

DML2000 MAGNETIC LOCATOR

TROUBLESHOOTING & CALIBRATION GUIDE

To access the instrument PC Board; remove the four adhesive backed rubber bumpers, remove the screws underneath, and then lift off the electronics cover.

Unit is dead, there is no Audio Output:

Check that the batteries are installed properly and the battery voltage is above 5.0 V dc. Check that the Power Switch is in the ON position and that all cables are properly connected. Examine the ribbon cable connections to the speaker and battery box. If the connections appear to be intact and direct substitution of another battery box does not cure the problem, then try substituting a new Control Panel for the existing Control Panel.

Some of our older units had a toggle power switch, if your unit has a toggle power switch it has probably failed. To check the switch, short across the back two pins; if the unit then begins to operate normally, you can either replace the toggle switch or return the unit to Dunham & Morrow where they will perform a power switch upgrade.

If a toggle switch is not the problem, then the problem is most likely a cracked Q5, reference Figure 1. In older units, Q5 can be damaged by repeated dropping of the unit. Note: in newer units, the metal control panel has been changed from aluminum to stainless steel and that eliminated any further problems from a broken Q5 transistor.

If after all of these tests, the problem still persists then it is time to contact Warren.

Instrument Screams:

Connect a DC voltmeter between ground and the PC board signal locations listed below. By doing this, you can measure the signal channel output voltage and determine if any of them are in saturation. Saturation means that the signal channel output will be above or near +/- 4.0 V dc and can switch polarity at random. In a working signal channel, the output will not exceed 3.5 V dc and the output voltage will vary linearly as the sensor is moved around in the Earth's magnetic field.

1. Zt signal channel output - pin 14 of U200 and R201.
2. Zb signal channel output – pin 1 of U200 and R301.
3. X signal channel output – pin 14 of U500 and R501.
4. Y signal channel output – pin 1 of U500 and R601.

Refer to Figure #1 for the location of the test points listed above.

If a signal channel is in saturation, a broken wire in the sensor assembly is the most likely cause. We redesigned the sensor wiring assembly several years ago to preclude any further reoccurrence of this type of problem, but occasionally we still get an older unit with a broken wire.

To fix a broken wire in the sensor assembly follow these procedures:

1. Cut off the rubber crutch tip.
2. Take an X-acto knife and carefully run it around the inside of the sensor tube so that it separates the clear rubber binding the internal sensor assembly to the outside tube.
3. Turn the unit over and remove the electronics' PC board.
4. Push down on the sensor connector from the inside and the sensors should slip out of the tube. If they resist, repeat step 2 above until the sensor assembly slides out freely.
5. Look for a broken wire in the middle of the sensor assembly, where the top sensor is soldered to the sensor PC board.
6. Repair the wire break, and reassemble the sensors inside the sensor tube.

It case you did not take note of the connector position when removing the sensor assembly, the sensor connector goes down as you face the unit (it is on the underside of the sensor PC board). Push the sensor assembly back into position, and then hold it in the tube as you reattach the Electronics' PC board to the other end. Seal the sensors with Silastic or Room Temperature Vulcanizer (RTV) and then glue a replacement crutch tip onto the end of the sensor tube.

