

# Sonus PD Mobile Application

## Operating Manual

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# 1 IRISS SONUS PD Application

The SONUS PD app is an android based data display and recording application, to be used in conjunction with the SONUS PD. It is capable of recording and storing Partial Discharge data collected by the SONUS PD. It enables the user to view live PD readings as either a numeric decibel display or as an animated graph. This also allows the user to see actual PD during onsite testing.

The SONUS PD app allows user to have an overview of all Partial Discharge site tests. The SONUS PD communicates with a central database as well as maintaining a local database to allow an accurate picture of asset health to be created over time.

The SONUS PD app requires the user to connect a SONUS PD unit via Bluetooth. To ensure accurate records, the user should check the SONUS PD with the PD Function Tester included in the SONUS PD kit.



## 2 General Substation Safety Precautions



Before using the SONUS PD in the substation or switchyard it is important for the user to read and understand the following general safety information.

The test engineer should obey the plant owner's High Voltage safety rules at all times. The following safety rules which are particular to the SONUS PD equipment should be applied in addition to the existing safety rules, which are required by the plant owner. General safety rules for the use of the SONUS PD are as follows:

1. Avoid working alone.
2. Only accredited personnel with appropriate Health and Safety Training should use the equipment.
3. Do not use the equipment if it is damaged, or its safety is impaired in any way.
4. Inspect and test all ground leads and signal cables for continuity.
5. The User should have read and understood the appropriate equipment manuals.
6. Always select the appropriate sensor and sensor connection for the application.
7. The connected SONUS PD has been designed for use only on the earthed, outer surfaces of metal-clad equipment and the earth/neutral connections of cables/switchgear. Under no circumstances should the SONUS PD or PD sensors be connected to the high voltage terminals of HV Plant under test.
8. Always maintain Safety Distances between the instrument, PD sensors, the operator and any high voltage components.
9. Do not disturb or interfere with the high voltage equipment in any way.
10. The User should wear sensible and appropriate PPE and clothing when in the substation.
11. The User should ensure that proper attention is given to their surroundings and that do not become distracted by the SONUS PD app while on site.

### 2.1 Access

The Test Engineer shall only enter the customer's switchyard or substation after they have received permission from an Authorised Person appointed by the Plant Owner. If in doubt on any matter the Plant Owner's High Voltage safety rules should be consulted by the Test Engineer(s) who will carry out the testing.

### 2.2 Visual Inspection of Substation

On entry to the test area a visual inspection of the area should be carried out by the Test Engineer(s). This should enable the operator to identify any potential hazards in the area and to assess both the type of equipment to be tested and the method of doing so i.e. Switchgear using CC sensors or Cables using HFCT sensors. Only when this visual inspection has been completed can the equipment be set-up for testing.

## 3 Login Screen

On launching the SONUS PD App the user will be presented with the login screen which requires Username and Password, which has been pre-authorized by an Administrator.

Once the user has entered a pre-authorized login and presses the “Sign in” button, the app will authenticate the login. If Login fails the user will receive an error message.

If the correct details have been entered the user will move onto the main menu and will be shown what level access their login credentials has been assigned by the administrator.

1. **Login Username:** Username pre-set by administrator.
2. **Login Password:** Password pre-set by administrator.
3. **Sign in Button:** Allows the user to sign into the app after entering the sign in details.

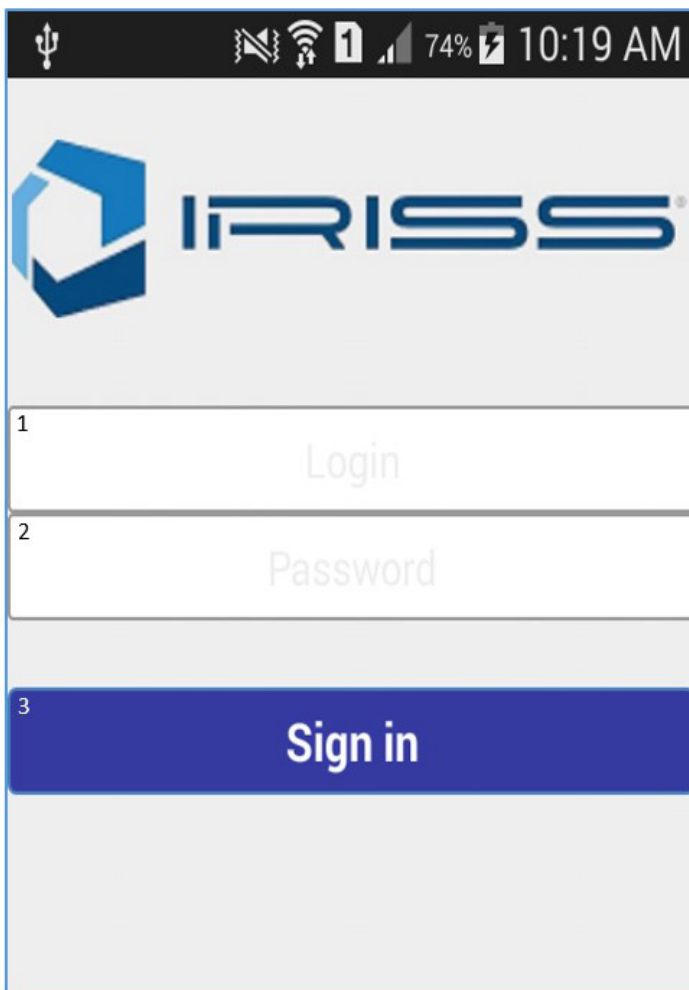


Image 1: Login Screen

## 4 Main Menu

From the main menu, the user can access a number of features using the buttons on screen.

1. **Detect Device:** The app will enable Bluetooth and scan for all nearby SONUS PD devices to connect with.
2. **Synchronise:** Takes the user to the main Synchronisation menu which will allow the user to synchronise all data it has collected with a remote database.
3. **Sign out:** Logs the user out of the App and returns them to the sign in page.
4. **Settings:** Takes the user to the settings menu.
5. **Database:** This button is only available to administrators and allows the administrator edit the users and assets stored locally.

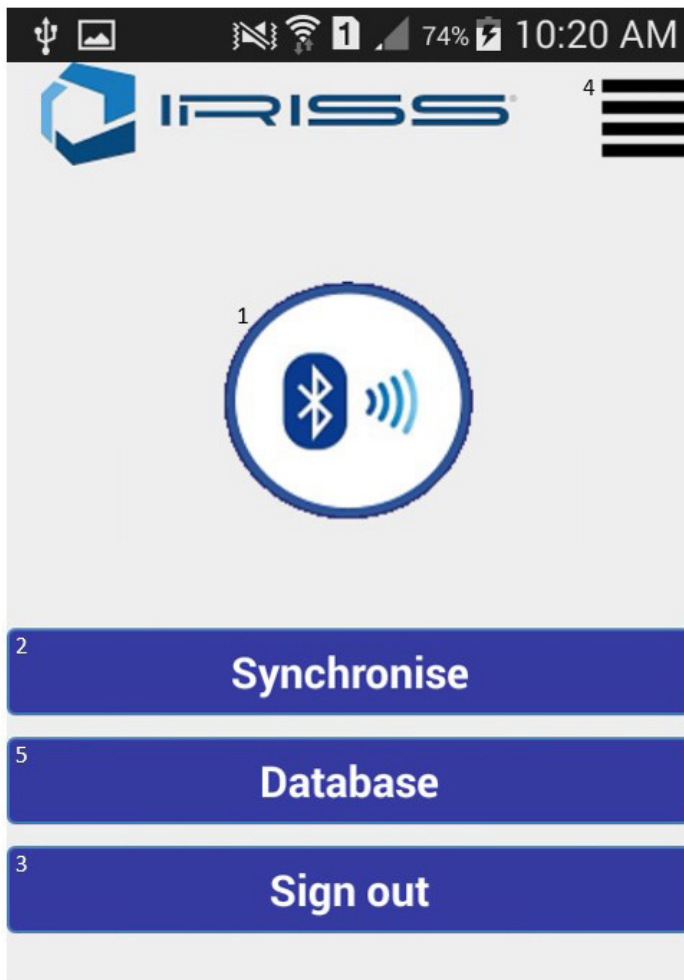


Image 2: Main Menu

## 5 Detect Device

When the user presses Detect Device Button on the main menu the user will be taken to a device list, here the app will search for any nearby SONUS PD devices. Only devices that are not already paired with another app will be displayed in the list.

Once a device has been detected it will show in the list with the device ID and a 5-digit serial number. This corresponds to the serial number of the SONUS PD allowing the user to identify the correct SONUS PD unit.

After selecting the SONUS PD device and pressing connect the user will be asked to enter a pin. If an incorrect PIN is entered the user will receive an error message and will be prompted to re-enter the correct PIN. Once a correct PIN has been entered the user will be taken to the Level screen.

1. **Device List:** This list allows the user to select which SONUS PD device to connect to with the app, if there are multiple SONUS PD units within Bluetooth range.
2. **Connect:** Connect allows the user to connect with the device selected in the Device List.
3. **Cancel:** Cancels the current search and returns the user to the Main Menu.

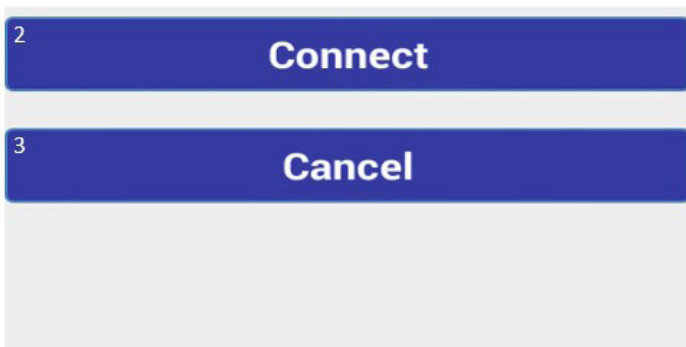
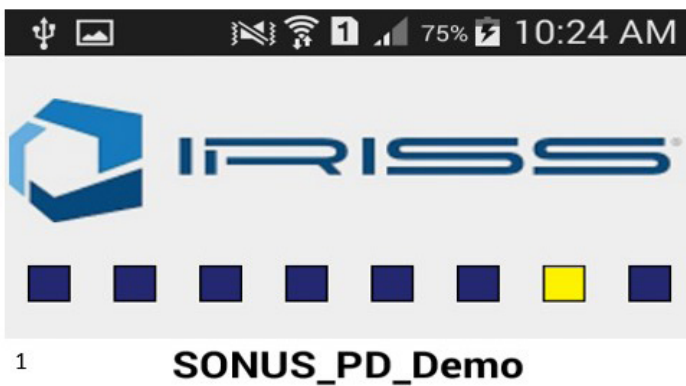


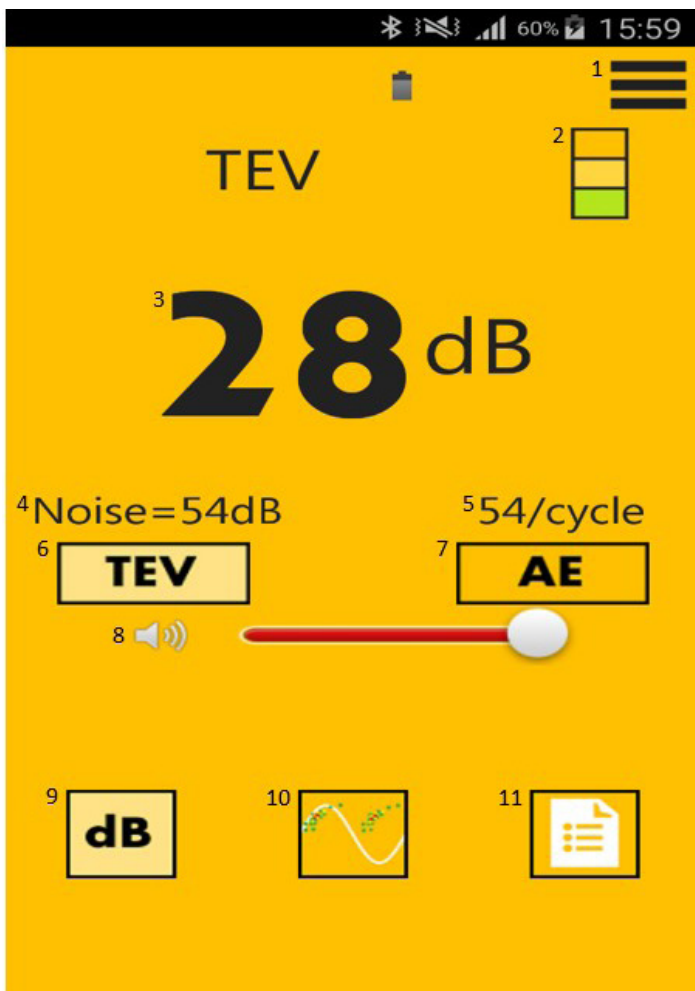
Image 3: Detect Device Screen



## 6 Level Screen

After the user has connected the SONUS PD to the app, the level screen will appear. On the Level Screen, the user will be presented with the dB readings being collected by the SONUS PD unit.

1. **Settings Button:** Allows the user to access further settings for the App.
2. **Criticality Level:** Green indicates that the signal level being collected by the SONUS PD is below 20dB. Amber indicates a signal level of more than 20dB but less than 30dB, Red indicates a signal level in excess of 30dB.
3. **dB Display:** Displays the current PD signal level as dB.
4. **Noise:** Displays the signal level received but not classed as PD.\*
5. **Cycle Count:** Displays a number of power cycles that have been detected.
6. **TEV Level Mode:** Switches the SONUS PD unit to TEV Level mode, this allows the SONUS PD to acquire TEV signal readings. This mode is set by default when the SONUS PD app connects to the SONUS PD unit.
7. **AE Level Mode:** Switches the SONUS PD unit to AE Level Mode, this allows the SONUS PD to acquire AE Signal readings.
8. **Volume Slider:** Allows the user to adjust the volume of the SONUS PD's built in speaker.
9. **Level Screen Button:** Refreshes the Level Screen.
10. **PRPD Screen:** Switches app view to PRPD Screen.
11. **Database Screen:** Switches app view to the Database Screen.



\* Will not display while in AE mode

Image 4: Level Screen

## 7 PRPD Screen

After the user navigates to the PRPD Screen, the user can select TEV or AE mode and view a live representation of the PRPD on the screen. Using the arrow buttons, the user can adjust the scale of the PRPD graph between 4 settings (0-30dB, 0-40dB, 0-60dB and 0-80dB). By enabling the persistent PRPD the SONUS PD app will start building up a graph of PRPD detected in power cycles. The graph will be displayed as a colour scale from green to red, which is indicative of the number of PD pulses detected with a particular magnitude at a given point in the power cycles. The graph ranges from Green being single pulse and red being the maximum number of pulses as defined by the user in the settings menu.

1. Synchronisation Indicator: Indicates if the SONUS PD has synchronised with the power cycle.
2. Settings Button: Allows the user to access further settings for the App.
3. Scale Increase: Increases the amplitude scale of the PRPD graph.
4. Scale Reduction: Reduces the amplitude scale of the PRPD graph.
5. PRPD Display: Displays the Phase Resolved Partial Discharge in real time.
6. Live Button: Switches the PRPD graph to show a live graph of current dB.
7. Persist. Button: Switches the PRPD graph to show a persistent view.
8. TEV Level Mode: Switches the SONUS PD unit to TEV Level mode, this allows the SONUS PD to acquire TEV signal readings. This mode is set by default when the SONUS PD app connects to the SONUS PD unit.
9. AE Level Mode: Switches the SONUS PD unit to AE Level Mode, this allows the SONUS PD to acquire AE Signal readings.
10. Volume Slider: Allows the user to adjust the volume of the SONUS PD's built in speaker.
11. Level Screen Button: Switches app view to the Level Screen.
12. PRPD Screen: Displays that the PRPD Screen is selected.
13. Database Screen: Switches app view to the Database Screen.

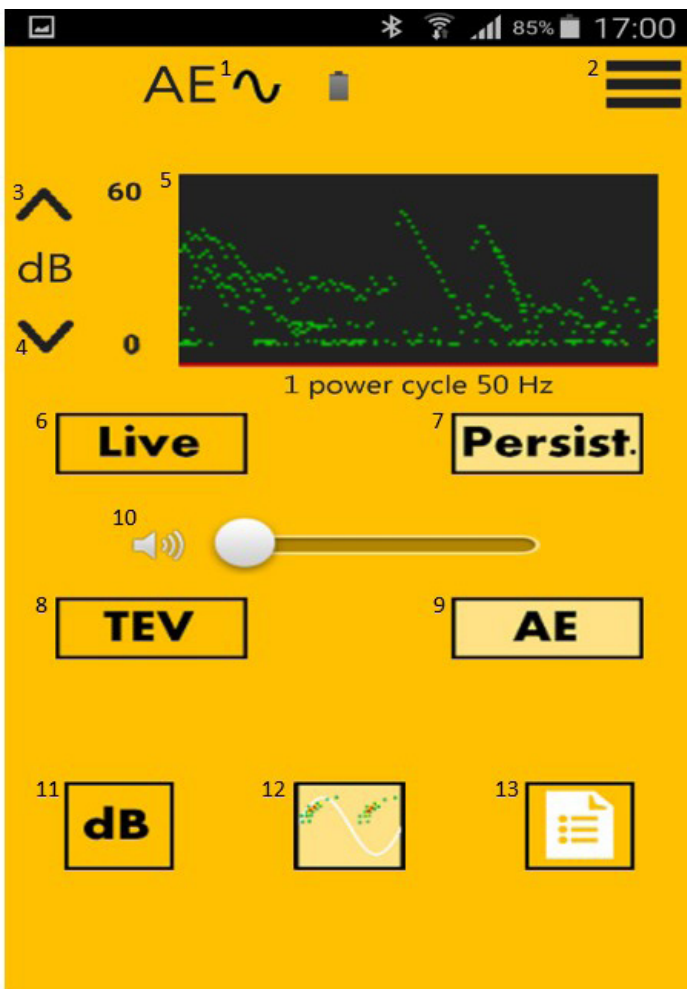


Image 5: PRPD Screen

## 8 Database Screen

After navigating to the Database screen, the user will be presented with a list of substations. The Database Screen allows the user to create, edit, maintain and review their local database. This Screen also allows the user to access the substation list which gives the user

1. **Back Button:** Returns the user to the Main Menu Screen.
2. **Add New Item Button:** Allows the user to add new Substations to the list. \*
3. **Location Sorting Button:** Enables or disables location sorting. The Location Sorting feature allows the user to sort the Substation List by the distance from the user to the substation, the closest being the displayed at the top. \*\*
4. **Favourites List:** Filters substations to show only substations marked as favorites.
5. **Search Button:** Allows the user to search for specific substations names or initials.
6. **Site List:** Lists all pre-set substation sites and shows any new substations that are added.
7. **Menu Button:** Allows the user to access addition information and administrators to take additional actions. \*\*\*

### Menu Button:

1. **Delete Database:** is a feature that allows an administrator profile to delete the local database of substations and substation assets. Before confirming a deletion care should be taken to ensure all data is synced to the main database to ensure no data loss occurs.
2. **Factory Reset:** is only usable by administrator profiles, it allows the user to reset all user data, synchronisation settings and the local database. \*\*\*\*

\* Requires Engineer permissions or above to access, please contact the Administrator for further information

\*\* This feature requires a coordinates to be entered as longitude and latitude, also requires location services on.

\*\*\* Depending on the version of android and the cell phone which the app is installed on, is the phone has a physical menu button, the "Menu Button" will not appear, and the further menu can be accessed by pressing the phone's menu button.

\*\*\*\* Standard Users and Engineer profiles cannot use the Delete Database and Factory Reset, if you do not have permissions to perform these actions and require assistance, please contact an administrator.

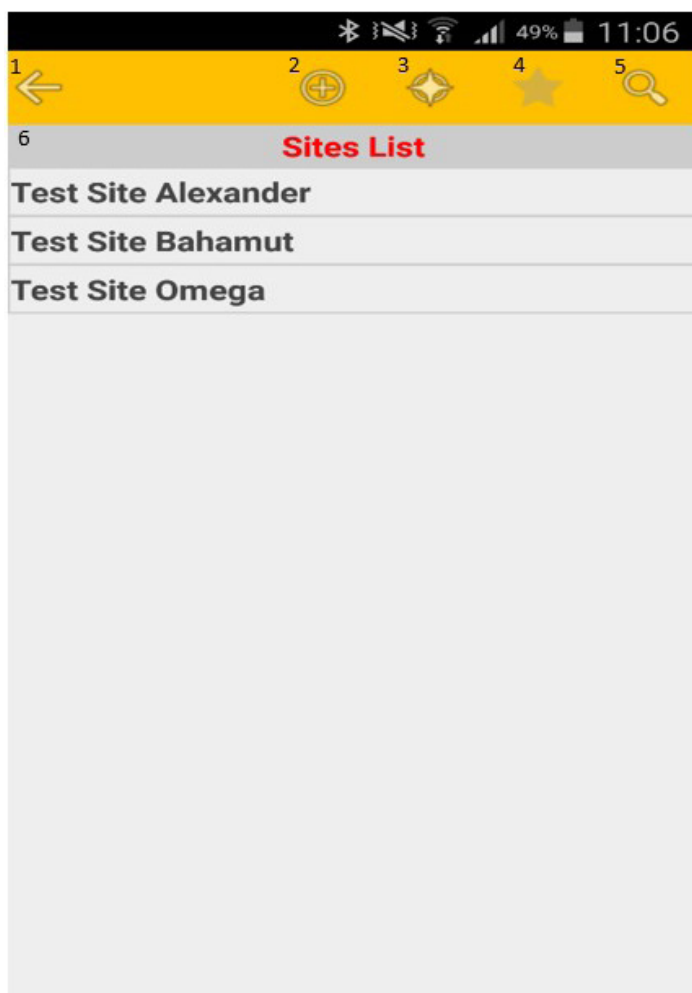


Image 6: Database Screen

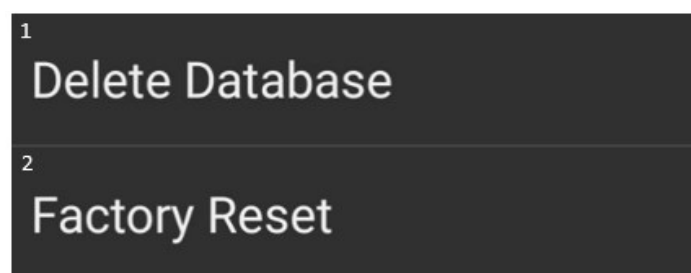


Image 7: Menu Button

## 8.1 Site List

From the Database Screen, the user can access the Site List, which will display a list of sites which have been set up and stored locally (by default the substations will be sorted in alphabetical order). The user can look through more pre-set substations by selecting “Load More” at the bottom of the Site List. It can take a few seconds for the app to retrieve information for the database. The user may select a Site from the Site list by pressing and holding the Site name. From this menu, the user can add the substation to their favorites list, or access a further options menu.

1. **Map:** Not yet available. \*
2. **Edit:** From the edit menu, the user can amend the site ID and location. By using the location services of most cell phones, the user can also set the geographic coordinates.
3. **Sync this site:** Allows the user to synchronise the individual site to a main database.
4. **Delete:** Allows the user to flag the site for deletion of local data from an individual substations and substation assets. Before confirming a deletion, care should be taken to ensure all data is synced to the main database to ensure no data loss occurs. \*\*
5. **Reset:** This deletes all locally stored measurements for the selected substation without deleting the assets associated with the substations. Before confirming a deletion, care should be taken to ensure all data is synced to the main database to ensure no data loss occurs.

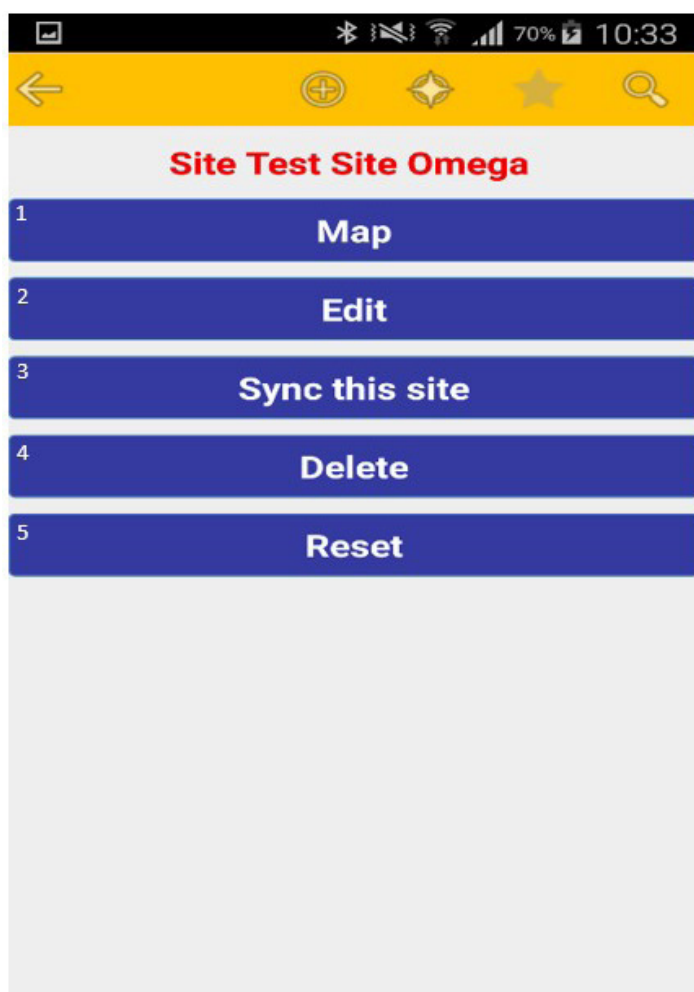


Image 8: Site List

\* For all features marked not yet available please contract IRISS for further information. ([www.iriss.com](http://www.iriss.com))

\*\* Requires Engineer permissions or above to access. This feature will not immediately delete the substation from the Substation List, the user will need to complete a final synchronisation with the main database before the SONUS PD app will permanently delete the local data of the substation. The user can also remove a flag the deletion by pressing the Undo Delete button.

## 8.2 Site Asset List

The Site List allows the user to select a specific substation, taking the user to the Asset List. From the Asset list the user will be able to view all assets that have been assigned to a specific Substation. A Criticality Level: Indicates the maximum PD readings detected of detected as a coloured scale from green to red. \*

From this List the user can view or add site assets. New assets can be added via the Add New Item button along the Navigation Bar. Any new assets will automatically be assigned to the bottom of the list, the user can thereafter assign the new asset to a specific position. The new asset will not have any measurements recorded against it but will otherwise behave like any other asset in the list. The user will be immediately able to take measurements.

By pressing and holding on the chosen asset, the user may delete \*\* or edit the asset. From editing the Asset may be renamed, or repositioned in the list and where applicable add a barcode related to the asset, either manually or by scanning the code. It is also possible to swap the positions of assets from the asset screen by pressing and holding the Sync Indicator icon on each asset until they change colour. The user will then be prompted to switch asset positions, here the user can cancel the switch if the wrong assets have been selected.

1. **Back Button:** Returns the user to the Site List.
2. **Add New Item Button:** Allows the user to add new Asset to the Asset list. \*\*\*
3. **Asset List:** List of all assets that have been added to the selected substation.
4. **Sync Indicator:** A green tick is displayed next to measurements that has not been synced to a main database, a grey tick is displayed next to measurements that have been synced.

\* Will only be displayed to users with Administrator permissions

\*\* this feature will not immediately delete the substation from the Substation List, the user will need to complete a final synchronisation with the main database before the SONUS PD app will permanently delete the local data of the substation. The user can also remove a flag the deletion by pressing and holding the asset again and selecting the Undo Delete button. (This feature requires engineer or above permissions)

\*\*\* Requires Engineer permissions or above to access. please contact the Administrator for further information

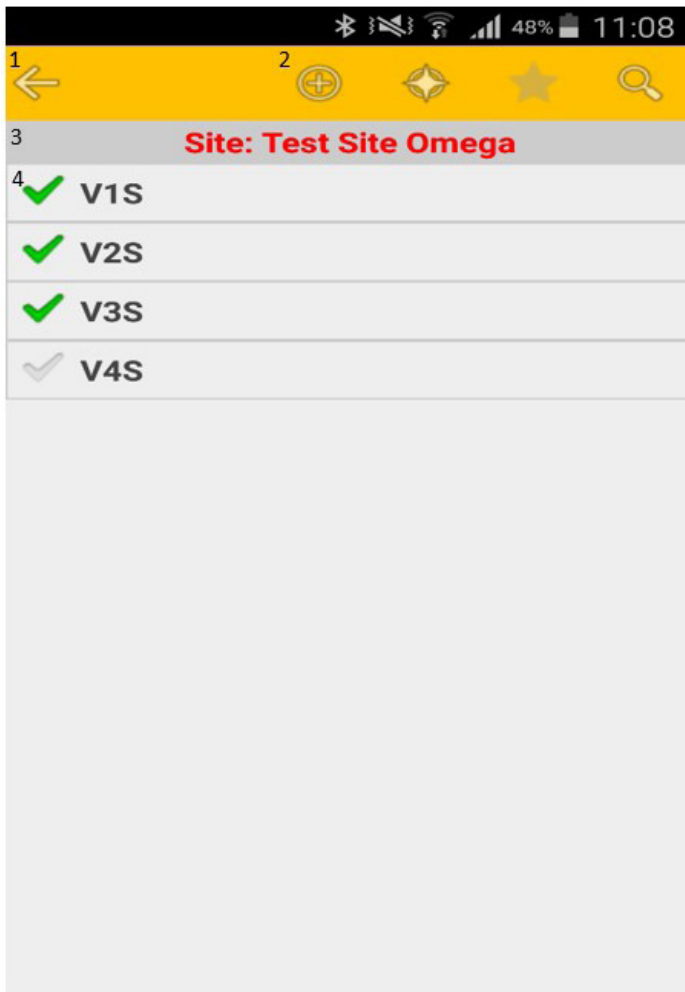


Image 9: Site Asset List



## 8.3 Taking Measurements

The user can take new measurements for an asset, by selecting specific assets from the Asset List. The user will then be taken to the measurement screen. From this screen, the user can utilize the connected SONUS PD device to take readings from an electrical asset. By pressing the Scan button for either TEV or AE signals, the status bar will change to “Acquiring” and the Signal Bar will show any signals detected by the SONUS PD unit during the course of the scan. During the data acquisition, the user will be unable to disrupt the scan until it has been completed. Once data acquisition has been completed, the data will be stored locally until it can be synchronised with a main database. If the SONUS PD detects less than a pre-set dB level in a number of consecutive PRPD cycles the data acquisition may not complete. Once the user has collected measurements from assets, they may use the Measurement List button to access further details regarding the data collected.

