ULTRA II

User Guide: Version 1.2

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1 Software – Ultra II

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 Balancer™
- 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 II™** 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 II™** 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 customisation of the display and processing functions of the **Ultra II™** 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 II™** 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 II™** or to update this list of routes before proceeding.

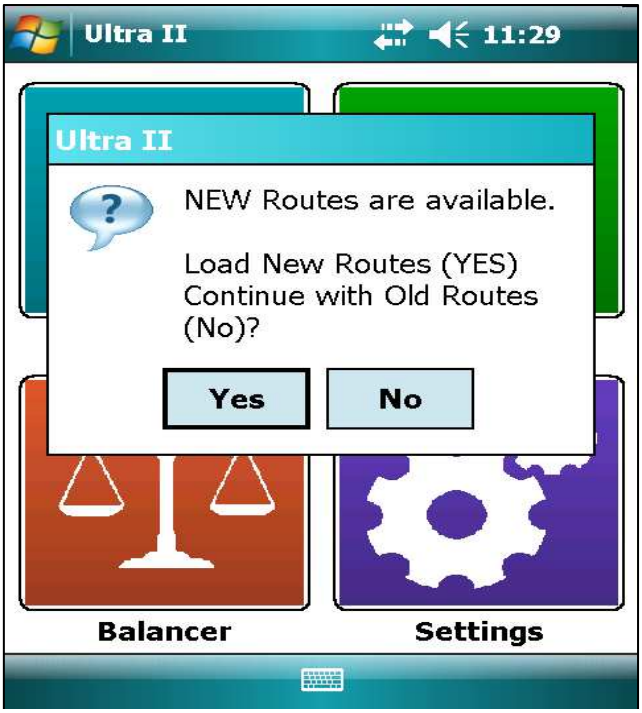


Figure 1.1.1

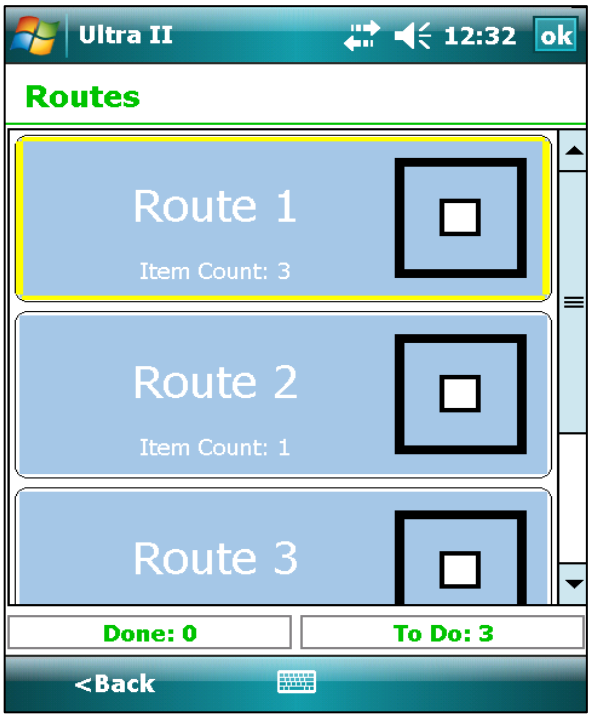


Figure 1.1.2

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, the text display at the bottom of the screen shows that there are three routes registered on this device, and none of them have had all their measurements completed.

Below are examples of a route which has had its measurements partially and wholly completed. The blue square against Route 1 in *Fig 1.1.3* indicates that a least one measurement point has been completed while the blue tick in *Fig 1.1.4* shows all measurements completed for the route. The Route's status, as indicated by the worst reading taken, is reflected in the colour coding of the background (Red, Amber & Green corresponding to Critical, Warning & OK), which is standard throughout the system.

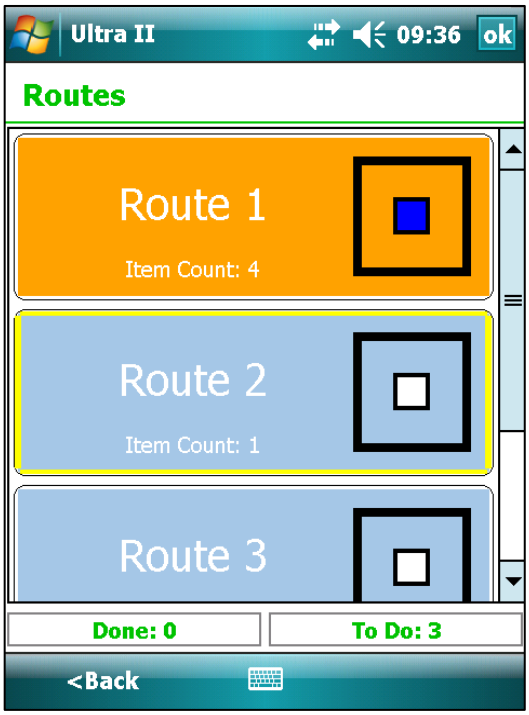


Figure 1.1.3

Figure 1.1.4

Upon selecting, in this instance, Route 1, the user is presented with the screen shown in *fig 1.1.5.*

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

This information is again summarised at the bottom of the screen.

Examples of routes containing partly and fully complete measuring points are shown in *figs 1.1.6* and *1.1.7.*

