



# Humboldt Digital ProLoader

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# Introduction

## Applications

Designed specifically for triaxial applications, the HM-2900 ProLoader takes the proven concept of the HM-2900 MasterLoader, downsizes it, and provides a triaxial-specific load frame on a smaller footprint without giving up any of the MasterLoader's versatility, accuracy or its internal four-channel data logger.

## Product Description

The ProLoader is a very versatile load frame providing an internal 4-channel data logger, which allows it to be used as a standalone device capable of full test control and data logging. It also can be quickly integrated into a complete, computer-controlled lab system incorporating its internal data logger as a component of the complete system.

Its heavy-duty design and precise stepper-motor control provides a stable platform for years of reliable service allowing it to perform any tests required up to its load capacity of 3000 lbf (15 kN). Whether as standalone unit or as part of a computer-controlled system, the ProLoader provides the user with fully-automatic test performance allowing unattended operation while controlling motor start/stop, speed selection and test data acquisition. Its modular design and its technical specifications allow the machine to be handle any triaxial test with ease.

The HM-2900 ProLoader includes the following key features:

- Control of a stepper motor driven platen at speeds from 0.000001 to 3.000000 in/min (or equivalent 00.000001 to 75.000000 mm/min).
- Support for up to 4 analogue transducer inputs from 0 to 100 mV suitable for most load, pressure, volume change and displacement devices. Configuration and calibration capability is provided, and all-important data is stored in non-volatile memory for safe preservation.
- Complete Data logger capacity for the following triaxial testing applications, including: UU, CU and CD triaxials and UC. All are fully configurable for automated Start, Stop and Logging conditions and can hold up to 1000 readings per test.
- A large LCD screen and 9 key membrane panel for easy presentation of results, parameter configuration, and machine control. To protect against operator misuse, key parameters can only be changed under pass code control.

- Plug and play Serial port (RS232) communications with Humboldt Material Testing Software (HMTS) for controlling and downloading stored data.
- Unique ID and RS485 communication port for multiple unit connections with a single computer.

In addition, the loader offers a large, backlit LCD display, a touch-sensitive keypad, a battery-backed real time clock, and auto-conversion of calibration and speed parameters between English and SI units.

## **General Warnings**

### **Safety Warnings**

Operators should take care to operate this machine under the maximum load restrictions. The machine is programmed at the factory to provide safety shutdown if the upper or lower maximum travel is exceeded as well as if the upper instrument calibration is exceeded.

### **Electrical Warnings**

Typically, there is no reason for the operator to open the machine. However, if the customer's engineers attempt to change settings to the circuit board connected to the back panel, the machine must always be unplugged before this operation. Unplugging the internal connection to the back panel circuit board while the machine is under power will result in permanent damage to the circuit board.

## **Manufacturer's Rights and Responsibilities**

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### 3

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The manufacturer reserves the right to change or modify product design or construction without prior notice and without incurring any obligation to make such changes and modifications on products previously or subsequently sold.

#### **Fitness for application**

The manufacturer makes no recommendations or claims regarding fitness for applications other than the specific tests as defined in this User Guide.

# Quick Start Guide

## Startup Scenarios

- 1** **If your HM-2900 was purchased with instrumentation for one specific test:** the instrumentation has been installed and calibrated. There is no need to configure or calibrate the machine. It is ready for use.

### **DO NOT RECALIBRATE!**

Refer to the Installation and Setup Section and then proceed to the section for the specific test desired.

- 2** **If your HM-2900 was purchased with instrumentation for multiple tests:** one of those tests is ready for use and the additional tests may or may not require the mounting of a different transducer than the one that is currently mounted. However all instrumentation shipped with your unit is calibrated and assigned specific channels for use. These channels are marked on the corresponding instrumentation. Unless it is required by your QC/QA program, there is no need to configure or calibrate the machine. It is ready for use.

### **DO NOT RECALIBRATE!**

Refer to the Installation and Setup Section and then proceed to the section for the specific test desired.

- 3** **If your HM-2900 was purchased without instrumentation for specific tests:** you will need to acquire, check compatibility, mount and calibrate your instrumentation for use with the HM-2900.

Refer to the Installation and Setup Section to make sure if your instrumentation is compatible with the HM-2900. You will need to calibrate your instrumentation, please refer to configuration and calibration instructions. You can then proceed to the Section for the specific test desired.

# Installation and Set-up

## Unpacking

Initial inspection should include checking for physical damage during shipping and obvious external damage to the product.

Package contents are defined by your packing list. Each MasterLoader is configured according to customer specifications. In your inspection, make certain that the contents of your shipment match the documentation provided by your packing list.

Place unit on a flat smooth surface and use leveling feet (supplied) and a bubble level to ensure that the unit is level side-to-side and back-to-front.

## Electrical Connections

The HM-2900 is equipped with an internal, digital, switching power supply, which allows it to be used with most power configurations throughout the world. The unit is supplied with an IEC electrical cord with a standard 110V plug.

The HM-2900 arrives ready for operation. Attach the supplied IEC electrical cord to the machine and plug into a standard wall receptacle for use in the United States.

For locations other than the U.S., replace the supplied electrical cord with an IEC cord with the correct plug for your application. The supplied cord can also be used by cutting the standard plug from the cord and attaching the correct plug.

## Instrument Inputs (load cell/transducer connections)

The HM-2900 has 4 instrumentation inputs located on the back panel to accommodate load cell/transducer connections. This feature allows you to set up and calibrate up to 4 different instruments, which the unit can quickly switch between for those needing to do multiple types of tests.

