1000B/2000B Gauge Systems and
1000P/2000P All-in-One Systems

User's Manual

Revision 5, May 2023

SAFETY
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WELL CONTROL MONITORING AT ITS FINEST

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Table of Contents

Section 1 – Introduction

A. General Information

This manual describes the installation, operation, and maintenance of the HDI 2000B and 2000P Pressure Gauge Systems. The 1000 Series products includes HDI's Calibration Certificate and Certificate of Compliance. The 2000Series products include the third-party approval (ATEX / IECEx / CSA) along with HDI's Calibration Certificate and Certificate of Compliance.

For brevity, we will use the name "2000B" to refer to both the 1000Band 2000B products, and we will use the name "2000P" to refer to both the 1000P and 2000P products. The 1000 and 2000 Series unites are identical for purposes of this user's manual, unless noted otherwise (E.G., third-party approvals).

The HDI 2000B is a panel mount system that requires an interconnect cable while the HDI 2000P is an All-in-One system commonly known as a Parking Meter Style Gauge or Mud Gauge. This manual will provide the user with all the necessary information to properly inspect, install, operate, and perform routine maintenance and troubleshooting for onsite repairs. The HDI 2000B configuration is like all of HDI's core products, and has three (3) key elements: The Control Head, a Sensor Assembly specified by the end client, and the Cable Assembly connecting the Control Head to the Sensor Assembly. These items will be discussed in greater detail in Section 2. The HDI 2000P is a self-contained unit without any interconnect cables.

B. Unpacking and Inspection

Upon receipt of the equipment, it is critical to confirm all the necessary items are accounted as some items can settle to the bottom of the box or be thrown out/misplaced if previously inspected by a freight forwarder or third party (Customs) during transit. If any items are missing, contact the freight forwarder or third party. Examples of items: protective diaphragm, mating connectors or spare parts. If there are still missing items, please contact our office.

C. Cautionary Information

Power

This system is typically configured with an internal powerpack and dry contact sensors that will be damaged if tested or connected to a 12 or 24VDC system without proper modifications from HDI.

Exposed Electronics

Caution: Do not leave the equipment out and unconnected (open cables or display) as this may expose the connector leads to moisture and outside elements damaging the electronics.

Cleaning
Caution should be used when cleaning the Gauge (LCD) Head to prevent any static discharge. You will need to use a "damp" cloth to clean the LCD overlay or the phenolic gauge case. We suggest that you use a soft cloth to prevent accidental damage (scratching) to the protective lens.

Returns
Inbound returns should have a Return Material Authorization ("RMA") control number issued from our website. You will visit http://hdigauges.com/quality/repairs/ to initiate an online RMA ticket. You may return multiple units on one RMA ticket. Proper protection of the equipment should be a top priority when returning the equipment back to HDI or an authorized agent for repair. Additionally, the shipper must ensure equipment clears all Customs duties and inspection as different agencies may hold equipment without notifying HDI.

D. Personnel Qualifications
Caution: Anyone testing the equipment should have a basic Electronic Technician understanding and knowledge of circuitry and use of voltage meters. Read the entire manual prior to opening the display, testing, or making any modifications as work performed by personnel without the proper qualifications will null the warranty.

Section 2 – HDI 2000B/P Series Pressure Gauge Systems Overview

The HDI 2000 B/P Series Pressure Gauges are stand alone and intrinsically safe electronic pressure gauge systems when powered with our field replaceable internal 3.6vdc power pack. This power 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 4-20mA loop (if 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 system is designed to measure the applied force exerted upon the sensor(pill) face of the HDI Pressure Transducer (sensor). **The 2000B/P gauge will work only with the proper HDI Transducer and will not work with other vendor's transducers.**
Caution: Connection to a non-HDI transducer could damage the internal circuitry of the Control Head (Gauge).
Note: The HDI2021 is a 4-20mA transmitter and is not a direct replacement.

The HDI 2000B/P Gauge Displays are comprised of a liquid crystal display (LCD) that includes both a numeric (5 digit) representation (for accuracy) and a bar-graph (101 segments) representation (for trend) and low battery alarm indicator. 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. **Warning:** It is extremely 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 microcontroller. 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 E^2Prom (Electronically 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 E^2Prom, 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 E^2Prom at any time. The user can also clear the E^2Prom, and start from the factory configuration.

The units have a few output options enabling you to have a 4-20mA signal for chart recording or PLC integration. There is also the ability to have a Remote (secondary) Display to show the same pressure reading elsewhere on the rig.

Our sensors include a 3.5K strain gage with several pressure ranges. This technology offers flexibility on some configurations to allow a 2000B 6K sensor to be used on a 10K system or an original 10K system to be used on a 16K system, for example. This offers cross compatibility of pressure ranges to limit stock requirements, and more importantly, getting out of a bind if a key sensor fails. All units have key interchangeable parts that will minimize your suggested in-house operational spares.

Overall, the HDI 2000B/P systems can be supplied with various pressure ranges and several transducer options that may not be available to both models from: 1" NPT, 2" Line Thread, ANSI or API Flanges, 9/16" Autoclave, standard 2" WECO connections for 1502, 2002, and 2202. See related noted ranges and connection types in Section 10.

The HDI 2000B Series Pressure Gauges are shipped as matched and calibrated systems, comprised of the gauge head and transducer. The Gauge and transducer are serialized and once calibrated, are a matched set. A historic myth is that both components must be replaced when either the gauge or sensor reaches end of life; this is FALSE. In fact, our previous models as far back as 1998 can be interchanged with the current gauge or sensor. You may relate the 2000B system similar to a Bluetooth pairing procedure that is conducted anytime you replace either your phone (gauge) or earpiece (sensor). This is how simple our system is to calibrate.

The HDI 2000P Series are integrated as an All-in-One style pressure gauge that can replace all related traditional local hydraulic gauges.

Accuracy: The HDI 2000B/P are factory calibrated to measure and display the applied pressure to a maximum tolerance of 0.50 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 key component such as: gauge, sensor, pill assembly, or primary internal processor board (HDI 202) will require a recalibration of the system, see Calibration details in a later subsection.

2.A Control Head

The HDI 2000B Series has a 6" diameter LCD face providing a traditional analog arc (101) segment bar graph with numeric digits at the bottom of the LCD for a quick glance reading. The display is visible from 35' when properly installed and some adjustments may be necessary dependent upon location and mounting methods to take in deck lighting and overhead sunlight into consideration. The overall mounting diameter is 7.75" to the edge of the case ring with a cut out diameter hole of 6" and 4 (90-degree apart) drill thru holes on a 6.90" diameter bolt circle. When preparing or deciding on a location for mounting, you should consider the interconnecting cable and the access route to attach or remove the cable from the gauge. Our recommendation is to have 4-6" clearance from the bottom edge of the case ring. Alternatively, you could request custom specific cables with 90-degree mating connectors if spacing is limited which would face directly to the rear of the gauge. For enclosed control panel applications, we would suggest a bulkhead access plate on the side so the interconnect cables to the gauges can be pre-routed and the side plate would be plug and play installation with the inline cable coming from the sensors.

As for the HDI 2000P system, the unit has the same 6" LCD face, but is housed in the all-in-one molded unit and will require a vertical installation or could be slightly pitched as needed to obtain the optimal reading angle. Prior to ordering, you should refer to the estimated overall height details to ensure you have the ability to install the unit for your specific pressure connection.

The Gauge (LCD) portion of both units have the same interchangeable parts for the LCD display board, the main Analog/Digital processor board assembly and applicable 3.6 Vdc powerpack. The key difference is the related membrane control panel that is used for calibration and engineering unit selection.

Note: Effective 4th Quarter 2014, HDI made a significant software change which now allows the client to toggle from PSI, Bar or kPA as required based on rig location or application. However, the silkscreen LCD overlay by default will have PSI and Bar scales. The common alternative option will be PSI and kPA.

B. Pressure Transducer

Our transducers are comprised of a 3.5K strain gage with several pressure ranges that offers flexibility on some configurations to allow the sensor to be used one pressure step up. The 2000B pressure gauge system comes with a factory-supplied transducer. This device is specifically matched to the gauge's control head and tracked with corresponding serial numbers that allows us to view repair history and specific configuration requirements and any special wiring details for future replacement units.

Caution: Use of non-HDI supplied transducers could severely damage the instrument and voids any applicable warranty.

Replacement or substitution of the transducer will require the user to recalibrate the gauge to the new sensor. Please review calibration procedures in Section 5.2.2 or you may visit: http://hdigauges.com/products/videos/ for more details.

C. Cable

We use a high-grade 4 conductor 20 AWG instrument cable with woven shield that is mud resistant and offshore marine shipboard approved as our standard configuration. The user is responsible for confirming the required interconnect cable length at the time of order, if required or can be ordered at a later date. As part of our ordering system to better serve our clients, interconnect cables are ordered in 5' increments only. If you require meters, we will convert over to feet and generally round up as a precaution. In the event you receive your specified interconnect cable only to find that it is short based on cable tray routing, etc. you can order an additional "inline" cable which is basically a cable extension with corresponding male/ female connections for a plug and play installation.

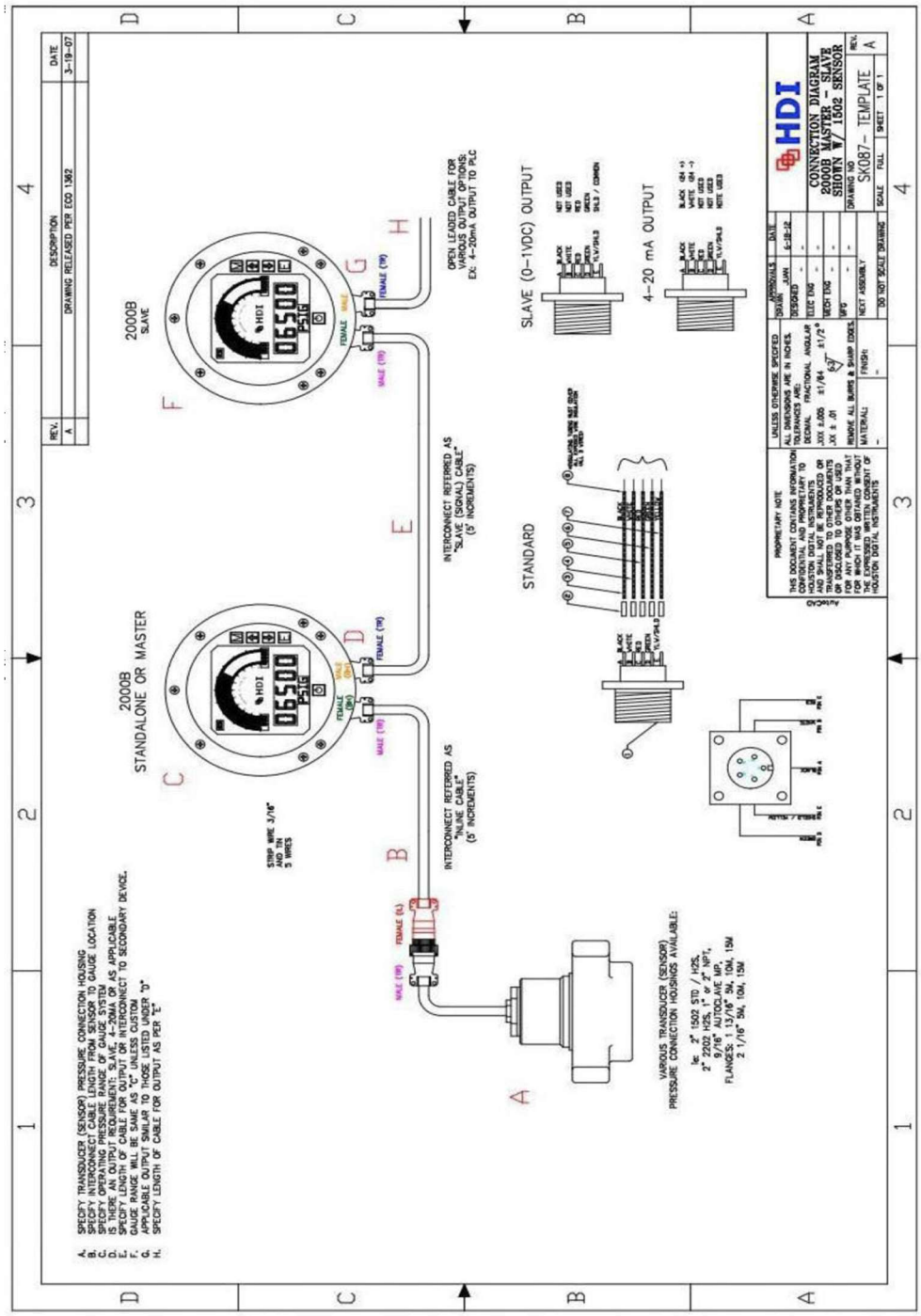
System Option

We offer various standard options as listed in the following subsections along with custom designed systems, per the customers' request or 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:

