



Kelly Walsh High School

Operation and Maintenance Manuals

Division 26 – Electrical – Volume I

Project: Kelly Walsh High School
3500 East 12th street
Casper, Wyoming 82609
(307) 253-2000

Owner: Natrona County School District
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Casper, Wyoming 82601
(307) 253-5317

Electrical Contractor: Casper Electric

Construction Manager: Sampson Construction
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Cheyenne, Wyoming 82001
(307) 426-4050

Architect: RB+B Architect's
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Fort Collins, Colorado 80524-2913
(970) 484-0117

Commissioning Authority: Beaudin Ganze Consulting Engineers
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Lakewood, Colorado 80401
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October, 2015

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SUBMITTAL FORM

402/434-5450
3730 S. 14th Lincoln, NE 68502
FAX: 402/434-5466

TO: RB+B Architects, Inc.

PROJECT: Kelly Walsh High School

SUBMITTAL #	260536-1-0
FIRST SUBMITTAL	X
RESUBMITTAL	
ADDITIONAL INFO.	
SHOP DRAWING	
PRODUCT DATA	X
SAMPLE/OTHER	

SAMPSON PROJECT NO: 13011

DATE: 5/28/2014

SUBMITTAL			DESCRIPTION	SUBCONTRACTOR / SUPPLIER
SPEC.	Copies	REF	ITEM	NAME AND ADDRESS
260536			Product Data	Flextray

A – REVIEWED
C – REVISE AND RESUBMIT

B – MAKE CORRECTIONS NOTED
D – REJECTED - RESUBMIT

****PLEASE SIGN AND INDICATE THE ACTION ON THIS SUBMITTAL FORM AND FORWARD WITH THE SUBMITTAL TO SAMPSON CONSTRUCTION. THANKS.**

COMMENTS:

ARCHITECT: RB+B

DATE: _____

CONSULTANT: Lower & Co

DATE: _____

CONTRACTOR: **Sampson Construction Company**

BY: Tim Farber

DATE: 5/28/2014

REVIEWED

NO OBJECTIONS NOTED
 FURNISH WITH CORRECTIONS
 REVISE AND RESUBMIT

REVIEW IS FOR THE LIMITED PURPOSE OF VERIFYING COMPLIANCE WITH SPECIFIED MATERIALS AND WORKMANSHIP, AND/OR CONFORMANCE WITH A REASONABLY INFERRABLE INTENT OF THE DESIGN, AS EXPRESSED IN THE CONTRACT DOCUMENTS. ANY ACTION SHOWN OR COMMENTS MADE REMAIN SUBJECT TO THE REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS. THE CONTRACTOR IS RESPONSIBLE FOR QUANTITIES REQUIRED AND DIMENSIONS WHICH SHALL BE CONFIRMED AT THE JOB SITE; FABRICATION PROCESSES, MEANS, METHODS, TECHNIQUES, SEQUENCES, ASSEMBLY, AND PROCEDURES OF CONSTRUCTION; COORDINATION OF THE WORK WITH THAT OF OTHER TRADES; AND PERFORMING THE WORK IN A SAFE AND SATISFACTORY MANNER.

ENGINEERING DESIGN ASSOCIATES

By: MNS Date: 5/29/14

260536 Cable Tray for Electrical Systems Submittal

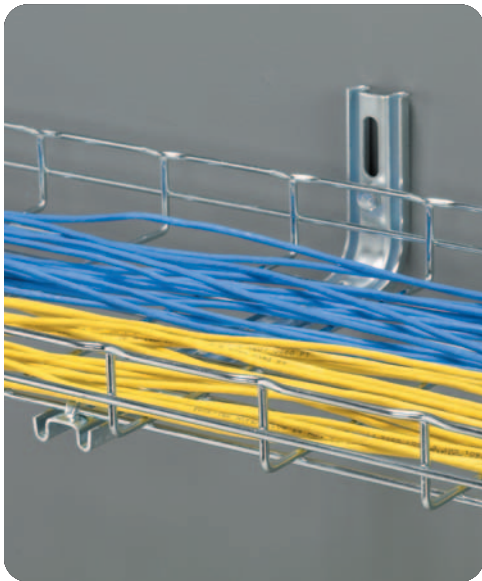
Sampson
Construction

Approval in general as to confirmation with architect's drawings.
Approval does not release sub-contractor or material supplier from
responsibility as to accuracy of dimensions or compliance with sub
contract documents.

SAMPSON CONSTRUCTION CO., INC.

By: tim.farber

Date: 05/28/2014



Flextray is a flexible, field-adaptable way to manage cables throughout your project. The tray itself can be cut and bent to the needs of the installer on the jobsite, allowing cable runs to be adjusted as needed. The wide range of sizes offered by Cooper B-Line makes Flextray a great choice for everything from a small cable drop to a large trunk of cables. Our tray has the market-preferred "T" weld safety edge, protecting both the cable and the installer during cable installation. Flextray is also UL Classified as an equipment grounding conductor.

The F.A.S.T. System is Foldable, Adjustable, Stackable, and Tool-less, providing many options to manage cables inside your raised floor space. With only a few parts, you can create everything from a basic single layer installation to a cantilevered, multiple-tier cable run. Make the most of your raised floor space and your time with the F.A.S.T. System!

Finish Information

Flextray Cable Tray and Accessories are available in a wide variety of finishes to meet the environmental or aesthetic requirements of customer installations. Use the list below to find the finish and suffix that will meet your needs.

Available product finishes will be listed on individual pages throughout the catalog.

Finish codes shown in bold type are the standard for that product.

EG Electroplated Zinc Galvanized Finish applied after fabrication
(ZN) Recommended applications: Controlled interior
UL/CSA Classified as an equipment ground conductor when spliced as recommended
ASTM B633 - Average thickness of 0.3 mils (8 microns)

GS Pre-Galvanized Zinc Finish applied before fabrication
(GLV) Recommended applications: Limited industrial & interior
UL/CSA Classified as an equipment ground conductor when spliced as recommended
ASTM A641

BLE Black Powder Coat Finish applied after fabrication
(FB) Recommended applications: Controlled interior
UL/CSA Classified as an equipment ground conductor when coating has been removed at splice contact points
Average paint thickness of 1.2 mils (30 microns) to 3.0 mils (75 microns)

BLO Black Oxide Finish
Recommended applications: Controlled interior
ASTM D769

HD Hot Dip Galvanized Finish applied after fabrication
(HDG) Recommended applications: Exterior, corrosive
UL/CSA Classified as an equipment ground conductor when spliced as recommended
ASTM A123 - Average thickness of 2.4 mils (60 microns) to 3.2 mils (80 microns)

304S 304L Stainless Steel
(SS4) Recommended applications: Food preparation, wash-down areas
ASTM A580

316S 316L Stainless Steel
(SS6) Recommended applications: Highly corrosive applications & marine environments
ASTM A580

Custom Powder Coat Finish applied after fabrication
Recommended applications: Controlled interior
UL/CSA Classified as an equipment ground conductor when coating has been removed at splice contact points
No Specification

Grounding Information

Statement for all UL Classified products:



This product is classified by Underwriters Laboratories, Inc. as to its suitability as an equipment grounding conductor only. 556E



Most sizes of FLEXTRAY are UL Classified to serve as an Equipment Ground Conductor. The ground path can be achieved in one of two ways listed on page 3:

Grounding Information (cont.)

1. Use the recommended quantity of UL Classified splices to connect sections and at places where the tray is cut.
2. Run an appropriately sized ground wire alongside the tray and attach it to each tray section and on both sides of a cut in the tray. (This method is recommended by NEMA VE-2 Installation Manual.)

Load & Fill Chart

Flextray Series Part Number	Size height x width	Support Span / Loading Capacity*				Cable Fill (50% fill)**		
		5'-0"	6'-0"	7'-0"	8'-0"	Actual Area Inside Tray (in ²)	Number of CAT 5e Cables***	Number of CAT 6 Cables***
FT1.5X12	1 1/2" x 12"	29	17	14	11	12.2	176	124
FT2X2	2" x 2"	34	28	24	20	4.3	61	43
FT2X4	2" x 4"	52	43	35	27	8.2	118	83
FT2X6	2" x 6"	66	47	35	27	12.1	175	123
FT2X8	2" x 8"	66	47	35	27	16.1	231	163
FT2X12	2" x 12"	68	47	35	27	23.9	345	243
FT2X16	2" x 16"	68	47	35	27	31.8	459	324
FT2X18	2" x 18"	68	47	35	27	35.8	516	364
FT2X20	2" x 20"	68	47	35	27	39.7	573	404
FT2X24	2" x 24"	68	47	35	27	47.5	686	484
FT2X30	2" x 30"	68	47	35	27	59.8	862	608
FT2X32	2" x 32"	77	53	39	30	63.3	914	645
FT4X4	4" x 4"	58	49	42	36	15.8	227	160
FT4X6	4" x 6"	93	77	60	46	23.6	341	240
FT4X8	4" x 8"	94	78	61	47	31.5	454	321
FT4X12	4" x 12"	119	83	61	47	47.5	686	484
FT4X16	4" x 16"	119	83	61	47	63.5	917	647
FT4X18	4" x 18"	119	83	61	47	71.5	1032	728
FT4X20	4" x 20"	119	83	61	47	79.5	1148	810
FT4X24	4" x 24"	128	89	65	50	95.5	1379	973
FT4X30	4" x 30"	128	89	65	50	119.5	1725	1217
FT6X8	6" x 8"	111	77	57	43	47.3	682	481
FT6X12	6" x 12"	124	86	63	48	71.6	1034	729
FT6X16	6" x 16"	128	89	65	50	95.3	1375	970
FT6X18	6" x 18"	128	89	65	50	107.3	1549	1092
FT6X20	6" x 20"	141	98	72	55	118.9	1716	1211
FT6X24	6" x 24"	154	107	78	60	143.3	2068	1459

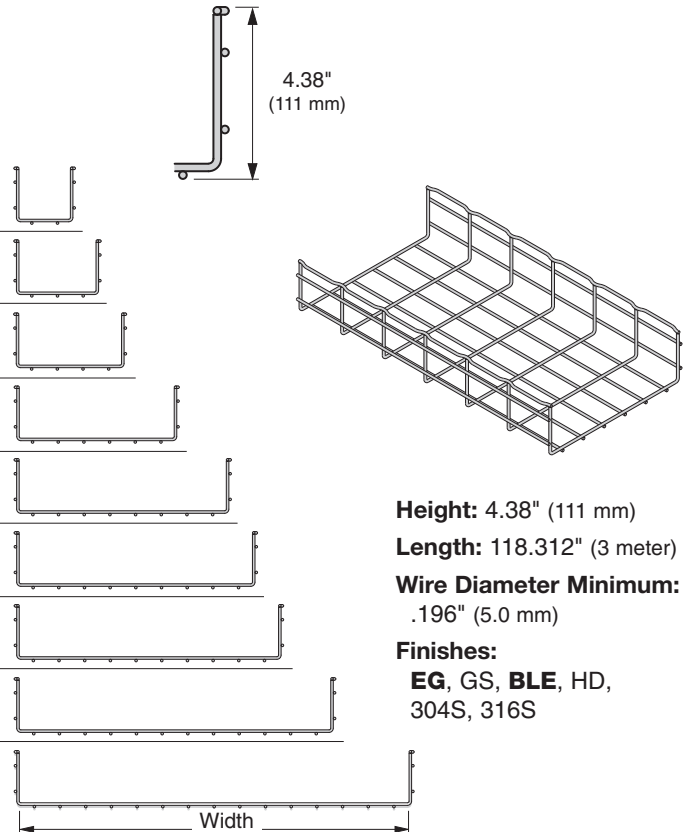
* Published load chart has not been tested with Flexmate splice. Please consult the factory for load information when using the Flexmate option.

** Flextray fill capacity is based on NEC allowable fill of 50%. The NEC rule requires that the cable cross-sectional areas together may not exceed 50% of the tray area (width x depth = fill). Cables will nearly completely fill the cable tray when reaching the 50% cable fill, due to empty space between the surface of the cables. TIA recommends 40% fill ratio. Flextray loads shown in the loading chart will not be exceeded at 50% fill.

*** CAT 5e 4-pr non-plenum approximated at .21 in. diameter, CAT 6 4-pr non-plenum approximated at .25 in. diameter. Actual diameters vary by cable manufacturer.

4" Deep Flextray

Part Number	Width		Wt. Per Pc.	
	in.	mm	lbs.	kg
FT4X4X10	4	100	11.25	5.10
FT4X6X10	6	150	12.79	5.80
FT4X8X10	8	200	14.32	6.49
FT4X12X10	12	300	17.39	7.89
FT4X16X10	16	400	20.45	9.27
FT4X18X10	18	450	21.99	9.97
FT4X20X10	20	500	23.52	10.67
FT4X24X10	24	600	26.59	12.06
FT4X30X10	30	750	31.19	14.15

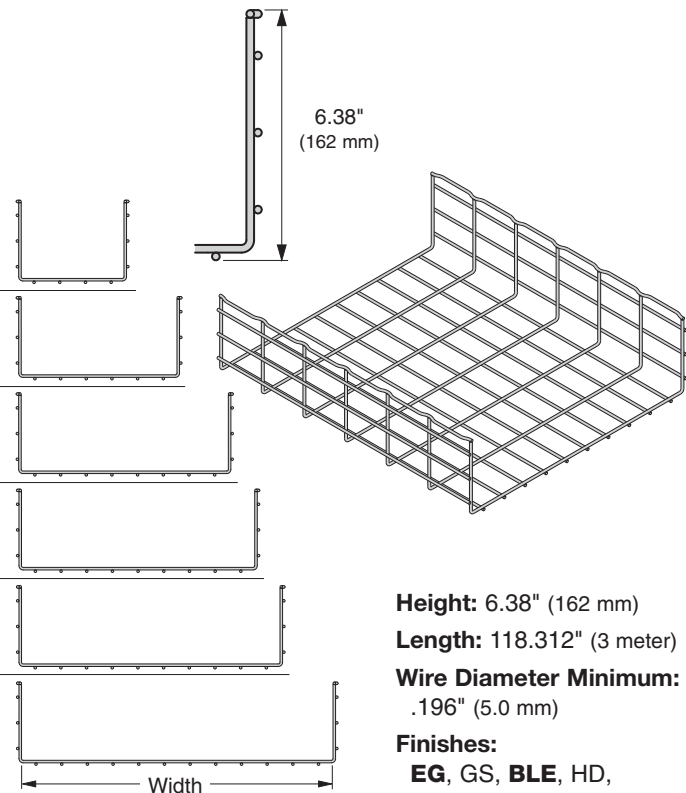


Height: 4.38" (111 mm)
Length: 118.312" (3 meter)
Wire Diameter Minimum:
 .196" (5.0 mm)
Finishes:
EG, GS, BLE, HD,
304S, 316S

All 4" deep Flextrays are UL Classified and CSA certified

6" Deep Flextray

Part Number	Width		Wt. Per Pc.	
	in.	mm	lbs.	kg
FT6X8X10	8	200	17.39	7.89
FT6X12X10	12	300	20.45	9.27
FT6X16X10	16	400	23.52	10.67
FT6X18X10	18	450	25.06	11.37
FT6X20X10	20	500	26.59	12.06
FT6X24X10	24	600	29.66	13.45



Height: 6.38" (162 mm)
Length: 118.312" (3 meter)
Wire Diameter Minimum:
 .196" (5.0 mm)
Finishes:
EG, GS, BLE, HD,
304S, 316S

All 6" deep Flextrays are UL Classified and CSA certified

See page - 2 for finish information

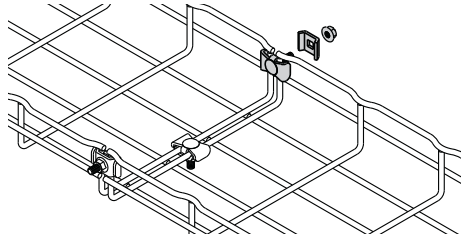
Washer Splice Kit

- Washer is staked to bolt, holding part stationary during installation
- Fewer parts to handle
- For use with all tray widths and sizes
- Finishes __: **EG, BLE**

BLE suffix indicates black zinc finish for this part only



Part Number	Description	Qty./Box	Wt./Box	
			lbs.	kg
WASHER SPL KIT__	Assembly of Staked Washer Stud/Washer & Finned Nut	50	4.5	2.04



Splicing Chart (number of splices required for UL Classification)

Tray Height	Tray Width - number of splices								
	2" (50mm)	4" (100mm)	6" (150mm)	8" (200mm)	12" (300mm)	16" (400mm)	18" (450mm)	20" (500mm)	24" (600mm)
2"	NC	NC	4	4	4	4	4	5	5
4"	NM	4	5	6	6	7	7	7	8
6"	NM	NM	NM	6	6	7	7	7	8

NC = Not UL Classified in this size NM = Flextray is not manufactured in this size

Splice Hardware Components

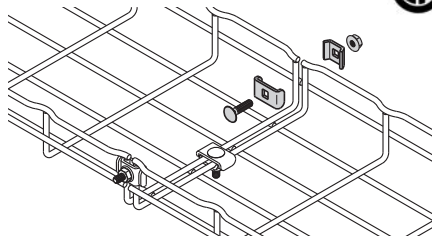
- Works with all splicing needs
- For use with all tray widths and sizes
- Components are sold separately
- Finishes __: **EG, BLE-BLO, 304S, 316S**

FTHDWE 1/4 not available in **BLE**.

TOP WASHER & BTM WASHER not available in **BLO**.



Part Number	Description	Qty./Box	Wt./Box	
			lbs.	kg
FTHDWE 1/4__	1/4" x 1" Carriage Bolt & Finned nut	50	1.2	0.54
TOP WASHER__	1" Square Splice Washer	50	1.4	0.63
BTM WASHER__	1 3/16" Square Splice Washer	50	2.0	0.91



BTM WASHER



FTHDWE1/4



TOP WASHER

Splicing Chart (number of splices required for UL Classification)

Tray Height	Tray Width - number of splices								
	2" (50mm)	4" (100mm)	6" (150mm)	8" (200mm)	12" (300mm)	16" (400mm)	18" (450mm)	20" (500mm)	24" (600mm)
2"	NC	NC	4	4	4	4	4	5	5
4"	NM	4	5	6	6	7	7	7	8
6"	NM	NM	NM	6	6	7	7	7	8

NC = Not UL Classified in this size NM = Flextray is not manufactured in this size

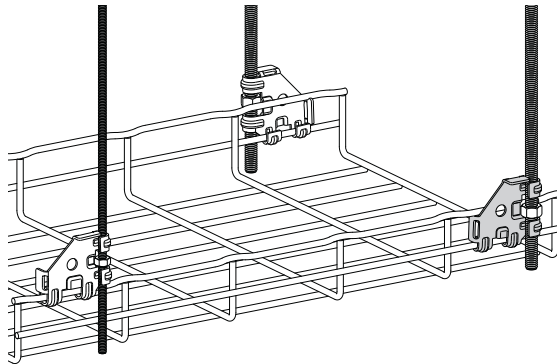
See page 2 for finish and grounding information

Flip Clip™

- Accommodates 1/4" and 3/8" rod sizes
- Installs quickly with a screwdriver or pliers thus reducing installation time
- Requires only one hex nut (not included) to hang and level the Flextray
- Retainer tabs can be bent over to lock-in the threaded rod and wire basket
- Finishes __ **ZN**, FB, SS6

Part Number	Description	Qty./Box	Wt./Box	
			lbs.	kg
WB46H__	Flip Clip	50	5.2	2.36

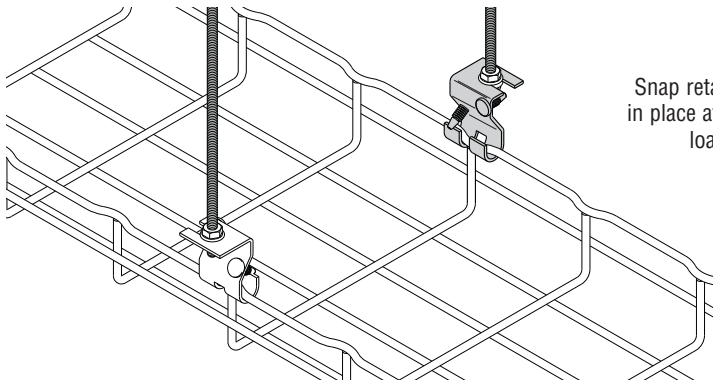
Snap retainer stops in place after cable is loaded.



Trapeze Support

- Trapeze Clip installs fast
- For use with trays up to 4" (100mm) deep, 12" (300mm) wide, and spans up to 8'-0" (2.44m)
- Tray can be released from support to allow side cable loading
- Accepts 1/4" and 3/8" threaded rod sizes
- Finishes __: **GS**, BLE

Part Number	Description	Qty./Box	Wt./Box	
			lbs.	kg
TRAPEZE SUPT2__	Trapeze Support Clip	50 trapeze clips 100 retainer stops	7.0	3.17



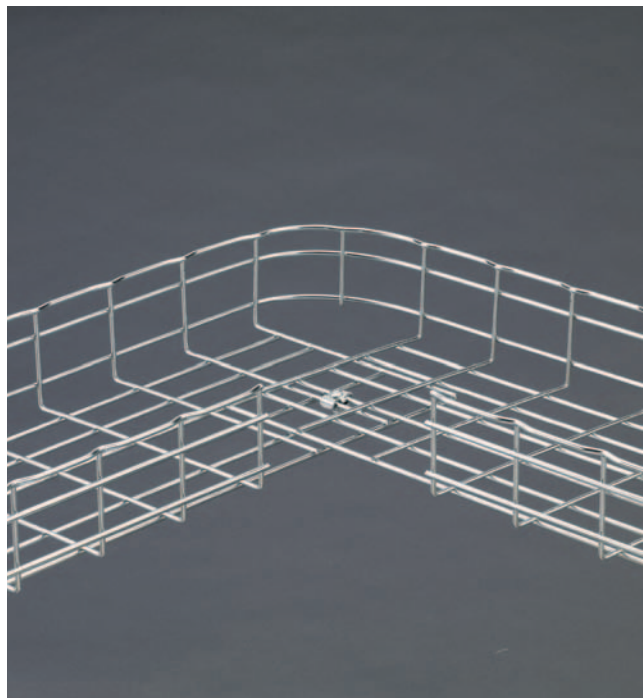
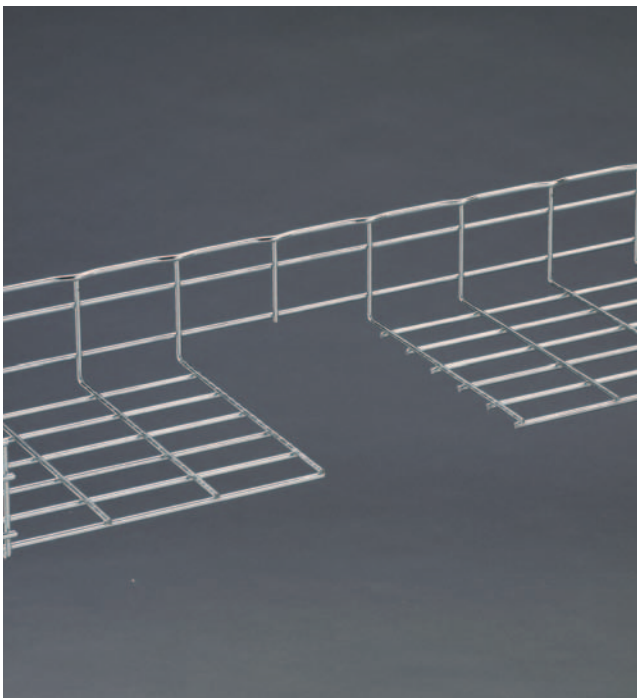
Snap retainer stops in place after cable is loaded.



See page 2 for finish information

Flextray™ - Installation

Installation



Flextray Cutters



Patented

Part Number	Description	Qty./Box	Wt./Box	
			lbs.	kg
CLEANSHEAR	Cleanshear™ Cutting Tool	1	4.3	1.95

- Exclusive, patented Cleanshear cuts tray fast
- No sharp edges
- Designed specifically for cutting Flextray
- Safely cut and bend Flextray into any configuration



1 Face tray up. Slide cutter next to vertical wire and cut.



2 Turn tray to the side with open side facing you. Repeat step 1 to cut wire.



3 Finish cutting all side wires.



4 Turn tray open-side down and cut wires from bottom of tray.



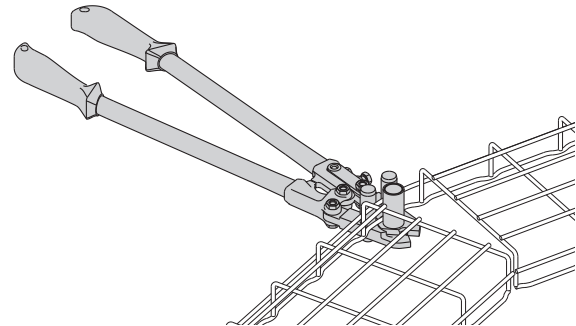
5 Finish cutting by moving to other side of tray to cut remaining wires,

Flextray™ - Installation

Flextray Bender

Part Number	Description	Qty./Box	Wt./Box	
			lbs.	kg
CLEANSHEAR BEND	Cleanshear Cutting Tool With Bender Attachment	1	5.4	2.45

- Cleanshear™ Bender has our exclusive bending attachment
- Makes bending larger trays easy
- Recommended for bending tray widths of 16" (400mm) or greater

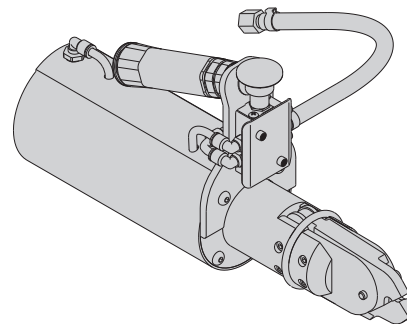


Patented

Airshear Cutter

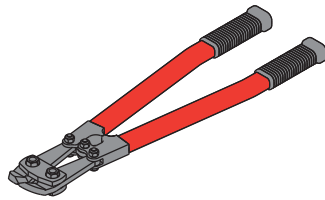
Part Number	Description	Qty./Box	Wt./Box	
			lbs.	kg
AIRSHEAR	Pneumatic Cleanshear Cutting Tool	1	9.0	4.08

- Fastest wire mesh cutter available
- 57% time savings over regular Cleanshear
- Airshear is available when you have a large project to install. Call us for details.

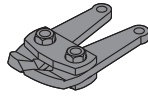


Patented

Angular Bolt Cutter



WB30BC
Angular Bolt Cutter

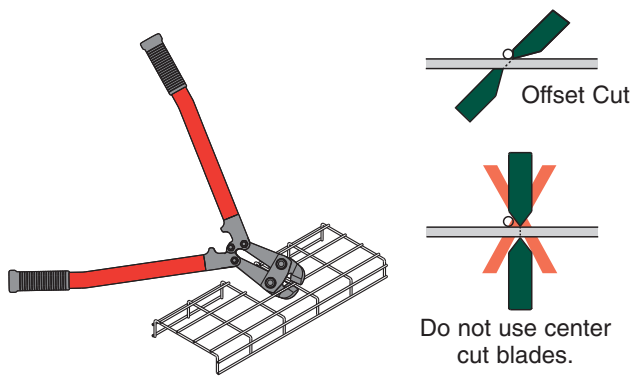


WB30RB
Replacement Blade

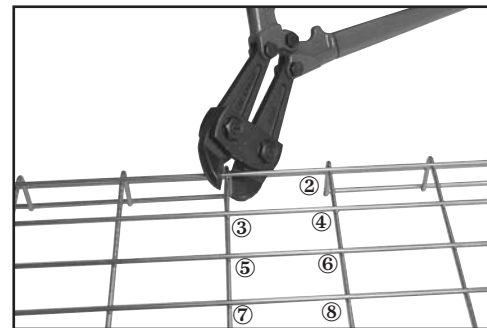
Part Number	Description	Qty./Box	Wt./Box	
			lbs.	kg
WB30BC	Bolt Cutter	1	6.8	3.1
WB30RB	Replacement Blade	1	1.3	0.6

Completely adaptable, Cooper B-Line's Flextray is designed to accommodate jobsite changes. Cut wires with Cooper B-Line's Angular Bolt Cutter, bend to create a bend, tee, or reducer.

Cut and remove each wire as illustrated below. Follow cutting pattern and blade positioning. Placing Flextray open side down provides the optimum cutting angle.



Cutting Order



For the best results, use a WB30BC Angular Blade Offset Bolt Cutter with 24" (600 mm) long handles. The Offset Blade Cutter produces a clean cut. Position bolt cutter blades near the cross wire and perpendicular to wire to be cut (see illustration above). Proper cut will make the assembly faster, easier and safer while minimizing grinding.



Part Number	Length		Wt. Per Cutter		Box Quantity
	in.	mm	lbs.	kg	
WB50WC	12 ³ / ₄ "	325	3.0	1.3	1

Part Number	Description	Box Quantity
WB50RB	Replacement Blade	1
WB50BA	Replacement Battery	1

The Greenlee cable wire cutter makes flush cuts without burrs. Will cut .191" diameter wire in 2 seconds. Cutting head rotates 330° for ease of positioning and the tool automatically retracts when cut is complete. Comes with 2 batteries, charger, and carrying case. Approximately 250 cuts per charge.

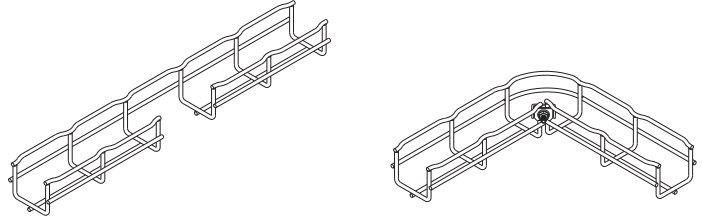
Flextray™ - Installation

90° Horizontal Bends (Short Radius)

- Make your own field cut horizontal bends using Clearshear™ to make safe, smooth cuts
- Can be made from any tray width and depth with any available finish
- SUPT WASHER & FTHDWE 1/4 hardware may be used on bottom of tray instead of WASHER SPL KIT where desired

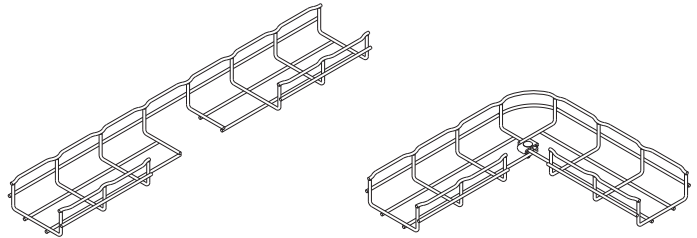
2" (50mm) Tray Width

Flextray Depth	Required Hardware Description	Quantity
2" (50mm)	WASHER SPL KIT	1



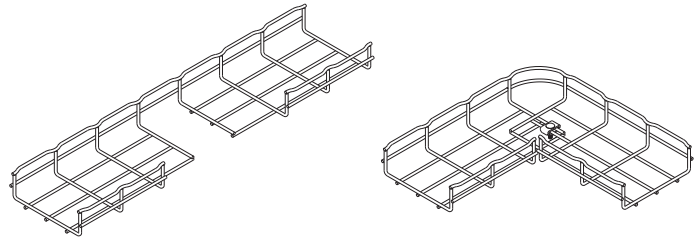
4" (100mm) Tray Width

Flextray Depth	Required Hardware Description	Quantity
1 1/2" (38mm)	WASHER SPL KIT	1
2" (50mm)	WASHER SPL KIT	1
4" (100mm)	WASHER SPL KIT	1



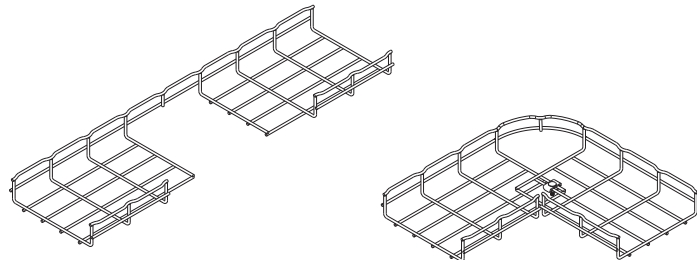
6" (150mm) Tray Width

Flextray Depth	Required Hardware Description	Quantity
1 1/2" (38mm)	WASHER SPL KIT	1
2" (50mm)	WASHER SPL KIT	1
4" (100mm)	WASHER SPL KIT	1



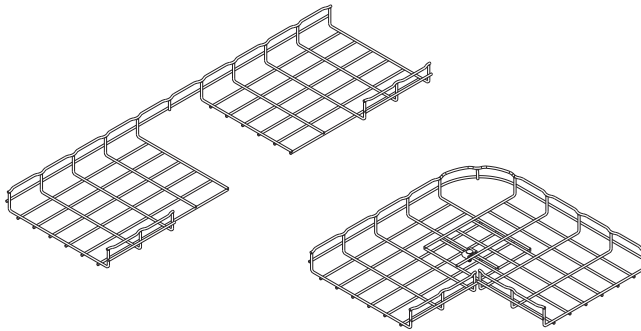
8" (200mm) Tray Width

Flextray Depth	Required Hardware Description	Quantity
1 1/2" (38mm)	WASHER SPL KIT	1
2" (50mm)	WASHER SPL KIT	1
4" (100mm)	WASHER SPL KIT	1
6" (150mm)	WASHER SPL KIT	1



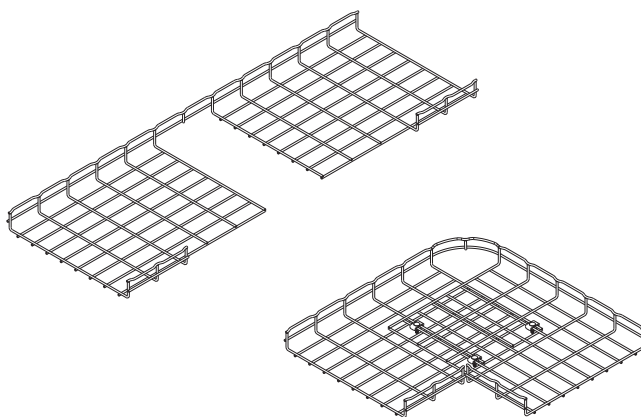
90° Horizontal Bends (Short Radius)

- Make your own field cut horizontal bends using Clearshear™ to make safe, smooth cuts
- Can be made from any tray width and depth with any available finish
- SUPT WASHER & FTTHDWE 1/4 hardware may be used on bottom of tray instead of WASHER SPL KIT where desired



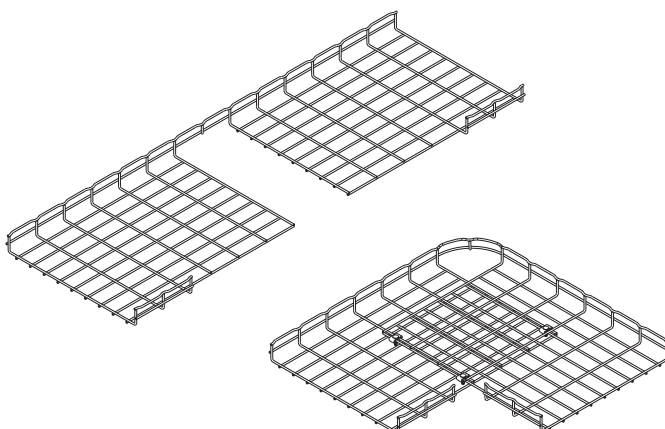
12" (300mm) Tray Width

Flextray Depth	Required Hardware Description	Quantity
1 1/2" (38mm)	WASHER SPL KIT	1
2" (50mm)	WASHER SPL KIT	1
4" (100mm)	WASHER SPL KIT	1
6" (150mm)	WASHER SPL KIT	1



16" (400mm) Tray Width

Flextray Depth	Required Hardware Description	Quantity
2" (50mm)	WASHER SPL KIT	3
4" (100mm)	WASHER SPL KIT	3
6" (150mm)	WASHER SPL KIT	3



18" (450mm) Tray Width

Flextray Depth	Required Hardware Description	Quantity
2" (50mm)	WASHER SPL KIT	3
4" (100mm)	WASHER SPL KIT	3
6" (150mm)	WASHER SPL KIT	3

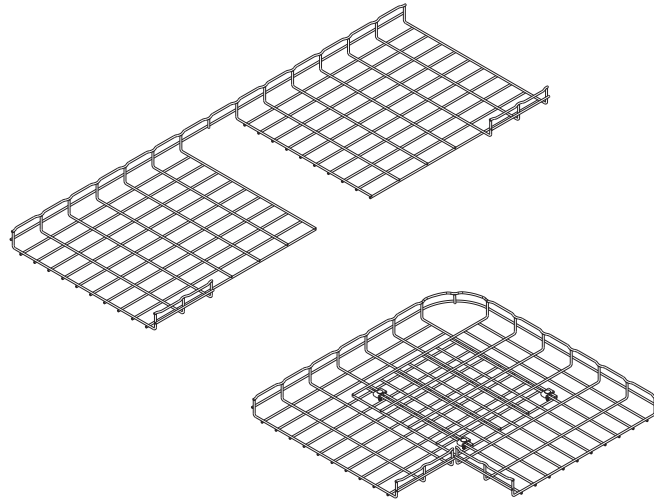
Flextray™ - Installation

90° Horizontal Bends (Short Radius)

- Make your own field cut horizontal bends using Clearshear™ to make safe, smooth cuts
- Can be made from any tray width and depth with any available finish
- SUPT WASHER & FTHDWE 1/4 hardware may be used on bottom of tray instead of WASHER SPL KIT where desired

