



RST INSTRUMENTS LTD.

VW2106
VW Readout
Instruction Manual

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VW2106 VW Readout Instruction Manual

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Installation Manual

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1 OVERVIEW

The RST VW2106 Vibrating Wire Readout represents the next generation in vibrating wire readout devices. It's lightweight, yet extremely rugged design is perfectly suited for harsh environmental conditions often encountered in the field. Furthermore the VW2106 is extremely easy to use with a USB interface for downloading data. The readout uses 3 standard AA alkaline batteries which are field replaceable, negating the need to return the readout to the factory for battery replacement. The use of standard AA batteries eliminates the need for a charger.



Figure 1 – VW2106 Readout

- | | |
|---|---|
| 1. USB Connector | 6. Scroll Down |
| 2. Large Character LCD display | 7. Enter |
| 3. Backlight (Hold for Engineering Units display) | 8. Terminal Strip (for sensor connection) |
| 4. ESC (navigates back a menu) | 9. Expansion Port (VW Load Cells and external Multiplexers) |
| 5. Scroll Up | |

2 QUICK START INSTRUCTIONS

The instructions for performing a manual reading on a Vibrating Wire Piezometer (i.e. not storing to memory) are simple and straightforward:

1. Connect the Piezometer to the terminal block (Figure 1)
2. Turn display on (press any key)
3. Wait a few moments for unit to startup
4. Record the displayed reading (B-units and Temperature).

Note

Step 4 (above) is assuming the Monitor Settings are set to *default*. The VW2106 has the ability to custom configure the readout settings so that engineering units can be displayed. Please refer to the Multireadout Host Software Instruction Manual for more information.

3 POWERING ON/OFF

The VW2106 readout can be powered on anytime by pressing any key. The unit can be powered off manually or automatically. To power off manually, use the up/down arrows to scroll to the following screen:

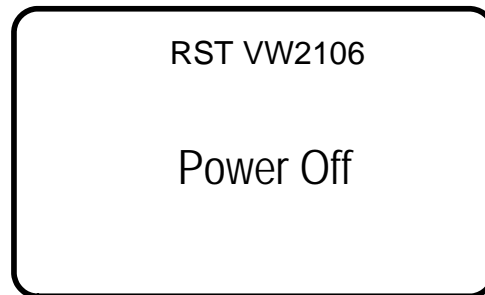


Figure 2 – Manual Power Off

- Press *Enter* and the unit will turn off.
- To adjust the automatic power off settings, navigate to the *Auto Off* screen as shown below:



Figure 3 – Auto Off Screen

- Press *Enter* and the following screen will appear:

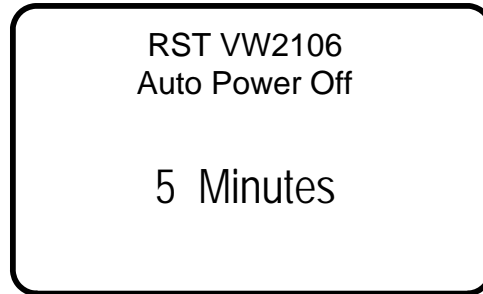


Figure 4 – Auto Power Off Time

Use the arrow keys to scroll to the desired auto power off time. Please note that the auto power off feature is always active and cannot be disabled. This is to conserve battery life. The default is 5 minutes. The next screen prompts to set the Auto Backlight Off:



Figure 5 – Auto Backlight Off

Use the up/down scroll buttons to adjust. The Auto Backlight Off screen is followed by the *Speaker On Time*:

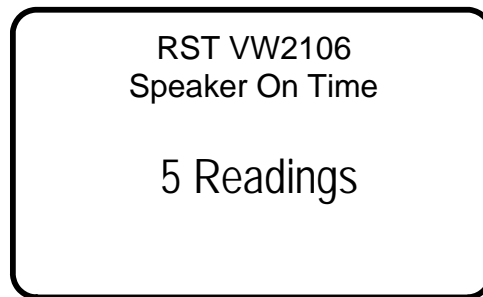


Figure 6 – Speaker On Time

Use the up/down scroll buttons to adjust. Press *Enter* and you will be returned to the previous menu.

4 VW2106 FRONT PANEL CONTROLS

4.1 Startup

Upon powering on the unit (by pressing any key), an opening screen will appear showing the RST Instruments logo. If the user wishes to view the details of the readout *press any key* immediately and the following will appear:

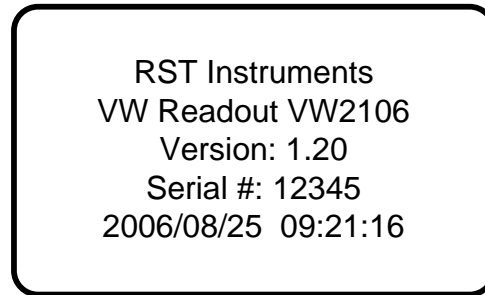


Figure 7 – VW2106 Readout Details

This displays the model, version number, serial number and the current date/time settings. It is always a good idea to ensure that the date and time are correct, as this may affect any readings being stored in memory on the unit. Refer to section 4.2 for setting the date and time.

If no keys are pressed after power on, the unit will default to readings screen as shown below.

