1S24 User Guide

Arc Fault Monitoring System

RMS Mors Smitt

Advanced Protection Devices

User Guide

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1S24 User Guide

About This Manual

This User Guide covers all 1S24 relays manufactured from July 2025. Earlier relays do not necessarily incorporate all the features described. Our policy of continuous development means that extra features & functionality may have been added.

The 1S24 User Guide is designed as a generic document to describe the common operating parameters for all relays built on this platform.

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Contact Us

RMS Mors Smitt
19 Southern Court • Keysborough 3173 • AUSTRALIA
Phone +61 3 8544 1200
Email sales.rms@wabtec.com • Web http://www.morssmitt.com/rms

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Documentation

Technical Bulletin

The detailed technical attributes, functional description & performance specifications for the 1S24 are described in the product Technical Bulletin.

The order of precedence for product information is as follows:

- Technical Bulletin
- User Guide

User Guide

This User Guide covers all 1S24 relay versions & describes the generic features & attributes common across all versions.

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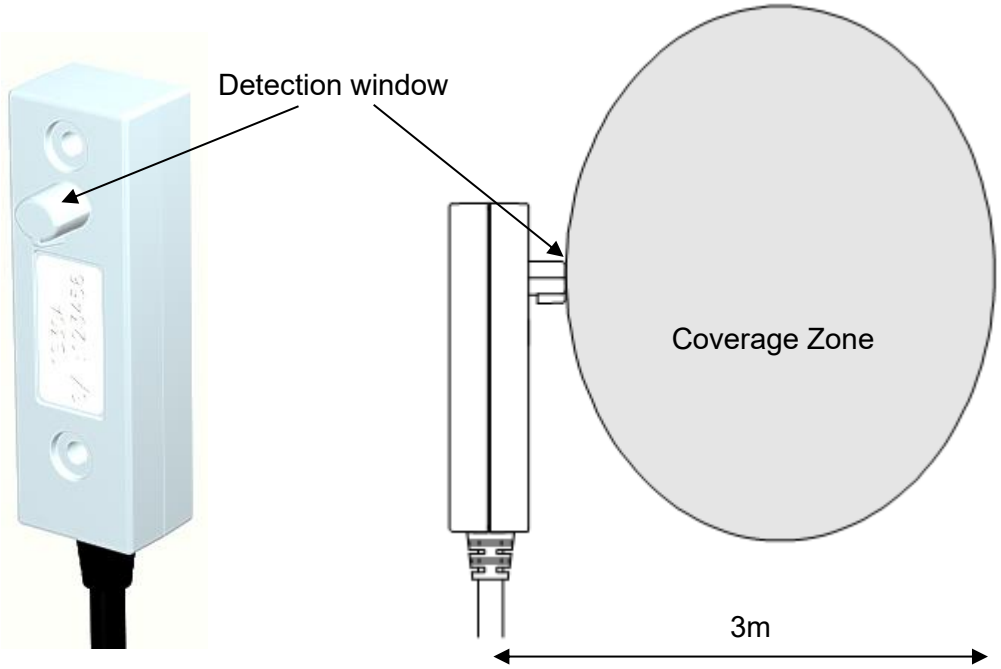
Sensor Installation

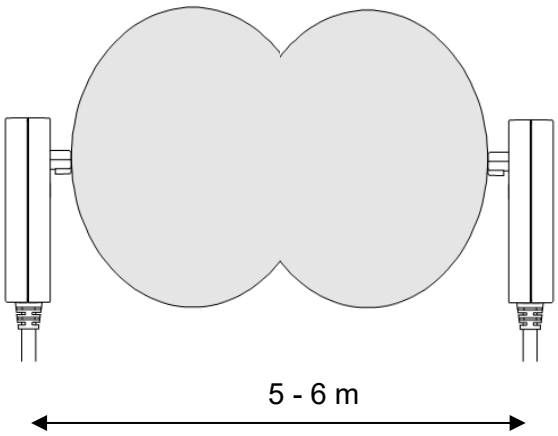
1S30 Sensors

The 1S30 sensor is available as a single detector or dual detector package.

The 1S30A single detector version is depicted below showing the location of the detection window and the approximate coverage zone:



The recommended spacing for the 1S30A single detectors is approximately 5 - 6 m to ensure adequate detection overlap.



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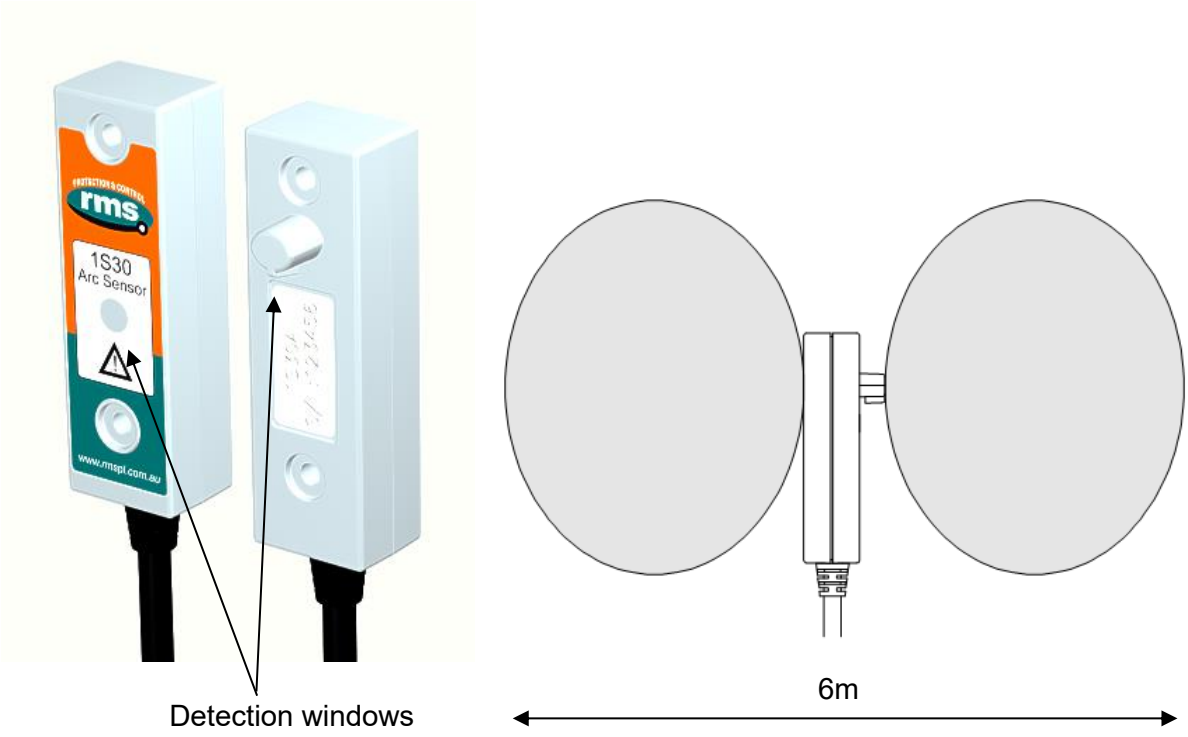
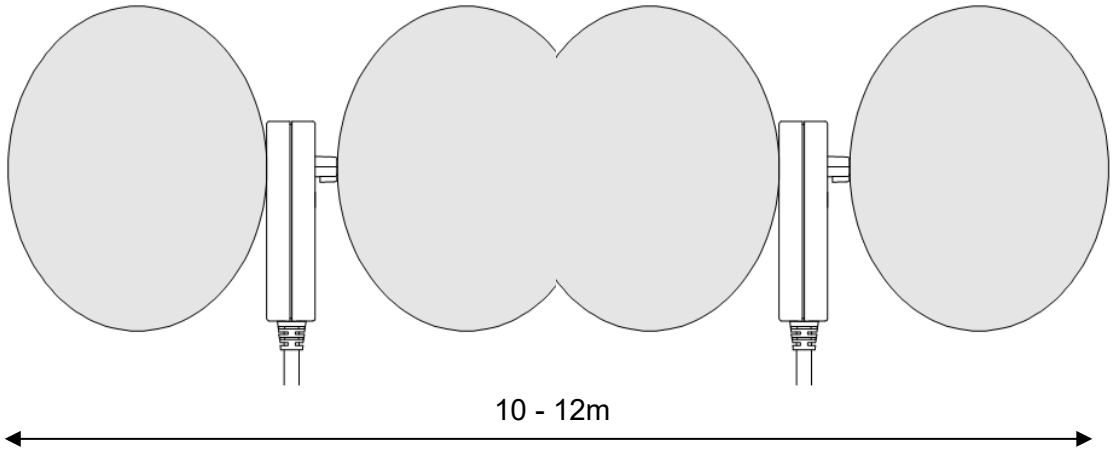
The 1S30B Dual detector version provides an additional detection window for dual zones of coverage as depicted below :



The recommended spacing for the 1S30B single detectors is approximately 5 - 6 m to ensure adequate detection overlap, this combination provides an overall coverage zone of approximately 10 - 12 m.



The 1S30A and 1S30B sensors may also be mixed to provide various coverage combinations, again spacing's of approximately 5 - 6 m should be observed to ensure adequate detection overlap.

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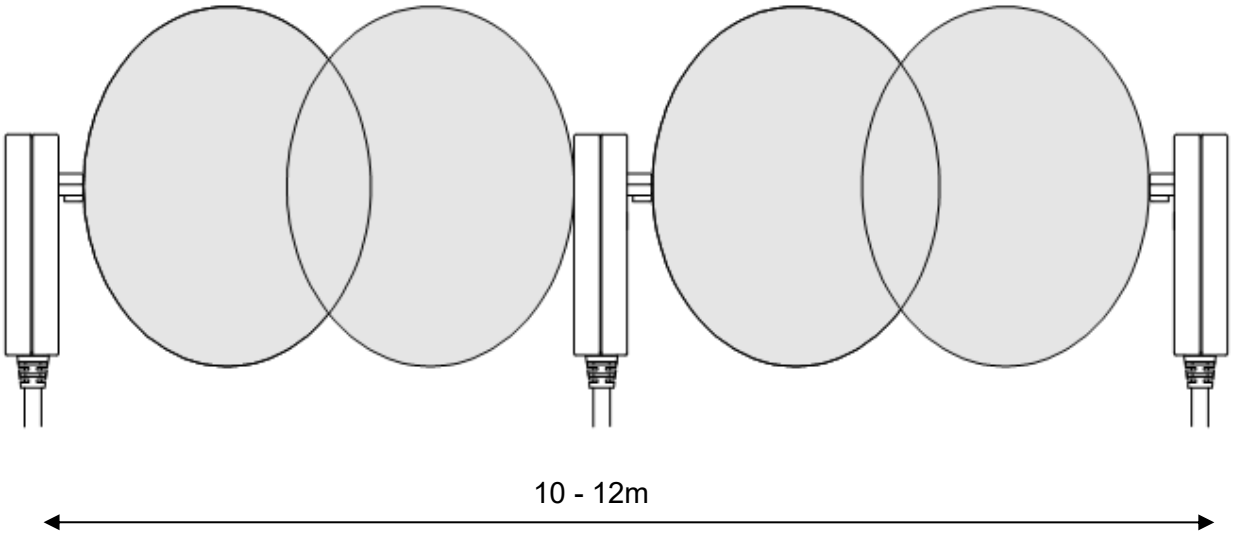

Sensor Placement

Sensors need to be mounted to provide full coverage of the switchgear cubicles to be protected. Where the protected zone is larger than the sensor coverage then the use of multiple sensors is required.

Precise positioning of the sensors is generally not required as the light caused by the arc is reflected from the walls.

Sensor Mounting

The 1S30 is suitable for flush panel mounting in a number of configurations, for further information on mounting arrangements and mounting hardware refer to the 1S30 Technical Bulletin.

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Example Sensor Placement

The following are some typical examples of sensor placement.

Sensor placement inside CB racking chamber

Sensor placement inside busbar chamber

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Sensor placement inside cable termination chamber

Sensor placement for switchgear Busbar coverage (External through Hole Detector)

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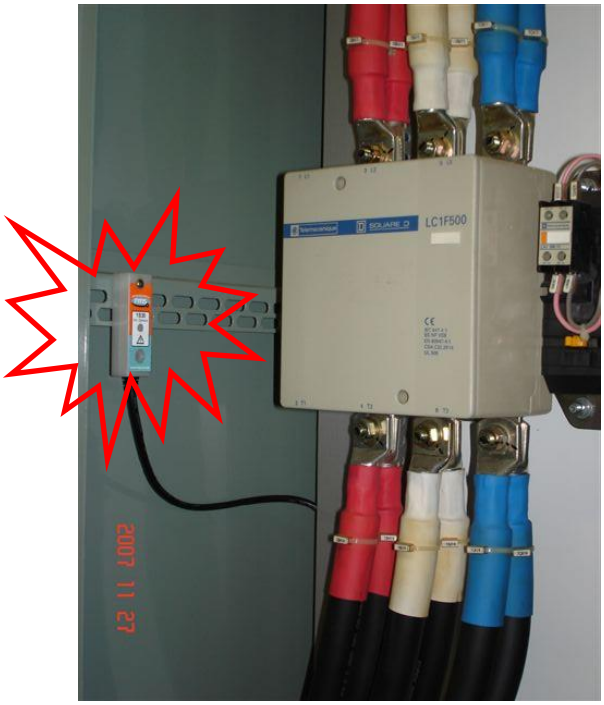

Sensor placement near Low Voltage Contactor for a Variable Speed Drive

Sensor placement for Switchgear cable termination chamber (External through Hole Detector)

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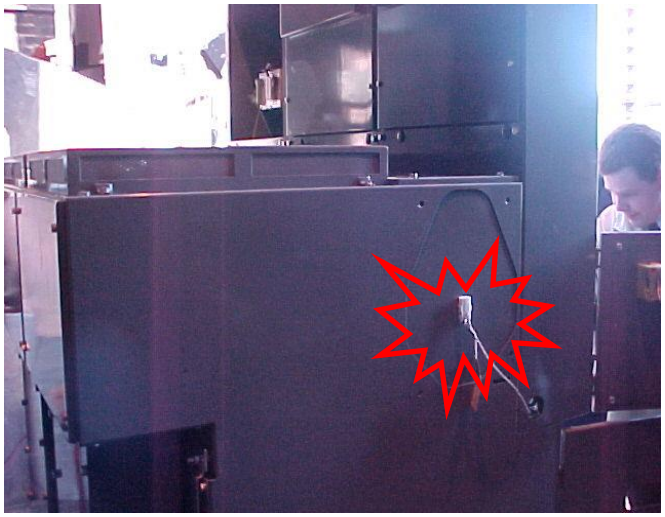

Sensor placement for end of Bus chamber (External through Hole Detector)

Sensor placement for Switchgear cable termination chamber (External through Hole Detector)

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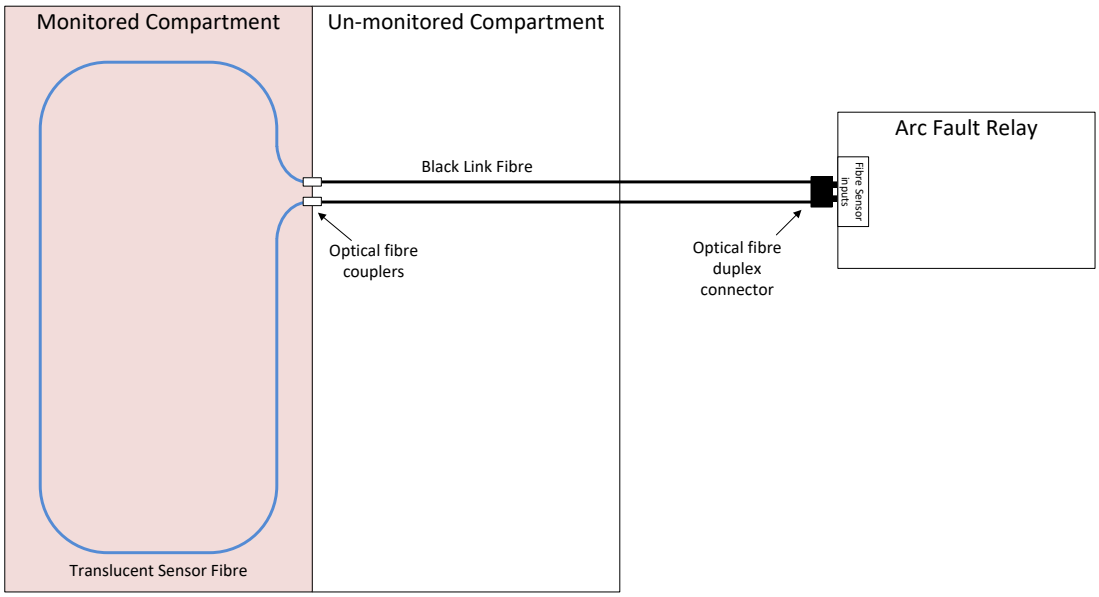
1S40 Linear Sensors

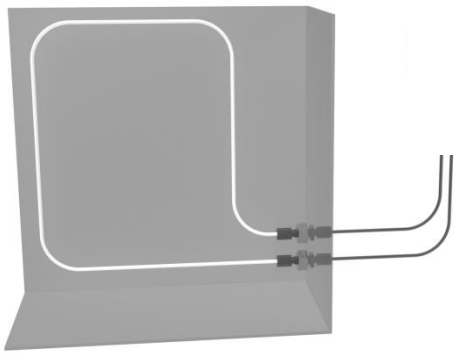
The 1S40 linear sensor may be applied to protect large volumes where multiple point sensors would otherwise be required.

A separate 1S40 linear sensor is required for each segregated protection zone.

The linear sensor kits provide both a black link fibre and a translucent arc sensor fibre. The translucent fibre is located within the detection zone and black link fibres allow routing of the linear sensor back to the relay.

Translucent and black link fibres are joined through the use of optical fibre couplers. An optical fibre duplex connector is utilised for relay connection





For the most effective coverage it is preferable to loop the translucent fibre within the monitored compartment or chamber as shown in the diagrams above. A light intensity of >10,000 Lux over a length of 300mm is required to cause an arc trip.

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The 1S40 kit comprises of lengths of black link fibre (pre-terminated with a duplex connector for relay connection), unterminated translucent fibre, 2 x optical fibre couplers and a fibre optic fibre cutter.

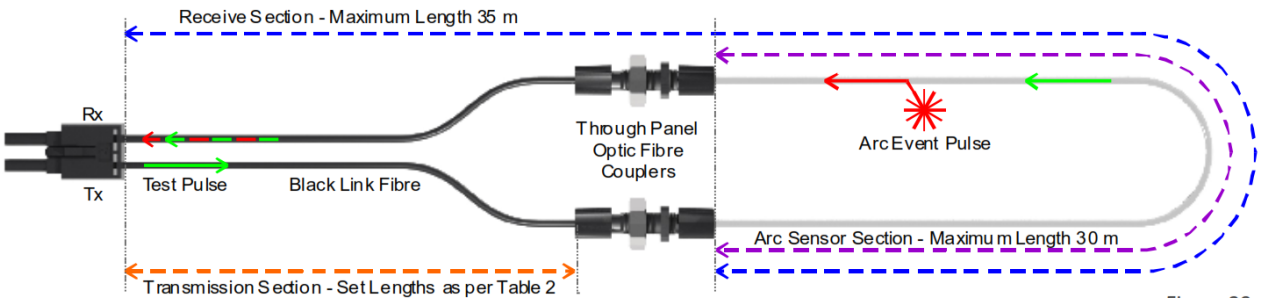
Black Link Fibre Assembly

Translucent Sensor Fibre

Optic Fibre Couplers

Optic Fibre Cutter

The individual components are combined per the diagram below :



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The following sensor dimensioning criteria must be satisfied for the arc fault relay linear sensor input to self calibrate and function correctly :

1. Transmission Section (section of clad fibre from relay Tx connection) to optic fibre coupler must be ≤ 40m and cut to the set lengths in Table 2 within a tolerance of ±10%
2. Receive Section (section of bare and clad fibre back to the relay Rx connection) must be ≤ 35m
3. Arc Sensor Section (section of bare fibre) must be ≤ 30m

Transmission Section Length	Setting
0 metres	<1
1 metres	1m
5 metres	5m
10 metres	10m
20 metres	20m
30 metres	30m
40 metres	40m

Table 2

The chosen Transmission Section Length must also be configured in the 1S24 Fibre Loop Sensor configuration screen – refer to Linear Sensor Configuration.

1S40 Linear Sensor Assembly

Once the lengths of black link fibre and translucent sensor fibre have been determined cut them using the optic fibre cutter provided – other cutting tools must not be used as this will lead to excessive attenuation within the fibre and result in incorrect operation.

The cut sections of black link fibre and translucent fibre are coupled using the provided optic fibre couplers. Slide the cut lengths completely into the couplers and hand tighten the coupler cinch nuts taking care not to strip the cinch nut threads.

Coupled Black Link and Translucent Sensor Fibres

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1S40 Linear Sensor Compartment Fixing

The optic fibre couplers may be positioned and held in place with the provided fixing nuts at a compartment interface.

The optic fibres may be retained using cable ties or silicon adhesive. When using silicon adhesive no more than 10% of the sensor fibre shall be masked by the silicon.

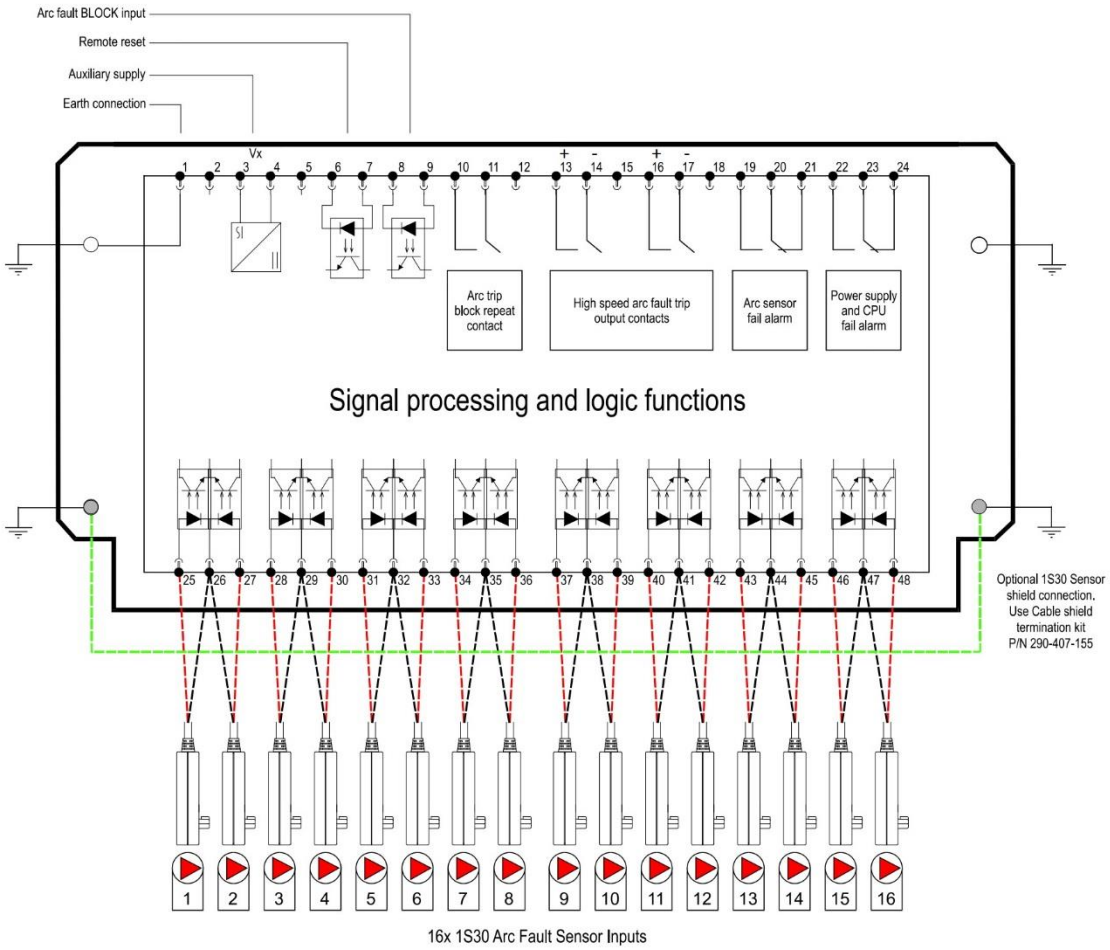
Care should be taken not to apply excessive force when fixing the 1S40 sensor. Excessive force or rough handling may result in damage to the fibre sensor.

Care should also be taken when bending the 1S40 sensor to ensure that the minimum bending radius of 30mm is adhered to.

Scheme Wiring

1S24 Connection diagrams

2 Trip Output Version



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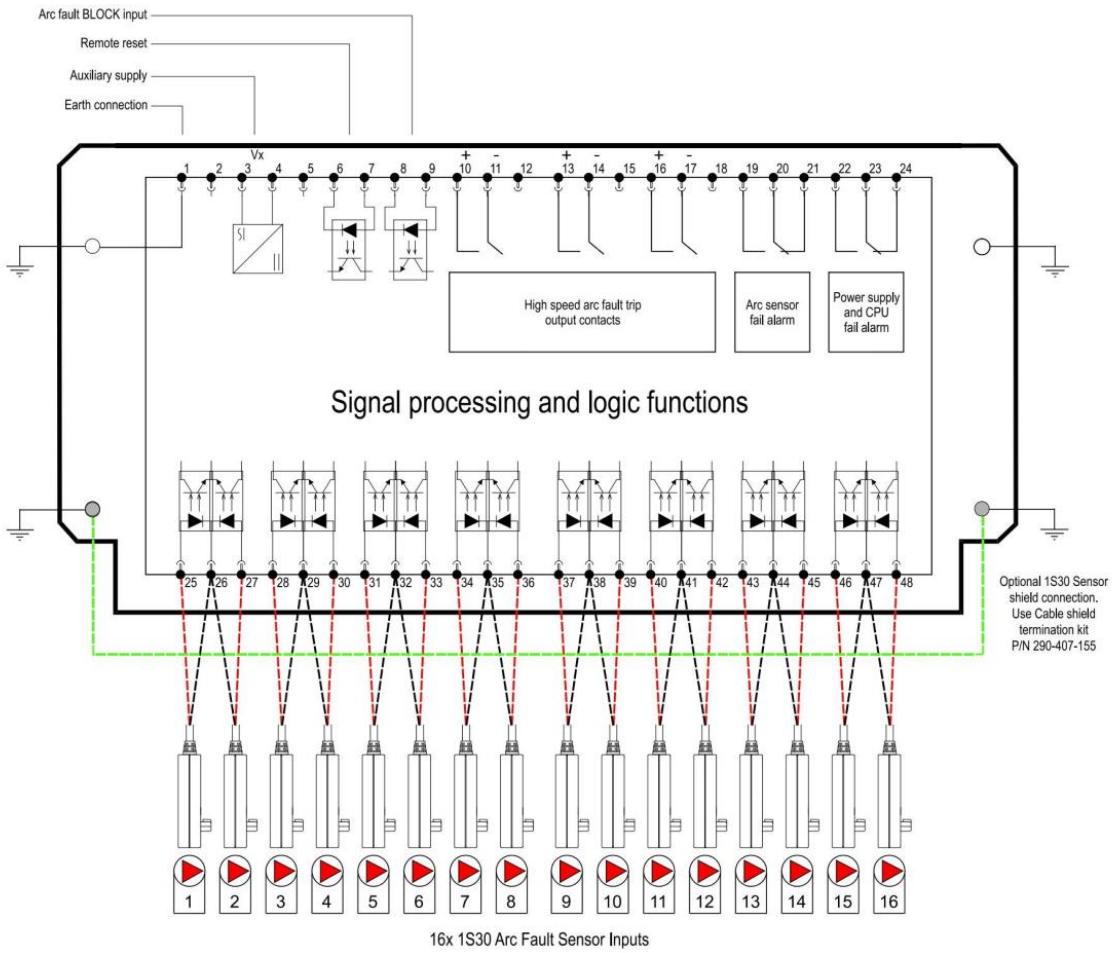
3 Trip Output Version



The above diagrams show the 1S24 connections.

The connected sensor inputs need to be enabled and unused inputs disabled via the Web browser configuration tool. This is essential to:

- Allow connected sensor inputs to operate for an ARC Fault
- Allow connected sensor inputs to be supervised
- Ensure unconnected sensor inputs do not indicate an Arc sensor Alarm condition

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Linear Sensor Connections

A unit with 1S24 Linear sensor connections is pictured below showing the connection points for the Linear sensors:

Linear Sensor equipped units provide inputs for 2 Linear sensors and 12 point sensors.

Each Linear Sensor input provides a Transmit (TX) and Receive (RX) set of connections.

For details of the Linear Sensor refer to the 1S40 Technical Bulletin.

