



In which:

- # = Shot number
- S = Shot status
- m = Length of drill rod entered in metres
- Cx = Accelerometer raw data
- Cy = Accelerometer raw data
- Cz = Accelerometer raw data
- Mx = Magnetometer raw data
- My = Magnetometer raw data
- Mz = Magnetometer raw data
- G = Gamma meter raw data
- fl = Flags or shot error codes
- tm = Time 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
- 2000 - Last shot in branch
- 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 |
| F2 - Page Down | F13 - Delete Shot |
| F3 - Change Display Format | F14 - First shot in Branch |
| F4 - Go to Shot | F15 - Include Shot (Undelete) |
| ↑ - Go to Previous Shot | X - Return to "Select Operation:" |
| ↓ - Go to Next Shot | |

F1 page up

Will cause the screen to page up, that is display previous page or 10 shots.

F2 page down

Will allow you to page down, that is display the following page or 10 shots.

F4 Go to shot

Entering the shot number and pressing the enter key will take you directly to that shot.

F5 meters F4 - F5

This function is included to allow for incorrect entered meterage. This allows you to change the meterage on a given shot.



This function should be preceded by an F4 to select the shot you desire to correct. The new length is entered on the numeric keyboard followed by the enter key.

The Uphole Monitor will automatically recalculate all data for the changed shot plus any subsequent holes.

F13 Delete Shot F13

This function allows the deletion of a specific shot. Normally it is used to remove from the hole a suspect shot.

On removal of the shot all data for subsequent shots is recalculated.

Whilst the shot is removed from the calculation the data is preserved and marked in the first column of the data display by the lack of a 'stab' or a solid block.

F14 Branch from Shot F14

This function allows you to branch from the main hole and continue with heading, dip and yaw offsets from the collar. When F14 is selected the Uphole Monitor will ask you from which shot number you wish to branch.

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



F15 Undelete Shot F15

This function allows the operator to undelete a shot previously deleted. Once the operator enters the shot number in the keypad and presses enter the shot will be included in the hole and all subsequent data recalculated to reflect this inclusion of this shot.

F4 - Clear all Data

When the main display is in "Select Operation mode" and if 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-01A, press the FS 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 just enter the declination 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 depends on how your mine is surveyed, magnetic or true.

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

F7 - Reset Tool

This function is required every time you start a new hole. The system 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. It is therefore very important not to forget to perform this function when starting a new hole.

The Downhole unit will calculate its offset from the position of the bend/toolface in the drill motor.

Rotate the tool to start the data sending routine ensuring the bend is pointing upwards at 12 o'clock. Place the sensor on the drill rod as if taking a normal survey shot. Press F7.

The Uphole monitor will receive the survey data and calculate the bend offset 1.



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 stored in the Uphole Monitor it will query whether 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.



REMEMBER

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.

F10 - Self Test

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 F1 2 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 special software package is available to interpret the data and to convert the data in to 3-dimensional hole co-ordinates, as well as supply management information regarding drilling speed etc. Please contact Advanced Mining Technologies for details.

F13 - Set the Real Time clock

This function allows the setting of the realtime clock, press F1 3 when the main display is in "Select Operation mode". The realtime 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 - Escape

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 the present value.

An example of this is when the realtime 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 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, the default value or Standard length is taken as pipe length.

DDM Downhole Rechargeable Ni Cd Battery Maintenance and Charging Procedures

1. Remove the discharged Downhole battery from DDM Downhole unit.
2. Place the battery in the battery stand.
3. Connect and switch on the battery charger to fully charge the battery from a discharged state, leave connected for at least 16 hours. The battery can be left in the charger indefinitely.
4. The battery is now ready for use.



- Once every 3 months, directly after removing the Downhole battery from the DDM Downhole unit and placing it in the battery stand, connect the battery conditioner/tester to the battery stand and leave connected for a maximum of 4 hours.

DO NOT LEAVE THE BATTERY CONDITIONER/TESTER UNIT CONNECTED FOR MORE THAN 4 HOURS.

