Honeywell

4974 Series Sanitary Mounting Clean-In-Place Conductivity Cells Installation and Maintenance

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9/96

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Honeywell
Industrial Automation and Control
Automation College
2820 West Kelton Lane
Phoenix, AZ 85023

(602) 313-5669

About This Document

Abstract

The purpose of this document is to support the installation, operation and maintenance of the 4974 Series Sanitary Mounting Clean-in-Place Conductivity Cells.

Revision Notes

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

Rev. ID	Date	Notes
0	10/96	This document is the initial release of the Honeywell version of the 4974 Series Sanitary Mounting Clean-In-Place Conductivity Cells Installation and Maintenance manual. This publication was originally released under the L&N system as 277078 Rev. A1.

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 #	Binder Title	Binder ID #

Contacts

The following list identifies important contacts within Honeywell.

Organization	Telephone	Address
Honeywell TAC	1-800-423-9883 Voice	1100 Virginia Drive Fort Washington, PA 199034

Contents

Figures

1. Introduction

1.1 Overview

The 4974 series Conductivity Cells, Figure 1, have a rugged configuration for reliable continuous measurements of electrolytic conductivity in industrial water processes at the maximum temperature and pressure shown in Specifications.

For excellent corrosion resistance, cell bodies are made polyethersulfone (PES). Cells with constants 0.01 and 0.1 are made with titanium electrodes. Cells with constants 1.0 and 10 are made with high density carbon electrodes.

The 4974 series cells are equipped with an integral standard 7 foot lead or optional 20 foot lead, and may be equipped with a junction box type universal head for longer lead lengths.

1.2 Description

All 4974 Series Conductivity Cells are suitable for use in Clean-In-Place (CIP) fittings. They are one piece molded units that cannot come apart and require no replacement parts.

The physical appearance of the cells is shown in Figure 1. All cells are similar in construction with differences as noted below:

Cell constant 0.01

This cell has an outer electrode length of 2 3/4 inches. The temperature compensation sensor is located inside the inner electrode (Figure 1).

Cell constant 0.1

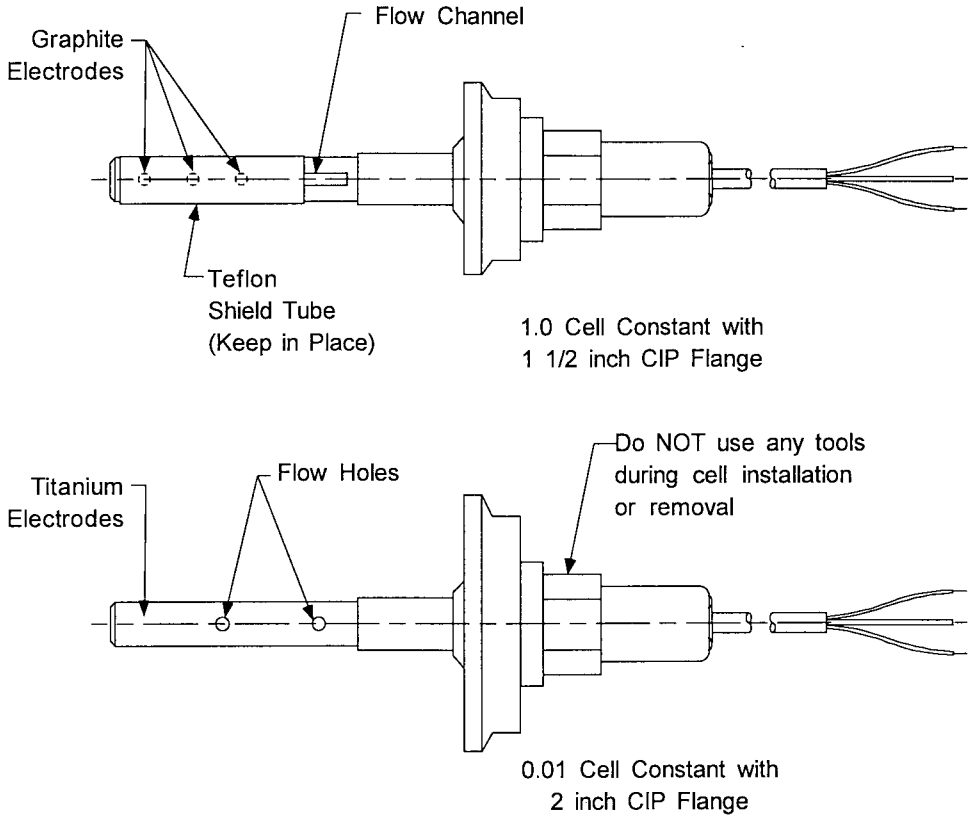
This cell has an outer electrode length of 2 inches. The temperature compensation sensor is located inside the inner electrode.

