

CSS Radial Bond Service Services

Computer Sonics produces two types of radial bond tool. One (the earlier model, though still produced) is known as the sequential tool. This tool has four modes of operation:

- 3 ft.- 5 ft. mode for generating the conventional dual spaced CBL
- radial mode for generating the eight receiver radial bond log (RBL)
- calibration mode for generating the internal calibration signal
- open hole mode

The tool is switched from mode to mode and to acquire data for a complete log two passes must be made over the log interval, one in CBL mode and one in RBL.

The later tool model generates all the required signals simultaneously and is known as the multiplexed tool.

Both tools transmit nuclear, collar, and temperature log data in a digital form interleaved with analog sonic data. The telemetry scheme employed is not the same for the two tools, however in both cases it is detected and decoded in the Warrior system by DSP software through selection of the appropriate script command.

The sequential tool transmits acoustic signals on the wireline at their natural frequency (approximately 20 – 25 kHz). The multiplexed tool divides the downhole frequency by a factor of four before transmission to the surface, therefore the frequency of the tool signals on the line is approximately 6 kHz. Special provision must be made for this feature in the logging system in the form of a special filter / amplifier card that can be switched to accommodate conventional as well the CSS multiplexed tool.

In both tools CSS has provided an internal calibration signal which can be used for a well site calibration which does not rely on finding (assuming) free pipe in the well. For both tools the philosophy is the same, namely the tool is calibrated in a known environment (zero signal and a calibration pipe) and the internal calibrate signal evaluated. The calibrations for all the receivers and the value of the internal calibration signal are recorded by tool serial number. This procedure is termed the shop or master calibration. At the well site the receiver zero signals and internal calibration signal are re-evaluated and corrections made to reproduce the readings obtained during the shop calibration. In this way any changes in signal amplitudes due to electronic drift, differences in wireline and other factors may be minimized.

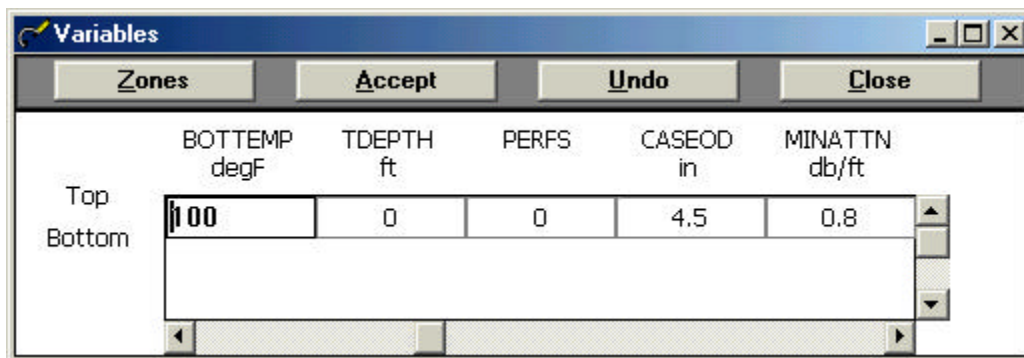
The 3 ft receiver signal curve is calibrated to industry standard values. The sector signals are normalized to a given log amplitude during the shop calibration for calibration pipe diameter. When logging casing of other diameters the sector amplitudes are adjusted to produce the same log deflection and cement map appearance.

Computer Sonics Radial Bond Tools on DSP 5000 Based Systems with CBL01-09 Bond Cards

1. The gains and filters for the CSS tools should be setup as follows:
From Warrior/Utilities/Edit Logging Service Details highlight the Service, and click on 'Edit Gains and Filters'.
For the CSSM 1 11/16" tool, use a Gain of 8 with a Hi Filter and Pulse on.
For the CSSM 3 1/8" tool, use a Gain of 2 or 4 with a Lo Filter and Pulse on.
2. After starting Acquisition, the first step when running a Bond Tool of any type on Warrior will be to set the proper casing size.. This will ensure that the gates will default to the correct saved settings. Casing size also effect the sector reading.
3. Click on the *Edit* menu box of the Warrior Logging System menu box and scroll down to and select *Variables*.

Variables

Displays the Variable (parameter) editor window, enabling depth dependent parameters associated with the selected service to be zoned and values to be set.



The screenshot shows a window titled "Variables" with a toolbar containing "Zones", "Accept", "Undo", and "Close" buttons. Below the toolbar is a table with columns for BOTTEMP (degF), TDEPTH (ft), PERFS, CASEOD (in), and MINATTN (db/ft). The table has two rows: "Top" and "Bottom". The "Top" row contains values: 100, 0, 0, 4.5, and 0.8. The "Bottom" row is currently empty.

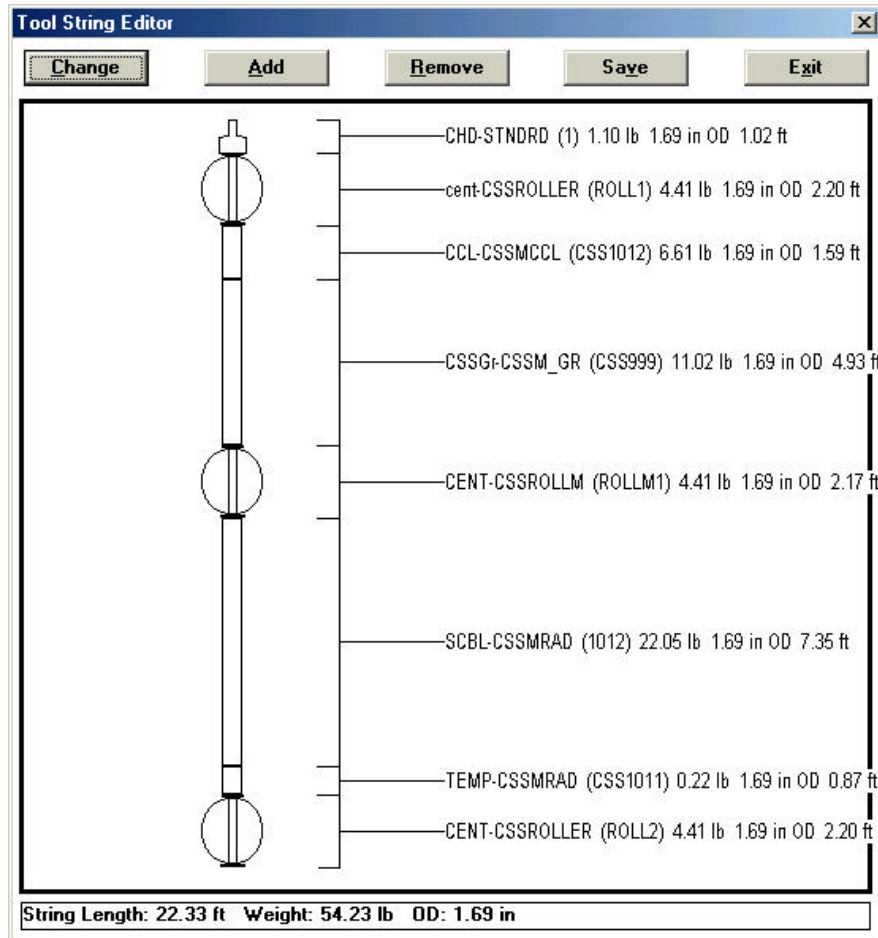
	BOTTEMP degF	TDEPTH ft	PERFS	CASEOD in	MINATTN db/ft
Top	100	0	0	4.5	0.8
Bottom					

4. Check the proper Casing OD under CASEOD. If you are outputting a Bond Index curve, enter the Minimum and Maximum Amplitudes. Enter any other variables that may be required. Then push the *Accept* button.

NOTE: The Minimum and Maximum Amplitude values are used for calculating the Bond Index Curve. Of these values the MINAMPL will have the greatest impact upon the calculations. The proper values are listed in Appendix A. Also, the MINATTN value is typical for most standard casings.

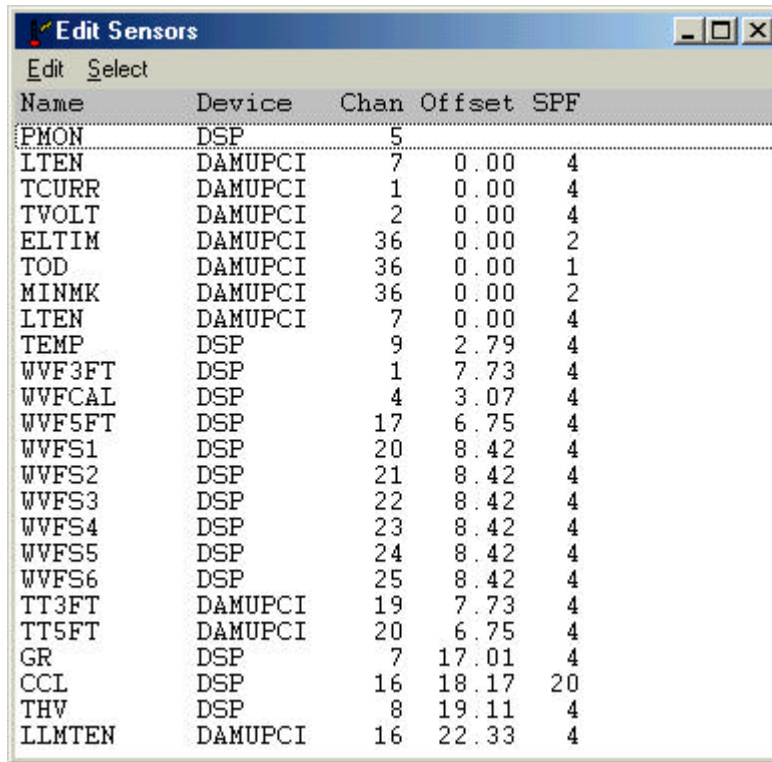
5. From the Warrior Logging System menu box, click on *Services* and select the proper service for the tool type. Tools have different telemetry schemes and the services must be set up to match the telemetry.

6. When the Service is selected the Edit Toolstring Window will come up automatically. Or, select *Edit* and *Tool String*, to display the following window:



From this window it is possible to change the tool being run, the order of the tools in the string, and add or delete centralizers, weight bars, knuckle joints or other tool string components. It is from the information set in this window that the calibrations, default offsets and filters settings for the log to be run are derived.

7. Depth offsets that were derived from the *Edit - Tool String* step may be viewed by choosing *Edit - Sensors*, to display the following window:



The screenshot shows a window titled "Edit Sensors" with a menu bar containing "Edit" and "Select". Below the menu bar is a table with the following columns: Name, Device, Chan, Offset, and SPF. The table contains the following data:

Name	Device	Chan	Offset	SPF
PMON	DSP	5		
LTEN	DAMUPCI	7	0.00	4
TCURR	DAMUPCI	1	0.00	4
TVOLT	DAMUPCI	2	0.00	4
ELTIM	DAMUPCI	36	0.00	2
TOD	DAMUPCI	36	0.00	1
MINMK	DAMUPCI	36	0.00	2
LTEN	DAMUPCI	7	0.00	4
TEMP	DSP	9	2.79	4
WVF3FT	DSP	1	7.73	4
WVFCAL	DSP	4	3.07	4
WVF5FT	DSP	17	6.75	4
WVFS1	DSP	20	8.42	4
WVFS2	DSP	21	8.42	4
WVFS3	DSP	22	8.42	4
WVFS4	DSP	23	8.42	4
WVFS5	DSP	24	8.42	4
WVFS6	DSP	25	8.42	4
TT3FT	DAMUPCI	19	7.73	4
TT5FT	DAMUPCI	20	6.75	4
GR	DSP	7	17.01	4
CCL	DSP	16	18.17	20
THV	DSP	8	19.11	4
LLMTEN	DAMUPCI	16	22.33	4

These offsets may be edited from this window, by double clicking on a sensor. The information in this window normally consists of the hardware source of the sensor (Device and Channel number), the depth offset of the sensor from tool zero reference, and the sampling rate.

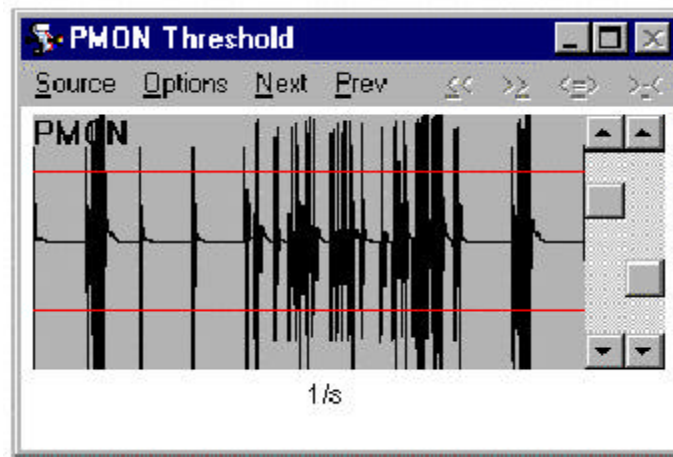
The information contained in Edit Sensors is defaulted to the current service and current tool string information. For example, sensor depth offsets are derived from the selected tool string and the information contained in the tools database. The default sample rates and device channel assignments are derived from the services file. *The default device and channel settings, and the default sample rates are contained in the services.ini file. The default depth offsets are derived from tool information contained in the tools.ini file.* Sensors can not be modified while in a record mode.

NOTE: It is important to know that no permanent changes are saved from this window. If you change anything in the Edit Tool String window and save them, any changes under Edit Sensors will be deleted when the service is closed. If you have to edit offsets in the Edit Sensor window the Tool.ini file should be modified.

9. Power up the tool string. (Nominally 125V at the STIP)

10. Adjusting the sync. Start by turning the Sync Pot all the way counterclockwise. Monitor the Waveform Window and slowly turn the Pot clockwise. On the Waveform Window you will see the 0/s changes to typically 3/s or 4/s on the 1 11/16" tool and 7/s or 8/s for the 3 1/8" tool. At this point the waveforms are synced. The PMON Window is used to adjust the telemetry thresholds. (This window will be hidden behind the Waveform window, and must be brought to the front.) On the PMON Window the left arrow adjusts the positive threshold and the right arrow the negative threshold.

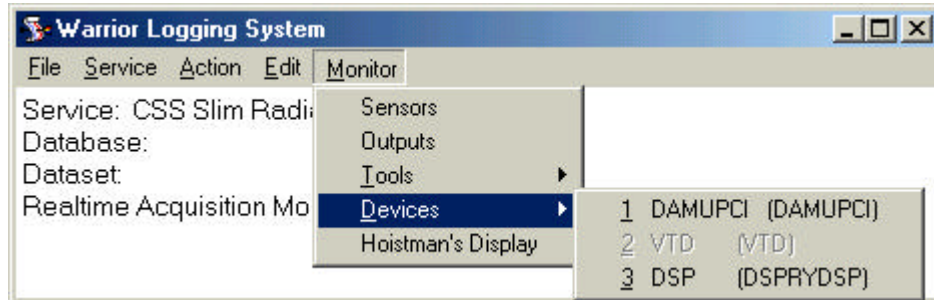
11. Adjusting CSS Telemetry sync. While looking at the PMON window, adjust the positive (+) and negative (-) thresholds to about 50%. Adjust the SYNC Control on the front of the Tool Interface Panel to adjust the height of the digital signal, until the pulses are just below saturation.



