CRESTCHIC

ORION

AC Loadbank
Operating Instructions

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1.0   Introduction

This document describes the operation of a *Crestchic* AC loadbank using the Orion AC Load Control System program running on a PC under the *Microsoft* Windows™ operating system. **These are general instructions and some of the facilities and options described will depend upon the size, specification and operating range of loadbank being used.**

The computer control system is split into two parts. Firstly, there is a powerful microprocessor board situated in the loadbank enclosure. This processor is responsible for the actual calculation and control of the applied load, and the monitoring of the loadbank operating conditions.

The second part of the control system is an electronic controller unit that can be sited at a distance from the loadbank - for example, in the control room of the equipment under test. This controller can be either the ruggedized *Crestchic* touch-screen tablet, the LC80, or a laptop personal computer (PC) running the Orion software. The controller is used to provide the user interface, allowing the required load steps to be set-up and applied and then displaying instrumentation data whilst on-load.

The Orion software can be supplied to customers so they may use their own suitable Windows PC to control the loadbank. This software will run under Windows 7, 8 and 10.

2.0   Loadbank Setup

When operating a single Orion loadbank the PC that will be used as the controller can be connected, via the FMC1 media convertor module, to any of the fibre connectors on the loadbank's fascia. This can be done either directly or using a number of extension reels.

With multiple loadbanks, these can be linked in either "daisy-chain" or "star" layout. For "daisy-chain" configuration simply connect each loadbank to its neighbour using a 15m fibre crossover cable to form a chain of loadbanks. If the loadbanks are separated by greater distances extension reels can be used to provide the additional cable length. The PC controller can then be plugged into an available fibre socket on any of the loadbanks, via the FMC1 module and any necessary extension reels.

In "star" connection mode, each loadbank is connected to a *Crestchic* FDH1/2 fibre distribution hub using a fibre crossover cable and any required extension reels. In this case, the PC should be then connected to a spare fibre socket on the FDH1/2 module to allow the controller to be sited at a further distance from the FDH1/2 module using extension reels. Alternatively, the PC can be connected directly to the hub module using the standard 5m PC lead.

The loadbank cooling fans and control system require a power supply to operate. This supply can be derived from the equipment on test, or from a separate independent source. Check the ratings plate on the actual loadbank(s) being used for information about the voltage and frequency range that will be suitable for the control system supply. **It is preferable to run the loadbank(s) from a stable external power supply where possible.**

The switches on the loadbank fascia should be set appropriately:

Internal-Off/Reset -External-Standby	Set to select the source of power for the loadbank's control system. Standby is used when multiple loadbanks are connected in "daisy-chain" mode, but an individual loadbank is not required. This uses the external supply to power the network comms routed through that loadbank without the loadbank's control system being enabled, thus maintaining the "daisy-chain" connectivity.
Voltage Selector (if fitted)	Set to the voltage rating of the power source being used for the loadbank's control system.
Emergency Stop	Deactivated

3.0   Start Up Sequence

First power-up the controller and allow it to go through its start-up sequence until it reaches the point where the Windows desktop is displayed. To start the loadbank control program double-click the Orion icon on the desktop or from the Windows Start menu to launch the application.

The controller will display the screen shown below and is now ready for the loadbank(s) to be powered up and establish contact.
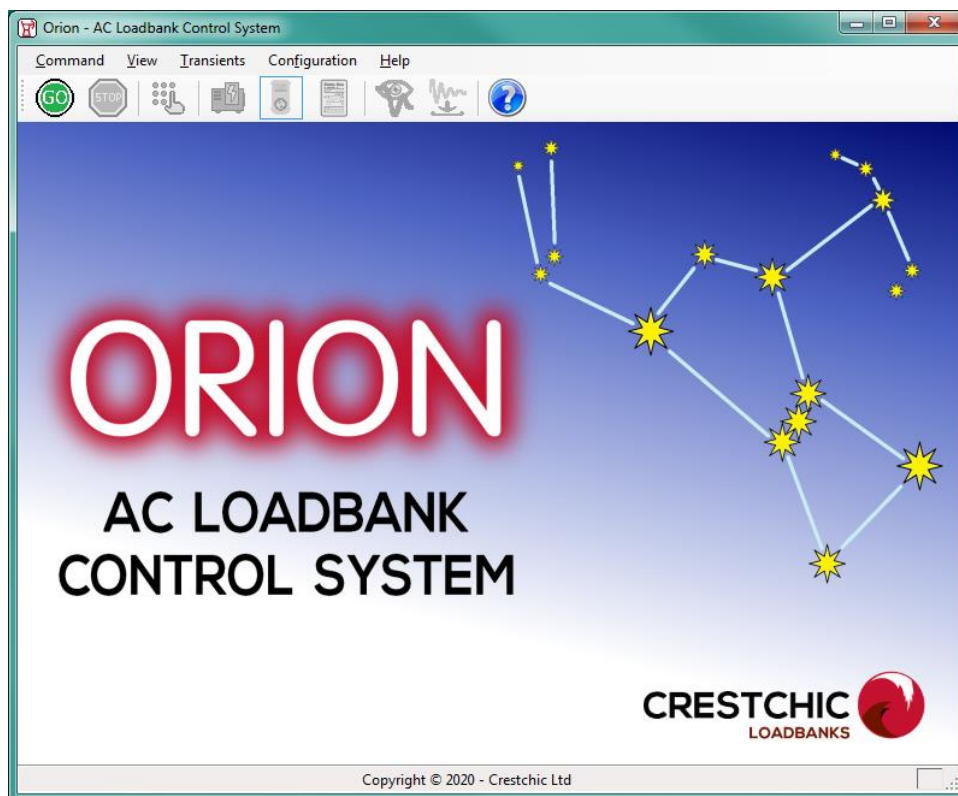
The loadbank(s) may now be switched on. Before doing so ensure the emergency stop buttons on all loadbank enclosures are deactivated and any network distribution hubs are powered. Power-up each loadbank by moving the Control Supply selector switch from the OFF/RESET position.