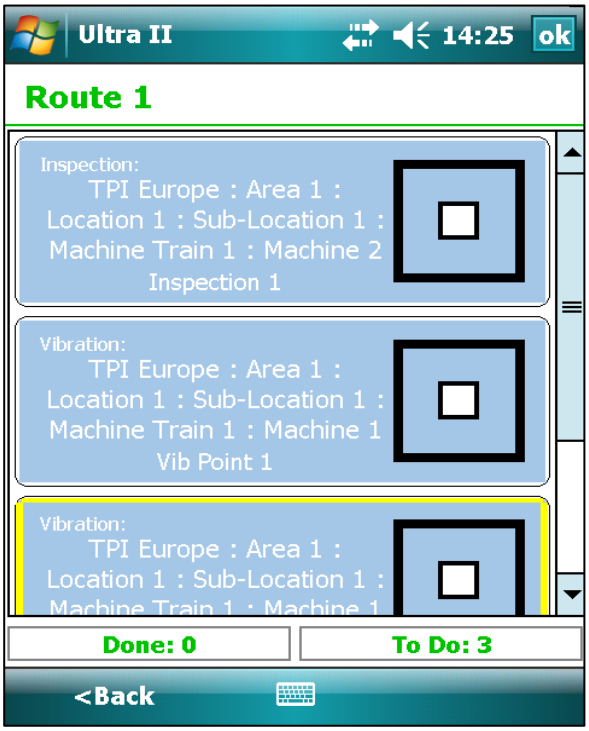


Figure 1.1.5

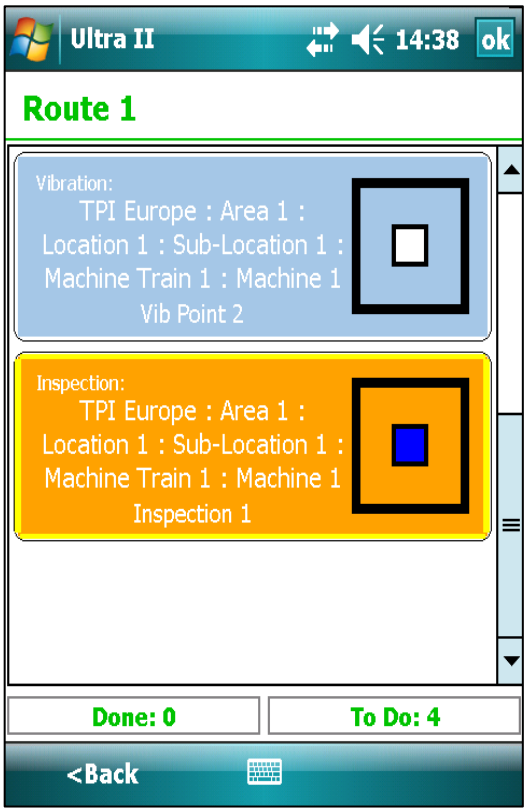


Figure 1.1.6

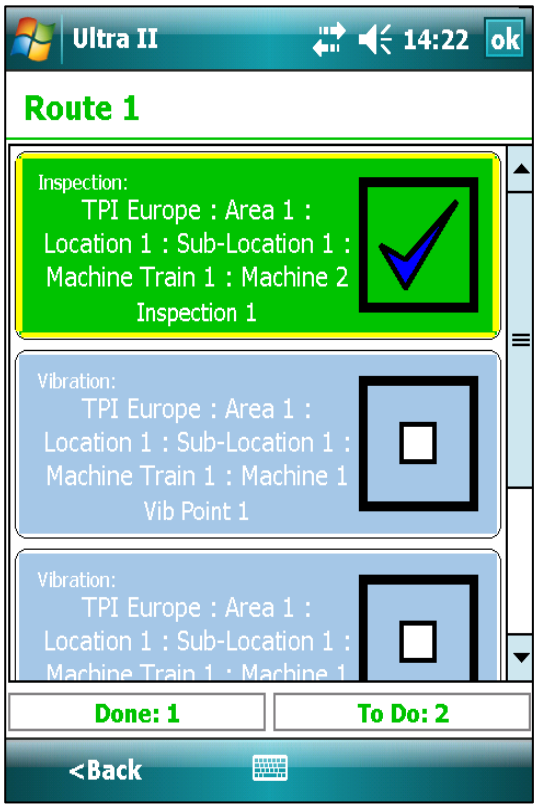


Figure 1.1.7

1.1.2 Inspection Points

Figure 1.1.2.1

The first point on this route, Inspection 1 (*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 ‘Done’ 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*).

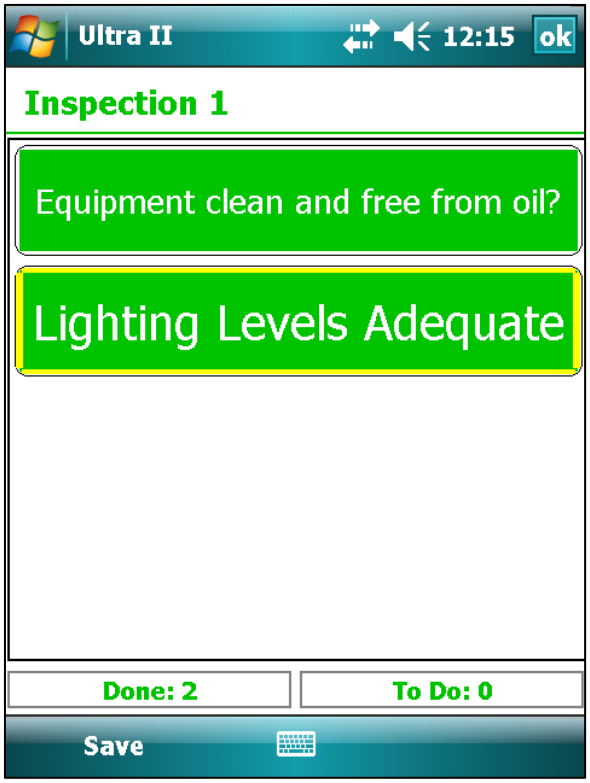


Figure 1.1.2.3

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.*

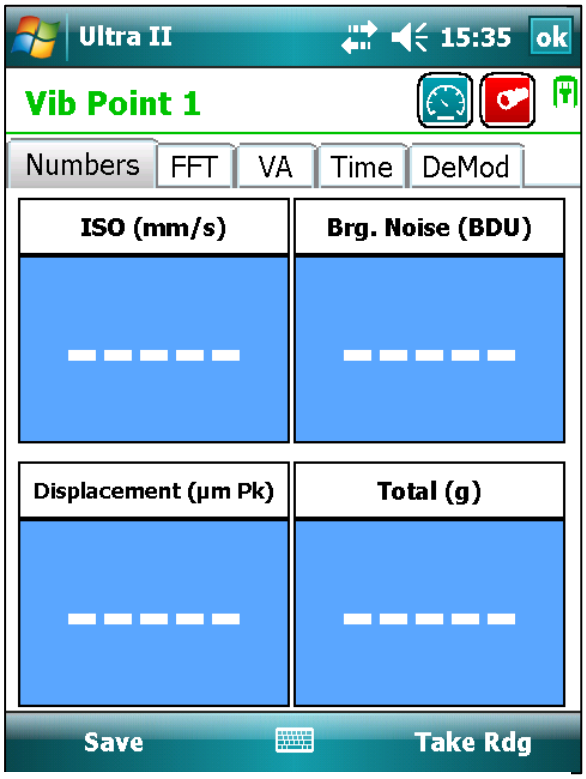


Figure 1.1.3.1.1

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.

During the measurement process the user is kept up-to-date with progress via a display across the bottom part of the screen, as exemplified in *fig 1.1.3.1.2.*

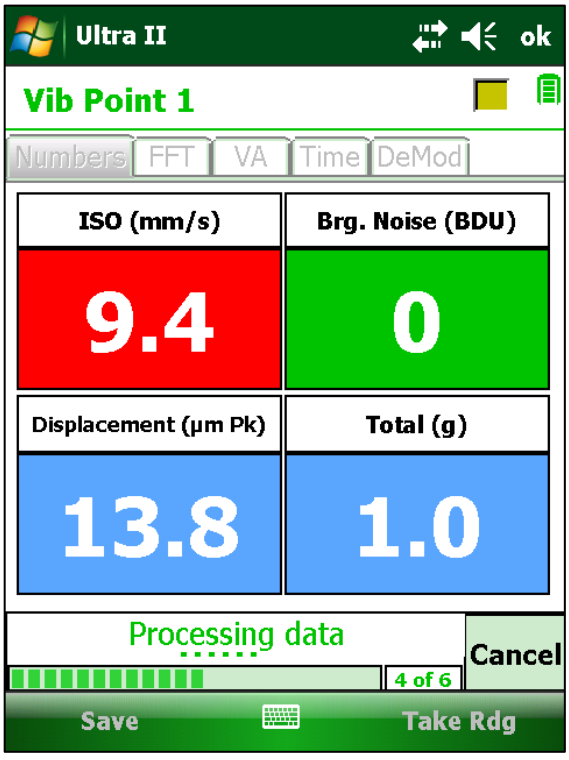


Figure 1.1.3.1.2

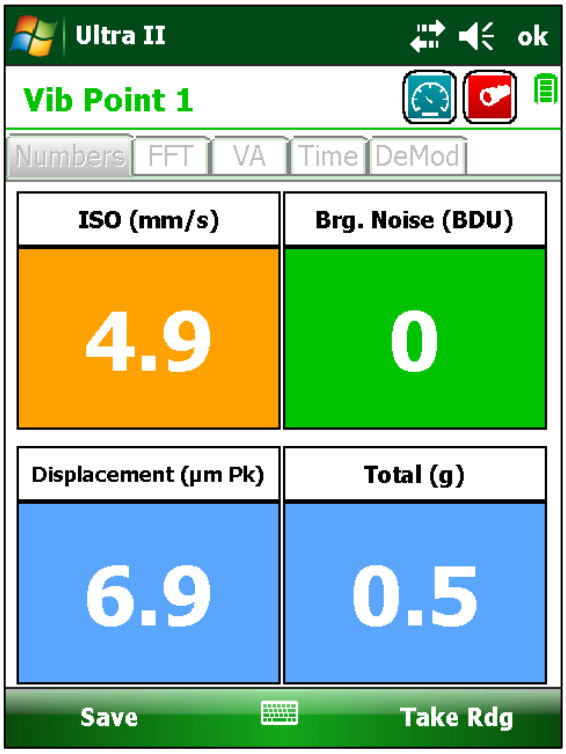


Figure 1.1.3.1.3

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.

