DAP 640

Users Manual

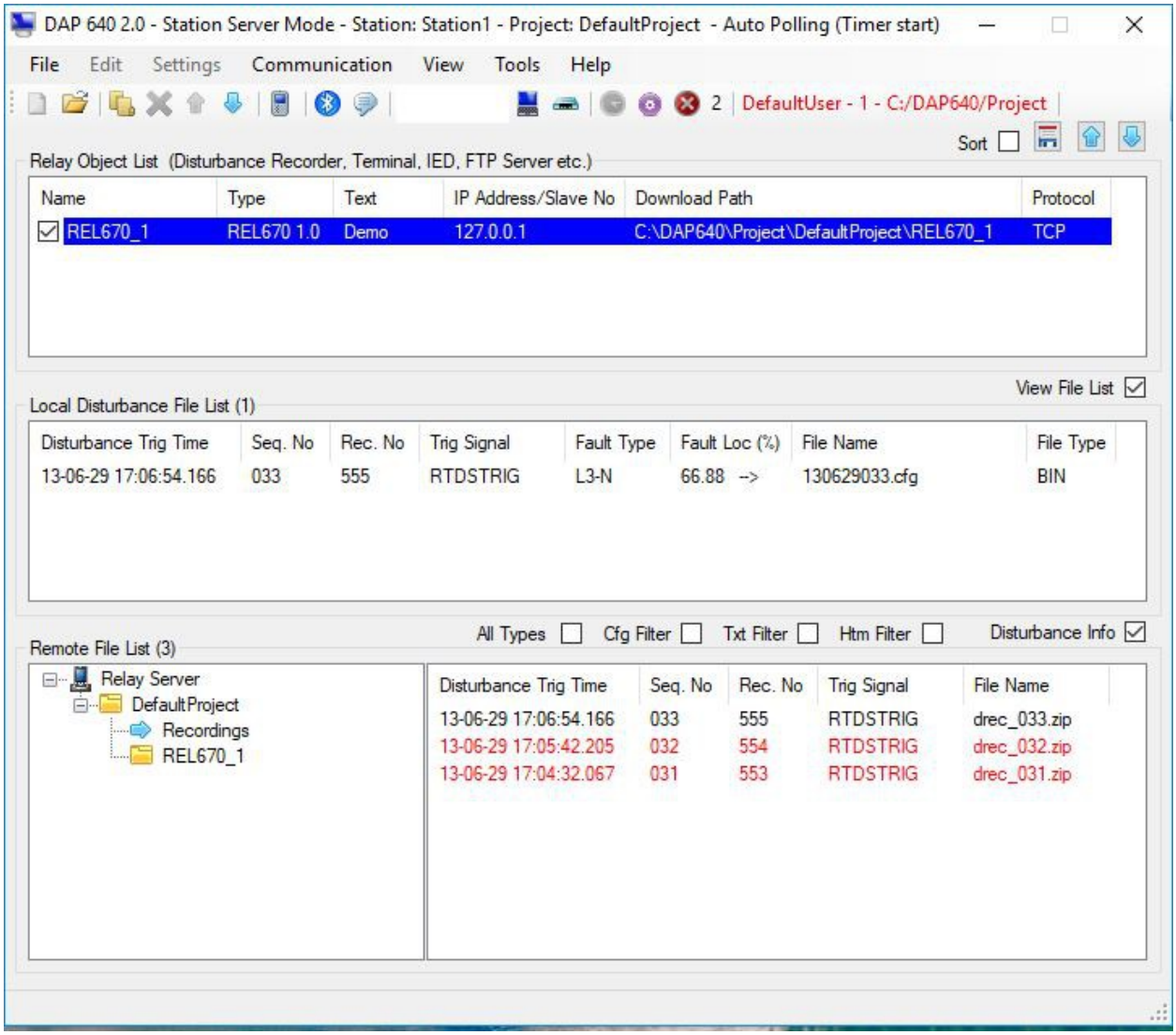
Contents

1 General

DAP 640 is a FTP client program for disturbance handling of disturbance recorders supporting the FTP protocol. Serial communication of disturbance recorders of Reval type is also supported. Timer, event or manual start of disturbance polling is possible. Tools as event list manager, database manager, disturbance file browser, distance protection characteristic, DFT analyzis and external program starter are included. The auto polling function could also be run as a Windows service with start, stop and check functions.

2 Getting Started

When DAP 640 is started for the first time after installation the running mode *Station Server Mode* will be selected and a default project is opened with a REL670 relay object. The login user will be SysAdmin with read and write permission. Click the relay object and then click the toolbar button <List Files> to simulate a real connection with DAP 640 FTP server. The files are visible in the group box *Remote File List*. Double click one of the files in the list to download the file. The disturbance will now be visible in the *Local Disturbance File List*. Double click the disturbance in the list and the disturbance evaluation program will be opened with the selected disturbance. To edit the relay object click <Edit/Edit Object>, see paragraph 6.2.



3 System Configuration

Click <Settings/General Settings> to select a *Running Mode*

3.1 Station Server (PC-Relay Connection)

This mode is normally a server mode but could also be a client.

Network Communication

Click <Edit/Add Object> and select a relay object of 600 series type and type the *IP address* of the relay. Click OK to add the relay to *Relay Object List.*

Serial Communication

Click <Edit/Add Object> and select a relay object of 500 series type and type the Slave number of the relay. Click OK to add the relay to *Relay Object List.* Click then <Settings/Communication Settings> to setup the serial communication parameters. The default values could normally be used but the serial port must be selected. All serial ports available in the PC are listed in the combo box.

Manual Polling

Right-click an object in *Relay Object List* and select <List Files> to get the remote relay disturbance file list. To view more info of the disturbance file, check the *Disturbance Info* check box and repeat the listing. To speed up the communication the box should be unchecked. To download a disturbance file to the PC, double-click the disturbance in the list or right-click a disturbance and select <Download File(s) to PC>. To download more than one file select first the number of files to download or select <Download all Files to PC>.

The file type of the remote disturbance files are .zip, .cfg or .reh . When downloading disturbance files of .cfg type which is the file type shown in remote disturbance list the .dat and .hdr will also downloaded. When downloading disturbance files of .reh type the .rev file will also be downloaded.

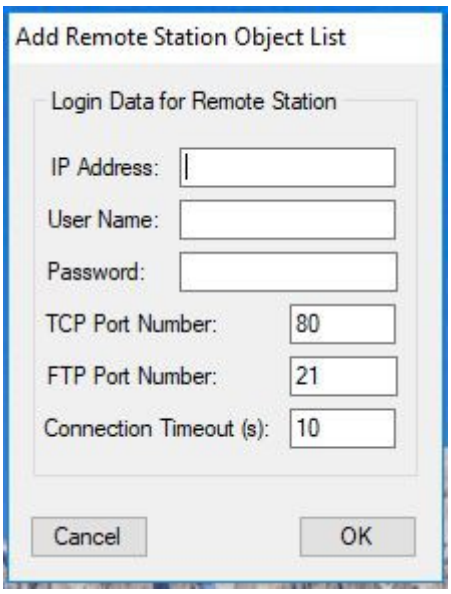
AutoPolling

Click <Settings/General Settings> and select *Timer Start of Disturbance Auto polling.* Set the *Timer Start Time and Periodicity* and click OK. Check then all relay objects in the *Relay Object List* to be polled automatically. Click the *Start Timer* toolbar button to start the auto polling. A counter indicates that the timer process is running. The TCP Server, Administration Server and FTP Server starts at the same time. All new disturbance files will automatically be downloaded to the download path of each relay object.

3.2 Station Client (PC-PC Network Connection)

This mode is the normal client mode for network communication with a Server PC.

Right-click the Station Client node in *Local Report File List* and select <Add Station>. Click Yes to add a station for network connection.



Type the Station IP address, User Name and Password. Use the default values for Port Numbers. To use default login values with read permission leave the fields blank. Click OK to download the Relay Object List from the remote Station.

Right-click a relay node and select <List Server Files> to list the remote disturbance files stored on Station Server. In the *Remote File List* double-click a disturbance file to download it.

Options

<Station Disturbance Polling> Start polling all relays in remote Station

<Relay Disturbance Polling> Start polling a relay in remote Station

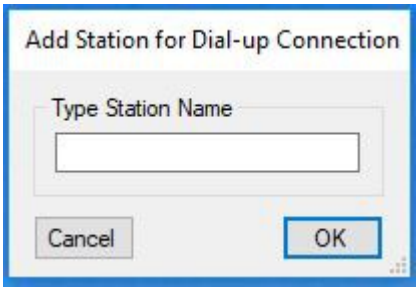
<Send Settings to Station Server> Send all General and Communication Settings to Station Server

<Station Web Site>Connect to Station server and view *Relay Object List* in a web browser

3.3 Station Client (PC-Relay DialUp Connection)

This mode is used for serial communication with a remote modem connected to a relay spa loop .

Right-click the Station Client node in *Local Report File List* and select <Add Station>. Click No to add a station for dial-up connection.



For dial-up connection the Station, Project and Relay Object Name must be typed manually. After adding the Station right-click the Station node and select <Add Project>. Type the Project Name and then right-click the Project Node and select <Add Relay Object>. Select a Relay Object and Slave Number and

leave the other fields blank.

Right-click the Station node and select <Edit Station> to edit Communication Settings. Type the phone number to remote Station and select a modem. Select a Serial Port and the Baud Rate. The other fields could be left unchanged.

Right-click the Station node and select DialUp to connect to the remote Station. After a successful connection right-click a relay node and select <List Server Files> to list the remote disturbance files stored in the relay. In the *Remote File List* double-click a disturbance file to download it.

Options

<Relay Disturbance Polling> Start polling a relay in remote Station

3.4 Central FTP Client (PC-Central FTP Server Connection)

This mode is used to handle disturbance files uploaded to the Central FTP Server after disturbance polling in Station PC. All disturbance files from all Stations in the Power Grid will be stored on this FTP server.

Click <Settings/Communication Settings to setup communication data. Type the *IP Address* and login data to the remote FTP Server. The Station directory is a folder in the User Directory where the disturbance files are stored. Default name is DAP640.

Check first the *Cfg Filter* checkbox and then click a relay node in *Remote File List* navigator to get disturbance file list. Double-click a file to download it. The file will be visible in *Local Disturbance File List*. Double-click the file to view it in the disturbance evaluation program selected in General Settings.

3.5 Central Web Client (PC-Central Web Server Connection)

This mode is used to handle disturbance report files (htm) uploaded to the Central Web Server after disturbance polling in Station PC. All report files from all Stations in the Power Grid will be stored on this web server.

Click <Settings/Communication Settings to setup communication data. Type the IP Address and login data to the remote Web Server. The Station directory is a folder in the User Directory where the report files are stored. Default name is DAP640.

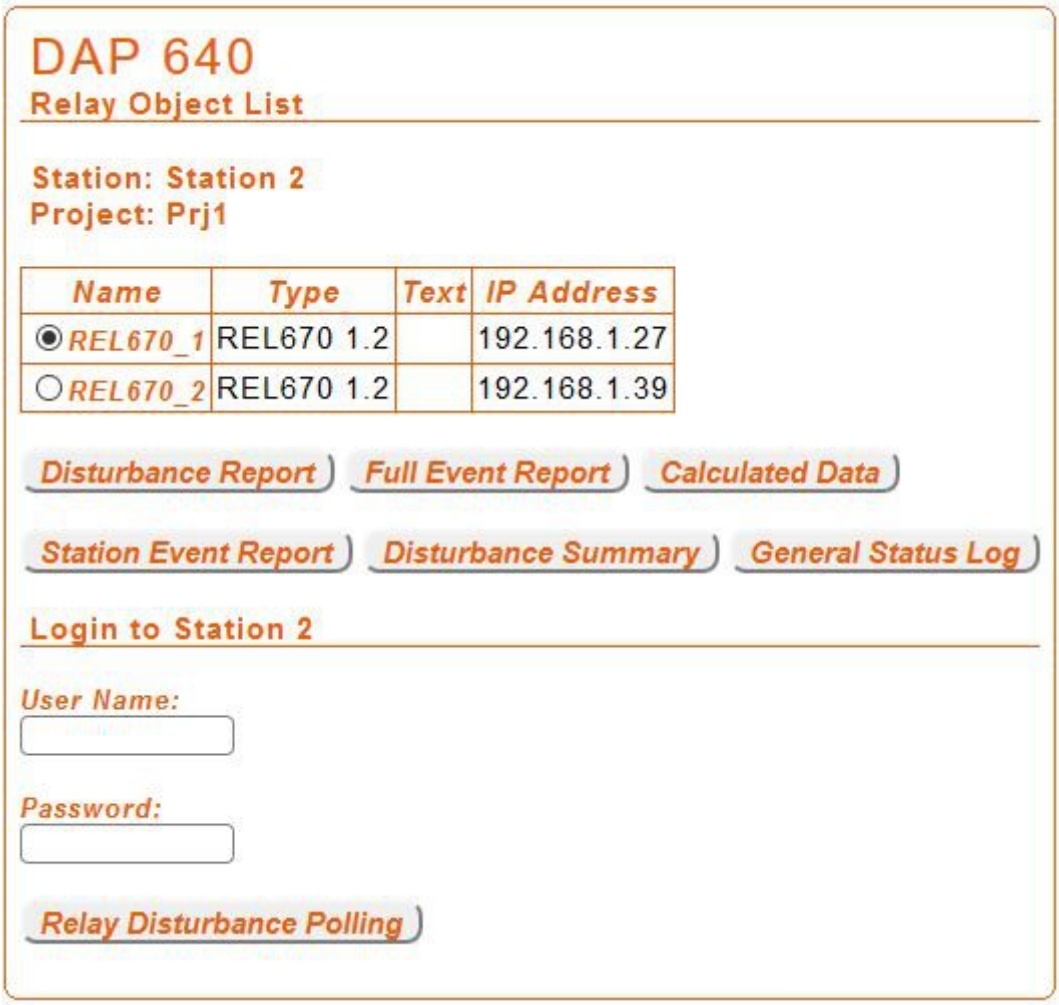
Check first the *Htm Filter* checkbox and then click a relay node in *Remote File List* navigator to get report file list. Double-click a file to download it. The file will be visible in *Local Report File List*. Double-click the file to view it in a web browser.

