

# 7SR242 Duobias

Multi-Function 2-Winding Transformer Protection Relay

## Document Release History

This document is issue **2010/06**. The list of revisions up to and including this issue is:

2010/06	Additional Comms modules option of (RS485 + IRIG-B) and (RS232 + IRIG-B) and typographical revisions
2010/02	Document reformat due to rebrand
2010/02	Third issue. Software revision 2662H80001 R4c-3
2008/07	Second issue. Software revision 2662H80001R3d-2c.
2008/05	First issue

## Software Revision History

2010/02	2662H80001 R4c-3	Revisions to: VT ratio settings, 87BD 1 <sup>st</sup> bias slope limit setting increments, CB fail function, LED CONFIG menu, DATA STORAGE menu.  Added: Open circuit detection (46BC), CONTROL MODE menu, Close circuit supervision (74CCS), Measured earth fault undercurrent (37G), Pulsed output contacts.
2008/07	2662H80001R3d-2c.	Demand metering. Optional DNP3.0 data comms.
2008/05	2662H80001R3-2b	First Release

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## Section 1: Introduction

### 1.1 Relay Menus And Display

All relay fascias contain the same access keys although the fascias may differ in appearance from model to model. 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 the settings mode password) change settings in the relay.

**Instruments Mode** - allows the user to view the relay meters e.g. current, voltage etc.

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

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

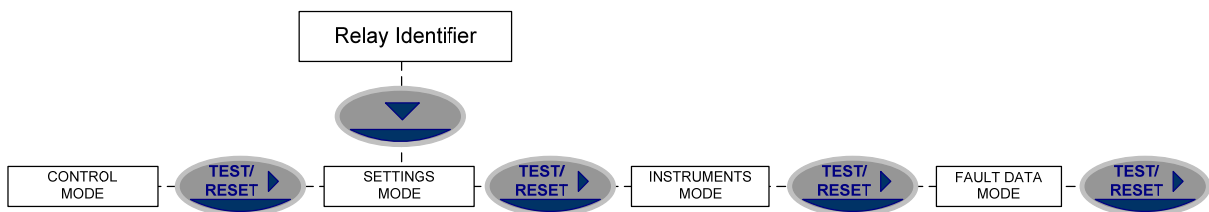


Figure 1-1: Menu

Pressing CANCEL returns to the Relay Identifier screen

#### LCD Contrast

To adjust the contrast on the LCD insert a flat nosed screwdriver into the screw below the contrast symbol, turning the screw left or right decreases and increases the contrast of the LCD.



Figure 1-2 Fascia Contrast symbol



Figure 1-3 Facia of 7SR242 Relay

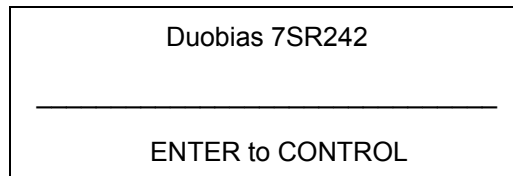
## 1.2 Operation Guide

### 1.2.1 User Interface Operation

The basic menu structure flow diagram is shown in Figure 1.2-2. 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 and the settings set to default as specified in settings document.

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



**Figure 1-4 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 prior to 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:



READ DOWN



READ UP

These pushbuttons are used to navigate the menu structure and to adjust settings.



ENTER

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.



CANCEL

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 is also moves the cursor right ► when navigating through menus and settings.

