

7PG2113/4/5/6

Feeder Protection

Document Release History

This document is issue 2010/08. The list of revisions up to and including this issue is:

2010/08	First Issue

Software Revision History

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Contents

Section 1: Introduction	3
1.1 Differential Protection	3
1.1.1 Protection Sensitivity	3
1.1.2 Pilot Resistance	3
1.1.3 Test Link	3
1.1.4 Pilot Supervision	3
1.2 Relay Menus And Display	3
1.3 Operation Guide	6
1.3.1 User Interface Operation	6
1.4 Setting Mode	7
1.5 Instruments Mode	9
1.6 Fault Data Mode	16
Section 2: Setting & Configuring the Relay Using Reydisp Evolution	17
2.1 Physical Connection	17
2.1.1 Front USB connection	17
2.1.2 Rear RS485 connection	18
2.1.3 Configuring Relay Data Communication	18
2.1.4 Connecting to the Relay for setting via Reydisp	19
2.1.5 Configuring the user texts using Reydisp Language Editor	19

List of Figures

Figure 1.1 -1 Fascia Links	3
Figure 1.2 -1 Menu	4
Figure 1.2-2 Fascia Contrast symbol	4
Figure 1.2-3 Fascia of a 7PG2113/4/5/6 relay	5
Figure 2.1-1 USB connection to PC	17
Figure 2.1-2 RS485 connection to PC	18
Figure 2.1-3 PC Comm Port Selection	19
Figure 2.1-4 PC Language File Editor	20
Figure 2.1-5 Language File Editor Setting Texts	21

Section 1: Introduction

1.1 Differential Protection

1.1.1 Protection Sensitivity

Differential Protection sensitivity is fixed, based on secondary current rating, with the only settable variable being the use of the N/N1 tap. Different sensitivity is applicable to different phases and fault types. Differential Protection sensitivity is stated in the Performance Specification section of this manual.

1.1.2 Pilot Resistance

The padding resistance is set by adding series resistance to that of the pilots to achieve a standard value. The total loop resistance required depend on the R or Rf mode selected and the tap position of the isolation transformers if they are used, see Applications Guide in this manual.

The link is fitted in the 'OUT' position to short out the resistor.

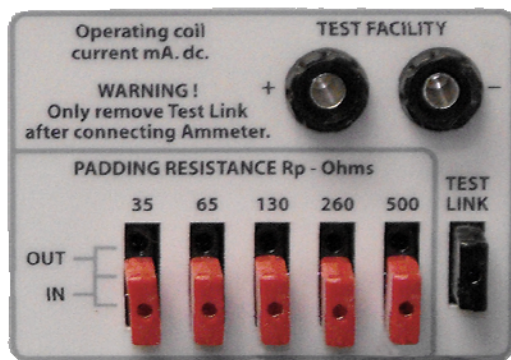


Figure 1.1 -1 Fascia Links

1.1.3 Test Link

The test facility provided on the relay fascia can be shorted by a similar link to that used for Pilot Resistance settings but black in colour. This link can be removed during testing but should be fitted to set the relay for normal operation.

1.1.4 Pilot Supervision

There are no variable settings associated with the Pilot Supervision system.

1.2 Relay Menus And Display

All relay fascias have the same appearance and support the same access keys. The basic menu structure is also the same in all products and consists of four main menus, these being,

Settings Mode - allows the user to view and (if allowed via passwords) change settings in the relay.

Instruments Mode - allows the user to see the conditions that the relay is experiencing i.e. current, voltage etc.

Fault Data Mode - allows the user to see type and data of any fault that the relay has detected.

Control Mode - allows the user to control external plant under the relays control for example the CB

All menus may be viewed without entering a password but actions will not be permitted if the relevant passwords have been set.

The menus can be viewed via the LCD by pressing the access keys as below,

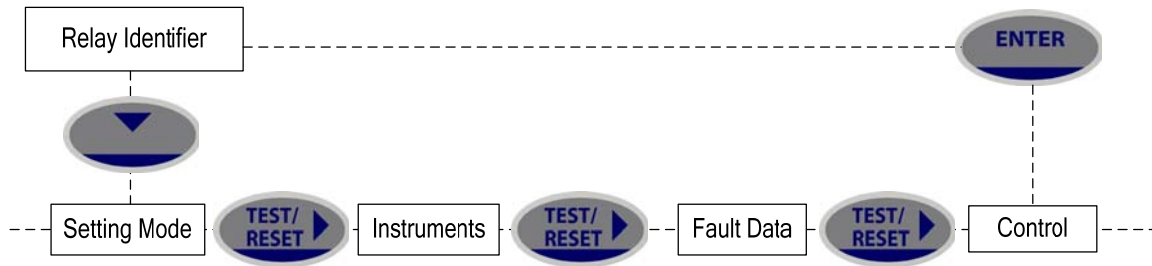


Figure 1.2 -2 Menu

Pressing CANCEL returns to the Identifier screen

This document describes the text descriptions as they appear in the menu structure when the relay is using the default files. The user can programme the relay to use alternative text descriptions by installing user language files through the Reydisp Evolution software language configuration tool – see 2.1.5

LCD Contrast

To change the contrast on the LCD insert a flat bladed screwdriver into the screwhead below the contrast symbol, turning the screwhead left (anti-clockwise) lightens the contrast of the LCD and turning it right (clockwise) darkens the display.



