VAN WALT
monitoring your needs

*vanwalt*DataSlave Manual

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1 Introduction

The DataSlave is a standalone unit which takes automated sensor measurements from industrial Modbus or SDI-12 sensors. The data can be stored internally in non-volatile memory and/or transmitted wirelessly to a receiver unit. Typically data is received by a Van Walt DataHub, a Mandar Gateway, or a Mandar USB Config Tool.

Figure 1 shows the unit with a pair of AA sized batteries for size comparison.

Figure 1 DataSlave

The enclosure is made from a solid diecast metal and rated to IP67. A Gore valve, along with up to two environmentally sealed cable glands are fitted to allow vented sensors to be safely used. The antenna is a sealed tamperproof design, bolted on from inside the enclosure. Its length allows a greater wireless range than other typical low profile tamperproof aerials. Two AA sized LR91 batteries and its low power design can keep the unit running for 18 months[1]. If the application has a more demanding power budget, then an external 12V supply can be connected to power the sensors.

A DataSlave needs configuration so that it knows how to retrieve data from sensors and what to do with the data. The configuration is done wirelessly using a USB configuration

[1] Based on a single sensor taking measurements every 15 minutes.

tool, along with a GUI on a PC. Gateway products like the Van Walt DataHub and the Mandar Gateway are used to collect data which is uploaded to the internet.

Wireless range depends on various environmental factors. The main effect on range will non-line of sight, for example if you can not see the unit site because of a building, hill or other obstacle is in the way. Other factors that impact range are antenna height, metal structures, and buildings to name a few. You could expect greater than 30km line of sight at good elevation, or only a few kilometers in a built-up dense town centre.

2 Hardware

Inside the unit all the user accessible parts are clearly labelled. All wired interfaces apart from the antenna connection, are Weidmuller Omnimate 5.08mm pitch connectors. This allows the screw terminals to be easily removed to attach wires. Figure 2 show's all connectors fitted.

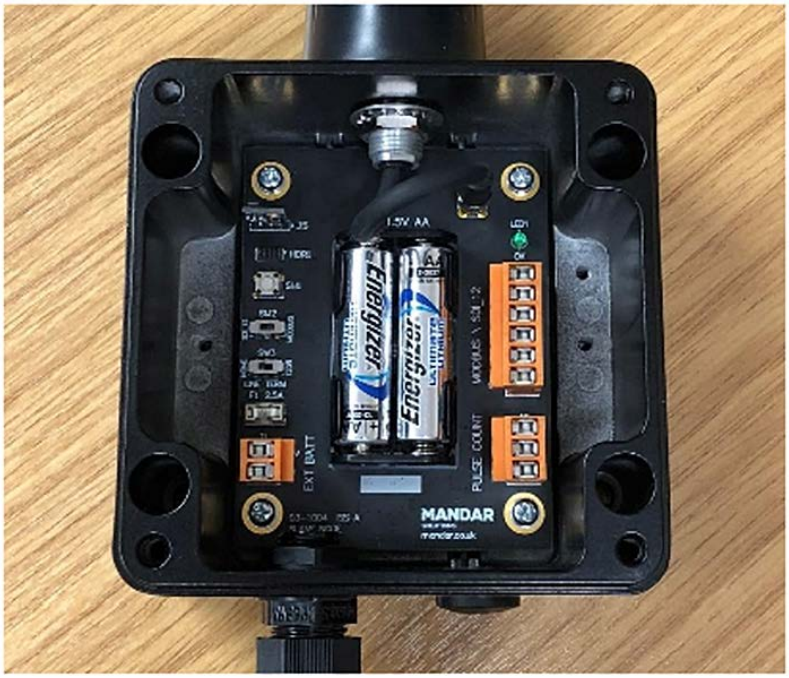

Figure 2 Inside the DataSlave

2.1 User hardware interfaces

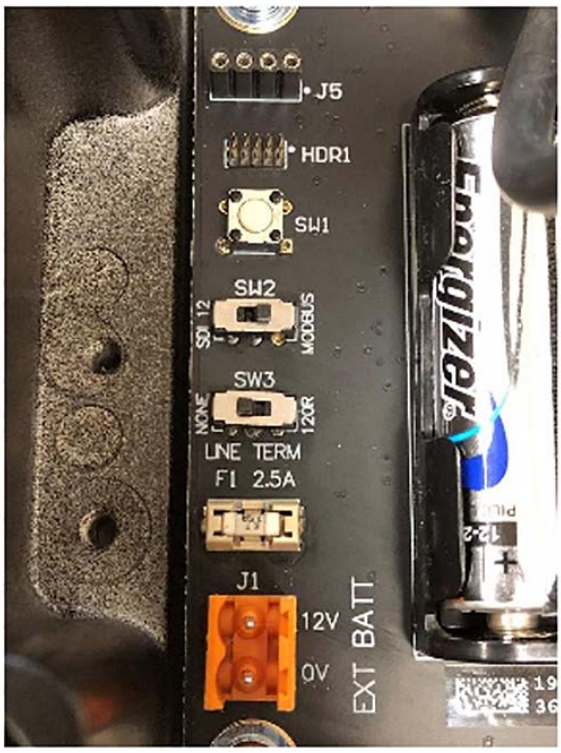

Figure 3 Fuse, switches and button

2.1.1 SW1 push button

SW1 has two primary uses.

2.1.1.1 Wireless link check

When the unit is powered and a receiver is in range, a single press of the button will transmit a wireless message. If an acknowledgement from a DataHub/Gateway product is received the LED will blink briefly.

