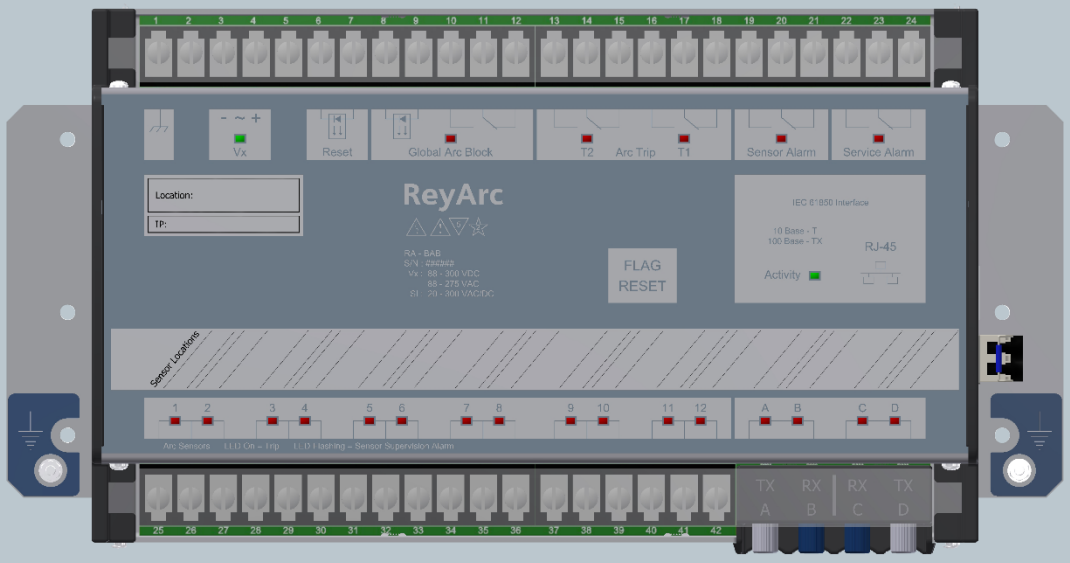


Reyrolle
Protection
Devices

# 7XG3124 - ReyArc24

**Arc Fault Monitor Relay**

## Energy Management

SIEMENS

# Contents

## Technical Manual Chapters

1. Installation

2. Application Guide

3. Commissioning

# 7XG3124

Installation Guide

## Document Release History

This document is issue 2019/02**.** The list of revisions up to and including this issue is:

| | |
|---|---|
| 2019/02 | Addition of Disposal information & update of photographs and drawings |
| 2014/09 | First issue |

## Software Revision History

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|---|---|---|
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# Section 1: Introduction

This manual is applicable to the following protection device:

**7XG3124 Arc Fault Detection Module**

**The 'Ordering Option' Tables summarise the features available in each model**

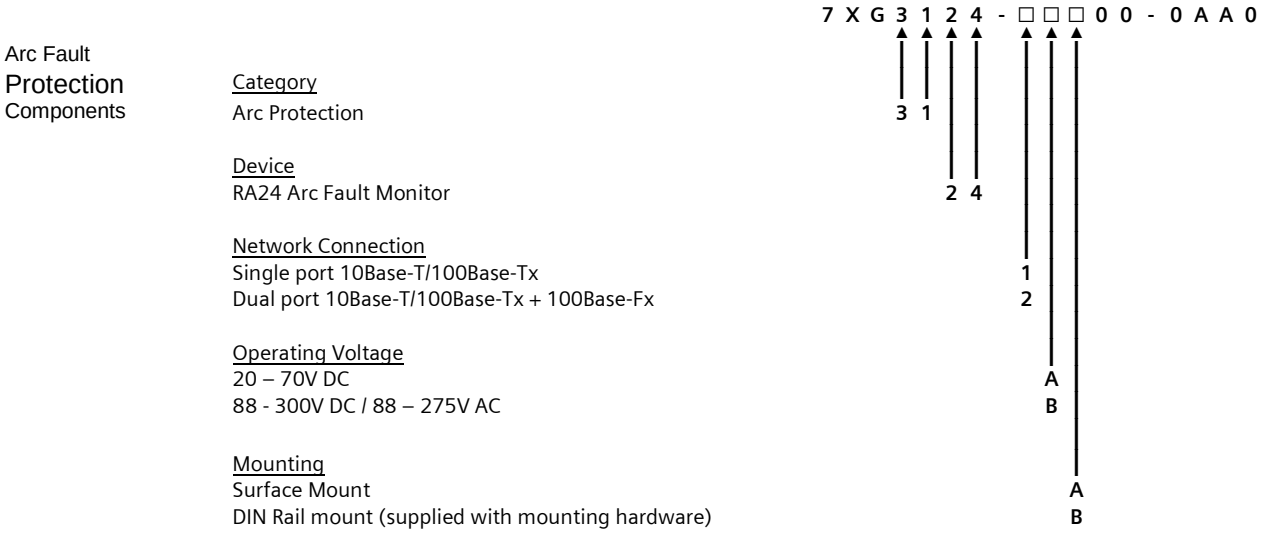


**Figure 1: 7XG3124 Ordering Options**

# Section 2: Hardware Description

## 2.1 Sensor Installation

### 2.1.1 Sensor Spacing

The RA30 sensor is available as a single detector or dual detector package.

The RA30A single detector version is depicted in figure 1 showing the location of the detection window and the approximate coverage zone:

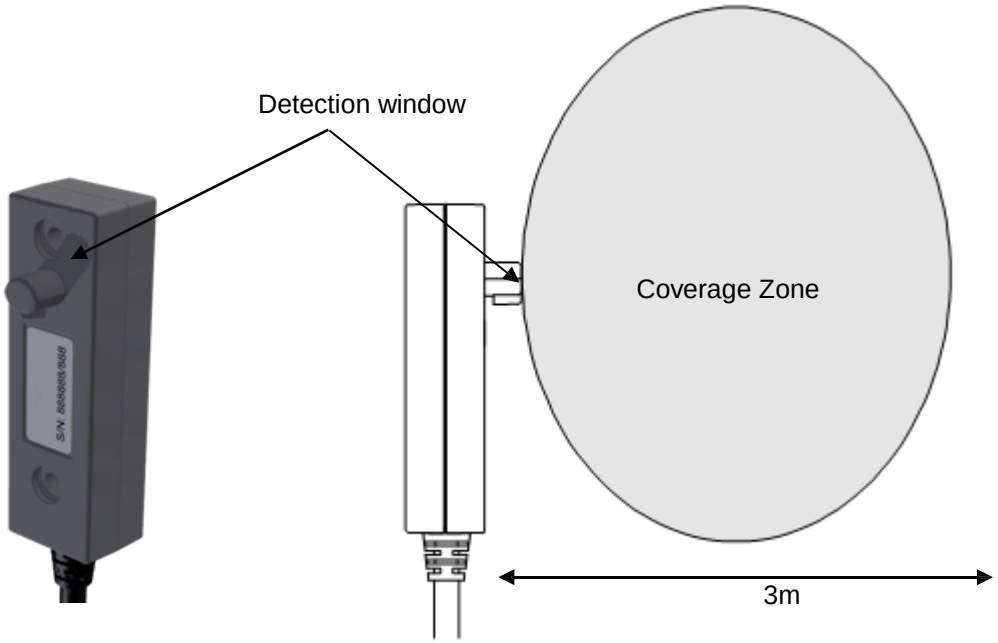


**Figure 2: RA30A single detector & Coverage Zone**

The recommended spacing for the RA30A single detectors is approximately 5 - 6 m to ensure adequate detection overlap.

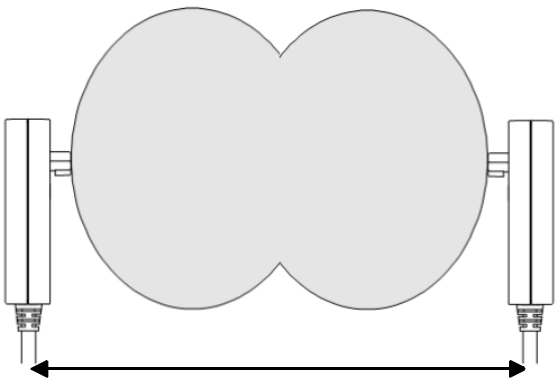


**Figure 3: RA30 Spacing**

The RA30B Dual detector version provides an additional detection window for dual zones of coverage as depicted below :

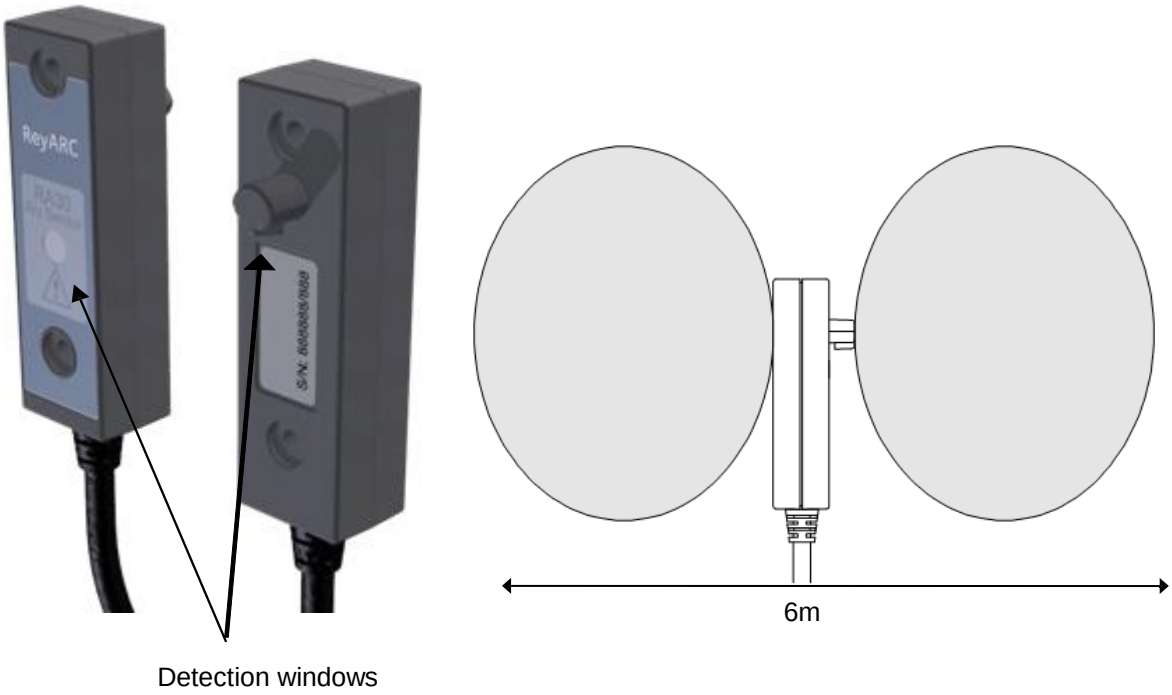


**Figure 4: RA30B Dual Detector**

The recommended spacing for the RA30B single detectors is approximately 5 - 6 m to ensure adequate detection overlap, this combination provides an overall coverage zone of approximately 10 -12 m.

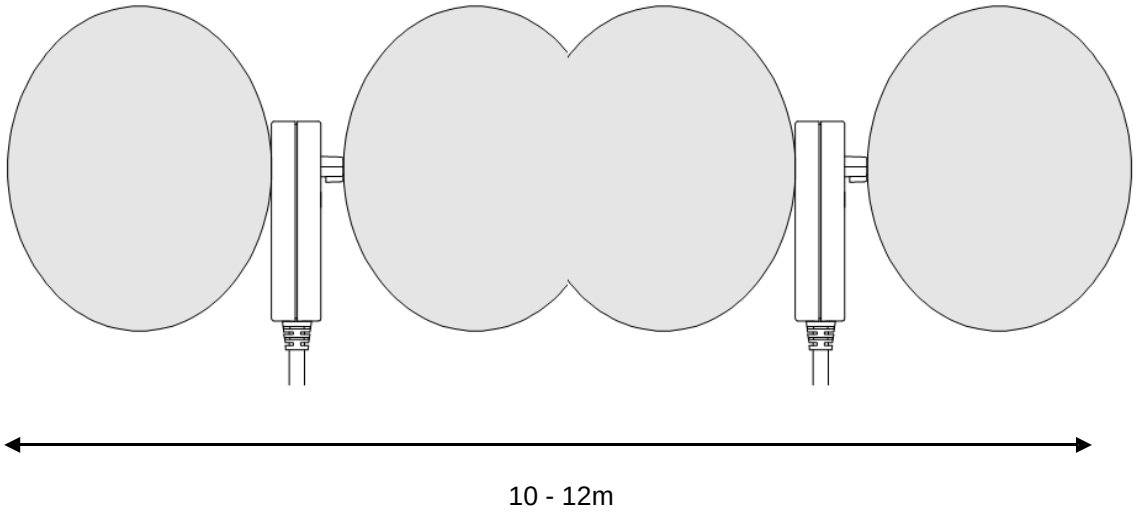


**Figure 5: RA30B Dual Detector Spacing**

The RA30A and RA30B sensors may also be mixed to provide various coverage combinations, again spacings of approximately 5 - 6 m should be observed to ensure adequate detection overlap.

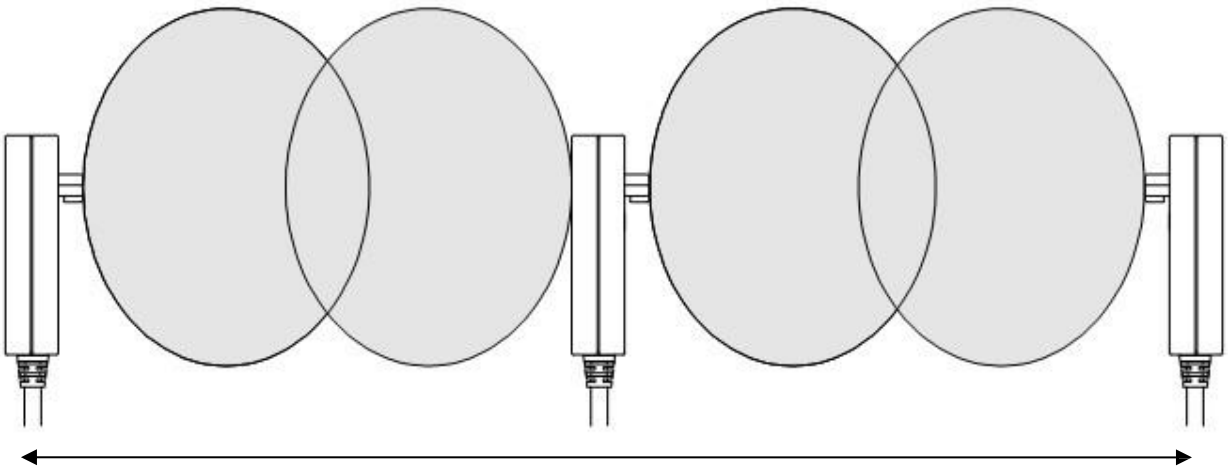


**Figure 6: RA30 & RA30B Spacing**

### 2.1.2 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.

### 2.1.3 Sensor Mounting

The RA30 is suitable for flush panel mounting in a number of configurations, for further information on mounting arrangements and mounting hardware refer to the RA30 Catalogue Sheet.

### 2.1.4 Example Sensor Placement

The following are some typical examples of sensor placement.


