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Instruction Manual

MKS Type PDR 2000
Dual Capacitance Diaphragm
Gauge Controller

Six Shattuck Road

MKS Type PDR 2000
Dual Capacitance Diaphragm
Gauge Controller

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Safety Procedures and Precautions

The following general safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of intended use of the instrument and may impair the protection

USE THE PROPER POWER SOURCE
This product is intended to operate from a power source that does not apply more voltage between the supply conductors, or between either of the supply conductors and ground, than that specified in the manual

USE THE PROPER FUSE
Use only a fuse of the correct type, voltage rating, and current rating, as specified for your product

DO NOT OPERATE IN EXPLOSIVE ATMOSPHERES
To avoid explosion, do not operate this product in an explosive environment unless it has been specifically certified for such operation.

HIGH VOLTAGE DANGER
High voltage is present in the cable, and in the sensor when the controller is turned on.

Sicherheitshinweise

In dieser Betriebsanleitung vorkommende Symbole

Definition der mit WARNUNG!, VORSICHT! und HINWEIS überschriebenen Abschnitte in dieser Betriebsanleitung.

Warnung!

Das Symbol WARNUNG! weist auf eine Gefahrenquelle hin. Es macht auf einen Arbeitsablauf, eine Arbeitsweise, einen Zustand oder eine sonstige Gegebenheit aufmerksam, deren unsachgemäße Ausführung bzw. ungenügende Berücksichtigung zu Körperverletzung führen kann.

Vorsicht!

Das Symbol VORSICHT! weist auf eine Gefahrenquelle hin. Es macht auf einen Bedienungsablauf, eine Arbeitsweise oder eine sonstige Gegebenheit aufmerksam, deren unsachgemäße Ausführung bzw. Ungenügende Berücksichtigung zu einer Beschädigung oder Zerstörung des Produkts oder von Teilen des Produkts führen kann.

Hinweis

Das Symbol HINWEIS weist auf eine wichtige Mitteilung hin, die auf einen Arbeitsablauf, eine Arbeitsweise, einen Zustand oder eine sonstige Gegebenheit von besonderer Wichtigkeit aufmerksam macht.

Erkärung der Am Gerät angebrachte Symbole

Der untenstehenden Tabelle sind die Bedeutungen der Symbole zu entnehmen, die an dem Gerät angebracht sind.

Definitionen der am Gerät angebrachten Symbole			
			
Ein (Netz)			

Erdung und Verwendung geeigneter elektrischer Armaturen!

In diesem Instrument liegen gefährliche Spannungen an. Alle verwendeten elektrischen Armaturen und Kabel müssen dem angegebenen Typ entsprechen und sich in einwand-freiem Zustand befinden. Alle elektrischen Armaturen sind vorschriftsmäßig anzubringen und zu erden.

Richtiges Netzkabel verwenden!

Das verwendete Netzkabel muß sich in einwandfreiem Zustand befinden und den in der Betriebsanleitung enthaltenen Anschlußwerten entsprechen.

Das Netzkabel muß abnehmbar sein. Der Querschnitt der einzelnen Leiter darf nicht weniger als 0,75 mm^2 betragen. Das Netzkabel sollte einen Prüfvermerk einer zuständigen Prüfstelle tragen, z.B. VDE, Semko oder SEV.

Richtige Stromquelle verwenden!

Dieses Produkt ist für eine Stromquelle vorgesehen, bei der die zwischen den Leitern bzw. zwischen jedem der Leiter und dem Masseleiter anliegende Spannung den in dieser Betriebsanleitung angegebenen Wert nicht überschreitet.

Richtige Sicherung benutzen!

Es ist eine Sicherung zu verwenden, deren Typ, Nennspannung und Nennstromstärke den Angaben für dieses Produkt entsprechen.

Gerät nicht in explosiver Atmosphäre benutzen!

Um der Gefahr einer Explosion vorzubeugen, darf dieses Gerät nicht in der Nähe explosiver Stoffe eingesetzt werden, sofern es nicht ausdrücklich für diesen Zweck zertifiziert worden ist.