If you purchased load cells/transducers with your unit, they will either be mounted and calibrated, or in the case of multiple load cells/transducers, will be calibrated but not mounted. Additional load cells/transducers will be marked to indicate what input channel was used in the calibration; and, these load cells/transducers should be connected to the indicated channels.

Third-party load cells/transducers, which are compatible, can also be used with the HM-2900. Compatible units will have an excitation voltage of 0-10 volts and an output of 0-100 millivolts. Prior to use all third-party instrumentation must be configured and calibrated for use. Please refer to the Configuration and Calibration sections of this manual.



If you are using third-party cables for load cells/transducers connections, make sure they are wired to be compatible with the HM-2900. Consult Figure #1 for a compatible reference wiring diagram. Plugs to connect third-party instrumentation to the Humboldt HM-2900 are available, order part HM-000474.

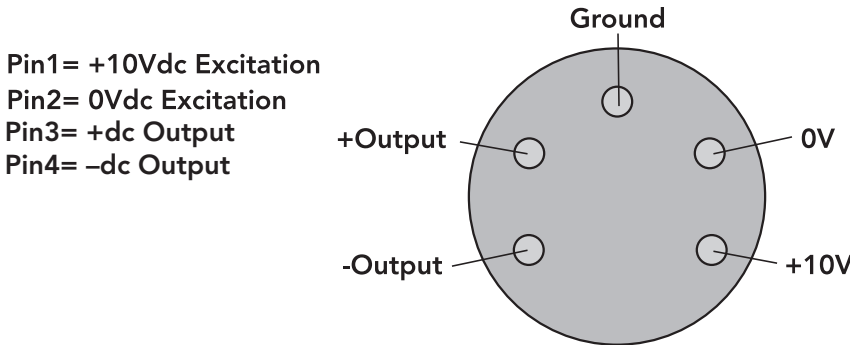


Figure 1. Compatibility wiring diagram for 3rd party cables

### Mounting Load Cells and Transducers

If you purchased your HM-2900 with instrumentation, one of the load cell/transducer setups should already be mounted to the unit. If you are using the machine for multiple tests or want to use instrumentation not included, including third-party instrumentation, the following photos can be used as a guide for load cells/transducers setup.



Figure 4. Unconfined Setup



Figure 5. UU Triaxial Setup

## **Computer Connection**

### **Single Device Connection**

The HM-2900 can be connected to a PC computer to take advantage of Humboldt's HMTS software capabilities, conduct real time data logging and enhanced report generation. This is accomplished via the RS-232 port on the back panel of the machine (refer to Figures 7 & 8.). Use a RS-232 cable (supplied) and attach it between the computer's RS-232 port and the HM-2900.

The minimum compatible computer configuration is a PC with Pentium III 800 MHz processor, 512 MB of RAM and a 40GB hard drive. Windows 2000 or XP with SP2 or later.

## Multi Device Connection

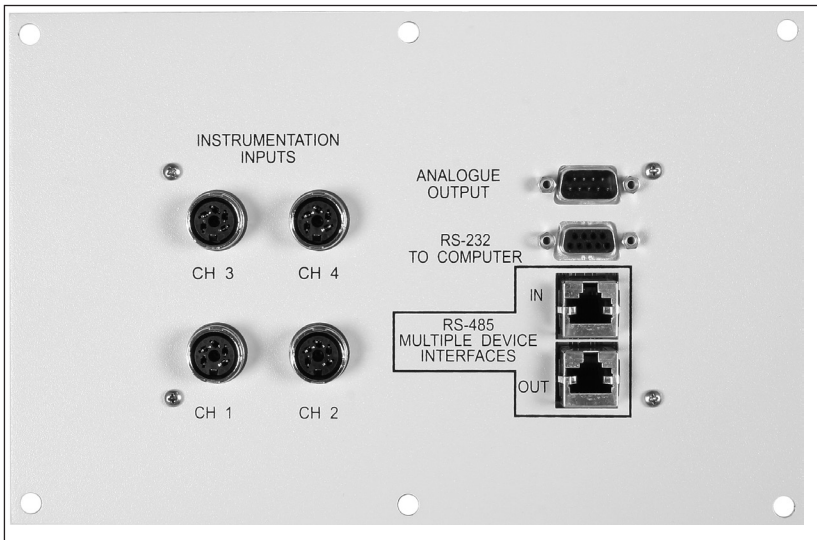
Multi devices, such as HM-2900s, HM-3000s, HM-2325A, HM-2330D MiniLoggers, HM-2560A, HM-2700A, HM-2700D Direct shear Apparatus can be connected to a computer via the HM-2900's RS-485 port. This allows you to daisy-chain several devices to the same computer; require HM-000375 (RS232 to RS485 converter not included). Use a standard CAT 5 cable (not included) to link

the additional device's output port to the HM-2900's RS-485 input port (refer to Figures 7 & 8). Dip switches need to be set to primary or secondary usage (see Figure 9).

The minimum compatible computer configuration is a PC with Pentium 4, 1.2GHz processor, 512 MB of RAM, and a 80GB hard drive Windows 2000 or XP with SP2 or later.

## Analogue Device Connection

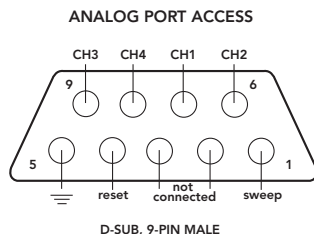
The HM-2900 can be set up to output directly to a chart recorder to provide a hard copy printout of test results. To accomplish this, connect your chart recorder via cable attached to the HM-2900's Analog port on the back panel (see Figure 7).



