Instruction Manual

OR 100 Viewer & ACRAWin32
(Data Viewer Software for OR 100 / OR 1400 / ORM)
OR 100 Connector
(Communication Software for OR 100)

IM 789501-61E

YOKOGAWA ◆

Precautions

Storage of Original Floppy Disk

Store the original floppy disk you purchased (containing the utility software) in a secure place. The software should be installed and run on the hard disk.

Make a Backup Copy

Before installing the software, make a backup copy of the purchased original floppy disk to another disk (DOS 1.44 MB, 2HD). During the installation procedure and operations, use this disk copy.

Agreements

Restrictions on Use

Use of this utility software and manual by more than one computer at the same time is prohibited. Use by more than one user is also prohibited.

Transfer and Lending

Transfer or lending of this product to any third party is prohibited.

Guarantee

Should a physical deviancy be found on the original floppy disk or this manual upon opening the product package, please promptly inform Yokogawa. Only if this claim is made within seven days from the date you received the product can it be replaced with a new one free of charge.

Force Majeure

Yokogawa Electric Corporation provides no guarantee other than for physical deviancies found on the original floppy disk or this manual upon opening the product package.
Yokogawa Electric Corporation shall not be held responsible by any party for any losses or damage, direct or indirect, caused by the use or any unpredictable defect of the product.

System Requirements

PC Requirements

A PC that can run Windows 95, or Windows NT 4.0 or later; CPU: Pentium 90 MHz or higher ; 16 MB or more RAM, 5MB or more HDD.

Operating System

Windows 95, or Windows NT 4.0 or later.

Disk Drive

3.5 Floppy disk drive, DOS 1.44 MB.

CRT, Printer, Mouse

Supporting Windows 95, or Windows NT 4.0 or later.

Serial Port / Modem

When using communication software (OR 100 Connector), the PC needs to either have a serial port (RS-232) or a modem connection, to establish contact. The OS must also recognize them.

RS-232 Cable, adapter

For serial communication, SD/RD*, or RS/CS* reversely connected RS-232 cable is required.
*RS-232 regular abbreviations: SD: Send Data; RD: Read Data; RS:Request to send; CS: Clear to Send.
The following products can be used as RS-232 cable and adapter:
RS-232 cable (for DOS-V) : D09-9F25F (SANWA SUPPLY Inc.)
Adapter : KRS-007K (SANWA SUPPLY Inc.)

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Contents

Software Functions

In this User's Manual you will find operation instructions for the following three software products:

'ACRAWin 32' Data Viewer Software
This software enables you to view data you have saved to a PC card (OR 100) or floppy disk (OR1400 / ORM) on a PC. The data are convertible to ASCII, Lotus, and Excel formats.

'OR 100 Viewer' Data Viewer Software
Enables you to view OR 100 measurement data saved to a PC card on a PC. The data can be converted to ASCII, Lotus, and Excel formats.

'OR 100 Connector' Communication Software
Enables you to receive OR 100 measurement data or set information using communication circuits like a RS-232 or modem. Information changed with a PC can also be send to OR 100.

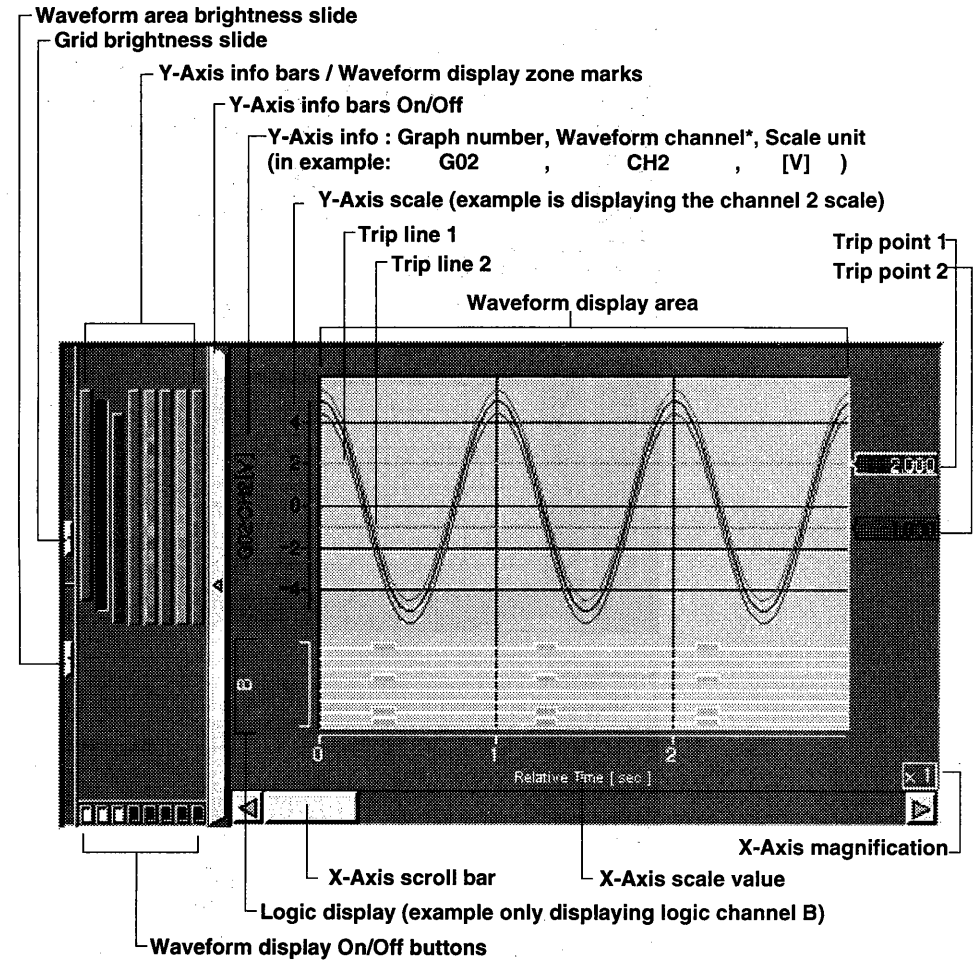
ACRAWin 32 –not the OR 100 Viewer– is mainly focussed on when Data Viewer Software is explained.

The software package you have purchased:

Software Package Model	789501	789502	789503
Software	OR 100 Viewer OR 100 Connector	ACRAWin 32	ACRAWin 32 OR100 Connector
Object	OR 100	OR 100 / OR 1400 / ORM	0R 100 / OR 1400 / ORM

Waveform Display

Hereunder an example of a waveform display screen.



*** If you add a tag to OR 100 measurement data it will replace the channel.**

- **Y-Axis Settings**
  It is possible to set a number Y-Axis display conditions.

  Waveform Display On/Off (page 2-5)
  Select the waveform you want to display by clicking the Waveform display On/Off buttons. The maximum amount of waveforms is 16.

  Logic Display On/Off (page 2-7)
  If you obtained logic data you can display them on screen.

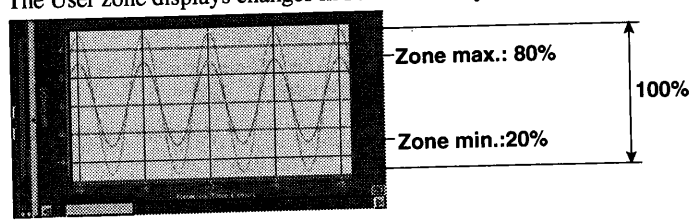
  Channel Assignment (page 2-5)
  Assign a graph number to each channel. You can also assign the same channel to multiple graph numbers. If you wish to totally remove a channel from the Y-Axis info bar set the channel to 'None' in the detailed Y-Axis check box list.

  Scales (page 2-5)
  You can set a minimum and maximum value for the Y-Axis scale.

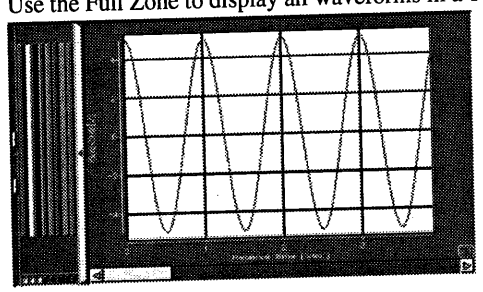
Display Zones (page 2-2, 2-3)

You may want to change waveform positions in Y-Axis direction. Please use the following 4 zone settings:

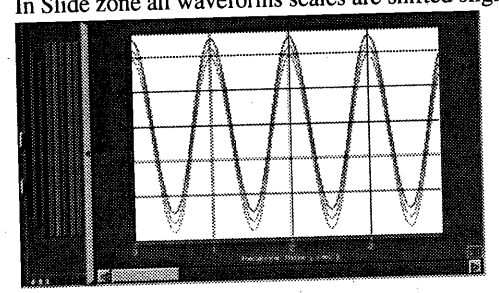
- User Zone
  The User zone displays changes in zone value if you have set these in the Y-Axis check box.



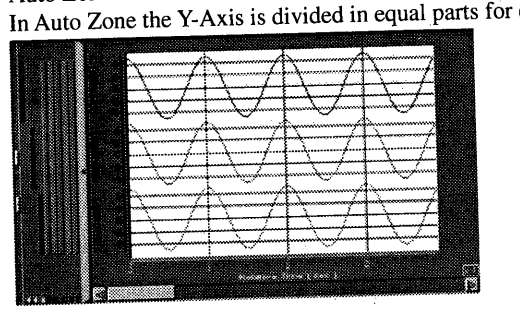
- Full Zone
  Use the Full Zone to display all waveforms in a 100% zone range.



- Slide Zone
  In Slide zone all waveforms scales are shifted slightly from top to bottom.



- Auto Zone
  In Auto Zone the Y-Axis is divided in equal parts for each selected waveform.



Trip Points (page 2-6)

If you want to mark a certain point on a waveform use the two so-called 'trip' points. For each waveform you can set two horizontal trip lines in the detailed Y-Axis check box.. The value at the trip point is displayed in the trip label on the right side of the waveform display area.

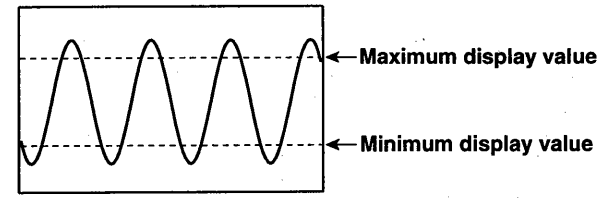
Color Display (page 2-6)

You can set a whole scale of colors for waveforms to improve clarity.

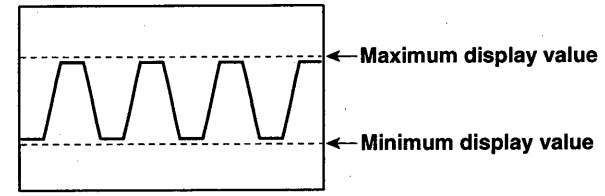
Display Limiter (page 2-4)

If a waveform exceeds the maximum or minimum value of the screen display area, you can choose to limit the waveform. Then the invisible part of the waveform will be displayed as a horizontal line within the display area.

- Waveform without limiter:



- Waveform with limiter:



X-Axis Settings

You can set the following X-Axis conditions:

Total Waveform Display (page 2-8)

If a waveform exceeds the X-Axis length of the waveform display area, you can use this function to compress the whole waveform to fit in the display area.

Zoom (page 2-8)

You can set an exact zoom factor, or use the auto zoom for factor 1-2-5 reduction or enlargement.

X-Axis Scale (page 2-8)

Select one of the following X-Axis scales:

- Actual time scale
  Scale that displays the time at the actual time of measurement. The display form automatically changes depending on the time length of the waveform in the display area.

Display form	Example	X-Axis Scale Title
Year / Month / Day	1997/08/01	Date Time
Month / Day Hour:Minute	08/01 14:55	Date Time
Hour:Minute:Second	14:55:23	Date Time
Hour:Minute:Second:Millisecond	14:55:23:99	Date Time

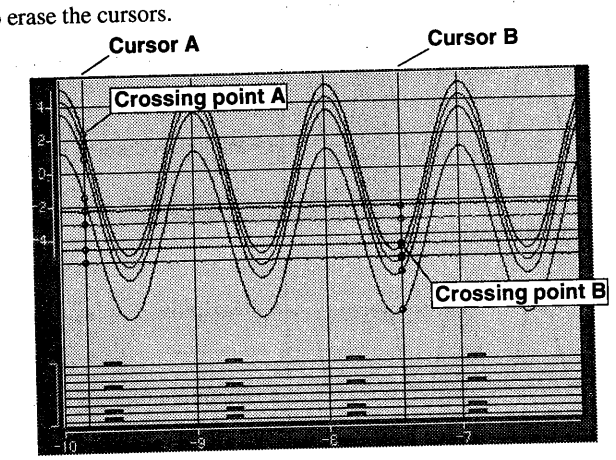
- Relative time scale
  Scale which displays the relative time from a base data point. You can choose the first measured data point or a trigger point as time base. The display form automatically changes depending on the time length of the waveform in the display area.

Display form	Example	X-Axis Scale Title
Hour:Minute	23:59	Relative Time [H:M]
Hour:Minute:Second	23:59:59	Relative Time [H:M:S]
Second	5.000	Relative Time [sec]
Millisecond	5.000	Relative Time [msec]
Microsecond	5.000	Relative Time [usec]

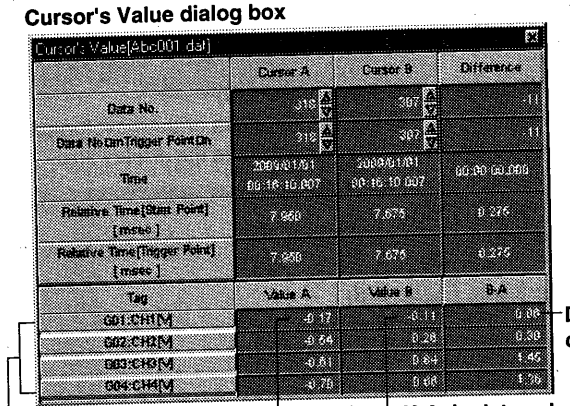
- Data number scale
  Scale which displays the number of measured data points starting from base data number zero. You can choose the first measured data point or a trigger point as data base. The X-Axis scale title is 'Data No.'.

Cursor Measurement (page 2-9)

By pushing your mouse pointer at a certain point in the waveform display area and dragging it to another point you can appoint vertical cursors A and B. In the Cursor's Value dialog box you can read the values at the crossing of cursors and waveforms, and the value difference between the waveform crossing points of cursor A and B. The first appointed cursor is cursor A. It is possible to erase the cursors.



Cursor's Value dialog box



Statistical Calculations (page 2-10)

Five different statistical calculations on the data between cursor A and B can be viewed. The software makes the following calculations , the data number being 'n' and the total measurement value 'Xi'.

