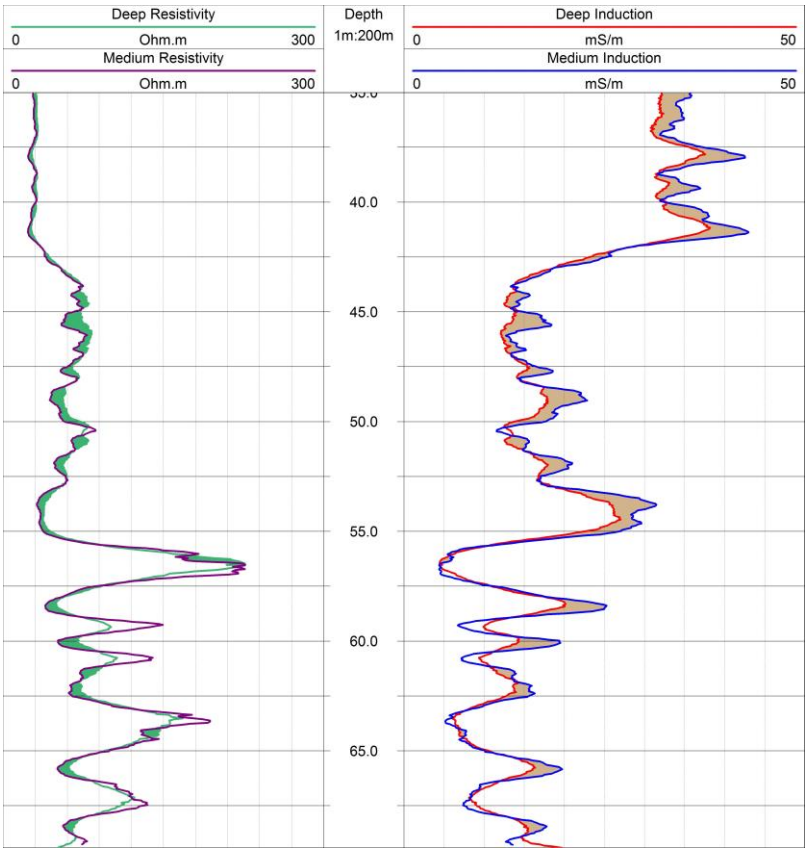

User Guide

QL40 IND – Dual Induction

MOUNT SOPRIS INSTRUMENTS

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1 General Information

QL stands for Quick Link and describes the latest line of stackable logging tools. This development is a joint venture of Mount Sopris Instruments (MSI) and Advanced Logic Technology (ALT). Innovative connections between tool elements (subs) allow users to build their own tool strings in the field.
The Tool Stack Factory – a sophisticated extension of the acquisition software – provides a convenient way to configure tool strings for operation.
Each sub has a Telemetry and Power supply element, the TelePSU, allowing them to operate individually without a separate telemetry sub. As a result all QL subs can be operated as standalone probes or in combination with other subs.

The QL40-IND Dual Induction probe uses a 3-coil induction measurement array, with 80 cm spacing between the transmitter and deep receiver coil, and 50 cm spacing between the transmitter coil and medium receiver coil. It is designed for measurement of the electrical conductivity of formations in both liquid filled and dry boreholes. It is also capable of logging inside PVC or other non-metallic casings. This instrument is characterized by high stability and exceptionally wide dynamic range.

1.1 Dimensions

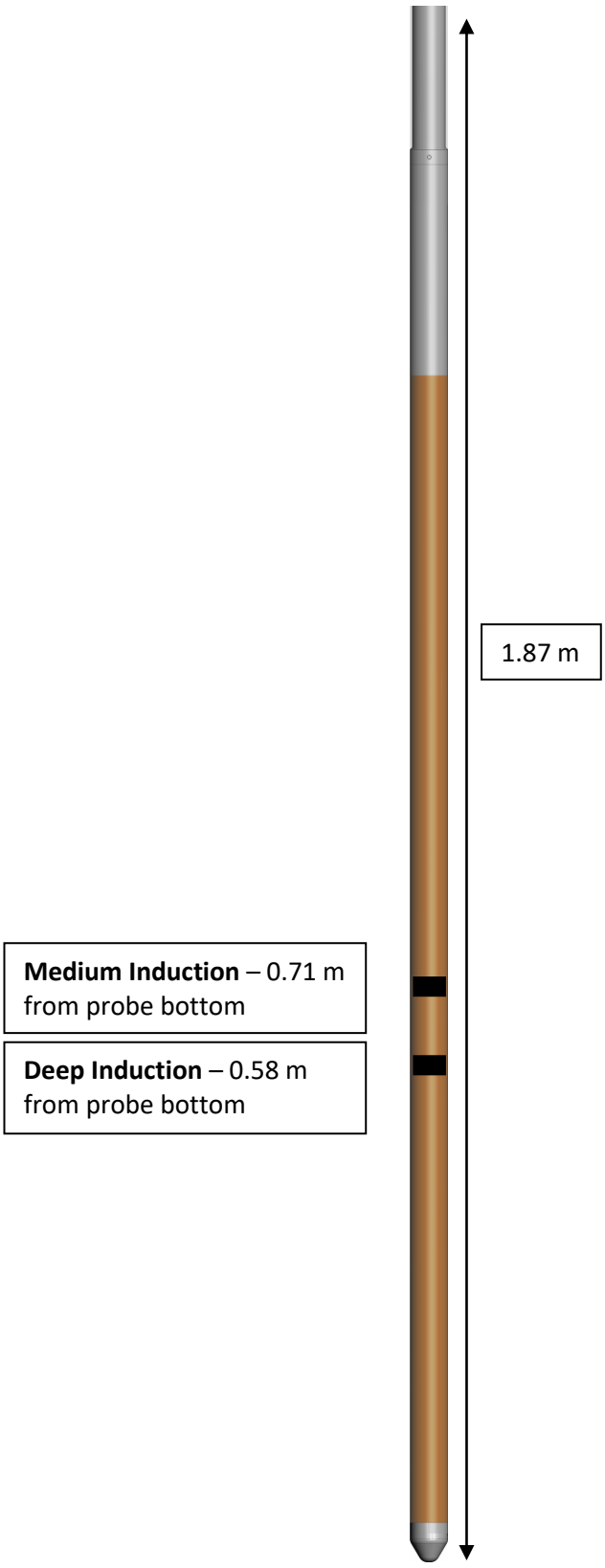


Figure 1-1-1 Tool general arrangement

1.2 QL40-IND Technical Specifications

Tool

Diameter:	45 mm (1.77”)
Length:	1.87 m (6.13 ft)
Weight:	7 Kg (19.8 lbs)
Max. Temp:	70 °C (158 °F)
Max.Pressure:	200 bar (2900 PSI)

Power requirements:

DC voltage at probe top	120 VDC with nominal current draw of 40 mA

Cable:

Cable type:	Mono, Coaxial, 4 or 7 conductor
Digital data transmission:	Up to 500 Kbits per second depending on wireline
Compatibility:	OPAL-SCOUT-BBOX-ALTlogger-Matrix

Reference measuring point (from bottom of bronze knurled ring):

DEEP Induction	0.58 m (1.90 ft) from bottom
MEDIUM Induction	0.71 m (2.33 ft) from bottom

Measurement specifications:

Conductivity
- Range: 1 mS/m – 3,000 mS/m
- Accuracy: < 100 mS/m 3% Full Scale
  0.1 – 1S/m 2%
  1 – 3 S/m 5%

Operating frequency
- 100 KHz

Zero Temperature Stability
- < 0.5 mS/m/10 ºC

2 Measurement Principle

Induction tools, in a very simplified approach, following Doll's theories, assume that magnetic permeability, μ, is constant (true for most sedimentary, iron-free rocks). By imposing an electromagnetic field between a transmitter and receiver located in a fixed axial symmetry on a logging probe, electric currents are induced in the formation surrounding the probe. The strength of the induced currents is proportional to the conductivity of the formation. These induced current loops produce a secondary electromagnetic field called the R signal, phase shifted from the original survey frequency, which is picked up by the receiver coil. The strength of the received R signal is related to the conductivity of the formation. Thus, induction tools respond to both the resistive and capacitive components of the complex impedance.

Some induction tools in the field today record the two components. These are sometimes called the in-phase or X signal, and the quadrature or R signal. The R signal (quadrature) is resistivity dependent. The X signal is capacitance dependent.

If the formation is purely resistive (typical sedimentary rocks), then the resistivity measured by galvanic and induction tools is the same.

The QL40-IND Dual Induction probe measures formation conductivity at two different radial distances from the borehole, which provides additional information on the possible invasion of drilling fluid into the formation.

3 QL40 IND assembly and set up

The QL40-IND sub can be used as a standalone tool or in a tool string when combined with other subs.

3.1 Notes on QL tool assembly

QL stands for **Q**uick **L**ink and describes an innovative connection between logging tools (subs) allowing the assembly of custom tool stacks. QL40 describes a specific family of logging tools. Each sub is equipped with its own telemetry board, power supply element and A/D converter, permitting operation either as a stand-alone tool or stacked in combination with other subs of the QL product family.
The QL40 probe line accommodates two types of sub - Bottom Subs and Mid Subs.

Bottom Sub
A bottom sub is a tool that has at least one sensor that must be located at the bottom of the stack. It can be operated in combination with other QL subs connected to the top but it is not possible to connect another sub below. When used in stand-alone mode the bottom sub only needs the addition of a QL40 tool top adaptor that mates with the cable head.

