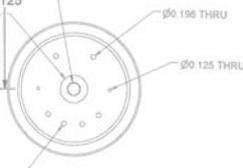
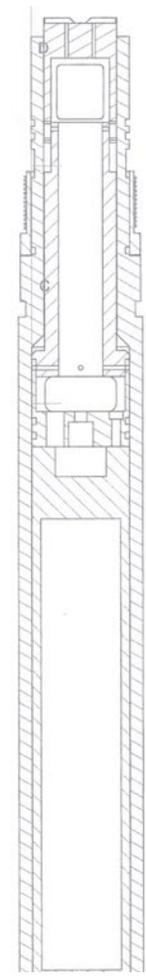
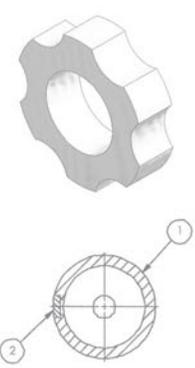
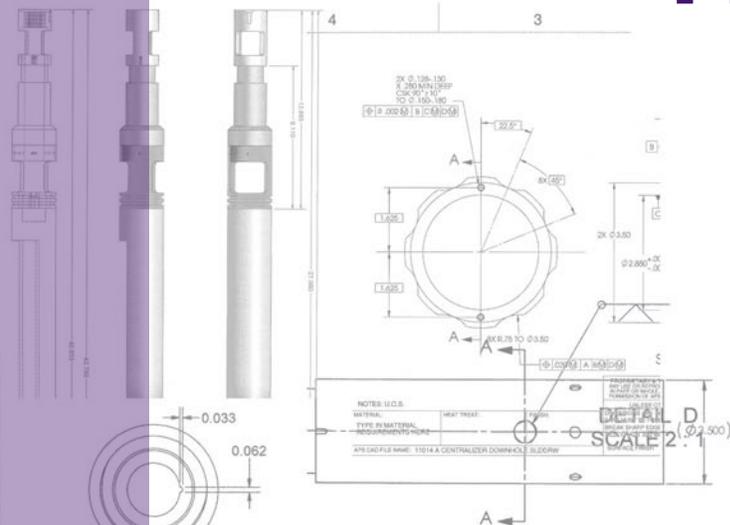


Temperature / Acceleration / Pressure Tool (TAP)





Temperature/Acceleration/Pressure Tool (TAP)

Operation Instructions for Memory Mode

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Section I

Overview

These operating instructions describe logging operations with the Temperature/Acceleration/Pressure (TAP) Tool. Designed as a replacement for the Lamont Temperature Tool (TLT), the TAP Tool was developed as a “dual application” logging tool that can be run as either a wireline tool or memory tool while using the same set of sensors and data acquisition electronics. The advantages of this approach include greater flexibility in logging operations, substantially improved quality and resolution of data, extended ambient temperature range (in the wireline mode), etc. In the “wireline mode” the tool overcomes most of the TLT’s limitations for making precise temperature/pressure measurements, while preserving the capability to make “quick and dirty” measurements when operating as the part of the Schlumberger tool string.

This document describes the TAP Tool operation in memory mode. In this mode the TAP Tool operates as a memory tool recording ambient temperature, pressure, and acceleration at a specified sampling rate. For logging operations the tool is attached to the bottom of Schlumberger logging string. The tool does not require electrical connection to the logging cable. The data is off-loaded to the third party data acquisition computer after the tool is retrieved from the hole.

The TAP starts recording from a predetermined hole depth (calculated from the pressure sensor signal) and the data can be recorded while logging uphole or downhole. The TAP.vi LabView program allows for the correlation of recorded data with the logging depth.

