

MI5 Multishot Orientation Tool User Guide

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Introduction

Overview

The MI5 multishot tool orients advanced piston corer (APC) cores by taking orientation measurements for a short period of time just prior to when the core is taken. The drill string is kept steady while the tool measures and stores measurements from a triaxial magnetometer and a triaxial accelerometer. The data are processed using the *Inclin* software, and data output includes hole ID, dip, azimuth, temperature, magnetic tool face, magnetic field strength, magnetic dip, and accelerometer output. The orientation tool is run on the APC bottom-hole assembly (BHA) within a nonmagnetic core barrel. The tool is synchronized with a Palm handheld computer before deployment. After deployment the recorded data are downloaded to the Palm and then transferred to a PC via serial and USB cables.

Theory of operation

Earth's magnetic field or geomagnetic field is a vector field that is mostly dipolar, with the dipole axis typically located near Earth's spin axis but varying in time. Hence, magnetic north tends to be near true north, and compasses or magnetometers can be used to find spacial orientation relative to the magnetic pole by mapping the direction and intensity of the field. The direction and magnitude of the geomagnetic field is commonly described using inclination, declination, and intensity (also referred to as total intensity or magnetic field strength); or horizontal intensity (north and east components) and vertical intensity. The magnetic field strength values increase toward the poles, being roughly twice as strong at the magnetic poles as at the magnetic equator, as expected for a dipolar field. Declination is the angular difference between true (geographic) north and magnetic north. Inclination is the angle at which the magnetic field lines intersect the surface of the earth (ranging from 0° at the Equator to 90° at the poles).

The core orientation process determines the angular correction to apply to the core's declination values as measured by the cryogenic magnetometer. The MI5 tool is connected to the core barrel in such a way that the double lines on the core liner are at a fixed known angle to the sensors. The MI5 tool records an azimuth to magnetic north for each core. This azimuth combined with the local magnetic declination values allows the scientists to correct the measured core declination's back to the true coordinates.

Core Orientation Tool Parts

Hardware

The MI5 core orientation tool contains the following parts (see *Fig. 1*):

1. Pressure Barrel

2. End Seal
3. End Seal with key
4. Orientation Tool
5. USB to Serial cable
6. Palm Pilot
7. Palm to Serial cable
8. Probe to Serial Cable
9. Charger Cord

The core techs use a Flex-it T-bar (snubber shock) adapter to connect the pressure case to the tensor pressure case on the drill floor. These pieces do break periodically and a supply must be maintained on board.

Without this piece we are unable to run the orientation tool. This piece is machined from brass.

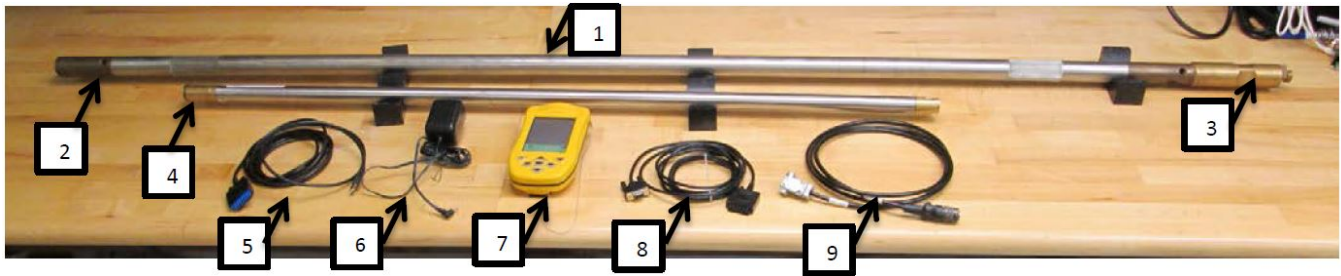


Figure 1. M15 Tool and Accessories



Figure 1.2a. Communications port end (without cap); arrow indicates LED



Figure 1.2b. T-slot end

Components

The orientation tool is a sealed tube with a communications port on one end (Fig. 1.2a) and a T-slot key on the opposite end (Fig. 1.2b). An LED light on the communications port end flashes green and red to indicate instrument status.

- Triaxial accelerometer (range 360°, accuracy ±0.1°)
- Triaxial magnetometer (range 100,000 nT, accuracy ±0.5 nT)
- Temperature sensor (solid state, range -30° to +85°C, accuracy ±1°C)
- Shot interval minimum: 10 sec
- Power: 6 AA batteries

Probe specifications

Feature	Specification
Dimensions	25.4 mm × 1.16 m
Weight	1.9 kg
Operating Temperature	-30° to +85°C
Pressure Rating	300 m (H2O)
Power Source	6 AA batteries

Pressure barrel specifications

Feature	Specification
Dimensions	33.4 mm × 1.88 m
Weight	8.6 kg
Operating Temperature	-30° to +85°C
Pressure Rating	3500 m (H2O)

Consumable parts

Part	Part number
Nitrile (Buna- N) Duro 70 (shore A) O-Ring (2 on Battery Plug)	AS568-013
Nitrile (Buna- N) Duro 70 (shore A) O-Ring (1 Internal on Instrument Cap)	AS568-115
Nitrile (Buna- N) Duro 70 (shore A) O-Ring (1 External on Instrument Cap)	AS568-117
Nitrile (Buna- N) Duro 70 O-Ring (2 Internal on In-Line snubber)	AS568-212
MI5 shoulder screw/ MI5 plug screw (Available through Icefield Tools Only)	G5014

MI5 tool and pressure case serial numbers

MI5 Serial Numbers	Pressure Barrel/Snubber Serial Numbers
2007	101
2043	104
2052	107

Tool 2007 had recording issue and no longer used. Snubber #104 is broken. Both are no longer on the JR.

Tools 2043 and 2052 are the only Icefield tools present on the JR, as of August 26, 2022.

Software installation

The user will need both the *Inclin* and *HotSync* software packages. An MCS will need to perform the software installation. Once the *Inclin* and *HotSync* software is installed on the Palm and PC you will be able to start and end a survey, download the data, and process the data files. During the install the user must specify where the data will be placed on the PC. By right-clicking on the *HotSync* icon, the user may check where the files were placed. Every time the computer is restarted, the user is given the option to change the directory for the *Inclin* files (see *Fig. 1.3*). User will also need the *Creat InclinFile* utility on a PC with *Labview* or *Labview Runtime* in order to process files.

Step	Action
1	Install <i>InclinFullSetup</i> (found on Icefield tool website http://www.icefieldtools.com/software-downloads/ as an automatic install). Software has also been placed in TAS software folder.
2	HotSync each Palm with the computer and name the Palms. Each Palm needs a unique name. The name should be entered the same on each computer the Palm will HotSync with in order to ensure the PC will recognize the Palm.

