

## BEN32 DEMONSTRATION

(by B. Trémérie)

### Technical Handout:

The purpose is in no way to give a comprehensive presentation of all BEN32 features. It is only intended to offer the users of the Demonstration disks help in mastering the program and to illustrate its user friendliness, its speed and powerful features. Some functionalities of the program have been limited for the demonstration purpose. It is intended for and refers to the BEN32 Version 1.3 Demonstration disk and the typical faults coming with it. The fully featured program BEN32 and reference manual are delivered upon purchase.

A basic knowledge of Windows95/WindowsNT is expected to proceed efficiently through this demonstration.

It is not recommended to install the demonstration version on a system already running another version of BEN32.

### *Run the program*

Run the program BEN32 on a system with the following minimum configuration:

Note: BEN32 is developed to make full use of a 32 bit operating system like Windows95/WindowsNT.

Operating System: Windows95™ or WindowsNT™ 4.0 or later.

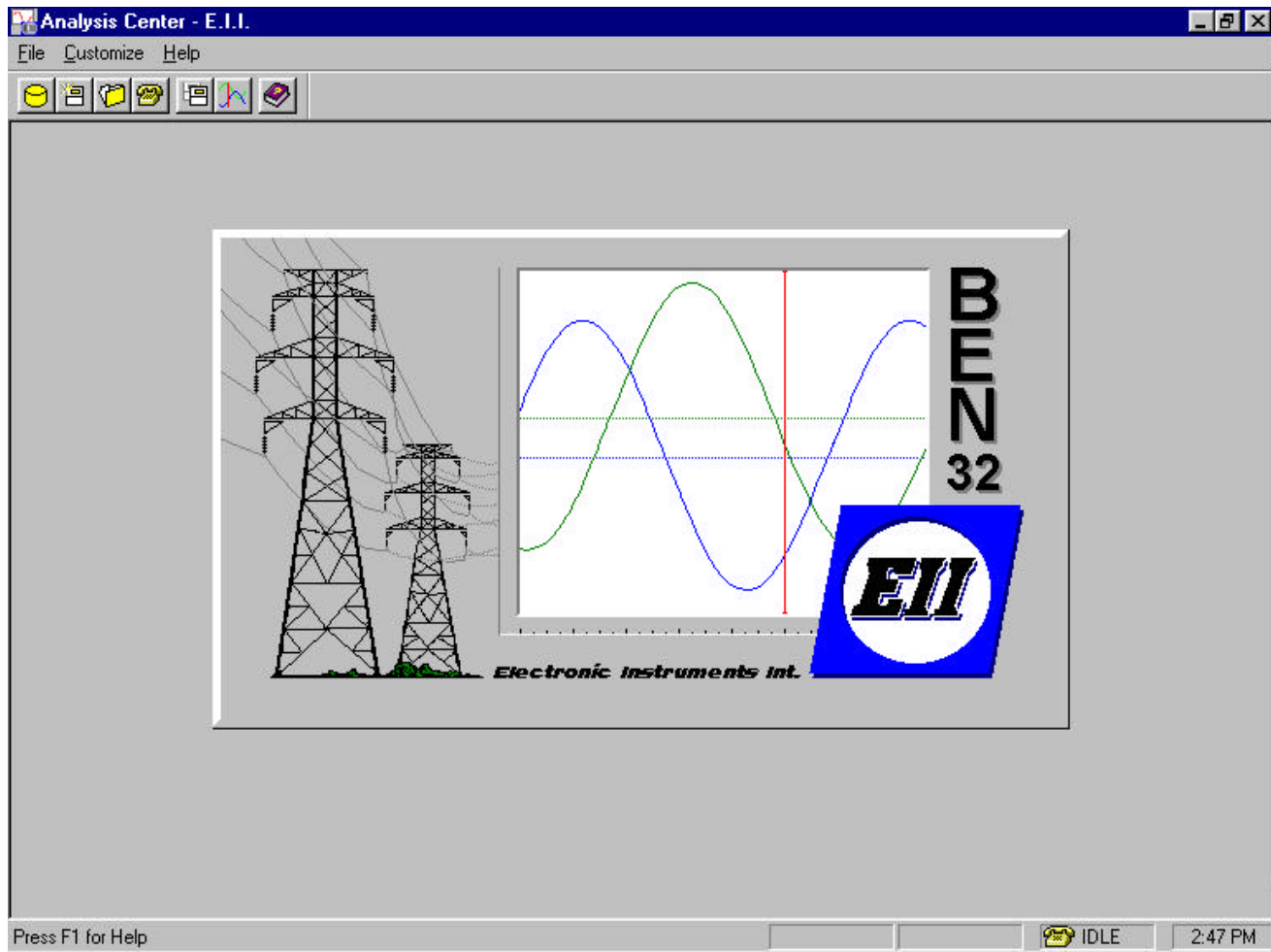
Microprocessor: 80486 at 33 MHz. Preferred: **Pentium Processor 120 MHz**

