

VR-3S Medium Voltage Vacuum Recloser

Instructions for Vacuum Recloser 15-38 kV 560/800 A



ABB

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Figure 1: Hazardous Voltage Nameplate

1.0 SAFETY NOTICES

The VR-3S power recloser should be installed within the design limitations as described on its nameplate and in these instructions.

Follow your company's safety procedures.

This recloser should not be used by itself as the sole means of isolating a high voltage circuit. For the safety of personnel performing maintenance operations on the recloser or connecting equipment, all components should be electrically disconnected by means of a visible break and securely grounded.

This product is intended to be operated and maintained by qualified persons thoroughly trained and knowledgeable of the hazards involved. This publication is written only for such qualified persons and is not intended to be a substitute for adequate training and experience in the safety procedures for this device.

Warning

Detailed descriptions of standard repair procedures, safety principles, and service operations are not included. It is important to note that this document contains some warnings and cautions against some specific service methods that could cause personal injury to service personnel, or could-, damage equipment or render it unsafe. These warnings do not cover every conceivable way in which service (whether or not recommended by ABB) may be done or possible hazardous consequence of each conceivable way, nor could ABB investigate all such ways. Anyone using service procedures or tools, whether or not recommended by ABB, must satisfy himself thoroughly that neither personal safety nor equipment safety will be jeopardized by the service method or tools selected.

All information contained in this manual is based on the latest product information available at the time of printing. The right is reserved to make changes at any time without notice.

2.0 INTRODUCTION

In the interest of clarity, a single identification number is used for each individual item throughout this book in every relevant figure or diagram.

These instructions do not attempt to provide the user of this equipment with every possible answer to questions which may occur in the application, operation and maintenance of the product. Also, as improvements in parts and assemblies are made, some parts may differ in appearance than depicted in illustrations; however, functionality will be equivalent.

The type VR-3S vacuum recloser is a sophisticated, high-voltage, three-phase device incorporating three vacuum interrupters. Together with the specialized control functions, the recloser will sense an overload and automatically open. Then after a pre-set time delay, the recloser will close again. If the overload condition still exists, the recloser will again trip and reclose. Standard VR-3S controls, the PCD, will allow up to four reclosing operations before the recloser will lock open. The source of the fault condition must then be removed before normal service can be restored.

Satisfactory performance of the recloser is contingent upon correct installation, adequate maintenance and service of the product. Careful study of these instructions will permit the user to obtain maximum benefit from this device.

3.0 RECEIVING, HANDLING AND STORAGE

Each recloser is assembled and tested at the factory prior to being prepared for shipment. This equipment is packed and shipped in perfect condition from the factory. If damage is noticed, call the carrier at once for inspection, and request an inspection report. File a formal claim with the carrier, supported with the paid freight bill, inspection report, and invoice. The local ABB sales office should be notified.

3.1 Receiving Inspection

Upon receipt, it is important to inspect promptly to be certain that the correct material has been received. In case of shortage, immediately notify the local ABB sales office. Check all parts against the shipping list as they are unpacked. Instructions and literature packed with the recloser should be kept with the unit. The low-voltage control cabinet provides a convenient place to keep this instruction book, a copy of the schematic diagram, and the card carrying the service record of the unit. Additional copies may be obtained upon request from the local ABB sales office.

If the recloser is not to be placed in service immediately, it is essential that proper care be exercised in handling and storage to ensure good operating conditions in the future.

3.2 Handling

The VR-3S recloser comes with two brackets that attach to the sides of the cabinet and provide provisions for lifting the recloser. A four-point lift is strongly recommended using the loops in these brackets(See Figure 2). If the unit is shipped unassembled, these brackets will be located in one of the shipping boxes.

Caution - Exercise care during lifting to avoid damage to the bushings.

For substation frames shipped assembled, lift the frame off the pallet (taking care not to damage the poles) and place in the desired location. Then remove the lifting brackets from the frame and mount to the recloser for lifting. Do not place the recloser on an uneven surface, as damage to the open/close indicators may occur.

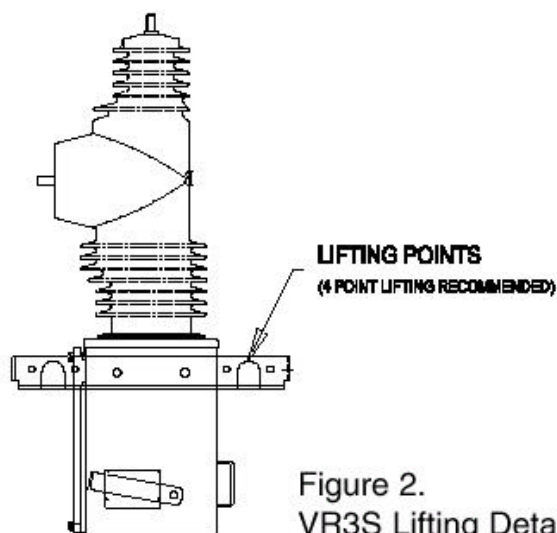


Figure 2.
VR3S Lifting Detail

3.3 Storage

For prolonged storage, indoor storage is recommended. If either cabinet is stored outdoors, there are two options to prevent condensation problems. The first option consists of energizing the anti-condensation heaters inside the high voltage cabinet and the low voltage control cabinet. This can be done with 12---?? cable that connects the high voltage cabinet or the low voltage cabinet to 120 VAC to energize the heaters. The second option is to have each unit pretreated at the factory with a special vacuum wrapping to prevent water penetration. See factory representative for more information.

The low voltage control cabinet comes with rechargeable batteries that should have power of the proper voltage and frequency supplied to the input of the charger assembly. A periodic check of battery voltage is also advised.

4.0 GENERAL DESCRIPTION

4.1 High-Voltage Assembly

The high-voltage assembly of the VR-3S recloser consists of three individual phase poles mounted onto a common housing. Each of the VR-3S poles is a separate module comprised of a vacuum interrupter and current sensor encapsulated in Polyurethane (Molded pole assembly), coupled to a magnetic actuator.

4.2 Housing

The door of the recloser housing (High voltage cabinet) is removable and is retained by four bolts. The position indicators for each phase are mounted in the floor of the cabinet and are visible from below. The recloser nameplate that shows rating information, serial number, and shop order number is mounted on the right-hand side of the housing. A heater is provided to prevent condensation.

4.3 Pole Assembly

Figure 3 on page 17 shows the details of the pole assembly. The top terminal stud (15) is attached directly to the fixed contact stud on the top end of the vacuum interrupter (16). The current transfer assembly housing (17) is fastened to the opposite end of the vacuum interrupter. In the current transfer assembly, contacts transfer current from the moving contact of the vacuum interrupter to the current transfer assembly housing, which is directly connected to the lateral stud terminal (19). The lateral stud terminal passes through a ring-type current sensor (18) before it exits the molded assembly. The two leads carrying the transformer's secondary current output are also encapsulated and brought down to a terminal block mounted on the actuator assembly. If the control cable is disconnected while the recloser is carrying load current, resistors are installed on the terminal block across the CT leads to prevent open circuit conditions. The stainless steel mounting flange (06) is attached to the molded pole assembly by four bolts, two of which also provide support for the magnetic actuator.

The magnetic actuator incorporates a very powerful permanent magnet assembly. When the armature is in contact with the upper pole piece, the magnet produces a holding force in excess of 300-500 lbs. Attached to the armature are two stainless steel guide rods. The upper guide rod attaches to the lower end of the main operating rod, which connects directly to the moving contact of the vacuum interrupter. The lower guide rod mounts the opening spring and the indicator assembly.