Note: The PMON discriminator values will be what is saved in the 'Source/Save Setup' for this service. *Options - View Axis Scaling* may be used to more accurately set these values. This window is digital. The screen will not update until waveform sync is established. Select *Source/Save Setup* to retain these values for your next log.

12. Verifying Telemetry Data:

From Warrior Acquisition Window -Select *Monitor/ Devices/ DSP*:



Values for a Warrior DSP 5000 System and a CSSM 1 11/16" Radial Bond Tool

Device: DSPRYDSP		
DSP-3	WVF3FTTHRS	-0.693 V
DSP-6	TEL1	130.000
DSP-7	TEL2	21.000
DSP-8	TEL3	115.000
DSP-9	TEL4	29.000
DSP-10	TEL5	-1.000
DSP-11	TEL6	-1.000
DSP-12	TEL7	-1.000
DSP-13	TEL8	32767.000
DSP-14	TEL9	0.000
DSP-15	TEL10	0.000
DSP-16	CCL1	130.000
DSP-19	WVF5FTTHRS	-0.703 V

DSP-3	WVF3FTTHRS	Voltage Setting For the 3' Travel Time Threshold
DSP-6	TEL1	CCL Telemetry Channel
DSP-7	TEL2	GR Telemetry Channel
DSP-8	TEL3	Cable Head Voltage Telemetry Channel
DSP-9	TEL4	Temperature Telemetry Channel
DSP-10	TEL5	Unused Telemetry Channel
DSP-11	TEL6	Unused Telemetry Channel
DSP-12	TEL7	Unused Telemetry Channel
DSP-13	TEL8	Unused Telemetry Channel
DSP-14	TEL9	Error Counts for Telemetry
DSP-15	TEL10	Last Encountered Error Code for Telemetry
DSP-16	CCL1	Named CCL Channel For CCL on TEL1
DSP-19	WVF5FTTHRS	Voltage Setting For the 5' Travel Time Threshold

The above values are very close to what the tool normally reads. Monitor TEL1-CCL, TEL3-Cable head voltage and TEL4-Temperature for stable readings. If necessary adjust the positive threshold in the PMON window up or down to stabilize the readings.

If the telemetry signals cannot be stabilized, go to Warrior/Utilities/Edit Logging Service Details, highlight selected services and click on Edit/Gains and Filters, turn Pulse filter on or off, save settings and restart service.

Values for a Warrior DSP 5000 System and a CSSM 3 1/8" Radial Bond Tool

DSP	Channel	Value
DSP-3	WVF3FTTHRS	-0.693 V
DSP-6	WVF5FTTHRS	-0.703 V
DSP-10	TEL1	0.000
DSP-11	TEL2	12.000
DSP-12	TEL3	0.000
DSP-13	TEL4	0.000
DSP-14	TEL5	7785.000
DSP-15	TEL6	12323.000
DSP-16	TEL7	12017.000
DSP-17	TEL8	2028.000
DSP-18	TEL9	-32768.000
DSP-19	TEL10	-32756.000
DSP-20	TEL11	0.000
DSP-21	TEL12	0.000
DSP-22	CCL1	7785.000

DSP-3	WVF3FTTHRS	Voltage Setting For the 3' Travel Time Threshold
DSP-6	WVF5FTTHRS	Voltage Setting For the 5' Travel Time Threshold
DSP-10	TEL1	Spare Counter Telemetry Channel
DSP-11	TEL2	GR Telemetry Channel
DSP-12	TEL3	Bottom Tool Negative Telemetry Channel
DSP-13	TEL4	Bottom Tool Positive Telemetry Channel
DSP-14	TEL5	CCL Telemetry Channel
DSP-15	TEL6	Waste Current Telemetry Channel
DSP-16	TEL7	Cable Head Voltage Telemetry Channel
DSP-17	TEL8	Temperature Telemetry Channel
DSP-18	TEL9	Spare Analog Telemetry Channel
DSP-19	TEL10	Spare Analog Telemetry Channel
DSP-20	TEL11	Error Counts for Telemetry
DSP-21	TEL12	Last Encountered Error Code for Telemetry
DSP-22	CCL1	Named CCL Channel For CCL on TEL5

The above values are very close to what the tool normally reads. Monitor TEL5-CCL, TEL7-Cable head voltage and TEL8-Temperature for stable readings. If necessary adjust the positive threshold in the PMON window up or down to stabilize the readings.

13. Monitoring Outputs.

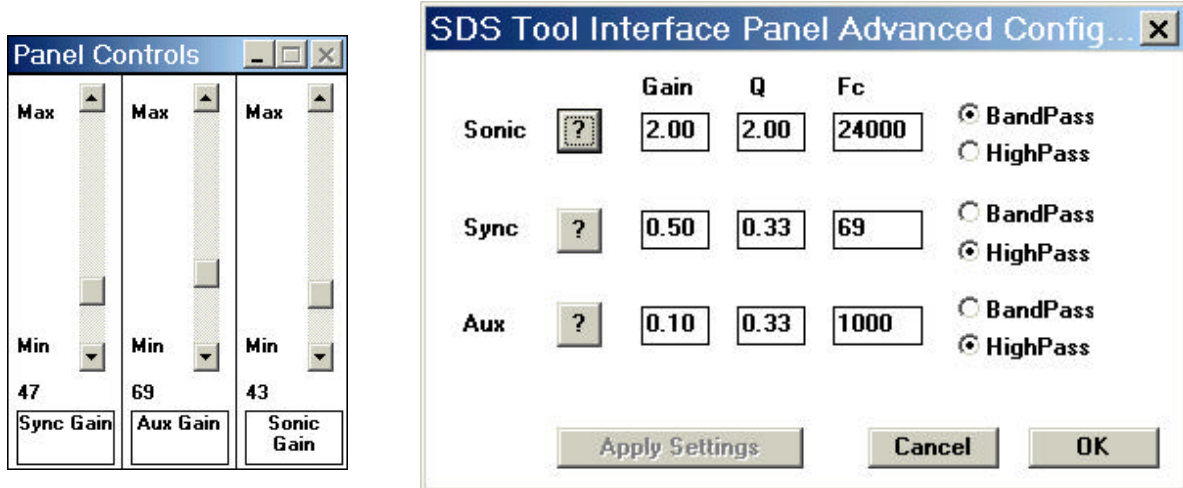
From Warrior Acquisition Window select *Monitor /Outputs*. An Outputs window will appear that allows you to monitor signals such as CCL, GR, and other sensors.

14. Continue to Shop Calibration Section.

Computer Sonics Radial Bond Tools on DSP 5000 Based Systems with CBLDR1 Bond Cards

1. The gains and filters for the CSS tools should be setup as follows:
From Acquisition Window Select 'Edit/Device Configuration/SDSTIP'

For the CSSM 1 11/16" tool, with Short to medium lines the following values should be entered in the SDSTIP Panel.



The Gains set the maximum gain for the Panel Control Slider bars and should be set to give a usable range for the slider bars depending on line length and tool signal.

The Sonic line is for the Sonic signal.

The Sync line is for the Sync signal.

The Aux line is for the Telemetry signal.

The FC is the frequency of the signal being detected. The Q is the sharpness of the filter, the higher the Q the sharper the cutoff frequency. Band Pass or High Pass is the type filter used.

The FC for the Sonic Line should be set for the frequency of the sonic receiver crystals, with a Band Pass Filter.

The FC for the Sync Line usually works best with a low Q and Low FC, with a High Pass Filter.

The FC for the Aux Line has been tested for short to medium lines and medium to long lines, and should be entered as shown.

For the CSSM 1 11/16” tool, with medium to long lines the following values should be entered in the SDSTIP Panel.

	Gain	Q	Fc	
Sonic	2.00	2.00	24000	<input checked="" type="radio"/> BandPass <input type="radio"/> HighPass
Sync	0.50	0.33	69	<input type="radio"/> BandPass <input checked="" type="radio"/> HighPass
Aux	0.25	0.80	10000	<input checked="" type="radio"/> BandPass <input type="radio"/> HighPass

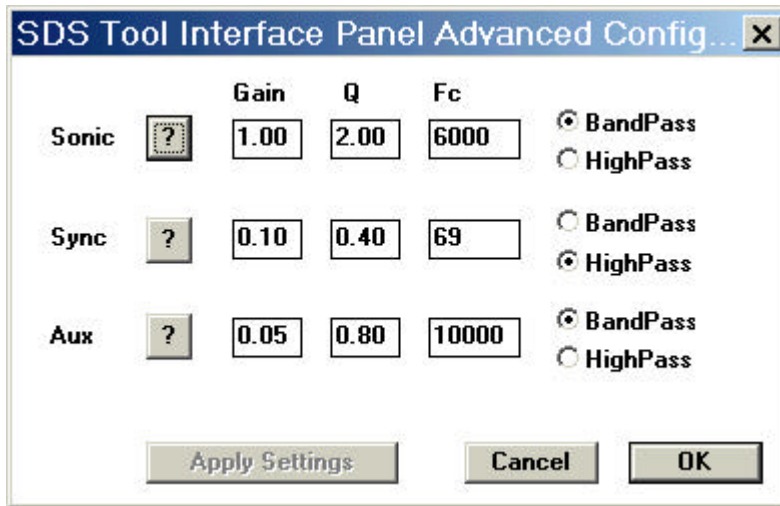
Buttons: Apply Settings, Cancel, OK

For the CSSM 3 1/8” tool, with short to medium lines the following values should be entered in the SDSTIP Panel.

	Gain	Q	Fc	
Sonic	1.00	2.00	6000	<input checked="" type="radio"/> BandPass <input type="radio"/> HighPass
Sync	0.10	0.40	69	<input type="radio"/> BandPass <input checked="" type="radio"/> HighPass
Aux	0.05	0.33	1000	<input type="radio"/> BandPass <input checked="" type="radio"/> HighPass

Buttons: Apply Settings, Cancel, OK

For the CSSM 3 1/8" tool, with medium to long lines the following values should be entered in the SDSTIP Panel.

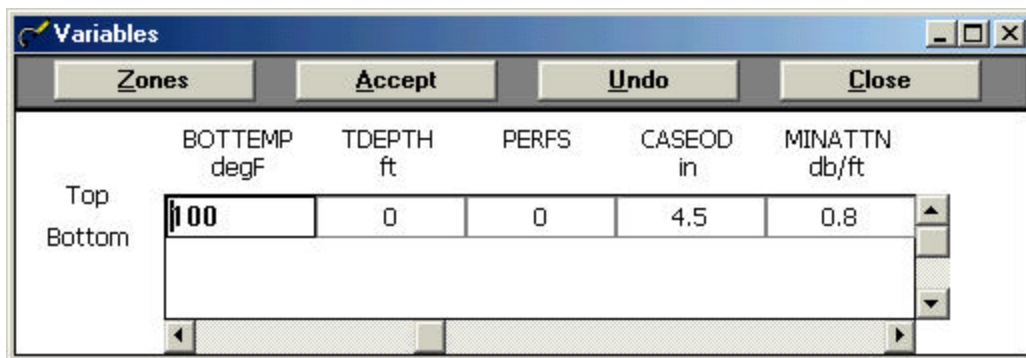


These values are not set and stone and may have to be tweaked for individual situations.

2. After starting Acquisition, the first step when running a Bond Tool of any type on Warrior will be to set the proper casing size.. This will ensure that the gates will default to the correct saved settings.
3. Click on the *Edit* menu box of the Warrior Logging System menu box and scroll down to and select *Variables*.

Variables

Displays the Variable (parameter) editor window, enabling depth dependent parameters associated with the selected service to be zoned and values to be set.

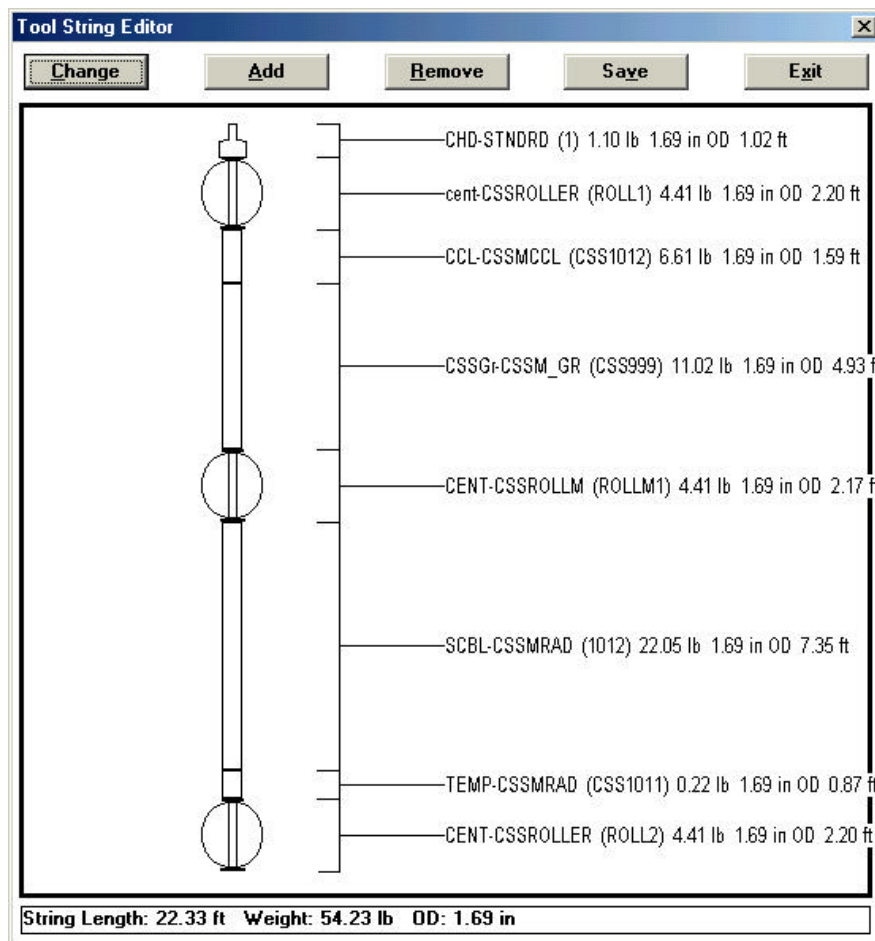


4. Check the proper Casing OD under CASEOD. If you are outputting a Bond Index curve, enter the Minimum and Maximum Amplitudes. Enter any other variables that may be required. Then push the *Accept* button.

NOTE: The Minimum and Maximum Amplitude values are used for calculating the Bond Index Curve. Of these values the MINAMPL will have the greatest impact upon the calculations. The proper values are listed in Appendix A. Also, the MINATTN value is typical for most standard casings.

5. From the Warrior Logging System menu box, click on *Services* and select the proper service for the tool type. Tools have different telemetry schemes and the services must be set up to match the telemetry.

