EAGLE EYE
POWER SOLUTIONS

Operator's Manual
DLV-Pro Data Logging Voltmeter *Plus*

Rev: 07
Date: 9/29/2014
DLV-Pro Firmware: Rev 003.011 and above
Winmeter 5.1 Software: Rev 1.0.0.010 and above

Table of Contents:

For the most accurate results, please read and follow these instructions carefully.

1.0 Overview

The DLV-Pro data logging voltmeters have been designed specifically for the battery test industry.

The DLV-Pro is capable of operating in (4) distinct measuring modes:

(i) **VDC 20 x 48**: The DLV-Pro can measure and analyze up to 960 readings of cell voltages between 0.1 VDC and 19.999 VDC (inclusive). These readings are stored in 20 separate data strings of 48 readings, denoted A through T. The date and time of the last reading in each string is also recorded.

(ii) **VDC 8 x 256**: The DLV-Pro can measure and analyze up to 2048 readings of cell voltages between 0.1 VDC and 19.999 VDC (inclusive). These readings are stored in 8 separate data strings of 256 readings, denoted A through H. The date and time of the last reading in each string is also recorded.

(iii) **HYD 8 x 256**: The DLV-Pro can receive and analyze to 2048 readings of specific gravity and temperature from a DMA35 digital hydrometer. These readings are stored in 8 separate data strings of 256 readings, denoted A through H. The date and time of the last reading in each string is also recorded.

(iv) **Discharge Test**: The DLV-Pro can measure and store up to 256 float and up to 10 sets of individually time-stamped readings each of the cells voltage during a discharge test.

Readings in **String "A"** are reserved for the initial (**float**) voltage of the cell and are **NOT** time stamped.

Readings in **Strings "B" through "K"** are reserved for cell voltages **during** the **discharge** (or charge) test with **each** reading being **time stamped** to the nearest second from the **start** of the discharge test. The date and time of the last reading is also recorded.

The user may also select to:

- Record up to 256 measurements of **load current** by measuring, scaling and time-stamping the mV output of a shunt or clamp-on meter.
- Record the **float & final** readings of **specific gravity & temperature**.

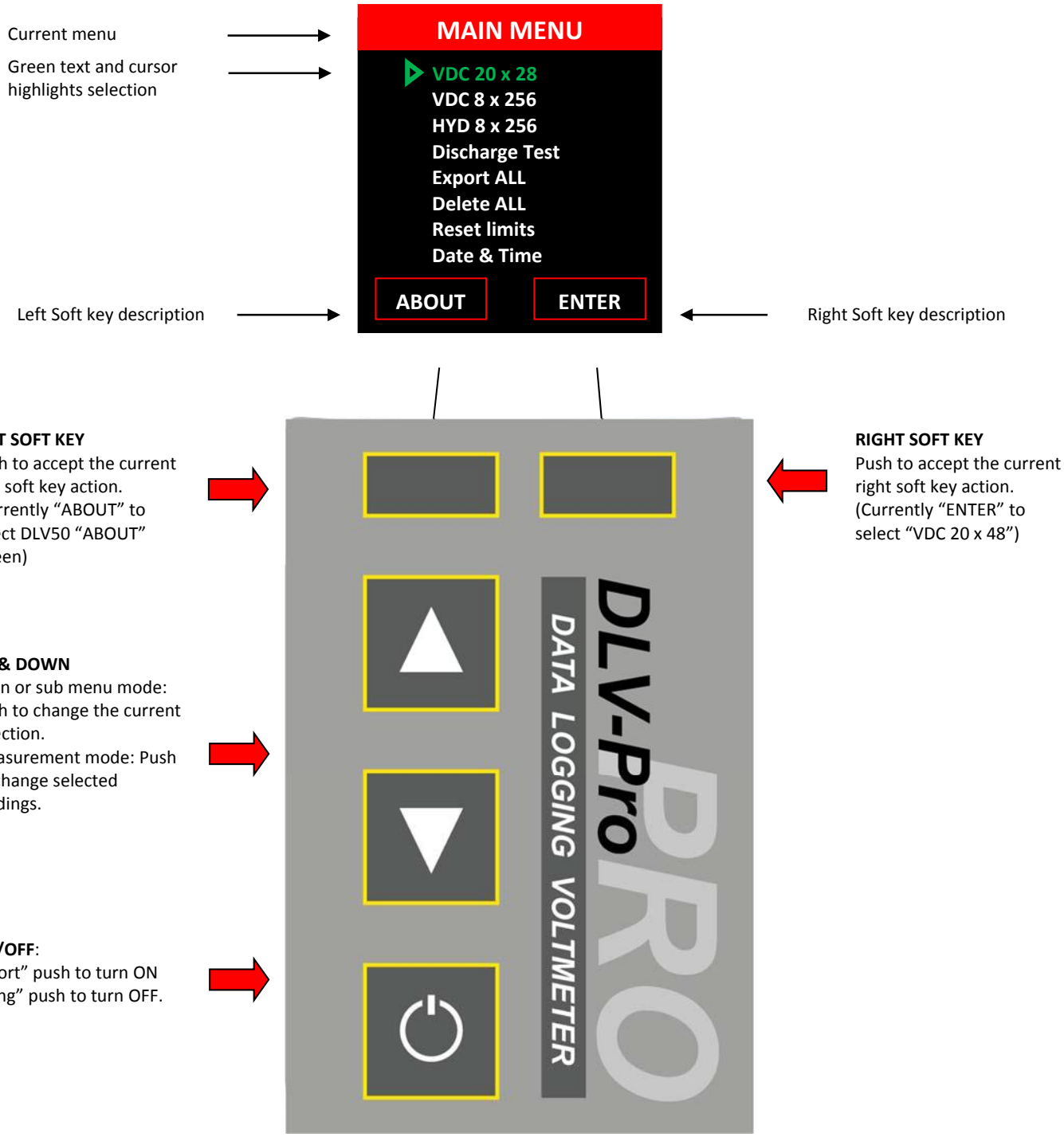
All **DLV-Pro** modes operate **independently**. Erasing the memory in one mode does **NOT** affect readings in the remaining (3) modes.

All stored readings can be downloaded via Winmeter 5.1 software to generate detailed test reports including statistical and graphical analysis and then stored into a custom database. This software communicates with the DLV-Pro via USB and allows the User to set the time/date, change modes, delete data string(s) and set thresholds and settings. The readings can also be transferred to a USB flash drive in .BDF (Float data) format or .DDF (discharge data) format.

2.0 Menu System

2.1 Main Menu

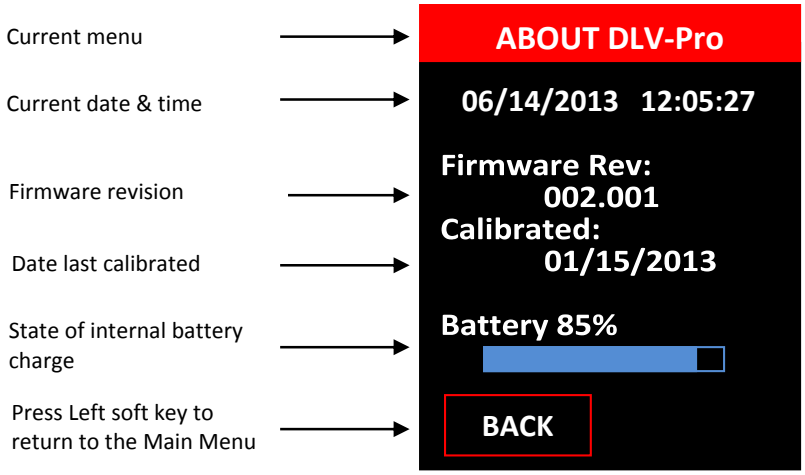
When turned ON, the DLV-Pro displays date, time and firmware revision for 3 seconds then displays the **"Main Menu".**



Regardless of DLV-Pro status, repeatedly pressing the left soft key will return the unit to the Main Menu (unless the DLV-Pro is connected to a PC via USB).

2.2 About Screen

Press the Left soft key (below "ABOUT") to display the "**About DLV-Pro"** screen.



2.3 Main Menu Options

From the **"Main Menu"**, use the Up/Down keys to highlight the appropriate option then push the Right soft key (below the **"BACK"** button) to select that option.

There are 6 options from the main menu:

VDC 20 x 48: Select to view, analyze, edit or measure DC cell voltages.
The DLV-Pro stores up to 20 strings of 48 readings stored in strings A through T.

VDC 8 x 256: Select to view, analyze, edit or measure DC cell voltages. The DLV-Pro stores up to 8 strings of 256 readings stored in strings A through H.

HYD 8 x 256: Select to view, analyze or upload additional strings of hydrometer reading from a DMA35 hydrometer. The DLV-Pro stores up to 8 strings of 256 readings stored in strings A through H. Both specific gravity and temperature are stored for each cell.

Discharge Test: Select to perform a discharge test. Measure and store up to 256 float and up to 10 sets of individually time-stamped readings each of the cells voltage during a discharge test. The User may also select to record load current during the discharge and/or record the float (before discharge) & final (after discharge) readings of specific gravity & temperature

Export ALL: Select to Export **ALL** data to USB Flash drive.

Delete ALL: Select to Delete **ALL** data in all strings.

Individual strings can be deleted by selecting the "Delete String" option of the VDC or HYD mode sub-menu OR by connecting the unit to the Winmeter 5.1 software.

Reset Limits: Select to Delete **ALL** high and low threshold limits for voltage and hydrometer readings. The load current calibration factor is also reset to 100mV => 100IDC

> Individual limits for particular strings can also be deleted by selecting the "Limits" option of the VDC or HYD mode sub-menu OR by connecting the unit to the Winmeter 5.1 software.

Date & Time: Select to view and/or edit the DLV-Pro date and time setting.

> The date and time setting is automatically synced with the PC date and time whenever the DLV-Pro is connected with the Winmeter 5.1 software

2.4 VDC Mode ("20 x 48" & "8x256")

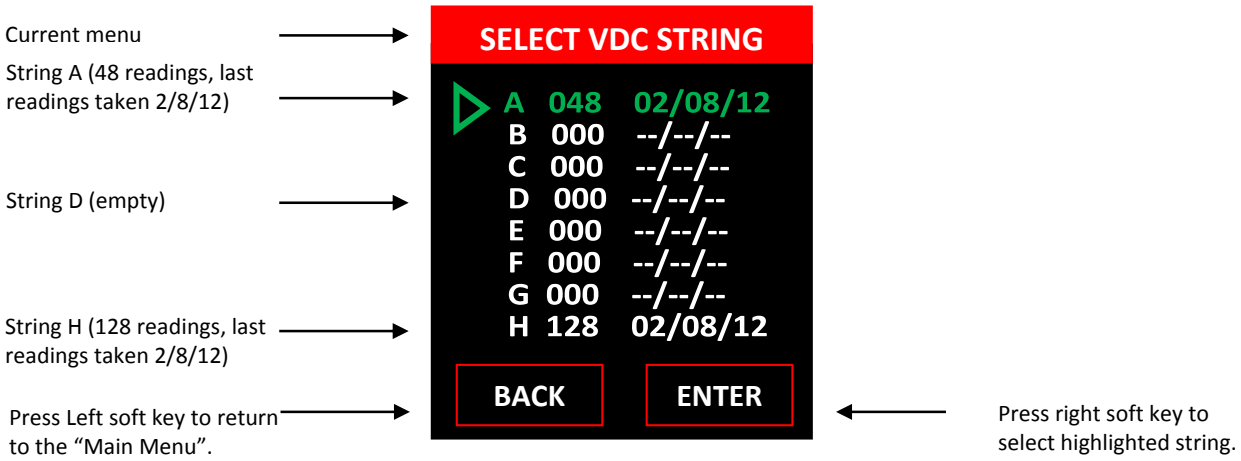
To select VDC Mode, from the **"Main Menu"** use the Up/Down keys to highlight **"VDC 20 x 48"** or **"VDC 8 x 256" mode** then push the Right soft key (below **"ENTER")** to select.

Select either VDC mode to View, Analyze, Export to USB flash drive, Print via IRDA, Edit or Add to stored DC cell float voltages.

In **"VDC 20 x 48"** mode, the DLV-Pro stores up to 20 strings of 48 readings stored in strings A through T.

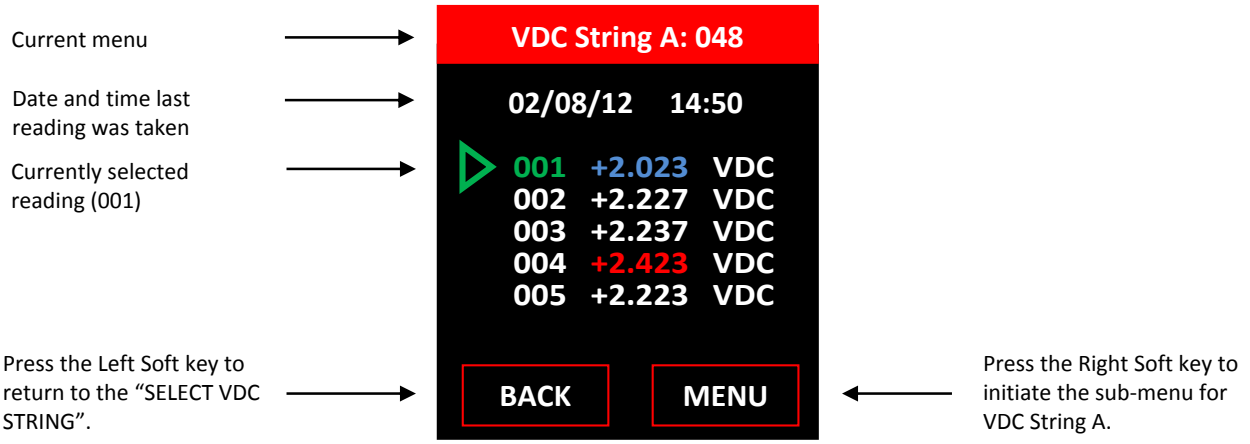
In **"VDC 8 x 256"** mode, the DLV-Pro stores up to 8 strings of 256 readings stored in strings A through H.

Once the VDC mode is selected the User then selects which string (A -> T or A -> H) to open. Each string is displayed together with the number of contained readings and the date the last reading was taken.



2.4.1 Selecting a Voltage String

Use the **“UP”** & **“DOWN”** keys to highlight the required string then push the Right Soft key (below **“ENTER”**) to select/open the string.



Reading 001 “+2.023” is highlighted in blue to show it is below the low threshold voltage of String A.
Reading 004 “+2.423” is highlighted in red to show it is above the high threshold voltage of String A.
Threshold levels are optional and editable.

To scroll through all voltage readings in String A, use the **“UP”** and **“DOWN”** keys.

2.4.2 VDC Sub-Menu

To enter the VDC sub-menu press the Right soft key (below **“MENU”**).

VDC Sub-Menu Options:

Use the Up/Down keys to highlight the appropriate option then push the Right soft key (below **“ENTER”**) to select that option.

