VW2106 Vibrating Wire Readout Manual

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REVISION HISTORY

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J	Added revision table, section 4.6 instruction 4 “thermistor” changed to “sensor”, updated column heading in Table 3-3 from “Thermistor Type” to “Sensor Type”.	2019-Sep-03	MP	JW
K	Updated Single Field Instrument Connection instructions to include push post terminals, Table 4-1 updated for clarity, added Section 4.2 Single Field Instrument Connection – Older Models, highlighted new features in introduction, all figures updated.	2019-Dec-05	MP	JW
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TABLE OF CONTENTS

1 INTRODUCTION 1

2 GETTING STARTED 2

2.1 Powering On 2

2.2 Powering Off 2

3 CONFIGURATION 4

3.1 Single Field Instrument Connection 4

3.2 Single Field Instrument Connection – Older Models 8

3.3 Multi-Channel Connection 8

3.4 Setting Date and Time 9

3.5 Creating Locations 9

3.6 Importing Parameters 11

3.7 Creating Custom Parameters 12

4 OPERATION 13

4.1 Startup 13

4.2 Storing Readings in Memory 14

4.3 Reviewing Data 15

4.4 Data Logging 15

4.5 Data Logging Through Store Data 16

4.6 Zeroing Readout 17

4.7 Deleting Data 18

5 MAINTENANCE 19

5.1 Device Health 19

5.2 Battery 20

5.3 Protecting the Device 21

6 SOFTWARE AND FIRMWARE UPDATES 22

7 SERVICE AND REPAIR 22

LIST OF FIGURES

Figure 1-1 VW 2106 Readout....1
Figure 1-2 Visual instructions for terminal posts and battery changes....2
Figure 2-1 Power Off screen....3
Figure 2-2 Auto Off screen....3
Figure 2-3 Auto Power Off time....3
Figure 2-4 Auto Backlight Off....4
Figure 2-5 Speaker On time....4
Figure 3-1 Terminal posts....5
Figure 3-2 Press down on the terminal post....6
Figure 3-3 Correct angle for wire insertion....6
Figure 3-4 Slide the wire into the gap....7
Figure 3-5 All wires connected to terminal posts....7
Figure 3-6 Set time screen....9
Figure 3-7 Memory screen....10
Figure 3-8 Create location screen....10
Figure 3-9 Selecting the sweep frequency....11
Figure 3-10 Thermistor type....11
Figure 3-11 One sensor connected....12
Figure 4-1 VW2106 Readout details....13
Figure 4-2 Readings screen....14
Figure 4-3 Storing a reading....14
Figure 4-4 Storing a reading with 6 sensors....15
Figure 4-5 Data logging interval....16
Figure 4-6 Data logging number....16
Figure 4-7 Logging screen....17
Figure 4-8 Zeroing options....17
Figure 4-9 Delete options....18
Figure 5-1 Battery compartment....20
Figure 5-2 Battery installation....20
Figure 5-3 Battery voltage screen....21

LIST OF TABLES

Table 4-1 Standard Wiring Colour Codes....5
Table 4-2 Standard Wiring Colour Codes....8
Table 3-3 Sweep Frequencies....12

1 INTRODUCTION

The RST VW2106 Readout is a lightweight device used to read and display vibrating wire sensor and thermistor data. It is suitable for harsh environments and the user interface is simple to use.

The VW2106 readout is powered by 3 standard "AA" alkaline batteries to facilitate replacement in the field. Data can be reviewed either on-board or downloaded to the computer using RST-provided software.

FIGURE 1-1 VW 2106 READOUT

1. USB Connector
2. Large character LCD display
3. Backlight (hold down to display Engineering Units)
4. ESC (navigates back one menu)
5. Scroll Up
6. Scroll Down
7. Enter
8. Terminal Posts (for sensor connection)
9. Expansion port (VW Load Cells and external Multiplexers)

The latest model of the VW2106 features push post terminals to easily connect VW Sensor instruments, visual instructions for using the terminal posts and changing the batteries (Figure 1-2), and a refreshed look.