Mid Sub
A mid sub is a tool that can be integrated anywhere within a stack of tools. When used at the bottom of a tool string a QL40 bottom plug must be used to terminate the string. If the mid sub is used as a stand-alone tool it needs a QL40 bottom plug at the lower end and a QL40 tool top adaptor at the top.

3.2 QL40 stack assembly

A QL40 tool stack may be terminated by either a QL40 bottom sub or a QL40 bottom plug. At the top of the stack a QL40 tool top is required to connect the tool string to the cable head. Several tool tops are already available; special ones can be made on request.

To assemble and disassemble the subs the C-spanner delivered with the tool must be used (Figure 3-1). It is recommended that before each assembly the integrity of the O-rings (AS216 Viton shore 75) is verified. Prime the O-rings with the silicon grease that was supplied with the subs.

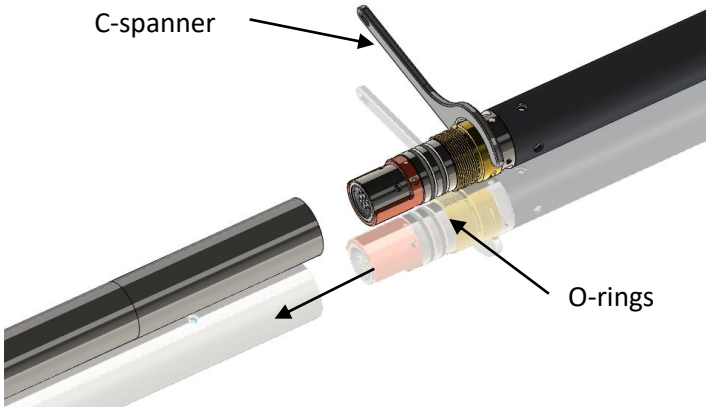


Figure 3-1 *C-spanner and O-rings of QL connection*

The following example of a QL40-ABI, QL40-GAM and QL40-GO4 (Figure 3-2) describes how to replace the QL40-ABI with a QL40-Plug in order to run the QL40-GAM sub stand-alone.

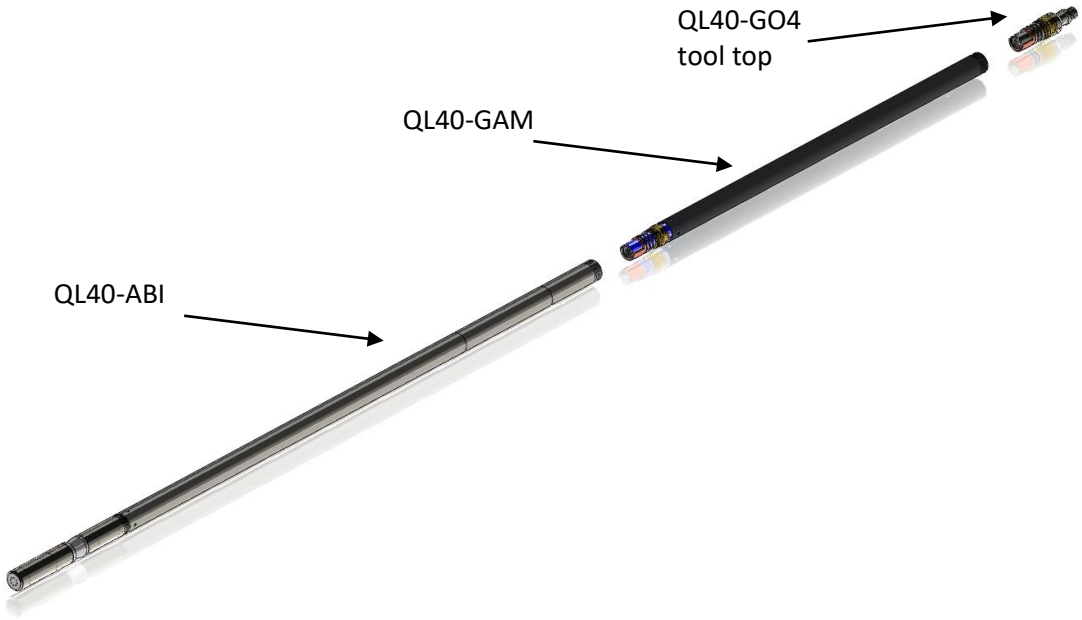


Figure 3-2 *Tool stack example*

To remove the QL40-ABI bottom sub attach the C-spanner to the thread ring as shown in Figure 3-3, unscrew the threaded ring, (anticlockwise about the tool axis when looking towards the bottom of the tool), and remove the QL40-ABI bottom sub.

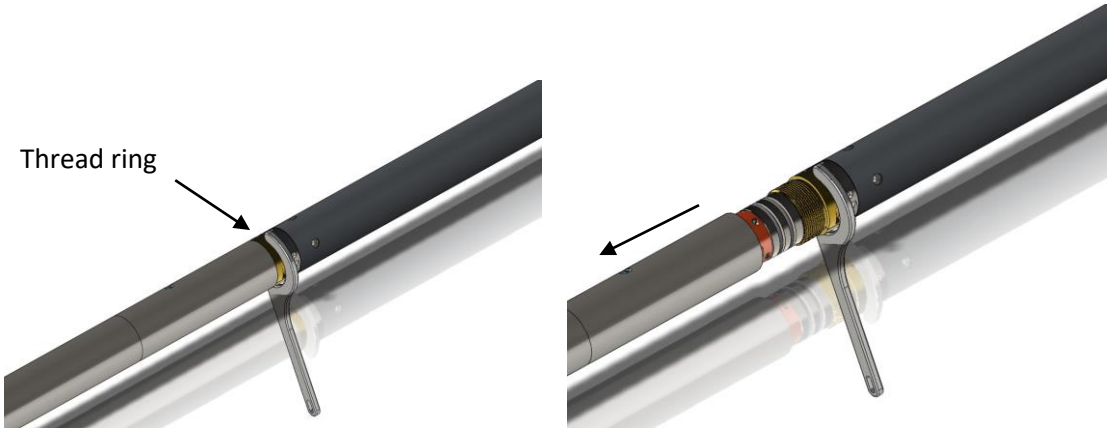


Figure 3-3 *Unscrewing the thread ring and removing the bottom sub*

After checking the O-ring integrity, align and slip the QL40-Plug over the exposed QL connector (Figure 3-4), attach the C-spanner and screw the threaded ring until the plug draws up tight to the ring.

Figure 3-4 *Attaching the QL40-Plug*

The QL40-GAM can now be run stand-alone (Figure 3-5).

Figure 3-5 *QL40-GAM mid sub with tool top and bottom plug*

4 Operating Procedure

Note: Parts of the topics discussed in these sections below assume that the user is familiar with the **LoggerSuite** acquisition software. Refer to the corresponding operator manuals for more details. Information about assembly and configuration of tool stacks can be found in the same manuals.

4.1 Quick Start

1. Connect the QL40-IND to your wireline and start the data acquisition software.

2. Select the relevant QL40-IND tool from the drop down list (***Figure 4-4-1***) in the software's **Tool** panel (if your tool is not listed check that your tool configuration file is stored in the designated folder on your computer).

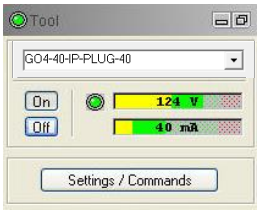


Figure 4-4-1 *Tool panel*

3. In the **Tool** panel switch on the tool (click **On** button) and verify that the power indicator shows a valid (green) level. The system goes through a short initialization sequence which sets the default parameters and communication settings held in the tool configuration file. The configuration returned by the tool is also checked during this procedure. (Setup tool communication as explained in chapter Erreur ! Source du renvoi introuvable. if error message is displayed.)

4. In the **Acquisition** panel (***Figure 4-4-2***) select the sampling mode (depth or time). Click on **Settings** and specify the corresponding sampling rate. Switch on the sampling (click the **ON** button).

Figure 4-4-2 *Acquisition panel*

5. Press the **Record** button in the **Acquisition** panel (***Figure 4-4-3***), specify a file name and start the logging.

6. During logging observe the controls in the **Telemetry** panel:
   - Status must be valid (green light);
   - Bandwidth usage in green range;
   - Memory buffer should be 0%;
   - Number of **Data** increases and number of **Error**s negligible.

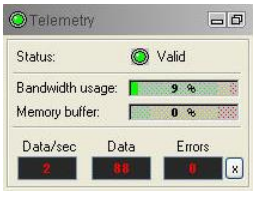


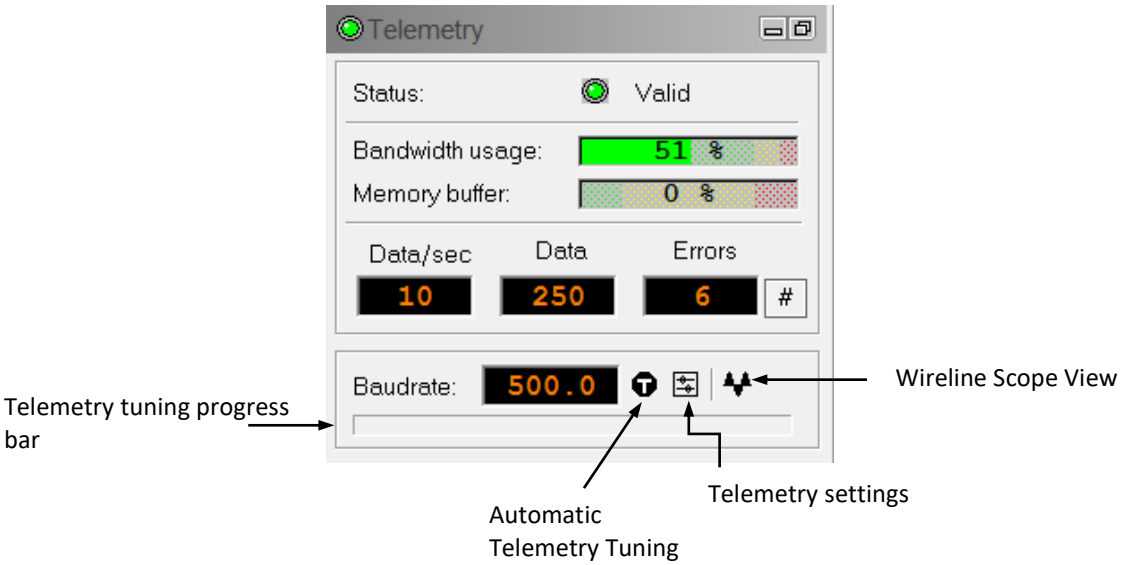
Figure 4-4-3 *Telemetry panel*

7. To end the logging procedure press the **Stop** button in the **Acquisition** panel and turn off the sampling (click **OFF** button).