6. When the Service is selected the Edit Toolstring Window will come up automatically. Or, select *Edit* and *Tool String*, to display the following window:



From this window it is possible to change the tool being run, the order of the tools in the string, and add or delete centralizers, weight bars, knuckle joints or other tool string components. It is from the information set in this window that the calibrations, default offsets and filters settings for the log to be run are derived.

7. Depth offsets that were derived from the *Edit - Tool String* step may be viewed by choosing *Edit - Sensors*, to display the following window:

The screenshot shows a window titled "Edit Sensors" with a menu bar containing "Edit" and "Select". Below the menu bar is a table with the following columns: Name, Device, Chan, Offset, and SPF. The table contains 25 rows of sensor data.

Name	Device	Chan	Offset	SPF
PMON	DSP	5		
LTEN	DAMUPCI	7	0.00	4
TCURR	DAMUPCI	1	0.00	4
TVOLT	DAMUPCI	2	0.00	4
ELTIM	DAMUPCI	36	0.00	2
TOD	DAMUPCI	36	0.00	1
MINMK	DAMUPCI	36	0.00	2
LTEN	DAMUPCI	7	0.00	4
TEMP	DSP	9	2.79	4
WVF3FT	DSP	1	7.73	4
WVFCAL	DSP	4	3.07	4
WVF5FT	DSP	17	6.75	4
WVFS1	DSP	20	8.42	4
WVFS2	DSP	21	8.42	4
WVFS3	DSP	22	8.42	4
WVFS4	DSP	23	8.42	4
WVFS5	DSP	24	8.42	4
WVFS6	DSP	25	8.42	4
TT3FT	DAMUPCI	19	7.73	4
TT5FT	DAMUPCI	20	6.75	4
GR	DSP	7	17.01	4
CCL	DSP	16	18.17	20
THV	DSP	8	19.11	4
LLMTEN	DAMUPCI	16	22.33	4

These offsets may be edited from this window, by double clicking on a sensor. The information in this window normally consists of the hardware source of the sensor (Device and Channel number), the depth offset of the sensor from tool zero reference, and the sampling rate.

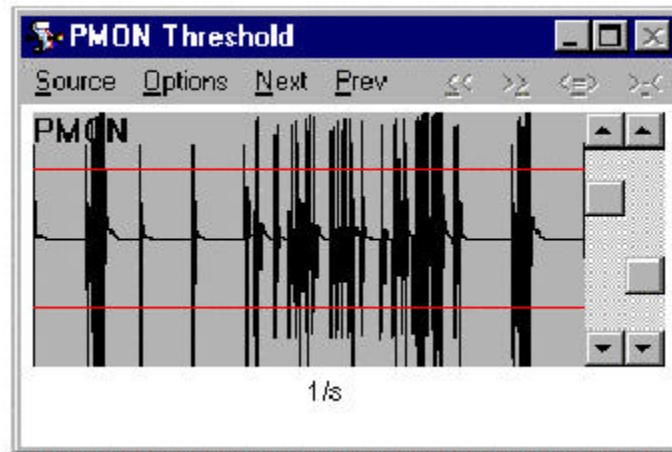
The information contained in Edit Sensors is defaulted to the current service and current tool string information. For example, sensor depth offsets are derived from the selected tool string and the information contained in the tools database. The default sample rates and device channel assignments are derived from the services file. *The default device and channel settings, and the default sample rates are contained in the services.ini file. The default depth offsets are derived from tool information contained in the tools.ini file.* Sensors can not be modified while in a record mode.

NOTE: It is important to know that no permanent changes are saved from this window. If you change anything in the Edit Tool String window and save them, any changes under Edit Sensors will be deleted when the service is closed. If you have to edit offsets in the Edit Sensor window the Tool.ini file should be modified.

9. Power up the tool string. (Nominally 125V at the STIP)

10. Adjusting the sync. Start by turning the Panel Control 'Sync' slider bar all the way down. Monitor the Waveform Window and slowly raise the Slider Bar. In the Waveform Window you will see the 0/s changes to typically 3/s or 4/s on the 1 11/16" tool and 7/s or 8/s for the 3 1/8" tool. At this point the waveforms are synced. The PMON Window is used to adjust the telemetry thresholds. (This window will be hidden behind the Waveform window, and must be brought to the front.) On the PMON Window the left arrow adjusts the positive threshold and the right arrow the negative threshold.

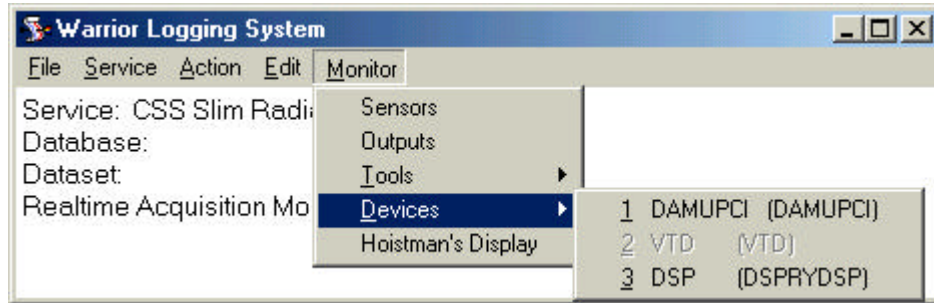
11. Adjusting CSS Telemetry sync. While looking at the PMON window, adjust the positive (+) and negative (-) thresholds to about 50%. Adjust the Panel Control 'AUX' Slider to adjust the height of the digital signal, until the pulses are just below saturation.



Note: The PMON discriminator values will be what is saved in the 'Source/Save Setup' for this service. *Options - View Axis Scaling* may be used to more accurately set these values. This window is digital. The screen will not update until waveform sync is established. Select *Source/Save Setup* to retain these values for your next log.

12. Verifying Telemetry Data:

From Warrior Acquisition Window -Select *Monitor/ Devices/ DSP*:



Values for a Warrior DSP 5000 System and a CSSM 1 11/16" Radial Bond Tool

Device: DSPRYDSP		
DSP-3	WVF3FTTHRS	-0.693 V
DSP-6	TEL1	130.000
DSP-7	TEL2	21.000
DSP-8	TEL3	115.000
DSP-9	TEL4	29.000
DSP-10	TEL5	-1.000
DSP-11	TEL6	-1.000
DSP-12	TEL7	-1.000
DSP-13	TEL8	32767.000
DSP-14	TEL9	0.000
DSP-15	TEL10	0.000
DSP-16	CCL1	130.000
DSP-19	WVF5FTTHRS	-0.703 V

DSP-3	WVF3FTTHRS	Voltage Setting For the 3' Travel Time Threshold
DSP-6	TEL1	CCL Telemetry Channel
DSP-7	TEL2	GR Telemetry Channel
DSP-8	TEL3	Cable Head Voltage Telemetry Channel
DSP-9	TEL4	Temperature Telemetry Channel
DSP-10	TEL5	Unused Telemetry Channel
DSP-11	TEL6	Unused Telemetry Channel
DSP-12	TEL7	Unused Telemetry Channel
DSP-13	TEL8	Unused Telemetry Channel
DSP-14	TEL9	Error Counts for Telemetry
DSP-15	TEL10	Last Encountered Error Code for Telemetry
DSP-16	CCL1	Named CCL Channel For CCL on TEL1
DSP-19	WVF5FTTHRS	Voltage Setting For the 5' Travel Time Threshold

The above values are very close to what the tool normally reads. Monitor TEL1-CCL, TEL3-Cable head voltage and TEL4-Temperature for stable readings. If necessary adjust the positive threshold in the PMON window up or down to stabilize the readings.

If the telemetry signals cannot be stabilized: From Warrior Acquisition window select 'Edit/Devices/SDSTIP', adjust FC and Q settings on 'AUX' line while viewing PMON window for proper telemetry signals.

Values for a Warrior DSP 5000 System and a CSSM 3 1/8" Radial Bond Tool

DSP	Channel	Value
DSP-3	WVF3FTTHRS	-0.693 V
DSP-6	WVF5FTTHRS	-0.703 V
DSP-10	TEL1	0.000
DSP-11	TEL2	12.000
DSP-12	TEL3	0.000
DSP-13	TEL4	0.000
DSP-14	TEL5	7785.000
DSP-15	TEL6	12323.000
DSP-16	TEL7	12017.000
DSP-17	TEL8	2028.000
DSP-18	TEL9	-32768.000
DSP-19	TEL10	-32756.000
DSP-20	TEL11	0.000
DSP-21	TEL12	0.000
DSP-22	CCL1	7785.000

DSP-3	WVF3FTTHRS	Voltage Setting For the 3' Travel Time Threshold
DSP-6	WVF5FTTHRS	Voltage Setting For the 5' Travel Time Threshold
DSP-10	TEL1	Spare Counter Telemetry Channel
DSP-11	TEL2	GR Telemetry Channel
DSP-12	TEL3	Bottom Tool Negative Telemetry Channel
DSP-13	TEL4	Bottom Tool Positive Telemetry Channel
DSP-14	TEL5	CCL Telemetry Channel
DSP-15	TEL6	Waste Current Telemetry Channel
DSP-16	TEL7	Cable Head Voltage Telemetry Channel
DSP-17	TEL8	Temperature Telemetry Channel
DSP-18	TEL9	Spare Analog Telemetry Channel
DSP-19	TEL10	Spare Analog Telemetry Channel
DSP-20	TEL11	Error Counts for Telemetry
DSP-21	TEL12	Last Encountered Error Code for Telemetry
DSP-22	CCL1	Named CCL Channel For CCL on TEL5

The above values are very close to what the tool normally reads. Monitor TEL5-CCL, TEL7-Cable head voltage and TEL8-Temperature for stable readings. If necessary adjust the positive threshold in the PMON window up or down to stabilize the readings.

13. Monitoring Outputs.

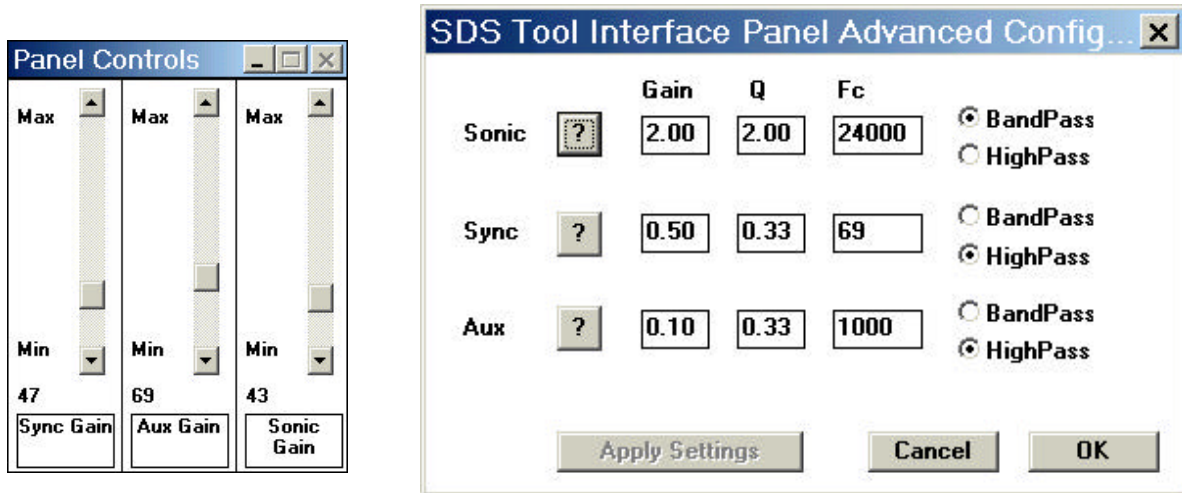
From Warrior Acquisition Window select *Monitor /Outputs*. An Outputs window will appear that allows you to monitor signals such as CCL, GR, and other sensors.

14. Continue to Shop Calibration Section.

Computer Sonics Radial Bond Tools on USB SDSDSP Based Systems

1. The gains and filters for the CSS tools should be setup as follows:
From Acquisition Window Select 'Edit/Device Configuration/SDSTIP'

For the CSSM 1 11/16" tool, with Short to medium lines the following values should be entered in the SDSTIP Panel.



The Gains set the maximum gain for the Panel Control Slider bars and should be set to give a usable range for the slider bars depending on line length and tool signal.

The Sonic line is for the Sonic signal.

The Sync line is for the Sync signal.

The Aux line is for the Telemetry signal.

The FC is the frequency of the signal being detected. The Q is the sharpness of the filter, the higher the Q the sharper the cutoff frequency. Band Pass or High Pass is the type filter used.

The FC for the Sonic Line should be set for the frequency of the sonic receiver crystals, with a Band Pass Filter.

The FC for the Sync Line usually works best with a low Q and Low FC, with a High Pass Filter.

The FC for the Aux Line has been tested for short to medium lines and medium to long lines, and should be entered as shown.

For the CSSM 1 11/16” tool, with medium to long lines the following values should be entered in the SDSTIP Panel.

	Gain	Q	Fc	
Sonic	2.00	2.00	24000	<input checked="" type="radio"/> BandPass <input type="radio"/> HighPass
Sync	0.50	0.33	69	<input type="radio"/> BandPass <input checked="" type="radio"/> HighPass
Aux	0.25	0.80	10000	<input checked="" type="radio"/> BandPass <input type="radio"/> HighPass

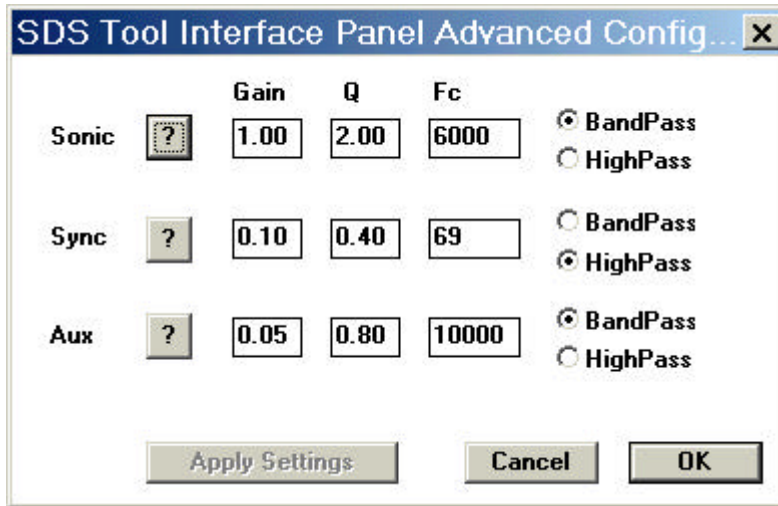
Buttons: Apply Settings, Cancel, OK

For the CSSM 3 1/8” tool, with short to medium lines the following values should be entered in the SDSTIP Panel.

	Gain	Q	Fc	
Sonic	1.00	2.00	6000	<input checked="" type="radio"/> BandPass <input type="radio"/> HighPass
Sync	0.10	0.40	69	<input type="radio"/> BandPass <input checked="" type="radio"/> HighPass
Aux	0.05	0.33	1000	<input type="radio"/> BandPass <input checked="" type="radio"/> HighPass

Buttons: Apply Settings, Cancel, OK

For the CSSM 3 1/8" tool, with medium to long lines the following values should be entered in the SDSTIP Panel.