**Figure 7.** Rear panel of HM-2900 showing Analog Port, RS-232 Port, RS-485 Input and Output and the four instrumentation channel inputs.

Cable configuration for analogue port access.

Pins 1, 2, 3 & 4  
(Reserved for Humboldt Chart Recorder)



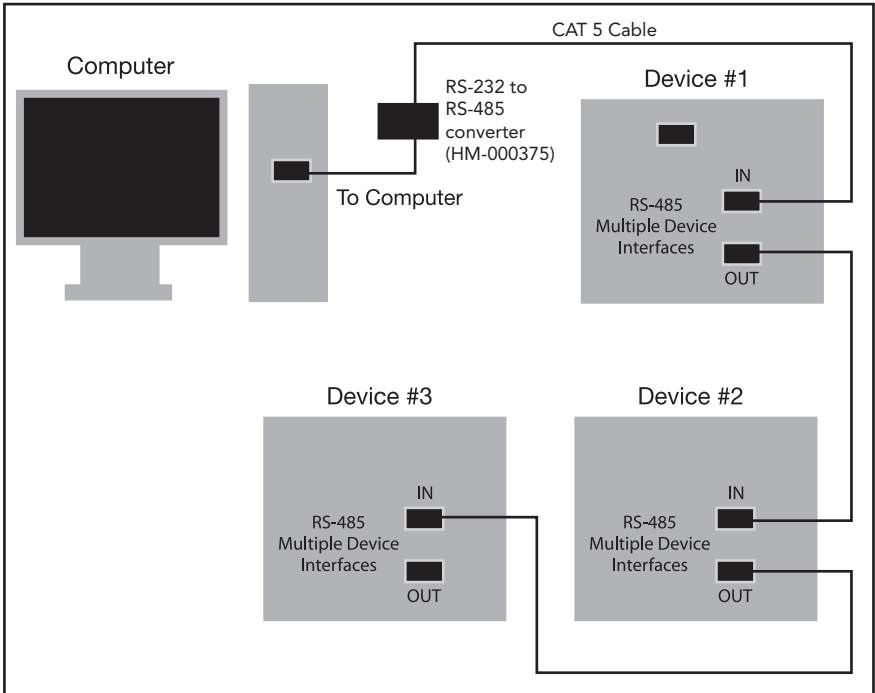
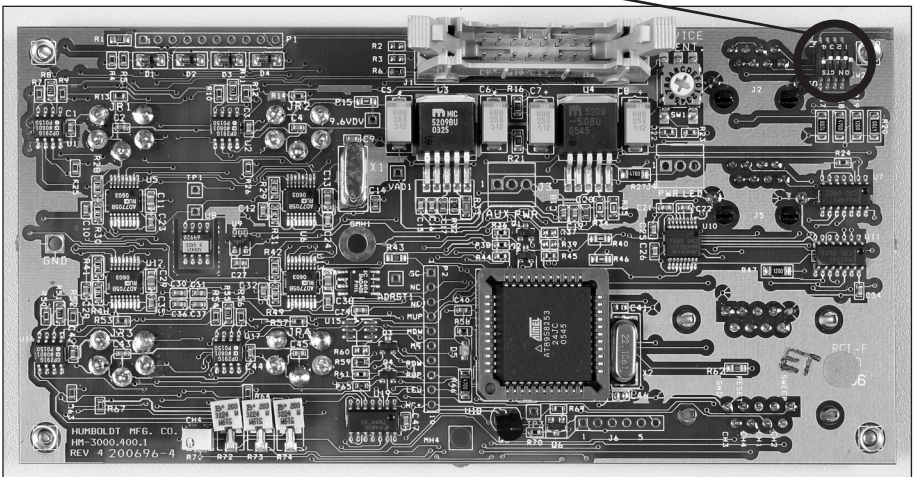


Figure 8. Diagram illustrating computer and multiple device connections.

Figure 9. Back Panel electronic board showing location of Dip switches for setting Computer connections. For single device setups, set Dip Switch #4 to on (default setting). For multiple device setups, set Dip Switch #4 to off.



# Operation

## Power Switch

The Power Switch is located in the back panel on the rear of the machine above the electrical cord inlet. Also, located between the electrical cord inlet and the Power Switch is the Fuse Compartment. The HM-2900 uses a 10 amp fuse. To begin operation, press the Power Switch.

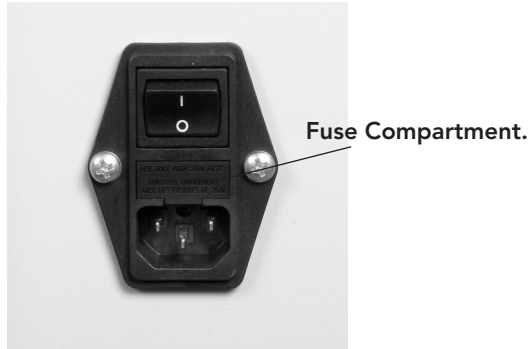


Figure 10. HM-2900 Power Switch, Electrical Cord Inlet and Fuse Compartment.