There are 7 options to select from the VDC sub-menu:

Add/Delete
Statistics
Graph
Limits
->Flash USB
->Print IRDA
Delete String

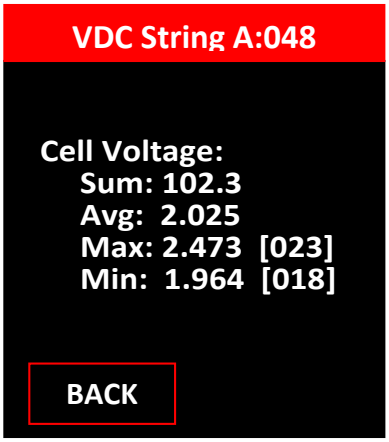
2.4.2.1 Add/Delete:

Select to Measure/Store, Delete or Insert DC cell voltages.

Refer to **Taking a DC Voltage Measurement** for additional instructions.

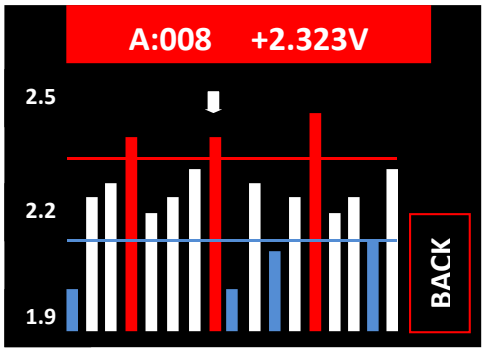
2.4.2.2 Statistics:

Select to View Statistics for the Current VDC string.



2.4.2.3 Graph:

Select to View Graphical Analysis of Current VDC string.



2.4.2.4 Limits:

Select to View, Remove or Edit the High and Low Threshold Voltage limits for the string.

2.4.2.5 -> Flash USB:

Select to export the Current VDC string to a .BDF file to a USB Flash Drive connected to the DLV-Pro USB port. This file can later be transferred to a PC and opened with Winmeter 5.1 software.

2.4.2.6 -> Print IRDA:

Select to Print the Current VDC string to a .BDF file to a USB Flash Drive connected to the DLV-Pro USB port.

2.4.2.7 Delete String:

Select to Delete **ALL** VDC data in the current VDC string.

This process cannot be undone!

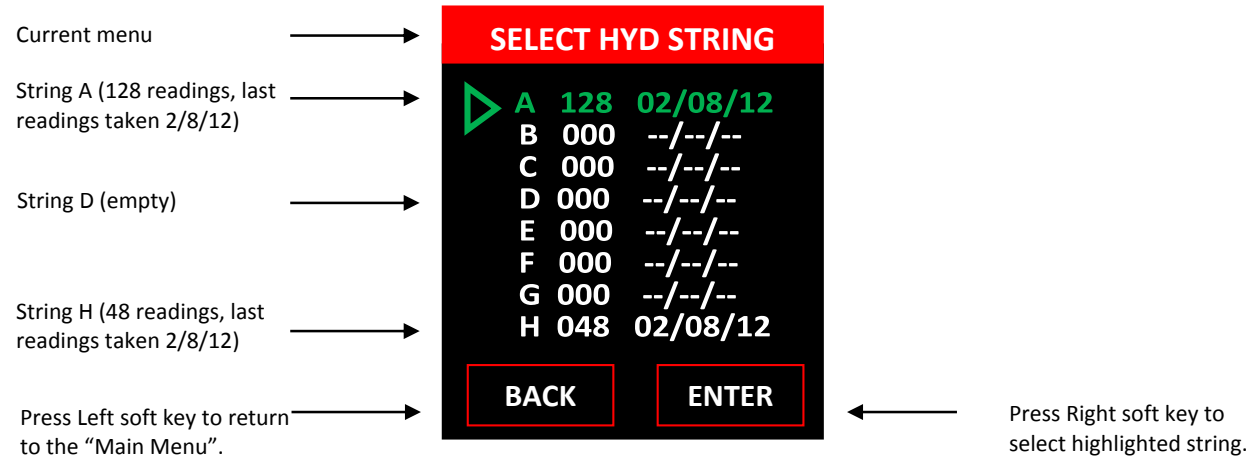
2.5 “HYD 8 x 256” Mode

To select HYD Mode, from the **“Main Menu”** use the Up/Down keys to highlight **“HYD 8 x 256”** then push the Right soft key (below **“ENTER”)** to select.

Select **“HYD 8 x 256”** to upload hydrometer data from a DMA35 digital hydrometer, then View, Analyze, Export to USB flash drive, Print via IRDA.

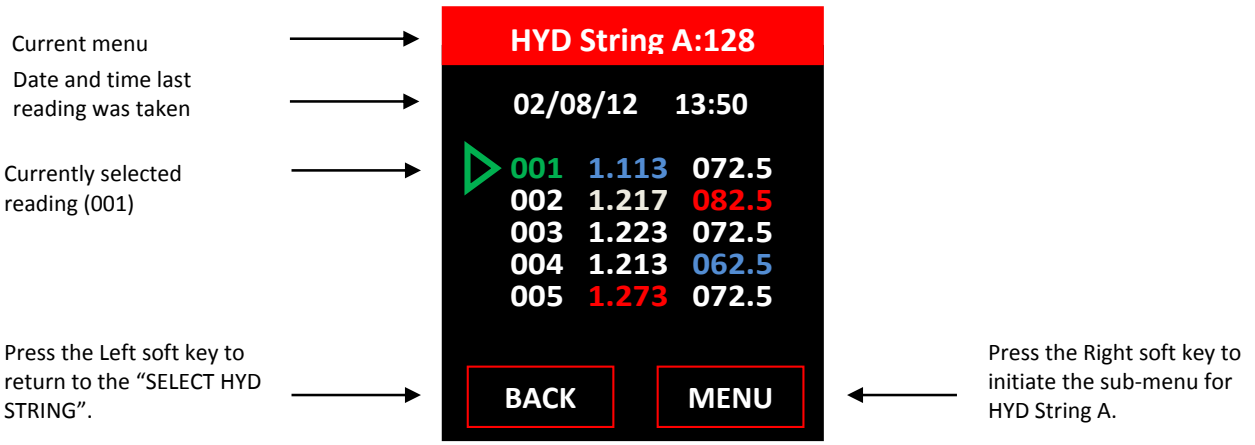
The DLV-Pro can upload and store up to 8 strings of 256 readings (specific gravity & temperature) stored in strings A through H.

Once HYD Mode is selected the User then selects which string (A through H) to open. Each string is displayed together with the number of contained readings and the date the last reading was taken.



2.5 1 Selecting a Hydrometer String

Use the **“UP”** & **“DOWN”** keys to highlight the required string then push the Right soft key (below **“ENTER”)** to select/open the string.

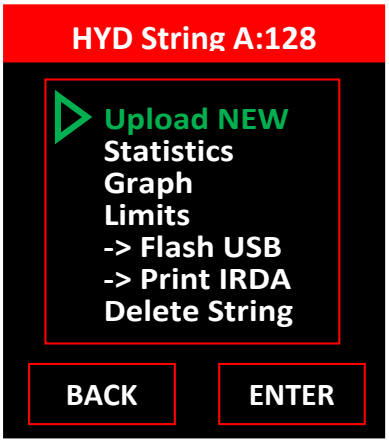


Readings highlighted in blue indicate they are below the low threshold level. Readings highlighted in red show they are above the high threshold level. Threshold levels for both specific gravity are optional and editable.

To scroll through all hydrometer readings in String A, use the **“UP”** and **“DOWN”** keys.

2.5.1 HYD Sub-Menu

To enter the VDC sub-menu, Press the Right soft key (below **“MENU”**).



Selecting VDC Sub-Menu Options:

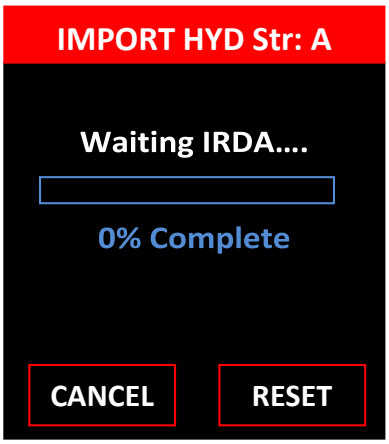
Use the **“UP”** & **“DOWN”** keys to highlight the appropriate option then push the Right soft key (below **“ENTER”**) to select that option.

There are 7 options to select from the HYD sub-menu:

Upload New
Statistics
Graph
Limits
->Flash USB
->Print IRDA
Delete String

2.5.2.1 Upload New:

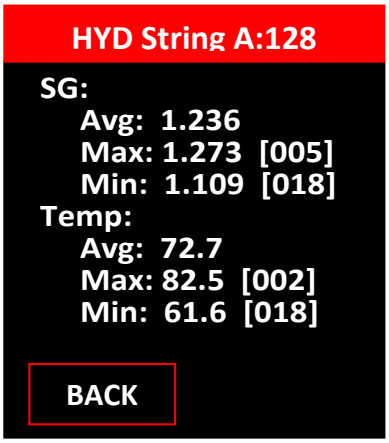
Select to upload hydrometer data directly from a DMA35 digital hydrometer (via IRDA).



Refer to Uploading Hydrometer Data to the DLV-Pro for additional instructions.

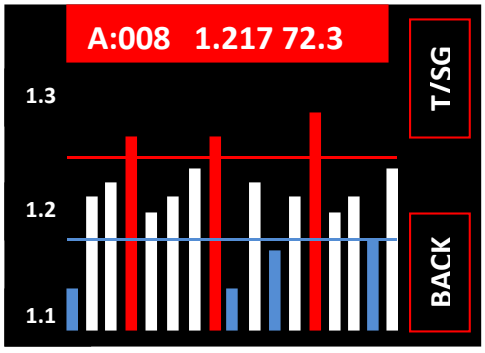
2.5.2.2 Statistics:

Select to view statistics for the current HYD string.



2.5.2.3 Graph:

Select to view graphical analysis of current HYD string.



2.5.2.4 Limits:
Select to View, Remove or Edit the high and low threshold limits (specific gravity and temperature) for the string.

2.5.2.5 -> Flash USB:
Select to export the current HYD string to a .BDF file to a USB flash drive connected to the DLV-Pro USB port. This file can later to transferred to a PC and opened with Winmeter 5.1 software.

2.5.2.6 -> Print IRDA:
Select to print the current HYD string to IRDA compatible printer.

2.5.2.7 Delete String:
Select to Delete **ALL** HYD data in the current HYD string.

This process cannot be undone!

2.6 "Discharge Test" Mode

To select **"Discharge Test"** Mode, from the **"Main Menu"** use the Up/Down keys to highlight **"Discharge Test"** then push the Right soft key (below **"ENTER")** to select.

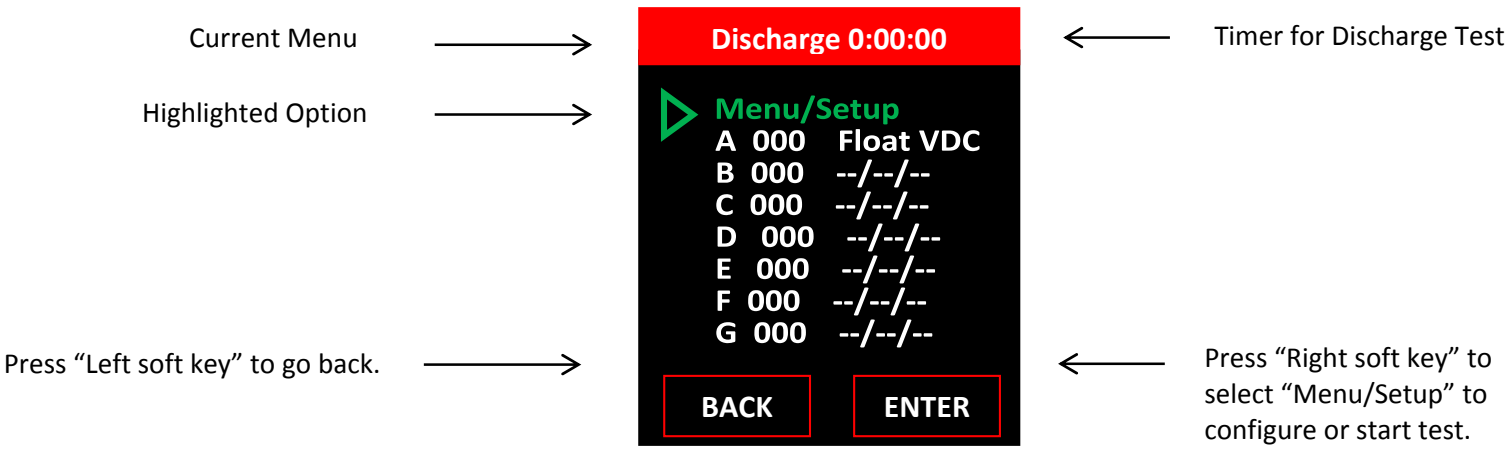
Select **"Discharge Test"** to measure and store up to 256 float and up to 10 sets of individually time-stamped readings each of the cells voltage during a discharge test.

The DLV-Pro can upload and store up to 10 strings of 256 readings (specific gravity & temperature) stored in strings B through K.

Once "Discharge Test" mode is selected, the user may also select to:

- Record up to 256 measurements of **load current** by measuring, scaling and time-stamping the mV output of a shunt or clamp-on meter.
- Record the **float & final** readings of **specific gravity & temperature**.

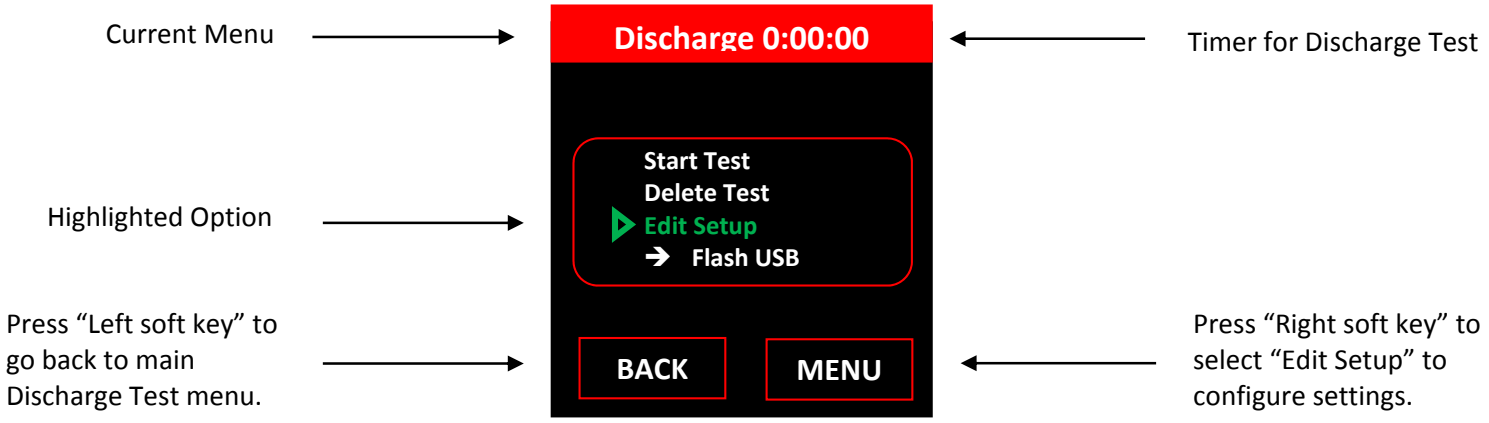
2.6.1 Menu/Setup
Select to start "Discharge Test" or configure settings for the "Discharge Test".



