

[illegible]



Multi-Sensor Gamma Ray Tool (MGT)

Operation Instructions

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Section I

Overview

The Multi-Sensor Spectral Gamma Ray Tool (MGT) was developed by the Lamont-Doherty Borehole Research Group to improve the vertical resolution of natural gamma-ray logs. This is achieved in the MGT by using an array of short detector modules with approximately 2-ft spacing. Each module comprises a small 2" x 4" NaI detector, a programmable 256-channel amplitude analyzer, and an Am²⁴¹ calibration source. The spectral data are later recalculated to determine the concentration of potassium, thorium, and uranium radioisotopes or their equivalents. The spectral data from individual modules are sampled 4 times per second and stacked in real time based on the logging speed. This approach increases vertical resolution by a factor of 3-4 over conventional tools while preserving comparable counting efficiency and spectral resolution. The radius of investigation depends on several factors: hole size, mud density, formation bulk density (denser formations display a slightly lower radioactivity), and the energy of the gamma rays (a higher energy gamma ray can reach the detector from deeper in the formation).

The tool also includes an accelerometer channel to improve data stacking by the precise measurement of logging speed. A specialized telemetry system developed for the MGT allows it to be combined with Schlumberger tool strings in a single logging operation, minimizing the required rig time to acquire the log.

The MGT can be run in-line with other tool strings to save rig time or run alone.

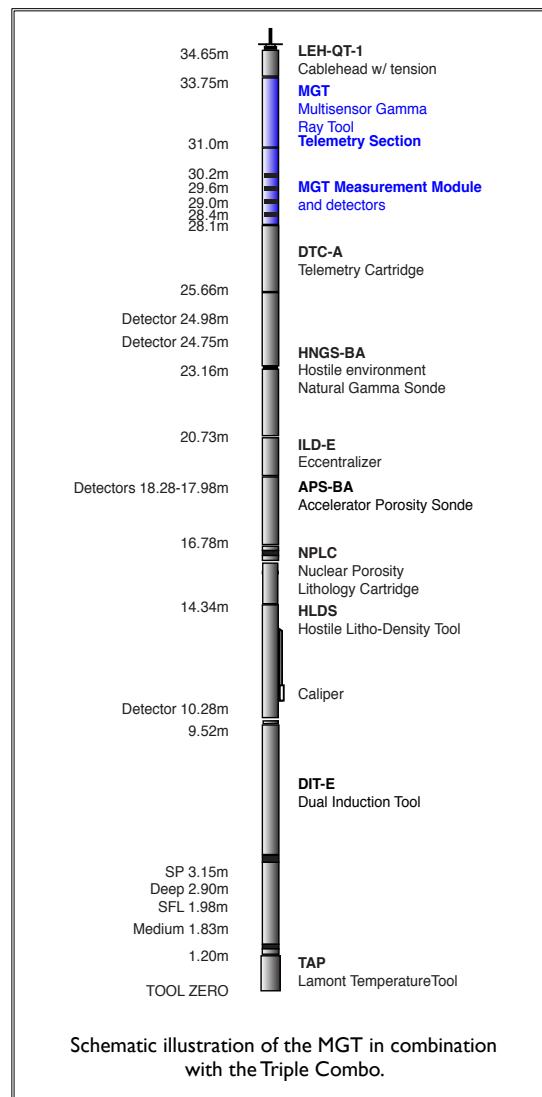
The MGT consists of two main sections: an upper telemetry cartridge and a lower measurement module. It is housed in two stainless steel pressure cases (approx. 2.5 and 3 m long, respectively) ending with 31-pin Schlumberger connectors on either end. It attaches to the ODP logging wireline using a standard Schlumberger cablehead.

The tool is centered in the hole using Schlumberger centralizers. In its in-line configuration, rig-up and rig-down time with the triple combo tool is less than 10 minutes. The Schlumberger engineer and the Logging Staff Scientist assemble and disassemble the combined tool string on the rig floor. The Schlumberger logging engineer is in control of the tool string for the triple-combo logs and the logging scientist is in control of the tool string for the MGT log.

Data are acquired with the MGT during a separate logging pass in either in-line or stand-alone configurations. A downhole wireline switch tool allows the logging cable line to communicate with either the Schlumberger tools or with the MGT via electronic command from the surface. This allows the MGT to be run in a "two-pass" rather than "two-string" logging operation, where the Schlumberger logs are recorded during the first pass and MGT log during the second. In the stand-alone configuration, the MGT simply runs as the second part of a two-string logging operation. To date the MGT has successfully been deployed on ODP legs 191, 194, 198, 199, 202, 207, and 208.

Initial considerations

1. The tool is sensitive to mechanical shock due in part to the presence of the four sodium iodide detectors. Care must be taken to avoid dropping the tool or deploying the tool in environments where excessive vibration will be encountered such as regions where ocean currents are 2 knots and greater.
2. The MGT is not designed to be user-serviceable at sea; however, several spare boards and parts are available. Please contact LDEO-BRG before attempting any repairs or modifications!
3. The MGT is typically deployed on top of the Schlumberger Triple Combo (see figure below). Both tools must not be powered at the same time!



Section II**Specifications**

Weight:	350 lbs (159.1 kg)
Length:	
Telemetry module:	9.0 ft (2.75 m)
Measurement module:	9.5 ft (2.90 m)
Diameter (without centralizers):	3.375 in (8.57 cm)
Maximum temperature:	100° C
Maximum pressure:	10,000 psi
Number of gamma spectrometry modules:	4
Module spacing:	0.64 m
Detectors:	
Type:	NaI (TI)
Dimensions:	4 in x 2 in
Spectral measurement range:	0.2 - 3.0 MeV
Spectral resolution:	40 KeV
Maximum cable length:	40 ft
Cable head connection:	Schlumberger style
Maximum logging speed:	900 ft/hr

Section III

Tool Setup and Bench Testing on the JOIDES Resolution

In this section we will describe the procedure for setting up the MGT and performing bench testing. These actions require familiarity with the Wireline Patch Panel (also called the Wireline Patch Box), the MGT Surface Panel, and the High Resolution Depth Counter (HRDC.) Each is discussed below.