Figure 1.2-3 Fascia Contrast symbol

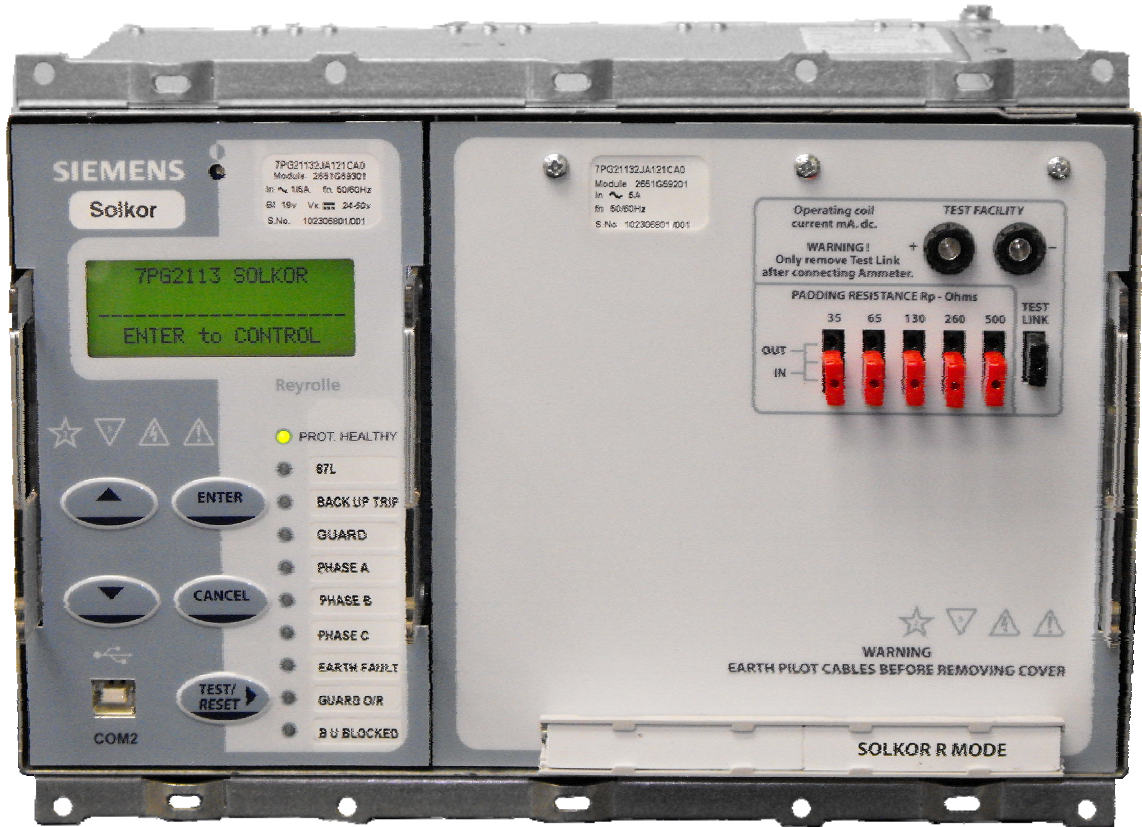


Figure 1.2-4 Fascia of a 7PG2113/4/5/6 relay

1.3 Operation Guide

1.3.1 User Interface Operation

The basic menu structure flow diagram is shown in Figure 1.2-1. This diagram shows the main modes of display: Settings Mode, Instrument Mode, Fault Data Mode and Control Mode.

When the relay leaves the factory all data storage areas are cleared, the passwords are set to none and the settings set to default as specified in settings document.

When the relay is first energised the user is presented with the following, or similar, message: -

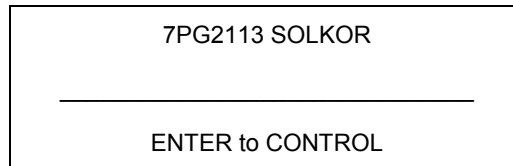


Figure 1.3-1 Relay Identifier Screen

On the factory default setup the relay LCD should display the relay identifier, on each subsequent power-on the screen that was showing before the last power-off will be displayed.

The push-buttons on the fascia are used to display and edit the relay settings via the LCD, to display and activate the control segment of the relay, to display the relays instrumentation and Fault data and to reset the output relays and LED's.

The five push-buttons have the following functions:



Used to navigate the menu structure.



The ENTER push-button is used to initiate and accept setting changes.

When a setting is displayed pressing the ENTER key will enter the edit mode, the setting will flash and can now be changed using the ▲ or ▼ buttons. When the required value is displayed the ENTER button is pressed again to accept the change.

When an instrument is displayed pressing ENTER will toggle the instruments favourite screen status.



This push-button is used to return the relay display to its initial status or one level up in the menu structure. Pressed repeatedly will return to the Relay Identifier screen. It is also used to reject any alterations to a setting while in the edit mode.