Section II

Specifications

| | |
|---|-------------------------------|
| Tool length: | 8.895 ft (2.71 m) |
| Tool diameter: | 3.25 in (8.26 cm) |
| Temperature rating: | 105° C (220° F) |
| Weight: | ~110 lbs (41.06 kg) |
| Acceleration measurement range: | -2 g to +2 g |
| Acceleration resolution: | 1 mm/s ² |
| Acceleration sampling rate: | |
| Low resolution mode (LR): | 4 Hz |
| High resolution mode (HR): | 8 Hz |
| Temperature measurement range: | -4° C to 85° C |
| Temperature resolution: | 0.005° C |
| Pressure measurement range: | 0 - 10,000 psi |
| Pressure resolution: | 1 psi |
| Pressure measurement precision: | 0.1% FS |
| Temperature/pressure sampling rate: | 1 Hz |
| Total data recording time: | |
| in HR mode: | 5 hr. |
| in LR mode: | 8 hr. |
| Power source: | 8 alkaline batteries (D type) |
| Total operation time from one set of batteries: | ~ 40 hr. |

Section III

Tool Preparation

NOTE: Before using the TAP Tool, always check the README file in the “TAP DAS” directory for information about the latest hardware/software upgrades.

- A. Approximately 1/2 to 1 hour before logging operations begin, remove the end cap from the TAP Tool. Pull out the connector carrier using the extraction tool as shown in Fig. I.
- B. Connect the TAP Serial Cable marked “TAP” (DB25 - six pin round connector) to the input of the Tool Bench Serial Line (DB25) and the Serial Data Connector on the tool (see Fig. I). Make sure that the slots and notches on the cable and tool parts of the connector match each other. Lock the cable part of the connector by gently rotating the outer shell. **DO NOT APPLY EXCESSIVE FORCE!**
- C. Make sure that the “SERIAL” switch, located on the serial communication strip on the back of the data acquisition rack, is off.
- D. Turn the computer on. When the computer boots up you will see the Windows 98 desktop with icons representing frequently used applications.
- E. Start the TAP Tool data acquisition program by double clicking the “TAP Tool” icon. This will bring up the “Terminal - TAP.TRM” communication window.

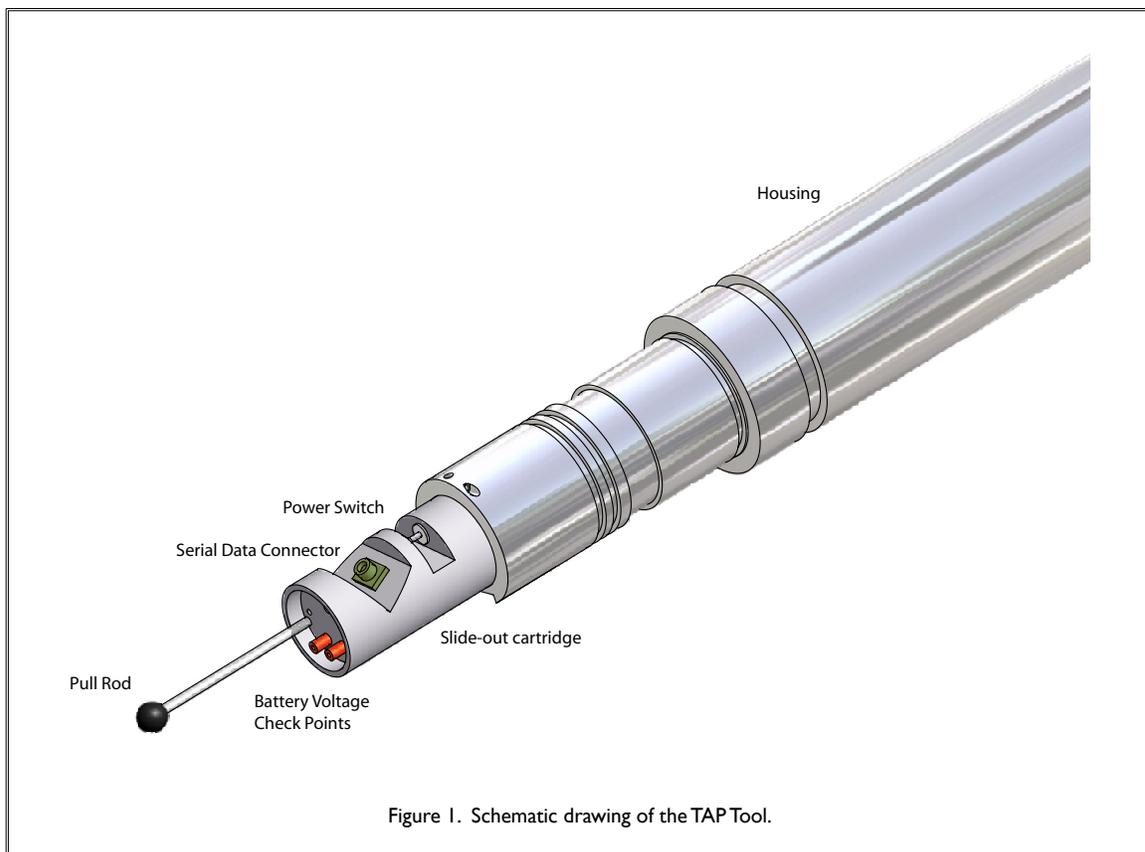
The following settings are required to communicate with the TAP Tool:

Baud rate - 19200
Data Bits - 8
Parity - none
Stop Bits - 1
Flow Control - none

(NOTE: The information above is given only for reference. The serial port in the TAP DAS program is initialized automatically with the right settings, and you should not attempt to change them manually unless advised to by BRG engineers.)

- F. Turn on the TAP Tool power switch (Fig. I). If the tool is connected properly you will see a welcome message and a message from the TAP self-diagnostics routine (see the Sample Dialog in Appendix A of this document). If the diagnostics message says “Hardware OK,” you can start initializing the tool. Do not operate the tool if you get the diagnostic message “Hardware failure” - this means there is a major problem with the tool electronics. Another

possible message is “Low battery,” which appears if the battery voltage in the tool is lower than 9V. Be sure to replace the battery in this case (see Section IX on battery replacement).



Section IV

Tool Initialization and Assembly

The initialization procedure for the TAP Tool involves synchronizing the TAP clock with the PC-DAS date and time, and then setting the logging direction (up or down) and starting depth. (You can refer to the Sample Dialog in Appendix A of this document for an example of the procedure.)

- A. To set the time, enter a time figure in advance and hit the Carriage Return (<CR>) at the moment when the terminal clock shows the predetermined time.
- B. When logging down, set the initial depth to 200 m less than the actual depth. When logging up, set the initial depth to 200 m greater. For bench testing, set the initial depth to zero.
- C. The tool always displays the figures you type and asks for confirmation of your input ("Correct? (1=yes, 0=no):"). Type "0" if you mis-typed data and you will be able to repeat your input. You must use the suggested format for date and time.
- D. Hit <CR> after initialization is complete and you will see the MAIN MENU (See Appendix for further details). Choose Option 1 for recording acceleration or Option 2 for temperature logging. The tool will then start the pressure transducer calibration procedure; when the procedure is complete it outputs the message:

```
Ready to log  
Disconnect serial line
```

- E. Disconnect the interface cable from the tattletale board jack.
- F. Assemble the tool. Take one connecting pin, two screws and a flat head screw driver with you out to the rig floor and connect the TAP Tool to the bottom of the Triple Combo. The TAP should be attached to the lower section of the Schlumberger DIT-E.

Section V

Recording Depth and Heave Data

- A. Before starting the process of recording data, make sure that:
1. The MCM system is running.
 2. The Wireline Heave Compensator (WHC) is running.
 3. The serial switch on the back of the PC-DAS rack is in the ON position.
- B. While the TAP Tool is deployed, double click the “TAP Depth” icon to launch the recording program. The LabView application starts and you will see the front panel of the depth-heave recorder (see Figure 2, below). All controls on the front panel are operated by mouse clicks. The recording program (TAP.vi) has two modes of operation, controlled by a “Mode” switch (Figure 2). To record depth/heave data for the TAP Tool you should use “Depth” mode (this is the default mode when the program starts). The “Heave” mode is used for recording WHC and depth information when running logs with tool strings, which do not include the TAP Tool. The program operation in both modes is identical from the operator’s point of view, but in the “Heave” mode the program records a few WHC internal parameters along with depth/heave data; this is necessary for evaluation of the WHC performance.

