

Acquire™

Lock-in Amplifier Applications Software

Instruction Manual

190461-A-MNL-D

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1.1 Overview

The Acquire™ Lock-in Amplifier Applications Software allows straightforward computer control of any currently available **SIGNAL RECOVERY** lock-in amplifier fitted with a GPIB (IEEE-488) or RS232 interface. These range from relatively simple units such as the models 5105 and 5106 through to the most complex instruments such as the models 7265 and 7280.

This 32-bit software is designed to run under the Windows 98/ME/2000/XP operating systems and conforms to common industry standards used in the design of such packages. Consequently it is very easy to learn and easy to use.

Two principal operating modes, remote front panel and experiment recording, are provided. In the remote front panel mode the vast majority of the functions of the connected lock-in may be controlled from the computer via a series of simple setup screens. These screens automatically adjust to reflect the capabilities of the connected instrument, so that for example there are no internal oscillator controls shown for the models 5105 and 5106, since these instruments do not have this capability. Users can choose which of the available data outputs to display on-screen.

In the experiment recording mode the user can define an experiment in which selected output(s) of the lock-in amplifier are recorded as a function of some X-axis variable. The range of possibilities for the X-axis again depend on the capabilities of the connected lock-in, but include such variables as time, frequency and trigger events.

Usability is further increased by offering, wherever possible, the ability to use the lock-in amplifier's ADC (analog to digital converter) inputs as trigger inputs. Consequently experiments can be defined which record one output reading per external trigger, or which record a burst of readings on receipt of a trigger pulse. Triggered acquisition can even be combined with internal oscillator frequency or auxiliary DAC output voltage sweeps.

Data is plotted to screen as it is acquired on user-defined axes, and the display can then be adjusted as required prior to generating hard-copy output on any Windows compatible printer or plotter. Displayed plots may be cut to the Windows clipboard for subsequent pasting into other Windows applications, and the source data may be exported as ASCII text or comma separated value (CSV) files for further analysis.

Naturally the package also includes file storage and recall of data curve sets.

A comprehensive context-sensitive help system is built in to the software and is backed up by free telephone and e-mail support to registered users.

1.2 What's New?

This latest version 3.xx of the package has major improvements when compared to earlier versions. These include:

- ♦ Automatic detection of compatible instruments, without the need to worry about GPIB or RS232 communications settings.
- ♦ Ability to operate more than one instrument simultaneously. For example, if two lock-ins are connected then two remote front panels can be displayed, while in experiment recording mode one unit can be used as a source of excitation for the experiment while data is acquired from both.
- ♦ Updated plotting routines, including better logarithmic plots and much better control of the data range that is displayed.
- ♦ Plots can be automatically rescaled during acquisition so as to accommodate the data range of acquired data.
- ♦ The colors of all plot elements can now be specified by the user.
- ♦ Parametric plots, where one acquired data curve is plotted against another, rather than against time or step number.
- ♦ The program now offers the option of saving the current experimental setup automatically on exit. These settings can then optionally be reloaded when the program starts up again.
- ♦ Much better support for the curve buffers found in the models 7225, 7265 and 7280.

Note that because of the extensive redesign and support for simultaneous use of two or more instruments, the new software will not in general load data (*.lia) or experiment files (*.tst) created under earlier versions.

1.3 Program Versions

The Acquire Lock-in Amplifier Applications Software is available in three versions:

1.3.01 Acquire

This is the full version of the package, available only by purchasing an Activation Code from **SIGNAL RECOVERY**.

1.3.02 DemoAcquire

When first installed, the Acquire software functions in the demonstration mode, which is known as DemoAcquire. Users who have purchased the software need to activate it

after installation by returning an installation code to **SIGNAL RECOVERY**. On receipt and verification of the purchase details we will then e-mail an activation code that permanently converts the software to the full version. Users who have downloaded and installed the DemoAcquire software from the website and who find it useful can purchase this activation code to convert the package to Acquire from any **SIGNAL RECOVERY** office or agent.

DemoAcquire has the following restrictions when compared to the full package:

Plots

Printed plots have “Demonstration Software” in the background

Data Export

Data cannot be exported to text files or comma separated value files for processing using other packages. Plots cannot be copied to the Windows clipboard.

Curve Length

The maximum number of steps per curve that can be recorded is 200. In the full version it is 50,000.

Time Limit

The package will run for 7 days from the date of first installation

1.3.03 5105Acquire

This version is a simple program that offers only the Remote Front Panel mode of operation and will only operate with the models 5105 and 5106 lock-in amplifiers via the RS232 interface. It cannot be upgraded to the full package. It is available free of charge from the **www.signalrecovery.com** website, and is also supplied on disk with each new model 5105 and 5106.

2.1 Introduction

This chapter describes how to install the Acquire™ Lock-in Amplifier Applications Software on a personal computer.

2.1.01 Media

The Acquire™ software is supplied either on a CD or as a download from the **www.signalrecovery.com** website. The download version is supplied as a zipped file. Windows XP includes the ability to open this file format directly, but if you are using an older operating system then you will have to use the free PKUNZIP utility that is widely available. Save the unzipped files into a new, empty folder on the PC.

2.1.02 Requirements

The Acquire™ software requires:-

- * A **SIGNAL RECOVERY** Model 5105, 5106, 5110, 5209, 5210, 7220, 7225, 7225BFP, 7260, 7265, 7280 or 7280BFP lock-in amplifier. Note that it will not work with the Models 5102, 5104, 5109, 5302, 5205, 5206, 5207, 5208 or 5301/5301A.
- * An Windows-32 compatible personal computer with a 450 MHz Pentium or better processor, hard disk, CD drive and Microsoft Windows 98/ME/2000/XP or later. 5 Mbyte free disk space is required for the full installation. An active internet connection and web browser is also useful for software activation, although it is possible to complete this process without these features.

Either

- * A National Instruments GPIB (IEEE-488) Interface Card types PCI-GPIB, PCMCIA-GPIB or USB-GPIB fitted into the computer or plugged into the USB port, and if necessary a suitable GPIB cable to connect this to the lock-in amplifier.

or

- * A free RS232 port (COM1, COM2, COM3 or COM4) on the computer and a suitable RS232 modem eliminator (also known as a null modem) interconnecting cable. The connectors required on this cable depend on the type of connector used on the computer's RS232 port and on the lock-in amplifier, as follows:-

Computers fitted with 9 pin RS232 connectors:-

a) Models 5105 and 5106 Lock-in Amplifiers

9-pin subminiature D type female connector to 9-pin subminiature D type female connector modem eliminator cable, **SIGNAL RECOVERY** Part Number C01001.

This cable is included with each unit and is the same as that used when operating them

with the software package supplied with these instruments.

b) Models 5109, 5110, 5209, 5210 and 5302

9-pin subminiature D type female connector to 25-pin subminiature D type male connector modem eliminator cable, **SIGNAL RECOVERY** Part Number C01002.

c) Models 7220, 7225, 7260, 7265 and 7280

9-pin subminiature D type female connector to 9-pin subminiature D type male connector modem eliminator cable, **SIGNAL RECOVERY** Part Number C01003.

Computers fitted with 25-pin RS232 connectors

Although it is possible to construct a dedicated cable to suit computers fitted with 25-pin RS232 connectors, it is suggested that one of the three cables listed above is used with a 25-pin female to 9-pin male adapter, **SIGNAL RECOVERY** Part Number K02001, fitted at the computer end.

All of the listed items are available from **SIGNAL RECOVERY** but users with reasonable practical skills may construct their own RS232 cables if they wish. Connection diagrams for the three RS232 cables mentioned above are given in Appendix A of this instruction manual.

2.1.03 Interface Selection

The Models 5105 and 5106 are only fitted with an RS232 interface port, and hence can only be operated via this interface. All the other supported instruments are fitted with both GPIB and RS232 interfaces, in which case it is necessary to decide which one to use. Generally speaking, operation via the GPIB is better and is recommended if curves with large numbers of data points are to be acquired, but obviously involves the purchase of a suitable GPIB interface card. RS232 operation offers a cheaper route to instrument control, but at the penalty of slightly degraded performance.

When the interface which will be used has been selected, follow the relevant procedures in section 2.2 or 2.3 below.

2.2 GPIB Installation

- 1) Turn off the computer and lock-in amplifier and disconnect them from their power source.
- 2) If installing a PCI-GPIB card, remove the computer's cover to gain access to the expansion slots. This is obviously not necessary when using a PCMCIA-GPIB or GPIB-USB interface.
- 3) Install the National Instruments GPIB interface card in accordance with the hardware installation instructions supplied by National Instruments.
- 4) Replace the computer's cover if necessary.
- 5) Connect the GPIB cable to the interface card and to the GPIB connector (marked

GPIB) on the rear panel of the lock-in amplifier(s). Carefully tighten the fixing screws on the connectors.

- 6) If using more than one instrument, set the GPIB address of each to a different value. The procedure for doing this differs between instruments, so consult the instruments' instruction manuals to learn how to do this for the instrument(s) you are using. This information is also given in summary form for the most popular instruments in section 2.5 below.
- 7) Reconnect both the computer and lock-in amplifier to their power source and turn them both on.
- 8) Install the National Instruments driver software in accordance with the software installation instructions supplied by National Instruments. Note: The Acquire™ program will not work unless this is done.
- 9) If installing from a CD, insert the supplied Acquire™ Program Disk 1 into the computer's CD drive (d:). Otherwise ensure that the downloaded zip file has been unzipped and the contents saved to a new, empty, temporary folder.
- 10) Use Windows Explorer to navigate to either the CD drive or to the temporary installation folder, and locate the file `setup.exe`. Double-click this file to start the installation program.
- 11) The installation program will now run, copying files to the computer's hard disk. Simply follow the on-screen instructions.
- 12) On completion, the Windows desktop screen returns.

2.3 RS232 Installation

- 1) Turn off both the computer and lock-in amplifier and disconnect them from their power source.
- 2) Identify a spare RS232 port (COM1, COM2, COM3 or COM4) connector on the computer and connect the matching connector on the RS232 cable to it. If the cable being used has a 9-pin connector and the computer a 25-pin connector then an adapter (Part Number K02001) will be needed as well. Carefully tighten the fixing screws holding the connector in place.
- 3) Connect the other end of the RS232 cable to the rear-panel connector on the lock-in amplifier, marked **RS232**, or in the case of the models 5105 and 5106, **Port 1**. Do not connect to the port marked **AUX RS232**, found on the models 7220, 7225, 7225BFP, 7260, 7265, 7280 or 7280BFP or **Port 2** on the models 5105 and 5106.
- 4) Reconnect both the computer and lock-in amplifier to their power source and turn them both on.
- 5) If installing from a CD, insert the supplied Acquire™ Program Disk 1 into the

computer's CD drive (d:). Otherwise ensure that the downloaded zip file has been unzipped and the contents saved to a new, empty, temporary folder.

- 6) Use Windows Explorer to navigate to either the CD drive or to the temporary installation folder, and locate the file `setup.exe`. Double-click this file to start the installation program.
- 7) The installation program will now run, copying files to the computer's hard disk. Simply follow the on-screen instructions.
- 8) On completion, the Windows desktop screen returns.

Once the installation process has been completed, the software may be started by clicking on the **SIGNAL RECOVERY**  Acquire icon on the Start Menu.

2.4 Instrument Connections Dialog

When the program is started for the first time following installation the Instrument connections dialog, shown below in figure 2-1, is displayed.

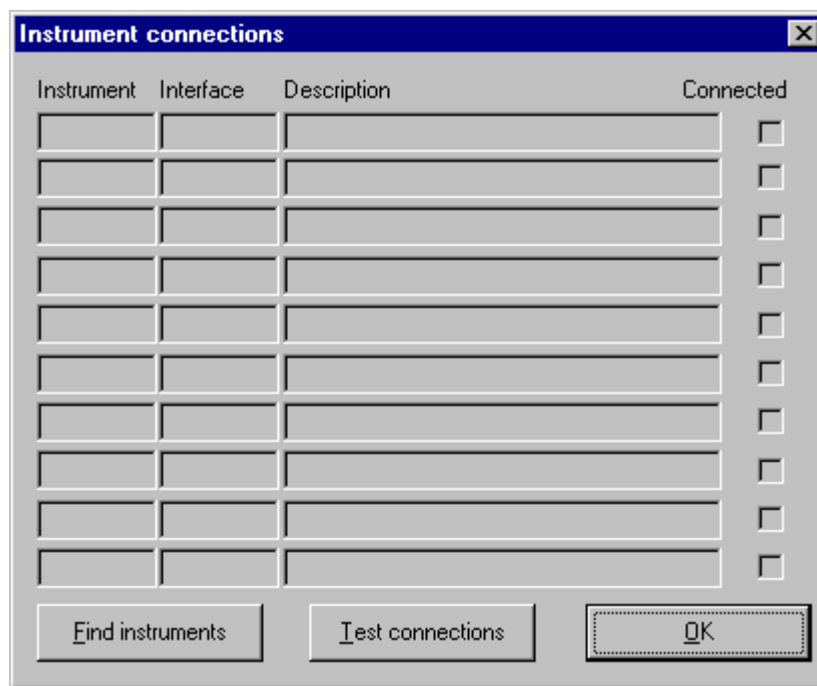


Figure 2-1, Instrument connections dialog - No Instruments Connected

Clicking the **Find Instruments** button starts a search for compatible connected instruments, during which the program systematically addresses each GPIB address and any available serial ports COM1 to COM4 by sending the "ID" (for Identify) command to that address. During this process the **Searching for Instruments... dialog**, shown below in figure 2-2, is displayed.