Hochspannungsgefahr!

Bei eingeschaltetem Steuerteil liegt im Kabel und im Sensor Hochspannung an.

Symboles apparaissant sur l’appareil

Le tableau suivant décrit les symboles apparaissant sur l’appareil.

Définition des symboles apparaissant sur l’appareil			
			

Mesures de sécurité et mises en garde

Prendre toutes les précautions générales suivantes pendant toutes les phases d'utilisation de cet appareil. Le non-respect de ces précautions ou des avertissements contenus dans ce manuel entraîne une violation des normes de sécurité relatives à l'utilisation de l'appareil et le risque de réduire le niveau de protection fourni par l'appareil. MKS Instruments, Inc. ne prend aucune responsabilité pour les conséquences de tout non-respect des consignes de la part de ses clients.

NE PAS SUBSTITUER DES PIÈCES OU MODIFIER L'APPAREIL

UTILISATION D'UN CORDON D'ALIMENTATION APPROPRIÉ

Utiliser uniquement un cordon d'alimentation en bon état et conforme aux exigences de puissance d'entrée spécifiées dans le manuel.

Utiliser uniquement un cordon d'alimentation amovible avec des conducteurs dont la section est égale ou supérieure à 0,75 mm^2. Le cordon d'alimentation doit être approuvé par un organisme compétent tel que VDE, Semko ou SEV.

UTILISATION D'UNE ALIMENTATION APPROPRIÉE

Cet appareil est conçu pour fonctionner en s'alimentant sur une source de courant électrique n'appliquant pas une tension entre les conducteurs d'alimentation, ou entre les conducteurs d'alimentation et le conducteur de terre, supérieure à celle spécifiée dans le manuel.

UTILISATION D'UN FUSIBLE APPROPRIÉ

Utiliser uniquement un fusible conforme au type, à la tension nominale et au courant nominal spécifiés pour l'appareil.

NE PAS UTILISER DANS UNE ATMOSPHÈRE EXPLOSIVE

Pour éviter tout risque d'explosion, ne pas utiliser l'appareil dans une atmosphère explosive à moins qu'il n'ait été approuvé pour une telle utilisation.

DANGER DE HAUTE TENSION

Une haute tension est présente dans le câble et dans le capteur lorsque le contrôleur est sous tension.

Información sobre seguridad

Símbolos usados en el manual de instrucciones

Símbolos que aparecen en la unidad

En la tabla que figura a continuación se indican los símbolos que aparecen en la unidad.

Definición de los símbolos que aparecen en la unidad			
			
Encendido (alimentación eléctrica) IEC 417, N.° 5007	Apagado (alimentación eléctrica) IEC 417, N.° 5008	Puesta a tierra IEC 417, N.° 5017	Protección a tierra IEC 417, N.° 5019

Procedimientos y precauciones de seguridad

Las precauciones generales de seguridad que figuran a continuación deben observarse durante todas las fases de funcionamiento del presente instrumento. La no observancia de dichas precauciones, o de las advertencias específicas a las que se hace referencia en el manual, contraviene las normas de seguridad referentes al uso previsto del instrumento y podría impedir la protección que proporciona el instrumento. MKS Instruments, Inc., no asume responsabilidad alguna en caso de que el cliente haga caso omiso de estos requerimientos.

NO UTILIZAR PIEZAS NO ORIGINALES NI MODIFICAR EL INSTRUMENTO

No se debe instalar piezas que no sean originales ni modificar el instrumento sin autorización. Para garantizar que las prestaciones de seguridad se observen en todo momento, enviar el instrumento al Centro de servicio y calibración de MKS cuando sea necesaria su reparación y servicio de mantenimiento.

REPARACIONES EFECTUADAS ÚNICAMENTE POR TÉCNICOS ESPECIALIZADOS

Los operarios no deben retirar las cubiertas del instrumento. El cambio de piezas y los reajustes internos deben efectuarlos únicamente técnicos especializados.

