



## A Start Guide for the *Ranger* PM7000

Welcome to the *Ranger* family and to our top of the range Power Master *Ranger*, the PM7000.



**PM7000 in Australia**

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## **First Step:**





Please read and feel comfortable with the safety warnings below.

# Warning

The Symbol  is about SAFETY and concerns YOU

Please read and take careful note of the following safety recommendations before using your PM7000 for the first time.



This symbol is displayed on the instrument to alert the user to the potential danger of using it. The symbol also appears from time to time in the manual. In some cases  draws attention to the fact that the parts or adjustments to which  refers are not serviceable by the user. In all cases the unit MUST be repaired or serviced by properly qualified personnel.

Please note that this includes changing internal fuses and batteries.

These following safety statements are particularly concerned with connecting your logger to the power source. To ensure your safety and avoid any damage to the PM7000 please take careful note.



Use extreme caution when connecting the signal input cables to the logger. Any voltage potential at the signal source will exist on the instrument's respective signal input cable. Consequently HAZARDOUS LIVE VOLTAGES may be exposed inside the instrument case and also may exist on the signal input terminals, which are floating with respect to the instrument chassis.



Because you will be attaching the PM7000 to a potentially hazardous live circuit, you must be suitably qualified. Before you make any such connection or disconnection you need to understand the dangers associated with doing this and how

to eliminate those dangers and control the risks associated with CAT IV (Category IV) type high fault current electricity supplies.

**You may safely connect the PM7000 input terminals to hazardous live circuits in normal operation provided that you take the following sensible precautions:**

- ⚠ Never use damaged leads. Always check leads for wear and tear or damage before using them. Once you are satisfied with their soundness make sure that they are securely plugged into the logger before they make contact with any live power source. Connect sensor leads to the logger first to remove the risk of producing any hazardous live lead ends.
- ⚠ When using current transformers, current probes, or step-down voltage transformers other than the voltage probes and Rogowski coils supplied with the logger, always consult the manufacturer's guide for connection information. Further information is also found in the *Ranger* PM3000 manual.

### **Voltage Measurement leads**

- ⚠ Use the GS38 approved test voltage leads supplied. These have fuses in the alligator clip end and safety connectors at the connection end. They are rated at CAT IV for 600 volts (CAT III for 1000 volts). Always use these or equally GS38 compliant leads for your safety.
- ⚠ Voltage leads must be treated with respect as they do an important job of carrying live voltage in a safe manner. Because they are flexible test leads they are strong and easy to coil and twist and will give good, safe, service when looked after carefully.
- ⚠ Always connect the voltage leads through the lower 4mm voltage ports, never through the upper BNC current ports.

### **Current Measurement Leads**

- ⚠ Any current transformer used with this logger must be voltage output type. This equipment is NOT designed for use with current output, current transformers.
- ⚠ When installing voltage output current transformers, connect them to the adaptors and then the adaptors to the logger before you attach them round the source of power. Be careful not to touch any of the connection points.

⚠ Always make sure that your logger is positioned in a way that ensures it is mechanically stable. There must be no possibility of the test leads becoming disconnected from it while they remain attached to any external power source.

⚠ For your safety and to avoid damage to the logger do not connect your PM7000 to a live voltage source outside the specified range of 0-600 (+ 10%) Vac. For measurements between 600 and 1000 Vac please refer to the manual. These are a special case.

⚠ Under no circumstances should you remove the front panel of the logger while it is connected to a power source.

⚠ In line with safety requirements the PM7000 gives correct over range voltage readings. No danger will arise for an operator relying on any indicated values. However, this does not remove the possibility that a single fault in the unit could give misleading results, leading to a hazard for the operator.

## Second step:

Check your kit



### **PM7000 and kit**

- **Ranger PM7000** power quality analyser
- Four 24" 6000 Amp Flexible Current Clamps (max conductor size 8"), braided
- Four Voltage probes 1000V Cat III (600V Cat IV), braided
- One earth voltage probe (600V Cat IV)
- Three Neutral Common Leads
- Mains lead or charger (US)
- USB lead
- Pronto for Windows Analysis Software
- Customer CD
- PDA

## Third Step:

### Put your PM7000 on charge

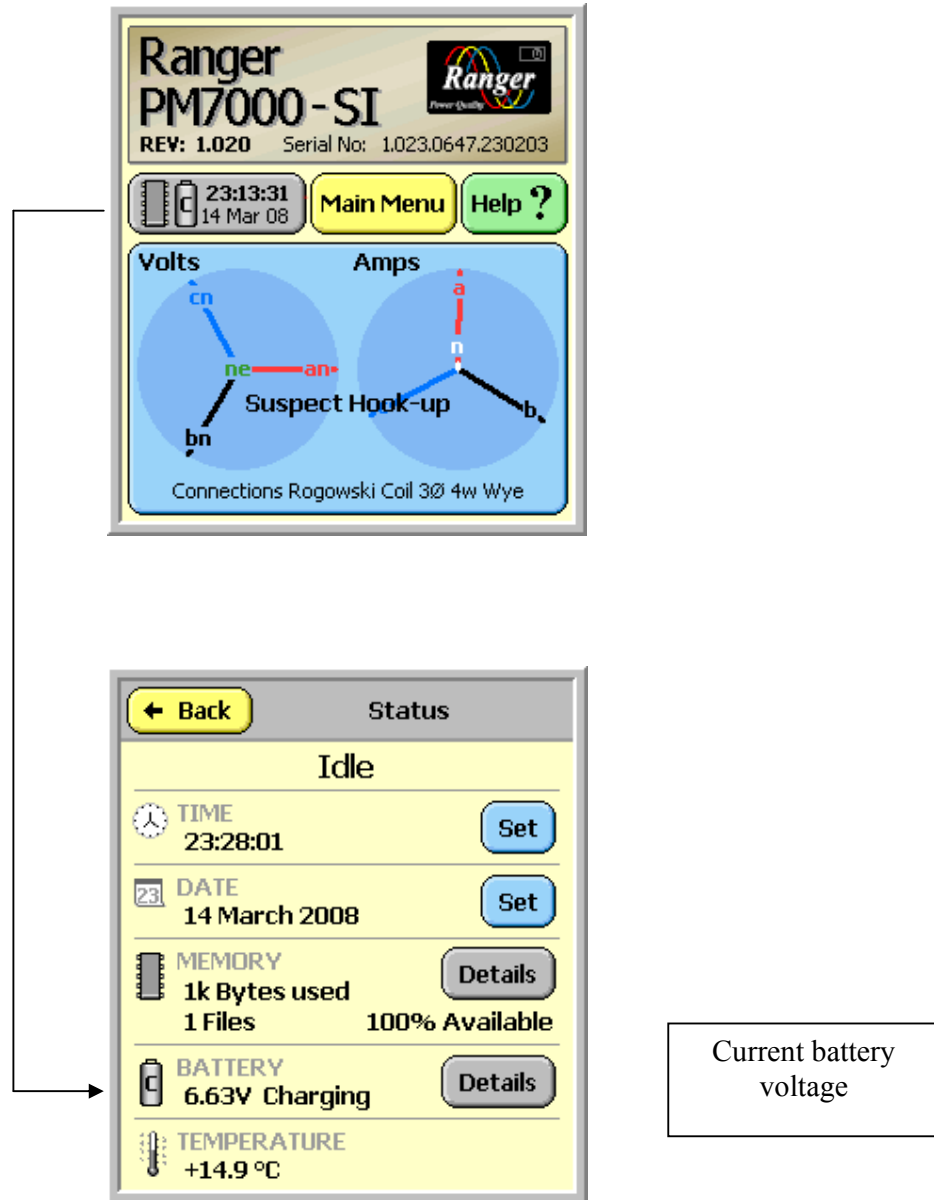
Immediately you take delivery of your PM7000 plug it into the mains, using the mains lead or wall charger, to charge the batteries ready for use.

Whenever your logger is in use, that is, attached to a voltage source above 90 Volts, the batteries will be charging automatically. Outram Research highly recommend that at all other times the logger is plugged into a power source to keep the batteries well charged and the unit always ready for action. (This is merely a precaution. The PM7000 can start up with batteries pretty flat and function once power is applied. There will soon be enough charge to allow any activity to be closed down successfully and retained in memory.)



End Plate of PM7000 showing the two ends of the mains cable attached. Note the bottom row of BNC connectors for the Rogowski coil current sensors.

Once the user interface screen is running, then taken directly from the initial screen is a status screen to give you the current battery voltage should you wish to check.



## Fourth Step:

### **Put your PDA on charge**

Take out the PDA and charging cable and plug into the mains to charge up the PDA. It can be used while on charge. After using it off the cable we recommend you leave it on charge when not in use.

(A car charger to charge the PDA could be a useful addition to your kit if you will be using the logger at different geographical locations.)

## **Fifth Step:**

### **Make the communication between the PDA and the PM7000**

Once the PDA is charged, make your connection with the logger.

#### **Prepare the PM7000**

Opening the PM7000 lid will stimulate it and it will wake up, nudge the Bluetooth into “Discovery Mode” and go back to sleep to conserve battery. The Bluetooth LED should flash twice every 4 seconds to show that the Bluetooth is awake. The Bluetooth will remain in discovery mode for about 1 hour after the lid is opened. (Once the logger is stimulated you may close the lid again.)

#### **Prepare the PDA**

Switch on the PDA. The on/off button position will vary but in the PDA supplied it is on the right hand side at the top.

Using the stylus provided with the PDA (or if your stylus is missing your finger nail will do just as well) touch “START” or the little Windows symbol at the top left of the screen. This will list the principle functions of the PDA.

Look down the list for “PmScreen”, the application programme that brings the live PM7000 screens onto your computer. Touch “PmScreen”.

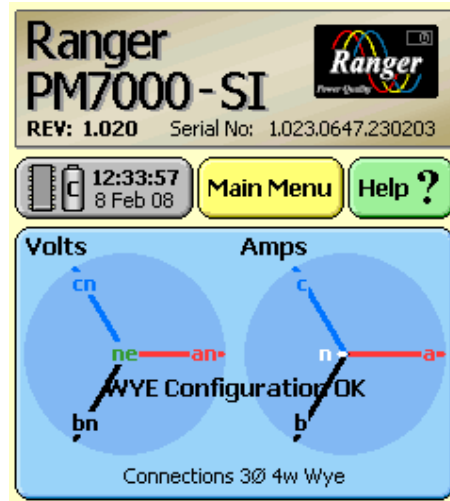
You will be invited to select the relevant COM Port. The COM port is COM 6 on the HP iPAQ114. Touch on “Reconnect to COM6”. (Other PDA’s may use COM8)

If the PDA and logger are within range of each other, nominally within 10 meters (30 feet) (but it may be more in open line of site conditions or less if one is shadowed from the other), and if the logger is in discovery mode (the blue light on the front panel is flashing), the PDA should offer (in the form of a list) any Bluetooth devices in range including the logger. The reference to the logger will come in the form of PM7000SN0123.

Depending upon how the PDA has been left, this list may be in icon form, in which case the Serial Number part of the text may have been truncated. This will not matter if you have only one PM7000 but it could be ambiguous if you have more than one. To avoid the latter you may wish to list a number of loggers in purely text form. To change between icon and text listing, touch on the View option on the bottom right of the screen and select the “view by text”.

Touch on the Serial Number of the logger you wish to talk to. This will cause the PDA to connect to the logger and the Bluetooth light on the logger will go solid blue. To start with it may say the

logger is not responding (actually the logger is waking up but can't talk properly yet). Then it may say "Finding" and then "Connecting..." and then "Found SN0123". PmScreen will come up with its initial screen if the logger is being turned on (or whatever the screen state is on the logger if you have been using it) and at that point **you are now in contact with the logger.**



PM7000 initial screen as seen on the PDA

Now with your PDA in your hand you can play around and explore all the options that are available to you within your PM7000.

[On the other hand before you go any further you may wish to explore the PM7000 menu interface in some detail without involving the logger. You can do this is via a PmScreens Simulator which will come up on your computer screen. Find it on the customer CD under PmStart or within the Pronto software programme. How to open and use the simulator is explained below.]

When you have finished with the PDA, IT IS IMPORTANT to release the Bluetooth communication on it or the PDA gets stuck. Do this by leaving Pmscreen by pressing "File"/"Exit" on the PDA. You should do this BEFORE you go out of range.

