

HDI 2000B & 2000P Series Pressure Gauges



Operations and Maintenance Manual

Revised 12/05/2003

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SECTION 1 Introduction:

1.1 Forward:

The Houston Digital Instruments, Inc. (HDI) 2000B and 2000P Series are designed to combine laboratory accuracy, repeatability, and withstand the rigors of the oil field environment. The 2000B and 2000P share a technology legacy that dates back to 1988 when HDI first introduced battery powered, intrinsically safe instrumentation to the industry.

The HDI Model 2000B is a direct replacement for most 6" diameter panel mounted gauge hydraulic systems with either a four-bolt (90°) or a three-bolt (120°) mounting pattern. The HDI Model 2000P directly replaces hydraulic standpipe (i.e. Parking Meter) style gauges.

This manual describes the installation, operation, maintenance and calibration of the HDI 2000 B/P Pressure Gauge Systems. This manual provides the user with information necessary to properly and fully utilize the instrument. Included within are all the necessary procedures to install and maintain this instrument properly.

1.1.1 Unpacking and Inspection:

Upon receipt of the equipment, please verify that all of the items are accounted for on the packing list. If any items are missing, immediately inform the Freight Forwarder. Inspect all items for damage. If any items are damaged, immediately inform the Freight Forwarder and Houston Digital Instruments, Inc.

1.1.2 Precautionary Information:

Please follow all directions when unpacking and handling this equipment. Extra care should be taken to assure that the pressure sensor, which is mounted in the transducer housing supplied with the system, is protected from contact with any hard or sharp objects, such as: screwdrivers, fingernails, etc. while installing the sensor. Mishandling or abuse of this device is *not covered* by HDI's warranty.

1.1.3 Qualifications / Training:

This equipment should be handled by those trained to do so. HDI can provide technical classes in the installation, trouble-shooting and operation of the equipment.



SECTION 2 System Description:

2.1 System Description:

The HDI 2000 B/P Series Pressure Gauges are battery powered, stand alone and intrinsically safe electronic pressure gauge systems. The gauge system is designed to measure the applied force exerted upon the sensor (pill) face of the HDI Pressure Transducer. The 2000 B/P gauge will work only with the proper HDI Transducer and ***will not work with other vendor's transducers.***

CAUTION: Connection to non-HDI supplied transducers could damage the internal circuitry of the Gauge Control Head.

The HDI 2000 B/P Series Pressure Gauges are shipped as matched and calibrated systems, comprised of the gauge head and transducer. The Gauge/Control head and transducer are serialized and matched as a set. Once calibrated, the gauge and the sensor become a matched pair.

ACCURACY: The HDI 2000 B/P are factory calibrated to measure and display the applied pressure to a tolerance of 0.5 (1/2) percent Full Scale (FS). The factory calibration is performed with a NIST traceable Pressure Standard, and each Gauge system is shipped with the signed and witnessed Factory Calibration Test Sheets. All Factory Calibration is performed in PSI regardless of final Engineering Unit Selection. Once calibrated, the gauge and the sensor become a matched pair. The substitution of any component, including wire / cable, requires a recalibration of the system.

The HDI 2000 B/P Gauge's Control Head is comprised of a liquid crystal display (LCD) display that includes both a numeric (5 digits) representation (for accuracy) and a bar-graph (101 segments) representation (for trend) and battery low alarm indicator.

The HDI 2000 B/P may be supplied with a range of transducer options. These include: 6000 PSI, 10000 PSI, and 16000 PSI transducers mounted in a variety of Process connections that include 1502 WECO, 2202 WECO, 2" Line Thread, as well as a variety of ANSI and API Flange. Please refer to the model matrix in section 2.2.1 for details.

2.2 System Components:

2.2.1 Pressure Gauge / Control Head:

HDI's 2000 B/P Pressure Gauges are available with any of the following Engineering Units (EU) and ranges:

HDI 2000B/P Model Matrix			
Model #	Eng Unit	Range	Process Connection Options
	PSI	0 -> 600	½"NPT, WECO, Line Thread, Flanged
	PSI	0 -> 6000	WECO, Line Thread, Flanged
	PSI	0 -> 10000	WECO, Line Thread, Flanged
	PSI	0 -> 16000	WECO, Flanged
	BAR		
	BAR		
	BAR		
	KPA		
	KPA		
	MPA		
	KGCM		
	KGCM		
	KGCM		

*** Additional / Custom Options are available upon request ***

2.2.2 Pressure Transducer:

The 2000 B/P pressure gauge system comes with a factory-supplied transducer. This device is specifically matched to the gauge's control head. Use of non-HDI supplied transducers could severely damage the instrument. Replacement or substitution of this device will likely require the user to recalibrate the pressure gauge system. Contact HDI for more details.