Cell constant 1.0

This cell differs visually from the 10 constant cell by having a wider shielded flow channel that conducts the solution being measured past the electrodes of the cell. The spacing of the electrodes also differs; the three electrodes are 1/4 inch diameter graphite spaced 1/16 in. apart. The temperature compensating sensor is integral with the cell body (Figure 1).

Cell constant 10

This cell differs visually from the 1.0 constant cell by having a narrower shielded flow channel that conducts the solution being measured past the electrodes of the cell. The spacing of the electrodes also differs; the three electrodes are 1/8 inch diameter graphite spaced 5/8 in. apart. The temperature compensating sensor is integral with the cell body.



NOTE: Cell Constants of 0.1 and 10.0 are similar in construction. a/n 23332

Figure 1-1 4974 Series conductivity Cells

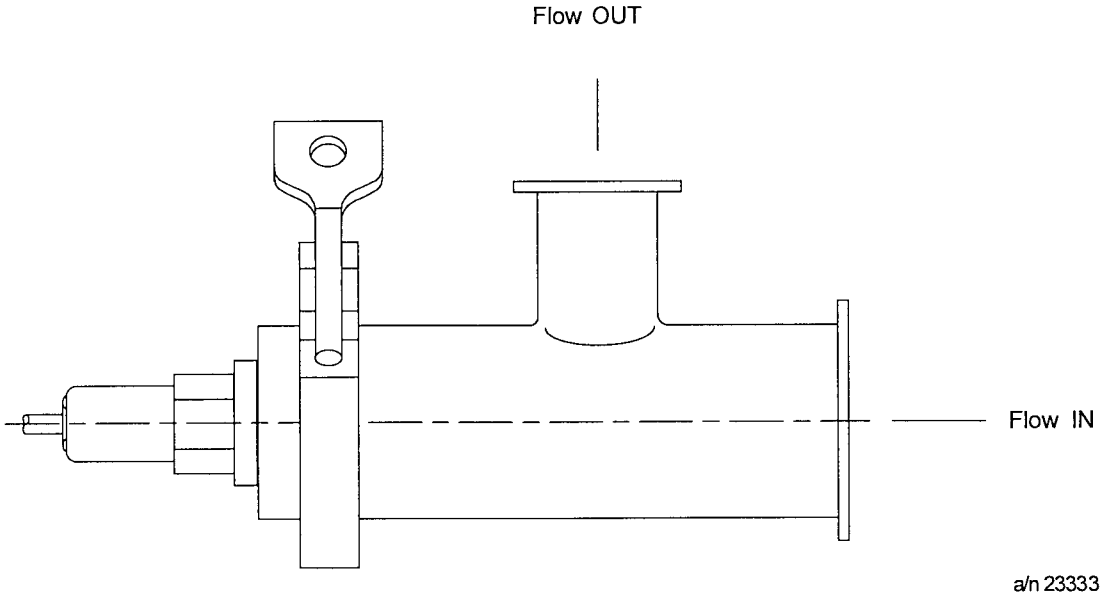
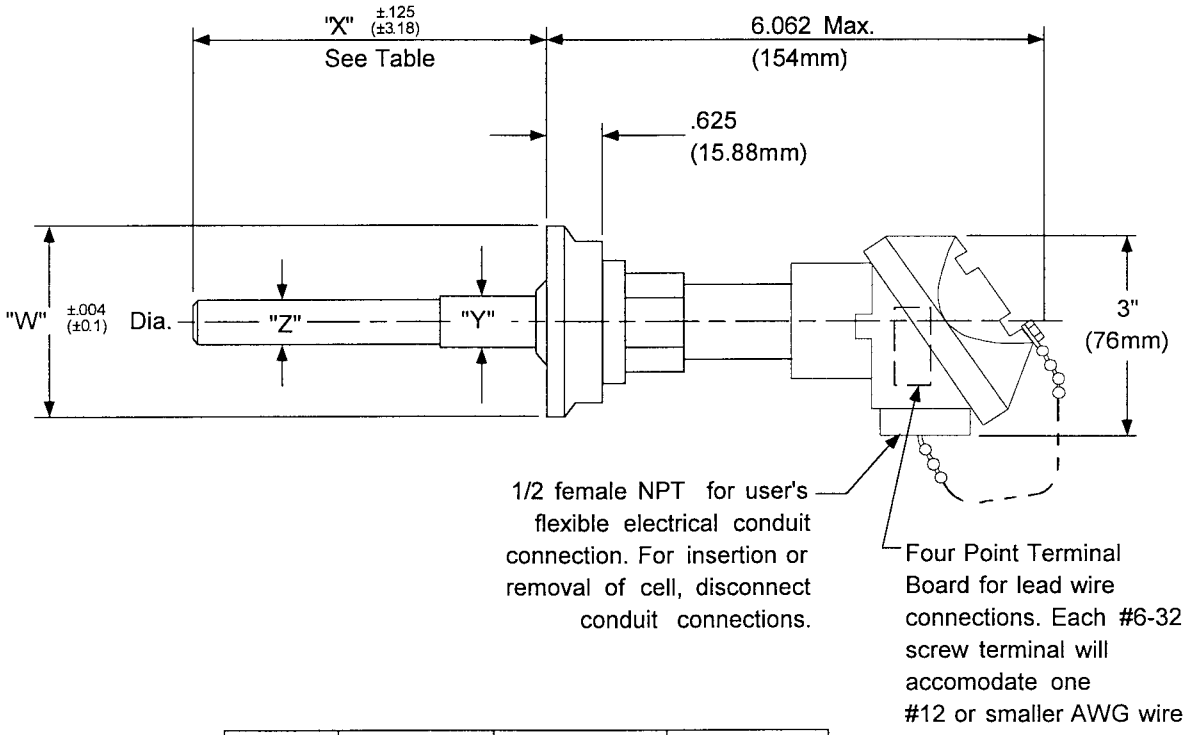


