

# W-Series Single Phase ACR with ADVC Controller

## Installation, Operation and Maintenance Manual

08/2019



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The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Schneider Electric nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

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When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

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## Important Information

### NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

### **DANGER**

**DANGER** indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

### **WARNING**

**WARNING** indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

### **CAUTION**

**CAUTION** indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

### **NOTICE**

**NOTICE** is used to address practices not related to physical injury.

### PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

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# About the Book

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## At a Glance

### Document Scope

This document describes the installation and maintenance procedures for the W-Series Single Phase Automatic Circuit Recloser with the ADVC Controller Range.

### Validity Note

This document is valid for W-Series remotely controlled and monitored automatic circuit recloser (ACR) which consists of a W-Series automatic circuit recloser (ACR) combined with an ADVC Controller (ADVC).

### Related Documents

Title of Documentation	Reference Number
U and W-Series Whitepaper	N00-805
ADVC Controller Operational Manual	N00-812

You can download these technical publications and other technical information from our website at <https://www.se.com/ww/en/download/> .

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# Chapter 1

## Introduction

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### Overview

#### General

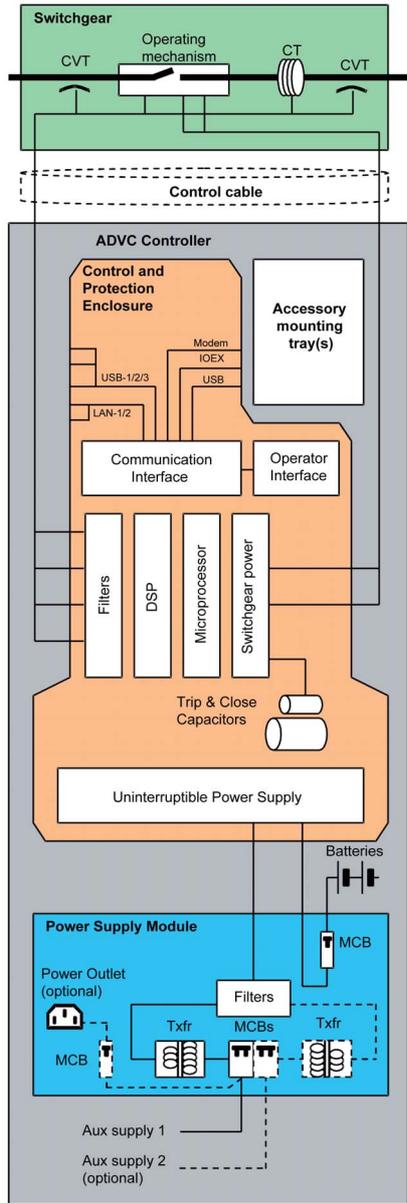
This manual describes the installation and maintenance of the W-Series Single Phase Automatic Circuit Recloser with the ADV C Controller Range.

While every care has been taken in the preparation of this manual, no responsibility is taken for loss or damage incurred by the purchaser or user due to any omission in the document.

Inevitably, not the details of the equipment are provided nor are instructions for every variation or contingency during installation, operation, or maintenance.

For additional information on specific requirements, contact the manufacturer or local distributor.

## Switchgear and Controller Architecture



ADVC Controller block diagram

## Symbols

The following symbols are used throughout this manual. They are designed to give a quick way of indicating information that is intended for specific areas of interest.

Symbol	Meaning
	The bushing symbol indicates that the adjacent information applies only to the specified Switchgear.
	The following information only relates to the <b>seVUE</b> Operator Control Panel. Refer setVUE Panel ( <a href="#">see page 55</a> ) for more details.
	The following information only relates to the <b>flexVUE</b> Operator Control Panel. Refer flexVUE Panel ( <a href="#">see page 59</a> ) for more details.

Panel Messages or Menu Navigation follow these icons in DOT MATRIX FONT.

## Software Identification

The software loaded into the ADVC Controller is identified by its version number, which has the following format:

**AXX-XX.XX.**

This format precisely identifies the software loaded on the controller.

To obtain effective technical support from the manufacturer or local distributor, it is vital to record the software version and to quote it when making the inquiry. This information helps the customer service department to identify the software details quickly and to provide the right support.

 The software version is shown on the Operator Control Panel "Switchgear Wear/General Details" page, in the field "App.Ver":

```
-- Switchgear Wear/General Details-- S
I Contact 100.0%      Cubicle S/N 1234
                      App.Ver A44-01.01
```

**NOTE:** Images shown are for illustration purposes only.

 Switchgear Status can be found on the *flexVUE* at the following location:

**OPERATOR MENU → Switchgear Status → Switchgear Info**

Refer Operator Control Panel ([see page 53](#)) to know about the usage of Operator Interface (O.I.).

## Revision Record

Level	Date	Comment
R00	June, 2017	ADVC Controller updates

## Introduction

The switchgear and controller described in this manual consists of a W-Series single phase automatic circuit recloser (ACR) combined with an ADVC Controller(ADVC).

The W-Series Single Phase ACR:

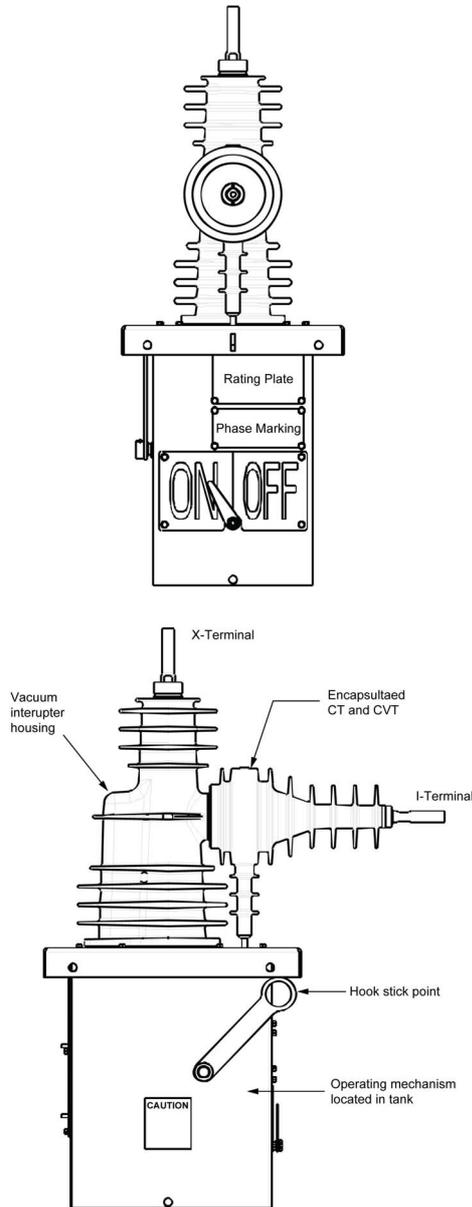
- contains a vacuum interrupter insulated with hydro phobic cyclo-aliphatic epoxy resin mouldings.
- operates by a single magnetic actuator for both tripping and closing.
- it has a mechanism enclosed in a 316 grade stainless steel tank and lid, with hydrophobic cyclo-aliphatic epoxy resin casting bolted to it.
- allows surge arresters to be directly fitted using surge arrester mounting brackets to the ACR (depending on the mounting method) and should be fitted during installation.
- allows voltage to be measured on the I - Side Bushing and can be measured on the X - side Bushing, if an external VT is fitted.
- measures current on a single phase
- retains information such as serial number, switchgear type, operations and contact wear, independently of the ADVC.
- can be tripped and locked out mechanically from the ground by a hook stick. It can also be locked out electronically by opening the isolating switches located on the ADVC.
- has a clearly visible, external pointer that shows whether the ACR is tripped or closed.
- is connected to the ADVC Controller via control cable through the base of the cubicle.
- can be connected into a bare conductor system.

The ADVC Controller reads and displays the information that is stored in the ACR, to provide protection and communication properties for the ACR.

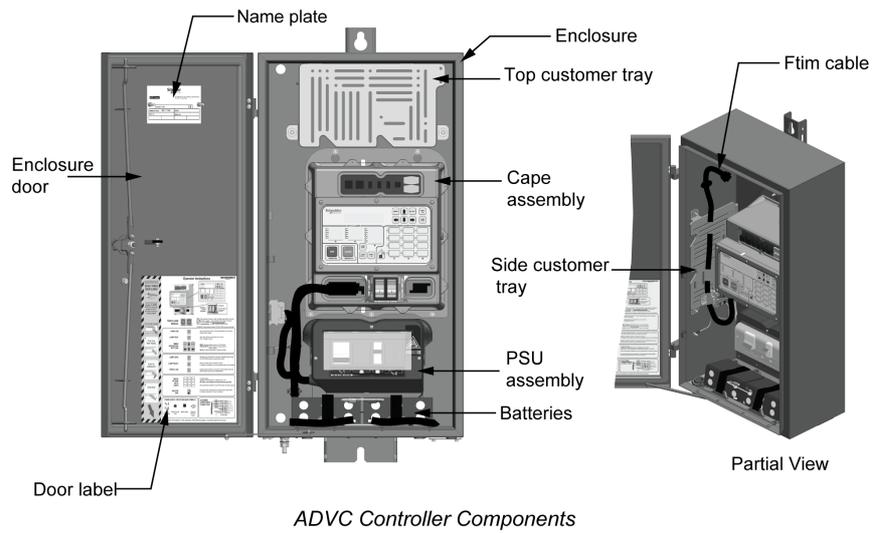
- The ADVC Controller consists of:
  - An operator control panel mounted on the CAPE.
  - An electronic switchgear controller that monitors the ACR, and provides communication and protection functions.
  - A power supply, which also supplies power for the customer equipment.
  - Accessories and customer equipment compartment.

- The ADVC is powered by an auxiliary voltage supply of 110, 220, or 240 volts AC.
- The ADVC is connected to the ACR via detachable control cable.

The customer compartment provides ample room for the equipment. Standard communication cables can be used for connecting the communication ports on the CAPE and power is readily accessible from the programmable power terminal block. For more information, refer Communications and Accessories Installation ([see page 29](#))

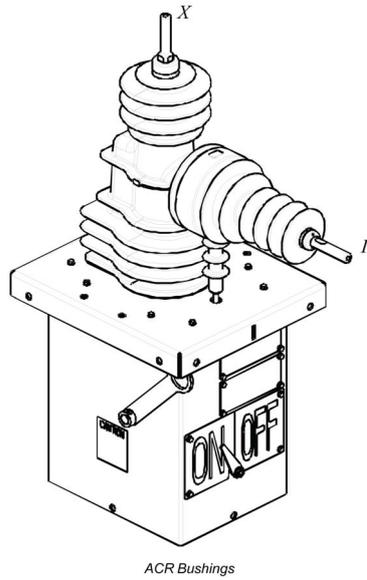


W-Series ACR Construction



**Terminology**

The W-Series recloser bushing is identified as I on the same side as the CTs and CVTs, which is, by default, the source side. The bushing on the other (default load side) is identified as X.





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# Chapter 2

## Installation

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### What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Introduction	16
Site Installation	19

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## Introduction

### Contents of Crate

Each crate includes the following:

- ACR
- Pole mounting bracket with optional clamps, if ordered
- Two connectors (15 TP or 30 TP), if ordered
- Appropriate mounting kit
- ADVC Controller Cubicle (which normally contain two batteries unless arrangements have been made to ship batteries separately)
- Control cable

**NOTE:** The ADVC Controller should be stored indoors until installation on site. If storage outdoors is unavoidable, place the ADVC Controller in an upright position.

On receipt, the contents should be checked for shipping damage and the manufacturer should be informed immediately, if any damage is found.

### Unpacking Procedure

Tools required:

- Wrecking bar to remove nails
- Four D shackles, two slings and crane with a working load of 100 kg to lift the ACR
- Screw Driver or Battery Drill with 8 mm socket
- 16 mm Spanner or Socket

**Procedure:**

1. Remove top of crate and lift out the control cable. Store carefully in a clean dry place.
2. Unscrew and remove the four (4) screws located on the wall of the crate. The mounting bracket, mounting kit and the two pieces of wood that the screws have been removed from are all fixed together. Lift the complete mounting bracket out of the crate.
3. Fit D-shackles to the lifting points on the ACR and lift it out of the crate, to the ground using the crane.

 <b>CAUTION</b>
<b>RISK OF EQUIPMENT DAMAGE</b> Do not drop the bracket onto the ACR. The bracket weighs approximately 13 kg (29 lb). <b>Failure to follow these instructions can result in injury or equipment damage.</b>

4. Tip the crate on to its side.
5. Remove the bolts fixed to the ADVC and slide the unit from the crate.

 <b>CAUTION</b>
<b>RISK OF EQUIPMENT DAMAGE</b> The control cubicle weighs approximately 40 kg (88 lb), hence two people are required to lift it. <b>Failure to follow these instructions can result in injury or equipment damage.</b>

### Control Cable Connection

When installing or testing the ACR, it is necessary to connect and disconnect the control cable either from the ACR, the ADVC Controller or both. The control cable is plugged into the back of the ACR and the other end into the ADVC Controller at the bottom, right-most socket on the Control and Protection Enclosure (CAPE).

To do this successfully, follow the following steps:

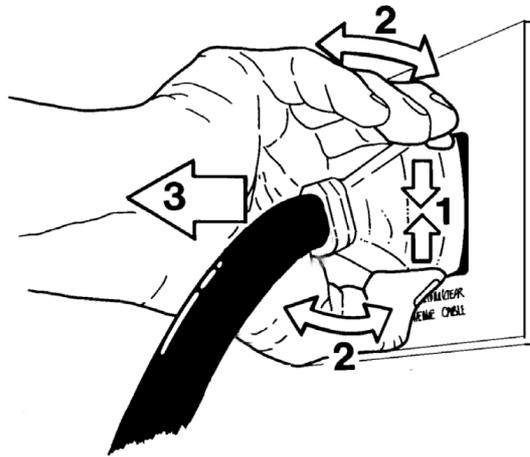
- Power down the control cubicle by switching off the MCB's. This should be done whenever connecting or disconnecting the control cable
- To connect, hold the plug by the long sides; check orientation, gently locate it on the socket and push firmly home. Check whether it is locked, by wriggling the plug. If the plug cannot be pushed with moderate force, then it has not been located properly. Heavy force is not required.
- To disconnect:
  - a. Hold the plug by the short sides, and grip hard to release the clips inside the plug (not visible.)
  - b. Wriggle the plug to allow the clips to release.
  - c. Then pull out the plug.

## NOTICE

### UNPROTECTED OUTPUTS

Never pull out the plug by the cable.

Failure to follow these instructions can result in equipment damage.



Handling the control cable plug

### Testing and Configuration

The tests can be carried out on site or in the workshop as preferred.

Unpack the crate as above and put the control cable in a clean preserved place, where they will not be damaged or soiled.

Make a temporary ground connection between the ADVC and the ACR. 1 mm<sup>2</sup> copper wire is adequate for the purpose.

Raise the ACR using a crane or fork lift in order to carefully gain access to the back of the ACR.

Unbolt the cover plate over the switch cable entry module (SCEM) on the back of the ACR and connect the ACR end of the control cable to the SCEM.

Lower the ACR on to props so that the control cable is not damaged by being caught between the base of the ACR and the floor.

Then, connect the ADVC Controller end of the cable to the socket at the lower right-hand corner of the CAPE located inside the ADVC cubicle. For more information, refer Site Procedure ([see page 19](#)).

For more information about LV auxiliary supply (if applicable) connection, refer figure LV Auxiliary Power from Mains ([see page 23](#)).

Turn on the battery and auxiliary supply circuit breakers at the bottom of the control cubicle to carry out the following tests:

1. Manual trip and close of the ACR.
2. Perform the megger test on the reclosure to check damage during the shipping.
3. Configure the protection settings. For details on changing the settings, refer the Operations Manual (N00-812).
4. Perform primary current injection as required.
5. Perform secondary current injection (if required by your authority), by using a Test and Training Set (TTS). (Contact your local distributor for details on purchasing this.)
6. Fit and test a radio or modem, if required.
7. Attend to the battery, by using the care instructions given in Battery Care. For more information about instructions to attend the battery, refer Battery Care ([see page 99](#)).

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## ***NOTICE***

### **UNPROTECTED OUTPUTS**

Maintain proper polarity when connecting and inserting batteries, to avoid damage to electronic systems.

**Failure to follow these instructions can result in equipment damage.**

**NOTE:** An application note detailing workshop and field test procedures is available. Contact your agent or distributor.

### **Transport to Site**

If the unpacking and testing were carried out in the workshop, then the ACR and ADVC must be transported properly to site. It is vital that the following steps are carried out:

- Turn off the ADVC MCB's and disconnect the auxiliary power supplies. Disconnect the control cable from both ACR and ADVC, and replace the cover plate on the back of the ACR.
- Transport the ACR, ADVC and all accessories in a secure manner to the site.

---

## Site Installation

### General

If you are replacing a pole-top control cubicle (PTCC) or an original ADVC Controller (Ver 43 or earlier) with an ADVC Controller (Ver 44 or above), the following should be considered:

- The ADVC mounting points are different.  
**NOTE:** An accessory mounting bracket can be purchased to allow the use of same mounting holes as were used with the manufacturer's PTCC. (Part No. 99800125)
- The connection to the auxiliary supply enters the cubicle at a different point.
- The earth stud is in a different position.
- Accessory cables may need extension.
- PTCC requires an auxiliary power supply rating of 50 VA, whereas the ADVC Controller requires 200 VA
- If the auxiliary supply is provided by an external VT connected through the ACR, there are limitations to the supply ratings of equipment that customers may fit. For more information, refer Radio/Modem Power (*see page 30*).
- The ADVC (Ver 44 or above) door is held open by a door stay mechanism, which stop the door swinging or blowing shut. To disengage the door stay, follow the directions on the operator sheet located inside of the door.

### Tools Required

- Torque wrench and metric socket set, normal engineer tools.
- Tools to prepare pole as required.
- Crane or other lift for ACR and ADVC, four D shackles, and slings.

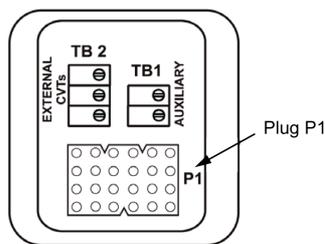
### Parts Required (Not Supplied by The Manufacturer)

- Two 20 mm galvanized or stainless steel bolts with washers and nuts to bolt the ACR mounting bracket to power pole. For more information, refer figure W-Series ACR Mounting and Dimensions (*see page 23*). This is not required if the optional pole clamps are already purchased.
- Mounting parts for the ADVC Controller, which can be either 20 mm steel strapping or 10 mm galvanized or stainless steel bolts, nuts, and so on.
- Mounting hardware for the control cable. This is a 27 mm (1 1/16 in) diameter sheathed conduit which can be fixed to the pole with ties, straps, P-clips, or saddles.
- Earth wire and lugs for the earthing scheme and parts for LV mains auxiliary power connection. For more information, refer figure Auxiliary Supply Connection (*see page 23*) and figure Common Earthing and LV Supply (*see page 23*).
- 20 mm sealing cable entry glands to suit auxiliary supply mains cables, 16 mm sealing cable entry glands to suit antenna or communications cable as required.
- Antenna, antenna feeder cable, and surge arrester as required if a radio is fitted (unless supplied by the manufacturer).

### Site Procedure

To install and test the ACR and ADVC, carry out the following steps. For more information about ACR mounting details, refer figure W-Series ACR Mounting and Dimensions (*see page 23*):

1. Transport to site and carry out testing before installation as required.
2. Connect cable tails and surge arresters before raising the ACR. For more information, refer Surge Arrester Mounting and Terminating (*see page 22*).
3. Ensure that the pole is of sufficient strength to support the ACR. A structural engineer may be required to determine the stresses involved.
4. Securely mount the ACR mounting bracket on the power pole.
5. Lift the ACR into position and lower it onto the mounting bracket so that it sits on the mounting bracket. For more information, refer figure W-Series ACR Mounting and Dimensions (*see page 23*).
6. Bolt the ACR to the mounting bracket with four 12 mm nuts and bolts. Tighten to 50 Nm if required.
7. Complete the power (HV) cable connections.
8. Unbolt the SCEM compartment cover plate from the back of the ACR. Connect the control cable to plug P1 on the SCEM located inside the ACR. Then bolt up the cover (connected to the control cable).

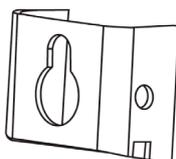


SCEM Card

For more information about the correct way to connect/disconnect the control cable, refer figure Handling the control cable plug ([see page 16](#)).

9. Run the control cable from the ACR down to the ADVC.

**NOTE:** The ADVC mounts have key holes as shown here so that you can lift the ADVC on to the mounting bolt and slide it into position.



Key Hole

10. If the ADVC cubicle is to be bolted to the pole, drill the top hole and fit the bolt. If it is to be strapped, feed the straps through the slots on the upper and lower mounting brackets.

## NOTICE

### RISK OF EQUIPMENT DAMAGE

Use a spirit level for correct alignment and to minimize torque on the mounting brackets, when mounting the ADVC to a wooden pole.

**Failure to follow these instructions can result in equipment damage.**

11. Lift the ADVC into position and bolt or strap it to the power pole.
12. Attach the control cable to the power pole maintaining maximum available separation from the main earth bond (at least 200 mm for wood and concrete poles and 150 mm for steel poles). Ensure that there is enough cable available at each end to permit connection to the equipment.
13. For more information about earth connections, refer Earthing (Grounding) ([see page 22](#)).

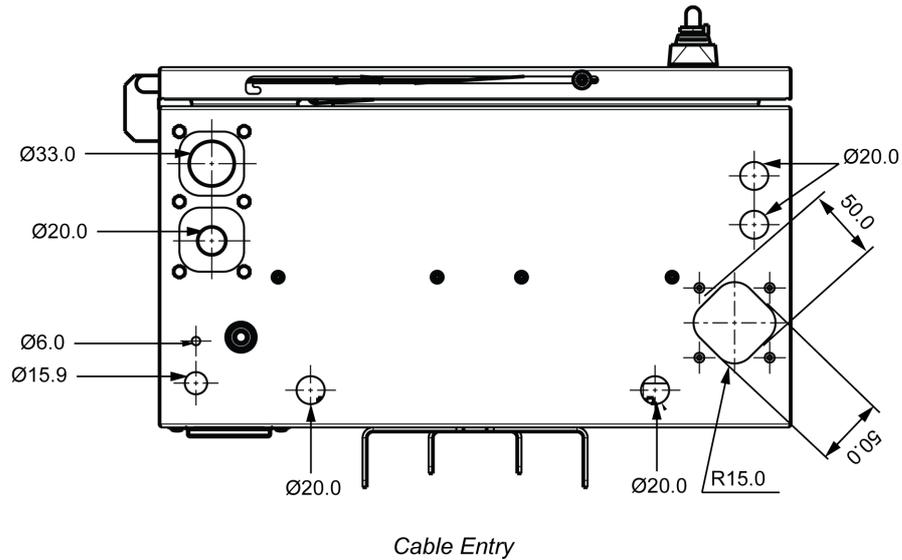
## ⚡ ⚠ DANGER

### HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Carry out earthing wiring diagram as instructed.

**Failure to follow these instructions will result in death or serious injury.**

14. Connect the control cable from the ACR through the base of the ADVC



and then to the switchgear socket on the CAPE.



15. For more information about LV mains supplies auxiliary wiring, refer figure Common Earthing and LV Supply ([see page 23](#)). For more information about the connection inside the ADVC, refer figure Auxiliary Supply Connection ([see page 23](#)).
16. For more information about LV mains supply from a dedicated transformer supplied by the utility, refer figure Utility Auxiliary Transformer ([see page 23](#)).
17. For more information about re-integrated supply from an external transformer, refer figure Utility Auxiliary Transformer ([see page 23](#)).
18. Power down the ADVC by switching off all the MCBs.
19. Fit the batteries, if they are not in place.

## NOTICE

### UNPROTECTED OUTPUTS

Maintain proper polarity when connecting and inserting batteries, to avoid damage to electronic systems.

**Failure to follow these instructions can result in equipment damage.**

20. For more information about installation of communications equipment, refer Communications and Accessories Installation ([see page 29](#)).
21. Otherwise, refer Installation Testing ([see page 33](#)).

## Surge Arrester Mounting and Terminating

The ACR is type tested for impulse withstand voltages up to 125 kV depending on the model. For more information, refer Ratings and Specifications (*see page 104*).

When there is a possibility that lightning or network switching conditions may produce peak voltages in excess of 70 % of the impulse withstand voltage, the manufacturer recommends the use of suitably rated surge arresters connected to each terminal of the ACR.

The arresters should be mounted on the mounting brackets supplied by the manufacturer and grounded. For more information, refer figures W-Series ACR Mounting Example and Common Earthing and LV Supply (*see page 23*).

**NOTE:** If the arresters are not mounted close to the ACR, the protection they provide is reduced.

Mounting brackets are provided for surge arresters on the ACR. For more information, refer figure W-Series ACR Mounting Example (*see page 23*).

**NOTE:** Lightning induced damage to the ACR or ADVC voids the warranty if surge arresters are not fitted.

The surge arresters can be mounted to the side of the brackets by using the holes provided. The holes are 16 mm in diameter. In this way, most types of surge arrester can be accommodated.

The user should check that phase/earth clearance is sufficient for their particular surge arresters and line voltages.

Connections from the surge arresters to the cable tails can be made by stripping off the cable tail insulation and by using a parallel or "T" type clamp, to make the connection to the cable tail. The connection to the cable tail should be made far enough up the tail, so that phase/earth clearances are maintained. It is a good practice to tape the joint using a bitumen or mastic tape, to maintain the cabling system insulation.

## Earthing (Grounding)

### DANGER

#### HAZARD OF EQUIPMENT DAMAGE

- Do not earth surge arresters by a different path, doing this may cause damage to the control electronics or ACR.
- Also, any antenna should be bonded to the ACR or the main earth bond.

**Failure to follow these instructions will result in death or serious injury.**

For more information about common earthing to all installations, refer figure Common Earthing and LV Supply (*see page 23*).

This arrangement earths the ACR frame and the surge arresters directly to earth through a main earth bond consisting of a copper conductor of 70 mm<sup>2</sup>. Any surges flow down this path.

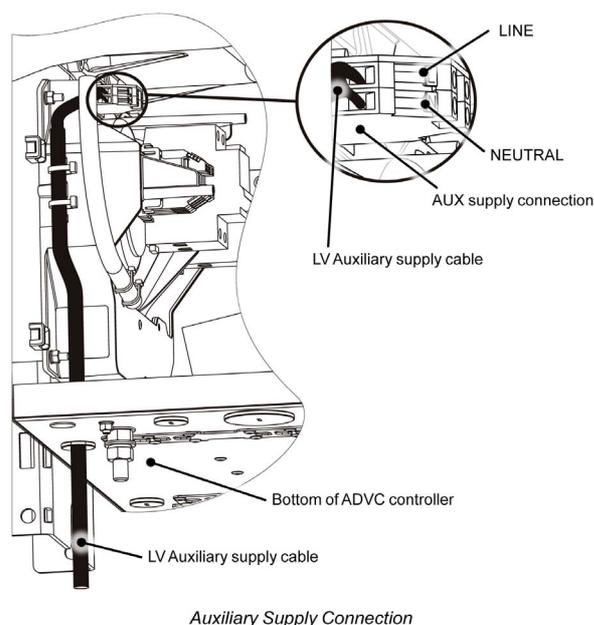
The control cubicle is connected to this main earth bond by a tee-off. The control cubicle electronics are internally protected from potential differences, which may occur between the ACR frame and control cubicle frame while surge currents are flowing down the main earth bond. No other connections to earth from the control cubicle are allowed, since surge currents also flow in those paths. Follow this arrangement on both conducting and insulating power poles. Keep the main earth bond physically separated from the control cable, as they run down the power pole, by the maximum spacing available and at least 150 mm.

## LV Auxiliary Power from Mains

Where the LV mains are connected to the control cubicle to provide auxiliary power, the connection must connect the neutral of the LV system to a tee-off from the main earth bond. For more information, refer figure Common Earthing and LV Supply ([see page 23](#)). A low voltage surge arrester must also be fitted from the LV phase connection to this tee-off.

This connection scheme bonds the LV and HV earths, and so protects the primary insulation of the auxiliary supply transformer in the control cubicle when surge currents are flowing. Fit additional LV surge arresters to all the other LV phases (if they exist), to balance the supply for other users connected to the LV system.

If local conditions or wiring rules prohibit bonding the HV and LV systems in this way, providing the auxiliary supply to the control cubicle from the LV mains system is not possible. Instead, use one of the alternative arrangements detailed below.



## LV Auxiliary Power from Dedicated Utility Transformer

For more information about wiring and earthing, if a dedicated transformer is supplied by the utility, refer figure Utility Auxiliary Transformer ([see page 23](#)). This should not be used to supply any other equipment without consulting the manufacturer, which helps to ensure that no hazard is caused to the control cubicle electronics.

Transformer and any steelworks are earthed to the switchgear tank and that one side of the transformer secondary is earthed to the earth stud on the equipment panel inside the control cubicle. For more information, refer figure Utility Auxiliary Transformer ([see page 23](#)).