PUESTA A TIERRA DEL INSTRUMENTO

Este instrumento está puesto a tierra por medio del conductor de tierra del cable eléctrico. Para evitar descargas eléctricas, enchufar el cable eléctrico en una toma debidamente instalada, antes de conectarlo a las terminales de entrada o salida del instrumento. Para garantizar el uso sin riesgos del instrumento resulta esencial que se encuentre puesto a tierra por medio del conductor de tierra del cable eléctrico.

PELIGRO POR PÉRDIDA DE LA PUESTA A TIERRA

Si se pierde la conexión protectora de puesta a tierra, todas las piezas conductoras a las que se tiene acceso (incluidos los botones y mandos que pudieran parecer estar aislados) podrían producir descargar eléctricas.

PUESTA A TIERRA Y USO DE ACCESORIOS ELÉCTRICOS ADECUADOS

Este instrumento funciona con voltajes peligrosos. Todos los accesorios y cables eléctricos deben ser del tipo especificado y mantenerse en buenas condiciones. Todos los accesorios eléctricos deben estar conectados y puestos a tierra del modo adecuado.

Warning

Explosive Gases

Do not use the Model PDR 2000 Dual Capacitance Diaphragm Gauge Controller to measure the pressure of combustible gas mixtures. The gauge normally operates at low temperatures, but it is possible that momentary transients or controller malfunction may cause ignition of combustible mixtures, which then might explode and cause damage to equipment and injury to personnel.

Warning

Limitation on Use of Compression Mounts

Do not use a compression mount (quick-connect) for attaching the gauge tube to the vacuum system in applications that may develop positive pressures. Positive pressures may cause the tube to be blown out of a compression fitting and damage equipment and injure personnel.

Warning

Chemicals

Many organic cleaning solvents, such as acetone, produce fumes

Chapter One: General Information

Introduction

Purpose

The MKS Instruments Model PDR 2000 Dual Capacitance Diaphragm Gauge (CDG) Controller displays vacuum pressure as measured from capacitance diaphragm gauges. The PDR 2000 supplies ±15 volts at up to 0.75 amp; this is sufficient to operate most heated capacitance diaphragm gauges. The PDR 2000 precisely measures the 0 to 10 volt signal from the CDG to determine pressure. The Model PDR 2000 controller covers full scale ranges from 20 mTorr to 10,000 Torr. The PDR 2000 is housed in a 1/8 DIN enclosure and is simple to operate. Figure 1 displays the PDR 2000 front view; Figure 2 displays the rear view and Figure 3 displays the dimensions.

Specifications

The PDR 2000 Dual Capacitance Diaphragm Gauge has the following specifications:

Useful Measuring Range

4 decades; full scale of 20 mTorr to 10.00 ktorr; full scale range selection is entered on the front panel by the user.

- Display Range
  - -9.9 torr to 10.00 ktorr; pressures higher than 10.00 ktorr display **OFF**.
- Display Resolution

  Varies according to full scale range, from 0.01 mTorr to 1 Torr

  Gauge Interface

  The PDR 2000 incorporates a high-resolution input circuit, which allows the use of the capacitance diaphragm gauge over its entire 4 decades.
- Input to the PDR 2000 Controller

  0 to 10 volts for full scale of the gauge
- Units of Display

  Torr (mtorr), mBar(Bar), arb (no units), Kpa, and (Pa) user selectable
- Full Scale

  User selectable range to match CDG: 20, 50, 100mTorr; 1, 2, 10, 100, 1000, 5,000 and 10,000 torr
- Calibration Adjust
- For calibration of display; allows user to multiply CDG response by 0.50 to 2.00.
-

- Vacuum Gauge

  One or two capacitance diaphragm gauges which require up to 0.75 amp total from ± 15 volt supplies; this is sufficient to operate most heated gauges.