Figure 1-2 Pipe Tee Cell Mounting

2. Specifications

Automatic Temperature Compensation:	Supplied on all cells
Cell Constants (cm-1):	0.01, 0.1, 1.0 and 10
Wetted Parts (Materials of construction meet the requirements of FDA 21 CFR, Part 177)	
Cell Body:	PES (polyethersulfone), RTV (Silicone Elastomer), 316 L Stainless Steel
Electrodes	
0.01 and 0.1 constant	Titanium
1.0 and 10 constant	High density graphite with Teflon guard tube
Temperature, Maximum:	130°C (266 F) at maximum pressure 105°C (221 F) for PVC cable
Pressure, Maximum:	1034 kPa (150 psig) at maximum temperature
Electrical Connections:	3 or 4 conductor nonshielded 18 gage PVC insulated cable
Standard	7 foot lead
Optional	20 foot lead
Optional head-type (universal head) junction box with terminals for extension wire and 1/2 inch NPT conduit connection	
Mounting:	1 1/2 inch and 2 inch tube sanitary fittings
Insertion Depth:	(from process side of sanitary fitting to end of cell)
0.01 constant	3 1/4 in. (83 mm)
0.1 constant	2 1/4 in. (57 mm)
1.0 and 10 constant	3 1/2 in. (89 mm)



	Dim "X"		Dim "Y"		Dim "Z"	
Table I	Inch	mm	Inch	mm	Inch	mm
001	3.250	82.6	.703	17.9	.542	13.8
X01	2.500	63.5	.703	17.9	.542	13.8
XX1	3.437	87.3	.593	1 5	.524	13.3
X10	3.437	87.3	.593	1 5	.524	13.3

