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# GENERAL PURPOSE DRY - TYPE DISTRIBUTION TRANSFORMER



## INSTALLATION, OPERATION, AND MAINTENANCE MANUAL



U.S. DEPARTMENT OF  
**ENERGY**  
DOE 2016 COMPLIANT



## **WARNING**

Electrical potentials hazardous to human life can exist within this equipment when it is energized. Disconnect all input power before opening the case or touching the internal parts

The information contained herein may not cover all variations in equipment supplied or provide for all contingencies that might arise during the installation, operation or maintenance for this equipment. If there is any question regarding the above items, contact your supplier.

IT IS EXPECTED THAT ANY INSTALLATION OR MAINTENANCE WILL BE PERFORMED  
BY QUALIFIED PERSONNEL ACCORDING TO LOCAL, STATE, AND NATIONAL CODES.

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## General

Read the entire manual before attempting to perform installation of this transformer. Dry type transformers are suitable for indoor or outdoor use depending upon the construction of the enclosure as well as the ability to protect the transformer from unwarranted access to live parts. They are cooled by the free circulation of air through the enclosures, the average ambient temperature over 24 hours should not exceed 30° C (86°F), the maximum ambient temperature should not exceed 40° C (104°F) or as otherwise specified in the specification. Overheating may occur if the air flow is restricted, the transformer is overloaded, it is supplied with over or under voltage, or operated at other than rated frequency.

## Inspection upon Receipt

Units are shipped in upright position and should arrive that way. Upon arrival, all units should be inspected for damage during shipment. Unpack and examine for broken or loose parts. Careful inspection should be made of transformer coils, wiring and insulators. What appears to be minor damage in these areas may result in an open or short circuit. Claims for damage should be filed with the transportation company and an ACME Electric representative must be notified immediately. For superficial or minor case part damage, spare parts may be available, contact an ACME Electric representative.

## Handling

Lifting with hand trucks or fork lift trucks is permissible if the blades or forks are long enough to pass completely under the case. Since most general purpose transformers have a high center of gravity, extreme caution should be exercised when lifting or moving the units.

If it is necessary to move ventilated dry-type transformers during inclement weather then they should be thoroughly protected against the entrance of moisture.

## Storage

Storage areas should be as clean and dry as possible without extreme temperature variations. Protective wrappings should be left intact until the transformer is moved to its permanent location. Dry type transformers stored under extremely wet or dusty conditions must have cleaning and drying operations performed before the unit can be energized. (See Maintenance Section.)

## Installation Location

Factors to be kept in mind when choosing a location for dry type transformers are: accessibility, ventilation, environmental conditions, and noise (see 'Reducing Sound Levels'). Installation should be made in an area reasonably free from dust, excessive moisture, fertilizers, chemicals and other corrosive fumes or vapors and separated from flammable materials in accordance with the NEC.

General purpose dry type transformers up to case GPC+ are supplied in dual rated enclosures suitable for indoor/outdoor installation and eliminates the need of a weather shield kit. Weather shield kits are for cases GPD and GPE which are available to convert these enclosures for UL listed outdoor NEMA 3R use. The appropriate kit can be obtained from a ACME Electric Transformer representative. Even with a properly attached weathershield kit, no transformer should be hosed off, or placed in the catchment area of a water sprinkler. Wall-mount brackets are also available for units up to 75 KVA.

In all locations dry type transformers must be installed in the upright position in an area with free air circulation. Check NEC codes for minimum required clearances from adjacent structures. Fencing in the transformer to prevent unauthorized access is strongly recommended.

## Room Requirements

Dry-type transformers located indoors should comply with the application requirements of NEC.

The room in which dry-type transformers are located should be sized to permit locating transformers with sufficient spacing between units and sufficient clearances to walls and other obstructions (as specified per NEC or as indicated below nameplate) to permit air circulation. Sufficient space should also be provided to permit routine inspection and maintenance.

Adequate ventilation is essential for the proper cooling of transformers. Clean, dry air is desirable. Filtered air at or above atmospheric pressure may reduce maintenance if dust or other contaminants present a particular problem. When transformers are located in rooms or other restricted spaces, sufficient ventilation should be provided to hold the air temperature within established limits when measured near the transformer inlets. This will usually require approximately 100 ft<sup>3</sup>/min of air per kilowatt of transformer loss. The area of ventilating opening required depends upon the height of the room, the location of openings, and the maximum loads to be carried by the transformer. Room ventilation should not impede normal circulation of air through the transformer.

When possible, the air inlet to the room should be near the floor with the outlet in the opposite upper end of the room. The exhausting air should not exceed 15°C over the inlet air temperature. When necessary, forced air exhaust should be used to maintain this maximum differential.



## Connections

**Cautions:** Make only those connections shown on the nameplate or connection diagram. Before energizing, check all tap jumpers for proper locations, and all bolted connections for tightness. All three sets of taps on a three phase transformer must be connected in the same location for each phase. For instructions on how to read nameplates and connection diagrams, please visit the documentation section of our website at: <http://www.hubbell.com/acmeelectric/en>.

All transformers, with bottom connections are designed for easy accommodation of cable sizes in accordance with NEC. Cables which will carry less than 100 amperes may have a 60° C temperature rating or higher, and cables which will carry 100 amperes or more must have a 75° C temperature rating or higher. All cables should be in the lower part of the transformer enclosure in accordance with markings on the enclosure.

Use 90° C cable sized to 75° C ampacity for the units having terminals located above the coils. After the first thirty days of service, re-tighten all connecting lugs and bolts. Depending on the kVA rating, the transformer may have flexible leads with bolted type wire terminals, copper/aluminum (CU/AL) lug connectors, or simply termination pads for mounting your own crimp or lug type terminations. The table below shows required torque for installing bolted wire connectors and cables in lug type connectors.