## Key Functions

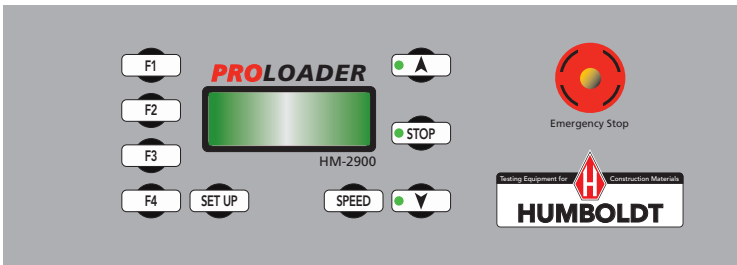


Figure 11. HM-2900 Front Control Panel and Emergency Stop Button

## Emergency Stop

The emergency stop button can be used to stop platen movement quickly. Pressing the button will stop platen travel. Once the emergency button has been pushed the operator must push the **STOP** button and pull out the emergency stop button to clear the emergency stop. Once this has been done the **UP** and **DOWN** buttons can then be used again. If the operator pulls out the emergency stop button before pressing the **STOP** button the machine will emit a high pitched sound until the **STOP** button has been pressed.

**SET UP****Set Up Key**

Pushing the Set Up Key brings up the main set up screen from which you can run a test, review your last test, access the engineering set up menus and set the date, time, units, standards criteria. This key also is used to return to a previous screen.

**SPEED****Speed Key**

Pushing the Speed Key allows you to set the test speeds of the machine.

**UP****Up Key**

Pushing the Up Key allows you to move the platen up to facilitate testing. Also, by pressing and holding down the Up Key, you can move the platen up at its fastest rate of speed—3.0"/min. Releasing the Up Key returns the platen to its set speed. When the key is pushed the green light next to it is lit.

**STOP****Stop Key**

Pushing the Stop Key stops platen movement. When the key is pushed the red light next to it is lit.

**DOWN****Down Key**

Pushing the Down Key allows you to move the platen down. Also, by pressing and holding down the Down Key, you can move the platen down at its fastest rate of speed—2.0"/min. Releasing the Down Key returns the platen to its set speed. When the key is pushed the green light next to it is lit.

**F1****Function Keys**

The four function keys are used to navigate through the HM-2900's menu-driven display. The function keys correspond with the command lines on the HM-2900's menu display. F1 corresponds with the first command line; F2, the second, etc. Command lines that are active in any display will be preceded by an (\*). If no (\*) is present, the corresponding function key is not active.

**F2****F3****F4**

LOAD	1	0001.2 lb
DISP	1	0.003 in
PRES	1	0.1 psi
VOLU	1	0.1 cc

LOAD	1 T	0000.0 lb
DISP	1 T	0.000 in
PRES	1 T	0.0 psi
VOLU	1 T	0.0 cc

Except when viewing all four channels values as above left, the function keys will perform a tare function to the displayed value and "T" will be displayed next to the channel name to indicate that the value of the channel has a tare (above right).

## Set-up Functions


### Set Date

To set the Date press  until you see this screen:

- \* REVIEW LAST TEST
- \* RUN TEST
- \* MORE SETUP

Press  you will see this screen:

- \* ENGINEERING SETUP
- \* SENSOR LIMITS                      OFF
- \* RAW\_DATA
- \* MORE SETUP

Press  you will see this screen:




- \* RECALL CALIBRATION
- \* CHANGE DEVICE ID
- \* DATE/UNIT/STANDARD
- \* MANUFACTURES INFO

Press  (DATE/UNIT/STANDARD). You should see this screen:

- \* CHANGE DATE
- \* CHANGE TIME
- \* UNIT = ENGLISH/METRIC
- \* STANDARD = ASTM/BS

Press  (CHANGE DATE). You should see this screen:

- \* DATE = "MM/DD/YY"
- \* INCREASE
- \* DECREASE

Press  (DATE) to select the month/date/year. Press  (INCREASE) or Press  (DECREASE) to change the appropriate number.

To return to any prior screen you can always press .

**Set Time**

To set the Time press  until you see this screen:

- \* REVIEW LAST TEST
- \* RUN TEST
- \* MORE SETUP

Press  you will see this screen:

- \* ENGINEERING SETUP
- \* SENSOR LIMITSOFF
- \* RAW\_DATA
- \* MORE SETUP

Press  you will see this screen:





- \* RECALL CALIBRATION
- \* CHANGE DEVICE ID
- \* DATE/UNIT/STANDARD
- \* MANUFACTURES INFO

Press  (DATE/UNIT/STANDARD). You should see this screen:

- \* CHANGE DATE
- \* CHANGE TIME
- \* UNIT = ENGLISH/METRIC
- \* STANDARD = ASTM/BS


Press  (CHANGE TIME). You should see this screen:

- \* TIME = "HH/MM/SS"
- \* INCREASE
- \* DECREASE

Press  (TIME) to select the HOURS/MINUTES/SECONDS. Press  (INCREASE), or Press  (DECREASE) to change the appropriate number. To return to any prior screen you can always press .



## Set Units

To set the Units the HM-2900 will use to display results, press  until you see this screen:

- \* REVIEW LAST TEST
- \* RUN TEST
- \* MORE SETUP

Press  you will see this screen:

- \* ENGINEERING SETUP
- \* SENSOR LIMITSOFF
- \* RAW\_DATA
- \* MORE SETUP

Press  you will see this screen:

- \* RECALL CALIBRATION
- \* CHANGE DEVICE ID
- \* DATE/UNIT/STANDARD
- \* MANUFACTURES INFO

Press  (DATE/UNIT/STANDARD). You should see this screen:


- \* CHANGE DATE
- \* CHANGE TIME
- \* UNIT = ENGLISH/METRIC
- \* STANDARD = ASTM/BS

Press  (units) to toggle between English and Metric Units.

