On the 10, 25 and 50 constant cells, the electrodes are short tubes located midway inside the two parallel tubular channels that run lengthwise through the cell, and are open to the sample at both ends of the cell. The channels are larger on the 25 constant cell and they are elliptical on the 5 and 10 constant cell. The 1, 0.1, and 0.01 constant cells have a removable cell guard which is screwed onto the cell body to protect the electrode surfaces. Electrodes are three disks on the 1 constant cell, parallel plates on the 0.1 constant cell, and wire wound on the cell body on the 0.01 constant cell. Cells must be used with the guard in place or the cell constant may differ from that specified.

Most of the auxiliary parts which enable the user to achieve the various types of mounting are readily obtained from local suppliers. For an immersion arrangement, only the appropriate length of 1/2 inch pipe (e.g., CPCV) and if desired, a 1/2 inch end coupling is needed. For an in-line flow arrangement, only a 1" schedule 40 tee is required. The basic cell can be converted to a flow cell for either bypass or in-line arrangements by use of the PES flow-cell housing (Honeywell Part 276127) shown in Figs. 3-1 and 3-3. However, the temperature and pressure specifications listed for this flow chamber under Specifications apply.

## 3.2 Types of Mounting

The three types of mounting; Flow, Immersion and Insertion, are illustrated in Figure 3-1. Mounting dimensions for each type of cell assembly are given in Figures 3-3, 3-4 and 3-5.

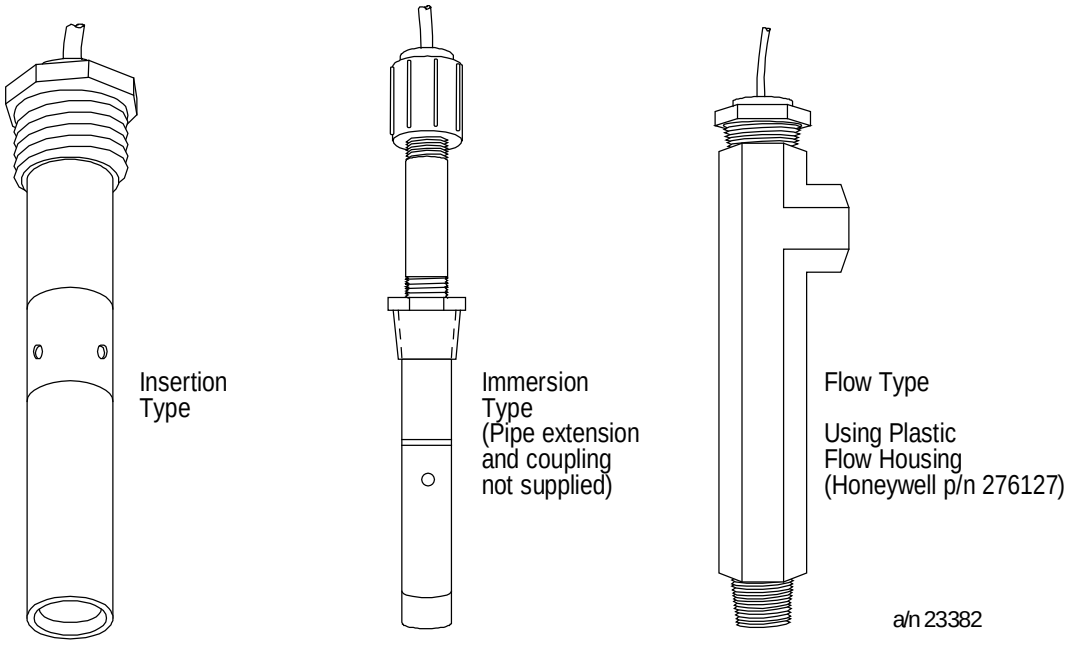



**Figure 3-1 Types of Mountings for 4905 Conductivity Cells**

## 3.3 Flow-Type Mounting

The cross-channel or guard-tube hole in the cell must always be covered by the solution and if integral compensation is provided, the solution level must be 1-1/2 inches above these holes. When mounting the cell in a pipe tee such as shown in Fig. 3-1, have the solution enter the tee from below and exit to the side. As shown, the guard-tube hole is in line with the horizontal pipe run. However, if it is possible that the pipe line will not be full at all times, locate the hole just below the exit pipe to insure flooding of the cell under all conditions. As shown in Fig.3-2, always locate the cell on the pressure side, not the vacuum side of the pump. The flow-cell-housing, an accessory part having 3/4" male inlet and female outlet threads, can be used for an in-line measurement or in a bypass line as shown in Fig. 3-2, depending upon the flow volume or pipe size. Adapter bushings are available to convert inlet and outlet fittings to 1/4" female threads. See Section 4.4. The cell must be covered by the solution at all times. Therefore, make certain the lowest solution head is higher than the cell location. See that an air bubble does not prevent the cell from filling properly.

Flow-cell housing can be used "in-line" only if a maximum flow of 2 gallons per minute can be tolerated. To avoid cracking the 276127 flow-cell housing, use Teflon tape on cell threads and tighten cell only enough to prevent leakage.

To install, tighten the cell into a 1" schedule 40 pipe tee. If the flow-cell housing is used, assemble the cell and housing and install it in the process flow line or in a bypass line.

