

Modification of PowlVac Switchgear for Through-Door Circuit Breaker Racking

Purpose: To provide detailed descriptions of the options available for racking a PowlVac circuit breaker with the compartment door closed and to provide instructions for the necessary modifications.

Discussion: PowlVac switchgear has four basic configurations for circuit breaker racking, with the following increase in complexity:

- A. The first is an unmodified circuit breaker and cubicle. The breaker compartment door is open and racking is performed with the circuit breaker completely visible.
- B. The second method utilizes an electric racking device temporarily mounted on the front of the circuit breaker. A 30-foot long control cable connects the racking device to the control panel, allowing the operator to remain at a distance during the racking process. The circuit breaker compartment door must remain partially opened, so that the control cable is not pinched. Alternately, the circuit breaker compartment door can be modified with a cutout and a tear-drop shaped cover (as for the through-door racking described as follows).
- C. The third configuration is through-door racking. For this, the circuit breaker compartment door is opened and a racking shaft extension installed on the circuit breaker. The compartment door is closed and the normal circuit breaker racking handle attached to the racking extension through a cutout in the door. The breaker is racked in and out with the compartment door closed. This configuration should also include a viewing window and light kit, so that the circuit breaker position can be monitored during the racking process.
- D. The final configuration is closed-door racking. The circuit breaker has a modified racking mechanism that is a permanent part of the circuit breaker. This circuit breaker racking mechanism is a factory installed component and cannot be performed in the field, since the circuit breaker would have to be rebuilt from the frame up.

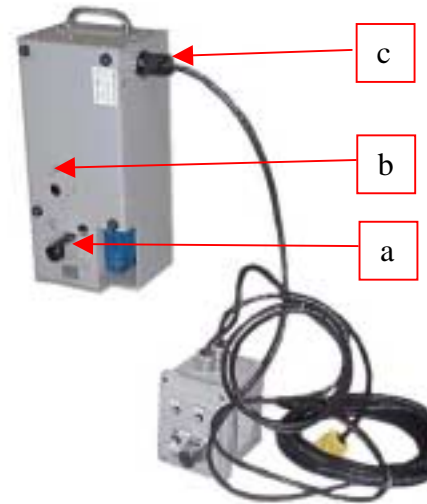
This document will describe both the PowlVac remote racking device and switchgear modifications for through-door racking, since these are the only field modifiable options.

