



Powering Business Worldwide

Freedom FlashGard® Aftermarket Kit Installation Manual

Instructional Literature

New Information

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Read This Manual Prior to Installing Your Unit.

Disclaimer:

This electrical control equipment is designed to be installed, operated, and maintained by adequately trained technicians. These instructions do not cover all details, variations, or combinations of the equipment, its storage, delivery, installation, check-out, safe operation, or maintenance. Care must be exercised to comply with local, state, and national regulations, as well as safety practices, for this class of equipment. The maximum short circuit capability of the equipment should not be exceeded by connection to a source with higher capability.

Section 1: General Information

1.1 Freedom FlashGard® Unit

Safety and reliability are probably the two most important features to be considered when selecting an MCC. The FlashGard® MCC - industry's first and only MCC designed for comprehensive arc flash prevention - provides protection features that enable electrical workers to operate and perform maintenance work on the MCC in an "arc-free" environment. At the core of FlashGard MCC's arc flash safety feature-set is a state-of-the-art stab racking mechanism called RotoTract™ (patent pending). The RotoTract™ mechanism enables bus isolation and provides stab position indication and lockout features that proactively prevent arc flash scenarios.

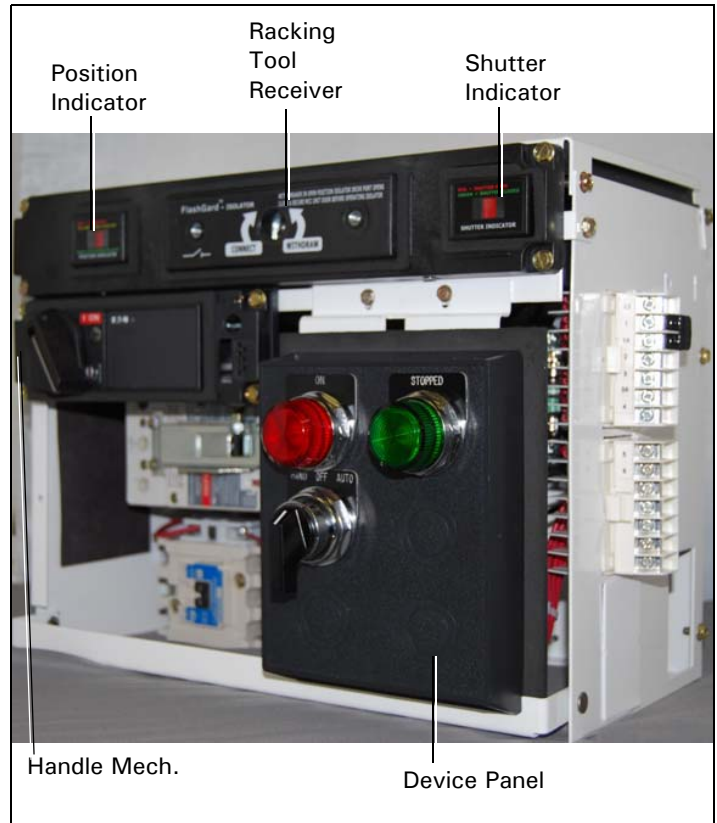


Figure 1. Freedom FlashGard® Unit Components.

Freedom FlashGard® Aftermarket Units may be retrofitted to the Series 2100, Five Star, Freedom 2100, and Advantage MCC structures manufactured post 1981.