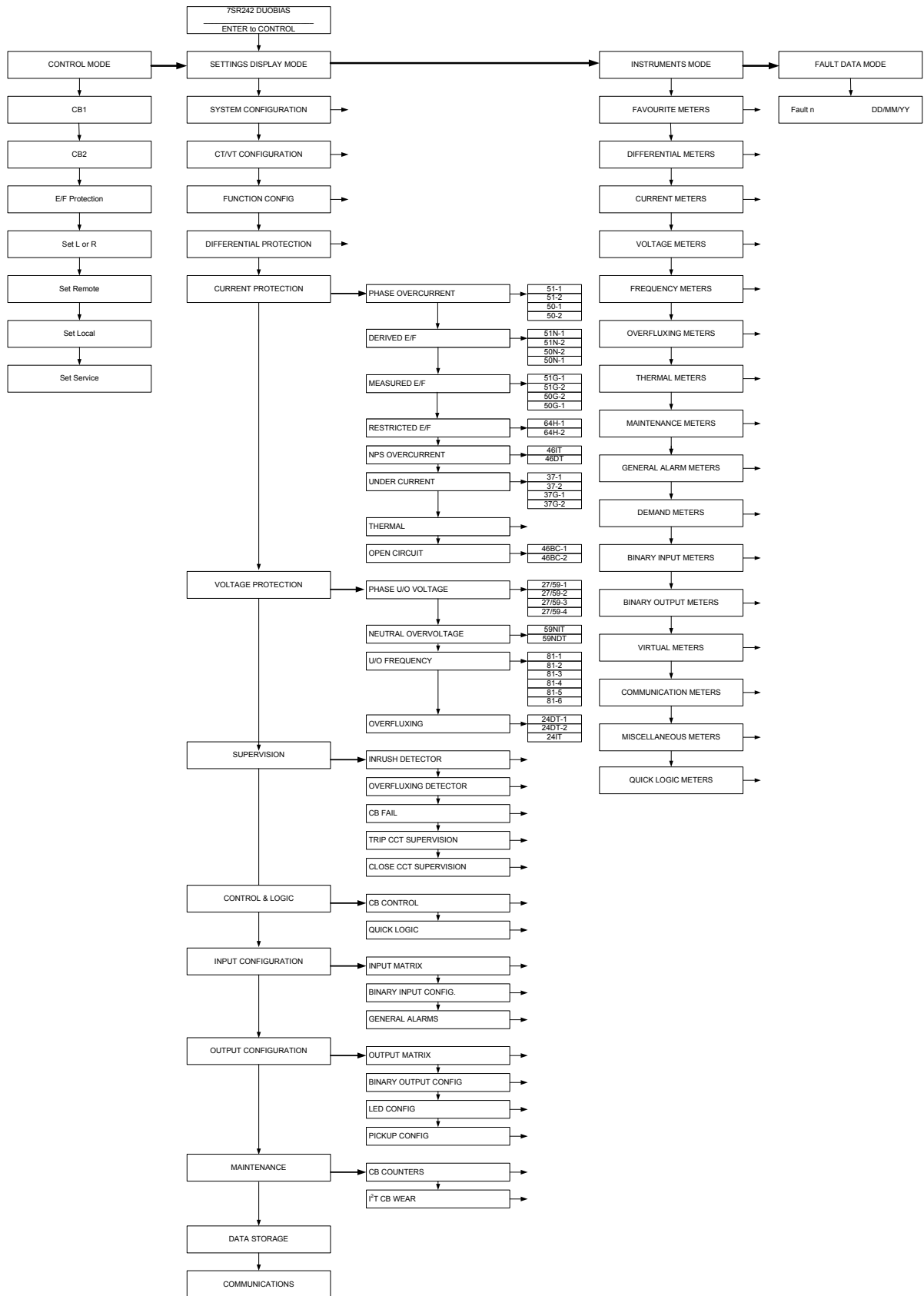


Figure 1-5: 7SR24 Menu Structure

### 1.3 Settings Display

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 even if the password is not known.

While a setting is being edited flashing characters indicate the edit field. Pressing the ▲ or ▼ buttons will display 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 setting change is effective immediately unless any protection element is operating, in which case the change becomes effective when no elements are operating.