Caution: Use extreme care when handling this component.
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2.2.3 Cable:

The user is responsible for the supply of interconnecting cable(s) with appropriate terminating connectors from and to the gauge assembly. A high-grade instrument cable with woven shield is standard. HDI can provide cables and connectors, contact HDI for pricing and availability.

2.3 System Options:

Custom designed systems will include, per the customers' request or customers' specifications, certain options required to meet offshore area classifications or specific customer requirements. Each system of this type will be designed to meet specific requirements or classifications and is therefore unique. As such, these custom options go beyond the scope of this publication. Please see specific instructions on the use of custom options (if applicable). Standard options include:

2.3.1 4/20 mA Output:

HDI offers as an option, a signal current loop providing a 4/20 mA remote output that may be used for chart recorder inputs and/or data logging. This option requires that the 4/20 mA Current loop be externally powered. This is a factory-installed option and field calibration is unnecessary.

2.3.2 0-1 V-dc Output:

HDI offers as an option, a signal current loop providing a 0-1 V-dc remote output that may be used for chart recorder inputs and/or data logging. This is a factory installed option and does not require calibration

2.3.3 Remote/Slave Gauge Display:

Remote displays may be provided to allow pressure indication at an alternate location.

Note: Call For availability of these options

SECTION 3 Installation:

3.1 Components:

3.1.1 Pressure Gauge and Transducer:

The pressure gauge and transducer are to be mounted by the customer at the locations deemed most suitable for such equipment.

3.1.2 Cables:

Standard cable length is 50'. Maximum recommended cable length is 200'. Cable lengths can exceed this recommendation, however this may have an impact on gauge operation. Cable lengths from the transducers to the gauge, other than standard, may be requested and supplied by HDI. Specific requests should be supplied at the time of order entry. Interconnecting cable shall be installed using acceptable standards for such installations.

3.2 Mounting Components (Model 2000B):

3.2.1 Pressure Gauge:

The pressure system gauge is designed to be installed in the standard 6" cutout hole in the panel. Both the 90-degree and 120-degree bolt patterns are designed into the gauge and all applicable mounting hardware is included with the system. Remove the #10 elastic stop-nuts from the 10 X 32 screws, drop the gauge in the appropriate hole and replace the stop-nuts.

Caution: Do not over tighten stop-nuts

3.2.2 Pressure Transducer:

Refer to the Pressure Transducer's specifications for mounting instructions.

CAUTION: Special care should be taken to insure that the transducer pill mounted in the center of the transducer housing, is not allowed to make contact with any hard and/or sharp object as the transducer pill is vulnerable to this type of contact and the accuracy and the sensitivity could be affected.

3.2.3 Cables and Cable Routing:

The transducer to gauge head cable (harness) comes as part of the system, and is properly mounted and routed within the Yoke Assembly. No customer or user input or action is required. Optional Output Cables must adhere to HDI specifications and only HDI specified cables are to be used to interconnect the Pressure Gauge assembly to other systems. Industry standards for the routing of such cables (to include minimum

bend radii) must be adhered to, with special attention paid to the routing of the transducer signal cable in close proximity to high voltage and/or high current cables. If such routing is required, then the HDI signal cable must be routed at least 6" from the high voltage cable for any parallel route length that exceeds three feet in length.

3.3 Mounting Components (Model 2000P):

3.3.1 Pressure Gauge and Transducer Assembly:

The HDI Model 20XXP is a modular assembly that includes the Pressure Gauge head and Transducer mounted in a "Yoke" Assembly. To install the system, the Gauge head shall be removed from the Yoke assembly by removing the two 10X32 bolts and stop-nuts, then carefully lifting the gauge head from the Yoke cradle. Located under the bottom center of the Gauge head, there is a Cannon / Bendix ¼ turn connector that connects the gauge electronics to the transducer wiring harness. Disconnect the cable from the gauge head and place the gauge head aside. Care must be taken to prevent water or other debris from getting into the yoke assembly while the gauge head is removed.