8. In the **Tool** panel power off the tool.

4.2 Tool Communication with OPAL/SCOUT (ALT MODEM)

The telemetry provided through the **OPAL-SCOUT** systems implementing the **ALT MODEM** controls and configures **AUTOMATICALLY** the telemetry settings for any wireline. In case communication status is not valid the user has different options to adjust manually the telemetry settings from the telemetry panel of the dashboard:



Baud rate:
Indicates the default baud rate or optimal baud rate in kbps found by the system for the selected winch/telemetry scheme

Automatic Telemetry Tuning:

The Tune button resets the telemetry tuning automatically. This process defines:

- the optimum baud rate for the winch configuration selected
- a transfer function and a filter to re-construct at the surface the shape of the pulse trains distorted by the wireline.

A **progress bar** at the bottom of the telemetry window shows the progression of the telemetry tuning. At the end of the process the baud rate display is refreshed with the optimal baud rate value.

Refer to **Appendix** at the end of this manual for more information on the **advanced telemetry settings**.

4.3 Tool Communication with ALT Logger

The telemetry provided through the ALTLogger is self-tuning**.** In case communication status is not valid the user can manually adjust the settings. In the **Telemetry** panel of the dashboard click on **Settings** to display the **Configure Tool Telemetry** dialog box (***Figure 4-4***). A procedure to achieve valid communication is given below:

- Change the **Baudrate** to 41666 kbps.
- Verify that the **Downhole Pulse width** knob is set on 20 (default value). This value is the preferred one and is suitable for a wide range of wirelines. For long wireline (over 2000m), increasing the pulse width could help to stabilize the communication. The reverse is true for short wireline (less than 500m).
- Set the **Uphole** discriminators in the middle of the range for which the communication status stays valid.
- Increase the **Baudrate** to the desired value and observe that the communication status stays valid and the **Bandwidth usage** (in **Telemetry** panel of the dashboard) is below the critical level.
- When **Uphole** discriminators are properly set, store the new configuration as default. The tool should go through the initialisation sequence successfully the next time it is turned on.

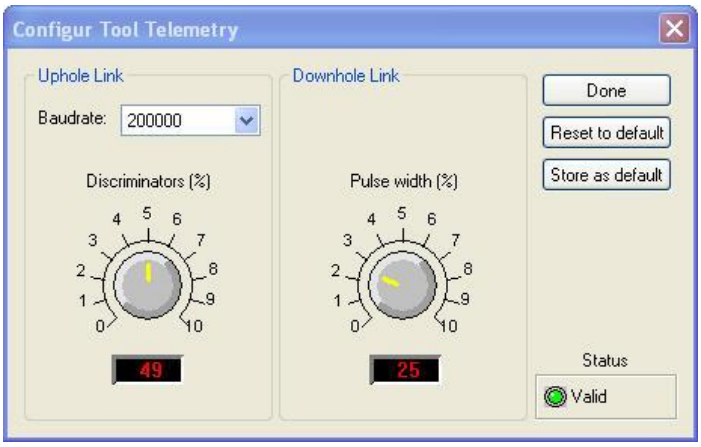


Figure 4-4-4 *Tool communication settings*

4.4 Tool Communication with MATRIX

The tool telemetry can be configured through the **Telemetry** panel of the Matrix dashboard. By clicking on **Settings**, the operator has access to the **Configure ALT Telemetry** dialog box (***Figure 4-5***) providing various controls to adjust the telemetry settings and monitor its current status.
The **Analysis View** displays the current discriminator levels (vertical yellow lines) and a histogram of the up-hole data signal. The scales of the **Analysis View** can be adjusted using the **Vertical Scale** and **Horizontal Scale** knobs and the **lin**ear / **log**arithmic scale buttons.
The status of the configuration should be flagged as Valid (indicated by the LED being green). In any other case (LED red) the telemetry should be adjusted (we assume a pulse signal is displayed in the analysis view). Click on the **Advanced** button to display additional controls to tune the telemetry.
The Automatic settings option is the preferred mode and should allow the telemetry to be configured for a wide range of wirelines without operator input. For wirelines with a more limited bandwidth, the operator might need to turn off the automatic mode and adjust the telemetry settings manually. In general, the gain setting should not be left in the automatic mode once a valid setting has been determined. Uncheck the box to disable automatic gain.

For each wireline configuration, the discriminators (vertical yellow lines) for the **positive** and **negative** pulses must be adjusted in order to obtain a valid communication status (see ***Figure 4-4-5***) for an example of a suitable discriminator position). There is also the option to alter the **baudrate** in order to optimize the logging speed. The input **gain** can be increased (long wirelines) or decreased (short wirelines) in order to set up the discriminator levels correctly.

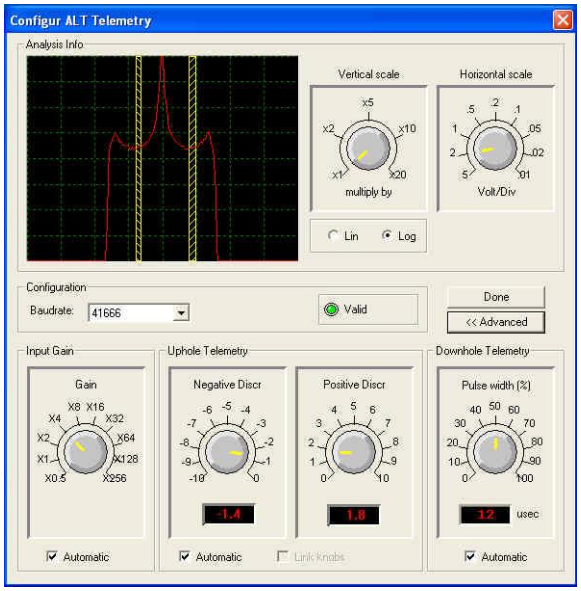


Figure 4-4-5 *Matrix telemetry settings*

Once the telemetry is correctly set, store the new settings as default. The tool should go through the initialization sequence in "Valid" status the next time the power is turned on.

4.5 Recorded Parameters, Processors and Browsers

4.5.1 Recorded parameters

The following data channels are recorded by the **QL40-IND** tool (***Table 1***).

Time	Time [sec]
TCPU	Tool CPU temperature [°C]
IMCOUNT	Induction Medium counts [Counts]
IDCOUNT	Induction Deep counts [Counts]
Medium Induction	Medium Conductivity [mS/m]
Deep Induction	Deep Conductivity [mS/m]
Medium Res	Medium Resistivity [Ohm.m]
Deep Res	Deep Resistivity [Ohm.m]

Table 1 *Recorded data channels*

4.5.2 MChNum Browser

Figure 4-6 shows a typical example of the numerical values displayed in the MChNum browser

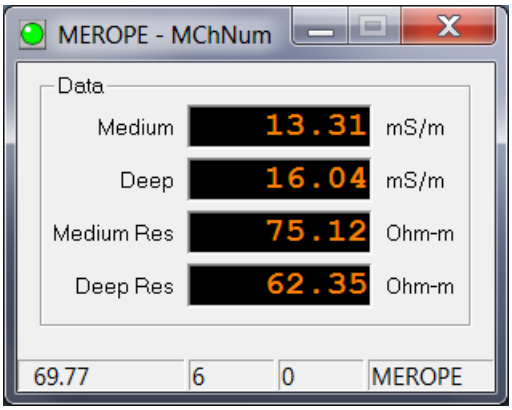


***Figure 4-6** MCHNum Browser Window*

Medium	Medium Conductivity [mS/m]
Deep	Deep Conductivity [mS/m]
Medium Res	Medium Resistivity [Ohm.m]
Deep Res	Deep Resistivity [Ohm.m]

The other parameters listed in **Table 1** can be displayed in real time if required. Right click on MChNum browser and click on “Display options” from the menu.

Select in the “Display options properties” dialog box and add the additional channels to display.
It is possible to change the format of decimal digits displayed for a channel. Select the channel and click on “Settings” to configure the number of digits after the period.