Select the standard desired—the flashing standard is the active choice.

To return to any prior screen you can always press .

## Set Standards

To set the Standards the HM-2900 will use, press  until you see this screen:

- \* REVIEW LAST TEST
- \* RUN TEST
- \* MORE SETUP

Press  you will see this screen:

- \* ENGINEERING SETUP
- \* SENSOR LIMITSOFF
- \* RAW\_DATA
- \* MORE SETUP

Press  you will see this screen:

- \* RECALL CALIBRATION
- \* CHANGE DEVICE ID
- \* DATE/UNIT/STANDARD
- \* MANUFACTURES INFO

Press  (DATE/UNIT/STANDARD). You should see this screen:


- \* CHANGE DATE
- \* CHANGE TIME
- \* UNIT = ENGLISH/METRIC
- \* STANDARD = ASTM/BS

Press  (STANDARD) to toggle between ASTM and BRITISH STANDARD.

Select the standard desired—the flashing standard is the active choice.

To return to any prior screen you can always press .

## Set Speed

To set the speed of the HM-2900 press  You should see this screen:

- MOTOR SPEED ADJUST
- \* SPEED = "X.XXXXXX"
- \* INCREASE
- \* DECREASE

Press **F2** (SPEED) to move between the numbers. Keep pressing **F2** until the digit you want to change is flashing. Once you have selected the number you want to change, press **F3** (INCREASE) or **F4** (DECREASE) to change the number to the desired value.

### Set Logging Interval

To set or change the logging interval for USER DEFINED TEST press **SET UP** until the following setup screen appears:

\* REVIEW LAST TEST  
\* RUN TEST  
\* MORE SETUP

Press **F4** you will see this screen:

\* ENGINEERING SETUP  
\* SENSOR LIMITSOFF  
\* RAW\_DATA  
\* MORE SETUP

Press **F1** (ENGINEERING SETUP). You should see this screen:

\* CONFIGURATION  
\* CALIBRATION  
\* LOGGING INTERVAL

Press **F3** (LOGGING INTERVAL). You should see this screen:

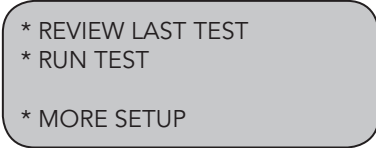
SAMPLE LOGGING TIME  
\* TIME = HH:MM:SS.T  
\* INCREASE  
\* DECREASE

Press **F2** (TIME) to cycle between the hour/minute/second/tenths to select the desired increment. Press **F3** (INCREASE) to **F4** (DECREASE) to change to the appropriate number

## Channel Configuration

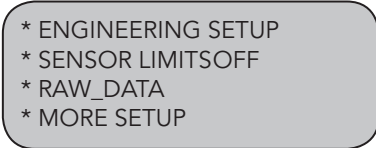
If you are adding new instrumentation, changing existing instrumentation or reconfiguring the HM-2900's channel setup, you need to configure the channel for use with the devices you have.

To configure a channel, press . You should see this screen:



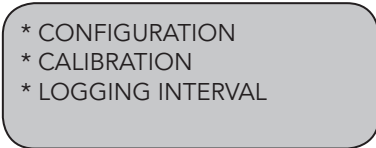
- \* REVIEW LAST TEST
- \* RUN TEST
- \* MORE SETUP

Press  you will see this screen:



- \* ENGINEERING SETUP
- \* SENSOR LIMITSOFF
- \* RAW\_DATA
- \* MORE SETUP

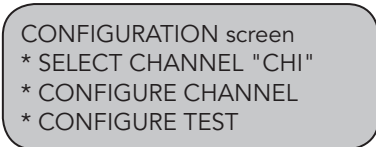
Press  (ENGINEERING SETUP). You should see this screen:



- \* CONFIGURATION
- \* CALIBRATION
- \* LOGGING INTERVAL



Press  (CONFIGURATION) You will be asked for a password, enter:

     You should see this screen:




CONFIGURATION screen

- \* SELECT CHANNEL "CHI"
- \* CONFIGURE CHANNEL
- \* CONFIGURE TEST

Press  (SELECT CHANNEL) to scroll through and choose the channel you wish to configure. Once you have selected a channel press  (CONFIGURE CHANNEL). You should see this screen:



## Naming Channel

From the previous screen, shown above, Press  (NAME) to select the name you wish to change, press the key until the name you wish to change is indicated. You should see this screen:


```

"CH1" CONFIGURATION
* NAME =          "CH1"
* INCREASE
* DECREASE

```

Press  (INCREASE) or  (DECREASE) repeatably to scroll through the available channel names for an appropriate choice. Choices for channel names are: CH1, CH2, CH3, CH4, LOAD1, LOAD2, LOAD3, LOAD4, DISP1, DISP2, DISP3, DISP4, FLOW, STAB, VERT, HORZ, PRES1, PRES2, PRES3, PRES4, VOLU1, VOLU2, VOLU3 and VOLU4.

**NOTE:** It is important to assign an appropriate name when naming channels because the HM-2900 will choose a unit of measure based on the name assigned. For example, if you are configuring a load cell, name the channel Load 1, 2, 3 or 4. This will ensure that the channel reads in lbs (kN). The same applies to Displacement (DISP 1, 2, 3 or 4) reading in inch (mm) and Pressure (PRES1, 2, 3 or 4) reading in psi (kPa) etc.

