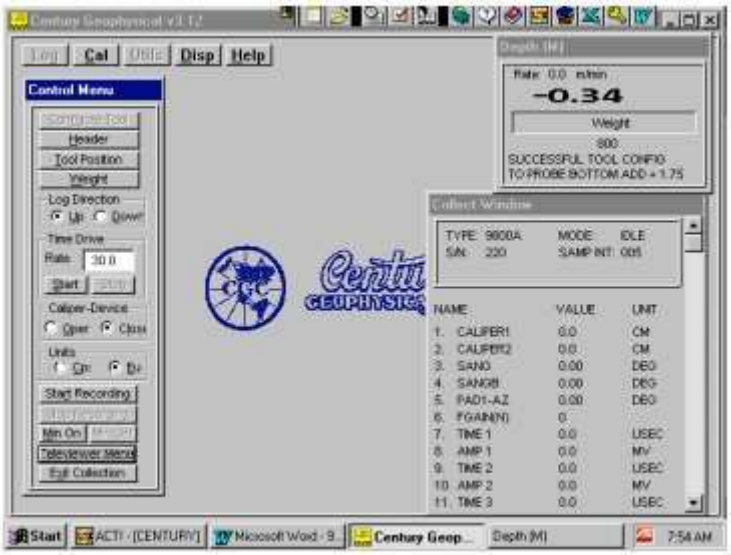
Detailed Logging Instructions

1. Connect tool to cablehead, turn on tool power, and enter **log**.



1. No configuration question.
2. Create header, remember to check the magnetic declination, as this adjusts the image to magnetic north.
3. Set tool position. The probe will only update while logging or in time drive mode, because the probe is depth based.
4. **Televiewer Menu** option appears after tool position is set (see below).

1. Choose .02 depth increment. (.005 for metric)
2. Set Gain to x2.
3. Gain Mode to Manual.
4. Set Borehole Diameter to Proper Hole Size
5. Click on Download. Successful Download message should display in the depth/rate window.
6. Proceed to bottom of borehole and select, Start recording
7. Maximum logging speed is 5.0 feet per min (1.3 m per min metric) .

Televiewer Logging Speed

English Units		
Sample Interval (feet)	**Maximum (Fpm)**	**Minimum (FPM)**
0.02	5	2
0.10	25	10
0.20	35	20

Metric Units		
Sample Interval (Meters)	**Maximum (M/Min)**	**Minimum (M/Min)**
0.005	1.3	0.5
0.02	5	2
0.1	18	10

Primary Calibration of the 9800 Tool

Calibration of the tool is required for the deviation data and caliper calculations.

Prior to use, the operator must obtain the DEV file for the deviation package, or perform a deviation calibration using the deviation test stand. Only after obtaining the DEV file, will the televiewer image be properly oriented to magnetic north.

The caliper response is recorded in a know hole size and cps response. These values must be entered in the tool calibration file. Normally the tool is calibrated in Inches from the factory, if using metric depth units, this standard must be converted to Centimeters (multiply times 2.54). An example calibration would be a standard of 4 inches = 117 CPS, and 6 inches = 185 CPS.

The caliper calibration is different on the 9800 than all other Century tools. This is because the tool only sends data when the tool is moving therefore to get the cps for the calipers a time drive in cps must be recorded in a calibration fixture of known diameter. The cps are then taken off the time drive log. The log should be run for approximately 10ft and the numbers for time1, time2, time3 and time4 averaged over 1ft in the center of the log. Times 1 and 3 are then added and represent the cps for caliper1. Times 2 and 4 are added together to represent the cps for caliper2. Additionally, the tool must be very well centralized in this calibration fixture, and will be indicated when all travel times are nearly the same.

Accuracy of the caliper measurements are based on the travel time signature, borehole size, mud weight, calibration accuracy, and centralization of the tool. With excellent hole conditions and a well centralized tool the caliper measurements on the 9800 televiewer are accurate to 2.5 mm (0.10 inches).

Default Calibrations

No default calibrations exist for the televiewer tool.

Notes On Logging The 9800 Tool

Successful operation of the televiewer is dependant on the following three factors namely: tool centralization, logging speed, and formation/borehole conditions.

