



107321-P1
Rev F, 2/98
Instruction Manual

MKS Type PDR-D-1/PDR-D-2 Power Supply Digital Readout



WARRANTY

Type PDR-D-1/PDR-D-2 Equipment

MKS Instruments, Inc. (**MKS**) warrants that the equipment described above (the "equipment") manufactured by **MKS** shall be free from defects in materials and workmanship for a period of one year from date of shipment and will for a period of two years from the date of shipment, 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-D-1/PDR-D-2
Power Supply
Digital Readout**

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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. 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. 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 II 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 mm². 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.

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 Betriebsphasen dieses Instruments zu befolgen. Jede Mißachtung dieser Sicherheitsvorschriften oder sonstiger spezifischer Warnhinweise in dieser Betriebsanleitung stellt eine Zuwiderhandlung der für dieses Instrument geltenden Sicherheitsstandards dar und kann die an diesem Instrument vorgesehenen Schutzvorrichtungen 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 Reparaturzwecken an einen MKS-Kalibrierungs- und -Kundendienst ein! Dadurch wird sichergestellt, 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 $0,75 \text{ mm}^2$ 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

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 triphase 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 mm². 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.º 5007	Apagado (alimentación eléctrica) IEC 417, N.º 5008	Puesta a tierra IEC 417, N.º 5017	Protección a tierra IEC 417, N.º 5019
			
Caja o chasis IEC 417, N.º 5020	Equipotencialidad IEC 417, N.º 5021	Corriente continua IEC 417, N.º 5031	Corriente alterna IEC 417, N.º 5032
			
Corriente continua y alterna IEC 417, N.º 5033-a	Equipo de clase II IEC 417, N.º 5172-a	Corriente alterna trifásica IEC 617-2 N.º 020206	
			
Precaución. Consultar los documentos adjuntos ISO 3864, N.º B.3.1	Precaución. Riesgo de descarga eléctrica ISO 3864, N.º B.3.6	Precaución. Superficie caliente IEC 417, N.º 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 descargas 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.

Chapter One: General Information

Introduction

The MKS Type PDR-D-1 and PDR-D-2 digital readout and power supply units are packaged in a plastic DIN enclosure (96 mm x 48 mm x 150 mm). The PDR-D-1 unit is configured for 115 Volt input power, whereas the PDR-D-2 unit is configured for 230 Volt input power. Either unit can be mounted in any panel through a standard DIN 96 mm by 48 mm cutout. The PDR-D unit can also be used as a stand alone instrument.

The power supply provides ± 15 VDC @ 35 mA and is capable of supplying the input power for any MKS Baratron[®] listed in Table 5.

Baratron Transducers Compatible with a PDR-D Power Supply Readout	
121A/B	422C
122A	622A
221B	626A
223B	722A

Table 5: Baratron Transducers Compatible with a PDR-D Power Supply Readout

The pressure transducer is connected to the PDR-D unit through a terminal block on the rear panel. Refer to Table 6, page 22, for the interface cables available.

How This Manual is Organized

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

Before installing your Type PDR-D 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, *Overview*, gives a brief description of the instrument and its functionality.

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

Chapter Five, *Maintenance and Troubleshooting*, lists any maintenance required to keep the instrument in good working condition. It also provides a fault isolation procedure you should follow should the PDR-D unit malfunction.

Appendix A, *Product Specifications*, lists the specifications of the instrument.

Appendix B, *Model Code Explanation*, describes the model code.

Customer Support

Standard maintenance and repair services are available at all of our regional MKS Calibration and Service Centers, listed on the back cover. In addition, MKS accepts the instruments of other manufacturers for recalibration using the Primary and Transfer Standard calibration equipment located at all of our regional service centers. Should any difficulties arise in the use of your Type PDR-D instrument, or to obtain information about companion products MKS offers, contact any authorized MKS Calibration and Service Center. If it is necessary to return the instrument to MKS, please obtain an ERA Number (Equipment Return Authorization Number) from the MKS Calibration and Service Center before shipping. The ERA Number expedites handling and ensures proper servicing of your instrument.

Please refer to the inside of the back cover of this manual for a list of MKS Calibration and Service Centers.