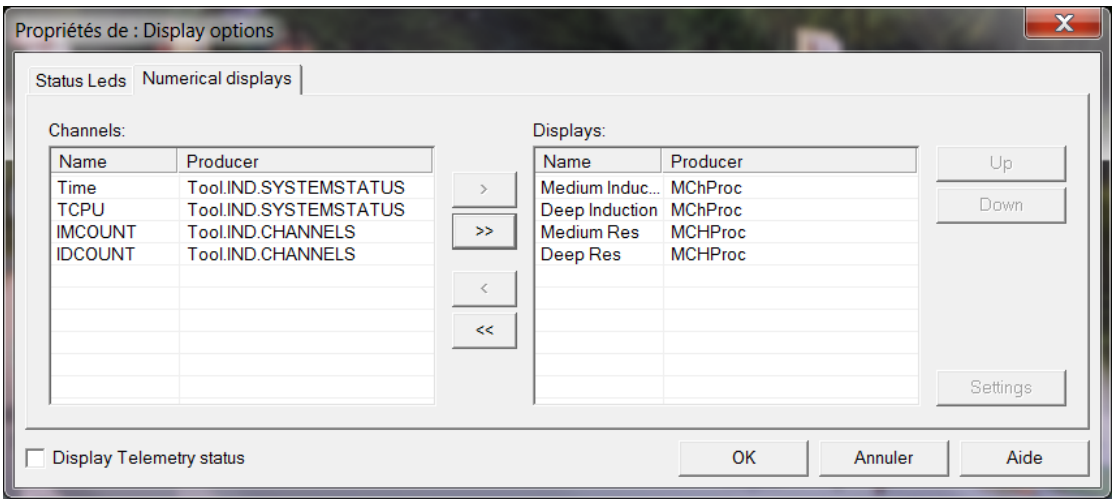


***Figure 4-7** Display options properties*

4.5.3 MChCurve Browser

By default the MchCurve Browser window displays the curves shown in **Figure 4-8** – Medium Induction, Deep Induction, Medium Resistivivty, Deep Resistivity.

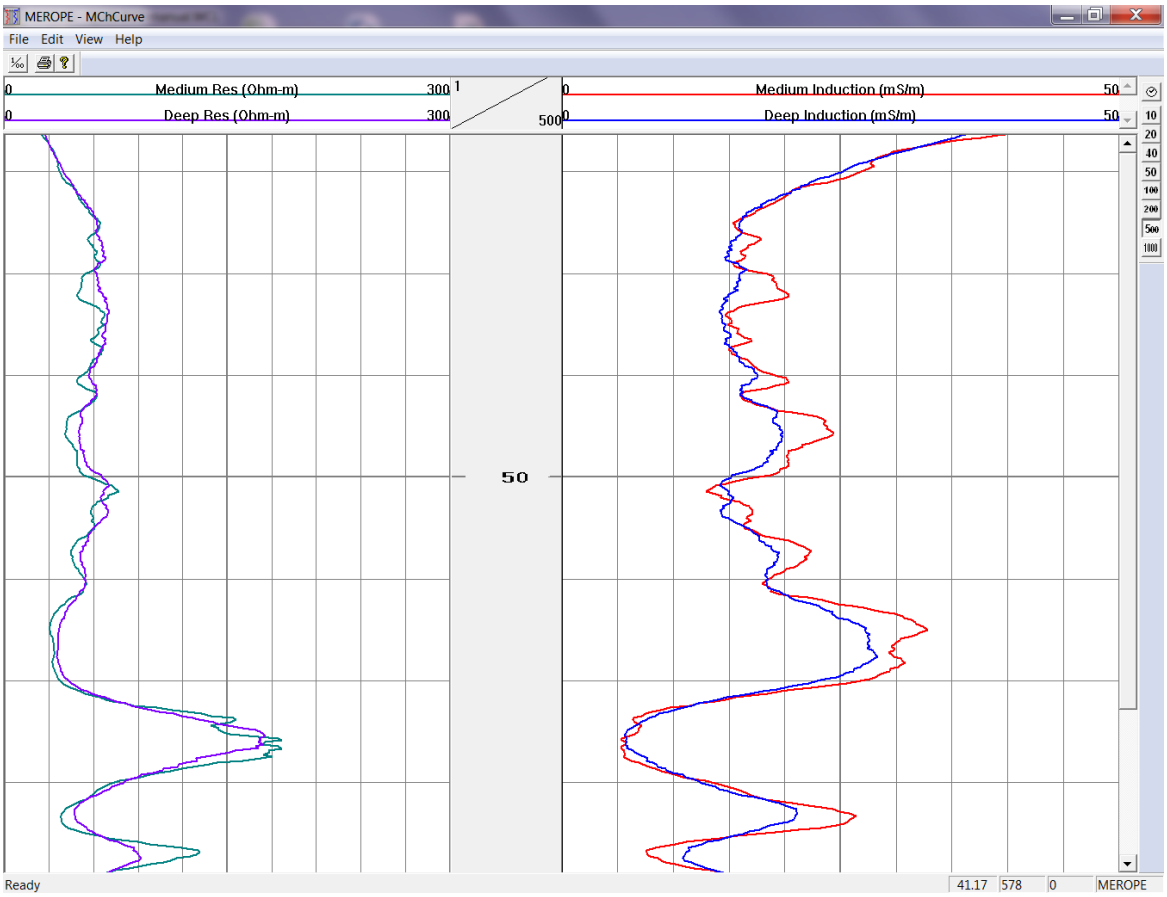


Figure 4-8 *MchCurve Browser window*

5 Performance Check & Calibration

Calibrations are performed at the factory. Each QL40-IND is delivered with a calibrated "sub" file that must be used for that specific tool. It is also possible to calibrate the tool before a field operation using the suitable **Calibration ring(s).**

Either two individual calibration rings or one combination ring can be provided for the probe. Each ring has values written on it. The white values refer to the medium induction channel, and the red values refer to the deep induction channel. Note: Other colors may be used to indicate the differing values.

The paragraph below describes the calibration ring functions:

Low Conductivity Ring:

- 200 mS/m for Medium Induction (center ring on the tape or dot located at 71 cm from probe bottom)
- 40 mS/m for Deep Induction (center ring on the tape or dot located at 58cm from the probe bottom)

High Conductivity Ring:

- 500 mS/m for Medium Induction (center ring on the tape or dot located at 71 cm from probe bottom)
- 100 mS/m for Deep Induction (center ring on the tape or dot located at 58cm from the probe bottom)

5.1 Calibration procedure

The probe should be suspended in air, approximately 1.5 m (5 feet) above the ground and at least 3 m (10 feet) from any metallic or conductive objects. This represents a zero conductivity reference.

Figure 5-1 *Example of a calibration /zero fixture*

1. Assemble the tool sub(s) and connect to the wireline
2. In the **Tool Panel**:
   Select the proper tool/stack;
   Turn tool power **On.** Wait for 10 min to **warm up** the tool
3. In the **Acquisition Panel** select **Time** and turn it **ON**.
4. Verify the telemetry status in the **Telemetry Panel**. The LED must be green and status valid
5. Right click on MChNum browser
6. From the menu, uncheck "Use calibration" and click on "Calibration Settings"
7. **<u>For each induction channel (Medium Induction, Deep Induction)</u>**, follow the steps below:

   - From the "**Calibration Settings**" dialog box select the calibration page of the induction channel to calibrate (***Figures 5-2 & 5-3***)

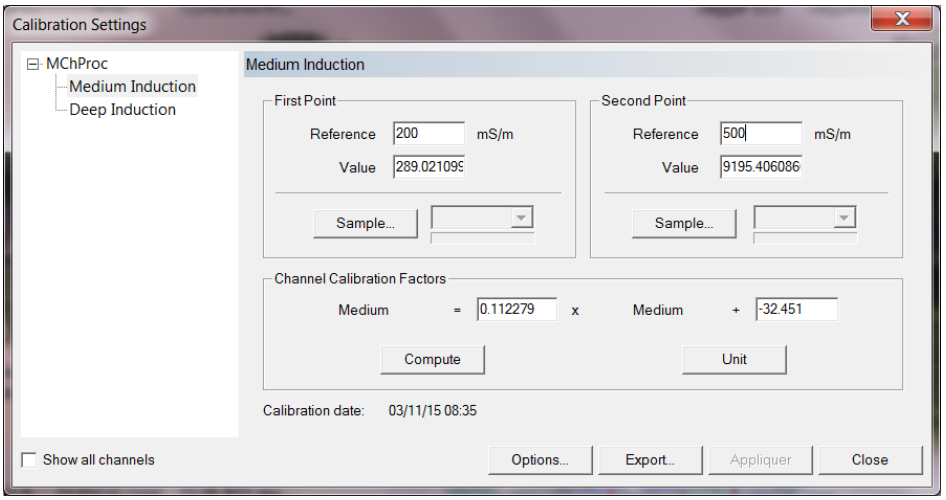


Figure 5-2 *Medium induction calibration page*

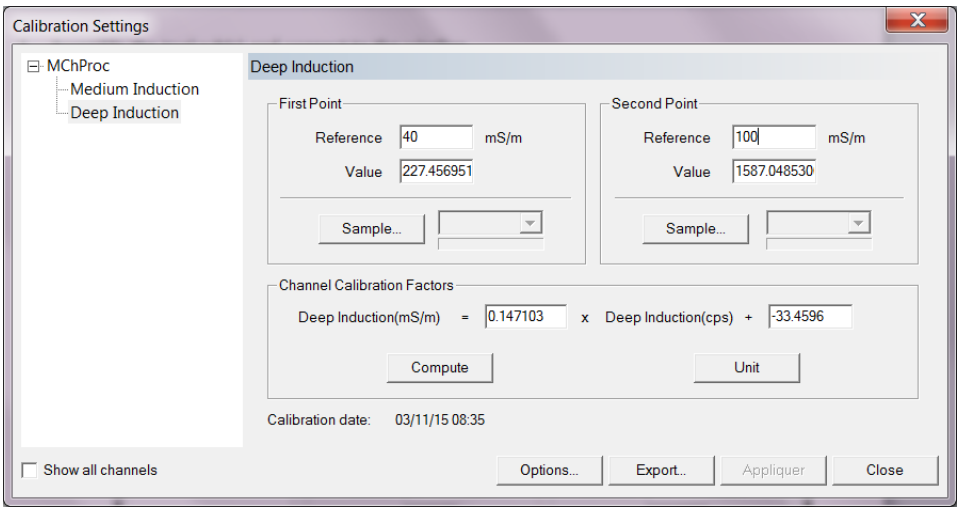


Figure 5-3 *Deep induction calibration page*

- Place the **"Low Conductivity ring"** on the **Medium channel** (71cm from probe bottom)

