

Germanium Detectors

User's Manual

9231358B

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The information in this document describes the product as accurately as possible, but is subject to change without notice.

Printed in the United States of America.



DETECTOR SPECIFICATIONS AND PERFORMANCE DATA

Specifications

DETECTOR MODEL GUL0110P SERIAL NUMBER 08078301
 CRYOSTAT MODEL 7905-BWR/S PREAMPLIFIER MODEL ITRP

The purchase specifications, and therefore the warranted performance, of this detector are as follows:
 (Electric cooling may degrade performance by as much as 10%.)

Energy	5.9 keV	122 keV	1332 keV
Resolution [eV (FWHM)]	140		

Cryostat description (if special) 1.0" Ø Endcap x 11.5" Chamber penetration. Drawing # B202684X, Rev.1

Physical Characteristics

Active diameter 11.3 mm
 Active area 100 mm²
 Thickness 10 mm
 Distance from window 5 mm
 Cryostat window thickness 0.025 mm
 Cryostat window material Beryllium

Electrical Characteristics

Depletion voltage (-) 700 V dc
 Recommended bias voltage (-) 1000 V dc
 Reset rate at recommended bias 5.0 sec (Reset preamp only)
 Preamplifier test point voltage at recommended bias --- V dc (RC preamp only)

Resolution and Efficiency

With amp time constant of 12usec shaping @ 1K CPS.

Isotope	⁵⁵ Fe	⁵⁷ Co	⁵⁷ Co	⁶⁰ Co	Peak to Bkgd.
Energy (keV)	5.9	6.4*	122	1332	5.9:1.0
FWHM (eV)	122		534		
FWTM (eV)	226		980		6325:1.0

*Substitutes for ⁵⁵Fe in some cases where ⁵⁵Fe peaks are not well separated.

Cool Down Time 4 Hours Cryostat Liquid Nitrogen Consumption Rate < 1.2 Liters per Day

Tested by: *John M. Goto* Date: 08/24/07

Approved by: *John M. Goto* Date: 08/24/07

CERTIFICATE OF COMPLIANCE

QA-2007

Rev. E

Effective 8/93

Page 1 of 1

CANBERRA INDUSTRIES

CUSTOMER:

TRIUMF

Customer Order#

PO-12508

Canberra ACK#

0614489

MODEL

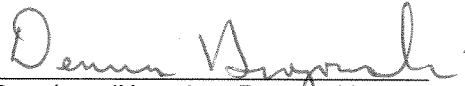
SERIAL NUMBER

GUL0110P-7905-BWR/S
C of C

08078301
In the detector manual

The undersigned certifies that the instruments described above as a part of the above referenced purchase order are in accordance with all requirements, specifications, and drawings referenced therein, are in conformance with the required manufacturer's specifications, and that records of inspection and test providing objective evidence of the foregoing are on file and are available upon request.

Test equipment utilized in the calibration of Canberra instruments is calibrated on a scheduled basis with N.B.S. traceable standards.



Dennis (Name) Brozowski

08/23/07

(Date)

Production Manager
(Title)

INSTRUCTIONS

Full Function I-TRP Integrated-Transistor Reset Preamplifier (For Single-element Detectors)

General Description

The I-TRP makes use of a low capacitance FET having a built-in transistor switch to discharge it. Compared to resistive feedback and optical reset preamplifiers it has lower noise and better transient response (no light-induced spurious effects).

Circuit Description

Refer to the block diagram. The preamplifier comprises a charge sensitive amplifier (U15) plus an FPGA controlled logic circuit which produces a reset signal to reset the preamplifier when the charge sensitive stage reaches the upper limit of its range. For ease of understanding the reset circuit is depicted as a comparator on the block diagram.

A comparator (A4) monitors a temperature sensor in the associated cryostat and provides a H.V. Inhibit signal in case of detector warm-up. A monostable provides an Inhibit Pulse to gate off the associated ADC during the amplifier overload recovery period. A rear panel control (P1) adjusts the width of this pulse.

Input/Outputs

The preamplifier circuit is built using surface-mount technology. Connection to the cryostat electrical feedthrough is by means of a 7 place socket. An eighth connection is located in the center of this socket. The rear panel contains the BNC connectors for Signal Output, Test Input, H.V. Inhibit and Reset Inhibit. In addition there is an SHV connector for detector bias voltage and a 9-pin D connector for preamplifier power.

Controls and Adjustments

The only external control is a rear panel potentiometer (P1) for Reset Inhibit pulse width. This control sets the inhibit pulse width appropriately to gate off the ADC during the amplifier overload recovery period following reset.

The internal controls are optimized at the factory for the detector with which the preamplifier is used. Should it be replaced or swapped with another preamplifier, the following controls may require re-adjustment:

Refer to the "Adjustments and Test Points" drawing.

- P1 Reset Inhibit
Adjusts the Reset Inhibit pulse width to allow the ADC to be gated off long enough to avoid reset overload artifacts but not so long as to unnecessarily increase dead time.
- P2 FET Substrate
Adjusts the bias on the FET for proper operation and minimum noise.
- P3 Drain Voltage
Adjusts the drain voltage of the FET.
- P5 FET Heater (optional)
Adjusts power to a FET heater for independent control of FET temperature.
- P6 H.V. Inhibit
Trims the H.V. Inhibit circuit to match the temperature sensor.
- P7 Risetime
Adjust this potentiometer to prevent oscillation of the preamp should it be unstable.
- SW2 Drain Current
Affects ramp range and noise slope (noise vs. input capacitance) and controls FET temperature which also affects noise.
- R_x/R_y These components can be chosen to trim the preamplifier gain in special applications.