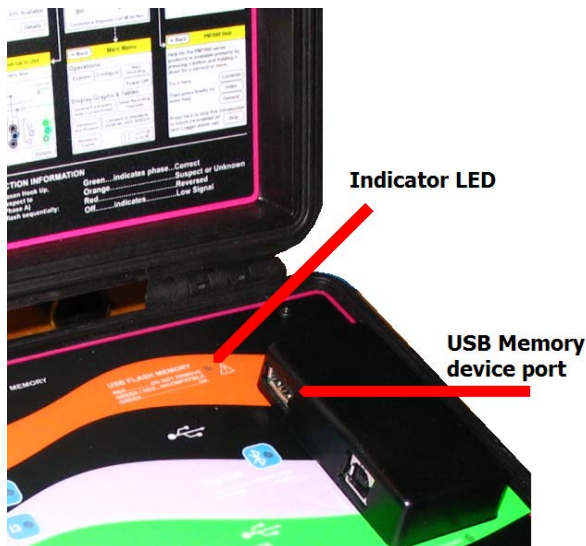
(In PDA's supplied earlier DO NOT press the "X" in the top right hand corner as this doesn't turn off PmScreen or the Bluetooth, it merely hides them.)

To turn off the PDA (having exited PMScreens), press the off button on the PDA itself. (Generally top right).

## Sixth Step:

### **Make the communication between the computer and the PM7000**

You can produce the same screens on your PC as you can on the PDA. To bring 'PmScreen' up on the computer, first attach the logger via the USB communication lead provided.

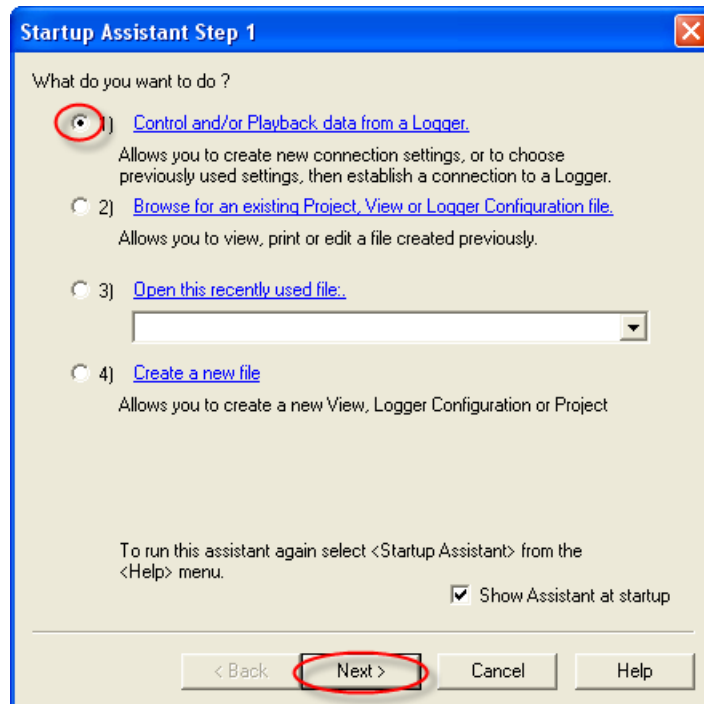


The USB port will take either a USB memory device (jump drive) or a USB lead to communicate with a PC.

Insert the customer CD. Because the PM7000 is using a USB communication method you need hardware drivers. They may already be on your computer but if they are not click on "Install PM7000 Hardware Drivers" and follow the instructions. If you are unsure whether or not you have the drivers install them anyway. There is no adverse effect from re-installing them. Then launch Pronto. Follow the "Start Up Assistant" to connect to your PM7000. The first time you make a new connection there are four steps.

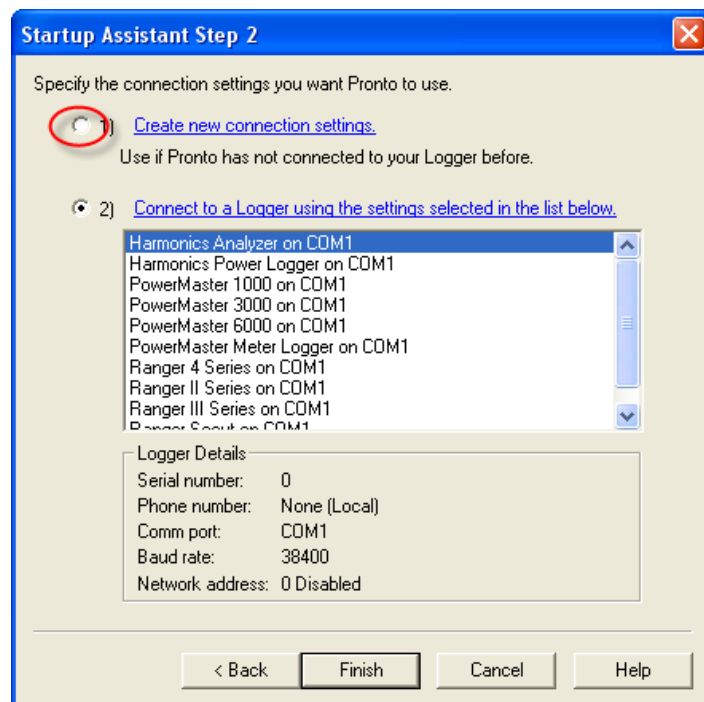
#### Startup Assistant Step 1

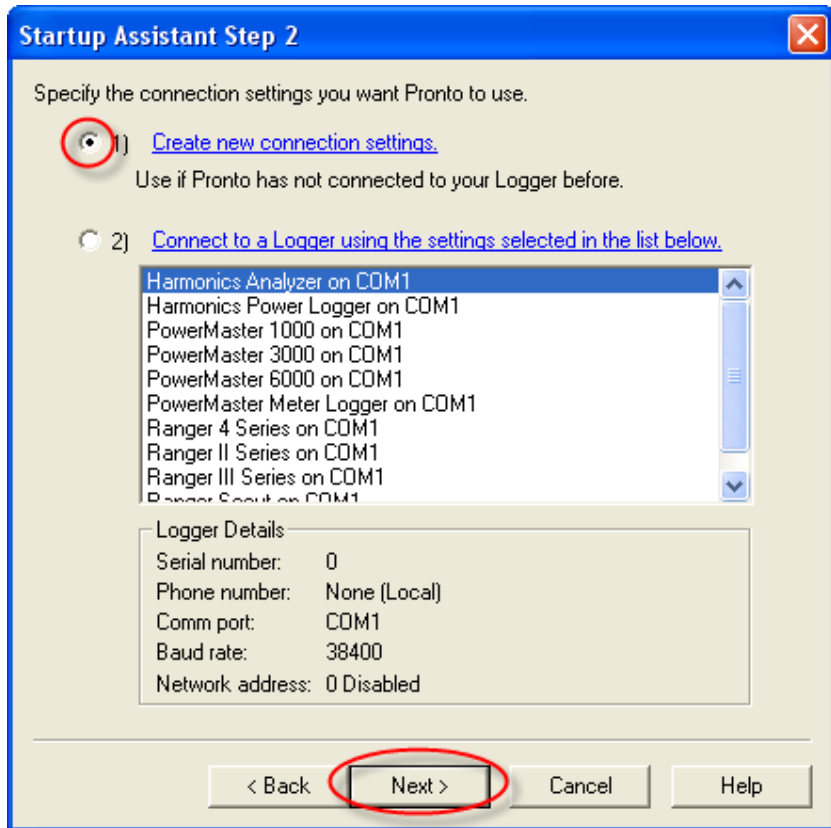
In step 1 the default selection is "Control and/or Playback data from a logger". You do not yet have any data and files to browse for.



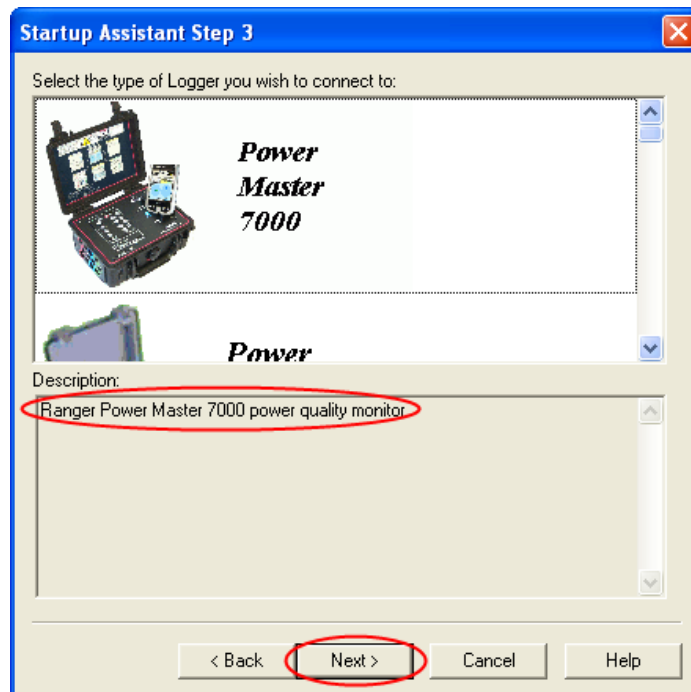
Click on 'Next'.

In the following step 2 for this first connection select 'Create new connection settings'.



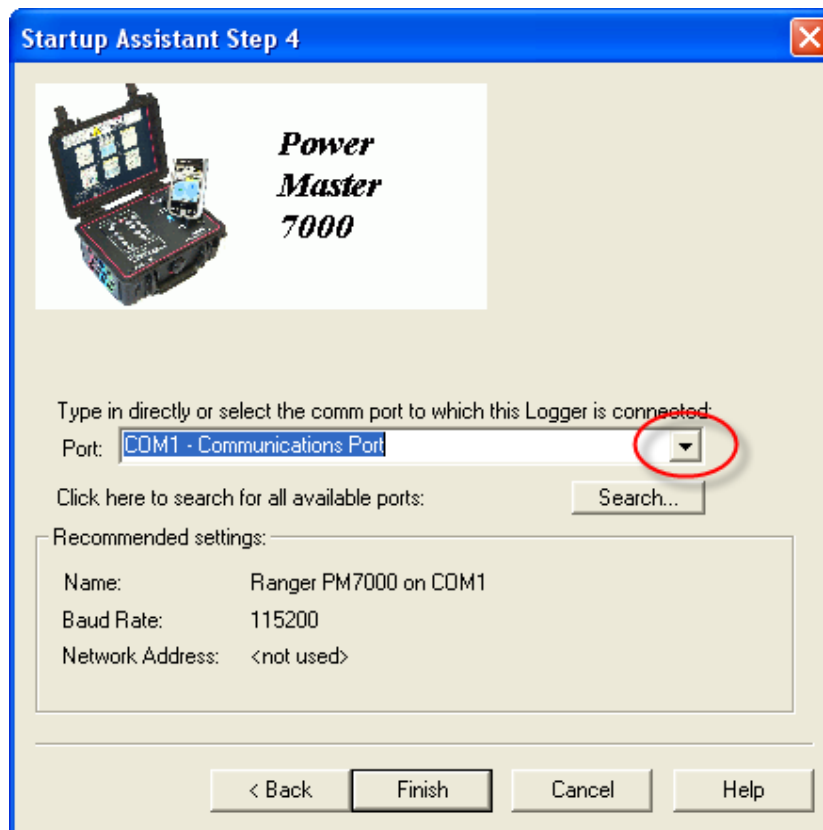


Click on 'Next' to bring up Startup Assistant Step 3. This will give you the list of Ranger products supported by Pronto.