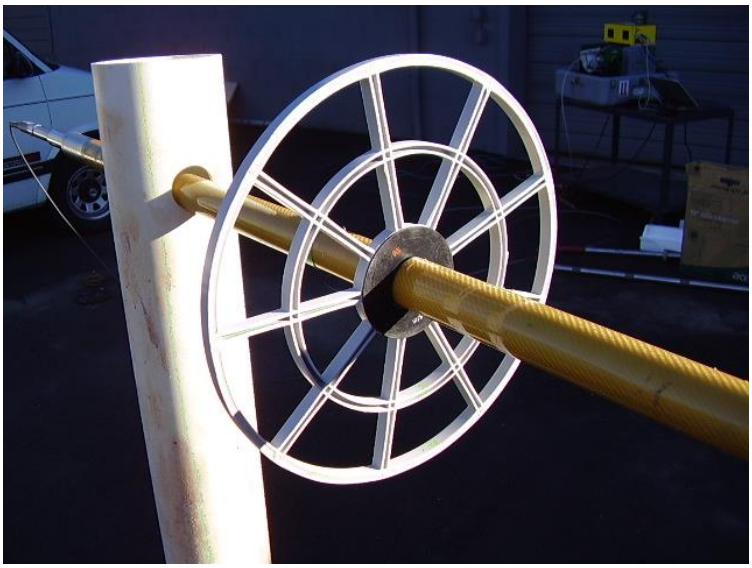


Figure 5-4 *Low conductivity ring placed on the Medium channel*

- Select the Medium channel calibration page and edit the first reference value (say 200 mS/m)
- Click on **SAMPLE** to get the corresponding value in cps

- Slide the **"Low Conductivity ring"** on the **Deep channel** (58 cm from probe bottom)
- Select the Deep channel calibration page and edit the first reference value (say 40 mS/m)
- Click on **SAMPLE** to get the corresponding value in cps

- Place the **"High Conductivity ring"** on the **Medium channel** (71 cm from probe bottom)
- Select the Medium channel calibration page and edit the second reference value (say 500 mS/m)
- Click on **SAMPLE** to get the corresponding value in cps
- Click on **Compute** and then on **Apply** to store the new calibration factors for the medium channel. **Close** the calibration page.

- Slide the **"High Conductivity ring"** on the **Deep channel** (58 cm from probe bottom)
- Select the Deep channel calibration page and edit the second reference value (say 100 mS/m)
- Click on **SAMPLE** to get the corresponding value in cps
- Click on **Compute** and then on **Apply** to store the new calibration factors for the medium channel. **Close** the calibration page.

When only one calibration ring is supplied for the First Point user can use a Reference of 0 and the Sample button to capture the zero value for the tool. The Second Point then uses respectively the medium and deep ring values.

6 Maintenance

Warning: Removing the electronic chassis from pressure housing without prior consultation with ALT/MSI will void the tool warranty.

The QL40 series tools require periodic maintenance. Make sure the threads on the brass nut on the sub bottom are free of sand, mud or other dirt. A thin layer of anti-seize is recommended. When disassembling the sub string, dry the joint as it is separated to prevent fluid from entering the sub top and getting into the electrical connector inside.
After replacing top and bottom protectors it is good to wash the probe off after each use.
Never take the probe apart. This probe is very difficult to disassemble and requires special steps to be taken in order to gain access to the inside of the probe without damaging the electronics. If you have read this after attempting to disassemble the probe chances are the probe has experienced damage and will need to be sent to the factory to be repaired.
Inspect O-rings occasionally and keep the threads on both ends of the probe clean, to minimize problems in the future.

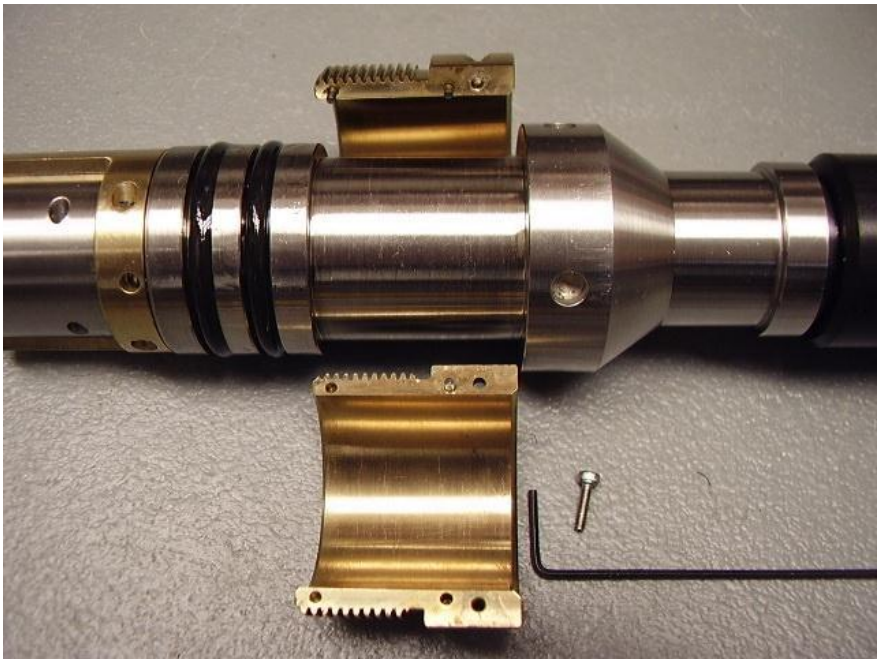
6.1 Locking Ring assembly Maintenance

Tools required:
1.5mm Allen wrench
2 ea 40-42mm spanner wrench
Paper towels or clean rags

Replacement Parts:
ALT26005, Large Threaded Ring, Qty 2
28-174-995 M2x8 SHCS, Qty 2

Disassembly:
Unscrew and remove the two M2x8 socket head cap screws and separate the two halves. Four guide pins align the two ring halves and tend to hold them together after the screws are removed.
To pry the halves apart you can use a pair of spanner wrenches inserted into the wrench holes on opposite sides of the ring mating surfaces to pull them apart slightly.
Do this carefully to prevent bending the guide pins.

Place something small in the opening and move the spanners to the other side and pry it open slightly.
This should be enough to release the two rings as below.



Clean inside surfaces thoroughly and reassemble, coating the inside with a very light film of anti-seize compound. Nickel based compounds are best, to prevent any sticking between the brass and steel surfaces.

7 Troubleshooting

NEVER DIS-ASSEMBLE THE PROBE WITHOUT CONSULTING THE FACTORY FIRST
The **QL40-IND** Probe should **never be disassembled** unless service is necessary. This is a very difficult probe to disassemble, and is highly recommended that any service be performed by Mount Sopris, ALT or a qualified technician.

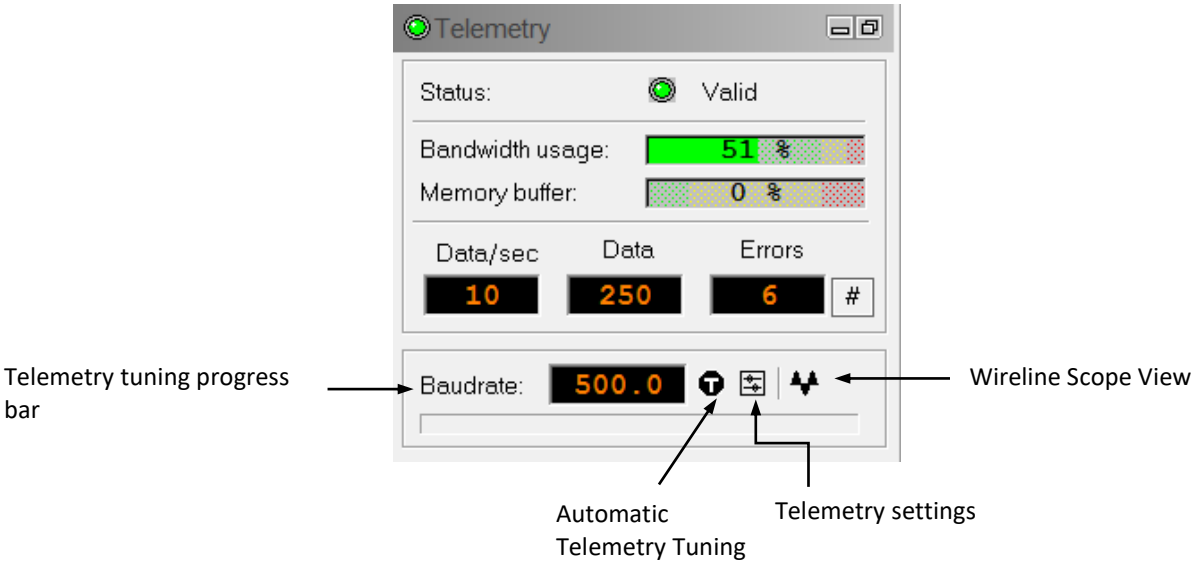
Observation	**To Do**
Tool not listed in Tool panel drop down list.	- Do you have a configuration file? - Has the configuration file been installed with the LoggerSettings application (refer to LoggerSettings and LoggerSuite manuals for more information)
Tool configuration error message when powering on the tool.	- Check all connections. - Adjust the telemetry settings for your wireline configuration (see chapter 3.2 or 3.3) and store the new settings as default. Apply the appropriate tool settings for your logging run (see chapter 3.4).
Tool panel - No current.	- Verify that the wireline armour is connected to the logging system. Test your interface cable between winch and data acquisition system. - Verify cable head integrity. - Verify voltage output at the cable head (it should be 120V).
Tool panel - Too much current (red area).	**! Immediately switch off the tool !** **-**Possible shortcut (voltage low, current high): Check for water ingress and cable head integrity - wireline continuity. - Verify the interface cable between winch slip ring and data acquisition system is not loose at the connectors. Check for possible source of the short circuit. - If the above shows no issues, use test cable provided by ALT/MSI to verify tool functionality. - If the problem still occurs, please contact service centre.
Telemetry panel - status shows red.	- Verify the telemetry settings for your wireline configuration (see chapter 3.2 or 3.3). - If problem cannot be resolved contact support@alt.lu or tech.support@mountsopris.com
Telemetry panel - memory buffer shows 100%.	- Indicates that the systems internal memory buffer is full. PC can't receive incoming data streams fast enough. Ensure your PC has enough resources available.
Telemetry panel – bandwidth usage shows 100%. *(Overrun error message.)*	- Set the baudrate to highest value allowed by your wireline configuration. - Reduce logging speed or increase vertical sample step.