BOLT SIZE	TYP TOL +/- NOM	ALUM		SIL BRONZE		STEEL	
		In-Lbs	Ft-Lbs	In-Lbs	Ft-Lbs	In-Lbs	Ft-Lbs
1/4-20	+/- 20%	50	4	60	5	75	6
5/16-18	+/- 20%	85	7	110	9	135	11
3/8-16	+/-20 %	145	12	195	16	240	20
1/2-13	+/-15 %	300	25	420	35	540	45
5/8-11	+/-15 %	480	40	840	70	1080	90
3/4-10	+/-15 %	720	60	1200	100	1560	130

### NOTES:

1. Always use two wrenches when tightening or loosening bolted connections to prevent damage.
2. Tighten, wait several seconds, then re-tighten all connecting lugs and bolts.

Minimum electrical clearances in the installation of lugs and cables must be per ANSI and NEMA Standards. All electrical clearances that are questionable must be insulated for the applied voltage. Particular care should be taken with shielded cables, so that the ground termination of the cables has sufficient clearance from all the manufacturers installed live parts, including parts that appear to be insulated.

## Grounding

It is the responsibility of the installer to ground the transformer enclosure assembly to the ground system in accordance with the latest revision of the NEC Section 450-10, NEC Article 250 and ANSI/IEEE Std. 144.

## Reverse Feed or Step-up Operation

Step-down transformers may be reverse fed for step-up operation to increase voltage. This means that the incoming power is connected to the low voltage (X's) and the load is connected to the high voltage (H's). If the low voltage is wye, the X0 terminal must NOT be connected in any way. Likewise, if the low voltage is a delta with a 120 volt lighting tap (high-leg), the X4 terminal must NOT be connected in any way.

**CAUTION:** Much higher than normal inrush currents may occur with reverse feed operation and may cause nuisance fuse blowing or breaker tripping. For this reason, fuses and breakers with time-delay characteristics must be used.

If a breaker is used for incoming over-current protection, it must be a thermal-magnetic type breaker, not a magnetic-only type breaker.

Tap Settings are for the high voltage side and when reverse fed the ability to adjust voltages is no longer available. This means some performance parameters may be affected.

## Reducing Sound Levels

Transformer noise originates within the steel core. It is an inherent characteristic of all transformers and cannot be completely eliminated. Therefore, care should be exercised in the selection of the transformer location, particularly in buildings where the ambient sound level is quite low. A transformer's sound level is quite often unintentionally amplified by improper installation, which makes the transformer appear to be considerably louder than it actually is. Transformer sound levels are amplified by sound waves in the air being reflected from surrounding objects and resonance of mounting construction and electrical connections. This situation should be avoided wherever possible. Transformers should be connected for and energized at rated voltage and frequency at no load to determine the correct noise level. Transformer sound level problems can also be further minimized by following these installation suggestions:

1. The case may be installed on vibration mounts for additional reduction of sound levels.
2. Flexible conduit couplings should be used to reduce vibration transfer from the case to the incoming and outgoing conduit.
3. The installation should be in an area where the sound will be least objectionable.
4. Avoid stairway and hall areas or reflecting objects which resonate or echo. Concrete or masonry walls, floors and ceilings are excellent sounding boards. If these and other reflecting surfaces cannot be avoided, acoustic absorbing materials should be used to cover them.

5. Mounting the transformer on walls, balconies or floors which have relatively light mass should also be avoided. The possibility of amplifying the sound waves in the structure will be greatly reduced if the weight of the mounting surface corresponding to the projected area of the transformer is equal to, or greater than the weight of the transformer. Surfaces which may distort or strain the transformer case should be leveled or squared before installation.
6. Shrubbery can be planted near the unit on outdoor installations to break up the sound pattern. Make sure all sprinklers are aimed away from the transformer.
7. Incoming line over-voltage is higher than tap setting. Change the tap settings according to the incoming line voltage.
8. Transformer installed too close to other noise generating transformers. Check adjacent transformers and isolate with acoustical barriers.
9. Loose parts of transformer enclosure, such as panels or loose bolts. Check panels and parts and tighten loose bolts and nuts.
10. Loose parts on core & coils that may have dislodged or shifted during shipment or installation. May require torquing bolts, nuts and coil support blocks.
11. Imbalanced loads. All three phase loads should be balanced per ANSI tolerances.
12. Triplen harmonic generating loads. Third harmonic circulating in delta primary will add over excitation. Disconnect load from transformer and then check sound level.

## Prior To Energizing

After the installation is completed, remove any debris from the bottom of the cable compartment and from under the transformer. After the transformer has been installed, but before it is energized, all shipping braces should be removed. Tighten securely all external bolts to eliminate any vibrations. Check tap jumpers for proper location, and all bolted connections for tightness. (use two wrenches).

## Maintenance

Although dry type transformers require less maintenance than liquid filled transformers and other electrical devices, periodic cleaning and inspection on the average of at least once a year should be performed except under extraordinary conditions, in which case the inspections should be made more often.

The unit must be de-energized and properly grounded before checking for loose connections or parts, accumulations of dirt on insulating surfaces, and dust which tends to restrict air flow. The windings may be cleaned with a vacuum cleaner, a blower, or with compressed air. The use of a vacuum cleaner is preferred as the first step in cleaning followed by the use of compressed air or nitrogen. The

compressed air or nitrogen should be clean and dry and should be applied at not more than 25 psi. Lead supports, taps, terminal boards, bushings and other major insulation surfaces should be brushed or wiped with a dry cloth. The use of liquid cleaners is undesirable because some of them have a deteriorating effect on most insulating materials.