2.1.1.2 Factory reset

To reset all settings of the unit back to when it left the factory; remove the batteries, hold down the button, and re-insert the batteries. Keep holding the button down for at least 10 seconds until the LED has stopped strobing. Please note sensor data stored in the datalogger memory will not be deleted, to prevent accidental loss of data. The date and time will also be reset.

2.1.2 SW2 SDI-12/Modbus switch

SW2 selects in which mode the sensor interface works. This must be set based on the sensor connected.

2.1.3 SW3 Line termination switch

In some instances, the Modbus serial bus will need to be terminated. SW3 inserts a 120 Ohm resistor across D+ and D-. In the interests of saving power, it is recommended to only use the termination if the sensor requires it. In most cases it should not be required.

2.1.4 J1 External sensor supply interface

The DataSlave can power the vast majority of industrial sensors from the internal AA batteries through its specially designed switched mode boost power supply. There may be an application that is a little more demanding, for example the sensor requires more than 75mA. J1 allows an external 12VDC sensor supply to be added. This supply is fed through to the Modbus/SDI-12 connector. Please note that this external supply does not power the rest of the internal hardware, so the internal AA batteries will still be required.

2.1.5 Factory headers

The J5 socket and HDR1 header are reserved for factory setup and future expansion use only.

2.1.6 LED1

LED1 performs a useful visual indication for diagnostic purposes.

2.1.6.1 Power on

When the DataSlave is powered on, for example inserting the internal batteries, the LED will blink three times.

2.1.6.2 Factory reset

During a factory reset procedure as described in 2.1.1.2, the LED will strobe at increasing frequency for 10 seconds to give warning.

2.1.6.3 Acknowledgement

A simple single blink will occur if SW1 has been pressed and the DataSlave received an acknowledgement from a remote receiver such as a Van Walt DataHub, a Mandar Gateway or a USB Configuration Tool.

2.1.6.4 Fault

A continuous fast flash indicates that a fault has occurred. The unit will indicate a fault for up to 30 seconds before it will reboot to try to correct any issues.

2.1.7 J4 Sensor interface

J4 is the main interface where Modbus and SDI-12 sensors are connected. Please ensure that SW2 is set to the correct position otherwise the DataSlave will not be able to communicate with the sensor. 12V is a switched supply which originates from either the internal supplies, or the external supply if an external 12V supply is used.

Figure 4 Modbus and SDI-12 interface

2.1.8 J3 Pulse count interface

The pulse counter interface is reserved for future use. Please do not connect anything to this interface.

2.2 Internal serial label

An internal serial label is located at the bottom of the internal battery holder. The code uniquely identifies the product.

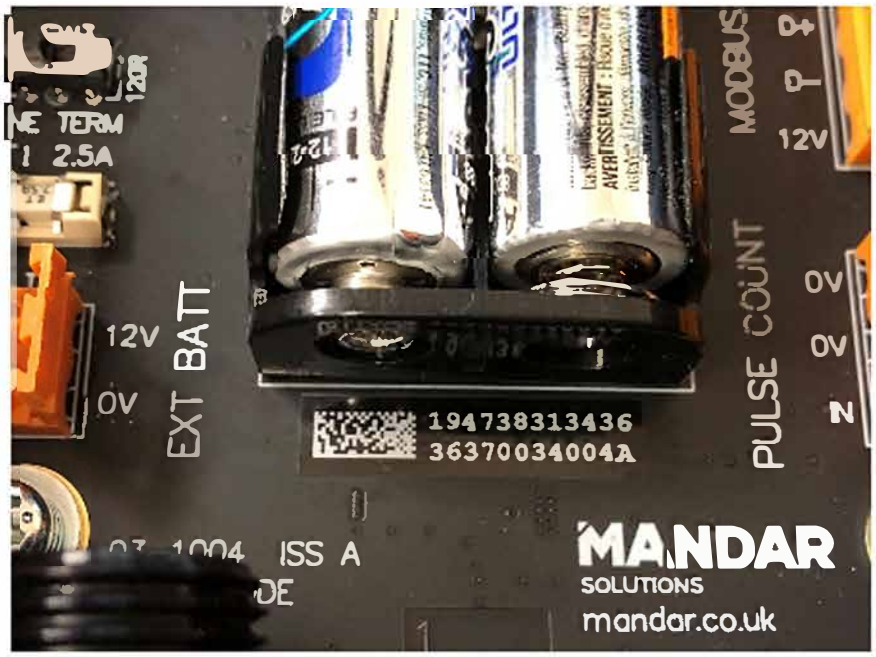

Figure 5 Internal serial label

3 Configuration

A PC GUI is used to configure units. It is a portable standalone executable. A USB configuration tool is required to wirelessly communicate with a DataSlave.