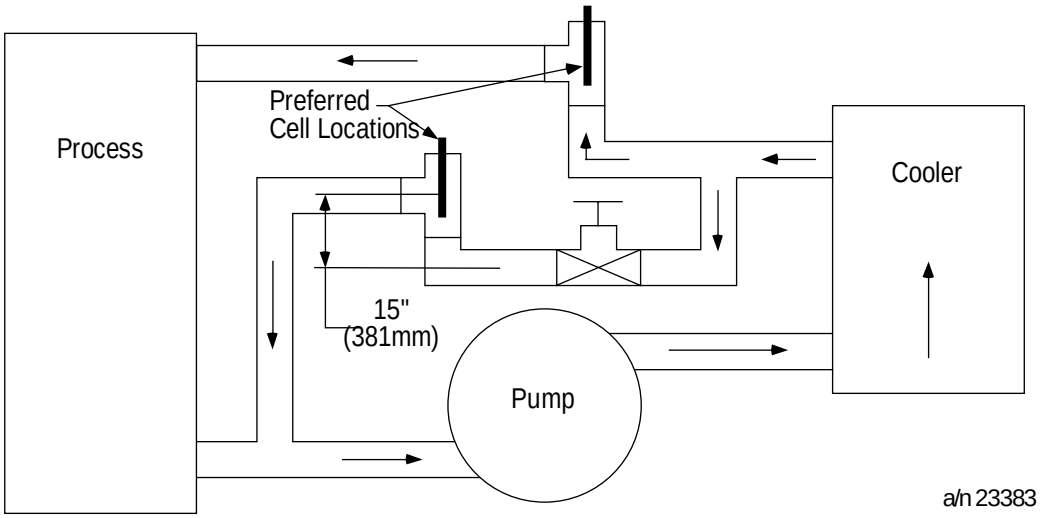



**Figure 3-2 Typical Conductivity Measuring Installation**

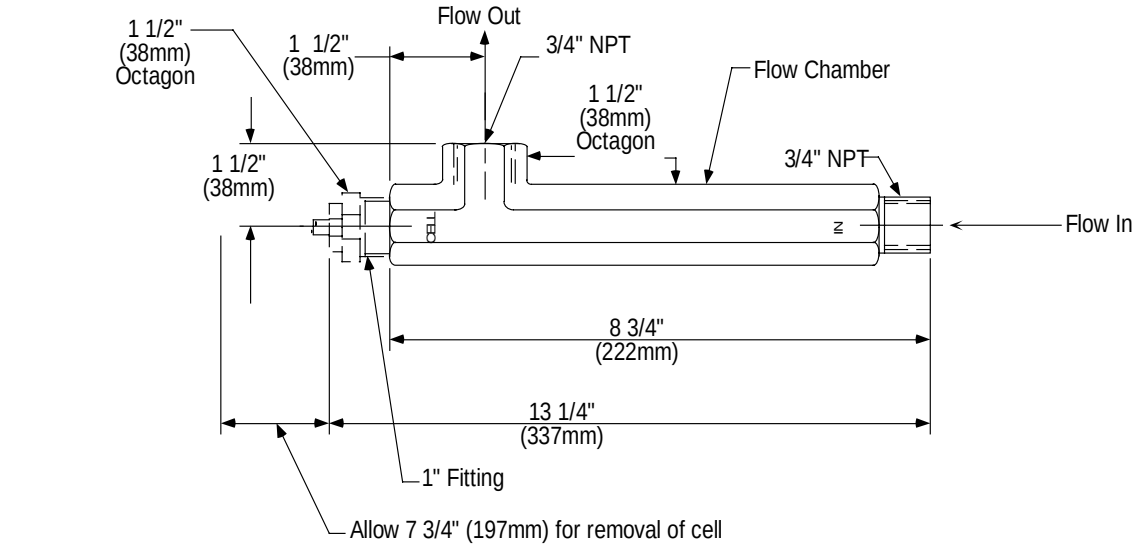
## 3.4 Immersion-Type Mounting

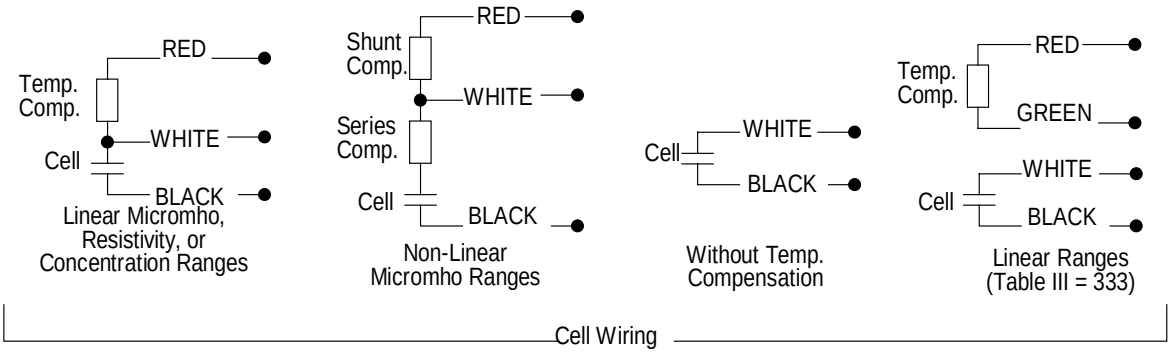
The cell must be immersed to a level above the cross-channel or guard tube hole and must be immersed to 1-1/2 inches above this hole if an integral compensator is used. For most immersion applications, a 1/2" support pipe, preferably CPCV must be threaded into the cell bushing, using Teflon tape to seal the threads, thus permitting adequate immersion. Unless this pipe extension is used, do not immerse the top of the bushing. To insured that a representative sample is measured at all times, the solution must circulate through the channels. In quiescent solutions, provide sufficient agitation.

To install the cell, determine the length of 1/2" pipe required to give the immersion needed to keep the cell completely immersed at all times. Up to six feet of pipe can be used for the standard cell having seven feet of cable. Remove the small bushing at the top of the cell, slide it off the cable, and replace it with the 1/2-inch pipe. At the top of the pipe slide a pipe coupling and the small bushing back over the leadwire as shown in Fig. 3-1, or install a junction box to terminate the pipe.

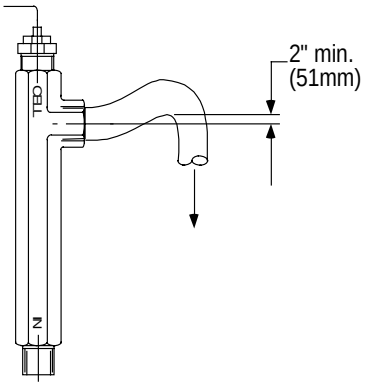
## 3.5 Insertion-Type Mounting

The cell can be inserted into a 1" N.P.T. threaded opening, but it is imperative that the tank or chamber be full under all process conditions. Make certain the liquid head is above the cell location. A vertical insertion (from above) or a horizontal insertion can be used. To install, simply tighten the cell into a 1" N.P.T. threaded opening (using a Teflon thread compound such as Teflon tape) so that the entire electrode is immersed in the measured solution. Allow at least 1/2-inch clearance beyond the end of the cell. In applications where vertical mounting is required, avoid a position with the cell channels pointed up, as this will permit solution to flow down into the open end of the cell and may result in clogging by solids settling in the cell channels. See Fig. 3-2.