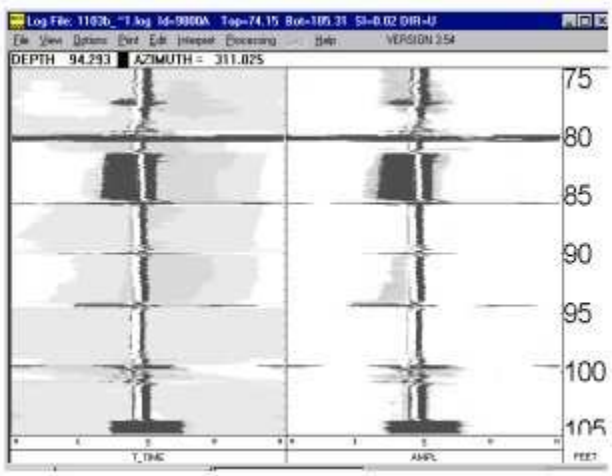
One of the most critical items of the televiewer is the centralization of the tool in the borehole. The steel centralizers are designed for hole sizes of 4 to 9 inches. You must adjust the size of the centralizer to keep the tool in the middle of the hole with as little variation as possible. In holes smaller than 4 inches, a plastic or rubber centralizer must be used to allow the tool to proceed down the borehole, but still remaining centralized. You can tell how well the tool is centralized by looking at the travel time trace data, is the line is fairly straight, the tool is centralized correctly, if the line appears as a sine wave, the tool is not well centralized (see image at end of document).

Logging speed is critical because if you exceed the recommended speeds, Missing Shots will start to appear, and you run the chance of "\Locking Up the Computer". If this happens, you must stop recording, check your depth to see if it is correct, exit LOG, and Power Down the Computer. Then restart the computer and start logging again.

Lastly, based on formation characteristics and density, the sonic signal may not have enough strength to be received by the acoustic sensor. The more dense formations reflect the acoustic signal and, therefore, the log is better. In some cases, changing the gain setting to X4 or X8 in softer formations will improve the log response.

Tool Check Out Procedure

Prior to running the tool in any borehole, the tool should be checked on the surface. This will verify the tool is working properly. A good "test jig" can be made with a aluminum pipe. The 9800 tool response is tested by using a water filled "coffee can" sized bucket and performing a time drive of the sensor response. By placing a pencil or bar around the sensor, the sensor and orientation of the response is checked, **see example**.



As with any deviation device, the test jig must be located away from any metallic objects and overhead power lines. The distance must be at a minimum of 30 feet. The jig should be oriented with the larger distance on the base in the N-S direction. Use the compass to make this orientation.

Once you have done this, a heavy object must be place on the stand to keep it from falling over, (or if not available, the operator must hold the tool in the stand at all times). Set up the tool in the logging menu to perform a time drive. You must enter 0 for magnetic declination in the header, as the compass reads magnetic north. For download parameters, you can use 0.1 foot sample intervals, 4 inch hole diameter, and gain x2. The logging rate should be 10 feet per minute.

Place the tool in the stand after you start recording and the time drive. You should orient pad1 Azimuth to the large marker on the south side of the stand. Once the tool has moved approximately 30 feet, slowly rotate the tool 1 revolution in the stand, (you may need to slightly lift the tool off bottom to do this). After the rotation, continue the time drive another 20 feet.