Warning

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

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Chapter Two: Installation

How To Unpack the Type PDR-D Unit

MKS has carefully packed the Type PDR-D unit so that it will reach you in perfect operating order. Upon receiving the unit, however, you should check for defects, cracks, broken connectors, etc., to be certain that damage has not occurred during shipment.

Note

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

If you find any damage, notify your carrier and MKS immediately. If it is necessary to return the unit to MKS, obtain an ERA Number (Equipment Return Authorization Number) from the MKS Service Center before shipping. Please refer to the inside of the back cover of this manual for a list of MKS Calibration and Service Centers.

Caution

Only qualified individuals should perform the installation and any user adjustments. They must comply with all the necessary ESD and handling precautions while installing and adjusting the instrument. Proper handling is essential when working with all highly sensitive precision electronic instruments.

Unpacking Checklist

Standard Equipment:

- Type PDR-D-1 or PDR-D-2 Unit
- Type PDR-D-1/PDR-D-2 Instruction Manual (this book)
- Fuse carrier (part number 025-4911)
- MD. plastic shield (part number 172-6438)
- Two screws

Optional Equipment:

- Interface cables

Interface Cables

MKS offers interface cables to connect a transducer to the PDR-D readout, as listed in Table 6.

Interface Cables	
To Connect A . . .	Cable Number
121A, 221B	CB472-1-xx
223B, 622A, 122A, 722A (terminal strip connector)	CB473-1-xx
626A, 122B, 722A (15-pin connector)	CB127-1-xx
<i>where X indicates the length of the cable, in feet</i>	

Table 6: Interface Cables

Generic Shielded Cable Description

Should you choose to manufacture your own cables, follow the guidelines listed below:

1. The cable must have an overall metal *braided* shield, covering all wires. Neither aluminum foil nor spiral shielding will be as effective; using either may nullify regulatory compliance.
2. The connectors must have a metal case which has direct contact to the cable's shield on the whole circumference of the cable. The inductance of a flying lead or wire from the shield to the connector will seriously degrade the shield's effectiveness. The shield should be grounded to the connector before its internal wires exit.
3. With very few exceptions, the connector(s) must make good contact to the device's case (ground). "Good contact" is about 0.01 ohms; and the ground should surround all wires. Contact to ground at just one point may not suffice.
4. For shielded cables with flying leads at one or both ends; it is important at each such end, to ground the shield *before* the wires exit. Make this ground with absolute minimum length. (A ¼ inch piece of #22 wire may be undesirably long since it has approximately 5 nH of inductance, equivalent to 31 ohms at 1000 MHz). After picking up the braid's ground, keep wires and braid flat against the case. With very few exceptions, grounded metal covers are not required over terminal strips. If one is required, it will be stated in the Declaration of Conformity or in the instruction manual.
5. In selecting the appropriate type and wire size for cables, consider:
 - A. The voltage ratings.
 - B. The cumulative I^2R heating of all the conductors (keep them safely cool).
 - C. The IR drop of the conductors, so that adequate power or signal voltage gets to the unit.
 - D. The capacitance and inductance of cables which are handling fast signals, (such as data lines or stepper motor drive cables).
 - E. That some cables may need internal shielding from specific wires to others; please see the instruction manual for details regarding this matter.

Cable Connections

The color code for the interface cables is described in Table 7.

Interface Cable Color Code	
Signal	Wire Color
+15 VDC Power Input	Green
-15 VDC Power Input	White
DC Signal*	Red
Power Ground (Return)	Black
Signal Ground (Return)	Black
Chassis (Case)	Black (large)
* At the transducer connector, this signal is referred to as the DC Output while at the PDR-D connector it is labeled "PRESS IN."	

Table 7: Interface Cable Color Code

Product Location and Requirements

Operating Environmental Requirements


- Maximum Operating Temperature: 50° C (122° F)
- Ventilation requirements include sufficient air circulation
- Connect the power cord into a grounded outlet

Electrical Information


Grounds

The PDR-D unit has a three ground system which allows for the separation of the power supply return (P Gnd) and the DC Output Signal return (S Gnd) and the Chassis ground. This is done primarily for use with the 221 and 221A-B transducers to keep these grounds separate in the power cable. When used with transducers that have only a two ground system (such as the 220, 222, and 223) connect the P Gnd and S Gnd to that transducer's common ground and then connect the two chassis grounds together.

Setup

Note  Mount the PDR-D unit in a location that provides sufficient air circulation.

