

GE
Industrial Solutions

Limitamp* AR

Arc Resistant Medium Voltage Motor Control
Installation Guide



imagination at work

Table of Contents

Introduction..... 3

Opening Medium Voltage Door 3

Medium Voltage Door Latches..... 4

Isolation Switch Handle to Contactor
Mechanical Interlock 5

Medium Voltage Door Defeater Latch 6

Low Voltage Box Wiring Details..... 7

Plenum Installation Guide..... 7

Turned Extension Plenum Installation Guide (Front/Rear) 10

Turned Extension Plenum Installation Guide (Top/Bottom) 11

Limitamp AR Extension Plenum..... 13

Extension Plenum - General Guidelines 14

Cable Entry From Top or Bottom..... 16

Dimensions 16

Introduction

GE's Limitamp AR controllers are the solution for medium voltage control when that extra margin of safety is essential. They comply to the IEEE/ANSI C37.20.7-2007 Type 2B safety standard and are designed to provide personnel protection in the event of an arc flash occurrence. This means that when the medium voltage doors are properly secured, the service technician can still access the interior of the low voltage compartment.

This installation guide is to be used in conjunction with GEH-6263 (Two high vacuum equipment), GEH-5306 (vacuum contactor) and GEH 5396B (800A) instructions.

Product Offering

- 1-high and 2-high 400A FVNR (full voltage non-reversing starters)
- 1-high 800A FVNR (full voltage non-reversing starters)
- 1-high 800A FVR (full voltage reversing starters)
- 1-high 400A FVR (full voltage reversing starters)
- RVAT (reduced voltage autotransformer starters)
- RVPR (reduced voltage primary reactor starters)
- 2S1W (two speed, single winding starters)
- 2S2W (two speed, dual winding starters)
- 400A MVSS (medium voltage solid-state starters)
- IC-1074 load break switches
- SYNC excitation starters
- Main, Feeder and Tie sections
- Incoming line cable sections
- Auxiliary sections



Figure 1. 36" wide Two-High AR FVNR starter with low-voltage doors open.

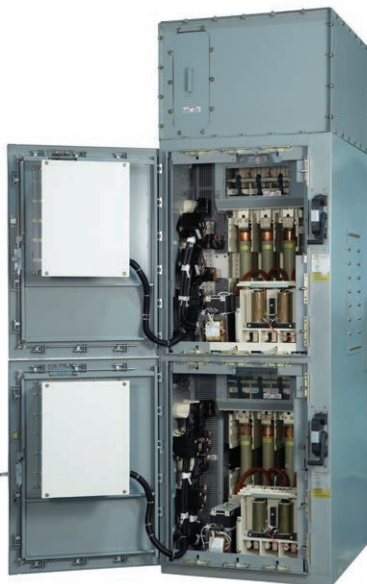


Figure 2. 36" wide Two-High AR FVNR starter with medium voltage doors open.

WARNING: Before any adjustments, servicing, parts replacement or any other act is performed requiring physical contact with the electrical working components or wiring of this equipment, all power must be removed and locked off from all sources and all attached rotating equipment must have come to a complete stop. User personnel must be completely familiar with the following operating and maintenance instructions before attempting to service this equipment.

WARNING: The vacuum interrupter integrity test should be performed before the high voltage vacuum contactors are energized for the first time and each time the contactors are returned to service after maintenance, adjustment or repair. Failure to perform this test may result in serious injury or death.

CAUTION: Product is not intended for nuclear use.

Opening Medium Voltage Door

The medium voltage doors on the CR194 Two-High Vacuum Limitamp AR are mechanically interlocked to prevent the opening of the doors when equipment is energized. For safe opening of medium voltage door, follow the step-by-step procedure as mentioned below.

Step 1: Press the silver latch release and rotate the black handle with a rapid positive motion to the full "OFF" position. The silver latch release must pop out and return to original position. See Figure 3.

Step 2: Rotate the medium voltage door latch handle (silver color) 90° in the counter-clockwise direction to disengage the multi latches on the inside of the door. See Figure 4.

Step 3: The medium voltage door may then be opened by pulling out on the latch handle.



Figure 3. Push in the handle latch



Figure 4. Rotating the medium voltage door latch handle.

WARNING: Confirm that equipment is de-energized before opening the medium voltage doors.

Medium Voltage Door Latches

The Limitamp AR design uses a special high strength door latching mechanism. All latches must be properly engaged for the product to function correctly. Rotating the silver door latch handle in a clockwise or counter-clockwise direction operates all of the locking pins.

The door latch locking pins are adjusted prior to shipment from the factory. If latch pins are moved or replaced, ensure they are adjusted per the sketch below. Apply thread locker to the locking stud and re-tighten.

When the door handle is in the locked position, adjust the locking pin bridge to provide a 0.150" gap between the bridge and the welded "U" fork on the door.

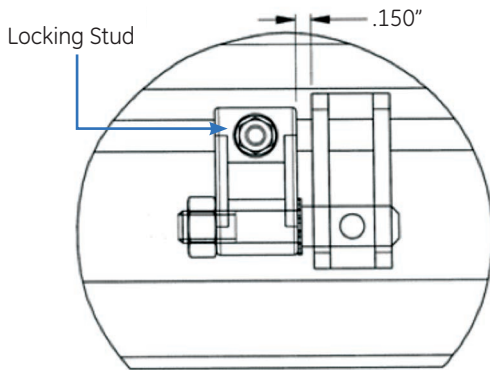


Figure 5. View to show gap between locking pin bridge and "U" fork on the door.

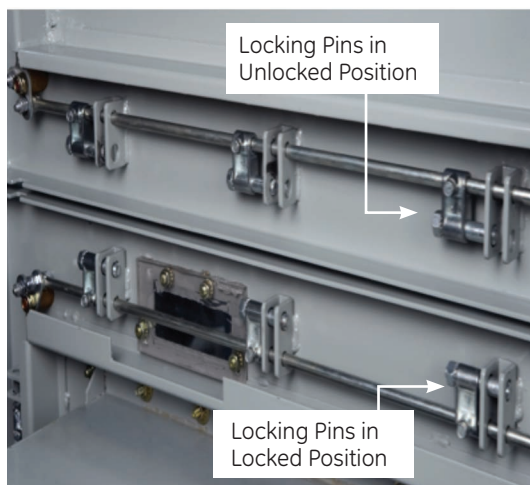


Figure 6. View of locking pins on medium voltage door.

The moving locking pins engage the fixed position latch plates. The mating part of the latch system is shown in Figure 7. The latch plates are bolted to the enclosure using a stud plate that passes through the flange of the case. The latch plates can be adjusted in all directions using the slots in the enclosure flanges and special shims. The latch parts should be adjusted so the moving locking pins engage the open slot latch plate. The nominal position for the latch plate is flush with the front edge of the enclosure flange.



Figure 7. View of enclosure mounted latch plates.

WARNING: Barriers or enclosure door latch parts removed to service the equipment must be re-installed in the exact location for safe operation. Non-compliance with these instructions could lead to serious injury. Mark the location of these items with ink for ease of re-assembly.

Isolation Switch Handle, Contactor Mechanical Interlock

The Limitamp AR vacuum starter is equipped with a quick-make/quick-break isolation switch in each starter. The isolation switch is not designed to make or break motor load current. To ensure that the isolation switch handle cannot be operated when the contactor is energized, a mechanical interlock mechanism is provided between the contactor and the isolation switch handle. Operation of this mechanical interlock for each starter should be checked per the following procedure.

WARNING: Confirm the equipment is de-energized before performing this check.



Figure 8. View of the contactor to isolation switch mechanical interlock at the vacuum contactor.



Figure 9. Adjusting connecting rod

Step 1: Adjust the nuts to shift the connecting rod position as shown in Figure 10.

Step 2: With the contactor de-energized and in the open position, the connecting rod should be adjusted such that the pusher rod will freely pass through the round hole in the connecting rod.

Step 3: Once adjusted, tighten the two nuts against the block.

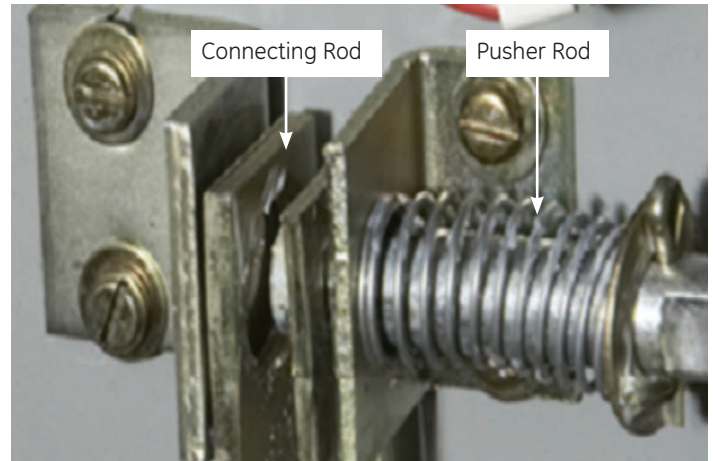


Figure 10. View of unblocked Pusher Rod when the contactor is open.