Freedom FlashGard® Aftermarket Kit Installation Manual

1.2 Aftermarket Kit and Unit Components

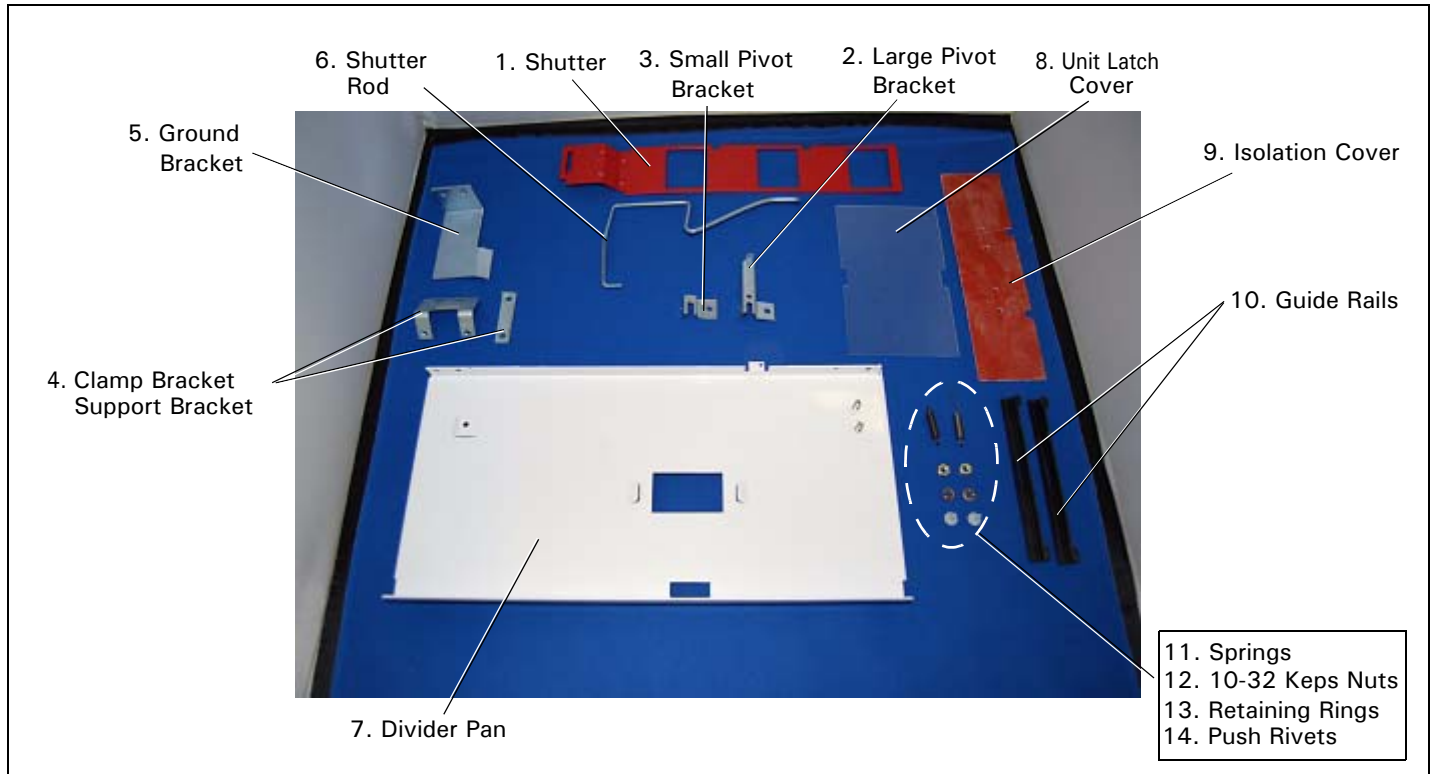


Figure 2. Aftermarket Kit and Unit Components.

The numbers shown in parenthesis in the following text refer to the call-outs in Figure 2

- **Shutter (1)** - A shutter is provided to automatically cover the stab openings in the labyrinth vertical bus barrier when a control unit is withdrawn. It is opened by engagement of the left-hand side of the control unit with the shutter rod attached to the left-hand vertical structural members. When the unit is withdrawn free of the rod, a spring automatically moves the shutter to its closed position.

Note: MCC structures with open vertical bus with barrier have no shutters, isolation covers are used.

- **Divider Pan (7)** - Located in the MCC structure above the unit, the primary function for this component is to guide the unit to its respective location during the assembly into the MCC.
- **Ground Bracket (5)** - Located on the right side of the divider pan, the ground clip provides a surface that allows for the unit to ground to the structure prior to the engagement of the unit bus stabs.
- **Vertical Ground (Clamp and Support) Brackets (4)** - Attached to the vertical ground bus, these brackets act as a stabilizer for the vertical ground bus as it is separated from the Freedom divider pan (see Figure 4).
- **Large Pivot Bracket and Spring (2)** - The pivot bracket and spring assembly is provided as a part of the shutter assembly. It provides a bracket for the shutter rod to pivot in and a spring which allows the shutter to retract as the stabs of the unit are removed from the bus bar.

- **Small Pivot Bracket and Spring (3)** - Provides the same function as the Large Pivot Bracket and Spring, however is used in the case that a customer has a blank unit space with a front to back member blocking the pivot bracket space (see Figure 10).
- **Retaining Rings (13)** - These small circular rings are slid onto the free ends of the shutter rod and prevent the shutter rod from sliding out of place with the teeth that are located at their center.
- **Shutter Rod (6)** - The shutter rod is provided as a part of the shutter assembly and acts as a lever that allows the shutter to open and close depending on the location of the FlashGard® unit.

1.3 Qualified Personnel

⚠ CAUTION

INDIVIDUALS WHO INSTALL, OPERATE, OR MAINTAIN MOTOR CONTROL CENTERS MUST BE TRAINED AND AUTHORIZED TO OPERATE THE EQUIPMENT ASSOCIATED WITH THE INSTALLATION AND MAINTENANCE OF A MOTOR CONTROL CENTER, AS WELL AS THE OPERATION OF THE EQUIPMENT THAT RECEIVES ITS POWER FROM CONTROLLER UNITS IN THE MOTOR CONTROL CENTER.

SUCH INDIVIDUALS MUST BE TRAINED IN THE PROPER PROCEDURES WITH RESPECT TO DISCONNECTING AND LOCKING OFF POWER TO THE MOTOR CONTROL CENTER AND WEARING PERSONAL PROTECTIVE EQUIPMENT, THAT INCLUDES ARC FLASH, INSULATING AND SHIELDING MATERIALS, AND ALSO USE INSULATED TOOLS AND TEST EQUIPMENT, FOLLOWING ESTABLISHED SAFETY PROCEDURES AS OUTLINED IN THE NATIONAL ELECTRICAL SAFETY CODE (ANSI C2) AND ELECTRICAL EQUIPMENT MAINTENANCE (NFPA 70E).

Section 2: Receiving, Handling, and Storage

2.1 Receiving

After unloading the Freedom FlashGard® Aftermarket kit, inspect each component for evidence of damage that may have been incurred during shipment. Report any damage found to the carrier at once. Ensure that all pieces are included in the kit. If there are any missing pieces, or to order additional parts, call your local Eaton representative and reference the Kit part numbers in parenthesis. Kit components include:

- (1) Freedom FlashGard® Aftermarket Kit - 99-5713
 - (1) Divider Pan (47-40862-4)
 - (2) Guide Rails (54-13894)
 - (1) Shutter - 1491C33H01
 - (1) Shutter Rod - 1491C09H01
 - (1) Shutter Spring, for Small Shutter Pivot Bracket - 4700A92H02
 - (1) Shutter Spring, for Large Shutter Pivot Bracket - 4700A92H01
 - (1) Large Shutter Pivot Bracket - 1427B31H50
 - (1) Small Shutter Pivot Bracket - 1427B04H01
 - (2) Retaining Rings - 4712A05H01
 - (1) Ground Bracket - 21-1597
 - (1) Vertical Ground Support Bracket - 47-50763*
 - (10) Thread Forming Screws - 839A681H05
 - (4) Thread Forming Screws - 839A681H06
 - (2) #10-32 Keps Nuts - 839A680H03
 - (1) Unit Latch Cover - 56-10075
 - (1) Isolation Cover - 4700A12H01
 - (2) Push Rivets - 112C296H03
- * Provided in place of the ground clip for MCC's with a vertical ground bus.

2.2 Handling

The following guidelines are provided to help avoid personal injury and equipment damage during handling. Handle the aftermarket kit with care; avoid damage to the components and to the unit or its paint finish. Exercise care during any movement and placement operations to prevent falling or unintentional rolling or tipping.

2.3 Storage

When an aftermarket unit cannot be installed and placed into operation immediately upon receipt, take steps to prevent damage by condensation or harsh environmental conditions. Store it in a clean, dry, ventilated building, heated to prevent condensation, and protected from dirt, dust, water, and mechanical damage.