The PDR-D mounts through a standard DIN 96 mm x 48 mm opening in any panel (maximum thickness of $\frac{3}{4}$ inch). A plastic bracket slides over the unit into slots on the sides of the enclosure to hold the unit in place. Tighten the screws in the bracket against the rear panel. Figure 1 shows the recommended panel cutout dimensions. Without the bracket the PDR-D unit can be used as a stand alone unit.

Note  All dimensions are listed in inches with millimeters referenced in parentheses.

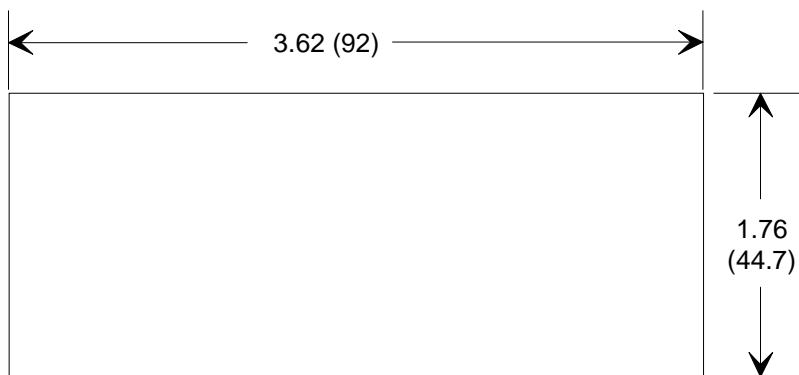


Figure 1: Recommended Panel Cutout Dimensions

Chapter Three: Overview

Front Panel Controls

Zero Control

This control is used as a fine zero for the pressure transducer. The pressure transducer should be pumped down below its resolution before this adjustment can be made. The zero control on the pressure transducer is used as a coarse zero.

Note

To access the remaining front panel controls, you must remove the plastic bezel and lens.

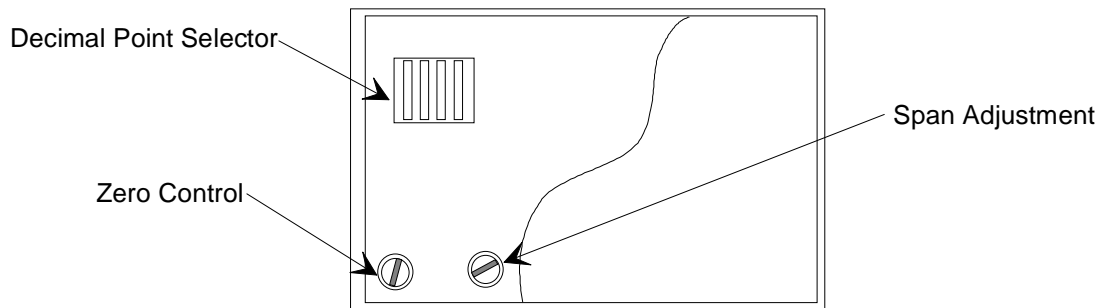


Figure 2: Front Panel Controls

How To Access Front Panel Controls

Figure 3 shows the how the components of the PDR-D enclosure fit together.

Figure 3: Exploded View of the PDR-D Unit

Span Adjust

This control is used to set the proper full scale display reading for a full scale input, that is, a +10 VDC input yields a display of +10000.

Note

The span adjustment is made at the factory. Do not adjust the span control.

Decimal Point Selector

This four pole slide switch is used to select the placement of the decimal point in the front panel display as described in Table 8.

Note



Make sure that only one switch is in the “On” position. If more than one switch is in the “On” position, multiple decimal points will result.