4 Web Functions

4.1 Connect to Station PC web server

It is also possible to start a relay polling in a Station PC from a web browser in a Station Client PC or smart phone and view disturbance and event information.

To connect to a Station PC from a Station Client PC type the IP address of the Station PC in the address field of a web browser and the relay object list page will appear.



Select first a Relay Object by clicking the radio button.

Click *Disturbance Report* to view disturbance and event information for selected object.

Click *Full Event Report* to view all events (1000) in selected object.

Click *Calculated Data* to view Load Data, Characteristic Operation Status and Fault Location Data in selected object.

Click *Station Event Report* to view a merged report list for all active objects in the Station Server PC.

Click *Disturbance Summary* to view a disturbance list of new downloaded disturbance files for selected object.

Click *General Status Log* to view a communication status list.

Click *Relay Disturbance Polling* to start a polling in selected object.

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Relay Disturbance Report
2018-09-16 15:06:47

Station: Station 2
Project: Prj1
Relay: REL670_2

Disturbance File: 1032-0_160502241.cfg				
Trig Time	Trig Signal	Fault Type	Fault Location	Fault Direction
2016-05-02 12:11:22.899	DR_Trigger	L3-L1	40.50 %	-->

Disturbance Event Data			
Event Time	Event Signal	Value	Channel
2016-05-02 12:11:22.899	DR_Trigger	On	96
2016-05-02 12:11:22.902	PhSel_PhG	On	24
2016-05-02 12:11:22.905	PhSel_A	On	15
2016-05-02 12:11:22.905	PhSel_PhPh	Off	25
2016-05-02 12:11:22.905	PhSel_Fwd_A	On	26
2016-05-02 12:11:22.909	PHSELZ_AG	On	18
2016-05-02 12:11:22.912	Zone2_PU_A	On	52
2016-05-02 12:11:22.912	CarSend_A	On	56
2016-05-02 12:11:22.912	WEI_Blk_A	On	67
2016-05-02 12:11:22.912	Zone4_PU_NDir	On	76
2016-05-02 12:11:22.919	DR_Trigger	Off	96
2016-05-02 12:11:22.919	21_Trip	On	13
2016-05-02 12:11:22.919	PhSel_C	On	17
2016-05-02 12:11:22.919	PhSel_Fwd_C	On	28
2016-05-02 12:11:22.919	Zone1_PU_A	On	49

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Station Event Report
2018-09-16 15:14:10

Station: Station 2 (192.168.1.126)
Project: Prj1

Relay	Date	Time	Signal	Value	Number (2000)
REL670_2	2016-05-02	12:13:22.813544372	DIR3_Rev_AB	On	2000
REL670_1	2016-05-02	12:13:22.813544372	DIR3_Rev_AB	On	1999
REL670_2	2016-05-02	12:13:22.813544372	Dir_Z3_PURV	On	1998
REL670_1	2016-05-02	12:13:22.813544372	Dir_Z3_PURV	On	1997
REL670_2	2016-05-02	12:13:22.806878155	PHSELZ_CG	Off	1996
REL670_1	2016-05-02	12:13:22.806878155	PHSELZ_CG	Off	1995
REL670_2	2016-05-02	12:13:22.806878155	DIR3_Rev_AB	Off	1994
REL670_1	2016-05-02	12:13:22.806878155	DIR3_Rev_AB	Off	1993
REL670_2	2016-05-02	12:13:22.806878155	Dir_Z3_PURV	Off	1992
REL670_1	2016-05-02	12:13:22.806878155	Dir_Z3_PURV	Off	1991
REL670_2	2016-05-02	12:13:22.803544803	PhSel_Fwd_C	Off	1990
REL670_1	2016-05-02	12:13:22.803544803	PhSel_Fwd_C	Off	1989
REL670_2	2016-05-02	12:13:22.803544803	PhSel_Fwd_1Ph	Off	1988
REL670_1	2016-05-02	12:13:22.803544803	PhSel_Fwd_1Ph	Off	1987
REL670_2	2016-05-02	12:13:22.803544803	PhSel_C	Off	1986
REL670_1	2016-05-02	12:13:22.803544803	PhSel_C	Off	1985
REL670_2	2016-05-02	12:13:22.790212893	PhSel_Fwd_1Ph	On	1984
REL670_1	2016-05-02	12:13:22.790212893	PhSel_Fwd_1Ph	On	1983
REL670_2	2016-05-02	12:13:22.776880215	PHSELZ_CG	On	1982
REL670_1	2016-05-02	12:13:22.776880215	PHSELZ_CG	On	1981
REL670_2	2016-05-02	12:13:22.773545046	PhSel_Fwd_C	On	1980
REL670_1	2016-05-02	12:13:22.773545046	PhSel_Fwd_C	On	1979
REL670_2	2016-05-02	12:13:22.773545046	PhSel_C	On	1978
REL670_1	2016-05-02	12:13:22.773545046	PhSel_C	On	1977
REL670_2	2016-05-02	12:13:22.763544547	DIR3_Rev_AB	On	1976

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Calculated Data
2018-09-16 15:06:51

Station: Station 2
Project: Prj1
Relay: REL670_2

Disturbance File: 1032-0_160502241.cfg					
Load Data					
Angle (deg)	*S (MVA)*	*P (MW)*	*Q (MVAr)*	*ILoad (kA)*	*ZLoad (ohm)*
33.9	1752.8	1083.0	1336.4	1.916	156.2

Characteristic Operation Status - Correct: inside (27)						
Sample	*L1N*	*L2N*	*L3N*	*L1L2*	*L2L3*	*L3L1*
0	L	L	L	L	L	L
	B	B	B	B	B	B
	D	D	D	D	D	D
	N	N	N	N	N	N
1	L	L	L	L	L	L
	B	B	B	B	B	B
	D	D	D	D	D	D
	N	N	N	N	N	N
2	L	L	L	L	L	L
	B	B	B	B	B	B
	D	D	D	D	D	D
	N	N	N	N	N	N
3	L	L	L	L	L	L
	B	B	B	B	B	B
	D	D	D	D	D	D
	N	N	N	N	N	N

Fault Location		
Sample	Fault Location (%)	Fault Resistance (ohm)
27	26.01	52
28	30.86	43
29	33.52	37
30	34.51	34
31	33.99	33
32	36.00	31
33	37.37	31
34	38.96	31
35	39.09	31
36	39.00	32
37	39.13	32
38	38.71	32
39	38.49	32
40	38.64	31
41	39.09	31
42	39.59	31
43	40.76	31
44	42.32	32
45	43.82	34
46	45.01	36
47	45.91	39
48	45.20	42
49	43.02	46
50	39.70	51

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Station Disturbance Summary
2018-09-16 15:13:26

Station: Station 2
Project: Prj1

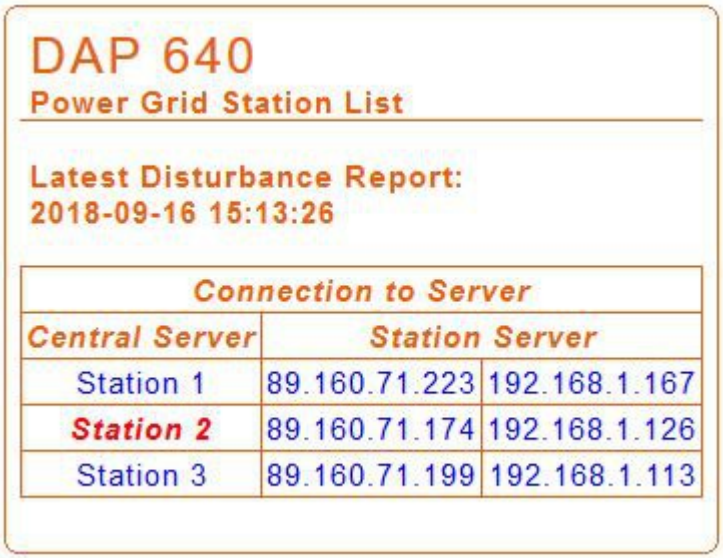
Relay	Trig Time	Trig Signal	Fault Type	Fault Location %	Fault Direction	File Name
REL670_1	16-05-02 12:13:22.537	DR_Trigger	L1-N	0.09	-->	1033-0_160502242.cfg
REL670_2	16-05-02 12:11:22.899	DR_Trigger	L3-L1	40.50	-->	1032-0_160502241.cfg

Relay Object: REL670_2 (127.0.0.1)
Remote Disturbance List
2018-09-16 18:44:51 Connected to REL670_2 (127.0.0.1)
2018-09-16 18:44:54 Downloaded File: 1033-0_160502242.hdr
2018-09-16 18:44:54 Downloaded File: 1032-0_160502241.hdr
2018-09-16 18:44:55 Downloaded File: 1031-0_160502240.hdr
Disturbance Files
2018-09-16 18:44:55 Downloaded File: 1032-0_160502241.cfg
2018-09-16 18:44:55 Downloaded File: 1032-0_160502241.dat
2018-09-16 18:44:55 Downloaded File: 1032-0_160502241.hdr
Checking Operation
2018-09-16 18:44:59 Checking Operation RMS completed
2018-09-16 18:45:00 Checking Operation DFT completed
2018-09-16 18:45:09 1032-0_160502241.dpc created
Event Report
2018-09-16 18:45:22 EventLogUnFiltered.txt created
Relay HTML Files
2018-09-16 18:45:27 RemoteDisturbanceListStationClient.htm created
2018-09-16 18:45:31 RemoteDisturbanceList.htm created
2018-09-16 18:45:41 RemoteEventList.htm created
2018-09-16 18:45:43 RemoteCalculatedValues.htm created
Uploading to Web Server
2018-09-16 18:45:46 Uploaded File: RemoteDisturbanceList.htm
2018-09-16 18:45:47 Uploaded File: RemoteCalculatedValues.htm
2018-09-16 18:45:49 Uploaded File: RemoteEventList.htm
2018-09-16 18:45:49 Uploading Relay Html Files to Web Server completed
Merged Event Report
2018-09-16 18:46:17 EventLogMergeUnFiltered.txt created

4.2 Connect to central web server

After polling of all relays in a station, disturbance and event information files could be sent to an central web site automatically. These files will be updated each time new disturbances are downloaded from the relay objects – either when auto polling or when using remote functions.

When connecting to the central web site the *Power Grid Station List* will appear. The red color indicates where to find the latest disturbance report. It is possible to connect to both central and station server. The first station server column is the Wan ip address and the second is the Lan ip address. To use the Wan ip address the router in the Station Server must be configured with portforwarding.



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Power Grid Station List

Latest Disturbance Report:
2018-09-16 15:13:26

Connection to Server		
Central Server	Station Server	
Station 1	89.160.71.223	192.168.1.167
Station 2	89.160.71.174	192.168.1.126
Station 3	89.160.71.199	192.168.1.113

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Relay Object List

Station: Station 2
Project: Prj1

Relay Disturbance Report	Type	Text	IP Address
REL670_1	REL670 1.0		127.0.0.1
REL670_2	REL670 1.0		127.0.0.1