1. **Asset Name:** Displays the designated asset name.
2. **Next Asset Button:** Moves the user to the next asset in the list.
3. **Previous Asset Button:** Moves the user to the previous asset in the list.
4. **Measurement List:** Takes the user to a list and breakdown of the measurements taken and currently stored locally using the SONUS PD unit.
5. **TEV Scan Button:** Begins the SONUS PD unit’s TEV measurement scan. The SONUS PD unit will then begin recording TEV Measurements. \*
6. **AE Scan Button:** Begins the SONUS PD unit’s AE measurement scan. The SONUS PD unit will then begin recording AE measurements.\*
7. **Latest TEV:** Displays the last date that new TEV measurements registered.
8. **Latest AE:** Displays the last date that new AE measurements registered.
9. **Status Indicator:** Shows current status of SONUS PD app.
10. **Signal Bar:** Displays the current readings being collected by the SONUS PD unit currently paired with the SONUS PD app.

\* Please refer to the SONUS PD manual for further information.

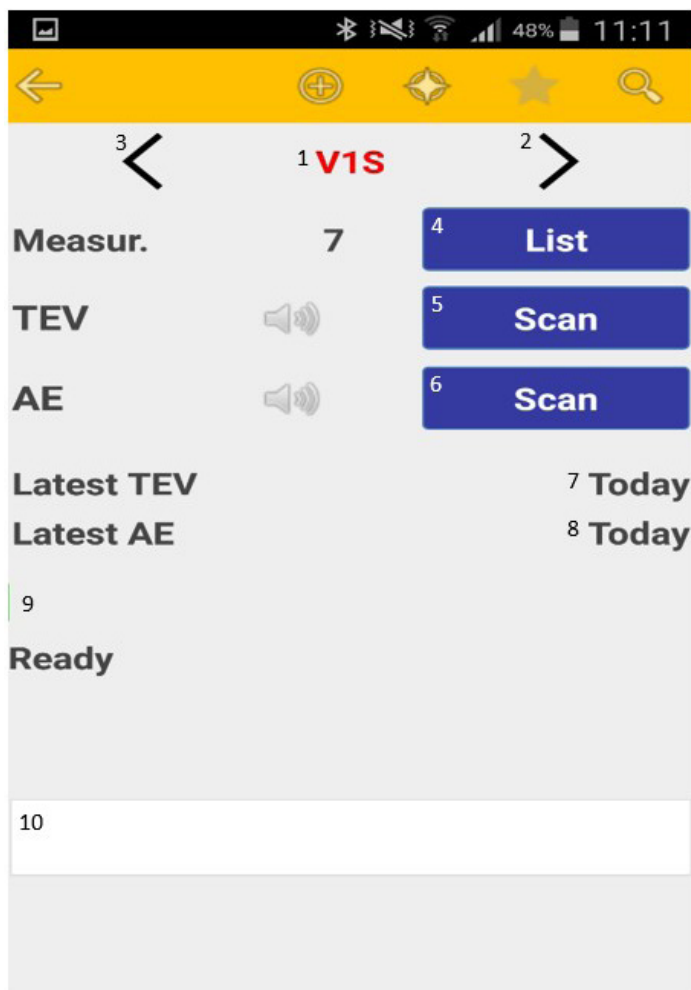


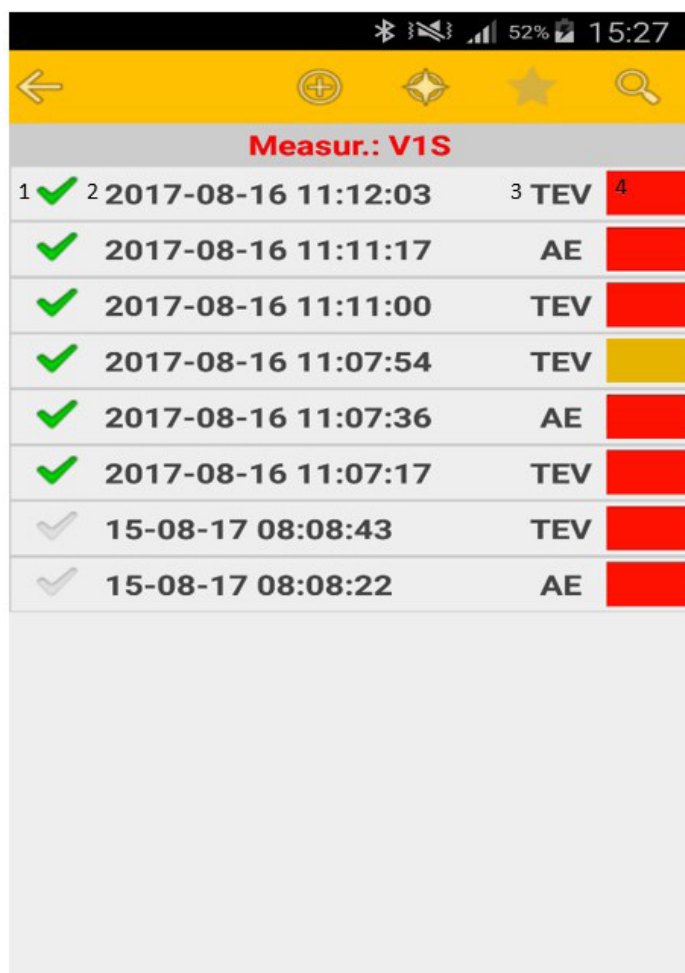
Image 10: Measurements List

## 8.4 Measurement List

Once the user has acquired data from assets, they will be displayed in the measurement list, with a date and time stamp. The user may select a measurement for deletion by pressing and holding the specific measurement the user wishes to delete, they will then be prompted to confirm the deletion. From this menu, it is possible for the user to leave a note on measurements of specific interest for later review, or cancel the deletion.

Deleting a measurement in this way will not flag them for deletion but delete them immediately. If the user is an administrator the user will also be asked whether or not they wish to delete the main database copy of this measurement if the measurement has already been synchronised. Care should be taken to ensure all data is adequately backed up to ensure no loss occurs.

1. **Sync Indicator:** A green tick is displayed next to measurements that has not been synced to a main database, a grey tick is displayed next to measurements that have been synced.
2. **Time and Date Stamp:** Indicates what date the measurement was taken.
3. **Signal Type:** Indicates the type of signal that has been recorded.
4. **Criticality:** Green indicates that the signal level collected by the SONUS PD is below 20dB. Amber indicates a signal level of more than 20dB but less than 30dB, Red indicates a signal level in excess of 30dB.



















Measur.: V1S			
1 	2 2017-08-16 11:12:03	3 TEV	4 
	2017-08-16 11:11:17	AE	
	2017-08-16 11:11:00	TEV	
	2017-08-16 11:07:54	TEV	
	2017-08-16 11:07:36	AE	
	2017-08-16 11:07:17	TEV	
	15-08-17 08:08:43	TEV	
	15-08-17 08:08:22	AE	

Image 11: Measurements List

## 8.5 PD Report

From the measurements list the user may select a measurement where PD has been detected, which will take them to a PD report which has been generated by the SONUS PD app. This report is only test specific and should be used in conjunction with a full PD report to assess asset health.