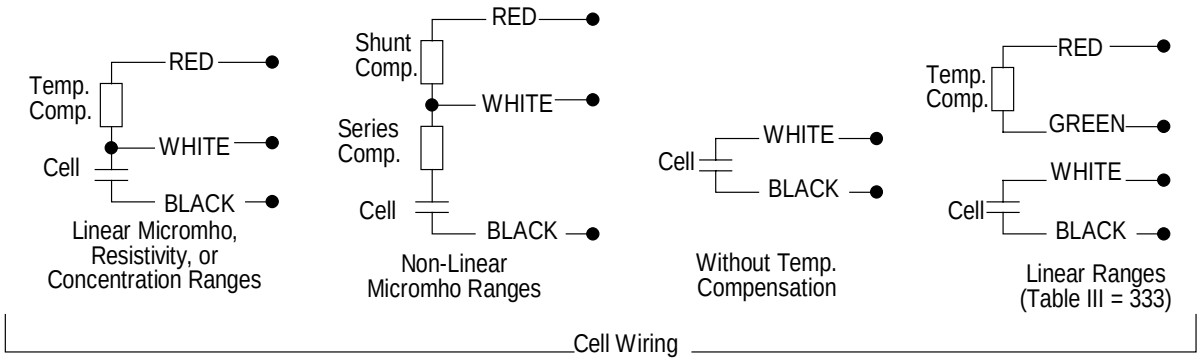



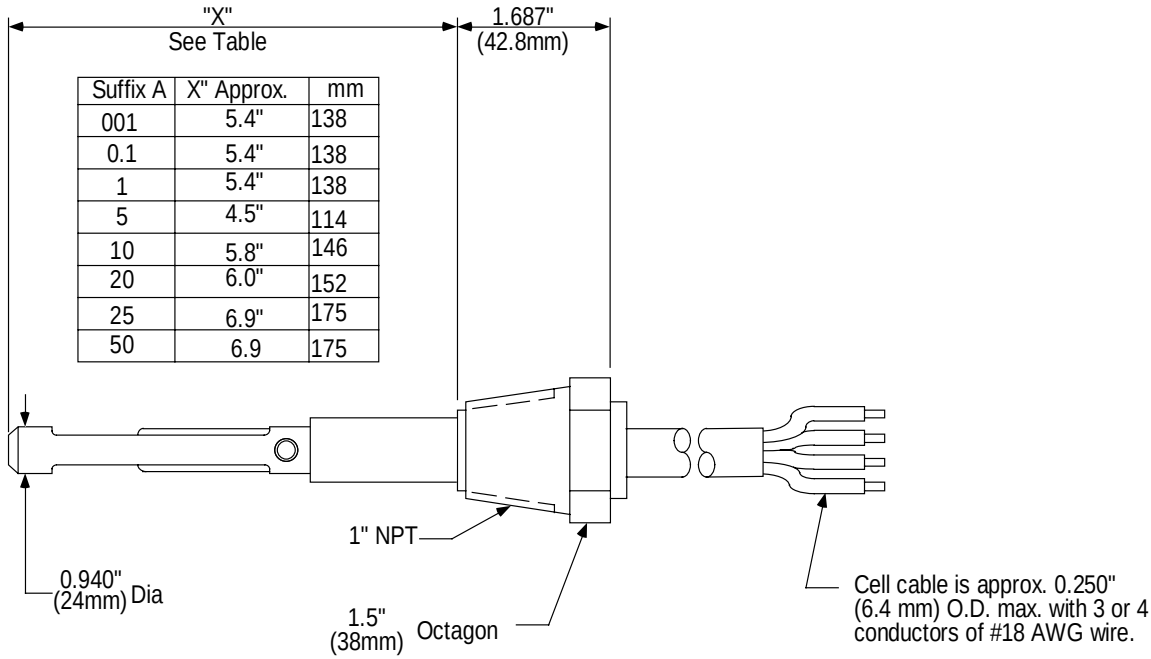

NOTES:
1. Mount cell and flow chamber horizontally as shown above with flow exit "up to eliminate possible air gap around cell body.
2. If cell and flow chamber must be mounted vertically, attach a short length of tubing to flow exit as shown below and form a trap to ensure filling of flow chamber, especially at low flow.




a/n 23384

**Figure 3-3 Dimension Drawing for 276127 Flow Housing**

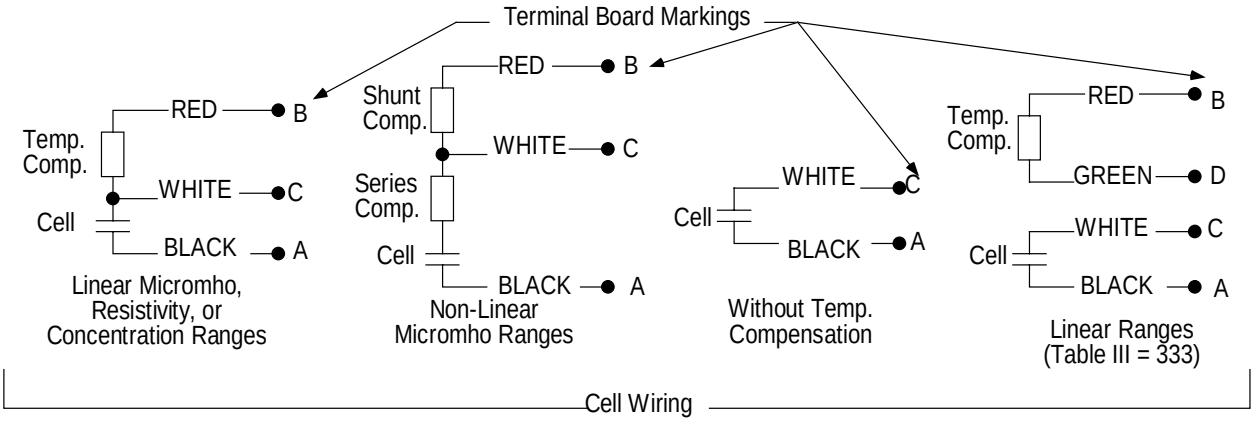



| Suffix A | X" Approx. | mm |
|---|---|---|
| 001 | 5.4" | 138 |
| 0.1 | 5.4" | 138 |
| 1 | 5.4" | 138 |
| 5 | 4.5" | 114 |
| 10 | 5.8" | 146 |
| 20 | 6.0" | 152 |
| 25 | 6.9" | 175 |
| 50 | 6.9 | 175 |