This push-button is used to reset the fault indication on the fascia. When on the Relay Identifier screen it also acts as a lamp test button, when pressed all LEDs will momentarily light up to indicate their correct operation. It also moves the cursor right ► when navigating through menus and settings.

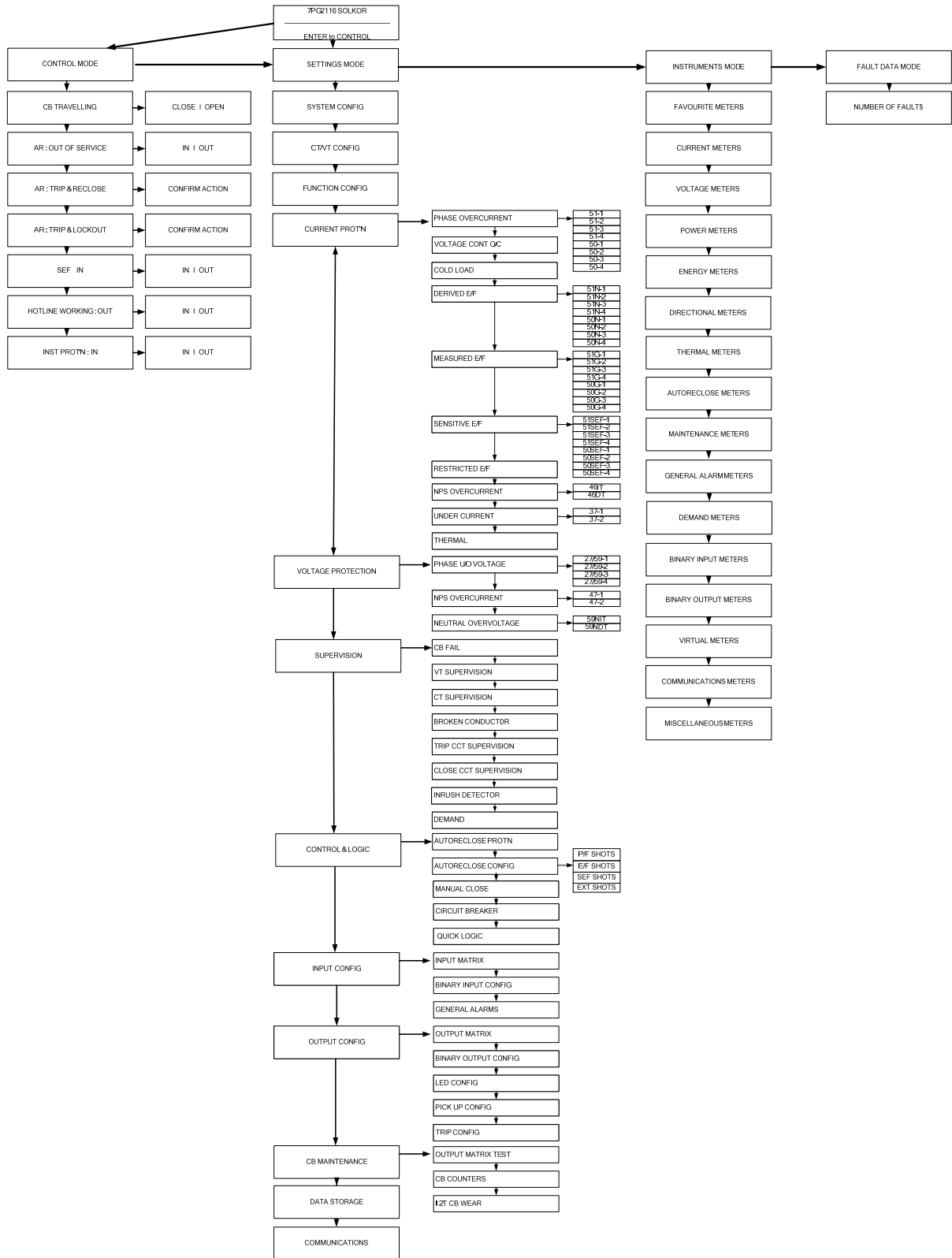


Figure 1.3-2 Menu Structure

1.4 Setting Mode

The Settings Mode is reached by pressing the READ DOWN ▼ button from the relay identifier screen.

Once the Settings Mode title screen has been located pressing the READ DOWN ▼ button takes the user into the Settings mode sub-menus.

Each sub-menu contains the programmable settings of the relay in separate logical groups. The sub menus are accessed by pressing the TEST/RESET ► button. Pressing the ▼ button will scroll through the settings, after the last setting in each sub menu is reached the next sub menu will be displayed. If a particular sub menu is not required to be viewed then pressing ▼ will move directly to the next one in the list.

While a setting is being displayed on the screen the ENTER button can be pressed to edit the setting value. If the relay is setting password protected the user will be asked to enter the password. If an incorrect password is entered editing will not be permitted. All screens can be viewed if the password is not known.

While a setting is being edited flashing characters indicate the edit field. Pressing the ▲ or ▼ buttons will scroll through the valid field values. If these buttons are held on, the rate of scrolling will increase.