**Figure 7: Sensor placement inside CB racking chamber**

**Figure 8: Sensor placement inside busbar chamber**

**Figure 9: Sensor placement inside cable termination chamber**


**Figure 10: Sensor placement for switchgear Busbar coverage (External through Hole Detector)**

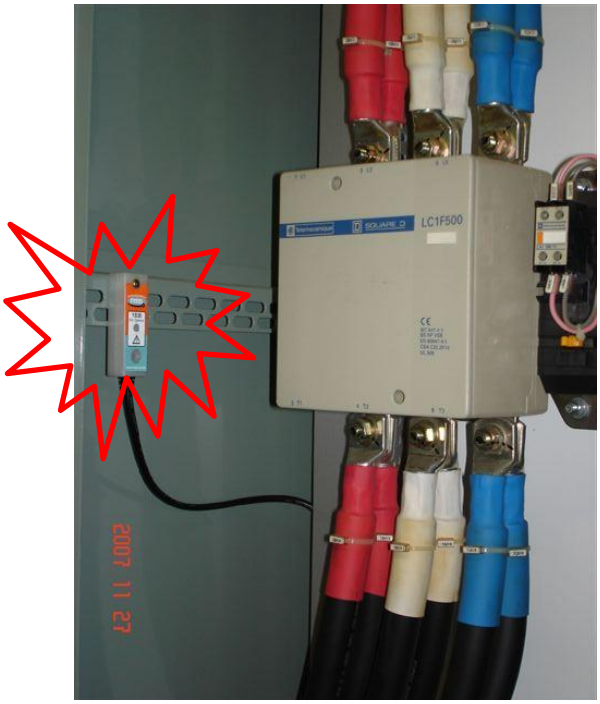


**Figure 11: Sensor placement near Low Voltage Contactor for a Variable Speed Drive**

**Figure 12: Sensor placement for Switchgear cable termination chamber (External through Hole Detector)**

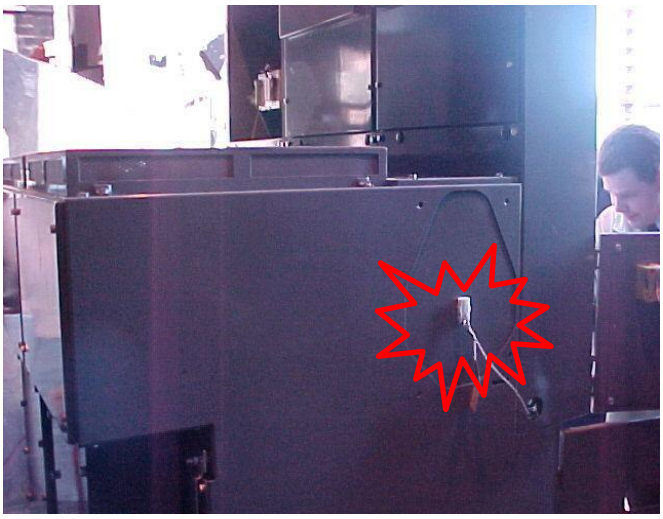

**Figure 13: Sensor placement for end of Bus chamber (External through Hole Detector)**

**Figure 14: Sensor placement for Switchgear cable termination chamber (External through Hole Detector)**

## 2.2 Scheme Wiring

### 2.2.1 RA24 Connection Diagram

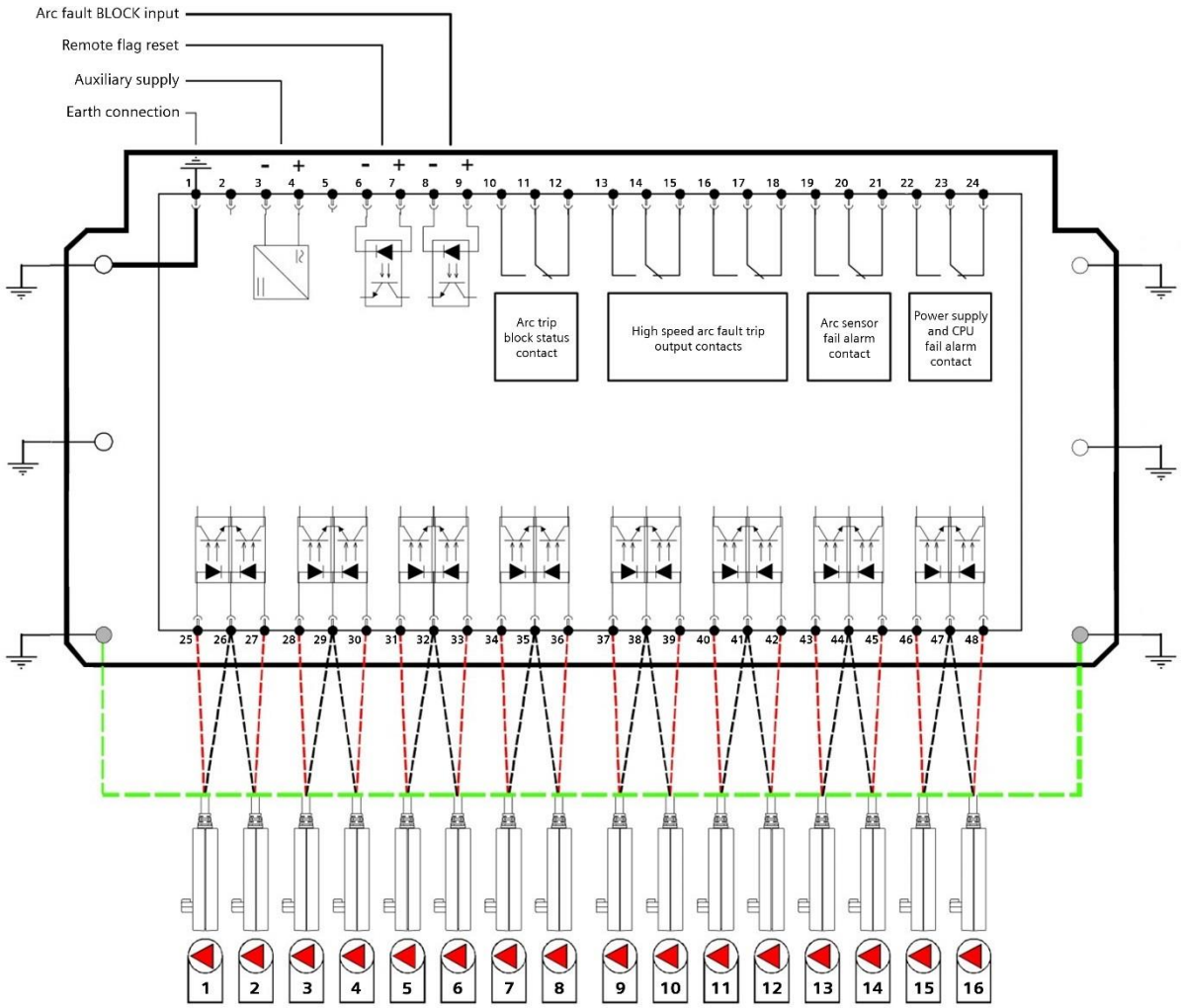


**Figure 15: RA24 Connection Diagram**

The above diagram shows the RA24 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

## 2.3 Terminal Layout and Module Dimensions

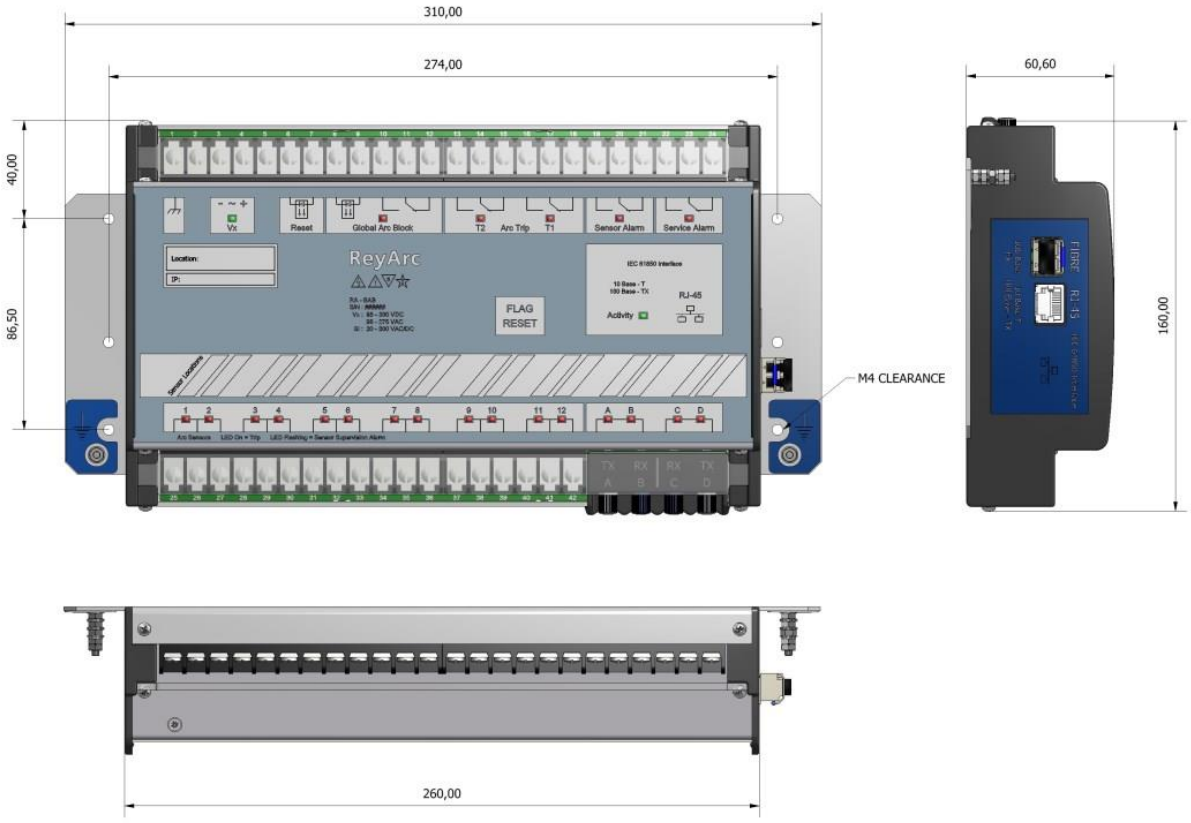


**Figure 16: Terminal Layout and Module Dimensions**

The module may be surface mounted or alternatively mounted on a din rail by using 2 optional din rail mounting kits (See Catalogue Sheet for Ordering Options)

## 2.4 Custom Labels

The RA24 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 Reyrolle website, printed and slipped behind the clear windows on the front panel as depicted below.

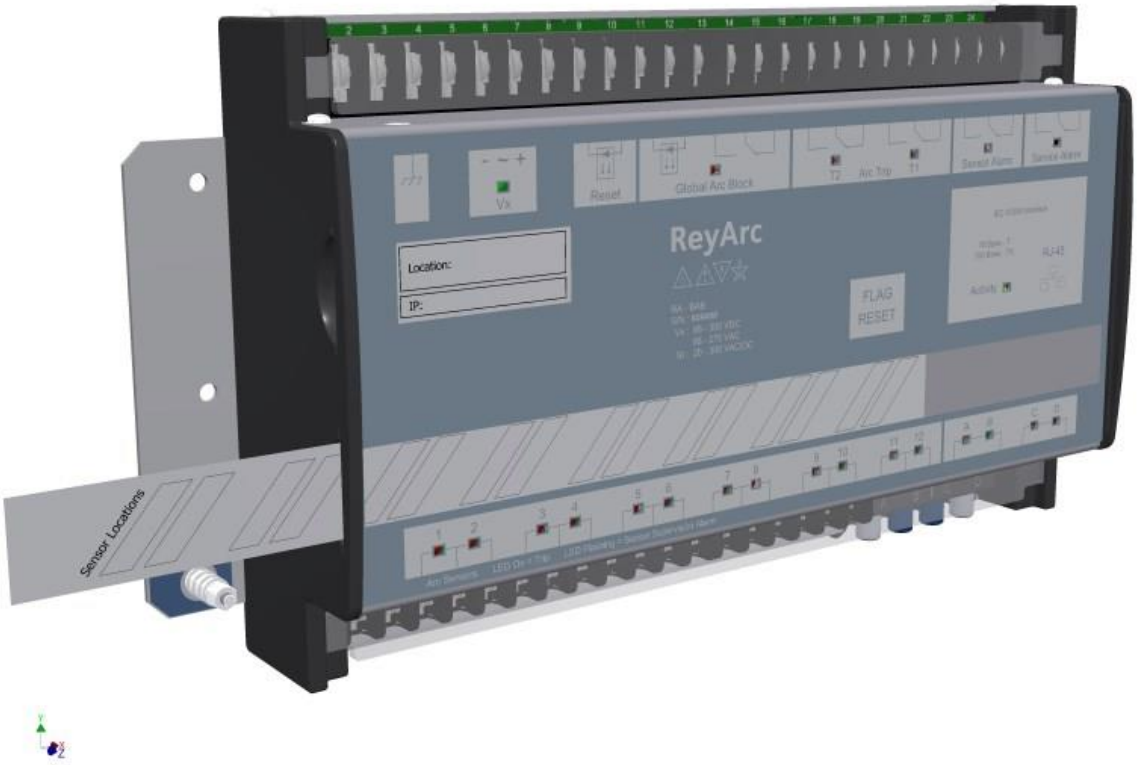


**Figure 17: RA24 Custom Label**

# Section 2: Communication

## 2.1 Physical Connections

The RA24 is ordered with either of the following Ethernet connection options :

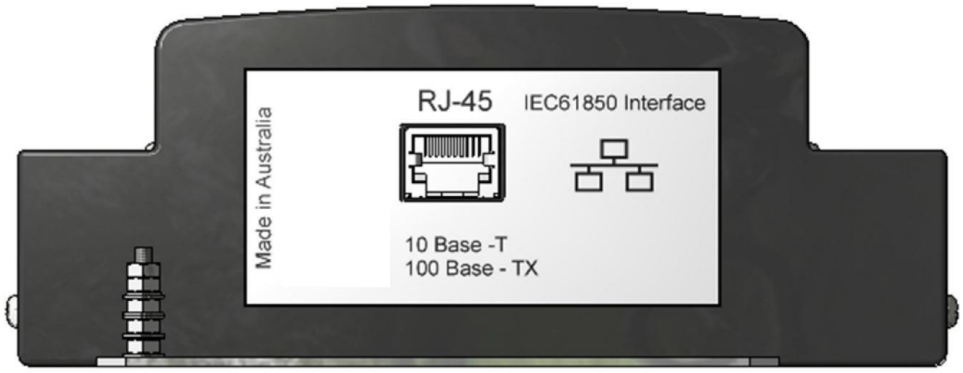


**Figure 18: RA24 RJ45 port**

**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.

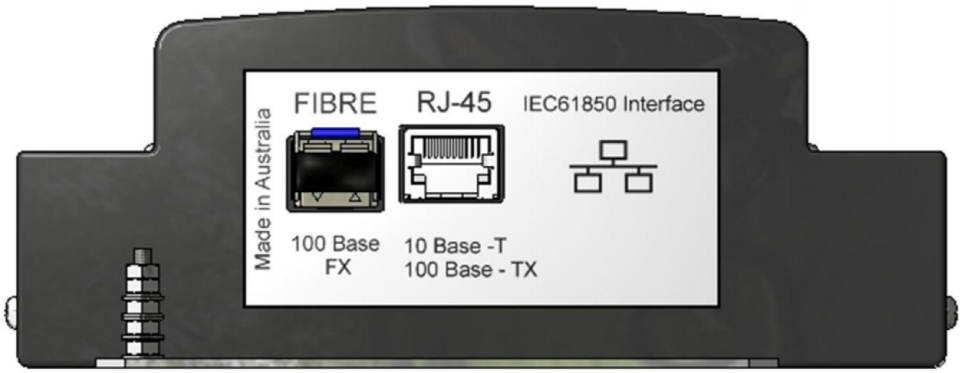


**Figure 19: RA24 RJ45 & FO ports**

**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

The RA24 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.

The simplest application topology is to connect a single RA24 directly with a single IED using a suitable crossover connection :


**Figure 20: RA24 Direct Connection**

Alternatively the RA24 or many RA24 Arc Fault Monitors may be connected to a Station Bus Lan as shown below :

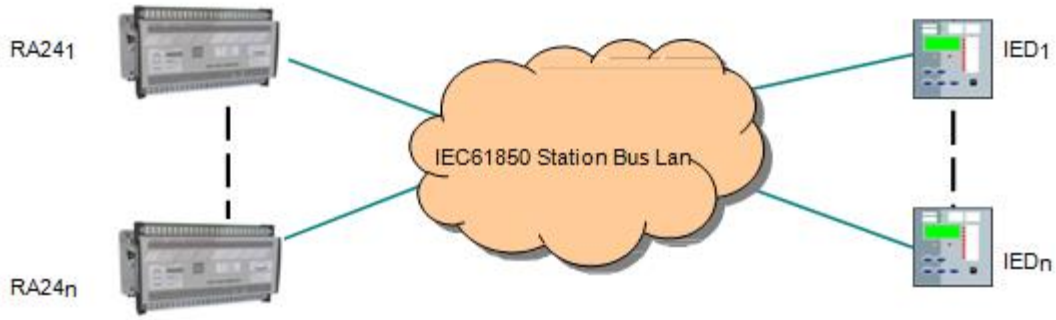


**Figure 21: RA24 IEC61850 Station LAN**

## 2.2 IP Addressing

The RA24 IED will come 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 RA24 IP address may be required according to the IP addressing defined in the IEC61850 substation configuration, any subsequent web browser sessions will need to utilise the reconfigured IP address.

# Section 3: RA24 File Glossary & Firmware Upgrade

## 3.1 RA24 File Glossary

### 3.1.1 1S24.cid

This XML file is interpreted by the RA24 every time it powers up to determine all nodes the RA24 will support, the explicit Goose and Report datasets *this* RA24 will output, and optionally set initial values of some configuration items. It also contains some private SystemCorp extensions. The IP address quoted in this file *must* match an IP address already configured on the RA24. It is used to select whether the RJ45 *or* Fibre ports are used for IEC61850. It is loaded onto A:\ drive using FTP. There are two .icd files that can be downloaded from Reyrolle website. Descriptions of both files are provided below:

#### 3.1.1.1 1S24.ICD

The ***1S24.cid*** can be used as-is on the RA24 and has a default set of 16 separate Goose messages, one for each FADet point with stVal and Quality included in the Goose. However, The IP address within this file, must match the IP Address configured on the RA24

#### 3.1.1.2 1S24-bare.icd

The ***1S24-bare.icd*** has an ICD extension as it is intended for importing into site configuration tools which can add specific Goose to it (with whatever VLAN, Versioning etc. required). The Tool can then export a CID file for use on the RA24. **Please Note:** On the RA24 itself, it must be called 1S24.cid.

### 3.1.2 sarc.exe

This file contains the runtime application code for the RA24 arc sensor. This executable includes the SystemCorp IEC6180 stack and all the RMS firmware. It is usually run at start-up by autoexec.bat. It is loaded onto A:\ drive using FTP.

### 3.1.3 test.exe

This file contains the test code for the RA24 hardware. It includes RMS test firmware. It is run manually on the command line, usually by the test-jig. 1S24.exe must not be running already, so an autoexec.bat that doesn't include 1S24.exe is required. Test.exe does not have to be removed after testing, it can remain on the A:\ drive. It is loaded onto A:\ drive using FTP.

### 3.1.4 PIS10.key

This is the special license key file required by the SystemCorp stack (see 1S24.exe) to allow it to run. A different key file is required for each BECK chip and is keyed to the Serial Number on the BECK chip.

**Note** that RMS production versions of the stack will not require a PIS10.key, but only BECK-IEC chips bought direct from BECK by RMS will allow this configuration. Others will require a specific key file. Some key files are located in:

L:\ENG\Projects\1s024\Firmware\release\A-drive\key

### 3.1.5 Autoexec.bat

Applications to run on start-up on the RA24 are listed in this file. Typically this includes sarc.exe and ETH1.exe on a runtime system.
For testing hardware it should not include sarc.exe.
For firmware debugging it should also include Probe.exe.

### 3.1.6 CHIP.INI

This is the BECK system configuration file.
When @CHIPTOOL or RA24 web app is used to configure IP addresses, or select DHCP, this file is modified automatically.
Other configuration items are included that are desirable for the proper operation of the RA24, so a default CHIP.INI file is included with the project. Ability to upgrade the operating system or not can be controlled using this file. Configuration of FTP, or enabling/disabling Telnet or SSH can be controlled using this file. It is loaded onto A:\ drive using FTP.

### 3.1.7 HTTP directory

This entire folder and sub-folders is required by the RA24 to support the web browser. If not present the web browser will give a default BECK screen or be unbrowsable. This folder and contents needs to be copied from the RA24 release project verbatim. The default web admin password is “RMS”. It is loaded onto A:\ drive using FTP.

### 3.1.8 ETH1.exe

An application supplied to support the 2nd Ethernet channel. On the RA24 this is used for the optic fibre port. It is loaded onto A:\ drive using FTP.

### 3.1.9 ARC_IO.hex

This Intel hex file is used to program the Arc IO expander peripheral on the relay/psu board. Programming of this file is done using Atmel JTAG or ISP dongles plugged onto the Jtag or ISP headers on the Relay PCB. It is not possible to upgrade this processor remotely via the BECK chip (yet).

### 3.1.10 SC1x3V0*xyy*_FULL.hex

This hex file contains version *x.y* of the BECK operating system. As of writing, the latest version is *1.51*. At least this version must be present on the BECK board to properly support RA24 operation. The upgrade procedure is detailed below. Chips supplied from BECK may not have necessarily have the most recent operating system version installed. Version *1.20* was seen on BECK chips supplied by SystemCorp.

## 3.2 Upgrading the RA24

### 3.2.1 Upgrading the Operating System

- Connect Ethernet cable to RJ45
- Run @CHIPTOOL on PC
- If necessary configure target RA24 to be on same IP network as your PC or configure DHCP
- Ensure there is a CHIP.INI installed that allows upgrades. TFTP must be enabled, which is disabled by default for security.
- Right click on target RA24 and select Program Flash image
- IP address of target device should appear in UDP/IP subsection
- Browse for “Load File” to select the new SC1x3V0*xyy*_FULL.hex file
- Click “Start” in the UDP/IP subsection
- Do not power off RA24 until upgrade has completed

### 3.2.2 Upgrading the RA24 firmware

- Connect Ethernet cable to RJ45
- Run @CHIPTOOL on PC
- If necessary configure RA24 to be on same network as PC or configure DHCP
- Right click on target RA24 and select FTP
- FTP username=ftp, password=ftp are the factory defaults
- Copy new sarc.exe from PC to A: on RA24
- Reboot RA24.
- Default Autoexec.bat starts sarc.exe on startup.

## 3.3 Loading a new sub-station configuration

As an IEC61850 device, the RA24 needs to be configured so it can communicate appropriately in a particular sub-station. How and which GOOSE messages are sent between IED devices is setup in a system configurator. Information the RA24 requires as a result of this configuration of the site are the GOOSE datasets that must be sent by this RA24, and the Report datasets that must be sent, and where to.