As long as the transformer is energized, humidity conditions are unimportant. In the event that a dry type transformer is de-energized and allowed to cool to ambient, consideration must be given to the possible effects of humidity. If moisture is noted, it should be removed by drying with heated air from a blower, with the maximum temperature of 110°C or 230°F. The heat must be distributed in the enclosure. Incandescent lamps or heaters may also be used if the same temperature limitations are observed.

## Lighting Tap Applications

Most transformers with 240V delta secondaries have a 120V single-phase lighting tap. The maximum single-phase 120V load can not exceed 10% of the three-phase kVA rating. The load must also be balanced at 5% maximum between X1 and X4 and 5% between X2 and X4. The three-phase kVA rating will be reduced by 15% when lighting tap is used to maximum capacity.

## Dielectric Insulation

Transformer insulation system is designed to protect the integrity of the transformer to the BIL rating on the nameplate. If exposed to lightning, switching surges or severe transients, additional protection such as surge arrestors, surge capacitors or a higher BIL rating should be provided.

## Ambient Temperature

Limiting ambient temperatures for normal service conditions are specified in ANSI Standards for Transformers. Transformers depend entirely on the surrounding air for adequate ventilation. The ambient should not exceed 40° C (104° F) and the average temperature of the air for any 24 hour period should not exceed 30°C (86° F). For operation at higher ambient temperatures, transformer loading should be reduced 0.6% of rated kVA for each degree above 30° C average ambient to a maximum of 50° C (unless transformer is specifically designed for this temperature). The use of transformers in cooling air above 50° C is not covered by this guide, and the manufacturer should be consulted before such installations are made.

## **Altitude**

Transformers are normally designed for operation at altitudes up to 1000 meters (3300 feet). To operate a transformer above 1000 meters requires special considerations in winding insulation. Consult your nearest sales office for additional details. Refer to the latest edition of NEMA ST20 for detailed guidelines.

## **Single Phase Three Wire Operation**

Transformer is shipped from the factory with a link between X2 & X3 for single phase three wire operation. X2 & X3 link can be treated as neutral and can be solidly grounded. X1 to neutral and X4 to neutral can be loaded up to 50% of kVA each and will provide 120 Volts output. X1 & X4 will provide 240 Volts output.

If only 120 Volts is desired then remove the links (there will be 2 links) between X2 and X3 and connect X1 to X3 and X2 to X4 to make windings in parallel.

## **References**

All transformers are manufactured per NEMA and ANSI/IEEE standards. Where the UL Label is affixed, the transformer conforms to UL requirements.

Further information may be found in ANSI/IEEE Standard C57.94. Recommended Practice For Installation, Application, Operation And Maintenance Of Dry Type General Purpose Distribution And Power Transformers.

## **When you need Service**

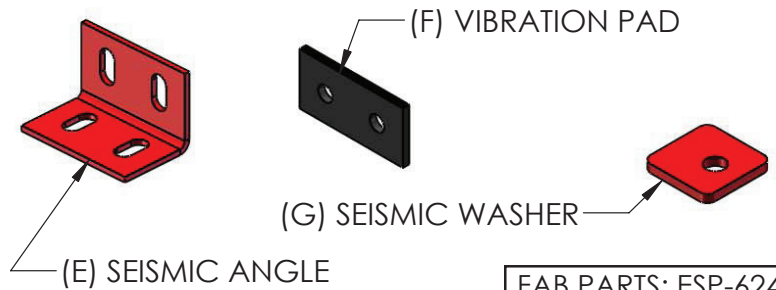
If you need service on products manufactured by ACME Electric we are ready to serve you. Contact the nearest sales office for more information.

## Transformer Maintenance Log

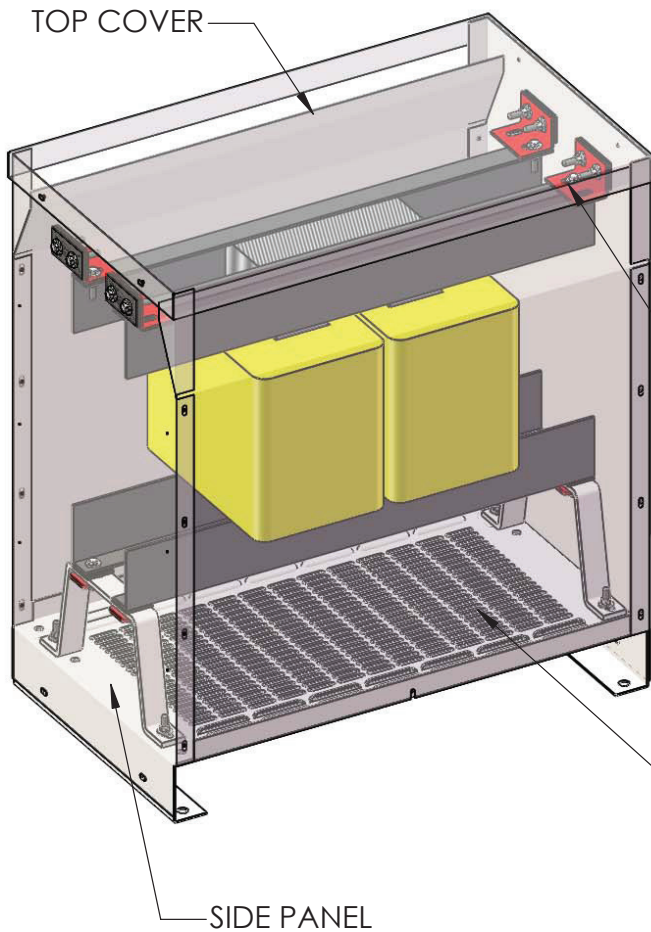
[illegible]