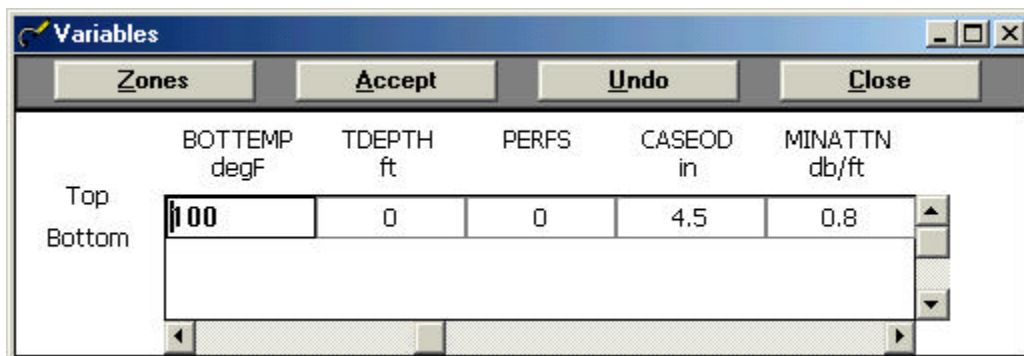


These values are not set and stone and may have to be tweaked for individual situations.

2. After starting Acquisition, the first step when running a Bond Tool of any type on Warrior will be to set the proper casing size.. This will ensure that the gates will default to the correct saved settings.
3. Click on the *Edit* menu box of the Warrior Logging System menu box and scroll down to and select *Variables*.

Variables

Displays the Variable (parameter) editor window, enabling depth dependent parameters associated with the selected service to be zoned and values to be set.

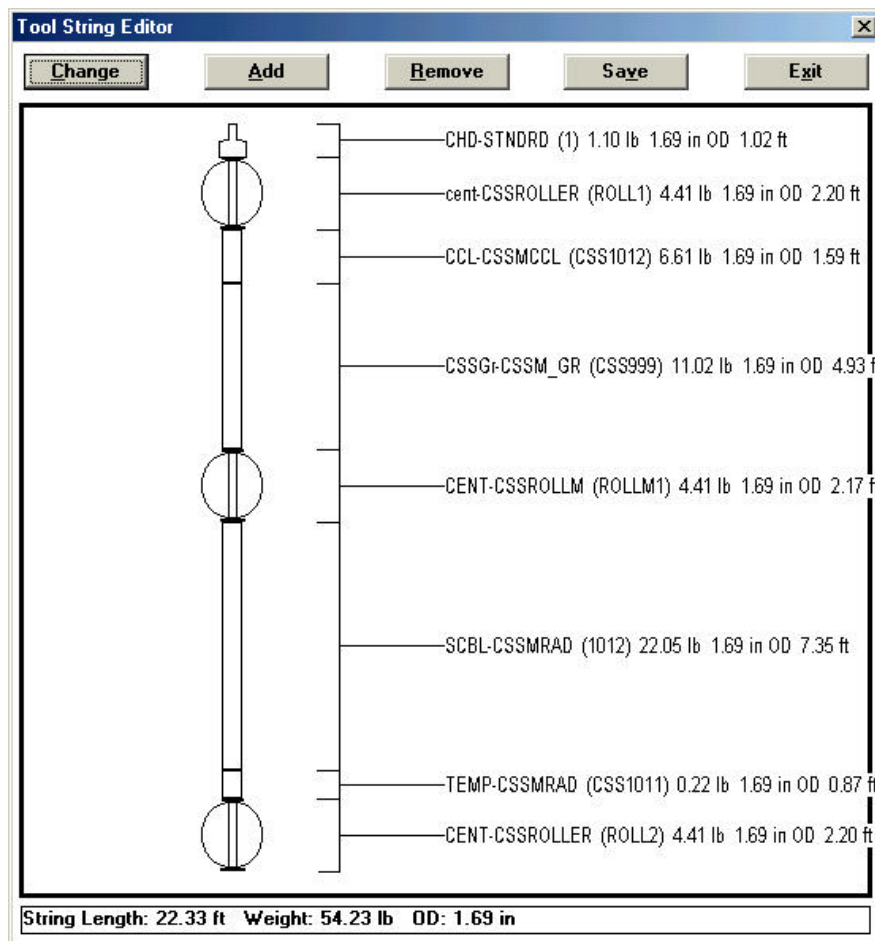


4. Check the proper Casing OD under CASEOD. If you are outputting a Bond Index curve, enter the Minimum and Maximum Amplitudes. Enter any other variables that may be required. Then push the *Accept* button.

NOTE: The Minimum and Maximum Amplitude values are used for calculating the Bond Index Curve. Of these values the MINAMPL will have the greatest impact upon the calculations. The proper values are listed in Appendix A. Also, the MINATTN value is typical for most standard casings.

5. From the Warrior Logging System menu box, click on *Services* and select the proper service for the tool type. Tools have different telemetry schemes and the services must be set up to match the telemetry.

6. When the Service is selected the Edit Toolstring Window will come up automatically. Or, select *Edit* and *Tool String*, to display the following window:



From this window it is possible to change the tool being run, the order of the tools in the string, and add or delete centralizers, weight bars, knuckle joints or other tool string components. It is from the information set in this window that the calibrations, default offsets and filters settings for the log to be run are derived.

7. Depth offsets that were derived from the *Edit - Tool String* step may be viewed by choosing *Edit - Sensors*, to display the following window:

The screenshot shows a window titled "Edit Sensors" with a menu bar containing "Edit" and "Select". Below the menu bar is a table with the following columns: Name, Device, Chan, Offset, and SPF. The table contains the following data:

Name	Device	Chan	Offset	SPF
PMON	DSP	5		
LTEN	DAMUPCI	7	0.00	4
TCURR	DAMUPCI	1	0.00	4
TVOLT	DAMUPCI	2	0.00	4
ELTIM	DAMUPCI	36	0.00	2
TOD	DAMUPCI	36	0.00	1
MINMK	DAMUPCI	36	0.00	2
LTEN	DAMUPCI	7	0.00	4
TEMP	DSP	9	2.79	4
WVF3FT	DSP	1	7.73	4
WVFCAL	DSP	4	3.07	4
WVF5FT	DSP	17	6.75	4
WVFS1	DSP	20	8.42	4
WVFS2	DSP	21	8.42	4
WVFS3	DSP	22	8.42	4
WVFS4	DSP	23	8.42	4
WVFS5	DSP	24	8.42	4
WVFS6	DSP	25	8.42	4
TT3FT	DAMUPCI	19	7.73	4
TT5FT	DAMUPCI	20	6.75	4
GR	DSP	7	17.01	4
CCL	DSP	16	18.17	20
THV	DSP	8	19.11	4
LLMTEN	DAMUPCI	16	22.33	4

These offsets may be edited from this window, by double clicking on a sensor. The information in this window normally consists of the hardware source of the sensor (Device and Channel number), the depth offset of the sensor from tool zero reference, and the sampling rate.

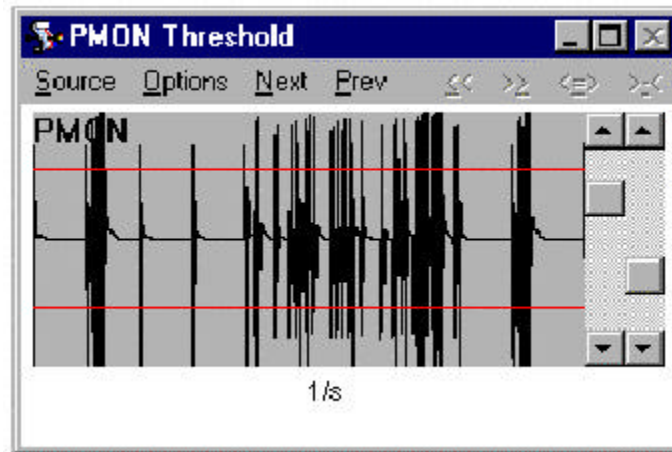
The information contained in Edit Sensors is defaulted to the current service and current tool string information. For example, sensor depth offsets are derived from the selected tool string and the information contained in the tools database. The default sample rates and device channel assignments are derived from the services file. *The default device and channel settings, and the default sample rates are contained in the services.ini file. The default depth offsets are derived from tool information contained in the tools.ini file.* Sensors can not be modified while in a record mode.

NOTE: It is important to know that no permanent changes are saved from this window. If you change anything in the Edit Tool String window and save them, any changes under Edit Sensors will be deleted when the service is closed. If you have to edit offsets in the Edit Sensor window the Tool.ini file should be modified.

9. Power up the tool string. (Nominally 125V at the STIP)

10. Adjusting the sync. Start by turning the Panel Control 'Sync' slider bar all the way down. Monitor the Waveform Window and slowly raise the Slider Bar. In the Waveform Window you will see the 0/s changes to typically 3/s or 4/s on the 1 11/16" tool and 7/s or 8/s for the 3 1/8" tool. At this point the waveforms are synced. The PMON Window is used to adjust the telemetry thresholds. (This window will be hidden behind the Waveform window, and must be brought to the front.) On the PMON Window the left arrow adjusts the positive threshold and the right arrow the negative threshold.

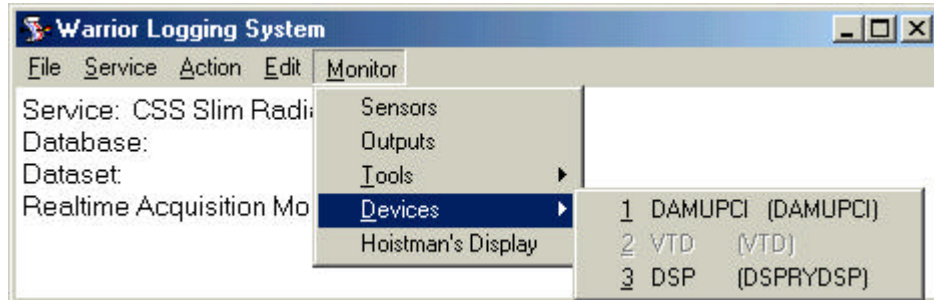
11. Adjusting CSS Telemetry sync. While looking at the PMON window, adjust the positive (+) and negative (-) thresholds to about 50%. Adjust the Panel Control 'AUX' Slider to adjust the height of the digital signal, until the pulses are just below saturation.



Note: The PMON discriminator values will be what is saved in the 'Source/Save Setup' for this service. *Options - View Axis Scaling* may be used to more accurately set these values. This window is digital. The screen will not update until waveform sync is established. Select *Source/Save Setup* to retain these values for your next log.

12. Verifying Telemetry Data:

From Warrior Acquisition Window -Select *Monitor/ Devices/ DSP*:



Values for a Warrior DSP 5000 System and a CSSM 1 11/16" Radial Bond Tool

Device: SDDSP		
DSP-3	WVF3FTTHRS	-0.728 V
DSP-5	TEL1	130.000
DSP-6	TEL2	19.000
DSP-7	TEL3	115.000
DSP-8	TEL4	29.000
DSP-9	TEL5	65535.000
DSP-10	TEL6	65535.000
DSP-11	TEL7	65535.000
DSP-12	TEL8	32767.000
DSP-13	CCL1	130.000
DSP-14	ErrCnt	670.000
DSP-15	ErrCode	2.000
DSP-18	WVF5FTTHRS	-0.654 V

DSP-3	WVF3FTTHRS	Voltage Setting For the 3' Travel Time Threshold
DSP-6	TEL1	CCL Telemetry Channel
DSP-7	TEL2	GR Telemetry Channel
DSP-8	TEL3	Cable Head Voltage Telemetry Channel
DSP-9	TEL4	Temperature Telemetry Channel
DSP-10	TEL5	Unused Telemetry Channel
DSP-11	TEL6	Unused Telemetry Channel
DSP-12	TEL7	Unused Telemetry Channel
DSP-13	TEL8	Unused Telemetry Channel
DSP-14	TEL9	Error Counts for Telemetry
DSP-15	TEL10	Last Encountered Error Code for Telemetry
DSP-16	CCL1	Named CCL Channel For CCL on TEL1
DSP-19	WVF5FTTHRS	Voltage Setting For the 5' Travel Time Threshold

The above values are very close to what the tool normally reads. Monitor TEL1-CCL, TEL3-Cable head voltage and TEL4-Temperature for stable readings. If necessary adjust the positive threshold in the PMON window up or down to stabilize the readings.

If the telemetry signals cannot be stabilized: From Warrior Acquisition window select 'Edit/Devices/SDSTIP', adjust FC and Q settings on 'AUX' line while viewing PMON window for proper telemetry signals.

Values for a Warrior DSP 5000 System and a CSSM 3 1/8" Radial Bond Tool

DSP	Channel	Value
DSP-3	WVF3FTTHRSRSH	-0.693 V
DSP-6	WVF5FTTHRSRSH	-0.703 V
DSP-10	TEL1	0.000
DSP-11	TEL2	12.000
DSP-12	TEL3	0.000
DSP-13	TEL4	0.000
DSP-14	TEL5	7785.000
DSP-15	TEL6	12323.000
DSP-16	TEL7	12017.000
DSP-17	TEL8	2028.000
DSP-18	TEL9	-32768.000
DSP-19	TEL10	-32756.000
DSP-20	TEL11	0.000
DSP-21	TEL12	0.000
DSP-22	CCL1	7785.000

DSP-3	WVF3FTTHRSRSH	Voltage Setting For the 3' Travel Time Threshold
DSP-6	WVF5FTTHRSRSH	Voltage Setting For the 5' Travel Time Threshold
DSP-10	TEL1	Spare Counter Telemetry Channel
DSP-11	TEL2	GR Telemetry Channel
DSP-12	TEL3	Bottom Tool Negative Telemetry Channel
DSP-13	TEL4	Bottom Tool Positive Telemetry Channel
DSP-14	TEL5	CCL Telemetry Channel
DSP-15	TEL6	Waste Current Telemetry Channel
DSP-16	TEL7	Cable Head Voltage Telemetry Channel
DSP-17	TEL8	Temperature Telemetry Channel
DSP-18	TEL9	Spare Analog Telemetry Channel
DSP-19	TEL10	Spare Analog Telemetry Channel
DSP-20	TEL11	Error Counts for Telemetry
DSP-21	TEL12	Last Encountered Error Code for Telemetry
DSP-22	CCL1	Named CCL Channel For CCL on TEL5

The above values are very close to what the tool normally reads. Monitor TEL5-CCL, TEL7-Cable head voltage and TEL8-Temperature for stable readings. If necessary adjust the positive threshold in the PMON window up or down to stabilize the readings.

13. Monitoring Outputs.

From Warrior Acquisition Window select *Monitor /Outputs*. An Outputs window will appear that allows you to monitor signals such as CCL, GR, and other sensors.

