

Portable Multi-Gauge Surface Box

User Manual V1.0

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Table of Contents

1	ABOUT THIS GUIDE	5
1.1	WHO SHOULD USE IT.....	5
1.2	DISCLAIMER	5
2	INTRODUCTION.....	6
2.1	GENERAL INFORMATION	6
2.2	NETWORK CONNECTIONS.....	7
3	SYSTEM DESCRIPTION	8
3.1	COMPONENTS AND ACCESSORIES	9
3.2	USB CONNECTION	10
3.3	DISPLAY ON/OFF BUTTON	10
3.4	FUSE.....	10
3.5	BACKUP CLOCK BATTERY	10
3.6	MAIN INTERNAL BATTERY	11
3.6.1	Battery Charging.....	12
4	GAUGE AND LOGGING CONFIGURATION.....	13
4.1	CONNECTING TO DATACAN DOWNLOAD SOFTWARE	13
4.2	CONFIGURING TO READ DOWN HOLE GAUGES.....	16
4.2.1	Gauge Setup – Original Style.....	17
4.2.2	Gauge Setup – Multi-Gauge Style	19
4.3	CONFIRMING SENSOR SETUP	22
4.4	PROGRAMMING SAMPLE RATE.....	23

4.5	CHANGING UNITS	25
4.6	DIAGNOSTICS.....	26
5	BASIC OPERATION.....	28
5.1	TOOL INSPECTION.....	28
5.2	OPERATING SEQUENCE.....	28
6	DOWNLOADING AND GRAPHING DATA.....	30
6.1	DOWNLOADING AND ERASING ALL JOBS	30
6.1.1	Downloading Data.....	30
6.1.2	Erase All Jobs.....	32
6.2	GRAPHING DATA.....	34
7	SCREEN WARNINGS AND ERRORS.....	36
8	SURFACE SENSOR SETUP.....	38
8.1	GAUGE SETUP – SURFACE TRANSMITTER.....	38
9	OTHER SETUP AND TESTING.....	41
9.1	MODBUS OUT SETUP (CONNECTING TO A SCADA NETWORK).....	41
9.1.1	ModBus Out Connections.....	41
9.1.2	ModBus Out Settings.....	41
9.1.3	ModBus out Registers	42
9.2	SCREEN SETTINGS	43
9.3	OUTPUT VOLTAGE.....	43
9.4	POWER CYCLE TIMER	45

History of Changes

Rev. No.	Date	Pages	Description of Changes	Author
1.0	January 2021	47	Modified from V1.6 of Multigauge SRO	M.J.

1 About this Guide

1.1 Who Should Use It

This guide is intended for users of different degrees of knowledge and experience:

Operators – Tool operators can learn how to operate the software and maintain the tools.

Technicians – Our technicians can learn how to interrogate and troubleshoot the tools.

This guide assumes that you have some computing and tool knowledge. For more information, contact your local service representative.

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We thank you for any feedback or comments that will help us to continue to improve our products and service.

1.2 Disclaimer

This document is intended as a supplement to formal training. DataCan is constantly working to improve its products. We must therefore reserve the right to change designs, materials, specifications, and prices without notice. DataCan declines any liability that may arise out of the potential inaccuracies in this guide. We thank you for any feedback or comments that will help us to continue to improve our products and service

2 Introduction

The DataCan Multi-Gauge Surface Box is a logging unit capable of storing and displaying data from telemetry cards, downhole gauges, surface gauges, and many other sensors. The internal telemetry card can be programmed to communicate with any of DataCan's one-way (original style) or two-way (multi-gauge or newer-style) permanent / SRO gauges.

This manual is supplemented by a number of other manuals depending on the elements of your system:

- DataCan Download Software User Manual – for all features of the software and graphing.
- Surface Transmitter Manual
- Multi-Gauge Telemetry Card Manual
- Cablehead Installation Manual
- Permanent Gauge Installation Manual
- Multi-Gauge Surface Box Troubleshooting Guide

To answer questions not covered in the manual about a specific component of your system, please refer to the manual for that specific component.

2.1 General Information

The DataCan Surface Box is a reliable instrument that works in conjunction with DataCan telemetry units, DataCan Downhole gauges, and DataCan surface gauges. In addition to providing power to the attached equipment, the surface box displays the data collected; also, depending upon user settings, it stores some of or all the collected information. A PC can be

plugged into the surface box to program which data is collected and recorded, as well as to download records from the memory using the included DataCan Download Software.

2.2 Network Connections

The Surface box connects to 3 different networks, as well as a USB link to a PC. The 3 networks are the downhole tool network, the surface gauge Modbus network, and the Modbus-Out network used to connect to a user's SCADA system. Each external Multi-Gauge Telemetry Card has its own downhole tool network.

Each device connected to the Modbus-In network needs its own a unique Modbus address on the network. This can be in the range of 1 to 247, with no two devices having the same address. The internal telemetry in the Surface Box is address 0 (reserved). Addresses on this network are separate from the Modbus-Out network, so devices on this network can have the same addresses as devices on the user's SCADA network.

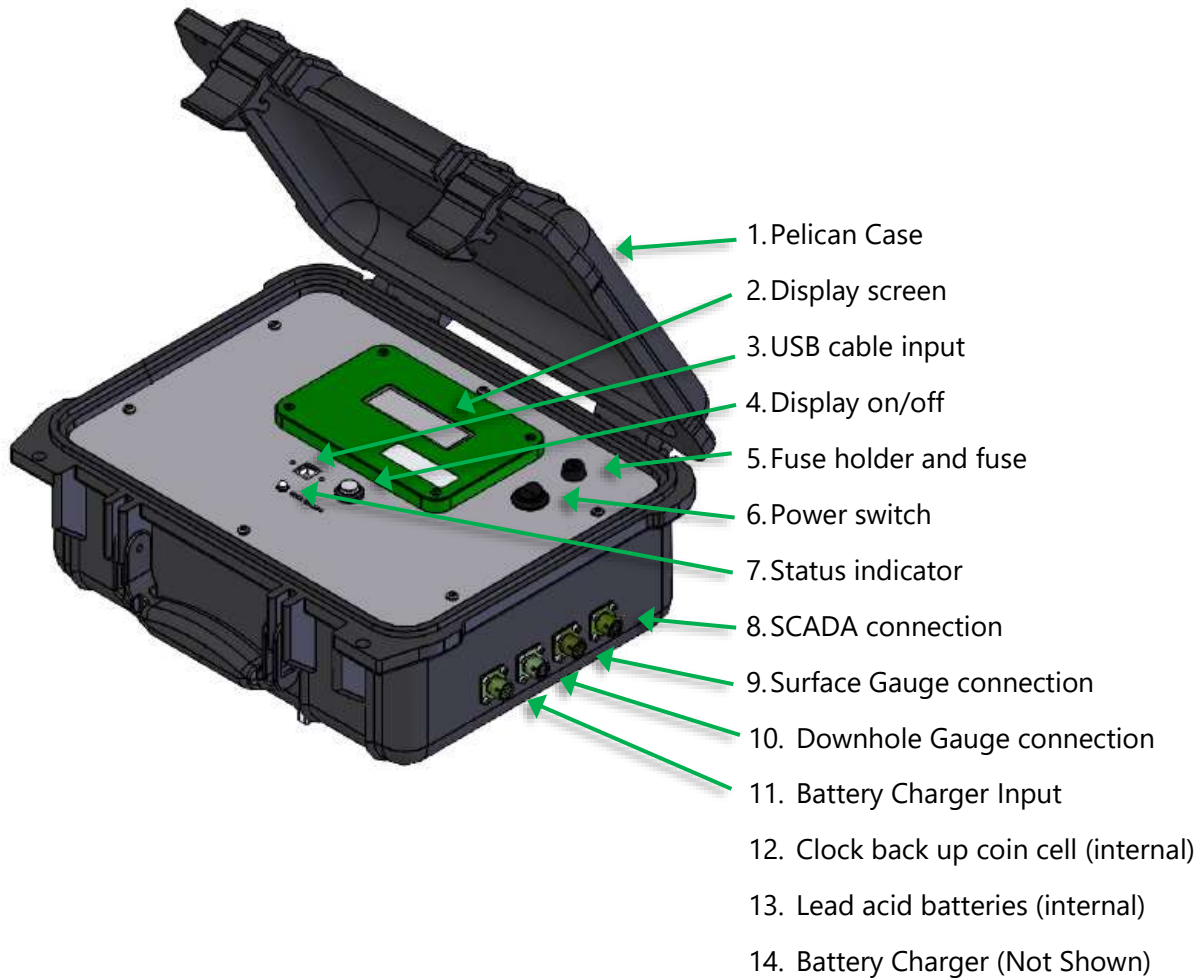
For two-way communication style gauges, each downhole gauge on each telemetry card must be set up with its own gauge address. These gauge addresses have nothing to do with the Modbus addresses between telemetry cards. If a gauge has never had its address changed, it defaults to address 1.

3 System description

The DataCan Portable Surface Box is a reliable instrument that works in conjunction with DataCan downhole permanent gauges and surface gauges. In addition to providing power to the attached equipment, the surface box displays a readout of the data collected and stores some or all of the collected information inside its on board memory. A PC can be plugged into the surface box to program what data is collected, displayed, and recorded, as well as download jobs from the memory using the included DataCan Download Software. Components and Accessories

3.1 Components and Accessories

Your portable surface box may be made up of the following components.



DataCan will attempt to program the Surface Box for the customer's requirements prior to shipping whenever possible. The only setup that must be done for every unit is to remove the battery tag and set the time; however, it is recommended that users connect the system and confirm the setup before attempting to install the system in the field. Record rate, time, pressure

and temperature units are set to defaults and can be changed using the download software. If it is discovered that the sensors are not set up to the user's requirements then proceed to section 8—Surface Sensor Setup—to change the setup.

3.2 USB Connection

The USB connection is a standard USB type B socket. Any USB-B cable will connect to it.

NOTE: The USB connection will provide enough power to the unit to allow for memory download. This is to allow for access to data even with a dead battery. However, USB will not provide enough power to run a gauge or recharge the battery.