Memory: 8Mbytes RAM (16 Mbytes for WindowsNT™)

3 Mbytes Hard disk space

Screen: VGA 640x480. Preferred **SVGA 800 x 600**

BEN32 presents you with a starting screen as follows:



On the top:

the Menu: File, Customize, ...Help

and

the Toolbar: with the various default and user defined icons

At the bottom:




the message line and indicators

**Note:** The user can customize up to seven (7) different Toolbar setups according to the task he/she is performing: Database analysis, Record analysis, BEN remote control, etc.... This guide refers to many icons. If you do not find them in your Toolbar as described, you may customize the corresponding Toolbar to show that icon (*See Customize/Toolbar for more information*).


**Note1:** Make sure that under Customize/Options, the system frequency is set to 50Hz. This demo uses 50Hz records.

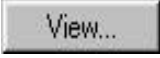
## Help

A comprehensive and fully structured Help function is available for additional information about the meanings or the use of the program. The user can access the Help function through:

- Pressing the <F1> key: Traditional Help key
- Clicking on the  button
- Pointing to any screen function after clicking on the  button (note how the cursor changes).
- Clicking on the  button where available.
- Choosing the Help function from the Menu

## Records Database

Click on the  button or from the Menu: File/Open Record Database.  
BEN32 visualizes the records currently stored on your system.



Note: Increase or reduce the type of information displayed by the mean of the View/Options function (*choose the fields*) and amount of information with the  button (*choose the systems*)

Note1: See how your Toolbar has changed from the initial one.

Show the sorting of the records according to each of the parameters, simply by clicking on each parameter's name (*Toggle to sort ascending or descending*).

The user can at his/her discretion provides a name, a class and a status to each record. This information can later be used for sorting.

Show more details about a record by selecting the record and selecting Edit/Record Info or click


the  or  button. That window will, among other indications, display whether data from all or part of the channels were recovered since the user may choose which group of channels to transfer (**New feature**).

BEN32 offer the user to import and export records to and from the Database.

Use File/Import... function (or the  button) to import a record

Use File/Export... function (or  the button) to export a record

## Record analysis

Open record 2077 (*double click on it or select it and use ).*

Notice the speed at which the display is updated.

Identify the Analysis Window:

Window Title

Page Title (*expansion factor, date & time down to the millisecond, page N°*). Click once on the Page Title and see how the User Page Title is displayed.

Channel Description Pane (*channel name, signal amplitude at the marker position*)

Digital channel plot

Analog channel plot

Time Scale

Scrolling Bar


Maximize the Analysis Window using  button.

## Channel Description

Move your cursor on an analog channel name in the Channel Description Pane, and click the left mouse button to select one or more channels. Click the right mouse button and select Channel(s) Properties to visualize and/or modify the parameters of the channels selected using the left mouse button. Example, change the color of the selected channel(s).