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

### 1.4 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/RESET buttons.

Instrument	Description
<p><b>FAVOURITE METERS</b></p> <p>→to view</p>	<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> <p>The relay will poll through, displaying each of the meters selected in favourite meters, after no key presses have been detected for a user settable period of time. The time is set in the Setting menu&gt;System Config&gt;Favourite Meters Timer.</p>

<b>DIFFERENTIAL METERS</b> →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
W1 Line Ia Ib Ic	0.00xIn ----° 0.00xIn ----° 0.00xIn ----°	Displays Winding 1 Input 3 Phase currents Nominal RMS values & phase angles with respect to PPS voltage.
W2 Line Ia Ib Ic	0.00xIn ----° 0.00xIn ----° 0.00xIn ----°	Displays Winding 2 Input 3 Phase currents Nominal RMS values & phase angles with respect to PPS voltage.
W1 Relay Ia Ib Ic	0.00xIn ----° 0.00xIn ----° 0.00xIn ----°	Displays Winding 1 relay currents Nominal RMS values & phase angles with respect to PPS voltage.
W2 Relay Ia Ib Ic	0.00xIn ----° 0.00xIn ----° 0.00xIn ----°	Displays Winding 2 relay currents Nominal RMS values & phase angles with respect to PPS voltage.
Operate Ia Ib Ic	0.00xIn 0.00xIn 0.00xIn	Displays the 3 phase operate currents' relevant to the biased differential (87BD) and highset differential (87HS) functions.
Restraining Ia Ib Ic	0.00xIn 0.00xIn 0.00xIn	Displays the 3 phase restraining currents relevant to the biased differential (87BD) function.
W1 1st Harmonic Ia Ib Ic	0.00xIn 0.00xIn 0.00xIn	Displays W1 3 phase fundamental current components Nominal RMS values.
W1 2 <sup>nd</sup> Harmonic Ia Ib Ic	0.00xIn 0.00xIn 0.00xIn	Displays W1 3 phase 2 <sup>nd</sup> Harmonic current components Nominal RMS values.
W1 5 <sup>th</sup> Harmonic Ia Ib Ic	0.00xIn 0.00xIn 0.00xIn	Displays W1 3 phase 5th Harmonic current components Nominal RMS values.
W2 1st Harmonic		See above.
W2 2 <sup>nd</sup> Harmonic		See above.
W2 5th Harmonic		See above.



<b>CURRENT METERS</b> →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
W1 Primary Ia                    0.00kA Ib                    0.00kA Ic                    0.00kA	Displays the 3 phase currents Primary RMS values
W1 Secondary Ia                    0.00A Ib                    0.00A Ic                    0.00A	Displays the 3 phase currents Secondary RMS values
W1 Nominal Ia                    0.00xIn ----° Ib                    0.00xIn ----° Ic                    0.00xIn ----°	Displays the 3 Phase currents Nominal RMS values & phase angles with respect to PPS voltage.
W1 Sequence Izps                0.00xIn ----° Ipps                0.00xIn ----° Inps                0.00xIn ----°	Displays the 3 Phase currents Nominal RMS values & phase angles with respect to PPS voltage.
W1 Derived Earth (In) Ia                    kA Ib                    A Ic                    xIn	Displays the Earth currents derived from W1 line currents. RMS values.
W2 Primary	See above.
W2 Secondary	See above.
W2 Nominal	See above.
W2 Sequence	See above.
W2 Derived Earth (In)	See above.
Measured Earth – 1 (Ig) Ig                    0.000kA Ig                    0.000A Ig                    0.000xIn	Displays the Earth currents for IG1. RMS values
Measured Earth – 2 (Ig) Ig                    0.000kA Ig                    0.000A Ig                    0.000xIn	Displays the Earth currents for IG2. RMS values

<b>VOLTAGE METERS</b> →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
Voltage Meters Pri (Ph-Ph)                    0.00kV Sec                                0.00V Nom                                0.00xVn	Displays the Voltage RMS values

<b>FREQUENCY METERS</b> →to view	This is the sub-group that includes all the meters that are associated with Frequency TEST/RESET ► allows access to this sub-group
Frequency                        00.000Hz	Displays the power system frequency.