Station Disturbance Summary

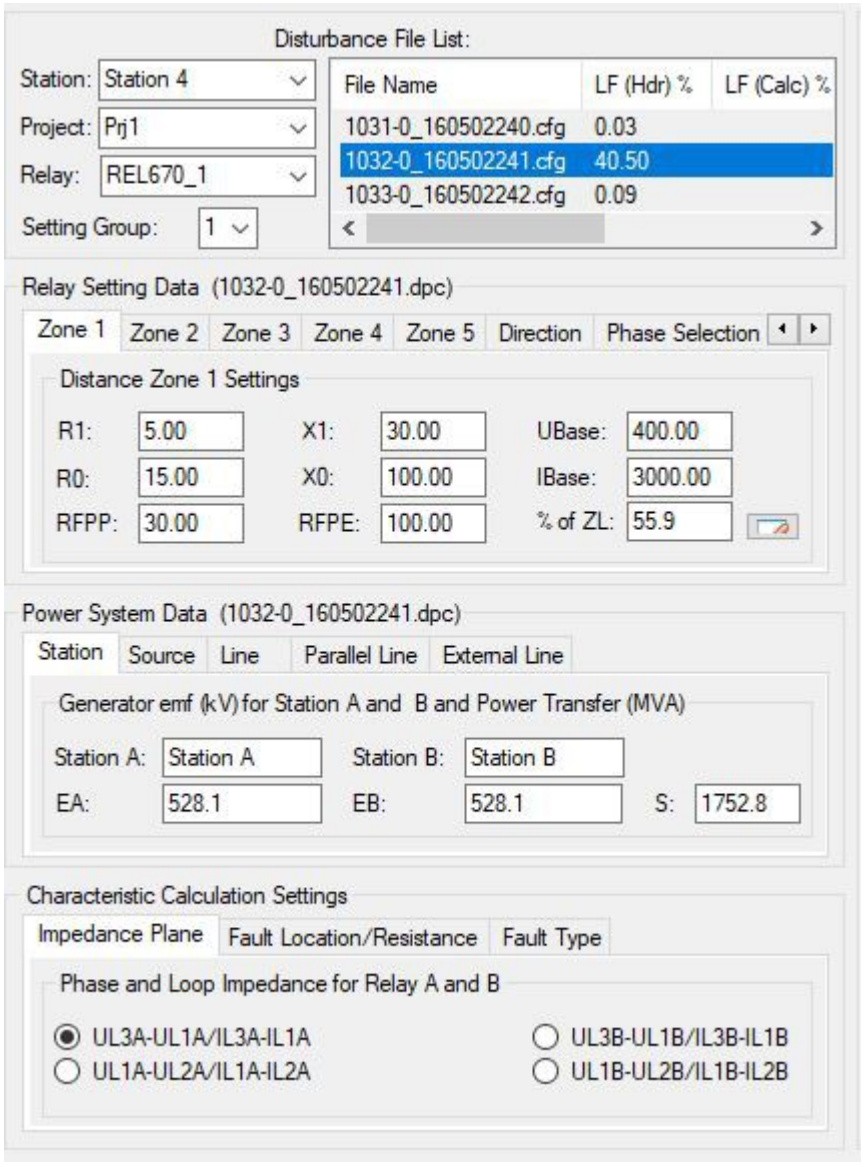
Station Event Report

General Status Log

5 Distance Protection Characteristic

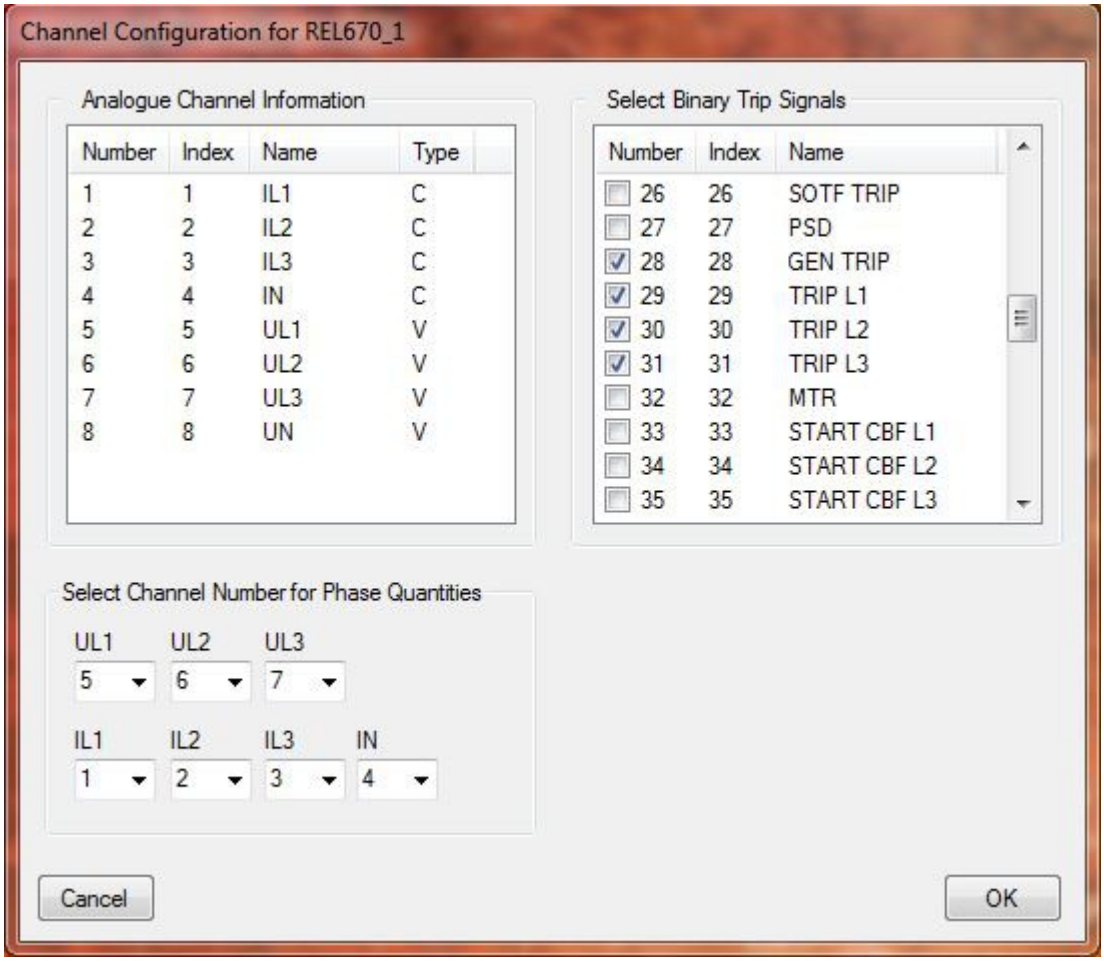
5.1 General

Click <Tools/Distance Protection Characteristic> to open the form. Relay setting data and power system data are the input data to the relay characteristic function and the check operation function. Select first a station, project, relay and a setting group and then select a file in the *Disturbance List*. At least on disturbance file must be visible in the list to continue the configuration. Click menu item <Configuration> to create a Channel Configuration file (see below) or download it from the station server. Then click <Configuration/Remote Functions> to download setting data from the relay or station server. It also possible to type the relay setting data and power system data manually and then clicking <File/Save Dpc file> to save the data. The file name RelaySettingsBase.dpc must not be changed.



5.2 Channel Configuration File

To use input data of a disturbance file for plotting or check of operation a channel configuration file must me created. Click menu item <Channel Configuration >to open a form to select channel numbers for phase quantities and binary trip signals. Select correct channel number for UL1,UL2,UL3 and IL1,IL2,IL3 and IN with help of analogue channel information listview. Check at least one binary trip signal which will indicate that a trip has occurred. Click OK to create the file.



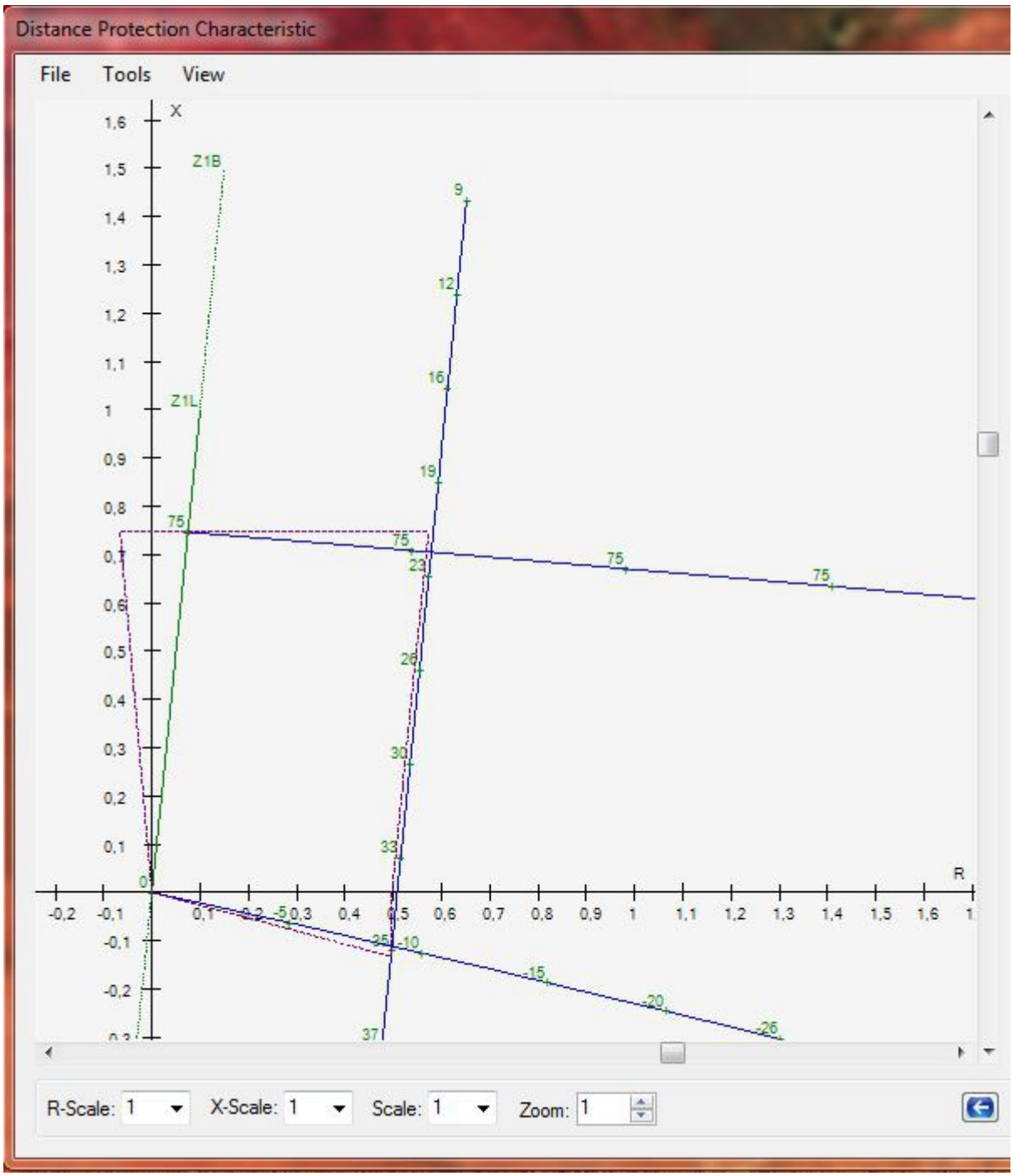
5.3 Plotting of Characteristic

Start the plotting by clicking the menu item <Tools/Power System Calculation> or the button in bottom right corner. The calculation will also be started automatically when opening a dpc file from File menu.

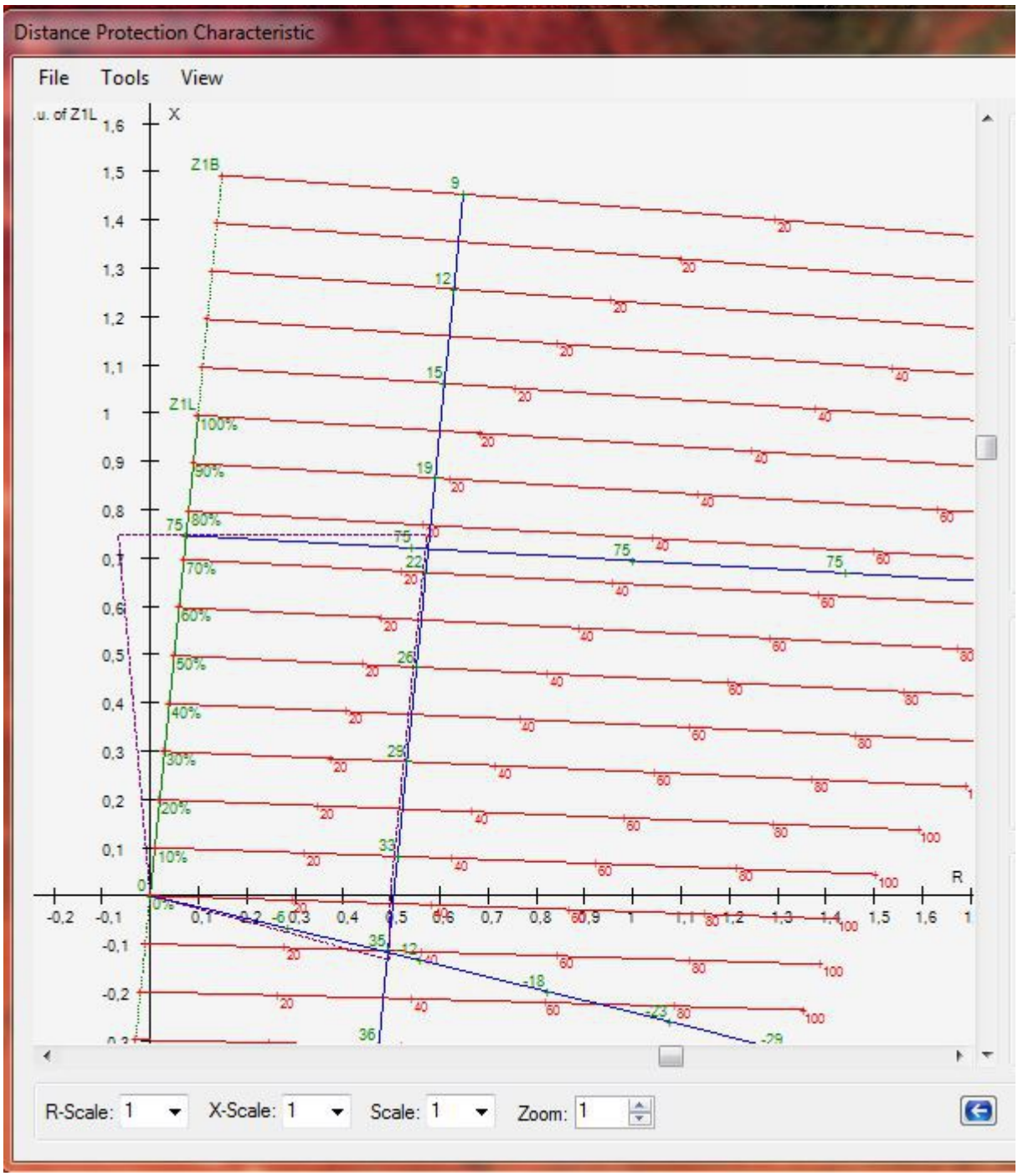
To plot the calculated characteristic check the box *Plot Calculated Characteristic.* The reactive, resistive and direction lines will be visible on the plot area.

To plot static characteristic check the box *Plot Static Characteristic* which is a none calculated characteristic plotted as described in the relay manual.