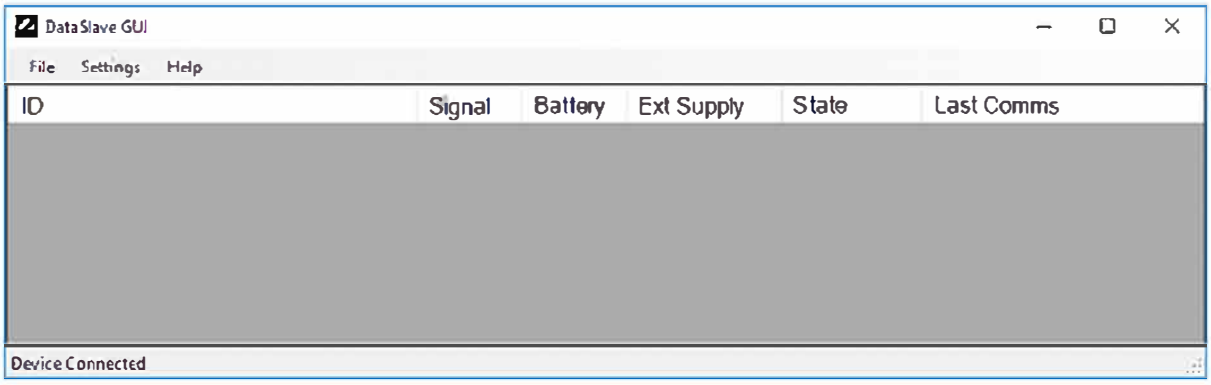

Figure 6 GUI main window un-populated

3.1 USB configuration tool

The USB configuration tool is a small rugged portable USB device which allows a computer to communicate wirelessly with DataSlaves.

Figure 7 USB config tool

Connect the tool to the computer and select the COM port from the settings menu.

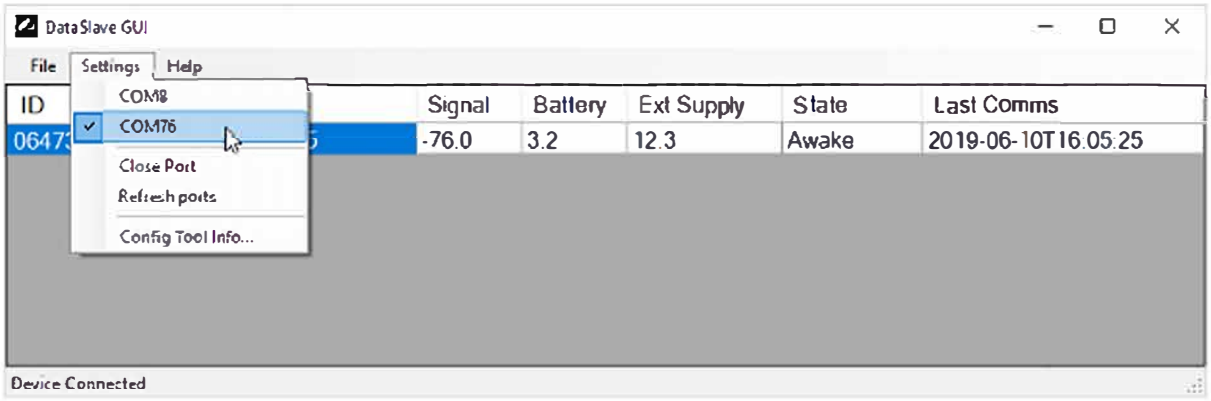

Figure 8 Select COM port

The connection state of the tool is displayed in the status bar at the bottom of the main window. To view more information about the tool, select 'Config Tool Info..' in the settings menu.

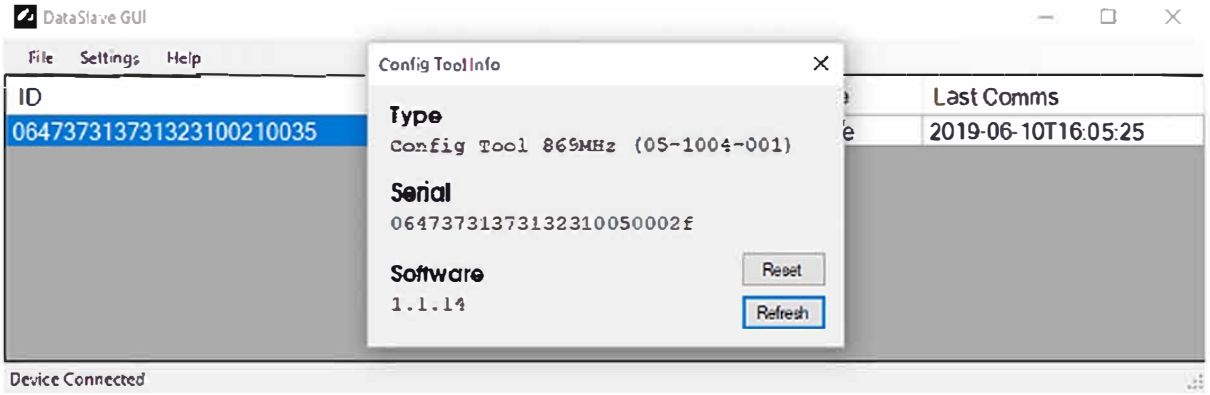

Figure 9 Config tool info

The GUI will populate cells with data as it is received from DataSlaves. The time it takes data to appear, depends on the unit configuration.