Once editing is complete pressing the ENTER button stores the new setting into the non-volatile memory.

The actual setting ranges and default values for each relay model and version of the numeric module can be found in the appendix to this manual.

1.5 Instruments Mode

The Instrument Mode sub-menu displays key quantities and information to aid with commissioning. The following meters are available and are navigated around by using the ▲, ▼ and TEST/REST buttons. The text description shown here is the default information. Depending upon the relay model you have, you may not have all of the meters shown.

Instrument	Description
FAVOURITE METERS →to view	<p>This allows the user to view his previously constructed list of 'favourite meters' by pressing TEST/RESET button and the READ DOWN button to scroll though the meters added to this sub-group</p> <p>To construct a sub-group of favourite meters, first go to the desired meter then press ENTER this will cause a message to appear on the LCD 'Add To Favourites YES' pressing ENTER again will add this to the FAVOURITE METERS Sub-menu. To remove a meter from the FAVOURITE METERS sub-menu go to that meter each in the FAVOURITE METERS sub-menu or at its Primary location press ENTER and the message 'Remove From Favourites' will appear press ENTER again and this meter will be removed from the FAVOURITE METERS sub-group</p>
Current Meters →to view	This is the sub-group that includes all the meters that are associated with current TEST/RESET allows access to this sub-group
Primary Current Ia 0.00A Ib 0.00A Ic 0.00A	This meter displays the Primary current. The value displayed will automatically adjust between A and kA.
Secondary Current Ia 0.00A Ib 0.00A Ic 0.00A	This meter displays the Secondary current
Nom Current Ia 0.00XIn----° Ib 0.00XIn----° Ic 0.00XIn----°	This meter displays the Nominal current
Pri Earth Current In 0.00A Ig 0.00A	This meter displays the Primary earth current. The value displayed will automatically adjust between A and kA.

Instrument	Description
Sec Earth Current In 0.00A Ig 0.00A	This meter displays the Secondary earth current
Nom Earth Current In 0.00XIn----° Ig 0.00XIn----°	This meter displays the nominal Earth current
I Seq Components IZPS 0.00XIn----° IPPS 0.00XIn----° INPS 0.00XIn----°	This meter displays the current sequence components
2 nd Harmonic Current Ia 0.00xIn Ib 0.00xIn Ic 0.00xIn	This meter displays the 2 nd Harmonic current
VOLTAGE METERS →to view	This is the sub-group that includes all the meters that are associated with Voltage TEST/RESET allows access to this sub-group
Prim Ph-Ph Voltage Vab 0.00kV Vbc 0.00kV Vca 0.00kV	This meter displays the Primary RMS Phase to Phase Voltage. The value displayed will automatically adjust between V and kV
Sec Ph-Ph Voltage Vab 0.00V----° Vbc 0.00V----° Vca 0.00V----°	This meter displays the Secondary RMS Phase to Phase Voltage and the angle
Nominal Ph-Ph Voltage Vab 0.00xVn Vbc 0.00xVn Vca 0.00xVn	This meter displays the Nominal RMS Phase to Phase Voltage
Prim Ph-N Voltage Va 0.00kV Vb 0.00kV Vc 0.00kV	This meter displays the Primary RMS Phase to Neutral Voltage
Sec Ph-N Voltage	This meter displays the Secondary Phase to Neutral

Instrument		Description
Va	0.00V----°	Voltage and the angle
Vb	0.00V----°	
Vc	0.00V----°	
Nom Ph-N Voltage		This meter displays the Nominal RMS Phase to Neutral Voltage.
Va	0.00xVn	
Vb	0.00xVn	
Vc	0.00xVn	
V Seq Components		This meter displays the voltage sequence components a long with the angle
IZPS	0.00V----°	
IPPS	0.00V----°	
INPS	0.00V----°	
Calc Earth Voltage		This meter displays the calculated Earth voltage both primary and secondary which also shows the secondary angle
Pri	0.00kV	
Sec	0.00V----°	
POWER METERS →to view		This is the sub-group that includes all the meters that are associated with Power TEST/RESET allows access to this sub-group
Phase A	0.0MW	Displays Real Power The value displayed will automatically adjust between W and MW
Phase B	0.0MW	
Phase C	0.0MW	
P (3P)	0.0MW	
Phase A	0.0MVAr	Displays Reactive Power
Phase B	0.0MVAr	
Phase C	0.0MVAr	
Q (3P)	0.0MVAr	
Phase A	0.0MVA	Displays Apparent Power
Phase B	0.0MVA	
Phase C	0.0MVA	
S (3P)	0.0MVA	
PF A	0.00	Displays Power Factor
PF B	0.00	
PF C	0.00	
PF (3P)	0.00	
ENERGY METERS		This is the sub-group that includes all the meters that are associated with Energy TEST/RESET allows