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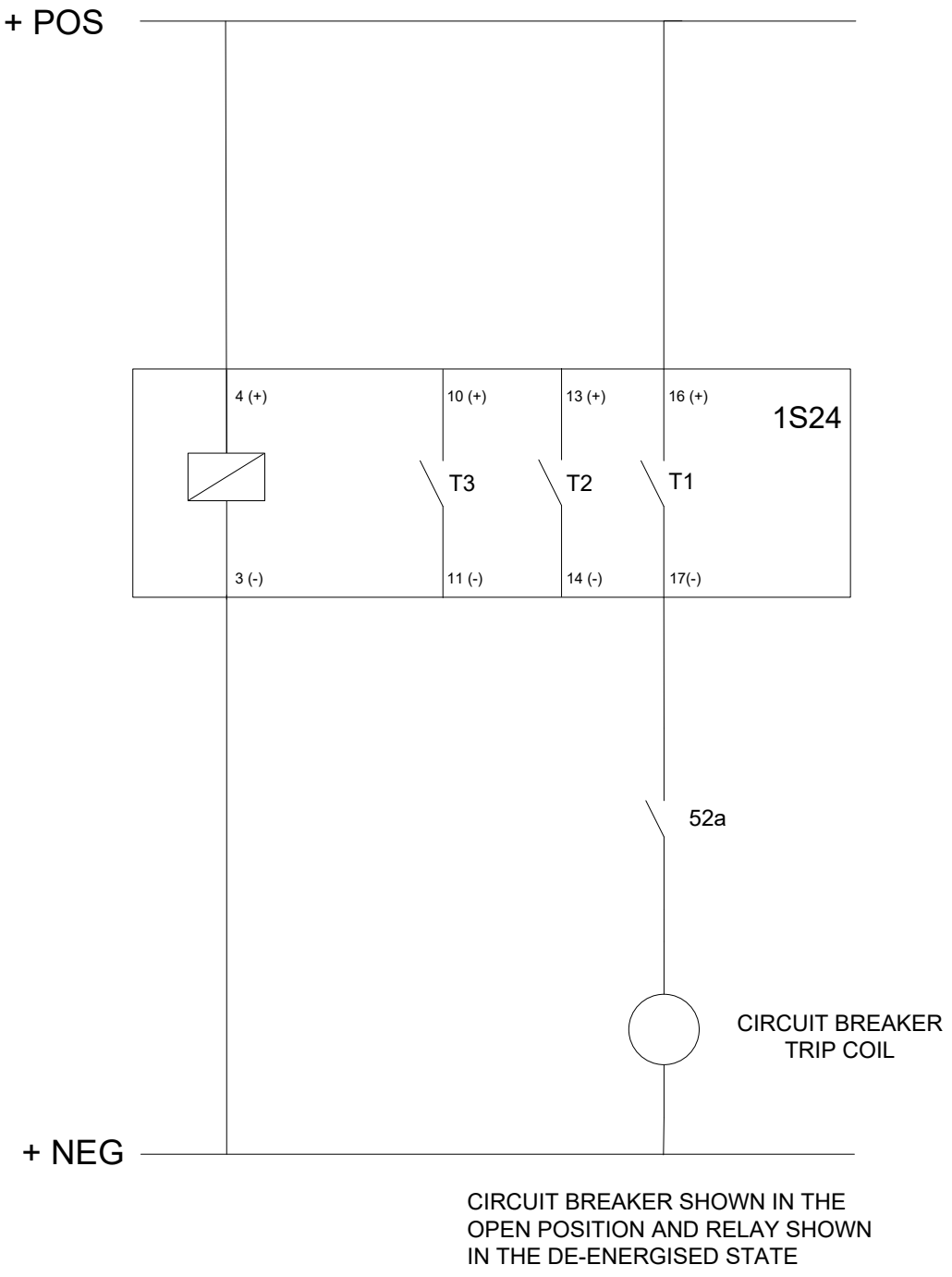
Example Schematic – Direct Arc Trip Only Application



Note: When using Hybrid high speed trip outputs:

1. **The polarity markings as nominated on the trip output connections must be observed to ensure correct operation.**

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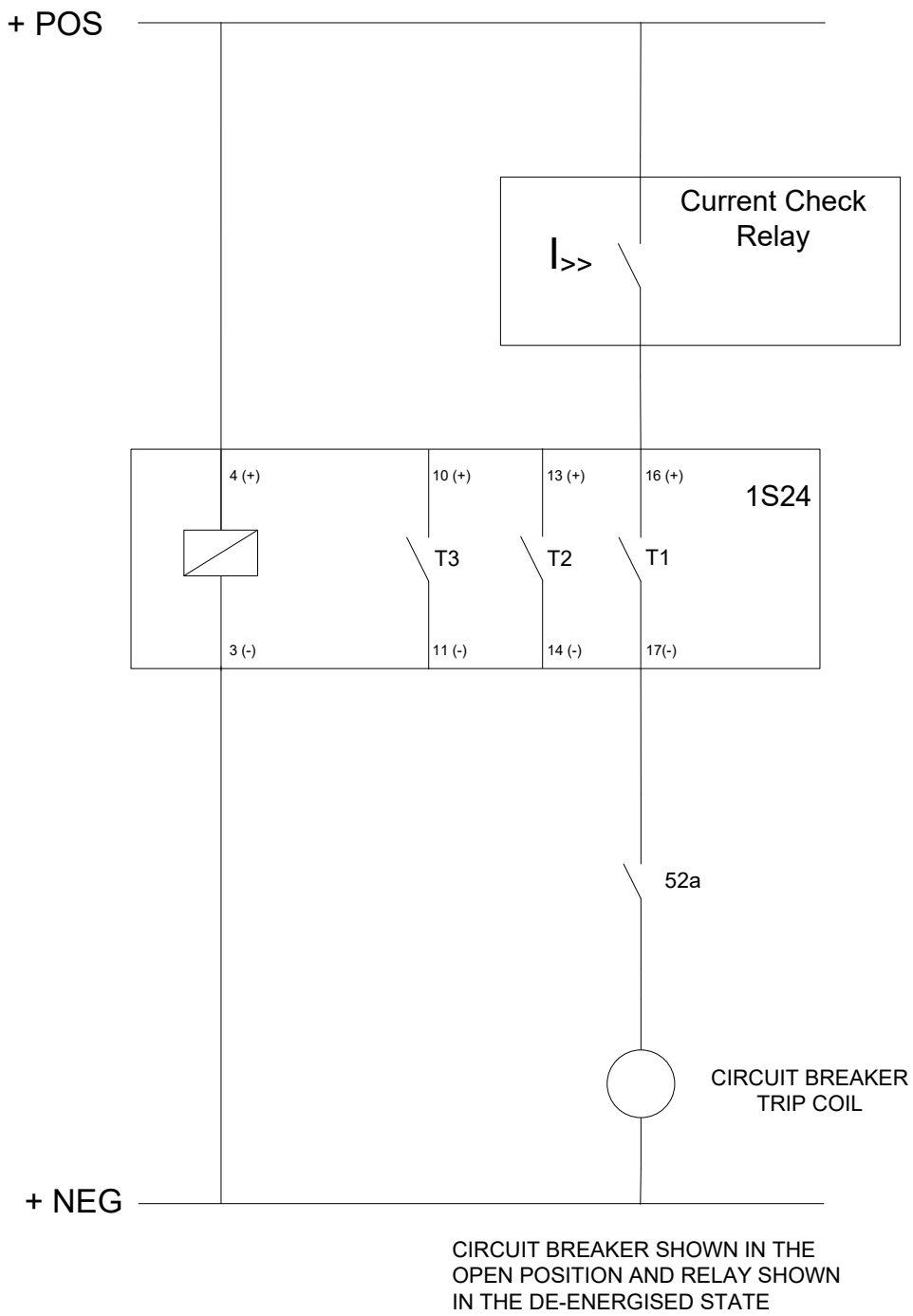
Example Schematic – Current Checked Arc Trip Application



Note: When using Hybrid high speed trip outputs:

1. **The polarity markings as nominated on the trip output connections must be observed to ensure correct operation.**

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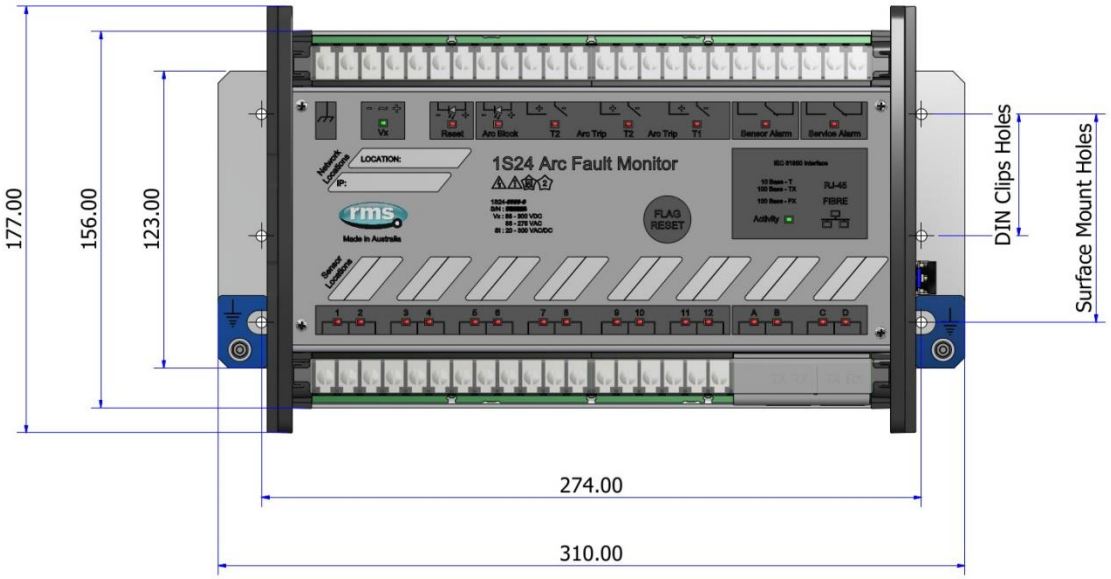
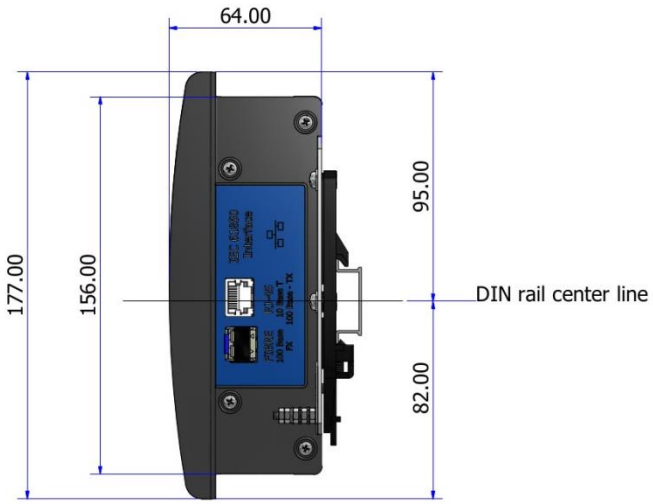
Terminal Layout and Module Dimensions

Surface or Din Rail Mounting





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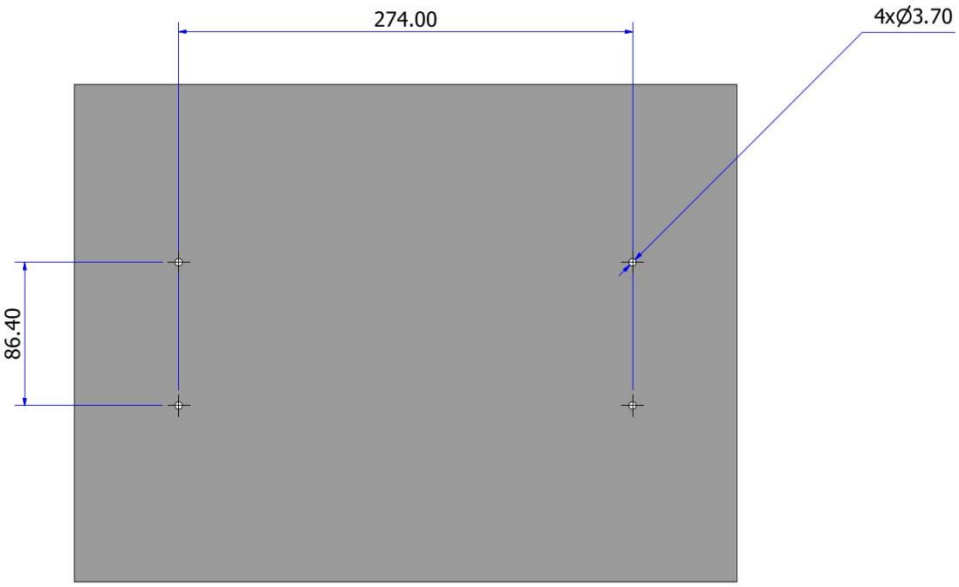
The drilling plan for surface mounting is shown below:



The module may alternatively be mounted on a din rail by using 2 optional din rail mounting kits (2 x RMS P/N: 290407157).

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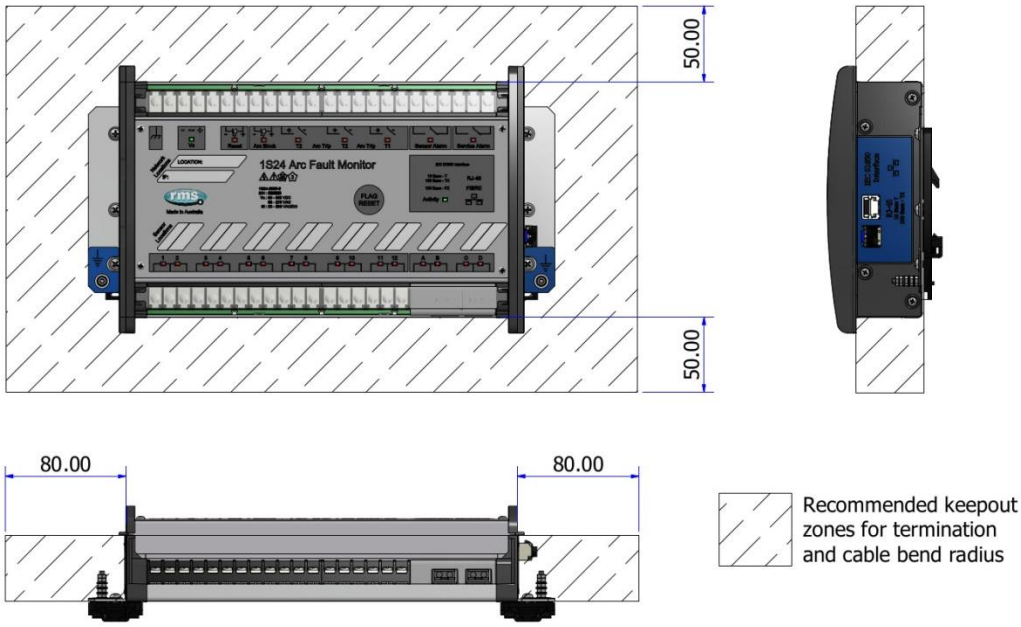
The recommended keep out zones to allow for cable terminations are shown below:



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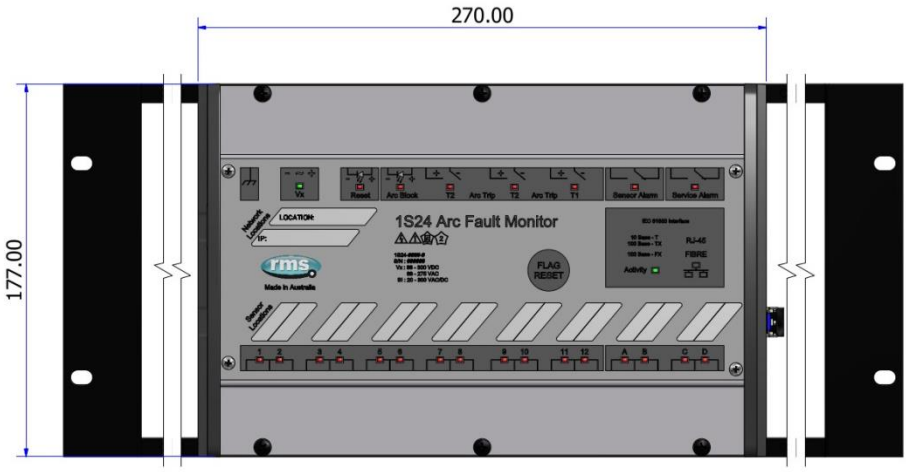
Horizontal or Vertical Flush Mounting

The Horizontal or Vertical module options allow for rack frame or flush panel mounting.



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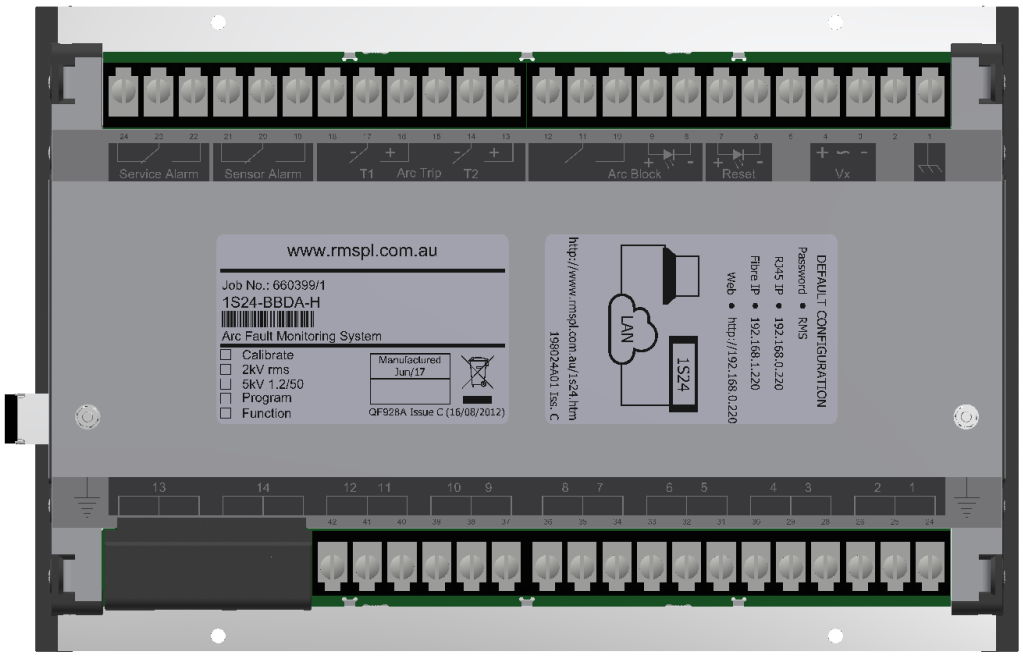
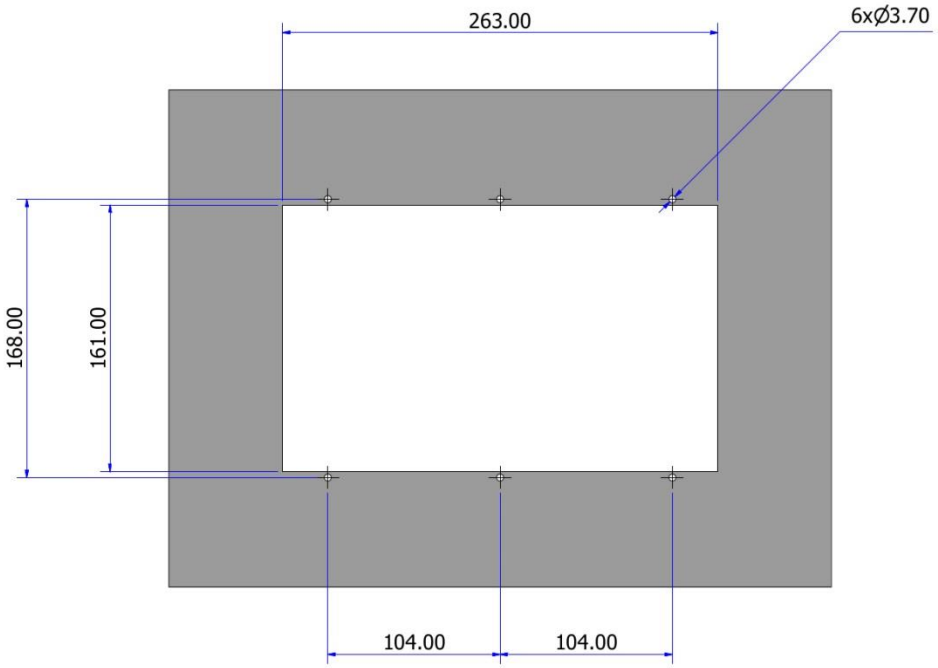
Rear view of Terminals:



The cutout dimensions for flush mounting are shown below:



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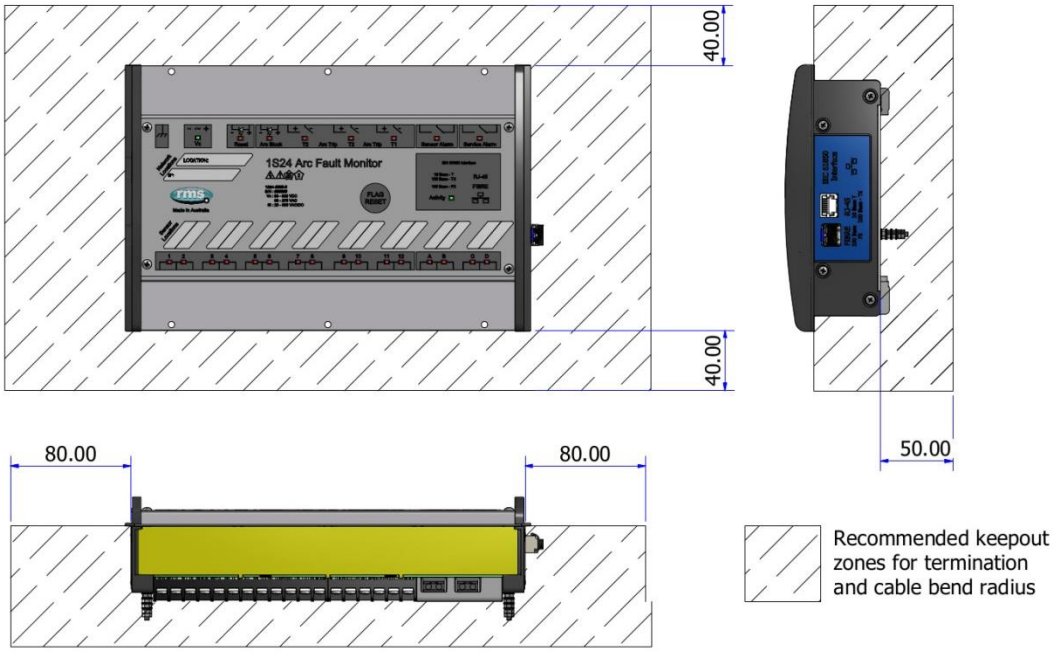

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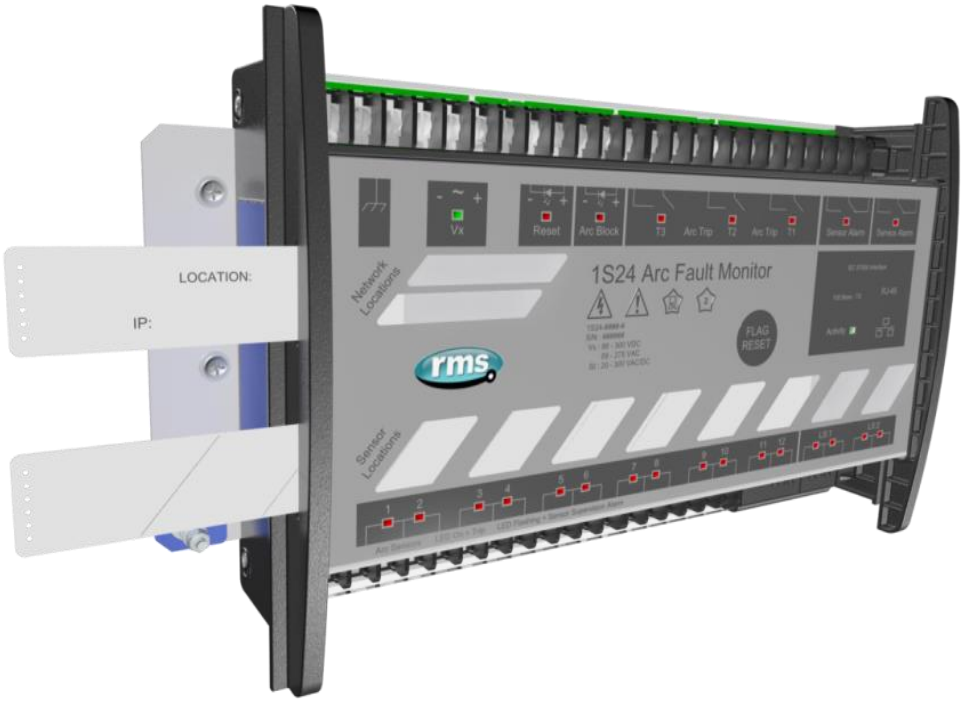
Custom Labels

The 1S24 front panel makes provision for two (2) custom labels, one label identifies the sensor location and the remaining label provides IED identification and IP address details.

The default labels supplied with the relay may be marked up by hand or alternatively custom labels may be produced using the template provided on the RMS website, printed and slipped behind the clear windows on the front panel as depicted below.



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Communications

Physical Connections

The 1S24 is ordered with either of the following Ethernet connection options:

Standard Single Port : RJ45 10Base-T / 100Base-TX

In the single port option the RJ45 port is utilised for connection to an IEC61850 station bus LAN for Goose messaging purposes and for device configuration.

Optional Two Port : RJ45 10Base-T / 100Base-TX and
Fibre 100Base-TX

The two port option allows one of the ports to connect to an IEC61850 station bus LAN for Goose messaging purposes and either port may be utilised for device configuration.

Fibre Port Details

Connectors :	Duplex LC connector
Fibre Type :	50/125 μm multimode fibre
Transmitter Type :	1310 nm laser based transmitter

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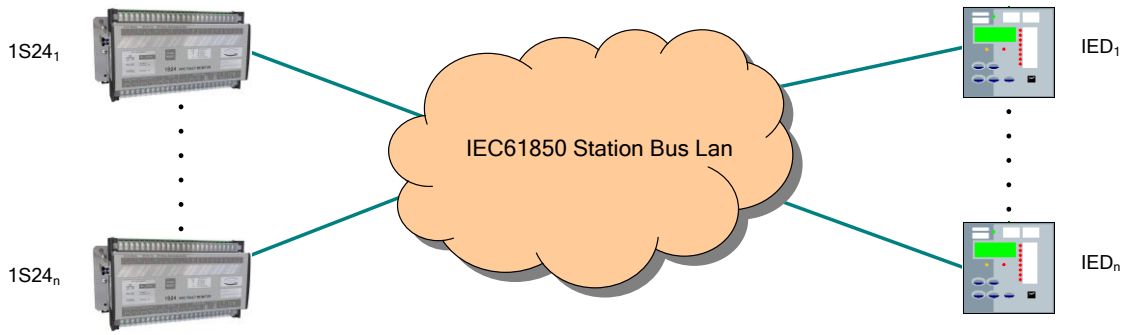
IEC61850 Communication Topologies

The 1S24 IED employs IEC61850 Goose messaging to convey the operation of ARC Fault Sensors and may be used with one or many subscribing IEDs to deploy ARC Fault protection schemes.

A 1S24 or many 1S24 Arc Fault Monitors may be connected to a Station Bus Lan as shown below:



The Station Bus Lan may be arranged using many different topologies, discussion of the various LAN topologies is beyond the scope of this user guide.

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IP Addressing

The 1S24 IED comes preconfigured from the factory with the IP address 192.168.0.220. The default IP address may be used in a web browser session to undertake relay configuration. Full details of relay configuration are described in subsequent sections of the user guide.

Reconfiguration of the 1S24 IP address may be required according to the IP addressing defined in your network or IEC61850 substation configuration, any subsequent web browser sessions will need to utilise the reconfigured IP address.

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1S24 Arc Fault Monitor Configuration

Web Browser Session

Configuration of a 1S24 can be undertaken either via direct connection to a PC or via a LAN.

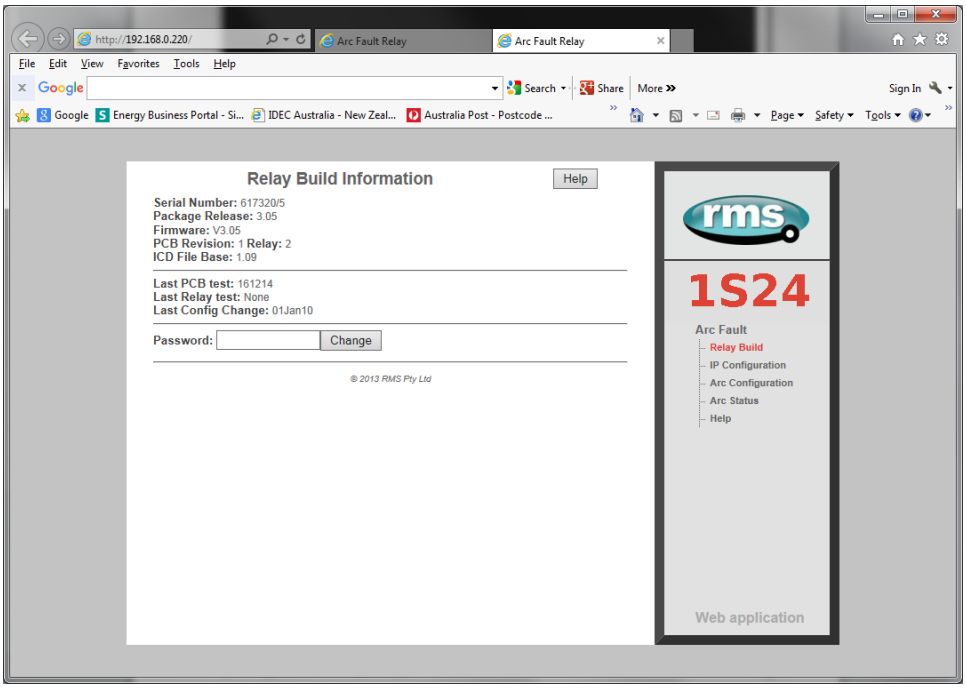
Direct connection to a PC or connection via a LAN is possible using a standard Ethernet patch lead.

Whether the communication is direct or via a LAN, both the PC and the 1S24 need to have IP addressing within the same network.

With a subnet mask of 255.255.255.0 the first 3 octets of the IP address need to be the same for the PC and the 1S24 and the last octet needs to be unique, for example:

1S24 IP Address: 192.168.0.220
PC IP Address: 192.168.0.238

In the above example entering the 1S24 IP Address (192.168.0.220) into the PC web browser address field will establish a web browser session displaying the Relay Build Information and a menu tree to navigate to the other configuration screens.



To make any changes you will be prompted for a User name and Password

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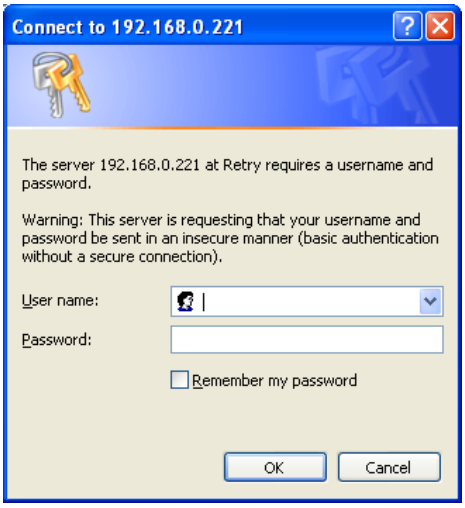

The factory default username and password is:

Username: admin
Password: RMS

The username and password need only be entered once for each web server session and allows for multiple setting changes with access automatically timing out after 2 minutes of inactivity.

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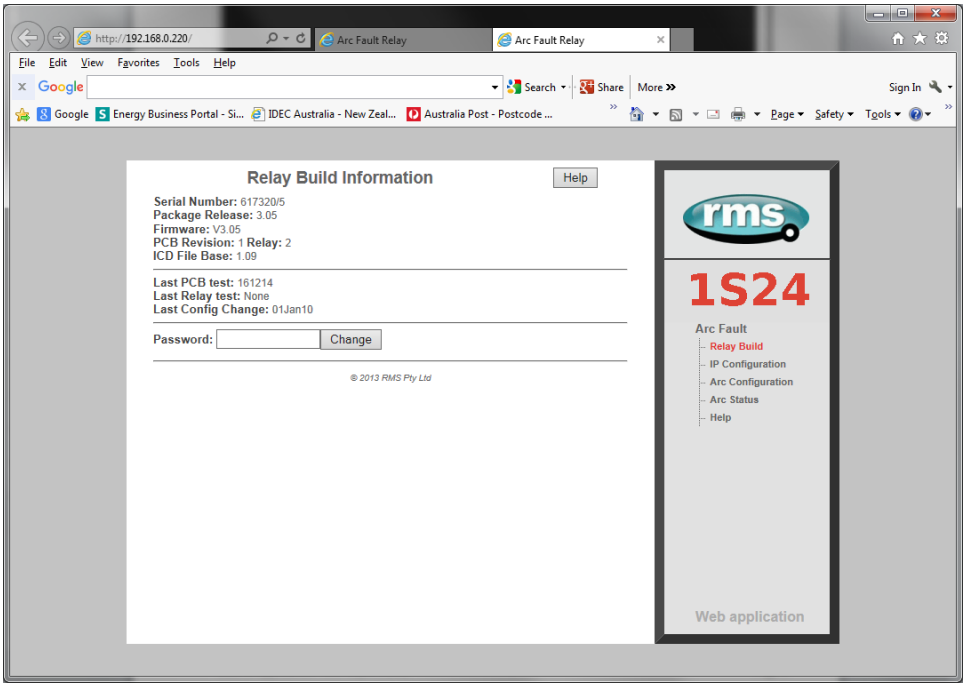
Relay Build

The Relay Build screen provides device details such as the of the Serial Number and Firmware version.

