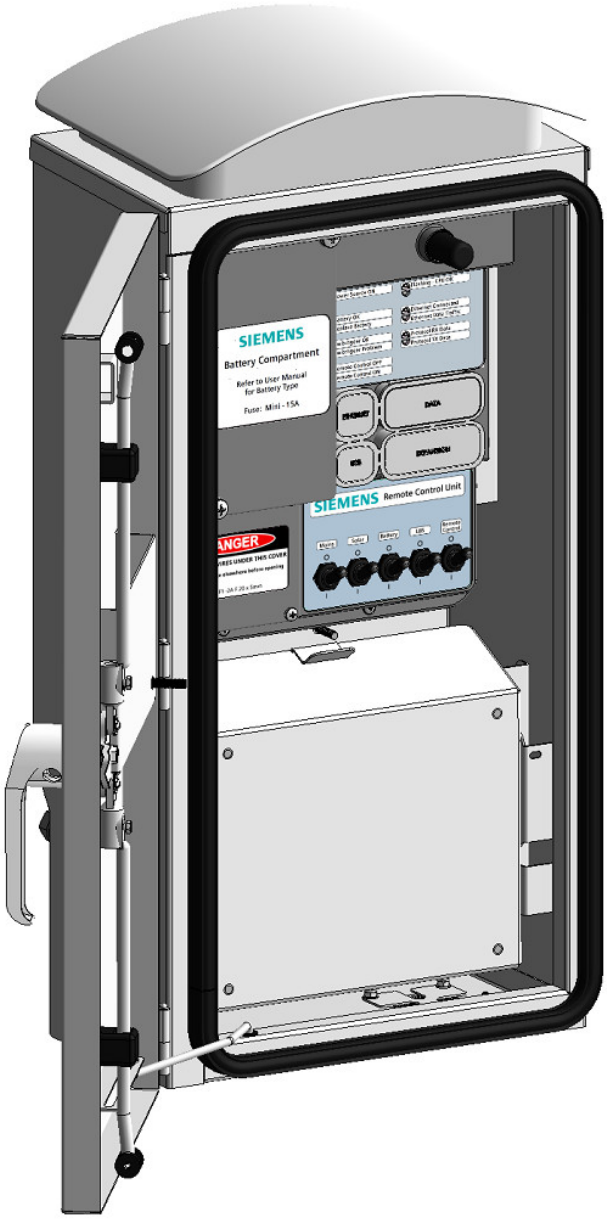
SIEMENS

3AD8

Remote Control Unit 3AD8

Remote Control Unit Operating Instructions



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Ordering location: SI DS OMVS
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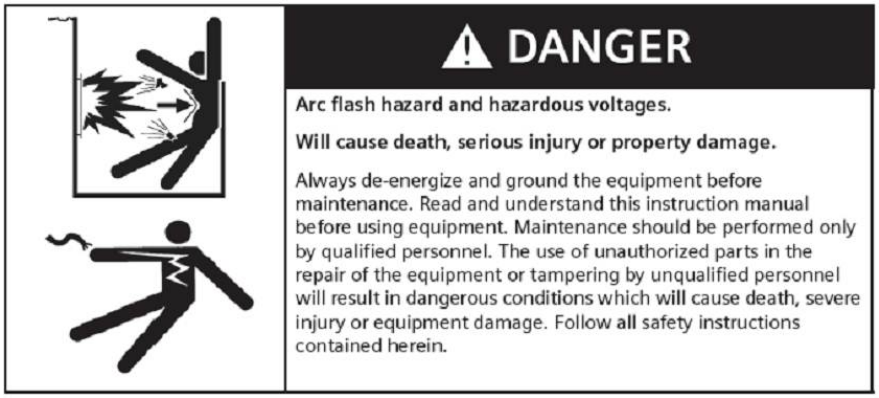
For your safety



Important

The information contained herein is general in nature and not intended for specific application purposes. It does not relieve the user of responsibility to use sound practices in application, installation, operation and maintenance of the equipment purchased. Siemens reserves the right to make changes in the specifications shown herein or to make improvements at any time without notice or obligation. Should a conflict arise between the general information contained in this publication and the contents of drawings or supplementary material or both, the latter shall take precedence.

Qualified person

For the purpose of this instruction manual a qualified person is one who is familiar with the installation, construction or operation of the equipment and the hazards involved. In addition, this person has the following qualifications:

- **Is trained** and authorized to de-energize, clear, ground and tag circuits and equipment in accordance with established safety procedures.

- **Is trained** in the proper care and use of protective equipment, such as: rubber gloves, hard hat, safety glasses or face shields, flash clothing, etc., in accordance with established safety practices.

- **Is trained** in rendering first aid.

Further, a qualified person shall also be familiar with the proper use of special precautionary techniques, personal protective equipment, insulation and shielding materials, and insulated tools and test equipment. Such persons are permitted to work within limited approach of exposed live parts operative at 50 volts or more, and shall, at a minimum, be additionally trained in all of the following:

- The skills and techniques necessary to distinguish exposed energized parts from other parts of electric equipment
- The skills and techniques necessary to determine the nominal voltage of exposed live parts
- The approach distances specified in the applicable local standards and the corresponding voltages to which the qualified person will be exposed
- The decision-making process necessary to determine the degree and extent of the hazard and the personal protective equipment and job planning necessary to perform the task safely.

Hazardous voltages.

Will cause death, serious injury or property damage.

Always de-energize and ground the equipment before maintenance. Read and understand this instruction manual before using equipment.

Maintenance should be performed only by qualified personnel. The use of unauthorized parts in the repair of the equipment or tampering by unqualified personnel will result in dangerous conditions which will cause death, severe injury or equipment damage. Follow all safety instructions contained herein.

Table of Contents

Abbreviations

CMR	Compact Modular Recloser
FS	Fusesaver
HV	High Voltage
IEC	International Electrotechnical Commission
LED	Light Emitting Diode
LV	Low Voltage
MLFB	Maschinenlesbare Fabrikatenummer (order number)
MV	Medium Voltage
PC	Personal Computer
RCU	Remote Control Unit
SCADA	Supervisory Control and Data Acquisition
USB	Universal Serial Bus
UTC	Universal Time Coordinated
VT	Voltage Transformer

References

[1] SMG-0087 CMR DNP3 Protocol Manual

[2] CMR-7001 Compact Recloser Configuration Manual

[3] RCU-CMR Pairing and Communication Manual

[4] RCU Operator Panels for CMR

[5] RCU Firmware Update

[6] KMS-0017 - Fusesaver Operating Instructions

[7] CMR-7000 Compact Recloser Installation Manual

[8] SMG-0054 Fusesaver DNP3 Protocol Manual

[9] SMG-0086 Fusesaver IEC-104 Protocol Manual

[10] SMG-0088 CMR IEC-104 Protocol Manual

1 General

1.1 Introduction

The Remote Control unit is used to connect the Fusesaver pole mounted circuit breaker or CMR Compact Modular Recloser into a utility SCADA system. The Remote Control Unit is a pole mounted enclosure containing a microprocessor, a short range (approximately 20 m) radio used to communicate with the switchgear and a long range radio (or modem). The long range radio (or modem) is not supplied or fitted by Siemens unless specifically agreed to in the sale contract.

Successful application and operation of this equipment depends as much upon proper installation and maintenance by the user as it does upon the proper design and fabrication by Siemens.

1.2 Format and aim of the operating instructions

These operating instructions apply for the Remote Control Unit.

The purpose of this instruction manual is to assist the user in developing safe and efficient procedures for the installation, maintenance and use of the equipment.

These instructions are intended to familiarise personnel with the mechanical and electrical design as well as the general functionality of the Remote Control Unit. These instructions also include notes on operation and information concerning installation and maintenance.

It is required that operating and installation personnel familiarise themselves early as possible with the instructions and other documents provided, in order to gather any relevant further information on the Remote Control Unit and its features.

In written or verbal communications, please provide the complete description from the operating instructions, quote the serial number and use only the designations and key numbers for subparts used in these locations.

Contact the nearest Siemens representative if any additional information is desired.

1.3 Safety instructions

The Remote Control Unit, together with the accessories and special tools also supplied, is in conformity with the statutory laws, rules, and standards applicable at the time of delivery, especially those regulations concerning health and safety.

1.3.1 Signal words

The signal words “danger,” “warning” and “caution” used in this instruction manual indicate the degree of hazard that may be encountered by the user. These words are defined as:

Danger	Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.
Warning	Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.
Caution	Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury.
Notice	Indicates a potentially hazardous situation that, if not avoided, may result in property damage.

1.3.2 Field service operation and warranty issues

Siemens can provide competent, well-trained field service representatives to provide technical guidance and advisory assistance for the installation, overhaul, repair and maintenance of Siemens equipment, processes and systems. Contact:

Australia	+61 (7) 3801 9814
Germany	+49 (30) 3862 3199

1.4 Designated usage

The Remote Control unit is used to connect the Fusesaver pole mounted circuit breaker or CMR Compact Modular Recloser into a utility SCADA system. Any other use is forbidden, unless the consent of Siemens has been obtained.

> **Note**
>
> Changes to any part of the Remote Control Unit or its accessories, that are carried out by the user or others, and not previously agreed by Siemens, will void the warranty of the whole product.

1.5 Compatibility

This version of the Remote Control Unit Operating Instructions is compatible with the following firmware and software versions:

Application	Applicable Versions
RCU-FS Firmware	RCU-FS v1632
RCU-CMR Firmware	RCU-CMR v2000
RCU Connect	v1.6.4.0

1.6 Additional instructions

In addition to this manual, a *Protocol Manual* detailing the configuration options for each communications protocol is available. The utility may also be supplied with an *RCU Manual Supplement* which details the type of radio fitted, the radio cable and SCADA system protocol details which are specifically engineered for that utility (additional fees may be charged for this configuration service). Finally, if the RCU is fitted with an Operator Control Panel (order codes vary by the targeted switchgear) the user will be supplied with a manual detailing the function and maintenance of the panel.

2 Shipment and Storage

2.1 Packaging

Each Remote Control Unit is packaged in its own cardboard box. Each box is labelled with a list of the contents of the box and the serial number of the Remote Control unit.

The cardboard box holds:

- Remote Control Unit
- Pole Mounting Bracket
- Battery
- Radio and/or Antenna (if purchased from Siemens)
- Power Supply Isolation unit (if purchased from Siemens)
- RCU cubicle heater (if purchased from Siemens)

To open the box use a box cutter to cut through the sealing tape and then fold open the top flap to access the contents. All items in the box can then be easily removed.

Other items as follows are packed separately (optional):

- Solar Panel Kit
- VT Kit

2.2 Marking

The packaging has symbols which give instructions for safe transport and proper storage. For the dispatch of non-hazardous goods, the following symbols apply. These symbols must be strictly observed.

1 2 3

Fig. 1 Symbols for the dispatch of packages

1 This way up
2 Fragile
3 Keep dry

2.3 Receipt and handling of shipment

⚠ CAUTION

Weight of package exceeds 15kg, handle with caution.

On receipt, the contents of each Remote Control Unit box should be checked for shipping damage and the manufacturer informed immediately if any damage is evident:

- Check the cardboard box for shipping damage.
- Major damage must be documented photographically.
- Ensure that any damage to the cardboard box is confirmed by the transport company.

2.4 Unpacking

- Unpack the Remote Control Unit and the other items
- Check delivery for completeness, and
- Examine it for damage during transportation.

If the RCU has been stored in a cold environment and is unpacked in a warm environment it is recommended to wait a minimum of 2 hours before powering up the RCU to avoid causing condensation to form inside the RCU.

2.5 Storage

⚠ CAUTION

Avoid damage to any units during storage – damage can affect subsequent operation

Do not overload any goods by over stacking. Do not place heavy goods on top of another.

The Remote Control Unit box should be handled with care and protected from water exposure. It can be stored in its original transport packaging. The storage room should be well ventilated, as dust-free as possible and dry. It should have a temperature between -20 °C and +50 °C. The relative humidity should be kept below a level of 80%.

☞ Note

If stored for long periods of time the battery will require re-charging at least every 6 months. This should be done using a standard 12 V battery charger. Take care to not overcharge the battery.

3 Description

3.1 RCU principle

The Remote Control Unit (RCU) is an outdoor device. The RCU works in partnership with Siemens switchgear (Fusesaver or CMR) to increase network automation by allowing the utility control centre to be able to remotely monitor and control the switchgear. .

Additionally, the RCU can be equipped with an operator panel to enable local operator control of the switchgear. Operator Panel controls can trip and close the switchgear and change its protection mode..

Siemens switchgear is equipped with a short range radio (approx 20 m) to allow configuration and control. In order to connect the switchgear into a utility SCADA system a Remote Control Unit (RCU) is required. For understanding of switchgear operation, refer to the relevant switchgear manual [6] [2] .

The RCU is a pole mounted enclosure containing a microprocessor, a short range radio and a long range radio (or modem). The microprocessor retrieves data from the switchgear using the short range radio and sends it to the SCADA system using the long range radio. Incorporated into the RCU is a power supply system with a standby battery and provision for mains or solar power.

This manual describes in detail the functions, configuration and maintenance of the RCU. The intended users of this manual are the utility SCADA, operations and maintenance staff.

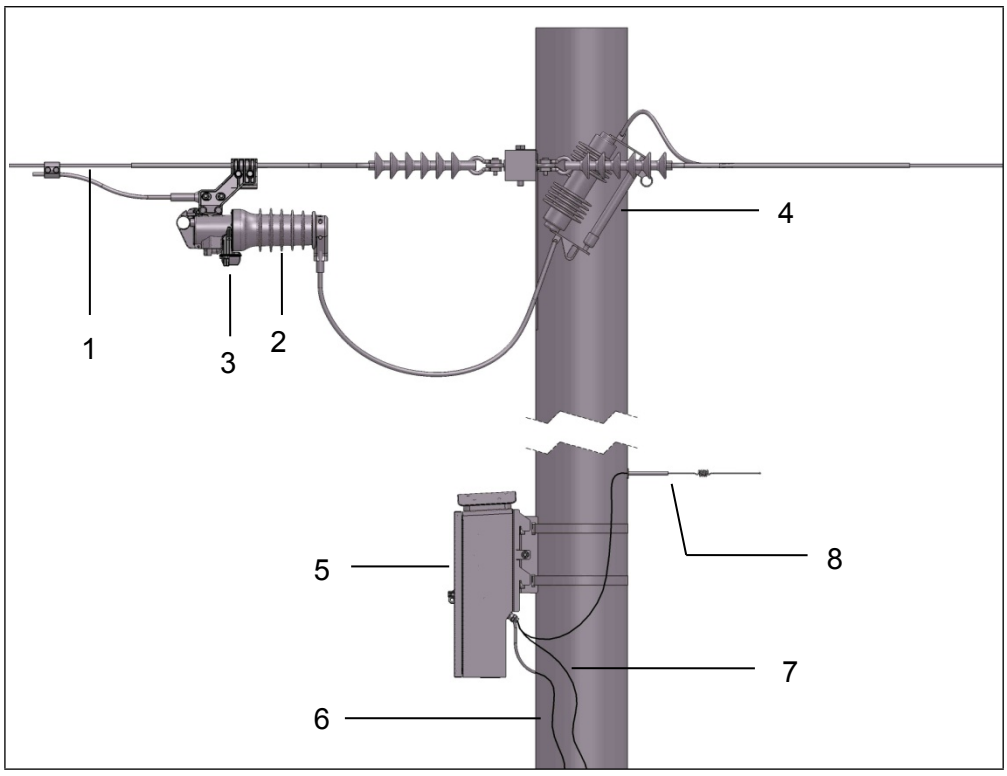


Fig. 2 Installation of RCU with Fusesavers

1 Conductor
2 Fusesaver
3 Communications Module
4 Fuse or isolating link
5 Remote Control unit
6 Earth Connection
7 Mains Connection
8 Antenna for long range communications

The design and testing of the Remote Control Unit is according to the relevant parts of **IEC 60950-1:2005 Information technology equipment – Safety.**

3.2 Remote Control Unit External Features

As shown below in figure 3, the RCU enclosure in mounted to the pole using the pole mounting bracket. Various options for how the pole mounting bracket connects to the pole and the installation methods are discussed in section 5.3. The RCU enclosure itself is manufactured from powder-coated stainless steel for long service life. Material options are available at time of ordering including 304 and 316 grade stainless steel.

The RCU enclosure has a handle with internal three point locking mechanism. An external padlock can be fitted to restrict access. The locking mechanism will accept padlocks in the size range diameter 6-10mm shank.

On the top of the RCU enclosure is a high grade UV stabilized plastic shade hood. This shade hood fulfils two functions:

1 Reduces the effect of enclosure heating from direct sunlight onto the top of the enclosure.

2 Provides an aperture for the short range radio in the RCU to send and receive signals to and from the switchgear above.

At the rear of the RCU enclosure there is an earth stud and a number of apertures fitted with cable glands to allow external wiring to access the internals of the RCU for items such as:

- An LV mains or VT supply
- Solar power supply
- External antenna's

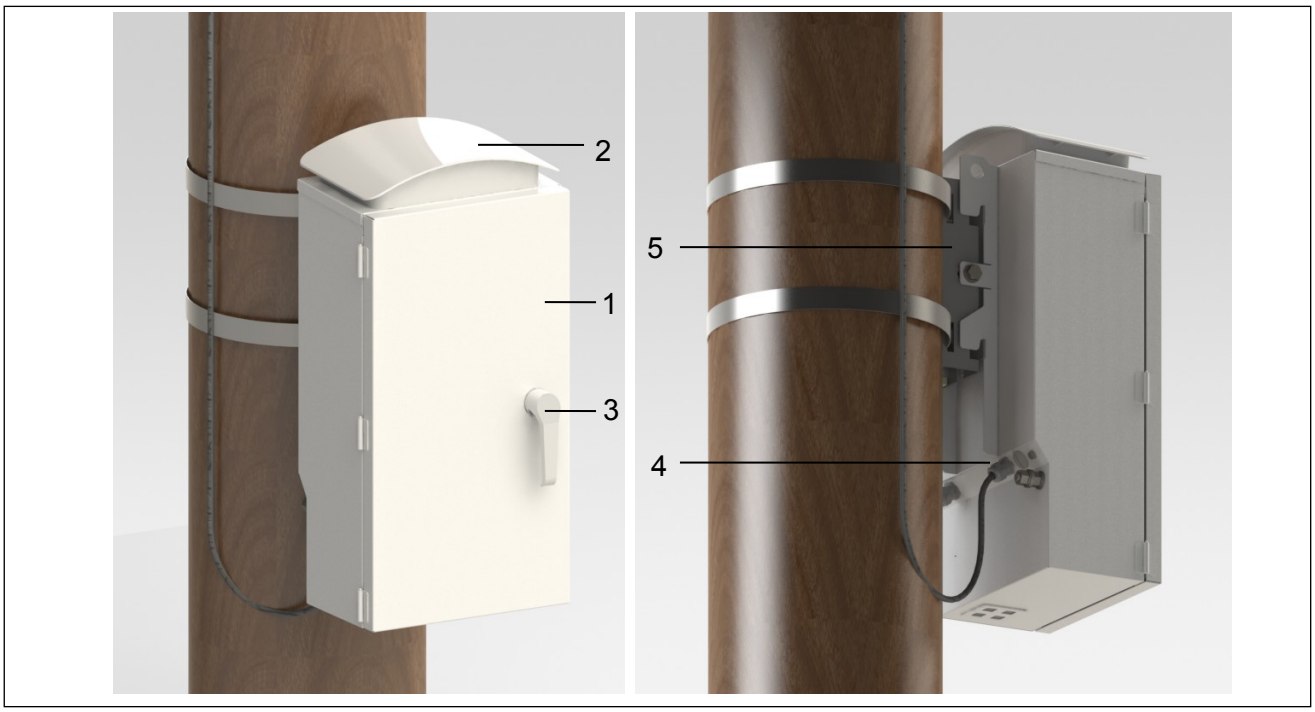


Fig. 3 Remote Control Unit mounted on pole

1 RCU Cubicle
2 Shade Hood
3 Padlockable Handle
4 Cable Entry Glands
5 Pole Mounting Bracket

3.3 Remote Control Internal Features

The RCU enclosure provides a protective shell for the electronics housing and radio tray as shown in figure 4 below.

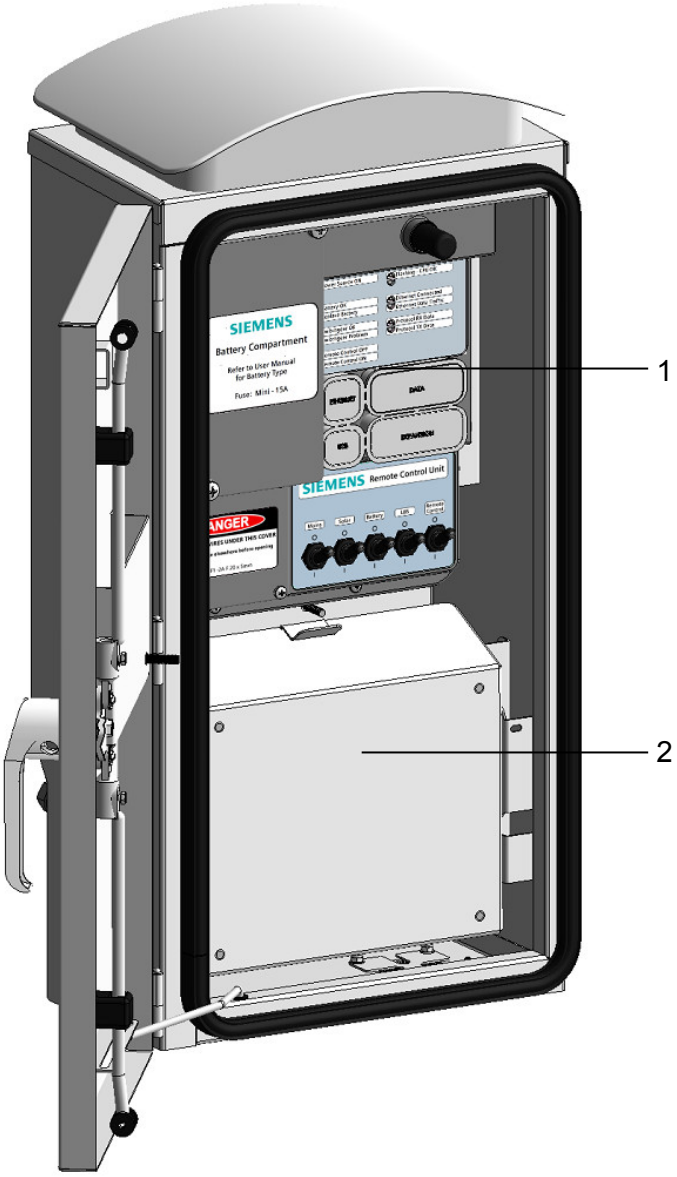


Fig. 4 Main Internal Elements

1 Electronics Housing
2 Radio Tray

3.3.1 Electronics Housing

The electronics housing contains the micro-processor, battery, power connection terminals, data connection points and the user interface for the RCU. The RCU has a simple user interface for operations and maintenance purposes. The RCU front panel is shown overpage in figures 5 and 6. It has a number of LED indictors. The LEDs are normally off (to reduce power consumption) and turn on automatically while the door is open as controlled by the position of the door switch.

After connection of a power supply the operator uses toggle switches to turn the RCU “ON”. The LED indicator display panel provides feedback to the operator as to the function of the RCU and the connections between RCU, switchgear and the SCADA system.

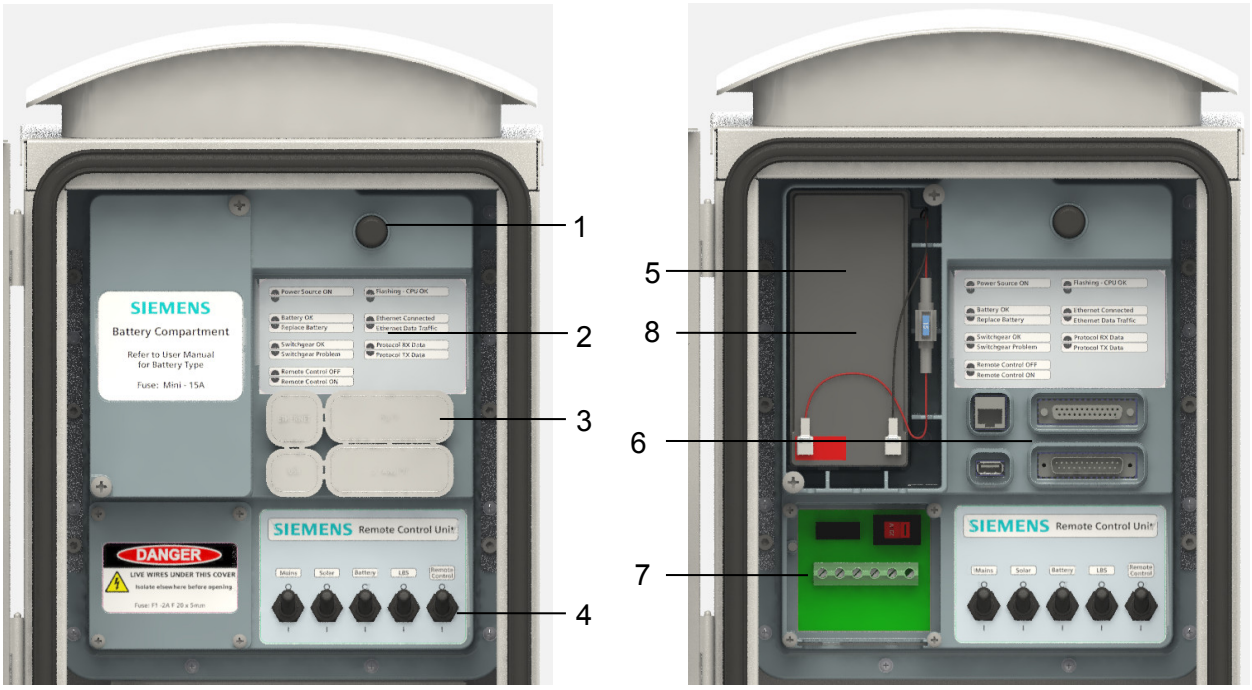


Fig. 5 Electronics Housing

1 Door Switch
2 LED Display
3 Connector Covers
4 Toggle Switches
5 Battery
6 USB, Ethernet, Linesman, operator panel & Radio interface connectors
7 Power supply and earth connection
8 Battery fuse

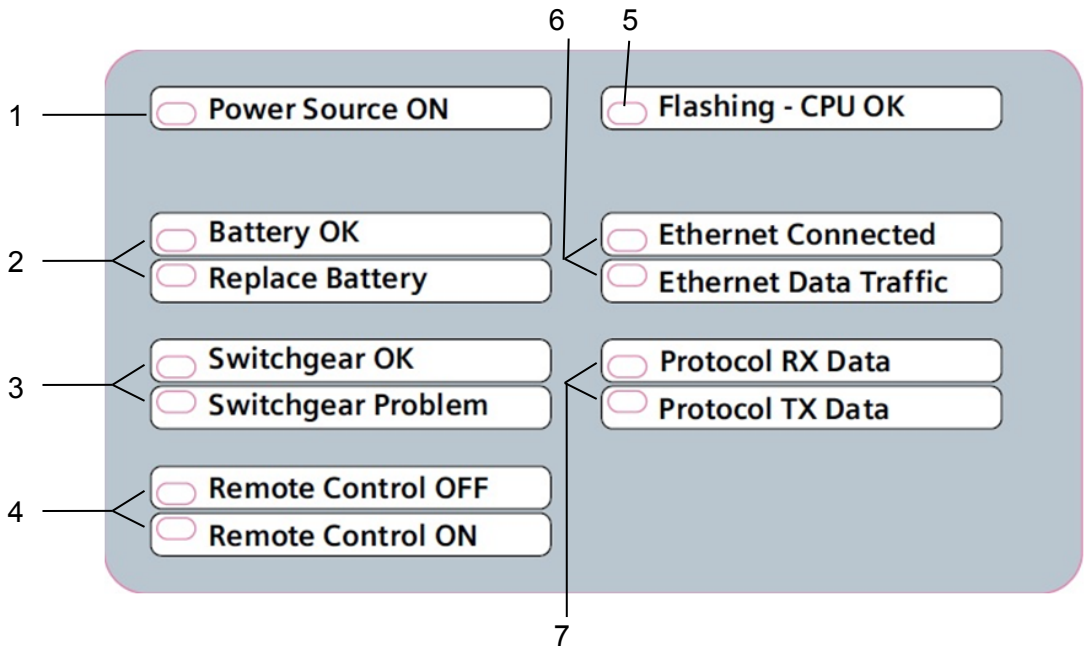


Fig. 6 LED Indicator Display

1 GREEN light ON – Power source (solar or mains) providing power

Light OFF – No incoming power

2 GREEN light ON – Battery is OK

Light OFF – Battery off or disconnected

RED light ON – Battery needs replacing

3 GREEN Light ON – Switchgear OK

GREEN Light Flashing – Searching for switchgear

RED light ON – Switchgear configuration or communication problem

4 GREEN light ON – Remote Control Off.

RED light ON – Remote Control On.

5 GREEN FLASH – Microprocessor OK.

GREEN Light ON or OFF – Microprocessor problem

6 GREEN light ON – Ethernet Connected

RED FLASH – Network traffic

7 GREEN FLASH – SCADA message received

RED FLASH – SCADA message sent

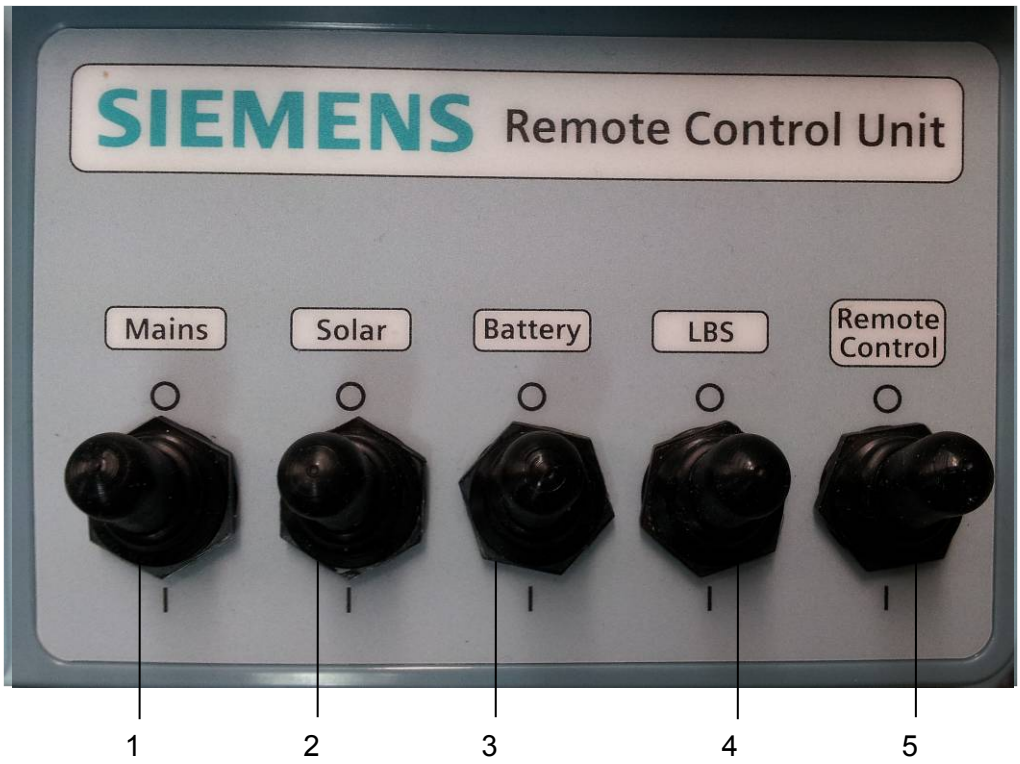


Fig. 7 User Toggle Switches

1 Mains supply ON/OFF – no effect for solar installations
2 Solar panel supply ON/OFF – no effect for mains installations
3 Battery ON/OFF – used when replacing battery
4 LBS ON/OFF – For future use, leave OFF
5 Remote Control ON – remote control is enabled so that remote SCADA operator can control switchgear
Remote Control OFF – remote control is disabled so that remote SCADA operator cannot control switchgear. This switch also affects control from an Operator Control Panel if fitted, see page 31

3.3.2 Radio Tray and Operator Control Panel

The radio tray is used to accommodate the long range radio and the optional Operator control panel. The radio tray hinges down and allows access to the radio behind. When in the hinged up position, the tray provides a degree of protection from driving rain.

The maximum allowable dimensions of the radio are as follows:

	Width	Height	Depth
Without Cubicle Heater	200 mm	160 mm	105 mm
With Cubicle Heater Fitted	200 mm	160 mm	70 mm

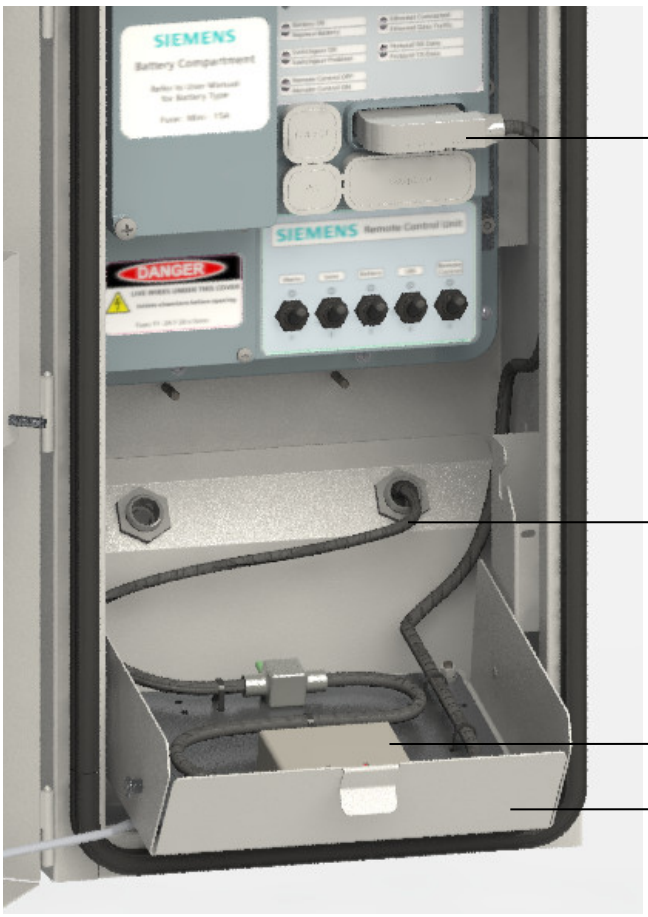


Fig. 8 Radio Tray

1 Customer radio/modem
2 Radio Tray
3 Radio/Modem specific cable
4 Antenna Cable

The radio tray is available for fitting the customer specific radio, modem or other means to connect to the utility's SCADA system.

> **Note**
>
> It is the responsibility of the user to correctly configure the RCU with the selected communications means and to verify the SCADA controls and events perform as expected.

At the customer request, and subject to additional fees, Siemens may customise the radio tray to meet a specific communications device mounting. Further, Siemens may also provide a value-added service by fitting and testing the communications device in the factory prior to shipment. Please contact a Siemens Sales representative to discuss these services.

Optionally the Radio Tray can be fitted with a Operator Control Panel on the reverse side as shown below. The Operator Control Panel is an accessory to the RCU. An Operator Control Panel fitted to an RCU provides a local operator with the ability to send trip, close and protection controls and view of the current state of the switchgear connected to the RCU by short range radio.

The Operator Control Panel is fitted inside the RCU enclosure and can be accessed by the operator when the RCU door is open.

Fig. 9 Operator Control Panel

1 Radio Tray

2 Operator Control Panel

3 Operator Control Panel Connected to Expansion Interface

3.3.3 Power Supply Isolation Unit

Power Supply Isolation Unit (part 3AD8800-3AX1350-8B) is an optional accessory that provides a double pole point of isolation for the electronics housing and the cubicle heater. Where an isolator is fitted, the incoming mains is connected to the isolator and the isolator provides sockets for the electronics assembly and for the heater

⚠ DANGER

Electrical hazard – Danger to life!

The isolation unit is required if-

- The RCU is mains powered and if it is preferred to provide a point of isolation *inside* the cubicle for changing the electronic housing. Note that the user will still need to provide a point of isolation for the wiring to the RCU.
- A cubicle heater is fitted.

The isolation unit is not an applicable option for a solar powered RCU.

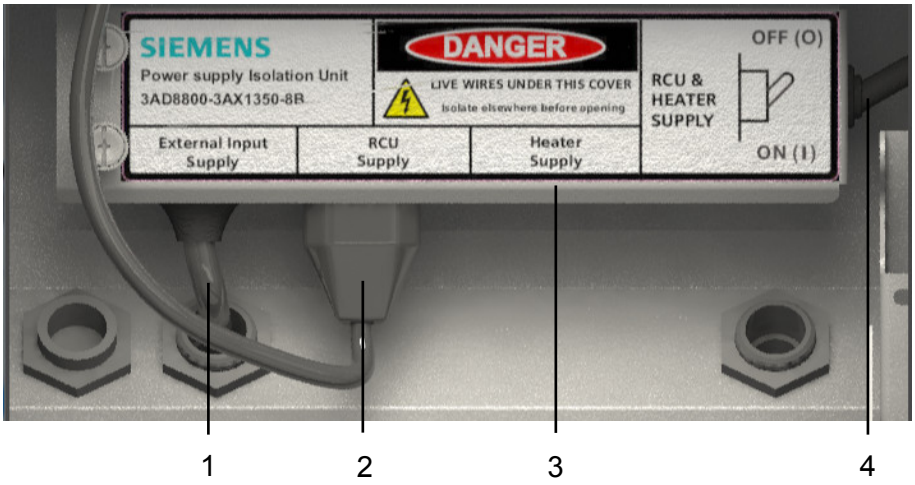


Fig. 10 Power Supply Isolation Unit

1 Incoming supply cable
2 Outgoing connection to RCU electronics housing (10 A IEC outlet)
3 Outgoing connection to cubicle heater (10 A IEC outlet)
4 Toggle switch

3.3.4 Cubicle Heater

The cubicle heater (part 3AX1350-8A) is an optional accessory that mounts behind the radio tray and plugs into the power supply isolator. It uses a natural convection to heat the cubicle, i.le., there is no fan. It has a positive temperature coefficient element which acts as a thermostatic heater keeping the battery and electronic compartment above -15 ^{O}C for ambient temperatures as low as -30 ^{O}C.

The heater is required for climates:

- Where the temperature can fall below -20 ^{O}C or
- Where the temperature will regularly fall below -10 ^{O}C or
- Where condensing humidity is a recurrent problem

The heater is suitable for continuous operation AC: 90 V to 265 V.

Note that a Power Supply Isolation unit is required if a heater is fitted.

The heater is not suitable for fitting to a solar powered RCU.

⚠ CAUTION

The surface of the heater may be hot.

The surface grill of the heater may reach 30^{O}C higher than the ambient air temperature inside the cubicle.

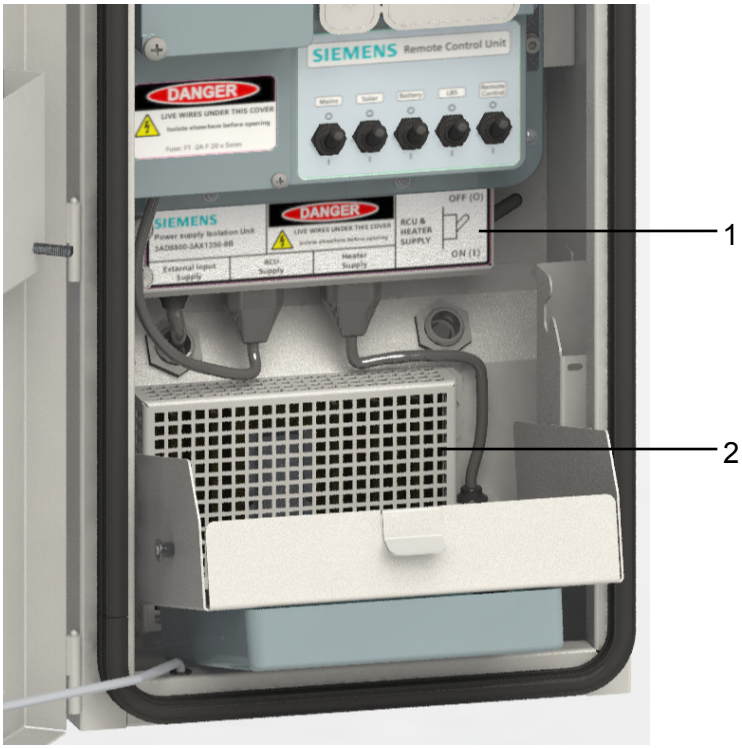


Fig. 11 Cubicle Heater

1 Power Supply Isolation Unit
2 Cubicle Heater

3.4 Function of the RCU

The RCU acts as an interface between a switchgear installation on the power line and a utility SCADA system. To do this the RCU uses its configuration to find and access installed and running switchgear mounted on the power pole. It communicates with the switchgear using its built-in short range radio.

Fusesavers: installed on each of the phases of the power line and are organised to work as a set to control that line. One, two or three Fusesavers can be organised in this way for a single phase, two phase or three phase line. An RCU provides access to the Fusesavers on a *single* power line so that if there are multiple lines at a site, then a separate RCU is required for each line.

CMRs: available either as optically ganged multiphase installations (two or three phases), or as a set of independent poles (one, two or three phases). The RCU provides access to the CMRs it has been paired with, so if there are multiple lines at a site, then a separate RCU is required for each line.

On start up the RCU turns on its short range radio and scans for transmissions from the switchgear matching its configuration. For Fusesaver installations, the RCU can connect promiscuously (i.e., connect to the first 3 Fusesavers it finds), connect to Fusesavers by line name or connect to Fusesavers by Serial number. For CMR installations, the RCU must be paired to target CMR devices by serial number [3] .

When it finds them it will acquire data from the switchgear and put it into its database ready for re-transmission over a long range radio (or modem) back to the utility SCADA system master station. The long range radio is mounted in the radio tray and is provided with power by the RCU electronic system. A variety of data interfaces and power supplies are provided by the RCU (refer to page 29). The exact radio, interface, power supply and protocol used to interface to the SCADA system may be different for each user.

Data in the RCU database includes information about the switchgear and the RCU itself. Usually a subset of this data is mapped into the protocol used by the SCADA system.

The functional block diagram shown in figure 12 identifies the main elements of the RCU.

- A short range radio with built-in antenna that is used by the microprocessor to communicate to a PC to enable configuration of the RCU. The short range radio is inside the electronics compartment.
- A short range radio with built-in antenna that is used by the microprocessor to communicate to the switchgear mounted on the line above the RCU. The short range radio is inside the electronics compartment.
- The microprocessor retrieves data from the switchgear for sending to the SCADA system. The microprocessor is inside the electronics compartment.
- The data interface between the microprocessor and the long range radio (or modem). This has a variety of possible interfaces. The data interface is inside the electronics compartment.
- The long range radio which connects to an external antenna to communicate with the SCADA system. The long range radio is outside of the electronics compartment and is mounted on a removable radio tray.
- A power supply system which can take power from either a solar panel or from a 115 V or 230 V AC source and uses it to charge a standby battery. The power supply system provides power to all the parts of the RCU including the long range radio or modem. The power supply is inside the electronics compartment. The standby battery is in a separate compartment.
- An Operator Control Panel (optional) which connects to the microprocessor to provide additional status displays and controls for an operator.

3.5 RCU Internal Database and Controls

The RCU maintains an internal database which can be accessed by a SCADA protocol. The database consists of three parts:

- Points from the switchgear such as open/closed or line current.
- Points from the RCU itself such as door open or remote control active.
- Controls such as switchgear Trip/Close or change to switchgear protection mode/group.

Refer to the relevant protocol manual ([1] [8] [8] [9] [10] for more detail on the database and controls.

3.6 RCU Connect Utility

To interface to the switchgear and to the SCADA system, the RCU requires a configuration which is set up using a utility running on a PC called *RCU Connect. RCU Connect* is used to specify the information that the RCU needs to operate,

RCU Connect is also used to commission and test the RCU. Instructions on how to use *RCU Connect* and the configuration parameters are in chapter 7.

RCU Connect cannot change switchgear policies or settings, nor can it operate the switchgear. Switchgear can be operated from a PC using Siemens Connect (for Fusesaver) or CMRConnect (for CMR). Refer to the Siemens Fusesaver Operating Instructions or the Siemens CMR Configuration Instructions.

RCU Connect uses wireless communication from the PC for which a USB Antenna (the same one that is used for communication between a PC and a switchgear) is required. To enable communications either the RCU door must be opened or the SCADA master must send an appropriate as this allows *RCU Connect* to start communications at any time over the next 10

minutes. If communication is not started then the door must be closed and opened again or the control sent again.

3.7 SCADA System Protocols

The following SCADA system protocols are supported by the RCU.

1 DNP3 over Serial Port
2 DNP3 over IP – TCP Listener
3 DNP3 over IP – TCP Dual
4 DNP3 over UDP
5 IEC 60870-5-104
6 Others in future

It is important to understand that while each protocol is different, they all utilise the data in the RCU database and map it into the SCADA protocol in a different way. The mapping and other details needed to understand how to program the SCADA system master station are given in the relevant Protocol Manual. The details of the RCU database are given in the relevant protocol manual.

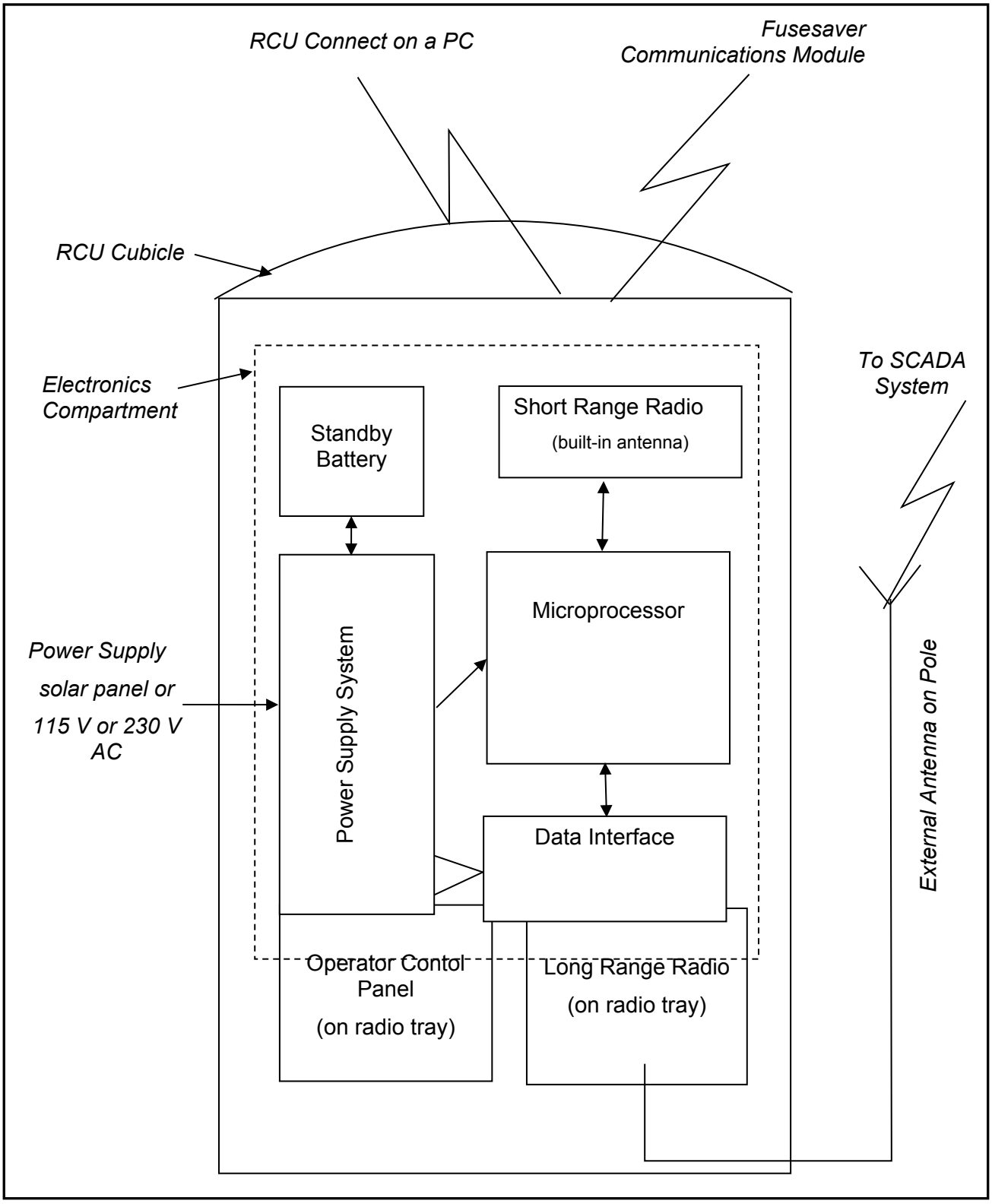


Fig. 12 RCU Functional Block Diagram

3.8 Short range radio communication security.

Encryption of communication on the short range radio link was introduced in the following revisions

- RCU Firmware v112 (for Fusesaver installations the RCU preferentially connects to Fusesaver Communications modules that encrypt their communication)
- RCUConnect v1.5.2.0
- Fusesaver Communication Module firmware v1563

- CMR firmware – all versions

Prior to this communication was not encrypted. Backward compatibility is maintained so that, for example, current versions of RCUConnect can communicate with RCU with firmware prior to v112.

3.9 RCU Power Supply

The RCU can be powered from either a mains supply or a solar panel supply and incorporates a battery for standby backup purposes when the supply is absent. Refer to the technical data on page 91 for specification of voltage ranges, power consumption etc.

3.9.1 Mains Supply

⚠ DANGER

Electrical hazard – Danger to life!

This is connected into the terminal compartment to a dedicated set of terminals. There is a voltage selector switch to select between AC: 115V and 230V supplies and a fuse. Optionally the incoming supply can be connected via a Power Supply Isolation Unit, see section on Power Supply Isolation Unit.

Refer to page 44 onwards for safe installation practices.

3.9.2 Solar Supply

Where an LV mains supply is not available Siemens has a solar panel option to provide charge to the batteries. The solar panel is sized to provide adequate charge for energy efficient radios and modems in environments where it does not snow, and at latitudes less than 45^{O}. The panel angle can be adjusted between two settings to optimise performance for given latitudes. The solar panel must be mounted on the same power pole as the RCU, refer installation details on page 41.

The solar panel is connected into the terminal compartment to a dedicated set of terminals as an alternative to the mains supply. Siemens Service Centre can assist with determining the correct power rating of solar panels or a suitable solar panel can be supplied by Siemens.

The RCU monitors the solar supply in two ways:

1. The RCU checks that each day there is some voltage from the solar panel (even on the most overcast day the solar panel will have some output). This will detect a solar panel that has been disconnected or failed.
2. If there is insufficient sunlight during the day the solar panel may not be able to fully recharge the battery on that day, this is not a problem since the battery will usually have sufficient power stored to operate during periods of low sunlight. However, over a period of days it is expected that the panel will fully charge the battery. Accordingly, the RCU checks that the solar supply has been able to fully recharge the battery within a specified number of days and if not, this indicates that either the panel is degraded in some way (for example covered in leaves or dust) or there has been an exceptional run of bad weather. The maximum time period for full recharge is set in the RCU configuration, refer page 96.

If either of these conditions occurs, then a solar panel problem database point (DPID_4) is set and is available for transmission via the SCADA system.

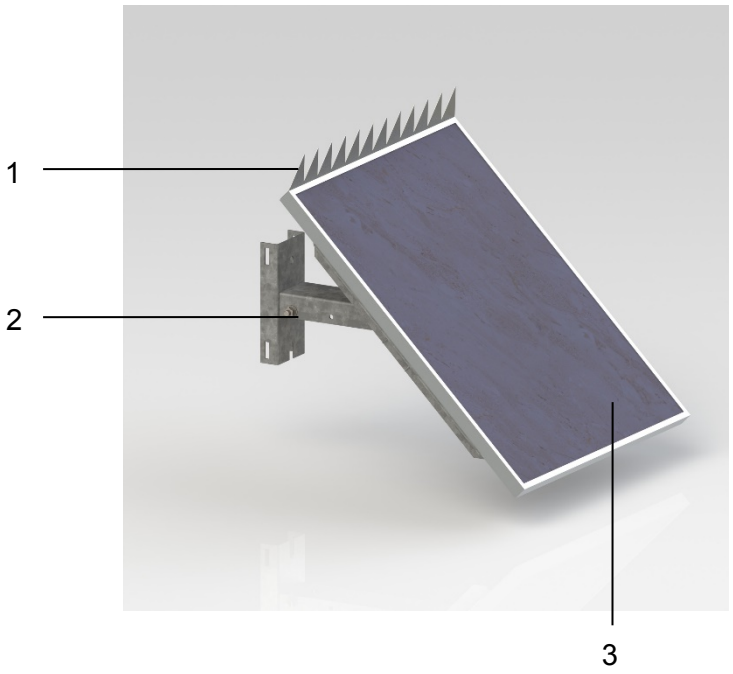


Fig. 13 Solar Panel Assembly

1 Bird Roost Guard
2 Mounting Bracket
3 Solar Panel

3.9.3 Battery Backup

The battery provides backup power for the RCU. The battery is of the lead-acid type with a 12 V, 7.2 Ah rating. The battery is protected by a fuse in the cable. If the battery is accidentally reversed the battery fuse will blow but no damage will be done to the RCU electronics. The battery cable is a replaceable item in case it is damaged in service.

Note that the battery negative terminal is connected to the ground of the cubicle and is also the 0 V signal for all the electronic interfaces in the RCU.

The RCU maintains a digital point “Battery Needs to be Replaced” (DPID 2) which indicates that the battery is at end of life. When this point is set it lights the “Replace Battery” LED on the RCU front panel and is available for transmission via the SCADA system. When the battery is replaced, refer page 84, the point is reset and the LED is turned off.

The “Battery Needs to be Replaced” point can be set in a number of ways:

- **Charging** : While recharging the battery after it has had a significant discharge (for example, when the source has been off for several hours) the total charge put into the battery is monitored and if it requires excessive charge (indicating the battery is at end of life) the battery replacement flag is set.
- **Discharging** : When the source supply is off the battery is discharged to power the RCU, both the electronics and the SCADA radio. During discharging the battery voltage is monitored and the time taken to drop to a level that indicates 50 % of the battery charge has been consumed is measured. If this time is too short then it indicates that the battery capacity is severely reduced and the battery is at end of life and the battery replacement flag is set. This requires the Radio Average Current to be correctly configured, see the relevant protocol manual for more information.
- **Time in Service** : After a battery has been replaced the days it spends in service are counted and when they exceed the Battery Life configuration setting, refer page 96, the battery replacement flag is set.

3.10 Radio Power Supply

The long range radio/modem requires a power supply to operate. The RCU provides the following options:

- A regulated supply which can be configured between DC: 3 V and 9 V. This supply is internally protected by current limit from radio short circuits.
- Supply direct from battery. In this case a 6 A fast fuse must be included in the radio cable to protect the RCU from radio short circuits.

Both of these supplies are provided via the serial port connector on the electronics compartment. RCUConnect is used to configure which of the supplies is enabled.

Refer page 92 for more information on the radio power interface.

⚠ WARNING

Do not connect a modem directly to the RCU battery terminals. Always use the serial port connector as described on page 92.

3.11 Load Break Switch Power Supply

The RCU incorporates a terminal to power other Switchgear devices that Siemens may develop in the future. This is not used for Fusesaver/CMR installations. If this terminal is shorted to ground when the LBS switch is ON the battery fuse will blow but no damage will be done to the RCU electronics.

☞ Note

The LBS switch has no use for Fusesaver/CMR installations and should normally be turned OFF.

The terminal can be used to supply power to other devices, refer to Siemens Service Centre for engineering support if this is required.

3.12 Radio/Modem Interface

In order to communicate with the SCADA system master station a long haul radio or modem is required. The RCU electronics provides two digital interfaces for the radio:

- Serial Asynchronous data (Serial Interface)
- 10/100BaseT (Ethernet Interface)

The use of the Ethernet interface increases the power consumption of the RCU. A purpose built cable connects the radio/modem to the RCU interface. The design and construction of this cable may be carried out by the customer referring to section 10.5, or as a value added service provided by Siemens Service Centre.

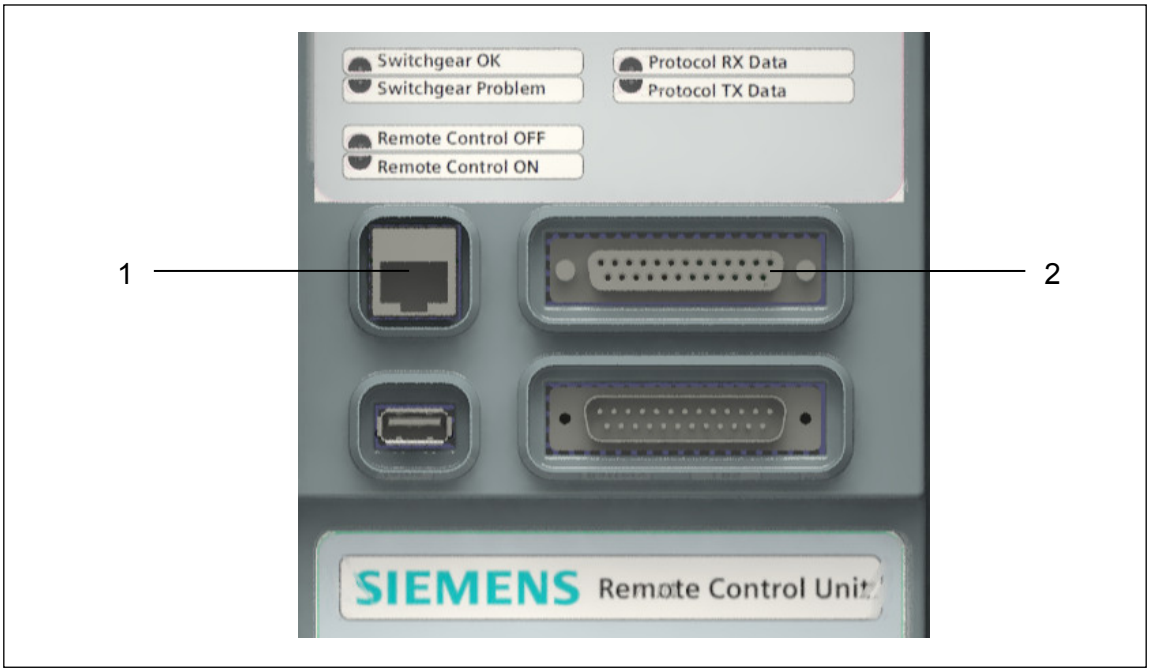


Fig. 14 Radio/Modem Interfaces

1 Ethernet Port
2 Serial Port

4 Control of Switchgear

4.1 Fusesaver

The Fusesaver has multiple sources of control for Tripping, Closing and changing Protection Mode as follows:

- TRIP/CLOSE levers on the Communications Module (refer to Fusesaver Operating Instructions KMS-0017 for more details)
- Siemens Connect utility running on a PC equipped with a USB antenna module (refer to Fusesaver Operating Instructions KMS-0033 for more details)
- SCADA operator via the RCU
- Operator control panel if fitted to the RCU.
- Controls generated from the RCU itself based upon condition criteria

This section provides details on the protection mode functionality that is possible via the RCU and the various means by which these controls can be asserted.

4.1.1 Methods of Asserting Controls

4.1.2 SCADA Operator Controls

The purpose of the RCU is to allow a remote operator to connect through the RCU to the Fusesavers to receive events and to apply controls. The availability of these events and controls is determined by the type and implementation to the utility SCADA system. Refer to the relevant Protocol Manual for information on the event types and controls supported by the RCU for your protocol. It is the user's responsibility to engineer the SCADA interface required to manage RCU's in the field.

The SCADA control centre will be able to perform the following functions:

1 View RCU status and event information.

2 Issue trip and close commands to the Fusesavers via the RCU. The RCU must have Remote Control Switch set to ON for this to be possible.

3 Change protection modes in the Fusesaver via the RCU. RCU must have Remote Control Switch set to ON for this to be possible.

4 Issue a command to the Fusesavers to force the protection to be armed regardless of whether there is adequate line current to power the Fusesavers as in normal operation. The protection will remain armed until a command to disable the "forced" arming is received or a time limit that is set by the Fusesaver policy file is reached

Control by the SCADA operator of Fusesaver Trip, Close, protection mode and forced protection arming is enabled when the Remote Control Switch is ON and disabled when the Remote Control Switch is OFF.

It is possible to configure the RCU so that SCADA trip is always accepted, refer "Always Allow Trip" setting in the relevant protocol manual.

SCADA control of the Fusesaver dummy control is always allowed.

4.1.3 Fusesaver Operator Control Panel Controls

Control by the Fusesaver Control panel (refer page 19) for Fusesaver Trip, Close and protection mode is enabled when the Remote Control Switch is OFF and disabled when the Remote Control Switch is ON however it is possible to configure the RCU so that the Operator Control panel is always able to control the Fusesaver irrespective of the Remote Control Switch. This is detailed on page 98.

4.1.4 Siemens Connect Control

If a local operator is using the Siemens Connect PC application to operate the line Fusesavers (this is called being in-session) then the RCU will not send controls to the Fusesavers and will not retrieve events from the Fusesavers. This is because Siemens Connect is considered to be a local operator and takes charge of communications to the Fusesavers. Any controls received from the SCADA system or from a Fusesaver Control Panel fitted to the RCU will be rejected.

Once the Siemens Connect session is complete, all new events in the Fusesaver will be passed to the RCU for relay through the SCADA system.

Whilst Siemens Connect is in-session with the Fusesavers a digital point indicating that the Fusesavers are not in-session with the RCU is available for transmission to the SCADA system.

4.1.5 Fusesaver Protection Mode Control

One of the core functions of the RCU is to allow remote control of the Fusesaver protection functionality. The Fusesaver has up to nine possible protection modes (depending on its configuration) as defined in the Fusesaver Operating Instructions as follows:

1 Protection Off Mode: the Fusesaver will not TRIP when a fault occurs, protection functionality is disabled.

2 Normal-Off Mode: the Fusesaver utilises the “normal” protection curve defined by the policy file and fuse settings at time of configuration. The Fusesaver will automatically CLOSE after the dead time.

3 Normal-Single Mode: the Fusesaver utilises the “normal” protection curve defined by the policy file and fuse settings at time of configuration. The Fusesaver will NOT automatically CLOSE after the dead time, i.e. it will TRIP and stay in the OPEN state.

4 Normal-Normal Mode: the Fusesaver utilises the “normal” protection curve defined by the policy file and fuse settings at time of configuration. The Fusesaver will automatically CLOSE after the dead time and will then activate the “normal” protection curve allowing a second TRIP if necessary.

5 Normal-Fast Mode: the Fusesaver utilises the “normal” protection curve defined by the policy file and fuse settings at time of configuration. The Fusesaver will automatically CLOSE after the dead time and will then activate the “fast” protection curve allowing a second TRIP if necessary.

6 Fast-Off Mode: the Fusesaver utilises the “fast” protection curve defined by the policy file and fuse settings at time of configuration. The Fusesaver will automatically CLOSE after the dead time.

7 Fast-Single Mode: the Fusesaver utilises the “fast” protection curve defined by the policy file and fuse settings at time of configuration. The Fusesaver will NOT automatically CLOSE after the dead time, i.e. it will TRIP and stay in the OPEN state.

8 Fast-Normal Mode: the Fusesaver utilises the “fast” protection curve defined by the policy file and fuse settings at time of configuration. The Fusesaver will automatically CLOSE after the dead time and will then activate the “normal” protection curve allowing a second TRIP if necessary.

9 Fast-Fast Mode: the Fusesaver utilises the “fast” protection curve defined by the policy file and fuse settings at time of configuration. The Fusesaver will automatically CLOSE after the dead time and will then activate the “fast” protection curve allowing a second TRIP if necessary.

The Fusesaver can be put into any of these modes from the following inputs:

1 The external lever of the Fusesaver. When the lever is pulled down the protection mode is forced to the mode defined in Fusesaver policy file. This always overrides the current mode setting in force. Important - when the external lever is returned to the UP position

the protection mode will return to whichever mode was active prior to the lever being pulled down.

2 Commands from the RCU sent over the short range radios that have originated from a SCADA operator.

3 Commands from the RCU sent over the short range radios that have originated from an Operator Control panel in the RCU (if one is fitted).

4 Commands from the RCU sent over the short range radios that have originated from the RCU itself when certain configurable conditions are met.

The interlocking of these sources of control is defined in the following table, the result of the interlocking can be summarised as follows:

- When a Fusesaver external lever is down, the protection mode is set to the mode predetermined in the Fusesaver policy file (for example a Fast-Single mode to be used for live line working). When *any* Fusesaver external level is down the RCU locks out *all* Fusesavers on the line from operations (including mode change) via RCU control panel or SCADA. Normally all the Fusesavers on the line will have their levers pulled down at the same time so their mode is the same.
- When the Fusesaver external lever is up on all the Fusesavers then the SCADA operator can control the protection mode or a local operator can control the protection mode depending on the position of the Remote Control ON switch. However, if desired, the RCU can be configured so that the RCU Operator Control panel is always active to change mode control irrespective of the Remote Control switch.

Fusesaver External lever	Siemens Connect	Remote Control ON/OFF Switch	Fusesaver Operator Control Panel Ignore Remote Switch Parameter	Mode Control by SCADA	Mode Control by Fusesaver Control Panel	Comment
Down on any Fusesaver	Not relevant	Not relevant	Not relevant	NOT ALLOWED	NOT ALLOWED	Mode will be forced to the Mode defined in the Fusesaver policy file for the Fusesavers which have levers down
Up on all Fusesavers	In session	Not relevant	Not relevant	NOT ALLOWED	NOT ALLOWED	When Siemens Connect is in-session (i.e. On the operate page) all other sources of control are locked out.
UP on all Fusesavers	Not running	ON	False	ALLOWED	NOT ALLOWED	
UP on all Fusesavers	Not running	ON	True	ALLOWED	ALLOWED	
UP on all Fusesavers	Not running	OFF	Not relevant	NOT ALLOWED	ALLOWED	

4.1.6 Condition Based Controls

The RCU also has the capability to do post processing of events received from the Fusesavers to assess whether certain conditions have occurred from which the RCU may apply commands to the Fusesavers.

4.1.7 Excessive Cleared Faults

This section describes a system whereby the Remote Control Unit (RCU) monitors the number and time frame of cleared faults of Fusesavers under the RCU's control. If the number of cleared faults is deemed excessive according to the configured excessive cleared fault parameters, the RCU will:

Fusesaver (Tribe) Configuration	Action
OC operation	Force all Fusesavers to set their "Remote Protection Off" protection bit. This effectively forces the Remote protection mode for the Fusesavers to "Protection Off"
OCO operation	Force all Fusesavers to set their "Remote No Reclose" protection bit. This effectively forces the Remote protection mode for the Fusesavers into the single shot equivalent of the current setting.

The RCU analyses Cleared Fault Events from Fusesavers and keeps a running tally of the number of cleared faults that occur on the line within a configurable time frame. An attempt to match Cleared Fault Events from different phases is made by using a 30s time match window in order to count simultaneous multiple phase faults as one event for the line.

When the configured number of cleared faults is reached, the RCU will send a remote protection mode change control to the Fusesavers, as if it is another control such as a SCADA operator, setting the Protection bits as described above. The event record of the Fusesaver will show the source of the control as "RCU". The RCU will also set the protocol database digital point for Excessive Cleared Faults Flag if the threshold is exceeded.

If the RCU is unable to control the Fusesaver remote protection mode, the control is lost, but will be attempted again if there is another cleared fault which exceeds the count/time constraint. Reasons for a control fail/rejected are:

1. the Fusesaver external lever is down,
2. Siemens Connect is in session,
3. communications failure,
4. another control is in progress

When the Fusesaver active protection mode changes, the RCU will also reset the timing/counting of Cleared Fault Events. This means that any change of Active Protection Mode by the user (eg pulling down the external lever of the Fusesaver or by a SCADA control) resets the excessive cleared faults count and timing starts again.

The RCU configuration has parameters that allow configuration of the excessive cleared faults functionality. These are:

- The time window size specified in seconds (maximum of 65535 seconds, 18.2 hours),
- the number of cleared faults that occur within the time window (maximum of 16)

Setting either the number of cleared faults or the sliding window size fields to zero disables the feature.

4.2 CMR

Like the Fusesaver, the CMR has multiple sources of control for Trips & Closes and for changing protection operation.

4.2.1 RCU as a conduit for data

The RCU is simply a conduit from SCADA (and the Operator Panel) to the CMR. Therefore, as long as its local state allows it (see below), the RCU will

- pass all requests (from SCADA or the operator panel) onto the target CMR without considering the CMR's state or configuration.
- Immediately send a SCADA acknowledgement, without checking whether the CMR has accepted, or successfully actioned the request.

The RCU's SCADA database provides point indicating whether a CMR accepted (i.e., positively acknowledged) or rejected (i.e. negatively acknowledged (i.e., blocked or rejected), or failed to acknowledge within a timeout) the last request it sent.

4.2.2 Hierarchy of Control

In general, local operation takes precedence over remote operation with the following order of priority:

- CMR handles
    - If the red handle is down, the CMR's protection group cannot be changed.
    - If the yellow handle is down, the CMR cannot be closed.
- local operator using the CMRConnect PC application
    - While CMRConnect is communicating with ("in session" with) any phase paired with the RCU, the RCU will not interact with ANY CMR. It will not send controls (whether they come from SCADA or the operator panel) nor retrieve events until the session ends. This means that certain RCU database points will not update until the session ends. The RCU maintains a database point indicating when a CMR is "in session". See [3] for further details regarding the interaction between RCU and CMRConnect.
- local operator using an RCU Operator panel (see [4] for further details)
    - If the "Remote Control" switch on the RCU front panel in the OFF position then the RCU will not accept SCADA controls (*with one exception – see below*), only controls from the panel.
    - If the "Remote Control" switch on the RCU front panel in the ON and the RCU is configured with the "Control Panel Ignore Remote Switch" item enabled, then the RCU will accept controls from both SCADA and the operator panel.
- a remote user sending SCADA controls.
    - If the "Remote Control" switch on the RCU front panel in the ON and the RCU is configured with the "Control Panel Ignore Remote Switch" item disabled, then the RCU will only accept controls from SCADA (and not from the operator panel).
    - If the "Remote Control" switchon the RCU front panel is in the OFF position, and the RCU is configured with the "Always Allow Trip" configuration item enabled, then SCADA trip operations will be allowed.

4.2.3 Trip and Close

Trip and close operations can be triggered:

- Automatically by the CMR as part of a protection sequence.
- Using the yellow handle.
    - Optically Ganged installations: Pulling any yellow handle down will trip all phases. Putting the last yellow handle back up will close all phases. No close operations (from any source) will occur while any yellow handle is down.
    - Independent Pole installations: Pulling a yellow handle down will trip that phase. Putting the yellow handle up will close that phase. No close operations (from any source) will occur while the yellow handle is down.
    - Pulling a yellow handle down will mechanically trip the CMR is unpowered.
    - A CMR is mechanically prevented from closing while its yellow handle is down.
- Using the CMRConnect utility on a PC equipped with a USB antenna module.
- SCADA operator via the RCU
- Operator control panel if fitted to the RCU

The CMR applies a number of rules (based on its state and configuration) to decide whether a trip or close operation should be performed

- Trip & close operations are blocked if
    - optical communication between devices has failed (for an optically ganged installation only)
    - all relevant phases are already in the target position.
        - For ganged operations, only phases that are not already in the target position will operate (assuming the operation is not blocked by some other rule)
    - the CMR has a pending (delayed) close operation.
- Protection/Zone Sequence Coordination/Sectionalizer trips are blocked if
    - any yellow handle is down.
- Trip operations from the RCU (includes SCADA, Panel, RCUProbe) are blocked if
    - the red handle is down, and user has configured the CMR to block RCU sourced trips when the red handle is down.
- Manual close operations (i.e. from yellow handle) are blocked if
    - the red handle is down, and the user has configured the CMR to block user close operations.
    - the recloser is not idle (i.e., is not Open and Locked out, is in a protection sequence)
    - the active protection group is configured to not allow close operations
- Close operations from the RCU (includes SCADA, Panel, RCUProbe) are blocked if
    - the red handle is down, and the user has configured the CMR to block all close operations
    - the red handle is down, and the user has configured the CMR to block RCU sourced close operations
    - the recloser is not idle (i.e., is not Open and Locked out, is in a protection sequence)
    - the active protection group is configured to not allow close operations

4.2.4 Protection Operation

Protection operation of a CMR can be changed in-service (i.e., without reconfiguring the CMR) by either (a) changing protection groups or (b) changing protection modifiers to block or allow certain protection functionality.

The primary function of the red handle on the CMR is to change protection groups

- When the red handle is up, the CMR will apply the users selected protection group.
- When the red handle is down, the CMR will apply the configured lever down protection group.

Protection group and protection modifiers can also be changed

- Using the CMRConnect utility on a PC equipped with a USB antenna module.
- SCADA operator via the RCU
- Operator control panel if fitted to the RCU

Refer to [1] for further detail of how protection groups and modifiers can be changed and monitored.

The CMR will reject any group change request if the target group has not been configured.

4.2.5 Excessive Cleared Faults

The RCU does not support this functionality for CMR switchgear.

5 Installation

This section provides information about the installation and commissioning with regard to the following:

- Required documents
- Personnel requirements
- Tools, devices, and expendable materials to be used
- Accident prevention
- Recording and documentation.

5.1 Safety instructions for installation

DANGER

Electrical Hazard – danger to life!

Touching live parts is fatal or causes serious physical injury.

CAUTION

It is the user's responsibility to ensure all installation procedures developed comply with all applicable safe work practices.

Attend the local network rules.

CAUTION

To prevent damage to the RCU operators should always wear ESD earth straps whilst operating the equipment if in a high static environment.

Note

The RCU requires earthing in accordance with the user's normal procedures.

5.2 Installation guidelines

The RCU installation occurs at the bottom of the pole and is not connected to high voltage. Subject to local utility regulations installation can be completed by personnel with suitable low voltage qualifications.

Earthing of the RCU is required in accordance with the user's standard procedures.

5.2.1 Tools required for installing the RCU

- 1 x 24 mm A/F spanner
- 2 x 18 mm A/F spanner

- 2 x 19 mm A/F spanner
- Adjustable torque wrench in range 40 Nm to 70 Nm with 18 mm, 19 mm and 24 mm A/F sockets
- Flat No.2 screwdriver
- Flat No. 1 screwdriver
- Cable stripping and lugging tools

5.2.2 Additional Parts

- Earth cables and lugs

5.2.3 Mechanical Installation

A responsible person (or supervisor) must be assigned to oversee the installation and commissioning work who instructs personnel during installation and commissioning tasks and checks for compliance with the applicable safety measures. Furthermore, this person is responsible for the organization, monitoring and signing off of the work.

The installation and commissioning work must be performed by authorised personnel with sufficient qualifications and experience. Suitable lifting gear in good working order must be used for installation.

Applicable accident prevention regulations must be observed.

5.3 RCU Mounting

The RCU is intended to be pole mounted onto timber, steel, concrete and stobie poles. The standard RCU mounting bracket can accommodate all these options through the use of either bolting or strapping of the bracket to the pole. A combination of one bolt and a strap is also acceptable so long as the upper restraint is bolted.

⚠ CAUTION

Weight of RCU is approximately 15 kg (33 lbs), handle with caution. Use safe lifting procedures.

The recommended installation sequence is:

1 Mount the bracket to the pole using either M16 galvanised bolts of grade 4.6 or higher (torque 70 Nm) or straps taking into account orientation guidelines described in section 5.6.

2 Hang the cubicle over the bracket using the locating ears as a guide.

3 Fit the M12 cross-bolt and secure the RCU to the pole bracket (torque 40 Nm)

4 Connect earthing wire as required in section 5.10.

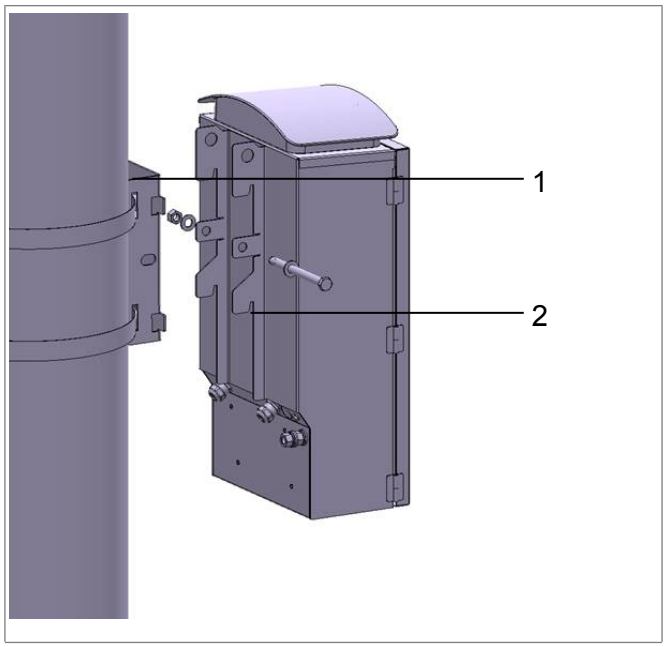


Fig. 15 RCU Mounting

1 Pole Mounting bracket
2 Locating ear

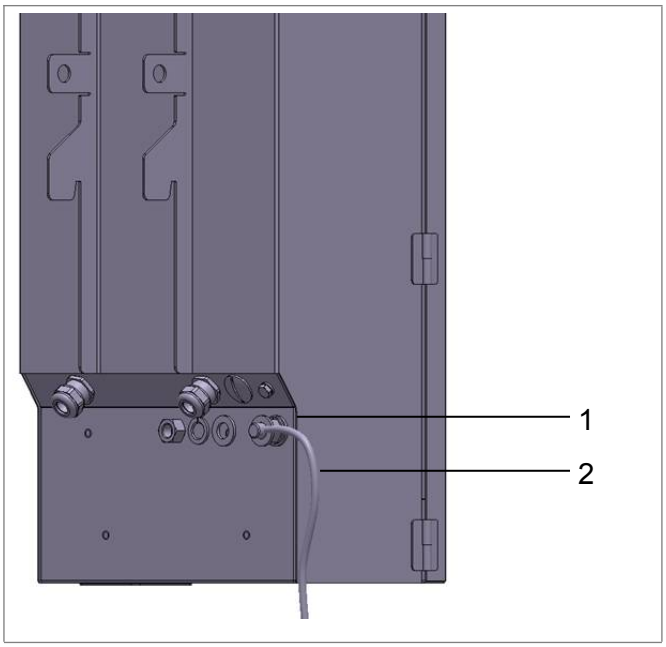


Fig. 16 Connecting

1 Earth Stud
2 Earth wire

5.4 Battery Installation

Only after mounting the RCU it is necessary to install the battery according to the following process:

1 Remove the battery from the packaging material.

2 Ensure the “Battery I/O“ toggle switch is set to the “O“ position

3 Unscrew the battery compartment cover.

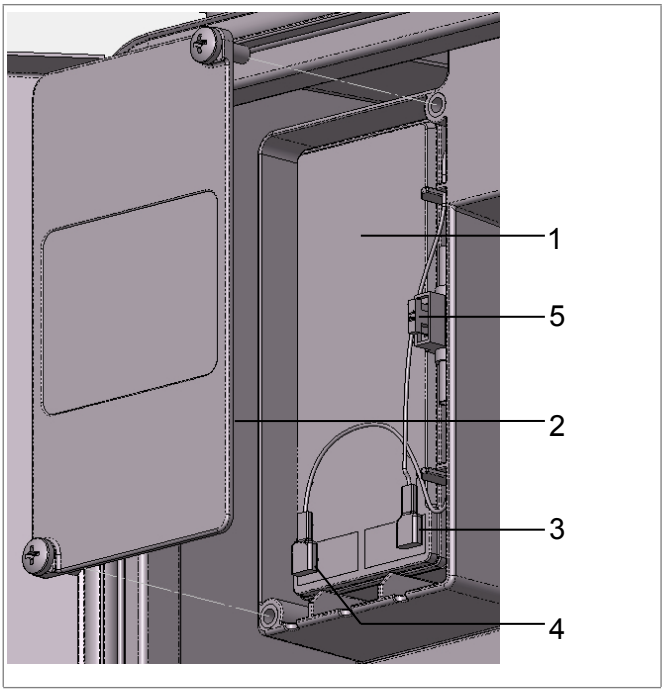
4 Fit the battery into the compartment in the orientation shown in figure 17 below.

5 Connect the red wire to the positive (red) terminal of the battery and the black wire to the negative (black) terminal of the battery.

6 Fit the battery compartment cover and screw in place using Flat blade screwdriver to 1.0 Nm torque.

Note

It is recommended that a battery is charged before being placed into service.



1 Battery
2 Battery Compartment Cover
3 Negative Terminal (Black)
4 Positive terminal (Red)
5 Battery fuse

Fig. 17 Battery Connection Details

WARNING

Incorrect Battery Polarity Connected.

If the battery is connected in the reverse polarity the fuse will blow.

WARNING

Don't Pinch Battery Wire.

When fitting the battery care must be taken not to pinch the battery wire.

The battery should be removed prior to removing the RCU from a pole and for any transport. Refer section 9.4.

5.5 Solar Panel Mounting

The solar panel assembly is intended to be pole mounted onto timber, steel, concrete and stobie poles. The standard solar panel mounting bracket can accommodate all these options through the use of either bolting or strapping of the bracket to the pole. A combination of one bolt and a strap is also acceptable so long as the upper restraint is bolted.

WARNING

Bird Roost Guard can fall down.

Suitable safety protection equipment should be worn including a hard hat during installation of Solar Panel Assembly.

⚠ WARNING

Bird Roost Guard has sharp edges.

Suitable safety protection equipment should be worn including protective gloves during handling of Bird Roost guard.

The recommended installation sequence is:

1 Mount the bracket to the pole using either M16 bolts (torque 70 Nm) or straps taking into account orientation guidelines described in section 5.6.

2 On the ground, assemble the bird roost guard and the U-channel to the bracket using the 10G screws provided leaving the screws loose.

3 Mount the panel on the U-channel and orientate. Fit the M8 bolts and torque to 15 Nm. The solar panel can be installed at two different angles. The best angle of the panel depends upon the latitude of the site as follows:

   a. For latitudes <30^{O} (degree) install solar panel at 30^{O} (degree) angle to the horizontal.

   b. For latitudes >30^{O} (degree) and <45^{O} (degree) install the solar panel at 45^{O} (degree) angle to the horizontal.

4 Tighten all bolts and screws.

5 Connect earthing wires as required in section 5.10 below.

6 Connect the panel output leads to the RCU.

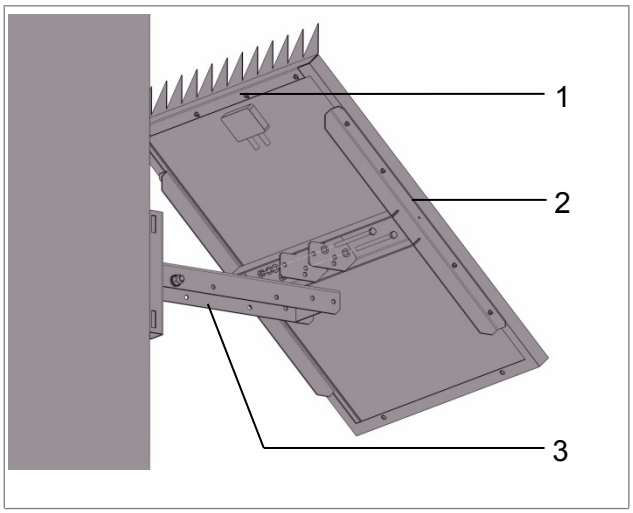


Fig. 18 Solar Panel Mounting

1 Bird Roost Guard
2 Solar Panel Frame
3 Pole Mounting Bracket

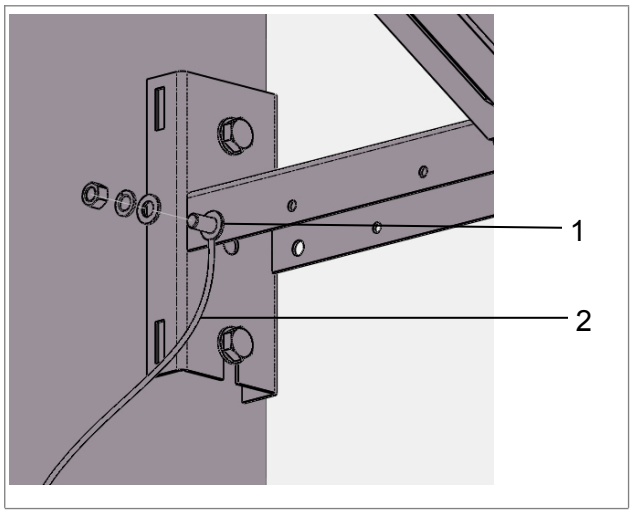


Fig. 19 Connecting

1 Earth Stud
2 Earth Wire

5.6 RCU Location and Orientation

The following provides the preferred mounting orientation for the RCU and solar panel. For many real world installations these ideal requirements will be contradictory and impossible to achieve. Therefore a hierarchy of constraints is provided.

5.6.1 RCU Orientation

The RCU must be mounted on the power pole within 20m of the switchgear it is to connect with. Best radio connection between RCU and switchgear is when the RCU is under the power lines with a line of sight to the switchgear. The worst orientation is when the RCU is on the power pole at right angles to the line. If there are communications problems between the RCU and the switchgear then try moving the RCU through 90^{O} (degrees) on the pole.

Also, the RCU should be mounted on the shady side of the power pole to minimise solar heating which strongly affects battery life. In the Northern hemisphere this means on the North side of the pole. In the Southern Hemisphere this means on the South side of the pole. If this is impracticable then the RCU should be mounted towards the Eastern side of the pole to minimise afternoon sun heating.

5.6.2 Solar Panel Orientation

The solar panel should be mounted as follows:

- On the same pole as the RCU within 2 m vertically of the RCU.
- Facing South in the Northern Hemisphere and North in the Southern Hemisphere.
- With no shading of the panel except within 1 hour of sunrise and sunset. This is vital to ensure correct operation of the solar panel. Any shadow that falls over any part of the panel significantly degrades the panel output. If this condition cannot be met then the site is probably not suitable for solar operation.
- Where possible avoid mounting the panel in the line of sight between the RCU and the switchgear to reduce interference with the RCU radio communications.

5.6.3 Hierarchy of Constraints

When the above orientation recommendations are not possible or incompatible the following is the recommended hierarchy of constraints:

1. Achieve appropriate location of solar panel to generate acceptable charging. Suggested tolerance +/-30^{O} from north facing (for Southern hemisphere installations)
2. Position the RCU to achieve reliable communications to switchgear. Ideally the RCU should be mounted the same side of the pole as the switchgear being careful to avoid interference from the solar panel above.
3. Position RCU on shaded side of pole as much as possible maintaining point 2 to a tolerance of +/- 45^{O} of co-linear with the overhead line.

Figures 20-23 demonstrate the preferred location of RCU and solar panel for various line orientations (Southern Hemisphere example).

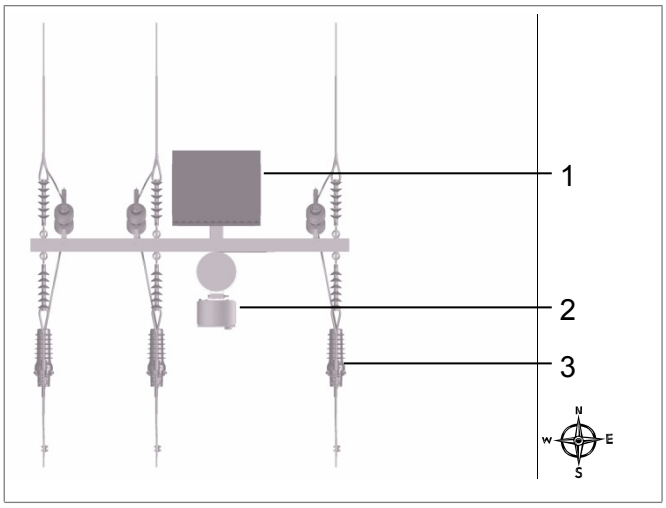


Fig. 20 North-South Line – version 1

1 Solar Panel – facing North
2 RCU – facing South
3 Fusesaver

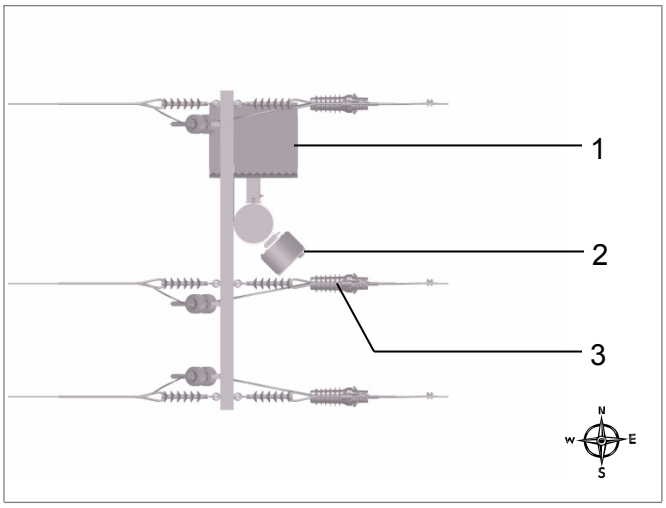


Fig. 21 East-West Line – version 1

1 Solar Panel – facing North
2 RCU – facing South East
3 Fusesaver

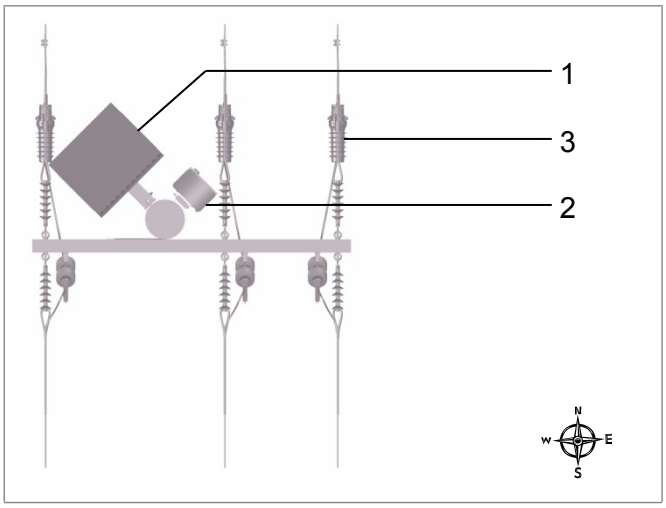


Fig. 22 North-South Line – version 2

1 Solar Panel – facing North West facing
2 RCU – facing North East
3 Fusesaver

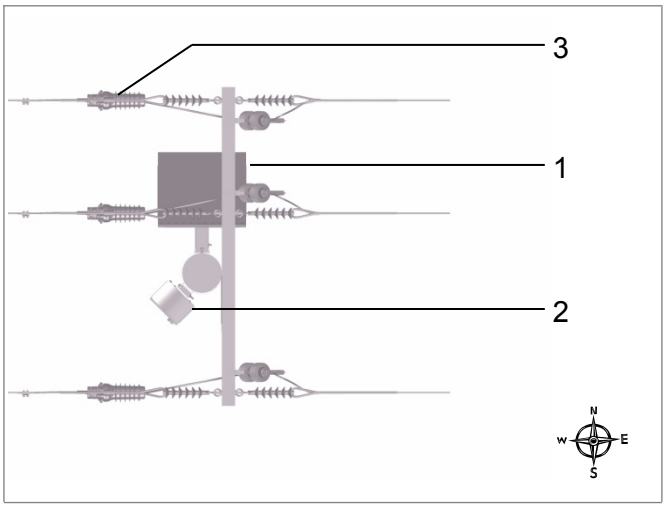


Fig. 23 East-West Line – version 2

1 Solar Panel – facing North
2 RCU – facing South West
3 Fusesaver

5.7 Mains Power supply

When a local LV supply is available at the RCU pole this may be connected directly to the RCU to provide power in accordance with the following guidelines. It is the user's responsibility to source an appropriate earth cable and to conduct the installation.

DANGER

For safe installation ensure that the supply from the mains is isolated and de-energised before connecting to the RCU.

It is mandatory that the user installs a service fuse and point of isolation externally to the RCU.

Service fuse should be rated to protect 1.5 sq.mm cable.

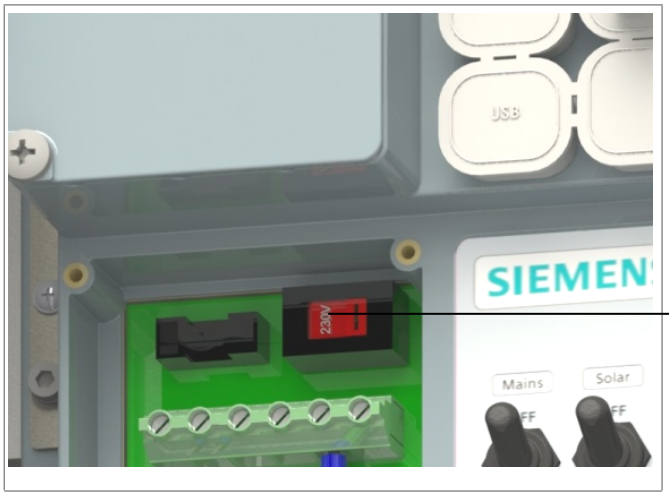
DANGER

For safe maintenance ensure that the supply is isolated elsewhere before removing the power supply compartment cover

DANGER

Fit the power supply compartment cover before energising RCU supply.

Ensure that the voltage selector in the power supply compartment is selected to match the mains supply incoming voltage. If the voltage selector is set to AC: 115 V and AC: 230 V is applied the fuse will blow. A spare fuse is supplied in the battery compartment. If the voltage selector is set to AC: 230 V and AC: 115 V is applied the RCU will not sense source supply on. Short term overvoltage of no more than +20% nominal voltage to the input voltage can be sustained for 1 hour without damage.



1 Voltage Selector Switch

Fig. 24 Mains Voltage Selector Switch

5.7.1 Mains Cable Specification

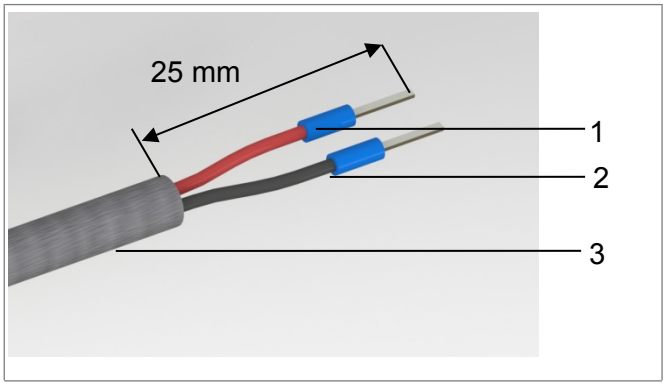
The mains cable shall be two core cable with external insulation suitably rated for the voltage and operating environment. It shall have the following additional specification:

- External insulation is be circular in cross-section
- External insulation diameter to be in range 8 mm to 12.5 mm
- The external insulation is to be cut back as shown in figure 25 below.
- The wire size of each core is to be in the range 1.5 mm^2 to 4 mm^2. It is preferable to terminate the wires with crimps as shown.

DANGER

If IP 3x rating for terminal compartment is breached through incorrect mains wire installation this creates a situation of

possible electric shock risk that could lead to serious injury or death.



1 Active wire
2 Neutral wire
3 Insulation

Fig. 25 Mains Cable Details

5.7.2 Installation Process – Incoming Mains Connected to Electronics Housing

The mains cable should be connected according to the following process using wire of the correct specification to ensure IP 3x rating is maintained for the terminal compartment.

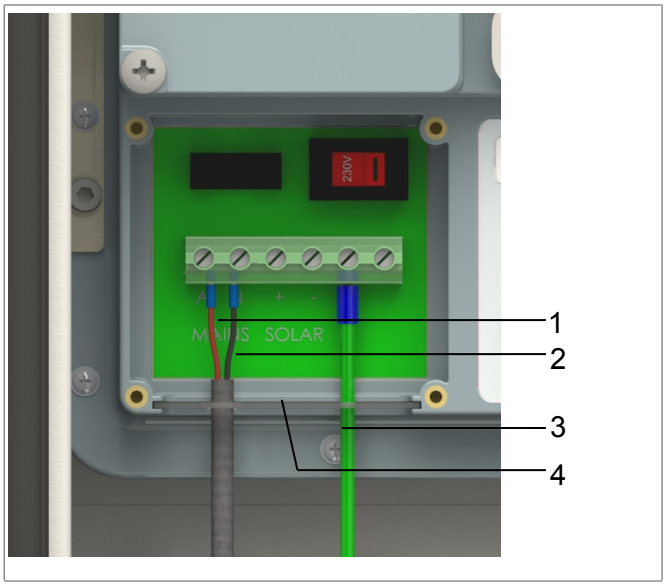
1 The mains cable is fed through the cable gland on the RCU enclosure a suitable amount to allow connection into the power supply compartment. The cable gland should be tightened to clamp the mains cable.

2 Active and neutral of the mains cable are connected into the power supply compartment terminal block and tightened in place. Ensure the correct wire is installed into the matching terminal block.

3 Select the appropriate wire entry blanking plate from the various plates provided. Minimise the clearance between the slot in the blanking plate and the external diameter of the mains cable insulation.

4 The plastic cable barrier suitable for the mains cable (not the one for solar power supply) is slid into place over the mains cable outer insulation.

5 Fit the power compartment cover and screw in place (torque 1.5Nm) using screw driver.



1 Active wire
2 Neutral wire
3 Earth wire
4 Wire entry blanking plate - mains

Fig. 26 Mains Cable Connection Details

Unless the RCU is operated from a dedicated power transformer mounted on the same pole it is recommended to install surge arrestors on both the incoming LV Active and Neutral grounded to the external cubicle earth stud.

⚠ WARNING

Do not disconnect earth wire.

Do not disconnect earth wire from the terminal block to the cubicle earth stud. After installation of mains supply ensure the earth wire is still connected.

5.7.3 Installation Process – Incoming Mains Connected to Power Isolation Unit

If the RCU is supplied with a power isolation unit then the incoming mains active and neutral are connected to the terminal block in the isolator rather than the terminal block in the electronics housing. The specification for the mains wire is the same as above. When the power isolation unit is factory fitted to the RCU, the power cable to the electronics housing will be pre-fitted to the electronics housing.

1 The mains cable is fed through the cable gland on the RCU enclosure a suitable amount to allow connection into the power isolation unit. The cable gland should be tightened to clamp the mains cable.

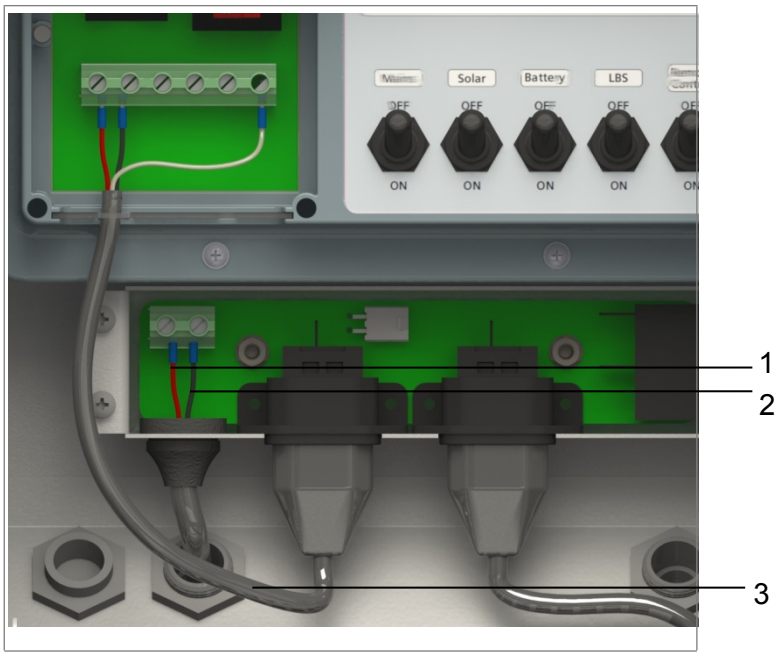
2 The cover of the power isolation unit is then removed by a suitably qualified person by undoing the screws on the front.

3 The mains cable is fed through the gland in the power isolation unit. Ensure the gland seals around the insulation of the mains cable.

4 Active and neutral of the mains cable are connected into the power isolation unit terminal block and tightened in place. Ensure the correct wire is installed into the matching terminal block.

5 Fit the power isolation unit cover and screw in place (torque 1.5 Nm) using screw driver.

6 Plug the cable from the RCU electronics compartment into the labelled socket on the power isolation unit.



1 Active / Line
2 Neutral
3 RCU electronics power cable

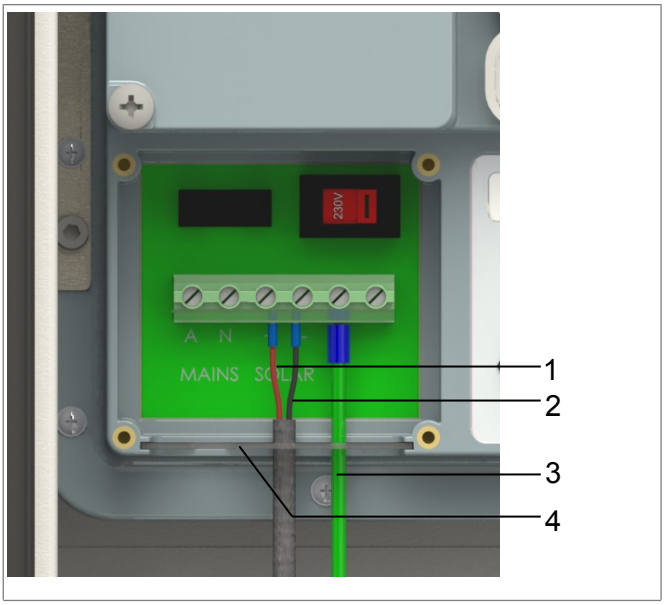
Fig. 27 Power Isolation Unit Connection Details

> **Note**
>
> The earth wire for the RCU electronics is factory fitted as part of the power supply isolation unit and RCU power cable.

5.8 Solar Power Supply

The solar cable should be connected according to the following process:

1. The solar cable is fed through the cable gland on the RCU enclosure a suitable amount to allow connection into the power supply compartment. The cable gland should be tightened to clamp the solar cable.
2. Positive (red) and negative (black) of the solar cable are connected into the power supply compartment terminal block and tightened in place. Ensure the correct wire is installed into the matching terminal block.
3. The plastic wire entry blanking plate suitable for the solar cable is selected from the various plates provided and is slid into place over the solar cable.
4. Fit the power compartment cover and screw in place (torque 1.5Nm) using screw driver.



1 Positive wire
2 Negative wire
3 Earth wire
4 Wire entry blanking plate - solar

Fig. 28 Solar Cable Connection Details

> **Note**
>
> Reversing the connections to the solar panel will not cause damage to the RCU electronics in the short term however this should not be allowed to persist since at high sunlight conditions for long periods the RCU electronics could be damaged by the current from the panel in high sunlight conditions.

Shorting the solar supply terminals to ground will not damage the RCU.

> **WARNING**
>
> **Do not disconnect earth wire.**
>
> Do not disconnect earth wire from the terminal block to the cubicle earth stud. After installation of mains supply ensure the earth wire is still connected.

5.9 Separate Voltage Transformer Power supply

In some locations a separate voltage transformer (VT) is installed to provide power to the RCU. This VT should be:

- Fused and rated on the high voltage side to match the supply conditions.
- The secondary voltage should be AC: 115 V or 230 V as preferred and rated at 150 VA.
- A fuse on the secondary adjacent to the VT is recommended to protect from wiring faults of the pole. The fuse should be rated for the VT and wiring. 2 A recommended.
- A method of isolating the RCU from the source supply is required for safe operation.

For most primary voltage ratings Siemens can supply a suitable VT.

DANGER

For safe installation ensure that the supply from the voltage transformer is isolated and de-energised. Use a single pole device before connecting to the RCU.

It is mandatory that the user installs a service fuse (2A) and point of isolation externally to the RCU.

DANGER

For safe maintenance ensure that the supply is isolated elsewhere before removing the power supply compartment cover

DANGER

Fit the power supply compartment cover before energising RCU supply.

WARNING

When installing the VT supply ensure that the voltage selector in the power supply compartment is selected to match the VT secondary voltage. Incorrect voltage selection may result in the fuse blowing.

The VT secondary power supply cable specification and installation process is identical to the mains cable specification and installation in section 5.7.

5.10 Earthing

Earthing of the RCU and connected accessories in the correct way is critical to ensuring operator safety.

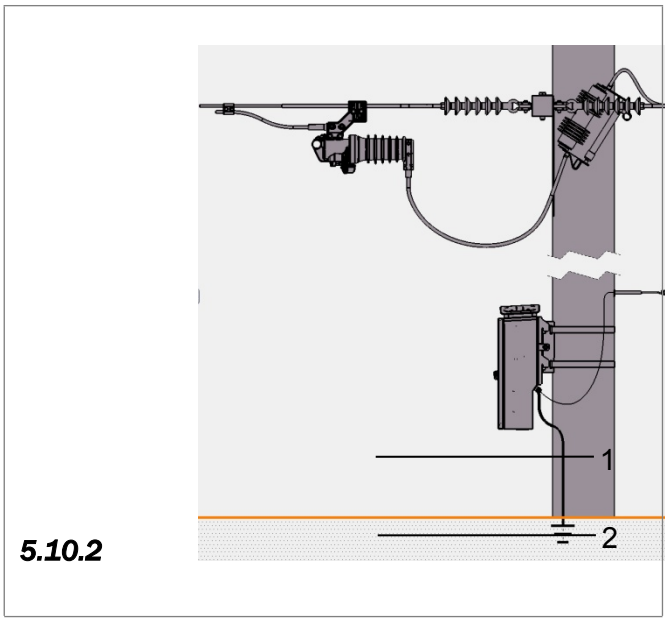
DANGER

Incorrect earthing of the RCU may expose operators to dangerous voltages that may result in death or serious injury.

Note

The RCU cubicle should be bonded to ground using the M12 earth stud provided to meet the safety requirements of the utility. The earth wire must be 16mm^2 in size or larger. It is the user's responsibility to provide the earth wire.

5.10.1

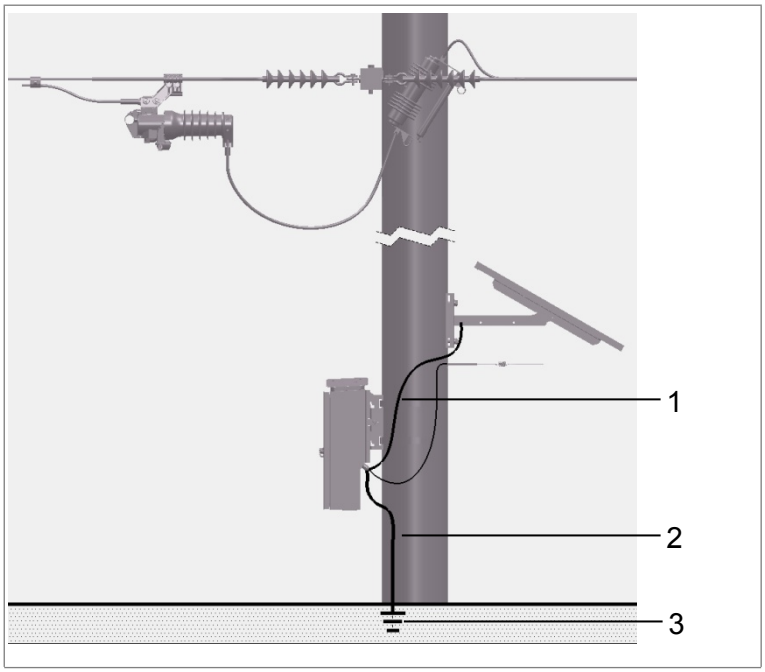


1 Earth wire
2 Earth

Fig. 29 RCU Earthing Diagram

5.10.3 RCU and Solar Panel Earthing

When a solar panel is fitted, in addition to the RCU earthing described above, the frame of the solar panel must be connected using the M12 stud provided to the M12 earth stud of the RCU using earth wire of 16 mm^2 in size or larger. It is the user's responsibility to provide the earth wire and to fit in accordance with the applicable safety guidelines.



1 Earth wire from Solar Panel to RCU
2 Earth wire
3 Earth

Fig. 30 RCU and Solar Panel Earthing Diagram

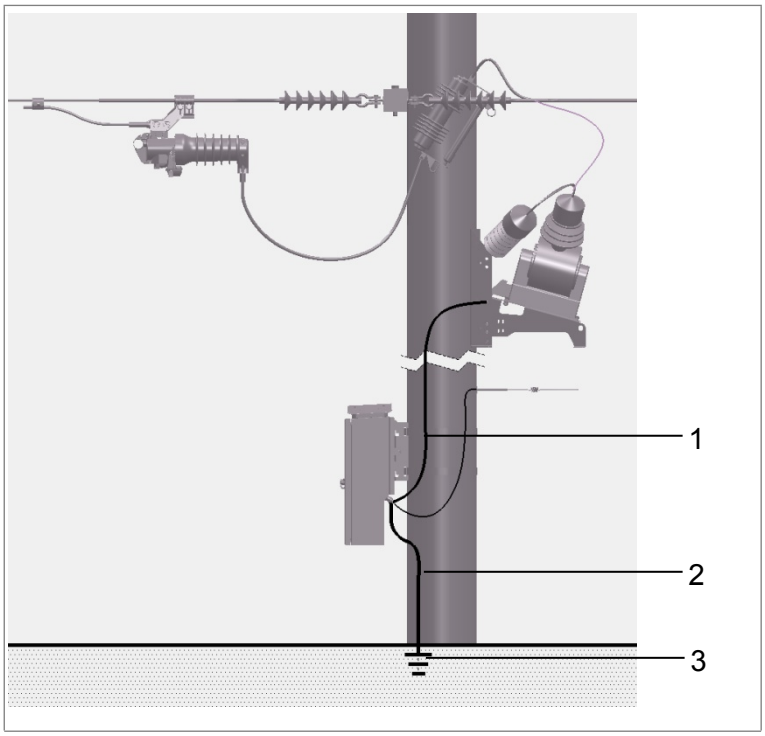
5.10.4 RCU and VT Earthing

When a voltage transformer is fitted, in addition to the RCU earthing described above, the following additional earthing is required using earth wire of 16mm^2 in size or larger:

- One side of the VT secondary must be grounded to the VT earth stud to create a defined neutral wire in the supply to the RCU. In the active wire a service fuse and point of isolation should be fitted.

- The VT mounting frame must be connected to the RCU cubicle earth stud and to ground. If the VT has an earth screen it must be grounded to the frame.
- If the primary of the VT is fitted with surge arrestors they must be grounded to the VT mounting frame.

It is the user's responsibility to provide the earth wire and to fit in accordance with the applicable safety guidelines.



1 Earth wire from VT to RCU
2 Earth wire
3 Earth

Fig. 31 RCU and Voltage Transformer Earthing Diagram

5.11 Radio Installation

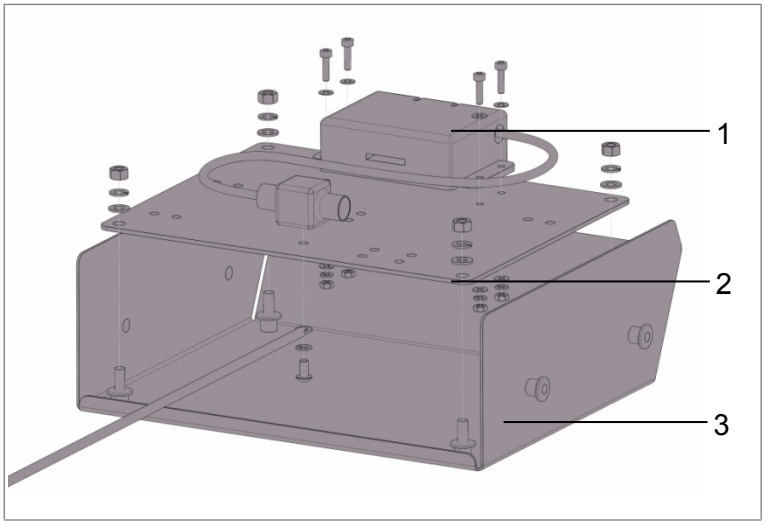
Each different radio or modem will require slightly different installation methods to be developed. Refer page 19 for allowable radio sizes. A generic approach is as follows:

1. Remove the radio tray from the RCU.
2. Remove the radio mounting plate from the radio tray by unscrewing the M5 nuts using an 8mm socket.
3. The user is to arrange the radio/modem items, including antenna surge arrester in a appropriate way on the mounting plate. Mark all hole locations required.
4. Drill holes and deburr edges as required.
5. Assemble radio/modem items to mounting plate. User to provide fasteners etc.
6. Install the mounting plate back onto the radio tray and tighten in place with the M5 nuts using the 8 mm socket. Torque to 3 Nm.
7. Fit the radio tray back into the RCU enclosure taking account of antenna connections and connection to electronics compartment.
8. If an antenna surge arrestor is fitted (recommended) ground it to the M6 earth stud in the cubicle.
9. Connect the appropriate radio cable (user to supply or can purchase from Siemens – Contact Siemens sales representative) to the radio and the appropriate port on the RCU electronics enclosure.

> **Note**
>
> User is to ensure that radio/modem selected has appropriate fire safety ratings and has no failure mode that could result in causing a fire.

> **Note**
>
> The radio must be powered via the RCU Serial Port.

> **Note**
>
> If the radio uses a power supply from the battery (via the Serial Port), the radio cable must be fitted with a 6A fast acting fuse in the cable.



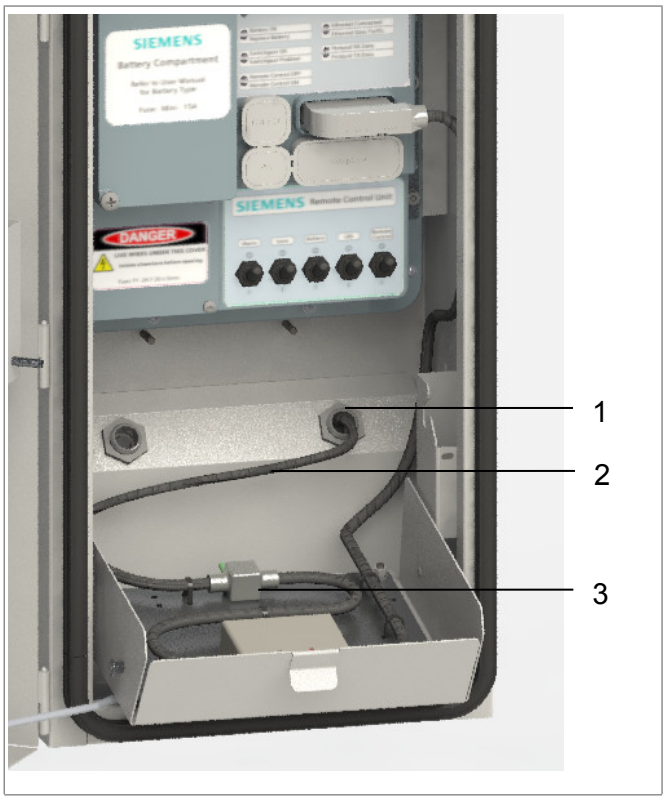
1 Radio or Modem
2 Mounting Plate
3 Radio Tray

Fig. 32 RCU and Voltage Transformer Earthing Diagram

5.12 External Antenna Connection

To enable long range wireless connection to the SCADA control centre it will be necessary for the user to fit an appropriate external antenna. The antenna cable is passed through a cable gland at the rear of the RCU enclosure and connected to the users radio equipment. The cable gland must be tightened to clamp the cable. It may be desirable to fit an antenna surge arrestor inside the RCU cubicle. The surge arrestor should be grounded to the 6mm earth stud inside the RCU cubicle.

> **WARNING**
>
> **Do not disconnect earth wire.**
>
> Do not disconnect earth wire from the terminal block to the cubicle earth stud. After installation of surge arrestor, ensure the earth wire to the power supply compartment is still connected.



1 Antenna Radio Cable Gland
2 Antenna Radio Cable
3 Antenna Surge Arrestor

Fig. 33 Antenna Cable Connection

6 RCU Connect Installation Instructions

RCU Connect is supplied as a setup file which will self-install on the PC running the following Windows® operating systems:

1. Windows® 10
2. Windows® 7

When first run, the user is guided to select the Windows® folder that will hold the utility's configuration files. The default folder is /Siemens/RCU Connect/ created under the user's application data folder in Windows®. It is recommended to use the default location.

RCUConfigure.zip file contents

File	Description
dotNetFx40_Client_x86_x64.exe	an executable file for the installation on a PC
RCUConfigureSetup.exe	an executable file for the installation on a PC
USB2Drivers.zip	the zip file includes drivers for various systems
RCU Connect instructions.pdf	a separate manual with these installation instructions

The installation sequence is as follows:

1. Install .NET
2. Install *RCU Connect* software.
3. Install drivers.
4. Check operation.

6.1 Install .NET

The .NET framework is normally already installed on windows 7 operating systems. For windows XP and Vista it may be necessary to do an installation. Launch the installation by clicking on the executable file (dotNetFx40_Client_x86_x64.exe) and following the windows installation instructions.

6.2 Install RCU Connect Application

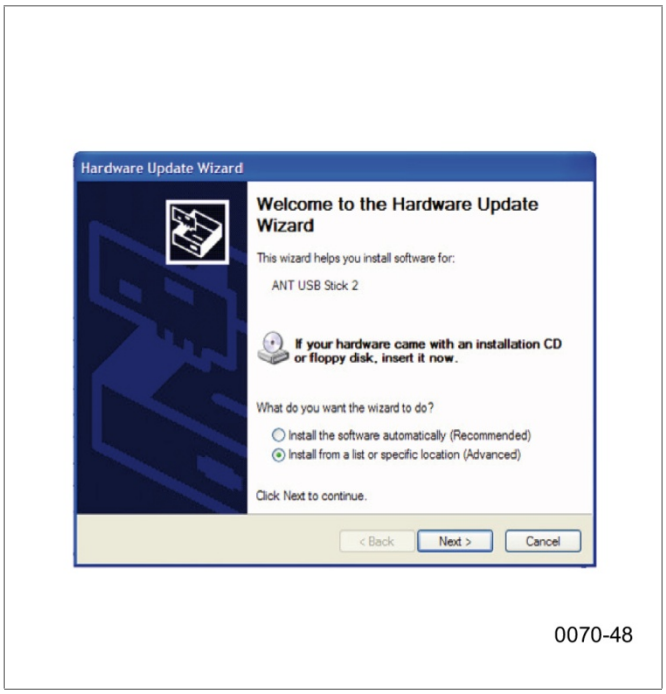
- Unzip the install folder to a suitable place on your PC such as your desktop and open the *RCU Connect* folder which has been created.
- Run the RCUConfigureSetup.exe self-extracting installation program (double-click it).
- If you have a previous version of *RCU Connect* installed you do not have to uninstall it before installing the new version.
- The installation process offers to install *RCU Connect* to a standard location. Accept this default location unless you have a good reason not to (see "Table .Location Tables." on page 58).
- Accept the licence agreement.

RCU Connect has now been installed. An icon is on the desktop and in the program menu.

6.3 Install drivers

When using Windows® 7 firstly plug in the USB antenna. Usually Windows® 7 finds and installs drivers automatically. If not, then act as for Windows Vista®.

To install drivers on Windows Vista® and Windows® XP firstly plug in the USB antenna, and when prompted for drivers, direct the installer to the USB2 drivers folder.



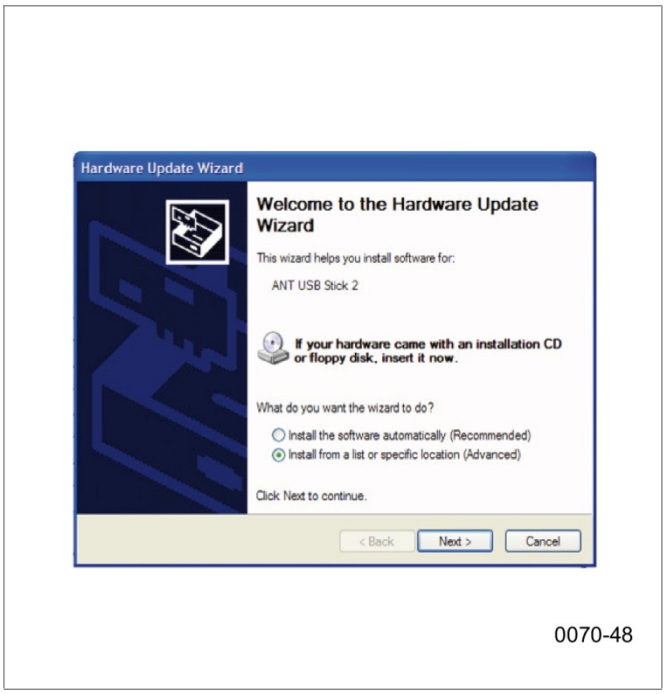


Fig. 34 Install drivers

1 Select the “install from specific location” checkbox

2 Click “next”.

3 Browse to the USB2 Drivers Folder that you installed.

4 Click “next”.

The installation is now complete.

In some instances after plugging in the USB antenna Windows® does not automatically prompt to search for drivers. In this case the following steps are necessary:

1 Click on the Windows start menu.

2 Select the Control Panel option.

3 Select the device manager option.

4 Expand the LibUSB-Win32 Devices to show the ANT USB Stick 2 option.

5 Right click on the ANT USB Stick 2 option to show the menu. Click the “Update Driver Software…” option.

6 Select the Browse for driver files option and browse to the USB2 Drivers Folder that you installed.

7 Click “next”.

8 The installation is now complete.

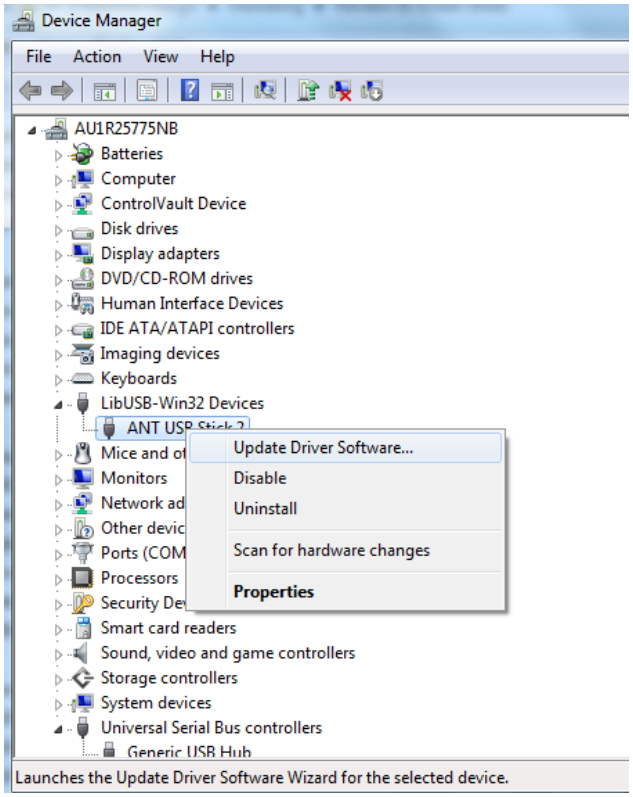


Fig. 35 Manual USB Driver update

6.4 Check Operation

When started for the first-time, *RCU Connect* offers to locate the configuration files in the Windows® standard location.

To locate the event files in another location see also “Location of installed files” on page 58.

To locate the event files in the standard location:

- Double-click the *RCU Connect* Icon on the desktop.
- Accept this default location.

RCU Connect starts and locates the USB antenna. If the USB and its drivers are installed correctly the USB antenna customer number is shown on the bottom of the screen.

More information on how to use *RCU Connect* can be found in section 7.

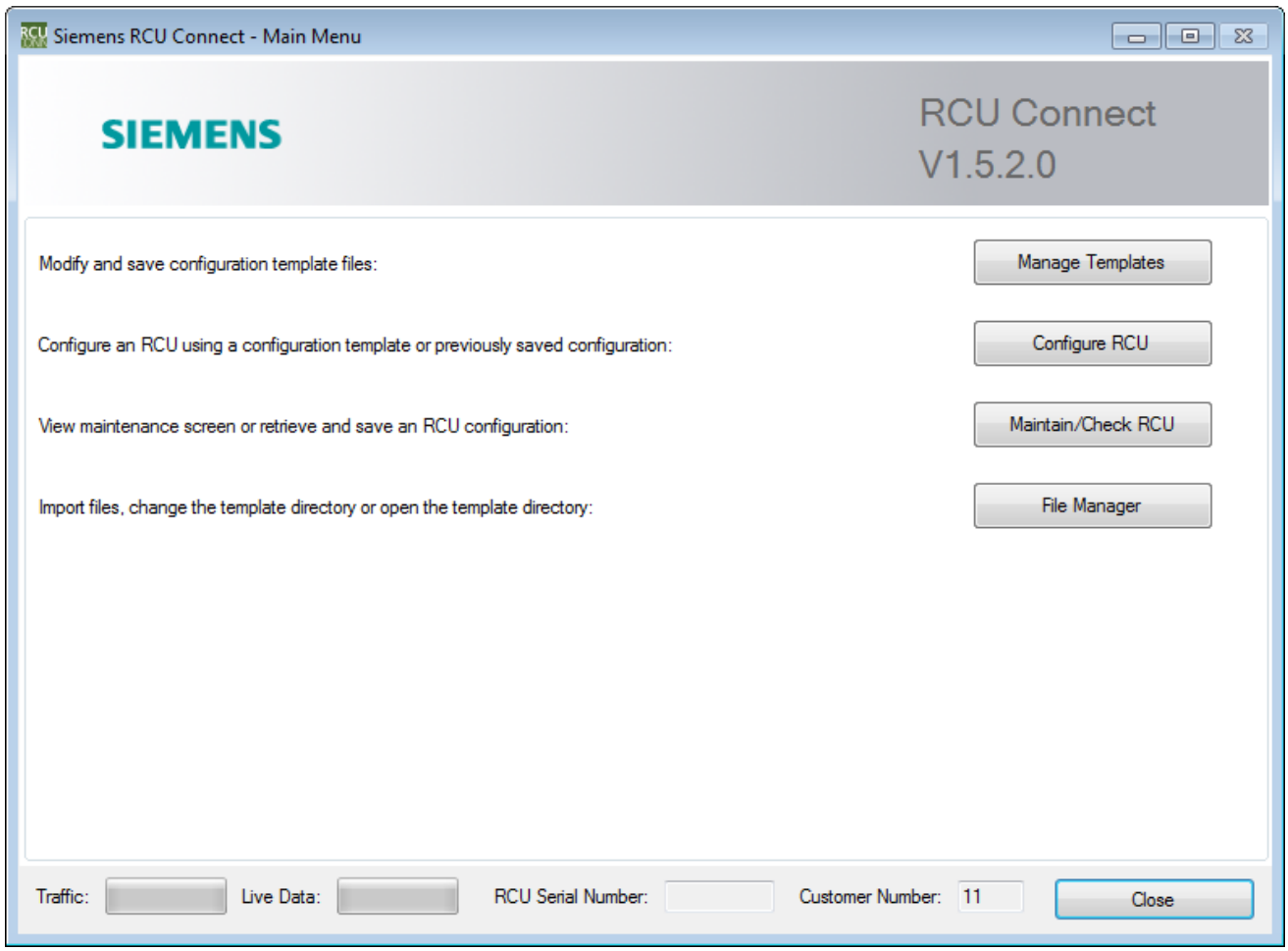


Fig. 36 *RCU Connect* – Main Menu

6.5 Location of installed files

The installer will default to installing the program files in the standard windows folders which depend on the operating system.

Table .Location Tables.

Windows® 7 and Vista®	**Default Location**
Program	"[ProgramFilesFolder]\ Siemens\RCU Connect" which is usually "C:\Program Files (x86)\ Siemens\RCU Connect"
Configuration file folders	"[AppDataFolder]\ Siemens\RCU Connect\" which is usually C:\Users\user\AppData\ Roaming\ Siemens\RCU Configurations\..."

7 RCU Commissioning

The process described in this section assumes the switchgear has already been correctly installed according to the relevant instructions [6] [7] [3] . This section covers the on-site configuration of an RCU to couple with the available switchgear overhead using the *RCU Connect* PC application. The overall process consists of four steps:

1 The user completes the RCU configuration template form (KMS-3100) and sends this to Siemens. There are different versions of this form for Fusesaver and CMR installations.

2 Siemens creates two files and returns these to the user.

3 The user loads these files into the *RCU Connect PC application*.

4 The user chooses configuration settings for each site and loads these into the RCU using *RCU Connect*.

Configuration of an RCU is carried out wirelessly using the *RCU Connect* PC application and a USB antenna (the same one as used by PC utilities (Siemens Connect/CMRConnect) to communicate with switchgear). Before this wireless connection is possible, either

- the operator must open the door of the RCU enclosure releasing the door switch.
- the SCADA master must send an “Enable ANT Radio” control.

This enables a 10 minute window during which wireless short range connection can be made to the RCU with *RCU Connect*

It is advised to connect the USB antenna to the PC using a short USB extension cable so the antenna can be placed away from the body of the Notebook computer and pointed towards the RCU.

This section will explain how to do the following:

1 Use *RCU Connect* to create and maintain templates for various installation scenarios, including setting up the protocol mapping

2 Use *RCU Connect* to enter the required information for deployment at a site, and send this information to the Remote Control Unit

3 Use *RCU Connect* to check the operation of a Remote Control Unit once configured

Note

Radio communication between the RCU and *RCU Connect* running on a PC can be disrupted by metal objects adjacent to the USB antenna such as the body of the Notebook computer or an adjacent USB memory stick.

- Keep metal objects away from the RCU and USB antenna.
- Do not stand immediately below the RCU as the signals may be blocked by the metal cabinet.
- If the radio connection is lost during configuration, repeat the process.

CAUTION

To prevent damage to the RCU operators should always wear ESD earth straps whilst operating the equipment.

7.1 Configuration and Layout Templates

RCU Connect is a PC application that allows a user to configure a Remote Control Unit, check the operation of a Remote Control Unit, and allow a user to maintain configuration templates to suit various installation scenarios.

7.1.1 Configuration Templates

Each utility will have a set of configuration settings that are applicable to their entire population of Remote Control Units (or, at worst a few different configuration scenarios such as solar powered and mains powered sites). They will also have a small number of settings that are unique for each site. *RCU Connect* allows the user to set-up a configuration file whereby all common settings are pre-set and only those site-specific settings are available to the commissioning crew and require data entry. This saves time and reduces the chance for operator error during the commissioning process.

This is achieved with the aid of a configuration template. The customer completes the RCU Configuration Template Specification Form (KMS-3100) for each installation scenario and returns the completed form to Siemens. Siemens will then create a configuration template file for each scenario tailored to the user's specified requirements.

Configuration templates have a ".rcu" file extension.

Configuration templates are specific to the switchgear type they are created against. RCUConnect will not allow a template targeted to an RCU-CMR to be used to configure an RCU-FS or vice versa.

See the appendix for details of the RCU specific configuration settings.

7.1.2 Layout Templates

The RCU Configuration Template Specification Form also allows the customer to specify the visibility to each configuration item as displayed in *RCU Connect*.

Each configuration item can be set to be:

- **Open** - for the end user to enter data freely into the field,
- **Read Only** - to display data in a field without being able to modify it,
- **Challenge** -requiring a response to a challenge, meaning that the user is restricted from entering data into the field until the user has clicked a button and entered a word to satisfy the challenge, or
- **Hidden** – the field is not visible to the user at all

Read only fields can be used to convey information without being able to change it. Challenge fields appear and behave like read only fields until the challenge is satisfied. They will then appear and behave like open fields. Challenge fields can be used to prevent accidental data entry.

This allows the user to choose what specific set of configuration options the person responsible for the deployment of the Remote Control Unit requires.

In addition to the configuration template file described above, using the visibility selections specified by the user in the RCU Configuration Template Specification Form (KMS-3100), Siemens will provide a second file called a "Layout File" back to the user. This layout file will also be loaded into *RCU Connect* to define how the settings display appears.

Layout files have a ".ucl" file extension.

7.2 Importing Layout Files and Configuration Templates into RCU Connect

The *RCU Connect* installer does not install any customer layout files or configuration templates. Layout files and configuration templates are supplied by Siemens separately, and are based on the RCU Configuration Template Specification Form (Form KMS-3100).

When the layout files and configuration templates have been received from Siemens, create a folder on the Windows® desktop called "RCU" and copy the layout files and configuration templates into this folder (or any other convenient folder).

If running *RCU Connect* for the first time, select "File Manager" from the main menu (refer Figure 36) to bring up the file manager window as shown in figure 37. Click the import file button and browse to the RCU directory created previously and click “Ok”. See figure 38. This will import the template files into the correct location for *RCU Connect* to use in future.

7.2.1 Template Folder Management

RCU Connect provides a shortcut to the configuration template folder by clicking the "Open Templates Folder" button. This will open Windows® Explorer starting at the configuration templates folder. From here, the user can rename, copy, delete and move files manually.

The default folder location for configuration templates and layout files may be changed to a new location by clicking the "Change Templates Folder" button. In the "Browse For Folder" box that appears, the user can navigate to a new folder location, or create a new folder. Click "OK" to make the change from now on, or "Cancel" to leave the folder location as it was.

The user will need to re-import the required configuration templates and layout files after changing the Templates Folder Location.

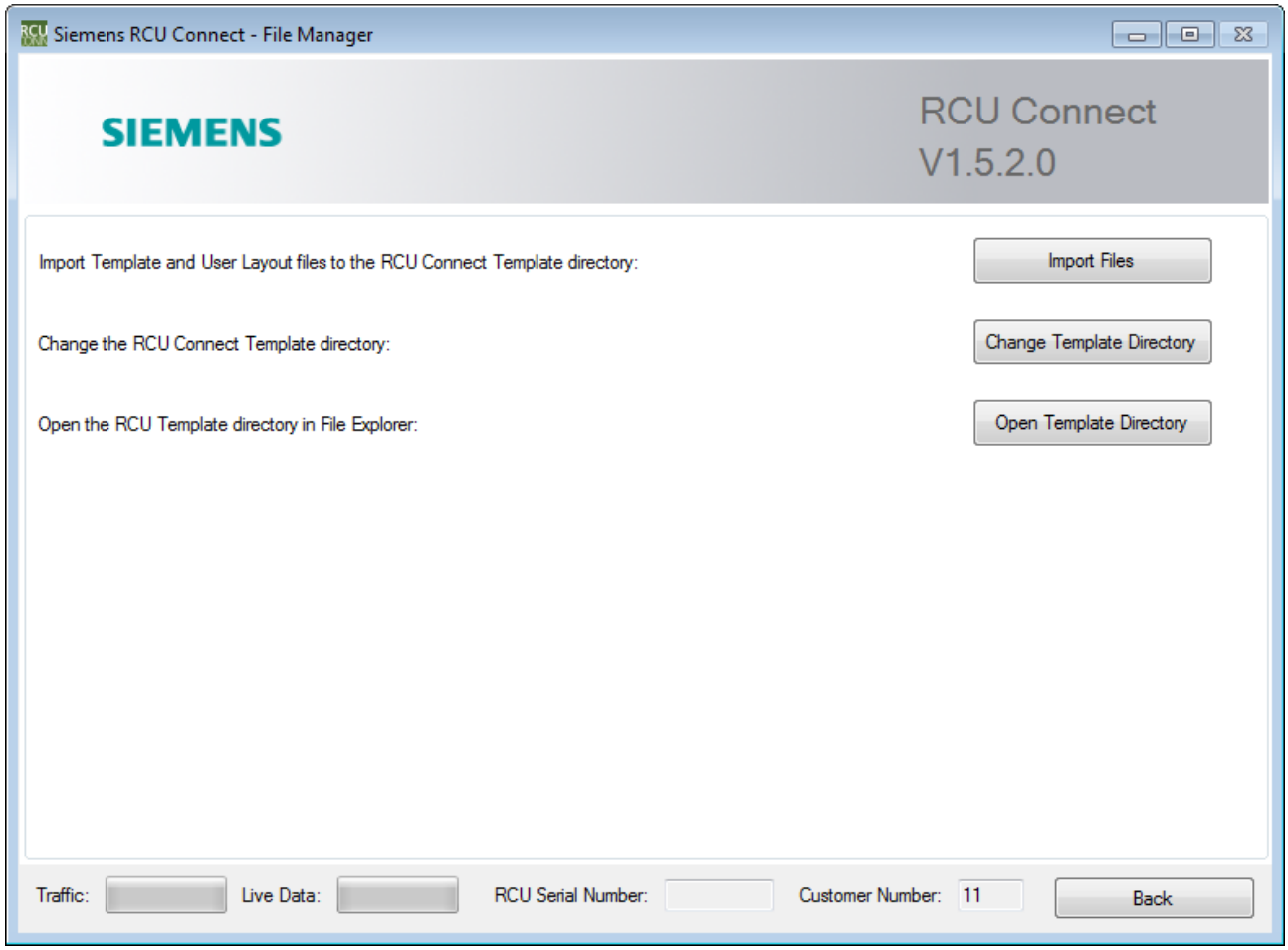


Fig. 37 *RCU Connect* – File Manager window

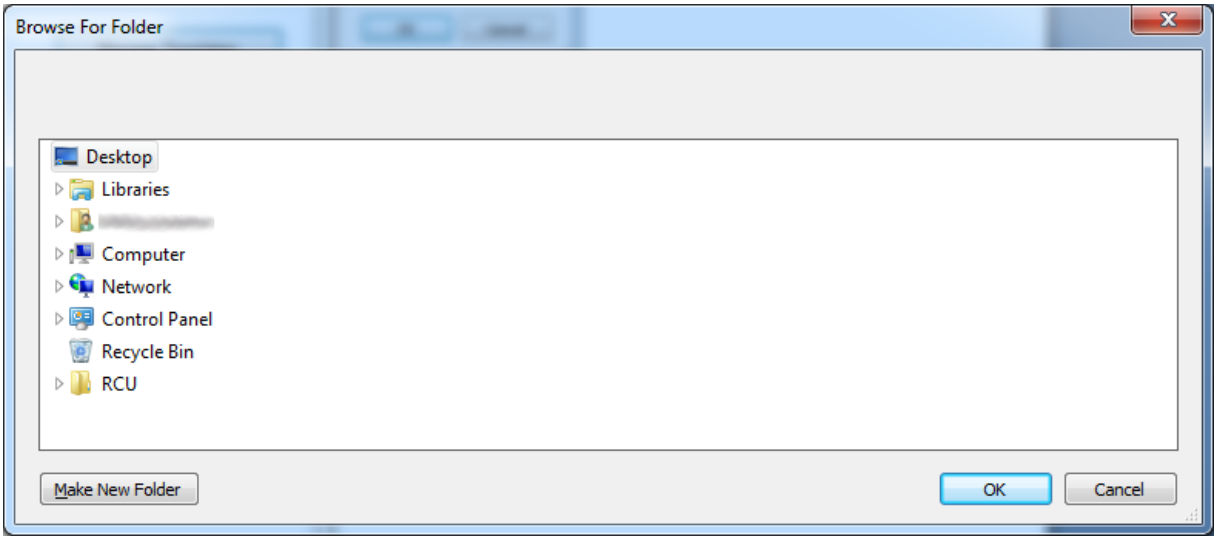


Fig. 38 Browse for folder dialogue box

7.3 Managing Templates

The Manage Templates menu can perform the following tasks:

- change a template's default values
- create a new template based on an existing one
- copy template files using Windows® Explorer

The user can manage templates by clicking on the "Manage Templates" button from the main menu of *RCU Connect*. The user must type "YES" into the challenge dialogue box shown in figure 39 before RCU Connect will allow further progress.

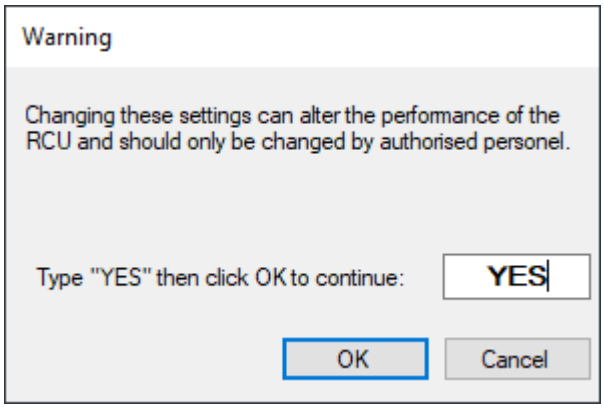


Fig. 39 Challenge dialogue box

The user is then asked to choose whether they are managing templates for Fusesaver or for CMR. This choice ensures the correct configuration items are available for construction of layout and template files and the correct database points are available for point mapping.

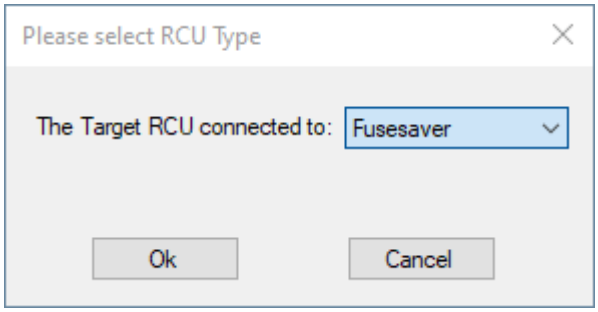


Fig. 40 Target RCU Type

If the user has no template files or no layout files, the *RCU Connect* will prompt the user to import the files. If *RCU Connect* cannot find any layout files, or the user has more than one layout file, *RCU Connect* will open a file selection box allowing the user to locate and select the desired layout file. A layout file must be selected, or the user will be returned to the main menu.

If *RCU Connect* cannot find any configuration templates, or the user has more than one configuration template, *RCU Connect* will open a file selection box allowing the user to locate and select the desired configuration template. A configuration template must be selected, or the user will be returned to the main menu.

After passing the challenge screen, the user will see a screen similar to that shown in figure 40.

The configuration template currently in use is shown in the box labelled "Configuration". The layout file is displayed in the title bar of the *RCU Connect* window.

Just below the "Configuration" box are the configuration settings to be addressed for each RCU site deployment.

On the right hand side are a number of buttons. Whether the “Edit Protocol Mapping” button and the “Enable Challenge Fields” button are visible is subject to the user’s selections in the *RCU Configuration Template Specification Form*.

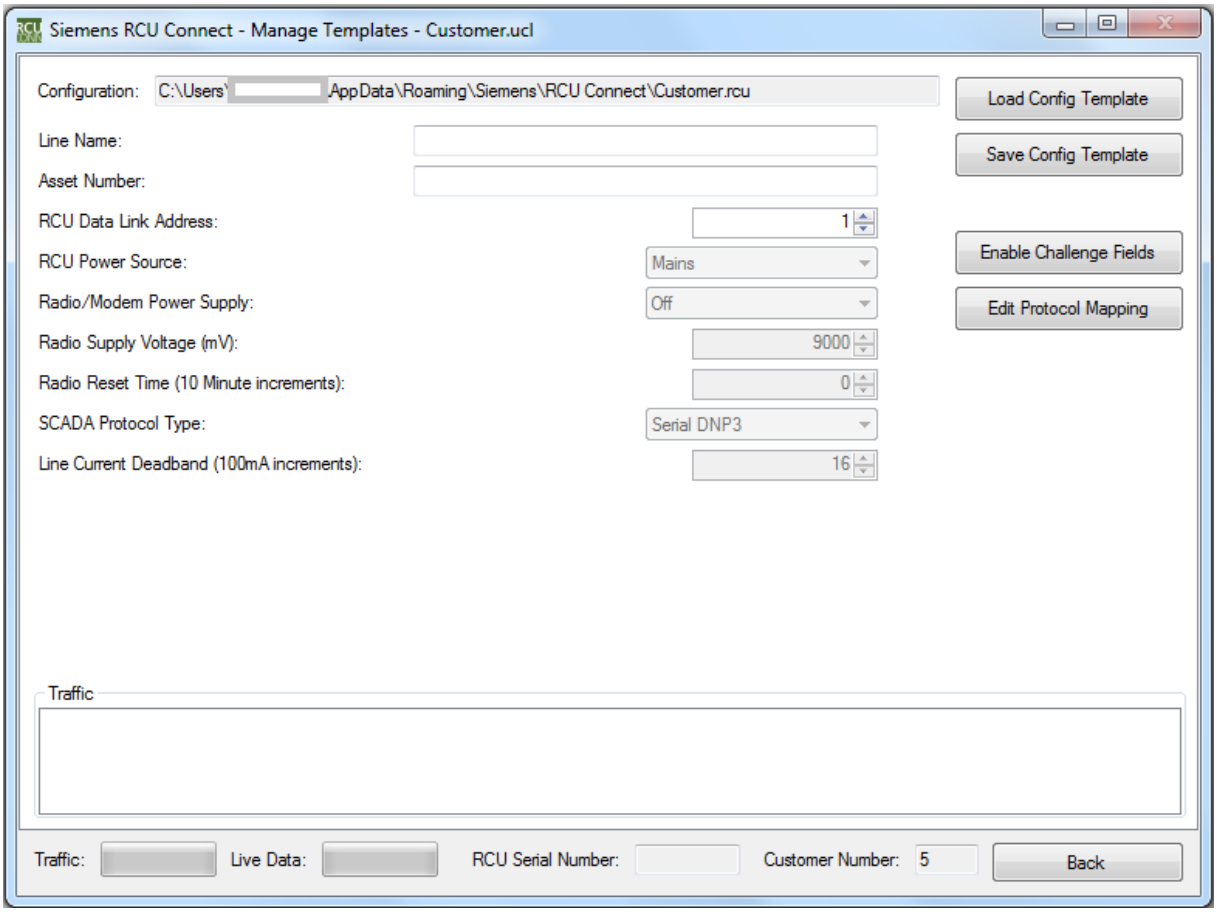


Fig. 40 *RCU Connect* – Manage Templates Window

7.3.1 Changing and Creating Templates

Changing a template's default values, or creating a new template based on another are both accomplished by loading a template, changing the data in the fields on the screen, and saving the template.

1 Load the template that you wish to change (or use as the base for the new template) by clicking the "Load Config Template" button and selecting the required starting configuration file.

2 Change the values in the fields to the desired values. If you have any "Challenge" fields, you can enable them for editing by clicking on the "Enable Challenge Fields" button and satisfying the challenge dialog box requirements.

3 Save the existing template by clicking "Save Config Template" and selecting the current template file then clicking "OK". When asked if you wish to replace the existing file, click "Yes". Create a new template by changing the template name to a name that is not already used by a configuration template in the Templates folder.

The user can only make changes to the default values in the fields with open or challenge access. They cannot change hidden fields.

7.3.2 Challenge Fields

Challenge fields are configuration template fields that require the user to complete a challenge sequence to verify that they are in fact intending to change the values of these fields. It protects the user from accidentally changing values in those fields when managing templates or configuring an

RCU. The challenge sequence simply requires the user to enter the text "YES" in the challenge box before clicking "OK". Refer figure 39.

7.3.3 Editing Protocol Mapping

If enabled, the user can maintain the protocol mapping for a specified configuration template by clicking the "Edit Protocol Mapping" button.

These items are usually very sensitive to change, and entering this screen requires the user to complete the challenge box. The user will then see a screen similar to figure 41 (the actual screen shown will depend on the type of switchgear the RCU is controlling and the protocol used by the customer).