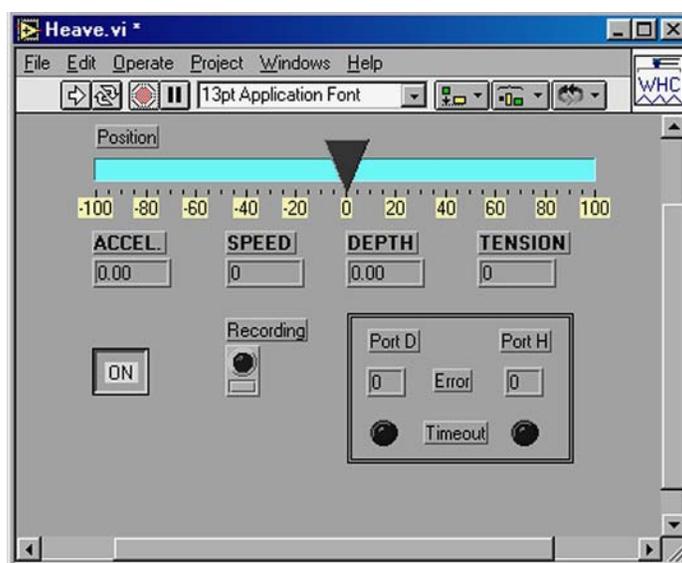


Figure 2. The front panel of the depth-heave recorder.

- C. Start recorder operation by clicking the RUN button. If the Schlumberger MCM logging system, WHC and serial lines are operating, the indicators on the front panel will show you the depth and heave parameters as follows:
- Slider “Position” (current position of the WHC carriage)
 - Digital indicators “Accel,” “Speed,” “Depth,” and “Tension” (numeric values of ship’s acceleration (in m/s^2), logging speed (in m/s), current depth (in m), and logging cable tension (in lb))
 - Error indicators for serial ports (“Port D” and “Port C”) should show “0,” and both timeout indicators should be black. If the timeout indicators are red, it indicates a serial data transmission failure. Please check the serial switch position in this case.
- D. You will be prompted with a data file name. Change it only if you need to record more than one depth file with the same date. Otherwise the date should always be present in the data file name.
- E. To start recording data, click the “Write” button. The “Write” LED will turn green. To stop recording, click the “Write” button again.

WARNING: Make sure that you start depth recording before the TAP Tool begins taking measurements. In the DOWN mode, this would be about 300m **above** the sea floor (or predetermined recording depth); when logging in the UP mode, it should be 300m **below** the predetermined depth. Do not interrupt depth recording while the TAP Tool is downhole.

- F. When the logging operation is complete, stop the depth recording by clicking the ON/OFF button. Clean the tool, bring it to the DHML and position it on the tool bench.

Section VI

Off-Loading Data

- A. Remove the end cap and connect the serial cable. You should not have closed the terminal window during logging, but if you did so start the "TAP Tool" application again as described in the previous section. Now you are ready to offload data from the tool's memory.

- B. Stop data recording by hitting CR. You will see the Main Menu in the terminal window. After choosing Option 3 ("Offload") from the menu you will see the message, "Prepare to save data file and hit CR". Choose the "Receive text File" option in the TRANSFERS menu. You will be prompted to choose the file name in the "Receive text File" dialog window. You can choose any file name (within DOS naming conventions), but the following names are recommended:

TDMMDYY.DAT - for temperature data

ACMMDYY.DAT - for acceleration data

- C. After naming the data file, click OK in the "Receive Text File" window. Then hit CR and observe the data scrolling in the terminal window. Once all of the data is dumped, the tool sends the message "Save data file and hit CR to continue." At this point you should click on the function key "Stop" under terminal window and then hit CR. The operation of saving data is finished and the program displays the Main Menu. You can repeat the offloading of data as many times as is necessary.

Important Note: Never interrupt the process of data transfer, otherwise part of the data remaining in memory will be lost.

- D. After downloading, choose the option "Quit" from Main Menu and disconnect the battery (by turning off the Tool Power Switch on the battery cartridge).

Section VII

Data File Structure and Data Processing

The data file is a sequence of ASCII lines separated by Line Feed (LF) and Carriage Return (CR) characters, starting with a three-line header. The first line of the header shows the type of data (“Low Resolution Data” or “High Resolution Data”), and the next two lines contain the date of logging and starting time of recording in HH:MM:SS format.

The next lines contain measurement data. The data format for Low Resolution mode is shown in Appendix A. The first column of data is ambient temperature in degrees C; the second is ambient pressure in psi; the next four columns contain four consecutive readings of acceleration data in mm/sec²; and the last line is the internal temperature in the electronics cartridge of the tool in degrees C. The ambient temperature data resolution is 0.001 °C, and the sampling rate is one reading per second.