1. **4-20mA Output:**
   HDI offers as an option, for a signal current loop providing a 4-20mA remote output that may be used for chart recorder inputs, data logging or PLC interface for the driller's cabin. This option requires that the 4-20mA Current loop be externally powered via 12 or 24 Vdc. This is a factory-installed option and field calibration is unnecessary. Please follow applicable zone barrier requirements, etc.

2. **0-1 Vdc Output:**
   HDI offers as an option, a signal current loop providing a 0-1 Vdc 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.

3. **Remote/Slave Gauge Display:**
   The Remote ("Slave") function utilizes the 0-1 Vdc output signal from the Primary Gauge display typically installed near the pressure connection or in the local control panel. The Slave gauge provides an identical gauge readout as displayed on the primary utilizing one pressure sensor. The Slave can be installed at any desired location. The Slave unit may also have the 4-20mA option installed if required for monitoring. See below:


2000B
STANDALONE OR MASTER
2000B
SLAVE
STANDARD
SLAVE (0-1VDC) OUTPUT
4-20 mA OUTPUT
INTERCONNECT REFERRED AS "SLAVE (SIGNAL) CABLE" (5' INCREMENTS)
INTERCONNECT REFERRED AS "IN-LINE CABLE" (5' INCREMENTS)
OPEN LEADED CABLE FOR VARIOUS OUTPUT OPTIONS; EX: 4-20mA OUTPUT TO PLC
STRIP WIRE 3/16" AND TIN 5 WIRES
VARIOUS TRANSDUCER (SENSOR) PRESSURE CONNECTION HOUSINGS AVAILABLE:
FLANGES: 1 13/16" SN, 10M, 15M
2 1/16" SN, 10M, 15M
SPECIFY TRANSDUCER (SENSOR) PRESSURE CONNECTION HOUSING
SPECIFY INTERCONNECT CABLE LENGTH FROM SENSOR TO GAUGE LOCATION
SPECIFY OPERATING PRESSURE RANGE OF GAUGE/SYSTEM
IS WIRE AN OUTPUT REQUIRED? IF SO, 4-20mA OR 0-1VDC AS APPLICABLE
SPECIFY LENGTH OF CABLE FOR OUTPUT OR INTERCONNECT TO SECONDARY DEVICE.
GAUGE RANGE WILL BE SAME AS "C" UNLESS CUSTOM
APPLICABLE OUTPUT SIMILAR TO THOSE LISTED UNDER "D"
SPECIFY LENGTH OF CABLE FOR OUTPUT AS PER "E"
CONNECTION DIAGRAM
2000B MASTER - SLAVE
SET WITH W/ 1502 SENSOR
SK087- TEMPLATE
HDI

D. Certification

The HDI 2000B/P Systems are certified as follows:

- CSA: Intrinsically Safe Class 1, Division1, Groups A, B, C, and D (Standard)
- ATEX / IECEx: II 1 G, Ex ia IIC T4

In order to verify which IS certificates are applicable to your systems, you should locate the serial # data plate located on the back side of the gauge (LCD) head or the pressure transducer and verify the applicable markings.

See Section 9.F for particular certification details.

Section 3 – Installation

A. Control Head 2000B (Gauge)

The Control Head can be mounted using the 3 bolt (120) or 4 bolt (90) mounting pattern based on the earlier details. The gauge comes with four (4) 1 ½" 10-32 screws by default for the 90-degree bolt pattern and utilizes lock nuts used for securing the gauge. You should ensure removal of the lock nuts from the back before removing the screws from the case as this could cause issues.

We do offer various single to quad gauge brackets for remote mounting of the gauge(s) if you do not have a particular panel for installation. In addition, we offer a custom sensor bracket that mounts the gauge directly above the sensor similar to the 2000P version and allows the gauge to be rotated for horizontal mounting.

Caution: Take caution to not overtighten the bolts as cracking the front case lens is possible.

B. Transducer Assembly

The transducer assembly should be installed at the specified location deemed suitable for the transducer and pressure range. HDI provides a few connection specific protective diaphragms that should be installed to extend the life span of the sensor. You may view the previous noted Tech File Videos on our website for a short instructional video. The diaphragm should be checked as part of a preventive maintenance checklist once every 90-120 days.

C. Cables and Routing

Cable assemblies are built with an instrument grade shipboard cable with user defined cable lengths with preinstalled connectors allowing for simple plug and play installation for most applications. Cable lengths are ordered in increments of five (5) feet and can be extended up to 1000' if necessary, subject to application. At times, HDI may provide an open lead cable for output options or for location junction box termination for common cable runs of multiple pair cables, etc.

General caution should be made during cable routing for cable bend radii and placement from power cables, etc., that may create noise interference. 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. A past myth: is that the system would require re- calibration if the cable run length is changed, this is False.

D. Cleaning

During installation, it may be that you need to clean the gauge LCD after installation.

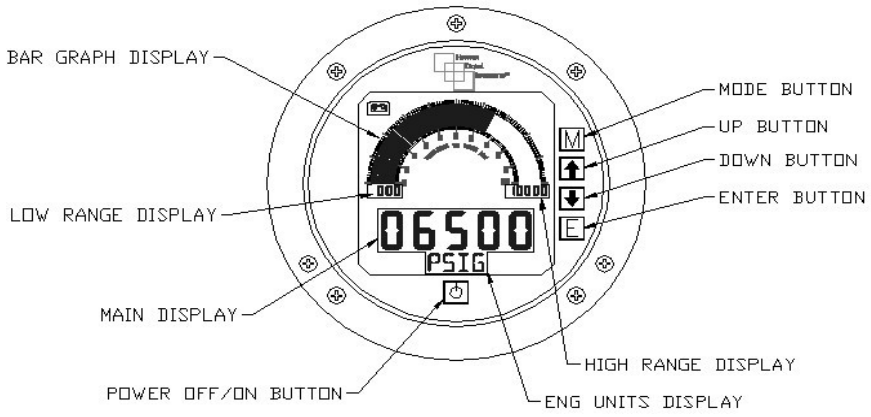
Caution: Should be used when cleaning the Gauge (LCD) Head to prevent any Static Discharge. You will need to use a "damp" cloth to clean the LCD overlay or the phenolic gauge case. In addition, the gauge head should be cleaned prior to opening the unit to prevent debris from entering the case. We suggest that you use a soft cloth to prevent accidental damage (scratching) to the protective lens.

E. 2000PMounting

HDI provides a few connection specific protective diaphragms that should be installed prior to the sensor to help extend the life span of the sensor. The 2000P assembly should be installed at the specified location deemed suitable for such transducer and pressure range with a vertical installation or at slight angle for an optimal viewing angle. The unit should be positioned, and hand tightened so you can rotate the unit so the LCD can be adjusted to the desired viewing position or angle. Once positioned, use a 5-10 lb. sledgehammer to tighten the unit.
Warning: Use caution to avoid hitting the upper gauge assembly which could damage the LCD assembly.

Section 4 – Gauge Functions

The following illustration (image) will be used for general reference in explaining day-to-day operation of the gauge.



4.A Gauge Head Features

As shown in the above figure, the Gauge head has several distinctive features and functions that this manual will explain in following subsections. The (M, ↓, ↑, E) and ON/OFF buttons are part of the Membrane Panel which will be discussed under its own subsection (4.G).

4.B Engineering Units Display:
The Engineering Units Display (ENG UNIT) 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. A primary use of this field is for retrieving serial number of the gauge or for calibration function to be explained in a later subsection.

C. 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 UNIT window. In other operating modes, such as "SERIAL NUM", this unit will display other pertinent information to the user/operator.

D. 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 has an overlay with a scalar graph of the indicated range. Depending on the client, has a few options while the default overlay is for PSI and Bar with PSI being the dominant engineering unit.

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

F. High Range Display:
In all operating modes, this display indicates or displays the Full Scale (or Span) range of the Pressure Gauge system. As noted on the illustration, this would identify the gauge as a 10K PSI unit.

G. Membrane Panel:
The membrane panel is a momentary contact switch with a tactile feel so the end user can feel a selection is being made while depressing and releasing the buttons. This panel is used for basic operations to calibrate the unit, to set Low and High Cal reference points, to identify the related serial number on the unit or other applicable functions. On the HDI 2000B, the panel has a thin clear lens covering the unit. Please note on the H DI 2000P, the related function buttons: M, ↑, ↓, E and the Power OFF/ON are located on the rear of the gauge in a separate membrane panel.

1. **Power ON/OFF Button:**
   The Power ON/OFF Button is located on the bottom center of the membrane panel and is a momentary contact switch. 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.

2. **Mode (M) Button:**
   The Mode (M) 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.

3. **Up (↑) Button:**
   The Up (↑) Button is used to cycle through certain settings within the configuration and calibration modes of the Gauge head. During calibration, it will be used to adjust the stress range for setting High or Low set points and the serial number. In Normal Run mode, this button allows you to toggle through: PSIG, BAR or KPA to change your numeric readout to the desired Engineering Unit.

4. **Down (↓) Button:**
   The Down (↓) Button is also used to cycle through certain settings within the configuration and calibration modes of the Gauge head. It is also used during calibration mode to set Low or High reference point along with the serial number. In Normal Run mode, this button has no effect on operation.

5. **Enter (E) Button:**
   The Enter (E) Button is used to either select a configuration, calibration mode or to confirm selection of user-entered data or settings. During calibration of both Low and High reference point, the "E" will be used to store the related resistance pill details into the E^2Prom. During this process, you should see a quick reaction/response (500m sec) on the LCD for the numeric display. On the low set point, the display should go to Zero (0) while during high calibration, the bar graph and numeric should jump to the reference high set point. Ex: on a 10K unit, the high set point from factory is likely to be set at 7,800; therefore, the numeric window and bar graph should jump to 7,800 instantly.