a/n 23385

**Figure 3-4 Mounting Dimensions and Integral Temperature Compensator Circuit and its Leadwire Terminal Board Connections**



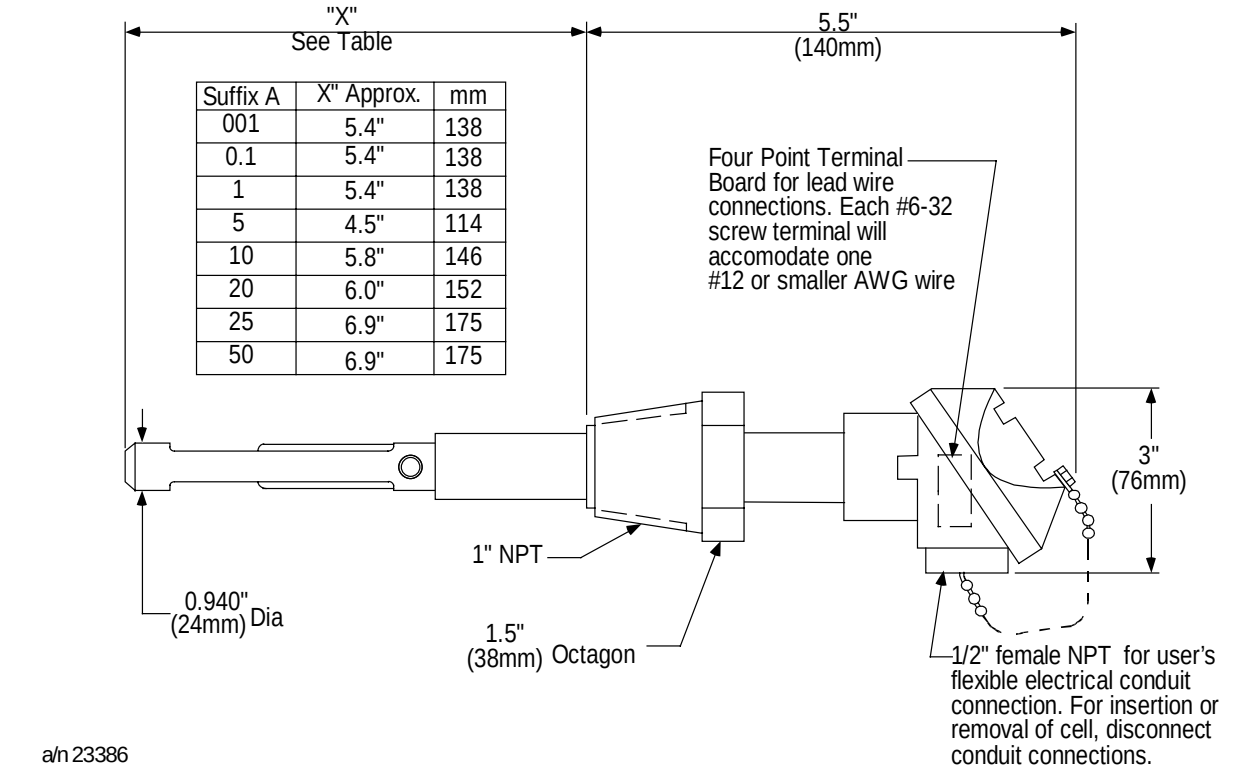
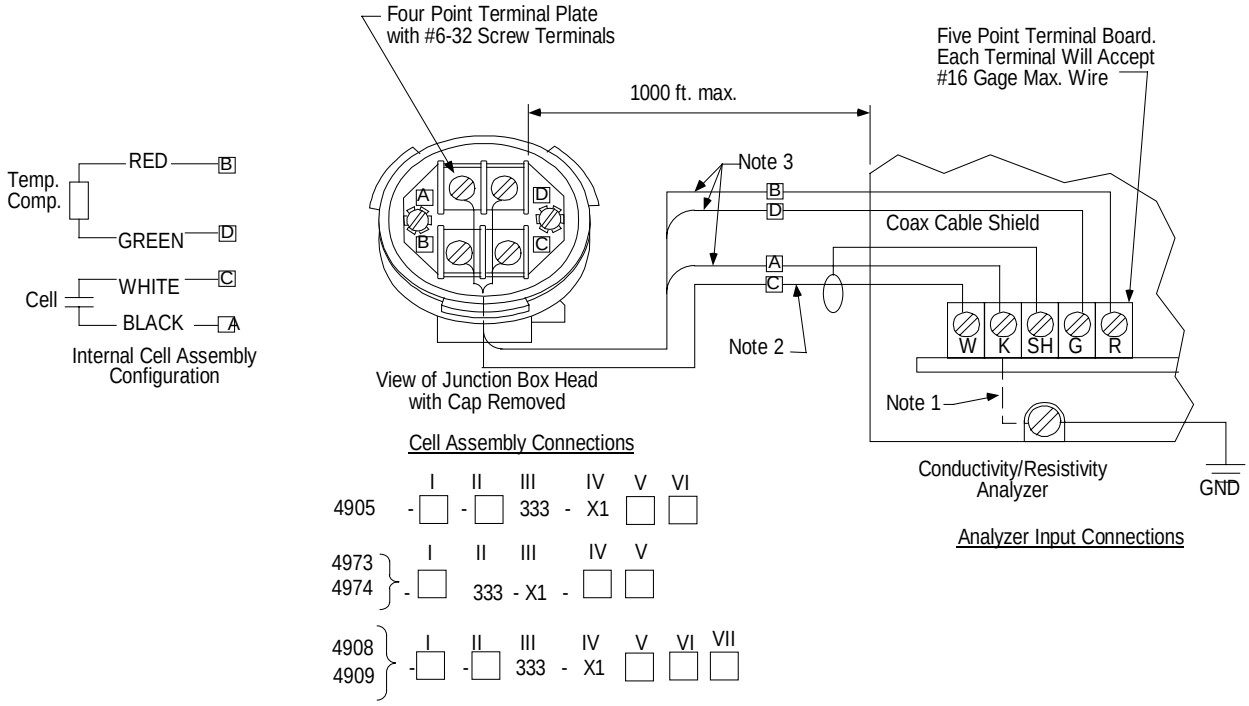