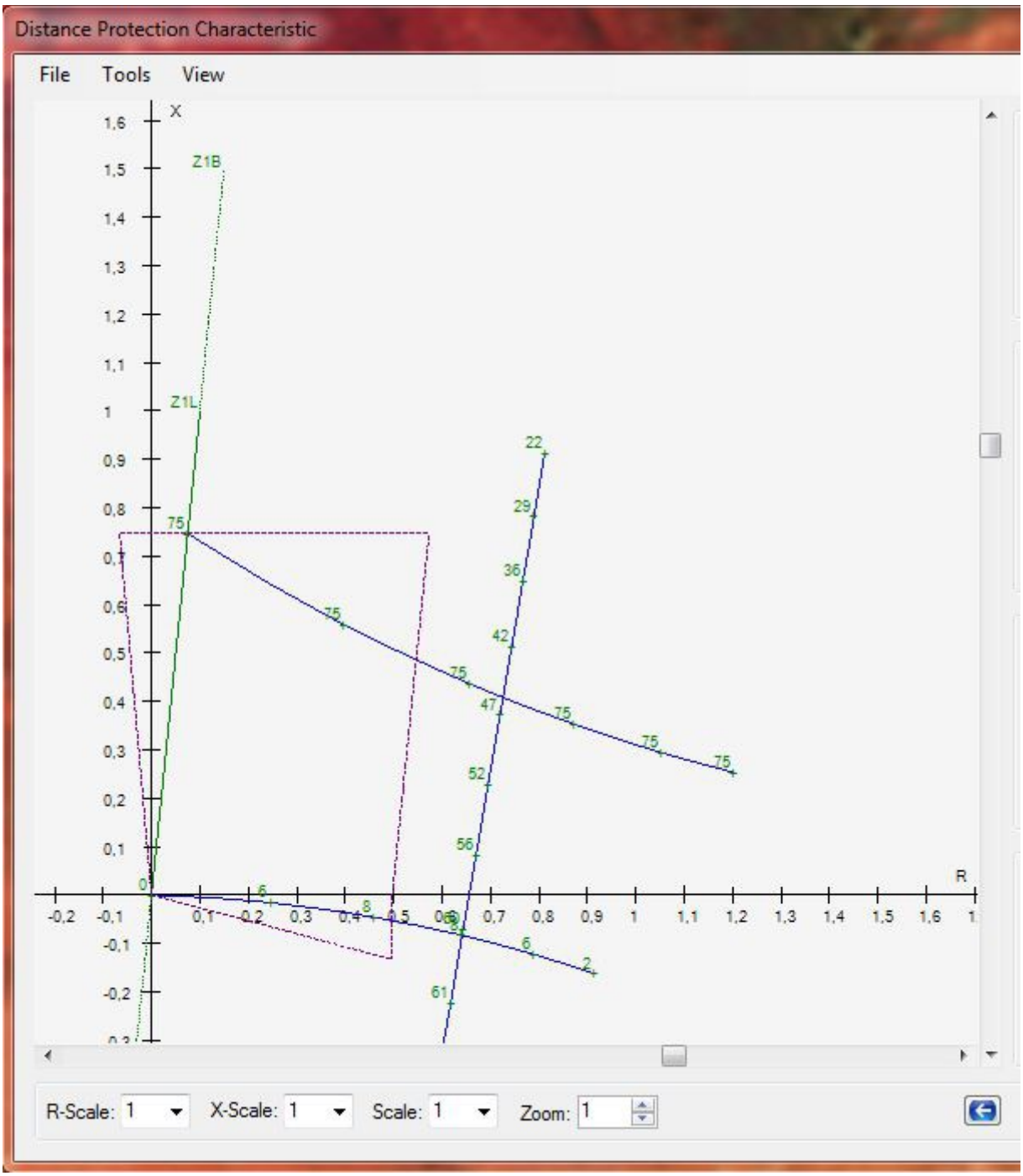
To plot the fault impedance for different values of fault resistance and fault locations check the box *Plot Phase/Loop Impedance.*



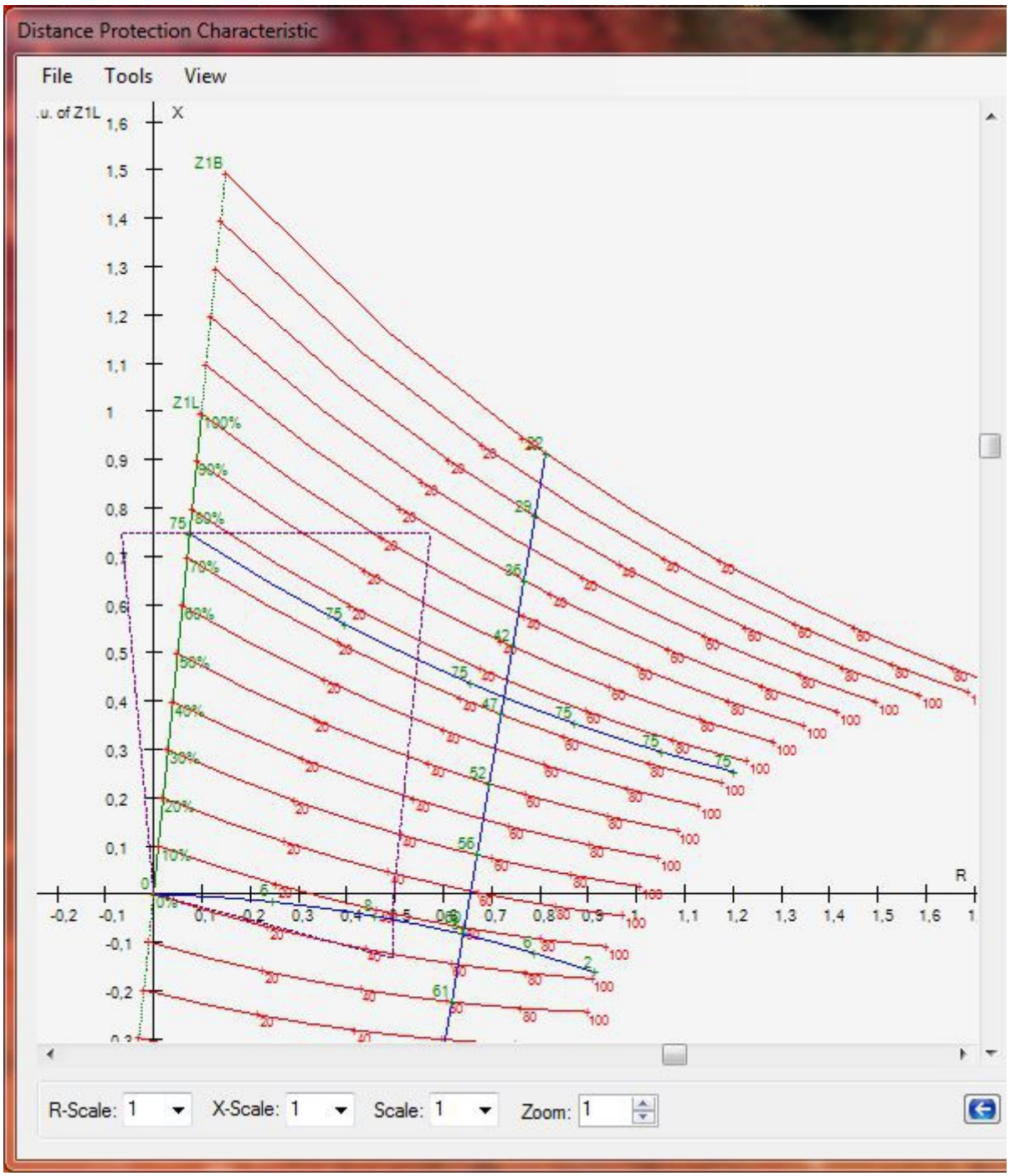
Plot of calculated (blue color) and static (violet color) characteristics at power angle of 8 degrees.



Plot of fault impedance (red color), calculated (blue color) and static (violet color) characteristics at power angle of 8 degrees.



Plot of calculated (blue color) and static (violet color) characteristics at power angle of 56 degrees.



Plot of fault impedance (red color), calculated (blue color) and static (violet color) characteristics at power angle of 56 degrees.

5.4 The Plot Area

The reactive, resistive and direction characteristics are visible as blue lines. The graduation of reactive and direction line is fault location limit and for resistive line fault resistance limit.

The green lines are line impedance (Z1L) and source impedance (Z1A, Z1B). The graduation of R and X axis is in per unit of the magnitude of line impedance.

To pan the plot use the vertical and horizontal scroll bars and to zoom use the up-down arrows . The scale

of R and X axis could be changed by using the list boxes *R-Scale* and *X-Scale* or by clicking the check box *Equal Scale* which set them equal. The blue arrow button sets the scale to default values.

5.5 Tab Control Relay Setting Data

When clicking the *Zone 1-5* or *Phase Selection* tab pages the calculation will start automatically if the box *Plot Calculated Characteristic* is checked. To edit or view the values in the tabs just uncheck the box. The reactive setting could also be set in % of line impedance by typing the value in the text box *% of ZL.* By clicking the button to the right the calculation will started with the new %-value typed.

5.6 Tab Control Power System Data

Power system data are normally transferred from fault locator source- and line impedance values when reading setting values from the relay.

The source impedance zero sequence values are not available but are needed for power system calculation. The X0 value is calculated by multiplying the X1 value with zero sequence compensating factor. The R0 value is calculated by multiplying the R1value with R/X ratio of line impedance.

Power transfer (S) is not available and is calculated from the pre-fault voltage and pre-fault current rms values of analogue channels in the disturbance header file.

5.7 Tab Control Characteristic Calculation Settings

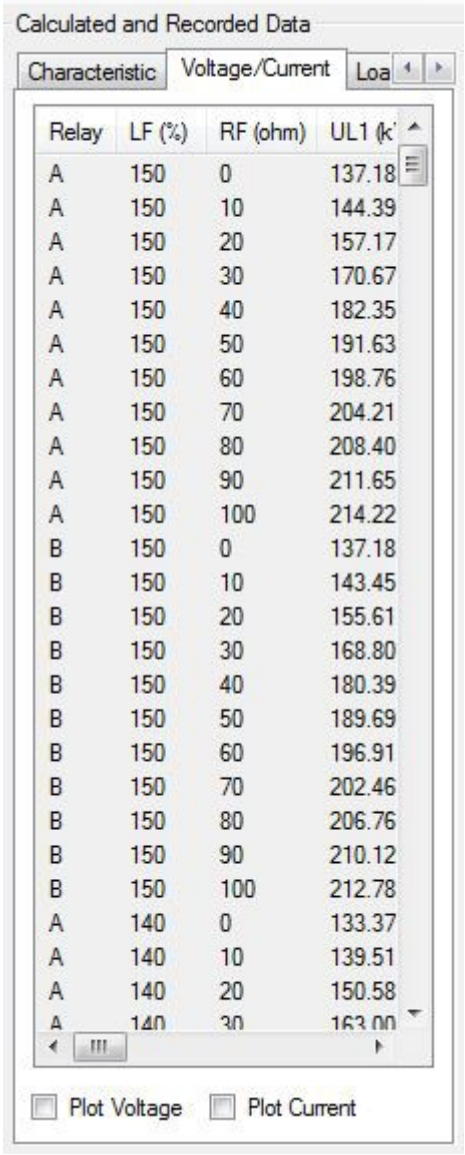
Two different impedance planes are used, U/(I+KN*IN) and U/I. The characteristics can be plotted in both planes but to read the correct setting on R and X axis of the plot area the correct plane must be used which is U/(I+KN*IN) for reactive characteristic (L) and U/I for resistive (B) and direction (D,N).

The power system calculation function divide the line and sources in fault location steps of 10% from -50% to 150% and at each fault location calculates the voltage, current and impedance for 10 different fault resistances from 0 to 100 ohm. This will cover the impedance plane in reactive and resistive direction. Fault location and fault resistance max and min values could be changed by selecting other values in list boxes LF Max, LF Min, LF Step and RF Max, RF Step. The RF value to mark the fault impedance curves with fault resistance is determined by the parameter RF Mark.

5.8 Tab Control Calculated and Recorded Data

5.8.1 Calculated Data

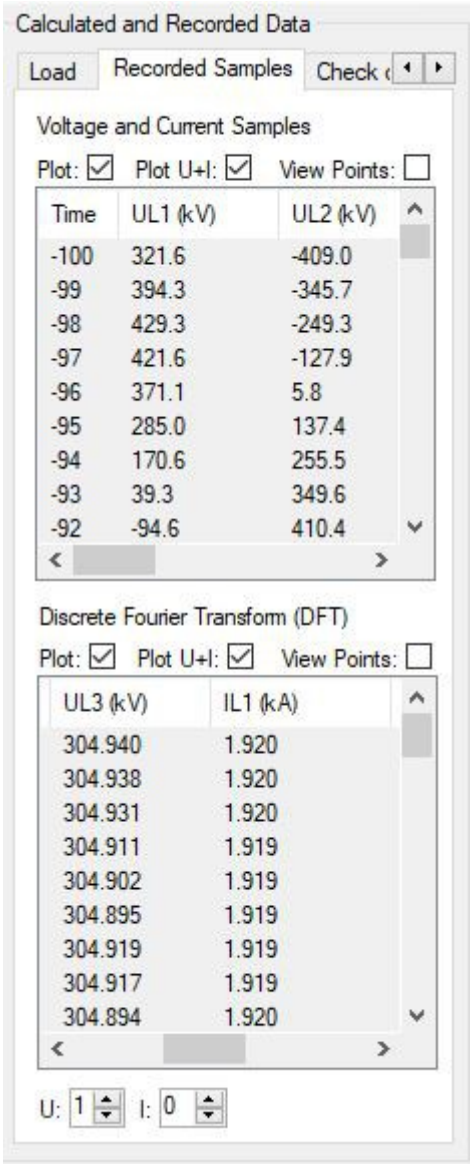
After Power System Calculation the impedance, voltage/current, characteristic and load data for different fault locations and fault resistances are visible in this control. It is possible to plot the voltage and current in polar coordinates by selecting an item in the list box if check box *Plot Voltage* or *Plot Current* is checked.