Decimal Point Selector				
Full Scale Pressure	Selection Switch			
	1	2	3	4
1 Torr	On	Off	Off	Off
10 Torr	Off	On	Off	Off
100 Torr	Off	Off	On	Off
1000 Torr	Off	Off	Off	On
10000 Torr	Off	Off	Off	Off

Table 8: Decimal Point Selector

Rear Panel Controls

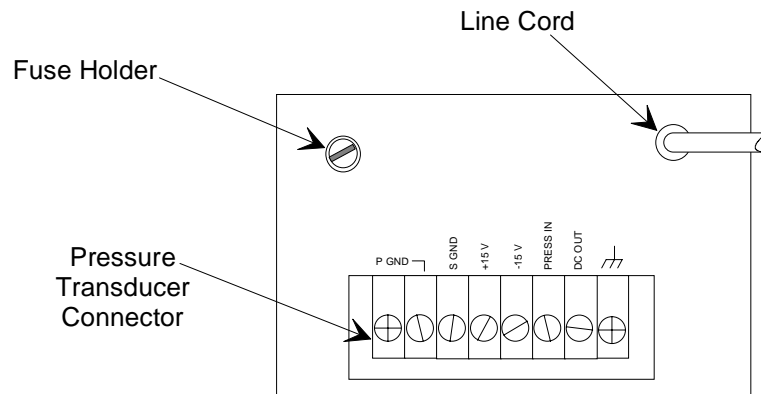


Figure 4: Rear Panel Controls

Pressure Transducer Connector

The pressure transducer connector provides a connection to your pressure transducer, supplies power and receives the pressure signal from the transducer. The DC Output signal is also present on this connector. This output voltage is capable of driving a load of 10K ohms or greater and is referenced to S Gnd.

Fuse Holder

The PDR-D unit has line fuse to protect the internal circuitry. The “high side” of the line is fused. This unit is shipped from the factory with a U.L. 198.6 approved type 3AG fuse. The PDR-D unit also includes an extra fuse carrier that accepts the I.E.C. 127 approved 5 x 20 mm fuse. Choose whichever fuse is most readily available.

Fuse Information		
Nominal Line Voltage	U.L. 198.6 3AG	I.E.C. 127 5 x 20 mm
115V, 50-60 Hz	1/8 ASB	FST 125 mA
230 V, 50-60 Hz	1/16 ASB	FST 63 mA

Table 9: Fuse Information

Line Cord

The line cord provides a connection for the 115 or 230 VAC to the PDR-D. Multiple taps on the power transformer select 115 VAC or 230 VAC operation. Unless otherwise marked, all units are shipped as 115 VAC.

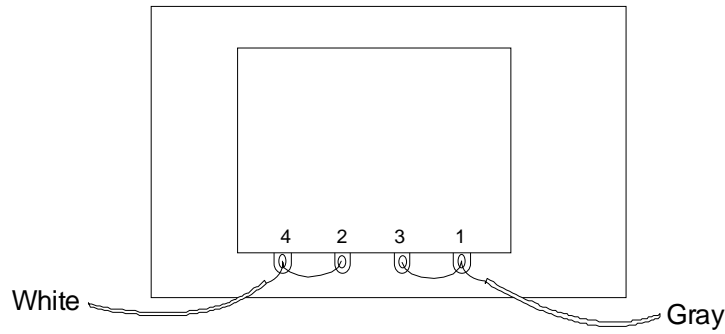


Figure 5: Jumper Position for 115 VAC Operation

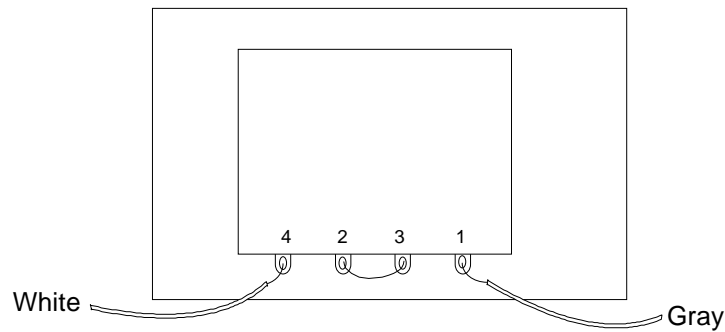


Figure 6: Jumper Position for 230 VAC Operation

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Chapter Four: Operation

General Information

1. Connect the PDR-D unit to the pressure transducer. Refer to the instruction manual of the transducer for the proper input connections.
2. Select the proper decimal point with the front panel decimal switch.
Refer to Figure 2, page 25, for the location of the decimal switch.
3. Apply power to the PDR-D unit.
4. Pump the pressure transducer down to a pressure less than its resolution and check the zero. Correct if necessary with the front panel zero control.
Refer to Figure 2, page 25, for the location of the zero control.