**Figure 3-5 Mounting Dimensions and Integral Temperature Compensator Circuit and its Leadwire Terminal Board Connections (Universal Head)**

## 3.6 Electrical Connections

The terminal-board connections for recorder or analyzer are given in the appropriate directions furnished with the measuring instrument. See Figures 3-6 and 3-8 for connections to the 7082 Analyzer and Figure 3-7 and 3-9 for connections to the 9782 Analyzer.

To avoid the possibility of ac pickup in the cell leads, separate them from all ac line-voltage wiring or run them in a separate grounded conduit.




NOTES:

1. For pure water samples in non-conductive (plastic, glass, etc.) piping, ground the black cell electrode lead near the cell. Alternatively, connect to the 7082 ground screw as shown dotted. Do not ground 10, 25, or 50 constant cells.

2. 7082-16, 17, 18, 19 (only)
   Use 22 gage minimum coaxial cable type RG59/U connecting shield to terminal "SH" only.

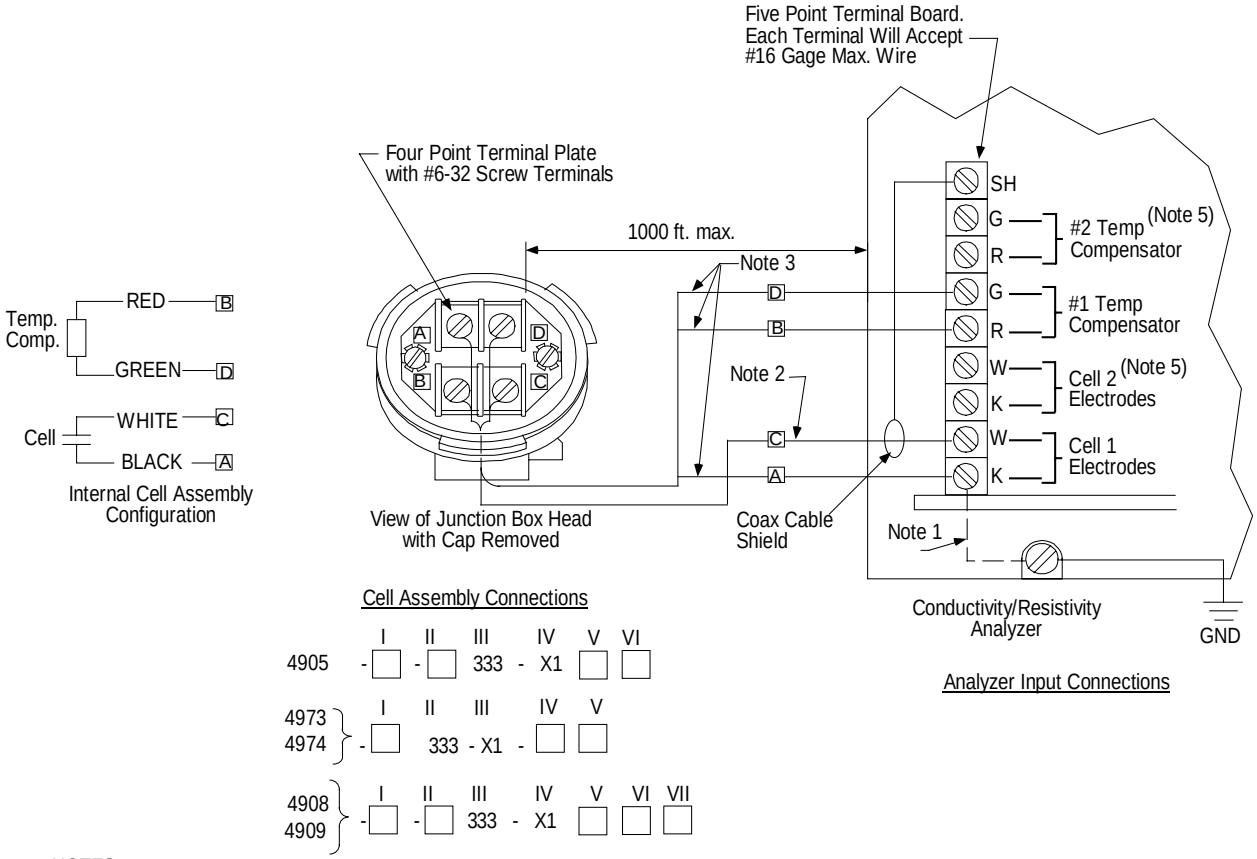
3. 7082-16, 17, 18, 19
   For cable runs of up to 500 ft., use: 18 gage minimum, three conductor cable.
   For cbale runs of 500 - 1000 ft., use: 16 gage minimum, three conductor cable.

   7082-13, 14, 15 [coax and shield (SH) not used]
   For cable runs of up to 500 ft., use: 18 gage minimum, four conductor cable.
   For cable runs of 500 - 1000 ft., use: 16 gage minimum, four conductor cable.

4. Cell to analyzer cables are considered low level. Run seperate from high level wiring.

a/n 23345

**Figure 3-6 4905 Cell with Junction Box Head Connected to 7082 Conductivity/Resistivity Analyzer**




NOTES:

1. For pure water samples in non-conductive (plastic, glass, etc.) piping, ground the black cell electrode lead near the cell. Alternatively, connect to the 7082 ground screw as shown dotted. Do not ground 10, 25, or 50 constant cells.