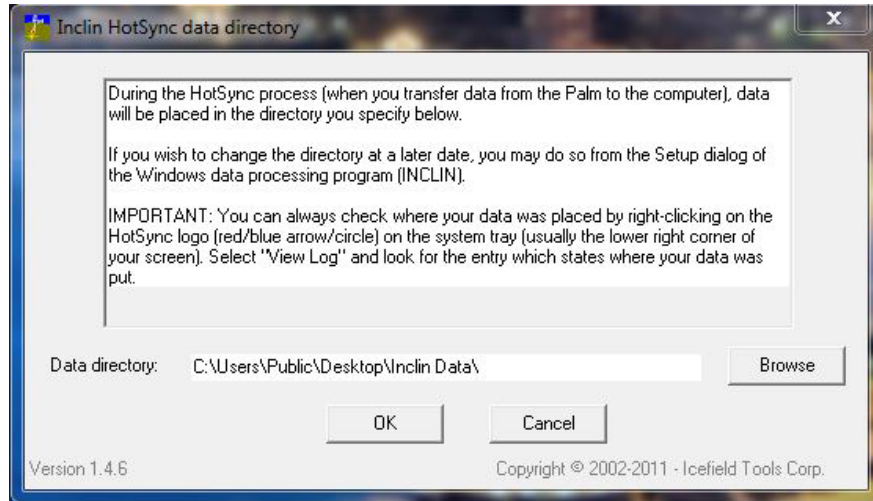
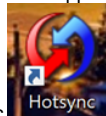
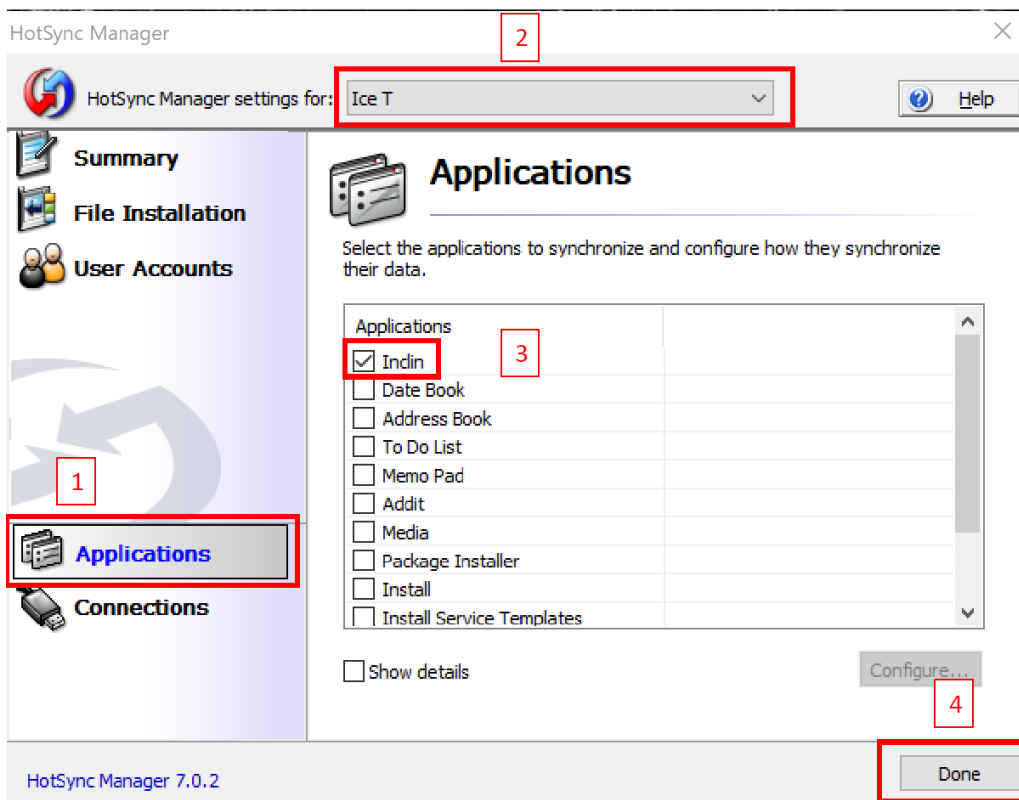


Figure 1.3. *Inclin HotSync data directory window*

You may need to reinstall *Inclin* application on the Palm device if the Palm ran out of battery and died. To reinstall the application, connect the Palm to



the PC and open *HotSync* located on the computer desktop. In *Settings*, choose **Applications** (Figure 1.4, #1). Select the name of the Palm device to be set up (Figure 1.4, #2). Select in the Applications list the *Inclin* application to be installed and uncheck the other applications (Figure 1.4, #3). Click "Done" (Figure 1.4, #4). Follow the instructions on the computer. Wait for the installation. Disconnect the Palm from the computer and check on the Palm if the *Inclin* application is there.



.Figure 1.4. HotSync Manager to reinstall Inclin application on a Palm device

Tool Setup and Deployment

Overview

The Palm *Inclin* software application is used to set up and start a survey and to end and recover data from the MI5 multishot tool. The PC *Inclin* software is used to translate the raw data into user readable information.

The *HotSync* software is used to sync the data on the Palm with the PC. The general process for collecting core orientation data is as follows:

Process	Action
1	Initialize survey and synchronize tool with Palm (see Initialize Tool).
2	Setup tool for deployment (see Assemble Tool).
3	Measure orientation of cores (see Deploy Tool and Measure Core Orientation).
4	Setup second tool for deployment while first tool is being retrieved.
5	Recover data from the first tool and Hotsync with PC (see Download Data from Tool) while the second tool is downhole.
6	Continue measuring core orientation, alternating tools, until APC refusal.
7	Disassemble, clean, and store tools (see Maintenance and Storing the Tool).
8	Reduce the data using <i>CreateInclinFile.exe</i> , <i>Inclin</i> , and Excel (see Data Reduction).

Initialize Tool

The MI5 multishot tool must be initialized and synchronized with the Palm in order to start a survey. The Core Orientation flow chart and Quick Start Guide are available to assist a technician in quickly setting up a survey.

Step	Action
1	Install 6 AA batteries in the tool and replace battery plug. Align the hole in the end piece and the tool and fasten the end with the shoulder screw (Figs. 2.1a, 2.1b).
2	Open <i>Inclin</i> on the Palm (Fig. 2.2a) and select SURVEY in the Inclin window (Fig. 2.2b).
3	Name the Survey by selecting the icon of a hand over a keyboard from the Survey Name window (Fig. 2.3a). In the Keyboard window (Fig 2.3b), type the survey name. Suggested format is Site-Hole-Starting Core. Select DONE, then select OK.
4	In the Specify Survey Start Time (Fig. 2.4) window, select BY DELAY and set delay to 0 sec in the next window. Select OK.
5	In the Shot Interval window (Fig. 2.5), set the shot interval to 10 sec (minimum interval). Select OK.
6	In Header Information window (Fig. 2.6), set declination to zero. Select OK. <i>Optional:</i> Before selecting OK, select DETAILS and enter operator name, site name, date, and time in the Detailed Information window (Fig. 2.7). Select OK twice.
7	In the Initiate Survey window (Fig. 2.8), connect MI5 tool to Palm via serial cables making sure to align the pins properly (Fig. 2.9). Select OK.
8	Memory capacity and battery voltage will be displayed on the Palm. Begin a survey with tool memory at 0% full. Batteries should be replaced when nearing 8.4V.
9	The Monitor Survey window (Fig. 2.10) will be displayed when the survey is started. The LED should flash green every second and red once every 10 seconds indicating when a measurement is taken. The Palm will go to sleep while inactive. Do not press Go or Done.
10	Record the start time of the survey, the name of the survey, the operator name, and any other comments in the Core Orientation Notebook.
11	Assemble the tool and pressure barrel (see Assemble Tool).