Set-up and Tuning

The following settings will usually result in optimum results. Use a short amplifier time constant for set-up. This will make it easier to see a change in noise level which should be measured at the amplifier output. Ramp range, ramp rate, and reset time are measured at the preamplifier output. Always discharge the detector H.V. bias before removing or replacing preamplifiers.

- A. Set P5 to the voltage measured on the preamplifier that is being replaced. Measure the heater voltage at pin 4 on the cryostat connector or at the Heater Test Point. This setting will normally be 6.0VDC for single element detectors or 4.0-6.0VDC for array detectors.
- B. Set the drain current to approximately 2.3mA by turning on SW2 switches 1 and 3. Measure the voltage across the Drain Current Test Points and convert to mA using:
 $100\text{mV} = 1\text{mA}$
- C. Set P7 at mid-range.
- D. Set P3 to 2.0VDC. Measure the voltage at the test point adjacent to P3.
- E. Set P2 to -9.0VDC. Measure the voltage at the test point adjacent to P2.

Apply a small amount of H.V. bias (10-30VDC) to the detector and observe the preamplifier output. The output should appear as a sawtooth with a very long rise and an abrupt fall. If a sawtooth is not evident then increase P2 in .5VDC increments by turning in the CW direction. Allow 10-20 seconds at each increment. If a sawtooth is still not evident then return P2 to -9.0VDC. Adjust P3 to 1.0VDC and increment slowly while observing the preamp output.

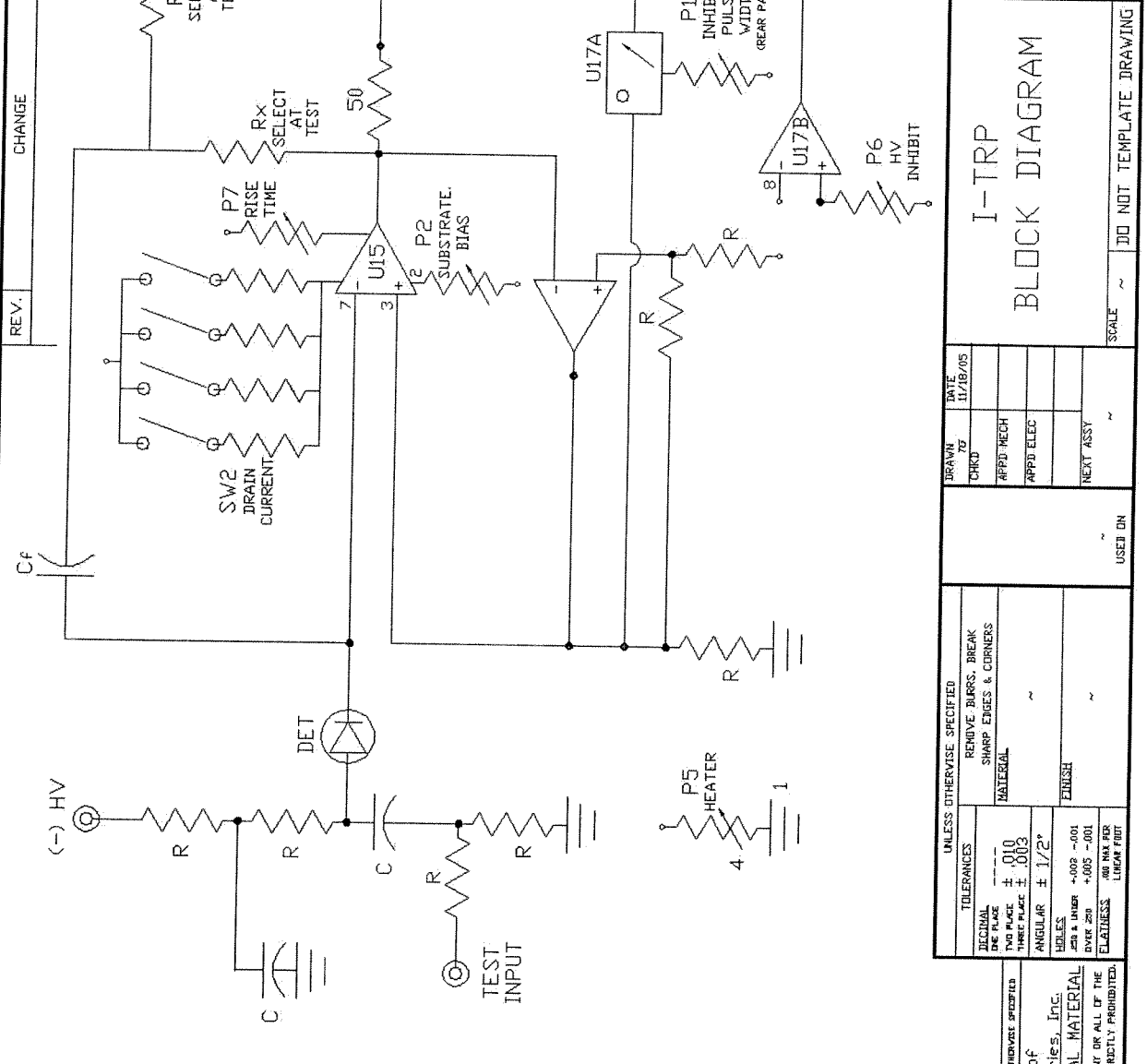
If a sawtooth is not evident when P3 has reached 4.0VDC then return P3 to 2.0VDC and decrease the drain current to 1.85mA by turning off switch 1 on SW2 leaving switch 3 as the only one on. If no sawtooth is evident then repeat the substrate voltage and drain voltage iterations described above at this lower drain current.

