

### 3.8 How to Install the Remote Control (Optional)

This is the Polycold standard remote control.

Electrical signals are transferred to and from the refrigeration unit via remote connector.

#### 3.8.1 Connect the Remote Control to a Remote Connector

Tools and materials needed:

- Connector plug (shipped with the unit)
- Remote connector pins (shipped with the unit)
- Heat shrinkable insulating tubes (shipped with the unit)
- Multi-strand cable with 18 AWG (0.75 mm<sup>2</sup> cross-sectional area) wires
- Wire stripper
- 60/40 tin-lead rosin core solder
- soldering iron
- switches with a minimum capacity of 1A
- 24 V indicator lamps (optional<sup>1</sup>)


<sup>1</sup> If function indicator lamps are wanted at a remote location

##### 3.8.1.1 Review the Remote Control Schematic

Determine if a unit ON/OFF switch or function indicator lamps are wanted at a remote location. All circuits connected to the remote connector are 24 V(ac). (See [Figure 10-7](#), [Figure 10-7](#), or [Figure 10-8](#).)

**NOTE:** *A temperature from the TC SELECT switch can also be displayed at a remote location through the remote connector. To do this, see [section 3.8.2 Additional Instructions for Remote Temperature Indication](#).*

### 3.8.1.2 Assemble the Connector Plug


	<b>⚠ WARNING</b>
	<b>ELECTRICAL HAZARD</b> Contact could cause electric shock and result in death or serious injury. Make certain the ON/OFF switch and the power disconnect switch are in the OFF position.


(See [Figure 3-28](#).)

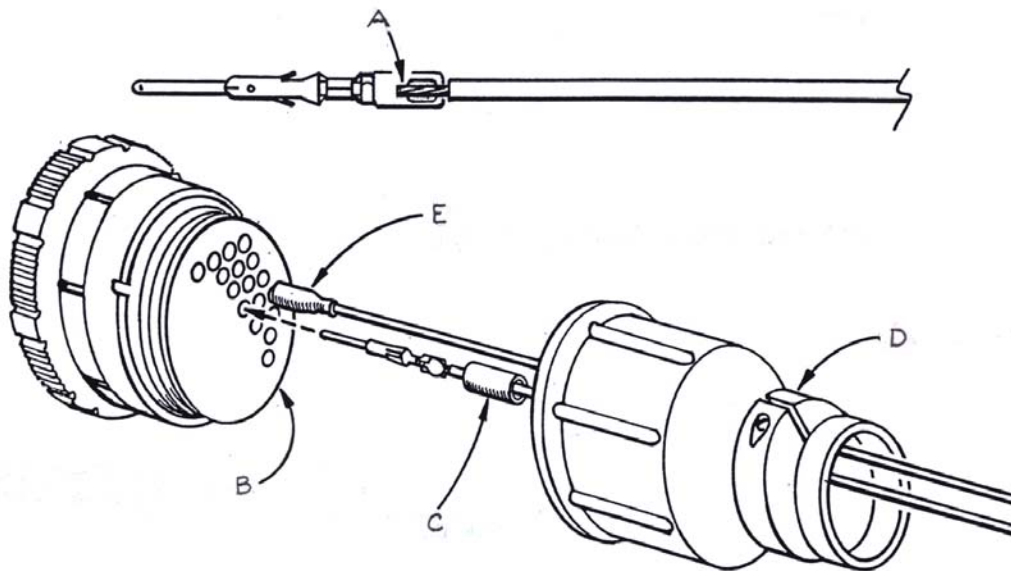
1. Remove no more than 1/2 inch (13 mm) of the cable jacket. The cable jacket is the outer most covering of the insulated cable. Once the cable jacket has been removed, strip 5/32 inch (4 mm) of inner insulation from the 18 AWG wires. Pre-tin each wire. Solder a pre-tinned wire to the back of each pin—do not insert the wire into the hole on the back of each pin.
2. Cut the heat shrinkable insulating tubes into 1/2-inch (13 mm) lengths. Slide a 1/2-inch long insulating tube onto each wire. Slide the cable clamp over the jacket. (Item D in [Figure 3-28](#).)
3. Insert each pin into the back of the connector until it clicks into place.
4. Slide the 1/2-inch long insulating tubes over the uninsulated wire and solder joint. Use a heat gun to shrink them in place. Firmly attach (thread, turn or screw) the cable clamp onto the connector. Tighten the cable clamp over the cable jacket.

### 3.8.1.3 Connect the Wires to the Remote Control

See [Figure 3-28](#); [Figure 3-29](#); and [Table 3-10](#) in this section.