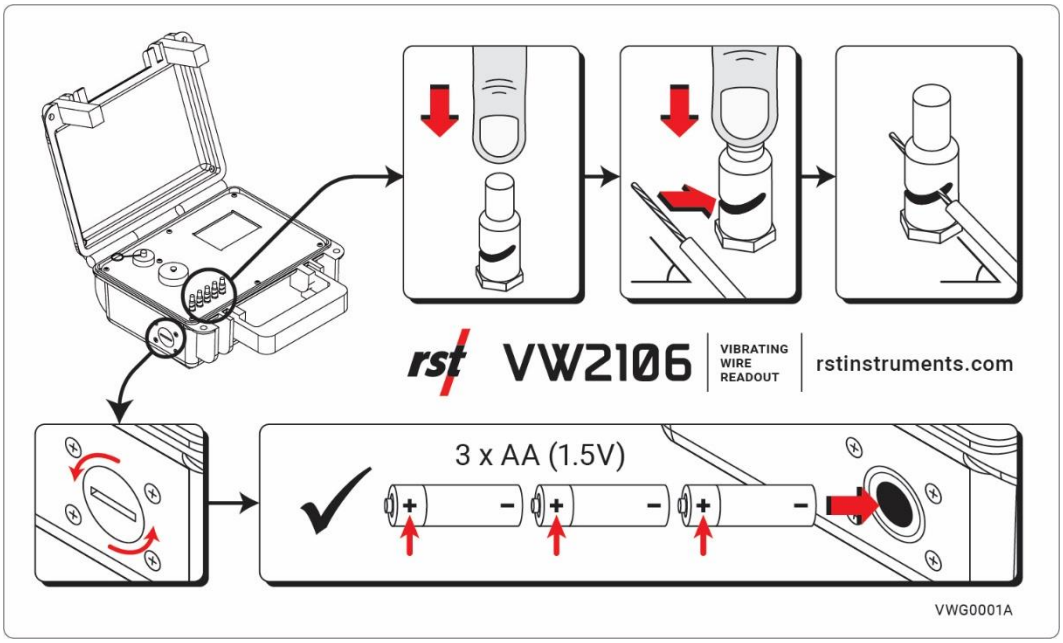

FIGURE 1-2 VISUAL INSTRUCTIONS FOR TERMINAL POSTS AND BATTERY CHANGES

If you have an older model VW2106, please refer to Section 3.2 for instructions to connect a single field instrument to the readout. The multi-channel connection instructions are identical for all models.

1.1 SAFETY

This product is battery operated. There are no major safety concerns associated with use.

It is important to keep the unit clean during use in the field. Ensure there is no dirt or dust in the wire terminals, battery compartment, and weather seal along the edge of the lid of the enclosure. Make sure that weather caps for the USB port and expansion port are properly secured when not in use.

2 GETTING STARTED

2.1 POWERING ON

The VW2106 Readout unit can be powered on any time by pressing any key.

2.2 POWERING OFF

The VW2106 unit can be powered off either manually or automatically.

The following instructions illustrate how to power off the unit manually:

1. Use the up/down arrows to scroll to the **Power Off** screen (Figure 2-1).

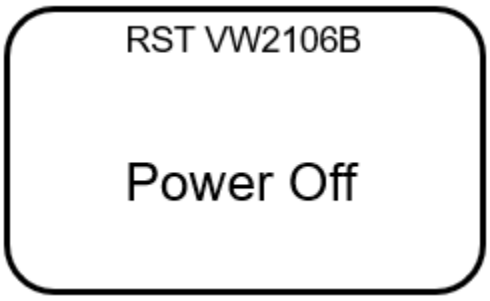

FIGURE 2-1 POWER OFF SCREEN

2. Press **Enter** and the unit will turn off.

The following instructions detail how to configure the unit to power off automatically.

1. Navigate to the **Auto Off** screen (Figure 2-2).

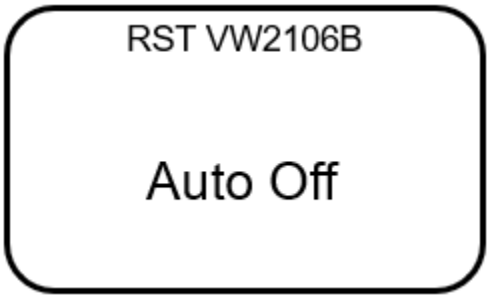

FIGURE 2-2 AUTO OFF SCREEN

2. Press **Enter**. The following screen will appear (Figure 2-3):

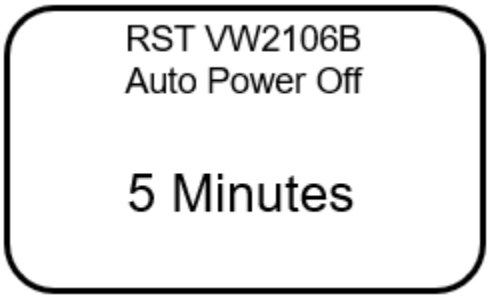

FIGURE 2-3 AUTO POWER OFF TIME

3. Use the up/down arrows to scroll to the desired auto power off time. Press **Enter** to select the time. The default time is five minutes.

NOTE: THE AUTO POWER OFF FEATURE IS ALWAYS ACTIVE TO CONSERVE BATTERY LIFE AND CANNOT BE DISABLED.

4. The next screen prompts the user to select the Auto Backlight Off (Figure 2-4). Use the up/down arrows to adjust the desired time and press **Enter**.

FIGURE 2-4 AUTO BACKLIGHT OFF

5. The next screen prompts the user to select the Speaker On time. Use the up/down arrows to select the desired time and press **Enter**. The unit will return to the previous menu.