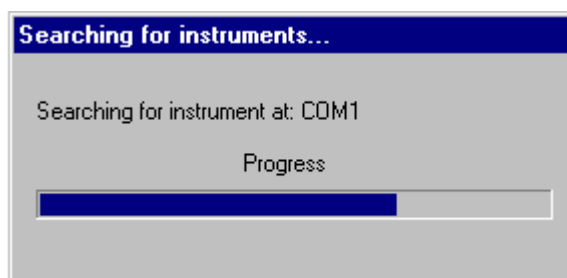


Figure 2-2, Searching for instruments dialog

When an instrument of a type supported by the software responds, the details of the model number, communications settings and other information are stored. Once all ports have been searched, the Instrument connections dialog is updated. For example, if a 7225 is connected at GPIB address 13 and a 5106 at serial port COM1 then the dialog would appear as shown below in figure 2-3.

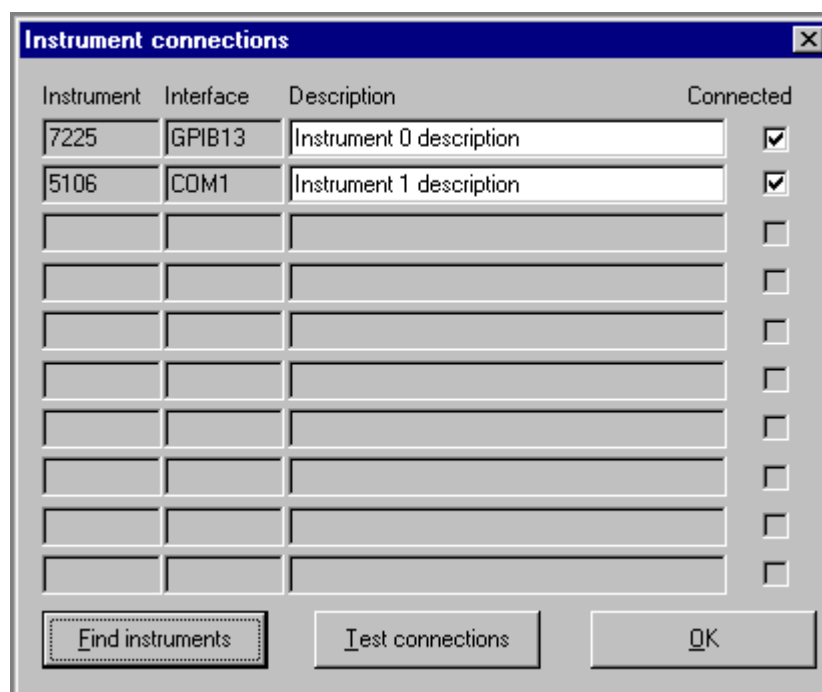


Figure 2-3, Instrument connections dialog - Models 5106 and 7225 Connected

If desired, the default instrument descriptions can be changed so that they are meaningful in your experiment. For example, descriptions such as "photocurrent", "sample voltage" or "temperature" could be used.

Clicking the **OK** button closes the dialog and returns to the main program window.

On second and subsequent occasions the program is run, it first verifies that the instruments recorded in the Instrument connections dialog are present, and if not displays a warning message, allowing the error to be fixed

The **Instrument connections** dialog can also be activated at any time by clicking the



toolbar button or selecting the **Hardware, Instrument connections...** menu item.

The “Connected” check boxes next to each description indicate whether the specified instrument is actually present. For example, in the case above where a 7225 and 5106 were detected the first time the program was run, if the software were started again but without having turned on the 7225 then a warning message would be displayed. On displaying the Instrument connections dialog the relevant box would be unchecked, giving a quick indication of where the problem lay. Having turned on the 7225, clicking **Test Connections** would re-establish connection and check the corresponding Connected box.

Clicking the **Find Instruments** button clears the saved information and descriptions, and starts a new search for connected instruments.

2.5 Software Activation

The first time the software is used following installation it will operate in the DemoAcquire demonstration mode. In order to activate the full version, you need to purchase and install an activation code. This is done using the **Tools Options** dialog, which can be accessed either directly from the Demonstration software dialog that appears each time the program starts, or from the Main menu bar. It is shown below in figure 2-4

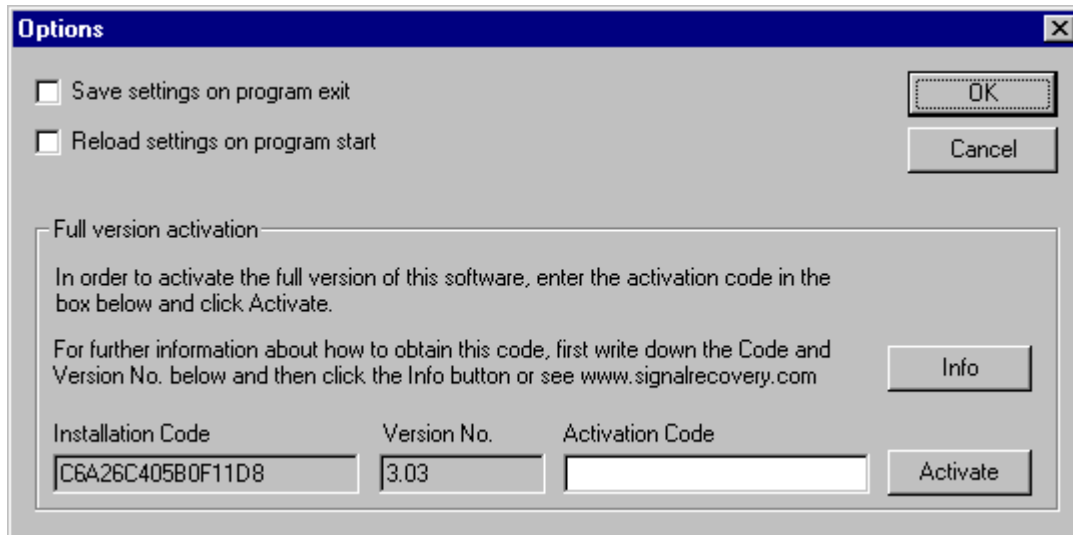


Figure 2-4, Options Dialog - DemoAcquire mode

On the **Options** dialog, click the **Info** button. If the computer has web browser software (Internet Explorer or Netscape Navigator) installed and a working Internet connection, a webform will be displayed on which you can enter the product Installation Code and Version Number, together with other details needed to identify you.

- ♦ If you have already placed a purchase order with us for the full software package, then on receipt and verification of these details we will send you the activation code by e-mail.
- ♦ If you have not yet ordered the full software package then we will contact you to give details of pricing applying in your particular territory.

If for any reason the internet activation process does not work, then please contact us for further assistance

Product activation will ensure that you are kept informed of software enhancements and developments as they become available. In addition, should you need to contact us for support we will check your details against those we have on file, and, if your copy of the software is not activated then we will not be able to help you.

Note that it is not necessary to activate the product if you simply wish to use the default demonstration version, DemoAcquire.

2.6 Troubleshooting

The most common problem likely to be encountered is a failure to establish communications between the instrument and the software. The procedure to adopt for resolving this depends on whether the GPIB or RS232 interface is being used.

GPIB interface.

- 1) If this has not already been done, exit the program and exit Windows. Restart Windows.
- 2) Switch off the lock-in amplifier and disconnect the GPIB cable.
- 3) Run the NI 488.2 troubleshooting wizard supplied with the National Instruments software. This will confirm that the card and software are correctly installed.
- 4) Reconnect the GPIB cable to the lock-in amplifier and switch on.
- 5) Confirm that the GPIB communications parameters on the lock-in amplifier are set as follows, by following the relevant procedure for the instrument being used.

Models 5110, 5209 and 5210.

The GPIB settings on these instruments are adjusted by pressing the **CONFIG** key immediately above the power switch on the extreme left hand side of the instrument, followed by the **SETUP GPIB** key immediately under the output time constant adjustment keys.

Once this has been done, the left-hand display changes to read "0" or "1" and the right hand display shows a number.

Press the **PARAMETER** keys under the left hand display until it shows a "0". Then use the **VALUE** adjustment keys under the time constant display to set the

number on the right hand display to read "12". This sets the instrument's GPIB address to 12.

Press the **PARAMETER** keys under the left hand display until it shows a "1". Then use the **VALUE** adjustment keys under the time constant display to set the number on the right hand display to read "0". This sets the terminator character to a Carriage Return (<CR>).

Finally press the **CONFIG** key a second time to return to normal operation.

Models 7220 and 7225

The GPIB parameters are adjusted via three setup menus accessed from the main display by pressing the **MENU** (on early units marked **AUTO**) key twice and then using the keys on the left hand side of the left hand display to cycle through the various setup menus until the GPIB Setup Menu 1 appears.

Set the Address to 12 and the Terminator to Carriage Return (<CR>). Now select the second setup screen, GPIB Setup Menu 2. Set the SRQ mask byte to 0 and the Test Echo to Off.

Press the **MENU** key again to return to the Main Display.

Model 7260

The GPIB parameters are adjusted via an on-screen menu, GPIB COMMS, which is accessed from the main display by pressing the front-panel **MENU** key followed by the **COMMUNICATIONS** and **GPIB OPTIONS** soft-keys. Use the corresponding keys to set the Address to 12, Terminator to Carriage Return (<CR>) and Test Echo to Disabled. Having set these parameters, return to the main display by pressing the **MENU** key again.

Model 7265

The GPIB parameters are adjusted via an on-screen menu, GPIB SETTINGS, which is accessed from the main display by pressing the front-panel **MENU** key followed by the **COMMUNICATIONS** and **GPIB SETTINGS** soft-keys. Use the corresponding keys to set the Address to 12, Terminator to Carriage Return (<CR>) and Test Echo to Disabled. Having set these parameters, return to the main display by pressing the **MENU** key again.

Model 7280

The GPIB parameters are adjusted via an on-screen menu, GPIB SETTINGS, which is accessed from the main display by pressing the Main Display **MENU** soft-key followed by the **CONFIGURATION**, **COMMUNICATIONS** and **GPIB SETTINGS** soft-keys. Use the corresponding keys to set the Address to 12, Terminator to Carriage Return (<CR>) and Test Echo to Disabled. Having set these parameters, return to the main display by pressing the **MAIN DISPLAY** soft-key.

- 6) Restart the Acquire™ program by clicking on the **SIGNAL RECOVERY**  Acquire icon on the Start Menu.

RS232 interface

Since there are more parameters affecting the RS232 than the GPIB interface on the lock-in amplifier, troubleshooting RS232 problems may take a little longer.

- 1) Confirm that the cable being used provides exactly the connections given in the relevant diagram in Appendix A of this instruction manual.
- 2) Confirm that the RS232 communications parameters on the lock-in amplifier are set as follows, by following the relevant procedure for the instrument being used.

Models 5105 and 5106

The communications parameters of these units is factory set at 4800 baud (bits per second), no parity, eight data bits, one stop bit and a Carriage Return (CR) terminator. These settings cannot be adjusted.

Models 5110, 5209 and 5210

The RS232 settings on these instruments are adjusted by pressing the **CONFIG** key immediately above the power switch on the extreme left hand side of the instrument, followed by the **SETUP RS232** key immediately under the output time constant adjustment keys.

Once this has been done, the left-hand display changes to read "0" or "1", while the right hand display shows a number.

Press the **PARAMETER** keys under the left hand display until it shows a "0". Then use the **VALUE** adjustment keys under the time constant display to set the number on the right hand display to read "11". This sets the instrument's baud rate to 9600 baud.

Press the **PARAMETER** keys under the left hand display until it shows a "1". Then use the **VALUE** adjustment keys under the time constant display to set the number on the right hand display to read "16". This sets the other RS232 parameters to 7 data bits, 1 stop bit, even parity, parity check enabled and character echo "on".

Finally press the **CONFIG** key a second time to return to normal operation.

Models 7220 and 7225

The RS232 parameters are adjusted via three setup menus accessed from the main display by pressing the **MENU** (on early units marked **AUTO**) key twice and then using the keys on the left hand side of the left hand display to cycle through the various setup menus until the RS232 Setup Menu 1 appears.