3.3 Display On/Off Button

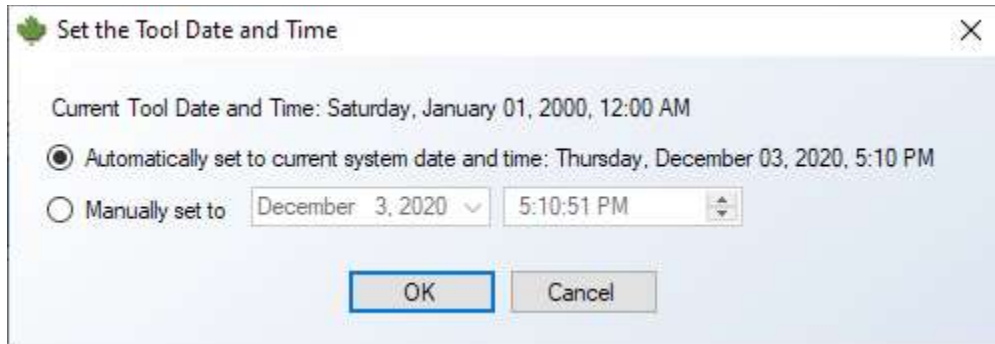
The button on the bottom of the box (front panel of rack-mount unit) turns the screen off and on. To conserve power, the screen is by default set to turn off after 1 minute. To change the turn off time or to leave the screen always on, see section 9.2—Screen Settings.

3.4 Fuse

DataCan has installed a 1.8A 3AG slow blow fuse. If required replace with same.

3.5 Backup Clock Battery

There is a coin cell that is used as back up power to keep time so that samples can be accurately timestamped. Some units use a non-chargeable coin cell. If you see the below popup when you connect to the surface box after powering up, then your clock backup battery is not functioning.



The back up battery is located behind the screen and can only be accessed by removing the screws around the edge of the edge of the faceplate. A battery saver tab may have to be removed in new boxes. To replace the back up battery use a new CR1632.

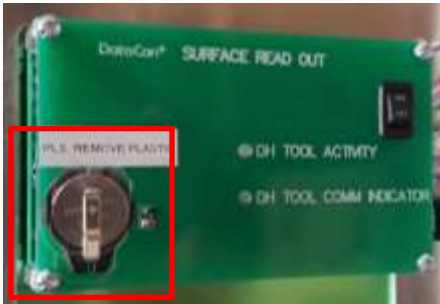


Figure 1: Non-Rechargeable Backup Clock Battery with plastic slip still installed.

3.6 Main Internal Battery

The portable SRO box contains two 9Ah sealed glass mat lead acid 12V batteries. These should provide power for 6 days of continuous operation on a full charge.

The battery voltage can be viewed by connecting to the box with the download software.

Opening **Utilities** -> **Diagnostics** and reading the **Surface Box Input Voltage**. If the box power switch is not turned on the USB bus voltage will be displayed not the battery voltage. See the **Software Guide – DataCan Permanent Surface Logger** for information about installing the software and connecting it to the box.

3.6.1 Battery Charging

DataCan provides a 1A battery charger with the SRO box. To charge the batteries simply connect the provided charger to the 2 pin plug on the box and plug the charger into a standard AC wall outlet. A discharged battery can take up to 20 hours to fully charge. The charger can be left connected and it will maintain a float charge that will not overcharge the batteries.

WARNING: Do not allow the batteries to drain below 10V. It can damage the batteries and reduce the battery life of your box.

4 Gauge and Logging Configuration

The Datacan Download software is the interface to configure the system and download stored logs. It can be downloaded from the DataCan website at datacan.com/downloads. For more information on installing the software see the **DataCan Download Software – User Manual**.

The Download software is updated regularly with bug fixes and new features.

This section goes over the most common actions performed when using the portable surface box. For more features see sections 6, 8, and 9.


4.1 Connecting to DataCan Download Software

The user interface with the Surface Box is through a Windows PC connected via a USB cable while running the DataCan Download Software. You will need a Windows PC with the DataCan Download Software installed, a USB-A to USB-B cable, and a DataCan Permanent Surface Logger Box that is powered up and connected to sensors.

STEP1: connect the surface box to a Windows PC using the USB cable and run the DataCan Download Software.



Figure 2: DataCan Download Software main page

Step 2: Click on the **Connect** button. . A progress bar will appear, stating its connectivity status as shown below.

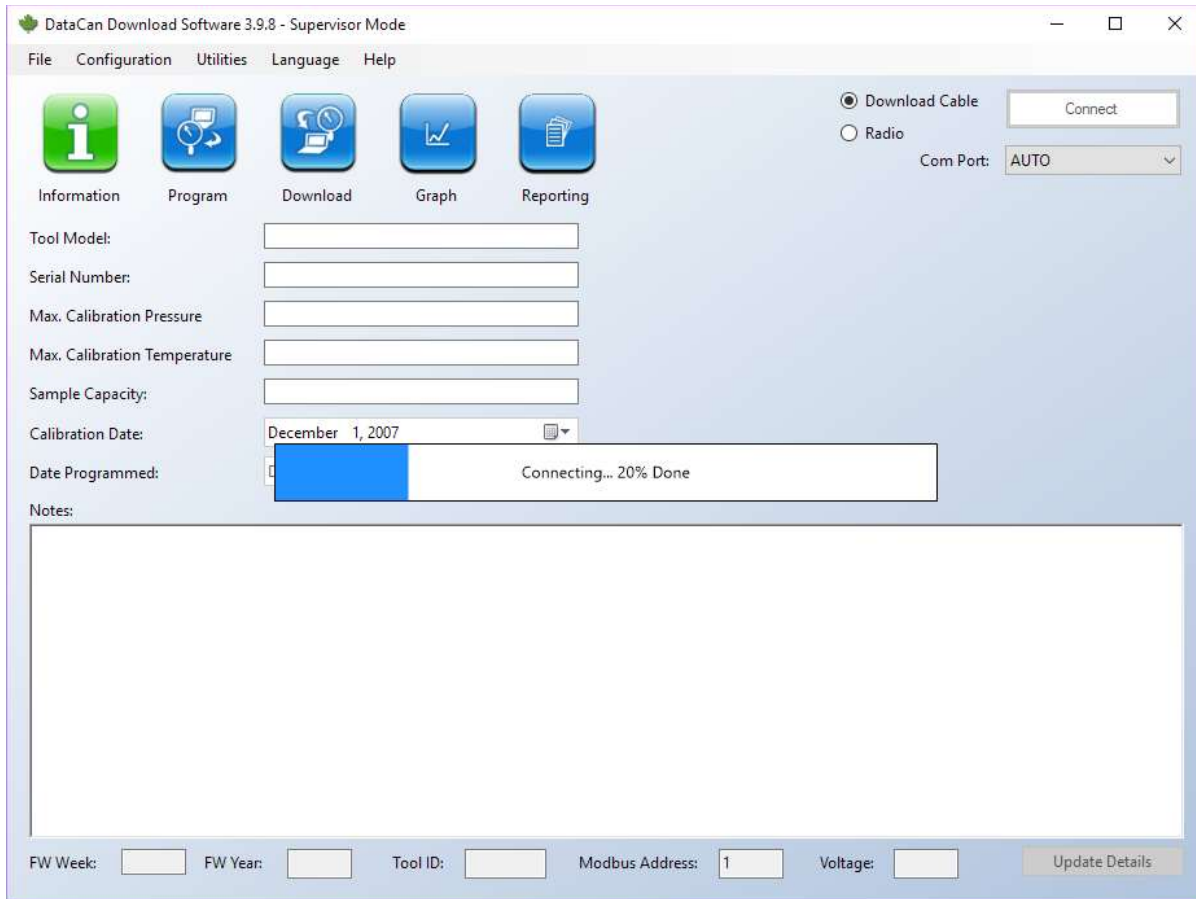


Figure 3: Progress bar demonstrating the connectivity with the device.

Note: If this is the first time connecting to the surface box, you will be prompted to set the time; this is normal. If you are prompted to set the time every time you connect to the Surface box, make sure you have removed the plastic slip on the Backup Clock Battery. If the slip has been removed, the backup battery may need to be replaced. If the battery has recently been replaced, then the backup clock may be damaged and your surface box should be serviced by DataCan.

Step 3: After successful connection, in the information page you should see the following details:

- Tool Model of the logger
- Serial Number of the logger
- Company Info
- Location Info

- Date and time of the logger's clock
- Modbus details
 - Modbus Out (slave address)
 - Modbus In & Out baud rates.
- Details of devices connected to logger
- Tool ID, Modbus Address and Firmware Week & Year

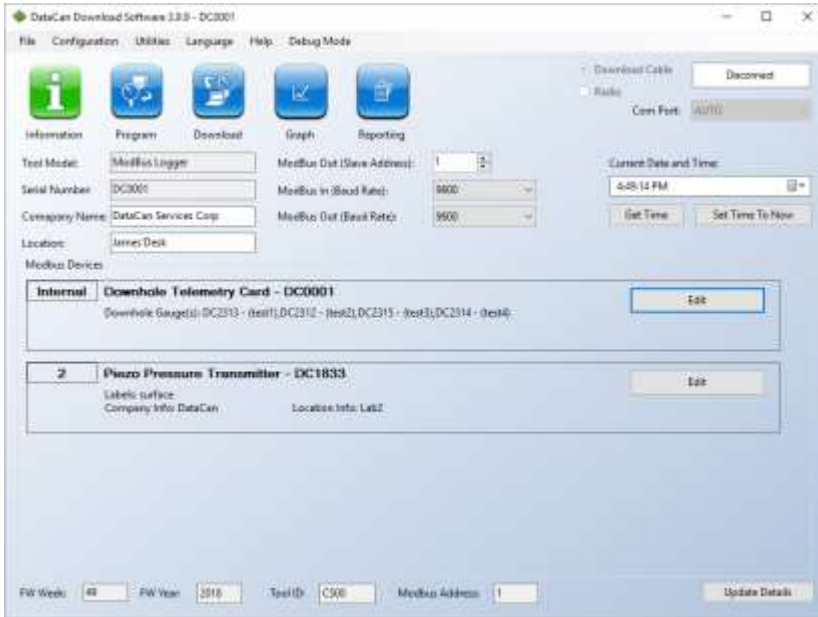


Figure 4: Information after successful connection.