The Password may be changed at this point by entering your new password and pressing the Change button, enter the user name and previous password if prompted.



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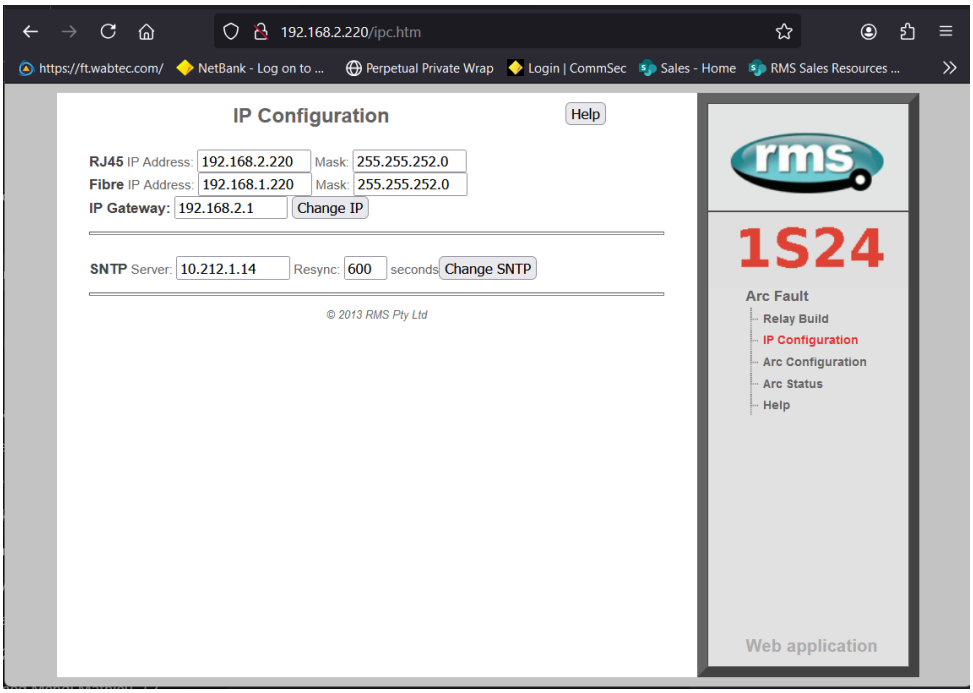
IP Configuration

The IP Configuration screen displays and allows editing of the IP address parameters for the RJ45 port, Fibre port, Gateway and the SNTP Server.



To change the IP address edit the IP address field and then click the Change button and enter the user name and password if prompted.

Note that the Fibre port must be on a different IP network to the RJ45 port.

The subnet mask will need to match that of the network being connected to.

For time stamping in accordance to the IEC61850 standard an SNTP server is required. The SNTP server IP address can be set in the IP Configuration screen but if left blank the 1S24 will attempt to find a default SNTP server if available.

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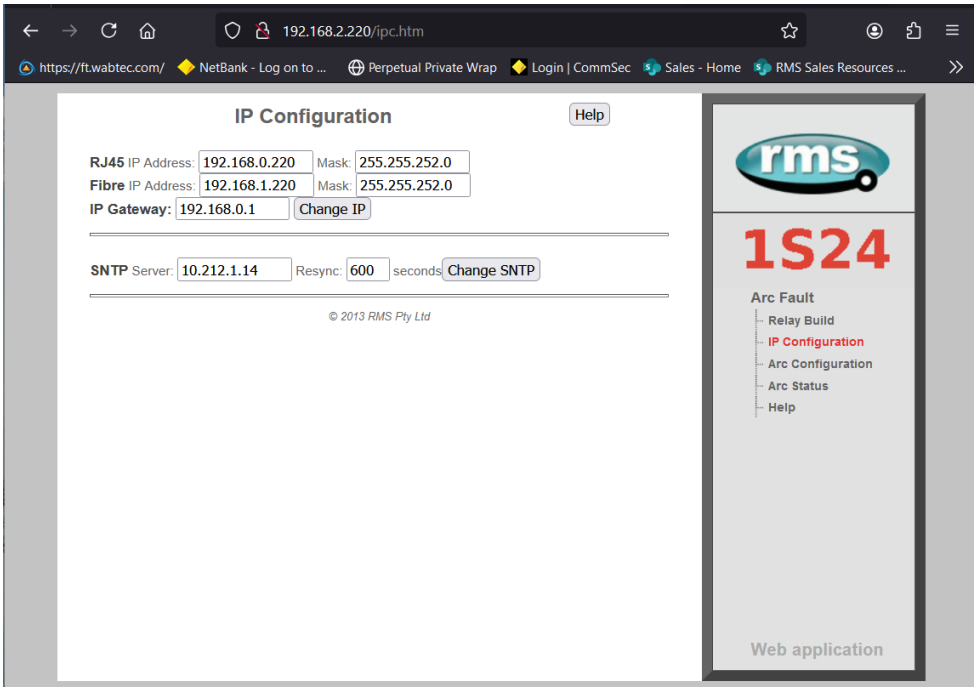
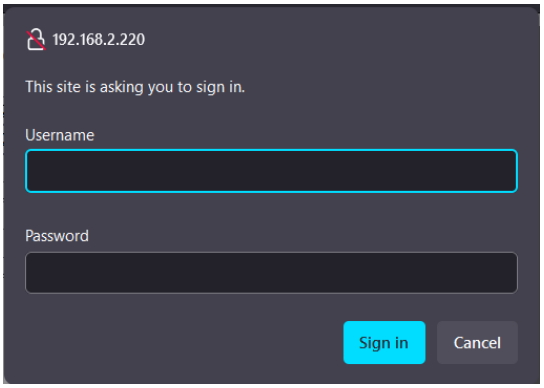
Let's say we want to change the IP address and IP gateway to 192.168.0.220 and 192.168.0.1 respectively:



Then press the Change IP button.

Enter the Username and Password if prompted:



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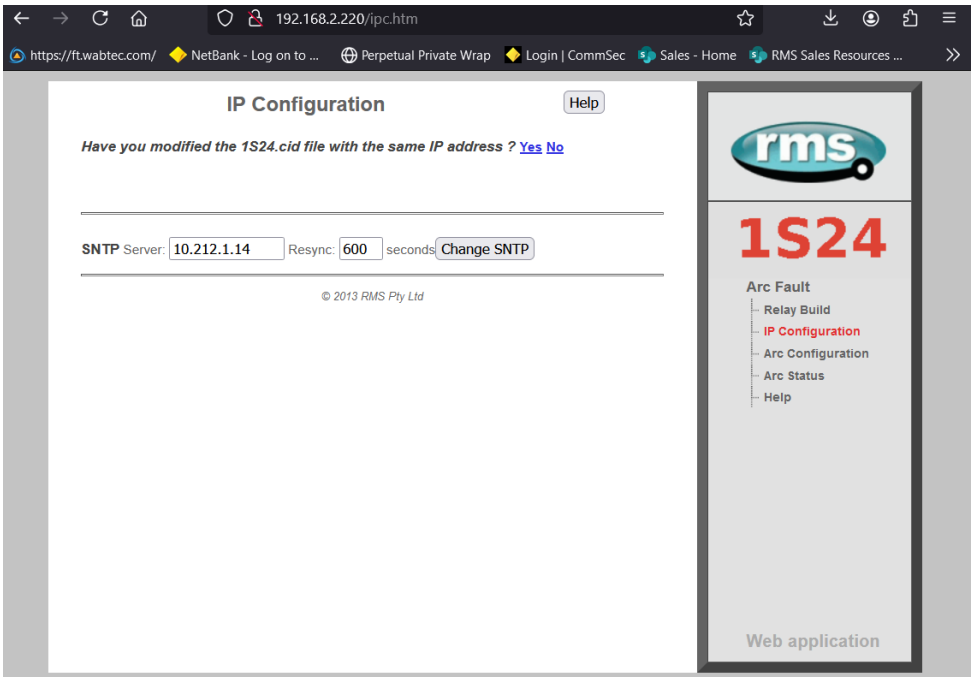
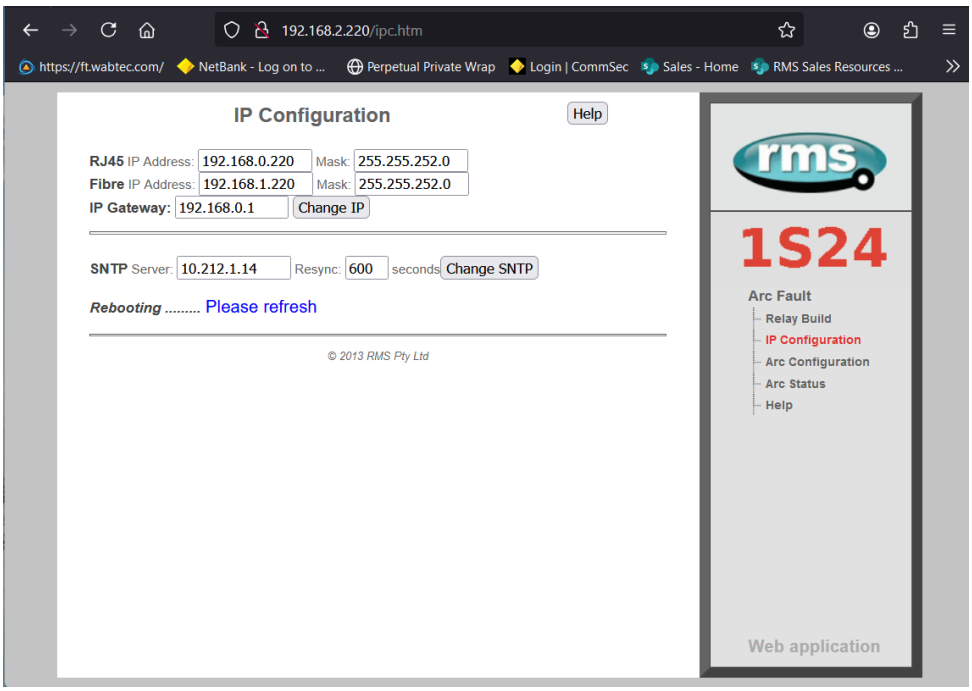
You will then get the following message:



Choose Yes and this will initiate a device reboot and you will get the following message:



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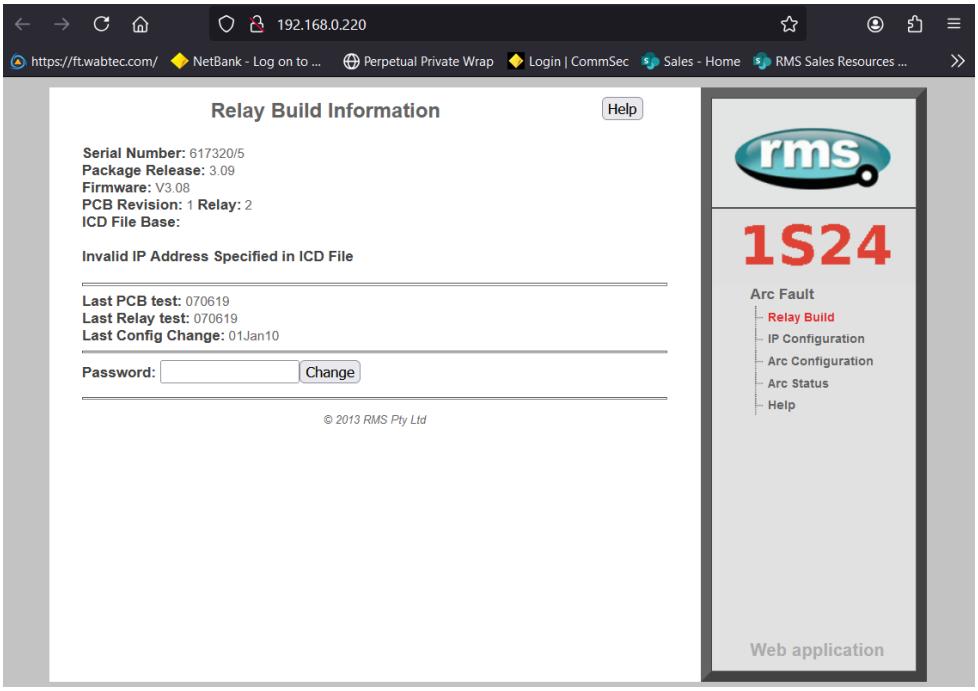
Once the reboot completes enter the changed IP address in your browser (you will need to make sure that your PC is also on the same network range as the changed IP address):



A warning message will appear on the Relay Build screen: “Invalid IP Address Specified in ICD File”

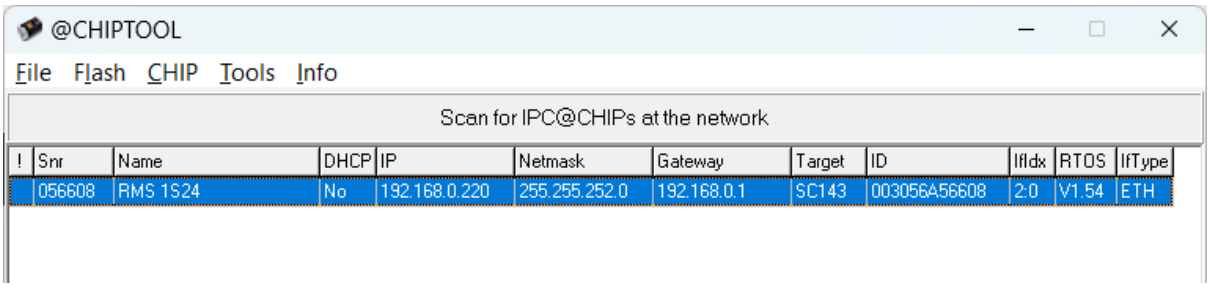
The last step is to change the address specified in the ICD file of the device.

To access the ICD file use @Chiptool.

@Chiptool may be downloaded using the following link:

https://hmsnetworks.blob.core.windows.net/nlw/docs/default-source/products/anybus/monitored/software/chiptool-install-v7-2-7-2.exe?sfvrsn=90a514b7_4&download=true

With @Chiptool you can view any 1S24 device on your network:



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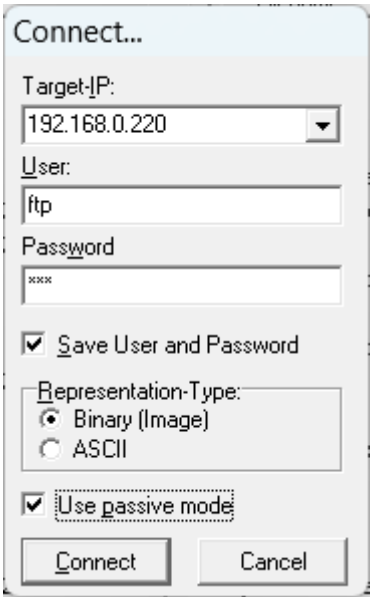
To access the device ICD file right click on the device in question in the @Chiptool application window and select FTP:

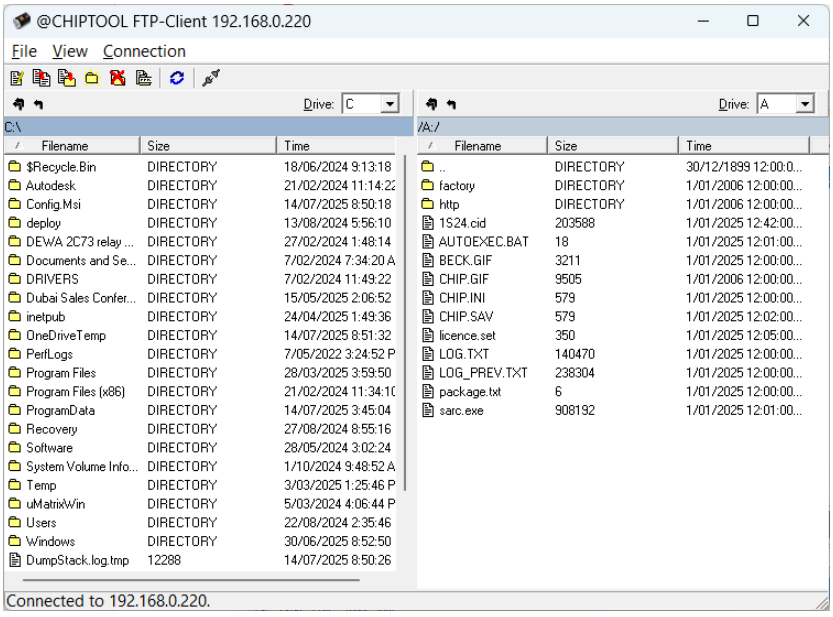


The User and Password are:

User: ftp
Password: ftp

Ensure the “Use passive mode” is selected.

In the right hand of the FTP session you will see the contents of the 1S24 device.



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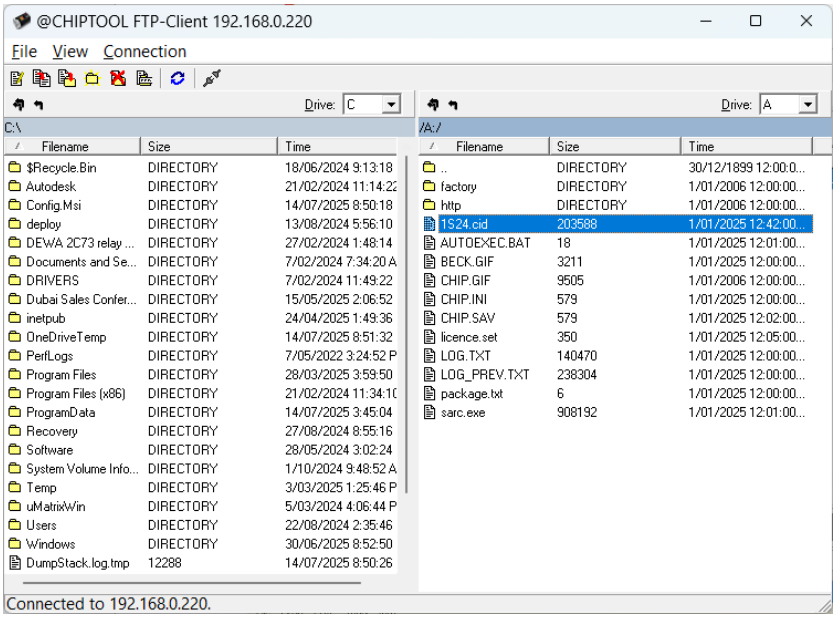
Look for the file 1S24.cid, right click on the file and choose Edit.



This will start a notebook session and allow you to edit the 1S24.cid file:

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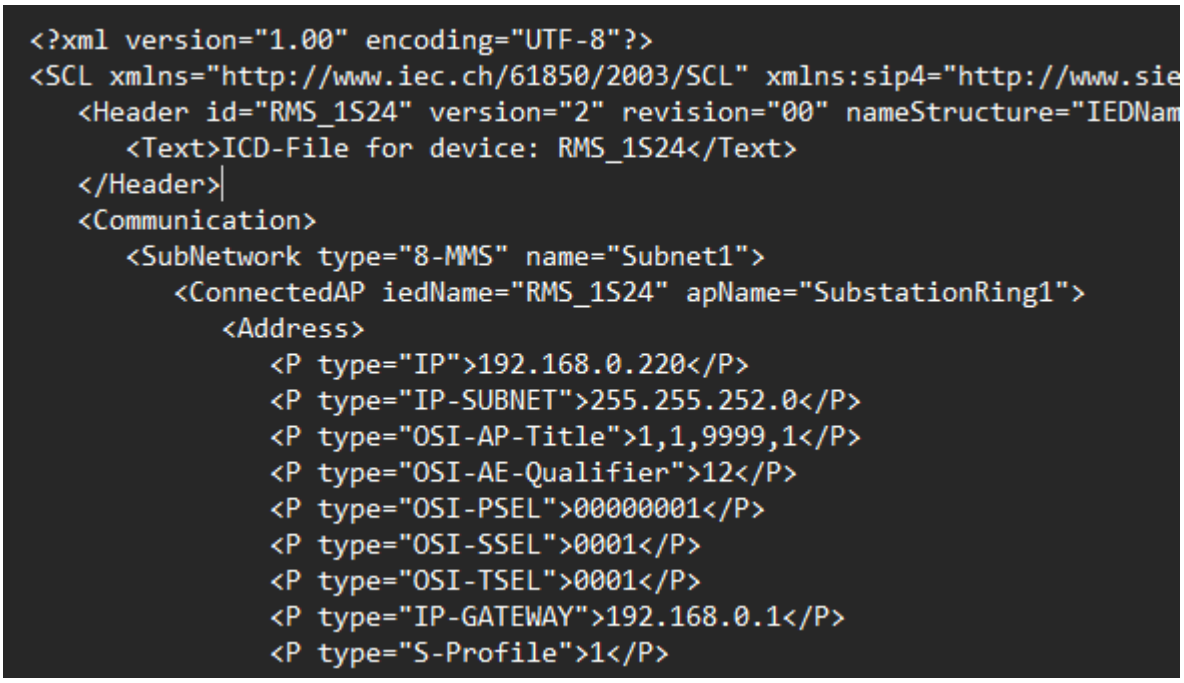
Edit the highlighted text:

The IP addresses need to match the changed device IP addresses:



The device will now need to be power cycled for the ICD file change to be recognised.

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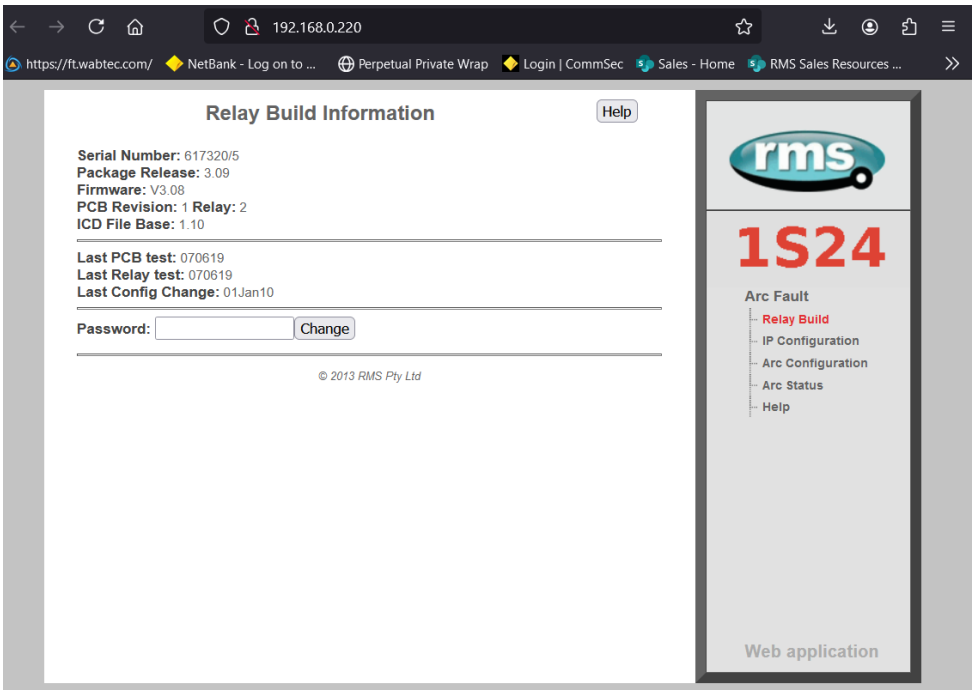
Once rebooted the warning message should no longer appear on the relay build screen:



The IP address change is now complete.

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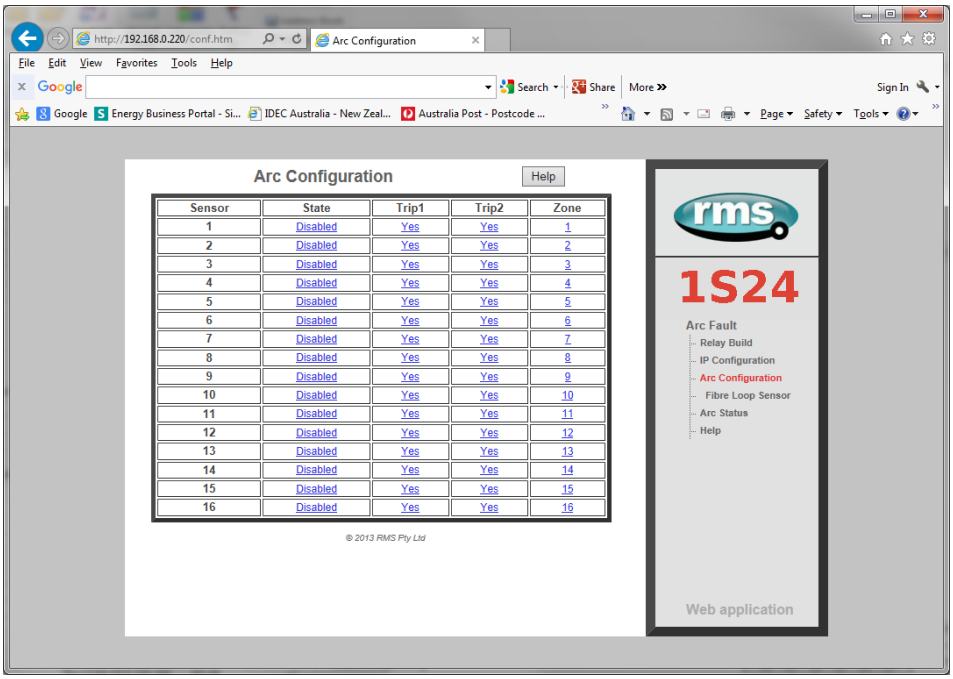
Arc Configuration

The Arc Configuration screen provides configuration settings for up to 16 Sensor inputs.



Each sensor input has 4 settable parameters:

State

Armed or disabled, defines if the Sensor input is enabled or disabled, click on the field to change the state and enter the user name and password if prompted.

Trip 1

Yes or No, determines if the Sensor input operates the Trip 1 output, click on the field to change the state and enter the user name and password if prompted.

Trip 2

Yes or No, determines if the Sensor input operates the Trip 2 output, click on the field to change the state and enter the user name and password if prompted.

Zone

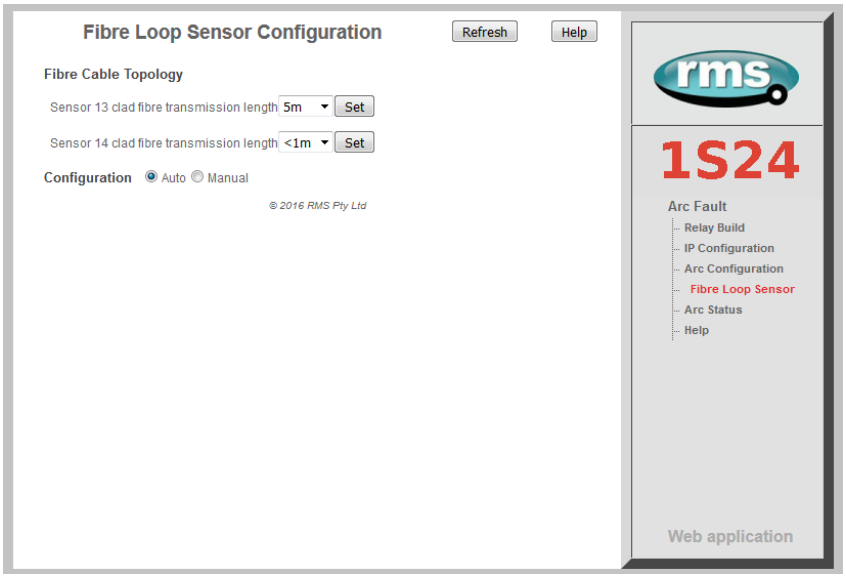
The Zone Setting provides a means of improving Goose response time for simultaneous trips in a single Arc Fault tripping zone. The Zone setting ensures that a Goose is immediately broadcast without having to wait for the updating of all arc detectors in the same corresponding zone. Allowable Zone values are from 1 to 16. Set the Zone value the same for sensors located in the same zone. Click on the field to alter the Zone value.

Linear Sensor Configuration

1S24 relays fitted with Linear Sensor inputs provide 12 point sensor inputs and 2 Linear Sensor inputs denoted 13 and 14.

For Linear Sensor inputs that have a Linear Sensor connected there is a need to configure the Fibre Cable Topology to ensure correct arc detection and supervision.

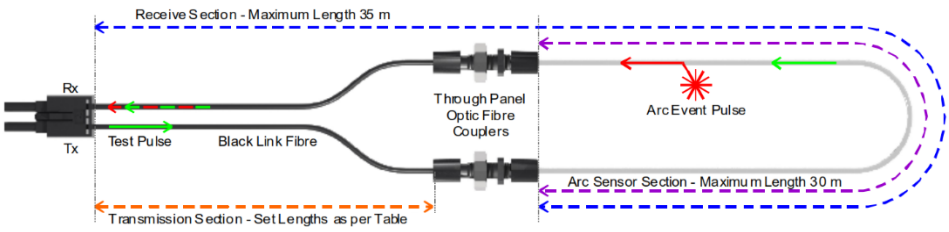
The screen shot below shows the Fibre Loop Sensor Configuration screen:

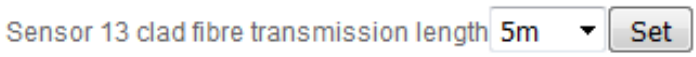


Set the configuration to “Auto”.

For each of the Linear sensors inputs select the transmission section length in the drop down field in accordance with the following fixed lengths:

Transmission Section Length	Setting
0 metres	<1
1 metres	1m
5 metres	5m
10 metres	10m
20 metres	20m
30 metres	30m
40 metres	40m





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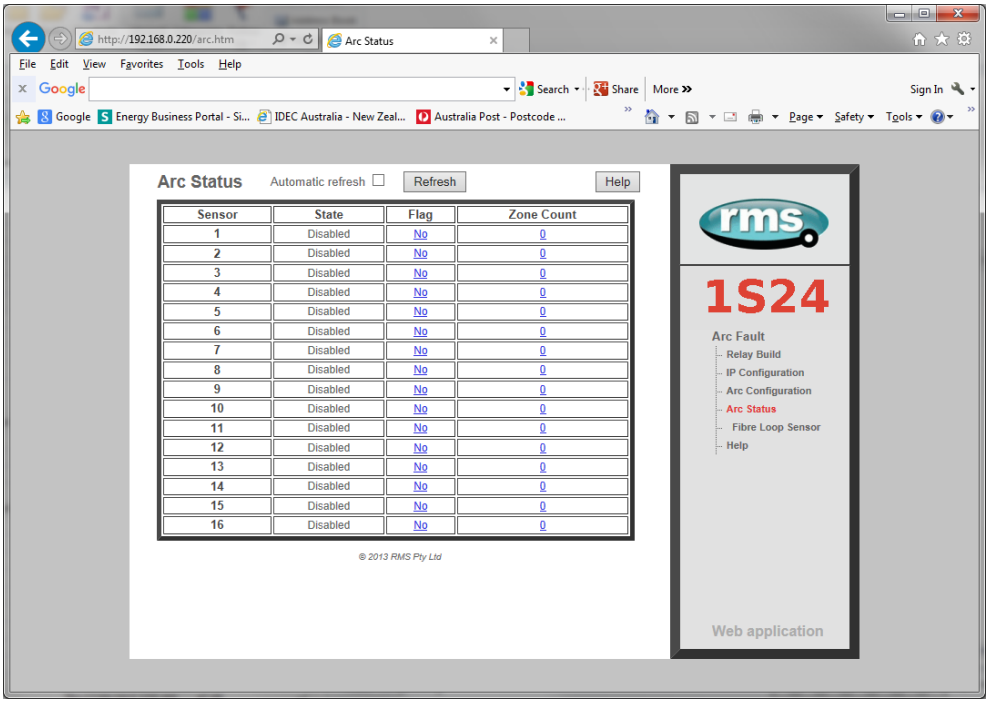
Arc Status

The Arc Status screen provides status information on up to 16 sensors inputs.