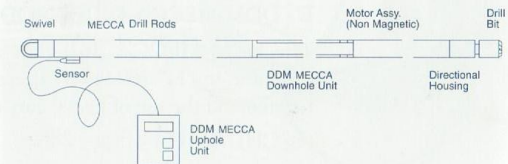
- Disconnect the battery conditioner/tester and go to point 3.



Directional Drilling System Overview MECCA

A typical Long Hole Drill String Assembly with the DDM-MECCA installed is shown below.

Long Hole Drill String Assembly

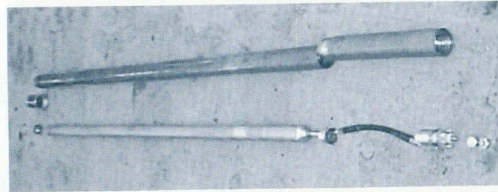


(Figure 26).



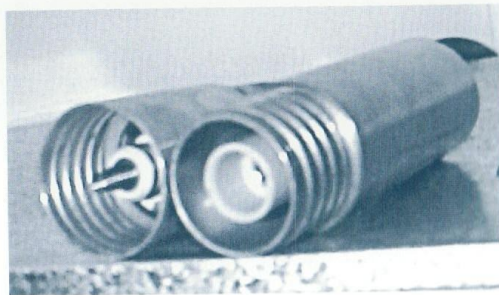
D - DDM-MECCA DOWNHOLE UNIT

The DDM-MECCA Downhole unit is positioned between the drill motor and the drill rods. It contains very sensitive electronics in a brass instrument pipe which is itself housed in a short and a long Copper Beryllium, Non-magnetic rod (CuBe), casing, or other suitable non-magnetic housing. (Figure 27).



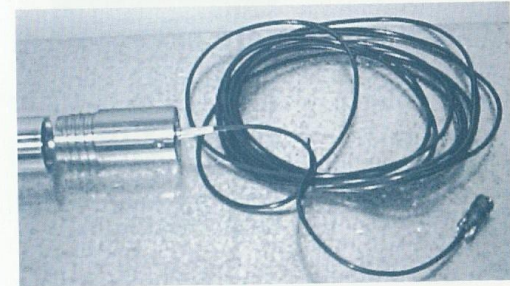
E - DDM-MECCA DRILL RODS

The DDM-MECCA drill rods are presently only available in "N" (69.9mm) size outer diameter. We recommend the use of heavy duty drill rods. (eg CHD76, HT) (Figure 28).



F - WATER SWIVEL/SIGNAL SUB (Figure 29).

A swivel is required for the introduction of the flushing medium. The DDM-MECCA signal sub is designed to connect to a swivel and allows the free passage of sufficient flushing medium to meet the full requirements of a 73mm (2-7/8") drill motor. The signal sub provides a direct connection to the drill rod, without the need to thread on the DDM MECCA Test sub, every time a survey or checkshot is required. (Figure 27 next page).



G - MECCA INTERFACE CABLE

The MECCA Interface Cable connect the MECCA drill rod system up to the Uphole Unit.



H - DDM-MECCA UPHOLE MONITOR UNIT

The Uphole Monitor Unit displays the directional data to the operator on a LCD Display screen. It also contains all the keys and buttons to control the DDM-MECCA system.



(Figure 30).

DDM-MECCA System

The DDM-MECCA System itself consists of the following components:

1. Downhole Unit - Brass Instrument pipe with electronics
 - Downhole battery pack
 - Long Instrument Non-magnetic rod (CuBe)



- Short Instrument Non-magnetic rod (CuBe)
 - Thread saver sub on MECCA side
2. MECCA Drill Rods
 3. DDM MECCA Signal Sub
 4. DDM MECCA Interface Cable
 5. Uphole Monitor Unit
 6. Battery Charger Unit *
 7. Battery Charger Lead
 8. Downhole Non-Rechargeable Lithium Batteries
 9. MECCA Downhole Test Sub

* Only for above ground use in a non-hazardous area.