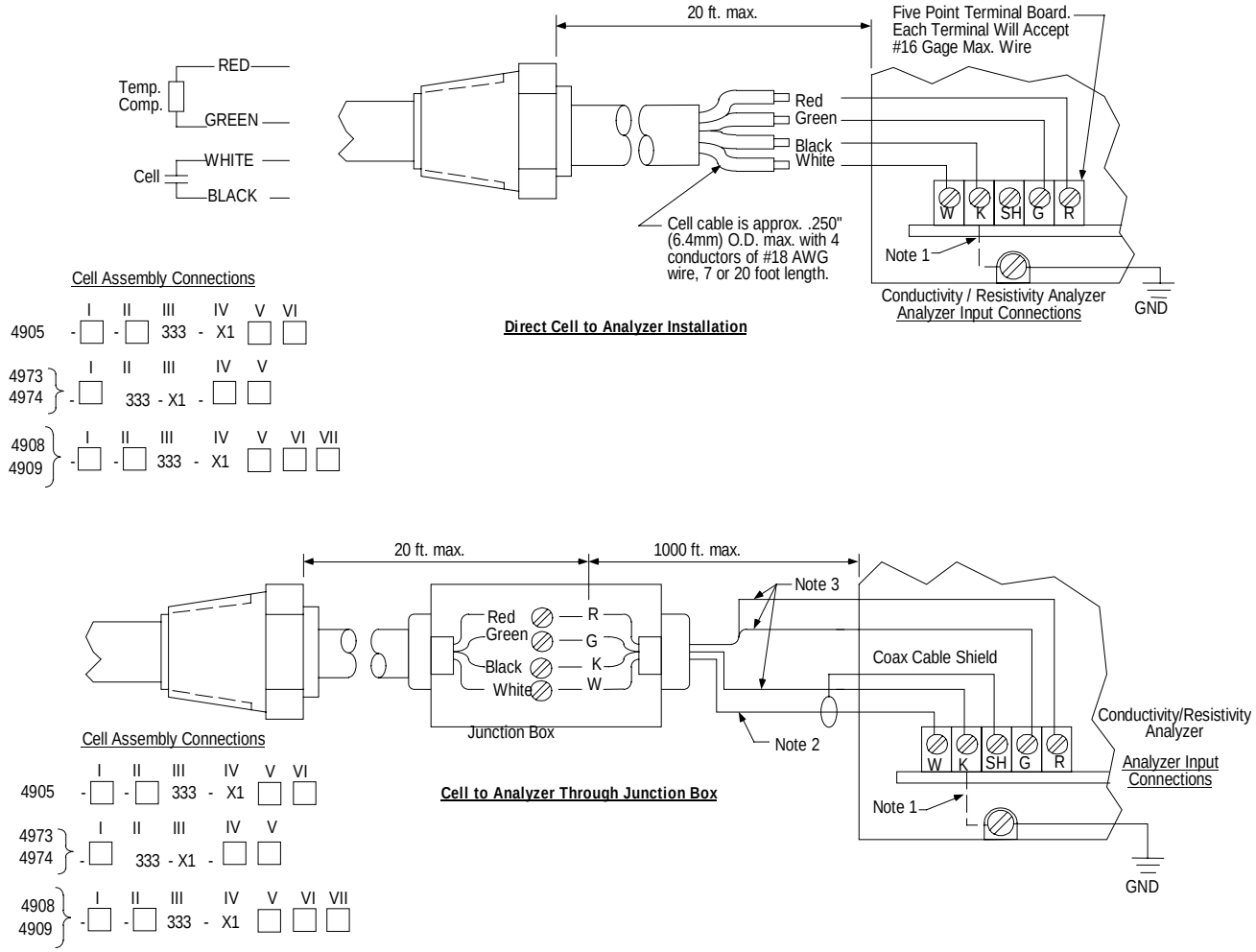
2. 9782C - S0 (only)
   Use 22 gage minimum coaxial cable type RG59/U connecting shield to terminal "SH" only.

3. 9782C - S0
   For cable runs of up to 500 ft., use: 18 gage minimum, three conductor cable.
   For cbale runs of 500 - 1000 ft., use: 16 gage minimum, three conductor cable.

   9782C - W0 [coax and shield (SH) not used]
   For cable runs of up to 500 ft., use: 18 gage minimum, four conductor cable.
   For cable runs of 500 - 1000 ft., use: 16 gage minimum, four conductor cable.

4. Cell to analyzer cables are considered low level. Run seperate from high level wiring.
5. If 2 Cells are to be appplied, the same wiring guidelines are applied to Cell 2 as are followed for Cell 1.