Figure 2.1a. Insert batteries positive end first



Fig. 2.1b. Replace end cap and secure with shoulder screw



Figure 2.2a. Inclin Icon on Palm

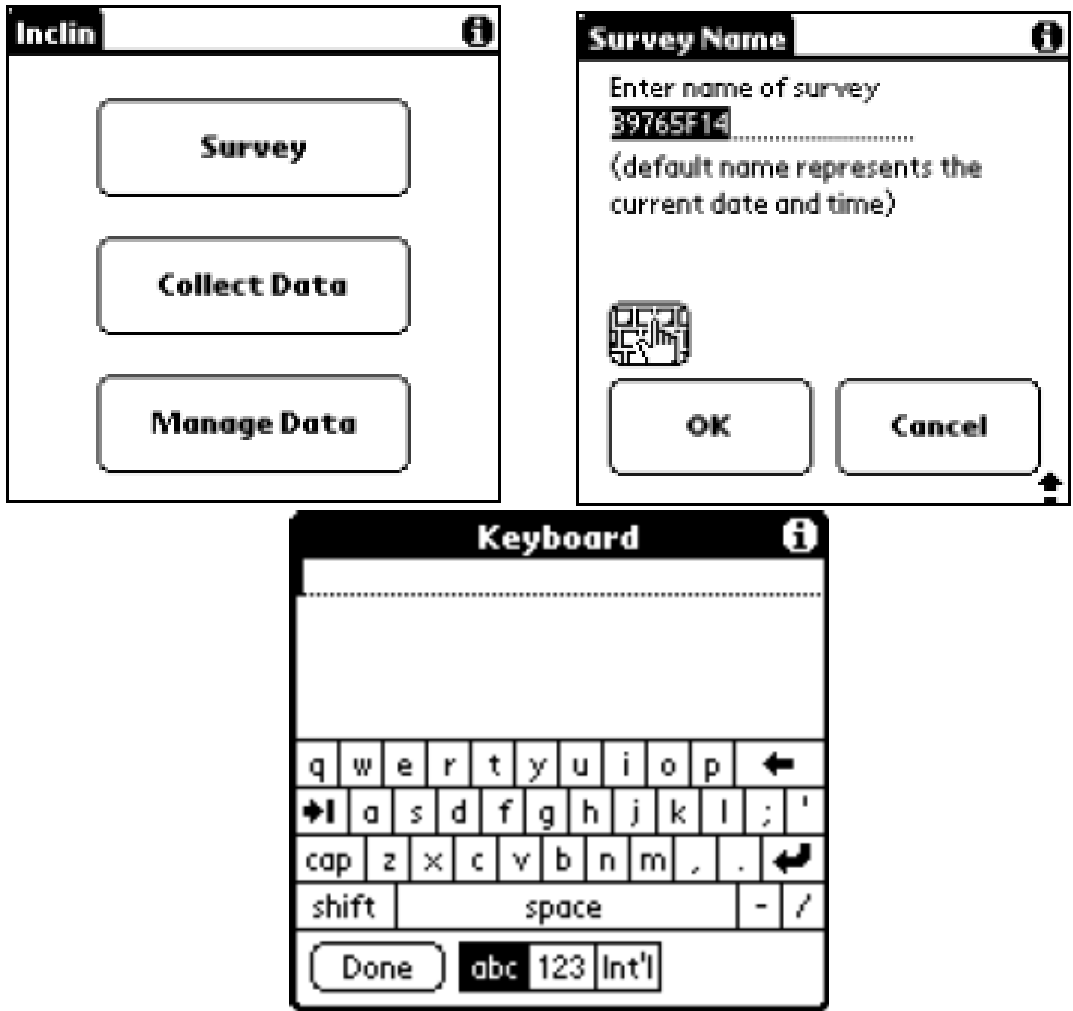


Figure 2.2b. Main Inclin Screen Fig.

2.3a. Survey Name Window Figure

2.3b. Keyboard Window

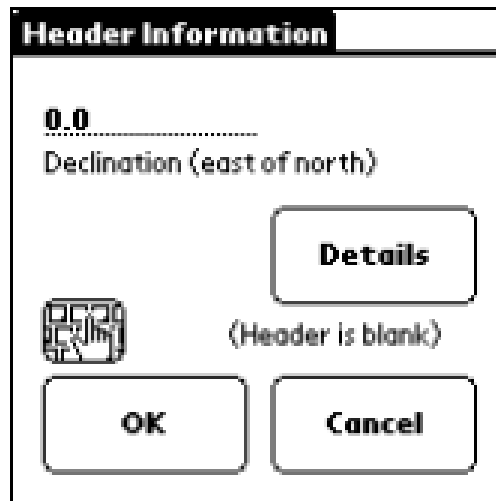
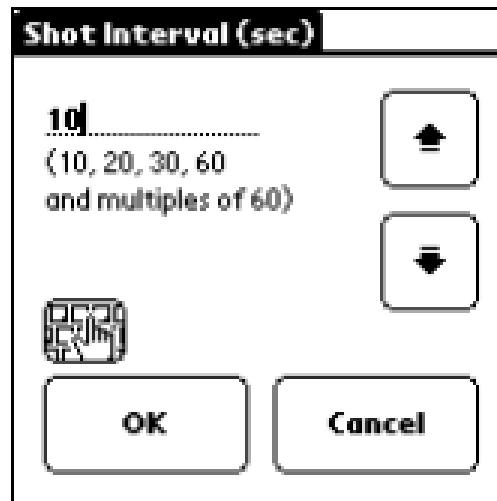
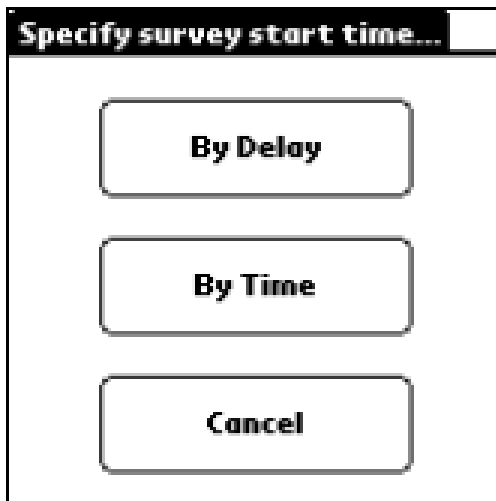