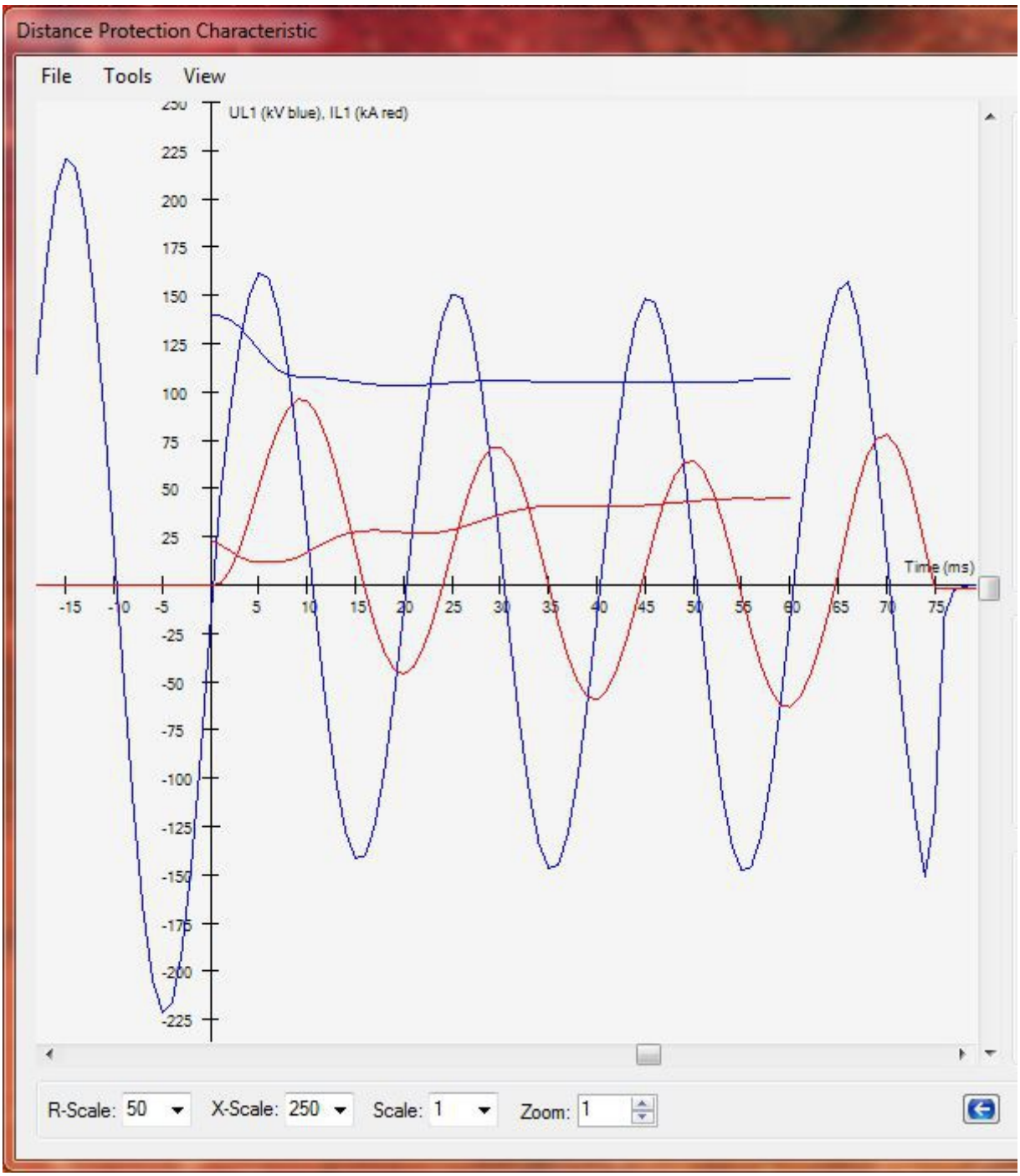


5.8.2 Recorded Data

Recorded Samples

When selecting a disturbance file in *Disturbance File List* the voltage and current samples of the comtrade .dat file will be shown in the tab page *Recorded Samples*. The discrete fourier transform (DFT) values are shown below. To plot values check first the box *Plot* and then click a voltage or current column header item to plot the samples. Check the box *U+I* to plot both voltage and current. Check the box *View Points* to graduate the curves with sample number. Use the numeric up-down control *U and I* at the bottom to change the scale and use the numeric up-down control *Sample Interval* to set the time scale.



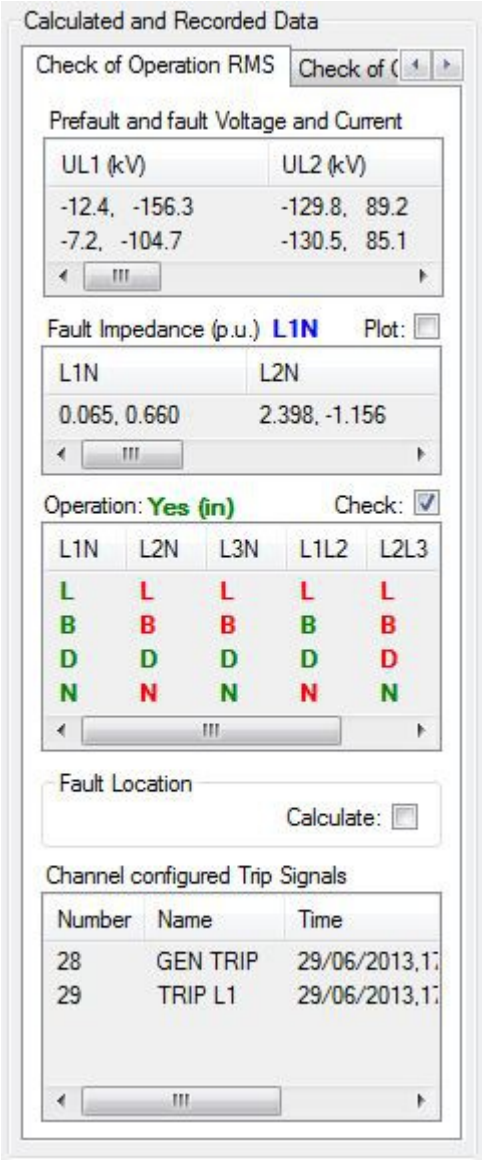


Plot of recorded voltage and current samples and the corresponding DFT.

Check of Operation RMS

To check relay operation for a selected disturbance file based on rms fault values click tab page *Check of Operation RMS.* Check the box *Plot* to plot the fault impedance vector and check the box *Check* to start the calculation and get an operation status list of all characteristics for all fault loops. L is the reactive line, B is the resistive line, D is the direction line and N is negative resistance line. The color green means operation and red means no operation. If all 4 characteristics are green the fault impedance is inside the relay operation area. If the relay operation is correct is determined by the channel configured trip signals shown in the list. If at least one trip signal exists in the list the relay operation is correct and the status Yes

(in) is shown in green color. Four different status texts are possible: Yes (in), No (in), Yes(out) and No (out). Yes and No indicate if operation is correct or not and (in) and (out) indicate if fault impedance is inside or outside of relay operation area. The status is also visible in disturbance file list column *Operation*. The fault location could also be calculated using power system data by checking the box *Calculate* and shown in disturbance file list column *LF (Calc).*

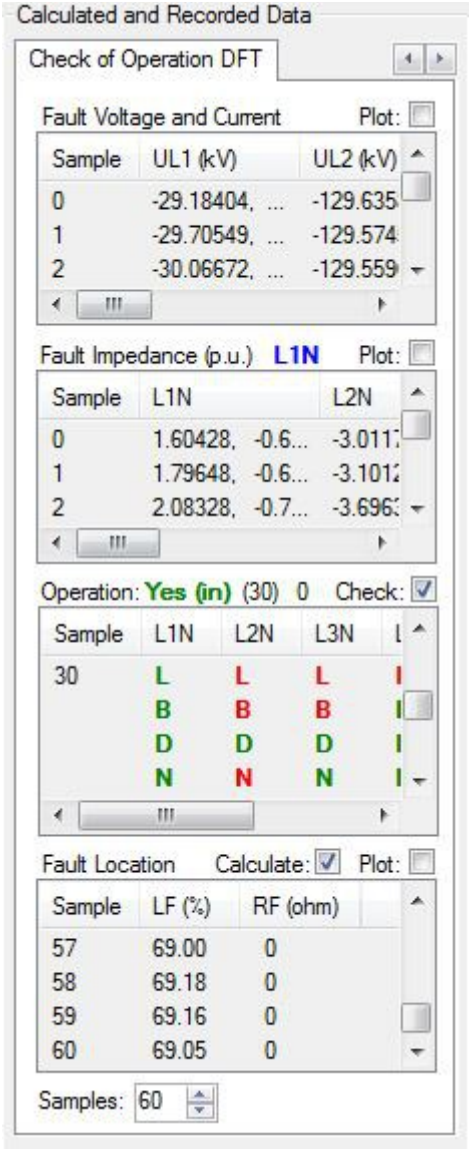


Check of Operation DFT

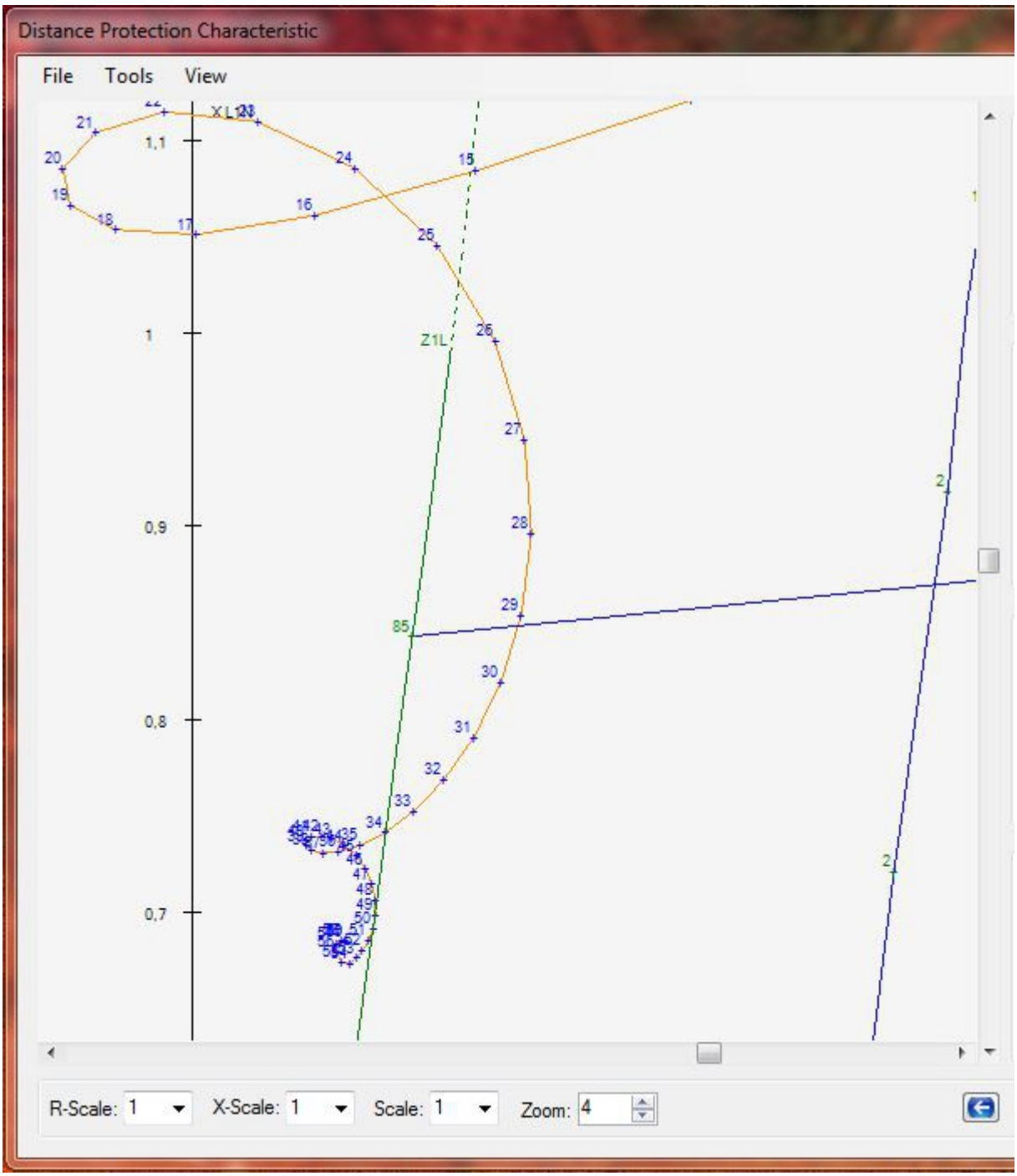
To check relay operation or view voltage, current or impedance for a selected disturbance file based on DFT values click tab page *Check of Operation DFT.* Check the boxes *Plot* to plot voltage and current or impedance and click on column headers to view the values of different phases or fault loops. Use the numeric up-down control *Samples* to increase or decrease the number of samples to view. Check the box *Check* to start the calculation and get an operation status list of all characteristics for all samples and fault loops. If all 4 characteristics are green for at least 3 samples in sequence the fault impedance is considered to be inside the relay operation area. The first samples of 3 in sequence that is inside the operation area will be shown in brackets above operation listview. For correct operation description, see

Check of Operation RMS above. The fault location for each sample could also be calculated using power system data by checking the box *Calculate* and shown in list. Check the box *Plot* to plot the fault locations as a function of samples.

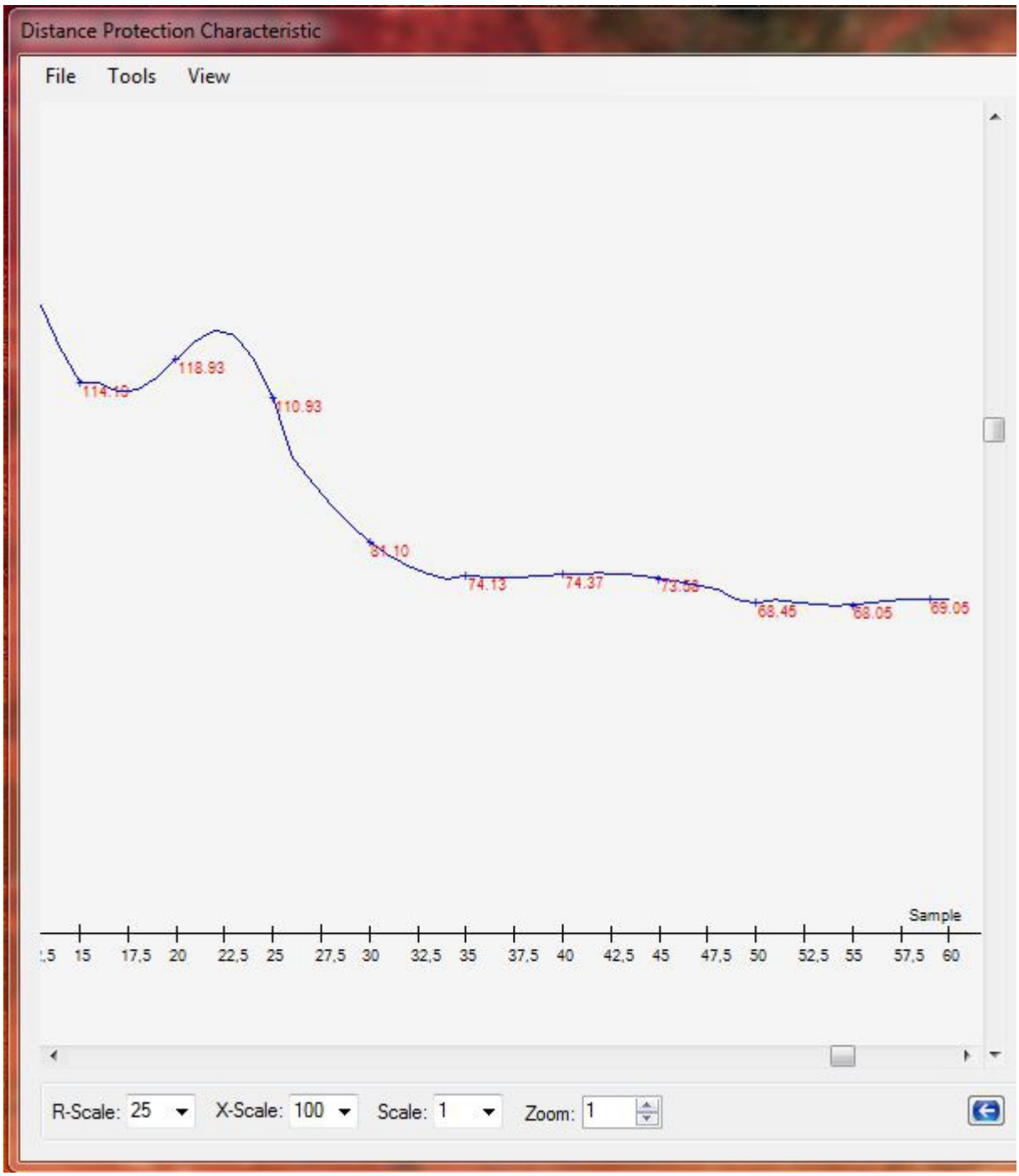
Click menu item <View/Relay Operation Log> to view check of operation status.