PowlVac Remote Racking Device

Material	
PowlVac Remote Racking Device for non-through door racking	51897G02

Tools Required
Crescent wrench or combination wrench

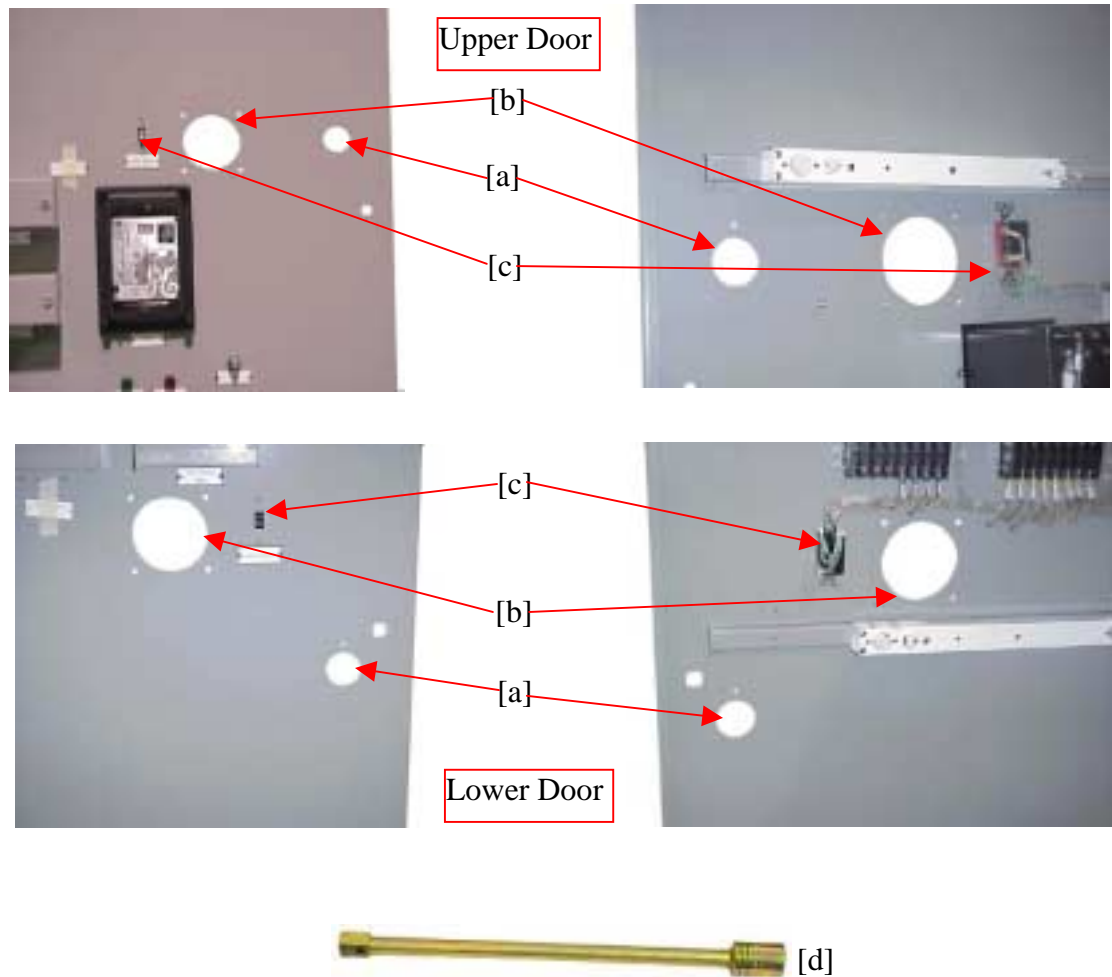
1. Ensure that the circuit breaker indicates open (indicating lights).
2. Open the switchgear cubicle door.
3. Confirm that the circuit breaker is open by the indicating flag on the circuit breaker.
4. Remove the circuit breaker cover mounting bolt directly above and to the right of the racking shaft access opening.
5. Depress the circuit breaker trip pushbutton and pull down the racking access plate. Hold the plate open for the next step.
6. Holding the remote racking device, position the racking socket [a] over the hex racking shaft on the circuit breaker. Rotate the racking device as necessary to engage the socket over the shaft.
7. Positioning the racking device vertically, engage the mounting screw [b] in the bolt hole made available in step 2 above.
8. Plug the control cable into the receptacle [c] on the racking device. Twist to lock into position. Note that if the circuit breaker cubicle door has been modified for through door racking, route the control cable through the 2-inch opening.
9. Close the cubicle door as much as feasible, but do not allow the door to clamp the control cable.
10. With the control cable laid out to place the operator at the required safe distance, plug the control box into a 120 VAC source.
11. Ensure that the circuit breaker on the control panel is in the reset (not tripped) position.
12. Position the control switch in either the "IN" or "OUT" position as required and depress the pushbutton. Once the circuit breaker reaches the desired position, release the switch. If the racking process is allowed to continue past the point where the breaker no longer moves, the circuit breaker on the control panel will trip on thermal overload.
13. Confirm the breaker position by observing the local indicator on the circuit breaker.
14. Disconnect the control panel from the 120 VAC power supply. Disconnect the control cable from the racking device.
15. Remove the racking device from the circuit breaker and reinstall the bolt removed in step 2.