14. Continue to Shop Calibration Section.

Shop / Tank Calibration:

1. Make up the tool with the centralizers and slide it into the tank. The tool should show signals on all of the signals in the Waveform Window.
2. Bring the Waveform Window to the front. The gates appear on the waveforms as a white line on the section of the waveform where they are set.

The gates can be changed on this window by clicking on the waveform that needs to be adjusted (note the dark border around the selected waveform) and then using the buttons in the top right corner of the Waveform Window. To move the gate right or left on the x-axis use the buttons labeled $\leq\leq$ to move it to the left or the button labeled $\geq\geq$ to move the gate to the right. The width of the gate can be increased by selecting the $\leq\equiv\geq$ button and decreased by using the $\gt; _ <$ button.

Note: It is recommended that you keep all of your gate widths the same. Approximately 30 micro-seconds works well with most tool types.

Also, specific waveforms can be viewed by selecting *Options – Enable*, and selecting the waveforms that you want displayed. Reducing the number of waveforms gives you a screen that is easier to work with. Remember to click on the waveform before adjusting the gates.

3. Before gating on the first arrival use the ('BHC/CBL' pot on the panel for CBL01-09 systems) (Panel Control 'Sonic' Slider Bar on CBLDR systems) to increase/decrease the signal. Make sure that none of the signals are saturated. (If you are going to be running logs in casing that is smaller than your calibration tank, be aware that the signals will be larger in smaller casings and decrease your signal to accommodate this.)

Note: The signal height on the screen is not valid if you are in threshold mode.

4. After all of the gates are set select *Source – Save As*. Give this setup a name, such as 'CSSM 1 11/16" Cal Tank Amplitudes.' If there is a problem later the setting can be restored by selecting *Source – Load* and selecting that setup name.

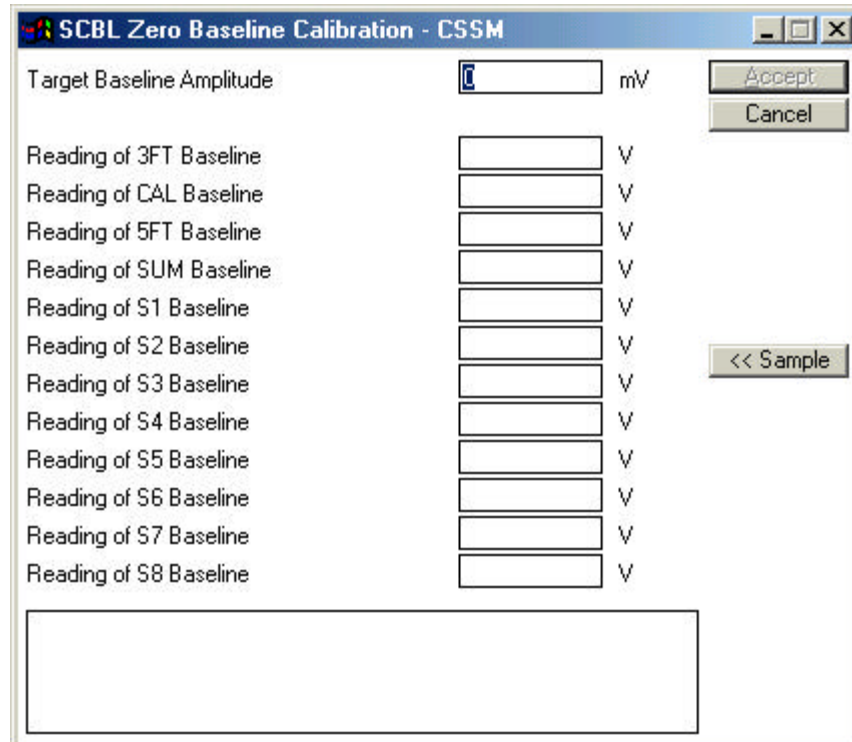
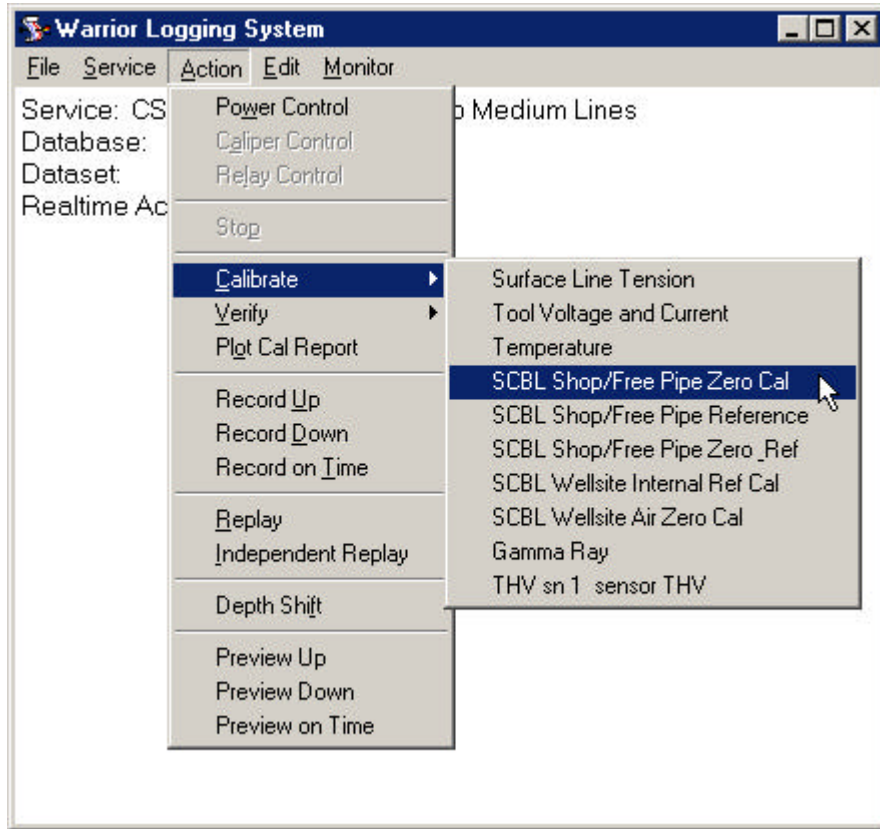
Note: The same can be done for settings on the PMON Window.

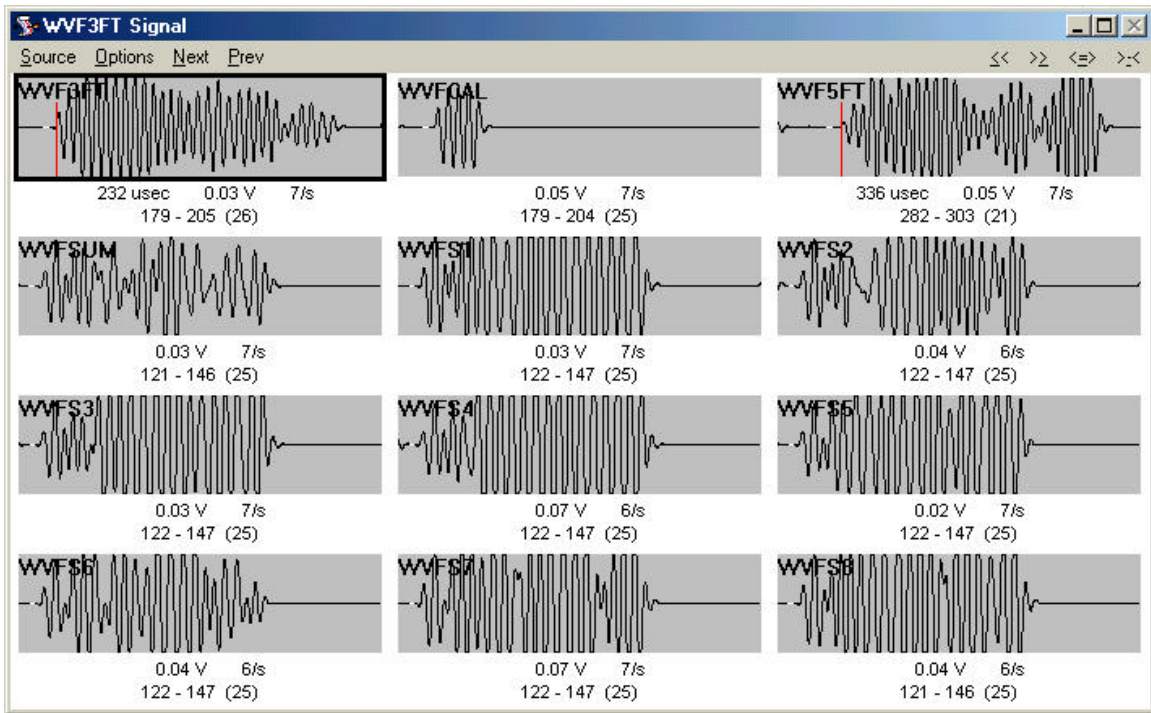
AT THIS POINT YOU SHOULD HAVE YOUR GATE (WHITE LINE) ON ALL THE FIRST POSITIVE ARRIVALS OF ALL THE SIGNALS BEING DISPLAYED.
(The CAL pulse first arrival should be positive. If the first arrival is not positive, the polarity can be changed through Warrior/Utilities/Edit Logging Tool Details.)

5. On the Waveform Window, select *Source – Threshold Mode* and use the UP/DOWN Arrows (Only on the 3 ft and 5 ft display). To move the red threshold line to a suitable position where the threshold cuts the first arrival. Make sure it is far enough to avoid baseline noise (This may be above or below the baseline). *Threshold Mode* is only used to set the travel time thresholds.

6. On the Waveform Window, select *Source – Normal Mode*.

7. On the Acquisition Window select *Action – Calibrate – Shop / Free Pipe Zero Cal*. A window will appear to sample the base line noise.





Make sure the gates for all signals are on the flat part of baseline before the first arrival. These values will be updated when doing the well site air zero cal. Click on the <<sample button. The Sample & Average Sensor(s) box will appear. Click on the begin button. When the sample is complete, monitor the values they should be very close to zero. If they are click the Acept button. If the values are not close to zero click the Reject button and correct the problem.

Sample & Average Sensor(s)

SCBL Zero Baseline Calibration

Reading of 3FT Baseline
 Reading of CAL Baseline
 Reading of 5FT Baseline
 Reading of SUM Baseline

Sensor	Instantaneous	Average	Units
WVF3FT	0.0269	0.0382	V
WVFCAL	0.0549	0.0367	V
WVF5FT	0.0464	0.0365	V
WVFSUM	0.0317	0.0428	V
WVFS1	0.0269	0.0472	V
WVFS2	0.0439	0.0378	V
WVFS3	0.0281	0.0349	V
WVFS4	0.0671	0.0666	V
WVFS5	0.0256	0.0321	V
WVFS6	0.0427	0.0484	V
WVFS7	0.0671	0.0486	V
WVFS8	0.0391	0.0499	V

100% Complete

Accept

Reject

The SCBL Zero Baseline Calibration box will appear check that the values are all close to zero and click Acept.

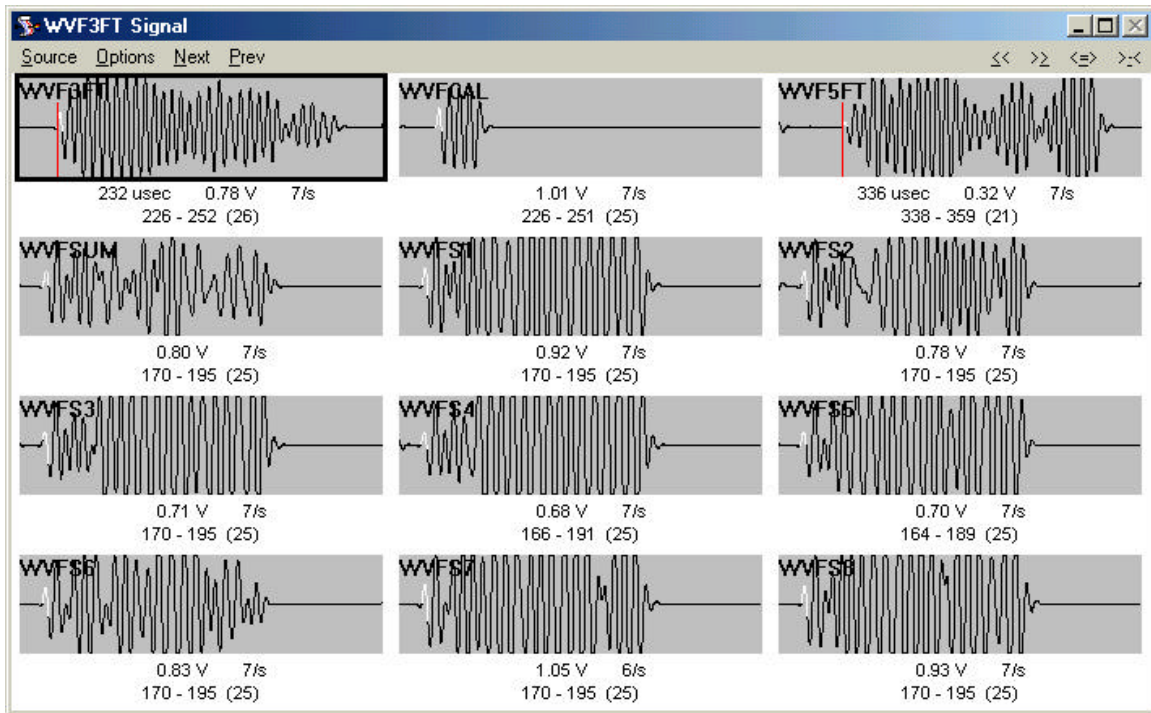
Channel	Reading (V)
Target Baseline Amplitude	0 mV
Reading of 3FT Baseline	0.0382446
Reading of CAL Baseline	0.0366699
Reading of 5FT Baseline	0.0364624
Reading of SUM Baseline	0.0427979
Reading of S1 Baseline	0.0472168
Reading of S2 Baseline	0.0377808
Reading of S3 Baseline	0.0349121
Reading of S4 Baseline	0.0665772
Reading of S5 Baseline	0.0321045
Reading of S6 Baseline	0.0483765
Reading of S7 Baseline	0.048645
Reading of S8 Baseline	0.0499146

Buttons: Accept, Cancel, << Sample

On the Acquisition Window select *Action – Calibrate – Shop/Free Pipe Reference*. The SCBL E1 Amplitude Calibration window will appear to sample the first arrival pipe amplitude. The Free Pipe Millvolt of the casing you are sampling is in the cells at the top of the window. The Sector E1 amplitude is normally set to 100 or made to match the 3ft E1 amplitude.

Note: If the value is not there or not correct check to see if the Casing OD and Maximum Amplitude were input in the Variables Window.