Data is electrically transmitted by the Downhole Unit, the MECCA drill rods and the Signal sub to the Uphole Monitor Unit. The data, containing the directional information is processed and displayed on the Uphole Monitor unit.

Whilst all efforts have been made to design and construct both the Downhole unit and the Uphole Monitor to meet the rigours of the mining industry, it should be remembered that both units are sensitive precision electronic equipment.

The Uphole Monitor should not be treated like a tool box. It should not be thrown around or damage to the display screen and/or electronics will result.

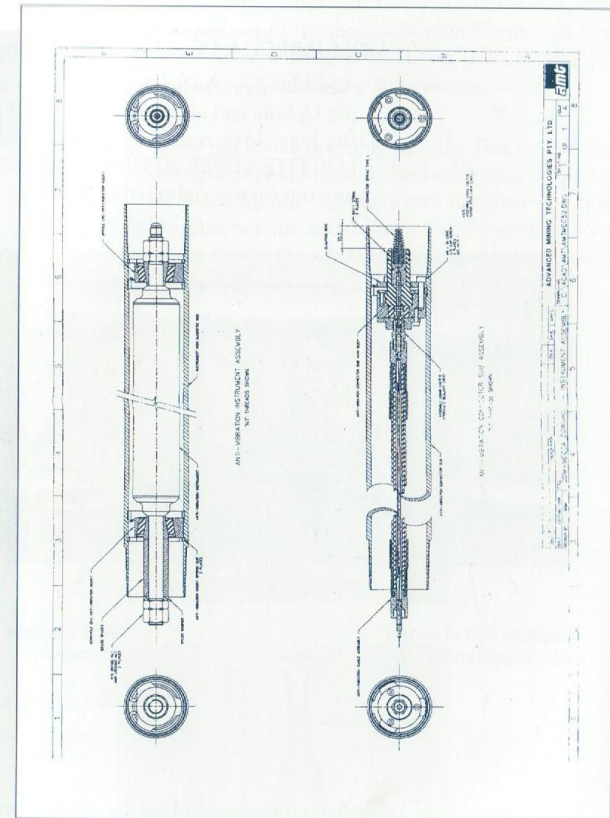


REMEMBER

The Downhole unit is a robust tube but it does contain sensitive electronic components. Dropping it to the ground instead of placing it on the ground could lead to serious and expensive damage. The Downhole instrument is mounted inside the special Non-magnetic rod (CuBe) rods.

The thread on the Uphole side is protected from the damage by a Thread saver sub. This sub, a mini MECCA drill rod is mounted on the MECCA side of the Downhole instrument. This Thread saver is only to be removed when the Downhole battery requires replacement.

There are no user serviceable parts within the Downhole unit or Uphole Monitor.

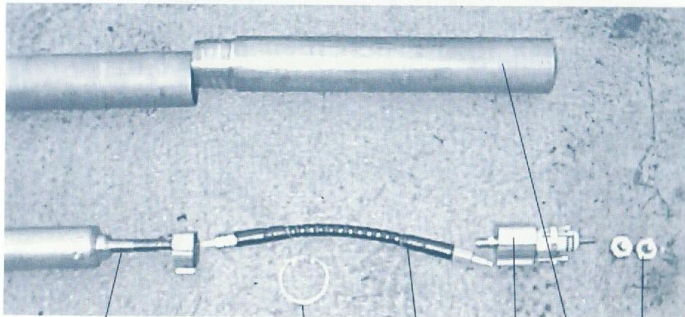


(Figure 31). DDM - MECCA
Downhole - Instrument Assembly



DDM-IMECCA Downhole assembly instructions

1. Assemble one Anti-vibration Mount as shown on the Uphole end of the instrument and secure using the brass M16 nut and lock nut as shown using LOCTITE SUPER STUD LOCK (262) and being sure not to over tighten the nuts.



Uphole end of survey instrument

Anti vibration cable

Anti vibration mount

sub cover

(Figure 32).

