



Monitor
with
Confidence

DT Logger Host Instruction Manual Mobile Platform

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1 OVERVIEW

The RST Single Channel and Multi Channel Dataloggers were intended to be low cost, simple to use, battery powered data loggers, designed for reliable, unattended monitoring of a mix of vibrating wire sensors and thermistors. They are deployable in harsh environments and as compact as possible. The user-friendly software allows easy downloading of the data and maintenance in the field. The software is preinstalled on an Ultra-Rugged Field PC²™ that can withstand often demanding field conditions. Even users with very little experience with Geotechnical Instruments will be able to connect, download data and change settings with a matter of a few inputs. Moreover, the DT Logger host software is fully compatible with RST Single Channel Datalogger, the same software interface can be used to configure and download data from either Multichannel or Single Channel logger.

DT Logger Host software is compatible with the following RST Instruments dataloggers:

- DT2011 (discontinued, replaced by DT2011B)
- DT2011B (single channel logger, vibrating wire and thermistor)
- DT2055 (discontinued, replaced by DT2055B)
- DT2055B (10 channel logger, vibrating wire and thermistor)
- DT2040 (40 channel logger, vibrating wire and thermistor)
- IC6560 (uniaxial tilt logger)
- IC6660 (biaxial tilt logger)
- DTL201B-2B (uniaxial and biaxial tilt logger)
- DT4205 (10 channel logger, 4 to 20mA and thermistor)
- DT2306 (18 channel potentiometer logger)
- DT2485 DT-BUS logger
- DT2033 Wireless Downhole logger
- DT2350 Strain logger

Supported loggers are shown in Figure 1 for reference.

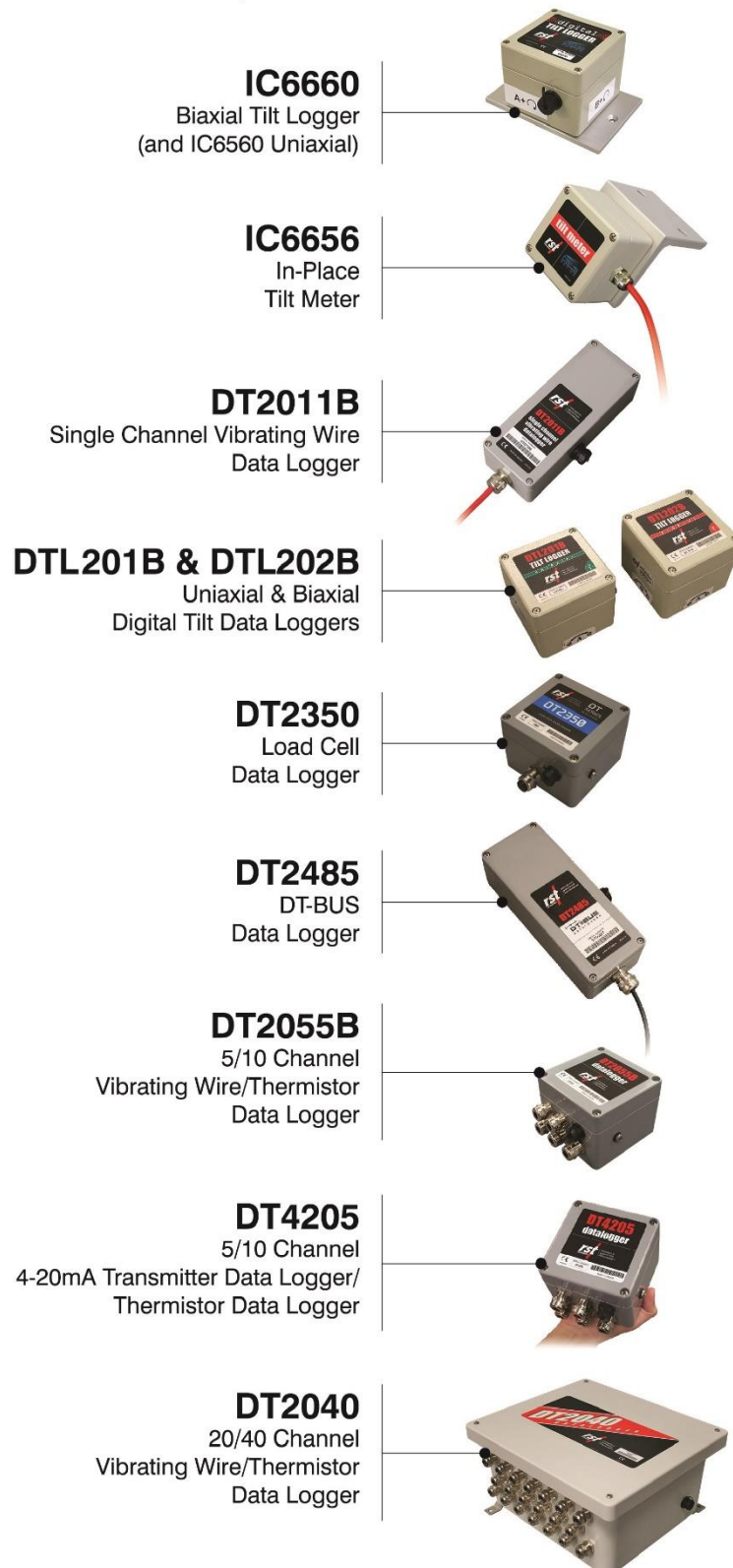


Figure 1: Supported dataloggers

2 QUICK-START INSTRUCTIONS

The following is a brief outline with references to other parts of this manual to get you up and running quickly with the RST Multi Channel Datalogger:

2.1 SINGLE CHANNEL DATALOGGER SETUP

1. Remove the cover of the datalogger by the four Phillips screws.
2. Insert the stripped ends of the cable for the VW Transducer through the cable gland and attach them to the terminal strip according to Table 1:

Table 1: Wiring chart

Terminal ID	Wire Colour
C1	Red
C2	Black
T1	Green
T2	White
SH	Bare (shield)

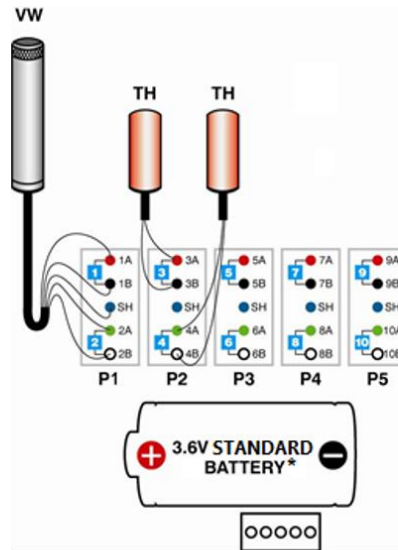
3. Using the supplied COM cable, connect the DT2011 RS232 to the Ultra-Rugged Field PC²™ serial port. Select *RS232* from pull down menu on *Status* screen.
4. Using the supplied USB cable, connect the DT2011B USB to the Ultra-Rugged Field PC²™ USB A port (white). Select *USB* from pull down menu on *Status* screen.

Note

If a pop-up dialog shows up asking for a driver name, type in *ftdi_ser.dll* in full.

2.2 MULTICHANNEL DATALOGGER SETUP

1. Remove the cover of the datalogger by the four Phillips screws.
2. Insert the stripped ends of the cable for the VW Transducer or thermistor sensor through the cable gland and attach them to the terminal strip as shown in Figure 2.



*See Section 9 for more information about batteries

Figure 2: Sensor connections

3. Using the supplied USB cable, connect the datalogger to your Ultra-Rugged Field PC™.
4. Select *Multi* from pull down menu on *Status* screen.

Note

If a pop-up dialog shows up asking for a driver name, type in *ftdi_ser.dll* in full.

2.3 TILT LOGGER SETUP

Tilt Logger contains internal MEMS tilt sensors, therefore there is no need for external wiring. Using the supplied USB cable, connect the Tilt Logger USB to the Ultra-Rugged Field PC²™ USB A port (white). Select *USB* from pull down menu on *Status* screen.

2.4 4 TO 20mA LOGGER SETUP

Follow the same steps as in Section 2.2, using 4 to 20mA sensor in place of VW sensor.

The DT4205 is designed to work with loop-powered (2 wire) 4-20 mA transmitters and NTC thermistors in any mix. Thermistors are non-polarized, but 4-20 mA transmitters typically require correct connection polarity. Refer to Figure 3.

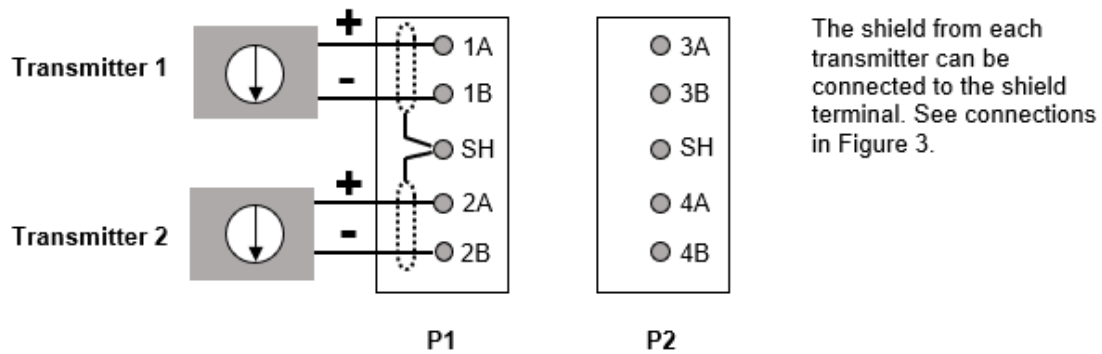
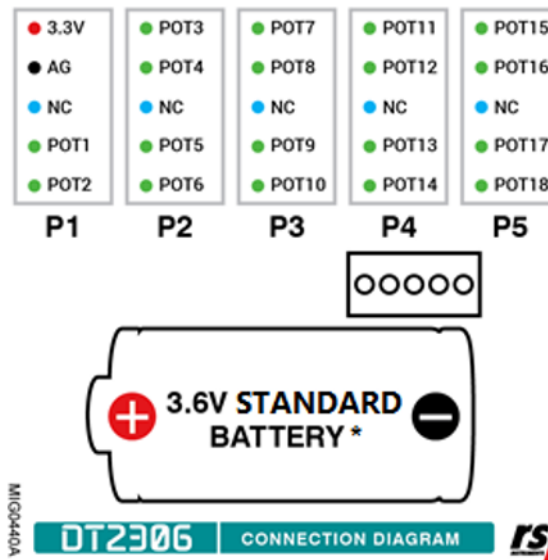


Figure 3: 4-20 mA Sensor Connections

2.5 POTENTIOMETER LOGGER SETUP



*See Section 9 for more information about batteries

Figure 4: DT2306 Sensor connections

2.6 DT-BUS DATALOGGER SETUP

- Remove the cover of the datalogger by the four Phillips screws.
- Insert the stripped ends of the cable for the RS485 bus through the cable gland and attach them to the terminal strip (see Table 2).

Table 2: DT-BUS wiring chart

Terminal ID	Wire Colour	Alternate Wire Colour
SH	Bare (shield)	Bare (shield)
7V	Red	Brown
GND	Black	White
B	White	Black
A	Green	Blue

2.7 DATALOGGER CONFIGURATION

1. The software is preinstalled on Ultra-Rugged Field PC²™.
2. Launch the software. Once connected, the status screen should automatically appear displaying logger information. Select RS232 or USB connection depending on connected device. See Section 10 for connection troubleshooting.
3. Navigate to the *Sensors* tab and setup all attached sensors parameters. Once the desired parameters are set, press the *Apply* button to apply the changes and start logging.
4. If you wish to record the data in specific Engineering Units, enable the *Eng Units* and enter the appropriate parameters and press the *Apply* button to update the logger.
5. Go to Logging tab and check that logging parameters are correct and change them if necessary. If changes were made, Press the *Apply Settings* button to apply settings and start logging.
6. If desired, the sensor current reading can be monitored in real time by selecting the *Monitor* tab.
7. Under the *Status* tab, check to make sure the parameters are correct and that the logger is either *logging* or there is a *log pending*.
8. Exit the software and disconnect the RS232 or USB cable.
9. The datalogger should now be taking readings. Return when desired to download the data. Make the habit of checking the battery voltage every time you connect. The battery state is an approximate value based on recent battery use.

2.8 DOWNLOADING DATA

1. Connect the RS232 or USB cable to your computer and the datalogger and launch the software. If the connection is successful, the *Status* screen should fill up with the details of the datalogger.
2. Press the *Collect Data* button to download the data. A data file (*.csv) will automatically be created in **My Documents\Multichannel**.
3. After downloading, the program will prompt you whether you would like to erase the existing data on the logger or keep appending to existing records. Alternatively, if you wish to erase the old data and continue logging with the same parameters, press the *Sensors* tab and press *Apply*.
4. If you wish to keep the old data on the logger and continue logging, exit the program and disconnect the RS232 or USB cable.
5. If you wish to change any logging parameters, do so under the *Logging* tab and press *Apply* to save the changes.

6. Disconnect the RS232 or USB cable when finished.

3 READOUT UNIT

The Ultra-Rugged Field PC²™ (Figure 5) is well suited for use in the often-demanding field conditions. All connections are conveniently located on the front of the case, after taking readings the cover should be always put back in place to protect connectors.



Figure 5: Ultra-Rugged Field PC²™ Case

3.1 USING THE ULTRA-RUGGED FIELD PC²™

Once the Ultra-Rugged Field PC²™ is connected to the Datalogger, turn on the power to the Ultra-Rugged Field PC² by pressing the power button (Figure 6).



Figure 6: Overview of the Ultra-Rugged Field PC²™

Front Image		Back Image
1. Elastomer overmold	9. Microphone	17. Speaker
2. Touchscreen	10. Keypad buttons	18. Battery Door
3. Buttons Control	11. LED Indicator	19. Hand Strap
4. Hold-to-Zoom	12. Power button	20. Stylus
5. Pictures and Videos	13. Enter button	21. Stylus Tether
6. Tab button	14. Backspace	
7. Home Screen	15. Context Menu Button	
8. Shift Function	16. Right Soft Key	
Bottom Image		
22. USB client (micro USB)		
23. Microphone/Headphones jack		
24. 12V DC jack		
25. USB host (full size USB)		
26. 9-pin serial port		

Note

DC charging is done through the 12V DC jack (barrel connector, bottom left of the unit).

FieldPC2 has many other features. For complete list of all FieldPC2 features and detailed instructions, please refer to FieldPC2 manual in PDF format Archer-2-Manual.pdf or available for download:
<http://www.junipersys.com/content/download/12916/197827/version/2/file/Archer-2-Manual.pdf>

4 DATALOGGER CONNECTION

Once the datalogger is connected to the Ultra-Rugged Field PC²™, turn on the power to the Ultra-Rugged Field PC²™ by pressing the power button (Figure 6).

Use the stylus to navigate through the operating environment. If you are unfamiliar with the *Windows Mobile* operating environment, please refer to the “*Archer-2-Manual*” which is accessible from the Ultra-Rugged Field PC²™ programs window.

From the *Start* menu, choose: *DT Logger Host* to launch the RST DT Logger Host Software. The logger menu appears when the program is initially launched. The menu contains six tabs: *Status*, *Mon*, *Log*, *Sensors*, and *Exit*. Each tab option is explained in detail below. Until successful logger connection, all tabs are inaccessible except *Status*.

4.1 WIRED CONNECTION

All loggers can be connected to the host computer using USB cable. Older type DT2011 logger requires RS232 cable and either RS232 port or RS232 to USB adapter.

4.2 WIRELESS CONNECTION USING RST DT LINK MODULE

With optional wireless module installed and configured, a host computer connected to the DT Link HUB will have wireless access to the user selected loggers. Once connected to the DT Link Hub (Figure 7), DT Link button will be available to access the user selected loggers

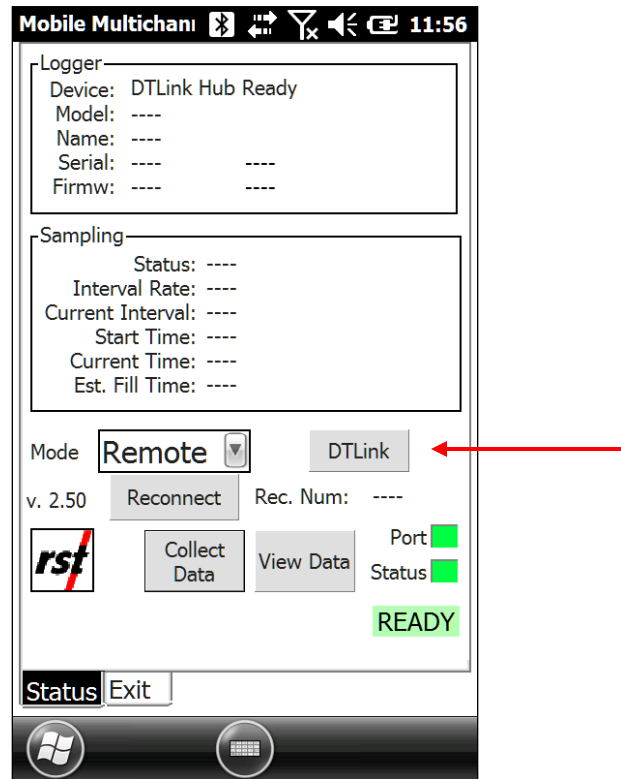


Figure 7: Status Tab with DT Link hub connected

Click on DT Link button to display DT Link remote dialog (Figure 8).

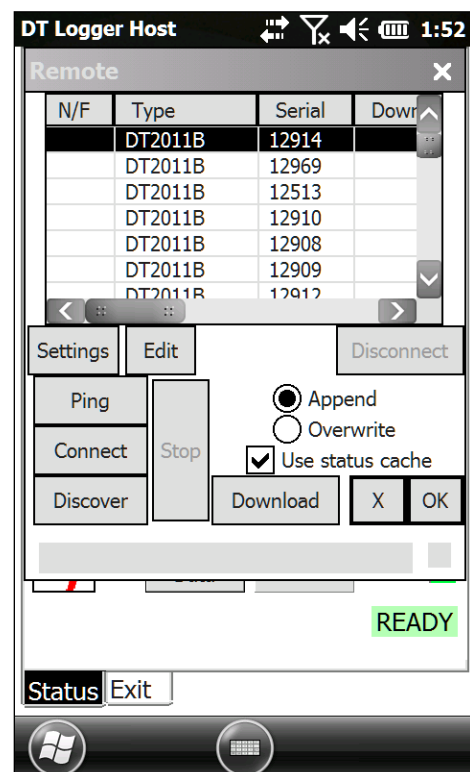


Figure 8: DT Link remote dialog

Settings

Settings button will show DT Link Hub Settings dialog for changing various wireless options (Figure 9).

All loggers belonging to the same network need the same Hub Address and Network ID.

Advanced tab will show additional communication parameters.

Click *Query Logger* to retrieve all parameters.

Note

RST data logger shipped as part of a DT Link system have all settings preconfigured. It is strongly recommended to contact RST personnel before modifying any DT Link settings.

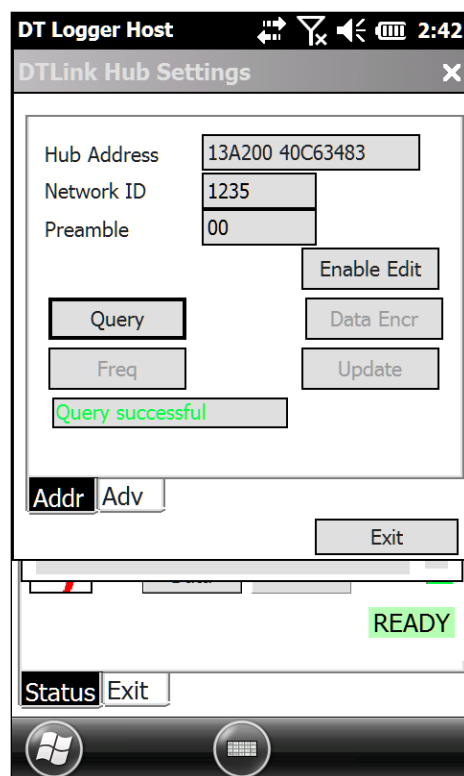


Figure 9: DT Link Hub Settings

Wireless Logger List

Logger list can be updated manually using *Edit* button. The following activities are available:

- *Add* to add new logger entry manually.
- *Del Sel* to delete selected logger from the list.
- *Del All* to delete all loggers from the list.
- *Edit Sel* to edit selected logger settings
- *Import* to import loggers from text file.

More convenient automatic logger search can be initiated using *Discovery* button.

The list entries consist of logger type, logger serial number, data download time, logger label, record number and radio MAC address. Discovery search indicates found (F) and new (N) loggers.

Ping

To verify logger accessibility, click *Ping* button. The software will try to retrieve basic information from selected logger: Download Time, Record Number, Label and wireless signal strength. Click *Stop* to stop pinging.

Connecting loggers

Click *Connect* button to establish wireless communication link with selected logger. Upon successful connection, logger status is retrieved and the software will automatically switch to Status tab. Click *Disconnect* button to disconnect and switch back to wireless logger list.

Download

For speedy data download, click *Download* button. The software will connect to selected logger, download all data to a file and disconnect wireless connection. Select Append radio button to keep historical data or select Overwrite radio button to restart logging after data download.

Use local status cache

After successful connection, current logger settings will be saved in local cache file. Enabling local cache will decrease subsequent connections time.

4.3 WIRELESS CONNECTION USING RSTAR SYSTEM

The RSTAR Array Radio Series use wireless technology to provide continuous data acquisition. Please refer to section 8 for RSTAR system details.

4.4 LOGGER OPTIONS

Figure 10 illustrates the Logger Options dialog box.

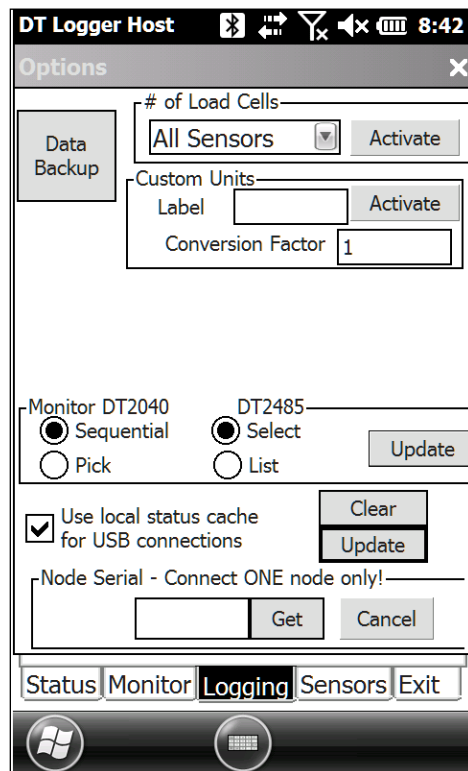


Figure 10: Logger Options dialog

Logger Options for all logger types

Data Backup feature allows storing of a backup copy of the downloaded files automatically after each transfer. Backup can be enabled and destination specified in Backup dialog. Custom units are used to program user defined units to be used in Sensor engineering settings.

Monitor Mode (DT2040 and DT2485 only)

Two monitor modes are made available for large channel number logger (DT2040). Sequential (standard mode) displays 10 consecutive channel monitor data. Pick mode allows selecting up to 10 channels from active sensor pool. When DT2485 logger gets connected, monitor display mode offers selecting sensor address or list type displaying all configured sensors.

Use local status cache for USB connections (DT2485 only)

Enabling local status cache will shorten initial logger connection time. When used with high number of sensors, connection time will be reduced significantly.

Node serial (DT2485 only)

Node serial can be retrieved from the one node connected to the logger.

4.4.1 BACKUP AND RESTORE

Figure 11 illustrates the Backup and Restore dialog box.

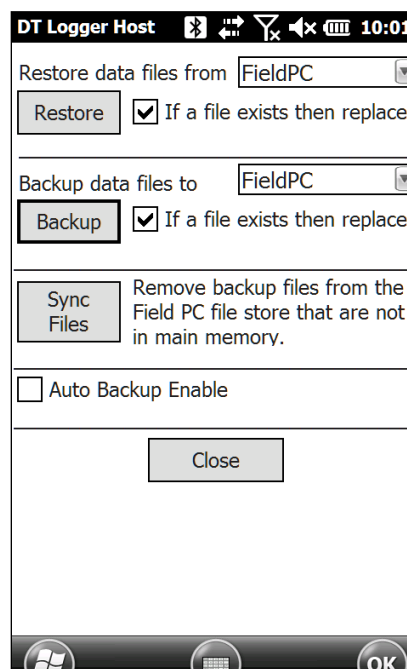


Figure 11: Backup and Restore dialog

1. All Ultra-Rugged Field PC's come with the Field PC storage location however, optional Flash™ Storage Cards are additional and are available through RST.
2. Choose from the several options whether you would like to *Restore*, *Backup* or *Synchronize* the files. Check boxes allow the options of overwriting files if desired.
3. Press the desired button to initiate the function.
4. Press *Close* to exit this screen.

