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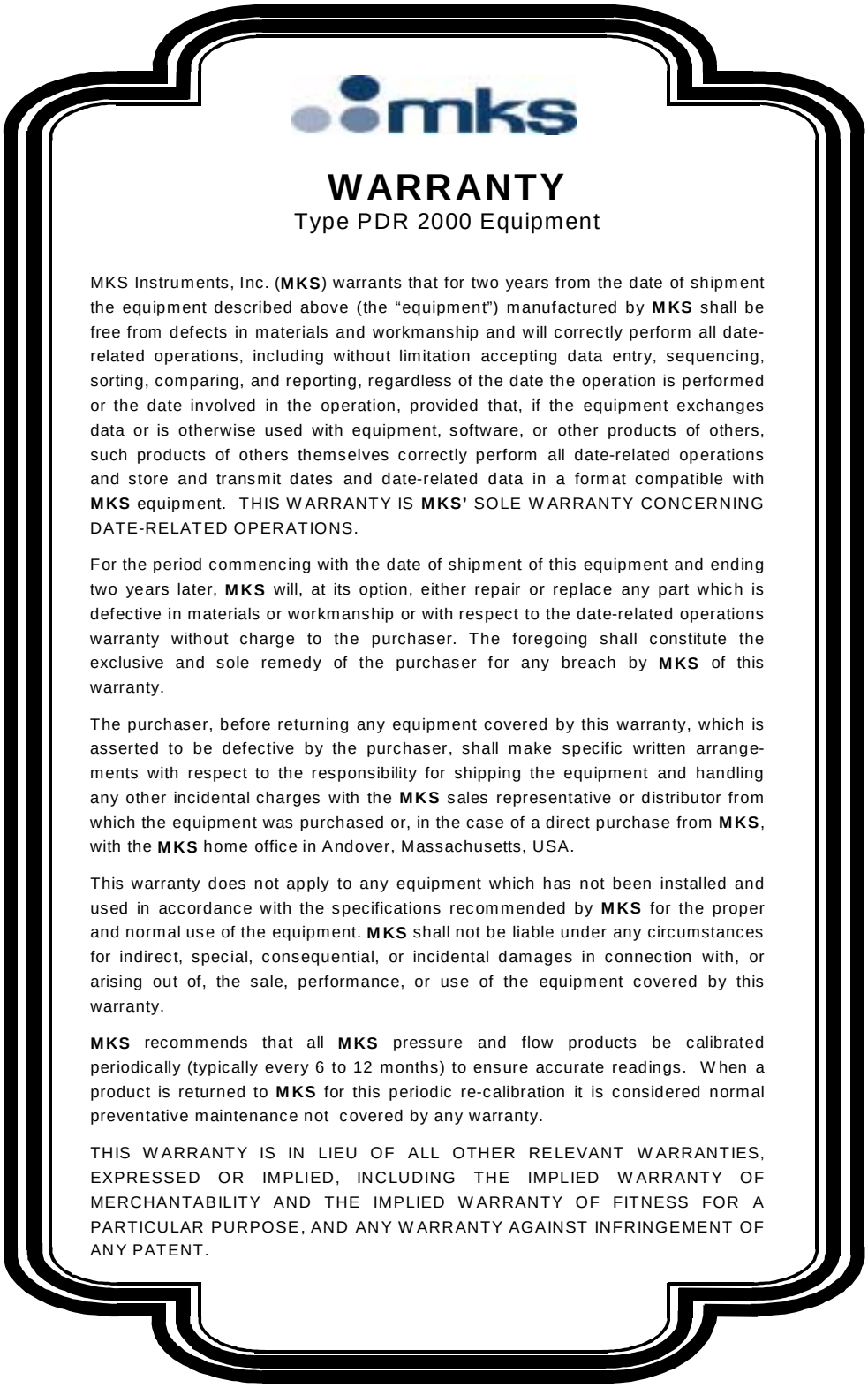