Turn on the auxiliary power supply (if one is being used) and switch the test-supply through to the loadbank(s). Obviously, for a loadbank's control system to function when it is being powered internally from the test supply, that power source must be providing voltage to the bus bars at this point.

To commence the loadbank start-up sequence select the Start Loadbank option from the Command menu or simply press the 🟢 button on the application toolbar.

When the start-up sequence is initiated the loadbank calibration data is first read into the controller. Once this is done the start-up sequence automatically moves through various stages. Read the display and respond to the prompts to work through this sequence.

During the start-up sequence the user will be asked to specify the parameters for the supply being tested. It is important that this information is correctly entered, as it is these values that the Orion software uses to protect the supply from overload. The generator ratings screen is shown below.

Press the Units button to see the load expressed in Amps, kW or kVA. Press the Edit button to edit the test supply parameters. This information will be retained in the loadbanks memory and used in subsequent re-starts of the loadbank system. Therefore, it is only necessary to set-up the test supply details once, assuming the power source is not changed.

Once the test supply has been correctly specified then press Next button to continue the start-up sequence.

Later during the start-up sequence the display will show the total capacity of the loadbanks comprising the system and their operating limits. The loadbank protection system will automatically reject load if these values are exceeded. If the limits are not suitable for the required testing, please contact *Crestchic*.