Note: User must record float readings before being able to start Discharge Test!!!

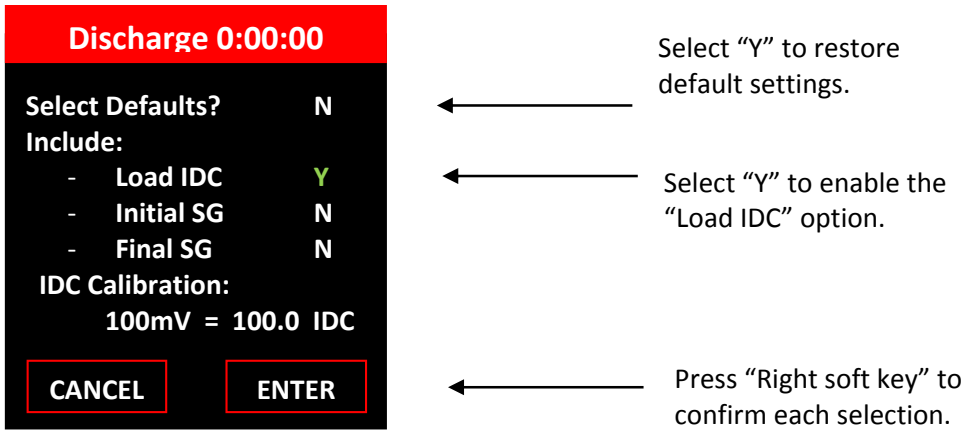
2.6.2 Optional Discharge Parameters

To enable optional parameters for the “Discharge Test”, the user can toggle off “Load IDC”, “Initial SG”, “Final SG” from the “Menu/Setup” > “Edit Setup”.



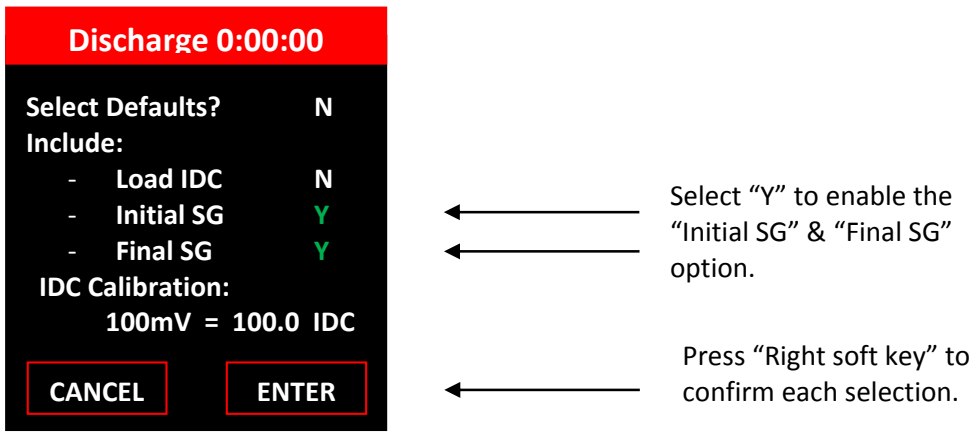
2.6.2.1 Load IDC

Enable this option to record measurements of load current with the use of a shunt or clamp-on meter.



2.6.2.2 Initial & Final SG/T

Enable these options to include Initial and Final SG and Temperature readings in the Discharge Test.



2.6.3 Discharge Cell Voltage Readings (Strings B through K)

The User can record measurements of up to 256 readings per string from B through K. The number of measurements that can be recorded per string from B through K is defined by how many float readings are measured in String A.

Note: User must record float readings and start Discharge Test first before measuring discharge voltages on String B through K.

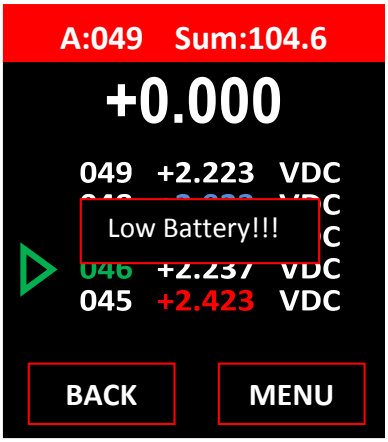
3.0 Power Features

3.1 Auto-Off

After approximately **(3) minutes** of non-operation, the unit will **beep** and display an auto-off warning for **10 seconds**. Pressing **any** button during this time will **cancel** the auto-off feature.

3.2 Low Battery Indication

A low battery is indicated by a warning:



It is recommended that the battery is fully recharged before the next scheduled use.

3.3 Checking Internal Battery Voltage

To check the battery voltage at any time:

(i) If not in Main Menu, press the **"BACK"** button **repeatedly** to enter the **"Main Menu".**

(ii) Press the Left soft key **"ABOUT"** to display the "About Screen".

3.4 Rechargeable Features

To charge your unit, please use the provided USB wall charging jack with the provided AC USB Wall Adapter. It will offer the fastest charging time for the unit. As an alternative, the mini USB cable via PC can be used to charge the unit at a much slower charging rate.

Accessory/Cable:	Estimated Charging Time
USB charging jack cable with AC USB Wall Adapter	~4 to 5 hours
Mini USB cable connected to PC via USB	~10 to 12 hours

Note: PLEASE DO NOT CONNECT USB CHARGING JACK CABLE DIRECTLY TO PC TO CHARGE UNIT!!!

While the unit is charging, there will be an LED on the bottom of the unit above the charging port that will be orange while charging and green when it is fully charged.

4.0 Deleting String Data and Editing Test Thresholds

4.1 Option 1: Using Winmeter 5.1 Software

(i) Connect the DLV-Pro to Winmeter 5.1 software via USB.

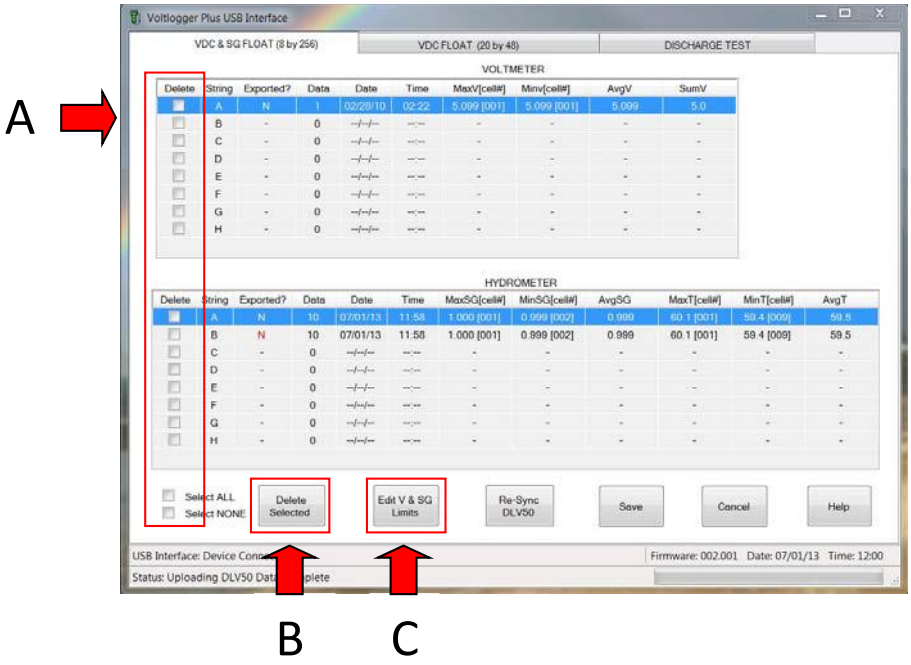
If the Winmeter Autostart software is not enabled, **RUN** the Winmeter 5.1 software to initiate data transfer.

If the "DLV50 USB Interface" does not initiate automatically select **"Download Device" -> "DLV-Pro (search for device)"**

Once connected, the DLV-Pro will display **"DLV-Pro <-> PC"** and sync contained data and settings with Winmeter 5.1.

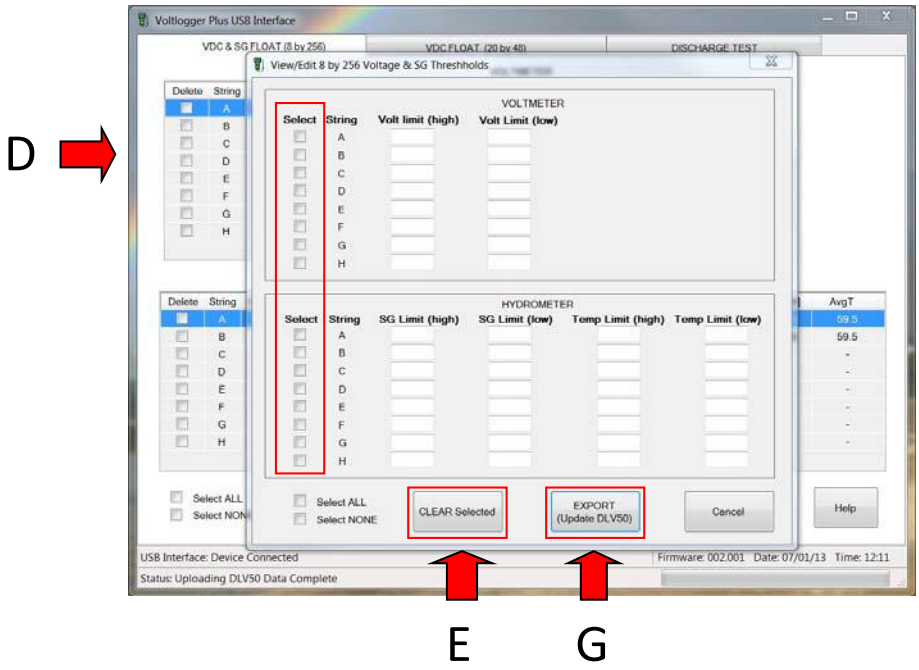
(ii) Once data transfer is complete:

(A) Select any/all strings that contain obsolete data.



(B) Click the “Delete” button.
The DLV-Pro will then delete all selected strings.

(C) Click the “Edit V & SG Limits” button to View/Edit the current 8 x 256 voltage & SG thresholds.



(D) Select ALL strings that you would like to remove limits for.

(E) Click **“CLEAR Selected”.**

(F) Edit all threshold limits you would like to change.

(G) Click **“EXPORT (Update DLV-Pro)”** to send these changes to the attached DLV-Pro.

(H) Disconnect the USB cable from the DLV-Pro.

The DLV50 USB cable **MUST** be **DISCONNECTED** whenever measuring cell voltages!

4.2 Option 2: Manually

4.2.1 Deleting Individual VDC/HYD Strings

(i) Turn the DLV-Pro **ON** & select "**VDC Mode**" or **"HYD Mode".**

The DLV-Pro must **NOT** be connected to the PC via USB!

(ii) Select required VDC or HYD string to delete.
(iii) Press **"Menu"** to select the VDC sub-menu or HYD sub-menu and select **"Delete String**"
(iv) Press **"YES"** to delete the VDC or HYD string.

The DLV-Pro will now delete the selected VDC/HYD string.
This process will take approximately 3 seconds.

4.2.2 Deleting ALL (Voltmeter and Hydrometer) Strings

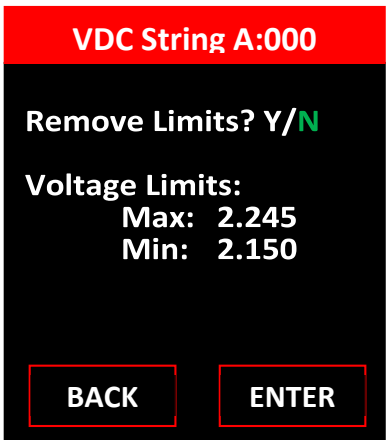
(i) From the Main Menu select "Delete ALL".
(ii) Press **"YES"** to Delete **ALL** voltmeter strings and **ALL** hydrometer strings.

This process cannot be undone!

4.2.3 Editing Individual VDC/HYD String Threshold Limits

(i) Select required VDC/HYD string.
(ii) Press **"Menu"** to select the VDC/HYD sub-menu and select **"Limits".**

For example, to edit String A voltage limits:



To **remove** the limits for the selected voltage string:

- Push the **"UP"** key to select "**Remove Limits? Y/N**" to remove limits.
- Push **"ENTER".**

To **edit** the limits for the selected voltage string:

- With "**Remove Limits? Y/N**", Push "ENTER".
- Use the **"UP"** and **"DOWN"** keys to edit the "**Max**" Limit then Push **"ENTER"** to select.
- Use the **"UP"** and **"DOWN"** keys to edit the "**Min**" Limit then Push **"ENTER"** to select.

(iii) Press **"YES"** to delete the VDC string.

4.2.4 Remove ALL (Voltmeter and Hydrometer) Thresholds Limits

(iv) From the Main Menu select "Reset Limits".
(v) Press **"YES"** to remove **ALL** voltmeter limits and **ALL** hydrometer limits.

This process cannot be undone!

5.0 Taking DC Cell Voltage Measurements

5.1 Measuring DC Cell Voltages

The DLV-Pro is designed to measure absolute DC cell voltages between 0.1 VDC and 19.999 VDC Attempts to measure higher DC voltages will result in an **"OVERVOLTAGE!!!" warning.**

ALL DLV-Pro USB and RS232 cables **MUST** be **DISCONNECTED** before measuring voltages!

Cell voltage measurements are taken in a similar fashion to traditional voltmeter.