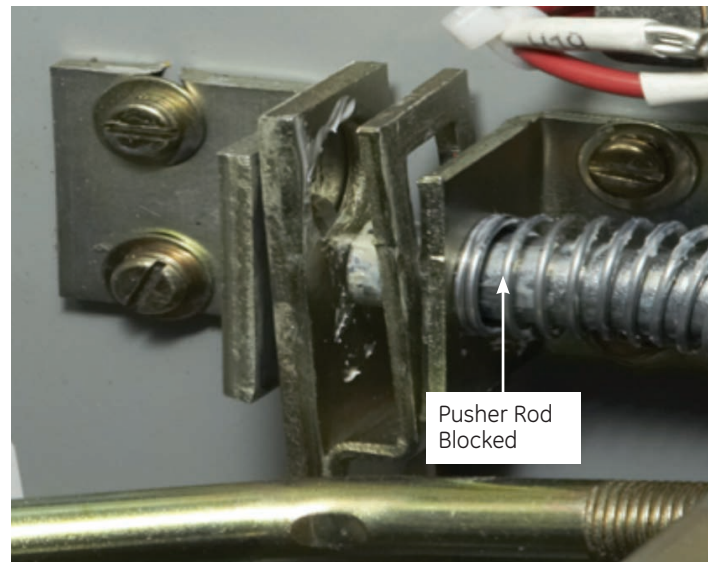


Figure 11. View of blocked Pusher Rod when the contactor is closed.

To verify that the interlock is properly adjusted, press or hold down moveable armature on top of the contactor. Press the silver handle latch. The mechanical interlock should prevent the silver handle latch from going in and prevent the handle from being moved.

Medium Voltage Door Defeater Latch

WARNING: The following steps should be taken only as a last resort to enter a malfunctioning controller. It is imperative that all power to main bus be removed before proceeding.

IN CASE OF EMERGENCY, remove all power to the controller, then the medium voltage door may be opened with the contactor in the closed position and with the isolation switch closed, by following the procedure listed below.

WARNING: Do not proceed unless all power to the controller is removed. In this situation, doors must not be opened with power connected to the bus.

Step 1: Remove the door interlock defeater locking nuts shown in Figure 12.

Step 2: Pull down the door latch operating handle to disengage the multiple door latches on the inside of the medium voltage door.

Step 3: Unscrew all flange nuts simultaneously until disengaged.

Step 4: You should be able to open the medium voltage door by pulling out on the silver handle. As you pull on the door, the door interlock defeater will pull away from the door.

WARNING: Defeating medium voltage door interlock leaves the power fuses and contactor connected to the bus. The bus power must remain de-energized while the medium voltage door is open.



Figure 12. View showing door interlock defeater locking nuts.

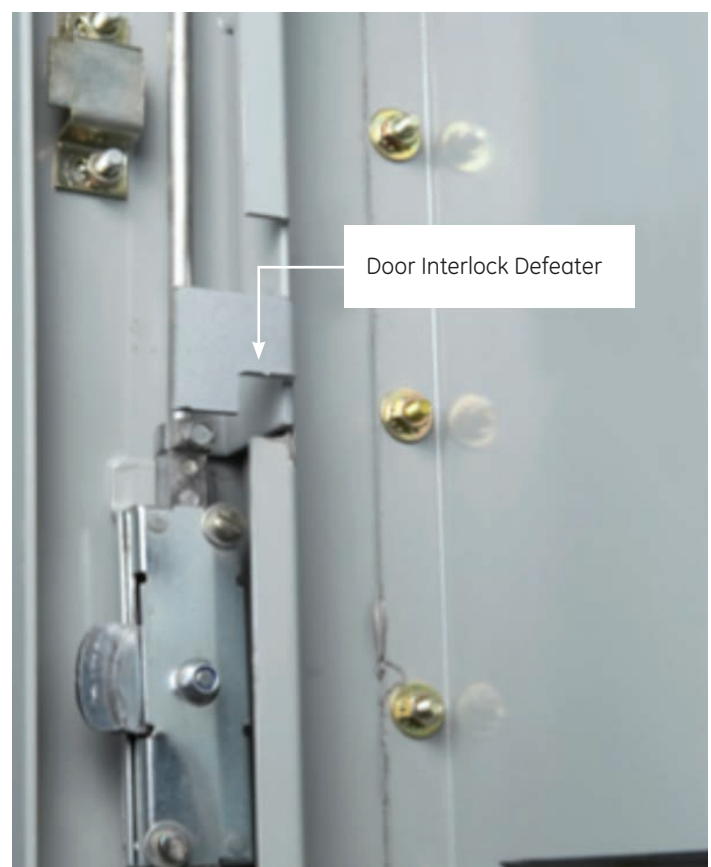


Figure 13. View showing door interlock defeater.

Low Voltage Box Wiring Details

Step 1: All low voltage wiring entering and exiting the low voltage compartment must be routed through the bushings provided on the box.

Step 2: Once all wiring is complete, fill the bushings with R.T.V or other equivalent sealant material.

Step 3: Wrap the outside of bushings and wiring with 3M, 130C tape. Tape must extend down the wire bundle a minimum of 6 inches. Refer to figure 14 for details.

WARNING: Ensure all wire way openings are properly sealed before energizing.



Figure 14. Low voltage box wiring.

Plenum Installation Guide

The Limitamp AR design requires the use of a ventilation plenum to route any arcing gases and particles away from the equipment. Each section requires a plenum. Extra extension plenum parts can be used to exhaust the arcing gases and particles out of the building. The plenum parts are shipped with the equipment. It is the end user's responsibility to install the plenum part on the Limitamp AR enclosure.

Store the plenum or extension plenums on a level surface to avoid distortion. Ensure they are kept in clean and dry condition with ample air circulation before installation.

NOTE: It is NOT recommended to store the plenum outdoors.

At the installation site, remove all separately packaged components shipped inside the Limitamp AR unit. Locate the plenums, cover plates and mounting hardware and place them in the work area. It is recommended that the plenum parts be installed in the sequence listed below.

WARNING: Allow at least 12 feet of unobstructed space for exhaust gases. Otherwise, serious injury or death may occur.

Step 1: Before installing the plenum system, remove all plastic snap-in clips in the top vent flaps of the Limitamp AR enclosure to ensure vent flaps operate properly.

Step 2: Apply a strip of sealer around the top perimeter of the first shell. Sealer should be placed on the outside of the mounting holes on the shell top.

Step 3: Lift plenum box for the first section with appropriate means and place it on top of the unit, taking care not to damage the vent flaps on top of the Limitamp AR enclosure.

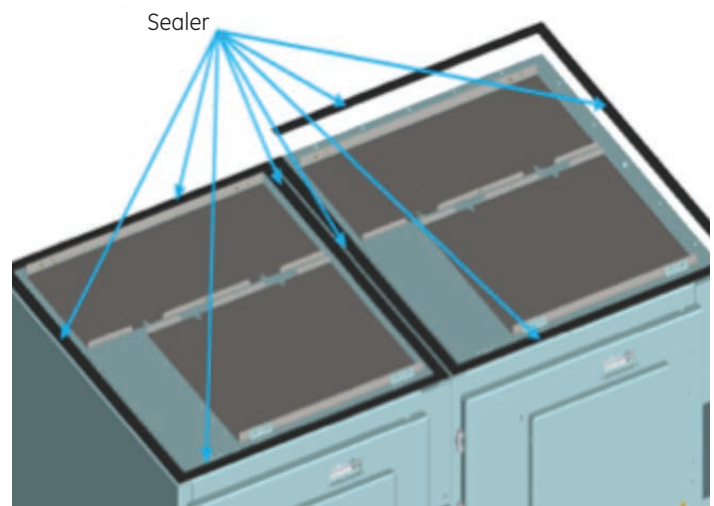
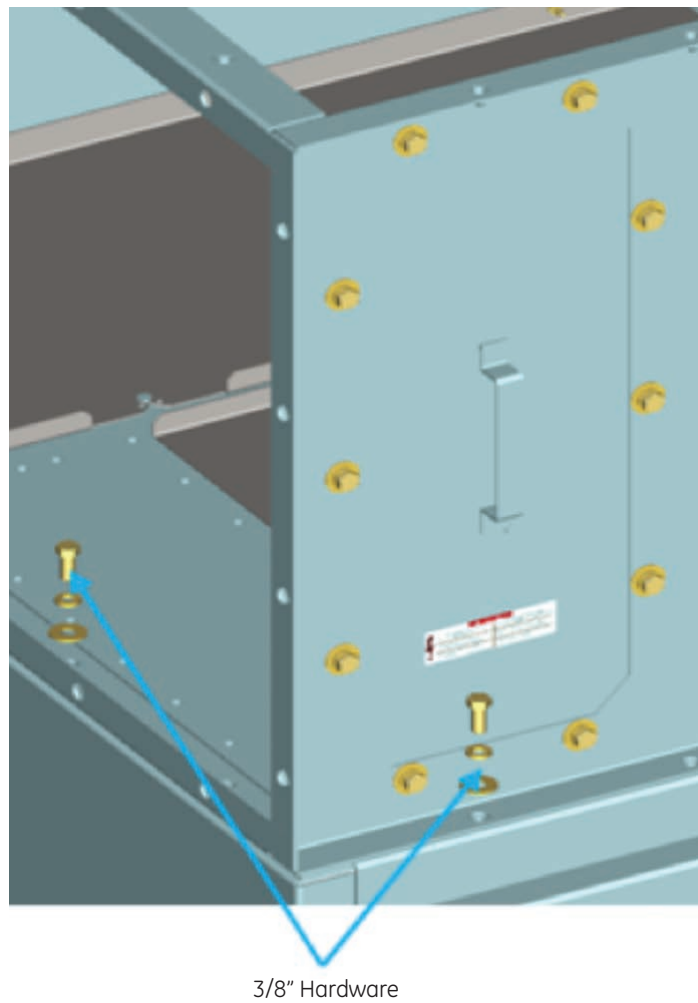


Figure 15. Apply sealer around the top perimeter of the shell.