From sample number 30 in L1N loop all 4 characteristics (L,B,D,N) are inside relay operation area, see also the plot below. Two binary trip signals exists in the list of *Channel configured Trip Signals* above which means correct operation.



Plot of fault impedance DFT. From sample number 30 the fault impedance is inside the relay operation area. The blue lines are the reactive and resistive characteristics.



Plot of fault location based on DFT as a function of sample number.

6 Menu Items

6.1 File

New Project

Create a new project. The default name is Prjx.dap with x as a current number. Only for Station Server Mode.

Open Project

Open an old project file with file extension '.dap'. Only for Station Server Mode.

Delete Project

Delete an old project other than the current opened project. This item is only enabled if the user has logged in as an Administrator, see menu <Tools/Log in>. Only for Station Server Mode.

Compress Project

Compress a project by selecting the project file (*.dap) in a file browser. The location of the compressed file (*.zip) is the folder ProjectFiles. Only for Station Server Mode.

Decompress Project

Decompress a project by selecting the compressed project file (*.zip) in a file browser. The location of the decompressed project is the folder ProjectFiles. Only for Station Server Mode.

Save Relay Object List

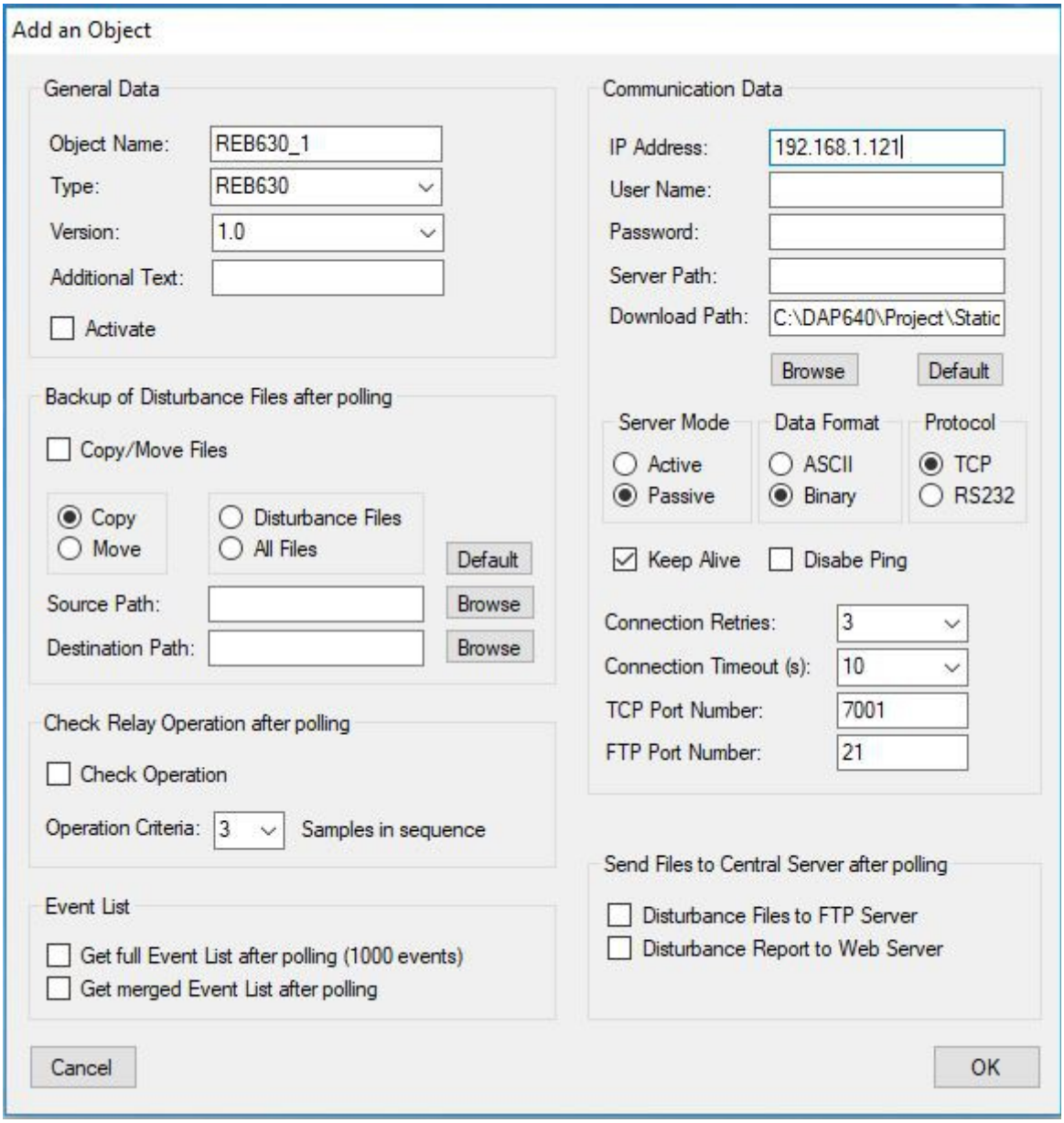
Save the list after sorting. Use the arrow buttons above the list to move selected item up or down. Check the box Sort to enable sorting and then click the column headers to sort.

Exit

Terminate the program.

6.2 Edit

Add and Edit Object



General Data

Select the type of relay object – either an object of 600 or 500 series type or a FTPClientObject which is used when downloading files from the FTP server. The name of the object is automatically typed in the text box but could be changed by the user. The characters in the name must be valid characters of file names. If desired type an additional text to describe the relay object. To include this relay object in the disturbance polling scheme click check box *Activate.*

Backup of Disturbance Files after polling

Click check box *Copy/Move files* to move or copy the disturbance files or all files from DownloadPath\NewFiles to a destination folder.

Check Relay Operation after polling

Click check box *Check Operation* to perform a calculation of relay operation. This is an approximate methode using the samples from the disturbance file to create the impedance as a function of time and compare it with the operation criteria of the relay based on static source and line impedance of the power system.

Event List

Click the check boxes to either get a full event list (1000 events) for selected relay or get a merge list of all active relay objects in the disturbance polling scheme after polling.

Communication Data

Type the *IP Address* for a 600 relay object or the Slave Number for a 500 object. The downloaded files are by default stored in the relay name folder but the location could be changed by clicking on the browser button and select a different folder. If *User Name* and *Password* are leaved blank default values are used. When a Relay Object of 500 type is selected the fields are disabled. The *Server Path* should normally be left blank. It is determined by the FTP server user authorization.

Server Mode:

Active mode means that the Server establish the data channel connection to the Client for data transfer. Passive mode means that the Client establish the data channel connection to the Server for data transfer. Passive mode is the default setting and should be used when connecting through a fire wall.

Data Format:

The file format of the transferred files. Default value is binary

Keep Alive:

If *Keep Alive* is checked the FTP communication is not terminated after each transfer. Default value is checked.

Disable Ping

Some FTP Servers do not respond on ping command. Click the check box to avoid sending a ping command before connecting to the server. Normally it should be unchecked.

Connection Retries

Set the number of connection retries before timeout occurs.

Connection Timeout

Set the time of each connection retry.

TCP Port Number

TCP Server port number. The value must not be changed

FTP Port Number

FTP Server port number. The value must not be changed

Send files to Central Server after polling

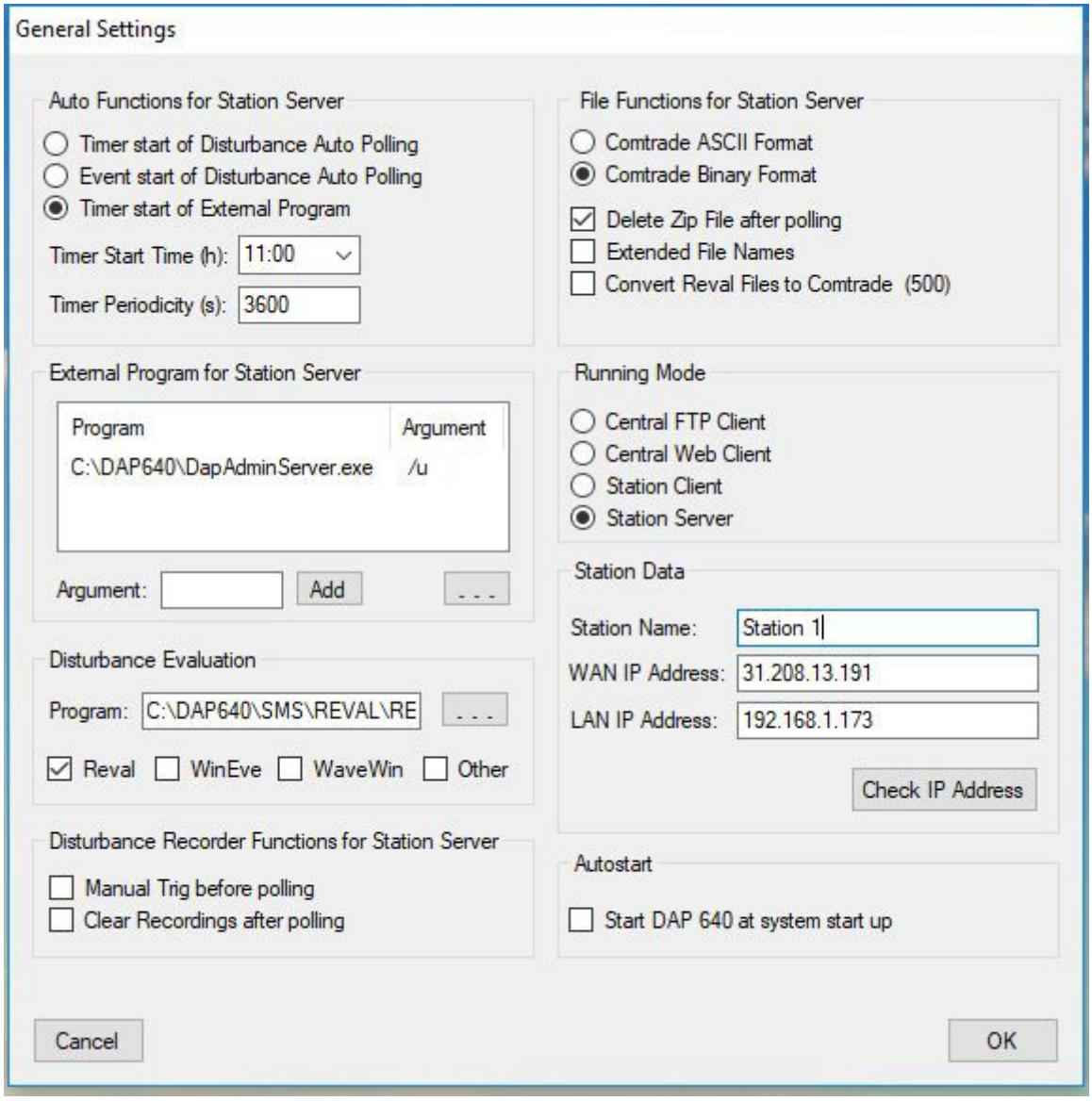
Click the check boxes to send disturbance files or report files (.htm) to central server. The login data must first be setup in *Communication Settings.*

Delete Object

Selected object in *Relay Object List* will be deleted with all its content. This item is only enabled if the user has logged in as an Administrator, see menu <Tools/Log in>.

6.3 Settings

General Settings



Auto Functions for Station Server

Timer start means that the polling will start at the hour selected in combo box Timer Start Time and then will start again after a number of seconds typed in text box Timer Periodicity. To activate the timer click the toolbar button *Start Timer* in the main form and a counter will indicate that the timer process is running. To stop click the toolbar button *Stop Timer*. Click the toobar button *Start Disturbance Polling* to start the polling immediately.

Event start means that an external program could start the program DapInit with a certain command line parameter, see Appendix. The DapInit program will then send a TCP message to DAP 640 to start the polling or other functions. DAP 640 could be run in different PC´s. DapInit will send the start message to all PC´s in the DapInit PC list, see menu <Settings/Event controlled Settings>.

External Program for Station Server

Timer Start of External Program means that the program selected in the list will be started by the timer

explained above. The program to start must end its execution automatically after some time. To fill the list with items click the browser button and select an executable file. Right-click an item or press the delete key to remove and item. To add a command line argument to the file name type the argument in the text box and click the *Add* button. Click button *OK* to save the selected item.

Disturbance Recorder Functions (Auto polling)

Manual Trig could be performed before starting the polling.

Clear all recordings could be performed after the polling to speed up the communication.

Disturbance Evaluation

Any Disturbance Evaluation Program could be selected by clicking on the browser button. Three preselected programs are available in case they are installed. The default program is Reval.

File Functions for Station Server

The file format of the Comtrade Data file (.dat) is of binary type when stored in the relay. If selecting the radio button *Comtrade ASCII format* the file will be converted to ASCII format when downloaded.

The compressed disturbance file stored in the relay (drec_xx.zip) is by default not deleted when it is uncompressed. To delete it after it is uncompressed click the check box *Delete Zip File after polling*.

The name of the disturbance file is by default the trig time and the sequence number (ex. 120325007.cfg). To extend the file name with current project name and relay folder name (ex. Prj3_REL670_2_120325007.cfg) clic th check box *Extended File Names*.