The Transducer assembly (with Yoke) may then be installed onto the pressure port. Refer to the Pressure Transducer's specifications for mounting instructions.

Caution: Special care should be taken to insure that the transducer pill mounted in the center of the transducer housing, is not allowed to make contact with any hard and/or sharp object as the transducer pill is vulnerable to this type of contact and the accuracy and the sensitivity could be affected.

Once the Transducer/Yoke assembly has been securely mounted, the gauge head can be re-installed into the Yoke Cradle. This accomplished by following the removal process, but in reverse order. First re-connect the Canon/Bendix ¼ turn connector, and then mount the gauge head into the cradle. Finally, re-install and tighten the 10X32 bolts and stop-nuts.

Caution: Do not over tighten the stop-nuts

3.3.2 Cables and Cable Routing:

The transducer to gauge head cable (harness) comes as part of the system, and is properly mounted and routed within the Yoke Assembly. No customer or user input or action is required. Optional Output Cables must adhere to HDI specifications and only HDI specified cables are to be used to interconnect the Pressure Gauge assembly to other systems. Industry standards for the routing of such cables (to include minimum bend radii) must be adhered to, with special attention paid to the routing of the transducer signal cable in close proximity to high voltage and/or high current cables. If such routing is required, then the HDI signal cable must be routed at least 6" from the high voltage cable for any parallel route length that exceeds three feet in length.

SECTION 4 Theory of Operation:

4.1 Pressure Gauge System:

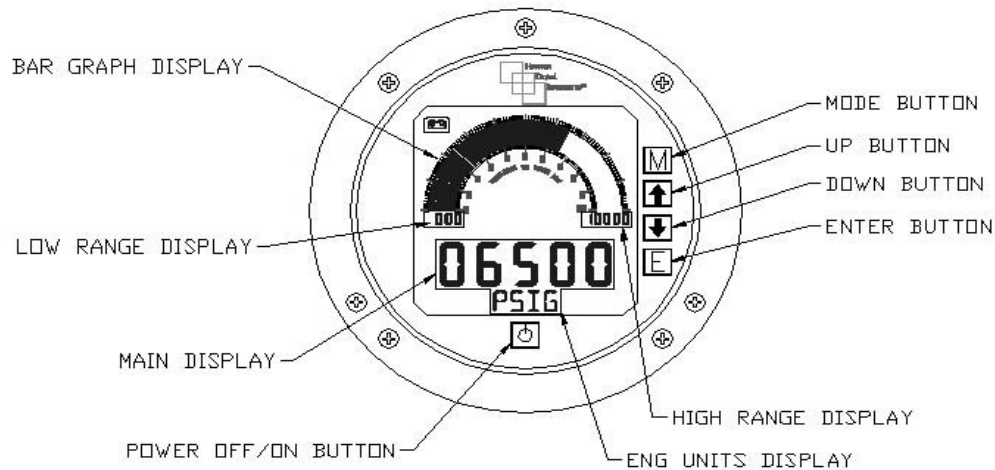
The major components of this system are the gauge head assembly, the pressure transducer assembly, cabling, and in the case of a HDI2000P, the Yoke/cradle assembly.

The gauge head assembly contains its own internal power supply in the form of an “intrinsically safe” EXIA approved, 3.6 V dc, replaceable battery pack. This battery pack provides the power to run the internal circuitry of the gauge assembly, including its display, micro-controller, and transducer excitation and sensing circuitry. The internal battery **does not** provide the power to drive the 4-20 mA loop (if so equipped). The pressure gauge system requires minimal power during normal operation. The gauge is designed for continuous operation, but can be turned off by the user if desired. The gauge will retain its calibration information while off. The battery life is guaranteed for one (1) year of continuous operation, typical battery life is approximately 18 months.

The gauge assembly excites the transducer with a constant current source and measures the output voltage of the transducer. Typically the full-scale output voltage is about 100mV DC. It is therefore important to pay close attention to cable routing as to avoid spurious noise sources that may impact gauge operation.