Figure 2.4. Specify Survey Start Time Window

2.5. Shot Interval Window

2.6. Header Information Window



Figure 2.7- Detailed Information Window

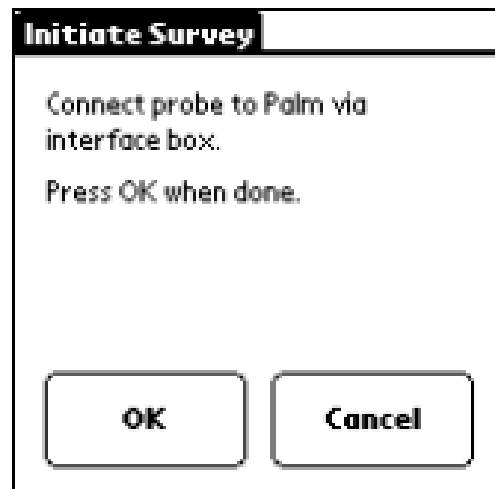


Figure 2.8- Initiate Survey Window



Figure 2.9- Align pins from tool with labeled holes on cable

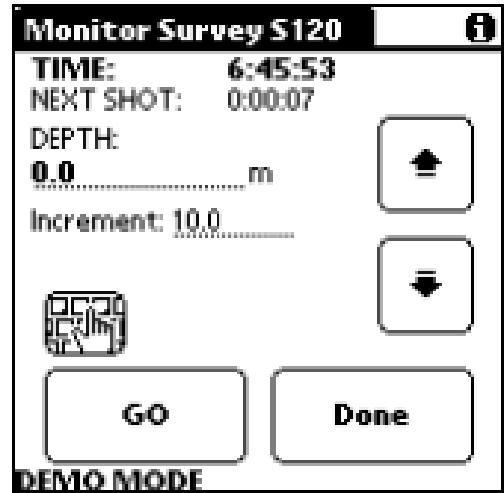


Figure 2.10- Monitor Survey Window

Assemble Tool

Prepare tool for deployment as follows:

Step	Action
1	Lightly dress all of the O-rings in silicone lubricant. (Dow Corning 111)
2	Place MI5 tool in pressure barrel with keyed end of tool toward the open end of the pressure barrel (Fig. 3.1).
3	Connect the keyed end of the tool with the keyed end of the in-line snubber (Fig. 3.2).
4	Insert the tool the rest of the way into the pressure barrel and hand-tighten the in-line snubber (Fig. 3.3).
5	Pass the tool to the Core Tech for final preparation and deployment.



Figure 3.1- Orientation tool in Pressure Barrel



Fig. 3.2- Keyed End Seal connected with Orientation tool



Fig. 3.3- End seal in place at end of pressure barrel

Deploy Tool and Measure Core Orientation

The Core Tech prepares the tool for deployment with the APC core barrel. The orientation tool is placed inside the tensor housing on the drill floor. When the driller lands the pressure barrel, the tool is held still for approximately 5 minutes and core orientation begins.

Download Data from Tool

After the tool has been run for approximately 8–12 hours, the tool should be retrieved and the data should be recovered to the Palm. Depending on hole conditions (partial strokes on APC cores can result in the tool hitting hard downhole), battery life, and the advice/decisions of the core techs, the tool may be removed earlier. We use the *Recover Data* function, which retrieves all measured data from the tool. The data from *Recover Data* is dumped into a special file on the Palm. Once the data is recovered to the Palm, a HotSync (data download) can be performed with the Dtech Computer, the downhole lab computer, the DescLogik computer, or any computer that has the *HotSync* software installed. *Note: Selecting New Data or All Data allows the Palm to filter the data from the tool looking for times when the "GO" button was pressed during the survey. Since we do not use the "GO" button the New Data and All Data downloads should not be used.*

Data Recovery

Step	Action
1	Detach the in-line snubber from the pressure barrel and remove the MI5 tool from the pressure barrel.
2	Select the DONE button in the Monitor Survey window on the Palm screen (Fig 2.10).
3	Select Collect Data on the main <i>Inclin</i> screen (Fig. 2.2a).
4	Select RECOVER DATA (Fig. 4.1) in the Collect Data window. In the Confirm window that appears, select YES to continue with the data recovery.
5	A second Confirm window will appear telling the user to connect the probe to the Palm. Once the tool and Palm are connected, select YES to continue. Data recovery will begin and a window will show the progress of the recovery. Note: This may take a long time if there is a large amount of data on the tool. <i>Palm will return to the main Inclin screen when download is complete.</i>
6	Once recovery is complete, return to the main Palm window by selecting the HOME button on the Palm (Fig. 4.2). Open the <i>HotSync</i> application on the Palm (Fig. 4.3).
7	Connect the Palm to the PC via the USB HotSync Cable.
8	In the HotSync window on the Palm, ensure that LOCAL is selected and connection type is cradle/cable. Press the HotSync button in the center of the screen. Palm will chime when HotSync begins and ends. If the Palm does not chime, return to the Palm Main Menu and reopen HotSync.

9	Locate the Core Orientation\Data\Recover folder on the PC (or shortcut Inclin Recover on the desktop). Locate the .txt and .raw file you just loaded onto the PC. If the data file does not appear, repeat steps 3-9 again. The .txt files will only HotSync from the Palm to the PC once. Make sure the file has transferred and contains data. <i>File name will be Data#.txt with the # incrementing with each data download.</i>
10	Rename the .txt file so that it has the same name as the survey (SiteHoleFirstCore.txt).
11	Back up .txt and .raw file to server.

Note: If you recover the data to a Palm that did not start the survey, the survey won't appear in the Manage Data menu on the Palm.

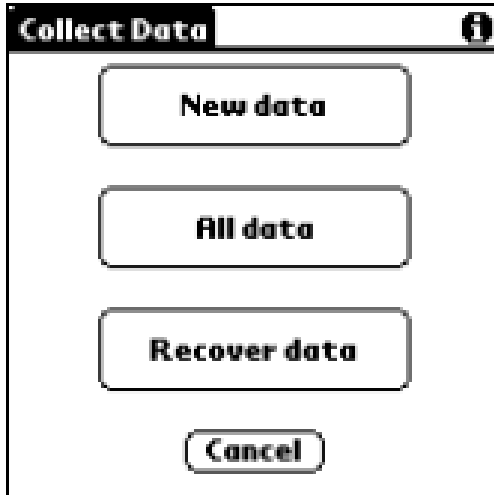


Figure 4.1. Collect Data Window



Figure 4.2. Home Button on Palm



Figure 4.3. HotSync Icon

Data Reduction

The data recovered from the MI5 tool is not directly usable in its raw format. The user must process the data using *CreateInclinFile.exe* and the *Inclin* software. User should make sure that the .txt file only contains one survey before continuing.

If there are multiple surveys in the .txt file, *CreateInclinFile.exe* will only process the first survey in the file. *CreateInclinFile.exe* combines the recovered data in the .txt file with the tool calibration information from the .raw file.

The calibration data for each tool is stored within the *CreateInclinFile.exe* program and will automatically be selected based on the tool name found in the .txt file.

The following steps will result in a user readable file containing hole ID, dip, azimuth, temperature, magnetic tool face, time, magnetic field strength, magnetic dip, and accelerometer output. These can be changed in the **Inclin Tools** menu under **Setup**.