PowIVac Through-Door Racking

The complete through-door racking system consists of four assemblies:

- [a] Racking access opening cover
- [b] Viewing window
- [c] Light fixture and light switch
- [d] Racking extension



Through-door racking modifications can be as limited as only cutting the access opening and mounting the cover "tear-drop". However, this defeats the purpose of being able to rack the breaker with the compartment door closed, since without the viewing window and light, the door would have to be opened to view the breaker position flag.

Racking Access Opening and Cover

Reference Drawing 90015G04

The racking access location differs between lower and upper cubicles due to the orientation of the breaker with respect to the bottom of each cubicle, but in each case will center on the physical location of the racking access opening on the circuit breaker.



Materials Required	
(1) Cover plate	48034P01
(1) Machine screw, truss head, 1/4-20 x 3/4"	W1505
(2) Nylon washers 1/4"	W9201
(1) Flat washer, 1/4"	W5204
(1) Lock nut/star-kep washer, 1/4-20	W3751

Tools Required
Tape measure
Pencil
Center Punch
Screwdriver
Electric Drill
Drill bits
1/4-20 tap
2 inch hole punch or hole saw
Half-round metal file

1. Mark the following center point for the access opening:

Upper door – 25-1/2 inches from bottom and 4 inches from the right (exterior) side of the door
Lower door – 18 inches from bottom and 4 inches from the right (exterior) side of the door
2. Mark another point 1-3/4 inches directly above the previous point
3. Referring to the locations determined in steps 1 and 2, open the compartment door and ensure no components, wires, or structural steel is located in those areas. Some nameplates or labels may have to be relocated.
4. Center punch both locations.
5. For the lower mark (step 1), drill a hole sufficient for the drive bolt for a 2 inch hole punch or use a hole cut saw. Punch the 2 inch access opening.
6. File the opening edges smooth.

Racking Access Opening and Cover (continued)

7. For the upper mark (step 2), drill a clearance hole for a ¼-20 tap (#7 or 13/64 drill bit). Tap the hole.
8. Mount the "tear-drop" cover plate as follows:
 - a. Place one nylon washer on the ¼-20 screw
 - b. Insert the ¼-20 screw through the cover plate
 - c. Place the second nylon washer over the screw. This will act as a spacer and allow rotation of the cover plate.
 - d. Thread the bolt into the tapped hole. Tighten to the point where the cover plate rotates with slight force.
 - e. Install the flat washer and locknut on the inside length of the screw. Tighten to lock the assembly in place.

Viewing Window

Reference Drawing 90015G04

The viewing window location differs between upper and lower cubicles, since the position is designed to allow looking up into an upper cubicle and down into a lower cubicle at the necessary angle to see the breaker position indicating flag.

Materials Required	
(1) Viewing Window 1/8" x 5-1/4" x 5-1/4" lexan	95170P01
(4) Machine screws, truss head, 1/4-20 x 3/4"	W1505
(4) Flat washer, 1/4"	W5204
(4) Lock nut/star-kep washers, 1/4-20	W3751

Tools Required
Tape measure
Pencil
Center Punch
Screwdriver
Electric Drill
Drill bits
4 inch hole punch or hole saw
Half-round metal file

Note: The center point locations listed are the recommended locations. Existing instruments or wire runs may preclude using the specified location. If such interference exists, installer should select a location as close as possible to that listed, and will still allow viewing the circuit breaker position indicator.

1. Mark the following center point for the window opening:

Upper door – 25-1/2 inches from bottom and 13 inches from the right (exterior) side of the door
Lower door – 26-1/4 inches from bottom and 13-1/2 inches from the right (exterior) side of the door
2. Open the compartment door and ensure no components, wires, or structural steel is located in the area. Some nameplates or labels may have to be relocated.
3. Center punch the location.
4. Drill a hole sufficient for the drive bolt for a 4 inch hole punch or use a hole cut saw. Punch the 4 inch access opening.
5. File the opening edges smooth.
6. Using the window as a template and ensuring the window is level, locate and mark the location of the four mounting bolts. Center punch each location. Drill a 5/16 inch hole at each location.

Viewing Window (continued)

7. Attach the viewing window with the hardware listed (window is to be located on the inside of the door).

Lighting Kit

Reference Drawings 90022G01 and 90022G02

The light fixture is usually mounted on a horizontal steel door cross brace, but can be mounted at any convenient location that will illuminate the front of the breaker but will not interfere with any existing components and clearances. If the light fixture is mounted other than on a cross brace, a mounting bracket will be required. This mounting bracket is attached to a vertical door brace.

Reference drawing 90022G01 is for installation on an existing horizontal door brace and reference drawing 90022G02 utilizes a separate bracket that mounts on the vertical door brace.

The light switch can be mounted at any convenient location.

Material Required – Mount on Existing Horizontal Brace	
(1) Light fixture	2V809
(1) 8W Fluorescent bulb	F8T5-CW
(1) Light switch	1221
(1) Nameplate	9022P01
(1) 4 pt Terminal block	IKU4
(40 ft) Gray #14 SIS	14SIS
(10 ft) Green #14 SIS	14SIS-GREEN
(10) Blank wiretags	N/A
(10) #14 insulated spade lugs	32060
(2) #14 wire splice	320562
(2) Pan head screw #8-32 x 1/2"	

Material Required – Mount on Existing Vertical Brace	
(1) Light fixture	2V809
(1) 8W Fluorescent bulb	F8T5-CW
(1) Light switch	1221
(1) Nameplate	9022P01
(1) 4 pt Terminal block	IKU4
(40 ft) Gray #14 SIS	14SIS
(10 ft) Green #14 SIS	14SIS-GREEN
(10) Blank wiretags	N/A
(10) #14 insulated spade lugs	32060
(2) #14 wire splice	320562
(1) Mounting bracket	90022P02
(2) Pan head screw #8-32 x 1/2"	
(2) Pan head screw #8-32 x 1/4"	

Tools Required
Electric Drill
Drill index
Tap, #8-32
File, flat, small
Sabre/jig saw
Screwdriver

Lighting Kit (continued)

Note: For parts orders, only blank wiretags are provided for labeling the lighting circuit wires, since providing preprinted wiretags will require engineering labor to determine the correct wire numbers. If the customer desires preprinted wiretags and revised drawings for their Powell switchgear, the pricing and delivery provided in this guide are not applicable and a separate quotation will be provided for any customer who desires a complete engineered modification.

1. Determine location for light fixture that will illuminate the front center of the circuit breaker, but will not interfere with existing instrumentation and wiring.
2. Disassemble the light fixture.
3. For mounting on an existing horizontal door brace, use the light fixture base as a template and mark the location for the two mounting screws.
4. For mounting on an existing vertical door brace, use the mounting bracket as a template and mark the two mounting screw locations.
5. Center punch the two locations marked in step 3 or 4.
6. Drill the two holes for a #8-32 tap (#29 suggested). Tap the mounting holes.
7. As applicable, mount the light fixture on the horizontal door brace or mounting bracket with #8-32 screws. Use ¼" long screws if mounting to the bracket or ½" long screws if mounting to the horizontal door brace.
8. If mounting on the vertical door brace, mount the bracket using #8-32 x ½" screws.
9. Connect the light power wires using #14 SIS wire and in-line splices or wire nuts. Reassemble the light fixture.
10. Determine a convenient location for the light switch, allowing for operator height and location of other components.
11. Drill clearance holes for an electric sabre or jig saw. Overall hole will be 1 inch in height and ½ inch in width. Cut the light switch operator rectangular hole. File edges smooth.
12. Using the light switch as a template, mark the location for the two mounting screws furnished with the light switch.
13. Center punch and drill the two light switch mounting holes.
14. Mount the light switch, ensuring correct orientation of the switch.
15. Using the nameplate as a template, mark, center punch, and drill the nameplate mounting screw holes.
16. Install the light switch nameplate(s).

