

ULTRA III

User Guide: Version 1.1



Contents

DISCLAIMER	3
LICENSE AGREEMENT	3
1 SOFTWARE - ULTRA III	5
1.0 Opening Menu	5
1.1 Routes	6
1.1.2 Inspection Points	9
1.1.3 Vibration Points	11
1.1.3.1 Taking a Vibration Reading	11
1.1.3.2 FFT Plot	12
1.1.3.3 VA Bands	14
1.1.3.4 Time Plot	14
1.1.3.5 DeMod Plot	15
1.1.3.6 Machine View	15
1.2 Meter Mode	16
1.2.1 Setup	16
1.2.1.1 Reading Mode	16
1.2.1.2 Meter Mode Settings	17
1.2.1.2.1 Sampling Setup	17
1.2.1.2.2 VA Bands	18
1.2.1.2.3 Alarm Levels	19
1.2.1.2.4 Initial Screen	20
1.2.2 Off Route Readings	20
1.2.2.1 Saving a Reading	20
1.2.2.2 Loading a Reading	21
1.3 Settings	22
1.3.1 Units	22
1.3.2 Accelerometer Settings	23
1.3.3 FFT Display	23
1.3.4 Meter Mode	24
1.3.5 App Configuration	24
REVISION HISTORY	25

Disclaimer

This document has been carefully prepared and checked. No responsibility can be assumed for inaccuracies. TPI reserves the right to make changes without prior notice to any products herein to improve functionality, reliability or other design aspects. TPI does not assume any liability out of the use of any product described herein; neither does it convey any license under its patent rights nor the rights of others. TPI products are not authorized for use as components in life support services or systems. TPI should be informed of any such intended use to determine suitability of the products.

Copyright ©2022 TPI

License Agreement

(c) TPI EUROPE LIMITED 2014 ALL RIGHTS RESERVED LICENSE AGREEMENT
FOR TPI SOFTWARE – ULTRA III
IMPORTANT PLEASE READ:

This license agreement is a legal agreement between TPI Limited ("TPI") and you. By opening the sealed package containing the software programs that accompany this license agreement ("the Software") and/or using the Software you are agreeing to be bound by the terms of the license agreement.

1. License

1.1. Copyright, trademarks and other intellectual property rights in the Software together with any firmware supplied with it, and any accompanying documentation, whether in printed or machine readable form, belong to TPI and its licensors. You shall acquire no rights in the Software, firmware or documentation except as expressly provided in this license agreement.

1.2. TPI grants you the right to install and use the Software in the manner set out in the documentation and on the terms set out below:

2. General Restrictions

2.1 Installation and Use

You may load store and run one copy of the Software on one Personal Computer and/or associated handheld computer or PDA. You must acquire an additional license for each additional Personal Computer and/or handheld computer or PDA on which the Software is used or to which it is distributed.

2.2. Copying

You may make one back-up copy of the Software for internal purposes only. You may not distribute any back-up copy to third parties. Any such copy shall in all respects be subject to the terms and conditions of this license agreement.

2.3 Reverse Engineering

You may not reverse engineer, decompile, or disassemble the Software except and only to the extent allowed by any applicable law, this limitation notwithstanding.

2.4 Sale, Rental and Transfer

You may not sell, rent or lease the whole or any part of the Software. You may not assign or transfer your rights under this license agreement.

2.5 Support

Technical support is not provided under the terms of this license agreement.

3. Warranty

3.1. You acknowledge that:

3.1.1. The Software is not a bespoke program prepared to meet your individual requirements;

3.1.2. It is not possible to produce the Software to be error-free; 3.1.3. The Software cannot be tested in advance in every possible operating combination, application or environment.

3.2. Warranty

3.2.1. TPI does not warrant that the use of the Software will meet your individual requirements or that the operation of the Software (including where in machine-readable form accompanying documentation) will be uninterrupted or error-free.

4. TPI Liability

4.1. Subject to the limited warranty at clause 3, the Software and any accompanying documentation is supplied AS IS without warranties conditions or terms express or implied statutory or otherwise.

4.2. TPI shall not be liable to you for any loss or damage whatsoever or howsoever caused arising directly or indirectly in connection with this license agreement or your use of the Software, except to the extent to which it is unlawful to exclude such liability under the applicable law.

4.3. Notwithstanding the generality of the preceding paragraphs, TPI expressly excludes liability for any indirect, special, incidental or consequential loss or damage which may arise in respect of the Software and any firmware supplied with it, its use or in respect of equipment or property, or for loss of profit, business, revenue, goodwill or anticipated savings.

4.4. In the event that any exclusion contained in this license agreement shall be held to be invalid for any reason and TPI becomes liable for loss or damage that it may otherwise have been lawful to limit, such liability shall be limited to the price paid for the product.

5. Termination

If you breach any of the terms and conditions contained in this license agreement, TPI may terminate the license agreement without notice. In such event you shall destroy the Software and any accompanying documentation.

6. Law

This license agreement shall be governed by and interpreted in accordance with the laws of England and the English courts shall have exclusive jurisdiction to determine any matter relating to it.

1. Software - Ultra III

1.0 Opening Menu

The opening display screen (fig 1.0) shows four icons that allow the user to select from the following operational modes:

- Routes
- Meter Mode
- TPI Pocket Balance™
- Set-up menu

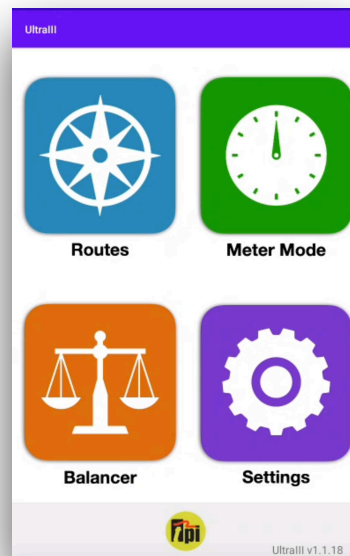


Figure 1.0

Routes This option gives the user access to pre-set “routes”, allowing readings to be taken from assets in a predetermined order. Routes are downloaded to Ultra III™ from a PC, where they are created and maintained using TPI’s C-Trend II™ condition monitoring software (See section 1.1 for more detail).

Meter Mode This allows the Ultra III™ to be used as a stand-alone vibration meter, independent of any route. Its operation is explained in detail in Section 1.2 of this user guide.

The **Balancer** menu option accesses the TPI Pocket Balancer™ field balancing tool, if it is installed on the unit. The functionality of this software is outside the scope of this text, and is fully explained in the separate TPI Pocket Balancer™ manual.

The **Set-up** menu (see Section 1.3) allows the customization of the display and processing functions of the Ultra III™ unit.

1.1 Routes

Selecting the “Compass” icon from the main menu opens up the Routes option, which allows the user to run pre-determined routes which have been set up using C-Trend II™ .