The start-up sequence gives the option of starting the cooling fans. If this option is chosen there will be a short delay whilst each of the fans in the loadbank(s) starts in progression.
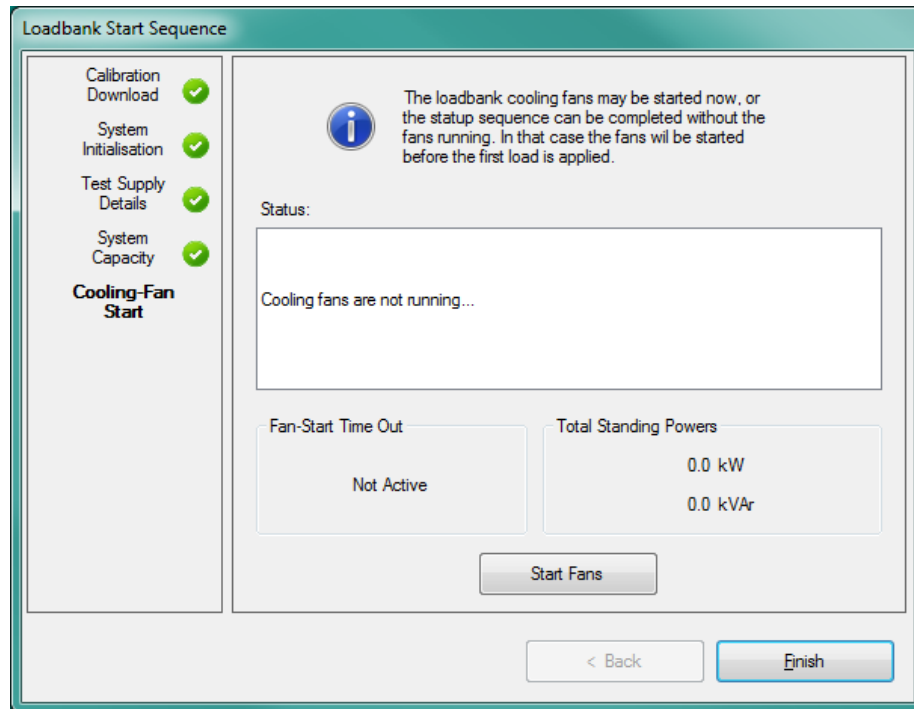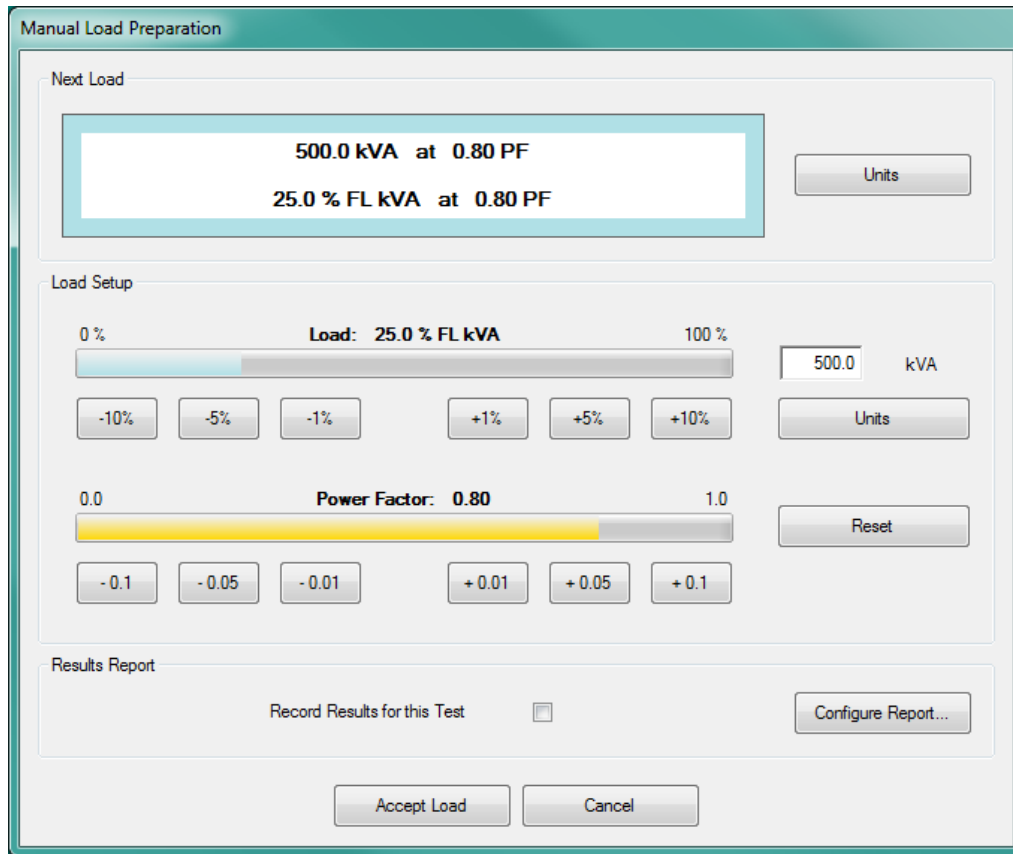

This completes the start-up sequence and the Instrumentation screen is displayed.
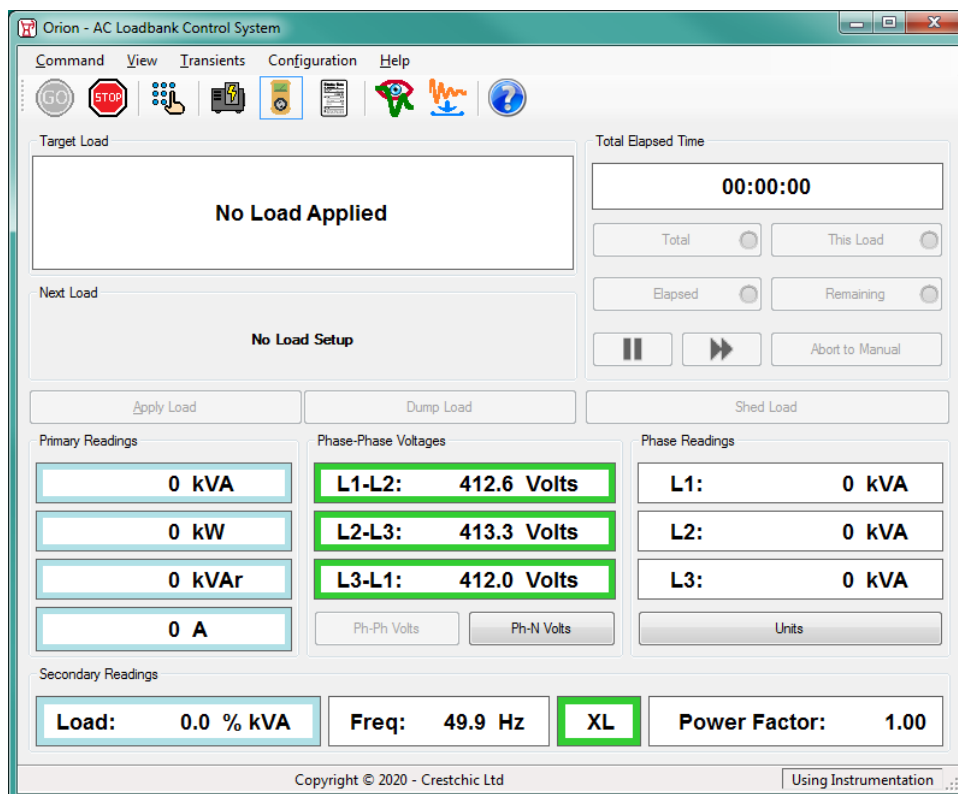
4.0   Manual Loads

This mode allows loads to be directly entered by the user. Press the 🖰 button on the toolbar to enter this mode. The screen will prompt for the size of load that is required.

To change the units in which the load is entered select the required item (Amps, kW or kVA) by pressing the Units button in the Load Setup area. Type the load magnitude into the edit box or use the slider controls to set this and the power factor values.

Once the load has been correctly specified, press the Accept Load button to confirm the load details.

The screen will now display the instrumentation values, but the new load will not yet have been applied. When ready press the Apply Load button to use the prepared load.

To change the load, press the 🖰 button and enter the new load details as before.

Press the Shed Load button to remove the entire applied load and finish the test.

5.0   Load Calculation

When a load is entered by the user the Orion software requires values of voltage and frequency to calculate the resistive and reactive load components it must apply to draw the requested power.

Either the nominal ratings values for the generator or the actual transducer values measured by the loadbank instrumentation during the load test can be used in the load calculation. The user must select whichever source of voltage and frequency figures will be most suitable.

To use the loadbank instrumentation values select the Use Instrument Values from the Configuration menu or press the 🔘 button on the toolbar. To use the test supply's nominal ratings, choose the Use Nominal Values option from the Configuration menu or press the 📃 button on the Orion toolbar.

The user can switch between either of these sources at any time. The status bar indicator will display the currently selected option.

There are advantages and disadvantages to both sources of these values. If nominal values are used these are obviously fixed throughout the range of the test, whereas the voltage supplied by the equipment being tested may fall as the load is increased. In this case the use of measured values would be more appropriate.

Alternatively, if there is significant voltage drop between the generator output terminals and the loadbank bus bars (where values are measured by the instrumentation) then using the nominal values of the generator output may give a more accurate load calculation. The user must select which mode to use based on the individual circumstances of each installation.

When the Orion program is first started it always defaults to using measured values as this method generally gives the more accurate results. If nominal values are to be used the user must explicitly change to this mode of operation.

Finally, when using the Nominal Values option the software does not check for violation of the minimum operating voltage level. Therefore, this mode should be used if the loadbank is to perform "black-start" testing, where a load must be set-up and applied to a generator's outputs before the generator is started and there is voltage on the loadbank bars.

6.0   Transient Response

The Orion control system will record information about the excursion of a test supply's output frequency and voltage during each load-change. This transient response information can then be downloaded to the PC for storage and analysis.

6.1   Overview

At each load-change the loadbank processor will monitor and record information from its instrumentation's frequency and voltage transducers. The user can select the voltage source displayed from one of the three phase-neutral voltage transducers or one of the three phase-phase voltage transducers.

During a load-change, readings are taken from the transducers for each cycle of the AC test-supply. This continues for a period of up to 15 seconds (depending on supply frequency) after the load-change. If the next load-change occurs before the duration of the transient monitoring has been reached, the monitoring of the current transient is prematurely terminated and recording of the next load-change transient commences.

The loadbank computer has the capacity to store transient response data from the previous 6 load-changes. This information is held in volatile memory and so it is important to realise that the transient data **will be lost** if the loadbank is powered down before the transient details are downloaded for storage on the PC hard disk.

Downloaded transient response data is available for graphical viewing, analysis and printing using the *Crestchic* TransView program.

Transient response data may be downloaded in one of two ways. If the user presses the button after a load-change this will automatically send the transient details recorded at the last load-change to the PC hard disk and then display them using the TransView application. Alternatively, the Transient menu can be used to select which of the last six transients to download. The Transient Menu is described in detail later in this section.

Downloaded transient data is stored in the C:\Crestchic Loadbanks\Transient Charts folder on the PC hard disk. Transient response files, like the other types of Orion generated report, are automatically deleted after a period of time unless they are moved from the folder or renamed.

The information in a transient response file is stored as standard text. There are several lines of header information and then the transducer data is written in the comma-separated variable (CSV) format recognised by most spreadsheets.

6.2 Download of Last Transient

To download the transient response data from the last load-change performed the user should select the Download Last Transient option from the Transients menu or press the 🦉 button on the Orion toolbar.

When this is done the transient data will be transferred from the loadbank memory and stored as a file on the PC hard disk. The TransView program will then automatically be launched so that this data can be viewed graphically and printed out if required. An example of the TransView output is shown below.
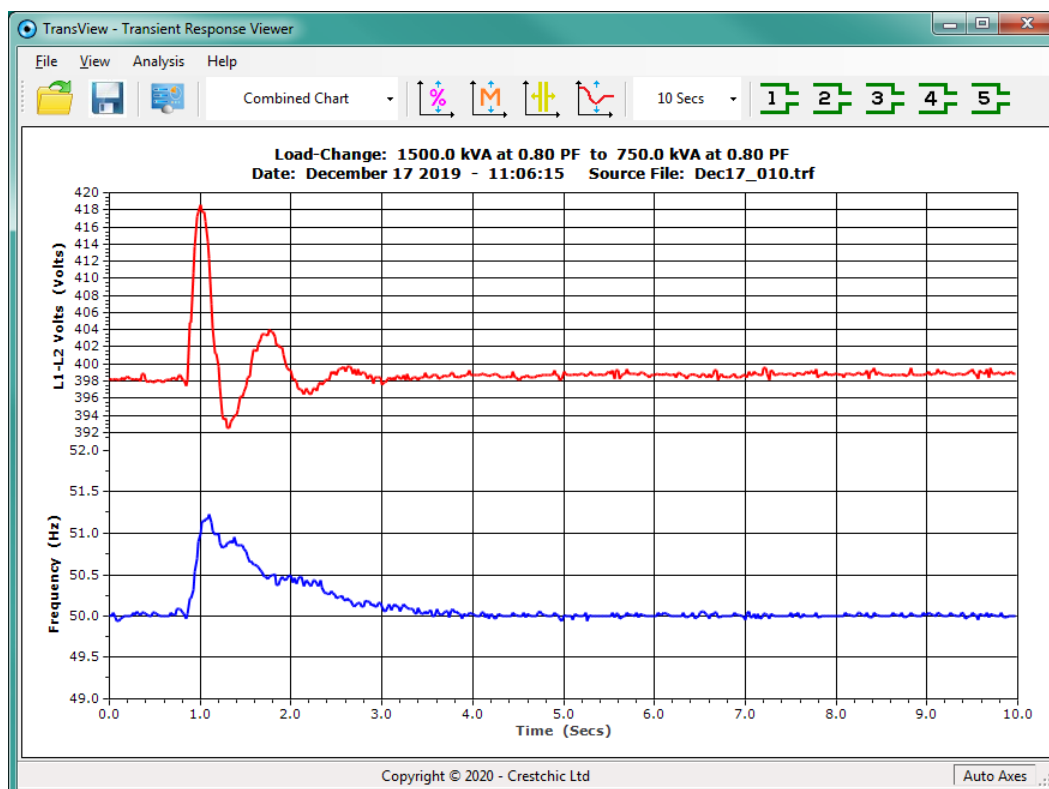

This is the simplest way to use the transient response facilities of the loadbank. More advanced features are available using options from the Transient menu.

6.3   Transient Menu Options

If it is required to analyse the transient response of the test supply from one of the last six load-changes, then the Transient Select dialog box can be displayed. This allows the user to select the load-change transients for download.

Choosing the Select Transient option on the Transients menu or pressing the ⚓ button on the toolbar will display the dialog box reproduced below.
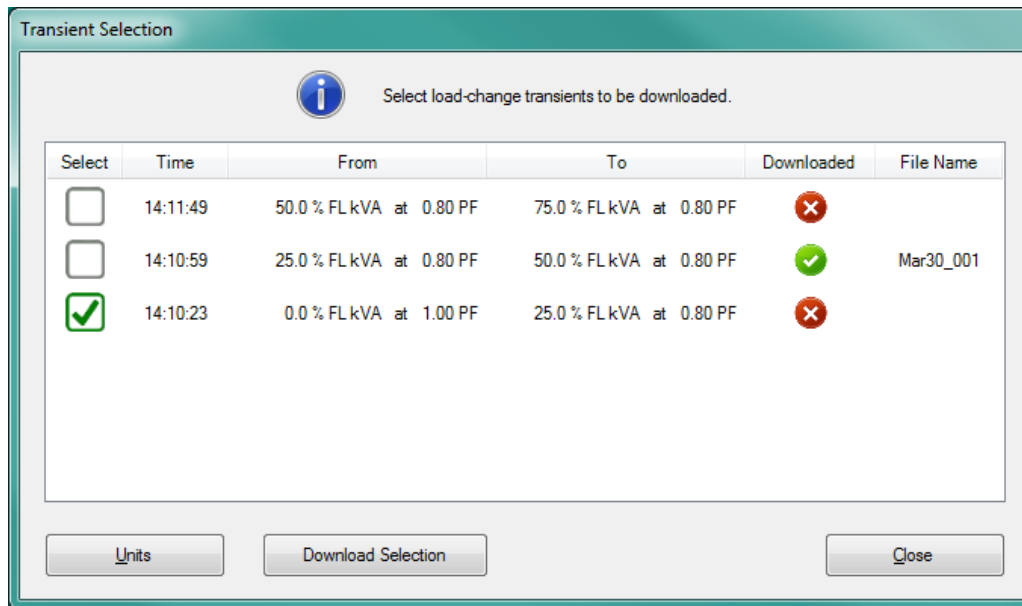
The Transient Select dialog box displays a list of the previous six load-changes with the most recent at the top of the list. The time and details of the load-change are shown for each transient and, if the information has already been downloaded, the filename assigned to that data is also displayed.