1. **Site:** The site where the reading was taken.
2. **Asset:** Name of the asset from which the reading was taken.
3. **Taken:** The time and date at which the measurement was taken.
4. **Channel:** The channel type which the measurement was taken.
5. **PD Graph:** The graph view of the PD measurements that were collected by the SONUS PD.
6. **Half/Full Button:** Switches the graph view from full to half view, then switches between the halves.
7. **Zoom +/-:** Changes the zoom level, to display more clarity in the graph or provide a more general overview.
8. **Detected PD:** Shows the PD Level detected by the SONUS PD unit.
9. **Noise:** Shows the amount of unrelated noise that was detected during the PRPD Cycles.

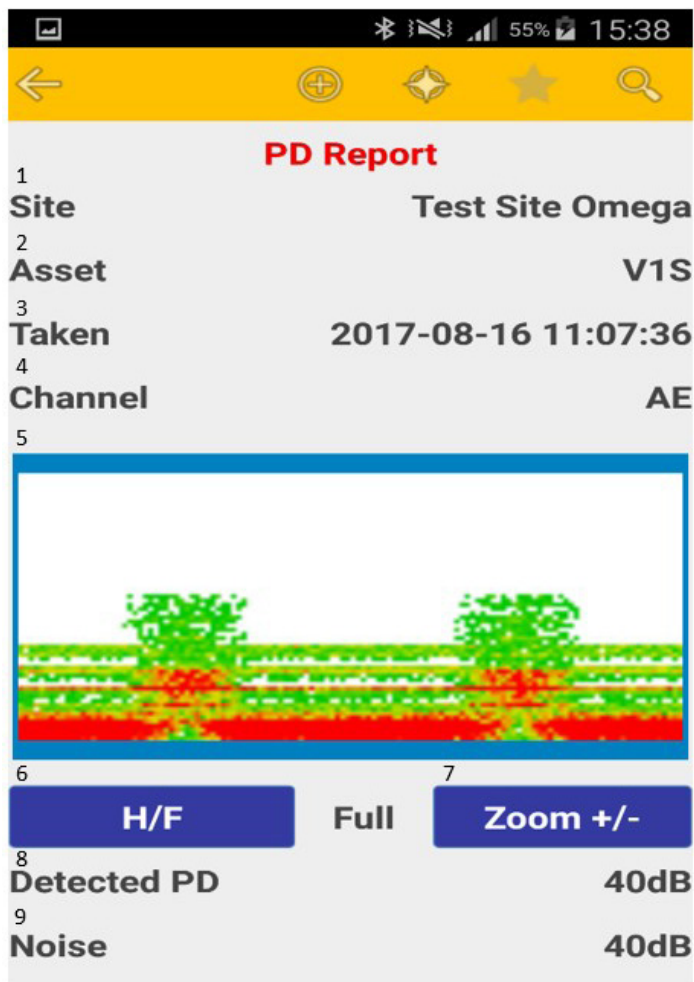


Image 12: PD Report

## 9 Settings Menu

From the main menu the user may access the options menu by pressing the settings button, from the settings menu the user may change settings or adjust the app.

All settings changes are automatically saved on exiting the Settings Menu.

1. **Demo Mode:** When enabled this option the app will no longer require a SONUS PD unit to be paired with it via Bluetooth. This allows the user to access the Level, PRPD and Database Screen, and all their sub-menus/screens without requiring a SONUS PD unit to be connected to the app.
2. **Automatic Bluetooth Pin Entering:** The user may choose to by-pass the Bluetooth PIN feature for the SONUS PD unit.
3. **Larger dots on PRPD:** The user can choose to make the Dots on the PRPD graphs in the persistent PRPD screen larger.
4. **PRPD Resolution:** The user can change the resolution of the PRPD between pre-sets ranging from 32 to 256 (by default the SONUS PD app is set to a resolution of 256).
5. **PRPD Depth Red Threshold:** Allows to user to set the number of points (depth) needed in a sample on the PRPD graph for it to show red.
6. **Tablet Layout:** If the user is running the app on a tablet, IRISS strongly recommends that the app is set to tablet mode.
7. **Connection Information:** Displays details of the current paired SONUS PD Unit.
8. **Disconnect:** Disconnects the SONUS PD app from the paired SONUS PD Unit.
9. **Back Button:** Returns the user to the pervious screen.