The first time the Ultra III™ unit accesses this option (assuming downloaded routes are available) and on each subsequent occasion when fresh route data has been downloaded from C-Trend II™ , the message shown in fig 1.1.1 is displayed. This gives the option to either proceed with the choice of routes already loaded into Ultra III™ or to update this list of routes before proceeding.

Note: Routes can be uploaded/downloaded from C-Trend II™ by connecting the USB cable from the Android™ device to the computer and selecting the “From Meter” and “To Meter” options in the top menu bar.

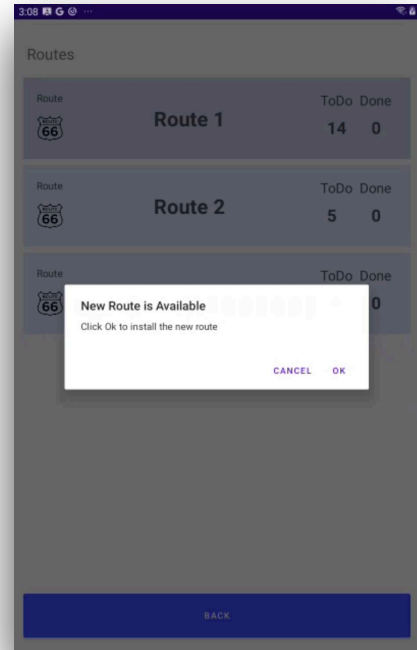


Figure 1.1.1



Figure 1.1.2

Once the current list of available routes for this device has been established, the user is presented with the option to select, and record measurements for, any route from the list (fig 1.1.2).

At this point, each route will display the number of tasks **To Do** and the tasks that are already **Done**, on the right side of each route row.

Below are examples of a route which has had its measurements partially and wholly completed. Route 1 in Fig 1.1.3 shows “0” ToDo Points, meaning it is completed. Route 3 is partially completed only “1” task is completed and “12” are still pending.

The Route’s status, as indicated by the worst reading taken, is reflected in the color coding of the background (Red, Amber & Green corresponding to Critical, Warning & OK), which is standard throughout the system.

At the machine level the nomenclature remains the same as shown in Fig 1.1.4 with a machine with completed measurements, no more tasks ToDo, and in OK condition represented by the green background.



Figure 1.1.3

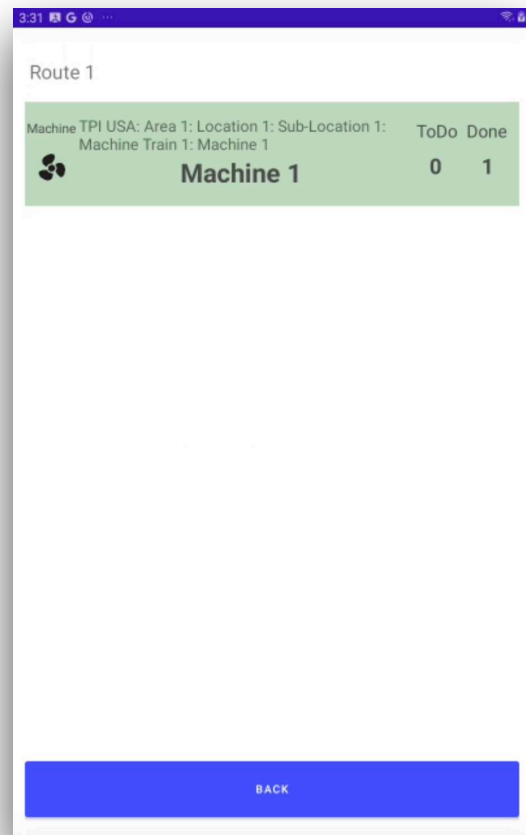


Figure 1.1.4

Upon selecting, in this instance, Route 2, the user is presented with the screen shown in fig 1.1.5. This route contains two machines with no measurements yet.

By selecting one of the machines the next screen will display the points to be measured, in this case the machine has two vibration points.

This route contains two vibration points and one inspection point, none of which are, as yet, displaying a completed measurement.

Example of a route containing one inspection point and two vibration points is shown in Fig 1.1.6. Fig 1.1.7 shows an example of a taken vibration reading marked by the blue tick on the right side of the box and in a warning condition.