<b>OVERFLUXING METERS</b> →to view	This is the sub-group that includes all the meters that are associated with Over-fluxing. TEST/RESET ► allows access to this sub-group
Overfluxing Meters V/f V                                xVn V/f                                    xVn/fn V/f 24IT                            %	Displays the over-fluxing values

<b>THERMAL METERS</b> →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%	Displays the thermal capacity

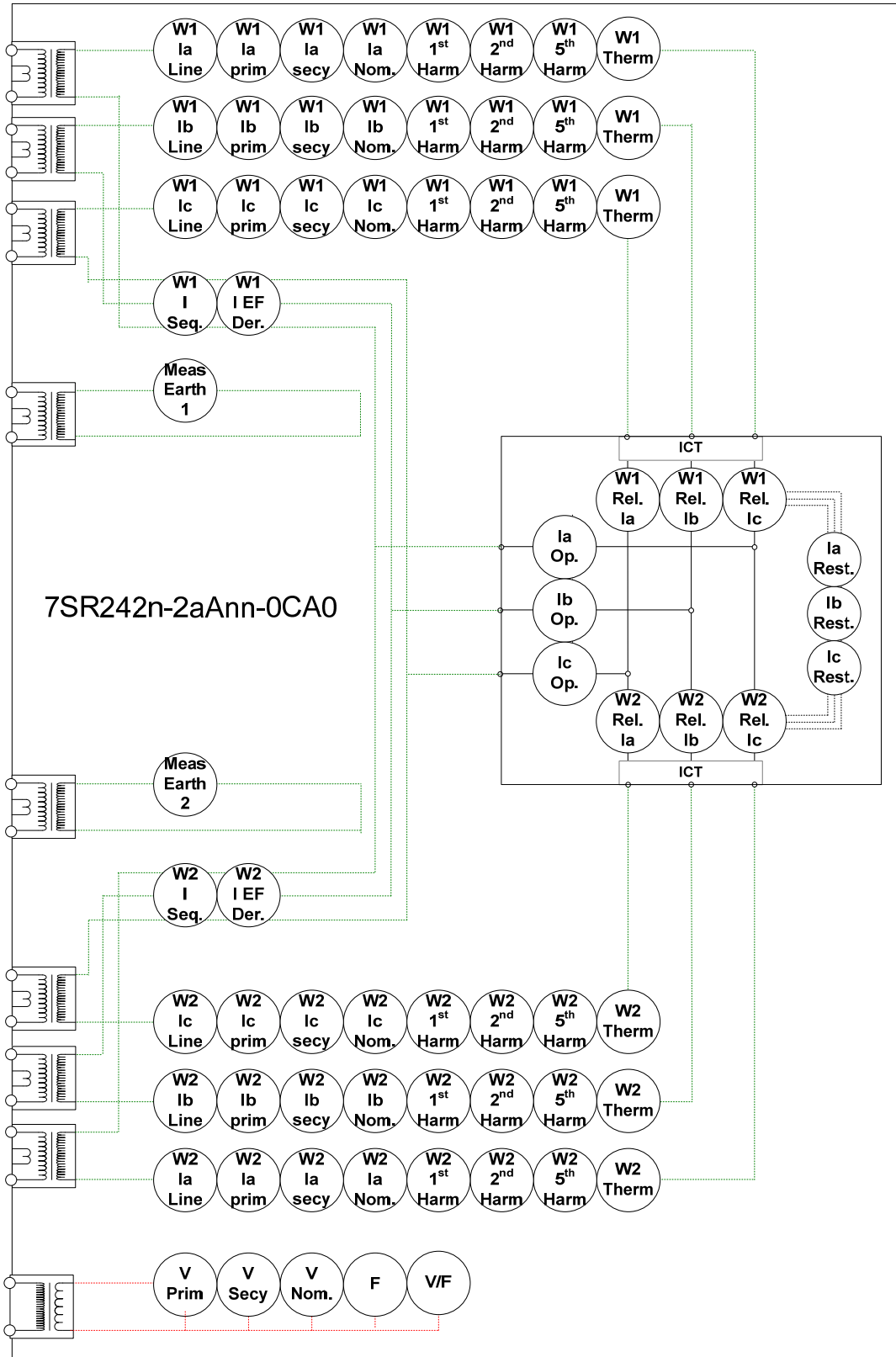


Figure 1-6: Schematic Diagram: Current and Voltage Meters (includes optional functionality)



