

# **HM-2560A**

## **DIRECT/ RESIDUAL SHEAR**

**Data Loggers Series**  
**User Guide**

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## **GENERAL AND SPECIFICATIONS**

### **DIRECT/RESIDUAL SHEAR DEVICE**

#### **ASTM D 3080-98**

This new shear device utilizes a pneumatic loading piston for applying the vertical load to the sample. The device is a self-contained tabletop model that eliminates the need for numerous weights used in dead weight systems. It has a built-in 4-channel Analogue to Digital converter with a large digital display for setting the vertical and horizontal load, the vertical and horizontal displacement. The vertical and shear displacements are measured with linear strain transducer. The vertical load measured with pressure transducer and the horizontal load measured with a load cell.

Applying the vertical load is accomplished by setting the precision regulator to the required pressure per the calibration chart. Load settings are verified on the pressure readout accurate to .25%. Sample loads are obtained by the use of two pneumatic pistons. This new concept increases the accuracy and sensitivity of light load settings. A small diameter rolling diaphragm piston is capable of applying loads up to 100 lbs.

The basic device comes complete with 2.5 in diameter (60mm square) shear rings and water chamber. Maximum shear displacement is 0.8 in (20mm). Travel is set with limit switches by the operator. A stepping drive motor and controller maintains the desired rate of strain. The strain rate is easily set with keypad and is maintained within 1% by microprocessor. The digital display of speed settings represents direct readings in inches per minute 0.0001 in/min (0.0001 mm/min).

### **CONSTRUCTION**

The Direct Shear was designed for harsh lab environments with a solid base (1.25 in (32mm) thick) for the loading and shear box assembly coupled with a sturdy aluminum cabinet. The upright rods are stainless steel and the cabinet is painted with an enamel finish. The shear rings are stainless steel and the water chamber is aluminum with a hard coat anodize for corrosion resistance.

## SPECIFICATIONS

Horizontal Movement:	0.8 in (20mm)
Rate of Strain:	0.0001 to 0.4000 in/min. (0.0001 to 10.0000 mm/min)
Overall Height:	22 in (560mm)
Cabinet Height:	9 in (230mm)
Length:	30 in (760mm)
Depth:	14.5 in (370mm)
Weight	140 lbs. (64 kg)
Power:	110 /220 Volts 60/50 Hz

<i>MODEL</i>	<i>LOAD CAPACITY</i>	<u>AIR PRES.</u> <u>REQUIRED</u>	<i>HORIZON. SHEAR</i> <i>FORCE</i>
<i>HM-2650A</i>	2000 lbs (1000kgf)	120 psi (800 kpa)	2000 lbs (1000kgf)

## INTRODUCTION

The direct shear test may be run on any type of soil sample, but it is particularly adapted to cohesion materials. This machine can also be used to establish the undrained shear strength of saturated, highly plastic cohesive soils under certain conditions.

The direct shear test is normally run as a strain controlled test. In order to obtain the effective stress parameters of any soil, excluding the most pervious medium and fine sands, it is necessary to use a slow rate of shearing in order for induced pore pressures to dissipate. The remainder of this procedure presents a discussion on the sample preparation for testing, equipment preparation, and running the direct shear machine. Refer to ASTM D 3080-98 (BS 1377: part 7 : 1990) for procedures and details on the test methods.

## CONNECTIONS

**VERTICAL INDICATOR ROD** – Screws into the top platform to the right of the rear pull-down rod.

**VERTICAL INDICATOR CLAMPING ARM** – Attaches to the above rod.

**VERTICAL DISPLACEMENT TRANSDUCER – CONSOLIDATION** – Attach to the clamping arm with the screw provided.

**HORIZONTAL DISPLACEMENT TRANSDUCER – SHEAR** – Attach to the threaded rod on the angle bracket – top platform, right front.

**AIR LINE** – A constant supply of air is required. The air inlet air pressure should not exceed 200 psi (1400kpa), nor should it ever be less than 20 psi (140kpa) higher than the highest pressure setting. The connection is a ¼ in (6mm) Swagelok, located in the rear of the cabinet. Insert the tubing into the fitting until it bottoms out. With the finger nut tight, tighten the fitting 1 ¼ turns with a wrench. Do not over tighten.

**LOAD CELL** – Connect the load cell to the support casting at the right end of the direct shear using the two knobs. Adjust the knobs so that the load cell is as far to the right as possible. This will allow room for assembling the water chamber and the shear rings with minimum interference. Connect the 5-pin din plug on the load cell to the socket at the rear of the cabinet.

**WATER CHAMBER** – Special care should be taken to see that the four (4) roller bearings between the water chamber and the base slide tracks are properly cleaned and contain a slight amount of oil during and after use. We advise using a cover over the direct shear after use to eliminate dust from entering the precision slide assembly. The main drive shaft should be at its home position. This will place the sample load pad in the center of the cross arm for consolidation.

**SHEAR BOX** – The shear box are held together with (2) stainless steel screws with lifting knobs. There are also (4) screws for adjusting the gap between the rings once consolidation has been reached. The gap is adjusted by turning the screws clockwise from the finger tight position. One full turn will give .031” gap. There is a line scribed on the adjusting knob for determining how much gap each screw has provided. The screws should be turned evenly to maintain a proper gap. At the bottom of each screw is a nylon glide, which keeps the top shear box from dropping during the test.

## PANEL CONTROLS – LOAD SETTING

**VERTICAL PRESSURE SETTING** – The readout is used for setting the vertical load on the sample and collecting the data for consolidation stage. Setup an Oedometer test as described in section 2 of the manual. Select the Oedometer test then set the required load from the table provided. It is a precision instrument with 0.25% accuracy. See the load setting table for the proper load setting. The readout has a built in pressure transducer reading to two decimal places.

**LOAD CELL** – The S type load cell is connected to the rear of the cabinet with a five-pin din plug to channel 1.

**HORIZONTAL DISPLACEMENT TRANSDUCER** – The LSCT is connected to the rear of the cabinet with a five-pin din plug to channel 2.

**VERTICAL DISPLACEMENT TRANSDUCER** – The LSCT is connected to the rear of the cabinet with a five-pin din plug to channel 3.

**LOAD REGULATOR** – A precision *Fairchild* regulator is used to set and maintain the air pressure to the pistons, which provides load to the sample. The regulator is sensitive to 1/8 in variations in water column. Select the load required from the load setting table.