The exact procedure may differ based on which system configurator is used, so here is the procedure that works for communication with a Reyrolle relay using the Siemens DIGSI system Configurator

## 3.4 Setting up a new RA24

These are the steps that are used to convert a bare board into a RA24. These steps will normally be done automatically by the production test jig, but it is worth documenting them here. In this case I'm using Ethernet whereas the test-jig will use a serial port, but they are doing the same thing.

- Connect an Ethernet cable to the RJ45 connector
- Run @CHIPTOOL on PC
- If necessary configure RA24 to be on same network as PC or configure DHCP
- Right click on target RA24 and select FTP
- Copy entire **http** folder to the RA24 A:\
- Edit CHIP.INI on PC to set the IP addresses
- Copy ETH1.exe, test.exe, CHIP.INI, Autoexec.bat, 1S24.cid, sarc.exe to the RA24 A:\
- Connect ISP dongle to relay card
- Use RA24 ArcIO upgrade tool or AVR Studio to load ATmega64 chip with IO firmware
- Reboot
- **NB:** IP address will change to that in copied CHIP.INI
- Browse the IP address on the web and configure RA24 as required.

## 3.5 Configuring a RA24

- RA24 configuration can be achieved in 3 ways with the same result: Use a web browser set to the RA24 IP address to configure individual ARC sensors on or off, and whether it is included in the overall alarm output. You can also change the default admin password from "RMS" and configure the IP and SNTP parameters.
- Use a terminal (either telnet from @CHIPTOOL, or a serial port terminal) to bring up the command line interface. Use CLI commands to configure parameters as required. Ctrl-F may be required to switch context.
- Edit the 1S24.cid file to contain initial values for some nodes. The IP address does not change the RA24 IP address, but must match either the RJ45 or Fibre IP address. FTP (from @CHIPTOOL) the new file onto the RA24. Reboot. These parameters will be loaded as the file is read on startup. Configuring an Arc sensor on/off or included is also possible this way. This is a convenient way to setup a number of RA24's with the same configuration.

# Section 4: Environmental Protection Hints

**Disposal of Old Equipment and Batteries (Applicable only for European Union and Countries with a Recycling System)**

The disposal of our products and possible recycling of their components after decommissioning has to be carried out by an accredited recycling company, or the products/components must be taken to applicable collection points. Such disposal activities must comply with all local laws, guidelines and environmental specifications of the country in which the disposal is done. For the European Union the sustainable disposal of electronic scrap is defined in the respective regulation for "waste electrical and electronic equipment" (WEEE).

The crossed-out wheelie bin on the products, packaging and/or accompanying documents means that used electrical and electronic products and batteries must not be mixed with normal household waste.
**According to national legislation, penalties may be charged for incorrect disposal of such waste**.

By disposing of these products correctly you will help to save valuable resources and prevent any potential negative effects on human health and the environment.

**NOTE:** Our products and batteries must not be disposed of as household waste. For disposing batteries it is necessary to observe the local national/international directives.

**Disposal of Mobile Storage Devices (e.g. USB Sticks and Memory Cards)**

When disposing of/transferring mobile storage devices, using the **format** or **delete** functions only changes the file management information and does not completely delete the data from your mobile storage device. When disposing of or transferring a mobile storage device, Siemens strongly recommends physically destroying it or completely deleting data from the mobile storage device by using a commercially available computer data erasing software.

**REACH/RoHS Declaration**

You can find our current **REACH/RoHS** declarations at:

https://www.siemens.com/global/en/home/products/energy/ecotransparency/ecotransparency-downloads.html

**NOTE:** You can find more information about activities and programs to protect the climate at the EcoTransparency website:

https://www.siemens.com/global/en/home/products/energy/ecotransparency.html

# 7XG3124

Application Guide

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| | |
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| 2019/02 | Updates Figure 47 photograph |
| 2014/09 | First Issue |

## Software Revision History

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# Section 1: RA24 Arc Fault Monitor Configuration

## 1.1 Web Browser Session

Configuration of a RA24 can be undertaken either via direct connection to a PC or via a Lan.

If a direct connection to a PC is utilitised a crossover patch lead will be required to enable communication with the RA24.

Whether the communication is direct or via a LAN, both the PC and the RA24 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 RA24 and the last octet needs to be unique, for example:

RA24 IP Address: 192.168.0.220
PC IP Address: 192.168.0.238

In the above example entering the RA24 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.

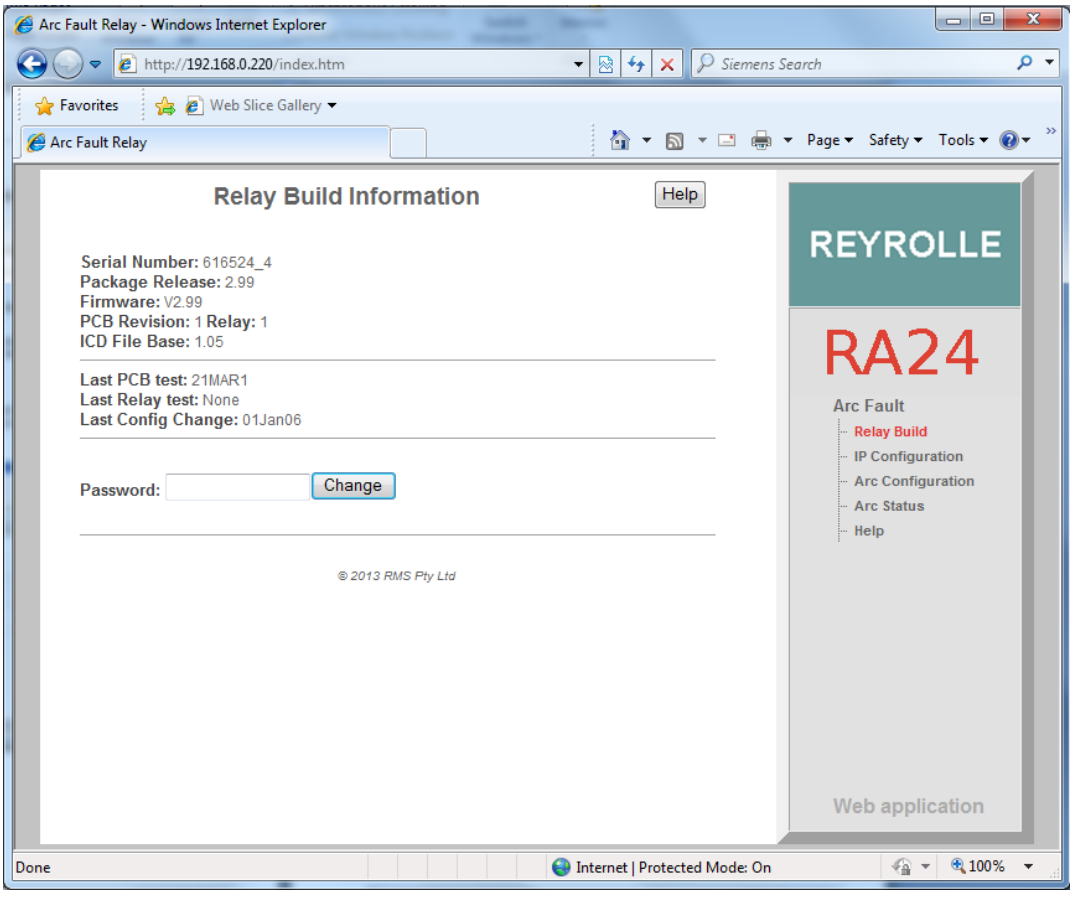



**Figure 1: Web Browser Session**

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

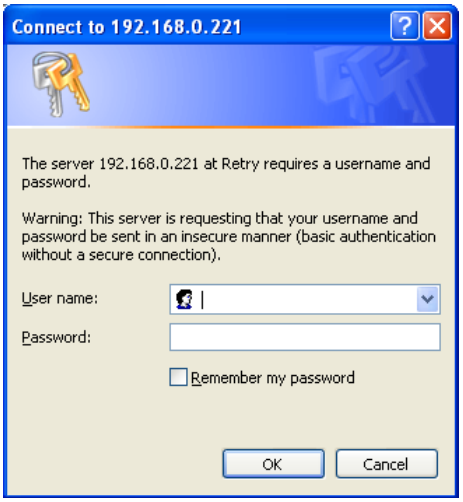



**Figure 2: RA24 Login window**

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.

## 1.2 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.

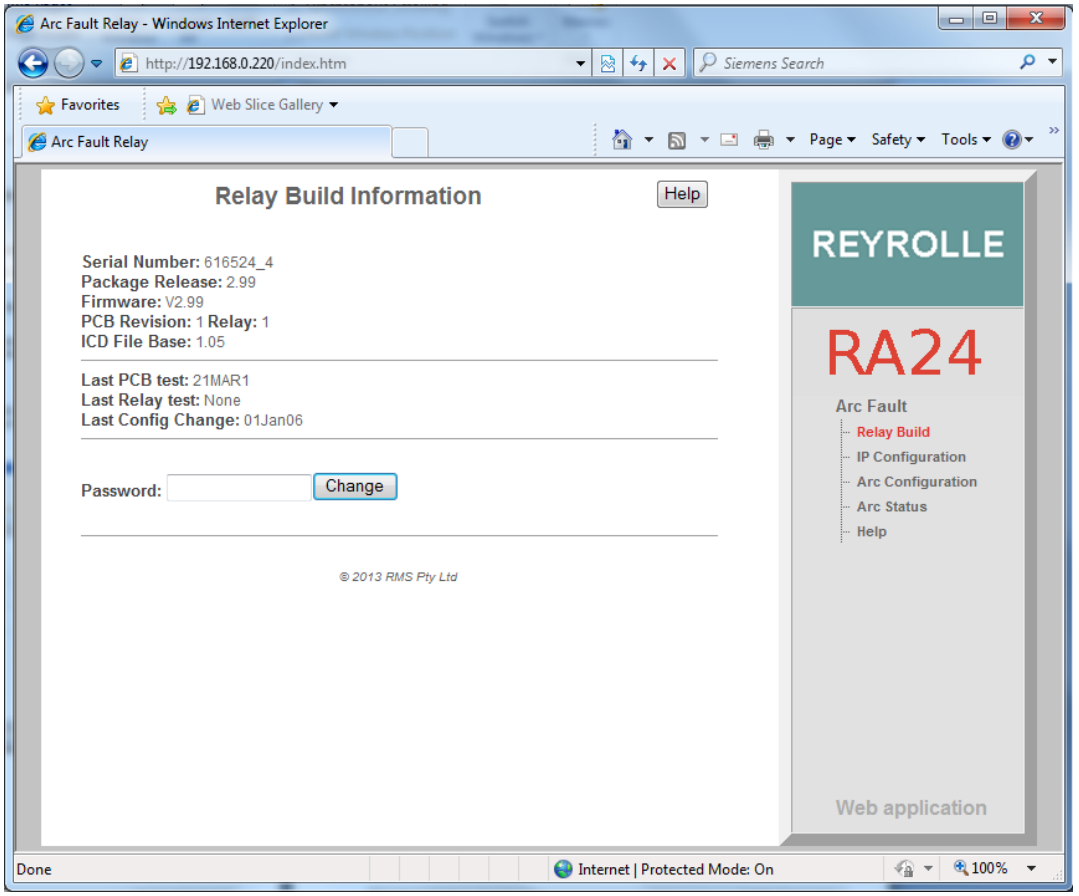



**Figure 3: RA24 Homepage**

## 1.3 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.

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 RA24 will attempt to find a default SNTP server if available.

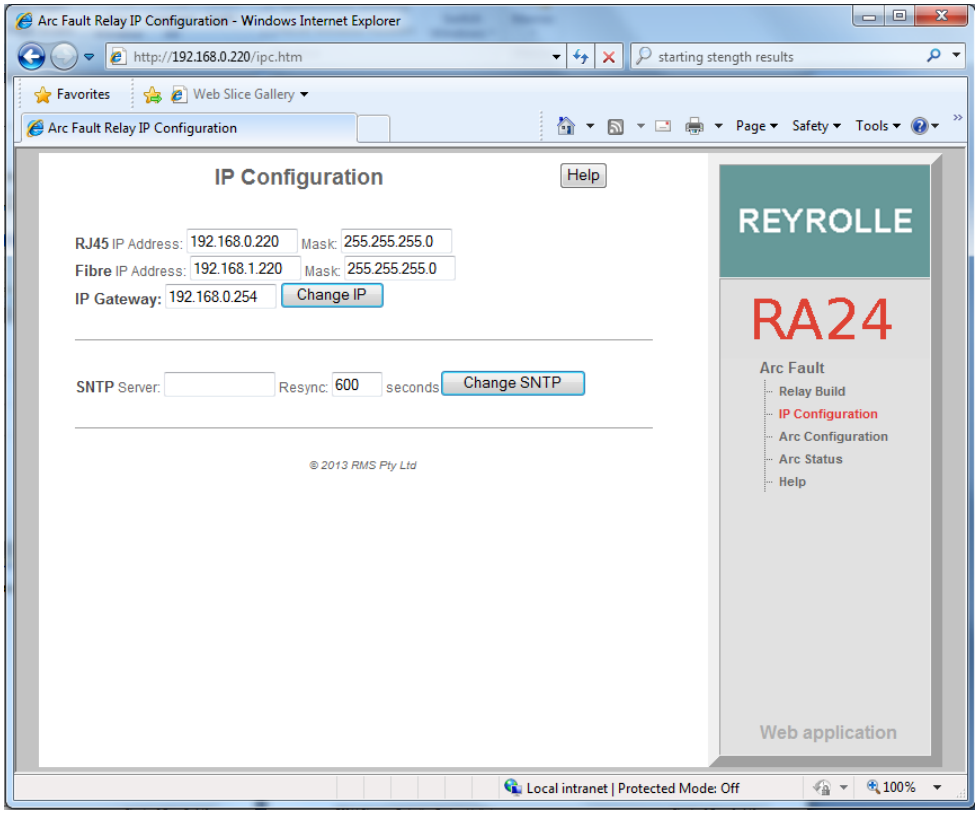
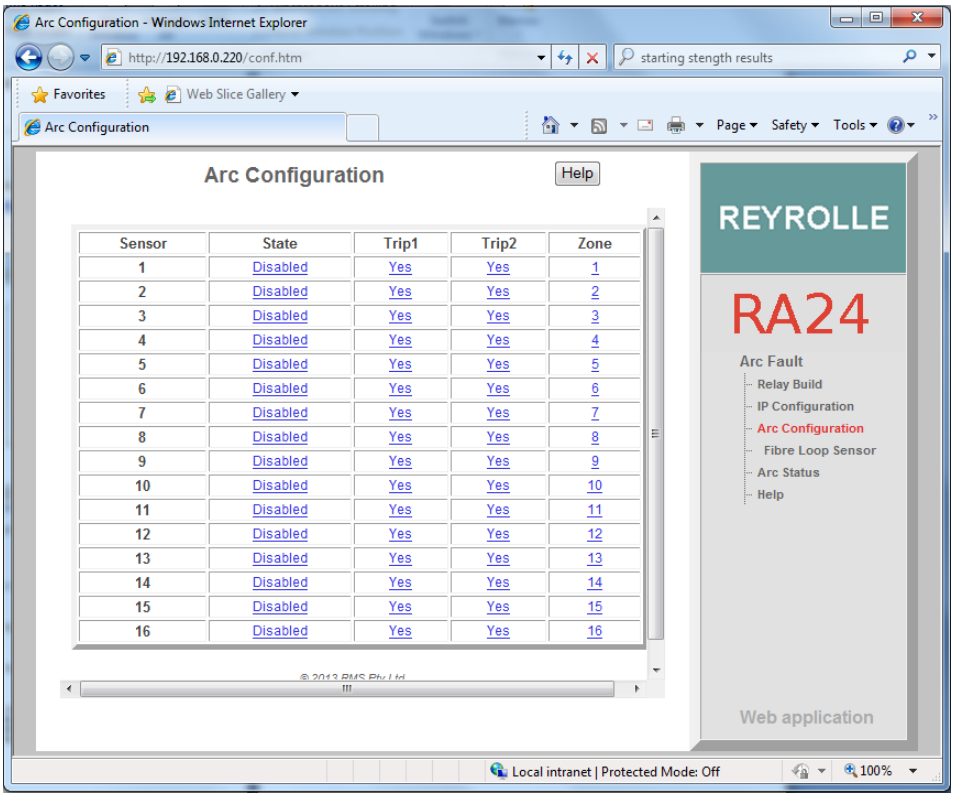



**Figure 4: RA24 IP Configuration**

## 1.4 Arc Configuration

The Arc Configuration screen provides configuration settings for each of the 16 Sensor inputs.




| Sensor | State | Trip1 | Trip2 | Zone |
|---|---|---|---|---|
| 1 | Disabled | Yes | Yes | 1 |
| 2 | Disabled | Yes | Yes | 2 |
| 3 | Disabled | Yes | Yes | 3 |
| 4 | Disabled | Yes | Yes | 4 |
| 5 | Disabled | Yes | Yes | 5 |
| 6 | Disabled | Yes | Yes | 6 |
| 7 | Disabled | Yes | Yes | 7 |
| 8 | Disabled | Yes | Yes | 8 |
| 9 | Disabled | Yes | Yes | 9 |
| 10 | Disabled | Yes | Yes | 10 |
| 11 | Disabled | Yes | Yes | 11 |
| 12 | Disabled | Yes | Yes | 12 |
| 13 | Disabled | Yes | Yes | 13 |
| 14 | Disabled | Yes | Yes | 14 |
| 15 | Disabled | Yes | Yes | 15 |
| 16 | Disabled | Yes | Yes | 16 |

**Figure 5: RA24 Arc Configuration**

There are 4 settable parameters for each sensor input:

**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 & 2 Output Contacts**
The RA24 provides two high speed tripping output contacts (Trip 1&2). These may be employed for local tripping functions and for system testing purposes. Each sensor input may be set to trip either of the output contacts. The arc trip contacts will self-reset after a 2s delay. The trip indication LED is reset either by pressing the front panel reset button, via the remote reset status input or via IEC61850 control.