State

The State column determines the state of each sensor input.

The following states are reported:

Disabled	ARC Sensor is disabled
Armed	ARC Sensor is armed
Tripped	ARC detected (changes for the period of the trip)
Failed	ARC sensor supervision failure
Initializing	ARC sensor initializing (transitory)
Stuck	ARC sensor stuck on

Flag

The Flag column will indicate and latch for an Arc Sensor operation, individual Flags may be reset by clicking on the sensor flag status and entering the user name and password if prompted.

Count

The Count field provides a log of ARC sensor operations since power on or the last counter reset, the individual sensor counters may be reset to 0 by clicking on the count field and entering the user name and password if prompted.

Summary of 1S24 Configuration

The following steps outline the 1S24 SARC Configuration:

- ✓ Establish a Web Browser session using the default IP address
- ✓ Set up the IP addressing for the SNTP server
- ✓ Arm the ARC Sensor inputs to be utilised in the application
- ✓ Set which outputs are to be operated by the respective ARC sensors

For installations not utilising IEC61850 Goose messaging that completes the configuration process.

For installations utilising IEC61850 follow the IEC61850 Substation Configuration process in the following sections.

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IEC61850 Substation Configuration

The following example will demonstrate the process of implementing an ARC Fault Protection scheme using IEC61850 Goose messaging in conjunction with other IEC61850 equipped IEDs.

The example will comprise of a 1S24 Arc Fault Monitor used in conjunction with subscribing Reyrolle 7SR22 Argus relays with IEC61850 communications and implemented with the Reydisp Manager productivity tool embedded with the optional Digsi System configurator.

A similar process is equally applicable to IEC61850 equipped IEDs from alternative vendors and alternative System Configuration tools.

The steps to implement our Application Example are:

- ✓ Create an IEC61850 project in a System configurator
- ✓ Populate the project with the Application IEDs
- ✓ Populate the project with the 1S24 IEDs using the default 1S24 icd file
- ✓ Populate the project with the IEC61850 Substation
- ✓ Using the System Configurator configure the desired IP addressing of the subnet containing all of the application IEDs
- ✓ With the System Configurator create the GOOSE applications with the associated GOOSE linkages between the source IED logical nodes (in the case of the 1S24 : SARCs) and the subscribing IED (in our example we use GGIO)
- ✓ With all GOOSE mapping complete create a .cid file for the 1S24 using the export facility in the System Configurator
- ✓ FTP the 1S24 .cid file into the 1S24
- ✓ Reboot the 1S24 to invoke the GOOSE mapping
- ✓ Create the subscribing relay application logic that will make use of the status changes to the subscribed GOOSE messages from the 1S24
- ✓ Send the relay configurations as well as IEC 61850 configurations to the respective subscribing IEDs in the application

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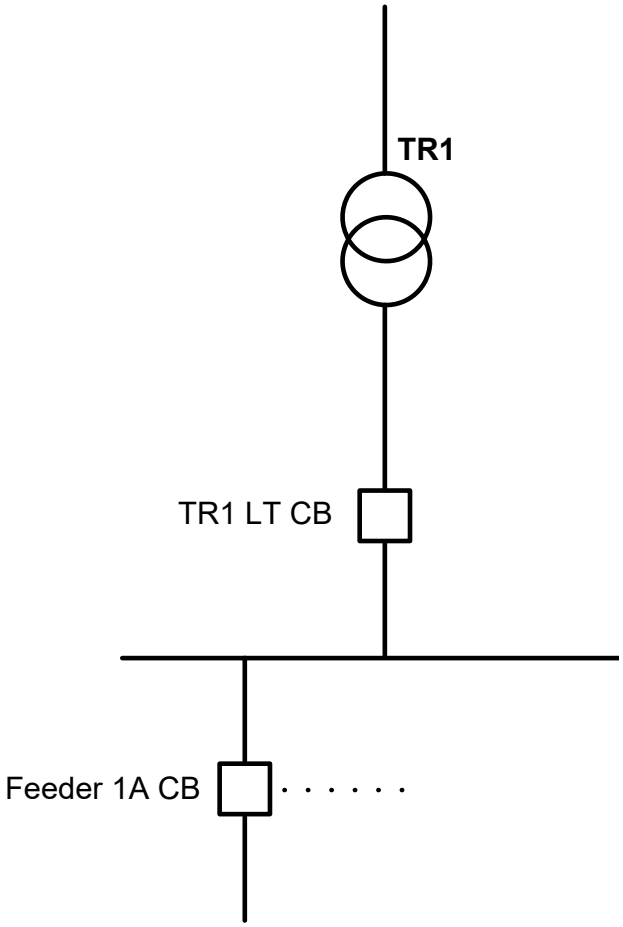
Arc Fault Scheme

The single line schematic arrangement of the application example is shown in the diagram below:



Arc Fault coverage is to be provided to the bus, circuit breaker chambers and cable termination chambers and shall be current checked with an overcurrent relay. Tripping shall be zoned to provide sectionalising and minimise affected plant.

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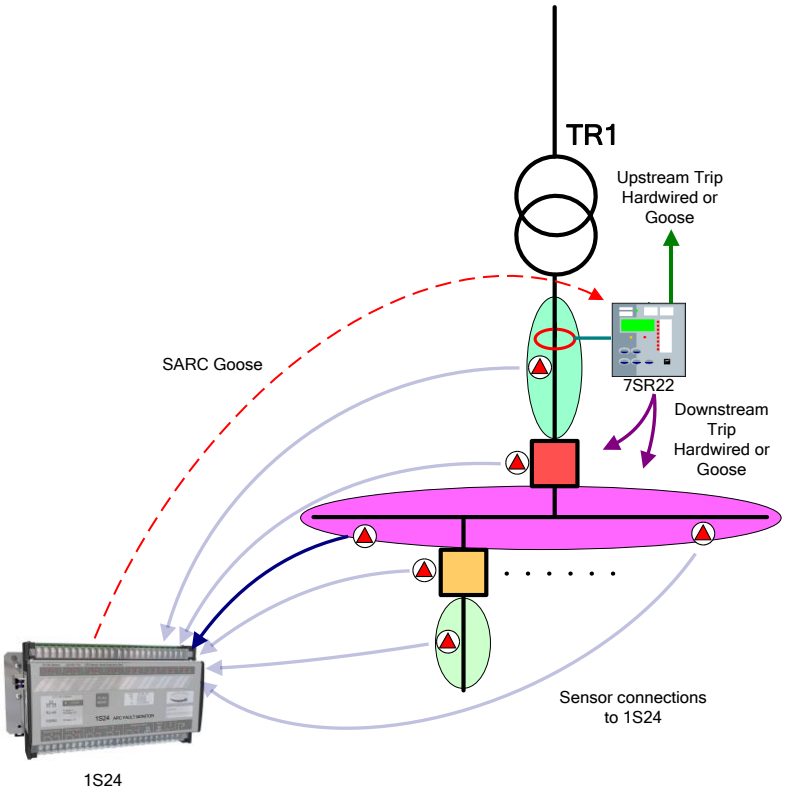
The proposed scheme is as follows:



The scheme comprises of 1S30 sensors connected to a 1S24 Arc Fault Monitor, providing ARC Fault coverage of the coloured protection zones.

The 1S24 provides the SARC Logical Node for the operation of Arc Fault Sensors.

The 7SR22 Overcurrent relay subscribes to SARC Goose messages and initiates the required protection tripping via an Overcurrent Check.

Tripping in this case will be carried out by hardwiring to respective circuit breakers and using binary outputs from the 7SR22 IED but could also be implemented via Goose by another subscribing IED.

Flexible tripping logic may be implemented in the 7SR22 according to specific application requirements and may also accommodate different operating arrangements in more complex applications.

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1S24 SARC Allocation

In the proposed scheme we have 6 Arc Fault Sensors installed providing coverage for 5 distinct protection zones. The individual SARCs are allocated as follows:

Zone Coverage	Colour	Number of Sensors	SARC Allocation
Feeder Exit Termination Chamber		1	SARC 1
Feeder CB Chamber		1	SARC 2
Bus		2	SARC 3 SARC 4
Incomer CB Chamber		1	SARC 5
Incomer Termination Chamber		1	SARC 6

Protection Zone Tripping

The required circuit breaker tripping is defined by the following tripping table:

SARC Operation	Zone Coverage	Colour	Trip
SARC 1	Feeder Exit Termination Chamber		1A CB
SARC 2	Feeder CB Chamber		TR1 LT CB
SARC 3 or SARC 4	Bus		TR1 LT CB
SARC 5	Incomer CB Chamber		Upstream
SARC 6	Incomer Termination Chamber		Upstream

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1S24 Source Arc Fault Detector Points

The 1S24 will broadcast the following Arc Fault Detector Points to subscribing IEDs:

Source ARC Fault IED Goose ARC Fault Detector points		
Function	SARC	Description
SARC1	RMS_1S24/DEV_1S24/RMS_SARC1/FADET	1S24 Arc Fault Detector 1
SARC2	RMS_1S24/DEV_1S24/RMS_SARC2/FADET	1S24 Arc Fault Detector 2
SARC3	RMS_1S24/DEV_1S24/RMS_SARC3/FADET	1S24 Arc Fault Detector 3
SARC4	RMS_1S24/DEV_1S24/RMS_SARC4/FADET	1S24 Arc Fault Detector 4
SARC5	RMS_1S24/DEV_1S24/RMS_SARC5/FADET	1S24 Arc Fault Detector 5
SARC6	RMS_1S24/DEV_1S24/RMS_SARC6/FADET	1S24 Arc Fault Detector 6

7SR22 Single Point Input GGIO Allocation

The 7SR22 relay will subscribe to SARC Goose messages broadcast by the 1S24 IED and shall assign subscribed SARCs to Single Point Input GGIO as follows:

Destination 7SR22 Relay Goose Single Point Inputs **ARC Fault Detectors**		
Function	Single Point Input	Description
SARC1	CBn/CTRL/SPi64GGIO1/SPCSO1	CBn Single Point Input 1 Data
SARC2	CBn/CTRL/SPi64GGIO1/SPCSO2	CBn Single Point Input 2 Data
SARC3	CBn/CTRL/SPi64GGIO1/SPCSO3	CBn Single Point Input 3 Data
SARC4	CBn/CTRL/SPi64GGIO1/SPCSO4	CBn Single Point Input 4 Data
SARC5	CBn/CTRL/SPi64GGIO1/SPCSO5	CBn Single Point Input 5 Data
SARC6	CBn/CTRL/SPi64GGIO1/SPCSO6	CBn Single Point Input 6 Data

Creating an IEC61850 Project

To create and configure an IEC61850 project requires an IEC61850 system configurator.

In our example Reydisp Manager with the optional embedded Digsi system configurator will be used to establish the Goose message linkages between the 1S24 and the 7SR22 Overcurrent relay.

Reydisp Manager is used as the productivity tool to manage the IEC61850 configuration process for Reyrolle relays and may also be utilised to create any required logic in Reyrolle devices.

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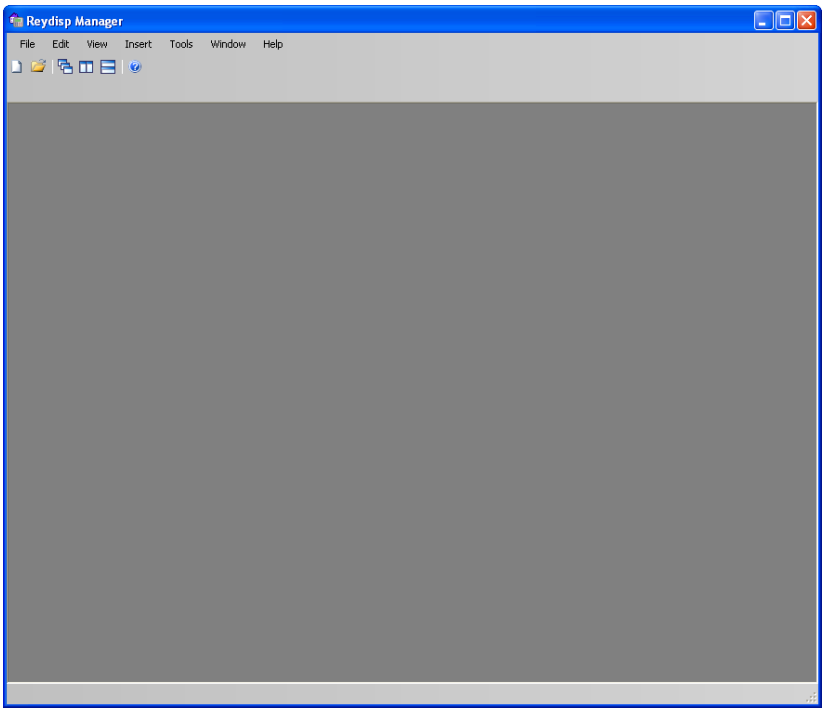
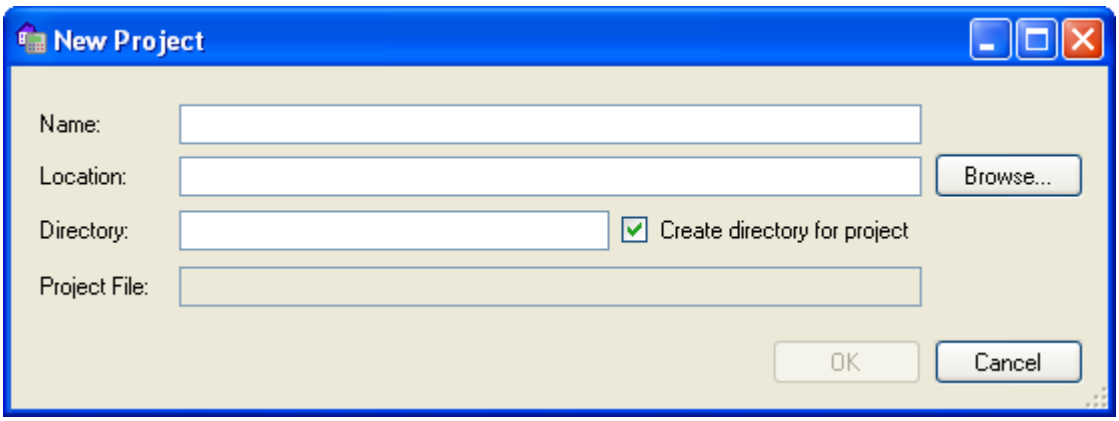
A screenshot of Reydisp Manager is shown below:



To create a new project choose File and New.



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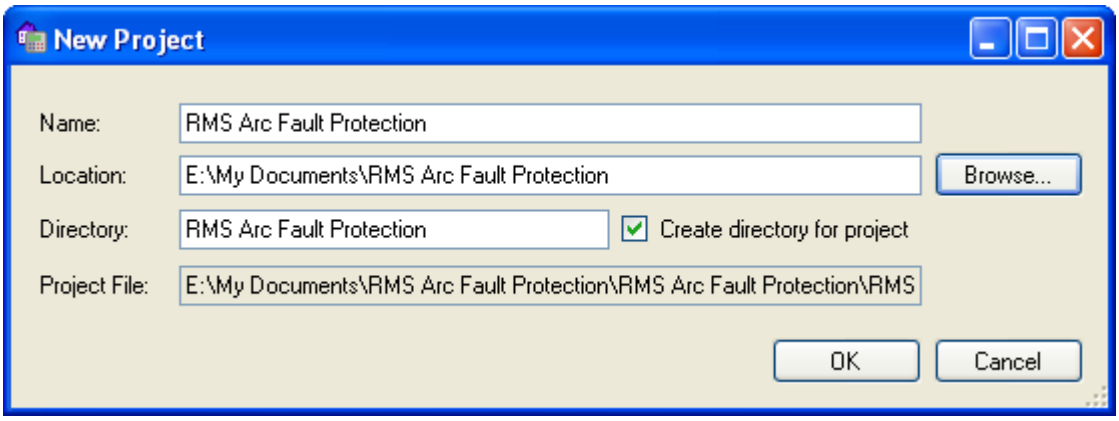
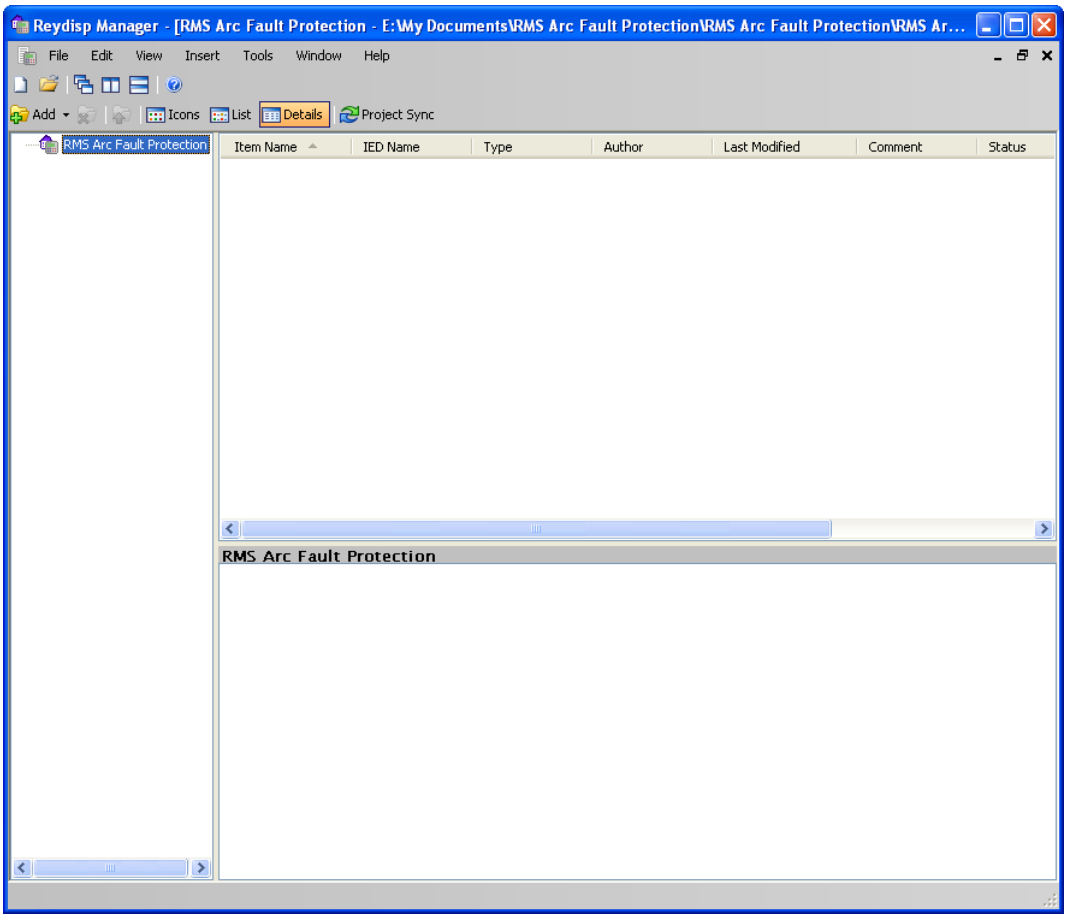
Fill in the details including where you want the project file to be stored and hit OK.



The new project has been created.



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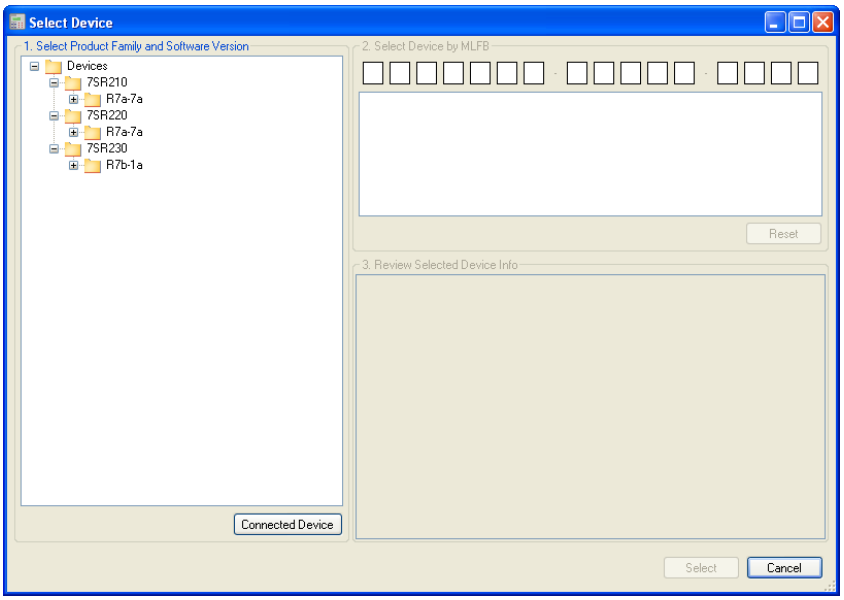
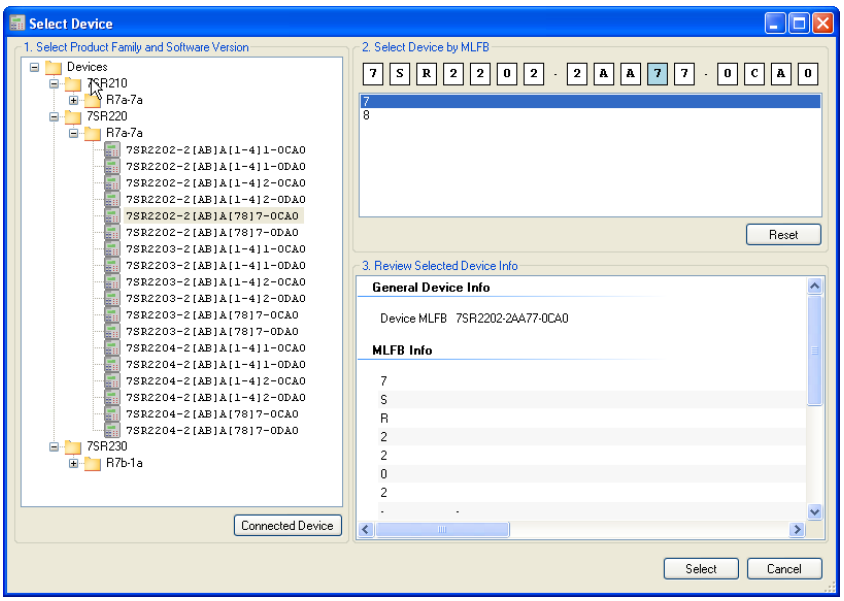
Populating IEDs In the IEC 61850 Project

We now need to populate the project with our IEDs, firstly the Reyrolle 7SR22. Choose Insert and Device and you will be presented with the following screen.



Select the required relay, for this example we will choose a 7SR2202-2AA77-0CA0 ensure that the MLFB code is correctly filled.



Once the MLFB codes is correctly filled you can then select the device.

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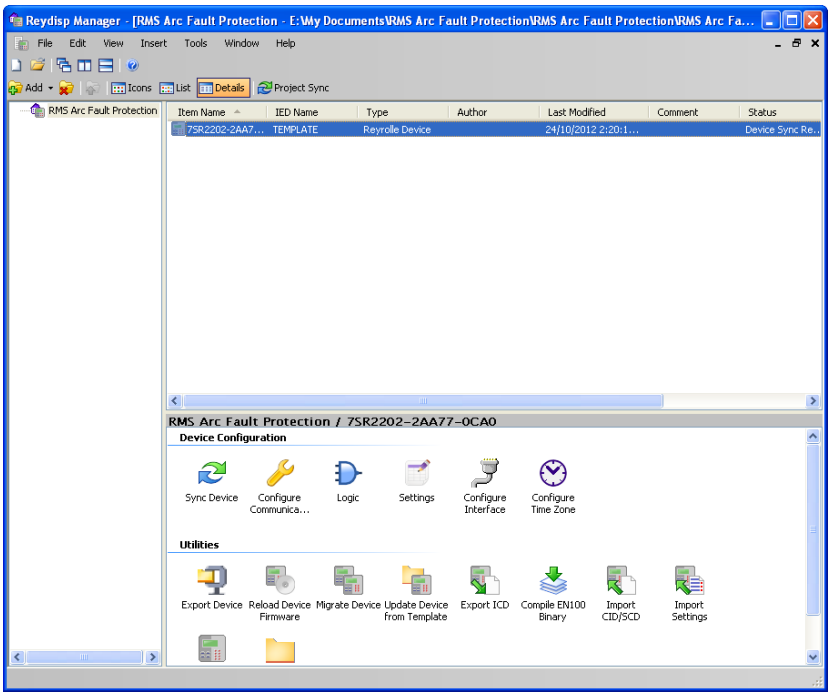
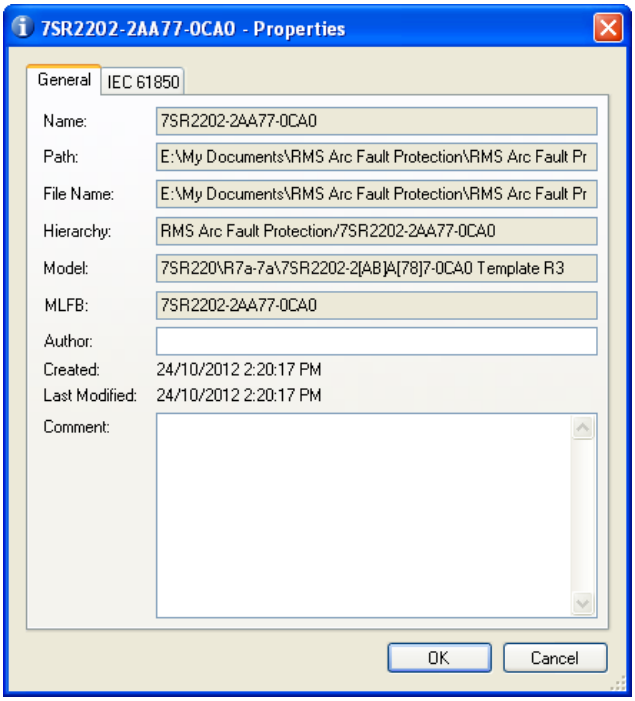
The 7SR22 IED has been added to your project.



Continue adding Reyrolle IEDs as required using the same process.

Nominate a meaningful IED name for each IED by right clicking on the IED and choosing properties.



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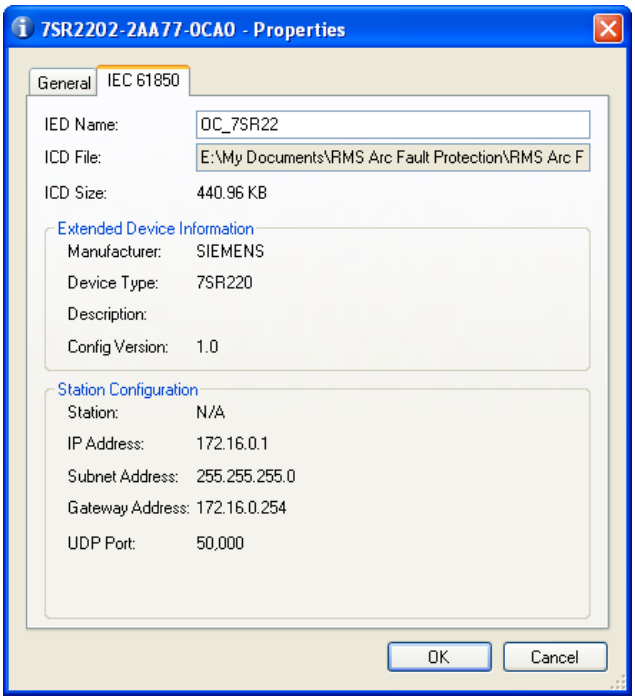
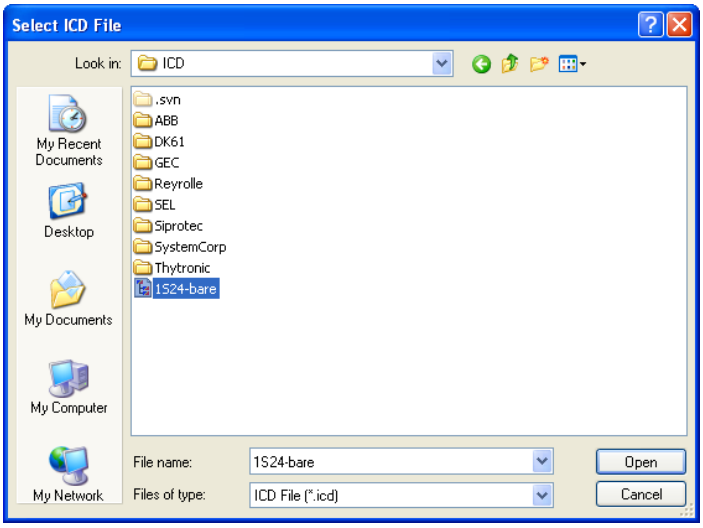
Choose the IEC 61850 tab and enter a name in the IED Name field.



Next we will add the RMS 1S24 IED which is added as a Third Party ICD File. You will need to have the 1S24 ICD file which is available through RMS.

Choose Insert and Third Party ICD File and you will be presented with the following file selection, choose the ICD file that has been supplied by RMS.



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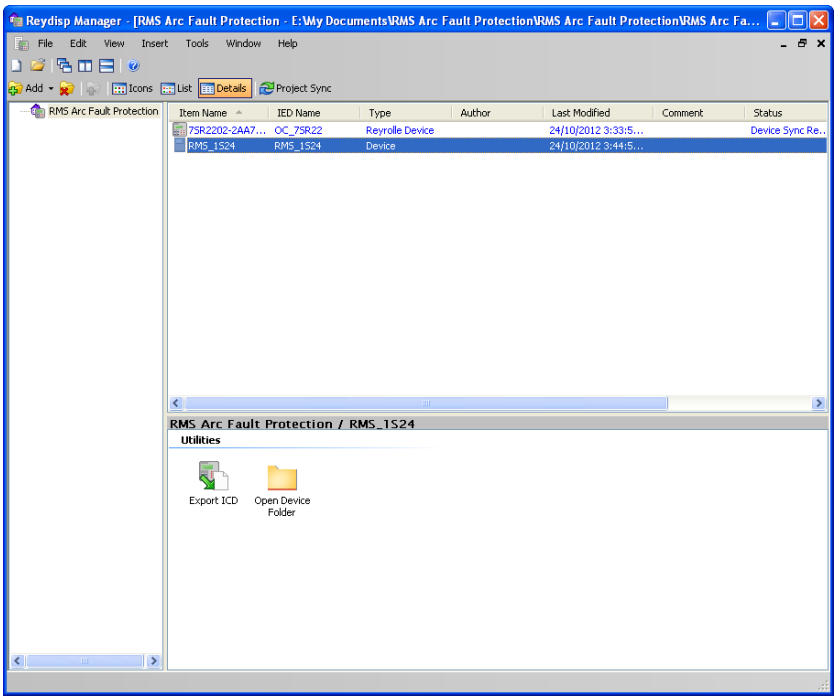
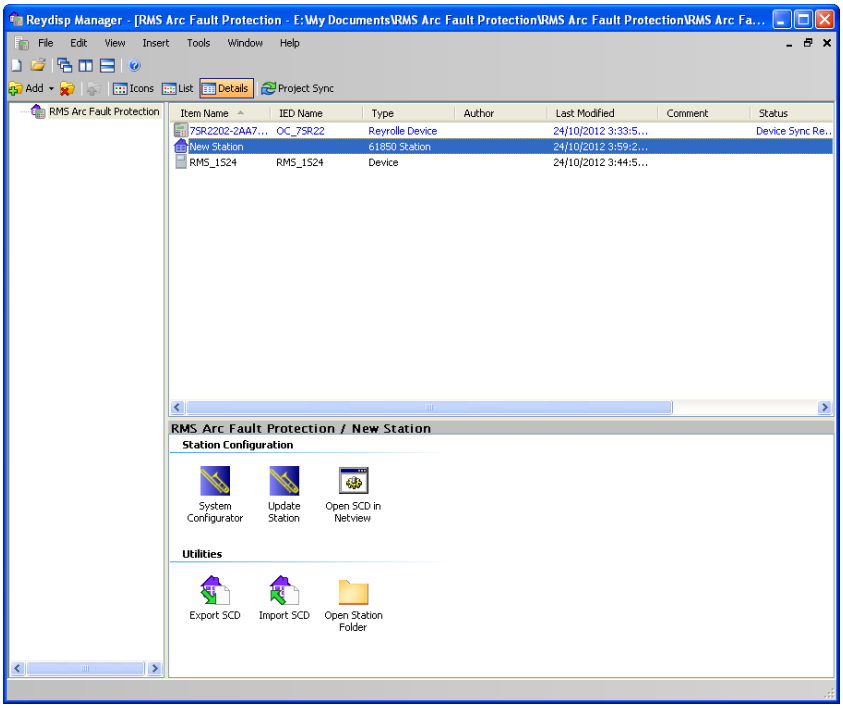
Due to RMS continuous product improvement policy this information is subject to change without notice.