**NOTE: THE CONSOLIDATION LOAD PAD, POROUS STONE, STAINLESS STEEL BALL HAVE NOT BEEN INCLUDED IN THE LOAD SETTING ALIBRATIONS.**

**HIGH LOAD/LOW LOAD SELECTOR VALVE** – This valve has two positions. The LOW LOAD POSITION is used for loads up to 100 lbs (5kgf). The HIGH LOAD position is used for loads up to 2000 lbs (1000kgf).

**LOAD VALVE – This valve is actuated by 90 degree rotation of the handle. When open it allows air to flow from the regulator to the pistons (HIGH or LOW LOAD) selected.**

## PANEL CONTROLS – POWER & SHEAR RATE

**STRAIN RATE SELECTOR** – The strain rate is set with keypad.

**LIMIT SWITCHES** – These switches are located on the platform behind the water chamber. Adjustment of these switches is made by loosening the Phillips-head screws and moving the limit switch assembly in the direction desired. The home position has been set so that the load cross arm is in the middle of the shear rings.

**NOTE: LIMIT OF TRAVEL OF THE DRIVE SHAFT IS DEPENDENT ON THE LIMIT SWITCH SETTINGS. DO NOT OPERATE THE DRIVE MOTOR WITH**

**THE WATER CHAMBER DISCONNECTED BECAUSE THIS WILL MAKE THE LIMIT SWITCHES INOPERABLE.**

**HOME & LIMIT INDICATORS** – Used to indicate the limit of travel of the shear box.

**FUSE** – 10 amp SLO BLO fuse located in the cabinet rear.

### **SHEAR BOX ASSEMBLY**

Place the two roller slide assemblies on the tracks between the load arms. Position the rollers in the center of the tracks. Be certain the tracks are on the platform shear box bottom and the roller assemblies are clean and are lightly oiled. Place the shear box assembly on the slide tracks being careful to align the limit switch rod and the drive bolt connection to the slots in the shear box. Place the end spacer (3/4" X 3/4" X 3") at the end with 3" long boss. This spacer is **not** required with the 4" sample rings.



## **SAMPLE PREPARATION**

Once extruded, the samples should be trimmed carefully down to the internal diameter of the direct shear box, in a similar manner as for consolidation test samples. The object is to get at least one inch of soil sample sandwiched between a layer of filter paper and a porous stone on either side of the sample. The porous stones provide drainage and are used to distribute the pressure during the test.

Place the bottom drainage plate and then a porous stone with a filter paper into the locked shear box. Extrude one inch of soil sample into the shear box. Place another piece of filter paper and porous stone on the top of the sample along with the top load pad.

## **SAMPLE SET-UP IN MACHINE**

At this time, the direct shear box are held together by two (2) bolts and the soil sample would be centered inside the rings. The shear rings with sample stones are then carefully placed inside the direct shear water chamber being certain the load cell shaft is connected to the shear rings. The shear ring assembly is placed against the end spacer. Alignment of the load cell connecting rod is required at this time. Tighten the two (2) shear ring clamping knobs located on the left side of the water chamber. Connect the load cell to the shear ring connecting rod using the stainless steel nut.

Connect the load cell and adjust the knobs to read "0" on the load cell readout. It may be necessary to use the tare feature to read "0". The top cross arm is usually removed for placement of the rings into the water chamber. Re-install the cross arm and adjust the height until there is 1/16" daylight between the arm and the stainless steel ball being certain the arm is level. The upper cross arm has a displacement indicator pin that is positioned on the load pad ball. Adjust the dial indicator or linear displacement transducer to the top of this pin and allow for sufficient travel when the soil sample compresses. The vertical dial indicator is positioned and set to read some arbitrary initial reading.

## **CONSOLIDATION OF THE TEST SAMPLE**

At this time, select a seating load per the load setting table. Set the high/low load selector valve to "LOW" and the load valve to "LOAD". Adjust the pressure regulator to the desired seating load per the load setting table. This sets the stage for the consolidation phase of the sample with the application of the desired overburden pressure or some other normal pressure.

Turn the "LOAD" valve to the "OFF" position and adjust the regulator to the desired normal load per the load setting table.

**NOTE: IF THE LOAD IS OVER 100 LBS (5kgf). YOU WILL NEED TO SWITCH THE LOAD SELECTOR VALVE TO "HIGH LOAD".**

The vertical transducer is logged at this time and noted on the data sheet. At the same time the load valve is turned to 'LOAD, a stop watch is started in order to record the appropriate time deformation characteristics of the soil sample undergoing consolidation. Consolidation data is taken at the usual time increments. The purpose of recording the time deformation characteristics of the soil sample is to establish the rate of shear testing of the soil. Refer to ASTM D 3080-98 or other standards for computations.

## **TEST PROCEDURES**

The final reading after consolidation is noted on the data sheet. Adjust the shear force on the sample by adjusting the two knurled nuts on the load cell support casting. Allow a small seating load to be exerted on the sample. The horizontal transducer indicator is then adjusted to some convenient zero point. Until this time, the two shear boxes have been held together by two (2) screws – these screws are now removed. There are also four (4) screws for adjusting the gap between the rings once consolidation has been reached. The gap is adjusted by turning the screws clockwise from the finger tight position. One full turn will give .031in (0.8mm) gap. For sands of a fine to medium size, 1 ¼ of a revolution of the adjusting screw is used. For coarser sands, 1 2/3 revolutions are used. For fine grain soils and clays, ½ revolution is used. These values are not absolute and can be altered accordingly. Initial readings are taken at this time. The screws should be turned evenly to prevent tilting the top shear box.

The test is now started at the prescribed rate of shear by setting the shear rate speed.

## **SAMPLE REMOVAL AND CLEAN-UP**

Put the motor drive in reverse (towards the home position) and stop when zero (0) load is reached on the load cell. Remove the sample at this time and inspect per ASTM D 3080-98. The vertical load is now reduced to zero (0) by adjusting the pressure regulator to zero (0) psi. The apparatus is taken down in reverse order as assembled. The sample is extracted and weighted in order to determine the dry density and water content at failure. The water chamber is returned to the home position by using the drive motor. Cover the roller bearing slide assembly to prevent dust and dirt from entering the bearings.

## **INSTRUMENTATION**

HM-2560A has been designed to provide in instruments all the basic functions required to carry out soil testing.

HM-2560A Support for up to 4 analogue transducer inputs HM2300 series instrumentation covering the range 0 to 100 mV suitable for most Load, pressure and displacement devices. Configuration and Calibration facilities are provided, and all-important data is stored in non-volatile memory for safe preservation.