To select a specific transient to download from the loadbank's memory check the box on the left of the list for each of the load-changes that are of interest. Then press the Download Selection button. The information from each selected load-change will be saved to a file on the PC hard disk.

As each file is transferred, the TransView program will be launched to display the transient data graphically.

The Erase All Transients option on the Transients menu is used to clear any existing load-change transients from the loadbank's memory. When this option is selected a warning message will be shown asking for confirmation before erasing the transient details. Ensure that any required load-change transients have been downloaded before confirming this option, otherwise the data will be lost.

Note that this option only erases transient data in the loadbank processor's memory. It does **not** delete any downloaded Transient Response Files from the PC hard disk.

6.4   Transient Download Configuration

Whether transient data is downloaded after each load-change or selected from the list of previous load-changes, as each transient is downloaded a configuration dialog box is shown. This is reproduced below.
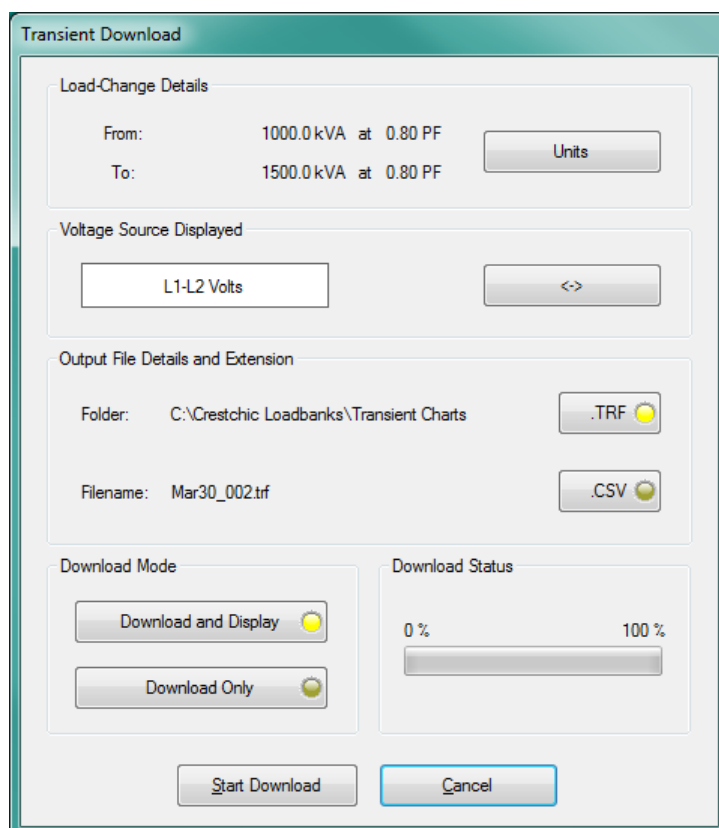
The Voltage Source Displayed area of the dialog box allows the user to select which of the six voltage sources to display on the transient chart.

The user can also select the file extension of a downloaded Transient Response File. If this is set to .CSV then the file will be automatically recognised and opened by most spreadsheets should it be desired to analyse the transient with one of these programs. Alternatively, the .TRF file extension should be selected to allow the file to be viewed graphically using the *Crestchic* TransView Transient Response Viewer program.