# APPENDIX A - SEISMIC KIT INSTALLATION INSTRUCTIONS (CASES A, B, B+, C, C+)

INCLUDED HARDWARE		
ITEM	DESCRIPTION	QTY.
A	3/8"-16 X 2.00" BOLT	20
B	3/8" FLAT WASHER	32
C	3/8" LOCK WASHER	20
D	3/8" NUT	20
E	SEISMIC ANGLE	4
F	VIBRATION PAD	4
G	SEISMIC WASHER	8



FAB PARTS: ESP-624-1



## 1) DE-ENERGIZE TRANSFORMER.


## 2) REMOVE TOP COVER AND FRONT & REAR PANELS.

## 3) BOLT SEISMIC ANGLE TO TOP CLAMP AS SHOWN. (SEE CUTAWAY VIEW 1 ON NEXT PAGE)

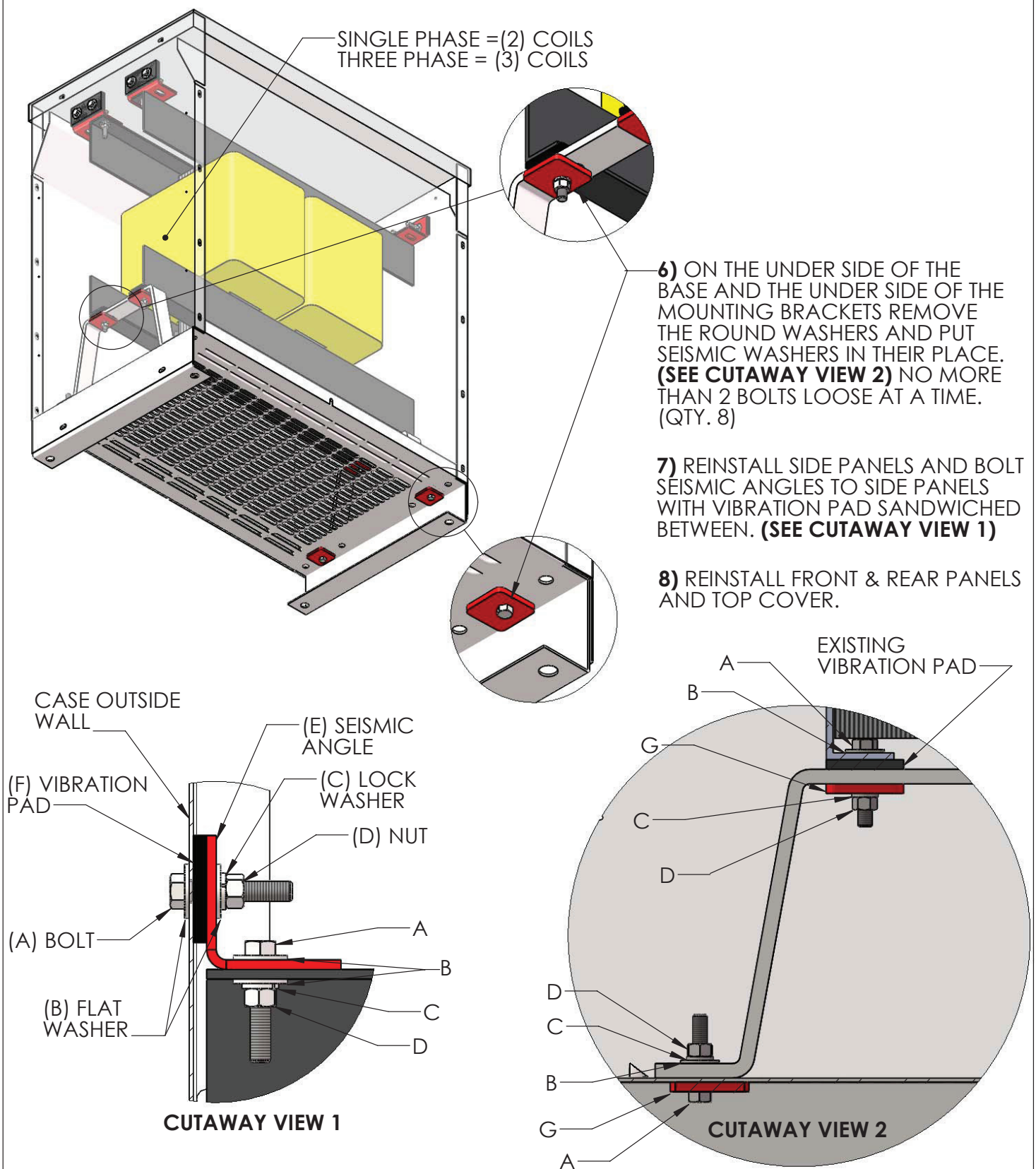
## 4) MARK HOLE LOCATIONS ON SIDE PANELS. (QTY. 4 PER SIDE) SEISMIC ANGLE MAY NOT BE CENTERED ON PANEL DUE TO CORE & COIL OFFSET.

## 5) REMOVE SIDE PANELS OR COVER COILS TO SHIELD FROM METAL SHAVINGS AND DRILL HOLES. **CAUTION:** METAL SHAVINGS CAN CAUSE ELECTRICAL FAILURE AND SERIOUS INJURY SHOULD THEY FALL INTO THE COILS.


**\*\*DRAWINGS ARE FOR ILLUSTRATION PURPOSE ONLY. TRANSFORMER MODELS MAY VARY.\*\***

REVISIONS				NAME	DATE	DESCRIPTION: PART NAME:	REV.
D	UPDATED DESCRIPTION AND NOTES.	BSB, 02/02/12	DRAWN	BSB	01/07/11	OSHPD (SEISMIC) RETROFIT GP CASE (A, B, B+, C, C+)	D
C	FINALIZED AND APPROVED BY ALL.	BSB, 01/11/12	CHK'D				
B	FORMAT WAS 11 X 17" & REVISED HARDWARE.	BSB, 12/21/11	APPV'D				
A	REVISED HARDWARE TO 3/8" PER MI.	BSB, 11/01/11					
					SHEET 1 OF 2		DRAWING NAME: ESP-621

# APPENDIX A - SEISMIC KIT INSTALLATION INSTRUCTIONS (CASES A, B, B+, C, C+) (CON'T.)

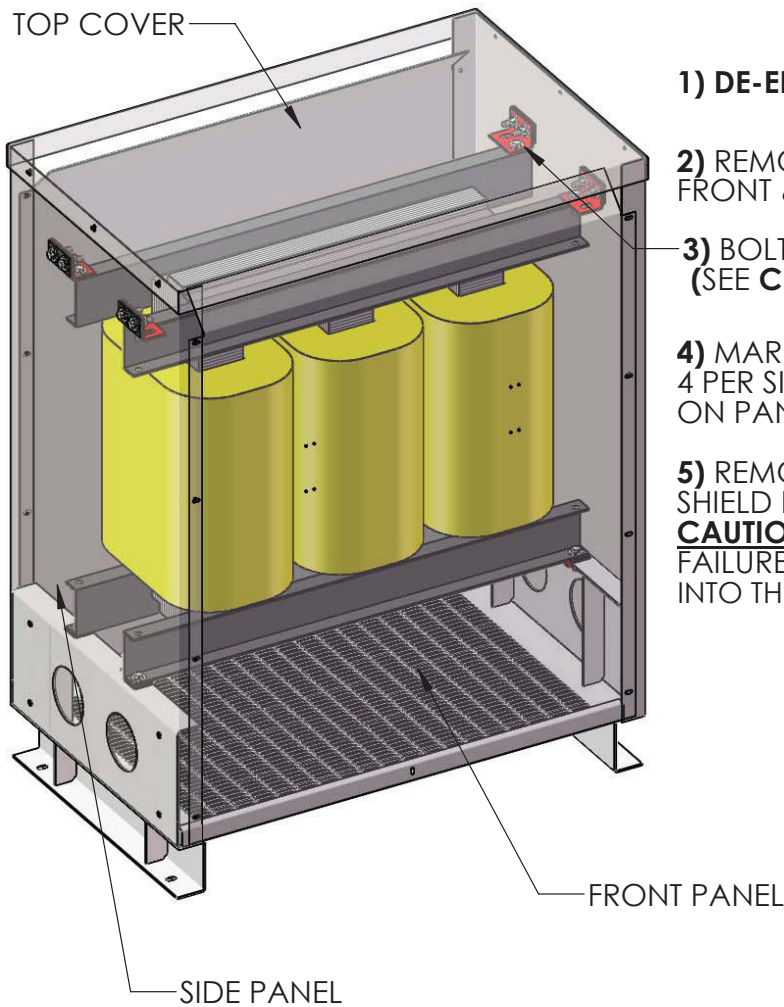
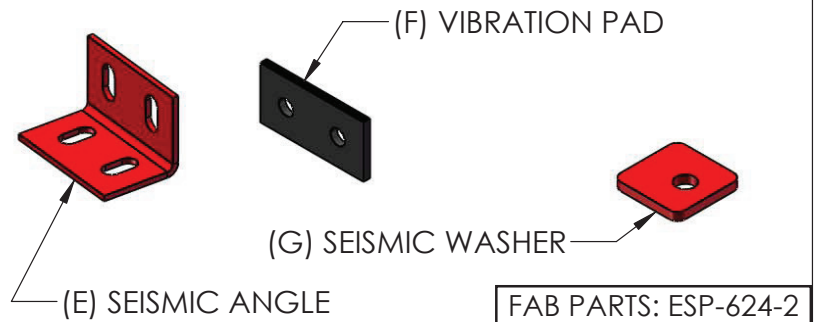


**\*\*DRAWINGS ARE FOR ILLUSTRATION PURPOSE ONLY. TRANSFORMER MODELS MAY VARY.\*\***

REVISIONS		NAME	DATE	DESCRIPTION: PART NAME:	REV.
		DRAWN	BSB	01/07/11	D
		CHK'D			
		APPV'D			
SHEET 2 OF 2					DRAWING NAME: ESP-621

# APPENDIX B - SEISMIC KIT INSTALLATION INSTRUCTIONS (CASES D & E)

INCLUDED HARDWARE		
ITEM	DESCRIPTION	QTY.
A	1/2"-13 X 2" BOLT	16
B	1/2" FLAT WASHER	28
C	1/2" LOCK WASHER	16
D	1/2" NUT	16
E	SEISMIC ANGLE	4
F	VIBRATION PAD	4
G	SEISMIC WASHER	4



## 1) DE-ENERGIZE TRANSFORMER.


2) REMOVE TOP COVER AND FRONT & REAR PANELS

3) BOLT SEISMIC ANGLES TO TOP CLAMP AS SHOWN. (SEE **CUTAWAY VIEW 1** ON NEXT PAGE)

4) MARK HOLE LOCATIONS ON SIDE PANELS. (QTY. 4 PER SIDE) SEISMIC ANGLE MAY NOT BE CENTERED ON PANEL DUE TO CORE & COIL OFFSET.

5) REMOVE SIDE PANELS OR COVER COILS TO SHIELD FROM METAL SHAVINGS AND DRILL HOLES.  
**CAUTION:** METAL SHAVINGS CAN CAUSE ELECTRICAL FAILURE AND SERIOUS INJURY SHOULD THEY FALL INTO THE COILS.

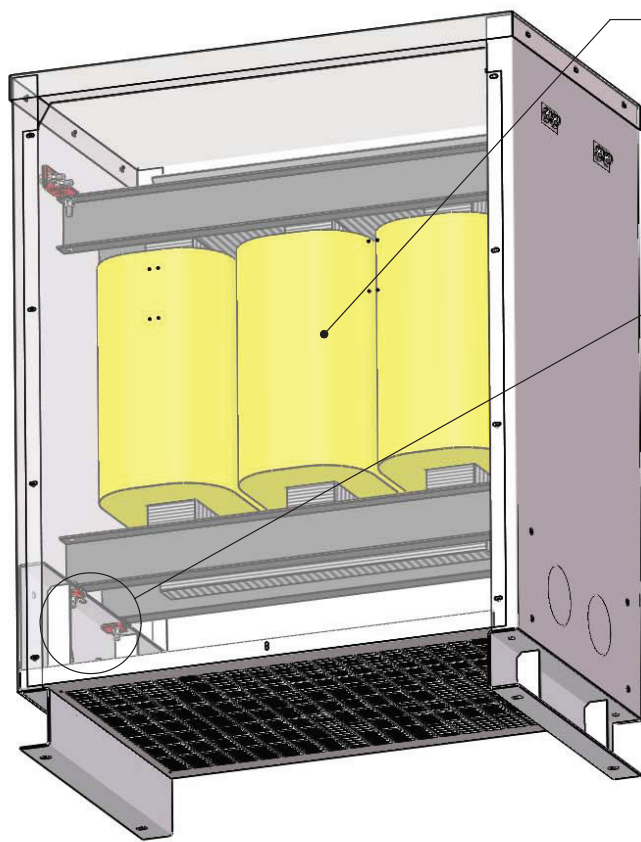
**\*\*DRAWINGS ARE FOR ILLUSTRATION PURPOSE ONLY. TRANSFORMER MODELS MAY VARY.\*\***

REVISIONS				NAME	DATE	DESCRIPTION: PART NAME:	OSHPD (SEISMIC) RETROFIT GP CASE (D & E)	REV.
			DRAWN	BSB	01/10/11			C
C	UPDATED DESCRIPTION AND NOTES.	BSB, 02/07/12	CHK'D				DRAWING NAME:  ESP-622	
B	FINALIZED AND APPROVED BY ALL.	BSB, 01/11/12	APPV'D					
A	FORMAT WAS 11 X 17" & REVISED HARDWARE.	BSB, 12/21/11		SHEET 1 OF 2				





# APPENDIX B - SEISMIC KIT INSTALLATION INSTRUCTIONS (CASES D & E) (CON'T.)

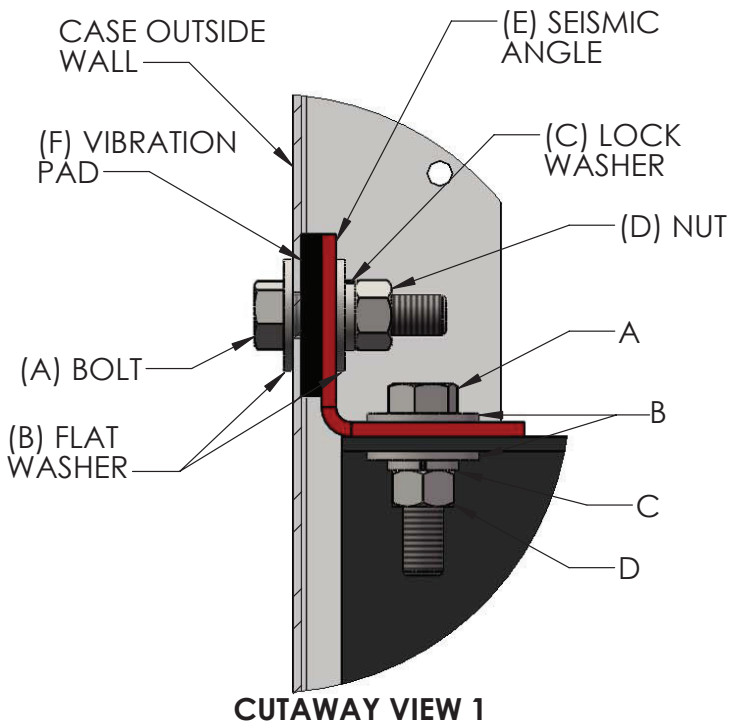


SINGLE PHASE = (2) COILS  
THREE PHASE = (3) COILS

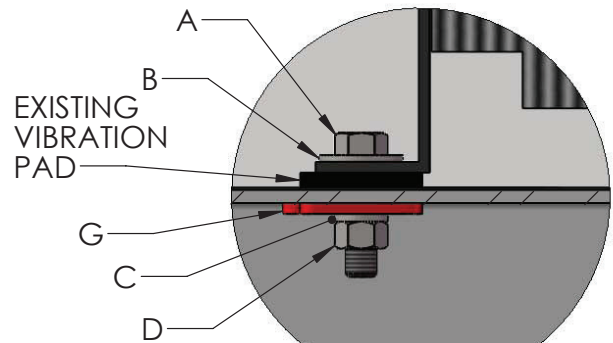
**6)** ON THE UNDER SIDE OF THE MOUNTING CHANNEL REMOVE THE ROUND WASHERS AND PUT SEISMIC WASHERS IN THEIR PLACE. **(SEE CUTAWAY VIEW 2)** NO MORE THAN 2 BOLTS LOOSE AT A TIME. (QTY. 4)

**7)** REINSTALL SIDE PANELS AND BOLT SEISMIC ANGLES TO SIDE PANELS WITH VIBRATION PAD SANDWICHED BETWEEN. **(SEE CUTAWAY VIEW 1)**

**8)** REINSTALL FRONT & REAR PANELS AND TOP COVER.



CUTAWAY VIEW 1



CUTAWAY VIEW 2

**\*\*DRAWINGS ARE FOR ILLUSTRATION PURPOSE ONLY. TRANSFORMER MODELS MAY VARY.\*\***

REVISIONS		NAME	DATE	DESCRIPTION:	REV.
		DRAWN	BSB	01/10/11	
		CHK'D			
		APPV'D			
				DESCRIPTION: OSHPD (SEISMIC) RETROFIT PART NAME: GP CASE (D & E)	C
				DRAWING NAME:	
				ESP-622	



