

# DRILL MONITOR DM-100

## OPERATIONS MANUAL



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## INSTALLATION AND SETUP

The Drill Monitor comes complete with the following parts:

- 1 Drill Monitor unit
- 1 Mounting bracket for Drill Monitor
- 1 Encoder
- 1 Encoder cable
- 1 Clinometer
- 1 Clinometer cable
- 1 Power cord

1. The Drill Monitor is powered by either +12 volts or +24 volts supplied to the Drill Monitor via the small connector located on the front. Pin 1 is connected to +12 volts (white wire), Pin 2 is common GND (black wire) . For best results, the power should be connected so that when the drill rig's power is shut off, the power to the Drill Monitor is also disconnected. This will eliminate chances that the battery will be drained if the power switch is not turned off.

2. Information as to what the drill is doing, is provided via rotary optical encoder coupled to the center of the drill's drive sprocket. As the drill hammer is raised and lowered, the encoder sends direction and distance information to the Drill Monitor.

Connect the encoder to the spindle located on one of the drive gears of the drill rig. This is normally located under a cover used to protect the spindle when not in use. The encoder is then connected to the Drill Monitor via the large connector located on the front, center of the Drill Monitor.

3. Clinometers are used to determine the angle and direction of the boom as compared to earth. This will give a true angle, regardless if the drill is on an incline or if the tracks are uneven.

Mount the clinometer box on the side of the boom so that it is perpendicular to the drill rig. This inclinometer will indicate the boom angle, front to back and left to right. To rough setup the clinometer, use a level and adjust the boom until it is straight up and down.

## ENTERING SETUP MENU

Before the monitor can be used it must be calibrated to the specific drill rig it is mounted on. There are 2 ways to calibrate the monitor, the first being to manually enter the calibration value recorded the last time the monitor was used on that specific rig or one of the same type. The second way to calibrate the Drill Monitor with the drill rig, as described below.

To enter the calibration portion of the program (as well as other setup parameters):

1. Turn the POWER SWITCH OFF.
2. Press and hold the ENTER button while turning the POWER SWITCH ON.
3. After the opening screen appears release the ENTER button.

At this point the screen will list three options:

CALIBRATE ENCODER  
ADJUST ANGLE  
OTHER SETUP/EXIT

Use the ↓ (DOWN) and ↑ (UP) buttons to select one of the three listed options. Once the → points to the correct option press and release the ENTER button.

NOTE: All menu selections are made by using the ↓, ↑ and ENTER buttons.

### CALIBRATE ENCODER

When this option is selected, you will be given additional choices. Select from:

CALIBRATE ON RIG  
MANUAL ENTRY  
EXIT

### CALIBRATE ON RIG

1. Once this option has been selected the screen will instruct you to move the drill rig to the Home Position. This requires that the hammer be run all the way to the top of the boom. Once at this position press and release the ENTER button.
2. Next move the drill down exactly 10 feet from the home position, once at this position press and release the ENTER button. For best results, it is recommended that a tape measure be used to mark the ten foot mark.
3. The screen will then display the CALIBRATION VALUE recorded for about 2 second. NOTE: If the number displayed is NEGATIVE, the ENCODER POLARITY is set incorrectly, you must change this setting (see below) and repeat the calibration steps listed above.
4. The calibration setup is now complete, and the Drill Monitor program will display the main screen and the Drill Monitor encoder is now calibrated for use on this drill rig. If the Drill Monitor is removed and mounted on a different drill rig, the calibration must be redone using the procedures described above. To assist in remounting the monitor on this exact drill rig (should it be removed for any reason) record the CALIBRATION VALUE displayed in step 3. Then when remounting, use the Manual calibration as described below.

#### **MANUAL ENTRY**

When the drill monitor is being reinstalled onto a drill rig which has previously been calibrated it may easier to enter the CALIBRATION VALUE manually.

1. Enter the CALIBRATION screen by holding in the ENTER key while turning on the power switch to the Drill Monitor.
2. Select CALIBRATE ENCODER using the → and the ENTER key
3. Select MANUAL ENTRY using the → and the ENTER key
4. Displayed is the current value of the encoder counts per 10 feet in the brackets. To change this value, use either the ? or the ? keys to alter the number located on the left side of the screen. Once the desired value is displayed, press the ENTER key to register the new value. This value will then be saved so that even if the power is removed from the Drill

Monitor, it will be retained.

5. The manual calibration step is now complete and the Drill Monitor will default to the main operating screen.

**EXIT**

Selecting this option will return you to the setup menu.

**ADJUST ANGLE**

Selecting this option will present you with two additional options:

ADJUST ON RIG  
EXIT

**ADJUST ON RIG**

Selecting this option will present you with a screen stating:

MOVE THE BOOM TO THE LEVEL POSITION.  
PRESS ENTER WHEN READY.