Once a name has been chosen for a channel Press  to return to the previous screen. You should see this screen (LOAD1 was chosen as name):

```


CH1 CONFIGURATION
* NAME =          "LOAD1"
* SENSOR MIN =    0
* SENSOR MAX =    "VALUE"

```

### Sensor Min

The Sensor Zero (SENSOR MIN) is not configurable and is set at 0.

### Sensor Max

Press  (SENSOR MAX) to set the Sensor Maximum value. You should see this screen:

```

"CH1" MAX SETUP
* SENSOR MAX =    "000000"
* INCREASE
* DECREASE

```

Press **F2** (SENSOR MAX) to move between the numbers. Keep pressing **F2** until the digit you want to change is flashing. Once you have selected the number you want to change, press **F3** (INCREASE) or **F4** (DECREASE) to change the number to the desired value. Below is a configuration chart for Humboldt instrumentation. These are the numbers that correspond to each Humboldt sensors.

Load Cell	Part#	English Max (lbf)	Metric Max (kN)
2,000 lb. (10kN)	HM-2300.020	2000.0	10.000
1,000 lb. (5kN)	HM-2300.010	1000.0	05.000
500 lb. (2.5kN)	HM-2300.005	0500.0	02.500
LVDT Transducer	Part#	English Max (in.)	Metric Max (mm)
0.4" (10.0mm)	HM-2310.04	0.4000	10.000
1.0" (25.4mm)	HM-2310.10	01.000	25.000
2.0" (50.8mm)	HM-2310.20	02.000	50.000
Pore Pressure	Part#	English Max (psi)	Metric Max (kPa)
100psi (1000kPa)	HM-2300.100	0100.0	001000

To return to any prior screen you can always press **SET UP**

### Channel Test Configuration

In order to perform a test, channels must be configured for the specific test you wish to run. To configure a channel for a test, press **SET UP**. You should see this screen:


Press **F4** you will

- \* REVIEW LAST TEST
- \* RUN TEST
- \* MORE SETUP

- \* ENGINEERING SETUP
- \* SENSOR LIMITSOFF
- \* RAW\_DATA
- \* MORE SETUP

Press  (ENGINEERING SETUP). You should see this screen:

\* CONFIGURATION  
\* CALIBRATION  
\* LOGGING INTERVAL

Press  (CONFIGURATION) You will be asked for a password, enter:












You should see this screen:


CONFIGURATION screen  
\* SELECT CHANNEL "CH1"  
\* CONFIGURE CHANNEL  
\* CONFIGURE TEST

Press  (SELECT CHANNEL) to scroll through and choose the channel you wish to configure test for. Once you have selected a channel press



(CONFIGURE TEST). You should see this screen:

* CBR/LBR TEST	N
* MARSHALL TEST	N
* USER DEFINED	N

To assign a test to the selected channel, press the corresponding function key to the test you wish to select. Pressing a key will toggle between "Y" and "N". For example, press  to choose Marshall Test, which will change the "N" to a "Y" next to Marshall. This would indicate that the channel selected would be set up to run Marshall Test.

**NOTE:** Multiple tests can be assigned to a single channel, however, multiple channels of the same category cannot be assigned to the same test.

**Example:** If channel 1 is configured with a 10,000 lb (50KN) load cell, and channel 2 is configured with a 5,000 lb (25KN) load cell, it is possible to use either channel to perform a Marshall test. However, only one of the channels can be used as the load channel (Stability channel).

To return to any prior screen you can always press 

# Calibration

This menu item is used to calibrate or verify the calibration of the HM-2900.

**WARNING: Calibration should only be performed by trained personnel with proper, certified equipment. The HM-2900 and its instrumentation should be calibrated once a year or as the need arises.**

## Channel Calibration

To calibrate a channel, press  You should see this screen:

- \* REVIEW LAST TEST
- \* RUN TEST
- \* MORE SETUP

Press  you will see this screen:

- \* ENGINEERING SETUP
- \* SENSOR LIMITSOFF
- \* RAW\_DATA
- \* MORE SETUP

Press  (ENGINEERING SETUP). You should see this screen:

- \* CONFIGURATION
- \* CALIBRATION
- \* LOGGING INTERVAL

Press  (CALIBRATION) You will be asked for a password, enter:

     You should see this screen:

- CALIBRATION screen
- \* SELECT CHANNEL "CH1"
  - \* CALIBRATION CHANNEL
  - \* CLEAR CALIBRATION



Press **F2** (SELECT CHANNEL) to scroll through and choose the channel you wish to calibrate. Once you have chosen the desired channel you wish to calibrate press **F4** (CLEAR CALIBRATION).

**WARNING: IF YOU CLEAR A CALIBRATION IT IS LOST FOREVER!**

After the calibration has been cleared, Press **F3** (CALIBRATE CHANNEL)  
You should see this screen:

CH1 CALIBRATION	
* SET GAIN	1
* SET SENSOR MIN	123
* SET SENSOR MAX	12345

Press **F2** (SET GAIN). With the instrument you wish to calibrate mounted to a calibration frame attached to the HM-2900, record the sensor min value with no load on the instrument (X divisions).

Next, apply the full engineering load value to instrument on the calibration frame and again, record the sensor min reading (X divisions). Subtract the two values. This value should be a number larger than the sensor maximum rating.

If not, you need to increase the gain to compensate for the difference. Press **F2** (SET GAIN) and repeat until the difference between the two values is more than the maximum sensor rating.

### EXAMPLE:

If you are calibrating a 10,000 lb. load cell, you need a difference value of at least 10,000 divisions. If you register a min value reading of 450 divisions with no load on the sensor and your min is 8450 divisions at full load on the instrument, your difference value will be 8000 divisions. ( $8450 - 450 = 8000$ ). To increase the gain press **F2** (SET GAIN) until you have more than 10,000 divisions.