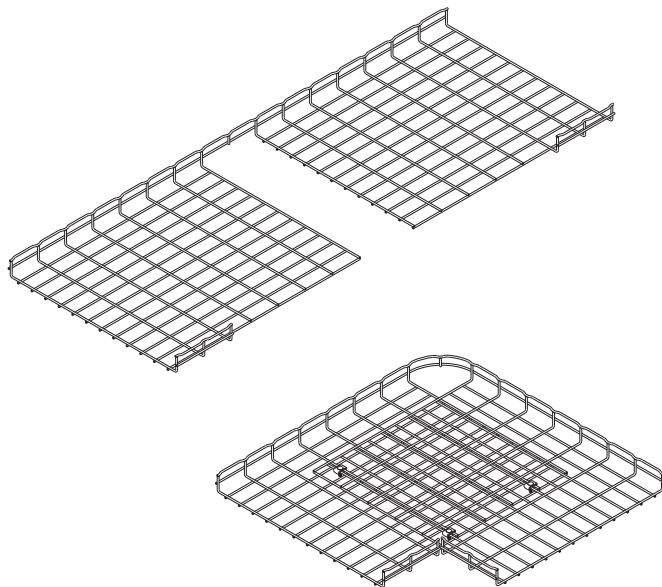
20" (500mm) Tray Width

Flextray Depth	Required Hardware Description	Quantity
2" (50mm)	WASHER SPL KIT	3
4" (100mm)	WASHER SPL KIT	3
6" (150mm)	WASHER SPL KIT	3



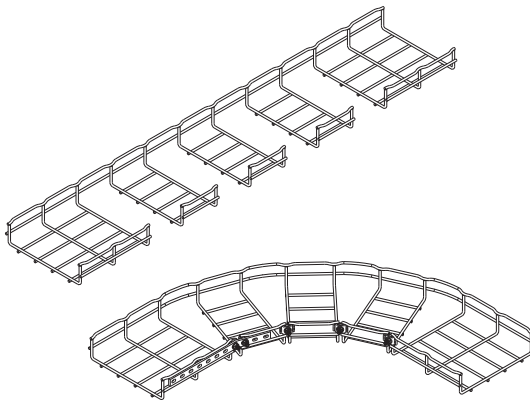
24" (600mm) Tray Width

Flextray Depth	Required Hardware Description	Quantity
2" (50mm)	WASHER SPL KIT	3
4" (100mm)	WASHER SPL KIT	3
6" (150mm)	WASHER SPL KIT	3



90° Horizontal Bends (Long Radius)

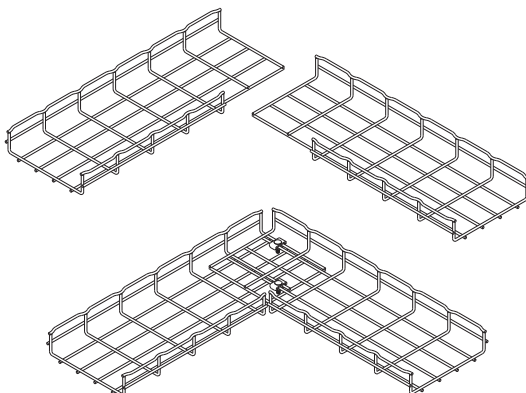
- Make your own field cut horizontal sweeps using Clearshear™ to make safe, smooth cuts
 - Can be made from any tray width and depth with any available finish
 - Cut as many Segments as required to control sweep radius (use chart for recommendations)
 - One (1) WASHER SPL KIT is required to connect each cut segment minus one, this segment uses one (1) SPLICE BAR, two (2) FTHDWE 1/4 and two (2) BTM WASHER
- Illustration shown below is for a 8" (200mm) width
 - 1.5" deep Flextray has only one (1) side wire
 - 2" deep Flextray has two (2) side wires - shown
 - 4" deep Flextray has three (3) side wires
 - 6" deep Flextray has four (4) side wires



Flextray Width	Segments To Be Removed	Component Qty.		
		WASHER SPL KIT	FTHDWE 1/4 & BTM WASHER	SPLICE BAR
4" (100mm)	2	1	2	1
6" (150mm)	3	2	2	1
8" (200mm)	4	3	2	1
12" (300mm)	6	5	2	1
16" (400mm)	7	6	2	1
18" (450mm)	8	7	2	1
20" (500mm)	10	9	2	1
24" (600mm)	11	10	2	1
30" (750mm)	13	12	2	1
32" (800mm)	13	12	2	1

90° Horizontal Bend From (2) Straight Sections

- Cut required number of wire side sections listed in chart per the illustration below (Illustration is for a 8" (200mm) width)
- 1.5" deep Flextray has only one (1) side wire
- 2" deep Flextray has two (2) side wires - shown
- 4" deep Flextray has three (3) side wires
- 6" deep Flextray has four (4) side wires

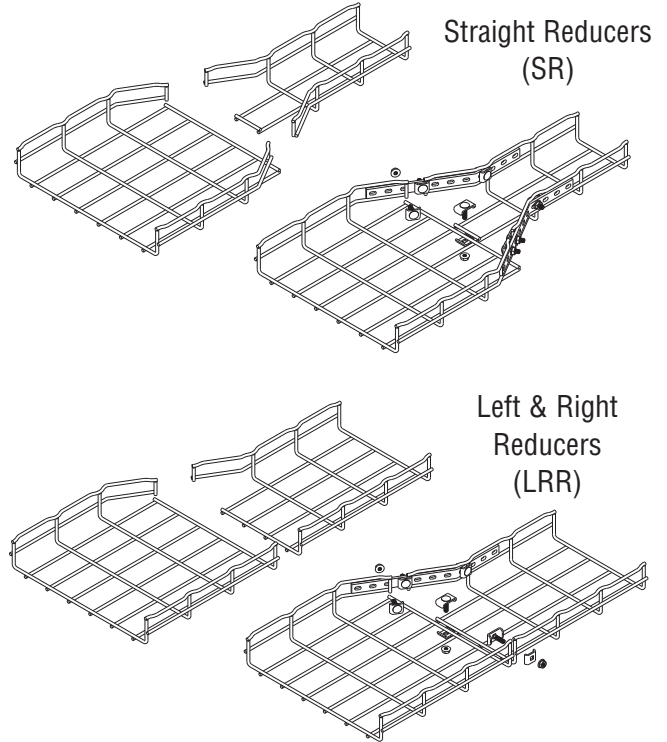


Flextray Width	Side Sections To Be Removed	WASHER SPL KIT Qty.
4" (100mm)	1	2
6" (150mm)	2	2
8" (200mm)	2	2
12" (300mm)	3	2
16" (400mm)	4	3
18" (450mm)	5	3
20" (500mm)	5	3
24" (600mm)	6	4
30" (750mm)	8	4
32" (800mm)	8	4

Flextray™ - Installation

Reducers

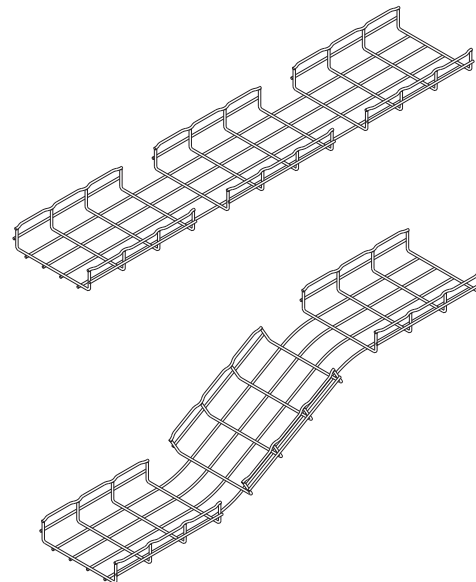
Large Flextray Width	WASHER SPL KIT		Component Qty. FTHDWE 1/4 & BTM WASHER		SPLICE BAR	
	(SR)	(LRR)	(SR)	(LRR)	(SR)	(LRR)
4" (100mm)	-	1	-	2	-	1
6" (150mm)	-	2	-	2	-	1
8" (200mm)	1	2	4	2	2	1
12" (300mm)	2	3	4	2	2	1
16" (400mm)	2	3	4	2	2	1
18" (450mm)	2	3	4	2	2	1
20" (500mm)	3	3	4	2	2	1
24" (600mm)	3	3	4	2	2	1
30" (750mm)	3	3	4	2	2	1
32" (800mm)	3	3	4	2	2	1



- 1.5" deep Flextray has only one (1) side wire
- 2" deep Flextray has two (2) side wires - shown
- 4" deep Flextray has three (3) side wires
- 6" deep Flextray has four (4) side wires

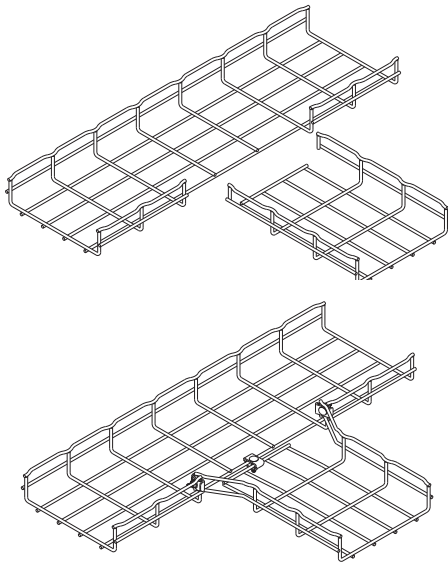
Vertical Inside & Outside Bends

- Cut wire section as shown and bend to desired angle
- 1.5" deep Flextray has only one (1) side wire
- 2" deep Flextray has two (2) side wires - shown
- 4" deep Flextray has three (3) side wires
- 6" deep Flextray has four (4) side wires



Horizontal Tees (and crosses)

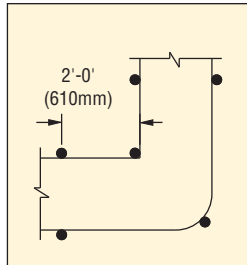
- Cut wire side sections as shown in the illustration below (Illustration is for a 8" (200mm) width)
- 1.5" deep Flextray has only one (1) side wire
- 2" deep Flextray has two (2) side wires - shown
- 4" deep Flextray has three (3) side wires
- 6" deep Flextray has four (4) side wires
- For crosses, duplicate process on opposite side



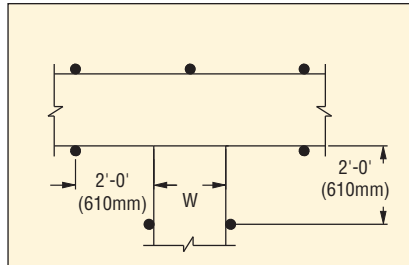
Flextray Width	WASHER SPL KIT Qty.
2" (50mm)	2
4" (100mm)	2
6" (150mm)	3
8" (200mm)	3
12" (300mm)	4
16" (400mm)	4
18" (450mm)	4
20" (500mm)	4
24" (600mm)	4
30" (750mm)	5
32" (800mm)	5

Recommended Support Locations For Fabricated Tray Fittings

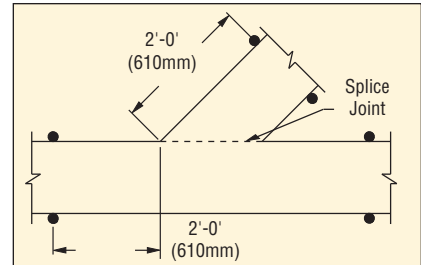
The following are recommended support diagrams to serve as guidelines for installing wire basket cable support systems in the field. The information is intended to provide the installer some practical assistance when estimating the amounts of supports and to help in identifying support locations for various field conditions for the installer. It does not, however, cover every situation that may arise when installing the product. It may be possible to install narrow trays with lighter loads and fewer supports. Wider trays that may require heavier loading, trays with long radii, or those with multiple side wires cut may require additional support to avoid unwanted deflection.



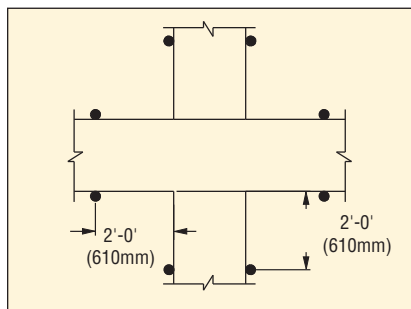
Horizontal Elbow Support
Inside corner supports are not required on 90° short radius bends.



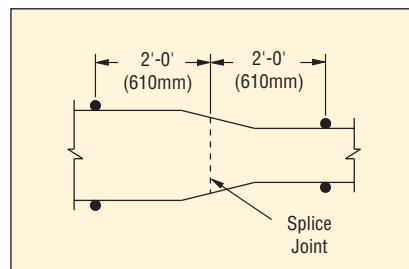
Horizontal Tee Support
On 24" wide items, one support may be placed at the mid-point of the back span as illustrated.



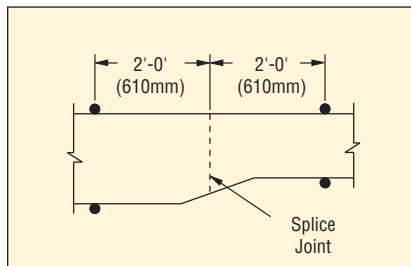
Horizontal Wye Support
On 24" wide items, recommended distance is 1 ft. 6 in. (457mm) from splice connection.



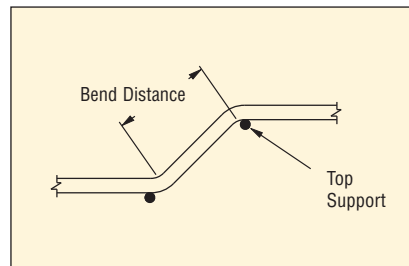
Horizontal Cross Support
On 24" wide items, recommended distance is 1 ft. 6 in. (457mm) from splice connection.



Straight Reducer Support
Place reducer supports within 2 ft. (610mm) of each splice connection.



Left/Right Reducer Support
Place reducer supports within 2 ft. (610mm) of each splice connection.



Vertical Elbows
Support vertical elbows at top support location. Bend distances of 4 ft. (1219mm) and over should be supported at each end as illustrated.



Wiremold

Evolution™ Series 6" Poke-Thru Devices INSTALLATION INSTRUCTIONS

Installation Instruction No.: 1 007 154 R2 – Updated May 2010

Wiremold electrical systems conform to and should be properly grounded in compliance with requirements of the current National Electrical Code or codes administered by local authorities.

All electrical products may present a possible shock or fire hazard if improperly installed or used. Wiremold electrical products may bear the mark as UL Listed and/or Classified and should be installed in conformance with current local and/or the National Electrical Code.

IMPORTANT: Please read all instructions before beginning.

Products Covered: 6ATCP, 6ATP, 6ATCPAV, 6ATPAV, 6ATC, 6AT, 6STC, 6CTC, 6CT, 68REC, 68MAAP, 682A, 68B, 6DP, 6DEC, 6S1, 6S2, 6MAAP, 6AAP, 6MAAP2A, 6B, 6TS, 6STCP, 6STCPAV, 575CHA, 5PTHA, 5BLH, 175CHA, 1125CHA, 1PTHA, 1BLH, CE6STCP, CE6STCPAV

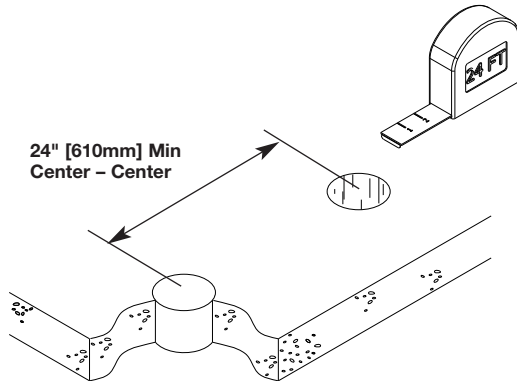
CAUTION: DO NOT operate tile stripper, cleaning, or resurfacing equipment over top of covers. This may result in damage to the surface finish of the product.

Suitable for use in air handling spaces in accordance with Sec. 300-22 (C) of the National Electrical Code.

FLOOR PREPARATIONS

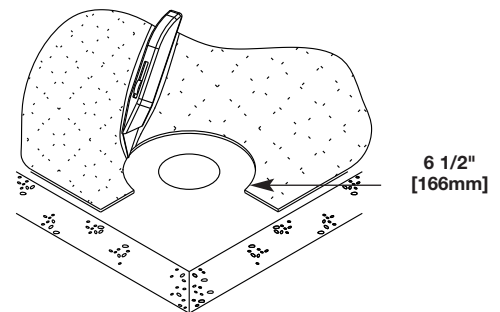
Step 1 Layout and locate position of hole(s).

CAUTION: Minimum spacing of 2ft on center and not more than one device per each 65 square feet of floor area in each span.

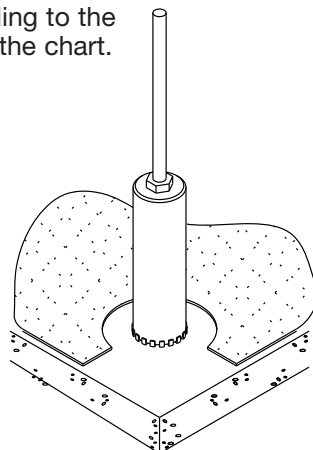


CAUTION: Be certain to locate hole at least 6" [152mm] from any wall or pillar to leave enough room for Poke-Thru cover assembly.

Step 2 Remove 6 1/2" dia. [166mm] section from carpet or tile. Use template provided.



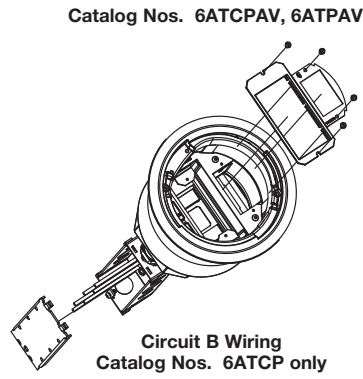
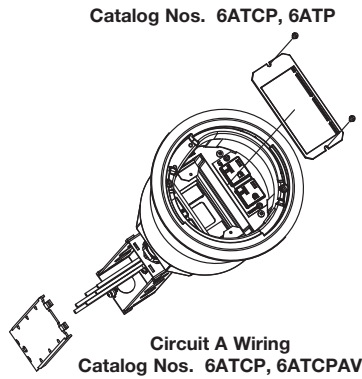
Step 3 Create core hole according to the dimensions provided in the chart.



FLOOR TYPE	CORE SIZE (Min.)	CORE SIZE (Max.)
Covered Floors (Carpet, Tile or Wood)	6" [152mm]	6 1/8" [156mm]
Bare Concrete or Terrazzo	6 1/16" [154mm]	6 1/8" [156mm]

INSTALLING COMPLETE ASSEMBLY

Step 1 Attach data and AV plates and wire power and data devices (Can be completed above floor). Refer to wiring schematic below for power wiring options.

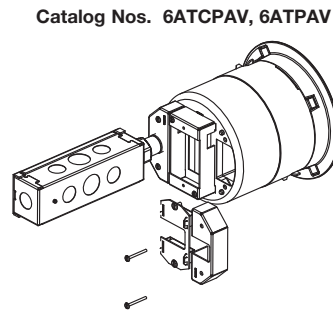
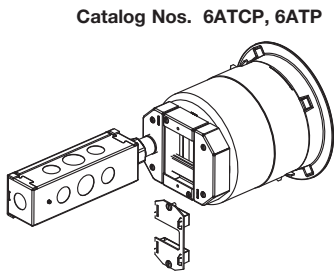


CONVENTIONAL WIRING SCHEMATIC		ISOLATED GROUND WIRING SCHEMATIC		CONVENTIONAL WIRING SCHEMATIC		ISOLATED GROUND WIRING SCHEMATIC	
BLACK or HOT From branch circuit	BLACK from Poke-Thru receptacle	BLACK or HOT From branch circuit	BLACK from Poke-Thru receptacle	BLACK or HOT From branch circuit	RED from Poke-Thru receptacle	BLACK or HOT From branch circuit	RED from Poke-Thru receptacle
WHITE or NEUTRAL From branch circuit	WHITE from Poke-Thru receptacle	WHITE or NEUTRAL From branch circuit	WHITE from Poke-Thru receptacle	WHITE or NEUTRAL From branch circuit	WHITE W/ BLUE STRIPE from Poke-Thru receptacle	WHITE or NEUTRAL From branch circuit	WHITE W/ BLUE STRIPE from Poke-Thru receptacle
GREEN or GROUND From branch circuit System Ground	GREEN from Poke-Thru receptacle	ISOLATED GROUND From branch circuit	GREEN from Poke-Thru receptacle	GREEN or GROUND From branch circuit System Ground	GREEN W/ YELLOW STRIPE from Poke-Thru receptacle	ISOLATED GROUND From branch circuit	GREEN W/ YELLOW STRIPE from Poke-Thru receptacle
	GREEN (jumper wire) from Poke-Thru junction box	GREEN or GROUND From branch circuit System Ground	GREEN (jumper wire) from Poke-Thru junction box		GREEN (jumper wire) from Poke-Thru junction box	GREEN or GROUND From branch circuit System Ground	GREEN (jumper wire) from Poke-Thru junction box

WARNING: Ground wire from junction box must be connected to system ground.

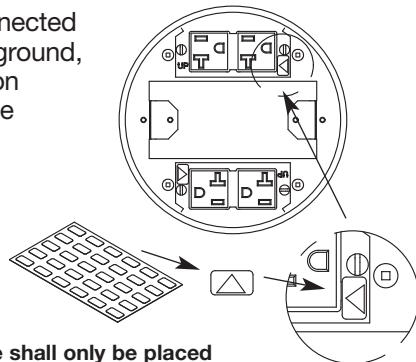
CAUTION: Receptacle mounting means not grounded. Grounding wire connection required. For isolated ground wiring, connect ground leads to a separate isolated grounding conductor. See NEC 250-146(d).

If necessary remove Feed Plates to pull communications wires through Poke-Thru device. Replace Feed Plates when finished pulling wires.



CAUTION: To maintain fire classification, Feed Plates must be installed.

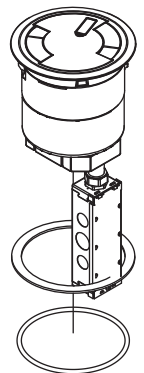
Step 2 If circuit is connected to an isolated ground, apply IG icon on receptacle plate as shown.



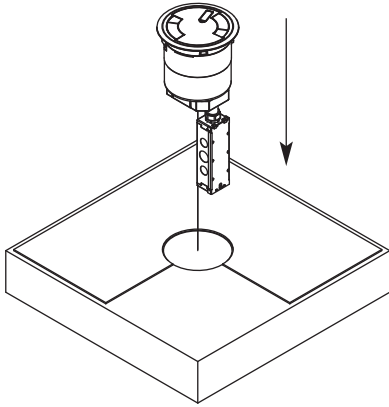
NOTE: The orange triangle shall only be placed on devices that are wired for isolated ground. See NEC 250-146(d).

For Carpet or surface mounted tile

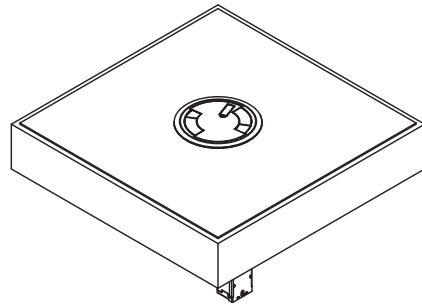
Step 3 Place appropriate gasket around poke thru and slide under flange. Use flat foam gasket for surface tile applications or use round neoprene gasket for carpet applications. For the flush tile applications no gasket is needed.



Step 4 Push Poke-Thru into floor.

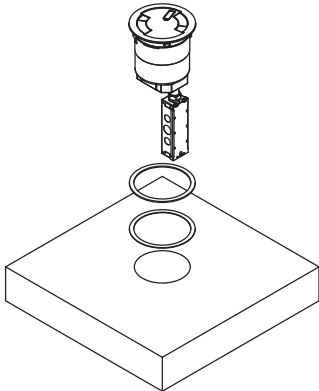


Step 5 Installation complete.



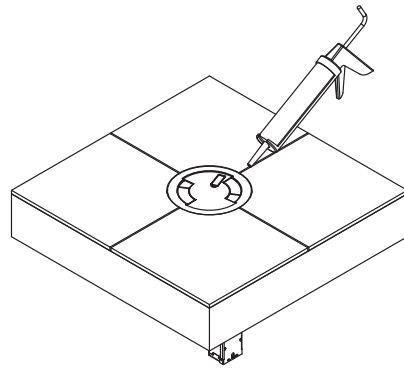
For Flush Tile Installation (Start with Steps 1 & 2 on previous page.)

Step 3 Place shims around bottom of flange to match thickness of tile. Flange is 1/8" thick. (2) 1/8" shims and (2) 1/16" shims are provided. Push Poke-Thru into floor.



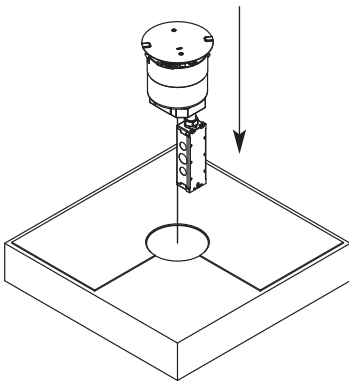
NOTE: If more shims are required, use Cat. No 6TS.

Step 4 Use grout and/or silicone caulk between edges of flange and tile.

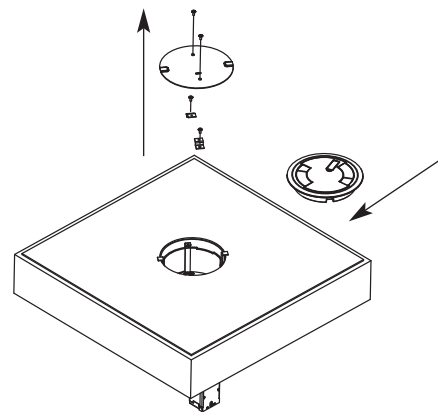


INSTALLING STEM ASSEMBLY AND SEPARATE COVER

Step 1 Insert Stem Assembly into core hole.



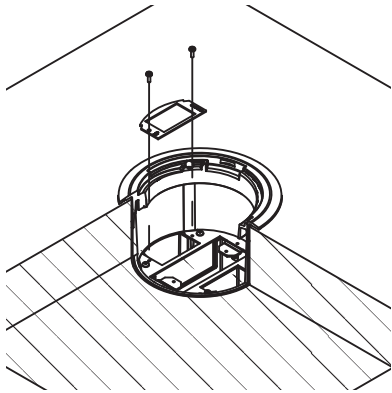
Step 2 Remove disposable plate and (2) plate clips by removing the 8-32 screws. Install Flange using the (2) 8-32 x 1/2" Cap Head screws provided with the cover assembly.



INSTALLING DEVICE PLATES

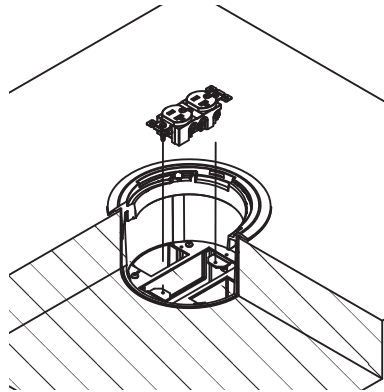
Half Gang Plates

Step 1 Install plates using (2) 6-32 x 1/2" screws. (provided)

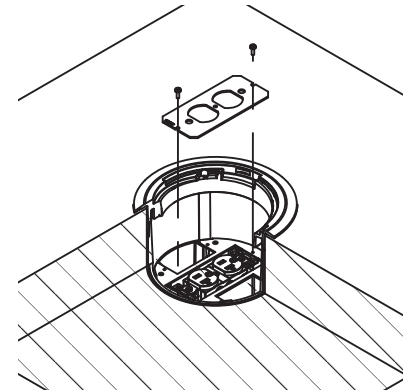


NEMA 1 Gang Device

Step 1 Screw receptacle into tabs using (2) 6-32 screws provided with the receptacle.

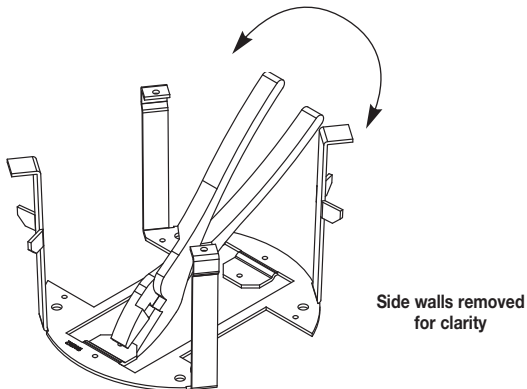


Step 2 Install plates using (2) 6-32 x 1/2" screws. (provided)

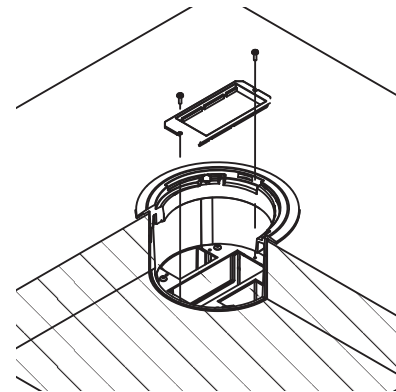


1.5 Gang Data/AV Plates

Step 1 Use pliers to bend device tabs along score lines. Bend in both directions repeatedly until tab breaks off.

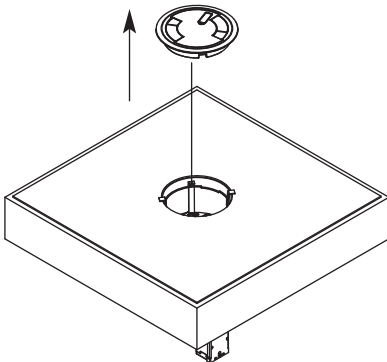


Step 2 Install device plate using (2) 6-32 x 1/2" screws. (provided)

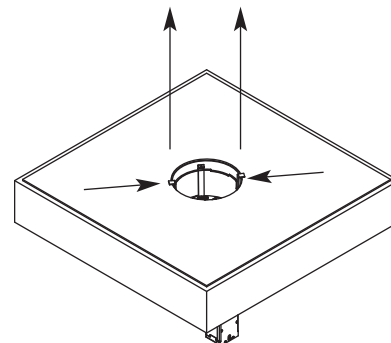


CONFIGURING FEED PLATES

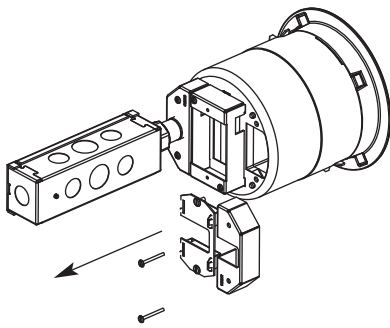
Step 1 Remove cover assembly from Poke Thru by removing (2) 8-32 screws and lifting cover off.



Step 2 Remove Poke Thru from floor by bending tabs inward and pulling unit up.

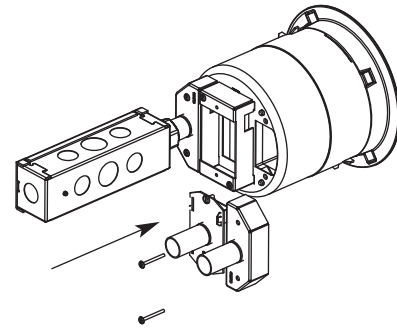


Step 3 Remove (2) 8-32 screws and pull off Feed Plate or housing.



CAUTION: To maintain fire classification, Feed Plates must be installed.

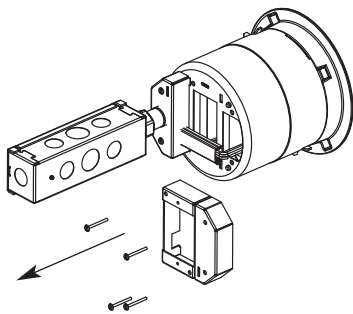
Step 4 Use (2) 8-32 screws to install new Feed Plate or housing



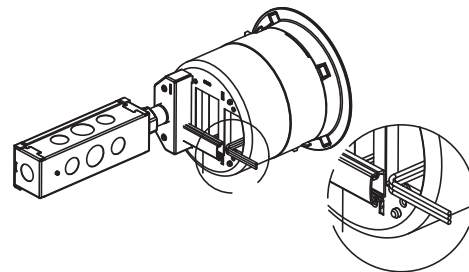
CAUTION: To maintain fire classification, Feed Plates must be installed.

WIRE TUNNEL REMOVAL

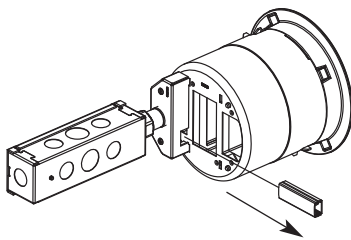
Step 1 Remove Feed Housing from center and side without J-box.



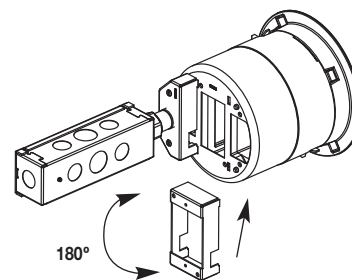
Step 2 Pull wires out of wire tunnel.



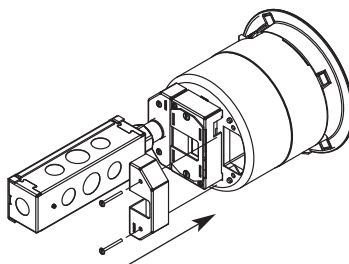
Step 3 Slide wire tunnel out of remaining Feed Housing.



Step 4 Rotate center housing and reattach with (2) 8-32 screws.



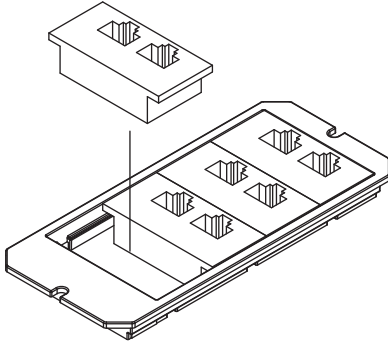
Step 5 Reattach side Feed Housing and feed plate with (4) 8-32 screws.



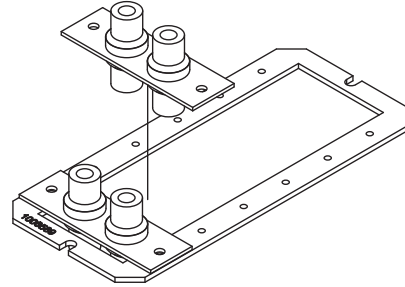
CAUTION: To maintain fire classification, Feed Plates must be installed.

INSTALLING DEVICES IN DEVICE PLATES

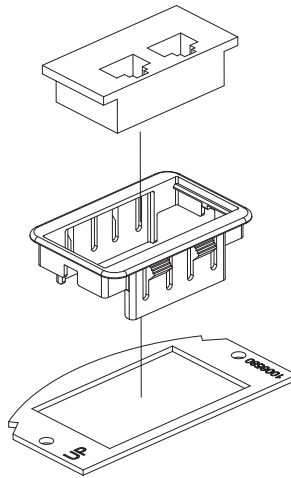
6TRAC, 6SER, 6ACT8A
(Devices not included)



6MAAP, 6AAP, 6MAAP2A, 68MAAP
(Devices not included)



682A, 6MAAP2A
(Includes 2A bezels. Devices not included)



Evolution Series Poke-Thru Devices are UL Listed and Classified to U.S. and Canadian safety standards to the following conditions:

The 6STC Poke-Thru Stem with the 6CTC or 6CT Service Head Fitting, and the 6ATCP, 6ATP, 6ATCPAV 6ATPAV, 6ATC or 6AT factory assembled Poke-Thru devices are for use with 1-, 1 1/2 -, or 2- hour rated unprotected reinforced concrete floors and 1-, 1 1/2 -, or 2- hour rated floors employing unprotected steel floor units and concrete topping (D900 Series Designs), or concrete floors with suspended ceilings. (Fire resistive designs with suspended ceilings should have provisions for accessibility in the ceiling area below the Poke-Thru fittings).

The assembled Poke-Thru stem and service fitting will not reduce the ratings of the floor assembly when the thickness and type of concrete (required for the specific rating) are within the specified limits and the fittings are installed as specified:

1. **Spacing** – Minimum of 2' [610mm] OC and not more than one unit per 65 sq. ft. [6 sq. m] of floor area in each span.
2. **Concrete** – Minimum thickness of structural concrete topping of 2 1/4" [57mm] over metal deck or a minimum 3" [76mm] thick reinforced concrete slab. Unit weight of concrete to be 110 to 155 pcf.
3. **Installation** – Mounted in a 6" [152mm] diameter hole in concrete per installation instructions accompanying the fittings. For use with power circuits, data and/or audio/visual cables as tabulated below:

COPPER CROSS-SECTION

	OUTER CHANNELS	CENTER CHANNEL
Max Copper X-Section	.0154 sq. in. [9.9mm ²]	.0387 sq. in. [24.97mm ²]
Max # Conductors	(3) 12 AWG	(12) 14 AWG

NOTE: When using conductor sizes other than listed above, the aggregate cross-sectional area of the copper conductors shall not exceed the cross-sectional areas listed.