Note

Proper data management is very important. The Ultra-Rugged Field PC, in conjunction with its onboard and optional non-volatile memory storage areas, and its ability to synchronize with a desktop PC, allows several options for backing up the data. At the same time, with all these options, data files can be confused with each other if not managed properly. After taking readings in the field it is always a good idea to back the files up in a safe location (i.e. network server etc.) back at the office using the ActiveSync software. Additional copies of this information will always be stored in the Field PC memory area should the main memory of the Ultra-Rugged Field PC become erased. Be sure to clear the Field PC memory of unneeded files on a regular basis to keep the files easily manageable.

Important

Because the Ultra-Rugged Field PC uses some power to maintain files in RAM and the clock, you need to recharge the battery regularly. Keep the Ultra-Rugged Field PC connected on AC or DC power while you are at your desk. The best policy is to keep the Ultra-Rugged Field PC connected to your computer when working at your desk and carry your AC adapter and DC adapter plug with you when traveling. Your Ultra-Rugged Field PC is shipped with a charge on the battery. You may want to ensure that it is fully charged before synchronizing. The Ultra-Rugged Field PC battery will provide approximately 20 hours of borehole survey time (when connected to the probe).

4.4.2 ADVANCED OPTIONS

The DT Logger Host software includes special features for advanced troubleshooting and data retrieval (Figure 12). *They are to be used with assistance of RST Instruments technical staff in case of corrupted data. The remaining advanced settings can be adjusted to fit custom situations:*

- *Default Settings* reset software settings to default values
- *Factory Reset*: Reset logger to factory defaults erasing all data and settings.
- *Memory Reset* triggers memory erasure.
- *Battery Type*: When replacing with different battery type, Select battery type from the list and click *Set Battery Type*.
- *Initialize Battery*: To be used after installing new battery.
- *Test for VW before reading*: adds additional test for VW sensor connection
- *USB Speed*: Throttle USB bandwidth.
- *DT2011 New Datafile Format* create compatible data file for DT2011 logger
- *Campbell format datafile*: Generate *.dat file in addition to *.csv file.
- *Adjustments*: Advanced settings for specific situations.
- *HT*: Logger command shell.

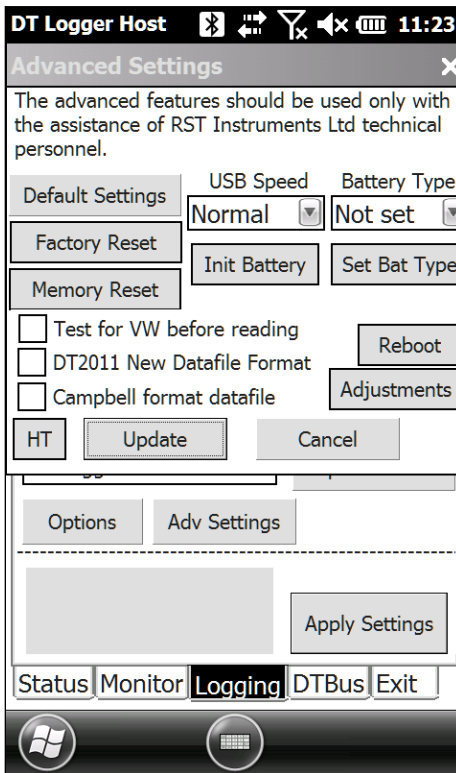


Figure 12: Advanced Logger Options dialog

The Adjustment dialog (Figure 13) allow fine tuning of various logger parameters. They are to be used with advice from RST Instruments technical personnel. Each setting has a default value specified.

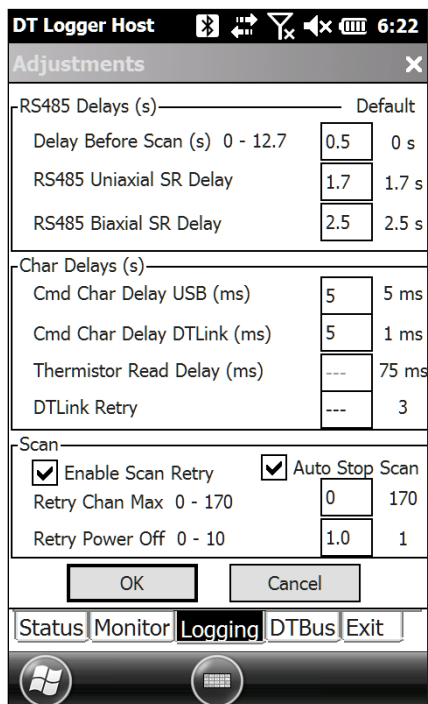


Figure 13: Adjustments dialog

5 LOGGER MENU

Once the datalogger is connected to the Ultra-Rugged Field PC²™, turn on the power to the Ultra-Rugged Field PC²™ by pressing the power button (Figure 6).

Use the stylus to navigate through the operating environment. If you are unfamiliar with the *Windows Mobile* operating environment, please refer to the “*Archer-2-Manual*” which is accessible from the Ultra-Rugged Field PC²™ programs window.

From the *Start* menu, choose: *DT Logger Host* to launch the RST DT Logger Host Software. The logger menu appears when the program is initially launched. The menu contains six tabs: *Status*, *Mon*, *Log*, *Sensors*, and *Exit*. Each tab option is explained in detail below. Until successful logger connection, all tabs are inaccessible except *Status*.

5.1 VIBRATING WIRE LOGGERS (DT2011, DT2055, DT2055B, DT2040, DT2011B)

5.1.1 STATUS

The status tab (Figure 14) contains three main components: *Logger*, *Sampling* and *Mode*.

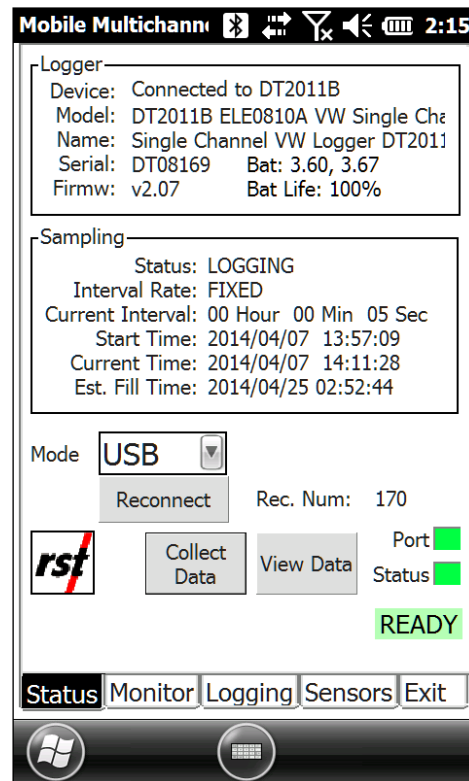


Figure 14: Status Tab

Logger

Provides information about the currently connected datalogger. This includes the model, name, serial number, and firmware version. Ensure that the serial number matches what is expected (in this example it is DT08169). If it does not, ensure that a connection with the logger has been established.

Sampling

Provides information about the status of the logger. This includes whether or not it is logging, the log interval, and various time parameters.

Battery

Displays the past battery voltage recorded when sample was taken, current battery voltage and the estimated battery life. To ensure uninterrupted operation, replace batteries when estimated battery life is getting low.

Note

Battery past value depends on the recorded data availability and the firmware version installed.

Refer to Section 9.4 for battery replacement instructions. Multichannel logger uses special long-life lithium battery; contact RST for replacement part.

DT2011 uses two AA alkaline batteries. See Section 9.4.2 for Single Channel logger battery information.

Mode

The RST DT Logger Host software connects to either the RST USB Dataloggers or RST RS232 Datalogger. Select the device you wish to access and press *Connect* button.

Collect Data

If the datalogger has already been configured to collect data at a specified interval, the *Collect Data* button can be pressed. The program will download the data (a progress bar will be displayed) and automatically write it to a *.csv file in **My Documents\Multichannel**. Please see Section 7 for the *.csv file format.

Note

When pressing the *Collect Data* button, after the data download completes, the program will give a choice to keep or erase the data currently contained in the datalogger. If the datalogger memory is not erased, the next time the data is collected (and no parameters have been changed) it will download the current readings and all of the previous data to a *.csv file.

The current memory can also be erased by pressing the **Apply Settings** in the *Logging tab* or **Apply in Sensors tab**. The program will prompt you to confirm the erasing of data from its memory.

RST Logo

Press the *RST Logo* button to display DT Logger Host version and copyright information.

5.1.2 VIEW DATA

After the data is downloaded from datalogger memory, the contents of the data file can be viewed by pressing *View Data* button. The File Listing Screen (Figure 15) is then presented. For each selected datafile, the status of the datalogger is shown at the bottom of the screen. This status is recorded in each datafile at the time of data download.

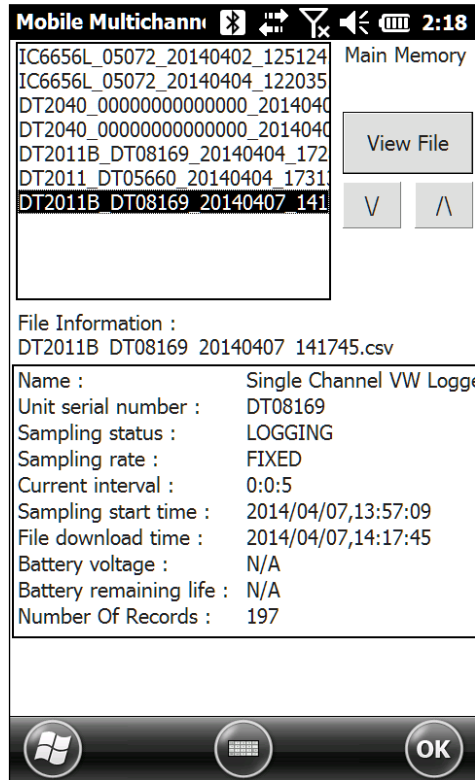


Figure 15: File Listing Screen

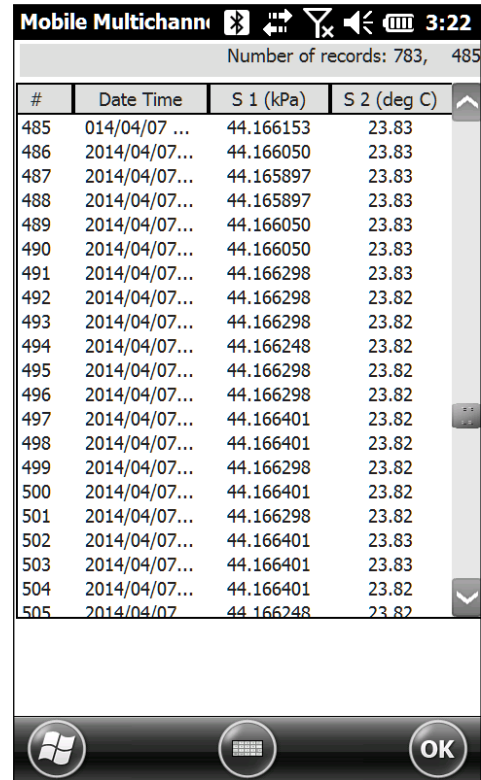


Figure 16: File View Screen

By selecting desired filename and pressing *View File*, the contents of the data file are displayed in the table. The status bar at the top of the screen shows the total number of recordings and the current line number. The sample screen is shown in Figure 16.

Note

Data View displays major datalogger settings and all saved data records. Use text file viewer or spread sheet program (ex. MS Excel™) to see the entire file

5.1.3 MONITOR

Selecting the monitor tab sets the datalogger into monitor mode. The screen reports in B-units ($f^2 \times 10^{-3}$) or the thermistor temperature in degrees Celsius (Figure 17 and Figure 18).

If successfully connected to the datalogger, the sensor reading or temperature reading is updated approximately once per two seconds. Dot indicator flashes each time a sensor data is updated. Clicking the check boxes changes the display to Engineering Units, or thermistor resistance. For Fahrenheit temperature units, check the appropriate box in *Sensors* tab.

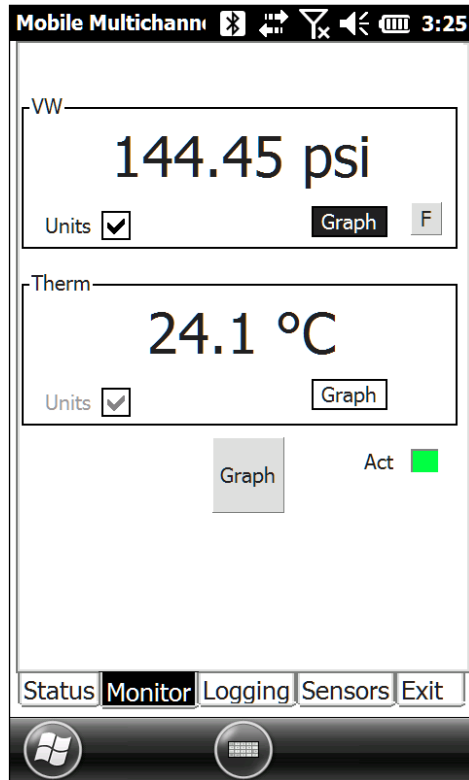


Figure 17: Single Channel Monitor Tab

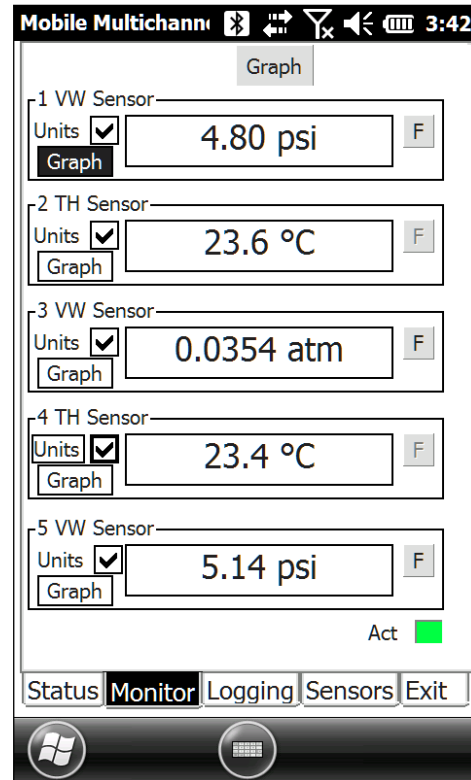


Figure 18: Multichannel Monitor Tab

Display Format

Click on **F** button to customize monitor display settings. Option is given to alter precision or switch to scientific display.

Note

Engineering Units are only available when sensor calibration data and conversion method is set in Sensors page. Please see Section 5.1.6 for the instructions on entering calibration data.

Until communication is established with the datalogger, the program will display "----" in Sensor Reading fields.

When Sensor Reading is outside of the valid range, "RANGE_ERR" will be displayed.

5.1.4 GRAPH

The graph button invokes the datalogger graphical monitor for selected sensor. Recent monitor readings are displayed then in a Sensor Reading vs. Time graph (Figure 19). If successfully connected, the graphical monitor is updated approximately once every two seconds. Initially, the graphical screen needs few seconds to auto calculate axis ranges.

The real time sensor reading is displayed below the graph window. Manual “Scale” slider bar is provided for fine tuning of graph vertical scale.

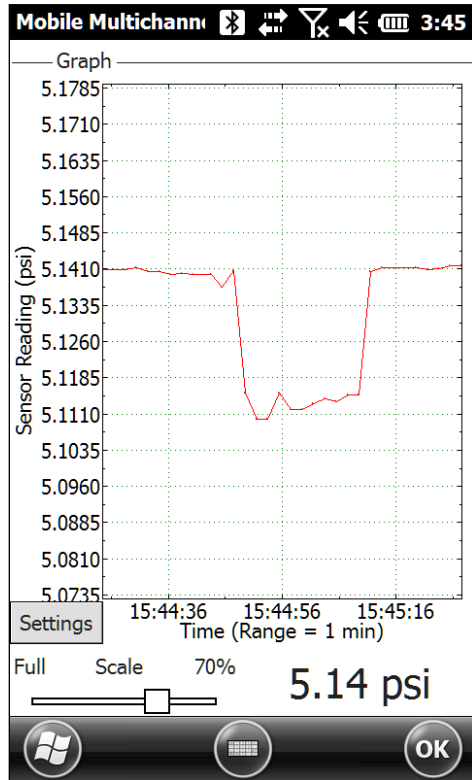


Figure 19: Graph Tab

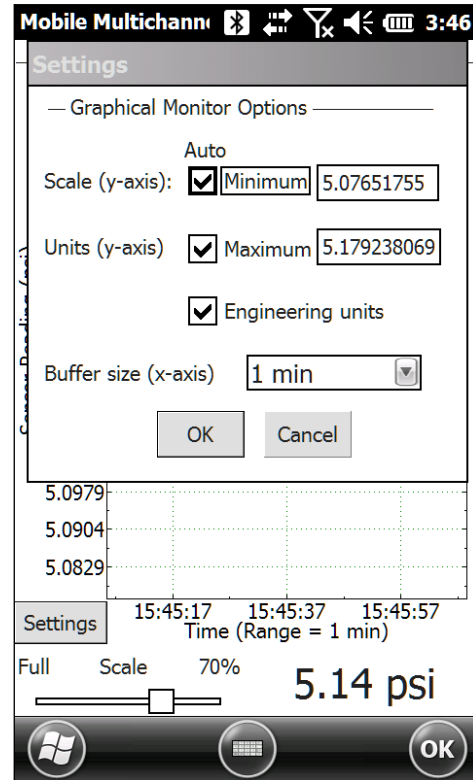


Figure 20: Graphical Monitor Options

Note

The Graph screen will be refreshed when engineering units are changed or relevant settings are changed.

Until communication is established with the datalogger, the program will display "----" in sensor reading area.

When Sensor Reading is outside of the valid range, "RANGE_ERR" will be displayed.

The "Scale" slider is disabled when manual scale settings are used in Graphical Monitor Options.

The "Settings" button launches the Graphical Monitor Options dialog (Figure 20), which allows the user to manipulate the graph. Options include the ability to display Engineering Units, set minimum and maximum Sensor Reading ranges (y-axis), and set the time range of monitor data points displayed (x-axis, range between 1 minute and 2 hours). To manually adjust the minimum and maximum Sensor Reading ranges (y-axis), the "Auto" checkboxes need to be cleared.

5.1.5 LOGGING

The Logging tab (Figure 21) contains three main components: *Interval*, *Logger Options* and *Clock Options*.

Figure 21: Logging Tab

Logger Label

Custom label can be entered if desired. Press the *Update Label* button to change logger label.

Interval

This section is used to set the logging interval. *Fixed* interval and *Multi* interval options are available. The fixed logging interval can be invoked by choosing the “Fixed” radio button and set within the main setup tab. Arrow buttons allow the user to scroll up or down pre-set values.

To setup the logger with multiple intervals, select the *Multi (Advanced)* radio button. Clicking the *Advanced* button launches the Multi Interval Table dialog (Figure 22), where up to 12 custom, multiple intervals can be applied.

	Hour	Min	Sec	Iteration	Fill Time (d)
1:	0	2	0	3000	4 04:00:00
2:	0	0	10	2000	0 05:33:20
3:	0	1	0	1500	1 01:00:00
4:	0	10	0	500	3 11:20:00
5:	0	30	0	0	3266 16:00:00
6:	0	0	0	0	
7:	0	0	0	0	
8:	0	0	0	0	
9:	0	0	0	0	
Totals:				7000	3275 13:53:20

Save Cancel Update

Figure 22: Multi Interval Table

The hour, minute, second and number of iterations per interval must be specified.

Note

Each interval **MUST** have an iteration except the last iteration which must be set to zero. This tells the program that the logger will continue at the last iteration rate.

The memory capacity depends on logger hardware. Multichannel logger data recording capability ranges from up to 303,030 records with 2 sensors connected and 106,470 records in 10 sensor configurations. Single Channel Loggers can hold up to a maximum of 32,000 iterations for all intervals. The dialog features an Interval Fill Time field, which allows the user to see the exact time, relative to the start time of the interval, the interval iterations will finish. To update both the *Interval Fill Time* and *Total Iterations field*, click the “Update” button. To save changes, click the “Save” button.

Logger Options

Start Time: A check box can be selected to enable a custom start time. The hour and minute can be entered in 24-hour format.

Note

If a custom start time is entered and this time has already past, the logger will not start until 24 hours has passed. For example: If the current time is 13:01 and the start time is set to 13:00, the datalogger will not start logging data until 13:00 *the next day*.

If a custom start time is applied, i.e. for some time in the future, the *Status* will read *Log Pending* until that interval is reached.

Wrap on Mem Full (Overwrite Data): When the datalogger memory becomes full, it will overwrite itself.

Stop on Mem Full: Datalogger stops collecting data when it reaches its memory storage limit.

Clock Options

Allows the user to set the date and time of the datalogger. Checking the *Auto Sync Time* checkbox will update datalogger internal clock each time *Apply Settings* button is pressed.

Options

The *Options* button displays pull down menu with *Logger* and *Wireless* entries.

Logger:

Allows changing several advanced settings, the exact view depends on the type of the connected datalogger.

Wireless:

Wireless system configuration settings. For further information on Wireless settings, see Section 8.

Apply Settings Button

After any changes have been made on the datalogger *Log* screen, pressing the *Apply Settings* button saves these changes and uploads them to the datalogger's memory.

<p>Note</p> <p>During logging settings upload, all existing logger data will be erased. Ensure to download data prior to changing logging settings. Sensor configuration will not be affected.</p>

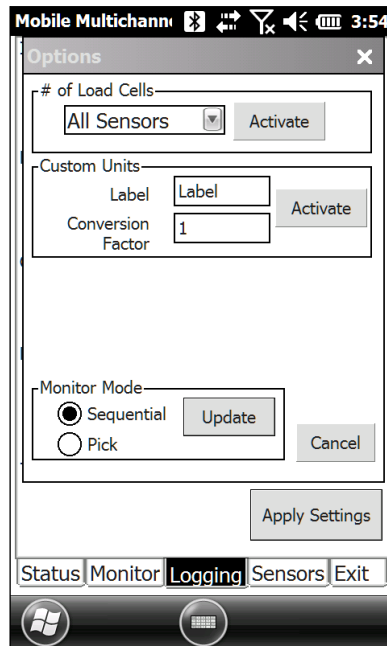


Figure 23: Logger Options

Load Cell Mode

The load Cell mode can be activated to display average sensor values in Monitor Tab. This setting is useful when all connected sensors are a part of a load cell. Data file download will have average values columns when downloaded in Load Cell mode.

Custom Units

The option is given to display and record sensor readings in engineering units other than predefined on Sensor tab. Enter desired label and conversion factor to add custom units. Then apply settings and use your custom units in Sensor configuration tab.

Custom Units option might not be available for some firmware versions. Check RST website for most up to date firmware version.

Monitor Mode (DT2040 only)

Two monitor modes are made available for large channel number logger (DT2040). Sequential (standard mode) displays 10 consecutive channel monitor data. Pick mode allows selecting up to 10 channels from active sensor pool.

Advanced Settings

The DT Logger Host software includes special features for advanced troubleshooting and data retrieval. They are to be used with assistance of RST Instruments technical staff in case of corrupted data.

5.1.6 SENSORS

The DT Logger Host Software *Sensors* tab will display one of two types of sensor configuration screens, depending on sensor type. The following buttons are common to all sensor configuration screens:

Add Sensor

This button will activate sensor add menu.

To add vibrating wire sensor, select *Add VW Sensor*. The screen will change to VW mode.

To add thermistor sensor, select *Add Temp Sensor*. The screen will show controls for setting up thermal sensor.

To insert vibrating wire sensor at current location, select *Ins VW Sensor*. The screen will change to VW mode.

To insert thermistor sensor, select *Ins Temp Sensor*. The screen will show controls for setting up thermal sensor.

Select *New Copy* to add copy of currently viewed sensor configuration screen.

Delete

Deletes currently displayed sensor configuration.

| button

Use this button to remove all sensors except the first two.

File

This button will activate sensor configuration file menu.

Select *Save to File* for later retrieval.

Select *Load from File* to load previously saved sensor settings.

Display Format

Customize monitor display settings. Option is given to alter precision or switch to scientific display.

Verify

Once sensor configuration is saved and sensors connected, click on *Verify* to detect and verify current setup. Each connection is tested and results displayed.

The following parameters are shown:

- Sensor label
- Pre-configured (Expected) sensor type
- Detected sensor type
- Measured sensor resistance in Ohms

When detected sensor parameters appear correct, background color turns green, otherwise background color turns red to indicate error.

The sample screen is shown on Figure 24.