<b>GENERAL ALARM METERS</b> →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
General Alarms ALARM 1                      Cleared	Displays the state of General Alarm
General Alarms ALARM 2                      Cleared	
General Alarms ALARM 3                      Cleared	
General Alarms ALARM 4                      Cleared	
General Alarms ALARM 5                      Cleared	
General Alarms ALARM 6                      Cleared	
General Alarms ALARM 7                      Cleared	
General Alarms ALARM 8                      Cleared	
General Alarms ALARM 9                      Cleared	
General Alarms ALARM 10                      Cleared	
General Alarms ALARM 11                      Cleared	
General Alarms ALARM 12                      Cleared	

<b>DEMAND METERS</b> →to view	This is the sub-group that includes Demand meters. Values are available for user defined time periods. TEST/RESET ► allows access to this sub-group
Voltage Demand	Displays maximum, minimum and mean values
W1 I Phase A Demand	
W1 I Phase B Demand	
W1 I Phase C Demand	
W2 I Phase A Demand	
W2 I Phase B Demand	
W2 I Phase C Demand	
Frequency Demand	

<b>BINARY INPUT METERS</b> →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 1-8                      ---- ---- BI 9-13                      ---- -	Displays the state of DC binary inputs 1 to 8 (The number of binary inputs may vary depending on model)



<b>QUICK LOGIC METERS</b> →to view	
E 1-8 E 9-16	
E1 Equation                      0 EQN                                    = 0 TMR 0-0                            = 0 CNT 0-1                            = 0	
En Equation	

## 1.5 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 the Relay Using Reydisp Evolution

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

PC with REYDISP Evolution Installed. (REYDISP can be downloaded from our website [www.siemens.com/energy](http://www.siemens.com/energy)).