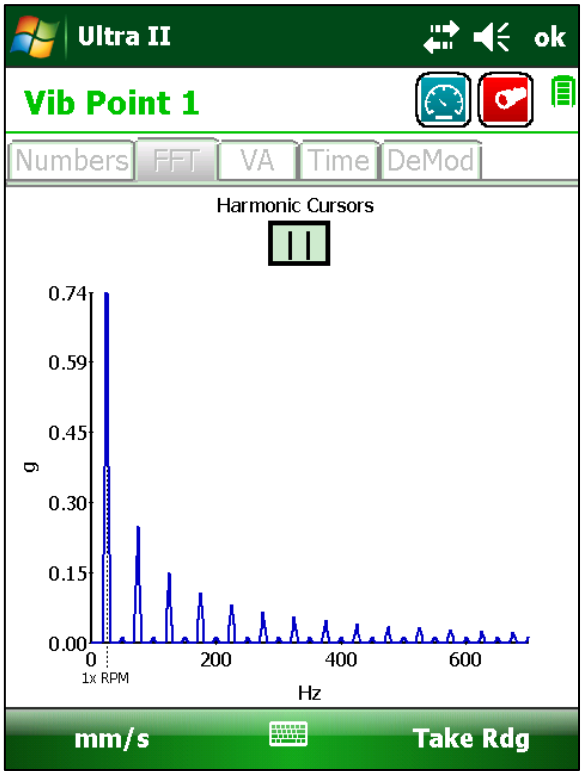


Figure 1.1.3.2.1

Tapping the ‘Harmonic Cursors’ symbol [II] places a cursor F at the peak of this fundamental frequency. 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 (fig *1.1.3.3.1.2*).

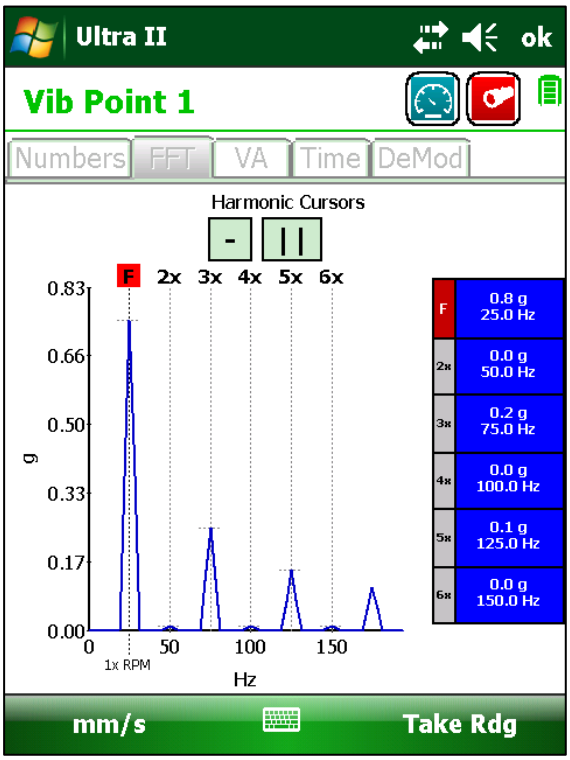
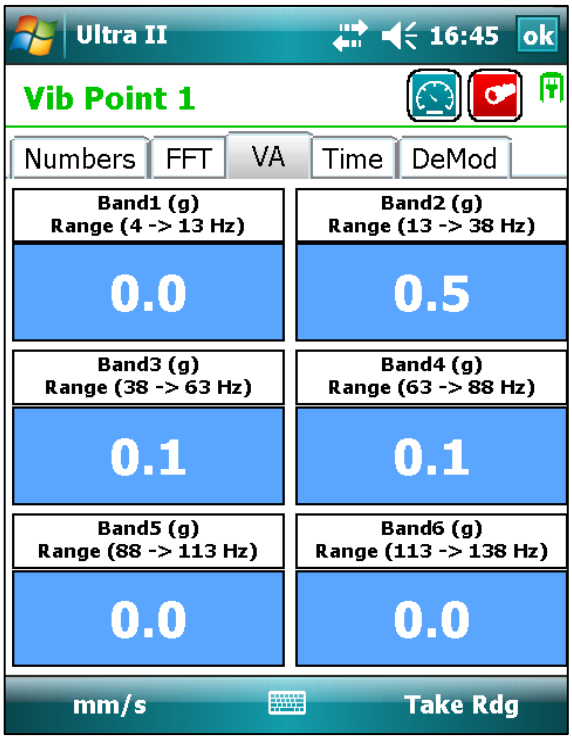


Figure 1.1.3.2.2

To assist in analysing any vibration plot in **Ultra II™**, the user can zoom-in on any area of particular interest by drawing a rectangle around it. This is achieved by placing the stylus on the screen at the top left hand corner of the required area, and dragging it downwards and to the right until the required area is surrounded. Double tapping the screen returns the plot to its original dimensions.

1.1.3.3 VA Bands



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 1.1.3.3

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.

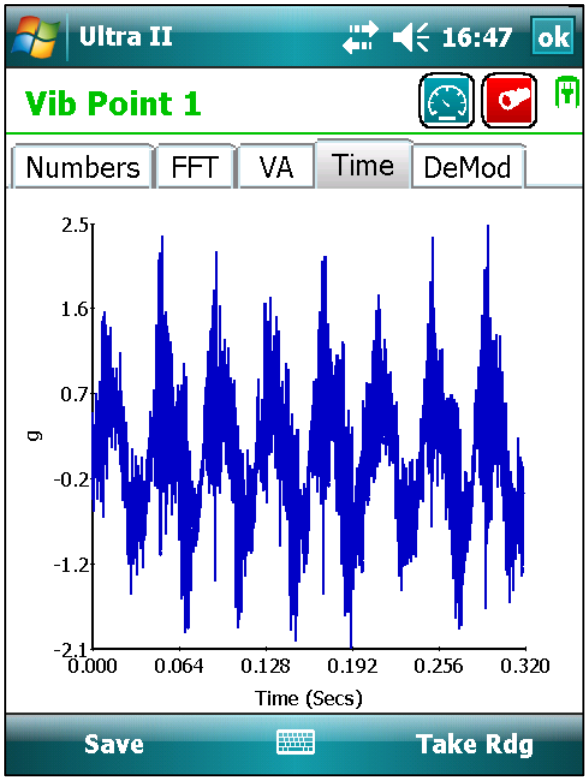


Figure 1.1.3.4

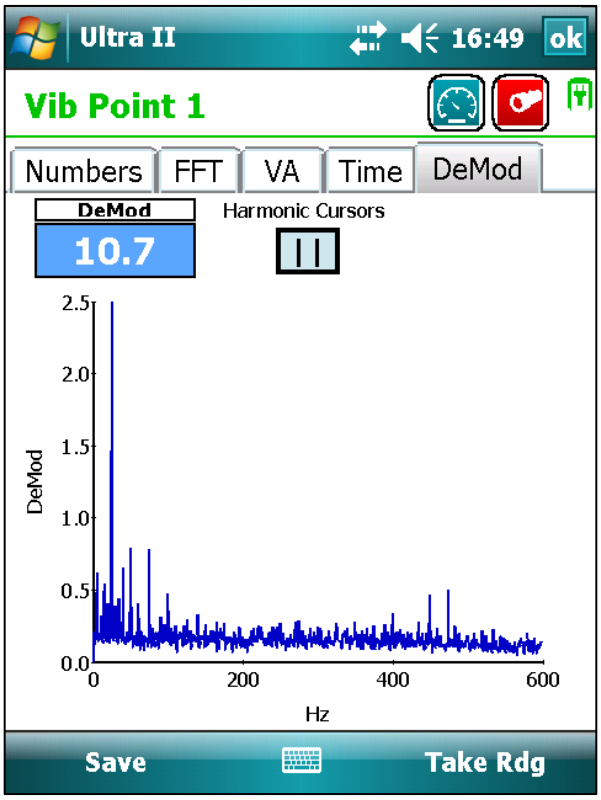


Figure 1.1.3.5

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.