Disassembly of the magnetic actuator is not recommended. Lubrication or maintenance is not required. Should an actuator fail to operate, contact ABB for service. The permanent magnet inside the actuator is very strong and will attract all metal objects with the potential to trap fingers.

4.4 Control

4.4.1 Low Voltage Control Cabinet

A separate weatherproof cabinet houses the low voltage control components. A hinged panel allows front and rear access to the control components. Other devices can be mounted on the side walls of the cabinet. Connections to the recloser are made through a plug-connected, shielded 24-pin cable. The hinged door has provisions for a 1/2 inch diameter padlock shackle.

For power, communication, and control inputs to the control cabinet, the floor is equipped with removable access plate and two knockout holes. A knockout is also provided for a radio antenna connection. On the rear inside wall of the control cabinet, there are four studs to accept an optional equipment-mounting panel (5D31236G02) for mounting a radio, modem or other user equipment.

A 45 W thermostatically controlled heater is provided to prevent condensation. (Note that the thermostat only controls the control cabinet heater. The recloser cabinet heater is constantly energized.) A typical unit comes standard with 48 VDC batteries. These batteries are rated to last 48 hours during a loss of AC if fully charged. The batteries should be checked periodically and replaced every three to five years.

4.4.2 PCD Control

The control supplied with the VR-3S is the microprocessor-based PCD Power Control Device. This sophisticated controller integrates most of the normal recloser control functions into a single device, providing a wide range of metering and remote control options. For details on programming, operating, and testing the PCD refer to Instruction book IB38-737-1. For details on the overall control circuit, refer to the specific wiring diagrams supplied with the recloser. Table 2 below shows voltage and power requirements for the VR-3S recloser with a PCD control.

Table 2

Nominal Control Voltage	Allowable Voltage Range	VR-3S Power Requirements		Anti-Condensation Heater VA Burden
		Nominal VA Burden*	Maximum VA Burden*	
48 VDC	38-56 V	20	See below**	N/A
125 VDC	100-140 V	20	See below**	N/A
120 VAC	104-127 V	30	75	45
240 VAC	208-254 V	30	75	45

* The VA burden of the PCD Control does not include the anti-condensation heaters or accessories such as a radio or modem. Loads connected to the switched DC output of the PCD may be no greater than 25 VA.

** DC powered VR-3Ss typically utilize the customers DC source, so batteries are not supplied. The customer supply voltage must be a dedicated source, and must be sized appropriately. For distances up to 150', use #8 or #10 AWG copper, for distances of 150' to 250' use #8 AWG copper wire. Consult factory for greater distances. There is a capacitor in parallel with the DC source designed to maintain proper voltage at the recloser for operation.

Warning: If the DC source is disconnected, the capacitor will still maintain charge until it is drained. Leaving the control powered for at least 5 minutes will discharge the capacitor.

4.4.3 UPS Battery Assist Module

The UPS Battery Assist module (S#12A00736G01) in the PCD control cabinet is designed to work as part of the battery system to allow the VR-3S to have operational capability in the event of a discharged or disconnected battery. The module includes a large capacitor, which stores energy for operating the magnetic actuators. It is also required to have the battery in place for carryover power on loss of AC, or for fast open – close operational sequences. See the wiring schematic for connections. The UPS Battery Assist module includes the following user interfaces: 1) A form C 15 Ampere contact which is slaved from the switched DC output of the UPS. (The switched DC output of the UPS shuts down upon the conditions of loss of AC and low battery, and occurs at a level before the PCD control itself shuts down.) 2) A pushbutton discharge switch on the top of the module to drain the capacitor for any repair. **WARNING: The battery and AC sources must be disconnected when the discharge switch is pressed or damage to the UPS Battery Assist Module can occur.**

5.0 STANDARD PRODUCTION TESTS

Standard production tests include:

1. Verification of all wiring per connection diagrams.
2. Electrical operation: Close and trip. Overcurrent response and automatic reclosing.
3. Check functioning of all manual controls on the PCD: Local/remote, non-reclosing, ground fault bypass, etc.
4. Three readings of contact pole resistance are made on each phase of a complete recloser. Typical values do not exceed 150 micro ohm (.00015 ohms).
5. 60 Hz Voltage Withstand: The complete recloser is tested (a) between live parts and tank, (b) across open contacts, and (c) between phases. In compliance with ANSI C37.60, applied test voltage is 50 kV for 15.5 kV rated maximum voltage, 60 kV for 27 kV rated maximum voltage, and 70 kV for 38 kV rated maximum voltage. Test duration is 1 minute.
6. Wiring Insulation: The terminal block connections (with the foil leads and microprocessor controller) are given an over-voltage test of 1500 volts AC to ground.

6.0 OPERATION

6.1 Closing

In the open position, the armature rests against the non-magnetic spacer in the actuator assembly. The armature is held there by the opening spring and a small force developed by the magnet. When the coil is energized with the correct polarity, the magnetic flux generated is in the same direction as the magnet assembly. The armature is drawn into the coil and brought into contact with the upper pole piece. In this position, the coil is de-energized and the armature is held in position by the magnet alone. As the armature is drawn into the coil, the operating rod (03), which is attached to the top guide rod, moves the moving contact of the vacuum interrupter (16) towards the closed position. The actuator has more stroke than the vacuum interrupter. The interrupter contacts make contact before the actuator has completed the stroke. The additional movement of the operating rod after the contact closes is needed for the contact pressure spring to compress at the top of the operating rod. This “over travel” allows for contact wear in service and provides low contact resistance.

6.2 Opening

When the coil is energized with the reverse polarity, the magnetic flux generated opposes the force generated by the magnet assembly. This reduces the holding force and the armature is released. The opening spring (with an initial assist from the contact pressure spring) drives the operating rod to the open position.

7.0 OPERATIONAL CHECK PRIOR TO INSTALLATION

The recloser should be tested for mechanical and electrical operation before it is energized in the power system. Make the necessary control power connections, including the cable between the high voltage compartment and the low voltage control cabinet. If necessary, remove the cover of the high voltage compartment to observe the mechanical operations.

Caution: Do not ground either side of the battery or attach ground to the terminals of the actuator operating coils. This will result in permanent damage of the unit.

7.1 Electrical Close - PCD

Observe the position-indicating LED located between the Open and Close pushbuttons on the front panel of the PCD. If the LED is green, the recloser is open. To close, depress the Close push button. The PCD will initiate a closing pulse to each actuator simultaneously and the recloser will move to the closed position and the LED will change to red. The duration of the closing pulse is precisely controlled by the PCD.

7.2 Electrical Trip - PCD

Observe the position-indicating LED located between the Open and Close pushbuttons. If the LED is red, the recloser is closed. To trip, depress the Open push button. The PCD will initiate a tripping pulse to each actuator and the recloser will move to the open position. The duration of the tripping pulse is controlled by the PCD.

Note: In the event of a malfunction, the indicating LED will blink Red/Green.

The front panel of the PCD also has control push buttons for several standard recloser functions. When these functions are activated, an LED adjacent to the push button provides indication. Push buttons Prog 1 and Prog 2 are mounted below the standard functions. These buttons are preprogrammed for the following:

Prog 1 - Battery test. This applies only when the batteries are supplied in the control cabinet and the UPS board is included in the PCD.

Prog 2 - Not currently used.

7.3 Vacuum Test

Run an over-voltage test on each interrupter to verify that there has been no loss of vacuum during transportation or handling. Experience has indicated that while a vacuum interrupter with the vacuum seal intact will withstand 35 kVAC across the open contacts, the same interrupter open to normal atmosphere will flashover at the gap at a much lower voltage.

