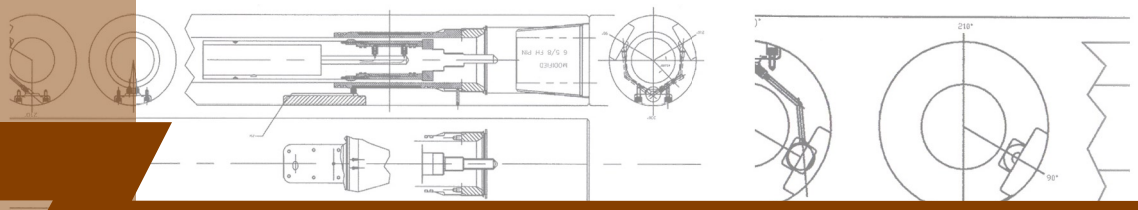
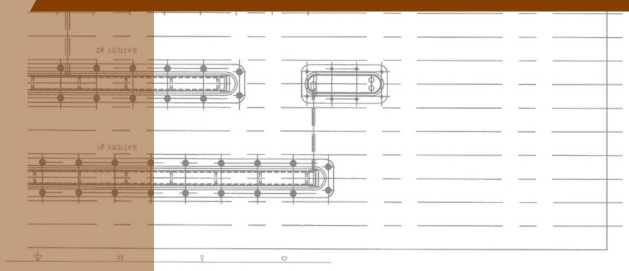
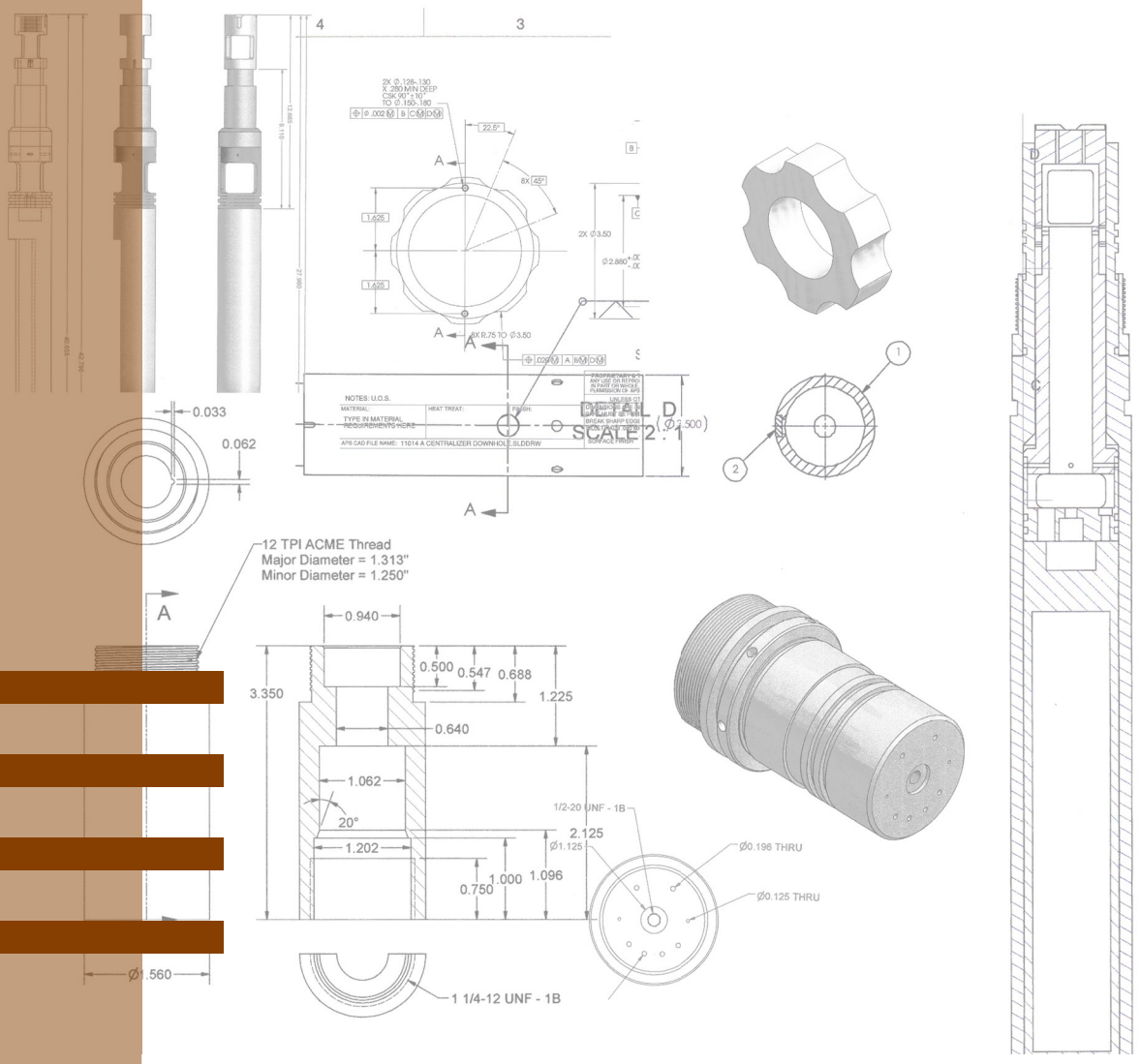




Core Barrel Temperature Tool



12/2004

Core Barrel Temperature Tool

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Section 1

Overview

The core barrel temperature tool (CB-TT) was developed for assessing temperature conditions while drilling for successful subsequent logging-while-drilling (LWD) operations in hydrothermal environments. Similar to the drill string accelerometer (DSA), the CB-TT is another development in the series of measurements-while-coring (MWC) that will be used to characterize *in situ* drilling conditions. The primary purpose of the CB-TT is to measure and record the borehole temperatures and pump rates while drilling in order to determine the feasibility of performing LWD operations in potentially high temperature conditions. The CB-TT contains a thermocouple and a battery operated electronics board encased in a single dewar inside the pressure case that was designed for the DSA.

For ease of deployment, the CB-TT has been designed as a removable extension of the RCB core barrel. Using standard threaded connections, the CB-TT is attached to the top of the core barrel by a core technician prior to core barrel deployment. Except for the connection and disconnection of the CB-TT, coring activities are not affected by its presence. Upon CB-TT/core barrel retrieval, the CB-TT is disconnected and the data downloaded to the third party data acquisition system in the DHML for immediate analysis. The data can then be correlated to pumping rates to determine the necessary parameter for successful subsequent LWD operations.

The CB-TT was tested on ODP Leg 193 (Manus Basin) as part of the measurement-while-coring project.

Section II

Tool Initialization

Tool initialization involves the following steps: Assemble the tool, check to make sure the battery has sufficient life, check to make sure the internal temperature is sufficiently low, synchronize the clock, and start logging.

A. Assemble the tool. The CB-TT electronics are housed in a dewar that is filled with glycerin for thermal mass, shown in Figure 1, below. The dewar then fits inside the DSA pressure case (replacing the DSA electronics), as shown in Figure 2 (next page).

Figure 1. CB-TT electronics and dewar. Note that the datalogger board is removed in this photo.

B. Initialize the software. To initialize the CB-TT, it must be removed from the dewar in order to reach the power switch.

C. Connect the CB-TT to a serial port on the logging computer. Connect one end of the CB-TT serial cable (shown in Figure 3) to the CB-TT (as shown in Figure 4), and the other end to the serial line that goes to the logging computer.

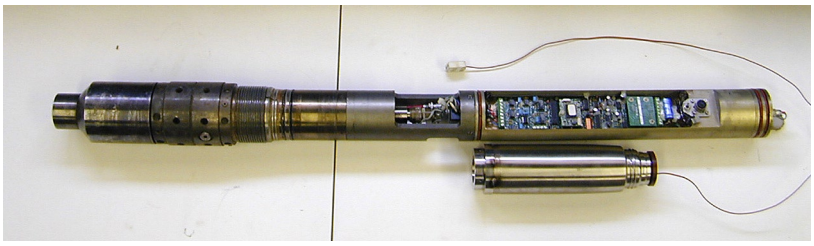

Figure 2. CB-TT dewar and DSA chassis. The CB-TT replaces the DSA electronics section, which it is next to in the picture. The CB-TT thermocouple wire connects to a thermocouple installed in the left-hand end of the DSA chassis.

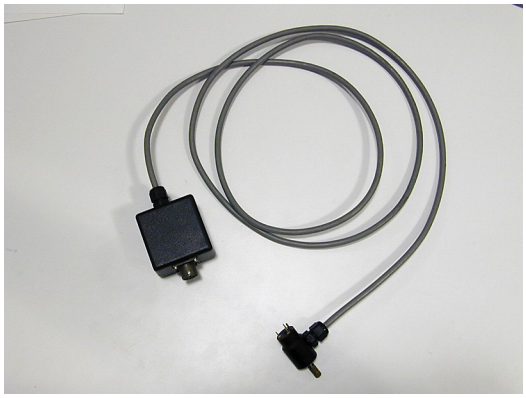

Figure 3. CB-TT serial cable.

Figure 4. CB-TT end of CB-TT serial cable.

D. Start hyperterminal, the program that is used to control the CB-TT, and configure the relevant serial port for:

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

E. Turn on the CB-TT by setting the power switch (shown in Figure 5, below) to "1".

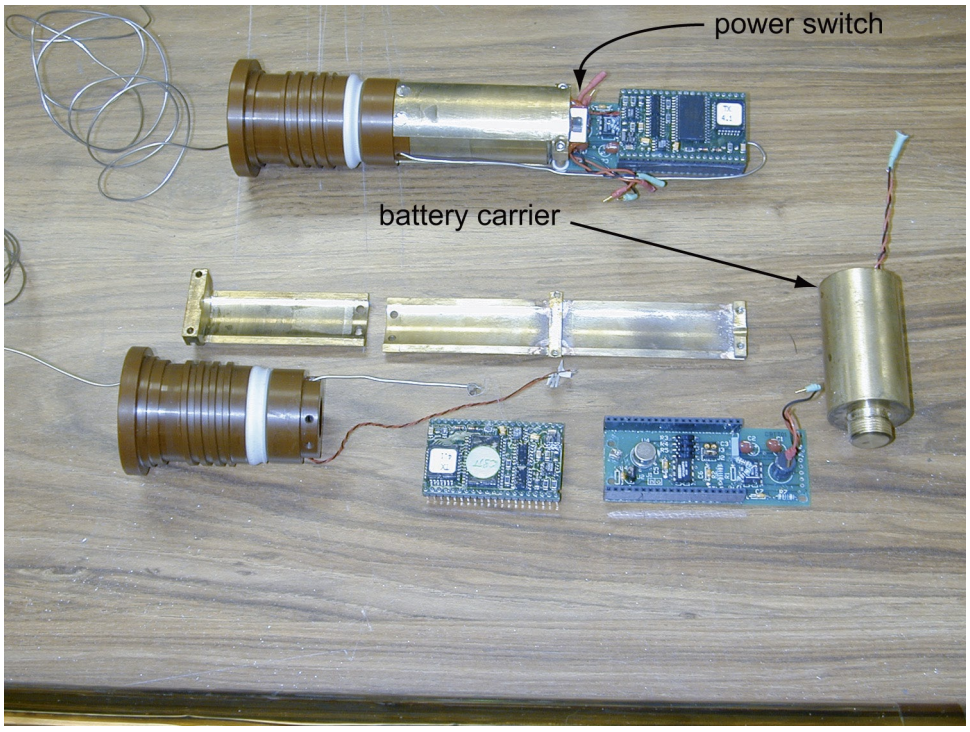

Figure 5. CB-TT electronics close-up, showing power switch and battery carrier.

You should see the following text in hyperterminal:

```
 _____________________________
| Core Barrel Temperature Tool |
|     Software Ver. 2.0        |
|   Developed by: A. Meltser   |
|______________________________|

MAIN MENU
Selftest   - 1
Initialize - 2
Logging    - 3
Offload    - 4
Real Time  - 5
Please choose menu option (1 - 5) :
```

F. Self test the CB-TT: Type "1," then "Enter." The tool will respond with something like:

```
Testing battery...
Voltage=3.64  Battery OK

Testing temperature sensors...

Internal temperature - 23.81 deg.C
External temperature - 22.22 deg.C

Are the temperature readings OK? (Y or N): y
Test OK
```

Type "Y", then "Enter."

Check that the battery has sufficient life - the CB-TT will tell you if it is OK.

Check that the internal temperature is < 80°C. If the CB-TT is being used multiple times in a hot hole, the temperature will be a bit higher each time it comes back. Keep a record of how quickly it rises so you can estimate when it will exceed the recommended maximum of 80°C. If it seems likely the tool will go over 80°C, put new glycerine in.

