

HDI 3300 Temperature Gauge



Operation and Maintenance Manual

(User to specify C or F)

Rev. 1203

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HOUSTON DIGITAL INSTRUMENTS, INC.
MODEL # HDI 3300 TEMPERATURE GAUGE
INSTALLATION, OPERATIONS AND MAINTENANCE MANUAL
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SECTION 1 System General Information:

1.1 General Information:

The HDI 3300 series is built to withstand the rigors of the oilfield. It is designed to provide the user with both laboratory accuracy and field repeatability. The HDI 3300 Temperature Gauge System provides you with the capability for the remote monitoring of temperatures.

This manual describes the installation, operation, maintenance and calibration of the HDI 3300 Temperature Gauge System. This manual shall provide the user with information necessary to properly and fully utilize the instrument. Included in this manual are all the necessary procedures to install and maintain this instrument properly.

1.2 Unpacking and Inspection:

Upon receipt of the equipment, assure that all 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.

1.3 Precautionary Information:

Assure all directions on the packages are followed during unpacking and handling. Extra care should be taken to assure that the temperature sensor, which is mounted in the transducer housing and flange supplied with the system, is protected from contact with any hard or sharp objects, i.e. screwdriver, fingernail, etc., during the installation of the sensor. Any evidence of mishandling or abuse shall **void** the warranty.

1.4 Personnel Qualifications:

This equipment requires experienced personnel to handle, install and maintain. HDI may provide technical schooling if it is required.

SECTION 2 System Description:

2.1 Systems Description:

The HDI model # 3300 is a battery powered, stand alone, electronic temperature sensing and display system. The display is a liquid crystal display (LCD), which includes both a numeric (5 digits) representation (for accuracy) and a bargraph (101 segments) representation (for trend), battery low indicators, optional slaved units, optional recorders and alarms may be included. The sensor itself is housed in a stainless steel case. The sensor is commonly housed in either a 1502 hammer union or a flange. Any style of housing may be specified by the customer. Once calibrated, the gauge and the sensor become a matched pair and the substitution of any component, including wire, requires recalibration of the system. The HDI Model # 2400 system will directly replace any panel gauge (6" diameter) with either a four bolt (90°) or a three bolt (120°) pattern without any modifications.

2.2 System Components:

2.2.1. Temperature Gauge:

HDI Model # 3300 Temperature Gauges are available with any of the following ranges:

FARENHEIT	-50 to +300
CELSIUS	-50 to +150
BOTH	BOTH

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. The following are common examples that may be encountered. HDI offers the following available options at additional cost.

2.3.1. Remote Display:

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

2.3. 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, slave gauges and/or data logging. This is a factory installed option and calibration is unnecessary.

2.3.3. 0-1 Vdc Output:

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

2.3.4 External Power

The external power (EPPM) option is available at 7-32Vdc.

SECTION 3 Installation:

3.1 Components:

3.1.1. Temperature Gauge and Transducer:

The temperature 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'. The maximum recommended cable length is 200'. Cable lengths can safely exceed this recommendation. Cable lengths from the sensors to the gauge, other than standard, shall have been specified by the customer to the factory in advance. Other cable types are available upon request. Cable shall be installed using acceptable standards for such installations.

3.2 Mounting Components:

3.2.1. Temperature Gauge:

The temperature system gauge is designed to be installed in the standard 6" diameter cut-out hole in the panel. Both the 90 degree (4 screw pattern) and 120 degree(3 screw pattern) bolt patterns are designed into the gauge and all applicable hardware is included. Remove the #10 elastic stopnuts from the 10 X 32 screws, drop the gauge into the appropriate hole and replace the stopnuts.

3.2.2. Temperature Sensor:

The temperature system transducer system comes from the factory as a complete assembly and only requires mounting of the housing using standard practices for such installations. **Note:** Special care should be taken to insure that the sensor mounted in the center of the housing, is

not allowed to make contact with any hard and/or sharp object as the sensor pill is vulnerable to this type of contact and the accuracy and the sensitivity could be affected. A wide variety of housings are available. Any evidence of mishandling or abuse shall **VOID** the warranty.

3.2.3. Temperature Gauge Wiring:

Note: The temperature gauge, cable and sensor are a matched, calibrated system. In multiple systems, when connecting the gauge to the transducer, special attention must be given to insure that the appropriate pairs are being connected. A four digit number with a one letter prefix (i.e., A5121) or a five digit number (91512) is stamped in the top of the sensor housing and the same number appears on the ID. tag on the back of the temperature gauge as part of the serial number. If unsure, check to see that these numbers match.