Complete Data logger capacity for Tests made up of any of the channels above. These tests can be standard Triaxials, Direct Shear, Consolidation, CBR, Marshall, Unconfined Compression, as well as Soil-Cement tests. All are fully configurable for automated Start, Stop and Log-rate conditions and can hold up to 1000 readings per test.

An LCD screen and 9 key membrane panel allows presentation of results, parameter configuration and other selections to be made easily. Some of the most important parameters can only be changed under pass code control to protect against operator misuse.

Plug and play Serial port communications with Humboldt Material Testing Software (HMTS) for controlling and downloading stored data.

Each unit has a unique ID and RS485 communication port for multiple unit connections with a single computer.

## BUTTON FUNCTIONS

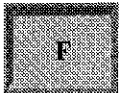
### 1.1.1 Speed Selector



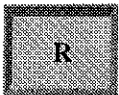
The selected platen speed in inch/min is displayed on the LCD. This speed can be adjusted between 0.00001 and 0.499999 inch/min at any time. To adjust the speed simply presses the "RATE" key and a cursor will appear over a digit. Use the function keys next to the display to move the cursor to the digit that you want to change, then use increase and decrease keys at the side of the display to change the number. The speed should adjust immediately.

### 1.1.2 Forward and Reverse Travel Switch

Once the Forward or Reverse switch is pressed the carriage should move forward or backward at the previously selected speed.



This key is used to move the shear box to the right. Also, by holding down the F key, the machine will move forward at the Fast Rate of 0.5 in/min. By releasing the key, the machine will resume at the set rate.



This key is used to move the shear box to the left. Also, by holding down the R key, the machine will reverse at the Fast Rate of 0.5in/min. By releasing the key, the machine will resume at the set rate.

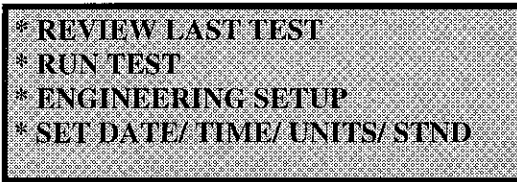


This key stops the machine.

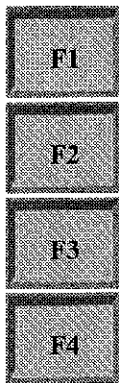


This key is for the setup screen menu. Also, used to go back to previous screens.

The main setup screen is:



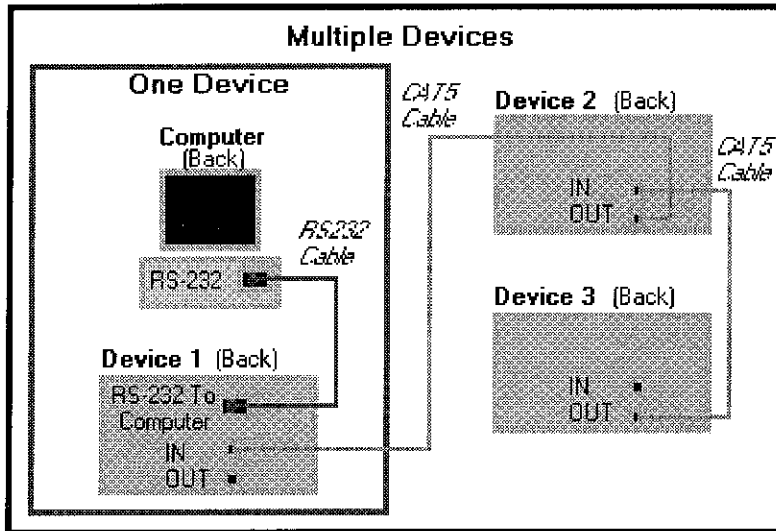
### 1.1.3 BUTTON FUNCTIONS



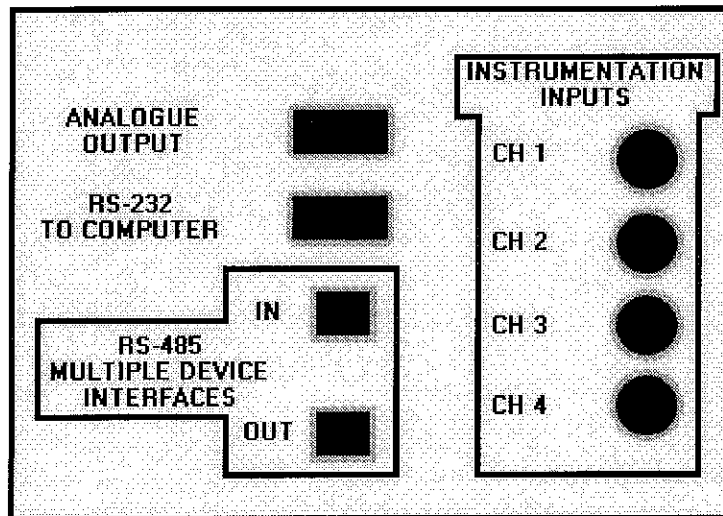
The HM-2560A has four function keys, F1 through F4, for each one of the displayed lines. Pressing the function keys allows the user to navigate through the menus. A line with (\*) indicates an action function line. If there is no (\*) next to the line displayed, the corresponding function key is not active.

## INSTRUMENT CONNECTIONS

### Connection Example

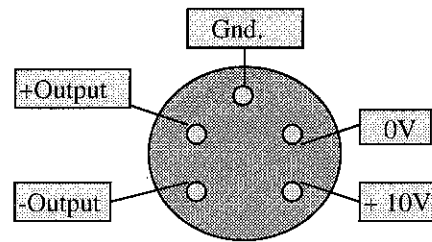


### Rear panel



Connect the appropriate transducers to the sockets marked CH1, CH2, CH3, & CH4. The following pin out is used for connections:

Pin 1 = +10Vdc Excitation  
Pin 2 = - 0Vdc Excitation  
Pin 4 = + Output  
Pin 5 = - Output



### SERIAL PORT ACCESS (RS-232 To Computer)

The serial port is fixed as

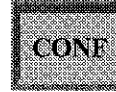
19200 baud  
8 data bits  
0 stop bits  
No parity

Press PRINT to output logged data including report heading.

## CONFIGURATION

**NOTE:** The HM-2560A instrumentation is usually configured and calibrated at the factory. The instrumentation should be recalibrated once a year in accordance to ASTM or any other international standards and to be performed by a calibration service with proper equipment.

To configure a channel go to the setup screen by pressing "CONF." Key If a password is requested enter F2+F2+F2+F3+F4.