Field	Value	Unit
Target Pipe E1 Amplitude	71.921	mV
Target Sector E1 Amplitude	100	
Reading of 3FT E1 Signal		V
Reading of CAL E1 Signal		V
Reading of 5FT E1 Signal		V
Reading of SUM E1 Signal		V
Reading of S1 E1 Signal		V
Reading of S2 E1 Signal		V
Reading of S3 E1 Signal		V
Reading of S4 E1 Signal		V
Reading of S5 E1 Signal		V
Reading of S6 E1 Signal		V
Reading of S7 E1 Signal		V
Reading of S8 E1 Signal		V



Make sure the gates for all signals are on the positive part of the first arrival. Click on the <<sample button. The Sample & Average Sensor(s) box will appear.

Sample & Average Sensor(s)

SCBL E1 Amplitude Calibration

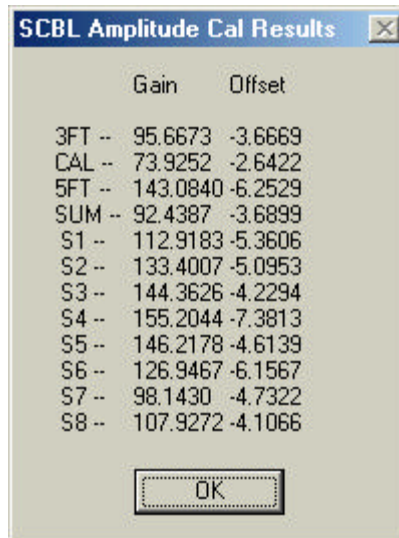
Reading of 3FT E1 Signal
 Reading of CAL E1 Signal
 Reading of 5FT E1 Signal
 Reading of SUM E1 Signal

Sensor	Instantaneous	Average	Units
WVF3FT	0.7788	0.7805	V
WVFCAL	1.0083	0.9957	V
WVF5FT	0.3186	0.5375	V
WVFSUM	0.8020	0.8060	V
WVFS1	0.9155	0.9194	V
WVFS2	0.7751	0.7768	V
WVFS3	0.7141	0.7116	V
WVFS4	0.6775	0.6825	V
WVFS5	0.7141	0.7065	V
WVFS6	0.8276	0.8244	V
WVFS7	1.0474	1.0514	V
WVFS8	0.9326	0.9508	V

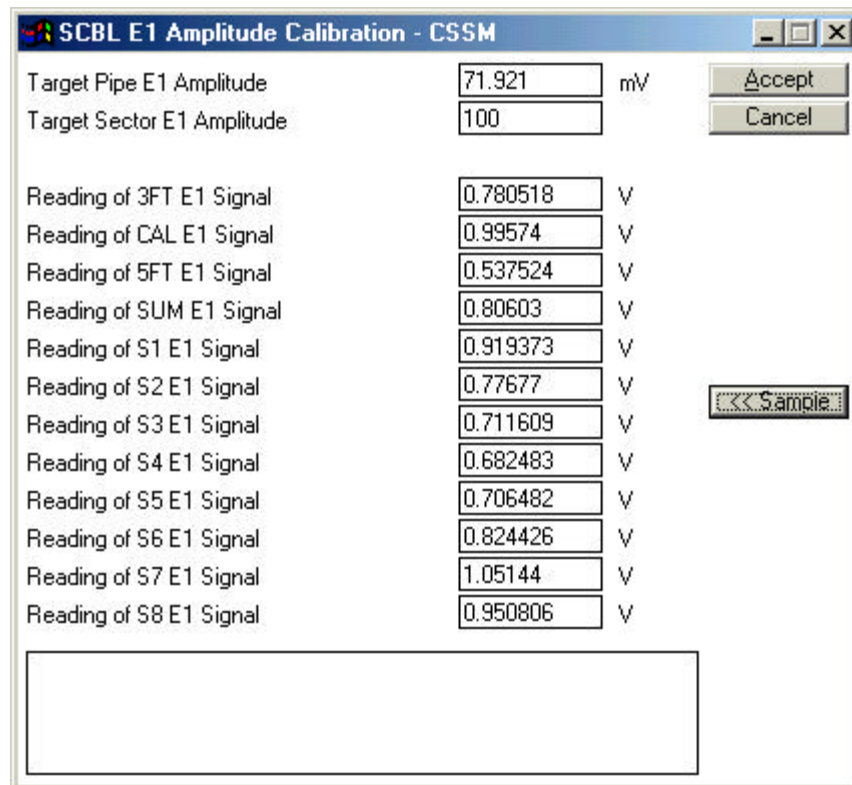
100% Complete

Accept
Reject

Select <<Sample. After the sampling has finished select Accept. The calibration gains and offsets for each waveform are displayed. The offsets on all waveforms should be near zero. The gains should range from 20 to150. Select OK.



The SCBL E1 Amplitude Calibration window will appear with the raw voltage readings displayed. Select Accept.



Note: If you need to make more than one calibration for each tool you must enter a different Serial Number.

WARNING: Do not do a downhole cal with the same Serial Number because if you accept the cal and it is no good you will have over written the good shop cal, which can be utilized, if there is no Free Pipe found in the well.

Note: To create In the Warrior Screen select *Utilities – Edit Logging Tool details* then click *Edit Tool*. A list will come up, select *SCBL* and enter the “alias” Serial Number which you will use to do other calcs on the same tool without over writing the original. Then Click *Create – Tool*. Enter a new serial number.

Wellsite Calibration Procedures:

1. The GR can be calibrated like any other GR tool. Select *Action – Calibrate – Gamma Ray*. Follow the onscreen menu.
2. **SCBL Air Zero Cal:** The following step is performed with the tool hanging in the air. On the Acquisition Window select *Action/ Calibrate/SCBL Well Site Air Zero Cal*. The *SCBL Air Zero Cal* window will appear.

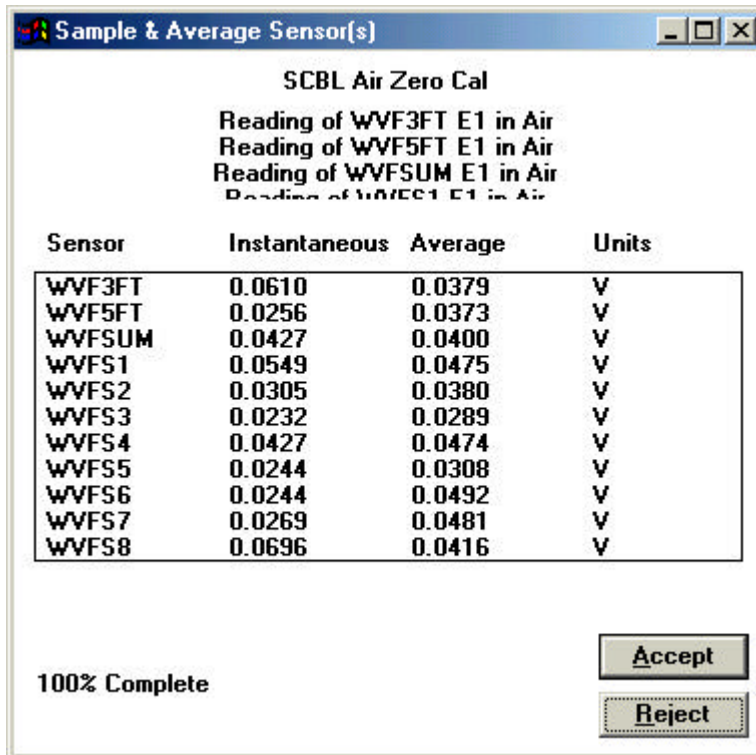
SCBL Air Zero Cal - CSSM

Accept
Cancel

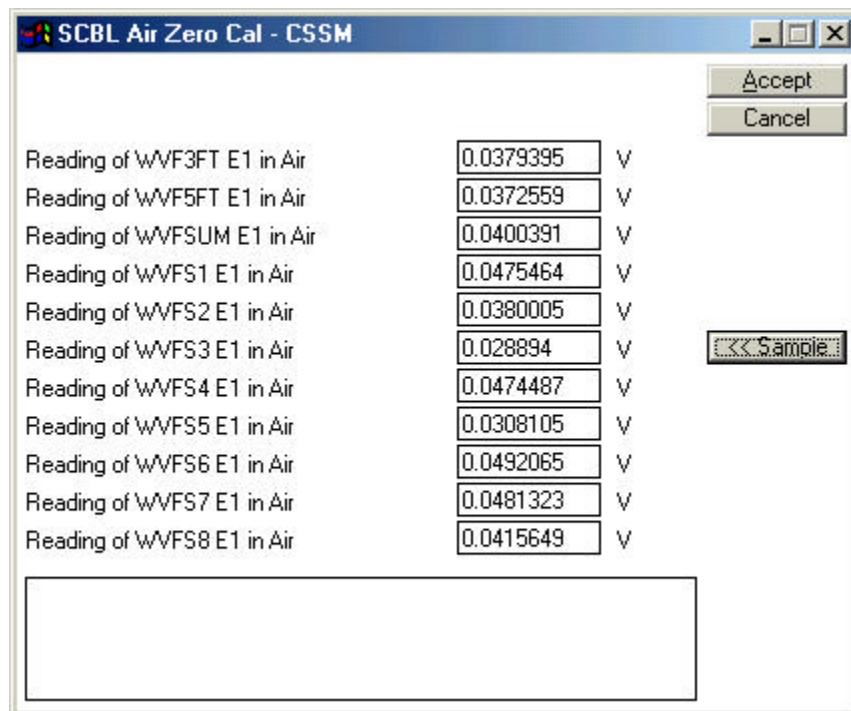
Reading of WWF3FT E1 in Air ▾
Reading of WWF5FT E1 in Air ▾
Reading of WWFS1 E1 in Air ▾
Reading of WWFS2 E1 in Air ▾
Reading of WWFS3 E1 in Air ▾
Reading of WWFS4 E1 in Air ▾
Reading of WWFS5 E1 in Air ▾
Reading of WWFS6 E1 in Air

<< Sample

3. Ensure the gates are set in the proper position for the size pipe to be logged select *<<Sample*. The *Sample & Average Sensor(s)* box will appear. Select *Begin*.

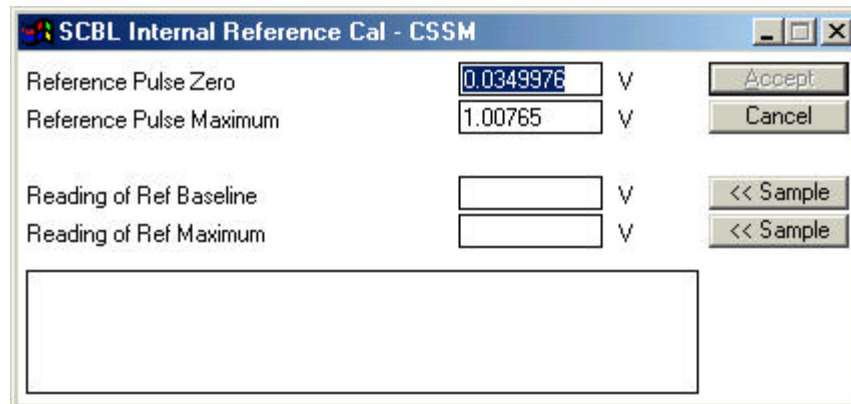


All the values should be close to zero, and are used to establish the offset to be applied to the primary gain and offset established in the Shop Calibration. Select Acept. Select Acept in the *SCBL Air Zero Cal* Window.



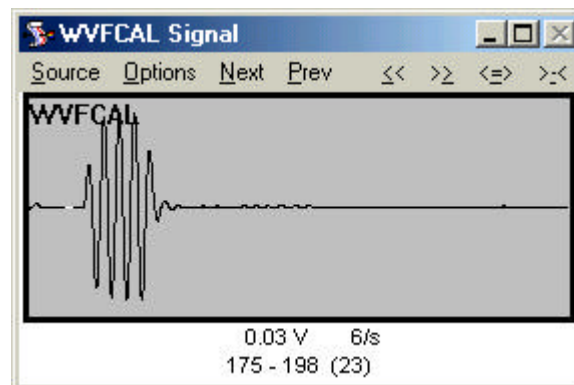
SCBL Wellsite Internal Ref Cal: The following step should be performed down hole. The CAL pulse is recalibrated to compensate for line resistance and temperature. The new values are used to normalize all waveform amplitude values back to the shop calibration.

1. On the Acquisition Window select *Action/ Calibrate/ Well Site Internal Ref Cal*. The *SCBL Internal Reference Cal* window will appear.

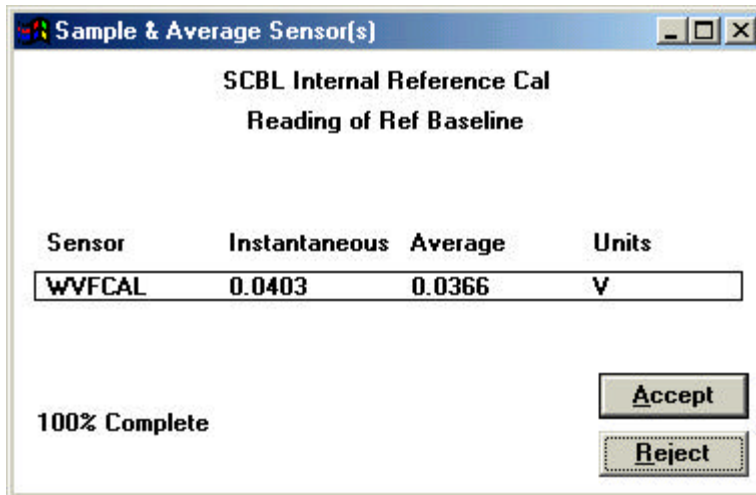


The image shows a dialog box titled "SCBL Internal Reference Cal - CSSM". It contains four input fields with corresponding units and buttons. The first two fields are pre-filled with values. The last two fields are empty and have "Sample" buttons next to them. There are also "Accept" and "Cancel" buttons.