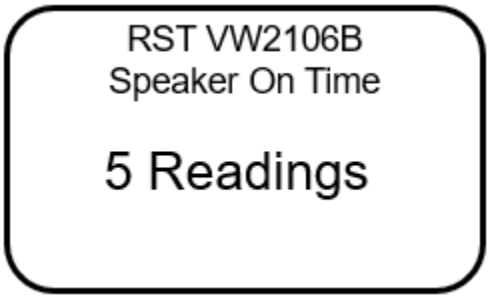

FIGURE 2-5 SPEAKER ON TIME

NOTE: KEEP THE UNIT OFF WHEN NOT IN USE TO PRESERVE BATTERY LIFE.

3 CONFIGURATION

The VW2106 may be connected to **either** single field instruments **or** multi-channel instruments.

3.1 SINGLE FIELD INSTRUMENT CONNECTION

The following instructions outlined below to connect single field instruments:

1. Match each wire to its respective terminal post. The posts have colour coded labels for quick reference (Figure 3-1).

FIGURE 3-1 TERMINAL POSTS

Table 3-1 lists matching colours and wire transducers.

TABLE 3-1 STANDARD WIRING COLOUR CODES

Post Colour	Wire Colour	Wire Transducer
Red	Red	Coil +
Black	Black	Coil -
Green	Green	Therm +
White	White	Therm -
Blue	Bare	Shield

CAUTION: MAKE SURE THAT THE WIRES ARE CLEAN AND FREE OF DIRT BEFORE INSERTING THEM INTO THE TERMINALS.

CAUTION: ENSURE THAT CABLES HAVE ENOUGH SLACK TO FACILITATE ATTACHMENT. APPROXIMATELY 2" OF SLACK IS RECOMMENDED.

CAUTION: ENSURE THAT THE TERMINALS ARE FREE FROM DIRT AND DEBRIS BEFORE INSERTING THE WIRES. TERMINALS CAN BE BLOWN OUT WITH COMPRESSED AIR IF NECESSARY.

2. Firmly press down on the first terminal post (Figure 3-2).

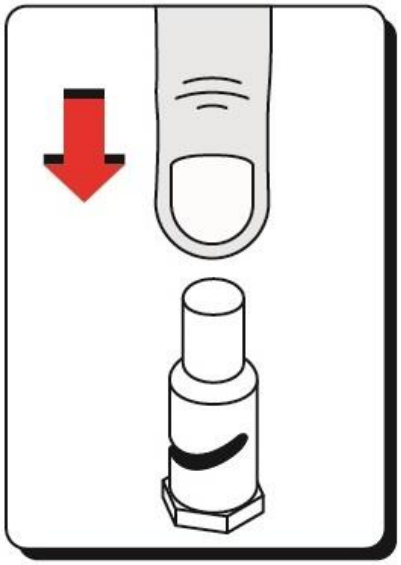

FIGURE 3-2 PRESS DOWN ON THE TERMINAL POST

3. Hold the wire parallel to the plane of the readout, to the left of the post, and at a slight angle to the terminal labels, as illustrated in Figure 3-3.

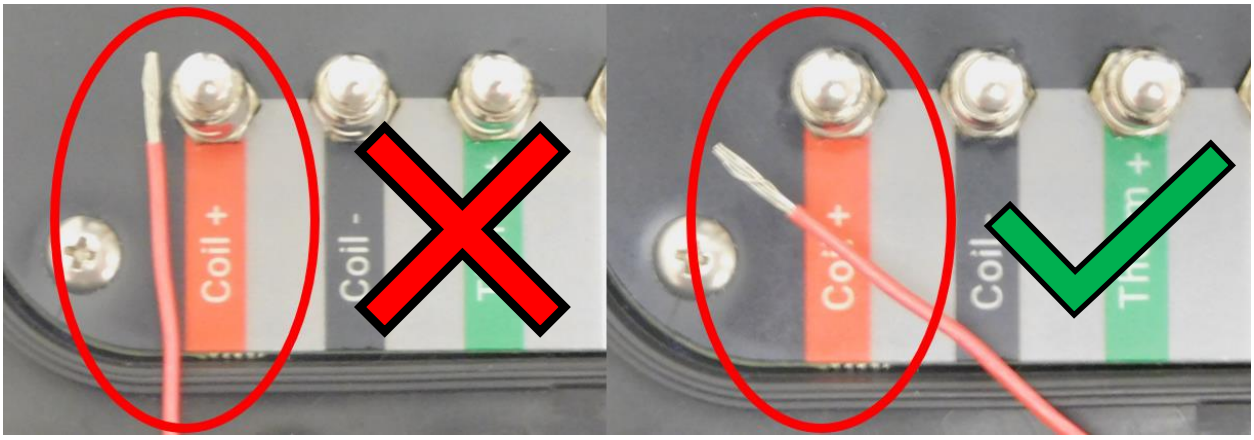

FIGURE 3-3 CORRECT ANGLE FOR WIRE INSERTION

4. With the post still depressed, slide the stripped end of the instrument cable into the opening on the matching terminal post (Figure 3-4).