The data format in High Resolution mode includes four additional acceleration data columns and a column for tension data (not valid in the Memory Mode). An example is shown below:

High Resolution Data

Date: 10/09/98

Time: 02:09:35

| TEMP | PRES | ACCL1 | ACCL2 | ACCL3 | ACCL4 | ACCL5 | ACCL6 | ACCL7 | ACCL8 | TINT |
|--------|------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| 22.532 | 0 | -259 | -233 | -266 | -236 | -262 | -238 | -258 | -240 | 26.8 |
| 22.484 | 0 | -253 | -232 | -259 | -240 | -267 | -232 | -265 | -243 | 26.8 |
| 22.476 | -4 | -253 | -247 | -265 | -235 | -262 | -232 | -260 | -241 | 26.8 |
| 22.489 | -3 | -257 | -244 | -260 | -238 | -264 | -238 | -259 | -246 | 26.8 |
| 22.502 | -2 | -255 | -243 | -247 | -235 | -259 | -234 | -263 | -234 | 26.8 |
| 22.489 | -1 | -255 | -240 | -251 | -249 | -266 | -228 | -261 | -238 | 26.8 |
| 22.513 | -1 | -264 | -262 | -252 | -244 | -270 | -237 | -260 | -234 | 26.8 |
| 22.505 | -2 | -263 | -237 | -249 | -251 | -248 | -237 | -261 | -231 | 26.8 |
| 22.516 | 0 | -264 | -243 | -259 | -244 | -253 | -252 | -268 | -241 | 26.8 |
| 22.511 | -1 | -262 | -244 | -255 | -246 | -252 | -252 | -264 | -240 | 26.8 |

The TAP Tool data file can be loaded directly into Kaleidagraph or Excel for plotting and/or data processing.

Before using the pressure data for depth calculation it is recommended to smooth them by running an averaging program (such as a Kaleidagraph macro) with a window width equal to 5 samples.

IMPORTANT: You must present to LDEO original (unedited) data files produced by the TAP Tool and TAP Depth programs.

Section VIII

Tool Maintenance

- A. Check the batteries regularly. There should be no visible damage or stains on them, and the voltage on the test jacks should be about 12.2V for a new battery set. You will get a “Low battery” message if the battery voltage drops lower than 9V, in which case you should replace the batteries. Remove the old or damaged “D” cells from their holders, discard them and install the new ones. (For detailed instructions, see Section IX.) Batteries are connected in series, and “+” should be connected to the “+” terminal of the battery holder.
- B. Replace the O-rings in the end cap of the tool every 5 runs, or sooner if they are damaged. Use Lubriplate 930 grease on the O-rings and threads. Cover them with thin layer of grease and be sure to wipe off any extra grease in order to prevent contamination of the rest of the tool as it is assembled.

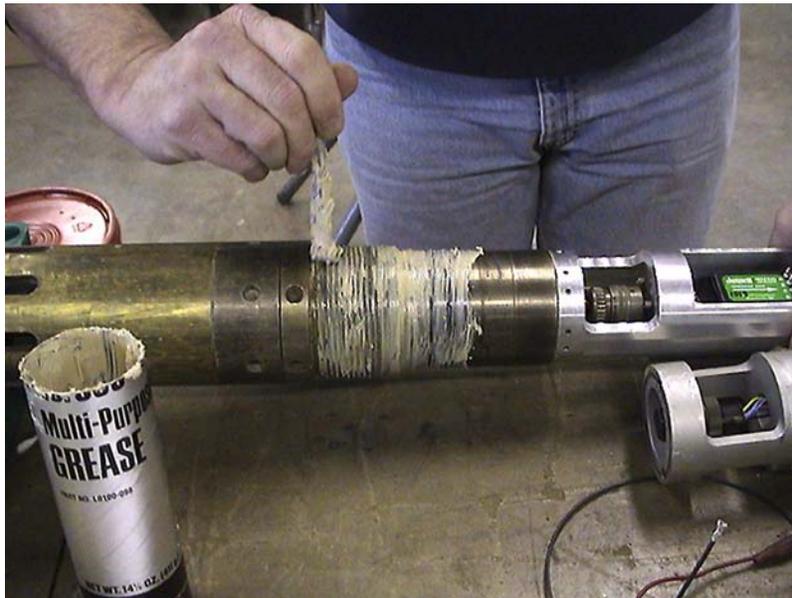


Figure 2. Application of Lubriplate 930 grease after replacement of the O-rings.