### 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.

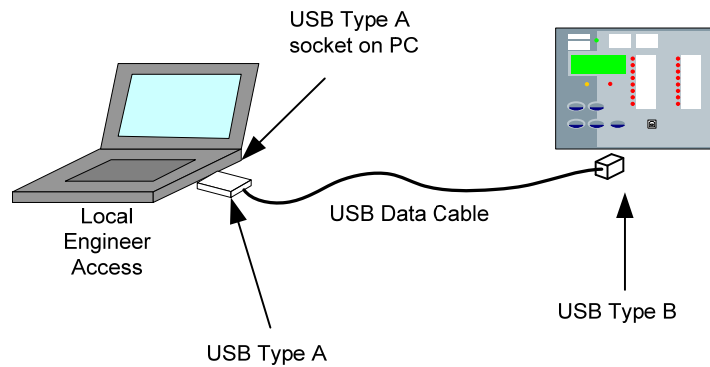


Figure 2-1 USB connection to PC



### 2.1.2 Rear RS485 connection

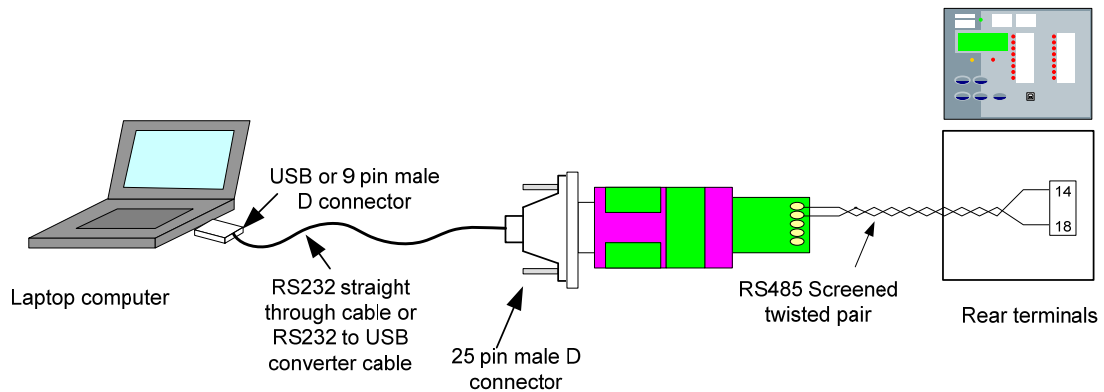


Figure 2-2 RS485 connection to PC

### 2.1.3 Optional rear fibre optic connection

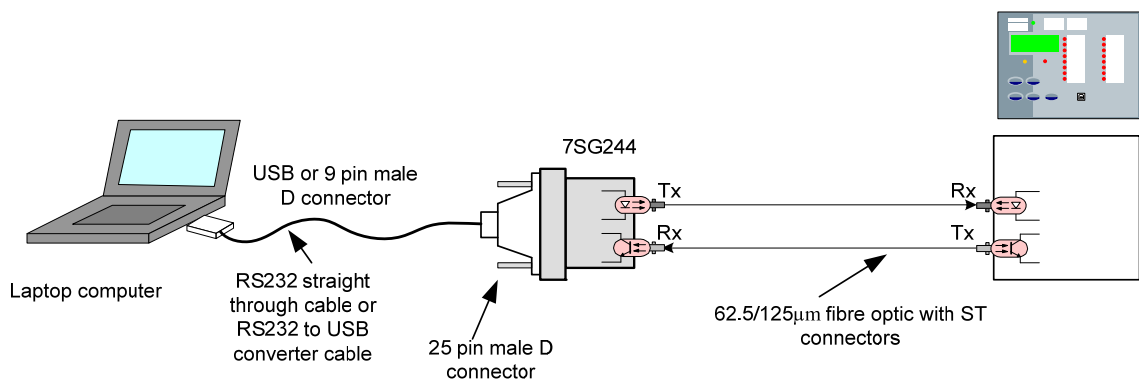


Figure 2-3 Fibre Optic Connection to PC

Sigma devices have a 25 pin female D connector with the following pin out.

Pin	Function
2	Transmit Data
3	Received Data
4	Request to Send
5	Clear to Send
6	Data set ready
7	Signal Ground
8	Received Line Signal Detector
20	Data Terminal Ready