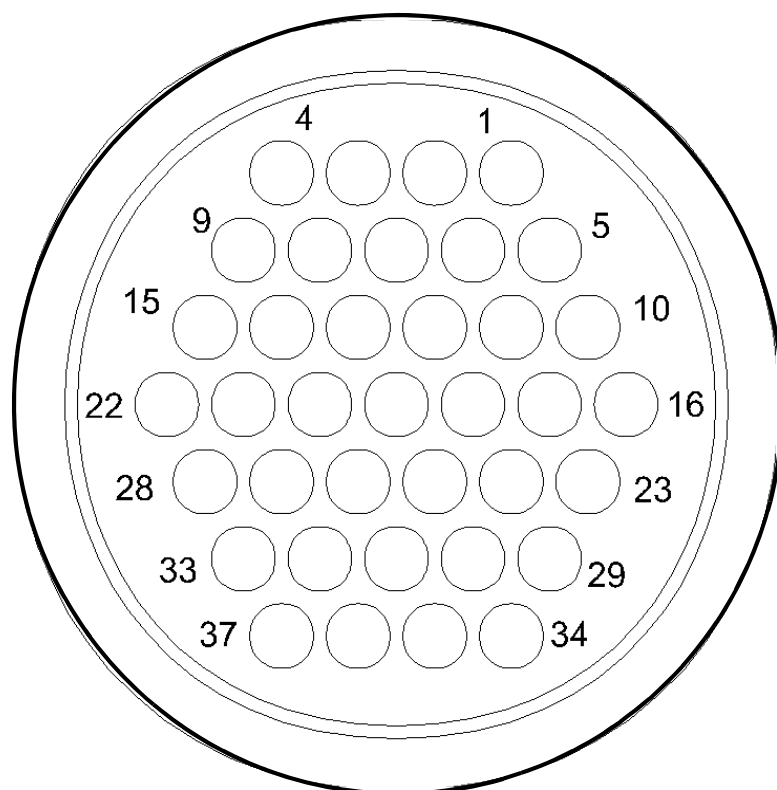
	<b>⚠ CAUTION</b>
	<b>GENERAL HAZARD</b> Make sure the wiring configuration does not operate the unit in COOL & DEFROST at the same time; damage to the equipment can result. Polycold recommends the use of a three-position switch.

	<b>⚠ CAUTION</b>
	<p><b>GENERAL HAZARD</b> Make sure the wiring configuration does not start the unit in COOL or DEFROST; damage to the equipment can result. The three-position switch should be in the neutral position so that the unit will start in STANDBY. (When REMOTE is selected local functions will be disabled.)</p>



*Figure 3-28: Remote Connector Assembly*

- A. Wire soldered to pin
- B. Wire side of connector
- C. Heat shrinkable insulating tube
- D. Cable clamp
- E. Pin inserted with insulating tube shrunk in place



*Figure 3-29: Wire Side of Remote Connector Plug*

*Table 3-10: Remote Connector Wiring Worksheet*

<b>Group</b>	<b>Wire Function</b>	<b>Pin Number</b>	<b>Customer's Wire Color</b>
System Control	Operate Unit	1	
		2	
	Indicate Unit OK	3	
	Indicate Power	4	
	Common	5	
	Ground	6	

Table 3-10: Remote Connector Wiring Worksheet

Group	Wire Function	Pin Number	Customer's Wire Color
Refrigerant Circuit 1 (PFC)	Indicate REMOTE	10	
	Operate COOL	11	
	Operate DEFROST	12	
	Indicate DEFROST COMPLETE	13	
	Indicate DEFROST ACTIVE	14	
Refrigerant Circuit 2 (PFC or P)	Indicate REMOTE	18	
	Operate COOL	19	
	Operate DEFROST (PFC only)	20	
	Indicate DEFROST COMPLETE (PFC only)	21	
	Indicate DEFROST ACTIVE (PFC only)	22	
Option	Indicate Setpoint Relay A	26	
		27	
Temperature Meter 1	Analog #1 - Out	28	
	Analog #1 - Return	29	
	Analog #1 - Shield	30	
Option	Indicate Setpoint Relay B	31	
		32	
Option—Temperature Meter 2	Analog #2 - Out	33	
	Analog #2 - Return	34	
	Analog #2 - Shield	35	

### 3.8.1.4 Program the Remote Control if a Controller is Present

(See [section 4 Operation](#).)