FIGURE 3-4 SLIDE THE WIRE INTO THE GAP

5. Release terminal post to secure the wire.
6. Gently tug on the wire to ensure it has been correctly secured.
7. Repeat for all wires (Figure 3-5).

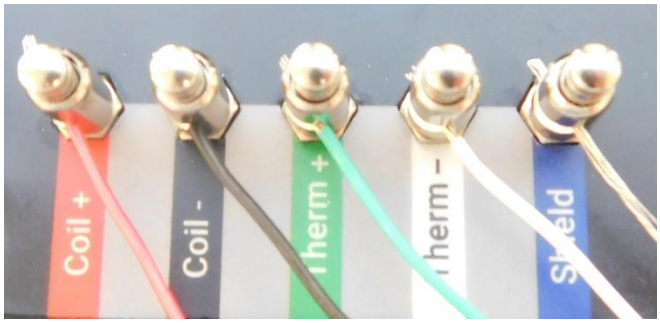

FIGURE 3-5 ALL WIRES CONNECTED TO TERMINAL POSTS

WARNING: ENSURE THERE ARE NO EXPOSED WIRES CONNECTING BETWEEN ADJACENT PUSH POST TERMINALS.

NOTE: APPLYING SOLDER TO THE BARE ENDS OF THE CABLE REDUCES FRAYING OVER TIME. ALL RST SENSORS ARE PRE-TINNED IN THE FACTORY.

3.2 SINGLE FIELD INSTRUMENT CONNECTION – OLDER MODELS

The following instructions outline the steps to connect single field instruments:

1. Using hands or a screwdriver, lift the gates on the terminal strip.
2. Insert the stripped ends of the instrument cable to the matching wire transducer. Refer to Table 3-2 for matching colours and wire transducers.

TABLE 3-2 STANDARD WIRING COLOUR CODES

Wire Colour	Wire Transducer
Red	Coil +
Black	Coil -
Green	Therm +
White	Therm -
Bare	Shield

CAUTION: MAKE SURE THAT THE WIRES ARE CLEAN AND FREE OF DIRT BEFORE INSERTING THEM INTO THE TERMINALS.

CAUTION: ENSURE THAT THE TERMINALS ARE FREE FROM DIRT AND DEBRIS BEFORE INSERTING THE WIRES. TERMINALS CAN BE BLOWN OUT WITH COMPRESSED AIR IF NECESSARY.

3. Close each gate to secure the wire.

CAUTION: ENSURE THAT THE GATES ARE SECURED BEFORE CLOSING THE LID TO THE UNIT TO AVOID DAMAGING THE GATES.

NOTE: APPLYING SOLDER TO THE BARE ENDS OF THE CABLE REDUCES FRAYING OVER TIME. ALL RST SENSORS ARE PRE-TINNED IN THE FACTORY.

3.3 MULTI-CHANNEL CONNECTION

The VW 2106 may be connected to multi-channel instruments through its expansion connection (Figure 1-1, 9).

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 section 3.7 for detailed instructions.

The expansion connection is also able to control external multiplexers, which can facilitate connecting multiple single-channel instruments simultaneously.

For specific applications and configurations, please contact RST Instruments.

3.4 SETTING DATE AND TIME

Each reading includes a date and time stamp and it is stored in the unit's memory. To ensure accurate historical records of the readout data, keep the date and time current.

The following outlines the steps to set the date and time on the readout.

1. Turn on the readout by pressing any key.
2. Scroll to the **Set Time** screen (Figure 3-6) using the up/down arrows and press 'Enter'.

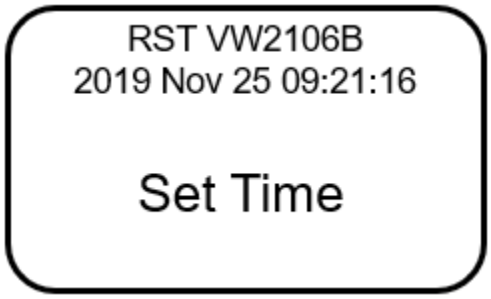

FIGURE 3-6 SET TIME SCREEN

3.5 CREATING LOCATIONS

The VW2106 Readout may be pre-configured either using the software on a host computer or directly on the device.

It is recommended that the VW2106 be pre-configured with the software prior to use in the field, as the site location names can be defined ahead of time.

If taken directly to the field prior to defining locations, each location will be assigned a generic name which can be edited once the VW2106 is connected to a host computer.

NOTE: THE MAXIMUM NUMBER OF PRE-DEFINED LOCATIONS IS 254.