The internal analog to digital (A to D) circuitry converts the analog voltage input signal to a digital (16 bit) source that is in turn read by the gauge system’s micro-controller. The micro-controller performs the math based upon the factory/field calibrations, and scaling inputs to drive the display circuitry, and optional output circuitry.

Calibration and field settable options are stored in internal E²Prom (Electrically Erasable Programmable Read Only Memory), and are retained during power off periods, such as transport or battery replacement. Upon Power-up of the Gauge assembly, the micro-controller interrogates the E²Prom, and uses this information in setting the runtime variables of the gauge operation. The user can change the calibration, settings, and therefore change the data stored in the E2Prom at any time. The user can also clear the E2Prom, and start from the factory configuration.



SECTION 5 Operations:

5.1 Gauge Head Features:

As shown in the above figure, the Gauge head has several distinctive features or sections features or aspects that this manual will explain in detail:

5.1.1 ENG UNITS DISPLAY:

The Engineering Units Display normally (Normal RUN Mode) indicates or displays the Engineering Unit of Measure that the pressure readout is measured in (i.e. BAR, PSI, KPA). In other operating modes, this display indicates the name of the mode that the gauge is currently in

5.1.2 MAIN DISPLAY:

The Main Display normally (Normal RUN Mode) displays in numerical format, the measured pressure. The displayed pressure is in the unit of measure as indicated in the ENG UNITS DISPLAY. In other operating modes, such as "SERIAL NUM", this unit will display other pertinent information to the user/operator.

5.1.3 BAR GRAPH DISPLAY:

In all operating modes, in which the bar graph is active, the Bar Graph Display will indicate the relative pressure as a scale (or percentage) of full scale. The Bar Graph Display is divided into 101 segments, with each segment representing 1% of full scale. In addition, the Bar Graph area of the LCD display is silk-screened with a scalar graph of the indicated range.

5.1.4 LOW RANGE DISPLAY:

In all operating modes, this display indicates or displays the low (or Zero) range of the Pressure Gauge system.

5.1.5 HIGH RANGE DISPLAY:

In all operating modes, this display indicates or displays the Full Scale (or Span) range of the Pressure Gauge system

5.1.6 POWER ON/OFF BUTTON:

The Power ON/OFF Button is part of the Front Face Button panel, and is a momentary contact switch. There is a tactile feel to the depressing and releasing of the buttons. The Power On/Off Button is used to turn on or off the gauge. If the gauge is OFF, depressing and releasing the button, will turn the gauge ON. If the gauge is ON, then the opposite occurs.

5.1.7 MODE BUTTON

The Mode Button is part of the Front Face Button panel, and is a momentary contact switch. There is a tactile feel to the depressing and releasing of the buttons. The Mode Button is used to cycle through the different operating modes of the gauge system. In Normal Run mode, this button has no effect on operation.

5.1.8 UP BUTTON

The Up Button is part of the Front Face Button panel, and is a momentary contact switch. There is a tactile feel to the depressing and releasing of the buttons. The Up Button is used to cycle through certain settings within the configuration and calibration modes of the Gauge head. . In Normal Run mode, this button has no effect on operation.

5.1.9 DOWN BUTTON

The Down Button is part of the Front Face Button panel, and is a momentary contact switch. There is a tactile feel to the depressing and releasing of the buttons. The Down Button is used to cycle through certain settings within the configuration and calibration modes of the Gauge head. . In Normal Run mode, this button has no effect on operation.

5.1.10 ENTER BUTTON

The Down Button is part of the Front Face Button panel, and is a momentary contact switch. There is a tactile feel to the depressing and releasing of the buttons. The Enter Button is used to either select a config/calibrate mode or to confirm selection of user-entered data or settings.

5.2 Operating Modes

The HDI 2000 B/P Series of Gauges have three operational modes contained within the firmware. One mode is for factory use only and is not accessible from the field. In rare cases, an HDI technician may instruct a user on how to enter and operate this mode, but for the purposes of this manual, this mode (factory) will not be discussed.

5.2.1 NORMAL RUN MODE

In “Normal RUN” Mode, the gauge will excite the transducer and display the measured pressure on the Main display. The Gauge will display the current Engineering Units in the ENG UNITS Display, and the Bar-graph will be active. The de-pressing and/or releasing of the MODE, UP, DOWN, and/or ENTER buttons will have no effect while in this mode.