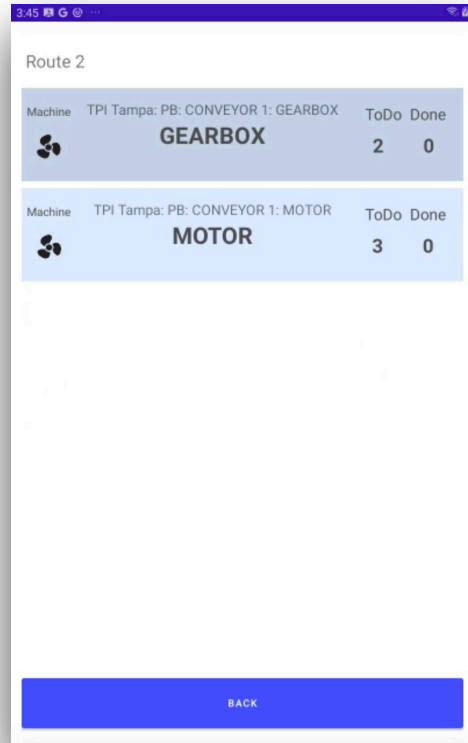


Figure 1.1.5

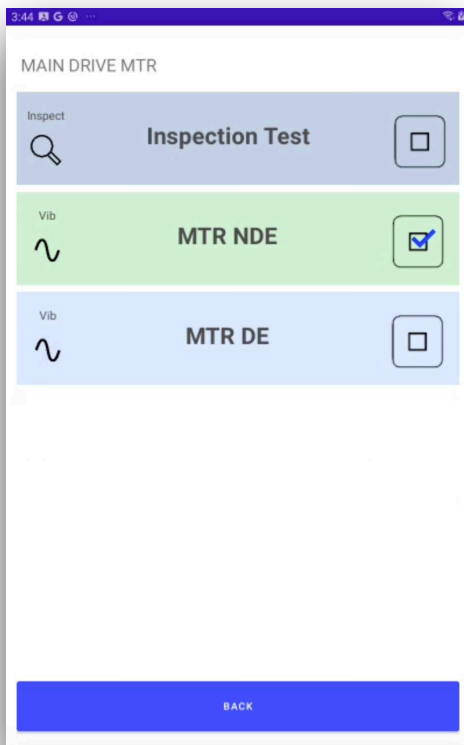


Figure 1.1.6

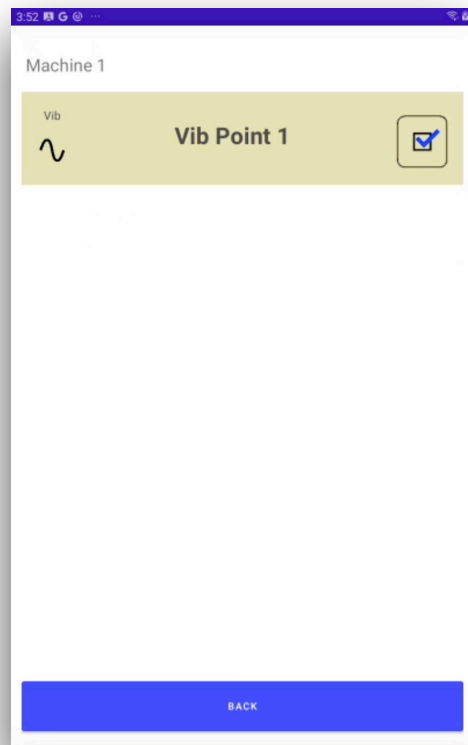


Figure 1.1.7

1.1.2 Inspection Points

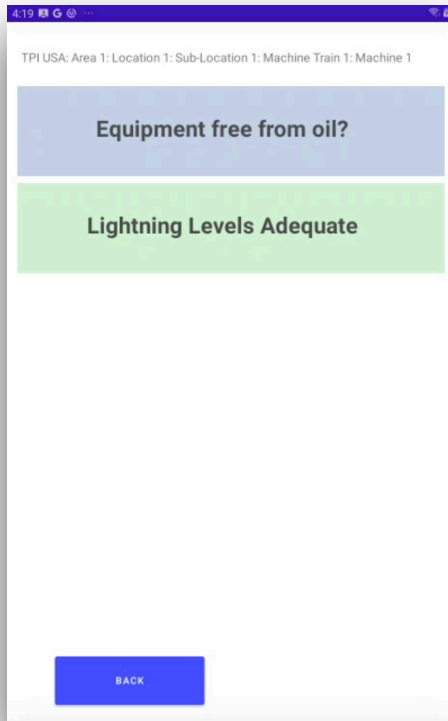


Figure 1.1.2.1

The first point on this route, Inspection Test (fig 1.1.2.1), contains two inspection items.

Since the first item appears against a blue background, a definite user response is required in order for it not to be recorded as 'skipped'.

The second item initially appears on a green background, indicating that it has been set with a default response of "OK" within C-Trend II™. (Defaults can only be set for 'status only' items.)

In this case user input is only required should the status encountered on inspection not match the default. Defaulted items will therefore initially appear as 'Done' at the bottom of the screen. In addition to those shown, other inspection item response types include Yes/No and user signature.

In this example, selecting the first item, "Equipment clean and free from oil?" presents the user with a 'Status + Text' screen (fig 1.1.2.2). Here a written response is required, in addition to the selection of a status (Critical, Warning or OK). In other instances, a numeric reading or temperature might be required rather than a text response.

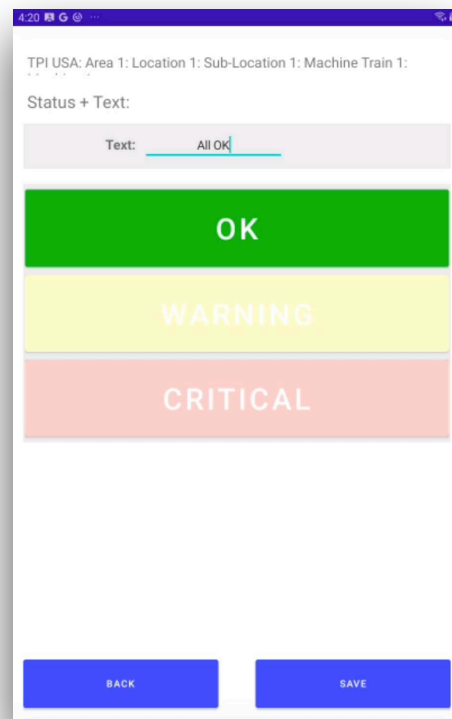


Figure 1.1.2.2

Tapping 'Save' in the bottom right corner of the screen returns the user to the inspection point screen, which now shows as complete (fig 1.1.2.3).

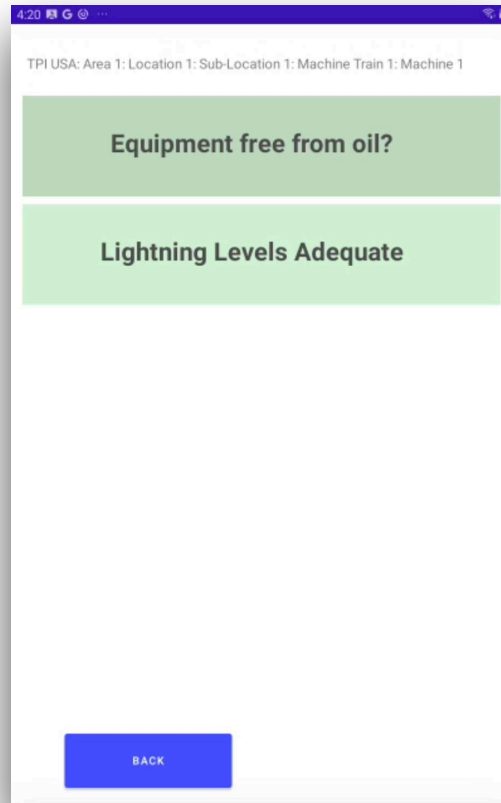


Figure 1.1.2.3

Saving this inspection point will now register it against the route as having been completed.

1.1.3 Vibration Points

1.1.3.1 Taking a vibration reading

Selection of a vibration point within a route displays the screen as shown in fig 1.1.3.1.1.

Once the wireless (BLE) sensor is tuned on and in range it will connect and the serial number and battery status will be displayed in the top right corner of the screen. Clicking the “Take Rdg” button in the bottom right corner will run a vibration measurement for this point, provided a suitable accelerometer has been attached to the Ultra II unit. If the point already has a reading, once the “Take Rag” button is pressed a dialog box will ask if the user wants to replace the measurement with the new one, or the new measurement will be added as an additional reading, as shown in fig 1.1.3.1.2. By selecting the Cancel option no measurement will be taken.



Figure 1.1.3.1.1

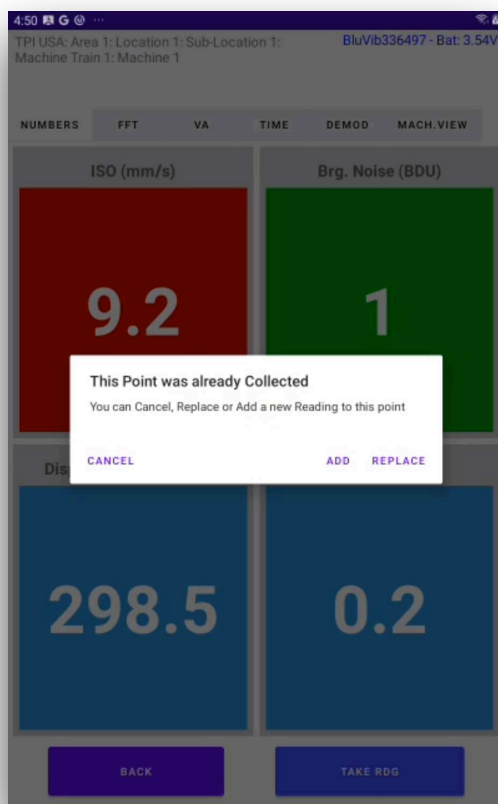


Figure 1.1.3.1.2



Figure 1.1.3.1.3

On completion of the vibration measurement, the recorded data is displayed as in fig 1.1.3.1.3.