TEST PROCEDURE



RADIATION WARNING: High voltage applied across an open gap in a vacuum can produce X-radiation. No radiation is emitted when the recloser is closed since no gap exists. Also, when the recloser is open to the specified contact spacing in service or tested within the voltages specified, X-radiation at one meter is below the level of concern. A danger could exist at voltages above or contact spacing below that specified on the nameplate.

1. With the recloser in the open position, jumper the three top terminals together. Connect the three lateral terminals and ground the lateral terminals and the housing. Connect the high voltage to the top terminals .
2. Stand clear more than one to three meters before energizing the high voltage source.
3. Do not exceed 37.5 kVAC and do not apply voltage for more than 60 seconds.
4. If internal flashover occurs, isolate the phases and test each one independently to identify the defective interrupter. Any defective pole assembly must be replaced prior to the recloser being placed in service.

8.0 INSTALLATION

The VR-3S recloser can be installed in a substation frame, pole-mounting frame, or can be mounted into a customer supplied structure. However, it is required that in all of the mounting methods the recloser be vertical and level, and securely fastened. Follow your company guidelines and various codes for setting the height of the recloser, securing the frame to the pole or foundation, and making connections.

8.1 Mounting

The recloser is shipped with either a pole mounting frame, substation frame or no frame.

The following is the recommended installation procedure for each frame:

8.1.1 Pole Mounting

For pole frames, do the following:

1. Attach the lifting brackets to the sides of the recloser as indicated in the section on lifting.
2. If the frame is not shipped assembled, put it together on a flat surface per the assembly instructions. Follow the drawing closely, making sure to use the correct bracket for mounting the recloser frame to the pole.
3. Install mounting bolts (not supplied) in the pole for the recloser and the control cabinet.
4. Lift the recloser by the lifting bracket at four points and bolt the frame to the two holes on the bottom of the bracket at both sides of the recloser.
5. Once mounted, lift the assembly onto the bolts in the pole. If Voltage Transformers (VTs) are used, it is recommended to install the frame without the transformers and then install them once the recloser and VT mounting brackets are on the pole. Alternatively, if it is desired to mount VTs on the frame before mounting the frame on the pole, do the following: Without mounting the recloser to the frame, install and wire the VTs on the frame and lift the frame up onto the pole using a four point lift at the corners of the frame. Then, with the lifting bracket attached to the recloser, lift the recloser up onto the frame and bolt into place.
6. Bolt the pole-mounting bracket to the control cabinet and then bolt the control to the pole.
7. Make sure all hardware is tight.

<p>CAUTION: DO NOT EXCEED 50 LBS FORCE ON ANY OF THE TERMINALS IN ANY DIRECTION. FAILURE TO COMPLY WILL RESULT IN PERMANENT DAMAGE!</p>
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8.1.2 Substation Mounting

1. With the lifting brackets mounted to the substation frame, lift the frame off the pallet and move into position.
2. Bolt the frame to the pad and raise the upper portion to the desired height. The frame allows adjustment in 3” increments (see Figure 11: the substation frame drawing).
3. Remove the lifting brackets from the frame and bolt to the sides of the recloser.
4. Lift the recloser over the top of the frame and lower into place.
5. Bolt the control cabinet to the cross-members on the side of the substation frame.
6. Make sure all hardware is tight.

CAUTION: DO NOT EXCEED 50 LBS FORCE ON ANY OF THE TERMINALS IN ANY DIRECTION. FAILURE TO COMPLY WILL RESULT IN PERMANENT DAMAGE!

8.1.3 No Frame

1. With the lifting brackets mounted to the recloser, lift the frame off the pallet and move into position.
2. If an alternate customer-provided bracket is used for mounting the recloser, use caution when lifting the recloser. Do not lift the recloser by the poles, as this may cause damage to the poles.
3. If a forklift is used to raise the recloser from the bottom, use caution to avoid damaging the open/close indicators below the high voltage cabinet.

8.2 Grounding

The recloser high voltage cabinet includes a standard NEMA 2 hole drilled stainless steel pad on the rear for grounding. Any voltage transformers used should be grounded to the main ground wire leading from the recloser to ground.

To ground the low voltage control cabinet, use the connector provided (see the shipping bag in the control cabinet) which accepts a #6 - 2/0 AWG conductor. Ground the control cabinet to the main ground wire from this external connector. All ground wire used must be #6 AWG minimum.

Both the high voltage cabinet and low voltage control cabinet are to be firmly grounded in series when installed. Grounding is important to ensure proper operation of all electronic components to prevent penetration of EMC noise and other transients into the sensitive electronic circuits (PCD, modems, radios, etc.)

8.3 Arrester Protection

Surge arresters must be supplied on both the source and load sides of the recloser. It is recommended that the arrester grounds be connected to the recloser ground and continued to the pole ground. The leads connecting to the arresters should be as short as feasible to limit stray inductance and to maximize the arrester’s effectiveness.

8.4 Control Power

Supply the control power as indicated on the wiring diagram. If 240 VAC is used, verify the connections for the heaters and the isolation transformer before applying power. The ground fault receptacle, if supplied, may need to be energized by the user by connecting the Hot and Neutral to the desired source.

If the control is supplied with an optional 2-pin power connector and 10' power cable, connect the AC source to this cable. Otherwise, one of the knockouts may be used or the removable plate drilled to suit for conduit.

Three phase voltage wiring is provided from the recloser to the low voltage control cabinet terminal block and then on to the voltage inputs on the PCD control for metering and voltage dependent protection purposes. When the recloser cabinet is supplied with a 5-pin connector at the bottom, the customer may connect the VTs through the recloser as shown on the wiring diagram. Otherwise, wire the three VTs directly to the terminal block in the control cabinet. It is not necessary to wire any voltage inputs directly to the back of the PCD relay.

If it is desired to obtain control power from one of the three VTs used for metering, jumpers must be added to the control cabinet to connect one of the voltage sources to the control power input. Following the wiring diagram, in the control cabinet, add a connection from terminal block point VA1 (alternatively VB1 or VC1) and VN to the control power inputs. Check all terminal block connections for proper tightness. For details of the overall control circuit refer to the specific wiring diagrams supplied with the recloser.

8.5 Line Connections

The recloser is connected in series with the line and does not require to face one direction or the other. However, there are two considerations:

1. The voltage transformer used for supply power must be installed on the source side of the recloser in order to avoid unnecessary drain on the battery backup system when the circuit is open at the recloser.
2. When voltage transformers are used for metering and protection purposes, they must be installed on the source side. The top terminal of the poles must also be connected to the source side. This is necessary for proper power flow metering, and for the directional protection elements to work according to programmed settings.

8.6 Final Inspection

When the recloser has been installed and all mechanical and electrical connections completed, EXCEPT ENERGIZING THE POWER LINE, the following points of inspection are recommended:

1. Ensure the recloser is properly leveled and securely anchored.
2. Make a final check of tightness of all hardware.
3. Securely tighten terminal and ground connections.
4. Check control cable entrance fittings for tightness.
5. Ensure that the high voltage and low voltage control cabinets are grounded.
6. Operate the recloser from the control box to verify normal operation.
7. If the recloser has been improperly stored or it is suspected that the unit was handled roughly during shipping, it is advisable to check the recloser alignments (VI open gap, VI contact wipe, microswitches, etc.) See your ABB representative if necessary.