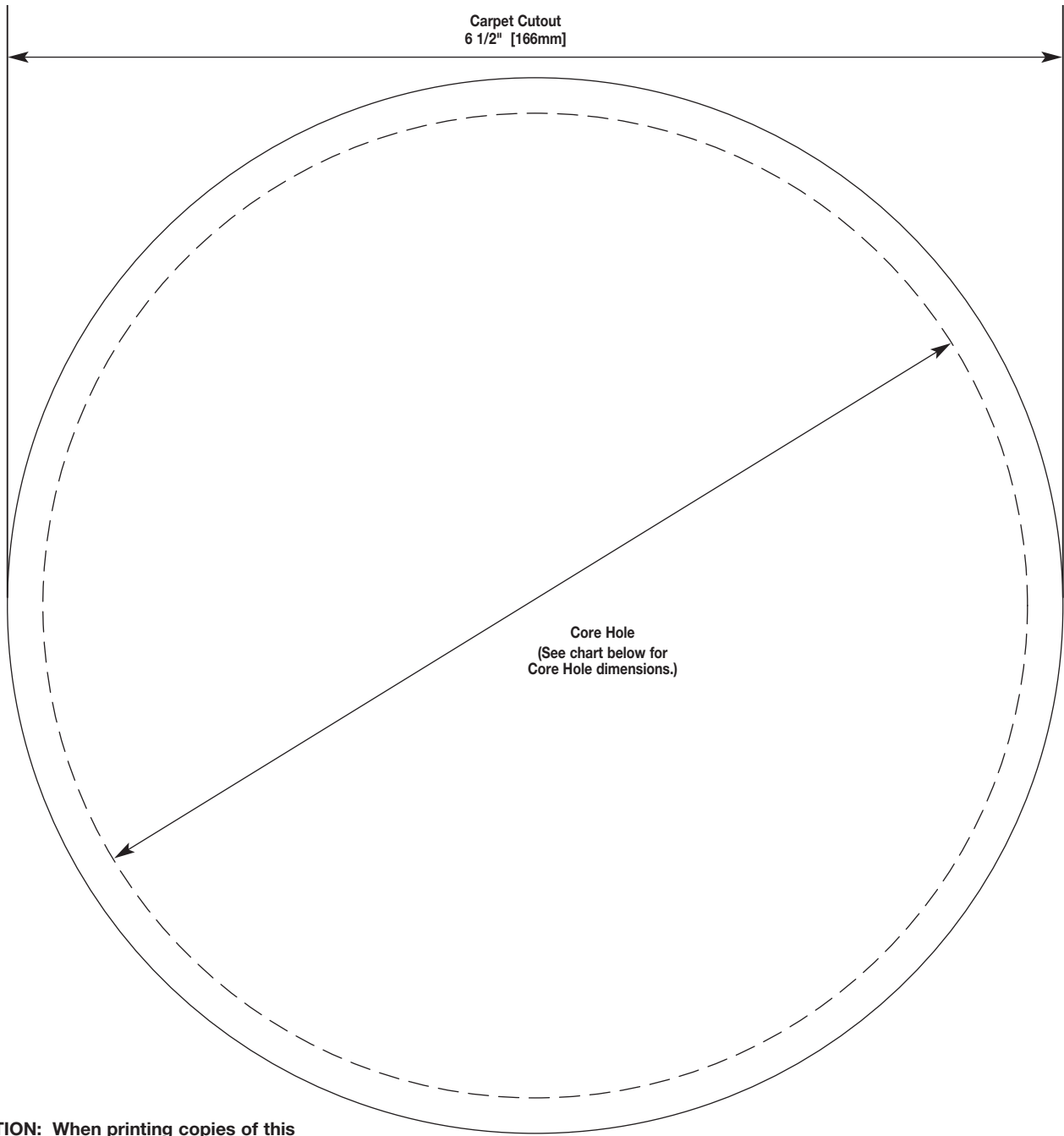
The “TC” suffix letters indicate that the device may be installed on tile or carpet covered concrete floors. The “T” suffix letter indicates that the device is intended to be installed on a concrete floor, embedded into the tile covering.

Copper Cross Sectional Area of Commonly Used Conductors	
Size	Solid
#24	.00032 sq. in. [.20645mm ²]
#22	.00050 sq. in. [.32258mm ²]
#14	.00323 sq. in. [2.08386mm ²]
#12	.00512 sq. in. [3.30321mm ²]
#10	.00815 sq. in. [5.25805mm ²]
#8	.01296 sq. in. [8.36127mm ²]

NOTE: Use above values for solid or stranded conductors.

CAUTION: Receptacle supplied with this Poke-Thru is not suitable for direct field wiring. Contact manufacturer for replacement. Field modifications will void UL Listing and Classification. Replacement receptacle is limited to this manufacturers' Catalog No 68REC.

Carpet Cutout Template



CAUTION: When printing copies of this template please be sure template is scaled correctly and is the correct size once it is printed.

FLOOR TYPE	CORE SIZE (Min.)	CORE SIZE (Max.)
Covered Floors (Carpet, Tile or Wood)	6" [152mm]	6 1/8" [156mm]
Bare Concrete or Terrazzo	6 1/16" [154mm]	6 1/8" [156mm]



Wiremold

WIREMOLD

U.S. and International:

60 Woodlawn Street • West Hartford, CT 06110
 1-800-621-0049 • FAX 860-232-2062 • Outside U.S.: 860-233-6251

Canada:

570 Applewood Crescent • Vaughan, Ontario L4K 4B4
 1-800-723-5175 • FAX 905-738-9721





Wiremold

Evolution™ Series 8" Poke-Thru Devices INSTALLATION INSTRUCTIONS

Installation Instruction No.: 1 007 156 R2 – Updated May 2010

Wiremold electrical systems conform to and should be properly grounded in compliance with requirements of the current National Electrical Code or codes administered by local authorities.

All electrical products may present a possible shock or fire hazard if improperly installed or used. Wiremold electrical products may bear the mark as UL Listed and/or Classified and should be installed in conformance with current local and/or the National Electrical Code.

IMPORTANT: Please read all instructions before beginning.

Products Covered: 8ATCP, 8ATP, 8ATC, 8AT, 8STC, 8CTC, 8CT, 68REC, 68MAAP, 682A, 68B, 8DP, 8DEC, 8S1, 8S2, 8MAAP, 8AAP, 8B, 8TS, 8STCP, 575CHA, 575PTHA, 575BLH, 175CHA, 1125CHA, 1PTHA, 1BLH, 22CHA, CE8STCP

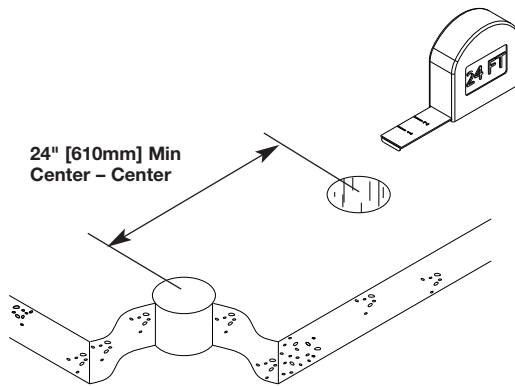
CAUTION: DO NOT operate tile stripper, cleaning, or resurfacing equipment over top of covers. This may result in damage to the surface finish of the product.

Suitable for use in air handling spaces in accordance with Sec. 300-22 (C) of the National Electrical Code.

FLOOR PREPARATIONS

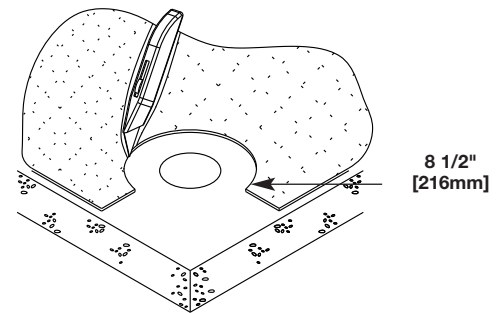
Step 1 Layout and locate position of hole(s).

CAUTION: Minimum spacing of 2ft on center and not more than one device per each 65 square feet of floor area in each span.

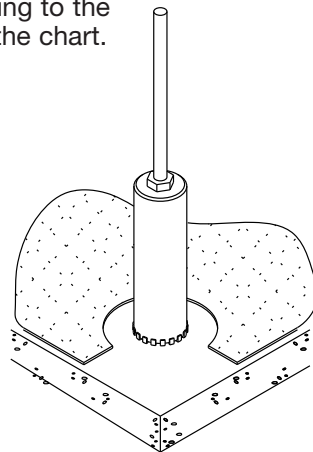


CAUTION: Be certain to locate hole at least 8" [203mm] from any wall or pillar to leave enough room for Poke-Thru cover assembly.

Step 2 Remove 8 1/2" dia. [216mm] section from carpet or tile. Use template provided.



Step 3 Create core hole according to the dimensions provided in the chart.

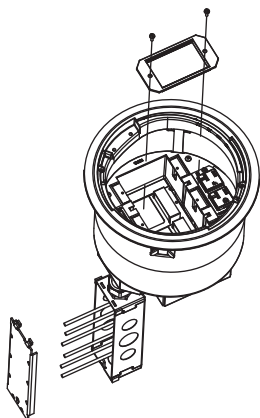


FLOOR TYPE	CORE SIZE (Min.)	CORE SIZE (Max.)
Covered Floors (Carpet, Tile or Wood)	8" [203mm]	8 1/8" [206mm]
Bare Concrete or Terrazzo	8 1/16" [205mm]	8 1/8" [266mm]

INSTALLING COMPLETE ASSEMBLY

Step 1 Attach data and AV plates and wire power and data devices (Can be completed above floor). Refer to wiring schematic below for power wiring options.

Catalog Nos. 8ATCP, 8ATP



Circuit A Wiring

Circuit B Wiring

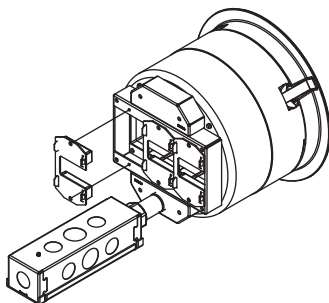
CONVENTIONAL WIRING SCHEMATIC		ISOLATED GROUND WIRING SCHEMATIC		CONVENTIONAL WIRING SCHEMATIC		ISOLATED GROUND WIRING SCHEMATIC	
BLACK or HOT From branch circuit	BLACK from Poke-Thru receptacle	BLACK or HOT From branch circuit	BLACK from Poke-Thru receptacle	BLACK or HOT From branch circuit	RED from Poke-Thru receptacle	BLACK or HOT From branch circuit	RED from Poke-Thru receptacle
WHITE or NEUTRAL From branch circuit	WHITE from Poke-Thru receptacle	WHITE or NEUTRAL From branch circuit	WHITE from Poke-Thru receptacle	WHITE or NEUTRAL From branch circuit	WHITE W/ BLUE STRIPE from Poke-Thru receptacle	WHITE or NEUTRAL From branch circuit	WHITE W/ BLUE STRIPE from Poke-Thru receptacle
GREEN or GROUND From branch circuit <i>System Ground</i>	GREEN from Poke-Thru receptacle	ISOLATED GROUND From branch circuit	GREEN from Poke-Thru receptacle	GREEN or GROUND From branch circuit <i>System Ground</i>	GREEN W/ YELLOW STRIPE from Poke-Thru receptacle	ISOLATED GROUND From branch circuit	GREEN W/ YELLOW STRIPE from Poke-Thru receptacle
	GREEN (jumper wire) from Poke-Thru junction box	GREEN or GROUND From branch circuit <i>System Ground</i>	GREEN (jumper wire) from Poke-Thru junction box		GREEN (jumper wire) from Poke-Thru junction box	GREEN or GROUND From branch circuit <i>System Ground</i>	GREEN (jumper wire) from Poke-Thru junction box

WARNING: Ground wire from junction box must be connected to system ground.

CAUTION: Receptacle mounting means not grounded. Grounding wire connection required. For isolated ground wiring, connect ground leads to a separate isolated grounding conductor. See NEC 250-146(d).

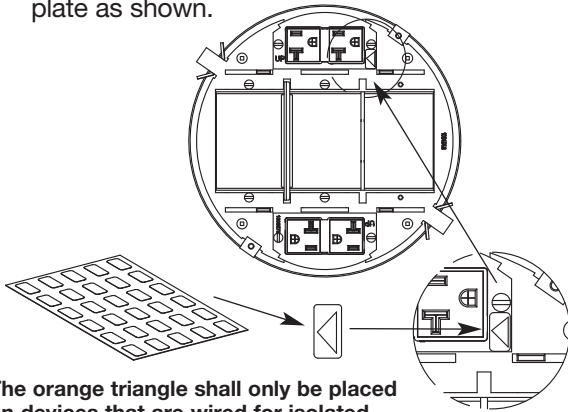
If necessary remove Feed Plates to pull communications wires through Poke-Thru device. Replace Feed Plates when finished pulling wires.

Catalog Nos. 8ATCP, 8ATP



CAUTION: To maintain fire classification, Feed Plates must be installed.

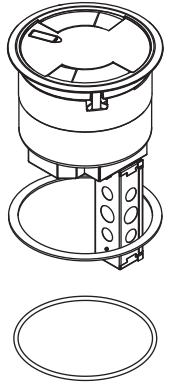
Step 2 If circuit is connected to an isolated ground, apply IG icon on receptacle plate as shown.



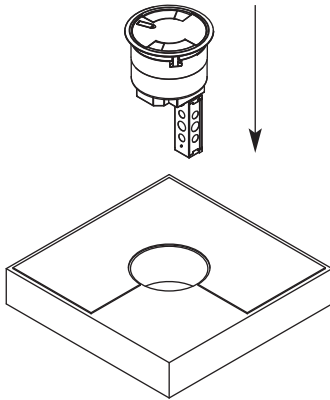
NOTE: The orange triangle shall only be placed on devices that are wired for isolated ground. See NEC 250-146(d).

For Carpet or Surface Mounted Tile Installation

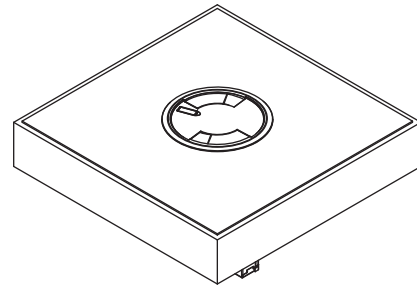
Step 3 Place appropriate gasket around poke thru and slide under flange. Use flat foam gasket for surface tile applications or use round neoprene gasket for carpet applications. For the flush tile applications no gasket is needed.



Step 4 Push Poke-Thru into floor.

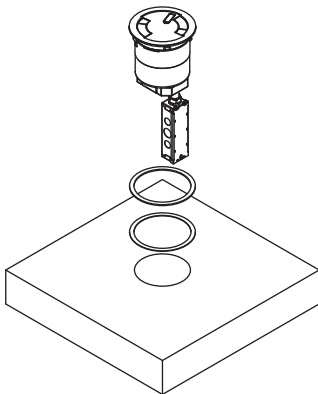


Step 5 Installation complete.



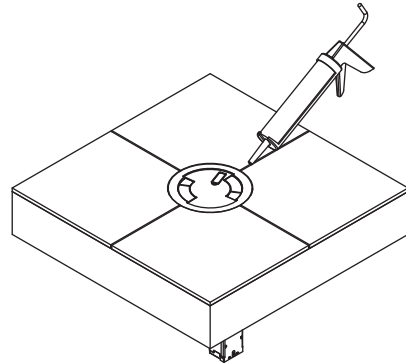
For Flush Tile Installation (Start with Steps 1 & 2 on previous page.)

Step 3 Place shims around bottom of flange to match thickness of tile. Flange is 1/8" thick. (2) 1/8" shims and (2) 1/16" shims are provided. Push Poke-Thru into floor.



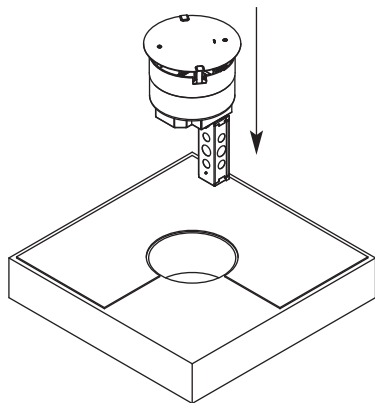
NOTE: If more shims are required, use Cat. No 8TS.

Step 4 Use grout and/or silicone caulk between edges of flange and tile.

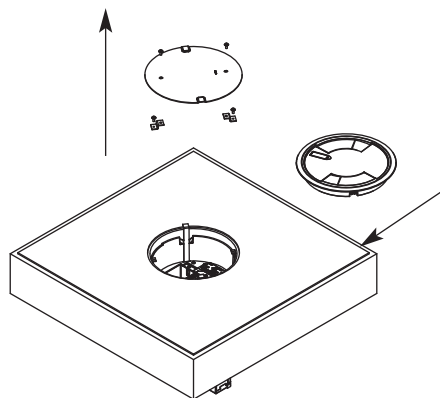


INSTALLING STEM ASSEMBLY AND SEPARATE COVER

Step 1 Insert Stem Assembly into core hole.

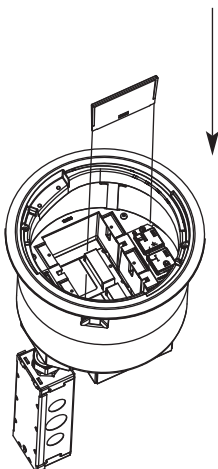


Step 2 Remove disposable plate and (2) plate clips by removing the 8-32 screws. Install Flange using the (2) 8-32 x 1/2" Cap Head screws provided with the cover assembly.

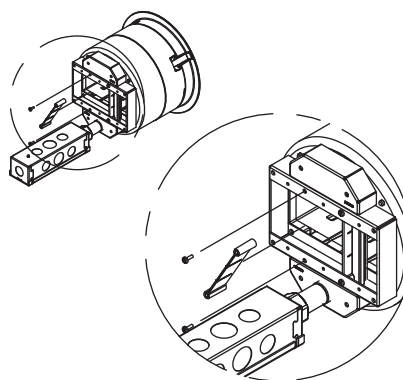


INSTALLING DIVIDERS

Step 1 Slide divider into slots in body of Poke Thru. Two sets of slots are provided. Either set may be used.



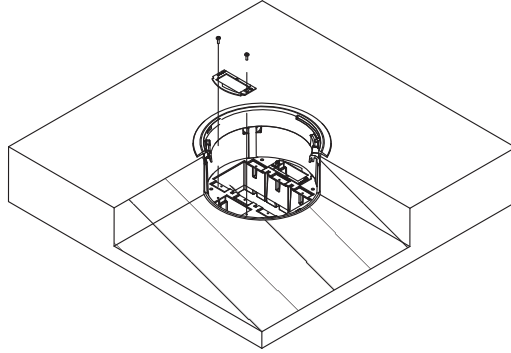
Step 2 Two dividers are provided for the bottom of the Poke Thru. Use the shorter divider on top of Wire Tunnel. Use the longer divider when separating channels without the Wire Tunnel. To install, turn divider at an angle to place inside the Feed Housing. Once inside, twist the divider to align with holes in the Feed Housing. Attach using (2) # 8-32 screws.



INSTALLING DEVICE PLATES

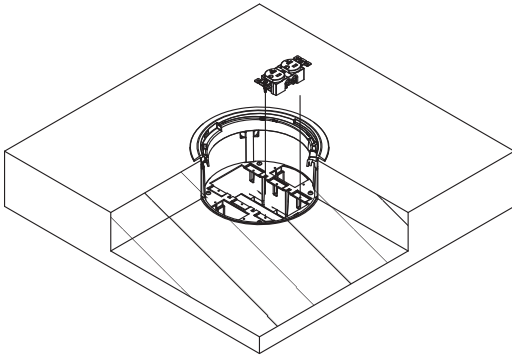
Half Gang Plates

Step 1 Install plates using (2) 6-32 x 1/2" screws.
(provided)

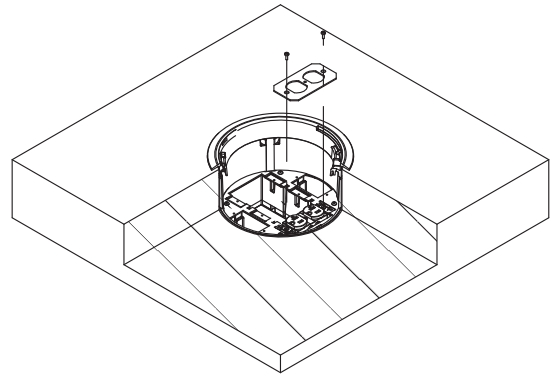


NEMA 1 Gang Device

Step 1 Screw receptacle into tabs using (2) 6-32 screws provided with the receptacle.

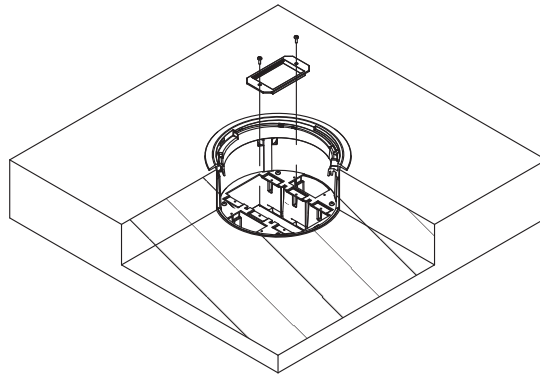


Step 2 Install plates using (2) 6-32 x 1/2" screws.
(provided)



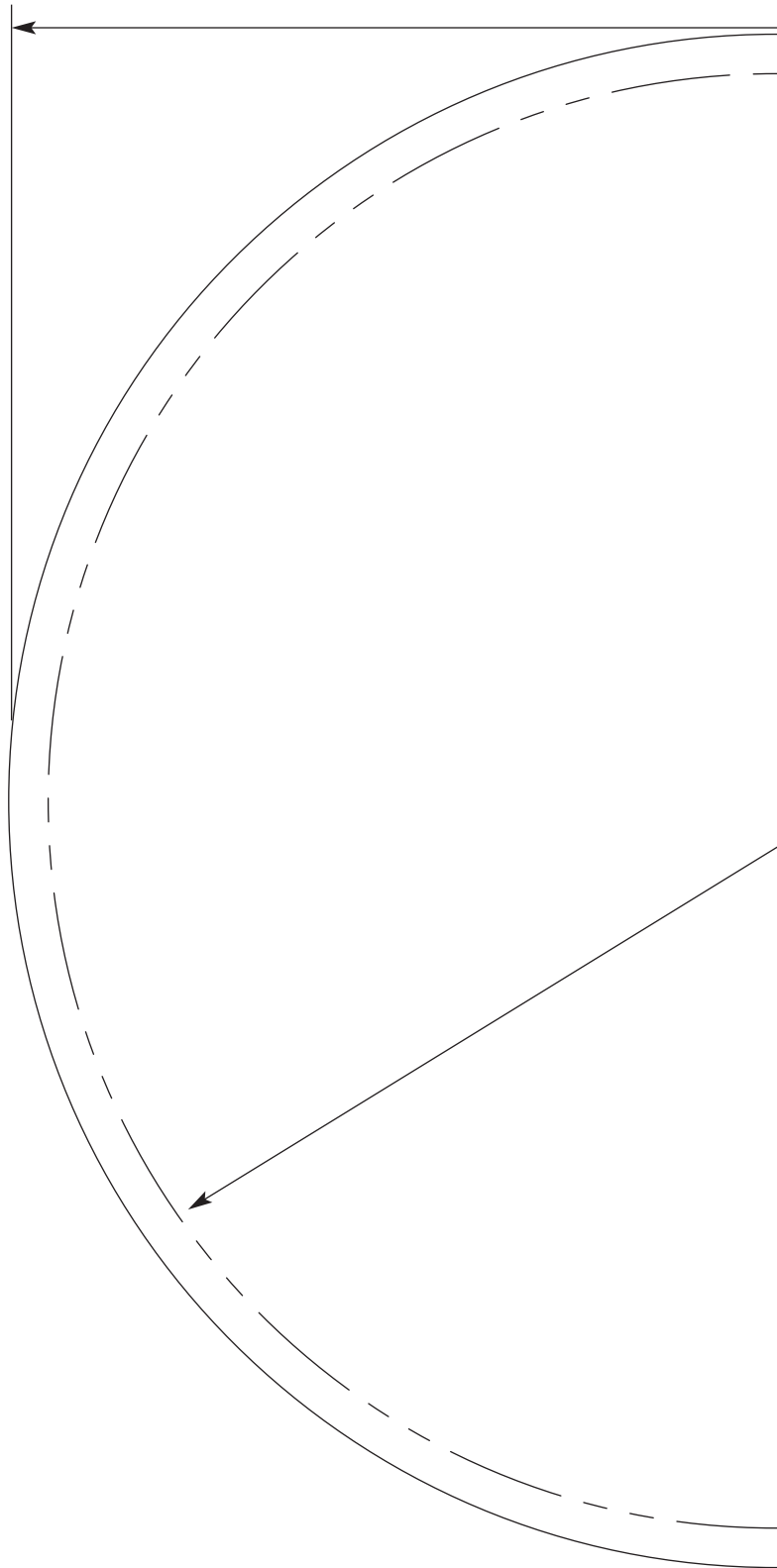
1.5 Gang Data/AV Plates

Step 1 Install device plate using (2) 6-32 x 1/2" screws. (provided)

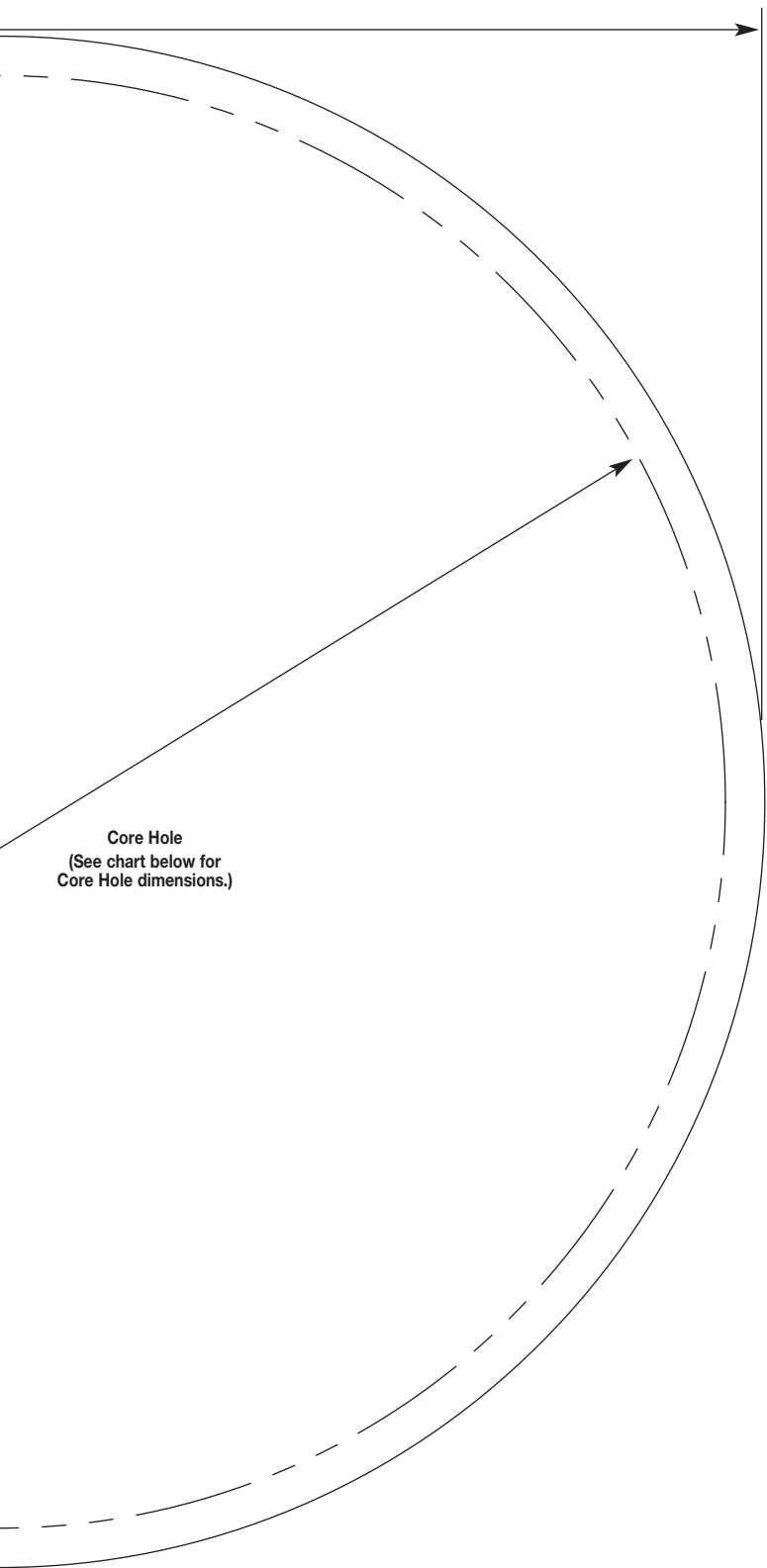


Carpet Cutout Template

Carpet Cutout
8 1/2" [216mm]



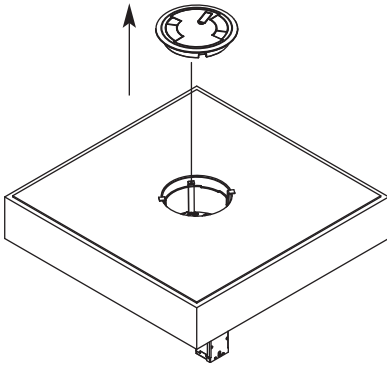
CAUTION: When printing copies of this template please be sure template is scaled correctly and is the correct size once it is printed.



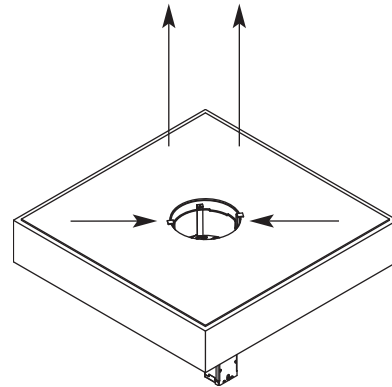
FLOOR TYPE	CORE SIZE (Min.)	CORE SIZE (Max.)
Covered Floors (Carpet, Tile or Wood)	8" [203mm]	8 1/8" [206mm]
Bare Concrete or Terrazzo	8 1/16" [205mm]	8 1/8" [266mm]

CONFIGURING FEED PLATES

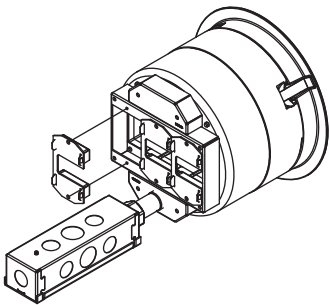
Step 1 Remove cover assembly from Poke Thru by removing (2) 8-32 screws and lifting cover off.



Step 2 Remove Poke Thru from floor by bending tabs inward and pulling unit up.

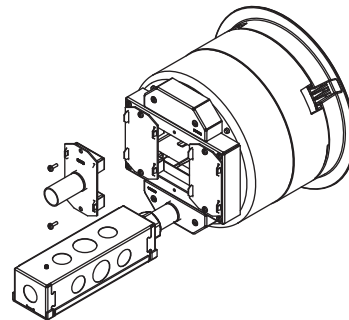


Step 1 Remove (2) 8-32 screws and pull off Feed Plate or housing.



CAUTION: To maintain fire classification, Feed Plates must be installed.

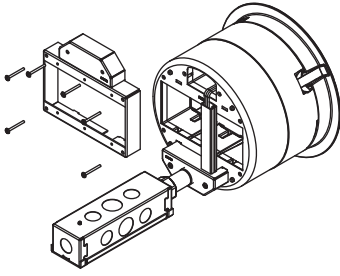
Step 2 Use (2) 8-32 screws to install new Feed Plate or housing



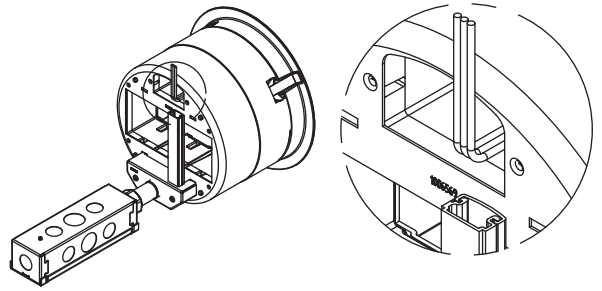
CAUTION: To maintain fire classification, Feed Plates must be installed.

WIRE TUNNEL REMOVAL

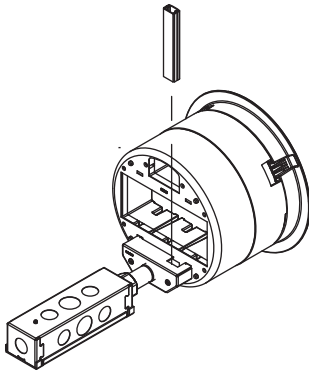
Step 1 Remove Feed Housing from center and side without J-box.



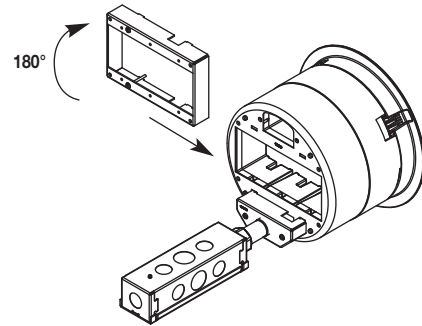
Step 2 Pull wires out of wire tunnel.



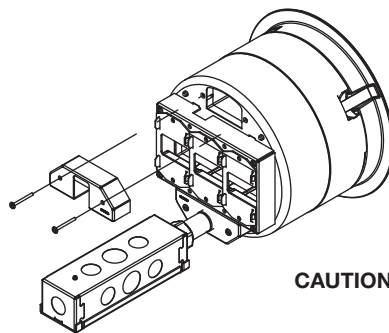
Step 3 Slide wire tunnel out of remaining Feed Housing.



Step 4 Rotate center housing and reattach with (4) 8-32 screws.



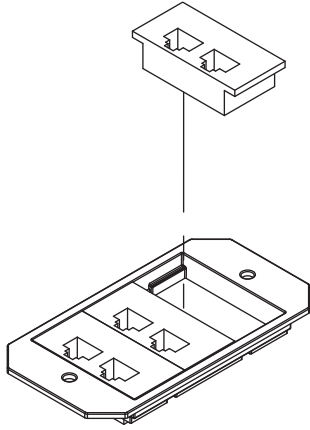
Step 5 Reattach side Feed Housing and feed plate with (2) 8-32 screws.



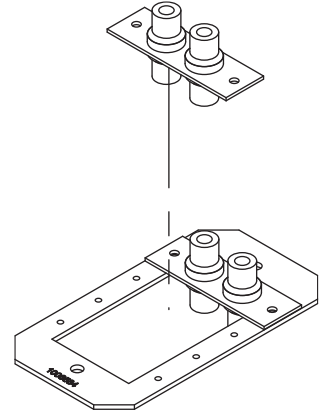
CAUTION: To maintain fire classification, Feed Plates must be installed.

INSTALLING DEVICES IN DEVICE PLATES

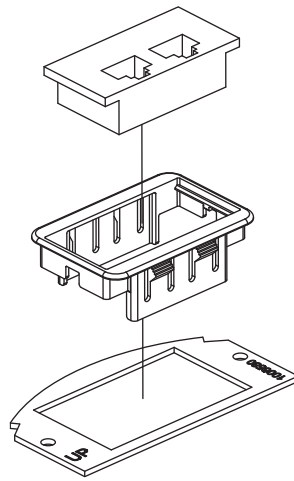
8TRAC, 8SER, 8ACT6A
(Devices not included)



8MAAP, 8AAP, 68MAAP
(Devices not included)



682A
(Includes 2A bezels. Devices not included)



Evolution Series Poke-Thru Devices are UL Listed and Classified to U.S. and Canadian safety standards to the following conditions:

The 8STC Poke-Thru Stem with the 8CTC or 8CT Service Head Fitting, and the 8ATCP, 8ATP, 8ATC or 8AT factory assembled Poke-Thru devices are for use with 1-, 1 1/2-, or 2- hour rated unprotected reinforced concrete floors and 1-, 1 1/2-, or 2- hour rated floors employing unprotected steel floor units and concrete topping (D900 Series Designs), or concrete floors with suspended ceilings. (Fire resistive designs with suspended ceilings should have provisions for accessibility in the ceiling area below the Poke-Thru fittings).

The assembled Poke-Thru stem and service fitting will not reduce the ratings of the floor assembly when the thickness and type of concrete (required for the specific rating) are within the specified limits and the fittings are installed as specified:

1. **Spacing** – Minimum of 2' [610mm] OC and not more than one unit per 65 sq. ft. [6 m²] of floor area in each span.
2. **Concrete** – Minimum thickness of structural concrete topping of 2 1/4" [57mm] over metal deck or a minimum 3" [76mm] thick reinforced concrete slab. Unit weight of concrete to be 110 to 155 pcf.
3. **Installation** – Mounted in a 8" [203mm] diameter hole in concrete per installation instructions accompanying the fittings. For use with power circuits, data and/or audio/visual cables as tabulated below:

COPPER CROSS-SECTION

	OUTER CHANNELS	CENTER CHANNEL
Max Copper X-Section	.0154 sq. in. [9.9mm ²]	.0775 sq. in. [16.6 mm ²]
Max # Conductors	(3) 12 AWG	(24) 14 AWG

NOTE: When using conductor sizes other than listed above, the aggregate cross-sectional area of the copper conductors shall not exceed the cross-sectional areas listed.

The “TC” suffix letters indicate that the device may be installed on tile or carpet covered concrete floors. The “T” suffix letter indicates that the device is intended to be installed on a concrete floor, embedded into the tile covering.

Copper Cross Sectional Area of Commonly Used Conductors	
Size	Solid
#24	.00032 sq. in. [.20645mm ²]
#22	.00050 sq. in. [.32258mm ²]
#14	.00323 sq. in. [2.08386mm ²]
#12	.00512 sq. in. [3.30321mm ²]
#10	.00815 sq. in. [5.25805mm ²]
#8	.01296 sq. in. [8.36127mm ²]

NOTE: Use above values for solid or stranded conductors.

CAUTION: Receptacle supplied with this Poke-Thru is not suitable for direct field wiring. Contact manufacturer for replacement. Field modifications will void UL Listing and Classification. Replacement receptacle is limited to this manufacturers' Catalog No 68REC.



Wiremold

Wiremold

U.S. and International:

60 Woodlawn Street • West Hartford, CT 06110
1-800-621-0049 • FAX 860-232-2062 • Outside U.S.: 860-233-6251

Canada:

570 Applewood Crescent • Vaughan, Ontario L4K 4B4
1-800-723-5175 • FAX 905-738-9721



WIREMOLD



RC4 Poke-Thru Series INSTALLATION INSTRUCTIONS

Installation Instruction No.: 1 001 636 R2 - Updated April 2005

Wiremold Electrical Systems conform to and should be installed and properly grounded in compliance with requirements of the current National Electrical Code, Canadian Electrical Code or codes administered by local authorities.

All electrical products may represent possible shock or fire hazard if improperly installed or used. Wiremold electrical products are UL Listed to U.S. and Canadian safety standards, made for interior use only, and should be installed in conformance with current local and/or the National Electrical Code.

IMPORTANT - PLEASE READ ALL INSTRUCTIONS BEFORE BEGINNING.

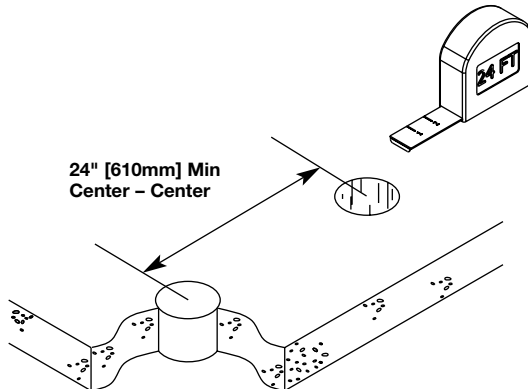
Products Covered: RC4ATC, RC4ARTTC, RC4CTC, RC4CRTTC, RC4STC, RC4SRTTC, and RC4SHTC
RC4ATC-LJB, RC4ARTTC-LJB, RC4ATCLJB25 and RC4ARTTCLJB25

CAUTION: Do Not operate tile stripper or resurfacing equipment over top of covers. This may result in damage to the surface finish of the product.

Suitable for use in air handling spaces in accordance with Sec. 300-22 (C) of the National Electrical Code.

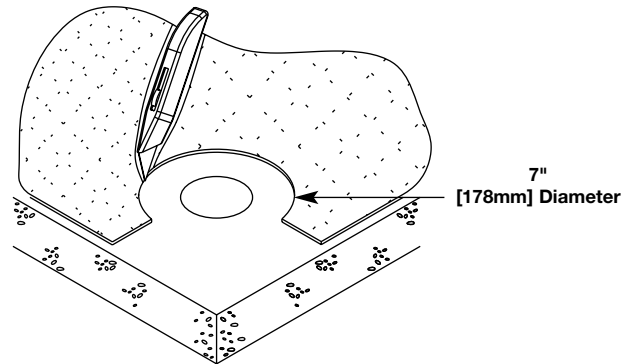
Step 1. Layout and locate position of hole(s).

CAUTION: Holes shall be spaced a minimum of 2' [610mm] on center and not more than one hole per each 65 sq. ft. [6 sq. m] of floor area in each span.



NOTE: Be certain to drill hole at least 4 1/4" [108mm] from any wall or pillar to leave enough room for Poke-Thru cover assembly.

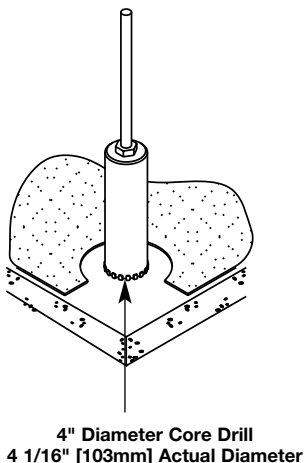
Step 2. Remove 7" [178mm] dia. section from carpet or tile. Use template provided.



For Tile Applications up to a Maximum of 3/4" [19.1mm] Thick.

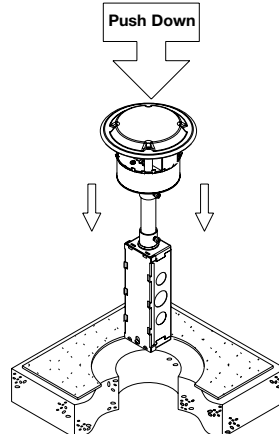
NOTE: For tile thickness greater than 3/4" [19.1mm] consult factory.

Step 3. Core drill hole.



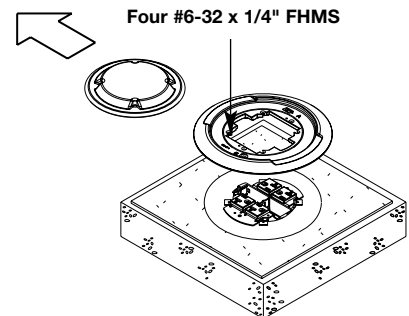
4" Diameter Core Drill
4 1/16" [103mm] Actual Diameter

Step 4. Stem Assembly: Catalog No. RC4STC Insert stem into hole.



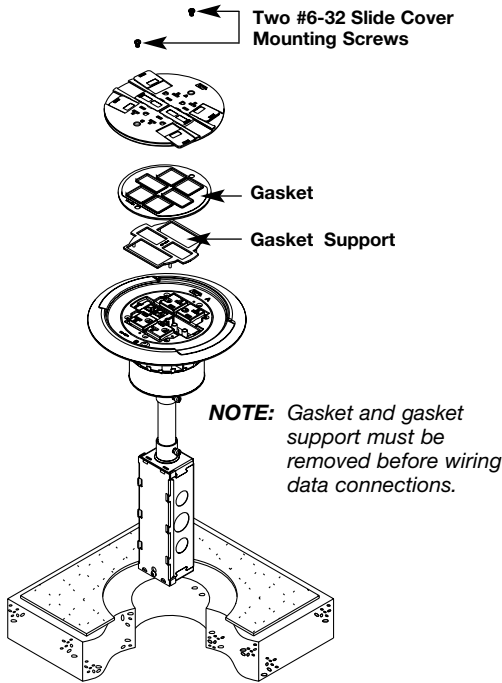
CAUTION: Poke-Thru cannot be rotated in hole after insertion into floor.

Step 5. Cover Assembly: Catalog No. RC4CTC Remove disposable plate and replace with carpet/tile flange. Install with four #6-32 x 1/4" [6.4mm] FHMS.



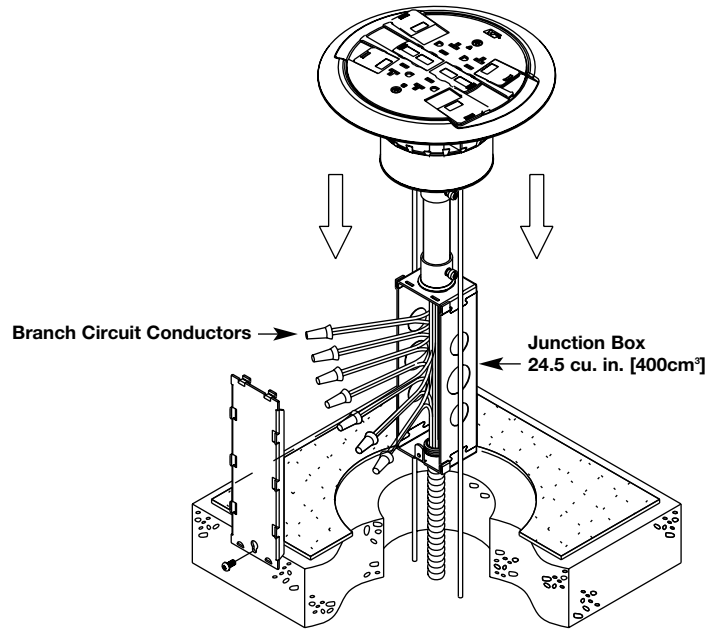
COMPLETE ASSEMBLY:

Step 6. Cat. Nos. RC4ATC or RC4ARTTC.
Wire the Poke-Thru device.
(Can be completed above floor.)
Refer to wiring schematic in Step 8.



Electrical and Communication Cables May be Connected to Unit Prior to or After Activation.

Step 7. Wire the power circuit. See wiring diagram.



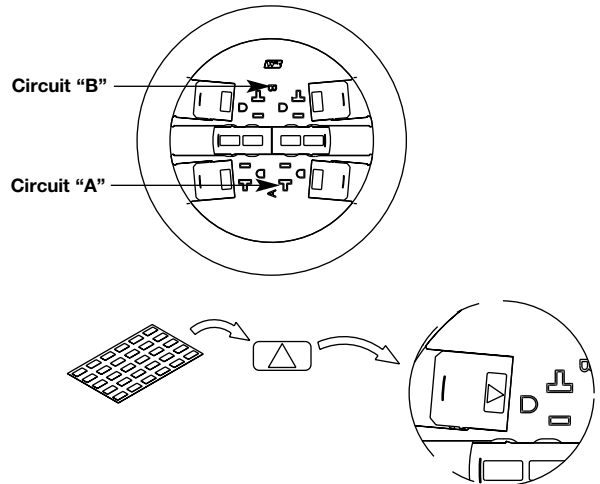
Step 8. Wiring Diagram. Connect receptacle leads to branch circuit conductors as required.

Electrical Wiring Chart		
	Circuit "A"	Circuit "B"
Line	Black	Red
Neutral	White	White w/Blue Stripe
Ground	Green	Green w/Yellow Stripe

WARNING: Ground wire from junction box must be connected to SYSTEM GROUND.

CAUTION: Receptacle mounting means not grounded. Grounding wire connection required. For isolated ground wiring; connect ground leads to a separate isolated grounding conductor. See NEC 250-146(d).

Step 9. If circuit is connected to an isolated ground apply IG icon on receptacle slide as shown.



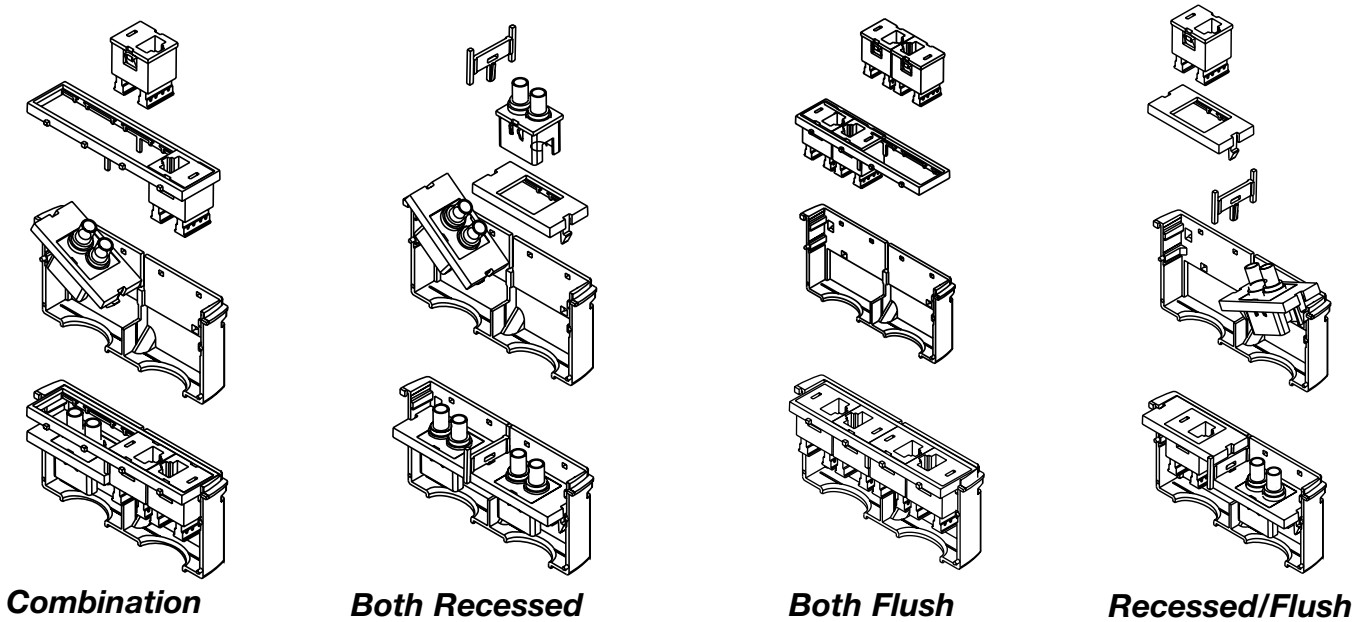
NOTE: The orange triangle shall only be placed on devices that are wired for isolated ground. See NEC 250-146(d).

Step 10. Communication Circuit Connections:

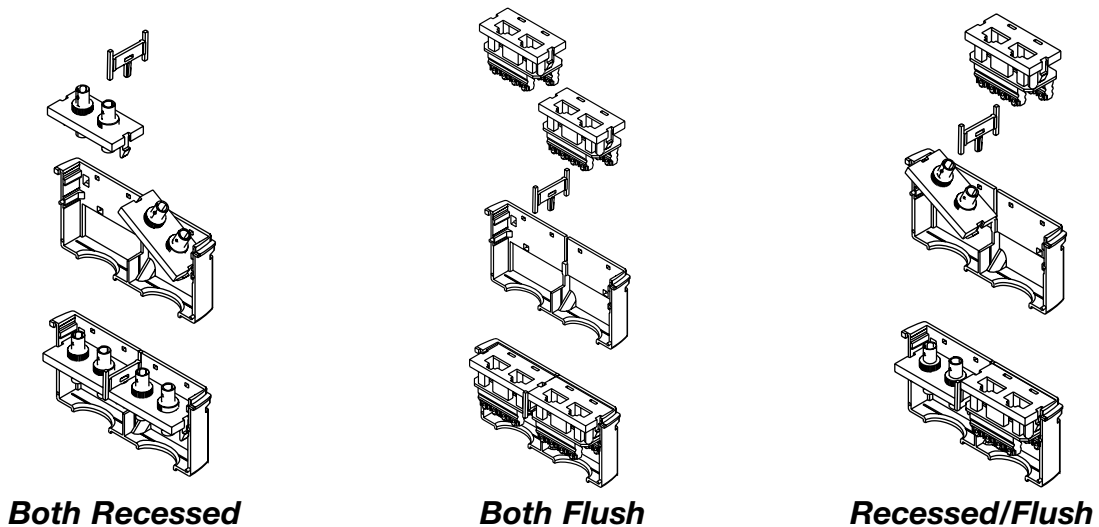
Wire communication devices per instructions provided with product. Mount in Poke-Thru per illustrations shown below.

Communication inserts may be mounted either flush or recessed. Some inserts, such as fiber optic, must be mounted recessed in order for slides to close properly.

Ortronics® TracJack® Installation: *TracJack Modules not included (sold separately).*

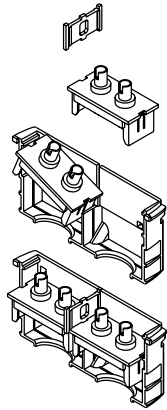


Ortronics Series II Installation: *Important: Series II Modular Inserts not included, sold separately.*

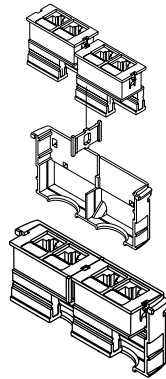


Pass & Seymour Network Wiring:

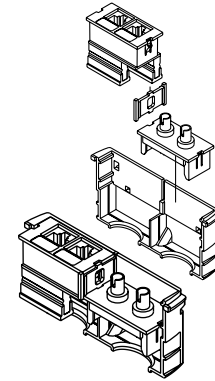
Two Category 5e inserts provided with Cat. Nos. RC4A and RC4C, other modules shown not included, sold separately.



Both Recessed



Both Flush



Recessed/Flush

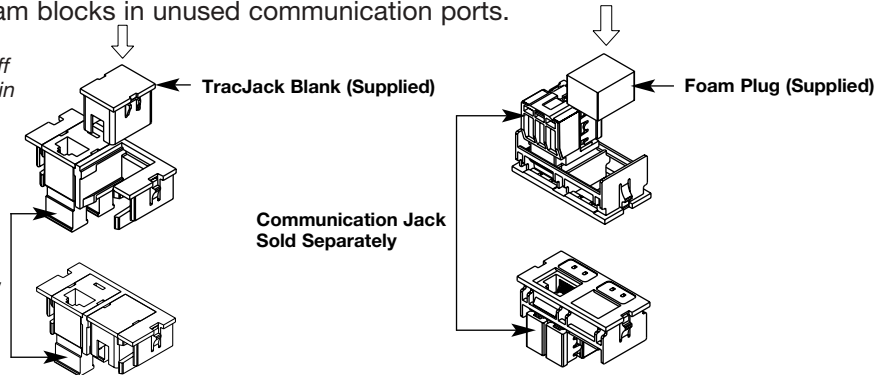
NOTE: To accommodate both Keystone and Avaya jacks, four communication inserts are provided with every unit (two dual port Keystone jack inserts, 2A-U2KEY-BK, and two dual port Avaya jack inserts, 2A-U2ATT-BK). Two Activate Dual Category 5e (2A245-B5-BK) inserts are also included. Whichever option is not installed may be discarded.

Step 11. Insert blanking plugs or neoprene foam blocks in unused communication ports.

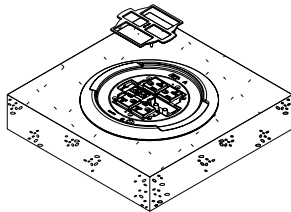
CAUTION: Empty communication ports must be closed off with foam blocks or TracJack blanks to maintain fire classification.

Communication inserts may be mounted either flush or recessed. Some inserts, such as fiber optic, must be mounted recessed in order for slides to close properly. Instructions for mounting communication inserts are shown in Step 10.

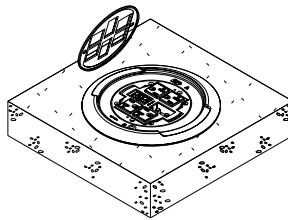
TracJack Sold Separately



Step 12. Place gasket support plate on Poke-Thru inserting the four posts through holes on receptacle brackets.

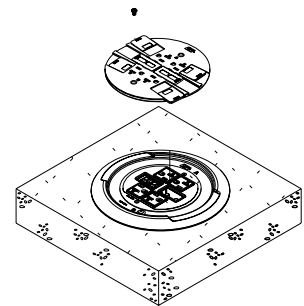


Step 13. Align gasket over receptacles and press bead into flange channel.



CAUTION: Gasket must be set in place to provide scrub water seal.

Step 14. Attach slide cover with two #6-32 screws.

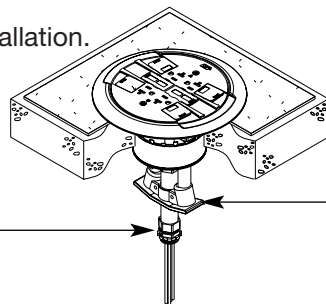


**RC4 Poke-Thru Less Junction Box Assemblies Only
Cat. Nos. RC4ATC-LJB, RC4ARTTC-LJB, RC4ATCLJB25
and RC4ARTTCLJB25.**

(Applies to installations in the City of Chicago or other locations where local codes require the use of a communication adapter, EMT compression fittings, and a junction box suitable for use in environmental air spaces.)

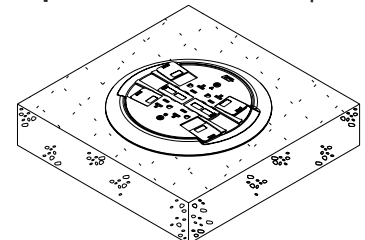
Step 15. Follow steps 1 - 14 for installation.

Once Poke-Thru is Pushed into the Cored Hole, from Below, Install a EMT Compression Fitting (Not Supplied) and Junction Box (Not Supplied) to the Conduit System. Complete Installation Per NEC and Local Codes.



Attach COM75 Adapter (Included with LJB Units) Per Instructions Supplied with Unit

Step 16. Installation complete.



The RC4TC Series Poke-Thru Device is UL Listed and Classified to U.S. and Canadian safety standards to the following conditions:

The RC4STC Poke-Thru Stem with the RC4CTC Service Head Fitting or the RC4KTC Conversion Kit Assembly, the RC4ATC factory assembled Poke-Thru device, and the RC4APTC Abandonment Fitting are for use with 1-, 1 1/2-, or 2-hour rated unprotected reinforced concrete floors and 1-, 1 1/2-, or 2-hour rated floors employing unprotected steel floor units and concrete topping (D900 Series Designs), or concrete floors with suspended ceilings. (Fire resistive designs with suspended ceilings should have provisions for accessibility in the ceiling area below the poke-thru fittings).

The assembled Poke-Thru stem and service fitting or the abandonment fittings will not reduce the ratings of the floor assembly when the thickness and type of concrete (required for the specific rating) are within the specified limits and the fittings are installed as specified:

1. **Spacing** – Minimum of 2' [610mm] OC and not more than one unit per 65 sq. ft. [6 sq. m] of floor area in each span.
2. **Concrete** – Minimum thickness of structural concrete topping of 2 1/4" [57mm] over metal deck or a minimum 3" [76mm] thick reinforced concrete slab. Unit weight of concrete to be 110 to 155 pcf.
3. **Installation** – Mounted in a 4" [102mm] diameter core-drilled hole in concrete per installation instructions accompanying the fittings or abandonment fittings. For use with power circuits, data and/or telephone cables as tabulated below:

POKE-THRU FITTING TYPE	SERVICE FITTING TYPE	POWER CONDUCTORS (A)	COMMUNICATION CONDUCTORS (B)
RC4ATC	–	6 (.03072 sq in.) [19.8205mm ²]	32 (.01600 sq. in.) [10.323mm ²]
RC4STC	RC4CTC	6 (.03072 sq in.) [19.8205mm ²]	32 (.01600 sq. in.) [10.323mm ²]
RC4STC	RC4KTC	6 (.03072 sq in.) [19.8205mm ²]	32 (.01600 sq. in.) [10.323mm ²]

The "TC" suffix letters indicate that device may be installed on tile or carpet covered concrete floors. All catalog numbers may have an "RT" suffix to indicate units supplied with Ortronics, Inc. communication modules and accessories. The "LJB" suffix letters indicate units supplied without a junction box. The "25" suffix numbers indicate units supplied with 25 foot receptacle leads.

- (A) Maximum number of No. 12 AWG Type THHN conductors in power compartment of Poke-Thru fitting.
- (B) Maximum number of 22 AWG conductors in low voltage compartment of Poke-Thru fitting (4-pair cables have (8) conductors). When conductors larger than No. 22 AWG are used, the aggregate cross-sectional area of the copper conductors shall not exceed the aggregate cross-sectional area of the 22 AWG conductors permitted in the low voltage compartment.

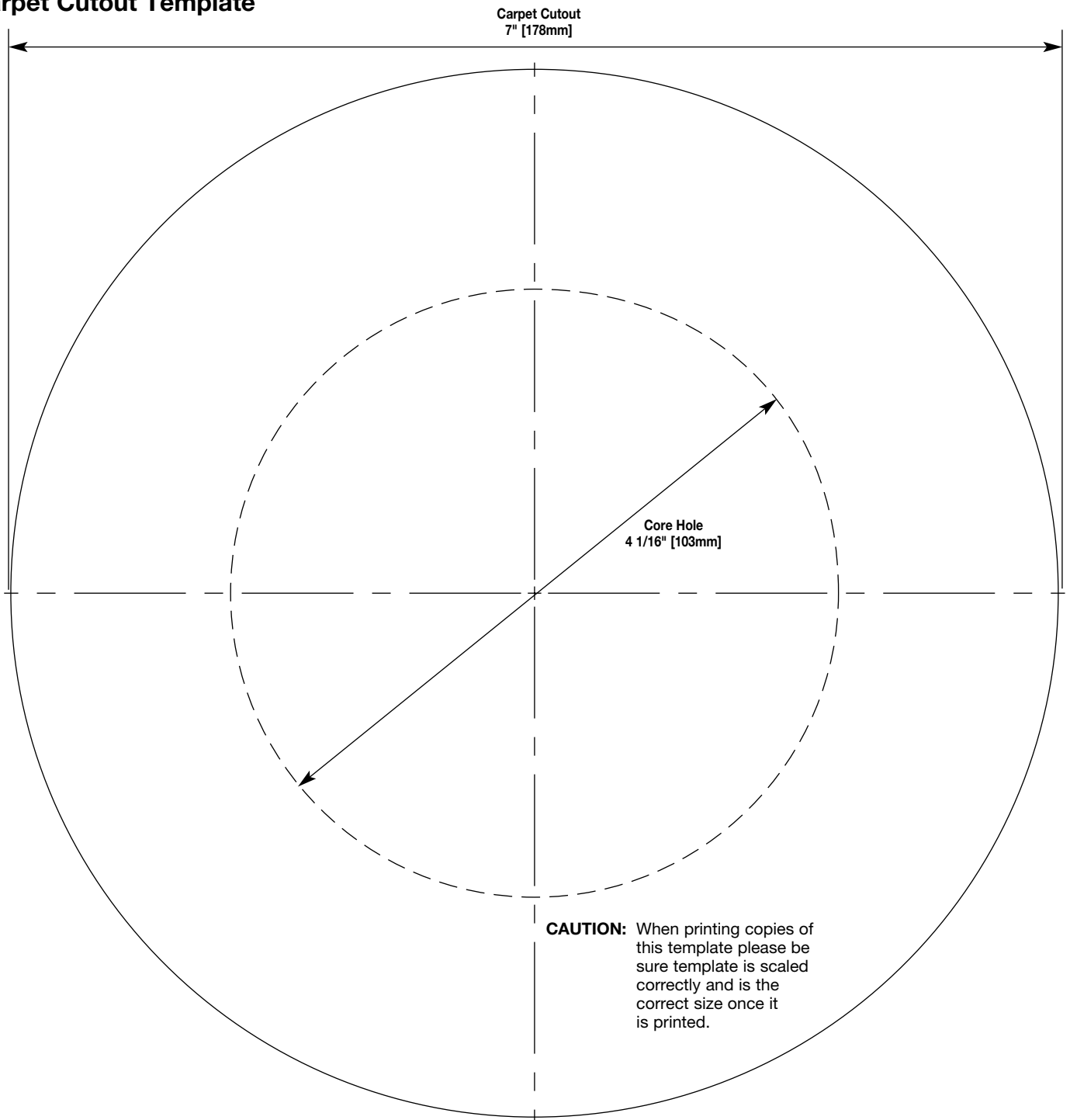
Copper Cross Sectional Area of Commonly Used Conductors	
Size	Solid
#24	.00032 sq. in. [.20645mm ²]
#22	.00050 sq. in. [.32258mm ²]
#14	.00323 sq. in. [2.08386mm ²]
#12	.00512 sq. in. [3.30321mm ²]
#10	.00815 sq. in. [5.25805mm ²]
# 8	.01296 sq. in. [8.36127mm ²]

NOTE: Use above values for solid or stranded conductors.

For use on carpet covered and tile floors up to 3/4" [19.1mm] thick.

CAUTION: Receptacle supplied with this Poke-Thru is not suitable for direct field wiring. Contact manufacturer for replacement. Field modifications will void UL Listing and Classification. Replacement receptacle is limited to this manufacturers' Catalog No. RC4REC2 or RC4REC2-25.

Carpet Cutout Template



WIREMOLD

legrand

Wiremold / Legrand

U.S. and International:

60 Woodlawn Street • West Hartford, CT 06110

1-800-621-0049 • FAX 860-232-2062 • Outside U.S. 860-233-6251

Canada:

570 Applewood Crescent • Vaughan, Ontario L4K 4B4

1-800-723-5175 • FAX 905-738-9721





Walker® Infloor Systems

RC3, RC7 & RC4 Receptacle Replacement INSTALLATION INSTRUCTIONS

Installation Instruction No.: 1 003 786R1 – Updated October 2003

Walker® electrical systems conform to and should be properly grounded in compliance with requirements of the current National Electrical Code or codes administered by local authorities.

All electrical products may present a possible shock or fire hazard if improperly installed or used. Walker electrical products may bear the mark as UL Listed and/or Classified and should be installed in conformance with current local and/or the National Electrical Code.

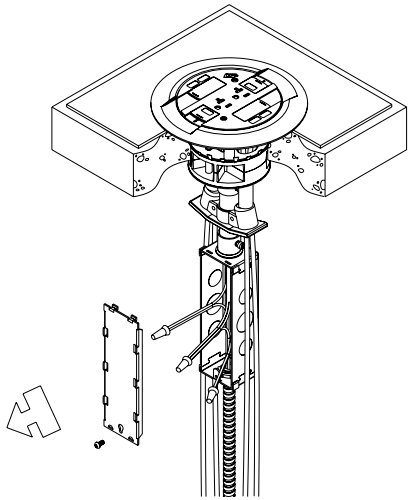
IMPORTANT: Please read all instructions before beginning.

Products Covered: RC37REC, RC4REC2, RC37REC-25 and RC4REC2-25

For use with: RC3TC, RC7TC, and RC4TC Series Poke-Thru Devices

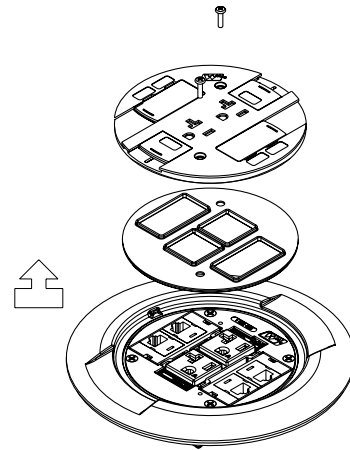
For RC3TC & RC7TC Series Devices

Step 1 Remove junction box cover and disconnect wires.

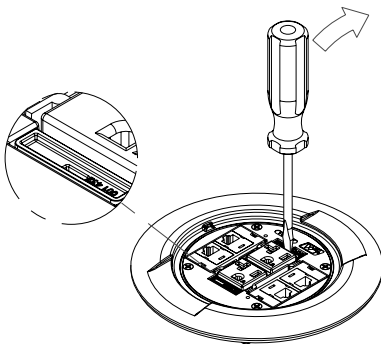


CAUTION: De-energize circuit before removing junction box cover.

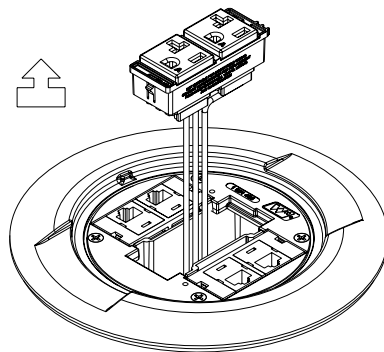
Step 2 Remove slide holder and scrub water gasket.



Step 3 Use screwdriver to disengage snap fingers. Move screwdriver to the outside and pull up. Repeat on the other side of the receptacle.

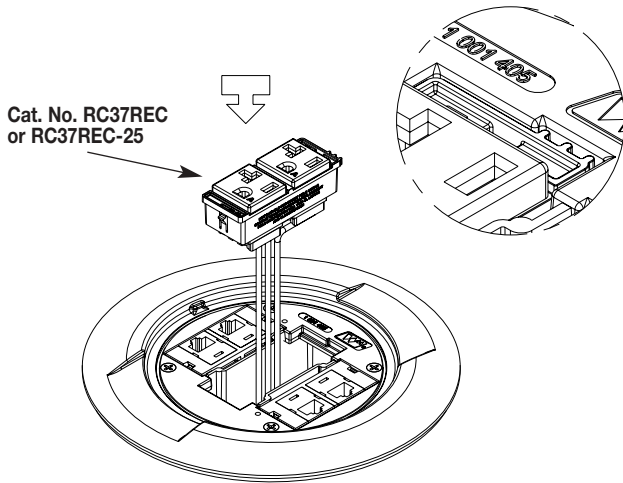


Step 4 Remove receptacle from assembly.

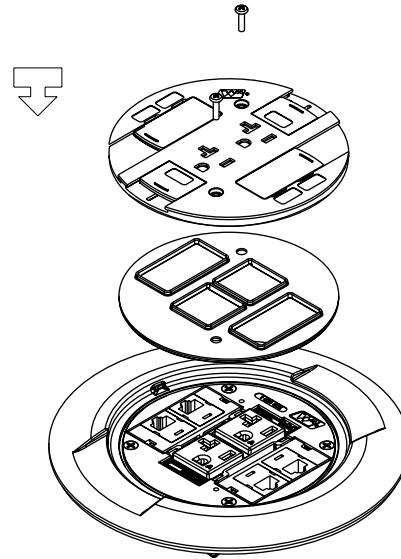


Step 5 Snap new receptacle into trim flange.

CAUTION: Make sure bosses on receptacle match up with cutout in the trim flange.



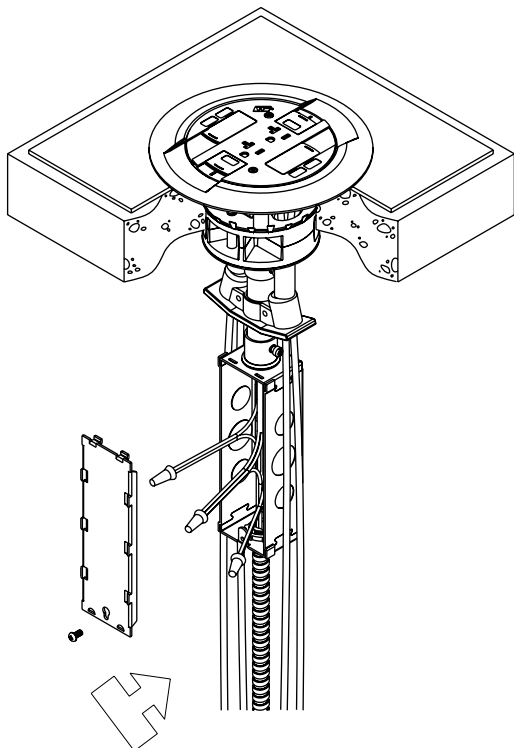
Step 6 Replace gasket and slide holder with the two #6-32 screws provided.



CAUTION: Gasket must be set in place to provide a scrub water seal.

CAUTION: Do not over tighten cover mounting screws.

Step 7 Wire up connections in the junction box. Connect poke-thru conductors according to required device configuration. See schematic below.



CONVENTIONAL WIRING SCHEMATIC		ISOLATED GROUND WIRING SCHEMATIC	
BLACK or HOT from branch circuit	BLACK from poke-thru receptacle	BLACK or HOT from branch circuit	BLACK from poke-thru receptacle
WHITE or NEUTRAL from branch circuit	WHITE from poke-thru receptacle	WHITE or NEUTRAL from branch circuit	WHITE from poke-thru receptacle
GREEN or GROUND from branch circuit SYSTEM GROUND	GREEN from poke-thru receptacle	ISOLATED GROUND from branch circuit	GREEN from poke-thru receptacle
GREEN (jumper wire) from poke-thru junction box		GREEN or GROUND from branch circuit SYSTEM GROUND	GREEN (jumper wire) from poke-thru junction box

WARNING: Ground wire from junction box must be connected to SYSTEM GROUND.

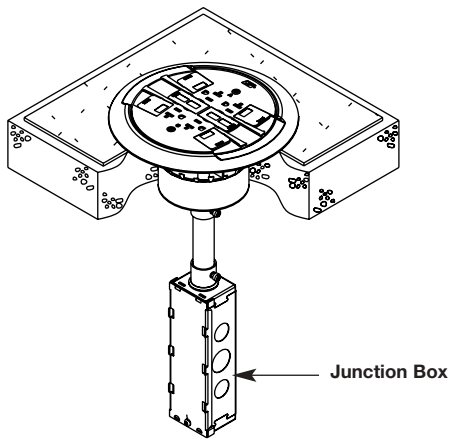
CAUTION: Receptacle mounting means not grounded. Grounding wire connection required. For isolated ground wiring, connect ground leads to a separate isolated grounding conductor. See NEC250-146(d).

NOTE: Factory supplied junction box shown. Junction boxes must be located in an accessible location. Poke-Thru devices with an "LJB" or "LJB25" suffix are supplied without a junction box (supplied by others).

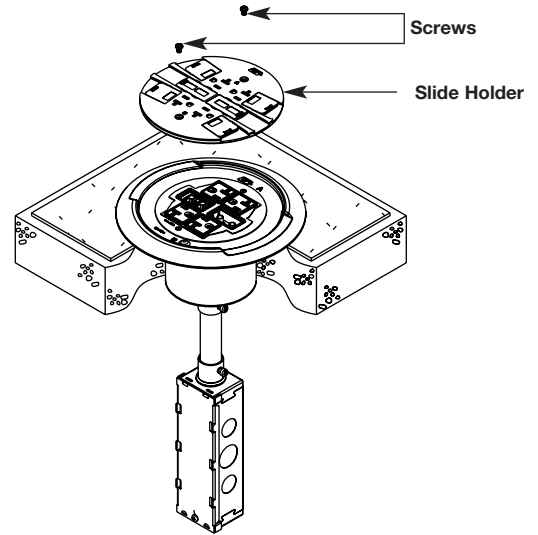
For RC4TC Series Devices

Step 1 Disconnect receptacle wiring in junction box.