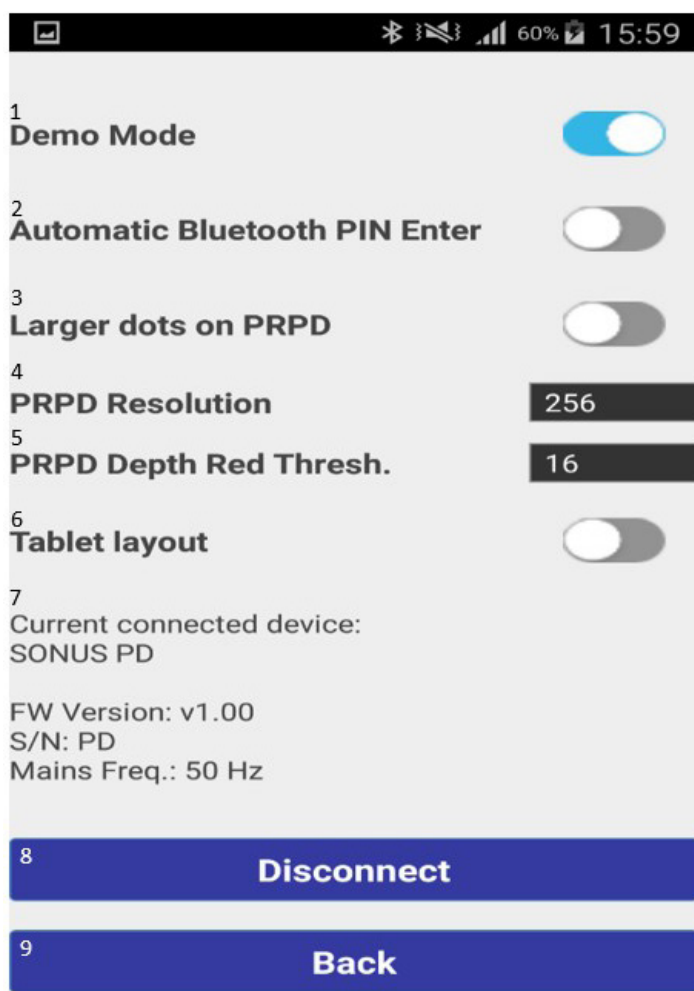


Image 13: Settings Menu

# 10 Synchronisation Menu

From the Main Menu, the user can synchronise data gathered by the SONUS PD app with a main database. Once the user has pressed the Start Synchronisation, the app will inform the user of the last date of synchronisation and ask for confirmation to complete the Synchronisation. If the username and password that the User signed in with are not recognised by the main database, the synchronisation will be unable to start and the user will receive an error message. If an error message occurs, please confirm the Database URL is the correct one, logging out of the app and then back into the app, and finally check the internet connect. Should the problem persist, please contact your administrator.

Once the user commences a synchronisation, the SONUS PD app will go through each substation and asset, verifying whether the Main Database has received the latest measurements. While synchronisation takes place, the app will also collate any data it has collected for assets against the main database. If any discrepancies are found in either the local or remote database, the app will update the relevant database either remote or local with the newest information. If the user has administrator permissions it is possible to perform a full sync. This causes every site and asset in the local database to update with an indicator of the highest PD criticality that has been synchronised. The flags will only update once the user syncs again if there has been a change in the criticality level.

During Sync, the SONUS PD app, will also check for sites and assets that have been flagged for deletion from the database by an administrator, which also need to be deleted from the main database, if the user has appropriate permissions the SONUS PD app will also delete the appropriate site/assets from the main database. While the app synchronises with the main database it will display how many assets have been synced as “Out” (uploaded measurements to main database) or “In” (downloaded data from main database). At the end of the synchronisation the SONUS PD app will generate a report confirming the number of sites, assets and measurements that were uploaded, downloaded or deleted, both locally and remotely.

1. **Settings:** Takes the user to the Settings menu.
2. **Start Synchronisation:** Allows the user to start the data sync process.
3. **Synchronisation Settings:** Takes the user to the Sync Settings Menu.
4. **Back:** Returns the user to the previous screen.

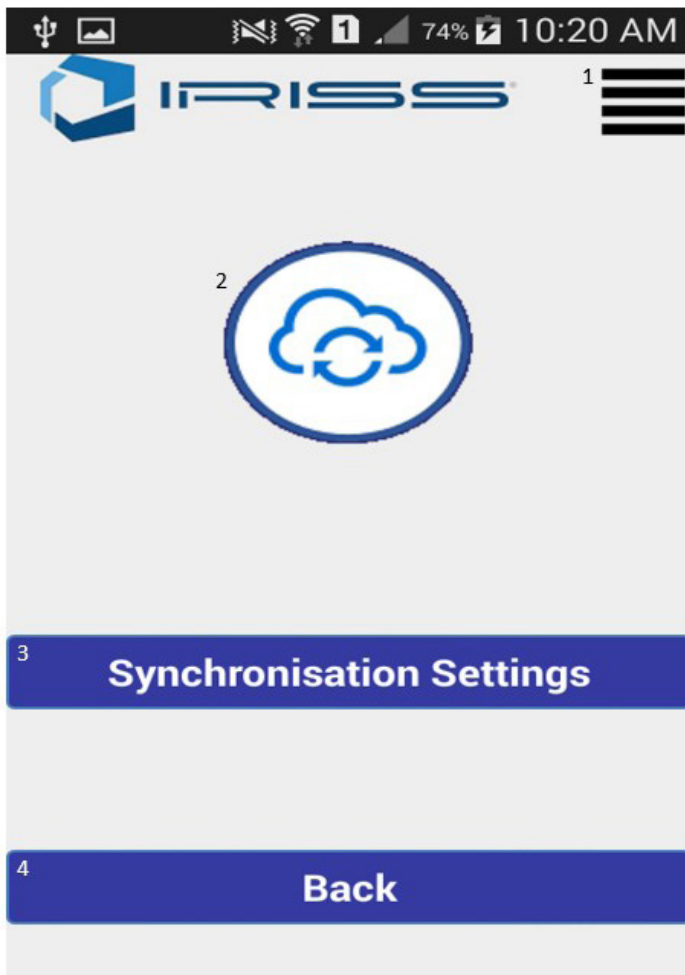


Image 14: Synchronisation Menu



## 10.1 Synchronisation Settings

From the main Synchronise screen, the user can access the Synchronisation Settings Menu.

1. **Server URL:** The Main Database URL, this is usually the PC or Laptop where the IRISS web-app runs. The URL is usually in the form of an IP Address.
2. **Sync Favourites Only:** Should the user this option, during the synchronisation process only sites, assets and measurements that have been marked as favourites will be synchronised.
3. **Force Full Sync:** If enabled, the SONUS PD app will force all data held by the SONUS PD app to be synced with the main database without checking against the last sync date of assets as recorded on the main database.
4. **Delete Measurements older than:** To prevent the SONUS PD app from becoming overburdened with expired data, the user may set a period that the SONUS PD app will retain data for a period between 1 Month and 2 Years. \*
5. **Download Measure:** Enables synchronisation to download data is not held locally for sites or assets that may have only recently been added.
6. **Download PD Data:** When the option is enabled and the SONUS PD app queries the main database for the measurement list for a particular asset, it will receive a full PD content response rather than a brief metadata report.
7. **Sync as Administrator:** If the user has Administrator permissions and this option is enabled, the user may sync the criticality flag index for sites and assets as appropriate. If no new measurements are detected that were not previously stored on the app, no updates will be made. \*\*
8. **Update all flags:** If the user has Administrator permissions, the user may enable this option to for the app to update the PD criticality of all sites/assets regardless of whether new measurements for that site/asset are present or not.†

\* This option will only delete data which has newer available data, it will not delete data which has no successor.

\*\* These features perform a full synchronisation with additional checks and data transfer, and may take some time to execute.

1 **Server URL**

192.168.2.98

2 **Sync Favorites Only** ☐

3 **Force full Sync** ☐

4 **Deleting Measur. older than** 1 year

5 **Downloading Measur. not older than** the la..

6 **Download PD Data** ☐

7 **Sync as Administrator** ☐

8 **Update all flags** ☐

**Back**

Image 15: Synchronisation Settings