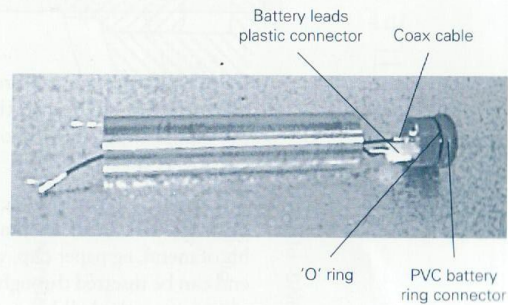




7. Push all the bottles pins in until they clear the brass pipe and pull out the transmitter section and battery pack slowly and carefully.
8. Remove the battery ring connector very carefully from the battery pack.
9. Gently pull the PVC battery ring connector from the brass battery pack. Do not pull too hard or else you will break the wires inside the battery pack.



(Figure 37). Downhole Battery Pack.



10. Disconnect the coax cable connector from the PVC battery ring connector, by gently pulling the snap-on connector. Never pull on the cable itself.
11. Disconnect the battery lead's plastic connector by unlatching it and pulling it from the PVC battery ring connector.
12. Place the PVC battery ring connector in a safe place.
13. Carefully unscrew and remove the brass Downhole battery tube from the Uphole end main body.
14. Warning: the coax cable snap-on connector has to be fully withdrawn from the battery pack. Make sure that it does not catch on anything.
15. Take the new battery pack and insert the coax cable snap-on connector right through the centre tube of the battery pack.
16. Screw on the brass battery pack, hand tight only, ensure that the coax cable snap-on connector has passed fully through the centre of the battery pack.
17. Plug the two connectors into the PVC battery ring connector, remember the plastic battery connector



is polarised. Now push the PVC battery ring connector fully into the brass battery tube. The 'O' ring on the battery ring connector has to be lubricated with a small amount of 'O' ring lubricant.

18. Before inserting the battery pack and Transmitter section, check the inside of the brass pipe for possible burrs, especially near the bottle pin holes. Remove the burrs because they can cut the 'O' rings and cause the Downhole unit to leak.
19. Also check the 'O' rings on the Transmitter section. They have to be in absolute prime condition with no damage to them at all. If any damaged 'O' rings are found, replace them immediately and find the cause.  

The 'O' rings protect the Downhole electronics from water ingress, and if damaged can and will cause severe damage to the electronics inside the brass instrument tube, so be sure to check the 'O' ring every time the Transmitter section is reassembled to the brass instrument tube.
20. Apply a small amount of 'O' ring grease to the 'O' rings. Insert the 3 bottle pins into their respective holes in Transmitter section and push the Chamber and battery slowly and carefully into the brass instrument pipe. Make sure that the bottle pins are aligned with the holes in the brass pipe. Always



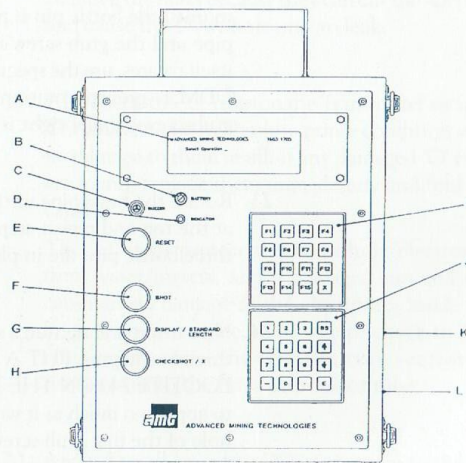
check for 'O' ring cuttings during and after insertion, and remove the assembly when any cuttings are visible. Find the cause and eliminate it.

21. Put one of the holes in the brass instrument pipe at the top and drop one stainless steel ball into the hole in the bottle pin.
22. Insert a grubscrew into the bottle pin and screw it in until the bottle pin is protruding from the brass pipe and the grub screw is tight. If the bottle pin itself rotates, use the special tool, supplied with the DDM, to prevent rotation. Do not over tighten the grubscrews, finger tight is sufficient.
23. Rotate the brass pipe until the next locking pin is at the top and repeat steps "10" and "11" until all three bottle pins are in place.
24. Now insert and tighten a second grubscrew into all three bottle pins. **PUT A SMALL AMOUNT OF LOCTITE 243 ON THE THREAD**, be careful not to apply too much as it would fill up the Allen key hole of the first grub screw and cause unnecessary frustration when disassembling at a later stage. If the bottle pin itself rotates, use the special tool, supplied with the DDM, to prevent rotation.
24. The Downhole unit is now ready for further assembly as described in section 2.1.



