Compass Dip needle calibration notes: A good dip needle can be used to a degree to indicate resulting latitude after the coming pole shift. It can also aid in finding of minerals and/or migration movement towards warmer environments.

1) How does one calibrate a dip needle in a primitive environment? Whether home made or store bought, or used they most probably will need some calibration.
2) How does one properly use a dip needle?
3) How does one tell if one is working properly?

We will answer number 2 and 3 first:

If held flat so the pivot is pointing up then it should act like a normal compass. Determine the north pointing needle. It should not very much in direction it is pointing as the case is move 360 degree around the north pointing needle. If it does then the case has some residual magnetism that will need to be handled.

If held so the dip in the needle can be measured. In the northern hemisphere the north will dip below the horizon according to amount of latitude one is positioned away from the equator. At the equator zero degrees would be typically measured. Providing the are no local anomalies that would make it point another direction. At the north pole 90 degree or pointing straight down would be measured. This is the magnetic pole and not the earth's rotational axis. But it will be somewhat close by.

Now if the dip needle is turned looking down from the top to an east-west direction there should be a point where the needle points straight down. If the perpendicular to this direction should be north-south direction. If it never goes vertical or gives a wildly different vertical when the measurements are made 180 rotated from each another looking down. Then there is residual magnetism in the case that is interfering with the reading.

Residual magnetism will be present in the case when different reading are encountered when measuring dip angle when the case is flipped 180 degrees. Residual magnetism will get into the case just by bringing a strong magnet close to the case. This can be so strong as the unit will not operate as a dip needle at all.

When the above measurements can be taken for both dip from the tangent to earth's surface and the deflection along the horizontal from some object in the distance. And both measurements can be made for when the device is flipped 180 degree, then the average of the readings will be close to the final result and should be used. Calibration will be needed when the reciprocity (flipping the unit) readings are wildly different from each other.

Now how to calibrate a unit:

First handle the residual magnetism in the case: (Three separate ways to do this. Pick the one that you can do with what you have at hand. Number order below indicates which is preferred and works best.)

1) take the needle out by backing off the adjustment screws. Wind or find an air core coil of wire. The more turns the better. Hook this up to AC 60 cycle through a light bulb (in series with it) chosen for it's size so that the coil doesn't heat ups. The frame or case is passed slowly over and around this electromagnets. That alternating field will magatize what ever it get close to and as it moves away and changes direction at 60 times per sec it will leave the case demagitized. While you have the needle out stroke the north end end along a srong magnet. The north will attract to the end it needs to be stroked with. Sroke the south end of the needle with the other pole of this magnet. Then put the needle back into the case. Don't over tighten the pivots.

2) Pass a strong bar magnet around the case moving away in gradients. Let the needle track this. Cardboard or paper or other non-magnetic shims can be used to force the spacing to be uniform as one moves away form all sides. The idea is the will result a balanced residual filed in the case in all directions. A Long bar magnet can be made of a lot of smaller button neodymium wafer magnets.

3) Attempt to balance the magnetism in the sides of the case by bringing a strong magnet close to the left and/or right side of the unit when doing the polar testing as shown below.

After demagnetizing as best you can then check the balance of the needle. If one side end is heaver than the other then it will not measure properly the dip angles. The way to do this is to cut a end (2 loops) of a fine spring off. This makes a small weight that can be slipped over the light end of the needle and spring loaded coil of wire with friction holds it in place.

Set up a long strong bar magnet that is perpendicular to the earth's magnetic north-south direction as shown above. This then is in an east-west direction and the earth's north-south field then has no influence. The angle can be measured on the dip needle and then the east-west bar magnet can be flipped over. The spring weight can be slid back and forth on the needle to minimize the resulting difference between the angle readings. The needle will be balanced when there is the same angle reading after the 180 degree flip of the needle. The spacing between the bar magnet can be adjusted to be not two close but not too far. This allows the weight of one end of the needle to cause a angle reading. It is important to have the pivot point exactly centered on the bar magnet and the pivot axis parallel to the bar magnet as shown above.

Once the balance is achieved then rotate the bar magnet to be parallel to the axis of rotation to the dip needle.

 Orientation from above is shown:

If you find that the angel is different when north is pointing toward the dip needle than when south is pointing toward it as shown above then --- this means that there is residual magnetism in the frame. In this case the aluminum, screws etc that support the needle were magnetic and retained magnetism if one brought a strong magnet near them. The goal you want to see at this stage is to see the needle vertical no matter which pole of the bar magnet is placed near it. At this point one would be wise to go back to the degaussing stage as described above. From my experience the residual magnetism in the frame is the most common and sometimes can not be totally gotten rid of. So average readings of the unit in it's two 180 degree positions be comes the final answer to getting usable readings.