The display will show:

```
CONFIGURATION SCREEN
* SELECT CHANNEL "CHI"
* CONFIGURE CHANNEL
* CONFIGURE TEST
```

Select the channel you want to configure by pressing **F2** (SELECT CHANNEL). This will toggle between CH1, CH2, CH3, and CH4. Once a channel is chosen, press **F3** (CONFIGURE CHANNEL).

The display will show:


```
"CHI" CONFIGURATION
* NAME = "CHI"
ENG MIN = 0
* ENG MAX = "VALUE"
```



## NAME SETUP AND SELECTIONS

To change the name of the channel selected press **F2** (NAME).

The display will show:

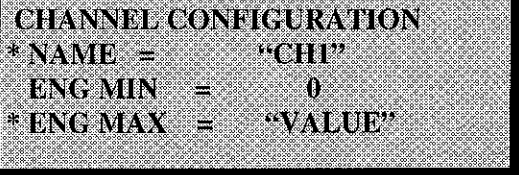


```
"CNF" NAME SELECTION
* NAME = "CHI"
* INCREASE
* DECREASE
```

Press **F3** (INCREASE) or **F4** (DECREASE) to toggle between names of channels available. This will toggle between CH "1" through CH "4", LOAD "1" through LOAD "4", VOLUME "1" through VOLUME "4", DISPLACEMENT "1" through DISPLACEMENT "4", FLOW, and STAB. It is important to assign the correct name of the channel, especially when changing units. If the name LOAD in (lbf) is chosen, the English units is assigned to it. When converted to metric it will convert it to KN. If the same channel had a name of CH1 or DISP it would not convert the load correctly.

After choosing a channel name, press  to return to previous screen.

The display will show:

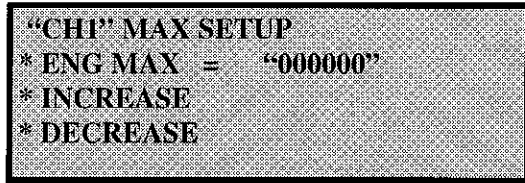


```
CHANNEL CONFIGURATION
* NAME = "CHI"
ENG MIN = 0
* ENG MAX = "VALUE"
```

## SETUP TRANSDUCER ENGINEERING MAX

The Engineering Zero (ENG MIN) is always set at 0. Press **F4** (ENG MAX) to set the Engineering Max value.

The display will show:



Press **F2** (ENG 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 Humboldt instrumentation configuration chart. These are the eng. max numbers that correspond to each Humboldt instrument device.

## HUMBOLDT CONFIGURATION INSTRUMENT CHART

LOAD CELL	ENG MAX (lbf)	METRIC MAX (kN)
10,000 lb. (50KN)	010000	050.00
5,000 lb. (25KN)	005000	025.00
2,000 lb. (10KN)	2000.0	10.000
1,000 lb. (5KN)	1000.0	05.000
500 lb. (2.5KN)	0500.0	02.500
LVDT TRANSDUCERS	ENG MAX (in)	ENG MAX (mm)
0.4" (10.0mm)	0.4000	10.000
1.0" (25.4mm)	01.000	25.400
2.0" (50.8mm)	02.000	50.800
PORE PRESSURE	ENG MAX (psi)	ENG MAX (kPa)
100 psi (1000kPa)	0100.0	001000

To return to any prior screen you can always press



## CALIBRATION

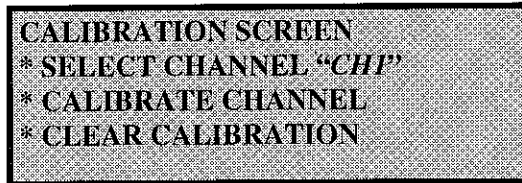
Before calibrating, check to see if the configuration of each channel is correct.

**NOTE: The HM-2560A instrumentation is usually configured and calibrated at the factory. The instrumentation should be recalibrated once a year in accordance to ASTM or any other international standards and to be performed by a calibration service with proper equipment.**

To calibrate a channel go to the setup screen by pressing:  
If a password is requested enter F2+F2+F2+F3+F4.



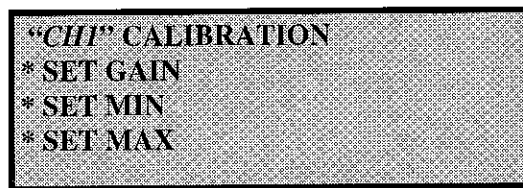
The display will show:



Select the channel you want to calibrate by pressing **F2** (SELECT CHANNEL). This will toggle between CH1, CH2, CH3, and CH4. Once a channel is chosen, press **F4** (CLEAR CHANNEL) **WARNING!!! ONCE YOU CLEAR CALIBRATION IT IS LOST FOREVER!**

Once the calibration is cleared press **F3** (CALIBRATE CHANNEL)

The display will show:



First check to see if you have enough gain. Record the engineering min value with no load on instrument (X divisions). Apply the full engineering value and record the same engineering min reading (X divisions). Subtract the two values. For example, if you are calibrating a 10,000lb load cell, you need 10000 divisions. Therefore, if the engineering min reading is 450 divisions with no load on instrument and the eng min is 8450 divisions at full-scale load on instrument, you only have 8000 divisions. You need to increase the gain by pressing **F2** (SET GAIN) and repeat procedure until you have more than 10000 divisions. Below is a table for Humboldt Instrumentation. It shows max

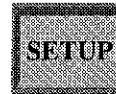
English and metric divisions, as well as typical gain needed for each instrument type. After the gain is set, the zero point needs to be set.

To set the zero point, apply the 0% force to the instrument and the press **F3** (SET MIN). Next apply the 100% force to the instrument and the press **F4** (SET MAX).

### HUMBOLDT CALIBRATION INSTRUMENTATION CHART

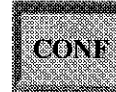
LOAD CELL	ENGLISH (divisions)	METRIC (divisions)	GAIN
10,000 lb. (50KN)	10000	5000	8
5,000 lb. (25KN)	5000	2500	4
2,000 lb. (10KN)	20000	10000	4
1,000 lb. (5KN)	10000	5000	4
500 lb. (2.5KN)	5000	2500	4
<b>LVDT TRANSDUCERS</b>			
0.4" (10.0mm)	4000	10000	2
1.0" (25.4mm)	1000	25400	1
2.0" (50.8mm)	2000	50800	4
<b>PORE PRESSURE</b>			
100 psi (1000kPa)	1000	1000	1

To return to any prior screen you can always press:

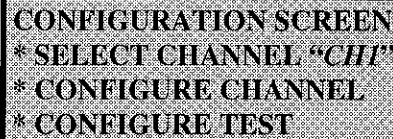


## CONFIGURE A TEST

To configure a channel with a test go to the setup screen by pressing:  
If a password is requested enter F2+F2+F2+F3+F4.