## Auxiliary Power from Integrated Transformer

The manufacturer can provide a dedicated voltage transformer outside the ACR tank, which connects directly into the control electronics. This is called an Integrated Auxiliary Supply.

An external transformer is mounted on the pole, which also shows suggested HV connections. For more information, refer figure Utility Auxiliary Transformer ([see page 23](#)). The secondary of the external transformer connects into the SCEM on the back of the ACR.

To connect the transformer secondary, follow the following steps:

- Remove the control cable cover.
- Pass the cable, which is pre-fitted with a cable gland through the hole.
- Secure the gland
- Connect the auxiliary supply to the screw terminal block on the SCEM.
- Replace the cover

# ⚠ DANGER

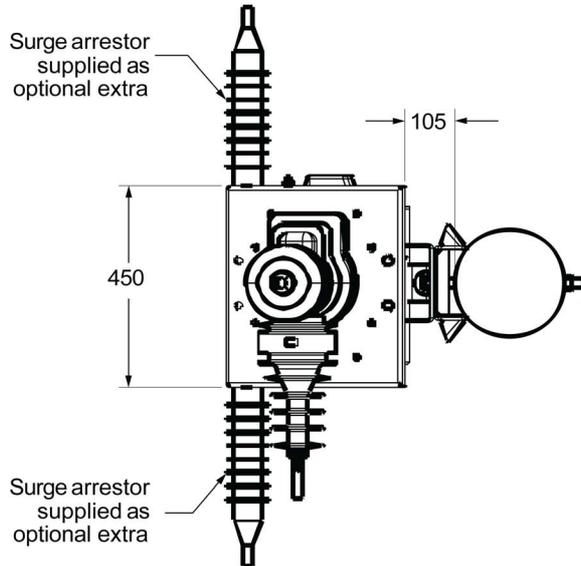
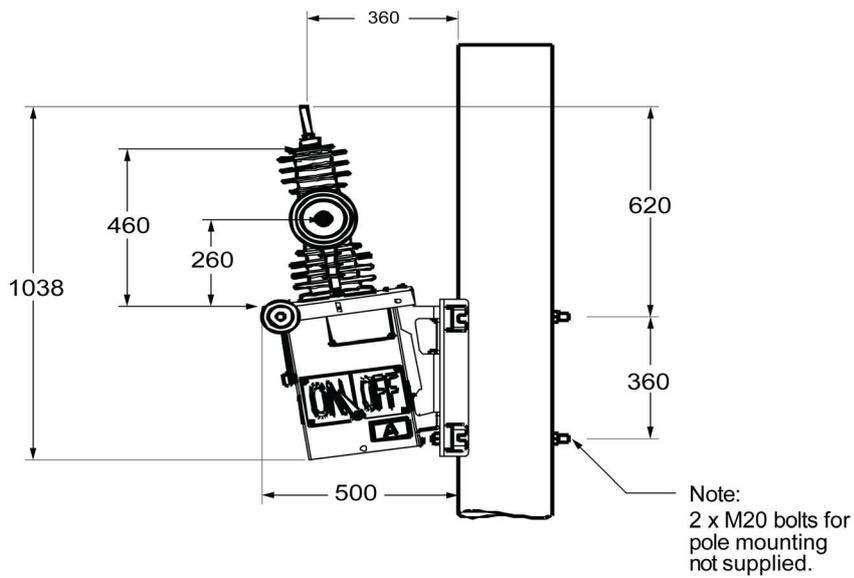
## HAZARD OF EQUIPMENT DAMAGE

If the secondary of the VT is earthed, electronics damage occurs.

**Failure to follow these instructions will result in death or serious injury.**

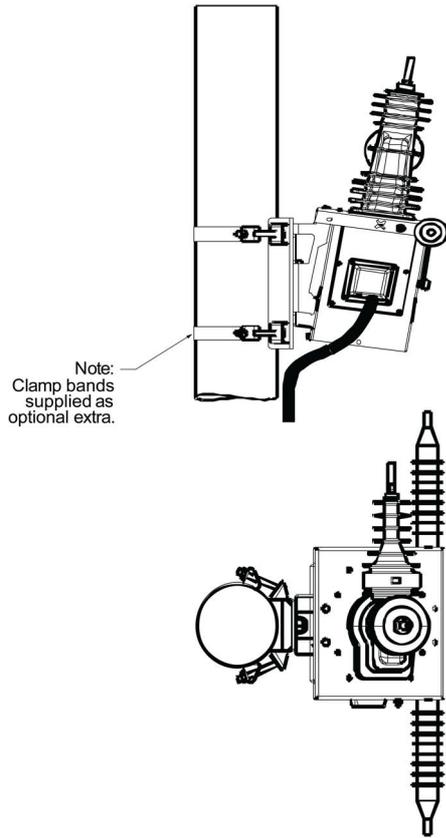
No additional earthing for Integrated Auxiliary Supply is required in addition to the common earthing shown in figure Utility Auxiliary Transformer (*see page 23*).

### Bracket Bolted to Pole



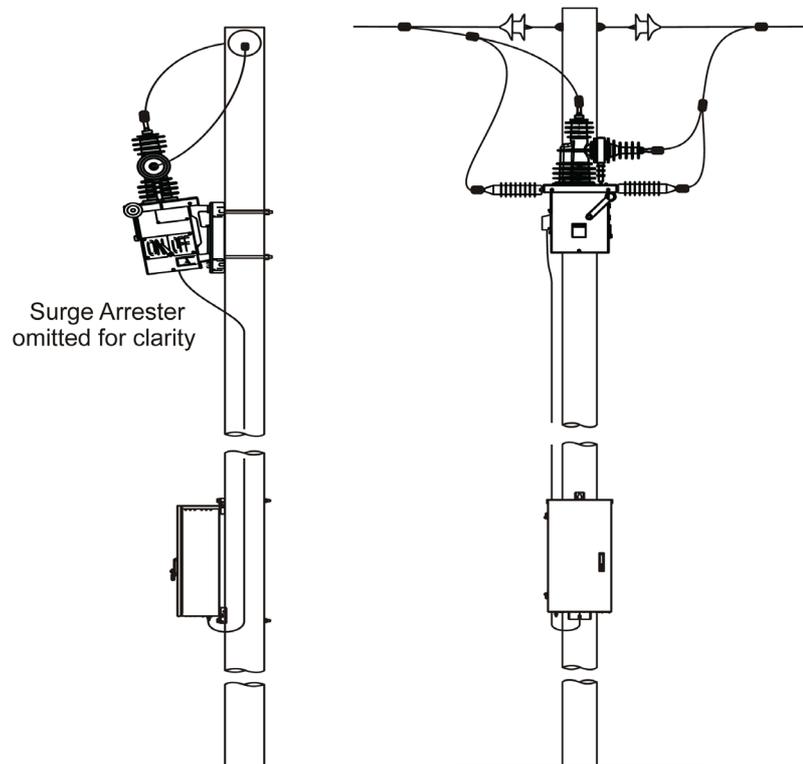
*W-Series ACR Mounting and Dimensions*

**Bracket Clamped to Pole**



*W-Series ACR Mounting and Dimensions*

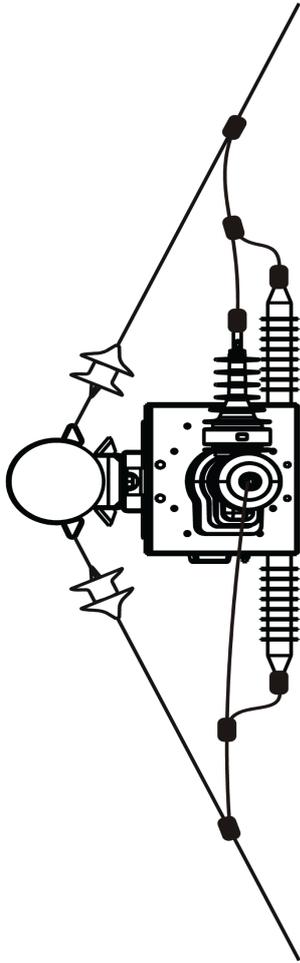
**Bracket Clamped to Pole**



*W-Series ACR Mounting Example*

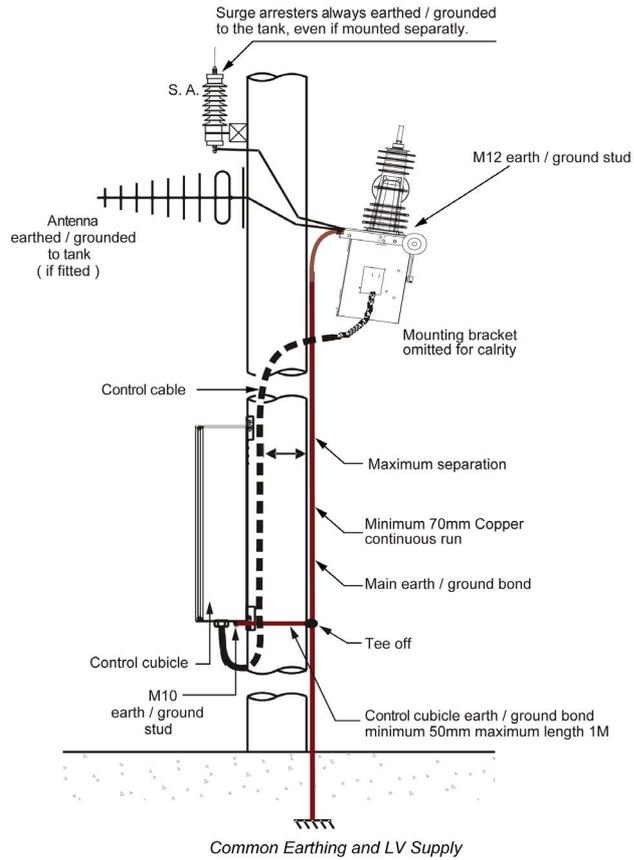
---

Top View

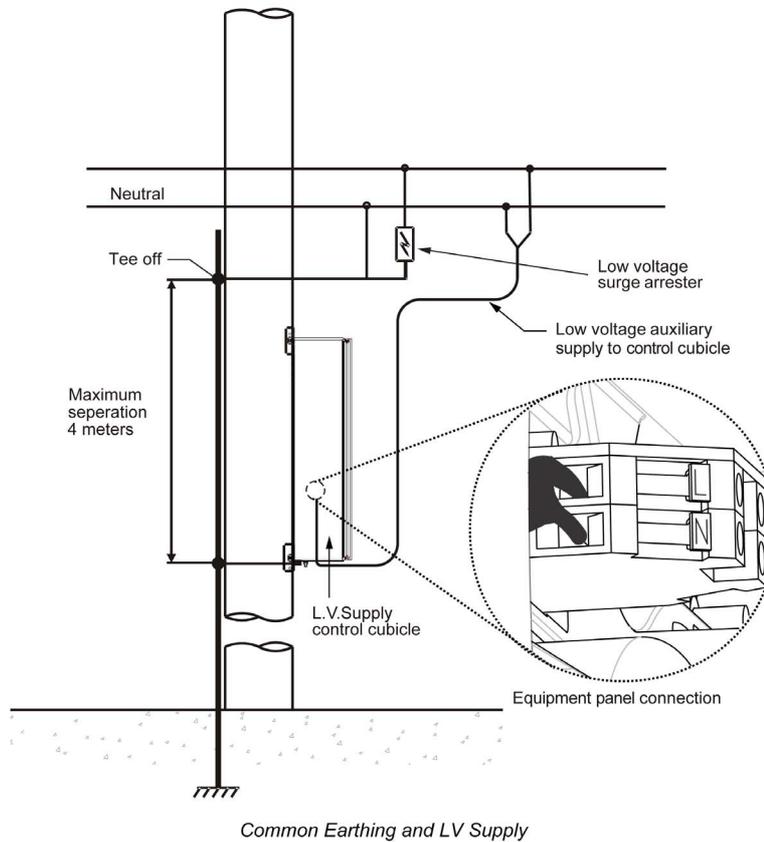


*W-Series ACR Mounting Example*

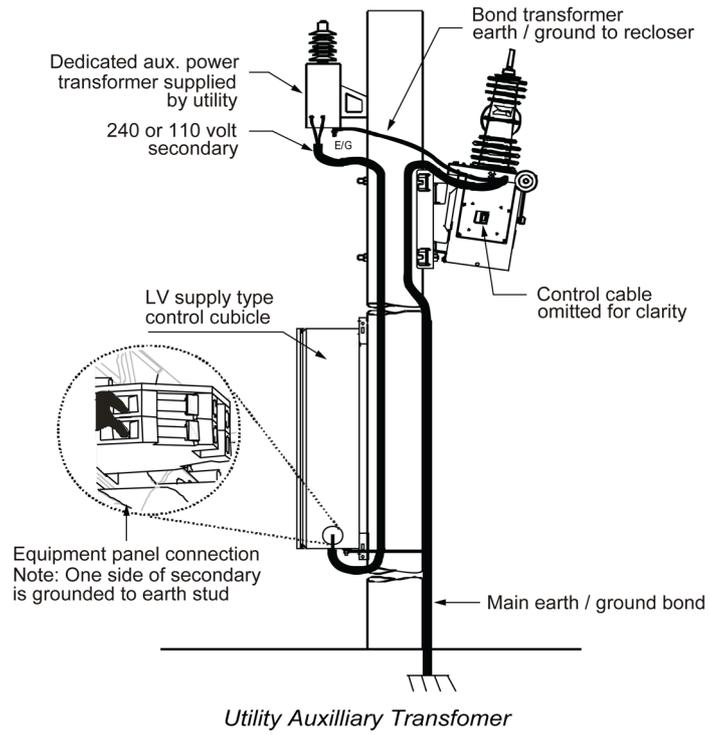
**Common Earthing / Grounding for all Installations**



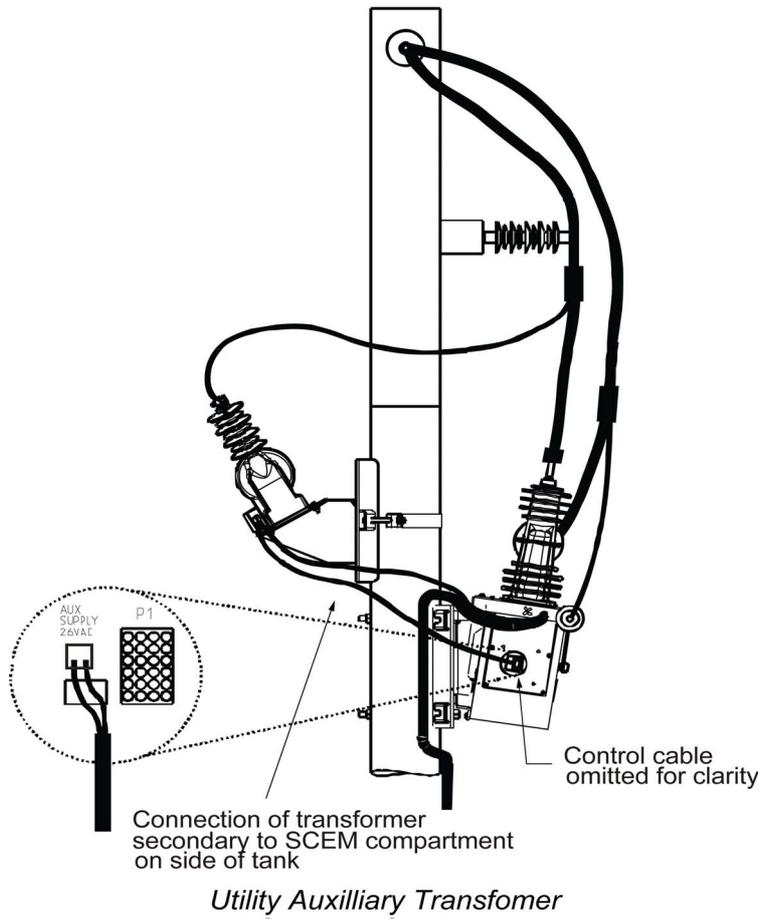
**L.V. Supply From a 2 Wire System**



**Utility Supplied Aux Power Transformer**



**Utility Supplied Aux Power Transformer**



---

# Chapter 3

## Communications and Accessories Installation

---

### What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Customer Accessories and Communication Equipment	30
Input Output Expander (IOEX3) Installation	32

---

## Customer Accessories and Communication Equipment

### Radio Antenna

Mount the antenna and run the antenna feed or an external communication cable to the ADVC. The communication cable/radio antenna, enters the cubicle via the 16 mm hole that is provided below the cubicle.

#### CAUTION

##### RISK OF EQUIPMENT DAMAGE

Switch off the ADVC before installing the accessories.

**Failure to follow these instructions can result in injury or equipment damage.**



Communications Cable Entry

*ULTRA Cubicle - Cable Entry (bottom view)*

### Protection of Radio Equipment

It is highly advisable to connect a gas discharge type of surge arrester in the antenna feed to the radio. Negligence to do so results in loss of radio and control electronics protection, if the ACR is subject to lightning activity, which could lead to complete electronic breakdown.

A feed-through or bulkhead type arrester fitted to the bottom of the control cubicle is recommended. If fitted internally, the surge arrester should be earthed to an equipment panel mounting stud by the shortest possible wire. Holes are provided for a bulkhead surge arrester.

If a surge arrester is not fitted, then the co-axial earth screen should be earthed to the equipment panel by the shortest possible wire.

**NOTE:** A problem of this nature is not covered by the product general warranty arrangements.

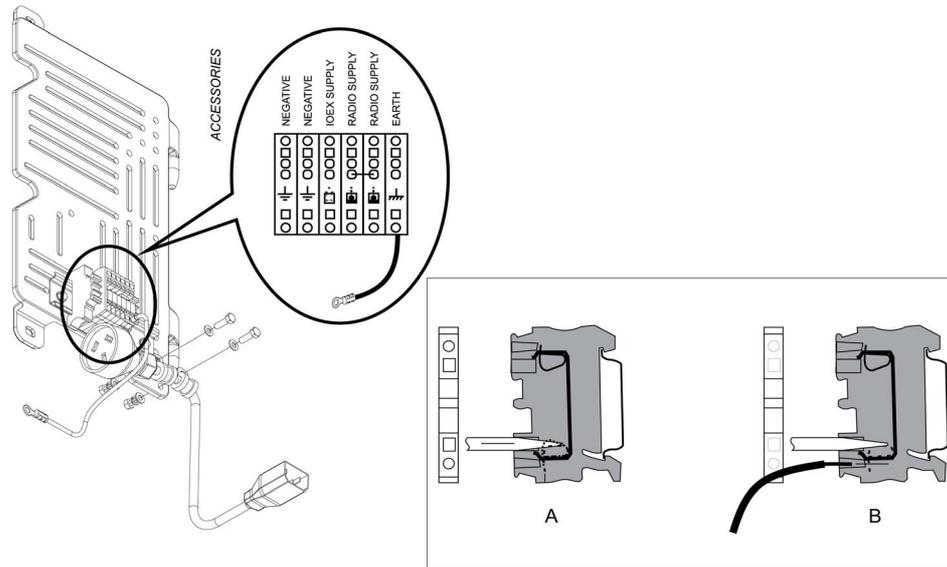
### Customer Compartment

At the bottom of the customer equipment tray, is an accessory mounting rail to install the customer equipment and accessories.

Equipment installed in this compartment can be powered from the terminal block and can also be mounted on the rail.

## Connecting to the Terminal Block

Step A: Insert a 4 mm screwdriver or similar tool into the square hole above the appropriate wiring point on the terminal block. Angle the head of the screwdriver slightly upwards and push it in, then lever it downwards.



Accessory Mounting Tray and Terminal Block

Step B: This action correctly positions the wiring clamp so that the stripped end of the cable can be inserted. Release and remove the screwdriver, then gently tug the inserted cable so that it is firmly gripped. Refer above image.

## Radio/Modem Power

The battery-backed power supply for a radio/modem is provided on the terminal block as described above. For correct radio connection point, refer to above figure for Accessory Mounting Tray and Terminal Block Connection.

The radio/modem power supply voltage is set by the user in the following menu page:

**set** SYSTEM STATUS → RADIO → S → Radio Supply 12 V

**flex** ENGINEER MENU → CONFIGURATION MENU → RADIO SETTINGS → Radio Supply 12 V

This is a password protected parameter.

If there is an auxiliary power outage, then battery power can be conserved by automatically shutting down the radio/modem power supply. The shutdown takes place after the radio holdup time is elapsed. This parameter is set in:

**set** System Status → RADIO → S: Radio Hold 60 min

**flex** ENGINEER MENU → CONFIGURATION MENU → RADIO SETTINGS → Radio Hold 60 min

If the Radio Hold time is set to zero, then the radio supply will not shut down except under special circumstances or until the unit power shutdown. The radio/modem power supply is restored when the auxiliary supply returns to normal.

The radio/modem power supply can be turned on or off by the operator, for radio maintenance without entering a password in:

**set** System Status → RADIO → S: Radio Supply ON/OFF

**flex** ENGINEER MENU → CONFIGURATION MENU → RADIO SETTINGS → Radio Supply ON/OFF

When there is shut down of the radio supply, it is indicated on these pages.

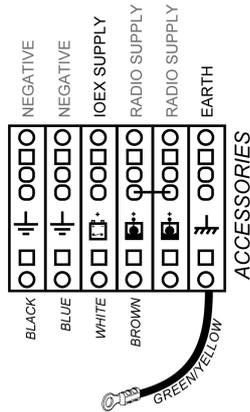
## Input Output Expander (IOEX3) Installation

### Introduction

IOEX3 module is a die-cast, sealed enclosure that provides optically isolated inputs and voltage free outputs to allow connection to external devices.

Either one or two IOEX3 modules can be used with each ADVC Controller. The second IOEX3 module is only available with the ADVC **ULTRA** cubicle, fitted with the optional upper customer tray. When two IOEX3 modules are used, they are designated as IOEX-A and IOEX-B.

IOEX3 modules, purchased at the time of initial ordering, comes readily installed in the cubicle, located on the customer tray, powered and earthed via the terminal block located accessory mounting rail on the side-mounted customer tray.



IOEX Supply and Earthing

If an IOEX3 module is purchased separately, refer to installation instructions available with the separate module. For more information on IOEX dimensions, refer Dimensions ([see page 121](#))

If one IOEX3 is fitted in the factory, it is connected to IOEX/WSOS RS-232 Port, with the baud rate of 19,200 to match that of the IOEX3. If a second IOEX3 is fitted, it can be connected to either to the MODEM RS-232 Port or to any of the three USB ports, using a suitable USB to RS-232 converter. If it is necessary to modify the baud rate of an RS-232 port with an IOEX3 connected, for example, IOEX/WSOS Port; do the following:

**set** Communications → IOEX/WSOS PORT - 1 → BAUD

**flex** ENGINEERING MENU → TELEMETRY MENU → CONFIG PORTS MENU → IOEX/WSOS

Default Settings for the IOEX3, including **Port Selection** and **IOEX Events Off/On** are available in the following location:

**set** Communications → IOEX+

**flex** ENGINEERING → TELEMETRY → Configure comms → IOEX Settings

---

# Chapter 4

## Installation Testing

---

### What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Operator Tests	34
Terminal Designation and Phase Rotation	39
Power Flow Direction Setting	41
Power Flow Direction Testing	43

## Operator Tests

### Overview

The following section details about the ACR installation. For more information, refer Installation *(see page 15)*.

**NOTE:** Check that the installation and external connections have been carried out as described in this manual and in accordance with local regulations.

Check that no visible damage has occurred during the installation. Carry out any visual and electrical tests, such as insulation and contact resistance, considered necessary to prove that the installation is sound.

### Powering up the ADVC



ADVC Controller PSU. located at the bottom of the cubicle

## ⚡ ⚠ DANGER

### HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Carry out earthing scheme as instructed.

**Failure to follow these instructions will result in death or serious injury.**

## ⚠ DANGER

### HAZARD OF EXPLOSION, FIRE, OR CHEMICAL

- The batteries are capable of supplying high currents. Always turn off the battery circuit breaker before connecting or disconnecting the batteries in the cubicle.
- Never leave fly leads connected to the battery.

**Failure to follow these instructions will result in death or serious injury.**

**NOTE:** If you are familiar with navigating operator control interface display groups, proceed with the checks described below. For more information refer, Operator Control Panel *(see page 53)* before proceeding.

The ACR will now be ready for operation. Before energizing the recloser, you should perform the following checks to confirm that the equipment is fully operational and properly configured.

### Auxiliary Supply

1. Check the Auxiliary Supply Status, which is found on the following menu page:

 System Status → SWITCHGEAR STATUS → S

```

----- SWITCHGEAR STATUS ----- S
Work Tag OFF
Aux Supply Normal Battery Normal 27.5V
Switch Connected Switch Data Valid
    
```

**NOTE:** Images shown are for illustration purposes only.

**flex** OPERATOR MENU → SWITCHGEAR STATUS → SWITCHGEAR DATA → Aux Supply Status

The auxiliary supply may be in any of the following two states: `Normal` or `Fail`. The battery status should be `Normal`.

2. If using LV auxiliary supply, switch off the auxiliary supply. Check whether the Aux Supply status changes to `Fail` in 3 - 5 seconds.
3. Check, whether the battery voltage has dropped slightly (by approximately 2 V), while remaining in the `Normal` state.
4. Go to Event Log (*see page 67*) for details on how to do this and check that the bottom line of the display (the most recent event) contains the Aux Supply Off event.
5. Switch on the auxiliary supply again.

**⚠ DANGER**

**HAZARD OF EXPLOSION, FIRE, OR CHEMICAL**

- If the battery voltage is continuously dropping, then the battery state is **LOW** and the batteries may be flat.
- If the batteries are flat, they must be replaced.

**Failure to follow these instructions will result in death or serious injury.**

### Work Tag

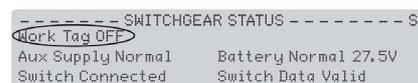
1. Check that **Local Control** is **ON**. This setting is found in the following:

**set** System Status → Operator Settings - 1 → S

**flex** Operator Menu → Operator Controls → LOCAL CONTROL ON

2. Check **Work Tag** Status on the following menu page

**set** System Status → SWITCHGEAR STATUS → S



```
----- SWITCHGEAR STATUS ----- S
Work Tag OFF
Aux Supply Normal   Battery Normal 27.5V
Switch Connected    Switch Data Valid
```

**NOTE:** Images shown are for illustration purposes only.

**OPERATOR MENU → OPERATOR CONTROLS → Work Tag Applied/OFF**

The Work Tag has two possible settings: `Applied` or `OFF`. `OFF` is the default setting.

3. Press the **SELECT** key to select the work tag field.
4. Press (→ **set**) or (↓ **flex**) to change the setting to `Applied`. Then press (**ENTER** **set**) or (**SELECT** **flex**) to activate the setting.

The message: **set** Work Tag Applied will flash at the top of the display.

**flex** Work Tag Applied will be displayed in the **Alerts Menu**, which is on the same level as that of the **Operator** and **Engineer** menus.

**NOTE:** For more details, refer the Event Log (*see page 67*), check that the bottom line of the display (the most recent event) contains the Work Tag Applied event.

5. Return to **WORK TAG STATUS** and change the setting back to `OFF`

### Terminal Designation and Phase Rotation

The power system phase assigned to each set of bushings on the recloser must be correctly configured at the time of installation of the ACR. This process is called “setting the phasing”. Setting the phasing affects all the displays, events, and so on, that are concerned with switchgear terminals, for example: voltage measurements, live/dead terminal displays and maximum current events.

Normal/default Phasing is A, B and C for bushings I/X, II/XX and III/XXX respectively. Normal/ default phase rotation is ABC.

If the Phasing at the recloser and/or phase rotation of the network are different from the defaults, you must set the Phasing and/or the Phase rotation.

On the **setVUE** O.I., Phasing is set from the following:

**set** SYSTEM STATUS → TERMINAL DESIGNATION/ROTATION → S

1. Press the **SELECT** key to select the **A Phase** field.
2. Press  to modify the setting. This will cycle A, B & C Phase through the six possible phase/bushing combinations.

```

--- TERMINAL DESIGNATION/ROTATION --- S
A Phase = Bushings I + X      Phasing ABC
B Phase = Bushings II + XX
C Phase = Bushings III + XXX
  
```

**NOTE:** Images shown are for illustration purposes only

3. Press the **ENTER** key, when you have the required combination. The controller then orientates the currents and voltages to match the selection.
4. In the Phasing field, select the **phase rotation** - either ABC or ACB.  
**NOTE:** For more details, refer the Event log (*see page 67*), check that the bottom line of the display (the most recent event) contains the Work Tag Applied event.
5. After the phasing has been set, record the details on the label on the rear of the control cubicle door (above the operator panel) to indicate the non-standard relationship between the bushings and phases.  
**NOTE:** A-B-C remains steady and the associated I-II-III designation rotates through the six possible combinations as shown in the following order, when down arrow is used.

1. A-B-C=I-II-III
2. A-B-C=III-II-I
3. A-B-C=II-III-I
4. A-B-C=III-I-II
5. A-B-C=II-I-III
6. A-B-C=I-III-II

For information on how to identify the individual bushings, refer Terminology .

## ⚠ CAUTION

### RISK OF EQUIPMENT DAMAGE

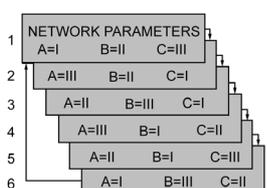
Incorrect terminal designation may cause incorrect operation, false trips, or even damage to the switch gear or controller.

**Failure to follow these instructions can result in injury or equipment damage.**

**flex** On the ADVc flexVUE O.I., Terminal Designation is set from the following:

**ENGINEER MENU → CONFIGURATION MENU → SYSTEM SETTINGS → NETWORK PARAMETERS → TERMINAL DESIGNATION/ROTATION**

1. Press the **SELECT** key and then use  and  to cycle through the possible combinations of bushing/phase relationship until the one representing the correct physical connection is found.



**NOTE:** Images shown are for illustration purposes only

2. Press the **SELECT** key when the required combination is displayed. The controller then orientates the currents and voltages to match the selection.

Use the  and  to scroll to the **Phasing ABC** option and select the correct phase rotation (either ABC or ACB) at:

**flex** ENGINEER MENU → CONFIGURATION MENU → SYSTEM SETTINGS → NETWORK PARAMETERS → TERMINAL DESIGNATION/ROTATION → Phasing ABC

**NOTE:** For more details, refer the Event log ([see page 67](#)), check that the bottom line of the display (the most recent event) contains the Work Tag Applied event.

3. After the phasing has been set, you should record the details on the label on the rear of the control cubicle door (above the operator panel) to indicate the non-standard relationship between the bushings and phases.

### Power Flow Direction Setting

The recloser is a symmetrical device meaning that, either side (I or X) can be connected to the supply. So, after installation, the controller must be configured to designate, which is the source side.

The power flow direction may be either **Source I, Load X** or **Source X, Load I** and is configured on page:

 **SYSTEM STATUS → PHASE VOLTAGE and POWER FLOW**

 **ENGINEER MENU → CONFIGURATION MENU → SYSTEM SETTINGS → METERING PARAMETERS → Source I, Load X**

Changing this setting, reverses the power flow direction but does not affect the phasing.

Power flow direction setting is used to determine:

- which power flow direction is positive for instantaneous metering purposes, when power is a signed value.
- whether power flow is forward or reverse for calculation of historical records
- whether the source or load corresponds to (I) or (X) on the voltage measurement displays.
- which power flow direction is considered positive by Automatic Protection Group Selection (APGS).
- which is the source or load for Live Load Blocking.
- which power flow direction is considered forward by Directional Blocking/Protection.

### Tripping and Closing

If system conditions allow, tripping or closing can be carried out.

- Trip and close the recloser from the ADV. For more information on the trip and close controls, refer Operator Control Panel ([see page 53](#)).
- Trip and close cause the **TRIP** or **CLOSE** LED to illuminate, which indicates the on/off status respectively on the bottom of the recloser.

### Enable/Disable Switches

For each of the **TRIP** and **CLOSE** keys in turn, test **ENABLE** and **DISABLE** by:

- Disable either mechanism (e.g.**CLOSE**) using Disabled Switches located underneath the O.I.
- Go to the **EVENT LOG** and check that the bottom line of the display (the most recent event) contains the Close Coil Disconnect event. (For the same test of the **TRIP** mechanism the Event Log should display Trip Coil Disconnect.)
- With both mechanisms disabled, check that pressing each of the **CLOSE** and **TRIP** keys are ineffective.
- Enable both **TRIP** and **CLOSE** mechanisms.

**NOTE:** For more details, refer Event Log ([see page 67](#)), check that the bottom line of the display (the most recent event).

### Mechanical Trip

Step	Action
1	Use a hook stick to manually trip the recloser via the manual trip lever.
2	For more details, refer Event Log ( <a href="#">see page 67</a> ), check that the bottom line of the display (the most recent event) contains the Mechanical Trip event.
3	With the manual trip lever still in the lock position, attempt to close the switchgear from the <b>CLOSE</b> key on the control panel. The switchgear should not close and the event log should display: <ul style="list-style-type: none"> <li>• Panel Close Request</li> <li>• Mechanical Interlocked</li> <li>• Operation Denied</li> </ul>
4	Use the hook stick to return the manual trip lever to its normal position and check that the switchgear can be closed from the operator panel.

---

### Secondary Injection Testing

If secondary injection testing is required to test protection settings but operation of the recloser is not possible, secondary injection can be performed with a suitable current injection set and the Test and Training Set (TTS) in standalone mode connected to the ADVC, with the recloser disconnected.

If tripping and closing of the recloser is possible and preferred, perform secondary injection testing with the TTS in parallel mode.

**NOTE:** Any secondary injection must use a frequency, which corresponds to the frequency set in the controller

### Primary Injection Testing

If the recloser can be isolated from the network, primary injection testing can be performed if required.

## Terminal Designation and Phase Rotation

### Introduction

The power system phase assigned to each set of bushings on the recloser must be correctly configured at the time of installation of the ACR. This process is called “setting the phasing”. Setting the phasing affects all the displays, events, and so on, that are concerned with switchgear terminals, for example: voltage measurements, live/dead terminal displays and maximum current events.

Normal/default Phasing is A, B and C for bushings I/X, II/XX and III/XXX respectively. Normal/ default phase rotation is ABC.

If the Phasing at the recloser and/or phase rotation of the network are different from the defaults, you must set the Phasing and/or the Phase rotation.

On the **setVUE** O.I., Phasing is set from the following:

 **SYSTEM STATUS → TERMINAL DESIGNATION/ROTATION → S**

1. Press the **SELECT** key to select the **A Phase** field.
2. Press  to modify the setting. This will cycle A, B & C Phase through the six possible phase/bushing combinations.

```
----- TERMINAL DESIGNATION/ROTATION ----- S
A Phase = Bushings I + X      Phasing ABC
B Phase = Bushings II + XX
C Phase = Bushings III + XXX
```

**NOTE:** Images shown are for illustration purposes only

3. Press the **ENTER** key, when you have the required combination. The controller then orientates the currents and voltages to match the selection.
4. In the Phasing field, select the **phase rotation** - either ABC or ACB.  
**NOTE:** For more details, refer the Event log ([see page 67](#)), check that the bottom line of the display (the most recent event) contains the Work Tag Applied event.
5. After the phasing has been set, record the details on the label on the rear of the control cubicle door (above the operator panel) to indicate the non-standard relationship between the bushings and phases.  
**NOTE:** A-B-C remains steady and the associated I-II-III designation rotates through the six possible combinations as shown in the following order, when down arrow is used.
  1. A-B-C=I-II-III
  2. A-B-C=III-II-I
  3. A-B-C=II-III-I
  4. A-B-C=III-I-II
  5. A-B-C=II-I-III
  6. A-B-C=I-III-II

For information on how to identify the individual bushings, refer Terminology .

### CAUTION

#### RISK OF EQUIPMENT DAMAGE

Incorrect terminal designation may cause incorrect operation, false trips, or even damage to the switch gear or controller.

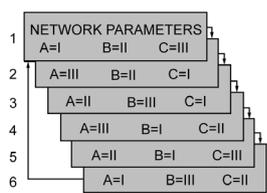
**Failure to follow these instructions can result in injury or equipment damage.**



On the ADVc flexVUE O.I., Terminal Designation is set from the following:

**ENGINEER MENU → CONFIGURATION MENU → SYSTEM SETTINGS → NETWORK PARAMETERS  
→ TERMINAL DESIGNATION/ROTATION**

1. Press the **SELECT** key and then use  $\uparrow$  and  $\downarrow$  to cycle through the possible combinations of bushing/phase relationship until the one representing the correct physical connection is found.



**NOTE:** Images shown are for illustration purposes only

2. Press the **SELECT** key when the required combination is displayed. The controller then orientates the currents and voltages to match the selection.

Use the  $\uparrow$  and  $\downarrow$  to scroll to the **Phasing ABC** option and select the correct phase rotation (either ABC or ACB) at:



**ENGINEER MENU → CONFIGURATION MENU → SYSTEM SETTINGS → NETWORK PARAMETERS → TERMINAL DESIGNATION/ROTATION → Phasing ABC**

**NOTE:** For more details, refer the Event log ([see page 67](#)), check that the bottom line of the display (the most recent event) contains the Work Tag Applied event.

3. After the phasing has been set, you should record the details on the label on the rear of the control cubicle door (above the operator panel) to indicate the non-standard relationship between the bushings and phases.

## Power Flow Direction Setting

### Introduction

The recloser is a symmetrical device meaning that, either side (I or X) can be connected to the supply. So, after installation, the controller must be configured to designate, which is the source side.

The power flow direction may be either **Source I, Load X** or **Source X, Load I** and is configured on page:

 **SYSTEM STATUS → PHASE VOLTAGE and POWER FLOW**

 **ENGINEER MENU → CONFIGURATION MENU → SYSTEM SETTINGS → METERING PARAMETERS → Source I, Load X**

Changing this setting, reverses the power flow direction but does not affect the phasing.

Power flow direction setting is used to determine:

- which power flow direction is positive for instantaneous metering purposes, when power is a signed value.
- whether power flow is forward or reverse for calculation of historical records
- whether the source or load corresponds to (I) or (X) on the voltage measurement displays.
- which power flow direction is considered positive by Automatic Protection Group Selection (APGS).
- which is the source or load for Live Load Blocking.
- which power flow direction is considered forward by Directional Blocking/Protection.

### Tripping and Closing

If system conditions allow, tripping or closing can be carried out.

- Trip and close the recloser from the ADVC. For more information on the trip and close controls, refer Operator Control Panel ([see page 53](#)).
- Trip and close cause the **TRIP** or **CLOSE** LED to illuminate, which indicates the on/off status respectively on the bottom of the recloser.

### Enable/Disable Switches

For each of the **TRIP** and **CLOSE** keys in turn, test **ENABLE** and **DISABLE** by:

- Disable either mechanism (e.g. **CLOSE**) using Disabled Switches located underneath the O.I.
- Go to the **EVENT LOG** and check that the bottom line of the display (the most recent event) contains the Close Coil Disconnect event. (For the same test of the **TRIP** mechanism the Event Log should display Trip Coil Disconnect.)
- With both mechanisms disabled, check that pressing each of the **CLOSE** and **TRIP** keys are ineffective.
- Enable both **TRIP** and **CLOSE** mechanisms.

**NOTE:** For more details, refer Event Log ([see page 67](#)), check that the bottom line of the display (the most recent event).

### Mechanical Trip

Step	Action
1	Use a hook stick to manually trip the recloser via the manual trip lever.
2	For more details, refer Event Log ( <a href="#">see page 67</a> ), check that the bottom line of the display (the most recent event) contains the Mechanical Trip event.
3	With the manual trip lever still in the lock position, attempt to close the switchgear from the <b>CLOSE</b> key on the control panel. The switchgear should not close and the event log should display: <ul style="list-style-type: none"><li>• Panel Close Request</li><li>• Mechanical Interlocked</li><li>• Operation Denied</li></ul>
4	Use the hook stick to return the manual trip lever to its normal position and check that the switchgear can be closed from the operator panel.

---

### Secondary Injection Testing

If secondary injection testing is required to test protection settings but operation of the recloser is not possible, secondary injection can be performed with a suitable current injection set and the Test and Training Set (TTS) in standalone mode connected to the ADVG, with the recloser disconnected.

If tripping and closing of the recloser is possible and preferred, perform secondary injection testing with the TTS in parallel mode.

**NOTE:** Any secondary injection must use a frequency, which corresponds to the frequency set in the controller

### Primary Injection Testing

If the recloser can be isolated from the network, primary injection testing can be performed if required.

## Power Flow Direction Testing

### Introduction

**NOTE:** Power flow direction test is valid only, if there closer is being supplied from a single source and can be energized before closing.

This test is to ensure that the source and load designations are correct.

Since either side of the recloser can be connected to the power source, the controller must be configured to designate which is the source side.

For more information about the configuration of Power Flow, refer Power Flow Direction Setting (see page 41).

If the I-side bushings are connected to the source, the Source/Load setting should be **Source I, Load X**.

1. Display the page as shown and check the Source/Load configuration.

```
----- PHASE VOLTAGE AND POWER FLOW ----- S
Live if > 2000V      Supply Timeout 4.0s
Power Signed        Source I, Load X
Display Ph/Ph Volt  Nom P-E V 6.300kV
```

**set**

```
METERING PARAMETERS
Source I, Load X
```

**flex**

**NOTE:** Images shown are for illustration purposes only.

The correct power flow setting can be confirmed by energizing the recloser, while it is open.

2. With the recloser energized but still open, check the source side voltages at:

**set**

System Measurement → SOURCE SIDE VOLTAGES → M

**flex**

ENGINEER MENU → MEASUREMENTS MENU → VOLTAGE → PHASE/LINE SRC → LD

3. Check the source side voltages, for example whether it is phase to ground or phase to phase.

SOURCE	VOLTAGE	LOAD	-M
33000V 0°	A-B	<2000V	
33000V 240°	B-C	<2000V	
33000V 120°	C-A	<2000V	

**set**

```
PHASE/LINE SRC-LD
33000V A-B < 2000V
```

**flex**

**NOTE:** Images shown are for illustration purposes only.

4. Check the LIVE / DEAD INDICATION of the recloser by going to:

**set**

System Status → LIVE/DEAD INDICATION → S

The bushings indications are available on one screen on the **seVUE** O.I. for example:

```
----- LIVE/DEAD INDICATION ----- S
Ai Live           Ax Dead
Bi Live           Bx Dead
Ci Live           Cx Dead
```

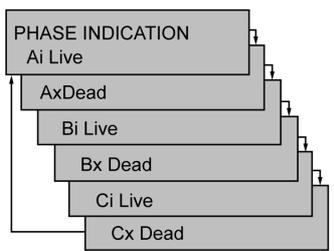
**NOTE:** Images shown are for illustration purposes only.

**flex**

OPERATOR MENU → MEASUREMENTS → PHASE INDICATION

On the **flexVUE** panel, use the **↑** / **↓** keys to scroll through the individual displays for the six indicators, for example:

**NOTE:** Images shown are for illustration purposes only.



- If steps 3 and 4 indicate an incorrect power low setting, return to step 1, modify the setting and repeat steps 2 to 4.

### On Load Checks

Once the recloser is closed and taking load, the following on-load checks can be carried out. To confirm correct operation, check the current against a known reading.

- Check system currents on:

**set** System Measurement → CURRENT

**NOTE:** Images shown are for illustration purposes only.

CURRENT				
A Phase	120 Amp	0°	Earth	0A 0°
B Phase	120 Amp	0°	Ipps	120A 0°
C Phase	120 Amp	0°	Inps	0A 0°

**NOTE:** Scroll through separate pages for each current type.

**flex** OPERATOR MENU → MEASUREMENTS → CURRENTS

- Then check other measurements at:

**set** System Measurements

**NOTE:** Images shown are for illustration purposes only.

SYSTEM MEASUREMENTS			
Current	120 A	Power P	6754 kW
Voltage	33000 V	Power Q	1191 kVAR
Frequency	50.00 Hz	PF	0.98

**NOTE:** Scroll through separate pages for each measurement.

**flex** OPERATOR MENU → MEASUREMENTS → SYSTEM MEASUREMENTS

Use these pages to confirm that the system measurements and power flow signs are as per the expectation.

- Check the source and load side voltages at:

**set** System Measurement → SOURCE VOLTAGE LOAD

**NOTE:** Images shown are for illustration purposes only.

SOURCE	VOLTAGE	LOAD	-M
33000 0°	A-B	0°	33000 V
33000 240°	B-C	240°	33000 V
33000 120°	C-A	120°	33000 V

**NOTE:** Scroll through separate pages for each voltage measurement.

**flex** ENGINEER MENU → MEASUREMENTS → VOLTAGE → PHASE/LINE SRC → LD

**NOTE:** Images shown are for illustration purposes only.

PHASE/LINE SRC-LD
33000V A-B 33000V

This information displays system voltage as phase-ground or phase-phase values as configured on the **System Status, Phase Voltage & Power Flow pages**.

Source and load side voltages should be the same, when the recloser is closed.

- Reset the **MAXIMUM DEMAND INDICATOR** go to:

**set** System Measurements → Maximum Demand Indicator → M



**OPERATOR MENU → MEASUREMENTS → MAX DEMAND IND**

5. Press **SELECT** to display:  
**RESET MAXIMUM DEMAND INDICATOR**  
(This display scrolls on *flexVUE*)
6. Press **SELECT** again to reset the flags.



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# Chapter 5

## Control Electronics Operation

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### Introduction

#### Overview

The ADVC is designed for outdoor pole mounted operation. Both the **ULTRA** and **COMPACT** cubicles are vented and insulated to minimize internal temperature variation and maximize battery life. For more information about cubicle dimensions, refer Appendix B ADVC **COMPACT** Dimensions and ADVC **ULTRA** Dimensions (*see page 121*).

#### Sealing and Condensation

All cubicle vents are screened against vermin entry and the cubicle door is sealed with replaceable foam tape.

Complete sealing against water entry under all conditions is not expected, for example, during operation in the rain. Instead, the design is such that, if any water enters, it drains out of the bottom without affecting the electrical or electronic parts. A rain shield on the PSU protects MCBs, if the door is open during driving rain. The extensive use of stainless steel and other corrosion proof materials helps to ensure that the presence of moisture has no detrimental effects.

Condensation can be expected to form under some atmospheric conditions such as, tropical storms. However, condensation is on metal surfaces, where it is of no consequence. The water runs out in the same way as any other water entering the cubicle. Condensation runs out of the bottom or be dried by ventilation and self-heating.

All electronic modules are fully sealed to IP65 and are self-heating.

#### Auxiliary Power Source

The auxiliary supply is used to maintain charge on the sealed lead-acid batteries that provide stand-by power, when auxiliary power is lost. The controller monitors the status of both the auxiliary and battery supplies.

A low-power mode is activated when the batteries are nearly exhausted. This typically occurs due to loss of the auxiliary supply. Low-power mode minimizes power consumption, while still maintaining critical functionality.

#### Controller

The controller consists of three submodules.

- Power Supply Unit (PSU)
- Control and protection enclosure (CAPE) with Operating Interface (O.I.)
- Customer Compartment

For more information, refer to ADVC Block Diagram (*see page 51*).

##### PSU Module

The PSU module supplies power to the CAPE, and controls the supply from external auxiliary sources.

The power supply module encloses all 115/230 Vac mains connections. Internally, it provides terminals for the auxiliary power supply connection. Cable-tie points are provided to secure the auxiliary supply cables. Circuit breakers are used to protect and switch the battery and auxiliary power supplies on/off. A durable cover is used to enclose all the terminations.

**NOTE:** The 115/230 Vac mains connection can handle a -20 % to +10 % variance from the auxiliary supply.

##### CAPE Module

The main module of control electronics is the Control and Protection Enclosure (CAPE). The CAPE digitizes the current transformer (CT) signals and capacitive voltage transformer (CVT) signals from the recloser. These are used to provide various data for the operator.

The CAPE module contains the PCOM board, PSSM board, trip/close capacitors, and O.I. assembled into a housing that provides protection from the environment, sealing, and EMC shielding.

---

The CAPE performs the following functions:

- Operator Interface (O.I.)
- Operating the external communications interface to allow monitoring and control from a remote computer or operator over a communications link.
- Switchgear Monitoring and Control
- Communicating with WSOS5 over an RS-232, USB or Ethernet link. The IOEX/WSOS port is by default configured for WSOS connection. USB type B (WSOS) and Ethernet ports are permanently configured for WSOS.
- Supply power to all electronic circuits and the customer compartment.

### Protection and Communications Submodule (PCOM)

The PCOM submodule contains a Digital Signal Processor (DSP), which samples the current and voltage signals from the switchgear and processes them to derive the basic power system information such as current, voltage, frequency, real power, reactive power, and so on. This is then used by the General Purpose Processor (GPP) to provide protection and communications functions for example, over-current protection. It also presents this data to the outside world via various communications protocols.

### Power Supply and Switchgear Module (PSSM)

The PSSM fulfills power supply and switchgear functionality.

The power supply function controls and filters the supply from external auxiliary supplies. Power is supplied to all the electronic submodules in the ADVC Controller and customer compartment. It also manages the battery power level and performs battery testing.

The switchgear interface function provides controlled pulses of current to trip and close the switchgear.

### Operator Interface

The O.I. is mounted on the CAPE and is accessed by opening the cubicle door. Operators can view switchgear and system data as well as control and configure the system via the O.I. The O.I. has its own electronic processing and driver circuit, and operator control panel with LCD, membrane keyboard, and status LEDs.

### WSOS5 Interface

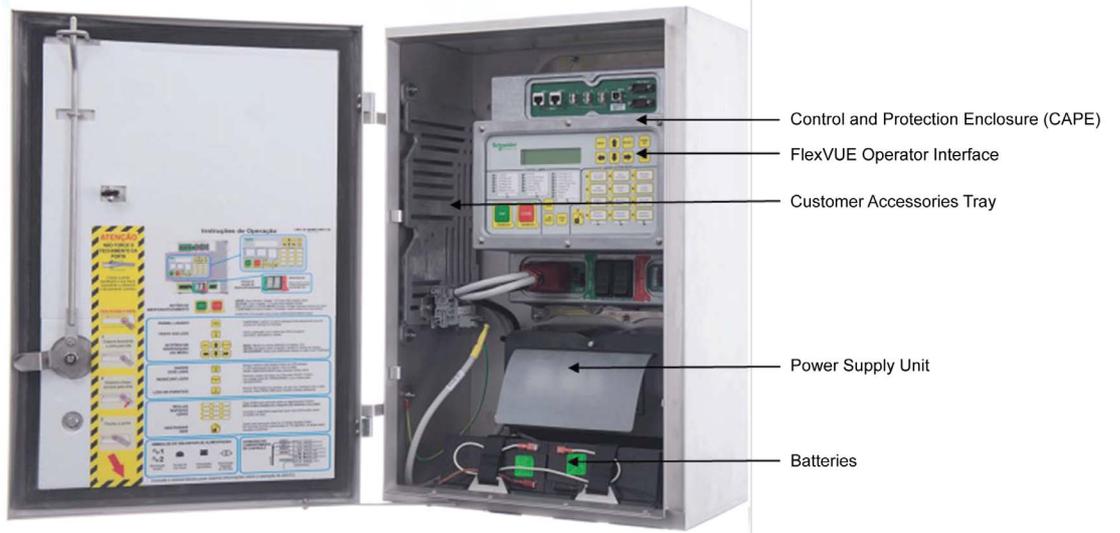
To use WSOS5 to upload or download data, connect between either:

- a serial port on the WSOS PC and the IOEX/WSOS RS-232 Port. Use an RS-232, DB9 female to DB9 female, crossover cable (also known as Null Modem).
- USB on the WSOS PC and the USB port on the controller. Use a standard USB Type A to Type B cable.
- 100Base-T Ethernet ports. Either a standard Ethernet cable or a cross-over cable can be used.

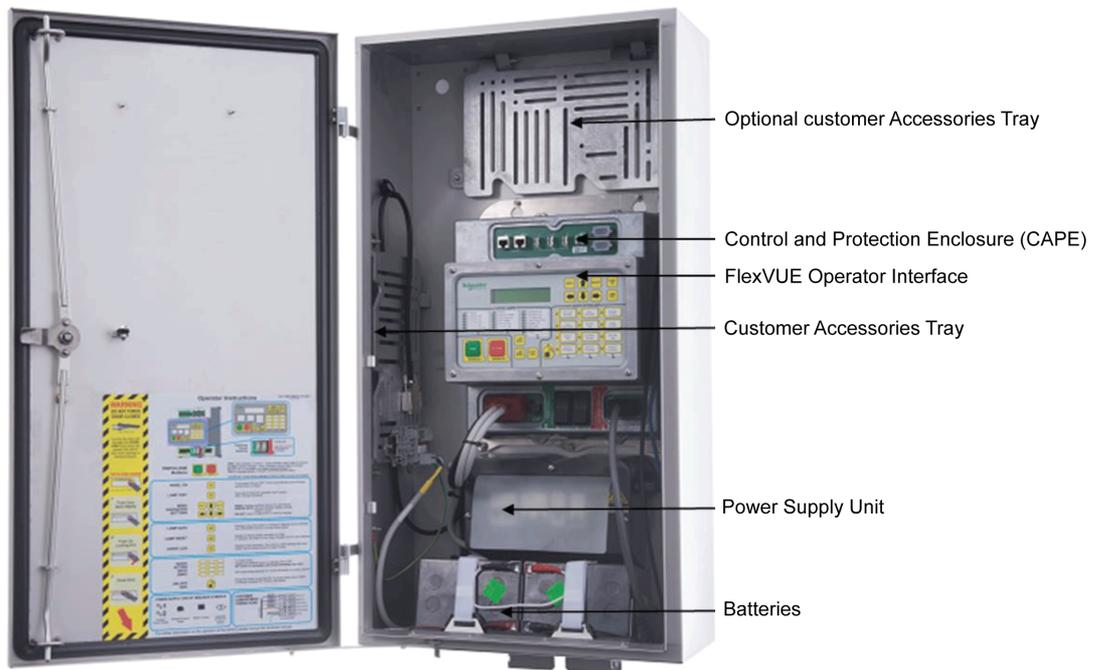
### Customer Compartments

The **COMPACT** cubicle compartment is fitted with an accessory tray that facilitates the mounting of your equipment, for example, a radio or modem.

The **ULTRA** cubicle has one standard, and one optional accessory tray to allow for more equipment. The standard tray has a terminal block for the radio power supply and power for accessories such as an IOEX3.



*Compact ADVC with flexVUE O.I.*



*Ultra ADVC with flexVUE O.I.*

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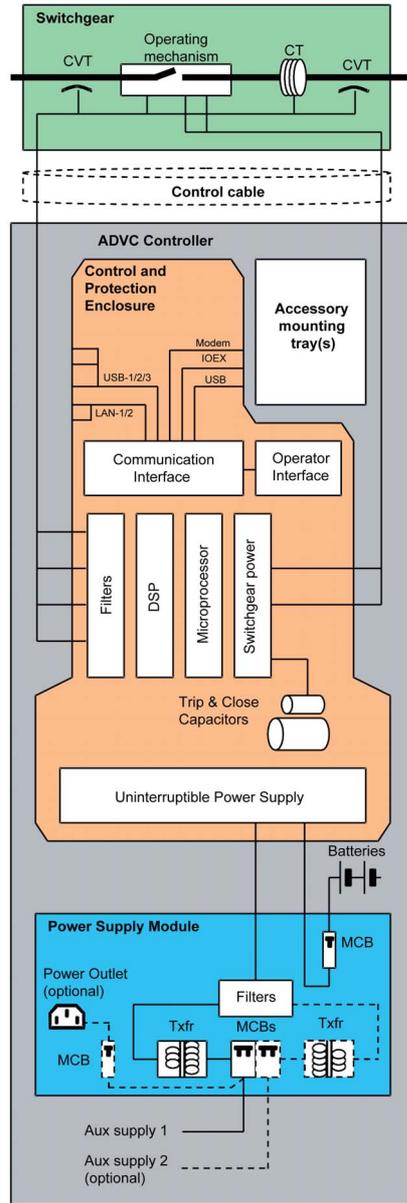
## Ancillary Equipment

The ADVC Controller is fitted with a standard customer compartment tray that facilitates the mounting of ancillary equipment, for example, a radio or modem including any special interfaces. The compartment has a terminal block for the radio supply and power for accessories such as, an IOEX3.



*Standard Customer Compartment Tray*

## ADVC Block Diagram



ADVC Controller block diagram



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# Chapter 6

## Operator Control Panel

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### What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Introduction	54
<i>se</i> VUE Panel Interface	55
<i>flex</i> VUE Panel Interface	59

## Introduction

### Overview

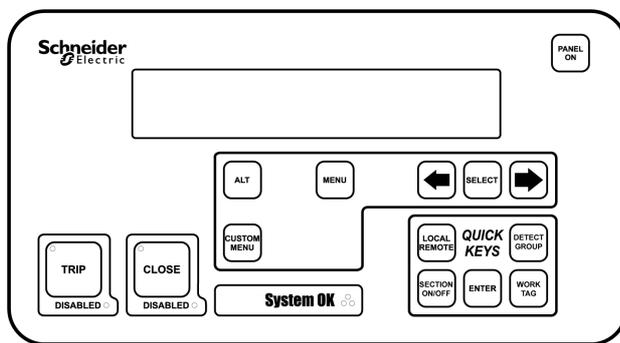
The ADVC can be remotely controlled via modems or other communications devices. It can be controlled locally using a laptop computer connected directly via serial, USB, or Ethernet port to the ADVC as well as by the Operator Interface (O.I.). The O.I. offers full functionality to modify settings, trip, and close the recloser or display current values and past events related to the operation of the ACR.

The O.I. is mounted on the CAPE inside the ADVC Controller cubicle and accessed by opening the cubicle door. The O.I. consists of a Liquid Crystal Display (LCD) and key pad with light emitting diodes (LEDs). Together, these hardware features provide a user interface to monitor and control the ACR/LBS.

The two styles of operator interface currently available are known as **seVUE** and **flexVUE**. Each style caters for particular customer requirements and are described below.