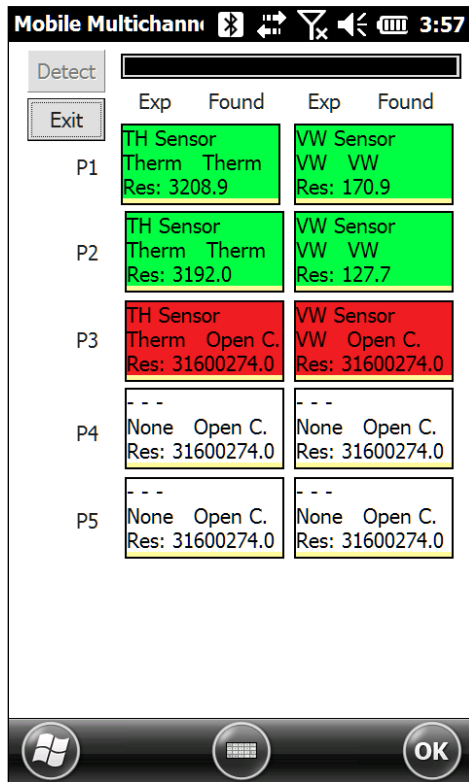


Figure 24: Verify Sensor Connections

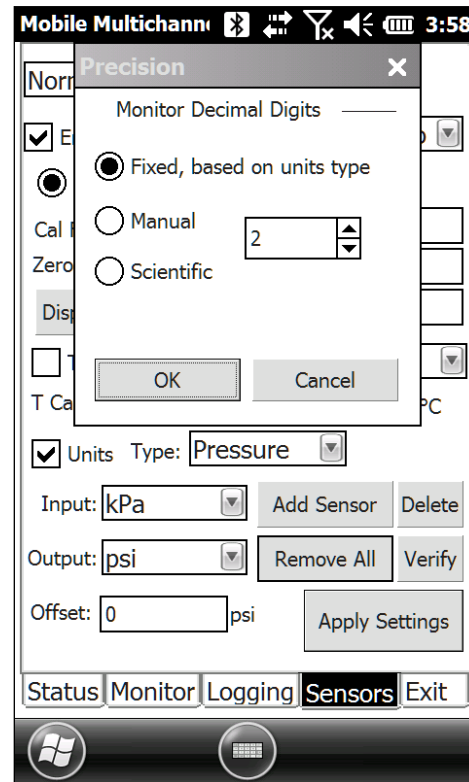


Figure 25: Display Format for Sensor

Apply

As a reminder, whenever **ANY** changes are made under the Sensors tab, the *Apply* button must be pressed in order to update the logger with the current sensor settings.

Note

Before sensor settings upload, the program will give a choice to keep or erase the data currently contained in the datalogger. If the datalogger memory is not erased, the next time the data is collected, it will download the current readings and all of the previous data to a *.csv file. Current sensor calibration settings will be applied to calculate engineering values from all recorded data.

5.1.6.a VW SENSOR CONFIGURATION SCREEN

Often the user may wish to report the readings directly in engineering units, rather than B-units ($f^2 \times 10^{-3}$). This can be done on the VW Sensors Tab (Figure 26). Data required for the conversion to engineering units is always found on the calibration sheets for the transducer.

Each transducer is shipped from the factory with a calibration sheet. If you have not received a calibration sheet, or the sheet has been lost, please contact RST Instruments and a copy will be faxed or e-mailed to you.

Figure 26: VW Sensors Tab

VW Sensor Type

A drop-down menu allows the user to select from a list of pre-set sweep frequency settings (Figure 27). The software also allows a custom, user defined sweep frequency for use with non-standard vibrating wire sensors (Figure 28). To select this option, choose the “Custom (Advanced)” option from the drop-down menu, click the “Advanced” button, fill in the required fields and click *Sweep* to determine the remaining parameters.

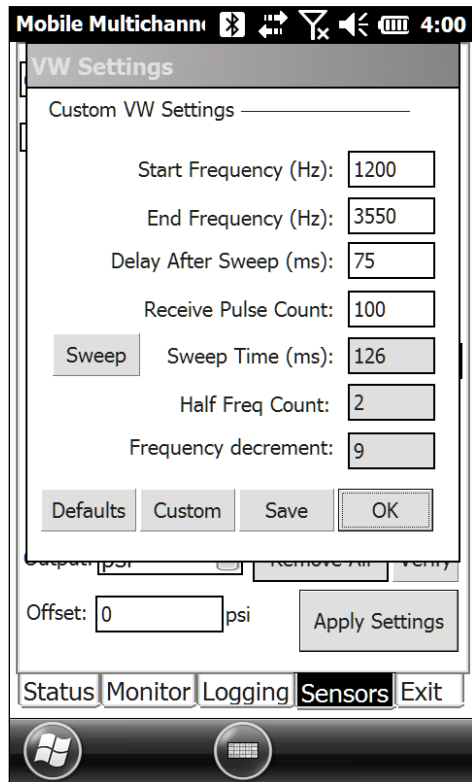
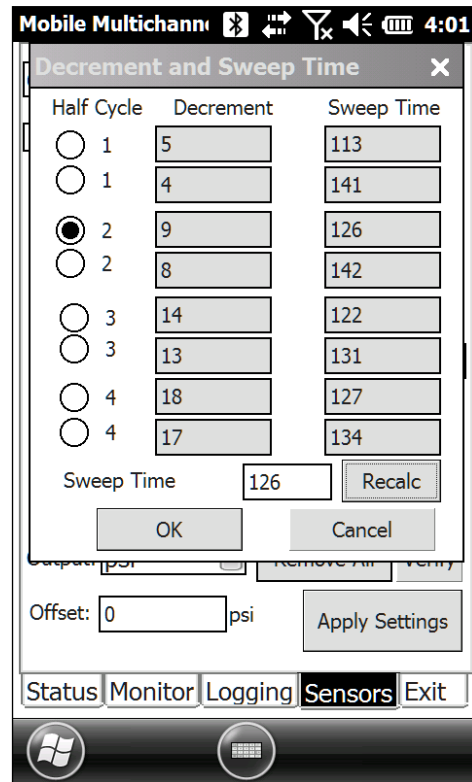


Figure 27: Custom Vibrating Wire Settings



Half Cycle	Decrement	Sweep Time
<input type="radio"/> 1	5	113
<input type="radio"/> 1	4	141
<input checked="" type="radio"/> 2	9	126
<input type="radio"/> 2	8	142
<input type="radio"/> 3	14	122
<input type="radio"/> 3	13	131
<input type="radio"/> 4	18	127
<input type="radio"/> 4	17	134

Figure 28: Decrement and Sweep Time options

Enter the desired Sweep Time and click *Recalc*. The program will calculate Decrement and Sweep Time and give option to choose optimal parameters

Conversion Method

The user is given an option to apply either a *Linear* or *Polynomial* Conversion. If *Linear conversion* is selected, input the provided Calibration Factor and Zero Reading into the appropriate boxes.

If *polynomial conversion* is selected, input the provided coefficients (A, B & C) into the appropriate boxes.

Temperature Correction

When the Temp Corr box is checked, the software will apply a temperature correction to the data. This requires the user to enter in the temperature correction factor and an initial temperature which is found on the calibration sheet for that particular instrument. Then select thermistor sensor used to read temperature.

If the calibration sheet is missing, please contact RST Instruments and a copy of the calibration sheet can be faxed or e-mailed to you.

Units Conversion

Units Type: Choose pressure or distance using the drop-down menu.

Input Units: These are the units of the calibration constants you inputted into either the linear conversion or polynomial conversion methods. In general, the calibration constants reported on the calibration sheets are either in kPa/B unit or psi/B unit. In the case of strain gauges, this could be mm/B unit.

Output Units: Select the appropriate output units from the drop-down list. The conversion will be done automatically resulting in desired units displayed in Monitor tab and recorded in downloaded file data.

Output Offset: This is a user defined offset value. Under certain circumstances, the user may wish to enter in the elevation of the pressure transducer. In this way the reported pressure will be correlated to a reference elevation (i.e. above sea level).

5.1.6.b THERMAL SENSOR CONFIGURATION SCREEN

Thermal Sensor Type

A drop-down menu on the Temperature Sensors Tab (Figure 29) allows the user to select the type of thermistor used in the vibrating wire instrument.

To display Fahrenheit units, check the *Fahrenheit temperature units* checkbox. This global setting applies to all thermistor sensors.

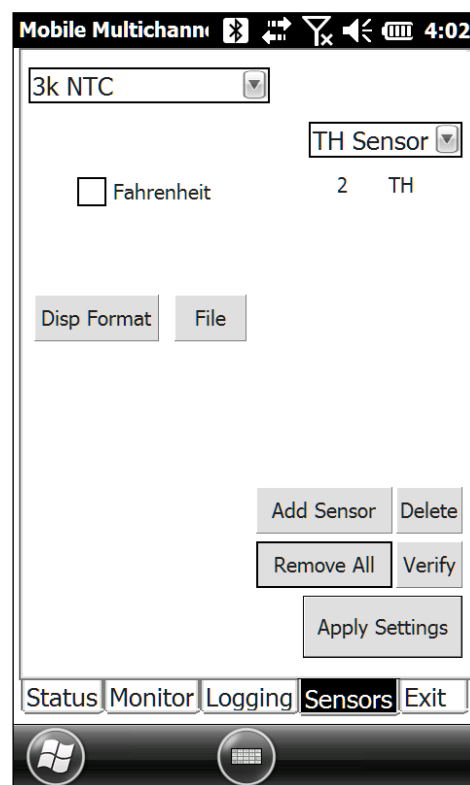


Figure 29: Temperature Sensors Tab

Apply

As a reminder, whenever **ANY** changes are made under the Sensors tab, the *Apply* button must be pressed in order to update the logger with the current sensor settings.

Note

Before sensor settings upload, the program will give a choice to keep or erase the data currently contained in the datalogger. If the datalogger memory is not erased, the next time the data is collected, it will download the current readings and all of the previous data to a *.csv file. Current sensor calibration settings will be applied to calculate engineering values from all recorded data.

5.2 4 TO 20mA LOGGER (DT4205)

5.2.1 STATUS

The Status Tab (Figure 30) contains three main components: *Logger*, *Sampling*, *Battery* and *Mode*.

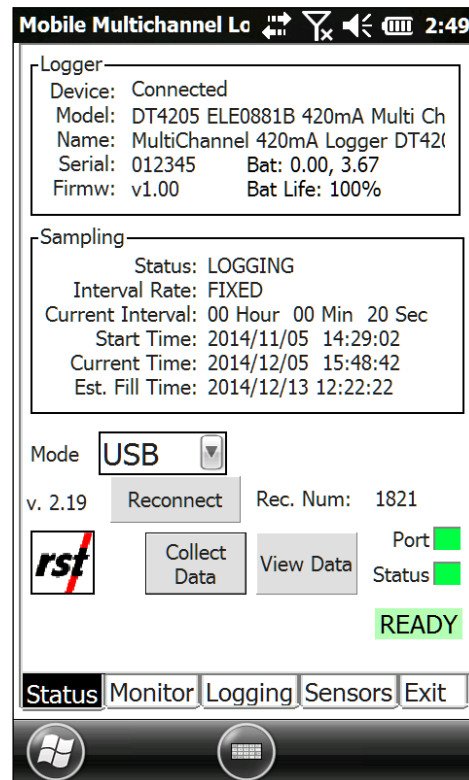


Figure 30: 4 to 20 mA Logger Status Tab

Logger

Provides information about the currently connected datalogger. This includes the model, name, serial number, and firmware version. Ensure that the serial number matches what is expected (in this example it is 012345). If it does not, ensure that a connection with the logger has been established.

Sampling

Provides information about the status of the logger. This includes whether or not it is logging, the log interval, and various time parameters.

Battery

Displays the past battery voltage recorded when sample was taken, current battery voltage and the estimated battery life. To ensure uninterrupted operation, replace batteries when estimated battery life is getting low.

Note

Battery past value depends on recorded data availability and firmware version installed.

Refer to Section 9.4 for battery replacement instructions. Multichannel logger uses special long-life lithium battery; contact RST for replacement part.

DT2011 uses two AA alkaline batteries. See Section 9.4.2 for Single Channel logger battery information.

Mode

The RST DT Logger Host software connects to either the RST USB Dataloggers or RST RS232 Datalogger. Select the device you wish to access and press *Connect* button.

Collect Data

If the datalogger has already been configured to collect data at a specified interval, the *Collect Data* button can be pressed. The program will download the data (a progress bar will be displayed) and automatically write it to a *.csv file in the

My Documents\Multichannel directory. Please see section 7 for the *.csv file format.

Note

When pressing the *Collect Data* button, after the data download completes, the program will give a choice to keep or erase the data currently contained in the datalogger. If the datalogger memory is not erased, the next time the data is collected (and no parameters have been changed) it will download the current readings and all of the previous data to a *.csv file.

The current memory can also be erased by pressing the **Apply Settings** in the *Logging tab* or **Apply in Sensors tab**. The program will prompt you to confirm the erasing of data from its memory.

RST Logo

Press the *RST Logo* button to display DT Logger Host version and copyright information.

5.2.2 VIEW DATA

After the data is downloaded from datalogger memory, the contents of the data file can be viewed by pressing *View Data* button. The File Listing Screen is then presented (Figure 31). For each selected datafile, the status of the datalogger is shown at the bottom of the screen. This status is recorded in each datafile at the time of data download.

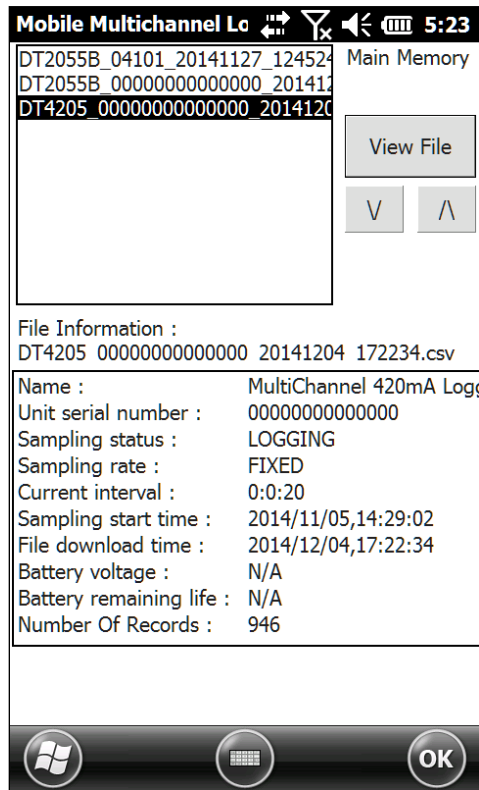


Figure 31: 4 to 20mA Logger File Listing Screen

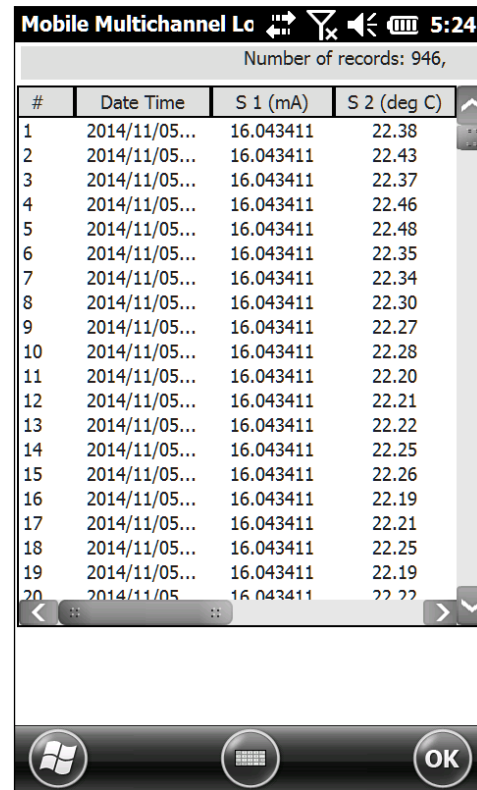


Figure 32: 4 to 20mA Logger File View Screen

By selecting desired filename and pressing *View File*, the contents of the data file are displayed in the table. The status bar at the top of the screen shows the total number of recordings and the current line number. The sample screen is shown on Figure 32.

Note

Data View displays major datalogger settings and all saved data records. Use text file viewer or spread sheet program (ex. MS Excel™) to see the entire file.

5.2.3 MONITOR

Selecting the monitor tab sets the datalogger into monitor mode (Figure 33). By default, the screen reports in mA of the detected current.

If successfully connected to the datalogger, the sensor reading is updated approximately once per two seconds. Dot indicator flashes each time a sensor data is updated. Clicking the check boxes changes the display to Engineering Units.

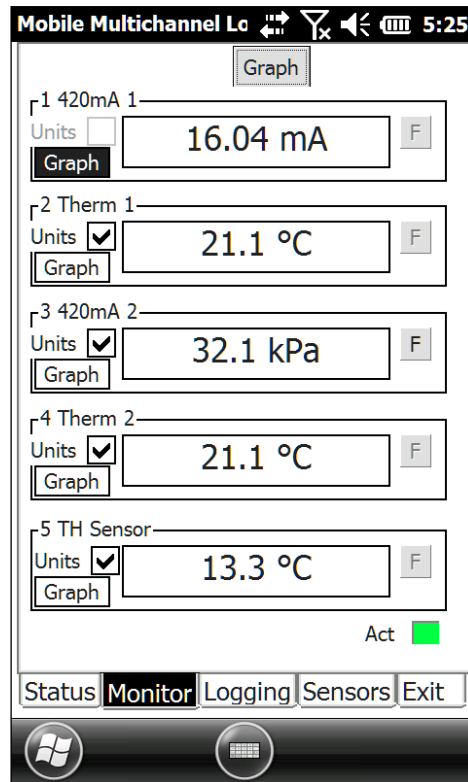


Figure 33: 4 to 20mA Logger Monitor Tab

Display Format

Click on **F** button to customize monitor display settings. Option is given to alter precision or switch to scientific display.

Note

Engineering Units are only available when sensor calibration data and conversion method is set in Sensors page. Please see section 5.2.6 for the instructions on entering calibration data.

Until communication is established with the datalogger, the program will display "----" in Sensor Reading fields.

When Sensor Reading is outside of the valid range, "RANGE_ERR" will be displayed.

5.2.4 GRAPH

The graph button invokes the datalogger graphical monitor for selected sensor. Recent monitor readings are displayed then in a Sensor Reading vs. Time graph (Figure 34). If successfully connected, the graphical monitor is updated approximately once every two seconds. Initially, the graphical screen needs few seconds to auto calculate axis ranges.

The real time sensor reading is displayed below the graph window. Manual "Scale" slider bar is provided for fine tuning of graph vertical scale.

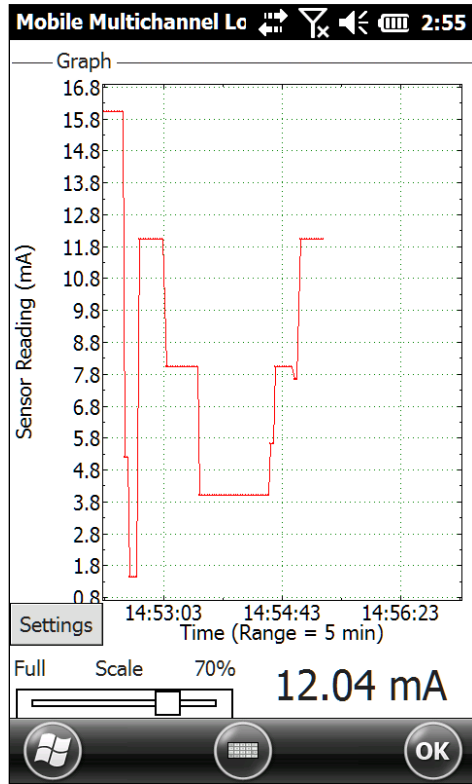


Figure 34: 4 to 20mA Logger Graph Tab

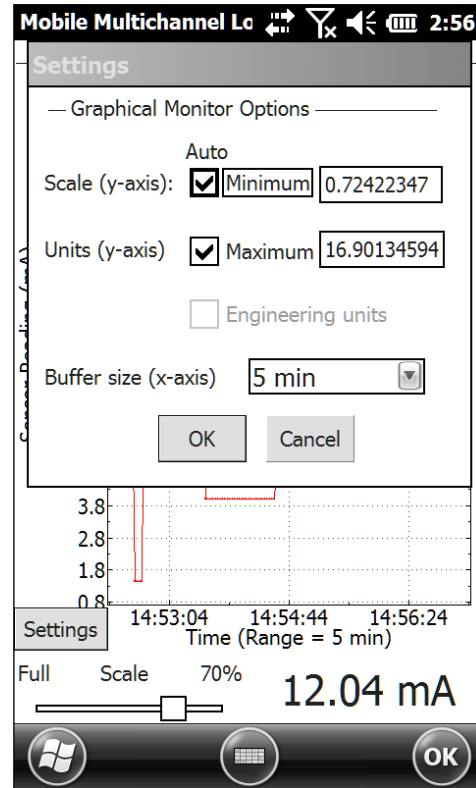


Figure 35: 4 to 20mA Logger Graphical Monitor Options

Note

The Graph screen will be refreshed when engineering units are changed or relevant settings are changed.

Until communication is established with the datalogger, the program will display "----" in sensor reading area.

When Sensor Reading is outside of the valid range, "RANGE_ERR" will be displayed.

The "Scale" slider is disabled when manual scale settings are used in Graphical Monitor Options.

The "Settings" button launches the Graphical Monitor Options dialog (Figure 35), which allows the user to manipulate the graph. Options include the ability to display Engineering Units, set minimum and maximum Sensor Reading ranges (y-axis), and set the time range of monitor data points displayed (x-axis, range between 1 minute and 2 hours). To manually adjust the minimum and maximum Sensor Reading ranges (y-axis), the "Auto" checkboxes need to be cleared.

5.2.5 LOGGING

The Logging tab contains three main components: *Interval*, *Logger Options* and *Clock Options* (Figure 36).

Mobile Multichannel Logger 5:27

Interval

Hour 0 Min 0 Sec 20

☒ Fixed ☐ Multi (Advanced) Advanced

Logger Options

☐ Start Time: Hour 14 Min 29

☒ Wrap on Mem Full ☐ Stop on Mem Full

Clock Options

Logger 2014/12/04 Time: 18:26:14 ☐ Sync to Computer Time

Logger Label

MultiChannel 420mA Logg Update Label

Options Adv Settings

Apply Settings

Status Monitor Logging Sensors Exit

Figure 36: 4 to 20mA Logger Logger Logging Tab

Logger Label

Custom label can be entered if desired. Press the *Update Label* button to change logger label.

Interval

This section is used to set the logging interval. *Fixed interval* and *Multi interval* options are available. The fixed logging interval can be invoked by choosing the “Fixed” radio button and set within the main setup tab. Arrow buttons allow the user to scroll up or down pre-set values.

To setup the logger with multiple intervals, select the *Multi (Advanced)* radio button. Clicking the *Advanced* button launches the Multi Interval Table dialog (Figure 37), where up to 12 custom, multiple intervals can be applied.

Mobile Multichannel 3:50

Multi Interval Table

	Hour	Min	Sec	Iteration	Fill Time (d)
1:	0	2	0	3000	4 04:00:00
2:	0	0	10	2000	0 05:33:20
3:	0	1	0	1500	1 01:00:00
4:	0	10	0	500	3 11:20:00
5:	0	30	0	0	3266 16:00:00
6:	0	0	0	0	
7:	0	0	0	0	
8:	0	0	0	0	
9:	0	0	0	0	
Totals:				7000	3275 13:53:20

Save Cancel Update

Figure 37: 4 to 20mA Logger Multi Interval Table

The hour, minute, second and number of iterations per interval must be specified.

Note

Each interval **MUST** have an iteration except the last iteration which must be set to zero. This tells the program that the logger will continue at the last iteration rate.

The memory capacity depends on logger hardware. Multichannel logger data recording capability ranges from up to 303,030 records with 2 sensors connected and 106,470 records in 10 sensor configuration. Single Channel Loggers can hold up to a maximum of 32,000 iterations for all intervals. The dialog features an Interval Fill Time field, which allows the user to see the exact time, relative to the start time of the interval, the interval iterations will finish. To update both the *Interval Fill Time* and *Total Iterations field*, click the “Update” button. To save changes, click the “Save” button.

Logger Options

Figure 38 shows the Logger Options dialog box.

Start Time: A check box can be selected to enable a custom start time. The hour and minute can be entered in 24-hour format.

Note

If a custom start time is entered and this time has already past, the logger will not start until 24 hours has passed. For example: If the current time is 13:01 and the start time is set to 13:00, the datalogger will not start logging data until 13:00 *the next day*.

If a custom start time is applied, i.e. for some time in the future, the *Status* will read *Log Pending* until that interval is reached.

Wrap on Mem Full (Overwrite Data): When the datalogger memory becomes full, it will overwrite itself.

Stop on Mem Full: Datalogger stops collecting data when it reaches its memory storage limit.