Section 5 – Gauge Operation

The following section will cover the HDI 2000 B/P three (3) operational modes contained within the firmware: Run, Config and Factory Mode. The most common mode is the "Run" mode, this is the day-to-day mode for general operation. The "Config" mode is utilized during device configuration set up or gauge calibration and the end user must be familiar with this mode. This mode will be referred to as "Cal" mode. Any accidental misuse of this mode may make the gauge inoperable and if this happens, our staff will suggest that you use the Factory Reset mode. This is strictly HDI factory use and in rare cases may be necessary to use as a last resort option to reset (clear) the gauge to ground zero as if it was just built. Warning: The Factory Mode will clear out your device calibration, your serial # and will be unusable until calibration is completed in accordance with Section 5.2.2.

1. "Run" Normal Mode:

In "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 (PSI, Bar, KPA or KGCM2) in the ENG UNITS, and the Bar-graph will have an active analog arc to match the numeric reading. The de-pressing and/or releasing of the MODE, UP, DOWN, and/or ENTER buttons will have no effect while in this mode. This is the safe mode and is the default mode when the gauge is powered on.

To enter into the 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) Configuration Mode:

The "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, it 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, it may be possible to inadvertently change some operating characteristics that will cause the gauge to operate incorrectly or become inoperable, and thus provide the user with correct pressure readings.

To enter into the 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 "M" Mode Button, while you then de-press and release the Power Button once from the OFF state. This will activate (turn ON) the gauge head and show the full LCD segments as a self-test (POST). Once the gauge has started the POST, release the "M" button. The gauge will enter the first of the CAL sub-modes, namely the "Display Serial Number" sub-mode.

- By de-pressing and releasing the "M" button, the user can cycle through the different sub-modes within the CAL Mode. See following details for each sub-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. Please note if the gauge was ordered as a spare or replacement unit, the serial number will only provide history details for the gauge, and we may ask for the serial # from sensor assembly. This would be located on the data plate on the sensor and if removed or lost, the primary digits of the serial number are stamped into the sensor housing.

In this sub-mode, the ENG UNITS, 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.

To display serial number:

- Press "M" once, the serial # will display. (**Note:** This works in any mode.)

5.2.2.2 Calibration Sub-Modes

Unlike all previous HDI Pressure Gauge systems, the HDI2000B/P Gauge systems are electronically calibrated from the front panel. This eliminates the past requirement for older units that required the gauges to be disassembled in order to access the calibration potentiometers, making system calibration user-friendly and efficient. The gauge systems are calibrated at the factory and should not need any adjustments prior to installation. Calibration is valid for at least one year of manufacturer or greater when not immediately put into service. In extreme cases of a system failure, transducer replacement, or primary PCB replacement (HDI202) etc., the gauges can be field calibrated. Follow the below instructions. We have summarized the below instructions into a one-page quick users guide, see Section 9.E.

2. 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 will change to a display of "LCAL", the Main display will display the zero-set point (typically 00000) as stored in E^2Prom. 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 transducer. Ensure that no static pressure is on the unit.
- 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 residual 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 HDI2000B/P to match the residual pressure reading of the test gauge.
- Once the Pressure readings match, confirm and store the zero-set point into the HDI 2000B/P E^2Prom, by de-pressing and releasing the "E" button.

3. Calibrate High Range (HCAL) Sub-mode

The Calibrate High Range (HCAL) sub-mode is used to re-calibrate the Span or High set point of the gauge system. The related high span set point must be a minimum of 50% of the operating pressure range, but would suggest 75% - 100% full calibration of the gauge whenever possible.

To enter 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 you are able to reach 50% minimum pressure and hold your designated pressure set point, if full scale cannot be reached.
- From the "Display Serial Number" sub-mode, de-press and release the MODE BUTTON. The ENG UNITS will change to a display of "ZERO". De-press and release the MODE BUTTON once more, the ENG UNITS will change to a display of "HCAL". The Main display will display the HCAL-set point (typically full scale of gauge or) as stored in E^2Prom. This is your desired or reference pressure reading that you will set the gauge to. Ex: you may observe our factory set point of 7,800 for a 10K Using the Up (↑) and Down (↓) Buttons, adjust the HCAL set point to your new set point. The Bar Graph is inactive in this mode.
- Pressurize the system to the designated set point, allow time to stabilize the pressure for bleed off or leaks. Caution must be taken so as not to over-pressurize either the HDI 2000B/P or the test gauge.
- Once the Pressure readings match, confirm and store the HCAL set point into the E^2Prom, by de-pressing and releasing the "E" enter Button.
- You should observe that the bar graph and the Main display both respond immediately to the designated pressure. On occasion, you may have to set the HCAL twice to store the resistance value into the E^2Prom.
- 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. The accuracy is based on the accuracy in which was used to complete calibration.

Section 6 – Maintenance

The HDI 2000B/P Pressure Gauge systems will require the following periodical maintenance.

A. Cleaning

During installation, it may be that you need to clean the gauge LCD after installation.

Caution: Should be used when cleaning the Gauge (LCD) Head to prevent any Static Discharge. You will need to use a "damp" cloth to clean the LCD overlay or the phenolic gauge case. In addition, the gauge head should be cleaned prior to opening the unit to prevent debris from entering the case. We suggest that you use a soft cloth to prevent accidental damage (scratching) to the protective lens. The system should initially be powered off any time the unit is to be opened.

B. Power Pack

The System is powered by an internal 3.6VDC power pack that is warranted for 12 months from the date of shipment. On average, the power pack will last at least one year based on 24/7 operation; however, if the user is able to turn off the unit when not in use, the battery life can be greatly extended. You should monitor the battery symbol located on the upper left corner of the LCD. Once illuminated, this should give you a 30-45 day window to procure a replacement. The replacement battery will have a desiccant pack, corrosion inhibitor, humidity indicator and a sticker to be applied to the case ring once installed with the new installation date.

Warning: Low battery voltage will affect calibration. See Section 7A.

C. Processor Boards

The Gauge has two (2) main internal processor boards: The HDI 201 (LCD) and the HDI 202 Analog/Digital Processor board. Additional output boards may also be included. All boards can be replaced in the field; however, the 1000P/2000P boards must be glued into place. Our Tech support team can assist by phone or email. The HDI 201 LCD display board can be replaced without any requirements for calibration; however, if the HDI 202 is replaced, full calibration is required. See Section 5.2.2 if an output board is replaced.

D. Sensors

Our sensors (transducers) are field repairable as well. The sensors have a small assembly referred to as a pill assembly. The pill assemblies are specific to the pressure range and some assemblies can be used for alternate range as previously noted. Our 600 Bar assembly can be used for a 6K or 10K unit and our 1000 bar can be used for a 10K or 16K which can reduce some of your operational spares. Our website has a training video available which covers the disassembly and repair procedure. Visit Tech Files/Videos under www.HDIGauges.com. See related Section 9 BOM illustrations.

E. Cable Assemblies

The connectors on the cable assemblies or on the gauges can be replaced in the field provided your ET staff has a handheld soldering iron with a fairly small pencil tip. In the event of a damaged cable assembly, it is likely that new cable will be required, or you could install mating Male/Female connectors to remove the damage section. See related wiring details in a later subsection.

Section 7 – Troubleshooting

A. Battery Voltage

The System effectiveness and accuracy is impacted when voltage of the power pack drops below 3.58 Vdc. The gauge accuracy will start to drift and may appear that the transducer has failed. In this event, the powerpack would be the easiest to isolate for possible cause.

B. How to Test Pill Assembly

The first thing you must do is loosen the gland nut completely and work the grommet out of the housing top being careful not to damage it. Next loosen the housing top and take precaution not to twist or pull the wires from the inside assembly. Once the top is removed, you will see a red puck protective case and inside asquare¾"pcb (temperature compensation) attached to the pill. Remove the leads that attaches to the pcb from the pill. Newer units have a phoenix terminal block for easier testing. Leave the leads from the cable (2' pigtail) attached to the pcb alone. Using a meter, test the OHM readings based on the following wire pattern:

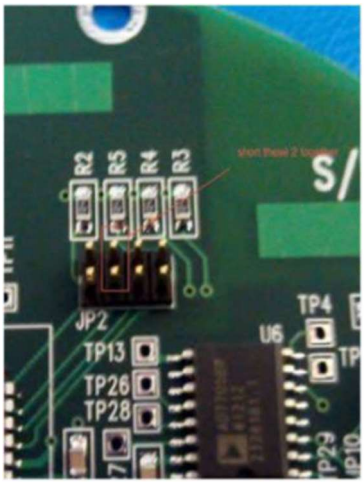
Wire Leads	Result
white / red	3 to 4k
white / black	5 to 6k
white / green	8 to 10k
white / yellow	12 to 14k

Note: If you have a 0 OHM or OL reading across any of the leads, then the pill is damaged.

7.C Factory Reset Procedure

This should only be done if the calibration sequence has overlapped or if instructed by HDI to do so.

- With gauge powered on, put the jumper shunt on JP2 2nd row down. (See picture.)
- Turn the gauge off and then in 5 seconds power back on.
- Press the "M" button and serial number should read zero. If so, then it has been reset.
- Pull shunt off and turn gauge back off and on again holding the "M" button to get back into Cal. Mode. See Section 5.2.2.