To enter into the Normal RUN Mode:

- Insure that the Gauge head is OFF. If the Gauge Head is ON (regardless of operating mode), de-press and release the Power Button once. This action will turn off the gauge head.
- De-press and release the Power Button once, from the OFF state, this will activate (turn ON) the gauge head, and the gauge will enter Normal Run mode automatically.

5.2.2 CONFIG / CAL MODE

The “CONFIG / CAL” mode is used to view, determine, or set certain configuration and calibration characteristics of the gauge system. There are several layers (sub-modes)

contained within this mode, and dependent upon which sub-mode, the gauge is in, determines the output on the gauge LCD as well as the interaction of user input from the button panel. Care must be taken when operating in this mode, for it may be possible to inadvertently change some operating characteristic that will cause the gauge to operate incorrectly, and thus provide the user with incorrect pressure readings.

To enter into the CONFIG/CAL mode:

- Insure that the Gauge head is OFF. If the Gauge Head is ON (regardless of operating mode), de-press and release the Power Button once. This action will turn off the gauge head.
- De-press and hold the “MODE” Button, and then de-press and release the Power Button once from the OFF state, this will activate (turn ON) the gauge head. Once the gauge has started the POST, release the “MODE” button. The gauge will enter the first of the CONFIG/CAL sub-modes, namely the “Display Serial Number” sub-mode.
- By de-pressing and releasing the MODE button, the user can cycle through the different sub-modes within the CONFIG/CAL Mode.

5.2.2.1 Display Serial Number Sub-mode

HDI keeps records on all the products it ships, and these records are filed by the serial number of the system. These records include date of build, options installed, as well as any service history. This sub-mode gives the user instant access to the serial number, thus providing the user and HDI with enhanced and prompt response to any service and operations issues.

In this sub-mode, the ENG UNITS DISPLAY, will display “SERN”, and the MAIN DISPLAY will display the five-digit Serial Number. The Bar Graph is disabled, and no measurements are processed. There is no user action in this sub-mode.

5.2.2.2 Calibration Sub-Modes

Unlike all previous HDI Pressure Gauge systems, the HDI20XXB/P Gauge systems are electronically calibrated from the front panel. That means that the user does not have to open-up the case and adjust potentiometers. The gauge systems are calibrated at the factory, and the gauges should not need any adjustments to this calibration for at least one year (or greater), but in the extreme cases of system failure, transducer replacement, etc., the gauges can be field calibrated.

5.2.2.3 Calibrate Low Range (ZERO) Sub-mode

The Calibrate Low Range (ZERO) sub-mode is used to re-calibrate the zero set point of the gauge system.

To enter this mode:

- From the “Display Serial Number” sub-mode, de-press and release the MODE BUTTON. The ENG UNITS DISPLAY will change to a display of “ZERO”, the Main display will display the zero-set point (typically 00000) as stored in E2Prom. The Bar Graph is inactive in this mode.
- Ensure that the Gauge is properly connected to the transducer/cable, and that 0 PSI is applied to the pressure transducer.
- Using a test pressure gauge, attached to the same pressure source, verify that 0 PSI is applied and the test gauge displays zero.
- If in the event that some residue pressure (not to exceed 30 PSI) is in the system, then by using the UP and DOWN BUTTONS, adjust the ZERO set point of the HDI20XXB/P to match the residue pressure reading of the test gauge.
- Once the Pressure readings match, confirm and store the zero set point into the HDI20XXB/P E2Prom, by de-pressing and releasing the ENTER BUTTON.

5.2.2.4 Calibrate High Range (SPAN) Sub-mode

The Calibrate Low Range (ZERO) sub-mode is used to re-calibrate the Span or High set point of the gauge system.

To enter this mode:

- From the “Display Serial Number” sub-mode, de-press and release the MODE BUTTON. The ENG UNITS DISPLAY will change to a display of “ZERO”. De-press and release the MODE BUTTON once more, the ENG UNITS DISPLAY will change to a display of “SPAN”. The Main display will display the Span-set point (typically full scale of gauge) as stored in E2Prom. The Bar Graph is inactive in this mode.
- Ensure that the Gauge is properly connected to the transducer/cable
- Using a test pressure gauge, attached to the same pressure source, verify that 0 PSI is applied and the test gauge displays zero.
- Pressurize the system to the full scale rating of the gauge head. Caution must be taken as not to over-pressurize either the HDI20XXB/P or the test gauge.
- The test system must be able to pressurize and hold pressure to at least 85% of the HDI20XXB/P full-scale rating.
- If in the event that the test system cannot pressurize the system to the full-scale pressure, there is an option to calibrate the system below full scale. By using the UP and DOWN BUTTONS, adjust the SPAN set point of the HDI20XXB/P to match the pressure reading of the test gauge. Please be advised, that the gauge calibration is now based upon this new setting, and HDI will not guarantee the accuracy of this gauge to meet HDI’s published specs.

Section 6 Battery Replacement

6.1 Battery Replacement

In order to replace the battery, it is first necessary to remove the screws attaching the ring surrounding the gauge face. Remove the ring. Supporting the gauge face with the palm of the hand, turn the assembly face down and lift the gauge housing away from the face. Install the replacement battery and secure in place using the supplied ty-wraps. Reconnect the battery and leads and re-assemble the gauge.



SECTION 7 Warranty Statement:

HOUSTON DIGITAL INSTRUMENTS, INC. (HDI) WARRANTS FOR A PERIOD OF ONE YEAR FROM THE DATE OF SHIPMENT, HDI'S MANUFACTURED PRODUCTS TO THE EXTENT THAT HDI WILL REPLACE THOSE PARTS HAVING DEFECTS IN MATERIAL OR WORKMANSHIP WHEN USED FOR THE PURPOSE OR SPECIFICATION HDI RECOMMENDS.

SPECIFICALLY EXCLUDED FROM THE DEFINITION OF **NORMAL USAGE** SHALL BE ANY WAGE WHERE THE TRANSDUCER IS SUBJECT EITHER TO NON-LAMINAR CONSTANT CYCLING OR EXPOSURE TO ACIDIC COMPOUNDS. IN THOSE USAGES WHERE NON-LAMINAR CONSTANT TRANSDUCER CYCLING OR ACIDIC COMPOUNDS ARE INVOLVED, THE HDI WARRANTY SHALL BE FOR A PERIOD OF SIX (6) MONTHS FROM THE DATE OF SHIPMENT.

HDI WILL REPLACE OR REPAIR, AS IT DEEMS NECESSARY, ANY PRODUCTS COVERED BY THIS WARRANTY, AFTER HDI'S EXAMINATION DISCLOSES TO ITS SATISFACTION, THAT IN FACT THE PRODUCTS ARE DEFECTIVE AND AN ADJUSTMENT IS REQUIRED. IF AN ADJUSTMENT IS REQUIRED, THE AMOUNT OF THE ADJUSTMENT IS THE NET SALES PRICE OF THE DEFECTIVE PRODUCT. NO ALLOWANCES SHALL BE MADE FOR LABOR OR EXPENSES OF REPAIRING DEFECTIVE PRODUCTS OR DAMAGE RESULTING FROM SAME. ALL PRODUCTS ACCEPTED UNDER THE PROVISIONS OF THIS WARRANTY SHALL BE SHIPPED PREPAID TO HDI AND RETURNED TO THE CUSTOMER PREPAID BY HDI. ALL PRODUCTS NOT ACCEPTED UNDER THE PROVISIONS OF THIS WARRANTY SHALL BE SHIPPED PREPAID TO HDI AND RETURNED FREIGHT COLLECT.

HDI SHALL NOT BE RESPONSIBLE FOR REPAIR OR REPLACEMENT OF PRODUCTS, RESULTING FROM IMPROPER HANDLING, STORAGE, INSTALLATION, MISUSE, NEGLIGENCE, OR USE IN A MANNER CONTRARY TO THE RECOMMENDATIONS OF HDI.

HDI WARRANTS ONLY THE PRODUCTS, WHICH IT SELLS OF OTHER MANUFACTURERS TO THE EXTENT OF THEIR WARRANTIES. ALL WARRANTY CLAIMS SHALL BE MADE IN WRITING TO THE NEAREST HDI OFFICE OR AUTHORIZED FACTORY REPRESENTATIVE. HDI MAKES NO OTHER WARRANTY OF ANY KIND, EXPRESSED OR IMPLIED, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WHICH EXCEED HDI'S AFORE-STATED OBLIGATION ARE HEREBY DISCLAIMED BY HDI AND EXCLUDED FROM THIS WARRANTY.