Clock Options

Allows the user to set the date and time of the datalogger. Checking the *Auto Sync Time* checkbox will update datalogger internal clock each time *Apply Settings* button is pressed.

Options

The *Options* button displays pull down menu with *Logger* and *RSTAR* entries.

Logger:

Allows changing several advanced settings, the exact view depends on the type of the connected datalogger.

RSTAR:

RSTAR Array Radio Series system configuration settings. For further information on RSTAR settings, see Section 8.

Apply Settings Button

After any changes have been made on the datalogger *Log* screen, pressing the *Apply Settings* button saves these changes and uploads them to the datalogger's memory.

<p>Note</p> <p>During logging settings upload, all existing logger data will be erased. Ensure to download data prior to changing logging settings. Sensor configuration will not be affected.</p>

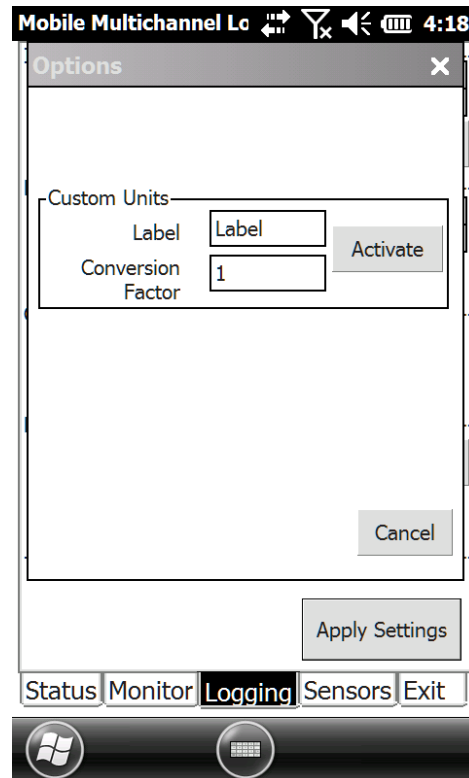


Figure 38: 4 to 20mA Logger Options

Custom Units

The option is given to display and record sensor readings in engineering units other than predefined on Sensor tab. Enter desired label and conversion factor to add custom units. Then apply settings and use your custom units in Sensor configuration tab. Custom Units option might not be available for some firmware versions. Check RST website for most up to date firmware version.

Advanced Settings

The DT Logger Host software includes special features for advanced troubleshooting and data retrieval. They are to be used with assistance of RST Instruments technical staff in case of corrupted data.

5.2.6 SENSORS

The DT Logger Host Software *Sensors* tab will display one of two types of sensor configuration screens, depending on sensor type. The following buttons are common to all sensor configuration screens:

Add Sensor

This button will activate sensor add menu.

To add 4 to 20mA sensor, select *Add 420 Sensor*. The screen will change to 420 mode.

To add thermistor sensor, select *Add Temp Sensor*. The screen will show controls for setting up thermal sensor.

To insert 4 to 20mA sensor at current location, select *Ins 420 Sensor*. The screen will change to VW mode.

To insert thermistor sensor, select *Ins Temp Sensor*. The screen will show controls for setting up thermal sensor.

Select *New Copy* to add copy of currently viewed sensor configuration screen.

Delete

Deletes currently displayed sensor configuration.

| button

Use this button to remove all sensors except the first two.

File

This button will activate sensor configuration file menu.

Select *Save to File* for later retrieval.

Select *Load from File* to load previously saved sensor settings.

Display Format

Customize monitor display settings. Option is given to alter precision or switch to scientific display.

Verify

Once sensor configuration is saved and sensors connected, click on *Verify* to detect and verify current setup. Each connection is tested and results displayed.

The following parameters are shown:

- Sensor label
- Pre-configured (Expected) sensor type
- Detected sensor type
- Measured sensor resistance in Ohms

When detected sensor parameters appear correct, background color turns green, otherwise background color turns red to indicate error.

The sample screen is shown on Figure 39.

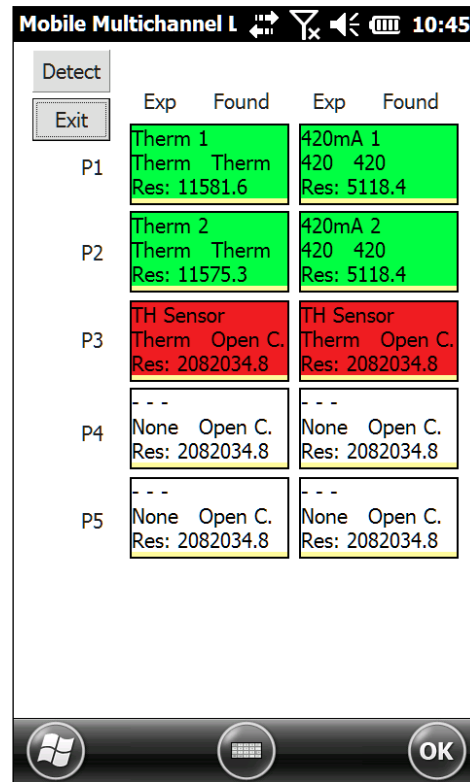


Figure 39: 4 to 20mA Verify Sensor Connections

Apply

As a reminder, whenever **ANY** changes are made under the Sensors tab, the *Apply* button must be pressed in order to update the logger with the current sensor settings.

Note

Before sensor settings upload, the program will give a choice to keep or erase the data currently contained in the datalogger. If the datalogger memory is not erased, the next time the data is collected, it will download the current readings and all of the previous data to a *.csv file. Current sensor calibration settings will be applied to calculate engineering values from all recorded data.

5.2.6.a 4 TO 20mA SENSOR CONFIGURATION SCREEN

Often the user may wish to report the readings directly in engineering units, rather than mA.

The screenshot shows the 'Sensors' tab of the Mobile Multichannel Logger. At the top, the status bar displays 'Mobile Multichannel Lo', signal strength, battery level, and time '5:29'. Below this, a dropdown menu shows '420mA 1' with a value of '1'. A checkbox labeled 'Eng' is checked, with buttons for 'File' and 'Disp Format'. A yellow '420' is displayed. The 'I Unit' section has a 'Type' dropdown set to 'Distance', 'In:' dropdown set to 'mm', 'Out:' dropdown set to 'mm', and an 'Offset:' field set to '0.00000e+00'. The 'Coefficient Input' section has a radio button selected, with 'BM:' set to '1.0000e+000' and 'CZ:' set to '0.0000e+000'. There are 'Add' and 'Delete' buttons. The 'Range Input' section has a radio button selected, with a table for 'Low Limit' and 'Full Scale' values. The 'Init:' field is set to '0' with a unit dropdown. The 'Eng' section has a table for 'Low Limit' and 'Full Scale' values. The 'Delay:' field is set to '0.00'. The equation '(BM * Reading) + CZ' is shown. The date '2014/11/05 13:28:43' is displayed. At the bottom, there are buttons for 'Status', 'Monitor', 'Logging', 'Sensors', and 'Exit'. The bottom status bar shows the Windows logo and a keyboard icon.

Figure 40: 4 to 20mA Logger Sensors Tab

Conversion Method

Engineering values are calculated using linear conversion.

The user is given two options to apply a Linear Conversion:

- Coefficient Input, enter Calibration Factor BM and Zero Reading CZ.
- Range Input. Input current and engineering calibration limits into appropriate boxes.

The option is also given to modify the sensor offset.

Equation used for calculations is shown for a reference.

Temperature Correction

When the Enable Temperature Correction box is checked, the software will apply a temperature correction to the data. This requires the user to enter in the temperature correction factor and an initial temperature which is found on the calibration sheet for that particular instrument. Then select thermistor sensor used to read temperature.

If the calibration sheet is missing, please contact RST Instruments and a copy of the calibration sheet can be faxed or e-mailed to you.

Units Conversion

Units Type: Choose pressure, distance, force, strain, VW temp, incline or custom units using the drop-down menu.

Input Units: These are the units of the calibration constants you inputted into either the coefficient or range conversion methods.

Output Units: Select the appropriate output units from the drop-down list. The conversion will be done automatically resulting in desired units displayed in Monitor tab and recorded in downloaded file data.

Output Offset: This is a user defined offset value.

File

This button will activate sensor configuration file menu. Select *Save to File* for later retrieval. Select *Load from File* to load previously saved sensor settings.

Display Format

This option allows the user to customize monitor display settings (Figure 41). The user is given the option to alter the precision or switch to scientific display.

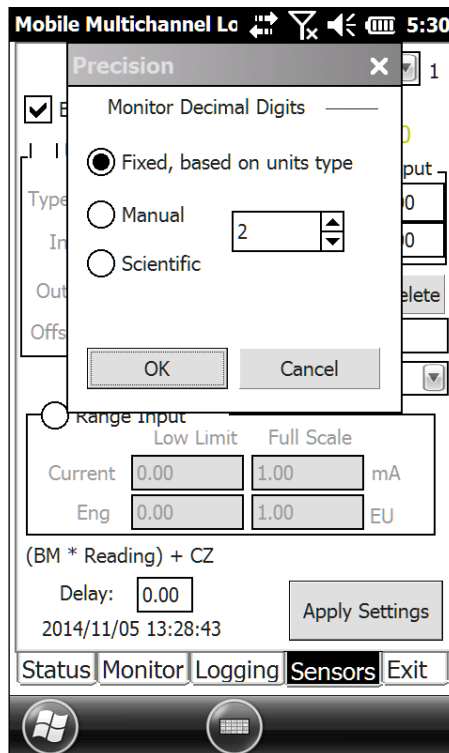


Figure 41: Display Format for 4 to 20mA Logger Sensor

Apply

As a reminder, whenever **ANY** changes are made under the Sensors tab, the *Apply* button must be pressed in order to update the logger with the current sensor settings.

Note

Before sensor settings upload, the program will give a choice to keep or erase the data currently contained in the datalogger. If the datalogger memory is not erased, the next time the data is collected, it will download the current readings and all of the previous data

to a *.csv file. Current sensor calibration settings will be applied to calculate engineering values from all recorded data.

5.2.6.b THERMAL SENSOR CONFIGURATION SCREEN

Thermal Sensor Type

A drop-down menu allows the user to select the type of thermistor used in the vibrating wire instrument (Figure 42).

To display Fahrenheit units, check the *Fahrenheit temperature units* checkbox. This global setting applies to all thermistor sensors.

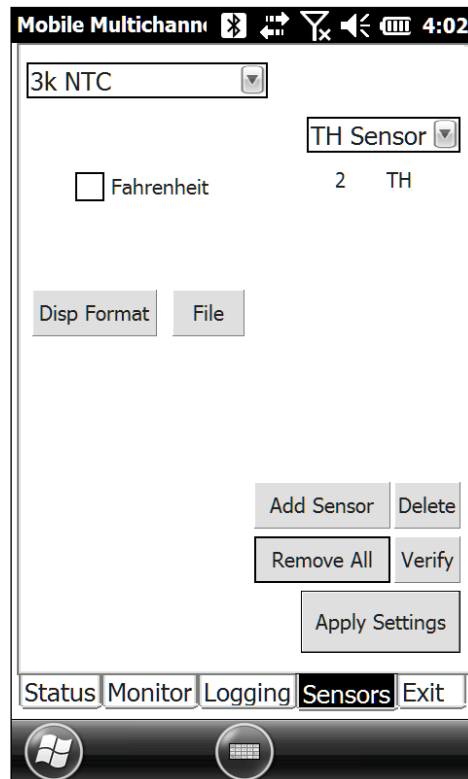


Figure 42: Temperature Sensors Tab

Apply

As a reminder, whenever **ANY** changes are made under the Sensors tab, the *Apply* button must be pressed in order to update the logger with the current sensor settings.

Note

Before sensor settings upload, the program will give a choice to keep or erase the data currently contained in the datalogger. If the datalogger memory is not erased, the next time the data is collected, it will download the current readings and all of the previous data to a *.csv file. Current sensor calibration settings will be applied to calculate engineering values from all recorded data.

5.3 TILT LOGGER (IC6560, IC6660, DTL201B AND DTL202B)

5.3.1 STATUS

The status tab contains three main components: *Logger*, *Sampling*, *Battery* and *Mode* (Figure 43).

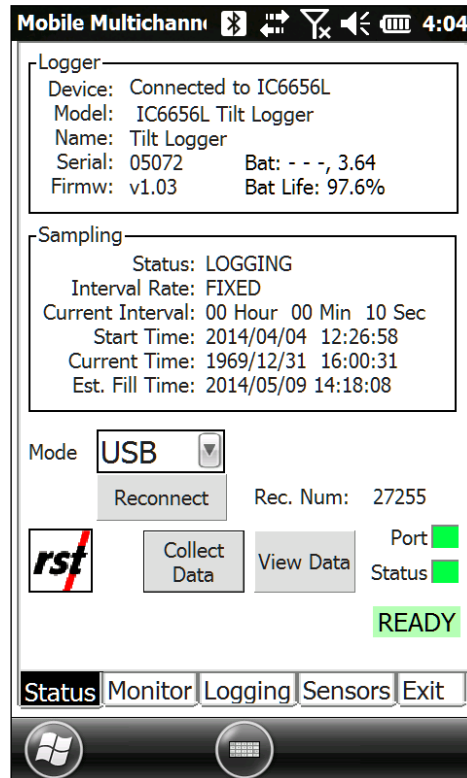


Figure 43: Tilt Status Tab

Logger

Provides information about the currently connected datalogger. This includes the model, name, serial number, and firmware version. Ensure that the serial number matches what is expected (in this example it is 05072). If it does not, ensure that a connection with the logger has been established.

Sampling

Provides information about the status of the logger. This includes whether or not it is logging, the log interval, and various time parameters.

Battery

Displays the past battery voltage recorded when sample was taken, current battery voltage and the estimated battery life. To ensure uninterrupted operation, replace batteries when estimated battery life is getting low.

Note

Battery past value depends on recorded data availability and firmware version installed.

Refer to Section 9.4 for Tilt Logger battery replacement instructions. The Tilt Logger uses special long-life lithium battery; contact RST for replacement part.

Mode

The RST DT Logger Host software connects to either the RST USB Dataloggers or RST RS232 Datalogger. Select the device you wish to access and press *Connect* button.

Collect Data

If the datalogger has already been configured to collect data at a specified interval, the *Collect Data* button can be pressed. The program will download the data (a progress bar will be displayed) and automatically write it to a *.csv file in the

My Documents\Multichannel directory. Please see section 7 for the *.csv file format.

Note

When pressing the *Collect Data* button, after the data download completes, the program will give a choice to keep or erase the data currently contained in the datalogger. If the datalogger memory is not erased, the next time the data is collected (and no parameters have been changed) it will download the current readings and all of the previous data to a *.csv file.

The current memory can also be erased by pressing the **Apply Settings** in the *Logging tab* or **Apply in Sensors tab**. The program will prompt you to confirm the erasing of data from its memory.

RST Logo

Press the *RST Logo* button to display DT Logger Host version and copyright information.

5.3.2 VIEW DATA

After the data is downloaded from datalogger memory, the contents of the data file can be viewed by pressing *View Data* button. The File Listing Screen is then presented (Figure 44). For each selected datafile, the status of the datalogger is shown at the bottom of the screen. This status is recorded in each datafile at the time of data download.

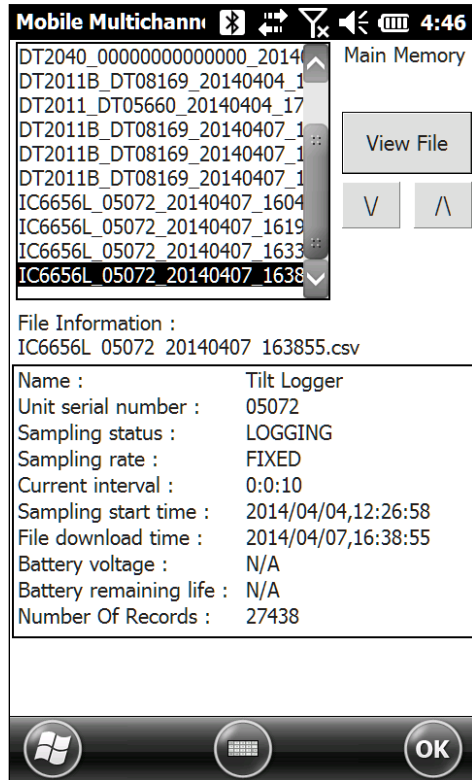


Figure 44: Tilt File Listing Screen

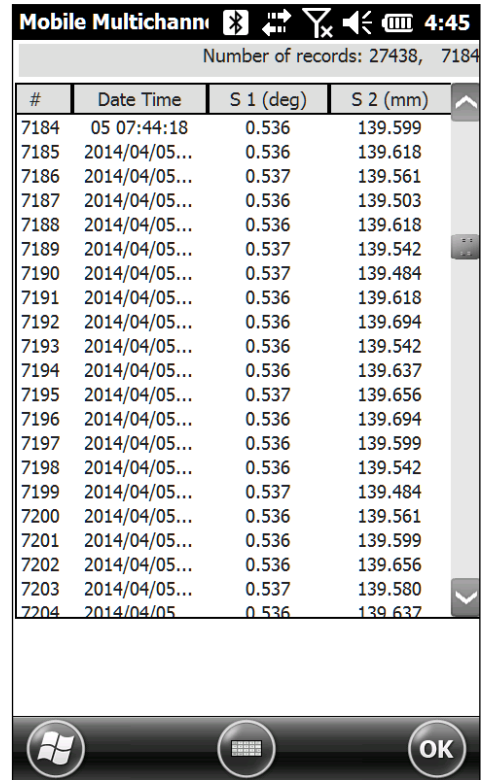


Figure 45: Tilt File View Screen

By selecting desired filename and pressing *View File*, the contents of the data file are displayed in the table. The status bar at the top of the screen shows the total number of recordings and the current line number. The sample screen is shown on Figure 45.

Note

Data View displays major datalogger settings and all saved data records. Use text file viewer or spread sheet program (ex. MS Excel™) to see the entire file.

5.3.3 MONITOR

Selecting the monitor tab sets the datalogger into monitor mode (Figure 46). By default, the screen reports the sine of the detected inclination.

If successfully connected to the datalogger, the sensor reading is updated approximately once per two seconds. Green indicator flashes each time a sensor data is updated. Dot indicator flashes each time a sensor data is updated. Clicking the check boxes changes the display to Engineering Units.

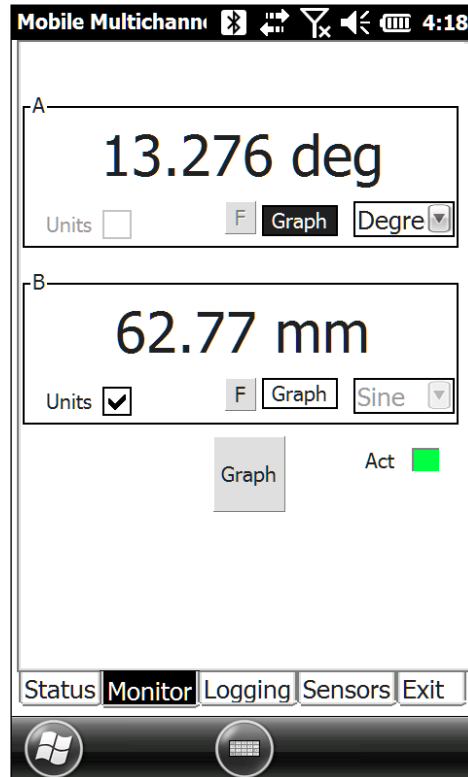


Figure 46: Tilt Monitor Tab

Display Format

Click on **F** button to customize monitor display settings. Option is given to alter precision or switch to scientific display.

Note

Engineering Units are only available when sensor calibration data and conversion method is set in Sensors page. Please see section 5.3.6 for the instructions on entering calibration data.

Until communication is established with the datalogger, the program will display "----" in Sensor Reading fields.

When Sensor Reading is outside of the valid range, "RANGE_ERR" will be displayed.

5.3.4 GRAPH

The graph button invokes the datalogger graphical monitor for selected sensor (Figure 47). Recent monitor readings are displayed then in a Sensor Reading vs. Time graph. If successfully connected, the graphical monitor is updated approximately once every two seconds. Initially, the graphical screen needs few seconds to auto calculate axis ranges.

The real time sensor reading is displayed below the graph window. Manual “Scale” slider bar is provided for fine tuning of graph vertical scale.

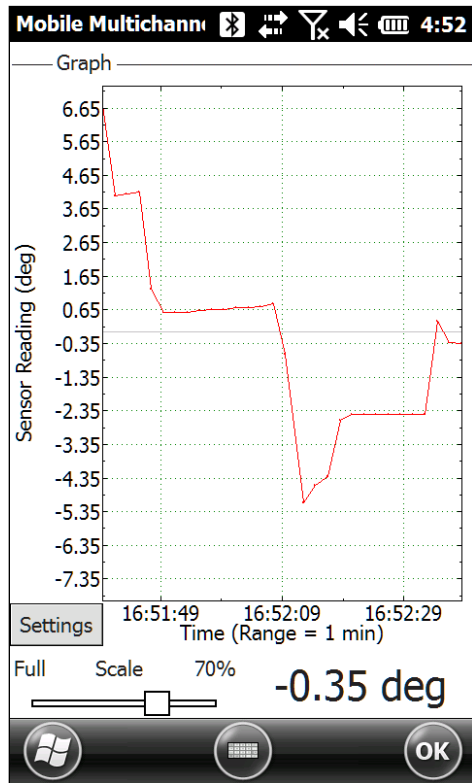


Figure 47: Tilt Graph Tab

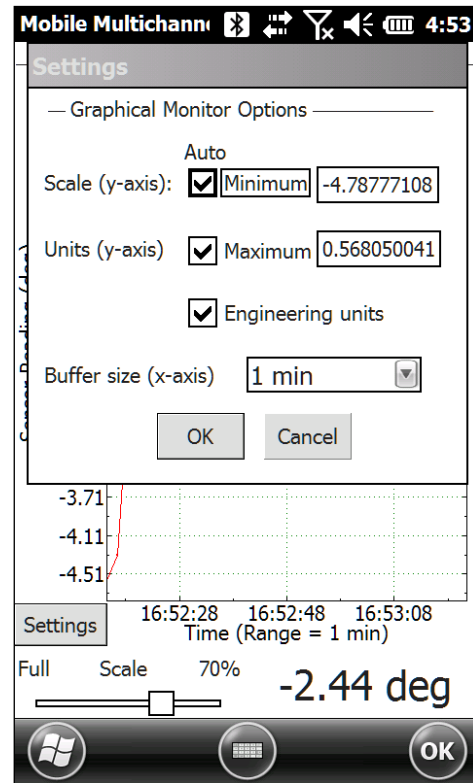


Figure 48: Tilt Graphical Monitor Options

Note

The Graph screen will be refreshed when engineering units are changed or relevant settings are changed.

Until communication is established with the datalogger, the program will display "----" in sensor reading area.

When Sensor Reading is outside of the valid range, "RANGE_ERR" will be displayed.

The "Scale" slider is disabled when manual scale settings are used in Graphical Monitor Options.

The "Settings" button launches the Graphical Monitor Options dialog (Figure 48), which allows the user to manipulate the graph. Options include the ability to display Engineering Units, set minimum and maximum Sensor Reading ranges (y-axis), and set the time range of

monitor data points displayed (x-axis, range between 1 minute and 2 hours). To manually adjust the minimum and maximum Sensor Reading ranges (y-axis), the “Auto” checkboxes need to be cleared.

5.3.5 LOGGING

The Logging tab contains three main components: *Interval*, *Logger Options* and *Clock Options* (Figure 49).

The screenshot displays the 'Mobile Multichannel' application interface for the 'Logging' tab. At the top, the status bar shows 'Mobile Multichannel' and various system icons. The main content area is divided into sections: 'Interval' with spinners for Hour (0), Min (0), and Sec (10); 'Logger Options' with a 'Start Time' spinner (Hour 12, Min 26) and radio buttons for 'Wrap on Mem Full' (selected) and 'Stop on Mem Full'; 'Clock Options' showing 'Logger Time: 2014/04/07 16:41:49' and a 'Sync to Computer Time' checkbox; and a 'Logger Label' field containing 'Tilt Logger' with an 'Update Label' button. Below these are 'Options' and 'Adv Settings' buttons, and an 'Apply Settings' button. The bottom of the screen features a tab bar with 'Status', 'Monitor', 'Logging' (active), 'Sensors', and 'Exit', and a Windows-style taskbar at the very bottom.

Figure 49: Tilt Logging Tab

Logger Label

Custom label can be entered if desired. Press the *Update Label* button to change logger label.

Interval

This section is used to set the logging interval. *Fixed* interval and *Multi* interval options are available. The fixed logging interval can be invoked by choosing the “Fixed” radio button, and set within the main setup tab. Arrow buttons allow the user to scroll up or down pre-set values.

To setup the logger with multiple intervals, select the *Multi (Advanced)* radio button. Clicking the *Advanced* button launches the Multi Interval Table dialog (Figure 50), where up to 12 custom, multiple intervals can be applied.