1.2 Meter Mode

Using **Ultra II™** 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 II™**, 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 Setup option, in the bottom left corner of the screen displays a four-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***.

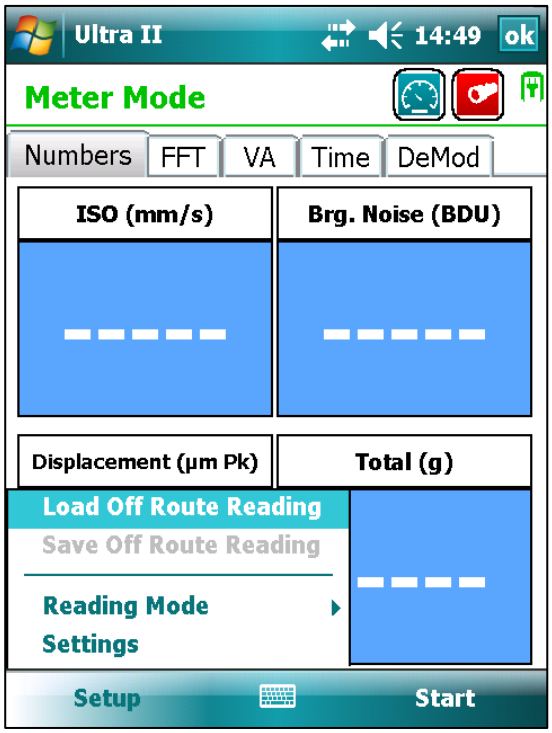


Figure 1.2.1

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. Only the numbers and FFT screens, as seen in *figs 1.1.3.1.3 & 1.1.3.2.1* are available in this mode. Once continuous reading mode has been activated, the screen will continue to be updated with fresh data until the stop button is pressed.

1.2.1.2 Meter Mode Settings

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

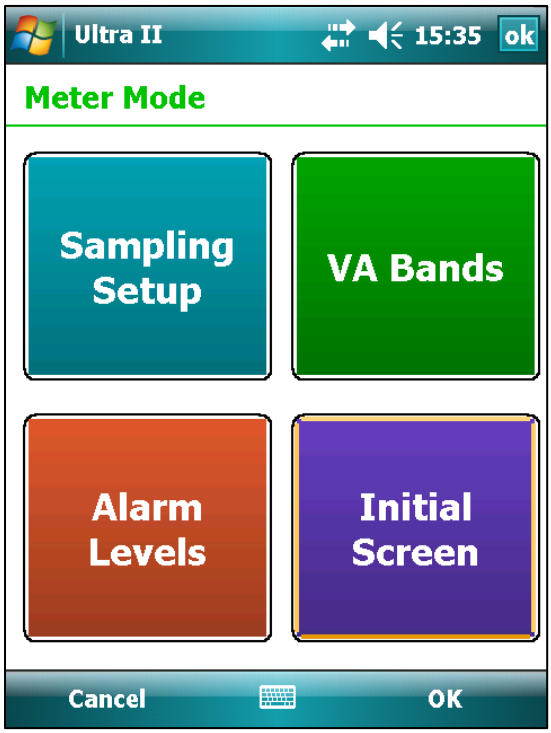


Figure 1.2.1.2

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.

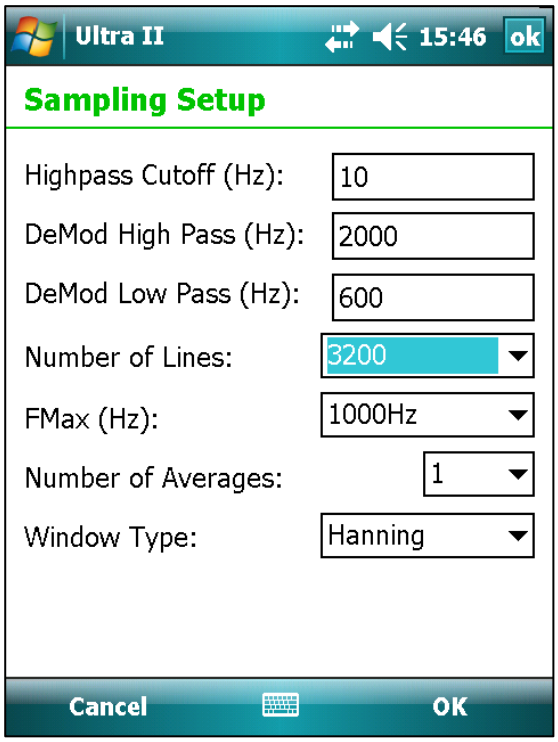


Figure 1.2.1.2.1

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	3.6 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.