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Instruction Manual

MKS Type PDR 2000
Dual Capacitance Diaphragm
Gauge Controller

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WARRANTY

Type PDR 2000 Equipment

MKS Instruments, Inc. (**MKS**) warrants that for two years from the date of shipment the equipment described above (the "equipment") manufactured by **MKS** shall be free from defects in materials and workmanship and will correctly perform all date-related operations, including without limitation accepting data entry, sequencing, sorting, comparing, and reporting, regardless of the date the operation is performed or the date involved in the operation, provided that, if the equipment exchanges data or is otherwise used with equipment, software, or other products of others, such products of others themselves correctly perform all date-related operations and store and transmit dates and date-related data in a format compatible with **MKS** equipment. THIS WARRANTY IS **MKS'** SOLE WARRANTY CONCERNING DATE-RELATED OPERATIONS.

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MKS Type PDR 2000
Dual Capacitance Diaphragm
Gauge Controller

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Safety Information

Symbols Used in This Instruction Manual

Definitions of WARNING, CAUTION, and NOTE messages used throughout the manual.

Warning



The WARNING sign denotes a hazard to personnel. It calls attention to a procedure, practice, condition, or the like, which, if not correctly performed or adhered to, could result in injury to personnel.

Caution



The CAUTION sign denotes a hazard to equipment. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of all or part of the product.

Note



The NOTE sign denotes important information. It calls attention to a procedure, practice, condition, or the like, which is essential to highlight.

Symbols Found on the Unit

The following table describes symbols that may be found on the unit.

Definition of Symbols Found on the Unit			
On (Supply) IEC 417, No.5007	 Off (Supply) IEC 417, No.5008	 Earth (ground) IEC 417, No.5017	 Protective earth (ground) IEC 417, No.5019
 Frame or chassis IEC 417, No.5020	 Equipotentiality IEC 417, No.5021	 Direct current IEC 417, No.5031	 Alternating current IEC 417, No.5032
 Both direct and alternating current IEC 417, No.5033-a	 Class ll equipment IEC 417, No.5172-a	 Three phase alternating current IEC 617-2 No.020206	
 Caution, refer to accompanying documents ISO 3864, No.B.3.1	 Caution, risk of electric shock ISO 3864, No.B.3.6	 Caution, hot surface IEC 417, No.5041	

Table 1: Definition of Symbols Found on the Unit

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 provided by the equipment. MKS Instruments, Inc. assumes no liability for the customer's failure to comply with these requirements.

DO NOT SUBSTITUTE PARTS OR MODIFY INSTRUMENT

Do not install substitute parts or perform any unauthorized modification to the instrument. Return the instrument to an MKS Calibration and Service Center for service and repair to ensure that all safety features are maintained.

SERVICE BY QUALIFIED PERSONNEL ONLY

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified service personnel only.

GROUNDING THE PRODUCT

This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting it to the product input or output terminals. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

DANGER ARISING FROM LOSS OF GROUND

Upon loss of the protective-ground connection, all accessible conductive parts (including knobs and controls that may appear to be insulating) can render an electrical shock.

GROUND AND USE PROPER ELECTRICAL FITTINGS

Dangerous voltages are contained within this instrument. All electrical fittings and cables must be of the type specified, and in good condition. All electrical fittings must be properly connected and grounded.

USE THE PROPER POWER CORD

Use only a power cord that is in good condition and which meets the input power requirements specified in the manual.

Use only a detachable cord set with conductors that have a cross-sectional area equal to or greater than 0.75 mm^2. The power cable should be approved by a qualified agency such as VDE, Semko, or SEV

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) IEC 417, Nr. 5007	 Aus (Netz) IEC 417, Nr. 5008	 Erde IEC 417, Nr. 5017	 Schutzleiter IEC 417, Nr. 5019
 Rahmen oder Chassis IEC 417, Nr. 5020	 Äquipotentialanschluß IEC 417, Nr. 5021	 Gleichstrom IEC 417, Nr. 5031	 Wechselstrom IEC 417, Nr. 5032
 Wechselstrom und Gleichstrom IEC 417, Nr. 5033-a	 Geräteklasse II IEC 417, Nr. 5172-a	 Drehstrom IEC 617-2 Nr. 020206	
 Vorsicht! Bitte Begleitdokumente lesen! ISO 3864, Nr. B.3.1	 Vorsicht! Stromschlaggefahr! ISO 3864, Nr. B.3.6	 Vorsicht! Heiße Fläche! IEC 417, Nr. 5041	