9.0 INSPECTION MAINTENANCE AND ADJUSTMENT

The VR-3S is an extremely simple device and will require minimal maintenance if handled properly and depending on the frequency of operation and local environmental conditions.

To a large extent, the safety and successful functioning of any apparatus or system connected with the recloser depends on the proper installation commissioning and programming of the unit.

To provide long, reliable service, the recloser should be inspected at regular intervals. Operating experience, environmental conditions, the number of operations, the magnitude of current and any unusual service conditions will guide you in establishing a maintenance schedule. The following check list is a minimum guide:

1. Check the molded pole assemblies for external damage and clean if contamination is evident. The poles can be cleaned with de-natured Alcohol.
2. Check contact wear. As a vacuum interrupter continues to switch current, material from the contacts slowly erodes away, and the moving contact is driven deeper into the interrupter by the operating mechanism. The over-travel spring at the upper end of the operating rod ensures that proper contact pressure is maintained in the closed position. Contact erosion reduces the compression of the over-travel spring, which in turn increases the contact travel (Total travel of the actuator is fixed). A gauge is provided with the recloser to allow easy confirmation of the allowable contact erosion. (Ref Figure 6.) Raise the operating rod using the lever on the underside of the adapter (04) until the contacts touch. Contact touch can be verified by using a continuity meter. Contact touch is not the same as the unit being closed because, when the unit is in the full closed position, the operating rod travels the distance of contact touch and then travels further by depressing the over-travel spring. Verify the contact wear using the gauge by inserting the short side of the gauge between the base of the actuator

and the flange nut. If the short side of the gauge will fit into the space, no adjustment is required. If the short side of the gauge will not fit into the space, the entire interrupter pole assembly should be replaced due to excessive contact wear.

3. Verify that the recloser operates correctly using the electrical controls.
4. A Hi -Pot test can be performed to verify the vacuum integrity.



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- A. With the recloser in the open position, jumper the three top terminals together and the three lateral terminals. Ground the lateral terminals and the housing. Connect the high voltage to the top terminals.
 - B. Stand clear more than one meter before energizing the high voltage source.
 - C. Do not exceed 37.5 kV and do not apply for more than 60 seconds.
 - D. If internal flashover occurs, isolate the phases and test each one independently to identify the defective interrupter. Any defective pole assembly must be replaced prior to the recloser being placed in service.
5. **Contact Resistance:** Measure contact resistance with suitable equipment rated not less than 100 A. The value should not exceed that shown in the rating table.
 6. **Battery Test:** Press the “Prog 1” button on the front of the PCD. The PCD will display a “Delta V” voltage. This value should not exceed 10 percent of the nominal battery voltage, or 4.8 V for a 48 V battery. A returned value of 99 V for the “Delta V” indicates that the battery has a very low charge, is disconnected, or has failed.

9.1 Maintenance

If the vacuum interrupters or embedded current transformers require replacement, the pole assembly is designed to be easily replaced as a complete unit. The assembly includes the molded pole and actuator component. This can be installed as a direct replacement.

9.1.1 Direct Replacement of the Complete Pole Assembly (Figures 4 & 5)

With the pole in the closed position:

1. Remove the trip handle cover (09). This will allow the trip shaft to rotate out of the way.
2. Loosen the double nuts directly above the indicator and screw the nuts as high up onto the stud as possible.
3. Loosen the indicator (11) and screw it onto the stud as far as it will go.
4. Loosen the two clamps holding the fixed portion of the indicator (10) to the floor of the cabinet and remove the indicator.
5. Unscrew the moving portion of the indicator from the stud and remove.
6. Disconnect the control wiring from the right-hand side of the terminal block.
7. Remove the six nuts holding the mounting flange to the top of the housing and withdraw the pole assembly using a suitable lifting device. (Note: The gasket sealing compound will bond the flange to the housing.)
8. Clean the sealing surface on the housing to remove remnants of the previous gasket.
9. Apply fresh sealant and install replacement pole assembly using the existing hardware.
10. Install the flange nut and lock nut and screw onto the stud as far as it will go.
11. Install the moving portion of the indicator and screw it onto the stud as far as it will go.
12. Install the fixed portion of the indicator (10) and assemble the clamps loosely so that it is still free to move.
13. Unscrew the moving portion of the indicator (11) until it bottoms out in the fixed portion. Then screw on one turn to provide clearance and lock in position.
14. Position the fixed portion of the indicator (10) so that the moving portion is centered and locked in position with the clamps.
15. Screw the lock nut and flange nut down close to the indicator.
16. Return the trip shaft to its normal position and re-install the trip handle cover (09).
17. This sets the position of the crank arms on the trip shaft.
18. Adjust the flange nut until it is within .06 of the crank arm and lock in place with the lock nut.

ITEM	DESCRIPTION
01	Molded Pole
02	Actuator
03	Operating Rod
04	Adapter
06	Flange
07	Spacer
12	Mounting Bracket
15	Top Terminal Stud
16	Vacuum Interrupter
17	Current Collector
18	Current Transformer
19	Lateral Terminal Stud
20	Nut
21	3/8 Lock Washer
23	Bolt 1/2 x 5 1/4 in
24	1/2 Lock Washer
27	Nut
28	Flange Nut