Telemetry panel - large number of errors.	- Verify the telemetry settings for your wireline configuration (see chapter 3.2 or 3.3). - Check bandwidth usage and telemetry error status.
No counts from the Induction probe	- Is the probe isolated from any metallic objects? Rebar in a concrete floor can kill the count rate. -Are discriminators set properly? In Matrix / Logger, Telemetry, Settings, Advanced, be sure you see the classic double fishhook signature indicating positive and negative pulses. -Did you install the probe correctly using the LoggerSettings program? -Is the logger supplying the correct voltage (~38V) at logger? In Matrix / Logger the tool will show approximately 90-100ma current draw Check cable for conductive leakage between the center conductor and ARMOR. If no results from the above, consult ALT/MSI
Counts are too high compared to the factory calibration values	-Are discriminators set properly? In Matrix/ Logger, Telemetry, Settings, Advanced, be sure you see the classic double fishhook signature indicating positive and negative pulses. The gain for this tool needs to be 0.5 for up to 500M 1/8" single conductor cable. If the gain is set too high the system will count noise

8 Appendix

8.1 Tool Communication with OPAL/SCOUT

The telemetry provided through the OPAL-SCOUT systems implementing the ALT MODEM adapter is self-tuning. In case communication status is not valid the user has different options to adjust manually the telemetry settings from the telemetry panel of the dashboard:



Baud rate:
Indicates the default baud rate or optimal baud rate in kbps found by the system for the selected winch/telemetry scheme

Automatic Telemetry Tuning:

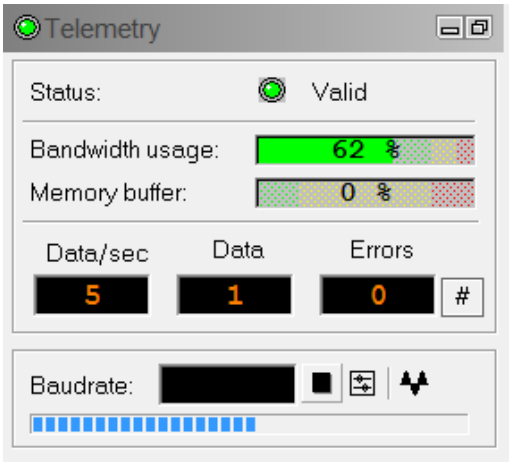
The Tune button resets the telemetry tuning automatically. This process defines:

- the optimum baud rate for the winch configuration selected
- a transfer function and a filter to re-construct at the surface the shape of the pulse trains distorted by the wireline.[1] Refer to the **Equalizer** paragraph for more details.

The Automatic Tuning is very useful on wireline over 1000m length to optimize the telemetry performance and logging speed.

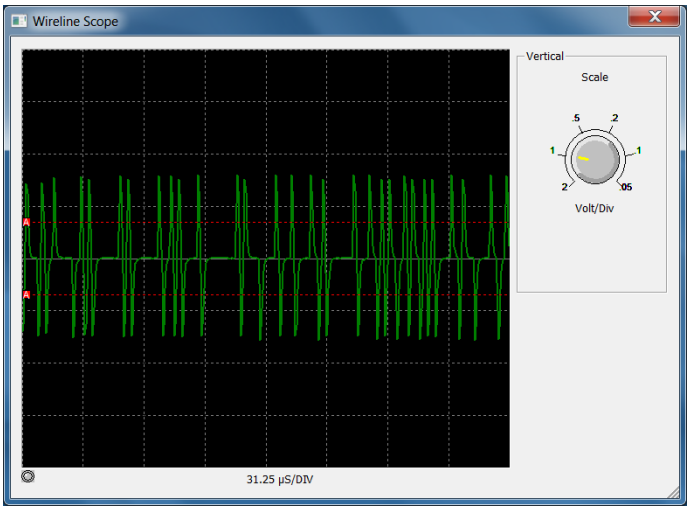
A **progress bar** at the bottom of the telemetry window shows the progression of the telemetry tuning. At the end of the process the baud rate display is refreshed with the optimal baud rate value.

[1] The transfer function and filter concept are only valid for tools implementing the latest generation of ALT MODEM telemetry board (i.e. QL40-ABI2G, ABI-GR-2G, QL40-OBI2G, OBI-GR-2G, QL43-ABI2G,…)



Scope:

Pressing the scope button on the **Telemetry Panel** brings up a **Wireline Scope** view (Figure x), which displays the pulse strings transmitted through the wireline and received by the system at the surface.



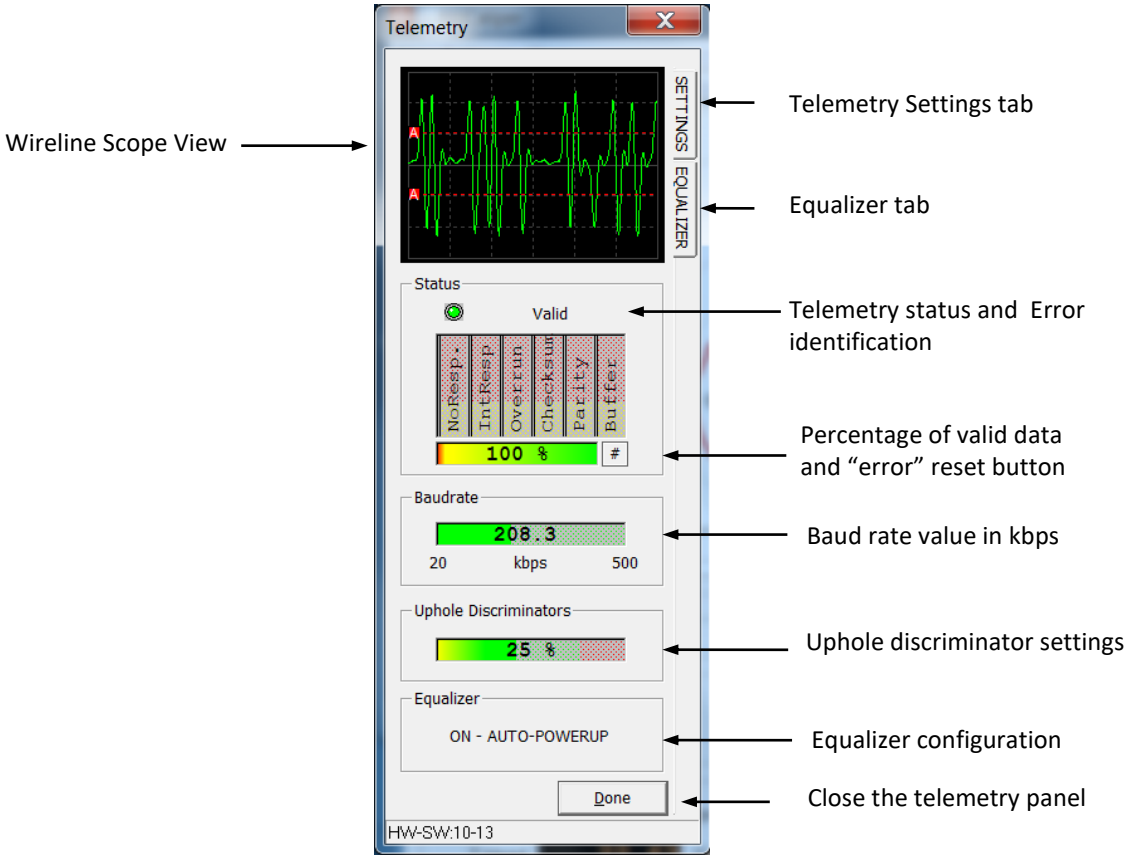
The two red-dashed horizontal lines help to visualize the position of the discriminator levels set for detecting the pulses at the surface. Discriminator levels can be tuned in the **Telemetry Settings** dialog – refer to section 3.6.1 for more information.

The Scale knob can be adjusted to show more or less vertical details. This view has no effect on the communications and is a visual aid only.