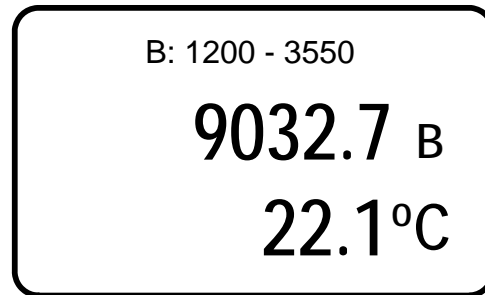


Figure 8 – Readings Screen

The readings screen displays the current sweep settings and reading on the VW instrument and its internal thermistor (assuming an instrument is connected). The default units are B units ($f^2 \times 10^{-3}$) and degrees Celsius. Temperature units can be changed if desired (section 5).

4.2 Setting the Date & Time

Keeping the date and time current ensures that you have accurate historical records of your VW data. Whenever a reading is taken and stored in the units' memory, an associated date/time stamp is always included.

- Turn on the readout by pressing any key.
- Using the arrow keys, scroll down to the *Set Time* screen and press *Enter*:

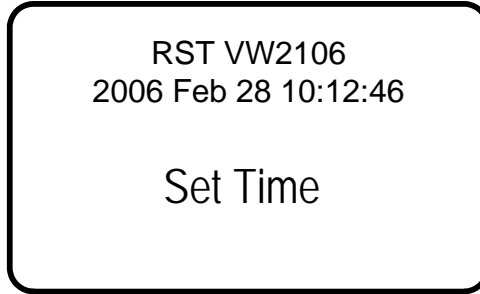


Figure 9 – Set Time

- The current editable data field will have an underline, use the arrow keys to modify the field and press enter when complete (pressing enter cycles through each field).

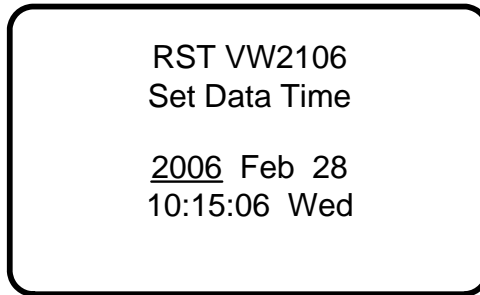


Figure 10 – Date/Time Set

- When complete the program will exit to the main menu screen.

4.3 Connecting Single Field Instruments

The standard wiring for an individual vibrating wire transducer consists of two pairs of wires plus an additional shield. The following table outlines the color codes:

Red	Coil +
Black	Coil -
Green	Therm +
White	Therm -
Bare	Shield

Flip up the gates on the quick connect terminal strip (Figure 1) and insert the stripped ends of the cable matching color for color. Close each gate to secure the wire. If needed, RST can supply a cable with alligator clips for instrument connection.

Note

Applying solder to the bare ends of the cable aids in reducing fraying over time. All RST sensors are pre-tinned from the factory.

4.4 Multi-Channel Connection

The VW2106 contains an internal multiplexer allowing it to be connected to multi-channel instruments through its *Expansion* connector. Appendix B – Expansion Connector Pin-out provides the pin-out of this connector. Mating halves of the connectors are available through RST if your current sensors are not equipped with the appropriate connector.

The most common instrument with multiple channels is a Load Cell. Typical load cells have either 3 or 6 Vibrating Wire sensors with a common thermistor. During location setup, the number of sensors can be specified. Please refer to sections 5 & 7.

The expansion connection also has the ability to control external multiplexers which could facilitate connecting multiple single channel instruments at the same time. For specific applications and configurations please contact RST Instruments.

5 MONITOR SETTINGS

Various parameters of the VW2106 readout can be adjusted by selecting the *Monitor Settings* menu as shown below:

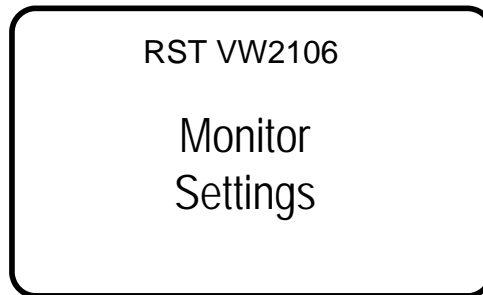


Figure 11 – Monitor Settings

- Press *Enter* to choose whether a custom or predefined setting is required.

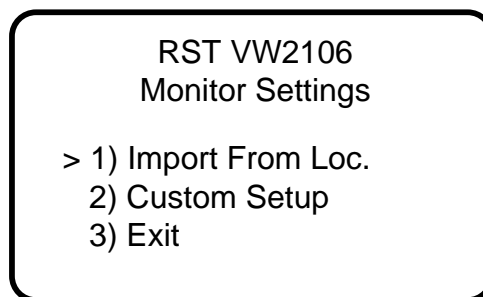


Figure 12 – Monitor Settings Options

5.1 Import From Loc. Option

If the *Import From Loc.* option is chosen (selecting option 2 and pressing *enter*), the screen will advance to the location screen (i.e. Figure 24), assuming at least one location was defined. If no memory locations currently exist in the readout's memory, a screen will appear stating "No Locations". Each location has its own specific settings such as: number of sensors; thermistor type and sweep frequency. Use the arrow keys to scroll to the location which you would like to set the monitor settings to. Press *enter* when complete. The location label will appear at the top of the screen indicating location settings currently in use.

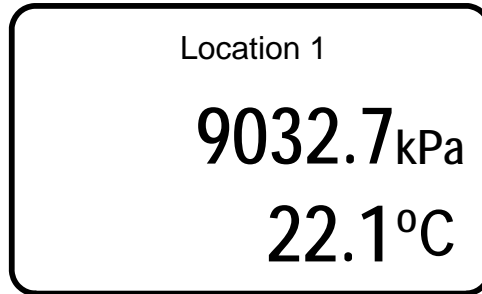


Figure 13 – Predefined Monitor Options

Note

Press Backlight button for more than 3 seconds to switch between Engineering Units and B Units monitor display. Engineering units calibration can only be set using the Multireadout Host Software, please refer to the Host Software manual for further information.