Step 4: Align holes on top of enclosure and the plenum. Attach the plenum using the 3/8" hardware provided with kit, as shown in Figure 16.

Figure 16. View of hardware to mount plenum to top of enclosure.



Torque Recommendations.

Table 1

Bolt Size	SAE Grade 5 Bolt Torque (Ft-lb)
1/4 - 20	4
5/16 - 18	9
3/8 - 16	16
1/2 - 13	39

Step 5: Apply sealer around perimeter of the plenum side that will be closed.

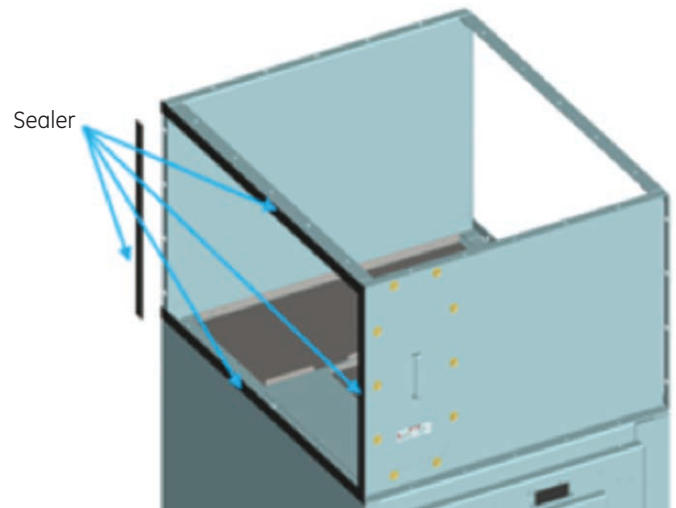


Figure 17. Apply sealer on closed end of plenum.

Step 6: Mount plenum end cover using 3/8" hardware. Refer to Table 1 for torque details.

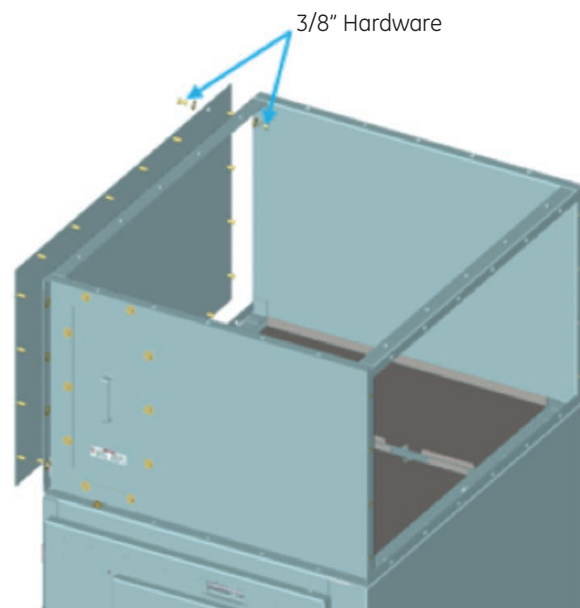


Figure 18. Mount end cover plate on plenum.

Step 7: Apply sealer around perimeter of the other side of the plenum and on the top of the second shell.

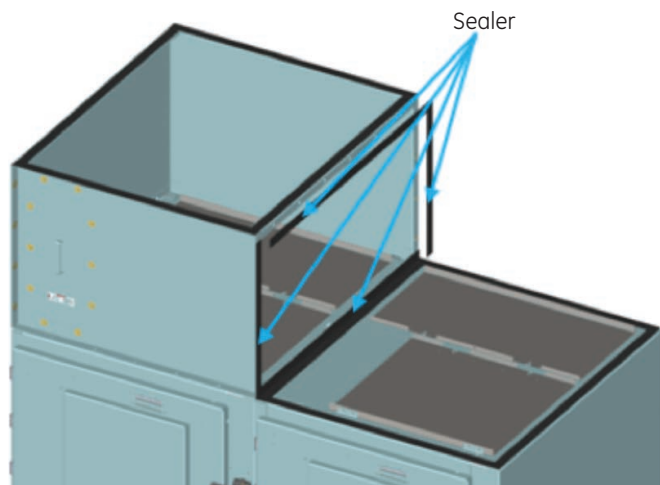


Figure 19. Application of sealer to plenum and shell.

Step 8: Lift second plenum and position to align holes. Bolt the second plenum in place. Install 3/8" hardware in all holes between the plenums and to the top of the shell.

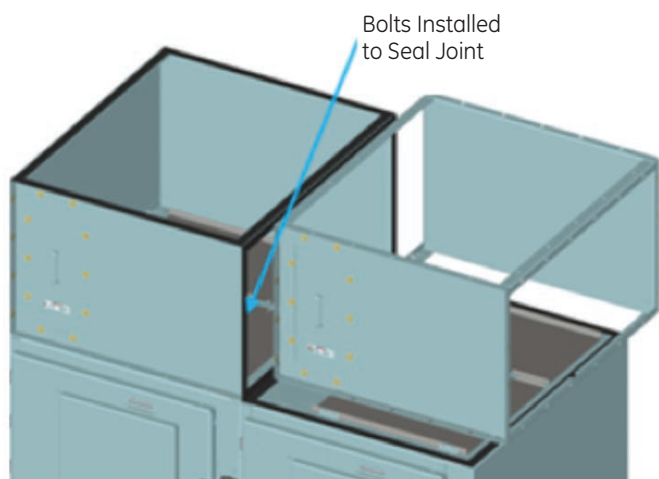


Figure 20. Bolting the plenums together

Step 9: Apply a layer of sealer on the bottom plate of the first extension plenum. Attach bottom plate to the plenum.

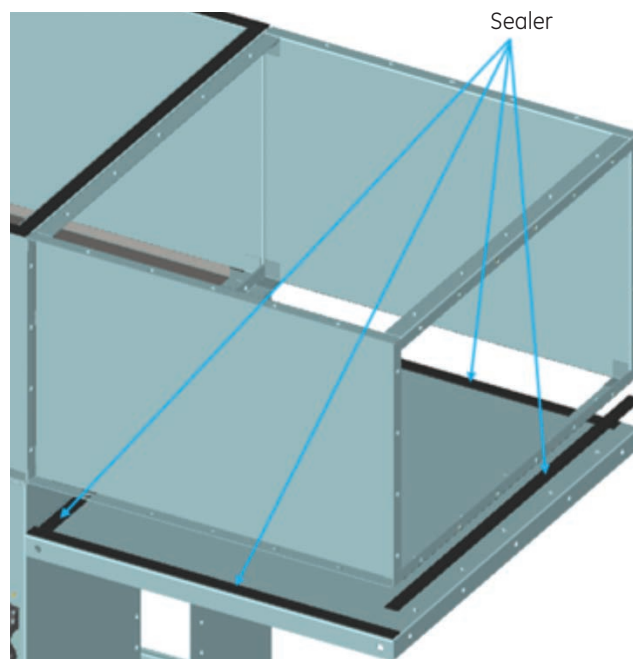


Figure 21. Mount extension plenum bottom plate in place.

Step 10: Apply a layer of sealer to the open end of the plenum that is mounted on the end of the lineup. Lift the extension plenum and hold it in place until bolts can be mounted to attach the two plenums together. Extension plenum should be supported.

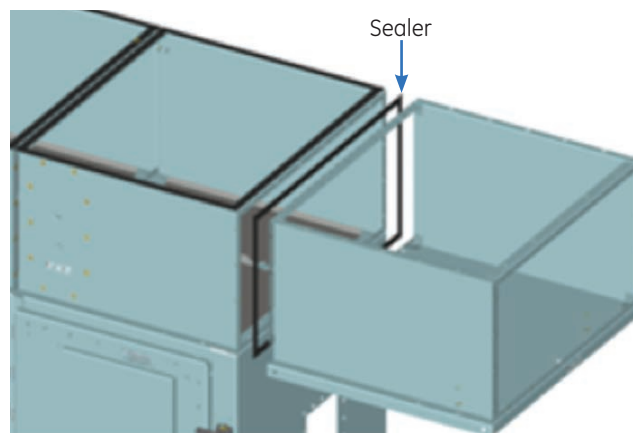


Figure 22. Assemble the extension plenum using 3/8" Hardware.

Step 11: Continue the assembly of extension plenums following the same procedure. At the end of the final extension plenum, the end duct assembly must be installed.

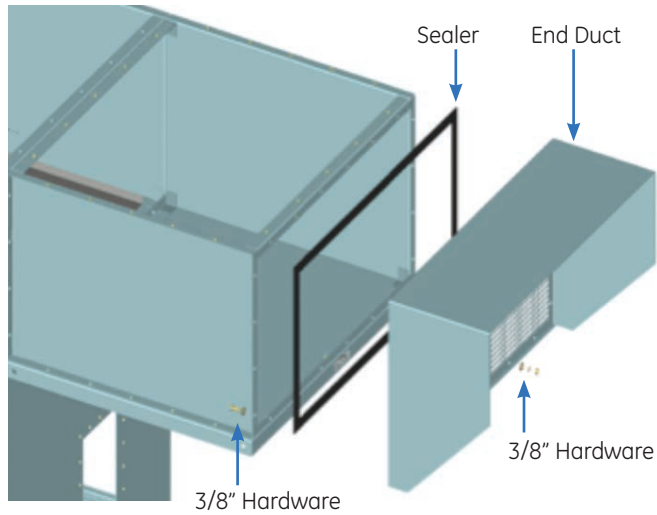


Figure 23. Assembly of end duct to the last segment of the plenum.