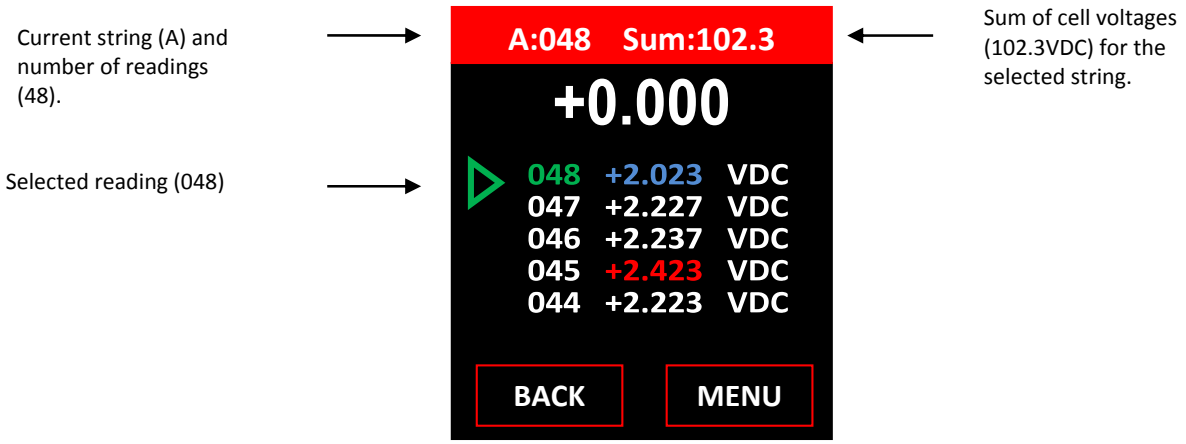
(i) Turn the DLV-Pro **ON.**

(ii) Select "**VDC Mode".**

(iii) Select **required string** (A through H)

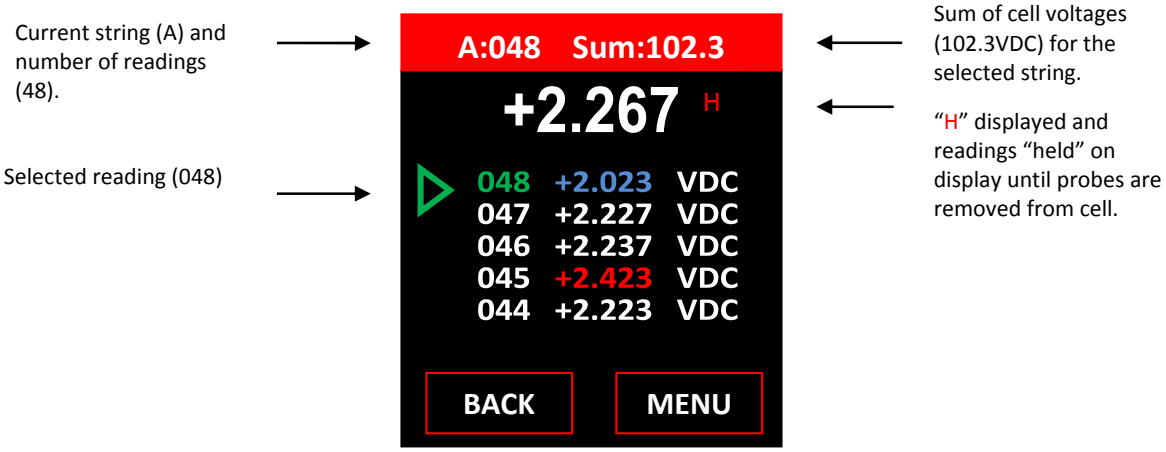
(iv) Press "**Menu"** then select "**Add/Delete".**

NOTE: If the selected string already contains voltage reading, the DLV50 will automatically "point" to the last reading location.



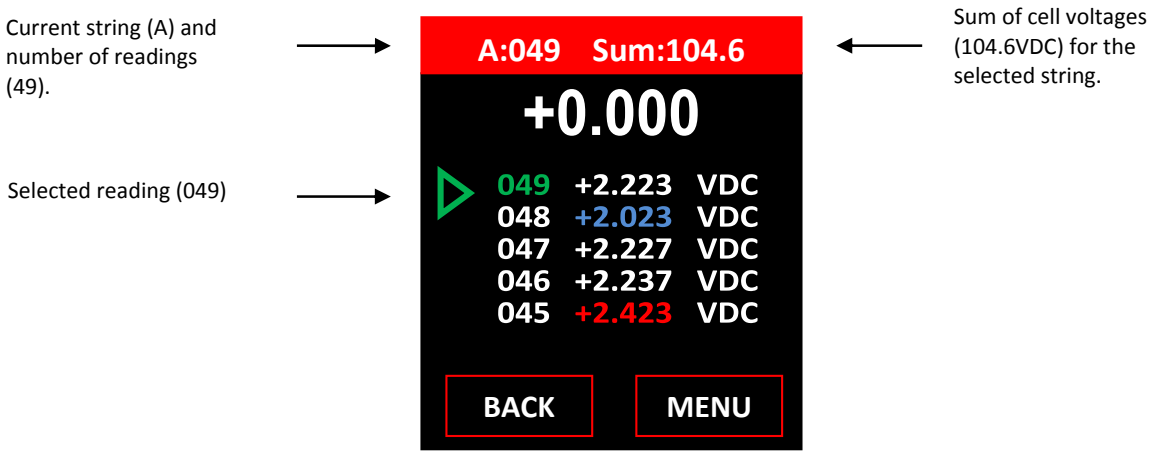
(v) Connect the voltage probes to the cell terminals.

The DLV-Pro automatically detects that it is connected to a cell and begins measuring the cell voltage. When the measurement is **stable** (within +/- 0.005 VDC) the DLV-Pro automatically **beeps** and the reading is **held** on the display until the probes are removed from the cell.



(vi) Remove the voltage probes from the cell terminals.

The reading is **held** on the display until the probes are **removed**. After approximately (1) second the DLV-Pro **stores** the reading, **adds** the reading to the sum of string cell voltages and **increments** to the next reading.



(vii) Repeat steps (iv) and (v) until all cell voltages in the string have been measured.

5.2 Over Voltage Indication

The DLV-Pro provides both an audio and visual indication if the probes are connected to an excessive input voltage (Vin < -19.999 VDC or Vin > +19.999 VDC).

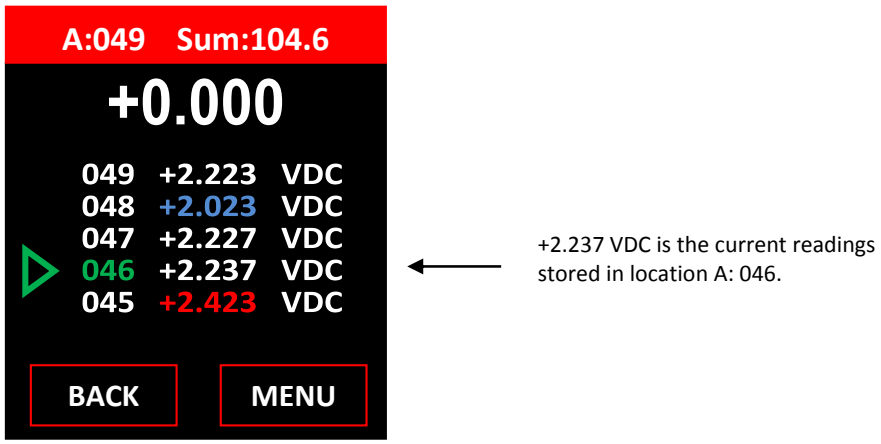
The unit will **beep** continuously and display:

This warning is removed as soon as the probes are disconnected from the high voltage source.

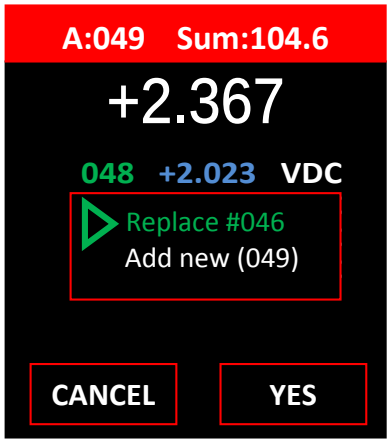
5.3 Recording over a Previous Measurement

To record over a previous measurement:

(i) Press the "**UP**" or "**DOWN**" buttons to scroll to the required reading location (Ex: reading 046).



(ii) Connect probes to cell 046 and take the new measurement.



(iii) Select the appropriate response ("Replace #046") and press **"YES"** or **"CANCEL"** to void last reading.

5.4 Deleting a Previous Measurement

(i) Press the "**UP**" or "**DOWN**" buttons to scroll to the required reading location (Ex: reading 047).

(ii) Press **"MENU"** and select "Delete # 047", then press **"ENTER"** to delete the selected reading.

6.0 When a reading is deleted **ALL** readings in memory locations **above** the deleted cells are moved **down** (1) location.

During the data transfer process, **ALL** existing data in the selected HYD string of the DLV-Pro will be **ERASED** and/or **OVERWRITTEN**!

6.1 Transferring Data from a DMA35 to the DLV-Pro

For the DMA35:

(i) Turn the DMA35 **ON.**

(ii) Use the **"EXPORT ALL"** function to initiate the data transfer by pushing the following buttons on the DMA35 in sequence:
"Menu" –> "OK" –> "Export" –> "OK".

(iii) Line up the IR windows of the DMA-35 and DLV-Pro.

For the DLV-Pro:

(iv) From the "**Main Menu"** select **"HYD Mode".**

(v) Select the required HYD string (A->H).

(vi) Select **"Menu".**

(vii) Select **"Upload New".**

NOTE: Only the **first 256 readings** stored in the DMA35 hydrometer can be uploaded to the DLV-Pro.

NOTE: IRDA data transfer will take 5 to 20 seconds depending on file size.

7.0 Discharge Test Procedure

7.1 Step 1: Select "Discharge Test" Mode, Clear Existing Test Data & Select Discharge Test Options/Thresholds

7.1.1 Option 1: Using Winmeter 5.1 Software (Recommended)

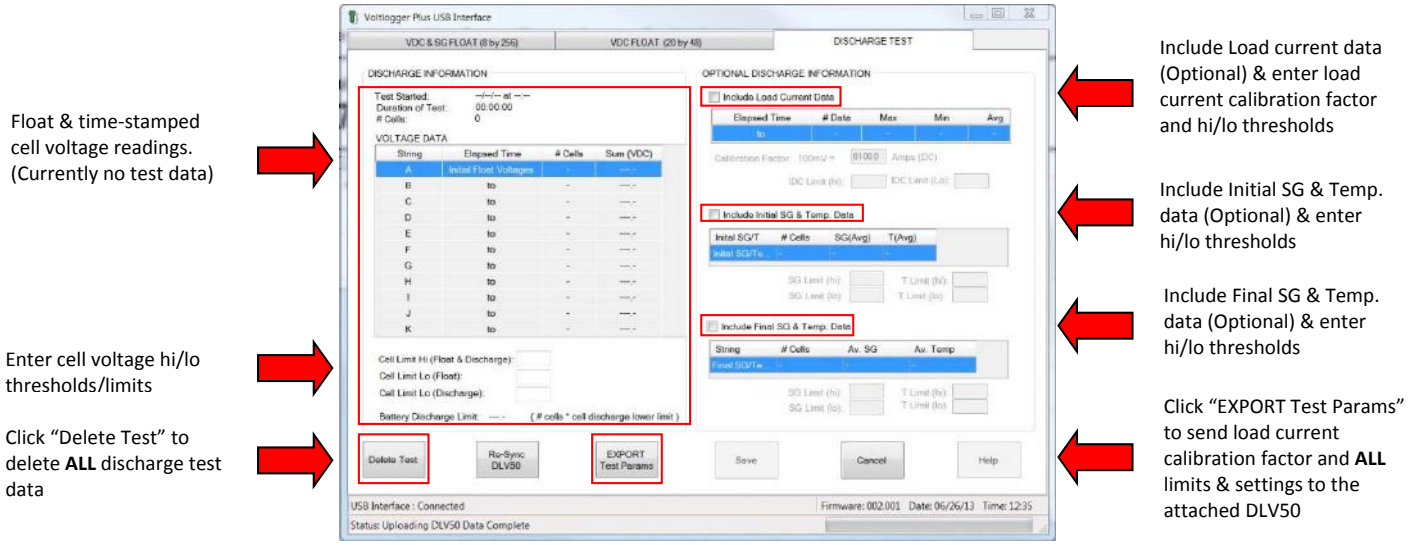
(iii) Connect the DLV-Pro to PC via USB

If the Winmeter 5.1 Autostart software is not enabled, **RUN** the Winmeter 5.1 software to transfer/sync all data & settings.

Once connected, the DLV-Pro will display **"DLV-Pro <-> PC"**

If the "Voltlogger Plus USB Interface" does not initiate automatically select **"Download Device" -> "DLV-Pro (search for device)".**

(iv) "Click" on the "DISCHARGE TEST" tab.



(v) "Click" the **"Delete Test"** button.

The DLV-Pro will then **delete ALL "Discharge Test"** data.

This **includes** deleting load current & initial/final hydrometer data (even if these options are **NOT** currently selected)

Test thresholds (voltage, load current, SG & temperature) & the load current calibration factor are **NOT** affected

(vi) "Program" the connected DLV-Pro with the required test parameters.

All thresholds are optional. To void any test threshold simply delete the contents of the associated text box

Cell Voltage:

- Enter/Edit "Cell Limit Hi (Float & Discharge)"
- Enter/Edit "Cell Limit Lo (Float)"
- Enter/Edit "Cell Limit Lo (Discharge)"

Load Current:

- Select/Unselect "Include Load Current Data
- Enter/Edit "Load Current Calibration Factor"

The load current calibration factor cannot be voided.

- Enter/Edit "IDC Limit (hi)"
- Enter/Edit "IDC Limit (lo)"

Initial SG & Temp.:

- Select/Unselect "Include Initial SG & Temp Data
- Enter/Edit "SG Limit (hi)"
- Enter/Edit "SG Limit (lo)"

- Enter/Edit “Temp. Limit (hi)”
- Enter/Edit “Temp. Limit (lo)”

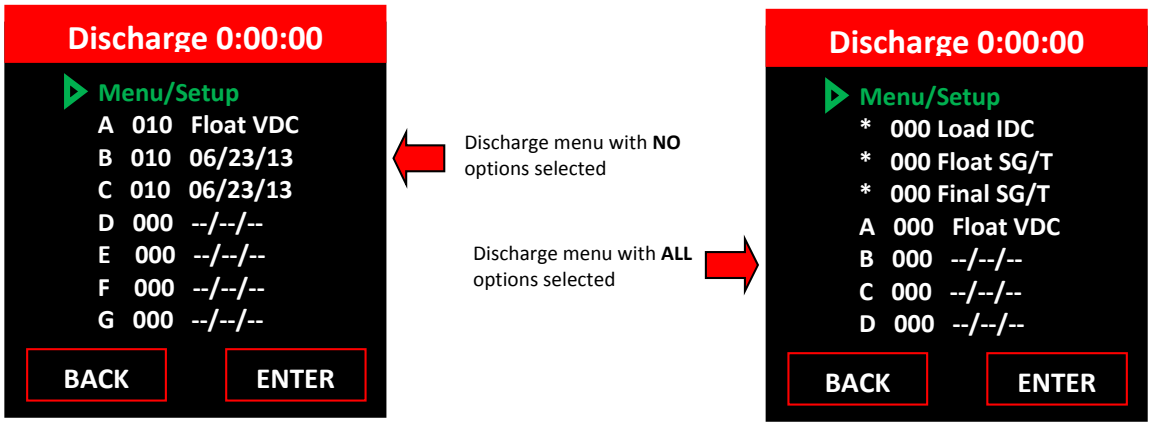
Final SG & Temp.:

- Select/Unselect “Include Final SG & Temp Data
- Enter/Edit “SG Limit (hi)”
- Enter/Edit “SG Limit (lo)”
- Enter/Edit “Temp. Limit (hi)”
- Enter/Edit “Temp. Limit (lo)”

Click **“EXPORT Test Params”** to send load current calibration factor and **ALL** limits & settings to the attached DLV-Pro

The DLV-Pro will “beep” to acknowledge the new parameters.