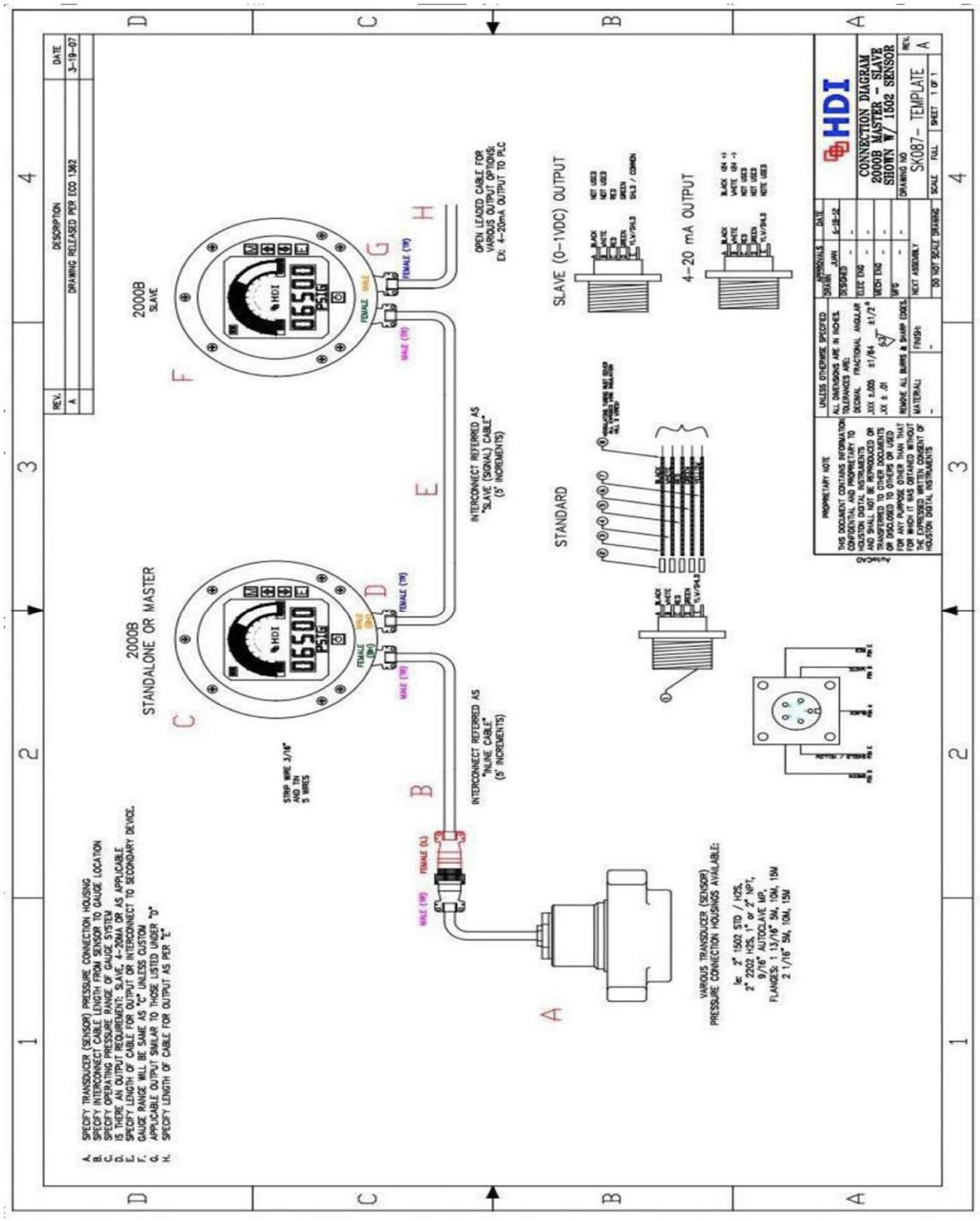
Section 8 – Non-Standard Options

Backlight and External Power

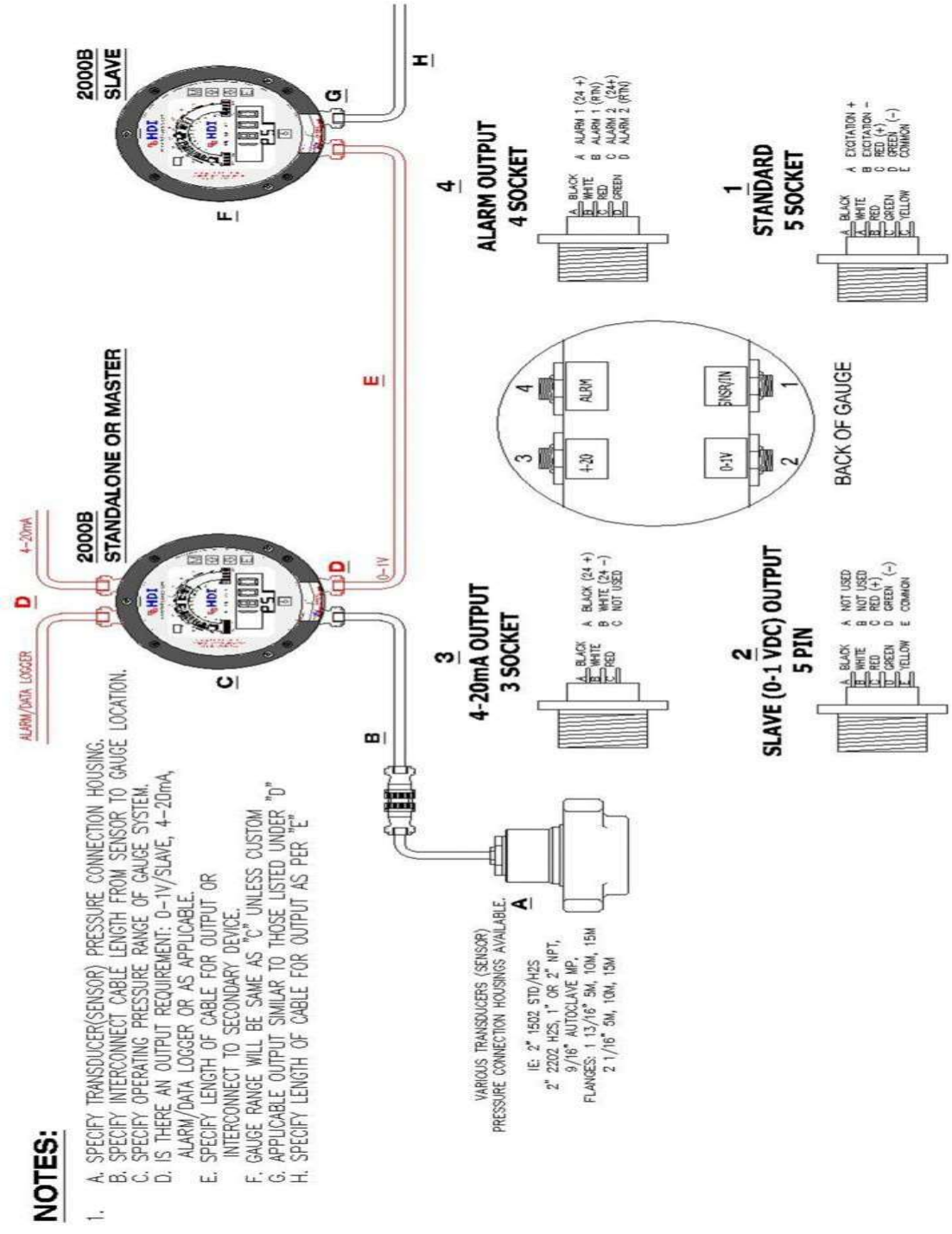
The Systems can be modified to add backlighting and the unit can be powered by an external 12 or 24VDC power source provided basic precautions and barriers are used. These are non-standard options and would require the modifications to be completed while the units are being built or to have the units returned to HDI for upgrades.

If you have possible alternative configurations not outlined in the manual, please feel free to contact HDI to discuss as we have listened to our clients and may work together to solve your requirements.