4.2 Configuring to Read Down Hole Gauges

There are 2 different categories of DataCan Downhole gauges. The original style has only one-way communication, from the gauge to surface, and can only have 1 gauge per line. This style requires the user to load the gauges calibration file in the surface box. The newer category allows for two-way communication between gauge and surface box. This allows for multiple gauges on a single line and the user does not need to have the gauge calibration file.

The portable SRO box also allows for the connection of surface transmitters and additional downhole telemetry cards. See section 8.1 for connecting those types of sensors.

4.2.1 Gauge Setup – Original Style

When using “original style” or one-way communication gauges down hole, the gauges themselves do not need any software setup. The surface box, however, needs to have the gauge calibration loaded handle this style of gauge.

The internal telemetry card always shows up on the **Information** page in the DataCan Download Software as address 0. To change your setup, you must enter supervisor mode by pressing **Ctrl+SHIFT+D** at the same time, and “- Supervisor Mode” should appear in the top bar. To then set up a one-way communication gauge, press the **Edit** button for the “Permanent Telemetry Logger”.



Figure 5: One-way communication gauge, "Edit" button.

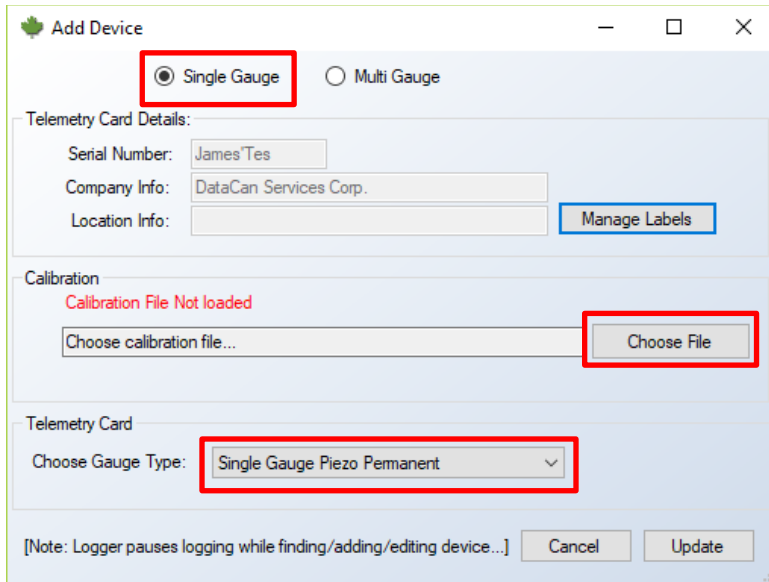


Figure 6: Select "Single Gauge".

Select **Single Gauge** for one-way communication style gauges. Press **Choose File** and browse to the calibration file for the gauge to be connected, select the file, and click **Open**.

A label can be added for the gauge. The label will be displayed on the Surface Box for each gauge reading. In the **Telemetry Card Details** section, press the **Manage Labels** button.

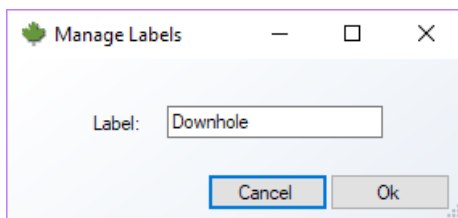


Figure 7: Gauge label section.

The label can be up to 20 characters. Suggested labels for each gauge are gauge depth (e.g. 2516 feet) or sensor measurement location (e.g. tubing, casing or vent).

In the **Telemetry Card** section, choose the gauge type from the drop-down list.

Once the label is set, the calibration is loaded, and the gauge type is set, click the **Update** button to store these settings to the Surface Box. The software will store the information to the Surface Box and then start a new job in the Surface Box memory.

4.2.2 Gauge Setup – Multi-Gauge Style

To configure the system to log two-way communication gauges you will need.

- The gauges you wish to log
- The portable SRO Box
- A cable to connect the SRO box to the gauge, one was shipped with the system (replacement is PN 109805)
- USB-B cable, one was shipped with the system
- Computer running windows with the DataCan Download Software installed.

To configure your system you must connect the box to the download software as described in section 4.1. Ensure you are on the **Information** page. To change your setup you must enter supervisor mode by pressing **Ctrl+SHIFT+D** at the same time, and “- Supervisor Mode” should appear in the top bar.

Once in supervisor mode press the **Edit** button for the “Internal” device.



Figure 8: Two-way communication gauge, "Edit" button.

Ensure "Multi Gauge" is selected. If isn't then select it.

If there are any gauges listed that will not be connected to this Surface Box on this job, press the **Remove** button.

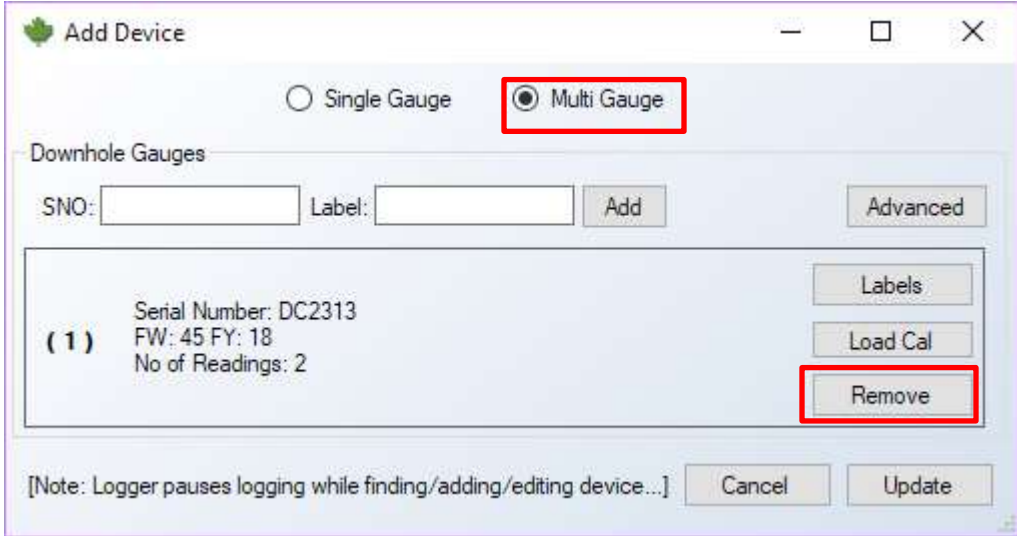


Figure 9: Select "Multi Gauge".

Next the gauges will be added one at a time:

1. connect a gauge that will be run on the job.
2. When connected fill in the serial number and desired label for the gauge. The label can be up to 20 characters. Suggested labels for each gauge are gauge depth (e.g. 2516 feet) or sensor measurement location (e.g. tubing, casing or vent).
3. Once filled in, click the **Add** button, and wait for a "Gauge Added" message. If you receive the error "Gauge Not Found!" please confirm that you have the correct serial number and that the correct tool, and only the correct tool, is connected.
4. Remove that gauge, connect the next gauge, and repeat until all gauges have been added.
5. Click the **Update** button. The software will store the information to the Surface Box and then start a new job in the Surface Box memory.

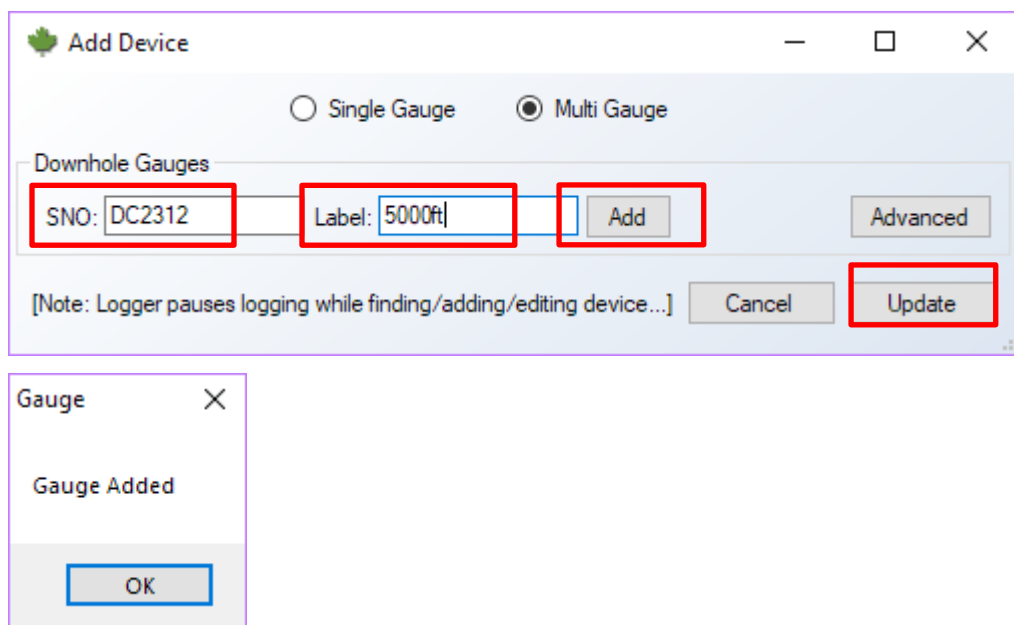


Figure 10: Add gauge dialog.

Once updated you should see the list of downhole gauges with (labels) in the information page.