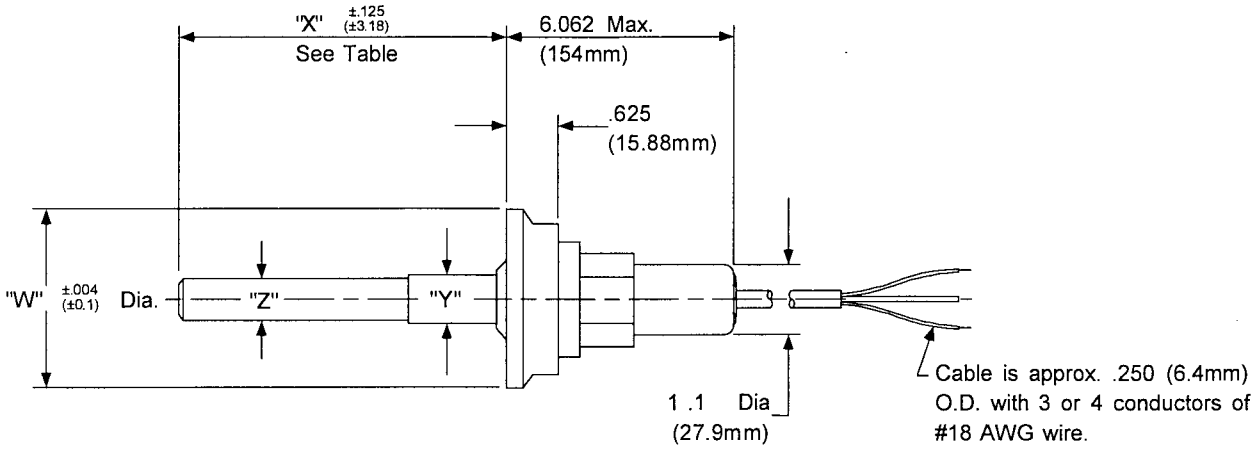
	Dim "W"	
Table IV	Inch	mm
015	1.980	50.3
020	2.520	64

NOTE:

1. To maintain Cell/CIP fitting pressure and temperature service ratings, use appropriate heavy construction clamp/gasket combination. (Clamp with wing nut tightened to 25 in-lb torque and Epom, Viton or Silicone gasket.)

a/n 23334

Figure 2-1 Dimension Drawing, Catalog 4974-❑-❑-❑-❑-❑



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015	1.980	50.3
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NOTE:

1. To maintain Cell/CIP fitting pressure and temperature service ratings, use appropriate heavy construction clamp/gasket combination. (Clamp with wing nut tightened to 25 in-lb torque and Epom, Viton or Silicone gasket.)

a/n23335

Figure 2-2 Dimension Drawing, Catalog 4974-❑-❑-7/20-❑-❑

3. Installation

3.1 General Requirements

Observe the following general requirements before installing a conductivity cell. Specific requirements for particular installations are given in later sections.

- Do not remove the Teflon guard tube from 1.0 or 10 constant cells, as this will change the cell constant.
- Do not use any cell in solutions which can affect the fittings or cell materials. If in doubt, contact Honeywell.
- Avoid all chlorinated hydrocarbons. Titanium, Teflon, PES, carbon, and silicone rubber are the only cell materials in contact with measured solutions. These materials are inert to corrosive chemicals such as mineral acids, oxidizing agents, and caustic solutions.
- Avoid trapped air; see that air is not trapped in the cell flow channels.
- Do not use the cell in solutions having temperatures or pressures greater than the maximum limits in the Specifications.
- Use appropriate clamp and gasket materials to maintain temperature and pressure specifications.
- Avoid locations where the operator must take an awkward position to install or remove the cell.

3.2 Sanitary Pipe Line Mounting

- In addition to the general requirements above, note the following with regard to CIP mounting:
- Make certain the liquid head is above the cell location during measurement. Vertical insertion (from above) or horizontal insertion can be used.
- Allow at least one-half inch clearance beyond the end of the cell.
- Have the solution flow up into the end of the cell since it is less likely to result in clogging by solids settling in the cell channels.
- Ensure that the solution moves continuously through the cell channels to be sure that a representative sample is being measured at all times.