Tabelle 2: Definitionen der am Gerät angebrachten Symbole

Sicherheitsvorschriften und Vorsichtsmaßnahmen

Die untenstehenden allgemeinen Sicherheitsvorschriften sind bei allen Betriebs-phasen dieses Instruments zu befolgen. Jede Mißachtung dieser Sicherheits-vorschriften oder sonstiger spezifischer Warnhinweise in dieser Betriebsanleitung stellt eine Zuwiderhandlung der für dieses Instrument geltenden Sicherheits-standards dar und kann die an diesem Instrument vorgesehenen Schutzvor-richtungen unwirksam machen. MKS Instruments, Inc. haftet nicht für eine Mißachtung dieser Sicherheitsvorschriften seitens des Kunden.

Keine Teile austauschen und keine Veränderungen vornehmen!

Bauen Sie in das Instrument keine Ersatzteile ein, und nehmen Sie keine eigenmächtigen Änderungen am Gerät vor! Schicken Sie das Instrument zu Wartungs- und Reparatur-zwecken an einen MKS-Kalibrierungs- und -Kundendienst ein! Dadurch wird sicher-gestellt, daß alle Sicherheitseinrichtungen voll funktionsfähig bleiben.

Wartung nur durch qualifizierte Fachleute!

Das Gehäuse des Instruments darf vom Bedienpersonal nicht geöffnet werden. Das Auswechseln von Bauteilen und das Vornehmen von internen Einstellungen ist nur von qualifizierten Fachleuten durchzuführen.

Produkt erden!

Dieses Produkt ist mit einer Erdleitung und einem Schutzkontakt am Netzstecker versehen. Um der Gefahr eines elektrischen Schlages vorzubeugen, ist das Netzkabel an einer vorschriftsmäßig geerdeten Schutzkontaktsteckdose anzuschließen, bevor es an den Eingangs- bzw. Ausgangsklemmen des Produkts angeschlossen wird. Das Instrument kann nur sicher betrieben werden, wenn es über den Erdleiter des Netzkabels und einen Schutzkontakt geerdet wird.

Gefährdung durch Verlust der Schutzerdung!

Geht die Verbindung zum Schutzleiter verloren, besteht an sämtlichen zugänglichen Teilen aus stromleitendem Material die Gefahr eines elektrischen Schlages. Dies gilt auch für Knöpfe und andere Bedienelemente, die dem Anschein nach isoliert sind.

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.

Informations relatives à la sécurité Pour le trangdueteur de pression

Symboles utilisés dans ce manuel d'utilisation

Définition des indications AVERTISSEMENT, ATTENTION et REMARQUE utilisées dans ce manuel.

Avertissement 

L'indication AVERTISSEMENT signale un danger potentiel. Elle est destinée à attirer l'attention sur une procédure, une utilisation, une situation ou toute autre chose présentant un risque de blessure en cas d'exécution incorrecte ou de non-respect des consignes.

Attention 

L'indication ATTENTION signale un danger potentiel. Elle est destinée à attirer l'attention sur une procédure, une utilisation, une situation ou toute autre chose présentant un risque d'endommagement ou de dégât d'une partie ou de la totalité de l'appareil en cas d'exécution incorrecte ou de non-respect des consignes.

Remarque 

L'indication REMARQUE signale des informations importantes. Elle est destinée à attirer l'attention sur une procédure, une utilisation, une situation ou toute autre chose présentant un intérêt particulier.