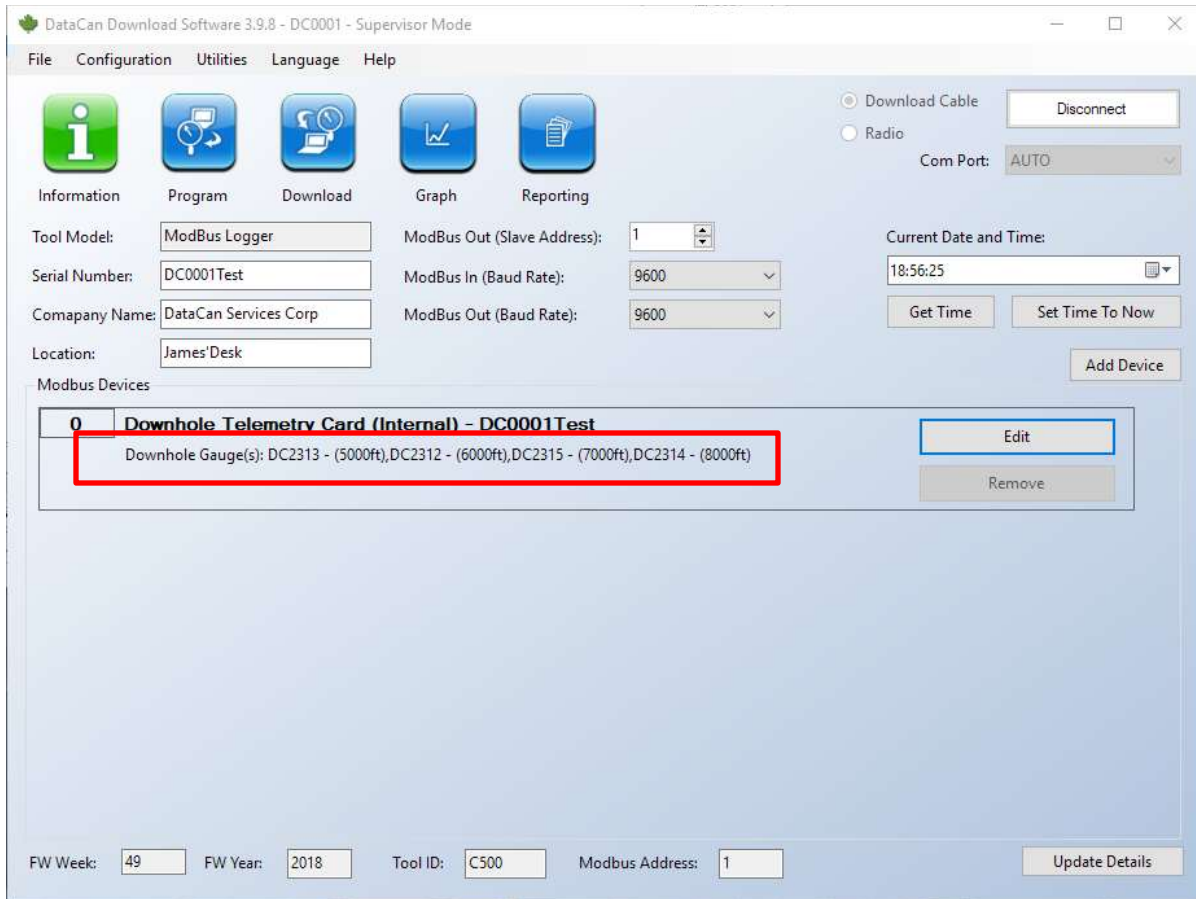


Figure 11: Updated Gauge List

The labels can be edited at any time by pressing the **Edit** then **Labels** buttons.

It is recommended that the user connects all the gauges to the Surface Box and then runs Diagnostic mode or views the data on the Surface Box screen to confirm that everything is working correctly.

4.3 Confirming Sensor Setup

As shown above, the "Information" page has a list of all connected devices. If the list of Downhole Gauges does not match the list of gauges attached, or you do not see a surface


transmitter or telemetry card that is connected to the surface box, please confirm your connections and serial numbers and then.

If a Downhole gauge is in the "Downhole Gauge(s)" list but "NO DATA" is displayed on the screen for that gauge, please try to confirm that it is connected and then proceed to Surface Sensor Setup to remove the gauge and then re-add it.

4.4 Programming Sample Rate

Programming Sample Rate sets how often the data is collected and stored to memory. For example, if the sample rate is set to 60 seconds, data will be sampled and recorded every 60 seconds. The default rate is 5 seconds. After connecting the box to the software, if you wish to change the sample rate, proceed with the following steps:



Step 1: Click on the  icon to get to the programming page.

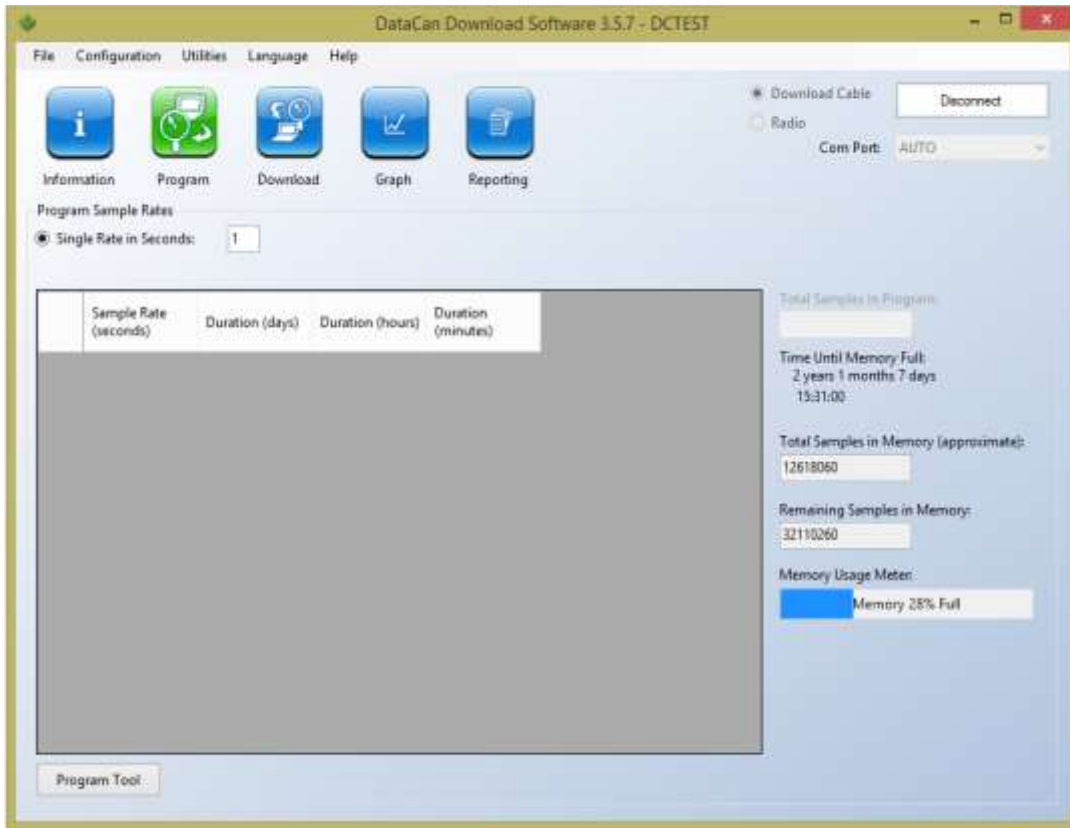


Figure 12: Program page.

Step 2: Enter an appropriate sample rate in seconds and click on the **Program Tool** button found at the bottom left of the screen.

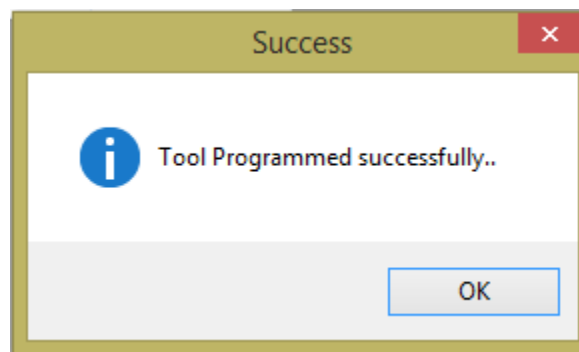


Figure 13: Success Dialogue box after clicking program tool button.

4.5 Changing Units

The DataCan readout can display units in a wide variety of formats.

If you wish to change the format, after connecting to the software, proceed with the following steps:

Step 1: Click on the **Configuration** menu, and then click on **Change Units** as shown in the figure.



Figure 14: Change units from configuration menu.

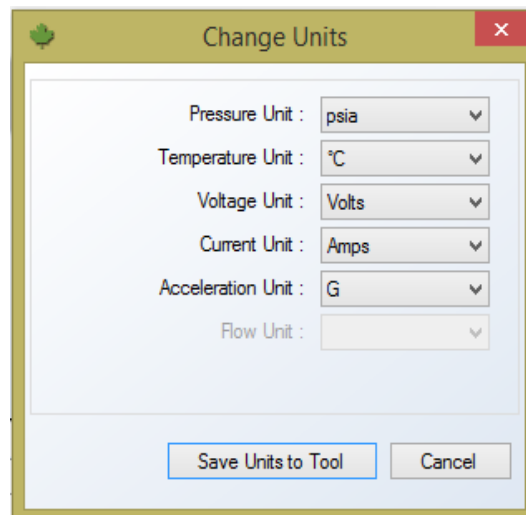


Figure 15: Change units form.

Step 2: Select appropriate units for each and click on **Save Units to Tool**. Once successful, you should see a dialogue showing status of operation and information related to the Job (i.e. job number and date and time of the job start)

[Note: This operation automatically restarts the device]

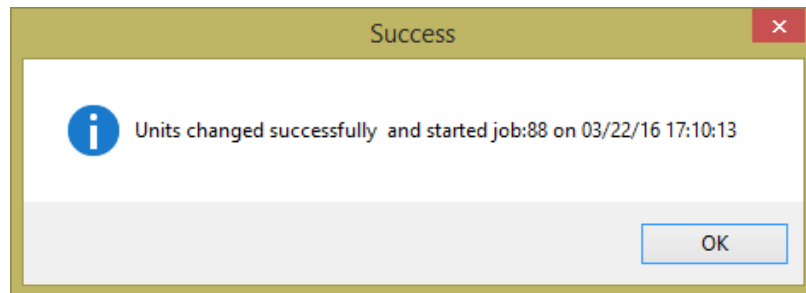


Figure 16: Dialogue confirming Changes.