Lighting Kit (continued)

17. Determine a convenient location for the 4 point terminal block. If sufficient terminals are available, these may be used for the lighting circuit. Mount the terminal block, using tapped holes.
18. Connect green #14 SIS wire to light switch ground connection.
19. Complete light circuit interconnect wiring. Incorporate wires into existing wire bundles as required.
20. Check wiring insulation using a 500 or 1000V megger.
21. Connect external source of 120 VAC to the lighting terminal points.
22. Check lighting operation. Close cubicle door and confirm that light illuminates circuit breaker in the area of the breaker position indicator.

Pricing and Terms of Sale

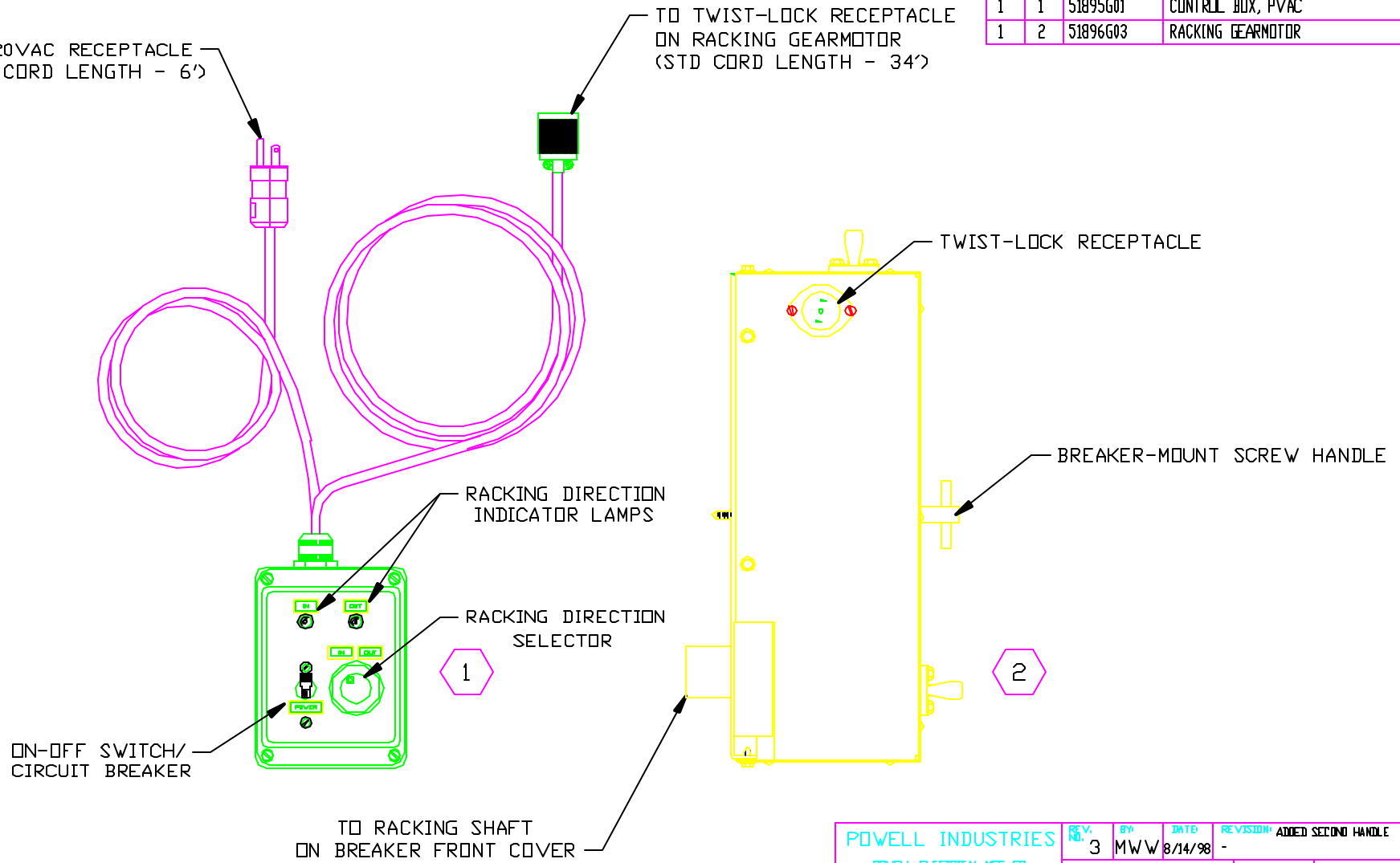
PowIVac Remote Racking Device	<u>\$ 4,350.00</u> each
Racking Access Opening and Cover	\$ <u>28.00</u> each
Quantity discount of 10% for orders of 10 or more units	\$ 25.00 each
Viewing Window	<u>\$ 50.00</u> each
Quantity discount of 10% for orders of 10 or more units	\$ 45.00 each
Lighting Kit (mount on horizontal brace)	<u>\$ 125.00</u> each
Quantity discount of 10% for orders of 10 or more units	\$ 110.00 each
Lighting Kit (mount on vertical brace [w/ bracket])	<u>\$ 150.00</u> each
Quantity discount of 10% for orders of 10 or more units	\$ 135.00 each