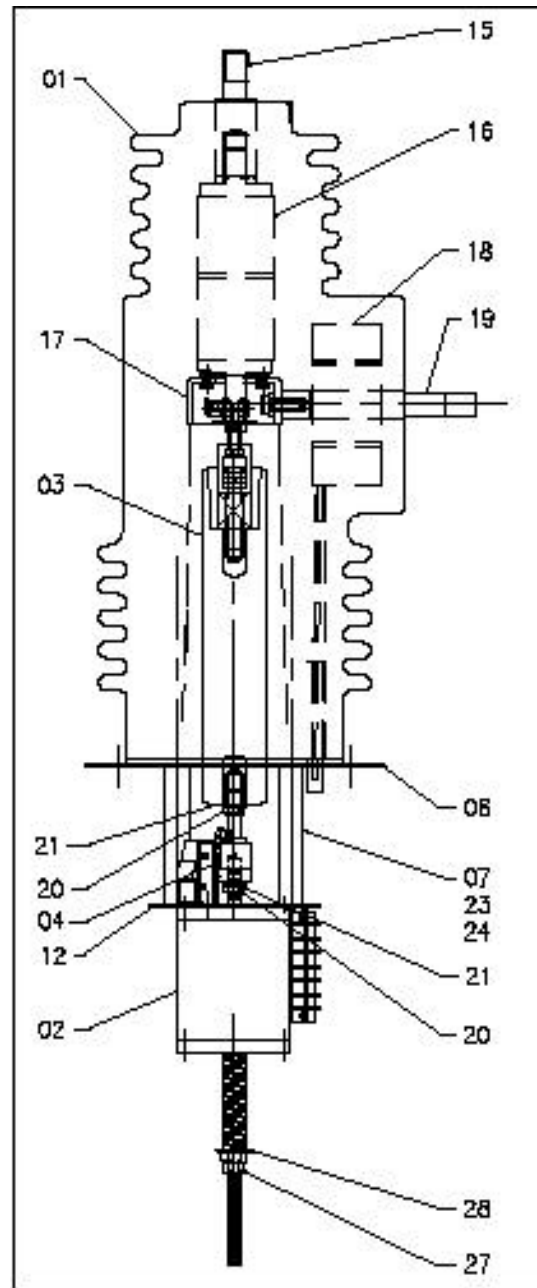


Figure 3: Pole Assembly

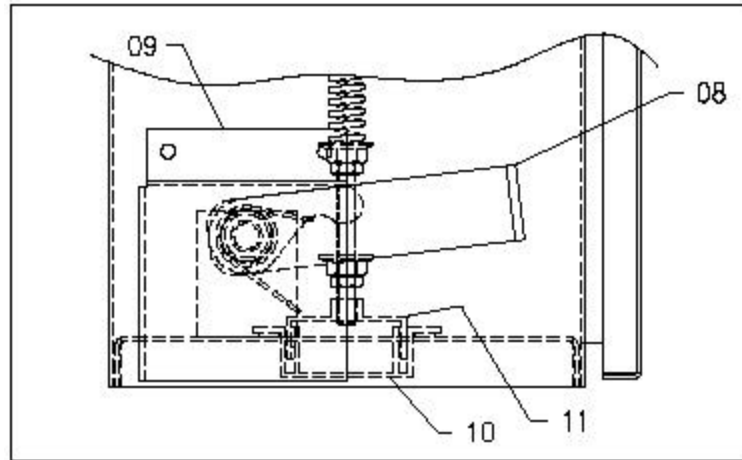


Figure 4: Indicator Assembly