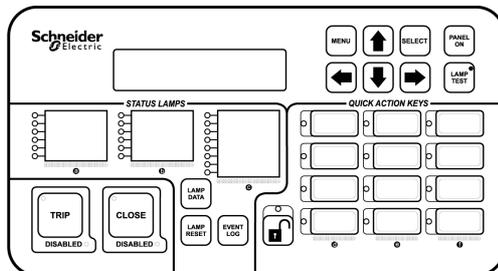
#### **seVUE**

A traditional O.I. that features a large 4 × 40 character display and uncluttered panel layout including four user configurable quick keys.



#### **flexVUE**

The **flexVUE** provides the user with 20 LED indicator lights and 12 quick action keys also with LED's that are configurable by the user through WSOS 5. This style provides the user with instant feedback about the switchgear, and reduces the need to navigate through layers of menu structure.

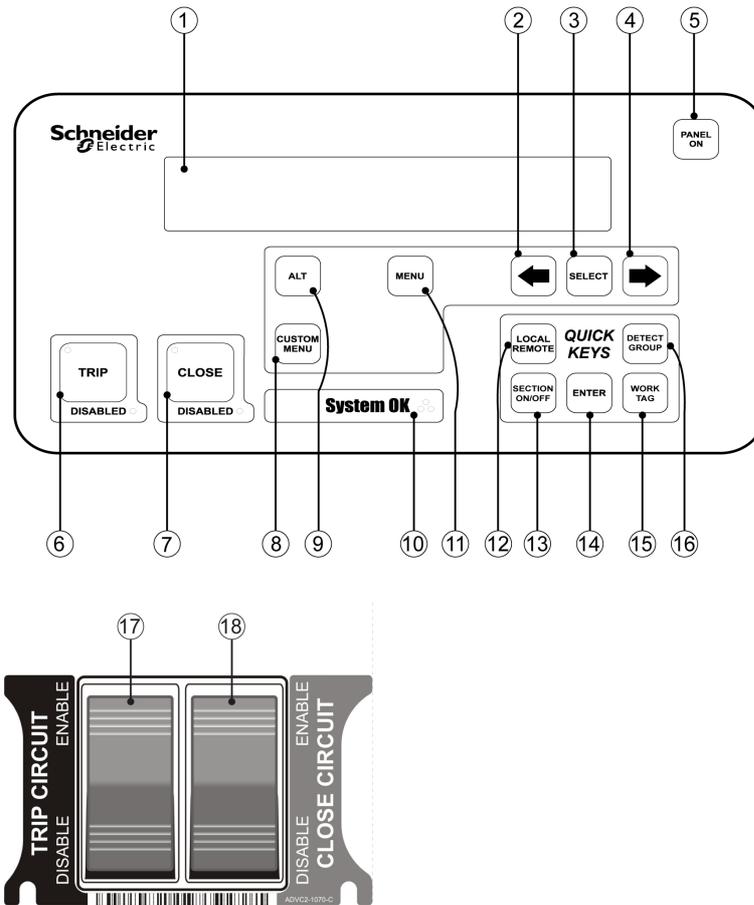


Both the **seVUE** and **flexVUE** O.I.'s, and their operation are described in detail on the following pages.

If the door proximity switch is installed, the O.I. turns on automatically when the door is opened and off when it is closed. The O.I. also turns off automatically, if no keys are pressed for 10 minutes. Pressing the **PANEL ON** key reactivates the panel.

This manual contains examples of display interface screens. In general, the language chosen for these examples is International English. In some cases, screen text differs if the configured language is English (USA).

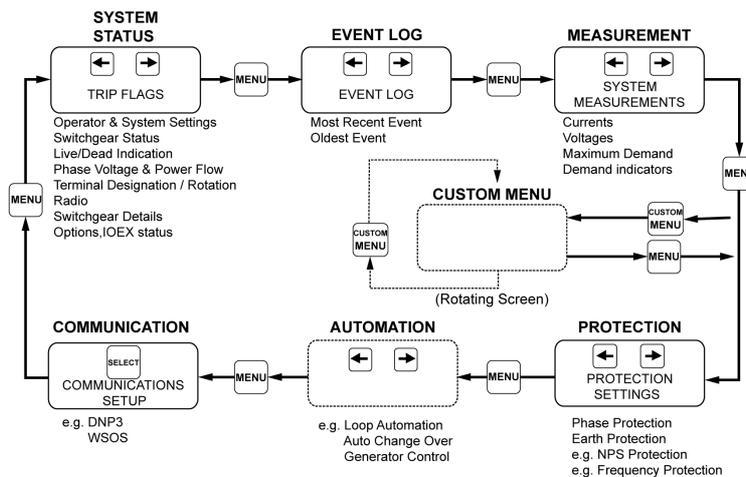
## seNUE Panel Interface



S.No	Item	Description
1	Display	Back-lit LCD, 4 line with 40 characters per line.
2	<b>LEFT</b> scroll key	Selects the previous screen in a display group or, if a setting is selected, decreases its value.
3	<b>SELECT</b> key	Selects a data field/setting so that it can be changed.
4	<b>RIGHT</b> scroll key	Selects the next screen in a display group or, if a setting is selected, increases its value.
5	<b>PANEL ON</b> key	Turns on the O.I.. The O.I. turns on when the cubicle door is opened if a door proximity switch is fitted.
6	<b>Trip</b> key	Generates a Trip request to the CAPE when the panel is active. An LED is embedded in the key to indicate its operation. Another LED is used to indicate whether this keys operation is <b>DISABLED</b> .
7	<b>Close</b> key	Generates a Close request to the CAPE when the panel is active. An LED is embedded in the key to indicate its operation. Another LED is used to indicate whether this keys operation is <b>DISABLED</b> .
8	<b>CUSTOM MENU</b> key	Grants access to the custom menu, which was configured using WSOS5. The custom menu is configured to provide a regular, updated data display by allowing a cycle of up to 12 screens.
9	<b>ALT</b> key	Grants access to an alternative event log display.
10	<b>SYSTEM OK</b>	The three System OK LEDs flash while the controller is operating normally.
11	<b>MENU</b> scroll key	Displays the first page of the next group. Pressing the <b>MENU</b> key after changing a setting causes the setting change to take effect.
12	<b>Configurable Quick Key</b>	Default linkage is to <b>LOCAL/REMOTE</b>
13	<b>Configurable Quick Key</b>	Default linkage is to <b>AUTO ON/OFF</b>
14	<b>ENTER</b> key	Press this key in order to commit a setting change that has been made. (Unlike the adjacent Quick Keys, the <b>ENTER</b> key is not configurable.)
15	<b>Configurable Quick Key</b>	Default linkage is to <b>PROT.GROUP</b>

S.No	Item	Description
16	Configurable Quick Key	Default linkage is to <b>EARTH PROT</b>
17	Enable/ Disable <b>TRIP</b> switch	Disables all <b>trip</b> Operations. When the switch is in the Disable position the trip coil in the recloser is electrically disconnected from the control electronics. Thus the switch provides a physical isolation point for the control circuitry. The recloser cannot be opened, and an audible alarm in the panel sounds and the DISABLED LED in the <b>TRIP</b> key will flash. The <b>TRIP</b> key operates normally when the switch is in the Enable position. This switch also stops a close operation, so that the switchgear cannot be carrying load without the ability to trip.
18	Enable/ Disable <b>CLOSE</b> switch	<b>Disables all close operations.</b> When the switch is in the Disable position the close coil in the recloser is electrically disconnected from the control electronics. Thus the switch provides a physical isolation point for the control circuitry. The recloser cannot be closed and an audible alarm in the panel will sound and the DISABLED LED in the <b>CLOSE</b> key will flash. The <b>CLOSE</b> key operates normally when the switch is in the Enable position.

## Display Groups



### Navigating the menu Structure

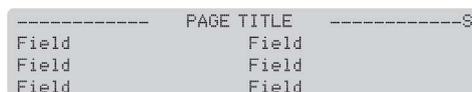
For more details on configuring the custom menu, refer to the diagram inside the controller door or to the Installation and Maintenance Manual for details of Navigation within groups.

For details on Navigation within groups, refer to ADVC Controller Operations Manual for more details. To use the custom menu, press the **CUSTOM MENU** button.

### Display Screen Layout

The display area consists of four lines, each forty character long.

**NOTE:** Images shown are for illustration purposes only.



The top line of the display is the page title. To the right of the title is a letter, indicating the display group to which the page belongs:

Display Group Codes

Code	Display Group
S	System Status Display Group
P	Protection Display Group
D	Detection Display Group
M	Measurement Display Group
A	Automation Display Group
C	Communications Setup
E	Event Log

- The next three lines are the data on display. Most displays have six data fields. A field may contain either:
- a setting, which can be changed - ON/OFF is the most common; or
  - a status

## Changing Settings

Three types of settings can be changed:

- Operator settings
- Password protected settings
- Protection settings

### Operator Settings

To change an operator setting:

Steps	Action
1	Navigate to the display page containing the setting to be changed
2	Press the <b>MENU</b> key to step through the Display Groups.
3	Communications Group (only) is divided into subgroups for different protocols. Press <b>SELECT</b> to display the subgroup required.
4	When the Display Group containing the setting to be changed is displayed, press  or  to locate the correct page.
5	Press <b>SELECT</b> until the field containing the setting to be changed is flashing.
6	Once you have selected the field to be changed, use  or  to change its setting.
7	Press <b>ENTER</b> to put the new setting into service.

**NOTE:** If a **QUICK KEY** is linked to the setting to be changed, you can use it to go directly to the relevant display page where the field with that setting will be selected. For more information, refer Quick Keys (*see page 58*).

### Password Protected Settings

Some settings are password protected. You are prompted for a password before you can change the setting. To enter the password:

Step	Action
1	Press either of the  /  keys until the first character of the password is displayed.
2	Press the <b>SELECT</b> key to move to the next character selection.
3	Repeat Steps 1 and 2 until the password is complete.
4	Press <b>ENTER</b> .

While the operator panel remains ON, you will not be required to enter the password again.

The default factory password is **AAAA** but you can change it using the Windows Switchgear Operator System (WSOS5) program. The factory password does not have to be remembered - the controller prompts you for it automatically.

### Protection Settings

Protection settings are password protected. To change a protection setting, follow the steps detailed in the Operator Settings section above but, in addition, enter the password when prompted. When you have completed the setting change by pressing **ENTER**, the following message flashes at the top of the screen:

Active Protection Setting has changed.

At this point, the changed setting is displayed but not in service. If further setting changes are required, they can be made now.

When you have completed making all the setting changes you require, press **ENTER**. The following text is displayed:

CHANGED ACTIVE PROTECTION SETTING [A]

The changed active PROTECTION SETTINGS are now in service.

Select the **MENU** or **ENTER** key to continue.

The changed settings are now in service. Press **MENU** or **ENTER** to return to the normal menu display.

## Quick Keys

The operator settings that you will frequently change can each be linked to a **QUICK KEY**. You use a **QUICK KEY** for instant display and selection of the linked setting which, otherwise, you would have to find by navigation.

You can link operator settings to individual Quick Keys using the Operator Interface or **WSOS5**.

A **QUICK KEY** can be set to blank if it is not required.

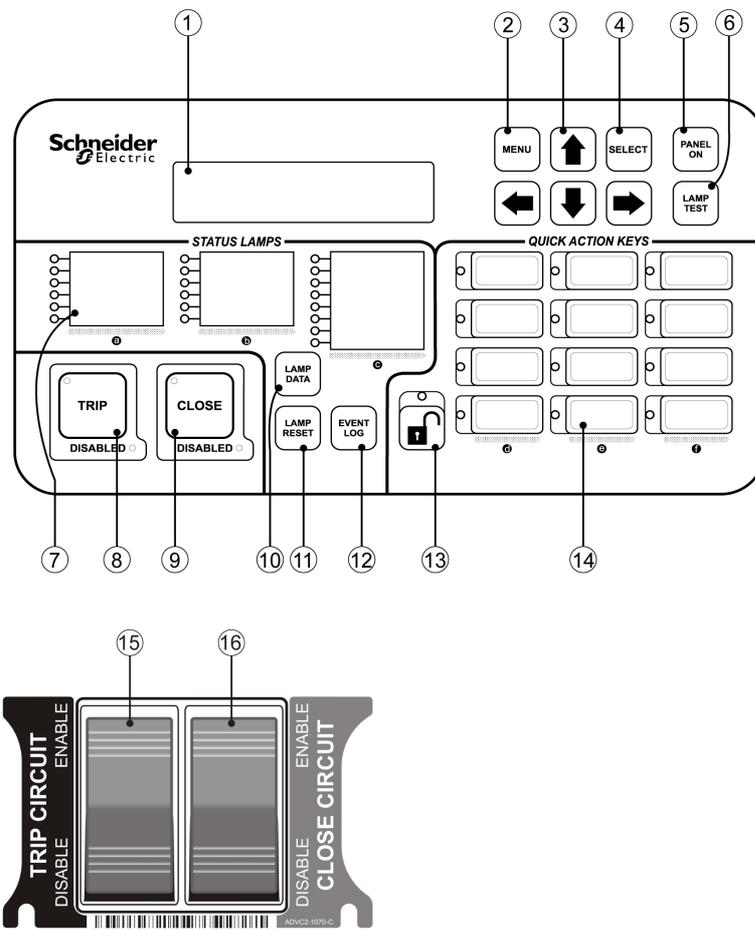
Otherwise, any one of the settings in below table, can be linked to one of the four Quick Keys.

Configurable Quick Key Settings

Setting	Default status
LOCAL/Remote / Hit & Run	Default setting, upper left key
Loop Auto ON/OFF	Configurable
Protection Group	Default setting, lower right key
Reset Flags	Configurable
Work Tag ON/OFF	Configurable
Auto ON/OFF Protection OFF	Default setting, lower left key
Cold Load ON/OFF	Configurable
Earth Protection	Default setting, upper right key
Live Block	Configurable
Negative Phase Sequence Protection OFF/ON/Alarm	Configurable
Detection Group	Configurable
Earth Detection	Configurable
Section ON/OFF	Configurable

For more information, refer to the ADVC Controller Operations manual (N00-812).

## flexVUE Panel Interface



S.No.	Item	Description
1	Display	Back-Lit LCD. 2 × 20 character display.
2	<b>MENU</b> key	Allows the user to enter the configuration menu from where it is possible to navigate the menu structure, select fields and edit settings. Navigating these pages is described separately.
3	Arrow/Navigation keys	Helps browse between display groups, fields, and change values.
4	<b>SELECT</b> key	Selects fields or values when changes are made.
5	<b>PANEL ON</b> key	Turns the panel on or off. An optional door switch is available to turn on the panel, when an operator opens the door and off, when the door is closed. If the controller is fitted with this option, the button can be used to turn the panel on/off while the door is open. Closing the door turns off the panel.
6	<b>LAMP TEST</b> key	Tests all lamps on the panel. The purpose is to alert the user of any lamps or colors that may not be working correctly. The test simultaneously cycles all lamps through red, orange, and green.

S.No.	Item	Description
7	Indicator LEDs	<p>Provide instant indication of the controller and switchgear status. Depending on the configuration, the lamps can be red, green, or orange and on, off or FLASHING. The multiple colors allow for grouping of similar functions for example, red for protection, orange for voltage and green for system health.</p> <div style="display: flex; justify-content: space-around; border: 1px solid black; padding: 5px;"> <div style="display: flex; flex-direction: column; gap: 5px;"> <li><span style="color: red;">●</span> LOCKOUT</li> <li><span style="color: red;">●</span> A - PHASE O/C</li> <li><span style="color: red;">●</span> B - PHASE O/C</li> <li><span style="color: red;">●</span> C - PHASE O/C</li> <li><span style="color: red;">●</span> GROUND FAULT</li> <li><span style="color: red;">●</span> SENSITIVE G/F</li> </div> <div style="display: flex; flex-direction: column; gap: 5px;"> <li><span style="color: orange;">●</span> A SOURCE LIVE</li> <li><span style="color: orange;">●</span> B SOURCE LIVE</li> <li><span style="color: orange;">●</span> C SOURCE LIVE</li> <li><span style="color: red;">●</span> MECH LOCK</li> <li><span style="color: green;">●</span> CONTROL OK</li> <li><span style="color: green;">●</span> AC POWER</li> <li><span style="color: green;">●</span> BATTERY PWR</li> <li><span style="color: red;">●</span> ALARM</li> </div> </div> <p><b>[For example]</b> The configuration of the status lamps can be changed within WSOS Version 5.</p>
8	TRIP key	Trips the switchgear to Lockout and the green lamp located inside the button indicates the open state of the recloser.
9	CLOSE key	Closes the switchgear and the red lamp located inside the button indicates the close state.
10	LAMP DATA key	Provides the operator with additional data specific to each status lamp.
11	LAMP RESET key	Resets the status lamps. Lamps requiring further attention from the operator remains lit. <b>NOTE:</b> Some of the status lamps such as “controller power” and “terminal live” are continuously updated and therefore not affected by the reset command.
12	EVENT LOG key	Displays the recloser and controller Event Log on the LCD display. Older events can be viewed by pressing the UP arrow key.
13	Quick Action Key Unlock	To use the Quick Action Keys, an operator must first press the <b>unlock</b> key. The lamp above the <b>unlock</b> key remains lit while the quick action keys are active. To deactivate the quick action keys an operator can press the <b>unlock</b> key again. The lamp turns off. Alternatively the quick action keys will be deactivated automatically a short configurable delay after the last quick action key was selected.
14	Quick Action Keys (QAK)	Allows the user to activate/deactivate functions directly from the interface without having to use the menu. The status of the function is indicated by the lamp next to the button. The lamp can be configured to be red, green, or orange in color and flashing. Before using the quick action keys, it is necessary to unlock the keys using the unlock button described above. Pressing a quick action key applies that action without any further confirmation and the lamp next to the key indicates the new status.
15	Enable/ Disable TRIP CIRCUIT key	Disables all trip operations. When the switch is in the Disable position, the trip coil in the recloser is electrically disconnected from the control electronics. Thus the switch provides a physical isolation point for the control circuitry. The recloser cannot be opened, and an audible alarm in the panel sounds and the DISABLED LED in the <b>TRIP</b> key flashes. The <b>TRIP</b> key operates normally when the switch is in the Enable position. This switch also stops a close operation, so that the switchgear cannot be closed unless it is able to trip.
16	Enable/ Disable CLOSE CIRCUIT key	Disables all close operations. When the switch is in the disable position, the close coil in the recloser is electrically disconnected from the control electronics. Thus the switch provides a physical isolation point for the control circuitry. The recloser cannot be closed and an audible alarm in the panel sounds and the DISABLED LED in the <b>CLOSE</b> key flashes. The <b>CLOSE</b> key operates normally when the switch is in the Enable position.

### Default Configuration

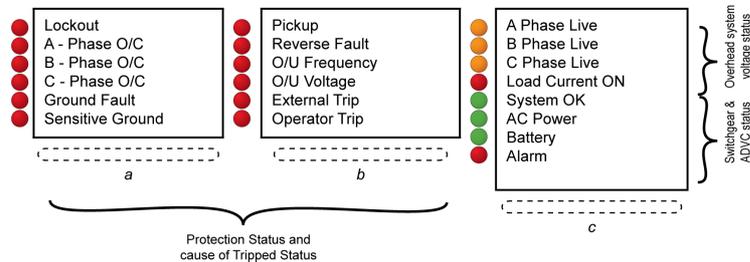
The status lamps and the quick action keys are programmed in the factory to a default configuration. This can be changed to suit the needs of the user through Windows Switchgear Operating System (WSOS5).

## Status Lamps

These lamps are used to indicate the controller and switchgear status. The default configuration is shown below. Each lamp indicates that the state of the function described next to it. When a state is active, the lamp is lit.

### For example:

When, the recloser is in Lockout the lamp next to "Lockout" is on. Conversely, if the lamp is off, the recloser is not in a lockout state.



It is possible that more than one lamp is lit at a given time.

### For example:

When, a recloser tripped to lockout due to an overcurrent fault on Phase A, both "Lockout" and "A-Phase O/C" lamps are lit.

LED#	Color	Description	Possible Causes
<b>Column A</b>			
a-1	Red	<b>Lockout</b>	Recloser has tripped to lock-out due to a protection sequence or operator command. Automatic close operations are not possible and the operator has to close the recloser using the control panel or a remote command.
a-2	Red	<b>A-Phase O/C</b>	The most recent protection trip of the recloser was caused by an over current detected fault on the network phase/s indicated.
a-3	Red	<b>B-Phase O/C</b>	
a-4	Red	<b>C-Phase O/C</b>	
a-5	Red	<b>Ground Fault</b>	A ground fault has caused the recloser to trip.
a-6	Red	<b>Sensitive Ground</b>	The recloser has tripped due to a sensitive ground fault.
<b>Column B</b>			
b-1	Red	<b>Pickup</b>	One of the protection elements has picked up. For example, when the phase current exceeds the trip setting value.
b-2	Red	<b>Reverse Fault</b>	Protection has detected a fault on the source side of the recloser.
b-3	Red	<b>O/U Frequency</b>	An over or under frequency detected fault has caused the recloser to trip.
b-4	Red	<b>O/U Voltage</b>	The switchgear has tripped due to the operation of an external device.
b-5	Red	<b>External Trip</b>	The switchgear has tripped due to the operation of an external device.
b-6	Red	<b>Operator</b>	A local or remote operator has tripped the recloser.
<b>Column C</b>			
c-1	Orange	<b>A Phase Live</b>	The source or load side bushing of the phases/s indicated are live.
c-2	Orange	<b>B Phase Live</b>	
c-3	Orange	<b>C Phase Live</b>	
c-4	Red	<b>Load Current On</b>	A current greater than 2 A is flowing through one or more phases.
c-5	Green	<b>System OK</b>	The controller is functioning normally. Maintenance may be required when the lamp is flashing red. For more information, consult the event log.
c-6	Green	<b>AC Power</b>	Flashing red LED when auxiliary power is off.
c-7	Green	<b>Battery</b>	Flashing red LED when battery is off or test failed.

LED#	Color	Description	Possible Causes
c-8	Red	Alarm	Flashing red LED when <b>TRIP</b> or <b>CLOSE</b> circuits are isolated, contact life is low or the switchgear is locked.

### Quick Action Keys (QAK)

The quick action keys allow the operator to select functions directly from the panel. Selecting a quick action applies that action without any additional confirmation and the LED next to the key indicates that the action was performed.

Before selecting a quick action, the operator must first unlock the **Quick Action** keys. This is done by pressing the **unlock** key.

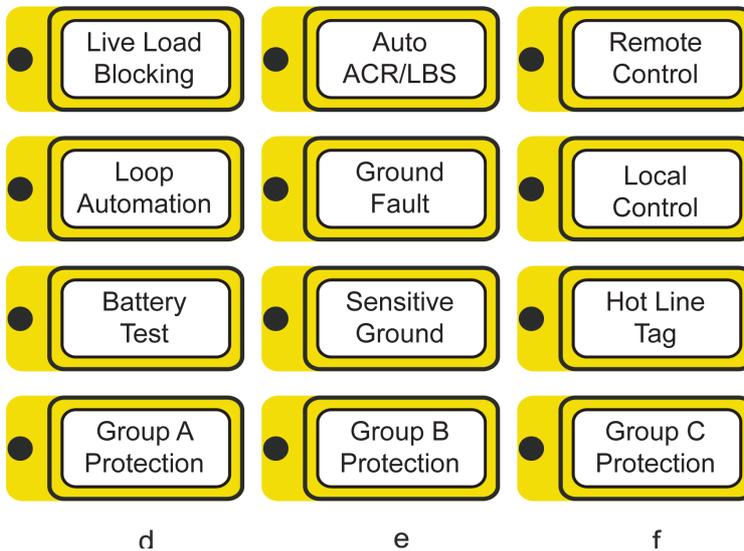
#### Example:

To, activate supervisory control (Remote Control) an operator should press the following keys:



It is possible to press a sequence of quick action keys while the unlock LED is lit. The keys will be locked automatically after a short delay after the last key press or alternatively when the **unlock** key is pressed a second time.

This controller is programmed with a default quick action key configuration that provides access to frequently used actions. The default configuration is shown below.

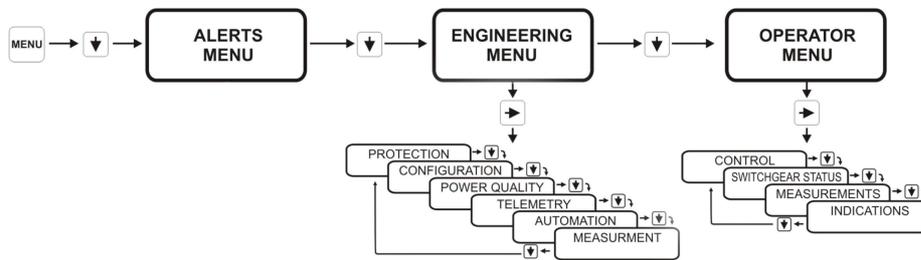


LED#	Color	Description	Possible Causes
<b>Column D</b>			
d-1	Red	Live Load Blocking	The key toggles the Live Load Blocking feature on/off. A red LED indicator
d-2	Red	Loop Automation	Turns the Loop Automation feature on/off
d-3	Red	Battery Test	This QAK performs a battery Test and the result is displayed in the Event Log.
d-4	Red	Group A Protection	Activates the settings configured in Protection Group A.
<b>Column E</b>			

LED#	Color	Description	Possible Causes
e-1	Red	Auto ACR/LBS	The key toggles the Auto Reclose feature on/off. A red LED indicator shows when Auto Reclose is on.
e-2	Red	Ground Fault	Turns Ground (Earth) Fault protection on/off.
e-3	Red	Sensitive Ground Fault	Turns Sensitive Ground (Earth) Fault protection on/off.
e-4	Red	Group B Protection	Activates protection settings configured in Protection Group B.
<b>Column F</b>			
f-1	Red	Remote Control	The key turns REMOTE control on and LOCAL control off. A red LED indicator shows when the controller is in Remote mode
f-2	Red	Local Control	The key turns LOCAL control on and REMOTE control off. A red LED indicator shows when the controller is in Local mode.
f-3	Red	Hot Line Tag	Hot LineTag (WorkTag) is applied using this QAK. Hot Line Tagging helps to ensure that closing cannot take place and also activates the Hot Line Tag protection settings.
f-4	Red	Group C Protection	Activates protection settings configured in Protection Group C

### Display Groups

The *flexVUE* O.I. displays are organized into three logical groups. Within each group is a menu of pages and those pages have various sub-menus.



### Navigating the Menu Structure

Refer to the diagram inside the controller door or to the Installation and Maintenance Manual for details of Navigation within groups.

### Display Screen Layout

The display area consists of two lines, each 20 character long as shown below.

```
PAGE TITLE
Options
```

The top line of the display is the page title. The top line of the display shows the current menu position and the second line lists the options available one option at a time. An operator uses the UP and DOWN arrows to scroll through the list of options. The RIGHT arrow will progress to the next level of the option shown on the second line of the display. Use the LEFT arrow to go back one level. When an operator is editing a setting, the top line of the display shows a few basic instructions and the bottom line shows the setting value.

```
EDIT, ESC, or SELECT
<< setting to change >>
```

### Changing Settings

Three types of settings can be changed:

- Operator settings
- Password protected settings
- Protection settings

## Operator Settings

Find the display page containing the setting to be changed:

Step	Action
1	Press the <b>MENU</b> key to enter the menu structure.
2	Press the <b>↓</b> arrow and then the <b>→</b> arrow to enter the <b>Operator Menu</b> .
3	Use the <b>←</b> or <b>→</b> arrow keys to navigate to the setting to be changed.
4	Press <b>SELECT</b> key.
5	Use <b>↑</b> or <b>↓</b> arrow keys to change the setting.
6	Press the <b>SELECT</b> key to accept the change, or press the <b>←</b> arrow to escape and leave the setting unchanged.

Alternatively, if a QAK operates the setting you wish to change:

Step	Action
1	Press the <b>QAK UNLOCK</b> .
2	Press the required Quick Action Key within 10 s (Configurable).

**NOTE:** Actions are executed without any confirmation via the arrow or select keys. The LED indicates the new state.

## Password Protected Settings

Some settings are password protected. You will be prompted for a password before you can change the setting. To enter the password:

Step	Action
1	Press the <b>↑</b> or <b>↓</b> arrows until you find the required character for the password.
2	Press the <b>→</b> arrow key.
3	Repeat steps 1 and 2 until the password is complete
4	Press <b>SELECT</b> to enter the password. While the operator panel remains ON, you will not be required to enter the password again.

The default factory password is **AAAA** but you can change it using Windows Switchgear Operator System (WSOS5) software. The factory password does not need to be remembered - the controller prompts you for it automatically.

## Alerts Menu

The *flexVUE* panel provides the user with a specific location to deal with alerts from the controller. The **ALERTS MENU** is found as part of the **MAIN MENU** on the operator interface. You can view these alerts in the same way you would view any other menu options. Alerts are split into two categories, critical and normal.

### Normal Alerts

All normal alerts go into the **ALERTS MENU**. The activation of a normal alert causes the title line of the current display to show:

#### xx Alerts Active

This alternates with the current display title at a sufficient rate that the current display is easily readable so that panel usage and field editing can easily continue. **XX** is the number of alerts that are present at the time.

The displayed number of normal alerts may change from one flash to the next if a new alert is added or an old one is removed.

The title of the alert menu contains the number of alerts that are present. This is shown as:

#### ALERT MENU X/Y

Where **'X'** is the alert currently displayed and **'Y'** is the total number of alerts present.

A normal alert message will generally be longer than 20 characters and will automatically scroll to allow viewing of the complete message. If, a normal alert is present a beep occurs at a fixed time interval.

All buttons function normally while a normal alert is present.

### Critical Alerts

A critical alert will completely subvert the operation of the LCD display regardless of what is being displayed. There is no way to remove the critical alert from the display while it is active.

If a critical alert is present, a beep occurs at a fixed time interval.

All buttons except for the navigation buttons (←, →, ↑, ↓, MENU, SELECT, LAMP DATA, EVENT LOG) operates normally while a critical alert is present.

### Activating Protection Settings

When settings are changed in the Active protection group (via the *flexVUE* O.I.), those new settings are saved but will not be put into service until they are made ACTIVE

When changing Active Protection Group settings, once the first setting is changed the following screen appears: (scrolling)

**NOTE:** Images shown are for illustration purposes only.



```
Settings Changed
SELECT to activate, ← continue changes
```

This message is displayed if:

- Settings are changed within the **ACTIVE PROTECTION GROUP**
- The current setting is the first one to be changed.
- Before changing this setting; all the current settings were ACTIVE in service

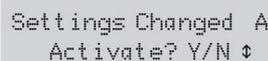
Once this message is displayed, there are three options:

- **NO ACTION:** The new setting will automatically go in service if the operator ignores the above message and turns off the operator interface, or the interface turns off automatically.
- **PRESS SELECT:** If the operator presses the **SELECT** key, the new setting is put into service immediately. The operator can continue to browse the menu. With all the current settings in active service, if the operator makes another setting change the above message is prompted when the first of the new settings are saved.
- **PRESS THE ARROW:** This allows the operator to browse other settings and allow them to be changed.

### Exiting the Protection Menu

The operator will not be prompted to ACTIVATE the settings again until they try to exit the **PROTECTION MENU**, when the following screen appears:

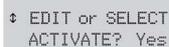
**NOTE:** Images shown are for illustration purposes only.



```
Settings Changed A
Activate? Y/N
```

The operator has to press the **UP** or **DOWN ARROW** key. That displays the following:

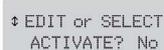
**NOTE:** Images shown are for illustration purposes only.



```
EDIT or SELECT
ACTIVATE? Yes
```



Images shown are for illustration purposes only.



```
EDIT or SELECT
ACTIVATE? No
```

When the operator scrolls to **YES** and presses **SELECT**, the settings are put in service. If the operator selects **NO** and presses the **SELECT** key, the following message is displayed: (scrolling)

**NOTE:** Images shown are for illustration purposes only.

---

← Continue  
Settings activate on panel shutdown

### Re-Entering the Protection Menu

The operator may exit the **Protection Menu** without activating the saved settings, and then re-enter the **Protection Menu** at a later time. In this case the process will run through the same activation sequence as shown in Exiting the Protection Menu ([see page 65](#)), providing the settings haven't already been put into service by a panel shutdown.

---

# Chapter 7

## Event Log

---

### What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Event Log	68
Event Log	70

# Event Log

## Introduction

The ADVC maintains a log of up to 100,000 events that record changes to the status of the switchgear, control electronics, and ADVC logic. The log also records critical setting changes. The events can be viewed via the O.I. in the **EVENT LOG** display group.

The event log display updates automatically as new events occur. The most recent event appears on the bottom line of the display and older events are scrolled upwards. When the event log is full, the oldest events are deleted to allow new events to be logged as they occur.

All events are date and time stamped to a 1 ms resolution and displayed in the order that they occurred. The source of each event is also recorded.

It is possible to apply event category filters when viewing events via the O.I.

WSOS5 software can also be used to upload and display the event log. In addition to O.I.-like time stamp, source identification and filter category features, it also allows text searches and go to a particular date/time. The event log can be saved as a text file or as a .csv file. For more information, refer to the WSOS5 help file.

## Reading the Event Log

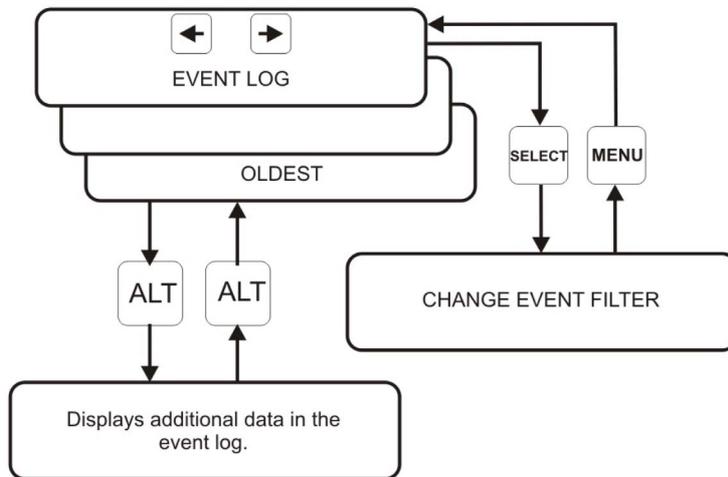


On the *setVUE* panel, the event log display group is one of the main display groups.

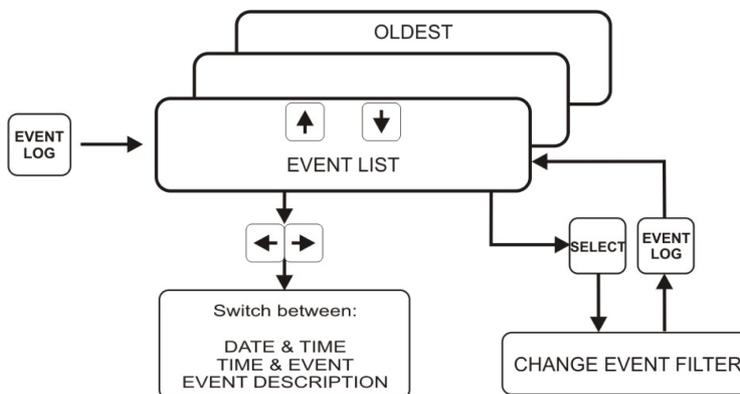


On the *flexVUE* panel, the event log is found via a dedicated key on the O.I.

The **EVENT LOG** is navigated slightly differently depending on which O.I. is installed. For more information on navigation diagrams, refer the following figures below for *setVUE* Navigation Diagram and *flexVUE* Navigation Diagram.



*setVUE* Navigation Diagram



*flexVUE* Navigation Diagram

Description		
Number of Events shown on screen	4 Max.	2 Max.
Key to Scroll to OLDER events	←	↑
Key to Scroll to NEWER events	→	↓
Show the <b>CHANGE EVENT FILTER</b> screen	SELECT	SELECT
Return to <b>EVENTLOG</b> from <b>FILTER</b> screen	MENU	EVENT LOG
View additional information about event (if available)	ALT	EVENT LOG
Switch between <b>DATE/TIME, TIME/EVENT&amp;EVENTDESCRIPTION</b>	-	← →

# Event Log

## Introduction

The ADVC maintains a log of up to 100,000 events that record changes to the status of the switchgear, control electronics, and ADVC logic. The log also records critical setting changes. The events can be viewed via the O.I. in the **EVENT LOG** display group.

The event log display updates automatically as new events occur. The most recent event appears on the bottom line of the display and older events are scrolled upwards. When the event log is full, the oldest events are deleted to allow new events to be logged as they occur.

All events are date and time stamped to a 1 ms resolution and displayed in the order that they occurred. The source of each event is also recorded.

It is possible to apply event category filters when viewing events via the O.I.

WSOS5 software can also be used to upload and display the event log. In addition to O.I.-like time stamp, source identification and filter category features, it also allows text searches and go to a particular date/time. The event log can be saved as a text file or as a .csv file. For more information, refer to the WSOS5 help file.

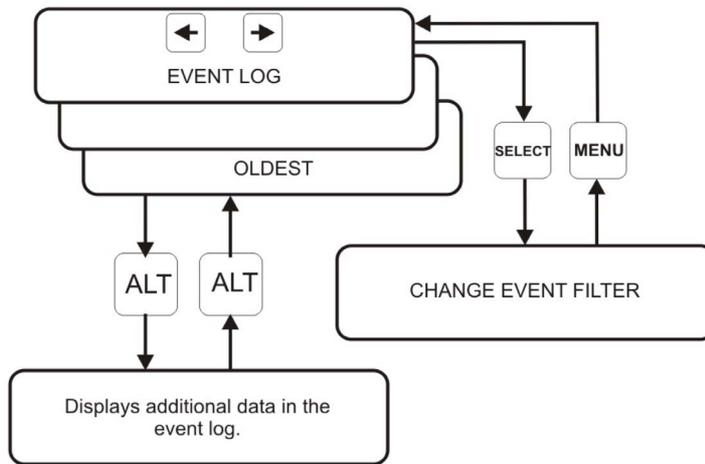
## Reading the Event Log

On the *setVUE* panel, the event log display group is one of the main display groups.

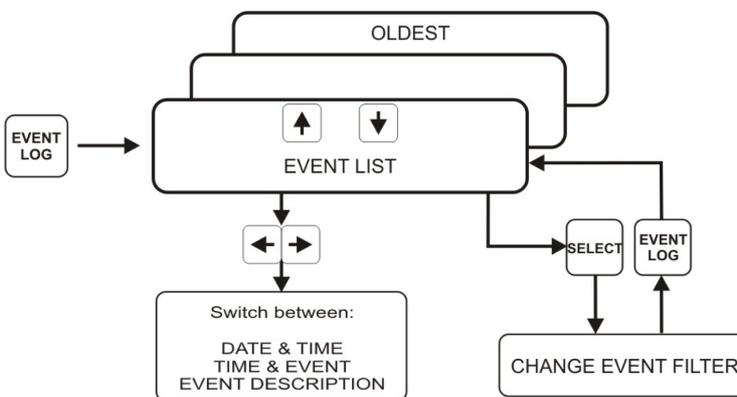


On the *flexVUE* panel, the event log is found via a dedicated key on the O.I.

The **EVENT LOG** is navigated slightly differently depending on which O.I. is installed. For more information on navigation diagrams, refer the following figures below for *setVUE* Navigation Diagram and *flexVUE* Navigation Diagram.



*setVUE* Navigation Diagram



*flexVUE* Navigation Diagram

Description		
Number of Events shown on screen	4 Max.	2 Max.
Key to Scroll to OLDER events	←	↑
Key to Scroll to NEWER events	→	↓
Show the <b>CHANGE EVENT FILTER</b> screen	<b>SELECT</b>	<b>SELECT</b>
Return to <b>EVENTLOG</b> from <b>FILTER</b> screen	<b>MENU</b>	<b>EVENT LOG</b>
View additional information about event (if available)	<b>ALT</b>	<b>EVENT LOG</b>
Switch between <b>DATE/TIME, TIME/EVENT&amp;EVENTDESCRIPTION</b>	-	← →

### Typical Event Log Trip Sequence Display

The following **EVENTLOG** is an example of a phase trip sequence with two trips to lockout (some events are not displayed for simplicity)

EVENTLOG -----E	Comment
08/06/05 09:27:52.64 Lockout	Lockout
08/06/05 09:27:52.63 C 305 Amp	C phase current at trip
08/06/05 09:27:52.63 B 302 Amp	B phase current at trip
08/06/05 09:27:52.63 A 303 Amp	A phase current at trip
08/06/05 09:27:52.36 Prot Trip 2	2nd trip after 17.26s
08/06/05 09:27:52.36 Phase Prot Trip	Phase element trip
08/06/05 09:27:52.36 Prot Group A Active	Protection group A
08/06/05 09:27:35.10 Pickup	Pickup again
08/06/05 09:27:33.70 Automatic Reclose	1st reclose
08/06/05 09:27:33.69 C 302 Amp	C phase current at trip
08/06/05 09:27:33.69 B 300 Amp	B phase current at trip
08/06/05 09:27:33.69 A 301 Amp	A phase current at trip
08/06/05 09:27:33.42 Prot Trip 1	1st trip after 17.27s
08/06/05 09:27:33.42 Phase Prot Trip	Phase element trip
08/06/05 09:27:33.42 Prot Group A Active	Protection group A
08/06/05 09:27:16.15 Pickup	Start of fault (pick up)

**NOTE:** Images shown are for illustration purposes only.

The following **EVENTLOG** is an example of a sequence reset (some events are not displayed for simplicity)

EVENT LOG -----E	Comment
09/01/05 10:39:22.50 Sequence Reset	Sequence reset after 10s
09/01/05 10:39:12.50 Automatic Reclose	1st reclose
09/01/05 10:39:12.49 C Max 301 Amp	Max C phase fault current
09/01/05 10:39:12.49 B Max 302 Amp	Max B phase fault current
09/01/05 10:39:12.49 A Max 300 Amp	Max A phase fault current
09/01/05 10:39:12.22 Prot Trip 1	1st trip after 17.27s
09/01/05 10:39:12.22 Phase Prot Trip	Phase element trip
09/01/05 10:39:12.22 Prot Group AActive	Protection group A
09/01/05 10:38:54.95 Pickup	Start of fault (pick up)

**NOTE:** Images shown are for illustration purposes only.

## Display of Events



The difference in the display on the *seVUE* and *flexVUE* are shown in the following example. Consider the following events, as shown on the *seVUE*:

**NOTE:** Images shown are for illustration purposes only.

```
09/01/15 10:39:12.49 B Max 302 Amp
09/01/15 10:39:12.49 C Max 301 Amp
09/01/15 10:39:12.50 Automatic Reclose
09/01/15 10:39:12.50 Sequence Reset
```



The *flexVUE*, by default, would display the bottom two lines (the most recent) first. See below:

```
10:39 Automatic Recl
10:39 Sequence Reset
```

**NOTE:** Images shown are for illustration purposes only.

From this screen, a complete **TIME** or **EVENT DESCRIPTION** is available by pressing the **←** or **→** keys respectively:

For the **TIME**, press **←**:

**NOTE:** Images shown are for illustration purposes only.

```
09/01/15 10:39:12.50
09/01/15 10:39:12.50
```

For the **EVENT DESCRIPTION** press **→**:

```
Automatic Reclose
Sequence Reset
```

In this example, pressing the **↓** twice would scroll to the next two events.

```
10:39 B Max 302 Amp
10:39 C Max 301 Amp
```

## Setting Change Events

A settings change can come from various sources - WSOS5, Operator Interface, SCADA protocol, and IOEX. The controller includes in its log, information regarding the source of each setting change.

If the **ALT** key () or **EVENT LOG** key () is pressed whilst the event log is on the display then the date and time details are replaced with extra information that includes the setting source and, if

applicable, the protection group, curve, and trip number. Pressing the **ALT** () or **EVENT LOG**

() key redisplay the date and time information.

Identifier	Settings change source
WSOS	WSOS5
OCP	Operator Control Panel
PTCL	SCADA protocol
IOEX	IOEX

---

As it is possible for multiple WSOS5 applications to be simultaneously connected to the controller via Ethernet, a source identification of 'WSOS' can be insufficient information. For WSOS5 over Ethernet connections the first four letters of the PC login name are logged. The usage of 'WSOS' is therefore restricted to serial port point-to-point communication links only.



For example, a *seVUE* event log display that looks like this:

```
08/06/15 11:05:50.25 Very Inv IEC255
08/06/15 11:07:15.66 Parity EVEN
08/06/15 11:09:23.03 Work Tag Applied
08/06/15 11:10:35.19 Load Supply ON
```

becomes:

```
WSOS Phase Trip 2 D Very Inv IEC255
OCP RS232-B Parity EVEN
PTCL Work Tag Applied
Load Supply ON
```

**NOTE:** Images shown are for illustration purposes only.

When the **ALT** key is pressed.

In the above example it can be seen that:

- WSOS5 has been used to set a Very Inverse IEC255 curve for phase trip 2, group D.
- The O.I. has been used to set the controller's RS-232 port communications parity to EVEN.
- The work tag has been applied via a SCADA protocol communications link.
- The controller has detected restoration of load supply. There is no setting change source associated with this event.



The *flexVUE* screen might look like this:

```
11:05 Very Inv IEC255
11:07 Parity EVEN
```

Pressing **EVENT LOG** would change it to:

```
WSOS Phase Trip 2 D
OCP RS232 - B
```

**NOTE:** Images shown are for illustration purposes only.



---

# Chapter 8

## Power System Measurements

---

### What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Power System Measurements	76
Power System Measurements	77

---

## Power System Measurements

### Introduction

The Current Transformer (CT) signals and voltage screen (CVT) signals from the recloser are digitized by the ADVC Controller and used to provide various data for the operator.

The ADVC Controller measures up to 10 power system components:

- A, B, C, phase and spill currents,
- Phase to earth voltage on all six terminals.

The ADVC Controller uses the above measurements to derive many system measurements including:

- frequency
- phase to phase voltages
- total and per phase power (kW, kVA, and kVAR)
- total and per phase power factor
- harmonics
- earth current, and
- sequence components

In addition, the ADVC Controller also measures internal values such as:

- CAPE temperature
- auxiliary voltage
- battery voltage.

### Power System Frequency

The controller must be set for the correct power system frequency (either 50 Hz or 60 Hz). This can be set on page:



SYSTEM STATUS → PHASE VOLTAGE and POWER FLOW



ENGINEER MENU → CONFIGURATION MENU → SYSTEM SETTINGS → NETWORK PARAMETERS → System Frequency 50 Hz/60 Hz

#### NOTE:

The setting to change the display between Phase- Phase or Phase-Earth voltages is found at the following location:



- SYSTEM STATUS → PHASE VOLTAGE and POWER FLOW → Display Phase → Phase Voltage



- ENGINEER MENU → CONFIGURATION MENU → System Settings → Metering Parameters → Display Voltage Phase/ Earth Voltage or Phase/Phase Voltage

---

## Power System Measurements

### Introduction

The Current Transformer (CT) signals and voltage screen (CVT) signals from the recloser are digitized by the ADVC Controller and used to provide various data for the operator.

The ADVC Controller measures up to 10 power system components:

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- harmonics
- earth current, and
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In addition, the ADVC Controller also measures internal values such as:

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- battery voltage.

### Power System Frequency

The controller must be set for the correct power system frequency (either 50 Hz or 60 Hz). This can be set on page:



**SYSTEM STATUS → PHASE VOLTAGE and POWER FLOW**



**ENGINEER MENU → CONFIGURATION MENU → SYSTEM SETTINGS → NETWORK PARAMETERS → System Frequency 50 Hz/60 Hz**

#### NOTE:

The setting to change the display between Phase- Phase or Phase-Earth voltages is found at the following location:



- **SYSTEM STATUS → PHASE VOLTAGE and POWER FLOW → Display Phase → Phase Voltage**



- **ENGINEER MENU → CONFIGURATION MENU → System Settings → Metering Parameters → Display Voltage Phase/ Earth Voltage or Phase/Phase Voltage**

### Real Time Displays

There are a number of measurements that are shown in real time within the ADVC Controller. The measurements are:

- **SYSTEM MEASUREMENTS** (Including average voltage, current and power)
- A, B and C Phase Current (includes phase angles)
- Earth Current (includes phase angle)
- Sequence Currents (Inps, Ipps)
- A, B, and C Phase Voltage (shown as phase-phase or phase-earth)
- Sequence Voltages (Vzps, Vpps and Vnps)
- A, B, and C Phase Power
- A, B, and C Phase Maximum Demand Indicators

### System Measurements



**SYSTEM MEASUREMENTS-M**

SYSTEM MEASUREMENTS			
Current	120 A	Power P	6754 kW
Voltage	33000 V	Power Q	1191 kVAR
Frequency	50.00Hz	PF	0.98

**NOTE:** Images shown are for illustration purposes only.

**flex** OPERATOR MENU → MEASUREMENTS → SYSTEMS MEASUREMENTS

**NOTE:** (Scroll through Average Current, Average Voltage, Frequency, Power Factor, 3PH Power P [Kw], 3PH Power Q [kVAR] and Power Factor)

This is a summary of the system measurements. Current and voltage values displayed are an average of the three phases. Frequency is measured on the first available bushing and is displayed as 'Unavailable' if all the bushings are dead.

• **Current:**

**set** SYSTEM MEASUREMENTS → Current → M

CURRENT			
A Phase	120 A	0° Earth	0A 0°
B Phase	120 A	0° Ipps	120A 0°
C Phase	120 A	0° Inps	0A 0°

**NOTE:** Images shown are for illustration purposes only.

**flex** ENGINEER MENU → MEASUREMENTS → CURRENT

**NOTE:** (Scroll through Magnitude and Angle-A, B, C and Earth and Sequence-I1 (Ipps), I2 (Inps))

These screens display the Current and Phase Angle for each Phase, Earth Current, Positive Phase Sequence Current (Ipps) and Negative Phase Sequence Current (Inps).

• **Voltage:**

SYSTEM MEASUREMENTS → Voltage → M

SOURCE	VOLTAGE	LOAD	- M
33000V 0°	A-B	0°	33000 V
33000V 240°	B-C	240°	33000 V
33000V 120°	C-A	120°	33000 V

**NOTE:** Images shown are for illustration purposes only.

**flex** ENGINEER MENU → MEASUREMENTS → VOLTAGE → PHASE/LINE\SRC-LD

**NOTE:** (Scroll through A, B and C-Phase)

• **Sequence Voltage:**

**set** SYSTEM MEASUREMENTS → Sequence Voltage → M

SEQUENCE VOLTAGE		M
Vzps	554 Volt	
Vpps	19034 Volt	
Vnps	554 Volt	

**NOTE:** Images shown are for illustration purposes only.

**flex** ENGINEER MENU → MEASUREMENTS → VOLTAGE → SEQUENCE

**NOTE:** (Scroll through Vpps, Vnps and Vzps)

These screens display the zero, positive and negative phase sequence voltages.

• **Power:**

**set** SYSTEM MEASUREMENTS → Power → M

POWER			
A	2222 kW	527 kVAR	PF 0.97
B	2300 kW	443 kVAR	PF 0.98
C	2188 kW	417 kVAR	PF 0.98

**NOTE:** Images shown are for illustration purposes only.

**flex** ENGINEER MENU → MEASUREMENTS → POWER → 3 -Phase, A, B & C-Phase

**NOTE:** (Scroll through Real Power, Apparent and Reactive Power, Power Factor)

These screens display real and reactive power, as well as the power factor on a per phase basis. Real Power (kW) is a signed quantity unless Power Flow Unsigned has been selected on page:

---

 **SYSTEM STATUS → PHASE VOLTAGE → and POWER FLOW:**  
Power Flow Signed/Unsigned

 **ENGINEER MENU → CONFIGURATION → SYSTEM SETTINGS → METERING PARAMETERS**  
→ **Power Signed/Unsigned**

Power Factor (PF) is an unsigned quantity.

- **Maximum Demand Indicators**

 **SYSTEM MEASUREMENTS → Daily, Weekly, Monthly, Maximum Demand**

 **ENGINEER MENU → MEASUREMENTS → DEMAND → DAILY, WEEKLY, MONTHLY MAX DEMAND**

**NOTE:** (Scroll through Date, Total kWh, Peak Period, Power/PF)

The Maximum Demand Indicator on the *flexVUE* panel is available in a different location at the following menu:

 **OPERATOR MENU → MEASUREMENTS - MAX DEMAND IND**

**NOTE:** (Scroll through A, B, C Phase Max and Time and Reset MDI)

These screens display real and reactive power, as well as the power factor on a per phase basis. Daily, Weekly and Monthly Demand Indicators display collected historical data while the Maximum Demand Indicator contains a mixture of real-time and historical data.



---

# Chapter 9

## Accessories Installation

---

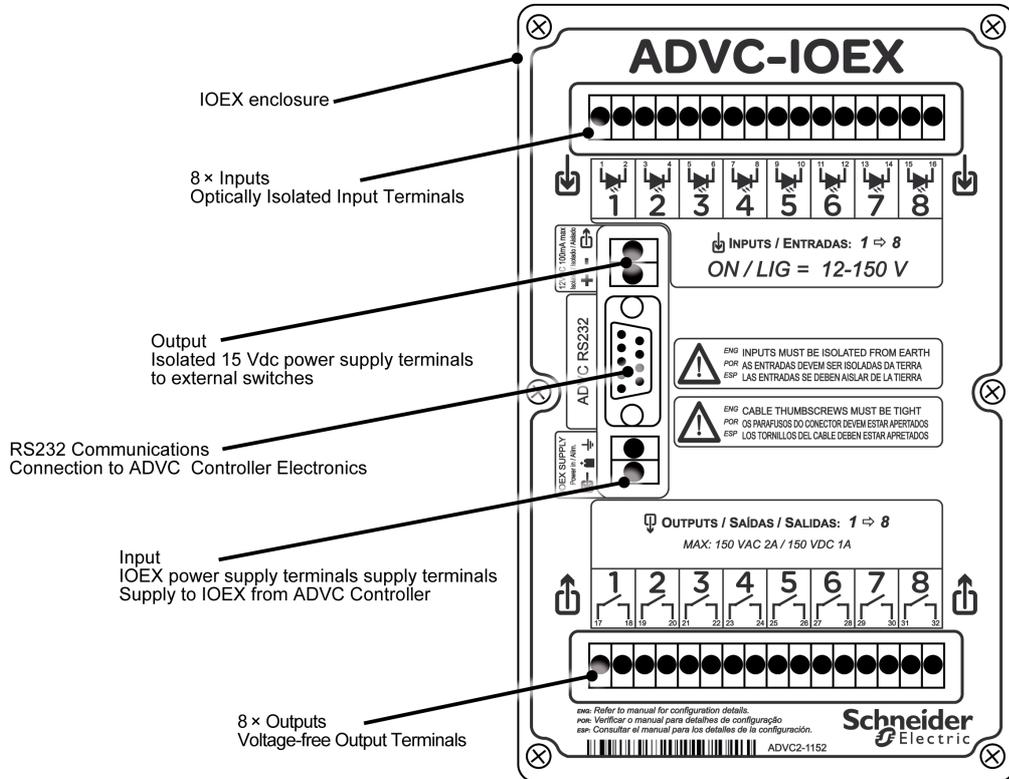
### What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Input Output Expander Module (IOEX)	82
Fast Trip Input Module (FTIM)	85
IOEX Electrical Connections	88
FTIM Electrical Connections	90

## Input Output Expander Module (IOEX)

The IOEX is an ADVC Controller Range accessory that accepts external control signals from third-party devices. It provides optically isolated inputs and voltage-free outputs. These allow connection of an external protection relay or Remote Terminal Unit (RTU). The electronic circuit is installed in a die cast, sealed enclosure which is attached to the upper accessory mounting tray of an ADVC **ULTRA** controller.



### IOEX Compatibility

The IOEX is compatible with the **ULTRA** model of the ADVC Controller range where the upper accessory tray is used to mount the IOEX module. The controller electronics includes a regulated power supply for the IOEX module/s. Connection to the power supply is via two terminals mounted on the side accessory tray.

RS-232 communications is used to interface the IOEX module/s to the control electronics.

The ADVC **ULTRA** model includes the following features to accommodate the IOEX module/s:

- Upper accessory tray for up to two IOEX modules
- Additional holes in the base of the controller for IOEX cable entry.
- Cable tie point on the cubicle side helps to protect the cables.

**NOTE:** Shielded cable (not supplied) for external connections and the EMC gland are essential for reliable operation.

### Parts Supplied with The IOEX

The following parts are supplied with each IOEX module:

- 1 x IOEX module
- 1x RS-232 cable
- 1 x Power cable
- 4 x MS stainless steel screws and washers.
- 1 x EMC cable gland

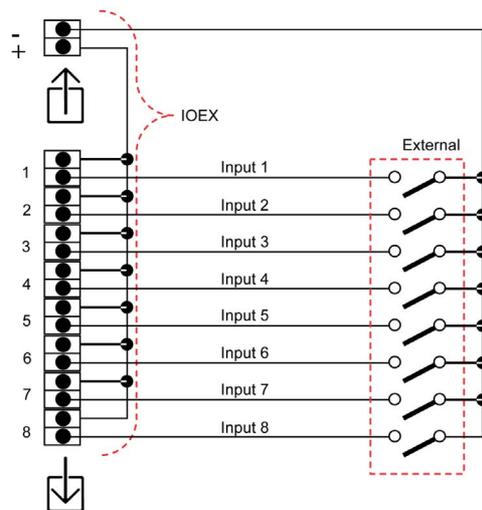
## IOEX Specifications

Isolated power supply output:	12–15 Vdc 100 mA max
IOEX power supply input:	18–36 Vdc, 200 mA max. Supplied by controller electronics.
Optically isolated inputs:	Eight inputs per IOEX module. ON=12–150 Vdc, 12–150 Vac. OFF=0–3 Vdc, 0–3 Vac
Voltage-free outputs:	Eight outputs per IOEX module. 150 Vdc at 1 A max 150 VAC RMS at 2 A Non-inductive max.
Dimensions [mm]:	188 high, 119.5 wide, 37 deep.
Controller connection:	RS232–DB9 Male/Female cable (part number ADC–640).

## IOEX Electrical Connections

### Connecting Inputs Using Built-in Isolated Supply

The IOEX has a built-in isolated power supply that can be used as field excitation voltage. The following connection diagram describes using this DC voltage as a source to supply the external switches.



## NOTICE

### RISK OF UNEXPECTED INPUT ACTIVATION

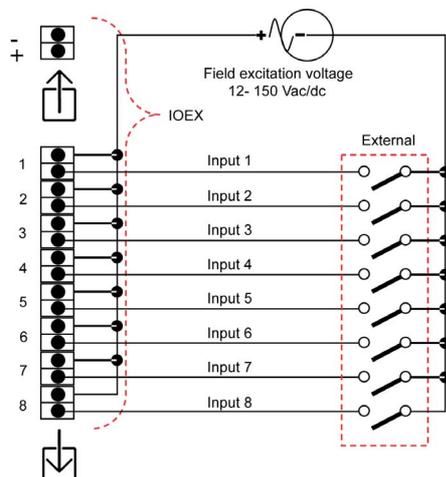
Isolate the field excitation power supply from earth

Failure to follow these instructions can result in equipment damage.

### Connecting Inputs Using an External Source

It is also possible to use a custom AC or DC source for field excitation of the external switches. This supply must be isolated from earth.

Field excitation voltage: 12 Vac/dc up to 150 Vac/dc.



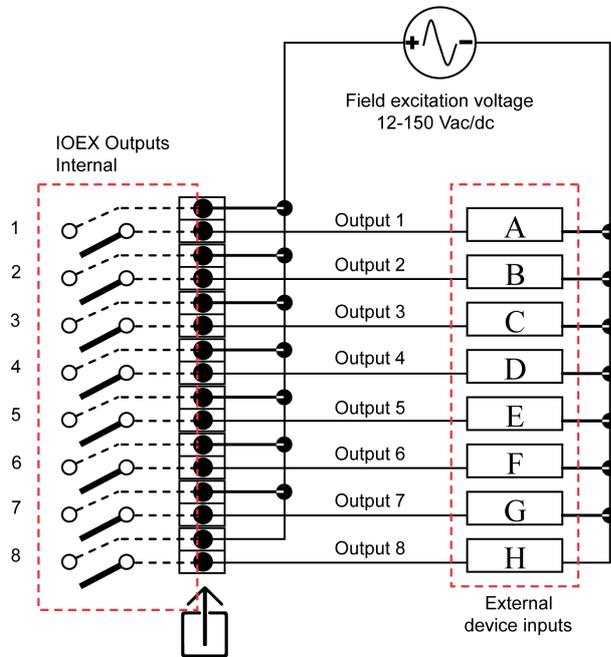
## NOTICE

### RISK OF UNEXPECTED INPUT ACTIVATION

- Field excitation must not be provided from the battery nor the radio power supply.
- Isolate the field excitation power supply from earth or use double pole switching for all inputs.

Failure to follow these instructions can result in equipment damage.

### IOEX Voltage-Free Outputs



## NOTICE

### RISK OF UNEXPECTED INPUT ACTIVATION

- Field excitation must not be provided from the battery nor the radio power supply.
- Isolate the field excitation power supply from earth or use double pole switching for all inputs.

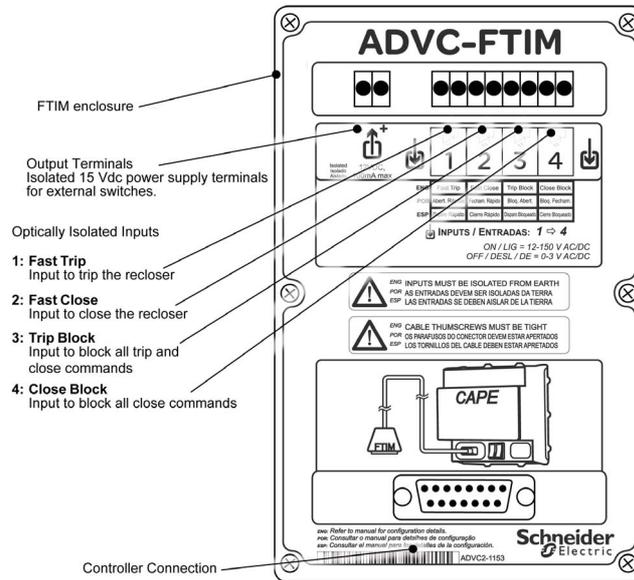
Failure to follow these instructions can result in equipment damage.

## Fast Trip Input Module (FTIM)

### General

The FTIM is an ADVC Controller range accessory that accepts external control signals from third-party devices. It provides optically isolated inputs. These allow connection of an external protection relay or Remote Terminal Unit (RTU). The electronic circuit is installed in a die cast, sealed enclosure which is attached to the upper accessory mounting tray of an ADVC **ULTRA** controller.

It is possible to interface external trip, close, or block signals to the recloser controller via the FTIM.



### FTIM Compatibility

The FTIM is compatible with the ADVC Controller range. If a controller is to be used with an FTIM, a connection cable for the module has to be included during manufacturing. It is therefore necessary to specify the intended use of an FTIM when ordering the controller. Note this connection cable cannot be retrofitted in the field.

Part Number	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
86xxxx2xxx	8	6	x	x	x	x	2	x	x	x
86xxxx3xxx	8	6	x	x	x	x	3	x	x	x
86xxxx5xxx	8	6	x	x	x	x	5	x	x	x

The part number has to start with **86** and the 7th digit must be a **2, 3 or 5**.

### Parts Supplied with The FTIM

The following parts are supplied with each FTIM.

- 1 x FTIM module
- 4 x M5 stainless steel screws
- 4 x flat washers and 4 x spring washer
- 1 x EMC cable gland

### FTIM Specifications

Isolated power supply output	12–15 Vdc, 100 mA max
Optically isolated inputs:	ON = 12–150 Vdc, 12–150 Vac
Dimensions (mm)	188 high, 119.5 wide, 37 deep.
Dimensions (mm)	Shielded cable with shielded 15-pin D-type connector

## IOEX and FTIM Installation

The IOEX and/or FTIM must be fitted to the accessory mounting tray

### 1. Removing and installing the mounting tray:

The upper accessory mounting tray can be removed in three steps:

- Undo and remove the self-locking nuts and washers
- Rotate the accessory tray to the slide-out position by lifting the bottom of the tray away from the cubicle; and
- Slide the tray to the left.



To install the upper tray, locate the accessory tray hinges to the left of the brackets in the top corner of the cubicle. Use the corner as a guide and slide the tray to your right. The self-locating hinges guide the tray into the brackets. Continue to slide the tray until the hinges are completely inside the brackets. Rotate the tray into the lock-down position and fasten the nuts.

### 2. Attaching the IOEX:

- Remove the upper accessory mounting tray from the ADVC **ULTRA** cubicle;
- The design of the mounting tray provides flexibility in terms of how the device is mounted.
- It is recommended that Nyloc nuts be used for fastening the device where possible.
- Slot width on the tray is 6 mm; bolts may require stacking mud-guard washers with standard washers for bolts smaller than M5. For example, for M3 bolts, it is recommended to use M5 mud-guard washers, M3 flat washer, and a M3 Nyloc nut.
- Holes provided on the customer tray act as a guide holes to identify the equipment position for installation. It is recommended that at least one guide hole is used for installing the device.
- Fit the tray containing the IOEX in the upper accessory mounting space using the existing mounting points. Refer below figure for Accessory tray removal.



Accessory tray mounting provisions

### If Connecting an IOEX

#### 3. Connect the IOEX to the controller:

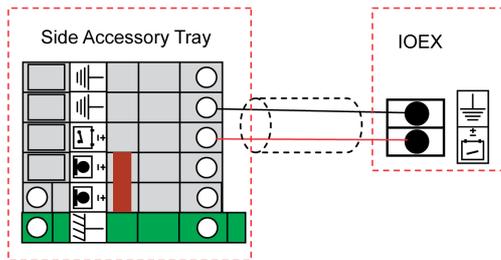
- Connect the IOEX power supply lead to the terminals on the side accessory tray. The terminals are marked with the following symbols.



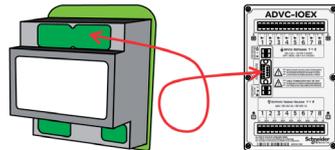
Ground Terminal



IOEX Positive power terminal



- Using the RS233 cable (ADC-640), connect the IOEX/WSOS Port on the ADVC Controller to the IOEX.
- Before you can use the IOEX, make IOEX available in the WSOS Feature Selection tool, download the configuration map, and select the IOEX communication port. For more information, refer the ADVC Operation Guide (ADVC2- 1160) and Configurable IOEX manual (N00-685).



## ⚠ WARNING

### RISK OF EQUIPMENT DAMAGE

When connecting the FTIM to the CAPE, the controller must be switched off to avoid unwanted trip/close operation.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## NOTICE

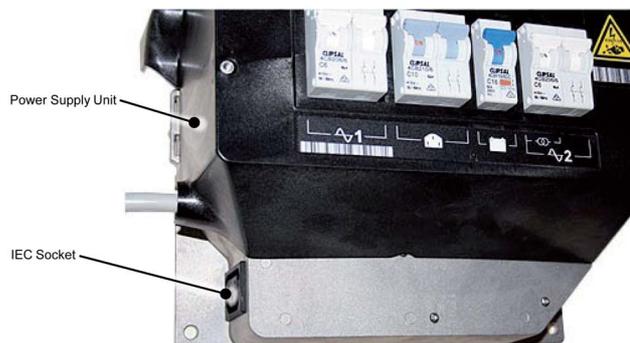
### RISK OF UNEXPECTED INPUT ACTIVATION

Field excitation must not be provided from the battery nor the radio power supply.

**Failure to follow these instructions can result in equipment damage.**

#### 4. If Connecting an FTIM

- Turn off power to the controller.



- Connect the shielded 15-pin D-connector to the FTIM. Fasten the connector properly to ensure a reliable connection.

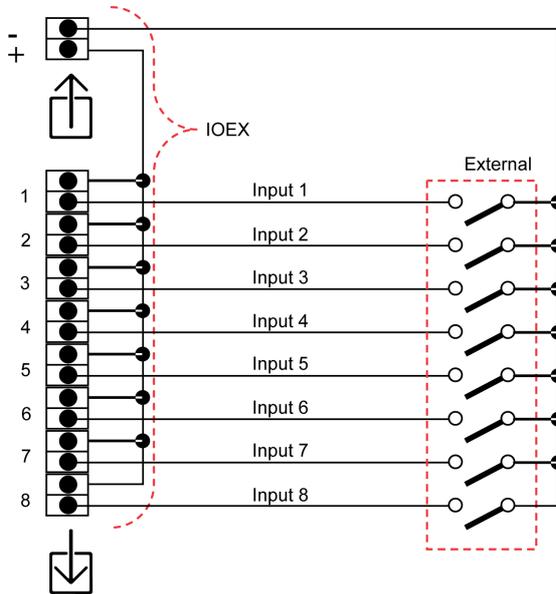


- Turn all power to the controller on when the installation is complete.

## IOEX Electrical Connections

### Connecting Inputs Using Built-in Isolated Supply

The IOEX has a built-in isolated power supply that can be used as field excitation voltage. The following connection diagram describes using this DC voltage as a source to supply the external switches.



### **NOTICE**

#### **RISK OF UNEXPECTED INPUT ACTIVATION**

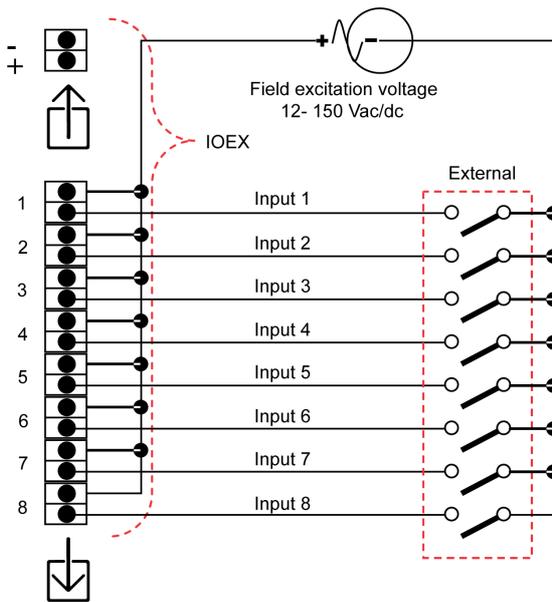
Isolate the field excitation power supply from earth

**Failure to follow these instructions can result in equipment damage.**

### Connecting Inputs Using an External Source

It is also possible to use a custom AC or DC source for field excitation of the external switches. This supply must be isolated from earth.

Field excitation voltage: 12 Vac/dc up to 150 Vac/dc.



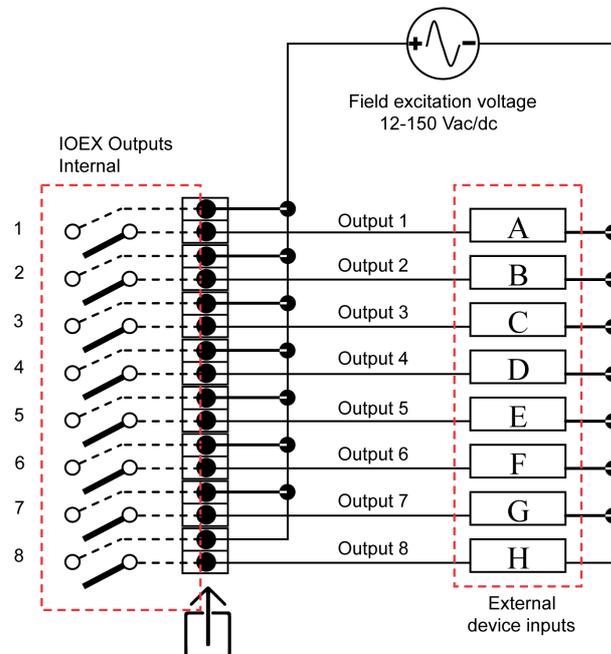
## NOTICE

### RISK OF UNEXPECTED INPUT ACTIVATION

- Field excitation must not be provided from the battery nor the radio power supply.
- Isolate the field excitation power supply from earth or use double pole switching for all input.

Failure to follow these instructions can result in equipment damage.

### IOEX Voltage-Free Outputs



## NOTICE

### RISK OF UNEXPECTED INPUT ACTIVATION

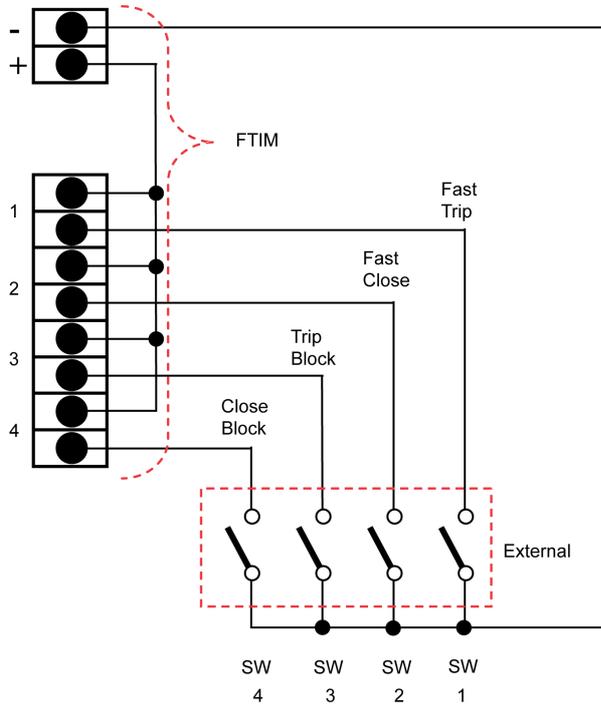
- Field excitation must not be provided from the battery nor the radio power supply.
- Isolate the field excitation power supply from earth or use double pole switching for all input.

Failure to follow these instructions can result in equipment damage.

## FTIM Electrical Connections

### Using The Built-in Isolated Supply

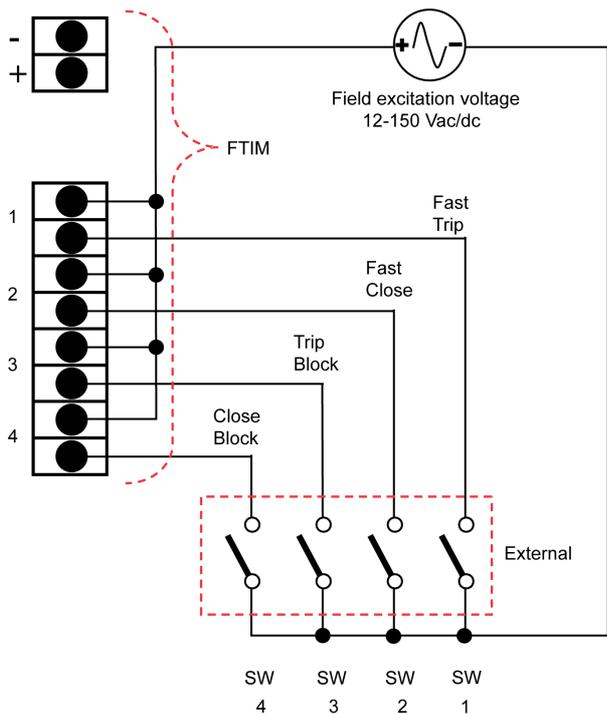
The FTIM has a built-in isolated power supply that can be used as field excitation voltage. The following connection diagram describes using this DC voltage as a source to supply the external switches.



### Using an External Source

It is also possible to use a custom AC or DC source for field excitation of the external switches. This supply must be isolated from earth.

Field excitation voltage: 12 Vac/dc up to 150 Vac/dc.



## NOTICE

### RISK OF UNEXPECTED INPUT ACTIVATION

- Field excitation must not be provided from the battery nor the radio power supply.
- Isolate the field excitation power supply from earth or use double pole switching for all input.

Failure to follow these instructions can result in equipment damage.

### Shielded Cable

For the external connections, shielded cable with the following main characteristics is recommended:

#### Operating Temperature:

-55 °C to +105 °C

#### Voltage Rating:

600 V

#### Product Description:

- Conductor: stranded tinned copper
- Area Conductor: 0.22 mm<sup>2</sup>
- External Diameter: 6-12 mm
- Screen Diameter: 5 mm min
- Insulation: Colour-Coded PVC
- Shield: Braided Tinned Copper (90 % coverage)
- Jacket: PVC



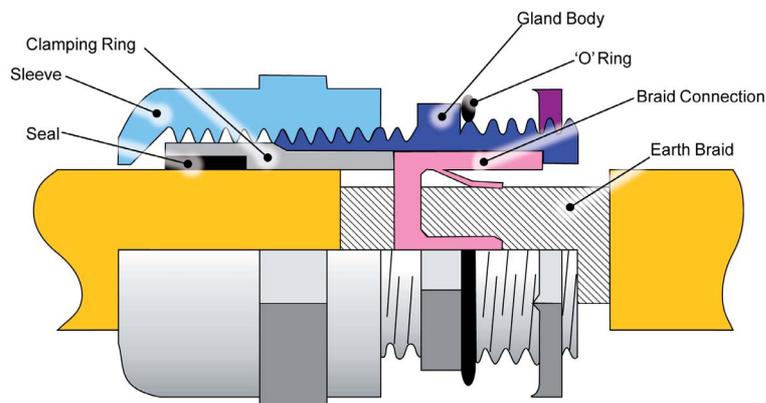
Picture of the shielded cable (not supplied)

### Customer Cable Installation

#### EMC Gland Specification

An M20 EMC cable gland with the following main characteristics is required:

- Diameter, cable max: 12 mm
- Diameter, cable min: 6 mm
- Diameter, cable screen min: 5 mm
- Material: Brass
- Plating: Nickel
- Thread size: M20
- Length, thread: 8 mm
- IP Rating: IP68



## ***NOTICE***

### **UNEXPECTED BEHAVIOUR**

Correct installation of the EMC gland is essential for reliable operation.

**Failure to follow these instructions can result in equipment damage.**

## ***NOTICE***

### **RISK OF EQUIPMENT DAMAGE**

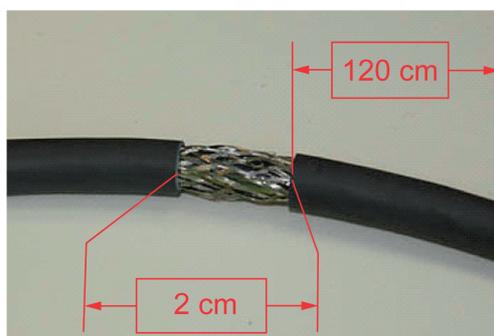
Do not push the cable in the opposite direction, doing so damages the gland.

**Failure to follow these instructions can result in equipment damage.**

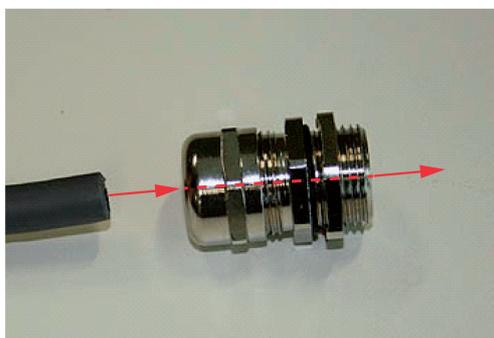
### **EMC Gland Installation**

Follow the following procedure for the EMC gland installation:

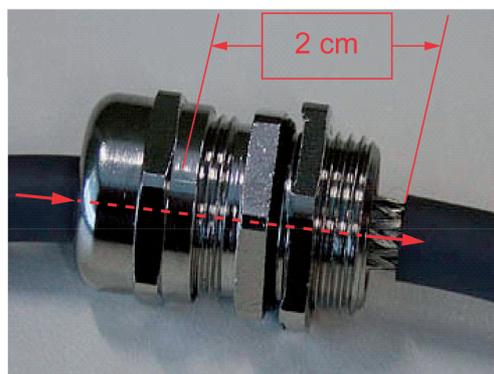
1. At 120 cm from the cable-end that is connected to the IOEX/FTIM, remove 2 cm of the plastic sheath to expose the earth braid.



2. Push the end of the cable that is connected to the IOEX/FTIM through the cable gland in the direction as shown.



3. Continue pushing the cable through the gland, until the earth braid aligns with the gland.



4. Ensure that the earth braid is in contact with the braid connection ring in the gland.

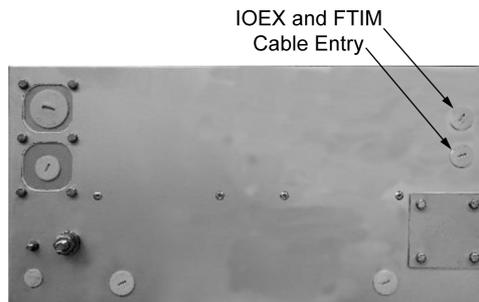


**NOTE:** Shielded cable is essential for reliable operation. Refer figure Shielded Cable.

5. Ensure that the seal and clamping mechanism is overlapping with the plastic sheath. Tighten the gland sleeve to firmly grip the cable in place.



6. Select a 20 mm hole in the base of the controller. The two holes on the right-hand side are provided for this purpose.



7. Remove the plug and fit the cable with gland.



#### Cable termination

- Use cable ties to fix the cable to the cubicle wall.
- Cut the cable to the appropriate length, and terminate the cable at the IOEX/FTIM connectors.

**NOTE:** Auxiliary power supply 1 is used to supply power to the GPO socket.

## General Purpose Outlet (GPO)

The GPO allows the user to power extra devices such as a laptop computer while operating the ADVC Controller.

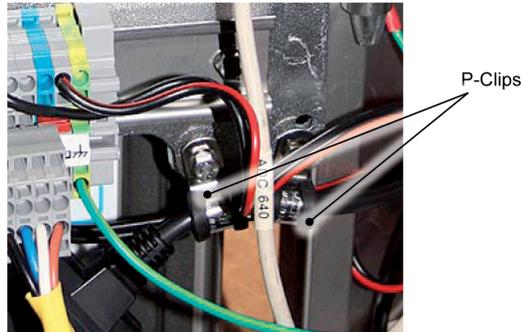
### Compatibility

Controller: ADVC **ULTRA** and **COMPACT**

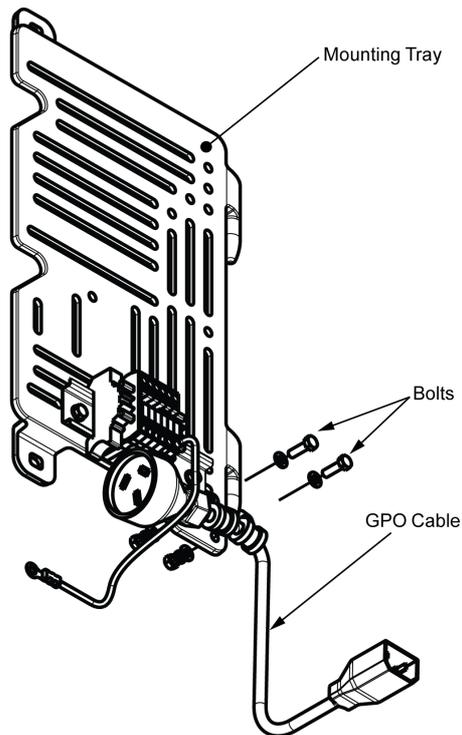
Power Supply: Models equipped with the IEC power outlet option

### GPO Cable Installation

- Remove the side accessory mounting tray.
- Fit the two P-clips around the GPO cable.



- Using the bolts provided, fix the cable to the accessory mounting tray.



- Install the accessory mounting tray in the normal position.

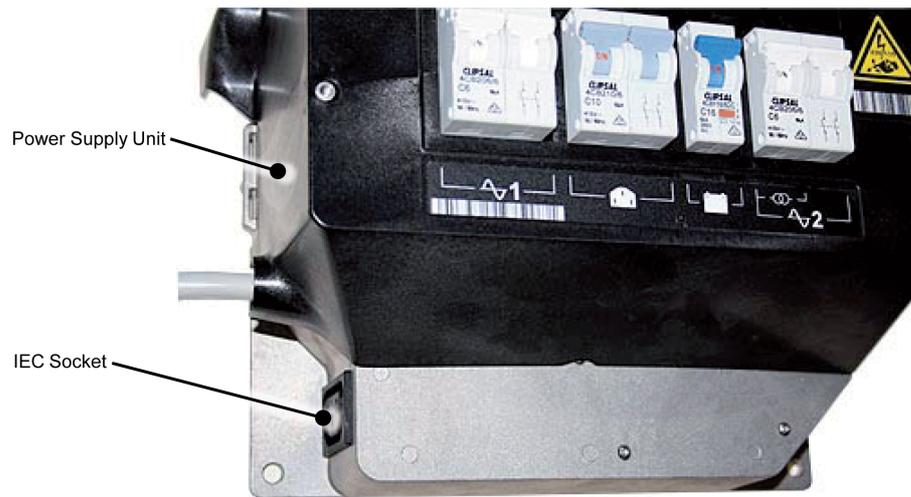
## **⚠ DANGER**

### **HAZARD OF EXPLOSION**

Rate the auxiliary 1 power source appropriately to provide GPO current required.

**Failure to follow these instructions will result in death or serious injury.**

- Plug the IEC male cable end connector into the female connector on the side of the power supply module



### GPO Cable Ratings

Voltage: 110 Vac or 240 Vac

Current: 2 A max.



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# Chapter 10

## Maintenance

---

### What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Introduction	98
Abnormal Operating Conditions	100

## Introduction

### Switchgear Maintenance

Maintenance can be carried out using standard electricians' and mechanics tools. No user maintenance of the switchgear mechanism is required.

The switchgear should be returned to the manufacturer for refurbishment, if the mechanical duty or breaking duty is exceeded. This is checked by examining the remaining contact life on the O.I. When the remaining contact life in any phase approaches zero, the switchgear has reached the end of its life and must be replaced.

**NOTE:** A alert message is displayed in the event log when the remaining contact life reaches 20 %.

Every five years the bushing should be checked, cleaned if necessary and the pointer checked to ensure that it is free from mechanical obstructions. In areas of high atmospheric pollution more frequent cleaning may be appropriate.

### ADVC Maintenance

Maintenance of the ADVC is required for every five years. The manufacturer recommends the work described below.

<b>⚠ CAUTION</b>
<b>UNPROTECTED OUTPUTS</b>
Avoid water entering into the circuit breakers or general power outlet when working on the ADVC with the door open during heavy rain.
<b>Failure to follow these instructions can result in injury or equipment damage.</b>

### Cleaning

Check for excessive dirt on the cubicle, particularly the roof, and clean off. Ensure that the mesh covering the air vents and the water drainage holes in the base are clean.

### Battery Replacement

<b>⚠ DANGER</b>
<b>HAZARD OF EQUIPMENT DAMAGE</b>
<ul style="list-style-type: none"><li>• These batteries are capable of supplying high currents. Always turn off the battery circuit breaker before connecting or disconnecting the batteries in the cubicle.</li><li>• Do not leave flying leads connected to the battery.</li></ul>
<b>Failure to follow these instructions will result in death or serious injury.</b>

**NOTE:** Ensure that battery polarity is correct.

Battery replacement is recommended after a period of five years. For more information, refer Battery Care ([see page 99](#)).