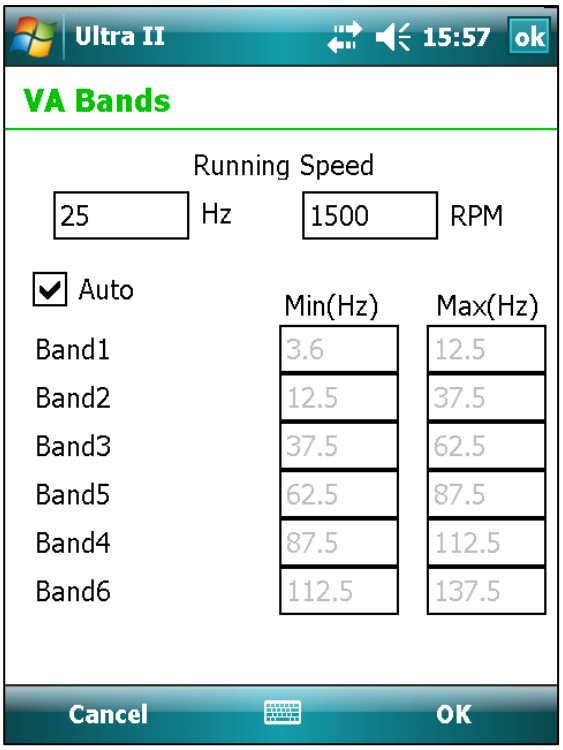


Figure 1.2.1.2.2

1.2.1.2.3 Alarm Levels

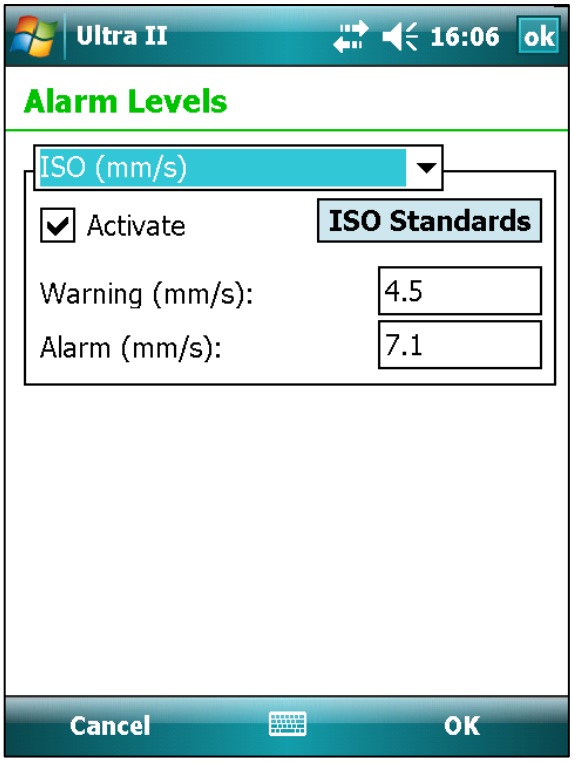


Figure 1.2.1.2.3.1

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).*

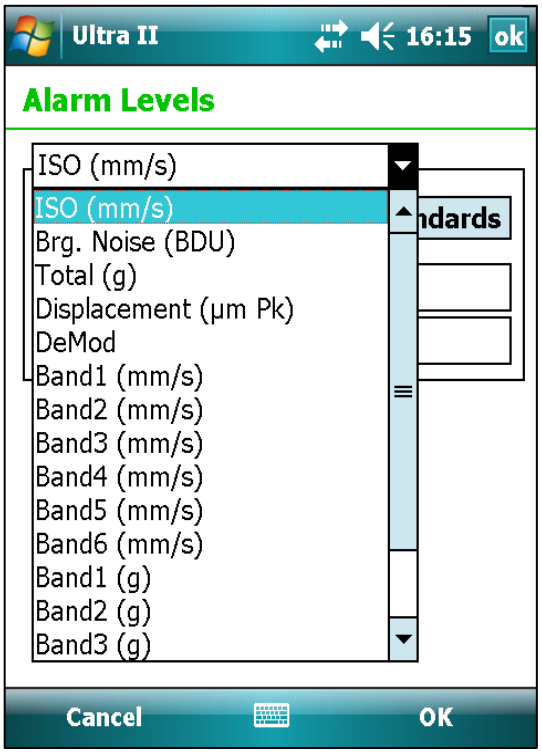


Figure 1.2.1.2.3.2

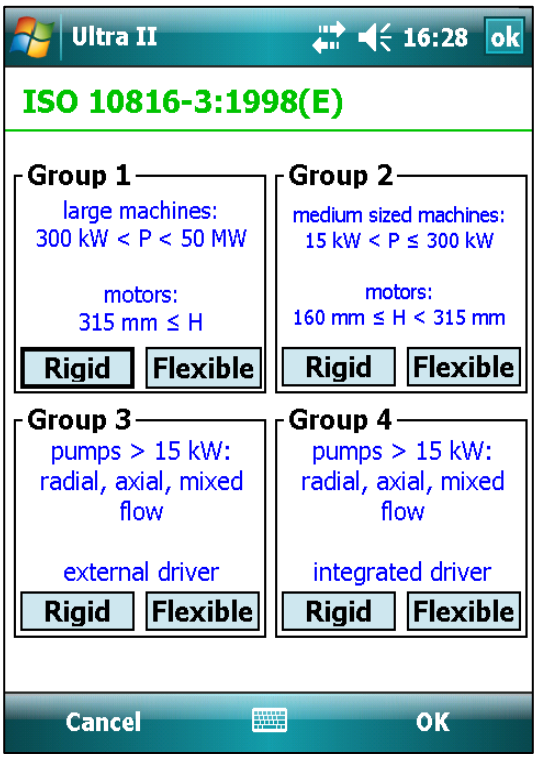


Figure 1.2.1.2.3.3

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 II™** is put into meter mode (*fig 1.2.1.2.4*).

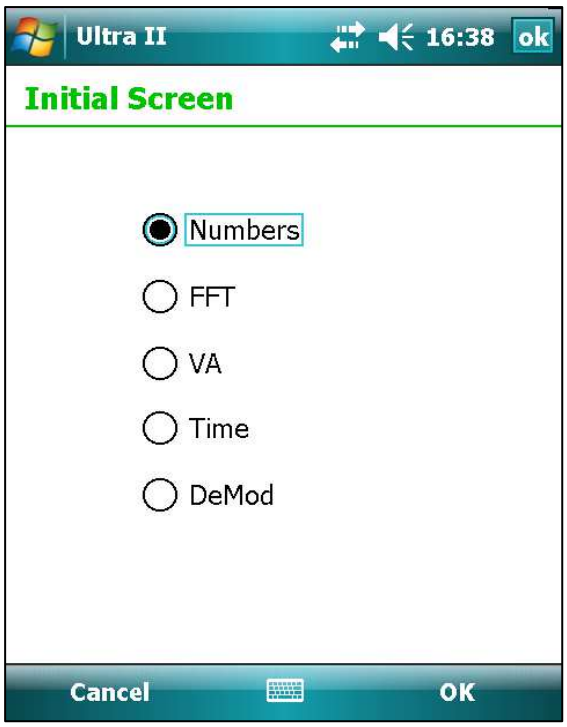


Figure 1.2.1.2.4

1.2.2 Off Route Readings

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*).

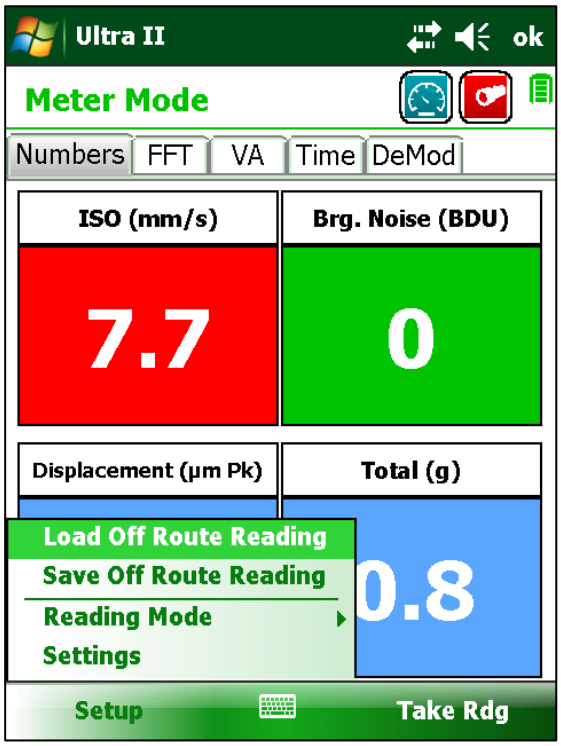
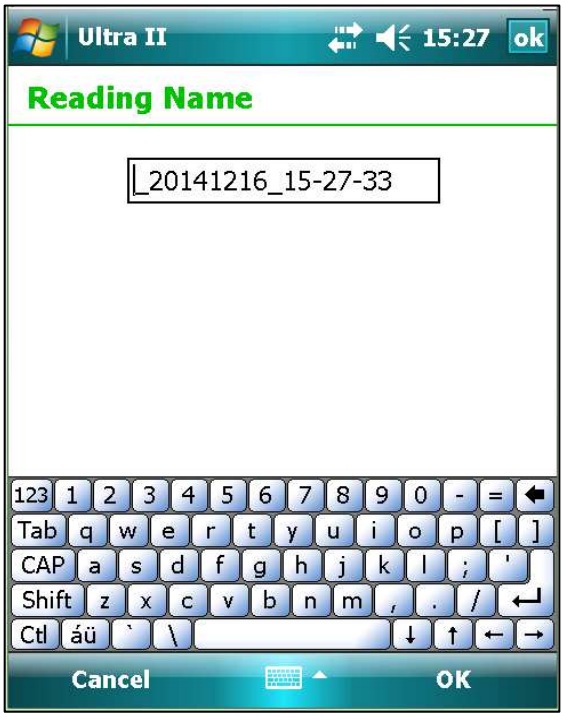


Figure 1.2.2

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).



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.

Figure 1.2.2.1

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 II™** for further examination.

Off route readings which are no longer required can also be selected and deleted from this screen.