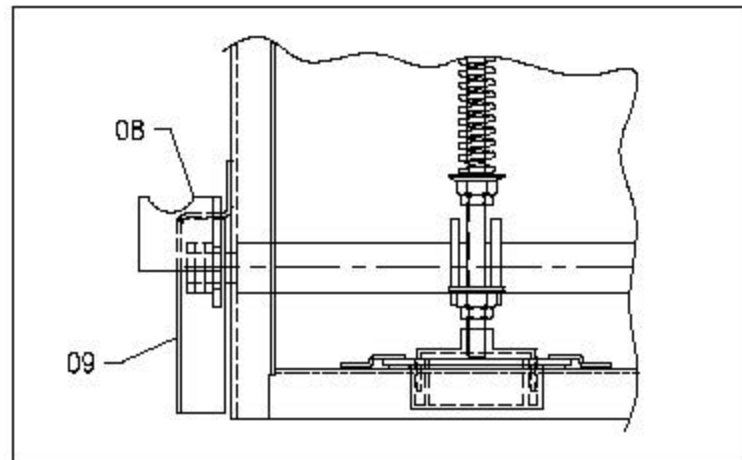


Figure 5: Trip Handle Cover

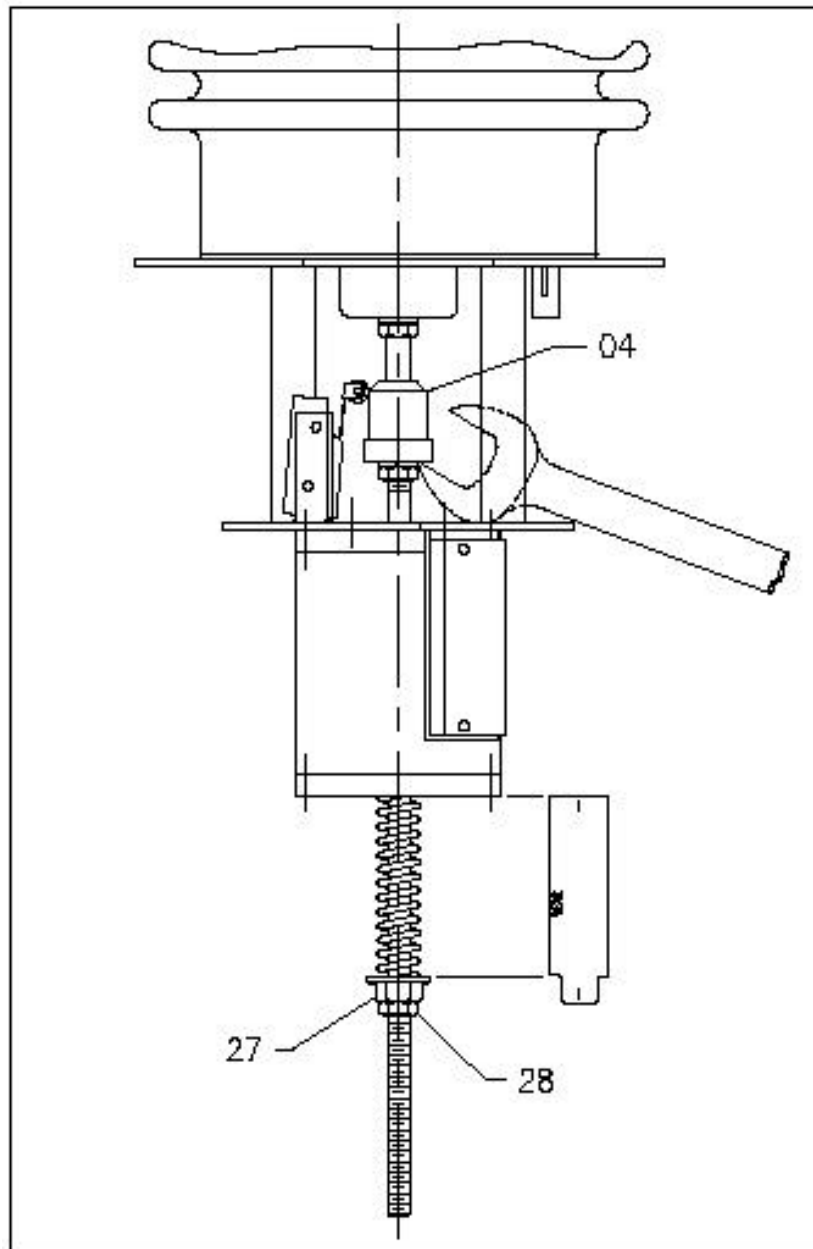
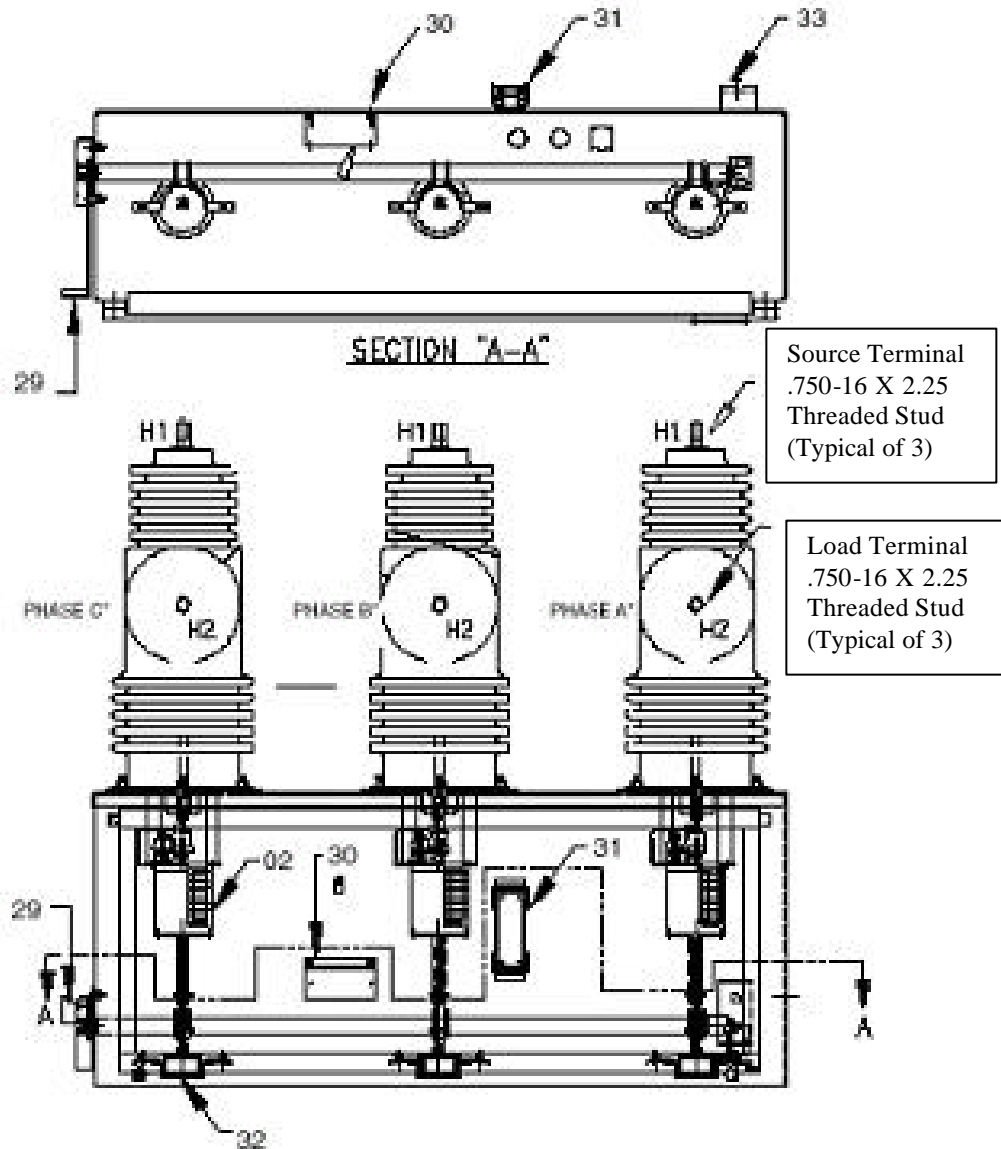