Display the parameters of a group of digital channels and look at each individual digital channel name and the way it is displayed in alarm state or not (*bold or normal*).




## Fine Zooming(1)

Press and Move the right hand side of the Scrolling Bar Slider  to the middle of the display to emphasize the beginning of the whole record.

## Measurements

Click once on the measurement Marker (*the vertical line crossing the whole page*) and keep your mouse key depressed while you move the Marker to another location. Release the mouse key and see how the measurements are updated in the Channel Description Pane. Double click in the graphic pane and see how the measurement marker moves.






Repeat the above Marker displacement, but use the keyboard cursor keys for fine positioning.


Press the middle of the Slider  and move it aside to display another portion of the record (*you can also use the left  or right  arrow buttons on each side of the Scrolling Bar*).

Click the right mouse button when in the Graphic Pane and set Marker 2 (*Green Marker*). Position the green Marker with the mouse and click to fix it.

Click alternatively on the green and red Markers and see how the measurements are updated in the Channel Description Pane.

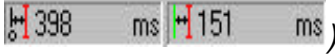
Note: The Measurement Type buttons at the left hand side of the Page Title indicate the type of measurement currently displayed:


- Peak value 
- Peak value/ $\sqrt{2}$  
- At the point of the red Marker 
- At the point of the green Marker 
- Delta measurements between Markers 

True RMS value of the channels can be displayed (*must have two markers displayed*) using the Math/Values/True RMS function or the  button. The true RMS calculation is performed for the samples between the two markers (*must be a whole number of cycle(s) and markers must be linked*).

Note: When true RMS measurements are activated, note how you can toggle between the different types of measurements by clicking on the Measurement Type button.

## Fine Zooming (2)

Unlink the markers (*click the right mouse button while on one Marker, and click Link Marker if it is already ticked off 3*), and position the Markers  $\pm 150$  ms apart (*see the Marker time indicator at the bottom of your screen* ).

Zoom on the data between the Markers by means of the function View/Zoom on markers or the  button. See how fast the display is updated.

Notice the change of size of the Scrolling Bar Slider.

## Multiple Channel Selection

Select the voltage channels V0, V4 and V8 (*Press the <Control> key while clicking on the channels with right mouse button. Alternatively select the channel V0 and select the channel V8 while keeping the <Shift> key depressed, see the three channels selected*). Selected channel(s) may be dragged and dropped within a window or to another window. Selected channels may also be copied to the clipboard then pasted later to another window (*Click the right mouse button within the Channel Description Pane after selecting the channel(s)*).

## Erase Channel(s)

Click the right mouse button while in the Channel Description Pane and choose Delete channel(s) from page.

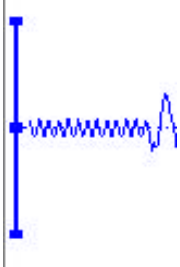
Note: Channel data **are not** lost. The channel can be retrieved by clicking the right mouse button in the Channel Description pane. The menu offers you the ability to Add channel(s) on page... Select the channel(s) you want to put on the page.

### Amplitude Zooming and Channel Positioning

Select (*click the left mouse button on*) the channel VR in the Channel Description Pane or on the Scale Indicator. See how the channel display and the Scale Indicator change.

Click the right mouse button and select Channel(s) Properties. Change the position to 1350 and the amplitude to 3000%. Note that you may eventually position the channels out of the Display Pane.


You can also perform this using the 'handles' of the channel Scale Indicator



- Click on the Scale Indicator middle 'handle' and keep the mouse key depressed while you reposition the channel
- Click on the Scale Indicator top or bottom 'handle' and keep the mouse key depressed while you resize the channel
- Look at the indication in the Status Bar while you drag the Scale Indicator (%).