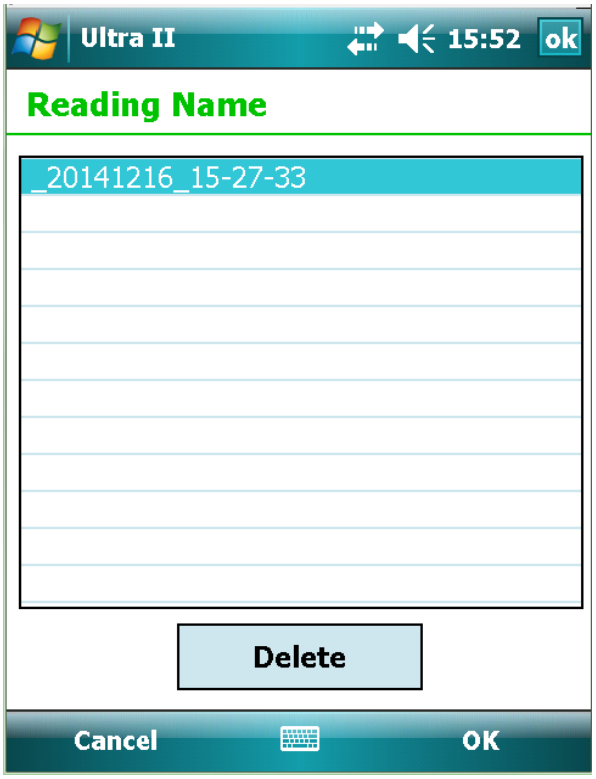


Figure 1.2.2.2

1.3 Settings

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

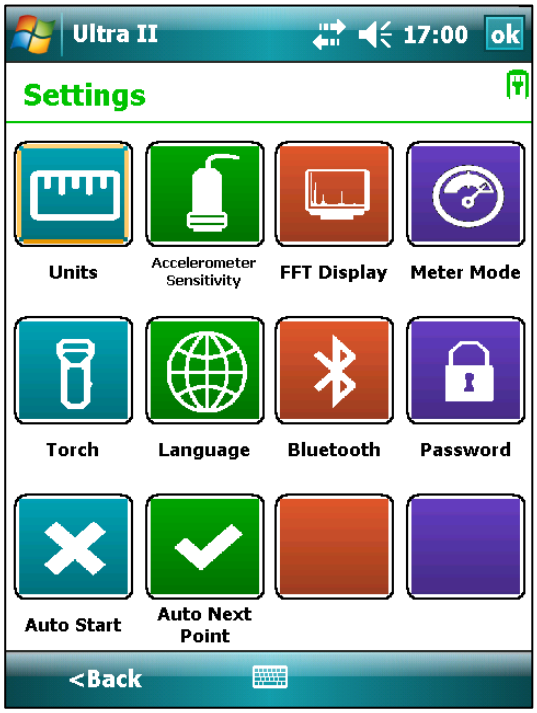


Figure 1.3

1.3.1 Units

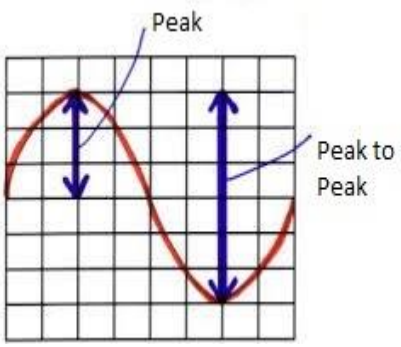
The Units screen (*fig 1.3.1*) firstly allows the axes of all graph plots to be displayed in the user’s preferred units.

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.



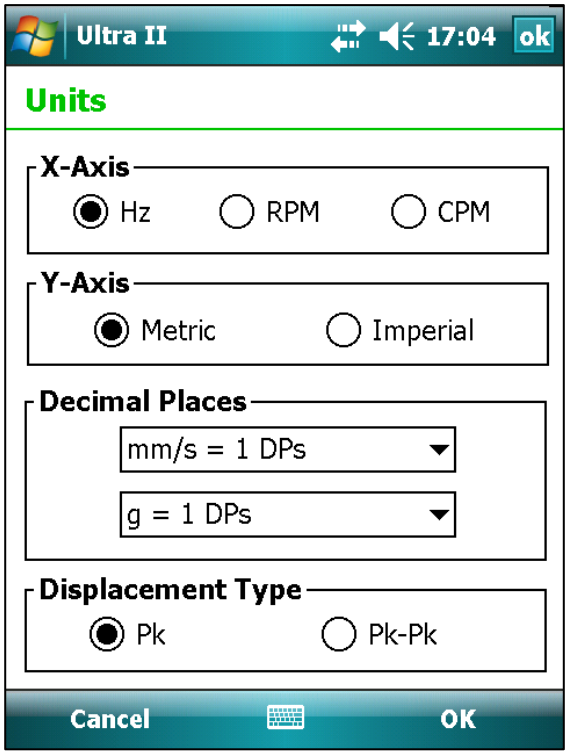


Figure 1.3.1

1.3.2 Accelerometer Sensitivity

This option simply allows the user to set the accelerometer sensitivity used by **Ultra II™** in its calculations to match the specific equipment being used (*fig 1.3.2*).

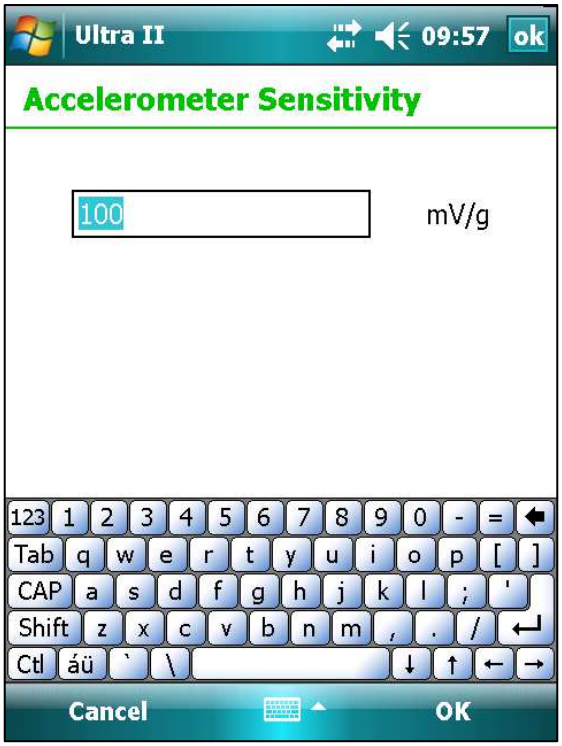


Figure 1.3.2

1.3.3 FFT Display

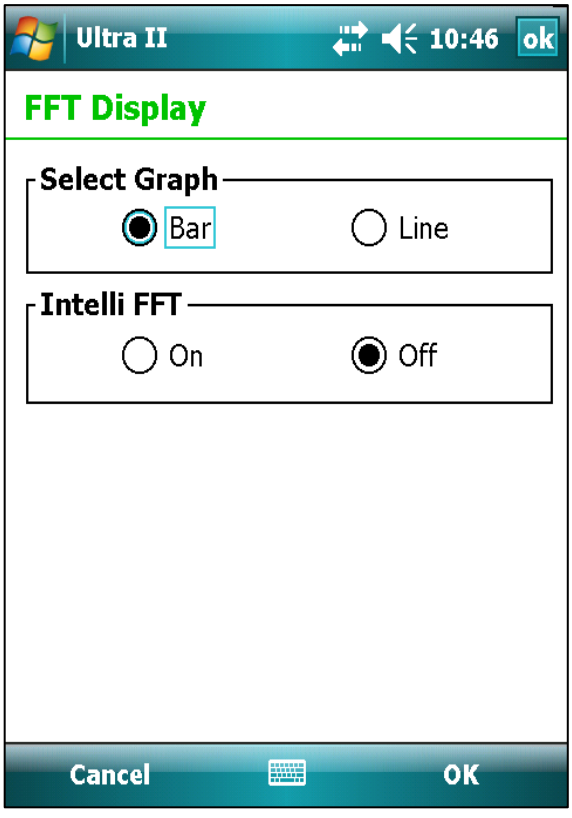


Figure 1.3.3

Here (*fig 1.3.3*) the user can choose the style of presentation for FFT displays (either a bar chart (fig 1.3.3.1) or line graph (fig 1.3.3.2). These are shown here in conjunction with the Zoom function, for added clarity.