Section 9 – Technical Overview

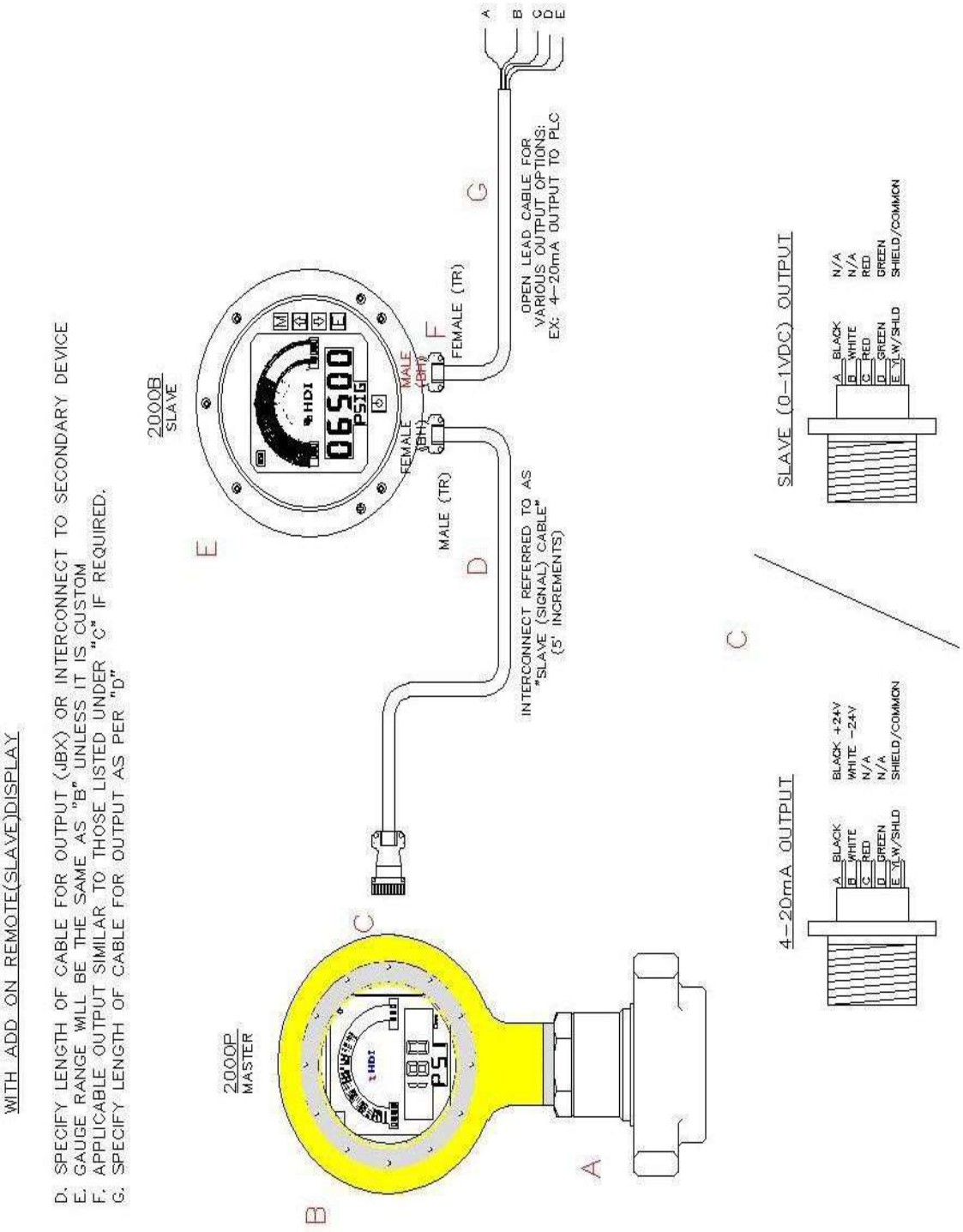


Cable Connection Drawing

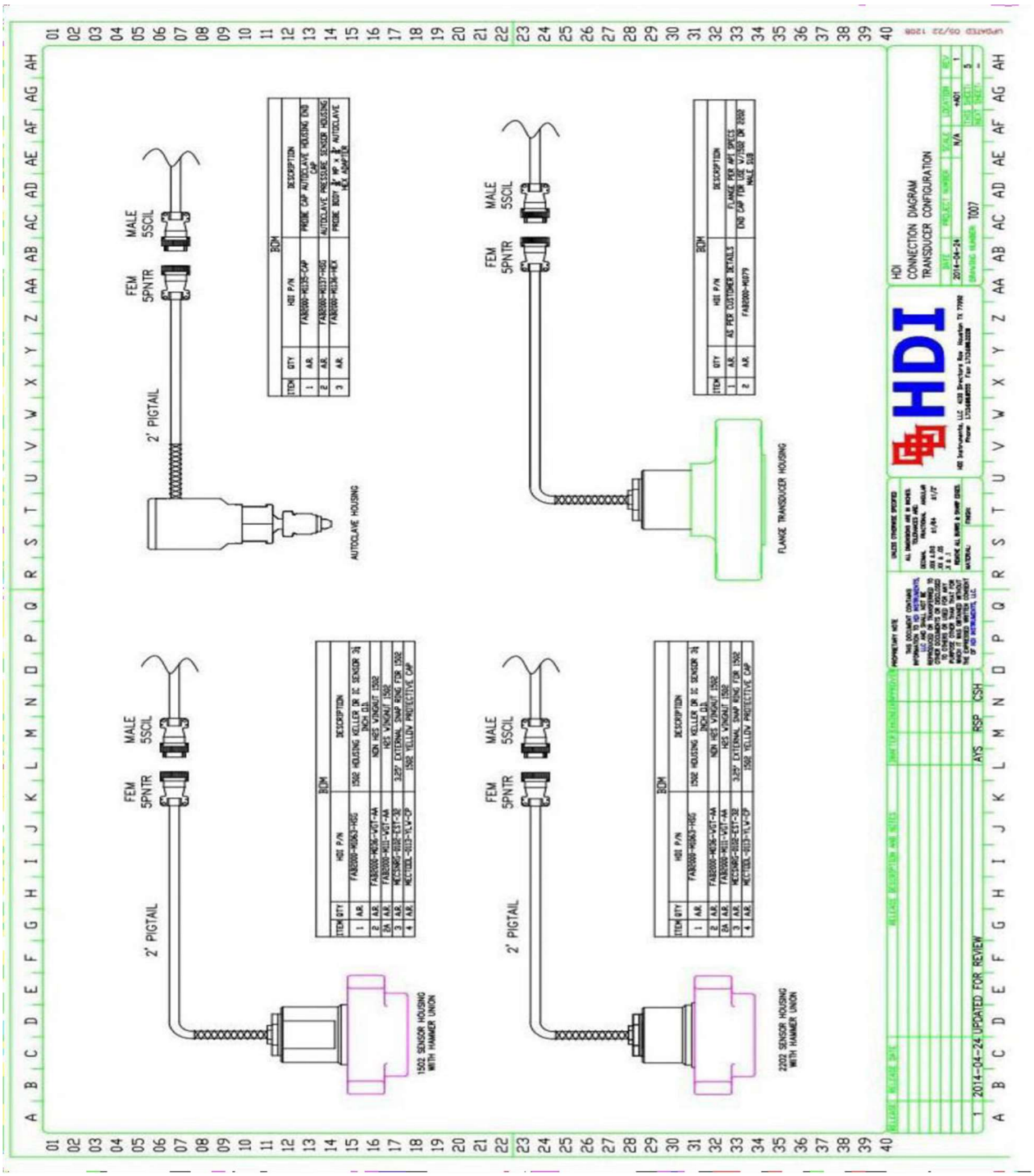


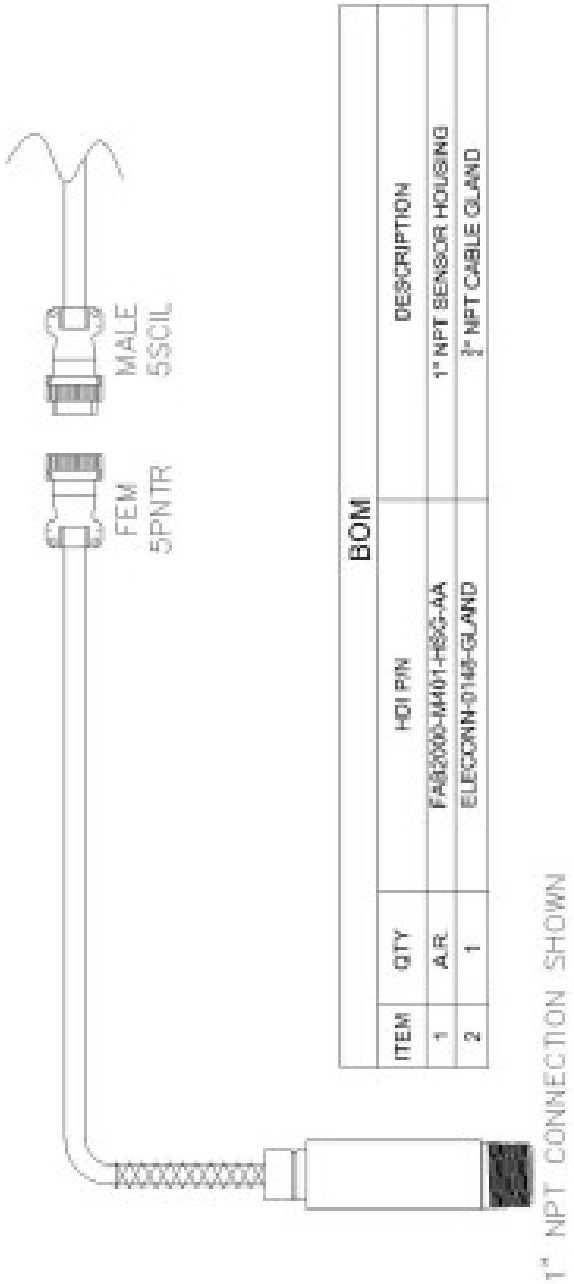
NOTES:

1. A. SPECIFY TRANSDUCER(SENSOR) PRESSURE CONNECTION HOUSING.
   B. SPECIFY INTERCONNECT CABLE LENGTH FROM SENSOR TO GAUGE LOCATION.
   C. SPECIFY OPERATING PRESSURE RANGE OF GAUGE SYSTEM.
   D. IS THERE AN OUTPUT REQUIREMENT: 0–1V/SLAVE, 4–20mA, ALARM/DATA LOGGER OR AS APPLICABLE.
   E. SPECIFY LENGTH OF CABLE FOR OUTPUT OR INTERCONNECT TO SECONDARY DEVICE.
   F. GAUGE RANGE WILL BE SAME AS "C" UNLESS CUSTOM
   G. APPLICABLE OUTPUT SIMILAR TO THOSE LISTED UNDER "D"
   H. SPECIFY LENGTH OF CABLE FOR OUTPUT AS PER "E"

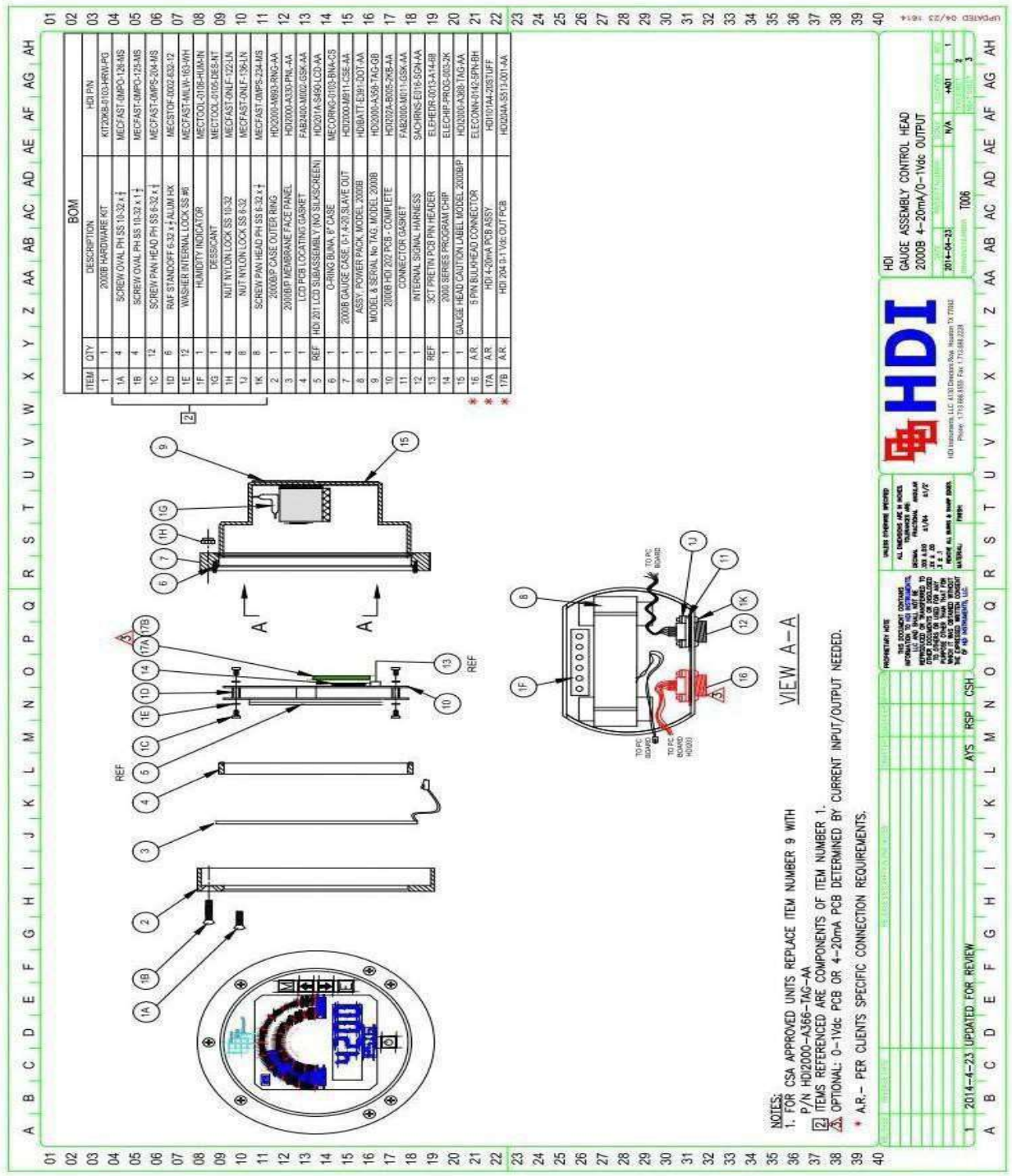

WITH ADD ON REMOTE(SLAVE)DISPLAY
D. SPECIFY LENGTH OF CABLE FOR OUTPUT (JBX) OR INTERCONNECT TO SECONDARY DEVICE
E. GAUGE RANGE WILL BE THE SAME AS "B" UNLESS IT IS CUSTOM
F. APPLICABLE OUTPUT SIMILAR TO THOSE LISTED UNDER "C" IF REQUIRED.
G. SPECIFY LENGTH OF CABLE FOR OUTPUT AS PER "D"
2000P
MASTER
2000B
SLAVE
FEMALE (JBH)
MALE (JBH)
MALE (TR)
FEMALE (TR)
INTERCONNECT REFERRED TO AS
"SLAVE (SIGNAL) CABLE"
(5' INCREMENTS)
OPEN LEAD CABLE FOR
VARIOUS OUTPUT OPTIONS:
EX: 4-20mA OUTPUT TO PLC
A
B
C
D
E
F
G
4-20mA OUTPUT
A BLACK
B WHITE
C RED
D GREEN
E N/W/SHLD
BLACK +24V
WHITE -24V
N/A
N/A
SHIELD/COMMON
SLAVE (0-1VDC) OUTPUT
A BLACK
B WHITE
C RED
D GREEN
E N/W/SHLD
N/A
N/A
RED
GREEN
SHIELD/COMMON