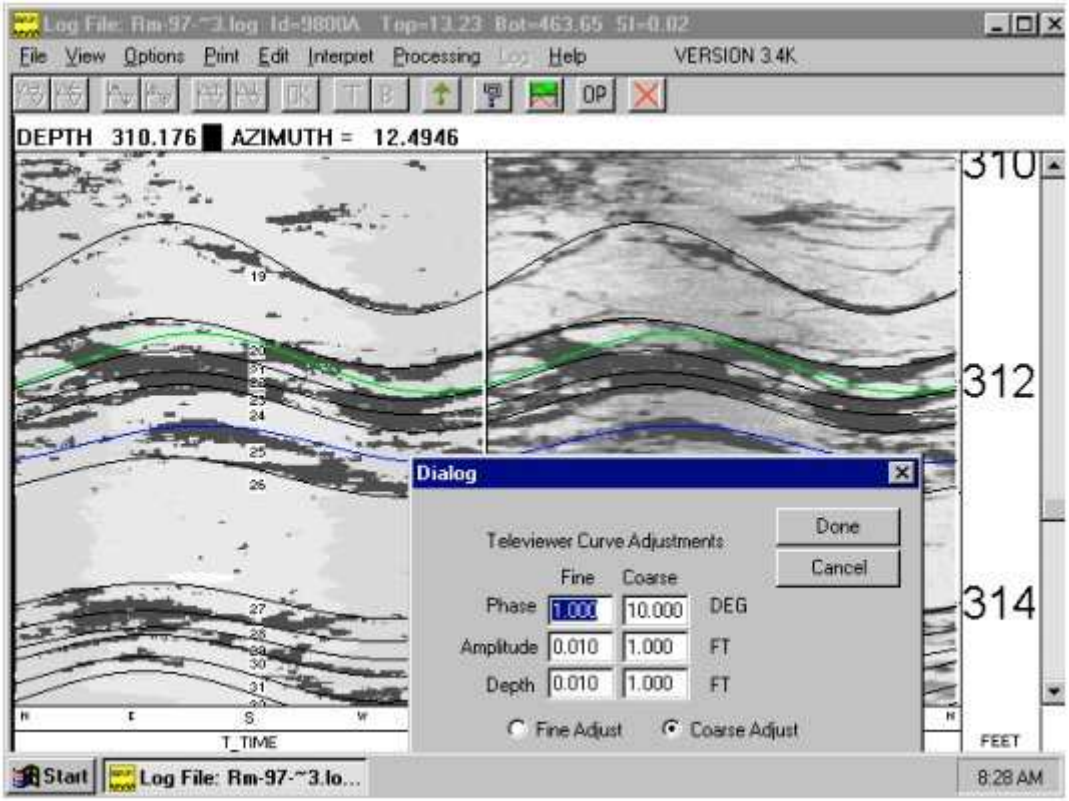
Data Printing:

The attached example log shows the print-out of the data. The calipers should be within 0.25 inches of

the 4 inch diameter. The deviation should show the PAD1-AZ to the south and then rotating back to south. The T Time is printed to also show the proper orientation to the south. Accuracy of the deviation data is based on proper orientation of the stand and the tool, therefore real accuracy can probably only be within 20 degrees of expected values.

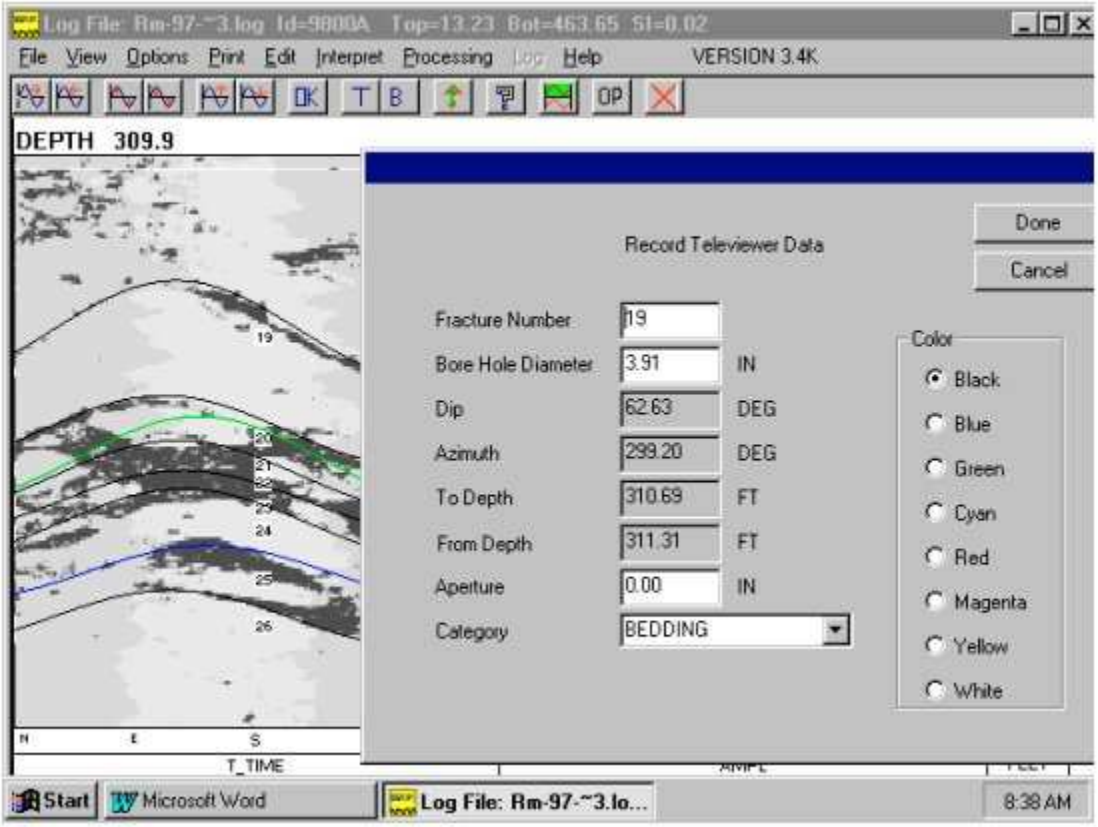
CALCULATION OF TELEVIEWER DIP AND DIRECTION