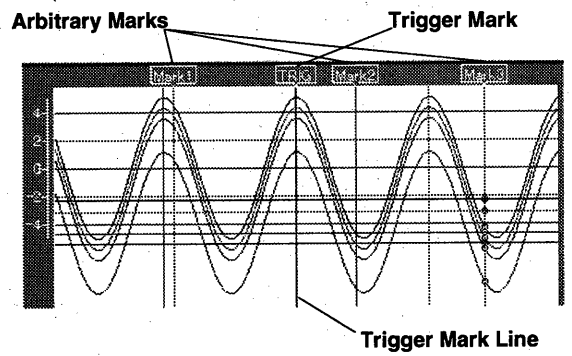
- Minimum value = $[X_i]_{min}$
- Maximum value = $[X_i]_{max}$
- Peak-to-peak (p-p) value = maximum value – minimum value
- Average value = $\frac{1}{n}\sum_{i=1}^{n} X_i$
- Root-mean-square (RMS) value = $\sqrt{\frac{1}{n}\sum_{i=1}^{n} X_i^{\,2}}$

User Defined Marks (page 2-13)

You can set arbitrary 'user defined' marks in the waveform display area. Set them one by one, only using cursor A. If you want you can change the names of the marks. Delete all marks at once or only the desired ones by enclosing them between cursor A and B.

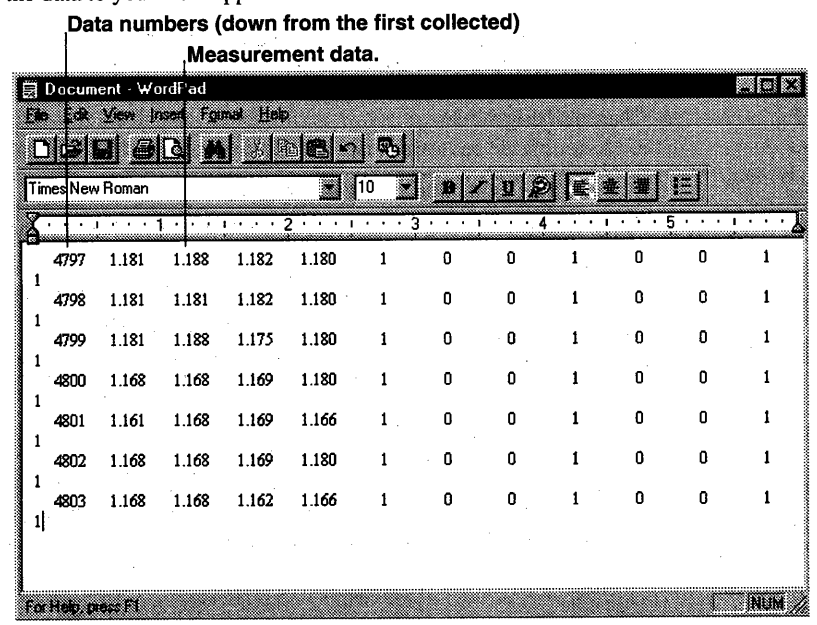
Trigger Marks (page 2-13)

For 0R 100, OR 1400, and ORM measurement data a trigger mark is displayed. The trigger mark will, however, not be displayed if triggering occurred before the first data were obtained. You may want to use the possibility to change the name of the trigger mark, or to remove it (by enclosing it between the two cursors and then delete). The initial trigger position and name (TRIG) can be restored (Edit > Reset Mark).



Notepad Copying (page 2-14)

Data you select between the two cursors can easily be copied to your PC's notepad. If you like, add the data to your PC's application software.

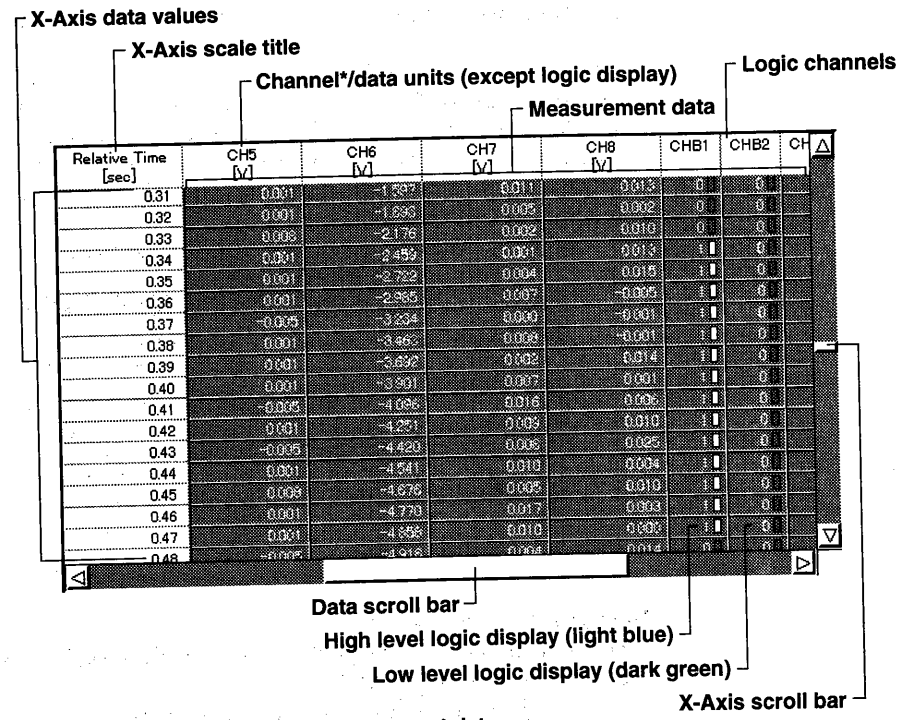


4797	1.181	1.188	1.182	1.180	1	0	0	1	0	0	1
1											
4798	1.181	1.181	1.182	1.180	1	0	0	1	0	0	1
1											
4799	1.181	1.188	1.175	1.180	1	0	0	1	0	0	1
1											
4800	1.168	1.168	1.169	1.180	1	0	0	1	0	0	1
1											
4801	1.161	1.168	1.169	1.166	1	0	0	1	0	0	1
1											
4802	1.168	1.168	1.169	1.180	1	0	0	1	0	0	1
1											
4803	1.168	1.168	1.162	1.166	1	0	0	1	0	0	1
1											

Copied are the channel data of all measurement files opened with Data Viewer software.

Digital Value Display

Measurement data can be viewed in tables.



*** If you add a tag to OR 100 measurement data it will replace the channel.**

Scales (page 2-5)

X-Axis scale and value display differ depending on the scale set for waveform display.

X-Axis scale title	Value display
Date Time	Year / Month / Day Hour:Minute:Second:Millisecond (example : 1997/08/01 14:55:23:999)
Relative Time	Hour:Minute:Second:Millisecond.Microsecond (example : 23:59:59:999.999)
Data No.	Same as waveform display

Cursor Measurement (page 2-9)

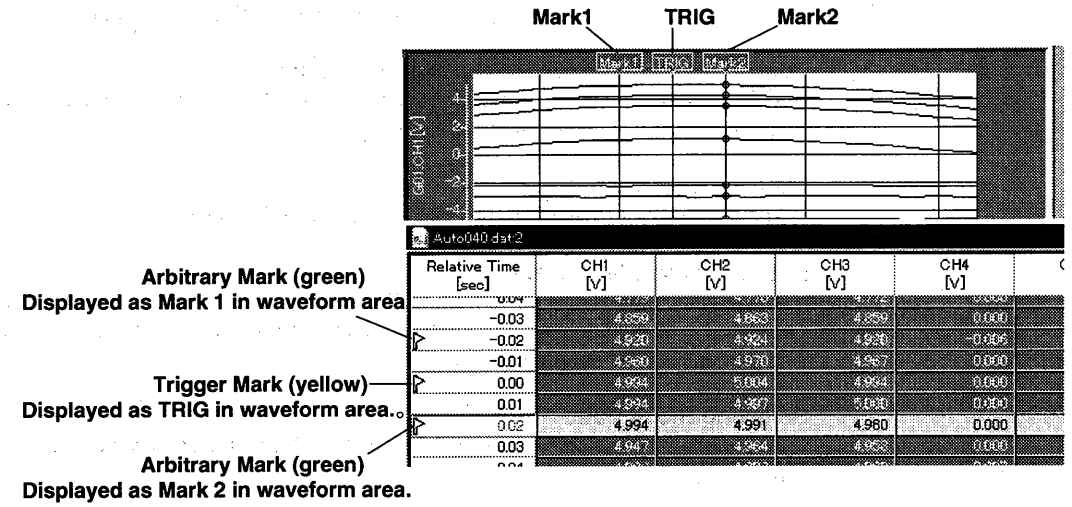
You can set cursor positions by pointing to a position in the X-Axis data value column (cursor A) and dragging it down to another position (cursor B). The Cursor's Value dialog box displays data values at the cursor positions and the value difference between the two cursors. Erase the cursors if you wish. Note that the waveform and digital display cursors are linked.

User Defined Marks (page 2-13)

You can set arbitrary marks as in the waveform display area. It's not possible to add mark names for digital value display.

Trigger Marks (page 2-13)

As in the waveform display area, you can display the trigger point for the OR 100, OR 1400, or ORM. It's not possible to add a name to trigger marks for digital value display.



Notepad Copying (page 2-14)

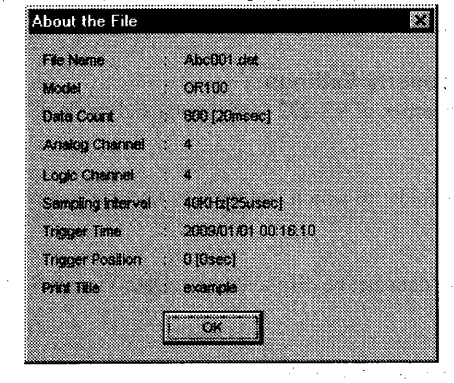
Data selected between the two cursors can be copied to your PC's notepad, as in the waveform display area. If you like, add the data to your PC's application software.

Saving Display Conditions (Page 2-15)

You can save the display conditions of waveform and digital display. Of one measurement data file, one display condition can be saved. For the saved file the extension '.dat' is automatically replaced by '.vho' in the case of the OR 100, and '.vor' for OR 1400 and ORM models.

Data Info Display (Page 2-1)

View file information as display below.



Converting the Data Format (Page 2-16)

You can convert measurement data - all, or only those between cursors - into three data formats: ASCII, Lotus and Excel. Automatically the extension of the converted files will be '.prn' for ASCII, '.wj2' for lotus (version 2.0 and later), and '.xls' for Excel (version 4.0 and later).

Printing (Page 2-23)

You can print waveforms and digital value display on an external printer.

Receiving / Transmitting Setting Information

The functions in this section are valid for communication software (OR 100 Connector) only. Using a communication circuit like RS-232 or a modem, it's possible to transmit OR 100 measurement data or setting information to a PC. Setting information changed with a PC can also be received by an OR 100.

Display of Last Access Time
The time OR 100 last received information transmitted by a PC is displayed.

Transmitting and Receiving Setting Information
Setting information from the OR 100 can be received by PC's, and setting data modified by a PC can be transmitted to the OR 100.

Time Synchronization
You can synchronize the OR 100 clock with the time of your PC.

Measurement after Access
Immediately after PC access to/from the OR 100 is aborted, you can choose to return to the OR measurement condition previous to the access (active or not). You can also choose to start or stop measurement after aborting access.

Selecting Block Data
Select which measurement data (devided in blocks) from the OR 100 you want your PC to receive.

Password
For modem communication a password may be entered. A wrong password will result in a communication error.

Adding / Modifying Access Points
You can save a whole list of access points with each of the above settings. In addition you can use the Cut-Copy-Paste options, to access points from one list to another or to delete access points.

Execute / Abort Communication
Your PC will contact the access points (with boxes checked) in list order. When access is achieved, OR 100 memory sampling will be suspended. After access is aborted sampling conditions will continue depending on the 'Measurement after Access' setting.
It is possible to abort access.

Communication Property Settings
You can set the properties of RS-232 (serial port) and modem.

Save to Folder
You can choose the folder to which you want to save measurement data.

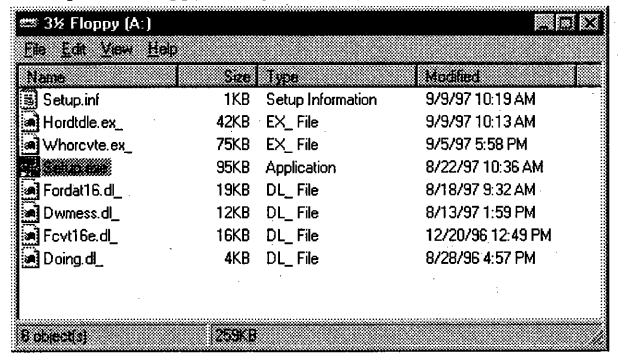
Data display
Saved measurement data can be displayed with Data Viewer Software.

Other displays
Log display of the last access status.
Toolbar and statusbar can be switched On/Off.

1.1 Setting up

Set this software up in the following manner:
1. Start Windows.
2. Insert a floppy containing a backup version of this sofware in the disk drive.
3. Double-click 3.5 Floppy in My Computer to open the 3.5 Floppy dialog box.

Example 3.5 Floppy dialog box.



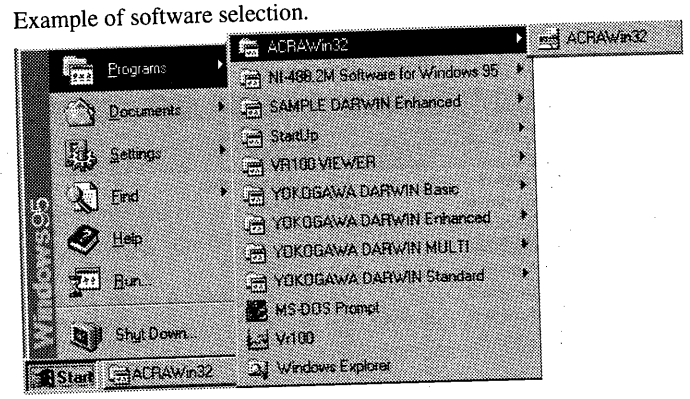
4. Setup will start after the 'Setup.exe' file is double-clicked.
Follow the instructions on your screen.

1.2 Starting and Quitting the Software

Starting the software

Click Start, point to Programs (Start >Programs), and then click the desired software.

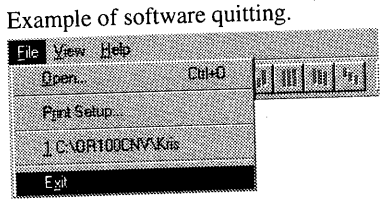
Example of software selection.



Quitting the Software

Select File > Exit (File followed by Exit), or Close the window.

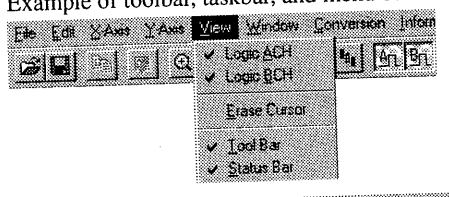
Example of software quitting.

