Installation Procedure for CP-100 and GP-100 Sensors

The following is a recommended procedure for permanent installation of CP-100 wire-wound Platinum sensors.

> **Warning:** Wire-wound Platinum sensors like the CP-100 have pure Platinum leads. These are very brittle, usually following the "you bend twice, you break" rule. All connections to the sensor leads should be made before installation and the connections should be potted with the sensor. Care should be taken during each step of the installation process to minimize bending the leads.

The sensor connection

Make connections to the sensor. Some users connect the cryostat wiring directly to the sensor. Others prefer attaching a small two-pin connector to the sensor. Connections may be made with standard 60/40 solder.

If a connector is used, it should be mounted close enough to the sensor so that the entire assembly may be potted, leaving only the connector pins exposed.

A two-piece, two-pin connector[1] can be used with the CP-100. The pin header should be connected to the sensor and the socket header should be connected to the cryostat wiring.

If direct connection to the cryostat wires is desired, the connection should be made close enough to the sensor so that the sensor and all connections can be potted.

Wiring form the Model 32 to the cryostat

Platinum sensors should be connected to instrumentation using the four-wire method. It is also strongly recommended that sensors be connected using shielded, twisted pair wire. Wires are connected as shown below and the shield should be connected to the metal backshell of the connector.

Pin	Function
1	Excitation (-), I-
2	Sense (-), V-
3	Do not connect
4	Sense (+), V+
5	Excitation (+), I+

Model 32 connector pin-out

> ☞ **Note:** The input connectors on the Model 32 will mate with either DIN-5 or DIN-6 plugs. Wiring is identical. If a DIN-6 plug is used, Pin 6 is not connected.

[1] The recommended connector is a Samtec SMS-102-01-G-S socket and a Samtec TMS-102-02-G-S pin header. Information is available at http://www.samtec.com .

Recommended color codes for a sensor cable are as follows:

Color Code	Signal	Pin
White	Excitation(+)	5
Green	Excitation(-)	1
Red	Sense(+)	4
Black	Sense(-)	2

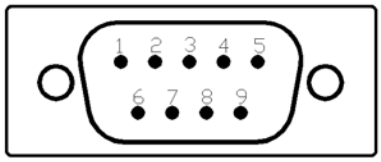
Dual Sensor Cable Color Codes

An example cable is Belden 8723. This is a dual twisted pair cable with individual shields and a drain wire. The shields and drain wire are connected to the DIN-5's connector's metal backshell in order to complete the shielding connection.

Wiring form the Model 34 to the cryostat

All four sensor connections are made at the rear panel of the Model 34 using the two DB-9 receptacles provided. There are two channels on each connector.

Silicon Diode and all resistor type sensors should be connected to the Model 34 using the four-wire method. It is strongly recommended that sensors be connected using shielded, twisted pair wire. Cable shields should be dressed for connection to the conductive back shell of the connector. Signal connection is as follows:



Model 34 Pinout

Input Channel	Connector	Signal	Pin
ChA	Lower	Current(+)	8
ChA	Lower	Current(-)	9
ChA	Lower	Sense(+)	4
ChA	Lower	Sense(-)	5
ChB	Lower	Current(+)	6
ChB	Lower	Current(-)	7
ChB	Lower	Sense(+)	1
ChB	Lower	Sense(-)	2
ChC	Upper	Current(+)	8
ChC	Upper	Current(-)	9
ChC	Upper	Sense(+)	4
ChC	Upper	Sense(-)	5
ChD	Upper	Current(+)	6
ChD	Upper	Current(-)	7
ChD	Upper	Sense(+)	1
ChD	Upper	Sense(-)	2

Sensor Input Connector Pinout

Color codes for the Dual Sensor Cable (Cryo-con part number 4034-038) are as follows:

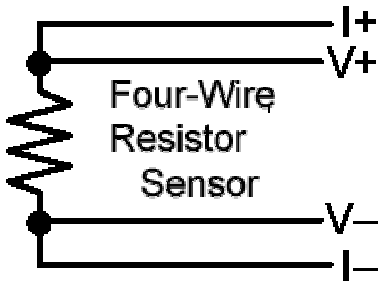
Input Channel	Color Code	Signal	Pin
ChA	White	Current(+)	8
ChA	Green	Current(-)	9
ChA	Red	Sense(+)	4
ChA	Black	Sense(-)	5
ChB	White	Current(+)	6
ChB	Green	Current(-)	7
ChB	Red	Sense(+)	1
ChB	Black	Sense(-)	2

Dual Sensor Cable Color Codes

The cable used is Belden 8723. This is a dual twisted pair cable with individual shields and a drain wire. The shields and drain wire are connected to the DB9 connector's metal backshell in order to complete the shielding connection.