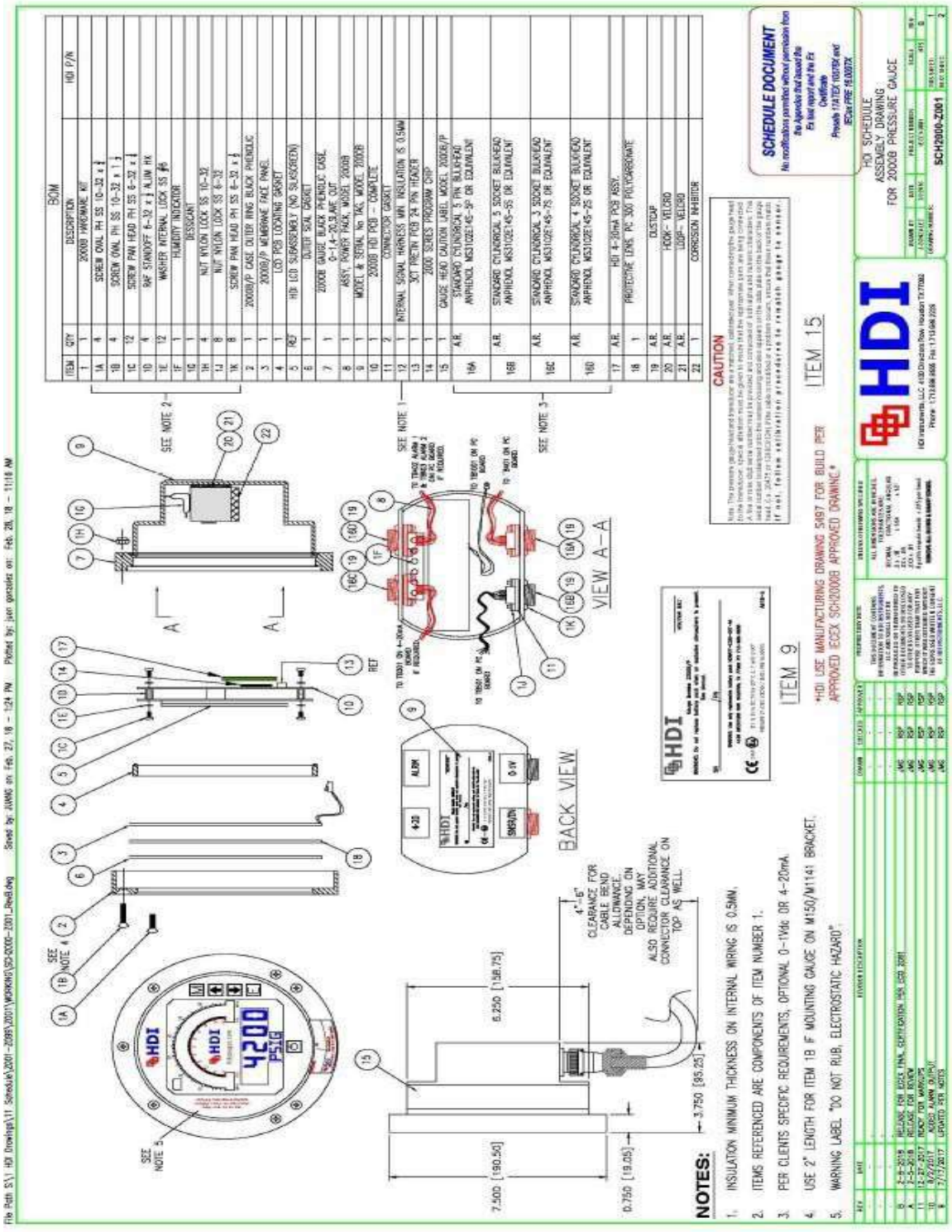
Sensor Illustrations

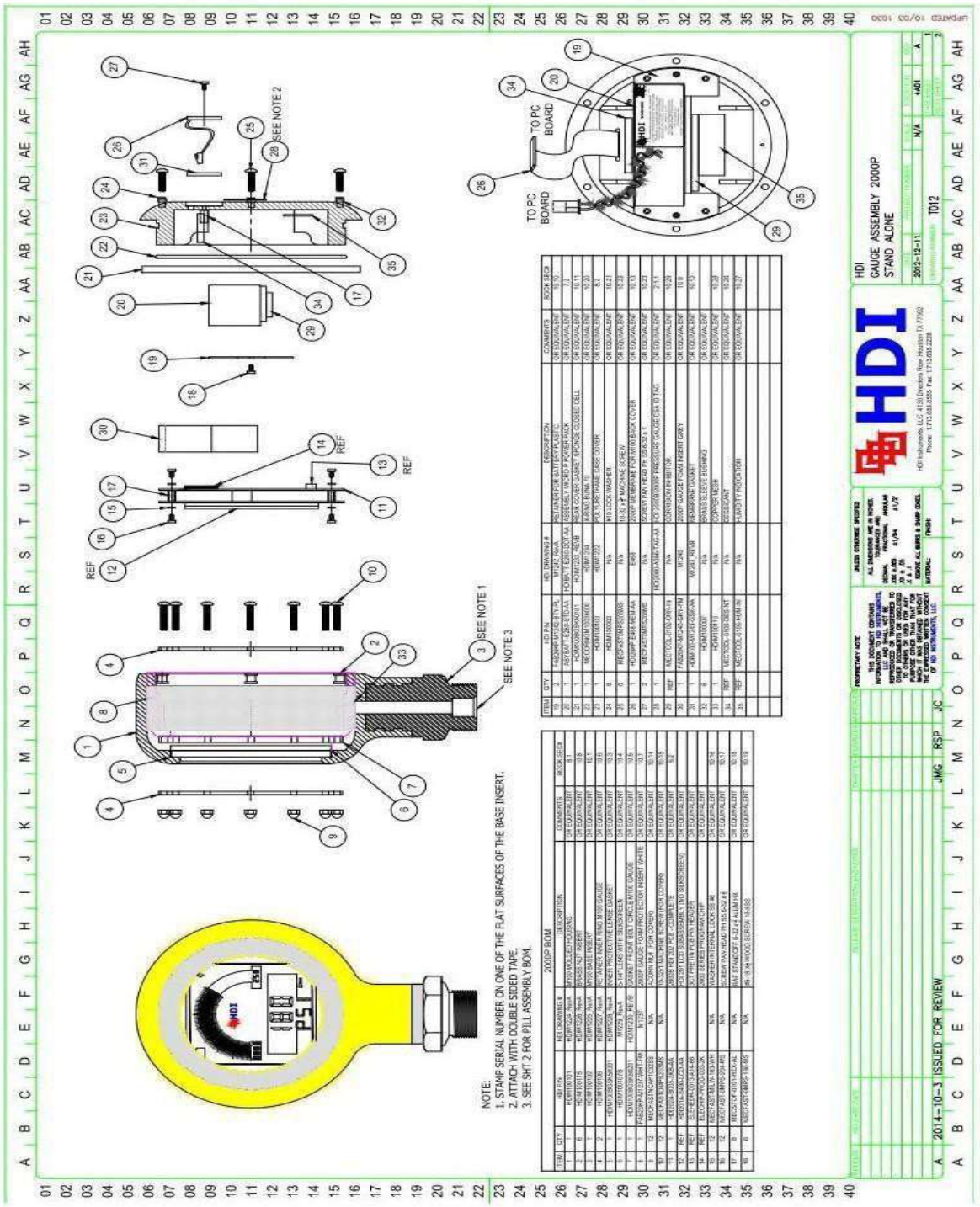



MALE
5SCIL
FEM
5PNTR
BOM
ITEM
QTY
HDI P/N
DESCRIPTION
1
A.R.
FA62000-HH01-HSSS-AA
1" NPT SENSOR HOUSING
2
1
ELECONN-0148-GLAND
¾" NPT CABLE GLAND
1" NPT CONNECTION SHOWN

Exploded BOM




BOM
ITEM | QTY | DESCRIPTION | HDI P/N
NOTES:
1. INSULATION MINIMUM THICKNESS ON INTERNAL WIRING IS 0.5MM.
2. ITEMS REFERENCED ARE COMPONENTS OF ITEM NUMBER 1.
3. PER CLIENTS SPECIFIC REQUIREMENTS, OPTIONAL 0-1Vdc OR 4-20mA.
4. USE 2" LENGTH FOR ITEM 1B IF MOUNTING GAUGE ON M150/M1141 BRACKET.
5. WARNING LABEL "DO NOT RUB, ELECTROSTATIC HAZARD".
CAUTION
SCHEDULE DOCUMENT
HDI SCHEDULE
ASSEMBLY DRAWING
FOR 2000B PRESSURE GAUGE
SCH2000-Z001
ITEM 15
ITEM 9
VIEW A-A
BACK VIEW
HDI USE MANUFACTURING DRAWING 5497 FOR BUILD PER APPROVED ECCX SCH2000B APPROVED DRAWING.


HDI
GAUGE ASSEMBLY 2000P
STAND ALONE
TO PC BOARD
SEE NOTE 1
SEE NOTE 2
SEE NOTE 3
REF
NOTE:
1. STAMP SERIAL NUMBER ON ONE OF THE FLAT SURFACES OF THE BASE INSERT.
2. ATTACH WITH DOUBLE SIDED TAPE.
3. SEE SHT 2 FOR PILL ASSEMBLY BOM.
2000P BOM

9.D Common Operational Spare Parts

Due to the various configurations offered by HDI, we are only listing common spare parts that would be applicable to most clients.

Part Number	Description
SUB-013	Micro P Power Pack, include MSDS Class IX UN 3090 or 3091
HDIBATTE260ADPTR	The enclosed adaptor is used to convert older "E391" batteries to use the common E260. If the HDI 202 PCB is newer style, this may not be required. No charge
FAB2000M993	1502 Diaphragm
FAB2000-M1124	2202 Diaphragm
SUB-008	6K PSI LCD Assembly HDI 201 PCB
SUB-009	10K PSI LCD Assembly HDI 201 PCB
SUB-010	16K PSI LCD Assembly HDI 201 PCB
SUB-084	HDI 202 2KB Processor Board Assy Standard 6K Preloaded Software
SUB-085	HDI 202 2KB Processor Board Assy Standard 10K Preloaded Software
SUB-086	HDI 202 2KB Processor Board Assy Standard 16K Preloaded Software
SUB-084 / SUB-172	HDI 202 2KB Processor Board Assy Standard 6K Preloaded Software 4-20mA Output
SUB-085 / SUB-172	HDI 202 2KB Processor Board Assy Standard 10K Preloaded Software 4-20mA Output
SUB-086 / SUB-172	HDI 202 2KB Processor Board Assy Standard 16K Preloaded Software 4-20mA Output
SUB-084 / SUB-015	HDI 202 2KB Processor Board Assy Standard 6K Preloaded Software Slave Output
SUB-085 / SUB-015	HDI 202 2KB Processor Board Assy Standard 10K Preloaded Software Slave Output
SUB-086 / SUB-015	HDI 202 2KB Processor Board Assy Standard 16K Preloaded Software Slave Output
SUB-031	600 Bar Pill And Temp Comp Board Assy For 6K or 10K PSI Pressure Gauge Sensors
SUB-032	1000 Bar Pill And Temp Comp Board Assy For 10K or 16K PSI Pressure Sensors
SUB-070	6-32 Screws, Standoffs, Corrosion Inhibitor, Desi Pack, Humidity Indicator, Outer Seal Gasket and Protective Lense
CONTACT HDI FOR PRODUCT CONFIGURATION	Pill Replacement Kit: Includes Pill Rubber Diaphragm, Snap Ring, Rubber Grommet for Kellum's Grip Design (Wire Mesh, Post 2009), Rubber Grommet for M983 Design (No Wire Mesh, Pre 2009), and Pill InsertionTool

* Denotes parts compatible for both HDI 2000B and 2000P systems.

9.E Quick Calibration Procedure

With the gauge turned off, hold the "M" button and power on the gauge. Release the "M" button once the display lights up. Once the POST is complete hit the "M" button again and at the bottom of the LCD, the "PSIG" will change to show serial #, press "M" again it will show you "Lo Cal" and press "M" again and "Hi Cal" will display. Note: Write down what the default "Hi Cal" set point is for your records. If possible, we would like for you to use this set point for future gauge calibrations but understand this may not always be possible.

To begin:

Start with the gauge display turned off, transducer connected to the gauge and no pressure on the system. If you have a 2" 1502 / or 2" 2202 knock the connection loose to ensure there is no static pressure. You must also be prepared to supply at minimum 50% of the gauge pressure range for final calibration.