Symboles apparaissant sur l'appareil

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

Définition des symboles apparaissant sur l'appareil			
Marche (sous tension) IEC 417, No. 5007	 Arrêt (hors tension) IEC 417, No. 5008	 Terre (masse) IEC 417, No. 5017	 Terre de protection (masse) IEC 417, No. 5019
 Masse IEC 417, No. 5020	 Equipotentialité IEC 417, No. 5021	 Courant continu IEC 417, No. 5031	 Courant alternatif IEC 417, No. 5032
 Courant continu et alternatif IEC 417, No. 5033-a	 Matériel de classe II IEC 417, No. 5172-a	 Courant alternatif triphasé IEC 617-2 No. 020206	
 Attention : se reporter à la documentation ISO 3864, No. B.3.1	 Attention : risque de secousse électrique ISO 3864, No. B.3.6	 Attention : surface brûlante IEC 417, No. 5041	

Tableau 3 : 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

Ne pas utiliser de pièces détachées autres que celles vendues par MKS Instruments, Inc. ou modifier l'appareil sans l'autorisation préalable de MKS Instruments, Inc. Renvoyer l'appareil à un centre d'étalonnage et de dépannage MKS pour tout dépannage ou réparation afin de s'assurer que tous les dispositifs de sécurité sont maintenus.

DÉPANNAGE EFFECTUÉ UNIQUEMENT PAR UN PERSONNEL QUALIFIÉ

L'opérateur de l'appareil ne doit pas enlever le capot de l'appareil. Le remplacement des composants et les réglages internes doivent être effectués uniquement par un personnel d'entretien qualifié.

MISE À LA TERRE DE L'APPAREIL

Cet appareil est mis à la terre à l'aide du fil de terre du cordon d'alimentation. Pour éviter tout risque de secousse électrique, brancher le cordon d'alimentation sur une prise de courant correctement câblée avant de le brancher sur les bornes d'entrée ou de sortie de l'appareil. Une mise à la terre de protection à l'aide du fil de terre du cordon d'alimentation est indispensable pour une utilisation sans danger de l'appareil.

DANGER LIÉ À UN DÉFAUT DE TERRE

En cas de défaut de terre, toutes les pièces conductrices accessibles (y compris les boutons de commande ou de réglage qui semblent être isolés) peuvent être source d'une secousse électrique.

MISE À LA TERRE ET UTILISATION CORRECTE D'ACCESSOIRES ÉLECTRIQUES

Des tensions dangereuses existent à l'intérieur de l'appareil. Tous les accessoires et les câbles électriques doivent être conformes au type spécifié et être en bon état. Tous les accessoires électriques doivent être correctement connectés et mis à la terre.

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

Definiciones de los mensajes de ADVERTENCIA, PRECAUCIÓN Y OBSERVACIÓN usados en el manual.

Advertencia



El símbolo de ADVERTENCIA indica un riesgo. Pone de relieve un procedimiento, práctica, condición, etc., que, de no realizarse u observarse correctamente, podría causar lesiones a los empleados.

Precaución



El símbolo de PRECAUCIÓN indica un riesgo. Pone de relieve un procedimiento, práctica, etc., de tipo operativo que, de no realizarse u observarse correctamente, podría causar desperfectos al instrumento, o llegar incluso a causar su destrucción total o parcial.

Observación



El símbolo de OBSERVACIÓN indica información de importancia. Pone de relieve un procedimiento, práctica, condición, etc., cuyo conocimiento resulta esencial.

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
 Caja o chasis IEC 417, N.° 5020	 Equipotencialidad IEC 417, N.° 5021	 Corriente continua IEC 417, N.° 5031	 Corriente alterna IEC 417, N.° 5032
 Corriente continua y alterna IEC 417, N.° 5033-a	 Equipo de clase II IEC 417, N.° 5172-a	 Corriente alterna trifásica IEC 617-2 N.° 020206	
 Precaución. Consultar los documentos adjuntos ISO 3864, N.° B.3.1	 Precaución. Riesgo de descarga eléctrica ISO 3864, N.° B.3.6	 Precaución. Superficie caliente IEC 417, N.° 5041	

Tabla 4 : Definición de los símbolos que aparecen en la unidad

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.

USAR EL CABLE ELÉCTRICO ADECUADO

Usar únicamente un cable eléctrico que se encuentre en buenas condiciones y que cumpla los requisitos de alimentación de entrada indicados en el manual.

Usar únicamente un cable desmontable instalado con conductores que tengan un área de sección transversal equivalente o superior a 0,75mm². El cable eléctrico debe estar aprobado por una entidad autorizada como, por ejemplo, VDE, Semko o SEV.