2.1.4 Optional rear RS485 + IRIg-B connection

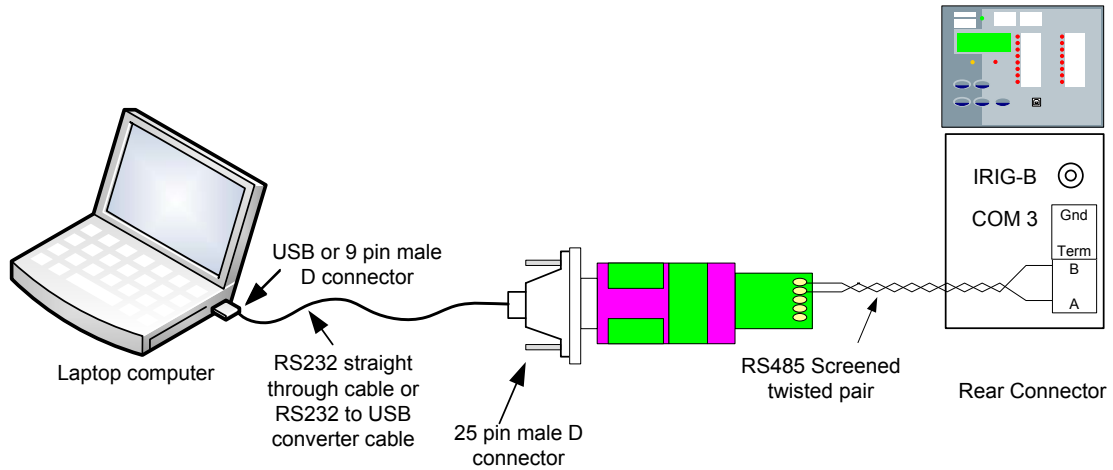


Figure 2.1-1 Additional (Optional) rear RS485 + IRIg-B connection to a PC

2.1.5 Optional rear RS232 + IRIg-B connection

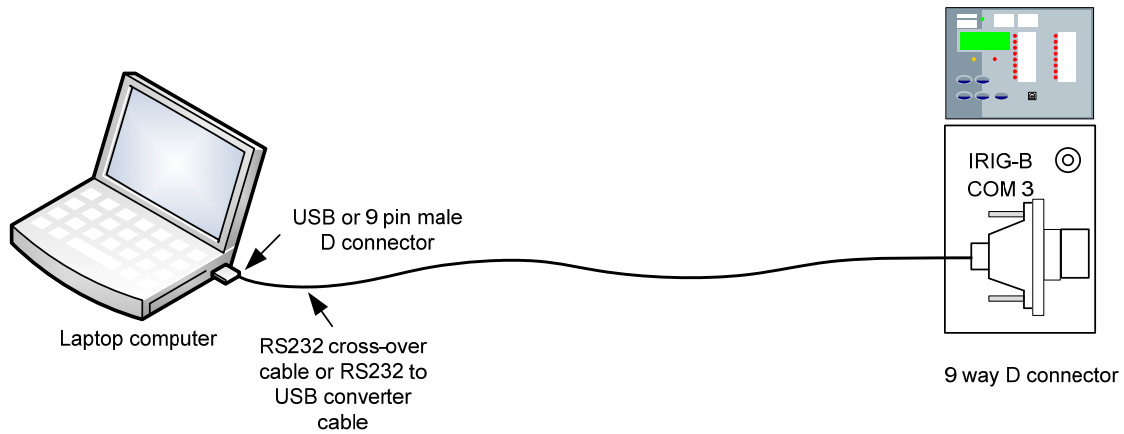


Figure 2.1-2 Additional (Optional) rear RS232 + IRIg-B connection to a PC

Pin	Relay Function
1	Not Connected
2	Receive Data (RXD)
3	Transmit Data (TXD)
4	Output Supply +5 V 50mA
5	Signal Ground (GND)
6	Input Supply +5 V 50mA
7	Linked to 8 (volts free)
8	Linked to 7 (volts free)
9	Output Supply +5V 50mA

## 2.1.6 Configuring Relay Data Communication

Using the keys on the relay fascia scroll down the settings menu's into the 'communications' menu. All of the below settings may not be available in all relay types. Reydisp software is compatible with IEC60870-5-103 protocol.

COM1-RS485 Port

COM2-USB Port (Front)

COM3 – Optional Fibre Optic

COM4 – Optional Fibre Optic

Setting name	Range	Default	Units	Notes
Station Address	0 ... 65534	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	ENABLED, DISABLED			
DNP3 Destination Address	0 ... 65534	0		
COM1-RS485 Protocol	OFF, IEC60870-5-103, MODBUS-RTU, DNP3	IEC60870-5-103		COM1: 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		COM2: Front USB port.
COM3 Protocol	OFF, IEC60870-5-103, MODBUS-RTU, DNP3	IEC6-0870-5-103		COM3: Optional rear mounted connection
COM3 Baud Rate	75 110 150 300 600 1200 2400 4800 9600 19200 38400 57600 115200	19200		
COM3 Parity	NONE, ODD, EVEN	EVEN		
<b>COM3 Line Idle*</b>	LIGHT ON, LIGHT OFF	LIGHT OFF		
<b>COM3 Data echo*</b>	ON, OFF	OFF		
<b>COM4 Protocol**</b>	OFF, IEC60870-5-103, MODBUS-RTU, DNP3	OFF		COM4: Optional rear mounted Fibre Optic ST connection
<b>COM4 Baud Rate**</b>	75 110 150 300 600 1200 2400 4800 9600 19200 38400	19200		
<b>COM4 Parity**</b>	NONE, ODD, EVEN	EVEN		
<b>COM4 Line Idle**</b>	LIGHT ON, LIGHT OFF	LIGHT OFF		
<b>COM4 Data echo**</b>	ON, OFF	OFF		