Bench testing should be performed at least a couple of hours before the MGT is to be deployed. By starting early, any problems can be identified and (hopefully) corrected with no impact on the logging operation. Bench testing also allows the tool to warm up properly before deployment.

When bench testing is completed, power down the tool (by switching off the surface panel), turn off all MGT software, and disconnect the MGT. **The power switch on the tool itself should always be left on.**

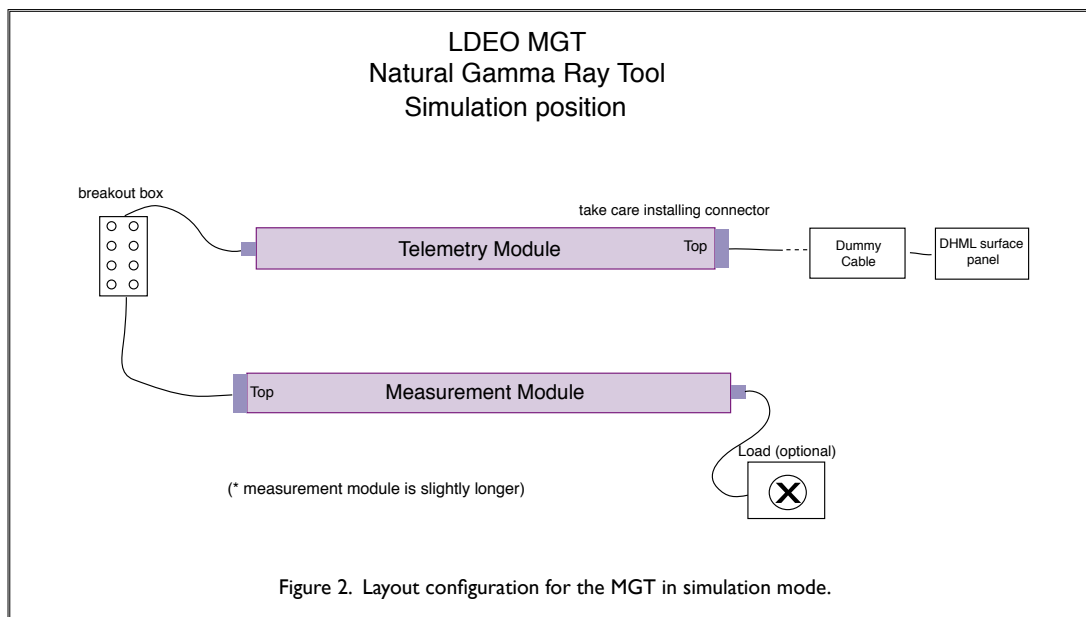
WARNING: Make sure the power is “off” to all panels and tools before switching any wireline patch panel settings! An incorrect setting can short circuit the tool and surface panel and cause serious equipment damage.

A. The wireline patch panel (see Figure 1) is located on the portside wall of the Downhole Measurements lab. The proper patch connection scheme is determined by the task you are trying to complete:

1. Bench testing - Disable all connections by disconnecting one end of the jumper cable from the wireline patch panel. The telemetry and measurement modules of the MGT should be connected through a breakout box as shown in Figure 2. (Warning: Do not connect the modules before you read through this chapter.)
2. Downhole data acquisition - For data acquisition, place the jumper between “Wireline” and “ACQ Rack.” Do this only after the Schlumberger tool has been powered down and you are making preparations to log with the MGT.
3. Storing the tool - When the tool is not in use, disconnect the jumper cable and leave the tool connected to the “ACQ Rack” connector only.



Figure 1. The wireline patch panel



- B. Once the wireline patch panel is configured correctly, set up the surface system. To do this, the surface panel must be installed in the data acquisition rack in the Downhole Measurements Lab (DHML). In most cases, the surface panel will already be set up in the DHML; if not, follow the instructions below:
1. Find an open slot in the rack and fasten the MGT surface panel with rack screws, which should already be in place.
 2. Run the serial cable from the surface panel "Serial 1" port to the "Com Port 1" port on the back of the data acquisition PC.
 3. The voltage switch on the back of the MGT surface panel should be set to the "High" position and remain there at all times. (See Figure 3).
 4. Make sure the switches on the front of the surface panel are configured appropriately (see Figure 4). The only switches you should touch are the power buttons on the left side of the surface panel; no other switches should be adjusted. The default settings should be: Cable = 3, Test = 3, Gain = 87.



Figure 3. The rear of the MGT surface panel. Note the voltage switch with high and low positions.



Figure 4. The front of the MGT surface panel. The power switches at left are the only ones you need to touch. The other switches should remain at the following settings: cable=3, test=3, gain=87.

- 5, Make sure the serial switch on the back of the data acquisition rack is switched to ON.
6. Disconnect the Ethernet cable from the computer!

C. Double check the PC-DAS connections:

As of Leg 200, the HRDC (High Resolution Depth Counter) has been added to the Data Acquisition System (DAS) to improve the resolution of the gamma data. The HRDC is virtually transparent to the user except for the need to turn it on along with the MGT surface panel. Figures 5 and 6 below show the location of the HRDC in the DAS:

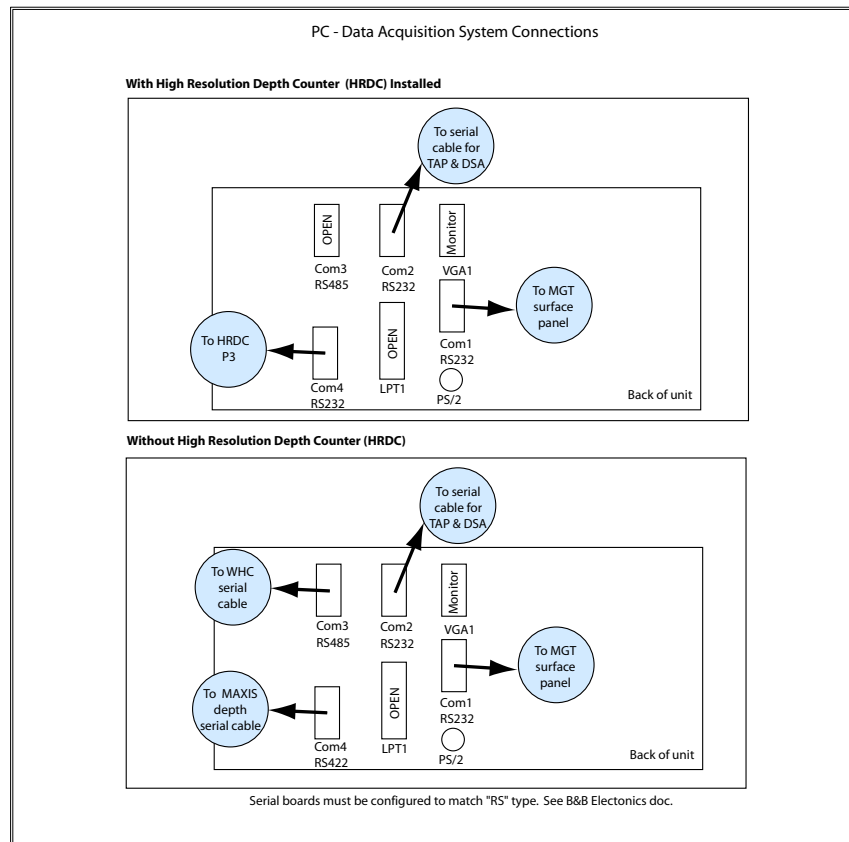


Figure 5. Front of the Data Acquisition System (DAS). The HRDC is located at the top of this picture. The user has only to switch the unit on. Notice the power switch on the left side of the MGT surface panel.



Figure 6. Rear view of the Data Acquisition (DAS). The HRDC is located at the top of this picture.

Figure 7, below, shows the proper PC-DAS connection scheme depending on whether or not the HRDC is installed:



- D. Set up the MGT telemetry and measurement modules on the bench:
 1. Lay the two sections side by side on the long center bench in the shipboard tool shop (see Figure 8, below).
 2. Attach the cables as depicted in Figure 2 (page 6).

- E. After all of the equipment is in place and the appropriate connections completed, proceed to Section IV to continue the bench testing operation.



Figure 8. Telemetry and measurement modules of the MGT side by side on the center bench of the shipboard tool shop. The breakout box is barely visible at the extreme far end of the table.

Section IV

Acquisition software and surface panel indicator lights

- A. Before powering the tool up, launch the acquisition software by performing the following steps:
1. Ask the wireline logging engineer to switch on the MCM depth simulation.
 2. Turn the Wireline Heave Compensation controller on. This is accomplished by turning the main power switch to ON back in the winch cab. If you aren't sure how to do this, ask the Schlumberger engineer for help.
 3. Make sure the serial switch on the back of the data acquisition rack is set to ON.
 4. Turn the High Resolution Depth Counter (HRDC) power switch to ON. Examine the HRDC's LCD and make sure the unit is set to Mode I. If it is not, press I and then "Enter" to set the unit to Mode I.
 5. Make sure no LabView or other programs are running.
 6. Open the MGT-appropriate application located on the DHML PC desktop. If the HRDC is installed (this is the default), use NGT Logger9.vi; if the HRDC is not installed, use NGT Logger8.vi. A generic Logger.vi program window is shown in Figure 9, below.

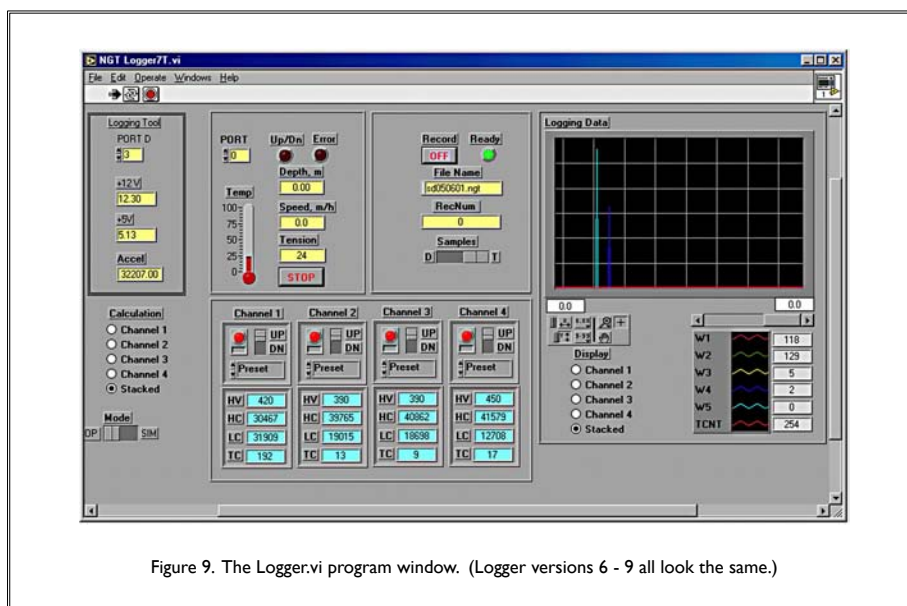


Figure 9. The Logger.vi program window. (Logger versions 6 - 9 all look the same.)

7. Start the application by pressing the arrow in the upper left-hand corner of the application window. A small window, labeled “Header,” will pop up. Fill in the required fields as necessary. An example is shown below in Figure 10.

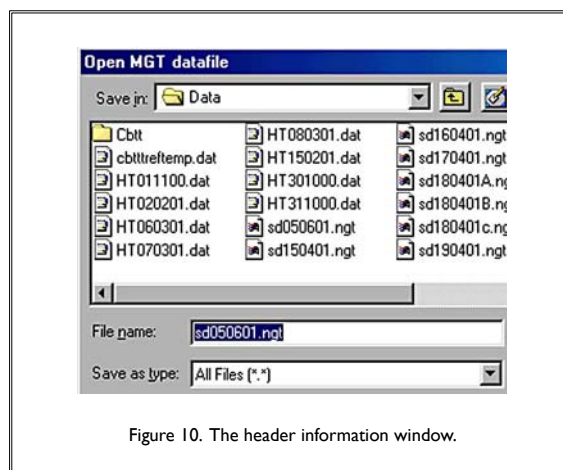


Figure 10. The header information window.

The depth offset is the distance between the detectors of the MGT and the bottom of the Schlumberger tool string (tool zero). This offset changes depending on logging direction. When logging down, the offset is the depth from the string bottom to the uppermost detector. When logging up, the offset is calculated as the distance from the string bottom to the lower-most detector. (A detector offset schematic chart is included in this document as Appendix A.) The difference between the upper and lower detectors is 76 inches, or 1.93 meters. **Regardless of the depth offset entered here, you should perform standard depth shifting when logging MGT gamma ray output with the Schlumberger HNGS and SGT tools.**

8. Press OK when you are done filling in the fields. The filename window will pop up:

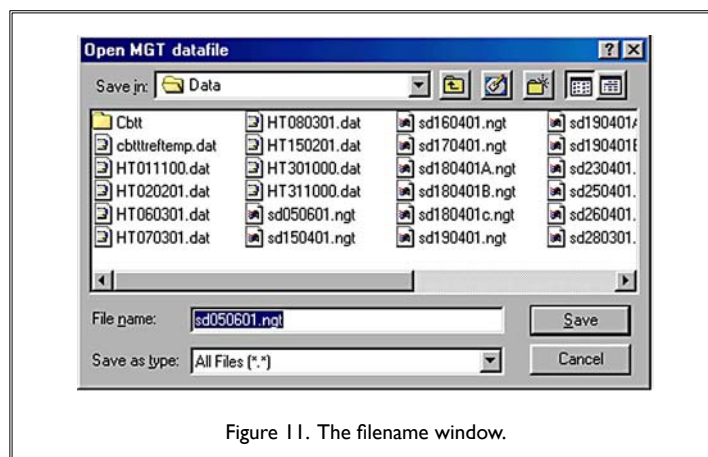


Figure 11. The filename window.

9. Type in the name of the data file. (By default, the program will assign the date as the filename.) For a repeat pass, add “rep” to the name so the passes can be distinguished. A typical data file name might be the hole name followed by the direction of the logging pass: sd050601down.dat, or sd050601up.dat. Once the file name is entered, press “Save.” You can now focus on the mail application window (Figure 12, below).

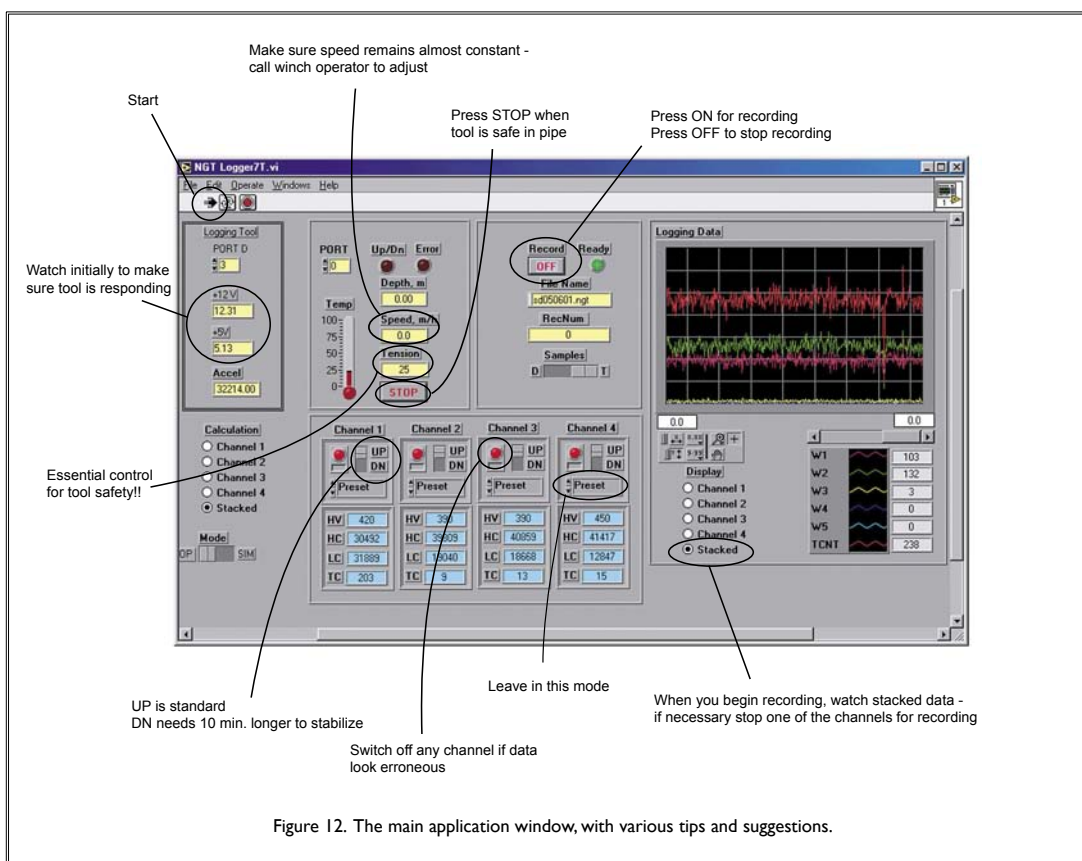


Figure 12. The main application window, with various tips and suggestions.

B. Power up the MGT.

1. Double check the wireline patch panel to make sure the settings are correct for bench testing (Section IIIA of this document).
2. On the MGT surface panel, make sure the SLB/NGT switch is set to NGT and turn the main power button ON. The tool power switch should remain ON at all times.

- C. Now it's time to check all of the indicator lights on the surface panel to make sure everything is working properly.
1. With the tool powered up, the current indicator on the front of the surface panel should show a current of 0.2 amps if the tool is consuming an appropriate amount of power.
 2. Initially, the only illuminated light on the front of the surface panel (Figure 4) is the red ERR (error) light. As the system self-checks and initializes, the error light remains illuminated for 3-5 minutes or so. Once communication between the surface equipment and downhole tool is established, the error light will turn off and the first green light, RDY (for "ready"), will illuminate.
 3. The MGT needs about 10 minutes to stabilize in UP mode and about 20 minutes to stabilize if it is run in DOWN mode. UP and DOWN mode do not correspond with the direction of the tool but rather are associated with the initialization of the tool. In UP mode, the regulation system is off, and in DOWN mode the regulation system is on. **You should leave the setting in the pre-set mode (UP) at all times.**
 4. The green lights on the surface panel indicate the telemetry status. When a light starts blinking, the panel is sending a request to the tool. When the second light blinks, it suggests that communication is OK but it does not necessarily guarantee that the tool is OK. The green lights also respond to the communication established with the Schlumberger depth system as the depth information is received from the MCM. Therefore, the serial switch on the rack in the back must be switched ON.
 5. Once all systems are started, the surface panel lights should behave as follows: The RDY ("ready") light should be solid green, and the TRM ("transmit") and RCV ("receive") lights should be blinking. However, even if the tool is *not* working properly, the green lights may still blink. For example, the TRM light may blink as the tool attempts to increase gain to get signal and mistakenly accepts bad communication from the tool as good communication data.
 6. Even without the measurement module connected, the telemetry system will work, so you will see appropriate behavior on the left side of the software's data acquisition screen (Figure 12). If the measurement module is connected and working properly, you will also see "refreshing" values being generated in the lower center part of the DAS panel.
 7. If the tool does not power up, ask the Schlumberger engineer to check the voltages on the back panel for you. It should be between 160-240 volts. (This is the voltage between lines 1 and 4.)

D. The following is a checklist to help you determine if the tool is working properly:

1. With the tool powered up, check the left side of the data acquisition screen (Figure 12) where the “12V,” “5V,” and “Accel” fields are. If you see nothing in these fields, the tool is dead. If you see information here, then the tool is at least partially working.
2. Make sure the MCM depth simulation is running. Ask the Schlumberger engineer to verify this. The tool will not work if MCM depth is not supplied.
3. Check the total counts after stabilization. You should see stabilized background counts in the range of 5-15 counts per second.
4. For verifying tool responses in the channel fields of the data acquisition window, there is a set of lab sources which emit energy at various levels. Use the following sources:
 - a. ^{134}Cs (0.662 MeV) - 54
 - b. ^{60}Co (1.173 MeV, 1.275 MeV) - 96, 104

Spectral windows will be:

- | | | |
|----|------------------|---------|
| a. | W1 0.2-0.5 MeV | 16-41 |
| b. | W2 0.5-1.1 MeV | 41-90 |
| c. | W3 1.1-1.59 MeV | 90-130 |
| d. | W4 1.59-2.00 MeV | 130-164 |
| e. | W5 2.00-3.00 MeV | 164-246 |

Place the lab sources close to, but not on, the detectors. Check how the gamma counts change in the first three windows. Check it for all four detector positions and switch the display channels from 1 to 4 depending on the source location.

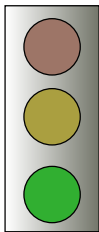
- E. To power down, simply turn the main power OFF. Leave the tool power switched ON at all times.

Section V

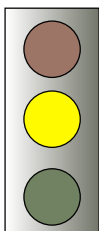
Deploying the MGT with the Schlumberger Triple Combo

- A. As previously discussed, complete all bench testing steps a couple of hours before the tool is to be deployed, in order to allow the tool time to warm up and to facilitate troubleshooting. After bench testing, power down the tool by switching off the surface panel. Turn off all MGT software and disconnect the MGT.
- B. Before proceeding with actual deployment of the MGT, verify that conditions for deployment are safe. There **must not** be dangerous levels of vibration in the drill pipe. The heave must be within safe limits (<5 meters). The water currents at the site must also be within safe limits. Only after all tool safety issues have been addressed can you proceed with the deployment of the tool.

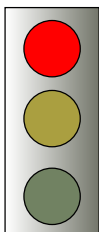
Follow the sea current guidelines below to ensure that the tool is deployed safely:



It is safe to deploy the MGT and other logging tools when currents are between 0.1 and 1.5 knots, provided that excessive drill string vibration has not been reported by the drill crew.



When currents are between 1.6 and 2.0 knots, extreme caution must be exercised before proceeding, as drill string vibration poses a serious risk to the MGT. Risk assessment discussions should be undertaken with the Schlumberger engineer and the driller in order to evaluate the level of vibration. The decision to deploy the tool is based on qualitative data, and your final judgment should be biased toward the conservative side.



If the sea currents are above 2 knots, the MGT must not be deployed. Damage to the tool is very likely in these conditions.

- C. Initialize the TAP tool if required and unplug the network cable.
- D. Now it is time to deploy the tool.

IMPORTANT: When the MGT is being deployed, you must not run any other program on the PC. This includes the Maxis depth program used for acquiring a time/depth file. Run the Maxis depth program with the Triple Combo, not the MGT.

1. Coordinate moving the MGT to the rig floor with the Schlumberger engineer and the rig floor crew.
 2. Oversee the MGT rig up operation. Ensure that the measurement module is connected *below* the telemetry module. It is useful to clearly label each module beforehand to avoid confusion during rig-up. The measurement module is slightly longer than the telemetry module. Remember that tool strings are rigged from the bottom up: measurement module first, then the telemetry module.
 3. The Triple Combo run will be performed first. When the Triple Combo run is completed the engineer will power down the tool string. Never switch any cables in the DHML when Schlumberger tools are still powered!
 4. If the TAP Tool MAXIS depth recording application is running, stop it now.
 5. Switch the wireline patch box cable lines to route the wireline signals to the DHML while the tool is still in the pipe. Ask the Schlumberger engineer to do this so the safety of their tools is assured. The proper setting is “Wireline” to “ACQ Rack.”
 6. Double check to make sure that the heave compensator is working properly!
 7. As the tool is running downhole in the pipe, power up the tool and wait to establish communication. If the tool current is not normal (i.e., is not 0.2 amps), switch the power off and terminate operation. If the tool and software appear to be working properly, call the winch operator and lower the tools.
- E. Begin recording data
 1. Ask the Schlumberger engineer for guidance on how fast to lower the tools. When the tool reaches the bottom of the hole, click the record button on the data acquisition screen of the Logger.vi application; it will change from OFF to ON.

2. Instruct the winch operator to maintain a logging speed of ~700 ft/h (210 m/hr). It is vital for data quality that the speed be constant.
 3. Remember that you, the logger, are the only person who can monitor tension, so be alert. Pay close attention to the data acquisition screen in the Logger.vi application (Figure 12).
 4. When the tool is back in the pipe, stop recording and exit the program.
 5. Run a repeat pass, but make sure that all repeat passes measure the transition from open hole into the pipe at a safe logging speed. You must start repeat passes by exiting and restarting the Logging.vi application. Make sure you input the correct depth offset for the direction you are logging.
 6. After you are done recording, switch the power off for the tool and get it back on deck.
- F. Clean and secure the tools.

Section VI**Miscellaneous Notes and Reminders Prior to Logging**

- A. If the tool has not been run for a period of weeks, turn it on and let it run for several hours before logging.
- B. When logging, make sure the logging cable is connected to the surface panel and the High/Low voltage switch on the back of the control panel is set to “High.”
- C. Place identifying marks with a permanent marker on the measurement module and the telemetry section. Mark the top of each section to avoid confusion.
- D. Check with the wireline logging engineer as to where the tool zero is set. Remember, stacking is different depending on logging direction: either the upper or lower detector will pass the measurement point first. The zero point guidelines are as follows:
 - 1. On the upward pass, the number four detector (lowermost detector) is zero for the MGT.
 - 2. On the downward pass, the number one detector (uppermost detector) is zero for the MGT.
- E. Make sure the MCM depth software is running.
- F. Remember, the MGT and Triple Combo combination must be fished if stranded in the hole.

Section VII

Processing Data

Data from the MGT are processed at BRG, and should be transmitted to Lamont as soon as possible. You are of course welcome to utilize the unprocessed data at sea if necessary.

The data files produced by the MGT data acquisition program are in the form of tab-delimited columns, which include information such as Depth, Time, Speed, Acceleration, Tool Temperature, etc. Depth is given in MBRF and **must be corrected to MBSF**. A 2-hour recording will generally take up about 4 MB of disk space. Figure 13, below, shows the left-hand side of a sample output file.

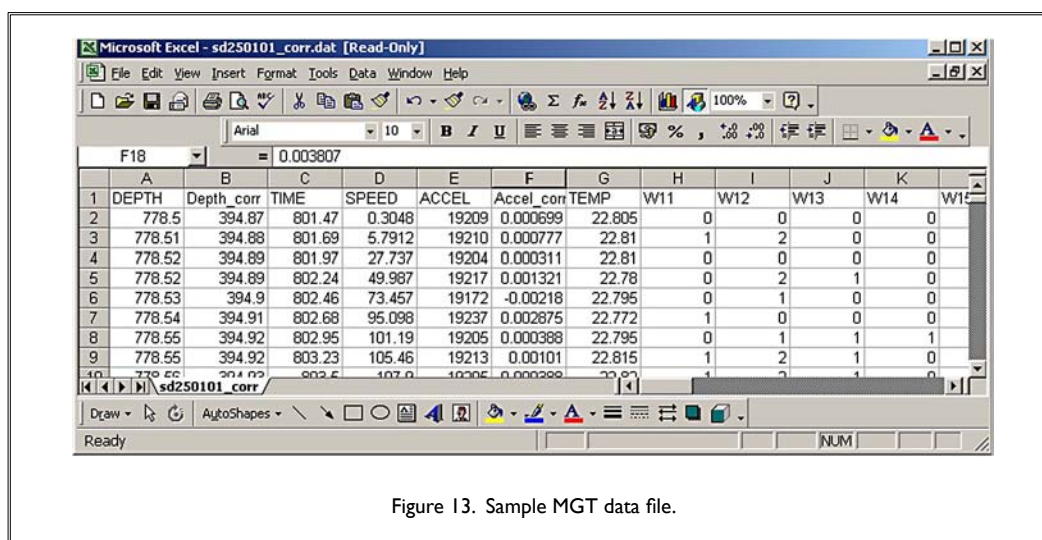


Figure 13. Sample MGT data file.

The “Speed” and “Acceleration” columns are good indicators of data quality. Poor logging conditions and/or inconsistent logging speed are prime corrupters of logging data; they make it difficult to correct the data for acceleration and thus can compromise stacking of the data.

All four channels, as previously discussed, are recorded (see Figure 14). W11 ... TCI are recorded from the first detector (where: W[x]1 is the first window, W[x]2 is the second window, etc.; PT[x] is the total potassium contribution; UR[x] is the total uranium contribution; TH[x] is the total thorium contribution; and TC[x] is the total counts).

At the right side of the data file are the stacked data (WS1, WS2, etc., as well as the calculated URAN, THOR, and POTA content and the spectral gamma ray values in GAPI). An example is

shown in Figure 15. These data are frequently very noisy and it is recommended to simply smooth over 8 data points.

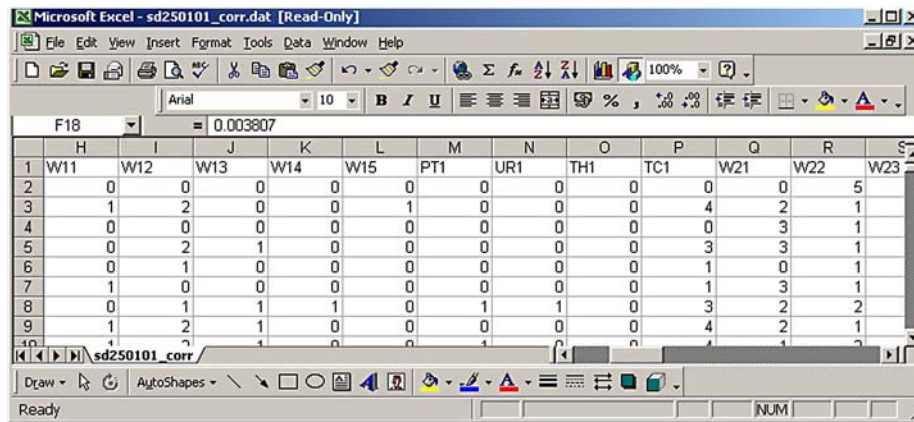


Figure 14

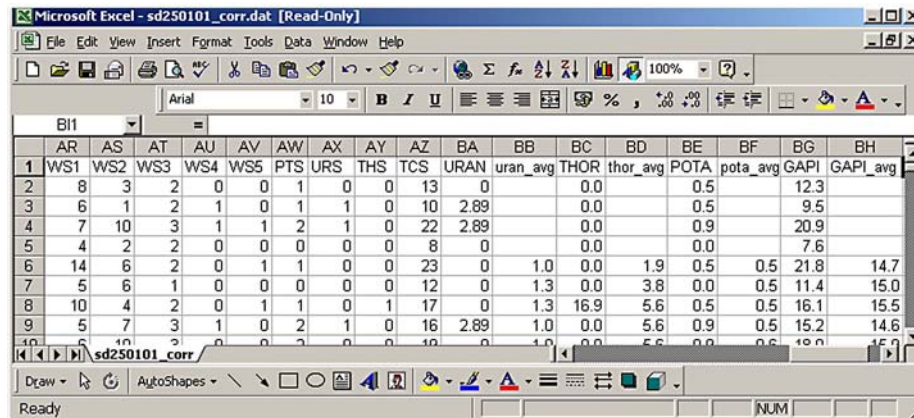


Figure 15

Remember, stacking depends on logging direction, as either the upper or lower detector will pass the measurement point first. On the upward pass, the Number 4 detector is the zero point; on the downward pass, the Number 1 detector is zero.

Figure 16 (next page) shows a comparison between MGT and Schlumberger NGT data.

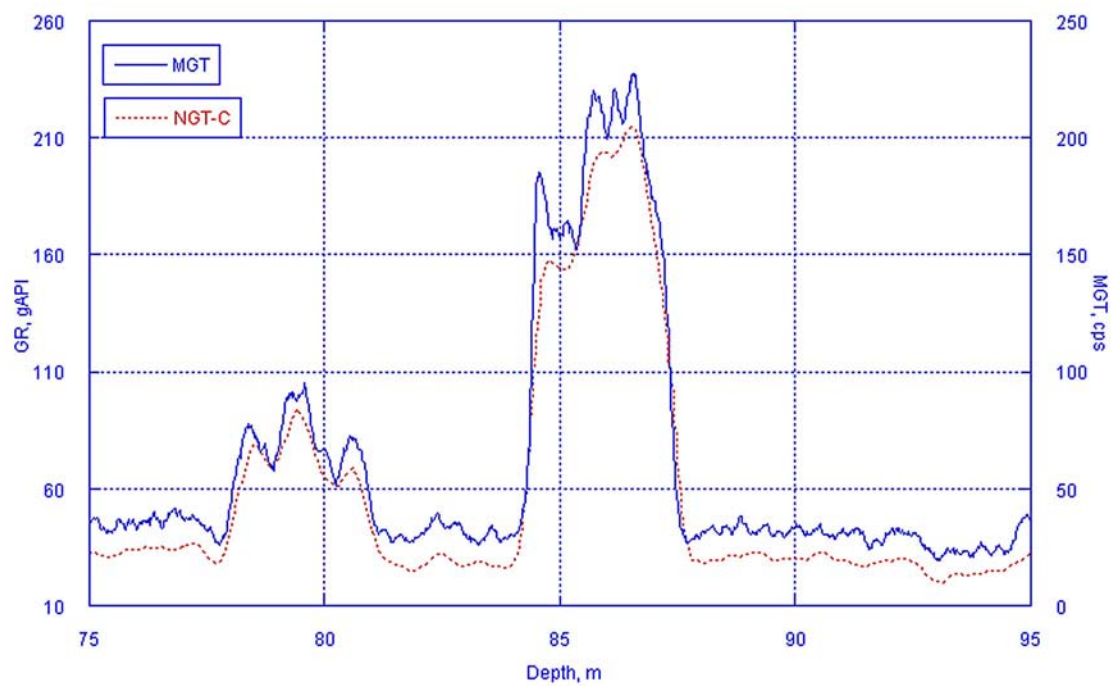


Figure 16. A comparison of gamma ray data between the MGT and NGT. Note the additional peaks identified by the MGT.

Section VIII

Troubleshooting Emails from Leg 194

Below are some emails that were used to troubleshoot the MGT during Leg 194. [Editors note: The problem on Leg 194 was not solved at sea. The tool was shipped back to LDEO where a hard-to-find wire was found to be loose.] Use the following emails as a model in terms of the thoroughness of information passed between the ship and BRG.

Hi Greg,

Steve checked the MGT. Tool doesn't appear to work. We observe that the current on the control panel is half of what it used to be (0.1 instead of 0.2). When we power on the tool after a while the green lights start blinking even with the tool unplugged. So, we have no idea what the green lights are telling us. We opened the tool and there doesn't appear something to be loosened or burned. No smoke We looked at the oscilloscope and although we get some signals it doesn't look like it was when I looked at it with Alex. We turned the 'test' button in the five different positions (guess Alex knows what I am talking about). Second problem is that the software doesn't get depth data. We double checked with the Maxis program from the TAP tool that we do get depth data. That's weird.

Please ask Alex how we should proceed. We'd like to run the tool again, logging is coming up soon.

Cheers,

Heike, Gregor and Steve

Hi Alex,

> Bring the tool to the lab and connect it through dummy cable (as we did during portcall).

We did it. Steve opened and checked the MGT. Nothing appears to be loosened or burned. No smoke

> Try to power and run the tool and describe to me in greatest possible detail what's happening, in particular:

> a) did the tool properly power up (i.e. you should see the initial "jerk" of current measuring device during switching, and current consumption after switching should be around 200 mA.

we don't see any jerk current . It slowly goes up to 100 mA. When we power on the tool after a while the green lights start blinking - BUT even with the tool unplugged. So, we have no idea what the green lights are telling us.

> Please don't forget to switch to lower voltage (switch on the back of the surface panel).

yepp, we did it.

> If the tool does not power up properly - just STOP and let me know.

> b) if the tool powers up and current consumption is about normal try to establish communication with the
(cont. on next page)

> tool, and tell me about results. It would be good if you could also check pulses with scope (remember how > we did it at portcall?). Ask Steve to help you if necessary. Go through all the switch positions (in the table I > left for you) and check the presence (or absence) of pulses and their amplitudes.

We looked at the oscilloscope and although we get some signals it doesn't look like it did before when I looked at it with you. Well, and considering we don't really think having tool contact it doesn't seem to be reliable at this point.

Alex, can you give us an idea where to check the voltage? Which value would be expected? We don't know if the problem is in the telemetry or in the measurement module. Steve tested it, but we couldn't see a signal at the tool box. Then he checked the dummy box cable and they are powered.

Second problem is that the software doesn't get depth data. We doublechecked with the Maxis program for the TAP tool, which gets depth data. So, communication to Steve works.

Heike

Greg & Alex,

I spent about 7 hours today messing with the MGT. I found the spare board. I got Peter Pretorius to help me a little and we found one problem, but that is not the main problem. The two 1/8 amp fuses on the board with the blue transformer were blown. The transformer is 240 volts AC in and 25 volts DC out? We replaced the fuses and got power to the wireline switch board and the UDTM Control board, but not to any other boards above it. I replaced the UDTM Control board and then swapped all the components on the Wireline Switch BRD. Still no power to the other boards. It looks like the power supply looking DC to DC boxes at the top get an input from the wireline switch board and then the big red and blue wires come off them to power the tool. I can't figure anything else out. Give me some hints. Some PDF schematics would be handy!

Steve

Steve,

Sorry to hear about MGT problems - I just got messages from you and Heike.

Don't worry about MGT software not reading depth, the program probably just hangs in the loop waiting for the tool response - so it's quite normal at this point.

Please give me more info about tool check described in my previous message, in particular I need to know whether only one green LED blinks or both of them, and if only one - which one. It would be also good if you could give me the amplitudes of pulses on BNC connector in positions 1-5 of the switch. I'm not quite sure about the meaning of the second part of your message (i.e. about voltage checks). Could you please clarify it for me where are the measurement points.

Meanwhile I'll check my schematics and notes and try to suggest something (hopefully tomorrow but not sure - have my hands 150% full these days...) I really appreciate your help to Heike in this situation. Say hello to her.

Cheers,

Alex

Steve,

Now I'm ready to answer your last email dated 02/07/01.

According to Heike's previous message the current consumption measured by current meter on the surface panel is around 100 mA, but at the same time it is obvious that the tool is not powered properly. Please do the following simple check:

1. Connect only the dummy cable to the surface panel (without the tool attached) and measure the AC current.

2. Repeat the previous measurement with the tool connected to the dummy cable. No difference or very small difference would mean that the tool is not powered, noticeable difference would mean that something in the tool "sinks" AC - this should be determined before proceeding any further.

3. If the tool is not powered open the telemetry chassis. Next to the cablehead connector is an aluminum plate with the power system including 2 DC/DC "bricks" with small perforated boards on top of them. On the both boards should be 3A socketed fuses (small yellow rectangulars), please make sure that they are still there and are not blown. On one of the boards there is an LED which lights on when the DC/DC system is powered. The rest of electronics (both in telemetry (TS) and measurement modules (MM)) is powered by +12V from DC/DC converter.

4. If the fuses are blown it is quite possible that there is a short in the measurement module (or blown HV PS) which "kills" the DC/DC converter, so if you had to replace fuses please disconnect MM and do all checks only with TS. This is safe if you power the TC through dummy cable with lower voltage from surface panel. The +12V voltage should be present on contacts 21 and 26 of the TC connector (contacts 30 and 31 - common). If this does not work you should check the downhole switch boards as described below.

5. Yes you are right, the small transformer (and the bridge installed on the same small board) powers only switch system. Please check the DC voltage on the output of the bridge - should be around 40-50V. Replacing the board probably was not such a good idea, please use the original boards previously installed in the tool. What you should try - please replace opto relays (in the DIP packages) on the switch board with corresponding chips from the spare board. Please notice that there are two different types of opto-relays on the board: AQW214 and AQW414, so make sure that replacement chips go into right locations.

I'll see what is possible to do about sending you schematics, but very few of them are in the PDF format, so chances are not so good.

Please let me know about the results of these checks, and then we'll discuss further actions.

I just hope that these exercises with the MGT will give you necessary experience for your future home projects...

Cheers

Aleksandr Meltser

Steve,

Here are answers to your questions and some suggestions about further work with the MGT:

1. Yes, the DC/DC converters (bricks) are powered from the switch board (as I mentioned in my previous message). As far as I remember it is a white twisted pair. Electrically it is connected to the contacts J19 and J24 on the switch board try to trace this circuit.

2. If the connection is there the next step would be to check connections between the control board and switch board and power to the switch board. Make sure that you have connections between boards as shown below:

Control board	Switch board
J4 (+5V)	J1 and J5 (red)
J9 (COM)	J4 and J20 (black)
J6	J15
J8	J11

If the control board operates normally there should be +5V on J4 (J9 common).

3. If all this checks fine you can try to replace the optorelays on the switch board (U4 and U7 SDV2415) with relays from the spare board, but be VERY cautious if you decide to do it, and then check the system again. Make sure that the measurement module is disconnected from telemetry during these checks.

4. You should also check the presence of jumpers on the switch board. They should be installed in either JP1 or JP2 and either JP5 or JP6. They do not affect power connections but are important for the proper switch board operation.

5. All these suggestions are based on the assumption that you did EVERYTHING that I suggested in my previous messages (in particular that you checked the DC voltage on the control board). If this is not the case please do so.

6. Do not bother about green lights and depth system /software operation. As far as I can tell everything (in this part) works just fine.

Alex

Section IX

Appendix

MGT Fishing Diagram and Detector Offsets