Figure 6: Adjustment/Wear Measurement

- ITEM 29 – MECHANICAL TRIP LEVER
- ITEM 02 – MAGNETIC ACTUATOR
- ITEM 30 – ANTI-CONDENSATION HEATER
- ITEM 31 – 24-PIN CONTROL CABLE
- ITEM 01 – POLE ASSEMBLY
- ITEM 32 – OPEN/CLOSE INDICATORS
- ITEM 33 – GROUND PAD - NEMA 2 HOLE DRILLED



Typical Pole Arrangement

FIGURE 7: High Voltage Cabinet Layout

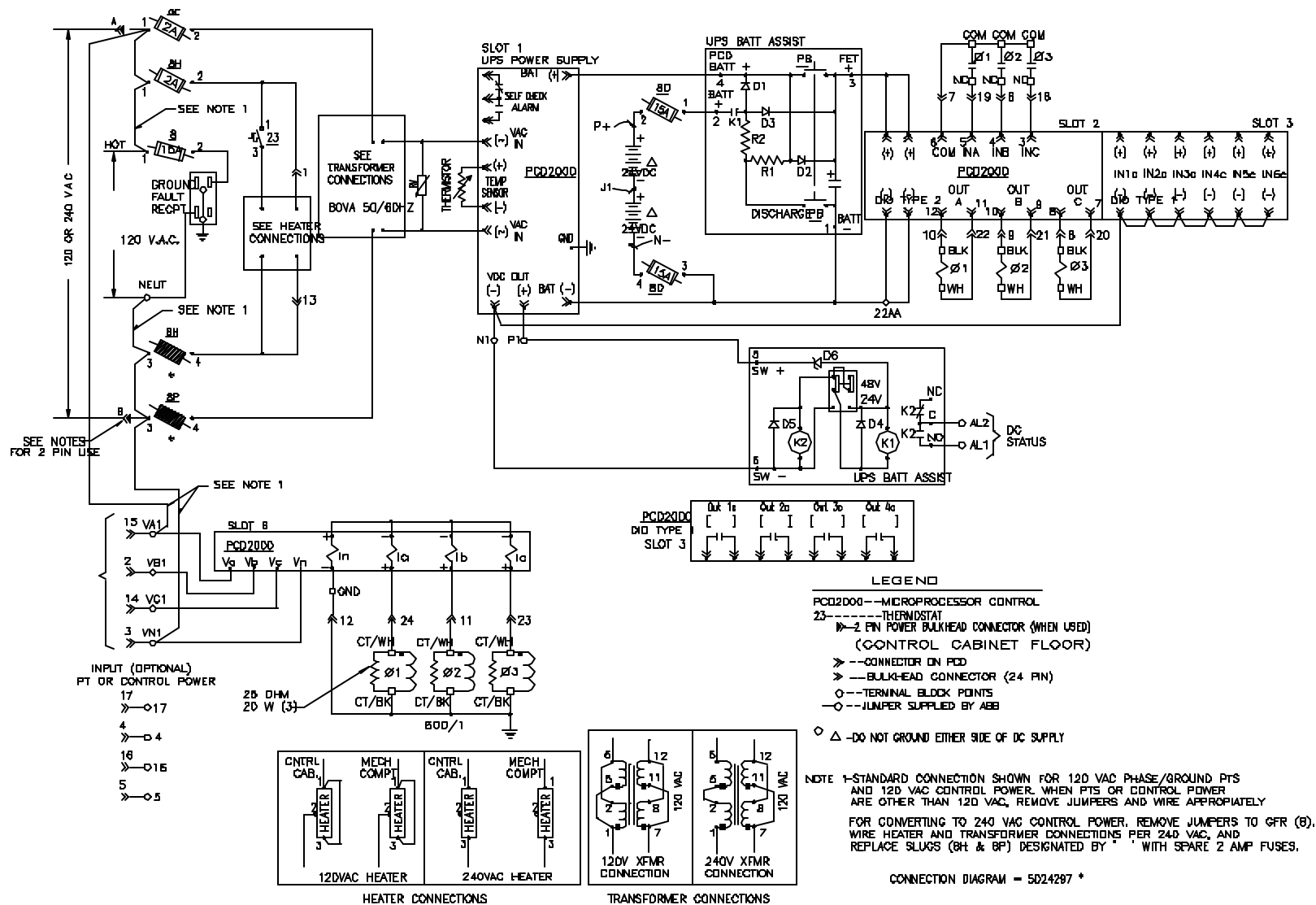


Figure 8: Typical Schematic Diagram

CONNECTION DIAGRAM - 5024297 *

VR-3S RATINGS

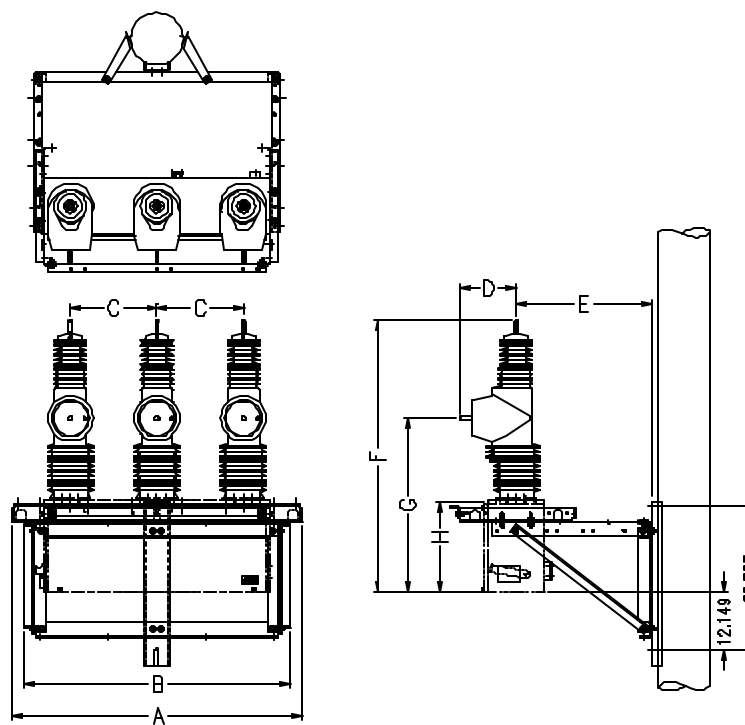
Nom. operating voltage:	2.4-14.4 kV	24.9 kV	36.0 kV
Max. design voltage:	15 kV	27 kV	38 kV
Max. continuous current:	560/800* Amps	560/800* Amps	560/800* Amps
Max. interrupting current:	12/16* kA	12.5/16* kA	12.5/16* kA
BIL:	110 kV	125 kV	170 kV
Dry withstand 60 Hz 1 Min.:	50 kV	60 kV	70 kV
Wet withstand 60 Hz 10 Sec.:	45 kV	50 kV	60 kV
Phase Spacing:	15.50 (394) inches (mm)	15.50 (394) inches (mm)	18.00 (457) inches (mm)
Min. external creep:	17.00 (432) inches (mm)	29.75 (756) inches (mm)	40.40 (1026) inches (mm)
Min. external strike distance:	10.00 (254) inches (mm)	12.25 (311) inches (mm)	16.50 (419) inches (mm)
Max. interrupting time:	0.040 sec max	0.040 sec max	0.040 sec max
Max. closing time:	0.048 sec max	0.048 sec max	0.060 sec max
Materials:	Vacuum interrupter encased in outdoor polyurethane		
Current sensors	: 0.3% accuracy; one per phase encased in polyurethane		
Operating temperature:	-50° to +70° C		
Weight (without frames):	435 lbs.	495 lbs.	565 lbs.
Control voltage:	24-240 VAC or 24-250 VDC (Nom.)		
Low Voltage Control cabinet weight:	100 lbs. (45 Kg) (with PCD & battery pack)		

Figure 9: VR-3S Ratings

Pole Mounting Dimensions

		A	B	C	D	E	F	G	H	I	J
15 kV	in	50	42	15.5	7.8	28	41	29	17.7	5.8	12.6
	mm	1270	1067	394	198	711	1041	737	450	145	320
27 kV	in	50	42	15.5	9.9	28	46	31.4	17.7	5.8	12.6
	mm	1270	1067	394	251	711	1168	798	450	145	320
38 kV	in	55	47	18	11.7	28	55.6	36.1	19.1	5.8	12.6
	mm	1397	1194	457	297	711	1412	917	485	145	320

Figure 10: Pole Mounting Dimensions



(Other pole frame drawings are available upon request. Please see your ABB representative for more information.)

Substation Mounting Dimensions

15 kV	in	B	C	D	L	M	N	O	P	Q	R
	mm	42	15.5	7.8	95.8	65.6	48	52.3	22	29.1	28.4
27 kV	in	1067	394	198	2433	1666	1219	1328	559	739	721
	mm	42	15.5	9.9	95.8	65.6	48	52.3	22	29.1	33.3
38 kV	in	1067	394	251	2433	1666	1219	1328	559	739	846
	mm	47	18	11.7	95.8	65.6	53	57.4	22	29.1	42.4
		1194	457	297	2433	1666	1346	1458	559	739	1077