If the customer chooses to install their own version of end duct segment, the duct must allow a minimum open exhaust area of 428 in².

Step 12: Once all the plenums are in place and bolted together, apply a gasket around the perimeter of each plenum frame and mount the cover plates using 3/8" hardware.

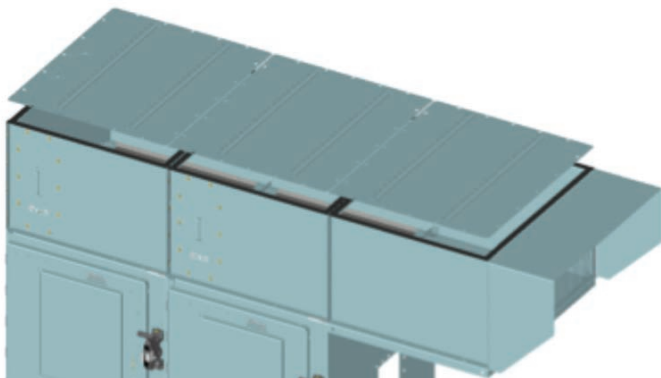


Figure 24. Mount top covers using 3/8" diameter bolts.

Turned Extension Plenum Installation Guide (Front/Rear)

At the installation site, remove all separately packaged components shipped inside the Limitamp AR unit. Find the Turned Plenum, and mounting hardware and place them in the work area.

Step 1: Remove top cover plate on existing extension plenum for assembly. Apply sealer around perimeter of existing extension plenum side flanges, where turned plenum (Front/Rear) will be attached.

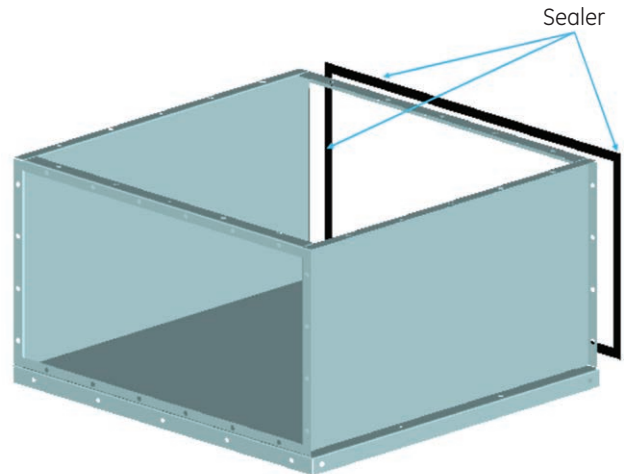


Figure 25. Apply sealer around perimeter of plenum.

Step 2: Install 3/8" hardware to fasten the turned plenum (Front/Rear) to the extension plenum.

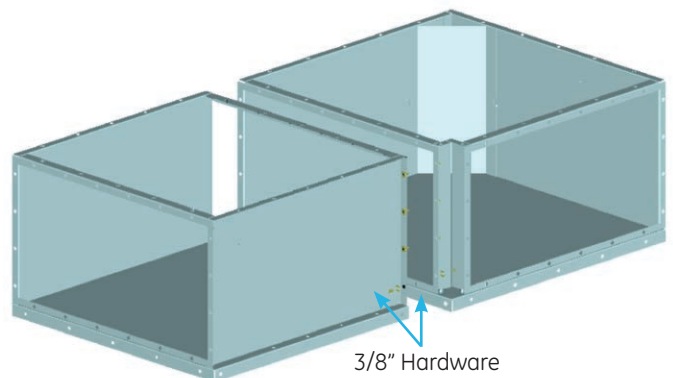


Figure 26. Use 3/8" hardware to mount turned plenum (Front/Rear).

Step 3: Apply sealer around perimeter of turned plenum (Front/Rear) flanges where extension plenum will be attached.

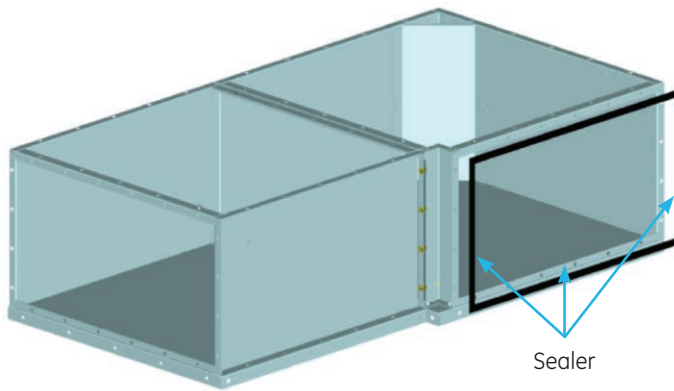


Figure 27. Apply sealer around perimeter of turned plenum (Front/Rear).

Step 4: Install 3/8" hardware to fasten the extension plenum to turned plenum.

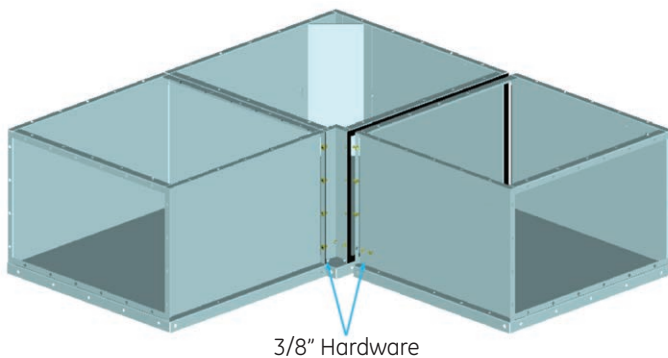


Figure 28. Use 3/8" hardware to mount extension plenum.

Step 5: Once all the plenums are in place and bolted together, apply sealer around the perimeter of each plenum frame and mount the cover plates using 3/8" hardware.

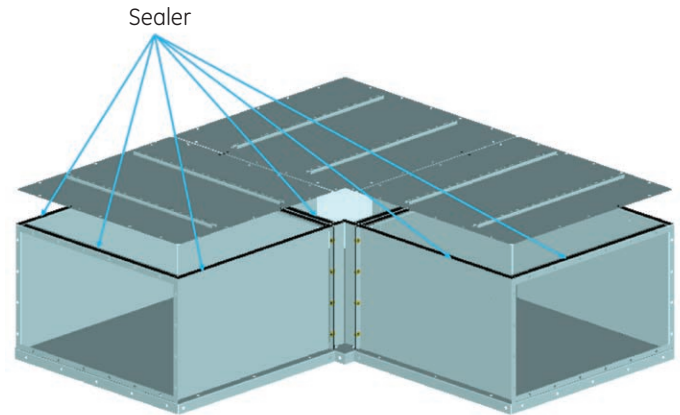


Figure 29. Assemble top covers using 3/8" diameter bolts.

Turned Extension Plenum Installation Guide (Up/Down)

At the installation site, remove all separately packaged components shipped inside the Limitamp AR unit. Find the Turned Plenum, and mounting hardware and place them in the work area.

Step 1: Remove top covers on existing extension plenum for assembly. Apply sealer around perimeter of existing extension plenum side flanges where turned plenum (up/down) will be attached.

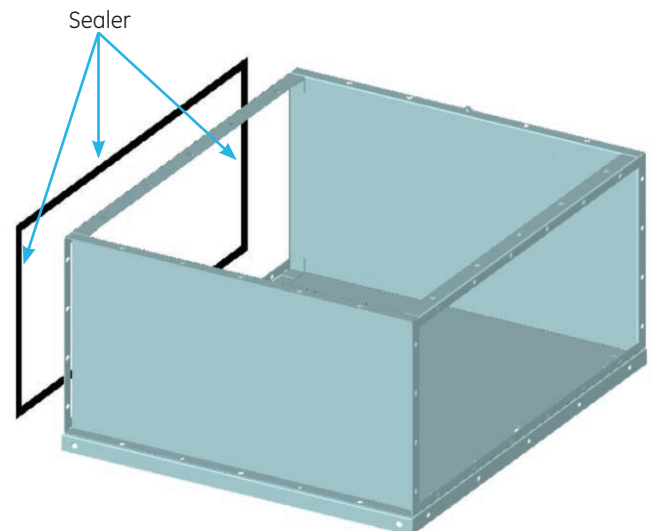


Figure 30. Apply sealer around perimeter of plenum.

Step 2: Install 3/8" hardware to fasten the turned plenum (top/bottom) to the extension plenum.

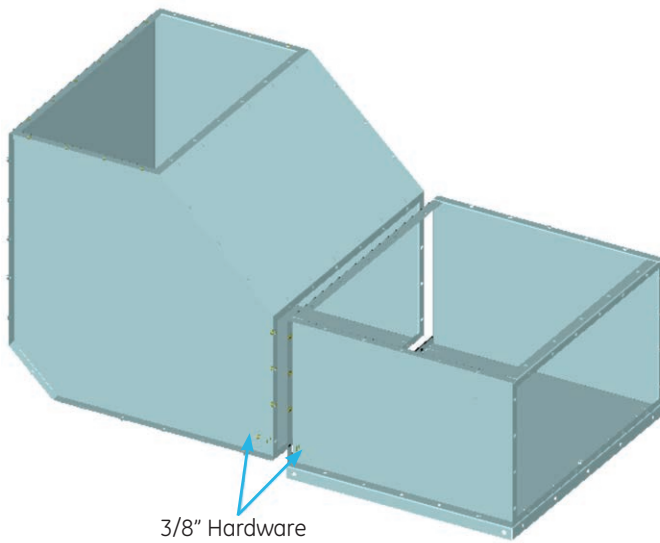


Figure 31. Use 3/8" hardware to mount turned plenum.

Step 3: Apply sealer around perimeter of turned plenum (top/bottom) flanges where extension plenum will be attached.

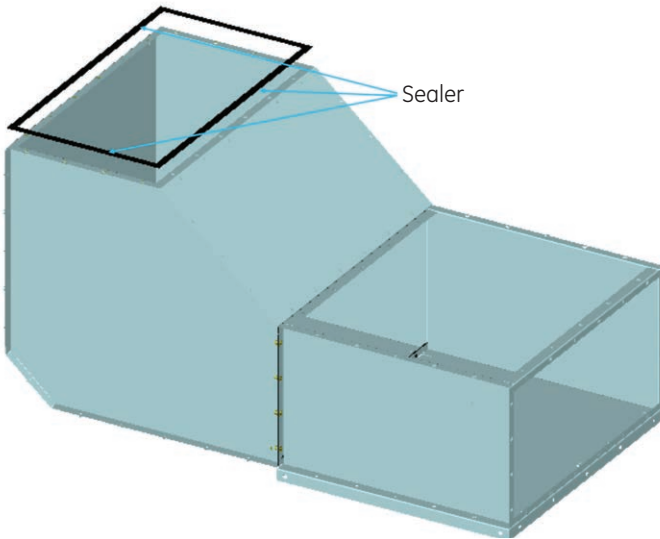


Figure 32. Apply sealer around perimeter of turned plenum.

Step 4: Install 3/8" hardware to fasten the extension plenum to turned plenum.

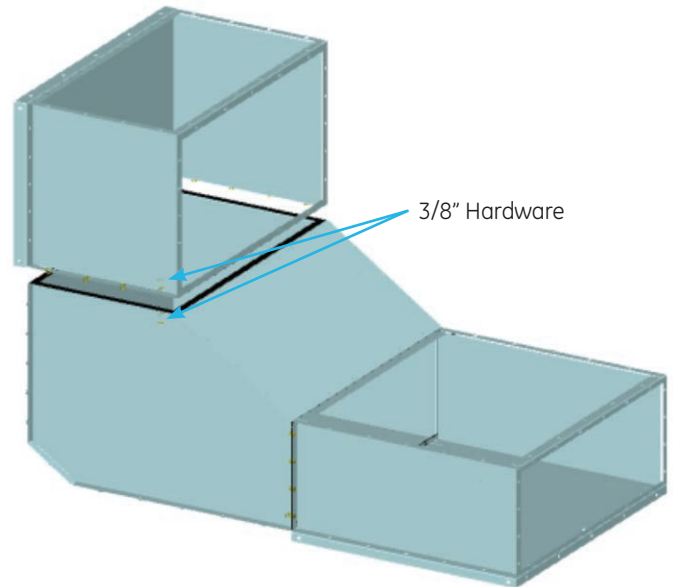


Figure 33. Mount extension plenum on turned plenum (up/down).

Step 5: Once all the plenums are in place and bolted together, apply sealer around the perimeter of each plenum frame and mount the cover plates using 3/8" hardware.

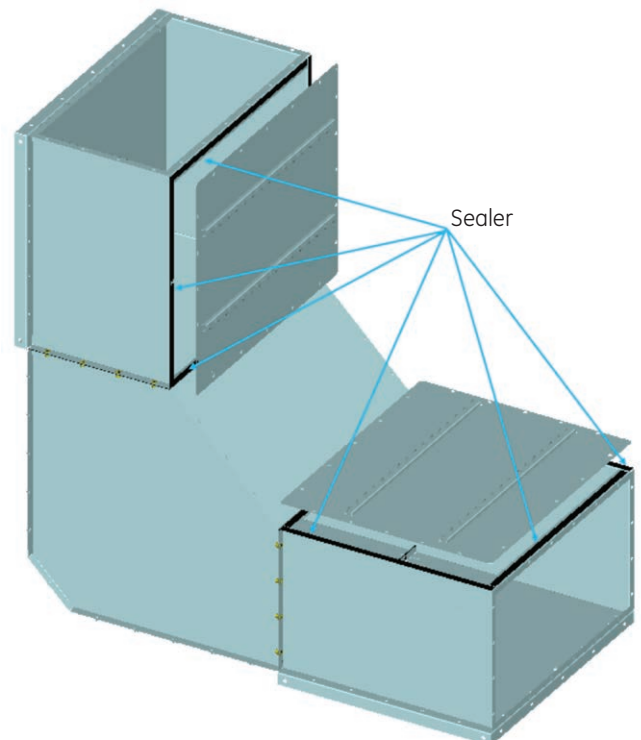
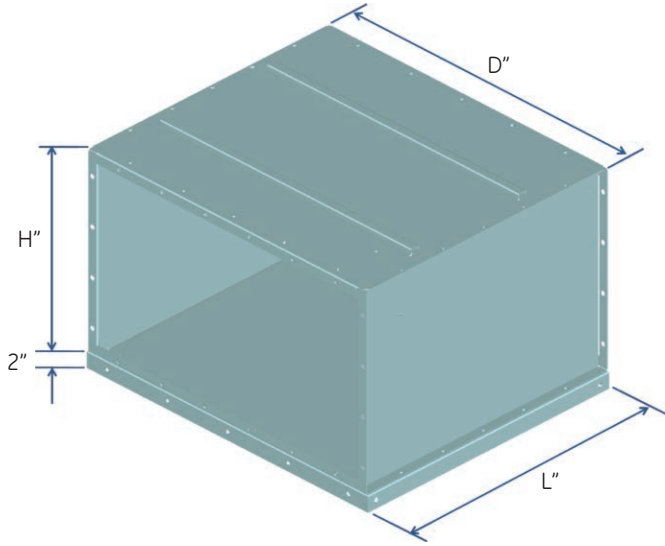


Figure 34. Use 3/8" hardware to mount cover plates.

Limitamp AR Extension Plenum

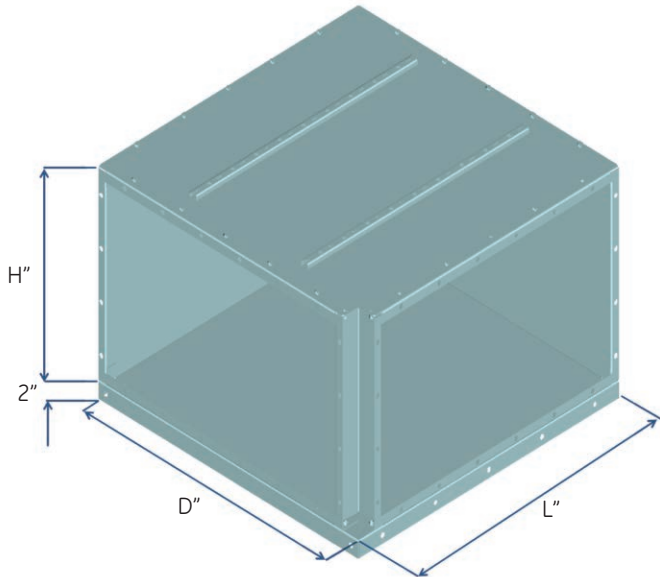
Limitamp AR Extension Plenum - Straight



Extension Plenum Type	Part number	L (in)	H (in)	D (in)	Approx. Weight (lbs)
12" straight	55B528942ENG4	12	24	42	90
22" straight	55B528942ENG1	22	24	42	135
24" straight	55B528942ENG5	24	24	42	140
36" straight	55B528942ENG2	36	24	42	195
40" straight	55B528942ENG3	40	24	42	215
48" straight	55B528942ENG6	48	24	42	250

Note: 2 inch bottom cover plate has \varnothing 0.635 holes to support the extension plenum

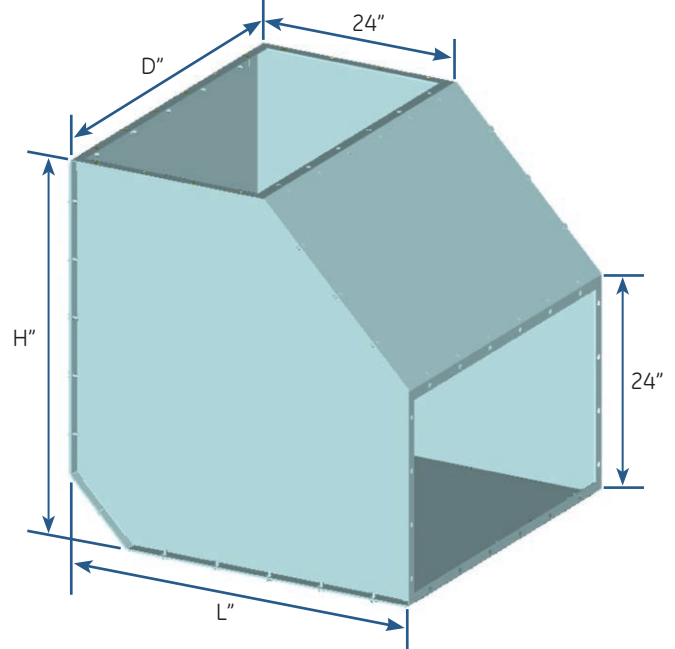
Limitamp AR Extension Plenum - Elbow - Front/Rear