SECTION 4 Theory of Operation:

4.1 Temperature System:

The major components of this system are the control head, the sensory system and the communications link (cable). The control head contains the power source for the system, the signal conditioning, processing, calibration, outputs and the display. The process of sensing temperature is begun in the control head by conditioning the power as a current constant source and then transmitting that as excitation to the sensor. This sensor when excited by the current source, will produce an electrical signal that is proportional to the temperature applied to it. This signal is then returned to the control head, via the comm. link for processing. Circuitry then converts the electrical signal to logic drive for the LCD. The only remaining components in the system are the scaling circuits which are part of the signal conditioning/processing and the temperature compensation PCB located inside the transducer housing.

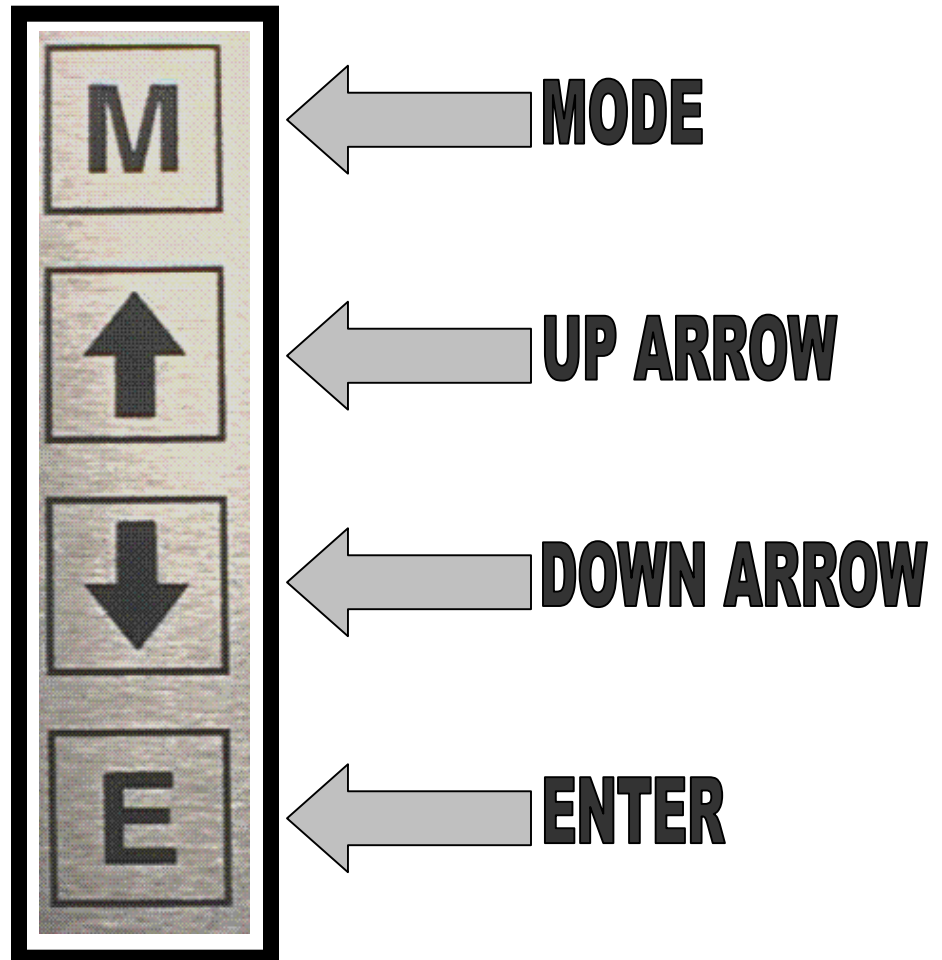
The "intrinsically safe" EXIA power source is a 3.6 volt, potted, replaceable, battery pack. The temperature gauge system requires only minimal power, therefore it is preferable to leave the pressure gauge in the "ON" position at all times.