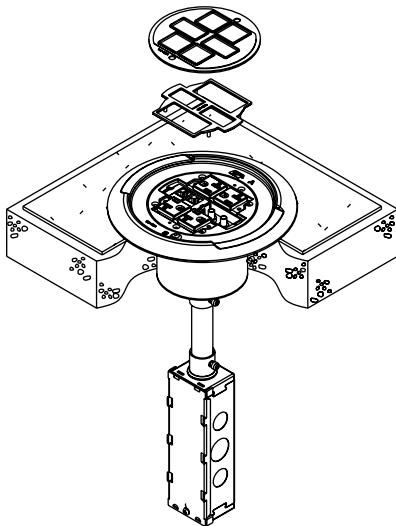
CAUTION: De-energize circuit before removing junction box cover.



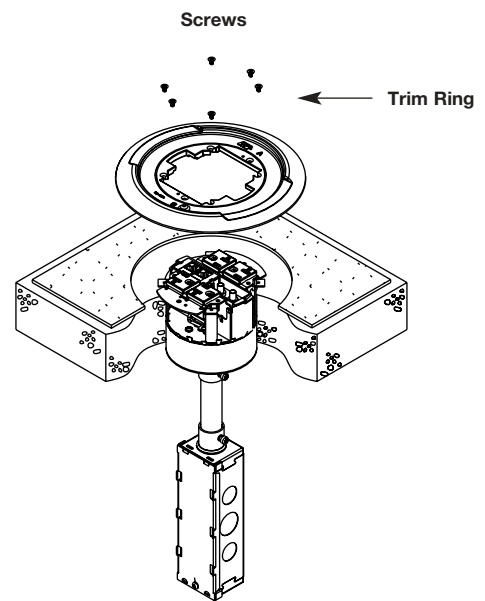
Step 2 Remove two screws and slide holder.



Step 3 Remove internal gasket and gasket support.

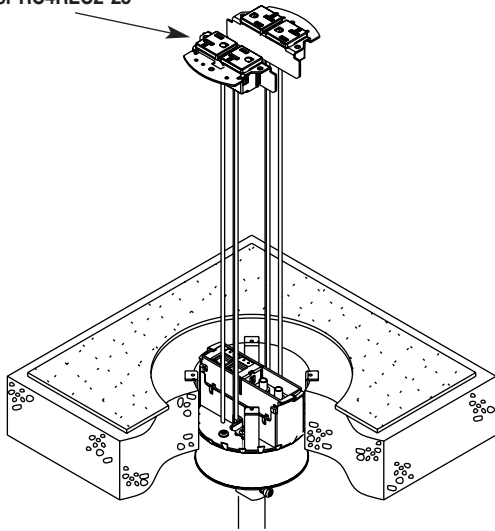


Step 4 Remove six screws and trim ring.

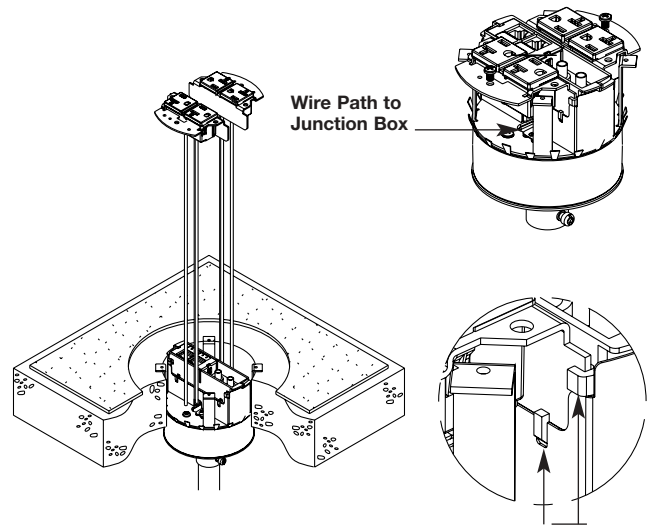


Step 5 Pull receptacles and receptacle brackets out of poke-thru.

Cat. No. RC4REC2
or RC4REC2-25

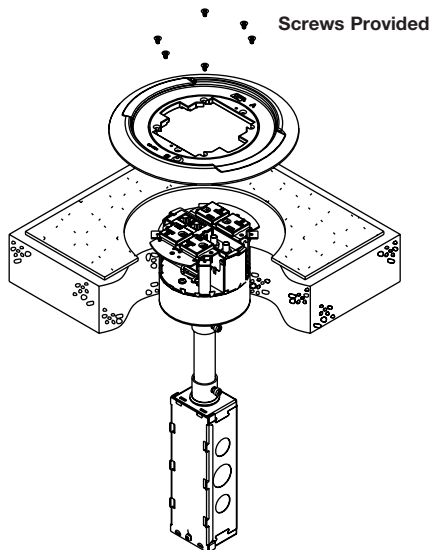


Step 6 Guide replacement receptacle brackets into place. Direct wire leads through indicated opening to junction box below.



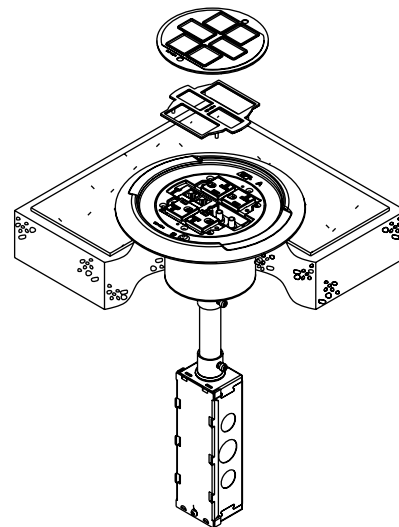
IMPORTANT: Receptacle bracket slides into the tabs shown here.

Step 7 Attach trim ring to bracket with four screws provided. Attach trim ring to receptacle bracket with two screws provided.



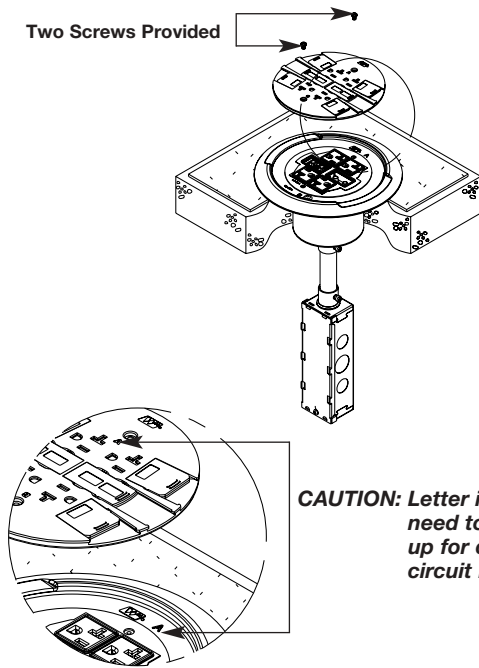
NOTE: Be certain to line up the trim ring with the holes on the receptacle bracket. The trim ring only attaches one way.

Step 8 Place gasket support on receptacle bracket. Place internal gasket on gasket support and press around edge to seat the gasket into the groove in the trim ring.



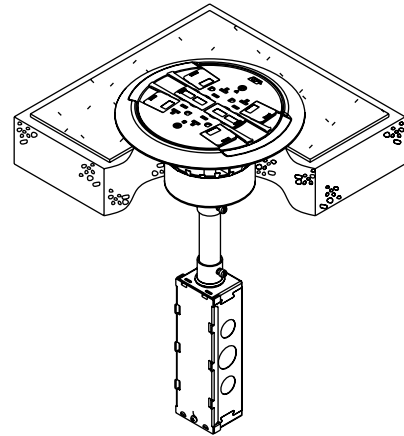
CAUTION: Gasket must be set in place to provide scrub water seal.

Step 9 Place slide holder on assembly lining up the “A” and “B” indicators on the trim ring and the slide holder. Fasten with two screws provided.



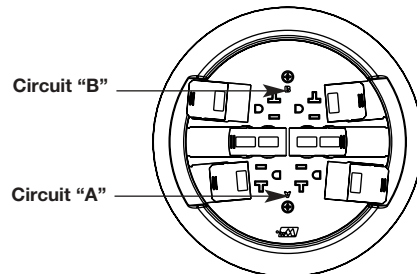
CAUTION: Letter indicators need to be lined up for correct circuit identification.

Step 10 Make electrical connections in junction box according to wiring diagram.



NOTE: Factory supplied junction box shown. Junction boxes must be located in an accessible location. Poke-Thru devices with an “LJB” or “LJB25” suffix are supplied without a junction box (supplied by others).

Electrical Wiring Chart		
	Circuit “A”	Circuit “B”
Line	Black	Red
Neutral	White	White w/Blue Stripe
Ground	Green	Green w/Yellow Stripe



CAUTION: Ground wire from junction box must be connected to SYSTEM GROUND.

CAUTION: Receptacle mounting means not grounded. Grounding wire connection required. For isolated ground wiring, connect ground leads to a separate isolated grounding conductor. See NEC250-146(d).



The Wiremold Company

U.S. and International:

60 Woodlawn Street • West Hartford, CT 06110

1-800-621-0049 • FAX 860-232-2062 • Outside U.S.: 860-233-6251

Canada:

850 Gartshore Street • Fergus, Ontario N1M 2W8

1-800-741-7957 • FAX 519-843-5980



SUBMITTAL FORM

402/434-5450
3730 S. 14th Lincoln, NE 68502
FAX: 402/434-5466

62726-3-0

TO: RB+B Architects, Inc.

PROJECT: Kelly Walsh High School

- FIRST SUBMITTAL
- RESUBMITTAL
- ADDITIONAL INFO.
- SHOP DRAWING
- PRODUCT DATA
- SAMPLE/OTHER

SAMPSON PROJECT NO: 13011

DATE: 6/9/2014

SUBMITTAL			DESCRIPTION	SUBCONTRACTOR / SUPPLIER
SPEC.	Copies	REF	ITEM	NAME AND ADDRESS
262726			Product data	Legrand

- A – REVIEWED**
- B – MAKE CORRECTIONS NOTED**
- C – REVISE AND RESUBMIT**
- D – REJECTED - RESUBMIT**

****PLEASE SIGN AND INDICATE THE ACTION ON THIS SUBMITTAL FORM AND FORWARD WITH THE SUBMITTAL TO SAMPSON CONSTRUCTION. THANKS.**

COMMENTS: **Verify device color with Architect.**
Ivory is district standard- acceptable to RB+B. Matt Arabasz

ARCHITECT: RB+B DATE: _____

CONSULTANT: EDA DATE: _____

CONTRACTOR: **Sampson Construction Company**

BY: Tim Farber DATE: 6/9/2014

REVIEWED

NO OBJECTIONS NOTED
 FURNISH WITH CORRECTIONS
 REVISE AND RESUBMIT

REVIEW IS FOR THE LIMITED PURPOSE OF VERIFYING COMPLIANCE WITH SPECIFIED MATERIALS AND WORKMANSHIP, AND/OR CONFORMANCE WITH A REASONABLY INFERABLE INTENT OF THE DESIGN, AS EXPRESSED IN THE CONTRACT DOCUMENTS. ANY ACTION SHOWN OR COMMENTS MADE REMAIN SUBJECT TO THE REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS. THE CONTRACTOR IS RESPONSIBLE FOR QUANTITIES REQUIRED AND DIMENSIONS WHICH SHALL BE CONFIRMED AT THE JOB SITE; FABRICATION PROCESSES, MEANS, METHODS, TECHNIQUES, SEQUENCES, ASSEMBLY, AND PROCEDURES OF CONSTRUCTION; COORDINATION OF THE WORK WITH THAT OF OTHER TRADES; AND PERFORMING THE WORK IN A SAFE AND SATISFACTORY MANNER.

ENGINEERING DESIGN ASSOCIATES

By: MNS Date: 6/09/14

PlugTail™ Single Pole 20 amp Toggle Switch, Ivory

PT20AC1I



PlugTail™ Single Pole Toggle Switch,
20amp 120/277vac, Ivory



features & benefits

- One-piece nickel-plated mounting strap for superior corrosion resistance
- Built-in connector features large brass terminal blades to ensure consistent, reliable electrical connections.
- Large brass contacts snugly terminate on device blade terminals. Audible snapping latch assures connection, allows release.
- Polycarbonate connector housing secures terminations and conductors in a UL Listed, finger safe housing.
- Pre-stripped connector leads fasten to conductors, easier than standard pigtails.
- No exposed terminals create a finger safe application before, during, and after installation.
- Glass-reinforced nylon back body for durability and strength.
- Heavy-duty bumpers for quiet, smooth operation.
- Shallow design for easier installation.
- Auto-ground clip assures positive ground.
- For covering patents, see www.legrand.us/patents.

specifications

General Info

Color: Ivory
Product Series: PlugTail
Type: Toggle
Number Of Poles: 1

Sampson
Construction

Approval in general as to confirmation with architect's drawings.
Approval does not release sub-contractor or material supplier from
responsibility as to accuracy of dimensions or compliance with sub
contract documents.

SAMPSON CONSTRUCTION CO., INC.

By: tim.farber

Date: 06/09/2014

Listing Agencies/Third Party Information

CSA Listing Info: C22.2 111
CSA Standard: Yes
cULus: Yes
Federal Spec: Yes
Fed Spec Number: WS896
UL Standard: Yes
UN SPS C: 39121507

Dimensions

Depth U S: 1.073"
Height U S: 3.281"
Width U S: 1.320"

Technical Information

Amps: 20 Amp
Volts: 120/277VAC
Volts A C: 120/277
Grade Type: Specification

Buy American Act Compliance

Country of Origin: MEXICO
Buy American Act Status: Trade Agreement Act Compliant

PlugTail™ Three-Way 20 amp Toggle Switch, Ivory

PT20AC3I



PlugTail™ Three-Way Toggle Switch,
20amp 120/277vac, Ivory



features & benefits

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- Built-in connector features large brass terminal blades to ensure consistent, reliable electrical connections.
- Large brass contacts snugly terminate on device blade terminals. Audible snapping latch assures connection, allows release.
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- Auto-ground clip assures positive ground.
- For covering patents, see www.legrand.us/patents.

specifications

General Info

Color: Ivory
Product Series: PlugTail
Type: Toggle
Number Of Poles: 3-way

Listing Agencies/Third Party Information

CSA Listing Info: C22.2 111
CSA Standard: Yes
cULus: Yes
Federal Spec: Yes
Fed Spec Number: WS896
UL Standard: Yes
UN SPS C: 39121507

Dimensions

Depth U S: 1.073"
Height U S: 3.281"
Width U S: 1.320"

Technical Information

Amps: 20 Amp
Volts: 120/277VAC
Volts A C: 120/277
Grade Type: Specification

Buy American Act Compliance

Country of Origin: MEXICO
Buy American Act Status: Trade Agreement Act Compliant

Spec Grade PlugTail™ Duplex GFCI, Ivory

PT2095I



From the innovator of the product category, comes a full range of Pass & Seymour GFCI receptacles to enhance safety, shorten installation times and increase productivity on the jobsite. Our PlugTail™ GFCI receptacles are the fastest-installing GFCI ever. Now you can beat tough deadlines on any commercial job.

features & benefits

- Faster, more reliable installation.
- No exposed terminals create a finger safe application before, during, and after installation.
- Built-in connector features large brass terminal blades to ensure consistent, reliable electrical connections to PlugTail Connector.
- GFCI works with the existing 3 wire PlugTail Connectors creating a non-feed-thru application for facility owners. At rough-in just install the same right angle connector for GFCI and receptacle openings.
- SafeLock™ Protection: if critical components are damaged and ground fault protection is lost, power to receptacle is disconnected.
- FSUL Listed (Federal Specification WC596).
- Exceeds UL943 voltage surge requirements; survives 100x the required UL 3kA/6kV voltage surge test cycles.
- Trip indicator light (red LED).
- Mounting screws are shipped captive in the device and wall plate for easier installation.
- High-impact-resistant thermoplastic construction.
- Zinc-plated steel mounting strap.
- Button colors match the device face.
- Dual-direction test and reset buttons.
- Class A rated GFCI.
- Supplied with matching TP26 nylon wall plate.
- Tri-drive screws.
- For covering patents, see www.legrand.us/patents.

General Info

Color: Ivory

Available Colors: White, ivory, light almond, red, brown, black, gray

Type: GFCI Receptacle

Listing Agencies/Third Party Information

cULus: Yes

Federal Spec: Yes

Fed Spec Number: WC596

UL Listing No: UL498

UL Standard: Yes

UN SPS C: 39121614

Dimensions

Depth U S: 1.2"

Height U S: 4.2"

Width U S: 1.72"

Technical Information

Amps: 20A

NEMA Configuration Number: 5-20R

NEMA Rating: Yes

Volts: 125V

Volts A C: 125

Grade Type: Specification

Buy American Act Compliance

Country of Origin: CHINA

Buy American Act Status: No

PlugTail™ Spec Grade Receptacles, 20A, 125V, Ivory

PT5362I



PlugTail™ Spec Grade Duplex Receptacle
20amp 125volt Ivory



features & benefits

- .036 inch thick, brass, triple-wipe power contacts for lasting retention.
- Plated steel wrap strap design for maximum durability and corrosion resistance.
- No exposed terminals create a finger safe application before, during, and after installation.
- Built-in connector features large brass terminal blades to ensure consistent, reliable electrical connections.
- Ultrasonically welded polycarbonate connector housing secures terminations and conductors in a UL Listed, finger safe housing.
- Crimped and welded contacts.
- Large brass contacts snugly terminate on device blade terminals.
- Pre-stripped connector leads fasten to conductors, easier than standard pigtailed.
- Auto-ground clip assures positive ground.
- For covering patents, see www.legrand.us/patents.

specifications

General Info

Color: Ivory
Product Series: PlugTail
Type: Receptacles

Listing Agencies/Third Party Information

CUL Listing No: UL498
cULus: Yes
Federal Spec: Yes
Fed Spec Number: WC596
UL Listing No: UL498
UN SPS C: 39121406
UR: No

Dimensions

Depth U S: .625"
Height U S: 3.281"
Width U S: 1.5"

Technical Information

Amps: 20 Amp
Volts: 125V
Volts A C: 125
Capacity: Duplex
Grade Type: Federal Specification

Buy American Act Compliance

Country of Origin: MEXICO
Buy American Act Status: Trade Agreement Act Compliant

PlugTail™ Connectors, Right Angle, Solid, 6"

PTRA6SOL



PlugTail™ Connectors Right Angle Solid 6"

features & benefits

- Ultrasonically welded polycarbonate connector housing secures terminations and conductors in a UL Listed, finger safe housing.
- Large brass contacts snugly terminate on device blade terminals.
- Pre-stripped connector leads fasten to conductors, easier than standard pigtails.
- Available in any wire length up to 25 inches, use Configurable Solutions to order.
- For covering patents, see www.legrand.us/patents.

specifications

General Info

Product Series: PlugTail

Type: connectors

Special Features: Right angle, solid

Listing Agencies/Third Party Information

CSA Listing Info: No

CUL Listing No: No

cULus: Yes

cURus: No

Federal Spec: No

UL Listing No: No

UN SPS C: 39121406

UR: No

Dimensions

Height U S: 6.375"

Buy American Act Compliance

Country of Origin: CHINA

Buy American Act Status: No

P&S PlugTail™ Switch Right Angle Connector 3-Wire, 6" Solid THHN12 for 277V Applications

PTS6SOL3



P&S PlugTail™ Switch Right Angle Connector, 3-wire, 6" Solid THHN12 for 277V Applications, Colors Green, Brown, Brown



features & benefits

- All PlugTail™ Connectors are available in any wire length up to 25 inches
- Large crimped and welded brass contacts
- Ultrasonically welded polycarbonate connector housing secures terminations and conductors in a UL Listed, finger safe housing. Audible snapping latch assures connection, allows release.
- Pre-stripped connector leads fasten to conductors, easier than standard pigtails.
- For covering patents, see www.legrand.us/patents.

specifications

General Info

Product Series: PlugTail
Type: Right Angle Connector
Number Of Poles: 1
Number Of Wires: 3
Style: Decorator

Buy American Act Compliance

Country of Origin: MEXICO
Buy American Act Status: Trade Agreement Act Compliant

P&S PlugTail™ Switch Right Angle Connector 4-Wire, 6" Solid THHN12 for 277V Applications

PTS6SOL4-277



P&S PlugTail™ Switch Right Angle Connector, 4-wire, 6" Solid THHN12 for 277V Applications, Colors Green, Brown, Yellow, Yellow



features & benefits

- All PlugTail™ Connectors are available in any wire length up to 25 inches
- Large crimped and welded brass contacts
- Ultrasonically welded polycarbonate connector housing secures terminations and conductors in a UL Listed, finger safe housing. Audible snapping latch assures connection, allows release.
- Pre-stripped connector leads fasten to conductors, easier than standard pigtails.
- For covering patents, see www.legrand.us/patents.

specifications

General Info

Product Series: PlugTail
Type: Right Angle Connector
Number Of Poles: 3-way
Number Of Wires: 4
Style: Decorator

Buy American Act Compliance

Country of Origin: MEXICO
Buy American Act Status: Trade Agreement Act Compliant

Installing and Testing a PlugTail™ GFCI Receptacle

For Use Only with Pass and Seymour PT Series Connector.

Please read this leaflet completely before getting started.

5. Installation instructions:

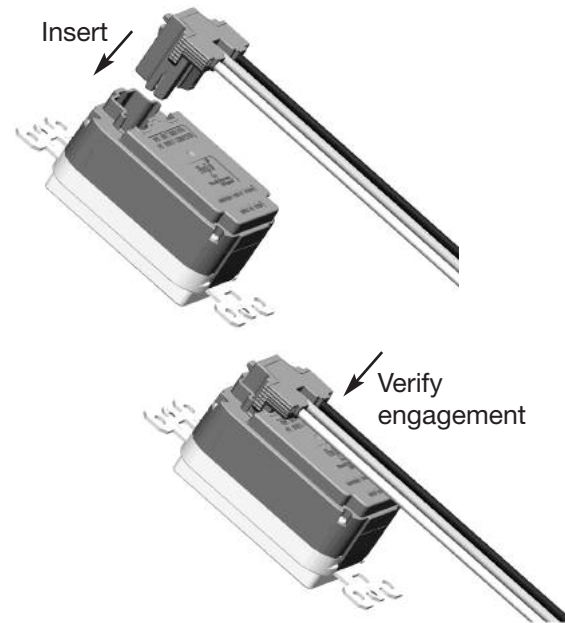
1. Disconnect power.
2. Attach connection to branch circuit wiring.

Black wire to Hot wire; (connector) (branch circuit wiring)

White wire to Neutral wire; (connector) (branch circuit wiring)

Green wire to Ground wire or (connector) Ground system. (branch circuit wiring)

3. Click Connector into PT Series GFCI.
4. Verify Connector security and engagement.



Note: The Plugtail™ GFCI does not provide protection to other receptacles/outlets.

⚠ CAUTION

- To prevent severe shock or electrocution, always turn the power OFF at the service panel before working with wiring.
- Use this GFCI receptacle with copper or copper-clad wire. Do not use it with aluminum wire.
- Do not install this GFCI receptacle on a circuit that powers life support equipment because if the GFCI trips, it will shut down the equipment.
- For installation in wet locations, protect the GFCI receptacle with a weatherproof cover that will keep both the receptacle and any plugs dry.
- Must be installed in accordance with national and local electrical codes.

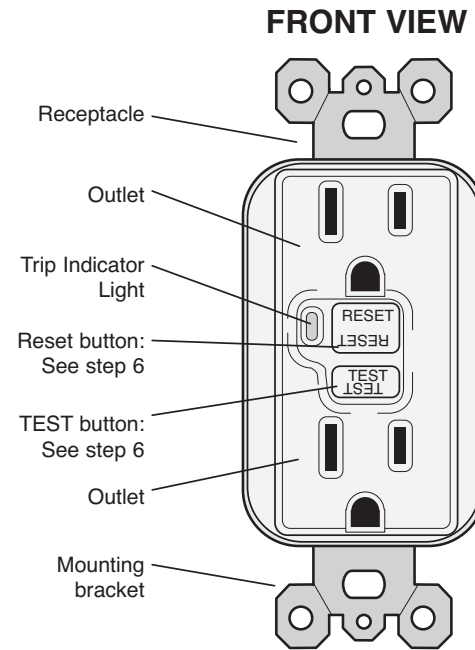
1. What is a GFCI?

A GFCI receptacle is different from conventional receptacles. In the event of a ground fault, a GFCI will trip and quickly stop the flow of electricity to prevent serious injury.

Definition of a ground fault: Instead of following its normal safe path, electricity passes through a person's body to reach the ground. For example, a defective appliance can cause a ground fault.

A GFCI receptacle does not protect against circuit overloads, short circuits, or shocks. For example, you can still be shocked if you touch bare wires while standing on a non-conducting surface such as a wood floor.

2. The GFCI's features



3. Should you install it?

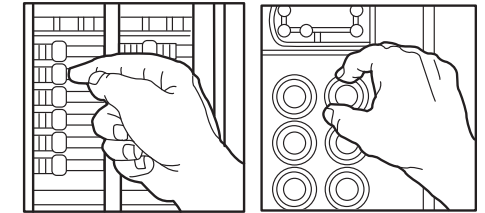
Installing a GFCI receptacle can be more complicated than installing a conventional receptacle.

Make sure that you:

- Understand basic wiring principles and techniques.
- Can interpret wiring diagrams.
- Have circuit wiring experience.
- Are prepared to take a few minutes to test your work, making sure that you have wired the GFCI receptacle correctly.

4. Turn the power OFF

Plug an electrical device, such as a lamp or radio, into the receptacle on which you are working. Turn the lamp or radio on. Then, go to the service panel. Find the breaker or fuse that protects that receptacle. Place the breaker in the OFF position or completely remove the fuse. The lamp or radio should turn OFF.

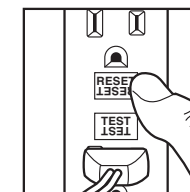
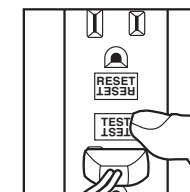
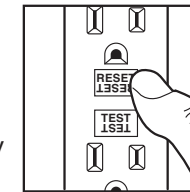


Next, plug in and turn ON the lamp or radio at the receptacle's other outlet to make sure the power is OFF at both outlets. If the power is not OFF, stop work and call an electrician to complete the installation.

6. Test your work

Procedure:

- (a) Turn the power ON at the service panel. Press the RESET button fully. The RESET button should stay in. Plug a lamp or radio into the GFCI (and leave it plugged in) to verify that the power is ON. If there is no power, turn the power OFF and check the wire connections (Step 5). Make sure that there are no loose wires or loose connections and verify that the PT Series Connector is snapped into the PlugTail™ GFCI.
- (b) Press the TEST button in order to trip the device. This should stop the flow of electricity, making the radio or lamp shut OFF and the GFCI's red Trip Indicator Light come on. Note that the RESET button will pop-out. If the power goes OFF, you have installed the GFCI receptacle correctly. To restore power, press the RESET button.
- (c) Press the TEST button (then RESET button) every month to assure proper operation.
- (d) This GFCI will trip and be unable to be reset (no output power) when it has reached its end-of-life. To confirm that the GFCI has reached its end-of-life, unplug the appliances connected to the GFCI and press the Reset Button. If the GFCI continues to trip, then the GFCI has reached its end-of-life and should be replaced. If the GFCI resets, the appliance may be defective.



General Information

Ratings:

15A 125V 60Hz 20A 125V 60Hz

Technical Assistance: (800) 223-4185

www.passandseymour.com

Part No. 340769 Rev. B

LIMITED ONE YEAR WARRANTY

Pass & Seymour will remedy any defect in workmanship or material in Pass & Seymour products which may develop under proper and normal use within one year from date of purchase by a consumer:

(1) by repair or replacement, or, at Pass & Seymour's option, (2) by return of an amount equal to consumer's purchase price. Such remedy is IN LIEU OF ANY AND ALL EXPRESSED OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Such remedy by Pass & Seymour does not include or cover cost of labor for removal or reinstallation of the product. ALL OTHER FURTHER ELEMENTS OF DAMAGE (INCIDENTAL OR CONSEQUENTIAL DAMAGES) FOR BREACH OF ANY AND ALL EXPRESSED OR IMPLIED WARRANTIES INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXCLUDED HEREBY. (Some states do not allow disclaimers or exclusion or limitation of incidental or consequential damages, so the above disclaimer and limitation or exclusion may not apply to you.) ANY IMPLIED WARRANTIES INCLUDING WHERE REQUIRED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE SHALL BE LIMITED TO THE ONE YEAR PERIOD SET FORTH ABOVE. (Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.)

To insure safety, all repairs to Pass & Seymour products must be made by Pass & Seymour, or under its specific direction. Procedure to obtain performance of any warranty obligation is as follows: (1) Contact Pass & Seymour, Syracuse, New York 13221, for instructions concerning return or repair; (2) return the product to Pass & Seymour, postage paid, with your name and address and a written description of the installation or use of the Pass & Seymour product, and the observed defects or failure to operate, or other claimed basis for dissatisfaction.

This warranty gives you specific legal rights and you may also have other rights which vary from state to state



Model: 17949330100
Type: SG200
Engine: G12.9

Owner's Manual
For
Stationary Industrial Generators
Standalone Gas or Diesel

⚠ DANGER!



**ONLY QUALIFIED ELECTRICIANS OR
CONTRACTORS SHOULD ATTEMPT
INSTALLATION!**



DEADLY EXHAUST FUMES!

This manual should remain with the unit.

**This manual must be used in conjunction
with the appropriate installation manual.**

WARNING!

California Proposition 65

Engine exhaust and some of its constituents are known to the state of California to cause cancer, birth defects, and other reproductive harm.

WARNING!

California Proposition 65

This product contains or emits chemicals known to the state of California to cause cancer, birth defects, and other reproductive harm.

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Section 1 Safety

1.1 — Introduction

Every effort was expended to ensure that the information and instructions in this manual were both accurate and current at the time it was released. However, the manufacturer reserves the right to change, alter, or otherwise improve this product at any time without prior notice.

Read this manual thoroughly. If any portion is not understood, contact the nearest Authorized Service Dealer for starting, operating, and servicing procedures. The operator is responsible for proper and safe use of the equipment. The manufacturer strongly recommends that the operator read this Owner’s Manual and thoroughly understand all instructions before using this equipment. The manufacturer also strongly recommends having an Authorized Service Dealer provide instruction to any designated operators in the safe inspection, starting, operating, and stopping of this unit.

1.1.1— Installation, Operation, and Maintenance

Installation and initial startup of this equipment is not a “do-it-yourself” project. This generator set must be installed by an Authorized Service Dealer or other competent, qualified contractor. The initial startup must be performed and documented by a factory Authorized Service Dealer. A factory Authorized Service Dealer can also provide the necessary training for authorized operators. It is the operator’s responsibility to perform all safety checks, to make sure that all maintenance for safe operation is performed promptly, and to have the equipment checked periodically by an Authorized Service Dealer. Normal maintenance service and replacement of parts are the responsibility of the owner/operator and, as such, are not considered defects in materials or workmanship within the terms of the warranty. Individual operating habits and usage contribute to the need for maintenance service.

Proper maintenance and care of the generator will ensure a minimum number of problems and keep operating expenses at a minimum. See an Authorized Service Dealer for service aids and accessories.

1.1.2— How to Obtain Service

NOTE: Use this page to record important information about the generator set.

Each generator set has a DATA LABEL containing important information about the unit.

When contacting an Authorized Service Dealer about parts and/or service, always supply the complete model number and serial number of the unit as given on the data label. For quick and easy reference, copy the information printed on the Data Label located on the generator onto the sample label printed here. See Figure 1-1.

GENERATOR UNIT					
GEN MODEL:					
MODEL:					
SERIAL:					
ALTERNATE					
PROD DATE:					
COUNTRY OF ORIGIN:					
GENERATOR DATA					
KW	KVA	HZ	PF		
UPSIZE	ALT	KW	KVA		
VOLT			/	AMP	
ENG RPM		ALT RPM			
BREAKER	KW	AMP			
X'D		X'D			

ROTOR	STATOR	CLASS			
WINDINGS	AMBIENT	TEMP			
				MANUF. LOC.	

Figure 1-1. Data Label (Sample)

1.2 — Safety Rules

Throughout this publication, and on tags and decals affixed to the generator, DANGER, WARNING, CAUTION, and NOTE boxes are used to alert personnel to special instructions about a particular operation that may be hazardous if performed incorrectly or carelessly. Observe them carefully. They indicate:

⚠ DANGER!

INDICATES A HAZARDOUS SITUATION OR ACTION WHICH, IF NOT AVOIDED, WILL RESULT IN DEATH OR SERIOUS INJURY.

⚠ WARNING!

Indicates a hazardous situation or action which, if not avoided, could result in death or serious injury.

⚠ CAUTION!

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTE: Notes provide additional information important to an operation or procedure.

Four commonly used safety symbols accompany the DANGER, WARNING and CAUTION blocks. The type of information each indicates is as follows:



This symbol points out important Safety Information that, if not followed, could endanger personal safety and/or property.



This symbol points out a potential Explosion Hazard.



This symbol points out a potential Fire Hazard.



This symbol points out a potential Electrical Shock Hazard.

⚠ WARNING!



SAVE THESE INSTRUCTIONS. This manual contains important instructions that should be followed during operation and maintenance of the generator and batteries. The manufacturer suggests that these rules for safe operation be copied and posted in potential hazard areas. Safety should be stressed to all operators, potential operators, and service and repair technicians for this equipment.

Study these Safety Rules carefully before operating or servicing this equipment. Become familiar with this Owner's Manual and with the unit. The generator can operate safely, efficiently, and reliably only if it is properly installed, operated, and maintained. Many accidents are caused by failing to follow simple and fundamental rules or precautions.

The manufacturer cannot anticipate every possible circumstance that might involve a hazard. The warnings in this manual, and on tags and decals affixed to the unit are, therefore, not all-inclusive. If using a procedure, work method, or operating technique the manufacturer does not specifically recommend, ensure that it is safe for others. Also make sure the procedure, work method, or operating technique utilized does not render the generator unsafe.

⚠ DANGER!

- Despite the safe design of this generator, operating the equipment imprudently, neglecting its maintenance, or being careless can cause possible injury or death. Permit only responsible and capable persons to install, operate, and maintain this equipment.
- Parts of the generator are rotating and/or hot during operation. Exercise care near running generators.
- The installation must always comply with applicable codes, standards, laws and regulations.

- If the generator is used to power electrical load circuits normally powered by a utility power source, installation of a transfer switch is required. The transfer switch must effectively isolate the electrical system from the utility distribution system when the generator is operating. Failure to isolate an electrical system by such means will result in damage to the generator and also may result in injury or death to utility power workers due to backfeed of electrical energy.
- Potentially lethal voltages are generated by this equipment. Ensure all steps are taken to make the unit safe before attempting any work on the generator.

1.3 — General Hazards

- For safety reasons, the manufacturer recommends that this equipment be installed, serviced, and repaired by an Authorized Service Dealer or other competent, qualified electrician or installation technician who is familiar with applicable codes, standards, and regulations. The operator also must comply with all such codes, standards, and regulations.
- Installation, operation, servicing, and repair of this (and related) equipment must comply with all applicable codes, standards, laws, and regulatory requirements. Also, ensure that the generator is installed, operated, and serviced in accordance with the manufacturer's instructions and recommendations. Following installation, do nothing that might render the unit unsafe or in noncompliance with the aforementioned codes, standards, laws, and regulations.
- The engine exhaust fumes contain carbon monoxide, which can be DEADLY. This dangerous gas, if breathed in sufficient concentrations, can cause unconsciousness or even death. For this reason, adequate ventilation must be provided. Exhaust gases must be piped safely away from any building or enclosure that houses the generator to an area where people, animals, etc. will not be harmed. This exhaust system must be installed properly, in strict compliance with applicable codes and standards.
- Keep hands, feet, clothing, etc. away from drive belts, fans, and other moving or hot parts. Never remove any drive belt or fan guard while the unit is operating. Ensure that all guards, covers, and protective devices removed during maintenance or service are reinstalled.
- Adequate, unobstructed flow of cooling and ventilating air is critical in any room or building housing the generator to prevent buildup of explosive gases and to ensure correct generator operation. Do not alter the installation or permit even partial blockage of ventilation provisions, as this can seriously affect safe operation of the generator.
- Keep the area around the generator clean and uncluttered. Remove any materials that could become hazardous.
- When working on this equipment, remain alert at all times. Never work on the equipment when physically or mentally fatigued.
- Inspect the generator regularly, and promptly repair or replace any worn, damaged, or defective parts using only factory approved parts.
- Before performing any maintenance on the generator, disconnect the battery cables to prevent accidental startup. Disconnect the cable from the battery post indicated by a NEGATIVE, NEG, or (–) first, then remove the POSITIVE, POS, or (+) cable. When reconnecting the cables, connect the POSITIVE cable first, the NEGATIVE cable last.
- Never use the generator or any of its parts as a step. Stepping on the unit can stress and break parts, and may result in dangerous operating conditions from leaking exhaust gases, fuel leakage, oil leakage, etc.

1.4 — Electrical Hazards

- All generators covered by this manual produce dangerous electrical voltages and can cause fatal electrical shock. Utility power delivers extremely high and dangerous voltages to the transfer switch as well as the stationary emergency generator when it is in operation. Avoid contact with bare wires, terminals, connections, etc. on the generator as well as the transfer switch, if applicable. Ensure all appropriate covers, guards, and barriers are in place, secured and/or locked before operating the generator. If work must be done around an operating unit, stand on an insulated, dry surface to reduce potential shock hazard.
- Do not handle any kind of electrical device while standing in water, while barefoot, or while hands or feet are wet. DANGEROUS ELECTRICAL SHOCK MAY RESULT.