The display will show:



```
CONFIGURATION SCREEN
* SELECT CHANNEL "CH1"
* CONFIGURE CHANNEL
* CONFIGURE TEST
```

Select the channel you want to configure by pressing **F2** (SELECT CHANNEL). This will toggle between CH1, CH2, CH3, and CH4. Once a channel is chosen, press **F4** (CONFIGURE TEST).

The display will show:



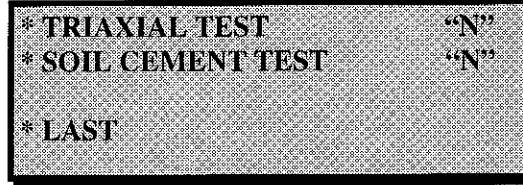
```
* CBR / LBR TEST      "N"
* MARSHALL TEST       "N"
* UNCONFINED TEST     "N"
* NEXT
```

To assign a test to the selected channel press the F key next to test name. Pressing the F key will toggle between "Y" and "N". For example, to run a CBR test press **F1** until Y appears. This means the channel selected is for running a CBR test. Multiple tests can be selected for the same channel. *(For example, if a 10,000 lb (50KN) load cell is on CH1, then a "Y" for Marshall Test, CBR Test, and Unconfined Test can be assigned).*

However, multiple channels cannot be selected for the same test. *(For example, if a 10,000lb (50KN) load cell is on CH1 and a 5,000lb(25KN) load cell on CH2, then "Y" to CBR for both CH1 and CH2 cannot be assigned. If the 10,000lb(50KN) load cell is used more than the 5,000lb(25KN) load cell then keep "Y" on the 10,000lb(50KN) load cell (i.e. CH1). When switching to the 5,000 lb (25KN) load cell, change the 10,000lb(50KN) load cell (i.e. CH1) to "N" and the 5,000 lb (25KN) load cell (i.e. CH2) to "Y").*

To get to the Triaxial Test or Soil Cement Test press **F4** (NEXT).

The display will show:



To assign a test to the selected channel press the F key next to test wanted. Pressing the F key will toggle between "Y" and "N". To see other tests press the F4 (LAST).

To return to any prior screen you can always press

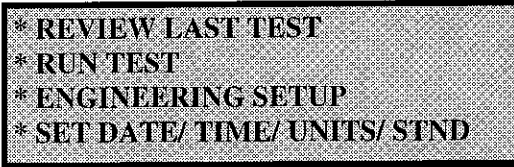


## RUN A DIRECT SHEAR TEST

To run a DIRECT SHEAR test go to the setup screen by pressing

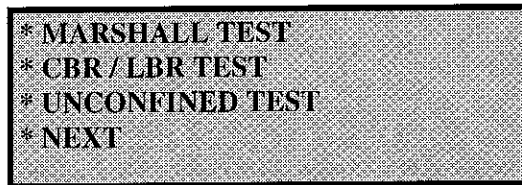


The display will show:



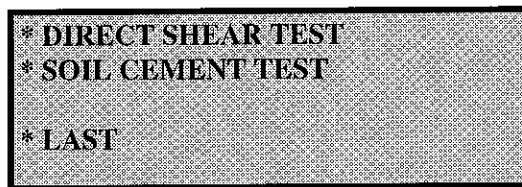
Press **F2** (RUN TEST)

The display will show:



Press **F4** (NEXT)

The display will show:



Press **F2** (DIRECT SHEAR TEST).

The display will show:

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

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

```
F
```

The display will show:

```
DIRECT SHEAR TEST # of readings
LOAD 1                "#"
```

LOAD 1	"#"
DISP 1	"#"
DISP 2	"#"

The display shows the current reading of the load. At any time you can press **F4** (**END TEST**) to end the test. This will stop the data collection and reverse the machine back.

Once the sample makes contact with the Box the machine will automatically zero the load reading and collect a load reading every "X" sec., depending on what the sampling interval is set at (see **SAMPLING INTERVAL**). Once the load cell has reached its peak load and fallen 2% the machine will stop collecting data and reverse the platen back to the lower limit at the Fast Rate (0.5 in/min). The peak load will be displayed.

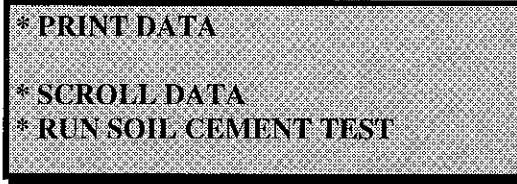
The display will show:

```
* REVIEW DATA
* RUN DIRECT SHEAR TEST
```

The peak values are shown on the first two lines. You can then review the data by pressing **F3** (**REVIEW DATA**).



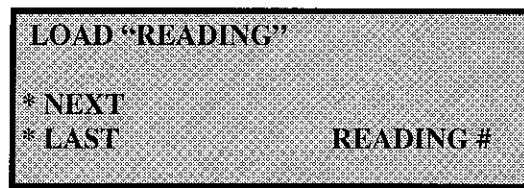
The display will show:



Pressing **F1** (PRINT DATA) will print the data either to a printer or a computer. Once you have printed the data you can run another test by just pressing **F4** (RUN DIRECT SHEAR TEST). However you need to load another before you press **F4** (RUN DIRECT SHEAR TEST). Once you press **F4** (RUN DIRECT SHEAR TEST) it will start running the test again.

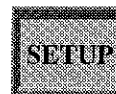
If you don't have a printer or computer connected to the frame you can press **F3** (SCROLL DATA) to scroll the data.

The display will show:



You can then press **F3** (NEXT) to see the next reading or **F4** (LAST) to see the last reading.

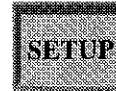
To return to any prior screen you can always press



## RUN A CBR/LBR TEST

Center the CBR mold on the machine with the first surcharge weight in the mold. Raise the mold close to the penetration piston until there is a slight gap between the two.

Run CBR test by going to the setup screen by pressing



The display will show:

```
* REVIEW LAST TEST
* RUN TEST
* ENGINEERING SETUP
* SET DATE/ TIME/ UNITS/ STND
```

Press **F2** (RUN TEST)

The display will show:

```
* MARSHALL TEST
* CBR / LBR TEST
* UNCONFINED TEST
* NEXT
```

Press **F2** (CBR/LBR TEST).