Telemetry Settings:

The Telemetry Settings button opens a **Telemetry** control panel summarizing the telemetry status and configuration.

If the system cannot establish a stable communication with the tool, the **Settings and Equalizer tabs** allow the user to modify the telemetry settings and to apply a telemetry filter (Equalizer option)

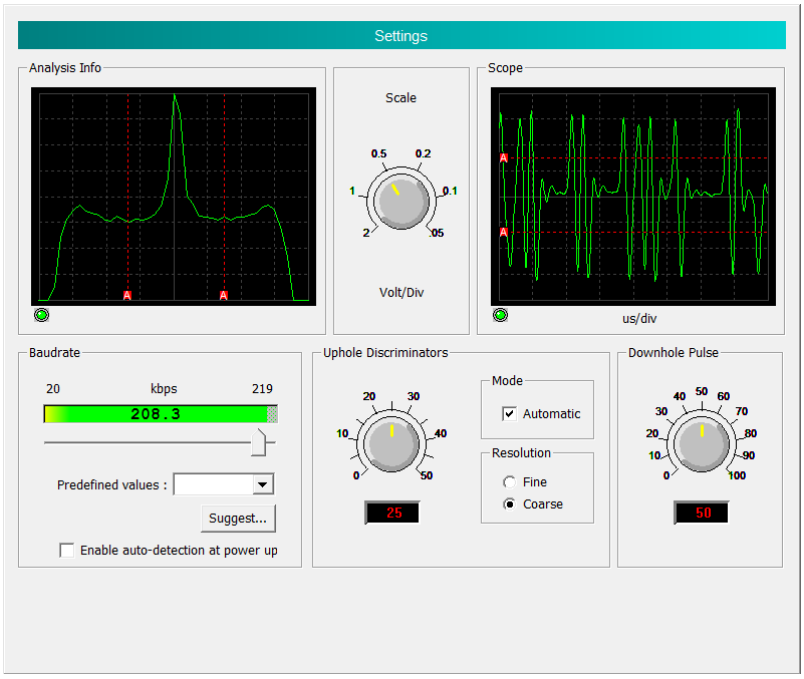


Adjusting the Telemetry Settings:

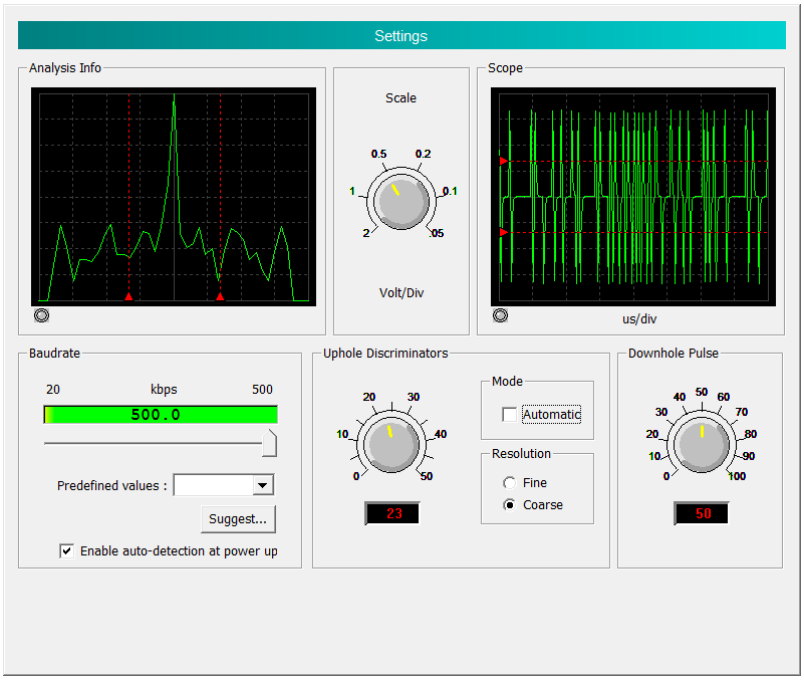
By default the telemetry settings are set to Automatic mode and should stay in this configuration. When more advanced tuning is required (i.e. long wirelines having a limited bandwidth) the manual mode can be activated.

In Automatic mode the uphole discriminators are set automatically to detect the pulse strings.
The position of the discriminator levels are visible on the Scope and Analysis views and are represented by two red dashed lines – one for the positive pulses and the other for the negative pulses.
The "A" letter on the red square means that the discriminators are set in automatic mode.
The **Scale knob** controls the scale for the Analysis and Scope displays.

Position of the discriminator lines should be set as illustrated below.



When the automatic mode is unchecked user has the option to adjust manually the uphole discriminators using either the discriminator knob or by moving interactively the red dashed lines in the Analysis and Scope displays. The red triangles located at the extremities of the red dashed lines refer to manual mode. For fine tuning of the discriminators the **Fine resolution** can be chosen.



The **Downhole Pulse knob** controls the width of the pulse commands sent to the tool.
It is set on 50 as a default value. This value is the preferred one and is suitable for a wide range of wirelines. For long wireline increasing the pulse width could help to stabilize the communication. The reverse for short wireline.

The **Baudrate** is generally set to the maximum value for which the communication status stays valid in order to optimize the logging speed for the wireline configuration.
The baudrate can be adjusted by moving the cursor below the baudrate bar meter or by selecting a predefined baudrate value from the select box.

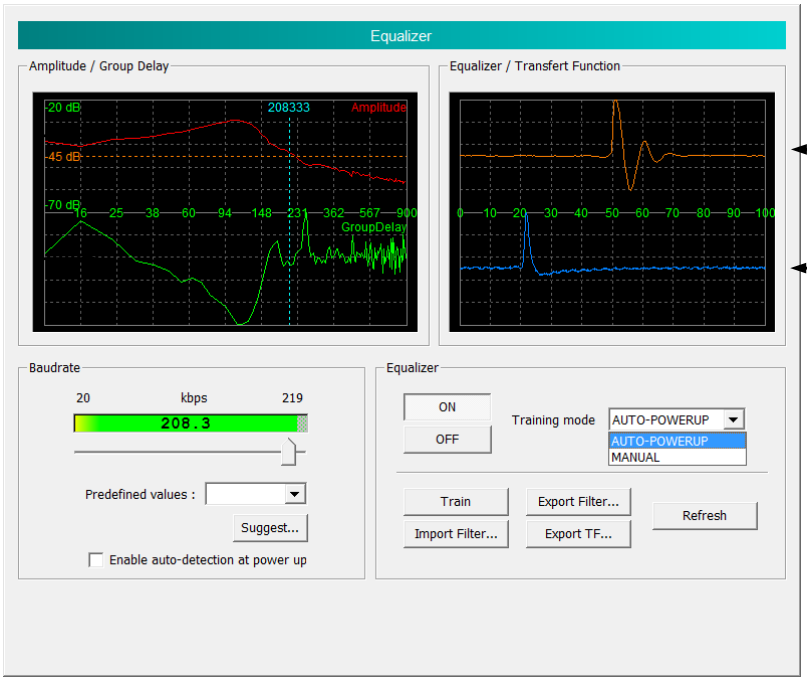
When clicking the **Suggest** button the system is searching for the optimum baudrate value and keeps this value for the data transmission.

The **Enable auto-detection at power-up** configures the system such a way that the baudrate is reset to its optimum value each time a tool is powered up.

Applying the Equalizer

Signal amplitude spectrum chart

Group delay chart



Telemetry filter

Transfer function

The **Equalizer** dialog provides some advanced telemetry settings described hereafter.

- The **Train** button computes the transfer function of a wireline - refer to the blue signal.
  When clicking on Train the tool sends a pilot pulse frame to the surface. The received signal at the surface is compared with the original pilot pulse frame to measure the distortion of the signal through the wireline. The result of this process is the definition of a transfer function specific to the wireline used.

  A filter is then derived from the transfer function - refer to the orange signal. The filter will be applied on the telemetry signal to counteract the distortion of the pulse strings through the wireline.
  Applying the filter will thus improve the telemetry performance of the system and logging speed on wirelines with unfavorable band width.

- The **Equalizer ON/OFF** buttons enables or disables the filter. The activation of the equalizer can be configured to **MANUAL** mode or to **AUTO-POWERUP**.

The AUTO-POWERUP feature applies the telemetry filter upon tool power-up.

- The **Export TF** option exports the **Transfer Function** defined by the wireline training process in a ASCII file format

- The **Export Filter** option exports the **Filter** derived from the transfer function in a ASCII format

- The **Import Filter** option loads a saved filter configuration

- The **refresh** button is refreshing the Equalizer/transfer function display

The **Amplitude/Group Delay** charts are mostly used by ALT developers for telemetry signal and performance analysis.

The Equalizer dialog repeats the **Baudrate** settings already discussed in the previous paragraph “Adjusting telemetry settings”.