Section 3: Installation Instructions

⚠ CAUTION

IF WORK IS INVOLVED IN CONNECTING THE UNIT WITH EXISTING EQUIPMENT, ENSURE THAT INCOMING POWER IS DISCONNECTED BEFORE WORK IS BEGUN. DISCONNECTING MEANS SHOULD BE LOCKED OUT AND/OR TAGGED OUT OF SERVICE. WHERE IT IS NOT FEASIBLE TO DE-ENERGIZE THE SYSTEM, THE FOLLOWING PRECAUTIONS SHOULD BE TAKEN:

- A) PERSONS WORKING NEAR EXPOSED PARTS THAT ARE OR MAY BE ENERGIZED SHOULD BE INSTRUCTED AND SHOULD USE PRACTICES (INCLUDING APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT, THAT INCLUDES ARC FLASH, INSULATING, AND SHIELDING MATERIALS AND INSULATED TOOLS, AND TEST EQUIPMENT IN ACCORDANCE WITH THE NFPA 70E).**
- B) PERSONS WORKING ON EXPOSED PARTS THAT ARE OR MAY BE ENERGIZED SHOULD, IN ADDITION, BE QUALIFIED PERSONS WHO HAVE BEEN TRAINED TO WORK ON ENERGIZED CIRCUITS.**

Note: If your new MCC unit is larger than your existing unit, there may be a case where your labyrinth will have exposed shutter slots. In this case, cover the slots using the stab cover (P/N#4700A12H01). Please ensure that, prior to installing your kit, all exposed stab slots are covered and all un-used shutters are removed and replaced with stab covers.

The numbers shown in parenthesis in the following text refer to the call-outs in Figure 2.

3.1 Kit Installation Instructions

1. Remove the existing blank door.



Figure 3. Unit Door.

2. Position the new unit door over the open space to ensure the hinges and latches are aligned. If the spaces differ, the hinges and latches on the structure must be re-located to match the unit door hinges and latches. Mount the door using the hinge pins provided.
3. Remove the existing divider pan located at the top of the space that is set aside for the bucket.
4. Assemble the ground bracket (5) to the holes on the right side of the new divider pan (7) using the two Keps nuts provided. If you have a vertical ground bus: use the vertical ground brackets (4) in place of the ground bracket. When assembled to the MCC, the bracket should lie on the outside of the vertical ground bus bar to stabilize it against the ground spring (see Figure 4).

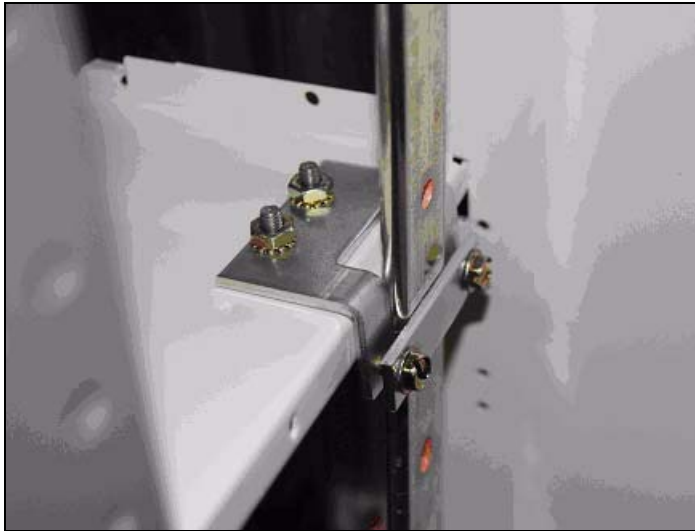


Figure 4. Vertical Ground Bracket Assembly.

5. Assemble the rail guides (10) to the divider pan (7) by sliding the rail guides onto the bends of the divider pan. Be sure that the rail guides are fully seated and snap into place.

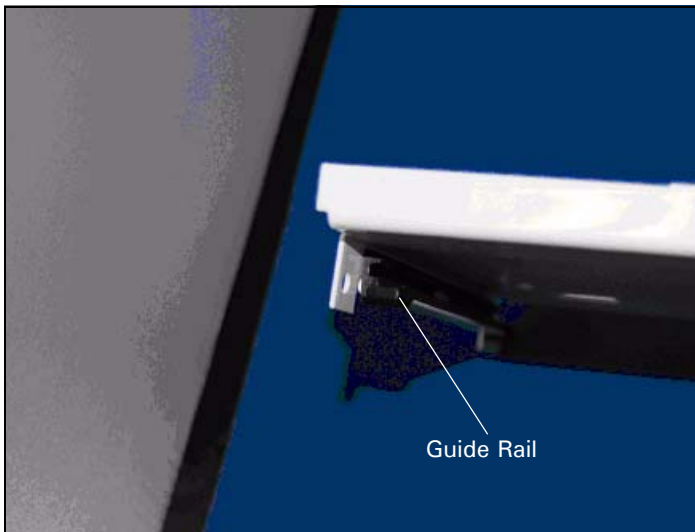


Figure 5. Guide Rail Assembled to the Divider Pan.

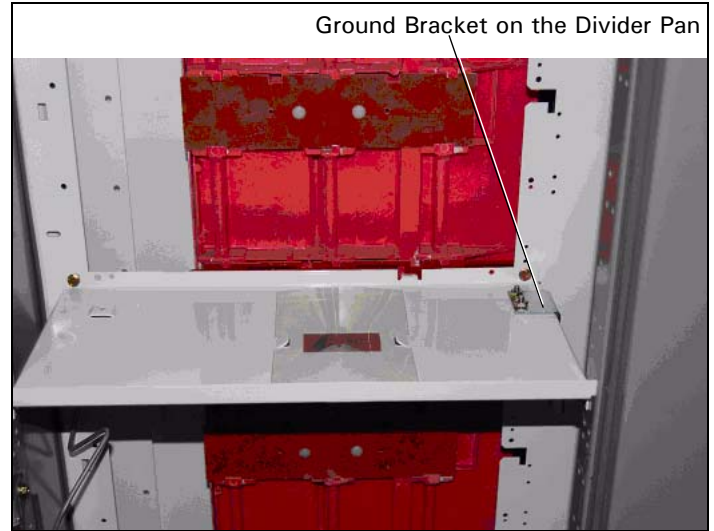


Figure 6. Divider Pan Mounted to Bullnose and Offset Plate.