This warranty is non transferable and HDI shall not be liable for any damage, injury, loss to property or persons resulting from the use of any HDI's products or equipment whether such damage, injury or loss results from, or is caused by: manner of use, defects in materials or workmanship or otherwise.

APPENDIX A OUTPUT INTERFACING

4 – 20ma OPTION OUTPUT WHEN ORDERED

MASTER GAUGE	A	B	C	D	E	MASTER GAUGE
- 4-20ma ONLY	4-20 +	4-20 -	N/A	N/A	Shield	- 4-20ma ONLY



Drilling Consoles – Manifolds – Mud Pumps – Cementing – Fracturing – Choke Consoles

The **HDI PanelGage** (Model 2000B) offers safety, accuracy, reliability, and low maintenance in a precise digital readout driller's pressure gauge. The **HDI PanelGage** is built to operate in the extreme temperatures and harsh conditions common in the oilfield. The threat of hydraulic tube ruptures and fluid leaks, serious operational and safety concerns, are eliminated with the **HDI PanelGage**. The electronic pressure transducer can be located up to 250 feet from the gauge and connected using electrical cable. HDI's advanced technology provides precise pressure indications to within 0.5% over the entire pressure range. The gauge reads both the minimum and maximum 10 PSI to the same degree of accuracy, ensuring that hydrostatic head pressure is precisely measured. Unlike hydraulic gauges, which fail to read low pressures, the **HDI PanelGage** maximizes low pressure safety with accurate pressure readings as low as 10 PSI. At high pressures, "kicks" can be assessed quickly. Bottomhole differential bit pressure indications are accurately obtained, a key advantage in horizontal and directional drilling. Because the gauge has no moving parts, downtime is significantly reduced. Maintenance costs are low because no field calibration is required and the HDI technology eliminates the Bourdon tube assembly, costly deboosters, check valves, swivels, and knuckles.

Drilling Instrumentation

HDI 2000 PanelGage



Specifications

Dimensions	6.25 in. (15.875 cm) O.D. x 4 in. (10.16 cm) deep with 7.75 in. (19.69 cm) O.D. mounting ring
Weight	3.4 Lbs. (1.55 Kgs)
Case Material	SUMIKON PM-9640 (black phenolic), aluminum optional
Front Panel Controls	Mode, Up, Down, Enter, Power
Pressure Range	0-5000 PSI standard, optional 0-10000 PSI, 0-16000 PSI
Power	Intrinsically Safe sealed HDI power pack
Battery Life	One year continuous operation
External Power	Optional +12 or +24VDC
Low Battery Indicator	Battery shaped ICON
Time Base	Quartz crystal oscillator
Maximum Cable Length	250 ft (76 m) - gauge to transducer
Accuracy	0.5% of full scale (linearity, hysteresis, and repeatability)
Resolution	10 psi (over full range from 0 psi to full scale)
Engineering Units	PSI standard / Options: bar, kpa, mpa, kg/cm ²
Media Temperature	-30 to 100°C
Storage Temperature	-40 to 100°C
Display	Liquid crystal with five-digit seven segment 0.825 inch (21 mm) digital pressure, 0.219 inch (5.56 mm) minimum / maximum digital scale, 0.383 inch (9.73 mm) alphanumeric engineering units, large 101-segment analog trend indicator, and low battery icon.
Viewing Angle	45°
Viewing Distance	30 Feet (9 Meters)
Electronics Protection	Gasket seal
Front Panel Protection	Optional thumbscrew clear lens or slip-on clear Lexan cover with phenolic ring
Sensor Housings	1502 or 2202 hammer union, API flange, NPT, autoclave
Sensor Protection	Replaceable primary and secondary diaphragms
Mounting	Standard 3-hole or 4-hole mounting patterns
Options	4-20 mA or 0-1V outputs, remote/slave configurations, backlight with rechargeable battery
CSA Certification	Intrinsically Safe for use in Class I, Groups A, B, C, and D for Hazardous Locations

An ISO 9001:2000 Registered Company

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 Printed in USA 11/03

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