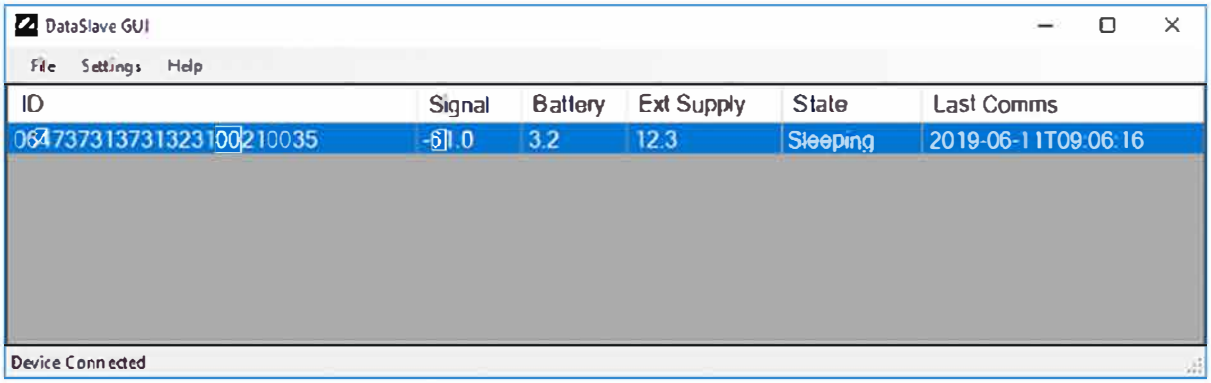

Figure 10 GUI main window populated

Units can be cleared from the table by either selecting 'Clear table' in the File menu, or by right clicking on a row and selecting 'remove unit from list' as shown in Figure 11 and Figure 12.

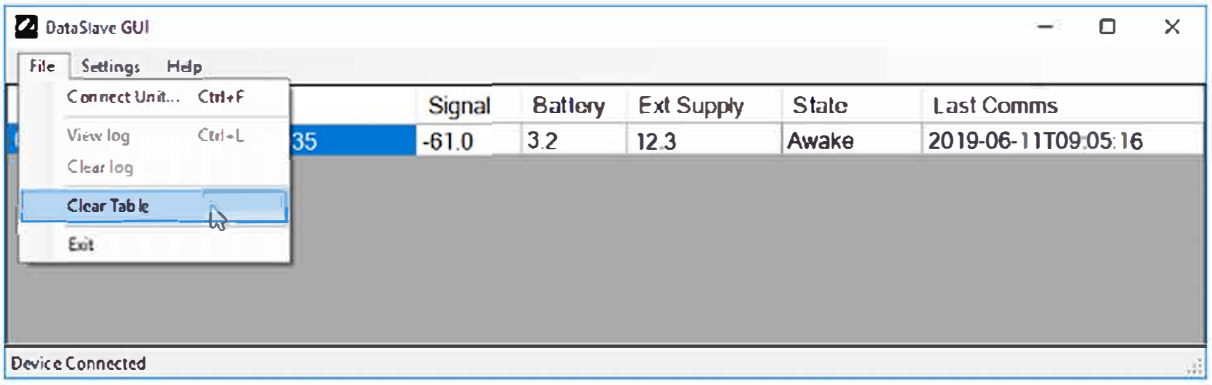

Figure 11 Clear table

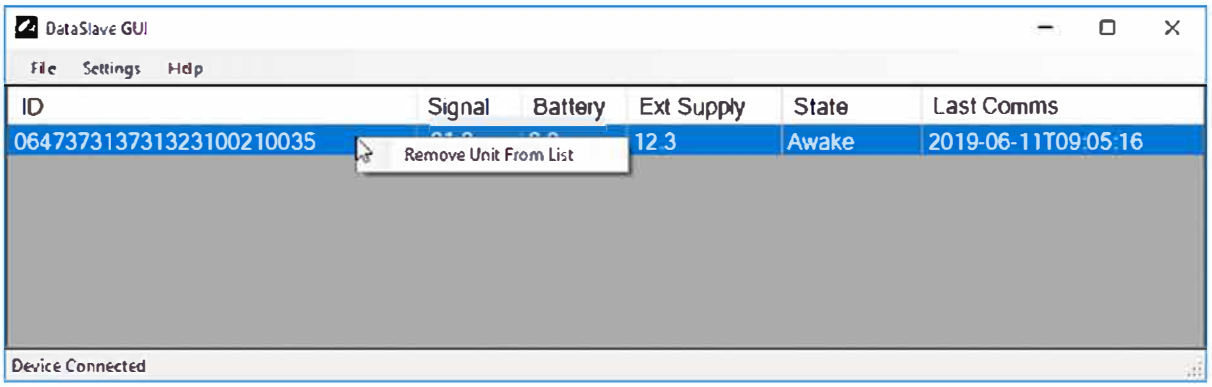

Figure 12 Remove unit from list

If the unit sends more data, it will be re-added to the table automatically.

3.2 Start communication

Several methods can be used to wake a DataSlave from low power sleep mode. A DataSlave will not communicate, other than sending data samples, unless a code unique to the unit has been provided by the user. These codes are pre-programmed and supplied with each device.

3.2.1 Push button

If the push button is pressed the unit will send a configuration request to the GUI and remain awake for 60 seconds. The GUI will attempt to communicate with the device and prompt the user for the 6-digit code if one is required.

3.2.2 Power cycle

By removing the batteries and replacing them, the unit will boot up and transmit a data sample to the GUI, stay awake for 60 seconds, then go to its low power mode. It will not request configuration. A caveat of a power cycle is the date and time will be reset.

3.2.3 Connect unit

The primary method to start communication with a DataSlave is to use 'Connect Unit...' in the File menu.