The following instructions outline the steps to define new locations and location parameters on the device.

1. Turn on the readout by pressing any key.

2. Scroll to the **Memory** screen (Figure 3-7) using the up/down arrows and press **Enter.**

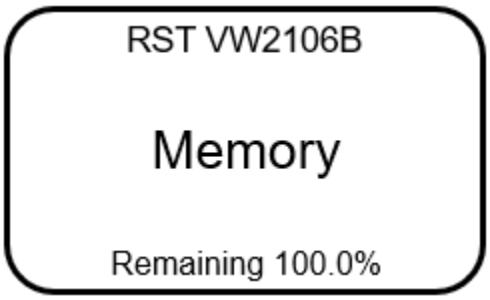

FIGURE 3-7 MEMORY SCREEN

3. Scroll to the **Create Location** screen (Figure 3-8) using the up/down arrows and press **Enter**.

FIGURE 3-8 CREATE LOCATION SCREEN

4. The VW2106 will automatically create a site called Location X, where 'X' is the next storage location available in the unit's memory. Make note of the real location name in your field notebook and its relation to the location number. When connected to the Host Software back in the office, a custom name can be entered, which replaced the site name assigned by the readout.

NOTE: NEW SITES CREATED IN THE FIELD ARE ASSIGNED THE NAME 'LOCATION X' BY DEFAULT. THE READOUT AUTOMATICALLY INCREMENTS THE 'X' TO THE NEXT NUMBER AVAILABLE IN THE UNIT'S MEMORY. LOCATION NAMES CAN ONLY BE CHANGED WHEN THE VW2106 IS CONNECTED TO HOST SOFTWARE.

5. Use the up/down arrows to select between 1 and 6 sensors to read and press **Enter**.

NOTE: IN MOST CASES, THE SENSOR NUMBER WILL BE EQUAL TO 1. CASES WHERE MORE THAN ONE SENSOR IS USED ON THE LOAD CELLS REQUIRE THE EXPANSION CONNECTOR WHICH WILL BE AUTOMATICALLY ENABLED.

6. When connecting a single sensor, you will be given a choice between reading from the terminal strip or the expansion connector when connecting a single sensor. Select the appropriate connection and press **Enter**.

7. Use the up/down arrows to select the appropriate 'Sweep Frequency' for the gauge being measured at that location (Figure 3-9) and press **Enter**. The default is the "B" sweep (1200-3550Hz), which is the standard range for the RST model VW2100 series piezometers. Additional Sweep Frequencies are summarized in Section 3.7.

FIGURE 3-9 SELECTING THE SWEEP FREQUENCY

8. Use the up/down arrows to select the type of thermistor (Figure 3-10) and press **Enter**. The default is 3K, which is the standard thermistor in all RST Vibrating Wire sensors.

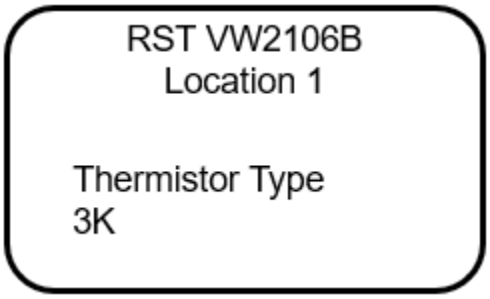

FIGURE 3-10 THERMISTOR TYPE

You may now use the newly created location to store readings. For instructions on how to store readings, refer to section 4.2.

3.6 IMPORTING PARAMETERS

If at least one location has previously been defined, the following instructions outline the steps to import parameters.

1. Scroll to the **Monitor Settings** screen using the up/down arrows and press **Enter**.

2. Select the **Import from Loc.** option and scroll to the desired location using the up/down arrows and press **Enter** when complete.

The location label will appear at the top of the screen to indicate the current location in use.

NOTE: THE DEVICE WILL DISPLAY THE MESSAGE "NO LOCATIONS" IF NO LOCATIONS EXIST IN THE READOUT'S MEMORY.

3.7 CREATING CUSTOM PARAMETERS

The following instructions outline the steps to set up custom parameters.

1. Scroll to the **Monitor Settings** screen using the up/down arrows and press **Enter**.

2. Select the **Custom Setup** option and press **Enter.**

3. Select the number of sensors connected and press **Enter**. Most devices will be set to connect to one sensor per terminal strip (Figure 3-11). The expansion connector is automatically enabled when more than one sensor is selected.

FIGURE 3-11 ONE SENSOR CONNECTED

4. Select the appropriate sweep frequency and press **Enter**. Refer to Table 3-3 for sweep frequencies corresponding to sensor type.