The file type for disturbance files of relay type 500 is by default Reval (.reh). To convert this file type to Comtrade format after polling click the check box *Convert Reval Files to Comtrade.*

Running Mode

Central FTP Client and *Central Web Client* mode are used for downloading or delete files on central server.

Station Client mode is the normal mode to connect to a server PC for starting polling and download files. Most functions in the server PC could be remote controlled from the client.

Station Server mode is used to setup functions in the server PC or direct communication of the relays.

Station Data

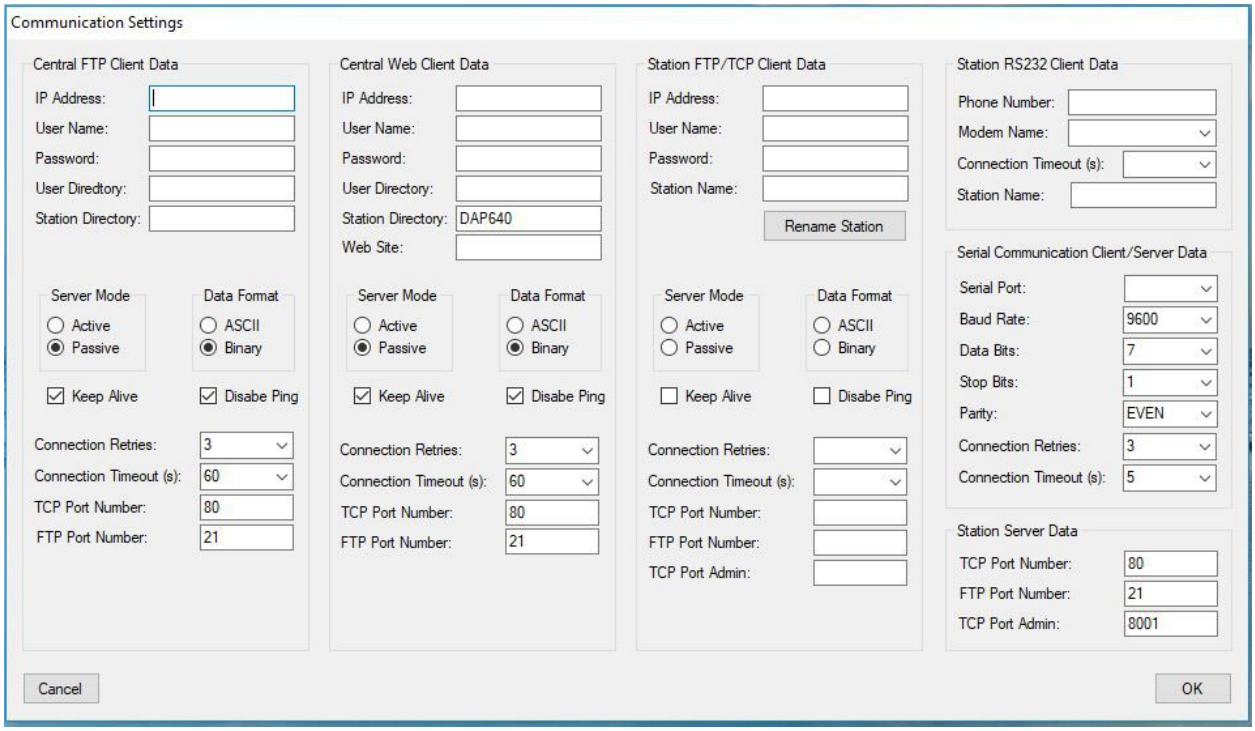
Station Name is by default the computer name but could be changed by typing a different name in the text box.

Wan IP Address and *Lan IP Address* will be typed in automatically by clicking the button *Check IP Address*.

Autostart

Click the check box to start DAP 640 automatically when the system starts up.

Communication Settings



Central FTP and Web Client Data

Type the login data and the communication data to upload the disturbance files or report files to a central server after polling. This function must be activated for each relay, see <Edit/Edit Object>.

Station FTP/TCP Client Data

The login data and *Station Name* will be filled in when adding remote station object list, see 3.2. The default value for *TCP port Admin* is 8001 and must be the same for Station Server Data. This port is used for DAP 640 Adminstration Server which handle some special functions as restarting DAP 640 from remote.

Station RS232 Client Data

For a dial-up connection type the *Phone Number* and select the *Modem Name*. Other modem types could be added to file c:\dap640\modem\modem.txt. The *Station Name* will be filled in automatically.

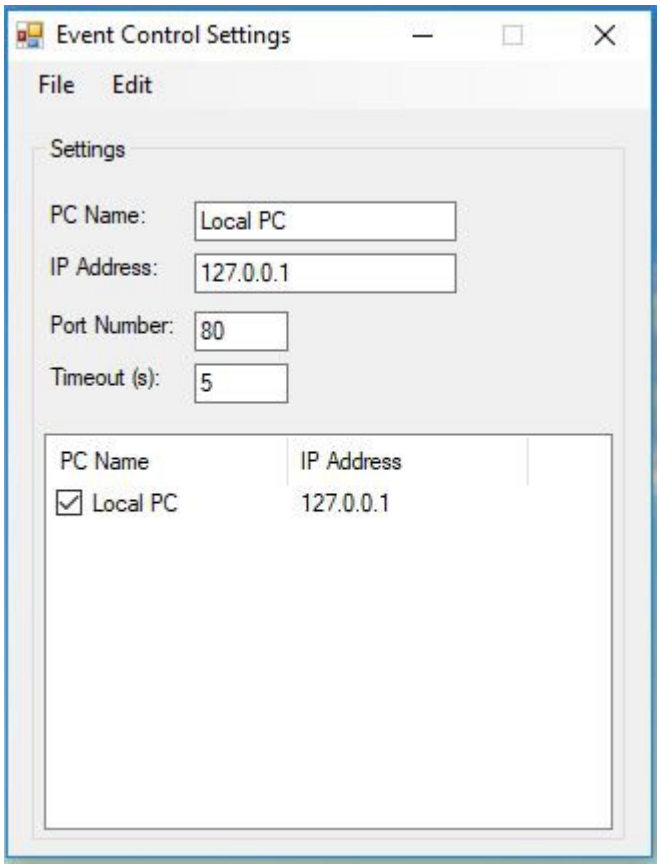
Serial Communication Client/Server Data

Select the *Serial Port*. All existed serial ports in the PC will be visible in the list. Select the serial communication parameters in the combo boxes. These parameters are used for serial SPA communication for relays of type 500 both for direct and remote connection and should not be changed.

Station Server Data

The port numbers shall normally not be changed. The TCP port number must be 80 to support web browsers, see 4.1.

Event Control Settings



Settings

Type the PC name and IP address in the text boxes and then click <Edit/Add PC> to add the data to the list. To remove an item from the list select first the item and then click <Edit/Delete PC>. The other parameters should normally not be changed.

6.4 Communication

FTP Functions

List Files

Select this function to list all remote files on the FTP Server for relays of type 600 or on any other FTP Server. The files will be visible in the *File Name* column of the *Remote File List.* Click the check box *Disturbance Info* before listing the files to get disturbance header info as *Disturbance Trig Time*, *Sequence Number, Recording Number* and *Trig Signal*. To be able to view disturbance header info the disturbance file must be of type Drec_xx.zip, Cfg or Reh. All other file types will only show the file name in the list. Drec_xx.zip is the file type of a 600 relay, Cfg is a Comtrade file type and Reh is Reval file type of a 500 relay.

To speed up the communication the *Disturbance Info* box should be unchecked.

Upload File(s)

Select a file in the file browser to upload. The destination path is the selected folder in the tree view of the *Remote File List*.

Download File(s), Download all File(s)

Select one or more files in the Remote File List and then click the item <Download File(s)> to download or double-click a single file. To download all files select <Download all File(s)>.

Delete File(s), Delete all File(s)

Select one or more files in the Remote File List and then click <Delete File(s)> to delete. To delete all files select <Delete all File(s)>.

Rename File

Select one file in the Remote File List and then click <Rename>.

SPA Functions

Manual Trig

Send a SPA command to trig the relay manually. Station Client and Server supported.

Clear all Recordings

Send a SPA command to delete all disturbances in the relay. Station Client and Server supported.

Restart Relay Object

Send a SPA command to restart the relay. Station Client and Server supported.

Activate Setting Group 1-6

Send a SPA command to activate a specific setting group in the relay. Station Client and Server supported.

FTP Server

Start, stop or check the FTP Server running in Station PC. Station Client and Server supported.

TCP Server

Start, stop or check the TCP Server running in Station PC. Station Client supported.

Disturbance Polling Timer

Start, stop or check the Timer running in Station PC. Station Client and Server supported.

Check Relay type

Send the SPA command RF to read the type and version of the relay. Station Client and Server supported.

Ping

Send a ping command to check the network connection to the relay. Station Client and Server supported.

6.5 View

General Error Log

General errors are written to this file.

General Status Log

Status of disturbance manual and auto polling for all relay types. The file is deleted each time the polling is started.

Serial Communication Log

SPA communication for relay type 500. The file is deleted each time the polling is started.

FTP Client Communication Log

FTP communication data from FTP Client in local PC.

Service Error Log

Errors from the Windows service DAP640Service.

Merged Event Log

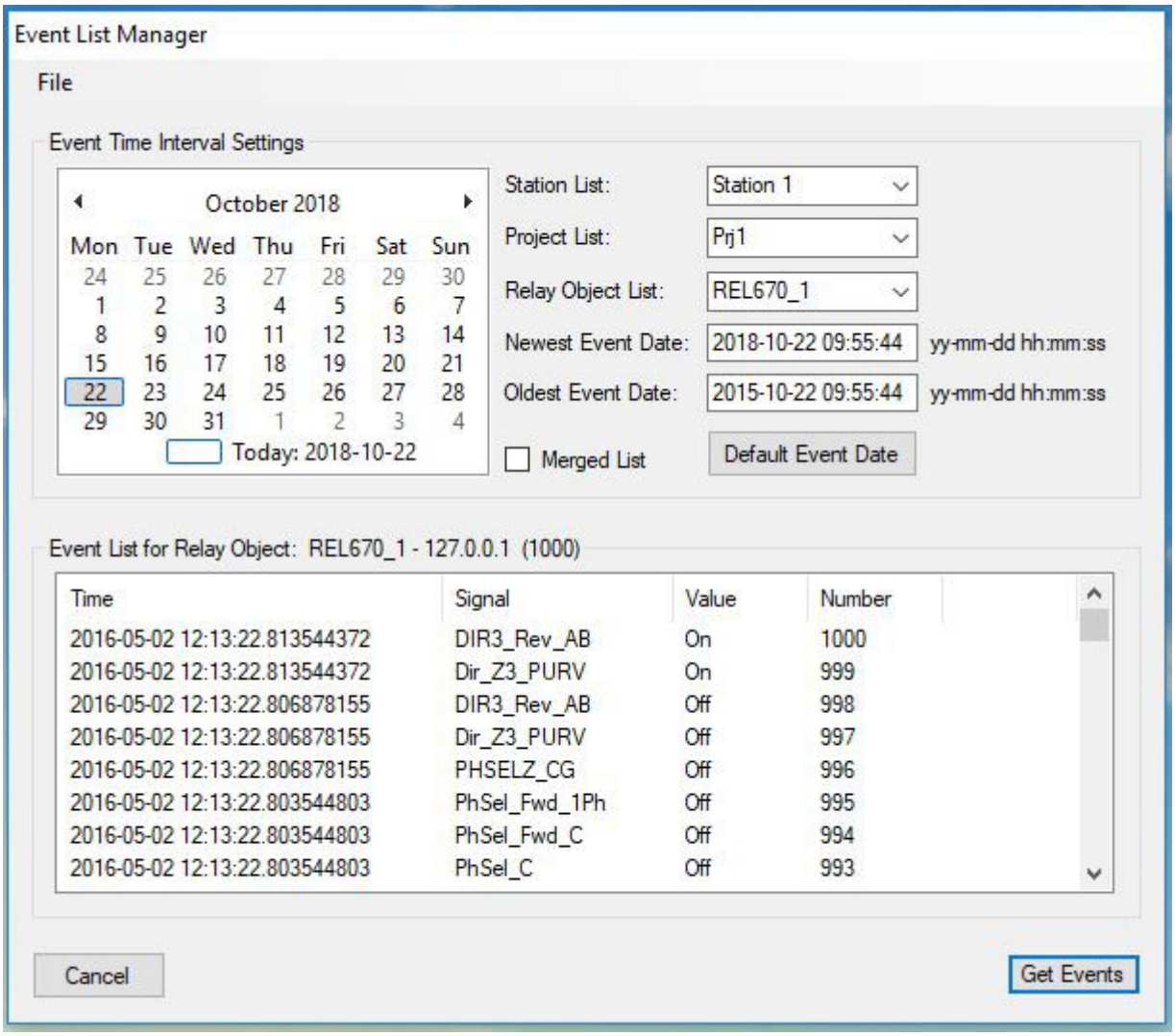
Unfiltered merged Event Log.

Central Web Site

Open central server web site typed in Communication Settings.

6.6 Tools

Event List Manager



Event Time Interval Settings

With the Event List Manager you can list all events (1000) or events in a time interval determined by a newest and oldest event date for a relay of type 650.