USAR LA FUENTE DE ALIMENTACIÓN ELÉCTRICA ADECUADA

Este instrumento debe funcionar a partir de una fuente de alimentación eléctrica que no aplique más voltaje entre los conductores de suministro, o entre uno de los conductores de suministro y la puesta a tierra, que el que se especifica en el manual.

USAR EL FUSIBLE ADECUADO

Usar únicamente un fusible del tipo, clase de voltaje y de corriente adecuados, según lo que se especifica para el instrumento.

EVITAR SU USO EN ENTORNOS EXPLOSIVOS

Para evitar el riesgo de explosión, no usar este instrumento o en un entorno explosivo, a no ser que haya sido certificado para tal uso.

PELIGRO POR ALTO VOLTAJE

Cuando el controlador está encendido, se registra alto voltaje en el cable y en el sensor.

Additional Safety Information

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 that are toxic or flammable. Use such solvents only in areas that are well ventilated to the outdoors and away from electronic equipment, open flames, or other potential ignition sources.

Please Let Us Know...

MKS Instruments products are the most advance instruments of their type available from any manufacturer. We have made this Instruction Manual as complete and clear as possible. Let us know if you have any comments that can make this manual or our products more useful.

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

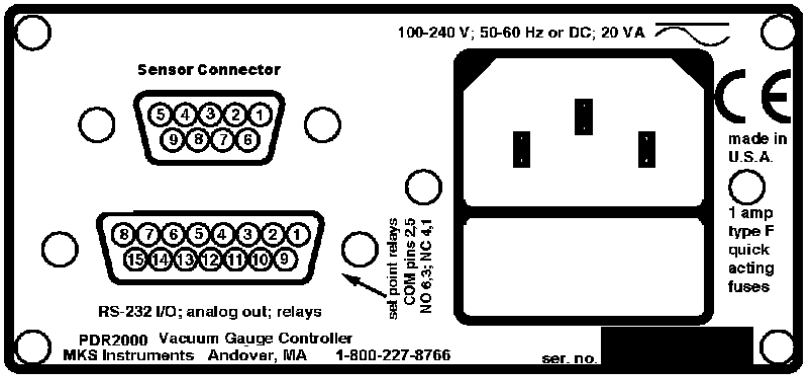


Figure 2: Model PDR 2000 Rear View

Figure 3: Model PDR 2000 Dimensions



How This Manual is Organized

This manual is designed to provide instructions on how to set up, install, and operate a Type PDR 2000 unit.

Before installing your Type PDR 2000 unit in a system and/or operating it, carefully read and familiarize yourself with all precautionary notes in the *Safety Messages and Procedures* section at the front of this manual. In addition, observe and obey all WARNING and CAUTION notes provided throughout the manual.

Chapter One, *General Information*, (this chapter) introduces the product and describes the organization of the manual.

Chapter Two, *Installation*, explains the environmental requirements and describes how to mount the instrument in your system.

Chapter Three, *Operation*, describes how to use the instrument and explains all the functions and features.

Chapter Four, *Maintenance and Troubleshooting*, lists any maintenance required to keep the instrument in good working condition, and provides a checklist for reference should the instrument malfunction.

Customer Support

Standard maintenance and repair services are available at all of our regional MKS Calibration and Service Centers, listed on the back cover. MKS also accepts the instruments of other manufacturers for recalibration using the Primary and Transfer Standard calibration equipment at our regional service centers. If any difficulties arise using the Type PDR 2000 instrument, or to obtain information about companion products MKS offers, contact any authorized MKS Calibration and Service Center.

If you need to return the gauge controller to MKS Instruments for service:

1. Contact MKS Instruments to get a **ERA** (Equipment Return Authorization) number.
2. Pack the instrument securely.
3. Use the original packaging if it is available.
4. If the MKS Instruments PDR 2000 was shipped with a cable and/or CDG sensor, diagnosis and repair will be more efficient if all components are returned together. If this is not convenient, please consult with your MKS Instruments Customer Service Representative
5. If you do not have appropriate packing materials, commercial packing and shipping firm can provide them.
6. Be sure to mark the **ERA** number on the outside of the package.