TABLE 3-3 SWEEP FREQUENCIES

Sweep	Frequency	Sensor Type
A	450-6000Hz	Wide Sweep
B (Default)	1200-3550Hz	Piezometer, Strain Gauge, Borehole Stressmeter, Jointmeter, Crackmeter, Displacement, Settlement, Temperature, Load Cells

C	450-1200Hz	Arc Weldable Strain Gauge
D	450-1200Hz	Embedment Strain Gauge
E	1000-3600Hz	Spot Weldable Strain Gauge
F	2500-6000Hz	Borehole Stressmeter
U (Custom)	1200-3550Hz	Custom user specified sweep frequency. May only be set within the readout software.

5. Select the Thermistor Type and press **Enter.** Options include 2252, 3K (default), 10K, and RTD.

6. Select the desired display units and press **Enter.**

7. The unit will return to the previous menu.

4 OPERATION

This section describes the operation of the VW2106 Readout once the unit has been powered on (see Section 2.1).

4.1 STARTUP

Once powered on, an opening screen will appear with the RST Instruments logo. If the user wishes to view the details of the readout, **press any key** immediately. Details of the unit (Figure 4-1) including the model, version number, serial number and current date and time settings are displayed.

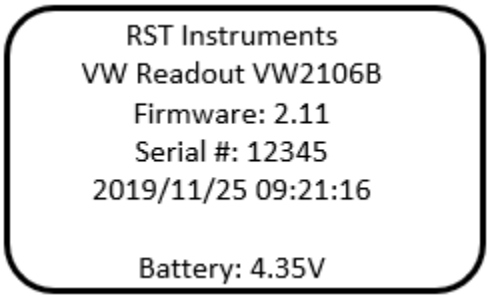

FIGURE 4-1 VW2106 READOUT DETAILS

NOTE: CHECK THAT THE DATE AND TIME SETTINGS ARE CORRECT, AS THIS MAY AFFECT ANY READINGS STORED IN THE UNIT'S MEMORY.

If no keys are pressed after powering on, the unit will default to the readings screen (Figure 4-2).

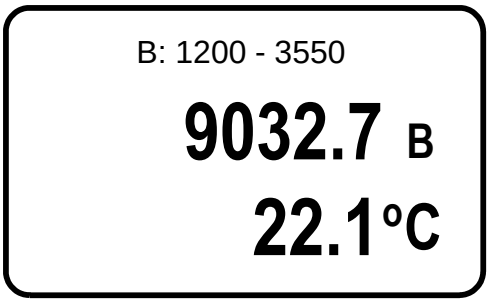

FIGURE 4-2 READINGS SCREEN

If a unit is connected, the readings screen will display the current sweep settings and a reading from the VW instrument and its internal thermistor. The default units are B units ($f^2 \times 10^{-3}$) and degrees Celsius. Units can be changed if desired (see section 3.7).

4.2 STORING READINGS IN MEMORY

The VW2106 readout has 128k of internal memory, allowing it to store over 11,000 time-stamped readings.

The following instructions outline the steps required to store readings in the unit's memory.

1. Using the up/down arrows, scroll to the **Store Data** screen and press **Enter**.
2. Using the up/down arrows, scroll to the desired location and press **Enter**.
3. Press **Enter** when prompted to store the reading (Figure 4-3).

FIGURE 4-3 STORING A READING

4. If the unit has more than once sensor, the unit will display both average readings (in bold) and individual readings (Figure 4-4).

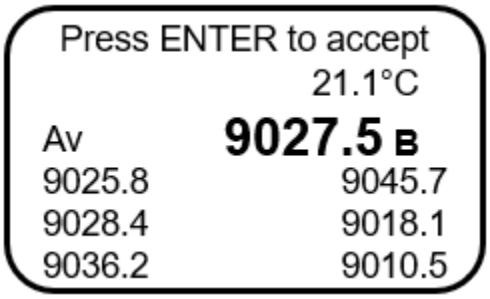

FIGURE 4-4 STORING A READING WITH 6 SENSORS

NOTE: AVERAGE READINGS WILL NOT BE STORED IN THE UNIT'S MEMORY.

4.3 REVIEWING DATA

The following instructions outline the steps to review readings on the VW2106.

1. Press any key to turn the readout on.
2. Using the up/down arrows, scroll to the **Memory** screen and press **Enter.**
3. Using the up/down arrows, scroll to **Review Data** and press **Enter.**
4. Scroll to the desired location using the up/down arrows and press **Enter**.
5. If a location contains more than one reading, the readings can be scrolled through using the up/down arrow.

4.4 DATA LOGGING

The VW2106 has a basic datalogging function where the user can set the datalogging interval and the number of iterations.

The following instructions detail the steps to log data at a given location.

1. Use the up/down arrows to scroll to the **Memory** screen and press **Enter**.
2. Use the up/down arrows to scroll to the **Data Logging** screen and press **Enter.**
3. Use the up/down arrows to select the location to record the data. If no locations are currently defined, the readout with respond with "No Locations." See section 3.5 for detail about how to define locations.
4. Use the up/down arrows to set the reading interval and press **Enter**. For example, if 4 is selected, the data will log every 4 seconds (Figure 4-5).