SECTION 5 Operation

5.1 Front Panel

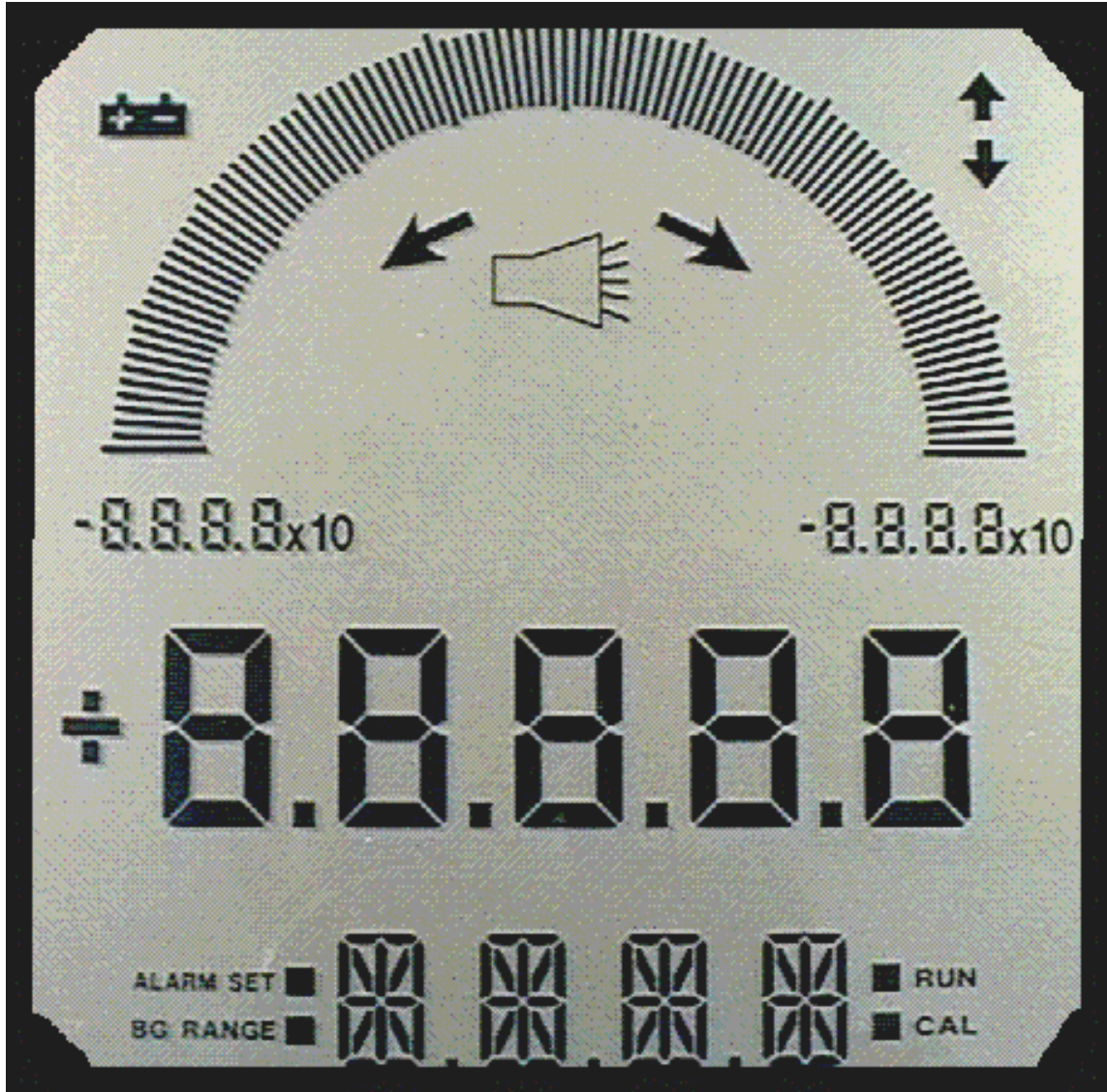
FRONT PANEL SWITCHES

1. There are four pushbuttons located on the face of the HDI 3300.
2. These PIEZO (Pressure) switches give the operator the ability to adjust and alter the settings on the HDI 3300.
3. A firm even pressure directly centered on the switch is required to activate it.