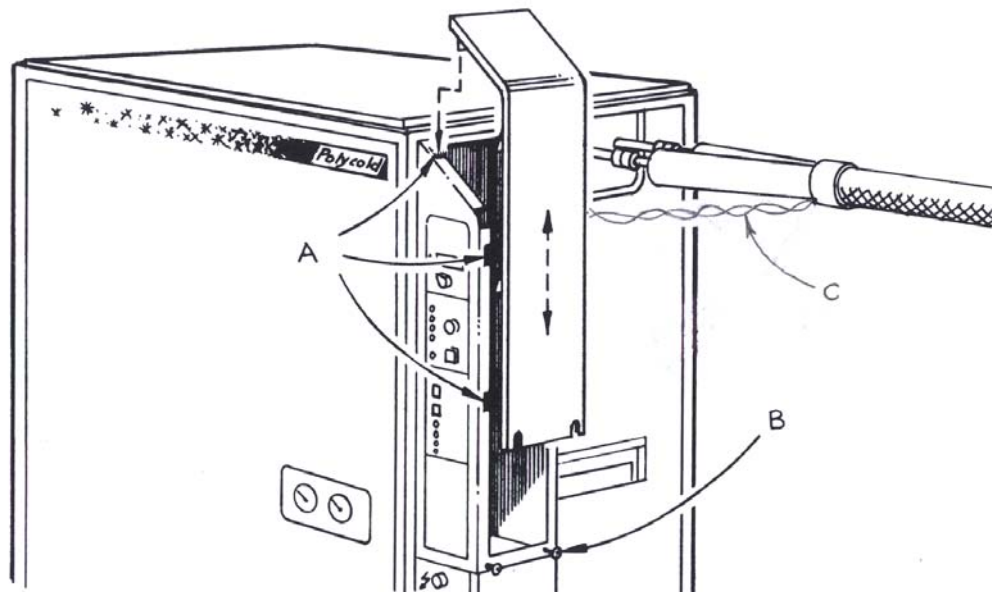
**3.8.1.5 If a remote ON / OFF Switch has been Installed, Unplug Jumper J11 from the SYSTEM CONTROL Printed Circuit Board**

1. Loosen the two lower screws on the side of the low voltage box. Slide the panel straight up to remove it. (See [Figure 3-30](#) Low voltage box panel removal and [Figure 3-31](#) Jumper J11 Location.)
2. Locate J11 on the SYSTEM CONTROL printed circuit board in the low voltage box. Squeeze the jumper's latch to unplug it.
3. Reinstall the low voltage box panel. Slide it straight down onto the low voltage box so that the two tabs go into their notches. Push the top of the panel towards the unit and at the same time push down so that the top tab goes into its notch. Tighten the two screws.

**3.8.1.6 Connect the Remote Plug to the Unit's Remote Receptacle and Select REMOTE**

**NOTE:** *Loosen the two lower screws on the side of the low voltage box. Slide the panel straight up to remove it.*

**NOTE:** *When a refrigerant circuit is in LOCAL, its remote functions are disabled (including the unit's ON/OFF switch).*



*Figure 3-30: Low Voltage Box Panel Removal*

- A. Notches
- B. Loosen screws
- C. Thermocouple wires

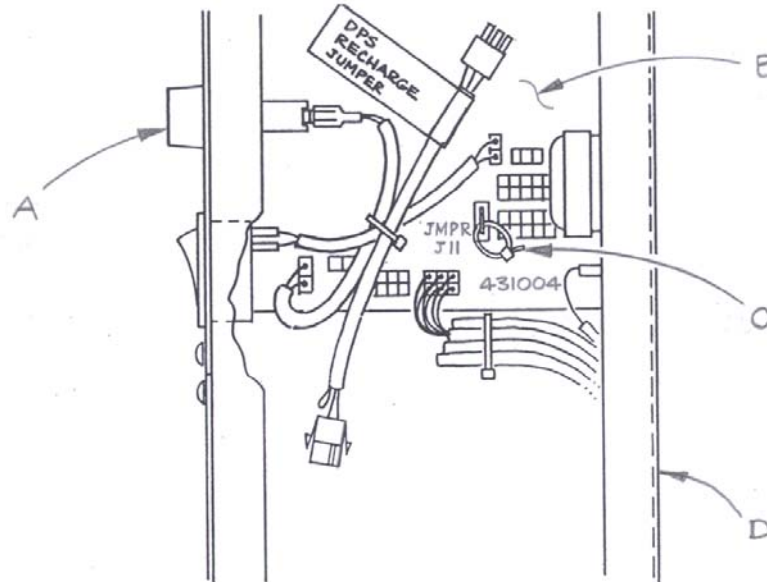


Figure 3-31: Jumper J11 location

**NOTE:** *DPS = Dual Pressure Switch*

- A. Reset button
- B. System control printed circuit board
- C. Jumper J11
- D. Low voltage box with panel removed


### 3.8.1.7 Ensure that the Remote Control Operates the Unit Properly

Use the remote control to do the following test:

1. Select STANDBY and turn on the refrigeration unit. The unit's compressor should be running. The unit's STANDBY indicator lamp should be lighted. The COLDEST LIQUID (TC #9) temperature should start getting colder. Wait 30 minutes.
2. Evacuate location of the cryosurface to at least 0.01 torr (1.33 Pa).