- If people must stand on metal or concrete while installing, operating, servicing, adjusting, or repairing this equipment, place insulative mats over a dry wooden platform. Work on the equipment only while standing on such insulative mats.
- The generator must be grounded in accordance with all code and regulatory requirements.
- Wire gauge sizes of electrical wiring, cables, and cord sets must be adequate to handle the maximum electrical current (ampacity) to which they will be subjected.
- Before installing or servicing this (and related) equipment, make sure that all power voltage supplies are positively turned off at their sources. Failure to do so will result in hazardous and possibly fatal electrical shock.
- Connecting this unit to an electrical system normally supplied by an electric utility shall be by means of a transfer switch so as to isolate the generator electric system from the electric utility distribution system when the generator is operating. Failure to isolate the two electric system power sources from each other by such means will result in damage to the generator and may also result in injury or death to utility power workers due to backfeed of electrical energy.
- Generators installed with an automatic transfer switch will crank and start automatically when NORMAL (UTILITY) source voltage is removed or is below an acceptable preset level. To prevent such automatic startup and possible injury to personnel, disable the generator's automatic start circuit (battery cables, etc.) before working on or around the unit. Then place a "DO NOT OPERATE" tag on the generator control panel and on the transfer switch.
- In case of accident caused by electric shock, immediately shut down the source of electrical power. If this is not possible, attempt to free the victim from the live conductor. AVOID DIRECT CONTACT WITH THE VICTIM. Use a nonconducting implement, such as a dry rope or board, to free the victim from the live conductor. If the victim is unconscious, apply first aid and get immediate medical help.
- Never wear jewelry when working on this equipment. Jewelry can conduct electricity resulting in electric shock, or may get caught in moving components resulting in injury.

1.5 — Fire Hazards

- Keep a fire extinguisher near the generator at all times. DO NOT use any carbon tetra-chloride type extinguisher. Its fumes are toxic, and the liquid can deteriorate wiring insulation. Keep the extinguisher properly charged and be familiar with its use. If there are any questions pertaining to fire extinguishers, consult the local fire department.
- All fuel types are potentially FLAMMABLE and/or EXPLOSIVE and should be handled with care.

1.6 — Explosion Hazards

- Properly ventilate any room or building housing the generator to prevent buildup of explosive gas.
- Do not smoke around the generator. Wipe up any fuel or oil spills immediately. Ensure that no combustible materials are left in the generator compartment, or on or near the generator, as FIRE or EXPLOSION may result. Keep the area surrounding the generator clean and free from debris.
- All fuel types are potentially FLAMMABLE and/or EXPLOSIVE and should be handled with care. Comply with all laws regulating the storage and handling of fuels. Inspect the unit's fuel system frequently and correct any leaks immediately. Fuel supply lines must be properly installed, purged, and leak tested according to applicable fuel-gas codes before placing this equipment into service.

Section 2 General Information

2.1 — Unit Identification

2.1.1— Data Label

Each generator set has a DATA LABEL containing important information about the generator. The data label lists the unit serial number, rated voltage, amps, wattage capacity, etc.

NOTE: The figure below is a generic representation only. For actual information on your particular model, refer to the data label(s) affixed to your unit.

2.1.2— Model Identification Code

The model identification code gives important information about the generator set. For example, if the code is:

SG 0100 A G03 6.8 N 23 H B Y Y 3

Then the generator would have the attributes shown in bold below:

SG	Stationary gaseous generator.	
	SD	Stationary diesel generator.
0100	Rated output is 100,000 watts (100kW).	
A	Voltage code (see Subsection 2.1.3).	
G03	Indicates engine MFG (for manufacturer's use).	
6.8	Engine is 6.8 liter.	
N	Natural Gas fuel system.	
	L	LP Liquid Withdrawal fuel system.
	V	LP Vapor Withdrawal fuel system.
	R	Dual fuel system with LP liquid as secondary.
	P	Dual fuel system with LP Vapor as secondary.
	D	Diesel fuel system.
23	2,300 Engine rpm rating (15 = 1500 rpm, 18 = 1,800 rpm, etc.) NOTE: Engines operating above 1,500 or 1,800 rpm use a gearbox to reduce the engine rpm to the desired alternator rotor rpm of 1,500 rpm (50 Hz operation) or 1,800 rpm (60 Hz operation).	
H	Unit has optional "H" control panel.	
B	Brushless excitation.	
	P	Permanent magnet excitation.
Y	Standard enclosure equipped.	
	N	No enclosure — suitable for indoor installation.
	S	Level 1 sound attenuation.
	L	Level 2 sound attenuation.
Y	Exhaust muffler mounted.	
	N	Exhaust muffler not provided.
	L	Exhaust muffler shipped loose with unit.
3	Emission designation (for factory use).	

GENERATOR UNIT

GEN MODEL:
MODEL: SG0100AG036.8N23HBYY3
SERIAL:
ALTERNATE
PROD DATE:
COUNTRY OF ORIGIN: _____

GENERATOR DATA

KW	KVA	HZ	PF
UPSIZE	ALT	KW	KVA
VOLT	/	AMP	
ENG RPM		ALT RPM	
BREAKER	KW	AMP	
X'D		X'D	

ROTOR	STATOR	CLASS
WINDINGS @	AMBIENT	TEMP
		MANUF. LOC.

OK0876

Sample

2.1.3— Voltage Code

The letter following the kilowatt rating in the model identification code is the voltage code. The voltage code indicates the following:

Code	Description
A	120/240 volts, single-phase, four-lead, 60 Hz
D	120/240 volts, single- and three-phase, 12-lead, 60 Hz
G	120/208 volts, three-phase, 12-lead, 60 Hz Broad Range
H	231/400 volts, three-phase, 12-lead, 60 Hz Broad Range
J	120/240 volts, three-phase, 12-lead, 60 Hz Broad Range
K	277/480 volts, three-phase, 12-lead, 60 Hz Broad Range
L	346/600 volts, three-phase, six-lead, 60 Hz
M	110/220 volts, single-phase, four-lead, 50 hz
N	115/200 volts, three-phase, 12-lead, 50 Hz Broad Range
P	100/200 volts, three-phase, 12-lead, 50 Hz Broad Range
R	231/400 volts, three-phase, 12-lead, 50 Hz Broad Range
S	277/480 volts, three-phase, six-lead, 50 Hz

2.2 — Equipment Description

This equipment is a revolving field, alternating current type generator set. The generator is designed to supply electrical power for the operation of compatible electrical loads when the utility power supply is not available or has dropped to an unacceptable level.

The generator's revolving field is directly connected to and driven by an engine by means of flexible discs or a gearbox. Generators with a four-pole rotor are driven at a rated speed of 1,800 rpm to supply a frequency of 60 Hertz. Four-pole rotors operating at 50 Hertz are driven at 1,500 rpm.

Refer to the data label affixed to the unit for rated AC voltage, wattage, amperage, number of phases, etc. See Subsection 2.1.2 for an explanation of how to identify the unit's features.

2.2.1— Standard Generator Features

The generator incorporates the following features:

- The rotor insulation system is Class "H" rated, and the stator insulation is Class "H" rated as defined by NEMA MG1-22.4 and NEMA MG1-1.65.
- The generator is self-ventilated and drip-proof constructed.
- The voltage waveform deviation, total harmonic content of the AC waveform and "telephone influence factor" have been evaluated and are acceptable according to NEMA MG1-22.
- All prototype tested models have passed three-phase symmetrical short circuit test to ensure system protection and reliability.

2.2.2— Generator and Load Compatibility

The generator must be fully compatible with the rated voltage, phase, and frequency of the connected electrical loads. The generator, connected electrical devices, or both, can be damaged if voltage, phase, and frequency are not compatible.

NOTE: This manual assumes that the generator set has been properly selected, installed and interconnected by a competent, qualified electrician or installation contractor. Once the installation is complete, do nothing that may result in non-compatibility between the generator and connected electrical loads.

2.2.3— Single-Phase “A” or “M” Code Units

The following statement applies to single-phase units with an “A” or “M” code alternator:

The generator is suitable for supplying typical residential loads, such as induction motors (sump pumps, refrigerators, air conditioners, furnaces, etc.), electronic components (TV, computer, monitor, etc.), lighting loads, and microwaves.

2.2.4— Three-Phase Load Imbalance Limits

For three-phase units the maximum load imbalance between phases can not exceed 25% of rated load (current).

2.2.5— Ambient Condition Derate

The maximum ambient temperature for the generator is indicated on the unit data label. Derate values for ambient temperature in excess of that indicated on the data label, as well as altitude, may apply depending on the engine and kW rating of the unit. Consult an Authorized Service Dealer for any derate values applicable to this specific generator at its installed location.

2.3 — Engine/Generator Protective Devices

The generator set may be required to operate for long periods of time without an operator on hand to monitor conditions such as coolant temperature, oil pressure, voltage, frequency, etc. For this reason, the generator set has numerous sensors to provide the control panel with the information it needs to protect both the engine and generator. The control panel is designed to shut down the engine if potentially damaging conditions occur. These conditions can include low oil pressure, high coolant temperature, low coolant level, engine overspeed, over or under voltage, over or under frequency, etc. These settings are configured at the factory and can be changed/adjusted by an Authorized Service Technician if required.

NOTE: Engine/generator protective devices are only mentioned here for the owner/operator’s general information. For details, consult the applicable control panel technical manual. The list below is not all inclusive.

2.3.1— Coolant Temperature Sensor

The control panel automatically shuts down the engine if the engine coolant temperature rises above a safe level.

2.3.2— Low Coolant Level Sensor

Should the engine coolant level drop below the level of the low coolant temperature sensor, it is possible for the engine to overheat without automatic shutdown. To prevent such overheating, the engine has a low coolant level sensor. If the level of engine coolant drops below the level of the low coolant level sensor, the control panel will shut the engine down.

2.3.3— Oil Pressure Sensor

This sensor monitors engine oil pressure. If oil pressure drops below a safe level, the control system automatically shuts down the engine.

2.3.4— Overspeed Shutdown

A speed circuit controls engine cranking, startup, operation, and shutdown. Engine speed signals are delivered to the control panel whenever the unit is running. Should the engine overspeed above a safe, preset value, the control panel initiates an automatic engine shutdown.

2.3.5— Overcrank Shutdown

After a pre-specified duration of cranking, this function ends the cranking if the engine has failed to start. The default settings are:

- The unit will attempt to start (crank) three times.
- Each crank cycle lasts either 10 or 15 seconds, followed by a five second rest (to cool the starter).
- After three starting attempts the unit will shutdown.

2.3.6— RPM Sensor Loss Shutdown

If the speed signal to the control panel is lost, engine shutdown will occur.

2.3.7— Low Fuel Pressure Warning

- Some gaseous units are equipped with a low fuel pressure warning switch which will trigger a Warning alarm if the fuel pressure drops below a minimum setting.
- Diesel units with fuel tanks are equipped with High and Low fuel level warning alarms, as well as a low fuel level shutdown alarm.

2.4 — DC Fuses

Located inside the front panel, the fuses protect the control panel wiring and components from damaging overload. For fuse location and identification, see Figure 3-4.

2.5 — Fuel System

This generator set is equipped with one of the following fuel systems:

- Diesel fuel system
- Natural Gas (NG) fuel system
- LP gas vapor withdrawal fuel system (LPV)
- LP gas liquid withdrawal fuel system (LPL)
- Dual fuel system: Natural Gas (primary fuel source), LP gas vapor (secondary fuel source)
- Dual fuel system: Natural Gas (primary fuel source), LP gas liquid (secondary fuel source)

2.5.1— Diesel Fuel System

The manufacturer recommends the use of No. 2 diesel fuel when temperatures are above freezing, and No. 1 diesel fuel when temperatures drop below freezing. Diesel fuel must meet the following requirements:

Beginning October 1, 2010, owners and operators that use diesel fuel must use diesel fuel that meets:

- Sulfur content of 15 parts per million (ppm) maximum.
- Cetane index or aromatic content as follows: A minimum cetane index of 40, or a maximum aromatic content of 35 volume percent.

2.5.2— Natural Gas Fuel System

Natural gas is supplied by a local utility in its vapor state through in ground piping.

2.5.3— LP Fuel System

LP is supplied as a liquid in pressurized tanks. It is usually made up of propane, butane, or a mixture of both gases.

2.5.3.1—LP Vapor Withdrawal Fuel System

Utilizes the vapors formed above the liquid fuel in the supply tank. Approximately 10 to 20 percent of the tank capacity is needed for fuel expansion from the liquid to the vapor state.

2.5.3.2—LP Liquid Withdrawal Fuel System

LP in a liquid withdrawal system must be converted to its gaseous state before it is introduced into the engine carburetor. A vaporizer converter is used to accomplish this. In such a converter, heated engine coolant is ported through the converter to provide the necessary heat for conversion of the fuel from a liquid to a gaseous state.

NOTE: Units with LP gas liquid withdrawal systems incorporate a block heater as standard equipment. The heater is powered by the utility power source during non-operating periods to provide heated coolant to aid in the fuel vaporization process.

2.5.3.3—Dual Fuel: NG/LP Fuel System

Some applications require the use of a “dual-fuel” system. This type of fuel system allows the generator to run on either natural gas (primary) or LP vapor or liquid (secondary). In the event that the primary source (utility supplied) becomes unavailable, the unit automatically switches to the secondary source. It can do so while in operation or while not operating.

2.6 — Specifications

2.6.1— Generator

Refer to the data plate on the generator for rated watts, amperes, frequency, voltage, phase, and other important information.

2.6.2— Engine Oil Recommendations

The engine has been filled with factory engine oil of a grade recommended by the engine supplier as follows:

- Gaseous Engines: 6.8L displacement or smaller - SAE 5W-20; Displacement larger than 6.8L - SAE 40.
- Diesel Engines: SAE 15W-40

The manufacturer recommends an initial oil and filter change after the first 50 hours (or first 3 months) of service operation. Use a high quality detergent oil with an appropriate classification and viscosity for the engine type and ambient temperature conditions. Consult your Authorized Servicing Dealer for oil recommendations. Synthetic oils meeting the same service category and viscosity requirements for the application may be used.

- Recommended API Service Category for gaseous engines: SJ, SL, SM, or SN.
- Recommended API Service Category for diesel engines: CH-4, CI-4, or CJ-4

2.6.3— Coolant

Use only deionized or distilled water and Ethylene glycol antifreeze (Propylene glycol can also be used but do not mix with Ethylene glycol). When adding coolant, always add the recommended 50-50 mixture.

⚠ DANGER!



- **DO NOT** remove the radiator pressure cap while the engine is hot. Serious burns from boiling liquid or steam could result.
- Ethylene glycol base antifreeze is poisonous. Do not use mouth-to-siphon coolant from the radiator, recovery bottle, or any container. Wash hands thoroughly after handling. Never store used antifreeze in an open container because animals are attracted to the smell and the taste of antifreeze even though it is poisonous.



Do not use any chromate base rust inhibitor with propylene glycol base antifreeze. Using any high silicate antifreeze boosters or additives also will cause overheating. The manufacturer also recommends that any soluble oil inhibitor is **NOT USED** for this equipment.

2.6.4— Gearbox Lubrication (If Equipped)

Use only SAE 90 gear oil with the correct proportion of Lucas Heavy Duty Oil Stabilizer. See the Maintenance section for more information.

2.7 — Starting Aids (If Equipped)

One or more of the following starting aids may be provided to ensure quicker, easier starts under varying climactic conditions.

- Engine coolant heater
- Engine oil heater
- Battery warmer

These aids are powered by a normal (utility) power source during non-operating periods.

2.7.1— Engine Coolant Heater

Heats the engine coolant when the unit is not operating. This action keeps the engine warm even in cold weather, helping to ensure quicker starts. Powered by a circuit normally fed by the utility power supply.

2.7.2— Engine Oil Sump Heater

Keeps the oil in the sump heated to allow easier starting and faster engine warm-up. Powered by a circuit normally fed by the utility power supply.

2.7.3— Battery Warmer

Keeps the battery warm so it can provide full cranking current when starting in cold conditions. Powered by a circuit normally fed by the utility power supply.

Section 3 Operation

3.1 — Generator Control and Operation

The operation of this generator set should only be performed by an “Authorized Operator,” that is, someone who has been properly trained by an Authorized Service Dealer. Contact your local Authorized Service Dealer for assistance in training Authorized Operators.

The following instructions assume that the generator has been properly installed, serviced, tested, adjusted, and otherwise prepared for use by a competent, qualified installation contractor and Authorized Service Dealer. Carefully read the Safety Rules and any other safety information before attempting to operate this (and related) equipment.

3.1.1— Grounding the Generator

Ground the generator set in accordance with all codes and regulatory requirements.

⚠ DANGER!



DO NOT connect the ground wire to any pipe that carries a flammable or explosive substance as FIRE or EXPLOSION may result.

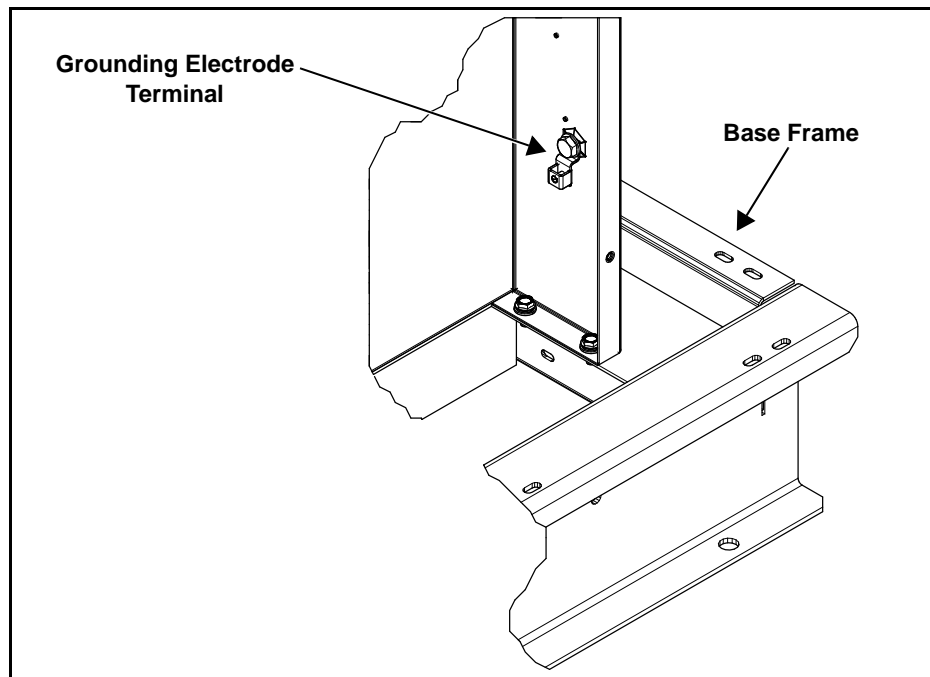


Figure 3-1. Grounding Electrode Terminal (Typical)

3.1.2— Generator AC Neutral Connections

Grounding is recommended only at one point in the system. Consult local building codes for proper neutral grounding requirements.

3.1.3— Initial Startup

The initial startup of the generator set must be performed and documented by an Authorized Service Dealer.

3.2 — H-100 Panel Interface

The H-100 Panel Interface mounted on the generator allows the operator to monitor, and if necessary, manually start the generator.

3.2.1— Emergency Stop Button

The red Emergency Stop Button is the top button on the right side of the panel. Pressing the button while the unit is running will immediately shut the generator down. To restart the unit, the Emergency Stop Button must be manually reset, the Key Switch turned to the “OFF” position, and then turned to either the “AUTO” or “MAN” position, depending on the desired mode of operation.

3.2.2— Common Alarm Horn

Directly below the Emergency Stop Button is a Common Alarm Horn. The “Common Alarm and Digital Output Function #1” are activated whenever a fault condition is set for “Alarm” and if the fault is “Active.” The Common Alarm will not activate on “Warnings” or “DTC” fault conditions. Pressing the “ENTER” button on the key pad will acknowledge the alarm and silence the horn. The manufacturer recommends that the local service dealer be notified of any alarm condition in order for qualified service personnel to assess and correct the situation.



Figure 3-2. H-100 Control Panel Interface

3.2.3— Key Switch

A manual three-position Key Switch is located beneath the Common Alarm Horn. The positions are:

- **AUTO:** The generator will automatically start when a properly connected automatic transfer switch senses a loss or reduction of available utility power.
- **OFF:** Immediately shuts down the generator and/or prevents it from starting automatically.
- **MAN:** Immediately starts the generator.

3.2.4— Left Display Window

The Left Display Window can be configured to display different menus. See the H-100 Operations Manual for more information. Normally, the following information is displayed:

- Volts
- Hertz
- Amps
- Kilowatts
- Frequency

3.2.5— Right Display Window

The Right Display Window displays:

- Alarm information
- HOME menu: basic engine menu information, such as oil pressure, oil temperature, water temperature, battery voltage
- MENU: main menu navigation screen

Alarms	Left Display
Engine	Generator
Status	Diagnostic
Service	Exercise/HTS

Figure 3-3. Right Display Window (Press MENU)

3.2.6— Arrow Keys Pad

The key pad contains four arrow keys, a HOME key, a MENU key, and an ENTER key. Two LEDs are also present, one labeled NOT IN AUTO and the other ALARM.

Use the arrow keys to navigate through the menus displayed in the Display Windows. For example, when the HOME key is pressed, the HOME menu is displayed in the Right Display Window. When a flashing cursor appears within a line of the text, move the cursor up, down, left, or right by pressing the corresponding arrow key.

The NOT IN AUTO LED flashes once each second when the Key Switch is moved to the OFF or MAN positions.

During normal operation when no alarms are present, the ALARM LED flashes for one second every 30 seconds (approximate) to indicate that the panel is operational. When an active alarm condition is detected, the ALARM LED flashes once each second. The LED remains ON if the alarm condition is acknowledged, but still active.

3.2.7— Fuse Block

The fuse block is located inside the control panel at the back lower left corner. The 10 amp fuse in the F2 slot is the control panel fuse.

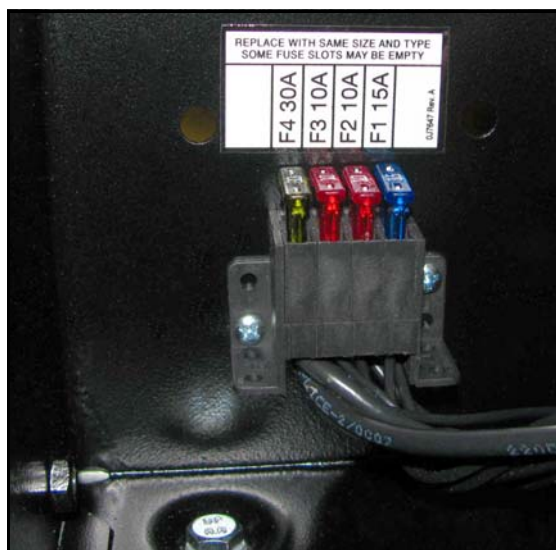


Figure 3-4. Panel Fuse Block

NOTE: Some units will NOT have a fuse in the F4 slot.

3.3 — Additional Components

3.3.1— Main Line Circuit Breaker

A Main Line Circuit Breaker (MLCB) is located on the face of the High Voltage Customer Connections panel, typically situated to the right of the H-100 Control Panel. The MLCB serves as the means of disconnect at the generator, to disconnect it from the Transfer Switch.

3.3.2— Automatic Transfer Switch

A typical automatic transfer switch monitors utility voltage and when that voltage falls outside of specific parameters, it will initiate the generator start command. As long as the generator control is in the AUTO position, it responds to the automatic transfer switch start command.

For information about any connected automatic transfer switch, consult the applicable transfer switch owner's manual.

⚠ DANGER!



Connecting this generator to an electrical system normally supplied by an electric utility shall be by means of a transfer switch (either fully automatic or manual), so as to isolate the electric system from the utility distribution system when the generator is operating. Failure to isolate the electric system by these means will result in damage to the generator and may also result in injury or death to utility workers due to backfeed of electrical energy.

3.3.3— Automatic Battery Charger

One of the following types of battery chargers may be provided:

- 2.5-amp
- 10-amp

The 2.5-amp charger is 12 VDC only. The 10-amp charger is available either as a 12 VDC or 24 VDC, as appropriate for the engine's DC system voltage.

Both chargers are fully automatic float types and are fully fuse protected (input and output). They have automatic current limiting to reduce risk of overcharging, and have automatic maintenance of charge voltage. Therefore, they can be connected to the batteries continuously.

The chargers require the connection of a charged battery in order to turn on. The battery provides boost voltage for the charger, so a completely dead battery will not allow the charger to operate. The boost required is approximately 9 to 11 volts for a 12 VDC system, and 18 to 22 volts for a 24 VDC system. Replace the battery if it is below the boost voltage.

3.3.4— Engine Coolant Heater (If Equipped)

Heats the engine coolant when the unit is not operating. This action keeps the engine warm even in cold weather, helping to ensure quicker starts. Powered by a circuit normally fed by the utility power supply.

3.3.5— Engine Oil Sump Heater (If Equipped)

Keeps the oil in the sump heated to allow easier starting and faster engine warm-up. Powered by a circuit normally fed by the utility power supply.

3.3.6— Battery Warmer (If Equipped)

Keeps the battery warm so it can provide full cranking current when starting in cold conditions. Powered by a circuit normally fed by the utility power supply.

3.4 — Alarm Response Procedures

The generator is protected by factory set alarms and warnings. The alarms and warnings alert the owner/operator of a fault condition that requires attention and action to keep the generator operating in an efficient and safe running order.

3.4.1— Alarm Types

When any alarm is triggered, the Common Alarm Horn sounds, the Alarm LED flashes, and the Alarm Page in the Right Display Window becomes active.

NOTE: Not all faults can be corrected and cleared by the owner/operator. Some Warnings and most Alarm conditions must be safely cleared by a qualified dealer or trained technician.

3.4.1.1—Warnings

Warnings are the lowest level alarm, and are generated to alert the operator that an operating condition has changed and may require action or inspection. Warnings clear once they are no longer active.

3.4.1.2—Non-Shutdown Alarms

Non-shutdown alarms are more urgent than warnings, and indicate a system parameter which is approaching or has exceeded a safe operating limit. Non-shutdown alarms require some form of action, such as inspection, close monitoring, etc. These types of alarms clear when they are no longer active and have been acknowledged.

3.4.1.3—Shutdown Alarms

Shutdown Alarms protect the generator from damage and indicate a system fault that if continued without immediate inspection or correction would result in damage to the unit. Shutdown Alarms are cleared only after the key switch has been placed in the OFF position and they are no longer active.

3.4.2— Alarm Display Window

Three system warning and alarm pages can be displayed in the Right Display Window. Each page is capable of displaying three warnings and/or alarms. If there are more than nine total warnings/alarms, only the most recent are displayed. All warnings and alarms remain in the list until they are cleared.

- Warnings clear when they are no longer active.
- Alarms clear when they have been acknowledged and the alarm condition has been corrected.
- Shutdown alarms clear only after they have been acknowledged, the alarm condition has been corrected, the Key Switch has been cycled from the “AUTO” to the “OFF” position, and the alarm is no longer active.

Any active warning or alarm condition will sound the Common Alarm Horn, and the Right Display Window immediately changes to the first alarm page.

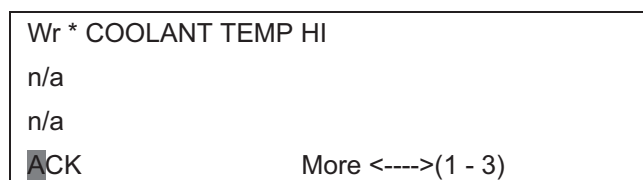


Figure 3-5. System Alarm Warning Page

See Figure 3-5. The alarm page display indicates the following:

Wr	=	Warning (Al = Alarm, SD = Shutdown alarm).
*	=	Indicates the alarm has not been acknowledged.
COOLANT TEMP HI	=	Indicates the fault condition. (Hi = tripped by being above the threshold; Lo = tripped by being below the threshold).
n/a	=	Indicates that no additional alarms or warnings exist and that these lines are vacant.
Cursor flashes on the "A" in "ACK"	=	Press the ENTER key to acknowledge the alarm. The horn stops and the asterisk (*) is removed from the display.
More <--->(1-3)	=	Indicates that as many as three pages of alarm information may be available.

3.4.3— General Fault Response Procedure

1. Press the ENTER key to acknowledge the fault, silence the alarm horn, and switch the ALARM LED from flashing to ON.
2. Carefully read each line of the Alarm Warning Page to determine what fault condition is present. If there is more than one fault, the most recent is listed first.
3. Press the MENU key to display the main menu navigation screen.
4. Depending on the fault condition, use the arrow keys to toggle to the corresponding area and press the ENTER key.
5. Observe the information displayed for the affected area.
6. Determine corrective action necessary.
7. When the fault condition is cleared, the ALARM LED will turn off.

3.5 — Operating the Unit with an Automatic Transfer Switch

If the generator has been installed along with an automatic transfer switch, the engine may be started and stopped automatically or manually.

NOTE: Refer to the applicable manual for any transfer switch being used and note the dangers during operation.

Normal operation is the generator in "Automatic" working with an automatic transfer switch. When the transfer switch senses a utility failure or loss it will provide a start command to the generator, the generator will automatically start and the transfer switch will transfer power to the load from utility to generator (emergency). It is important that both the generator and any connected automatic transfer switch(es) be properly connected and in "Automatic" mode for normal operation to work.

3.6 — Operating the Unit with a Manual Transfer Switch

If the generator was installed in conjunction with a transfer switch capable of manual operation only, or when an automatic transfer switch has failed and can only be transferred manually, the following procedure applies. A manually operated transfer switch is one that will not provide automatic startup.

⚠ DANGER!



DO NOT attempt to operate a manual transfer switch, or an automatic transfer switch in the manual mode, until all power supplies (utility and generator) to the transfer switch have been positively turned OFF, or extremely dangerous, and possibly lethal, electrical shock can result.

Transfer switch enclosure doors should be kept closed and locked. Only authorized personnel should be allowed access to the transfer switch interior. Extremely high and dangerous voltages are present in the transfer switch.

3.6.1— Manual Engine Startup and Transfer

If the unit is equipped with a control panel other than the H-100, refer to the applicable documentation for that panel. For additional and specific information about any transfer switch connected to the generator, refer to the applicable transfer switch manual as well.

In order to manually transfer load from the utility source to the generator (emergency source):

1. With the generator OFF, and the generator Main Line Circuit Breaker in the OFF (OPEN) position, turn OFF or disconnect the utility power circuit to the transfer switch, using the means provided (such as the utility source main line circuit breaker or other means of disconnect).
2. Set the transfer handle to its EMERGENCY (STANDBY/GENERATOR) position with load circuits connected to the emergency (generator) power supply.
3. Set the generator's main line circuit breaker to its OFF (OPEN) position.
4. Start the generator.
5. Allow the engine to stabilize and warm up.
6. Check all applicable instrument and gauge readings. When certain that all readings are correct, set the emergency generator's Main Line Circuit Breaker to its ON (CLOSED) position.
7. Load circuits are now powered by the stationary emergency generator.

3.6.2— Re-Transfer and Shutdown

To manually transfer the load back to the utility power source and shut down the generator:

1. Set the stationary emergency generator's main line circuit breaker to its OFF (OPEN) position.
2. Make sure utility power to the transfer switch is OFF (open the utility disconnect).
3. Manually move the transfer switch handle to its UTILITY (NORMAL) position, i.e., load circuits connected to the utility.
4. Turn ON the utility power supply to the transfer switch using the means provided (such as the utility power source main line circuit breaker).
5. Allow the generator to run at no-load for five to ten minutes to stabilize internal temperatures.
6. Shut down the generator.

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Section 4 Maintenance

4.1 — Maintenance Schedule

Periodic inspection, service, and maintenance of this unit is critical in ensuring its reliable operation. The following is the manufacturer's recommended maintenance schedule. The established intervals are the maximum required when the unit is used in typical standby service applications (approximately 200 hours per year). The maintenance items will need to be performed more frequently if the unit is used in severe applications (such as long duration outages, very high or very low ambient conditions, or extremely dirty/dusty environments). Use the unit hour meter or calendar time, whichever occurs first, from the previous maintenance interval to determine the next required maintenance interval. Note that some checks are based on hours of operation.

There may be times when the generator must operate continuously for long periods of time (for example, extended utility outages). During such extended operational periods some items will require more frequent checking (based on hours). Use the "Extended Run-Time Maintenance Checks" recommendation for such periods of operation.

Be sure to follow all applicable safety and caution statements found in the unit operating manual or engine service/maintenance manual before performing any maintenance checks or service.

This maintenance schedule reflects the minimum tasks that need to be accomplished to ensure that the unit remains operational. Some of the tasks can be performed by an authorized operator and others must be performed by an Authorized/Qualified Service Dealer Technician.

NOTE: An authorized operator is one who has been trained by a Manufacturer Authorized Service Dealer in the proper operation and inspection of this standby generator set.

4.1.1— Service Maintenance Intervals

Extended Run-Time Maintenance Checks: Daily checks which must be performed when the unit is operated continuously for extended periods of time. These checks and routine monthly checks can be performed by an authorized operator.

NOTE: For units equipped with a gearbox, the gearbox oil should be checked monthly or every 100 hours of operation.

- 1A. A **one-time** post installation, initial operation, service inspection of the generator set to ensure it is ready to operate, transfer to, and carry the load when required, and to identify any potential problem areas. *Performed ONLY ONCE following the first three months or the first 50 hours of operation after installation/startup of the unit and requires approximately 2.5 hours per unit to complete.*

The various service maintenance intervals are designated by interval numbers:

1. A frequent, periodic inspection of the generator set to ensure it is ready to operate when required and to identify any potential problem areas. *Performed monthly, or every 24 hours (interrupted) of operation of the unit, and requires approximately 0.5 hours per unit to complete.*
2. An operational service inspection of the generator set to ensure it is ready to operate and carry the load when required, and to identify any potential problem areas. *Performed semi-annually (6 months) or every 100 hours of operation of the unit and requires approximately 1.5 hours per unit to complete.*
3. A mid-level service inspection of the generator set to ensure it is ready to operate and carry the load when required, and to identify any potential problem areas. *Performed annually or every 200 hours of operation of the unit and requires approximately 6.0 hours per unit to complete.*
4. A comprehensive service inspection of the generator set to ensure it is properly serviced and ready to operate and carry the load when required, and to identify any potential problem areas. *Performed biannually (every 24 months or 500 hours) and requires approximately 8.0 hours per unit to complete.*

NOTE: Maintenance levels 2, 3, and 4 require the use of the applicable engine service manual and must be performed by a qualified service technician.

4.1.2— Maintenance Schedule

The following pages contain the maintenance schedule describing the checks/tasks which need to be accomplished at each designated maintenance interval. Some maintenance level tasks are combined. For example, if the 6 month tasks are due, both the monthly and the 6 month task should be completed at the same time. Similarly, when the annual tasks are due, the monthly and semi-annual tasks should also be completed. There is space on the sheets for recording the date and signature of the person completing the task, as well as recording the engine hours and other pertinent information. At the bottom of each sheet, space is also provided to record any fluids added, parts replaced or corrective action taken. All of this recorded information provides a detailed maintenance history of the unit. This maintenance history may be required for warranty validation purposes, and is a good idea to maintain throughout the lifetime of the unit. It is recommended by the manufacturer that service procedures beyond the normal monthly checks be performed by an Authorized Service Dealer.

4.1.3— Notes and Maintenance Item Explanations

Maintenance Item	Description
Oil and Oil Filter	Change oil and filter shortly after start up or commissioning of the unit. The recommendation is that this be done after the first 50 hours of operation or after the first three months of service. Perform oil and filter changes every 200 hours (or yearly) thereafter. If an oil analysis program is used (annually), the acceptable oil change interval can be extended to 500 hours or every 2 years, based on the results of the analysis.
Gearbox Oil (If Equipped)	Change gearbox oil every 2 years or 600 hours of operation. Check gearbox oil level monthly or every 100 hours of operation.
Coolant Quality	Check coolant annually for proper thermal protection levels. Drain, flush, and refill the cooling system with fresh coolant every 2 years regardless of operating hours.
Flexible Hoses	Change coolant, fuel (gaseous supply hoses from regulator to mixer), oil, charge air cooling, and block heater hoses, flexible joints, etc.) every 2 years regardless of operating hours.
Accessory drive belts	Replace accessory drive belts every 2 years regardless of operating hours. If necessary, check and replace automatic tensioner (if used).
Magnetic Pickup(s) mounted on flywheel housing	Remove, clean, inspect, and reset magnetic pickups to the correct operational output voltage every 2 years.
Crank and/or Cam Pickup for ignition system	Visually inspect (outside) for cleanliness and tightness.

NOTE: Certain applications may require more frequent maintenance checks and more frequent operation under load.

NOTE: This schedule does not reflect all of the possible requirements of an individual engine manufacturer service schedule, particularly if the unit is used in other than a standby power application.

NOTE: For more information about service schedules and support for your application, please consult your local Authorized Service Dealer.

4.2 — Extended Run-Time Maintenance Checks

These maintenance tasks can be performed by a trained authorized operator. Comply with all safety notices contained in the Owner's Manual.