5.2 Custom Setup

- If the *Custom Setup* is chosen (option 1 and pressing *enter*), the screen will advance and prompt for the number of sensors.
- Press *Enter* to select the number of sensors connected. Under most circumstances this will be set to 1 sensor connected to terminal strip. Alternatively, sensor number can be set to *1 Sensor Expansion* and single sensor connected to expansion connector. Expansion connector is automatically enabled when more than one sensor is selected. Load Cells will typically have 3 or 6 sensors.

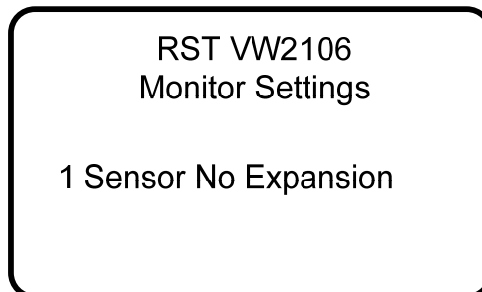


Figure 14 – Sensor Number

- Press *Enter* to choose the sweep frequency.

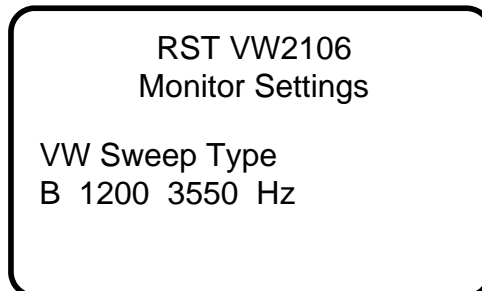


Figure 15 – Sweep Frequency

- Use the Up/Down arrows to choose the appropriate sweep frequency based on the type of Vibrating Wire Transducer connected. For most cases, this should be left at the default setting of 1200-3550Hz (as shown above). Below is a table indicating the various sweep frequencies available:

A Sweep	450-6000Hz	Wide Sweep
B Sweep	1200-3550Hz	Piezometer, Strain Gauge, Borehole Stressmeter, Jointmeter, Crackmeter, Displacement, Settlement, Temperature, Load Cells
C Sweep	450-1200Hz	Strain Gauge (Arc Weldable)
D Sweep	450-1200Hz	Strain Gauge (Embedment)
E Sweep	1000-3600Hz	Strain Gauge (Spot Weldable)
F Sweep	2500-6000Hz	Borehole Stressmeter
U Sweep (user specified)	1200-3550Hz	Any

Figure 16 – Sweep Frequencies

Note

“U-sweep” is a custom user specified sweep frequency. This can only be set in the Multireadout Host Software, please refer to the Host Software manual for further information.

- Press *Enter* when the desired sweep frequency is chosen.
- Next, choose the *Thermistor Type*:

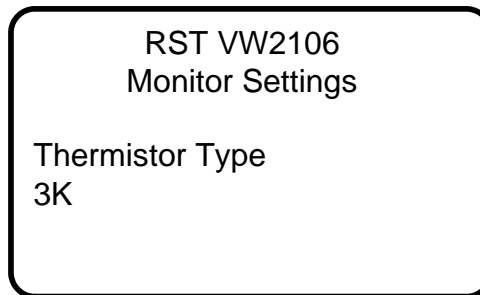


Figure 17 – Thermistor Type

- Use the up/down arrows to select the appropriate thermistor. Options include 2252, 3K, 10K and RTD. For most cases, the default “3K” thermistor should be chosen. RST Vibrating Wire instruments contain 3K thermistors (unless a custom order is made). Press *Enter* when complete.
- Select the desired display units (Centigrade/Fahrenheit):

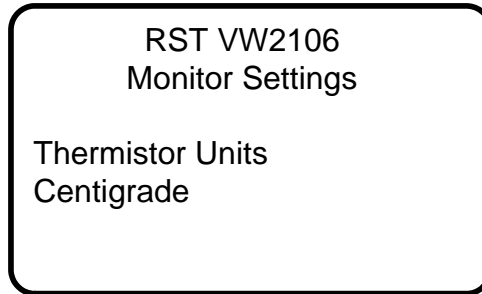


Figure 18 – Thermistor Units

- Press the up/down arrow keys to select and press *Enter* when complete. The unit will return to the previous menu.

6 MANUAL READINGS

The following instructions outline the basic steps needed to take a manual reading with the VW2106 readout:

- Connect the VW instrument leads to the quick-connect terminals. Match the wires color for color.
- Turn on the readout by pressing any key.
- The readout will go through its startup procedure, and automatically default to the reading screen.
- The VW B-unit reading ($f^2 \times 10^{-3}$) will appear along with the temperature ($^{\circ}\text{C}/^{\circ}\text{F}$).
- Record the reading and move onto the next instrument.
- If required, the user can listen to the VW coil by simultaneously pressing the up/down arrows. Hold for several seconds and a speaker icon will appear on the display. This can be a useful check to verify if the VW coil is functioning correctly. For more information please refer to section 8.
- Manual readings on sensors which contain multiple gauges (i.e. load cells) are performed by connecting the instrument to the *Expansion* port with the appropriate connector (section 4.4).

For memory functions, please refer to section 7.