Extension Plenum Type	Part number	L (in)	H (in)	D (in)	Approx. Weight (lbs)
Front /Rear Elbow	55B528942FZG1	44	24	44	260

Note: Rotate the extension plenum suitably to create Front/Rear elbow

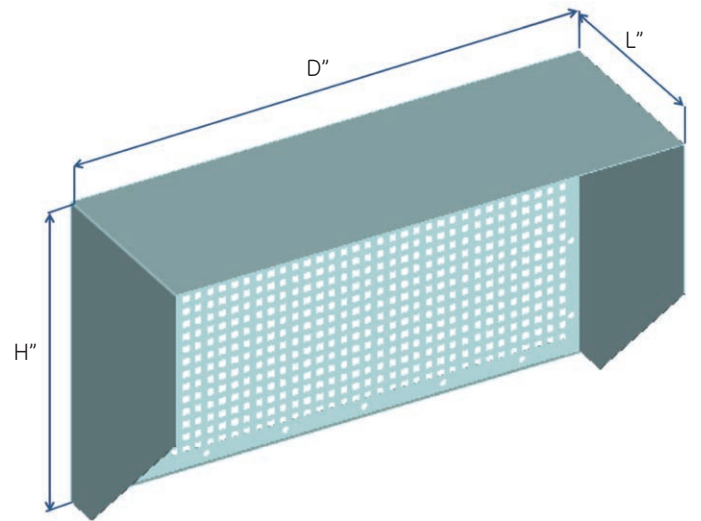
Limitamp AR Extension Plenum – Elbow – Up/ Down



Extension Plenum Type	Part number	L (in)	H (in)	D (in)	Approx. Weight (lbs)
Up/Down Elbow	55B528942GJG1	42.5	42.5	41.5	300

Note: Rotate the extension plenum suitably to create up/down elbow

Limitamp AR Extension Plenum – End Duct



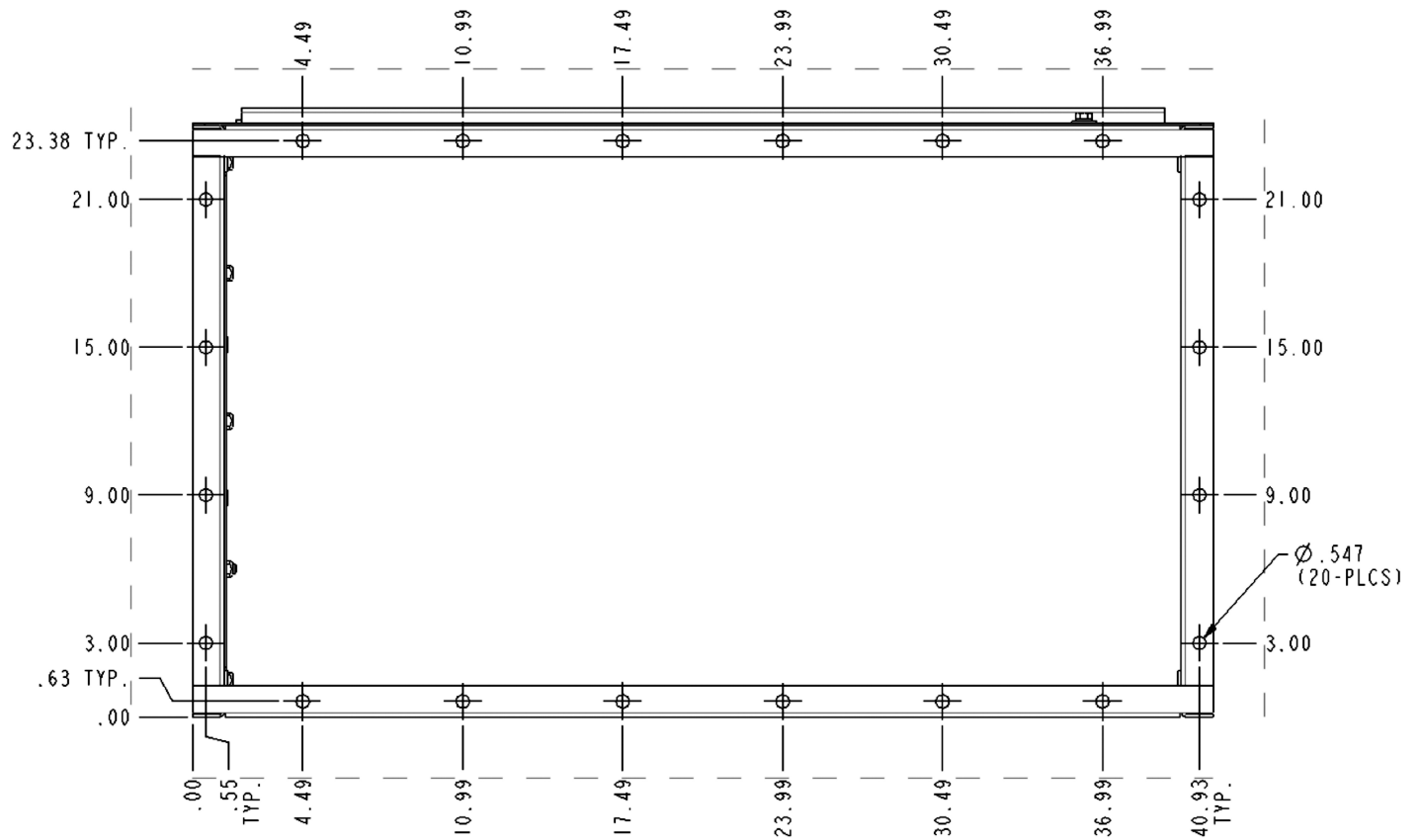
Extension Plenum Type	Part number	L (in)	H (in)	D (in)	Approx. Weight (lbs)
End Duct	55C682150ALG1	15	24	42	60

Note: End duct will be provided with a Rodent screen

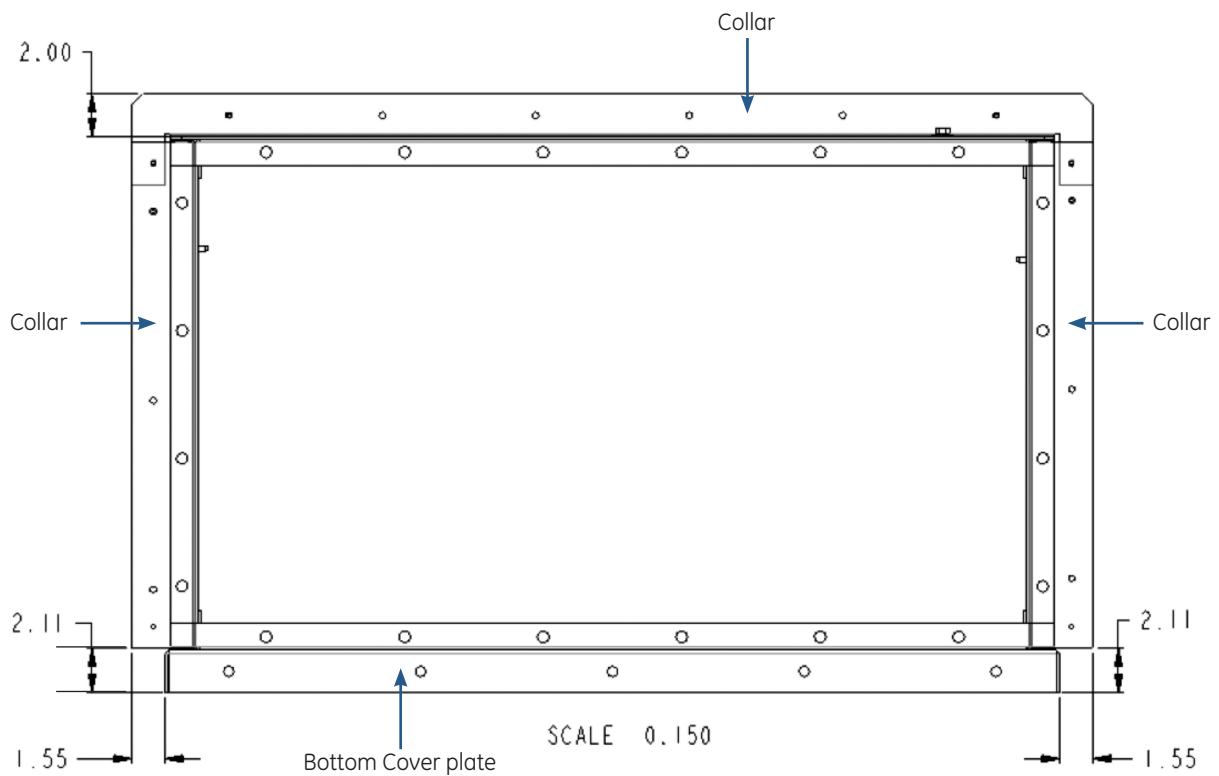
Extension Plenum – General Guidelines

1. Support the Extension plenum at a minimum, every 40 inches throughout the straight length.
2. Straight lengths can be used along with Front/Rear and/or Up/Down elbows to fit the customer layout.
3. Use the bottom cover plate with 0.635 inch diameter holes for supporting the extension plenum.
4. If required, contact the GE factory to order collars that may be installed on the plenum to support the straight extension plenum from the top.
5. Extension plenums are constructed using 12 gauge sheet metal.
6. Allow a minimum of 76 inches straight length between turns when designing the layout of the extension plenum.
7. Customers may install their own version of End duct. Ensure a minimum exhaust area of 428 in². Follow local code requirements.
8. Refer to installation section for assembly of extension plenums.