Warning 

All returns to MKS Instruments must be free of harmful, corrosive, radioactive, and toxic materials.

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Chapter Two: Installation

How To Unpack the PDR 2000 Controller

MKS has carefully packed the Type PDR 2000 unit to reach you in perfect operating order. On receiving the unit, however, you should check for defects, cracks, broken connectors, etc., making sure that the Type PDR 2000 was not damaged during shipment.

Note 

Do *not* discard any packing materials until you have completed your inspection and are sure the unit is intact.

If you find any damage, notify your carrier and MKS immediately. See Customer Support on page 12. Please refer to the last page of this supplement for a list of MKS Calibration and Service Centers.

Unpacking Checklist

- Type PDR 2000 Unit
- Type PDR 2000 Manual (this document)
- power cord
- mounting clips
- D-sub 15 accessory connector

Caution 

Do not plug the power cord in yet.

Mounting the Controller

You can rest the controller unit on a bench, tabletop, or shelf, or you can mount it on a rack or cabinet. The controller unit is housed in a standard 1/8 DIN box. If you are mounting the unit in a panel, the cutout dimensions are 1.78 inch by 3.60 inch (45.2 mm by 91.4 mm). One mounting clip attaches to each of the ides of the controller unit. To attach the clip, slide the beveled surfaces of the clip under the cutout on the side of the box and push the clip toward the back of the unit.

Note  Be sure to mount the unit with adequate space around it for proper air circulation..

Note  Be sure to leave enough clearance at the back of the controller unit for easy access to cable connections.

Selecting the CDG

The Model PDR 2000 controller is designed to work with standard capacitance diaphragm gauges, which operate on ±15 volts. If you have difficulty obtaining a CDG, please contact us at MKS Instruments.

Caution  Use of a CDG other than those, which operate from ± 15 volts, may cause damage to the CDG.

Connecting the CDG

Make sure that the CDG is securely connected to the vacuum system, using good vacuum practice.

Attaching the CDG Cable

The CDG cable has a 9-pin D-sub connector on one end, which plugs into the PDR 2000. There are a variety of conventions for connection to the CDG. You may assemble or modify the cable to adapt to the CDG as needed. Connect the 9-pin D-sub plug of the gauge cable to the 9-pin connector on the back of the PDR 2000 controller unit. Push the plug onto the connector until it

is firmly in place. Tighten the retaining screws to make certain the connector remains in place. Loose connections can cause a faulty reading.

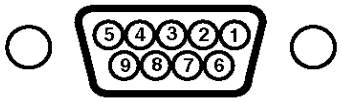


Figure 4: Model PDR 2000 Sensor Connector – 9 Pin Female D-Sub Connector

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
6	-15 volts	Green	Tube#1, Pin 2/-15 VDC
7	-15 volts	Green	Tube#2, Pin 2/-15 VDC
8	Tube #1 Signal Return	Brown	Tube#1, Pin 4/Output Return
9	Electronics Common	Black/shield Black/shield	Tube#1, Pins5/Pwr.Comm & none Tube#2,Pins5/Pwr.Comm & none

Table 3: PDR 2000 9-Pin 'D' - MKS Baratron 5-Pin Phoenix Connections

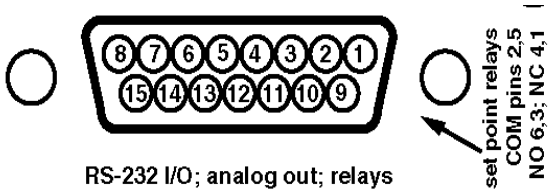
Current available for +15 volts from pins 4 and 5 and for –15 volts from pins 6 and 7 is internally protected and limited to approximately 0.75 amp total for each supply. For example, this allows CDG#1 and CDG#2 to draw 0.375 amp each; or CDG#1 may draw 0.72 amp and CDG#2 may draw 0.03 amp. If excessive current is taken through any of the power outut pins, the internal protection will shut off the power for the affected voltage. It will be necessary to disconnect power for thePDR 2000 for a few minutes to allow the internal protection device to cool and reset itself.