In addition to this numeric data, the tabs across the top of the screen allow the user to examine a frequency-based (FFT) plot for the vibration measurement (fig 1.1.3.2.1), analysis across pre-defined Vibration Analysis (VA) frequency bands (fig 1.1.3.3), a time domain wave-plot of the vibration (fig 1.1.3.4) and a Demodulation (DeMod) plot (1.1.3.5).

1.1.3.2 FFT Plot

The FFT plot shows the measured vibration broken down into its constituent frequencies. Typically the highest peak will be located at the machine’s run-speed, indicated on the plot by a vertical broken black line.

Both vibration velocity (in mm/s) and acceleration (in g) can be displayed.

Switching between the two is achieved by touching the appropriate units displayed on the menu at the bottom left of the display.

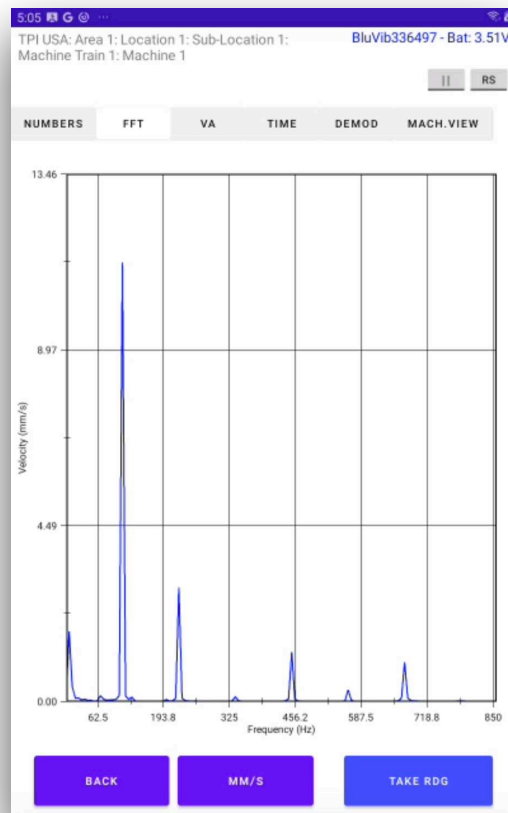


Figure 1.1.3.2.1

Tapping the ‘Harmonic Cursors’ symbol “||” places a cursor at the peak of this fundamental frequency “F”. A box appears to the right of the screen detailing the frequency and magnitude of the vibration component.

Additional, harmonic, cursors, at integer multiples of the fundamental can be added and removed from the plot by tapping the + & - symbols. These cursors can be dragged horizontally across the plot, maintaining their frequency ratio, to help in identifying harmonic patterns in the peaks, they can also be fine-moved by using the < & > buttons (fig 1.1.3.2.2).

Selecting the ‘Running Speed’ option places the Fundamental cursor on the defined RPM peak, synchronous cursors will appear in the same way as in the ‘Harmonics Cursor’ option.

To assist in analyzing any vibration plot in Ultra III™, the user can zoom-in on any area of particular interest by pinching in and out with two fingers. Use one finger to move the view to the left or right.

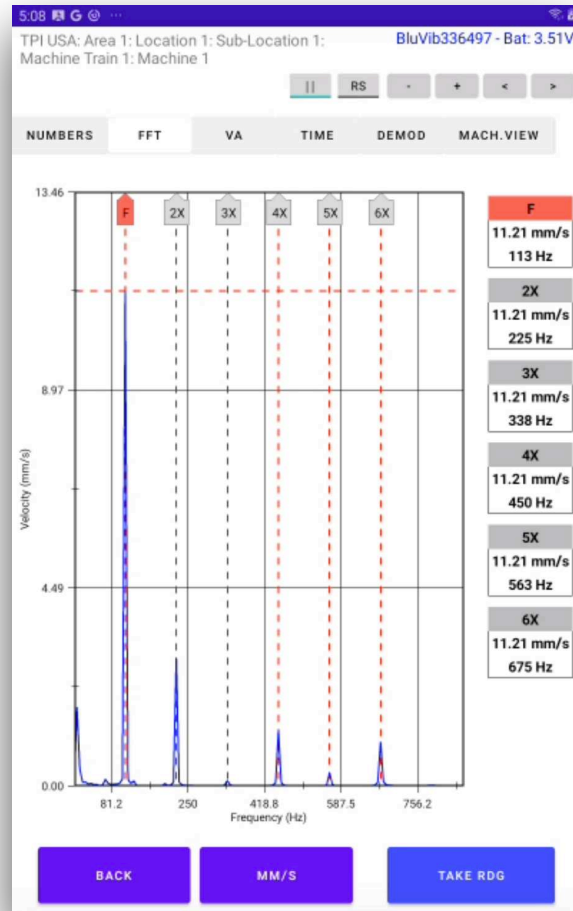


Figure 1.1.3.2.2

1.1.3.3 VA Bands



Figure 1.1.3.3

1.1.3.4 Time Plot

This allows a visual inspection of the vibration waveform in the time domain.

The acceleration (g) waveform is displayed, and the zoom function can be implemented, in exactly the same way as in the FFT graph.

The running speed cursors can be selected by clicking on the 'RS' button, this option will display the running speed cycles on the time wave form.

VA (Vibration Analysis) bands (fig 1.1.3.3) are passed from C-Trend II™, to facilitate the monitoring of vibrations across 6 frequency bands.

These can be defined for different potential problem types, tailored to the known characteristics of each vibration point, thus allowing for accurate diagnostics.

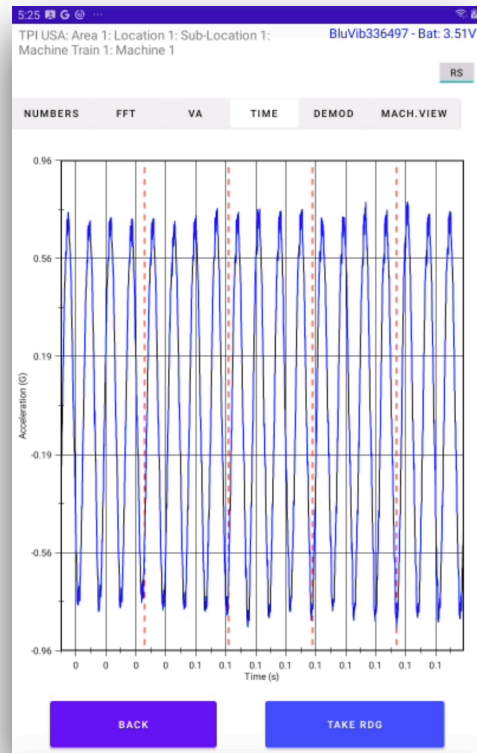


Figure 1.1.3.4

1.1.3.5 DeMod Plot

This option shows Demod (envelope demodulated) signals, which have been high pass filtered demodulated, and then low pass filtered (see fig 1.1.3.5). The filter frequencies to be applied for each point are configured within C-Trend II™.