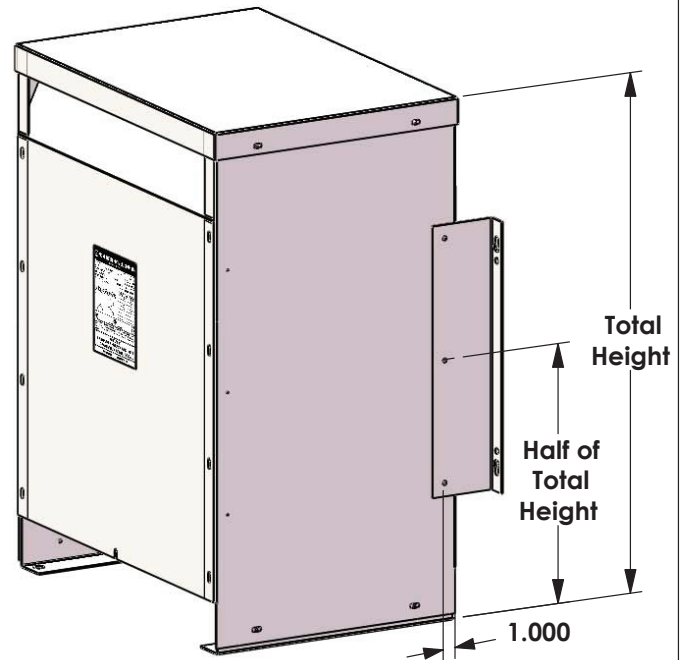


# APPENDIX C - WALL MOUNT BRACKET INSTALLATION INSTRUCTIONS

## KIT CONTENTS:

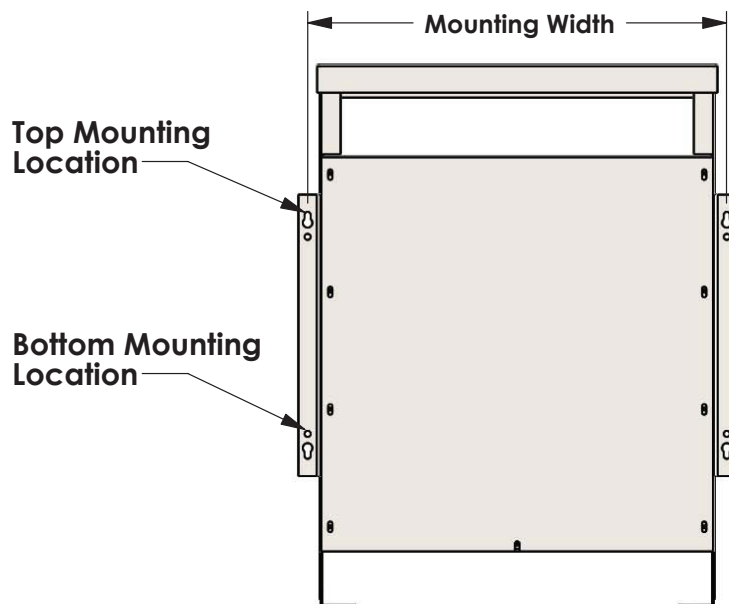
1. (Qty 6) 5/16 X 1" Self-drilling/tapping screws
2. (Qty 2) Wall mount brackets

**FAB PARTS ESP-628**




To attach wall mount brackets, put one of the included 5/16 x 1" self-drilling/tapping screws through the center hole of the wall mount bracket and through the case. It should be 1" from the rear of the case to the hole and at the centerline of the cases vertical height. Then add the other 2 adjacent screws. Repeat for other side.

\*If the side panel has pre-marked locations simply line up the bracket with these dimples.



To mount the unit on the wall, first install two bolts (not included) on the desired wall at the correct mounting width apart and at your desired height (Minimum bolt size is 5/16" and of a suitable length and type for the intended mounting surface). Hang the transformer like a picture from these bolts at the top mounting locations. Next install two bolts with washers at the bottom mounting locations. Then (ONE AT A TIME) remove the top bolts to add a washer and re-install them.

REVISIONS					NAME	DATE	GP WALL MOUNT INSTALLATION CASES (A, B, B+)		REV. A
				DRAWN	BSB	10/31/11	 DRAWING NAME: ESP-627		
				CHK'D					
				APPV'D					
A	FINALIZED AND APPROVED BY ALL.			BSB, 01/11/12		SHEET 1 OF 1			

## WEATHERPROOF KIT INSTALLATION INSTRUCTIONS

### ITEMS SUPPLIED WITH WEATHERPROOF KIT

QTY:	DESCRIPTION
2	RAINHOODS
2	RAIN DEFLECTORS
1	INSTRUCTION SHEET

1) Read and understand all the instructions before beginning installation.

2) Check that no parts are missing from the weatherproof kit.

3) If the transformer is energized, de-energize and lock out power supplying the transformer before proceeding.

4) Remove the top two front panel screws that secure the front panel to the enclosure. Save the screws for re-use.

5) Slip the rainhood lip up under the top cover flange.

6) Line up the rainhood mounting holes with the existing holes in the enclosure. Using the screws removed in step 4, secure the rainhood to the enclosure - see figure 1.

7) Install the other rainhood by repeating steps 4 thru 6 on the opposite side.

8) Remove the bottom two front panel screws that secure the front panel to the enclosure. Save the screws for re-use.

9) Line up the rain deflector mounting holes with the existing holes in the enclosure. Using the screws removed in step 8, secure the rain deflector to the enclosure - see figure 2.