At this point the operator should manually level and plumb the boom using a good quality level. When the operator is satisfied that the boom is physically plumb and level pushing the ENTER key will bring up a display showing:

ANGLE OFFSET  
CALIBRATION COMPLETE  
X OFFSET = XXX  
Y OFFSET = XXX

This display will show for approximately 3 seconds and then return you to the SETUP MENU. The clinometer is now calibrated to the rig and ready to measure boom angle and offset.

**EXIT**

Selecting this option will return you to the setup menu.

**OTHER SETUP**

This selected the screen will appear as follows:

ENCODER POLARITY  
SAMPLE TIME  
RATE UNITS  
EXIT

## **ENCODER POLARITY**

Depending on which side the encoder is mounted to the drill rig, the encoder will feed in either a negative or a positive direction. When drilling a hole, the Hole Depth should display an increasing positive number when drilling a hole. If this is not the case, the encoder polarity may have to be changed.

1. To change polarity, select Encoder Polarity and press ENTER.
2. Displayed is the current value of the encoder (either Positive or Negative). To change it's value, press the ↓ key and then press the Enter key to accept the new value.

## **SAMPLE TIME**

The time at which the Rate (drilling rate) is updated to the LCD, is programmable in one second intervals. The longer the time period, the more accurate the value displayed will be. If a shorter time is selected, a more instantaneous result will be display. A Sample Time should be selected to best fit the needs of your application.

When Sample Time is selected, the screen will show a value on the left side of the LCD, in brackets. This is the current value stored in memory. To change this value, press the ? or the ? buttons to alter the number on the right side of the screen. Once the new value is displayed, press the Enter button to store the new value.

## **RATE UNITS**

Rate Units is the units in which Rate (drilling rate) is displayed on the LCD. The two chooses are:

Feet/Minute  
Feet/Hour

Feet/Min will show a more instantaneous drilling rate. This is useful for determining dull bits, or for fine tuning the rig (feed pressure, etc.).

Feet/Hour shows the average drilling rate over an hours time period. This is good for showing progress over a longer period of time. Knowing the average footage drilled per hour can more accurately show progress per day, week, etc, whereas

Feet/Min only shows the instantaneous drilling rate which is  
sporadic at times.

**EXIT**

To exit the setup menu, point Exit and press the ENTER button.  
This will put the Drill Monitor at the main operating screen.



## OPERATION OF THE DRILL MONITOR

After installation and calibration, the Drill Monitor is ready to use. When powered on it will display the initialization message for 2 seconds and then display the main screen.

### HOLE DEPTH

Hole Depth is the depth of the hole that is currently being drilled. The only time this value increase is when the depth of the hole exceeds the displayed value.

For example: If the bit is drilled to a depth of 5 feet, then the Hole Depth value will then displayed as 5 feet. If the bit is stopped and retracted to 3 feet, the value of the HOLE DEPTH will remain 5 feet. (The hole is still 5 feet deep regardless of the bit depth). If the drill bit starts drilling again and is run down to 6.2 feet, the HOLE DEPTH will read 6.2 feet.

Note: the HOLE DEPTH is accurate to one tenth ( $1/10^{\text{th}}$ ) of a foot.

### BIT DEPTH

The bit depth indicates the depth of the drill bit to an accuracy of .1 feet. This function allows you to know exactly where the bit is at all times. This way the hole can be cleaned without slamming the bit into the bottom of the hole, or to know exactly where a seam is.

### RATE

The rate indicates the rate at which you are drilling. This is programmable in either feet/minute or in feet/hour. Feet/Min will give the user an instant reading to indicate whether altering feed pressure or other variables will increase the production rate. Feet/Hour will give a more accurate summary of production over a longer period of time.

The rate at which the rate is updated is programmable in 1 second intervals. To alter the update rate, see RATE UPDATE in the calibration section of this manual.

### ANGLE/SLOPE INDICATOR

The angle of the boom is indicated on the last line of the

LCD. The angle front to back of the boom is indicated on the left side of the LCD. The angle of the boom left to right (side to side) is indicated on the right side of the LCD.

### **ANGLE**

To change the LCD to indicate Angle of the boom, see CHANGE DISPLAY in this manual. Once the angle format is selected, the angles will be indicated with a ° sign.

In front of each angle, is a + or a - sign which designates whether the boom is leaning forward or backward (or left to right). Depending on how the inclinometers were mounted, the positive sign will correspond to either forward or backwards.

This can be quickly figured out by adjusting the boom angle forward and noting the corresponding sign indication.

Note: When the boom is straight up and down, the angle should read zero.