There is also an option to activate Intelli-FFT, which can be used to sharpen the display of individual peaks, by applying an algorithm which compensates for 'leakage' between the displayed frequency bins (smearing of the display).

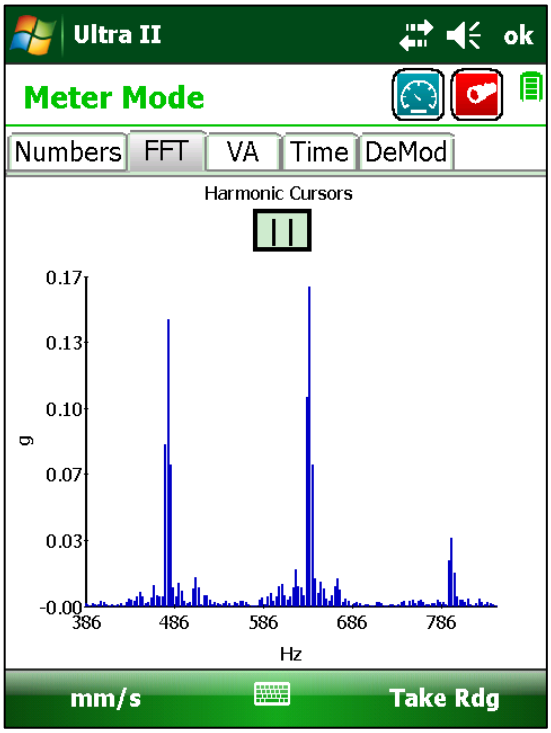


Figure 1.3.3.1

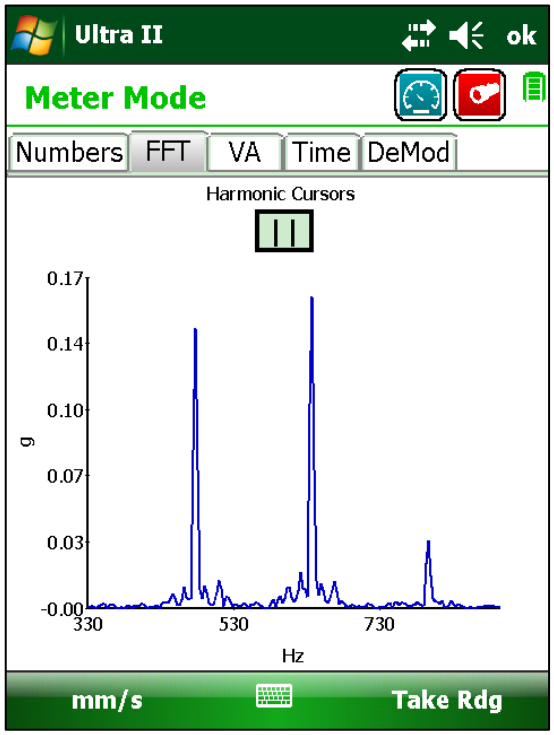


Figure 1.3.3.2

Intelli-FFT should be turned off should the user wish to view low level signals, which are closely spaced on the frequency axis.

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 Torch

This allows control of the brightness settings, and an on/off switch for the torch (fig 1.3.5). This is described further in section **1.4 Externals.**

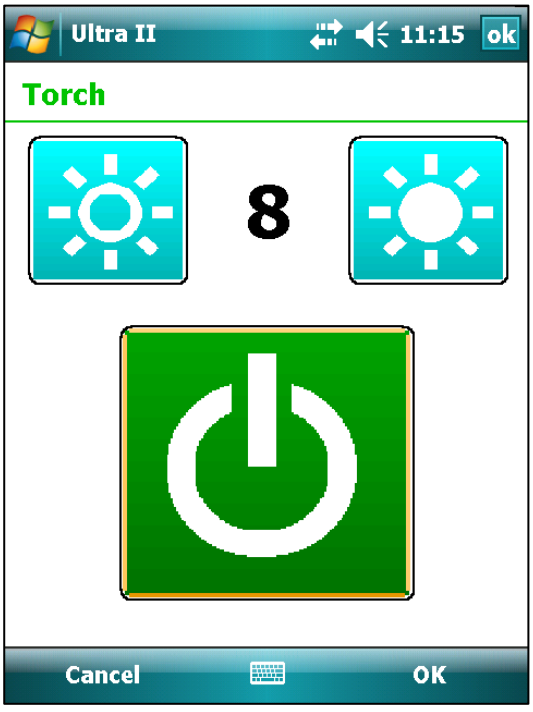


Figure 1.3.5

1.3.6 Language

Users can choose the operating language for **Ultra II™** from a drop-down menu showing the available choices.

The list of available languages is continuously being updated and customers should contact TPI if a desired language is not shown on the list.

1.3.7 Bluetooth

This allows Bluetooth connectivity to the **Ultra II™** device to be activated and deactivated, using a simple checkbox.

1.3.8 Password

Here the user can enable/disable password protection on **Ultra II™** and set a new password (*figs 1.3.8.1 & 1.3.8.2*).

The default password is ***default*** (all passwords are case sensitive).

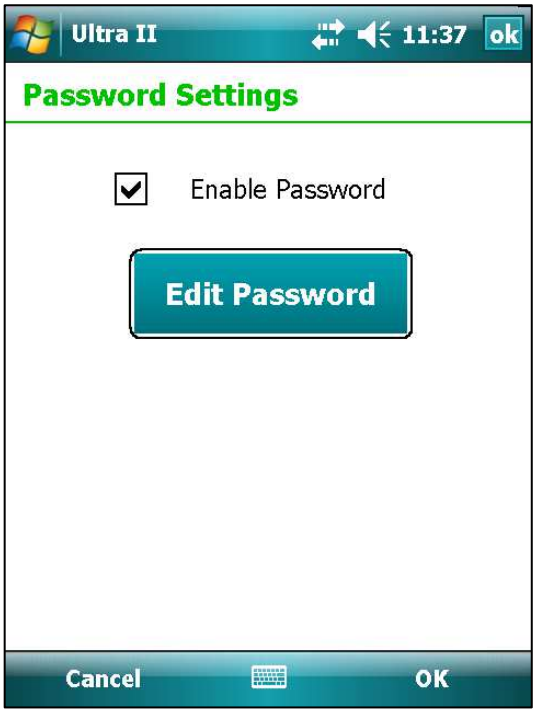


Figure 1.3.8.1

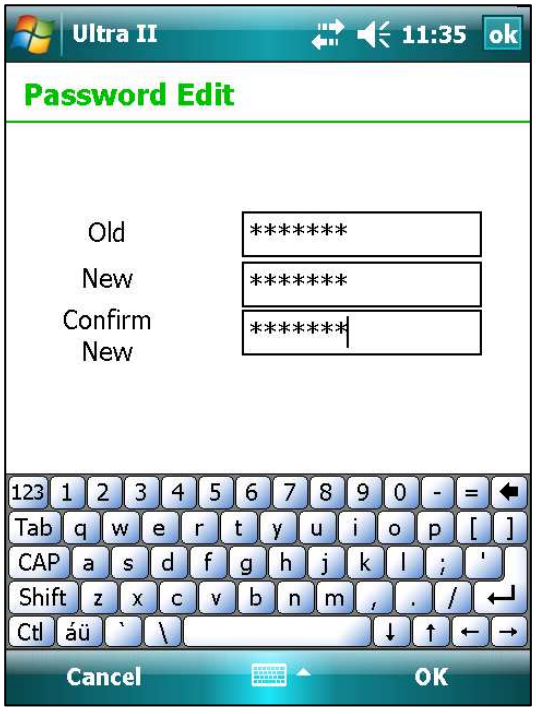


Figure 1.3.8.2

1.3.9 Auto Start

The Auto Start icon acts as a push-button on/off switch, enabling/disabling the automatic running of **Ultra II™** when the unit is switched on.