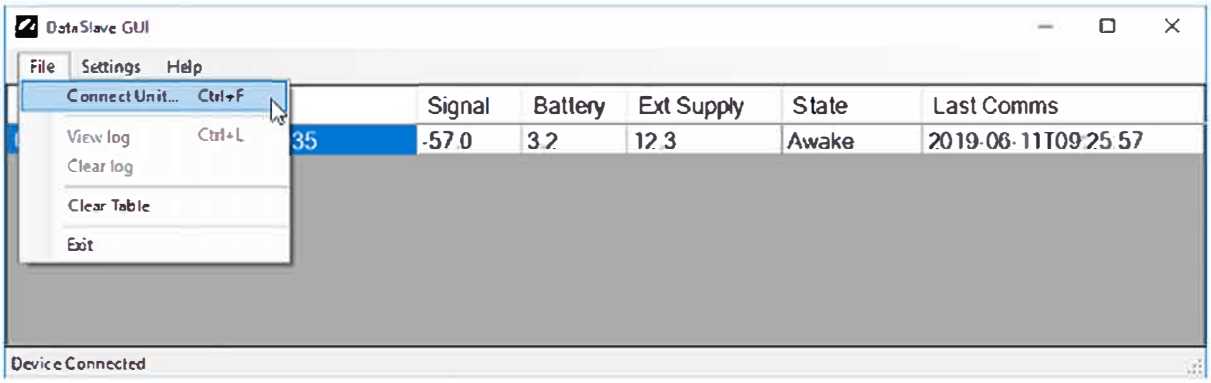

Figure 13 Connect Unit

This will open the connect window, where you can enter the 6-digit code supplied with the unit. If you do not have this code, please contact your seller.

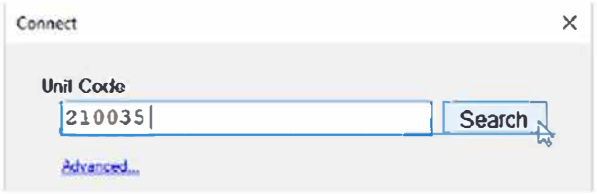

Figure 14 Connect window

The advanced section will reveal a box to additionally enter the serial number of the device. This is not required unless technical support ask you to do so.

Once the code has been format checked by the GUI, it will send out a request to all units in RF range. This process takes about 5 seconds.

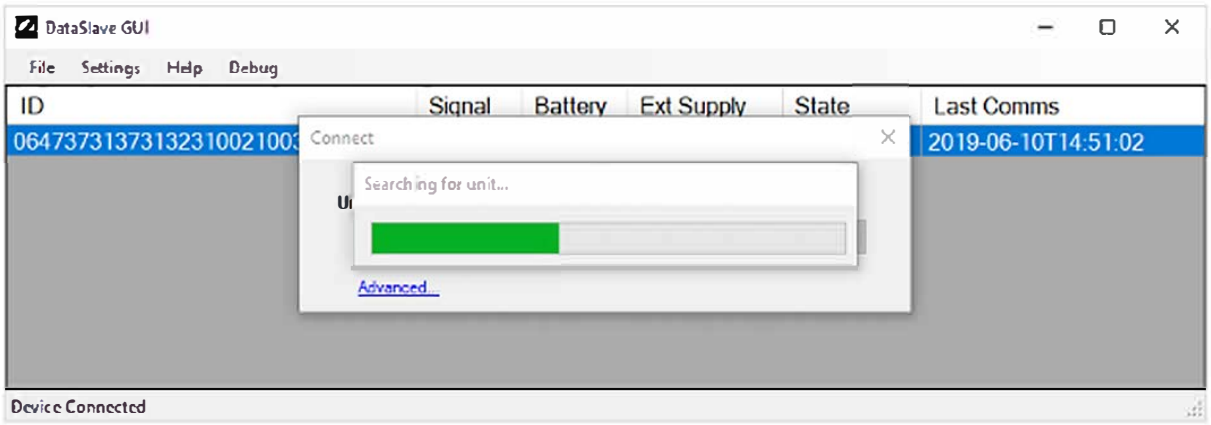

Figure 15 Searching for unit

If a unit with a matching code receives the request, it will wake up from low power mode, then the DataSlave Configuration window will open and begin downloading the current unit configuration.

3.3 DataSlave configuration window

3.3.1 Side bar overview

On the right-hand side of the window is an overview of the connected DataSlave. Most fields are selectable for ease of copying and pasting. 'Node state' displays if the remote unit is 'Awake' or 'Asleep'. The GUI will keep the unit awake for you whilst this window is open. Frequency is not user modifiable.

3.3.2 Date and Time

Inside the DataSlave is an accurate RTC. If the AA batteries lose too much charge, or if the batteries are removed, even briefly, the date and time will be lost.

The current date and time of the PC, including current time zone is set in the DataSlave by clicking on the 'Set Current Date and Time' button. Click 'Refresh' to get an instant readback of what has been set. To enter a custom date and time, fill in the section at the bottom and click 'Set'.