Step 3: Click on **OK** to exit.

4.6 Diagnostics

From the main menu bar, "Utilities -> Diagnostics" opens a window that shows real time data from all programmed and connected devices. It also shows the box battery voltage as **Surface Box Input Voltage**. The box voltage should be between 10 V and 15 V.

A diagnostic tool is the **Surface Box Tool Current**. This number is a measure of the current draw of the down hole tool line. should read approximately 2 mA per gauge connected.

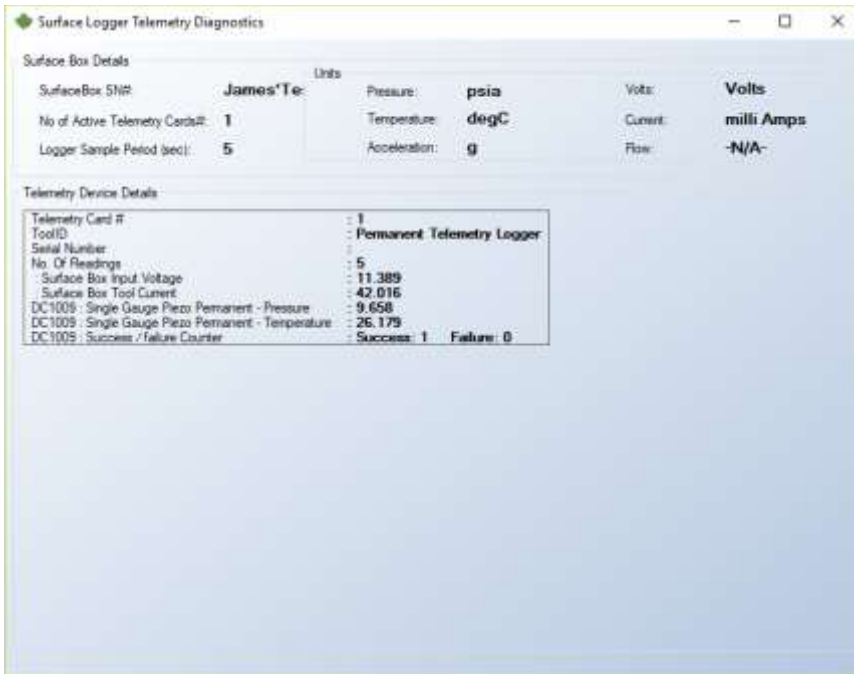


Figure 17: Diagnostics screenshot from a single one-way style gauge.

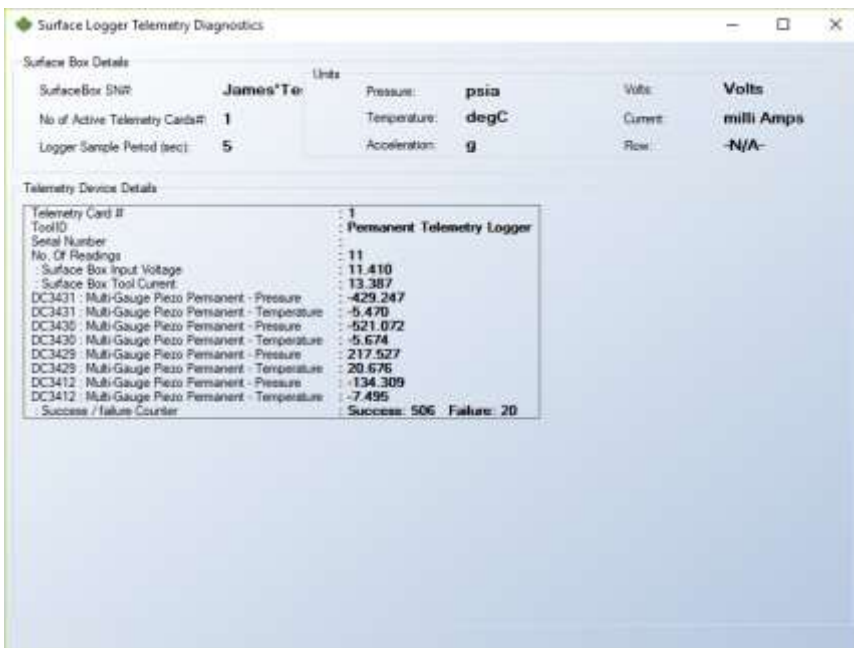


Figure 18: Diagnostics screenshot from 4 two-way communication style gauges.

5 Basic Operation

5.1 Tool Inspection

Ensure that the shipment includes all the components and accessories that were requested.

Ensure the specs of the gauges match that of your job requirements. **Record the serial number of the surface box and the downhole gauges.**

5.2 Operating Sequence

In general, the following sequence of events is required to operate a DataCan SRO pressure tool:

- Configure box and gauges as desired. The box will have to be reconfigured for each new job as the box must know which gauges are connected to function properly. See Section **Error! Reference source not found.** for more information about configuration.
- Connect tools to surface box (it is recommended that this be done using the hookup cables provided to confirm all parts of the system communicate before permanently assembling any cableheads).
- Confirm the system setup by viewing a readout of every connected tool.
- Permanently assemble the bottom tool and cablehead as outlined in the tool manual.
- After assembly turn box back on and confirm gauge is transmitting. If using multiple gauges, the provided hook up cable can have the yet to be installed gauges connected at the same time as the gauges already installed on the line.
- Install the gauges. The box can be monitored to confirm that line integrity and gauge connectivity was maintained during installation.
- After installation download and review data.

-
- **WARNING:** The sensor readings may have to cycle through once before a disconnection or a reconnection is displayed. Also, the connectivity check is only performed when a sample is taken, so it is advised to use the minimum sample rate (1sec/gauge) during installation.
-

6 Downloading and Graphing Data

6.1 Downloading and Erasing All Jobs

Data records are recorded in the logger as jobs. The Surface Box creates a new job every time it is powered up and is able to collect data. It also creates a new job anytime the settings are changed.

6.1.1 Downloading Data

To download jobs, after connecting to the software, proceed with the following steps:



Step 1: Click on the  button to go to the download page.



Figure 19: Download page with jobs.

Step 2: Select jobs that need to be downloaded and click on the **Download** button. You will be prompted to save a binary file for each job selected. Choose a location to save to and click **OK**. Once it succeeds, you will see a progress bar with the download progress.

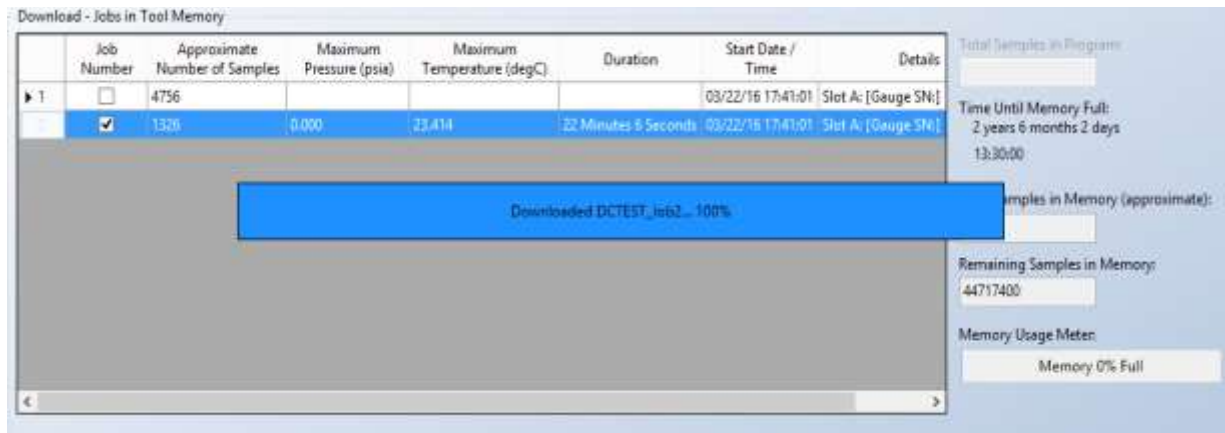


Figure 20: Progress bar showing status of download.

After the download, a dialogue box will appear stating the result of the download.

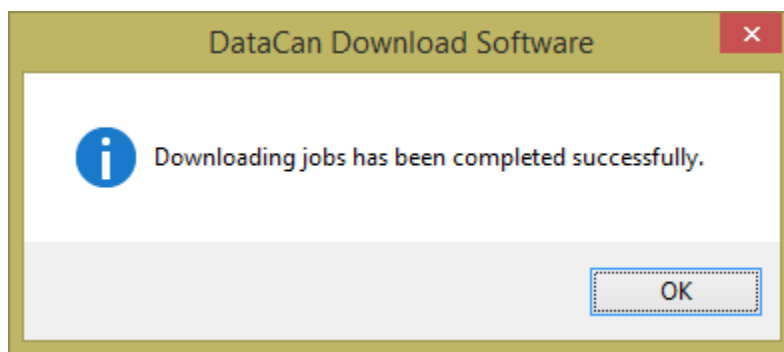


Figure 21: Success status after download succeeds.

6.1.2 Erase All Jobs

In the download page, click on the **Erase All Jobs** button to erase all jobs. Once you click on it, a confirmation prompt appears and states the approximate time to erase all jobs in memory depending on the memory filled.

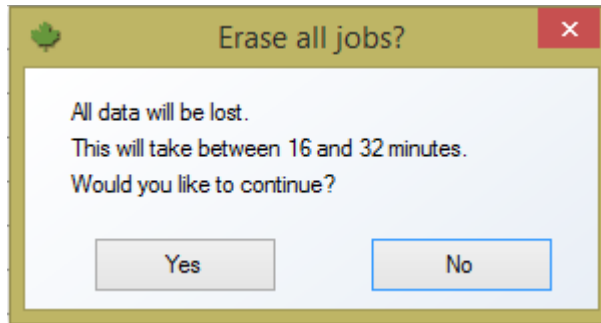


Figure 22: confirming erase all jobs dialogue box.