Post processing of the televiewer images is done via the Century Log Display program. A sine wave is placed over the televiewer image, best depicting the fracture or bedding feature.



The user clicks on the televiewer-processing menu in Century Log Display. A cross sign **(+)** is displayed and moved on the screen to indicate the top and bottom of the televiewer sine wave. Once the sine wave is drawn, it can be moved with the televiewer dia-log boxes at the top of screen to make better fit. Coarse and fine adjustment features are available and can be changed based on operator preference.

After clicking the OK button, the **Record Televiewer Data box** is displayed. Fracture Number, Borehole Diameter, Dip, Azimuth, To Depth, From Depth, Aperture, Category, and fracture Color Selection are computed and displayed. If the user does not like the televiewer feature, by clicking the right mouse button on the sine wave, you may delete, modify, or edit feature.

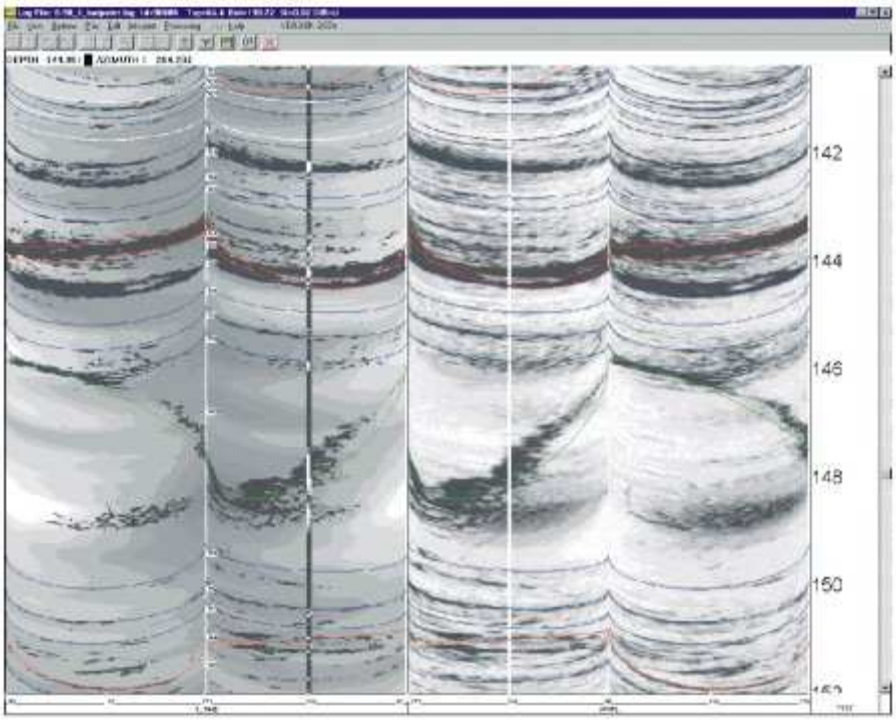


Dip Angle.