The 1S24 IED has now been added to your project.



You can nominate a meaningful IED name for the 1S24 IED by right clicking on the IED and choosing properties.

Now we will add an IEC61850 Station, choose Insert and Station.



We can give the Station a meaningful name by editing the Item Name. We then nominate the Station Devices to be included in the Station by right clicking on the Station and choosing properties.

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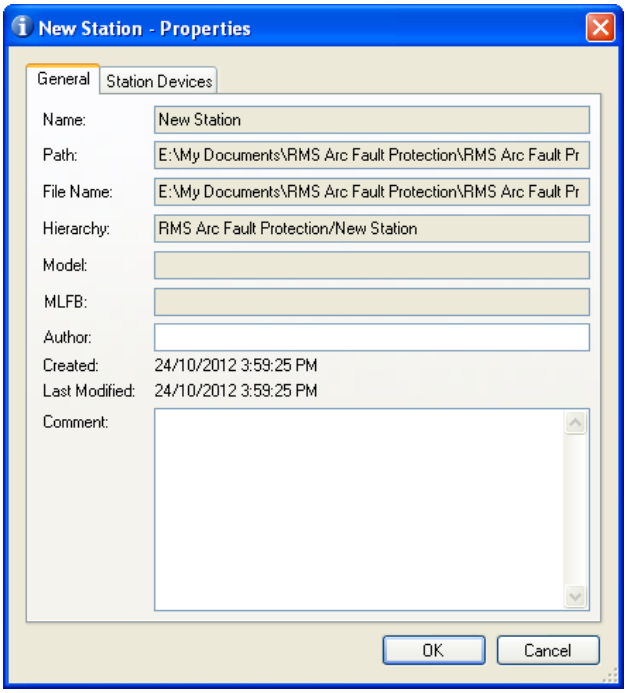
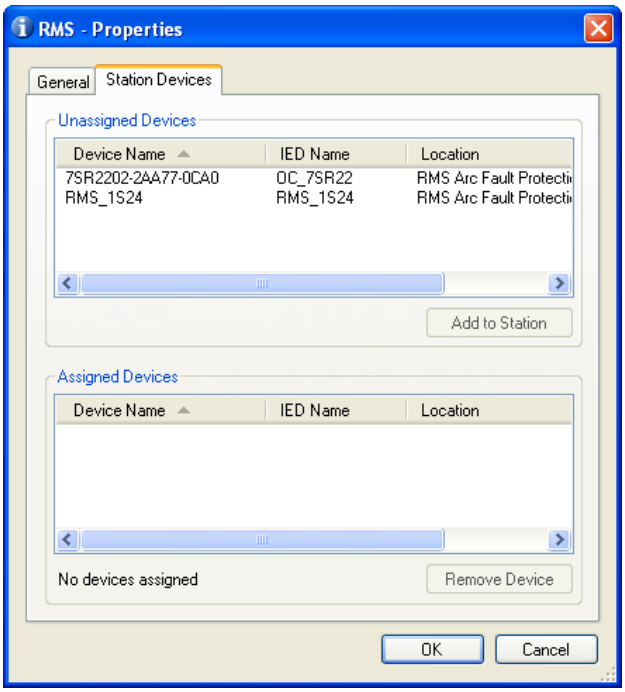


Select Station Devices and you will see a selection of available unassigned IEDs



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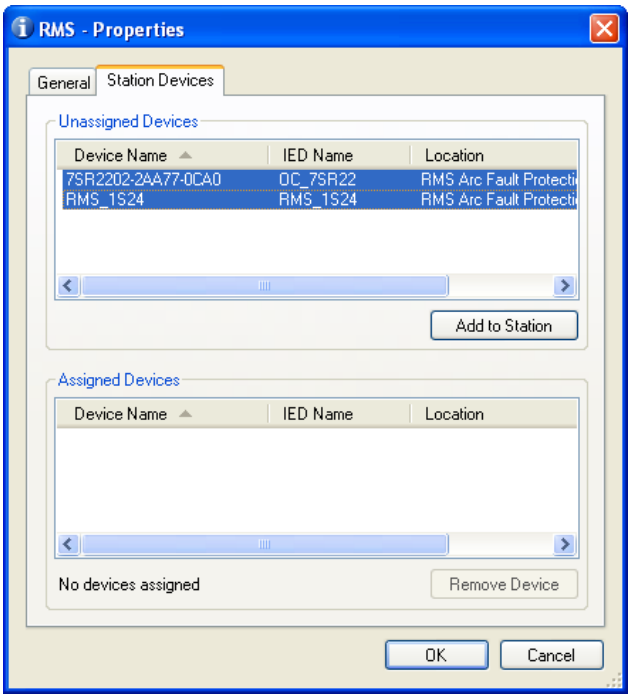
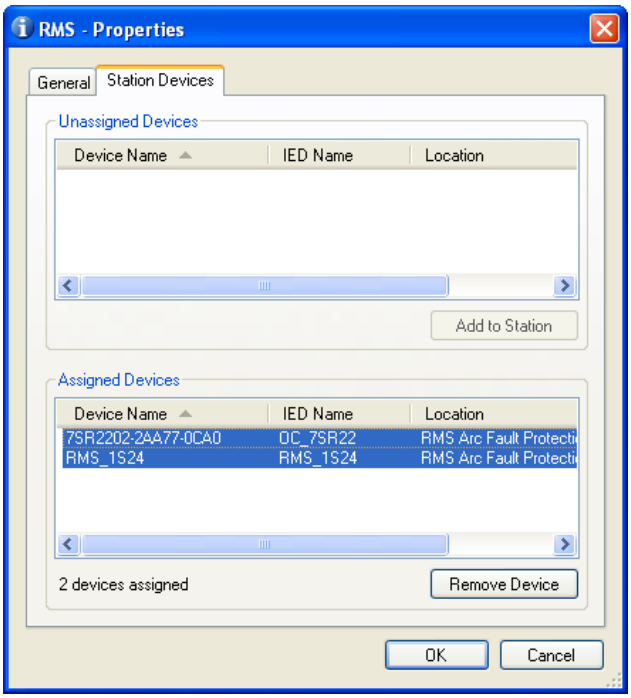
Select the IEDs



Press Add to Station.



Press OK to Assign the Devices to the Station.

System Configuration – Network View

We now need to configure the IP Addressing for our Station LAN and the Goose Linkages for our Goose messages.

Visit *www.morssmitt.com/rms* for the latest product information.
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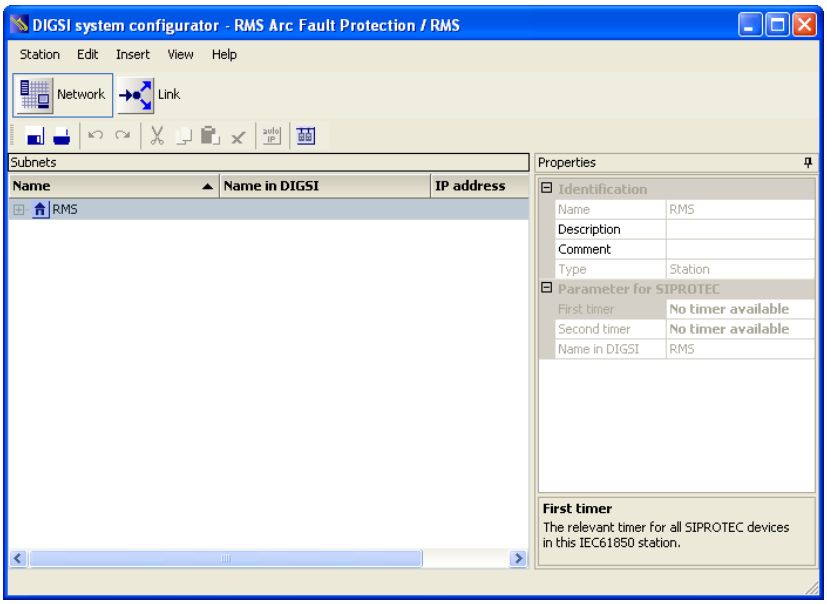
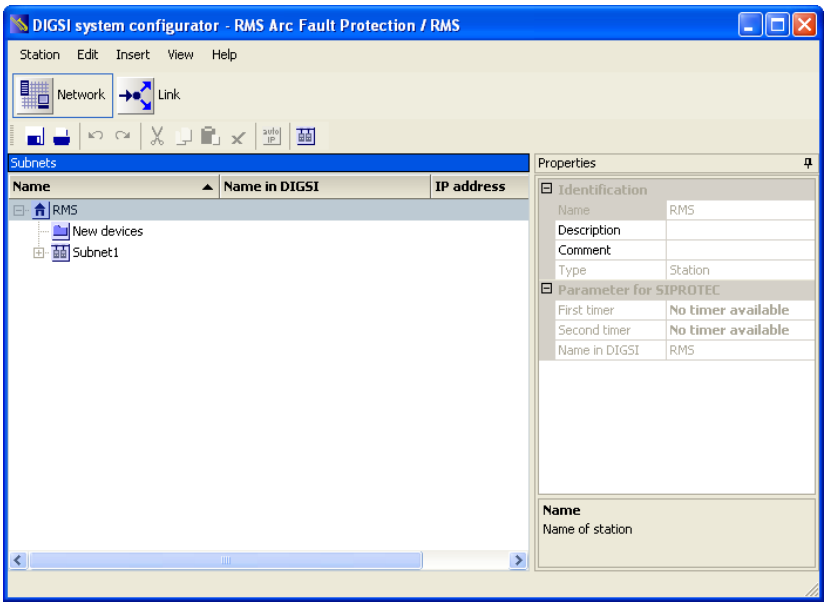
With the Station highlighted Double Click the System Configurator Button, this will start the Digsi System Configurator in the Network view.



Expanding the RMS Station will present the Subnets associated with the Station.



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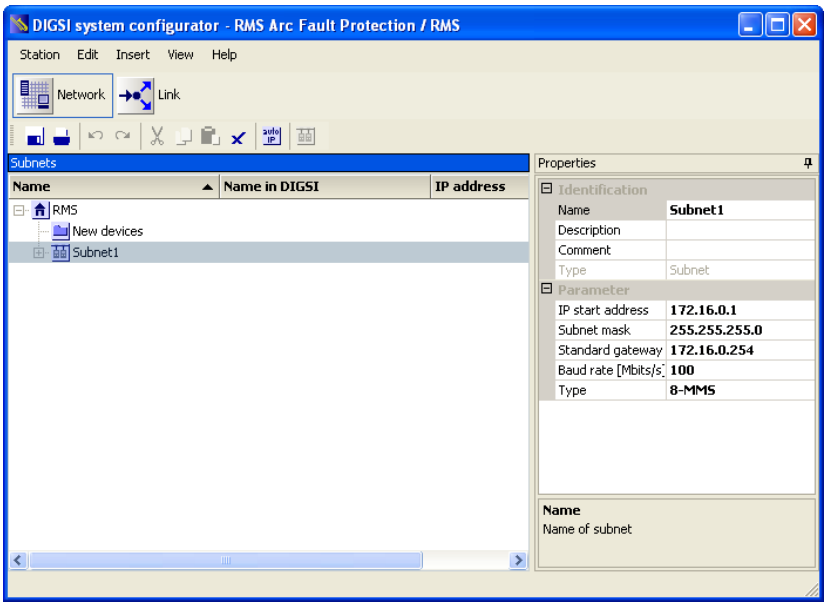
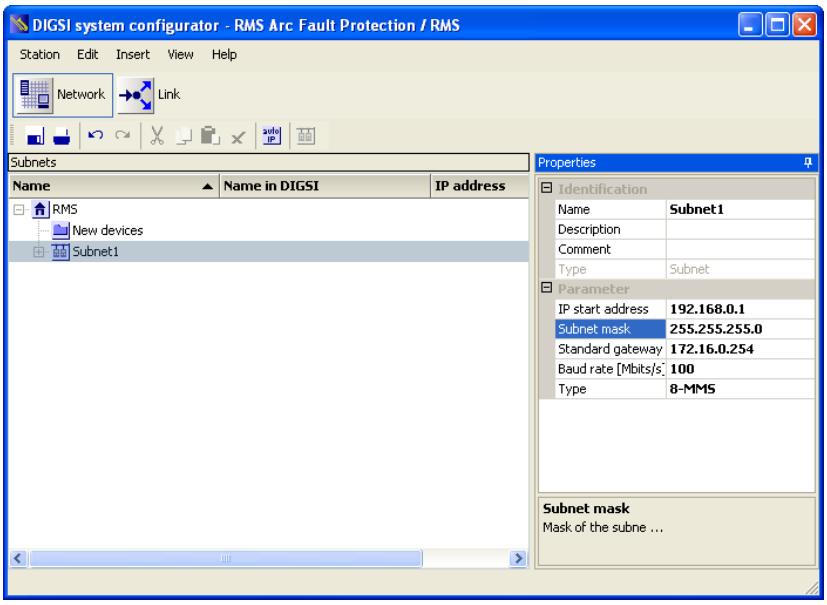
Due to RMS continuous product improvement policy this information is subject to change without notice.

Clicking on the Subnet will reveal the IP Start address, Subnet mask and standard gateway settings.

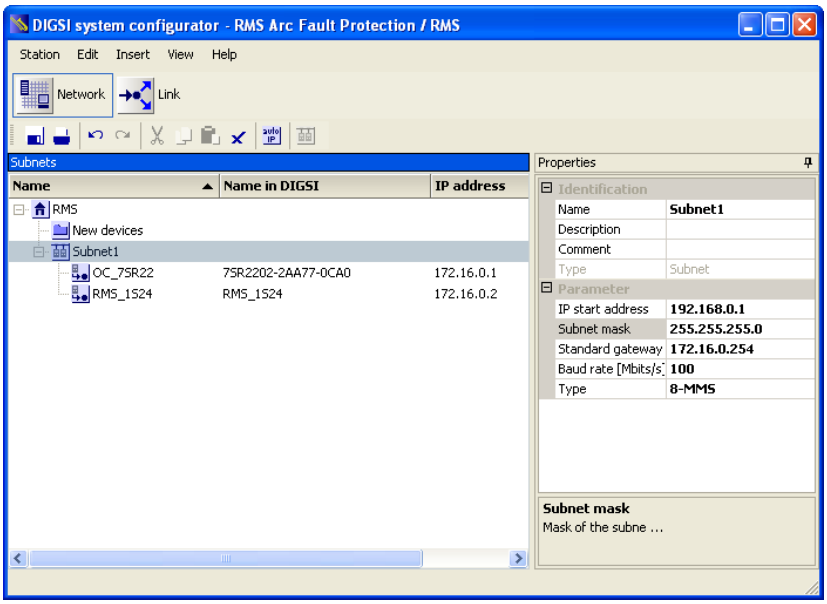


We can set the IP start address for our network for convenience, in this case 192.168.0.1. The Standard Gateway may also be set at this point if one exists.

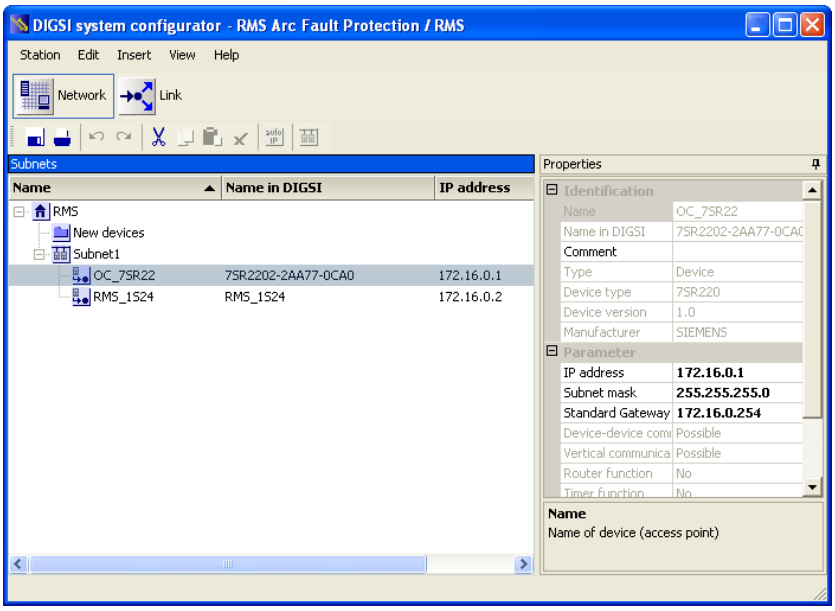


Visit *www.morssmitt.com/rms* for the latest product information.
Due to RMS continuous product improvement policy this information is subject to change without notice.

Expanding Subnet1 will reveal the IEDs that we previously assigned to the Station.



The individual devices may be selected to set their IP addresses.



Alternatively at the Subnet level the IP addressing may be automatically allocated starting at the IP start address previously set for the Subnet by pressing the auto IP button.

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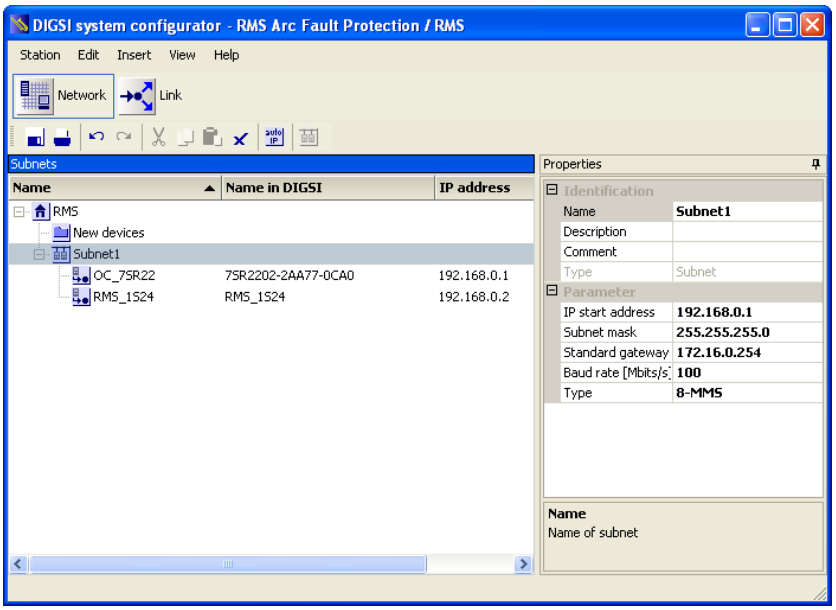
Due to RMS continuous product improvement policy this information is subject to change without notice.

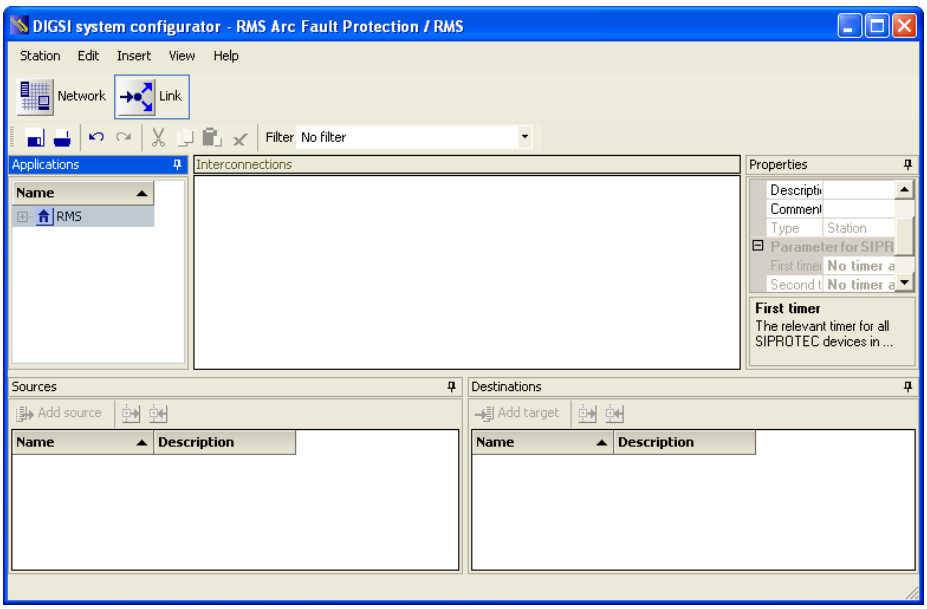
We'll choose to auto allocate the IP addressing, the result is shown below with the IP address of each device being incremented and unique.



System Configuration – Link View

With the network addressing having been completed we'll now create our GOOSE applications and associated GOOSE linkages.

The screenshot below shows the link view with the RMS Station:



The Applications window lists all the applications by Station, drilling down into the RMS station will reveal the Subnets and any associated reports or GOOSE applications.

Visit *www.morssmitt.com/rms* for the latest product information.
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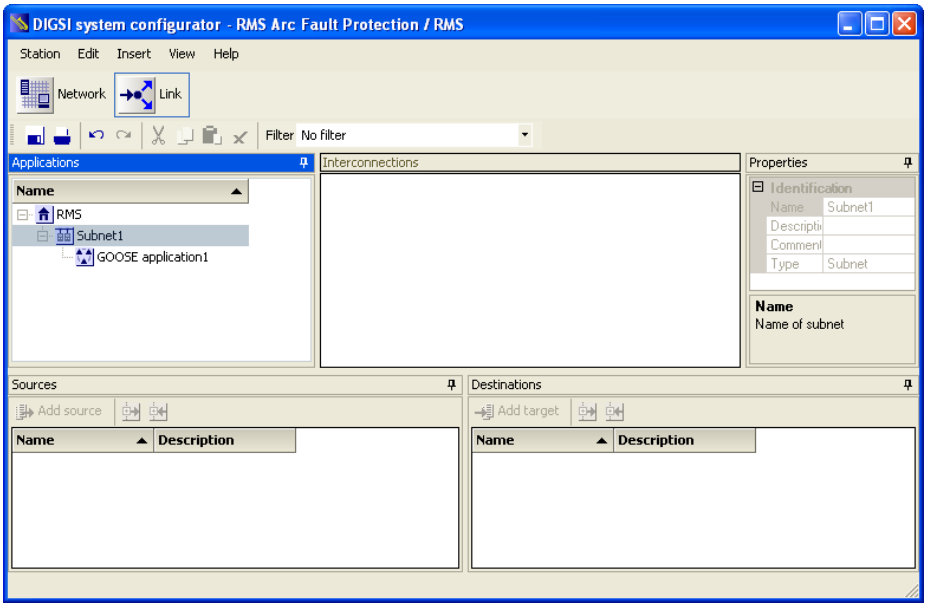
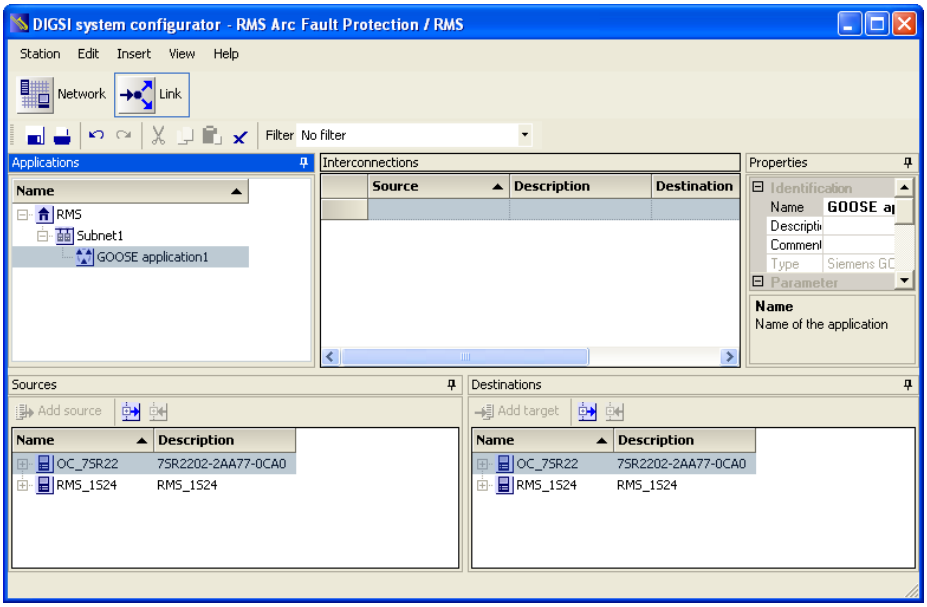


An existing GOOSE application may be used or alternatively a New GOOSE application created.

For our example we'll use the existing GOOSE application 1, selecting this application reveals the associated IEDs as sources and destinations.



Expanding the respective IEDs in the Sources and Destinations windows will show the Logical Nodes and their associated Data Objects.

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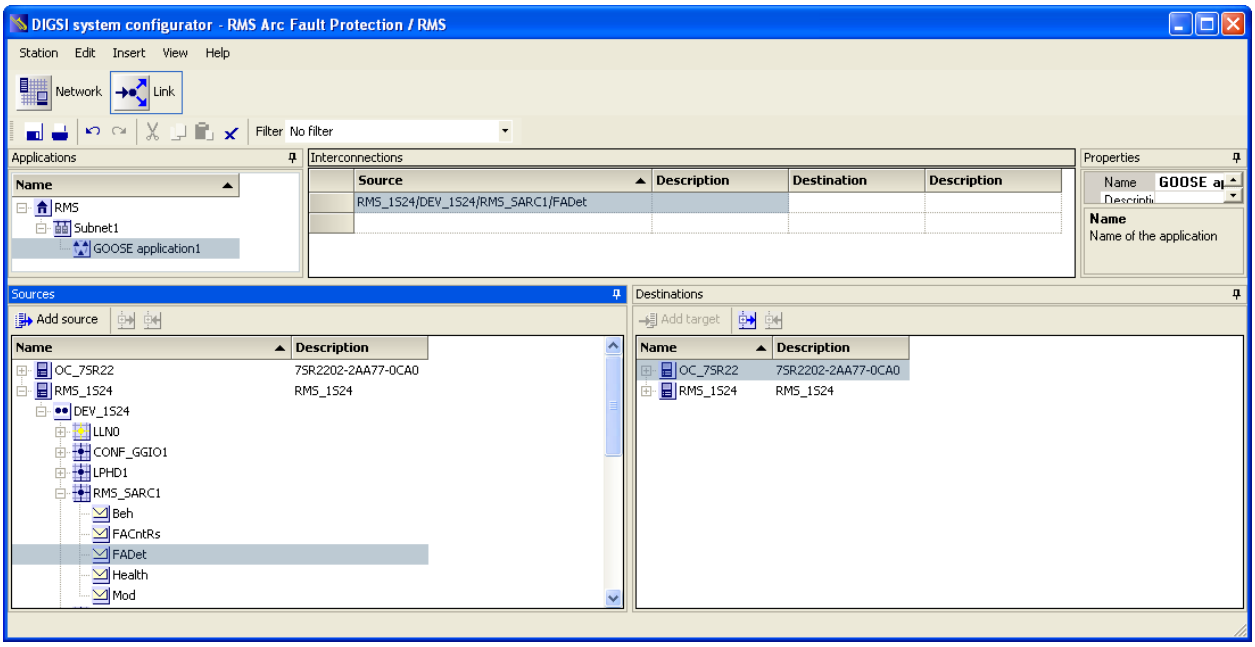
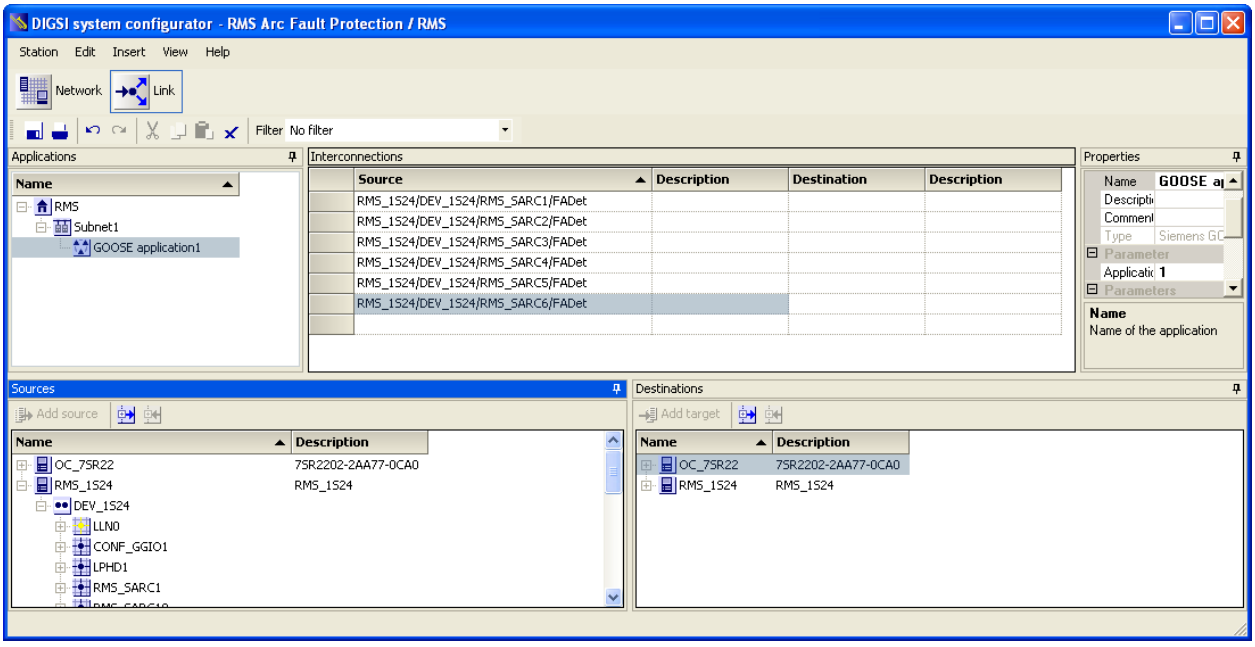
Firstly we'll select the RMS_1S24 IED and expand RMS_SARC1 and choose FADet to Add as a Source.