Click **Yes** to continue.

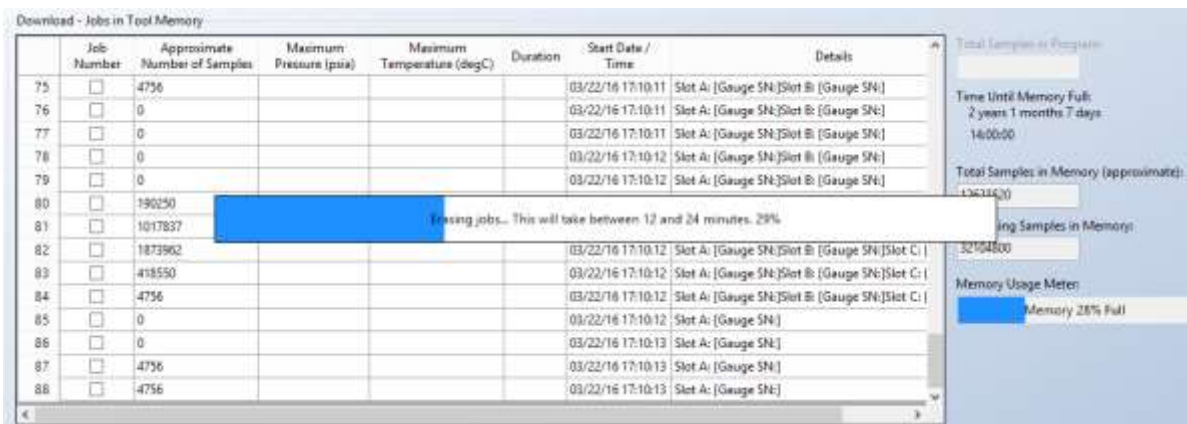


Figure 23: Progress bar stating status.

After the erase completes, you will see a dialogue box stating the results of the erase.

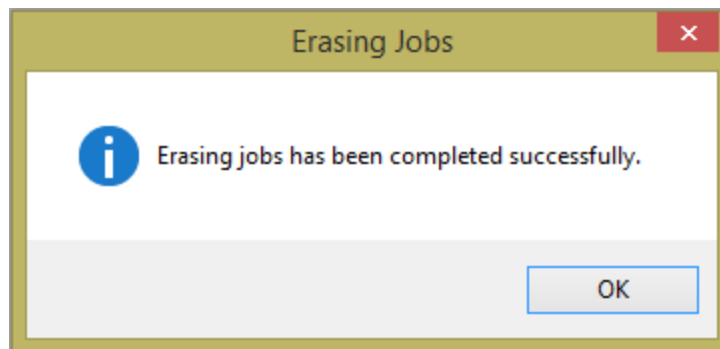


Figure 24: Erase jobs success dialogue box.

6.2 Graphing Data

After downloading a job, you can display the data by loading it in the graph screen.



Click the button to get to the graph page.

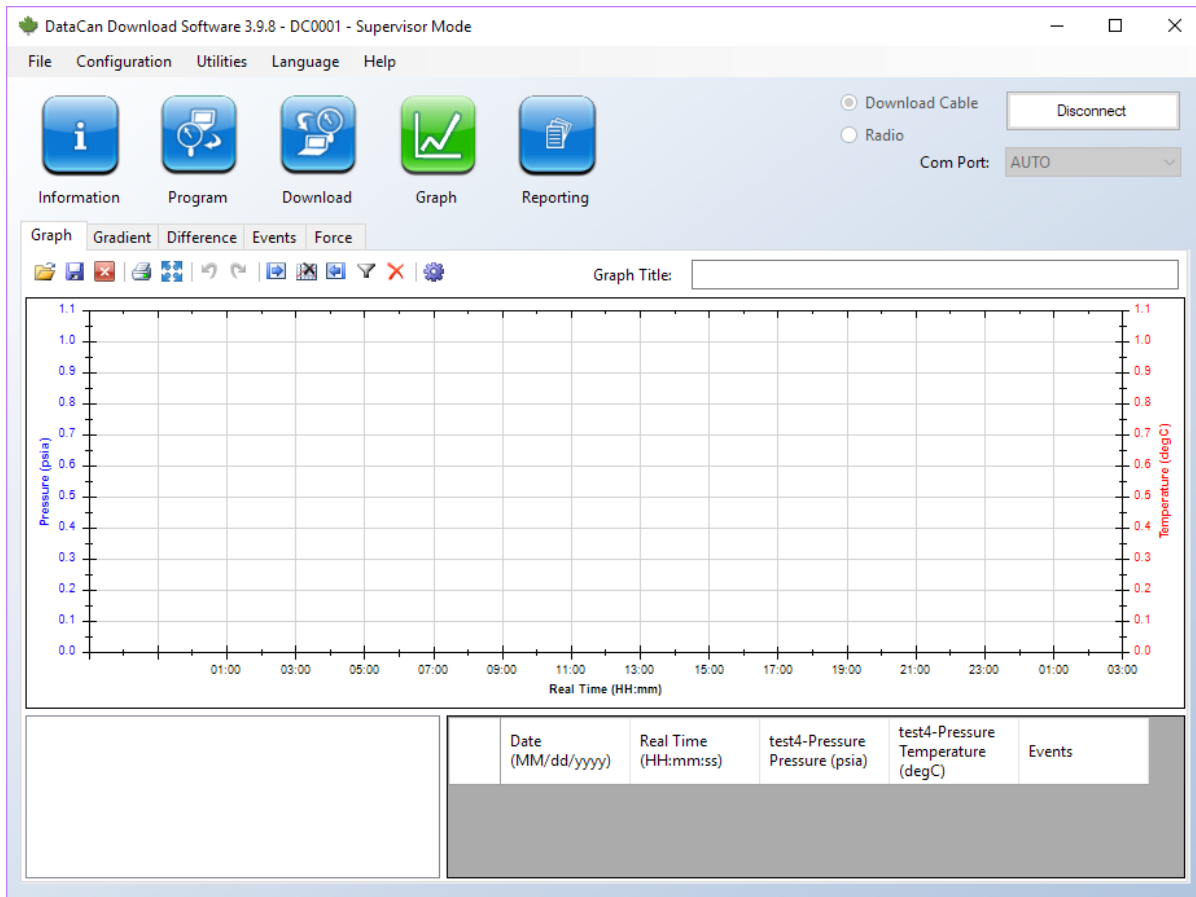



Figure 25: Graph page.

Next click the open icon .

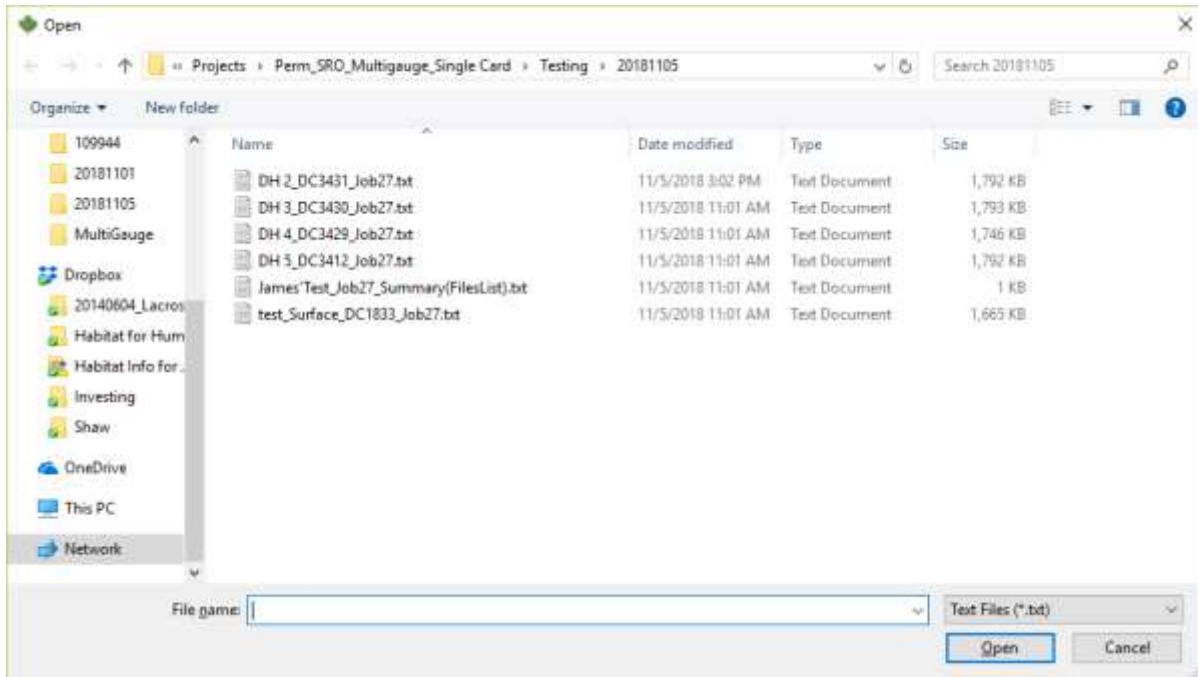


Figure 26: Graph "Open" window showing all files downloaded when 4 downhole gauges and 1 surface gauge were connected during a job.

If more than one gauge was connected during a job, the data downloaded is divided into one file per device and one summary file. The summary file has "_Summary(FilesList).txt" at the end of the file name. This summary file can be opened in the graphing software if the user would like to view all gauges from one job at the same time. Alternatively, each file can be opened and viewed individually.

Please see the *DataCan Download Software Guide* for a description of all the graphing functionality.