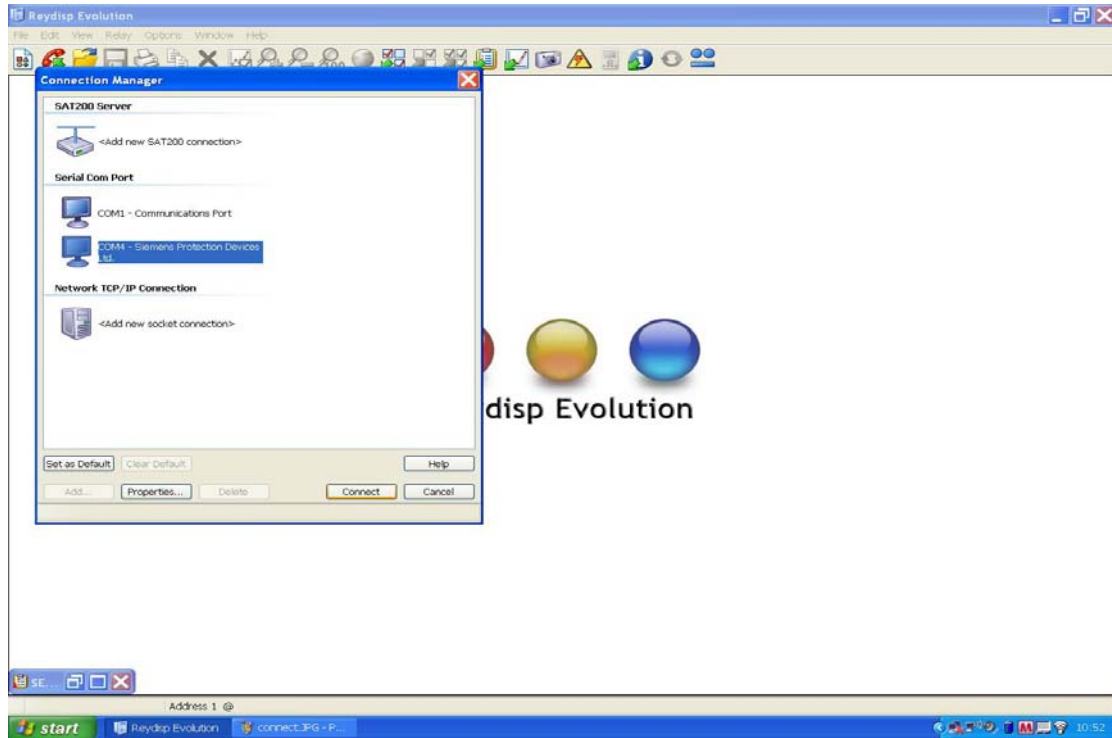
\*Not applicable for RS485 or RS232 interface modules.

\*\*Fibre Optic Module only

## 2.1.7 Connecting to the Relay via Reydisp

When Reydisp software is running all available communication ports of the PC will automatically be detected. On the start page tool bar open up the sub-menu File > Connect.

The 'Communication 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 Data Comms settings. Select 'Connect' to initiate the relay-PC connection.



**Figure 2-4 PC Comms Port Allocation**

Via the Relay > Set Address > Address set the relay address (1-254) or alternatively search for connected devices using the Relay > Set Address > Device Map. The relay can now be configured using the Reydisp software. Please refer to the Reydisp Evolution Manual for further guidance.