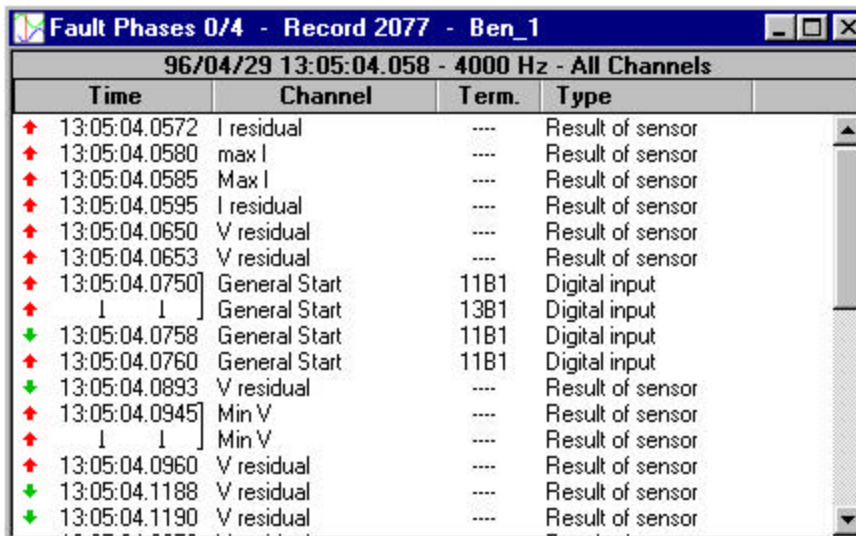
### Harmonic Analysis

Position your two Markers between 0 ms and 147 ms with at least one cycle interval displayed. Select channel VR. Display the harmonic analysis of channel VR by selecting the function

Math/Harmonics or clicking on the  button. See how quickly BEN32 performs the harmonic analysis. The resulting window shows the components up to the 15<sup>th</sup> harmonic for the selected channel (*for the portion between the two markers*). We can obviously recognize an important 3<sup>rd</sup> harmonic component. The fundamental is expressed in the user defined units RMS. The harmonics are expressed in a percentage of the fundamental value. Results are also displayed as a bar-graph. Select another channel and see how the harmonic analysis changes.

## SER View

Use the function View/Events view to display the list of the digital events in a Sequence of Event Recorder (SER) format. The following window shows up:






96/04/29 13:05:04.058 - 4000 Hz - All Channels				
Time	Channel	Term.	Type	
↑ 13:05:04.0572	I residual	----	Result of sensor	
↑ 13:05:04.0580	max I	----	Result of sensor	
↑ 13:05:04.0585	Max I	----	Result of sensor	
↑ 13:05:04.0595	I residual	----	Result of sensor	
↑ 13:05:04.0650	V residual	----	Result of sensor	
↑ 13:05:04.0653	V residual	----	Result of sensor	
↑ 13:05:04.0750	General Start	11B1	Digital input	
↑ 13:05:04.0750	I I	13B1	Digital input	
↓ 13:05:04.0758	General Start	11B1	Digital input	
↑ 13:05:04.0760	General Start	11B1	Digital input	
↓ 13:05:04.0893	V residual	----	Result of sensor	
↑ 13:05:04.0945	Min V	----	Result of sensor	
↑ 13:05:04.0945	I I	----	Result of sensor	
↑ 13:05:04.0960	V residual	----	Result of sensor	
↓ 13:05:04.1188	V residual	----	Result of sensor	
↓ 13:05:04.1190	V residual	----	Result of sensor	

Identify the various elements of the window: edge indicators, Time, Names,... You may also modify the type of information displayed, using the View/Options function, or the amount of information, using the View/View Filters function (or click the right mouse button while in the window).


## User Views

Switch back to a graphical view using the View/Ben View function.

Each time you change the screen layout, you can save it as a User View selecting the function File/Save View... or clicking on the  button. Click also on Default View if you want to use that layout preferably with each record coming from that BEN.

Mark the record as 'viewed' and/or 'analyzed' by using the function Edit/Atributes and selecting Viewed and/or Analyzed or by clicking the  and/or  buttons respectively.