Wiring inside the cryostat

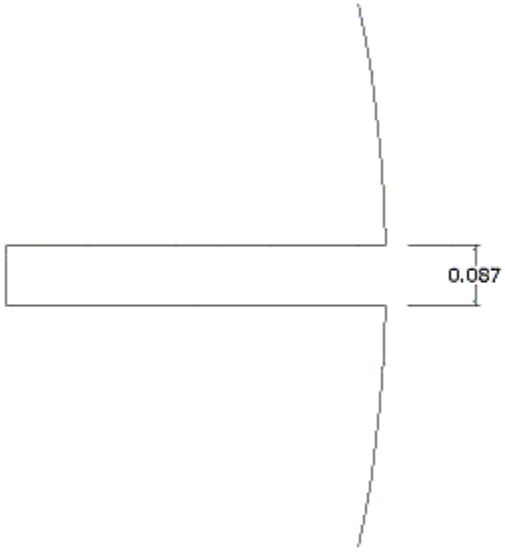
A four-wire connection is recommended in order to eliminate errors due to lead resistance. Cryogenic applications often use fine wires made from specialty metals that have low heat conduction. This results in high electrical resistance and, therefore, large measurement errors if the four-wire scheme is not used.



Drill a hole

Here, we assume that the cold plate where the sensor is to be mounted is made from Oxygen-free Copper and the sensor will be mounted using Stycast[2] epoxy. The thermal expansion of Stycast is very close to that of Copper.

For a CP-100 sensor, drill a 0.087” (2.2mm) hole in the cold plate. For the GP-100, use a 0.95 (2.4mm) drill. This will allow enough room to mount the sensor in Stycast.



The hole must be deep enough to accommodate the entire body of the sensor plus enough to allow potting of the leads.

Note: In applications below 523K, a non-permanent installation can be made using Apiezon[3] grease instead of Stycast epoxy.

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[2] Stycast epoxy refers to Emerson & Cuming Co. Stycast 2850-FT/Catalyst 9. It is commonly used in cryogenic applications since it has a thermal expansion coefficient very close to that of Oxygen Free Hard Copper. Complete data is available at http://www.emersoncuming.com.

[3] Apiezon grease refers to Apiezon type N or H grease. Complete data is available at http://www.apiezon.com/greasepack.htm

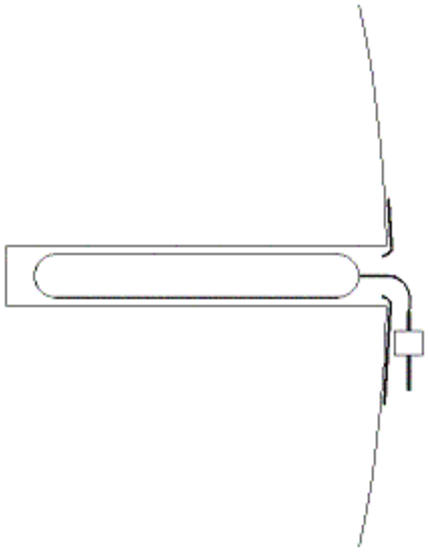
Insert the sensor
Fill the hole about ½ full with Stycast epoxy and slowly insert the sensor. Again, be very careful not to bend the sensor leads.

Fill with more epoxy until the hole is just full and the epoxy is flush with the surface of the plate.

Paint a thin layer of epoxy on the cold plate around the area of the hole and then press a layer of cigarette paper over it. The cigarette paper is used as a filler and helps ensure that there is no mechanical or electrical connection between the sensor connections and the cold plate.

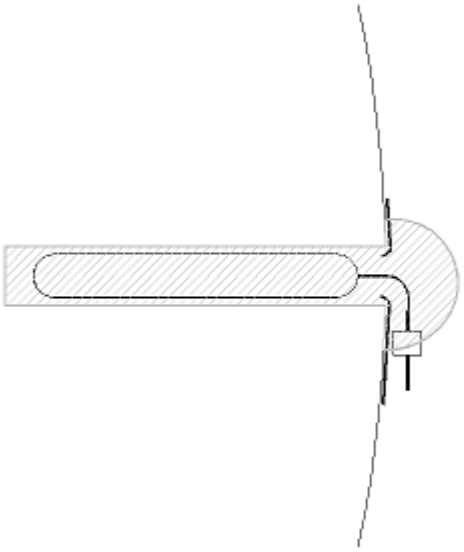
Note that the assembly shown here uses a connector to attach to cryostat wiring.

Allow the epoxy to completely cure before proceeding.



Pot the assembly
Pot the assembly, including the sensor connections with Stycast epoxy or Apiezon grease. Be sure to cover the sensor connections. Allow the epoxy to cure before use.

Note: If you are using a connector, the connection between the socket and the cryostat wiring may also be potted in Stycast for improved mechanical strength.



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