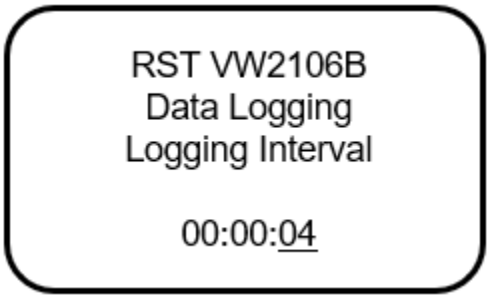

FIGURE 4-5 DATA LOGGING INTERVAL

5. Using the up/down arrows, select the data logging number and press **Enter**. For example, if the number 4 is selected, the data will log 4 times every interval, as illustrated in Figure 4-6. To continuously log data until the memory is full, set the data logging number to 0.

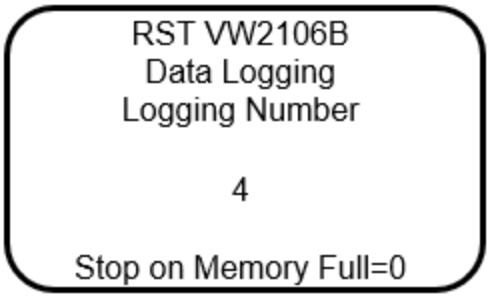

FIGURE 4-6 DATA LOGGING NUMBER

6. The readout will start the data logging process and will end with a message stating “Logging completed”. **ESC** can be pressed any time to abort the data logging process.

4.5 DATA LOGGING THROUGH STORE DATA

Once the intervals and iteration preferences have been defined (see section 4.4 step 4), data logging can also be accessed through the **Store Data** screen.

1. Using the up/down arrows, scroll to the **Store Data** screen and press **Enter**.

2. Select the location where the data will be stored. Press **Enter**.

3. Press and HOLD the **Enter** button to commence data logging. The logging screen will appear (Figure 4-7).

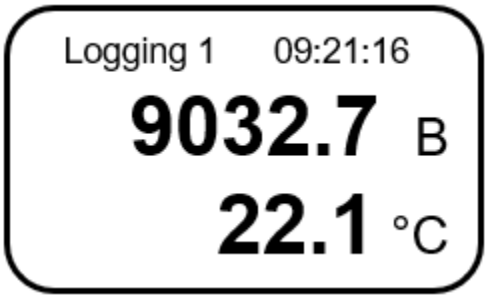

FIGURE 4-7 LOGGING SCREEN

During the logging process, the logging number and the corresponding time stamp will increase in the upper right-hand corner of the screen.

A message will appear indicating the logging process has been completed. The readout will automatically turn off.

4.6 ZEROING READOUT

The readout can be zeroed once the calibration factors are set for a specific location and the correct sensor engineering units are selected and uploaded from the RST Readout Host Software to the VW2106 unit. Please refer to the RST Readout Host Software Instruction Manual (ELM0084) to set up sensor engineering units.

The following instructions detail the procedure for zeroing the sensor:

1. Using the up/down arrows, scroll to the **Memory** screen and press **Enter**.
2. Scroll to the **Zero Readout** screen and press **Enter**.
3. Scroll to the desired location and press **Enter**.
4. Select **Zero Readout** and press **Enter**.
5. Press **Enter** to accept the value displayed or press **ESC** for more options (Figure 4-8).

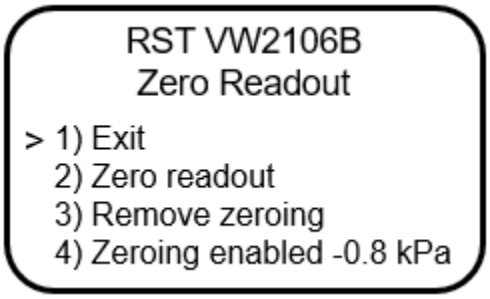

FIGURE 4-8 ZEROING OPTIONS

6. Using the up/down arrows, scroll to the desired option and press **Enter**.

- **Selection 1** will exit the current screen.
- **Selection 2** will zero the readout.
- **Selection 3** will delete the current zeroing value.
- **Selection 4** will toggle between zeroing enabled/disabled.

NOTE: "ENABLE/DISABLE" WILL SAVE THE ZERO OFFSET, SO IT CAN BE RE-APPLIED AT A LATER TIME. WHEN ZEROING IS ENABLED FOR A GIVEN LOCATION, 'TARE' WILL APPEAR IN THE READINGS SCREEN TO CONFIRM A READING IS BEING TAKEN WITH AN APPLIED ZERO OFFSET.

4.7 DELETING DATA

All location information can be deleted from the readout or through the RST Readout Host Software. The following instructions detail the process for deleting data in the readout.