6. Insert the divider pan tab into the bullnose slot.
7. Assemble the divider pan to the mounting hole in the bullnose on the left side of the MCC using one thread-forming screw provided.

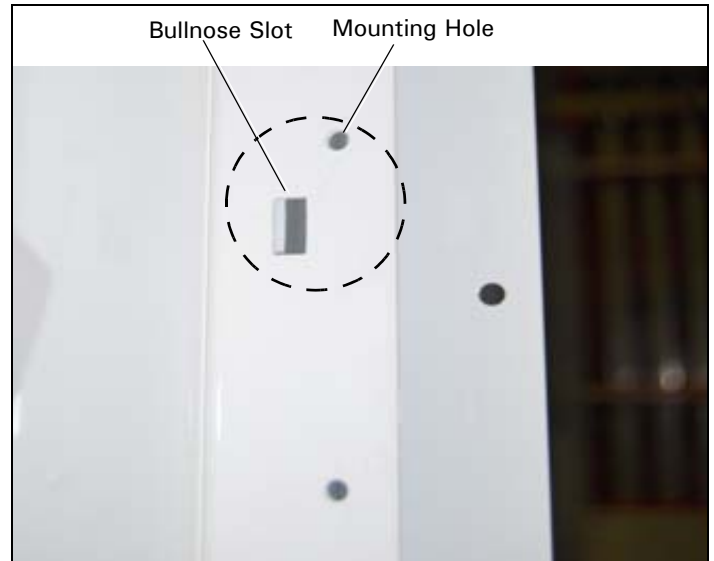


Figure 7. Bullnose Slot and Mounting Hole for Divider Pan.

- Attach the divider pan to the offset plate on the right side of the MCC using 1 thread-forming screw provided.

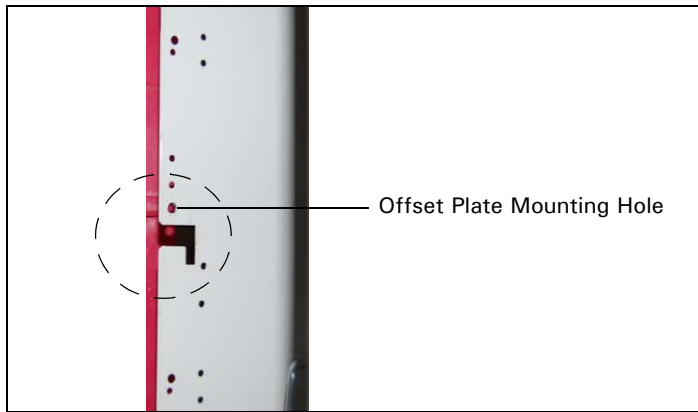


Figure 8. Offset Plate Slot and Mounting Hole for Divider Pan.

- Attach the divider pan, using two thread forming screws, to the left and right side walls of the MCC via the holes under the diver pan.

Note: MCC with Labyrinth Insulated Bus.

If you already have a functional shutter assembly in the MCC blank space that aligns where the new FlashGard unit will be, skip Steps 10 and 11. The shutters are used on MCC lineups with a labyrinth fully insulated vertical bus configuration (see Figure 18).

Note: MCC with Open Bus with Isolating Barriers.

⚠ CAUTION!

FOR UPGRADING OPEN BUS WITH ISOLATING BARRIER WITH FREEDOM FLASHGARD AFTERMARKET UNITS, PLEASE ENSURE THAT A COMPATIBLE REPLACEMENT ISOLATION BARRIER IS INSTALLED.

The MCC with an open bus with isolating barriers as originally installed, (see Figure 19) are not compatible with Freedom FlashGard Aftermarket units. A special aftermarket upgrading isolating barrier kit is provided to enable the MCC to accept the Freedom FlashGard Aftermarket units. Shutters are not used with the open bus configuration.

See Figure 20 showing the MCC with upgraded isolation barrier.

- Remove the flat plate which covers the stab holes in the labyrinth barrier (the stab cover) and begin to assemble the shutter (1) to the labyrinth by sliding the shutter through the labyrinth. Lift up on the shutter so that it will slide over the labyrinth cut outs.

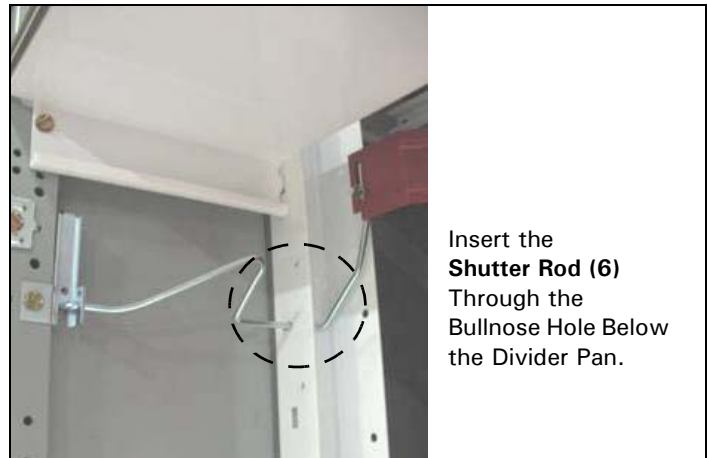


Figure 9. Shutter Assembled to Labyrinth.



Figure 10. Shutter Rod and Large Pivot Bracket Assembly.

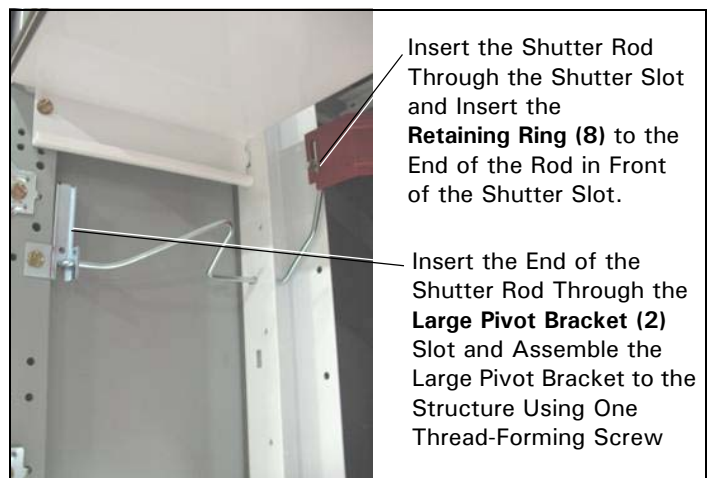
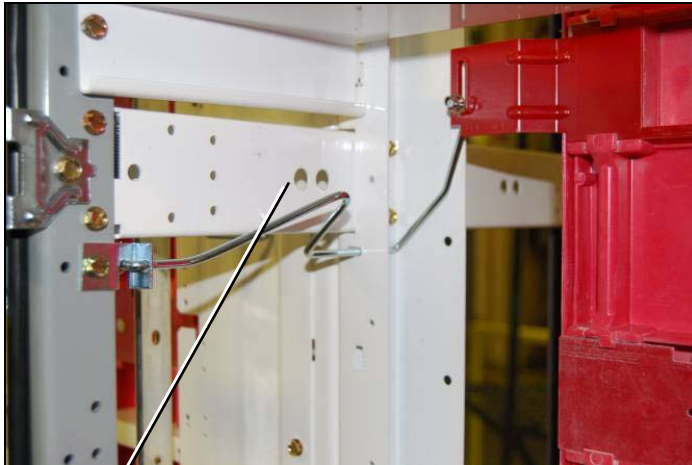


Figure 11. Shutter Rod and Large Pivot Bracket Assembly Cont.



If the Blank Space Has a **Front to Back Member** Blocking the Pivot Bracket, Use the **Small Pivot Bracket (3)** Supplied in the Kit.

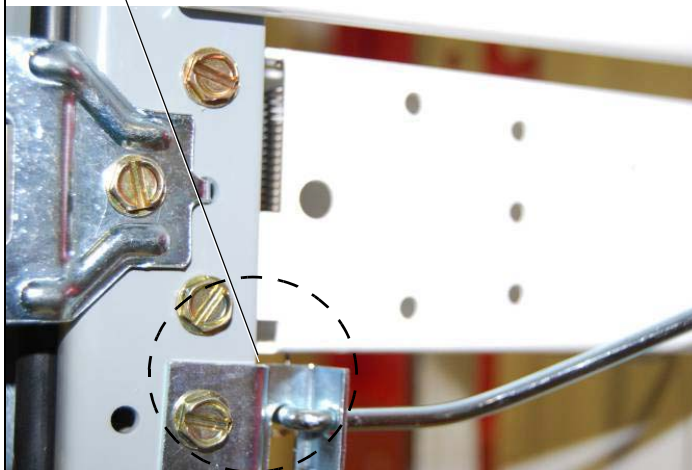


Figure 12. Shutter Rod and Small Pivot Bracket Assembly.

11. Insert the **retaining ring (8)** onto the end of the rod that is protruding through the back of the pivot bracket slot. Slip the associated **spring (11)** through the slot at the top of the retaining ring and through the hole at the top of the large pivot bracket (or front to back member for the case with the small pivot bracket).

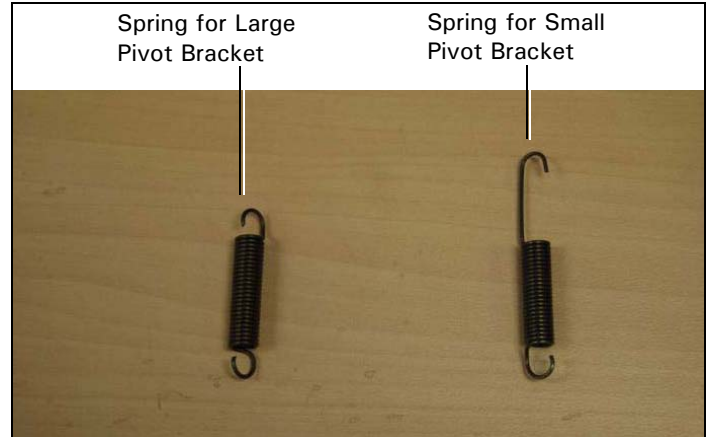


Figure 13. Springs for Large and Small Pivot Brackets.

12. Inspect the shutter after assembly. It should completely cover the stab openings on the labyrinth. If it does not cover the openings, use an adjustable wrench to bend the shutter rod to the right until the shutter covers the stab openings.

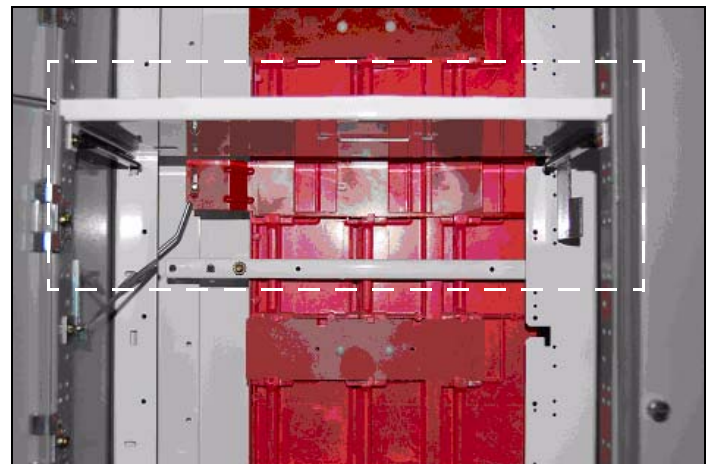


Figure 14. Fully Assembled Kit.

13. Prior to inserting your unit, ensure that all un-used shutters and any exposed/uncovered stab holes are covered with isolation plates.

3.2 Unit Installation

1. Prior to installation of the unit, verify that the unit stabs are fully withdrawn and the internal shutters are closed. The Unit Latch at the top of the unit needs to be flush with the top of the unit to prevent interference with the divider pan when installing the unit. (Figure 1) The unit operator needs to be in the OFF position and the unit latch should be turned down so the metal tab on the left side of the unit is inside the unit. This will prevent any interference with the structure frame when installing the unit into the structure.
2. Open the unit door and slide the unit into the structure. The unit uses two guide rails that are located on the left and right side bottom of the divider pan. The top wrapper of the unit has grooves on the left and right side that sit into the guide rail.
3. Press the unit in the structure until the front of the unit is approximately flush with the divider pan. You might feel a little resistance when sliding in the structure. This is due to the physical connection between the motor load stabs and motor load terminal block on the lower right-hand side of the unit.
4. The shutter should slide open as the unit enters the MCC allowing for the stabs to fit through the shutter and labyrinth. If interference is felt between the stab assembly at the rear of the unit and the shutter, the engagement of the control unit with the shutter arm linkage is insufficient to fully open the shutter. Use an adjustable wrench to bend the linkage arm inward toward the unit to increase its engagement with the unit. An inward bend of approximately ¼ in. will provide sufficient additional shutter travel.
5. Open vertical wireway door to install any plug-in terminal blocks or terminal and interconnection wiring inside the unit. Close and secure wireway door.
6. Turn the unit latch located to the left of the unit operator clockwise until it is horizontal.
7. Close the unit door and secure the unit latches located on the right side of the door.
8. To connect the stabs to the vertical bus, a 3/8-in. square drive should be inserted into the Racking Receiver. The 3/8-in. square drive can either be a manual tool or a remote racking device. Please see IL04300001E for instructions on proper installation of the remote racking device. Rotate the square drive clockwise to begin to insert the stabs. If you happen to rotate counterclockwise, the unit should spin freely and prevent the stabs from being withdrawn any further. The Stab Position Indicator flag and the Shutter Position Indicator flag should begin to rotate to show the position of the stabs and internal shutter. It takes approximately 22 full rotations to move the stabs from the disconnected to the connected position. The connect position will be illustrated when the Stab Position Indicator and the Shutter Position Indicator are both RED.
9. At this point, the operator handle can be turned ON to energize the unit.

3.2.1 1/4 Turn Unit Interlock

The 1/4 turn unit interlock is used to secure the unit into the structure. It also serves as the interlock to ensure that a unit is not removed or inserted while the disconnect is in the On position. If a unit disconnect cannot be turned On, verify that the unit interlock is in the engaged or locked position. This position is when the slot is parallel to the floor. If a unit cannot be withdrawn, verify that the unit interlock is fully in the unlocked or disengaged position. The interlock is fully disengaged when the slot is rotated 1/4 turn counter clockwise from parallel to the floor.

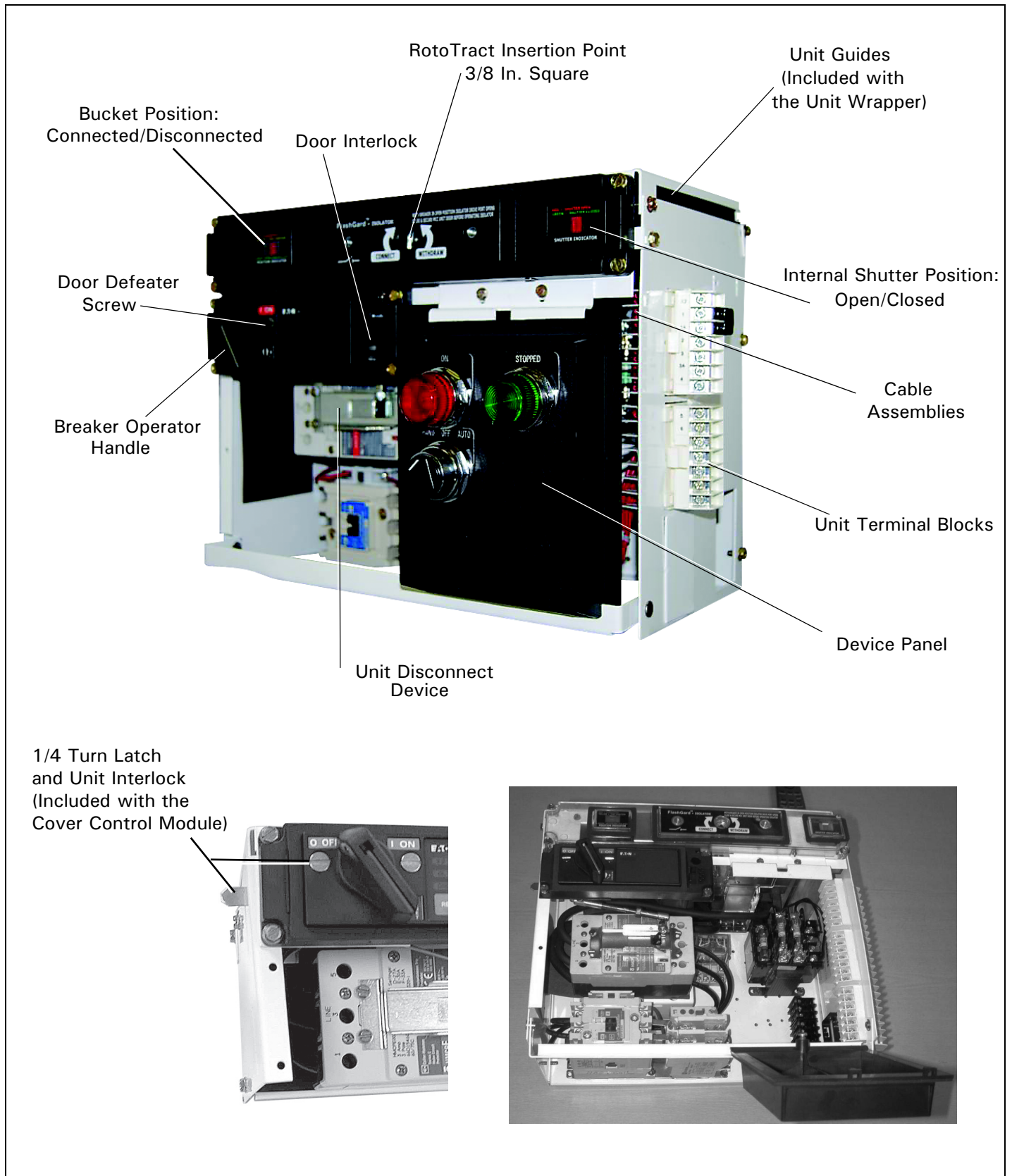


Figure 15. Control Center Unit Nomenclature.