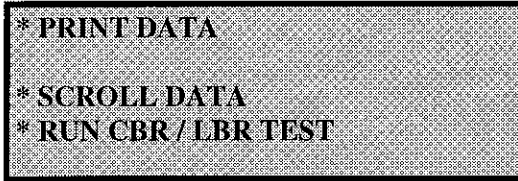
The display will show:

```
CBR/LBR TEST      # of readings
LOAD              ##
DISP              ##
* END TEST
```

Run the machine until a 10 lb. seating load is applied. Stop the machine add the remainder of surcharge weight then run the machine as normal at speed of 0.05 inch/min the load and displacement will be zeroed at that time indicating the start of the test.

(Note: If you apply all surcharge weight in the mold at the beginning of the test then just run your machine as normal). The display shows the current reading of the load and displacement. The internal logger will collect a load reading every 0.025in. Once the displacement reaches 0.5 in. the data collection will stop. At any time you can press **F4** (END TEST) to end the test. This will stop the data collection.

The display will show:

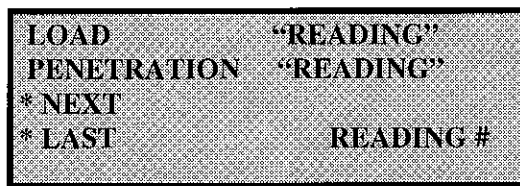


\* PRINT DATA  
\* SCROLL DATA  
\* RUN CBR / LBR TEST

Pressing **F1** (PRINT DATA) will print the data either to a serial printer or a computer using Windows Hyper Terminal (see communication section). Once you have printed the data you can run another test by just pressing **F4** (RUN CBR/ LBR TEST). However you need to load another sample and then raise it near the load cell before you press **F4** (RUN CBR/ LBR TEST). Once you press **F4** (RUN CBR/ LBR TEST) it will start running the test again.

If you don't have a printer or computer connected to the frame you can press **F3** (SCROLL DATA) to scroll the data.

The display will show:



LOAD "READING"  
PENETRATION "READING"  
\* NEXT  
\* LAST READING #

You can then press **F3** (NEXT) to see the next reading or **F4** (LAST) to see the last reading.

To return to any prior screen you can always press

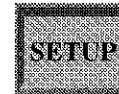


SETUP

## RUN A MARSHALL TEST

Center the breaking head on the machine. Raise the breaking head close to the load cell

To run a Marshall test go to the setup screen by pressing



The display will show:

```
* REVIEW LAST TEST
* RUN TEST
* ENGINEERING SETUP
* SET DATE/ TIME/ UNITS/ STND
```

Press **F2** (RUN TEST)

The display will show:

```
* MARSHALL TEST
* CBR / LBR TEST
* UNCONFINED TEST
* NEXT
```

Press **F1** (MARSHALL TEST).

The display will show:

```
MARSHALL TEST      # of readings
STAB  “#”
FLOW  “#”
* END TEST
```

The display shows the current reading of the stability and flow. At any time you can press **F4** (END TEST) to end the test. This will stop the data collection, but will not stop the machine from advancing please use the stop switch on the front of the machine.

Once the breaking head makes contact with the load cell the MiniLogger will automatically zero the stability and flow readings and collect a reading every 0.1 sec. Once the load cell has reached its peak stability (i.e. peak load) and fallen 5% the MiniLogger will stop collecting data. **Important Note** the machine will not stop automatically the operator need to stop the machine manually.

The display will show:

```
"STAB PEAK"      "#"  
"FLOW PEAK"     "#"  
* REVIEW DATA  
* RUN MARSHALL TEST
```

The peak values are shown on the first two lines. You can then review the data by pressing **F3** (REVIEW DATA).

The display will show:

```
* PRINT DATA  
* SCROLL DATA  
* RUN MARSHALL TEST
```

Pressing **F1** (PRINT DATA) will print the data either to a serial printer or a computer using Windows Hyper Terminal (see communication section). Once you have printed the data you can run another test by just pressing **F4** (RUN MARSHALL TEST). However you need to load another sample and then raise it near the load cell before you press **F4** (RUN MARSHALL TEST). Once you press **F4** (RUN MARSHALL TEST) it will start running the test again.

If you don't have a printer or computer connected to the frame you can press **F3** (SCROLL DATA) to scroll the data.

The display will show:

```
STAB "READING"  
FLOW "READING"  
* NEXT  
* LAST           Time = 0.0 sec
```

You can then press **F3** (NEXT) to see the next reading or **F4** (LAST) to see the last reading.

SETUP

To return to any prior screen you can always press

## RUN A SOIL CEMENT/ TSR TEST

Center the soil cement sample on the machine. Raise the sample close to the upper platen



To run a soil cement test go to the setup screen by pressing

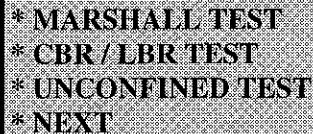
The display will show:



- \* REVIEW LAST TEST
- \* RUN TEST
- \* ENGINEERING SETUP
- \* SET DATE/ TIME/ UNITS/ STND

Press **F2** (RUN TEST)

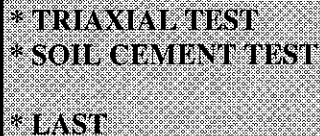
The display will show:



- \* MARSHALL TEST
- \* CBR / LBR TEST
- \* UNCONFINED TEST
- \* NEXT

Press **F4** (NEXT)

The display will show:



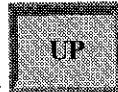
- \* TRIAXIAL TEST
- \* SOIL CEMENT TEST
- \* LAST

Press **F2** (SOIL CEMENT TEST).

The display will show:

```
MOTOR SPEED ADJUST
* SPEED = "X.XXX"
* INCREASE
* DECREASE
```

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



have set the speed you then press up key to start the test.

The display will show:

```
SOIL CEMENT TEST # of readings
LOAD                "##"
* END TEST
```

The display shows the current reading of the load. At any time you can press **F4** (END TEST) to end the test. This will stop the data collection and reverse the machine back.