3.3 Sanitary Pipe Tee Mounting

In addition to the general requirements above, note the following with regard to pipe tee mounting:

- When mounting the cell in a pipe tee (Figure 1-2), have the solution (1) enter the tee from below and exit from the side or (2) enter the tee from the side and exit from the top. To ensure flooding of the cell under all conditions, be sure the electrode is as far below the horizontal pipe run as possible so that it is always covered. If the cell is not flooded, the conductivity reading may go to zero.
- Mount the cell so that the sample will flow through the cell channel toward the mounting end of the cell, exiting through the other channel hole or through the outer electrode holes.
- Locate the cell on the pressure side, not the suction side, of pumps.
- Avoid a horizontal cell mounting having the flow channel (Figure 1) opposite the flow exit of the pipe line, especially for 1.0 and 10 constant cells. See also section 3.4 "Air Trapped in Cell Flow Channel".

3.4 Electrical Connections

Terminal board connections for measuring instruments are given in directions supplied with the instruments. Figures 3 and 4 show the lead arrangements of the conductivity cells. All cells have black, red, and white leads, and four-wire cells have a green lead.

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. Do NOT use shielded cable except where shown below for connections to Honeywell Catalog 7082 Analyzer instruments with conductivity cell model number, Table II =333.

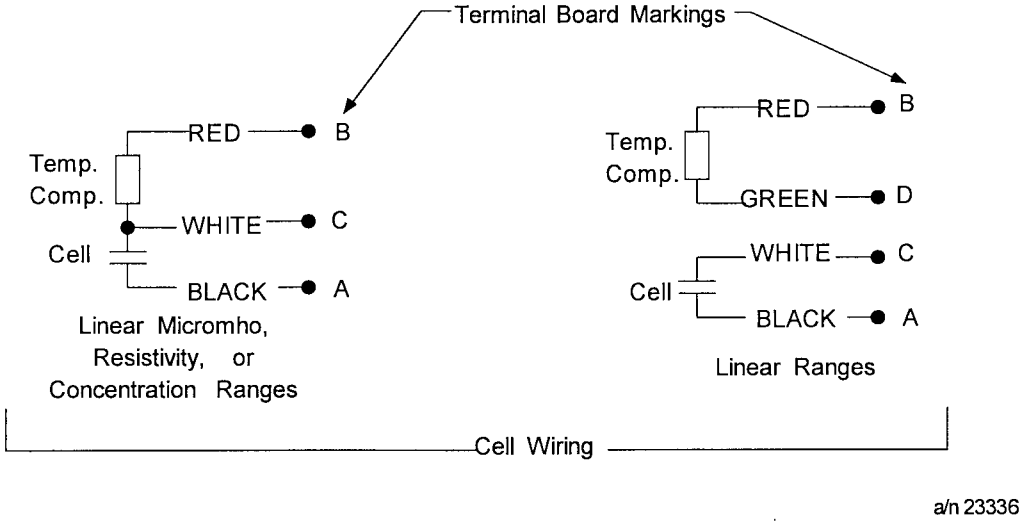
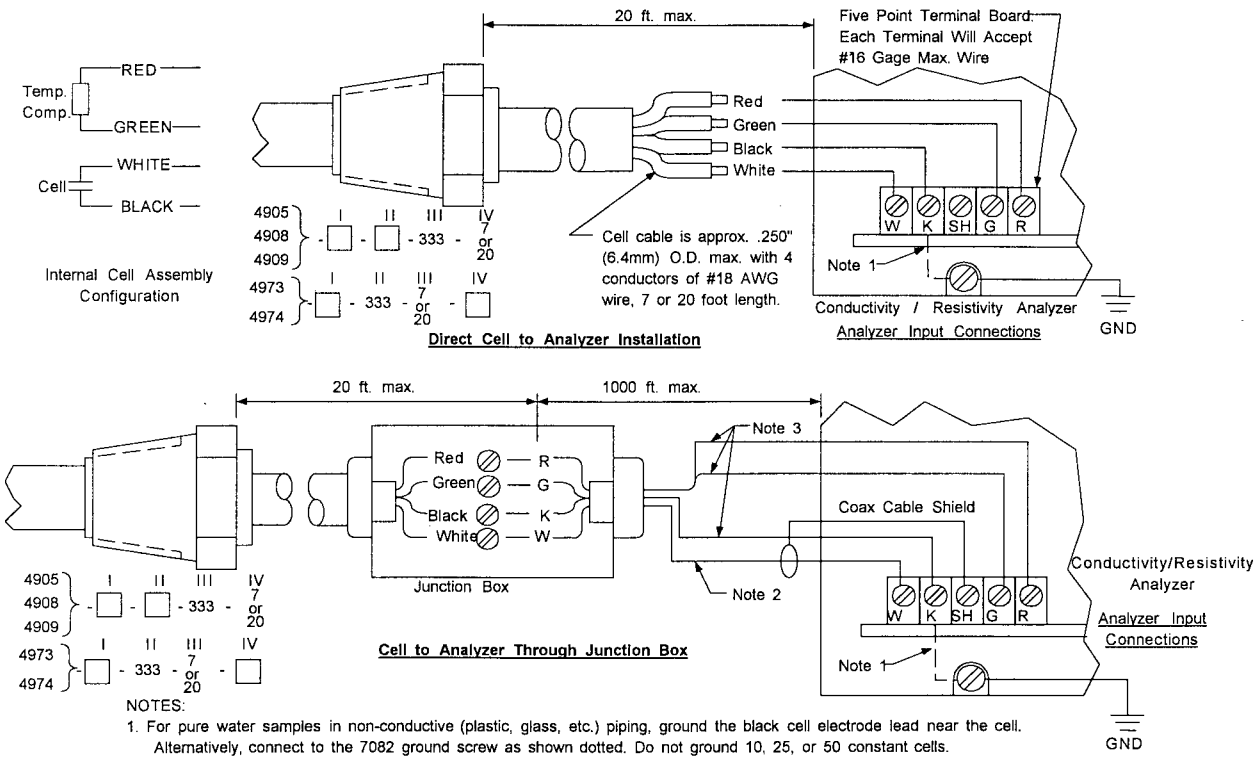