Once Added as a source it will appear in the interconnections. In turn add all of the required source SARCs.



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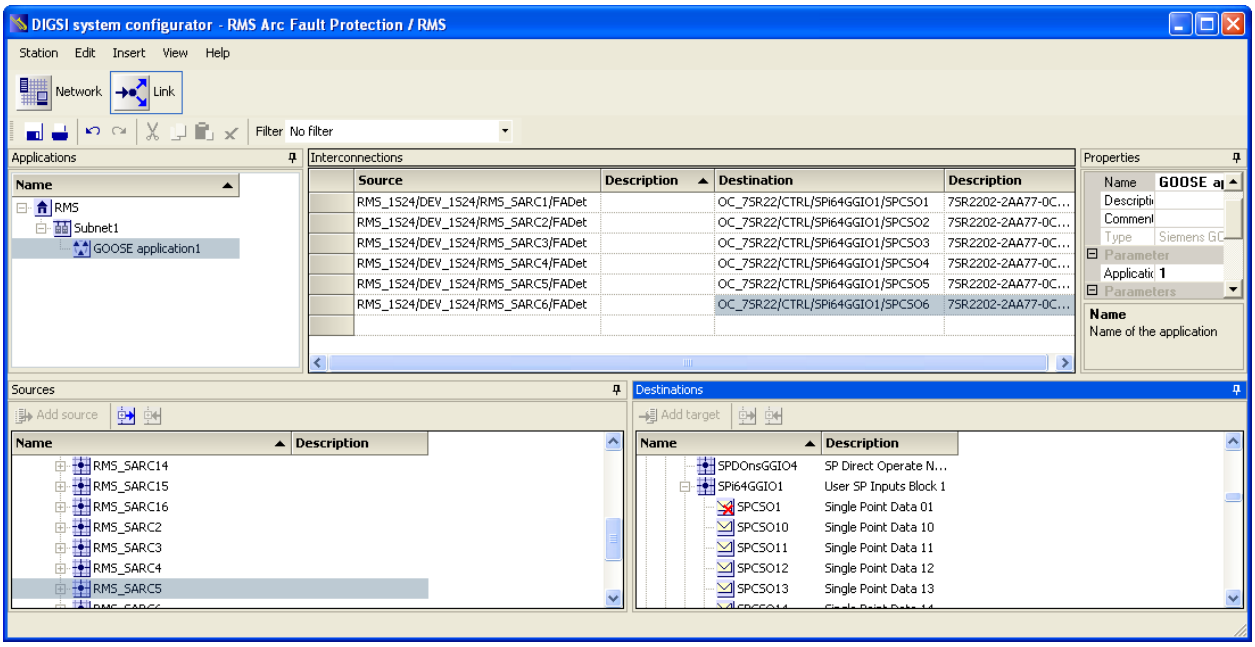
The SARCs are linked to the respective 7SR22 IED Single Point Input GGIO chosen from the Destinations window (refer also to the Allocation table in the earlier part of this example).



With the linkages complete save the configuration.

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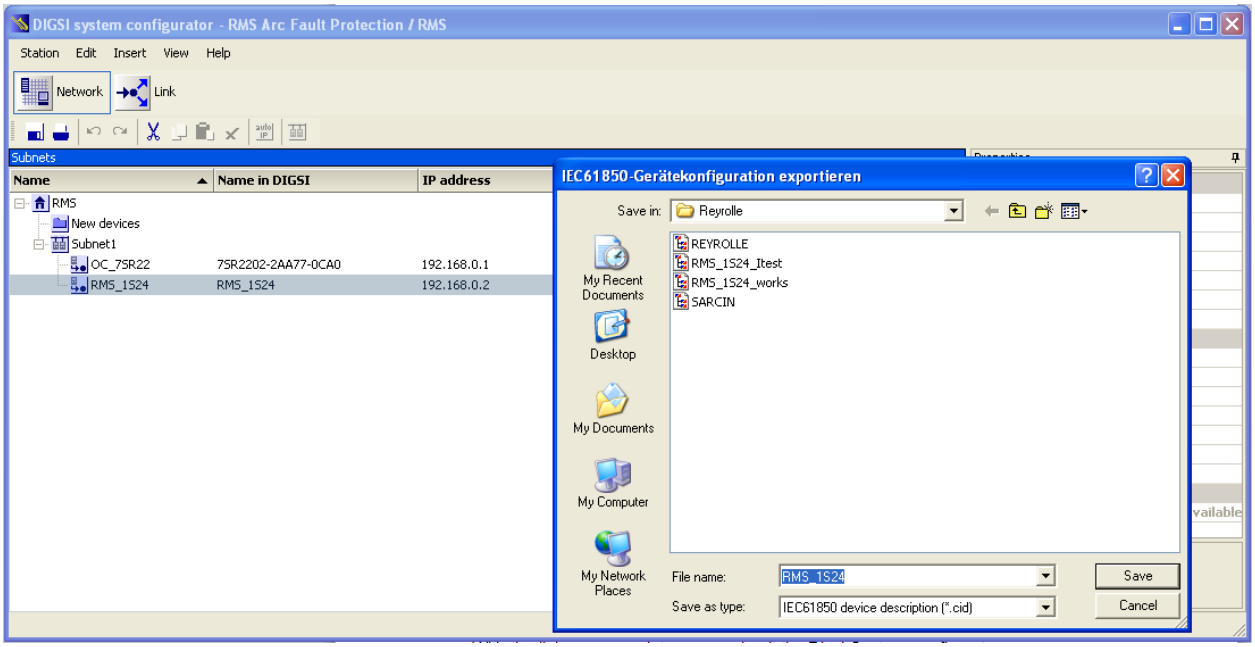
Due to RMS continuous product improvement policy this information is subject to change without notice.

Creating the 1S24 .cid File

We know need to create a .cid file which we will use at a later stage of the IED Configuration process.

Go to the Network screen, select the 1S24 IED, right click and select Export IEC61850 device configuration.



Save the file for later 1S24 configuration.

System configuration is now complete.

Visit *www.morssmitt.com/rms* for the latest product information.

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1S24 IEC61850 Configuration

The .cid File

The 1S24 requires a .cid file that incorporates the IEC61850 Substation Project Configuration including the Report datasets that must be sent and where they are sent to.

The Project Configuration is contained in the .cid file for the 1S24 created earlier from our Substation configuration process example and needs to be loaded into the 1S24 IED.

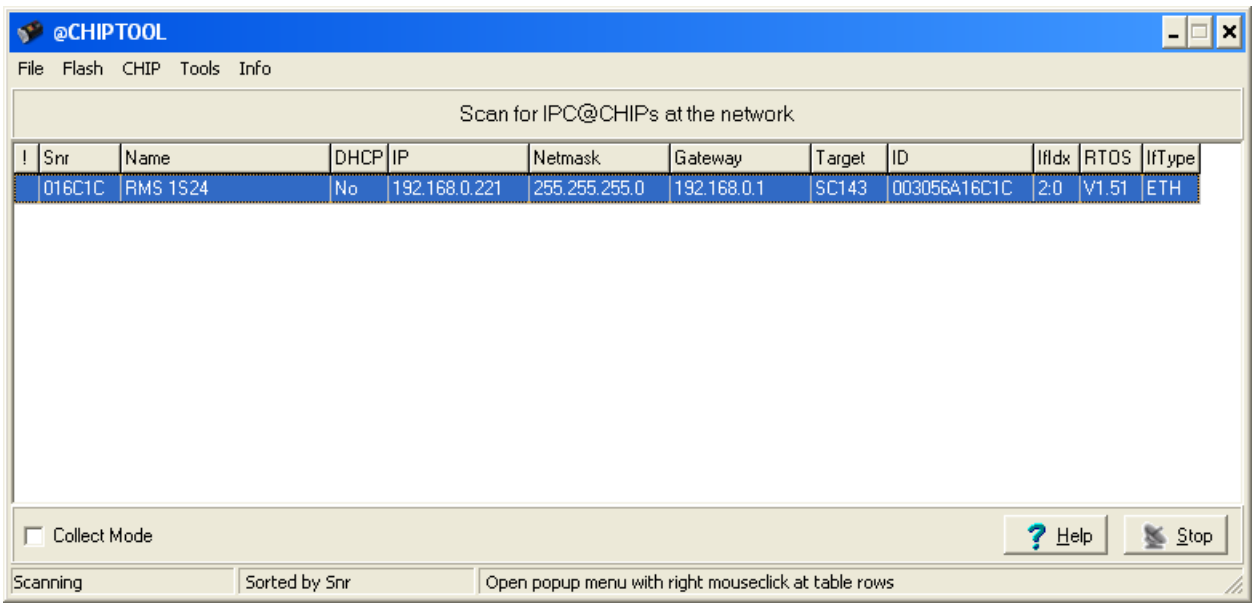
FTP 1S24.cid File

We will be using @CHIPTOOL software utility to establish a terminal session with the 1S24 and to FTP the .cid file.

Download @CHIPTOOL for free from:
https://hmsnetworks.blob.core.windows.net/nlw/docs/default-source/products/anybus/monitored/software/chiptool-install-v7-2-7-2.exe?sfvrsn=90a514b7_4&download=true

Run @CHIPTOOL on the PC.

The Tool will detect any 1S24 devices on the network as seen by the screen shot below:



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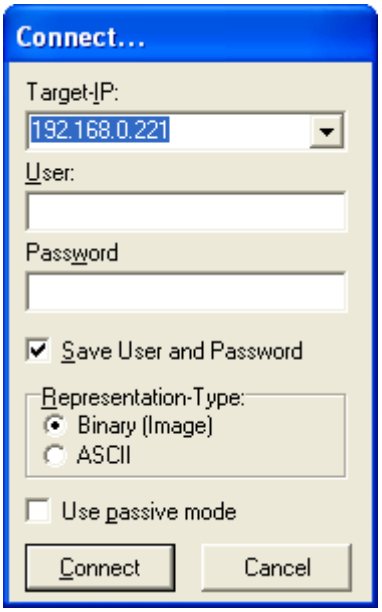
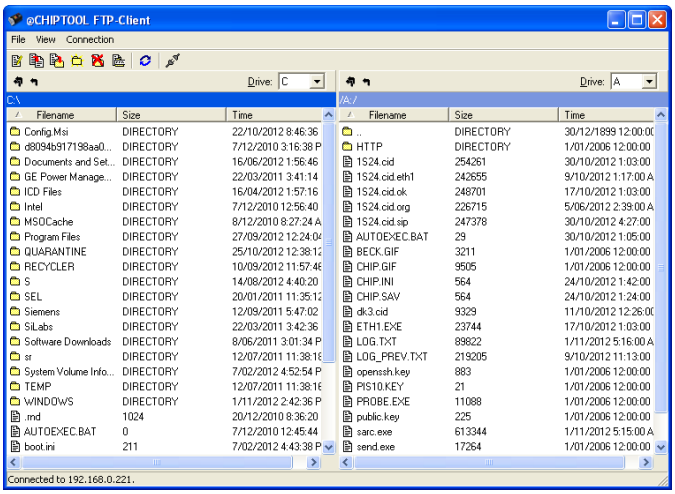
Due to RMS continuous product improvement policy this information is subject to change without notice.

With the 1S24 selected in the @CHIPTOOL screen we will establish an FTP session by choosing Tools and FTP-Client.



Enter the following Username and Password for the FTP session :

User : ftp
Password : ftp



You will be presented with 2 file directories; the left side is the source directory and the right side A:/ is the 1S24.

Locate and select the saved 1S24.cid file created earlier, right click on the file and copy it to the A:/ drive.
Once copied, ensure that any existing 1S24.cid file in the A:/ drive is renamed or deleted (right click on the file for renaming deletion options).

Then select the copied file in the A:/ drive, right click and ensure it is renamed as 1S24.cid.

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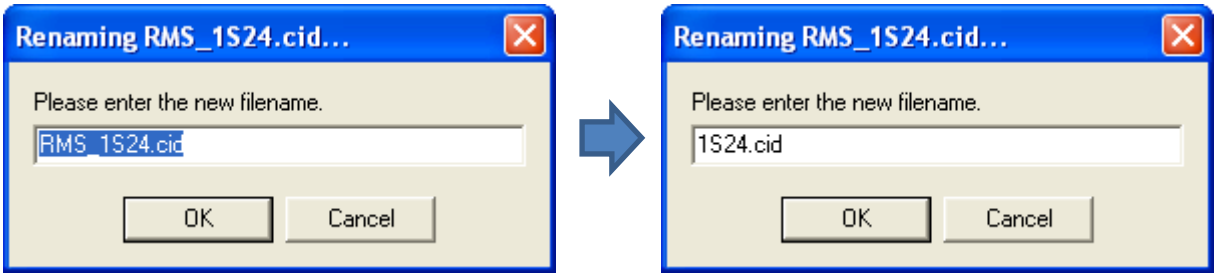
Due to RMS continuous product improvement policy this information is subject to change without notice.



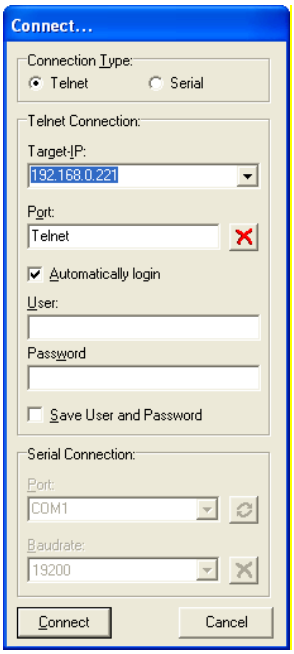
Rebooting the 1S24 with the New 1S24.cid File

A reboot of the 1S24 is required once the new 1S24.cid file has been loaded.

The reboot can be done either via powering down and repowering the device or by pressing and holding the Flag Reset button for about 5 sec until all the LEDs start flashing, refer to Reboot under Monitor Indications.

Alternatively you can set up a terminal session to reboot the 1S24 using @CHIPTOOL.

Using @CHIPTOOL select the 1S24 and choose Tools and Terminal.



Enter the following Username and Password for the terminal session :

User : tel
Password : tel

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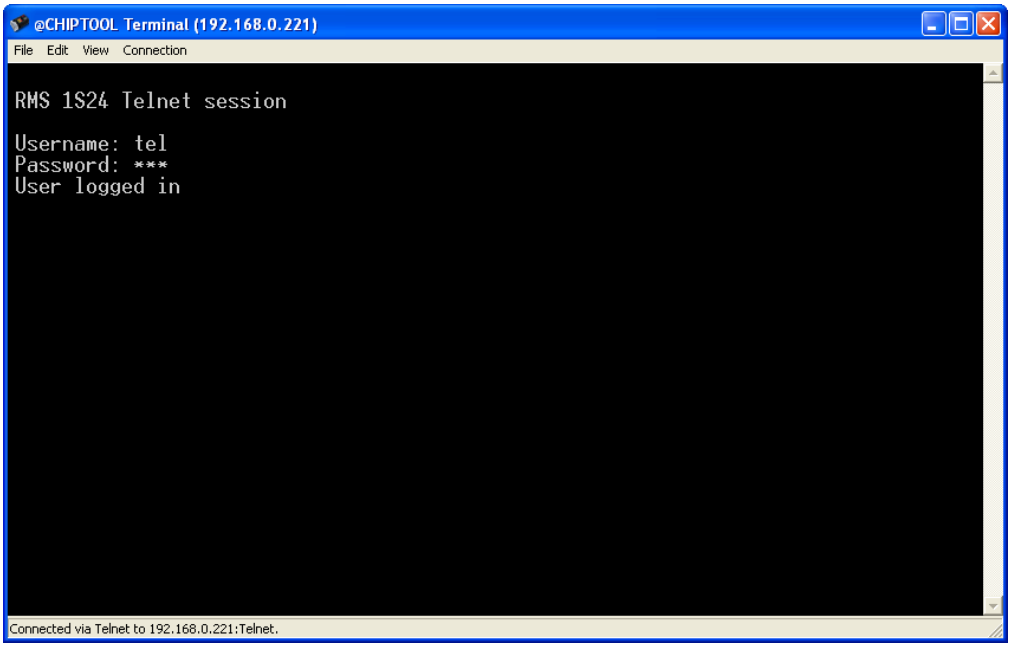
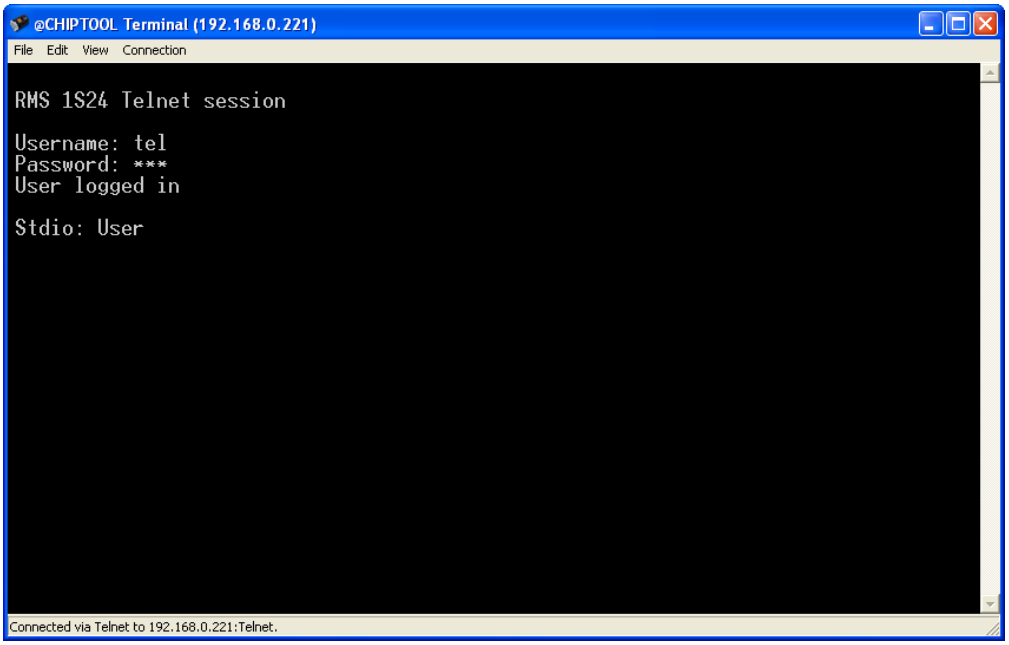


Use CTRL-F to check the context.



You need to be in Shell. CTRL-F to switch the context to Shell.

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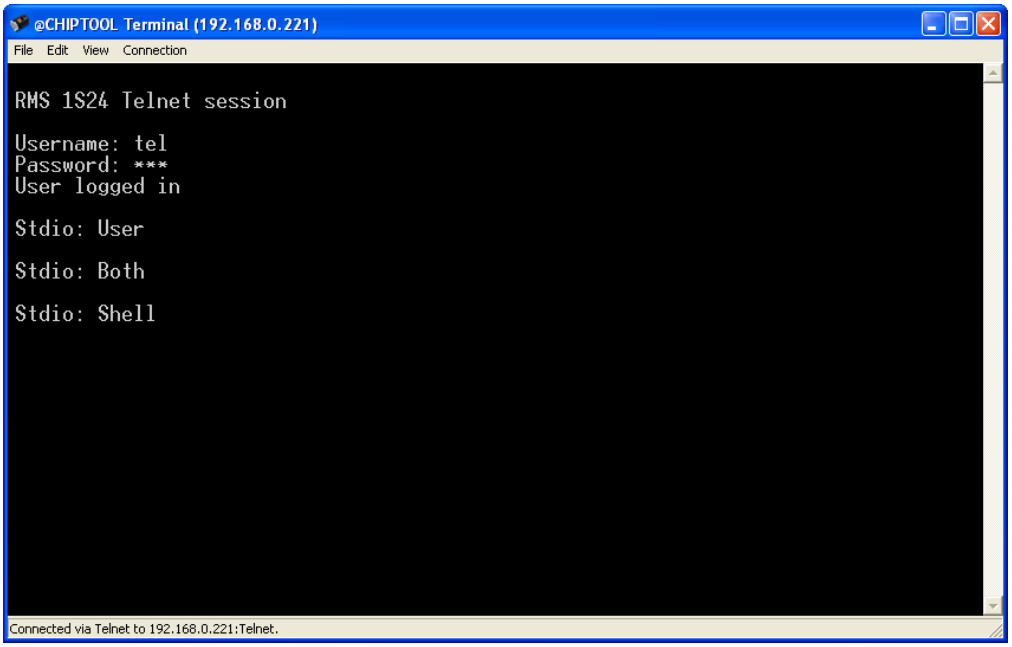
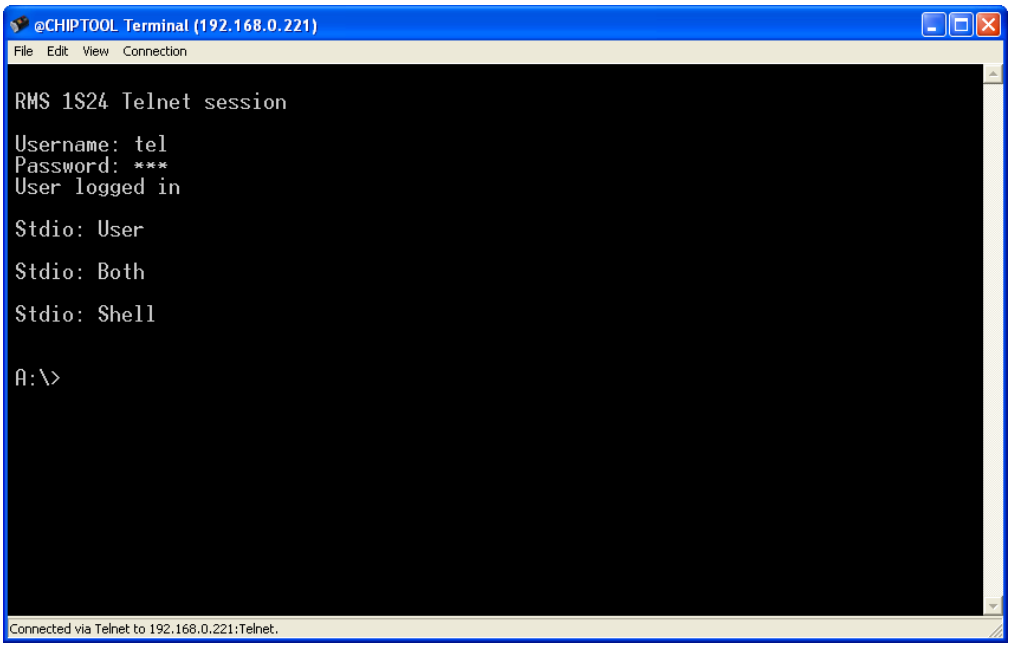
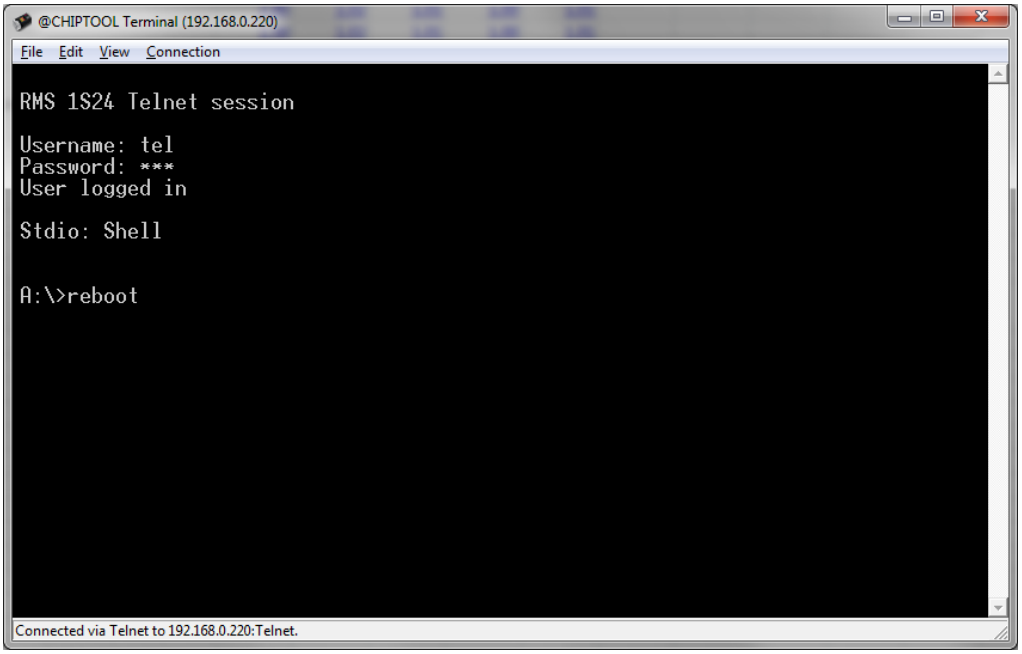


Press enter to make the command prompt visible.



Visit *www.morssmitt.com/rms* for the latest product information.
Due to RMS continuous product improvement policy this information is subject to change without notice.



Type in Reboot at the command prompt, the 1S24 will now restart and the LEDs indicate per a normal power up, refer to Power Up - Monitor Indications.

When all the LEDs stop flashing the 1S24 configuration is complete.

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Example Subscribing Reyrolle 7SR22 IED Configuration

Logic Configuration

Our application is to employ a current check using the pickup of an Instantaneous Overcurrent Element (50-1) to qualify an Arc Sensor operation. The following sections outline the logic implemented.

User Output Allocation

Using the previously defined ARC Fault Sensor Zones we will nominate the User Outputs that will capture the resultant SARC operation and current check logic.

Zone Coverage	Colour	SARC Allocation	User Output
Feeder Exit Termination Chamber		SARC 1	User Output 1
Feeder CB Chamber		SARC 2	User Output 2
Bus		SARC 3 SARC 4	User Output 2
Incomer CB Chamber		SARC 5	User Output 3
Incomer Termination Chamber		SARC 6	User Output 3

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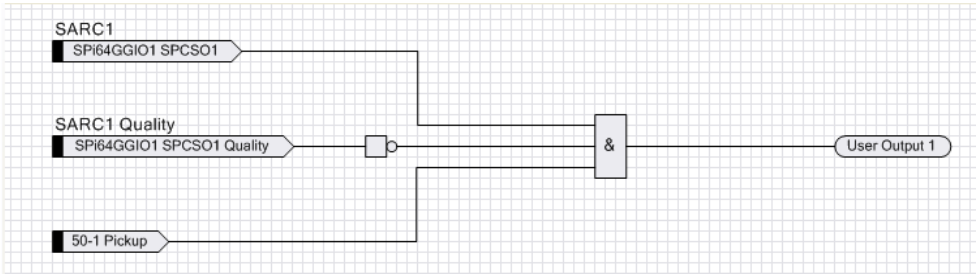
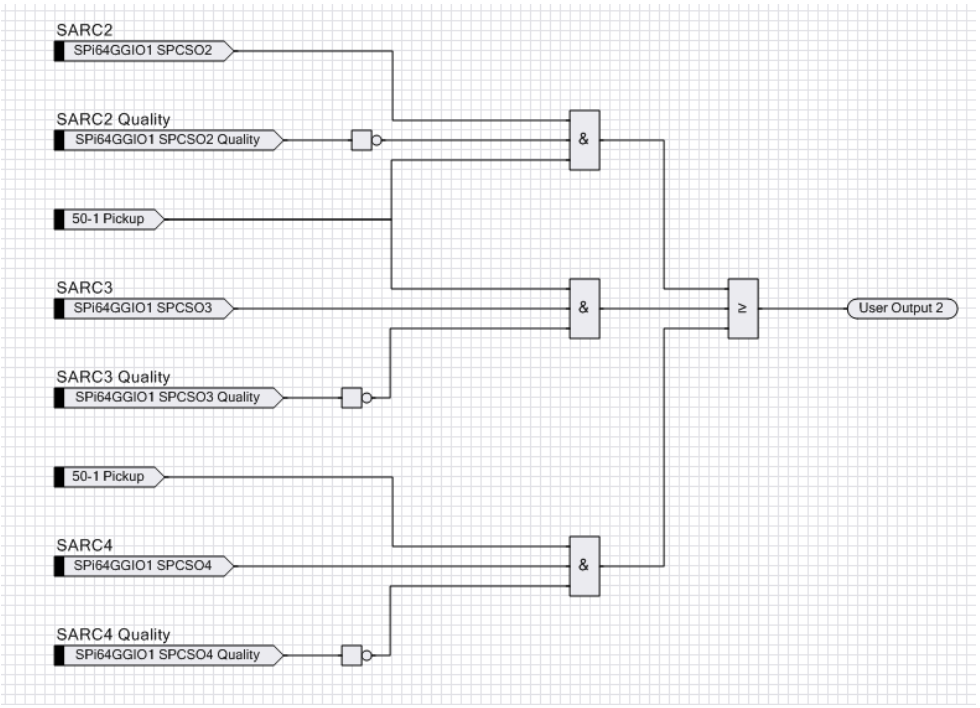
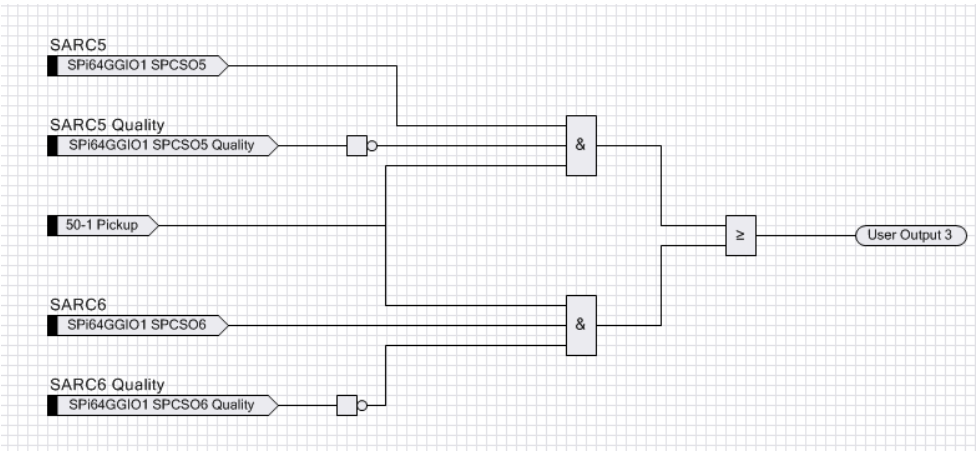
Due to RMS continuous product improvement policy this information is subject to change without notice.

Current Check Logic

The SARC GOOSE Trips are qualified by the SARC quality and a current check in our current check logic. The quality bit can be used for blocking purposes such as testing or isolations.