Step	Action
1	<p>Open the <i>CreateInclinFile.exe</i> program and follow the prompts:</p> <ul style="list-style-type: none"> • Select the survey .txt file (Fig. 5.1a). • Enter the operator's name (Fig. 5.1b). • Name the new file including the extension .raw (SiteHoleFirstCore_ edited.raw) (Fig. 5.1c). • When the process is done (Fig. 5.1d) the final window shows which tool calibration was used (Fig. 5.1e). Make sure the tool number matches the tool used for the survey. <p>(See the Quick Start Guide to <i>CreateInclinFile.exe</i> for further details.) <i>The CreateInclinFile program inserts/updates the user name and the current date and time in the new .raw file. The original .raw file is not altered.</i></p>
2	Open <i>Inclin</i> on the PC (Fig. 5.2).
3	Open the .raw file created using <i>CreateInclinFile.exe</i> in <i>Inclin</i> program.
4	<p>Check that columns displayed include Hole ID, Dip, Azimuth, Temperature, Magnetic Tool face (Tool-M), Magnetic field strength (MagnMag), magnetic dip (DipMag), accelerometer output (Accel), Mag-X and Mag-Y, Time (Fig. 5.3).</p> <p><i>If these are not displayed go to Tools > Setup >Data Tab: Select Format Wizard and select the data fields to be included in the table. (Fig. 5.4a and 5.4b). Select OK when the desired columns have been selected.</i></p>
5	Select SAVE AS and save the file with an ASCII output. Output will be 3 files: .prn, .out, and .edt.

File Formats

The .prn file contains the calibrated data with the header and column headings. This is the most useful of the 3 files. The .out file contains the calibrated data, but has no header information and no column headings.

The .edt file contains the raw data with the tool calibration information below the header.

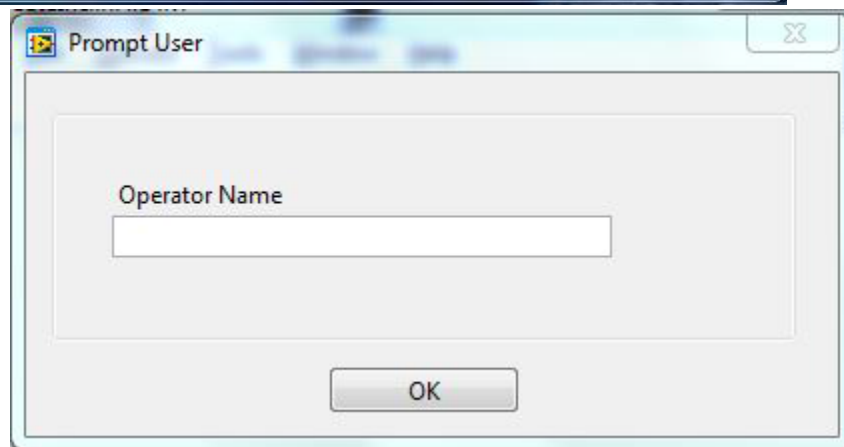
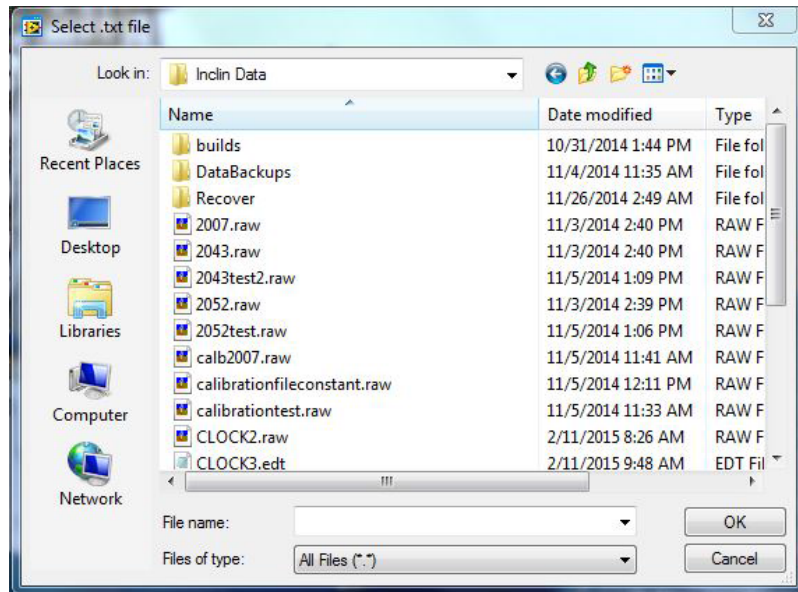


Fig. 5.1a. Prompt to Select .txt Survey file In CreateInclinFile.exe

Fig. 5.1b. Prompt to enter Operator Name

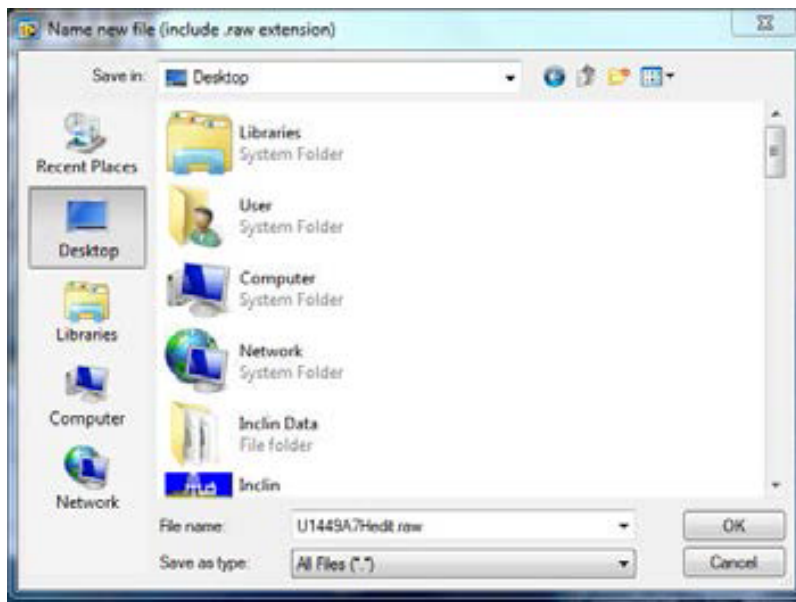


Fig. 5.1c- Prompt to enter new file name. User must add the .raw extension.