If you wish to do a more thorough test, type "5" to use real-time logging. This will continuously display temperatures. Type Ctrl C to quit, e.g.:

```
Ti = 25.88 *C, Te = 22.71 *C
Ti = 25.64 *C, Te = 22.63 *C
Ti = 25.70 *C, Te = 22.71 *C
```

G. Initialize the clock: Type "2", then Enter. Enter the date and time as prompted. A typical transcript is shown below:

```
Set date (dd/mm/yy)
Day:30 Month:11 Year:04

Set current time (hh:mm:ss)
Hours:10 Minutes:21 Seconds:00
The date is 30/11/04
The time is 10:21:00

Are the date and time settings correct ? (Y or N): y
```

NOTE: When entering date and time, do NOT use the implied "/" or ":" between fields. Use Enter instead (i.e., type number, then enter, then number, then enter, …)

H. Start Logging: Type "3", then "Enter" to start logging. You should see:

```
Starting recording...

Disconnect serial line
```

I. Disconnect the CB-TT cable.

J. Put the CB-TT electronics in the dewar, and fill with glycerine if necessary.

K. Connect the thermocouple wire to the thermocouple in the DSA chassis.

L. Put the chassis in the DSA pressure case and seal it up. The CB-TT is reading for logging.

Section III

Offloading Data

Once the CB-TT comes back from logging, you will need to offload the data it has collected.

A. Open the DSA pressure case and expose the end of the CB-TT. You can leave the CB-TT in the dewar and attached to the chassis when offloading data.

B. Connect the CB-TT cable to the CB-TT.

C. Start hyperterminal, as described earlier.

D. Type Ctrl C to wake the tool up. You should see:

```
MAIN MENU
 Selftest   - 1
 Initialize - 2
 Logging    - 3
 Offload    - 4
 Real Time  - 5
 Please choose menu option (1 - 5) :
```

E. Type "4", "CR" to start offload. You should see:

```
Prepare to save datafile and press CR
```

F. In hyperterminal, select a file to save the data too (Transfer menu, Capture Text).

G. Type CR. The tool will dump the temperature log to the screen and to the file you selected. The tool will finish with:

```
Save datafile and press CR
```

When you see this, end the capture. (Transfer menu, Capture Text, Stop). The data file is saved. The format is described in the following section.

Type Enter to get the menu again.

Section IV

Data File Format

An example data file produced by CB-TT is shown below:

```
Date: 30/11/04
Start time: 10:21:28
Datafile size: 16 points
22    23
22    25
22    24
…
22    23

Save datafile and press CR
```

The two columns are the temperatures; external first, then internal. The sample interval is 1/second. Note: the end of line characters are odd - LF followed by 2 CRs.

Section V

Changing the Battery

The tool must be completely dismantled to change the battery. The battery used is a Tadiran TL-6526 high temperature lithium (3.9V). It is glued into a special brass battery carrier, shown in Figure 5 (page 6).

Section VI

Troubleshooting

If serial communications cannot be established, check that the circuitry isn't shorted to the metal case. If the PCB screws are tightened too strongly, the insulating washers, shown in Figure 6, will compress and may cause a short circuit.

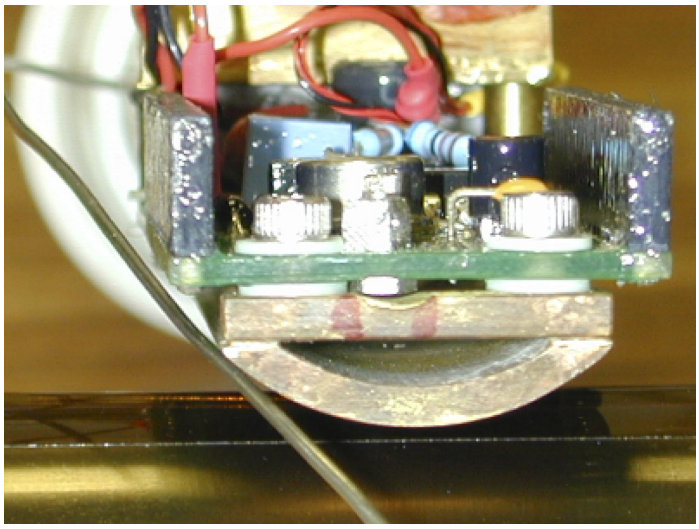

Figure 6. Insulating washers that can compress and allow a short circuit.