1. Hold the "M" button and power on the gauge. Once the POST test begins, release the "M" button.
2. Next is to toggle thru the "M" options to access the preset factory calibration points.
3. Press the "M" button and the display will show the gauge serial #.
4. Press the "M" button again, the "Lo Cal" set point will display. This by default will be Zero (0).
5. If you have no pressure, Press the "E" (enter) button to accept this set point. Note: The gauge will return to PSIG. Press the "M" button to enter back into Calibration mode.
6. In order to proceed to the "Hi Cal", you must be able to pressure to 50% of the gauge pressure range, i.e., 16K wouldrequiremin8K PSI. Go ahead and pressure the device.
7. Press "M" again to access the "Hi Cal" set point and once you have stabilized. pressure, Press "E" and if it is accepted/ stored – the bar graph display should instantly kick up to the applied pressure currently on the gauge. Note: If you need to adjust the factory preset, use the Up / Down arrows as necessary. If not, repeat this step. The gauge will return to PSIG. Press the "M" button to enter back into Calibration mode.
8. This completes calibration and the system should display "PSIG".
9. Slowly release/bleed the pressure off and observe the gauge is responding to your pressure drop.
10. Once you reach zero – you may still have static pressure, please do not continue to reset zero as this will affect calibration span over time.

Note: If you feel comfortable that the gauge is properly calibrated and within acceptable tolerances, please turn off the gauge to lock in your calibration settings until the next calibration is required.

Certification Markings

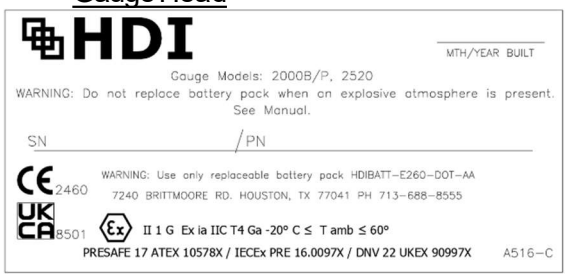
CSA Certification Markings:

Gauge Head

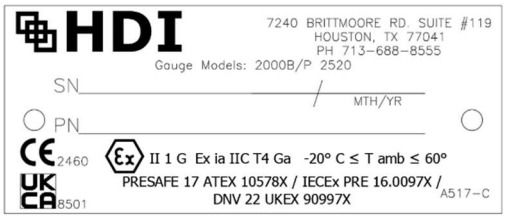
Sensor

ATEX / IECEx / DNV Certification Markings:

Gauge Head



Sensor



Note: In the event one of the components (gauge or sensor) fails, you can order the replacement for a quick drop-in replacement. When ordering, be sure to provide the applicable serial number or certification requirements to ensure the replacement is acceptable.

Certification Reports

CSAReport:

CSA Group

Certificate of Compliance

Certificate: 1380689 **Master Contract:** 159619

Project: 2651639 **Date Issued:** June 6, 2014

Issued to: **HDI Instruments LLC.**
4130 Directors Row
Houston, TX 77092
USA
Attention: Rohit Patel

The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US or with adjacent indicator 'US' for US only or without either indicator for Canada only.

C US

Jack Chin

Issued by: Jack Chin

PRODUCTS

CLASS 2258 03 - PROCESS CONTROL EQUIPMENT - Intrinsically Safe and Non - Incendive Systems - For Hazardous Locations

CLASS 2258 83 - PROCESS CONTROL EQUIPMENT-Intrinsically Safe and Non-Incendive - Systems-For Hazardous Locations-Certified to U.S. Standards

Class I, Division 1, Groups A,B, C and D

Pressure Gauge Transducer, Models 2000B*** or 20B*** , 2000P*** or 20P***, and 20S***. Intrinsically Safe only when powered by battery pack P/N E391-DOT-AA or HDIBATT-E392-DOT-AA or HDIBATT-E260-DOT-AA and installed per Installation Drawing ELTSCH-E403-CSA-PG or ELTSCH-E404-CSA-PG respectively. Temp. Code T4 at Tamb=60 Deg.C

Note: Model suffixes "***" consist of alpha-numerical characters denoting mechanical variations and configurations.

APPLICABLE REQUIREMENTS

CSA Std. C22.2 No. 142-M1987	-	Process Control Equipment
CAN/CSA-C22.2 No. 157-92 Hazardous Locations	-	Intrinsically Safe and Non-Incendive Equipment for Use

DQD 507 Rev. 2012-05-22 Page: 1

ATEX/IECEx Certificate

Presafe®
A DNV GL & NEMKO COMPANY

EU-Type Examination Certificate

[2] EQUIPMENT OR PROTECTIVE SYSTEM INTENDED FOR USE IN POTENTIALLY EXPLOSIVE ATMOSPHERES DIRECTIVE 2014/34/EU

[3] EU-Type Examination Certificate Number: Presafe 17 ATEX 10578X Issue 0

[4] Product: Pressure Gauge Models 2000B, 2000P, and 2520

[5] Manufacturer: HDI Instruments, LLC

[6] Address: 4130 Directors Row
Houston, TX, 77092, USA

[7] This product and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

[8] DNV GL Nemko Presafe AS, notified body number 2460, in accordance with Article 17 of Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Annex II to the Directive.
The examination and test results are recorded in confidential reports listed in section 16.

[9] Compliance with the Essential Health and Safety Requirements has been assured by compliance with:
EN 60079-0:2012/A11:2013 and EN 60079-11:2012

[10] If the sign "X" is placed after the certificate number, it indicates that the product is subject to the Specific Conditions of Use specified in the schedule to this certificate.

[11] This EU - TYPE EXAMINATION CERTIFICATE relates only to the design and construction of the specified product. Further requirements of the Directive apply to the manufacturing process and supply of this product. These are not covered by this certificate.

[12] The marking of the product shall include the following:

Ex II 1 G Ex ia IIC T4 Ga $-20°C \le T_{amb} \le +60°C$

Date of issue: 2018-03-14

Ståle Sandstad
For DNV GL Nemko Presafe AS
The Certificate has been digitally signed.
See www.presafe.com/digital_signatures for more info

PROD 021

This certificate may only be reproduced in its entirety and without any change, schedule included.

1 of 3

DNV GL Nemko Presafe AS, Veritasveien 3, 1363 Høvik, Norway

Presafe
A DNV GL & NEMKO COMPANY

EU-Type Examination Certificate

[13] Schedule

[14] **EU-TYPE EXAMINATION CERTIFICATE No.:** **Presafe 17 ATEX 10578X** Issue 0

[15] **Description of Product**

The HDI 2000B, 2000P & 2520 are industrial pressure gauges designed for use in explosive gas atmospheres. The gauges are electrically identical, and differ only in their enclosure and mounting options. The 2000B and 2520 are panel mounted gauges with remote sensor connections. The 2000B is a 6" gauge, while the 2520 is a 4" gauge. The 2000P is a 6" direct mounted gauge with integral sensor connection. All gauges are powered by replaceable battery pack, and can be optionally provided with various outputs for user feedback and/or connection to other pressure gauges. Reference HDI installation drawing E485 for all permissible installation configurations.

Type Designation

2000B, 2000P, and 2520

Electrical Data

Only the following replaceable battery packs shall be used:

- HDIBATT-E260-DOT-AA (2000B and 2000P)
- HDIBATT-E608-DOT-AA (2520)

External Connection Details:

Output	Connector	U_i	I_i	P_i	Barrier R_{min}	C_i	L_i
0-1V Output*	B	8.6V	0	0	-	0	0
4-20mA Output	C	28V	110mA	770mW	-		
		15.8V	150mA	593mW	-		
Alarm Output	D	28V	20mA	140mW	1435Ω		

** Alternatively, the 0-1V output may be connected to another HDI 2000B, 2000P, or 2520 pressure gauge, when connected in accordance with HDI installation drawing E485.*

[16] **Report No.:** 2018-3052, Issue 00
Project No.: PRJC-533786-2015-PRC-USA

[17] **Specific Conditions of Use**

1. Installation shall be in accordance with HDI installation drawing E485.
2. The battery pack shall only be replaced in an area known to be non-hazardous.
3. *2000B and 2000P Only:* The enclosure material has a surface resistance $>10^9\Omega$. Care shall be taken to avoid the generation of a potentially dangerous electrostatic charge. Clean only with a water damp cloth.
4. *2000P Only:* The metallic base insert is made of anodized aluminum. Care shall be taken to avoid impact or friction which may cause an ignition hazard.

2 of 3

DNV GL Nemko Presafe AS, Veritasveien 3, 1363 Høvik, Norway

Presafe
A DNV GL & NEMKO COMPANY

EU-Type Examination Certificate

Presafe 17 ATEX 10578X, Issue 0

[18] Essential Health and Safety Requirements

Essential Health and Safety Requirements (EHSRs) are covered by the standards listed at item 9

[19] Drawings and documents

Number	Title	Rev.	Date
	2000B and 2000P		
SCH2000-Z001	Assembly Drawing for 2000B and 2000P Pressure Gauges	B	2018-02-08
HDISCHE-E201-SCH-AA	LCD Glass Board Assy Schematic for 2000B/P Gauge	B	2018-02-07
E486	IECEx 4-20mA Board for 2000B/P Gauge	B	2018-02-08
M1303-E486-ASY	IECEx 2000B/P 4-20mA Board Assembly Drawing	B	2018-02-08
M1303-E486-FAB	IECEx 2000B/P 4-20mA Board Fabrication Details	B	2018-02-08
E484	IECEx Processor Board for 2000B/P Gauge	B	2018-02-08
M1300-E484-ASY	IECEx Processor Board for 2000B/P Gauge Assy Drawing	B	2018-02-05
M1300-E484-FAB	IECEx Processor Board for 2000B/P Gauge Fab Details	B	2018-02-05
	2520		
SCH2520-Z005	Assembly Drawing for 2520 Pressure Gauge	A	2018-02-08
HDISCHE-E601-SCH-AA	CPI LCD Board Schematic for 4" Gauge	A	2018-02-07
E603	IECEx 4-20mA Board for 2520 Gauge	B	2018-02-08
M1297-E603-ASY	IECEx 2520 4-20mA Board Assembly Drawing	B	2018-02-08
M1297-E603-FAB	IECEx 2520 4-20mA Board Fabrication Details	B	2018-02-08
E604	IECEx Processor Board for 2520 Gauge	B	2018-02-05
M1298-E604-ASY	IECEx Processor Board for 2520 Gauge Assy Drawing	B	2018-02-05
M1298-E604-FAB	IECEx Processor Board for 2520 Gauge Fab Details	B	2018-02-05
	Common		
E485	IECEx Installation Configurations for 2000B/P & 2520 Gauges	A	2018-02-08

[20] Certificate History

Issue	Description	Issue date	Report no.
0	Original Issue	2018-03-14	2018-3052, Issue 00

END OF CERTIFICATE

3 of 3

DNV GL Nemko Presafe AS, Veritasveien 3, 1363 Høvik, Norway

Section 10 - Product Data and Configuration Sheets for 1000P/2000P and 1000B/2000B

HDI

1000P and 2000P

PRESSURE GAUGE SYSTEMS

Data and Configuration Sheets

Specifications:

- Pressure Range: Up to 30K
- Battery Powered Instrumentation

1. PRESSURE RANGE (SELECT ONE)

○ 30PSI ○ 100PSI ○ 300PSI ○ 1KPSI ○ 3KPSI ○ 5KPSI ○ 6KPSI ○ 10KPSI ○ 20KPSI ○ 30KPSI

2. SENSOR CONNECTION (SELECT ONE)

○ 2" 1502 Hammer Union (Standard)