5.2 Power-On Self Test

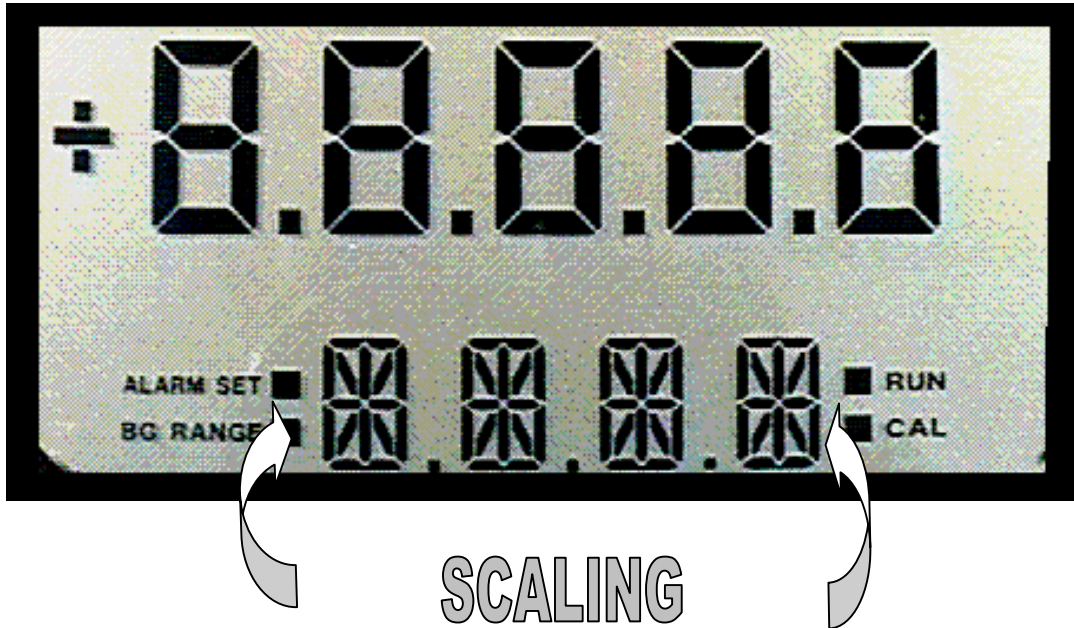
POST DISPLAY



POWER-ON SELF TEST (POST)

1. Located on the bottom-rear of the gauge is a Power-On toggle switch.
2. During the POWER-ON sequence the display goes through a series of internal tests lasting 1-2 seconds. For approximately 5 seconds all of the displays on the panel are lit. After this period it defaults into the normal Operating Mode.
3. The operator can bypass this POST by pressing the ENTER (E) key on the front panel.
4. This visual POST is repeated whenever the operator turns the unit off, and then on again after allowing for a three second wait to clear the system.
5. Pressing the DOWN ARROW at this time will display the individual Model Number.

5.3 Bar Graph Range Selection



System Scaling Units Selection

1. The HDI 3300 can cycle between the two available scaling units (if both are installed). The gauge is available with custom options containing any individual or combination of these two Scaling Units.

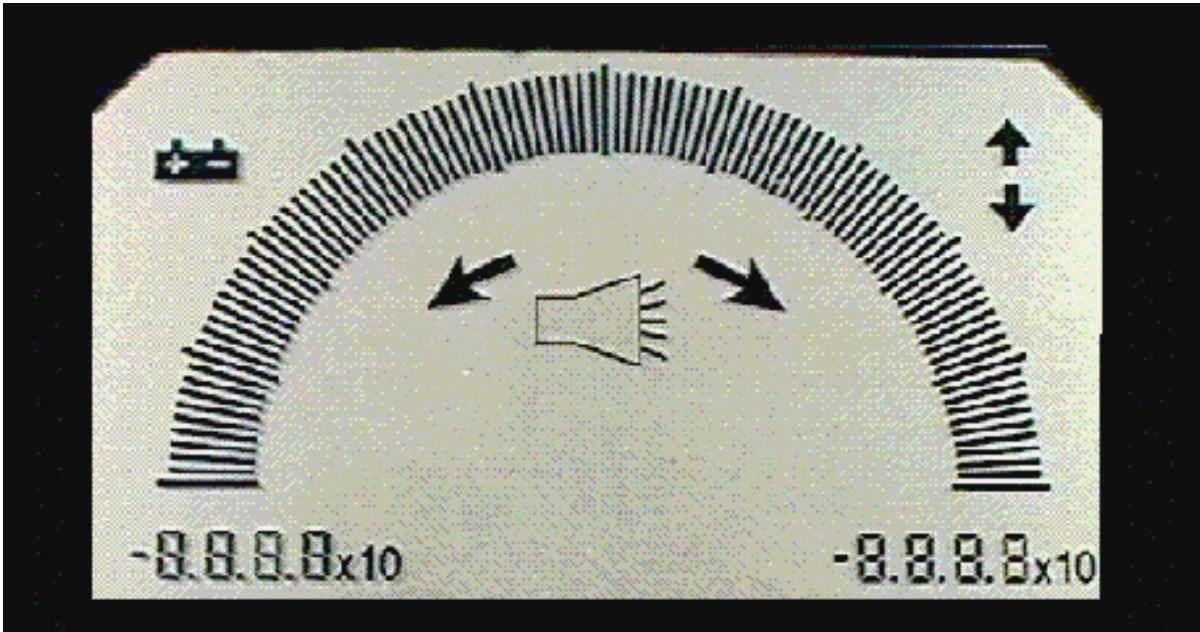


2. If a Scaling Unit is not available it will simply be skipped in the sequence. Once your HDI 3300 has reached the end of the list, it will return to the top of the scaling list and sequence forward again.(If you have only one range, nothing happens)
3. During POST it will automatically default to the Centigrade mode if that option is installed. Otherwise it will default to the first available installed scale.
4. The operator can select a particular Scaling Unit by pressing the MODE (M) button on the front panel.