(vii) Disconnect the USB cable from the DLV-Pro & select “Discharge Test” to confirm all options programmed successfully.

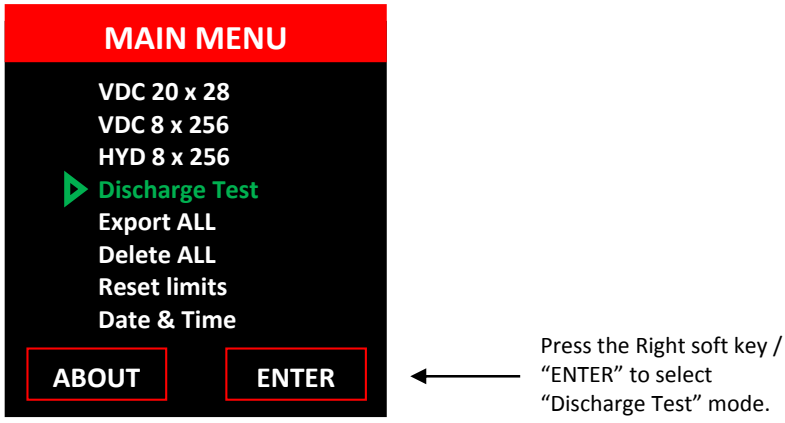


7.1.2 Option 2: Manually

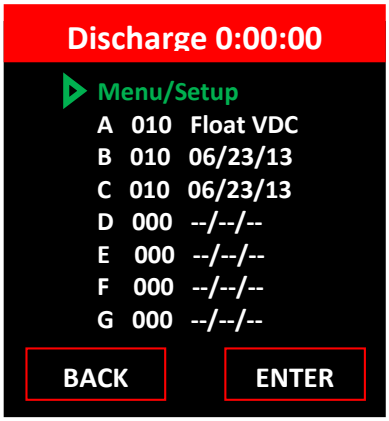
(i) Turn the DLV-Pro **ON**.

The DLV-Pro must **NOT** be connected to the PC via USB!

(ii) Select **“Discharge Test”** mode:



The DLV-Pro will change to **"Discharge Test Mode"** and display current mode information:



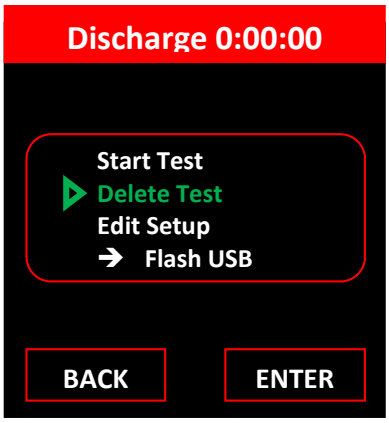
Press the Right soft key / "ENTER" to select "Menu/Setup.

String A is reserved for **float** voltages – cell voltage(s) BEFORE a load is attached to the battery.
Strings B through K are reserved for **discharge test** cell voltages. Cell voltages **AFTER** a load are attached to the battery.

As shown, String A, B & C all contains **10** readings and hence there is **existing** Discharge Test data and the DLV-Pro is not ready to start a **new** discharge test. See below for instruction on deleting ALL existing discharge test data.

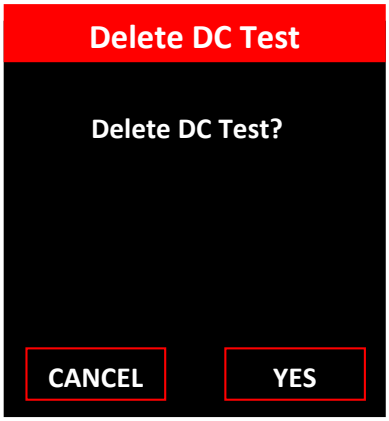
(iii) To manually **DELETE ALL** existing discharge test data:

A. Select "Menu/Setup" option from the "Discharge Test" menu.



Press the Right soft key / "ENTER" to select "Delete Test".

B. Press the Right soft key / "ENTER" to select "Delete Test".



Press the Right soft key / "ENTER" to select "Delete Test".

C. Press the right soft-key / "YES" to confirm "Delete Test".

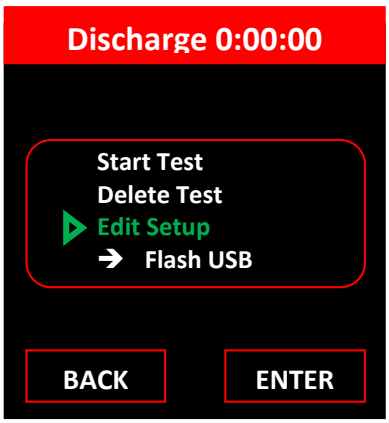
The DLV-Pro will now delete:

- ALL (11) voltage strings (Strings A -> K)
- ALL load current data (even if this option is not currently selected)
- ALL float hydrometer data (even if this option is not currently selected)
- ALL final hydrometer data (even if this option is not currently selected)

Test thresholds (voltage, load current, SG & temperature) & the load current calibration factor are **NOT** affected

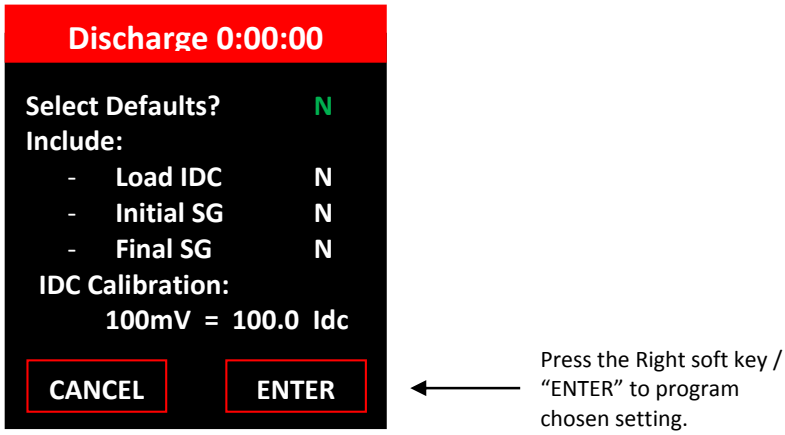
(iv) To manually edit discharge set up:

A. Select "Menu/Setup" option from the "Discharge Test" menu.



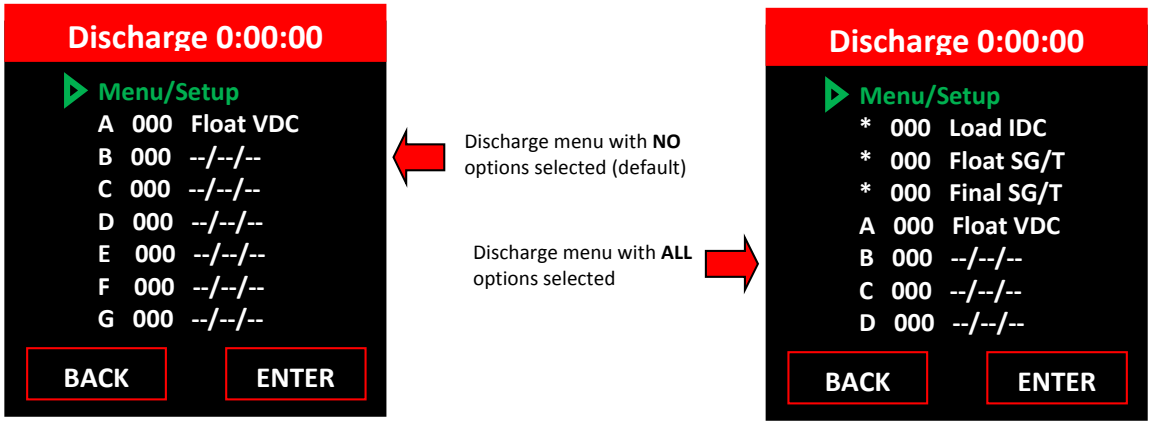
Press the Right soft key / "ENTER" to select "Edit Setup".

B. Press the Right soft key / "ENTER" to select "Edit Setup".



C. Use the **"UP/DOWN"** keys to edit each option then press **"ENTER"** to select.

D. Select "Discharge Test" to confirm all options programmed successfully.

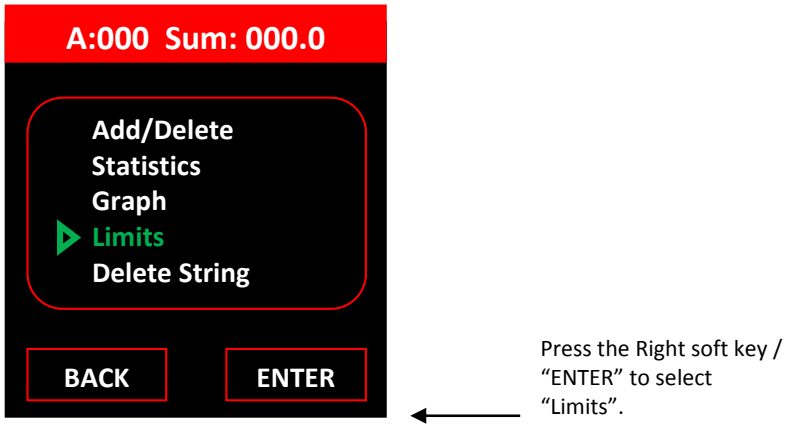


(v) To manually edit discharge test thresholds:

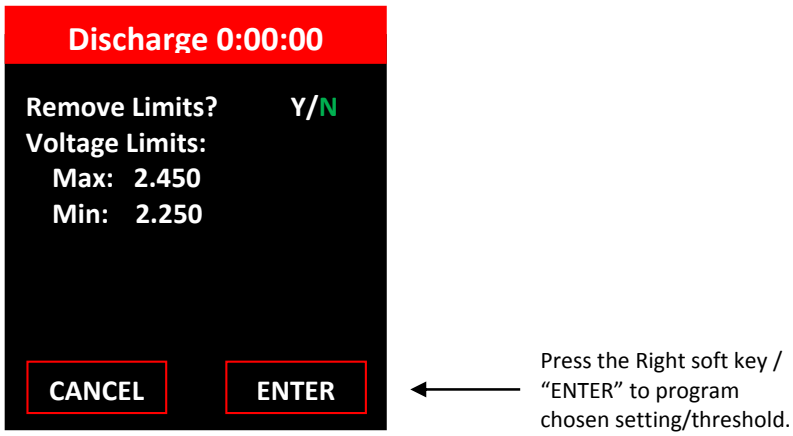
A. Select the data string associated with the threshold to be edited:
- For float voltage thresholds select **"A 000 Float VDC"**
- For discharge voltage thresholds select **any voltage string from B through K**
- For load current thresholds select **"* 000 Load IDC"**
- For load current thresholds select **"* 000 Float SG/T"**
- For load current thresholds select **"* 000 Final SG/T"**

B. Press the Right soft key "MENU".

For example, when changing change float voltage thresholds the DLV-Pro will display:



C. Press the Right soft key / "ENTER" to select "Limits".



D. Use the **"UP/DOWN"** keys to edit each option then press **"ENTER"** to select.

7.2 Step 2: Measure String Float Cell Voltages

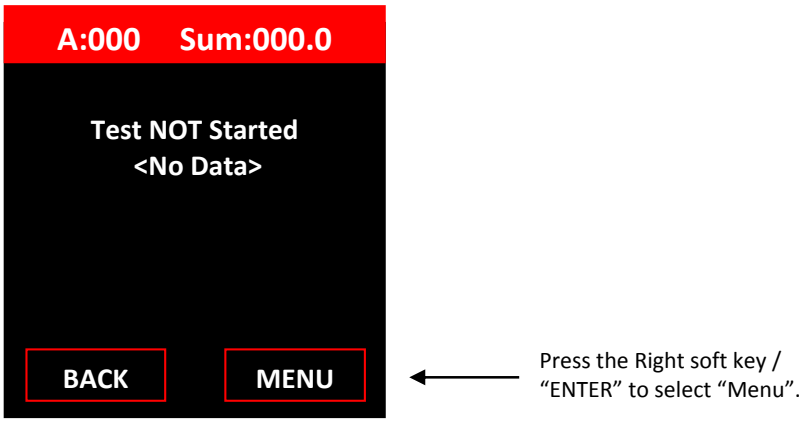
(i) Ensure the DLV-Pro USB cable is **DISCONNECTED!**

The DLV-Pro USB cable **MUST** be **DISCONNECTED** whenever measuring voltages!

(ii) Turn the DLV-Pro **ON.**

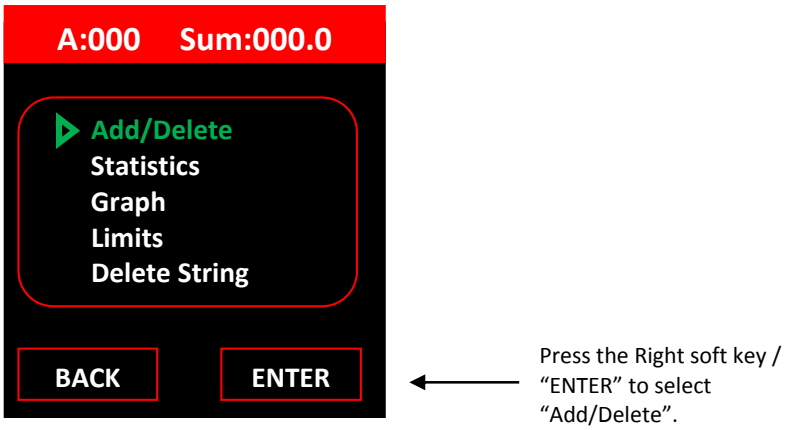
(iii) Select **"Discharge Test"** mode.

(iv) Select string **"A 000 Float VDC"**.