Once the gain has been set, the zero point needs to be set. To set the zero point, apply the 0% force to the sensor and press **F3** (SET SENSOR MIN). Now apply the 100% force to the sensor and press **F4** (SET SENSOR MAX).

To return to any prior screen you can always press **SET UP**


On the next page is an Instrumentation calibration chart listing max divisions, as well as typical gain factors needed in calibrating each instrument type.

## Humboldt Calibration Instrumentation Chart

Load Cell	Part#	English (divisions)	Gain	Metric (divisions)	Gain
2,000 lb. (10kN)	HM-2300.020	20000	8	10000	4
1,000 lb. (5kN)	HM-2300.010	10000	4	5000	4
500 lb. (2.5kN)	HM-2300.005	5000	4	2500	4
<b>LVDT Transducer</b>					
0.4" (10.0mm)	HM-2310.04	4000	2	10000	2
1.0" (25.4mm)	HM-2310.10	1000	1	25000	2
2.0" (50.8mm)	HM-2310.20	2000	1	50000	4
<b>Pore Pressure</b>					
100psi (1000kPa)	HM-2300.100	1000	1	1000	1

## Device ID

Factory set device ID to 1, if multiple units are connect to a single computer a unique device ID for each unit has to be establish for the computer to recognize the correct instrumentation and the correct motors.

To set the Device ID the HM-2900 will use, press  until you see this screen:

\* REVIEW LAST TEST  
 \* RUN TEST  
 \* MORE SETUP

Press  you will see this screen:




\* ENGINEERING SETUP  
 \* SENSOR LIMITS OFF  
 \* RAW\_DATA  
 \* MORE SETUP

Press  you will see this screen:

- \* RECALL CALIBRATION
- \* CHANGE DEVICE ID
- \* DATE/UNIT/STANDARD
- \* MANUFACTURES INFO

Press  (CHANGE DEVICE ID). You should see this screen:

- DEVICE ID = 1
- \* INCREASE
  - \* DECREASE

Press  to increase the ID number or press  to decrease the number. Once the ID has been changed, press  to go back to previous menu. Note: Up to 16 devices can be connected to a single computer.

## SENSOR LIMITS


Sensor upper limits can be set to ON or OFF. If the Sensor's Upper limit is set to ON and the motor/test is in progress, when the sensor reaches its upper limit, the motor/test will stop and a warning message will be displayed. In addition, if a sensor has been unplugged from the instrumentation back panel, the same warning message will be displayed.

## RAW\_DATA

RAW-DATA refers to the digital output of the sensors prior to apply the calibration factor and conversion into engineering units.


## USER-DEFINED TESTS

A user defined test could be used for any custom tests. The test would require up to 3 channels associated with it. User Defined test such as Triaxial (CU) would require 3 channels (load, displacement, pore water pressure), A Triaxial (UU) requires 2 channels (load and displacement), Unconfined Compressive strength would require 2 channels (load and displacement), Soil-Cement and TSR would requires a single channel (load).

USER DEFINED "Unconfined Compressive strength test" Center the soil sample on the platen. Press the  button to raise the sample to the start position, close to the unconfined upper platen. There should be about a 1/8" (3.000mm) gap between the top of the sample and the unconfined upper platen.

Press  You should see this screen:






\* REVIEW LAST TEST  
\* RUN TEST  
\* MORE SETUP

Press  (RUN TEST) You should see this screen:


\* MARSHALL TEST  
\* CBR/LBR TEST  
\* USER DEFINED TEST

Press  (USER DEFINED TEST). You should see this screen:

MOTOR SPEED ADJUST  
\* SPEED = "X.XXXX"  
\* INCREASE  
\* DECREASE

Press  (SPEED) to access the speed readout on line 2 of the screen above. Keep pressing  until the digit you want to set is flashing. Once you have selected the digit you wish to set, press  to increase the number or press  to decrease the number. Once the speed has been set, press  to initiate the test. You should see this screen:

LOAD 1	VALUE
DISP 1	VALUE
* END TEST	#1


The display above will give constant real-time readings of the load and displacement measurements during the test cycle. You can end the test at any time by pressing . This will stop all data collection and reverse the platen to its down position.

Once the sample makes contact with the unconfined upper platen the HM-2900 will automatically zero the load and displacement readings and collect a load reading every "X" second, depending on what logging interval has been set (see logging interval).



Once the load cell has reached its peak load and fallen 2%, the HM-2900 will stop collecting data and reverse the platen to its down position at the fast rate 2.0 in/min (50.8mm/min). The peak load will be displayed.


You should see this screen:

LOAD 1 PEAK	""
DISP 1 PEAK	""
* REVIEW DATA	
* RUN TEST	

Peak values are shown on the first two lines. To review all the data, press  (REVIEW DATA). You should see this screen:

* PRINT DATA
* SCROLL DATA
* RUN TEST

Pressing  (PRINT DATA) will print the data to a printer or save a file in ASCII mode to your computer using Humboldt Material testing Software (HMTS) or Windows Hyper terminal. Once the data has been printed or transferred, you can begin another test after you have loaded another sample and raised the head to the start position, close to the load cell. by pressing  (RUN TEST).

If you don't have a printer or a computer connected to the HM-2900, you can press  (SCROLL DATA) to scroll the data. You should see this screen:

LOAD 1	VALUE
DISP 1	VALUE
* NEXT	READING 1

Using the  (NEXT) key to scroll through the readings.