This spectrum is a good indication of bearing wear as it shows any low frequency signals (e.g. bearing clicks that have been modulated onto higher frequencies such as bearing shell resonances

Harmonic cursors and the zoom function can be applied exactly as in the FFT screen.

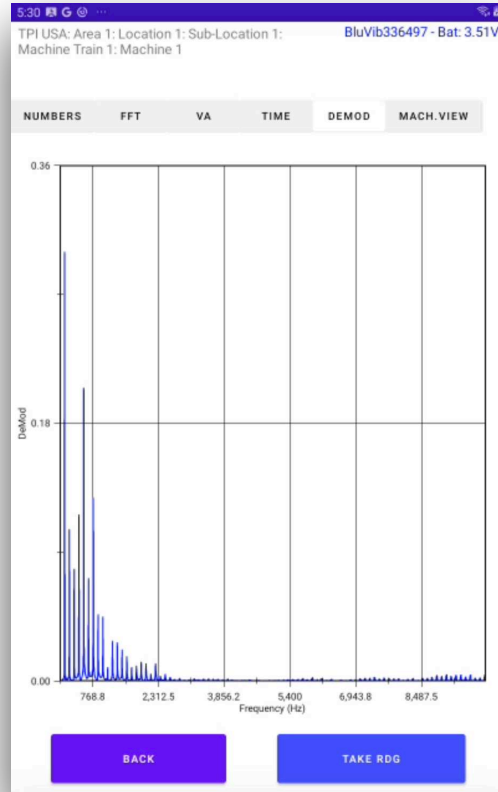


Figure 1.1.3.5



Figure 1.1.3.6

1.1.3.6 Machine View

This option shows the vibration levels filtered to the machine running speed 1X, 2X and 3X, to understand if the source of the vibration comes from imbalance, misalignment, etc. It also includes a BDU meter for bearing assessment.

1.2 Meter Mode

Using Ultra III™ to record a vibration measurement in meter mode involves essentially the same process as that described for a Vibration Point measurement within a route.

Where it differs is in that:

- i. Meter mode requires measurement parameters to be set up within Ultra III™, rather than having them passed down from C-Trend II™ as part of a Route.
- ii. Data recorded in meter mode is saved ‘off route’ rather than being uploaded to C-Trend II™ as part of the information linked to a route.

1.2.1 Setup

Choosing the “Options” button, in the bottom left corner of the screen displays a seven-option menu (Fig 1.2.1). The first two, ‘Load’ and ‘Save’ Off Route Readings, are dealt with in section 1.2.2 Off Route Readings.

1.2.1.1 Reading Mode

The next option, Reading Mode allows the user to select either ‘Single’ or ‘Continuous’ readings.

Single readings are collected according to the parameters established in meter mode sampling setup, as shown in section 1.2.1.2.1.

Once a single reading has been processed, and the results displayed, it is can be saved as an off route reading.

Continuous reading mode allows live monitoring of vibration data via live updates. Once continuous reading mode has been activated, the screen will continue to be updated with fresh data until the stop button is pressed.

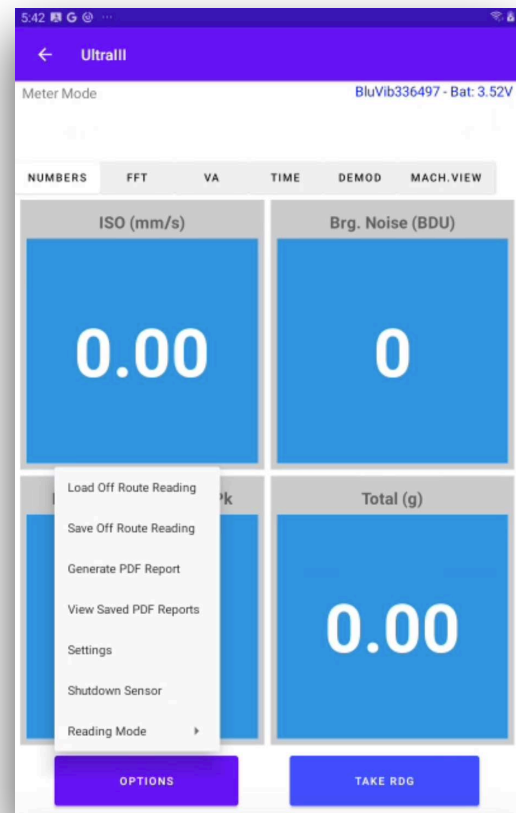


Figure 1.2.1

1.2.1.2 Meter Mode Settings

The Settings option displays a selection screen (fig 1.2.1.2).

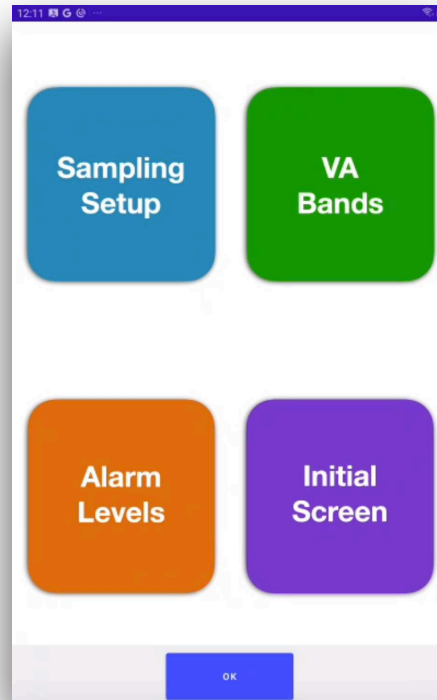


Figure 1.2.1.2

1.2.1.2.1 Sampling Setup

The Sampling Setup screen seen in fig 1.2.1.2 firstly allows the user to set cutoff frequencies for the high-pass filter and for high & low pass DeMod.

The number of FFT lines to be implemented, the maximum frequency, the number averages to be used and the window type to be applied to the FFT analysis can also be selected.

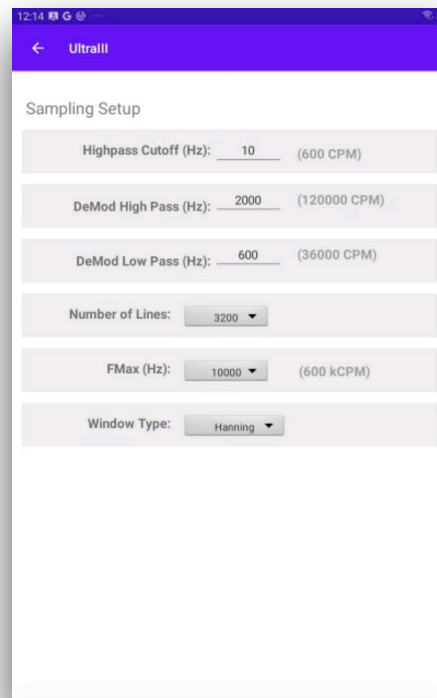


Figure 1.2.1.2.1

1.2.1.2.2 VA Bands

The VA Bands setup screen allows the specification, in the user’s preferred choice of units, of the motor running speed for which measurements are taken.