MODE (M)	█ RUN indicator turns OFF as the unit leaves the current operating mode
UP-ARROW	* FAHRENHEIT changes to the CELSIUS range
ENTER (E)	Enters the available and displayed mode. █ RUN indicator turns ON and the current mode is displayed

If the operator passes the desired scale, the system must be cycled forward through the sequence until the particular unit is again displayed.

5.4 Setting the Alarm Set-Points or Triggers



The Alarm Triggers or Set-Points

1. The optional alarm TRIGGERS or SET-POINTS can be set in either range. Each HDI 3300 has two available TRIGGERS. There is one each for both the HIGH and LOW temperature warnings.
2. The ALARM TRIGGER locations are displayed on the HDI 3300 as FLASHING segments of the BAR-GRAPH.
 - ALARM ARROWS are also shown beneath the BAR-GRAPH as a reminder of whether that particular setting is for the HIGH or LOW TRIGGER.
 - Shown in the center of the HDI 3300 is the HORN symbol indicating when an ALARM condition is present. Either the current temperature is outside of the range scale, or one of the TRIGGERS has been exceeded.
 - The arrows in the upper right hand corner of the HDI 3300 will indicate whether the gauge detects a trend in the temperature fluctuations. This can be either a rising or falling condition

MODE (M)	RUN Indicator turns OFF
MODE (M)	BG RANGE indicator turns OFF
UP-ARROW	ALARM SET indicator turns on. ← Low ALARM arrow on. Low ALARM TRIGGER INDICATOR starts to rise
UP-ARROW	Low ALARM indicator TRIGGER INDICATOR stops
ENTER (E)	Low ALARM Trigger is set. Low ALARM ARROW OFF ← High ALARM ARROW ON →
DOWN-ARROW	High ALARM ARROW starts to drop
DOWN-ARROW	High ALARM ARROW STOPS
ENTER (E)	High ALARM TRIGGER IS SET ALARM SET indicator Turns ON Low ALARM arrow OFF High ALARM arrow off
To CANCEL the ALARM TRIGGERS, toggle through the scaling units	Alarm indicators are blinking

NOTES

1. If the ALARM SET indicator is already ON and you want to change the current settings refer to the following:
2. In STEP 3, select the ALARM SET to deselect the current settings. Continue with STEP 4.
3. If you over or under-shoot the desired setting, use the opposite ARROW to move the TRIGGER point in that direction.
4. The operator cannot set the alarm triggers outside of the currently selected range.

5.5 Available HDI 3300 System Options

- The HDI 3300 Temperature gauge can be ordered with either the Fahrenheit, Centigrade or both sets of scales.

- The HDI 3300 is available in models either with or without alarm outputs.

- The HDI 3300 is available with or without external power options.

- The HDI 3300 is available with or without Chart Recorder options.

- The HDI 3300 is available with or without Slave outputs for remote monitoring capabilities.

- The HDI 3300 is available in a backlit model.

SECTION 6

Warranty:

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 usage where the transducer is subject either to non laminar constant cycling or exposure to acidic compounds. In those uses 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

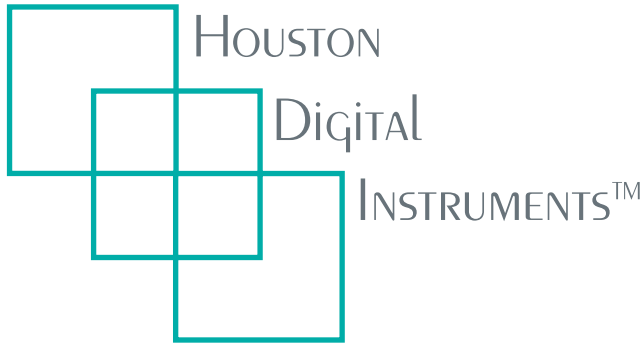
Output Interfacing

OUTPUT PINS

MASTER GAUGE	A	B	C	D	E	MASTER GAUGE
SLAVE ONLY	Meter +	Meter -	Meter Power	N/A	Gnd	SLAVE ONLY
SLAVE & ALARM*	Meter +	Meter -	Meter Power	Alarm Out	Gnd	SLAVE & ALARM
4-20ma ONLY	4-20 +	4-20 -	Shield	N/A	Gnd	4-20ma ONLY
ALARM ONLY*	N/A	N/A	Alarm Out	N/A	Gnd	ALARM ONLY
ALARM* & 4-20ma	4-20 +	4-20 -	Shield	Alarm Out	Gnd	ALARM & 4-20ma