Using the buttons in the Download Mode area of the dialog box, the user can select if the transient data is just downloaded or if, once downloaded, it should also be displayed with TransView.
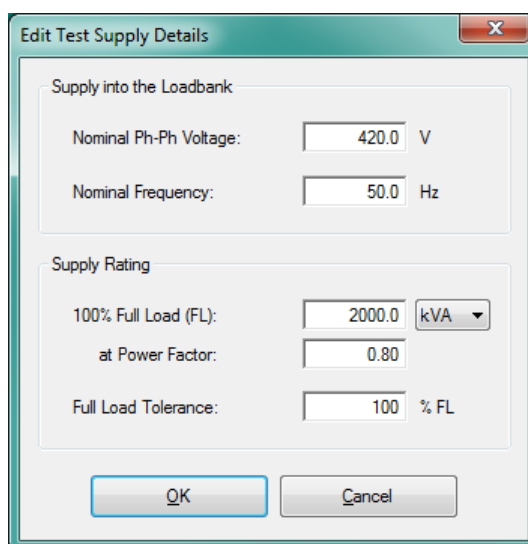
To start the download of the transient data, click the Start Download button. Once the download is complete the dialog box will close and, depending upon the download mode selected, the generator's response to the selected load-change will be displayed.

7.0   Configuration Options

The Configuration options that are important for loadbank operation are covered in this section.

7.1   Test Supply Set-up

Press the ⚡ button on the Orion toolbar to display the current test supply parameters. If these are incorrect press the Edit button to allow these parameters to be altered. This will display the dialog box shown below in which the correct parameters can be entered.
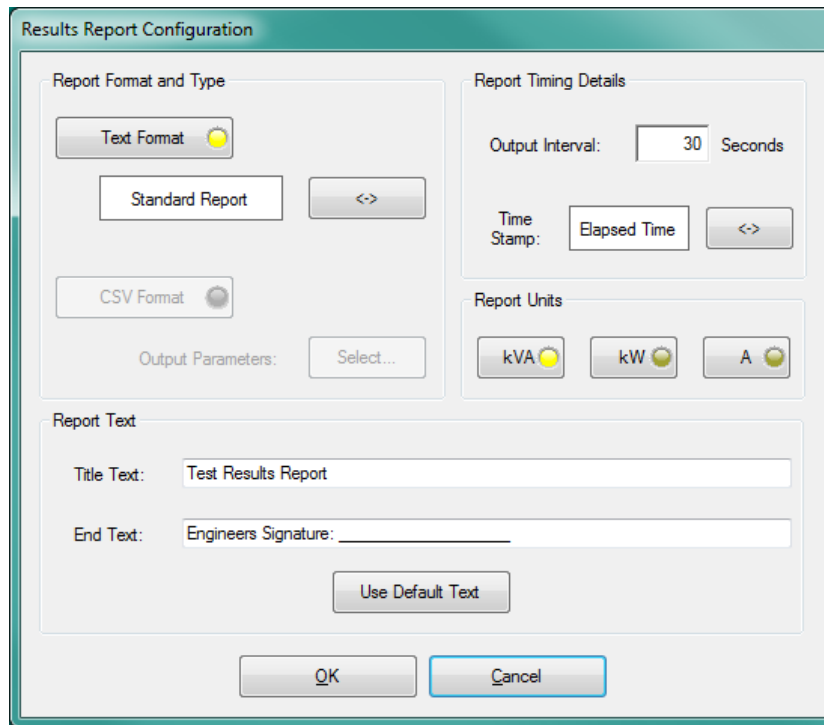

Enter the requested parameters for the generator being tested. The full-load tolerance is the desired maximum load that the loadbank is to draw from the test supply, expressed as a percentage of the full-load entered above. The loadbank software uses these values to protect the test supply from excessive loads so **it is important** that the generator parameters are correctly specified.

7.2   Results Report Configuration

This option allows the parameters used for the Results Report to be specified.

The parameters set up in this dialog box are retained in the loadbanks non-volatile memory and so do not have to be entered every time the loadbank is used.

Select the Results Report option from the Configuration menu to display the dialog box shown below.

When the loadbank is on-load the Orion software will output measured values from the instrumentation at regular intervals to be stored on the PC hard drive. The parameters on a Results Report are output as formatted text using the information provided from this dialog box.

The Results Output Interval allows the time between these outputs to be defined in seconds.

The Report Units area enables the setting of the units in which target loads are expressed on the Results Report. Target loads can be shown in Amps, kW or kVA. The units used for target loads on the Results Report are independent of the currently selected units on the Instrumentation display.

The Report Type area of the dialog box is where the user can select one of the two available report types. The standard report type will record the instrumentation readings for the total load on one line each time the Results Output Interval expires. A full report will record the readings for the total load on the first line and then the instrumentation readings for each phase on the three following lines every time the interval expires. The type of report to be produced is left to the user and will depend upon the amount of information required.

The Report Text allows a title line and an end-of-test message to be entered. The title line is printed at the start of the Results Report. This can be customised to the user's requirements. For example, this could be name of the installation being tested or the company name.

The End Text is the line that will be printed at the bottom of a test report. This could be set to display the name of the engineer conducting the test or a general message.