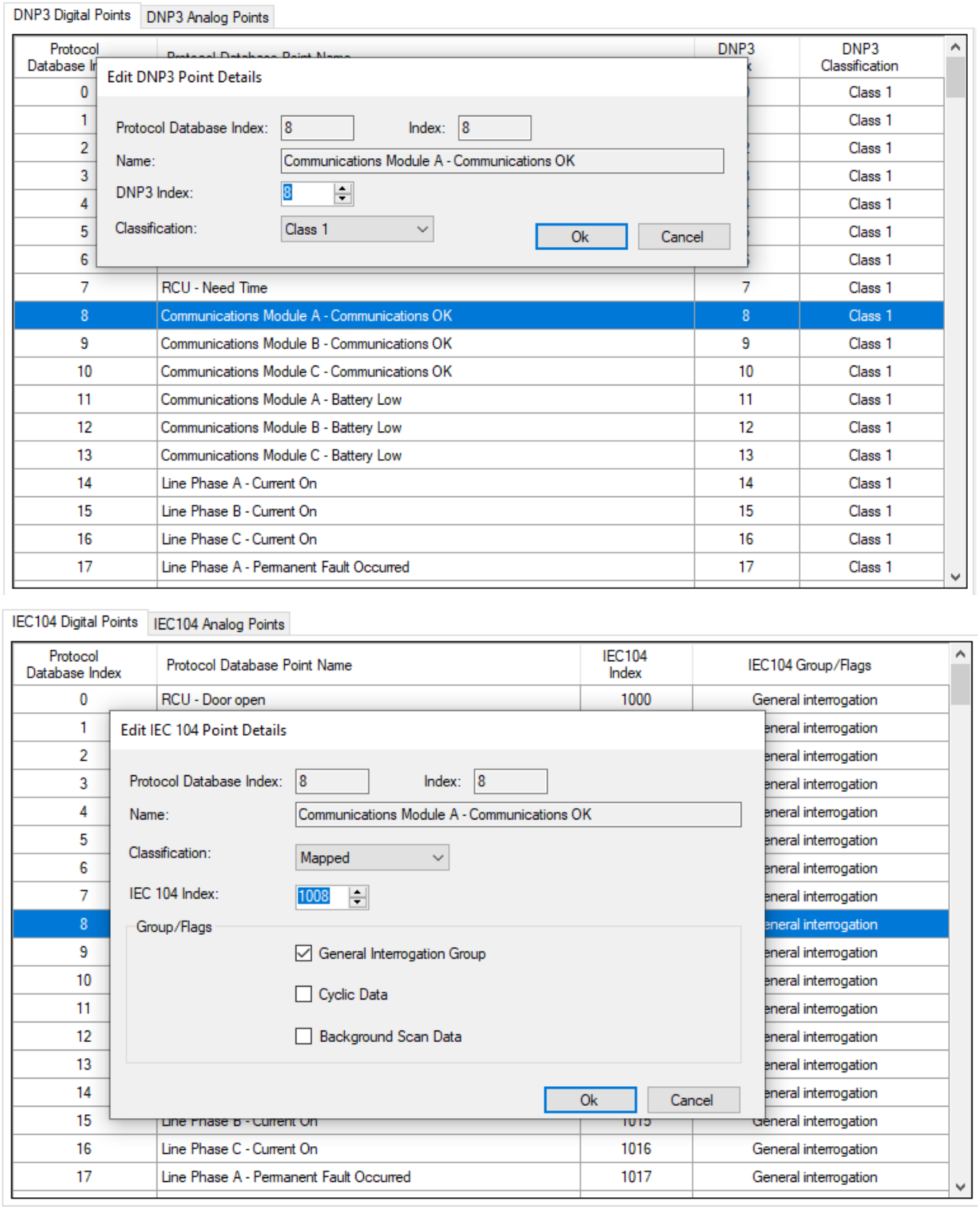


Fig. 41 *RCU Connect* – Edit Protocol Screen. Top is a DNP3 example. Bottom is an IEC104 example.

From this screen, the user can change the protocol database point mapping. Double clicking on a protocol database point will reveal the settings for that specific protocol database point, and right clicking on a protocol database point (or points if more than one is selected) will quickly allow the

classification of those points to be changed. The example shown is for DNP3 points, and the user can change settings for both Digital and Analog DNP3 points.

The rows are colour coded to distinguish between DNP3 classifications. In addition, rows that are shown in red indicate that the rows have a duplicate DNP3 index and need to be fixed before saving or sending to a Remote Control Unit is allowed.

Unmapped DNP3 points appear at the end of the list in dark grey.

The user can print the Protocol Database point mapping screens by clicking the Print button. For more information regarding the Protocol Database, refer to the relevant Protocol Manual supplied.

7.4 Loading a Configuration into an RCU

The process for configuring an RCU can occur on-site or be conducted in the workshop. The sequence for loading a configuration into the RCU is as follows:

1 Connect a USB antenna into a PC and start *RCU Connect*

2 Open the door of the RCU and power up the RCU

3 The user can load a configuration to a Remote Control Unit by clicking the "Configure RCU" button from the main menu of *RCU Connect*. If the user has no template files or no layout files, *RCU Connect* will prompt the user to import the files (see section 0). If *RCU Connect* cannot find any layout files, or the user has more than one layout file, *RCU Connect* will open a file selection box allowing the user to locate and select the desired layout file. A layout file must be selected, or the user will be returned to the main menu. If *RCU Connect* cannot find any configuration templates, or the user has more than one configuration template, *RCU Connect* will open a file selection box allowing the user to locate and select the desired configuration template. A configuration template must be selected, or the user will be returned to the main menu.

4 When suitable layout files and configuration templates have been selected, the "Connection" screen is displayed as shown below in figure 42.

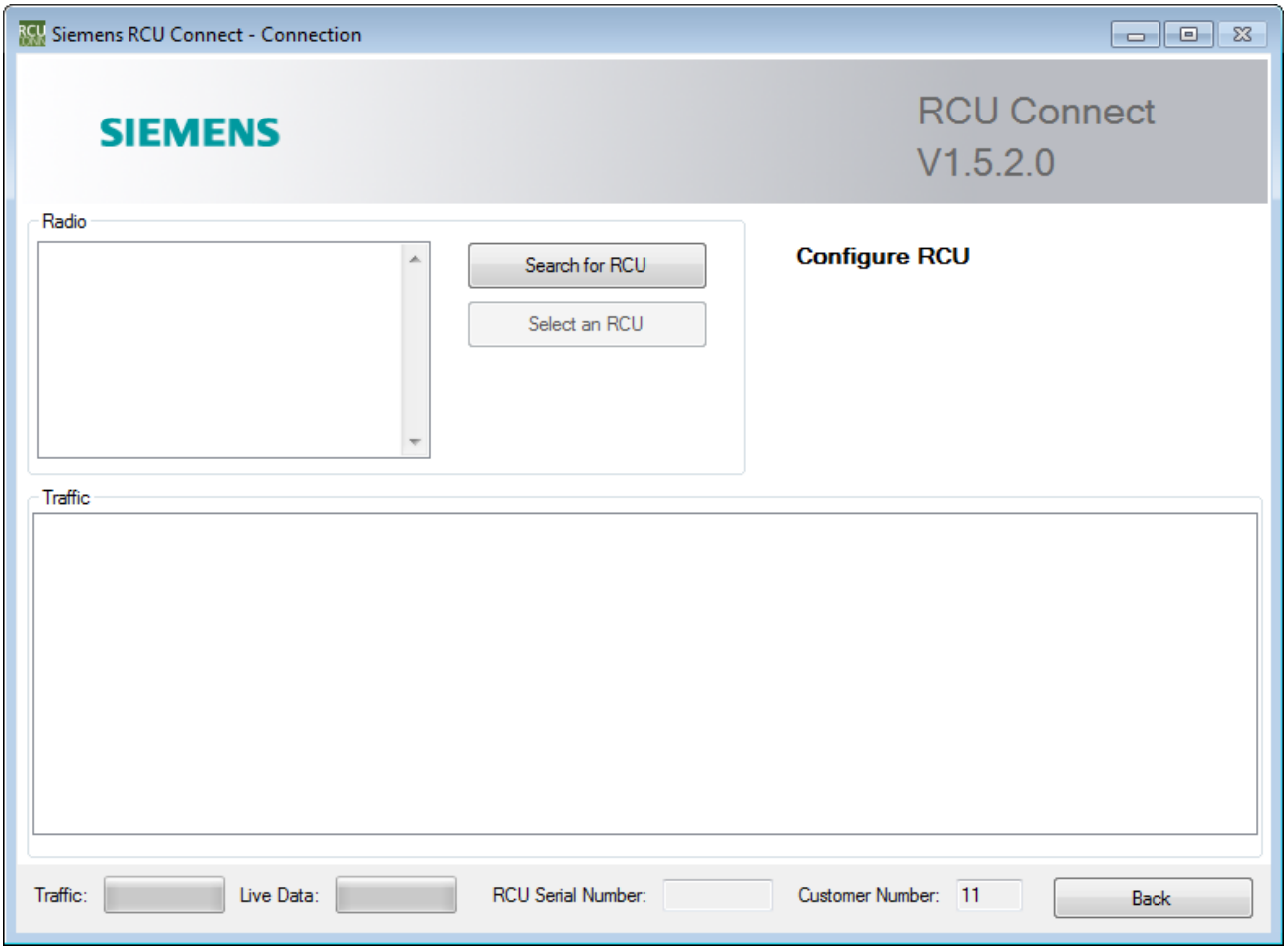


Fig. 42 *RCU Connect* – Connection Window

5 Click the "Search for RCU" button, RCU Connect will scan for available Remote Control Units, and display each one in the box listed by serial number, as shown in figure 43.

Note

It is recommended that only one RCU within the workshop be powered up whilst configuration occurs to simplify the process.

Note

An asterisk after an RCU Serial number indicates that RCU is programmed with firmware that supports encrypted communication via short range radio.

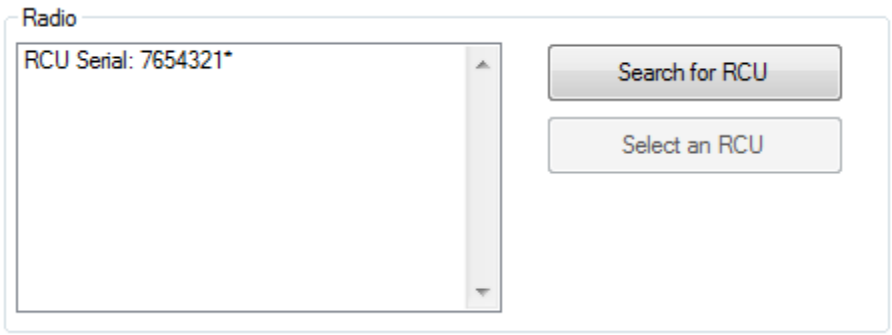


Fig. 43 *RCU Connect* – Selecting an RCU

6 Select a Remote Control Unit from the list, RCU Connect will attempt to connect to the Remote Control Unit. After a few seconds, if successful, the "Select an RCU" button will become enabled. The user can now click the "Select an RCU" button and *RCU Connect* will display the "Configure RCU" screen shown in figure 44. As it connects to the RCU, RCUConnect will check whether the RCU is configured for Fusesaver or CMR use. If the configuration template selected on previous screens does not target the correct switchgear, RCUConnect will NOT use that template to populate the “Configure RCU window” illustrated below.

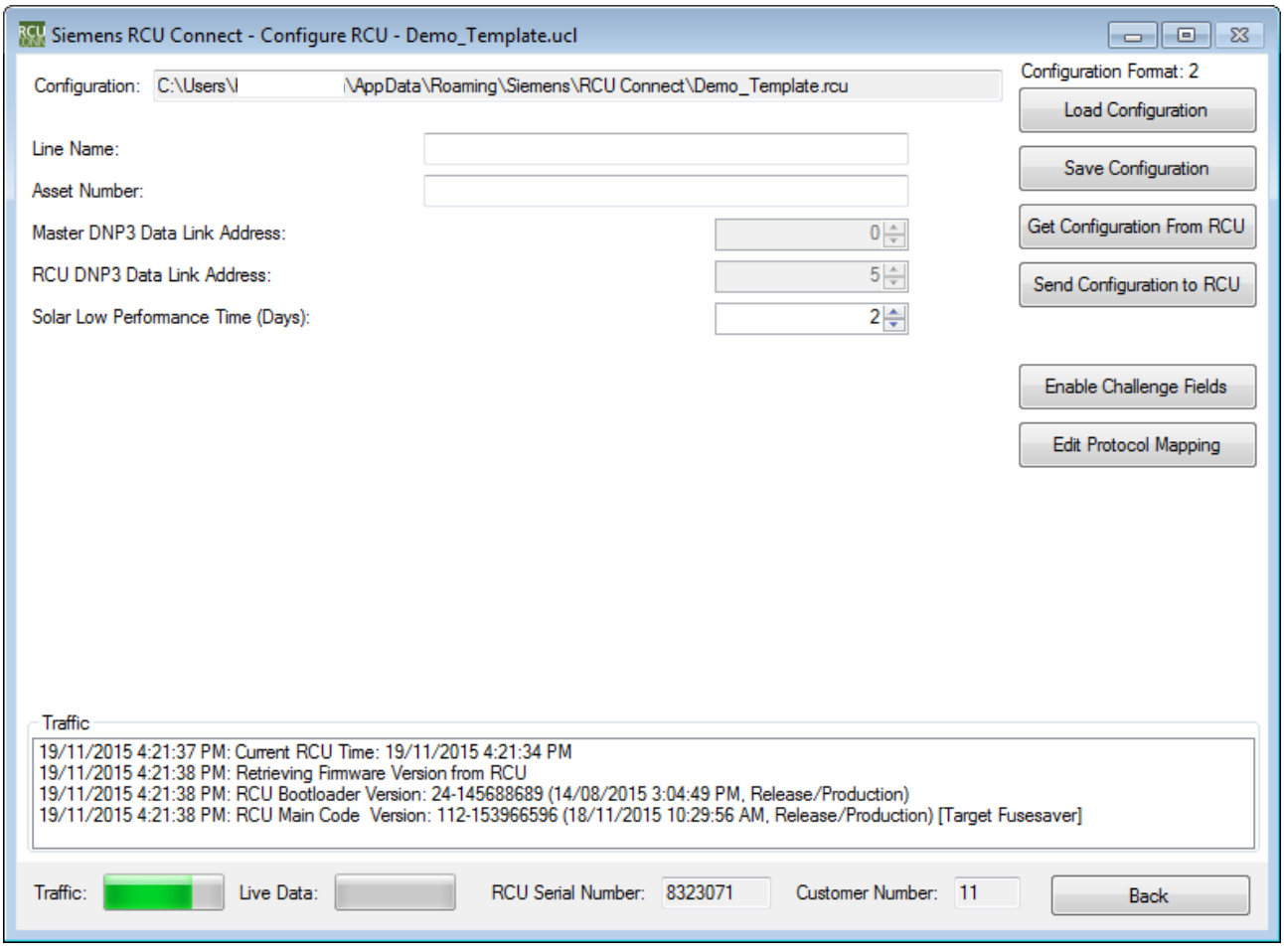


Fig. 44 *RCU Connect* – Configure RCU Window

> **Note**
>
> Once RCU Connect and the RCU are communicating the “Traffic” and “Live Data” indicators shown at the bottom of figure 43 will provide a visual indication that communications is in progress.

The Configure RCU menu allows the user to perform the following tasks:

- fill in the configuration fields for a Remote Control Unit
- load a specific RCU configuration that was previously saved
- save a specific RCU configuration for later use
- retrieve a configuration from a Remote Control Unit
- send a configuration to a Remote Control Unit

7 When the "Configure RCU" menu is shown, the data in the fields has been retrieved from the configuration template selected, which is shown in the "Configuration" field at the top of the screen. The user should then modify each field to suit the specific Remote Control Unit that is being configured for deployment. For example, if the Remote Control Unit being configured has an Asset Number of "98/AB665", and an RCU Data Link Address of "223", the user will enter the data as shown in figure 44.

8 Alternatively, the user might want to load a previously saved configuration. This can be achieved by clicking the "Load Configuration" button and selecting the configuration to load from the file selection screen. Once a configuration has been loaded, the settings based on the configuration template have been replaced by the settings in the configuration that has been loaded. Once a configuration has been loaded or saved, the name of the configuration is shown in the "Configuration" field at the top of the screen, see figure 45.

9 Another alternative is to download the currently connected RCU’s configuration. This can be achieved by clicking “Get Configuration From RCU” button. Once a configuration is successfully downloaded, the “Configuration” field at the top of window will read “Retrieved from RCU” and the settings in the configuration template will be replaced by the values downloaded from the RCU.

> **Note**
>
> Files with an extension of ".rcuconfig" are saved configurations, not configuration templates. They contain the information entered at the time of deployment for a specific Remote Control Unit. “.rcuconfig” files can be reused as the starting point for a new configuration process.

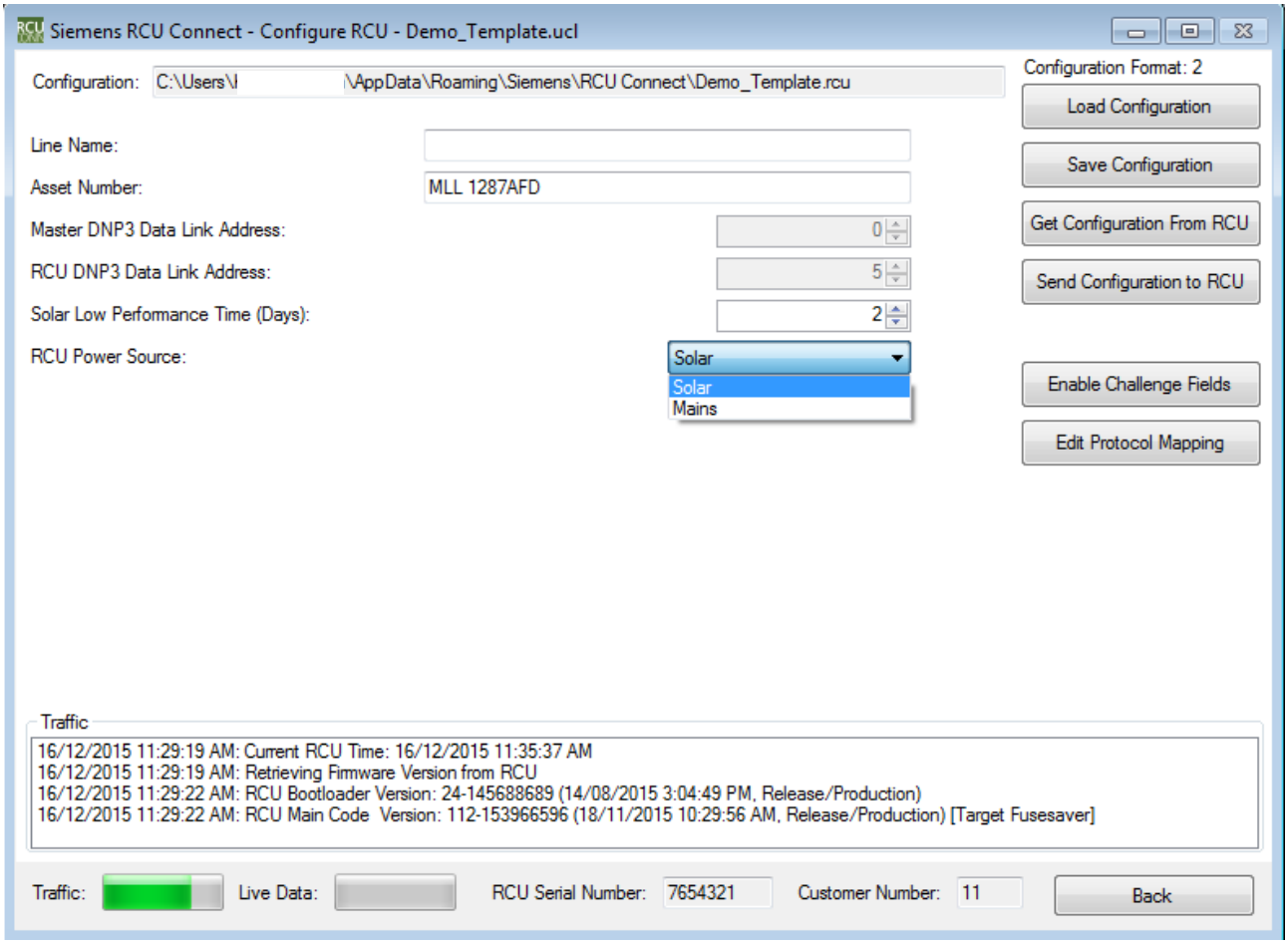


Fig. 45 *RCU Connect* – Enter site specific data

For CMR installations, refer to [3] for RCU configuration instructions related to pairing CMRs with the RCU.

10 Once the user is satisfied with the field values on the screen, the user can save the configuration by clicking the "Save Configuration" button and entering a file name for this Remote Control Unit configuration file.

11 The user then sends the configuration to the Remote Control Unit by clicking the "Send Configuration to RCU" button. This should be the last action that is performed for this Remote Control Unit on the "RCU Configuration" screen, as once the user sends the configuration to the Remote Control Unit, the Remote Control Unit restarts, and the dialogue box shown in figure 46 will appear. The user can click "OK" to return to the main menu.

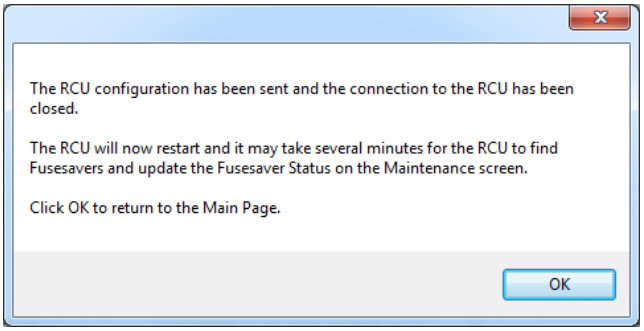


Fig. 46 *RCU Connect* – The RCU Restarts after the configuration has been sent.

The remainder of this section describes operation with Fusesaver. The equivalent description for CMR is available in [3] .

12 After the configuration is loaded, the RCU restarts and searches for the Fusesavers specified in the configuration. While searching, the RCU will flash the Switchgear OK LED. When it finds and establishes communications with all the Fusesavers in the line the Switchgear OK LED will stop flashing and be on steady. This normally takes approximately 5 minutes.

13 If the RCU cannot find all the Fusesavers in the line the Switchgear Problem LED will be on steady. This may take up to 10 minutes to occur. If the RCU cannot successfully find Fusesavers its behaviour depends upon the configuration.

   a. If, when configuring the RCU the user has entered a Fusesaver Line Name (this is the unique way that Fusesaver lines are identified) then the RCU will search indefinitely for the Fusesavers that make up the named Fusesaver line.

   b. However if no Fusesaver Line Name has been entered then the RCU will search for Fusesavers within range of its short range radio.

14 If the RCU finds at least one Fusesaver in a line it will continue searching for the other Fusesavers on that line until the search times out after several minutes. However, if it can't find any working Fusesavers it will restart itself and search for any Fusesaver over again. The RCU will do this up to three times at 10 minute intervals then 5 times at 1 hour intervals and then stop. This prevents continual restarts generating nuisance alarms for the SCADA system. To get the RCU to search again the RCU must be restarted either by remote control or by a local operator.

> **Note**
>
> It is strongly advised that only one RCU and one set of Fusesavers be within range at the same time. For workshop testing this means ensuring additional RCU's are turned OFF and additional Fusesavers do not have Communications Modules fitted.
>
> If multiple Fusesaver Lines co-exist at a single site please contact a Siemens Service Centre for advice on how to manage these sites.

7.5 Site Checking

The user can check a Remote Control Unit configuration by clicking on the "Maintain/Check RCU" Button from the main menu of *RCU Connect*. This allows the user to view Remote Control Unit data, and data about the connection the Remote Control Unit has to the Fusesaver line.

From the "Maintain/Check RCU" screen (see figure 47 below), the user can also save the configuration, restart the Remote Control Unit and set the clock on the Remote Control Unit (this can be useful if a connection to the SCADA network has not been made, for example, when testing in the workshop).

In the "RCU Status" section, the user can find information regarding the battery life remaining, communication statistics, and some diagnostic information on the power supply and configuration. If there is a problem with the connection between the Remote Control Unit and the Fusesaver line, the "Fusesaver Config Error" box is checked (see figure 47). If this occurs, there is a problem with the RCU configuration, the Fusesaver line configuration, or the radio connection between the two.

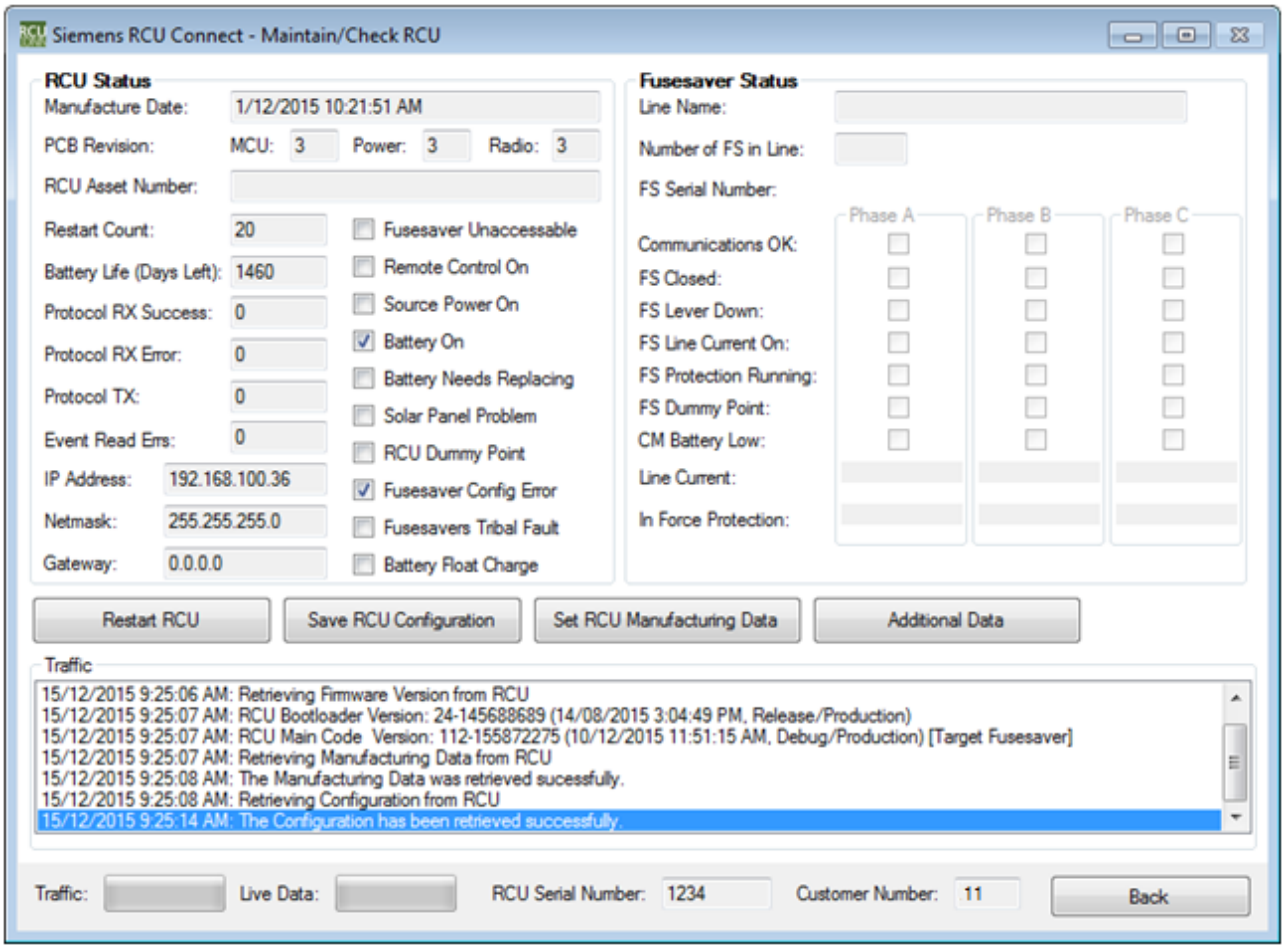
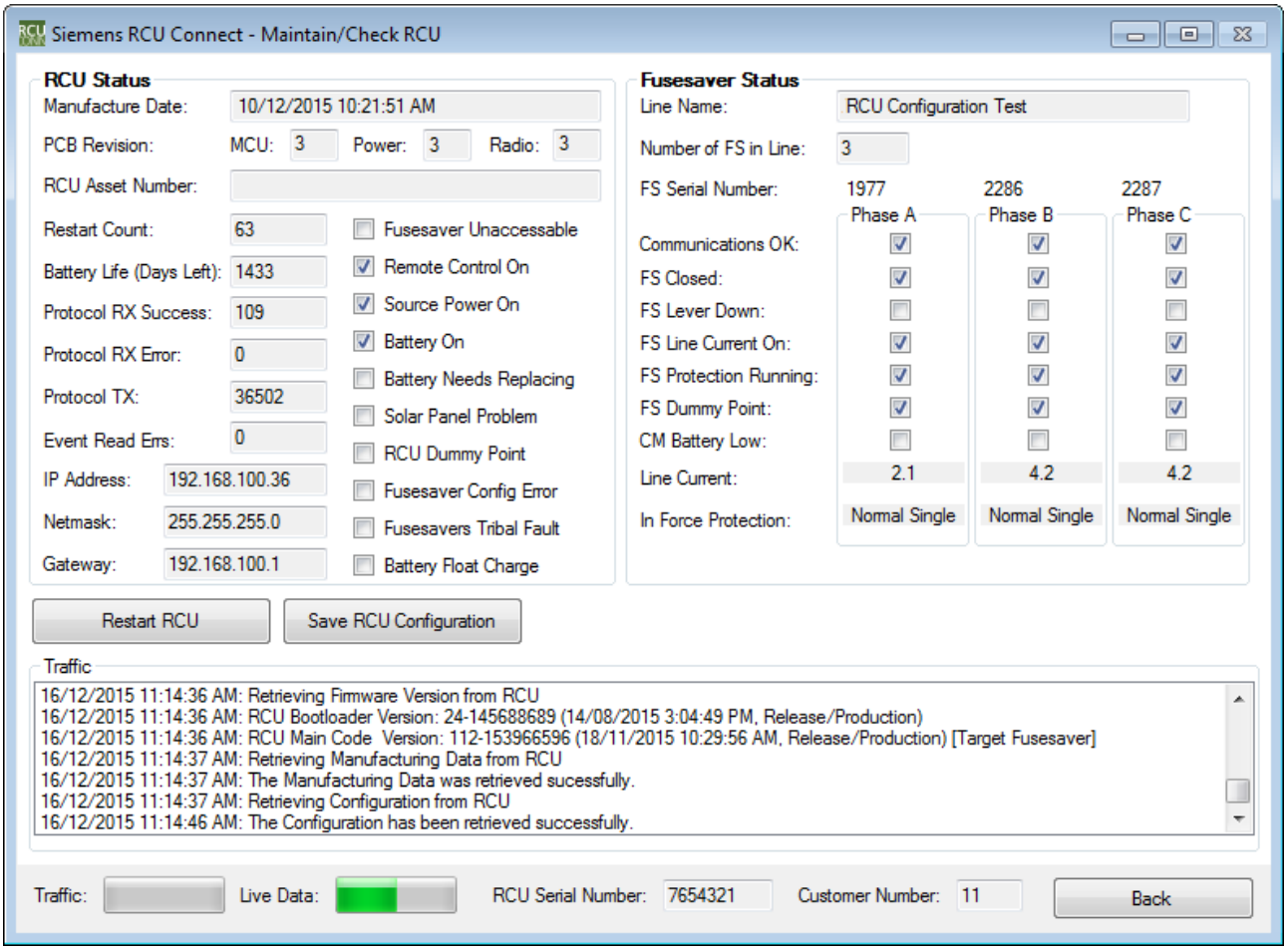


Fig. 47 *RCU Connect* – Maintain/Check Window for Fusesaver Installations.