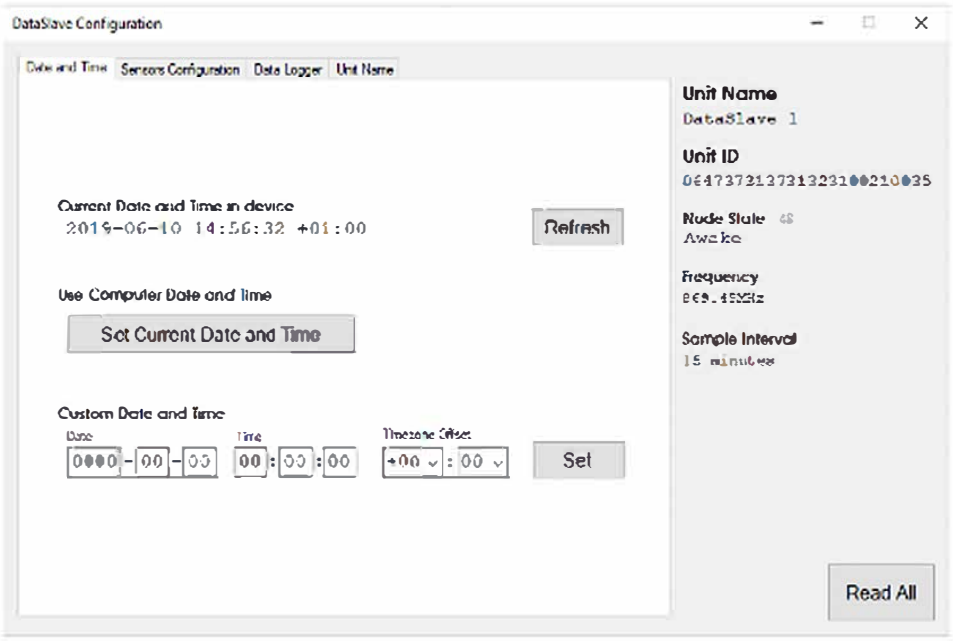

Figure 16 DataSlave Configuration Date and Time

3.3.3 Sensor configuration

The sensor configuration section is where all the Modbus or SDI-12 sensor configuration is entered.

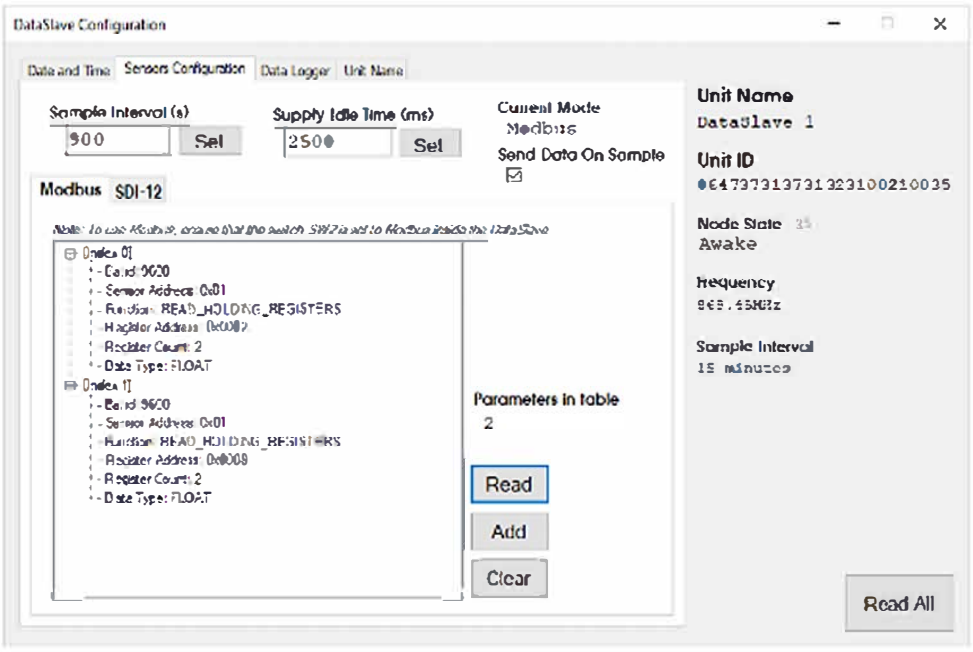

Figure 17 Sensor Configuration

3.3.3.1 Sample Interval

'Sample Interval' is the period between sample cycles in seconds. The minimum is 10 seconds, and maximum is 7 days (38404800 seconds).

3.3.3.2 Supply Idle Time

To save power, sensors are completely turned off when readings are not taking place. 'Supply Idle Time' is the period of time after the power to the sensors is applied before communication with the sensors begin, in milliseconds, to allow the sensors to become ready. Please consult your sensor manufacturer for this period. Most sensors require at least 1000ms (1 second). If the period is set un-necessarily high, it will have an impact on the battery life of your unit.

3.3.3.3 Current Mode

'Current Mode' reflects the mode of the serial sensor bus and is a direct reflection of the state of SW2 inside the unit.

3.3.3.4 Send Data On Sample

In some instances it is not necessary to transmit the sensor data, for example when the unit is standalone, logging data, with no DataHub or Gateway in range. Not sending data will save power. When this feature is enabled (checked), after each sample cycle, the data is sent immediately. This feature has no effect on the data logger.

3.3.3.5 Modbus table

Modbus configuration is displayed in tree form. An example is shown in Figure 18.

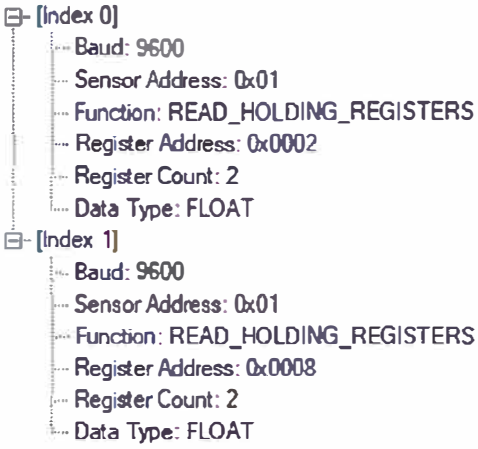

Figure 18 Modbus Table

Click 'Add' to add a new item to the table. For ease of configuration a small selection of preset sensors are available. Please consult your sensor manual to enter the correct details.