Calculation is done via the computer system using the offset of the sine wave and borehole size for the Dip Calculation. If the calculated hole size is not within +/- 10% of the header hole size, an alert flag is raised indicating the change to the header hole size.

H = Height of Offset from Televiewer Data.
D = Diameter of Borehole.
Dip = Arc Tan (H/D)

In the example below, the height of the televiewer sine wave = 0.62 feet.



The borehole diameter = 3.91 inches (0.325 feet), therefore the calculated dip angle would be: 62 degrees.

Dip Direction.

The Dip Direction is simply the low side of the sine wave. As the tool also records tool slant angle and bearing, the analysis software automatically corrects for hole deviation. In the fracture below, the dip direction would be to the West, Northwest.

Televiewer Display and Printing

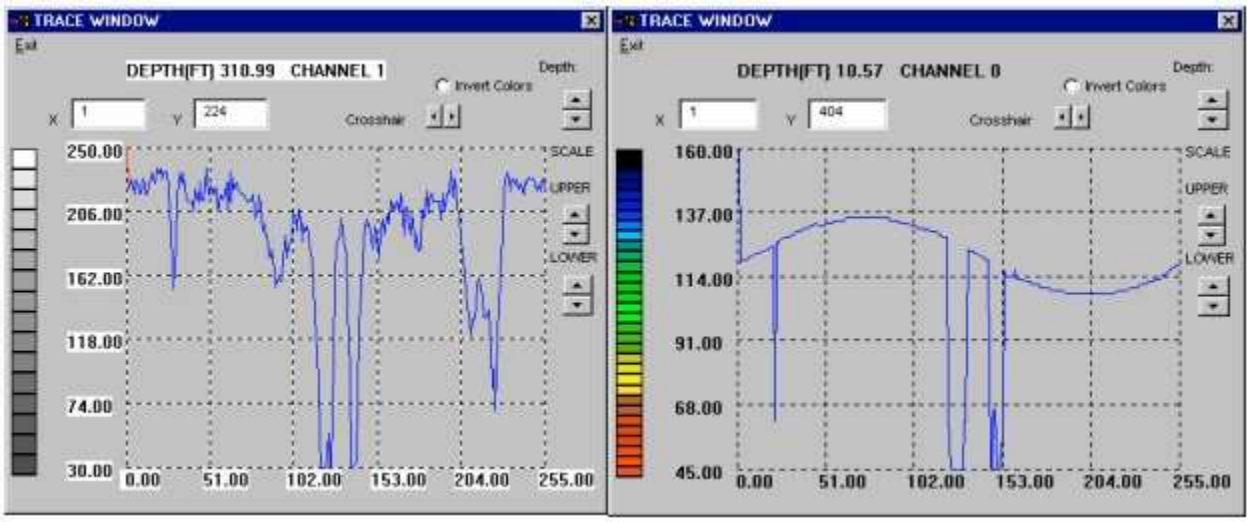
The acoustic televiewer images are printed using the Display program.

The televiewer image should be adjusted such that the visual representation of the televiewer images best depicts the fractures, features and borehole wall. Depth intervals on the screen should be kept to a few feet (3-5) or a meter at a time to maximize the vertical resolution. Data printouts should also be at smaller vertical scales than other logs (such as English ratio of 24, and Metric ratio of 20 or 25).

The 9800A application should be used for viewing the images while recording for data quality and fracture locations. Both travel time and amplitude are displayed in a magnetically oriented view. Usually the amplitude has better definition of the fractures and other features of the borehole wall. Clicking with the left-hand button on the image will show the Scale Selection Window. Normal operations as changing the palette color selection and decimation percent are done with this window.

With the televiewer image displayed on the screen, a click with the right hand button will display individual **Trace Windows** for Travel Time (Channel 0) and Amplitude (Channel 1). The trace windows have button adjustments to maximize the trace across the trace window screen. Fractures are indicated on the amplitude when the signal received is very low, while non-fractured intervals will have much higher and consistent amplitudes. The travel time trace data is good to quality control the data for

tool de-centralization indicated with a sine wave on the travel time data.