Visit *www.morssmitt.com/rms* for the latest product information.
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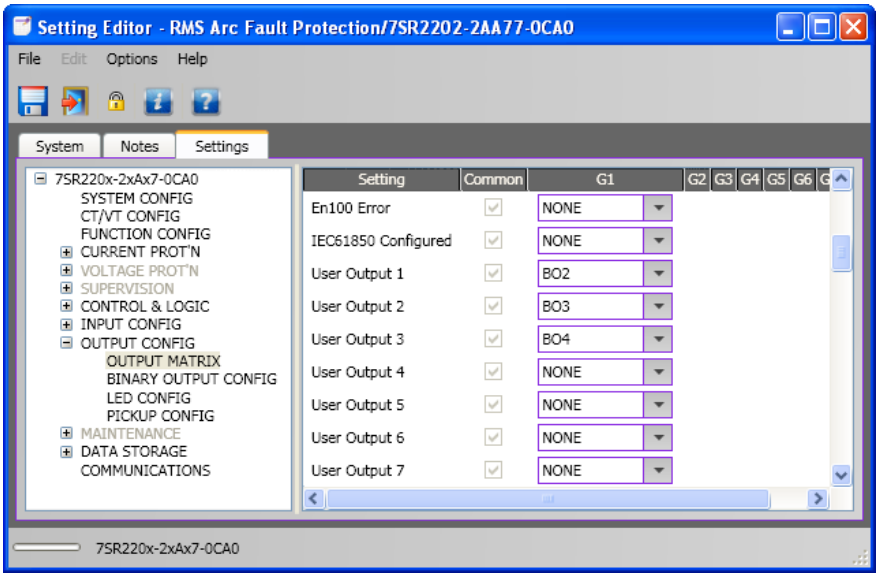
Binary Output Allocation for Circuit Breaker Tripping

The following User Output to Binary Output allocations completes our ARC Fault Trip with Current Check.

SARC Operation	Zone Coverage	User Output	Binary Output	Trip
SARC 1	Feeder Exit Termination Chamber	User Output 1	BO2	1A CB
SARC 2	Feeder CB Chamber	User Output 2	BO3	TR1 LT CB
SARC 3 or SARC 4	Bus	User Output 2	BO3	TR1 LT CB
SARC 5	Incomer CB Chamber	User Output 3	BO4	Upstream
SARC 6	Incomer Termination Chamber	User Output 3	BO4	Upstream

The screenshot shows the User Output to Binary Output allocation in the setting editor of Reydisp Manager.



Complete any other Protection settings otherwise required and save your setting.

Device Synchronization

With all IED settings, IED Logic and IEC61850 configuration complete we now need to synchronize the device.

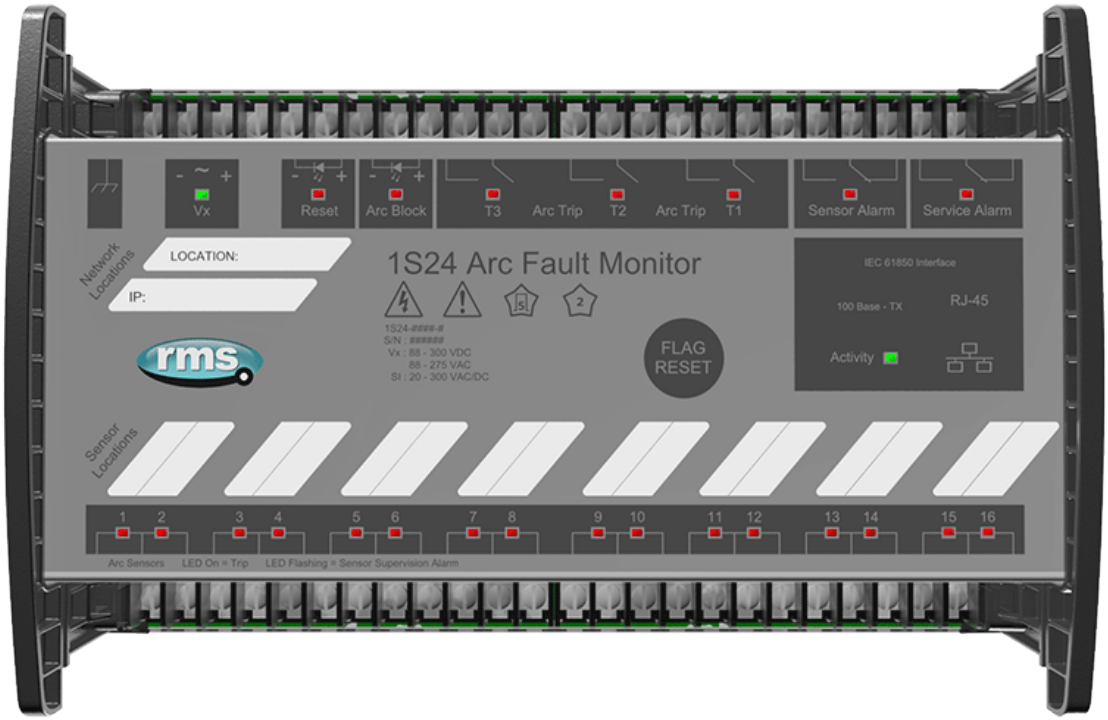
Reydisp Manager will manage the file transfer process to the 7SR22 IED and upon completion the 7SR22 will be able subscribe to SARC Goose messages from the 1S24 IED.

Visit *www.morssmitt.com/rms* for the latest product information.
Due to RMS continuous product improvement policy this information is subject to change without notice.

Monitor Indications

Front Layout

The picture below depicts the indications provided on the front of the Arc Fault Monitor.



Power Up

When powering up, all the Leds will flash once and then extinguish and then in turn sequentially illuminate 1 led at a time until all Leds are illuminated – the sequence takes about 30 secs during the boot cycle.

When the boot cycle is complete the 1S24 will indicate the current state.

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Due to RMS continuous product improvement policy this information is subject to change without notice.

System Status

Auxiliary Supply or Relay Healthy Indication

LED State	Meaning
On Solid	Healthy
Fast Flashing (approx. three times every sec)	CID loading error
Slow Flashing (approx. once every sec)	SNTP sync fail
Off	Internal Communications failure

Refer to the Commissioning section :
Interpreting Vx Auxiliary Supply or Relay Healthy Indications for further details

Ethernet Activity

Service Alarm

The module self-supervision checks the following:

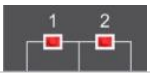
- Auxiliary supply failure
- Internal supply rail is outside acceptable limits
- CPU Hardware watchdog failure

Service Alarm

Visit *www.morssmitt.com/rms* for the latest product information.
Due to RMS continuous product improvement policy this information is subject to change without notice.

Arc Sensor Indicators

Indicate solid when an Arc Sensor has detected an Arc, the LEDs are reset after pressing the Flag Reset.

	Up to 16 Arc Sensor Indicators

A flashing Arc Sensor LED indicates a failure of the sensor; refer to the Sensor Alarm indicator description.

Arc Sensor Circuit Supervision

Indicates solid when an Arc Sensor has faulted either due to an open circuit, sustained short circuit (>10 sec) or high ambient lighting.

	Sensor Alarm

The affected sensor will be indicated by its front panel sensor LED 1-16 flashing.

The Sensor Alarm will self-reset upon the fault conditions being corrected.

Arc Trip

Indicate solid when the respective assigned self-reset Arc Trip contacts operate. The LEDs reset when the Arc Trip contacts self-reset.

	Arc Trip

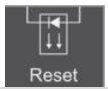
Global Arc Block

Indicate solid when the Global Arc Block input is energised, all Arc Trips are blocked (both IEC61850 and Arc Trip outputs).

	Global Arc Block

Visit *www.morssmitt.com/rms* for the latest product information.
Due to RMS continuous product improvement policy this information is subject to change without notice.

Flag Reset

FLAG RESET	To reset the ARC Sensor LEDs
	The ARC sensor LEDs may also be reset by energising the binary input

Reboot

FLAG RESET	A reboot is achieved by applying power to the relay, all the Leds will flash once and then extinguish and then in turn sequentially illuminate 1 led at a time until all Leds are illuminated – the sequence takes about 30 secs. Alternatively if the relay is powered, hold down the Flag Reset button for about 6 sec until all of the Leds (except Service) start flashing, and then release the Flag Reset button. The LEDs will continue to flash for approx. 9 secs and then extinguish and then in turn sequentially illuminate 1 led at a time until all Leds are illuminated – the sequence takes another 20 secs approx. When the boot cycle is complete the 1S24 will indicate the current state. The reboot must be used after loading in new .icd files into the IED and restarting the software process with the new 61850 configurations. The reboot may also be required if for some reason the 1S24 does not respond to web server commands or becomes unresponsive to ftp or terminal sessions.

Visit *www.morssmitt.com/rms* for the latest product information.
Due to RMS continuous product improvement policy this information is subject to change without notice.

Reset to Factory Default

FLAG RESET	With the relay unpowered, hold down the Flag Reset button and power up the relay, continue holding down the reset button until the Leds commence flashing rapidly (approx. 12 secs) then release the reset button. After releasing the reset button all of the Leds (except Service) will continue flashing rapidly and then extinguish (approx. 10 secs). The Leds will then in turn sequentially illuminate 1 led at a time until all Leds are illuminated – the sequence takes another 20 secs approx. When the boot cycle is complete the 1S24 will indicate the current state. The Cold Boot is used for reverting the IED back to factory default settings including default passwords.

Visit *www.morssmitt.com/rms* for the latest product information.
Due to RMS continuous product improvement policy this information is subject to change without notice.

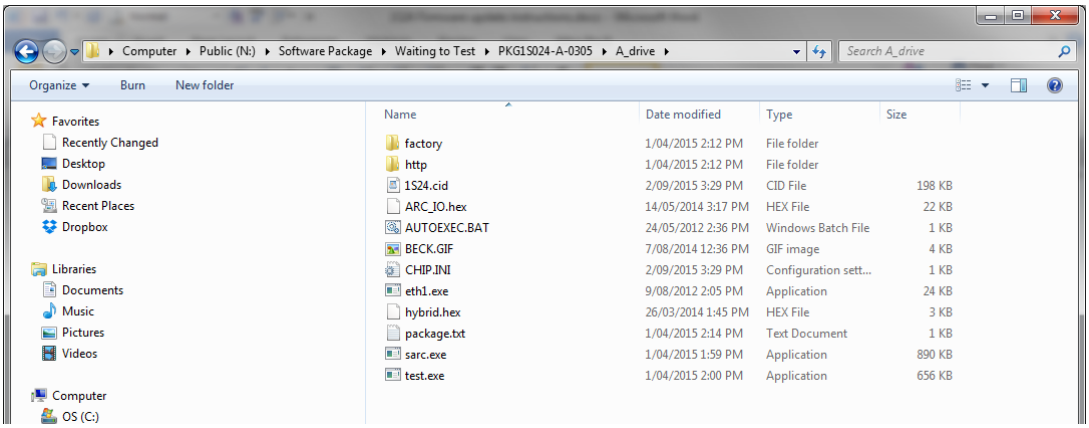
Firmware Update

Introduction

An FTP tool is required to load firmware updates into the 1S24; @CHIPTOOL mentioned earlier in the manual allows HTTP, FTP and Telnet sessions.

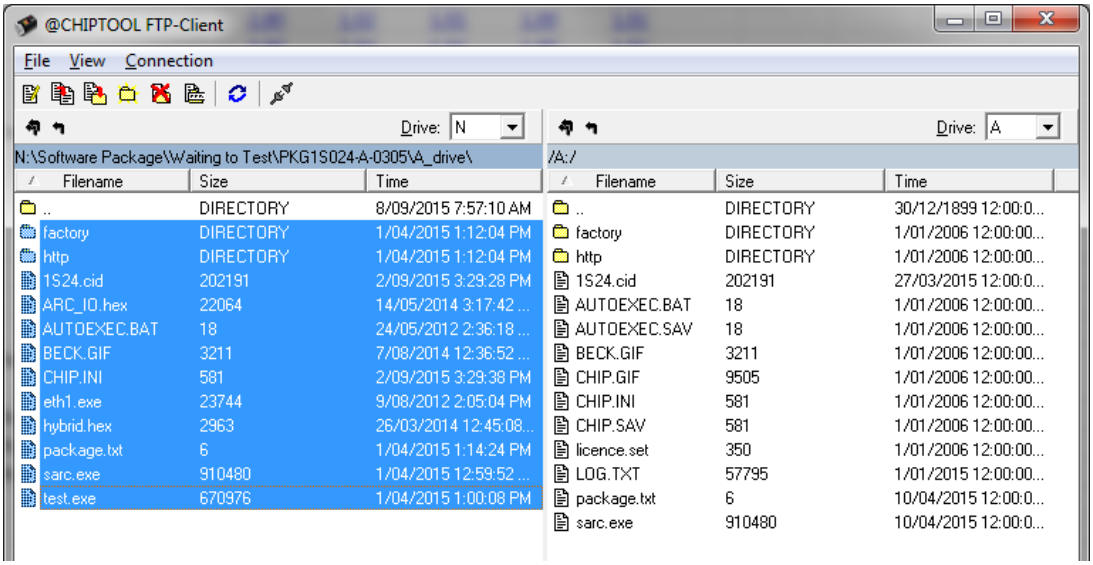
Firmware Package

The contents of a firmware update package will contain a directory called A_drive:



Using an FTP tool transfer across all files and subdirectories to the A:/ drive of the device.

In the FTP tool select all files residing on your PC located under the software package \A_drive, right click on the selection and choose copy:

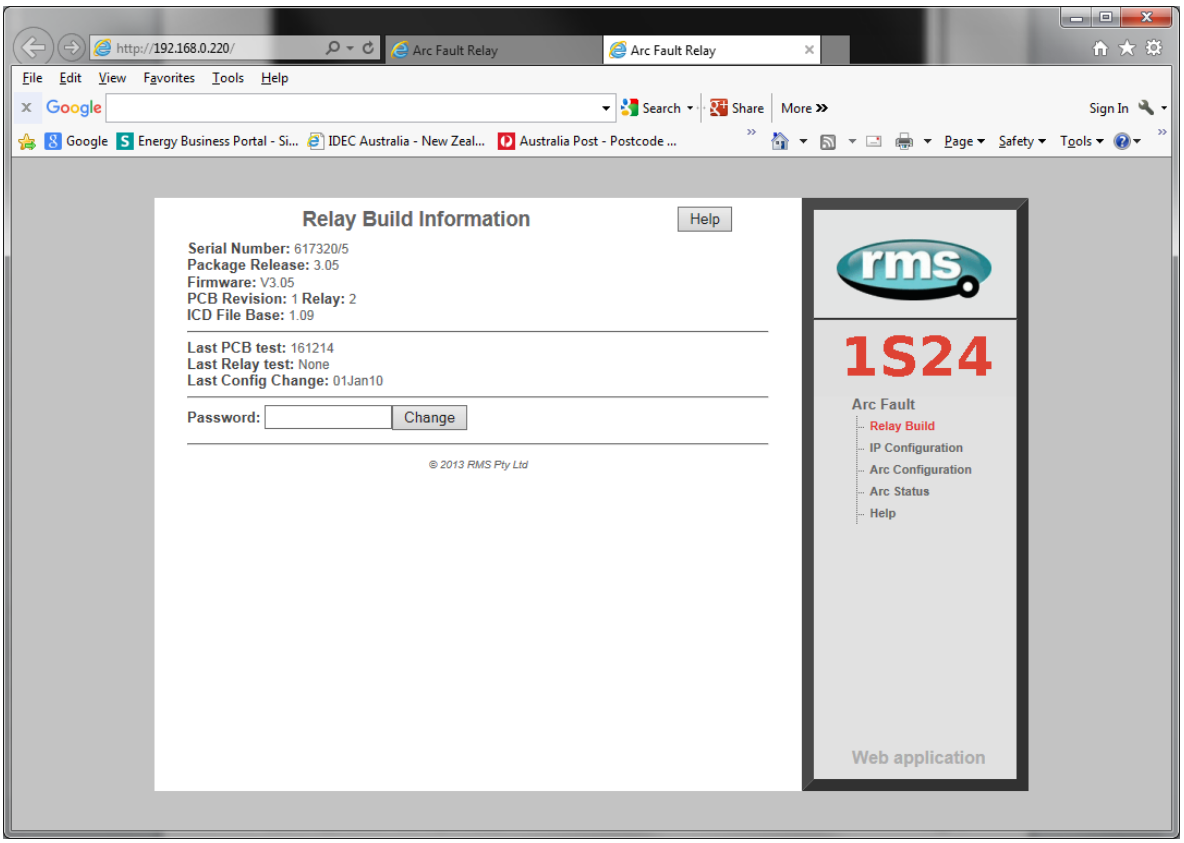


These files will then transfer across to the 1S24.

Visit *www.morssmitt.com/rms* for the latest product information.
Due to RMS continuous product improvement policy this information is subject to change without notice.

Then reboot the device.

Set up a web browser session of the device, you should get a similar screen to the following:

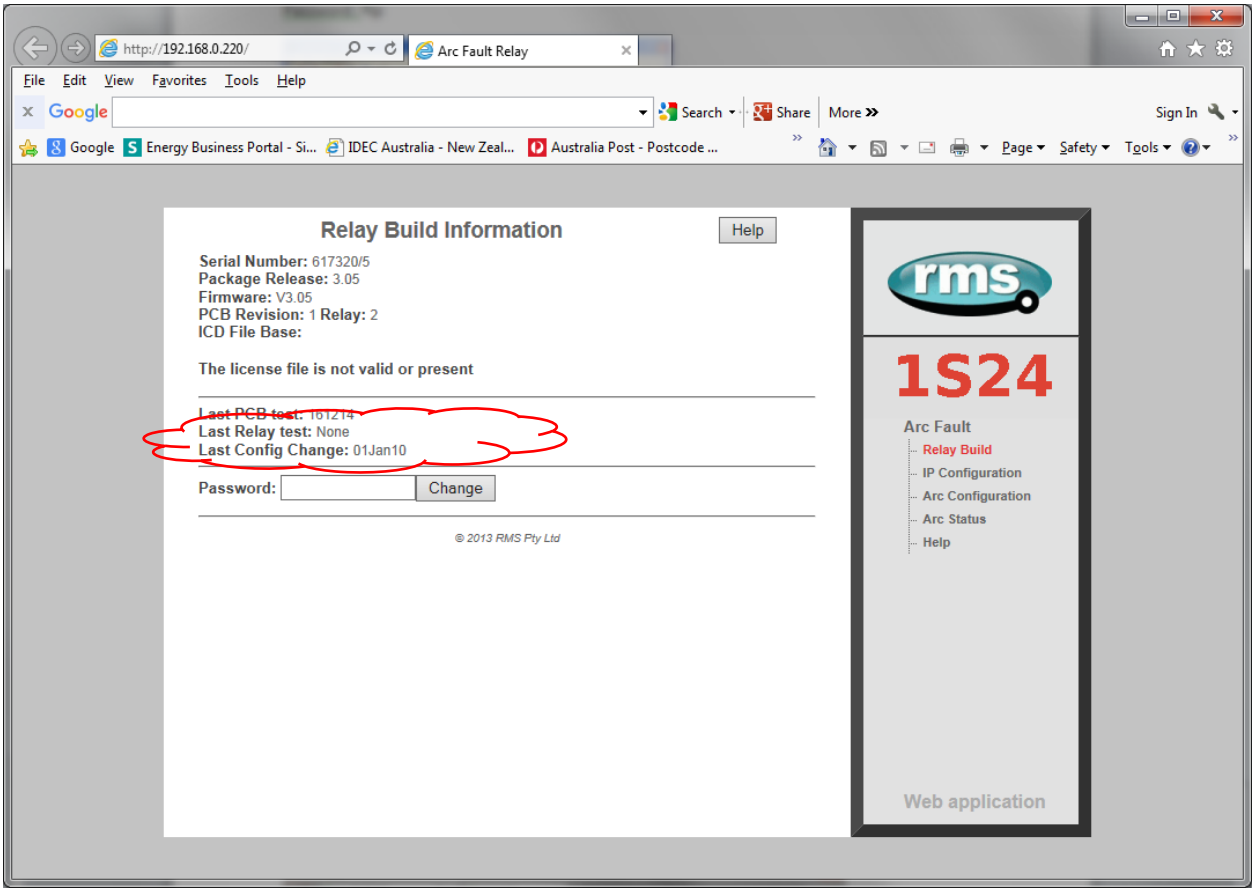


All is well and the 1S24 has been upgraded!

Visit *www.morssmitt.com/rms* for the latest product information.
Due to RMS continuous product improvement policy this information is subject to change without notice.

Trouble Shooting

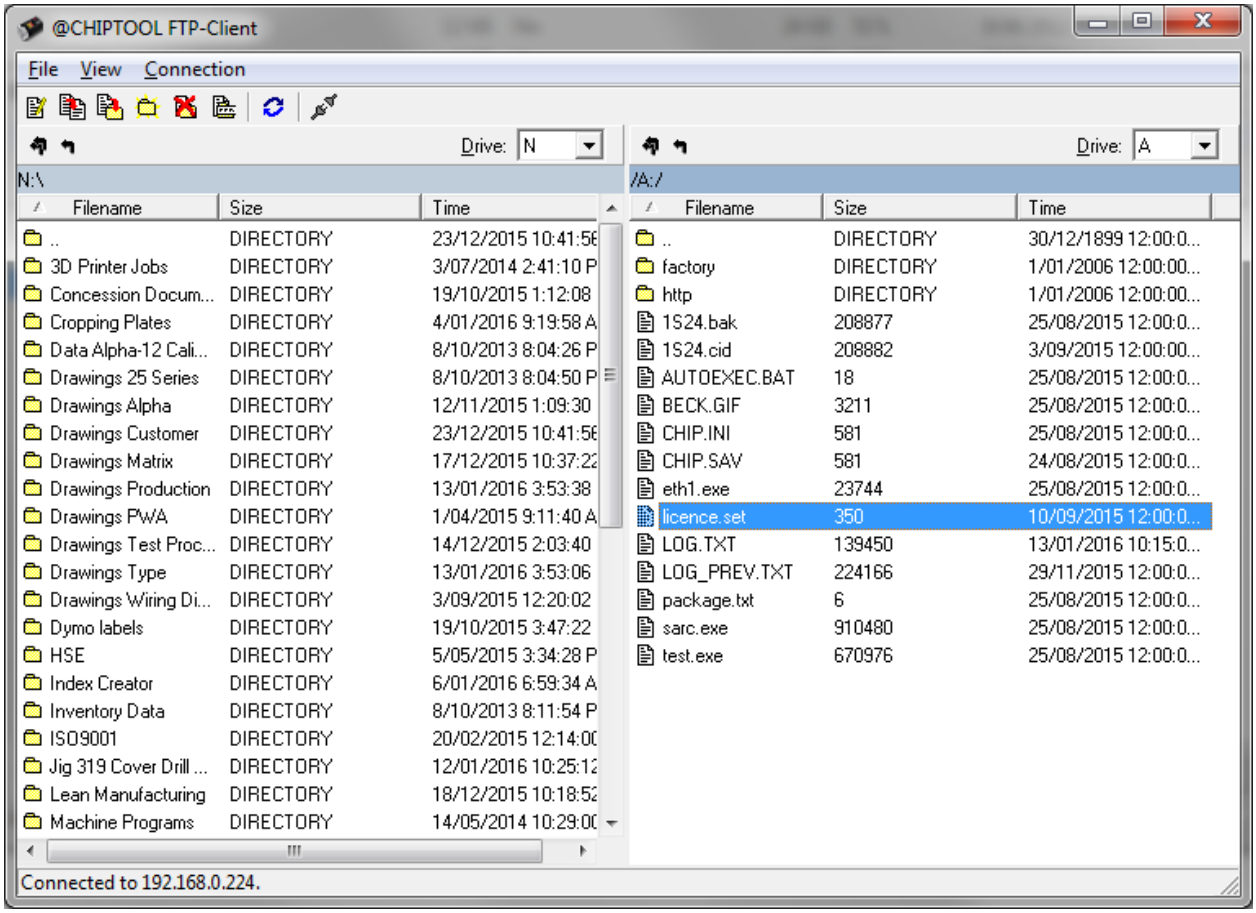
License file not valid or present



Using an FTP tool view the \A_drive and check whether the license.set file is present.

Visit *www.morssmitt.com/rms* for the latest product information.

Due to RMS continuous product improvement policy this information is subject to change without notice.

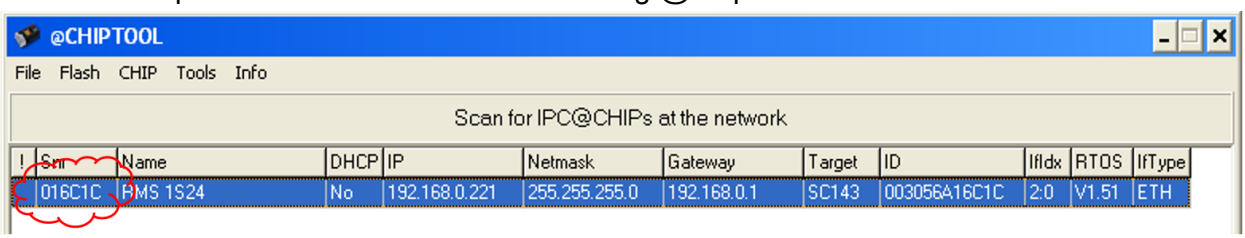


Later 1S24 builds have introduced a license key which is installed in the factory and cannot be reinstalled by the end user.

If the licence.set file is still present it is recommended that the contents of the \A_drive be reinstalled per the Firmware Update section of the User Guide. If you need a copy of your Firmware please contact your RMS representative for further assistance.

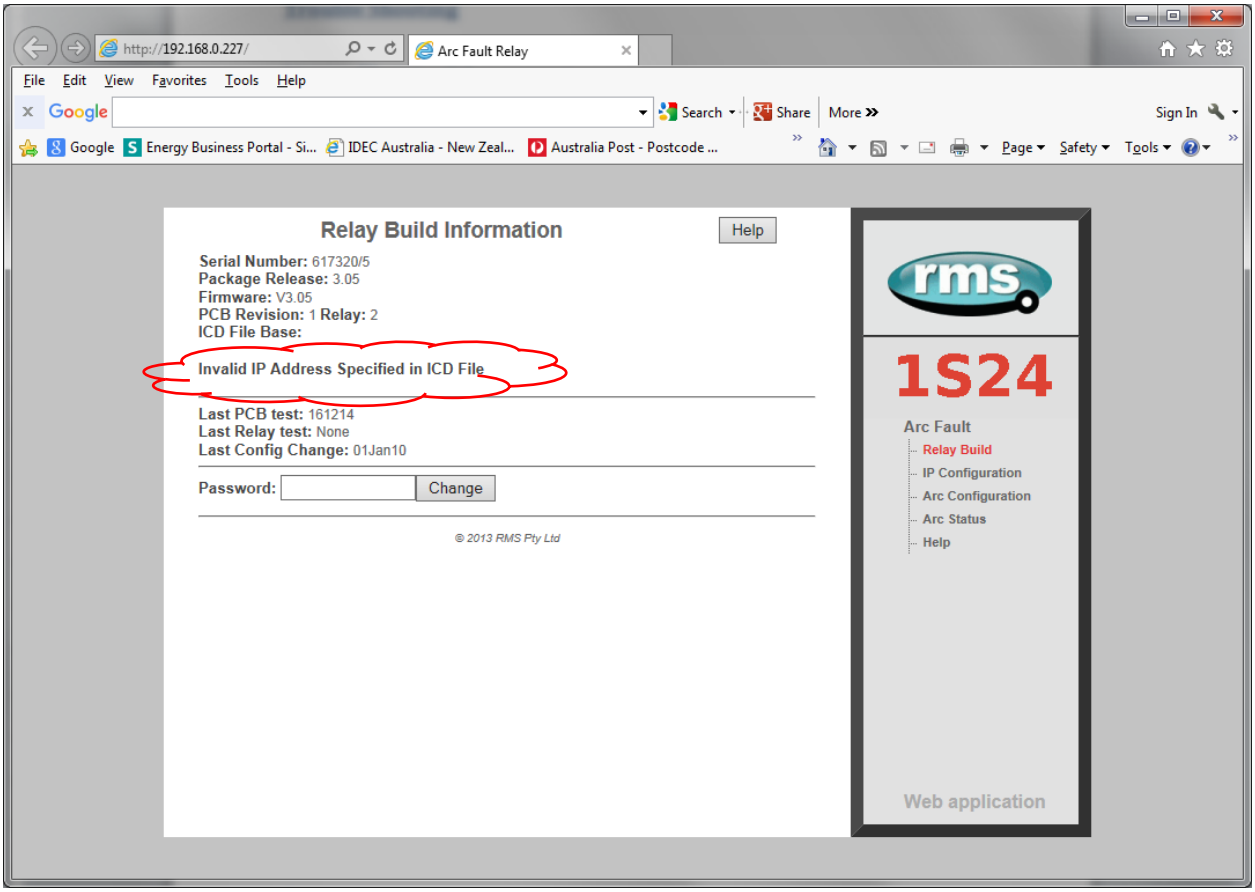
If the licence.set file is not present please contact your RMS representative for further assistance providing the Beck Chip serial number, with this information a replacement copy of the device licence.set file can be supplied.

The Beck Chip serial number can be viewed using @ChipTool :



Visit *www.morssmitt.com/rms* for the latest product information.
Due to RMS continuous product improvement policy this information is subject to change without notice.

Invalid IP Address Specified in ICD File



If you get the above message displayed in the relay build screen then the IP address setting in the device is not in alignment with the ip address in the 1S24.cid file.

Either edit the 1S24.cid file or amend the ip configuration in the device so that the ip addresses are in alignment – if amending the 1S24.cid file be mindful that you may disable any Goose messages created during an earlier IEC61850 system configuration!

Refer to the IP Configuration section of the User Guide for further instructions.

If editing the 1S24.cid file, there should only be one instance you need to change for example:

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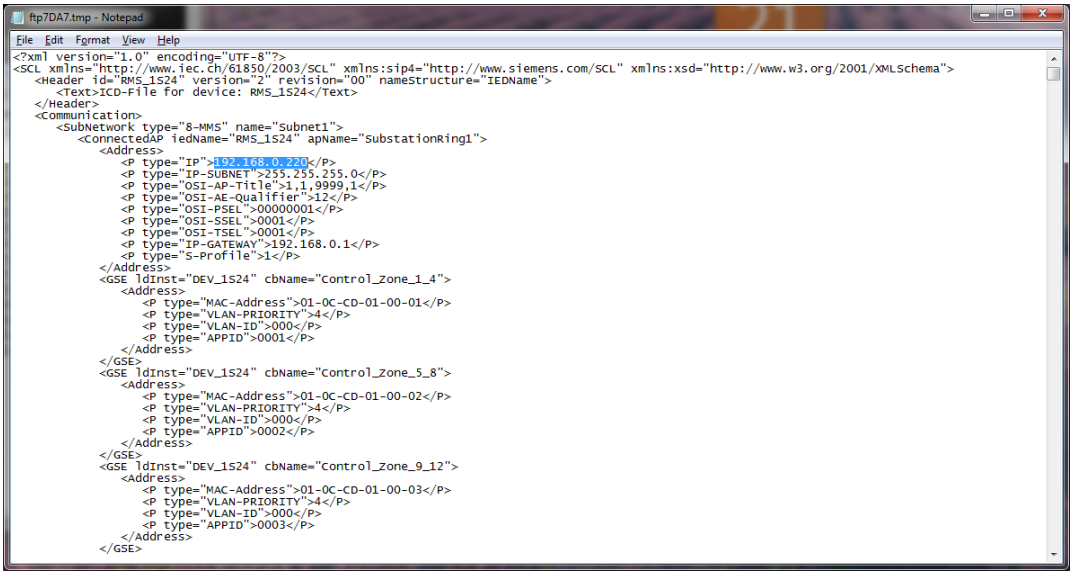

System Status

Check the Vx LED for other useful trouble shooting information.

System Status

Auxiliary Supply or Relay Healthy Indication

LED State	Meaning
On Solid	Healthy
Fast Flashing (approx three times every sec)	CID loading error
Slow Flashing (approx once every sec)	SNTP sync fail
Off	Internal Communications failure

Refer to the Commissioning section : Interpreting Vx Auxiliary Supply or Relay Healthy Indications for further details

Ethernet Activity

Visit *www.morssmitt.com/rms* for the latest product information.
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Commissioning

Commissioning Preliminaries

Carefully examine the module to ensure that no damage has occurred during transit. Check that the model number and rating information are correct.