	Hour	Min	Sec	Iteration	Fill Time (d)
1:	0	2	0	3000	4 04:00:00
2:	0	0	10	2000	0 05:33:20
3:	0	1	0	1500	1 01:00:00
4:	0	10	0	500	3 11:20:00
5:	0	30	0	0	3266 16:00:00
6:	0	0	0	0	
7:	0	0	0	0	
8:	0	0	0	0	
9:	0	0	0	0	
Totals:				7000	3275 13:53:20

Save Cancel Update

Figure 50: Tilt Multi Interval Table

The hour, minute, second and number of iterations per interval must be specified.

Note

Each interval **MUST** have an iteration except the last iteration which must be set to zero. This tells the program that the logger will continue at the last iteration rate.

The memory capacity depends on logger hardware. Multichannel logger data recording capability ranges from up to 303,030 records with 2 sensors connected and 106,470 records in 10 sensor configuration. Single Channel Loggers can hold up to a maximum of 32,000 iterations for all intervals. The dialog features an Interval Fill Time field, which allows the user to see the exact time, relative to the start time of the interval, the interval iterations will finish. To update both the *Interval Fill Time* and *Total Iterations field*, click the “Update” button. To save changes, click the “Save” button.

Logger Options

Start Time: A check box can be selected to enable a custom start time. The hour and minute can be entered in 24-hour format.

Note

If a custom start time is entered and this time has already past, the logger will not start until 24 hours has passed. For example: If the current time is 13:01 and the start time is set to 13:00, the datalogger will not start logging data until 13:00 *the next day*.

If a custom start time is applied, i.e. for some time in the future, the *Status* will read *Log Pending* until that interval is reached.

Wrap on Mem Full (Overwrite Data): When the datalogger memory becomes full, it will overwrite itself.

Stop on Mem Full: Datalogger stops collecting data when it reaches its memory storage limit.

Clock Options

Allows the user to set the date and time of the datalogger. Checking the *Auto Sync Time* checkbox will update datalogger internal clock each time *Apply Settings* button is pressed.

Options

The *Options* button displays pull down menu with *Logger* and *RSTAR* entries.

Logger:

Allows changing several advanced settings, the exact view depends on the type of the connected datalogger.

RSTAR:

RSTAR Array Radio Series system configuration settings. For further information on RSTAR settings, see Section 8.

Apply Settings Button

After any changes have been made on the datalogger *Log* screen, pressing the *Apply Settings* button saves these changes and uploads them to the datalogger's memory (Figure 51).

Note
During logging settings upload, all existing logger data will be erased. Ensure to download data prior to changing logging settings. Sensor configuration will not be affected.

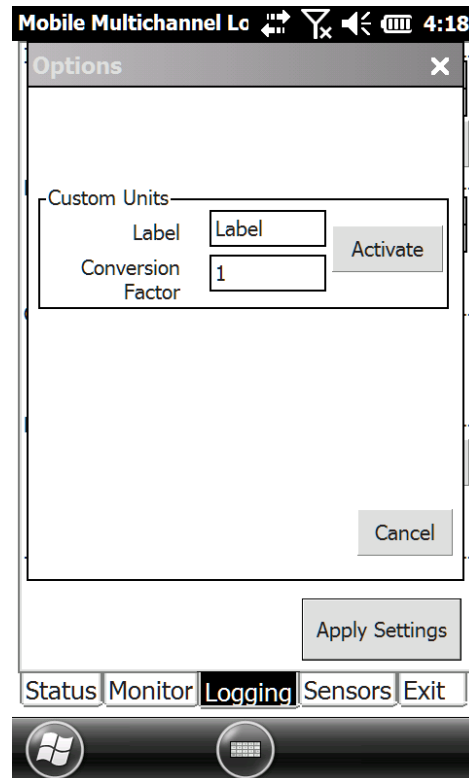


Figure 51: Tilt Options

Custom Units

The option is given to display and record sensor readings in engineering units other than predefined on Sensor tab. Enter desired label and conversion factor to add custom units. Then apply settings and use your custom units in Sensor configuration tab. Custom Units option might not be available for some firmware versions. Check RST website for most up to date firmware version.

Advanced Settings

The DT Logger Host software includes special features for advanced troubleshooting and data retrieval. They are to be used with assistance of RST Instruments technical staff in case of corrupted data.

5.3.6 SENSORS

Often the user may wish to report the readings directly in engineering units, rather than sin(angle). This can be changed on the Tilt Sensors Tab (Figure 52)

Figure 52: Tilt Sensors Tab

Conversion Method

The user is given an option to apply *Linear* Conversion. Input the provided Calibration Factor and Zero Reading into the appropriate boxes.

Units Conversion

Units Type: Currently only distance conversion is available.

Input Units: Currently set to sin(angle).

Output Units: Select the appropriate output units from the drop-down list. The conversion will be done automatically resulting in desired units displayed in Monitor tab and recorded in downloaded file data.

Output Offset: This is a user defined offset value.

File

This button will activate sensor configuration file menu.

Select *Save to File* for later retrieval.

Select *Load from File* to load previously saved sensor settings.

Display Format

This is used to customize monitor display settings. The option is given to alter the precision or switch to scientific display (Figure 53).

Copy to (Biaxial loggers only)

When adding subsequent sensors with identical parameters, click Copy to A or Copy to B.

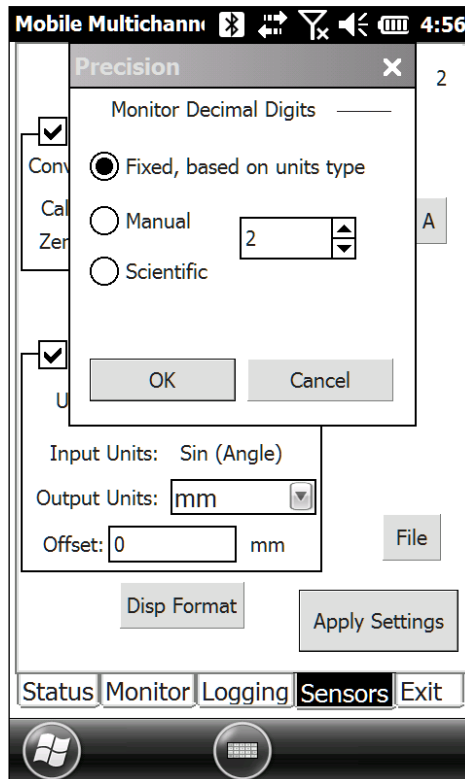


Figure 53: Display Format for Tilt Sensor

Apply

As a reminder, whenever **ANY** changes are made under the Sensors tab, the *Apply* button must be pressed in order to update the logger with the current sensor settings.

Note

Before sensor settings upload, the program will give a choice to keep or erase the data currently contained in the datalogger. If the datalogger memory is not erased, the next time the data is collected, it will download the current readings and all of the previous data to a *.csv file. Current sensor calibration settings will be applied to calculate engineering values from all recorded data.

5.4 DT-BUS LOGGER (DT2485)

5.4.1 STATUS

The status tab contains three main components: *Logger*, *Sampling*, *Battery* and *Mode* (Figure 54).

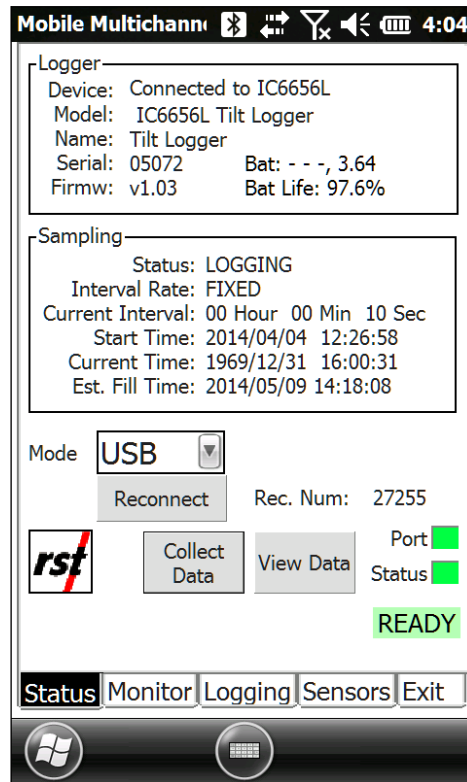


Figure 54: DT-BUS Status Tab

Logger

Provides information about the currently connected datalogger. This includes the model, name, serial number, and firmware version. Ensure that the serial number matches what is expected (in this example it is 05072). If it does not, ensure that a connection with the logger has been established.

Sampling

Provides information about the status of the logger. This includes whether or not it is logging, the log interval, and various time parameters.

Battery

Displays the past battery voltage recorded when sample was taken, current battery voltage and the estimated battery life. To ensure uninterrupted operation, replace batteries when estimated battery life is getting low.

Note

Battery past value depends on recorded data availability and firmware version installed

Refer to Section 9.4 for battery replacement instructions. The DT-BUS Logger uses special long-life lithium battery; contact RST for replacement part.

Mode

The RST DT Logger Host software connects to either the RST USB Dataloggers or RST RS232 Datalogger. Select the device you wish to access and press *Connect* button.

Collect Data

If the datalogger has already been configured to collect data at a specified interval, the *Collect Data* button can be pressed. The program will download the data (a progress bar will be displayed) and automatically write it to a *.csv file in the **My Documents\Multichannel** directory. Please see section 7 for the *.csv file format.

Note

When pressing the *Collect Data* button, after the data download completes, the program will give a choice to keep or erase the data currently contained in the datalogger. If the datalogger memory is not erased, the next time the data is collected (and no parameters have been changed) it will download the current readings and all of the previous data to a *.csv file.

The current memory can also be erased by pressing the **Apply Settings** in the *Logging tab* or **Apply in Sensors tab**. The program will prompt you to confirm the erasing of data from its memory.

RST Logo

Press the *RST Logo* button to display DT Logger Host version and copyright information.

5.4.2 VIEW DATA

After the data is downloaded from datalogger memory, the contents of the data file can be viewed by pressing *View Data* button. The File Listing Screen is then presented (Figure 55). For each selected datafile, the status of the datalogger is shown at the bottom of the screen. This status is recorded in each datafile at the time of data download.

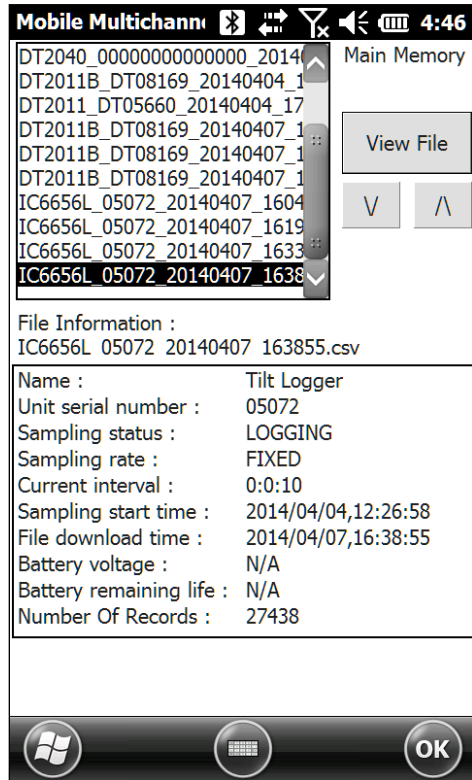


Figure 55: DT-BUS File Listing Screen

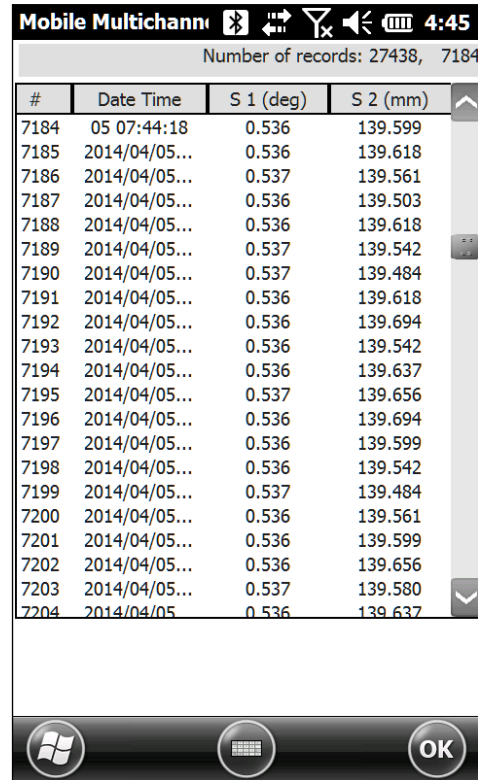


Figure 56: DT-BUS File View Screen

By selecting desired filename and pressing *View File*, the contents of the data file are displayed in the table. The status bar at the top of the screen shows the total number of recordings and the current line number. The sample screen is shown on Figure 56.

Note

Data View displays major datalogger settings and all saved data records. Use text file viewer or spread sheet program (ex. MS Excel™) to see the entire file.

5.4.3 MONITOR

Selecting the monitor tab sets the datalogger into monitor mode (Figure 57). By default, the screen reports the sine of the detected inclination.

If successfully connected to the datalogger, the sensor reading is updated approximately once per two seconds. Green indicator flashes each time a sensor data is updated. Dot indicator flashes each time a sensor data is updated. Clicking the check boxes changes the display to Engineering Units.

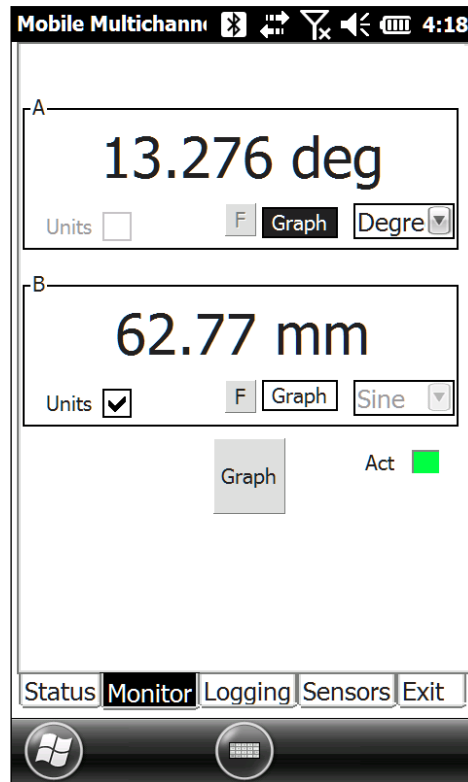


Figure 57: DT-BUS Monitor Tab

Display Format

Click on **F** button to customize monitor display settings. Option is given to alter precision or switch to scientific display.

Note

Engineering Units are only available when sensor calibration data and conversion method is set in Sensors page. Please see section 5.3.6 for the instructions on entering calibration data.

Until communication is established with the datalogger, the program will display "----" in Sensor Reading fields.

When Sensor Reading is outside of the valid range, "RANGE_ERR" will be displayed.

5.4.4 GRAPH

The graph button invokes the datalogger graphical monitor for selected sensor (Figure 58). Recent monitor readings are displayed then in a Sensor Reading vs. Time graph. If successfully connected, the graphical monitor is updated approximately once every two seconds. Initially, the graphical screen needs few seconds to auto calculate axis ranges.

The real time sensor reading is displayed below the graph window. Manual "Scale" slider bar is provided for fine tuning of graph vertical scale.

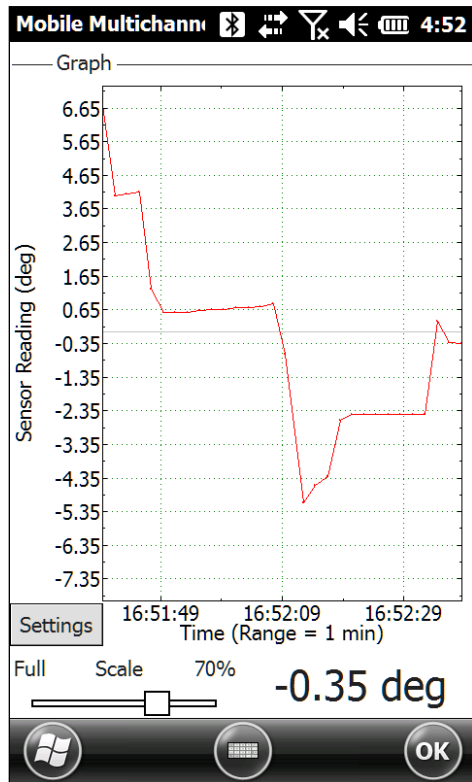


Figure 58: DT-BUS Graph Tab

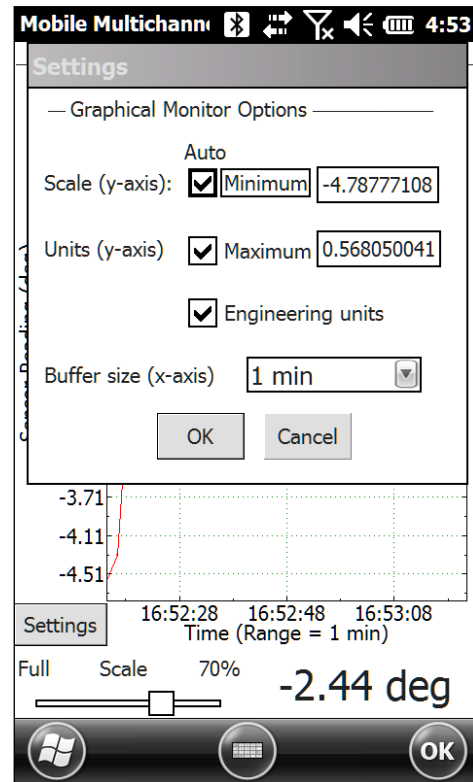


Figure 59: DT-BUS Graphical Monitor Options

Note

The Graph screen will be refreshed when engineering units are changed or relevant settings are changed.

Until communication is established with the datalogger, the program will display "----" in sensor reading area.

When Sensor Reading is outside of the valid range, "RANGE_ERR" will be displayed.

The "Scale" slider is disabled when manual scale settings are used in Graphical Monitor Options.

The "Settings" button launches the Graphical Monitor Options dialog (Figure 59), which allows the user to manipulate the graph. Options include the ability to display Engineering Units, set minimum and maximum Sensor Reading ranges (y-axis), and set the time range of monitor data points displayed (x-axis, range between 1 minute and 2 hours). To manually adjust the minimum and maximum Sensor Reading ranges (y-axis), the "Auto" checkboxes need to be cleared.

5.4.5 LOGGING

The Logging tab contains three main components: *Interval*, *Logger Options* and *Clock Options* (Figure 60).

Mobile Multichannel 4:54

Interval

Hour 0 Min 0 Sec 10

☒ Fixed ☐ Multi (Advanced) **Advanced**

Logger Options

☐ Start Time: Hour 12 Min 26

☒ Wrap on Mem Full ☐ Stop on Mem Full

Clock Options

Logger 2014/04/07 Time: 16:41:49 ☐ Sync to Computer Time

Logger Label

Tilt Logger **Update Label**

Options **Adv Settings**

Apply Settings

Status **Monitor** **Logging** **Sensors** **Exit**

Figure 60: DT-BUS Logging Tab

Logger Label

Custom label can be entered if desired. Press the *Update Label* button to change logger label.

Interval

This section is used to set the logging interval. *Fixed interval* and *Multi interval* options are available. The fixed logging interval can be invoked by choosing the “Fixed” radio button, and set within the main setup tab. Arrow buttons allow the user to scroll up or down pre-set values.

To setup the logger with multiple intervals, select the *Multi (Advanced)* radio button. Clicking the *Advanced* button launches the Multi Interval Table dialog (Figure 61), where up to 12 custom, multiple intervals can be applied.

Mobile Multichannel [Bluetooth] [Wi-Fi] [Signal] [Battery] 3:50

Multi Interval Table

	Hour	Min	Sec	Iteration	Fill Time (d)
1:	0	2	0	3000	4 04:00:00
2:	0	0	10	2000	0 05:33:20
3:	0	1	0	1500	1 01:00:00
4:	0	10	0	500	3 11:20:00
5:	0	30	0	0	3266 16:00:00
6:	0	0	0	0	
7:	0	0	0	0	
8:	0	0	0	0	
9:	0	0	0	0	
Totals:				7000	3275 13:53:20

Save Cancel Update

Windows Keypad OK

Figure 61: DT-BUS Multi Interval Table

The hour, minute, second and number of iterations per interval must be specified.

Note

Each interval **MUST** have an iteration except the last iteration which must be set to zero. This tells the program that the logger will continue at the last iteration rate.

The memory capacity depends on logger hardware. Multichannel logger data recording capability ranges from up to 303,030 records with 2 sensors connected and 106,470 records in 10 sensor configuration. Single Channel Loggers can hold up to a maximum of 32,000 iterations for all intervals. The dialog features an Interval Fill Time field, which allows the user to see the exact time, relative to the start time of the interval, the interval iterations will finish. To update both the *Interval Fill Time* and *Total Iterations field*, click the "Update" button. To save changes, click the "Save" button.

Logger Options

Start Time: A check box can be selected to enable a custom start time. The hour and minute can be entered in 24-hour format.

Note

If a custom start time is entered and this time has already past, the logger will not start until 24 hours has passed. For example: If the current time is 13:01 and the start time is set to 13:00, the datalogger will not start logging data until 13:00 *the next day*.

If a custom start time is applied, i.e. for some time in the future, the *Status* will read *Log Pending* until that interval is reached.

Wrap on Mem Full (Overwrite Data): When the datalogger memory becomes full, it will overwrite itself.

Stop on Mem Full: Datalogger stops collecting data when it reaches its memory storage limit.

Clock Options

Allows the user to set the date and time of the datalogger. Checking the *Auto Sync Time* checkbox will update datalogger internal clock each time *Apply Settings* button is pressed.

Options

The *Options* button displays pull down menu with *Logger* and *RSTAR* entries.

Logger:

Allows changing several advanced settings, the exact view depends on the type of the connected datalogger.

RSTAR:

RSTAR Array Radio Series system configuration settings. For further information on RSTAR settings, see Section 8.

Apply Settings Button

After any changes have been made on the datalogger *Log* screen (Figure 62), pressing the *Apply Settings* button saves these changes and uploads them to the datalogger's memory.

<p>Note</p> <p>During logging settings upload, all existing logger data will be erased. Ensure to download data prior to changing logging settings. Sensor configuration will not be affected.</p>

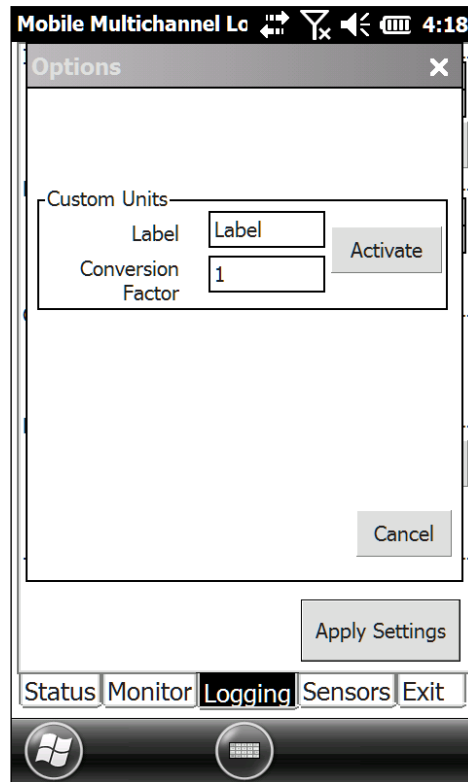


Figure 62: DT-BUS Options

Custom Units

The option is given to display and record sensor readings in engineering units other than predefined on Sensor tab. Enter desired label and conversion factor to add custom units. Then apply settings and use your custom units in Sensor configuration tab. Custom Units option might not be available for some firmware versions. Check RST website for most up to date firmware version.

Advanced Settings

The DT Logger Host software includes special features for advanced troubleshooting and data retrieval. They are to be used with assistance of RST Instruments technical staff in case of corrupted data.

5.4.6 SENSORS

Often the user may wish to report the readings directly in engineering units, rather than sin(angle). This can be changed on the Sensors Tab (Figure 63).

The screenshot displays the 'Sensors' tab of the 'Mobile Multichannel' application. At the top, the status bar shows 'Mobile Multichannel' and various system icons. The main content area is divided into sections for 'Tilt', 'Conversion', and 'Units'. The 'Tilt' section shows '15 degrees' and a dropdown menu set to 'Tilt 2'. The 'Conversion' section has a checked 'Eng' checkbox, a 'Cal Factor' of 10, and a 'Zero Read' of 0. The 'Units' section has a checked 'Units' checkbox, 'Units Type' set to 'Distance', 'Input Units' set to 'Sin (Angle)', 'Output Units' set to 'mm', and an 'Offset' of 0. Buttons for 'Copy to A', 'File', 'Disp Format', and 'Apply Settings' are present. The bottom navigation bar includes 'Status', 'Monitor', 'Logging', 'Sensors' (highlighted), and 'Exit'.