To return to any prior screen you can always press .

**UU Triaxial**

See User-Defined Unconfined Compression

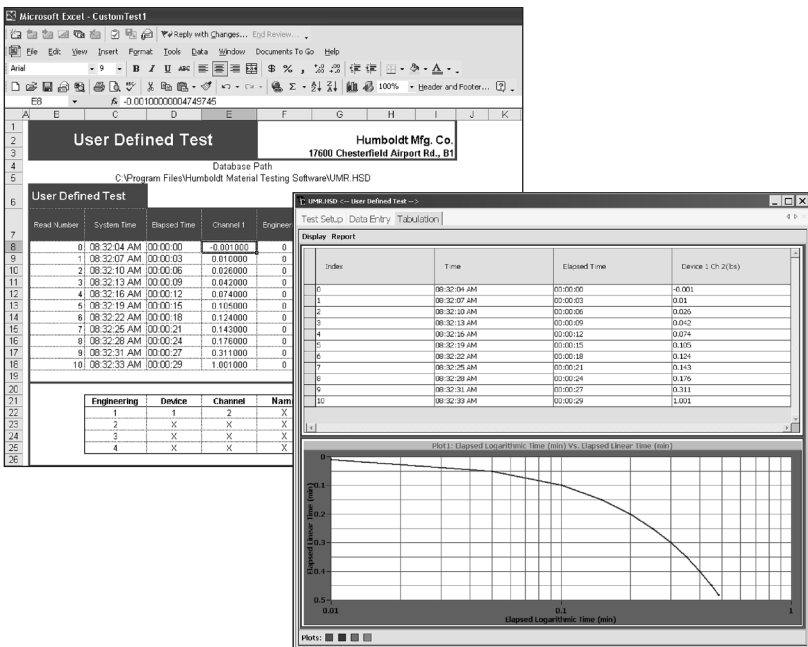
**CU Triaxial**

See User-Defined Unconfined Compression, plus add third channel for Pore Pressure into test configuration.

## Software

The HM-2900 comes with Humboldt's HMTS data collection software. This software can be used to collect data from tests by creating user-defined test parameters (start/stop). The resulting data can then be opened in Microsoft Excel to view the data collected, as well as create a simple table and graph.

Optional pre-defined reporting software modules and templates are available for specific tests, such as CBR, Triaxial, etc. These modules provide more control over start and stop conditions for specific tests, as well as provide extended reporting capabilities. Contact Humboldt for more information.



Table/graph and Excel output of user-defined test generated from software included.

## Specifications

### Applicable Standards

Covers: UU, CU, CD, UC

ASTM: D1883, D2850, D2166, D4767 and D5581 and D6927

AASHTO: T193, T296, T297, T208, T245 and T246

BS 1377: Part 4: 1990, BS 1377: Part 7: 1990,

BS 1377: Part 8: 1990, BS 598: Part 107

### Mechanical Specifications

Dimensions (l x w x h)	12 x 13.5 x 43.5 inch (305 x 343 x 1105mm)
Platen Travel	3 inches (76mm) Max.
Net Weight	77 lbs. (35Kg)
Shipping Weight	120 lbs. (54Kg)
Speed Range	0 - 3.0000 inch/min (0 - 75.0000 mm/min)
Load capacity	3000 lbs. (15 kN)
Vertical clearance	27 inch (686mm) Max.
Horizontal clearance	11.25 inch (286mm)

### Electrical /Electronics Specifications

Voltage	110/220 VAC 50/60HZ
Current	6 amps
Analogue to digital converter	16 Bit
Data storage	4000 Reading
Data collection rate	100 ms
Computer port	RS232



## Test Accessories

### HM-3002—Unconsolidated Undrained (UU) Triaxial Accessory Set:

HM-2300.020	Load cell 2,000 lb. (10 kN)
HM-200387	Ball seat adapter
HM-2310.20	Displacement Transducer 2.0" (50mm)
HM-4178BRT	Displacement Transducer Bracket
HM-3002SW	UU Reporting Software

### HM-3003—Consolidated Undrained (CU) Triaxial Accessory Set:

HM-2300.020	Load cell 2,000 lb. (10 kN)
HM-200387	Ball seat adapter
HM-2310.20	Displacement Transducer 2.0" (50mm)
HM-4178BRT	Displacement Transducer Bracket
HM-4170	Pore Water Pressure Transducer 200 PSI (1400 kPa)
HM-3003SW	CU Reporting Software

### HM-3004—Unconfined Compression (UC) Accessory Set:

HM-2300.005	Load cell 500 lb. (2.5 kN)
HM-2310.20	Displacement Transducer 2.0" (50mm)
HM-4178BRT	Displacement Transducer Bracket
HM-2002	Unconfined Upper Platen
HM-3004SW	Unconfined Reporting Software

## Support

Phone support is available for general operating questions and trouble shooting problems between 8am and 5pm Eastern Time. Please call:

**1.800.537.4183**

1.919.832.6509 or fax: 1.919.833.5283

support@humboldtmg.com

For sales and sales-related information, such as available accessories, general sales questions, pricing, please call:

**1.800.544.7220**

1.708.456.6300 or fax: 1.708.456.0137

hmc@humboldtmg.com

## Hidden Functions

The following are functions that are possible if needed, to access them, please contact support at the numbers or email address listed above.

### 1. **System reset**

Reset available in case of serious problem in system memory.

This will cancel all data in memory calibration/configuration of all channels.

**NOTES**

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Testing Equipment for



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