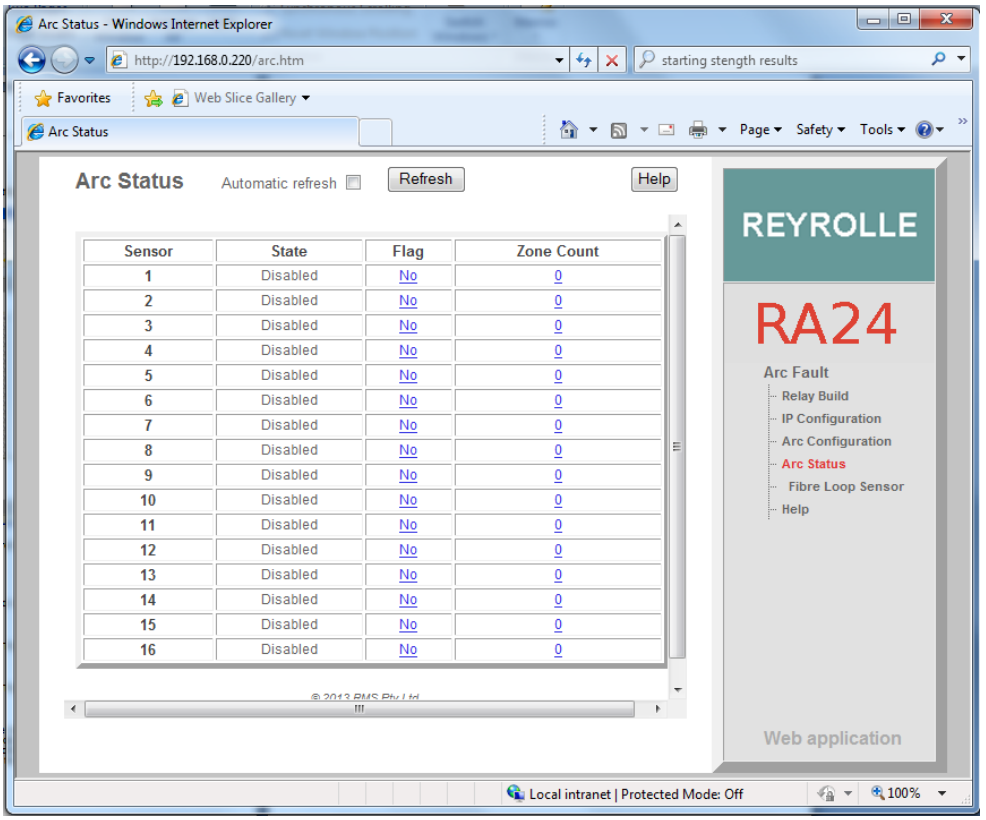
**Trip 1**
Yes or No, determines if the Sensor input operates the Trip 1 output, click on the field to change the state and enter the user name and password if prompted

**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

## 1.5 Arc Status

The Arc Status screen provides status information on each of the of the 16 Sensor inputs.




| Sensor | State | Flag | Zone Count |
|---|---|---|---|
| 1 | Disabled | No | 0 |
| 2 | Disabled | No | 0 |
| 3 | Disabled | No | 0 |
| 4 | Disabled | No | 0 |
| 5 | Disabled | No | 0 |
| 6 | Disabled | No | 0 |
| 7 | Disabled | No | 0 |
| 8 | Disabled | No | 0 |
| 9 | Disabled | No | 0 |
| 10 | Disabled | No | 0 |
| 11 | Disabled | No | 0 |
| 12 | Disabled | No | 0 |
| 13 | Disabled | No | 0 |
| 14 | Disabled | No | 0 |
| 15 | Disabled | No | 0 |
| 16 | Disabled | No | 0 |

**Figure 6: RA24 Arc Status**

**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.

## 1.6 Summary of RA24 SARC Configuration

The following steps outline the RA24 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 utilized in the application
- ✓ Set which outputs are to be operated by the respective ARC sensors

# Section 2: IEC61850 Substation Configuration

## 2.1 Application Example

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 RA24 Arc Fault Monitor used in conjunction with 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 RA24 IEDs using the default RA24 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 RA24 : SARCs) and the subscribing IED (in our example we use GGIO)
- ✓ With all GOOSE mapping complete create a .cid file for the RA24 using the export facility in the System Configurator
- ✓ FTP the 1S24 .cid file into the RA24
- ✓ Reboot the RA24 to invoke the GOOSE mapping
- ✓ Create the subscribing relay application logic that will make use of the status changes in the subscribed GOOSE messages from the RA24
- ✓ Send the relay configurations as well as IEC 61850 to the respective subscribing IEDs in the application

## 2.2 Arc Fault Scheme

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

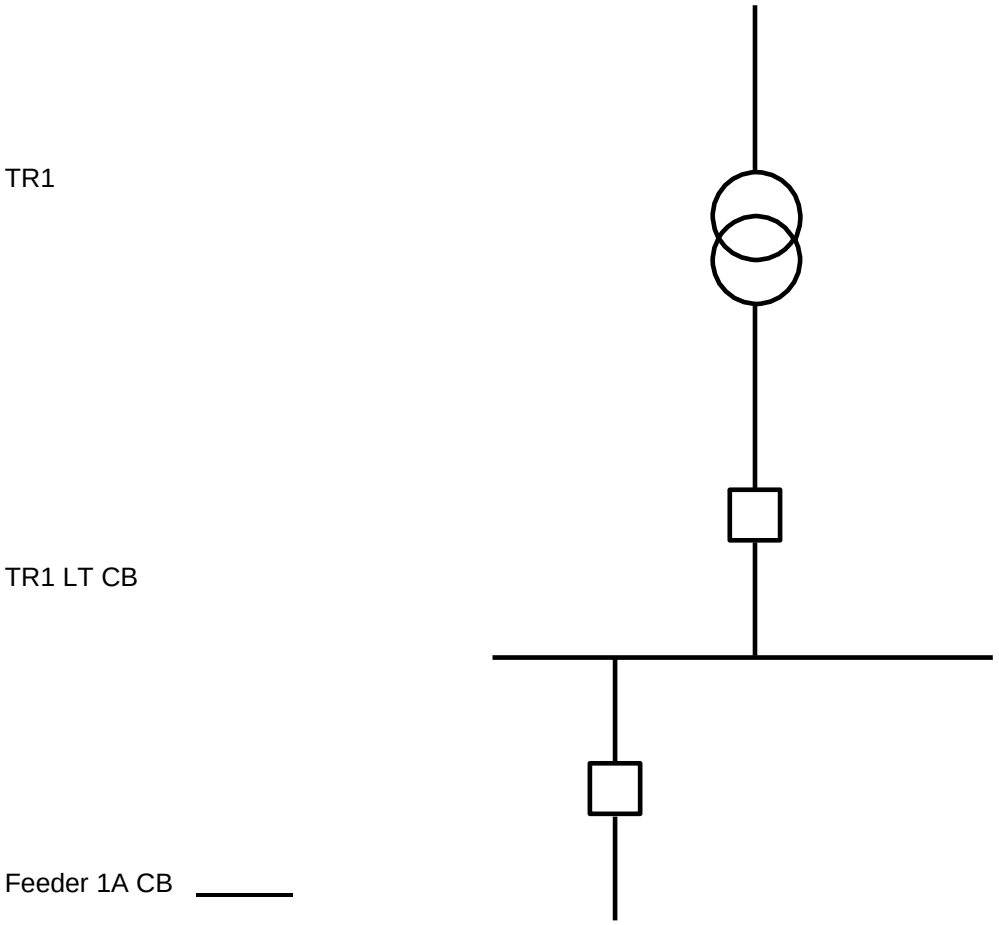



**Figure 7: Single Line Arc Fault Scheme**

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 sectionalizing and minimize affected plant.

**The proposed scheme is as follows:**

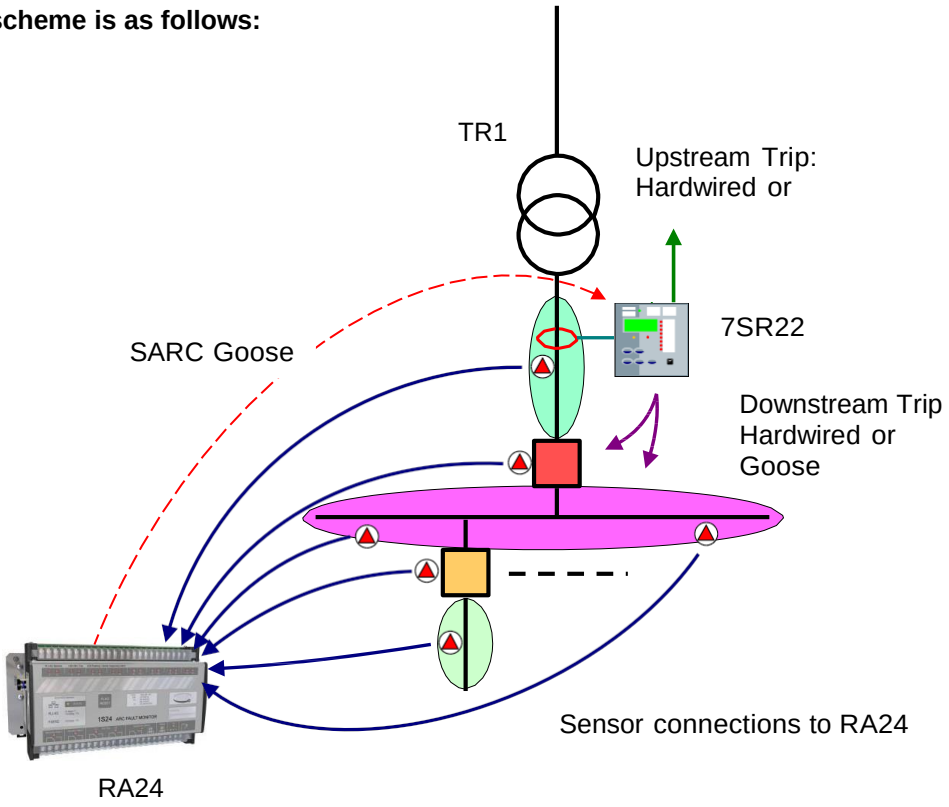



**Figure 8: RA24 Sample Protection Scheme**

The scheme comprises of RA30 sensors connected to a RA24 Arc Fault Monitor, providing ARC Fault coverage of the colored protection zones.

The RA24 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.

## 2.3 RA24 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<br>SARC 4 |
| Incomer CB Chamber | | 1 | SARC 5 |
| Incomer Termination Chamber | | 1 | SARC 6 |

**Table 1: RA24 SARC Allocation 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 |

**Table 2: RA24 Protection Zone Tripping**

## 2.4 RA24 Source Arc Fault Detector Points

The RA24 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_RA24/DEV_RA24/RMS_SARC1/FADET | RA24 Arc Fault Detector 1 |
| SARC2 | RMS_RA24/DEV_RA24/RMS_SARC2/FADET | RA24 Arc Fault Detector 2 |
| SARC3 | RMS_RA24/DEV_RA24/RMS_SARC3/FADET | RA24 Arc Fault Detector 3 |
| SARC4 | RMS_RA24/DEV_RA24/RMS_SARC4/FADET | RA24 Arc Fault Detector 4 |
| SARC5 | RMS_RA24/DEV_RA24/RMS_SARC5/FADET | RA24 Arc Fault Detector 5 |
| SARC6 | RMS_RA24/DEV_RA24/RMS_SARC6/FADET | RA24 Arc Fault Detector 6 |

**Table 3: RA24 Source Arc Fault Detector Points**

## 2.5 7SR22 Single Point Input GGIO Allocation

The 7SR22 relay will subscribe to SARC Goose messages broadcast by the RA24 IED and shall assign subscribed SARCs to Single Point Input GGIO as follows :

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

**Table 4: 7SR22 Single Point Input GGIO Allocation**

## 2.6 Creating an IEC61850 Station

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 RA24 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 utilized to create any required logic in Reyrolle devices.

A screenshot of Reydisp Manager is shown below :

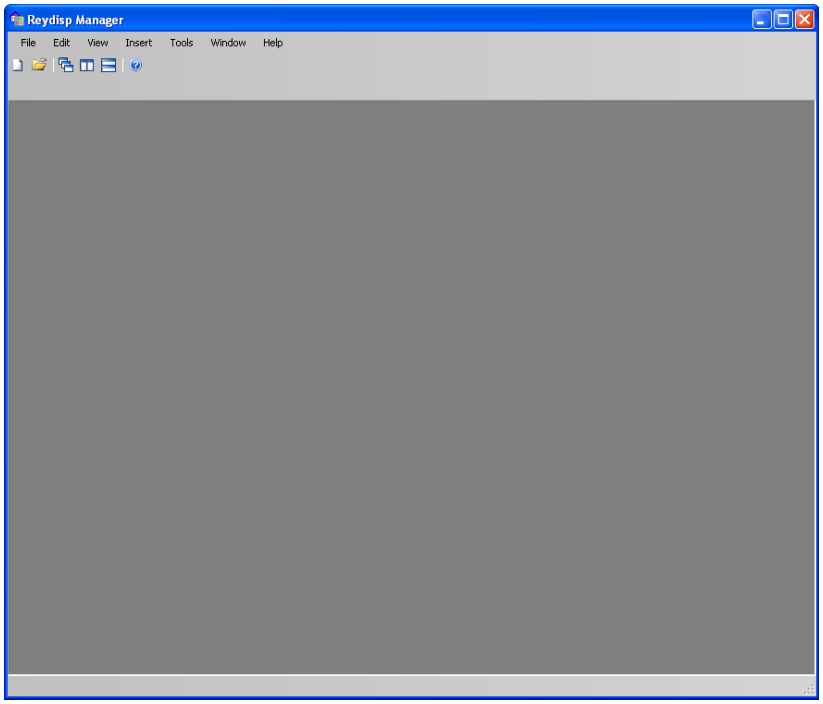



**Figure 9: Reydisp Manager Configuration - 1**

To create a new project choose File and New.

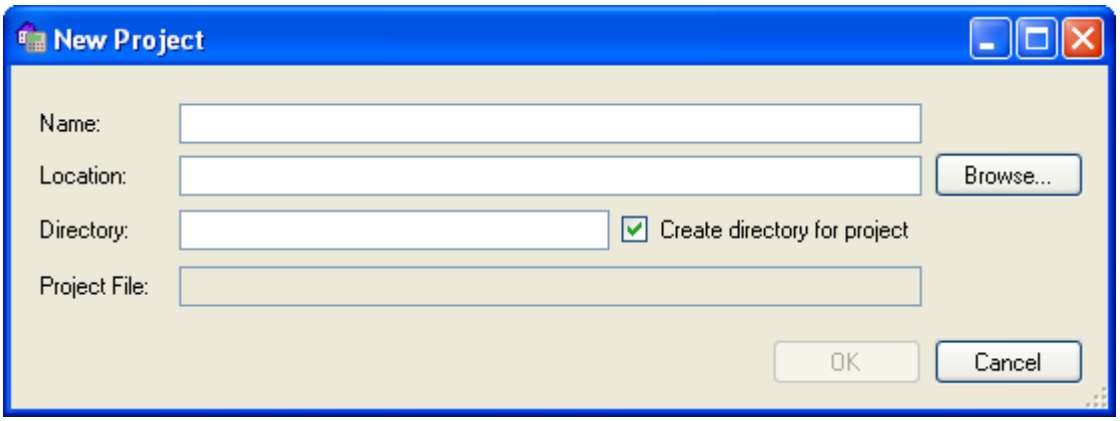



**Figure 10: Reydisp Manager – New Project**

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

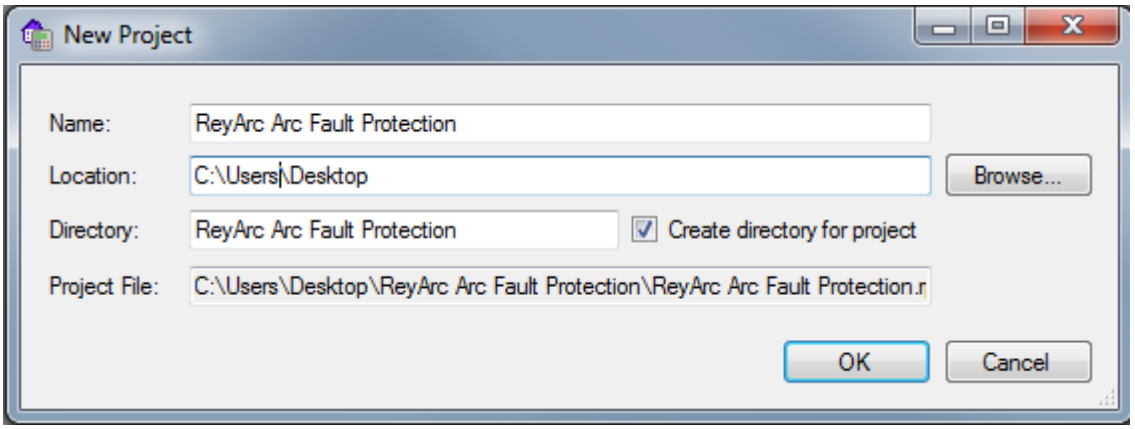



**Figure 11: Reydisp Manager – New Project 2**

The new project has been created.