Insulation

The relay, and its associated wiring, may be insulation tested between:

- all electrically isolated circuits
- all circuits and earth

An electronic or brushless insulation tester should be used, having a dc voltage not exceeding 1000V. Accessible terminals of the same circuit should first be strapped together. Deliberate circuit earthing links, removed for the tests, subsequently must be replaced.

ARC Trip Verification

ARC Trip Verification will require a flash source to initiate sensor operation.

A high powered photographic flash is the most convenient means of initiating positive sensor operation.

Note that mobile phone or small compact camera flashes may not have sufficient power to cause sensor operation.

The RMS 'Arc Flash Timing Test Guide' outlines a suggested test setup to provide a flash source and determine ARC Trip times. The 'Arc Flash Timing Test Guide' is available on the RMS website:

https://www.morssmitt.com/uploads/files/catalog/products/arc-flash-timing-test-guide(3).pdf

Arc only tests are conducted as per the section 'Timing test of 1S25 (no current check)' substituting the wiring for the 1S25 with equivalent wiring for the 1S24.

Current check tests are conducted as per the section 'Timing test of 1S26', with the 1S30 connected to the 1S24, the current source connected to the current check relay and the 1S24 and subscribing current check relay connected via a IEC61850 Station Bus Lan for the transfer of Goose messages.

The 'Arc Flash Timing Test Guide' only requires the use of a conventional test set; end users may also find it beneficial to have access to an IEC61850 equipped test set which can aid in the observation of GOOSE traffic, undertaking GOOSE timing tests and trouble shooting.

Note that the nominated RMS test guide makes use of conventional binary outputs for flash initiation, whilst this is convenient and will work with the majority of test sets the technique will introduce some minor delays in the timing test results due to the latency of the conventional binary output.

Visit *www.morssmitt.com/rms* for the latest product information.
Due to RMS continuous product improvement policy this information is subject to change without notice.

Where more precise timing is required then specialised test equipment should be employed that utilises solid state outputs for arc flash initiation. There are commercially available test sets on the market that provide this capability.

Site Commissioning Verification Checklist

Observe all site specific standard safety procedures.

The following tests are undertaken following the completion of all 1S24 ARC Monitor and Overcurrent Relay IEC61850 Substation Configuration and associated IED configurations, scheme wiring and the wiring of all 1S30 sensors.

System Power Up

Item	Description	Complete
1	Confirm all necessary primary equipment isolations	
2	Confirm all necessary secondary equipment isolations (including trip outputs)	
3	Check fitment of 1S30 and or 1S40 optical sensors and cable condition	
4	Check panel installation of the 1S24 monitor	
5	Check for correct case earthing	
6	Check the 1S24 is wired to the protection design schematic, connected to a Substation LAN and confirm all IEC61850 configurations	
7	Confirm Fail alarm relay is closed (Terminals 23 and 24)	
8	Apply correct Auxiliary voltage to power up the 1S24	
9	Upon power up the relay enters a relay boot cycle, all the Leds will flash once and then extinguish and then in turn sequentially illuminate 1 led at a time until all Leds are illuminated – the sequence takes about 14 secs. Observe that the green power LED remains illuminated (either solid or Flashing: refer to System Status section for complete description of indications) after the relay boot cycle.	
10	Confirm Fail alarm relay is open (Terminals 23 and 24) and the associated LED is extinguished	
11	Using a web browser check 1S24 configuration settings match protection setting specifications	
12	Confirm that the Arc Sensor fail alarm LED remains off and none of the sensor LEDs are flashing (Refer Sensor Failure Trouble shooting if a sensor fail is indicated)	
13	Confirm all Sensor LED's remain OFF	
14	Confirm the Ethernet LED is showing activity	

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Sensor Failure Alarm Verification

Item	Description	Complete
1	Disconnect each sensor from the associated 1S24 sensor input	
2	Confirm the associated sensor LED flashes, the Sensor Alarm LED illuminates and operation of the Relay Fail Alarm output contact	
3	Reconnect each sensor back to the associated 1S24 sensor input	
4	Confirm the associated sensor Fail indications clear and the Relay Fail Alarm output contact opens	
5	In turn short across each 1S24 sensor input (not applicable for 1S40 linear sensor inputs)	
6	Confirm the associated sensor LED flashes, the Sensor Alarm LED illuminates and operation of the Relay Fail Alarm output contact	
7	Remove the short on each 1S24 sensor input	
8	Confirm the associated sensor Fail indications clear and the Relay Fail Alarm output contact opens	

Arc Trip Testing

Item	Description	Complete
1	Initiate the operation of each sensor by the use of a suitably powered camera flash * If a current check interlock is employed in your ARC Fault protection scheme ensure that current is injected into the associated Overcurrent relay to cause operation of the current check element at the same time the sensor is flashed	
2	Check operation of the corresponding sensor LED and the arc fault trip output contacts	
3	Confirm that the subscribing IED has received the GOOSE SARC from the 1S24	
4	View the web browser settings of the 1S24 to explain any unexpected behavior	
5	Confirm operation of Flag Reset after each tripping operation. Repeat ARC trips and confirm correct operation of remote reset using the web browser	

Refer also to the RMS ‘Arc Flash Timing Test Guide’ for a suggested test setup to provide a flash source and determine ARC Trip times. The ‘Arc Flash Timing Test Guide’ is available on the RMS website:

https://www.morssmitt.com/uploads/files/catalog/products/arc-flash-timing-test-guide(3).pdf

Alternatively utilise commercially available test sets that provide Arc Flash testing capability.

Visit *www.morssmitt.com/rms* for the latest product information.
Due to RMS continuous product improvement policy this information is subject to change without notice.

Apply a Global ARC Fault block.

Item	Description	Complete
1	Initiate the operation of each sensor by the use of a suitably powered camera flash	
2	Confirm blocking of the arc fault trip output contacts	
3	Confirm blocking of the SARC GOOSE messages from the 1S24	

Sensor Failure Alarm Trouble Shooting

Item	Description	Complete
1	If any arc sensor LED's are flashing re-check the 1S30 wiring integrity or 1S40 linear sensor fibre and associated connections	
2	Check that the sensors are connected to the correct sensor inputs	
3	Using a web browser session check that the correct sensor inputs are enabled and any unused sensor inputs are disabled	
4	If the Sensor Alarm persists disable all of the sensor inputs and check that all Sensor Alarm indications are extinguished	

ARC Sensor Supervision Trouble Shooting

Item	Description	Complete
1	If there is a Sensor Alarm indication re-check the 1S30 wiring integrity or the 1S40 fibre and connection integrity	
2	Check that the sensors are connected to the correct arc sensor inputs and check that the correct sensor inputs are enabled and unused inputs are disabled	
3	Check for high ambient lighting conditions for all the sensors	

ARC Trip Trouble Shooting

If an arc trip occurs without an ARC being present this indicates either:

- a very high ambient light condition is triggering a sensor

or

- short circuit wiring of a 1S30 sensor

In both cases if the condition persists the Supervision output will operate after a 10 sec delay.

Item	Description	Complete
1	Check the 1S30 wiring integrity or check the 1S40 fibre and connection integrity	
2	Check for high ambient lighting conditions for all the sensors	

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Due to RMS continuous product improvement policy this information is subject to change without notice.

General Ethernet Communications Trouble Shooting

If you are having trouble communicating with the 1S24 IED or other subscribing IEDs check the following:

Item	Description	Complete
1	Check that the Station Bus Lan is active and functioning	
2	Check that the 1S24 IED and the subscribing IED Ethernet ports are active and communicating by checking the port activity LEDs	
3	Undertake a ping test on the 1S24 IED and the subscribing IEDs	
4	Confirm the IP addressing for each of the devices is correct as determined by the Substation topology (check the devices are on the same Subnet) and that devices connected on the same Subnet have unique addresses	

IEC61850 GOOSE Message Trouble Shooting

If a SARC GOOSE is not being received by a subscribing IED check the following:

Item	Description	Complete
1	Check that the required SARC is enabled in the 1S24	
2	For a current check scheme is the current check element enabled and being picked up?	
3	Check the GOOSE linkages in the Substation Project and ensure that the correct sources and subscriptions have been established	
4	Check that the Subscribing IED logic is consistent with the Subscribed SARC. If required troubleshoot the logic by observing the individual incoming signals are consistent with your test conditions for example • Is the correct GGIO being received? • Is the quality bit being correctly treated? • Is the current check qualification being asserted	
5	Using the 1S24 Web Browser check for any error messages on the Status screen when you FTP the .cid file into the device	
6	In the Web Browser observe the trip status when a Sensor is triggered	
7	Using and IEC61850 browser such as IED Scout observe the trip status changes in the 1S24 ICD	

Visit *www.morssmitt.com/rms* for the latest product information.
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Interpreting Vx Auxiliary Supply or Relay Healthy Indications

The Healthy LED will be illuminated solid to indicate normal operation of the 1S24.

The Healthy LED is also utilised to indicate error conditions to assist in troubleshooting.

The following table summarises all Healthy LED indications:

LED State	**Meaning**
On Solid	Healthy
Fast Flashing (approx. three times every sec)	CID loading error (61850 stack problem) The .cid file is in error or possibly corrupted, open a web server session where further information is reported on the Relay Build page A common error is a mismatch of the ip address as set in the device compared to that entered in .cid file, refer to the section in the user guide titled: **Invalid IP Address Specified in ICD File**
Slow Flashing (approx. once every sec)	SNTP sync fail Check SNTP server is functioning or check that the SNTP Server address on the IP config screen is correct
Off	Internal 1S24 Communications failure A permanent Internal 1S24 Communications failure will assert the Service Alarm

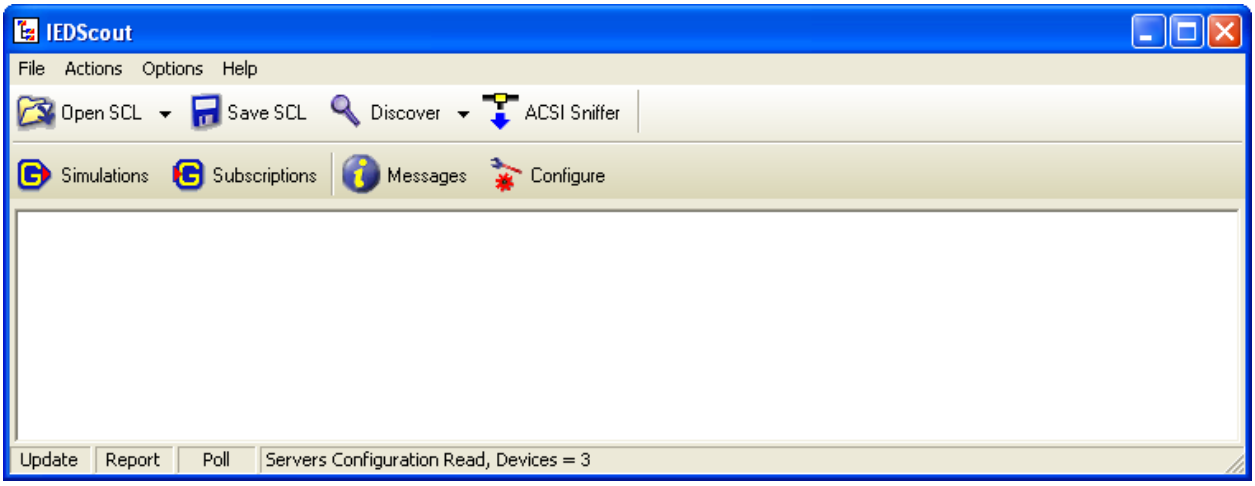
Visit *www.morssmitt.com/rms* for the latest product information.
Due to RMS continuous product improvement policy this information is subject to change without notice.

Using IED SCOUT IEC61850 GOOSE Message Trouble Shooting

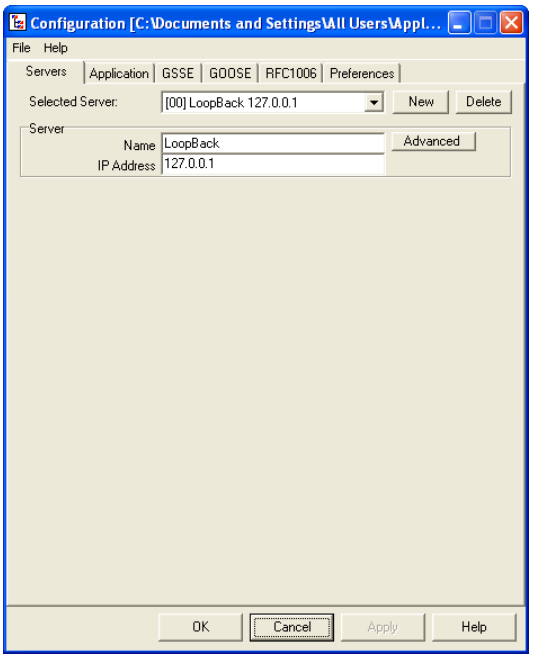
Status changes of the 1S24 ICD may be independently observed in more depth by using an IEC61850 browser such as IED Scout.

A free limited functionality version of IED Scout may be downloaded from the OMICRON website.

To view a 1S24 on a network start up IED Scout.



Go to Options and Configuration.



In the Servers tab press the New button.

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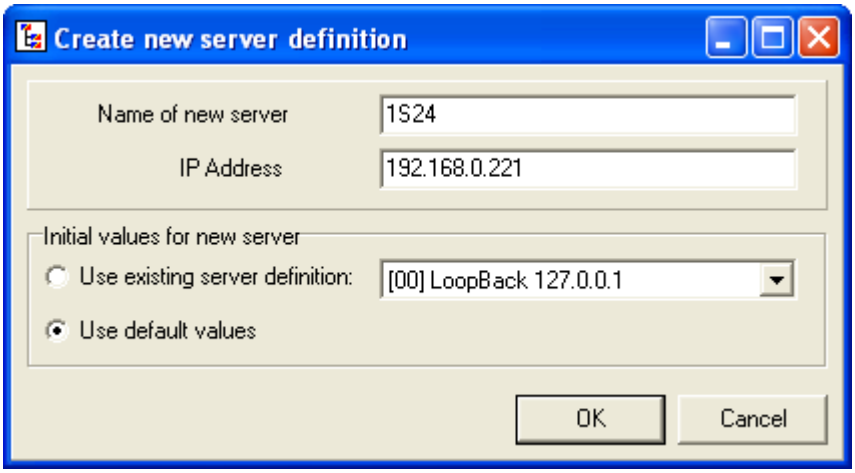
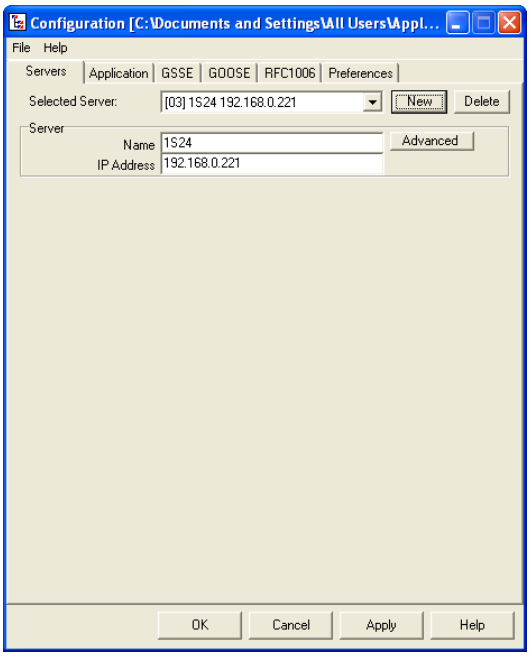
Due to RMS continuous product improvement policy this information is subject to change without notice.



Enter the name of the 1S24 and the IP address and hit OK.

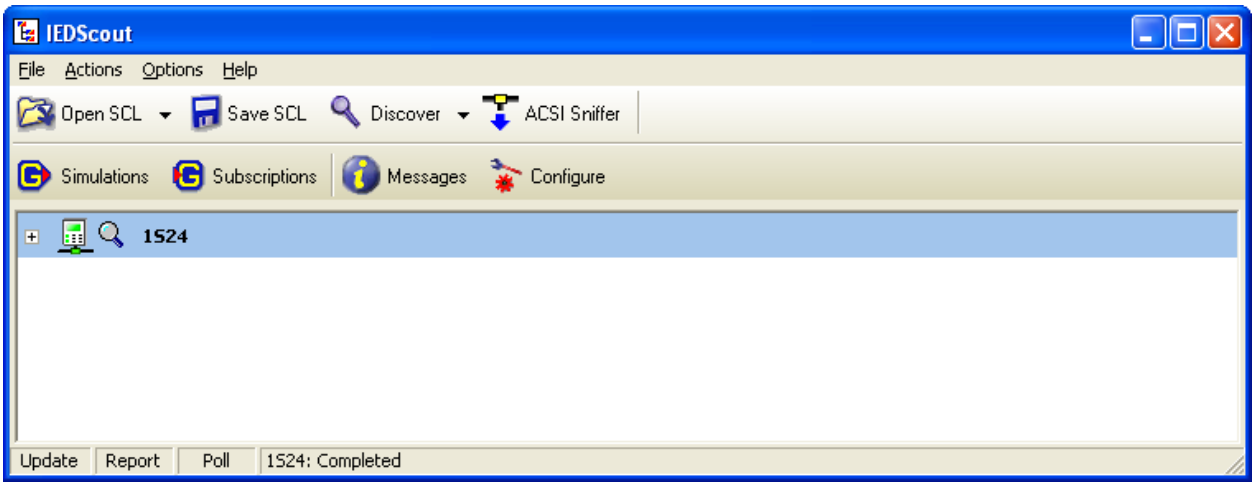


At the Servers Tab press the OK botton again.

Then at the main screen press the Discover button and choose the server you've just created and then Connect.

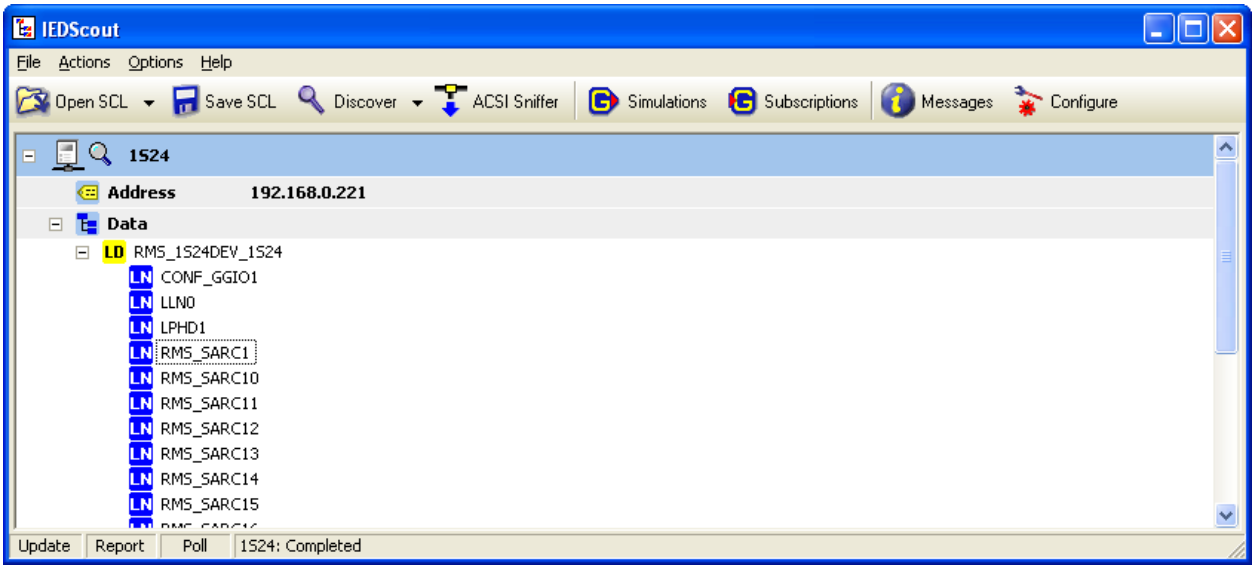
Visit *www.morssmitt.com/rms* for the latest product information.
Due to RMS continuous product improvement policy this information is subject to change without notice.

You will now see that the 1S24 is available for viewing.



You can drill down in the Logical Node structure of the 1S24.

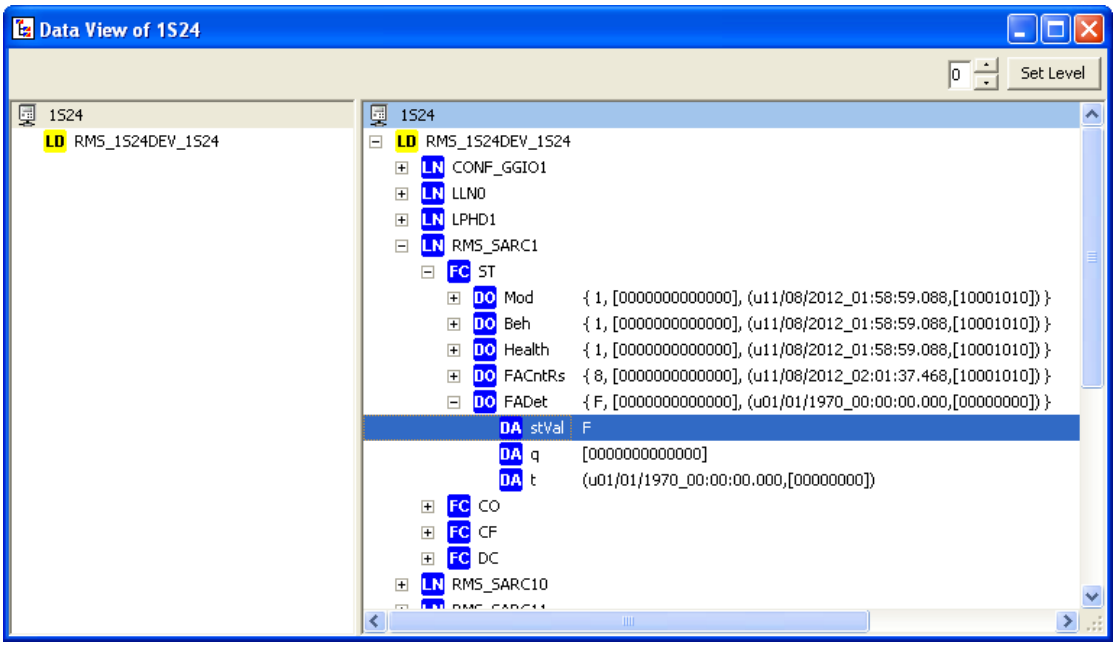
To view the Data for SARC1 double click RMS_SARC1



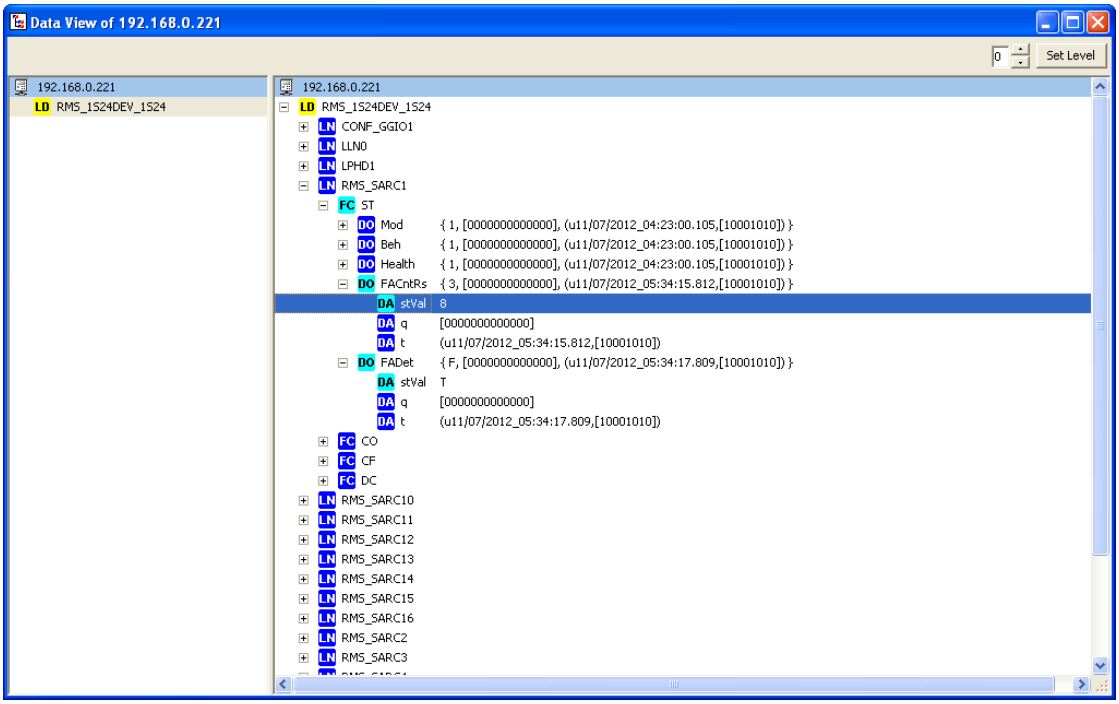
And then further drill down in to the status data for example to view the status of FADet.

Visit *www.morssmitt.com/rms* for the latest product information.
Due to RMS continuous product improvement policy this information is subject to change without notice.

In the untripped state the stVal will show as F (false)



In the 2 second window of a trip the FADet status will show as T (true)



The counter will also increment with each trip.

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Due to RMS continuous product improvement policy this information is subject to change without notice.

Installation

Handling of Electronic Equipment

A person's normal movements can easily generate electrostatic potentials of several thousand volts. Discharge of these voltages into semiconductor devices when handling electronic circuits can cause serious damage, which often may not be immediately apparent but the reliability of the circuit will have been reduced.

The electronic circuits of Relay Monitoring Systems Pty Ltd products are immune to the relevant levels of electrostatic discharge when housed in the case. Do not expose them to the risk of damage by withdrawing modules unnecessarily.

Each module incorporates the highest practicable protection for its semiconductor devices. However, if it becomes necessary to withdraw a module, the following precautions should be taken to preserve the high reliability and long life for which the equipment has been designed and manufactured.

1. Before removing a module, ensure that you are at the same electrostatic potential as the equipment by touching the case.
2. Handle the module by its front-plate, frame, or edges of the printed circuit board.
3. Avoid touching the electronic components, printed circuit track or connectors.
4. Do not pass the module to any person without first ensuring that you are both at the same electrostatic potential. Shaking hands achieves equipotential.
5. Place the module on an antistatic surface, or on a conducting surface which is at the same potential as you.
6. Store or transport the module in a conductive bag.

If you are making measurements on the internal electronic circuitry of equipment in service, it is preferable that you are earthed to the case with a conductive wrist strap.

Wrist straps should have a resistance to ground between 500k – 10M ohms. If a wrist strap is not available, you should maintain regular contact with the case to prevent the build-up of static.

Instrumentation which may be used for making measurements should be earthed to the case whenever possible.

Visit *www.morssmitt.com/rms* for the latest product information.
Due to RMS continuous product improvement policy this information is subject to change without notice.

Safety Section

This Safety Section should be read before commencing any work on the equipment.

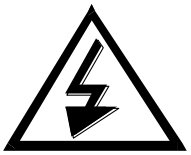
The information in the Safety Section of the product documentation is intended to ensure that products are properly installed and handled in order to maintain them in a safe condition. It is assumed that everyone who will be associated with the equipment will be familiar with the contents of the Safety Section.

Explanation of Symbols & Labels

The meaning of symbols and labels which may be used on the equipment or in the product documentation is given below.

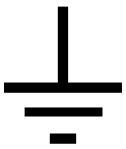
Caution: refer to product information

Caution: risk of electric shock



Functional earth terminal

Note: this symbol may also be used for a Protective/safety earth terminal if that terminal is part of a terminal block or sub-assembly eg. power supply.



Unpacking

Upon receipt inspect the outer shipping carton or pallet for obvious damage.

Remove the individually packaged relays and inspect the cartons for obvious damage.

To prevent the possible ingress of dirt the carton should not be opened until the relay is to be used. Refer to the following images for unpacking the relay:

Outer packing carton showing the shipping documentation pouch.
Address label on top of carton.

Example of the inner packing carton showing the front label detailing the serial number, relay part number & description.

Packing carton with lid open showing relay and packing insert.

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Storage & Handling

If damage has been sustained a claim should immediately be made against the carrier, also inform Relay Monitoring Systems Pty Ltd and the nearest RMS agent

When not required for immediate use, the relay should be returned to its original carton and stored in a clean, dry place.

Relays which have been removed from their cases should not be left in situations where they are exposed to dust or damp. This particularly applies to installations which are being carried out at the same time as constructional work.

If relays are not installed immediately upon receipt they should be stored in a place free from dust and moisture in their original cartons.

Dust which collects on a carton may, on subsequent unpacking, find its way into the relay; in damp conditions the carton and packing may become impregnated with moisture and the de-humidifying agent will lose is efficiency.

Equipment Operating Conditions

The equipment should be operated within the specified electrical and environmental limits.

Protective relays, although generally of robust construction, require careful treatment prior to installation and a wise selection of site. By observing a few simple rules the possibility of premature failure is eliminated and a high degree of performance can be expected.

Care must be taken when unpacking and installing the relays so that none of the parts are damaged or their settings altered and must at all times be handled by skilled persons only.

Relays should be examined for any wedges, clamps, or rubber bands necessary to secure moving parts to prevent damage during transit and these should be removed after installation and before commissioning.

The relay should be mounted on the circuit breaker or panel to allow the operator the best access to the relay functions.

Equipment Connections

Personnel undertaking installation, commissioning or servicing work on this equipment should be aware of the correct working procedures to ensure safety. The product documentation should be consulted before installing, commissioning or servicing the equipment.

Terminals exposed during installation, commissioning and maintenance may present hazardous voltage unless the equipment is electrically isolated.

If there is unlocked access to the rear of the equipment, care should be taken by all personnel to avoid electric shock or energy hazards.

Voltage and current connections should be made using insulated crimp terminations to ensure that terminal block insulation requirements are maintained for safety. To ensure that wires are correctly terminated, the correct crimp terminal and tool for the wire size should be used.

Before energising the equipment it must be earthed using the protective earth terminal, or the appropriate termination of the supply plug in the case of plug connected equipment. Omitting or disconnecting the equipment earth may cause a safety hazard.

The recommended minimum earth wire size is 2.5mm^2, unless otherwise stated in the technical data section of the product documentation.

Before energising the equipment, the following should be checked:

1. Voltage rating and polarity;
2. Protective fuse rating;
3. Integrity of earth connection (where applicable)

Decommissioning & Disposal

Decommissioning: The auxiliary supply circuit in the relay may include capacitors across the supply or to earth. To avoid electric shock or energy hazards, after completely isolating the supplies to the relay (both poles of any dc supply), the capacitors should be safely discharged via the external terminals prior to decommissioning.

Disposal: It is recommended that incineration and disposal to water courses is avoided. The product should be disposed of in a safe manner.

Maintenance

Mechanical Inspection

Inspect the relay for obvious signs of damage or ingress of moisture or other contamination.

Inspect the relay for signs of any overheating or burn marks which may have been caused by overvoltage surge or transient conditions on the power supply.

Test Intervals

The maintenance tests required will largely depend upon experience and site conditions, but as a general rule it is recommended that the following inspection and tests are performed every twelve months.

- Mechanical Inspection
- Check of Connections
- Insulation Resistance Test
- Flash test and trip check