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
Pin 10	No function
Pin 11	CDG#2 buffered analog signal; 1K output
Pin 12	No function
Pin 13	Analog output, 1K output, 0.5 volts/decade
Pin 14	No function
Pin 15	CDG# 1 buffered analog signal; 1K output

Table 4: PDR 2000 15 Pin - Accessory Connector Signals and Pins

Checking Supply Voltage

The Model PDR 2000 incorporates a universal power supply. This allow the PDR 2000 to operate on any input voltage from 90 VAC to 265 VAC, 47 to 65 Hz.

Attaching the Power Cord

Plug the power cord into the receptacle in the power module on the rear of the PDR 2000.

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 buttons labeled GAUGE SELECT, SELECT, RAISE and LOWER. Parameters, which you may adjust, are selected by scrolling through list that begins with SET PT 1 HIGH. Each time the SELECT button is pushed, the led indicator advances to the next parameter. The LED indicators will be lit to indicate which parameter is being adjusted, and the digital display will flash to indicate the value of the parameter being adjusted.

Each push of a button will give a short "beep" from the loudspeaker to confirm that the button was pushed. If you have reached the limit of adjustment or if the button push is not allowed, the loudspeaker will give a long "beep".

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 

SET PT 1 LOW operates in conjunction with SET PT 1 HIGH.

Note 

The High and Low set point allow the user to set the hysteresis of the set point operation. As the system is pumped down, the set point relay will be energized (set point turns on) as the pressure drops below SET PT 1 LOW. The relay will remain energized until the pressure rises above SET PT 1 HIGH.

It is not possible to adjust the High set point to be lower than the Low set point. If you adjust the High set point below the pressure previously selected for the Low set point, the PDR 2000 will automatically reduce the value for the Low set point so that it is the next increment lower than that of the High set point.

Set Pt 2 High

Default Value: OFF

This operates in the same manner as SET PT 1 HIGH, described above.

Set Pt 2 Low

Default Value: OFF

This operates in the same manner as SET PT 1 LOW, described above.

Units mTorr/Torr/kTorr—Bar/mBar/microBar—Pascal/kPascal—Arb

Default Value: Torr

This allows selection of the units to be used in display of the pressure. Press either the RAISE or LOWER buttons to alternate between Torr, mBar and Pascal. You will notice that both the GAGE 1and GAGE 2 indicators will be lit also. This is to let you know that the units of measure apply to both gauges; it is not possible to select Torr for one gauge and mBar for the other gauge. The “Arb” value allows arbitrary units to be used; the value displayed is the same as for Torr units, and can be adjusted using the “Full Scale” and “Calibrate” functions.

Calibrate

Default Value: 1.00 (Internal value)

This allows the user to modify the reading for either gauge by multiplying by a value between 0.500 and 2.000. This is convenient for calibration of the CDG. The CDGs are calibrated by the manufacturer before shipment; we suggest you use this adjustment only if you have reliable calibration data. The multiplier is internal and is not seen by the user. The digital display shows the result of the pressure multiplied by the internal multiplier.

This adjustment may also be used to set the display to some value that is unique to your application or experiment.

Note



This adjustment is applicable to either gauge; please select the appropriate gauge by pressing GAUGE SELECT until the desired gauge is indicated. Use RAISE and LOWER as described above to set to the desired value.

The CALIBRATE function may be adjusted only when the CDG pressure is at 50% of full scale or higher.

Full Scale

Default Value: 1.00 Torr

This adjustment is applicable to either gauge; please select the gauge by pressing GAUGE SELECT until the desired gauge is indicated. Use RAISE and LOWER as described above to set to the desired value.

This allows the user to select the full scale range for each CDG. Press RAISE or LOWER to set the desired full scale range. The full scale ranges available are 20 mTorr, 50 mTorr, 100 mTorr, 1 Torr, 2 Torr, 10 Torr, 100 Torr, 1000 Torr, 5000 Torr and 10,000 Torr.

Zero

Default Value: 0.0 (internal value)

This allows the user to adjust the zero for each CDG. Before making this adjustment, the CDG should be connected to a vacuum system at a pressure lower than 0.1% of the full scale for the CDG. This adjustment may also be used to set the display to a specific value if you know the pressure through other means. For example, if the CDG to be adjusted is attached to a system that has another CDG, which has been independently calibrated, the CDG may be made to read the same as the calibrated gauge.