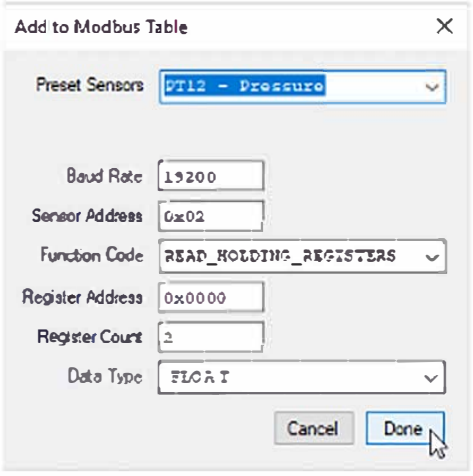

Figure 19 Modbus Add

Some Modbus sensors require delays between commands, for example an INWUSA PT12 sensor requires a dummy read holding register command followed by a delay, then another read holding register request to get an up to date reading having just been powered on. To add an inline delay between commands, select 'CUSTOM_TIME_DELAY' from the function code drop down box, and enter a number of milliseconds in the register address box.

To issue dummy commands to a sensor and ignore the response: select data type 'DUMMY_COMMAND'. All commands with a data type other than dummy command, will count towards the number of parameters/samples taken during a sample cycle.

3.3.3.6 SDI-12 table

SDI-12 configuration is displayed in tree form. An example is shown in Figure 20.

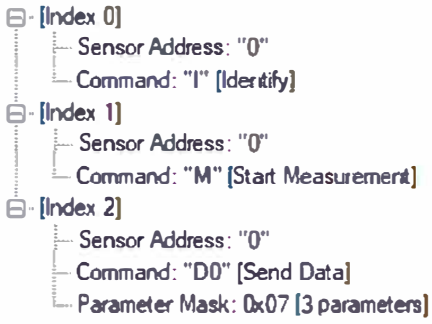

Figure 20 SDI-12 Table

SDI-12 sensors are quite forgiving in the complexity of setup. In most instances, all you need know is the address, and measurement/send data sequence, which is detailed in the sensor manual.

An SDI-12 send data request can often return more than one data sample. Select the samples that you wish to capture by checking the boxes. For example if a sensor returns 3 data points, "Pressure, Temperature, and Voltage" and you wish to capture only Pressure and Voltage, check '1st' and '3rd'.

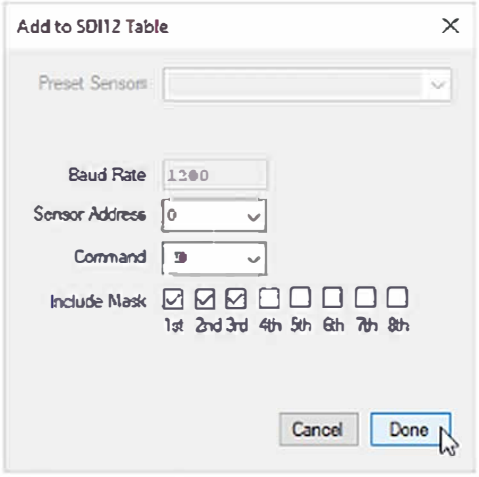

Figure 21 SDI-12 Add

3.3.4 Data logger

Each DataSlave contains non-volatile memory, capable of storing several months' worth of data. The number of records depends how many data samples are taken on each sample cycle.

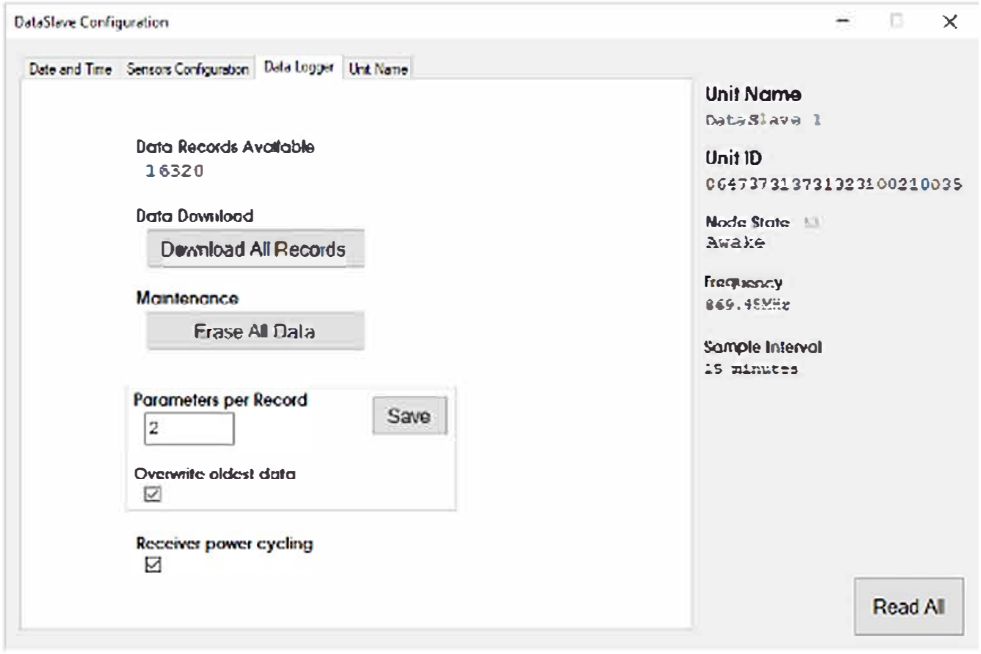

Figure 22 Data Logger

3.3.4.1 Data Records Available

This field displays how many populated records are available for download. Table 1 shows the number of records that can be achieved, at a sample interval of 900 seconds (15 minutes).