Figure 63: DT-BUS Sensors Tab

Conversion Method

The user is given an option to apply *Linear* Conversion. Input the provided Calibration Factor and Zero Reading into the appropriate boxes.

Units Conversion

Units Type: Currently only distance conversion is available.

Input Units: Currently set to sin(angle).

Output Units: Select the appropriate output units from the drop-down list. The conversion will be done automatically resulting in desired units displayed in Monitor tab and recorded in downloaded file data.

Output Offset: This is a user defined offset value.

File

This button will activate sensor configuration file menu.

Select *Save to File* for later retrieval.

Select *Load from File* to load previously saved sensor settings.

Display Format

This allows the user to customize monitor display settings (Figure 64). The option is given to alter the precision or switch to scientific display.

Copy to (Biaxial loggers only)

When adding subsequent sensors with identical parameters, click Copy to A or Copy to B.

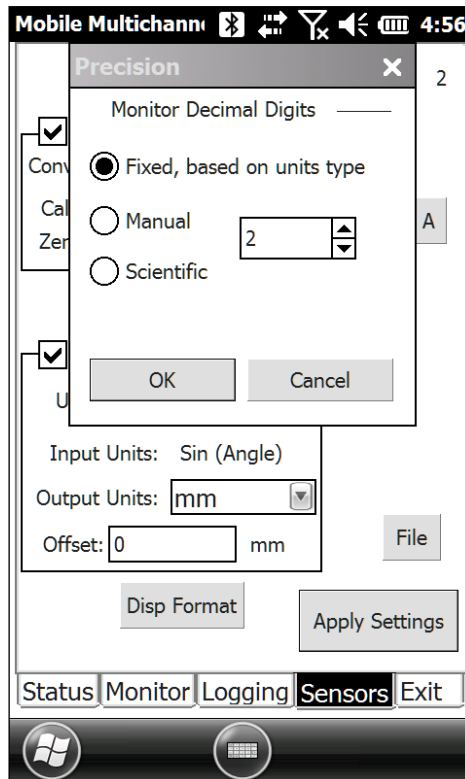


Figure 64: Display Format for DT-BUS Sensor

Apply

As a reminder, whenever **ANY** changes are made under the Sensors tab, the *Apply* button must be pressed in order to update the logger with the current sensor settings.

Note

Before sensor settings upload, the program will give a choice to keep or erase the data currently contained in the datalogger. If the datalogger memory is not erased, the next time the data is collected, it will download the current readings and all of the previous data to a *.csv file. Current sensor calibration settings will be applied to calculate engineering values from all recorded data.

5.5 STRAIN GAUGE LOGGER (DT2350)

5.5.1 STATUS

The status tab contains three main components: *Logger*, *Sampling*, *Battery* and *Mode* (Figure 65).

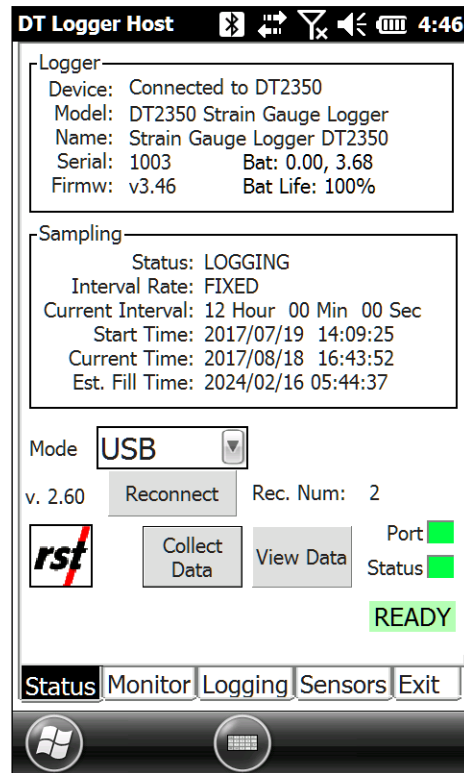


Figure 65: Strain Gauge Logger Status Tab

Logger

Provides information about the currently connected datalogger. This includes the model, name, serial number, and firmware version. Ensure that the serial number matches what is expected (in this example it is 1003). If it does not, ensure that a connection with the logger has been established.

Sampling

Provides information about the status of the logger. This includes whether or not it is logging, the log interval, and various time parameters.

Battery

Displays the past battery voltage recorded when sample was taken, current battery voltage and the estimated battery life. To ensure uninterrupted operation, replace batteries when estimated battery life is getting low.

Note

Battery past value depends on recorded data availability and firmware version installed.

Refer to Section 9.4 for Strain Gauge Logger battery replacement instructions. Strain Gauge Loggers use special long-life lithium battery; contact RST for replacement part.

Mode

The RST DT Logger Host software connects to either the RST USB Dataloggers or RST RS232 Datalogger. Select the device you wish to access and press *Connect* button.

Collect Data

If the datalogger has already been configured to collect data at a specified interval, the *Collect Data* button can be pressed. The program will download the data (a progress bar will be displayed) and automatically write it to a *.csv file in the **My Documents\Multichannel** directory. Please see Section 7 for the *.csv file format.

Note

When pressing the *Collect Data* button, after the data download completes, the program will give a choice to keep or erase the data currently contained in the datalogger. If the datalogger memory is not erased, the next time the data is collected (and no parameters have been changed) it will download the current readings and all of the previous data to a *.csv file.

The current memory can also be erased by pressing the ***Apply Settings*** in the *Logging tab* or ***Apply in Sensors tab***. The program will prompt you to confirm the erasing of data from its memory.

RST Logo

Press the *RST Logo* button to display DT Logger Host version and copyright information.

5.5.2 VIEW DATA

After the data is downloaded from datalogger memory, the contents of the data file can be viewed by pressing *View Data* button. The File Listing Screen is then presented (Figure 66). For each selected datafile, the status of the datalogger is shown at the bottom of the screen. This status is recorded in each datafile at the time of data download.

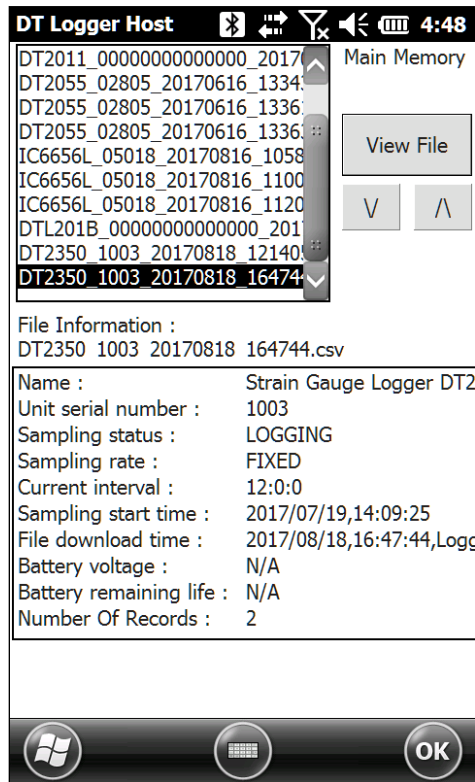


Figure 66: Strain Gauge Logger File Listing Screen

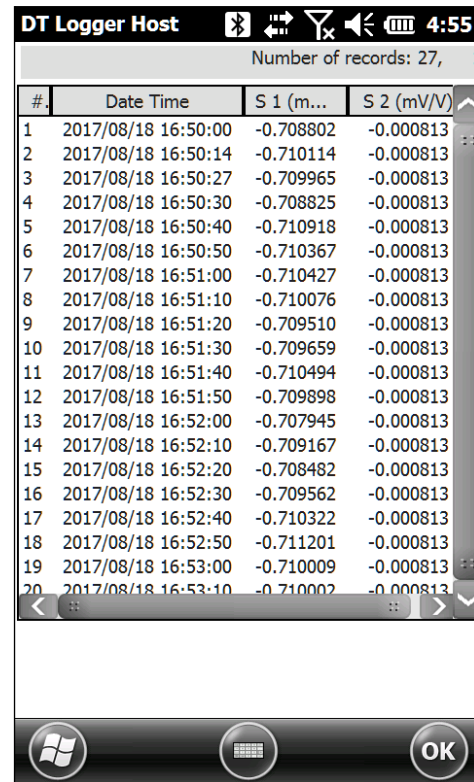


Figure 67: Strain Gauge Logger File View Screen

By selecting desired filename and pressing *View File*, the contents of the data file are displayed in the table. The status bar at the top of the screen shows the total number of recordings and the current line number. The sample screen is shown in Figure 67.

Note

Data View displays major datalogger settings and all saved data records. Use text file viewer or spread sheet program (ex. MS Excel™) to see the entire file.

5.5.3 MONITOR

Selecting the monitor tab sets the datalogger into monitor mode (Figure 68). By default, the screen reports the sine of the detected inclination.

If successfully connected to the datalogger, the sensor reading is updated approximately once per two seconds. Green indicator flashes each time a sensor data is updated. Dot indicator flashes each time a sensor data is updated. Clicking the check boxes changes the display to Engineering Units.

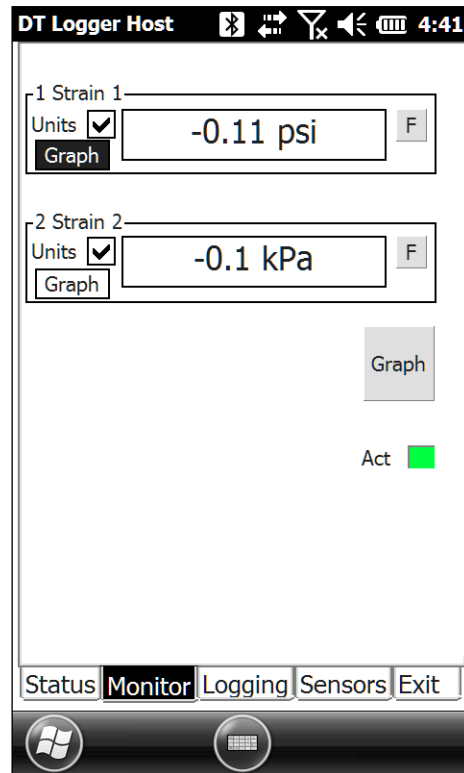


Figure 68: Strain Gauge Logger Monitor Tab

Display Format

Click on **F** button to customize monitor display settings. Option is given to alter precision or switch to scientific display.

Note

Engineering Units are only available when sensor calibration data and conversion method is set in Sensors page. Please see section 5.3.6 for the instructions on entering calibration data.

Until communication is established with the datalogger, the program will display "----" in Sensor Reading fields.

When Sensor Reading is outside of the valid range, "RANGE_ERR" will be displayed.

5.5.4 GRAPH

The graph button invokes the datalogger graphical monitor for selected sensor (Figure 69). Recent monitor readings are displayed then in a Sensor Reading vs. Time graph. If successfully connected, the graphical monitor is updated approximately once every two seconds. Initially, the graphical screen needs few seconds to auto calculate axis ranges.

The real time sensor reading is displayed below the graph window. Manual "Scale" slider bar is provided for fine tuning of graph vertical scale.

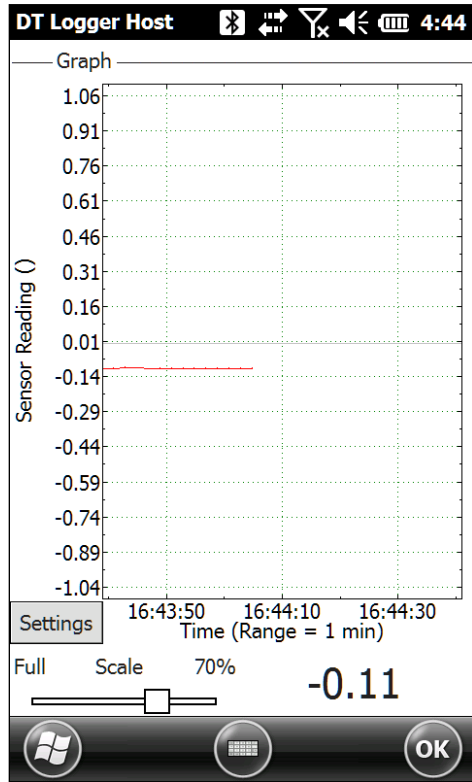


Figure 69: Strain Gauge Logger Graph Tab

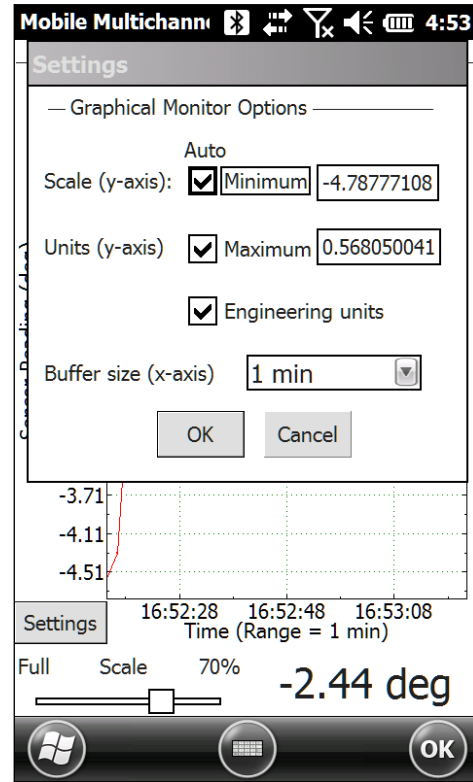


Figure 70: Strain Gauge Logger Graphical Monitor Options

Note

The Graph screen will be refreshed when engineering units are changed or relevant settings are changed.

Until communication is established with the datalogger, the program will display "----" in sensor reading area.

When Sensor Reading is outside of the valid range, "RANGE_ERR" will be displayed.

The "Scale" slider is disabled when manual scale settings are used in Graphical Monitor Options.

The "Settings" button launches the Graphical Monitor Options dialog (Figure 70), which allows the user to manipulate the graph. Options include the ability to display Engineering Units, set minimum and maximum Sensor Reading ranges (y-axis), and set the time range of monitor data points displayed (x-axis, range between 1 minute and 2 hours). To manually adjust the minimum and maximum Sensor Reading ranges (y-axis), the "Auto" checkboxes need to be cleared.

5.5.5 LOGGING

The Logging tab contains three main components: *Interval*, *Logger Options* and *Clock Options* (Figure 71).

The screenshot shows the 'DT Logger Host' application interface. At the top, there's a status bar with various icons and the time '4:49'. Below this, the 'Interval' section has three input fields: 'Hour' (0), 'Min' (0), and 'Sec' (10). There are two radio buttons: 'Fixed' (selected) and 'Multi (Advanced)'. An 'Advanced' button is next to the 'Multi (Advanced)' option. The 'Logger Options' section has two radio buttons: 'Sync To Interval' (selected) and 'Use Start Time'. Below these are two more radio buttons: 'Start Now' and 'Wrap on Mem Full' (selected). There are also two input fields for '14' and '9'. The 'Clock Options' section shows 'Logger 2017/08/18' and 'Time: 16:49:27'. There is a checkbox for 'Sync to Computer Time' which is checked. The 'Logger Label' section has a text field containing 'Strain Gauge Logger DT23' and an 'Update Label' button. Below this are two buttons: 'Options' and 'Adv Settings'. At the bottom, there is a large grey button labeled 'Apply Settings'. The bottom navigation bar has five tabs: 'Status', 'Monitor', 'Logging' (highlighted), 'Sensors', and 'Exit'. Below the navigation bar are two circular icons: a Windows logo and a keyboard icon.

Figure 71: Strain Gauge Logger Logging Tab

Logger Label

Custom label can be entered if desired. Press the *Update Label* button to change logger label.

Interval

This section is used to set the logging interval. *Fixed* interval and *Multi* interval options are available. The fixed logging interval can be invoked by choosing the “Fixed” radio button, and set within the main setup tab. Arrow buttons allow the user to scroll up or down pre-set values.

To setup the logger with multiple intervals, select the *Multi (Advanced)* radio button. Clicking the *Advanced* button launches the Multi Interval Table dialog (Figure 72), where up to 12 custom, multiple intervals can be applied.

Multi Interval Table					
	Hour	Min	Sec	Iteration	Fill Time (d)
1:	0	2	0	3000	4 04:00:00
2:	0	0	10	2000	0 05:33:20
3:	0	1	0	1500	1 01:00:00
4:	0	10	0	500	3 11:20:00
5:	0	30	0	0	3266 16:00:00
6:	0	0	0	0	
7:	0	0	0	0	
8:	0	0	0	0	
9:	0	0	0	0	
Totals:				7000	3275 13:53:20

Save Cancel Update

Figure 72: Strain Gauge Logger Multi Interval Table

The hour, minute, second and number of iterations per interval must be specified.

Note

Each interval **MUST** have an iteration except the last iteration which must be set to zero. This tells the program that the logger will continue at the last iteration rate.

The memory capacity depends on logger hardware. Multichannel logger data recording capability ranges from up to 303,030 records with 2 sensors connected and 106,470 records in 10 sensor configuration. Single Channel Loggers can hold up to a maximum of 32,000 iterations for all intervals. The dialog features an Interval Fill Time field, which allows the user to see the exact time, relative to the start time of the interval, the interval iterations will finish. To update both the *Interval Fill Time* and *Total Iterations field*, click the "Update" button. To save changes, click the "Save" button.

Logger Options

Start Time: A check box can be selected to enable a custom start time. The hour and minute can be entered in 24-hour format.

Note

If a custom start time is entered and this time has already past, the logger will not start until 24 hours has passed. For example: If the current time is 13:01 and the start time is set to 13:00, the datalogger will not start logging data until 13:00 *the next day*.

If a custom start time is applied, i.e. for some time in the future, the *Status* will read *Log Pending* until that interval is reached.

Wrap on Mem Full (Overwrite Data): When the datalogger memory becomes full, it will overwrite itself.

Stop on Mem Full: Datalogger stops collecting data when it reaches its memory storage limit.

Clock Options

Allows the user to set the date and time of the datalogger. Checking the *Auto Sync Time* checkbox will update datalogger internal clock each time *Apply Settings* button is pressed.

Options

The *Options* button displays pull down menu with *Logger* and *RSTAR* entries.

Logger:

Allows changing several advanced settings, the exact view depends on the type of the connected datalogger.

RSTAR:

RSTAR Array Radio Series system configuration settings. For further information on RSTAR settings, see Section 8.

Apply Settings Button

After any changes have been made on the datalogger *Log* screen (Figure 73), pressing the *Apply Settings* button saves these changes and uploads them to the datalogger's memory.

<p>Note</p> <p>During logging settings upload, all existing logger data will be erased. Ensure to download data prior to changing logging settings. Sensor configuration will not be affected.</p>

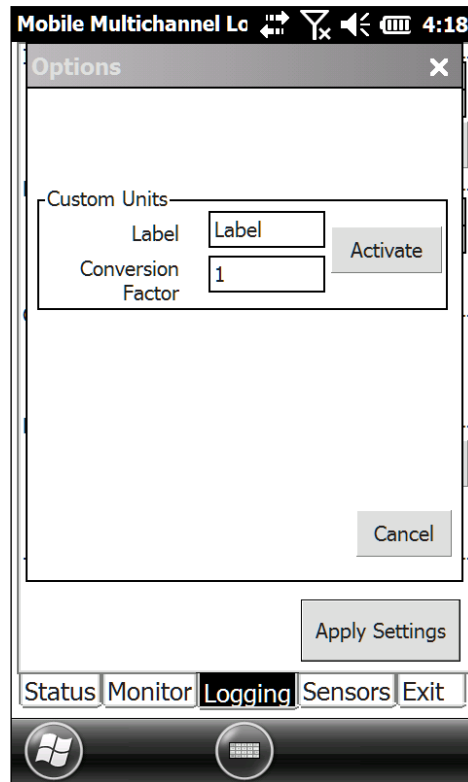


Figure 73: Strain Gauge Logger Options

Custom Units

The option is given to display and record sensor readings in engineering units other than predefined on Sensor tab. Enter desired label and conversion factor to add custom units. Then apply settings and use your custom units in Sensor configuration tab. Custom Units option might not be available for some firmware versions. Check RST website for most up to date firmware version.

Advanced Settings

The DT Logger Host software includes special features for advanced troubleshooting and data retrieval. They are to be used with assistance of RST Instruments technical staff in case of corrupted data.

5.5.6 SENSORS

Often the user may wish to report the readings directly in engineering units, rather than sin(angle). This can be changed on the Sensors Tab (Figure 74).

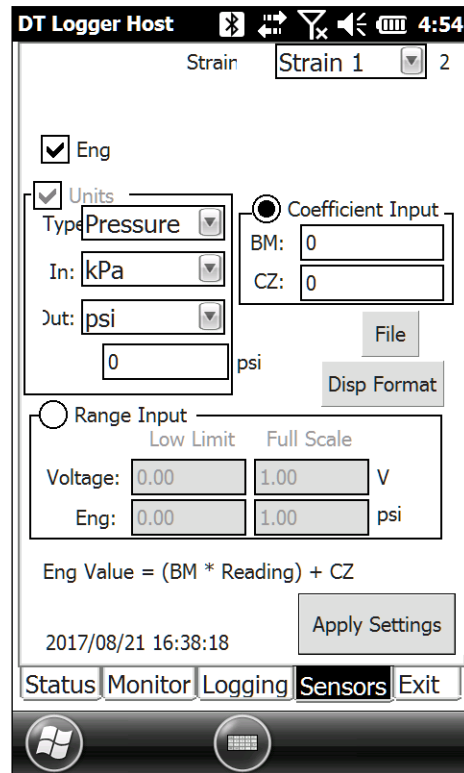


Figure 74: Strain Gauge Logger Sensors Tab

Conversion Method

Engineering values are calculated using linear conversion. Enter the Calibration Factor and Zero Reading into the appropriate boxes.

Alternatively, range input provides a way to automatically calculate coefficient parameters given range values.

Units Conversion

Units Type: Choose pressure, distance, force, strain or custom units using the drop-down menu.

Input Units: These are the units of the calibration constants you inputted into either the coefficient or range conversion methods.

Output Units: Select the appropriate output units from the drop-down list. The conversion will be done automatically resulting in desired units displayed in Monitor tab and recorded in downloaded file data.

Output Offset: This is a user defined offset value.

File

This button will activate sensor configuration file menu.

Select *Save to File* for later retrieval.

Select *Load from File* to load previously saved sensor settings.

Display Format

This allows the user to customize monitor display settings. The option is given to alter the precision or switch to scientific display (Figure 75).

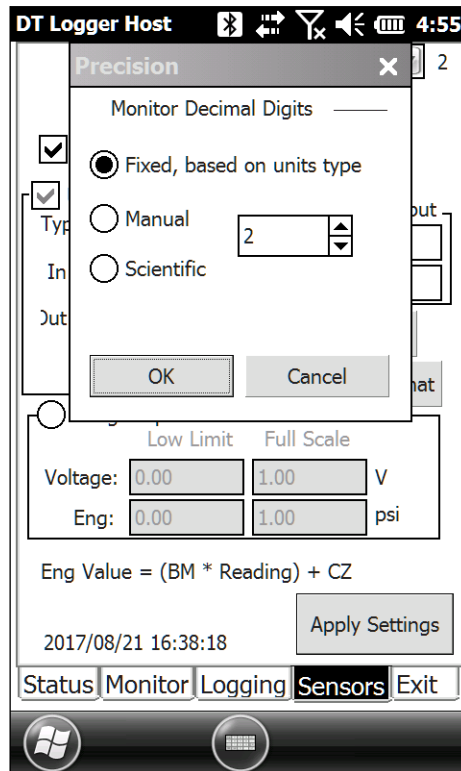


Figure 75: Display Format for Strain Gauge Logger Sensor

Apply

As a reminder, whenever **ANY** changes are made under the Sensors tab, the *Apply* button must be pressed in order to update the logger with the current sensor settings.

Note

Before sensor settings upload, the program will give a choice to keep or erase the data currently contained in the datalogger. If the datalogger memory is not erased, the next time the data is collected, it will download the current readings and all of the previous data to a *.csv file. Current sensor calibration settings will be applied to calculate engineering values from all recorded data.

5.6 EXIT

Pressing the *Exit* tab will close the DT Logger Host program.

6 DOWNLOADING DATA TO A DESKTOP PC

MS™ Windows 7, 8, 8.1, and Windows 10 requires installation of Mobile Device Center 6.1. It is highly recommended to download and install the newest updates from Microsoft website.

6.1 SETTING UP MOBILE DEVICE CENTER ON WINDOWS 7, 8, 8.1, 10

Before connecting to Ultra-Rugged Field PC², it should be verified that desktop PC or laptop contains current version of Microsoft Mobile Device Center™ (Figure 76). Communication between the two devices is achieved through an USB connection.