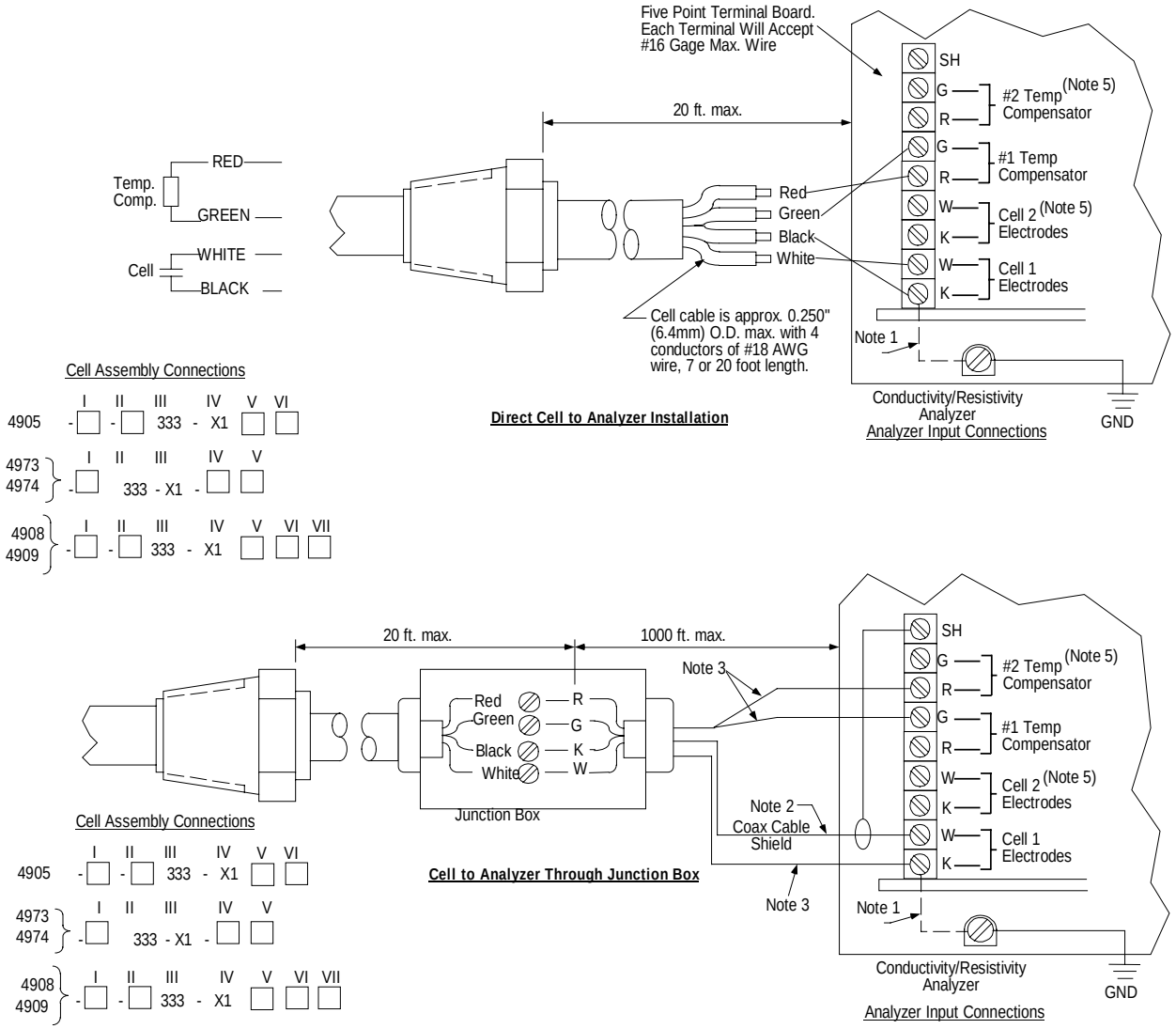
**Figure 3-7 4905 Cell with Junction Box Head**
**Connected to 9782 Conductivity/Resistivity Analyzer**




NOTES:
1. For pure water samples in non-conductive (plastic, glass, etc.) piping, ground the black cell electrode lead near the cell. Alternatively, connect to the 7082 ground screw as shown dotted. Do not ground 10, 25, or 50 constant cells.
2. 7082-16, 17, 18, 19 (only)
   Use 22 gage minimum coaxial cable type RG59/U connecting shield to terminal "SH" only.
3. 7082-16, 17, 18, 19
   For cable runs of up to 500 ft., use: 18 gage minimum, three conductor cable.
   For cbale runs of 500 - 1000 ft., use: 16 gage minimum, three conductor cable.
   7082-13, 14, 15 [coax and shield (SH) not used]
   For cable runs of up to 500 ft., use: 18 gage minimum, four conductor cable.
   For cable runs of 500 - 1000 ft., use: 16 gage minimum, four conductor cable.
4. Cell to analyzer cables are considered low level. Run seperate from high level wiring.

a/n 23346

**Figure 3-8 Cells with 7 or 20 Foot Leads Connected to 7082 Conductivity/Resistivity Analyzer or Connected to Junction Box**




NOTES:
1. For pure water samples in non-conductive (plastic, glass, etc.) piping, ground the black cell electrode lead near the cell. Alternatively, connect to the 7082 ground screw as shown dotted. Do not ground 10, 25, or 50 constant cells.
2. 9782C - S0 (only)
   Use 22 gage minimum coaxial cable type RG59/U connecting shield to terminal "SH" only.
3. 9782C - S0
   For cable runs of up to 500 ft., use: 18 gage minimum, three conductor cable.
   For cbale runs of 500 - 1000 ft., use: 16 gage minimum, three conductor cable.
   9782C - W0 [coax and shield (SH) not used]
   For cable runs of up to 500 ft., use: 18 gage minimum, four conductor cable.
   For cable runs of 500 - 1000 ft., use: 16 gage minimum, four conductor cable.
4. Cell to analyzer cables are considered low level. Run seperate from high level wiring.
5. If 2 Cells are to be applied, the same guidelines are applied to Cell 2 as wereused for Cell 1.

a/n 23346

**Figure 3-9 Cells with 7 or 20 Foot Leads Connected to 9782 Conductivity/Resistivity Analyzer or Connected to Junction Box**

# 4. Maintenance

## 4.1 Introduction

If abnormal readings occur, this may indicate poor response because the cell is not filled with process solution. Check the cell installation. Note that a grayish dull surface on the cell plastic (normally glassy) can result from exposure to temperatures above 140°C.

The only maintenance which may be required is occasional cleaning in certain applications. The low-constant electrodes are not platinized. Note that a series of below-normal conductivity readings could indicate a lack of response because the cell is not filled with solution. Cell constants 0.01, 0.1, and 1 cannot be used if solution resistance measures less than 1000 ohms unless the cell is platinized in accordance with Section 5.

## 4.2 To Clean The Cell

The cell will require cleaning if sludge, slime, etc., accumulates in the flow channels. Since the materials of construction are chemically inert, chemical agents may be used and are recommended for cleaning the cells. The particular cleaning agent used must be selected according to the type of contamination to which the cell is exposed.

**CAUTION**

The cell housing is PES (Polyethersulfone). DO NOT clean with acetone, chloroform, toluene, benzene, or any other chlorinated hydrocarbon.

In general, soap and hot water are effective and adequate. If necessary, a soft bristle brush of about 1/4" diameter may be used to clean out the tubular channels of the 10, 25, and 50 constant cells. These cells should be replatinized after cleaning, See Section 5. Do not scratch the electrode surfaces. Be especially careful not to bend the electrode plates of the 0.1 constant cell. Rinse the cell thoroughly in tap water and then in distilled water if available.