### **SLOPE**

To change the LCD to indicate SLOPE of the boom, see CHANGE DISPLAY in this manual. Once the slope format is selected, the angles will be indicated in Feet Over/1 Foot Down. The following is a chart to help you understand the slope indication of the Drill Monitor.

$$x:y \text{ Slope} = y/x = \tan^{-1} y/x$$

1:1	Slope = 1.000	= 45.0 degree angle
2:1	Slope = 0.500	= 26.5 degree angle
3:1	Slope = 0.333	= 18.4 degree angle
4:1	Slope = 0.250	= 14.0 degree angle
5:1	Slope = 0.200	= 11.3 degree angle
6:1	Slope = 0.167	= 9.5 degree angle
7:1	Slope = 0.143	= 8.1 degree angle
8:1	Slope = 0.125	= 7.1 degree angle
9:1	Slope = 0.111	= 6.3 degree angle

Example: 3:2 Slope Take the 2 and divide it by 3 and you get a result of  $2/3 = .667$  If you are in slope mode, adjust your boom until it reads 0.667 on the corresponding clinometer readout (example Front/Back). If you are in angle mode the following calculation can be made: Inverse TAN of 0.667 (or  $\tan^{-1}(0.667) = 33.7$  degrees



## **MENU SELECTIONS**

To enter the menu selections, press the ENTER key on the Drill Monitor. Listed are the following chooses:

TO MAIN PAGE  
CLEAR TOTAL  
CHANGE DISPLAY  
DISPLAY TOTAL

### **TO MAIN PAGE**

By selecting To Main Page, the Drill Monitor is returned to the main screen which displays Hole and angle information.

### **CLEAR TOTAL**

Clear Total is used to clear the total footage drilled per day. At the beginning of every day the total footage should be cleared. Whenever a hole is drilled, that footage will be added to this total. Selecting Clear Total will automatically clear the Total Drilled value.

### **CHANGE DISPLAY**

To toggle between angle and slope indication on the main page, select Change Display. Once selected, it will display what mode it is now in effect and will default back to the Menu Selection screen.

### **DISPLAY TOTAL**

Selecting Display Total will display the total footage drilled since the last time the total was cleared. (Refer to Clear Total above for details on clearing total). To exit the total footage screen, press the Enter key and you will return back to the Main screen.

## ZERO HOLE

### STARTING A NEW HOLE

1. Whenever starting a new hole, position the drill bit at the top of the hole.
2. Once in position, press the ZERO HOLE button once.
3. A screen will appear asking to Clear Hole Depth. To Accept this press the ZERO HOLE button again. This will zero out the HOLE DEPTH and the BIT DEPTH.

### NO STEEL ADDED:

4. Once at the desired depth retract the steel from hole.
5. Check the hole to check if it is loadable.
6. If not loadable, clean out hole as normally done.
7. Once hole is clear, setup for new hole and repeat steps 1 through 7.

### STEEL ADDED:

If the hole depth required steel to be added, perform the following steps.

- 4a. Once the current steel is down all the way, STOP.
- 5a. Press the HOLD button on the Drill Monitor. The third line of the LCD will read **HOLDING 00:00:01** and then will start counting up.
- 6a. Uncouple the drill steel and retract the drill hammer.
- 7a. Couple onto the new section of drill steel.
- 8a. Press HOLD button again. The third line of the LCD will change back to **RATE .0 FT/MIN.**

3, 9a. Run steel down to desired length, repeating steps 1-4a - 9a as required.

## RETRACTING STEEL (MORE THEN ONE LENGTH)

10. To retract steel out of the ground. retract the first section of steel all the way out.
11. Press the HOLD Button.
12. Uncouple steel and run hammer down to next section of steel.
13. Couple onto next section of steel.
14. Press HOLD Button to remove it from holding pattern and start retracting steel.
15. Repeat steps 10 - 14 as required.

Performing steps 10 - 15 will give an accurate account of the Bit depth. If bit depth is not important to your application perform the following steps in place of step 10 - 15 listed above.

- 10a. Retract steel
- 11a. Uncouple and run hammer down to next section of steel.
- 12a. Retract next section of steel.
- 13a. Repeat steps 10a - 13a as required to remove all sections of steel.

Watching the LCD you will notice the Hole Depth always remains the same. The Bit Depth although will run from the HOLE DEPTH back to a value the length of one steel from the bottom. Then when you run it back down to hook onto the next section of steel, The bit Depth increases back to the HOLE DEPTH value.

This allows you to remove steel without having to press any buttons on the Drill Monitor BUT it will not give an accurate position of the BIT Depth.

*NOTE: Remember to always press the ZERO HOLE button twice when setting up for a new hole. Otherwise the total footage drilled will not be accurate at the end of the day.*



## Technical Information

Power Supply Input: 10 Volts DC - 30 Volts DC

LCD: 4 Lines x 20 Characters  
8 mm high lettering  
Backlit Green  
Display Color Yellow

Transflective

Temperature Range: -20° C to 70° C (-4 F to +158 F)

Power Consumption: Approximately .850 Amps

Clinometer Specifications: Total Angle Range +/-  
60° Linear Range +/-  
45° Threshold and resolt. .001°  
Linearity +/- .25°  
Null to 10° +/- .1°  
10° to 45° +/-

1%

Box Dimensions: Length: 9.5 in (24.1 cm)  
Width: 7.0 in (17.8 cm)  
Depth: 4.5 in (11.4 cm)

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