25. To test the Downhole unit before being used underground or on site, connect to MECCA Downhole Test Sub to the Downhole unit. Connect the Test Sub via the MECCA Interface cable to the Uphole Monitor and take a Check Shot. This will indicate whether or not the Downhole unit is working correctly.

Uphole Monitor Unit Layout Diagram (Figure 38).



- A. Liquid Crystal Display (Display screen)  
 B. Battery Power Meter - Battery Condition  
 C. Buzzer  
 D. Indicator Light (LED)  
 E. Reset Button



- F. Shot Button  
 G. Display/Standard Length Button  
 H. Checkshot/X Button  
 I. 16 Key Keypad Function Keys  
 J. 16 Key Keypad Numeric, Scroll and Enter Function Keys  
 K. Battery Charger and Data Transfer  
 L. Downhole Data signal Input Connector

### Uphole Monitor Operation Procedures

The Uphole Monitor is a sophisticated computerised data collection, data processing and data display Unit. The whole of DDM-MECCA is controlled from the Uphole Monitor via the four large buttons Key function keypad and a 16-key numeric keypad all located on the front panel. A list and detailed description of each function follows:

- Reset ( Red Button). Display the main entry screen after some self tests.  
 F1 (or Green Button). Collect Shot/take survey  
 F2 (or White Button). Display Shots/Standard Length.  
 Additional functions in the Display Shot mode are available by pressing other function keys.

- F4 Clear All Data  
 F5 Display Settings  
 F6 Adjust Magnetic Declination  
 F7 Reset Tool / Bend  
 F8 New Hole  
 F9 Set Standard Pipe Length  
 F10 Self Test  
 F11 RS232 Raw Data Transfer  
 F12 RS232 Processed Data Transfer  
 F13 Set Clock  
 X (or Black Button). Check shot / Escape Key

**F1 (or Green Button) - Collect Shot**

First of all make sure that the MECCA Interface cable is connected between the MECCA Signal sub and the Uphole Monitor.

Press F1 or the Green button when the main display is in "Select Operation mode", to take a survey shot. The Uphole Monitor will transmit a data request signal via the MECCA drill rods to the Downhole unit. The Downhole unit will subsequently take the electronic directional readings and transmit raw data to the Uphole Monitor.

If it is the first shot in a hole the unit will request the desired heading in degrees. If no heading is entered a default of 0 degrees is assumed. It will then request the entry heading. The first shot is normally taken with the motor and instrument just past the standpipe. Because the standpipe will influence the magnetic readings, an entry heading must be entered. The Uphole Monitor will subsequently request the Pipe Length, this is the distance from the start of the hole to drill bit.

After receiving the raw data, the Uphole Monitor will ask for the Pipe Length. The length can be put in via the Numeric Keypad or by pressing the F2, the White Button (Standard Length), the Black Button or the X key, which will automatically put in the Standard Pipe Length (e.g. 6m). The Uphole Monitor will now calculate all the data and display the results on the Display screen. For more information on the display of data see function F2.



If the Uphole Monitor did not receive the signal within a pre-defined time or when too many characters have been received, a time out message will be displayed on the Display screen.

If however a message was received but somehow has been corrupted, the Display screen will display a Checksum error.

**F2 ( or White Button) - Display shots**

To go to the Display Shot mode and display the shots taken, press the F2 or the white button, when the main display is in "Select Operation mode".