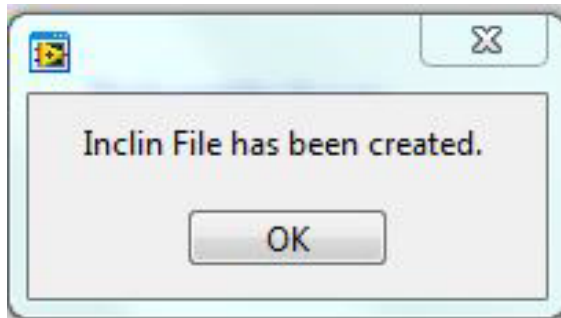


Fig. 5.1d. Inclin file has been created

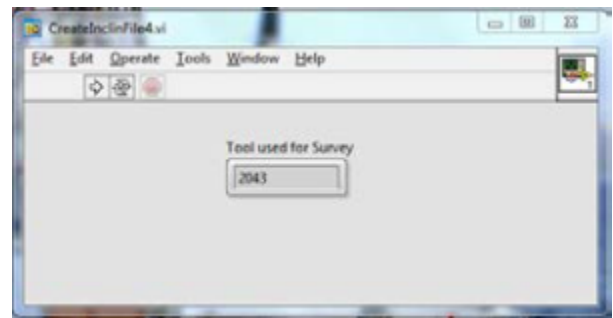


Fig. 5.1e. Which tool calibration was applied

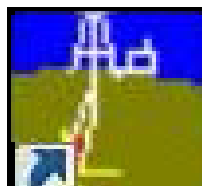


Fig. 5. Inclin icon

Results for hole TEST2043.												
HoleID	Dip	Azim.	Temp	MagnMag	DipMag	Tool-M	Mag-X	Mag-Y	Mag-Z	Time	Accel	
TEST2043	+0.4	+180.7	+21.3	51478.0	+68.9	+0.0	45417.5	15999.7	-18200.1	7:52:10	0.9999	
TEST2043	+0.5	+180.7	+21.3	51498.2	+68.8	+0.0	45424.0	16039.5	-18205.9	7:52:20	0.9999	
TEST2043	+0.4	+180.3	+21.3	51500.6	+68.9	+0.0	45356.4	16217.8	-18223.2	7:52:30	0.9999	
TEST2043	+0.4	+180.4	+21.3	51258.3	+68.6	+0.0	45110.0	16021.1	-18325.5	7:52:40	0.9999	

Fig. 5.3a. Inclin Table of Data



Figure 5.4a. Inclin Setup Window

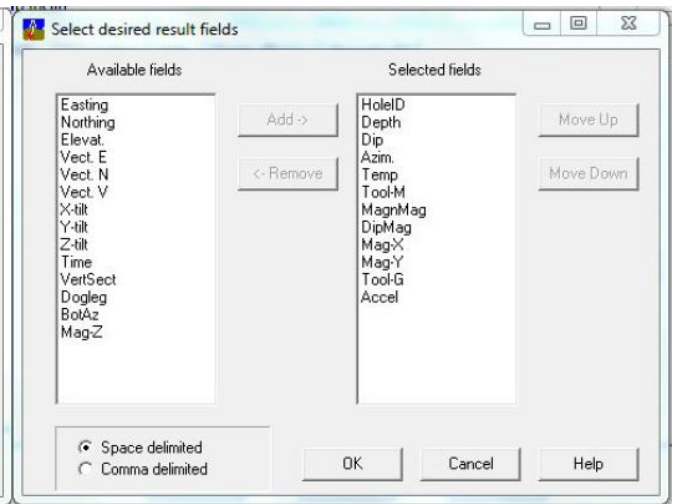


Figure 5.4b. Format Wizard

Retrieving Standpipe Pressure files and Picking Orientations

It is necessary for the technician to work out when the orientation tool was collecting orientations for a specific core. Standpipe pressure files and time on deck for each core are useful for accurately determining when the tool was held still. The technician must ask the Operations Superintendent to start Rigwatch to record the standpipe pressure files **before** the survey is started. Using the standpipe pressure files is optional, but it is recommended that the files are collected and used, especially for people new to picking orientation data.

Retrieving Standpipe Pressure files

The Operations Superintendent can provide the pmag technician with a Rigwatch file which includes the entire record for any parameters of interest (i. e., core line depth, standpipe pressure and time) for a given hole. If the Ops Superintendent cannot provide a file, follow the steps below.

Step	Action
1	On the open workstation in the Operation Superintendent's office (not the main Ops computer) open Master RDP . This should open a remote connection to Krakatoa.
2	When the Property of Texas A&M Research Foundation window appears, click OK.
3	You need to access the <i>Krakatoa RWPRO</i> file. If the computer window is entirely occupied by <i>Rigwatch</i> (Fig. 6.1), proceed to Step 4. If you can access the Krakatoa desktop, proceed to Step 6.
4	Look for the menu of 6 buttons in the top right corner of the window and select Key Pad (Fig. 6.1).
5	Select the Minimize Rigwatch button (Fig. 6.2).
6	Navigate to Computer > Local Disk (C:) > RWPRO > Livecap.
7	This folder contains the LiveCap files which include the standpipe pressure records. Choose the standpipe pressure files selectively based on the amount of time it takes to bring a core up and the time on deck. Otherwise it will be necessary to search through many large standpipe pressure files. A new standpipe pressure file is generated every 30 min. For Example: <i>Time on deck for Core 1H was 10:50. The cores take ~40 min to be brought up at this site after they are collected, which means they fired the core around 10:10 and the standpipe pressure should have increased around this time. Open the LiveCap file with the 10:00 timestamp and check for standpipe pressures in the third column that increase up to ~3000. If the pressure increases the expected amount proceed to Step 8, otherwise check the LiveCap files moving back in time, as it may have taken longer than expected to recover the core.</i>
8	Copy the standpipe pressure files you selected to the Temp file on "C on PC52481."
9	Maximize the <i>Rigwatch</i> screen and select the X on the Krakatoa.ship.iodp.tamu.edu (Fig 6.1) bar at the top of the page. This will disconnect the remote connection. Select OK when the remote desktop window appears.

10 Log in to Novell and copy the files from the Temp file to a location on the server for easy access during data processing.



Fig. 6.1. Krakatoa Screen Occupied by Rigwatch



Fig. 6.2. Key Pad Menu with the option to Minimize Rigwatch

Picking Orientations

1	Open the .prn file using Excel.
2	Use "Text to Columns" command to delimit the files by spaces.
3	Copy the time column to a new column and change to 24-hour format. Pay close attention to the AM/PM.
4	Compare the GMT time recorded in the Core Orientation Notebook to the first measurement time in the .prn file to determine if the times reported by the Palm match the time of the survey. Typically the times are off by a number of hours. The difference between the times should be added or subtracted from the measurement files in order to correct the time to GMT, and then placed in a new column. For example: <i>Survey started at ~10:45 GMT according to the Core Orientation Notebook. In the .prn file the first time record is 12:41 PM. The time on the Palm is 2 hours behind the actual survey start time. Using a formula in Excel, subtract 2 hours from the times recorded on the Palm and create a column of corrected times.</i>
5	Create a new column of the corrected times.
6	Save the edited .prn file with the corrected times as an .xlsx file with the survey name.
7	In Excel, open the standpipe pressure file for the window of time when the core was likely oriented.
8	Use "Text to Columns" to delimit the columns by commas. Standpipe pressure should be the third column.
9	Highlight the third column and use conditional formatting to highlight standpipe pressures >1500.
10	Locate the highlighted cells, make sure the pressure increases to ~3000 within the highlighted block, and then note the starting time of the high standpipe pressures.
11	In the .xlsx file that was saved in Step 6, locate the time that corresponds to the time noted in Step 10.
12	Check for consistent orientation values (particularly the Mag-M/Magnetic Tool Face values) and acceleration values near 1 for the ~5 min just prior to the increase in standpipe pressure.
13	Calculate an average for the dip, azimuth, temperature, magnetic tool face, magnetic field, magnetic dip, Hx and Hy, and accelerometer output for the period of orientation.
14	Repeat Steps 8–14 for each core.
15	Save the Excel spreadsheet.
16	See Formatting Orientation Data and Uploading to LIMS .