Instrument	Description
→to view	access to this sub-group
Active Energy Exp 0.00MWh Imp 0.00MWh	Export and Import direction convention is user configurable by the setting in the configuration menu.
Reactive Energy Exp 0.00MVArh Imp 0.00MVArh	Export and Import direction convention is user configurable by the setting in the configuration menu.
DIRECTIONAL METERS →to view	This is the sub-group that includes all the meters that are associated with Directional Elements. TEST/RESET allows access to this sub-group
P/F Dir (67) No Dir, PhA Fwd, PhA Rev, PhB Fwd, PhB Rev, PhC Fwd, PhC Rev	
Calc E/F Dir (67N) No Dir, E/F Fwd, E/F Rev	
Meas E/F Dir (67G) No Dir, E/F Fwd, E/F Rev	
THERMAL METERS →to view	This is the sub-group that includes all the meters that are associated with Thermal TEST/RESET allows access to this sub-group
Thermal Status Phase A 0.0% Phase B 0.0% Phase C 0.0%	
AUTORECLOSE METERS →to view	This is the sub-group that includes all the meters that are associated with Autoreclose TEST/RESET allows access to this sub-group. Only seen on models that have the 79 option
79 AR State Out Of Service AR Close Shot 0	
MAINTENANCE METERS →to view	This is the sub-group that includes all the meters that are associated with Maintenance TEST/RESET allows access to this sub-group
CB Total Trips Count 0 Target 100	This meter shows the number of CB trips experienced by the CB

Instrument	Description
CB Delta Trips Count 0 Target 100	This meter shows the number of CB trips experienced by the CB
CB Counts to AR Block Count 0 Target 100	This meter shows the number of CB trips to AR Block
CB Freq Ops Counter Count 0 Target 10	This meter shows the number of CB Operations
CB Wear Phase A 0.00MA ² s Phase B 0.00MA ² s Phase C 0.00MA ² s	
CB Trip Time 0.0ms	
GENERAL ALARM METERS →to view	
Alarm 1 Raised/Cleared	The general alarm description set in the relay for each alarm will be displayed.
Alarm 2 Raised/Cleared	
Alarm 3 Raised/Cleared	
Alarm 4 Raised/Cleared	
Alarm 5 Raised/Cleared	
Alarm 6 Raised/Cleared	
DEMAND METERS →to view	This is the sub-group that includes all the meters that are associated with Demand. TEST/RESET allows access to this sub-group
I Phase A Demand Max 0.00A	

Instrument		Description
Min	0.00A	
Mean	0.00A	
I Phase B Demand		
Max	0.00A	
Min	0.00A	
Mean	0.00A	
I Phase C Demand		
Max	0.00A	
Min	0.00A	
Mean	0.00A	
V Phase A Demand		
Max	0.00V	
Min	0.00V	
Mean	0.00V	
V Phase B Demand		
Max	0.00V	
Min	0.00V	
Mean	0.00V	
V Phase C Demand		
Max	0.00V	
Min	0.00V	
Mean	0.00V	
V Phase AB Demand		
Max	0.00V	
Min	0.00V	
Mean	0.00V	
V Phase BC Demand		
Max	0.00V	
Min	0.00V	
Mean	0.00V	
V Phase CA Demand		
Max	0.00V	
Min	0.00V	

Instrument	Description
Mean 0.00V	
Power P 3P Demand Max 0.00W Min 0.00W Mean 0.00W	
Power Q 3P Demand Max 0.00VAr Min 0.00VAr Mean 0.00VAr	
Power S 3P Demand Max 0.00VA Min 0.00VA Mean 0.00VA	
BINARY INPUT METERS →to view	This is the sub-group that includes all the meters that are associated with the Binary inputs TEST/RESET allows access to this sub-group
BI 1-6 ---- ----	Displays the state of DC binary inputs 1 to 6 (The number of binary inputs may vary depending on model)
BINARY OUTPUT METERS →to view	This is the sub-group that includes all the meters that are associated with the Binary Outputs TEST/RESET allows access to this sub-group
BO 1-8 ---- ----	Displays the state of DC binary Outputs 1 to 8. (The number of binary outputs may vary depending on model)
VIRTUAL METERS →to view	This is the sub-group that shows the state of the virtual status inputs in the relay
V 1-8 ---- ----	Displays the state of Virtual Outputs 1 to 8 (The number of virtual inputs will vary depending on model)
COMMUNICATIONS METERS →to view	Displays when the communication port is active
Com1 Com2	
COM1 TRAFFIC COM1 Tx1 COM1 Rx Error COM1 Rx	

Instrument	Description
COM2 TRAFFIC COM2 Tx1 COM2 Rx Error COM2 Rx	
MISCELLANEOUS →to view	This is the sub-group that includes indication such as the relays time and date, the amount of fault and waveform records stored in the relay
Date 01/01/2000 Time 22:41:44 Waveform Recs 0 Fault Recs 0	This meter displays the date and time and the number of Fault records and Event records stored in the relay
Event Recs 0	

1.6 Fault Data Mode

The Fault Data Mode sub menu lists the time and date of the previous ten protection operations. The stored data about each fault can be viewed by pressing the TEST/RESET ► button. Each record contains data on the operated elements, analogue values and LED flag states at the time of the fault. The data is viewed by scrolling down using the ▼ button.

Section 2: Setting & Configuring the Relay Using Reydisp Evolution

To set the relay using a communication port the user will need the following:-

PC with REYDISP Evolution Version 7.1.5.6 or later Installed. (This can be download from our website www.siemens.com/energy and found under the submenu 'Software') This software requires windows 2000-service pack 4 or above, or windows XP with service pack 2 or above and Microsoft.NET framework for tools.