## Calculated Channels

Select the function Math/Calculated channels or click on the  button. Input a new equation, and name it (e.g. *VR Harmonic 3*). Set the units in kV. Input the equation as follows:

Click  and select “Harmonic”

Click  and select 15A3 VR

Complete the equation to look like @Harmonic(“15A3:VR”,3)


Press 


Press 

Give a name to the View (e.g. *Test*) and see how BEN32 adds an additional channel to the view. Like any other channel, you can now reposition, resize, ... this channel.

## Parallel Analysis

Expand the scrolling bar to display the whole registration.

Open a new database record using the function File/Open Record Database (or clicking the  button) and selecting record N°279 URN B. The new selected record is displayed.

Tile the two opened analysis windows using the function Window/Tile Records (or click the  button).

As an example, position the red marker in record 2077 on the trigger point (0 ms) and the red marker in record 279 on 225 ms.

## Synchronized Analysis

Use the function Window/Synchronize... (or click the  button) to synchronize the two analysis

windows. Select Synchro ON and click all three synchro modes followed by 

You can now move the red marker in any of the two displayed records and see how the marker is also moving in the other window once you release it. Measurements are now synchronized between the two records.

Note: These records could come from the same BEN, from two different BENs or even from other devices that provide COMTRADE compatible files (COMTRADE import on request).

Position the second marker in any of the two windows (See *Measurements above to see how to place a second marker*). See how the second marker also appears in the second window at the same distance from the first marker as in the first record. Link the two markers by clicking on the mouse right button while pointing to a marker. Select the Link Markers function.

You can now move the link markers in one window, and see how the linked markers in the other window are also moving.

Zoom between the markers using the function View/Zoom on markers (or click the  button) and see how the zoom is performed in both windows.

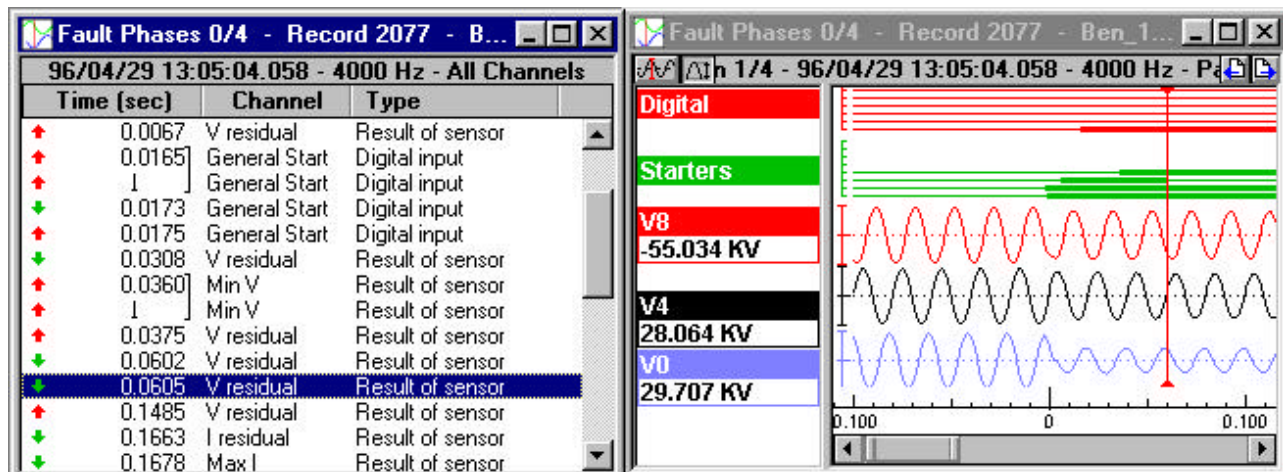
## SER and Graphical Display

The user may elect to analyze a record based on both a graphical and a SER type display. To do that, perform the following steps:

Close the window showing record N°279 (if you performed the above demonstration step)

Select the window showing record N°2077 and duplicate it using the Window/Duplicate function (or the button). Select one of the two windows showing the record and use the View/Event

View function to obtain the SER type display. Use the Window/Tile function (or the button) to tile the windows or move the windows sides to your preference (See example below).