SLAVE GAUGE	A	B	C	D	E	SLAVE GAUGE
4-20ma ONLY	4-20 +	4-20 -	Shield	N/A	Gnd	4-20ma ONLY
ALARM* ONLY	N/A	N/A	Alarm Out	N/A	Gnd	ALARM ONLY
ALARM* & 4-20ma	4-20 +	4-20 -	Shield	Alarm Out	Gnd	ALARM & 4-20ma

*ALARM OUTPUTS NOT TO EXCEED 25v @30 ma MAXIMUM.



HDI 3000 SERIES

Model 3300 Temperature Gauge System

The HDI Model 3300 Temperature Gauge System is a microprocessor based digital/analog temperature monitoring system. The System is designed specifically for monitoring high pressure nitrogen pumping, geothermal and mud based drilling, liquid level/bulk, and well control manifold/flare stacks. The HDI 3300 consists of gauge head, transducer, and connecting assembly. The HDI 3300 Gauge Head is available on a standalone basis in both 4" and 6" models and may be powered by the HDI patented battery. The HDI 3300 is oilfield rugged and is another proud member of HDI's growing family of "Intrinsically Safe" instruments.

FEATURES

- Verify temperature with a solid state RTD
- Proven HDI reliability
- HDI patented battery power
- HDI digital/analog bargraph display
- Low maintenance, field repairable design

OPTIONS

- Input for customer supplied 12/24VDC
- Fahrenheit and/or Centigrade measurements
- 4-20mA and 0-1VDC outputs
- Remote slave units available

SPECS

Dimensions:	7 3/4" diameter x 4" deep or 4"x4"(square)x7" deep	Backlighting:	Optional, but only with Customer supplied power
Weight:	5 Lbs. (Control Head)	Transducers:	1502 Hammer union 2202 Hammer union Flanges (Several sizes) NPT Adapters 9/16" Autoclave
View Angle:	50 degrees		
Viewing Distance:	50 feet		
Average Response Time(Head):	+20° to 0° C 0.1 sec -10° to -20° C 0.2 sec -30° to -40° C 2.2 sec	Accuracy:	0.5% of Full Scale
		Non Linearity and Hysteresis:	0.5% of Full Scale
Analog Inputs:	4-20mA(Externally Sourced) 0-1VDC	Operating Temperatures:	-40° to 70° C -40° to 175° F
		Ambient Humidity:	100%
Power:	Replaceable Battery Pack Optional External Power	Displayed Ranges:	-50° to 150° C -50° to 300° F
Certifications:	Pending: CSA		

U . S . Patent Number: 5,673,038

SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE

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HDI 2400 / 3300 Series Field Repairable parts list (Gauge)