3.2.2 Device Panel

The device panel can accommodate up to six pilot devices such as oil-tight pushbuttons, indicating lights, selector switches, and miniature meters. If unused space is available and the addition of other devices is desired, observe the following procedure.

After opening the unit door, gently lift up on the device panel and pivot the device away from the unit. With the peen end of a ball-peen hammer or with a drift or chisel, remove the desired knock-out from the device panel.

CAUTION

BRACE THE PANEL SOLIDLY TO AVOID BREAKING THE HINGE POINTS. USE A KNIFE OR SMALL FILE TO REMOVE THE REMAINING PLASTIC BURRS. INSTALL AND WIRE THE NEW DEVICE AND RE-ATTACH THE TOP OF THE DEVICE PANEL TO THE UNIT.

3.3 Functional Test Procedure

1. Place the unit inside of the structure and lock in place with 1/4 turn screw to the left of the operating mechanism.
2. Engage the 3/8 in. square drive and cycle the racking tool receiver module three times. During the operational test check the following:
 - **Withdrawn Position**
 - Verify that the operating mechanism handle CANNOT be closed.
 - Verify GREEN/GREEN indicator status
 - **Connected Position**
 - Verify that the operating mechanism handle CAN be closed.
 - Verify RED/RED indicator status.

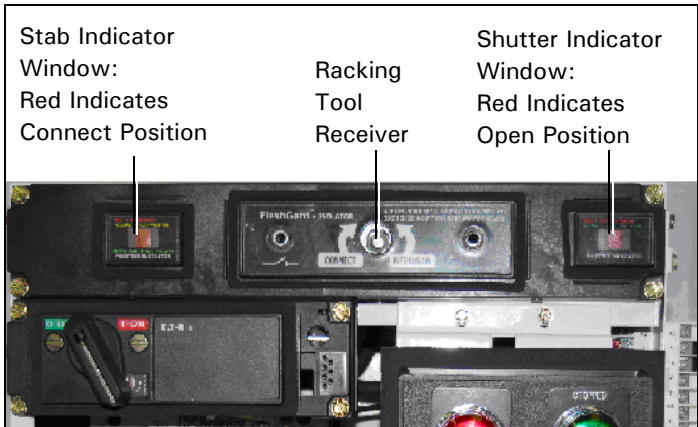


Figure 17. Stabs in Connected Position.



Figure 18. Labyrinth Fully Insulated Vertical Bus.

Stab Indicator Window: Green Indicates Disconnect Position

Racking Tool Receiver

Shutter Indicator Window: Green Indicates Closed Position

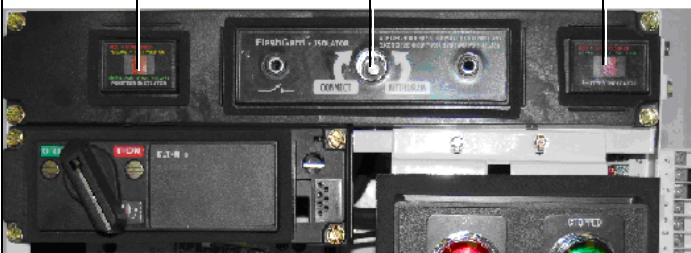


Figure 16. Stabs in Disconnected Position.

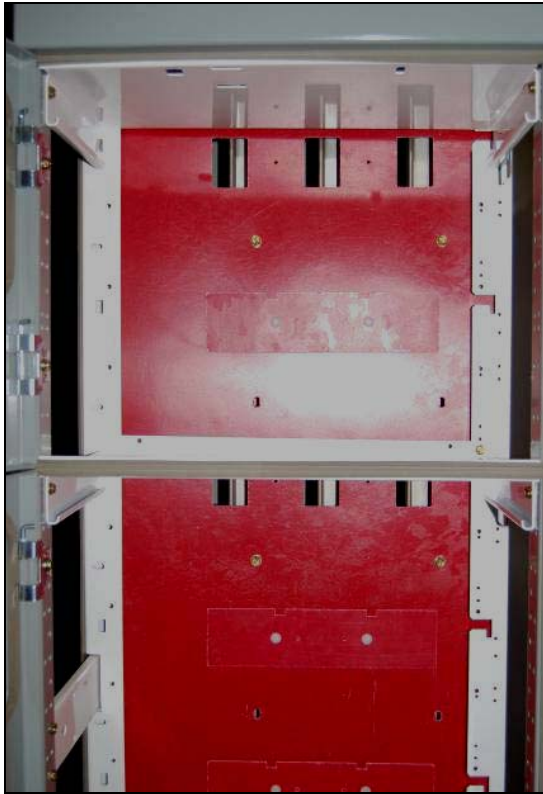


Figure 19. Open Vertical Bus With Original Installed Vintage Barrier.



Figure 21. Shows the Installation of an Isolation Barrier Opening - Cover, Covers Are Provided with Upgrade Kit (99-5713-2).

⚠ CAUTION

THIS IS NOT COMPATIBLE WITH FREEDOM FLASHGARD AFTER-MARKET UNITS. REFER TO NOTE ON PAGE 6, ITEM 9.

SEE FIGURE 20 BELOW FOR THE CORRECT COMPATIBLE REPLACEMENT BARRIER.

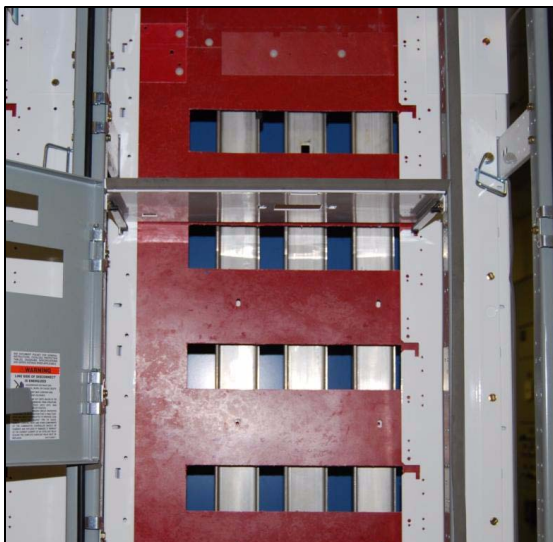


Figure 20. Upgraded Open Vertical Bus With CORRECT Replacement Barrier Compatible with the Freedom FlashGard Aftermarket Unit. Note: Shutters Are Not Applicable.