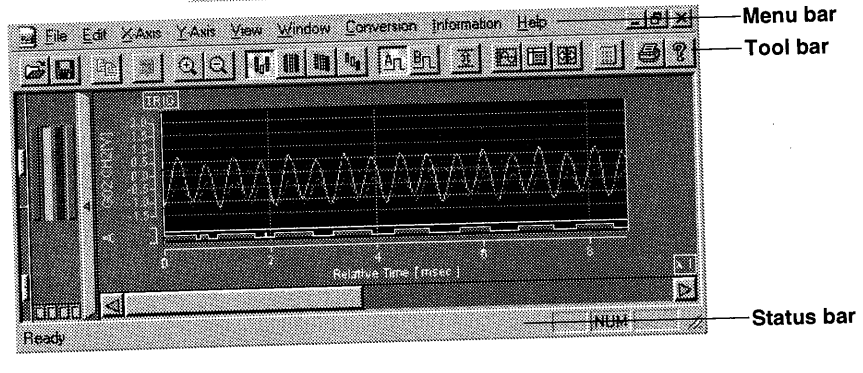


Toolbar / Taskbar Display

When starting the software toolbar and taskbar will be displayed.
Select View > Toolbar to remove or again display the toolbar.
Select View > Taskbar to remove or again display the taskbar.

Example of toolbar, taskbar, and menu bar.



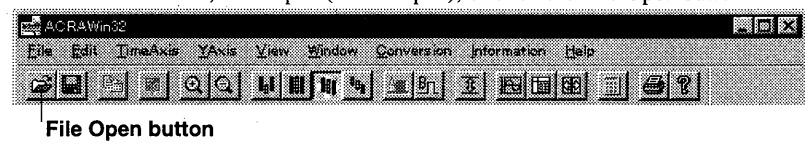


2.1 Displaying Waveforms Using Viewer Software

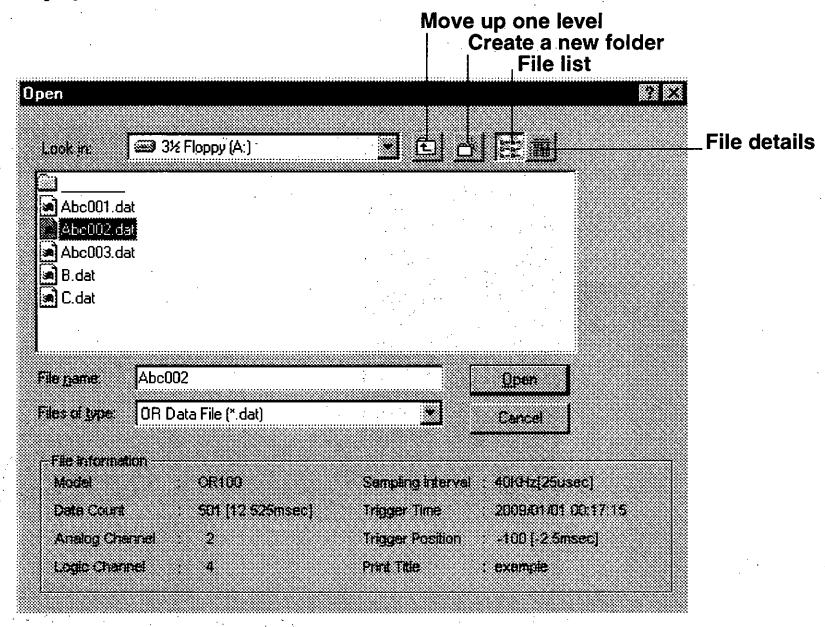
To view measurement data, first open your ACRA Win 32, or OR 100 Viewer data viewer software as discribed on page 1-2. Note that you can only use ACRA Win - not 0R 100 Viewer software to view data collected with OR 1400 or ORM.

Opening Files

1. Select the File Menu, then Open (File > Open), or click the File Open button on the toolbar.



2. Choose the desired file from the File Name box. Select a file with .dat extension. If necessary, select the file folder and the kind of file. Note that information will only be displayed if file data were collected with an OR model.



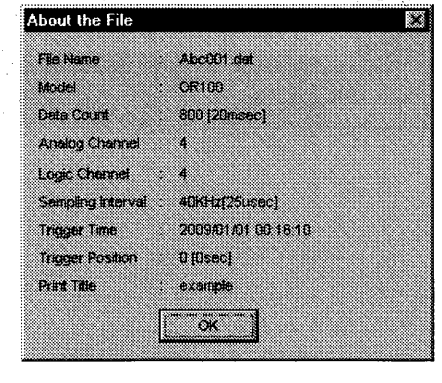
3. To displays the waveform, click Open.

Note

- It is possible to open more than one file at the same time.
- The number of data files you can open at the same time depends upon the memory size of your PC and the capacity of your floppy disk.
- It is handy to copy a data file from a floppy disk to the hard disk before using it.

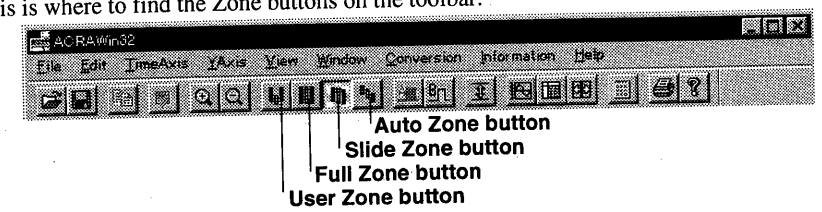
Viewing File Information

You can view file information on a displayed waveform by selecting Information and then About the file... (Information > About the file...).
The following information box will be displayed:



2.2 Waveform Display Zones

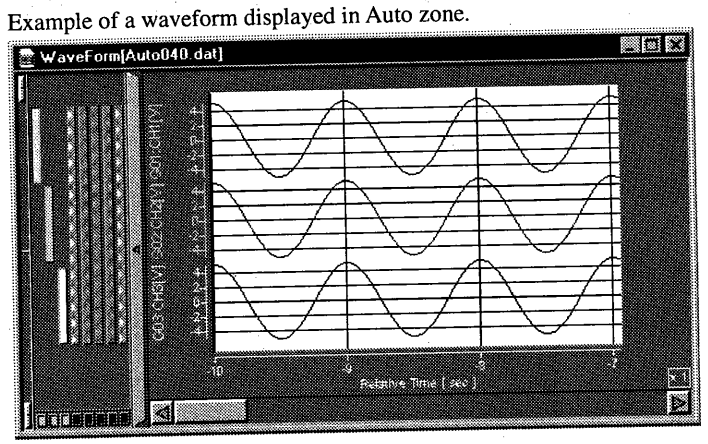
You can select four different waveform display zones: **Auto Zone** , **User Zone**, **Full Zone**, and **Slide Zone**. If you wish to display multiple waveforms, select the type of waveform display zone that suits your application best.
This is where to find the Zone buttons on the toolbar:



Auto Zone

In Auto Zone the Y-axis of the waveform display area is divided into equal parts for each selected waveform.
To display a waveform in Auto Zone, select Y-Axis > Zone > Auto Zone, or click the Auto Zone button on the toolbar.

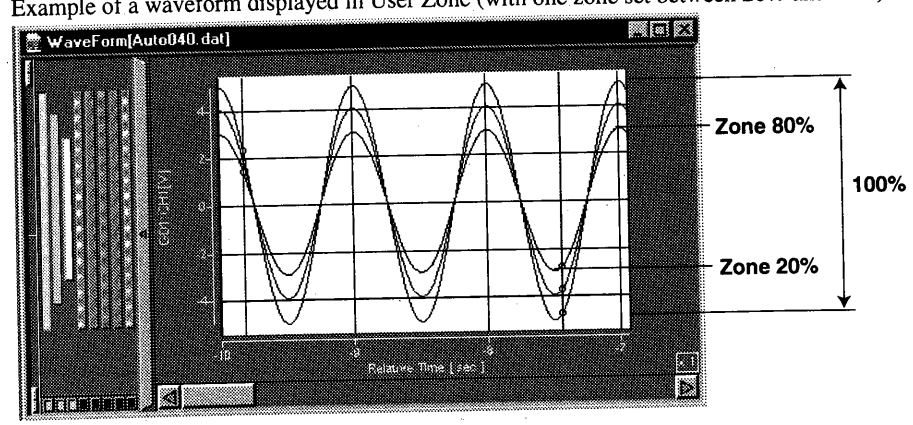
- Example of a waveform displayed in Auto zone.



User Zone

Waveforms in User Zone appear after you set the Y-Axis check box Details.
To display a waveform in User Zone, select Y-Axis > Zone > User Zone, or click the User Zone button on the toolbar.

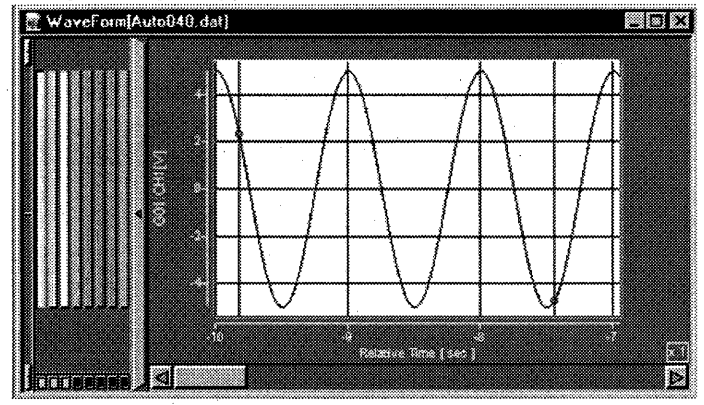
- Example of a waveform displayed in User Zone (with one zone set between 20% and 80%).:



Full Zone

To display a waveform in Full Zone, select Y-Axis > Zone > Full Zone, or click the Full Zone button on the toolbar.

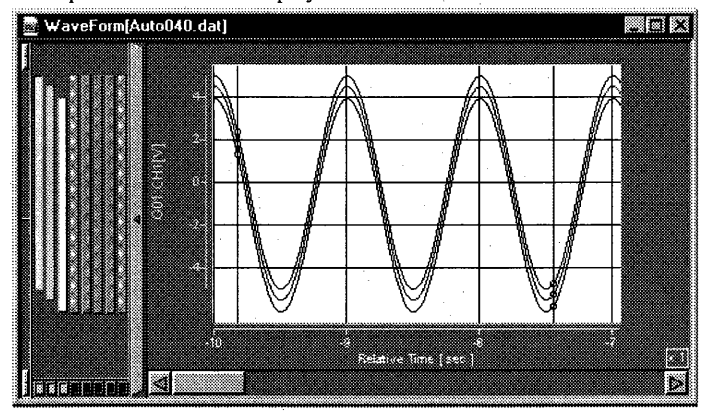
- Example of displaying a waveform using Full zone:



Slide Zone

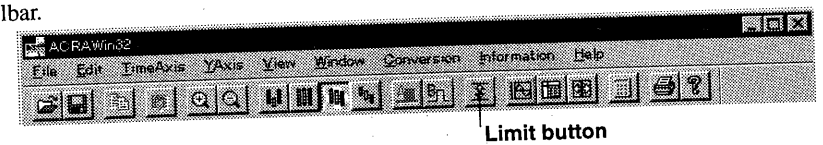
In Slide Zone waveforms scales are shifted slightly from top to bottom. This enables you to view overlapping waveforms.
To display a waveform in Slide Zone, select Y-Axis > Zone > Slide Zone, or click the Slide Zone button on the toolbar.

- Example of a waveform displayed in Slide Zone.

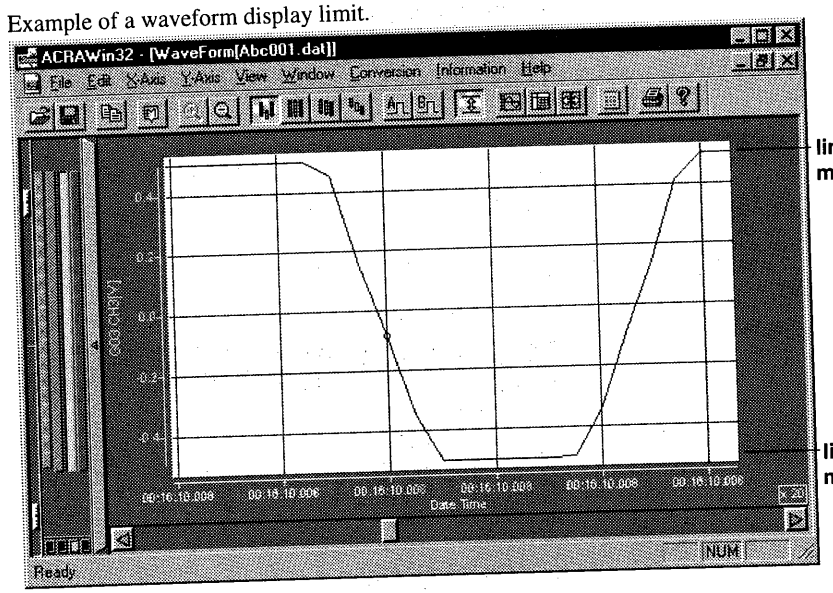


2.3 Setting Y-Axis Display Limits

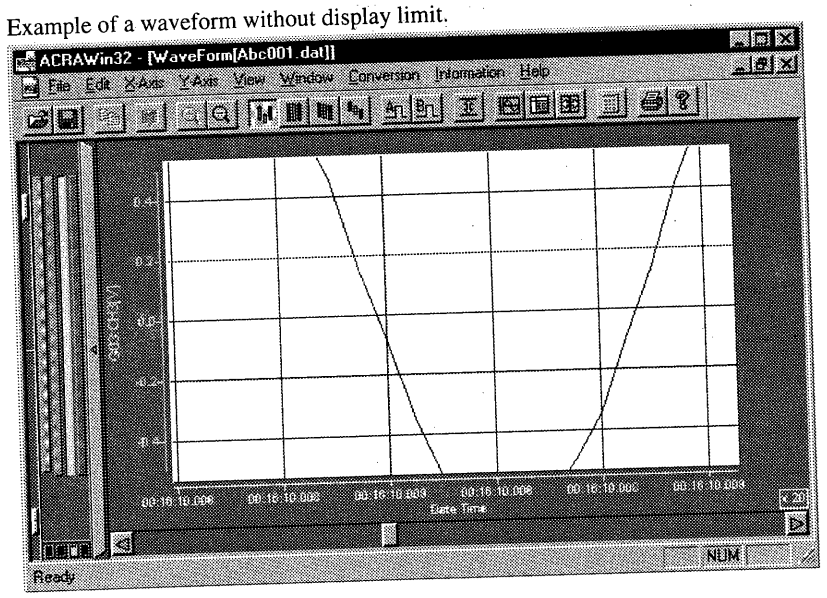
It's possible to apply a **display limit** to waveforms. When you set the display limit function, waveforms will be limited between the minimum and maximum values on the Y-Axis scale. Waveforms with data points smaller than the minimum scale value or larger than the maximum scale value will be truncated. This function enables you to view waveforms outside the screen range as horizontal lines in the display area.
To set the waveform display limit, select Y-Axis > Limiter, or click the Limit button of the toolbar.



- Example of a waveform display limit.