2. Assemble one end of the Anti-vibration Cable Assembly onto the Uphole end of the instrument using LOCTITE Hydraulic SEALANT (569) being sure not to over tighten.

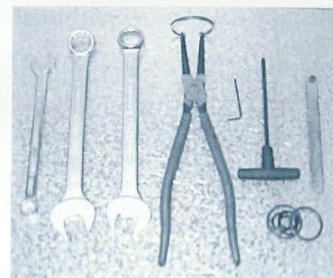


NAJDAT I AZIZ

3. Assemble the other end of the Anti-vibration Cable Assembly onto the Anti-vibration Connector Sub Main Body using LOCTITE HYDRAULIC SEALANT (569) being sure not to over tighten.
4. Insert the above assembly into the Box end of the Instrument Non Magnetic Rod and locate the Anti-vibration Mount's legs fully into the corresponding location notches thus allowing the insertion of an Anti-vibration Mount Spring Clip using the supplied Circlip Pliers



(Figure 33).



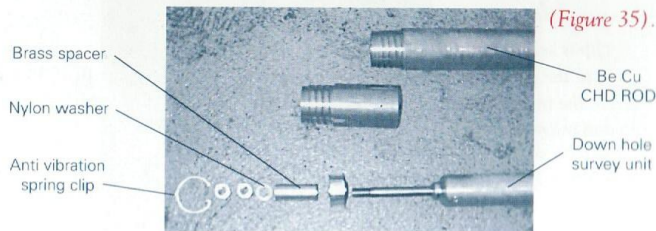
(Figure 34).

Ensure the spring clip is seated fully in the groove in the instrument non magnetic rod.

- Assemble the empty Anti-vibration Sub Pin end onto the Box end of the Instrument Non Magnetic Rod while carefully sliding the Anti-vibration Connector Sub Main Body down the inside of the sub and locate the Anti-vibration Connector Sub Main Body's legs fully into the corresponding location notches.

THE PIN/BOX THREAD CAN BE LOCTITED AND TIGHTENED AS REQUIRED PROVIDING THE ANTI-VIBRATION CABLE ASSEMBLY IS NOT LISTED MORE THAN A QUARTER OF A TURN.

- Assemble the Clamping Ring and install the three M6 Cap Screws using LOCTITE SUPER STUD LOCK (262) and being sure not to over tighten the screws.
- Assemble one Anti-vibration Mount as shown on the Downhole end of the instrument and assemble the brass spacer and nylon washer then secure using the brass M1 6 nut and lock nut as shown using LOCTITE SUPER STUD LOCK (262) and being sure not to over tighten the nuts.



- Insert an Anti-vibration Mount Spring Clip into the Downhole end of the Instrument Non Magnetic Rod using the supplied Circlip Pliers.

ENSURE THE SPRING CLIP IS SEATED FULLY IN THE GROOVE IN THE INSTRUMENT NON MAGNETIC ROD.

This concludes the assembly procedure and note that dis-assembly is the reverse of the above procedure.

Downhole Unit Battery pack information



WARNING

Removal of Downhole battery pack for replacement can only be done in a non hazardous clean environment

The new Downhole battery packs are not rechargeable.

Do not attempt to recharge the Downhole battery pack. The batteries used are non-rechargeable Lithium cells and will explode when connected to the battery charger.

Do not short circuit the Downhole battery terminals, because uncontrolled discharge will result in the battery pack being damaged.

The new Downhole battery pack can be used, once installed in the Downhole instrument tube, for a minimum of 1 month, with a shelf life of 5 years.



Always observe the Downhole battery voltage indication on the Uphole monitor box. To obtain the Downhole battery voltage, press F2 to display the survey data and read the value under the *Bt, Battery, column*.

When this value is less than 13.0 it is time to replace the battery. The borehole sensors will become inaccurate at battery values of less than 13.0. The Downhole battery voltage as shown on the display is measured under load. The open circuit voltage is approximately 18V DC.

The MECCA 2 system comes supplied with 2 Downhole battery packs.