If the Auto option is selected, the frequency bands for Vibration Analysis will default as follows:

Band Number	Minimum	Maximum
1	0 Hz	Running Speed x 0.5
2	Running Speed x 0.5	Running Speed x 1.5
3	Running Speed x 1.5	Running Speed x 2.5
4	Running Speed x 2.5	Running Speed x 3.5
5	Running Speed x 3.5	Running Speed x 4.5
6	Running Speed x 4.5	Running Speed x 5.5

For a running speed of 25Hz (1500 RPM), these default bands will be as seen in fig 1.2.1.2.2.

If the Auto option is not selected, the user can manually enter the frequency band values most applicable to the situation.

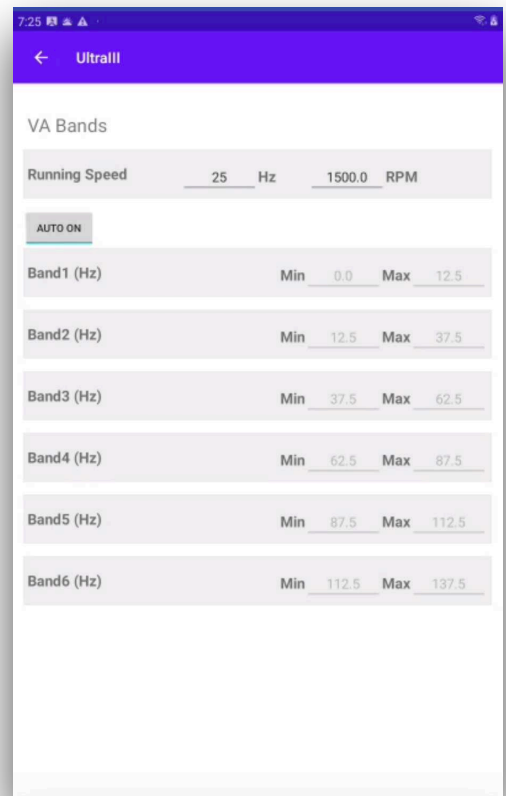


Figure 1.2.1.2.2

1.2.1.2.3 Alarm Levels

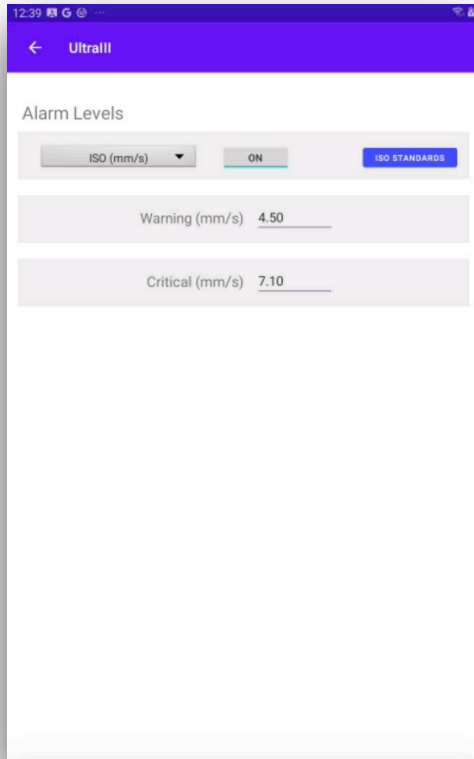


Figure 1.2.1.2.3.1

The Alarm Levels setup screen (fig 1.2.1.2.3.1) allows criteria to be set specifying the alarm levels for a range of reading types (fig 1.2.1.2.3.2).

In the case of ISO standards as shown in fig 1.2.1.2.3.1, in addition to the user being able to enter values on the screen, the ISO Standards button allows appropriate standard settings to be chosen (fig 1.2.1.2.3.3).

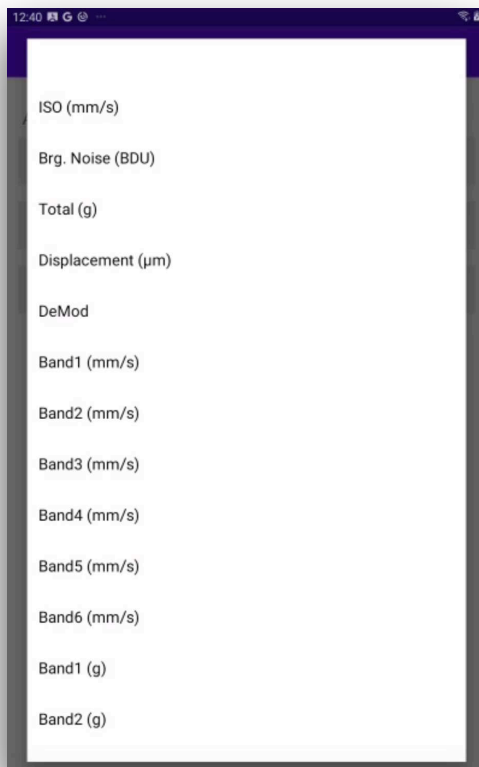


Figure 1.2.1.2.3.2

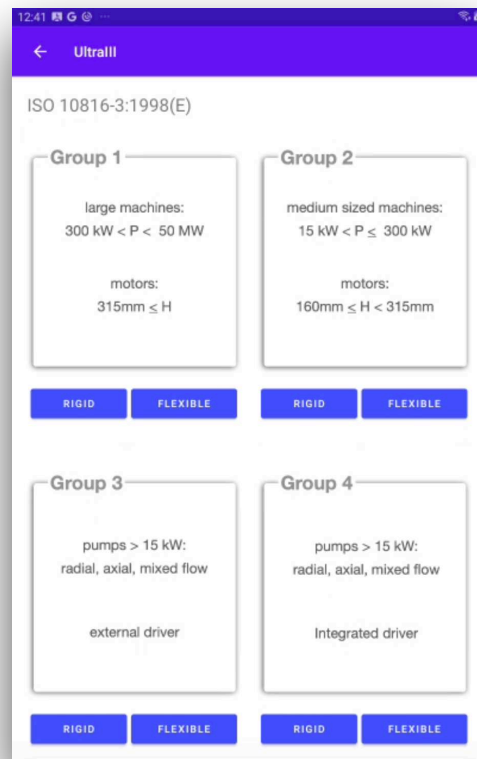


Figure 1.2.1.2.3.3

1.2.1.2.4 Initial Screen

This simply gives the user the choice of which tab selection on the Meter Mode screen should initially be displayed next time that Ultra III™ is put into meter mode (fig 1.2.1.2.4).