Set the Baud Rate to 9600 baud, the Format to 7D + 1P (seven data bits plus 1 parity bit) and the parity check to Even.

Now select the next setup screen, RS232 Setup Menu 2. Set the Prompt to ON, the Echo to ON and the Delimiter to 44 (a comma).

Select the final setup screen, RS232 Setup Menu 3. Set the Address to 0.

Press the **MENU** key again to return to the Main Display.

Model 7260

The RS232 parameters are adjusted via an on-screen menu, RS232 COMMS, which is accessed from the main display by pressing the front-panel **MENU** key followed by the COMMUNICATIONS and RS232 OPTIONS soft-keys. Use the corresponding keys to set the baud rate to 9600 bps, the Data Bits to 7 + 1 PARITY, the Delimiter to ,(44), the RS232 Address to 0, Echo ON, Even Parity and Prompt ON. Having set these parameters, return to the main display by pressing the **MENU** key again

Model 7265

The RS232 parameters are adjusted via an on-screen menu, RS232 SETTINGS, which is accessed from the main display by pressing the front-panel **MENU** key followed by the COMMUNICATIONS and RS232 SETTINGS soft-keys. Use the corresponding keys to set the baud rate to 9600 bps, the Data Bits to 7 + 1 PARITY, the Delimiter to ,(44), the RS232 Address to 0, Echo ON, Even Parity and Prompt ON. Having set these parameters, return to the main display by pressing the **MENU** key again

Model 7280

The RS232 parameters are adjusted via an on-screen menu, RS232 SETTINGS, which is accessed from the main display by pressing the Main Display MENU soft-key followed by the CONFIGURATION, COMMUNICATIONS and RS232 SETTINGS soft-keys. Use the corresponding keys to set the baud rate to 9600 bps, the Data Bits to 7 + 1 PARITY, the Delimiter to ,(44), the RS232 Address to 0, Echo ON, Even Parity and Prompt ON. Having set these parameters, return to the main display by pressing the MAIN DISPLAY soft-key.

- 3) Turn off the lock-in amplifier, wait 5 seconds and turn it back on.
- 4) Turn off the computer, wait 5 seconds, and turn it back on. This ensures that the RS232 communications buffer is emptied.
- 5) Restart the Acquire™ program by clicking on the **SIGNAL RECOVERY ** Acquire icon on the Start Menu.

3.1 Introduction

This chapter gives an overview of how to use the Acquire™ Lock-in Amplifier Applications Software. It is assumed that the user has already read the instruction manual(s) supplied with the lock-in amplifier(s) and is familiar with them as regards basic operation, terms, features and constraints. Should any questions arise as to the significance of selected operating features, please refer to the instrument's instruction manual.

Supported instruments vary greatly in their capabilities and hence the dialogs displayed by the software differ for different models. Sections in the discussion that follows are therefore only relevant for certain instruments.

3.2 Starting the Program

Having successfully completed the installation procedure as described in Chapter 2, the program may then be started by clicking on the **SIGNAL RECOVERY ** Acquire icon on the Start Menu.

When the program starts, it displays a splash screen. Following this screen, the software automatically attempts to establish communications with the connected instrument(s), firstly over the GPIB interface, and then over the RS232 serial ports COM1, COM2, COM3 and COM4. After the program has verified that the instrument(s) are connected, the main frame is displayed, which has a layout similar to that shown below in figure 3-1

Note, however, that the contents of the Title Bar, Menu Bar and Status Bar vary depending on the version of the program that is being run.

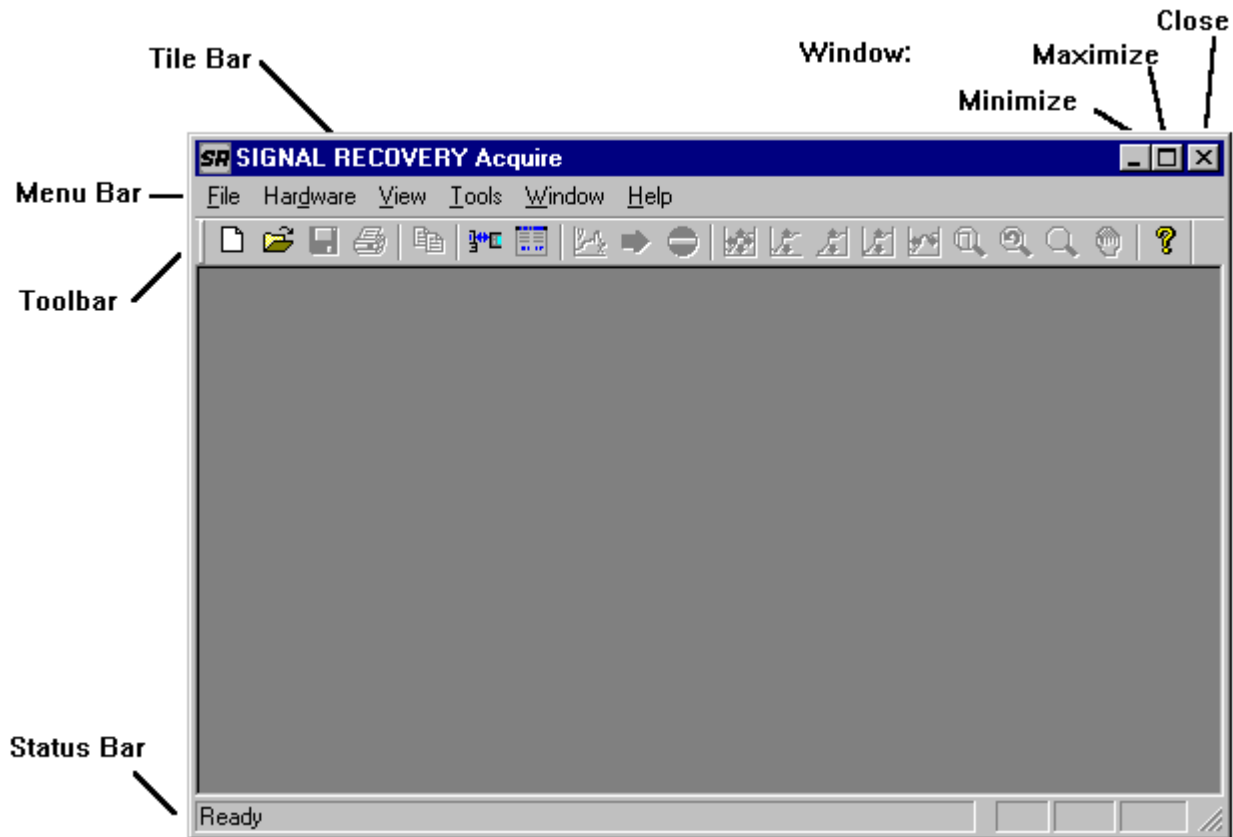


Figure 3-1, Main Screen - Display Elements

Figure 3-1 shows the principal elements of the display. The main window includes the title bar "**SIGNAL RECOVERY** Acquire", the main menu bar and a toolbar. Along the bottom edge a status bar displays information messages at the left hand side.

The Toolbar is dockable, and so can be dragged away from its default location, while the display of both the Toolbar and Status bar can be controlled via the **View** menu.

3.3 Remote Front Panel

Once communications have been established with at least one compatible instrument, then the **Hardware** menu, selected via the main menu bar, is modified to show the **Instrument connections...** item and a **Control xxxx** item for each available instrument. Selecting the former item opens the Instrument Connections dialog, as already discussed in section 2.4, while selecting one of the **Control xxxx** items opens a the remote front panel for the specified instrument.

When a front panel opens, the settings of the connected instrument are read by the software, so that they are not changed by the software unless the user so chooses. Once all the settings have been read, the panel is displayed as a dialog frame, with controls arranged on a series of tabbed pages in the upper part of the frame, and indicators towards the bottom.

The appearance of the panel depends on the type of instrument it is controlling. Figures 3-2 and 3-3 show typical panels for the models 5105 and 7265 respectively.