- Operating Temperature Range

  +2 to +50 deg. Celsius

- Process Control Set Points

  Two, with independent High and Low set points for each relay, for flexible control of hysteresis

- Process Control Relays

  Two relays; contacts rated at 2 amp/240 VAC, 30 VDC

- Nonvolatile Memory

  For all user specified parameters

- Analog Output

  Logarithmic, 0.5 volts/decade; 0.10 mTorr=0.5 volts

- Output Power

  +15 at 0.75 amp and –15 volts at 0.75 amp; sufficient to operate temperature-controlled gauges

- Mounting

  The PDR 2000 may be used as a bench-top instrument or it may be mounted in an instrument panel. Clips are provided for panel mounting.

- RS-232 Input/Output

  Allows user to read pressure and set points; 9600 baud, 8-N-1; available through the accessory connector.

- Operating Voltage

  The Model PDR 2000 has a universal power supply, which operates on input voltages from 90 VAC to 265 VAC 47 to 65 Hz; input is through a standard IEC 320 instrument power input receptacle on the rear panel; input power is protected by fuses in both lines of the input power.

- Weight Model PDR 2000 only; does not include cable or CDG 0.9 lb. /0.4 kg.
-

Controls and Indicators

- GAUGE SELECT Button

This button allows the user to select either of the two gauges that are shown on the digital display.

- SELECT Button

  This button allows the user to select parameters to be adjusted, e.g. Set Points.

- RAISE and LOWER Buttons

  These buttons allow the user to adjust the gauge and instrument parameters.

- Digital Display

  This is a 4-digit 7-segment bright red LED, 10 mm high.

- Display Indicators

  This is a bright red individual LED for miscellaneous indicators.

Figure 1: Model PDR 2000 Front View

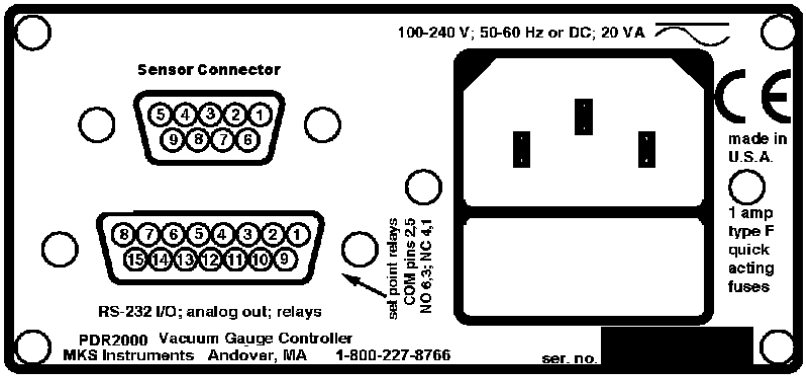

Figure 2: Model PDR 2000 Rear View

Figure 3: Model PDR 2000 Dimensions

Customer Support

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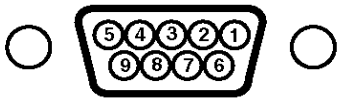

Figure 4: Model PDR 2000 Sensor Connector – 9 Pin Female D-Sub Connector

The following information allows you to make modifications to the cable as needed to interface with your CDG. Refer to the above figure. This shows the 9-pin connector, which is on the rear panel of the PDR 2000. This connector has female sockets; the mating connector on the CDG cable must have male pins.

PDR 2000 9-Pin 'D' – MKS Baratron 15-Pin 'D' Connections			
PDR Pin	**MKS Name**	**Color**	**Tube Pin/Connection Name**
1	Tube #1 Signal	White	Tube#1, Pin 2/Signal Output
2	Tube #2 Signal	White	Tube#2, Pin 2/Signal Output
3	Tube #2 Signal Return	Brown	Tube#2, Pin 12/Signal Common
4	+15 volts	Red	Tube#1, Pin 7/+15 VDC
5	+15 volts	Red	Tube#2,Pin 7/+15 VDC
6	-15 volts	Green	Tube#1, Pin 6/-15 VDC
7	-15 volts	Green	Tube#2, Pin 6/-15 VDC
8	Tube #1 Signal Return	Brown	Tube#1, Pin 12/Signal Common
9	Electronics Common	Black/shield . Black/shield	Tube#1, Pins 5/Pwr.Comm & 15/& Chassis Gnd Tube#2,Pins 5/Pwr.Comm & 15/&Chassis Gnd