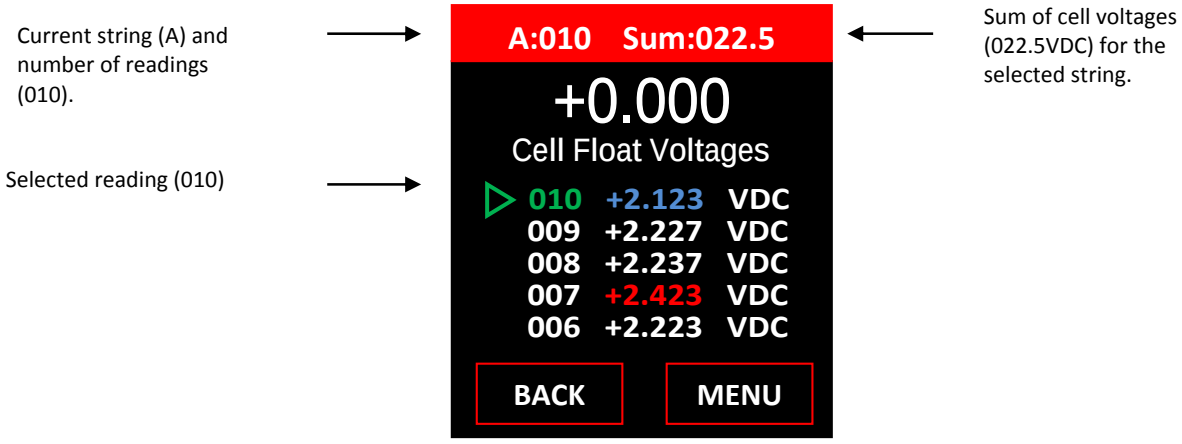


If any previous discharge test data had been deleted then the DLV-Pro display should match that shown above. If not, please erase ALL previous data (see Step 1

(v) Press the Right soft key / "ENTER" to select "Menu".



Connect voltage measurement probes to DLV-Pro and measure float cell voltages ensuring that the cell number of the **next reading** matches with the cell number counter in the bottom left hand corner of the display.



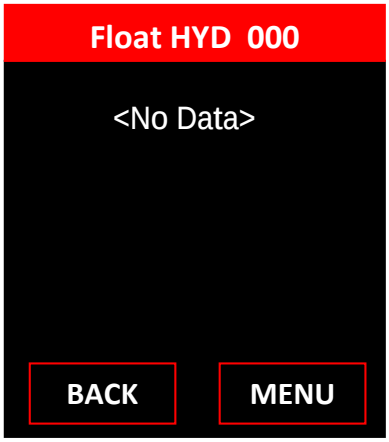
For example, after taking 10 cell float voltage readings of average ~ 2.25 the DLV-Pro display should match the above.

Note: The DLV-Pro may be turned **OFF** and **ON** while cell voltage readings are being taken. When turned **ON** and the previous mode selected, the DLV-Pro will record readings in the next empty location.

7.3 Step 3: Add Initial Hydrometer Readings (Optional)

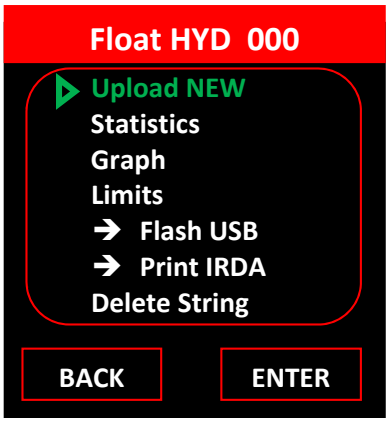
From the discharge test menu select data string **"* 000 Float SG/T"**

> If the data string option **"* 000 Float SG/T"** is not present, please refer to Section 7.1 for instructions of setting up the DLV50 for a discharge test.



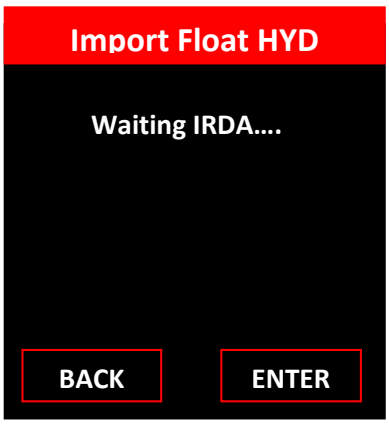
Press the Right soft key / "MENU"

Press the Right soft key / "MENU"



Press the Right soft key / "ENTER" to select "Upload NEW".

The DLV-Pro now waits for valid data from a DMA35 digital hydrometer



Press the Right soft key / "ENTER" to select "Upload NEW".

Refer to section **6.0 Uploading Hydrometer Data to the DLV-Pro** for instructions to initiate and complete DMA35 hydrometer data transfer.

7.4 Step 4: Start the Discharge Test, Take Up to (10) Sets of Time-Stamped Cell Voltage & Load Current (Optional)

(i) Ensure the DLV-Pro USB cable is **DISCONNECTED!**

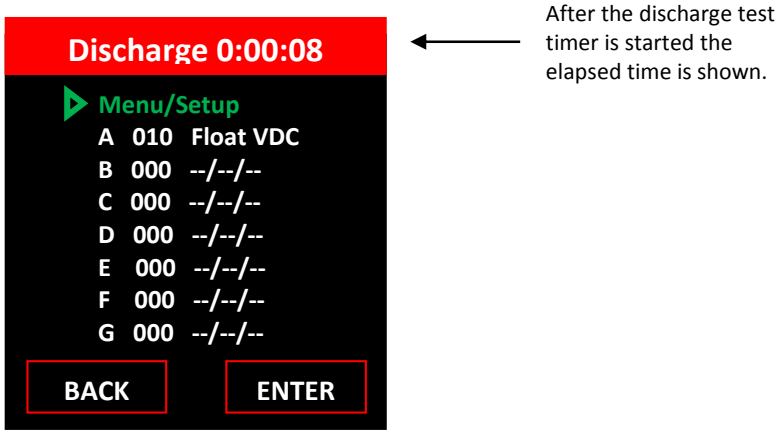
The DLV50 USB cable **MUST** be **DISCONNECTED** whenever measuring voltages!

(ii) Turn the DLV-Pro **ON.**

(iii) Select **"Discharge Test"** mode.

(iv) Select **"Menu/Setup"**.

(v) Connect the load bank to the battery string and select **"Start Test"** and press **"ENTER"**.



For example, if (10) cell float voltage readings have previously been recorded, the DLV-Pro display should match the above ~ 8 seconds after starting the discharge test.

The DLV-Pro may be turned **OFF** and **ON** after the Discharge Test has been started. It will also automatically turn **OFF** after ~3 minutes of inactivity. While **OFF**, the DLV50 will **continue to measure the time elapsed** since the discharge test was started.

If the batteries require changing during a discharge test be sure to **set the date and time correctly**. The DLV-Pro has a small battery backup system to keep the internal clock powered for several minutes during a battery change.

E. Wait for the appropriate time interval and take the first set of cell discharge voltage readings.

Note:

(i) Location 1, 2, 3 etc… for each string (A through K) **MUST** be used for the **same cell.**

(ii) **String A** readings are reserved for the **float** voltage of each cell.

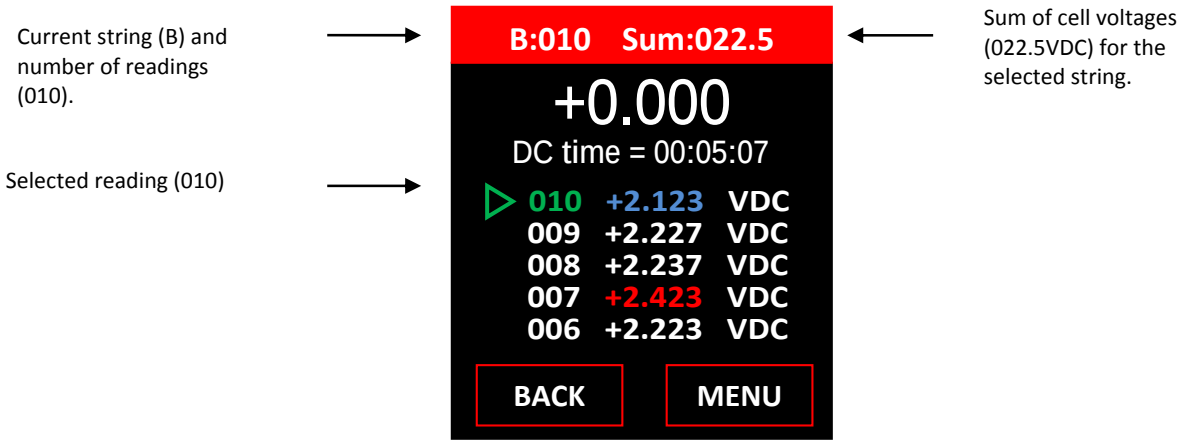
(iii) **Strings B through K** are reserved for time **cell discharge voltage** readings. Providing each cell with a maximum of (10) discharge data points (plus the float voltage data point).

(iv) **Each** cell discharge voltage reading is **time stamped** with the elapsed time from the **start** of the discharge test.

(v) The **User dictates** the approximate time interval between each set (string) of cell readings.

For best results, the User should divide the required battery discharge test duration by the number of discharge data points required (max 10). So a (35) minutes discharge test requiring (10) discharge data points for each cell would have the User starting each set of readings (measuring Cell 1 voltage) **every** (3.5) minutes **after** the discharge test was started.
NOTE: Some Users may prefer to take discharge readings more often during the end of a discharge test

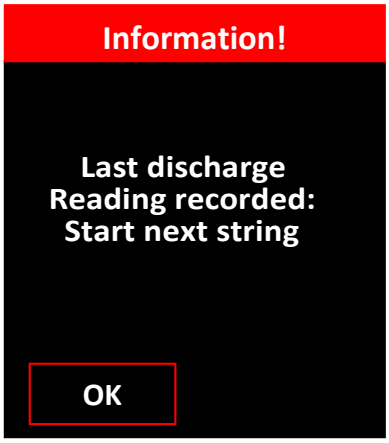
Connect voltage measurement probes to DLV-Pro and measure the discharge cell voltages ensuring that the cell number of **next** reading matches with the cell number counter in the bottom left hand corner of the display.



For example, after taking the first (10) cell discharge voltage readings of average ~ 2.25, the DLV50 display should match the above.

The DLV-Pro may be turned **OFF** and **ON** after the Discharge Test has been started. The DLV-Pro will continue to measure the time elapsed even when **OFF**. When turned **ON**, the DLV-Pro will automatically start in the previous mode and point to the next reading location.

When the number of readings in String B matches the number of float readings in String A (the User has completed the first set of cell discharge readings) the DLV-Pro automatically increments to String C.

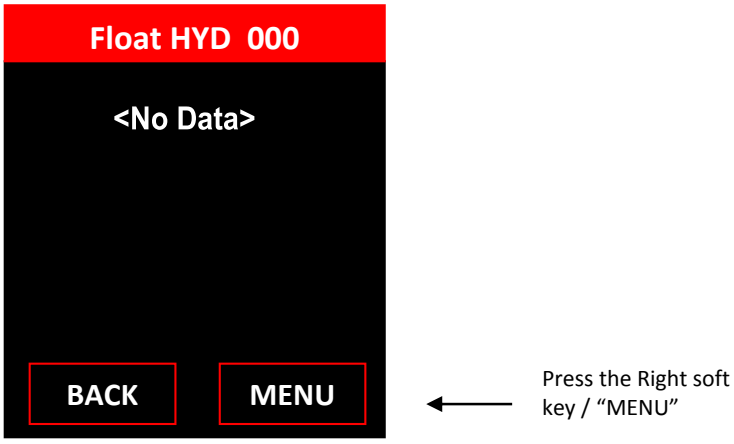


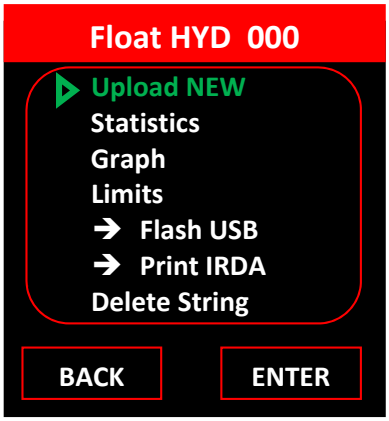
The User can now start recording the **second set** of discharge cell readings in string C. This process is repeated until the discharge test is completed or all the available Strings (B through K) have been used.

7.5 Step 5: Add Final Hydrometer Readings (Optional)

From the Discharge Test menu select data string **"* 000 Final SG/T"**

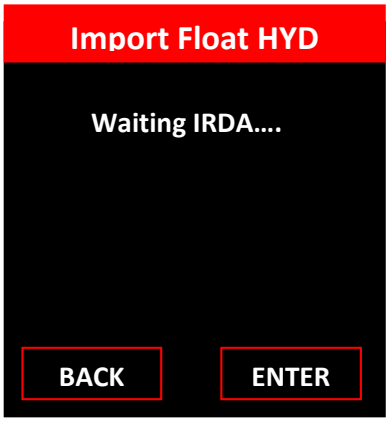
If the data string option **"* 000 Final SG/T"** is not present, please refer to Section 7.1 for instructions on setting up the DLV50 for a discharge test.





Press the Right soft key / "ENTER" to select "Upload NEW".

The DLV-Pro now waits for valid data from a DMA35 digital hydrometer:



Press the Right soft key / "ENTER" to select "Upload NEW".

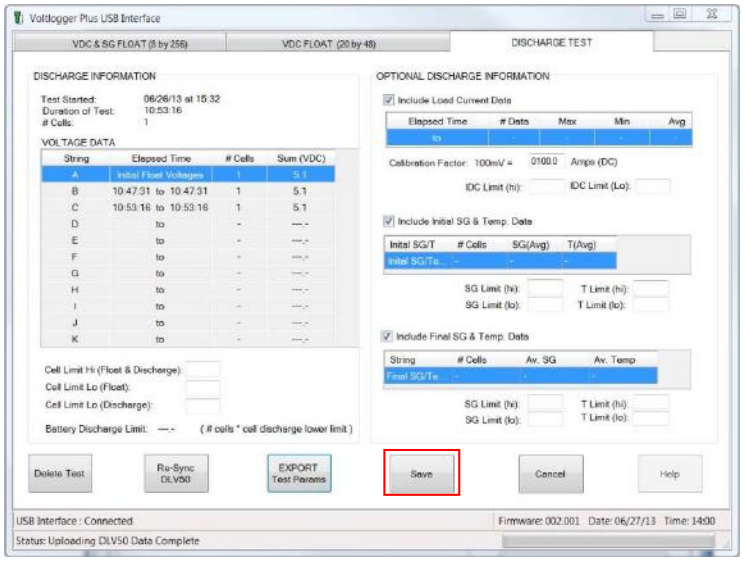
Refer to section **6.0 Uploading Hydrometer Data to the DLV-Pro** for instructions to initiate and complete DMA35 hydrometer data transfer.

7.6 Step 6: Upload Discharge Test Data to Winmeter 5.1

(i) Connect the DLV-Pro to a Winmeter 5.1 software via USB

> If the Winmeter 5.1 Autostart software is not enabled, **RUN** the Winmeter 5.1 Software
> If the "Voltlogger Plus USB Interface" does not initiate automatically select **"Download Device" -> "DLV50 (search for device)"**

Double Click row to preview cell discharge data.