○ 2" 1502 H2S Hammer Union

○ 2" 2002 H2S Hammer Union

○ 2" 2202 H2S Hammer Union

○ 9/16" Autoclave Sensor
Note: Only Compatible with HDI Autoclave Flanges

3. AUTOCLAVE FLANGES (MUST SELECT9/16" AUTOCLAVE SENSOR)

Specify Pressure Rating and Size

Pressure Rating: ○ 5M ○ 10M ○ 15M ○ 20M

Size: ○ 1 13/16" ○ 2 1/16" ○ 3 1/16"

HDI Instruments, LLC USA | 7240 BRITTMOORE ROAD, SUITE 119 | HOUSTON, TX 77041 USA
Phone: 713-688-8555 | Fax: 713-688-2228
Email: info@hdigauges.com
Website: www.hdigauges.com

Version 1, August 2021

SAFETY
PRECISION
INNOVATION

WELL CONTROL MONITORING AT ITS FINEST

HDI

1000P AND 2000P PRESSURE GAUGESYSTEMS

Data and Configuration Sheets

4. CROSSOVER FLANGES/WYE ADAPTERS (MUST SELECT 1502 OR 2202 HAMMER UNION SENSOR)

For Wye Adapter: 1502 Connection Only

For Cross Over Flange: Specify Pressure Rating, Size, and Connection Type below:

Pressure Rating: ○ 5M ○ 10M ○ 15M ○ 20M

Size: ○ 1 13/16" ○ 2 1/16" ○ 3 1/16"

Connection Type: ○ 1502 ○ 2002 ○ 2202

Cross Over Flange

Wye Adapter

5. CONFIGURATION (SELECT ONE)

- ○ 0-1 Volt Output
- ○ 4-20mA Output (under development)
- ○ Slave , Secondary Displays Available

6. SLAVE GAUGE (MUST SELECT SLAVE OUTPUT)

- ○ Slave Gauge w/ No Output
- ○ Slave Gauge w/ 4-20mA Output

7. CABLE

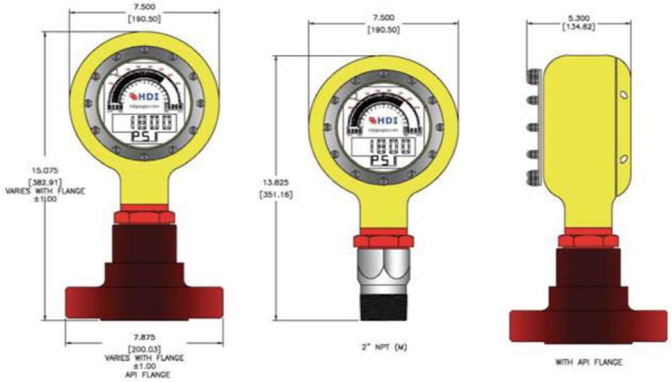
The 2000B Pressure Gauge System does not include any cable. Inline Cable is required for new orders; clients with existing Inline Cable may use the existing cable with a new 2000B Pressure Gauge System. 4-20mA Cable and Slave Cable are only used if the 4-20mA Output or Slave Output Configuration was selected in Section 5. Cable is purchased in 5' increments.

- ○ Inline Cable: Distance from Pressure Transducer (Sensor) to 2000B Gauge Display
- ○ 4-20mA Output Cable: Distance from 2000B Gauge Display to Local J-Box Termination Slave Cable:
- ○ Distance from 2000B Gauge (Master) Display to 2000B Slave Display

8. CERTIFICATION

- ○ CSA:Intrinsically Safe Class 1, Division1, Groups A, B, C, and D (Standard)
- ○ ATEX / IECEx: II 1 G, Ex ia IIC T4

APPENDIX A: DIMENSIONS



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HDI

1000B and 2000B

PRESSURE GAUGE SYSTEMS

Data and Configuration Sheets

Specifications:

- Pressure Range: Up to 30K
- Battery Powered Instrumentation

1. PRESSURE RANGE (SELECT ONE)

○ 30PSI ○ 100PSI ○ 300PSI ○ 1KPSI ○ 3KPSI ○ 5KPSI ○ 6KPSI ○ 10KPSI ○ 20KPSI ○ 30KPSI

2. SENSOR CONNECTION (SELECT ONE)

○ 2" 1502 Hammer Union (Standard)
○ 2" 1502 H2S Hammer Union

○ 1" NPT

○ 2" 2002 H2S Hammer Union
○ 2" 2202 H2S Hammer Union

○ 9/16" Autoclave Sensor
Note: Only Compatible with HDI Autoclave Flanges

3. AUTOCLAVE FLANGES (MUST SELECT9/16" AUTOCLAVE SENSOR)

Specify Pressure Rating and Size

Pressure Rating: ○ 5M ○ 10M ○ 15M ○ 20M

Size: ○ $1\ ^{13}/_{16}$" ○ $2\ ^{1}/_{16}$" ○ $3\ ^{1}/_{16}$"

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HDI 1000B AND 2000B PRESSURE GAUGESYSTEMS

Data and Configuration Sheets

4. CROSSOVER FLANGES/WYE ADAPTERS (MUST SELECT 1502 OR 2202 HAMMER UNION SENSOR)

For Wye Adapter: 1502 Connection Only

For Cross Over Flange: Specify Pressure Rating, Size, and Connection Type below.

Pressure Rating: ○ 5M ○ 10M ○ 15M ○ 20M

Size: ○ 1 13/16" ○ 2 1/16" ○ 3 1/16"

Connection Type: ○ 1502 ○ 2002 ○ 2202

5. CONFIGURATION (SELECT ONE)

- ○ No Output (Standard)
- ○ 4-20mA Output
- ○ Slave Output

6. SLAVE GAUGE (MUST SELECT SLAVE OUTPUT)

- ○ Slave Gauge w/ No Output
- ○ Slave Gauge w/ 4-20mA Output

7. CABLE

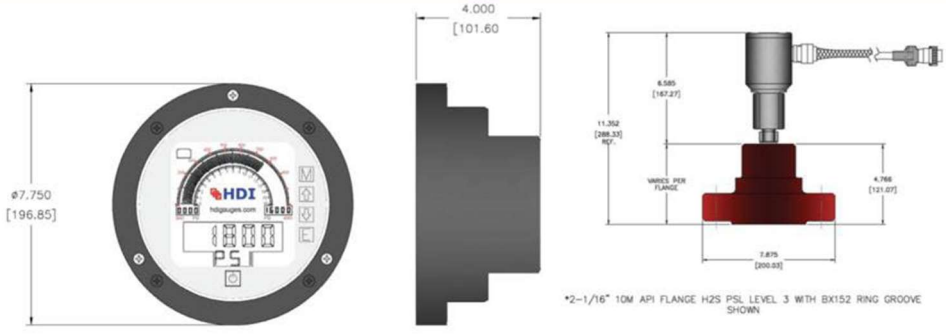
The 2000B Pressure Gauge System does not include any cable. Inline Cable is required for new orders; clients with existing Inline Cable may use the existing cable with a new 2000B Pressure Gauge System. 4-20mA Cable and Slave Cable are only used if the 4-20mA Output or Slave Output Configuration was selected in Section 5. Cable is purchased in 5' increments.

- ○ Inline Cable: Distance from Pressure Transducer (Sensor) to 2000B Gauge Display
- ○ 4-20mA Output Cable: Distance from 2000B Gauge Display to Local J-Box Termination Slave Cable:
- ○ Distance from 2000B Gauge (Master) Display to 2000B Slave Display

8. CERTIFICATION

- ○ CSA:Intrinsically Safe Class 1, Division1, Groups A, B, C, and D (Standard)
- ○ ATEX / IECEx: II 1 G, Ex ia IIC T4

APPENDIX A: DIMENSIONS



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HDI 1000B and 2000B PRESSURE GAUGESYSTEMS

Data and Configuration Sheets

APPENDIX B: REPLACEMENT SYSTEMS AND PARTS

Full Replacement 2000B Gauge Display
Specify Pressure Range, Configuration (Output), and Certification. Must be calibrated with existing HDI 2000B Sensor.
Full Replacement 2000B Sensor (Transducer)

Specify Pressure Range, Sensor Connection, and Certification. Must be calibrated with existing 2000B Gauge Display.

Part Number	Description
SUB-013	Micro P Power Pack, include MSDS Class IX UN 3090 or 3091
HDIBATTE260ADPTR	The enclosed adaptor is used to convert older "E391" batteries to use the common E260. If the HDI 202 PCB is newer style, this may not be required. No charge
FAB2000M993	1502 Diaphragm
FAB2000-M1124	2202 Diaphragm
SUB-008	6K PSI LCD Assembly HDI 201 PCB
SUB-009	10K PSI LCD Assembly HDI 201 PCB
SUB-010	16K PSI LCD Assembly HDI 201 PCB
SUB-084	HDI 202 2KB Processor Board Assy Standard 6K Preloaded Software
SUB-085	HDI 202 2KB Processor Board Assy Standard 10K Preloaded Software
SUB-086	HDI 202 2KB Processor Board Assy Standard 16K Preloaded Software
SUB-084 / SUB-172	HDI 202 2KB Processor Board Assy Standard 6K Preloaded Software 4-20mA Output
SUB-085 / SUB-172	HDI 202 2KB Processor Board Assy Standard 10K Preloaded Software 4-20mA Output
SUB-086 / SUB-172	HDI 202 2KB Processor Board Assy Standard 16K Preloaded Software 4-20mA Output
SUB-084 / SUB-015	HDI 202 2KB Processor Board Assy Standard 6K Preloaded Software Slave Output
SUB-085 / SUB-015	HDI 202 2KB Processor Board Assy Standard 10K Preloaded Software Slave Output
SUB-086 / SUB-015	HDI 202 2KB Processor Board Assy Standard 16K Preloaded Software Slave Output
SUB-031	600 Bar Pill And Temp Comp Board Assy For 6K or 10K PSI Pressure Gauge Sensors
SUB-032	1000 Bar Pill And Temp Comp Board Assy For 10K or 16K PSI Pressure Sensors
SUB-070	6-32 Screws, Standoffs, Corrosion Inhibitor, Desi Pack, Humidity Indicator, Outer Seal Gasket and Protective Lense
CONTACT HDI FOR PRODUCT CONFIGURATION	Pill Replacement Kit: Includes Pill Rubber Diaphragm, Snap Ring, Rubber Grommet for Kellum's Grip Design (Wire Mesh, Post 2009), Rubber Grommet for M983 Design (No Wire Mesh, Pre 2009), and Pill InsertionTool

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Section 11 – Warranty

HDI Instruments, LLC. (HDI) warrants this product 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 for Normal Oilfield Usage. For the purpose of this Warranty, Normal Oilfield Usage shall be defined as normal, oilfield monitoring applications.

HDI shall not honor the Warranty if any evidence of tampering, misuse or intrusion is indicated except by an HDI authorized technician or agent.

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 the same. All products accepted under the provisions of this warranty shall be shipped prepaid to HDI and returned to the customer prepaid by HDI. This is to include all applicable custom clearance fees, etc. for inbound international shipments. All products not accepted under the provisions of this warranty shall be shipped prepaid to HDI and returned freight collected.

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 that 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.

Client Maintenance Notes