2.1 Physical Connection

The relay can be connected to Reydisp via any of the communication ports on the relay. Suitable communication Interface cable and converters are required depending which port is being used.

2.1.1 Front USB connection

To connect your pc locally via the front USB port.

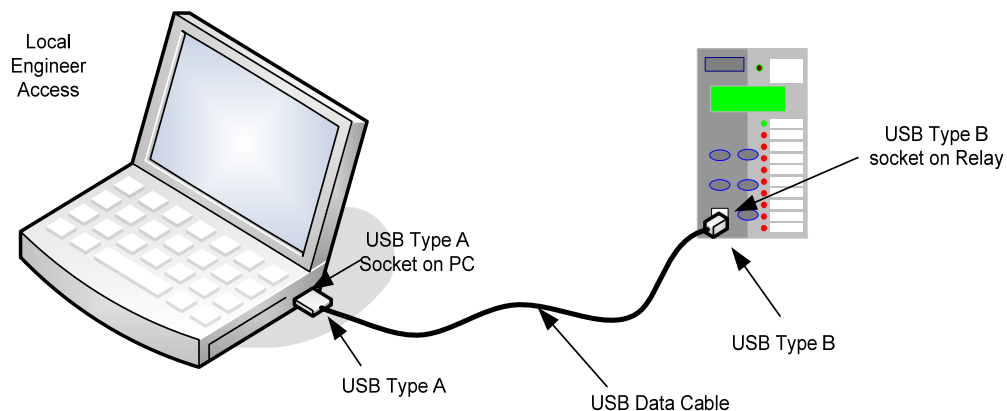


Figure 2.1-1 USB connection to PC

2.1.2 Rear RS485 connection

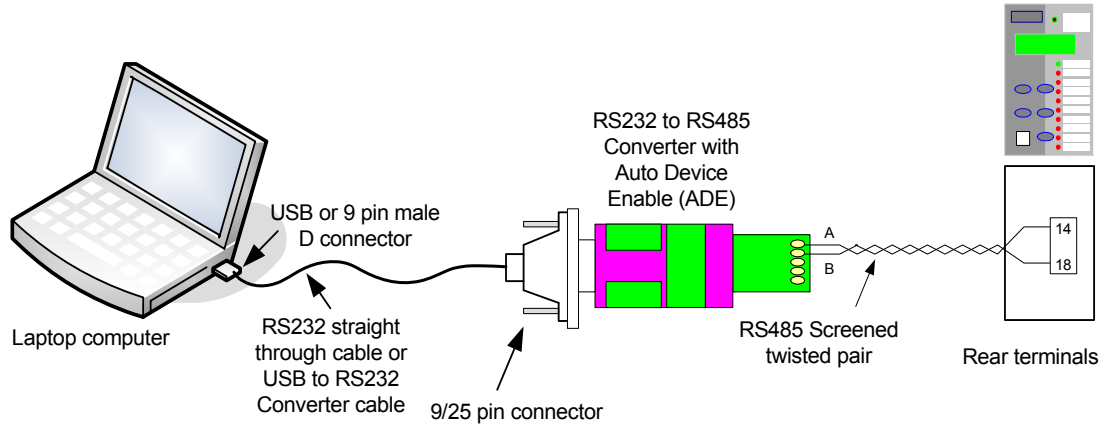


Figure 2.1-2 RS485 connection to PC

2.1.3 Configuring Relay Data Communication

Using the keys on the relay fascia scroll down the settings menus into the 'communications' menu and if necessary change the settings for the communication port you are using on the relay. Reydisp software uses IEC60870-5-103 protocol to communicate.

When connecting the relay to a pc using the front USB port, the Reydisp setting software will automatically detect the relay without making any setting changes in the relay first as long as the USB is selected to IEC60870-5-103.

COM1-RS485 Port

COM2-USB Port

Setting name	Range	Default	Units	Notes
Station Address	0 ... 65534 (DNP3) 1 ... 254 (103) 0 ... 247 (MODBUS)	0		Address given to relay to identify that relay from others which may be using the same path for communication as other relays for example in a fibre optic hub
DNP3 Unsolicited Events	Disabled/Enabled	Disabled		
DNP3 Destination Address	0 ... 65534	0		This setting is only visible when DNP3 Unsolicited Events is Enabled.
COM1-RS485 Protocol	OFF, IEC60870-5-103, MODBUS-RTU,DNP3	IEC60870-5-103		COM1 is the rear mounted RS485 port
COM1-RS485 Baud Rate	75 110 150 300 600 1200 2400 4800 9600 19200 38400	19200		
COM1-RS485 Parity	NONE, ODD, EVEN	EVEN		
COM2-USB Protocol	OFF, IEC60870-5-103, MODBUS-RTU, ASCII,DNP3	IEC60870-5-103		

2.1.4 Connecting to the Relay for setting via Reysdisp

When Reysdisp software is running all available communication ports will automatically be detected. On the start page tool bar open up the sub-menu 'File' and select 'Connect'.