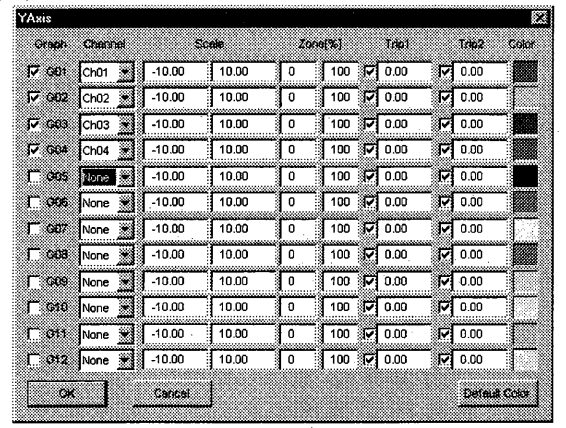
- Example of a waveform without display limit.



2.4 Setting Waveform Conditions

You can accurately set a number of waveform display conditions. In this section you can read how to set **waveform display On or Off**, and how to set **graph numbers**, **scales**, **zones**, **trip points**, and **display colors**. In addition the **logic display** function will be explained.

To make the first six settings select Y-Axis > Details. The below Y-Axis check box list will be displayed.

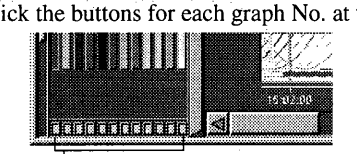


Note

The amount of channels is not equal for every OR model.

Waveform Display On/Off

To turn the waveform display On or Off, click each graph No. in the Y-Axis check box list, or click the buttons for each graph No. at the bottom left of the waveform display area.



Channel Assignment

To each graph number you can assign a channel. You can also assign the same channel to multiple graph numbers. Change the channel number by pushing the arrows in the Channel section of the Y-Axis chack box.
To remove a channel totally from the waveform display window set the Channel to 'None'.

Scales

In the scale check boxes you can set a display range which matches your data application.
Set a scale value for each channel. The check box on the left sets the minimum value, the box on the right sets the maximum.

The input range is between -999999 and 999999, excluding decimal points . For channel data scaled with OR 100, OR1400, and ORM the input range is between -34028 e+38 and 34028 e+38. Additional decimal points will automatically be round off depending on the measured data and scale.

Zones

When displaying multiple waveforms, you may wish to set waveform zones so that the waveforms do not overlap each other.
Set a zone for each channel as a percentage of the waveform display area width. The check box on the left sets the minimum value, the box on the right sets the maximum.
The input range of the minimum value of the zone is between 0 and 99%, and the input range of the maximum value is between 1 and 100%.
The lower end of the waveform display area is set 0%, and the upper end 100%.

Trip Points

A trip point sets the position of a horizontal line on a waveform display you can use to highlight specific values. You can set two different trip points. Trip point 1 is displayed in red, trip point 2 in blue. Clicking the trip point check boxes sets them On or Off.

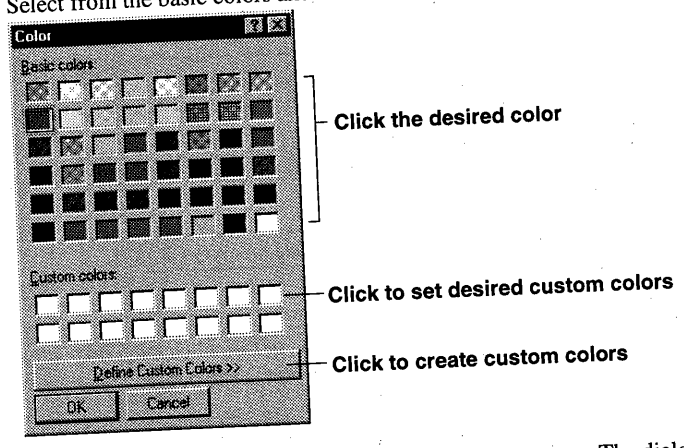
Set trip points within the range of the scale values set for each channel.

Note

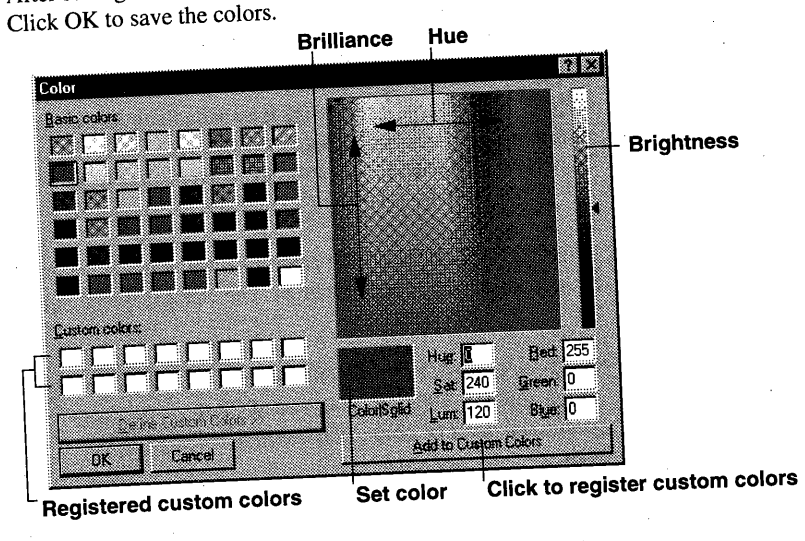
- The trip points actually displayed in the waveform display area are the trip points for the active waveform.
- Trip lines will be displayed for active waveforms only. Thus, only for Autozone, when all waveforms are active multiple trip lines can be viewed.
- You can change the position of the horizontal 'trip' lines by dragging the trip point labels on the right side of the waveform display area with the mouse.

Display Color

1. Click the Color check box of each graph to set the color of waveforms.
2. Select from the basic colors and click OK.

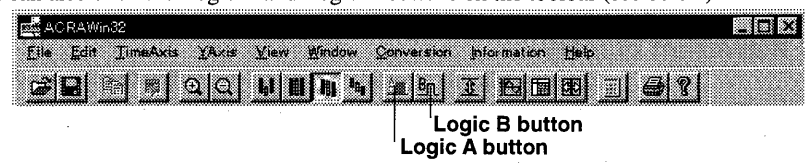


3. To make your own colors, click Define Custom Colors >>. The dialog box below for setting custom colors appears. Set the desired hue, brilliance and brightness.
4. After setting the custom color, click Add to Custom Colors.
5. Click OK to save the colors.

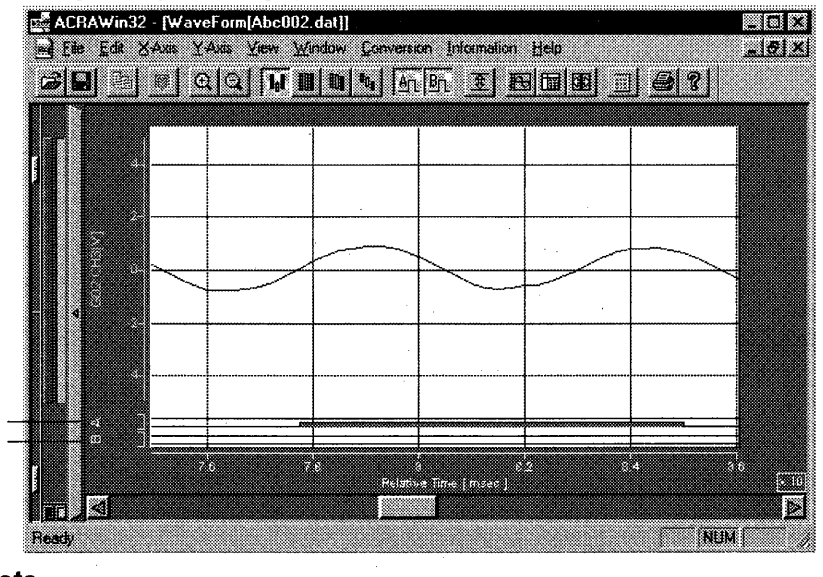


Logic Display

If you acquired logic data when measuring, it is possible to display them on screen. You can view two channels: Logic channel A and B.
Select View > ACH, for logic channel A, or View > BCH for logic channel B.
You can also click the Logic A and Logic B buttons on the toolbar (see below).



- Example of logic data display.



Note

For OR1400 and ORM all logic channels are displayed on screen, up from channel 1, down to the last channel.
Only two OR100 logic channels can be displayed at a time. Decide freely which channels to display. (For example logic display 2 and 5.)

2.5 Changing the X-Axis

If you wish to adjust the scale or size of the X-Axis, this software offers you a number of ways to reach that goal.

Total Wavefrom display

You may want to view all data points in a single display window, enlarged or reduced in the X-Axis direction. To achieve this simply select X-Axis > Display All.

X-Axis Scale Display

To **change the scale display** ot the X-Axis select X-Axis > Display Mode.
You can then choose five different scale displays:

- An actual time scale showing the time data were measured (> Time),
- A relative time scale starting from the first data point (> Relative Time).
- A relative time scale starting from the trigger point (> Relative Time (Trigger Point)).
- A data number scale starting from the first data point (> Data No).
- A data number scale starting from the trigger point (> Data No (Trigger Point)).

Note

When data were collected with an external sampling clock, you can only choose the data number scale (with either the first data point, or the trigger point as a base).

X-Axis Zoom

This software offers you two ways to zoom waveforms in X-Axis direction:

- Easily enlarge / reduce a waveform using the **Auto Zoom** function.
- **Exact Zoom** using the X-Axis > Set Scale function.

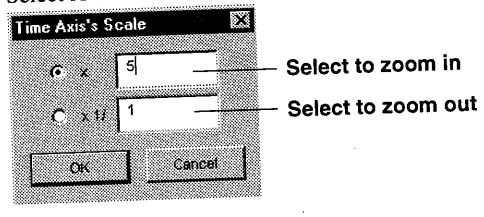
Auto Zoom

To enlarge waveforms in X-Axis direction, select X-Axis > Zoom In, or click the Zoom In button on the toolbar (see below).
To reduce a waveform in X-Axis direction, select X-Axis > Zoom Out, or click the Zoom Out button on the toolbar (below).

Exact Zoom

If you wish to exactly set the zoom factor, do as follows:

1. Select X-Axis > Set Scale.



2. To enlarge a waveform, enter the magnification factor in the upper box. To reduce a waveform, enter the reduction factor in the lower box.
3. Click OK.
   The waveform appears enlarged / reduced in the X-axis direction.

Note

Set the magnification factor between 1 and 20.
Magnification factor 5 means that 5 data items per vertical monitor line are displayed.
Set the reduction factor between 1/1 and 1/1000.
Reduction factor 1/500 means that 1 data item per 500 vertical monitor lines is displayed.

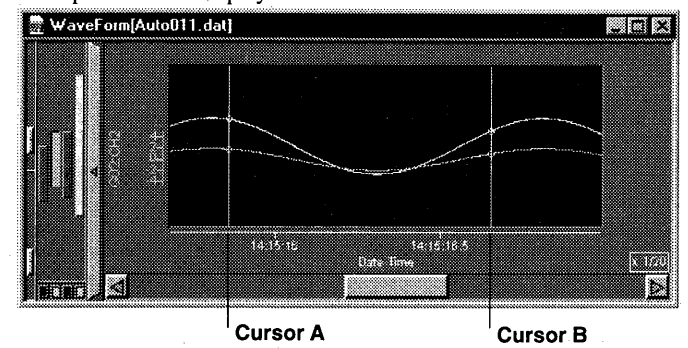
2.6 Cursor Measurement

It is possible to read time and measurement data values on the X-Axis using two cursors: cursor A and cursor B. This may be useful if you want to know the time or voltage difference between two occurrences.

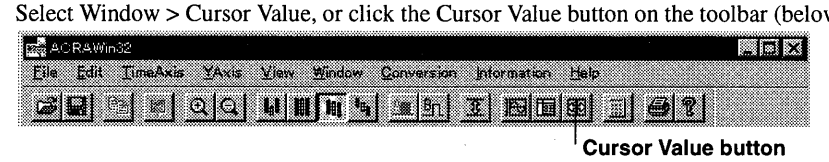
Use the cursors as follows:

1. Point the mouse at the position in the waveform display area where you want to read measurement data. The vertical bar that appears is cursor A. Hold the mouse and drag the pointer to the next position where you want to read measurement data. Cursor B gets set when you release the mouse.

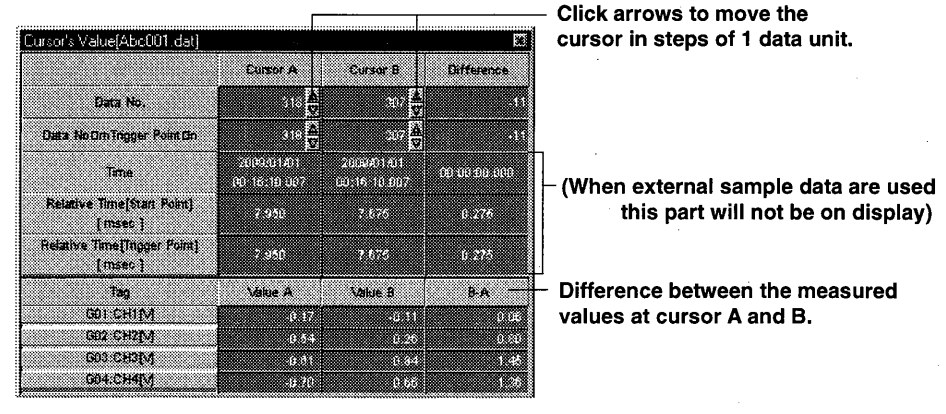
   - Example of cursor display



2. Select Window > Cursor Value, or click the Cursor Value button on the toolbar (below).



In the Cursor Value dialog box you can now read measurement values at the cursor positions and the value difference between the two cursors positions.
If you wish to accurately adjust the position of a cursor, click the arrow buttons next to data No. values in the Cursor Value dialog box. The cursor will move in steps of one data item.

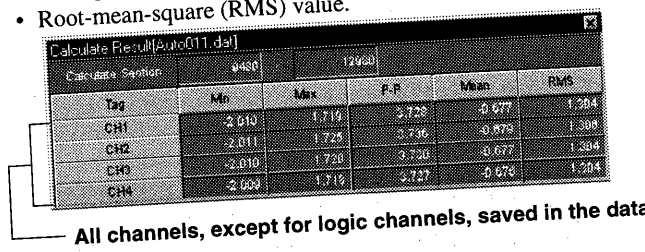


You can use Edit > Select All when you wish to select all measurement data from start till end.
To erase cursors from the waveform display area, select View > Erase Cursor.

2.7 Using Cursors for Statistical Calculations

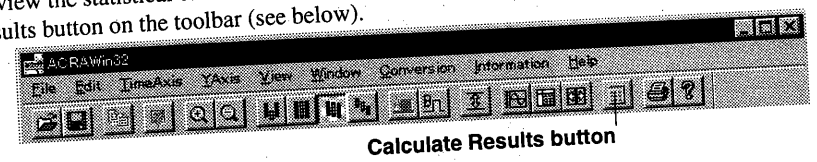
You can view five different statistical calculations on the data between cursor A and B:

- Maximum value.
- Minimum value.
- Peak-to-peak (P-P) value.
- Average value.
- Root-mean-square (RMS) value.



All channels, except for logic channels, saved in the data file.

To view the statistical calculations select Window > Calculate Result, or click the Calculate Results button on the toolbar (see below).