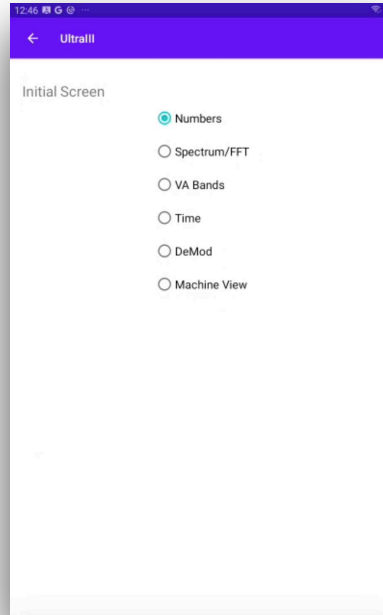


Figure 1.2.1.2.4

1.2.2 Off Route Reading

When a single reading has been completed in meter mode, the user can, by selecting the Setup option in the bottom left hand corner of the Numbers screen, choose to save the data as an Off Route Reading (fig 1.2.2).

1.2.2.1 Saving a Reading

Clicking “Save Off Route Reading” allows the user allocate a name to the reading. (This, as is shown in fig 1.2.2.1, defaults to a date & time stamp, but this can be overridden or amended by the user, to include other meaningful and relevant information).

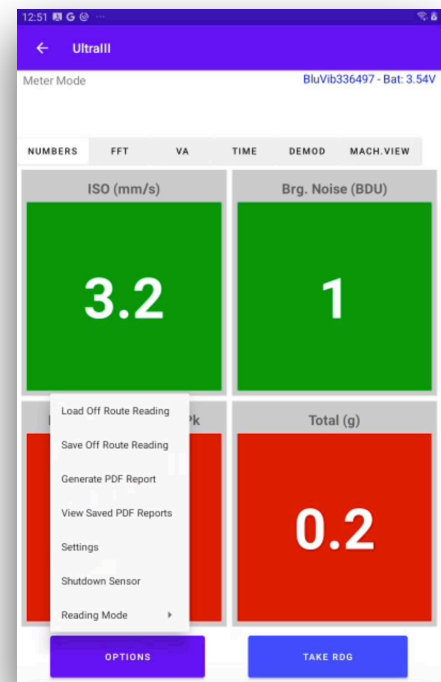


Figure 1.2.2

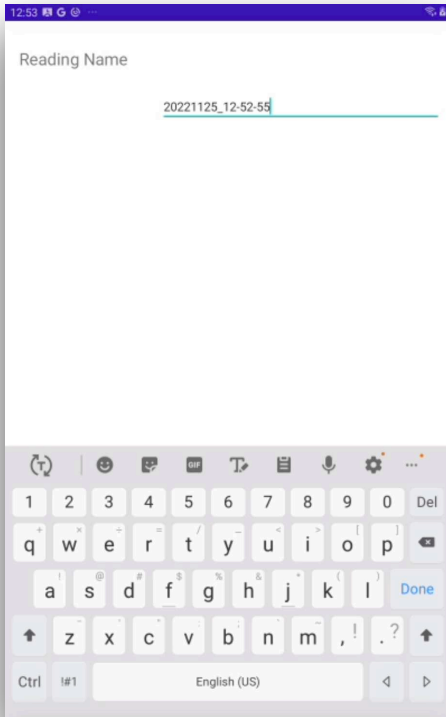


Figure 1.2.2.1

When the user is satisfied with the Off Route Reading’s name, it can be saved by clicking OK in the bottom right corner of the screen.

1.2.2.2 Loading a Reading

The Load Off Route Reading option (fig 1.2.2) displays a list of the saved readings on the device (fig 1.2.2.2). Selecting the required reading, and clicking OK will load the data into Meter Mode in Ultra III™ for further examination.



Figure 1.2.2.2

1.3 Settings

The final “Gearwheels” option from the Initial Menu screen displays the settings screen shown in fig 1.3.

1.3.1 Units

The Units screen (fig 1.3.1) firstly allows the axes of all graph plots to be displayed in the user’s preferred units.

The X-Axis can be set to either Hertz, Revolutions per Minute or Cycles per Minute.

The Y-Axis has a choice of either Metric or Imperial Units.

Next the user can choose the number of decimal places to be applied to whichever measurement system has been selected.

Finally, there is a choice of using ‘peak’ or ‘peak to peak’ displacement values.

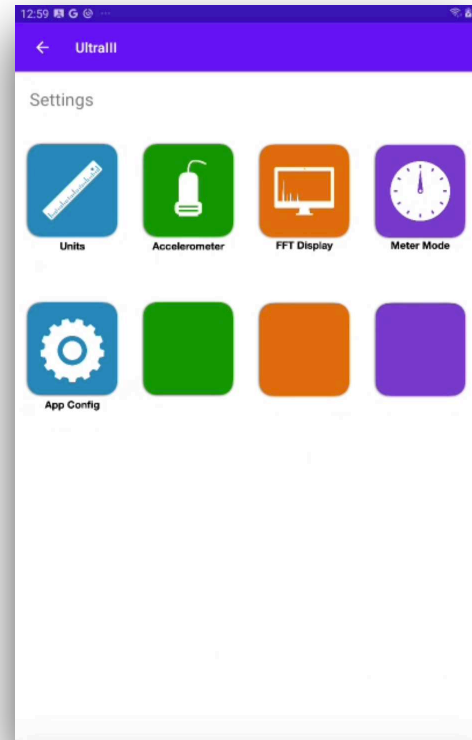
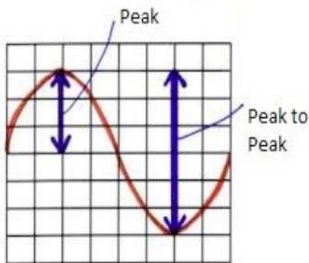


Figure 1.3

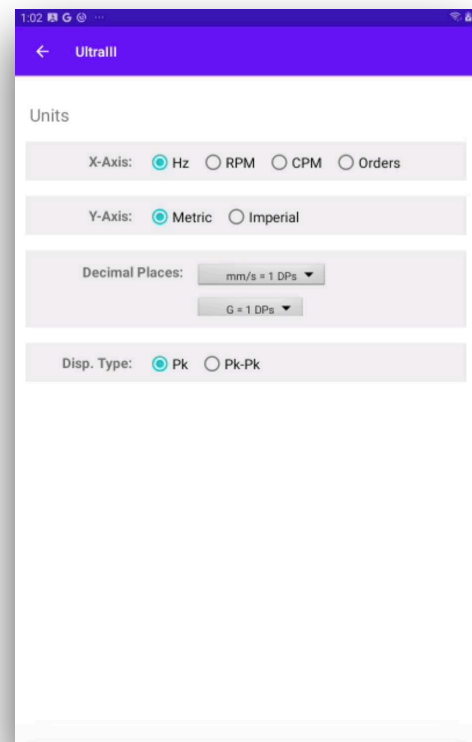


Figure 1.3.1

1.3.2 Accelerometer Settings

As seen in Fig 1.3.2, this option allows the user to select the accelerometer from a list of options.