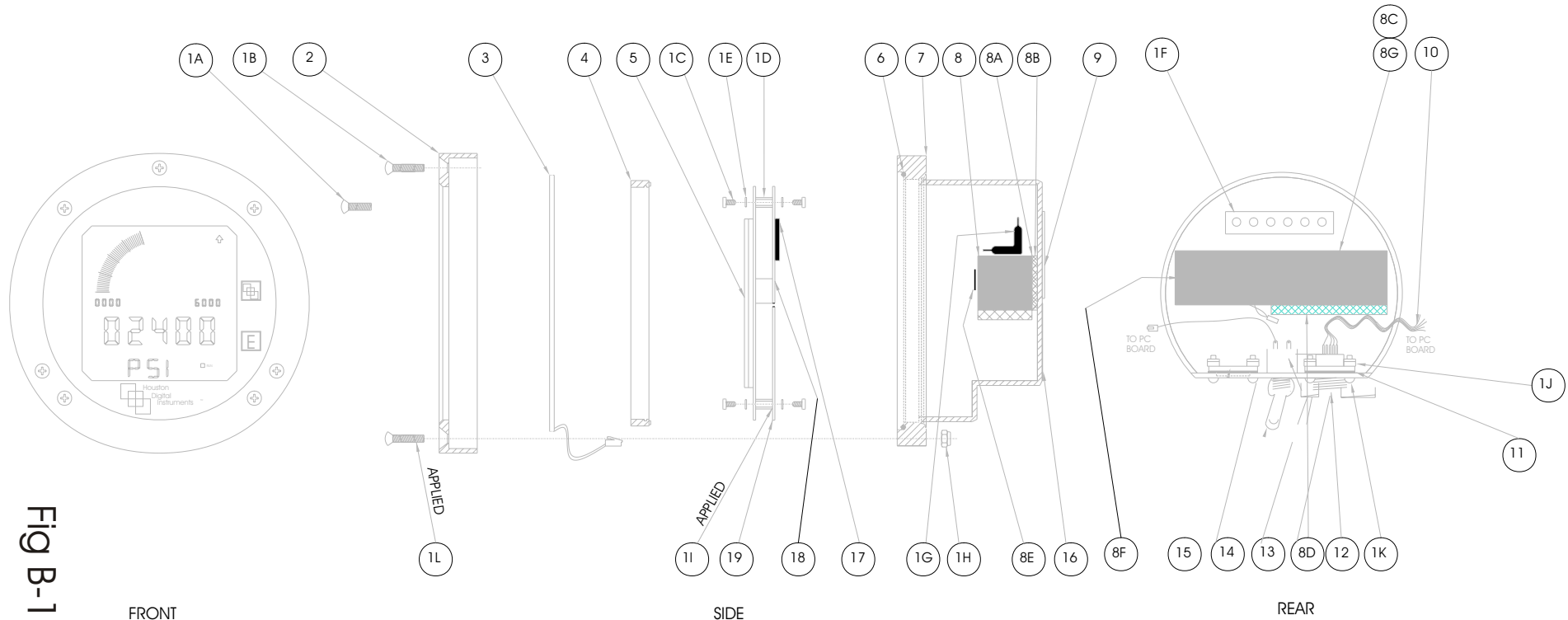


FIG B-1

#	QUANTITY	ITEM #	DESCRIPTION
1	SUB	KIT2400-0103-HRW-PG	- HARDWARE KIT
2	1	FAB2000-M003-CRG-AB	- FACE CASE RING
3	1	FAB2400-M478-FGB-AA	- 2 BUTTON PIEZO FACE PANEL
4	1	FAB2400-M002-GSK-AA	- LCD PCB LOCATING GASKET
5	1	HDI001D-S272-DIS-AD	- 2400 DISPLAY PCB COMPLETE
6	1	MECORNG-0103-BNA-CS	- O'RING BUNA CASE 6"
7	1	FAB2400-M045-CSE-AA	- MICROPROCESSOR GAUGE CASE
			- MICRO P POWER PACK ASSY

#	QUANTITY	ITEM #	DESCRIPTION
8	SUB	HDIBATT-E260-DOT-AA	- MICRO P POWER PACK ASSY
14	1	MECTOOL-0108-TGG-AA	- TOGGLE BOOT
18	1	HDI002D-S273-DIG-AD	- 2400 DIGITAL PCB COMPLETE
19	1	HDI003D-S274-ANA-AD	- 2400 ANALOG PCB COMPLETE

HDI 2400 / 3300 Series Field Repairable parts list (Sensor)