Calculate Results button

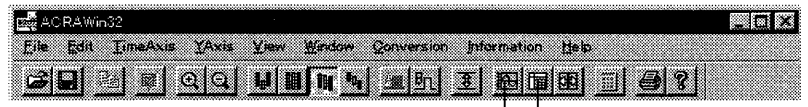
Note

If you wish to view the statistical calculations on data at different cursor positions close the Calculate Result window and again open it after you have repositioned the cursors.

2.8 Digital Value Display

Displaying Digital Values

To view measurement data as digital values click the Digital Value Display button on the toolbar (see below), or select Window > Digital Value Display . To switch back to the waveform display window click the Waveform Display button (below), or select Window > WaveForm.
Note that if more waveform display windows are opened at the same time only digital values of the active window will be displayed.

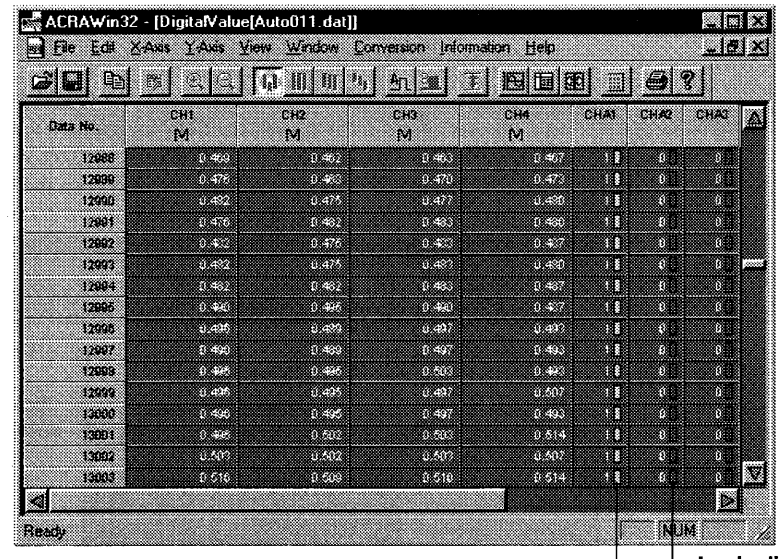


Digital Value Display button
Waveform Display button

Note

If you adapt the size of the waveform display and the digital value display you can view both windows simultaneously.
If you display a waveform, the initial scale value of the X-axis on the digital value display will be equal to the displayed waveform scale.

- Example of digital value display: In the left 'Data No.' block time and date can be displayed, if selected.

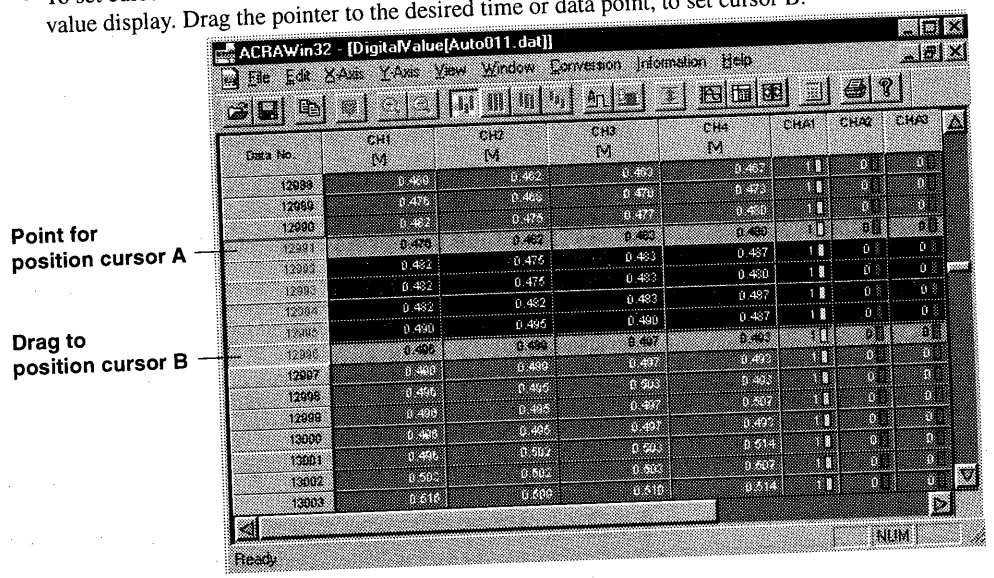


Logic display low level (dark green)
Logic display high level (light blue)

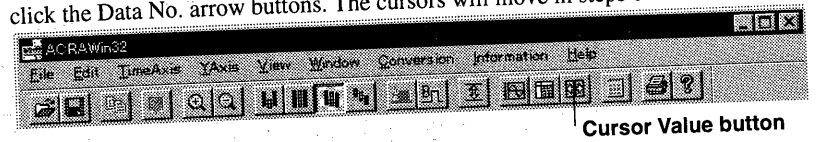
Digital Values and Cursors

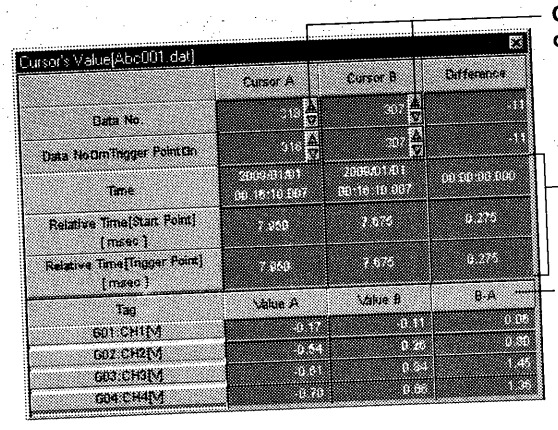
You can view the digital value of the measurement data at each cursor separately ,and view the value difference between the two cursors. In addition, you can set the position of cursors A and B using the digital value display following the below procedures:

- To set cursor A in the waveform, point your mouse to the block on the left side of the digital value display. Drag the pointer to the desired time or data point, to set cursor B.



- If you want to select all measurement data from start to end, select Edit > Select All.
- To erase the cursors from the digital value display, select View > Erase Cursor.
- If you wish to exactly adjust the position of a cursor, select Window > Cursor Value, or click the Cursor Value button on the toolbar (see below). Open the Cursor Value dialog box, and click the Data No. arrow buttons. The cursors will move in steps of one data item.





Click arrows to move the cursor in steps of 1 data unit.

(When external sample data are used this part will not be on display)

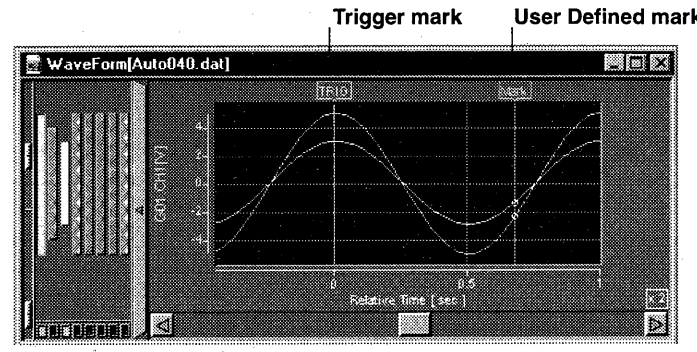
Difference between the measured values at cursor A and B.

2.9 User Defined and Trigger Marks

There are two kinds of vertcal bar marks:

- **User Defined marks**: Marks you can add to and remove from arbitrary points on the X-axis.
- **Trigger marks**: A mark you can set (and delete) indicating where a trigger took place at the time the data were saved by the OR recorder.

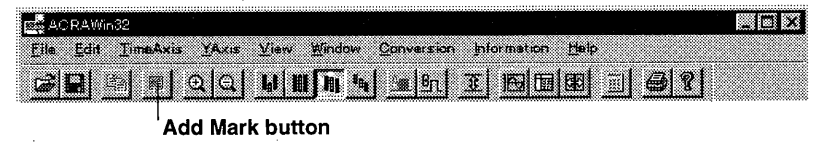
Example of the two vertical bar marks.



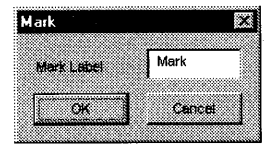
User Defined marks

Set User Defined Marks in the following manner:

1. Place the mouse pointer —either in the waveform or digital value display area— at the position where you wish to add a User Defined mark .
2. Select Edit > Add Mark, or click the Add Mark button on the toolbar (see below).



3. Enter the name of the User Defined mark in the text box.



4. Click OK.

You can set as many user defined marks as you like by repeating steps 1 to 4.

The name of the User Defined marks appear above the waveform display area.
To change the name of a mark, double-click the mark to be changed, and repeat step 3 and 4.
You may change the name of the trigger mark in the same way.

Note

- You can not set more than one User Defined mark at once.
- In the waveform display area User Defined marks are colored green, Trigger Marks are yellow. In the digital value display User Defined mark are indicated by a green flag, Trigger Marks by a yellow flag.

Deleting Marks

To delete marks from the waveform display area:

1. first capture them between cursor A and B. (For cursor setting see page 2-9 “Cursor Measurement”.)
2. Then select Edit > Delete Mark.
   Both Trigger marks and User Defined marks in the captured range will be deleted.

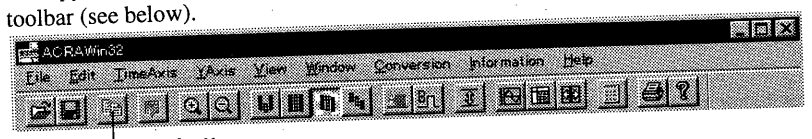
Resetting Marks

If you wish to reset User Defined marks select Edit > Reset Mark.
All User Defined marks will be deleted. If you deleted the trigger mark it will be reset.

2.10 Notepad Copying

To copy digital waveform data to your PC's notepad do the following:

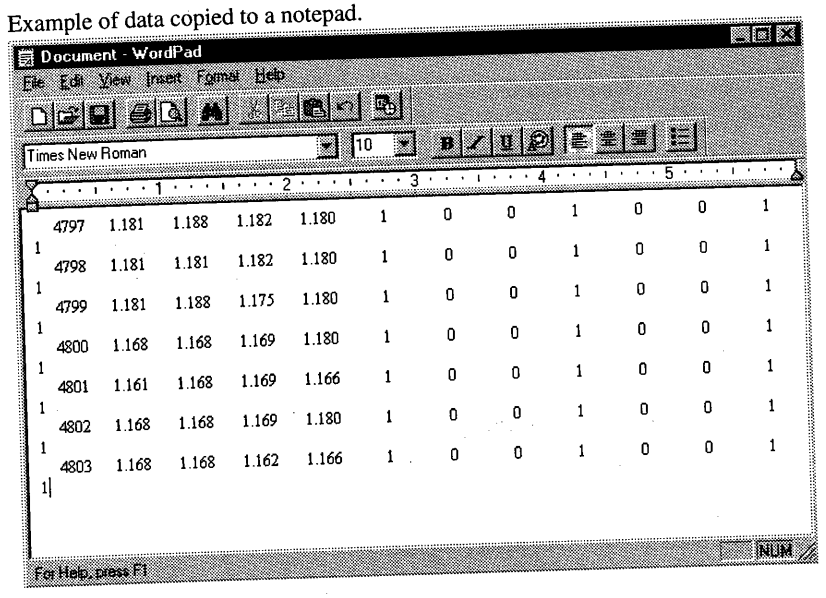
1. Set the data range you wish to copy with your mouse pointer in the digital value display or using cursor A and B in the waveform display area (For cursor setting see page 2-9 "Cursor Measurement").
2. To copy the selected data to your notepad select Edit > Copy, or use the Copy button on the toolbar (see below).



Note

- Copy a maximum of 1000 data sets to your notepad.
- If you copy to a notepad, data of all channels will appear (even data of channels not actively displayed).
- If desired use the notepad data after adding them to your application sofware.

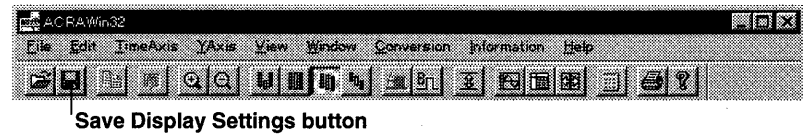
- Example of data copied to a notepad.



2.11 Saving Display Conditions

You can save waveform and digital value display conditions to a file.
Note that of one measurement data file, only one display condition can be saved. If you save new data, they will overwrite data earlier saved to the file.
The OR Series (ACRAWin32) filename is xxx.vor . However, the OR 100 (Handy OR) filename is xxx.vho (with xxx being the name of the measurement data on display).

To save display conditions, select File > Save Display Settings, or click the Save Display Settings button on the toolbar (see below).



Note

- The following data are saved to the file:
  - Waveform display area.
  - Printing title.
  - Positions of cursor A and cursor B.
  - Displayed waveform timing On/Off.
  - Y-axis details (channel No., waveform display On/Off, scale, zone, trip point 1, trip point 2, waveform color).
  - Selection of channel No./Tag/Tag ID.
  - Mark information.
  - X-axis magnification factor.
  - Logic display On/Off.
  - Brightness of waveform and grid.
  - X-Axis scale (Time, Data No., etc).
  - Y-Axis zone (Auto, User, Full, or Slide zone).
- If you wish to display the data file containing the display conditions under the display conditions used when a file was saved at the OR recorder, first delete the xxx.vor file containing the display conditions, then open the data file once again.

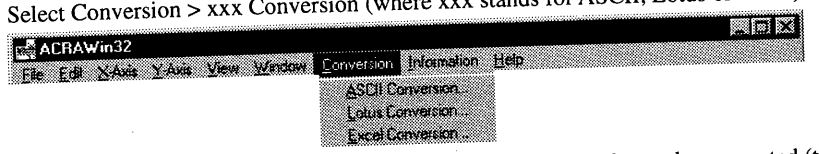
Display Saving File

You can save display conditions that were changed with this software as xxx.lrv. When reopening the file it will automatically reappear with the display conditions you saved. Overwrite the file as many times as you like.

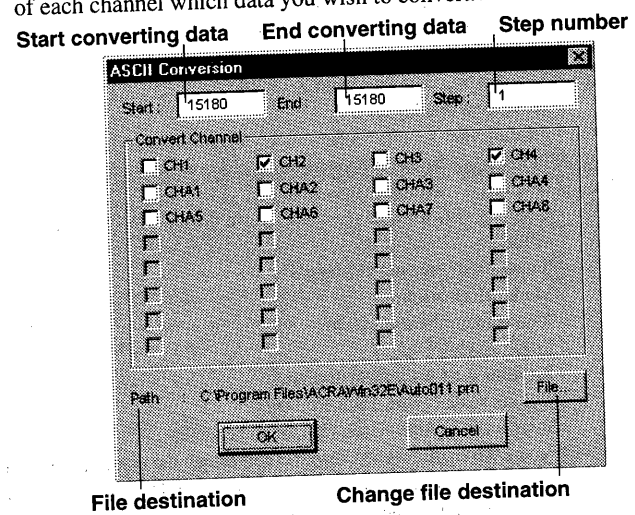
2.12 Converting the Data Format

With waveforms or digital values displayed, you can convert measurement data into one of three data formats, ASCII, Lotus and Excel.