Note

Microsoft's Mobile Device Center™ software can be freely downloaded from Microsoft's website. Choose 32-bit or 64-bit version depending on Windows 7™ operating system.

After Mobile Device Center™ is installed, connect the Ultra-Rugged Field PC to desktop or laptop computer using USB cable provided with the DT Logger host System. Windows 7™ should detect new connection and display following dialog box.



Figure 76: Mobile Device Center Screen

In order to synchronize the data in real-time between the Ultra-Rugged Field PC² and the desktop PC, you must click on *Set up your device*. If you do not wish to synchronize data and simply use Windows Explorer to copy files to and from the Ultra-Rugged Field PC², click *Connect without setting up your device*. Data files can be copied from Ultra-Rugged Field PC² using File Management, as shown on Figure 77.



Figure 77: Accessing Files on Windows 7, 8, 8.1, 10

If synchronizing files, decide what type of information you would like synchronized with the desktop computer. If you are only using the Ultra-Rugged Field PC² for the purposes of transferring DT Logger Host information, uncheck all the options and place a check mark next to the *Files* (see Figure 78).

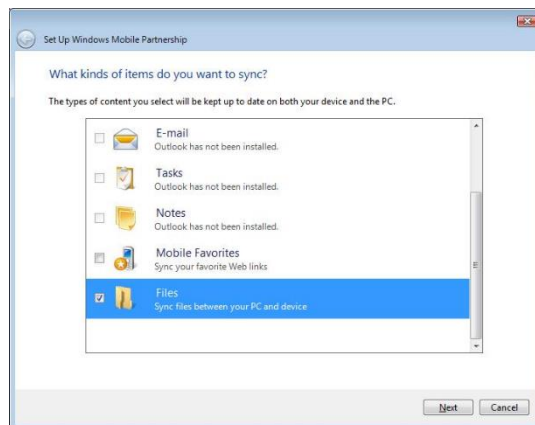


Figure 78: Synchronization Settings on Windows™ 7, 8, 8.1, 10

Important

It is extremely important that the user realizes that the synchronized folder created on the desktop is an **active** link to the Ultra-Rugged Field PC². Any changes you make in that folder will be reflected on the Ultra-Rugged Field PC². For example, if you delete a file in the folder, the same file will be deleted on the Ultra-Rugged Field PC². If the Ultra-Rugged Field PC² happens to be disconnected at the time, as soon as it is re-connected it will automatically see the missing file in the folder and the file will be deleted during the connection. It is therefore important to exercise good data management. Once the data is synchronized to the PC, move the inclinometer files to a safe location (i.e. a network server or hard drive).

For further instructions regarding synchronizing data between a PC and the Ultra-Rugged Field PC², please refer to the supplied documentation and software which comes with the Ultra-Rugged Field PC² (CD-ROM).

7 DATA FILES (*.CSV)

Whenever the *Collect Data* button is pressed under the *Status* tab, the software will collect all the current data stored in the memory of the datalogger. A progress bar will be displayed showing the status of this collection.

The software will automatically write the data to a *.csv file created in the **My Documents\Multichannel** directory.

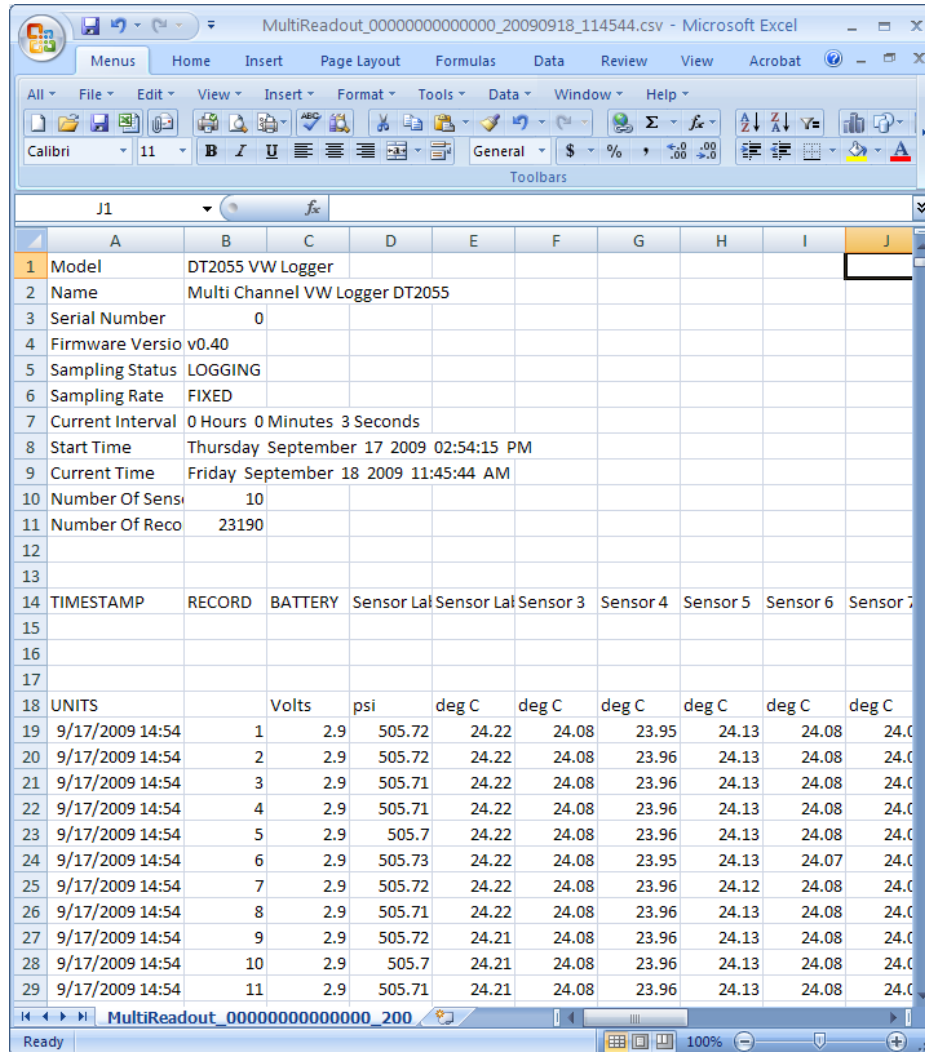
The *.csv file has the following format:

serialnumber_yymmdd_hhmmss.csv

This file can then be opened directly with Microsoft Excel™ or other spreadsheet programs. A new file will be created each time the data is collected. It is the user's responsibility to copy data into a single spreadsheet if desired.

7.1 VIBRATING WIRE LOGGER SAMPLE DATA FILE

Figure 79 shows how the data appears in Excel:



	A	B	C	D	E	F	G	H	I	J
1	Model	DT2055 VW Logger								
2	Name	Multi Channel VW Logger DT2055								
3	Serial Number	0								
4	Firmware Version	v0.40								
5	Sampling Status	LOGGING								
6	Sampling Rate	FIXED								
7	Current Interval	0 Hours 0 Minutes 3 Seconds								
8	Start Time	Thursday September 17 2009 02:54:15 PM								
9	Current Time	Friday September 18 2009 11:45:44 AM								
10	Number Of Sensors	10								
11	Number Of Records	23190								
12										
13										
14	TIMESTAMP	RECORD	BATTERY	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
15										
16										
17										
18	UNITS		Volts	psi	deg C	deg C	deg C	deg C	deg C	deg C
19	9/17/2009 14:54	1	2.9	505.72	24.22	24.08	23.95	24.13	24.08	24.08
20	9/17/2009 14:54	2	2.9	505.72	24.22	24.08	23.96	24.13	24.08	24.08
21	9/17/2009 14:54	3	2.9	505.71	24.22	24.08	23.96	24.13	24.08	24.08
22	9/17/2009 14:54	4	2.9	505.71	24.22	24.08	23.96	24.13	24.08	24.08
23	9/17/2009 14:54	5	2.9	505.7	24.22	24.08	23.96	24.13	24.08	24.08
24	9/17/2009 14:54	6	2.9	505.73	24.22	24.08	23.95	24.13	24.07	24.08
25	9/17/2009 14:54	7	2.9	505.72	24.22	24.08	23.96	24.12	24.08	24.08
26	9/17/2009 14:54	8	2.9	505.71	24.22	24.08	23.96	24.13	24.08	24.08
27	9/17/2009 14:54	9	2.9	505.72	24.21	24.08	23.96	24.13	24.08	24.08
28	9/17/2009 14:54	10	2.9	505.7	24.21	24.08	23.96	24.13	24.08	24.08
29	9/17/2009 14:54	11	2.9	505.71	24.21	24.08	23.96	24.13	24.08	24.08

Figure 79: Vibrating Wire Logger Sample Data File

Note

When sensor reading is outside of the valid range, the "99999" value will be recorded as the Eng Units and B Units data.

7.2 4 TO 20mA LOGGER SAMPLE DATA FILE

Figure 80 shows how the data appears in Excel:

DT4205_000000000000000_20141105.123123.csv - Microsoft Excel

FileHomeInsertPage LayoutFormulasDataReviewViewAdd-InsTeam

CutCopyFormat Painter

Clipboard

Calibri11

B

I

U

A

Font

Wrap Text

Alignment

General

Number

Conditional Formatting

Styles

Format as Table

Cell Styles

Insert

Delete

Format

Cells

AutoSum

Fill

Clear

Sort & Filter

Find & Select

B66C36

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
1	Model	DT4205 ELE0881B 420mA Multi Channel Logger																						
2	Name	MultiChannel 420mA Logger DT4205																						
3	Serial Number	0																						
4	Firmware Version	1 Software 1.39.9																						
5	Sampling Status	LOG PENDING																						
6	Sampling Rate	FIXED																						
7	Current Interval	0:00:20																						
8	Start Time	05/11/2014 12:54:34																						
9	Current Time	05/11/2014 12:31:23																						
10	Number Of Senc	6																						
11	Number Of Recor	110																						
12	Sensor Upload N	8 482022 8A00																						
13																								
14																								
15	TIMESTAMP	RECORD	BATTERY	420mA 1	Therm 1	420mA 2	Therm 2	420 Senc	TH Sensor	420mA 1	Therm 1	420mA 2	Therm 2	420 Senc	TH Sensor	LOGGER T	RESET	USB	RSTAR	STATUS				
16										Unit Type Disabled	Disabled	Pressure Disabled	Distance Disabled											
17										Input Unit Disabled	Disabled	kPa Disabled	mm Disabled											
18										Output Unit Disabled	Disabled	kPa Disabled	mm Disabled											
19										Offset Disabled	Disabled	0.00E+00	Disabled	0.00E+00	Disabled									
20										Lower Re Disabled	Disabled	0.00E+00	Disabled	0.00E+00	Disabled									
21										Upper Re Disabled	Disabled	1.00E+00	Disabled	1.00E+00	Disabled									
22										Lower En Disabled	Disabled	0.00E+00	Disabled	0.00E+00	Disabled									
23										Upper En Disabled	Disabled	1.00E+00	Disabled	1.00E+00	Disabled									
24										Linear M Disabled	Disabled	2.00E+00	Disabled	3.00E+00	Disabled									
25										Linear Z Disabled	Disabled	0.00E+00	Disabled	0.00E+00	Disabled									
26										Temp CF Disabled	Disabled	Disabled	Disabled	Disabled	Disabled									
27										Temp Int Disabled	Disabled	Disabled	Disabled	Disabled	Disabled									
28										Linked Ch Disabled	Disabled	Disabled	Disabled	Disabled	Disabled									
29										420mA	420mA	10K NTC	420mA	10K NTC	420mA	10K NTC								
30	UNITS->	Volts	mA	deg C	kPa	deg C	mm	deg C		mA	Ohms	mA	Ohms	mA	Ohms	deg C								
31	05/11/2014 12:54	1	2	4.028738	21.99	8.057	22.02	12.086	22.03	-4.02874	11413.29	-4.02874	11400.96	-4.02874	11391.72	22.3	0	1	0	11				
32	05/11/2014 12:54	2	2	4.028738	22.04	8.057	22.05	12.086	22.06	-4.02874	11390.18	-4.02874	11382.48	-4.02874	11377.87	22.3	0	1	0	11				
33	05/11/2014 12:55	3	2	4.028738	22.02	8.057	22.03	12.086	22.05	-4.02874	11399.42	-4.02874	11391.72	-4.02874	11382.48	22.3	0	1	0	11				
34	05/11/2014 12:55	4	2	4.028738	22.01	8.057	22.03	12.086	22.04	-4.02874	11404.04	-4.02874	11394.79	-4.02874	11388.64	22.3	0	1	0	11				
35	05/11/2014 12:55	5	2	4.028738	21.99	8.057	22	12.086	22.01	-4.02874	11413.29	-4.02874	11408.66	-4.02874	11402.5	22.3	0	1	0	11				
36	05/11/2014 12:56	6	2	4.028738	21.98	8.057	22	12.086	22.03	-4.02874	11417.92	-4.02874	11408.66	-4.02874	11396.33	22.3	0	1	0	11				
37	05/11/2014 12:56	7	2	4.028738	22.02	8.057	22.04	12.086	22.06	-4.02874	11400.96	-4.02874	11390.18	-4.02874	11380.95	22.3	0	1	0	11				
38	05/11/2014 12:56	8	2	4.028738	22	8.057	22.03	12.086	22.04	-4.02874	11407.12	-4.02874	11396.33	-4.02874	11388.64	22.3	0	1	0	11				
39	05/11/2014 12:57	9	2	4.028738	22.02	8.057	22.03	12.086	22.05	-4.02874	11399.42	-4.02874	11391.72	-4.02874	11384.02	22.3	0	1	0	11				
40	05/11/2014 12:57	10	2	4.028738	22.04	8.057	22.06	12.086	22.08	-4.02874	11387.1	-4.02874	11376.34	-4.02874	11368.66	22.3	0	1	0	11				
41	05/11/2014 12:57	11	2	4.028738	22.06	8.057	22.07	12.086	22.09	-4.02874	11380.95	-4.02874	11371.73	-4.02874	11364.05	22.3	0	1	0	11				
42	05/11/2014 12:58	12	2	4.028738	22.05	8.057	22.06	12.086	22.08	-4.02874	11384.02	-4.02874	11377.87	-4.02874	11370.19	22.3	0	1	0	11				
43	05/11/2014 12:58	13	2	4.028738	22.04	8.057	22.06	12.086	22.07	-4.02874	11390.18	-4.02874	11380.95	-4.02874	11374.8	22.3	0	1	0	11				
44	05/11/2014 12:58	14	2	4.028738	22.03	8.057	22.04	12.086	22.06	-4.02874	11394.79	-4.02874	11387.1	-4.02874	11380.95	22.3	0	1	0	11				
45	05/11/2014 12:58	15	2	4.028738	22.03	8.057	22.05	12.086	22.06	-4.02874	11394.79	-4.02874	11387.1	-4.02874	11380.95	22.3	0	1	0	11				

ReadyDT4205_000000000000000_2014110584%

Figure 80: 4 to 20mA Logger Sample Data File

Note

When sensor reading is outside of the valid range, the "99999" value will be recorded as the Eng Units and B Units data.

7.3 TILT LOGGER SAMPLE DATA FILE

Figure 81 shows how the data appears in Excel:

IC6656L_Manual_20131128_181353.csv - Microsoft Excel

FileHomeInsertPage LayoutFormulasDataReviewViewAdd-InsTeam

Paste

Clipboard

Font

Alignment

Number

General

Conditional Formatting

Format as Table

Cell Styles

InsertDeleteFormat

Cells

Sort & Find & FilterSelect

Editing

T93

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Model	IC6656L Tilt Logger												
2	Name	Tilt Logger												
3	Serial Number	5018												
4	Firmware Version	1.03	Software Version	1.39.2										
5	Sampling Status	LOGGING	APPEND											
6	Sampling Rate	FIXED												
7	Current Interval	0:00:05												
8	Start Time	28/11/2013	17:52:16											
9	Current Time	28/11/2013	18:13:53											
10	Number Of Sensor	2												
11	Number Of Record	960												
12	Sensor Upload Nur	11	8	0										
13														
14														
15	TIMESTAMP	RECORD	BATTERY	Tilt 1	Tilt 2				Tilt 1	Tilt 2	LOGGER TI RESET	USB	RSTAR	
16									Unit Type	Custom	Distance			
17									Input Unit	mm/m	mm			
18									Output Ur	mm/m	mm			
19									Offset	0.00E+00	0.00E+00			
20									Cal A =	1.00E+00	1.45E+00			
21									Zero B =	0.00E+00	8.80E-01			
22									Cal C =	Disabled	Disabled			
23									Temp CF	Disabled	Disabled			
24									Temp InIt	Disabled	Disabled			
25									Linked Ch	Disabled	Disabled			
26									Sensor	15 degree	15 degrees			
27	UNITS->		Volts	cm	mm				sin(angle)	sin(angle)	deg C			
28	28/11/2013 17:52	1	3.71	14.66	1.228				-0.01466	0.032997	23.3	0	0	0
29	28/11/2013 17:52	2	3.71	14.658	1.228				-0.01466	0.032986	23.3	0	0	0
30	28/11/2013 17:52	3	3.71	14.668	1.228				-0.01467	0.032984	23.3	0	0	0
31	28/11/2013 17:52	4	3.71	14.734	1.228				-0.01473	0.032967	23.3	0	0	0
32	28/11/2013 17:52	5	3.71	14.748	1.228				-0.01475	0.032955	23.3	0	0	0
33	28/11/2013 17:52	6	3.71	14.729	1.228				-0.01473	0.032963	23.3	0	0	0
34	28/11/2013 17:52	7	3.71	14.753	1.228				-0.01475	0.032961	23.4	0	0	0
35	28/11/2013 17:52	8	3.71	14.75	1.228				-0.01475	0.032955	23.3	0	0	0
36	28/11/2013 17:52	9	3.71	14.732	1.228				-0.01473	0.032959	23.4	0	0	0
37	28/11/2013 17:53	10	3.71	14.736	1.228				-0.01474	0.032969	23.4	0	0	0
38	28/11/2013 17:53	11	3.71	14.742	1.228				-0.01474	0.032957	23.4	0	0	0
39	28/11/2013 17:53	12	3.71	14.729	1.228				-0.01473	0.032963	23.4	0	0	0

IC6656L_Manual_20131128_181353

Ready

100%

Figure 81: Tilt Logger Sample Data File

8 RSTAR ARRAY RADIO SERIES CONFIGURATION

The RSTAR Array Radio Series use wireless technology to provide continuous data acquisition. The RSTAR Node uses the same star topology at the sensor level with a continuously active RTU hub which is accessible via ModBus RTU commands from an RTU Hub interfaced to a FlexDAQ datalogger. Figure 82 illustrates the configuration. It is based on the 900 MHz, 868 MHz and 2.4 GHz spread spectrum band (country dependent) with extensive open-country range through use of a simple dipole antenna. A complete RSTAR System is packet-oriented, and consists of RSTAR nodes (slaves) and an RTU Hub (master). The RSTAR nodes wake from low-power sleep and collect data from their attached sensors, such as RST's Vibrating Wire Piezometers. This data, which includes module address, hub address, sensor module serial number, diagnostics, data, and CRC check, is then sent (wirelessly) as a packet to the RTU Hub. Upon reception to the FlexDAQ, the RTU Hub will issue an ACK signal which may include clock synchronization and rate data. The RTU Hub stores the data in a temporary register set which is overwritten as new data is received; there is an intermediate data logging function in the RSTAR Node. The datalogger within the FlexDAQ has ultimate responsibility for logging data.

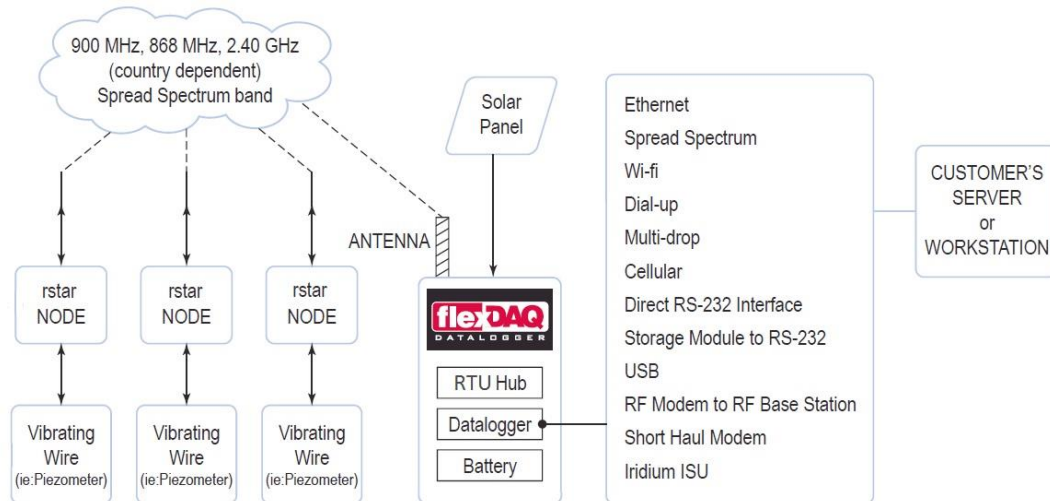


Figure 82: RSTAR Configuration Diagram

Figure 83 shows some examples of RSTAR-equipped data loggers. Figure 84 provides an example of an RTU hub.



Figure 83: RSTAR Equipped data loggers



Figure 84: RTU Hub

Figure 85 shows a FlexDAQ enclosure with an open lid to reveal an installed RSTAR RTU Hub (on DIN rail), datalogger, radio and power supply.



Figure 85: FlexDAQ Enclosure

Note

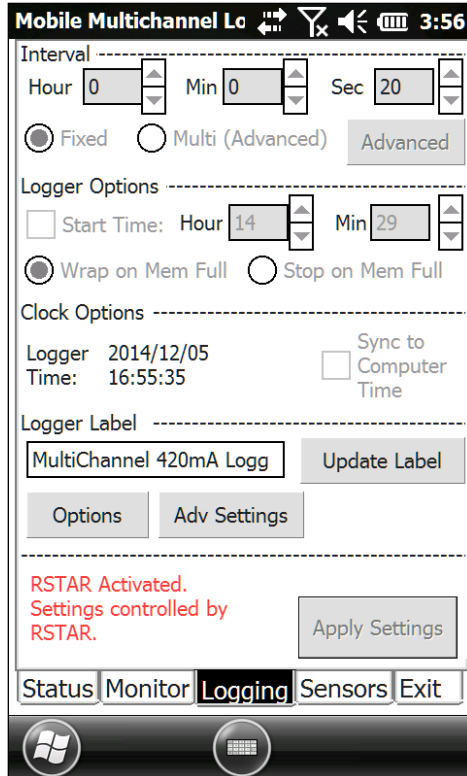
RST dataloggers shipped as part of RSTAR system have all settings preconfigured. It is strongly recommended to contact RST personnel before modifying any RSTAR settings.

Note

Wireless settings adjustments can be made using PC desktop or laptop computer.

Note

When the logger is in RSTAR enabled mode, some logger configuration parameters will be controlled by RTU base station. Any such parameters will be inaccessible by DT Logger Host Software (Figure 86).



Mobile Multichannel Logger 3:56

Interval
 Hour 0 Min 0 Sec 20
☒ Fixed ☐ Multi (Advanced) **Advanced**

Logger Options
☐ Start Time: Hour 14 Min 29
☒ Wrap on Mem Full ☐ Stop on Mem Full

Clock Options
 Logger 2014/12/05 Time: 16:55:35 ☐ Sync to Computer Time

Logger Label
 MultiChannel 420mA Logg **Update Label**

Options **Adv Settings**

RSTAR Activated.
Settings controlled by RSTAR. **Apply Settings**

Status Monitor **Logging** Sensors Exit

Figure 86: Settings disabled in RSTAR active mode

8.1 RSTAR SAMPLE DATA FILE

Figure 87 shows how the data appears in Excel:

	A	B	C	D	E	F	G	H	I
1	TOA5	RSTAR_DT11	CR800	29392	CR800.Std.27	CPU:CR800 rsta	12319	RSTAR_Data	
2	TIMESTAMP	RECORD	DT2011_Date_Time	DT2011_1(1)	DT2011_1(2)	DT2011_1(3)	DT2011_1(4)	DT2011_1(5)	
3	TS	RN							
4			Smp	Smp	Smp	Smp	Smp	Smp	
5	19/06/2014 15:55	0	19/06/2014 15:50	8342	3.660188	22.875	36	40	
6	19/06/2014 16:00	1	19/06/2014 16:00	8342	3.660188	22.875	36	40	
7	19/06/2014 16:05	2	19/06/2014 16:00	8342	3.656426	22.875	0	39	
8	19/06/2014 16:25	0	19/06/2014 16:10	8342	3.654546	22.8125	36	39	
9	19/06/2014 16:30	1	19/06/2014 16:30	8342	3.658308	23	36	39	
10	19/06/2014 16:41	2	19/06/2014 16:40	8342	3.662069	22.875	36	39	
11	19/06/2014 16:51	3	19/06/2014 16:50	8342	3.656426	23.0625	40	47	
12									
13									

Figure 87: RSTAR Sample Data File

The Campbell data table contains a fixed number of Campbell information columns followed by logger info and data columns. The logger entries in the Campbell data table will consist of a fixed number of logger information columns followed by a fixed number of logger data reading columns.