Reference Pulse Zero	0.0349976	V	Accept
Reference Pulse Maximum	1.00765	V	Cancel
Reading of Ref Baseline		V	<< Sample
Reading of Ref Maximum		V	<< Sample

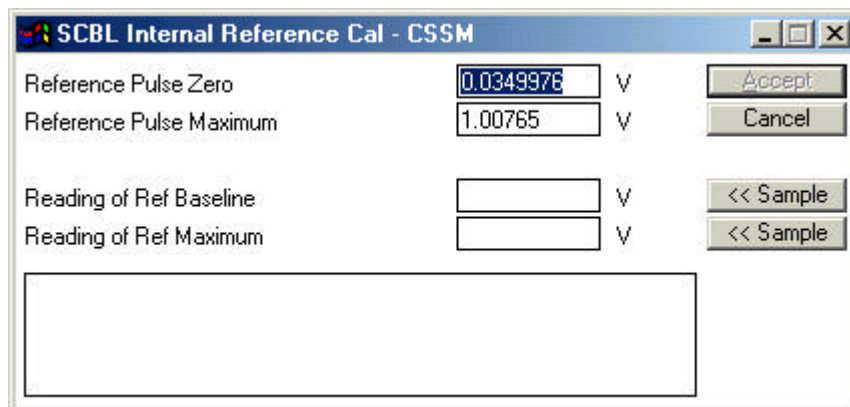
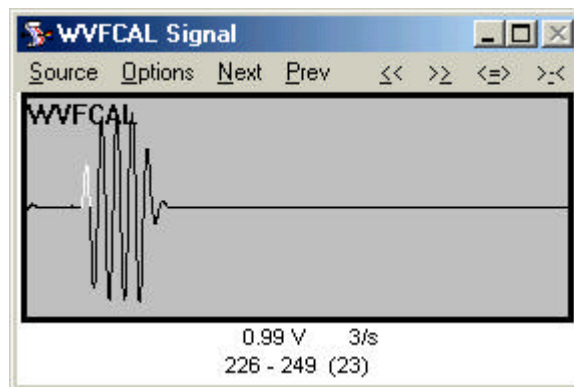


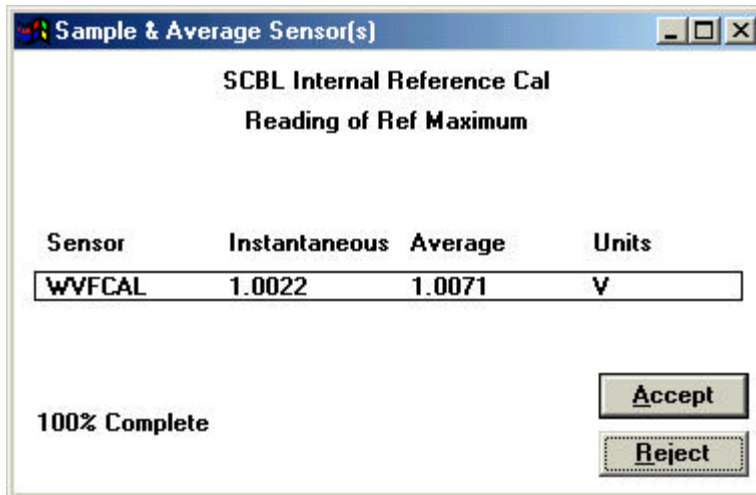
2. Move the gate in the *WVFCAL Signal* window to the flat part of the baseline in front of the first positive arrival. Select *<<Sample* on the *Reading of Ref Baseline*. The *Sample & Average Sensor(s)* window will appear.



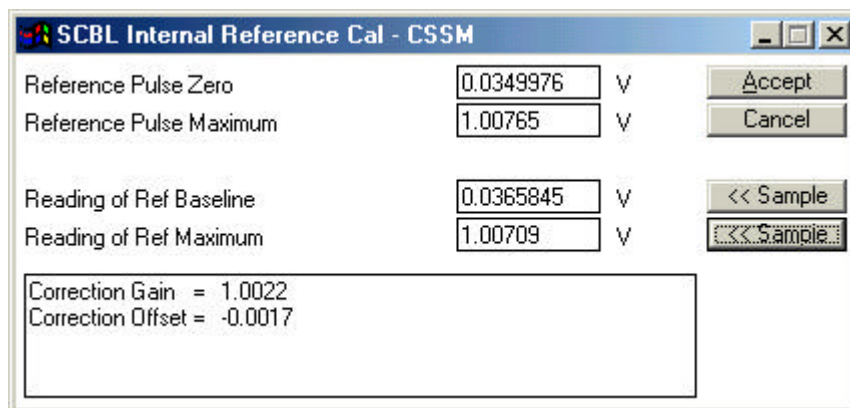
3. Select *Begin* the values should be very close to zero. Select *Accept*.

4. Move the gate in the *WVFCAL Signal* window to gate the first positive arrival. Select *<<Sample* on the *Reading of Ref Maximum*. The *Sample & Average Sensor(s)* window will appear.

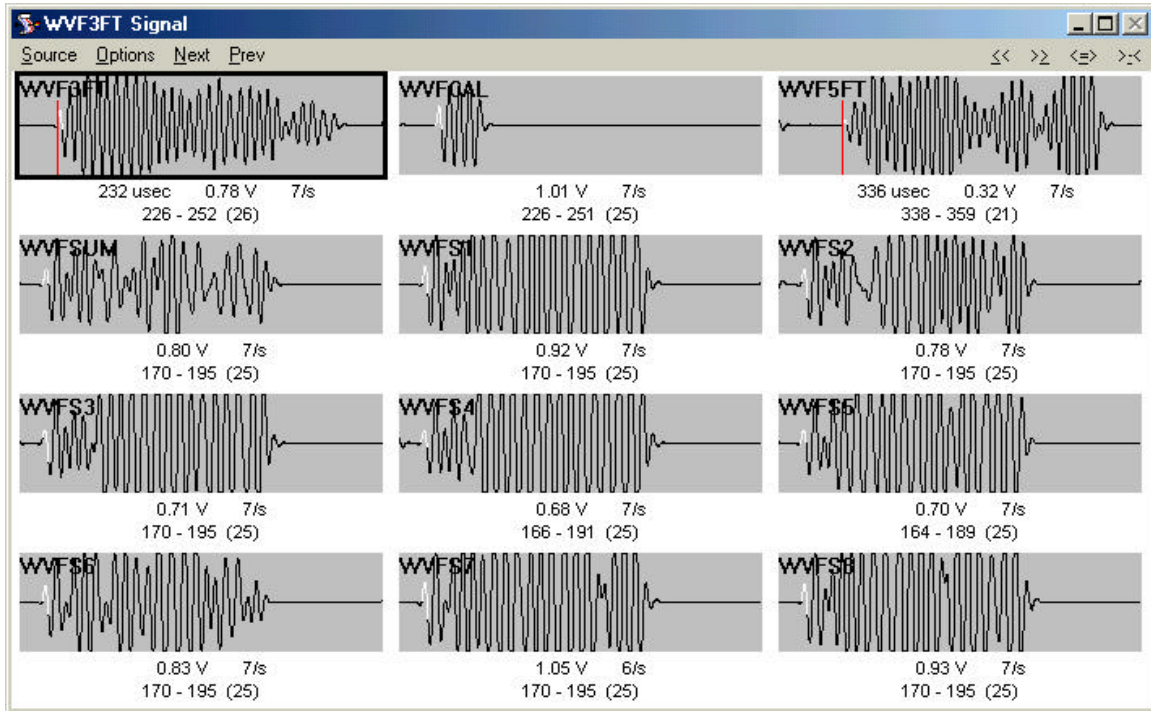




5. Select <<Begin on the Sample & Average Sensor(s). Select *Accept*. A gain and offset value will be shown in the *SCBL Internal Reference Cal* window. The gain should be very close to 1.0 and the offset value will be very close to 0. If they are not, redo your calibrations to ensure that the correct voltage is set for the WVFCAL and the gate was set in the proper position for each reading. Select *Accept* in the *SCBL internal Reference Cal* window.



6. Go in the hole monitoring the various waveforms as shown below. Ensure that the gates are over the first positive signal and that the relative positions of the gates are correct. The gate for the 5ft receiver should be approximately 114 microseconds later in time than the 3ft. The various sector gates should be approximately 57 microseconds earlier in time than the 3ft (for a 2 foot sector spacing).



Note: All waveforms may be shown by selecting *Options - Enable* from the waveform window.

7. After the gates are adjusted, open the *Monitor -Outputs* Window and monitor the various outputs.

Parameter	Unit	Value
LSPD	[STD]	31.500 ft/min
LTEN	[STD]	9827.054 lb
TCURR	[STD]	2.018 mA
TVOLT	[STD]	4.479 V
ELTIM	[STD]	512.420 sec
ADPTH	[STD]	9982.892 ft
LTENRT	[STD]	9827.054 lb
TEMP	[TEMP]	163.460 degF
DTMP	[TEMP]	0.000 degF
AMP3FT	[SCBL]	71.665 mV
AMPCAL	[SCBL]	72.708 mV
AMP5FT	[SCBL]	40.664 mV
AMPSUM	[SCBL]	71.919 mV
AMPS1	[SCBL]	99.032
AMPS2	[SCBL]	99.545
AMPS3	[SCBL]	100.052
AMPS4	[SCBL]	99.134
AMPS5	[SCBL]	98.940
AMPS6	[SCBL]	100.049
AMPS7	[SCBL]	99.923
AMPS8	[SCBL]	101.346
TT3FT	[SCBL]	233.250 usec
TT5FT	[SCBL]	335.750 usec
AMPMIN	[SCBL]	98.940
AMPMAX	[SCBL]	101.346
AMPAVG	[SCBL]	99.753
ATT3	[SCBL]	-0.810 db/ft
BONDIX	[SCBL]	0.061
GR	[GR]	305.000 GAPI
CCL	[CCL]	12.504
THV	[THV]	161.501 V

The maximum of the 3ft and sector outputs should be approximately those shown in appendix I for a given size casing. The minimum values in bonded casing should also match the indicated values. Sector values will tend to be slightly above indicated values in bonded pipe.

8. Setting Travel Time:

While monitoring the 3ft Waveform, choose *Source - Threshold Setup Mode*. Using the right hand scroll bar to set the Threshold Setting. The Travel Time should read within 10 microseconds of the value listed in Appendix I. This threshold should be kept as close to the baseline as possible without the threshold picking up baseline noise and triggering early.

Running the Log:

1 11/16" CSSM Radial Bond Tool

CCL Calibrations – Gain = 0.1

Offset = -12.8

Temp Calibrations - Gain =1.8

Offset = 32

3 1/8" CSSM Radial Bond Tool

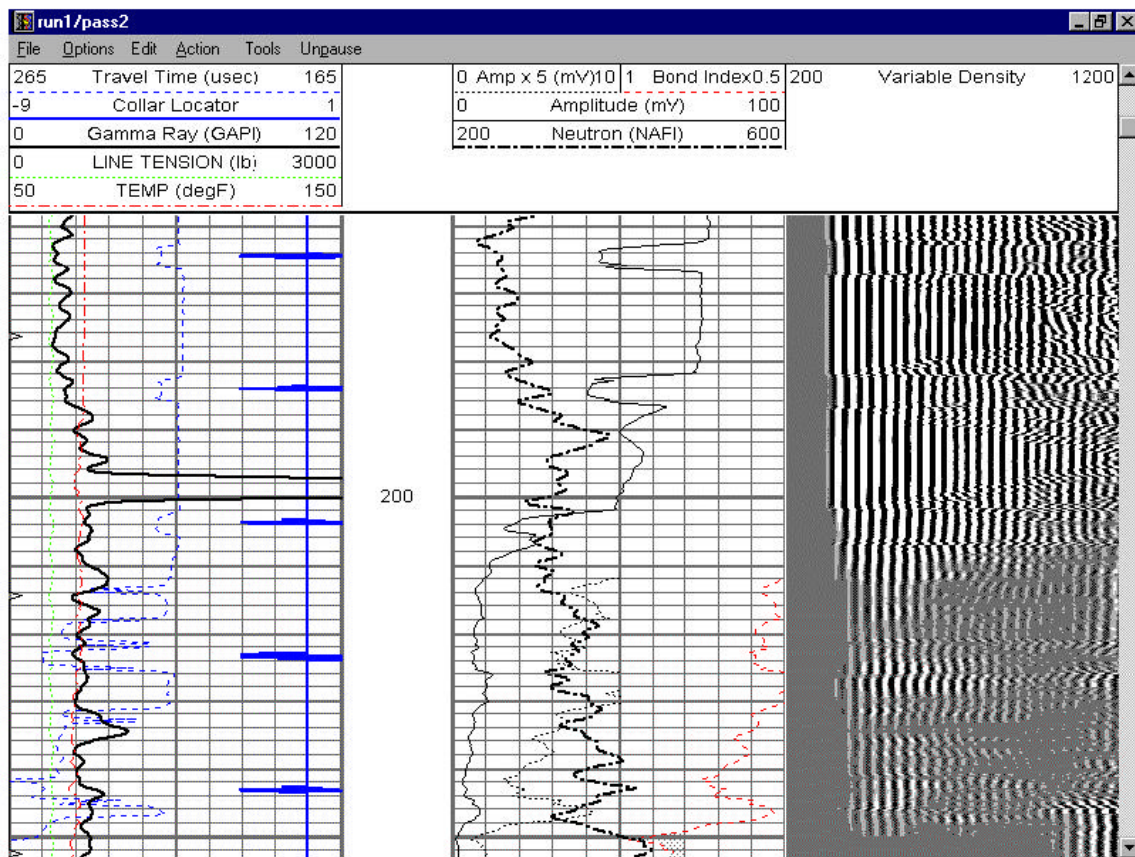
CCL Calibrations – Gain = 0.0005

Offset = -3.7

Temp Calibrations - Gain =0.02

Offset = 0

1. An example Radial Bond presentation is shown below.



The additional Radial Bond presentation is shown below. This presentation shows the eight sector readings and the waveforms of each as a signature presentation.

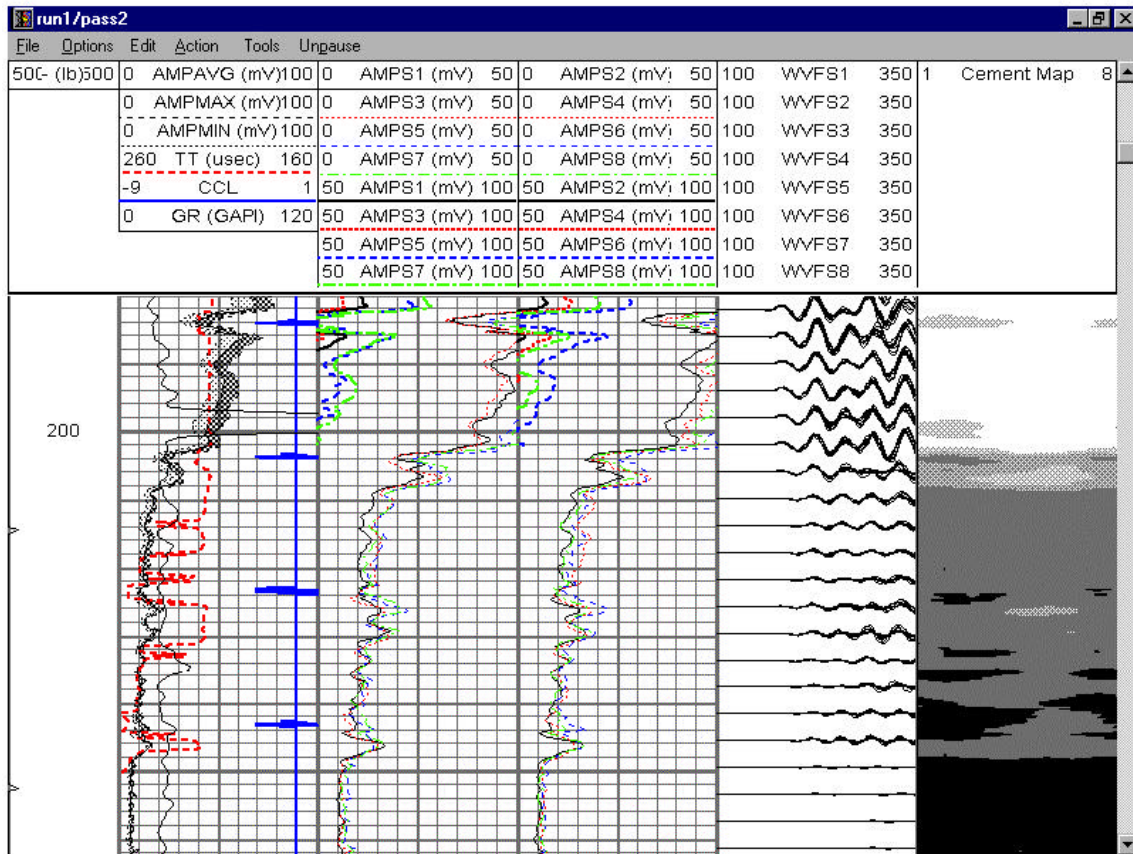


Figure 26: Additional Radial Bond Presentation with Cement Map

The Presentation may be changed by clicking on *Options* in the Interactive Plot Window. This brings up the window shown below. Either browse to select the presentation required, or edit the presentation name to the desired presentation.