To reset sensor simply activate the button and next time the user takes a reading it will reset the accelerometer to its factory settings.

The sensor mode will set the accelerometer to 'Manual Mode', where the user will need to turn the sensor on each time it disconnects, or select the 'Ready Mode' which will keep the sensor on at all times.

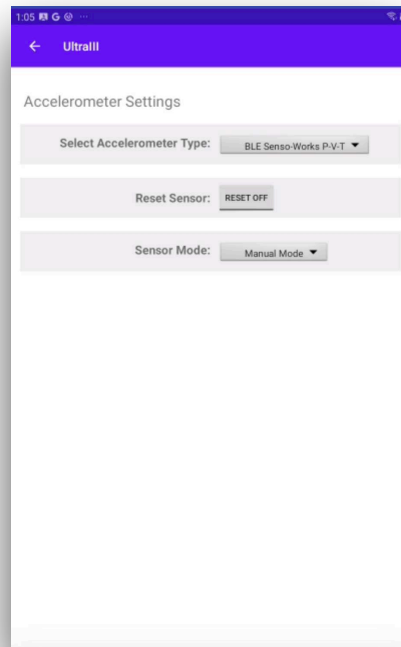


Figure 1.3.2

1.3.3 FFT Display

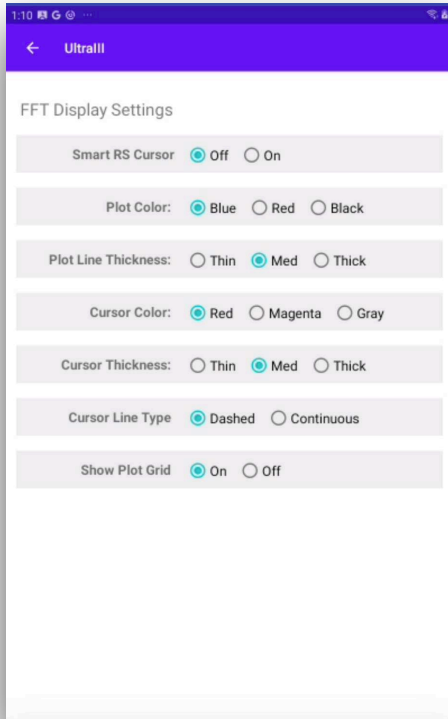


Figure 1.3.3

Here (fig 1.3.3) the user can choose the style and colors of the FFT plot and cursors. Also to turn the grid on or off.

There is also an option to activate Smart RS cursor, which will adjust the Running Speed cursor to the nearest peak, so that the RS cursor itself and the synchronous cursors will match the actual peak in the spectrum.

Fig 1.3.3.1 and 1.3.3.2 shows different configuration of style and colors for the plot, cursor lines and grid.

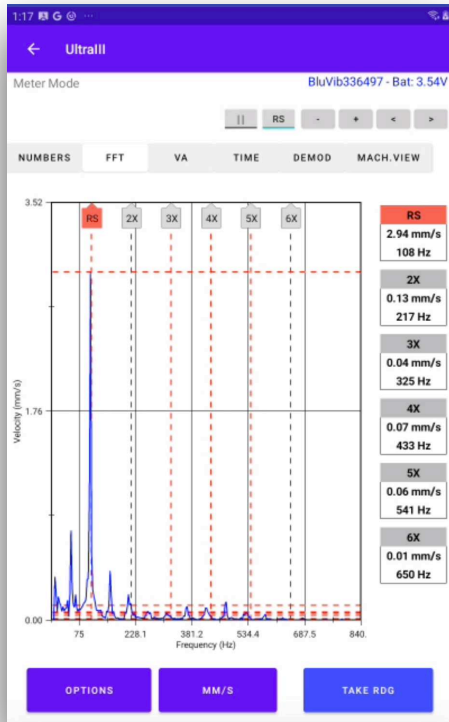


Figure 1.3.3.1

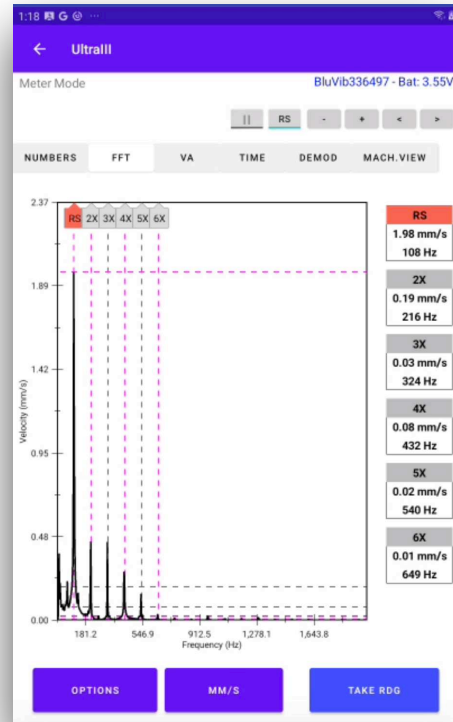


Figure 1.3.3.2

1.3.4 Meter Mode

This option offers an alternative route to the functionality described in **1.2.1.2 Meter Mode Settings**.

1.3.5 App Configuration

The app configuration (fig 1.3.5) allows the user to 'Reset App Defaults' settings to its original values (units, settings, sampling settings, etc). All data will remain intact,

The 'Delete Collected Data' will erase all collected data in the device. Routes will remain in the device.

The 'Delete All Routes and Data' will erase all Routes and collected data from the device.

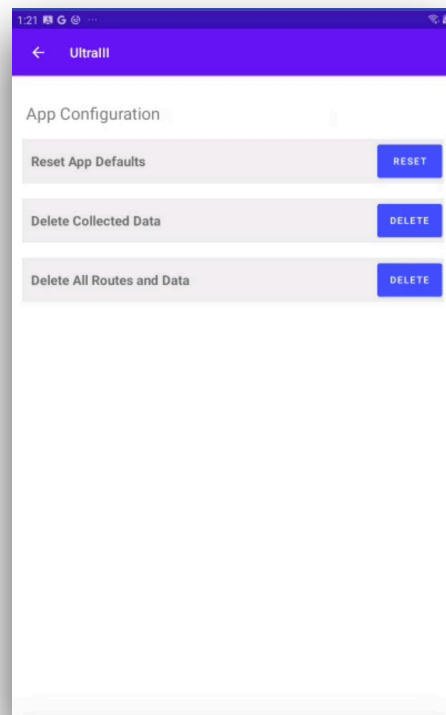


Figure 1.3.5

Revision History

ISSUE	PAGES	AUTHOR	DATE	NOTES
1.1	25		Nov-2022	First Issue