- C. Assemble the tool. If you plan to start working with the tool immediately, do not put the upper end cap on the tool.

Section IX

Changing the Batteries

- A. Clamp the tool in the vise with (if possible) the upper part of the tool extending over the edge of the bench. Locate the lower threaded collar wrench holes. Using a pin wrench, turn the lower collar counter-clockwise looking down from the top of the tool. Continue turning until the collar is free, and remove the complete assembly.



Figure 3. Unscrewing the assembly from the tool.

- B. Remove the battery cartridge by pulling it out of the top of the tool. Remove the old batteries. Before installing new batteries, wrap 1-2 coats of electrical tape around each battery end. This will insure that during high vibration periods the batteries won't get chafed, causing a possible short circuit. Now install the fresh batteries; make sure that the polarity is correct! Once the batteries are installed, slide the battery cartridge slowly back into the tool until it hits the end (see Figure 4, next page), and then slowly rotate as you keep pushing the cartridge into the tool. At some point the pinholes on the battery cartridge will align with the pins on the tool chassis, and then the cartridge will slide in approximately 1 more inch (see Figure 5, next page).



Figure 4. Sliding the battery cartridge back into the tool.



Figure 5. Aligning the cartridge's pinholes with the tool chassis's pins.

- D. Reinstall the threaded collar by rotating it clockwise.
- E. Lastly, attach the top connector and tighten it with the pin wrenches.



Figure 6. Tightening the top connector.

Appendix A: Memory Mode Sample Dialog

Operator's input is printed in **Purple Bold**.

Every operator's message should be terminated with a <CR>.

Comments printed in *blue italics*.

Welcome!

Testing hardware ...

Wait ...

After powering up, the tool outputs a welcome message and runs self-diagnostic routines.

The tool's microcontroller runs a hardware testing routine here, which takes about 10-12 seconds.

Hardware OK

Checking battery ...

Vbat=12.0

Battery OK

You will get a "Low Battery" message if the battery voltage is lower than 9V. Replace the tool's battery if this message appears.

Hit CR to continue ...

You should press CR after receiving this message.

Set Date (dd/mm/yy): **06/06/96**

Set Time (hh:mm:ss): **16:08:20**

Follow the time-setting procedure in Section IV of this manual.

Date: 6/6/96

Time: 16:8:20

Correct?: (1=yes, 0=no): **1**

Set initial depth (m): **2400**

Set direction of logging: (1-up, 0-down): **1**

Initial depth-2400m, logging up

Correct? (1=yes, 0=no): **1**

Hit CR to continue ...

Set start depth as described in Section IV. Set depth to 0 if you want to test the tool or start its operation immediately.

After you press CR, the program returns to the Main Menu dialog, and you can choose the measurement mode.

MAIN MENU

HI-Res - 1
LO-Res - 2
TP-log - 3
Offload - 4
Quit - 5

Choose option (1-5): **2**

Low resolution measurement mode was chosen. This is a primary mode for temperature measurements.

Calibrating transducers
Wait ...

The tool starts the calibration procedure, which takes 10-15 seconds.

Calibration done
Temp = 22.5 deg. C
Pres = 1 psi
Ready to log

Calibration is finished and the tool outputs calculated values of temperature and pressure.

Pressure readings should be within +/- 5 psi range.

Disconnect serial line

After 10 second delay, the tool is ready to start measurements. You should disconnect the serial cable within this time interval.

Logging operations now take place ...

The tool is back on deck ...

At this point, you've opened the tool, connected the serial cable and pressed CR ...

MAIN MENU

The Main Menu reappears and you begin the offloading process.

HI-Res - 1
LO-Res - 2
Offload - 3
Quit - 4

Choose option (1-4): **3**
Prepare to save data file and hit CR

You have now issued the command to offload data. Prepare to receive data as described in Section VI.