After F2 has been pressed the last 10 survey shot data will be displayed on the screen. The data on the Display screen is formatted as follows:

"# S m Azm Pt TL DT L/R U/D Bt tm"

In which:

- # = Shot number
- S = Shot status
- m = Total drill string length in metres
- Azm = Azimuth in degrees
- Pt = Pitch in degrees
- TL = Position of Toolface/bend in degrees



- DT = Downtrack is the measurement along the desired heading line in a horizontal plane, together with the Left/right deviation and Up/down deviation it provides a position fix for the drill bit
- L/R = Left / Right deviation in metres from the desired heading
- U/D = Up / Down deviation in metres from the horizontal line along the desired heading
- Bt = Downhole battery voltage
- m = Time when survey shot was taken

The Shot status has the following meaning:

*first column*

blank - Shot not included in Hole

- \* - Start of Hole
- Shot included in Hole

*second column*

blank - Shot OK

E - Data suspect

### F3 Change display format

When in the Display Shot mode and F3 is pressed the Display format will change to:

"# S m Cx Cy Cz Mx My Mz B fl dt"



In which:

- # = Shot number
- S = Shot status
- m = Length of drill rod entered in metres
- Cx = Accelerometer raw data
- Mx = Magnetometer raw data
- Cy = Accelerometer raw data
- My = Magnetometer raw data
- Cz = Accelerometer raw data
- Mz = Magnetometer raw data
- B = Battery voltage \* 100, raw data
- fl = Flags or shot error codes
- dt = Date when shot was taken

The shot error codes or flags have the following meaning:

- 0008 - Bad Data
- 0100 - Suspect Data
- 1000 - Part of Branch and not in main hole
- 3000 - Part of Branch and not in main hole and last shot in Branch
- 4000 - Start of new Hole
- 8000 - Data has been adjusted



Press F3 again and it will go back to the original processed Display Shot display.

Whilst in Display Shot mode the data on the screen can be manipulated by the following function keys:

F1 - Page Up	F5 - Edit length M of shot at top display
F2 - Page Down	F13 - Delete Shot, enter shot N°
F3 - Change Display Format	F14 - First shot in Branch/From shot N°
F4 - Go to Shot, enter shot N°	F15 - Include Shot (Undelete) enter shot N°
↑ - Go to Previous Shot	X - Return to "Select Operation:"
↓ - Go to Next Shot	

#### F4 - Clear all Data

When the main display is in "Select Operation mode" and when all shots are to be deleted or cleared press the F4 key and answer the question by pressing "1" (yes) or "0" (No) and then the "E" (Enter) key.

#### F5 - Display Settings

To find out the default settings, such as declination value, desired heading, standard pipe length, number of shots collected and software version of the DDM-MECCA, press the F5 key when the main display is in "Select Operation mode".

#### F6 - Adjust Magnetic Declination

Entering a magnetic declination allows the unit to calculate Azimuth bearings relating to true North.



To set the magnetic declination of the site, press F6 when the main display is in "Select Operation mode" and enter the value and press the "E" to accept that value. The Downhole unit measures the magnetic direction and thus to correct for the difference between the magnetic and true North the declination has to be programmed. The declination is the difference between the magnetic North and the true North, to obtain this value for your site, contact your surveyor for your local declination. For declinations easterly precede the declination with a - (minus sign). For declinations westerly enter the declination without a minus sign and press "enter".

If you set the declination to 0.00 then the Uphole Monitor will calculate the Azimuth as magnetic north and not true north. The choice is dependant on how your mine is surveyed, magnetic or true.

The default value is 12.1 degrees East, or -12.1 degrees.

#### F7 - Reset Tool

First of all make sure that the MECCA Interface cable is connected between the Signal sub and the Uphole Monitor.

To Reset the toolface or bend, press F7 when the main display is in "Select Operation mode". The system takes a survey shot and if no problems are encountered will ask for the present toolface to be input in Degrees.



12 O'clock	=	0(360) degrees
3 O'clock	=	90 degrees
6 O'clock	=	180 degrees
9 O'clock	=	270 degrees

This function needs to be run at the start of each hole. The systems will calculate the offset between the electronic tool reading and the toolface. This value is used to calculate the position of the toolface after a survey shot has been taken or when performing a check shot function. It is therefore very important not to forget to perform this function when starting a new hole.

#### F8 - New Hole

When the main display is in "Select Operation mode", this function allows the starting of a new hole without losing the data from a previous hole. If you try to use this function and you have no old hole in memory the unit will report this fact.

If there is a previous hole the Uphole Monitor will query if you really want to start a new hole. Entering a 1 (one) on the numeric keypad is Yes, entering a 0 (zero) signifies NO and does not start the new hole.