10) Install the other rain deflector by repeating steps 8 and 9 on the opposite side.

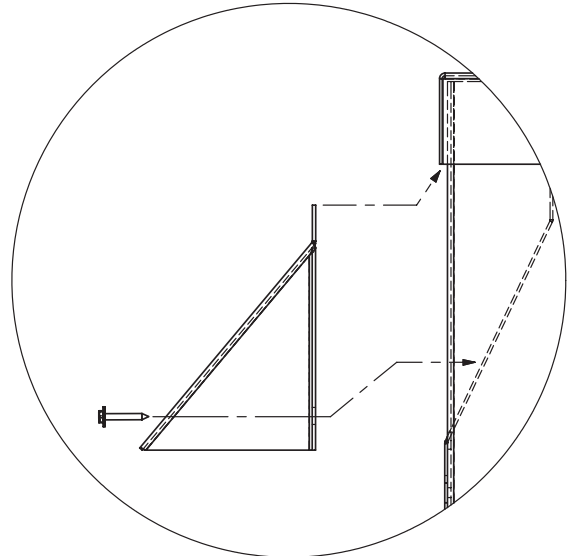


FIGURE 1 - RAINHOOD

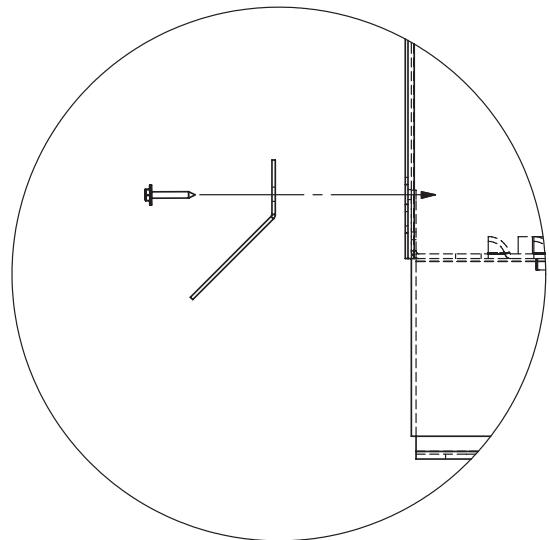



FIGURE 2 - RAIN DEFLECTOR

REVISIONS				NAME	DATE	DESCRIPTION: PART NAME:  WEATHERPROOF KIT INSTALLATION INSTRUCTIONS	REV.
			DRAWN	BSB	12/23/11		A
			CHK'D				
			APPV'D				
A	FINALIZED AND APPROVED BY ALL.			BSB, 01/11/12		<div> Acme Electric®</div>	DRAWING NAME:  ESP-629
						SHEET 1 OF 1	

## RODENT / BIRD SCREEN KIT INSTALLATION INSTRUCTIONS

### ITEMS SUPPLIED WITH WEATHERPROOF KIT

QTY:	DESCRIPTION
2	RODENT / BIRD SCREENS
1	INSTRUCTION SHEET

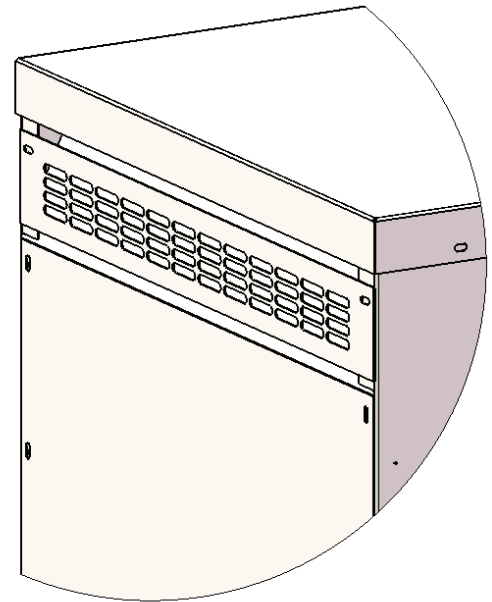
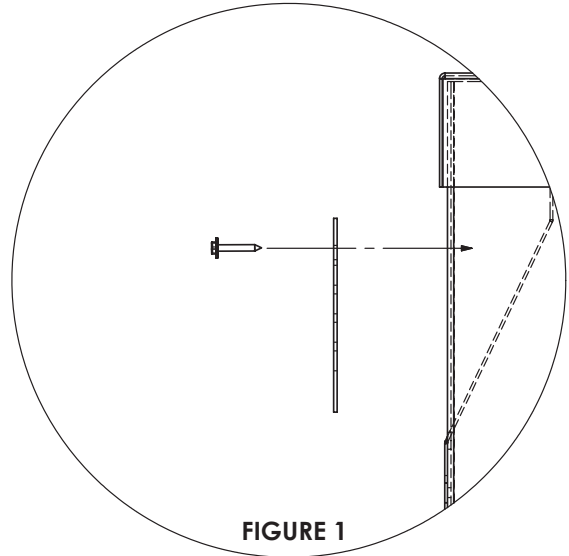
1) Read and understand all the instructions before beginning installation.

2) Check that no parts are missing from the rodent/bird screen kit.

3) If the transformer is energized, de-energize and lock out power supplying the transformer before proceeding.

4) Center the screen on the open vented area of the transformer. With the mounting slots on the top side, use two self drilling/tapping screws to mount the screen on the transformer.

5) Repeat step 4 on opposite side.



REVISIONS		NAME	DATE	DESCRIPTION: PART NAME:	REV.
		DRAWN	BSB	01/13/12	
		CHK'D			
		APPV'D			
A	FINALIZED AND APPROVED.	BSB, 01/16/12		RODENT/BIRD SCREEN INSTALLATION INSTRUCTIONS	A
				Acme Electric®	DRAWING NAME: ESP-631