Table 2: PDR 2000 9-Pin 'D' - MKS Baratron 15-Pin 'D' Connections

PDR 2000 9-Pin 'D' - MKS Baratron 5-Pin Phoenix Connections			
PDR Pin	**MKS Name**	**Color**	**Tube Pin/Connection Name**
1	Tube #1 Signal	White	Tube#1, Pin 3/Signal Output

2	Tube #2 Signal	White	Tube#2, Pin 3/Signal Output
3	Tube #2 Signal Return	Brown	Tube#2, Pin 4/Signal Common
4	+15 volts	Red	Tube#1, Pin 1/+15 VDC
5	+15 volts	Red	Tube#2,Pin 1/+15 VDC

Making Accessory Connections

The 15-pin D-sub Accessory Connector is on the rear panel of the PDR 2000. The connector has female pins. The mating connector must have male pins. Mating D-sub 15 connectors are available from many of the normal electronic sources. If you need help identifying a source, please contact us.

Figure 5: RS-232 I/O; Analog Out; Relays

The following are pin assignments for the Accessory Connector.

PDR 2000 15 Pin - Accessory Connector Signals and Pins	
15-pin	**Accessory Connector**
Pin 1	Set point #1 relay, normally closed
Pin 2	Set point #1 relay, common
Pin 3	Set point #1 relay, normally open
Pin 4	Set point #2 relay, normally closed
Pin 5	Set point #2 relay, common
Pin 6	Set point #2 relay, normally open
Pin 7	Tx, RS-232 signal out of the PDR 2000; 9600-N-8-1
Pin 8	Rx, RS-232 signal into the PDR 2000
Pin 9	Ground, RS-232 and analog common

Chapter 3: Operation

Sequence After Power Being Turned On

Plug the AC power end of the power cord into an electrical outlet. The loudspeaker will “beep” and test all indicators while the controller executes its self test. After being turned on, the instrument will go through the following sequence:

1. “beeper”
2. indicators for TORR, MTORR, MBAR, µBAR, Kpa, and Pa
3. 10 LED indicators for set points and other functions
4. all four digits will light, including decimal points
5. display shows the model number of the instrument, **908A**
6. display shows software version, e.g. **1.10**

The PDR 2000 will go into normal operation and begin measuring pressure. If the CDG is not connected, the display will show **OFF**. If the system pressure is greater than 10.00 ktorr, the display will show **OFF.**

Front Panel Controls

The Model PDR 2000 allows flexible configuration of operation using simple entry from the front panel

Description of Parameter Selection and Adjustment

Set Pt 1 High

Default Value: OFF

This sets the high limit of the set point. Above this pressure, the set point relay will be de-energized. Press the RAISE or LOWER buttons to enter the value desired. The minimum value is OFF; this shuts the set point off. The next increment is 0.2% of the full scale range. For example, if the full scale range is 1 torr, the increment sequence is OFF, 2.0 mTorr, 3.0 mTorr, etc.

When the RAISE or LOWER buttons are pressed, the display will change slowly at first. If you hold the button down for a few seconds, the rate of change will increase to allow you to make large changes more quickly.

SET PT 1 HIGH operates in conjunction with SET PT 1 LOW. While the PDR 2000 is in this mode, the set point may be assigned to either GAGE 1 or GAGE 2 by pressing the GAUGE SELECT button.

Set Pt 1 Low

Default Value: OFF

This sets the low limit of the set point. This is the pressure at which the set point relay will be energized. Operation is similar to that of SET PT 1 HIGH above. The minimum value is OFF; this shuts the set point off. The next increment is 0.1% of the full scale range. For example, if the full scale range is 1 torr, the increment sequence is OFF, 1.0 mTorr, 2.0 mTorr, etc.