Theory of Operation

Pressure Signal

The signal is received from the pressure transducer and applied to the input amplifier where the fine zero correction is applied. The output from this amplifier is applied to the following points:

- DC Output Terminal
- 4½ Digit Display
- Overrange Comparator

Overrange Comparator

This circuit monitors the input to the digital display. When this input exceeds ± 11 Volts, this circuit blanks the display to indicate an overranged condition.

Display and Decimal Selector

The display receives the pressure signal from the input amplifier. The display is a 4½ digit dual slope integrating meter with decimal points that are programmed with a 4 pole slide switch. In the event of an overload, meaning any voltage ≥ 11 Volts, the display will be blanked.

Power Supplies

These supplies provide power to the PDR-D as well as power for the attached transducer. These supplies are internally protected against shorts and overheating.

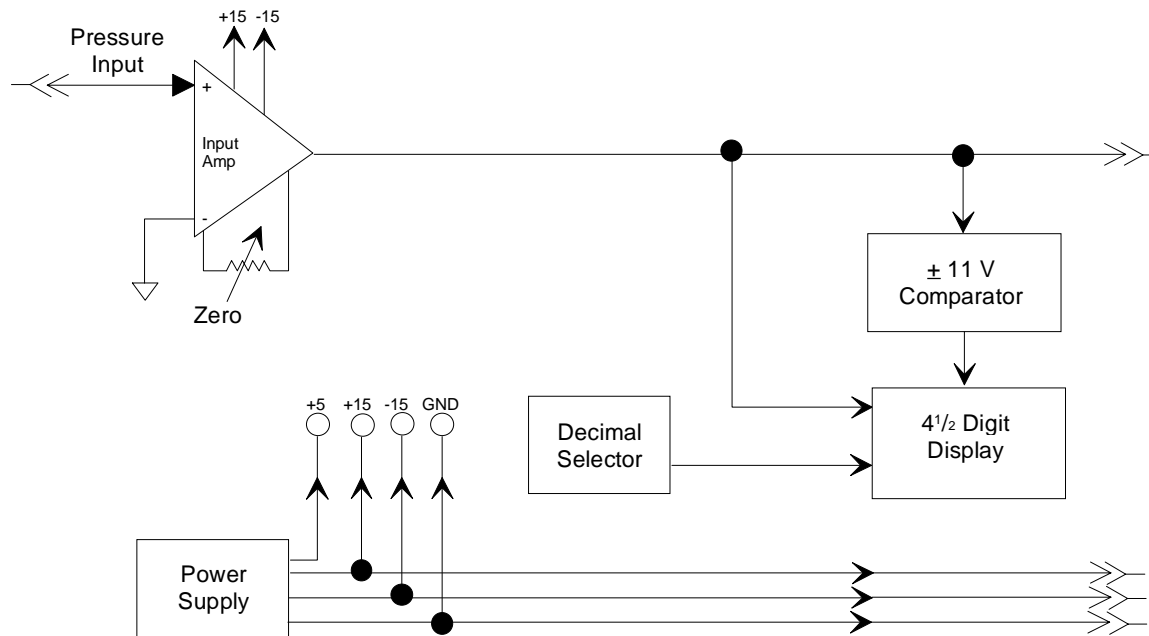


Figure 7: Block Diagram of the PDR-D Unit

Chapter Five: Maintenance and Troubleshooting

General Information

Periodically check for wear on the cables and inspect the enclosure for visible signs of damage.

Should it become necessary to attempt repair of the unit in the field, first isolate the source of the problem; the pressure transducer or the PDR-D unit. Any repair to the pressure transducer will usually require a recalibration. The PDR-D unit may be repaired without calibration as long as none of the calibration adjustments have been tampered with or changed.

How To Clean the Unit

Periodically wipe down the unit with a damp cloth.

Fault Isolation

The first approach to deal with a problem in a system is to isolate the section of the system where the fault lies. Once this is done, the problem can be corrected. The PDR-D unit and the associated pressure transducer can be broken down into the following sections:

- Power Supply
- Pressure Signal Amplification and Readout

Since a problem in the power supply will effect the performance of all sections, it is important to begin the fault isolation at this point.