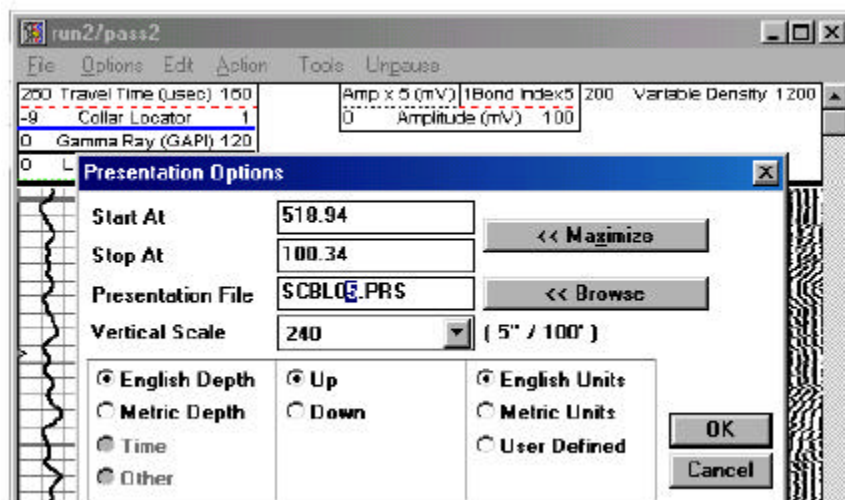


Figure 27: Presentation Options Window

Under Plot Job Editor, calling up Single Log pass will bring up a similar window. Editing the Format field will allow you to show the same pass, using different presentations.

Note: This same window allows you to show the same pass with different logging scales.

Note: Annotations must be made from the Interactive Replay Window for each presentation, as the annotations will not be transferred from one presentation to another.

Define Graphics File	
Type	Log
Database	c:\warrior\data\cssmtest.db
Dataset	field/well/run1/pass1.4
Format	SCBL.PRS
Start At	8874.73
Stop At	8776.22
Scale	200

APPENDIX A

OD	PIPE		1 11/16" RCBS				3 1/8" RCBL			
	WEIGHT	ID	RADIAL	3 FT	5 FT	AMP	RADIAL	3 FT	5 FT	AMP
2.875	6.500	2.441	128	204	318					
	7.900	2.323	126	202	316					
	8.700	2.259	125	201	315					
	9.500	2.195	123	199	313					
	10.700	2.091	121	197	311					
	11.000	2.065	121	197	311					
3.500	9.300	2.992	139	215	329					
	10.300	2.922	138	214	328					
	12.800	2.764	135	211	325					
	12.950	2.750	134	210	324					
	15.800	2.548	130	206	320					
	16.700	2.480	129	205	319					
4.000	11.850	3.476	149	225	339					
	14.000	3.340	146	222	336					
4.500	9.500	4.090	161	237	351	151	208	322		
	10.500	4.052	160	236	350	150	207	321		
	11.600	4.000	159	235	349	149	206	320		
	13.500	3.920	157	233	347	148	205	319		
	15.100	3.826	155	231	345	146	203	317		
5.000	11.500	4.560	170	246	360	160	217	331		
	13.000	4.494	169	245	359	159	216	330		
	15.000	4.408	167	243	357	157	214	328		
	18.000	4.276	164	240	354	155	212	326		
	20.300	4.184	162	238	352	153	210	324		
	23.200	4.044	160	236	350	150	207	321		
	24.200	4.000	159	235	349	149	206	320		
5.500	13.000	5.044	179	255	369	170	227	341		
	14.000	5.012	179	255	369	169	226	340		
	15.500	4.950	177	253	367	168	225	339		
	17.000	4.892	176	252	366	167	224	338		
	20.000	4.778	174	250	364	165	222	336		
	23.000	4.670	172	248	362	163	220	334		
	26.000	4.548	170	246	360	160	217	331		

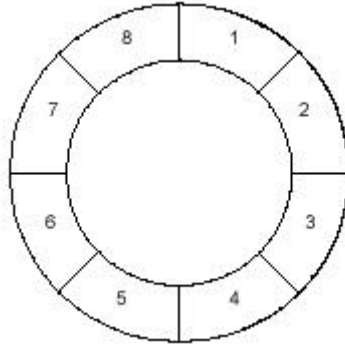
6.000	15.000	5.524	189	265	379	179	236	350
	18.000	5.424	187	263	377	177	234	348
	20.000	5.352	185	261	375	176	233	347
	23.000	5.240	183	259	373	174	231	345
	26.000	5.132	181	257	371	172	229	343
6.625	17.000	6.135	201	277	391	191	248	362
	20.000	6.047	199	275	389	190	247	361
	24.000	5.921	197	273	387	187	244	358
	28.000	5.791	194	270	384	185	242	356
	32.000	5.675	192	268	382	182	239	353
7.000	17.000	6.538	209	285	399	199	256	370
	20.000	6.456	207	283	397	198	255	369
	23.000	6.366	205	281	395	196	253	367
	26.000	6.276	203	279	393	194	251	365
	29.000	6.184	202	278	392	192	249	363
	32.000	6.094	200	276	390	190	247	361
	35.000	6.004	198	274	388	189	246	360
	38.000	5.920	196	272	386	187	244	358
7.625	20.000	7.125				211	268	382
	24.000	7.025				209	266	380
	26.400	6.969				208	265	379
	29.700	6.875				206	263	377
	33.700	6.765				204	261	375
	39.000	6.625				201	258	372
	45.300	6.435				197	254	368
8.625	24.000	8.097				230	287	401
	28.000	8.017				228	285	399
	32.000	7.921				226	283	397
	36.000	7.825				224	281	395
	40.000	7.725				222	279	393
	44.000	7.625				220	277	391
	49.000	7.511				218	275	389
9.625	29.300	9.063				249	306	420
	32.300	9.001				247	304	418
	36.000	8.921				246	303	417
	40.000	8.835				244	301	415
	43.500	8.755				243	300	414
	47.000	8.681				241	298	412
	53.500	8.535				238	295	409
	58.400	8.435				236	293	407
	61.100	8.375				235	292	406
	71.800	8.125				230	287	401

APPENDIX B

The Cement Map Explained

A. Introduction:

The heart of the Radial Bond Tool is the segmented crystal found below the transmitter. This crystal is cylindrical in shape. It is divided into 6 or 8 segments, each of which covers a section of the well bore.



B. The Calibration Procedure:

When the Radial Bond Tool is calibrated, the sonde section is rigidly centralized in a 5-1/2" calibration chamber and the chamber is pressured up to 500 lbs of water pressure. The tool is powered up and the calibration signal is set to a reference voltage, using pots within the electronics section of the tool. Gates are then set over E1 of the 3ft, 5ft, and each of the segmented crystals. Each of these signals is then set to 1 Volt, again using pots within the electronics section.

Using the SCBL Shop/Free Pipe Calibration routine, the tool is then calibrated so that each of the signals reads 100 millivolts within the test chamber. Then, the test chamber is depressurized, and the tool is rotated 180 degrees. The test chamber is again pressurized and the calibrations are checked again to assure that the tool was properly centralized during the calibration procedure.

NOTE: While it is true that the expected amplitude reading for the 3ft receiver in 5-1/2" casing is 72 millivolts, that is the expected reading with pressurized water on the backside of the casing. The presence of air on the backside allows the test chamber to vibrate more freely than 5-1/2" casing. The expected readings of the 3ft in various sizes of pipe, are based upon a tool calibrated to 100 millivolts in a 5-1/2" test chamber with air on the backside.

C. The Radial Readings:

With the Shop Calibration recorded in the Tools.ini file, all that is left for the Engineer to do at the well site, is to perform the SCBL Wellsite Internal Reference Cal and the SCBL Air Zero Cal. These calibrations generate a secondary Gain and Offset that are applied to readings from the SCBL outputs before they are plotted and recorded. These secondary calibrations are identified by WS_ and are listed directly under the curve to which they are applied.

Name	Type	Gain	Hi Read	Hi Ref	Lo Read	Lo Ref	Offset
AMP3FT	Lin2Pt	97.649	1.009	100.000	-0.015	0.000	3.004
WS_3FT	Lin2Pt	1.008	0.000	0.000	0.005	0.000	-0.021
AMPCAL	Lin2Pt	66.102	1.503	100.000	-0.009	0.000	0.625
WS_CAL	Lin2Pt	1.008	1.493	1.503	-0.008	-0.009	-0.001
AMP5FT	Lin2Pt	98.521	1.000	100.000	-0.015	0.000	1.491
WS_5FT	Lin2Pt	1.008	0.000	0.000	-0.006	0.000	-0.009
AMPSUM	Lin2Pt	99.273	0.993	100.000	-0.014	0.000	1.403
WS_SUM	Lin2Pt	1.008	0.000	0.000	-0.008	0.000	-0.006
AMPS1	Lin2Pt	97.452	1.011	100.000	-0.015	0.000	1.482
WS_S1	Lin2Pt	1.008	0.000	0.000	-0.008	0.000	-0.007
AMPS2	Lin2Pt	98.770	0.997	100.000	-0.015	0.000	1.505
WS_S2	Lin2Pt	1.008	0.000	0.000	-0.006	0.000	-0.009
AMPS3	Lin2Pt	98.485	1.002	100.000	-0.014	0.000	1.366
WS_S3	Lin2Pt	1.008	0.000	0.000	-0.008	0.000	-0.006
AMPS4	Lin2Pt	97.953	1.008	100.000	-0.013	0.000	1.296
WS_S4	Lin2Pt	1.008	0.000	0.000	-0.007	0.000	-0.006
AMPS5	Lin2Pt	97.091	1.016	100.000	-0.014	0.000	1.337
WS_S5	Lin2Pt	1.008	0.000	0.000	-0.003	0.000	-0.011
AMPS6	Lin2Pt	98.266	1.004	100.000	-0.014	0.000	1.346
WS_S6	Lin2Pt	1.008	0.000	0.000	-0.008	0.000	-0.006
AMPS7	Lin2Pt	99.237	0.994	100.000	-0.013	0.000	1.325
WS_S7	Lin2Pt	1.008	0.000	0.000	-0.008	0.000	-0.006
AMPS8	Lin2Pt	99.230	0.995	100.000	-0.013	0.000	1.308
WS_S8	Lin2Pt	1.008	0.000	0.000	-0.007	0.000	-0.006

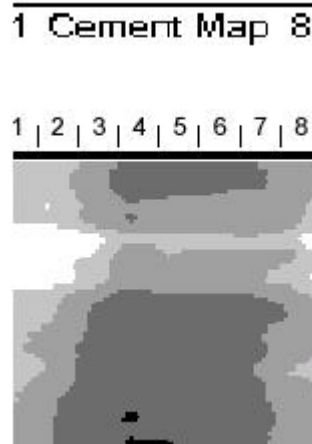
When the SCBL Internal Reference Calibration is performed, the High and Lo Read of the AMPCAL from the Shop Calibration are used as the Hi and Lo Ref for the WS_CAL and the Calibration Signal is calibrated back to the readings taken during the Shop Calibration. The Gain derived from this calibration is then applied to ALL of the Bond curves. This calibration adjusts the Warrior Logging System for differences in line length and variations in CBL/BHC Signal gains.

When the SCBL Air Zero Cal is performed, the gates of all the bond signals are set to their approximate values for the casing size anticipated by choosing the appropriate Setup (under *Load Setup*), while tool is in air. This calibration generates the secondary calibration offset, which is applied to each of the Bond curves individually. When using Shop Calibrations for logging, both of these calibrations must be done before going in the hole. If, for some reason a Wellsite Calibration is performed, there is no need to perform these two additional calibrations. Wellsite calibrations are not recommended except under unusual situations.

The Cement Map:

The Cement Map is a graphical representation of the response of the sector measurements. The shading of the cement map is purely representative of the recorded amplitude readings from the various sectors. Look back to the representation of the segmented crystal shown at the beginning of this bulletin, and visualize the sectors laid out horizontally.

Each of the individual sectors is represented by a section of the cement map, as shown below. The shade applied to each section of the map is a function of the amplitude of that sector as recorded.



The Warrior Logging System uses an algorithm to determine the shading associated with the amplitude recorded, based on several factors. These factors include:

1. The number of grayscales and the density of the grayscales in the Cement Map, as applied in the screen and printer setup within the Warrior.ini file.
2. The Filter level associated with each of the Sector Curves.
3. The amplitude reading of adjacent sectors.
4. The High Reference recorded in the Shop Calibration associated with each Sector Curve.
5. The Black and White values set in the presentation file.

Define Data Item

Data Source
DB Item: << Browse

Variable Data List

Position
Track #: Left value:
Right value:

Presentation Type
 Curve Variable Density Pattern Strip
 Tabular Signature Graphic Strip

Style
Set Intensity by: VDL Black Level:
 Percentage* Specific Values
VDL White Level:
Use % for sonic VDL, specific values for maps

Scale Type:
Label:
Color Map:

OK Cancel

The only factor under control of the engineer is the Black and White values within the presentation file. The purpose of the Cement Map is to graphically illustrate small channels that may pose a problem. With that end in mind, the following is the proscribed setup for the Cement Map.

With the Black and White Levels set as above, the grays scales of the Cement Map will change as follows:

- | | |
|--|-------------|
| 1. Amplitudes less than 10mv | Black |
| 2. Amplitudes greater than 10.0mv and less than 26.7mv | Dark Gray |
| 3. Amplitudes greater than 26.7mv and less than 43.3mv | Medium Gray |
| 4. Amplitudes greater than 43.3mv and less than 60.0mv | Light Gray |
| 5. Amplitudes greater than 60.0mv | White |

If different gray scales are needed for a particular application, contact Technical Support.

E. Logging Conditions:

The Cement Map is a visual representation of the cement conditions behind the pipe. The Sector Crystal is not free to rotate within the tool, and the cement and casing are not free to rotate. However, the tool itself is free to rotate with the well, and it is expected that it will. For this reason, apparent “channels” may rotate within the cement map while running repeats, and that the Cement Map may not repeat exactly.

The Cement Map also becomes an important aid to quickly identify problems in tool setup or logging procedures.