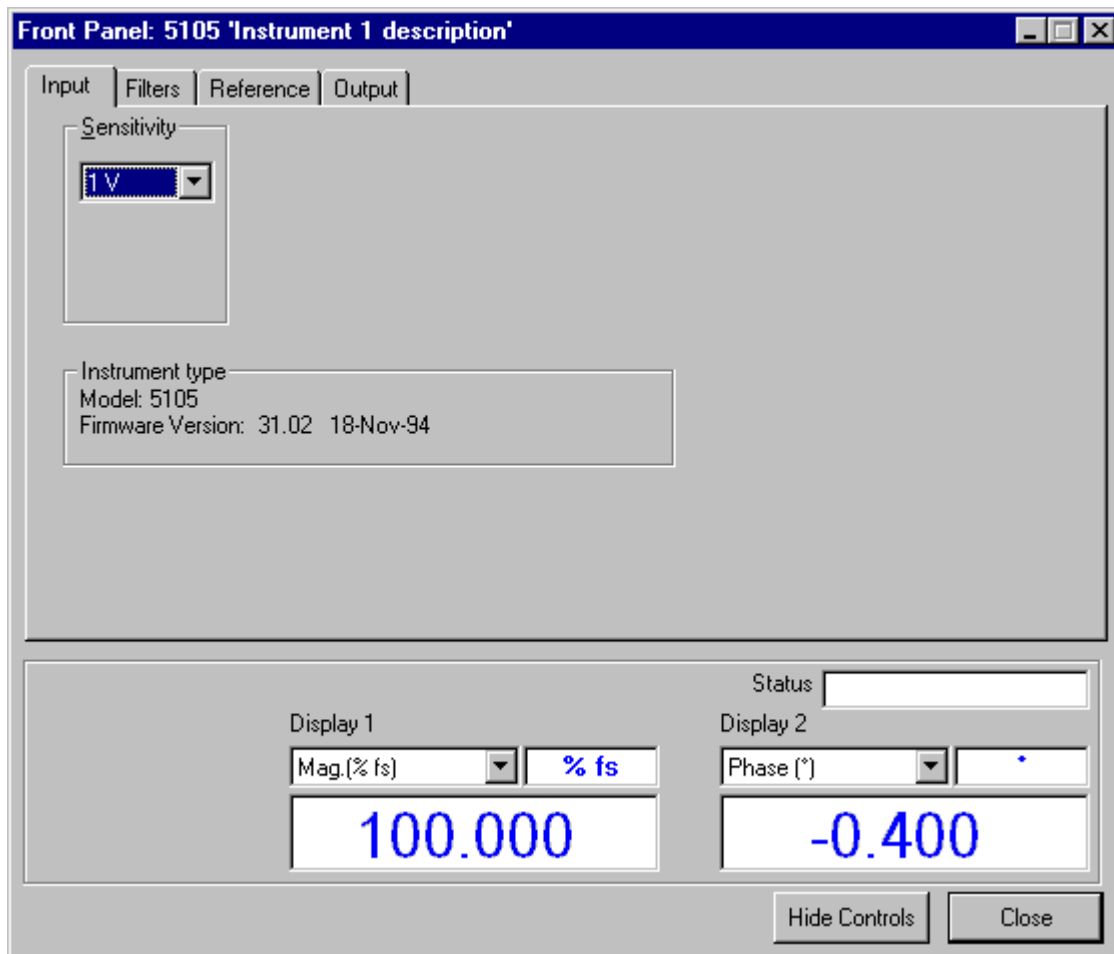


Figure 3-2, Model 5105 Remote Front Panel - Input Tab

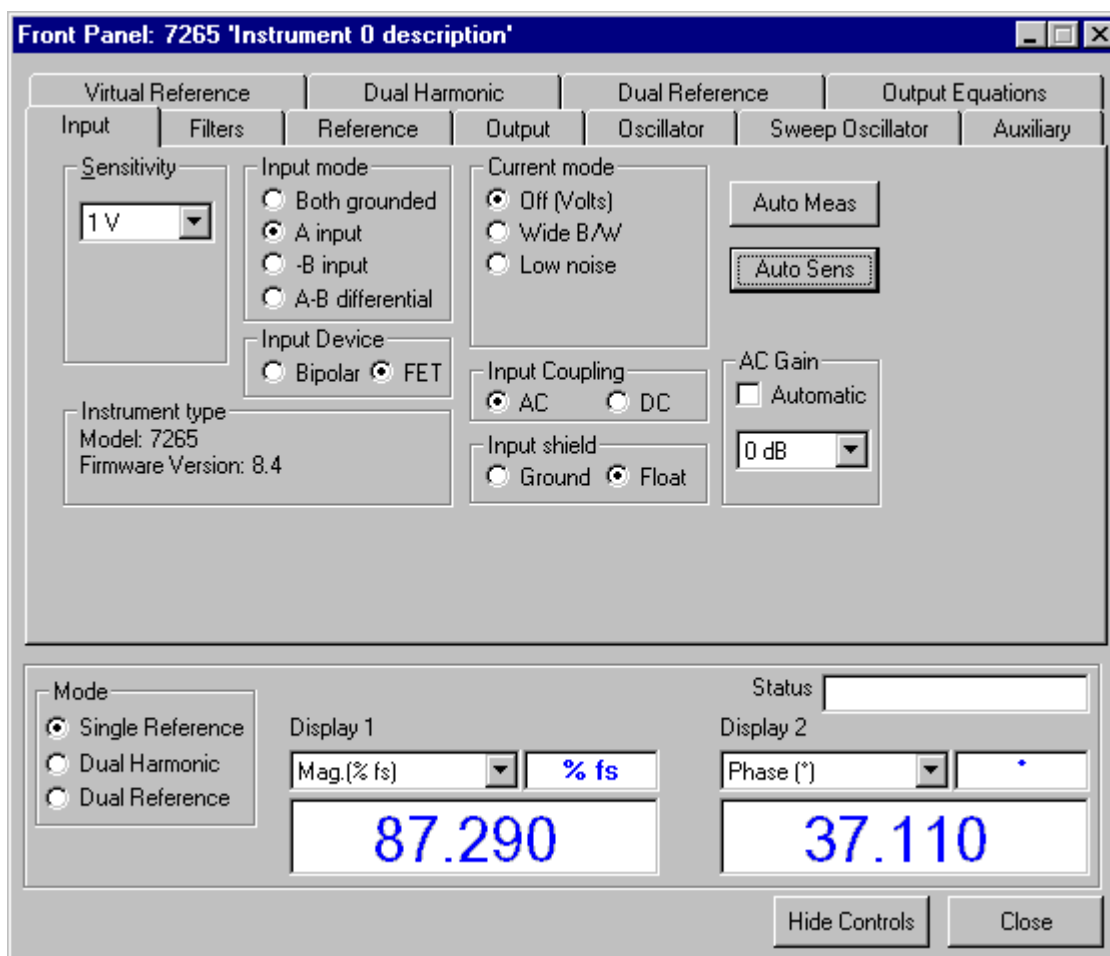


Figure 3-3, Model 7265 Remote Front Panel -Input Tab

Use the controls on the various tabs to adjust the instrument settings, while monitoring the output(s) on the two digital displays, **Display 1** and **Display 2**. Drop-down selectors above the displays allow you to choose the outputs to be monitored, while a status box gives information about overload and reference unlock conditions.

For detailed information on the effect of each control, refer to the instruction manual supplied with each instrument. Note in particular that some controls interact, so that for example adjusting the Sensitivity control on one of the DSP lock-in amplifiers potentially affects the AC Gain control as well. The software is designed to allow for all these interactions, so the control settings displayed are always those that are actually in effect.

Once any front panel is opened, the **Hardware** selections are reduced so that access to the **Instrument connections...** dialog is not possible and **Control xxxx** items are only active for instruments without an already-active front panel. The effect is that it is only possible to open one front panel per instrument.

Selecting one of the other active **Hardware**, **Control xxxx** items (there will only be one if more than one instrument is connected) opens a second front panel for that instrument. In this way it is possible to have several front panels open simultaneously,

each controlling a different instrument.

Once an instrument's controls have been set as required, the **Hide Controls** button can be clicked so that only the display area is left visible. This makes it easier to accommodate several panels on the screen. Figure 3-4 below shows one possible arrangement of two front panels set to the display-only mode.

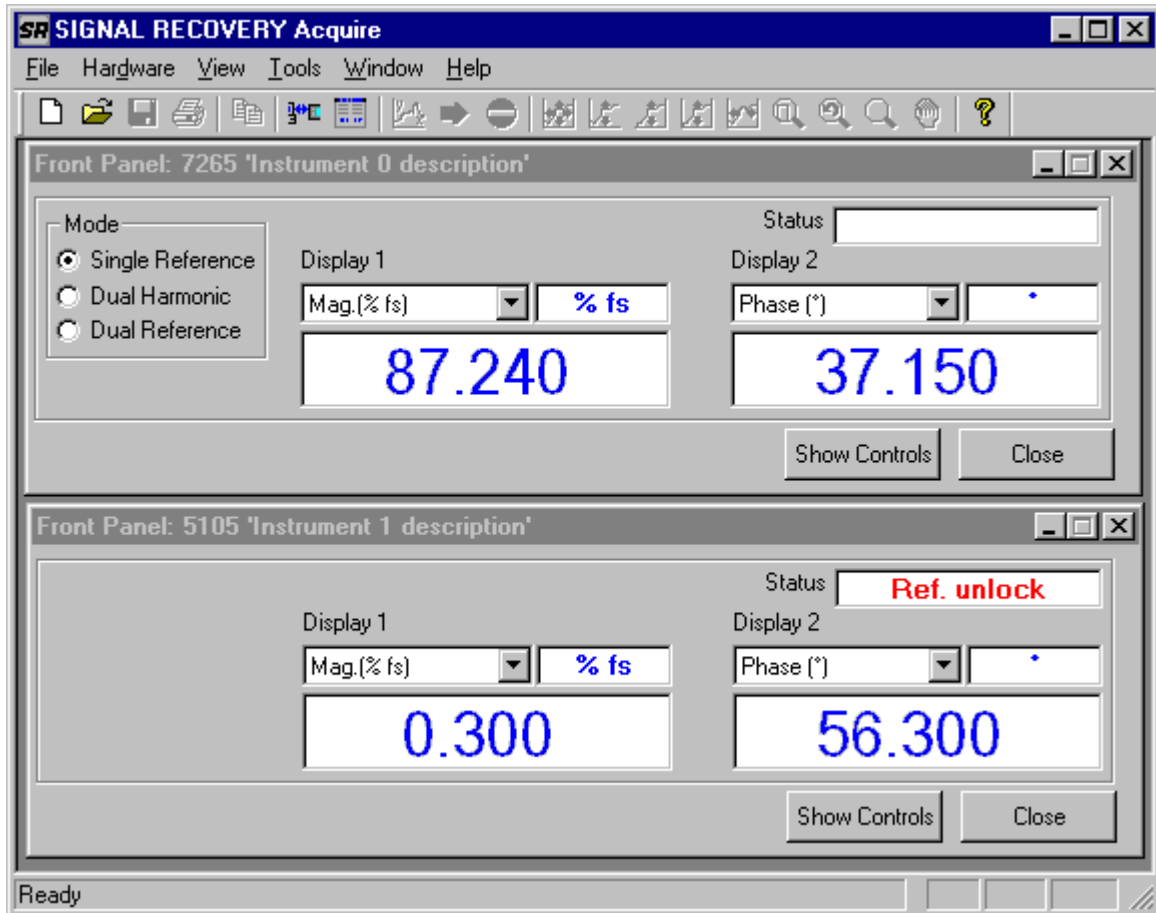


Figure 3-4, Acquire with two Front Panels Active, Display-Only Mode

When in the display-only mode, clicking the **Show Controls** button restores the display of instrument controls to the panel.

Clicking the **Close** button closes the active front panel.

3.4 Data Acquisition

Although the remote front panel capability of the Acquire™ software will be of benefit to many users, there is little doubt that the software will be mainly used to record in the PC the output(s) of the attached lock-in amplifier(s) as a function of time or some other variable.

Many experiments have fairly simple requirements for data recording, with little or no

analysis being needed on the acquired data. In these cases the software provides all the experimenter needs, and with its direct cut-and-paste transfer of plotted data into other Windows software allows easy generation of publication-quality output.

In other cases, more sophisticated analysis is required, for which purpose data may be exported as an ASCII text or CSV file for easy transfer to other software packages.

In order to define an experiment, a plot window must be open. Click the New button or select **File New** to create a new, empty Acquire data file, and then click the Define Experiment button or select **Measure Define Experiment** from the menu bar. The **Define Experiment** dialog, shown in figure 3-5, will be displayed:

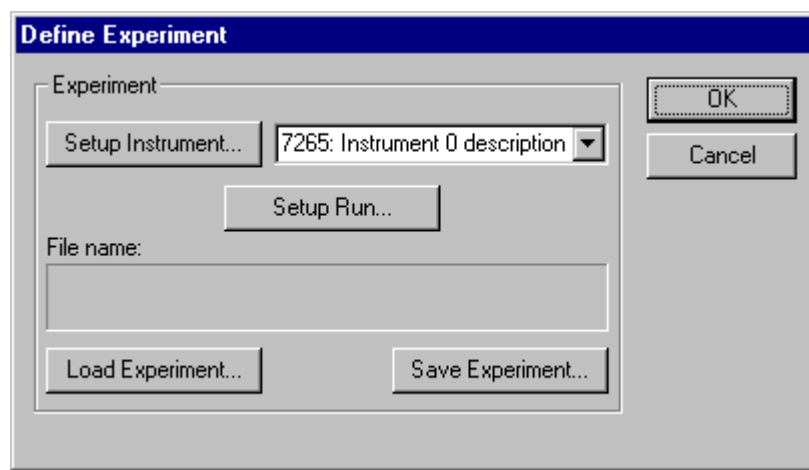


Figure 3-5, Define Experiment Dialog

This dialog allows you to specify all aspects of an Acquire experiment, which is made up of two main components:

- ♦ The “hardware” settings in effect in each of the connected instruments
- ♦ The data that will be taken during the acquisition, and how it will be displayed

The **Setup Instrument** button opens a remote front panel for the instrument selected in the list box adjacent to it. This allows all the instrument(s) settings to be adjusted to the correct values before the experiment is run. The panels are identical to those accessed via the **Control instrument** menu items and discussed earlier in section 3-3.

The **Setup Run** button, on the other hand, is used to access a property sheet where all other aspects of acquisition and display are defined. This sheet has the property pages described in the following sections 3.4.1 to 3.4.7

The **Load Experiment** button opens a file dialog that allows you to open an experiment (*.tst) file that defines all aspects of an acquisition, including hardware settings, experiment definitions and the plot appearance. It is also possible to load the same information from a saved Acquire3 data (*.lia) file.

The **Save Experiment** button opens a file dialog where an experiment (*.tst) file can

be specified. On saving the experiment, this file contains a full definition of an acquisition, including hardware settings, experiment definitions and the plot appearance. It can be loaded using the **Load Experiment** button.

3.4.1 Acquisition X Data

This page, shown in figure 3-6 below, is used to define the data that will be acquired to the X axis during an experiment. The basic mode of operation of Acquire is that selected instrument output(s) are recorded as a function of time, with the output(s) normally being shown on the Y axes and time on the X axis. But it is also possible to define dependent excitation outputs where the software controls an output, such as the oscillator frequency or amplitude, or DAC voltage, in a connected instrument at the same time as recording the instrument outputs. This allows experiments such as measuring an electrical frequency response to be simply carried out. Up to three such dependent outputs can be specified.

Dependent output variables		Start	Step	End	Units
Instrument...	...output				
7265: Instrument 0 description	Osc Frequency	1000.000	20.000	3000.000	Hz
7265: Instrument 0 description	Not selected	0.000	0.000	0.000	
7265: Instrument 0 description	Not selected	0.000	0.000	0.000	

Figure 3-6, Acquisition X data Property Page

The items on the property page have the following significance:

Acquisition Mode

In normal operation the software controls the acquisition of each data point. It sends commands to the instrument(s) to set up the required excitation signals, and then reads and stores the selected outputs, as well as plotting the data to screen. This procedure takes time and limits the minimum practical time per step to about 100 ms. Some instruments, however, have internal curve buffers. The software supports these when the whole system is composed entirely of instruments fitted with them. When selected, the buffered mode of operation takes data into the curve buffers, and only transfers it and plots it at the end of the experiment. The buffered mode offers two significant

advantages:

- ♦ Time per step is much more accurate and consistent, since the instrument has complete control of the acquisition as it runs.
- ♦ Data acquisition is potentially faster. The 7225 and 7265 support operation in buffered mode down to 0.005 s per step, while the 7280 will operate down to 0.001 s per step.

Buffered operation does however restrict the maximum curve lengths (number of steps) to $32768/(\text{number of curves acquired})$.

The software also supports the Transient Recorder mode of operation offered by the models 7225, 7265 and 7280.

Number of Steps

The fundamental experimental parameter is the number of data steps. Any data curve requires at least two points, one at the start and one at the end, so the number of points taken equals the number of steps plus one.

Time per Step

This can range from maybe 0.1 s per step for the simplest experiments, where only one output is recorded, up to one hour (3600 s). Note that in normal mode the actual time per step may not exactly equal the entered value; in the buffered and transient recorder modes, however, it is accurate.

Dependent Output Variables

As acquisition proceeds in normal mode, up to three output signals that can be used to excite the experiment can change. These outputs can be chosen from Oscillator Amplitude, Oscillator Frequency and Auxiliary DAC voltage. Hence, for example, by choosing the oscillator frequency output a frequency response experiment can be run. In buffered mode hardware restrictions mean that it is not possible to sweep DAC voltage, while in Transient Recorder mode no Dependent Outputs are possible.

Each output is characterized by a starting value, a step size and an ending value. Type the required entries in the edit fields. In each case the field will accept any legal value, so that a value of 1000 can be entered not only by typing 1000 but also as 1e3 or 1E3. If any values are out of range when attempting to close the page then the program warns which one is in error.

Having selected the X axis data, proceed to the Acquisition Y Data Property Page to select the instrument output(s) that will be saved as acquisition proceeds.

3.4.2 Acquisition Y Data

The Acquire software allows up to 8 data outputs to be recorded as acquisition proceeds. The Acquisition Y page, shown in figure 3-7 below, is used to select which outputs are recorded and from which instrument.

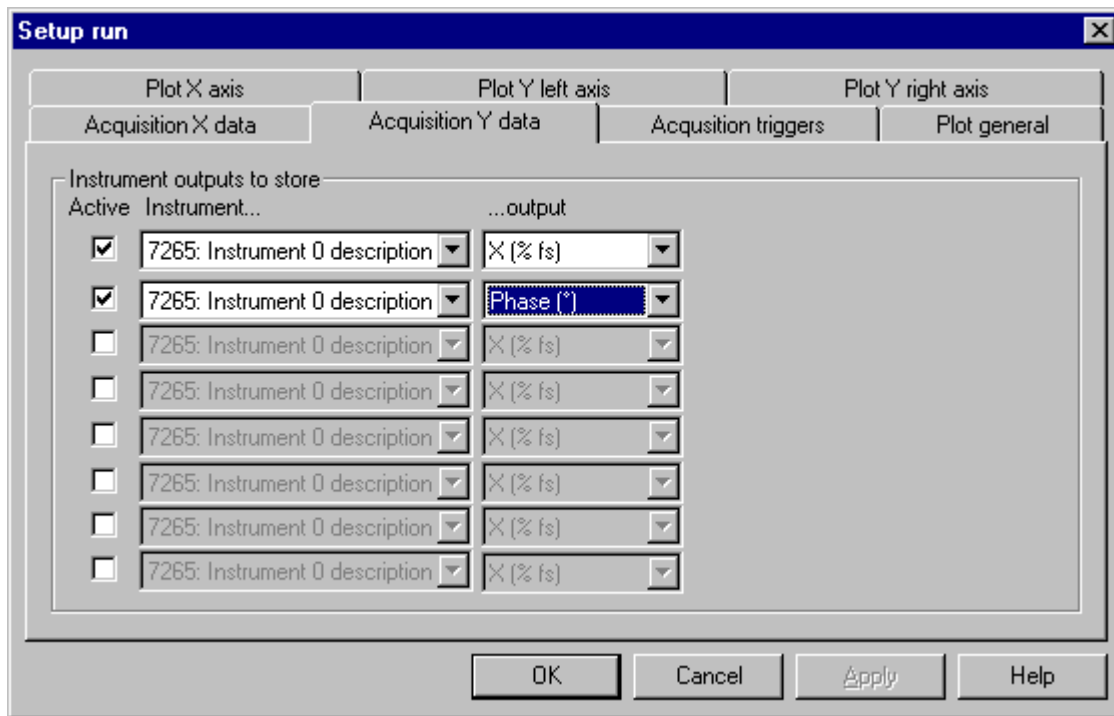


Figure 3-7, Acquisition Y data Property Page

Active

When one of these boxes is checked the adjacent instrument selector and output list boxes are activated, and the given output will be recorded.

Instrument

This list box defines the instrument from which the output will be recorded.

Output

This list box defines the actual output that will be recorded. The selections available depend on the capabilities of the instrument so that, for example, a single phase lock-in does not offer the ability to record signal phase, but a dual-phase instrument does.

3.4.3 Acquisition Triggers

In many experiments it is useful to be able to collect data on receipt of an external trigger signal, or, conversely, for a trigger signal to be generated either as the experiment starts or as each point is recorded. In Normal acquisition mode, the Acquire software allows instruments that are fitted with auxiliary ADC inputs and DAC outputs to use these features as trigger input/outputs. In Buffered or Transient Recorder modes, only trigger inputs are available, which in these cases should be applied in parallel to the **TRIG IN** connectors on all triggered instruments. The Acquisition Triggers page, shown in figure 3-8 below, is where these trigger inputs/outputs are specified.

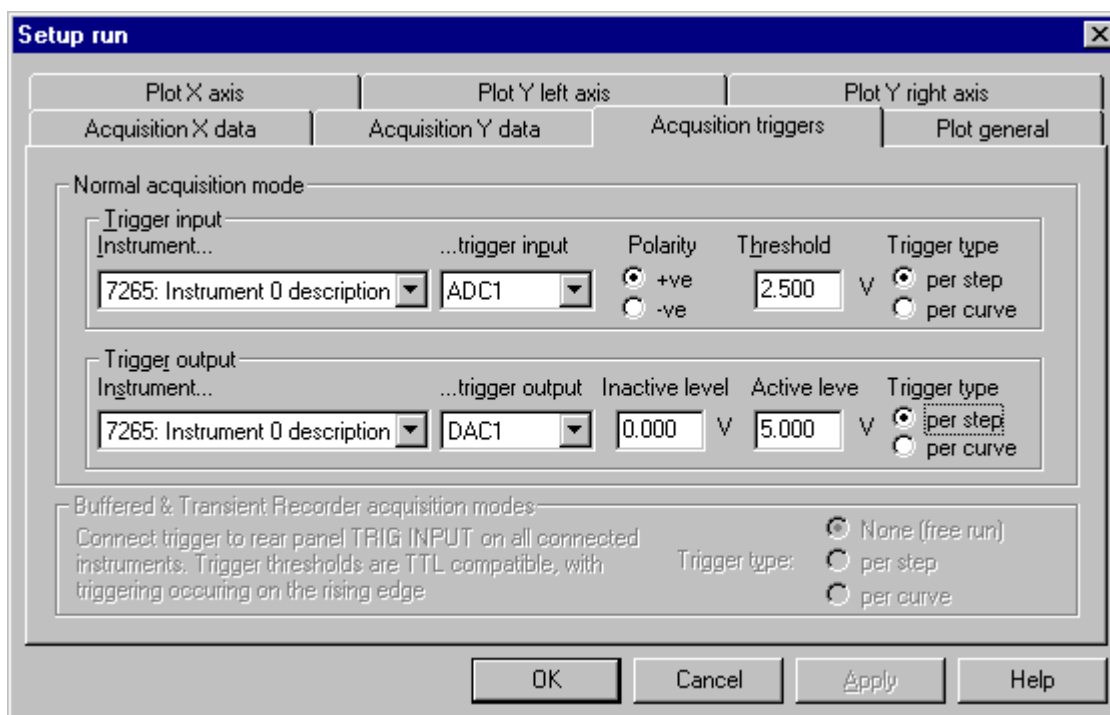


Figure 3-8, Acquisition Triggers Property Page

In Normal acquisition mode, the Trigger Input list box shows the instrument to which the trigger will be applied, as shown in the adjacent list box. The trigger polarity, threshold voltage and type can also be specified. In the same mode, the Trigger Output list box shows the instrument that will output a trigger. In this case two voltage levels are specified, an Inactive level (or logic 0) and an Active (or logic 1) level. Again, triggers can be generated once at the start of acquisition (per curve), or once per step.

Note that due to the method used to detect these triggers, the applied trigger pulses should be at least 100 ms wide. The trigger outputs are typically 5 - 10 ms wide.

In Buffered and Transient Recorder modes, only trigger inputs can be specified. They are always TTL compatible, rising edge triggers and must be applied to the **TRIG IN** connector on all instruments that are part of the experiment. Note that when using per step triggers in these modes then it is not possible to also use oscillator frequency or amplitude sweeps as dependent excitation outputs.

3.4.4 Plot X Axis

This page, shown in figure 3-9 below, is used to define the data that will be used as the X axis data set in the plot. The default selection is points (steps), but time may also be chosen. If excitation outputs are active (e.g. Oscillator frequency sweep) then these can be selected, as well as the acquired Y data curves. This latter option allows parametric plots to be made, where two outputs are plotted against one another.

Only one of all the available data sets can be used for a plot; all Y axis data is then plotted against this.

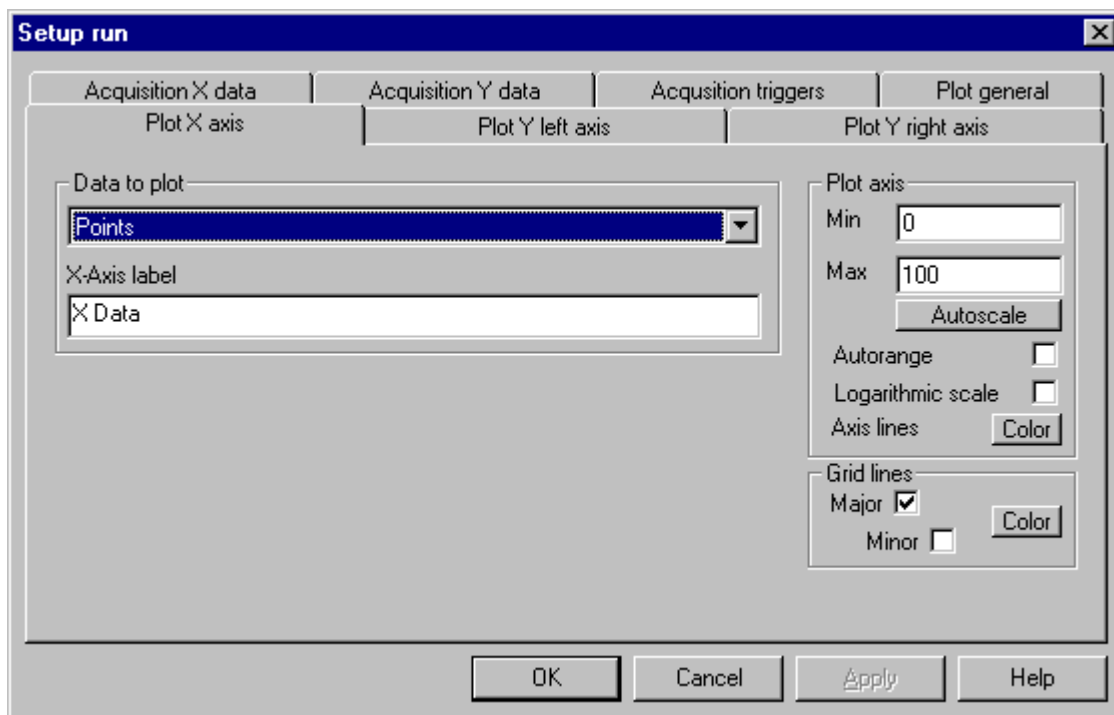


Figure 3-9, Plot X Axis Property Page

The **Plot Axis** controls define how the plot axis will appear. Clicking **Autoscale** sets the axis minimum and maximum values to accommodate the full range of data. The axis line color can be adjusted, and the axis plotted in linear or logarithmic modes. When the **Autorange** checkbox is checked and data is being acquired then the plot automatically re-scales during acquisition to show the available data.

The **Grid lines** controls are used to turn major and minor grid lines on or off, and to define their color.

3.4.5 Plot Y Left Axis

This page, shown in figure 3-10 below, specifies the data that will appear on the left hand Y axis. Up to 8 data sets can be selected from those specified in the Acquisition Y Axis page.

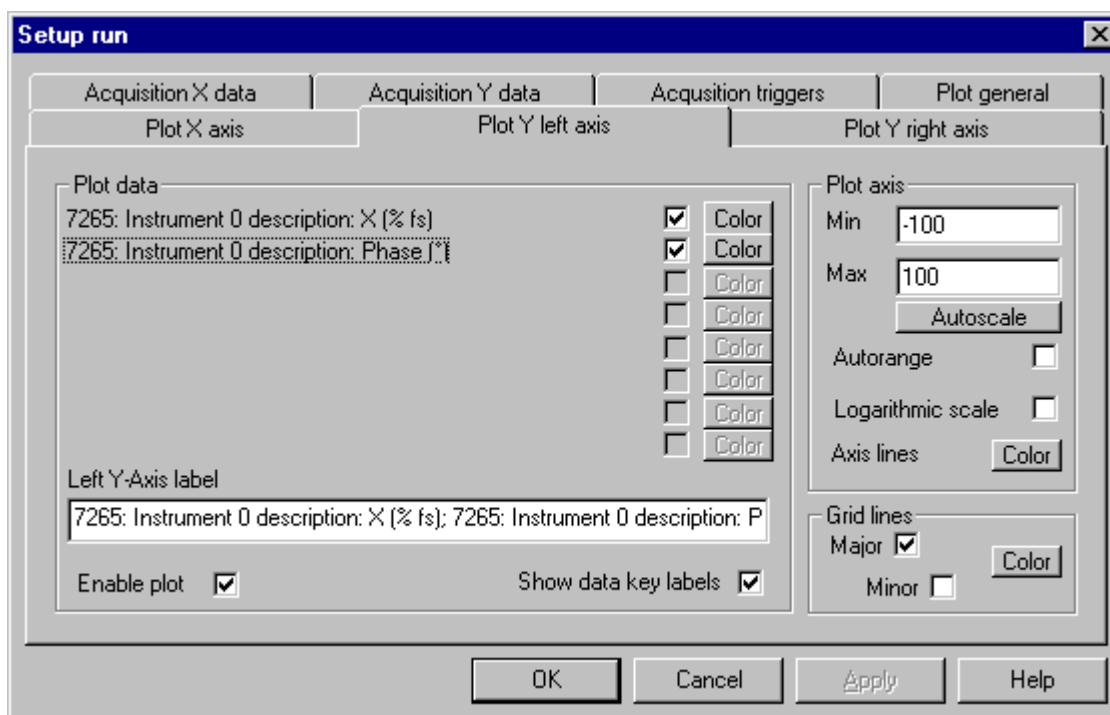


Figure 3-10, Plot Y Left Axis Property Page

The **Plot Data** controls specify the data curves that will be display and plotted against the left hand Y axis. Each curve can be turned on or off by checking the appropriate box, and the line colors can be specified. The left Y axis label automatically shows the curves selected, but can be edited to make the display more meaningful. The **Enable plot** check box turns the display of this axis on or off, while the **Show data key labels** checkbox determines whether color coded text will appear above the axis allowing the various data curves to be identified. It is most useful when plotting more than one curve per axis.

The **Plot Axis** controls define how the plot axis will appear. Clicking **Autoscale** sets the axis minimum and maximum values to accommodate the full rage of data. The axis line color can be adjusted, and the axis plotted in linear or logarithmic modes. When the **Autorange** checkbox is checked and data is being acquired then the plot automatically re-scales during acquisition to show the available data.

The **Grid lines** controls are used to turn major and minor grid lines on or off, and to define their color.

3.4.6 Plot Y Right Axis

This page, shown in figure 3-11 below, specifies the data that will appear on the right hand Y axis. Up to 8 data sets can be selected from those specified in the Acquisition Y Axis page.

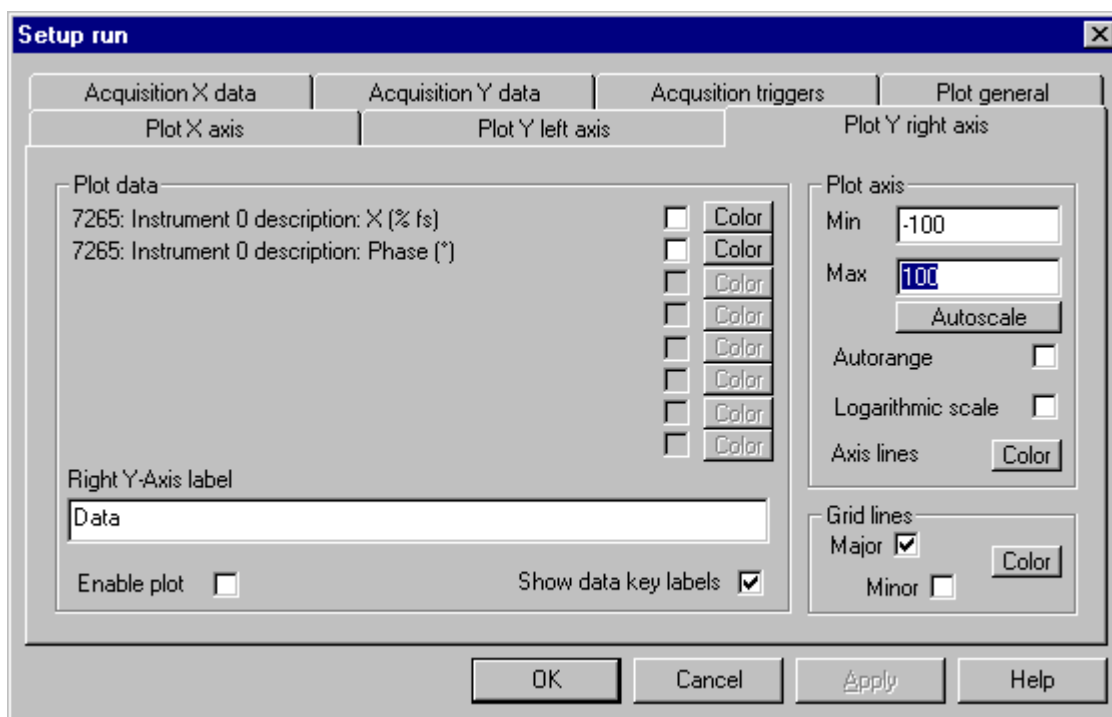


Figure 3-11, Plot Y Right Axis Property Page

The **Plot Data** controls specify the data curves that will be display and plotted against the right hand Y axis. Each curve can be turned on or off by checking the appropriate box, and the line colors can be specified. The right Y axis label automatically shows the curves selected, but can be edited to make the display more meaningful. The **Enable plot** check box turns the display of this axis on or off, while the **Show data key labels** checkbox determines whether color coded text will appear above the axis allowing the various data curves to be identified. It is most useful when plotting more than one curve per axis.

The **Plot Axis** controls define how the plot axis will appear. Clicking **Autoscale** sets the axis minimum and maximum values to accommodate the full rage of data. The axis line color can be adjusted, and the axis plotted in linear or logarithmic modes. When the **Autorange** checkbox is checked and data is being acquired then the plot automatically re-scales during acquisition to show the available data.

The **Grid lines** controls are used to turn major and minor grid lines on or off, and to define their color.

3.4.7 Plot General

This page, shown in figure 3-12 below, specifies general plot properties such as the plot title and frame color, as well as providing a notepad where notes about the data set can be recorded.

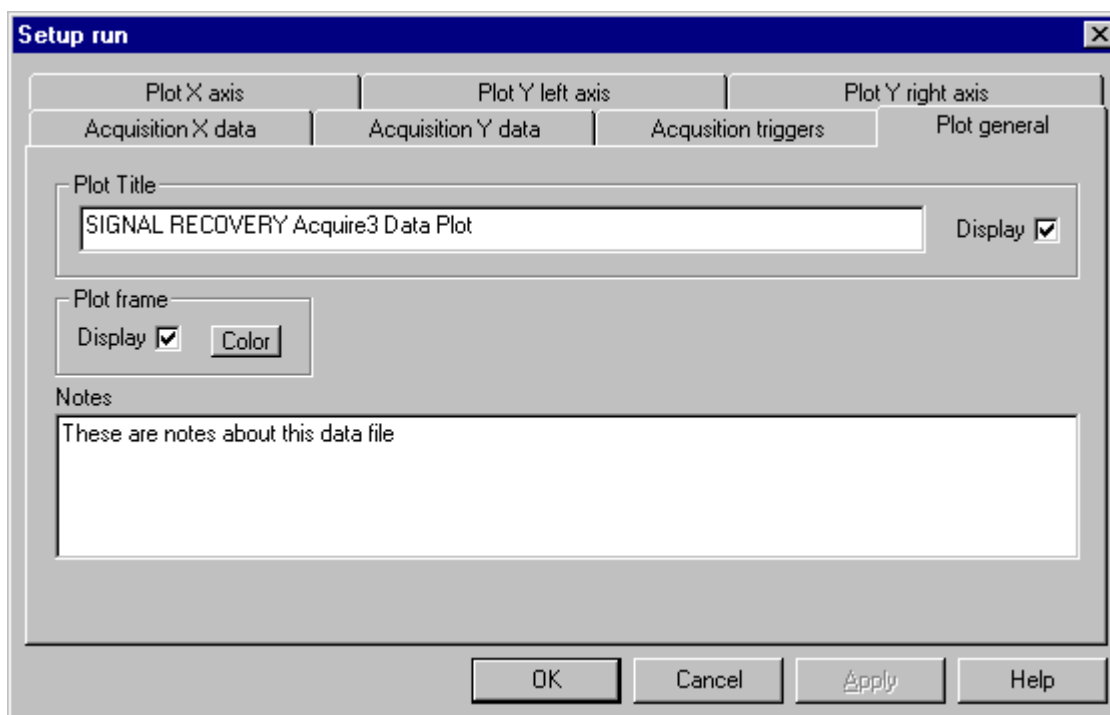


Figure 3-12, Plot General Property Page

The **Plot Title** edit box defines the title that will appear above the plot, and whether it will be shown. The **Plot Frame** control sets the color of the rectangular frame around the plot, and whether it is present. Finally, the **Notes** field allows you to record notes that are stored with the file, allowing easier file identification in the future.

3.4.8 Running an Experiment

Once an experiment has been fully defined, it can be started using either the toolbar



button or via the **Measure Start Experiment** menu item. The program then sets up the acquisition; as it does so the dialog shown in figure 3-13 below is displayed

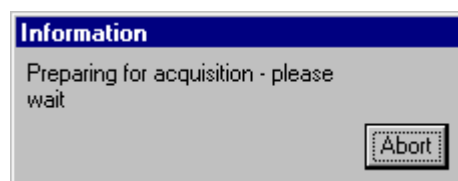


Figure 3-13, Information Dialog, Preparation Stage

If a triggered mode of acquisition has been selected then it displays a trigger monitor box during the periods it is waiting for a trigger signal. In all modes it identifies the number of data points acquired, both in the Information box and on the status bar.

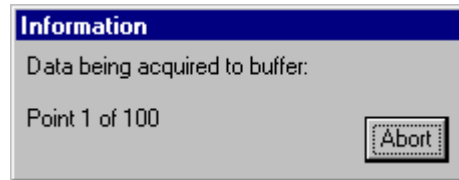


Figure 3-14, Information Dialog, Buffered Acquisition

Clicking Abort, clicking the  toolbar button, or selecting the **Measure Stop Experiment** menu item all stop acquisition at the current point. Otherwise it continues until the specified number of steps have been completed.

3.4.9 Plotting Data

Data is plotted to screen either as it is acquired, for the Normal acquisition mode, or at the end of an experiment when using Buffered or Transient Recorder modes. A typical data plot is shown below in figure 3-15.

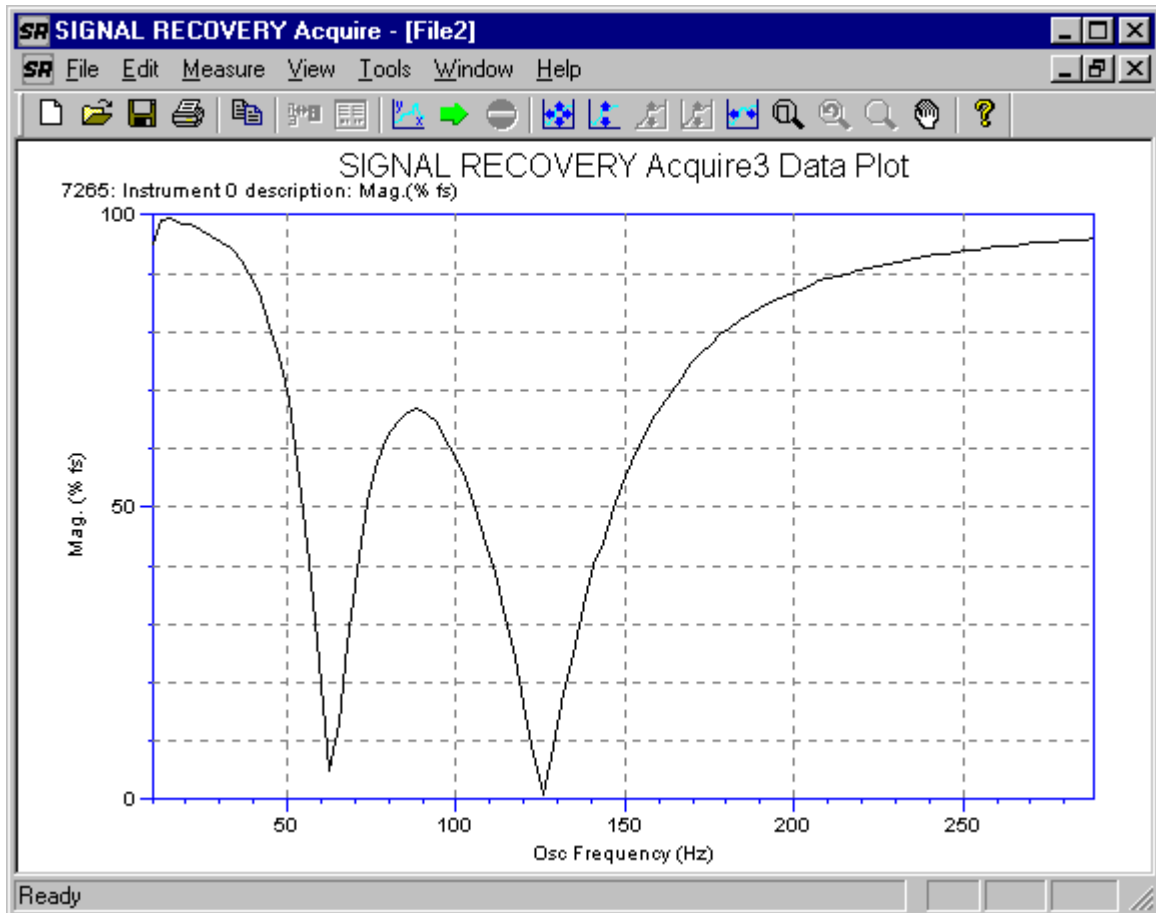


Figure 3-15, Typical Data Plot

The data plot appearance can be adjusted either by selecting **Edit Plot Properties** from the menu or by positioning the mouse cursor in the plot window but outside the

plot frame and then double-clicking the left mouse button. This displays the **Edit Plot Properties** property sheet, with the four pages **Plot X Axis**, **Plot Y Left Axis**, **Plot Y Right Axis** and **Plot General**



To zoom in on a particular feature, click the  button. The cursor changes to a magnifier. Move the cursor to the upper left hand corner of the region to be zoomed and then press and hold down the left mouse button. Drag the cursor to the lower right hand corner of the region to be zoomed and release. The selected region will then be expanded to fill the whole plot area. Up to 30 zoom steps can be carried out successively.



To unzoom by one step, click the  button. To restore the plot to the condition it was in before any zoom had been applied, click the  button.

Auto-scaling of axes to fit the available data is done with the following buttons:



Auto-scales the current plot's X, Left Y and Right Y axes



Auto-scales the current plot's Left Y axis



Auto-scales the current plot's Right Y axis



Auto-scales the current plot's X axis



It is also possible to pan the data plot. Click the  button and the cursor changes to an open hand. Move the cursor into the plot region and then press and hold down the left mouse button - the cursor will now change to a closed hand. Drag the cursor to the required position, which will pan the plotted data to the same position.

3.4.10 Saving and Exporting Data

Whenever a data plot is displayed, it can be saved to file in native Acquire3 data format, exported as an ASCII or CSV text file, or copied to the Windows clipboard so that it can be pasted into other applications.

To save data, use the **File Save** or **File Save As** menu commands. Acquire 3 data files have a default extension of ".lia". This file format contains all the experiment settings, including the settings of the connected hardware, as well as any acquired data and all plot definitions.

To export the data, use the **File Export File** menu item, and choose the required data

format. CSV (comma separated value) files are most useful since they can be directly loaded into Excel and many other applications. The CSV output format has the first row giving the data column headers, with each subsequent row being the data points. A typical section of such a file is shown below in table 3-1. Note that the first column is always the point number, and the second is the time. The next three columns are the dependent output curves (if any) while the final 8 columns represent stored Y data curves.

Points	Time s	7265: Instrument 0 description: Osc Frequency Hz	7265: Instrument 0 description: Mag.(% fs) % fs	7265: Instrument 0 description: Phase (°) °
0	0	1.00E+01	8.91E+01	-1.11E+00
1	0.28	1.19E+01	9.92E+01	-9.83E+00
2	0.5	1.38E+01	9.87E+01	-1.24E+01
3	0.72	1.57E+01	9.79E+01	-1.49E+01
4	1.05	1.76E+01	9.69E+01	-1.87E+01
5	1.27	1.95E+01	9.63E+01	-2.01E+01
6	1.54	2.14E+01	9.52E+01	-2.35E+01
7	1.82	2.33E+01	9.40E+01	-2.64E+01

Table 3-1, ASCII Text File Output Format

The displayed plot can be copied to the clipboard by clicking the  button.

3.4.11 Loading Data

Stored Acquire3 data files can be loaded using the **File Open** menu command. Note that this action does not cause the program to reload the hardware settings, but it does load plot settings and other experiment definitions.

In order to repeat an earlier experiment, create a new empty data file and then click the



button to open the Define Experiment dialog. Then use Load Experiment to load the complete experiment from the required data or experiment file. This action will reload all experiment settings, including the instrument hardware settings.

3.5 Menu and Toolbar Reference

Main Menu

The software the Main Menu has six or seven items, depending on the current operating mode, as per the following table:

Menu	Options	Effect
File	Open	Displays a file selection dialog allowing an Acquire data file (*.lia) to be opened
	New	Creates a new Acquire data file in the plot window
	Close	Closes the current Acquire data file in the plot window. If this has changed since it was last saved, prompts the user as to whether it should be saved.
	Save	Saves the current Acquire data file in the plot window.
	Save as...	Saves the current Acquire data file in the plot window to a new file.
	Export file...	Saves the current Acquire data file in the plot window to a new ASCII text file, either in plain text or as CSV (comma separated values). The latter format is suitable for direct import to many programs, including Microsoft Excel.
	Clear data	Deletes the currently displayed data curves. Note that these will remain in the file until the displayed plot is saved.
	Print, Print Setup	Used to print the current plot window.
	Print Preview	Used to preview the current plot window.
	Exit	Closes the program and terminates any open Remote Front Panel
Edit	Plot Properties	Displays a subset of the main Run Setup property pages, allowing plot -specific adjustments to the displayed data to be made.
Measure	Copy to clipboard	Copies plot to Windows clipboard
	Define experiment...	Opens the Define Experiment dialog, from which the attached instruments can be controlled and the experiment defined. In addition, experiments can be saved and recalled from file.
	Start experiment	Starts data acquisition according to the current experiment definition
Hardware	Stop experiment	Stops data acquisition at the current point
	Instrument connections...	Searches for connected instruments and opens the Instrument connections dialog
	Control xxxx	Opens a Remote Front Panel for the instrument identified by “xxxx”
Tools	Options	Displays dialog allowing product activation code to be entered, as well as selecting whether the experiment definition should be saved on exit and/or reloaded on startup

View	Toolbar	Toggles display of toolbar
	Status Bar	Toggles display of status bar
Window	Cascade, Tile, Arrange Icons	Used to select the displayed window arrangement
Help	Contents	Displays contents of the Help files
	About Acquire	Displays program type and revision information

Toolbar

In the full Acquire software the Toolbar has twenty buttons, as follows:



Displays a file selection dialog allowing an Acquire data file (*.lia) to be opened



Creates a new Acquire data file in the plot window



Saves the current Acquire data file in the plot window



Used to print the current plot window



Copies plot to Windows clipboard



Searches for connected instruments and opens the Instrument connections dialog



Opens a Remote Front Panel for the first instrument listed in the Hardware menu



Opens the Define Experiment dialog



Starts data acquisition according to the current experiment definition



Stops data acquisition at the current point



Auto-scales the current plot's X, Left Y and Right Y axes



Auto-scales the current plot's Left Y axis



Auto-scales the current plot's Right Y axis



Auto-scales the current plot's Right and Left Y axes



Auto-scales the current plot's X axis



Used to zoom in on a selected plot region. Click the button and the cursor changes to a magnifier. Move the cursor to the upper left hand corner of the region to be zoomed and then press and hold down the left mouse button. Drag the cursor to the lower right hand corner of the region to be zoomed and release. The selected region will then be expanded to fill the whole plot area. Up to 30 zoom steps can be carried out successively.



Unzoom by one step at a time.



Zoom default. Restores plot to condition it was in before any zoom had been applied.



Pan plot. Click the button and the cursor changes to an open hand. Move the cursor into the plot region and then press and hold down the left mouse button - the cursor will now change to a closed hand. Drag the cursor to the required position, which will pan the plotted data to the same position.



Displays the program's About dialog

RS232 Cable Diagrams

A.1 Introduction

RS232 serial ports may be configured as one of two types, these being DTE (data terminal equipment) and DCE (data communications equipment). All

SIGNAL RECOVERY lock-in amplifiers are configured as DTE devices, which is the same as most personal computers. Consequently, in order to satisfactorily connect a lock-in amplifier to a computer it is necessary to use a *Null Modem* (also known as a *Modem Eliminator*) cable.

For historical reasons units are fitted with one of three types of RS232 serial interface connectors, which when taken with the fact that the serial port on the computer may be fitted with either a 9-pin or 25-pin connector, means that one of six types of cable will be needed.

This chapter shows the connection diagrams for all six types of cable, which should prove of use to readers with reasonable practical skills who would like to assemble their own interconnecting cables.

A.2 Diagrams

Models 5105 and 5106 to computers with 9-pin serial connectors.

These units require a 9-pin female to 9-pin female null modem cable.

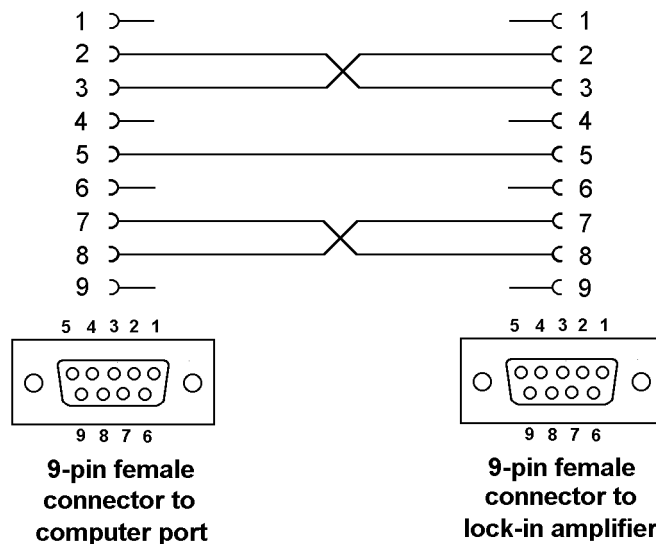


Figure A-1, Interconnecting RS232 Cable for Models 5105 & 5106 to computers with 9-pin Serial Interface Connectors

Models 5105 and 5106 to computers with 25-pin serial connectors.

These units require a 25-pin female to 9-pin female null modem cable.

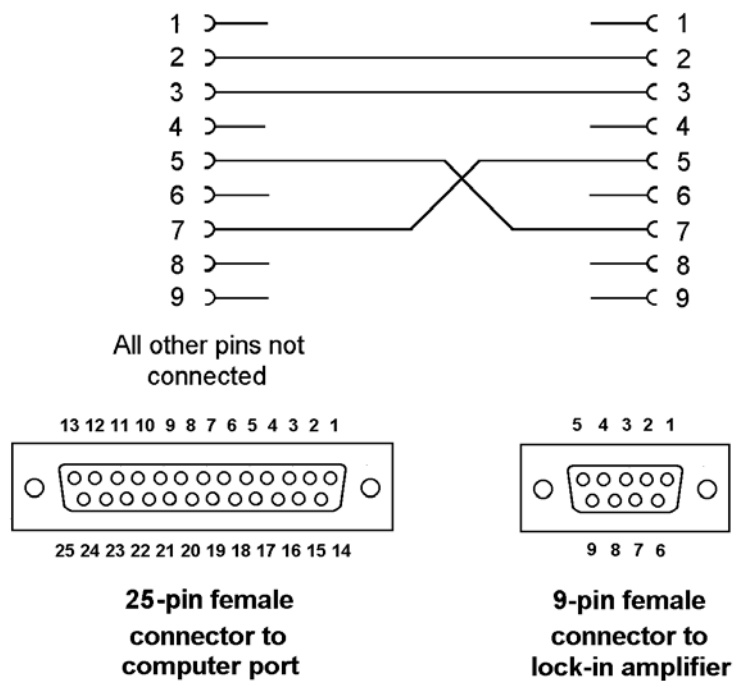


Figure A-2, Interconnecting RS232 Cable for Models 5105 & 5106 to Computers with 25-pin Serial Interface Connectors

Models 5110, 5209, and 5210 to computers with 9-pin serial connectors.

These units require a 9-pin female to 25-pin male null modem cable.

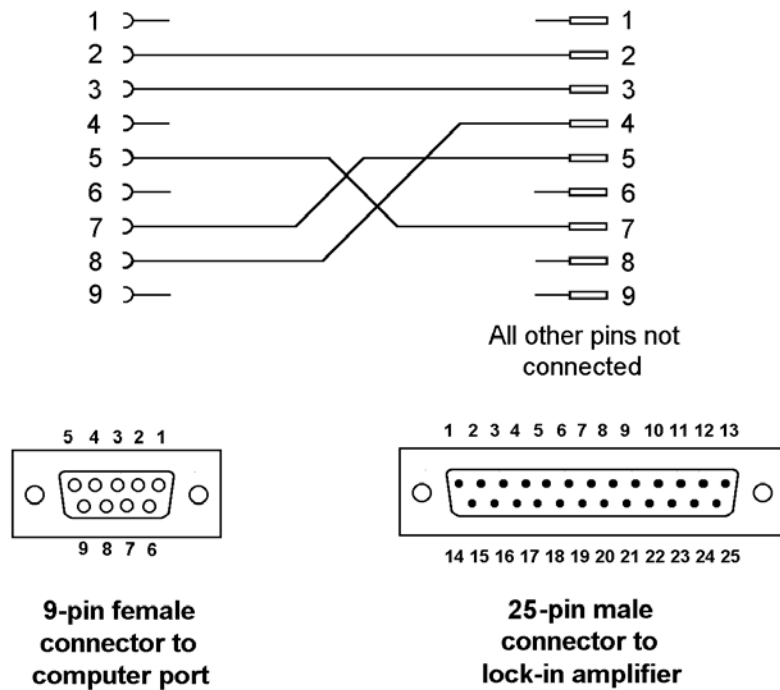


Figure A-3, Interconnecting RS232 Cable for Models 5110, 5209 and 5210 to Computers with 9-pin Serial Interface Connectors

Models 5110, 5209 and 5210 to computers with 25-pin serial connectors.

These units require a 25-pin female to 25-pin male null modem cable.

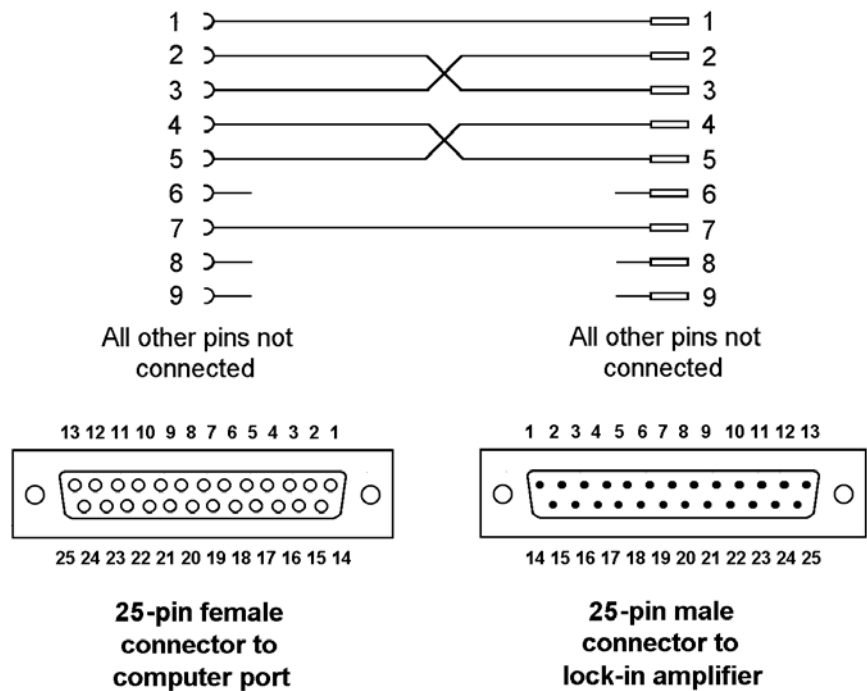


Figure A-4, Interconnecting RS232 Cable for Models 5110, 5209 and 5210 to Computers with 25-pin Serial Interface Connectors

Models 7220, 7225, 7225BFP, 7260, 7265, 7280 and 7280BFP to computers with 9-pin serial connectors.

These units require a 9-pin female to 9-pin male null modem cable.

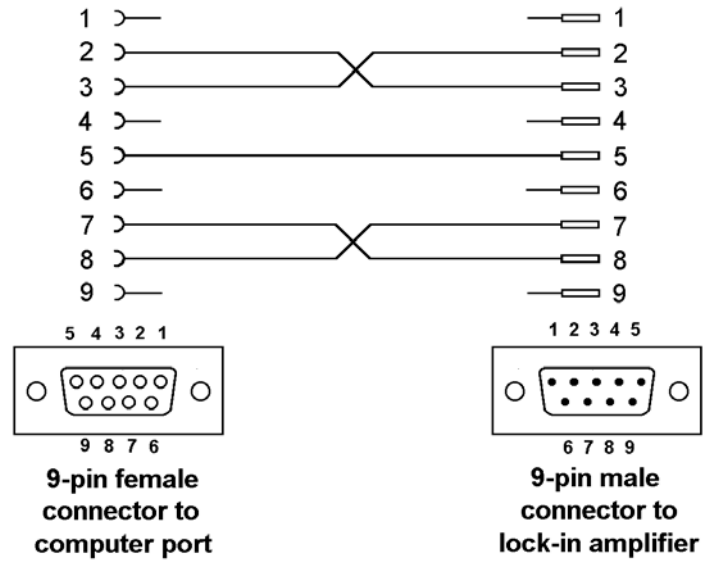


Figure A-5, Interconnecting RS232 Cable for Models 7220, 7225, 7225BFP, 7260, 7265, 7280 and 7280BFP to Computers with 9-pin Serial Interface Connectors

Models 7220, 7225, 7225BFP, 7260, 7265, 7280 and 7280BFP to computers with 25-pin serial connectors.

These units require a 25-pin female to 9-pin male null modem cable.

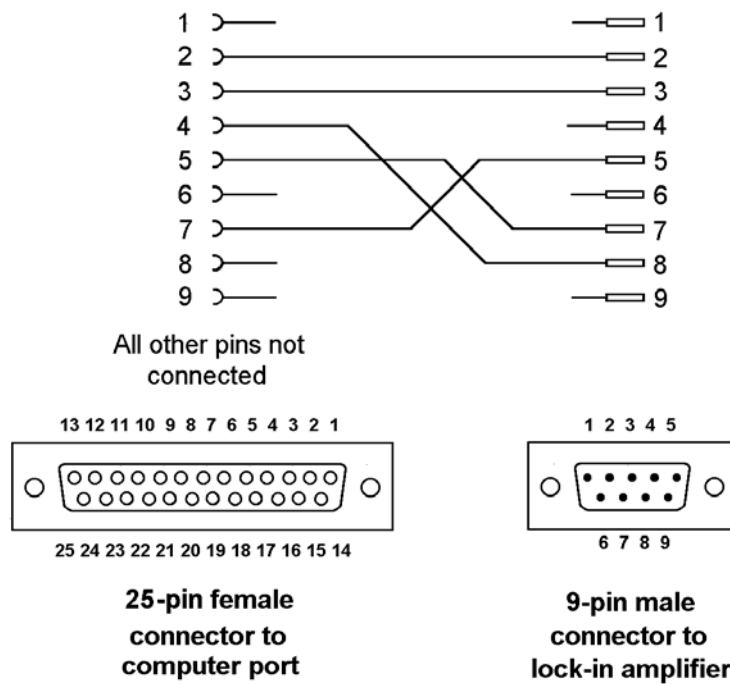


Figure A-6, Interconnecting RS232 Cable for Models 7220, 7225, 7225BFP, 7260, 7265, 7280 and 7280BFP to Computers with 25-pin Serial Interface Connectors

ASCII Text File Structure

Appendix B

B.1 Introduction

Data acquired by the Acquire™ lock-in amplifier applications software may be saved as an ASCII text file for import to other software packages. Two formats are offered, these being basic ASCII text and comma separated values (CSV). This appendix describes the format of such files to make it easier for users to design suitable import routines for these other packages.

B.2 .TXT file format.

Exported text files are by default given the file name extension “.txt”, although this may be overridden if required.

A typical data file listing is as follows:-

The first line consists of column headers, with a tab character between each item.

```
Points      Time s 7265: Instrument 0 description: Osc Frequency Hz
              7265: Instrument 0 description: Mag.(% fs) % fs      7265:
Instrument 0 description: Phase (°) °
```

Column 1 is always Points, and Column 2 is Time. The next three columns are the dependent output variable excitation curves, data for which will only be present if these are active. The remaining 8 columns are the acquire data curves.

The remaining lines are the data, with one line per point.

0	0.000000	1.000000e+001	9.480000e+001	-1.760000e+000
1	0.270000	1.290000e+001	9.890000e+001	-6.490000e+000
2	0.490000	1.580000e+001	9.914000e+001	-8.900000e+000
3	0.770000	1.870000e+001	9.828000e+001	-1.169000e+001
4	1.040000	2.160000e+001	9.809000e+001	-1.429000e+001
5	1.370000	2.450000e+001	9.722000e+001	-1.776000e+001
6	1.640000	2.740000e+001	9.623000e+001	-2.010000e+001
7	1.920000	3.030000e+001	9.519000e+001	-2.312000e+001
8	2.140000	3.320000e+001	9.395000e+001	-2.611000e+001
9	2.360000	3.610000e+001	9.212000e+001	-2.981000e+001
10	2.580000	3.900000e+001	8.969000e+001	-3.410000e+001

Data points are shown in floating point notation.

B.3 .CSV file format.

Exported CSV (comma separated value) files are by default given the file name extension “.csv”, although this may be overridden if required.

A typical data file listing is as follows:-

The first line consists of column headers, with a comma character between each item.

```
Points ,Time s,7265: Instrument 0 description: Osc Frequency Hz, ,
,7265: Instrument 0 description: Mag.(% fs) % fs,7265: Instrument 0
description: Phase (°) °, , , , , , ,
```

Column 1 is always Points, and Column 2 is Time. The next three columns are the dependent output variable excitation curves, data for which will only be present if these are active. The remaining 8 columns are the acquire data curves.

The remaining lines are the data, with one line per point.

```
0,0.000000,1.000000e+001,,,9.480000e+001,-1.760000e+000,,,,,,,,,
1,0.270000,1.290000e+001,,,9.890000e+001,-6.490000e+000,,,,,,,,,
2,0.490000,1.580000e+001,,,9.914000e+001,-8.900000e+000,,,,,,,,,
3,0.770000,1.870000e+001,,,9.828000e+001,-1.169000e+001,,,,,,,,,
4,1.040000,2.160000e+001,,,9.809000e+001,-1.429000e+001,,,,,,,,,
5,1.370000,2.450000e+001,,,9.722000e+001,-1.776000e+001,,,,,,,,,
6,1.640000,2.740000e+001,,,9.623000e+001,-2.010000e+001,,,,,,,,,
7,1.920000,3.030000e+001,,,9.519000e+001,-2.312000e+001,,,,,,,,,
8,2.140000,3.320000e+001,,,9.395000e+001,-2.611000e+001,,,,,,,,,
9,2.360000,3.610000e+001,,,9.212000e+001,-2.981000e+001,,,,,,,,,
10,2.580000,3.900000e+001,,,8.969000e+001,-3.410000e+001,,,,,,,,,
```

Data points are shown in floating point notation.

C.1 Introduction

This appendix provides details of the software license and support policy which applies to the Acquire™ Lock-in Amplifier Applications Software and discusses how you may obtain help in using the product from us. It also discusses how you may help us by reporting any errors you discover and making suggestions for new features.

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This Agreement will be governed by the laws of the state of Tennessee, USA.

C.3 Software Registration

SIGNAL RECOVERY will provide technical support in the use of the Acquire™ Lock-in Amplifier Applications Software to one registered, named, user for each copy purchased. In order to allow this to operate you must therefore complete the software activation process described in this manual.

Once registered, you may then telephone, fax or e-mail your query to the **SIGNAL RECOVERY** office in Wokingham, UK. You must give the unique Installation Code and Version number (from the Tools Options dialog), together with the registered user's name, on each occasion you contact us, or support will be denied.

If at all possible, when telephoning for advice, please be in front of the computer and lock-in amplifier you are using, so that you may immediately try our suggestions. You must also be able to tell us the type of computer and computer interface you are using, the version of the Acquire™ software and the version of Windows.

Registered users of the software will also be informed of future product upgrades and enhancements.

C.4 Software Errors

The Acquire™ software has been extensively tested prior to release, but it is possible that some errors remain which were not revealed by the testing process.

SIGNAL RECOVERY would very much appreciate receiving, by e-mail to service@signalrecovery.com or by post or fax to the Wokingham, UK, office, written notification of any problems you discover.

When reporting problems please try to be as specific as possible. Include details of the type of instrument used, the revision level of the instrument firmware and the type of interface and computer used.

If you feel there is a specific feature which would add to the software's functionality then please also do let us know. Naturally we cannot commit ourselves to adding any given new feature, but even so such suggestions are useful in identifying those areas in which the product may be improved.

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A. Contact **SIGNAL RECOVERY** at the address below.

B. We will need the following information.

- | | |
|---|---|
| 1. Product Installation Code and Version Number of the software, and the model number(s) of the lock-in amplifier(s) being used | 4 Your telephone number and extension or e-mail address |
| 2. Your name (instrument user) | 5. Symptoms (in detail, including control settings) |
| 3. Your address | |

C. For support on this product please contact:

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