Formatting Orientation Data and Uploading to LIMS

The averaged core orientation statistics for each core must follow a specific format or MUT2 will not recognize or upload the files to LIMS. Spelling must match the example column headings below.

The Tool ID column is required, and MUT2 will not upload without this information. Also, if the .csv file is opened in any program other than a basic text editor (e.g. it was opened in excel), then the file will likely contain extra rows of commons without any data and this will crash MUT2. These empty rows should be deleted in any basic text editor and the file saved again without them.

Example formatting for core orientation data:


```
Exp354 U1451A
Core Dip Azimuth Temperature Magnetic Tool Face Magnetic Field Magnetic Dip Hx Hy Gravitational field Tool ID comment
1 -89.4 124.6 13.5 28.1 62323 -47.7 36609 -19766 0.8 Icefield 2052
2 -88.6 220.7 7.9 116.9 61461 -49.1 -17844 -36728 0 Icefield 2052
```

Here is an example file/template with the exact headers in CSV format.

[MUT2-MOT-ExampleFile.csv](#)

Note: The core # does not need to include "H" in the .csv file when using MUT2.

S tep	Action
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1	Open a new Excel spreadsheet (or begin with above example file).
2	In Cell A1 enter the expedition number and the site and hole number (Exp### U#####). The formatting of this header must match the example above.
3	Copy all of the average orientation data calculated in Step 14 of Picking Orientations into this Excel worksheet. There should be a row for each oriented core. Make sure the column order matches the above example or use the template. There is no data formatting - choose significant digits adequately (two significant digits for Tool Face and Azimuth for instance)
4	Save the file as .csv with a name that includes expedition number, site, and hole (i.e., Exp354_U1451A.csv)
5	Copy the .prn file and the .edt files. Change the file name to match the name of the .csv file.
6	There should now be four files with identical file names and the extensions on the files should be .csv, .xlsx, .prn, and .edt.
7	Place these four files into the <i>IN for MUT2</i> folder on the Downhole lab computer.
8	 Open MUT2 MegaUplo... Select Upload .
9	Check LORE to ensure the data has uploaded. The data will be listed in the Expanded Orient Report under the Magnetism heading. If the data is not found, go to Troubleshooting the Uploads .

Troubleshooting Uploads

Symptom	Solution
Purple question mark in MUT	<ul style="list-style-type: none"> • Check that filenames are identical. • Open and check that the .prn and .edt files are readable data. • Check that the extensions on the files are correct. • Check that the header in the .csv file matches the format Exp### U#####.
File appears to upload (moves to archive file), but does not appear in LORE	Check the formatting within the .csv file, especially the significant digits of values (LORE has a maximum limit of digits).
An error message appears saying that a line in the file does not have the correct number of columns	Check that there is no comma in the table, especially in the comment box. Comma is used as separator for the upload. LIMS reads the .csv file.
Files will not upload and MUT2 hangs	Verify the the .csv file does not contain any extra empty rows of commas. If it does, delete them in a basic text editor, save, and retry.

Tool Maintenance and Storage

- Clean and dry the tool after use, including the pressure case.
- Store tool inside the pressure case.
- Check the O-rings. Keep them clean, undamaged, and lightly lubricated. Use small amounts of silicon lubricant (Dow Corning 111). The O-rings seal the tool from invasion of drill fluid so it is important to make sure to check them regularly.
- Tighten the sealed Pressure Barrel threads by hand (never use a pipe wrench on the barrel).
- Avoid rapid tool acceleration, fast braking, drill string rotation, or impacts.
- Check for burrs on the tool end cap and lightly sand them off if they are found. Burrs may damage the inside of the pressure barrel.

Credits

This document originated from MI5 Multishot Orientation Tool UG X361.pdf (see Archived Versions below for a pdf copy) that was written by B. Novak (02/04/2016), and edited by H. Evans. Credits for subsequent changes to this document are given in the page history.

LIMS Component Table

Note that this table covers both the Icefield MI-5 Multishot Tool and the Minex FlexIT tool.

ANALYSIS	TABLE	NAME	ABOUT TEXT
ORIENT	SAMPLE	Exp	Exp: expedition number
ORIENT	SAMPLE	Site	Site: site number
ORIENT	SAMPLE	Hole	Hole: hole number
ORIENT	SAMPLE	Core	Core: core number
ORIENT	SAMPLE	Type	Type: type indicates the coring tool used to recover the core (typical types are F, H, R, X).
ORIENT	SAMPLE	Sect	Sect: section number
ORIENT	SAMPLE	A/W	A/W: archive (A) or working (W) section half.
ORIENT	SAMPLE	text_id	Text_ID: automatically generated database identifier for a sample, also carried on the printed labels. This identifier is guaranteed to be unique across all samples.
ORIENT	SAMPLE	sample_number	Sample Number: automatically generated database identifier for a sample. This is the primary key of the SAMPLE table.
ORIENT	SAMPLE	label_id	Label identifier: automatically generated, human readable name for a sample that is printed on labels. This name is not guaranteed unique across all samples.
ORIENT	SAMPLE	sample_name	Sample name: short name that may be specified for a sample. You can use an advanced filter to narrow your search by this parameter.
ORIENT	SAMPLE	x_sample_state	Sample state: Single-character identifier always set to "W" for samples; standards can vary.
ORIENT	SAMPLE	x_project	Project: similar in scope to the expedition number, the difference being that the project is the current cruise, whereas expedition could refer to material/results obtained on previous cruises
ORIENT	SAMPLE	x_capt_loc	Captured location: "captured location," this field is usually null and is unnecessary because any sample captured on the JR has a sample_number ending in 1, and GCR ending in 2
ORIENT	SAMPLE	location	Location: location that sample was taken; this field is usually null and is unnecessary because any sample captured on the JR has a sample_number ending in 1, and GCR ending in 2
ORIENT	SAMPLE	x_sampling_tool	Sampling tool: sampling tool used to take the sample (e.g., syringe, spatula)
ORIENT	SAMPLE	changed_by	Changed by: username of account used to make a change to a sample record
ORIENT	SAMPLE	changed_on	Changed on: date/time stamp for change made to a sample record
ORIENT	SAMPLE	sample_type	Sample type: type of sample from a predefined list (e.g., HOLE, CORE, LIQ)
ORIENT	SAMPLE	x_offset	Offset (m): top offset of sample from top of parent sample, expressed in meters.
ORIENT	SAMPLE	x_offset_cm	Offset (cm): top offset of sample from top of parent sample, expressed in centimeters. This is a calculated field (offset, converted to cm)
ORIENT	SAMPLE	x_bottom_offset_cm	Bottom offset (cm): bottom offset of sample from top of parent sample, expressed in centimeters. This is a calculated field (offset + length, converted to cm)
ORIENT	SAMPLE	x_diameter	Diameter (cm): diameter of sample, usually applied only to CORE, SECT, SHLF, and WRND samples; however this field is null on both Exp. 390 and 393, so it is no longer populated by Sample Master
ORIENT	SAMPLE	x_orig_len	Original length (m): field for the original length of a sample; not always (or reliably) populated
ORIENT	SAMPLE	x_length	Length (m): field for the length of a sample [as entered upon creation]
ORIENT	SAMPLE	x_length_cm	Length (cm): field for the length of a sample. This is a calculated field (length, converted to cm).
ORIENT	SAMPLE	status	Status: single-character code for the current status of a sample (e.g., active, canceled)
ORIENT	SAMPLE	old_status	Old status: single-character code for the previous status of a sample; used by the LIME program to restore a canceled sample