## Reporting

The Printing function is very versatile and allow the user to print whole or partial records with the desired resolution on any printer supported by Windows95/WindowsNT.

Select the File/Print... function or click the button and select the desired print setup:

- Printer
- Pages
- Time scale
- Print range

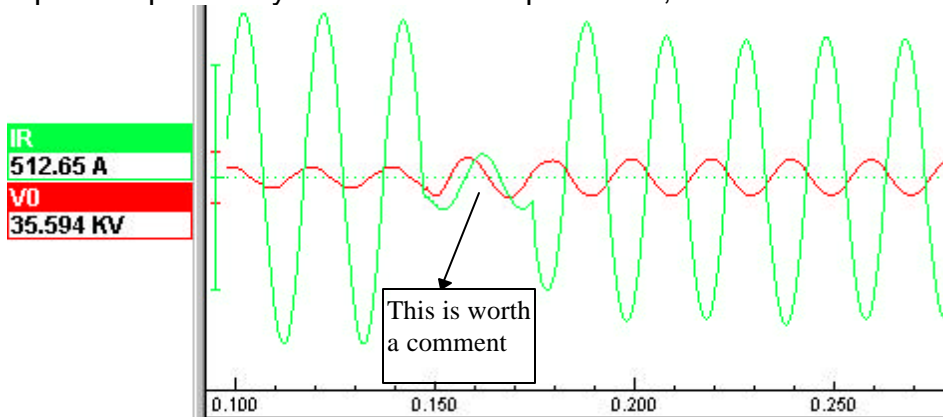
Click the button to preview how the print-out will look like. You can also click the button while in the Analysis window to preview a print-out.

The SER information may also be printed from the analysis screen.

BEN32 features AutoPrint functions to automatically print the BEN recorder results upon calling from the BEN recorder. The user may choose between graphical or SER type print-outs.


You may also choose a portion of the display and send it to the Windows Clipboard (**New feature**): Select the Edit/Screen Capture function (or click the button) and frame the area of the

screen you would like to capture. The selection is immediately sent to the Clipboard and may be used in any other Windows compatible program (*Word, Paint, a.s.o...*). You may pre-set fault report templates in your favorite word processor, insert and even edit your analysis selections.





In order to ease the handling of screens and meet some users preferences, it is now possible to display the records on a white background (**New feature**). Use the View/Options function and select White Background. Color schemes are user programmable under the Customize/Options/Preference. The user may set colors per phases (*when the phase information is available in the BEN recorder*) or per their sequence on the display. Two different color schemes may be set for white and black background respectively.


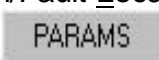
## Fault Location (BENLOC32) (Optional)

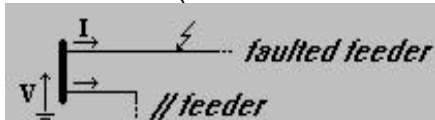
Select the Database view through File/Open Record Database (or Click on the  button) and select the record N°2 from BEN S/N 999.


Note: to speed up the BENLOC32 demonstration, the line and phase parameters have already been established for a demo fault.



Open the record through pressing  or double clicking on it. Maximize the Analysis Window using  button.

BEN32 displays the record made of 3 voltages ( $V_a, V_b, V_c$ ) and 4 currents ( $I_a, I_b, I_c$  and  $I_n$ ).