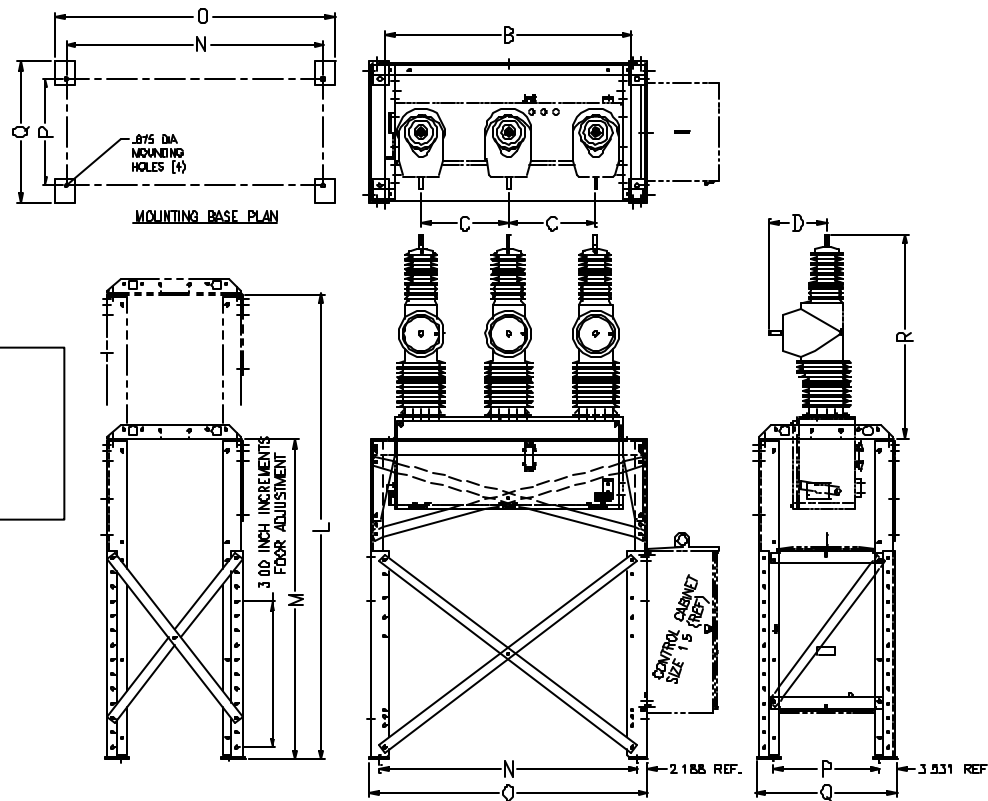


Figure 11: Substation Mounting Dimensions

Low Voltage Control Cabinet Dimensions

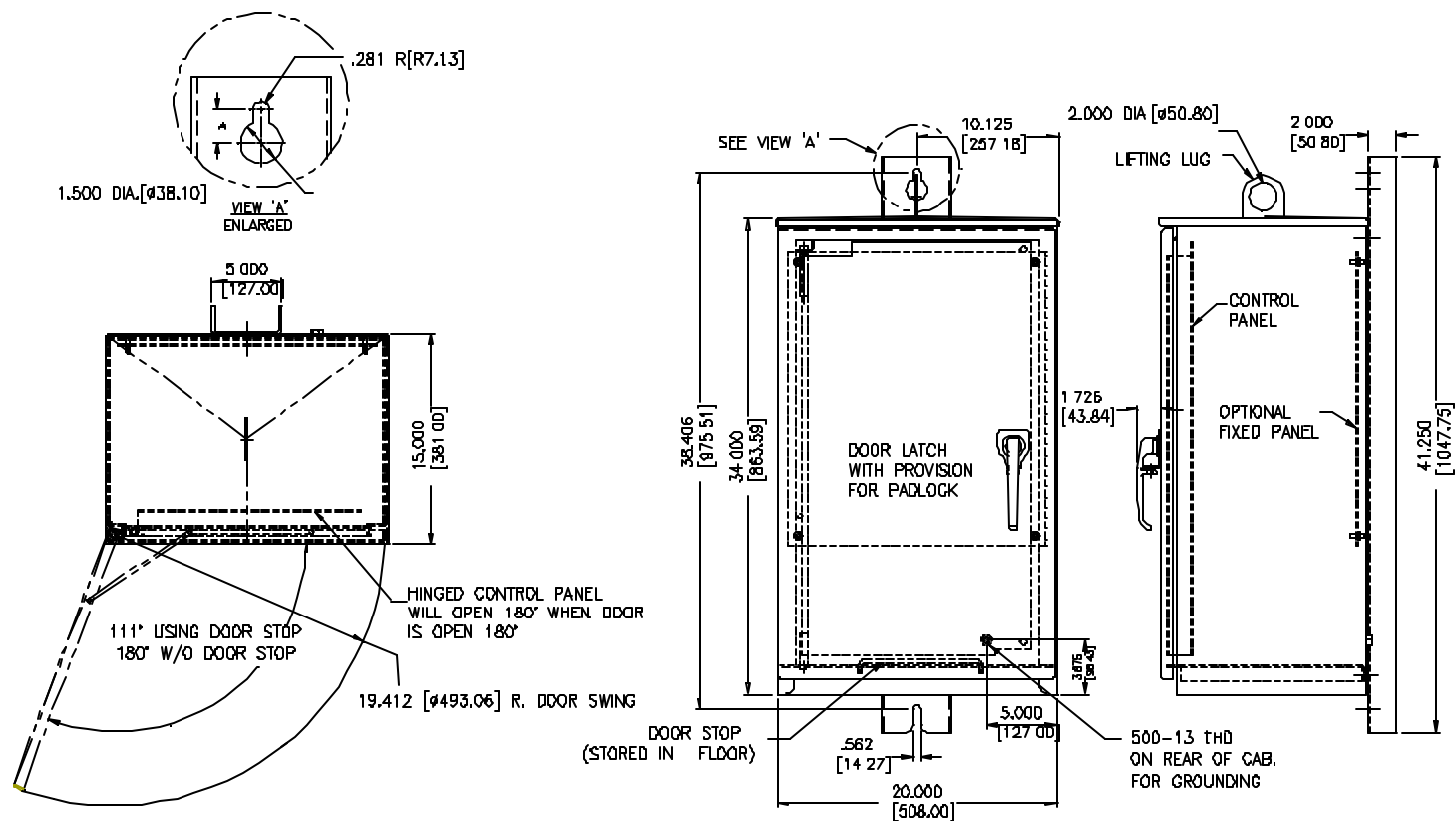


Figure 12: Low Voltage Control Cabinet Dimensions

ABB		ABB, Inc.		Lake Mary, FL U.S.A.	
○ TYPE ○					
SERIAL NO.	S.O.	DATE OF MFG.	RATED MAX. KV		
RATED FREQUENCY Hz	RATED CONTINUOUS AMPS	KV RANGE FACTOR K			
RATED SHORT-CIRCUIT AMPS	FV IMPULSE WITHSTAND KV	RATED INTER-TIME CYCLES			
CLOSING CONTROL VOLTAGE RANGE			DIAGRAM NO.		
TRIPPING CONTROL VOLTAGE RANGE			WEIGHT		
BEFORE INSTALLING READ INSTRUCTION BOOK					
FOR PARTS OR SERVICE CALL YOUR LOCAL ABB REPRESENTATIVE					
MADE IN U.S.A.					

Figure 13: Recloser Nameplate

Lifting Instruction Diagram

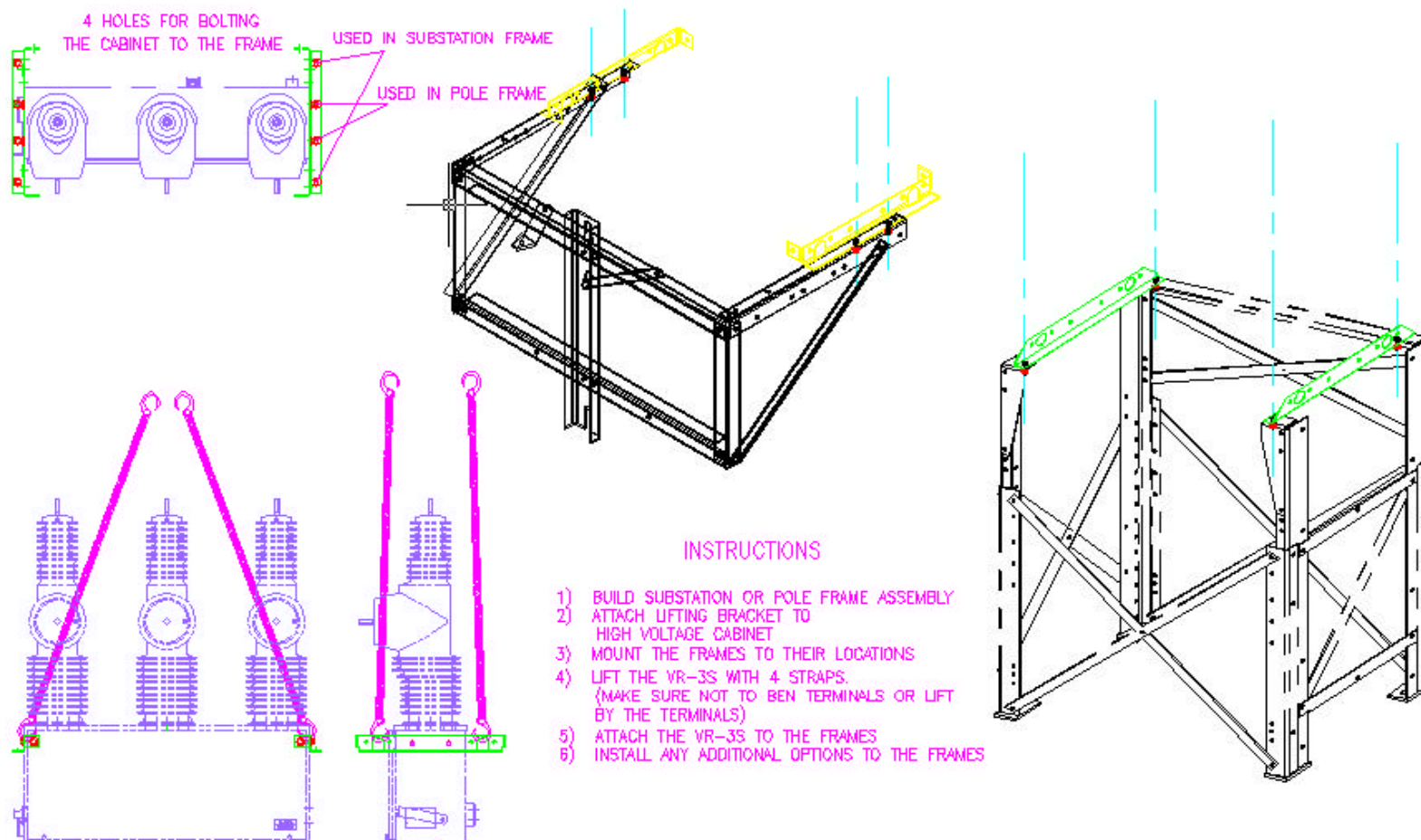


Figure 14: Lifting Instruction Diagram



ABB Inc.

655 Century Point

Lake Mary, FL 32746-2137

Telephone: (407) 732-2000

Fax: (407) 732-2161

www.abb.com/mediumvoltage