Please ensure you order the battery packs well in advance as there could be a lead time of several weeks. It is recommended to have 2 to 3 spare Downhole battery packs.

**REMEMBER**

Always return the used, discharged, Downhole battery packs to:

AMT Pty. Ltd
Meadows Estate, 18 Lucca Road,
North Wyong, NSW 2259
P.O. Box 376
Wyong, NSW 2259

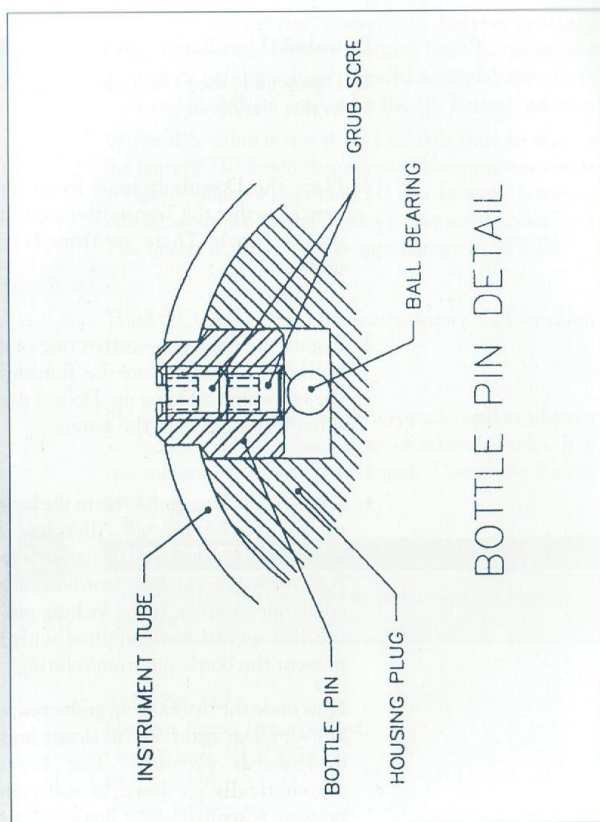
AMT Pty. Ltd. will ensure that the batteries are disposed of in a responsible- and environmentally safe method.

**Downhole Unit Battery pack replacement**

1. Disassemble the Downhole instrument as described in this Handbook.
2. Place the Downhole brass instrument pipe on a bench, so that the Transmitter section is not resting on the bench. There are three bottle pins to be undone.
3. Rotate the brass pipe so that one of the locking or bottle pins, which secure the Transmitter section to the brass pipe is facing up. Do not touch any of the other locking pins in the system.
4. Undo the locking grub screw in the locking pin facing up, using a 2.5mm A/F Allen key. Always apply downward pressure on the grub screw. Sometimes both the locking and the first/bottom grub screw will come out together. If the locking pin itself rotates, use the special tool supplied with the DDM to prevent the bottle pin from rotating.

Now undo the first/bottom grub screw with the Allen key supplied, again do this slowly and always apply downwards pressure. The bottle pin will automatically go down, if sufficient downward pressure is applied whilst unscrewing the grub screw and the stainless steel ball will be inside the bottle pin.

** See Figure 36 Overleaf*



(Figure 36).



5. Once the bottle pin is down and the grub screws are out of one bottle pin, turn the instrument so that the bottle pin now faces the floor.

Hold your hand below the bottle pin when doing this and if required gently bump/jiggle the instrument so that the ball bearing will come out.



REMEMBER

Remember that the locking pin is a fail safe design and therefore patience is required when removing the grub screws and stainless steel balls. The ball might not come out the first time, but it must be removed before trying to push the bottle pin in.

If the ball bearing is captured under the bottle pin, one must first pull the bottle pin up and away from the ball bearing, an MS bolt has been provided to assist with this.

The ball bearing is now free to move and with some jiggling the ball should come out. Sometimes a thin bit of metal, eg paper clip, with a small hook at the end can be inserted through the centre of the bottle pin to move the ball bearing or to loosen it.

6. Repeat item 3,4 and 5 until all 3 sets of grub screws and balls have been removed.