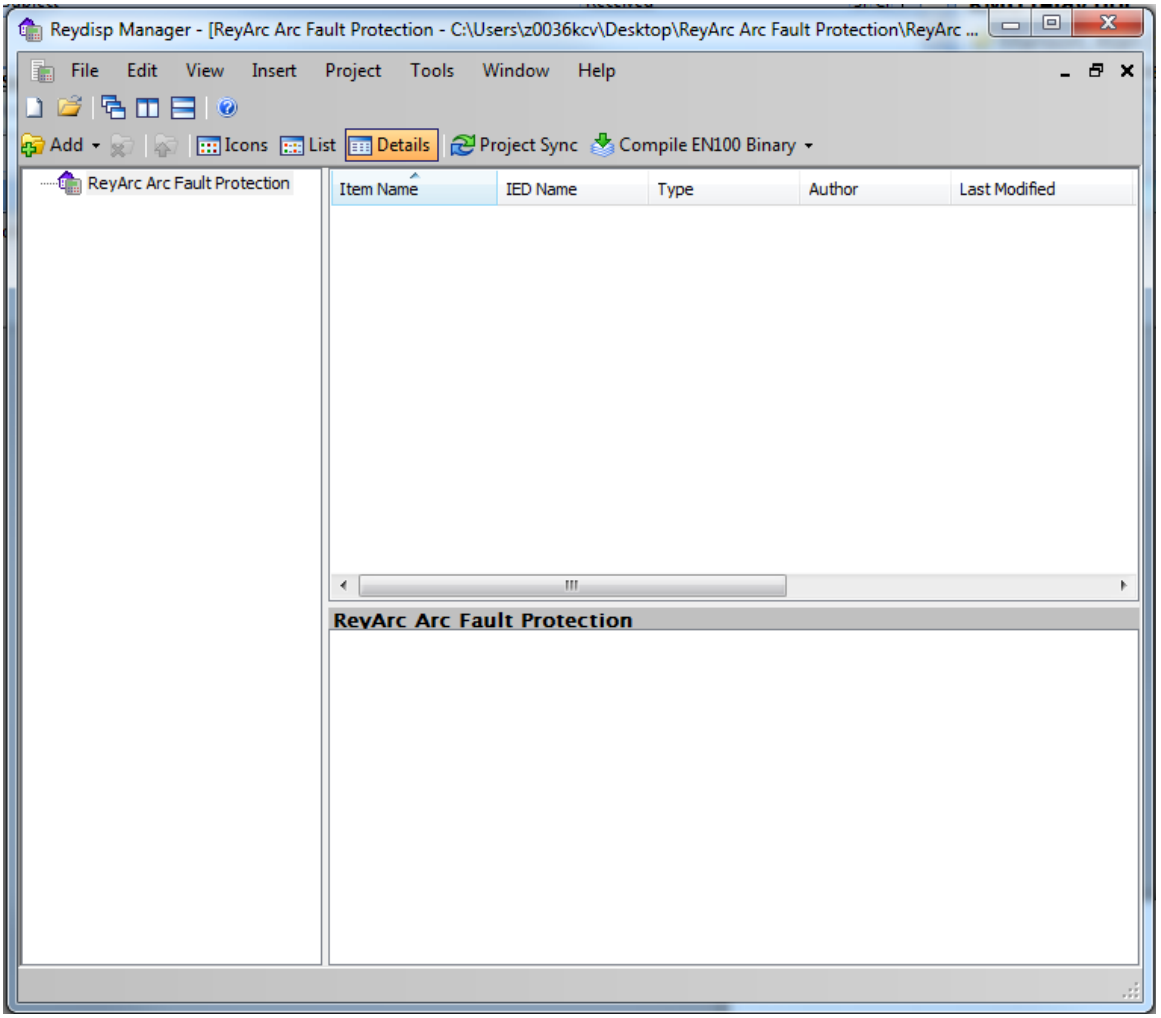



**Figure 12: Reydisp Manager – New Project 3**

## 2.7 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.

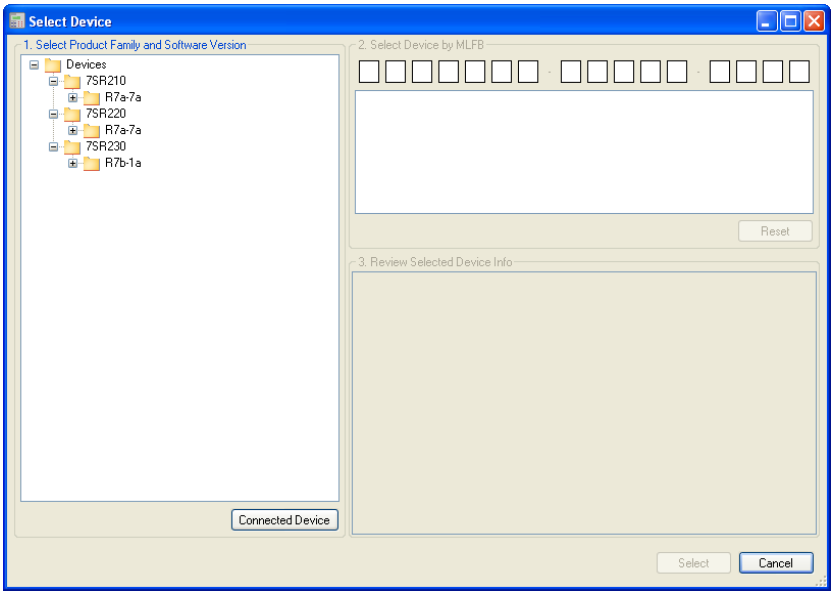



**Figure 13: Reydisp Manager – Add Device**

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

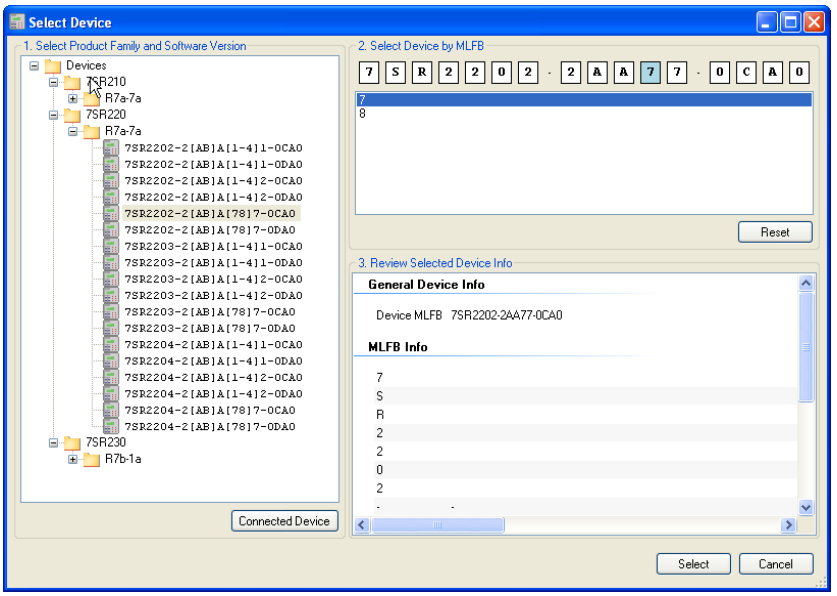



**Figure 14: Reydisp Manager – Add Device 2**

Once the MLFB code is correctly selected, you can then select the device.

The 7SR22 IED has been added to your project.

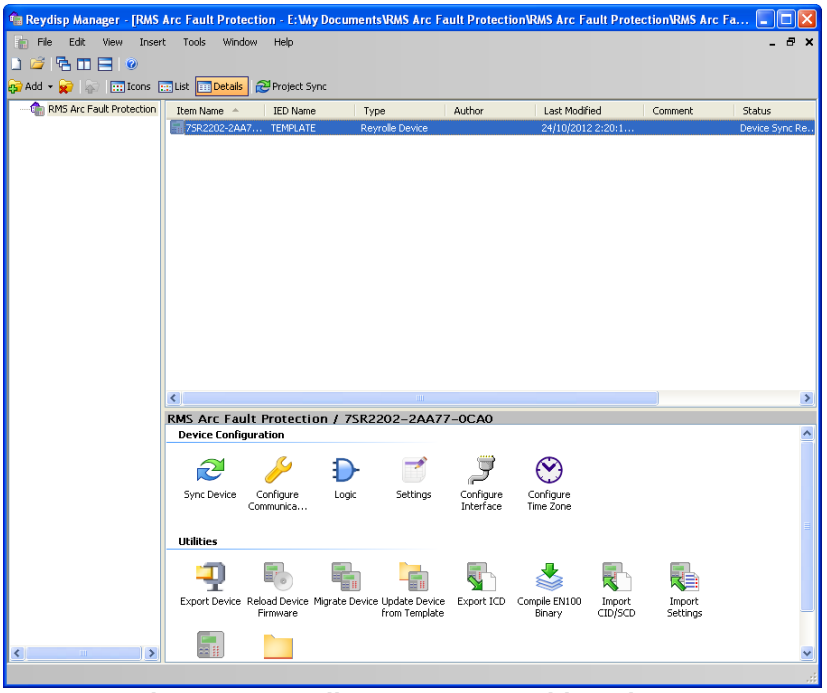



**Figure 15: Reydisp Manager – Add Device 3**

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.

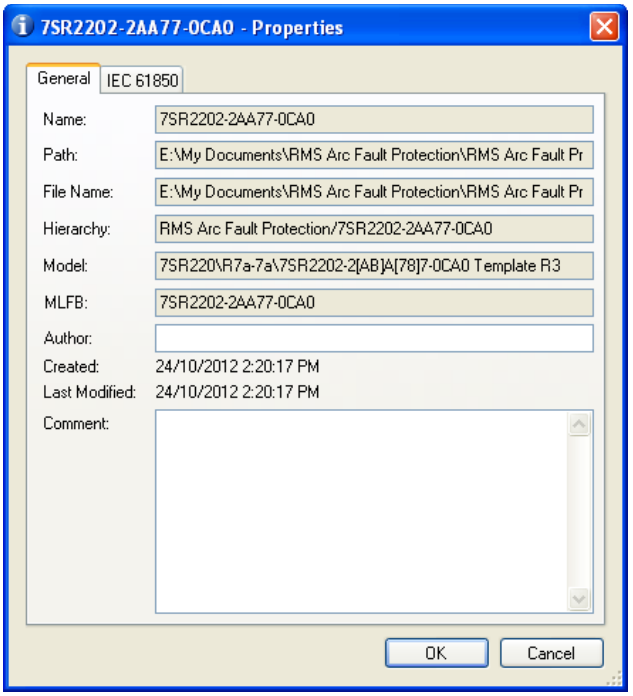



**Figure 16: Reydisp Manager – Rename Device**

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

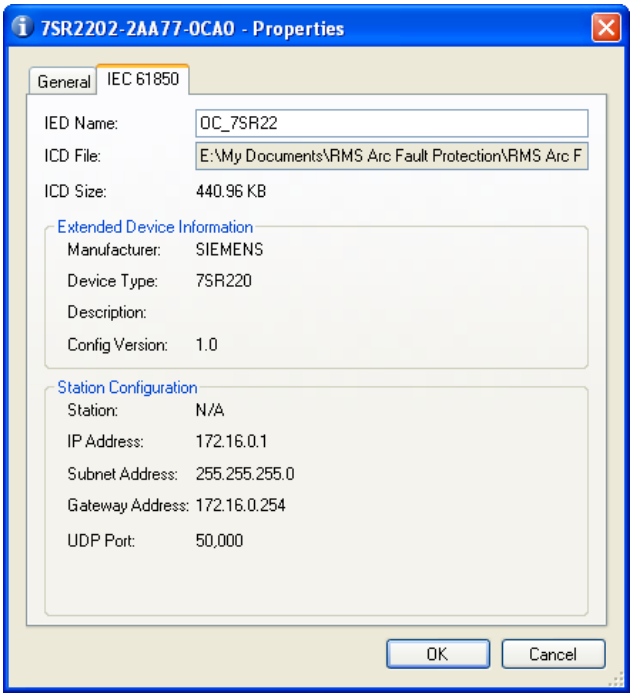



**Figure 17: Reydisp Manager – Rename Device 2**

Next we will add the ReyArc RA24 IED which is added as a Third Party ICD File. You will need to have the RA24 ICD file (Note: This file is called 1S24.icd) which is available through the Reyrolle website.

Choose Insert and Third Party ICD File and you will be presented with the following file selection, choose the RA24 ICD file

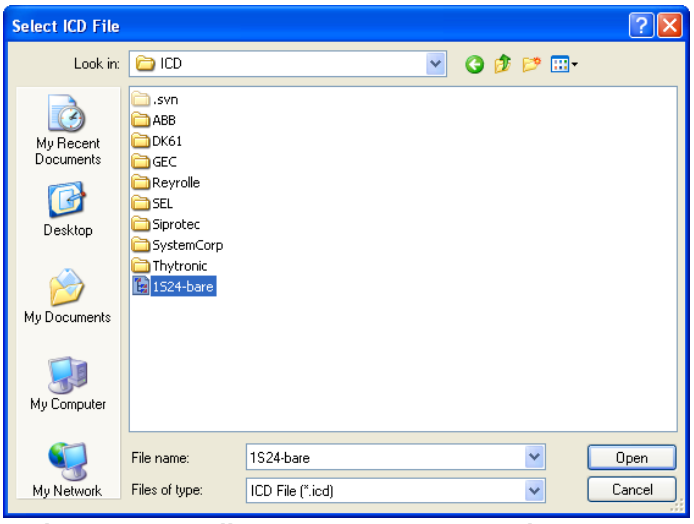



**Figure 18: Reydisp Manager – Insert 3rd Party ICD**

The RA24 IED has now been added to your project.

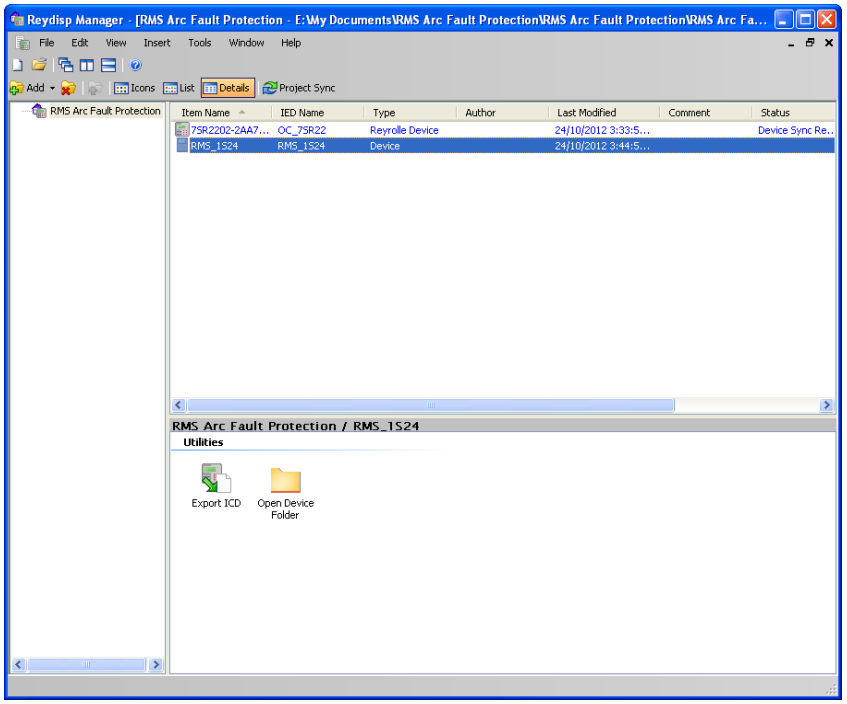



**Figure 19: Reydisp Manager – Insert 3rd Party ICD 2**

You can nominate a meaningful IED name for the RA24 IED by right clicking on the IED and choosing properties.

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

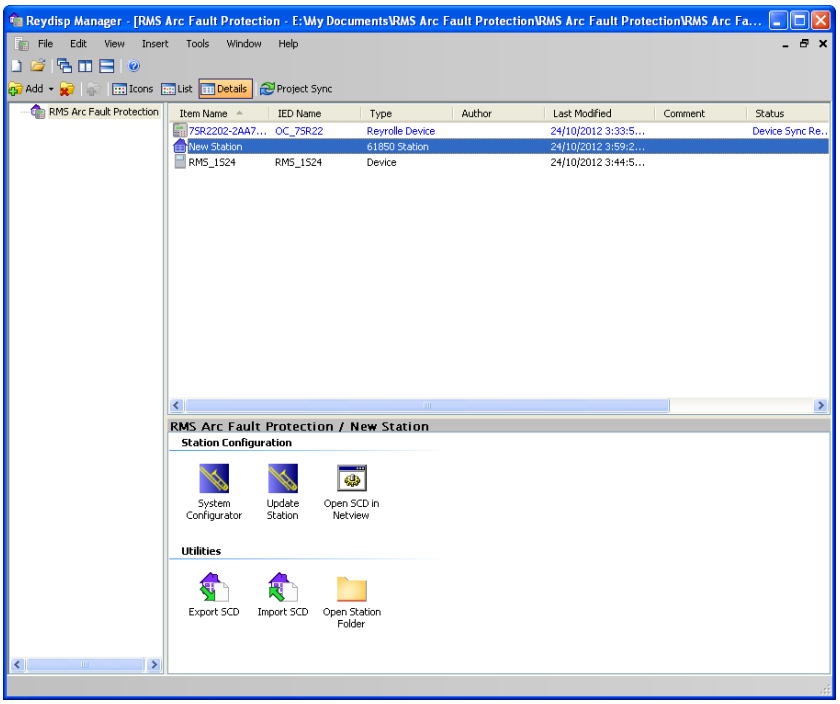



**Figure 20: Reydisp Manager – Add IEC61850 Station**

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.

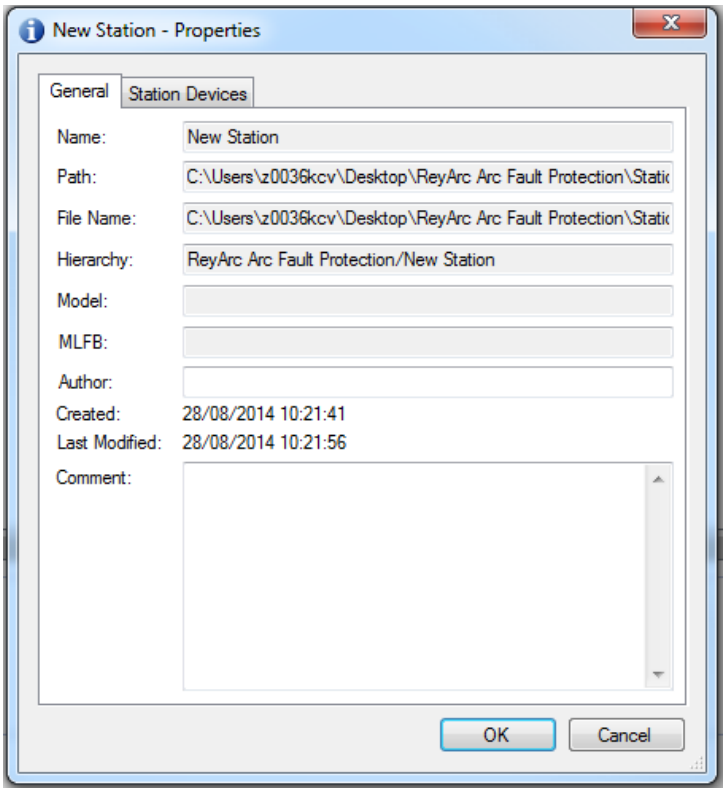



**Figure 21: Reydisp Manager – Rename IEC61850 Station**

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

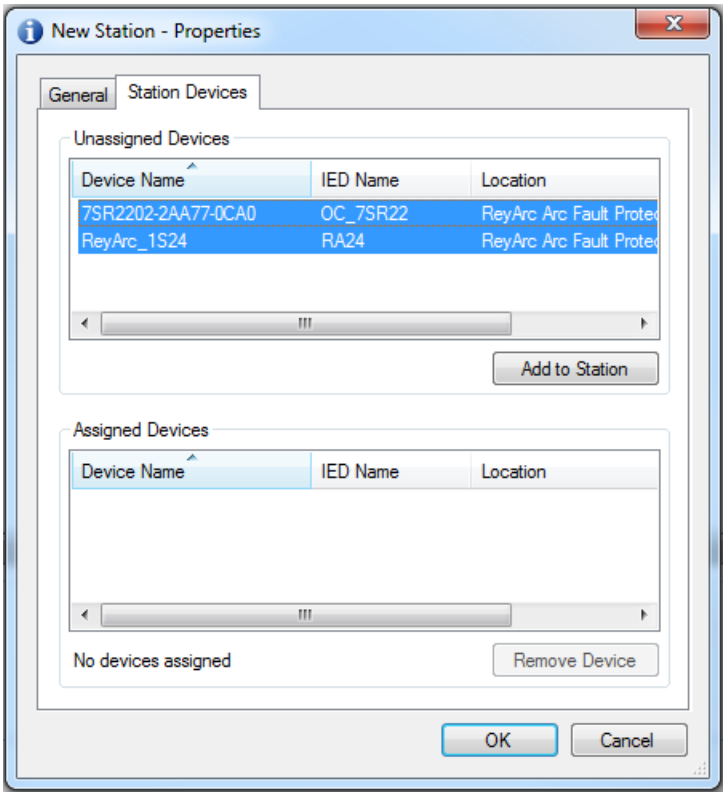



**Figure 22: Add Device to IEC61850 Station**

Select the IEDs

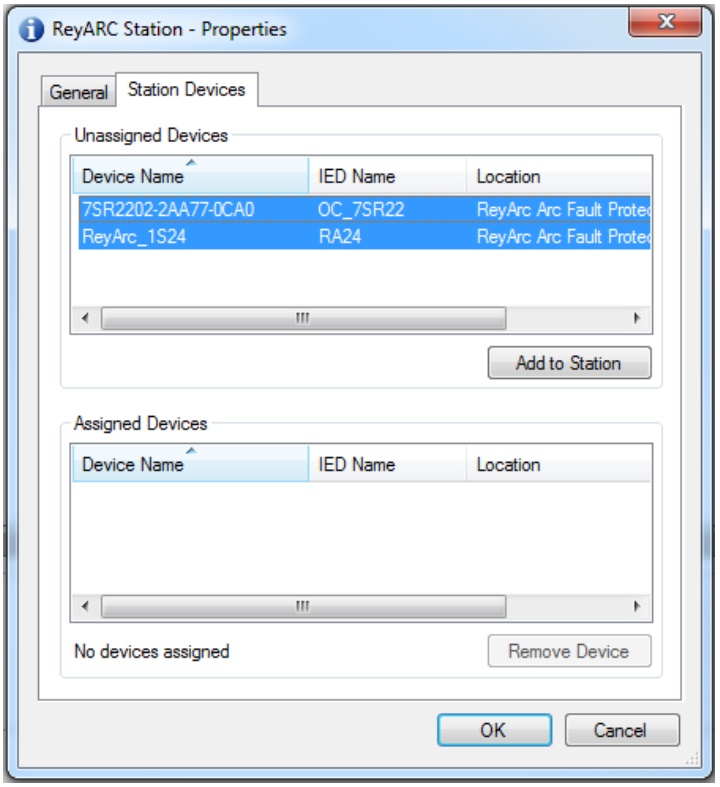



**Figure 23: Add Device to IEC61850 Station 2**

Press Add to Station.