When the configuration and connection is working correctly, the user will see something similar to figure 48. Under Fusesaver Status, the Line Name, number of Fusesavers in the line and serial number of each Fusesaver can be seen, as well as the individual Fusesaver status for each device. In the example shown in figure 48, the Fusesaver line has line current, the devices are all closed, communications is OK, protection is running, and the protection mode is normal.


Siemens RCU Connect - Maintain/Check RCU
RCU Status
Manufacture Date: 10/12/2015 10:21:51 AM
PCB Revision: MCU: 3 Power: 3 Radio: 3
RCU Asset Number:
Restart Count: 63
Battery Life (Days Left): 1433
Protocol RX Success: 109
Protocol RX Error: 0
Protocol TX: 36502
Event Read Errs: 0
IP Address: 192.168.100.36
Netmask: 255.255.255.0
Gateway: 192.168.100.1
Fusesaver Unaccessable
Remote Control On
Source Power On
Battery On
Battery Needs Replacing
Solar Panel Problem
RCU Dummy Point
Fusesaver Config Error
Fusesavers Tribal Fault
Battery Float Charge
Fusesaver Status
Line Name: RCU Configuration Test
Number of FS in Line: 3
FS Serial Number: 1977 2286 2287
Phase A
Phase B
Phase C
Communications OK:
FS Closed:
FS Lever Down:
FS Line Current On:
FS Protection Running:
FS Dummy Point:
CM Battery Low:
Line Current: 2.1 4.2 4.2
In Force Protection: Normal Single Normal Single Normal Single
Restart RCU
Save RCU Configuration
Traffic
16/12/2015 11:14:36 AM: Retrieving Firmware Version from RCU
16/12/2015 11:14:36 AM: RCU Bootloader Version: 24-145688689 (14/08/2015 3:04:49 PM, Release/Production)
16/12/2015 11:14:36 AM: RCU Main Code Version: 112-153966596 (18/11/2015 10:29:56 AM, Release/Production) [Target Fusesaver]
16/12/2015 11:14:37 AM: Retrieving Manufacturing Data from RCU
16/12/2015 11:14:37 AM: The Manufacturing Data was retrieved sucessfully.
16/12/2015 11:14:37 AM: Retrieving Configuration from RCU
16/12/2015 11:14:46 AM: The Configuration has been retrieved successfully.
Traffic:
Live Data:
RCU Serial Number: 7654321
Customer Number: 11
Back

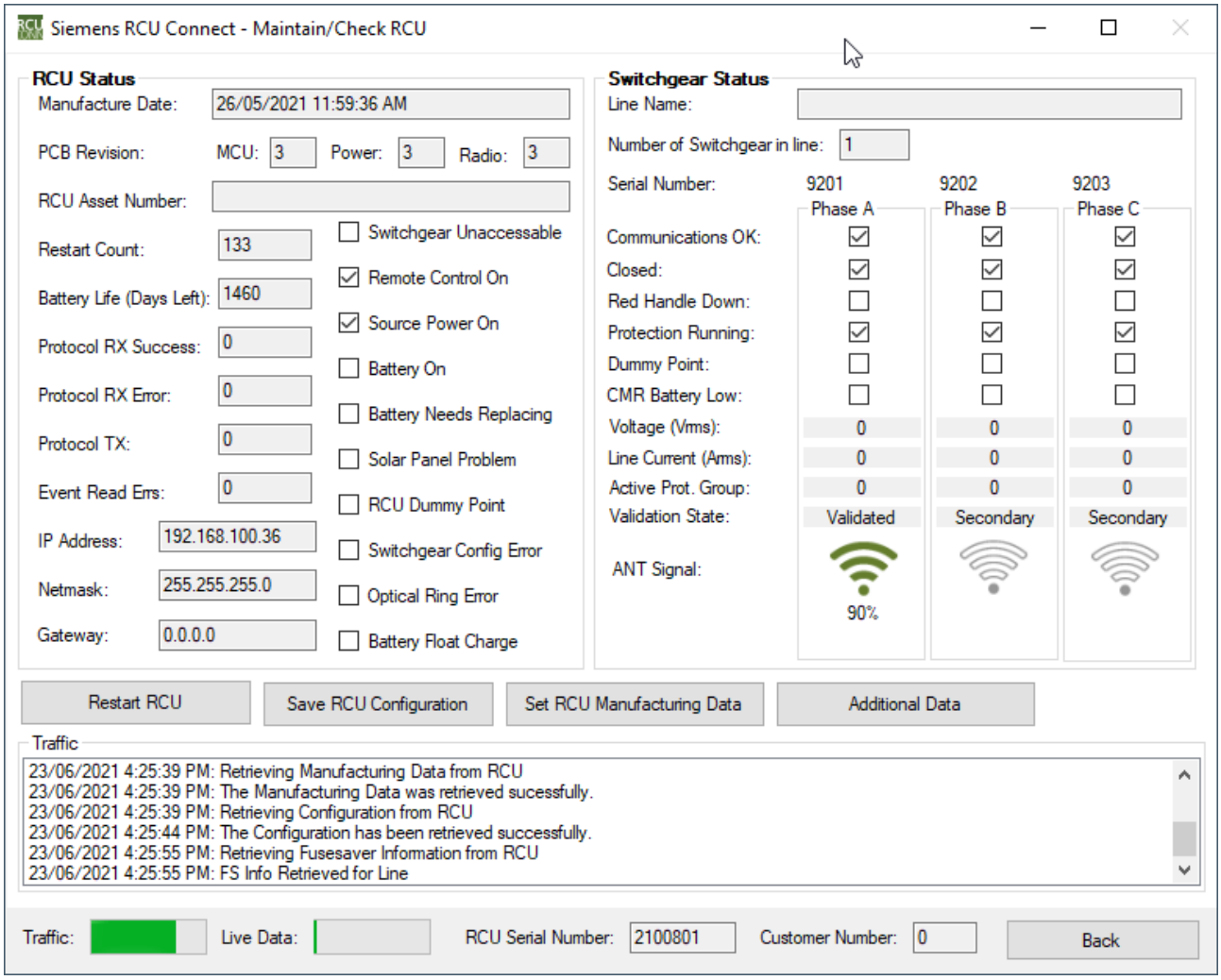


Fig. 48 *RCU Connect* **–** RCU communicating correctly with Fusesavers (top) and CMR installations (bottom)

Using this data and the displays on the RCU the user satisfies themselves that the site is working correctly.

A suggested check list for confirming successful RCU commissioning at a site is:

1 RCU Battery LED ON

2 Switchgear OK LED ON

3 Switchgear line name correct.

4 RCU messages being received by SCADA and being responded to by the RCU. The Protocol Tx and Protocol Rx LEDs on the front of the RCU can be used for this or the protocol counters in *RCU Connect.*

5 RCU Source Supply ON.

6 Dummy control of Fusesaver working from SCADA operator for all phases.

7 Remote Control LED ON.

8 If an Operator Control Panel is fitted then the displays on the panel show the correct switchgear state, the correct protection mode and all phases are healthy.

7.6 Reset RCU Configuration Procedure

Under some circumstances it may be desirable to reset the configuration in the RCU back to the default. This is achieved by the following method:

1 Press and hold the door switch at the top of the electronics housing.

2 Turn the Remote Control OFF switch ON and OFF five times with an delay of approximately 1 second between toggles.

This need might arise if, for example, a user has configured the RCU with a USB antenna with the wrong customer number in it. In this case a user with the correct USB antenna will not be able to connect to the RCU to re-configure it because it has been configured with the wrong customer number. However, by following the above method the configuration will be cleared from the RCU and it will then be available for configuration by the user.

7.7 SCADA Protocol Testing

It is usual for each utility to configure the SCADA protocol and exhaustively test every point and control. This can be very difficult and time consuming to achieve without the support of special test equipment.

Siemens provides such a utility called *RCU Probe* which gives visibility into the RCU database and allows hand overriding of database points. Using *RCU Probe* the expert user can prove the protocol configuration and operation of the protocol prior to the configuration being distributed to the installation team.

RCU Probe has its own user manual (KMS-0020) and is intended for use by the appropriate technical expert. It is not suitable for use outside of the acceptance test workshop since it connects to the RCU using the Ethernet port on the RCU and provides unrestricted control of switchgear.

Note that both RCU Probe and an IP modem (for DNP3 over IP) can be used together with an appropriate RCU and network configuration, as explained in KMS-0020.

Contact Siemens Service Centre for further information.

7.8 Customer Number

Each end customer has a unique customer code and this code is embedded in the USB antenna. The code is sent as part of the configuration to both Fusesavers (with Siemens Connect Utility) / CMR (with CMRConnect utility) and to RCU's with the RCU Connect utility. When searching for switchgear, RCU will only find devices that have a customer number that matches the RCU customer number. This ensures that different utilities will not be able to operate each other's switchgear or be able to connect to each other's RCU's.

7.9 Fusesaver Operator Control Panel

Refer to [4] for details of CMR Operator Panel operation.

As the Fusesaver Control Panel is an accessory to an RCU, the RCU may need to be configured to work with the Fusesaver Control Panel. There are a number of RCU configuration settings that will affect the Operator Control Panel. Settings for these are to be completed by the user in the RCU Configuration Specification form (KMS-3100)

If an RCU is unconfigured, the RCU will not attempt to connect to any Fusesavers and thus the Fusesaver Control Panel will not have anything useful to display or control. Under this circumstance the Control Panel On/Off LED will flash on and off to indicate that the Fusesaver Control Panel is working but the RCU is not configured.

7.9.1 Enable Operator Control Panel

This setting must be set to *Enabled* so that the RCU will auto-detect and drive the Fusesaver Control Panel. If this setting is set to disabled the RCU will not power up the Control Panel so no LEDs will be lit.

7.9.2 Operator Control Panel Ignore Remote Switch

This setting allows Fusesaver Control Panel controls to the Fusesavers such as Trip/Close or change of protection mode to always be allowed irrespective of the position of the Remote Control ON/OFF switch. Setting options are:

- TRUE: The RCU will allow controls from the panel to be sent to the Fusesaver irrespective of the position off the Remote Control ON switch.
- FALSE: The RCU will disable all controls from the Control Panel if the Remote Control Switch is ON.

Note that when this setting is TRUE both the Local and Remote Control Source LEDs may be lit because both sources of control can be enabled.

7.9.3 Always Allow Trip

This setting allows Fusesaver Control Panel TRIP commands to either be passed to the Fusesaver or rejected by the RCU depending upon the status of the external lever of the Fusesaver. Settings options are:

- TRUE: The RCU will issue the TRIP command to the Fusesaver to trip regardless of external lever position. The Fusesaver will TRIP regardless of policy file setting for MANUAL INHIBIT (see Fusesaver Operating Instructions).
- FALSE: If the external lever of the Fusesaver is down then the RCU will reject the TRIP command.

Note; this setting only applies to Fusesaver TRIP commands. Fusesaver CLOSE commands will always be rejected if the external lever is down regardless of whether the Fusesaver policy for the external lever is to allow manual operations when the external lever is down.

8 RCU Operation

The RCU has been designed with the intention that limited operator interaction is required with the RCU once installed and configured. The primary reason for interaction is to:

- Check the RCU panel LEDs for problems, refer maintenance on page 82.
- Disable remote control of the switchgear from the SCADA operator. This would normally occur to allow line crews to work downstream of the switchgear, refer below.
- Operate the switchgear with an operator control panel installed on the RCU, refer page 30.
- Observe the LED light status on the display to assist in SCADA communications debugging.
- Conduct maintenance on the RCU such as changing batteries as described on page 84.
- Open the door to allow *RCU Connect* to open communications with the RCU, refer page 24.
- Load newer versions for RCU firmware as described on page 87.

8.1 Remote Control

To disable remote SCADA control of the switchgear the following process is followed:

1. Open the enclosure door.
2. Change the “Remote Control” toggle switch position from “I” to “O”.
3. Check that the RED LED light next to the “Remote Control ON” text on the display has turned OFF.
4. Check that the GREEN LED next to the “Remote Control OFF” text on the display has turned ON.
5. Close the RCU enclosure door and lock.

The same process is applied to restore the switchgear to remote SCADA control, except the “Remote Control” toggle switch is set to “I”.

It is possible to permit switchgear trip controls from a SCADA system even though the Remote Control On switch is in the OFF position, refer configuration parameters on page 98.

8.2 Fusesaver Operator Control Panel

Refer to [4] for details of CMR Operator Panel operation. If a Fusesaver operator control panel is fitted in the RCU then the local user has a much greater range of local interaction with the RCU. The local user will be able to trip and close Fusesavers or to change their protection mode.

⚠ CAUTION

After pressing the operator “Panel ON” button ensure the LED for this button lights up. If the LED does not light up then there is a problem with the panel and the user should contact the Siemens service centre. In this case the user should not press any other buttons on the operator panel as the user cannot confirm whether the control has been issued or the status of the Fusesavers.

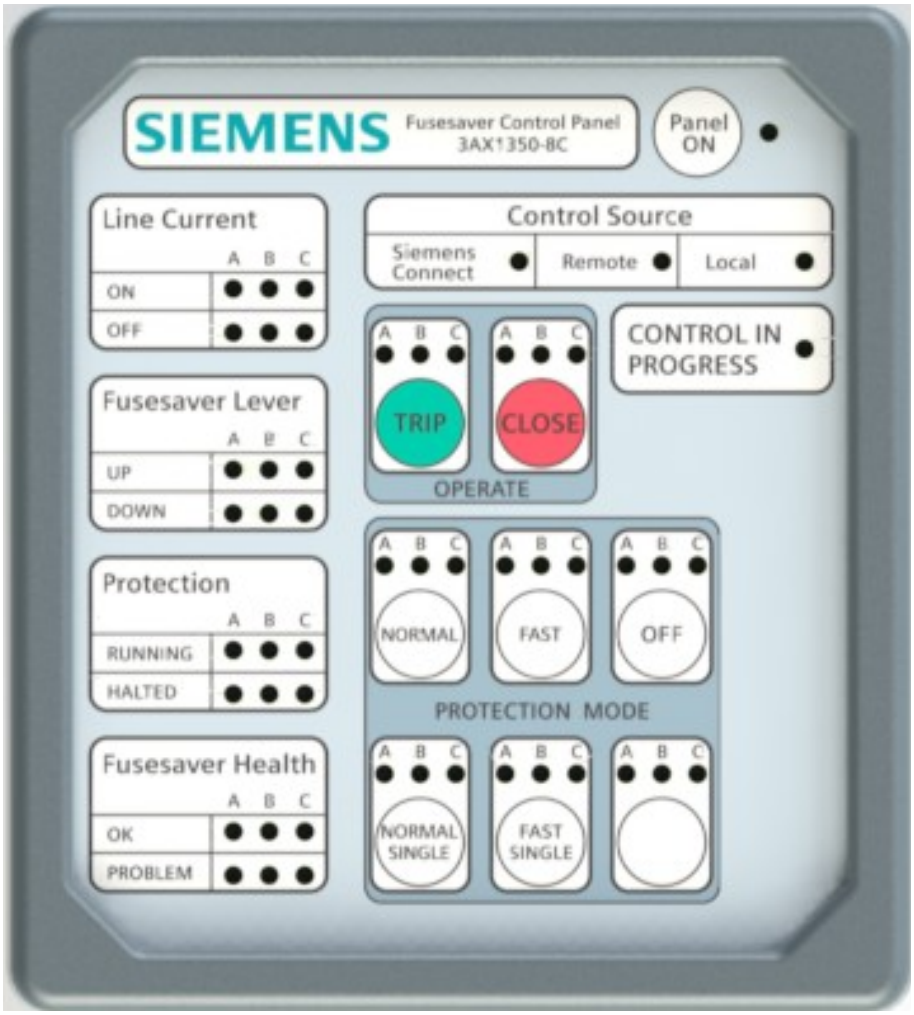


Fig. 49 A Fusesaver Operator Control Panel (multiple versions available)

After opening the RCU door the local operator must press the “Panel ON” button on the panel to make it active. The LED lights will come on showing the status of each Fusesaver on the line above. If the panel is plugged in after the RCU has been powered up please allow up to 30 seconds for the RCU to detect the panel.

When the RCU has completed searching for and has verified the Fusesavers it is connected to the RCU switchgear OK LED will go green. This normally takes around 5 minutes. When this stage is complete the Fusesaver Control Panel should have valid status data for all of the phases that the RCU is connected to.

Depending upon the configuration settings chosen by the utility, the operator may be required to switch the remote control ON/OFF toggle switch to the remote control OFF position prior to attempting to apply controls to the Fusesaver via the operator panel. If the operator does not do this and tries to apply a control by pressing a button on the panel, the control will be rejected.

The operator can send controls to the Fusesavers by pressing the appropriate button on the panel. On pressing a button the following sequence of events will occur:

1 The LED lights on the button will begin to blink to indicate the RCU is attempting to apply the controls to the Fusesaver.

2 So long as the Fusesaver can accept controls from the RCU (i.e. the external lever is UP and is the Fusesavers are not in session with Siemens Connect) the controls will be passed to the Fusesaver. Typically this takes 15-20s, however can take up to 70s before the RCU will time-out.

3 Once the control is successfully applied, the LEDs on the panel will change to reflect the new state of the Fusesavers. There can be a delay of 5-10s before the state update occurs.

4 If the control was not successfully applied then the LEDs will stop blinking and the Fusesaver state will remain as previously indicated.

The operator panel can be turned OFF by pressing the “Panel ON” button again (the LED lights will go out), or by closing the RCU door.

Each of the buttons on the Fusesaver Operator Control Panel has the following functionality.

8.2.1 Panel ON

The Control Panel will be off when the cubicle door is opened and is turned on by pressing the *Panel ON* button. When the Control Panel is on the LED adjacent to the *Panel ON* Button will be lit. The Control Panel can be turned off by pressing the *Panel ON* button while the panel is already on or by closing the RCU door. When the Control Panel is off no LEDs will be lit.

8.2.2 Fusesaver Status

The Fusesaver status LEDs indicate the current status for each phase of the Fusesaver line. If no LED is lit for a phase this means *No Data* is available for that phase. The Fusesaver statuses are:

- Fusesaver Line Current is ON or OFF
- Fusesaver External Lever is UP or DOWN
- Fusesaver Protection is RUNNING or HALTED.

8.2.3 Fusesaver Control Source

The control source LEDs indicate who has permission to send controls to the Fusesavers connected to the RCU. The possible control sources are:

- Local: This Control Panel is allowed to issue controls to the Fusesavers connected to the RCU. If the Local LED is not lit then all Fusesaver controls from the Control Panel will be rejected. This includes both trip/close and protection controls.
- Remote: The remote operator, i.e. the SCADA operator, is allowed to issue controls to the Fusesavers connected to the RCU. If the Remote LED is not lit then all Fusesaver controls from the remote operator will be rejected.
- Siemens Connect: A Siemens Connect session is currently in progress with the Fusesavers and is allowed to send trip/close controls to the Fusesavers. All Fusesaver controls originating from the RCU, whether they are local or remote, will be rejected.

8.2.4 Control in Progress

This LED will flash to indicate that a control issued by the Fusesaver Control Panel is in progress. The Control-in-progress LED will stop flashing when one of the following conditions is met:

- The control has been sent to the Fusesavers and the control is successful, e.g. Close Control has been sent and all phases are now closed.
- The control has been sent to the Fusesavers but the control has timed out after 70 seconds without being successful, e.g. Close control has been sent but not all phases are closed after 70 seconds.

No further panel controls are allowed while the control in progress LED is flashing. The typical time for a protection control to be applied is 10-20sec and for a trip or close control is 40-60sec.

8.2.5 Fusesaver Operate

The Fusesaver Trip/Close LEDs indicate the current open/close state for each phase of the Fusesaver Line.

If no LED is lit for a phase this means there is *No Data* available for that phase.

The Trip button will issue *Ganged Trip* control to all Fusesavers on the line. The Close button will issue a *Ganged Close* control to all Fusesavers on the line.

A *Ganged Trip or Ganged Close* will command all Fusesavers on the line to Trip/Close only if communications are normal to each and every Fusesaver. If communications have failed to any Fusesaver then no trip/close command will be sent to any Fusesaver.

Once a Trip or Close control is issued to the Fusesavers the corresponding status LEDs will begin to flash. (i.e. a Trip control in progress will flash Trip LEDs). The Trip/Close status LEDs flash in conjunction with *Control In Progress* LED to indicate which control is currently in progress. The status LEDs will stop flashing when the control in progress has finished.

It is possible to issue controls to Fusesavers that are already in the required state, e.g. sending a trip control to Fusesavers that are already open. In this scenario the RCU will still send the control to the Fusesavers. The control in progress LEDs will begin to flash but will stop soon after as the Fusesavers are already in the desired state. The benefit of this is, for example, if two phases are tripped and one is closed, pressing the Trip control will open the closed Fusesaver and bring the phases to the same state. If independent trip/close control of Fusesavers is required it is necessary to use the Siemens Connect PC application (refer to Fusesaver Operating Instructions KMS-0017)

8.2.6 Protection Mode

The Fusesaver Protection Mode Status indicates the currently active “protection modes” for each phase of the Fusesaver Line.

If no LED is lit for a protection mode on a phase this means there is *No Data* available for that phase.

The Fusesaver Control Panel Protection Controls are ganged controls which will command all Fusesavers on the line to change a protection mode only if communications are normal to each and every Fusesaver. If communications have failed to any Fusesaver then no protection mode change command will be sent to any Fusesaver.

Once a Protection control is issued to the Fusesavers the corresponding status LEDs will begin to flash, e.g. a FAST-SINGLE control in progress will flash the FAST-SINGLE LED and the *Control In Progress* LED. The status LEDs will stop flashing when the control in progress has finished, see Control in Progress Indicator above.

It is possible to issue controls to Fusesavers that are already in the control state, e.g. sending a FAST-SINGLE control to Fusesavers that are already in FAST-SINGLE mode. In this scenario the RCU will still send the control to the Fusesavers. The control in progress LED will begin to flash but will stop soon after as the Fusesavers are already in the desired state.

8.2.7 Fusesaver Health

The Fusesaver Health LED indicate the operational health for each phase on the line. A Fusesaver’s Health can be OK, PROBLEM or No Data if no data is available for that phase.

A Fusesaver Health is deemed to be OK if ALL of the following conditions are met:

- The Phase is correctly configured.
- Communications to the Fusesaver is healthy.
- The Fusesaver Communications Module battery life is not low.
- The Fusesaver VI is not worn out.
- The Fusesaver does not have a mechanism fault.

A Fusesaver is deemed to have a PROBLEM if ANY of the following conditions are met.

- There is a communications problem to the Fusesaver.
- There is a problem with the Fusesaver configuration (RCU Switchgear Problem LED will also be red).
- The Fusesaver Communications Module battery life is low.
- The Fusesaver VI is worn out.

- The Fusesaver has a mechanism fault.

Both LEDs will be off under the following circumstances:

- There is no Fusesaver for that phase.
- The RCU is currently in the process of checking the Fusesaver configuration (RCU Switchgear OK LED will be flashing)
- The state of the Fusesaver Communications Module, Fusesaver VI or Fusesaver Mechanism is unknown as data for these points has not been updated recently.

8.3 Time Management

The RCU has in internal real time clock which runs on *Universal Coordinated Time* (UTC).

Is operation in the case of a CMR installation is described in [1] .The following refers to Fusesaver installations.

Time is set by the SCADA protocol (if supported by the protocol and the master station). Time is maintained in the RCU during loss of supply by using the standby battery. If the battery is disconnected or turned off for more than 1 hour, time may be lost and must be reset when power is restored to the RCU, usually the SCADA protocol will do this.

On power up the RCU acquires time from the following sources in this order:-

- The battery backed up clock
- The SCADA system
- The Fusesaver time master if SCADA time not acquired.

The RCU sets time in the Fusesavers every 24 hours and when time is set by the SCADA system.

Note that the earliest time that the RCU will accept from SCADA is 1st January 2011. A time earlier than this will not be accepted by the RCU.

8.4 Fusesaver Availability Monitoring

The following functionality is available for Fusesaver installations only.

For Fusesavers configured to work with a partner fuse (i.e. configured for OC operation), the Fusesaver protection is only armed when the line current is sufficient to power the Fusesaver (line power is needed for protection even if a Communications Module is fitted). At times of low demand it is possible that the line current will fall low enough such that the Fusesaver protection is inactive. It can be difficult to ascertain if a particular line has enough current for some or all of the day for the Fusesaver protection to be armed. Fusesavers installed on sites with inadequate line current will not provide the improved network reliability and return on investment potentially forecast by the user.

To assist the user in assessing that Fusesavers have been installed on lines with adequate line current the RCU monitors the line current ON flag in the Fusesaver and determines the Fusesaver protection availability over the previous 24 hours for which Fusesaver data is available. The RCU then provides this as an analogue database point for the SCADA system (APID 23, 24, 25). This enables SCADA monitoring of the Fusesaver protection availability.

These points are updated every 2.4 hours and are initialised to 100.00% on restart.

Note that no line current due to the Fusesaver being open is included as an outage in the availability calculation.

9 RCU Maintenance

The Remote Control Unit has been designed for maintenance free operation except for the battery which is discussed in section 9.4.

Note

Don't attempt to disassemble the Remote Control Unit.

- Disassembly will void the warranty.
- Except for the battery and electronics compartment, serviceable parts are not inside the Remote Control Unit.

If the RCU is suspected of having a fault please contact Siemens Service Centre. When contacting the Service Centre you will need to provide the following information:

- Manufacturing serial number. This is located on the label on the side of the battery compartment.
- Software version installed in the RCU. This is displayed in *RCU Connect* maintenance tab when connected to the RCU.
- Details of any customer specific equipment installed including radios, modems or RCU accessories fitted.

In case of a genuine electronic failure the entire electronics compartment will need to be returned to Siemens for analysis, repair or replacement. The process to replace an electronics compartment is described in section 9.5.

To ensure that the RCU operates reliably, spare parts must be replaced only by trained and certified personnel. To order spare parts from Siemens an MLFB number is required. For more information see the MLFB-list or contact the Siemens Service Centre.

9.1 Safety Instructions for Maintenance

DANGER

Electrical hazard – Danger to life!

This work may only be performed by qualified personnel who have received appropriate instruction.

Do not touch live parts.

9.2 Site Check

Coming to site allows a quick check of the operation of the RCU. After opening the door the panel LEDs will come on. Normal operation will display:

- Power Source ON (unless it is dark and the power source is solar)
- Battery OK
- Switchgear OK

- Remote Control ON
- CPU OK Flashing
- Protocol RX Data and TX Data flashing occasionally when the SCADA system polls the RCU. For some protocols such as DNP3 which may not have frequent polling of the RCU it may be possible to force unsolicited messages to the SCADA system by turning the Remote Control Switch OFF and ON again. The Protocol LEDs can be observed and voice communication with the SCADA operator will confirm receipt of the data.

9.3 Spare Parts

Spare parts must only be replaced by qualified personnel.

Accessory / Spare part	Order Number
Battery 12 V, 7.2 Ah Lead acid	3AX1350-6A
Solar panel kit 65 W	3AX1350-6B
Fusesaver Operator panel	3AX1350-8C

9.4 Battery replacement

The RCU monitors the battery to determine when replacement is required as described on page 97. If the battery is detected as being near end of its life the Replace Battery indicator on the front panel is lit and the replace battery database point will be set.

When the battery is replaced it must be of the same type. The battery is a sealed lead-acid battery preferably conforming to the battery standard JISC8702. Battery specification is in section 10.4 and the Siemens part number is listed above for re-ordering.

To replace a battery the action is:

1 Turn off the battery switch, check that the battery LED lights on the display panel go out. The mains or solar switches can be left on and the RCU will still be operating.