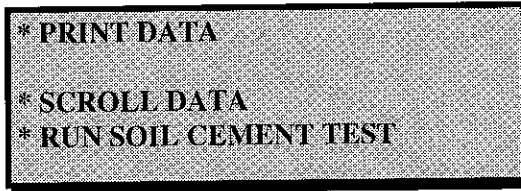
Once the sample makes contact with the platen the machine will automatically zero the load reading and collect a load reading every "X" sec., depending on what the sampling interval is set at (see SAMPLING INTERVAL). Once the load cell has reached its peak load and fallen 2% the machine will stop collecting data and reverse the platen back to the lower limit at the Fast Rate (3.0 in/min). The peak load will be displayed.

The display will show:

```
LOAD PEAK                "##"
* REVIEW DATA
* RUN SOIL CEMENT TEST
```

The peak values are shown on the first two lines. You can then review the data by pressing **F3** (REVIEW DATA).

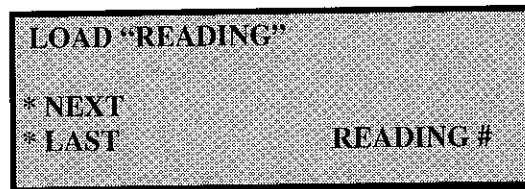
The display will show:



Pressing **F1** (PRINT DATA) will print the data either to a serial printer or a computer using Windows Hyper Terminal (see communication section). Once you have printed the data you can run another test by just pressing **F4** (RUN SOIL CEMENT TEST). However you need to load another sample and then raise it near the load cell before you press **F4** (RUN SOIL CEMENT TEST). Once you press **F4** (RUN SOIL CEMENT TEST) it will start running the test again.

If you don't have a printer or computer connected to the frame you can press **F3** (SCROLL DATA) to scroll the data.

The display will show:



You can then press **F3** (NEXT) to see the next reading or **F4** (LAST) to see the last reading.

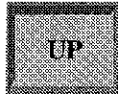


To return to any prior screen you can always press

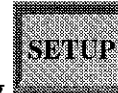


## RUN A UNCONFINED COMPRESSION TEST

Center the UC sample on the machine. Raise the sample close to the platen by holding



down the "UP" key until there is a slight gap between the two.



To run an unconfined compression test go to the setup screen by pressing

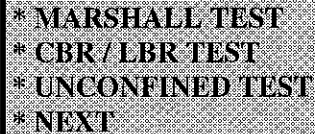
The display will show:

A rectangular screen with a black border containing a list of menu options:

- \* REVIEW LAST TEST
- \* RUN TEST
- \* ENGINEERING SETUP
- \* SET DATE/ TIME/ UNITS/ STND

Press **F2** (RUN TEST)

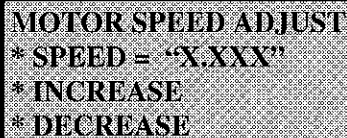
The display will show:

A rectangular screen with a black border containing a list of menu options:

- \* MARSHALL TEST
- \* CBR / LBR TEST
- \* UNCONFINED TEST
- \* NEXT

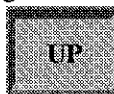
Press **F3** (UNCONFINED TEST).

The display will show:

A rectangular screen with a black border containing the following text:

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

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



have set the speed you then press "UP" key to start the test.

The display will show:

U.C. TEST	# of readings
LOAD	“#”
DISP	“#”
* END TEST	

The display shows the current reading of the load and displacement. At any time you can press **F4** (END TEST) to end the test. This will stop the data collection and reverse the machine back.

Once the sample makes contact with the platen the machine will automatically zero the load and displacement readings and collect a load reading every “X” sec., depending on what the sampling interval is set at (see SAMPLING INTERVAL). Once the load cell has reached its peak load and fallen 2% the machine will stop collecting data and reverse the platen back to the lower limit at the Fast Rate (3.0 in/min). The peak load will be displayed.

The display will show:

LOAD PEAK	“#”
DISP PEAK	“#”
* REVIEW DATA	
* RUN UNCONFINED TEST	

The peak values are shown on the first two lines. You can then review the data by pressing **F3** (REVIEW DATA).

The display will show:

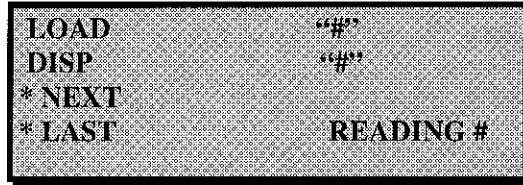
* PRINT DATA
* SCROLL DATA
* RUN CBR / LBR TEST

Pressing **F1** (PRINT DATA) will print the data either to a serial printer or a computer using Windows Hyper Terminal (see communication section). Once you have printed the data you can run another test by just pressing **F4** (RUN UNCONFINED TEST). However you need to load another sample and then raise it near the load cell before you

press **F4** (RUN UNCONFINED TEST). Once you press **F4** (RUN UNCONFINED TEST) it will start running the test again.

If you don't have a printer or computer connected to the frame you can press **F3** (SCROLL DATA) to scroll the data.

The display will show:




You can then press **F3** (NEXT) to see the next reading or **F4** (LAST) to see the last reading.



To return to any prior screen you can always press

## MANUFACTURES INFO

To see manufactures info that gives you the software version and phone number

press  until the following setup screen appears.

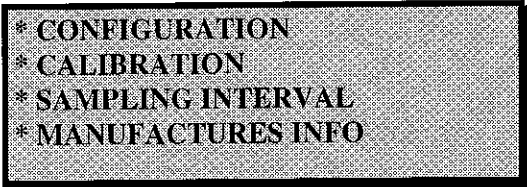
The display will show:



- \* REVIEW LAST TEST
- \* RUN TEST
- \* ENGINEERING SETUP
- \* SET DATE/ TIME/ UNITS/ STND

Press **F3** (Engineering Setup).

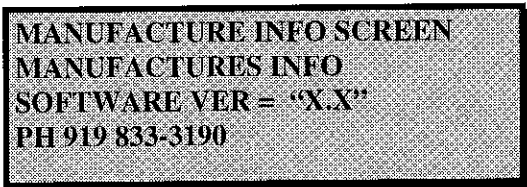
The display will show:



- \* CONFIGURATION
- \* CALIBRATION
- \* SAMPLING INTERVAL
- \* MANUFACTURES INFO

Press **F4** (MANUFACTURES INFO).

The display will show:

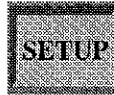


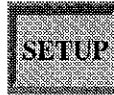
MANUFACTURE INFO SCREEN  
MANUFACTURES INFO  
SOFTWARE VER = 'X.X'  
PH 919 833-3190

To return to any prior screen you can always press



## SAMPLING INTERVAL



To change or set the sampling interval press  until the following setup screen appears.