Plenum Flange details to connect the plenum extension or End Duct



Straight extension plenum with Collar installed (Side View)



Cable Entry From Top or Bottom

Removable cable entry plates are provided on the top and bottom of the equipment.

Step 1: Remove cable entry cover plates. Cut an appropriate size hole for required conduit bushing.

Step 2: Install a conduit bushing(s) capable of sealing against 20-psig minimum pressure on all cables entering or exiting the enclosure.

WARNING: Conduit bushings capable of sealing against 20-psig minimum should be installed on all cables entering or exiting the enclosure. If these bushings are not installed, hot arc gases can escape thru open area around cables. Serious injury or death may result.

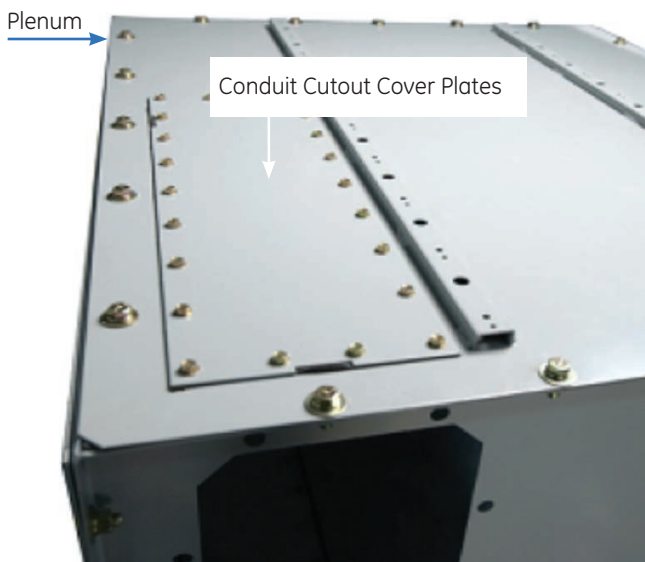


Figure 35. Conduit cover plate in plenum for top cable entry.

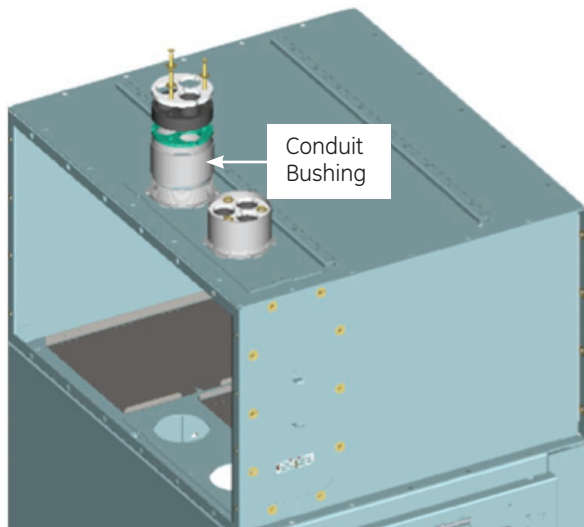


Figure 36. Assembly of conduit bushing on to the plenum top cover for top cable entry.

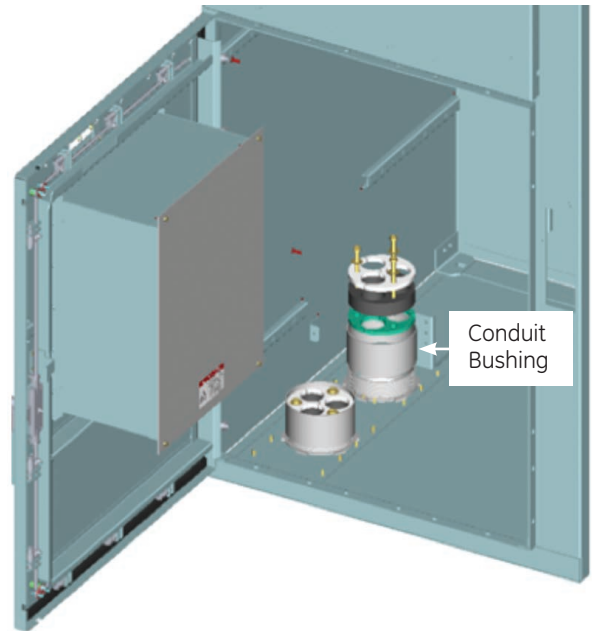


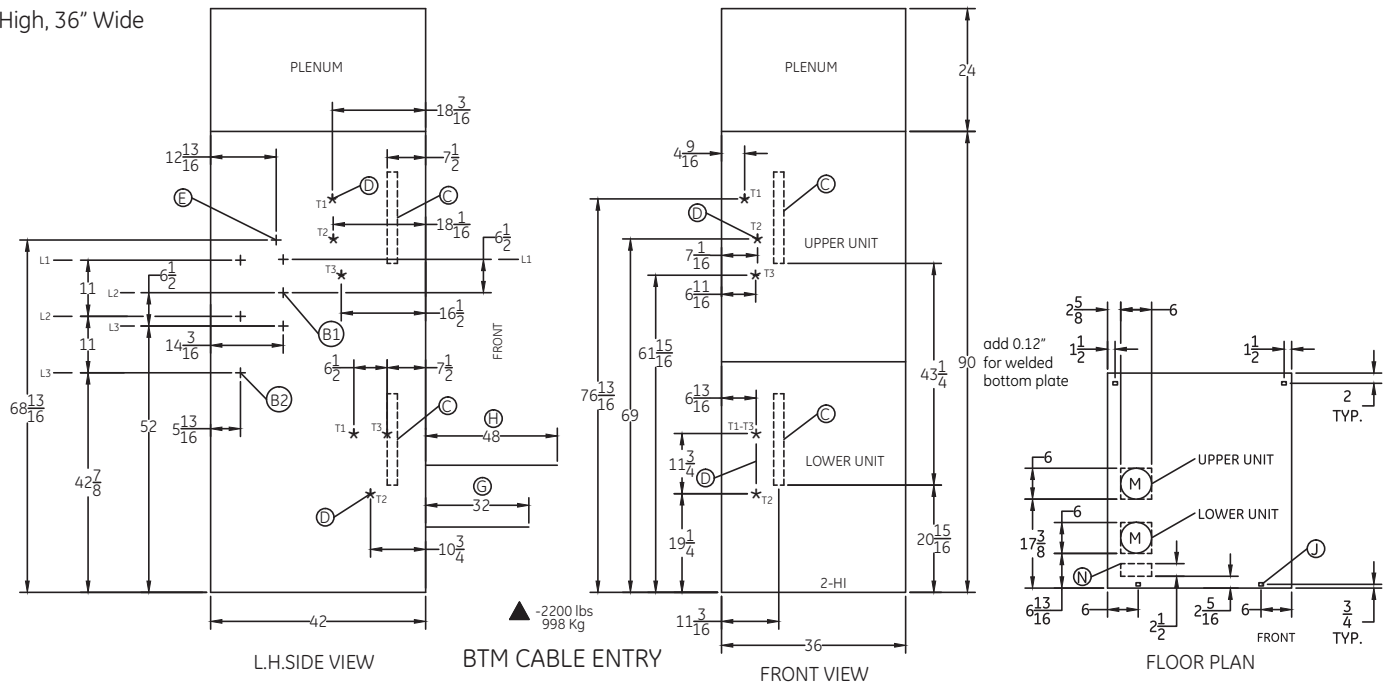
Figure 37. Assembly of conduit bushing on the bottom conduit plates for bottom cable entry.