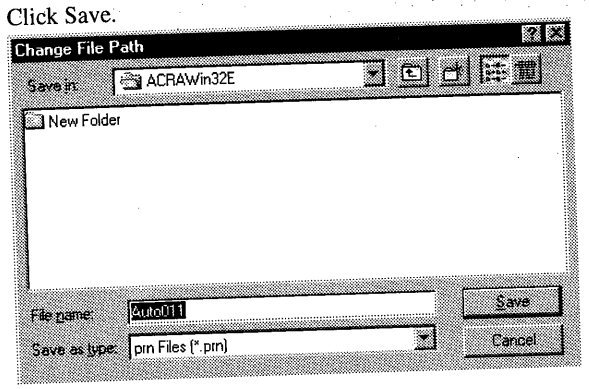
1. Select Conversion > xxx Conversion (where xxx stands for ASCII, Lotus or Excel).



2. Using each xxx Conversion dialog box, enter the range of the data to be converted (the first and last data point) and the step (e.g. if you enter "3", two out of three consecutive data items are skipped; to convert all of the data in the specified range, enter "1"). Click the check box of each channel which data you wish to convert.



3. If you wish to save to a different folder or file, click File... .
Select a file name from the File Name box, or type a file name in the text box. If necessary, select the type of folder or file in which the data is to be saved.
Click Save.



4. Click OK in the xxx Conversion dialog box.
The measurement data is converted into the selected data format, and saved in a file.

Note

- The range of the data you wish to convert, indicated in each xxx Conversion dialog box, is automatically set to the range specified by cursor A and B. If the range is not specified by the cursors, or if the cursors have been deleted, the first data point is automatically set to 0, the final to the last recorded data point minus 1.
- An extension that identifies the data format is automatically added behind the displayed filename. The extension are: .prn for ASCII conversion; .wrk for Lotus (only version 2.0 or higher) conversion; and .xls for Excel conversion (only version 4.0 or higher).
- Lotus 1-2-3 and Excel convert a limited number of data sets. This software doesn't have such a limit. Before carrying out conversion, set the number of data items to be converted so that the number of converted data items does not exceed the maximum number of items. Note also that if the memory capacity of your PC is small, it may be impossible to read the data even if the number of converted data items is below the limit.

Converted File Formats

Converted data should appear on your screen similar to the following examples:

- Example of an **ASCII**-converted file.

```
"Model","OR-Series"
"Sample Rate","1kS/s"
"Data Length",     1000
"Trigger Point",      500
"Trigger Time","1997-07-28 11:34:41"
"Tag","CH1","CH2","CH3","CH4"
"Unit","V","V","V","V"
        0,    1.015,    1.003,    1.014,    1.008
        1,    1.083,    1.076,    1.075,    1.075
        2,    1.123,    1.130,    1.128,    1.136
        3,    1.197,    1.197,    1.195,    1.190
```

- Example of a **Lotus**-converted file.

	A	B	C	D	E	F
1	Model		OR-Series			
2	Sample Rate		4kS/s			
3	Data Length		800			
4	Trigger Point		0			
5	Trigger Time		1997-09-02 01:58:43			
6	Tag	CH1	CH2	CH3	CH4	
7	Unit	mV	mV	mV	mV	
8	0	2.5	1.6	-0.7	-4.3	
9	1	-0.4	-0.9	-2.7	-6.3	
10	2	2.9	2.1	-0.4	-3.8	
11	3	1.3	0.6	-1.4	-4.6	
12	4	0.1	-0.2	-2.4	-5.1	

- Example of an **Excel**-converted file.

	A	B	C	D	E	F
1	Model		OR-Series			
2	Sample Rate		4kS/s			
3	Data Length		800			
4	Trigger Point		0			
5	Trigger Time		1997-09-02 01:58:43			
6	Tag	CH1	CH2	CH3	CH4	
7	Unit	mV	mV	mV	mV	
8	0	2.5	1.6	-0.7	-4.3	
9	1	-0.4	-0.9	-2.7	-6.3	
10	2	2.9	2.1	-0.4	-3.8	
11	3	1.3	0.6	-1.4	-4.6	
12	4	0.1	-0.2	-2.4	-5.1	

Note

In case an external sampling clock was used, 'Ext' will be displayed after 'Sample Rate.'

2.13 File Format

In this section you can find ASCII, Lotus and Excel file formats.

ASCII File

1	Model	CR	LF
2	Sample Rate	CR	LF
3	Data Length	CR	LF
4	Trigger Point	CR	LF
5	Trigger Time	CR	LF
6	Tag	CR	LF
7	Unit	CR	LF
8	Data Number, All Channel Data	CR	LF
	(Continuous Data Numbers)		

Model

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
"	M	o	d	e	l	"	,	"	O	R	-	S	e	r	i	e	s	"	CR	LF

Sample Rate

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
"	S	a	m	p	l	e		R	a	t	e	"	,	"	8	0	k	S	/

21	22	23	24
s	"	CR	LF

Example

15	16	17	18	19	20	21	22	23
"	1	k	S	/	s	"	CR	LF

For 1kS/s

Data Length

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
"	D	a	t	a		L	e	n	g	t	h	"	,	Data length 9-digits					

21	22	23	24	25
			CR	LF

Example

14	15	16	17	18	19	20	21	22	23	
							1	0	0	100 Data
				1	2	0	0	0	0	120000 Data

Trigger Point

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
"	T	r	i	g	g	e	r		P	o	i	n	t	"	,	Trigger Point 9-digits			

21	22	23	24	25	26	27
					CR	LF

Example

14	15	16	17	18	19	20	21	22	23	
							1	0	0	100
					1	0	0	0	0	10000

Trigger Time

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
"	T	r	i	g	g	e	r		T	i	m	e	"	,	"	Y	Y	Y	Y

21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
–	M	M	–	D	D		H	H	:	M	M	:	S	S	"	CR	LF

Tag (Channel name)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
"	T	a	g	"	,	Tag 1			,	Tag 2						,	Tag 3		

21	22	23	24	25	26	27	28	29	30	31	. . .		??	??
	,	Tag 4							,	. . .			CR	LF

Example

24	25	26	27	28	29	30
"	T	A	G	0	4	"

For TAG 04

The first six characters are fixed. The space after the sixth character varies depending on the length of the tag. Every tag is enclosed by double quotation marks.

Unit

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
"	U	n	i	t	"	,	Unit 1					"	Unit 2			,	Unit 3		

21	22	23	24	25	26	27	28	29	30	31	. . .	??	??
	,	Unit 4							,	. . .		CR	LF

Example

24	25	26	27	28	29	30
"	U	N	I	T	4	"

For UNIT 04

The first seven characters are fixed. The space after the seventh character varies depending on the length of the tag. Every tag is enclosed by double quotation marks. For logic channels there is no unit, so that only two double quotation marks get displayed.

Data No. and Each Channel Data

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Data Number									,	Measurement data 1									,

21	22	23	24	25	26	27	28	29	30	. . .	??	??
Measurement data 2									,	. . .	CR	LF

Example data No.

1	2	3	4	5	6	7	8	9	10
						1	0	0	,
			1	2	0	0	0	0	,

Example measurement data

1	2	3	4	5	6	7	8	9	10
				1	0	.	1	2	,
			1	2	0	0	.	0	,

Data No. and Measurement data both have 9-digits fixed.

Lotus File

Below the file format read by Lotus 123 (Lotus Development Corporation), (version 2.0 and higher). The added extension is .wj2.

	A	B	C	D	E	F
1	Model		OR-Series			
2	Sample Rate		40kS/s			
3	Data Length		800			
4	Trigger Point		0			
5	Trigger Time		2009-01-01 00:16:10			
6	Tag	CH1	CH2	CH3	CH4	A3
7	Unit	V	V	V	V	
8	0	0.19	-1.14	-0.62	-0.91	0
9	1	0.16	-1.11	-0.71	-0.97	0
10	2	0.19	-0.91	-0.71	-0.91	0
11	3	0.22	-0.79	-0.67	-0.82	0
12	4	0.22	-0.57	-0.63	-0.69	0

Tag
Units

Data No.

Measurement values

Excel File

Below the file format read by Excel, (version 4 and higher). The added extension is .xls.

	A	B	C	D	E	F
1	Model		OR-Series			
2	Sample Rate		40kS/s			
3	Data Length		800			
4	Trigger Point		0			
5	Trigger Time		2009-01-01 00:16:10			
6	Tag	CH1	CH2	CH3	CH4	A3
7	Unit	V	V	V	V	
8	0	0.19	-1.14	-0.62	-0.91	0
9	1	0.16	-1.11	-0.71	-0.97	0
10	2	0.19	-0.91	-0.71	-0.91	0
11	3	0.22	-0.79	-0.67	-0.82	0
12	4	0.22	-0.57	-0.63	-0.69	0

Tag
Units

Data No.

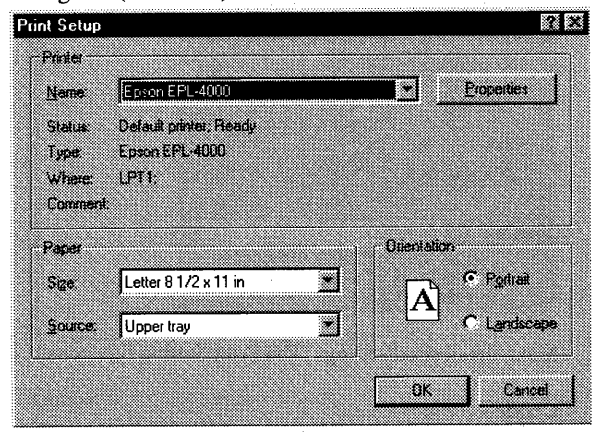
Measurement values

2.14 Printing

Printer Setting

Set your printer in the following manner:

1. First, select File > Print Setup… .
2. Set the name of your printer, paper size and source, and print orientation in the Printer Setup dialog box (see below).

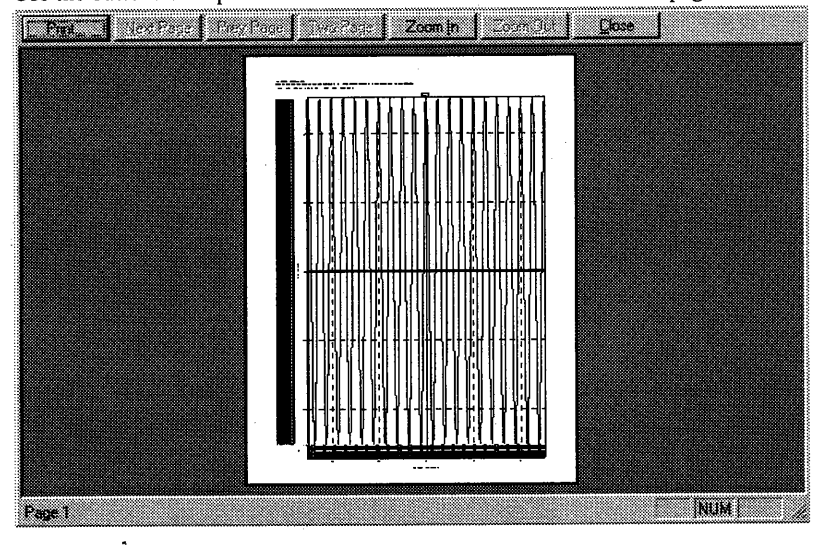


3. When the printer setup suits the system environment that you are using, click OK.

Print Preview

To preview the pages you want to print, do as follows:

1. Select File > Print Preview.
2. Use the buttons on top of the Print Preview window to zoom or turn pages .



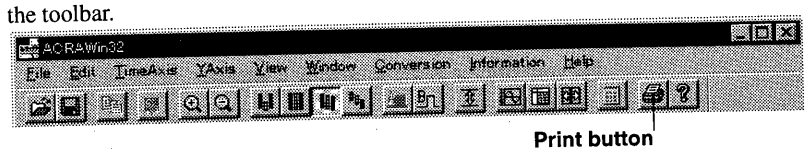
3. When you finish previewing, either Close the Print Preview window to return the original screen or click Print to continue the printing procedure.

Note

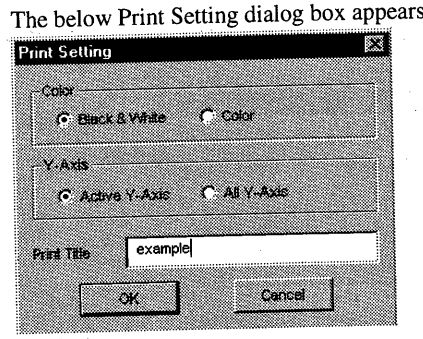
- The print preview starts with the first file data.
- The print preview may slightly differ from the actual prinout.
- Refer to the instruction manual of your own PC for further info on print preview operation.

Printing Waveforms and Digital Values

1. To print waveforms and digital values, first select File > Print... or click the Print button on the toolbar.



The below Print Setting dialog box appears.



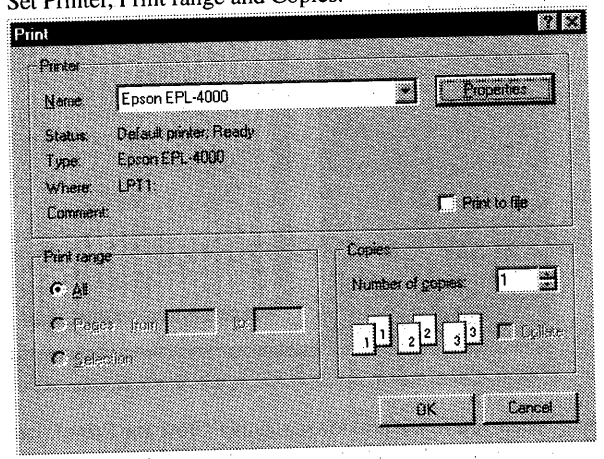
2. Make the desired settings. The Print Setting box consits of three sections:

Color
In the Print Setting dialog box Color section you can select either Black & White or Color print.

Y-Axis
The Print Setting dialog box Y-Axis section enables you to set whether you want to print out the waveform with the active Y-Axis only, or all waveforms.

Print Title
If you wish select File > Print Setting..., and insert a name in the Print Title textbox. The title you insert in the Print Title text box will appear top-left on the print-out.

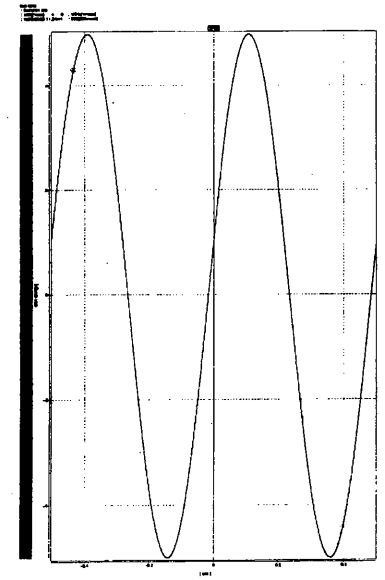
3. After you finished the print settings click OK. The below Print dialog box will appear. Set Printer, Print range and Copies.