- A minimum order of \$ 150.00 applies.
- No drawings are included in the price quoted.
- Material availability 2 to 3 weeks after receipt of a purchase order.
- Prices are FOB Powell, Houston.
- Shipping expense to be prepay and add.
- No export, crating, or shipping expenses are included.
- Payment terms are NET 30 days. Finance charges of 1-1/2% per month on the unpaid balance will be added if payments are not made according to terms.
- No taxes are included.
- No field installation is included in the price quoted.

DESCRIPTION				ELECTRIC RACKING DEVICE ASSEMBLY, NON-THRU-DOOR			
FINISH		NONE		TOLERANCE		.XX .XX .XX ±.02 FRAC 1/16 ANG	
NO. OF ASSEMBLIES REQUIRED		01		APPLICATION		PVAC	
BTY.	ITEM NO.	PART NO.	DESCRIPTION				
1	1	51895G01	CONTROL BOX, PVAC				
1	2	51896G03	RACKING GEARMOTOR				

TO 120VAC RECEPTACLE
(STD CORD LENGTH - 6')

TO TWIST-LOCK RECEPTACLE
ON RACKING GEARMOTOR
(STD CORD LENGTH - 34')



TWIST-LOCK RECEPTACLE

BREAKER-MOUNT SCREW HANDLE

RACKING DIRECTION
INDICATOR LAMPS

RACKING DIRECTION
SELECTOR

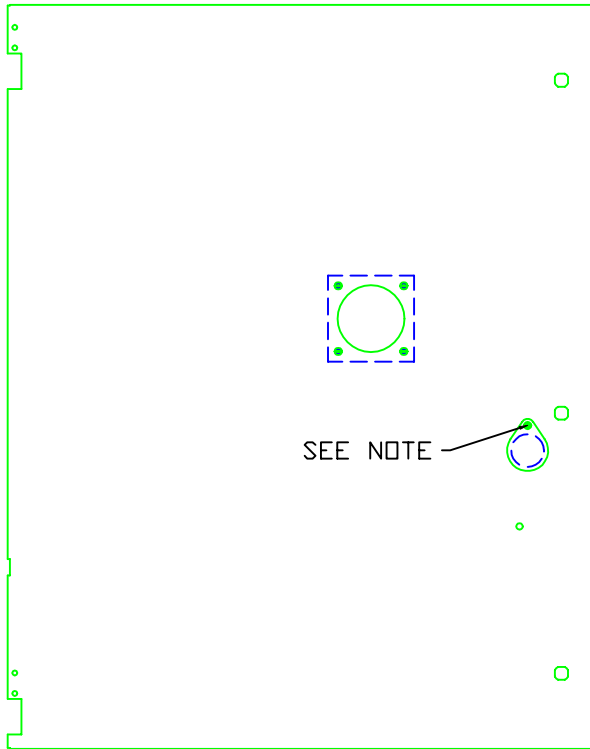
ON-OFF SWITCH/
CIRCUIT BREAKER

TO RACKING SHAFT
ON BREAKER FRONT COVER

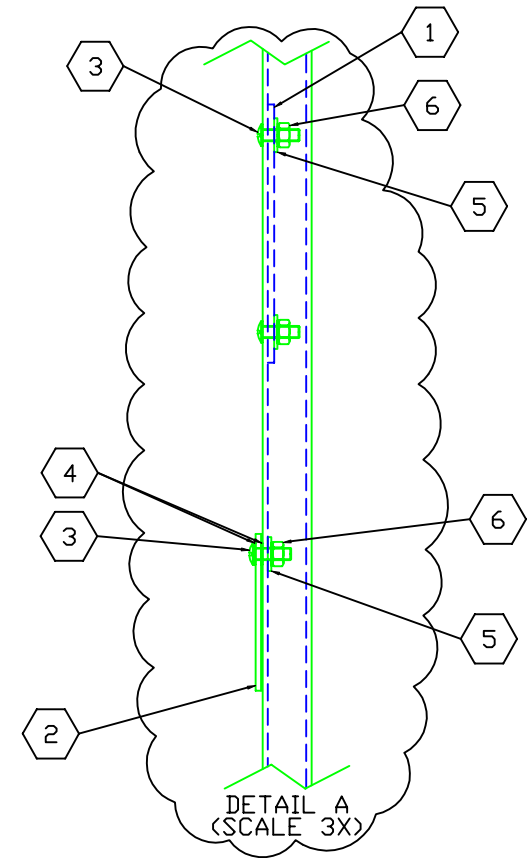
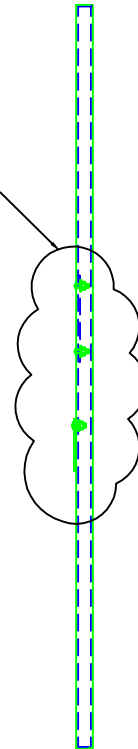
POWELL INDUSTRIES		REV. NO.	BY	DATE	REVISION	ADDED SECOND HANDLE
POWELL ELECTRICAL MFG CO		3	MWW	8/14/98	-	
HOUSTON, TEXAS		THIS DRAWING IS DRAWN TO A SCALE OF 1/2" = 1", THE BORDER IS SCALED UP 1 TIMES TO FIT		DRAWN DATE	DATE	DWG NO
				KM	08/14/98	51897G02

NOTE: TAP TEARDROP MOUNTING HOLE FOR 1/4-20. SEAT BOLT, NYLON WASHERS AND TEARDROP FIRST, THEN USE WASHER AND NUT TO LOCK IN PLACE.

NOTE: TEARDROP MOUNTS ON FRONT OF DOOR, VIEW WINDOW MOUNTS ON REAR OF DOOR.