8.2 Charts and figures

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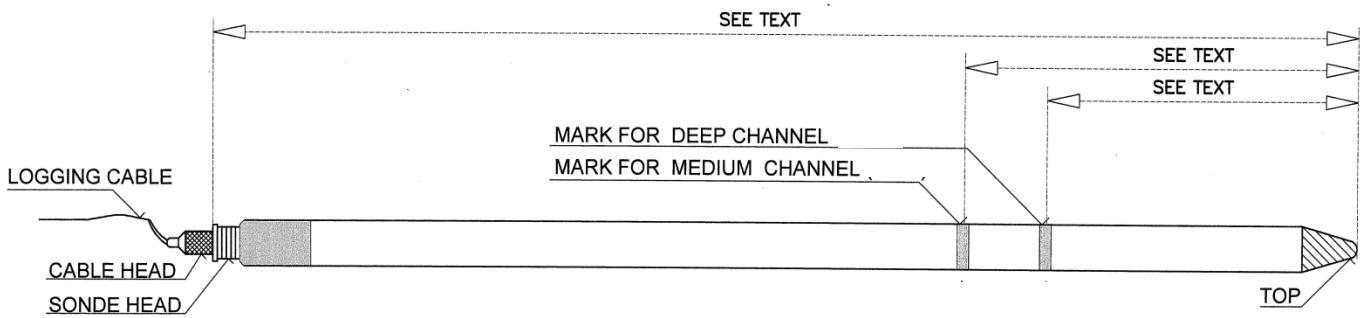
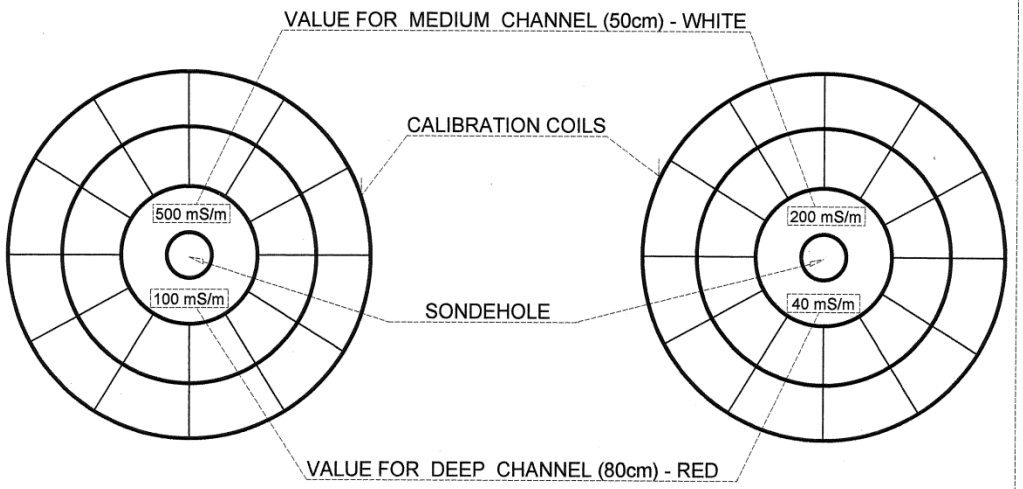
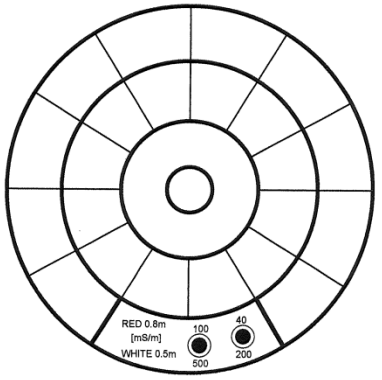
CALIBRATION of DUAL INDUCTION CONDUCTIVITY PROBE - HII 453



SINGLE CALIBRATION COILS



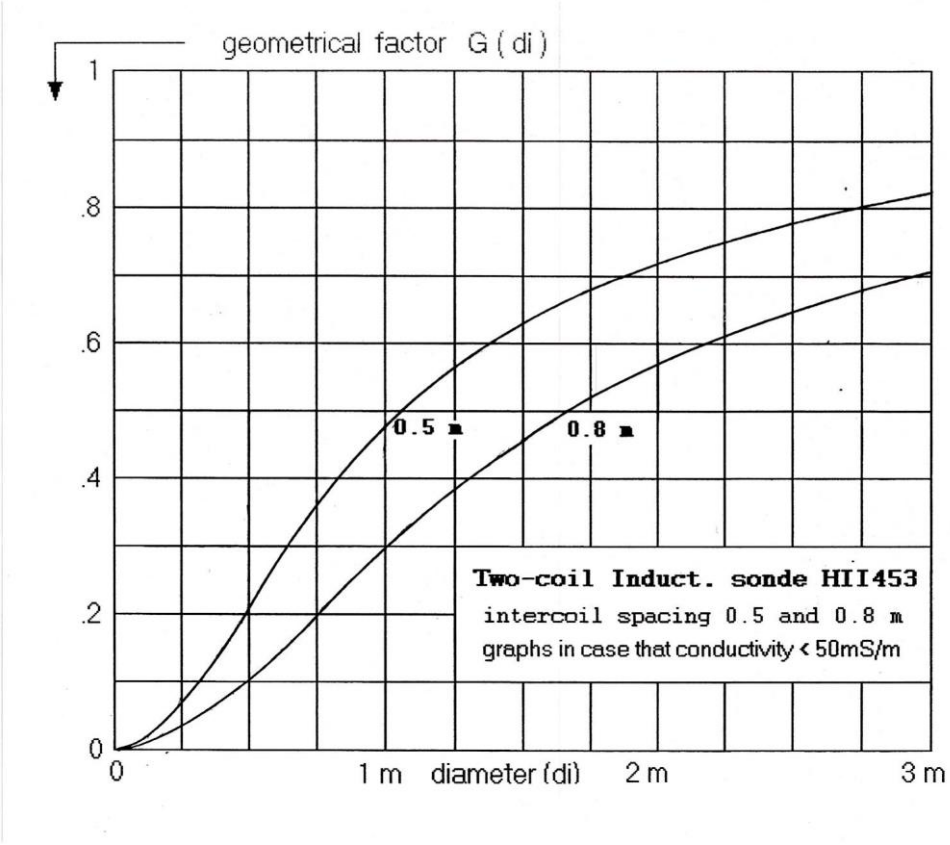
TRIPLE CALIBRATION COIL



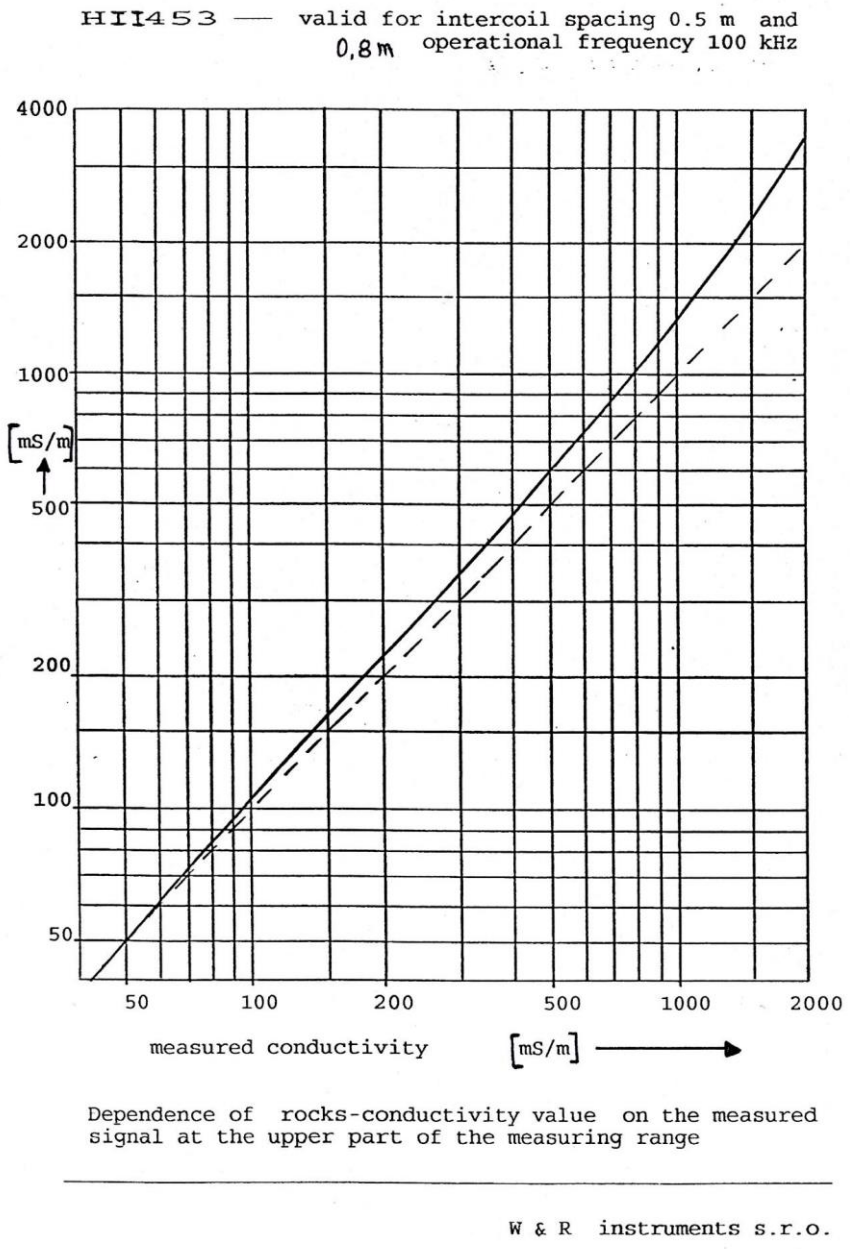
SETTING:

WHITE Channel 0.5m		
mS/m	PUSH BUTTON	
	200	500
0	OFF	OFF
200	ON	OFF
500	OFF	ON
700	ON	ON

RED Channel 0.8m		
mS/m	PUSH BUTTON	
	40	100
0	OFF	OFF
40	ON	OFF
100	OFF	ON
140	ON	ON



Geometrical Factor



Upper range rock conductivity dependence