The 'Connection Manager' window will display all available communication ports. With the preferred port highlighted select the 'Properties' option and ensure the baud rate and parity match that selected in the relay settings. Select 'Connect' to initiate the relay-PC connection.

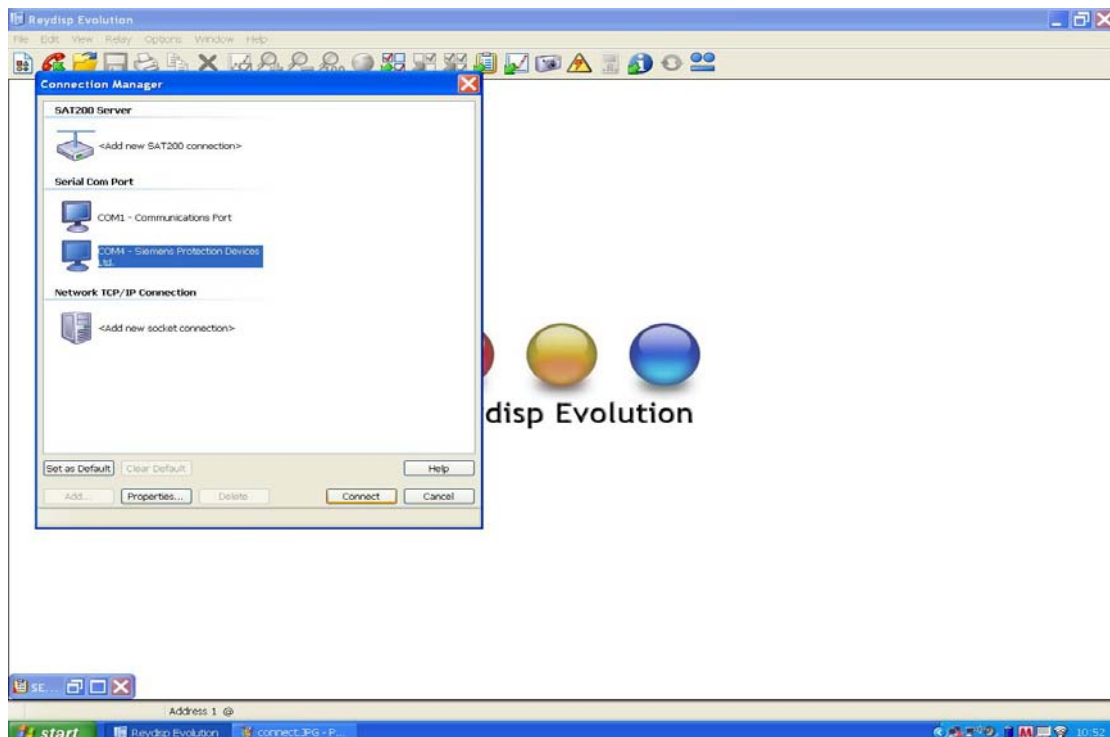


Figure 2.1-3 PC Comm Port Selection

The relay settings can now be configured using the Reysdisp software. Please refer to the Reysdisp Evolution Manual for further guidance.

2.1.5 Configuring the user texts using Reysdisp Language Editor

As default the relay uses the text descriptions in all menus as they appear in this manual. These descriptions can be changed by installing a user language file in the relay, allowing the user to edit all views to meet their needs and provide easier operation.

The Reysdisp Language File Editor tool and its user manual are installed as part of the Reysdisp Evolution software package. They can be found in your pc as sub menus of the Reysdisp Evolution installation.