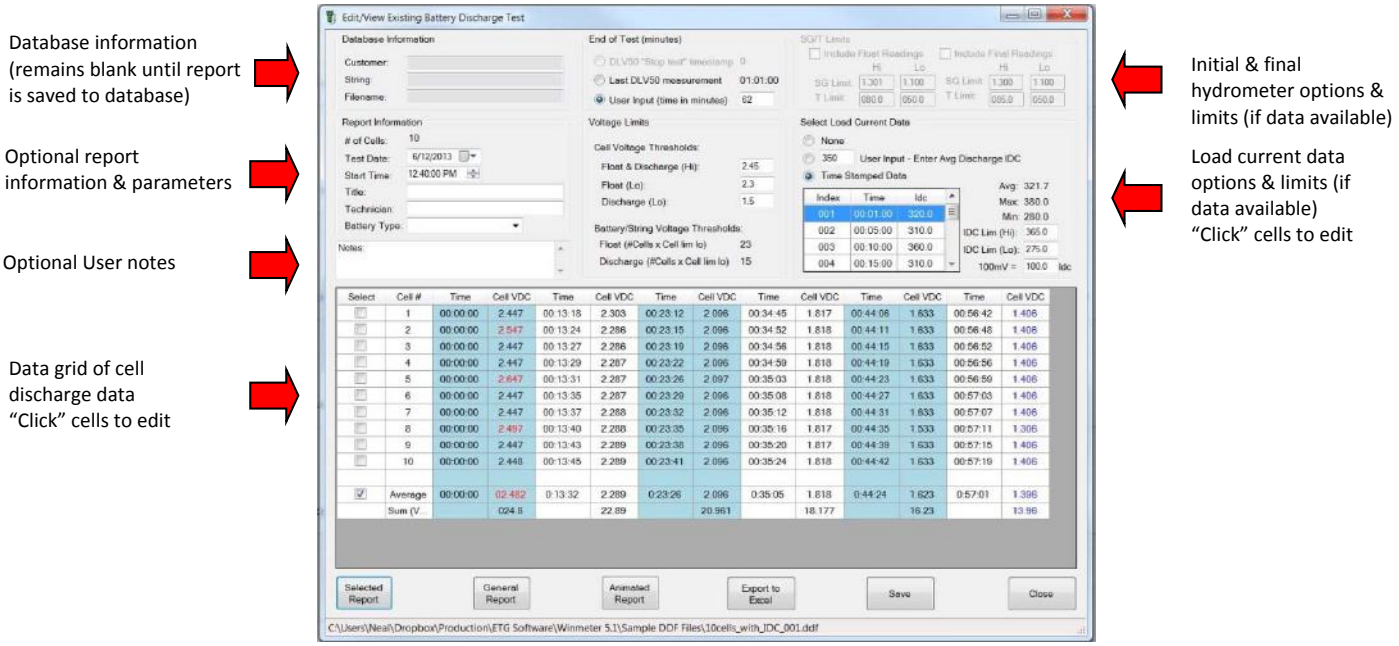


Click “Save” to begin the report generation process

(ii) Click **“Save”** to begin the discharge report generation process.

7.7 Step 7: Generate Cell Discharge Report(s)

Select/enter “End of Test” time
&
Enter/Edit cell voltage limits



(i) Add report information and parameters:

- **# of Cells**

*Number of cell float voltages (**NOT** User Editable).*

- **Test Date**

Date on which discharge test was started (User editable).

- **Start Time**

Time which discharge test was started (User editable).

- **Report Title**

(Optional)

- **Technician Name**

(Optional)

- **Battery Type**

(Optional)

- **User Note**

(Optional)

(ii) Enter/Edit **"End of Test"** information

(This is the time that the discharge test is complete)

Select either:

- **DLV-Pro "Stop Test" time-stamp**
- **Last DLV-Pro measurement**
- **User Input (time in minutes)**

(iii) Enter/Edit cell voltage thresholds (Optional)

- *Float & discharge (hi), cell voltage readings above are highlighted in RED.*
- *Float (lo), cell voltage readings below are highlighted in BLUE.*
- *Discharge (lo), cell voltage readings below are highlighted in BLUE.*

Battery/string voltage are calculated from the number of cells and the various cell thresholds

(iv) Select hydrometer data (Optional)

- **Include Float Readings**
  Edit/enter float hydrometer limits for SG & temperature (optional)
  - *SG/T limits (hi), SG/T readings above are highlighted in RED.*
  - *SG/T limits (hi), SG/T readings below are highlighted in BLUE.*
- **Include Final Readings**
  Edit/enter float hydrometer limits for SG & temperature (optional)
  - *SG/T limits (hi), SG/T readings above are highlighted in RED.*
  - *SG/T limits (hi), SG/T readings below are highlighted in BLUE.*

(v) Select load current data(Optional)
Select either:

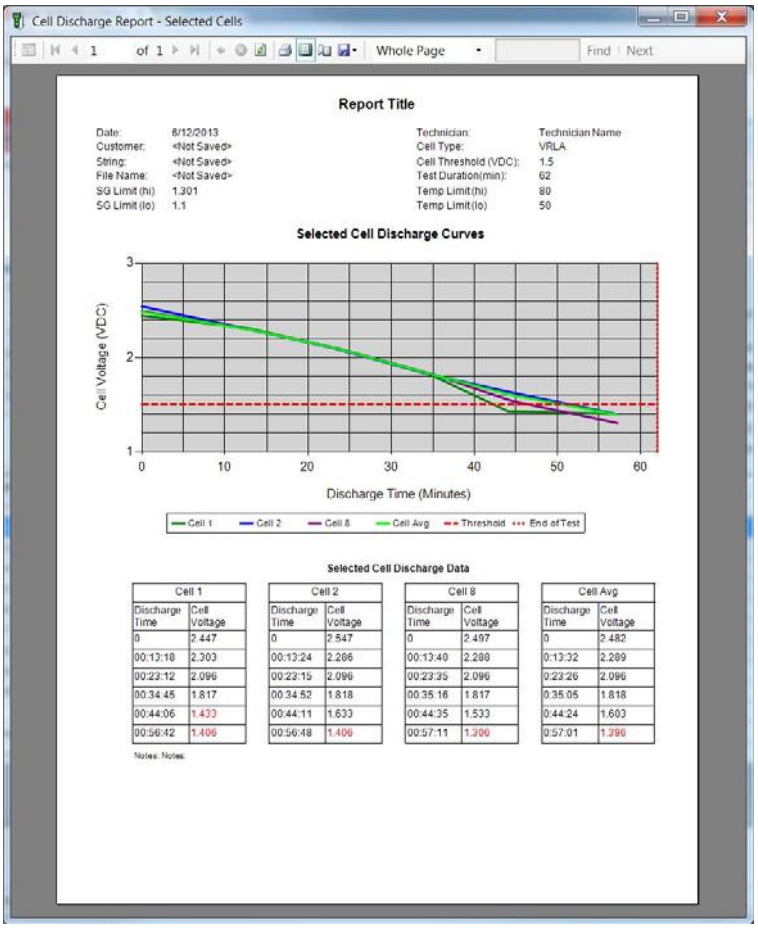
- **None**
- **User Input**
  (Enter average load current)
- **Time-stamped data**
  Enter/edit load current limits (optional)
  - *Load current limit (hi), readings above are highlighted in RED.*
  - *Load current limit (lo), readings below are highlighted in BLUE.*

(vi) Review/Edit test data:

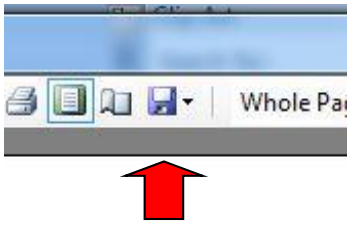
The User can now scroll through the detailed test data and edit/correct any cell's erroneous data. Simply click and edit the appropriate cell in the data grid.

7.7.1 Generate Selected Report

Select up to 4 cells (including average cell data) and click the **"Selected Report"** button.



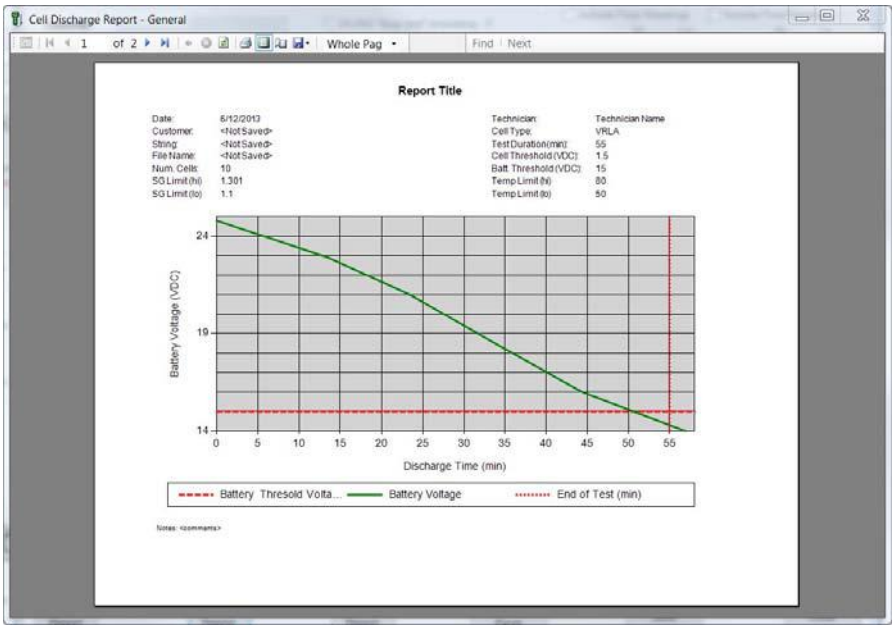
The User can generate multiple reports, selecting a different combination of cells each time.

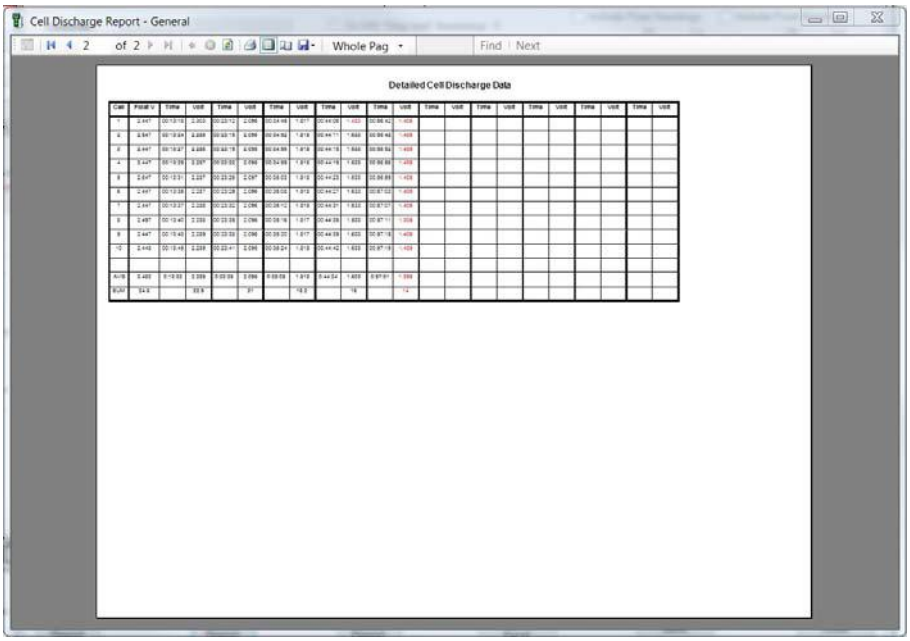


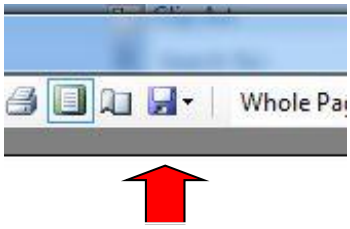
To save the report to Excel or PDF format, click the "**Save As**" icon in the Report header.

7.7.2 Generate General Report

Click the **“General Report”** button.



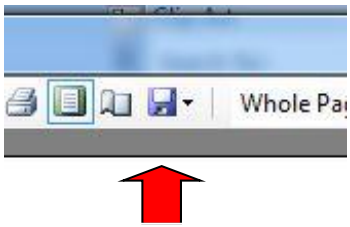




To save the report to Excel or PDF format, click the **“Save As”** icon in the Report header.

7.7.3 Generate Animated Report

Click the **"General Report"** button.

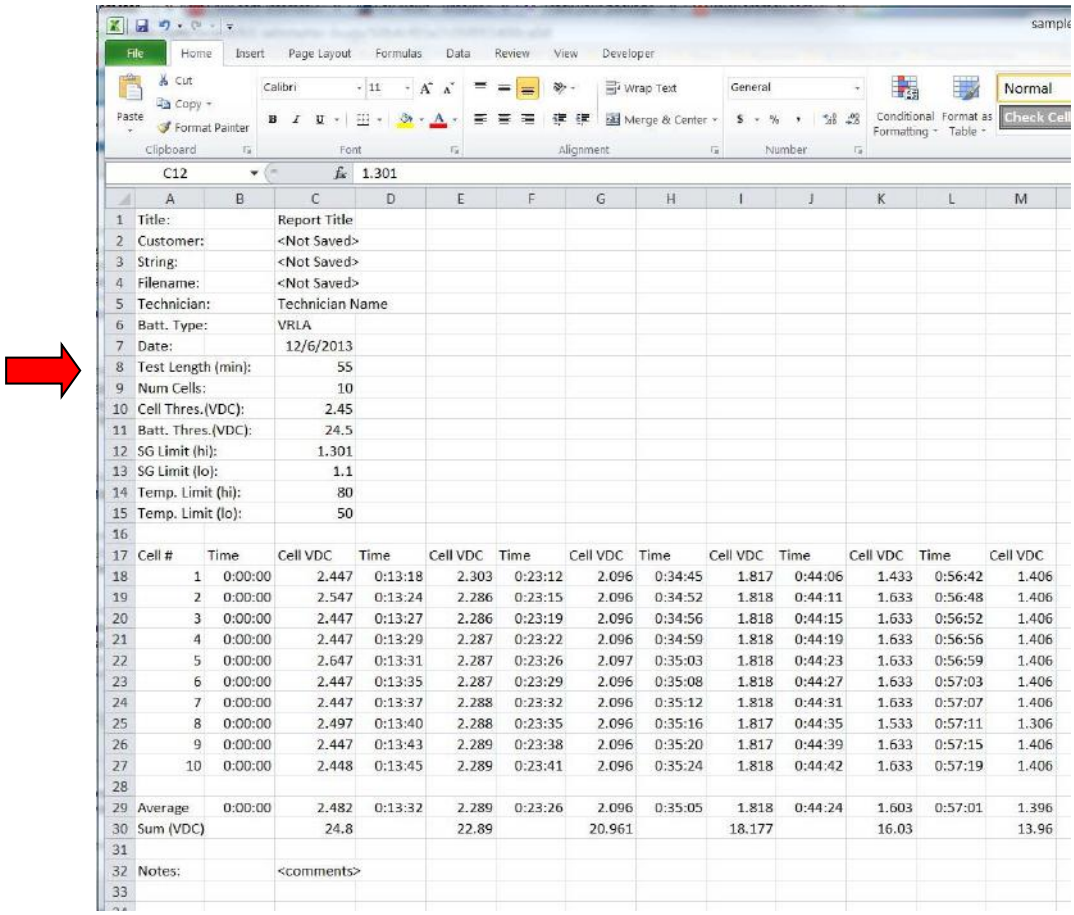


To save the report to Excel or PDF format, click the **"Save As"** icon in the Report header.