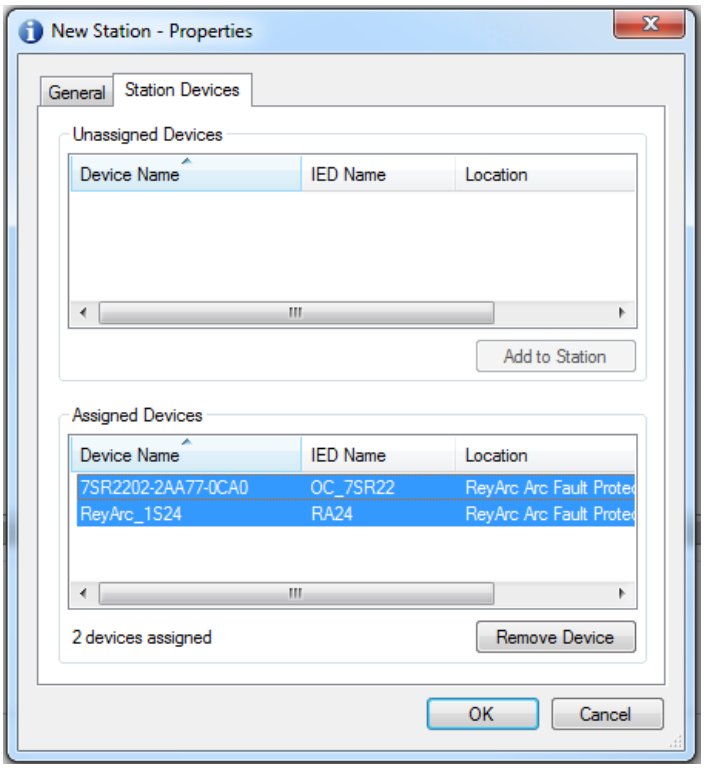



**Figure 24: Add Device to IEC61850 Station 3**

Press OK to Assign the Devices to the Station

## 2.8 IEC61850 Station - System Configuration

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

With the Station highlighted Double Click the System Configurator Button, this will start the Digsi System Configurator in the Network view.

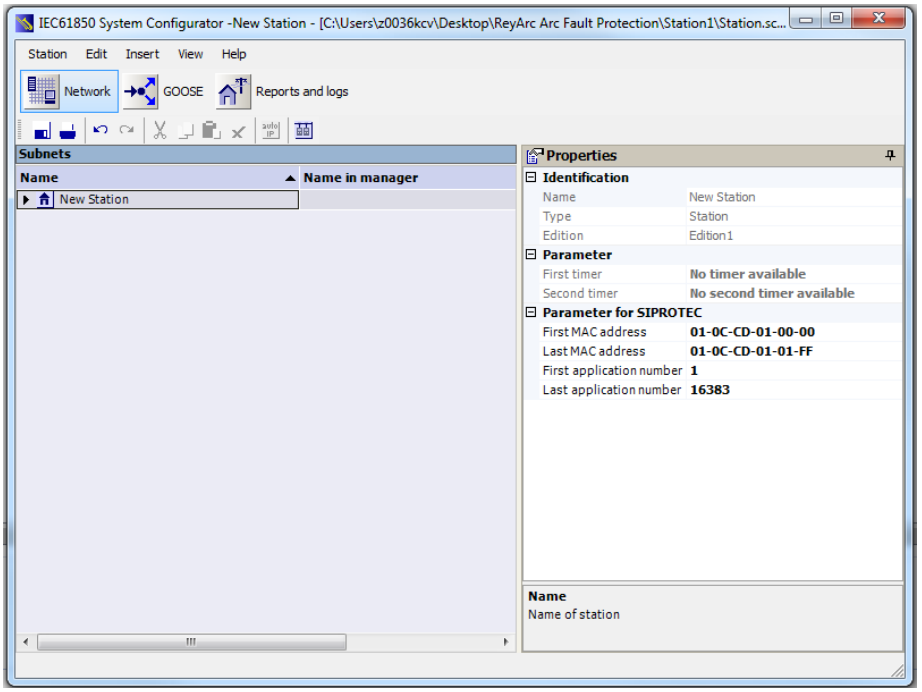



**Figure 25: System Configurator**

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

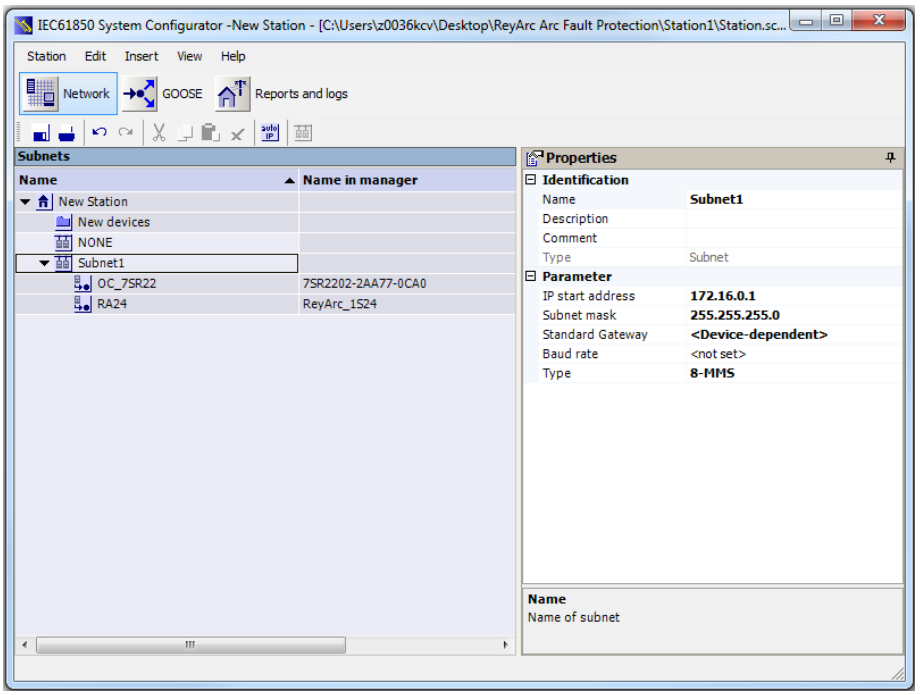



**Figure 26: System Configurator - Devices**

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

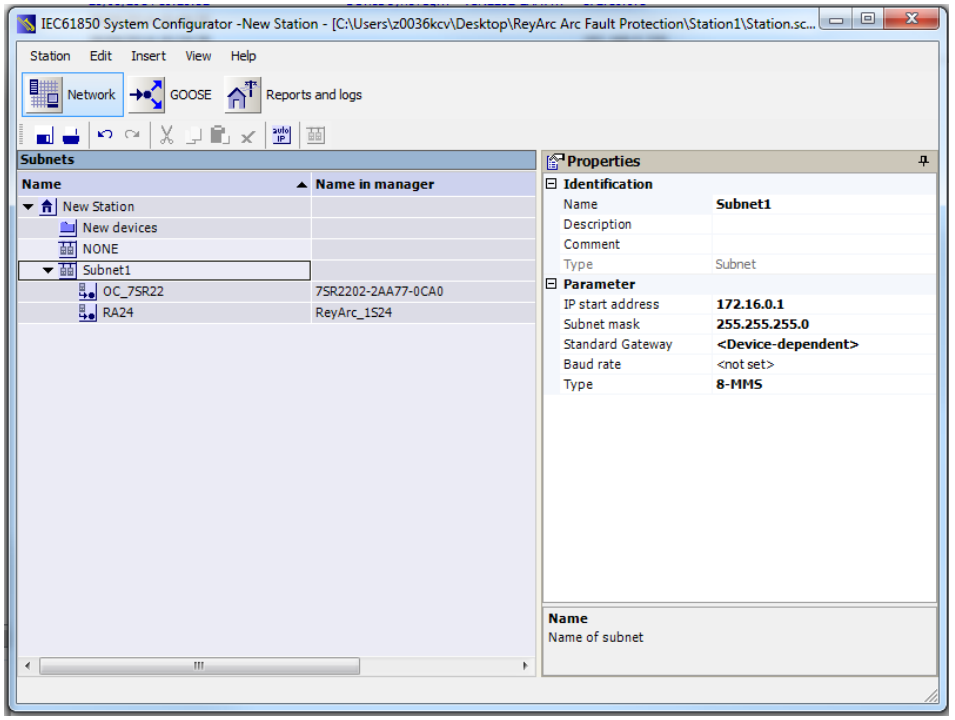



**Figure 27: System Configurator - IP Address**

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.

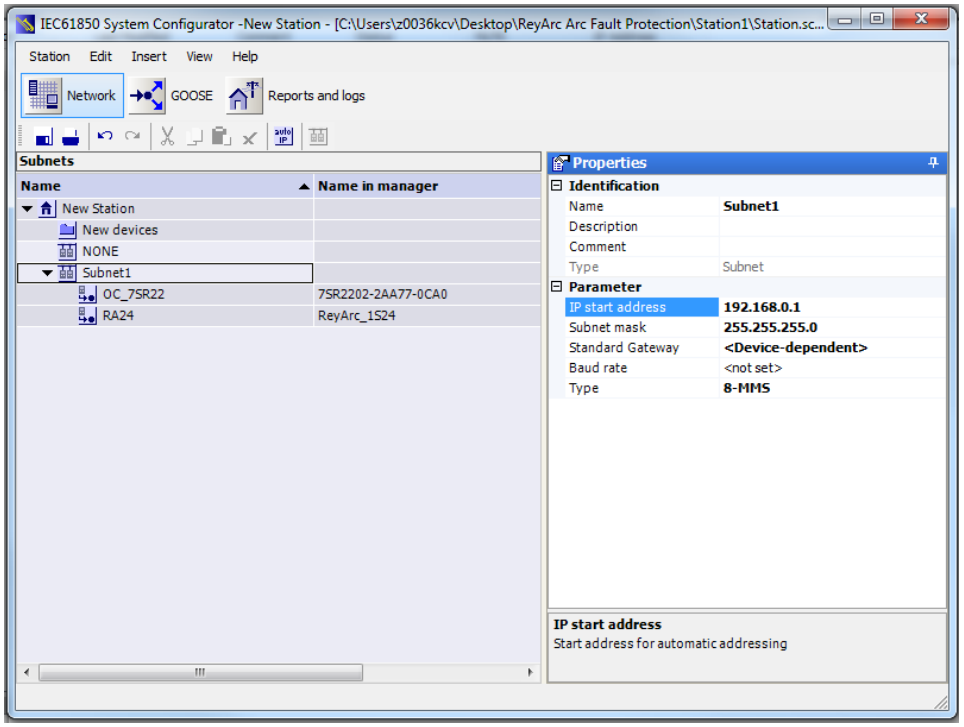



**Figure 28: System Configurator - IP Address 1**

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

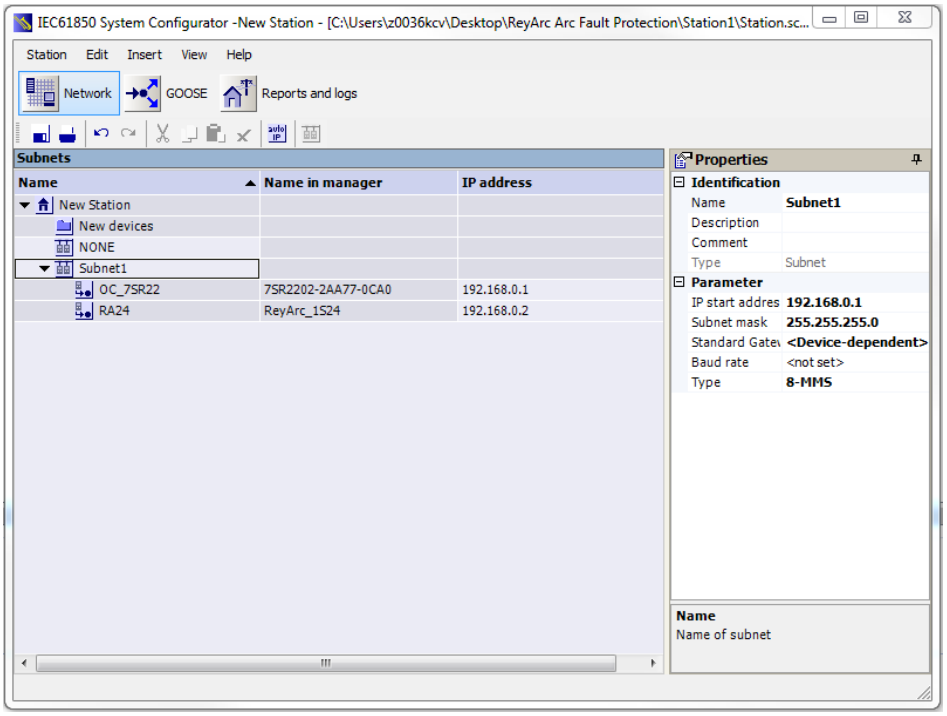



**Figure 29: System Configurator - IP Address 2**

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

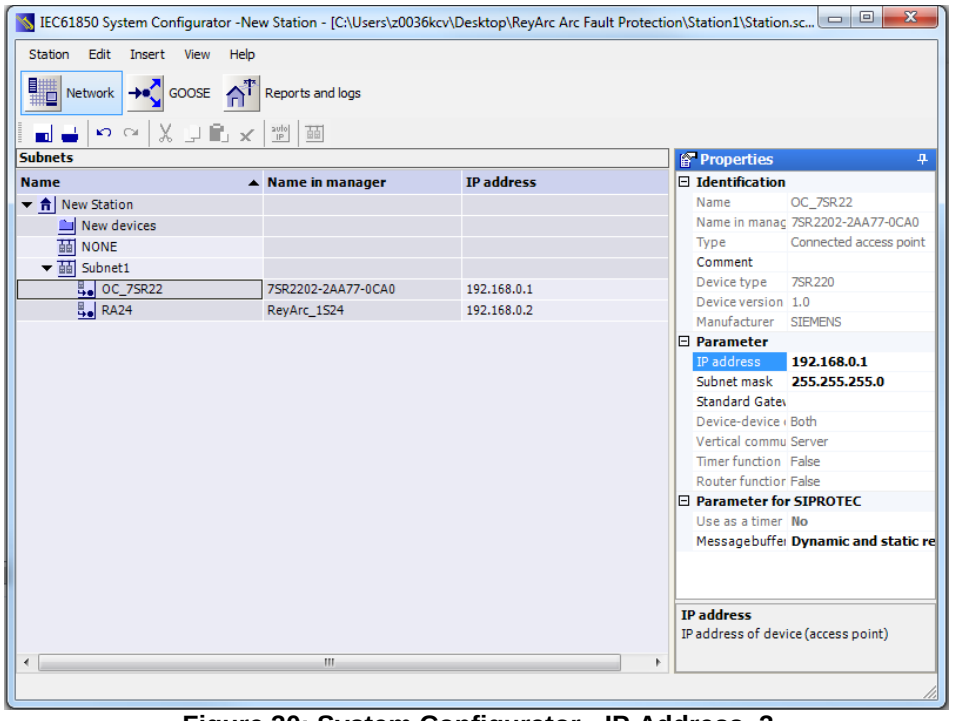



**Figure 30: System Configurator - IP Address 3**

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.

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

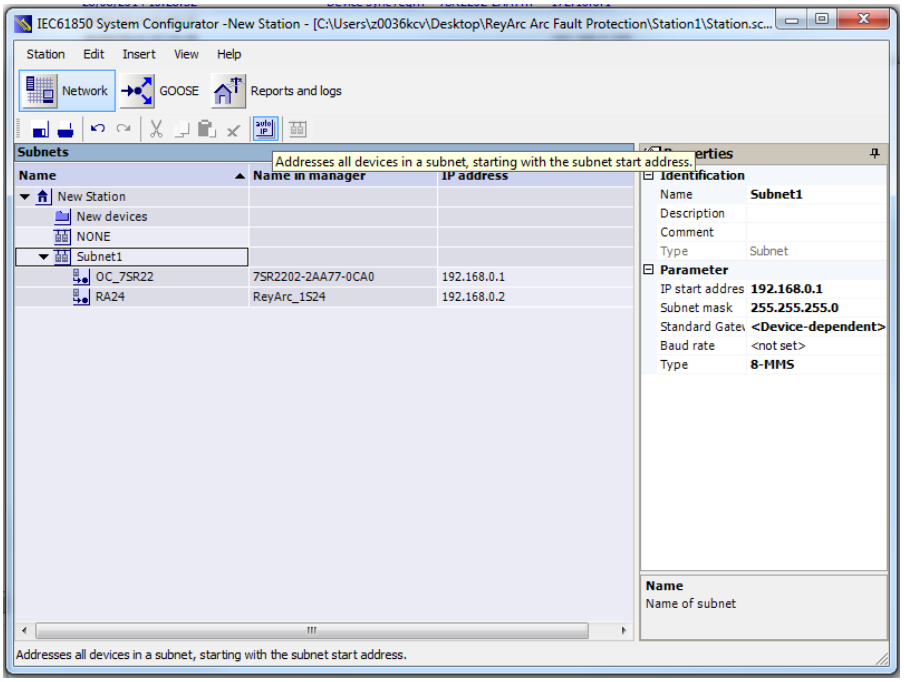



**Figure 31: System Configurator - IP Address 4**

### 2.8.1 System Configuration – GOOSE View

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

The screenshot below shows the GOOSE view within the ReyArc System configurator Station :

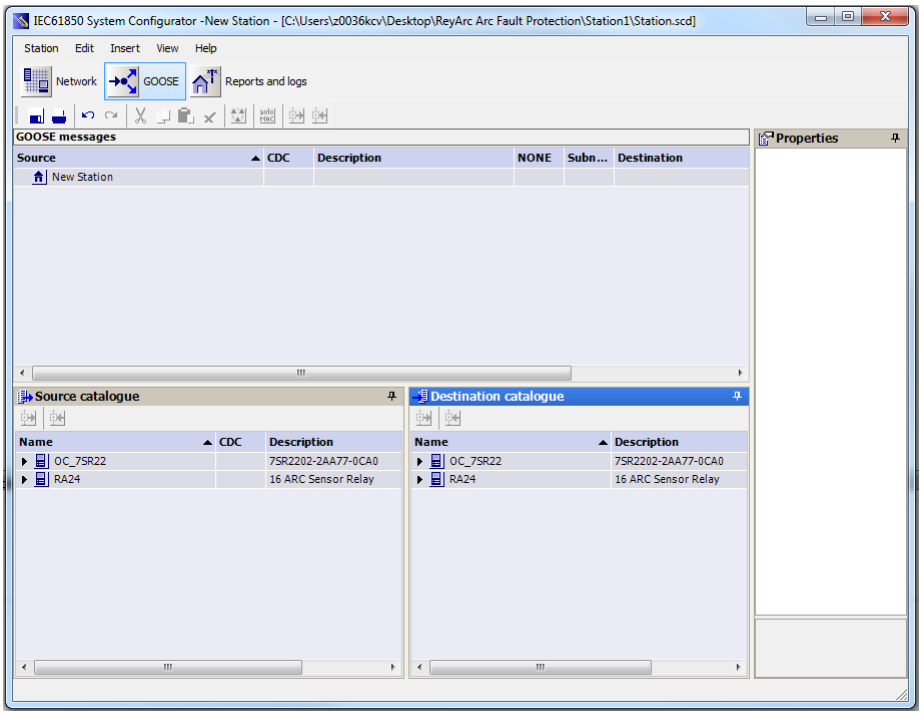



**Figure 32: System Configurator - GOOSE**

A GOOSE application needs to be added to you station. Select New Station & “Add New Goose Application”