2 Remove the battery compartment cover (Phillips No 2 screwdriver required).

3 Disconnect the battery and remove. Dispose of battery according to local environmental regulations.

4 Put in new battery and re-connect. Take care to connect with the correct polarity, red wire to battery positive terminal. If the battery is connected in reverse the battery fuse in the battery positive lead will blow. If this happens reverse the connections and replace the fuse. Fuse type is Automotive MINI - 15 A.

5 Turn on the battery switch. Check the battery LED comes on. This may take several seconds.

6 Press and released the door switch four times within a 10 second period. Take care to ensure the LEDs go out before releasing the door switch. The replace battery LED will go out and the battery life has been reset.

9.5 Electronics Compartment Replacement

The following process describes how to replace an entire electronics compartment in the RCU.

⚠ DANGER

High voltage – Danger to life!

Touching live parts is fatal or causes serious physical injury.

⚠ CAUTION

It is the utilities responsibility to ensure all installation procedures developed comply with all applicable safe work practices.

- Follow the local network rules.

9.5.1 Tools required to replace electronics compartment

- 4mm Allen Key – recommend T-Handle
- Torque Driver (1.5 Nm)
- Phillips No.2 Screwdriver
- Small Flat Screwdriver

9.5.2 Replacement Process

The following process should be followed by suitably qualified technicians to replace an electronics enclosure in the RCU:

⚠ CAUTION

It is the technician's responsibility to take all necessary actions to notify the control centre that the RCU is undergoing maintenance.

- Follow the local network rules.

⚠ DANGER

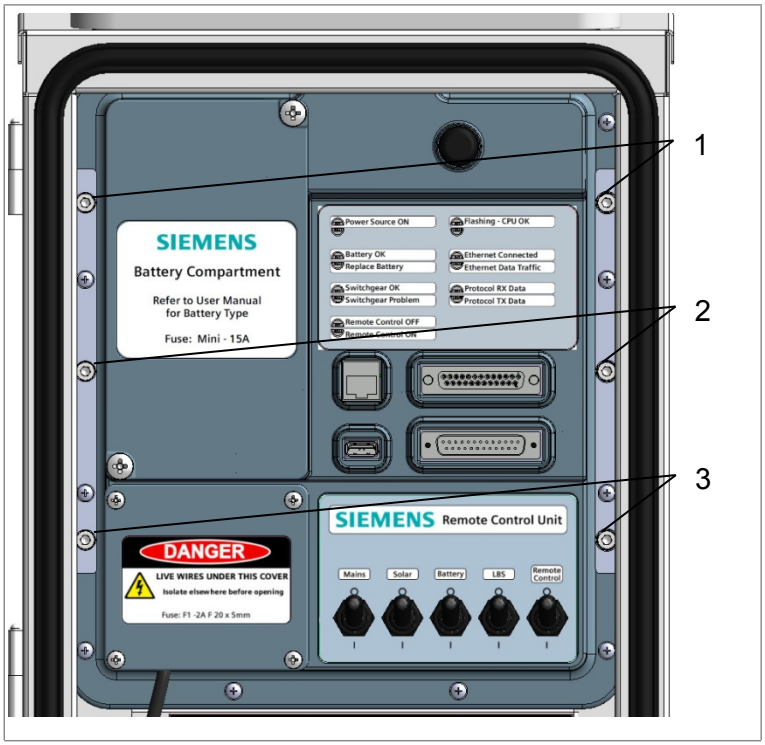
Failing to isolate the supply may result in operators being exposed to hazardous voltages.

High voltage – Danger to life!

Touching live parts is fatal or causes serious physical injury.

1. Turn the mains power, solar power and battery toggle switches to the "O" position on the electronics enclosure.If a mains or VT supply is connected then isolate the supply externally from the RCU. If an isolation module is fitted then turn off the isolation switch and unplug the outgoing connection to the RCU electronics housing (refer figure 10).

2. Disconnect the radio cable from the electronics enclosure.
3. Remove the power compartment cover using the Phillips head screwdriver.
4. Disconnect the earth wire and the mains or solar cable wires in the terminal block in the power supply compartment.
5. Replace the power compartment cover and screw in place using the Phillips head screwdriver.
6. Unscrew the M5 caphead screws holding the electronics compartment into the RCU enclosure (see figure below) using the 4mm Allen key being careful to support the compartment whilst doing so. Retain the screws and washers.
7. Remove the electronics compartment from the RCU enclosure.



1 Upper retaining screws
2 Middle retaining screws
3 Lower retaining screws

Fig. 50 Screws holding electronics compartment in RCU Enclosure

7 Insert a replacement electronics compartment into the RCU enclosure.
8 Align the holes and screw the M5 x 20 capscrews with spring washers into the captive nuts in the RCU enclosure using the 4mm Allen key. Torque to 1.5Nm.
9 Remove the power compartment cover using the Phillips head screw driver.
10 Fit the earth wire connected to the internal RCU enclosure earth stud into the terminal block as shown. Tighten in place.
11 Complete remainder of installation as per section 5 of this user manual

1 Earth wire

2 Earth terminal connection

Fig. 51 Earth wire connection in terminal block

> **⚠ WARNING**
>
> **Do not forget earth wire.**
>
> The earth wire must be reconnected from the terminal block to the cubicle earth stud.

9.6 Firmware Update

The firmware update process is described in [5]

9.7 Troubleshooting the Fusesaver Operator Control Panel

Trouble shooting options for CMR operator panels are described in [4] .

9.7.1 Fusesaver LEDs off - indicating No Data

Some LED indications on the Fusesaver Control Panel have a third state of *No Data* when both LEDs are off. There are a number of reasons why a Panel Indication would have no data:

- RCU Power up: On power up the RCU searches for Fusesavers, checks their configuration for correct match and synchronises time to them. The RCU Switchgear OK LED will be flashing during this time which may take up to 10 minutes to finish. During this time No Data will be available.
- RCU failed to find Fusesavers line: If the RCU fails to find a correctly configured Fusesaver line then all phases will remain in the No Data state and the RCU Switchgear Problem LED will be red.
- Phase Not Present: If a Fusesaver line has less than 3 phases then the phase's that are not present will always have their LEDs in the No Data state. e.g. Fusesaver line only has B and C phase then A phase will have No Data.
- Communications Lost to a Fusesaver (e.g. Communications Module Removed). When Communications to the Fusesavers are restored the RCU will verify the Fusesaver configuration is still OK which can take up to 5 minutes for a single phase and during this time No Data will be displayed for that Fusesaver.

9.7.2 No Control Source - Local

In order to carry out Fusesaver controls via the Control Panel the Control Source must indicate local control is allowed. There are a number of reasons why the control source local would not be lit.

- Control Source - Siemens Connect: Local control will not be allowed while Siemens connect is in session with the Fusesavers.
- Control Source – Remote: Local control may not be allowed while the remote operator has control to the Fusesavers. This functionality depends on the configuration setting of the RCU.
- RCU Power up: On power up the RCU will search for and check the configurations of Fusesavers in the vicinity. During this time the RCU Switchgear OK LED will be flashing and both local and remote control to Fusesavers is not available.
- Fusesaver External Lever Down: When the external lever of any Fusesaver on the line is down then controls to all Fusesavers, remote or local, are disallowed. Depending on the RCU configuration trip controls may still be allowed even though the control source is LED is not lit.
- RCU Synchronising New Time: All RCU controls, remote or local, will be locked out for a short period (less than 30 seconds) when new time is being synchronised from the RCU to the Fusesavers, this avoids unreliable controls.

9.7.3 Fusesaver Control – No Control In Progress

When an operator presses a Fusesaver control the Control In Progress LED and the corresponding control status LED will begin to flash when the control has been accepted by the RCU and sent to the Fusesavers. If the control in progress LEDs do not start to flash the control has been rejected. A control will be rejected for the following reasons.

- Control Source – Local: The control source local LED is not lit, therefore all Fusesaver controls from the Control Panel will be rejected.
- Control Already Active: The control has been reject because the RCU is already in the process of sending a control to the Fusesavers. The previous control may have been from the remote operator, the RCU itself (if configured to do so) or from the Control Panel. If the previous control was from the Control Panel the control in progress LEDs will already be flashing.
- Line not Configured: If the RCU fails to find a correctly configured Fusesaver line on start-up then all controls to Fusesavers will be rejected. RCU Switchgear Problem LED will be red in this case.
- RCU Power up: On power up the RCU searches for Fusesavers, check their configuration for correct match and synchronises time to them. The RCU Switchgear OK LED will be flashing during this time which may take up to 10 minutes to finish and there will be No Data for some or all of the Fusesaver status LEDs. During this time controls to Fusesavers will be rejected.
- Communications Lost: If the RCU loses communications to a Fusesaver or is currently verifying the configuration of a Fusesaver that had lost communications then all Fusesaver controls will be rejected. This is because all Fusesaver Control Panel controls are ganged controls that require communications to be good to all phases. Communications lost can be indicated by the Fusesaver Health Indicators whereas the RCU verifying the Fusesaver configuration after having lost communications will result in the Fusesaver status data for that phase being No Data.
- Button Press Rejected: If the Operator Presses the control button for more than 5 seconds or presses more than one button at the same time the button press will be ignored.

9.7.4 Fusesaver Control – Does Not Complete

When an operator presses a Fusesaver control the Control In Progress LED and the corresponding control status LED will begin to flash when the control has been accepted by the RCU and sent to the Fusesavers. If the control that was sent does not complete (e.g. Close control sent but some/all phases still in open state) the most likely cause is communications failure during the control. Note that if the control in progress LED is flashing then the RCU has determined the communications to the Fusesavers to be working at the start of the control so the probability of this occurring is low.

9.7.5 Panel On Indicator is the only LED that is lit

When the Panel is turned on and Panel On LED is the only LED that is lit. This is because the Control Panel has *No Data* for any of the phases. The most likely cause in this case is the RCU has just been powered up.

9.7.6 Panel On Indicator LED and Control Source are the only LED that are lit

When the Panel is turned on and the Panel On LED and Control Source are the only LEDs that are lit. This is because the Control Panel has *No Data* for any of the phases. The likeliest cause in this case is the RCU has just been powered up and is searching for Fusesavers and has not found a correctly configured Fusesaver line.

9.7.7 Panel does not turn on

There are a number of valid reasons for a Fusesaver Control Panel not turning on:

- The RCU is configured with the Fusesaver Control Panel disabled.
- The RCU firmware is an old version and cannot drive the Fusesaver Control Panel.
- The Fusesaver Control Panel Connector is not plugged into the RCU. It is acceptable to plug the panel into a powered up RCU (hot connection). On re-connection it may take up to 30 seconds for the RCU to detect the Fusesaver Control Panel.
- The RCU Power is off.

9.7.8 Panel LEDs are all flashing On / Off

The Fusesaver Control Panel type is unknown to the RCU. The RCU requires a panel map update. Siemens Service Centre can assist with providing the correct panel mapping.

9.7.9 Panel LEDs turn on one-by-one across the panel

The Fusesaver Control Panel firmware version is not compatible with the firmware in the RCU. Siemens Service Centre can assist with providing the latest panel firmware.

9.8 Switchgear Replacement and reconfiguration

If a Fusesaver is replaced or any change made to the Fusesaver line name then the RCU should be powered down and up again so that it will search again and find the changed installation.

Similarly, if a CMR is replaced or its configuration is changed, then the RCU should have its configuration updated where appropriate, and be power cycled.

In particular, the RCU must be turned OFF (the Mains, Solar and Battery Switches in the “O” position) if the phase configured of CMR devices is being changed. Once all CMR devices have had their phase configuration updated, the RCU can be turned back on, and its configuration updated to match that of the CMRs. Refer to [3] for further information.

9.9 Manufacturer's product liability

The manufacturer's product liability shall be excluded if at least one of the following criteria applies:

- Original Siemens spare parts are not used.
- Fitters carrying out replacements have not been trained and certified by Siemens.
- Parts have been incorrectly fitted or adjusted.
- Settings are not made in accordance with Siemens specifications.
- After installation and setting, no final test is performed by a qualified person including documentation of the test results.

To keep documentation complete, it is important that measurement results are submitted to the local competent Siemens agency.

9.10 Disposal

The materials of the Remote Control Unit should be recycled. Disposal of the Remote Control Unit with minimum environmental impact is possible on the basis of existing legal regulations.

- The metal components can be recycled as mixed scrap, although wide-ranging dismantling into sorted scrap and mixed scrap residues is more environmentally sustainable.
- Electronic scrap must be disposed of in accordance with applicable regulations.

The RCU consists of the following materials:

- Steel
- Copper
- Plastics
- Rubber materials
- Batteries
- Electronic boards

If the packaging is no longer needed, it can be fully recycled.

9.11 Service

Contact your Siemens Service Centre if you require further information.

For details of contacts for service work, consult Siemens IC LMV MV Services at

Telephone: +49 180/5247000

Fax: +49 180/5242471 or

on the Internet at the Web address: www.siemens.com/energy-support

by e-mail: support.energy@siemens.com

or any local Siemens office

10 Technical Data

10.1 Mains Supply Voltage Details

Selection	Minimum Continuous Supply Voltage	Maximum Continuous Supply Voltage	Maximum Power Draw No Heater/Heater	Fuse F1 (located in Terminal Compartment)
AC: 230 V	184	265	50 W/150 W	20 mm x 5 mm cartridge 400 mA Time Delay 1500 A Interruption Type LittleFuse 215.400MXP
AC: 115 V	92	133	50 W/150 W	

10.2 Ambient conditions and installation height

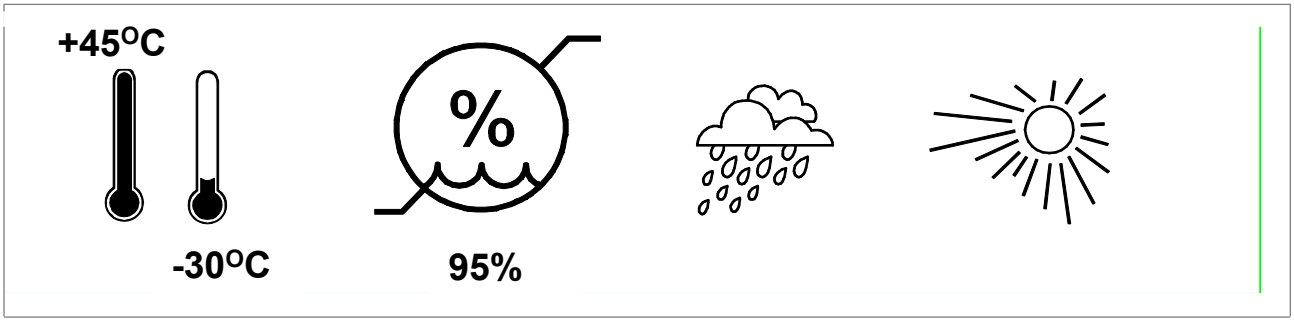


Fig. 52 Ambient conditions

The maximum installation height is 3,000 m above sea level.

The minimum temperature listed requires fitment of a cubicle heater. The minimum temperature limit for RCU's without a heater is -15 °C.

The RCU is designed for outdoor use and with the door closed has an IP 55 category 2, degree of protection rating.

10.3 Rating plate

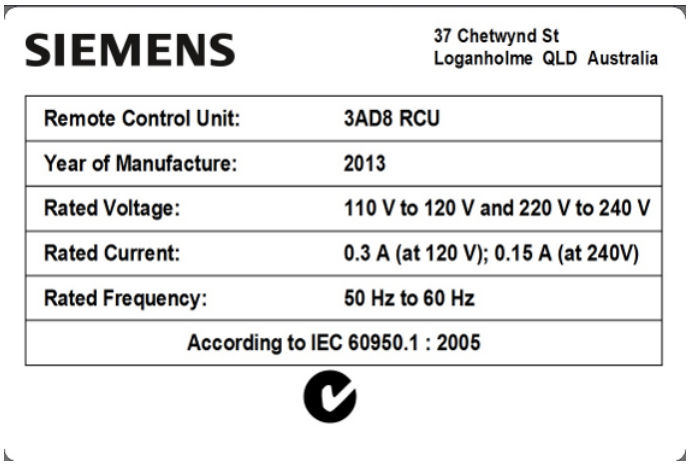


Fig. 53 Example – RCU rating plate

10.4 Battery Life

The RCU uses a standard sealed lead acid (SLA) 12 V battery conforming to standards JISC8702, 12 V, 7.2 Ah. This type of battery is readily available however battery quality varies greatly by manufacturer and this affects battery life significantly. It is recommended to purchase replacement batteries from Siemens.

In service, the battery life is affected by two factors:

- The first is temperature, the higher the temperature the lower the battery life. This means that at time of installation care should be taken to ensure that the RCU is on the shady side of the power pole to reduce solar temperature rise.
- The second is discharge/charge cycles of the kind found in solar powered systems. Each charge/discharge cycle reduces battery life and the deeper the discharge the greater the effect. This means that a solar system should be engineered to keep worst case overnight discharge below 25 % of the battery nominal capacity.

For typical installations a battery life of 4 years or more would be expected.

The RCU battery management system maximises battery life by a three stage charging method, temperature compensation and system shutdown if the battery nears exhaustion. The period of backup available is related to:

- The state of charge and capacity of the battery. At end of life the battery will have reduced capacity, typically 60 % of its capacity at new.
- The power consumption of the radio in receive or idle mode.
- The power consumption of the radio in transmit mode and the transmit duty cycle.
- The power consumption of the RCU electronic system which is typically <20 mA when a serial data interface is employed and <120 mA when the Ethernet interface is employed.

10.5 Radio/Modem Interface Electrical

A cable (or cables) is required between the radio/modem and the RCU electronics compartment to carry data signals and power. Siemens Service Centre can design and build this cable as a value added service, or the utility can design and make their own using the information provided in this section.

10.5.1 Power Supply

Power for the radio/modem is available on the DB25 serial connector on the electronics compartment pin 6 (positive) and pins 1, 8, 9, 21 (negative/ground).

There are two options for power supply.

- A regulated supply which can be configured between DC: 3 V and 9 V that can supply up to 2A continuous. This supply is internally protected by current limit from radio short circuits.
- Supply direct from battery. In this case a 6A fast fuse must be included in the radio cable to protect the RCU from radio short circuits.

For details of how to set the power supply to the correct voltage refer to section 5.7.

There is the additional option to specify a “no-activity” time out period. If the RCU does not receive data for the specified period of time, power to the modem is cycled.

10.5.2 Serial Interface

This is via the DB25 serial connector on the electronics compartment. Use of these signals is protocol dependent. Refer to the relevant Protocol Manual for details. There are two options for electrical signal levels:

1 RS232

2 DC: 3 V to 9 V logic level with respect to 0 V (battery negative). The voltage is configurable and applies to all signals. The sense of each signal can be configured separately (i.e. whether voltage high signals logic true or false).

When using the Serial Interface there is a Push-To-Talk (PTT) clean contact for operation of some radios (max current 0.5 A, max voltage 20 V). When using the PTT output there are configurable pre-transmit and post-transmit times (0 – 10 sec resolution 0.1 sec).

10.5.3 10/100baseT Data Interface

Connection is though the Ethernet RJ45 connector on the electronics compartment. If a modem is being used, power can be supplied via the DB25 connector as described above.

The interface supports IPv4 and IP address allocation can be configured statically or via DHCP. The RCU defaults to the following static allocation, which is useful for a direct connection to a PC:

IP Address	192.168.100.36
Gateway	0.0.0.0
Netmask	255.255.255.0

This interface is intended for use where DNP3 over IP is required. This implementation allows a single master only, and supports TCP Listener and TCP Dual Endpoint types. Refer to “KMS-0022 DNP3 Protocol Manual” for full configuration details.

10.5.4 Serial Connector – DB25

The 25 way serial connector on the electronics compartment is female. The radio cable should have a male connector to match. The table below lists the interface signals available on each pin of the connector.

Serial Data Connector			
Pin	**Signal**	**Level**	**RCU Electronics Input/Output**
1	GND		
2	DTR	RS232	Output
3	TXD	RS232	Output
4	RXD	RS232	Input
5	DCD	RS232	Input
6	Radio Power Supply Positive	Configured DC: 3-9 V or battery	Output
7	PTT	Clean contact	Output
8	GND		

Serial Data Connector			
Pin	**Signal**	**Level**	**RCU Electronics Input/Output**
9	GND		
10	DTR	3-9 V Configurable	Output
11	TXD	3-9 V Configurable	Output
12	RXD	3-9 V Configurable	Input
13	RI	3-9 V Configurable	Input
14	RI	RS232	Input
15	CTS	RS232	Input
16	RTS	RS232	Output
17	DSR	RS232	Input
18	Radio Power Supply Positive	Configured DC: 3-9 V or battery	Output
19	Radio Power Supply Positive	Configured DC: 3-9 V or battery	Output
20	PTT	Clean contact	Output
21	GND		
22	Signal Supply	DC: 3-9 V 5 mA	Output
23	CTS	3-9 V Configurable	Input
24	RTS	3-9 V Configurable	Output
25	DCD	3-9 V Configurable	Input

10.5.5 3-9V Configurable Signals

Voltage range DC: 3-9 V configurable, only one voltage, called the signal supply is configured for all these signals.

These signals supply an alternative data interface to RS232 to operate with radio/modems which have logic level types of serial interface.

The signal supply itself is also available on pin 22.

Max output current for all lines is 10 mA.

10.5.6 RS232 Signals

Conforms to RS232 standard.

10.6 Dimensions and Weights

Mass	(without battery)	kg	15
	(with Battery)	kg	18

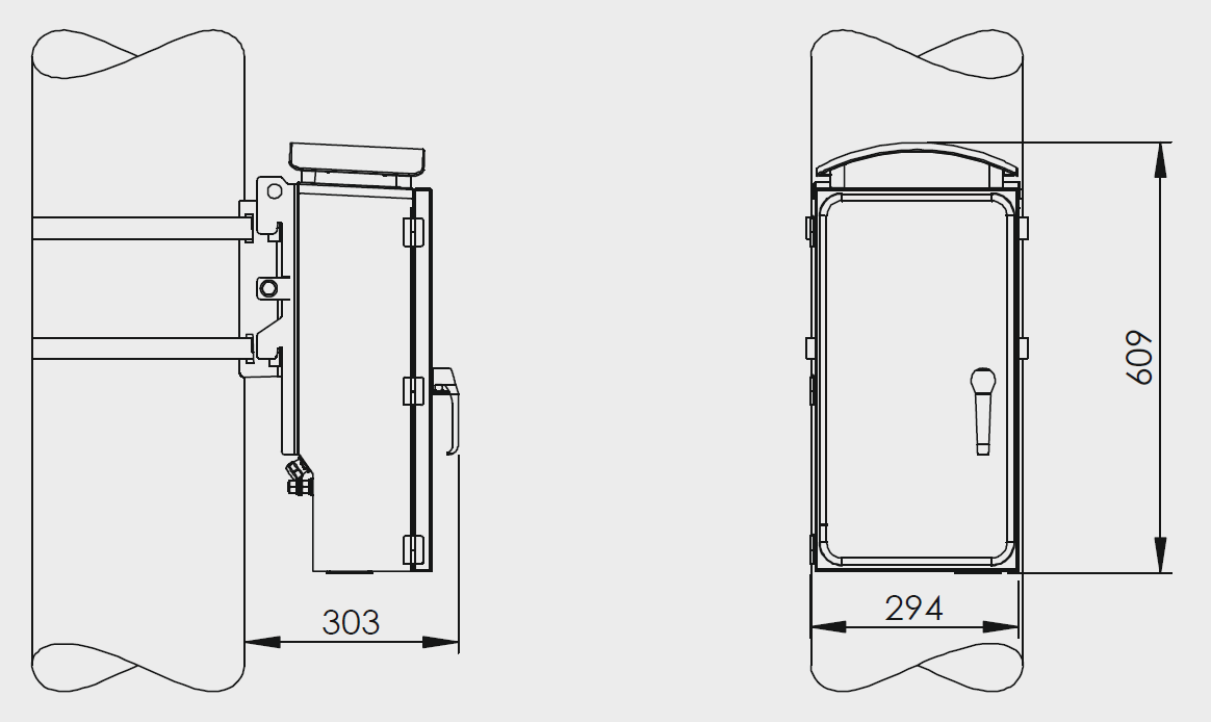


Fig. 54 RCU Dimensions (in mm)

11 Appendix

The following configuration settings relate to the RCU.

11.1 Site Specific Settings

These settings will have to be provided for each site. They are included in the RCU Configuration Specification Form (KMS-3100) only for the purpose of selecting the visibility option for each setting. Otherwise, the specific site data is entered as part of the commissioning process.

11.1.1 Line Name

For CMR installations, this is an optional setting to describe the stie. For Fusesaver installations, this setting determines how an RCU will locate and couple with Fusesavers when turned ON. Two options are available:

1 No Line Name - The line name field is left blank. This method is suitable for sites with only one set of Fusesavers within range of the RCU per site. Provided that there is a configured line at that site the RCU will find it and connect to that line. This is very helpful in minimising configuration problems and also permits testing an RCU in a workshop with test Fusesavers and then taking it to site to work with the Fusesavers already installed at site without the need for re-configuration.

2 Named Line – In this case the user configures the RCU to search for a line of a particular name. This mode must be used when more than one Fusesaver line is within range of the RCU.

> **Note**
>
> If “No Line Name” is suitable for all sites then the line name can be hidden in the configuration template to avoid site errors.

11.1.2 Asset Number

The user can use this optional setting to assign their own internal asset number to the RCU for this site. This asset number is available for transmission over the SCADA system as a string (SPID_2). Maximum of 32 characters available.

11.1.3 Serial Numbers

For CMR installations, the RCU is paired to CMR devices based on serial number. Refer to [3] for pairing details.

If the phase designators of CMR devices need to be changed on site, it is important to turn off the RCU before commencing this process. Once all CMRs in the installation have their phase designators updated, the RCU can be turned on, and the serial number settings updated.

11.1.4 Protocol Address

Most SCADA protocols require a unique site address, refer relevant Protocol Manual Supplement.

11.2 RCU Power Supply Settings

These settings would normally be applied to a population of RCU’s.

11.2.1 RCU Power Source

The power source setting tells the RCU which terminal block it should expect to receive power from. Setting options are:

- Mains (including VT)
- Solar

11.2.2 Lead Acid Battery Replacement Interval

The purpose of this setting is to alert the control centre when RCU batteries require replacement due to being in service for a long time. The setting is the number of days of battery service that indicates end of useful battery life. If the battery has been in service for longer than the setting DPID 2 (RCU - Battery Needs to be Replaced) database point is set which can be monitored by the SCADA system.

The range of values available are from 365 – 3650 days.

Most utilities have experience of this type of battery in this type of application (for example automatic circuit reclosers typically use the same type battery) and have maintenance schedules which are appropriate. In this case the battery replacement period should be set to match the field experience and maintenance schedule

In the absence of this field experience Siemens recommends:

- For solar installations the maximum battery life should be set to 1460 days (4 years) or less due to the day/night cycling of the battery.
- For cooler climates where daily peak temperatures very rarely go above 30 ^{O}C and usually stay below 25 ^{O}C, battery life of 1825 days (5 years) is appropriate.
- For hotter climates where the daily temperature regularly goes above 30 ^{O}C battery life of 1460 days (4 years) is appropriate. Maximising the shading effect of the power pole is essential to achieve this battery life.
- For very hot climates where most of the day is spent at high temperatures and night temperatures are also high then battery life will be reduced further. Refer Siemens Service Centre for alternative battery options.

11.2.3 Solar Low Performance Time

This is a threshold setting that is the number of consecutive days of low solar power input. If the threshold value is exceeded an event is created in the RCU database and transmitted via the SCADA system. The purpose of this setting is to alert the control centre of a damaged or dirty solar panel requiring maintenance. This setting is only applicable if the Power Source option is set as Solar. Values in the range of 2-10 days are available. Recommended value is 5 days.

11.3 Condition Based Command Settings

The RCU configuration has parameters that allow configuration of the excessive cleared faults functionality (Fusesaver installations only). These are:

- The time window size specified in seconds (maximum of 65535 seconds, 18.2 hours),
- the number of cleared faults that occur within the time window (maximum of 16)

11.4 Operator Control Panel Settings

11.4.1 Enable Operator Control Panel

If no RCU's have Operator Control Panels fitted then set this to Disabled. If one or more sites will have a Operator Control Panel fitted then set this to Enabled (the RCU will then auto-detect if a panel is fitted at a particular site).

11.4.2 Operator Control Panel Ignore Remote Switch

This setting allows the RCU to be configured so that Operator Control panel controls such as Trip/Close or change of protection mode will always be allowed irrespective of the position of the Remote Control ON switch. Setting options are:

- TRUE: The RCU will allow controls from the Operator Control Panel to be sent to the irrespective of the position off the Remote Control ON switch.
- FALSE: The RCU will disable all controls from the Operator Control Panel if the Remote Control Switch is ON.

11.5 Protocol Settings

Refer to the relevant protocol manual for protocol setting option explanations. The protocol manual addresses:

- Radio power supply settings
- Radio/Modem Serial interface settings
- SCADA Operation Settings
- Protocol Point Configuration
- DNP3 Configuration

REVISION CONTROL

REVISION	DATE	BY	REASON FOR CHANGE
1	16.05.13	BAW	FUSESAVER CONTROL PANEL CHANGES
2	13.06.13	JNA	UPDATE FUSESAVER AVAILABLITY DATA DETAILS
3	12.08.13	MHH	UPDATE IMAGES FOR CUBICLE & LABEL CHANGE
4	27.8.13	BAW	VARIOUS MINOR UPDATES
5	3.10.13	BAW	FOR RELEASE
6	1.4.14	BAW	Updated with New Features for MP1a
7	9.5.14	BAW	Added Fusesaver operator Panel Detail
8	18.12.15	JPK	Changes for Encryption, OCO and GUI updates
9	05.07.21	JPK	Updated for RCU-CMR