7.7.4 Export Data to Excel

Click the **"Export to Excel"** button.

Including report information and parameters is OPTIONAL



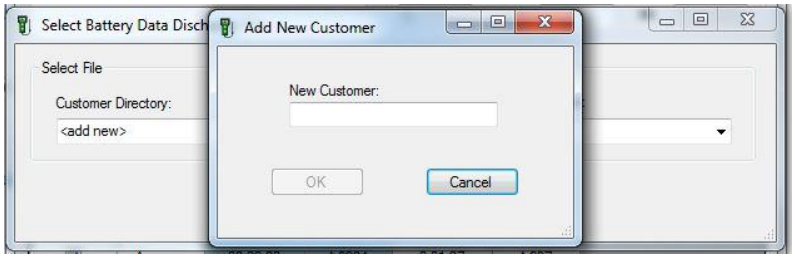
	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Title:		Report Title										
2	Customer:		<Not Saved>										
3	String:		<Not Saved>										
4	Filename:		<Not Saved>										
5	Technician:		Technician Name										
6	Batt. Type:		VRLA										
7	Date:		12/6/2013										
8	Test Length (min):		55										
9	Num Cells:		10										
10	Cell Thres.(VDC):		2.45										
11	Batt. Thres.(VDC):		24.5										
12	SG Limit (hi):		1.301										
13	SG Limit (lo):		1.1										
14	Temp. Limit (hi):		80										
15	Temp. Limit (lo):		50										
16													
17	Cell #	Time	Cell VDC	Time	Cell VDC	Time	Cell VDC	Time	Cell VDC	Time	Cell VDC	Time	Cell VDC
18	1	0:00:00	2.447	0:13:18	2.303	0:23:12	2.096	0:34:45	1.817	0:44:06	1.433	0:56:42	1.406
19	2	0:00:00	2.547	0:13:24	2.286	0:23:15	2.096	0:34:52	1.818	0:44:11	1.633	0:56:48	1.406
20	3	0:00:00	2.447	0:13:27	2.286	0:23:19	2.096	0:34:56	1.818	0:44:15	1.633	0:56:52	1.406
21	4	0:00:00	2.447	0:13:29	2.287	0:23:22	2.096	0:34:59	1.818	0:44:19	1.633	0:56:56	1.406
22	5	0:00:00	2.647	0:13:31	2.287	0:23:26	2.097	0:35:03	1.818	0:44:23	1.633	0:56:59	1.406
23	6	0:00:00	2.447	0:13:35	2.287	0:23:29	2.096	0:35:08	1.818	0:44:27	1.633	0:57:03	1.406
24	7	0:00:00	2.447	0:13:37	2.288	0:23:32	2.096	0:35:12	1.818	0:44:31	1.633	0:57:07	1.406
25	8	0:00:00	2.497	0:13:40	2.288	0:23:35	2.096	0:35:16	1.817	0:44:35	1.533	0:57:11	1.306
26	9	0:00:00	2.447	0:13:43	2.289	0:23:38	2.096	0:35:20	1.817	0:44:39	1.633	0:57:15	1.406
27	10	0:00:00	2.448	0:13:45	2.289	0:23:41	2.096	0:35:24	1.818	0:44:42	1.633	0:57:19	1.406
28													
29	Average	0:00:00	2.482	0:13:32	2.289	0:23:26	2.096	0:35:05	1.818	0:44:24	1.603	0:57:01	1.396
30	Sum (VDC)		24.8		22.89		20.961		18.177		16.03		13.96
31													
32	Notes:		<comments>										
33													

The User will be prompted to include/exclude report parameters and to enter a file name.

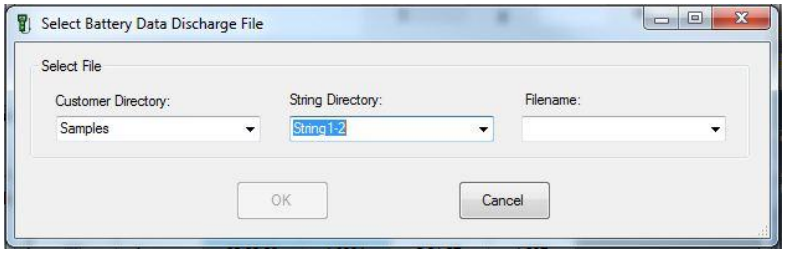
7.8 Step 8: Save Cell Discharge Report(s)

Click the **"Save"** button to save the cell discharge test report into the Winmeter 5.1 battery database.

(i) Select an **existing customer directory** or **"<add new>"** to add a new customer directory into the Winmeter 5.1 database.

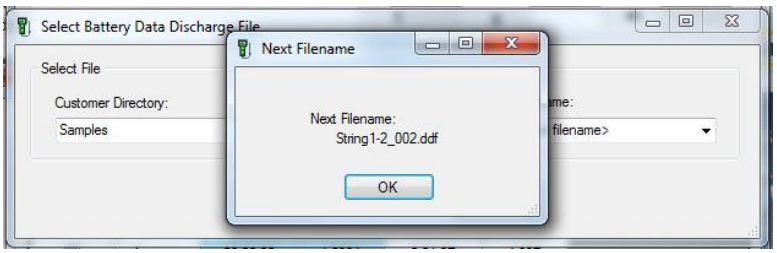


(ii) Select an **existing string directory** or **"<add new>"** to add a new string directory into the Winmeter 5.1 database.

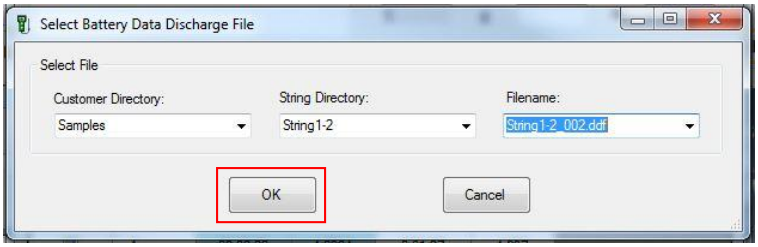


(iii) Select either an **existing filename** or **"<next filename>"** to create a new discharge test file.

Selecting an existing filename will cause the old test file to be overwritten!



(iv) Next, click the **"OK"** button to **save** the report.



The Discharge Test is now **saved** into the Winmeter 5.1 database.

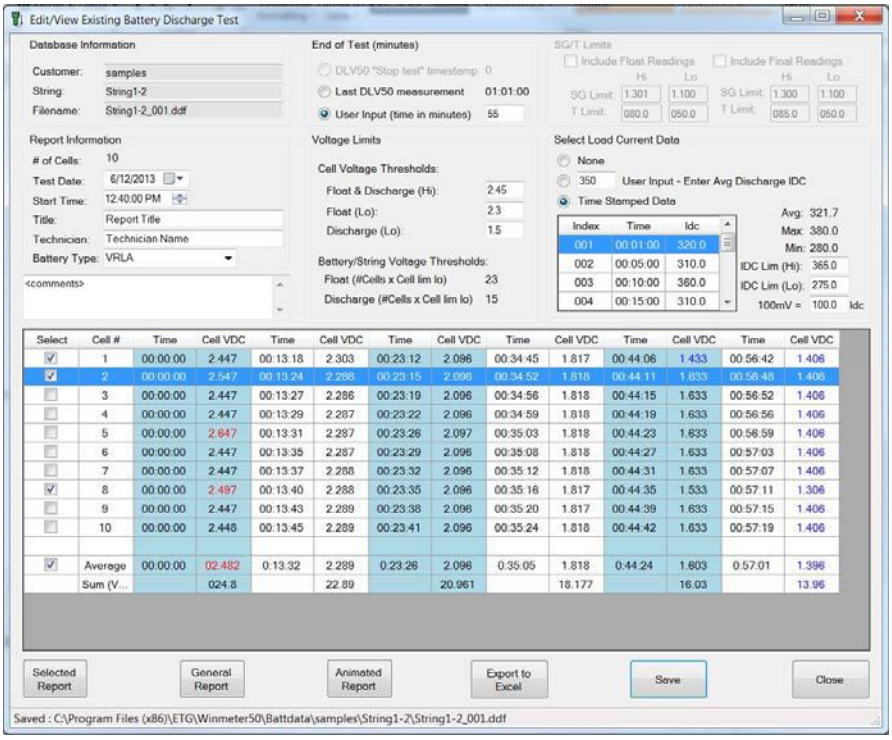
Database parameters of saved file.

Optional report information and parameters.

Optional notes

Data grid of Cell Discharge Data (“Click” cells to edit).

Report filename



The discharge test file is now **saved into the Winmeter 5.1 database** and the User can safely **“Close”** the Winmeter 5.1 software.

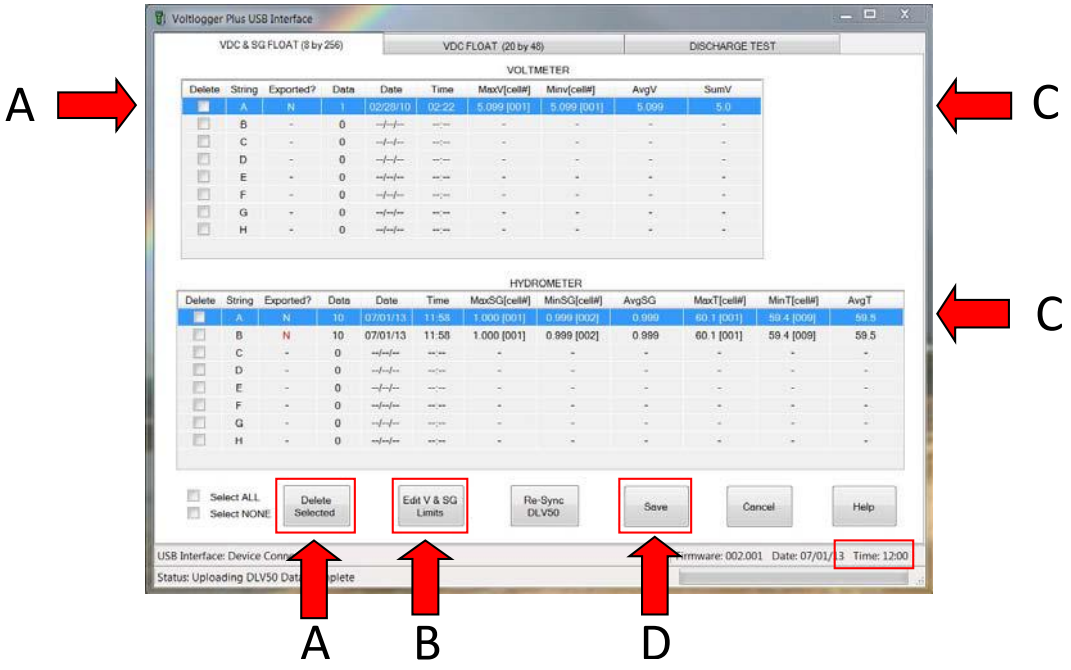
8.0 Connecting the DLV-Pro to PC/Winmeter 5.1

(i) Connect the DLV-Pro to a PC (via USB cable) with Winmeter 5.1 software installed.

If the Winmeter 5.1 Auto-start software is not enabled, **RUN** the Winmeter 5.1 Software.

If the "Voltlogger Plus Interface" does not initiate automatically, select **"Download Device" -> "DLV-Pro (search for device)".**

Once connected, the DLV50 will display **"DLV-Pro <-> PC"** and sync contained data, threshold and date & time settings with Winmeter 5.1.



Once data transfer is complete the user can easily:

(A) Select & delete any/all strings that contain obsolete data.
(B) Click **"Edit V & SG Limits"** tab to edit/remove thresholds (voltage, SG & temp.) for *any* string.
(C) Double-click any data row to preview string data.
(D) Click **"Save"** to begin the report generation process.

NOTE : Please refer to the Winmeter 5.1 Help file for additional instruction for battery test report generation.

9.0 Upgrading DLV-Pro Firmware

(i) Place the DLV-Pro into bootloader mode:

- Turn the DLV-Pro off
- Push and continue to hold the right soft key below the display
- Turn the DLV-Pro ON
- The DLV-Pro will beep twice but the display will remain blank (this indicates the unit is in bootloader mode)

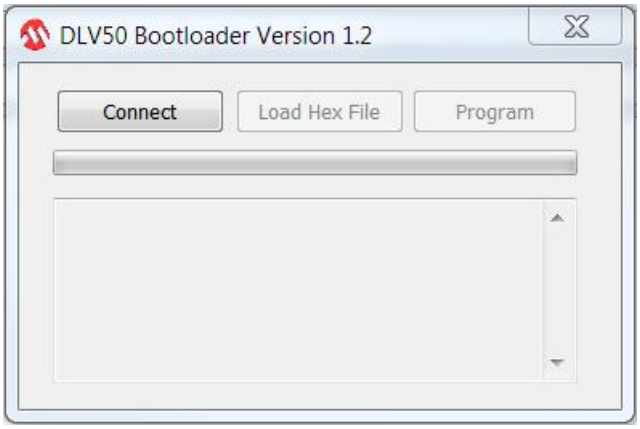
The DLV-Pro will restart in normal mode in ~ 30 seconds if not connected to a PC via

Close Winmeter 5.1 (if open)

(ii) Connect the DLV-Pro to a PC via the supplied USB cable.

(iii) Ensure that Winmeter 5.1 is **NOT** running

(iv) Run the bootloader program "***DLV-Pro Bootloader Rev02.exe***", typically located here "***C:\Program Files (x86)\ETG\Winmeter50***"



(v) Click "**Connect**" on the Bootloader program

(vi) Click **"Load Hex File"** and select the new DLV-Pro firmware file (*.HEX).

Ensure the **correct** firmware for the **correct** device is selected!

(v) Click **"Program"** to begin the firmware upgrade.

Do **NOT** disconnect the USB cable while the Device is being programmed!

(vii) Once the DLV-Pro firmware has been updated, the Device Bootloader software will close and the DLV-Pro will restart with the new firmware.