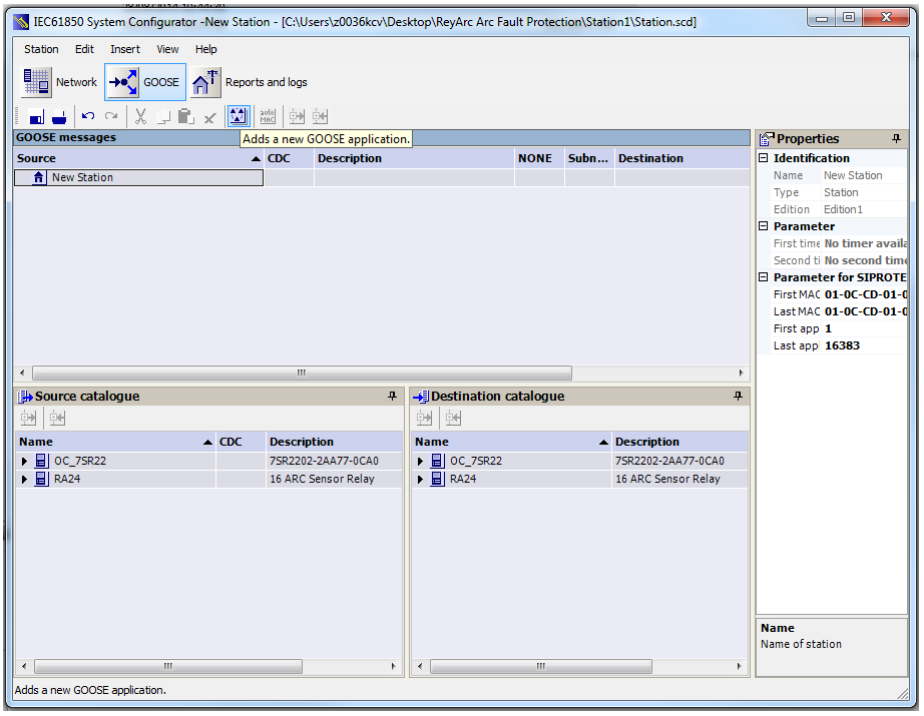



**Figure 33: System Configurator - GOOSE 2**

Once our Goose application is added, selecting this application reveals the associated IEDs as sources and destinations.

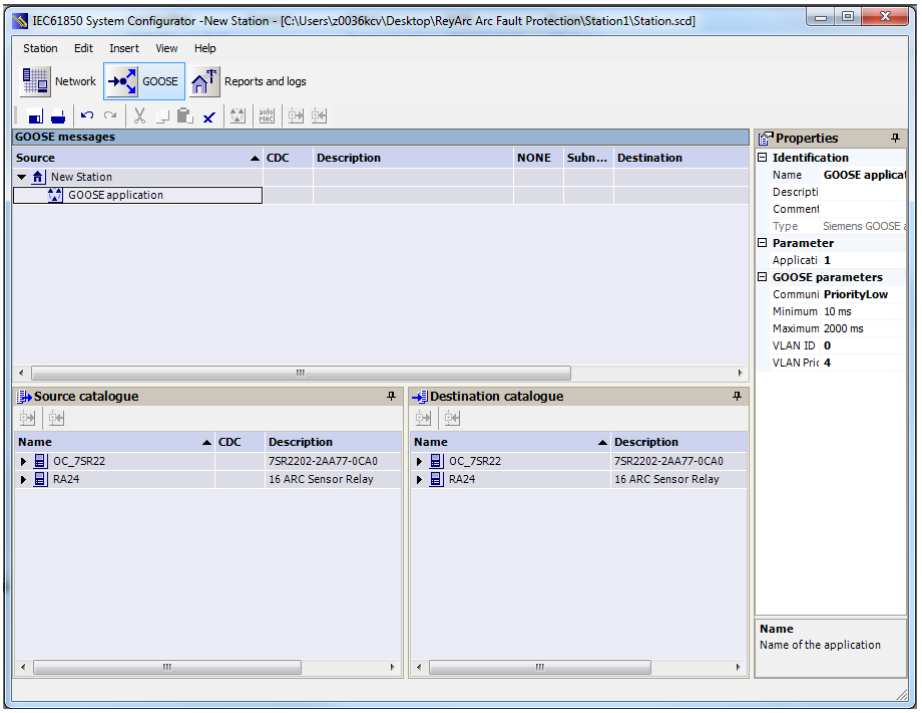



**Figure 34: System Configurator - GOOSE 3**

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

Firstly we'll select the RA24 IED and expand RMS_SARC1 and choose FADet to Add as a Source.

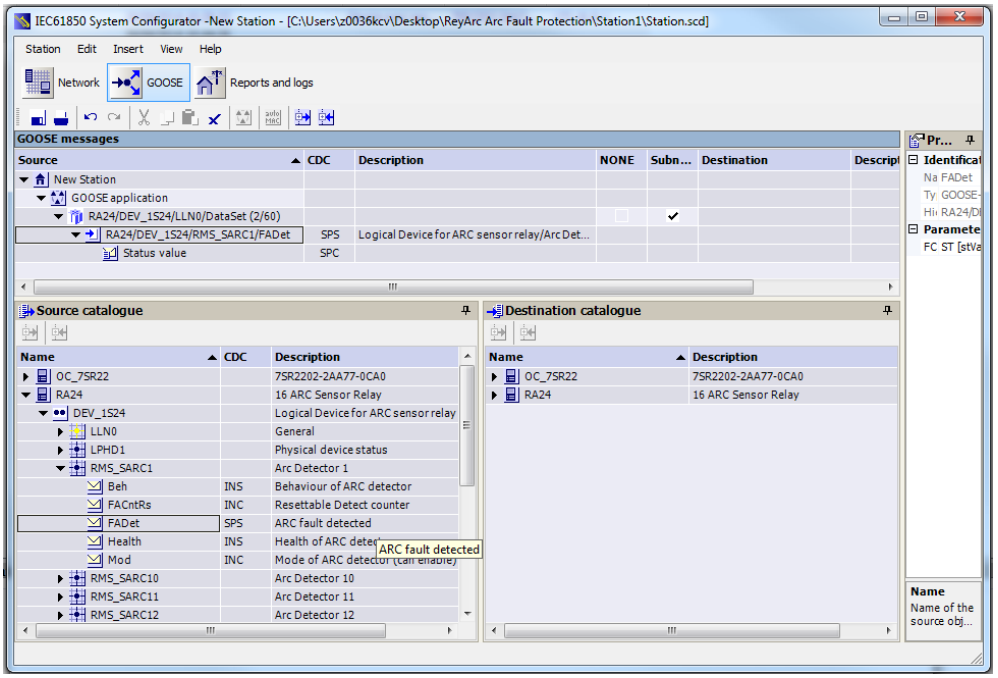



**Figure 35: System Configurator - GOOSE 4**

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

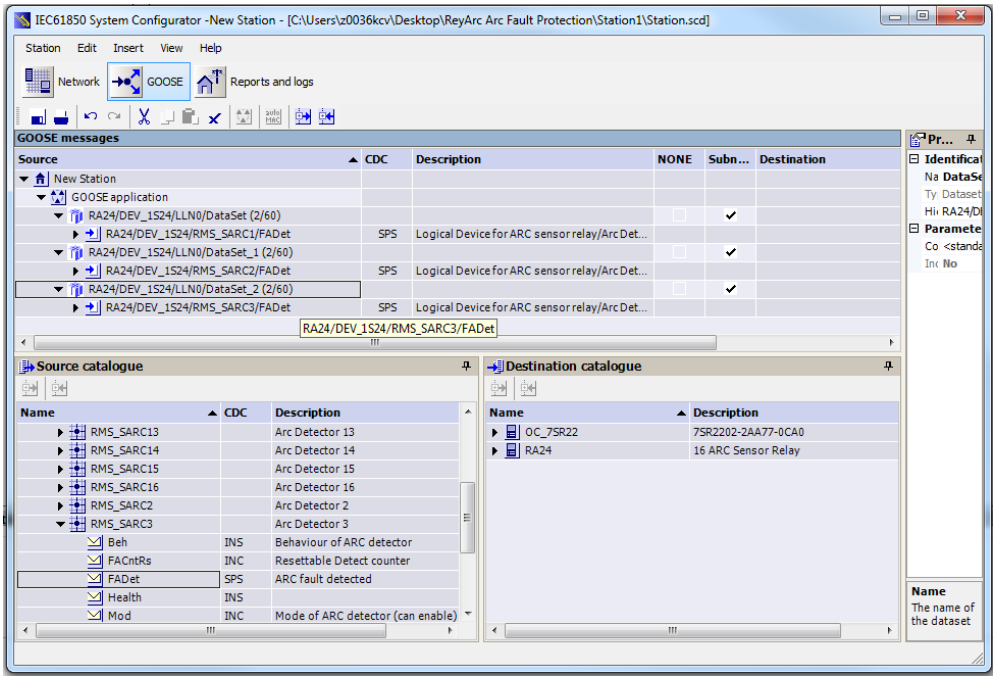



**Figure 36: System Configurator - GOOSE 5**

The SARCs are linked to the respective 7SR22 IED Single Point Input GGIO chosen from the Destinations window .

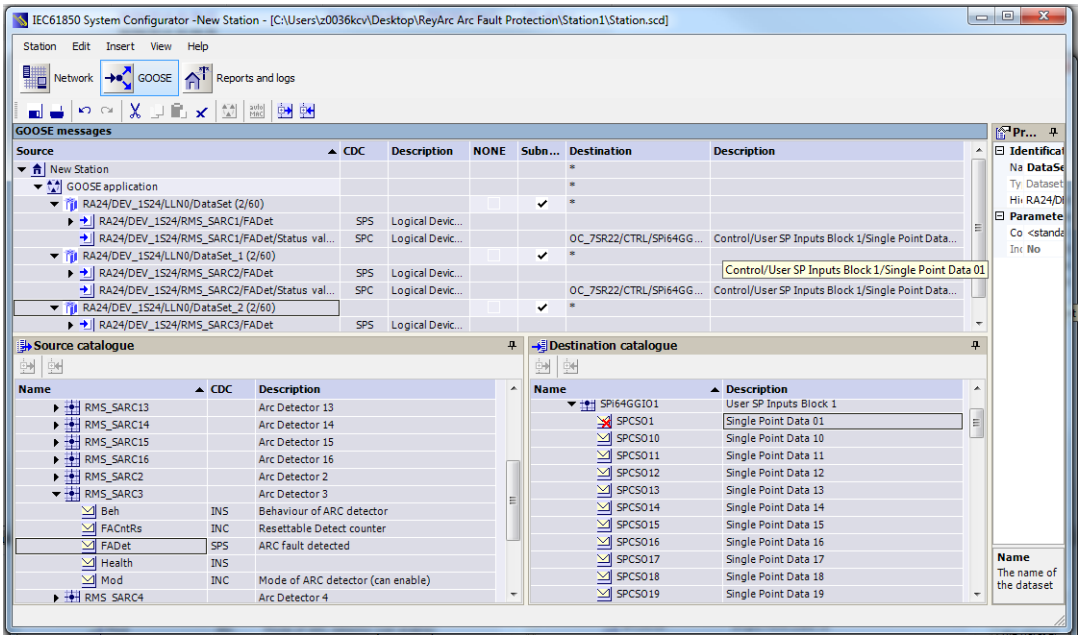



**Figure 37: System Configurator - GOOSE 6**

With the links complete save and exit the Digsi System Configurator.

## 2.9 Creating the RA24 .cid File

We know need to create a .cid file which we will use at a later stage of the IED Configuration process. (Note: Please close and re-open Digsi System configurator before proceeding with the next step)

1. Open the Station in Reydisp Manager, go to the Network screen, select the RA24 IED, right click and select Export IEC61850 device configuration.

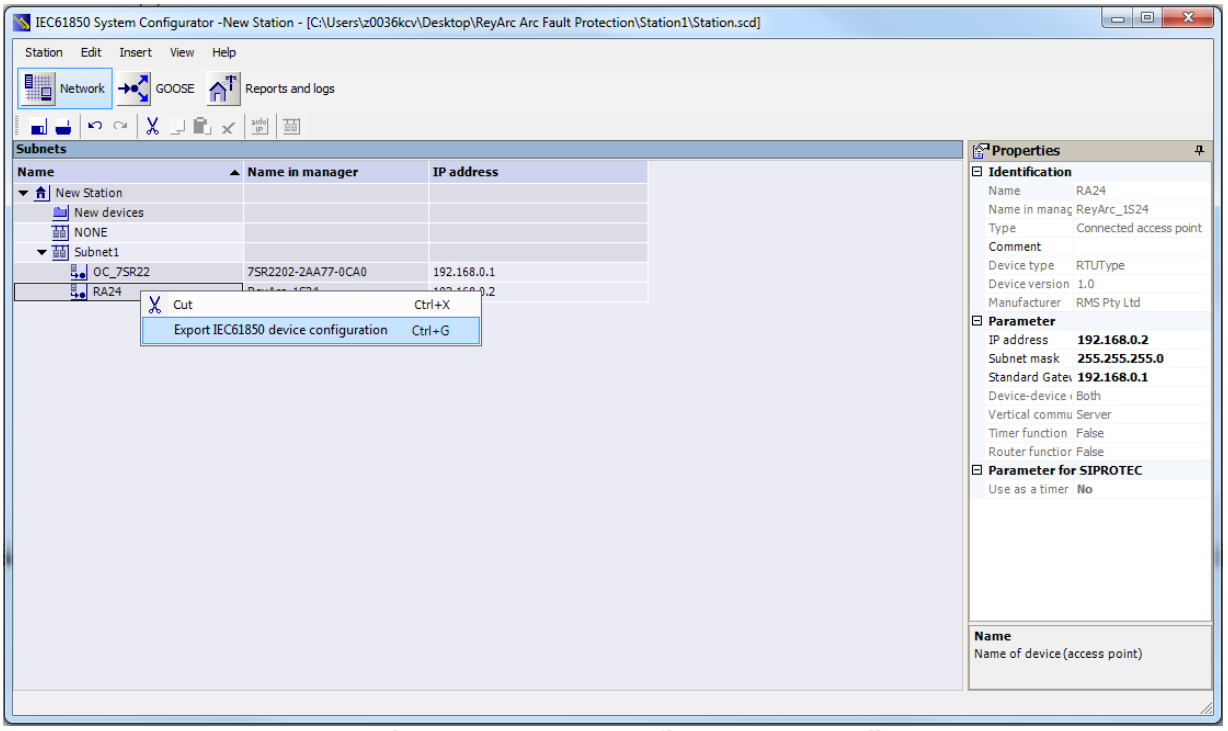



**Figure 38:System Configurator - .CID File**

Save the file for later RA24 configuration. System configuration is now complete.
Save the file as 1S24.cid

# Section 3: RA24 IEC61850 Configuration

## 3.1 The .CID File

The RA24 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 RA24 created earlier from our Substation configuration process example and needs to be loaded into the RA24 IED.

FTP 1S24.cid File

We will be using the Beck's @CHIPTOOL software utility to establish a terminal session with the RA24 and to FTP the .cid file.

Download @CHIPTOOL for free from :

http://www.beck-ipc.com/en/download/licence.asp?id=chiptool_install&l=1

Run @CHIPTOOL on the PC.

The Tool will detect any RA24 devices on the network as seen by the screen shot below :

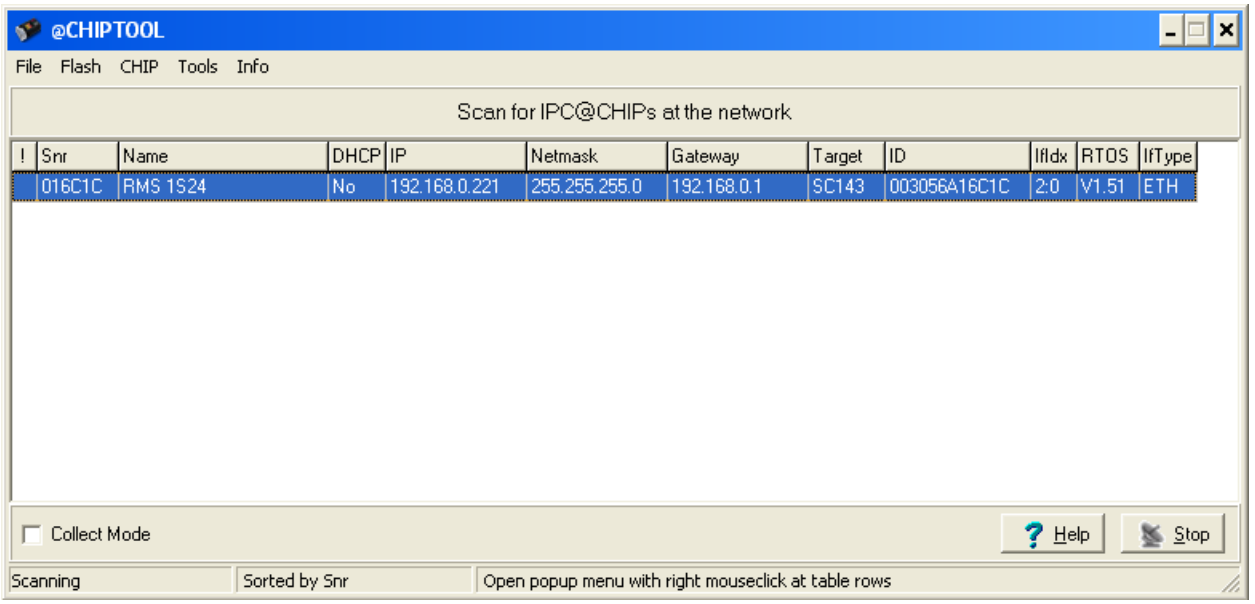



**Figure 39: @CHIPTOOL**

With the RA24 selected in the @CHIPTOOL screen we will establish an FTP session by choosing Tools and FTP-Client.