Note

Note

HEATED CDGs

When using heated or temperature-controlled CDGs, you should wait four hours before adjusting the PDR 2000 or the CDG. This will allow the CDG to come to its regulated temperature. When you are confident the CDG is at a stable temperature, adjust the zero adjustment on the CDG until the PDR 2000 display shows a value close to zero.

Reset of Stored (Default) Values

This allows you to recover the factory (default) settings for all stored values and resets the SET POINTS to off. For a system that is far out of calibration, the factory settings provide a good starting point for re-calibrating or adjusting the gauge controller.

To recover the factory settings:

1. Unplug the PDR 2000 from its power source.
2. Press and hold the RAISE and LOWER buttons at the same time.
3. Plug in the power cord, while holding the depressed RAISE and LOWER buttons.

You will hear a few short 'chirps' from the loudspeaker confirming the factory settings have been entered. The digital display will show **RST** to confirm the reset has been entered.

Set Point Operation

When pressure values have been entered for a set point (1 or 2) and assigned to a gauge (1 or 2), the set point relay operates as follows:

- As the pressure on the assigned gauge falls through the chosen "Set Point N Low" pressure, the relay actuates, either opening (if the Normally Closed pin has been used on the Auxiliary I/O connector) or closing (if the Normally Open pin has been used on the Auxiliary I/O connector).
- Likewise, as the pressure on the assigned gauge rises through the chosen "Set Point N High" pressure, the relay de-actuates, either closing (if the Normally Closed pin has been used on the Auxiliary I/O connector) or opening (if the Normally Open pin has been used on the Auxiliary I/O connector).
-

Reading Pressure

Pressure display and ranging are automatic in the PDR 2000. Most readings will take place between zero pressure and the full scale of the PDR 2000. Table 5 that follows, will help explain the operation.

PDR 2000 Ranges: Sensor, High, Low, Set Points

Sensor Range Full-Scale	PDR 2000 Lowest Scale	PDR 2000 Highest Scale	Highest Resolution	Lowest Recommended Reliable Value	Lowest Set Point	Highest Set Point Highest

100 torr	X.XX torr	XX.X torr	0.01 torr	0.1 torr	0.2 torr	99.9 torr
20 torr	XXX mtorr	XX.X torr	1 mtorr	20 mtorr	40 mtorr	19.9 torr
10 torr	XXX mtorr	X.XX torr	1 mtorr	10 mtorr	20 mtorr	9.99 torr
2 torr	XX.X torr	X.XX torr	0.1 mtorr	2 mtorr	4.0 mtorr	1.99 torr
1 torr	XX.X mtorr	XXX mtorr	0.1 mtorr	1 mtorr	2.0 mtorr	999 mtorr
100 mtorr	X.XX mtorr	XX.X mtorr	0.01 mtorr	0.1 mtorr	0.2 mtorr	99.9 mtorr
50 mtorr	X.XX mtorr	XX.X mtorr	0.01 mtorr	0.05 mtorr	0.1 mtorr	49.9 mtorr
20 mtorr	X.XX mtorr	XX.X mtorr	0.01 mtorr	0.1 mtorr	0.04 mtorr	19.9 mtorr

Table 5: PDR 2000 Ranges: Sensor, High, Low, Set Points

Note

- From 100% of full scale to approximately 105% of full scale, the display will flash.
- Above approximately 105% of full scale, the display will indicate “OFF”.
- Prior to proper setting of zero, the display may show a negative value, as low as –1% of full scale.

  Of course negative readings are meaningless, but only provide span for adjustment.
- Below approximately –1% of full scale, the display will indicate “LO”. Proper adjustment of PDR2000 zero and sensor zero will move readings out of the negative range.

Analog Output

0.016 mTorr (µBar)	0.10
0.10 mTorr (µBar)	0.50

The Commands Used in the PDR 2000:

Pressure

To read the pressure of both gauges:

Send “p” (ASCII value 112); the PDR 2000 sends pressure for gauge 1 and gauge 2 to the terminal. The output is in the format:

ABCDeE FGHIeJ

Where:

- *ABCD* is the multiplier and *E* is the exponent for CDG #1.
- *FGHI* is the multiplier and *J* is the exponent for CDG #2.