If you do start a new hole you will be prompted for the desired heading and the entry heading.

Also the first shot in the new hole is marked with 4000 at the end of the data when viewed on the screen.



#### F9 - Set Standard Pipe Length

To change the standard pipe length, press F9 when the main display is in "Select Operation mode". The standard pipe length is the interval length at which you most often take a survey shot. This will speed up operation when taken a survey shot as only one key has to be pressed when prompted for the entry of the pipe length. This key can be the large white button, the large black button, the F2 key or the X key.

#### F10 - Self tests

To perform a series of internal tests of the Uphole monitor box, press F10 when the main display is in "Select Operation mode". Some of the internal tests are the checking of the integrity of the program memory and data memory, it also checks whether any of the keys are stuck in the on position. If an error is found the unit reports the error and then powers down.

If the Uphole monitor reports an error, make note of the error and press the large Red reset button. Upon pressing the Reset button the Uphole Monitor will again perform self tests and initialise part of the electronics.

If after this the Uphole Monitor still reports an error, please advise Advanced Mining Technologies with the details and return the unit for repair.

**F12 - RS232** (Transmit all shot data to a remote computer)

This function will send all the data contained in the Uphole Monitor to be transferred, transmitted, through the RS232 port to any computer system with an RS232 port. To select this function press F12 when the main display is in "Select Operation mode".

The data is in pure ASCII format, and is transmitted at 2400 Baud, 8 bits, No parity and 1 stop bit (2400,8,N,1). A standard Personal computer can be used, running DOS operating system or a you can use a standard communication package, eg Telix.

First the computer communication port will have to be set up. In this example serial port com2 has been used, com 1 can be used as well, if required. Type the following command at the DOS prompt `c:\> "mode com2: 24,n,8,l"`. The computer communication port 2 is now set to, a speed of 2400 Baud, with No Parity, 8 Data bits and 1 Stop bit.

To transfer the data from the Uphole Monitor box to the computer, first of all connect the data transfer cable between the Uphole Monitor box and the computer com2 port.



Type in the following command at the DOS prompt `c:\> "copy com2: filename.dat"` followed by the enter key. The file name can have a maximum of 8 characters, with no spaces, full stops or other special characters in the name, use only alpha-numeric characters, a-z and 0-9. The file name is then followed by a full stop and the letters "dat", to indicated that it is a data file. Some examples of file names are:

"BHPM01.DAT", "TAHMOR01.DAT", "BHPHOL01.DAT", "HL960301.DAT".

Press F11 or F12, depending on the data you require, on the Uphole Monitor box and wait for the data to be transferred. After the data has been transferred it can be read, printed, manipulated, or read in and used in a spread-sheet program, such as Excel and Lotus. The data has comma delimited input, meaning data separation is achieved with the comma character.

The processed data transferred to the computer will look similar to the data displayed on the Uphole Monitor box, except that it includes the status and date information as well.

The Downtrack information has been calculated and is shown on the first data display screen on the monitor box.



**F13 - Set the Real Time clock**

This function allows the setting of the real time clock, press F13 when the main display is in "Select Operation mode". The real time clock keeps track of the day, month, year, and time, with the time in a 24 hour format. Please make sure that the time and date are correctly set as this information is stored with each survey shot taken.

**X - Checkshot / Escape**

First of all make sure that the MECCA Interface cable is connected between the Signal sub and the Uphole Monitor.

This key has a dual function, Checkshot and Escape. The Checkshot function can only be performed when the Display Screen is in "Select Operation mode".

A Checkshot is similar to a Survey Shot, however the information will not be stored and thus will not be part of the hole survey. This function is mainly used to give the operator the Toolface orientation without storing the hole survey data. This will allow only real hole survey data to be stored when required. After the Checkshot has been taken the Toolface will be shown on the Display screen in Degrees and as a clock face value.



Where:

12 O'clock	=	0 (360) degrees
3 O'clock	=	90 degrees
6 O'clock	=	180 degrees
9 O'clock	=	270 degrees

Also the Azimuth, Roll and Pitch will be shown on the Display screen.

The Escape function is used when the main screen is not in the "Select Operation mode", and when pressed will either return to the "Select Operation mode" or when prompted to enter a value will mean default value is to be used or do not change present value.