Figure 3-1 Lead Arrangements of the Conductivity Cells



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.

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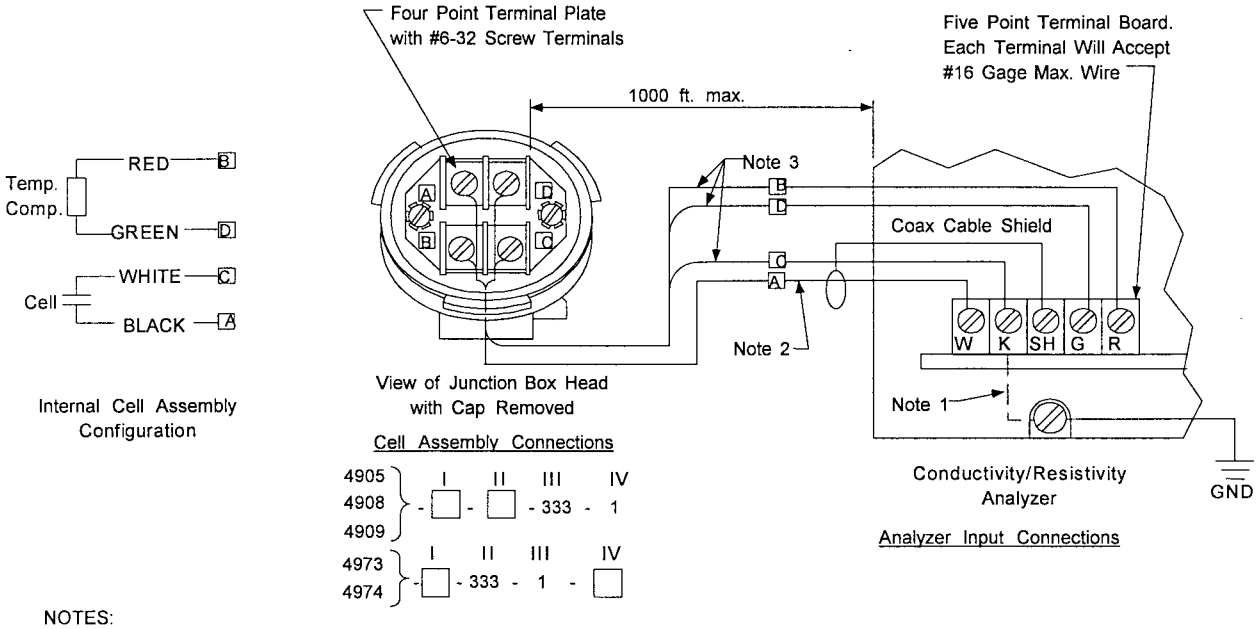
Figure 3-2 Cells Without Junction Box