3. Switch to COOL.
  - The unit's COOL indicator lamp should be lighted.
  - The COIL OUT (TC #4) temperature should start getting colder.
4. Switch to DEFROST.
  - The unit's DEFROST ACTIVE indicator lamp should be lighted.
  - When DEFROST is complete, the unit's DEFROST COMPLETE and STANDBY indicator lamps should be lighted.
5. Open your vacuum chamber. The cryosurface should be dry and at room temperature or warmer.

	<b>⚠ CAUTION</b>
	<b>EXTREME TEMPERATURES EXIST</b> Parts of the cryosurface may be hot; contact with the hot surface may result in minor or moderate injury. Do not touch the cryosurface.

**NOTE:** For PFC/PFC: Also test the second refrigerant circuit (#2 COIL OUT temperature = TC #6).

**NOTE:** For PFC/P: For the second refrigerant circuit, select COOL with your remote control. The #2 COIL OUT (TC #6) temperature should start getting colder.

### 3.8.2 Additional Instructions for Remote Temperature Indication

#### 3.8.2.1 About the Thermocouples

##### DISCHARGE LINE (TC #1):

The thermocouple is located in the refrigeration unit's compressor compartment. It is on the compressor discharge line near the compressor. It can be used to monitor compressor performance.

##### LIQUID LINE (TC #2):

The thermocouple is located in the refrigeration unit's compressor compartment. It is on the refrigerant circuit near the exit of the condenser. It can be used to monitor the effectiveness of the system's cooling water.

**#1 COIL IN (TC #3):**

The thermocouple is located on the feed line near the cryosurface. It can be used for troubleshooting if cryopumping is inadequate.

**#1 COIL OUT (TC #4):**

The thermocouple is located on the return line near the cryosurface. It can be used to monitor the warmest cryosurface temperature.

**#1 FEED (TC #7):**

The thermocouple is in the refrigeration unit's foamed compartment. It is on the refrigerant circuit near the feed line. It can be used for troubleshooting if cryopumping is inadequate.

**#1 RETURN (TC #8):**

The thermocouple is in the refrigeration unit's foamed compartment. It is on the refrigerant circuit near the return line. It can be used for troubleshooting if cryopumping is inadequate.

**3.8.3 COLDEST LIQUID (TC #9):**

The thermocouple is in the refrigeration unit's foamed compartment. It is on the final strainer in the "Polycold stack". It can be used to determine when to switch from STANDBY to COOL.

**NOTE:** *For PFC/PFC or PFC/P—additional thermocouples for the second refrigerant circuit:*

#2 COIL IN (TC #5): See #1 COIL IN

#2 COIL OUT (TC #6): See #1 COIL OUT

#2 FEED (tied back): See #1 FEED

#2 RETURN (TC #10): See #1 RETURN

**NOTE:** *The COIL IN, COIL OUT, FEED and RETURN thermocouples only provide meaningful information when refrigerant is flowing through the cryosurface (i.e., when the unit is in COOL or DEFROST).*

### 3.8.3.1 About the Temperature Meter

The display range is  $-199.9$  to  $+199.9^{\circ}\text{C}$  and has an accuracy of  $\pm 3^{\circ}\text{C}$ . The temperature meter accepts a type T (copper-constantan) thermocouple input and is powered by the unit's 24 V(ac) control transformer.

The temperature meter provides an analog output from  $-1.999$  to  $+1.999$  V(dc). The output is 0 V(dc) for  $0^{\circ}\text{C}$ . It provides positive voltage for positive temperatures and negative voltage for negative temperatures at a rate of  $10$  mV/ $^{\circ}\text{C}$ .

### 3.8.3.2 Using the Analog Output

The output is taken directly from the analog stages immediately preceding the analog-to-digital conversion for the meter's display. This circuit is sensitive to currents introduced into the output from external noise sources and ground loop situations. Therefore, the following precautions must be observed.

- The connecting cable must be less than 100 feet (30.5 m).
- The connecting cable must be shielded with only one end of the shield connected to ground. This grounding is done at the refrigeration unit. Use the designated pins in the remote connector for cable shield connections.
- The shielded connecting cable must be separate from the remote cable bundle. However, it may be routed next to the remote cable bundle.
- Do not ground either side of the analog output of the meter. The external device must have a differential input to isolate the connections.