If a sawtooth is not evident then increase the drain current to 2.8mA by turning on switch 2 on SW2 so that switches 2 and 3 are on. If no sawtooth is evident then repeat the substrate voltage and drain voltage iterations described above at this higher drain current. If the preamplifier output sawtooth cannot be acquired then consult the factory or the service department of the distributor.

If the sawtooth output appears normal then apply full bias to the detector while observing the preamplifier output. The ramp rate will increase with each increment in H.V then slowly decrease to greater than 1 reset every .1 seconds. If the sawtooth locks positive and does not recover within a few seconds then the detector may be at fault and the user should reduce the H.V. and consult the factory or the service department of the distributor. At full bias the ramp rate without a radiation source should be on the order of .1 to >1 second with a range of about -1 to +4 volts. The reset time of the ramp should be on the order of 1-10us.

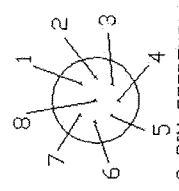
- F. Set the H.V. Inhibit Trim. The H.V. Inhibit functionality is factory set for Canberra H.V. Power supply compatibility. With detector cold turn P6 fully CW. Turn P6 CCW until LED1 (yellow) turns on and the H.V. Inhibit output goes to ground thereby disabling the power supply. Slowly turn P6 CW ¼ turn past the point at which LED2 (green) turns on and the H.V. Inhibit output measures open circuit to ground thereby enabling the H.V. power supply.

REV.	CHANGE	ECN	BY	DATE	APPD
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WIRING SIDE

D-9 WIRING	
PIN NO.	WIRE COLOR DESCRIPTION
1	BLACK GROUND
2	---
3	---
4	RED +12V
5	---
6	---
7	---
8	---
9	GREEN -12V



WIRING SPECIFICATIONS AS VIEWED FROM OUTSIDE CRYSTAT

PIN NO.	DESCRIPTION
1	HEATER GND
2	SUBSTRATE
3	RESET
4	HEATER
5	DRAIN
6	SOURCE
7	FEEDBACK
8	TEMP SENSOR

UNLESS OTHERWISE SPECIFIED		REMOVE BARRS, BREAK SHARP EDGES & CORNERS
DECIMAL PLACE	± 0.10	MATERIAL
TWO PLACE	± 0.03	FINISH
THREE PLACE	± 0.02	
ANGULAR	± 1/2°	
HOLES		
DRILL & UNDER	+0.02 -0.01	
OVER DRILL	+0.05 -0.01	
FLATNESS	0.005 MAX PER LINEAR FOOT	