Table 1 Example Data Logger Record Counts

Parameters	Records	Months
0	32640	11.15
1	21760	7.43
2	16320	5.57
3	13056	4.46
4	10880	3.72
5	9325	3.18

3.3.4.2 Data Download

To download all records, click 'Download All Records'. When the download is complete, the GUI will check for any missing records and automatically re-request them if necessary. The GUI will prompt where to save the output data file. For best results, first check that the signal level in the main window for your unit is at a reasonable strength. If

the signal is too weak, the process will take much longer and could fail. Data remains in the unit after a download.

3.3.4.3 Erase All Data

The only method of deleting data from the unit is to click on the 'Erase All Data' button. Not even setting the unit factory defaults will erase your data. After erasing all data, the data is un-recoverable. The process will take up to 30 seconds. Once complete the data logger remains in an inactive state. To reactivate the data logger, save the data logger configuration.

3.3.4.4 Parameters per Record / Overwrite data

Only while the data logger is in the inactive state (erased) can the data logger configuration be modified. 'Parameters per record' relates to the number of parameters from the sample cycle that are being recorded. In almost all instances, this should directly match what has been configured in the selected sensor table. For example, if the sensor table is configured to take two measurements, the data logger should be configured to two parameters per record. If 'Overwrite oldest data' is checked, and the data logger is full, it will loop around and start overwriting the oldest data, one record at a time for each new record. If the data logger is active (not erased) the DataSlave will not allow you to change these settings.

When the data logger has been erased, to begin logging once again, you must check and save the configuration.

3.3.4.5 Receiver power cycling

This feature is available to save battery power. Receiver cycling is used to wake the DataSlave when you have no physical access to wake the unit by pressing the button inside. The feature wakes to the receiver to check for messages every few seconds. You may wish to disable this feature if you are not using the data logger and instead sending 'live' data samples to a DataHub or Gateway, and/or the unit needs no re-configuration. Please note: if this option is disabled, when the unit returns to low power sleep it will not respond to the connect request, unless you wake it by pressing the internal push button.

3.3.5 Unit name

Unit name allows you to name the unit to help identify it. Up to a maximum length of 20 characters can be used. Valid input consists of ASCII symbols, numbers (0-9) and letters (a-z/A-Z) (ASCII 0x20 to ASCII 0x7E).

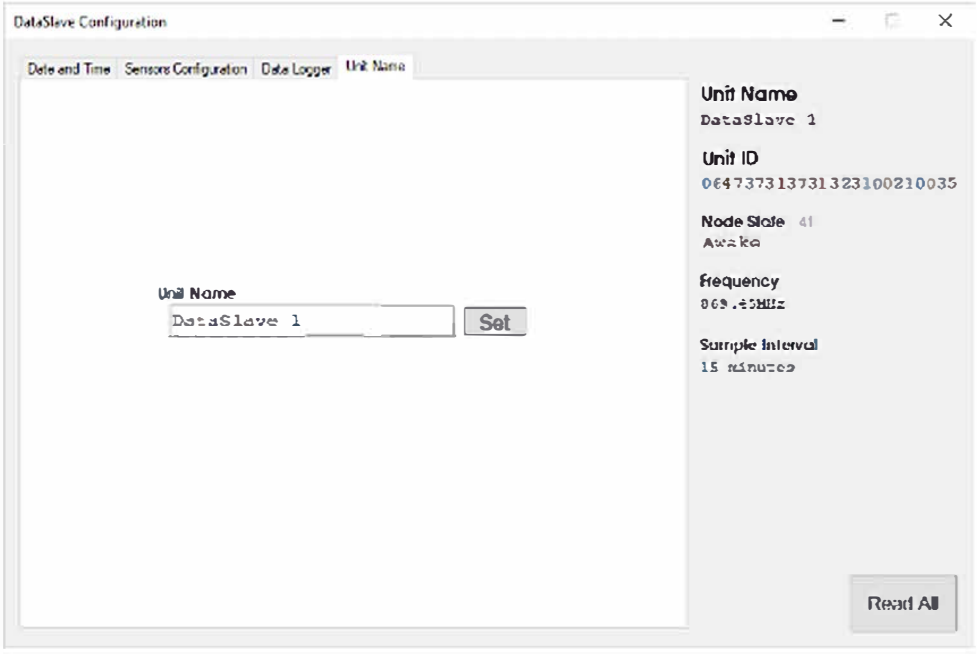

Figure 23 Unit Name

Appendices

Appendix A: Definitions

Term	Definition
AA	A common battery size
ASCII	American Standard Code for Information Interchange. A common format for computers
GUI	Graphical User Interface
LED	Light Emitting Diode
MHz	Megahertz. A unit of frequency. (10^6 Hz)
Modbus	Digital serial interface for intelligent sensors
PC	Personal Computer
RF	Radio Frequency
RTC	Real Time Clock. A device for keeping track of time.
SDI-12	Digital serial interface for intelligent sensors
USB	Universal Serial Bus. A communications technology

Appendix B: Document Revision History

Revision	Description of Change	Author(s)	Date
V1.0	Initial Release	D. Manning	12/06/19