An example of this is when the Real time clock function is used and the time and or date has been changed but it shouldn't have. Simply by pressing the X function key or Black button, the Uphole monitor will return to the "Select Operation mode" and the time and date will not have changed.

Another example is when a Shot has been taken and the Display Screen prompts for the input of the Pipe Length. By pressing the X function key or the Black button, the default value or Standard length is taken as pipe length.



### DDM MECCA Operation Procedures

Once the Declination, Reset Toolface/Bend, Standard Pipe Length and real time clock functions have been performed the Uphole Monitor unit is ready to start storing survey data from the Downhole Unit.

The Uphole Monitor is a fully self contained unit that collects the data from the Downhole Unit via the MECCA drill string.

There is no On/Off switch on the Downhole unit or the Uphole Monitor as microprocessors manage the power requirements.

On the Uphole Monitor a visual indicator shows the condition of the battery. This indicator should have the needle in the green region when the Uphole Monitor is in standby (Power down mode). If it drops into the red region when on standby then the Uphole Monitor should be recharged. The needle of the Battery indicator will flick into the red zone during shot collection, this is normal.

Pressing the Red Reset button, when the Uphole Monitor is in standby mode, will activate the Uphole Monitor and it will show the "Select Operation" screen. Whenever the Reset button is pressed the monitor will perform certain self tests, do not press any keys whilst the self tests are in progress. If the Uphole Monitor



detects a fault, it will report this on the LCD Display screen. Write down the error message and report the incident to Advanced Mining Technologies when it occurs again when the Reset button is pressed a second time. More extensive testing can be performed by pressing F10.

During normal usage the Uphole Monitor will power down and go in standby mode after approximately 1.5 minutes. The battery has sufficient power to run for several weeks without recharging.

The Uphole Monitor is a sophisticated electronics/computer piece of equipment and should be protected from severe shock and exposure to water.

The following paragraphs will deal with potential drilling and survey problems, eg a large change in dip, deviation or Azimuth (error code 0100 suspect data). This error code is here to assist the operator to identify hazardous situations developing that could bog the drill motor and survey tool and possibly lead to the loss of these valuable components.



Connect the MECCA interface cable between the signal sub and the Uphole Monitor and press F1 or the large Green button to collect a survey shot. If everything is normal the Display screen will prompt for the length drilled since the last survey. After entering this length, either by entering the value and pressing the Enter key or by pressing the large White button, or the large Black button or the 'X' key to accept the Standard Length, the Uphole monitor will calculate the data and display it along with an error code if the data is in error.

If it is the first shot in a hole the Uphole Monitor will request the desired heading in degrees. If no heading is entered a default of 0 degrees is used. It will then request the entry heading and will also request the length of drilling from the start of the hole.

When the Uphole Monitor displays the survey data and an error code of 0100 is shown, then the data is suspect as the difference in Azimuth, Dip or Yaw since the last survey shot exceeds a predetermined limit. This limit is 0.5 degrees change per metre.

This error can mean one of the following:

- 1 - The survey was incorrect, possible Downhole battery failure or survey components failure.
- 2 - The hole has diverged in either Azimuth, pitch or yaw at an unsafe rate, greater than 0.5 degrees per metre.



The recommended procedure is to pull back to the previous survey point and resurvey. If the two surveys agree push the string forward one third(1/3) the distance to the next survey point and survey. Repeat this until the survey point that gave the suspect data code has been reached.

If the survey confirms the rapid change in Azimuth, pitch or yaw, pull back to the previous survey point. Delete the surveys used to confirm the problem and redrill the length taking care to ensure the hole does not deviate so strongly.

#### Branching

The branching function allows you to branch from the main hole and continue with heading, dip and yaw offsets from the collar. When the shots are displayed on the Display screen, press F14 and enter the shot number you wish to branch from followed by the Enter key.

Once you have selected the shot you wish to branch from, the drill string should be positioned at this shot length and the main hole or branch continued. If a branch is terminated by a new branch the last shot in the branch will have a "2000" status flag at the end of the shot data for that branch.