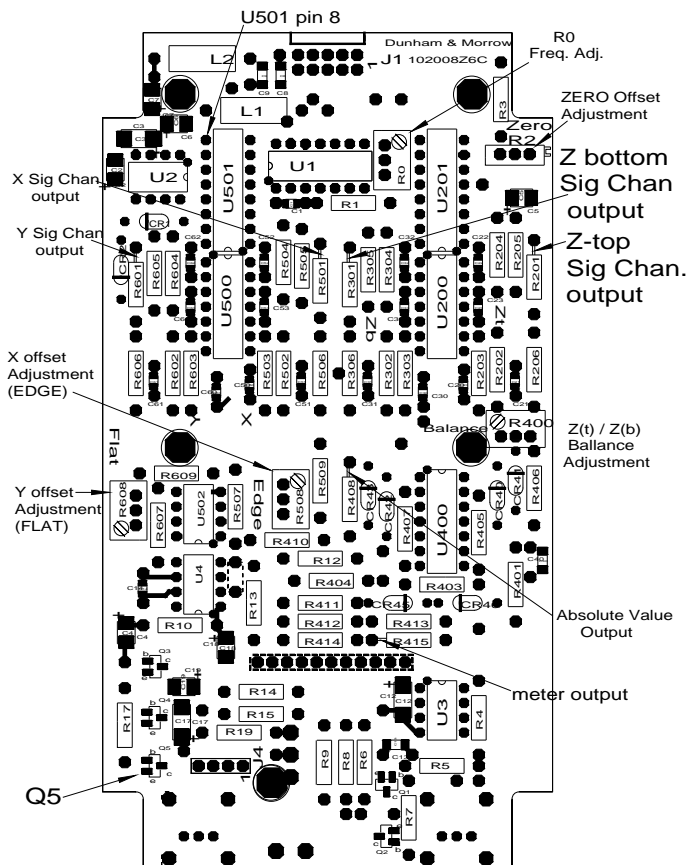


Figure 1, DML2000 PC Board layout

If none of the signal channels are in saturation, the only other likely cause for the unit to be screaming is failure of capacitor C14. Push down on C14 with an insulated tool or the eraser end of a #2 pencil. If the screaming stops, replace C14. In newer units, C14 has been changed from a surface mounted capacitor to a leaded capacitor and that has alleviated any further problems of this type.

The Unit Occasionally Goes into Saturation at Turn-On:

My suggestion for this type of problem is to replace the PC Board with a new PC board and recalibrate the unit. Then return the old PC board to Dunham & Morrow for replacement.

What is happening is rather complex and hard to diagnose, so that is why I recommend this approach. The PC board replacement works for all of our older locators, no matter when they were produced. Moreover, it is the procedure we are following in-house.

Other Types of Problems:

If you are experiencing any other type of problem start looking for obvious signs of mistreatment or neglect, such as:

- Corrosion on the battery terminals; causes higher circuit resistance and can impede operation.
- Oxidation on the PC board circuitry; caused by exposure to salt water or by exposure to battery acid corrosion can also cause cessation of operation or improper operation.
- Severely Dented Sensor tubes; can cause poor operation from sensor misalignment or screaming if one or more of the sensors has been crushed or the circuitry cut.
- Customer installed crutch tips with steel washers inside have also been observed.

Always remember that the ultimate responsibility for any repair is Dunham & Morrow, Inc. and you can send the unit back to us for repair at anytime.

In addition, you can always call or email Warren Dunham; Warren@magneticlocator.com for assistance with any problem.

SENSOR ALIGNMENT



Figure 2, Alignment Fixture

If you have replaced the sensors or the instrument PC board, then you will need to realign the sensors, and to do that you will need a fixture similar to the one shown above. This fixture holds the DML2000 in a horizontal position so that it can be rotated easily about its' longitudinal axis. For best results, orient the fixture along the Earth's East-West axis. This puts the sensor assembly perpendicular to the Earth's magnetic Field. Set the instrument sensitivity on the #3 position and clip the positive DC voltmeter lead to R112 as shown in Figure #1.

1. With the instrument in the "FLAT" position adjust R608 the FLAT potentiometer until the instrument idles at the same frequency in this position facing you and when rotated 180° facing away from you.
2. Turn the unit on EDGE, and adjust R508 the EDGE potentiometer until the instrument idles at the same frequency in this position and when rotated 180°.
3. Repeat steps 1 & 2, until the unit idles at about the SAME frequency as it is continually rotated through a full 360°.

Don't expect the unit to idle anywhere near 20 hertz in the alignment fixture, local magnetic fields will interfere and prevent this from happening.

DML2000 Calibration:

CALIBRATING THE DML2000 IS EASY IF YOU FOLLOW THESE STEPS;

1. You must have the unit powered and the speaker functional while providing access to two potentiometers; R2 the **(ZERO)** pot and R400 the **(BALANCE)** pot. You can do this by taping the control panel in position and taping the battery box to the back of the electronics, thus leaving the instrument PC Board accessible.
2. You need a **MAGNETICALLY CLEAN AREA**. This normally means going outside and getting away from any buildings, automobiles, underground sewer systems, etc.
3. You need to **MAKE YOURSELF MAGNETICALLY CLEAN**. Remove all wristwatches, costume jewelry, pocketknives, belt buckles, etc.
4. Set the Sensitivity Control SW801 to maximum. Hold the unit vertically and adjust R400 the **BALANCE** pot to cut the output frequency in half. Then switch to R2 the **ZERO** pot and adjust it until the unit idles. Then hold the unit upside down and repeat the process. Repeat these two steps as necessary until the unit idles at about the same low frequency in both positions.

The tuning is optimized when the unit idles at the same low frequency pointing vertically up or down.



Figure 3, Calibration position 1



Figure 4, Calibration position 2