ALL DIMENSIONS IN UNITS UNLESS OTHERWISE SPECIFIED

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I-TRP
 BLOCK DIAGRAM

SCALE ~ DO NOT TEMPLATE DRAWING

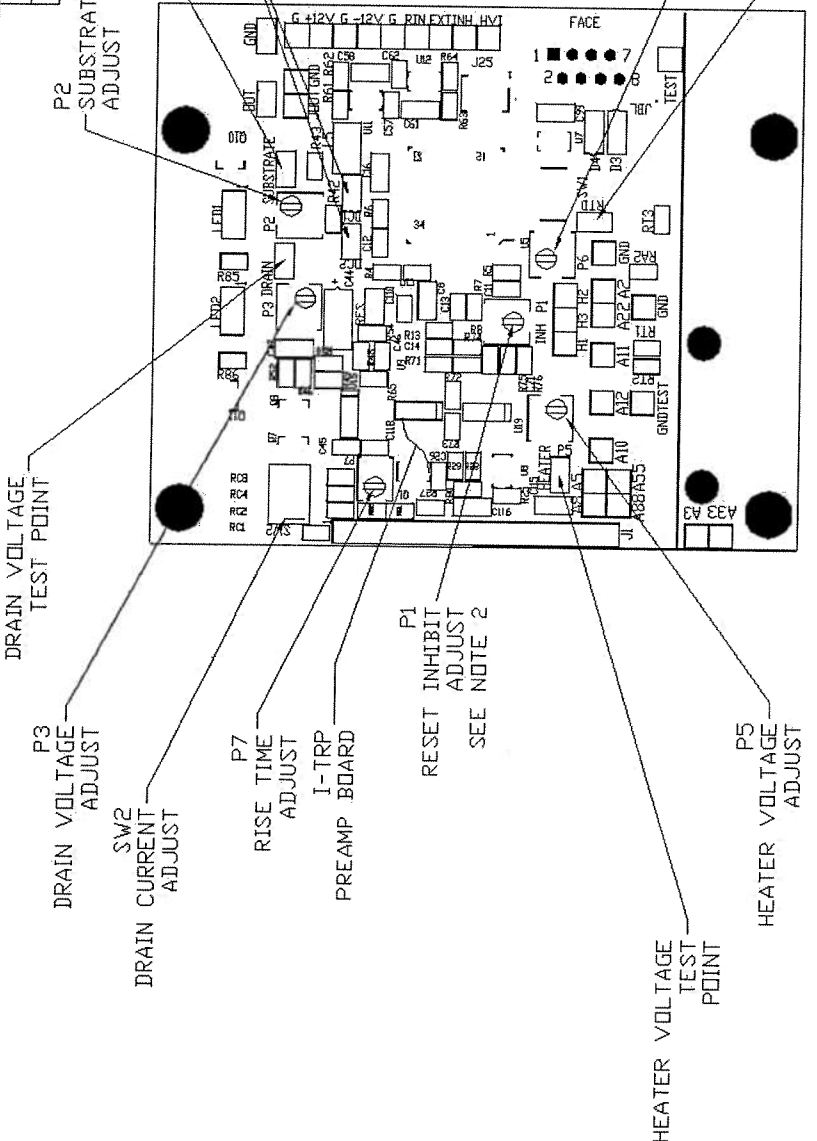
DATE	11/18/05
DRAWN	YD
CHKD	
APPD MECH	
APPD ELEC	
NEXT ASSY	

USED ON ~

REV.	CHANGE	ECN	BY	DATE	APPD
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A CANBERRA
 MERIDEN, CONNECTICUT
 DRAWING NO. B203119
 REV. 1
 SHEET 1 OF 1

REV.	CHANGE	BY	DATE	APPD
01	ADD TAG NUMBERS TO DISCRIPTORS	7G	11/16/05	



- NOTE:
1. ALL ADJUSTMENTS INCREASE IN CLOCKWISE DIRECTION.
 2. P1 RESET INHIBIT ADJUST MAY BE MOUNTED REMOTELY ON REAR PANEL OF PREAMP FOR SINGLE ELEMENT DETECTORS.

CANBERRA MERIDEN, CONNECTICUT		DRAWING NO. B203004	REV. 01
ADJUSTMENT & TEST POINTS		SCALE ~	DO NOT TEMPLATE DRAWING SHIT 1 OF 1

DRAWN: 7G CHKD:	DATE: 01/27/05
APPD MECH:	PREAMPS USED ON:
APPD ELEC:	903002
NEXT ASSY:	~

TOLERANCES DECIMAL TWO PLACE ± .010 THREE PLACE ± .003 ANGULAR ± 1/2° HOLES DIA & UNDR +.008 -0.01 OVER DIA +.005 -0.01 ELASTICITY .001 MAX PER LINEAR FOOT	UNLESS OTHERWISE SPECIFIED REMOVE BURRS, BREAK SHARP EDGES & CORNERS MATERIAL FINISH
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**Model 7905-WR
Model 7905-BWR
Windowless Retractable Cryostats**

Instructions

Supplement to the Ge Detector
And Si(Li) Detector
Instruction Manuals

Contents:

- 1) General Description
- 2) Initial Detector Testing
- 3) Removing the Beryllium Cryostat Window
- 4) Detector Installation and Gate Valve Operation
- 5) Bellows/Seal Evacuation
- 6) De-icing
- 7) Wiring Diagram
- 8) Cryostat Outline Drawing
- 9) Appendix – Valve Operator Instructions

1) General Description:

The Windowless Retractable Cryostat is equipped with a manual slide table, bellows (Model 7905-BWR only), and a high vacuum gate valve. When operated in the windowless mode the detector element occupies a common vacuum with the target chamber. Proper sequencing of the gate valve and slide table are essential to avoid damaging the detector and cryostat assembly.

The detector is shipped from the factory equipped with a beryllium window in a removable flange assembly. The detector is shipped with the gate valve in the closed position to protect the beryllium window. It is essential that the detector be tested with the beryllium window in place before attempting windowless operation. It is recommended that the detector be used with the beryllium window left in place unless improved sensitivity for low energy photons is required.

Caution! Do not remove the beryllium window assembly until preliminary testing is complete!

Warning! The detector can be damaged during windowless mode of operation due to condensable contamination from the target chamber. It is essential that the target chamber be kept clean and baked out to minimize moisture and other condensable contaminants from condensing on the detector's surface. It is also extremely important to prevent the detector from being exposed to atmosphere when cold. Such abuse is not covered by the warranty.

Summary of Features:

- Windowless operation.
- Manual slide table allowing up to 8 inch chamber penetration.
- 2.75 inch Conflat coupling spool.
- Metal bellows (Model 7905-BWR only).
- Dual Viton O-ring slide seal (Model 7905-WR only).
- High vacuum gate valve.
- Mini-Conflat pump out port.
- Built-in heater for de-icing.

2) Initial Testing

The Windowless Retractable Cryostat is delivered from the factory having a 1 mil thick (other thickness optional) removable cryostat window installed on the endcap. This allows full check out and characterization of the detector before attempting to operate the detector in windowless mode.

- a) Open the gate valve to the full open position.

CAUTION

The beryllium cryostat window is exposed at this point. Extreme care must be taken to avoid touching the fragile beryllium window with anything. The slightest touch to the beryllium window will damage the window and cause a catastrophic cryostat vacuum failure and damage the detector element. Failures of this type are not covered by the warranty. Review the detector instruction manual for details concerning the beryllium cryostat window.

- b) Operate the slide table until the end cap protrudes approximately one inch from the coupling spool.
- c) Follow the set-up and test procedures in the detector instruction manual. Compare the obtained test results with that shown on the detector test report supplied with the detector.
- d) Once the detector has been proven to be in good operating condition, retract the detector to its HOME position such that the end cap is completely behind the gate valve. Close the gate valve to protect the detector and beryllium cryostat window.
The HOME position is indicated on the scale attached to the slide.

3) Removing the Beryllium Cryostat Window

To achieve windowless operation the beryllium window must be removed. Canberra cannot be held responsible for damage caused by contamination or mishandling after the Be window is removed.

- a) Power down the detector, remove all cables, remove the liquid nitrogen and allow the detector to warm-up to room temperature for a minimum of 24 hours before proceeding.
- b) Open the gate valve and position the detector such that the end cap protrudes approximately one inch beyond the coupling spool. This will expose the beryllium window.

- c) Connect a low pressure (≤ 1 PSIG) source of dry nitrogen gas to the vacuum valve operator supplied with the detector. Flush the valve operator with dry nitrogen gas purging any air from this assembly.
- d) Connect the vacuum valve operator to the cryostat evacuation port located near the preamplifier section of the cryostat. Tighten the compression nut to form a vacuum tight seal around the outer diameter of the vacuum port. Insert the valve plunger until it makes contact with the vacuum port plug. Rotate the knob clockwise to engage the port plug with the valve operator handle. Complete instructions for the valve operator are provided in the appendix.
- e) With the nitrogen gas supply on, slowly open the cryostat vacuum valve using the valve operator. This procedure will back-fill the cryostat with dry nitrogen gas and reduce the risk of contamination. Vent the cryostat very slowly to avoid a rush of gas that may damage internal materials or components.
- f) The beryllium window is attached to a ring that slips over the end of the end cap. A radial O-ring seal is utilized to make a seal around the end cap.
- g) Immediately retract the cryostat to the HOME position on the slide so that the end cap is completely behind the gate valve. Close the gate valve and evacuate the cryostat to pressures less than 1×10^{-6} torr for a minimum of 0.5 hours using an oil free or cold trapped vacuum system. It is also possible to evacuate the cryostat by connecting the detector to the target chamber, using the chamber vacuum system to pump down the cryostat. When pumping down the cryostat or backfilling the cryostat do so very slowly to avoid a rush of air that may damage internal materials or components. After most of the air is removed you may open the pump valve fully to achieve the desired low pressures.
- h) Once the cryostat has been evacuated close off the evacuation port by pushing the plug back into position. Remove the valve operator in reverse order to that listed in step d of this procedure.

CAUTION

The detector is sensitive to corrosive atmosphere and humidity. For this reason the beryllium cryostat window should be removed in a clean and dry laboratory environment. The cryostat should not be left open exposed to atmosphere any longer than necessary for the removal of the window.

4) Detector Installation and Mechanical Operation

The cryostat assembly should first be attached to the target chamber by means of the appropriate adapter flange. The slide table must be supported to avoid excessive stress on the coupling flange. Once attached, the target chamber can be evacuated. The gate valve must not be opened until the target chamber is at a pressure less than 10^{-6} torr when operating the detector in windowless mode of operation. During the chamber evacuation the detector dewar may be filled with liquid nitrogen. Observe the cool down time as indicated on the detector serial number tag before applying high voltage to the detector.

System Considerations

There are potential system problems that can appear when detectors are attached to target chambers. Be aware of the following common ones:

a) Microphonics

Vibrations from pumps or other devices may be transmitted to the detector. Detectors are extremely sensitive to noise and vibrations. If you can feel any vibration in the chamber it is too much. The chamber should be isolated from the vibrations source(s) before even attempting to install the detector.

b) Electrical Interference

Electrical isolation between the detector and the slide table/gate valve assembly is designed in the cryostat. This means that the detector assembly is grounded only through the preamplifier connections. Nonetheless, there may be pick-up from noise sources in or around the vacuum chamber. These will have to be eliminated to achieve good detector performance.

c) Light Interference

Ge detectors are sensitive to visible light and **IR**. There is a light filter over the detector element but it is not effective against strong light or **IR** (from hot surfaces) within view of the detector element. These detectors should be operated in the dark.

The step-by step procedure is as follows:

- a) Attach the detector to the target chamber. Be sure to provide support for the detector as the flanges are not designed to support all the weight.
- b) Evacuate the target chamber.
- c) Open the gate valve only after the vacuum chamber pressure is less than 1×10^{-6} torr.

CAUTION

During windowless mode of operation high vacuum must be maintained in the target chamber at all times when the detector gate valve is open.

- d) Operate the slide table to advance the detector to the desired location in the target chamber. **DO NOT** attempt to advance the detector beyond the LIMIT position which is indicated on the scale attached to the slide table.

The detector may be returned to the safe storage position as follows:

- a) Operate the slide table until the detector is fully retracted to the HOME position. (The detector end cap must be fully retracted before the gate valve is closed.)
- b) Once the detector is fully retracted, the gate valve may be closed.
- c) The target chamber may then be vented.

5) Bellows/Seal Evacuation

An auxiliary evacuation port is provided just behind the gate valve. It is a seal-off valve attached to a mini-conflat flange. This port can be used to evacuate the bellows/seal volume when the detector is equipped with a beryllium window in case the user wishes to avoid air from this area to be pumped through his vacuum chamber.

6) De-Icing System

The Detector can accumulate an ice layer if used in a vacuum system in which water vapor is present. This ice layer will attenuate low energy photons and can lead to an increase in detector leakage current as well. In many applications the ice layer can be removed by temperature cycling the detector (allowing the detector to warm up thoroughly to room temperature and then cooling it again). This, of course takes time to accomplish and the ice build-up may occur again if conditions remain the same. Ideally, detectors should not be operated under these conditions, but if they are, it is possible to evaporate the ice by heating the detector assembly slightly on systems equipped with de-icing capability.

The de-icing system involves a heater which is built in the detector holder assembly and a platinum resistance thermometer element (PRTD-100) to measure the temperature. The wiring diagram shows the external connections for these components. The detector holder assembly is coupled to the cold finger with appropriate thermal resistance so that a moderate amount of power can warm the detector assembly allowing de-icing while the dewar is filled with liquid nitrogen. It has been proven that raising the temperature by 10 to 50 degrees is sufficient to de-ice the system.

Operation

- a) Remove preamplifier power and detector bias.
- b) Attach an ohmmeter to the PRTD terminals and measure the temperature using the chart below.
- c) Apply power from a variable transformer or d.c. power supply to the heater terminals in the heater box located on the cryostat near the preamplifier. Observe the power limitation of 10 watts maximum. This is approximately 115 V d.c. or RMS for the 1350 ohm heater.
- d) Allow the temperature to rise until the ice layer has been eliminated.

It has been shown that the temperature need be raised only 10 to 20 degrees Celsius for 30 minutes or so to eliminate the ice layer. You will need to experiment with the temperature and time for your specific operating conditions.

- e) Disconnect the power source and allow the detector to cool.
- f) Once the original cold operating temperature has been reached, the preamplifier power and detector bias can be restored.
- g) Disconnect the heater and temperature sensor leads as they can act as a noise source which can degrade the energy resolution of the system.

Temperature versus temperature sensor resistance chart:

Temp. (Celsius)	PRTD Value* (Ohms)	Temp. (Celsius)	PRTD Value* (Ohms)
-200	18.49	-130	48.00
-190	22.80	-120	52.11
-180	27.08	-110	56.19
-170	31.32	-100	56.19
-160	35.53	- 90	64.30
-150	39.71	- 80	68.33
-140	43.87	- 70	72.33

The temperature coefficient is about 0.4 ohms per degree Celsius in this range.

The resistance values above do not include the least resistance which is approximately 8 – 12 ohms.

Instructions

Seal-off Valve Operator

I. Introduction

Canberra cryostats are equipped with seal-off valves, which are opened and closed by means of a seal-off valve operator. This valve operator provides a sealed evacuation path between the cryostat and an evacuation hose (pump) along with a mechanism for withdrawing and replacing the seal-off valve plug.

II. Inspection

1. Valve Operator

Look at the valve operator and observe the following key design features:

- 1) The O-ring seal which is compressed against the seal-off valve by means of a hex or knurled threaded nut or ring.
- 2) The sealed shaft with the knob (outside) and the threaded tip (inside). The shaft can be rotated and depressed to engage the valve plug, then withdrawn to remove the valve plug.
- 3) The evacuation tube which can be connected to a vacuum pump by means of flexible hose or quick-disconnect fitting.

III. Operation

1. Prepare the seal-off valve by removing the cover (if present) and any vacuum grease that may be packed in the valve body. Clean the valve body with lint-free paper towels or swabs.
2. Attach the valve operator to the seal-off valve and tighten the nut or ring (hand tight).
3. Engage the valve plug by pushing the valve handle inward and turning it clockwise a few turns. You should feel the resistance to rotation as the threads engage and tighten.
4. Withdraw the handle pulling the plug out of its seat.
5. To reseal the valve reverse the order of the steps above. That is:
 - a) Push the handle inward and feel the plug returning to its seated position.

- b) Turn the handle counterclockwise several turns to disengage the shaft. To ensure that the plug does not rotate you can push inward on the handle while turning it.
- c) Withdraw the handle observing that it moves more freely with the plug detached.
- d) Remove the valve operator from the valve.
- e) Replace the vacuum grease (if desired) and the valve cover.

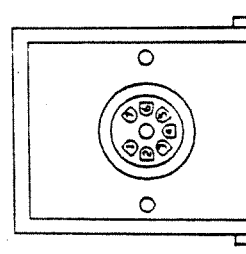
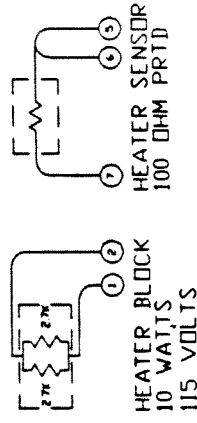
IV. Maintenance

Use silicone vacuum grease sparingly on the o-ring and on the shaft (only if it becomes hard to operate).

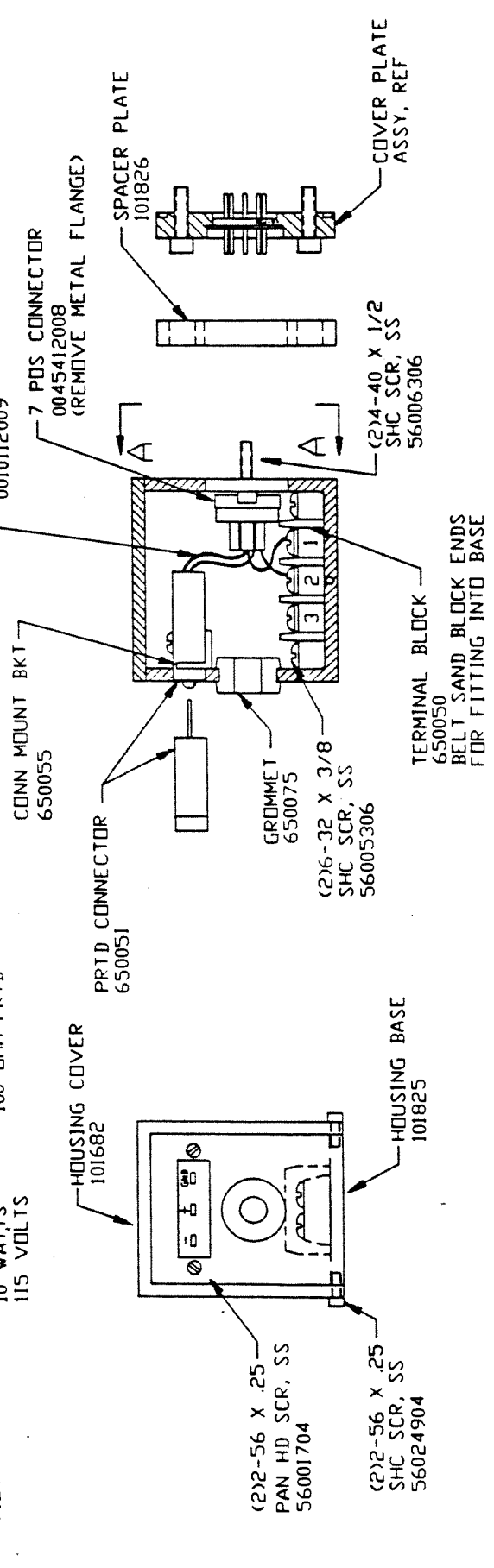
REV	CHANGE	ECN	BY	DATE	APPD
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WIRING: 7 POSITION CONNECTOR,
(2) 22 AWG STRAND PTFE COAT WIPE

PIN 1 : #1 SCR ON TERMINAL BLOCK
 PIN 2 : #2 SCR ON TERMINAL BLOCK
 PIN 5 : GND SCR ON PRTD CONNECTOR
 PIN 6 : + SCR ON PRTD CONNECTOR
 PIN 7 : - SCR ON PRTD CONNECTOR

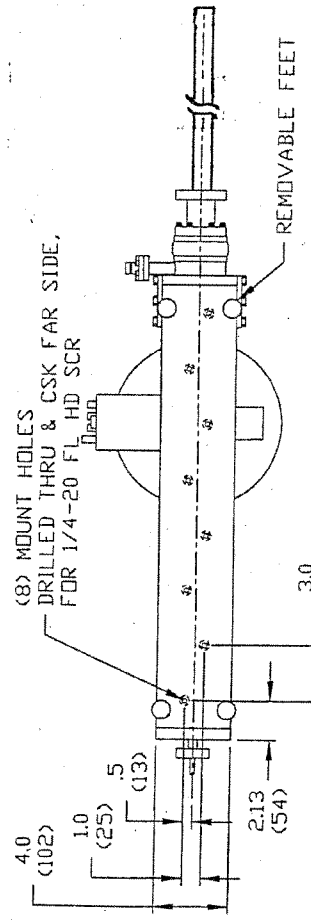
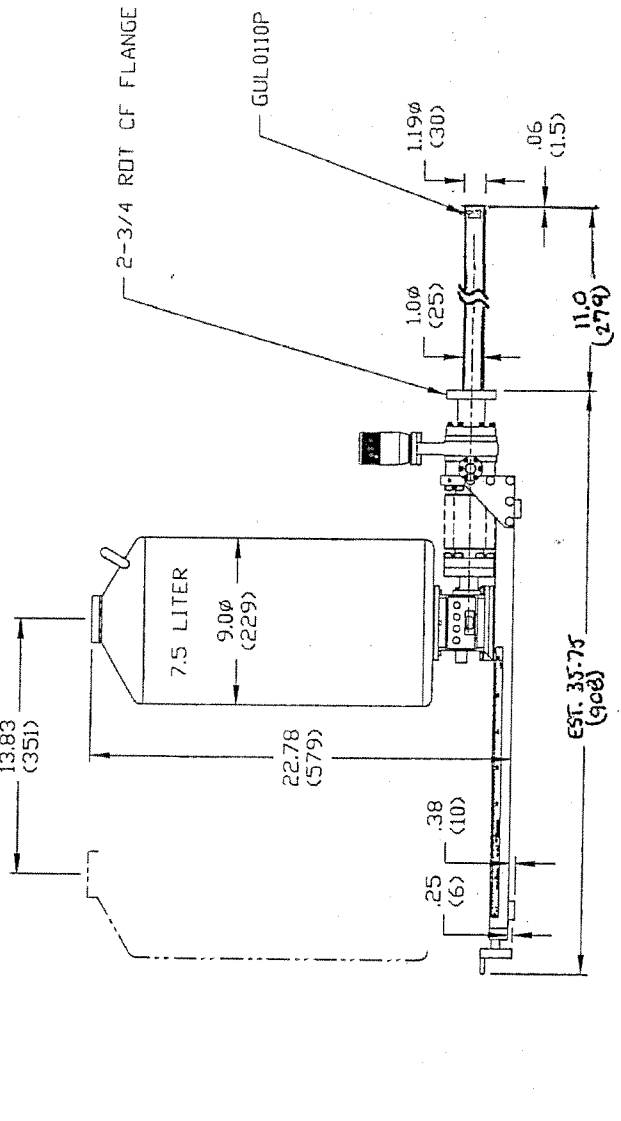