## 4.3 To Check Conductivity System

To check the conductivity system comprising conductivity cell, leadwire, and measuring instrument, the user may desire to make a measurement in a reference solution of known conductivity. Table 4-1 defines standard solutions for 5 to 50 constant cells only, and lists their conductivity. Control the temperature only within limits consistent with the desired accuracy. The 25°C temperature value is suggested. The solutions may be prepared in the presence of air. The solution must fill the cell during measurement.

To check the constant of a cell, use a second cell having the same constant and compare the reading of one against the other.

If Table III of the conductivity cell model number is 333, the normal resistance of the temperature sensor as measured across the red (B) and green (D) leads is 8550 ohms at 25°C.

To check the electrode insullation, connect an ohmmeter across the black (A) and white (C) leads. With a dry and clean cell, the resistance should be greater than 50 megohms.

## 4.4 Replacement Parts and Accessories

| Description | Part Number |
|---|---|
| Cell Guard Tube (1, 0.1, and 0.01 constants only) | 065632 |
| Leadwire bushing | 050366 |
| Flow Cell Housing, PES | 276127 |
| 1 1/4” to 1” Bushing to adapt cell to 1 1/4” Schedule 80 pipe tee, PVDC | 276142 |
| Cell Extension Leadwire Table III other than 333 | |
| Three conductor PVC 18 gage (105°C max, Belden 9493) | 834059 |
| Three conductor Tefzel 18 gage (140°C max) | 834086 |
| Junction Box | 276127 |
| Platinizing Solution, 2 ounces | 103011 |
| **Table III=333, 7082/9782 Standard Ranges**<br>**Up to 500 ft** | |
| Three conductor, 18 gage cable (Belden 9493) | 834059 |
| Coax Cable (Belden 9259) | 835024 |
| **Up to 1000 Ft** | |
| Four conductor (3 used), 16 gage cable (Belden 9494 or equivalent) | 834055 |
| Coax Cable (Belden 9259) | 835024 |
| **7082-13 to –15/9782 Wide Ranges** | |
| Up to 500 ft - Four conductor, 18 gage | 834052 |
| Up to 1000 ft - Four conductor, 16 gage | 834055 |
| **Adapter bushings for connecting the flow cell housing to 1/4” bypass line** | |
| 3/4” male to 1/4” female | 276315 |
| 3/4” female to 1/4” male | 276316 |

### ATTENTION

The conductivity cell and the mounting bushing (with temperature compensator) cannot be separated. For replacement of either cell or integral compensator, order the appropriate 4905 catalog number specified in Table I. (See Section 2.2.)

**Table 4-1 Standard Reference Solutions**

| Approximate Normality | Definition | Temp. °C | Specific Conductance (micromhos) |
|---|---|---|---|
| 1.0 N | 71.1352 grams KCl | 0 | 65,176 |
| | per 1000 grams of | 18 | 97,838 |
| | solution | 25 | 111,342 |

# 5. Platinization and Platinum Black

## 5.1 Overview

Only the electrodes having constants from 5 to 50 must be platinized if the velvety-black deposit has been rubbed off the electrodes in service or in cleaning or if platinized electrodes are recommended and this black deposit is not present when the new cell is received. Always replatinize if a brush was used in cleaning the electrodes. The indication of a need for replatinization of the electrodes is loss in sensitivity (slow response of measuring instrument), erratic behavior of measuring instrument, or difficulty in balancing. The electrodes of the high constant cells are not visible since they are located near the middle of the flow channels. Therefore the need for platinization is only indicated by the effect on the measuring instrument. Do not platinize cells intended for high purity water measurements.

## 5.2 To Platinize

Before platinizing, clean the cell with detergent and brush as described in section 4.2.

To platinize the cell use the following procedure.

1. Support the cell in a cylindrical vessel with the end of the cell raised from the bottom. It is not necessary to remove the cell from the fittings for platinizing. However, the guard tube must be removed from the low constant cells.
2. Pour in platinizing solution (Honeywell Part 103011) to a level above the cross-channel.
3. To platinize the cells, immerse an auxiliary platinum electrode in the solution to a point about midway between the cross-channel or tube hole and the open end of the cell.

**ATTENTION**

This third electrode should be chemically pure platinum. Its shape is unimportant. It may be one of the electrodes in another conductivity cell or a platinum strip, sheet, rod, wire, etc.

4. Both electrodes of the cell are platinized simultaneously by connecting the negative terminal of the battery (see Table 5-1 for voltage) to both leadwires of the cell.
5. Connect the positive terminal of the battery to the auxiliary platinum electrode.
6. Note the time lapse and continue the platinizing operation for the time in seconds listed in Table 5-1. Then disconnect the battery and remove the cell.
7. Rinse the cell thoroughly in tap water and then rinse in distilled water.
8. During the platinizing operation, move the cell up and down gently to keep the solution stirred. Although only 5 to 50 constant cells are usually platinized, any cell may need to be platinized for a particular application. Do not platinize cells intended for high purity water measurements.

**CAUTION**

The preceding procedure produces a thin coating of platinum black on the electrode surfaces. Do NOT attempt to darken electrodes by additional platinization since this will affect cell performance adversely.

Pour the platinizing solution back into is container as it may be used a number of times.

If the cell is not to be installed immediately after platinizing, it should be kept submerged in distilled water until put into use, as platinum black is not stable when dry.

**Table 5-1 Voltage and Time Limits for Platinizing Cells**

| DC | Cell Constants | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Voltage | .01 | .1 | 1 | 5 | 10 | 20 | 25 | 50 |
| 1.5 | — | 160 sec. | 150 sec. | — | — | — | — | — |
| 3.0 | 20 sec. | 60 sec. | 30 sec. | 200 sec. | 240 sec. | — | — | — |
| 6.0 | — | — | — | 80 sec. | 100 sec. | 180 sec. | 200 sec. | 300 sec. |
| 12.0 | — | — | — | — | — | 120 sec. | 150 sec. | 240 sec. |

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