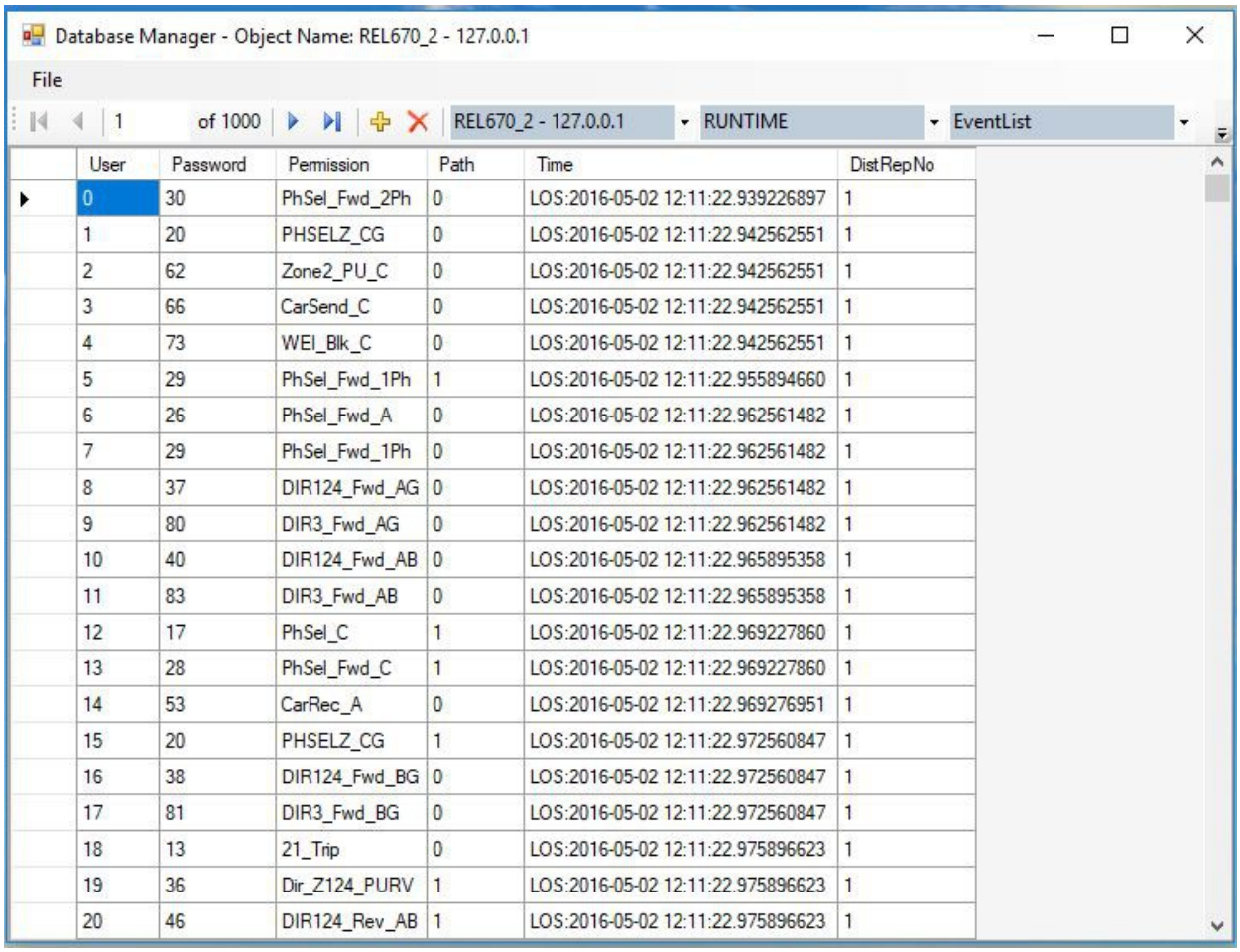
Select first a station, project and relay in the combo boxes. For a relay of type 650 right-click a date in the calendar and select the newest and oldest event time or type the date directly in the text boxes. Click then the button *Get Events* to start reading the events.

Event List for Relay Object

In the event list all events that meet the criteria of selected time interval will be shown. If the time interval is large enough all 1000 events will be shown. You can create a new time interval by right-clicking the events of interest in the list and select newest and oldest event and then click button *Get Events*. If the item *Merge List* is selected, event lists from all active items will be merged.

Database Manager

This tool can only be used for direct connection. Administrator rights is required.



User	Password	Permission	Path	Time	DistRepNo
0	30	PhSel_Fwd_2Ph	0	LOS:2016-05-02 12:11:22.939226897	1
1	20	PHSELZ_CG	0	LOS:2016-05-02 12:11:22.942562551	1
2	62	Zone2_PU_C	0	LOS:2016-05-02 12:11:22.942562551	1
3	66	CarSend_C	0	LOS:2016-05-02 12:11:22.942562551	1
4	73	WEI_Blk_C	0	LOS:2016-05-02 12:11:22.942562551	1
5	29	PhSel_Fwd_1Ph	1	LOS:2016-05-02 12:11:22.955894660	1
6	26	PhSel_Fwd_A	0	LOS:2016-05-02 12:11:22.962561482	1
7	29	PhSel_Fwd_1Ph	0	LOS:2016-05-02 12:11:22.962561482	1
8	37	DIR124_Fwd_AG	0	LOS:2016-05-02 12:11:22.962561482	1
9	80	DIR3_Fwd_AG	0	LOS:2016-05-02 12:11:22.962561482	1
10	40	DIR124_Fwd_AB	0	LOS:2016-05-02 12:11:22.965895358	1
11	83	DIR3_Fwd_AB	0	LOS:2016-05-02 12:11:22.965895358	1
12	17	PhSel_C	1	LOS:2016-05-02 12:11:22.969227860	1
13	28	PhSel_Fwd_C	1	LOS:2016-05-02 12:11:22.969227860	1
14	53	CarRec_A	0	LOS:2016-05-02 12:11:22.969276951	1
15	20	PHSELZ_CG	1	LOS:2016-05-02 12:11:22.972560847	1
16	38	DIR124_Fwd_BG	0	LOS:2016-05-02 12:11:22.972560847	1
17	81	DIR3_Fwd_BG	0	LOS:2016-05-02 12:11:22.972560847	1
18	13	21_Trip	0	LOS:2016-05-02 12:11:22.975896623	1
19	36	Dir_Z124_PURV	1	LOS:2016-05-02 12:11:22.975896623	1
20	46	DIR124_Rev_AB	1	LOS:2016-05-02 12:11:22.975896623	1

If you have logged in as an administrator you can open the Database Manager and view the data in different tables. It is also possible to open a local Access database (.mdb).

File Menu

1. Click Open Remote Rex6xx Database.
2. Select a relay object in the first combo box.
3. Select a database source in next combo box (RUNTIME or VARDATA).
4. Select a database table in next combo box and the data will be shown in the grid.

Disturbance File Browser

With the Disturbance File Browser you can open a Comtrade file (.cfg) in the Disturbance Evaluation Program selected in General Settings.

Distance Protection Characteristic

Calculation of relay characteristic, check of relay operation, (RMS, DFT), calculation of fault location, DFT calculation etc. for distance protections REL 670, REL 650 and REL 630, see Distance Protection Characteristic in paragraph 5.

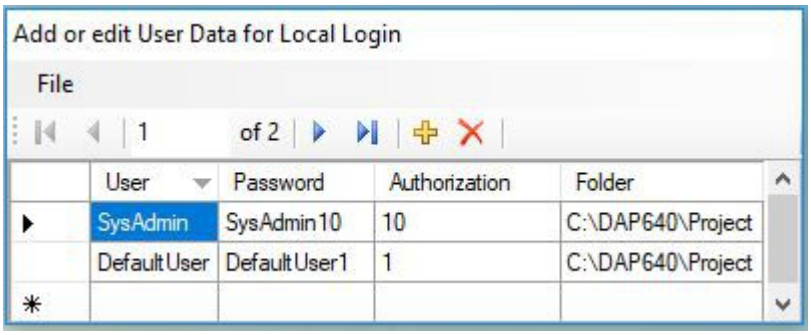
DAP640Service

The auto polling can also be run as a Windows service. The service is installed by clicking <Install> and started by clicking <Start>. All settings must be done before starting the service. <In Settings/General Settings> you must set the *Timer Start Time* and *Periodicity* and in the *Relay Object List* all objects to poll must be checked. To stop the service click <Stop> and to uninstall it click <Uninstall>. To check the status – running or stopped – click <Check>. Every time DAP 640 is opened the service is stopped. Administrator rights is required.

Terminate External Program

External program started via the timer or manually will be terminated.

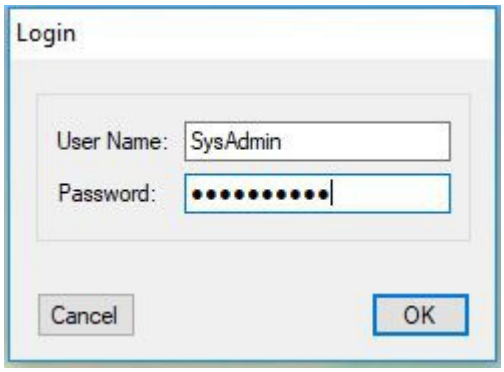
Add Users



This form is used by the administrator for adding local users on the client PC and remote users on the server PC. To add a new user click the yellow plus button to get a new line and then type the *User* name, *Password* and *Authorization* number. The *Folder* could not be changed. To remove a selected line click the red cross and to save the data click *File/Save*. Administrator rights is required. In the table below the local and remote users communication access are listed.

Authorization	**Local User**	**FTP Server**
1	Read-only Access	List, Download Files
>=2	Write Access	Create, Delete, Rename, Upload
>=10	Add Users	

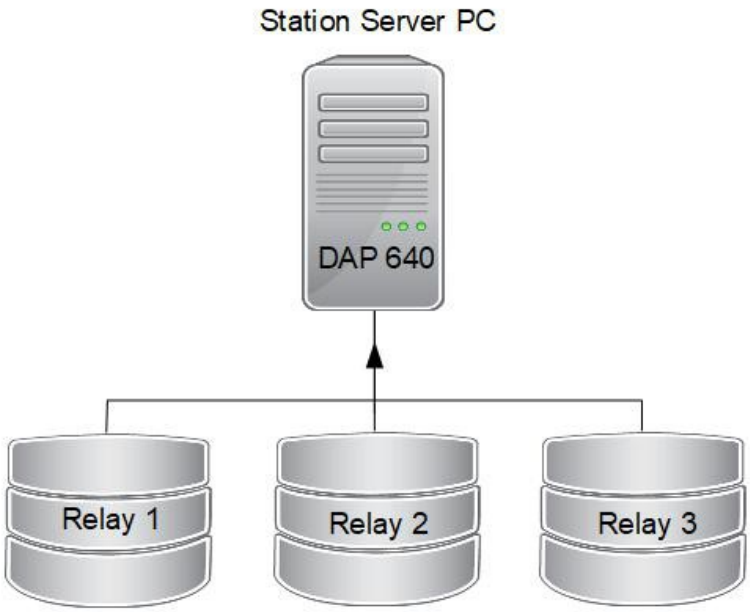
Log in



To get administrator rights it is necessary to log in. Default administrator name is SysAdmin and password is SysAdmin10. The administrator login data should then be changed by the administrator, see *Add Users* above.

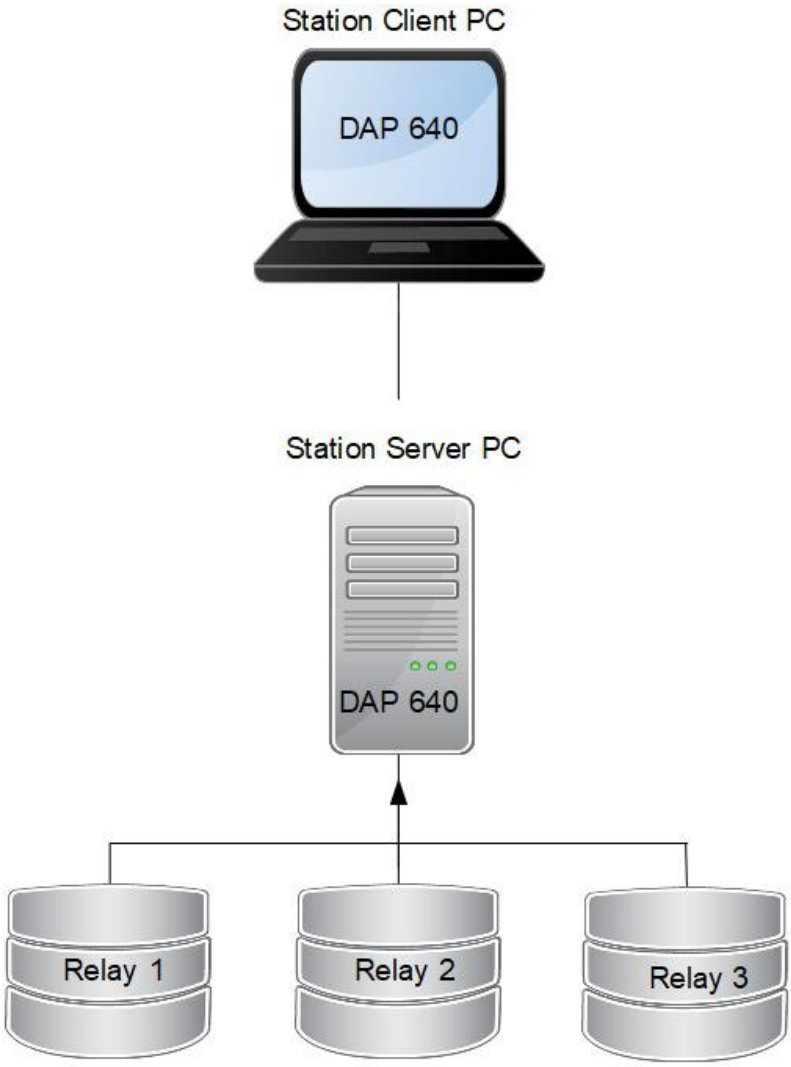
7 Application Examples

Direct Connection - Station Server mode



In this configuration the disturbance files are locally polled via timer or manually and stored in the Station Server PC.

Remote Connection - Station Client mode



In this configuration the locally stored disturbance files in the Station Server PC could be downloaded to the Station Client PC.

Remote Connection – Central FTP/Web Client mode

In this configuration the Central Client PC is connected to a Central FTP/Web Server for administration or downloading files.

8 Appendix

Event start commands (not all relay versions are supported)

Example of command to send to program DapInit for Event start of disturbance auto polling.

Add a Sequence Number to the disturbance file name for each event start:

C:\DAP640\DapInit.exe /A=<Sequence Number> Ex. /A=7

Start an external program:

C:\DAP640\DapInit.exe /B=<Program Path> Ex. /B=C:\CAP540\CAP540_13-00.exe

Get distance protection settings for a setting group:

C:\DAP640\DapInit.exe /C=<Setting Group Number> Ex. /C=1

Get measurement values for checked items in Relay Object List:

C:\DAP640\DapInit.exe /D= Ex. /D=

Check measurement value:

C:\DAP640\DapInit.exe /E=<Relay Name, Parameter Name, Spa Code, Accuracy, Value>

Ex. /E=REL670_1, outAmp, R7O2237 ,5, 0.77

Get Product Info:

C:\DAP640\DapInit.exe /F= Ex. /F=REL670_1