VIEW A-A



CANBERRA MERIDEN, CONNECTICUT		HEAT BOX ASSEMBLY		REV. DRAWING NO. B201824	
UNLESS OTHERWISE SPECIFIED REMOVE ROUNDS, BREAK SHARP EDGES & CORNERS		DRAWING NO. C201860		DATE 2/9/76	
TOLERANCES	FRACTIONAL	DECIMAL	APPROX MECH	APPROX ELEC	NEXT ASSY
RECTANGULAR	----	----	----	----	C201813
CIRCULAR	----	----	----	----	C201860
ANGULAR	----	----	----	----	USER DN
PROPERTY OF CANBERRA INDUSTRIES, INC. COMPANY CONFIDENTIAL MATERIAL UNAUTHORIZED REPLICATION OR USE OF ALL OR ANY PART OF THIS MATERIAL CONTAINED HEREIN IS STRICTLY PROHIBITED		7905-BVR 7905-WP		DO NOT TEMPLATE DRAWING	

REV.	CHANGE	ECN	BY	DATE	APPD
01	ADDED DIMENSIONS AND FLANGE DESCRIPTION		WFD	01/19/02	



XJ.F.C.
OCT. 03, 2006

CANBERRA MERIDEN, CONNECTICUT		DRAWING NO. B202684X	REV. 01
OUTLINE DRAWING MODEL 7905-BWRS		SCALE	DO NOT TEMPLATE DRAWING
UNLESS OTHERWISE SPECIFIED		7905-BWRS USED ON	
TOLERANCES	REMOVE BURRS, BREAK SHARP EDGES & CORNERS	NEXT ASSY	
DECIMAL	HALF	7905-BWRS	
FRACTION	HALF	USED ON	
ANGULAR	FINISH		
HOLES	FINISH		
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Important Safety Considerations

Read Carefully

There are three potential hazards in the use and handling of Ge detectors that must be recognized and properly dealt with to avoid the risk of personal injury.

High Voltage



Ge detectors may operate at bias voltages of 5000 V dc or more. Always be sure that detectors are properly grounded (through the SHV coaxial cable ground to a properly grounded Power Supply/NIM Bin). Also use extreme caution when adjusting internal preamplifier controls to avoid contact with the high voltage circuit.

Liquid Nitrogen



LN₂ can cause frostbite if not handled properly. Avoid skin contact with LN₂ or with surfaces cooled by LN₂. Read “Handling Liquid Nitrogen” on page 54 for more detailed instruction on LN₂ hazards.

Vacuum Failure - Overpressurization



When a cryostat exhibits signs of catastrophic vacuum failure, such as heavy moisture or ice formation on the surfaces, extremely high LN₂ loss rate, and so forth, the adsorber (molecular sieves or charcoal), which normally maintains vacuum, may be virtually saturated.

When allowed to warm up, the adsorber will outgas and the pressure in the cryostat will rise. Canberra cryostats and Dewars sold by Canberra have a pressure relieving seal-off valve which is designed to prevent dangerous levels of pressurization.

The pressure rise, however, can be high enough to break or break loose beryllium windows and/or end-caps. A frozen or ice clogged seal-off valve may fail to relieve pressure, resulting in dangerous levels of pressurization.

Precautions

For these reasons use extreme caution in handling cryostats with symptoms of catastrophic vacuum failure. When you do have to handle them, take the following precautions:

1. Stop using the failed unit immediately. Do not allow it to warm up until additional steps are taken to prevent damage or injury due to overpressurization.
2. Drape a heavy towel or blanket over the end-cap and point the end-cap away from personnel and equipment. If the unit is in a shield, close the shield door.

3. Call the factory for further instructions if the incident occurs during working hours.
4. If it is impractical to keep the unit cold until advice is available from the factory, keep the end-cap covered with a heavy towel or blanket and place the unit in a restricted area in a container (corrugated cardboard, for example). If the unit is in a shield, let it warm up in the shield with the door closed.
5. After the unit has warmed up, cautiously check for overpressurization (outwardly bulging end-caps or windows). If there are no signs of pressure, the unit may be shipped to the factory for repair. Consult the factory for shipping information.