Some examples follow on the next page in Table 7.

Serial Output and Displayed Pressure	
Displayed Pressure	**Serial Output**
OFF	Off
LO	Low
0.000 mTorr	0.000e-3
0.800mTorr	0.800e-3
2.800 mTorr	2.800e-3
-1.600 mTorr	-1.600e-3
57.10 mTorr	57.10e-3
2.340 Torr	2.340e+0
105.0 Torr	105.0e+0
4115 Torr	4115e+0
9999 Torr	9999e+0

Table 7: Serial Output and Displayed Pressure

Since both gauges are maintained in an active state, pressure data taken over the serial port are valid for both gauges at the same time, regardless of which gauge is shown on the digital display.

Full Scale Of the Gauges

To read the full scale range selected during set up for each gauge:

Send “f” (ASCII value 102); the PDR 2000 returns full scale, which the user has selected for each gauge in the format:

JKLMeN OPQReS

Where:

- *JKLM* is the multiplier and *N* is the exponent for CDG #1.
- *OPQR* is the multiplier and *S* is the exponent for CDG #2.
- Some examples follow on the next page in Table 8.

Serial Output and Full Scale Range Setting	
Full Scale Serial	**Serial Output**
50 mTorr	50.00e-3
100 mTorr	100.0e-3
1 Torr	1.000e+0
100 Torr	100.0e+0
1000 Torr	1000e+0
10000 Torr	10.000e+3

Table 8: Serial Output and Full Scale Range Setting

Units of Measurement

To read the chosen units of measure (both gauges):

Send “u” (ASCII value 117); the PDR 2000 returns:

Torr

Changing Fuses

The controller contains two fuses. Both fuses are held in the fuse assembly that is part of the power module located on the back panel of the controller.

To change fuses, do the following:

1. Unplug the line cord from the power entry module at the rear of the PDR2000.
2. Locate the fuse block immediately below the line cord socket.
3. Press the tab of the fuse assembly and withdraw the fuse assembly from the power module.
4. Turn the fuse assembly around so that the fuses are facing you.
5. Check both fuses; replace the burnt-out fuse with a fuse of the appropriate rating (refer to Chapter One for specifications information).
6. Reinsert the fuse assembly into the power module; push it in until the ears click into place.

Below is a table for information on the replacement fuse type: 5 mm X 20 mm, regular 1 amp

Information on Replacing Fuses	
Manufacturer	**Fuse Type**
Bussman	GDB-1A
Littlefuse	217 001

Table 9: Information on Replacing Fuses

Schematic Diagrams

Because of the proprietary nature of our products, we do not supply schematic diagrams or software listings. If you have any problem with operation or interface to any of our products, please contact us. We will do everything we can to serve your needs.

Trouble Shooting

Below is a checklist for trouble shooting.

- If the self-test fails, run the self-test again by turning the power off and then on again. If it fails again, call MKS Instruments. If fuses burn out, check to see that the proper voltage has been supplied to the power input module.

- If fuses burn out repeatedly, call MKS Instruments.
- If the digital display consistently shows **-LO** or **OFF**, it may be that one of the internal power supply protection devices has removed power to the CDG. You may check this by measuring the voltage at the connector or cable for the unaffected gauge. Since power for both gauges use the same protection device, either connector will show the power supply voltages. Normal range for the voltages is 14.5 to 15.5 volts for both +15 volts and -15 volts. +15 may be measured on the red wire; -15 is on the green wire; power return is on the black wire. If the power supply protection has shut the power off, you will typically measure less than 4 volts on the affected supply.
- If you verify that either power supply is shut off, remove power from the CDG for a few minutes to allow the protection device to reset itself. The protection device does not need to be replaced; it is a reusable thermal fuse.
- You may wish to determine the cause for the loss of power supply voltage before applying power again. The PDR 2000 will protect itself if it finds excessive power draw again.
- It is normal for the PDR 2000 to feel warm to touch along the left side of the case. This is especially true when operating heated CDGs because of the greater power they require.
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