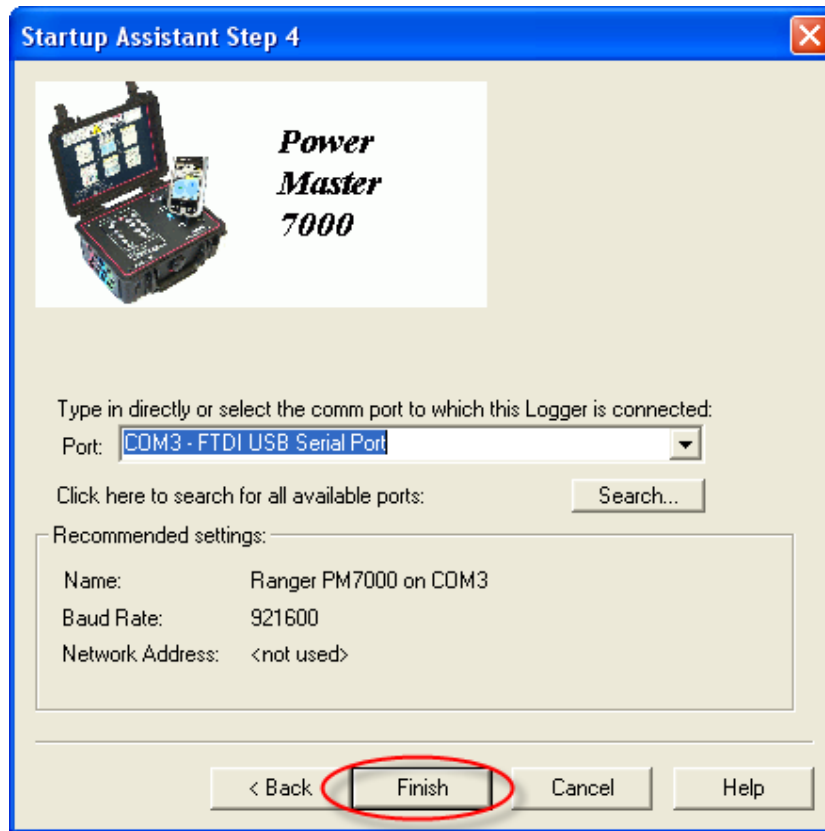


The PM7000 is at the top of the list and will appear in the window.

Click 'Next' to select it and bring up the final Startup Assistant Step 4 screen. Now you are going to search for the USB communication port.



Click on the port box. A dropdown menu will reveal the USB communication channel option. Select it.



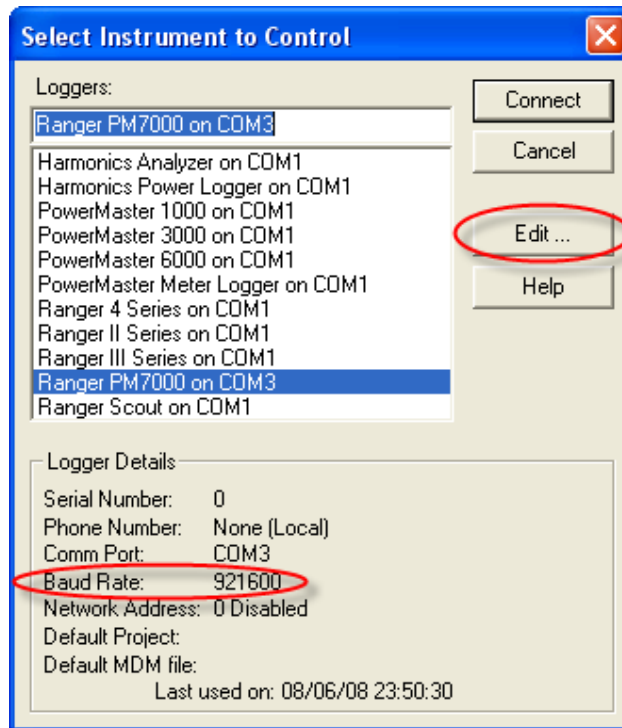
FTDI are the initials of the USB manufacturer.

The USB port will be assigned a particular port number, in this case 3. Each time you connect your USB serial lead to the same port on your computer the port number will be 3. If your computer has multiple USB ports and you choose a different port next time the PM7000 and computer communicate, Pronto will have to find the new communication Port.

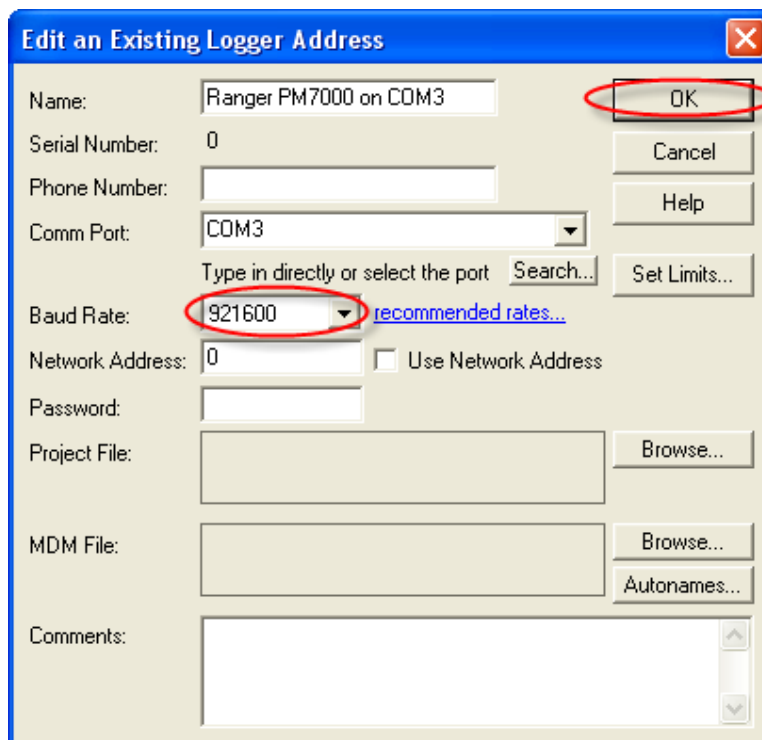
Note the Baud rate (the speed at which traffic flows between the logger and the computer). For the PM7000 it is 921600 and Pronto will choose this value for you when you select PM7000. (Different Ranger models may have different baud rates).

Click 'Finish'.

The following 'Select Instrument to Control' window may come up confirming the right instrument is connected to the right port. The following example of Pronto on a computer with more than one PM7000 attached

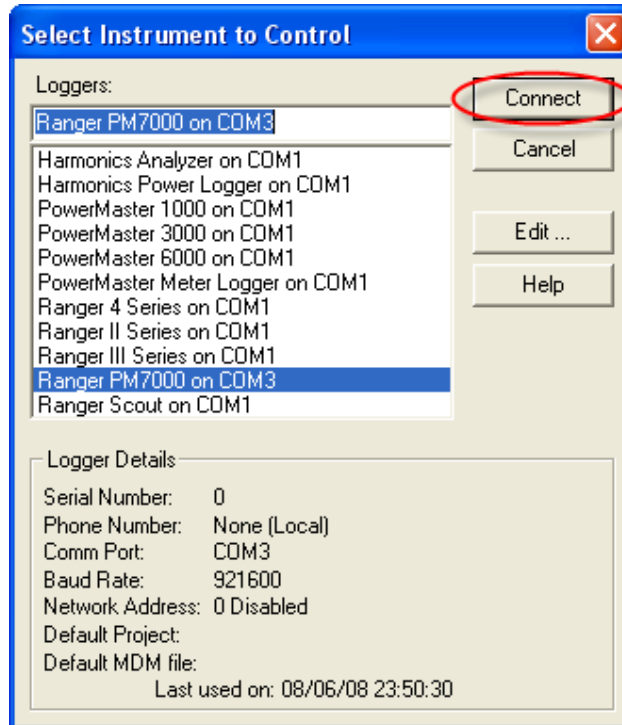


Here is the opportunity to change the name, add comments or alter the baud rate if you ever need to do so. Click on 'Edit' and bring up an 'Edit an Existing Logger Address' screen.



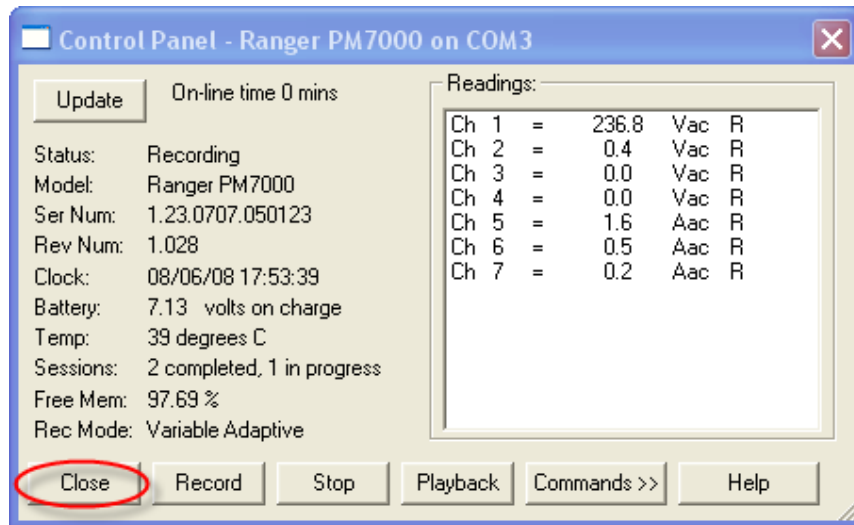
Clicking on '[recommended rates...](#)' will bring up Pronto Help and advice on the correct baud rate). Currently the correct baud rate for the PM7000 is automatically chosen by Pronto. In the future if further types of communication mode become available (such as over the mobile phone network) it may be necessary to change the baud rate.

Click OK to return to the 'Select Instrument to Control' window.



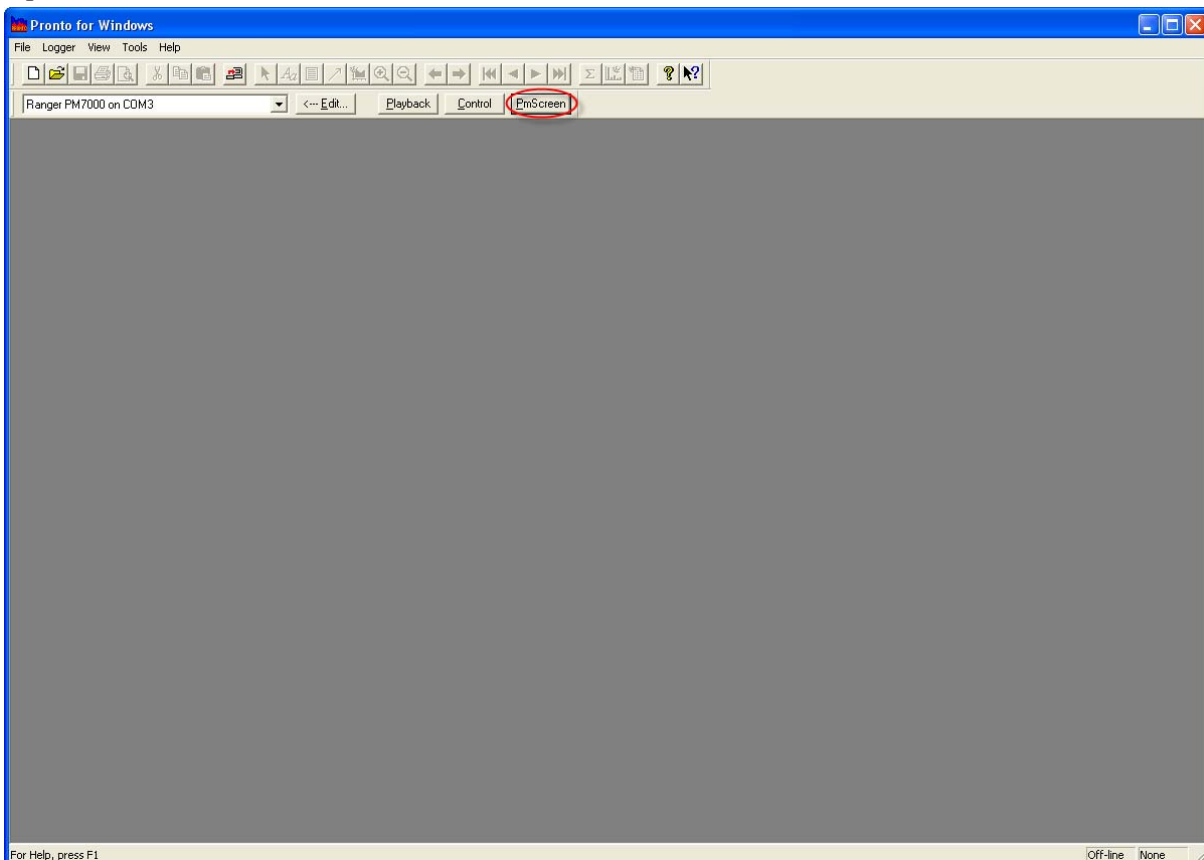
Finally click on 'Connect'....

and you'll see on the screen 'Pronto is connecting to the instrument'. 'Control panel' comes up next.



The 'Control Panel' gives you useful information on the status of the logger such as how many sessions you have recorded. Historically this screen was used to communicate to Rangers before the latest models were given the display user interface, PmScreens. If your requirement is to play back data or start a recording click on the appropriate button here. To access PmScreens click 'Close'.

Up comes the main Pronto screen.

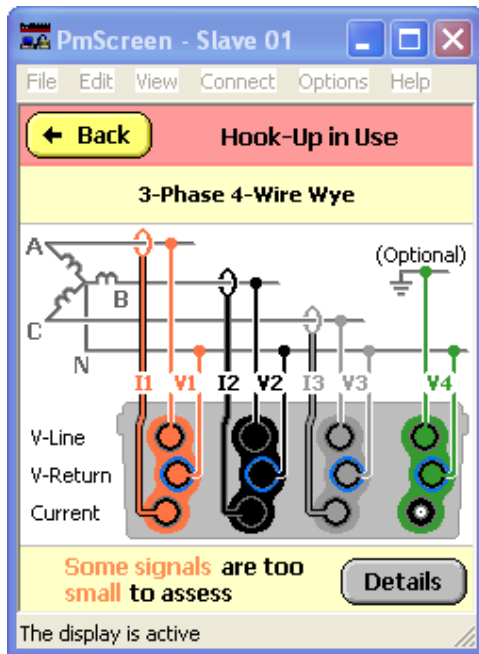


To bring up your PM7000 display click on 'PmScreen' on the tool bar.

Now you can talk to your Ranger via the computer. The screen to come up will be whichever you used the last time you talked to your PM7000. For the first time you will see the initial screen of your PM7000 on the computer in front of you. This is the default screen with a 3 phase 4w Wye Hook Up.

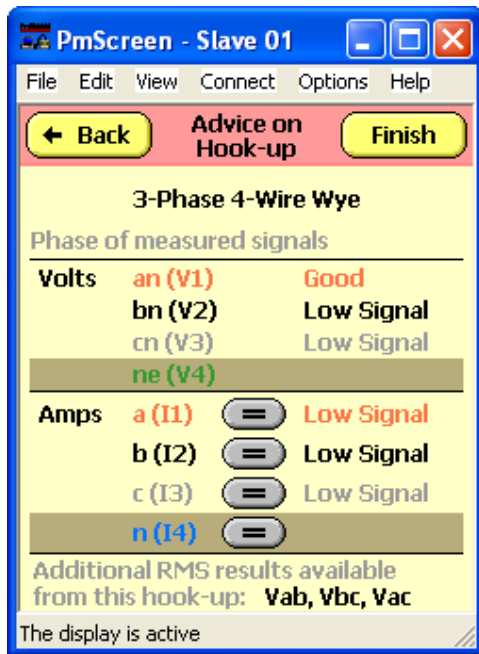
You can enlarge or contract the PmScreen area by clicking "View", Zoom in" or Zoom out". This screen is intended to give you an immediate indication of system status, and especially the connections you have made (the "Hook up"). The PM7000 does need to know what was *intended* so that it can assess the voltage and current phases it finds correctly.

If you want further information click anywhere in the blue box and bring up a 'Hook-Up in Use' screen.



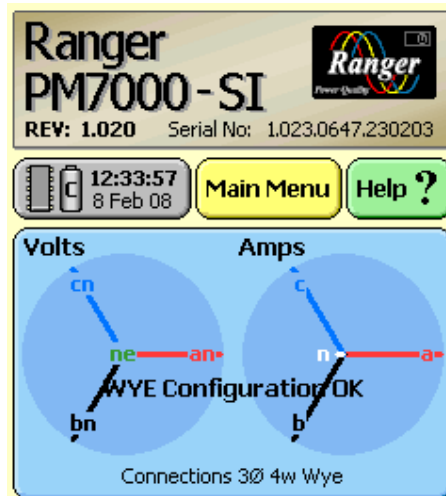
Note the default Hook Up

Click on **Details** to get...

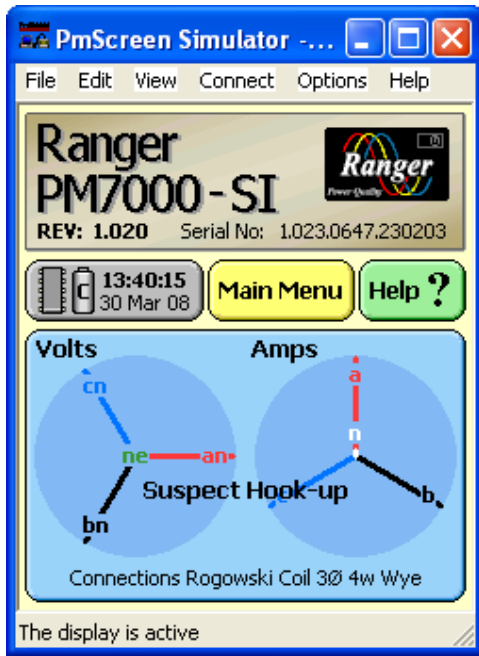


This screen confirms what we know; that only V1 has a proper signal in this case.

This is an example of the initial screen for a 3 phase 4 wire wye application showing the current correctly in phase with the voltage.



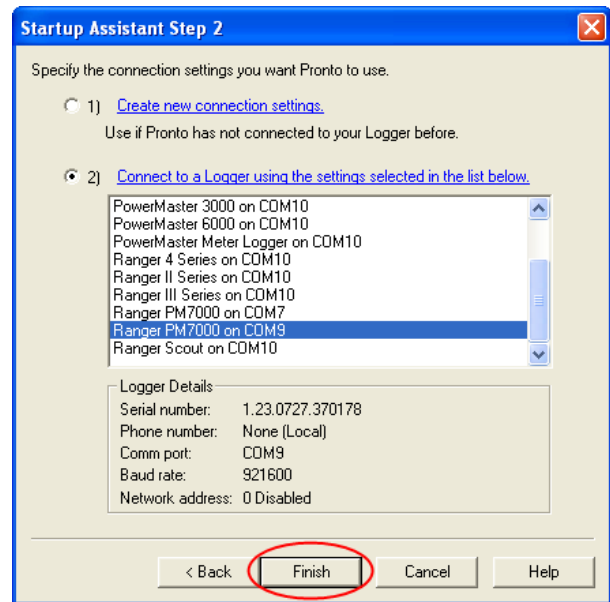
Here is another possible initial screen.



In this simulator example the phasor diagram shows 'Suspect Hook-up' to alert you to the likelihood you have fitted the wrong CTs. The give away is the current, 90 degrees out of phase with the voltage.

### Subsequent Connection to the Computer

Please note that NEXT time you open Pronto it will remember the previous connection information and four steps will become only two steps.



If however you use a different port subsequently, Pronto will ask you to go through a similar selection process, and then it will remember that connection also.

## Seventh Step: (Optional)

### Using the Simulator

#### Use the Simulator for learning about PmScreens

Before you do your first recording (or after) you may wish to play with the PM7000 simulator. We suggest that as you read through the rest of this guide or the manual you have the Simulator open on the computer and follow the steps in parallel with the Simulator.

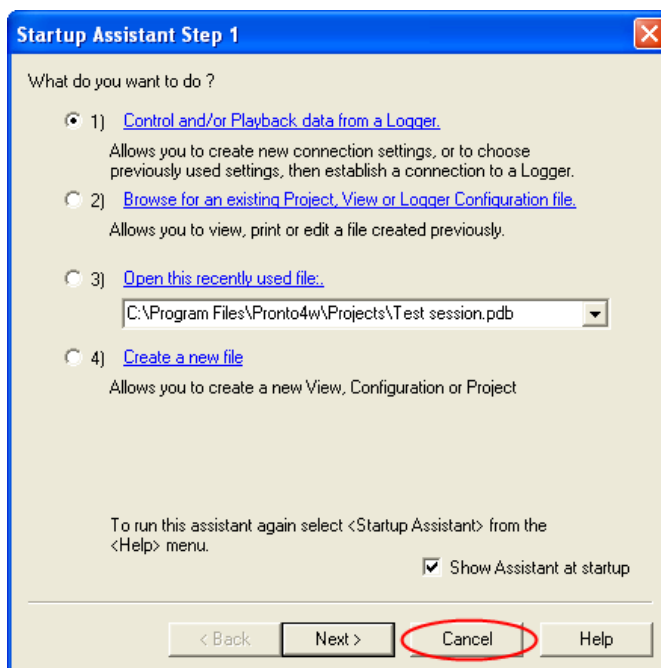
If you wish to have the instructions and the Simulator open at the same time ‘Resize’ the material by clicking on the middle box, top right of the screen...



... and make room for both programmes on the computer screen.

#### To bring up the Simulator

Insert the customer CD into your computer. Launch ‘Pronto.exe’. Cancel the “Start up Assistant” as it isn’t needed for this activity.

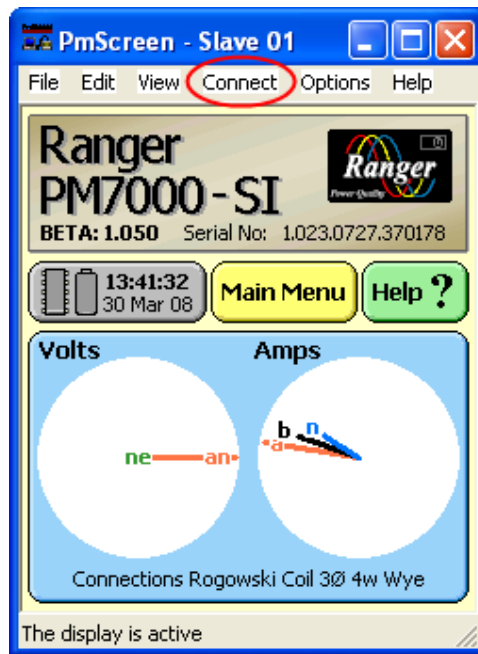


The main Pronto window will come up.



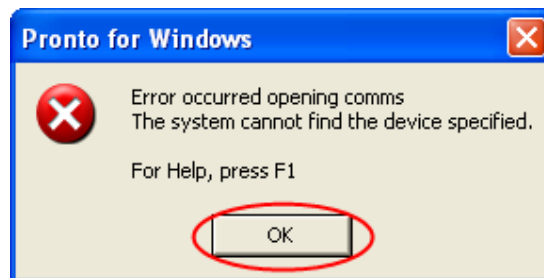
Click on 'PmScreen' on the tool bar.

**If you have a logger connected** and are communicating with it, clicking on 'PmScreen' will bring up PmScreens on the computer screen. Select the Simulator by clicking on 'connect' on the top tool bar of PmScreens.

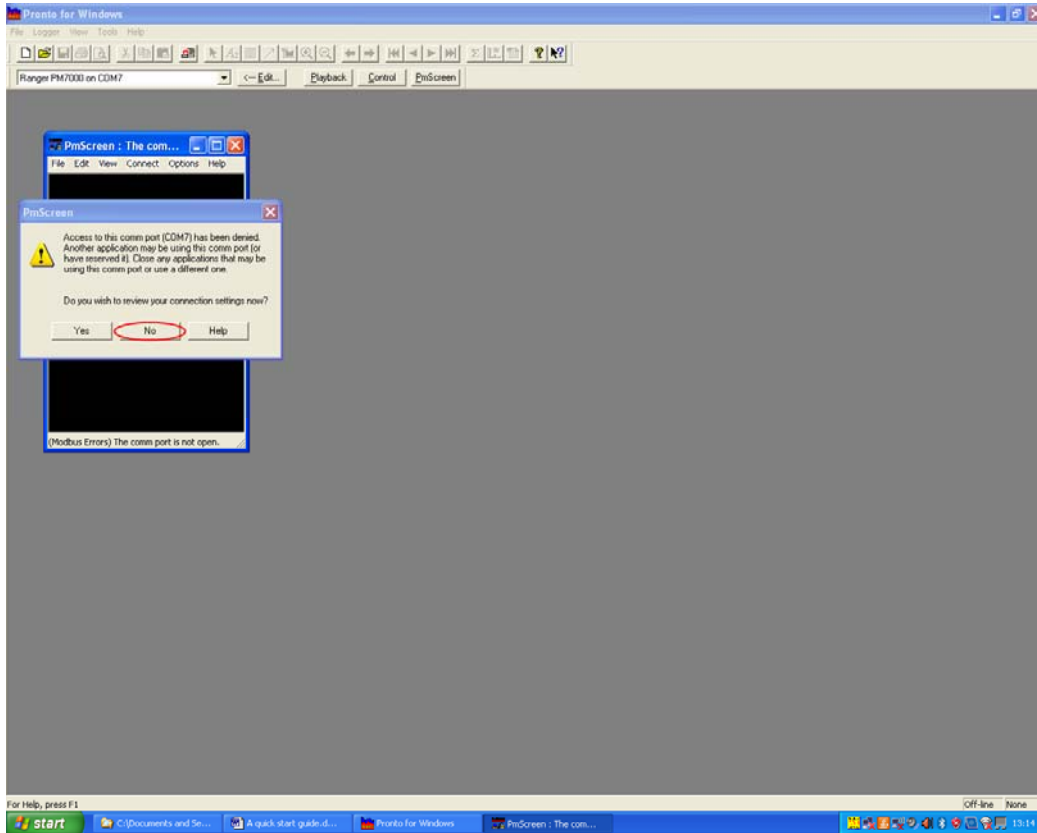


Follow the path from 'Launch Simulator' to 'PM7000' after which the Simulator screen will arrive. See below.

**If no logger is connected**, when you open Pronto the following advice window will come up:

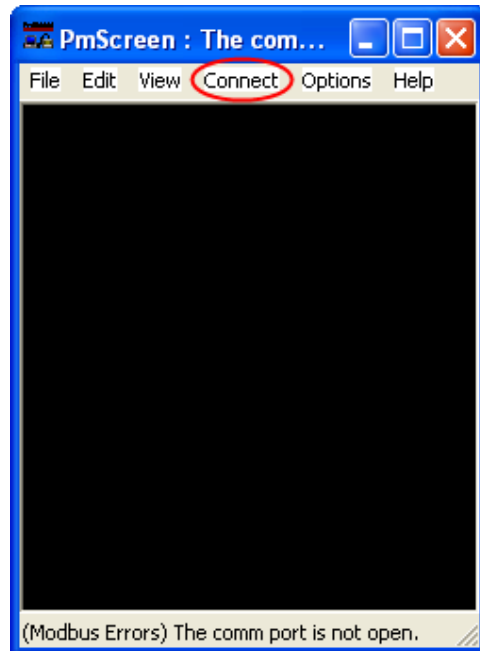


Click OK and it will go away. For the simulator we don't require a communication route.  
Click on 'PmScreen on the Pronto tool bar.



For the same reason you are told “Access to this comms. port has been denied”. Click on “No”. This window will go away.

In this example there is no logger connected and therefore no live PmScreen

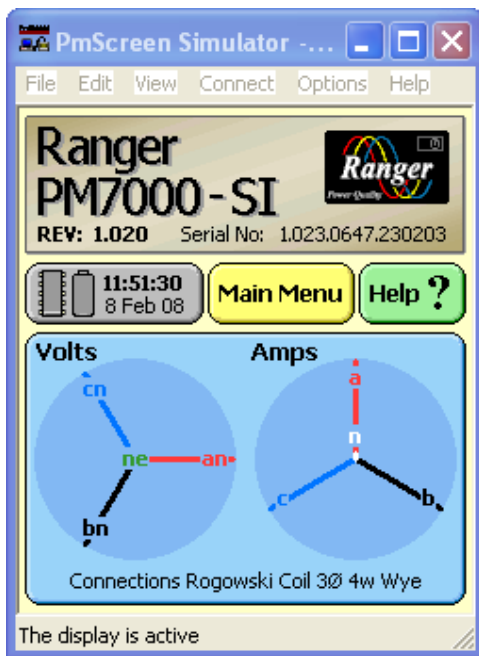


Click on “Connect” on the ‘PmScreen’ tool bar,

then “Launch Simulator” and select “PM7000”. The Simulator will arrive.

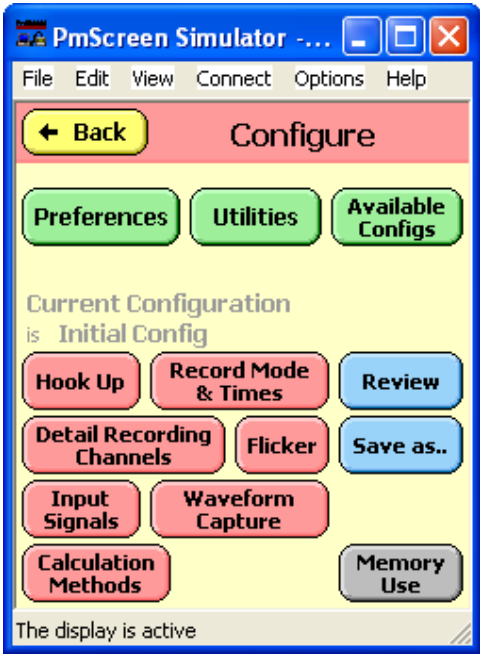
Yet another way into the Simulator is to click on PmStart on the customer CD and follow the steps indicated.

Now you have the initial Simulator screen in front of you.



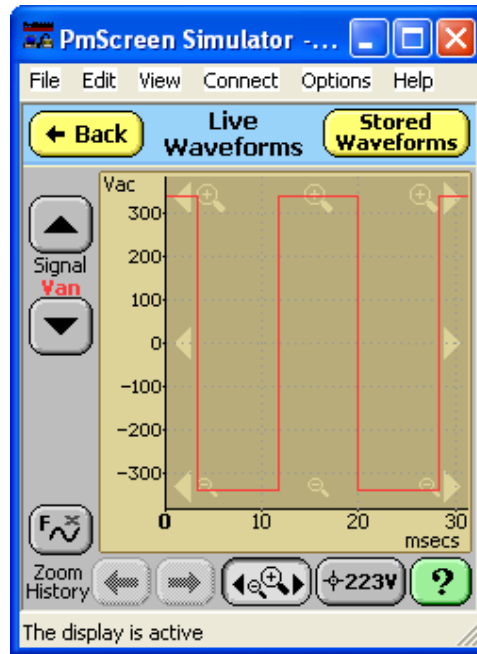
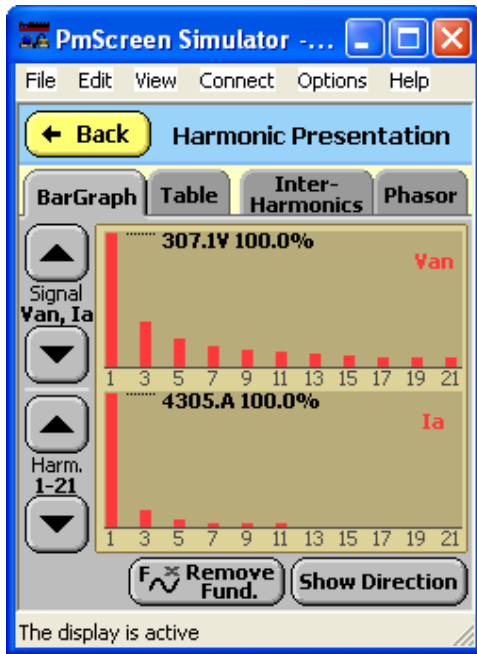
The Simulator will give you a comprehensive set of artificial readings. Use this facility to investigate the capability of your new PM7000.

Here is an example screen, the 'Configure' screen, showing the extent of the options available to set up.



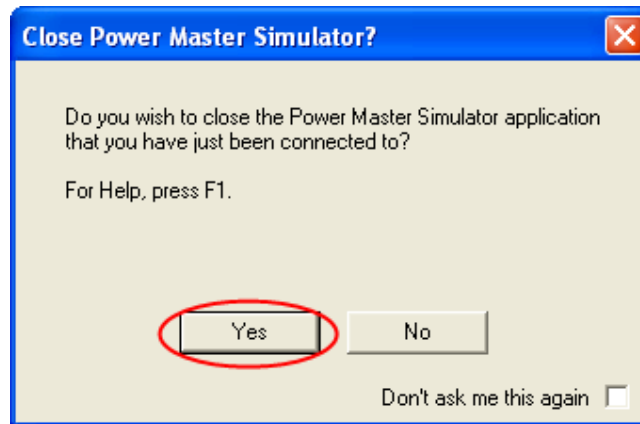
Note the 'Hook up' button.

Further example screens.



Explore what is available to you as you use your PM7000.

When you close the Simulator the following window will appear. It is asking you to close down the executable programme running PmScreen. Click 'yes'. And the programme will close down.



## Button help

If you hold down a button on PmScreens for a few seconds, most of the time you will stimulate the popping up of a help message. This message will explain the function of the button you are pressing. We hope you find it useful.

## **Eighth Step:**

### **Make a first recording with the PM7000 by measuring the live mains (or using the Simulator)**


Below we go through some basic steps to show you how to start a recording. These will be the same whether you are practicing on the Simulator or doing it for real on the logger itself.

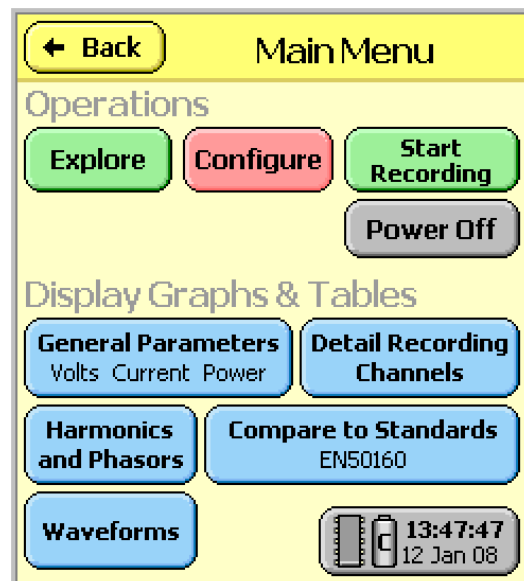
If using the PM7000, plugging it into the mains will give you readings of Phase A voltage. Let us measure this voltage. If you don't have a mains cable you will need to clip voltage probes onto Phase A line and return.

We'll use the default hook up connection that comes with the logger. This is 3 phase 4 wire wye. The initial screen always indicates the hook up connection. See the simulator screen in the previous section.

In a genuine 3 phase application it is valuable to check the vector diagram to make sure your connections are correct. If all your phases appear to be in error by 90 degrees, check that you have not physically installed voltage output CTs but selected flexible Rogowski coils in the logger set up, or vice versa. If your Rogowski coils (or CT's) are reversed this will be indicated on the vector diagram and you will have the opportunity to correct the orientation in PmScreen under 'Hook ups'.

Note. Using the simulator for this exercise will give you phase readings, doing a single phase live measurement of the mains will not.

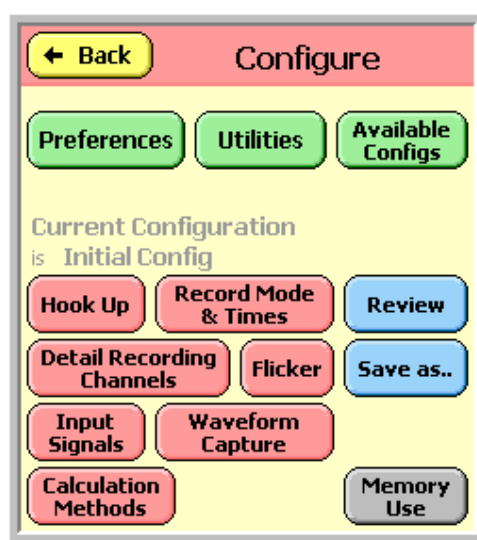
Click on  to produce the following 'Main Menu' screen.



This main menu screen gives you the opportunity to select **Explore** to explore your stored data, **Configure** to configure your different set ups, **Start Recording** to start a recording' or **Display Graphs & Tables** either historically or in some cases live. These latter buttons, the ones displaying your results, are all blue and their functions are explained in detail later in the manual.

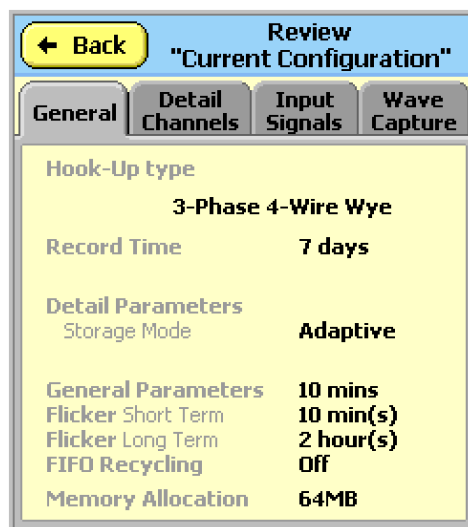
As we are interested in doing a simple “start” we shall ignore these buttons for the time being and click on **Configure** to bring up the screen that contains the pink ‘set up’ buttons:

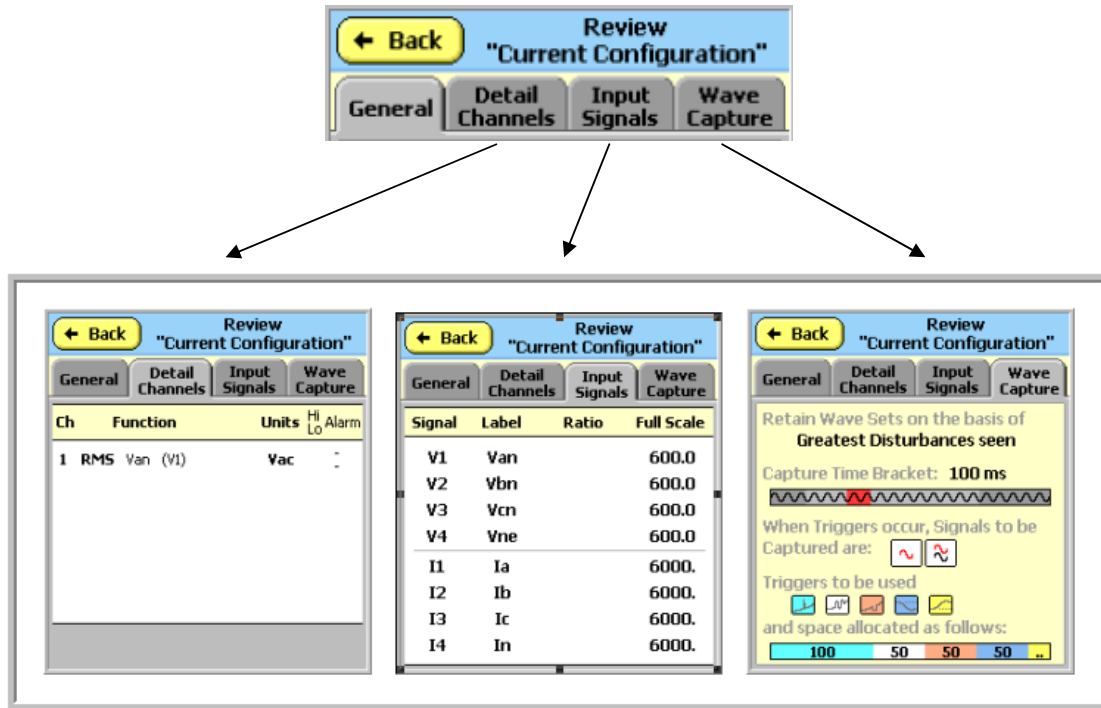
The pink buttons bring up our ‘set up’ screens and are described later in the manual.





For the moment we want to **Review** our initial set up as configured by the factory.


The **General** Review screen shows our general set ups such as duration of recording.






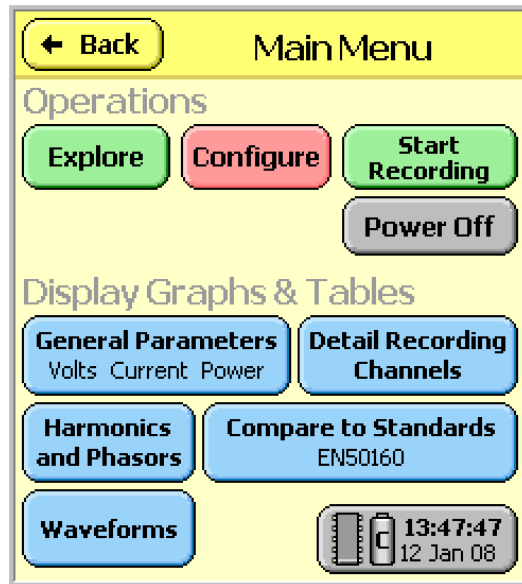
The  screen shows the channels with functions selected to be recorded using the Adaptive Store process, in this case we are measuring voltage on Phase A only.


The  screen shows the input signals available to you with the particular hook up.

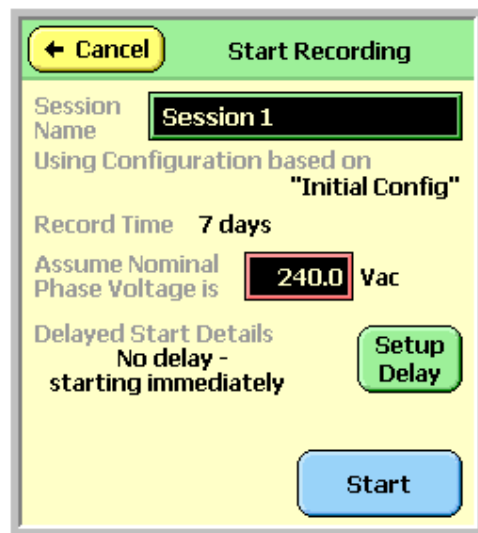
In the PM7000 you have the facility to rank the wave sets, choose a time during which the trigger is captured, allows you to decide which signals to capture, which type of fault condition to trigger and how much memory to allocate to each type. The  screen shows you how the logger is set up.

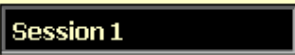
(How to set up Waveform Capture is explained in detail in the Manual).

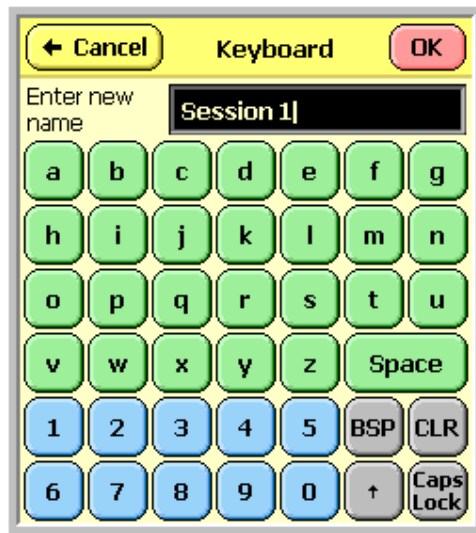
We assume we are satisfied with the set ups (factory) for this initial exercise so we can now start the recording. To do this we go up the menu tree using the  button until we arrive back at the Main Menu screen.






Now we touch  and bring up the 'start recoding' screen.

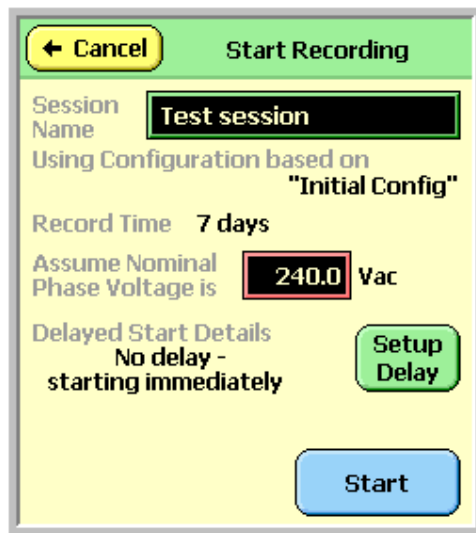



If you want to give this first session a different name touch the box  on the above screen and bring up the Keyboard screen.



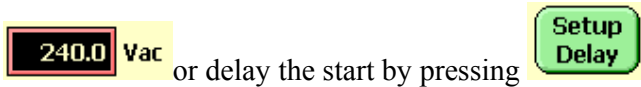
Use the keyboard to 'clear' the box by pressing  and type in another name and press . A more detailed explanation of how to use the keyboard is found in the manual.

One key worth mentioning is the up arrow key . Pressing this will allow you to type in the file name and the first letter only will automatically be a capital letter.




Now you have a screen showing you something similar to the above details. If you change your mind it is possible to  your recording set up and redo it.

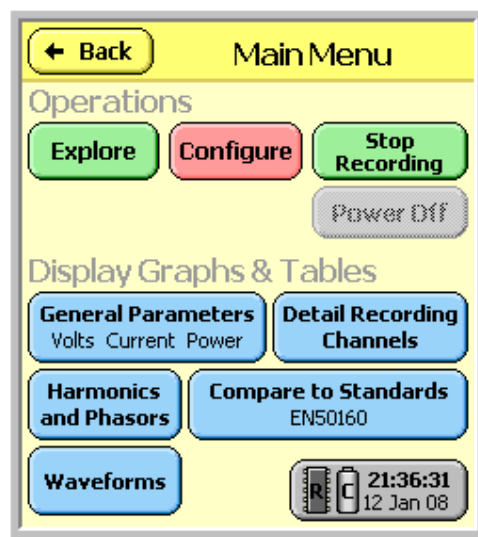
This screen gives you the opportunity to adjust the nominal phase voltage by pressing


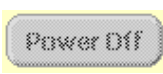


or delay the start by pressing

See “USB Memory Device operations in the Ranger PM7000” in the manual for more information on the delayed start facility.

Now we can start recording. Touch  and the logger will start recording. The screen will revert to the ‘Main Menu’:



Note the recording button has changed to give you the option to  but the  button is greyed out so that you cannot inadvertently turn the power off while the logger is recording.

The PM7000 is now set to record for 1 week. If the recording logger is interrupted by a power outage, once power is resumed it will automatically restart in the same session for all the time the restart is within that set period.

At the end of the set period the recording will stop automatically but it is perfectly OK to stop the recording at any time to see the results, or download, and then ‘start recording’ again.

Your PM7000 can be configured and a recording started using either the PDA with its Bluetooth communication method or the computer with its USB serial link.

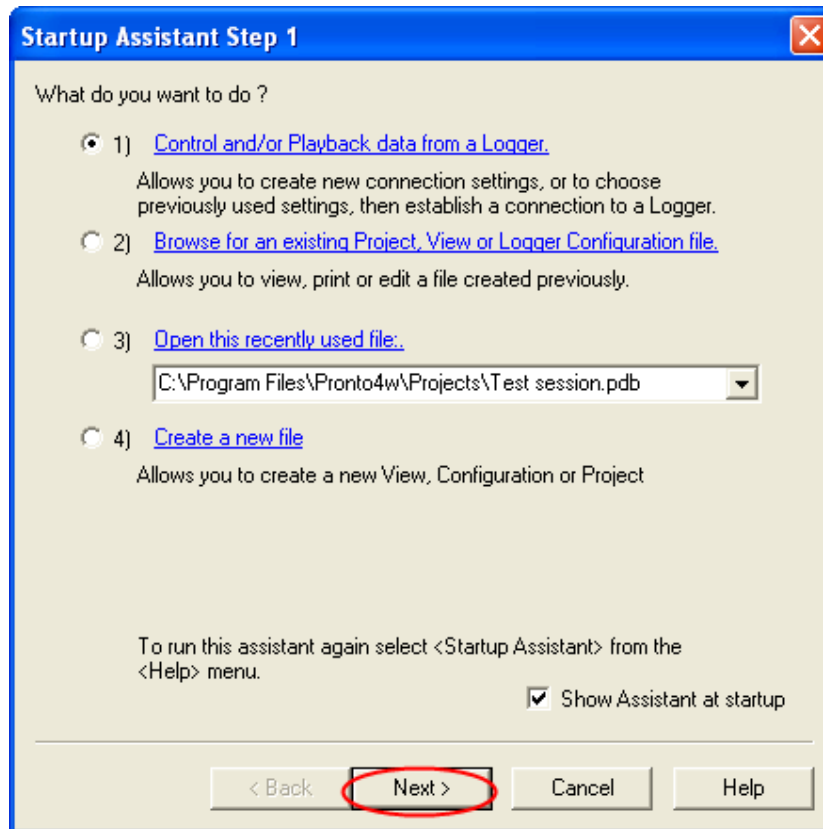
## Ninth Step:

### To Download the PM7000

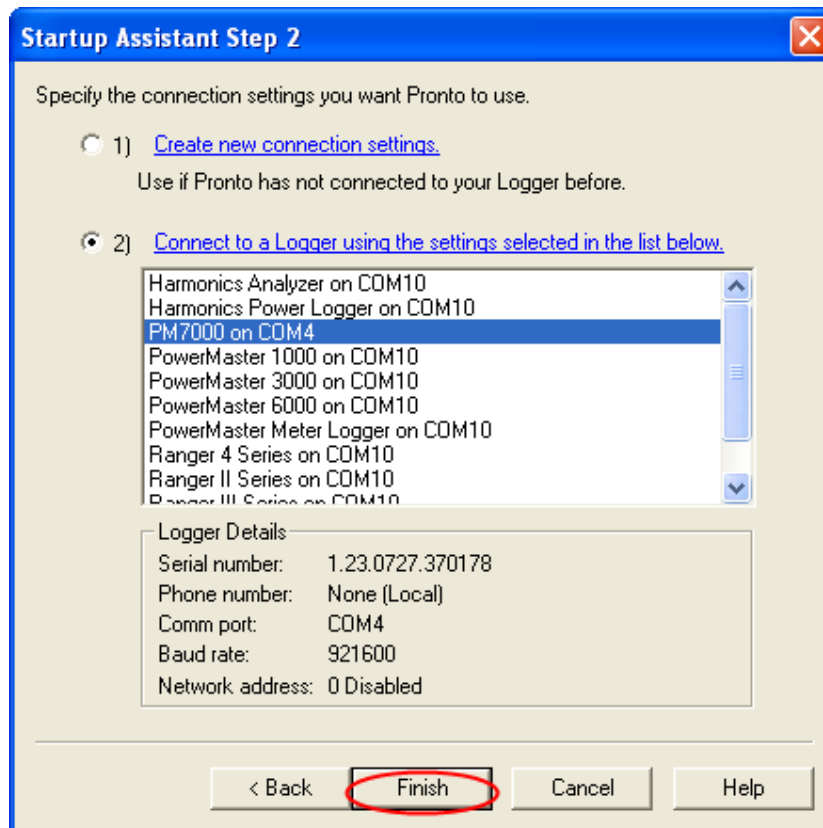
To take the data out of the PM7000 requires a computer and the USB serial link supplied or a USB memory drive. The recording will either have stopped because it reached the end of the recording period or because it was stopped manually, or the logger will still be recording. In the latter case Pronto will invite you to stop the recording prior to the download as part of the download process.

For this “Start” download we shall use the USB serial link to the computer. For more detailed information on using the USB memory device please see the section “USB Memory Device operations in the Ranger PM7000”.

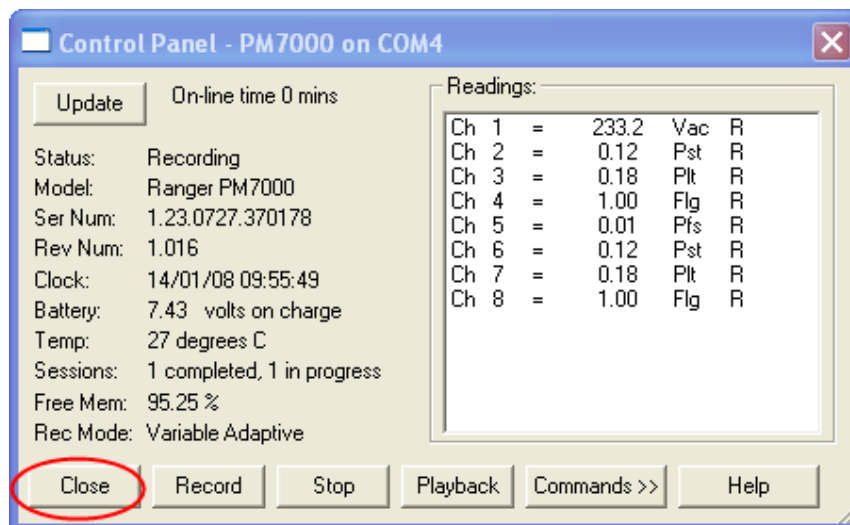
Attach the logger to the computer using the USB serial interface lead.  
Open ‘Pronto for Windows’. The Pronto ‘Start Up Assistant’ will appear.



The default is ‘Playback data from a Logger’ which is what we want so click on ‘Next’.

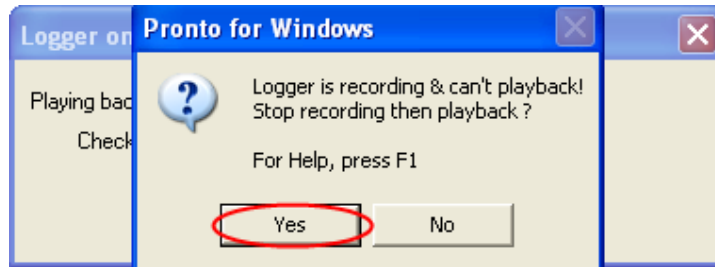


Use the list to select PM7000 if you have connected it to your computer previously.

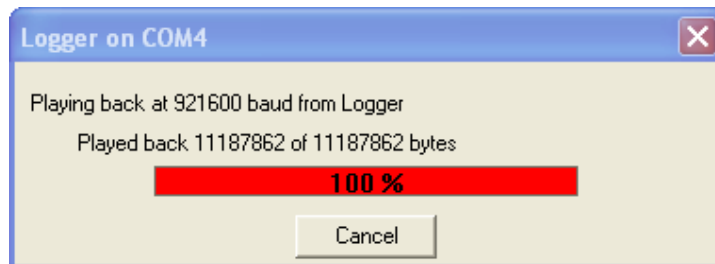
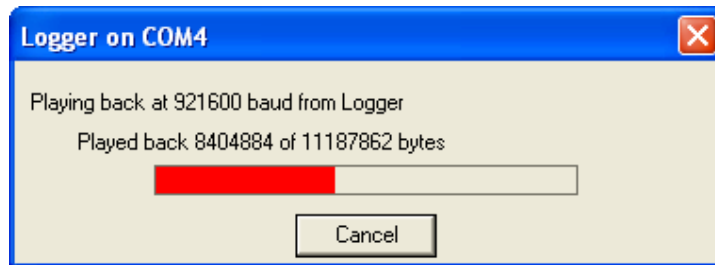
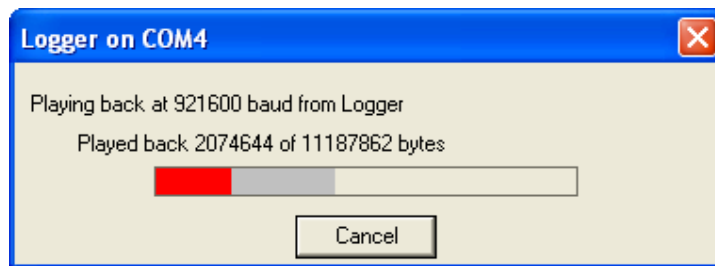


The control panel always gives you the current status of your recordings and will be useful in the future. For the quick start we can close it.

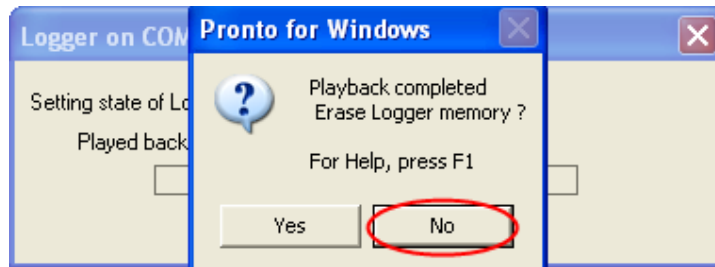
The next screen to come up invites us to stop the recording if we have not already done so.



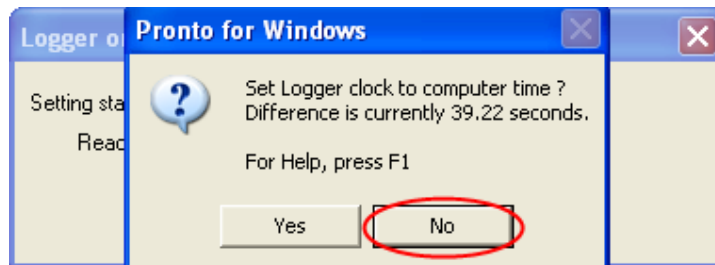
Click on 'yes'. Now we watch the playback.



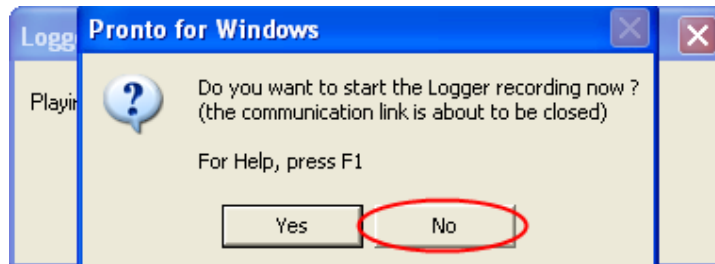
Next you will be invited to 'Erase logger memory'



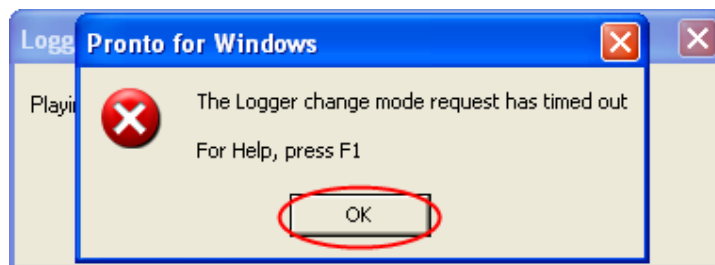
Normally we would recommend you to click 'No'.



Many computers these days have clocks updated automatically from reference clocks on the internet. If yours is one of these you may wish to click 'yes'. However, the Ranger loggers have good clocks that keep their time better than the average PC. So generally speaking, click on 'No'.

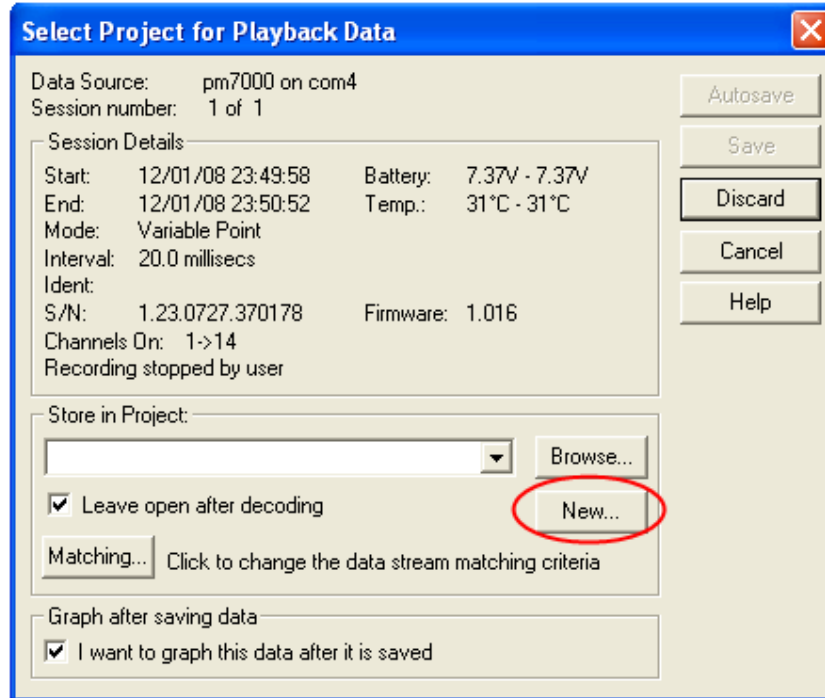


Unless you want a further recording click 'No'.

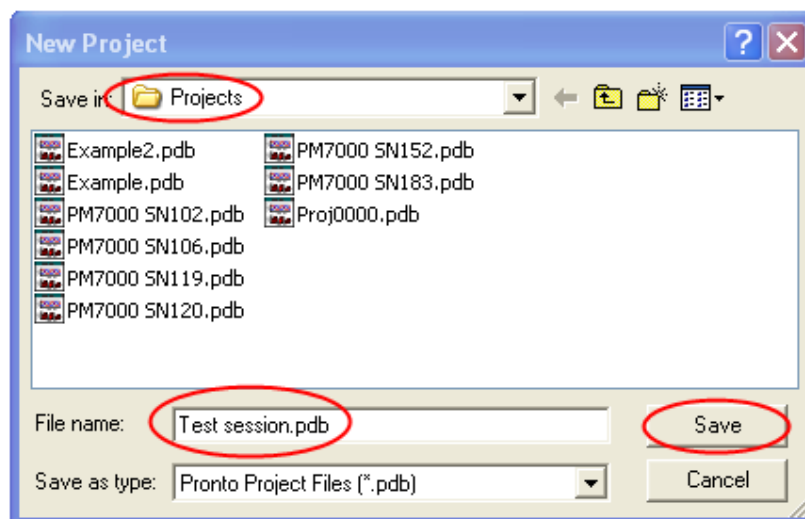


If you have taken a long time or gone off to get a cup of coffee this screen may come up. Click 'OK'.

The next screen offers us a place to save our recording. We create a folder. Pronto already has a default folder called 'Projects'.

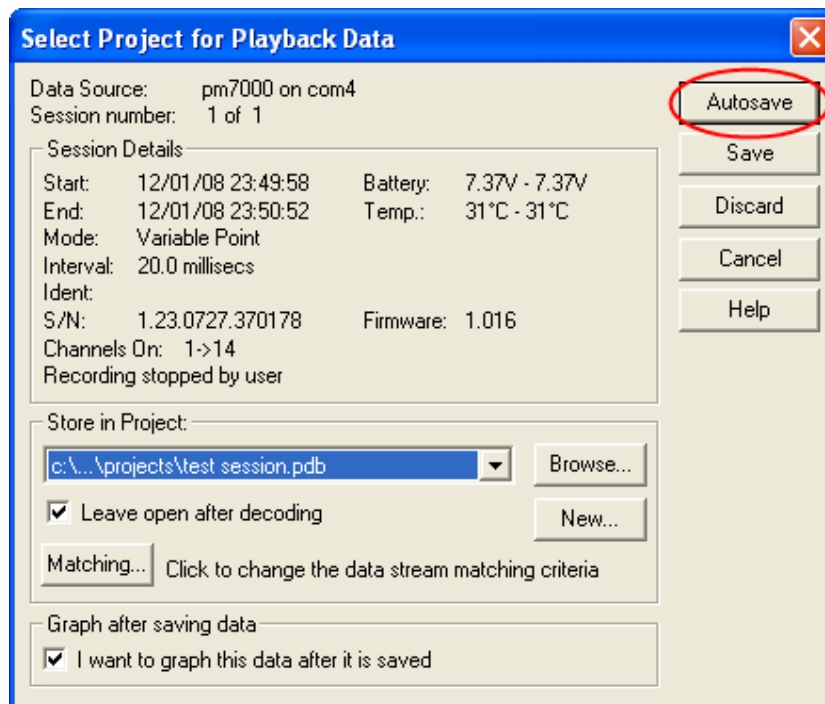


Click on 'New' as it is a new project. The following screen will allow you to search for the folder you want. In the example we select the default folder, 'Projects'. Our first project can be called 'Test session'. Type it into the box 'File name:' (We can discard it later.) New recordings may go in a new or an existing project.



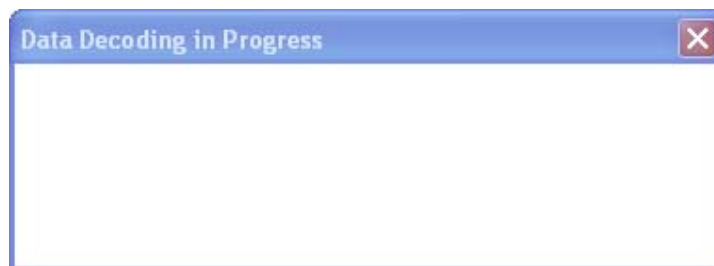
Your recording will go in the Projects folder. Click 'Save'.

Now we have a name and a location for our data. This screen comes up.



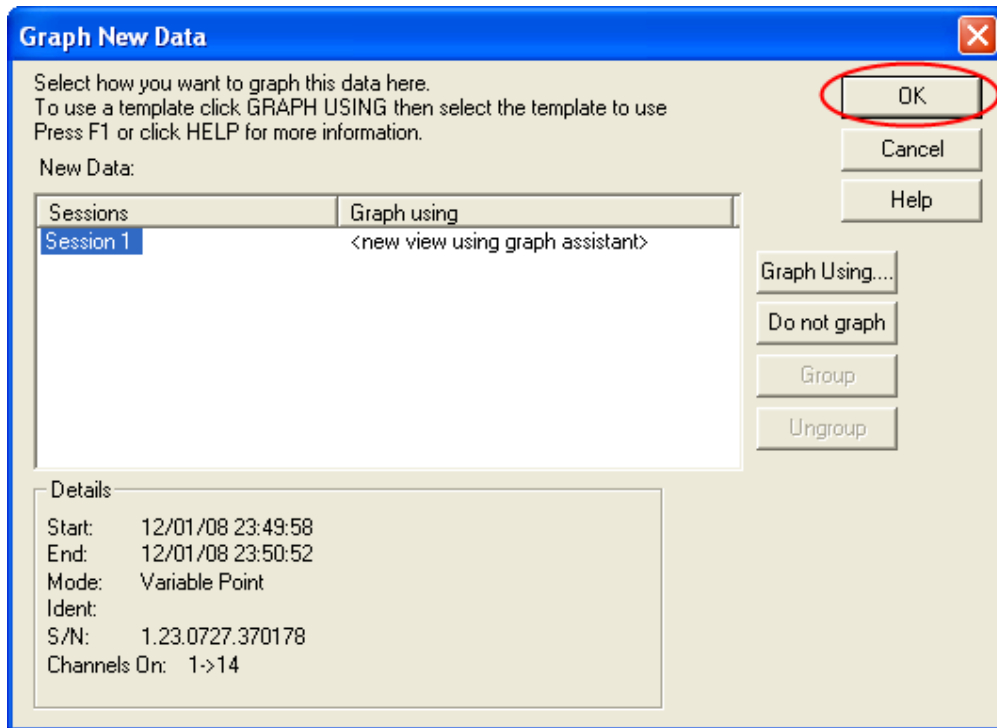
Click either 'Autosave' or 'save'.

NB, if you have multiple sessions in your logger, Autosave saves all of them to the same project.

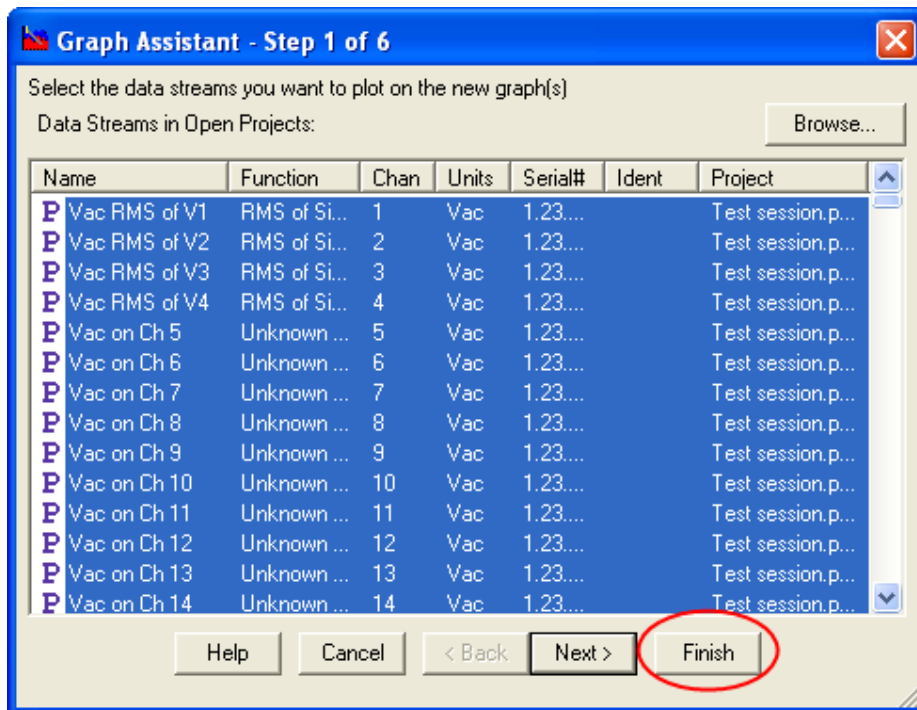


Patience while data decoding takes place.

Finally we are asked how we would like to graph our data. We'll use the Graph Assistant.



At this stage we have not created any templates so we automatically select the only choice. This is <new view using graph assistant>. Click 'OK'. The 'graph assistant' will come up.



It has six steps.

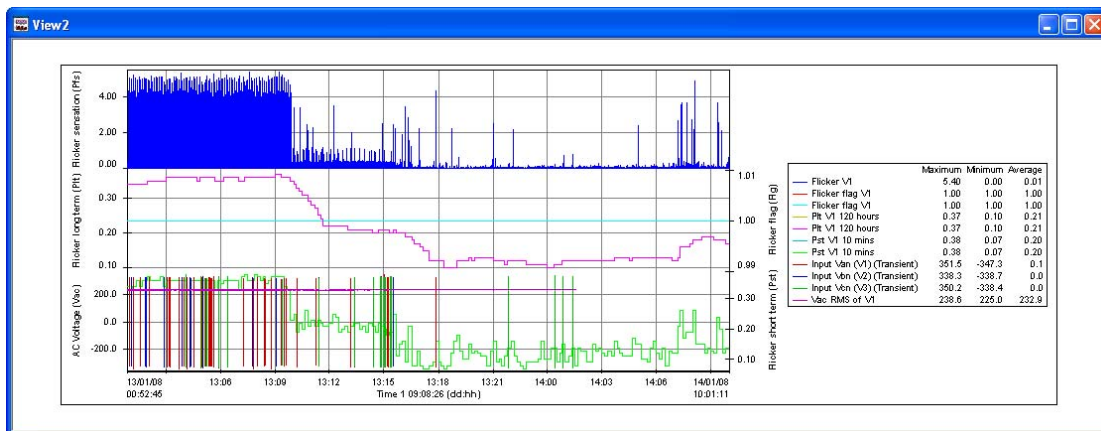
In the first step you have the opportunity to select the data streams you want to graph. 'P' on the left hand side in the above example refers to Point Store. The Factory set up in your new PM7000 will show red 'A's, as the recording mode is Adaptive Store.

Below these 'detailed channels' in the 'graph assistant' list will always be found the entries labelled 'G' (green) for General Parameters, and 'T' (blue) if there are waveform recordings present. The 'detailed channels' are the troubleshooting channels, either Adaptive Store or Point Store. The 'detailed channels' will be selected automatically for you within the 'graph assistant'. We have taken the view that as you especially selected these parameters, you are particularly interested in the results from them.

An account of the 'Storage Regimes' in the PM7000 is given in the manual.

The other five steps enable you to format the graphs in different ways. You will want to familiarize yourself with the choices at a later stage.

Go straight to 'Finish' for this 'Start' activity.



Here is an example of a graph you might produce. Each different graph is called a 'view'. As just mentioned you can play around with the different ways of formatting it and adding text. 'How to zoom in' and other facilities are covered in the Pronto video and manual.

Enjoy your PM7000. For further help see the PM7000 Manual or the Pronto for Windows Manual on your customer CD or contact your distributor, Synergy Systems Inc,

or Outram Research Ltd on +44 (0)1243 573050, email [support@outramresearch.co.uk](mailto:support@outramresearch.co.uk), website [www.outramresearch.co.uk](http://www.outramresearch.co.uk)