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.

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   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 23338

Figure 3-3 Cells With Junction Box

4. Maintenance

4.1 Overview

The only Conductivity Cell maintenance that may be required is occasional cleaning. When cleaning, use standard CIP cleaning procedures. Do not use a brush or pipe cleaner and avoid scratching electrode surfaces or the sanitary fitting. Never use a wrench or other tool to remove a cell from its sanitary fitting, as this may destroy the seal.

If the gasket binds the fitting to the piping system after removal of the clamp, do not pry on the cell or fitting with tools. Try running hot water over the gasket area for about one minute, then grasp the cell housing and gently "jiggle" the fitting free.

4.2 Cell Constant Recertification

Cells returned to Honeywell for recertification of the cell calibration factor must have the sanitary fitting protected against nicks or scratches during shipment.

4.3 Check Conductivity System

To check the conductivity system comprising the conductivity cell, leadwires, and measuring instrument, make a measurement in a reference solution of known conductivity. Alternatively, use a second cell having the same constant and temperature compensation and compare the two readings. Be sure the cells are not touching the bottom or sides of the container for this test.

If Table II 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 insulation, 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 Troubleshooting

A series of below normal conductivity readings could indicate that the cell is not filled with solution resulting in a lack of response.

If the plastic surface of the cell has a grayish dull appearance instead of its normal glassy appearance, the cell has been exposed to temperature above its specified maximum. Check the solution temperature and replace the conductivity cell.

4.5 Air Trapped in Cell Flow Channel

If measurement errors appear for horizontal mounting of a 1.0 or 10 constant cells, air may be trapped in the cell flow channel. Take one of the following actions to eliminate this problem:

1. Increase flow to at least 1 GPM past the cell.
2. Rotate the cell mounting so that its flow channel faces the same direction as the pipeline flow exit.
3. Install the cell vertically.

4.6 Accessories and Parts

Description	Part Number
Teflon Shield	
White for 1.0 constant cell	31021599
Clear for 10 constant cell (heat shrink onto cell at 300 F max.)	31018760
Junction Box	31316260
Cable to connect Conductivity Cell (Table 2=333) to 7082 Instrument Standard Ranges	
Coax cable and multiconductor cable needed: Coax cable (Belden 9259)	835024
Multiconductor cable	
Up to 500 feet, 3 conductor 18 gage (Belden 9493)	834059
Up to 1000 feet, 4 conductor (3 used) 16 gage	834055
Cable to connect Conductivity Cell to 7082 Wide Range Instrument	
Up to 500 feet, 4 conductor 18 gage	31834052
Up to 1000 feet, 4 conductor 16 gage	834055

5. Ordering Information

5.1 Model Number

Table I II III IV V

4974 - □ - □ - □ - □ - □

Table I - Cell Constant

Description	Suffix
0.01	001
0.1	X01
1.0	XX1
10	X10

Table II- Auto Temperature Compensator

Refer to measuring instrument literature for proper suffix and cell constant.

Table III- Lead Length and Termination

Description	Suffix
7 feet, integral cable	-7
20 feet, integral cable	20
Junction box	-1

Table IV- Sanitary Fitting Size

Description	Suffix
None	00
1.5" Sanitary Fitting	01
2.0" Sanitary Fitting	10

Table V - Tagging

Description		Suffix
None		0--
Linen Tag		1--
Stainless Steel		2--
Certificate of Calibration	No	-0-
	Yes	-1-
Future		--0