Note

- The printing rage is set using cursor A and B, a s explained on page (Cursor Management) for Waveforms and on page (Digital Value Display) for digital values.
- When the Cursor's Value or Calculate Results windows are on display when printing, those values will also appear on print .

- Example of waveform printout.



- Example of digital value printout.

Data No.	CH3 [V]	CH2 [V]	A3	A1	B4	B1
100	0.33	0.18	0□	1■	0□	0□
101	0.52	0.42	0□	1■	0□	0□
102	0.64	0.69	0□	1■	0□	0□
103	0.68	0.79	0□	1■	0□	0□
104	0.59	0.86	0□	1■	0□	0□
105	0.51	0.89	0□	1■	0□	0□
106	0.37	0.87	0□	1■	0□	0□
107	0.20	0.79	0□	1■	0□	0□
108	0.01	0.64	0□	1■	0□	0□
109	-0.22	0.44	0□	1■	0□	0□
110	-0.47	0.16	0□	1■	0□	0□
111	-0.69	-0.12	0□	1■	0□	0□
112	-1.02	-0.36	0□	1■	0□	0□
113	-1.08	-0.56	0□	1■	0□	0□
114	-1.01	-0.69	0□	1■	0□	0□
115	-0.89	-0.74	0□	0□	0□	0□
116	-0.76	-0.69	0□	0□	0□	0□

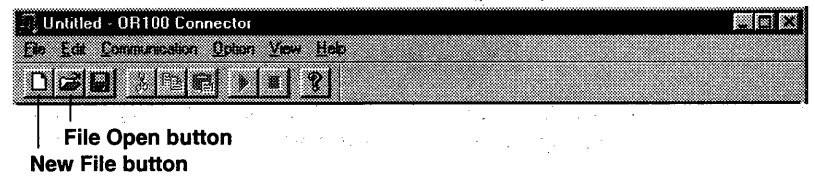
3.1 Preparing OR 100 - PC Connection

In this chapter you can find how to operate **OR 100 Connector** software.
OR 100 Connector Communication Software enables you to receive OR 100 measurement data and setting info using communication circuits like a RS-232 or modem The software also allows you to transmit data modified with a PC back to the OR 100.

Start **OR 100 Connector** software as described in Chapter 1-2.
Then, create a new access list file or open an already saved access point list.

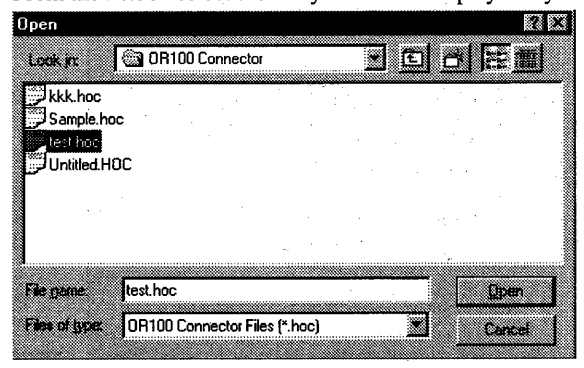
Creating New Files

To create a new access list click the New File button (below) on the toolbar or select File > New.

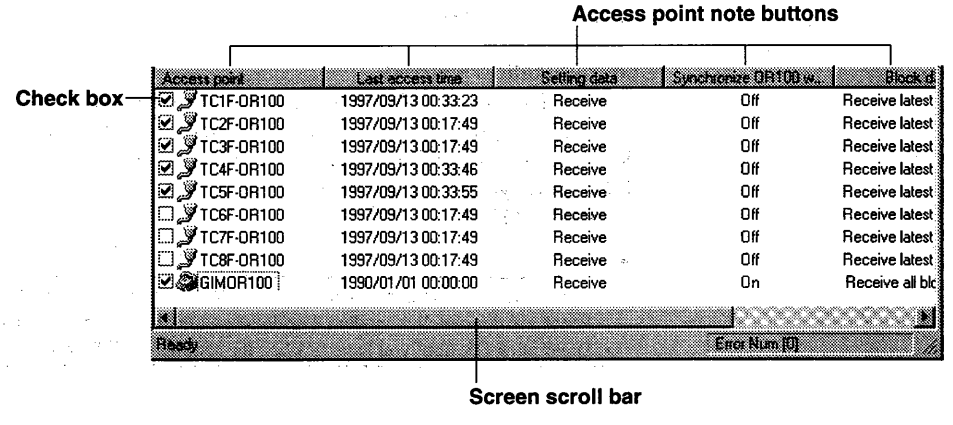


Opening Files

1. Click the File Open button on the toolbar or select File > Open...
2. From the listbox select the file you want to display. Only select files with a '.hoc' extension.

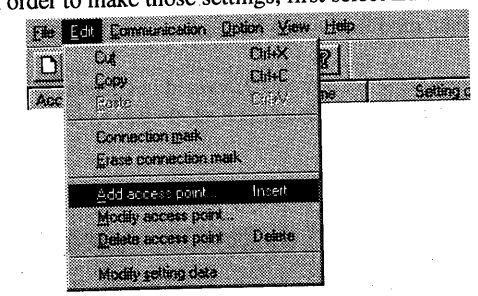


3. Click Open to display the access point list.



3.2 Adding Access Points

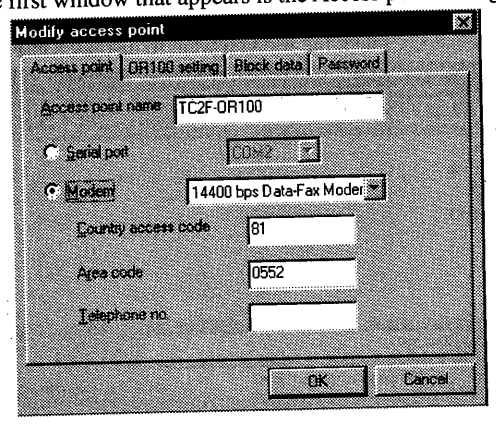
Before you add a new access points you have to make a number of settings . For example: The name of the access point, the communication method, will you transmit or receive data, which data do you wish to receive, a password, etc.
In order to make those settings, first select Edit > Add access point...



The Add Access Point dialog box opens containing four dialog windows: Access point, OR 100 setting, Block data, and Password. Please go through all the dialog windows before clicking OK.

Access Point

The first window that appears is the Access point dialog window.



Access Point Name

Start by inserting an arbitrary name so you can know what OR 100 to choose when more than one Handy OR is connected.

Communication Method

Select a Serial port or Modem as communication method.
If you use a modem, make sure to insert country access code, area code, and telephone number.
See page 3-9 for details on modem and serial port setting.

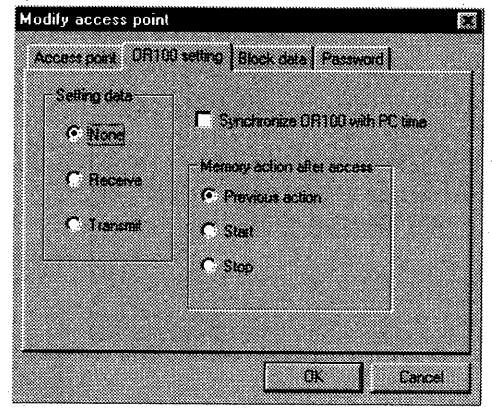
Serial port symbol — TC8F-OR100
Modem symbol — GIMOR100

Note

- When you use a modem it is necessary for Windows to recognize the modem. Select Settings > Control Panel and double-click modem. For details on modem connection, please read your Windows manual.
- Don't click OK until you have finished the settings of all four dialog windows.

OR 100 Setting

Click the OR100 Setting tab. In the second dialog window please go through three different settings.



Setting Data

If you don't want to receive OR 100 setting data, select None.
To receive setting data from the OR 100, select Receive. To send data from your PC to an OR 100 select Transmit.

Synchronization

To set the time of the OR 100 correct with the time of your PC, check Synchronize OR 100 with PC time.

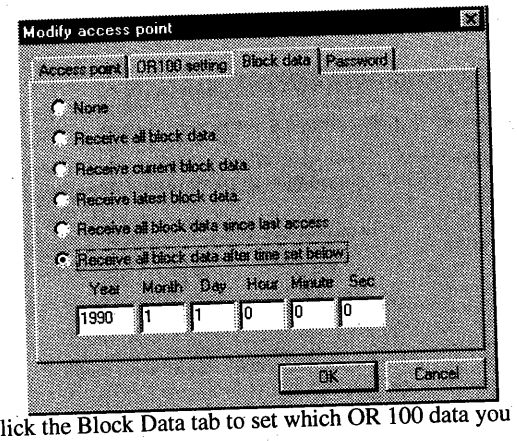
Memory Action After Access

You can choose the measurement status after access is aborted.
Selecting Previous action means that the OR will continue the action before access was established (measuring data or not).
Clicking Start will result in measurement after access.
Clicking Stop will result in abortion of measurement after access.

Note

- Setting data received from the OR 100 can be modified and then returned to the OR 100 to change its settings. Setting values that can be transmitted are channel settings memory length, sample rate, and ordinary triggers.
- Only setting values that have first been received from the OR 100 can be transmitted.

Block data



Click the Block Data tab to set which OR 100 data you want your PC to receive. You can choose from:

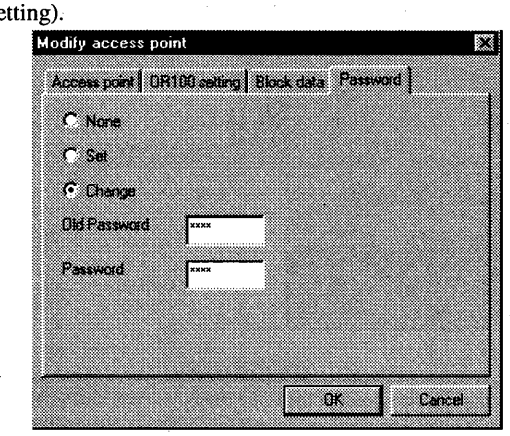
- None.
- Receive all block data.
- Receive current block data.
  (The data that are on the OR 100 screen at the time of access.)
- Receive latest block data.
  (The last data the OR 100 measured.)
- Receive all block data since last access.
- Receive all block data after time set below.
  (After the set time is reached, the first data block after a trigger takes place will be transmitted to the PC.)

Note

The received data are automatically labeled and saved. You can decide to which folder you want the data to be saved. (See section 3.4.)

Password

When using an open communication circuit a password will improve safety. A pass'word' must consist of four numbers.
You can only set a password when you connect OR 100 with a modem (see page 3-2 for modem setting).



Select None if you don't want to set a password.
If you wish to set a password select Change. Initially the OR 100 is not protected by a password, so you can freely set a password. Use only numbers!! Up to 4-digits. After the password is set modem access will be impossible for anyone without password knowledge.

Note

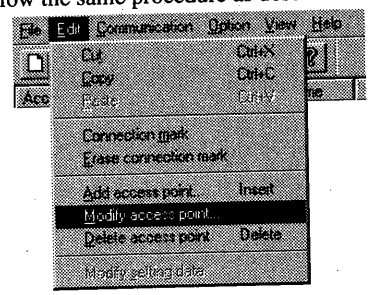
- After you have entered the four numbers as password, an error message will appear when the incorrect number is entered.
- When you use a modem, people using the public communication circuit can accidently enter your circuit. Using a password is therefore recommended.
- You can delete a password with the OR 100. To accomplish this select System > Initialize > Next > Password.

After you have finished all the settings described in this section, click OK.
The OR 100 Settings and Block Data settings will, however, only be executed after you push the execute button on the toolbar. (See section 3.5).

3.3 Editing Access Points

Modifying Access Points

Click the name of the access point you wish to modify, and select Edit > Modify Access Point... .
Follow the same procedure as described in section 3.2 to establish the alterations.

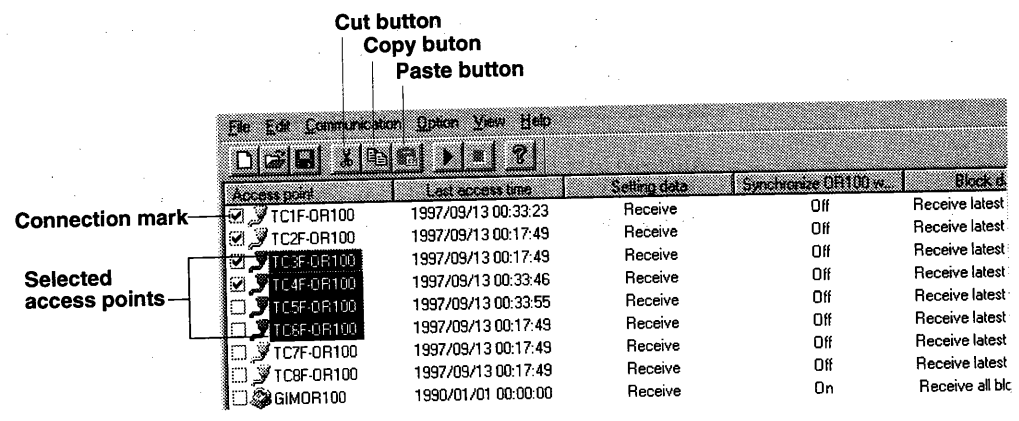


Note

If you select more access point at the same time , you can change their data at once. However the contents of the Access Point dialog window can not be changed collectively.

Cut-Copy-Paste, and Delete Access Points

You may want to cut or copy selected access points from an access point file, and paste them to another.
To edit easily use the Cut, Copy or Paste buttons from the toolbar, or select Edit > Cut, > Copy, or > Paste.
To delete access points select Edit > Delete Access Point.



Connection Marks

When you execute communication, connection is only established for access point which have the Connection Mark checked. Click the checkboxes on the left of the access point information lines once to connect, and again to disconnect.

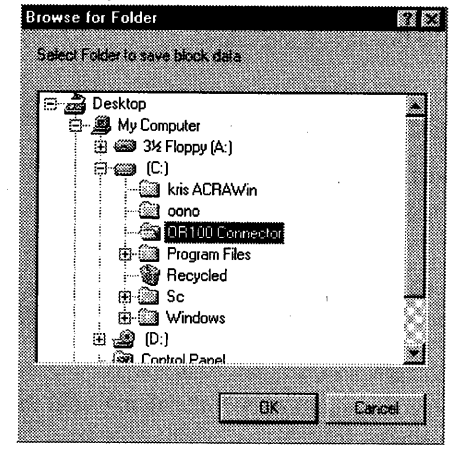
Note

- When communication is executed, checked access points get connected from top to bottom.
- By selecting a number of access points followed by Edit > Connection Mark, you can check many access point at the same time.

3.4 Saving Received Data

To save a memory block and setting data received from the OR 100, first select Option > Set Folder...

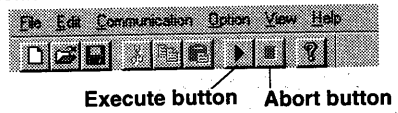
After selecting the desired folder , click OK.



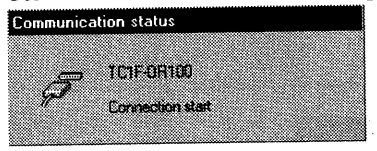
3.5 Executing and Aborting Communication

Executing Communication

No communication is established, until the Connection marks are checked and all settings are executed.
To establish communication click the Execute button, or select Communication > Execute.