<p style="text-align: center;">Authorized Operator Maintenance Tasks. Perform steps 1 through 8 and 11 every 24 continuous operating hours. These checks require approximately 0.5 hours per unit.</p>	<p style="text-align: center;">Task Completed Date/Initials</p>
1. Before shutting the unit down, perform a thorough visual inspection for leaks, loose components or connections, excessive apparent wear or damage. Any discrepancies noted should be further inspected and corrected while the unit is shut down.	
2. Shut the unit down per the procedure in the owner's manual.	
3. Check the engine oil level. The level should be between the low and full markings on the dipstick. Adjust as necessary.	
4. Check the engine coolant level. Make sure the level in the coolant catch tank is between the cold and hot level markings. Adjust as necessary. Use only a 50/50 mixture of appropriate coolant.	
5. Visually inspect the engine accessory drive belts and fan coupling device (if equipped) for correct tension and any signs of abrasion, wear, deterioration or damage. Correct as necessary.	
6. Visually inspect all hoses and connections (exhaust, intake, coolant, block heater, fuel lines and filters, oil filters, etc) for leaks, tightness, signs of deterioration, wear, or damage. Correct as necessary.	
7. Check the air inlets and outlets (enclosure or building vents) for debris or blockage. Correct as necessary.	
8. Visually inspect the fuel supply system for signs of leaks or damage. Correct as necessary.	
9. Gearbox Equipped Only: Check the gearbox oil level every 100 operating hours. Adjust as necessary.	
10. Weekly When Operating: Check the battery electrolyte level (if accessible). Adjust as necessary (add only distilled or deionized water to replenish battery cells).	
11. Return the unit to operational condition and restart. Check unit voltage and frequency. Visually inspect the unit for leaks, loose connections or components. Place the unit back in service.	
Date inspection Completed:	Unit Hour-Meter Reading:
Technician/Authorized Operator Signature signifying inspection complete:	
Record any oil or coolant added and notes about any discrepancies found and corrective action taken.	

4.5 — Maintenance Level 2 - Semi-Annual

These maintenance tasks must be performed by a trained/qualified service technician. Perform these tasks every 6 months or every 100 hours of operation. Perform these tasks in addition to the regularly scheduled Monthly maintenance tasks. Comply with all safety notices contained in the Owner's Manual. Some of the tasks will require the use of the applicable engine service manual.

Qualified Service Technician Maintenance Tasks Requires approximately 2.0 hours per unit.	Task Completed Date/Initials
1. Disable the unit from operating per the procedure found in the owner's manual.	
2. Check the engine accessory drive belts and fan coupling device (if equipped) for correct tension, wear, abrasion, deterioration, or damage. Correct as necessary.	
3. Check all hoses, piping, and connections (intake, exhaust, coolant, block heater, fuel and filters, oil lines and filters) for tightness, leaks, deterioration or damage. Correct as necessary.	
4. Load test the battery or test electrolyte levels (specific gravity) with a hydrometer.	
5. Return the unit to operational condition and test. Place the unit in automatic and open the service disconnect to force the unit to start and transfer to the load. Exercise the unit against the load for 15 minutes, visually inspecting for leaks, loose connections or components, and any abnormal operating conditions. Record the unit voltage and frequency while running. Restore utility power and monitor transfer to utility, cool-down and shutdown. Correct any discrepancies. Voltage: Frequency: kW: kVA:	
6. If the control has alarm and/or event or run logs, record the alarm and event logs to a history file for the unit.	
7. Return the unit to operational condition.	
Date inspection Completed: _____ Unit hour Meter Reading: _____	
Technician/Authorized Operator signature signifying inspection complete: _____	
Record any oil or coolant added and notes about any discrepancies found and corrective action taken.	

4.6 — Maintenance Level 3 - Annual

These maintenance tasks must be performed by a trained/qualified service technician. Perform these tasks every 12 months or every 250 hours of operation. Perform these tasks in addition to the regularly scheduled Monthly and Semi-Annual maintenance tasks. Comply with all safety notices contained in the Owner's Manual. Some of the tasks will require the use of the applicable engine service manual.

Qualified Service Technician Maintenance Tasks Requires approximately 6.0 hours per unit.	Task Completed Date/Initials
1. Disable the unit from operating per the procedure found in the owner's manual. Some of the following tasks will require the use of the applicable engine service manual.	
2. Change the engine oil.	
3. Change the engine oil filter(s).	
4. Inspect the air filter. Replace as necessary.	
5. Gaseous Units Only: Inspect, clean, and gap the spark plugs. Replace as necessary.	
6. Gaseous Units Only: Inspect ignition wires for damage, deterioration and tightness. Replace as necessary.	
7. Diesel Units Only: Test the fuel quality. If required, strip any water/sediment from the tank. Filter or polish the fuel and add any additional additives required to maintain fuel quality.	
8. Diesel Units Only: Change the primary and secondary fuel filters (if equipped). Clean any water separator or mechanical strainer (if equipped). Prime and bleed the fuel system per the engine service manual procedures.	
9. Check the engine accessory drive belts and fan coupling device (if equipped) for correct tension, wear or abrasion, deterioration, or damage. Correct as necessary.	
10. Check all hoses, piping, and connections (intake, exhaust, coolant, block heater, fuel and filters, oil lines and filters) for tightness, leaks, deterioration or damage. Correct as necessary.	
11. Visually inspect the radiator and charge air core (if equipped) for any build up of dirt, debris, or oil contamination (external). Clean, correct as necessary.	
12. Check the coolant thermal protection level. Correct as necessary.	
13. Check all wiring connections in the high voltage and low voltage connection panels. Check for loose connections, corrosion, arcing or damage. Check torque on all main load lugs at generator connections (MLCB) and transfer switch connections (refer to applicable transfer switch manual). Correct as necessary.	
14. Return unit to operational condition and test. Place unit in automatic and open the service disconnect to force the unit to start and transfer to the load. Exercise unit against the load for 1 hour (60 minutes). Visually inspect for leaks, loose connections or components, and any abnormal operating conditions. Record unit voltage, frequency and kW while running. Restore utility power and monitor transfer to utility, cool-down and shutdown. Correct any discrepancies. Voltage: Frequency: kW: kVA:	
15. If control has alarm and/or event or run logs, record the alarm and event logs to a history file.	
16. Return the unit to operational condition and place back in automatic operation.	
Date inspection Completed:	Unit hour Meter Reading:
Technician/Authorized Operator signature signifying inspection complete:	
Record any oil or coolant added and notes about any discrepancies found and corrective action taken.	

4.7 — Maintenance Level 4 - Bi-Annual

These maintenance tasks must be performed by a trained/qualified service technician. Perform these tasks every 24 months or every 500 hours of operation. Perform these tasks in addition to the regularly scheduled Monthly, Semi-Annual and Annual maintenance tasks. Comply with all safety notices contained in the Owner's Manual. Some of the tasks will require the use of the applicable engine service manual.

Qualified Service Technician Maintenance Tasks Requires approximately 6.0 hours per unit.	Task Completed Date/Initials
1. Disable the unit from operating per the procedure found in the owner's manual. Some of the following tasks will require the use of the applicable engine service manual.	
2. Gearbox Equipped Only: Change the gearbox oil. Can be extended to 600 hours.	
3. Replace the engine air filter(s).	
4. Gaseous Units Only: Replace the spark plugs. Gap per the engine specifications.	
5. Replace the engine accessory drive belts. Inspect and lubricate (if required) the belt tensioning device (if equipped) and replace if necessary.	
6. Drain and flush the cooling system. Refill with fresh coolant of appropriate type (50/50 mixture).	
7. Replace all flexible hoses: Coolant hoses including the block heater hoses and vaporizer hoses (if equipped); charge air system connection hoses/joints/couplings, and any flexible fuel or oil lines.	
8. Remove, clean, inspect, reinstall and reset to correct voltage level the flywheel magnetic pickup(s) (if equipped).	
9. Return the unit to operational condition and test. Place the unit in automatic and open the service disconnect to force the unit to start and transfer to the load. Use an appropriate load bank to supplement load to full rated load (100% kW at rated kVA) if possible. Exercise the unit against the load for 2 hours (120 minutes). Visually inspect for leaks, loose connections or components, and any abnormal operating conditions. Record the unit voltage, frequency, kW and kVA while running. Remove the load bank load, restore utility power and monitor transfer to utility, cool-down and shutdown. Correct any discrepancies. <div style="display: flex; justify-content: space-between; width: 100%;"> Voltage: Frequency: kW: kVA: </div>	
10. If control has alarm and/or event or run logs, record the alarm and event logs to a history file.	
11. Return the unit to operational condition and place back in automatic operation.	
Date inspection Completed: _____ Unit hour Meter Reading: _____	
Technician/Authorized Operator signature signifying inspection complete: _____	
Record any oil or coolant added and notes about any discrepancies found and corrective action taken.	

4.8 — Disabling a Generator for Maintenance

⚠ CAUTION!



There are two conditions when maintenance checks may have to be performed on the unit:

1. When the unit is in standby mode (automatic) and NOT running. To disable the unit from starting in this condition, in order to perform maintenance checks or service, follow the steps in 4.2.1.
2. **When the unit is running and providing power to the load. To shut down the unit safely, without damaging loads or the generator, follow the steps for shutting down a unit while in operation. Before shutting down an operating unit for maintenance, always make sure that personnel are warned that the power will be shut down temporarily, so that equipment that might be damaged can be properly turned off or placed in standby.**

4.8.1— To Disable the Generator From Starting

To prevent injury, BEFORE performing any maintenance, disable the generator set from starting and/or connecting to the load:

1. Set the control panel AUTO/OFF/MANUAL switch to the OFF position.
2. Remove the control panel fuse (F2-10A fuse).
3. Turn off power to the battery charger (remove battery charger ATC style fuse or open the battery charger circuit breaker located in the load control panel).
4. Disconnect the negative battery cable.

NOTE: The battery charger must be turned off BEFORE disconnecting the battery cable to prevent an over-current condition from burning out sensitive control panel components and circuits.

NOTE: Following any maintenance, reverse these steps to insure the unit is returned to standby setup for normal operation.

4.8.2— Shutdown and Restart an Operating Generator

If the unit is operating and required checks must be performed:

1. Ensure that power to the load can be interrupted (warn any equipment users that there will be a temporary power disruption). There may be other procedures that must be done before shutting a unit down, depending on application.
2. Open the generator Main Line Circuit Breaker (MLCB).
3. Allow the unit to cool down (running at no-load) for approximately 5 minutes to prevent damage to critical engine components.
4. Set the control panel AUTO/OFF/MANUAL switch to the OFF position. There may be safety tag-outs or lockouts required at this point, depending on application.
5. Perform the necessary maintenance checks or tasks (based on the hourly requirements).
6. When all checks have been completed and any discrepancies corrected, set the control panel AUTO/OFF/MANUAL switch to the AUTO position.
7. When the generator is running, and all engine/generator parameters (voltage, frequency, coolant temp, oil pressure, etc.) have been verified as correct, close the generator Main Line Circuit Breaker (MLCB). The unit will accept and carry the load.
8. Make a last visual inspection of the generator set to make sure it is operating properly.

4.9 — Maintenance Tasks

4.9.1— Visually Inspect Unit

Perform a visual inspection of the unit periodically. If problems are found contact your local authorized service dealer. Look for the following:

- Any debris, trash, grass or weed growth, which would obstruct the flow of cooling air into and out of the unit ventilation louvers.
- Visually inspect hoses and hose connections for signs of leakage. This includes all coolant hoses, fuel hoses, exhaust system connections, intake system connections, etc. Also look at the engine block and gearbox (if equipped) for signs of fluid leakage.
- Visually inspect the engine accessory drive belts for evidence of obvious wear, fraying or deterioration, and obvious looseness. A “squeeling” sound heard during starting and running could indicate a loose belt.

4.9.2— Check Engine Fluids

The following checks can be performed by a trained authorized operator. Observe all safety precautions outlined in the “Safety” section.

4.9.2.1—Check Engine Oil Level

An authorized operator should check the levels of engine oil and engine coolant monthly (or every 24 hours of operation). The oil level should be maintained between the “FULL” and “ADD” marks on the engine dipstick. Recommended fluids are listed in Subsection 2.6.2.

To check the engine oil:

1. Locate the engine oil dipstick.
2. The most accurate oil level readings are measured when the engine is cold. If the engine was running, wait at least 10 minutes before proceeding.
3. Remove the dipstick and wipe it dry with a clean, lint free cloth.
4. Slowly insert the clean dipstick into the tube. Visually confirm that the dipstick is fully seated in the dipstick tube. A visual inspection is required because some dipsticks will require more effort than others to fully seat.
5. After 10 seconds remove the dipstick.
6. Look at the oil level on both sides of the dipstick. The lower of the two readings will be the correct oil level measurement.
7. Add oil (if necessary) to adjust the level. After adding or changing the oil, the engine should run for one minute before checking the oil level. Remember to wait 10 minutes to allow the engine to cool and oil to fully drain into the oil pan.

Typical causes of inaccurate oil level readings:

- Reading the high level of the dipstick.
- Reading the dipstick before the oil fully drains into the oil pan.
- Inserting and removing the dipstick too quickly.
- The dipstick is not fully seated in the dipstick tube.

4.9.2.2—Check Coolant Level

⚠ DANGER!

- **DO NOT** remove the radiator pressure cap while the engine is hot. Serious burns from boiling liquid or steam could result.
- Add coolant only to the expansion tank when the engine is cool (not at operating temperature).
- Ethylene glycol base antifreeze is poisonous. Do not use mouth-to-siphon coolant from the radiator, recovery bottle, or any container. Wash hands thoroughly after handling. Never store used antifreeze in an open container because animals are attracted to the smell and the taste of antifreeze even though it is poisonous.



Do not use any chromate base rust inhibitor with propylene glycol base antifreeze. Using any high silicate anti-freeze boosters or additives also will cause overheating. The manufacturer also recommends that any soluble oil inhibitor is NOT USED for this equipment.

Visually check the coolant expansion tank and make sure the coolant level is between the “Cold” and “Hot” level markings. To add coolant to the system add it to the expansion tank when the engine is cool (not at operating temperature, not running). Add only a 50/50 mixture of the correct antifreeze and distilled or deionized water to the coolant system.

4.9.2.3—Check/Change Gearbox Oil (If Equipped)

Check monthly, or every 100 hours of operation. Biannually (or every 600 hours), an authorized service technician should completely drain and refill the gearbox.

Gear oil used is 80W-90. Lucas Heavy Duty Oil Stabilizer should be added as follows by Fluid volume:

- 390 Gearbox - Approximately 32 oz. total. 26 oz. gear oil and 6 oz. Lucas Heavy Duty Oil Stabilizer.
- 520 Gearbox - Approximately 55 oz. total. 44 oz. gear oil and 11 oz. Lucas Heavy Duty Oil Stabilizer.

To Check Gearbox Oil Level:

1. Disable the generator from starting.
2. Remove the oil level check plug. See Figure 4-1.
3. The oil level should be at the bottom edge of the oil level check plug hole.
4. To add oil, remove the oil filler/vent cap, and fill through the vent line.
5. Replace the vent cap and oil level check plug and tighten.

NOTE: Do NOT overfill the gearbox. If too much fluid is added let the excess drain from the level check plug hole and collect it in a suitable container or with rags.

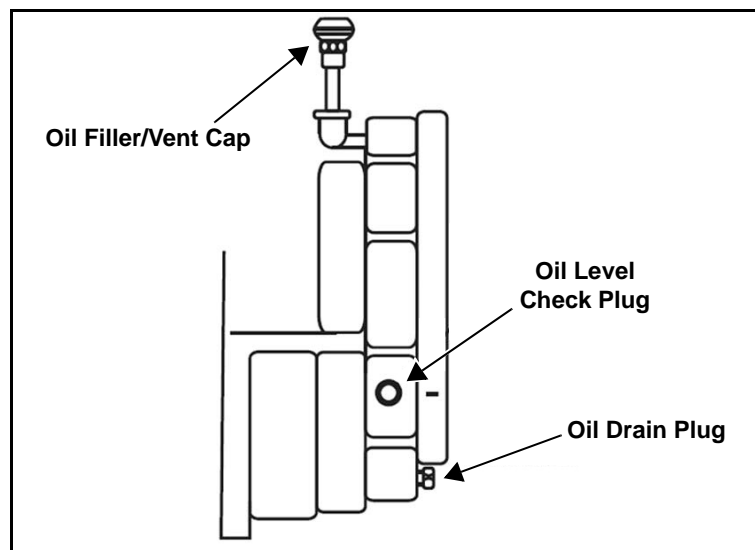


Figure 4-1. Gearbox Oil Servicing Points

To change the gearbox oil:

1. Disable the generator from starting.
2. Remove the oil drain plug and drain the oil into an appropriate container. Properly dispose of or recycle the oil.
3. Reinstall the oil drain plug.
4. To add oil to the gearbox, remove the oil level check plug and oil filler/vent cap.
5. Add the recommended oil/stabilizer mix until it just starts to flow from the oil level check plug opening.
6. Install and tighten the oil filler/vent cap and oil level check plug.

Return the generator to operating condition. Start the unit and check for leaks.

4.9.3— Battery Inspection

⚠ DANGER!



Stationary emergency generators installed with automatic transfer switches will crank and start automatically when NORMAL (UTILITY) source voltage is removed or is below an acceptable preset level. To prevent automatic startup and possible injury to personnel, do not connect battery cables until NORMAL source voltage at the transfer switch is correct and the system is ready to be placed into operation.



Storage batteries give off EXPLOSIVE hydrogen gas. This gas can form an explosive mixture around the battery for several hours after charging. The slightest spark can ignite the gas and cause an explosion. An explosion can shatter the battery and cause blindness or other injury. Any area that houses a storage battery must be properly ventilated. Do not allow smoking, open flame, sparks, or any spark producing tools or equipment near the battery.



Battery electrolyte fluid is an extremely caustic sulfuric acid solution that can cause severe burns. Do not permit fluid to contact eyes, skin, clothing, painted surfaces, etc. Wear protective goggles, protective clothing and gloves when handling a battery. If fluid is spilled, flush the affected area immediately with clear water.



DO NOT dispose of the battery in a fire. The battery is capable of exploding.



DO NOT open or mutilate the battery. Released electrolyte can be toxic and harmful to the skin and eyes.



The battery represents a risk of high short circuit current. When working on the battery, always remove watches, rings, or other metal objects, and only use tools that have insulated handles.

An authorized operator should inspect the engine battery system monthly. At this time, the battery fluid level should be checked and distilled water added if needed. Battery cables and connections also should be inspected for cleanliness and corrosion.

Once every six months, an Authorized Service Technician should inspect the battery system. At this time the battery condition and state of charge should be checked using a battery hydrometer. The battery should be recharged or replaced as required.



Servicing of the battery is to be performed or supervised by personnel knowledgeable of batteries and the required precautions. Keep unauthorized personnel away from batteries. Observe the following precautions when working on batteries:

- Remove the 10A F2 fuse from the generator control panel.
- Remove watches, rings, or other metal objects.
- Use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of the battery.

- Disconnect the charging source prior to connecting or disconnecting battery terminals. Remove the battery charger fuse (ATC style fuse, 5 amp on the 2.5 charger and 15 amp on the 10A charger).
- Wear full eye protection and protective clothing.
- Where electrolyte contacts the skin, wash it off immediately with water.
- Where electrolyte contacts the eyes, flush thoroughly and immediately with water and seek medical attention.
- Spilled electrolyte is to be washed down with an acid neutralizing agent. A common practice is to use a solution of 1 pound (500 grams) bicarbonate of soda to 1 gallon (4 liters) of water. The bicarbonate of soda solution is to be added until the evidence of reaction (foaming) has ceased. The resulting liquid is to be flushed with water.



Lead-acid batteries present a risk of fire because they generate hydrogen gas.

- DO NOT SMOKE when near the battery.
- DO NOT cause flame or spark in battery area.
- Discharge static electricity from the body before touching the battery by first touching a grounded metal surface.



Be sure the AUTO/OFF/MANUAL switch is set in the OFF position before connecting the battery cables. If the switch is set to AUTO or MANUAL, the generator can crank and start as soon as the battery cables are connected.



Be sure the utility power supply to the battery charger is turned OFF and the 10A and 15A fuses are removed from the generator control panel and the ATC style fuse removed from the battery charger, or sparking may occur at the battery posts as the cables are attached and cause an explosion.

NOTE: A negative ground system is used. Battery connections are shown on the wiring diagrams. Make sure the battery is correctly connected and terminals are tight. Observe battery polarity when connecting the battery to the generator set.

4.9.4— Battery Installation and Replacement

When required, the battery must be replaced with one of equivalent size, voltage, and CCA (cold crank amp capacity). Consult the Unit Specification Sheet or contact the local Authorized Service Dealer for proper battery sizing.

A new battery must be filled with the proper electrolyte and be fully charged before installing.

Preliminary Instructions

1. Set the AUTO/OFF/MANUAL switch on the generator control panel to OFF.
2. Turn off utility power supply to the battery charger circuit.
3. Remove the 10A fuse from the generator control panel.
4. Remove the ATC style fuse from the battery charger.

Battery cables are connected to the generator connection points at the factory. Connect the cables to the battery posts as shown in Figure 4-2.

12VDC System

1. Connect the red battery cable from the starter contactor to the positive (POS or +) battery post.
2. Connect the black battery cable to the frame ground to the negative (NEG or -) battery post.

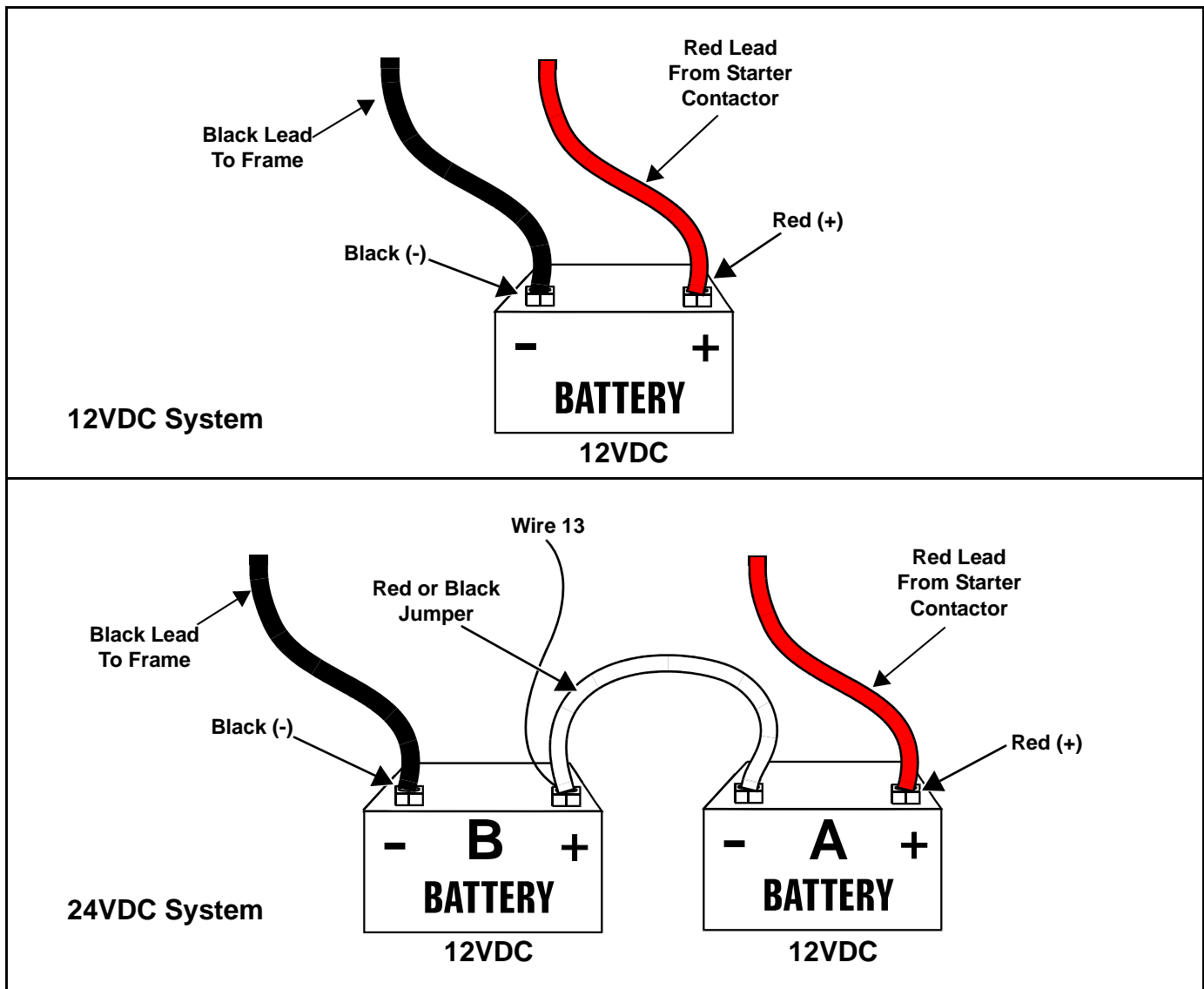


Figure 4-2. Battery Cable Connections

24VDC System

1. Connect the red battery cable from the starter contactor to the positive (POS or +) post of battery A.
2. Connect the black battery cable to the frame ground to the negative (NEG or -) post of battery B.

NOTE: On 24V gaseous units, center tap wire number 13 between the batteries as shown in Figure 4-2.

3. Connect either a black or red jumper cable from the negative (NEG or -) post of battery A to the positive (POS or +) post of battery B.

Final Instructions

1. Install the ATC style fuse in the battery charger.
2. Install the 10A fuse in the generator control panel.
3. Turn on the utility power supply to the battery charger circuit.
4. If the unit was previously operational, turn the AUTO/OFF/MANUAL switch on the generator control panel to AUTO.



Damage will result if the battery connections are made in reverse.

4.9.5— Other Maintenance Checks

The following inspections should be performed by a qualified/authorized service technician, or a properly trained authorized operator. These maintenance items require a high level of experience and skill to evaluate and correct.

- Inspect engine accessory drive belts
- Inspect hoses and connections
- Inspect fuel supply system
- Inspect exhaust system

4.10 — Maintenance and Repair Parts

All recommended service maintenance or repairs should be completed by an authorized service technician to maintain the warranty status of a unit.

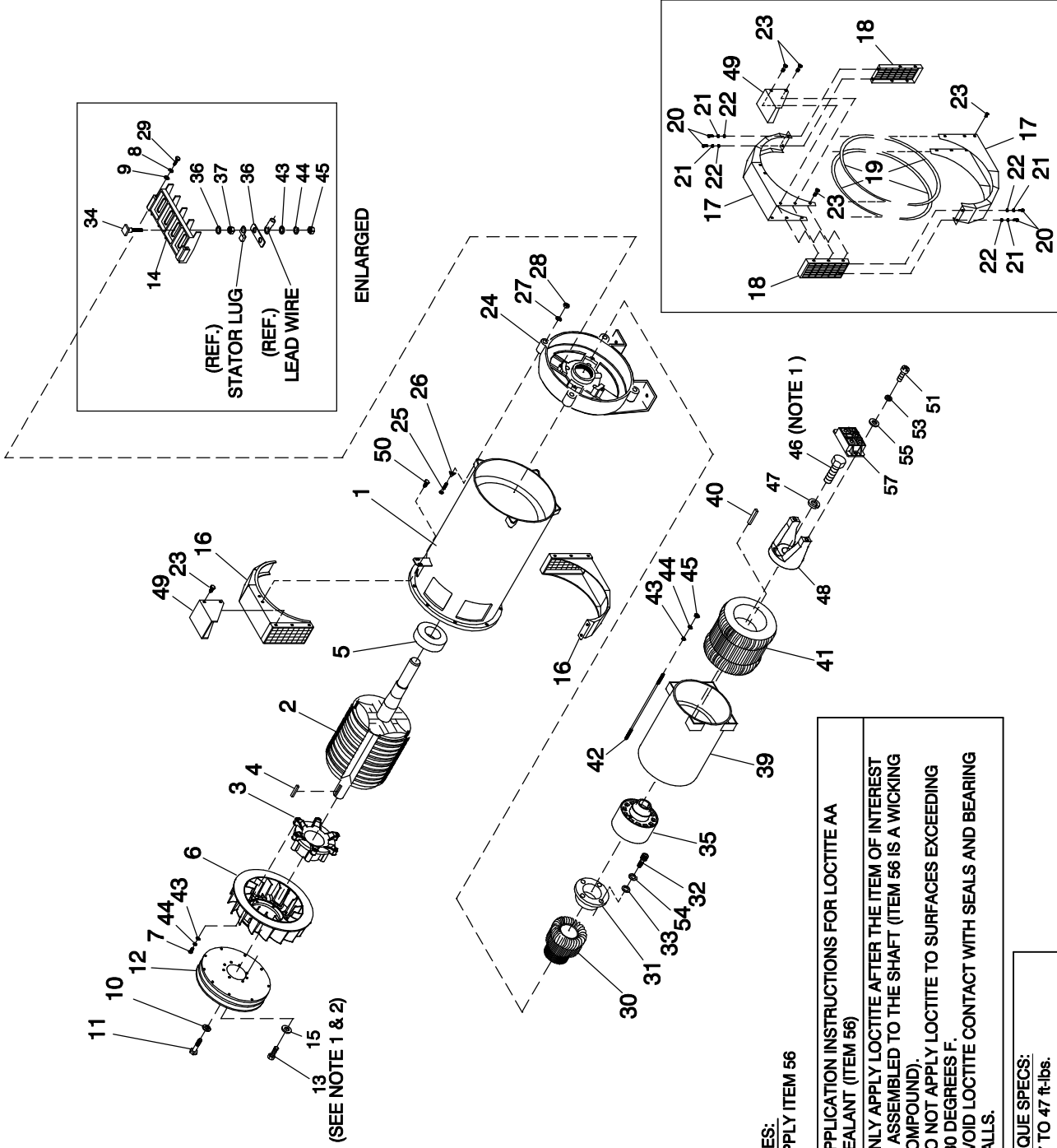
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GROUP A



(SEE NOTE 1 & 2)

- NOTES:**
 1. APPLY ITEM 56

APPLICATION INSTRUCTIONS FOR LOCTITE AA SEALANT (ITEM 56)
 - ONLY APPLY LOCTITE AFTER THE ITEM OF INTEREST IS ASSEMBLED TO THE SHAFT (ITEM 56 IS A WICKING COMPOUND).
 - DO NOT APPLY LOCTITE TO SURFACES EXCEEDING 180 DEGREES F.
 - AVOID LOCTITE CONTACT WITH SEALS AND BEARING BALLS.

TORQUE SPECS:
 I/N 7 TO 47 ft.-lbs.
 I/N 11 TO 260 ft.-lbs.
 I/N 13 TO 133 ft.-lbs.
 I/N 32 TO 10 ft.-lbs.
 I/N 42 & 45 TO 29 ft.-lbs. MIN
 I/N 46 TO 260 ft.-lbs.
 BRIDGE RECTIFIER WIRE ATTACHMENT TO 12 in.-lbs.

EXPLODED VIEW:
 GENERATOR
 DRAWING #: 0H8348

EXPLODED VIEW: GENERATOR
DRAWING #: 0H8348

GROUP A

APPLICABLE TO:

ITEM	PART #	QTY.	DESCRIPTION
1	0A2865A (1)	1	STATOR ASSEMBLY 520 150KW
	0A2865B (2)	1	STATOR ASSEMBLY 520 200KW
	0A2865C	1	STATOR ASSEMBLY 520 250KW
	0A2865D	1	STATOR ASSEMBLY 520 300KW
	0A2865E	1	STATOR ASSEMBLY 520 350KW
	0A2865L	1	STATOR ASSEMBLY 520 400KW
	0A6424	1	STR-520-210QP2 SAE X
2	0H8272A	1	ASSY RTR 520 150KW 4P 1800 DD
	0H8272B	1	ASSY RTR 520 200KW 4P 1800 DD
	0H8272C	1	ASSY RTR 520 250KW 4P 1800 DD
	0H8272D	1	ASSY RTR 520 275KW 4P 1800 DD
	0H8272E	1	ASSY RTR 520 330KW 4P 1800 DD
	0H8272F	1	ASSY RTR 520 400KW 4P 1800 DD
	0H8272M	1	ASSY RTR 520 150KW 4P 1PH DD
	0H8272N	1	ASSY RTR 520 200KW 4P 1PH DD
3	0G5957	REF	HUB, MACHINED 520 ALT, 14MM
4	081825 (4)	1	KEY SQ 16MM X 76MM STEEL
5	081831 (4)	1	BALL BEARING SINGLE ROW
6	0E4891	1	FAN 520MM CAST ALUMINUM
7	049814	6	SCREW HHC M10-1.5 X 25 G8.8
8	022129	6	WASHER LOCK M8-5/16
9	022145	6	WASHER FLAT 5/16 ZINC
10	0A2716 (4)	1	WASHER FLAT .813 ID X 4.0 OD
11	0A7633 (4)	1	SCREW HHC M20-1.5 X 35 G8.8
12	021322A	REF	FLEX PLATE,520,SAE11-1/2,14MM
	021406A	REF	FLEX PLATE SAE 14 M14 BOLTS
13	0G5956	6	M14-1.5 X 45 BOLT, CLASS 10.9
14	092261	3	BOARD SOLID LEAD TERMINAL
15	0G5961	6	WASHER FLAT M14, CLASS 10
16	0A7092	1	SCROLL ASSEMBLY 520 SAE (ITEMS 17-23)
17	0A2727	2	SHROUD 520 SAE
18	0A2729	2	SCREEN 520 SHROUD
19	056326	1	TRIM VINYL BLACK 1/8 GP (160" LG)
20	045757	4	SCREW HHC M6-1.0 X 25 G8.8
21	022097	4	WASHER LOCK M6-1/4
22	022473	4	WASHER FLAT 1/4-M6 ZINC
23	0A2110	12/20	SCREW SWAGE 1/4-20 X 1/2 Z/YC
24	0A7671	1	CARRIER REAR BEARING (MACH)
25	0A5615	4	SCREW HHC M16-2 X 170 G8.8
26	021504	4	WASHER TRIANGLE 520 SAE
27	070265	4	WASHER LOCK M16
28	0A5618	4	NUT HEX M16-2.00 G8 YEL CHR
29	039287	6	SCREW HHC M8-1.25 X 45 G8.8
30	094511	1	STATOR ASSEMBLY PME 520MM
	0C8011	1	STATOR ASSEMBLY PME 13.3IR
31	080934	1	RING PME STATOR RETAINING
32	082460	4	SCREW SHC M6-1.0 X 65 G10.9
33	022473	4	WASHER FLAT 1/4 ZINC
34	095152	REF	BOLT SQHB M10-1.5 X 40.5
35	0H8256	1	ASSEMBLY MAGNET HOUSING (230KW AND ABOVE)
	0H8256A	1	ASSEMBLY MAGNET HOUSING (200KW AND BELOW)
36	095586	REF	WASHER FLAT .41 ID X .75 OD
37	096139	12	NUT HEX JAM M10-1.5
38	095153	REF	PLATE JUMPER
39	021147	1	EXCITER FIELD 2-3/4"
	021148	1	EXCITER FIELD 3-3/4"
	0C8012	1	EXCITER FIELD 2-3/4" IRRIG.
40	085666	1	KEY SQ 3/8 X 3 STEEL (200KW AND BELOW)
	082459	1	KEY SQ 3/8 X 4 STEEL (230KW AND ABOVE)
41	0F5992	1	ASSY EXCITER 2-3/4"
	0F5993	1	ASSY EXCITER 3-3/4"
42	04576100CB	4	STUD M10-1.5 X 320 G5 ZINC
43	022131	22	WASHER FLAT 3/8-M10 ZINC
44	046526	22	WASHER LOCK M10
45	045772	16	NUT HEX M10-1.5 G8 YEL CHR
46	0F1965	1	SCREW HHC M20-1.5 X 55 C8.8
47	0H7393	1	M20 RIBBED LOCK WASHER
48	0E9107	1	MOUNT RECTIFIER
49	0C8129 (3)	1	DIFF FACTOR 13.3I IRR

ITEM	PART #	QTY.	DESCRIPTION
50	0A2110	2	SCREW SWAGE 1/4-20 X 1/2 ZYC
51	089520	2	SCREW PFHM M4-0.7 X 16
52	0D8468 (5)	6	WASHER LOCK M12 RIBBED
53	023365	2	WASHER SHAKEPROOF INT #8
54	022097	4	WASHER LOCK M6-1/4
55	043180	2	WASHER FLAT M4
56	0A1786	.5CC	ADH LOCTITE #8931 AA W/S
57	090152	1	BRIDGE RECTIFIER ASSEMBLY

(1) NOTE: USED FOR 105KW IRRIGATION

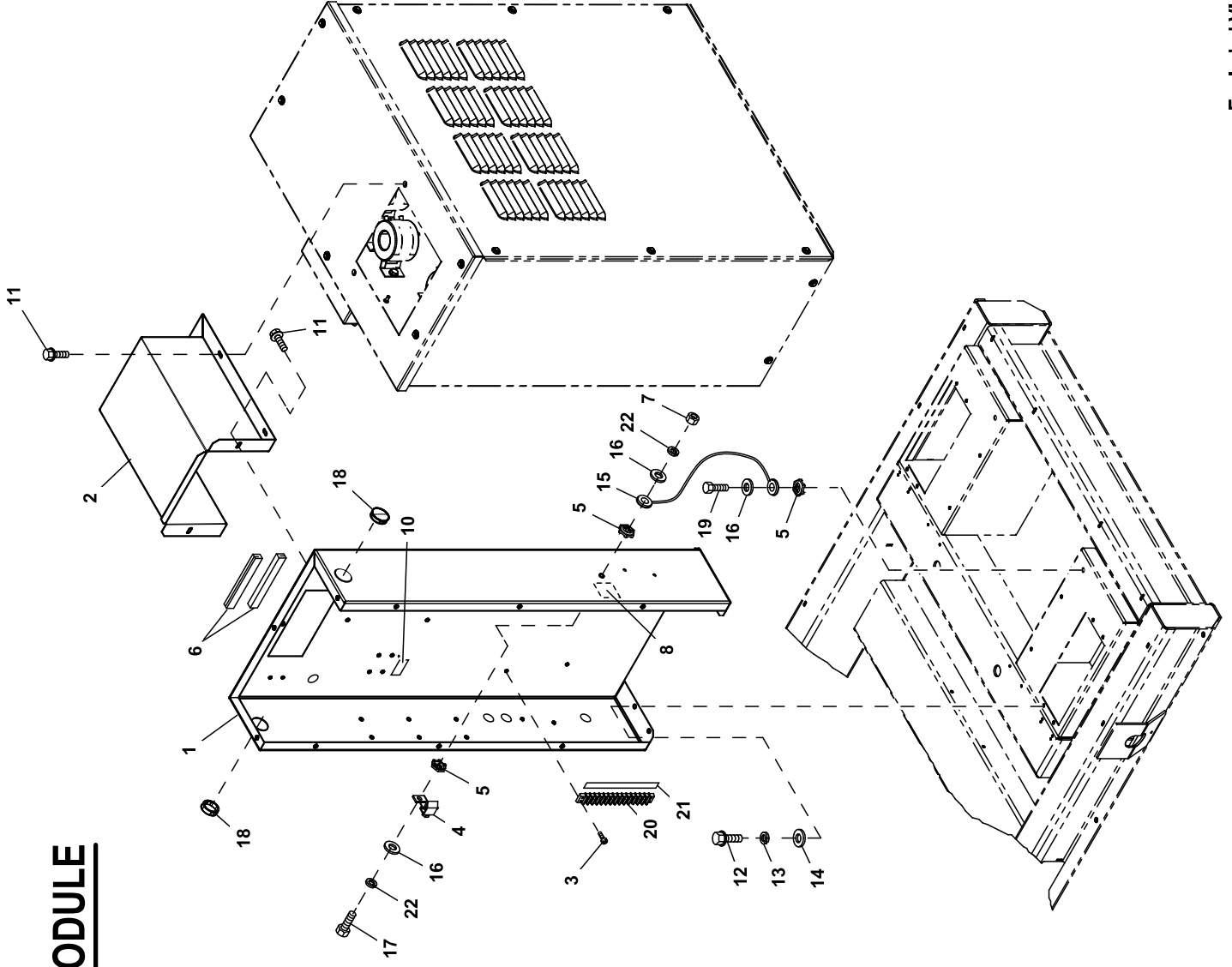
(2) NOTE: USED FOR 160KW IRRIGATION

(3) NOTE: USED ON 105/160KW IRRIGATION ONLY.