#### MECCA Downhole Non Rechargeable Lithium Battery Cells

1. Non-rechargeable and will explode if connected to battery charger.

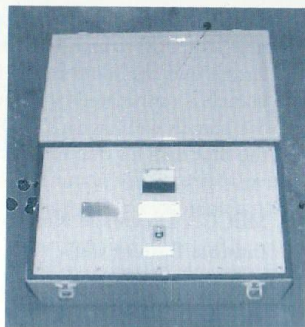


2. Do not short-circuit battery terminals.
3. Once installed in Downhole instruments can be used 4-6 weeks depending on frequency of surveying.
4. To observe Downhole battery voltage on the uphole monitor box press F2 and read the value under Bt (Battery) column. When it is less than 13.0 it is time to replace the battery.

#### Charging Of The Uphole Monitor Unit (UMU- Computers) Both Mecca and DDM

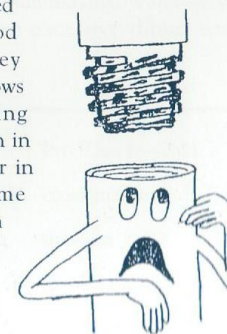
1. With a 240v power turned off, connect charger output lead plug to the socket on the UMU.
2. Turn on the 240v power supply to the charger unit. From flat to full charge takes 16 hours and lasts one week.

(Figure 39). Uphole Charging Unit



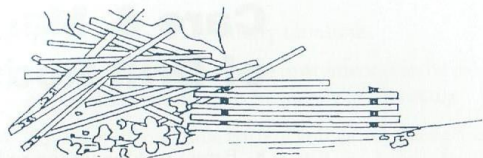
## Care & Maintenance of Drill Rods

- Before making up the rod joints for the first time, examine the rods carefully for damage which might have occurred during transport to the drilling site.
- Remove any accumulated dirt from box and pin threads.
- Make up the joint. There will be a slight "stand off" when the joint is hand tight. In order to make the shoulders, it is necessary to torque the joint with the drilling machine.
- Avoid stabbing the pin ends of the rods when making them up. Engage the threads by hand.
- If rods are not contained in an automatic rod handling device, they should be stacked in rows with timber lagging between the rows when in transit, when drilling or in storage with the same number of rods in each row to make counting easier.

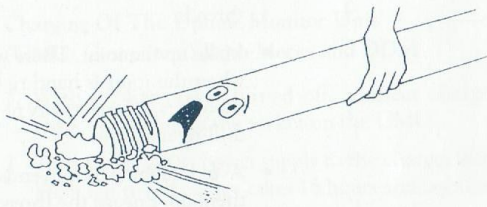




**CARE & MAINTENANCE OF DRILL RODS**

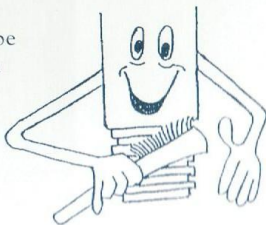


- When rods are in transit and in the process of being made up, avoid dragging the threads in the dirt.

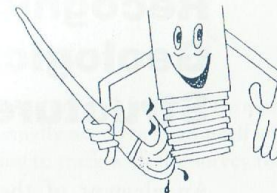


- Rod threads (both pin and box ends) must be thoroughly cleaned each time before use so that there is no foreign matter entrapped in the threads. This cleaning should be done with a wire brush and finished with a rag moistened with diesel, if necessary.

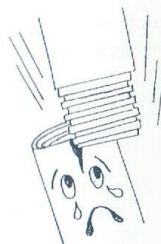
- The rod should be lightly greased with proper rod grease (Mobil Grease) prior to use.



**CARE & MAINTENANCE OF DRILL RODS**



- The rods should be screwed up as far as possible by hand and then tightened gently on the machine to the full capacity of the machine, but making sure the rods do not spin in the grippers or jaws.
- The rods should only be uncoupled on the machine if the uncoupling speeds matches the thread pitch. Severe thread damage will result by a coupling speed mismatch. Have the problem rectified to prevent damage.
- During rod operations check the condition of water for thread wear and accumulated dirt. Water swivel should be changed when excessive thread wear occurs.



Rod Types	AWJ	Pro Ram in-seam
	BW	cross-measure. dr 3,4
	BQ	in-seam
	NWNQ CHD	in-seam. dr 5,1