The procedure is:

1. Turn off the battery circuit breaker.
2. Unplug batteries and replace with new batteries.
3. Turn on the battery circuit breaker and check that **BATTERY NORMAL** status is restored via:

 **System Status → Switchgear Status → S**

e.g.

```
----- SWITCHGEAR STATUS ----- S
Work Tag OFF
Aux Supply Normal
SWGR Connected
Battery Normal 27.5V
SWGR Data Valid
```

or

 **Operator Menu → Switchgear Status → Switchgear Data → Battery Status**

e.g.

---

## SWITCHGEAR DATA

### Battery Normal 27.3V

#### With Battery Heater Accessory

**NOTE:** Ensure that battery polarity is correct. Battery heater breakdown is reported in the Event Log.

Where the battery heater accessory has been fitted the following procedure should be followed:

1. Turn off the battery circuit breaker.
2. Disconnect batteries and heater.
3. Open velcro straps and open heater mat. There is no need to remove mat.
4. Remove batteries and replace with new batteries.
5. Return the heater mat to its original position, close straps.
6. Reconnect batteries and heater.
7. Turn on the battery circuit breaker and check that the "Battery Normal status", is restored. For more information, refer Battery Replacement (*see page 98*)

#### Door Seal

Check the door sealing rubber for perishing or undue hardening. If necessary, renew the seal.

### Battery Care

The battery is predicted to provide good performance for the recommended five-year service period. This is based on the battery manufacturer data. No battery warranty is given by the manufacturer of the ADVC.

Once in service, batteries need little care. Procedures for storage and other contingencies are as follows:

- Batteries should be stored at a temperature of between 0 °C to 30 °C (32...86 °F) and cycled every six months. Batteries should be stored for a maximum of one year.
- Batteries should be cycled before putting into service if they have not been cycled within three months. When shipped by the manufacturer the batteries have been cycled within the previous 30 days.
- If the batteries become exhausted in service and are left for more than two weeks without auxiliary supply being restored to the ADVC they should be taken out, cycled and have their capacity checked before being returned to service.

To cycle a battery, discharge with a 10 Ohm 15 Watt resistor to a terminal voltage of 10 V. Next, recharge it with a voltage regulated DC supply set to 13.8 V. A 3 A current limited supply is appropriate.

More information on the battery care is available from the battery manufacturer.

## Abnormal Operating Conditions

### Introduction

The operation of the capacitor charging inverter can be affected under abnormal conditions, such as when the battery capacity is low. The following features are used to protect the ADVC in this situation while still allowing the switchgear to keep operating.

#### Low-Power Mode

When the batteries are nearly exhausted, the ADVC may modify its capacitor charging mode from normal to low power. In low-power mode, the controller takes longer to charge the capacitors and the radio supply is shut down. A **Low-Power Mode** event is logged, whenever this happens.

When a protection trip occurs in low-power mode, the sequence is extended, if the capacitors cannot be recharged quickly. Operator close and trip operations can be performed, even at a longer time interval than normal. If an operator trip or close request is denied, a **Cap Chrg** event is logged.

To return to normal power mode, the auxiliary supply must have been switched back on, the battery must be normal, and a minimum of 15 minutes must have elapsed. If, the ADVC stays in Low-Power Mode the batteries may have to be replaced.

#### Excess Close Operations

During testing, it is possible to carry out so many trip/close operations that the capacitor charging inverter shuts itself down before it overheats. It takes more than 20 operations within a minute to do this and is not going to happen, while in service (it happens only during excessive testing).

When this happens the inverter shuts down for 5 minutes and a **Cap Excess Closes** event is logged. During this time, all trip/close requests are denied.

### Defect Finding

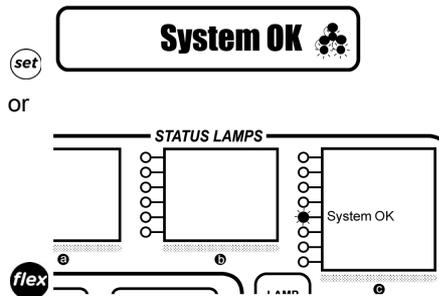
#### ADVC Controller Check

Defect finding within the ADVC involves determining whether the detected defect lies in the electronic modules, the wiring or elsewhere. The electronic modules are user replaceable items. Other detected defect require the ADVC to be returned to the factory.

A suggested defect detection approach is as follows:

1. If the System OK LAMPs, located on the operator interface (O.I.), are flashing, then the CAPE microprocessor is running. If the O.I. does not operate, then follow Step 4.

**System OK** LAMPs are located in different places on the **seVUE** and **flexVUE** panels:



**NOTE:** Default location can be configured differently.

2. If the display is operating, check the

**set** System Status → Switchgear Status → S

**flex** Operator Menu → Switchgear Status → Switchgear Data → Battery Status

and

**flex** Operator → Switchgear Status → Switchgear Data → Aux Supply Status

Page for an indication of any power supply problems (Aux Supply Fail and/or Battery off), which can be traced and rectified.

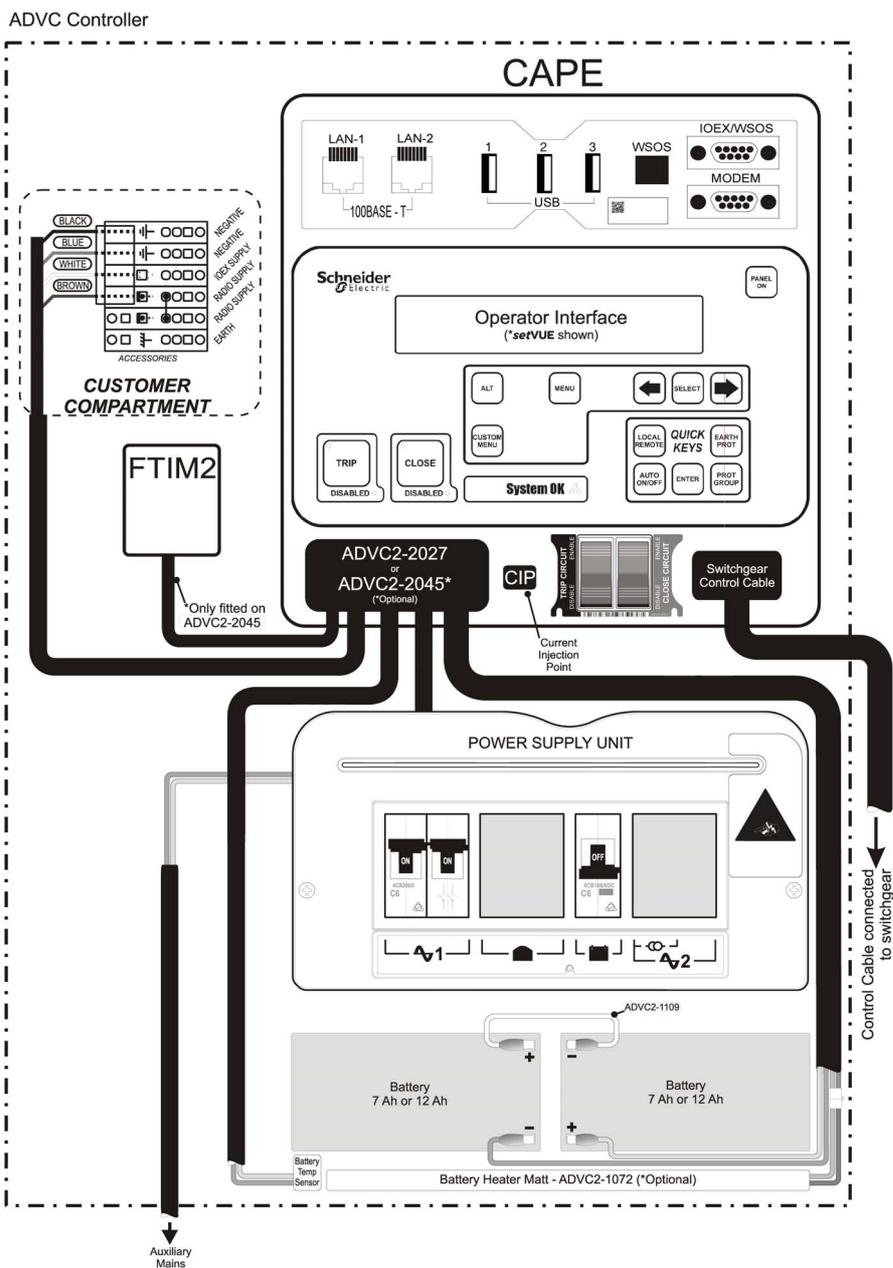
3. If the System OK lamps is not flashing, check for loss of power. Check that the battery circuit breaker is on and that full battery voltage is present at the terminals. Check the presence of auxiliary supply on the auxiliary supply circuit breaker. Rectify if a problem is discovered.
4. If power supply is present, then attempt to go on-line with WSOS to determine whether the CAPE is functioning correctly. Replace the CAPE if required.
5. If this does not rectify the problem, Then the ADVC Controller should be returned for factory repair.

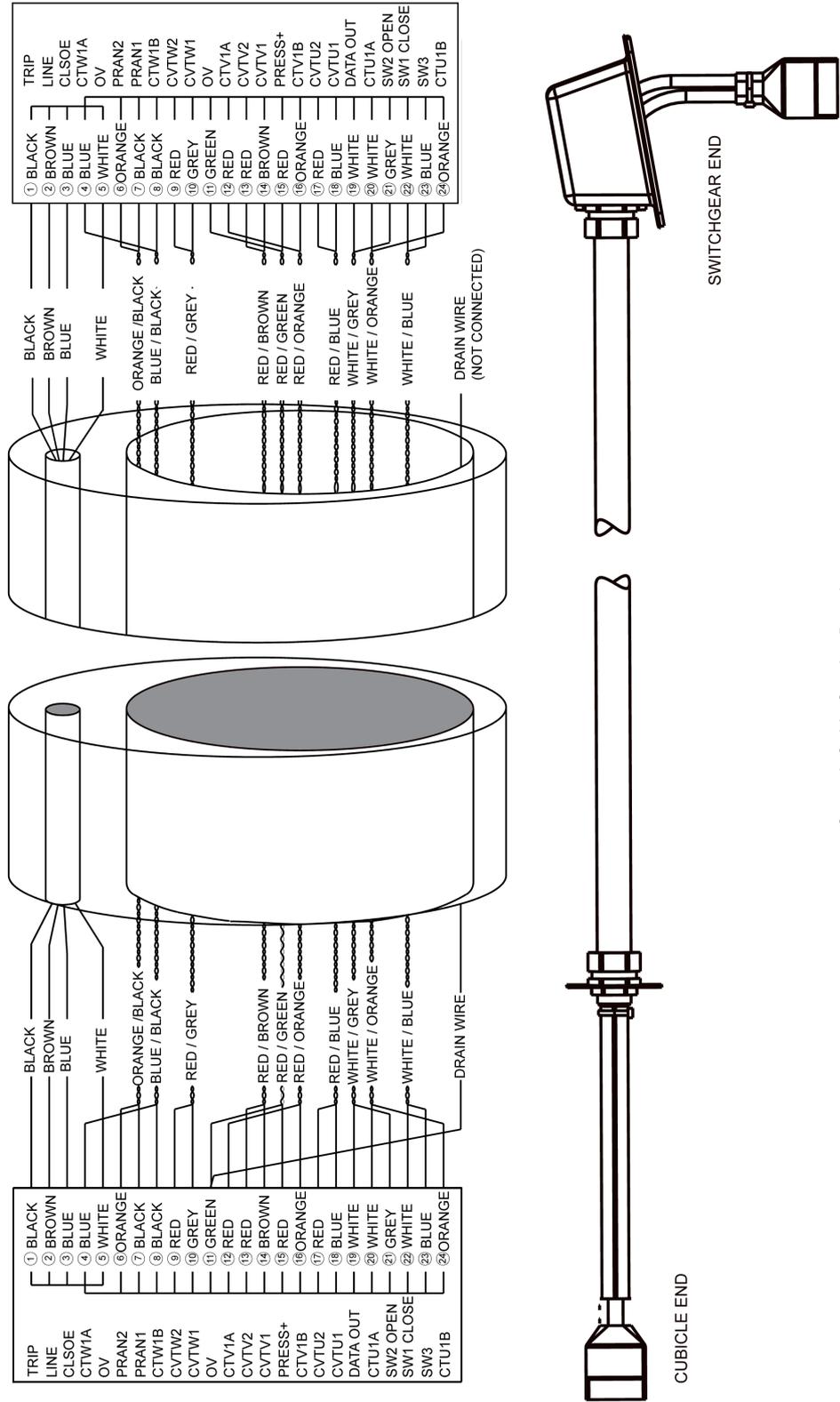
## Replacement of Electronic Modules and Upgrades

Electronic modules are user replaceable. Care should be taken to avoid damage to the modules while they are outside the cubicle and replacement should only be carried out by competent personnel.

NOTICE
INOPERABLE EQUIPMENT
Removal of parts from modules will void the warranty.
Failure to follow these instructions can result in equipment damage.

CAPE firmware can be upgraded through WSOS. Refer to the Operator Manual for further details.





Control Cable Service Drawing

---

# Chapter 11

## Ratings and Specifications

---

### What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Equipment and Crating Dimensions	104
ADVC	106

## Equipment and Crating Dimensions

Equipment Weights	
Part	Weight kg (lbs)
Control cable.	6 (13)
Control cubicle	37 (81) (without accessories and with 7 Ah batteries)
HV cables (185mm <sup>2</sup> Al cables, qty 2, length as ordered) complete with bushing boots.	26 (57)
Pole Mounted ACR	118 (261)
Pole mounting bracket	24 (53)
Surge Arrester mounting Bracket	16 (36)
Sundry mounting items	8 (18)
Gross weight of crate	297 (655)
Dimensions mm (ins)	
Cubicle (for more information, refer Appendix B ( <a href="#">see page 121</a> ))	1000 x 375 mm x305 mm (39.4 in x 14.8 in x12.0 in)
Crate Dimensions	
Width	1150/45.3
Depth	1150/45.3
Height	57/22.4

## ACR

Rated maximum voltage	24 kV
Rated continuous current	400 Amp
Rated frequency	50/60 Hz
Rated mainly active (0.7 pf) breaking capacity	400 A
Rated cable charging interrupting current	25 A
Rated line charging interrupting current	5 A
Rated transformer magnetizing interrupting current	22 A
<b>Rated symmetrical interrupting current</b>	6 kA
Rated asymmetrical making current (peak)	15 kA
Rated symmetrical making current (RMS)	6 kA
<b>Short time current for 3 seconds</b>	6 kA
Short time current recovery time	180 s
Rated impulse withstand voltage	125 kV
Power frequency withstand phase/earth and across interrupter	60 kV
Opening/closing mechanism	Latching magnetic actuator
D.C. resistance terminal/terminal	<120 micro-ohm
Tank construction	Stainless steel
Bushings/VI housings	Outdoor cyclo-aliphatic epoxy resin
Maintenance interval	5 years
Earthing	12 mm stud provided
Applicable standards	ANSI C37.60

## Basic Timings

Contact close from energization of close coil <sup>a</sup>	< 50 ms
Opening time <sup>a</sup>	< 35 ms
Interrupting time <sup>a</sup>	< 45 ms
Fault clearing time on instantaneous protection for fault > 4 x setting current	< 70 ms
Time to contact part from receipt of trip command by operator, telemetry protocol, or IOEX	< 150 ms
Time to contact touch from receipt of close command by operator, telemetry protocol, or IOEX	< 150 ms
<b>(a)</b> The precise definition of these times is given in ANSI C37.60.	

## Breaking Duty

The duty limits of the circuit breaker are shown in the following table.

Mechanical operations	10000
Contact wear - 400 A	10000
Contact wear - 2 kA	1955
Contact wear - 6 kA	217

Circuit breaker is rated for ANSI C37.60 duty cycle. Contact wear is automatically calculated for each interrupter by the control cubicle based on fault current and mechanical operations.

The remaining contact life is shown on the operator control panel.

## Duty Cycle

Maximum allowable duty cycle at full short current rating:

- Open-0.5 s-Close.
- Open-2 s-Close.
- Open-2 s-Close.
- Open followed by 300 second recovery time.

## Terminal Clearance/Creepage

Insulator material type	Outdoor Cyclo-aliphatic epoxy resin
Creepage distance	780 mm
Taut String clearance phase/earth	295 mm

## Current Transformers

There is no access to current transformer connections on the equipment. This data is supplied for information only.

Ratio	2000:1
Accuracy 2...400 A	±1 %
Accuracy 400...6000 A	±5 %

## Environmental

Operating temperature <sup>a</sup>	-30 °C to +50 °C
Operating humidity	0 to 100 %
Operating solar radiation	1.1 kW/m <sup>2</sup> max
Operating altitude <sup>b</sup>	3000 m max
<b>(a)</b> Temperature range depends on control cubicle versions.	
<b>(b)</b> Altitudes above 1000 meters must be de-rated per ANSI C37.60.	

## ADVC

### General Specifications

Cubicle material	<b>COMPACT</b>	304 stainless steel
	<b>ULTRA</b>	316 stainless steel
Cubicle shell sealing	<b>COMPACT</b>	IP 54
	<b>ULTRA</b>	IP 65
Electronic enclosure sealing		IP 65
Wind loading resistance of structure		>160 km/hr
Wind loading on door when latched in open position		>60 km/hr
Angle of door opening		135 °
Standard ambient operating temperature range		-10 °C...50 °C
Extended operating temperature range (battery heater required) <b>ULTRA</b> Only		-40 °C...50 °C
Electronics temperature range		-40 °C...50 °C
Maximum radiation		1.1 kW/m <sup>2</sup>
Humidity		0...100%
Standard control cable length <sup>a</sup>		7 m (23 in)
Maximum vertical separation from ACR with standard control cable.		5 m (16.4 in)
Maintenance interval <sup>b</sup>		5 years
Auxiliary supply voltage (LV AC mains supply)		As Ordered 115/230 Vac nominal -20% to +10%
Required auxiliary supply rating		100 VA
Battery (With battery heater option, 12AH batteries are standard.)		2 x 12 V 7.2 Ah
Battery hold up time from fully charged at 250C		28 h with 7 Ah 48 h with 12 Ah
Capacity available for communications, holds up time (no heater, OCP, or IOEX) 13.8 V TX:2.1 A, 15 min, RX 320 mA		20 h
Battery replacement interval <sup>b</sup>		5 years
Battery Low Voltage <sup>c</sup>		23 V
Battery High Voltage <sup>c</sup>		33 V
Earthing <sup>d</sup>		10 mm earth stud
Battery Heater Power (where fitted)		10 W
Battery Heater Element Life		30,000 h
<b>Radio/Modem</b>		
A radio or modem may be fitted by the manufacturer or by the utility, for remote communications. Space, power, and data interfaces are provided within the control cubicle.		
Radio/Modem Power Supply Voltage (set by user)		5...15 Vdc
Radio/Modem Power Supply Continuous Current <sup>e</sup>		3 A
Radio/Modem Power Supply Max Current		8 A for 30 s with 10% duty cycle
Radio/Modem Power Supply continuous power		45 W
Radio/Modem Power Supply peak power		120 W for 15 mins at 10% duty cycle
Radio/Modem Space on Radio Panel		300 x 250 x 150 mm
Radio/Modem Interface		Ethernet, USB 2.0, RS-232
Radio/Modem Power Shutdown Time (user configurable)		1...1440 min
Shutdown time increment		10 s
<b>Control Electronics</b>		
Continuous Primary current		800 A
Continuous secondary current		0.8 A
<b>(a)</b> Other control cable lengths available-4, 11 and 20 meters.		
<b>(b)</b> Battery replacement interval is influenced by environmental temperature.		
<b>(c)</b> Temperature compensated at 48 m V/°C.		
<b>(d)</b> Adhere to Earthing details as specified. For more information, refer Earthing (Grounding) ( <a href="#">see page 22</a> ).		
<b>(e)</b> For an external VT, the maximum continuous current drawn from the radio supply should be limited to 0.5 amps.		

Short time primary current	16 kA for 3 s
Short time secondary current	12 A for 3 s
Short time current recovery time	60 s
Required auxiliary supply rating	32 Vac, 100 VA
Real time clock hold time	20 days
Recloser Operations	20 in 1 min, 1 per minute thereafter
<p>(a) Other control cable lengths available-4, 11 and 20 meters.  (b) Battery replacement interval is influenced by environmental temperature.  (c) Temperature compensated at 48 m V/°C.  (d) Adhere to Earthing details as specified. For more information, refer Earthing (Grounding) (<a href="#">see page 22</a>).  (e) For an external VT, the maximum continuous current drawn from the radio supply should be limited to 0.5 amps.</p>	

## Controller EMC Type Tests

Immunity Tests			
Standard	Description	Application	Test Level
IEC 61000-4-2	Electrostatic Discharge	Contact	+/- 8 kV
		Air	+/- 15 kV
IEC 61000-4-3	Radiated Electromagnetic Field (Antennae transmitting 3M away)	Four faces (Door open)	10 V/m, 80 MHz-1000 MHz 10 V/m, 1000 MHz-2700 MHz
IEC 61000-4-4	Fast Transient (5ns/50ns 5 kHz, 15 ms burst 300 ms spaced)	A.C. Power Port	+/- 4 kV
		RS232 (WSOS)	+/- 4 kV
		RS232 (Modem)	+/- 4 kV
		USB (WSOS)	+/- 4 kV
		USB1 + USB to RS485 isolated converter	+/- 4 kV
		LAN 1	+/- 4 kV
		LAN 2	+/- 4 kV
		Umbilical port	+/- 4 kV
		IOEX2 port input	+/- 4 kV
		IOEX2 port output	+/- 4 kV
FTIM2 port	+/- 4 kV		
IEC 61000-4-5	Surge	A.C. Power Port	+/- 4 kV line-to-earth, +/- 2 kV line-to-line, 1.25/50 µsec
		RS232 (WSOS)	+/- 4 kV, 1.25/50 µsec
		RS232 (Modem)	+/- 4 kV, 1.25/50 µsec
		USB (WSOS)	+/- 4 kV, 1.25/50 µsec
		USB1 + USB to RS485 isolated converter	+/- 4 kV, 1.25/50 µsec
		LAN 1	+/- 4 kV, 10/700 µsec
		LAN 2	+/- 4 kV, 10/700 µsec
		Umbilical port	+/- 4 kV, 1.25/50 µsec
		IOEX2 port input	+/- 4 kV, 1.25/50 µsec
		IOEX2 port output	+/- 4 kV, 1.25/50 µsec
FTIM2 port	+/- 4 kV, 1.25/50 µsec		

Immunity Tests			
Standard	Description	Application	Test Level
IEC 61000-4-6	Conducted Disturbances	A.C. Power Port	10 V RMS
		RS232 (WSOS)	10 V RMS
		RS232 (Modem)	10 V RMS
		USB (WSOS)	10 V RMS
		USB1 + USB to RS485 isolated converter	10 V RMS
		LAN 1	10 V RMS
		LAN 2	10 V RMS
		Umbilical port	10 V RMS
		IOEX2 port input	10 V RMS
		IOEX2 port output	10 V RMS
FTIM2 port	10 V RMS		
IEC 61000-4-8	Power Frequency Magnetic Field	Three axis X, Y, Z	100 A/m continuous, 1000 A/m for 1 s
IEC 61000-4-11	Voltage Dips and Interruptions	A.C. Power Port	Voltage dips - 0% 1 cycle, 40% for 10 cycles, 70% for 25 cycles, 80% for 250 cycles
			Voltage interruptions - 0% for 250 cycles
IEC 61000-4-12	Oscillatory Wave immunity test	A.C. Power Port	1 kV common mode, 0.5 kV differential mode
		Umbilical port	2.5 kV common mode
IEC 61000-4-16	Conducted Common mode disturbances 0-150 kHz (direct on L and N)	A.C. Power Port	30 V continuous, 300 V 1 sec, 50/60 Hz
		Umbilical port	30 V continuous, 300 V 1 sec, 50/60 Hz
IEC 61000-4-18	Damped Oscillatory Wave (Decaying waveform)	A.C. Power Port	2.5 kV common mode, 1 kV diff. @ 100 kHz and 1 MHz
		Umbilical port	2.5 kV common mode @ 100 kHz and 1 MHz

Emissions			
Standard	Description	Application	Test Level
EN61000-6-4	Emission for Industrial Environmental	A.C. Power Port + Enclosure	Class A
EN61000-3-2	Harmonics	A.C. Power Port (50 Hz & 60 Hz)	Class A
EN61000-3-3	Voltage Fluctuations and Flicker	A.C. Power Port (50 Hz & 60 Hz)	Pst<1, PI<0.65%, Dc<3.3%, Dmax<4%, Dt <3.3% for less 500 ms
FCC Part 15 Subpart B (Similar to EN61000-6-4 but American standard)	Radio Frequency Devices: Unintentional radiators	A.C. Power Port + Enclosure	Class A digital devices
		Mains set to 110 VAC 60 HZ	

## Power Systems Measurements

HV line measurements on all three phases are made as follows

Voltage Range (RMS Phase/Earth)	2...24 kV
Voltage Resolution	1 V
Voltage Accuracy <sup>a</sup>	2.5% ±25 V
Live Terminal Threshold Voltage range <sup>b</sup>	2...24 kV
Live Terminal Threshold Voltage setting resolution <sup>b</sup>	1 V
Live Terminal Threshold Voltage accuracy <sup>a,b</sup>	5% ±250 V
Live Terminal Threshold Hysteresis	-20%
Current Range (True RMS) <sup>c</sup>	1...800 A
Current Resolution	1 A
Current Accuracy <sup>a</sup>	2.5% ±2 A over range 1...800 A
Apparent Power Range	0 - 12 MVA
Apparent Power Resolution	1 kVA
Apparent Power Accuracy <sup>a</sup>	±5% over range 20...800 Amp
Real Power Range <sup>d, e</sup>	-12...12 MW
Real Power Accuracy <sup>a,e</sup>	±5% of apparent power
Real Power Resolution	1 kW
Reactive Power Range <sup>d</sup>	0...12 MVAR
Reactive Power Resolution	1 kVAR
Reactive Power Accuracy <sup>a</sup>	±5% of apparent power
Unsigned Power Factor	0.5...1.0
Power Factor Resolution	0.01
Power Factor Accuracy	±0.05
Measurement Filter Time Constant (Step Response)	2 s
Measurement Update Rate	0.5 s
<p><b>(a)</b> Includes accuracy of switchgear current and voltage transformers.  <b>(b)</b> Used for Live/Dead display, Live Load Blocking, and Loss Of Supply detection.  <b>(c)</b> Measurements are zeroed for currents less than lower value in range.  <b>(d)</b> In database for transmission by a protocol.  <b>(e)</b> Used to accumulate kWh reading for weekly maximum demand data.</p>	



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# Appendices

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## What Is in This Appendix?

The appendix contains the following chapters:

Chapter	Chapter Name	Page
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B	Dimensions	121



# Appendix A

## Replaceable Parts and Tools

### ACR and ADVC Part List

All the replacement parts are listed in the following table which are available from the manufacturer.