Dimensions

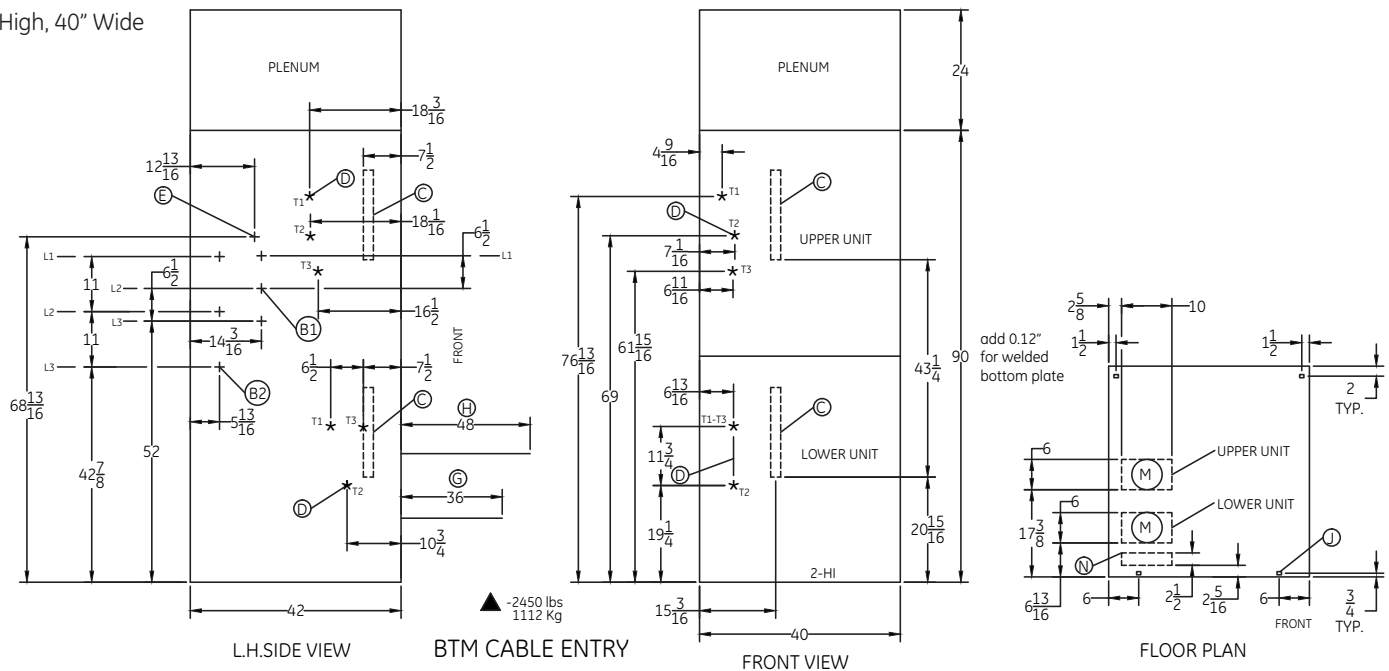
Dimensions vary according to controller type. For dimension details of 400 Amp starters, refer to Figures 38 and 39. For dimension details of 800 Amp starters, refer to Figure 40.

Limitamp AR Medium Voltage Motor Control
CR194 AR 400A, Stationary or Draw-out,
Outline Dimensions 2400-7200 Volts, Two-High, Bottom Cable Entry.

2 High, 36" Wide



2 High, 40" Wide

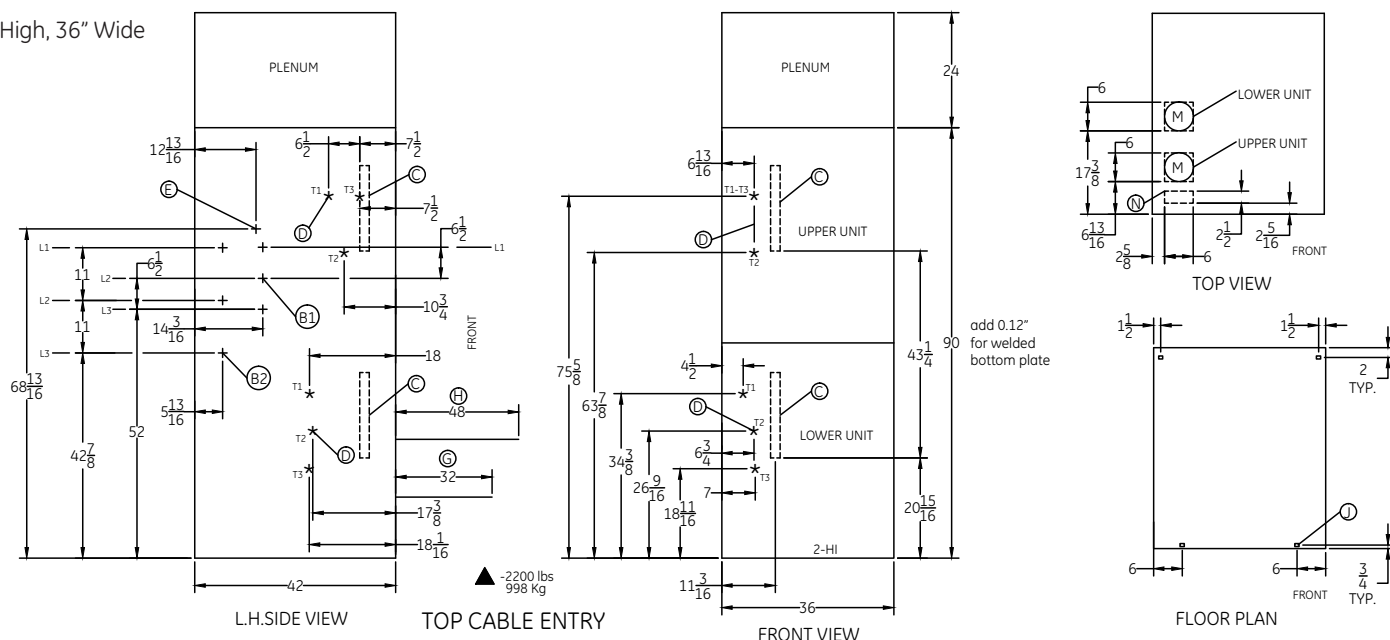


Notes:

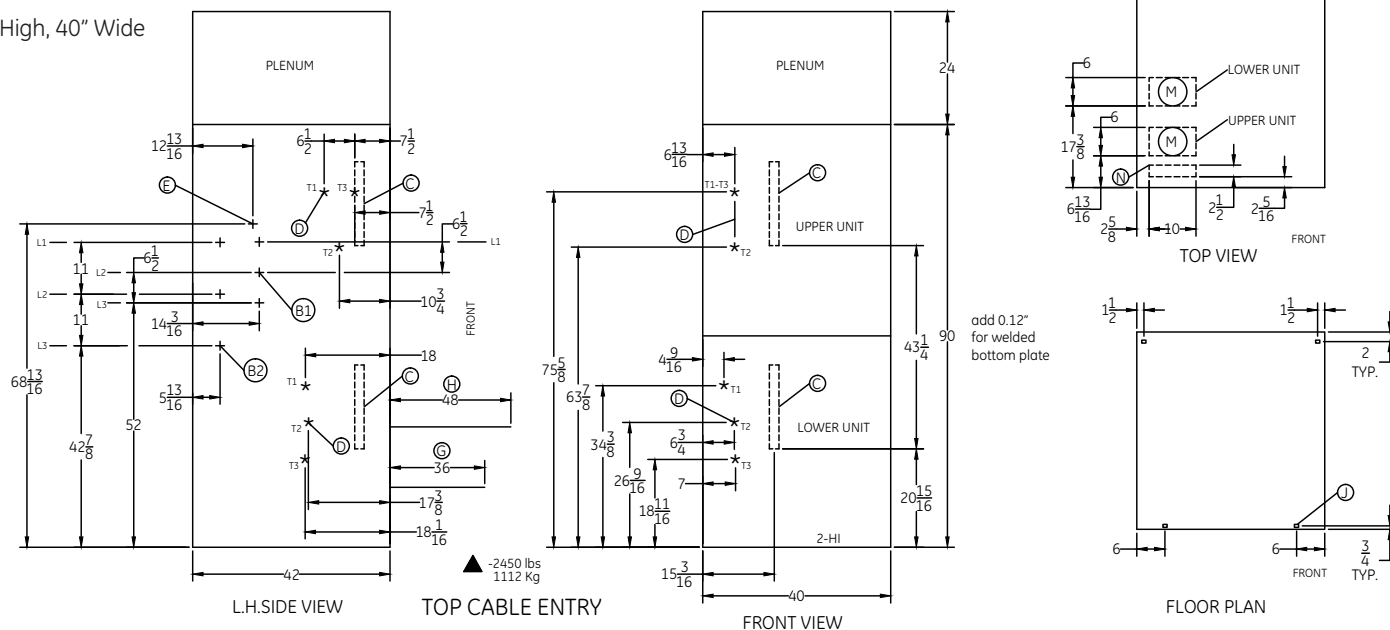
- B1 — AC Power Bus, 1200A
- B2 — AC Power Bus, 3000A
- C — Control Lead Terminal Board
- D — Motor Lead Terminal Connection
- E — Ground Bus Terminal Connection
- G — Space Required to Open Doors 135°
- H — Four-foot Aisle for Contactor Removal
- J — Mounting Holes for 1/2" Diameter Anchor Bolts
- M — Recommended Position for Incoming Motor Conduit
- N — Recommended Position for Incoming Control Conduit
- * — Indicates Terminal Location - Approximate for Cable Length
- ▲ — Approximate Weight

Limitamp AR Medium Voltage Motor Control
CR194 AR 400A, Stationary or Draw-out,
Outline Dimensions 2400-7200 Volts, Two-High, Top Cable Entry.

2 High, 36" Wide



2 High, 40" Wide



Notes:

- | | |
|---|--|
| B1 — AC Power Bus, 1200A | J — Mounting Holes for 1/2" Diameter Anchor Bolts |
| B2 — AC Power Bus, 3000A | M — Recommended Position for Incoming Motor Conduit |
| C — Control Lead Terminal Board | N — Recommended Position for Incoming Control Conduit |
| D — Motor Lead Terminal Connection | * — Indicates Terminal Location - Approximate for Cable Length |
| E — Ground Bus Terminal Connection | ▲ — Approximate Weight |
| G — Space Required to Open Doors 135° | |
| H — Four-foot Aisle for Contactor Removal | |

Reference Publications

Standard, non-Arc Resistant Limitamp

Vacuum Contactors	GEH-5306
Installation Instructions	GEH-6263
Application and Selection Guide	GET-6840
Load-Break Switches Installation Instructions	GEH-4268
Vacuum Contactors, Renewal Parts Bulletin	GEF-8016

Limitamp AR

Limitamp AR Application Guide	DET-745
Limitamp AR Product Flyer	DEA-527

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