Section 4: Inspection Prior to Energizing

1. Before energizing the MCC, conduct a thorough inspection to make certain that all foreign materials such as tools, scraps of wire, and other debris are removed from all units and the structure. Remove any accumulation of dust and dirt with a vacuum cleaner
2. All circuit connections are tightened at the time of assembly by power-driven tools with controlled torque. However, the vibrations experienced in transit may loosen some of these connections. Check at least 10% of the total connections for a tight connection. Should this spot check reveal some loose connections, it will be necessary to check all connection points. The connections to be checked include bus hardware, circuit breaker and switch terminals, contactor and relay terminals, and terminal blocks. Always check the incoming line connections. Tighten to the torque values provided in Table 1
3. Make certain that field wiring is clear of live busses and physically secured to withstand the effects of fault current.
4. Check to determine that all grounding connections are made properly.
5. Check all devices for damage. Make all necessary repairs or replacements prior to energizing.
6. Manually exercise all switches, circuit breakers, and other operating mechanisms to make certain that they are properly aligned and operate freely.
7. Test any ground-fault protection systems that were furnished.
8. Set any adjustable current and voltage trip mechanisms to the proper values.
9. Ensure that the selected overload relay matches the full-load current shown on the nameplate of the motor.
10. Install power circuit fuses in the fusible switches in accordance with NEC application requirements. Make sure that the fuses are completely inserted in the clips provided. Do not attempt to defeat the rejection feature on the fuse clip, when provided.
11. Do not operate a current transformer with its secondary circuit open. Insure that the current transformer is connected to a load, or a secondary shorting bar is installed.
12. To prevent possible damage to equipment or injury to personnel, check to ensure that all parts and barriers that may have been removed during wiring and installation have been properly reinstalled.
13. For labyrinth vertical bus barrier system, verify the operation of the automatic shutters. See Section 3 for adjustments of this mechanism.
14. Install covers, close doors, and make certain that no wires are pinched and that all enclosure parts are properly aligned and tightened.
15. Turn all circuit breakers and fusible switches to the OFF position before energizing the bus.

Table 1. Driving Torque.

CONTROL WIRING:	
Coil Leads	8 lb. - in.
Relays	8 lb. - in.
Push Buttons	8 lb. - in.
Control Fuse Blocks	8 lb. - in.
Auxiliary Contacts	8 lb. - in.
Control Wiring Terminal Blocks	
Side Mounted Lug/Compression	9 lb. - in.
Rail Mounted Lug Type	12 lb. - in.
Rail Mounted Compression Type	18 lb. - in.

POWER WIRING: STARTERS			
CATALOG NUMBER	TIGHTENING TORQUE - LOAD SIDE		CONDUCTORS
C306DN3	20 lb.-in.		
	Wire Size (AWG)	Torque (lb.-in.)	
C306GN3 and Size 2 Contactor	14 - 10	35	Use 75 Degrees C copper conductors
	8	40	
	6 - 4	45	
	3 - 2	50	
For Starters	Slotted Head Screw		
	Wire Size (AWG)	Torque (lb.-in.)	
Size 3	8	40	Use 75 Degrees C copper or aluminum conductors
	6 - 4	45	
	3 - 2	50	
	Socket Head Screw		
	Socket Size (in.)	Torque (lb.-in.)	
Size N and Size 4	3/16	120	
	1/4	200	
	5/16	250	
Size 5 and Size 6	275 lb.-in.		
	500 lb.-in.		

FUSED SWITCHES:	TORQUE (LB. - IN.)
30 Amp Fuse Assy	25 lb. - in.
60 Amp Fuse Assy	50 lb. - in.
100 Amp Fuse Assy	50 lb. - in.
200 Amp Fuse Assy	300 lb. - in.
400 Amp Fuse Assy	300 lb. - in.
600 Amp Fuse Assy	300 lb. - in.

BREAKERS-REFER TO TORQUE VALUES ON BREAKER CASE	
INCOMING LINE LUGS:	
#2/0-350 MCM	360 lb. - in.
#2/0-650 MCM	360 lb. - in.
#2/0-750 MCM	500 lb. - in.
500-1000 MCM	600 lb. - in.

BUS BOLTS	
All	275 lb.-in. (23 lb.- ft.)

Section 5: Maintenance

Preventative Maintenance

This control equipment is designed to be installed, operated, and maintained by adequately trained personnel. These instructions do not cover all details, variations, or combinations of the equipment, its storage, deliver, installation, check-out, safe operation, or maintenance. Care must be exercised to comply with local, state, and national regulations, as well as safety practices, for this class of equipment.

Authorized personnel may open a unit door while the starter unit is energized. This is accomplished by defeating the mechanical interlock between the operating mechanism and the unit door. A counter clockwise 1/4 turn of the slotted head screw located to the right of the operating handle will allow the unit door to open.

CAUTION

MAINTENANCE OF THE CONTROL COMPONENTS REQUIRES THAT ALL POWER TO THESE COMPONENTS BE TURNED OFF BY THE BRANCH CIRCUIT DISCONNECT MEANS AND WITHDRAWING THE UNIT TO THE DISCONNECTED POSITION IN THE FREEDOM FLASH-GARD® UNIT.

Section 6: Reference Documents

- RotoTract Remote Racking Operating Manual IL04300001E
- Freedom FlashGard® Motor Control Center Instruction Manual IM04302001E
- Overload Relay Instructions PUB24374 and PUB24375
- Overload Relay Technical Data Sheet DC117B
- C396 Brochure BR03408001E
- E777 Solid State Overload Relay PA04300001E
- Installation Instructions for E777/M777-LR 50-39168



Notes:

Notes:

The instructions for installation, testing, maintenance, or repair herein are provided for the use of the product in general commercial applications and may not be appropriate for use in nuclear applications. Additional instructions may be available upon specific request to replace, amend, or supplement these instructions to qualify them for use with the product in safety-related applications in a nuclear facility.

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Printed in USA
Publication No. IL04302002E/ TBG00199
March 2010



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