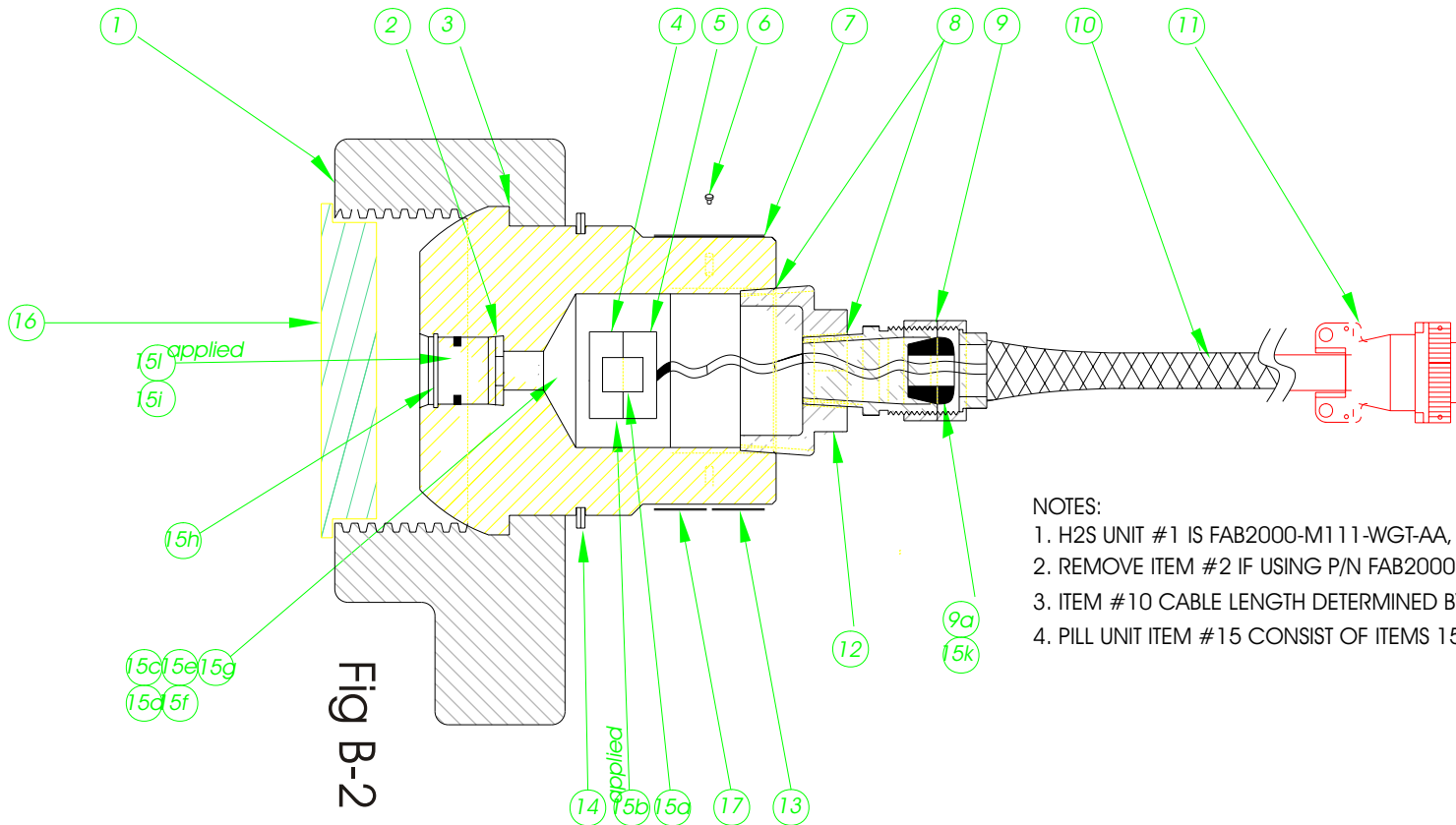
SEE NOTE 1
SEE NOTE 2

#	QUANTITY	ITEM #	DESCRIPTION
1	1	FAB2000-M036-WGT-AA	- WINGNUT
2	1	FAB2000-M030-WSH-AD	- WASHER BACK UP
3	1	FAB2000-M113-HSG-AB	- 1502 TDXR HOUSING S.S. MALE SUB
4	1	MECTOOL-0111-RED-FM	- SENSOR RED CAP FEMALE
5	1	MECTOOL-0112-RED-ML	- SENSOR RED CAP MALE
9	1	ELECONN-0152-CBL-GR	- CABLE GRIP W/ MESH
9A	INC(-1)	ELECONN-0152-GRO-MT	- CABLE GROMMET

SEE NOTE 3

#	QUANTITY	ITEM #	DESCRIPTION
10	CSTMR	RMACBLE-0032-420-OB	- 4/20 EXANE CBL
11	1	ELECONN-0105-5PN-TR	- CONNECTOR TERMINATOR W/ COLLAR 5 PIN
12	1	MECBUSH-0102-BRS-HX	- REDUCER
14	1	MECSNRG-0102-EXT-32	- EXT. SNAP RING
15	(REF)	HDIPLL-XXXX-XXX-AA	- PILL & TEMP BOARD ASSY
15H	1	MECSNRG-0101-INT-00	- INTERNAL SNAP RING

SEE NOTE 4



NOTES:

1. H2S UNIT #1 IS FAB2000-M111-WGT-AA, H2S WINGNUT
2. REMOVE ITEM #2 IF USING P/N FAB2000-M332-WSH-AB, ORFICE PLATE
3. ITEM #10 CABLE LENGTH DETERMINED BY CUSTOMER
4. PILL UNIT ITEM #15 CONSIST OF ITEMS 15A THRU 15L

Mounting Pattern for HDI 2000, 2400 or 3300 Series Gauge Systems (Gauge)