ORIENT	SAMPLE	original_sample	Original sample: field tying a sample below the CORE level to its parent HOLE sample
ORIENT	SAMPLE	parent_sample	Parent sample: the sample from which this sample was taken (e.g., for PWDR samples, this might be a SHLF or possibly another PWDR)
ORIENT	SAMPLE	standard	Standard: T/F field to differentiate between samples (standard=F) and QAQC standards (standard=T)
ORIENT	SAMPLE	login_by	Login by: username of account used to create the sample (can be the LIMS itself [e.g., SHLFs created when a SECT is created])
ORIENT	SAMPLE	login_date	Login date: creation date of the sample
ORIENT	SAMPLE	legacy	Legacy flag: T/F indicator for when a sample is from a previous expedition and is locked/uneditable on this expedition
ORIENT	TEST	test changed_on	TEST changed on: date/time stamp for a change to a test record.
ORIENT	TEST	test status	TEST status: single-character code for the current status of a test (e.g., active, in process, canceled)
ORIENT	TEST	test old_status	TEST old status: single-character code for the previous status of a test; used by the LIME program to restore a canceled test
ORIENT	TEST	test test_number	TEST test number: automatically generated database identifier for a test record. This is the primary key of the TEST table.
ORIENT	TEST	test date_received	TEST date received: date/time stamp for the creation of the test record.
ORIENT	TEST	test instrument	TEST instrument [instrument group]: field that describes the instrument group (most often this applies to loggers with multiple sensors); often obscure (e.g., user_input)
ORIENT	TEST	test analysis	TEST analysis: analysis code associated with this test (foreign key to the ANALYSIS table)
ORIENT	TEST	test x_project	TEST project: similar in scope to the expedition number, the difference being that the project is the current cruise, whereas expedition could refer to material/results obtained on previous cruises
ORIENT	TEST	test version	TEST version: version number of the test; almost always 1
ORIENT	TEST	test sample_number	TEST sample number: the sample_number of the sample to which this test record is attached; a foreign key to the SAMPLE table
ORIENT	CALCULATED	Sample top depth CSF-A (m)	Top depth CSF-A (m): position of observation expressed relative to the top of the hole.
ORIENT	CALCULATED	Sample bottom depth CSF-A (m)	Bottom depth CSF-A (m): position of observation expressed relative to the top of the hole.
ORIENT	CALCULATED	Sample top depth CSF-B (m)	Top depth [other] (m): position of observation expressed relative to the top of the hole. The location is presented in a scale selected by the science party or the report user.
ORIENT	CALCULATED	Sample bottom depth CSF-B (m)	Bottom depth [other] (m): position of observation expressed relative to the top of the hole. The location is presented in a scale selected by the science party or the report user.
ORIENT	RESULT	Hv (nT)	RESULT earth field horizontal (nT): the horizontal component of the earth's magnetic field measured during the orientation period
ORIENT	RESULT	Hx (nT)	RESULT earth field vertical (nT): the vertical component of the earth's magnetic field measured during the orientation period
ORIENT	RESULT	azimuth (deg)	RESULT azimuth (deg.): average azimuth of the hole measured during the orientation period
ORIENT	RESULT	csv_asman_id	RESULT csv ASMAN_ID: serial number of the ASMAN link for the CSV reduced data file
ORIENT	RESULT	csv_filename	RESULT csv filename: file name of the CSV reduced data file
ORIENT	RESULT	csy_asman_id	RESULT csy ASMAN_ID: serial number of the ASMAN link for the CSY raw data file (Minex Flex-IT tool only)
ORIENT	RESULT	csy_filename	RESULT csy filename: file name of the CSY raw data file (Minex Flex-IT tool only)
ORIENT	RESULT	dip (deg)	RESULT dip (deg.): average dip of the hole measured during the orientation period
ORIENT	RESULT	edt_asman_id	RESULT edt ASMAN_ID: serial number of the ASMAN link for the EDT raw data file (Icefield MI-5 tool only)
ORIENT	RESULT	edt_filename	RESULT edt filename: file name of the EDT raw data file (Icefield MI-5 tool only)

ORIENT	RESULT	gravitational_field (g)	RESULT acceleration (g): average acceleration due to gravity and other forces during the orientation period
ORIENT	RESULT	magnetic_dip (deg)	RESULT magnetic dip (deg.): average dip of the earth's magnetic field measured during the orientation period
ORIENT	RESULT	magnetic_field (nT)	RESULT magnetic field (nT): average total earth's magnetic field strength measured during the orientation period
ORIENT	RESULT	magtoolface (deg)	RESULT magnetic tool face (deg.): average angular difference between magnetic North and the double lines on the core liner
ORIENT	RESULT	prn_asman_id	RESULT prn ASMAN_ID: serial number of the PRN raw data file (Icefield MI-5 tool only)
ORIENT	RESULT	prn_filename	RESULT prn filename: file name of the PRN raw data file (Icefield MI-5 tool only)
ORIENT	RESULT	svy_asman_id	RESULT svy ASMAN_ID: serial number of the SVY raw data file (Minex Flex-IT tool only)
ORIENT	RESULT	svy_filename	RESULT svy filename: file name of the SVY raw data file (Minex Flex-IT tool only)
ORIENT	RESULT	temperature (°C)	RESULT temperature (deg. C): average temperature measured during the orientation period
ORIENT	SAMPLE	tool_id	RESULT tool ID: tool name and ID used for each oriented core
ORIENT	RESULT	xls_asman_id	RESULT xls ASMAN_ID: serial number of the ASMAN link for the XLS/XLSX reduced data file
ORIENT	RESULT	xls_filename	RESULT xls filename: file name of the XLS/XLSX reduced data file
ORIENT	SAMPLE	sample description	SAMPLE comment: contents of the SAMPLE.description field, usually shown on reports as "Sample comments"
ORIENT	TEST	test test_comment	TEST comment: contents of the TEST.comment field, usually shown on reports as "Test comments"
ORIENT	RESULT	result comments	RESULT comment: contents of a result parameter with name = "comment," usually shown on reports as "Result comments"

Archived Versions

- [MI5 Multishot Orientation Tool UG X361.pdf](#) : Original source file written by B. Novak (02/04/2016)
- [MI5 Multishot Orientation Tool exp378.pdf](#): PDF version of this wiki page as of 2020-02-24