7 STORING READINGS IN MEMORY

The VW2106 has 128k of internal memory allowing it to store over 11 000 time-stamped, VW and Thermistor readings. The current memory usage is displayed on *Memory* screen, as shown in Figure 19. Data can be reviewed either on-board or downloaded to a host computer via the USB connector. Individual locations can be preconfigured in the office via the Multireadout Host Software or by creating locations on the unit itself (section 7.1).

7.1 Creating Memory Locations in the Field

The VW2106 Readout has the ability to be either pre-configured in the office (through Host Software), or taken directly to the field. If taken directly to the field, each location will be assigned a generic name which is editable once back in the office and connected to a host computer. In most cases it is recommended that the VW2106 be pre-configured in the office prior to taking readings in the field. In this manner, site location names can be setup ahead of time allowing the field personnel to be able to arrive at instrument locations, and store readings without needing to create a location in the units' memory.

If the VW2106 has not been pre-configured in the office, the following instructions explain how to create new locations. Please refer to Figure 44 (flow chart) for a graphical representation of the steps outlined below:

- Turn on the readout by pressing any key.
- Using the arrow keys, scroll to *Memory* and press *Enter*.

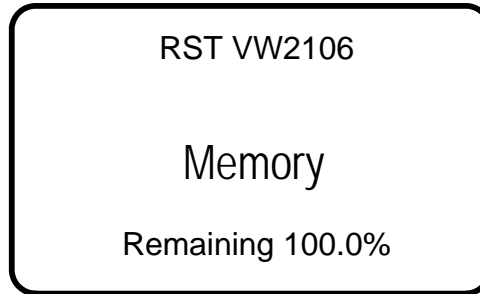


Figure 19 – Memory Screen

- Press *Enter* to advance to the next screen.
- Using the arrow keys, scroll to *Create Location* and press *Enter*.

Note

The maximum number of predefined locations is 254.



Figure 20 – Create Location

- The readout unit will automatically create a site called *Location X* where 'X' is the next storage location available in the units' memory. Please note that when creating new sites in the field, you can only name them *Location X*. Make note of the real location name in your field notebook and its relation to the *Location* number. When connecting to the Host Software back in the office, a custom name can be entered at that time. This replaces the site name assigned by the readout.

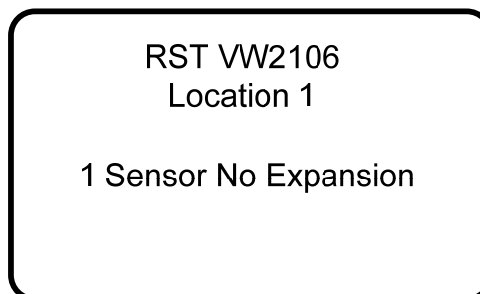


Figure 21 – New Location

- The VW2106 automatically increments the new location to the next number available.

- Use the arrow keys to select the number of sensors associated with that location. Valid entries are between 1 and 6 sensors. When connecting single sensor, the choice is given between terminal strip and expansion connector. Expansion connector is automatically enabled when more than one sensor is selected.

Note

In most cases the sensor number will be equal to 1 (only one sensor). Cases where more than one sensor is used are on Load Cells which use the special *Expansion* connector (Figure 1, item 9).

- Press *Enter* and the following screen will appear:

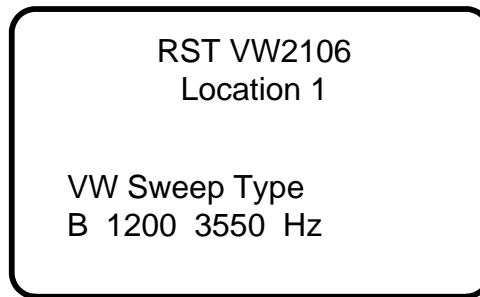


Figure 22 – Select Sweep Frequency

- Use the arrow keys to select the appropriate sweep frequency for the gauge being measured at that location. The default is the “B” sweep (1200-3550Hz) which is the standard range for RST model VW2100 series piezometers. When complete press *Enter*.
- Next, choose the type of Thermistor. The default is “3K” which is the standard thermistor in all RST Vibrating Wire sensors (unless custom ordered). Press *Enter* when complete.

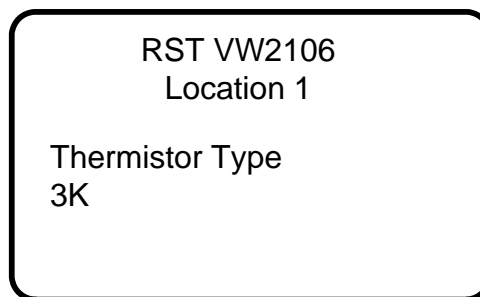


Figure 23 – Thermistor Type

- Once the thermistor type has been chosen, press *Enter* and the unit will return to the previous menu. Use the arrow keys to scroll to *Store Data* and press *Enter*. The following screen will appear:

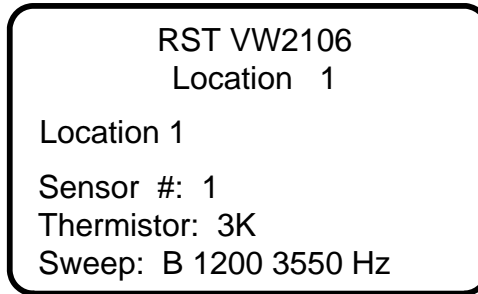


Figure 24 – Select Location

- Use the arrow keys to select the location you just created. When the desired location is found, press *Enter* to select it. The following will appear:

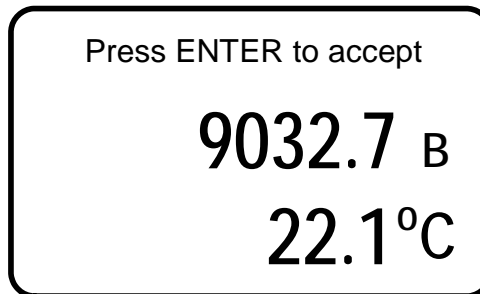


Figure 25 – Storing a Reading

- The VW2106 will prompt you with the question: *Accept?*, press *Enter* to store the reading.
- After storing the reading, the VW2106 will return the user to the previous screen.
- In the case where more than one sensor is specified for the location (i.e. load cells) the following screen will appear:

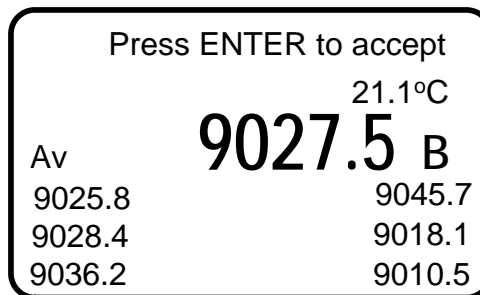


Figure 26 – Storing Reading Multiple Readings

- Figure 26 illustrates a location that has 6 sensors associated with it. Each individual reading is displayed with the average reading in bold. These readings are accepted in the same manner by pressing *Enter*.

Note

The average reading is not stored to memory, only the raw readings.

7.2 Reviewing Data

To review any reading on the VW2106 unit itself, please follow these instructions:

- Power on the readout by pressing any key.
- Using the arrow keys, scroll down to *Memory*, press *Enter*.
- Scroll to *Review Data* and press *Enter*.
- Scroll to the desired location (using arrow keys) and press *Enter*.

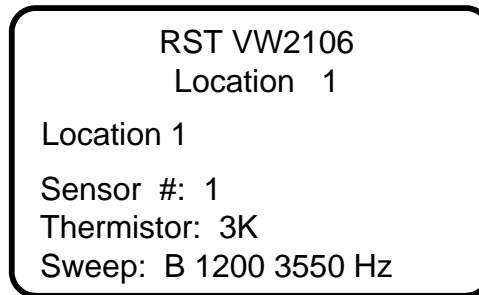


Figure 27 – Select a Location

- If the location contains more than one reading, these readings can be scrolled through using the arrow keys. The date and time of each reading will appear to differentiate each reading.

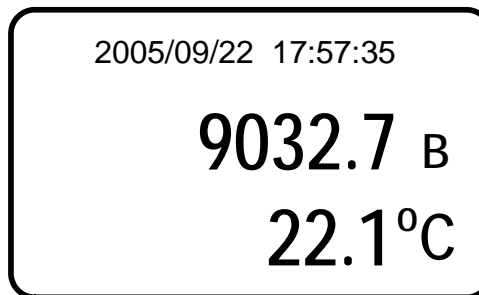


Figure 28 – Reviewing Data

- In the case where multiple sensors are associated with a single location (i.e. load cells) the following screen will appear:

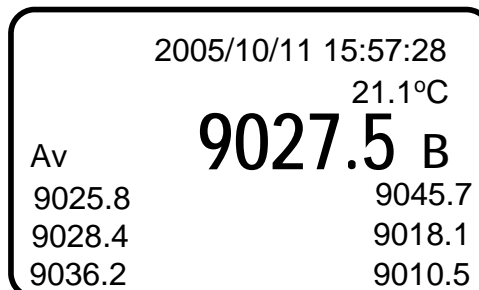


Figure 29 – Reviewing Multiple Sensors

- Figure 29 illustrates 6 independent sensors associated with a single location. The average of these 6 readings is displayed in bold.

7.3 Datalogging

The VW2106 has a basic datalogging function where the user is able to set the datalogging interval and the number of iterations. Datalogging can function on either the single or multiple channel features of the readout.

During multi-channel operation, the individual readings are displayed with the average in bold (Figure 29). The datalogging feature only records the raw readings, the average can then be calculated when the data file is exported to *.csv format in the Host Software.

- From the VW2106 main reading screen scroll to *Memory* and press *Enter*.
- Use the arrows to scroll to the datalogging screen as shown below and press *Enter*.

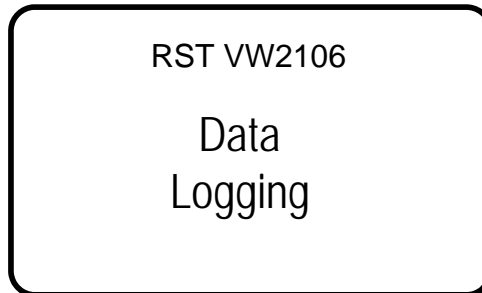


Figure 30 – Datalogging Screen

- Choose a location you wish to record data to by using the arrow keys. If no locations are currently set-up, the readout will respond with "No Locations". Proceed to setup a location as described in section 7.1.
- First set the *Interval* but using the arrow keys. Holding down the arrow keys make the digits scroll faster. Press *Enter* when complete.