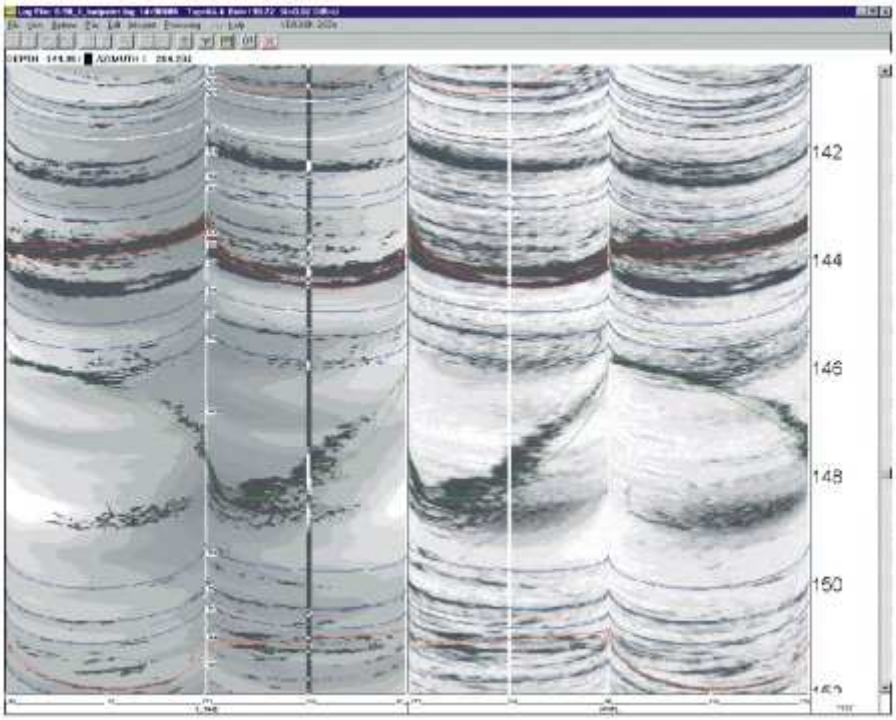


Televiewer 3D

Televiewer data may now be curled to resemble a three-dimensional well-core; Able to rotate and wrap-around though the full 360 degrees.

Instructions

left click in the televiewer data area , click "*3D*"



User may rotate the display through all 360 degrees.

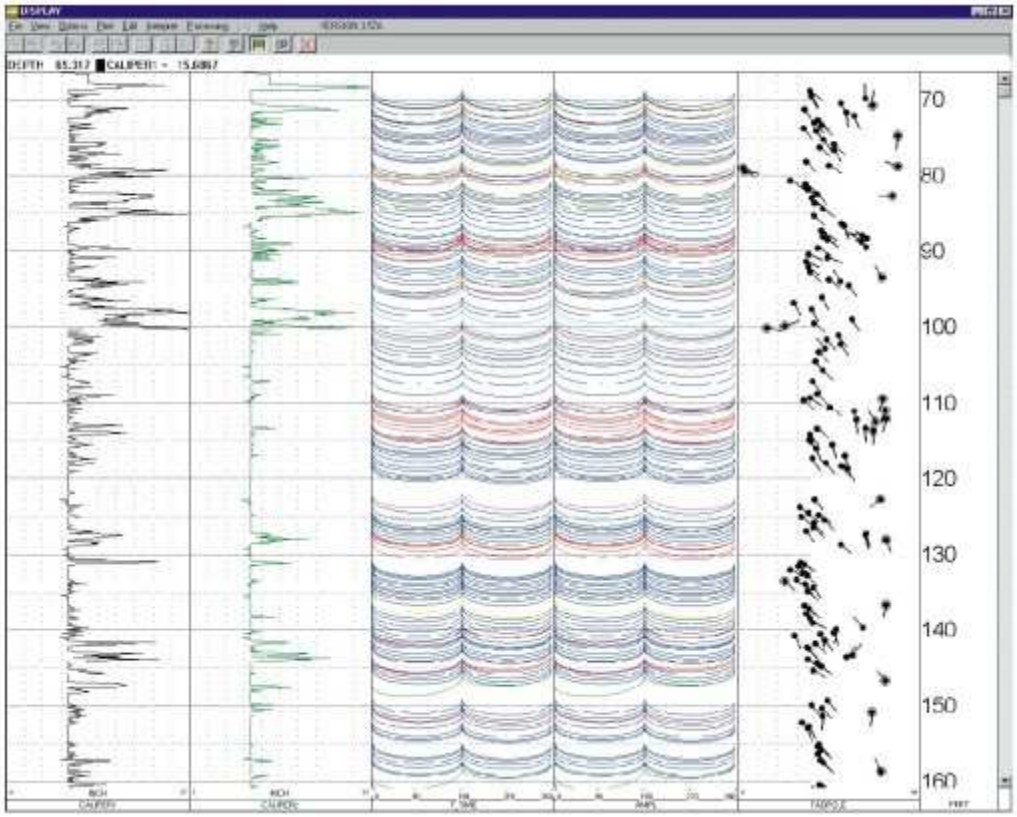
Enter -*90* and *270* to rotate the core -90 degrees.
Enter "*Done*"