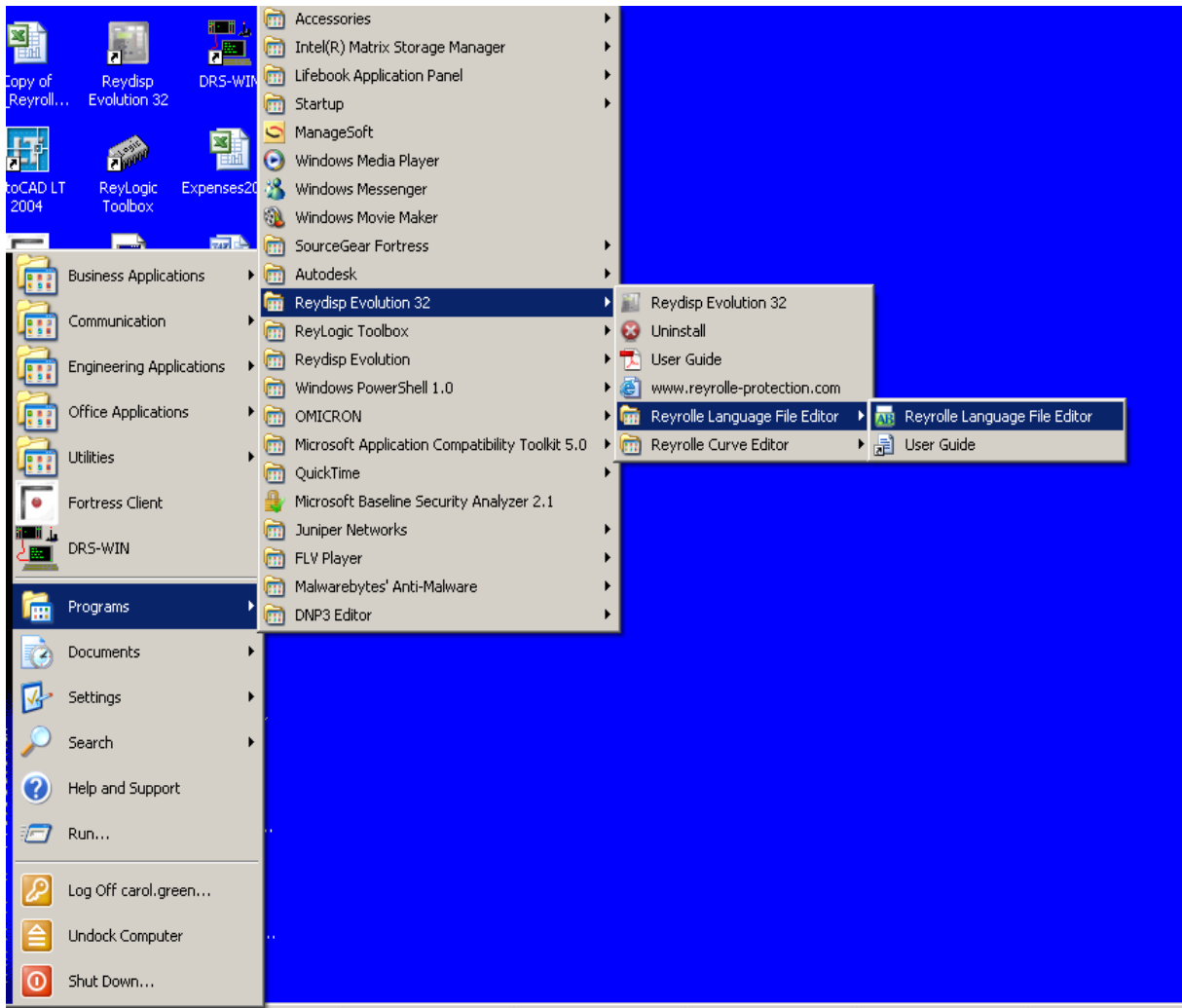


Figure 2.1-4 PC Language File Editor

When the software is opened a 'new project from template' should be used to generate your file. The file will display all default 'Original' text descriptions in one column and the 'Alternative' text in the other column. The descriptions in the 'Alternative' list can be changed and will be used in the relays menu structures. Once the file is complete, a language file can be created and loaded into the relay using the 'send file to relay' function. The communication properties in the software and on the relay must be set. The relay must be restarted after the file is installed.

To activate the language file it must be selected in the relay configuration menu, the 'Original' file is the file labelled 'ENGLISH' and the new file will be displayed using the file name allocated by the user.

Care should be taken to ensure a unique file name is given including a version control reference. The user will be prompted to restart the relay to activate the language file.

Please refer to the Language Editor Manual for further guidance.

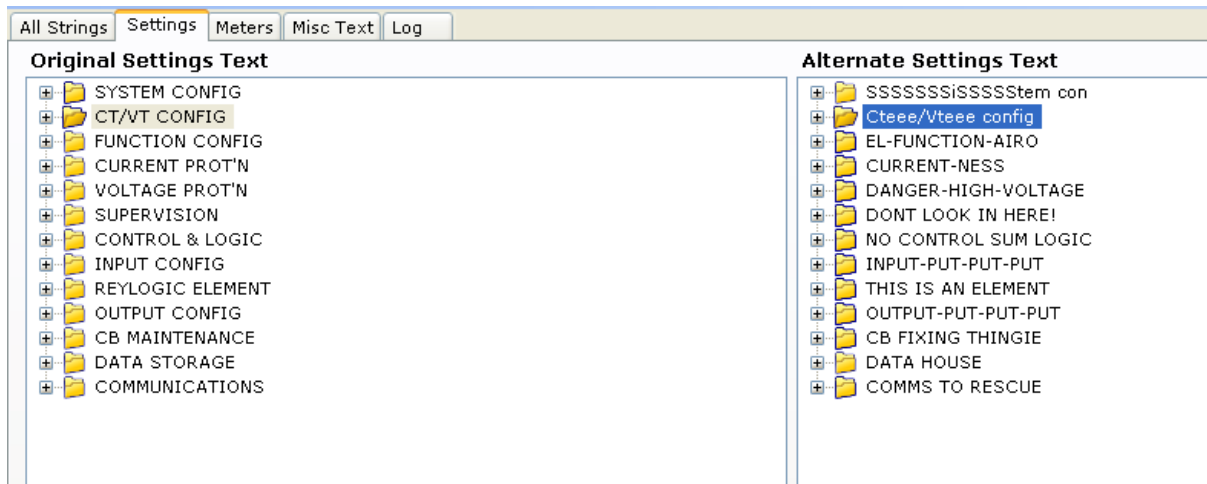


Figure 2.1-5 Language File Editor Setting Texts