Select BENLOC32 through Math/Fault Locator (or by clicking the  button). The BENLOC32 window appears. Select the  button to set the phase and line parameters. BENLOC32 can compute fault location taking into account the eventual parallel feeder and the line load (See the model description in the upper right hand of the window)



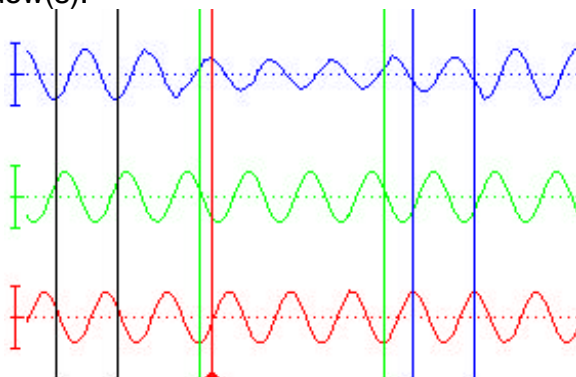
The channel parameters are displayed (and are adjustable by the user), the line parameters are set or selected in the Line Database accessed by clicking the  button. Exit the Line

Database by clicking on the  button and exit the channel parameters display, clicking on the  button.


BENLOC32 advances into its computation through a sequence of 3 steps

- identification of the possible multiple fault stages and selection of evaluation windows within these stages.


Note1: See how, in the BEN32 graphic analysis window the position of the additional markers highlight the evaluation window(s).






- identification of the faulted phase(s) and fault type.
- computation of the fault location for each of the identified fault stages.
- Indication of the most accurate computation based on the parameters and different fault

stages. 



After selection of the parameters, the user can elect to immediately accept the results of all three

steps and press twice on the  button. Or, the user may decide to change BENLOC32 selections by editing the values displayed at each step of the calculation. The user may do this by clicking with the right mouse button on the data to be changes and then selecting from the choice of options. The user may graphically reposition the evaluation window(s) by dragging and dropping them within the record (Use <shift> + right mouse key to expand the evaluation




window). The  button allows you to go one step back in the calculation. Click the  to obtain a formal report of the fault location calculation including the phasor equations.


The  button ends BENLOC32.


## Access to a BEN

Open the list of the BEN currently set-up in your BEN32 through the function File/Open Ben... or by clicking on the  button. Select the Ben\_1 by double clicking on its name or painting it and using the  button. The BEN\_1 last record directory (if any) is displayed (Note the

date of the last update at the window top right hand corner). The record already received is marked with a 3. Note the changes in the Toolbar.

- ◇ Use the function View/Directory or click the  button to show the BEN directory. Change the directory display options by clicking on  and tick off the desired options. Close the Options dialog window, select a directory entry ticked off (3) and click on the  button to display the record summary. Close the Record Info window.




You can directly retrieve a record from a remote BEN by clicking on the  button. No more user action is needed (*not available with the Demonstration version of BEN32*). The user may also elect to retrieve only part of a record, picking the group of channels to transfer (**New feature**). For that purpose, use the Control/Get Part of Records... function and select the groups of channels (*not available with the Demonstration version of BEN32*).

- ◇ Use the function View/Setup or Click the  button to display the BEN Setup:

Main setup: (BEN name, Serial Number, Type and PC directory)

Communication setup: (Address, Modem type and configuration, Phone Number, Access password, Automatic modes, Data origin, ...)

Options setup

- ◇ Click the  button to display the current status of the Communication interface. This is an important window to verify the performance of the communication between BEN32 and a BEN Fault Recorder (this communication is otherwise totally user transparent except for the Communication indicator at the bottom of the screen):  IDLE .
- ◇ Use the function View/Status or click the  button to display the BEN statuses:

## Self Diagnostics

This section illustrates the performance of the BEN in terms of precise self diagnostics. Precise and specific diagnostics are given for the following:

### System

- System status
- the accessories
- the relay settings
- the temperature inside the system
- the next fault number
- all sub-unit error count

### Acquisition

- acquisition status and last calibration
- the hardware and software version
- the configuration of each acquisition controller

### Control Unit

- the Muldex(es) status and version
- the CPU software version
- the Memory card(s) status and version


### Subsystem(s)

- the Communication status and hardware and software versions
- the Hard Disk status, size and % free
- the Sensor(s) status, computing power and version


### Sub BEN(s)

- the Sub Ben status and error code
- the memory used and available
- the system user parameters revision and date of update

## BEN Communications

By clicking on  BEN32 will communicate with the remote BEN and update the parameters and statuses without any other user action (*not available with the Demonstration version of BEN32*).