SI No.	Stock or Part Number	Part Description
<b>Manuals</b>		
1	998001511	INSTALL MANUAL RL SERIES ADVC ENG
2	998001506	INSTALL MANUAL U SERIES ADVC ENG
3	998001516	INSTALL MANUAL W SERIES ADVC ENG
4	998001508	INSTALL MANUAL E SERIES ADVC ENG
<b>ADVC Spares</b>		
5	998002003	ADVC CAPE FLEXVUE ENG
6	998002013	ADVC CAPE FLEXVUE ESP
7	998002023	ADVC CAPE FLEXVUE POR
8	998002235	ADVC CAPE SETVUE ENG
9	998002395	ADVC CAPE SETVUE ESP
10	998002825	ADVC CAPE SETVUE POR
<b>ADVC Spares</b>		
<b>Batteries</b>		
11	997000000	ADVC BATTERY 2X 12V 7.2AH STD CSB
12	998000055	ADVC BATTERY 2X 12V 12AH LRG CSB
13	998000056	ADVC BATTERY 2X 12V 12AH LRGP YUASA
14	998002050	ADVC BATTERY HEATER MAT
<b>Cubicle Enclosure</b>		
15	998002065	ADVC COMPACT DOOR NO DOOR LABEL
16	998002045	ADVC COMPACT ENCLOSURE NO DOOR LABEL
17	998002060	ADVC ULTRA DOOR - NO DOOR LABEL
18	998002040	ADVC ULTRA ENCLOSURE - NO DOOR LABEL
19	998002300	ADVC DOOR LABEL FLEXVUE ENG
20	998002310	ADVC DOOR LABEL FLEXVUE ESP
21	998002320	ADVC DOOR LABEL FLEXVUE POR
22	998002305	ADVC DOOR LABEL SETVUE ENG
23	998002315	ADVC DOOR LABEL SETVUE ESP
24	998002325	ADVC DOOR LABEL SETVUE POR
25	998002030	ADVC CUSTOMER TRAY
26	998002035	ADVC CUSTOMER TRAY & DINRAIL TBLOCK
27	998001025	ADVC DINRAIL TBLOCK FOR CUSTOMER TRAY
<b>Communications</b>		
28	997000115	ADVC COMS MODEM BNC CABLE KIT
29	998001041	ADVC COMS MODEM MAESTRO E200 E205XT02
30	997000165	ADVC COMS RADIOSUPPRESSOR 125-1000MHZ
31	998002055	ADVC FTIM FIELD INSTALL KIT 1X
32	998002070	ADVC IOEX3 FIELD INSTALL KIT 1X
33	998001110	ADVC IOEX/FTIM EXTRA MOUNT BRACKETKIT (Note: Only required when 3 IOEX/FTIMs required)

SI No.	Stock or Part Number	Part Description
<b>GPO Cables</b>		
34	998001075	ADVC GPO CABLE AUS SPARES KIT
35	998001090	ADVC GPO CABLE EU-A EUROPE CEE 7/5KIT
36	998001095	ADVC GPO CABLE EU-B EUROPE CEE 7/4KIT
37	998001085	ADVC GPO CABLE UK SPARES KIT
38	998001080	ADVC GPO CABLE US SPARES KIT
<b>Power Supply Units (PSU)</b>		
39	998002110	ADVC PSU COMPACT/ULTRA 115
40	998002100	ADVC PSU COMPACT/ULTRA 115 GPO
41	998002150	ADVC PSU COMPACT/ULTRA 115 INT
42	998002140	ADVC PSU COMPACT/ULTRA 115 INT GPO
43	998002115	ADVC PSU COMPACT/ULTRA 230
44	998002105	ADVC PSU COMPACT/ULTRA 230 GPO
45	998002155	ADVC PSU COMPACT/ULTRA 230 INT
46	998002145	ADVC PSU COMPACT/ULTRA 230 INT GPO
47	998002191	ADVC PSU ULTRA 115 DUAL FTIM
48	998002181	ADVC PSU ULTRA 115 DUAL FTIM GPO
49	998002130	ADVC PSU ULTRA 115 FTIM
50	998002120	ADVC PSU ULTRA 115 FTIM GPO
51	998002170	ADVC PSU ULTRA 115 FTIM INT
52	998002160	ADVC PSU ULTRA 115 FTIM INT GPO
53	998002196	ADVC PSU ULTRA 230 DUAL FTIM
54	998002186	ADVC PSU ULTRA 230 DUAL FTIM GPO
55	998002135	ADVC PSU ULTRA 230 FTIM
56	998002125	ADVC PSU ULTRA 230 FTIM GPO
57	998002175	ADVC PSU ULTRA 230 FTIM INT
58	998002165	ADVC PSU ULTRA 230 FTIM INT GPO
59	998002080	ADVC PSU TOROIDAL 115/230V-32V 100VA
60	997000150	ADVC & PTCC VARISTOR CNR-20D681K
<b>ADVC BRACKET FOR PTCC FRAME</b>		
61	998000125	ADVC BRACKET FOR PTCC FRAME
<b>USB Cables</b>		
62	998001045	ADVC USB CABLE
63	998000100	ADVC USB TO SERIAL CONVERTER
<b>Bare Terminal Kits for RL15KV BT</b>		
64	994000030	BT KIT RL2 2 HOLE PALM 6X
65	994000060	BT KIT RL2 2 HOLE PALM ANSI 6X
<b>HJ Connectors for U, E &amp; W Series</b>		
		<b>Spare Part HJ Connector for U &amp; W Series</b>
66	992000065	U/W SERIES HJ 400A 15TP 1X
67	992000060	U/W SERIES HJ 630A 30TP 1X
68	992000095	U/W SERIES HJ 630A 2 HOLE ANSI PALM 1X
<b>W Series HJ Connector</b>		
69	992000067	W SERIES HJ 400A 15TP 2X
70	992500062	W SERIES HJ 630A 30TP 2X
71	992000097	W SERIES HJ 630A 2 HOLE ANSI PALM 2X
<b>U Series HJ Connector</b>		
72	992000066	U SERIES HJ 400A 15TP 6X
73	992000061	U SERIES HJ 630A 30TP 6X
74	992000096	U SERIES HJ 630A 2 HOLE ANSI PALM 6X

SI No.	Stock or Part Number	Part Description
<b>E Series HJ Connector</b>		
75	995000005	E SERIES HJ 630A 6X
76	995000001	E SERIES HJ 630A 2 HOLE ANSI PALM 6X
77	995000003	E SERIES HJ 630A 4 HOLE ANSI PALM 6X
<b>Bushing Boots for N &amp; RL Series</b>		
78	990000337	BUSHING BOOT 27KV 630A 1X BOOT ONLY
79	990000332	BUSHING BOOTS KIT 27KV 630A 1X
80	990000331	BUSHING BOOTS KIT 27KV 630A 3X
81	990000330	BUSHING BOOTS KIT 27KV 630A 6X
82	990000335	BUSHING BOOTS KIT 27KV 630A 6X NOGREASE
83	990000309	BUSHING BOOTS KIT 38KV 800A 1X
84	990000306	BUSHING BOOTS KIT 38KV 800A 3X
85	990000305	BUSHING BOOTS KIT 38KV 800A 6X
86	990000308	BUSHING BOOTS KIT 38KV 800A 6X NOGREASE
87	990000345	BUSHING BOOT GREASE & SPANNER KIT
88	990000340	BUSHING BOOT GREASE DOW CORNING 7 18.1KG
89	990000325	BUSHING BOOT GREASE DOW CORNING 7 300G
90	990000322	BUSHING BOOTS CAULKING GUN RATCHET TYPE
91	990000315	BUSHING BOOTS CLAMPING RING 1 ONLY
<b>Control Cables E Series</b>		
92	995000302	CONTROL CABLE E ONLY - 7M
93	995000304	CONTROL CABLE E ONLY - 11M
94	995000306	CONTROL CABLE E ONLY - 20M
<b>Control Cables U/W/RL Series</b>		
95	992000025	CONTROL CABLE U/W/RL - 4M
96	992000030	CONTROL CABLE U/W/RL - 7M
97	992000035	CONTROL CABLE U/W/RL - 8M
98	992000075	CONTROL CABLE U/W/RL - 9M
99	992000040	CONTROL CABLE U/W/RL - 10M
100	992000045	CONTROL CABLE U/W/RL - 11M
101	992000115	CONTROL CABLE U/W/RL - 12M
14 M to 20 M only works with RL Motorpack with a White 'A' Sticker		
102	992000082	CONTROL CABLE U/W/RL - 14M
103	992000175	CONTROL CABLE U/W/RL - 15M
104	992000100	CONTROL CABLE U/W/RL - 20M
<b>Control Cables PTCC to ADVC Replacement</b>		
105	998002200	CONTROL CABLE EXTENSION PTCC TO ADVC
<b>High Voltage Cables For N and RL Series</b>		
Set Of 1		
106	990000600	HV CABLE 250A 3M 80MM 1xALLUG&PALM2HOLE
107	990000601	HV CABLE 250A 4M 80MM 1xALLUG&PALM2HOLE
108	990000603	HV CABLE 250A 6M 80MM 1xALLUG&PALM2HOLE
109	990000620	HV CABLE 340A 3M 120MM 1xALLUG&PALM2HOLE
110	990000640	HV CABLE 400A 3M 180MM 1xALLUG&PALM2HOLE
111	990000641	HV CABLE 400A 4M 180MM 1xALLUG&PALM2HOLE
112	990000642	HV CABLE 400A 5M 180MM 1xALLUG&PALM2HOLE
113	990000643	HV CABLE 400A 6M 180MM 1xALLUG&PALM2HOLE
114	990000645	HV CABLE 400A 8M 180MM 1xALLUG&PALM2HOLE
115	990000650	HV CABLE 400A 10M 180MM 1xALLUG&PALM2HOLE
116	990003150	HV CABLE 630A 3M 240MM 1xCULUG&PALM2HOLE

SI No.	Stock or Part Number	Part Description
117	990003135	HV CABLE 630A 4M 240MM 1xCULUG&PALM2HOLE
118	990003130	HV CABLE 630A 6M 240MM 1xCULUG&PALM2HOLE
119	990003180	HV CABLE 630A 7M 240MM 1xCULUG&PALM2HOLE
120	990003230	HV CABLE 800A 3M 400MM 1xCULUG&PALM2HOLE
121	990000116	HV CABLE 800A 4M 400MM 1xCULUG&PALM2HOLE
122	990000170	HV CABLE 800A 5M 400MM 1xCULUG&PALM2HOLE
123	990003120	HV CABLE 800A 6M 400MM 1xCULUG&PALM2HOLE
Set Of 6		
124	990000607	HV CABLE 250A 3M 80MM 6xALLUG&PALM2HOLE
125	990000602	HV CABLE 250A 4M 80MM 6xALLUG&PALM2HOLE
126	990000604	HV CABLE 250A 6M 80MM 6xALLUG&PALM2HOLE
127	990000623	HV CABLE 340A 3M 120MM 6xALLUG&PALM2HOLE
128	990000660	HV CABLE 400A 3M 180MM 6xALLUG&PALM2HOLE
129	990000670	HV CABLE 400A 4M 180MM 6xALLUG&PALM2HOLE
130	990000680	HV CABLE 400A 5M 180MM 6xALLUG&PALM2HOLE
131	990000690	HV CABLE 400A 6M 180MM 6xALLUG&PALM2HOLE
132	990000646	HV CABLE 400A 8M 180MM 6xALLUG&PALM2HOLE
133	990000651	HV CABLE 400A 10M 180MM 6xALLUG&PALM2HOLE
134	990003190	HV CABLE 630A 1M 240MM 6xCULUG&PALM2HOLE
135	990003100	HV CABLE 630A 3M 240MM 6xCULUG&PALM2HOLE
136	990003105	HV CABLE 630A 4M 240MM 6xCULUG&PALM2HOLE
137	990003115	HV CABLE 630A 6M 240MM 6xCULUG&PALM2HOLE
138	990003181	HV CABLE 630A 7M 240MM 6xCULUG&PALM2HOLE
139	990003182	HV CABLE 630A 10M240MM 6xCULUG&PALM2HOLE
140	990000115	HV CABLE 800A 3M 400MM 6xCULUG&PALM2HOLE
141	990000117	HV CABLE 800A 4M 400MM 6xCULUG&PALM2HOLE
142	990000171	HV CABLE 800A 5M 400MM 6xCULUG&PALM2HOLE
143	990003121	HV CABLE 800A 6M 400MM 6xCULUG&PALM2HOLE
Set Of 3		
144	990000665	HV CABLE 400A 3M 180MM 3xALLUG&PALM2HOLE
145	990000695	HV CABLE 400A 6M 180MM 3xALLUG&PALM2HOLE
146	990003145	HV CABLE 630A 3M 240MM 3xCULUG&PALM2HOLE
147	990003155	HV CABLE 630A 4M 240MM 3xCULUG&PALM2HOLE
148	990003170	HV CABLE 630A 6M 240MM 3xCULUG&PALM2HOLE
HV Cables Per Meter		
149	990000120	HV CABLE XLPE 250A 80MM CABLE PER METRE
150	990000125	HV CABLE XLPE 400A 180MM CABLE PER METRE
151	990000130	HV CABLE XLPE 630A 240MM CABLE PER METRE
HV Cable Connectors - Lugs (Crimped on HV cables)		
152	990000270	HV 250A 80MM 1xALLUG2HOLE
153	990000280	HV 340A 120MM 1xALLUG2HOLE
154	990000265	HV 400A 185MM 1xALLUG2HOLE
155	990000201	HV 630A 240MM 1xCULUG2HOLE
156	990000275	HV 800A 400MM 1xCULUG2HOLE
HV Cable Connectors - Palms (Screw into RL and N Series Bushing)		
157	990000212	HV 400A 1xALPALM2HOLE KIT WITH SCREWS
158	990000205	HV 800A 1xCUPALM2HOLE KIT WITH SCREWS - ALSO USED FOR 630A
<b>Mounting Brackets &amp; Substation Mounts</b>		
159	992500005	MOUNTING BRACKET POLE W SERIES
160	994000005	MOUNTING BRACKET POLE RL SERIES

SI No.	Stock or Part Number	Part Description
161	992000010	MOUNTING BRACKET CENTRE U SERIES
162	992000005	MOUNTING BRACKET END U SERIES
163	992000092	MOUNTING SUB U SERIES 2290MM ULTRA ONLY - WAS SUBSTATION U SERIES ADJUSTABLE
164	995000104	MOUNTING BRACKET POLE E SERIES
165	995000106	MOUNTING SUB E SERIES 1750MM ULTRA ONLY
<b>Pole Clamp Bands</b>		
1 x required for the VT		
2 x required for the N, W, RL & W Series		
166	990000400	MOUNTING POLE CLAMP BAND KIT 230-270 1X
167	990000405	MOUNTING POLE CLAMP BAND KIT 270-310 1X
168	990000410	MOUNTING POLE CLAMP BAND KIT 310-360 1X
169	990000401	MOUNTING POLE CLAMP BAND KIT 230-270 2X
170	990000406	MOUNTING POLE CLAMP BAND KIT 270-310 2X
171	990000411	MOUNTING POLE CLAMP BAND KIT 310-360 2X
172	990000402	MOUNTING POLE CLAMP BAND KIT 230-270 3X
173	990000407	MOUNTING POLE CLAMP BAND KIT 270-310 3X
174	990000412	MOUNTING POLE CLAMP BAND KIT 310-360 3X
<b>SCEMs</b>		
175	999900055	SCEM 11B U SERIES
176	999900065	SCEM 11D W SERIES
177	999900070	SCEM 12 RL2 SERIES 15KV/27KV
178	999900220	SCEM 13 RL2 SERIES 38KV
179	999900205	SCEM 4 TO 11A N15KV/27KV UPGRADE KIT
180	999900210	SCEM 5 TO 11C N38KV UPGRADE KIT
181	999900145	SCEM ASSEMBLY BOSS-CEM11
182	991000085	SCEM FIELD SERVICE ADAPTOR
<b>Voltage Transformers Accessories</b>		
183	990000086	VT HV 2X CABLE KIT 250A 1.5M 80MM
184	990000087	VT HV 2X CABLE KIT 250A 3M 80MM
185	990000099	VT HV 2X CABLE KIT 250A 4M 80MM
186	990000088	VT HV 1X CABLE KIT 250A 3M 80MM SWER - W SERIES ONLY
187	990000063	VT LV CABLE 9M
188	990000089	VT LV CABLE KIT 1.5M
189	990000090	VT LV CABLE KIT 3M
190	990000091	VT LV CABLE KIT 9M
191	990000092	VT LV CABLE KIT 11M
192	990000078	VT LV CABLE KIT 13M
193	990000076	VT LV CABLE KIT 18M
194	990000080	VT LV CABLE KIT 22M
195	990000740	VT LVCABLE FUSEDSEATH 9M ADV C 240/110V
196	990000765	VT LVCABLE FUSEDSEATH 13M ADV C 240/110V
197	990000700	VT LVCABLE FUSEDSEATH 3M N ONLY 28V
198	990000735	VT LVCABLE FUSEDSEATH 3M U/W/RL 28V
199	990000745	VT LVCABLE FUSEDSEATH 5M N ONLY 28V
200	990000093	VT MOUNTING BRACKET KIT N SERIES MOUNT
201	990000094	VT MOUNTING BRACKET KIT POLE MOUNT
202	990000066	VT MOUNTING BRACKET ONLY N SERIES MOUNT
<b>Surge Arresters</b>		
Surge Arresters Spares for N, U, E, W & RL Series Set of 1		

SI No.	Stock or Part Number	Part Description
203	990000560	SURGE ARRESTER 12KV BRITECH OB12 1X
204	990000562	SURGE ARRESTER 15KV BRITECH OB15 1X
205	990000540	SURGE ARRESTER 21KV BRITECH OB21 1X
206	990000566	SURGE ARRESTER 24KV BRITECH OB24 1X
207	990000570	SURGE ARRESTER 30KV BRITECH OB30 1X
208	990000572	SURGE ARRESTER 36KV BRITECH OB36 1X
209	990000574	SURGE ARRESTER 38KV BRITECH OB38 1X
210	990000505	SURGE ARRESTER 12KV ABB MWK10 1X
211	990000510	SURGE ARRESTER 15KV ABB MWK12 1X
212	990000515	SURGE ARRESTER 21KV ABB MWK17 1X
213	990000520	SURGE ARRESTER 24KV ABB MWK18 1X
214	990000525	SURGE ARRESTER 30KV ABB MWK24 1X
215	990000530	SURGE ARRESTER 36KV ABB MWK30 1X
216	990000535	SURGE ARRESTER 38KV ABB MWK36 1X
<b>Surge Arresters for W Series Set of 2</b>		
217	990000576	SURGE ARRESTER 12KV BRITECH OB12 2X
218	990000578	SURGE ARRESTER 15KV BRITECH OB15 2X
219	990000580	SURGE ARRESTER 21KV BRITECH OB21 2X
220	990000582	SURGE ARRESTER 24KV BRITECH OB24 2X
221	990000507	SURGE ARRESTER 12KV ABB MWK10 2X
222	990000512	SURGE ARRESTER 15KV ABB MWK12 2X
223	990000517	SURGE ARRESTER 21KV ABB MWK17 2X
224	990000522	SURGE ARRESTER 24KV ABB MWK18 2X
<b>Surge Arresters for N, U, E &amp; RL Series Set of 6</b>		
225	990000584	SURGE ARRESTER 12KV BRITECH OB12 6X
226	990000586	SURGE ARRESTER 15KV BRITECH OB15 6X
227	990000588	SURGE ARRESTER 21KV BRITECH OB21 6X
228	990000590	SURGE ARRESTER 24KV BRITECH OB24 6X
229	990000594	SURGE ARRESTER 30KV BRITECH OB30 6X
230	990000596	SURGE ARRESTER 36KV BRITECH OB36 6X
231	990000598	SURGE ARRESTER 38KV BRITECH OB38 6X
232	990000506	SURGE ARRESTER 12KV ABB MWK10 6X
233	990000511	SURGE ARRESTER 15KV ABB MWK12 6X
234	990000516	SURGE ARRESTER 21KV ABB MWK17 6X
235	990000521	SURGE ARRESTER 24KV ABB MWK18 6X
236	990000526	SURGE ARRESTER 30KV ABB MWK24 6X
237	990000531	SURGE ARRESTER 36KV ABB MWK30 6X
238	990000536	SURGE ARRESTER 38KV ABB MWK36 6X
<b>Surge Arresters Brackets</b>		
239	994000000	SURGE ARRESTER BRACKET RL2 15KV & 27KV
240	994000070	SURGE ARRESTER BRACKET RL2 38KV
241	992000015	SURGE ARRESTER BRACKET U CENTRE MOUNT
242	992000020	SURGE ARRESTER BRACKET U END MOUNT
243	995000102	SURGE ARRESTER BRACKET E SERIES
<b>Wildlife Guards</b>		
244	992500075	WILDLIFE GUARD W SERIES 2X
245	992000190	WILDLIFE GUARD U SERIES 6X
246	994000145	WILDLIFE GUARD N & RL SERIES 6X
247	995000152	WILDLIFE GUARD E SERIES LOAD 1X
248	995000156	WILDLIFE GUARD E SERIES SOURCE 1X

SI No.	Stock or Part Number	Part Description
249	995000150	WILDLIFE GUARD E SERIES 6X
<b>Miscellaneous</b>		
Gas Tools for RL & N Series		
250	999700065	GAS FILL TOOL SF6 N & RL
251	999700050	GAS GAUGE RL SERIES 0-200KPA
U Series CVTs		
252	992000050	U SERIES EXTERNAL CVT KIT 3 PHASE
RL Motorpack		
253	994000245	RL2 - MA & FA MOTOR PACK V3 RETROFIT KIT (Replaces 994000035)



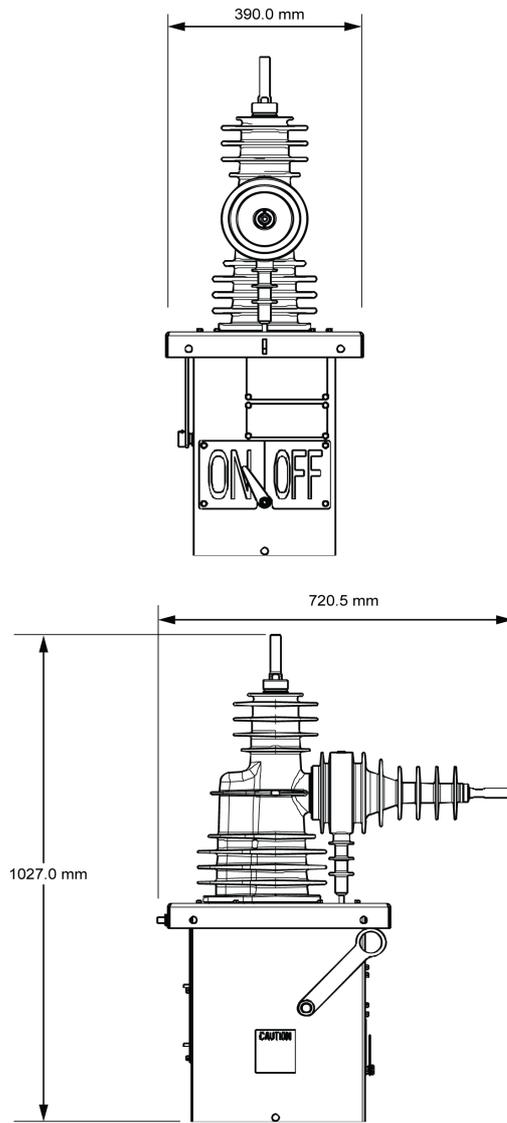
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## Appendix B

### Dimensions

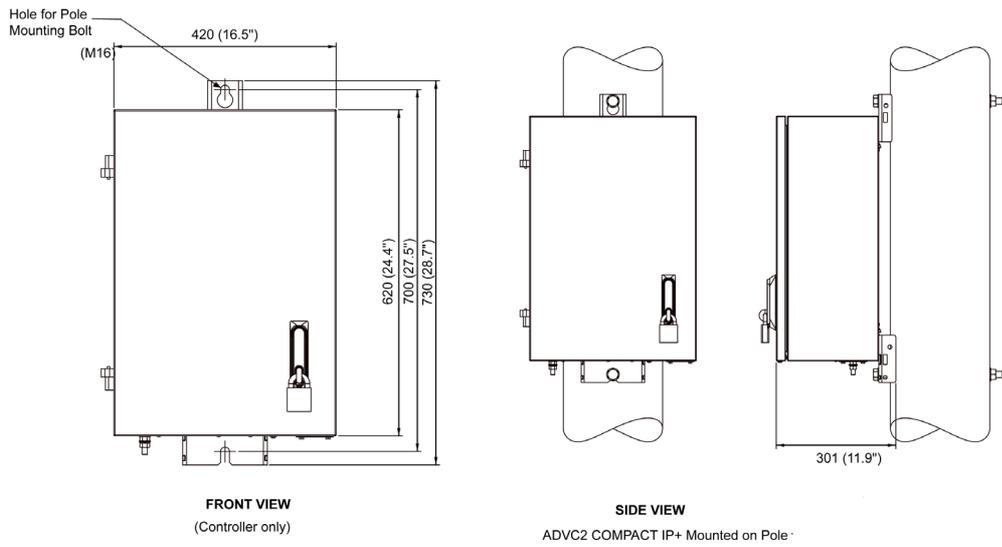
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#### ACR



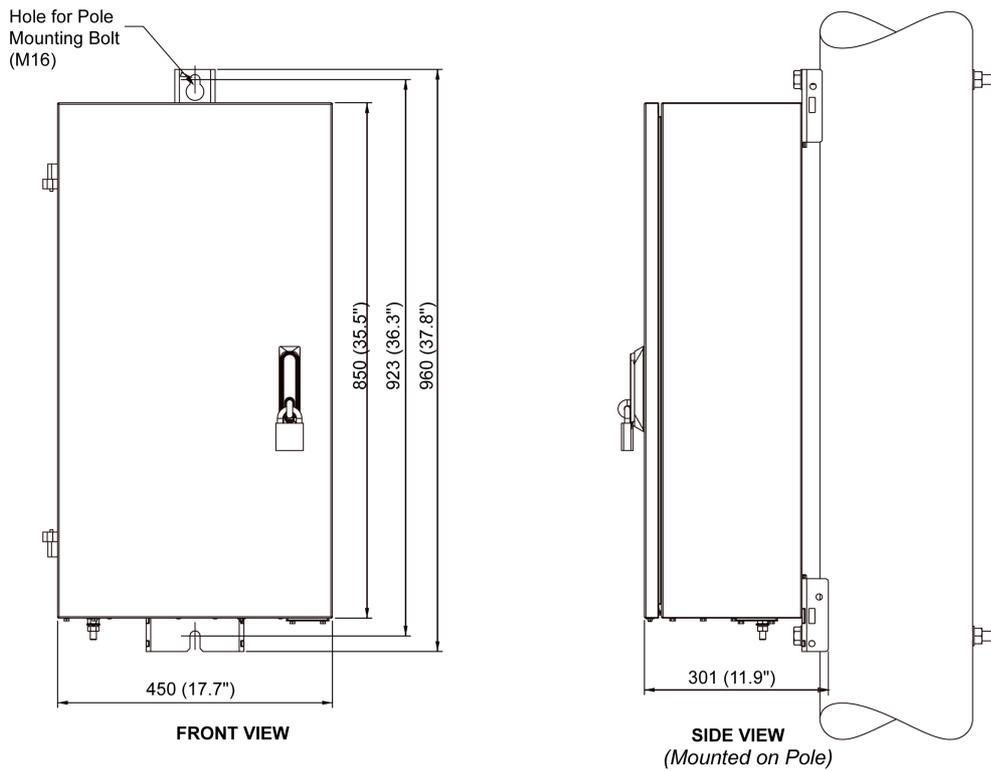
*ACR Dimensions*

**ADVC COMPACT**



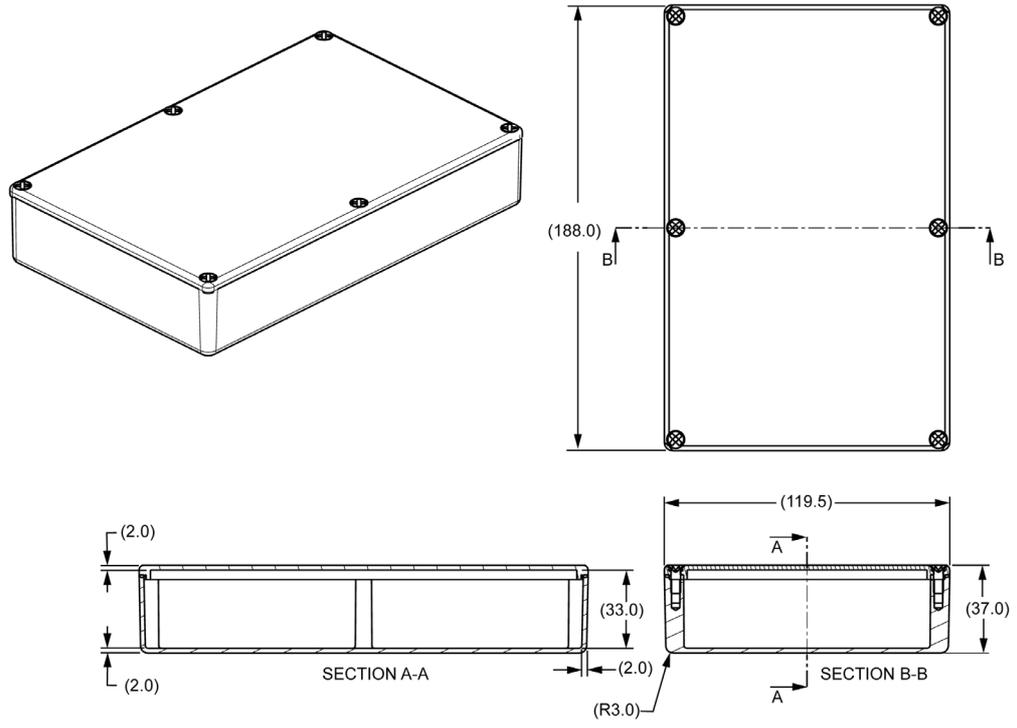
*Front and Side View of ADVC COMPACT cubicle*

**ADVC ULTRA**



*Front and Side View of ADVC ULTRA Cubicle*

IOEX3



IOEX 3 Dimensions





## A

**ACR** Automatic Circuit Recloser

**ADVC** ADVC Controller

## C

**CAPE** Control and Protection Enclosure

**CT** Current Transformer

**CVT** Capacitive Voltage Transducer

## L

**LCD** Liquid Crystal Display

**LED** Light Emitting Diode

## M

**MCB** Miniature Circuit Breaker

## O

**O.I** Operator Interface

**OCP** Operator Control Panel

## P

**PCOM** Protection and Communication Module

**PSSM** Power Supply and Switchgear Module

**PSU** Power Supply Unit

**PTCC** Pole Top Control Cubicle

## Q

**QAK** Quick Action Keys

**S**

**SCEM**

Switch Cable Entry Module

**W**

**WSOS5**

Windows Switchgear Operating System





**N00-810-01**

**Schneider Electric Industries SAS**

35, rue Joseph Monier  
CS30323  
F - 92506 Rueil Malmaison Cedex

[www.schneider-electric.com](http://www.schneider-electric.com)

*As standards, specifications and designs change from time to time, please ask for confirmation of the information given in this publication.*

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