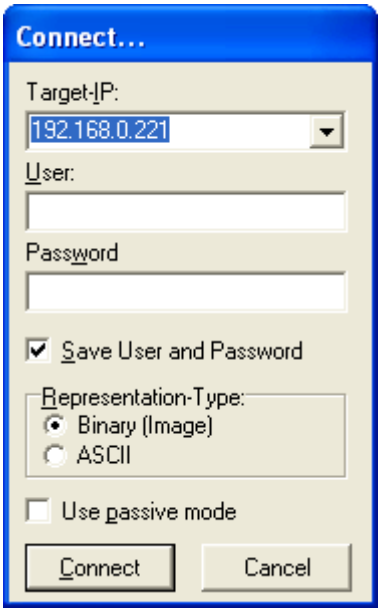



**Figure 40: @CHIPTOOL - Connect**

Enter the following Username and Password for the FTP session:

User : **ftp**
Password : **ftp**

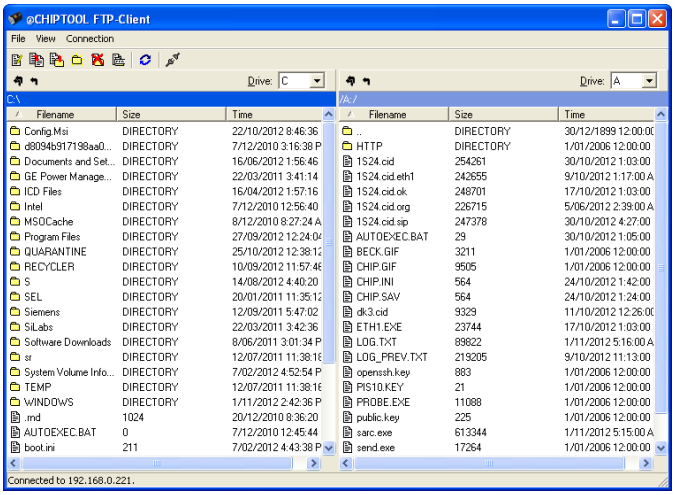



**Figure 41: @CHIPTOOL - FTP**

You will be presented with 2 file directories, the left side is the source directory and the right side A:/ is the RA24.

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. (Note: The new .cid file must be renamed “1S24.cid”)

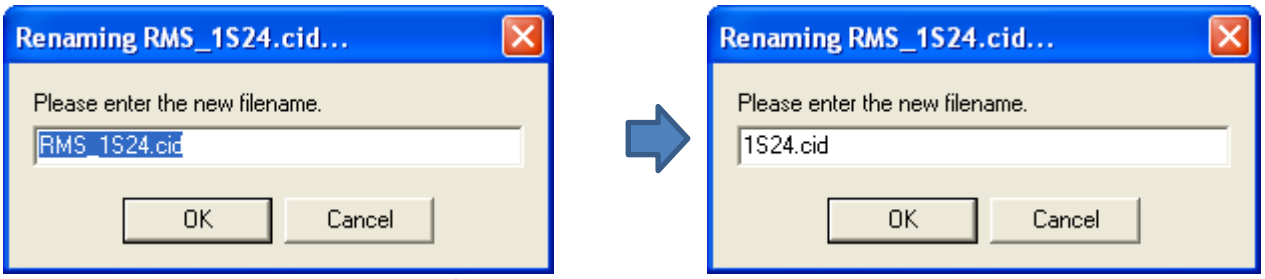



**Figure 42: @CHIPTOOL - FTP 2**

Rebooting The RA24 With The New 1S24.cid File

A reboot of the RA24 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.

# Section 4: 7SR22 Configuration

## 4.1 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.

## 4.2 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<br>Termination Chamber | | SARC 1 | User Output 1 |
| Feeder CB Chamber | | SARC 2 | User Output 2 |
| Bus | | SARC 3<br>SARC 4 | User Output 2 |
| Incomer CB Chamber | | SARC 5 | User Output 3 |
| Incomer Termination Chamber | | SARC 6 | User Output 3 |

**Table 5: RA24 User Output Allocation**

## 4.3 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.

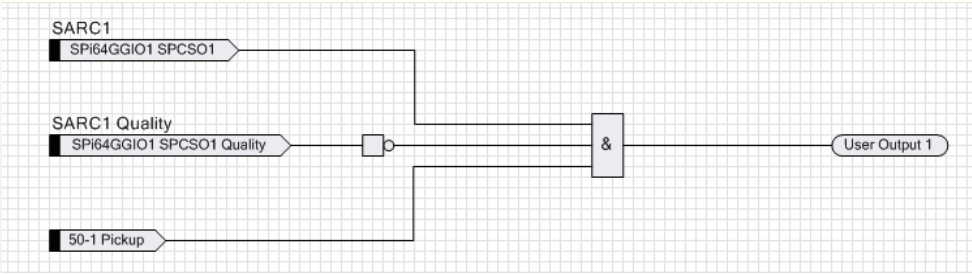



**Figure 43: Relay Logic - SARC 1**

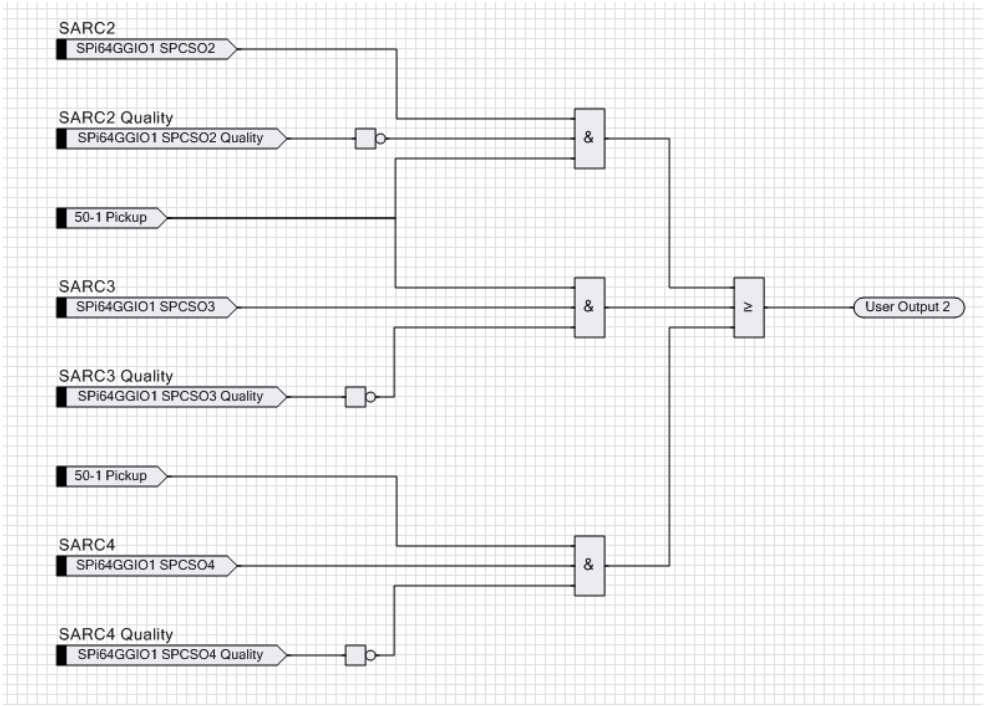



**Figure 44: Relay Logic - SARC 2 - 4**

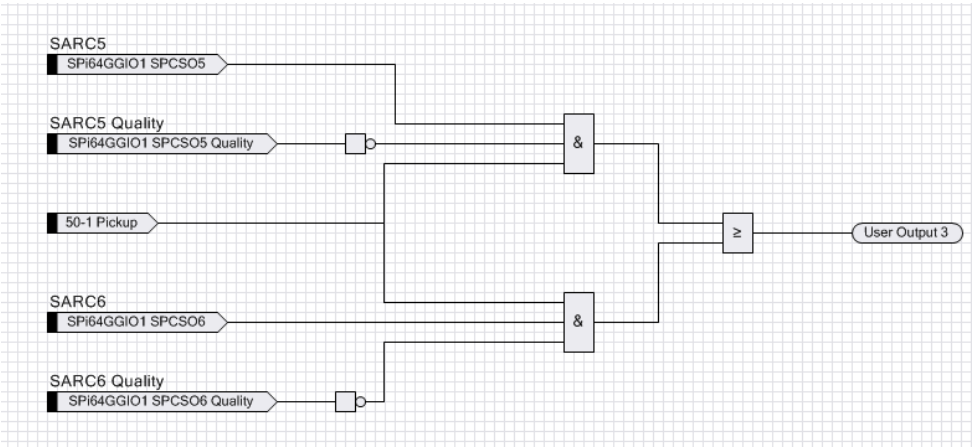



**Figure 45: Relay Logic - SARC 5 & 6**

## 4.4 Binary Output Allocation for Circuit Breaker Tripping

The following User Output to Binary Output allocations complete 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 |

**Table 6: Binary Output Allocation**

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

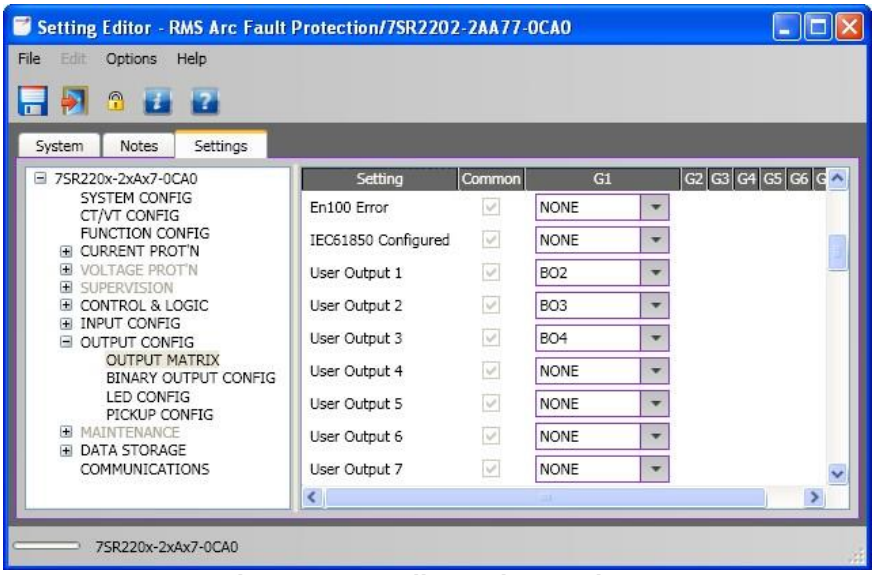



**Figure 46: Reydisp Relay Settings**

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

## 4.5 Device Sync

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 RA24 IED.

# Section 5: Monitor Indications

## 5.1 Front Layout

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

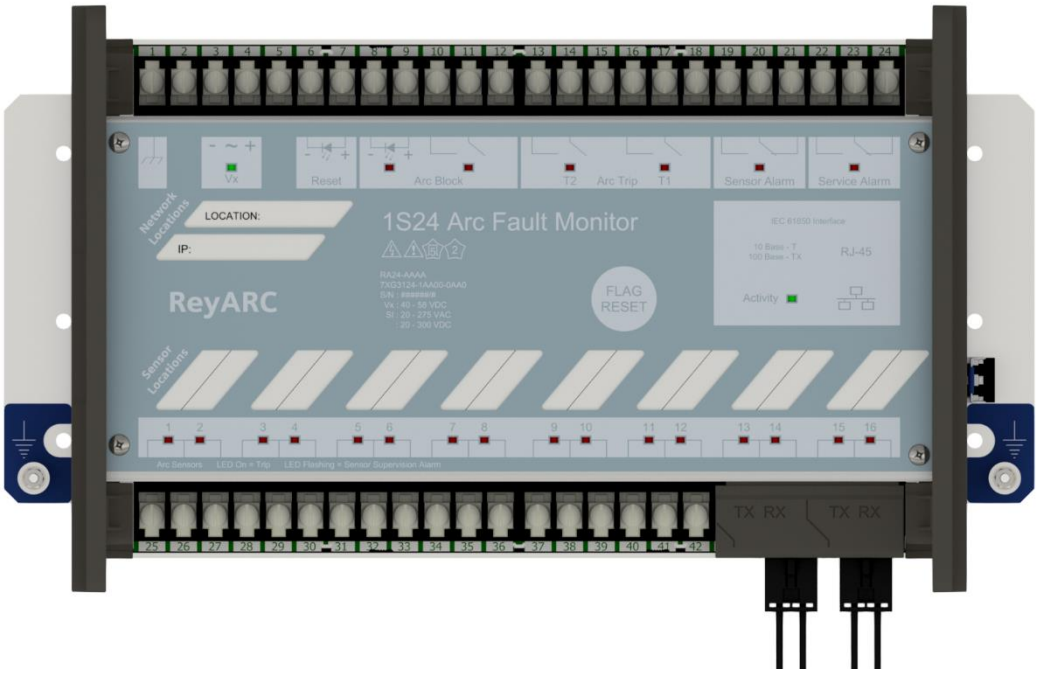



**Figure 47: RA24 Front Layout View**

## 5.2 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 14 secs during the boot cycle.

When the boot cycle is complete the RA24 will indicate the current state.

## 5.3 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

**Figure 48: RA24 System Status**

## 5.4 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

**Figure 49: RA24 Service Alarm**

## 5.5 Arc Sensor Indicators

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

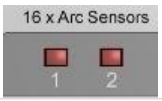
| | |
|---|---|
|  | 16 Arc Sensor Indicators |

**Figure 50: RA24 Arc Sensor Indications**

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

## 5.6 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.

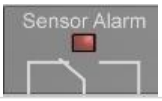
| | |
|---|---|
|  | Sensor Alarm |

**Figure 51: RA24 Arc Sensor Cicuit Supervision**

reset upon the fault conditions being corrected.

## 5.7 Arc Trip

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

| | |
|---|---|
|  | Arc Trip |

**Figure 52: RA24 Arc Trip Indication**

## 5.8 Global Arc Block

Indicates solid when the Global Arc Block input is energised, all Arc Trips are blocked (61850 and Arc Trip outputs).

| | |
|---|---|
|  | Global Arc Block |

**Figure 53: RA24 Global Arc Block**

## 5.9 Flag Reset

| | |
|---|---|
|  | To reset the ARC Sensor LEDs |
|  | The ARC sensor LEDs may also be reset by energising the binary input |

**Figure 54: RA24 Flag Reset**

## 5.10 Reboot


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 14 secs.

Alternatively if the relay is powered, hold down the Flag Reset button for about 5 sec until all of the Leds (except Service) start flashing, 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 14 secs approx.

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 RA24 does not respond to web server commands or becomes unresponsive to ftp or terminal sessions.

**Figure 55: RA24 Reboot**

## 5.11 Reset To Factory Default


With the relay unpowered, hold down the Flag Reset button and power up the relay. After releasing the reset button all of the Leds (except Service) 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 another 14 secs approx.

The Cold Boot is used for reverting the IED back to factory default settings including default passwords.

**Figure 56: RA24 Reset to Factory Default**

# 7XG3124

Commissioning Guide

## Document Release History

This document is issue 2014/09. The list of revisions up to and including this issue is:

| | |
|---|---|
| 2014/09 | First Issue |

## Software Revision History

| | | |
|---|---|---|
| | | |

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# Section 1: Commissioning Preliminaries

## Overview

Commissioning tests are carried out to prove:

a) Equipment has not been damaged in transit.

b) Equipment has been correctly connected and installed.

c) Confirm that settings have been correctly applied.

d) To obtain a set of test results for future reference.

## 1.1 Before Testing

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

## 1.2 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.

## 1.3 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.

# Section 2: Commissioning Checklists

## 2.1 Site Commissioning Verification Checklist

Observe all site specific standard safety procedures.

The following tests are undertaken following the completion of all RA24 ARC Monitor and Overcurrent Relay IEC61850 Substation Configuration and associated IED configurations, scheme wiring and the wiring of all RA30 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 RA30 optical sensors and cable condition | |
| 4 | Check panel installation of the RA24 monitor | |
| 5 | Check for correct case earthing | |
| 6 | Check the RA24 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 25 and 26) | |
| 8 | Apply correct Auxiliary voltage to power up the RA24 | |
| 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.<br><br>Observe that the green power LED remains illuminated solid after the relay boot cycle. | |
| 10 | Confirm Fail alarm relay is open (Terminals 25 and 26) and the associated LED is extinguished | |
| 11 | Using a web browser check RA24 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 | |

**Table 1: System Power Up**

## 2.2 Sensor Failure Alarm Verification

| Item | Description | Complete |
|---|---|---|
| 1 | Disconnect each sensor from the associated RA24 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 RA24 sensor input | |
| 4 | Confirm the associated sensor Fail indications clear and the Relay Fail Alarm output contact opens | |
| 5 | In turn short across each RA24 sensor input | |
| 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 RA24 sensor input | |
| 8 | Confirm the associated sensor Fail indications clear and the Relay Fail Alarm output contact opens | |

**Table 2: Sensor Failure Alarm Verification**

## 2.3 Arc Trip Testing

| Item | Description | Complete |
|---|---|---|
| 1 | Initiate the operation of each sensor by the use of a suitably powered camera flash<br><br>* 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 RA24 | |
| 4 | View the web browser settings of the RA24 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 | |

**Table 3: Arc Trip Testing**

## 2.4 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 RA24 | |

**Table 4: Global Arc Fault Block**

## 2.5 Sensor Failure Alarm Trouble Shooting

| Item | Description | Complete |
|---|---|---|
| 1 | If any arc sensor LED's are flashing re-check the RA30 wiring integrity | |
| 2 | Check that the sensors are wired 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 | |

**Table 5: Sensor Failure Alarm**

## 2.6 ARC Sensor Supervision Trouble Shooting

| Item | Description | Complete |
|---|---|---|
| 1 | If there is a Sensor Alarm indication re-check the RA30 wiring 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 | |

**Table 6: Arc Sensor Supervision**

## 2.7 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 RA30 sensor

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

| Item | Description | Complete |
|---|---|---|
| 1 | Check the RA30 wiring integrity of the sensors | |
| 2 | Check for high ambient lighting conditions for all the sensors | |

**Table 7: Arc Trip Trouble Shooting**

# Section 3: Commissioning Ethernet Communications'

## 3.1 General Ethernet Communications Trouble Shooting

If you are having trouble communicating with the RA24 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 RA24 IED and the subscribing IED Ethernet ports are active and communicating by checking the port activity LEDs | |
| 3 | Undertake a ping test on the RA24 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 | |

**Table 8: Ethernet Comms Trouble Shooting**

## 3.2 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 RA24 | |
| 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<br>Is the correct GGIO being received?<br>Is the quality bit being correctly treated?<br>Is the current check qualification being asserted | |
| 5 | Using the RA24 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 RA24 ICD | |

**Table 9: GOOSE Trouble Shooting**

# Section 4: RA24 Power Supply Indications

## 4.1 Interpreting Vx Auxiliary Supply or Relay Healthy Indications

The Healthy LED will be illuminated solid to indicate normal operation of the RA24.

The Healthy LED is also utilised to indicate error conditions to assist in troubleshooting. The following table summarises all Healthy LED indication

| LED State | Meaning |
|---|---|
| On Solid | Healthy |
| Fast Flashing<br>(approx three times every sec) | CID loading error (61850 stack problem)<br><br>The .cid file is in error or possibly corrupted, open a web server session where further information is reported on the Relay Build page |
| Slow Flashing<br>(approx once every sec) | SNTP sync fail<br><br>Check SNTP server is functioning or check that the SNTP Server address on the IP config screen is correct |
| Off | Internal RA24 Communications failure<br><br>A permanent Internal RA24 Communications failure will assert the Service Alarm |

**Table 10: Relay Healthy Indications**

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