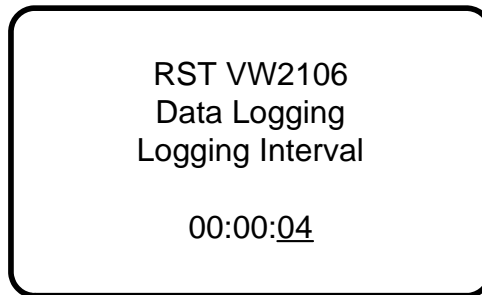


Figure 31 – Datalogging Interval

- Once the interval is set, press *Enter* and the following screen will appear:

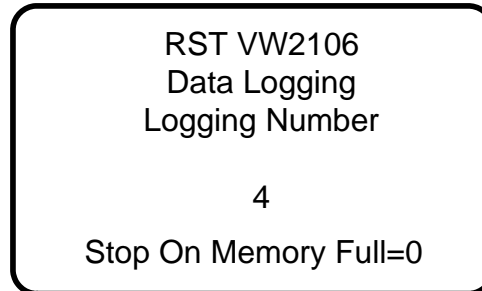


Figure 32 – DataLogging Number

- Use the arrow keys to select the number of iterations you wish the readout to datalog (in the above case, it will take 4 readings at a 4 second interval). To continuously datalog until the memory is full, select 0. After pressing *enter* the readout will start the datalogging process and will end with “logging completed”. ESC can be pressed at any time to abort the datalogging process.
- Datalogging can also be accessed through the *Store Data* screen (once the intervals have been created as described above). Scroll to *Store Data* and select the location were you would like to datalog. Press *Enter*.
- Press and HOLD the enter button to commence datalogging. The screen will appear as follows:

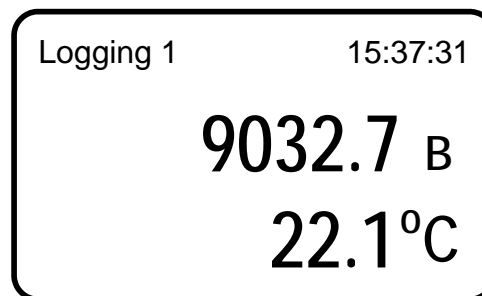


Figure 33 – Logging Screen

- During datalogging, the logging number will increase with the corresponding time stamp being updated in the upper right-hand corner of the screen.
- Once logging has finished, the following will appear:

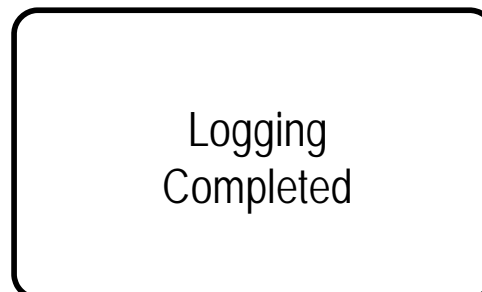


Figure 34 – Logging Completed

- Once datalogging is complete, the readout will automatically turn off according to the *Auto Off* setting (section 3).

7.4 Zero Readout

Sensor zeroing can only be performed when the correct sensor engineering units are setup in the Multireadout Host Software. Please refer the Host Software manual for further instructions.

Once the calibration factors are set for a specific location and the engineering units are chosen and uploaded from the Host Software to the VW2106, the readout can be zeroed. From the main menu scroll to *Memory* and press *Enter*. Scroll to the *Zero Readout* screen as shown below:

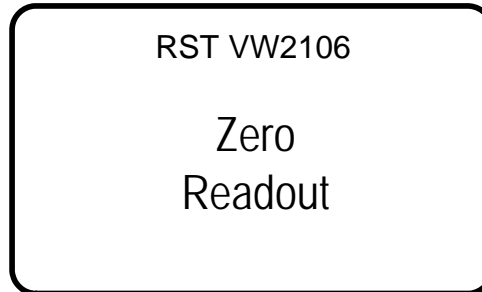


Figure 35 – Zero Readout

- Press *Enter* and the screen will change to the location screen (Figure 24). Use the arrow keys to scroll to the location that is to be zeroed. Press *Enter* and the following screen will appear:

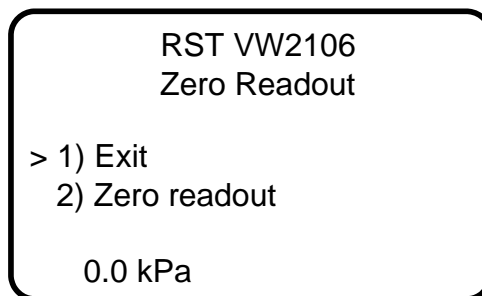


Figure 36 – Select Zero Readout

- Either press *Enter* to exit or move the pointer to *Zero Readout* and press *Enter*. The following screen will appear:

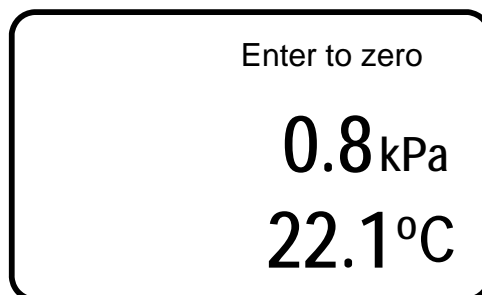


Figure 37 – Zero Value

- The actual value being used for the zero is displayed. Press *Enter* to accept the value displayed. In this example the engineering unit is set to kPa.

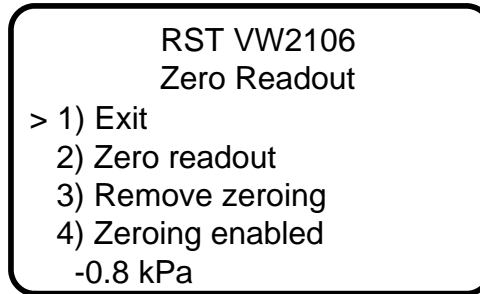


Figure 38 – Zeroing Options

- Once the zero value has been accepted, press *ESC* and the above screen will appear (Figure 38) with several options. Use the *arrow keys* to scroll and press *Enter* to select. Selection option 2 will re-zero the readout. Option 3 will remove the current zeroing value (delete it). Select option 4 and press *Enter* to toggle back and forth between “zeroing enabled” and “zeroing disabled”. This function saves the zero offset so that it can be re-applied later if desired. To exit this screen either choose *exit* or press the *ESC* button.
- When the zeroing function is enabled for a given location, every time a reading is to be stored to memory “tare” will appear in the readings screen as shown below. This identifies and confirms that a reading is being taken with an applied zero offset.

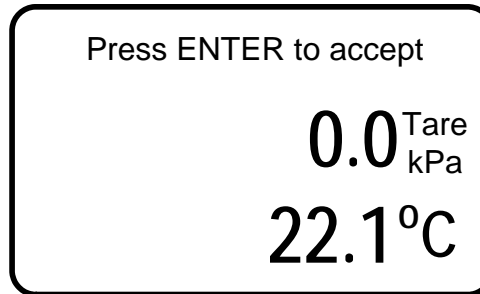


Figure 39 – Zero Reading (Tare)

7.5 Deleting

All location information can be deleted from the VW2106 readout or via the Host Software. This is done by the following:

- Power on the display by pressing any key.
- Using the arrow keys, scroll down to *Memory*, press *Enter*.
- Using the arrow keys, scroll to *Delete* and press *Enter*.

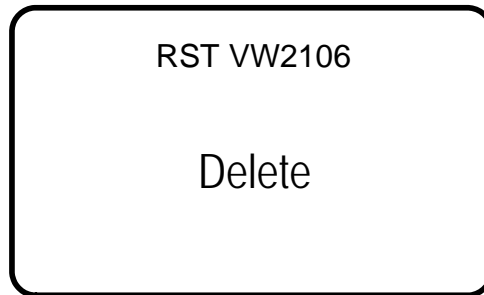


Figure 40 – Delete

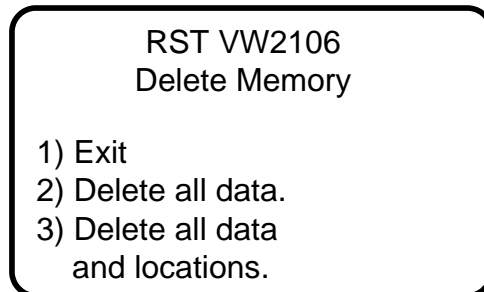


Figure 41 – Delete Options

Using the *arrow keys*, scroll to the desired delete option and press the *Enter* key to select. Press *Enter* to confirm, press *ESC* to exit back to the main menu.

8 AUDIBLE READING OPTION

The VW2106 has a built in speaker allowing the added feature of determining a vibrating wire instruments “health” by listening to the ring of the wire. To enable the audible feature, simultaneously hold down the up and down arrows on the keypad (Figure 1, items 5 & 6). These are marked “audio” on the front of the unit. When enabled, a small speaker graphic will appear on the screen and a ring will be heard. To disable the feature either wait for it to time out or hold down the arrow keys.

If a Vibrating Wire instrument is functioning correctly, a steady ping should be heard with no distortions.

9 VW2106 INTERNAL BATTERY

The RST VW2106 operates on 3 alkaline AA batteries. Access to the batteries is done through a port on the side of the unit. Use a flathead screwdriver or a coin to access the batteries (see Figure 42). The unit ships standard with regular AA batteries. If the unit is being used consistently in cold environments, the user may replace the alkaline batteries with lithium batteries which are also readily available.



Figure 42 – Battery Door

The status of the battery can be checked by:

- Turning on the readout by pressing any key.
- Using the arrow keys, scroll to the battery voltage screen.
- The readout will display the *battery voltage* as shown below:

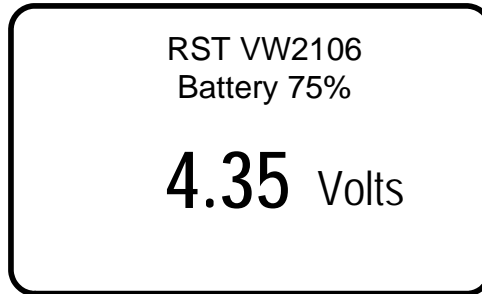


Figure 43 – Battery Voltage

Note

If the battery voltage drops below 3.5 volts a low battery warning will be displayed in the form of "BATT" in the upper right of each screen. Change the batteries at this time.

10 SOFTWARE & FIRMWARE UPDATES

The VW2106 readout is designed such that the unit's software and firmware can be easily updated by the customer through the USB port. Please regularly visit: <http://www.rstinstruments.com> for product updates.

11 CONTACT US

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12 APPENDIX A – VW2106 MENU FLOW CHART

The following flow chart outlines all functions of the VW2106 front panel controls:

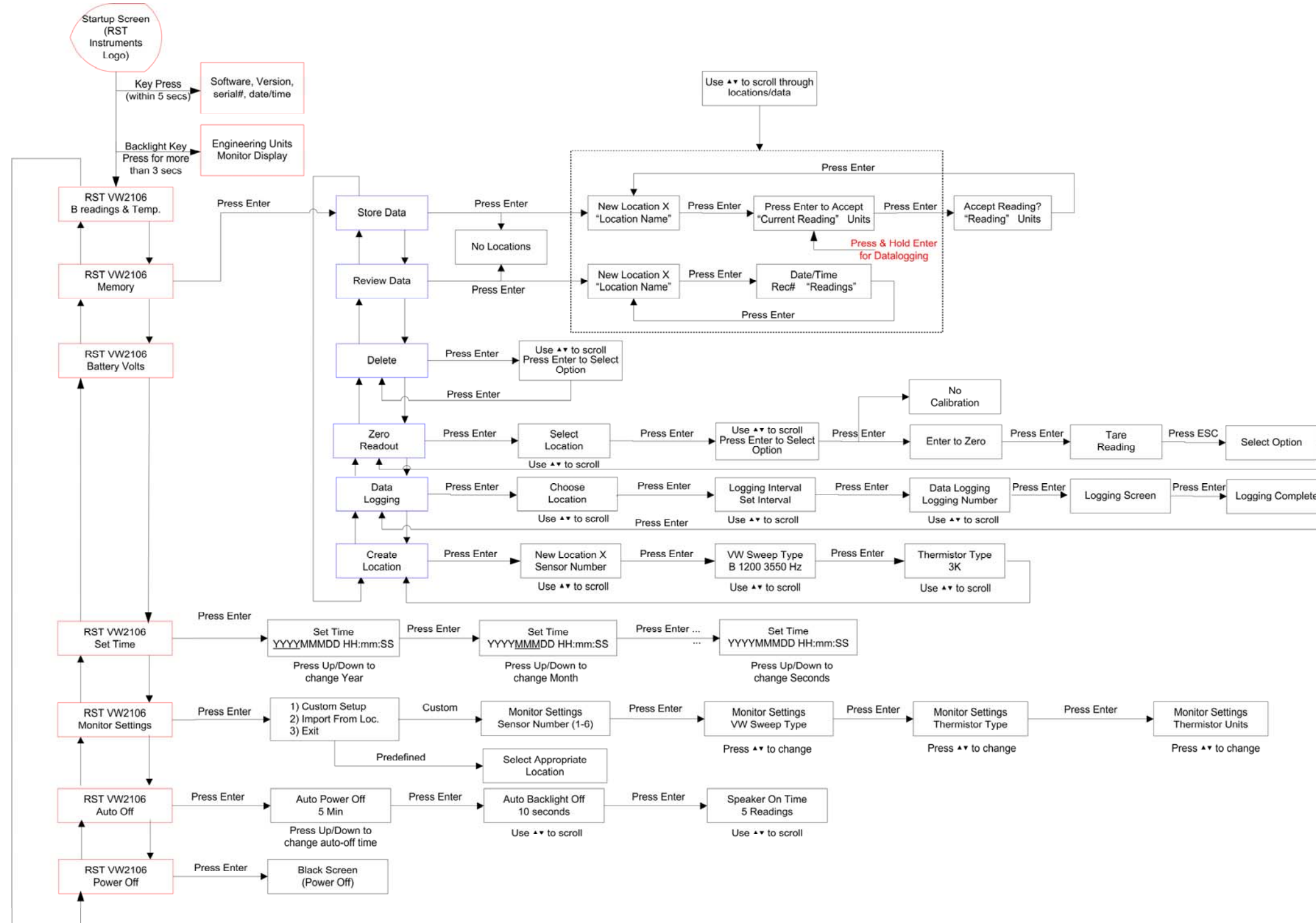


Figure 44 – VW2106 Menu Flow-Chart

13 APPENDIX B – EXPANSION CONNECTOR PIN-OUT

Trident Connector Pin	Signal
A	Analog Ground
B	Thermistor -
C	Thermistor +
D	Multiplexer RST
E	Multiplexer CLK
F	VW 6+
G	VW 6-
H	VW 5+
J	VW 5-
K	VW 4+
L	VW 4-
M	VW 3+
N	VW 3-
P	VW 2+
R	VW 2-
S	VW 1+
T	VW 1-
U	GND
V	5V

VW2106 Connector ITT: **Trident Part No. = 192900-0039**

Mates with: **Trident Part No. = 192922-1280**

14 APPENDIX C – SPECIFICATIONS

<i>Description</i>	<i>Specification</i>
Vibrating Wire Readout Excitation Range	400 Hz to 6000Hz, 5V Square Wave
Vibrating Wire Readout Resolution	0.01 μ s
Vibrating Wire Readout Timebase Accuracy	\pm 50 ppm
Supported Temperature Readout Sensors	NTC3000 (standard), NTC2252, NTC10K, RTD
Temperature Readout Accuracy	\pm 0.1 $^{\circ}$ C
Temperature Readout Range	-50 $^{\circ}$ C to 80 $^{\circ}$ C
Display	Graphic 128 x 64 pixels large character display
Display Backlight	High efficiency LCD with auto off
Memory	128 kB
Max Instrument Locations	254
Memory Capacity	11 400 custom labeled points
Location Identification String	Up to 20 characters
Download Speed	15 seconds (full memory)
Battery	3 "AA" alkaline
Battery Indicator	On-screen low battery indicator
Operating Temperature	-20 $^{\circ}$ C to 60 $^{\circ}$ C
Dimensions	W 22cm x D 19cm x H9.5cm (8.75 x 7.5 x 3.75in.)
Weight	1.1 kg (2.4 lbs)