SEE DETAIL A



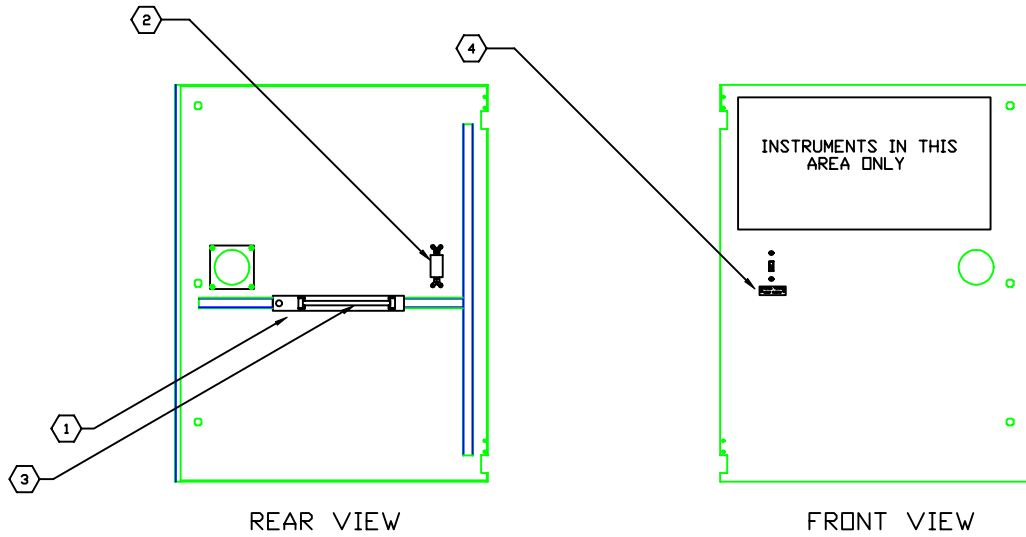
DETAIL A (SCALE 3X)

DESCRIPTION THRU DOOR RACKING ASSEMBLY			
FINISH N/A		STD. TOLERANCE UNLESS OTHERWISE NOTED .X ±1 .XX ±03 .XXX ±031 FRAC. 1/32 ANG. ±5°	
NO. OF ASSEMBLIES REQUIRED 1		APPLICATION PV36	
QTY.	ITEM NO.	PART NO.	DESCRIPTION
1	1	95170P01	DOOR VIEW WINDOW, 1/8" LEXAN
1	2	48034P01	COVER, CRANK ACCESS (TEARDROP)
5	3	W1505	TRUSS HEAD MAC. SCR. 1/4-20 X 3/4"
2	4	W9201	FLAT WASHER 1/4 TYPE A NYLON
5	5	W5204	FLAT WASHER 1/4 TYPE A WIDE
5	6	W3751	STAR-KEP-NUT/WASHER 1/4-20

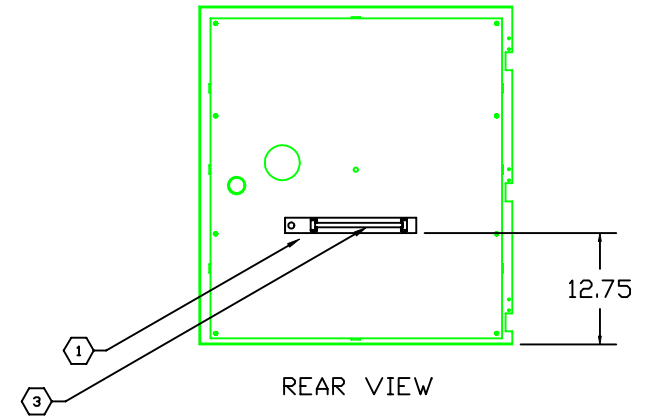
NOTES:

1. FOR USE ON STANDARD SPLIT DOORS WITH INSTRUMENTS ON TOP HALF ONLY.
2. FOR ARC RESISTANT DOORS, MOUNT ON COVER PLATE
SWITCH CANNOT BE MOUNTED ON DOOR ON ARC RESISTANT DESIGNS.

DESCRIPTION		INTERNAL VIEWING LIGHT KIT - NO BRACKET	
FINISH		STD. TOLERANCE UNLESS OTHERWISE NOTED	
N/A		.X ±.1 .XX ±.03 .XXX ±.031 FRAC. 1/32 ANG. ±5°	
NO. OF ASSEMBLIES REQUIRED		APPLICATION	
1		POWL VAC	
QTY.	ITEM NO.	PART NO.	DESCRIPTION
1	1	2V809	LIGHT FIXTURE
1	2	1221	SWITCH
1	3	F8T5-CW	LIGHT BULB
1	4	90022P01	NAMEPLATE (SHOWN FOR REF. ONLY)



STANDARD DOOR



ARC RESISTANT DOOR