Note: At this stage BEN32 establishes the communication with the BEN and updates the record of the parameters. If it can not establish the communication (no BEN connected) it will display the last parameters retrieved.

◇ Use the function View/Parameters or click the  button to have access to the BEN user parameters:

BEN32 now displays the following parameter:

### System

- Acquisition...
- Sub BEN info...
- Parameters File...

## AnalogChannels

- Channel name, terminal, type, sensor and group
- Units, scale and display parameters

## Digital Channels

- Channel name, terminal, type, sensor and group
- Polarity

## Sensors

- Input, terminal, status, type, outputs
- Threshold, hysteresis, frequency, Tmax, Tpost

## Groups


- Name, type
- Channels in group
- Position

## Pages


- Page number, title

When updated, BEN32 allows the user to send the parameters back to the BEN fault recorders totally transparently (*not available with the Demonstration version of BEN32*).

◇ Additional functions are offered to the user:

- Remote start of the BEN for a specified length recording using the function Control/Remote Start... (or clicking the  button) (*not available with the Demonstration version of BEN32*).
- Set/Get the BEN date & time using the function Control/Ben Date and Time
- Configure BEN
- High Level Access...
- ...

## Events logging

BEN32 provides the user with a full logging of the various events that happened during the use of the program (information messages, warnings and errors). This log can be viewed at any time using the function File/Open Logging (or clicking the  button).

## Records on your Demo disk

Record name	Class name	Status	Ben	Ben name	Rec.	Size	Duration	Speed	Initial trigger
A-Temp. fault	New Record		1	Ben_1	1	41	0.418	6000	94/11/03 16:18:24.574
Fault Location	C to Ground		999	Ben_999	2	24	0.341	3000	96/11/21 09:33:17.060
URN B	A to Ground		1	Ben_1	279	176	1.735	3000	94/11/25 10:32:07.117
Slow Record	Imported Record		1	Ben_1	550	12	25.966	30	95/01/26 07:42:02.605
-	New Record		1	Ben_1	716	13	12.650	20	96/02/14 06:00:10.523
Fault Phases 0/4	2 Phases		1	Ben_1	2077	166	1.220	4000	96/04/29 13:05:04.058
Demo	New Record		1	Ben_1	2163	227	1.676	4000	96/05/09 10:31:18.648

Record 1 illustrates a high frequency transient on phase R. Use the Harmonic function to see the harmonic distribution.

Record 2 is a record for which the line parameters were known and introduced in the BENLOC line database. Use BENLOC to determine the fault location.

Record 279 illustrates a 11 kV line fault. See the voltages on page 1 and the currents on page 2. Emphasize the currents on page 2 to display distortion.

Record 550 is a record from a slow acquisition unit. It illustrates a bus bar disconnection and attempted re-connection. See the active and reactive power traces as input to the BEN from external transducers.

Record 716 is a record from a slow acquisition unit. It shows voltage and frequency traces on page 1. Emphasize the traces on page 2 and see the traces of the active and reactive power as well as the operation of two BEN sensor types: the Step sensor triggering at each power gradient and the Swing (pending) sensor only triggering after the user programmed number of oscillations.

Record 2077 illustrates how the BEN sensor timing logic allows for the complete capture of one event in one record. The record length is optimized based on the fault detection time.

Record 2163 illustrates similar fault with a BEN recorder triggered by external digital signal (General Start). See how the recording is less optimized versus the record 2077. A better tuning of the General Start should be done or a BEN trigger logic based on the BEN Analog trigger sensors.



NOTES: