

## 1988/17. Field manual for the operation of the density/caliper tool.

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### INTRODUCTION

This manual has been prepared to assist in the safe operation in the use of the RADIATION tools. Before the use of such tools it is advisable that the user consult the Radiation Safety Officer for handling guidelines as set out by the Radiation Safety Council. If at any time the user is unsure of a practice or procedure they should consult the Radiation Safety Officer. If an accident or incident occurs with the radiation source the safety officer and the Department of Health **MUST** be informed at once. No action is to be taken until these people are consulted.

An internal Departmental report on the use of radiation sources and the safety requirements is available. The user of the radiation source should read this and discuss with the Radiation Safety Officer before commencing field operations. At all times, if commonsense is used and the radiation sources are treated with respect, then no serious problems should occur.

### T59 DENSITY/CALIPER TOOL

**NOTE:** At all times the GAMMA radiation badge should be worn when near the source. This includes loading and unloading into the vehicle, driving the vehicle and while logging.

Set up logger and tripod in operating positions as described in operations manual. Make certain all interconnecting cables are in place. Ascertain the estimated condition and approximate total depth of the hole from the driller or other informed person(s) before commencing logging. Verify hole depth and condition with dummy tool before using Density/Caliper tool.

It must be ascertained prior to density logging that the risk of losing the gamma source downhole is acceptably low. Consult with the driller or others familiar with the hole, inspect the condition of the hole visually, consider the type of strata penetrated and the time elapsed since drilling ceased. Always lower the dummy tool before using the Density/Caliper tool to ascertain that the hole is not prone to collapse or snag a tool. Only when you are fully satisfied should logging commence. Under no circumstance should you be forced to log a hole when you consider it unsafe.

- Set the NUCLEAR/ELECTRIC switch to NUCLEAR
- Prepare the cablehead. Smear a small amount of 'Lubriplate' grease on the threads and 'O' rings. Connect the DENSITY/CALIPER tool to the cable head (pausing once or twice to allow the air to escape, causing a watertight seal).
- Plug in the T19 CALIPER and the T150 RATEMETER module (both are marked for the DENSITY/CALIPER tool).
- Plug in both ink cartridges and ensure ink flows smoothly. Make sure the Normal/Reverse switch on the control module is set to 'N'. This ensures that the CALIPER is BLUE and the DENSITY is RED.

- Turn recording unit on.
- Turn the function switch on the caliper module to 'ARMS PWR' and open the CALIPER arm by pushing the spring-loaded switch to the OPEN position. Note that the LED on the module will illuminate while the arm is opening and will drop in intensity when the arm is fully open. In some field conditions (bright sunlight) it may be difficult to see this operating. In this case it is advisable to hold the OPEN switch in position for about 60 seconds. This will ensure sufficient time for the arm to OPEN.
- To set the caliper pen to zero, turn the function switch to the log position, hold the spring-loaded switch on OPEN and turn the ZERO control (on the control module) to set the pen on the left hand side of the chart. Note that because the CALIPER tool is two inches (50 mm) in diameter when the arm is closed, the zero position represents two inches. Full scale deflection therefore would represent twelve inches (300 mm).
- To zero the density pen turn the function switch on the RATEMETER to 'ZERO' and adjust the zero control (on the CONTROL MODULE) to set the pen on the left-hand side of the chart.
- Check the CALIPER calibration by sliding the CALIPER calibrator onto the tool and positioning the arm in the six inch (150 mm) and the ten inch (250 mm) ring while observing the chart readings (see Figure 1). If readings are incorrect refer to Technician.
- Check the DENSITY tool calibration by sliding the cylindrical calibrator over the detector in the bottom of the tool. The detector for the DENSITY/CALIPER tool is located 1.34 m from the cable head/tool junction. The calibrator should be placed so that the scribe mark around the tool is at the BOTTOM of the calibrator. The location dimple on the top of the calibrator should be in line with the caliper arm on the side of the tool. This positioning allows precise location of the radiation strip in the calibrator over the detector.
- Once the calibration check is complete, close the arm by turning the CALIPER function switch to 'ARMS PWR' and holding the spring-loaded toggle switch on CLOSE until the LED turns off. At this point turn both modules off.

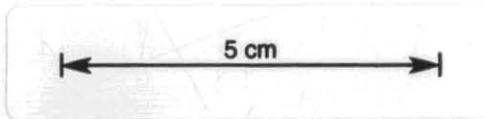
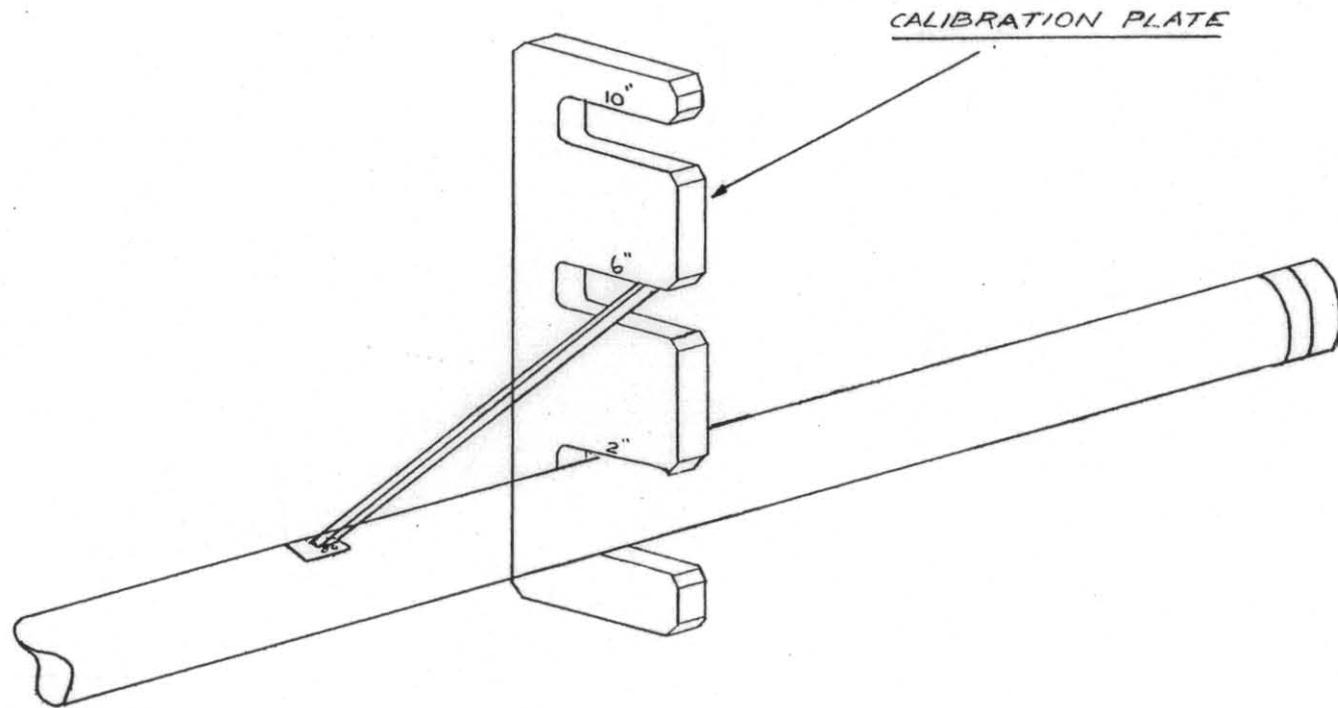
**CAUTION SHOULD BE TAKEN FROM NOW ON.**

- Place the GAMMA RAY source storage container in a VERTICAL position near the borehole. Screw the required spacers to the source and tighten with the 'C' spanners supplied.

**LEAVE THE PADLOCK IN PLACE AT THIS STAGE AS IT HOLDS THE SOURCE IN THE CORRECT ALIGNMENT POSITION.**

- Screw the tool to the spacers (or directly to the source if not using spacers) and tighten the thread with the 'C' spanners, ENSURING THAT THE CALIPER ARM LINES UP WITH THE 'V' MARKS ON THE STORAGE CONTAINER.

This procedure ensures that the window on the source will be directly opposite the caliper arm.



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DO NOT SCALE PRINTS  
REMOVE BURRS & SHARP EDGES  
TOLERANCES,  
1 DEC., = 0.2m.m.  
2 DEC., = 0.025m.m.  
ANGLES, = 2min.

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CALIPER ARM CALIBRATION

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Figure 1.

**MAKE CERTAIN THAT THE WINCH BRAKE IS ON.**

**REMOVE PADLOCK - MAKE SURE YOU ARE STANDING ON THE SAME SIDE OF THE TOOL AS THE CALIPER ARM (THIS WILL ENSURE THE WINDOW OF THE SOURCE IS OPPOSITE YOU), QUICKLY PLACE THE TOOL IN THE BORE HOLE.**

**WARNING!!!!!!**

### **DO NOT STAND IN FRONT OF WINDOW**

For calibration and data processing purposes, the zero depth point is taken as the junction of the tool and the cablehead. The arm, however, is located approximately 780 mm from this point and the actual density detector is located 1.24 m from this point down the tool. The distance from the gamma source to the detector, with no spacers, is a further 200 mm.

Zero the depth counter and lower the tool to the bottom of the hole.

Open the caliper arm and zero both pens as described in steps 6 to 8. Note that if the pen zero control is accidentally moved while a log is being run, then it can be re-zeroed by repeating steps 6 to 9 above.

Select the appropriate CPS range setting on the ratemeter and turn the function switch to line. Set the T.C. switch to 2. This may be altered depending on special requirements.

Select the required chart speed setting and set the chart direction switch to NORMAL.

Release the brake and wind the cable up at a speed of six metres/minute. It is important that the speed be kept constant. Special requirements may dictate a slower winding speed. The slower the speed the better the resolution.

Continue to wind until the cablehead reaches the surface. Bearing in mind that the radiation detector and caliper arm are a certain distance below this point, calculate the true depth of the readings using the diagram shown in Figure 2 and write these on the corresponding graphs.

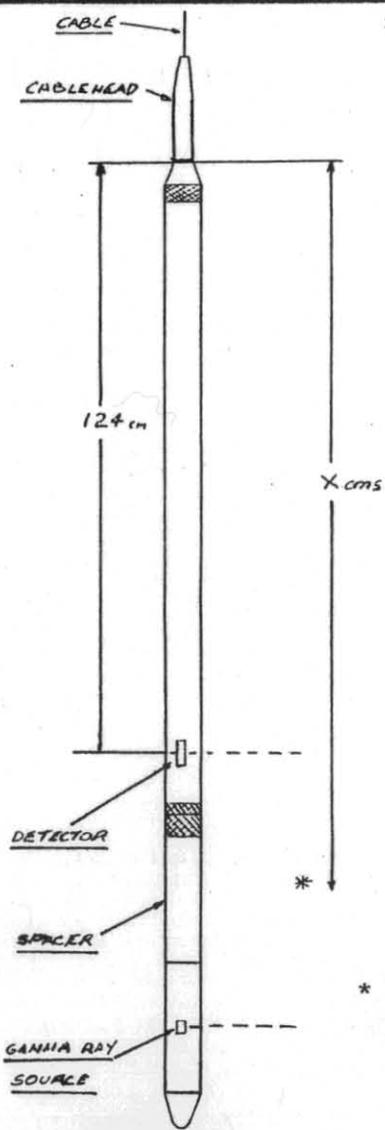
Close the caliper arm, quickly remove the tool from the borehole making sure that you are standing on the same side of the tool as the caliper arm (this puts the radiation window on the opposite side of the tool) and place the gamma source into the storage container. Unscrew the tool from the spacers and/or gamma source using the spanners provided. LOCK the storage container.

Remove the tool from the cablehead, wipe the threads and 'O' rings, and replace protective caps. Lock the storage container.

### **RADIATION SAFETY**

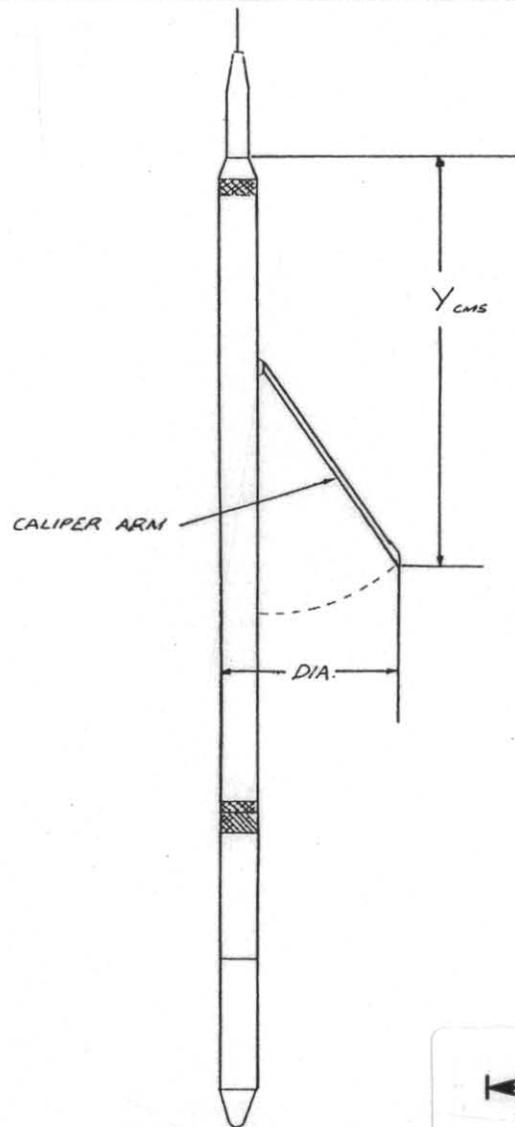
- Stay as far away from GAMMA source as possible at all times.
- Store the source storage container a minimum of 7 metres from any working area.

[20 June 1988]

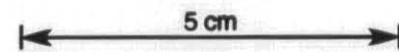


SPACER	X (CMS)
NONE	134
10 CM	139
15 CM	141.5
10 CM + 15 CM	146.5

\* This point is halfway between detector and gamma source.



DIA (INCHES)	Y (CMS)
2	811
4	811
6	801
8	781
10	731
12	661



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TOOL, DENSITY CALIPER 50MM



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Figure 2.