The vertical stripe marks the new rotated position of true North.
Other suggested values you might try are:

0, 360	-90, 270	-180, 180	90, 450
0, 180	-90, 90	90, 270	270, 450
0, 90			

(Complete this setup **before** adding "*Interpret" "Televiewer*")

Tadpoles from Televiewer "*Processing", "Add Tadpole*" can now generate tadpoles from televiewer.



Instructions

The dialog screen is used only to set a correlation value of 50 or 100 for each tadpole.
(Tadpoles given a correlation value of 100 will have a circled/bulls-eye appearance on the trace.)

Option 1

Pick/edit the Structural Dip and the +/- deviation degrees.
Tadpoles which fall within the normal range will get a correlation value of 50.
Tadpoles which fall outside the tolerance deviation will get a correlation value of 100.

Option 2

Automatically uses the from_depth and to_depth to try to pick out the biggest sinusoidals and to give them a correlation value of 100. All other tadpoles will have a correlation value of 50 and will appear as normal black tadpoles.

Option 3

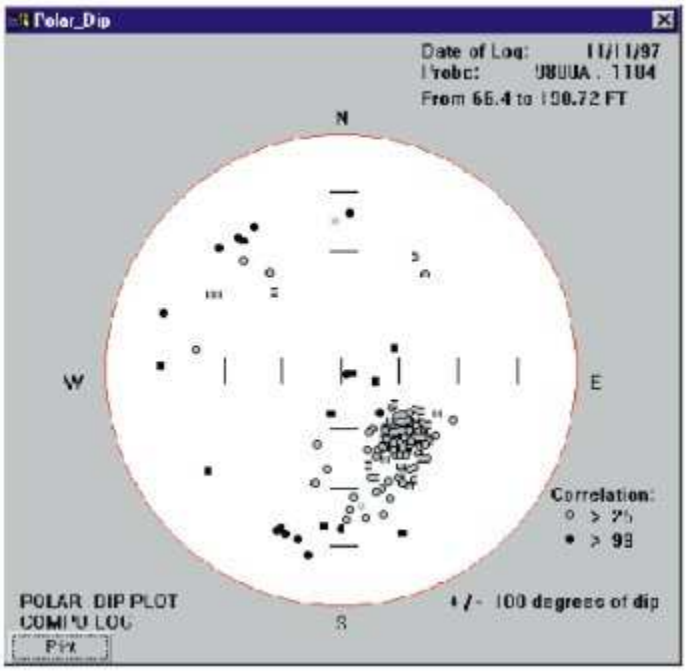
All tadpoles are created equal , with a correlation value of 50.

T_TIME and AMPL wrapped display

Users may also ***rotate*** the standard televiewer presentation through a circular 360 degrees. See the rotation described earlier.

Polar Dip Plot

"Interpret" , "Polar_Dip plot" Plots all the tadpoles over a user specified depth interval, sorting the tadpoles by azimuth and dip.



Save to multiple floppies

"*File" ,"Save*" can now save a large file to multiple floppies

Phone: 918-838-9811
Fax: 918-838-1532

Century
Geophysical Corp.
1223 S. 71st E. Ave
Tulsa Oklahoma, 74112

sales@century-geo.com
www.century-geo.com