Low Resolution Data

Date: 10/09/98

Time: 02:11:30

| TEMP | PRES | ACCL1 | ACCL2 | ACCL3 | ACCL4 | TINT |
|--------|------|-------|-------|-------|-------|------|
| 22.559 | 0 | -243 | -237 | -249 | -240 | 26.9 |
| 22.570 | 0 | -247 | -241 | -247 | -246 | 26.9 |
| 22.561 | 0 | -238 | -241 | -240 | -248 | 26.9 |
| 22.554 | 0 | -243 | -242 | -242 | -246 | 26.9 |
| 22.552 | -1 | -244 | -244 | -243 | -251 | 26.9 |
| 22.554 | 0 | -251 | -245 | -242 | -246 | 26.9 |
| 22.546 | 0 | -249 | -247 | -241 | -241 | 26.8 |
| 22.548 | 0 | -247 | -241 | -242 | -238 | 26.8 |
| 22.550 | -1 | -249 | -253 | -249 | -236 | 26.9 |
| 22.546 | -2 | -243 | -241 | -253 | -247 | 26.8 |

.....

| | | | | | | |
|--------|----|------|------|------|------|------|
| 22.554 | -1 | -236 | -244 | -241 | -243 | 26.9 |
| 22.548 | 0 | -238 | -241 | -243 | -249 | 26.9 |
| 22.548 | 0 | -244 | -229 | -246 | -253 | 26.9 |
| 22.540 | 0 | -244 | -268 | -246 | -237 | 26.8 |
| 22.527 | 0 | -246 | -237 | -242 | -229 | 26.9 |

Done! Save the data file and hit CR to continue ...

MAIN MENU

HI-Res - 1
 LO-Res - 2
 Offload - 3
 Quit - 4

Choose option (1-4): **4**

This shuts down tool operations.

Don't forget to turn the tool off!!

Appendix B: Quick Start

TAP - TEST PROCEDURE

| Bench / tool | Acquisition PC |
|----------------------------------|---|
| 1) remove cap | |
| 2) connect cable | |
| | 3) serial switch OFF |
| | 4) run TAP TERMINAL |
| 5) Switch ON tool | |
| | 6) See messages and voltage |
| | 7) Initialize tool date, time, depth, DOWN (0) [CR] Low res.(2) |
| 8) Disconnect/Reconnect | |
| | 9) CR to access main menu |
| | 10) off load data |
| | Trsfert menu/ receive txt file Filename TDMMDDYY.txt |
| | OK (receive file) |
| | CR to dump file |
| | CR to continue |
| | Stop (terminal window) CR |
| | 11) Redo 10 |
| | 12) quit |
| 13) switch tool off / disconnect | |

TAP - LOGGING OPERATION

I) INITIALIZATION

| Bench / tool | Acquisition PC |
|---|---|
| 1) remove cap | |
| 2) connect cable | |
| | 3) serial switch OFF |
| | 4) run TAP TERMINAL |
| 5) Switch ON tool | |
| | 6) See messages and voltage |
| | 7) Initialize tool date, time, depth (-200m), DOWN (0) [C] Low res. (2) Disconnect serial line! |
| 8) Disconnect Assemble with Triple Combo | DO NOT CLOSE TAP TERMINAL WINDOW |

II) RECORDING DEPTH

| Bench / tool | Acquisition PC |
|--------------|--|
| | 1) serial switch ON |
| | 2) Depth recorder ON – MODE 2 |
| | 3) Run TAP Depth |
| | 4) filename |
| | 5) WRITE button GREEN when done STOP – File close |
| | 6) switch OFF depth recorder |

III) OFFLOADING DATA

| <u>Bench / tool</u> | <u>Acquisition PC</u> |
|---------------------------------|--|
| | 1) serial switch OFF |
| 2) remove cap | |
| 3) connect cable | |
| | 4) CR to access main menu |
| | 5) off load data (3) |
| | Transfer menu/ receive txt file Filename TDMMDDYY.txt |
| | OK (receive file) |
| | CR to dump file |
| | CR to continue |
| | Stop (terminal window) CR |
| | 6) Redo 5 – check size of the files |
| | 7) quit |
| 8) switch tool off / disconnect | |