1. Measure the ± 15 Volt supplies on the pressure transducer connector. (Reference to P Gnd.) The voltages should be within the range of 14.7 to 15.3 Volts and the AC ripple should be less than 10 mV peak-to-peak.
2. Measure the +5 Volt supply referenced to D Gnd. The voltage should measure +4.75 to 5.25 Volts and the AC ripple should be below 20 mV peak-to-peak. If the voltages in steps 1 and 2 are within the correct range, proceed to step 5. If the voltages are incorrect, continue with step 3.
3. Disconnect the pressure transducer and repeat the voltage measurements. If the voltages are now correct, the pressure transducer is at fault. If the voltages are still incorrect, the problem is in the circuits of the PDR-D unit or the power supply itself.

4. Isolate the power supply from the circuits in the PDR-D unit by disconnecting the power supply jumpers. This will indicate a defective supply or some form of short or malfunction in the PDR-D circuits.

If the power supply is defective, return the unit to MKS for further diagnostic testing. If the power supply is functioning properly, continue with step 5.

5. Examine the pressure signal path through the system.
6. Use an external meter to measure the output of the pressure transducer (PRESS IN) at the rear terminal block of the PDR-D unit. If this voltage closely (± 0.2 V) tracks¹ the voltage that is displayed on the front panel meter, but is still in error, the PDR-D unit is functioning properly and the problem is in the pressure transducer or cable. If the voltage does not track, proceed to step 7.
7. Troubleshoot the signal path in the PDR-D unit by disconnecting the pressure transducer and replacing it with two resistors connected in the manner shown in Figure 8.

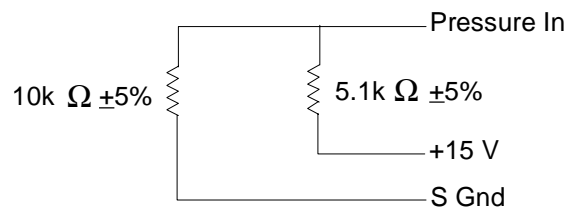


Figure 8: Configuration of Two Resistors

This will produce an input voltage of 9.6 to 10.3 Volts. To produce a zero input, simply short out the 10K resistor.

8. Use an external meter to measure the DC output voltage for this channel. Reference the meter to S Gnd on the input connector. Refer to Figure 4, page 28. This voltage should track the input voltage of step 7 to within ± 0.2 Volts. If it does not, the problem lies in the channel amplifier and zero circuit. If the voltage does track but the digital meter does not agree, either the meter or the overrange comparator is defective. Return the unit to MKS for further troubleshooting.

¹ A voltage above approximately ± 10.8 Volts will cause the digital panel meter to overrange and blank. This is normal.

Appendix A: Product Specifications

Electrical Specifications

Analog DC Output	0 to 10 VDC into 10k Ω or greater load
Input Impedance	900K
Power Line Voltage	117/234 VAC \pm 15%, 50-60 Hz
Power Consumption	7 watts @ 115 VAC - 60 Hz
Power Supply Outputs	\pm 15 V @ 35 mA maximum ripple < 10 mV

Performance Specifications

Accuracy	\pm 0.01% F.S. \pm 1 count
Resolution	1 mV
Zero Temperature Compensation	2 ppm/ $^{\circ}$ C
Span Temperature Compensation	50 ppm/ $^{\circ}$ C
Conversion Rate	2.5/second

Physical Specifications

Connector	Terminal block on the rear panel
Dimensions	96 mm x 48 mm x 150 mm
Display	4½ digit, 7 segment, 0.4" red LED
Enclosure	Plastic
Weight	2 lbs (0.91 kg)

Environmental Specifications

Maximum Operating Temperature	50 $^{\circ}$ C (122 $^{\circ}$ F)
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Due to continuing research and development activities, these product specifications are subject to change without notice.

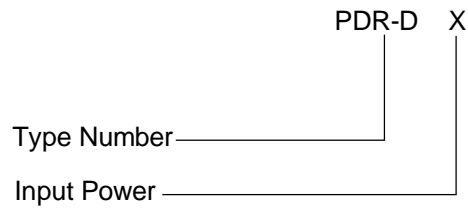
Appendix B: Model Code Explanation

Model Code

The options of your unit are identified in the model code. The model code is identified as follows:

PDR-D-X

where:



Type Number (PDR-D)

This designates the model number of the instrument.

Input Power (X)

The input power is indicated by a single number code.

Input Range	Ordering Code
115 V	1
230 V	2

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