1.3.10 Auto Next Point

This option is activated in the same way as Auto Start, and enables the automatic advancement to the next measurement point on the current route whenever a reading is taken in **Ultra II™**.

1.4 Externals

Whenever a vibration measurement is being taken, or vibration data displayed on the screen, either within a route, or in meter mode, the following two symbols appear in the top right corner of the screen . These relate to the external light which can be fitted into the right hand of the three sockets in the **Ultra II™** unit.

1.4.1 Strobe

This allows the setting of stroboscopic flashing of the external light for use in checking and, if necessary adjusting, the run speed of the machine for which the measurement is required (fig 1.4.1).

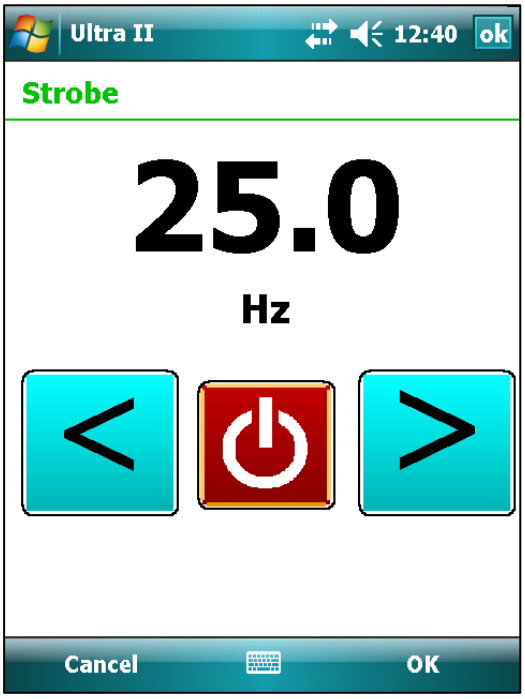


Figure 1.4.1

1.4.2 Torch

This option simply allows the external light to be used as a torch to assist in the measurement process.

1.5 RFID tags

Employing RFID tags with Ultra II means that individual vibration points can be tagged on an asset so that when the RFID tag is 'read' the Ultra II screen will display that particular vibration point, regardless of where in the pre-defined route the user has reached. For example, Pump 24 'NDE V' (or non-drive end vertical). The Ultra II will then be set to take a new reading at that vibration point.

Using Ultra II with RFID tags also means that the person using the Ultra II need not be fully familiar with the location and order of all vibration measurement points – they need only find the RFID tag, scan it and then take a reading. Using RFID tags with Ultra II also means there can be no dispute between client and consultant or manager and staff as to whether the correct measurement has been taken.

Outline operation.

It is important to note that configuring or assigning an RFID tag is performed using the Ultra II hardware and not the C-Trend II software.

C-Trend II has an *Asset Manager* which is used to create *plants, machine trains*, and then individual *machines* and their particular vibration and inspection points. Similarly the *Route Manager* is then used to decide which *plants, machine trains*, and then individual *machines* are contained in a particular route.

N.B. RFID tags can only be configured once the route, containing the machines that will have the RFID tags is sent to the Ultra II hardware.

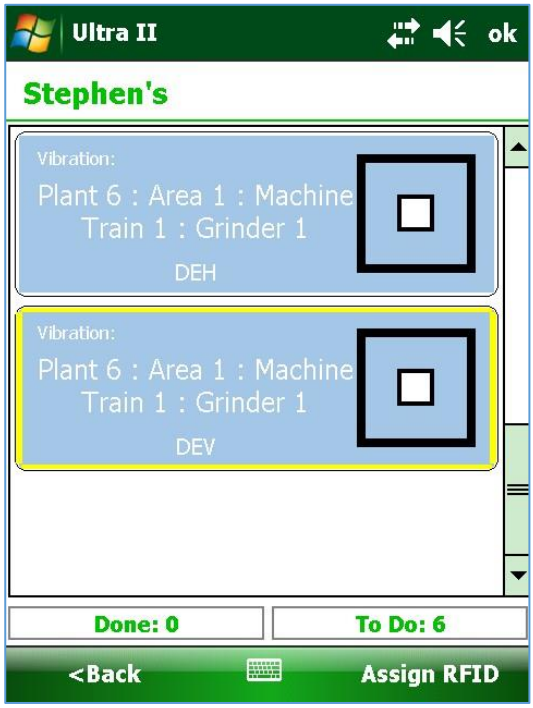
N.B. The following instructions are all related to the Ultra II hardware and not C-Trend II PC software. It is also assumed that a suitable route containing machines with vibration points has already been sent to the Ultra II.

To assign a tag:

- From the Start menu of the Ultra II data collector select 'TPI Ultra II' and select 'Routes'

- Select the route containing the machine(s) of interest (this opens a screen showing all assets within the route).

- Use the yellow up and down keys to select the vibration point to be assigned to the RFID tag – in the example shown 'Plant 6 : Area 1 : Machine Train 1 : Grinder 1 : DEV'. The selected vibration point will now be bordered in yellow.



- Select 'Assign RFID' (shown at the bottom right of the screen).

- A new screen will appear with green text detailing the selected vibration point. The text at the top of this screen says 'Please scan an RFID tag'

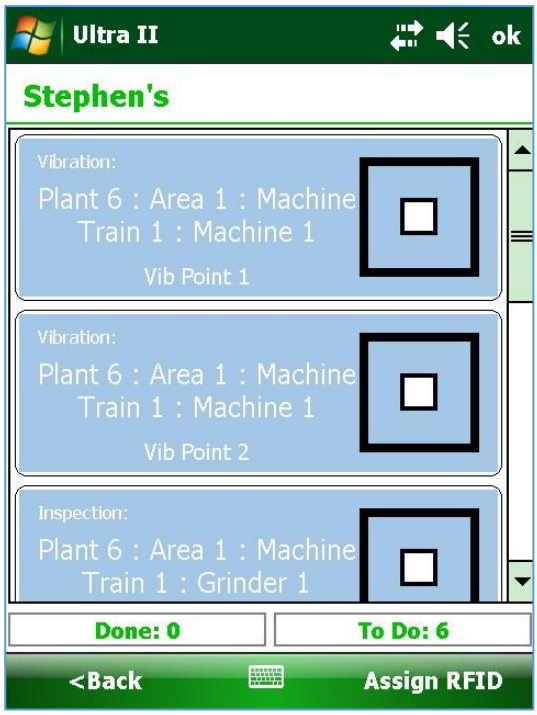
- Scan an RFID tag by holding it in close proximity to the rear of the Ultra II head unit – i.e. at the back where it says 'TPI'.

- A successful scan is indicated by a chime sound and the appearance of the tag's unique code in the bottom window underneath the words 'To the following RFID Tag'.

- Choose 'yes' to continue.

- Scan the tag again, as directed by the Ultra II, and wait for the confirmation beep.

- A successful tag confirmation results in the screen reverting to the asset list as shown on the left.



To read from a tag:

- From the Start menu of the Ultra II hardware select 'TPI Ultra II' and select 'Routes'

- Select the route containing the machine(s) of interest (this opens a screen showing all assets within the route).

- Scan an RFID tag by holding it in close proximity to the rear of the Ultra II head unit – i.e. at the back where it says 'TPI'.

- A successful scan results in the assigned vibration point being displayed – e.g. 'Plant 6 : Area 1 : Machine Train 1 : Grinder 1 : DEV'

- Attach an accelerometer and then select 'take reading' from the bottom right of the screen.

Revision History

ISSUE	PAGES	AUTHOR	DATE	NOTES
1.0	31	L Jordan	2014	First Issue
1.2	32	JKA	May 2016	Updated layout and RFID added