7 Screen Warnings and Errors

Shown on Display	Meaning
“Found internal telemetry only. No external devices found.”	The user has only programmed an internal telemetry card and no other devices such as pressure transmitters or external telemetry cards. This message is just informational and a warning only if the user thinks the message is incorrect.
“Found X device(s).”	The Surface Box was able to connect to X devices (including itself) programmed by the user, devices such as pressure transmitters or external telemetry cards.
“Erasing all jobs...”	The user has selected to erase all jobs in the Surface Box memory using the DataCan Download Software, and it is currently in progress.
“Restarting...”	The DataCan Download Software has requested to restart the Surface Box, and it is in progress.
“Logging paused.”	The DataCan Download Software has paused logging so that it can complete some user requested actions. This will clear itself within 10 seconds of the software actions completing.
“No data.”	The Surface Box has not received good data from a connected device or no devices are connected. Check electrical connections and power.

WARNING: Tool Current too low. Tool may be disconnected	The tool current monitor is reading less than 0.3 mA. Most likely this means a loss of connection to the downhole gauge. Check the connections to the downhole gauge.
“ERROR: Telemetry power fault. Possible short circuit”	The Surface Box has detected a power fault or short circuit on the telemetry connection to the down holes gauge(s). Check the electrical connection to the downhole gauge(s).
“WARNING: Input voltage may be too low for telemetry operation.”	The Surface Box firmware has measured the input voltage to the Surface Box and determined that it is too low. Please check the input power.
“Updating firmware...”	The user has selected to update the Surface Box firmware, and it is in progress.
“No devices connected or programmed.”	The initial setup of the Surface Box has not been completed. Please connect to the DataCan Download Software and set up the system.
“Error – Number of devices found is too large.”	The user has programmed more than 100 external devices. Please connect to the DataCan Download Software and correct this.
Data from some gauge(s), but not all.	If a gauge is not responding, its data will not show up on the display. Check electrical connection to the downhole gauge(s).

8 Surface Sensor Setup

This section describes how to configure the Box to read surface Modbus sensors. It is assumed you are familiar with the basic functionality of the DataCan Download Software. Each device on the sensor network needs a unique Modbus address. See the devices manual for setting the address of that device. The sensor network is separate from the user's SCADA Modbus system. There is no need to avoid using an address used on the SCADA network.

8.1 Gauge Setup – Surface Transmitter

To configure your setup you must enter supervisor mode by pressing **Ctrl+SHIFT+D** at the same time, and “- Supervisor Mode” should appear in the top bar. Once in supervisor mode, on the **Information** page, press the **Add Device** button.

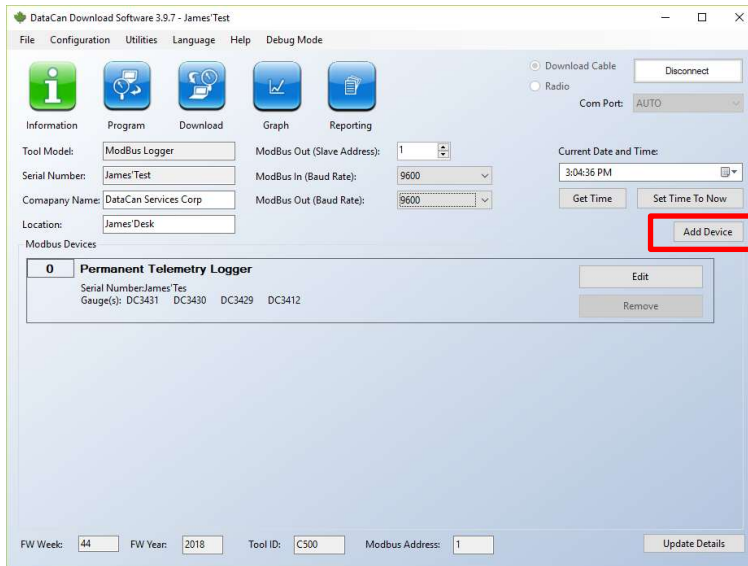


Figure 27: Add Device button.

To add a device, enter the “Modbus Address” of the device to be added and then press the **Find** button. For pressure transmitters start at address 1 and attempt to add, if unsuccessful attempt 2 through 4. If you need to set the address of a transmitter, see the manual for that device.



Figure 28: Find connected device screen.

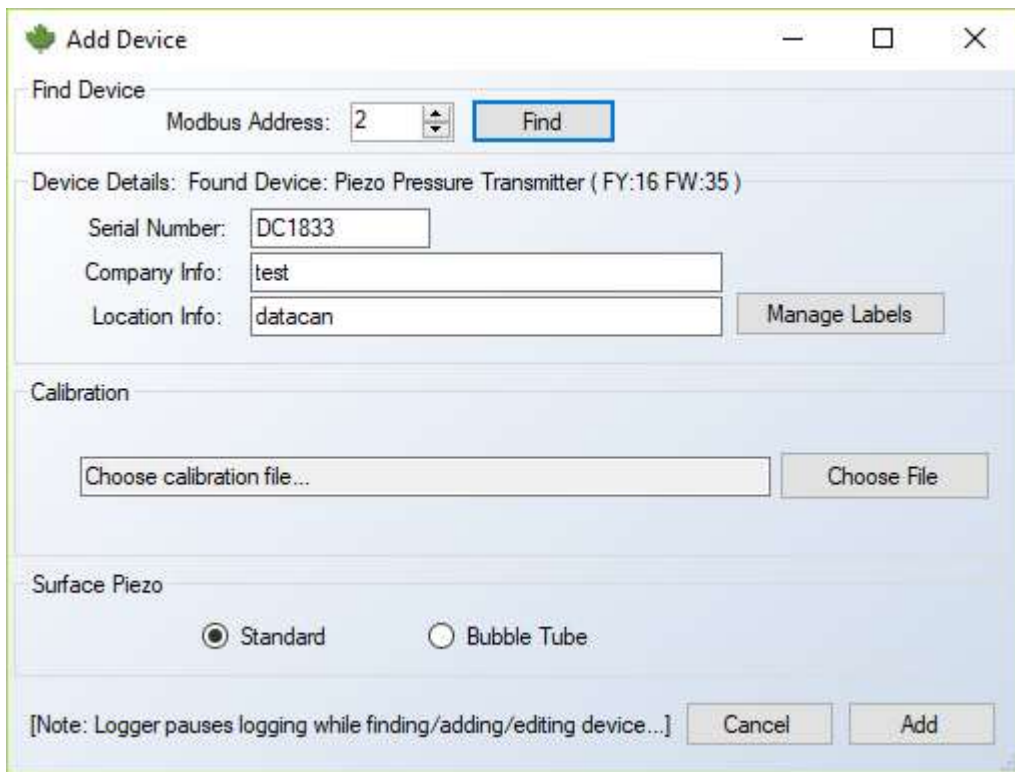


Figure 29: External device found.

Once the device is found, the user can change “Company Info”, “Location Info”, change labels, update calibration files and change various device settings. Usually only “Company Info”, “Location Info” and / or labels change when setting up a system.

After all changes have been completed, press the **Add** button. The logger will add the device to the system and restart the Surface Box.

9 Other Setup and Testing

The previous sections describe the basic functionality needed to operate and install a properly configured system. This section describes other functionality.

9.1 ModBus Out Setup (Connecting to a SCADA Network)

9.1.1 ModBus Out Connections

The Surface Box can be connected to a customer SCADA network using Modbus. The connector is labeled SCADA and a cable is provided that has wire ends of A, B, and 0V.

9.1.2 ModBus Out Settings

To change the slave address of the Surface Box or the baud rate, set the **Modbus Out (Slave address)** and **Modbus out (Baud Rate)**. Change this on the **Information** page. If any changes are made, press the "Update Details" button.

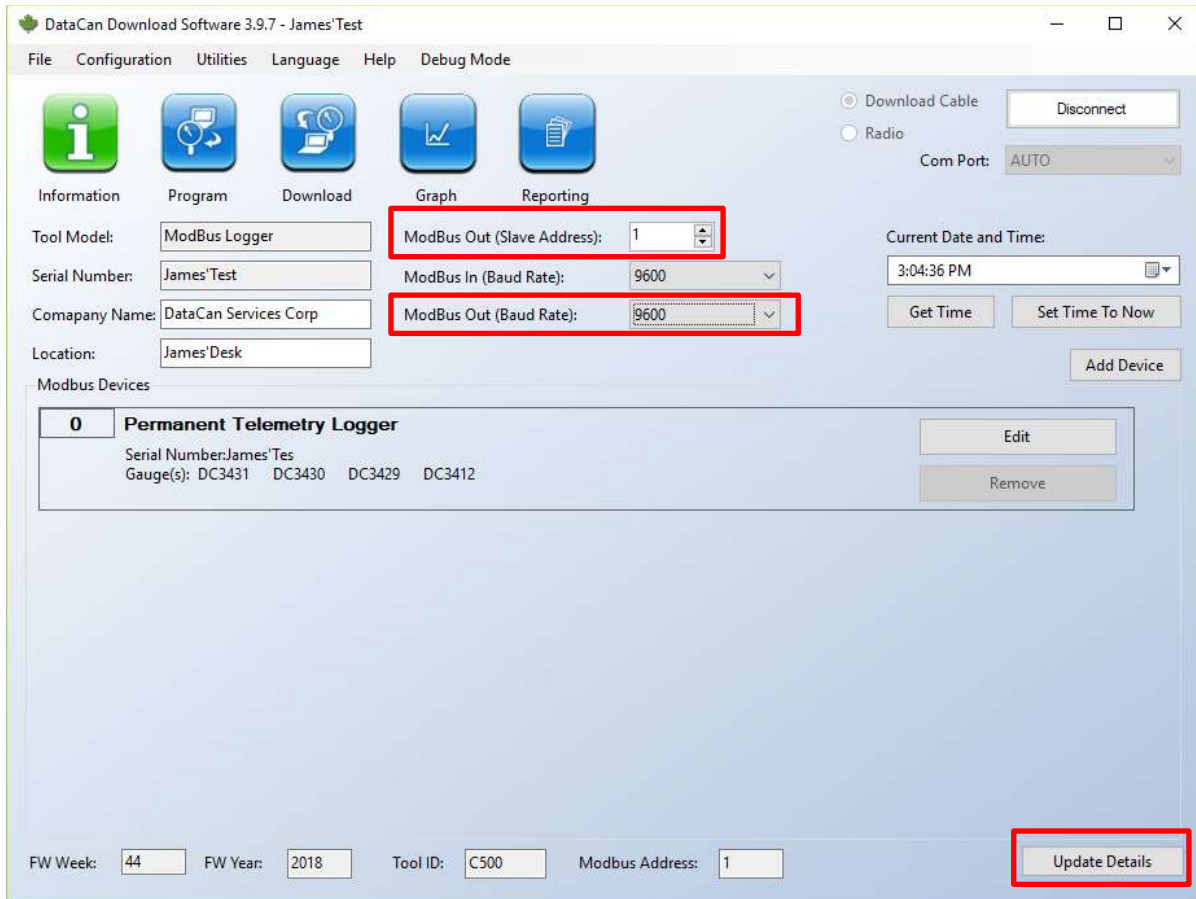


Figure 30: Modbus settings.