The display will show:



- \* REVIEW LAST TEST
- \* RUN TEST
- \* ENGINEERING SETUP
- \* SET DATE/ TIME/ UNITS/ STND

Press **F3** (ENGINEERING SETUP)


The display will show:



- \* CONFIGURATION
- \* CALIBRATION
- \* SAMPLING INTERVAL
- \* MANUFACTURES INFO

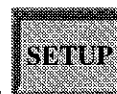
Press **F3** (SAMPLING INTERVAL)

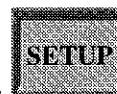
The display will show:




**"TEST"                      INTERVAL**  
\* PERIOD    **"HH:MM:SS"**  
\* INCREASE  
\* DECREASE

First select the test you want by pressing **F1** ("TEST") to toggle between the tests. The only tests you can change the sampling interval are Triaxial, Unconfined Compression, and Soil Cement. Once you have chosen a test press **F2** (PERIOD) to toggle between the hour/minute/second. Press **F3** (INCREASE) or **F4** (DECREASE) to change to the appropriate number.



To return to any prior screen you can always press 

## SET DATE

To set the date press  until the following setup screen appears.

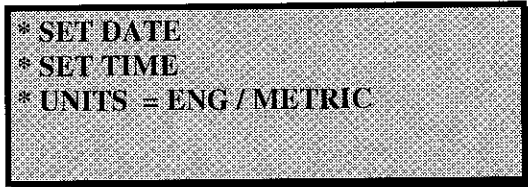
The display will show:



```
* REVIEW LAST TEST
* RUN TEST
* ENGINEERING SETUP
* SET DATE/ TIME/ UNITS/ STND
```

Press **F4** (SET DATE/ TIME/ UNITS) to set the date.

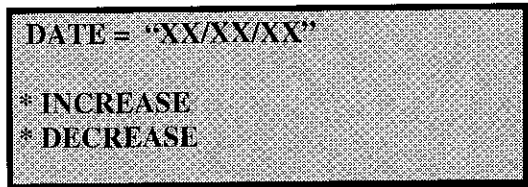
The display will show:



```
* SET DATE
* SET TIME
* UNITS = ENG / METRIC
```

Press **F1** (SET DATE) to set the date.

The display will show:




```
DATE = "XX/XX/XX"
* INCREASE
* DECREASE
```

Press **F1** (DATE) to toggle between the month/day/year. Press **F3** (INCREASE) or **F4** (DECREASE) to change to the appropriate number.

To return to any prior screen you can always press



## SET TIME

To set the time press  until the following setup screen appears.


The display will show:



\* REVIEW LAST TEST  
\* RUN TEST  
\* ENGINEERING SETUP  
\* SET DATE/ TIME/ UNITS/ STND

Press **F4** (SET DATE/ TIME/ UNITS) to set the date.

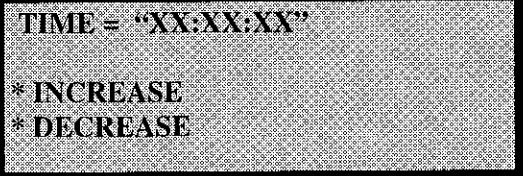
The display will show:



\* SET DATE  
\* SET TIME  
\* UNITS = ENG / METRIC

Press **F2** (SET TIME) to set the time.

The display will show:




TIME = "XX:XX:XX"  
\* INCREASE  
\* DECREASE

Press **F1** (TIME) to toggle between the hour/minute/second. Press **F3** (INCREASE) or **F4** (DECREASE) to change to the appropriate number.

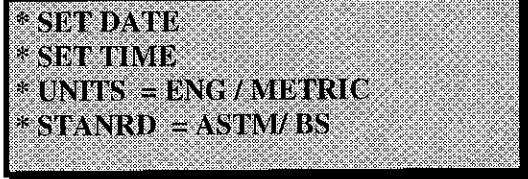
To return to any prior screen you can always press



## SET UNITS

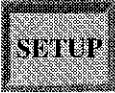
To change the units press  until the following setup screen appears.

The display will show:



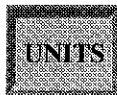
\* SET DATE  
\* SET TIME  
\* UNITS = ENG / METRIC  
\* STANRD = ASTM/ BS

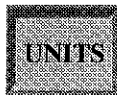
Press **F3** (UNITS) to toggle between English and Metric units. The flashing units are the active units.

To return to any prior screen you can always press .



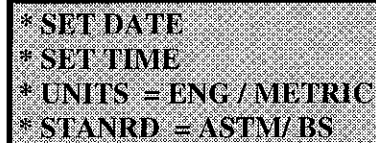
## SET STANDARDS



To change the standard press  until the following setup screen appears.

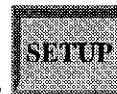
Press **F4** (SET DATE/ TIME/ UNITS/STND) to set the date.

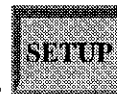
The display will show:

A rectangular box with a textured background containing the following text:

\* SET DATE  
\* SET TIME  
\* UNITS = ENG / METRIC  
\* STANRD = ASTM/ BS

Press **F4** (STND) to toggle between ASTM and British Standard. The flashing units are the active units.



To return to any prior screen you can always press 

## **WARRANTY**

The purchase of this equipment includes a limited 12 months warranty against defective material and workmanship. The owner may replace defective parts in the field by prepaid shipment for installation.

Equipment shipped prepaid to the factory will be repaired or replaced at the option of HUMBOLDT and returned prepaid to the customer. This warranty does not apply if the product as determined by HUMBOLDT, is defective because of normal wear or accident or misuse, or as a result of service or modification by other than an Authorized Service Facility.

THERE ARE NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS, WHICH EXTENDS BEYOND THIS DESCRIPTION. THIS EXPRESS WARRANTY EXCLUDES COVERAGE OF AND DOES NOT PROVIDE RELIEF FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND OR NATURE, INCLUDING BUT NOT LIMITED TO LOSS OF USE, LOSS OF SALES OR INCONVENIENCE. THE EXCLUSIVE REMEDY OF THE PURCHASER IS LIMITED TO REPAIR, RECALIBRATION OR REPLACEMENT OF THE EQUIPMENT AT HUMBOLDT'S OPTION.

Specifications and descriptions are as accurate as possible. HUMBOLDT reserves the right to make changes and improvements in accordance with the latest specifications and design improvements. Upgrading of older equipment to current specifications will be made, where possible, at the expense of the current owner except where HUMBOLDT may elect to make the upgrade at no cost to the owner.