The Communication Status window will appear.



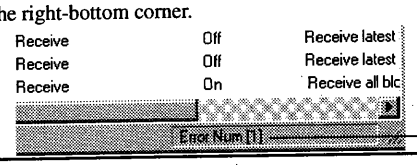
When access is established, the checked access points will get connected from top to bottom. All OR 100 memory sampling will be interrupted during access.

Aborting Communication

If you wish to abort communication, click the Abort button on the toolbar or select Communication > Abort.

Note

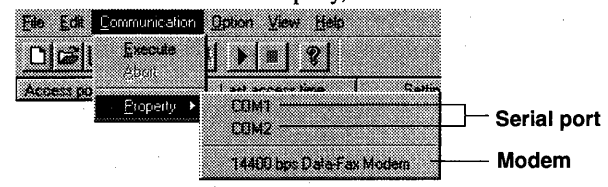
If an error occurs when trying to execute communication, the amount of communication errors appear in the right-bottom corner.

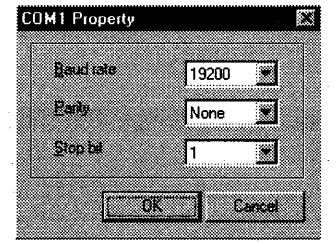


Serial Port

To connect a serial port, first select Add Access Point or Modify Access point, and select Serial port in the Access Point dialog window (see page 3-2) . Then select the serial port properties as follows:

1. Select Communication > Property, and then the desired serial port.





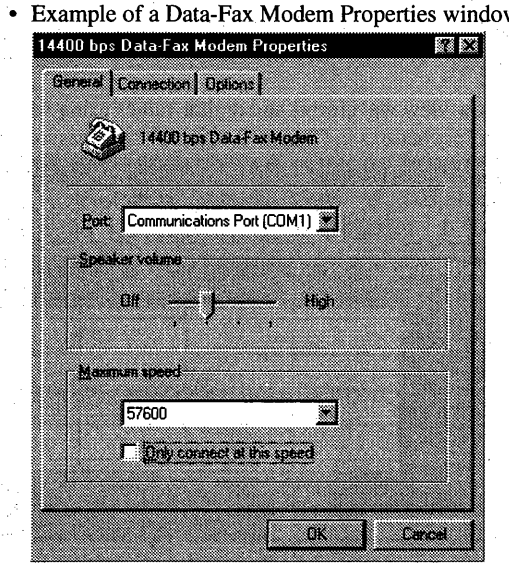
2. In the property listbox that opens set Baud rate, Parity, and Stop bit, to fit with the settings of the OR 100 you are connecting.

Modem

To connect a modem, first select Add Access Point or Modify Access point, and select Modem in the Access Point dialog window (see page 3-2) . Then select the modem properties as follows:

1. Select Communication > Property, and then the desired serial port.
2. For further instructions see Supplement IM789501-62E, and section 3.2 (Adding Access Points) of this chapter.

- Example of a Data-Fax Modem Properties window.

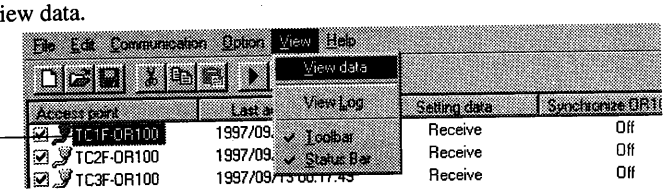


3.6 Displaying Received Data

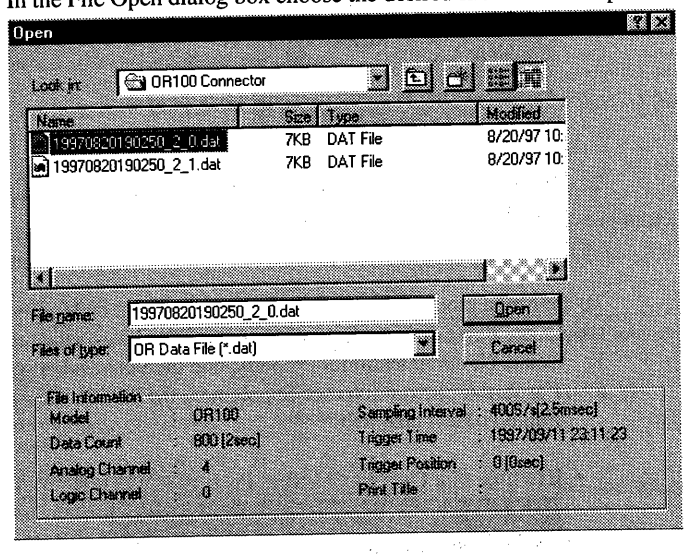
Displaying OR 100 Measurement data

To display the measurement data you receive from the OR 100, please use ACRAWin 32 or OR 100 Viewer software. To transfer the data to the data viewer products proceed as follows:

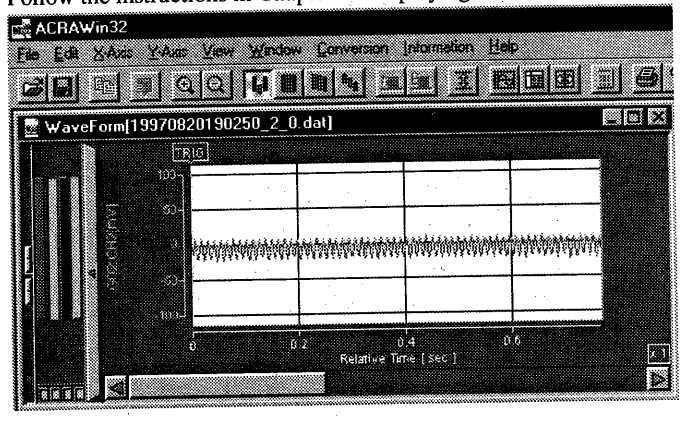
1. In the access point list click the OR 100 which data you wish to display.
2. Select View > View data.



3. In the File Open dialog box choose the desired file and click Open.

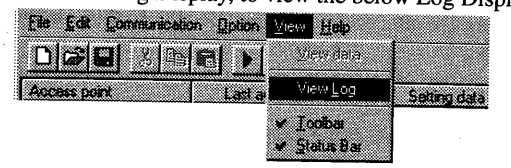


4. You can now view waveforms and digital values using ACRAWin 32 or OR Viewer software. Follow the instructions in Chapter 2 'Displaying Measurement Data', to proceed.

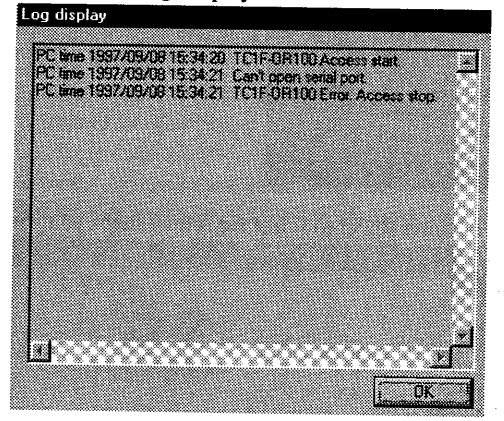


Log Display

The last executed communication actions can be viewed with the Log Display window. This enables you to view which OR 100 was connected, or whether there were access errors. Select View > Log Display, to view the below Log Display window.



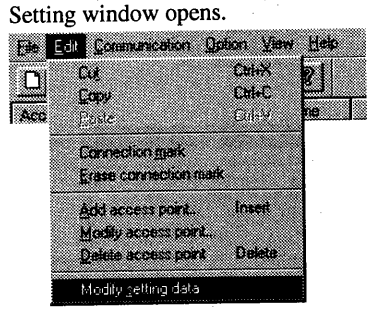
- Example of Log Display.



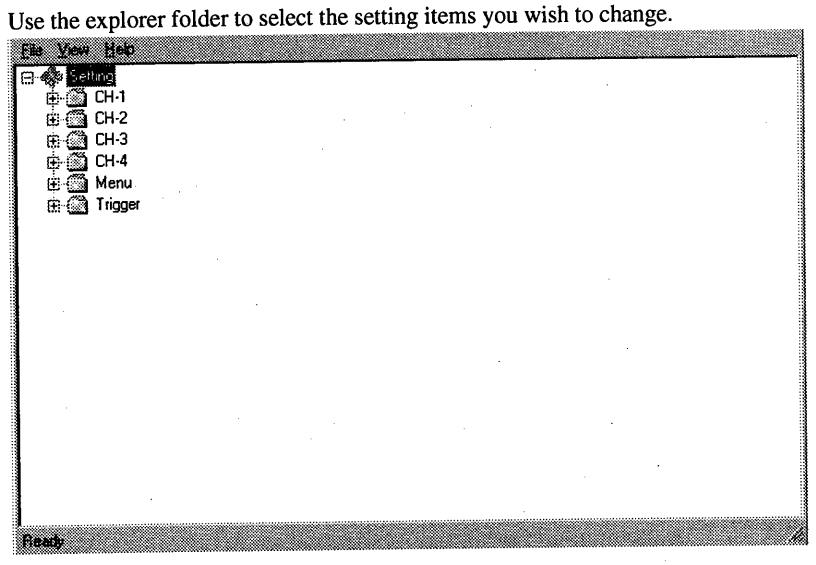
3.7 Changing OR 100 Settings

After you receive OR 100 settings you can change them using the OR 100 Easy Setting function, and then return the alter settings to the OR 100. In this way you can change a number of settings using your PC.

1. To change the OR 100 settings first select Edit > Modify Setting Data. The OR 100 Easy Setting window opens.



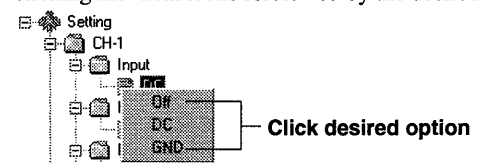
2. Use the explorer folder to select the setting items you wish to change.



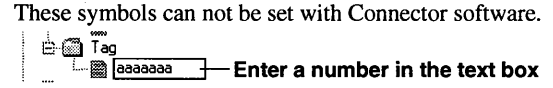
The settings you can change using the pop-up menu are:

Settings
- Channel
  - Input
  - Range
  - Filter
  - Tag
- Menu
  - Memory Length
  - Sample Rate (Time / Div)
- Trigger
  - Mode
  - Combination (AND/OR)
  - Channel Type
  - Channel Level 1
  - Channel Level 2

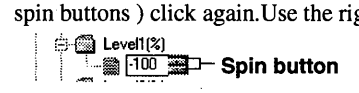
3. All items —except the Channel Tag, and Trigger Channel Level items— can be changed by clicking the item icons fololowed by the desired setting.



Change the Channel Tags by first clicking the icons and then clicking the text box. After a new tag is set, click any place on the screen to set the change. Click the right mouse button to cancel your setting. Note that some Tag symbols set in the OR 100 change on your PC screen: 'µ' gets displayed as 'u', and degree (°), and Ω symbols appear as a open space. These symbols can not be set with Connector software.

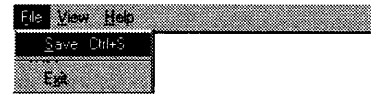


Change the Channel levels by clicking the channel icons. After setting a number (using the spin buttons) click again.Use the right mouse button to cancel the setting.



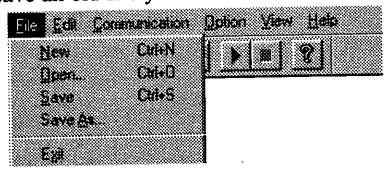
Saving OR Settings File

Save the OR settings by selecting File > Save from the OR Easy Setting window.



3.8 Saving Files

To save a new file select File > Save as..., and enter a new file name.
To save an old file you have modified, select File > Save.



Note

After having communicated with an access point, again save the list file if data have changed (for example the last access time).

Error Messages & Troubleshooting

Error Messages and Corrective Actions

No	Message	Corrective action
EO203	No file data.	No data were found in the file. Check the file.
EO204	File not in OR binary format.	You attempted to open a file that was not an OR file. Select an OR 1400 / ORM data file.
EO205	File not in OR100 binary format.	Select a data file in OR 100 format.
EO211	Can't write data to file.	Possibly the disk has either insufficient capacity or is write-protected. Please check.
EO213	Can't open file.	Possibly this file is being used by different software. Check.

Troubleshooting

Content	Possible cause / Corrective action
Setup won't work .	Check whether your harddisk has sufficient free memory.
Can't connect OR100/0R1400/ORM.	Check whether the communication settings fits with the OR settings.
OR100/0R1400/ORM settings refuse.	Check whether the communication device settings fits with the OR settings.

Specifications

Software

- 'ACRAWin 32' Data Viewer Software for OR 100 and OR 1400 / ORM.
- 'OR 100 Viewer' Data Viewer Software.
- 'OR 100 Connector' Communication Software.

The software package you have purchased:

Model	Software Package
789501	OR 100 Viewer / OR 100 Connector
789502	ACRAWin 32
789503	ACRAWin 32 / OR100 Connector

ACRAWin 32

Data Display
Displays saved waveforms and digital values measured with OR 100, OR 1400 or ORM.

Maximum Data Length
Depends on the amount of empty hard disk memory.

Data Conversion
Data measured with OR 100, OR 1400 and ORM are converted to ASCII, Lotus and Excel formats.

Waveform Display Amount
For each file 16 waveforms and 16 logic displays.

Computing Functions
For waveforms and digital values, using cursors, it calculates: maximum and minimum values, peak-to-peak values, average values and Root-mean-square (RMS) values.

Printing
Prints waveform and digital display screens, cursor values and calculation results.

Cursor Measurement
Displays cursor appointed data values.

OR 100 Viewer

Functions equal to ACRAWin 32 except for the amount of displayed waveforms.

Waveform Display Amount
Displays a maximum of 4 analog waveforms and 8 logic displays.

OR 100 Connector

Communicating with Access Points
Executes communication after, name, password, access method, and the desired data are set.

Changing Setting Values
Receives, modifies and transmits OR 100 data.

Data Display
Data measured with OR 100 are displayed using OR 100 Viewer software.

System Requirements

PC Requirements

A PC that can run Windows 95, or Windows NT 4.0 or later; CPU: Pentium 90 MHz or higher ; 16 MB or more RAM, 5MB or more HDD.

Operating System

Windows 95, or Windows NT 4.0 or later.

Disk Drive

3.5 Floppy disk drive, DOS 1.44 MB

CRT, Printer, Mouse

Supporting Windows 95, or Windows NT 4.0 or later.

Serial Port / Modem

When using communication software (OR 100 Connector), the PC needs to either have a serial port (RS-232) or a modem connection, to establish contact. The OS must also recognize them.

RS-232 Cable, adapter

For serial communication, SD/RD*, or RS/CS* reversely connected RS-232 cable is required.
*RS-232 regular abbreviations: SD: Send Data; RD: Read Data; RS: Request to send; CS: Clear to Send
The following products can be used as RS-232 cable and adapter:
RS-232 cable (for DOS-V) : D09-9F25F (SANWA SUPPLY Inc.)
Adapter : KRS-007K (SANWA SUPPLY Inc.)