Campbell information columns

- 1) Date Time
 - Date and time when data was collected from the RTU
- 2) Record Number
 - Record number of data entry
- 3) Battery
 - Battery voltage of Campbell.
- 4) Temperature
 - Temperature of Campbell
- 5) Sample Time
 - Date and time when all loggers took a reading.

Logger information columns

- 6) Serial Number
 - Serial number of logger.
- 7) Battery
 - Battery voltage of logger.
- 8) Temperature
 - Temperature of logger.
- 9) RSSIL
 - Previous RSSI of ack packet received at logger from RTU.

- 10) RSSIB
 - RSSI of data packet received at RTU from logger.
- 11) RxTime
 - Time in ms after sample time that the logger data was received at the RTU.
- 12) TxRxStatus
 - Status code for the previous logger data transmission and ack reception.
- 13) ReTxCount
 - Retransmission count.
- 14) Status
 - Logger status code.
- 15) Open
 - Reserved for future use.

Logger reading columns

- 1) DT2011B
 - 2 columns.
 - VW data.
 - Thermistor data.
- 2) DT2055B
 - 10 columns
 - VW and thermistor position dependent on logger configuration
- 3) DT2040
 - 40 columns
 - VW and thermistor position dependent on logger configuration
- 4) DT4205
 - 10 columns
 - 420 and thermistor position dependent on logger configuration
- 5) Tilt Logger
 - 2 columns.
 - Tilt A data.
 - Tilt B data.

Total number of columns allocated per logger type

- 1) DT2011B
 - 12 columns.
- 2) DT2055B
 - 20 columns
- 3) DT2040
 - 50 columns
- 4) DT4205
 - 20 columns
- 5) Tilt Logger
 - 12 columns.

<p style="text-align: center;">Note</p> <p>The Campbell data table will always have allocated the total number logger columns per logger type, even if the channels in the logger have not been assigned.</p>
--

8.2 RSTAR SAMPLE CALIBRATION FILE

The Campbell table for logger calibration holds all the calibration data for a logger of a given type. There is separate table for each logger calibration DT2011B, DT2055B, DT2040 and DT4205. Within a table, each column contains all the calibration information for a logger channel, both current and past. The rows hold the individual calibration items and all the calibration is stored in a block of 20 rows. If the calibration is updated at the logger, the new calibration will be transferred over to the RTU and the block will be appended to the end of the last row, separated by a NaN. The current calibration for all loggers will be also copied and appended. The last entries in the table will always contain the current calibration for the loggers.

Figure 88 shows how the data appears in Excel:

	A	B	C	D	E	F	G	H	I	J	K	L
1	TOA5	RSTAR_DT11	CR800	29392	CR800.Std.27	CPU:RTU DT20:	20954	Cal11_Data				
2	TIMESTAMP	RECORD	Cal11_Type	Cal11_File(1)	Cal11_File(2)	Cal11_File(3)	Cal11_File(4)	Cal11_File(5)				
3	TS	RN										
4			Smp	Smp	Smp	Smp	Smp	Smp				
5	18/06/2014 16:56	0	SN11	8342	8342	8338	8338	8340				
6	18/06/2014 16:56	1	ID11	8342	8342	8338	8338	8340				
7	18/06/2014 16:56	2	Type11	0	0	0	0	0				
8	18/06/2014 16:56	3	Cal11Type	0	0	2	2	0				
9	18/06/2014 16:56	4	CalEN11	0	0	0	0	0				
10	18/06/2014 16:56	5	Co_A11	250	0	0	0	0				
11	18/06/2014 16:56	6	Co_BM11	0.022	1	1	1	1				
12	18/06/2014 16:56	7	Co_CZ11	9010	0	0	0	0				
13	18/06/2014 16:56	8	OP_Off11	0	0	0	0	0				
14	18/06/2014 16:56	9	T_Mult11	0.0022	1	1	1	1				
15	18/06/2014 16:56	10	INT_Temp11	25.55	0	0	0	0				
16	18/06/2014 16:56	11	T_EN11	1	0	0	0	0				
17	18/06/2014 16:56	12	IN_Units11	0	0	0	0	0				
18	18/06/2014 16:56	13	OUT_Units11	1	0	0	0	0				
19	18/06/2014 16:56	14	U_Type11	0	0	0	0	0				
20	18/06/2014 16:56	15	U_Con_En11	1	0	0	0	0				
21	18/06/2014 16:56	16	Spare11A	153413	153413	175323	175323	112022				
22	18/06/2014 16:56	17	Spare11B	140618	140618	140616	140616	140616				
23	18/06/2014 16:56	18	Spare11C	2.77	2.77	2.77	2.77	2.77				
24	18/06/2014 16:56	19	Up_Date11	0	0	0	0	0				
25	18/06/2014 17:31	20	SN11	8342	8342	8338	8338	8340				
26	18/06/2014 17:31	21	ID11	8342	8342	8338	8338	8340				
27	18/06/2014 17:31	22	Type11	0	0	0	0	0				
28	18/06/2014 17:31	23	Cal11Type	0	0	2	2	0				
29	18/06/2014 17:31	24	CalEN11	0	0	0	0	0				
30	18/06/2014 17:31	25	Co_A11	250	0	0	0	0				
31	18/06/2014 17:31	26	Co_BM11	0.022	1	1	1	1				
32	18/06/2014 17:31	27	Co_CZ11	9010	0	0	0	0				
33	18/06/2014 17:31	28	OP_Off11	0	0	0	0	0				
34	18/06/2014 17:31	29	T_Mult11	0.0022	1	1	1	1				
35	18/06/2014 17:31	30	INT_Temp11	25.55	0	0	0	0				
36	18/06/2014 17:31	31	T_EN11	1	0	0	0	0				
37	18/06/2014 17:31	32	IN_Units11	0	0	0	0	0				
38	18/06/2014 17:31	33	OUT_Units11	1	0	0	0	0				
39	18/06/2014 17:31	34	U_Type11	0	0	0	0	0				
40	18/06/2014 17:31	35	U_Con_En11	1	0	0	0	0				
41	18/06/2014 17:31	36	Spare11A	153413	153413	175323	175323	112022				
42	18/06/2014 17:31	37	Spare11B	140618	140618	140616	140616	140616				
43	18/06/2014 17:31	38	Spare11C	2.77	2.77	2.77	2.77	2.77				
44	18/06/2014 17:31	39	Up_Date11	0	0	0	0	0				

Figure 88: RSTAR Sample Calibration File

The rows contain following information:

- 1) SN55
 - Serial number of logger.
- 2) ID55
 - Data ID of logger.
- 3) Type55
 - Type of sensor installed
 - 10 = VW_A, 11 = VW_B, 12 = VW_C, 13 = VW_D, 14 = VW_E, 15 = VW_F, 16 = VW_USER
 - 20 = Therm_3K, 21 = Therm_2252, 22 = Therm_2K_RTD, 23 = Therm_5K, 24 = Therm_10K
 - 7 = Tilt
- 4) Cal55_Type
 - Type of calibration.
 - 0 = VW linear, 1 = 2nd order poly, 2 = Linear, 3 = 5th order poly
- 5) CalEN55
 - Calibration enabled state.
 - 0 = Disabled, 1 = Enabled
- 6) Co_A55
 - “A” coefficient for poly calibration
- 7) Co_BM55
 - “B” coefficient for poly calibration, or multiplier for linear.
- 8) Co_CZ55
 - “C” coefficient for poly calibration, or offset for linear.
- 9) OP_Off55
 - Output offset
- 10) T_Mult55
 - Temperature correction multiplier.
- 11) INT_Temp55
 - Initial temperature for correction.
- 12) T_EN55
 - Temperature correction enabled state.
 - 0 = Disabled, 1 = Enabled
- 13) IN_Units55
 - Input units type
 - Value depends on U_Type55.
 - Pressure: 0=kPa, 1=psi, 2=atm, 3=bar, 4=in H2O, 5= ft H2O, 6=mm H2O, 7=m H2O
 - Distance: 0=mm, 1=cm, 2=m, 3=in, 4=ft
 - Force: 0=kips, 1=kN, 2=ton US, 3=ton Metric
 - Strain: 0=uE
 - VW Temp: 0=deg C, 1=deg F
 - Incline: 0=degree, 1=radians, 2=sin()
 - Custom:
- 14) OUT_Units55
 - Output units type
 - Value depends on U_Type55.
 - See IN_Units55 above

- 15) U_Type55
 - Type of units selected.
 - 0 = pressure, 1 = distance, 2 = force, 3 = strain, 4 = temperature, 5 = incline, 6 = custom
- 16) U_Con_En55
 - Units conversion enabled state.
 - 0 = Disabled, 1 = Enabled
- 17) Spare551A
 - Calibration update time.
- 18) Spare55B
 - Calibration update date.
- 19) Spare55C
 - Logger firmware version
- 20) Up_Date55
 - Calibration has been updated.
 - 0 = Not updated, 1 = New calibration transferred from logger.

9 BATTERIES

9.1 BATTERY DEFINITIONS

Two kinds of batteries are used across the DT Logger range of products: standard and compact. They are summarized in Table 3.

Table 3: Battery Definitions

Battery Name	Standard Battery	Compact Battery
Battery Type	SAFT LSH 20 D-cell	One SAFT LSH 14 light C-cell Or Two SAFT LS 14500 AA

Standard batteries are defined as SAFT LSH 20 D-cell batteries and can be placed directly into the battery holder inside the logger. Standard batteries are recommended for radio-equipped models but may be used with non-radio loggers.

Compact batteries are defined as either one SAFT LSH 14 light C-cell battery or two SAFT LS 14500 AA batteries and require the use of the appropriate adaptor prior to placement in the battery holder. Compact batteries are recommended for stand-alone loggers. Both compact battery options are designed to support the same level of performance in DT loggers and are considered equivalent.

9.2 MONITORING REMAINING BATTERY LIFE

To determine the remaining battery life, connect the DT Logger to a computer or Field PC with a USB cable and launch the DT Logger Host program. Once the software connects to the logger, the status of the battery, including the voltage and current battery life, is displayed (highlighted in the red box in Figure 89).

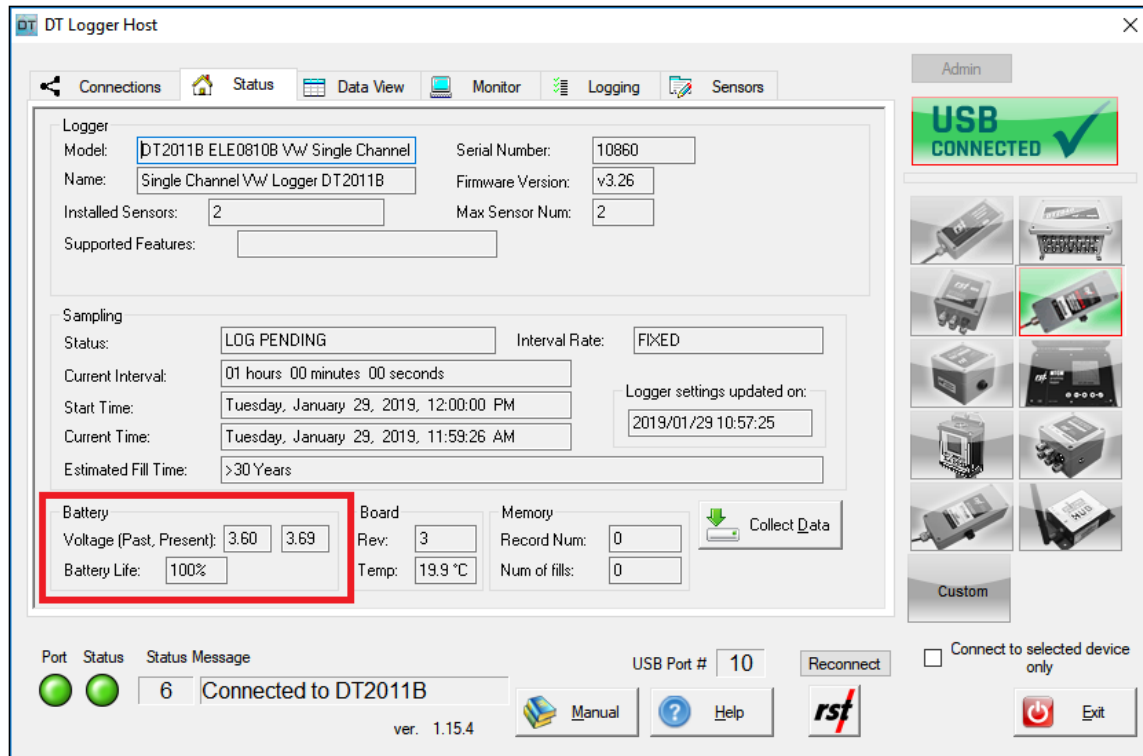


Figure 89: Battery status on DT Logger Host

Warning

When operating at lower than 0°C or higher than +40°C, the capacity of the lithium battery will decrease. The Battery Life indicator on DT Logger Host may overestimate the remaining battery life at temperatures outside this range.

Note

Batteries should be replaced when the Battery Life estimates there is less than 20% remaining.

9.3 BATTERY LIFE ESTIMATIONS IN DATA LOGGERS

The DT series loggers are purpose built with the battery capacities required to support static applications over a long period of time. Readings should be taken at a rate of once every hour or longer. The reading interval can be set to less than an hour, but this will significantly decrease overall battery life. Table 4 details estimates battery life for DT data loggers set at 1-hour, 10-minute and 1-minute reading intervals in typical operating environments.

See Section 9.1 for the definitions of standard and compact batteries.

Table 4: Battery life estimations

Data Logger Configuration	Reading Interval	Radio	Compact battery	Standard battery
DT2011B, 1 VW/thermistor pair	1 hour	none	4 years	4 years
		RSTAR	n/a	4 years
		DT Link	n/a	4 years
	10 minutes	none	4 years	4 years
		RSTAR	n/a	2 years
		DT Link	n/a	3 years
	1 minute	none	6.5 months	2 years
		RSTAR	n/a	2.5 months
		DT Link	n/a	1 year
DT2055B, 5 VW/thermistor pairs	1 hour	none	4 years	4 years
		RSTAR	n/a	4 years
		DT Link	n/a	3.5 years
	10 minutes	none	1 year	3.5 years
		RSTAR	n/a	1.5 years
		DT Link	n/a	2 years
	1 minute	none	1 month	4.5 months
		RSTAR	n/a	2 months
		DT Link	n/a	4 months
DT2040, 20 VW/thermistor pairs	1 hour	none	1.5 years	4 years
		RSTAR	n/a	3 years
		DT Link	n/a	2 years
	10 minutes	none	3 months	1 year
		RSTAR	n/a	6.5 months
		DT Link	n/a	9.5 months
	1 minute	none	10 days	1 month
		RSTAR	n/a	19 days
		DT Link	n/a	1 month
DT2485, 3 IPIs 1-minute reading intervals are not recommended due to high power requirements.	1 hour	none	n/a	4 years
		RSTAR	n/a	4 years
		DT Link	n/a	2.5 years
	10 minutes	none	n/a	12 months
		RSTAR	n/a	10 months
		DT Link	n/a	9.5 months
	1 minute*	none	n/a	46 days
		RSTAR	n/a	39 days
		DT Link	n/a	44 days
DT2485, 10 IPIs 1-minute reading intervals are not recommended due to high power requirements.	1 hour	None	n/a	2 years
		RSTAR	n/a	1.5 years
		DT Link	n/a	1 year
	10 minutes	None	n/a	4 months
		RSTAR	n/a	3.5 months
		DT Link	n/a	3.5 months
	1 minute*	None	n/a	16 days
		RSTAR	n/a	14 days
		DT Link	n/a	15 days
DT2485, 30 IPIs 1-minute reading intervals are not recommended due to the reading rate (approximately 90 seconds) and high-power requirements.	1 hour	none	n/a	7.5 months
		RSTAR	n/a	7 months
		DT Link	n/a	6.5 months
	10 minutes	none	n/a	1 month
		RSTAR	n/a	1 month
		DT Link	n/a	1 month

Data Logger Configuration	Reading Interval	Radio	Compact battery	Standard battery
DTL201B, DTL202B	1 hour	none	n/a	4 years
		RSTAR	n/a	4 years
		DT Link	n/a	2.5 years
	10 minutes	none	n/a	1 year
		RSTAR	n/a	1 year
		DT Link	n/a	1 year
	1 minute	none	n/a	1.5 months
		RSTAR	n/a	1 month
		DT Link	n/a	1.5 months
DT4205* *Estimations heavily depend on the number of sensors and the conditions under which the logger operates. These calculations are based on 10 sensors (5 4-20 mA sensors and 5 thermistors) with a 4-20 mA sensor reading time of 4 seconds and sensor output current of 12mA at 24°C	1 hour	none	n/a	3.6 years
		RSTAR	n/a	3.4 years
		DT Link	n/a	2.4 years
	10 minutes	none	n/a	7 months
		RSTAR	n/a	7 months
		DT Link	n/a	7 months
	1 minute	none	n/a	23 days
		RSTAR	n/a	21 days
		DT Link	n/a	23 days
DT2306, 18 potentiometers	Same performance as DT2055, or better			
DT2350, 2 load cells	Same performance as DT2055, or better			

Given that battery life is dependent on a number of different variables, battery life can vary from the values shown in Table 4. It is important to note that:

- This table is intended as a guideline. Battery life is best monitored via DT Logger Host (see Section 9.2).
- The values in Table 4 are interpolations based on laboratory measurements.
- Standard batteries are recommended for loggers equipped with RSTAR and DT Link.
- Compact batteries should be used for non-radio loggers only.
- The best battery performance will be observed in a typical environment, with temperatures between 0°C and +40°C. Loggers operating outside of this range will experience reduced battery capacity and decreased battery life.

9.4 BATTERY REPLACEMENT

The following sections detail methods to replace batteries in different loggers.

9.4.1 CURRENT DT LOGGER AND GAA2820 BATTERY REPLACEMENT INSTRUCTIONS

This section outlines the battery replacement procedure for current DT loggers and the GAA2820. Current DT loggers are DT2011B, DT2055B, DT2040, DT4205, DT201B, DT202B, DT2306, DT2485 and DT2350.

The following steps outline the battery replacement procedure:

Very Important

Prior to beginning the replacement procedure, ensure that the correct batteries are being used. Standard batteries are highly recommended with wireless (i.e. RSTAR and DT Link) loggers. Compact batteries will not work with wireless loggers.

1. Connect to the data logger via the USB cable and download the data.
2. Disconnect the logger from the computer and remove the top cover (4 Phillips screws).
3. Lift the battery from the negative terminal and remove the battery from the carrier. Replace it with a new one, maintaining the correct polarity.

Note

Data loggers powered by compact batteries will house batteries in an adapter, which sits in the battery carrier. Remove the adapter before removing the batteries. Place new batteries into the adapter, then place the adapter into the carrier in the logger.

4. Replace the logger's lid.
5. Connect the logger to the PC again and navigate to the *Connections* screen. Click on *Advanced* button and then on *Initialize Battery*.
6. Switch to the *Logging* screen. Verify that the settings are correct and press the *Apply Settings* button. You must press *Apply Settings* to reset the data logger regardless of whether any parameters have been changed.

Very Important

When replacing the batteries, it is important to connect to the data logger and re-apply the data logger logging settings. This re-initializes the data logger and ensures that the time settings are correct. Failure to do this could result in improper time stamps after the batteries are replaced.

9.4.2 DT2011 SINGLE CHANNEL LOGGER BATTERY REPLACEMENT INSTRUCTIONS

Note

The DT2011 is an older model logger and has different power requirements than the newer model, the DT2011B. For information about the DT2011B, please refer to Table 4 and Section 9.4.1.

The single channel VW Datalogger uses 'AA' alkaline batteries which are readily available. If the unit is being used in a cold environment, RST also offers Lithium-Ion 'AA' batteries. The following steps outline the procedure to change the batteries:

1. Connect to the data logger via the COM or USB cable and download the data.
2. Disconnect from the computer and remove the top cover (4 Phillips screws).
3. Remove the batteries from the carrier and replace with new ones, maintaining the correct polarity.
4. Replace the lid.
5. Connect to the PC again and navigate to the *Logging* screen. Verify that the settings are correct and press the *Apply Settings* button. You must press *Apply Settings* to reset the data logger regardless of whether any parameters have been changed.

9.4.3 MTCM LOGGER BATTERY REPLACEMENT INSTRUCTIONS

MTCM Graphing Logger operates on 3 'AA' alkaline batteries, which are readily available.

MTCM Closure Station Logger uses a standard battery. Contact RST for a replacement.

The following steps outline the procedure to change the battery:

1. Connect to the data logger via the USB cable and download the data.
2. Disconnect from the computer. Remove the batteries from the carrier and replace with new ones, maintaining the correct polarity.
3. Replace the lid.

10 TROUBLESHOOTING

10.1 CONNECTION PROBLEMS

Upon launching, DT Logger, the software will try to connect to the Data logger using current communication settings. Once connected, the *Status* screen should display logger information.

Note

If a pop-up dialog shows up asking for a driver name, type in *ftdi_ser.dll* in full.

The connection status is displayed on status tab. If the connection fails (status screen shows no status data), take note of the message displayed, then find the corresponding description in Table 5.

1. Port not open: The communication port is being used by some other application.
Solution: Close other windows applications that might be using serial port assigned to DT Logger. Ensure that USB is selected when connecting DT2011B, DT2055, DT2055B, DT2040, DT4205, DT5660 and DT6660 loggers.
When connecting to DT2011, RS232 Mode must be selected.
2. Connecting to the logger message continuously displayed.
Solution: Verify that the serial communication cable is connected and connections are tight.
3. State Errors, Reading Errors, Memory Read Errors.
Solution: Check the battery status on the *Status* screen on DT Logger Host; replace if necessary. Check cable for damage. Replace communication cable if in doubt.

10.2 SOFTWARE STABILITY

The DT Logger Host real time readout relies on continuous data transmission over serial communication port. This transmission may be occasionally interrupted by other computer activity resulting with program freezing or displaying erroneous data. If this happens, DT Logger Host needs to be closed down and restarted. Check battery state regularly, drained battery might cause data transmission errors. Always close software when changing loggers or reconnecting serial communication cable.

10.3 STATUS CONNECTION MESSAGES

Table 5 lists the status bar messages with descriptions.

#	Status Message	Description
1	Communication port open	Communication port is open
2	Unable to open communication port	Some other application is using this port
3	Connecting to the logger	DT Logger Host is trying to connect to the logger
4	Connection not established	DT Logger Host was unable to connect to the logger
5	Connection established to the logger	DT Logger Host was able to connect to the logger
6	Reading logger settings	All logger settings are copied to the DT Logger Host for display
7	Error during settings read	Error occurred during settings read
8	Idle	Idle time between status or data reads
9	New logger detected	Logger exchanged with another logger, DT Logger Host reset
10	Logger settings successfully read	All logger settings were successfully transferred to DT Logger Host
11	Error reading logger settings	Error occurred during reading logger settings
12	Connection Error	Connection attempts timed out
13	Reading logger memory	Logger memory contents is being copied to the DT Logger Host
14	Writing logger settings	All displayed settings are being transferred to the logger
15	Error during settings write	Error during settings write

Table 5: Status Messages

11 SYSTEM SPECIFICATIONS

Table 6 lists the specifications for the Field PC²:

Ultra-Rugged Field PC ²	
Water Proof	IP68
Rugged Case	1.5 m or 5' drops onto concrete
Operating Temperature	Optimized for excellent performance in cold temperatures Operating temperature: –22F to 140F (–30C to 60C) Note: Bluetooth® wireless technology is rated to –4F (–20C)
Processor	1.0GHz ARM Cortex A8 i.MX53 processor
Memory	512 MB DDR2 RAM
Internal Flash Disk	8 GB
Operating System and Software	Microsoft® Windows Embedded Handheld 6.5.3 Microsoft Office Mobile 2010* (Word Mobile, Excel Mobile, PowerPoint Mobile, Outlook Mobile) Multiple languages (English, French, Spanish, German, Portuguese) Adobe Reader® LE
Battery	Intelligent Li-Ion battery 3.7VDC @ 10600mAh, 38.7Whr Operates for up to 20 hours on one charge Charges in 2 to 4 hours Battery easily changeable in field
Wireless Connectivity Options	Bluetooth® wireless technology, 2.1 +EDR, Class 1.5, range greater than 100 feet (30m) Wi-Fi® 802.11b/g/n with extended range
Certifications and Standards	FCC Class B CE Marking (applicable EMC, R&TTE, and LVD directives) Industry Canada EN60950 Safety

Table 6: Ultra-Rugged Field PC² Specifications

12 CONTACT US

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