Pressing the Use Default Text button will reset the title and end-of-test lines to their default values of "Test Results" and "Engineers Signature:" respectively.

7.3   PC LAN Selection

This option is selected by choosing the PC Network Select option from the Configuration menu. The dialog box shown below will be displayed.
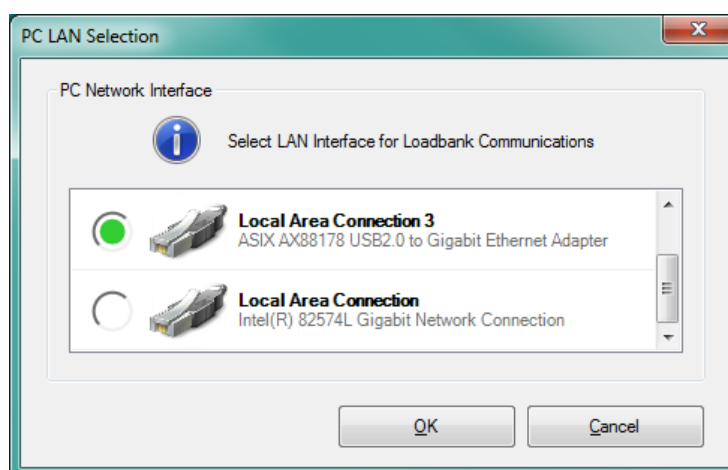
This dialog is used to select the PC's network LAN port used to communicate with the loadbank(s). For more information on the LAN ports installed on their PC, the user should consult the hardware documentation supplied when they purchased their computer.

7.4   Report Auto Deletion

The dialog box shown below is displayed when the user selects the Report Auto-Delete option from the Configuration menu.
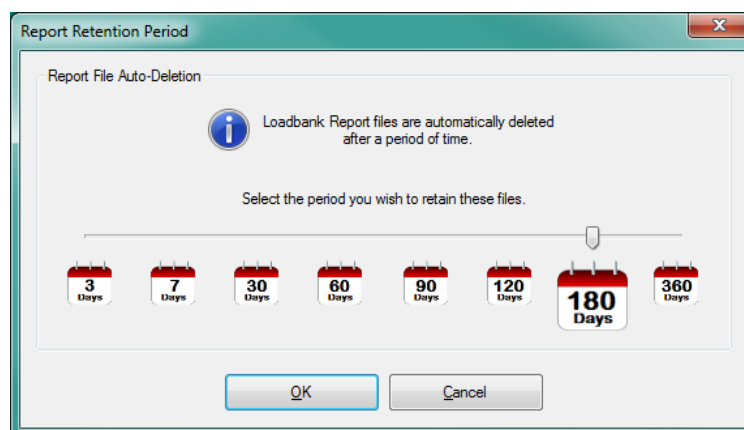
Using this option, the user can specify how long the report files generated by the Orion software are to be retained on disk before they are automatically deleted. Note that only files with the Orion file-naming convention will be affected by this mechanism.

8.0 Shutdown Loadbanks

When all load testing has been completed and no load is applied, the 🛑 button can then be used to initiate the loadbank shutdown sequence.

Once this sequence commences the fans will run for up to 240 seconds to ensure the loadbank elements are at a sufficiently low temperature before the cooling fans are stopped and the loadbank power is removed.

During the shutdown sequence the screen below will be displayed showing the remaining countdown and allow the shutdown to be aborted if required.
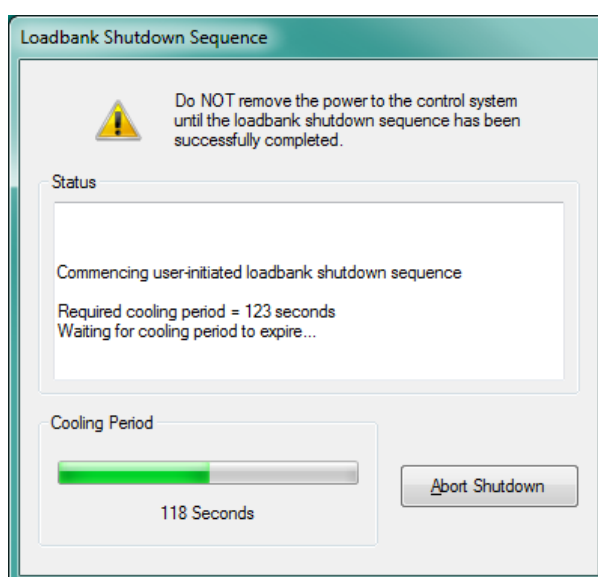
Once the cooling period has expired the fans will stop and the shutdown sequence will conclude. Once this is done the loadbank may be powered down.

The Orion software can then be closed by selecting the Exit option from the Commands menu or by pressing the Close button on the application title bar.