1. Press **any key** to power on the display.
2. Scroll to the **Memory** screen using the up/down arrows and press **Enter**.
3. Scroll to **Delete** using the up/down arrows and press **Enter**.
4. Scroll to the desired delete option (Figure 4-9) using the up/down arrows and press **Enter**.

FIGURE 4-9 DELETE OPTIONS

NOTE: ESC CAN BE PRESSED AT ANY TIME TO ABORT THE DATA DELETION PROCESS.

5 MAINTENANCE

5.1 DEVICE HEALTH

The VW2106 Readout contains a built-in speaker. The following procedure outlines the steps to determine the health of the device by listening to the ring of the wire.

1. Simultaneously press the **Up** and **Down** arrows for several seconds to enable the audio feature. Once enabled, a small speaker graphic will appear on the screen.

2. Listen to the ring emitted from the device, If the instrument is functioning correctly, a steady ping without distortion will be audible.

3. This feature can be disabled by either waiting for it to time out or by simultaneously pressing both the **Up** and **Down arrows.**

5.2 BATTERY

The VW2106 operates on 3 standard “AA” batteries. The battery terminal can be found the left side of the readout unit (Figure 5-1).

FIGURE 5-1 BATTERY COMPARTMENT

The following instructions detail the process for accessing the battery compartment and installing batteries (Figure 5-2):

1. Using a flat-head screwdriver, turn the cap on the battery cover one quarter turn counterclockwise.
2. Remove the cap.
3. To replace the cap, ensure the notched on the cap align with the notches on the compartment. Firmly press the cap into place and turn the cap one quarter turn to the right.

CAUTION: ENSURE THE NOTCHES OF THE BATTERY COMPARTMENT COVER AND THE BATTERY COMPARTMENT ITSELF ARE ALIGNED BEFORE REPLACING AND TIGHTENING THE COMPARTMENT COVER TO PREVENT DAMAGING THE COVER.

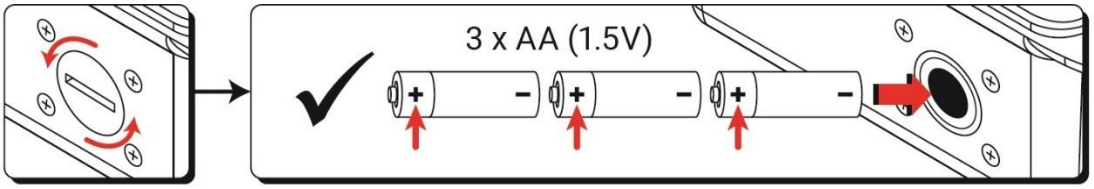

FIGURE 5-2 BATTERY INSTALLATION

The status of the battery can be checked using the following steps:

1. Turn on the readout by pressing **any key**.
2. Using the up/down arrow keys, scroll to the **Battery Voltage** screen.
3. The readout will display the current battery status, as illustrated in Figure 5-3.

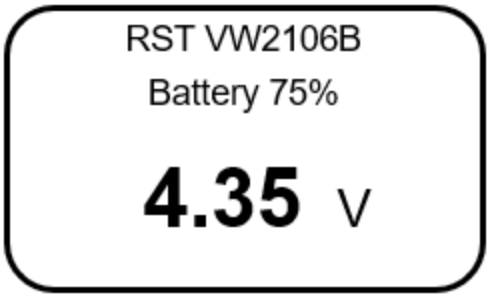

FIGURE 5-3 BATTERY VOLTAGE SCREEN

When the battery level is low (i.e. the battery voltage drops below 3.5 volts), “BATT” will appear on the upper right corner of every screen. All 3 batteries should be changed once this warning appears.

NOTE: REPLACE ALL 3 BATTERIES WHEN THE “BATT” WARNING APPEARS.

CAUTION: DO NOT REPLACE BATTERIES IN WET CONDITIONS TO PREVENT WATER INGRESS.

5.3 PROTECTING THE DEVICE

There are a number of steps that can be taken to protect the integrity of the unit:

- Ensure wires and terminals are free from dirt before inserting wires into the terminals.
- For older model VW2106 readouts, check that the latches on the terminal block are closed prior to closing the lid of the enclosure.
- It is important to keep the weather seal free from dust and dirt to maintain the water ingress protection.
- Make sure the weather caps are secured before closing the lid of the enclosure.
- Ensure the unit is dry before storing it to avoid damage from standing water.

6 SOFTWARE AND FIRMWARE UPDATES

The VW2106 Readout is designed so that the unit's software and firmware can be easily updated by the customer by connecting a host computer to the unit via the USB port. Please visit http://www.rstinstruments.com for product updates.

7 SERVICE AND REPAIR

The product contains no user-serviceable parts. Contact RST for product service or repair not covered in this manual.