The ZERO function may be adjusted only when the CDG pressure is at 10% of full scale or lower.

Note



Pressing the [ZERO] key ***only*** adjusts the display! It ***does not*** adjust the output of the gauge or the buffered analog output.

Note



INITIAL ZERO

When installing a CDG for the first time, it is good practice to reset the PDR 2000 internal settings. This will prevent errors in set up; e.g., if the CDG has not had its internal zero properly adjusted.

To reset the PDR 2000, see **Reset of Stored Value**s, just below.

To adjust the zero, the vacuum system to which the CDG is connected should be at a pressure lower than 0.001 times the full-scale range of the CDG. For example, for a 10 Torr CDG, the system should be at a pressure lower than 0.01 torr, or 10^{-2} torr.

Adjust the zero adjustment on the CDG (usually a trimpot) until the PDR 2000 display shows a value close to zero. After this initial adjustment, the display may be conveniently set to zero using front panel controls on the Model PDR 2000.

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**
1000 torr	XX.X torr	XXX torr	0.1 torr	1 torr	2 torr	999 torr

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

The analog output is calculated from the value of the digital display. The output is logarithmic, 0.5 volt/decade. The source impedance for the output is 1 K ohm. The output voltage is calculated from: $V=0.50*(\log_{10}(100*Pressure))$

where V is the Analog Output in volts; P is the pressure in mTorr or µbar. Some examples follow because of normal tolerances in the electronics; there may be minor differences in the values you observe compared to those shown.

Analog Output and Displayed Pressure	
Displayed Pressure	**Analog Output – volts**
LO	0.00
0 mTorr (µBar) or less	0.00

0.016 mTorr (µBar)	0.10
0.10 mTorr (µBar)	0.50
0.20 mTorr (µBar)	0.65
1.0 mTorr (µBar)	1.00
1.58 mTorr (µBar)	1.10
10.0 mTorr (µBar)	1.50
100 mTorr (µBar)	2.00
1.00 Torr (mBar)	2.50
10.0 Torr (µBar)	3.00
100 Torr (mBar)	3.50
999 Torr (mBar)	4.00
10.00 kTorr (mBar)	4.50
OFF	5.00

Table 6: Analog Output and Displayed Pressure

The pressure as a function of the Analog Output voltage is:

$$\mathbf{P=0.01*log^{-1}(2V)} \text{ or}$$

$$\mathbf{P=0.01*10^{(2V)}}$$

Note 

The analog output is valid for the gauge that is selected on the display.

Serial Interface

The RS-232 serial port gives pressure readings when requested by the terminal. The interface is standard RS-232 format: 9600 baud, 8-bits, no parity, 1 stop bit. The interface is through the 15-pin D-sub accessory connector.

- Pin 7 is Tx (signal from the PDR 2000 to the terminal)
- Pin 8 is Rx (signal from the terminal to the PDR 2000)
- Pin 9 is return (ground).

The serial port allows reading pressure and other parameters of the PDR 2000; it is not possible to modify stored parameters over the serial port.

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

or

mBar

or

Pascal

or

Arb

Set Point #1

To read the setting and status of set point #1:

Send “1” (ASCII value 49); the PDR 2000 returns information for set point #1 in the format:

STUVeW XYZAeBCD

where:

- *STUV* is the multiplier and *W* is the exponent for set point #1 high
- *XYZA* is the multiplier and *B* is the exponent for set point #1 low
- *C* is set point relay status; 0= relay is not energized, 1=relay is energized.
- *D* is the gauge to which the set point #1 has been assigned: either 1 or 2

Set Point #2

To read the setting and status of set point #2:

Send “2” (ASCII value 50); the PDR 2000 returns information for set point #2 in the same format as for set point #1, above.

Model and Software Revision

To read the software identification:

Send “v” (ASCII value 118); the PDR 2000 returns the model number of the instrument and the revision number, as in the following example 908A ver 1.10

Chapter Four: Maintenance and Troubleshooting

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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