9.1.3 ModBus out Registers

Once all of the sensors are configured and connected to the Surface Box, the user can generate a map of the ModBus registers for all of the sensor readings. Click on **Utilities -> Generate ModBus Map (PDF)**. Note that if you change your sensor configuration your map will change.

Choose a location and file name and then save the PDF. The PDF will include all the box setup information, sensor reading registers, and reading types. Below is an example of the sensor readings Table. If the Gauge # is the same as the Surface Box Serial number then the reading is generated by the Surface Box.

ModBus reading Locations			
Register	Gauge (Label)	Reading Type	Data Type
31129	DC3569	Surface Box Input Voltage	Swapped Float
31131	DC3569	Surface Box Tool Current	Swapped Float
31133	DC3752(5000 ft)	Pressure	Swapped Float
31135	DC3752(5000 ft)	Temperature	Swapped Float
31137	DC3569		Decimal
31138	DC3569		Decimal

Table 1: Example Sensor ModBus reading locations.

9.2 Screen Settings

The screen on the Surface Box shows a maximum of two readings at a time. The readings also have a label (optional) that can be shown.

To change the way the screen works, in the main menu, select **Configuration -> Logger Setup**.

9.3 Output Voltage

The telemetry card can output either 12 Volts or 24 Volts to the tool line. Lower voltage requires less power and puts less stress on the tools, extending their life. A single tool on a line less than

7 000 m (23000 ft) should be run on 12 Volts. A pair of tools run on a line less than 4 000 m (13 000 ft) should be run on 12 Volts. If you have more than 2 tools or depths deeper then described above, you will likely need to run the system at 24 V output.

To change the tool line voltage you must enter supervisor mode by pressing **Ctrl+SHIFT+D** at the same time, and "- Supervisor Mode" should appear in the top bar. Then select *Configuration* -> *Logger Setup*.

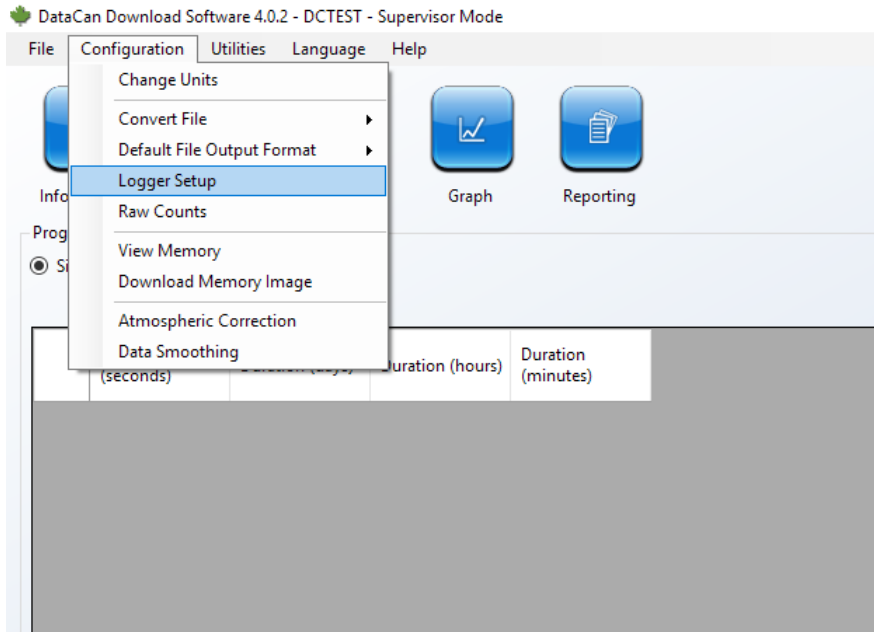


Figure 31: Select *Logger Setup*

The **Logger Setup** popup will appear. Select the desired output voltage then click **Save**.

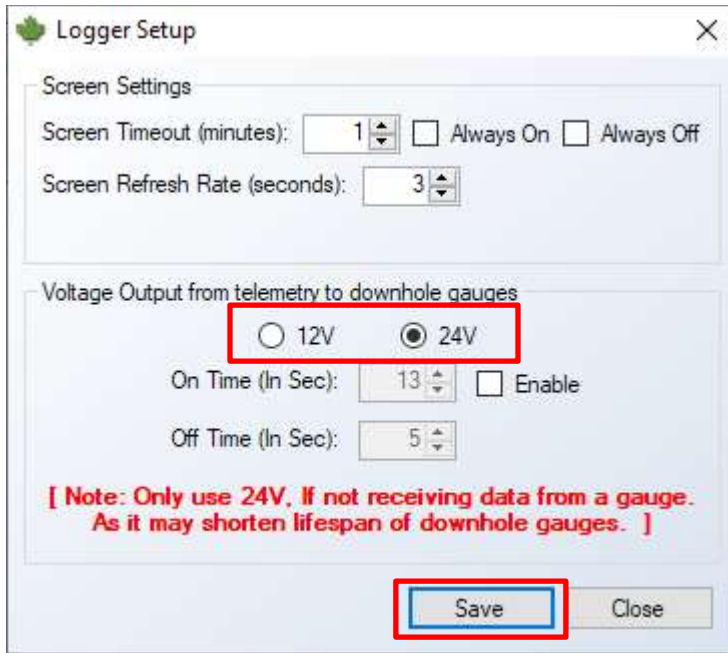


Figure 32: Select Tool Line Voltage

9.4 Power Cycle timer

WARNING: Do not set this timer until after you have finished setting up the sensor and sampling. Trying to change settings when the power is in the off phase, will not work.

The telemetry unit can turn off the power to the connected gauges. The user can set a timer to turn the gauge power on for a time and then off for a time. Turning the power off to the gauges will lower the power to 0.5W of power consumption, extending battery life if needed.

To enable the On/Off timer you must enter supervisor mode by pressing **Ctrl+ SHIFT+D** at the same time, and "- Supervisor Mode" should appear in the top bar. Then select *Configuration* -> *Logger Setup*.

The **Logger Setup** popup will appear. Click the **Enable** box and then set the on and off time in seconds. The minimum On time is 11 seconds. Once the On and Off time are set then click **Save**.

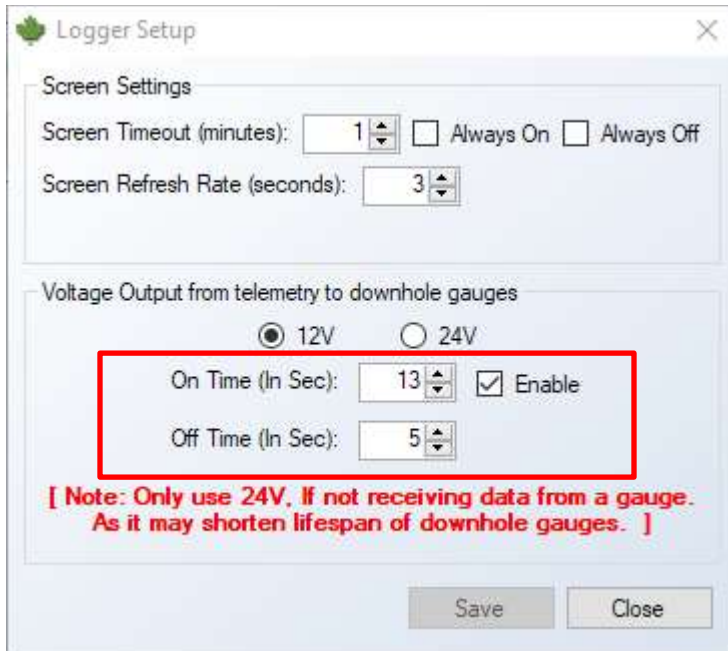


Figure 33: Logger Setup with On/Off cycle time.

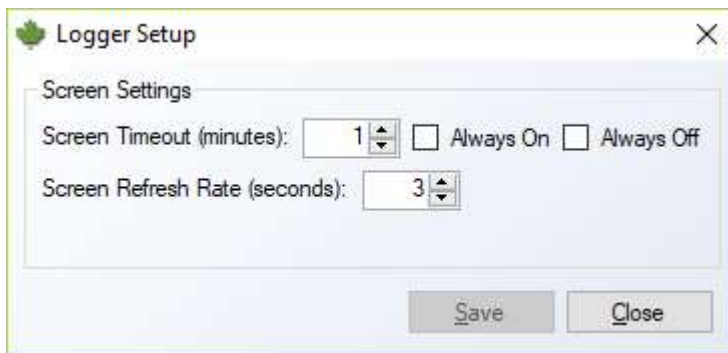


Figure 34: Screen settings.

The Surface Box screen can be set up to be **Always On, Always Off** (for data security), or to turn on for a set period of time. If the user would like the screen to stay on for a set period of time and then turn off, set the **Screen Timeout** to the number of minutes it stays on before it automatically turns off.

The **Screen Refresh Rate** sets the amount of time in seconds the current readings are displayed before the screen cycles to the next set of readings.

If any changes are made to the settings, press the **Save** button to store them to the logger.

The Surface Box has a button that, when pressed, toggles whether the screen is on or off.