(4) ROTOR REPLACEMENT PARTS

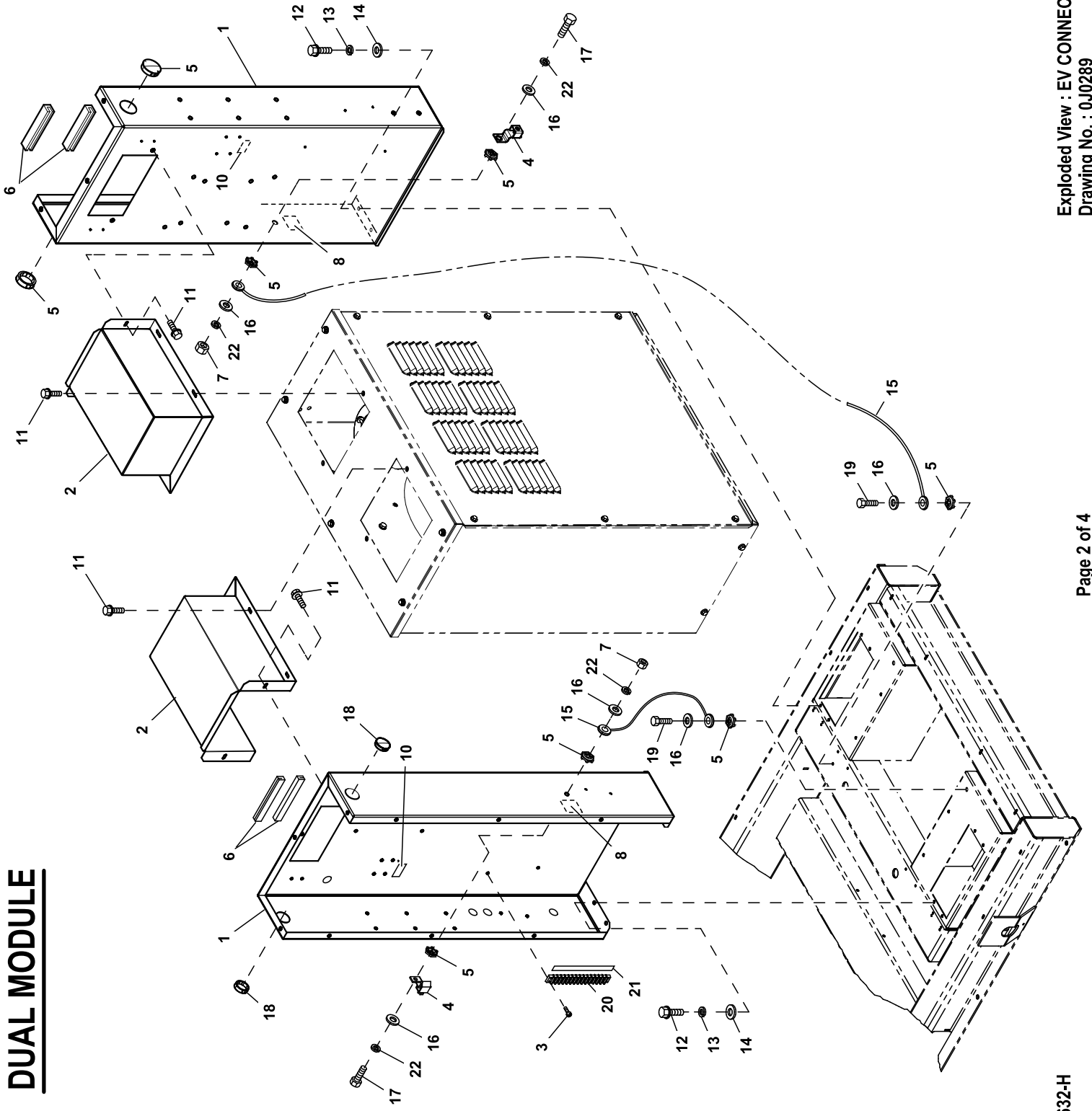
(5) USED ON 7.5L MITSUBISHI

SINGLE MODULE



DUAL MODULE

GROUP A



EXPLODED VIEW: EV CONNECTION BOX 520 ALT

DRAWING #: 0J0289

GROUP A

APPLICABLE TO:

ITEM	PART#	QTY.	DESCRIPTION
SINGLE MODULE			
(1)1	0J13550ST0R	1	MD2, MAIN BREAKER MODULE 520
	0J10610ST0R	1	MD3, MAIN BREAKER MODULE 520
	0H93770ST0R	1	MODULE, MD4 CB MODULE
(1)2	0J09900ST0R	1	WIRE FUNNEL, MD2 & MD3 CCI MODULE
(2)3	0J5462	REF	SCREW THTT M4-0.7 X 16 ZP
4	061383	1	LUG SLDLSS 3/0-#4 X 13/32 CU
5	0A4456	3	WASHER LOCK SPECIAL 3/8
6	056326	1	TRIM VINYL BLACK 1/8GP (18"LG)
7	045772	1	NUT HEX M10-1.5 G8 YEL CHR
8	067210A	1	DECAL GROUND LUG
10	0A9457A	1	DECAL NEUTRAL
11	0C2454	8	SCREW HWHT M6-1 X 16 N WA Z/JS
12	024526	4	SCREW HHTT 5/16-18 X 3/4 CZ
13	022129	4	WASHER LOCK M8-5/16
14	022145	4	WASHER FLAT 5/16-M8 ZINC
15	0441140782	1	WIRE ASM, GND 3/0 WIRE 3/8 LUG
16	022131	3	WASHER FLAT 3/8-M10 ZINC
17	049541	1	SCREW HHC M10-1.5 X 35 C8.8
18	0E1534A	2	PLUG PLASTIC 1.50"
19	0H6943	1	SCREW HHTT M10-1.5 X 30 ZINC
(3)(2)20	0J0455	REF	BLOCK, TERM 14 POS X 8 X 1600V
(3)(2)21	0J9078	REF	DECAL, TB4 HV CUSTOMER CONN
22	046526	2	WASHER LOCK M10
DUAL MODULE			
(1)1	0J13550ST0R	2	MD2, MAIN BREAKER MODULE 520
	0J10610ST0R	2	MD3, MAIN BREAKER MODULE 520
	0H93770ST0R	2	MODULE, MD4 CB MODULE
(1)2	0J09900ST0R	2	WIRE FUNNEL, MD2 & MD3 CCI MODULE
(2)3	0J5462	REF	SCREW THTT M4-0.7 X 16 ZP
4	061383	2	LUG SLDLSS 3/0-#4 X 13/32 CU
5	0A4456	6	WASHER LOCK SPECIAL 3/8
6	056326	2	TRIM VINYL BLACK 1/8GP (18"LG)
7	045772	2	NUT HEX M10-1.5 G8 YEL CHR
8	067210A	1	DECAL GROUND LUG
10	0A9457A	2	DECAL NEUTRAL
11	0C2454	8	SCREW HWHT M6-1 X 16 N WA Z/JS
12	024526	8	SCREW HHTT 5/16-18 X 3/4 CZ
13	022129	8	WASHER LOCK M8-5/16
14	022145	8	WASHER FLAT 5/16-M8 ZINC
15	0441140782	2	WIRE ASM, GND 3/0 WIRE 3/8 LUG
16	022131	6	WASHER FLAT 3/8-M10 ZINC
17	049541	2	SCREW HHC M10-1.5 X 35 C8.8
18	0E1534A	4	PLUG PLASTIC 1.50"
19	0H6943	1	SCREW HHTT M10-1.5 X 30 ZINC
(3)(2)20	0J0455	REF	BLOCK, TERM 14 POS X 8 X 1600V
(3)(2)21	0J0394	REF	DECAL, TB4 HV CUSTOMER CONN
22	046526	2	WASHER LOCK M10

NOTES (UNLESS OTHERWISE SPECIFIED):

- (1) SHEET METAL PARTS LISTED IN THE BOM TABLE ARE REPRESENTING GENERIC PARTS (NO COLOR)
 - MANUFACTURING: FOR CORRECT MATERIAL AND COLOR REFER TO XA BOM.
 - CUSTOMER: WHEN ORDERING REPLACEMENT PARTS ENTER BASE NUMBER (FIRST 6 DIGITS ONLY) IN THE SYSTEM FOR CORRECT MATERIAL AND COLOR (FOR REFERENCE SEE GUIDELINE 0H7169).
- (2) WILL BE INSTALLED ON PRIMARY CB MODULE ONLY.
- (3) NOT REQUIRED IF UNIT IS EQUIPPED WITH LOAD CENTER.

EXPLODED VIEW: EV CONNECTION BOX 520 ALT

DRAWING #: 0J0289

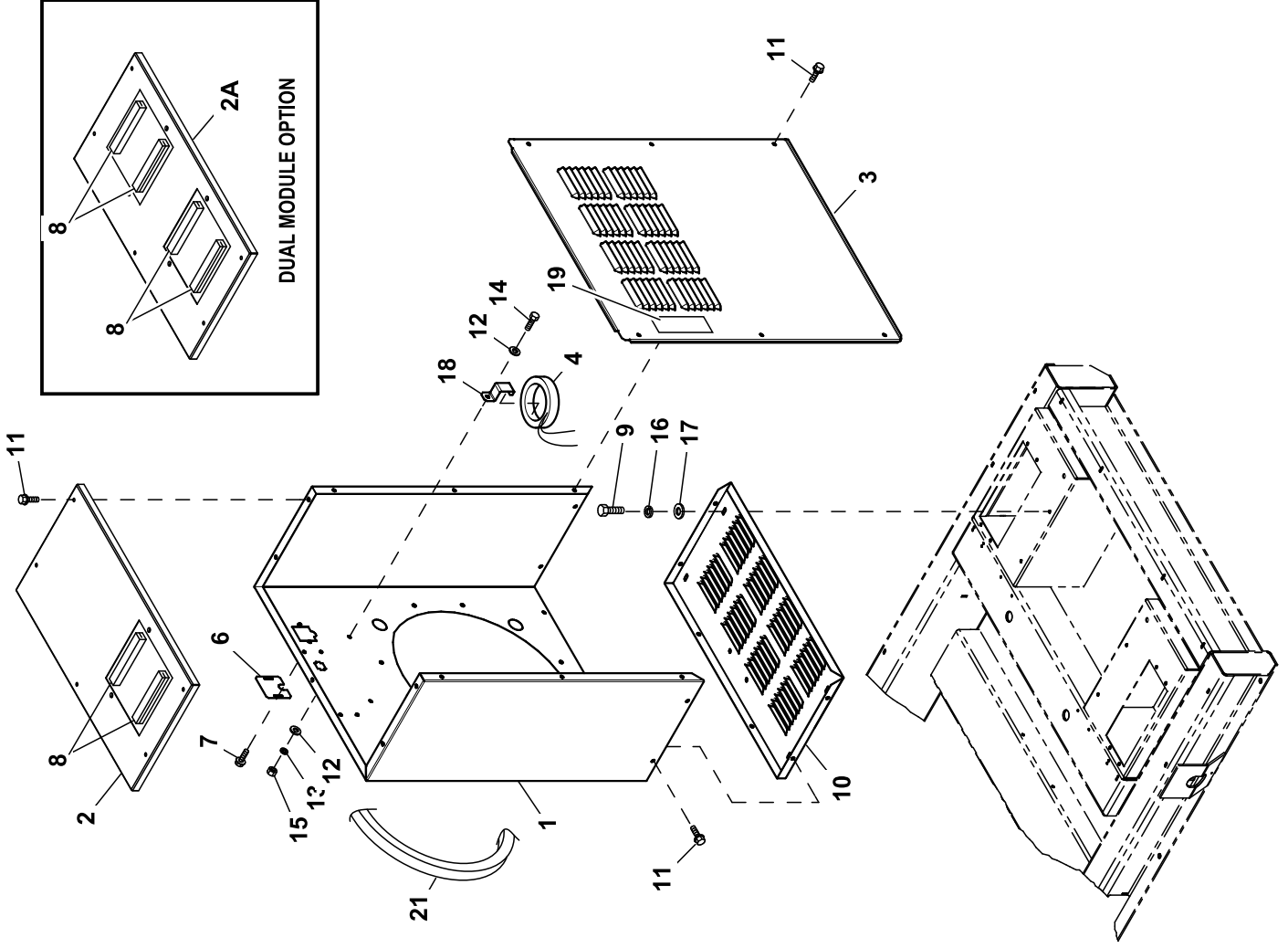
APPLICABLE TO:

GROUP A

ITEM	PART#	QTY.	DESCRIPTION
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GROUP A



EXPLODED VIEW: EV 520 ALTERNATOR TOWER ASM

DRAWING #: 0J0369

GROUP A

APPLICABLE TO:

ITEM	PART#	QTY.	DESCRIPTION
(1)1	0H96440STOR	1	MAIN, ALT TOWER 520
(1)2	0H96450STOR	1	TOP, ALT TOWER 520 LH MODULE
	0J27520STOR	1	TOP, ALT TWR 520 LH MOD 13.3L
(1)2A	0H9645ASTOR	1	TOP, ALT TOWER 520 DUAL MODULE
	0J2752ASTOR	1	TOP, ALT TWR 520 DUAL MOD 13.3
(1)3	0H96460STOR	1	COVER, ALT TOWER 520
(3)4	0J0481	2/3	XFMR CURRENT 50A W/BRKT UL RCG
	0J0481A	2/3	XFMR CURRENT 100A W/BRKT UL G
	0J0481B	2/3	XFMR CURRENT 150A W/BRKT UL
	0J0481C	2/3	XFMR CURRENT 200A W/BRKT UL
	0J0481D	2/3	XFMR CURRENT 300A W/BRKT UL
	0J0481E	2/3	XFMR CURRENT 400A W/BRKT UL
	0J0481F	2/3	XFMR CURRENT 500A W/BRKT UL
	0J0481G	2/3	XFMR CURRENT 600A W/BRKT UL
	0J0481H	2/3	XFMR CURRENT 800A W/BRKT UL
	0J0481J	2/3	XFMR CURRENT 1000A W/BRKT UL
	0J0481K	2/3	XFMR CURRENT 1250A W/BRKT UL
	0J0481L	2/3	XFMR CURRENT 1400A W/BRKT UL
5	0J0155	REF	INTERFACE 3PH 416/480V
	0J0156	REF	INTERFACE 3PH 208/240V
	0J0157	REF	INTERFACE 1PH 120/240V
	0J0158	REF	INTERFACE 3PH 600V
(1)6	0J01360STOR	1	PLATE, WIRE HARN BLOCKOFF
7	0J5464	2	SCREW THTT M5-0.8 X 16 ZP
(2)8	056326	2/4	TRIM VINYL BLACK 1/8GP (6"LG)
9	024983	4	SCREW HHTT 1/4-20 X 3/4 CZ
(1)10	0J02840STOR	1	ALTERNATOR TOWER, BOTTOM 520
11	0C2454	17	SCREW HWHT M6-1 X 16 N WA Z/JS
(3)12	022145	4/8	WASHER FLAT 5/16-M8 ZINC
(3)13	022129	2/3	WASHER LOCK M8-5/16
(3)14	042907	2/3	SCREW HHC M8-1.25 X 16 C8.8
(3)15	045771	2/3	NUT HEX M8-1.25 G8 CLEAR ZINC
16	022097	4	WASHER LOCK M6-1/4
17	022473	4	WASHER FLAT 1/4-M6 ZINC
(3)18	0J1857	2/3	CT BRKT 1.1" WINDOW FRAME
	0J1857A	2/3	CT BRKT 2.25" WINDOW FRAME
	0J1857B	2/3	CT BRKT 3.48" WINDOW FRAME
19	0C1229	1	DECAL WARNING ELECTRICAL SHOCK
20	0H9845	1	HARN 390/520 CONBOX H-PANEL (NOT SHOWN)
21	052250	1	TAPE FOAM 1X1 (63" LG)

(NOTES (UNLESS OTHERWISE SPECIFIED):

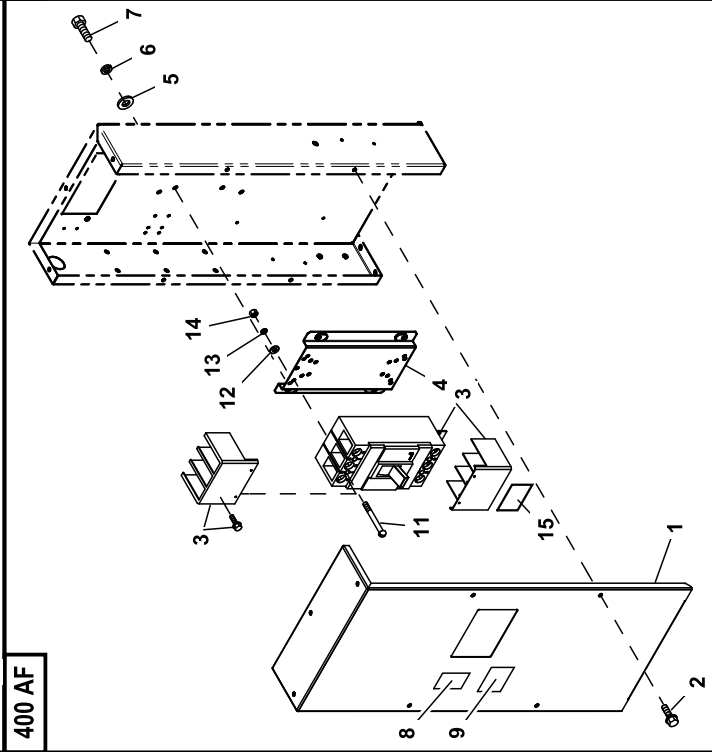
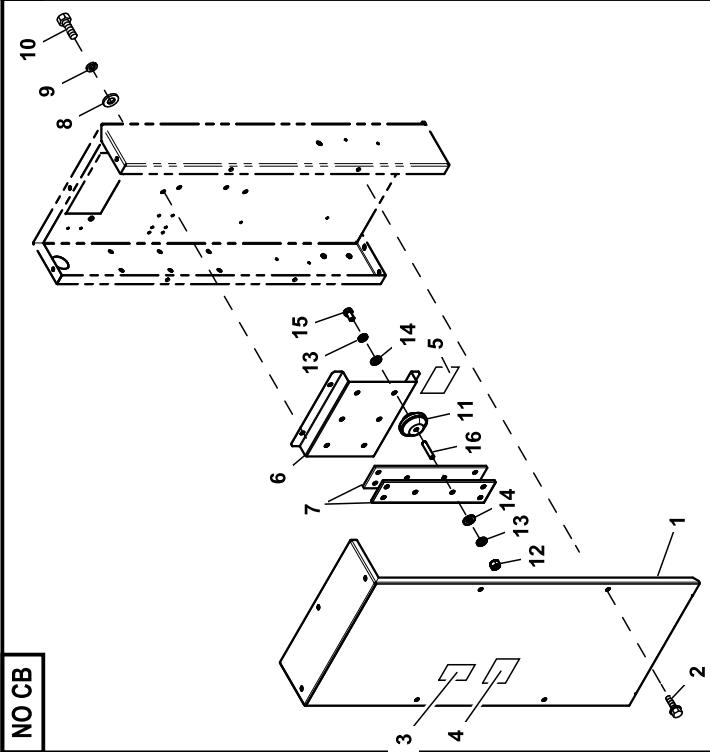
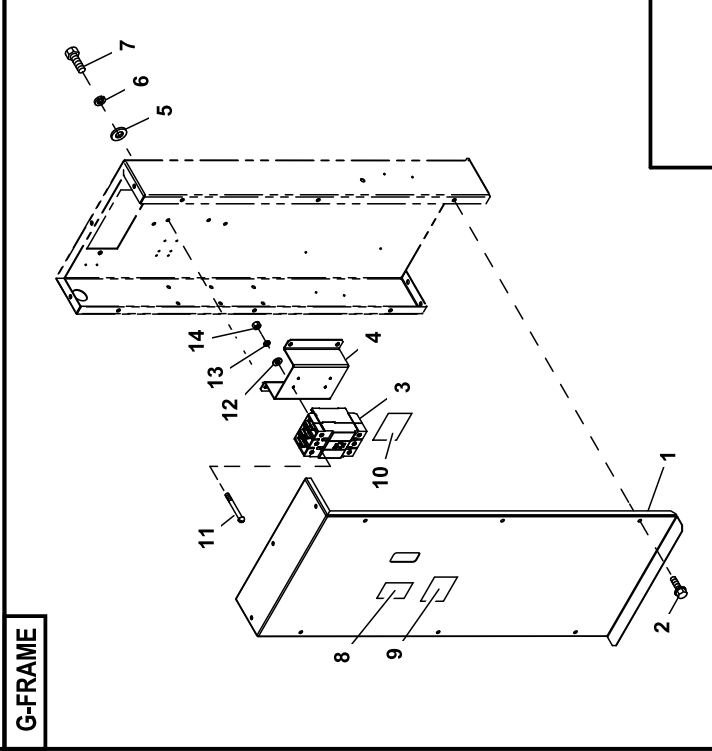
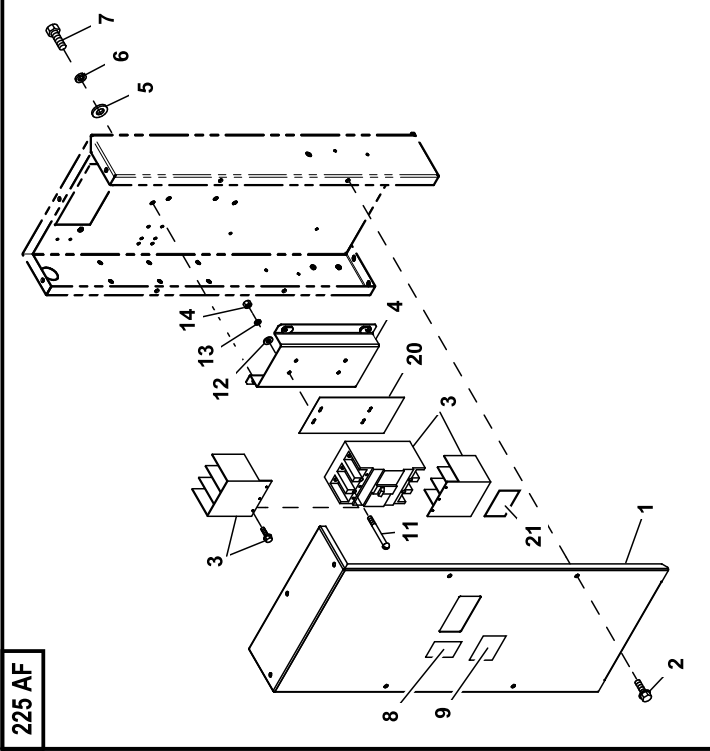
(1) SHEET METAL PARTS LISTED IN THE BOM TABLE ARE REPRESENTING GENERIC PARTS (NO COLOR)

- MANUFACTURING: FOR CORRECT MATERIAL AND COLOR REFER TO AS400 BOM.
- CUSTOMER: WHEN ORDERING REPLACEMENT PARTS ENTER BASE NUMBER (FIRST 6 DIGITS ONLY) IN THE SYSTEM FOR CORRECT MATERIAL AND COLOR (FOR REFERENCE SEE GUIDELINE 0H7169).

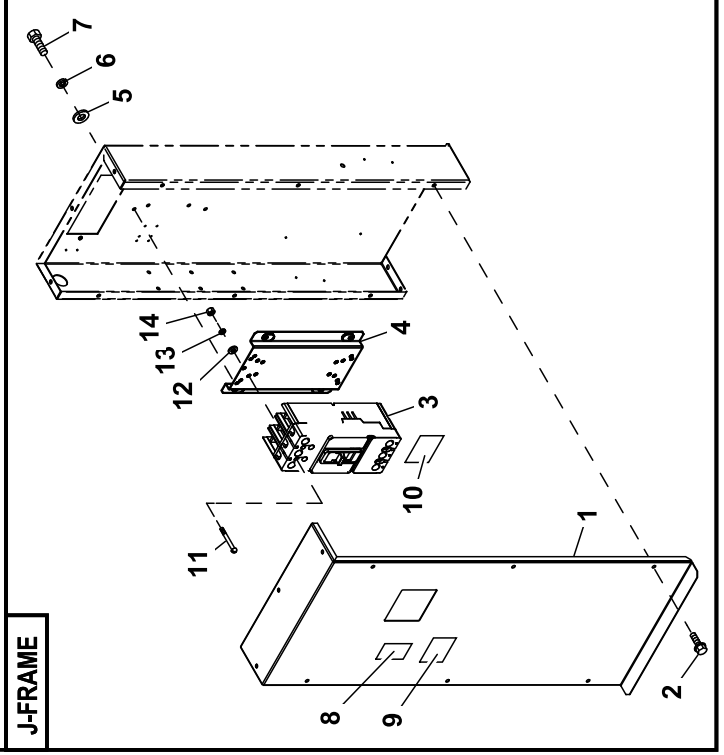
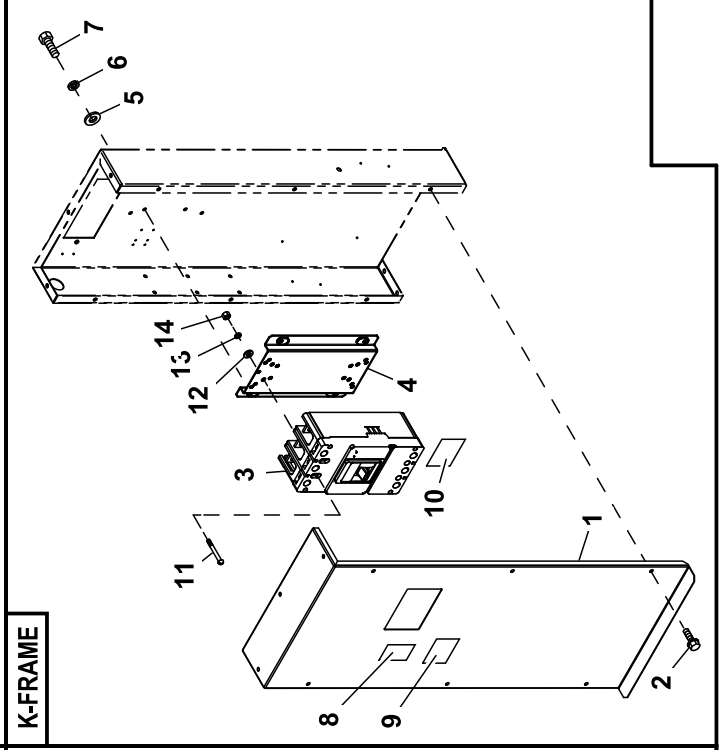
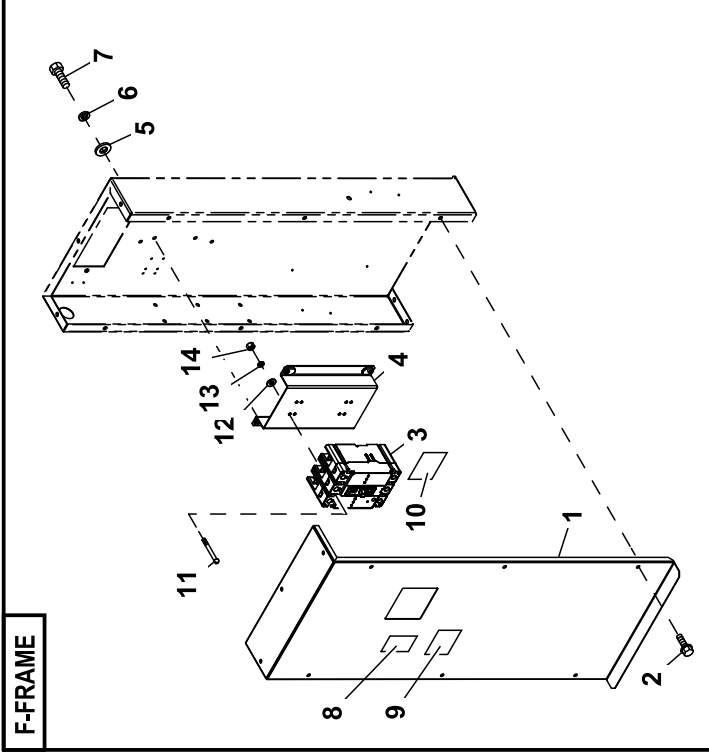
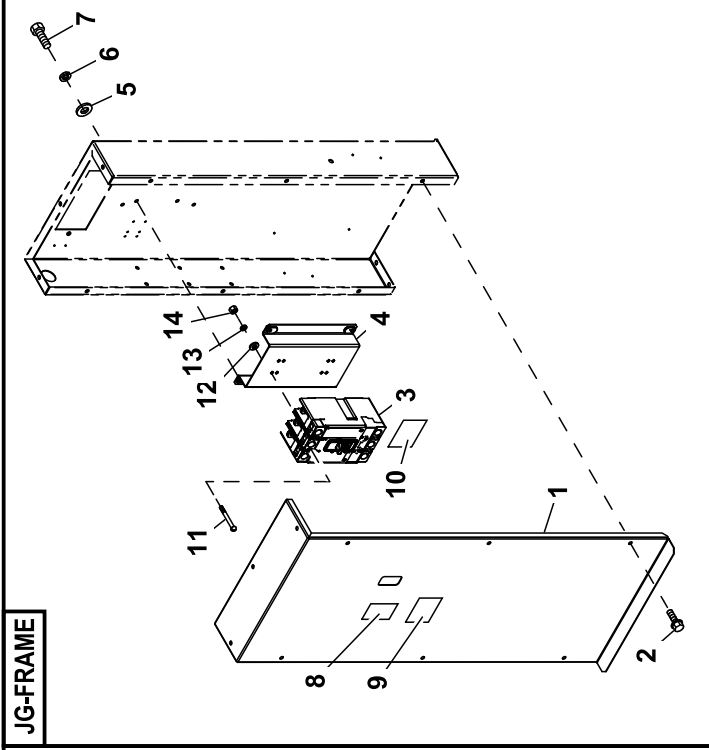
(2) QTY. REQ. FOR SINGLE MODULE UNITS / QTY. REQ. FOR DUAL MODULE UNITS.

(3) QTY. REQ. FOR 1 PHASE / QTY. REQ. FOR 3 PHASE.

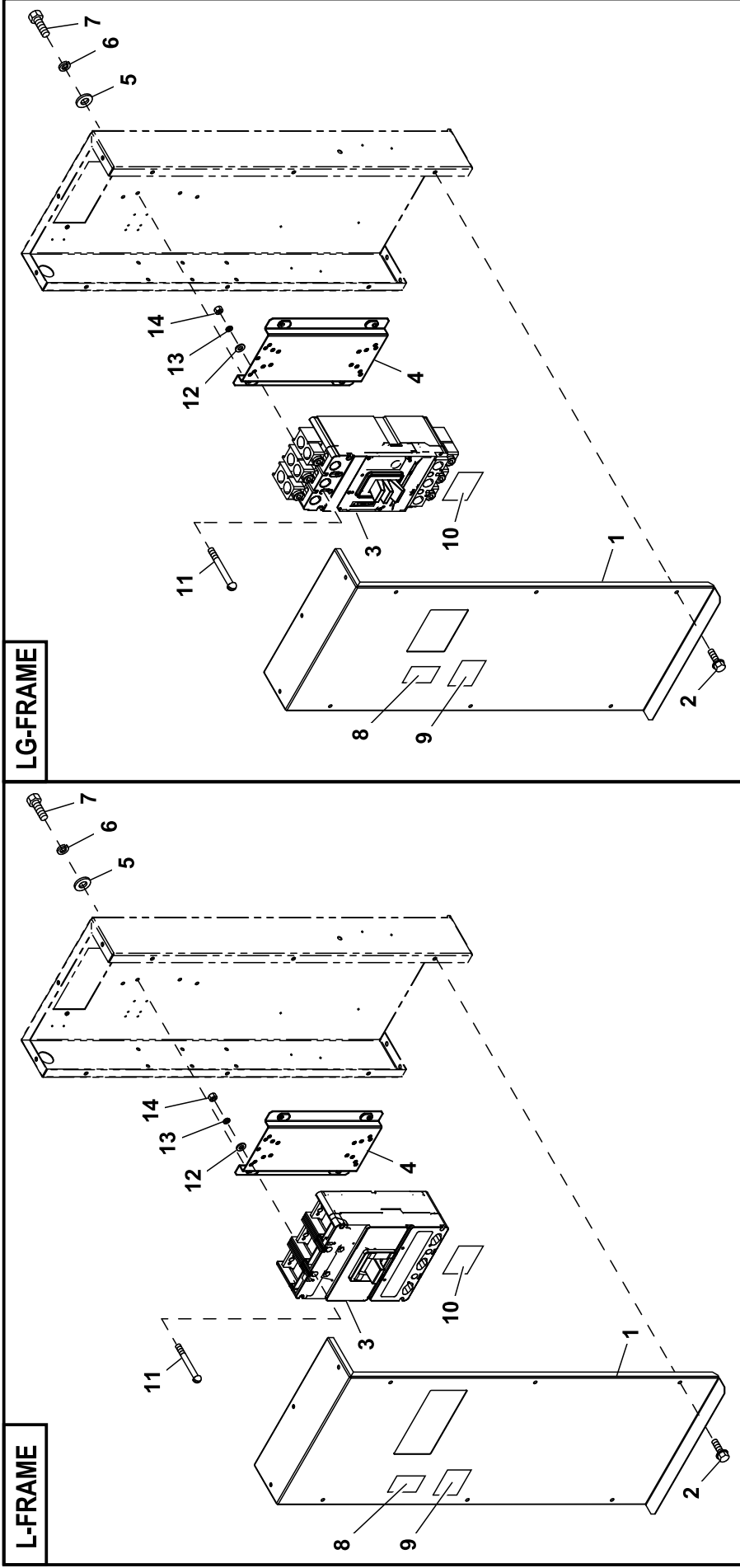
GROUP A



GROUP A



GROUP A



EXPLODED VIEW: EV MD2 CB MOUNTING KIT

DRAWING #: 0J0386

GROUP A

APPLICABLE TO:

ITEM	PART#	QTY.	DESCRIPTION
NO CIRCUIT BREAKERS			
(1)1	0J13560STOR	1	MD2, MODULE COVER 520 NO CB
2	0C2454	9	SCREW HWHT M6-1 X 16 N WA Z/JS
3	0J0679	1	DECAL, CANADIAN SAFETY CODE
4	0J0546	1	DECAL, HV CUSTOMER CONN INSIDE
5	0D3719C	REF	DECAL CUSTOMER CONN E1 E2 E3
	0D3719D	REF	DECAL CUSTOMER CONN E1 E3
(1)6	0J34710STOR	1	MD1-MD3 NO CB MNT BRACKET
7	0J3958	REF	CU BUSS BAR 1/4"X2.5" 625A
8	022145	4	WASHER FLAT 5/16-M8 ZINC
9	022129	4	WASHER LOCK M8-5/16
10	042907	4	SCREW HHC M8-1.25 X 16 C8.8
11	0C6937M	6	INSULATOR, STANDOFF 600V3/8-16
12	022241	6	NUT HEX 3/8-16 STEEL
13	022237	12	WASHER LOCK 3/8
14	022131	12	WASHER FLAT 3/8-M10 ZINC
15	032414	8	SCREW HHC 3/8-16 X 5/8 G5
16	090865	6	STUD 3/8-16 X 1.75 G5 STEEL
UL CIRCUIT BREAKER (225AF)			
(1)1	0J1356ESTOR	1	MD2, MODULE COVER 520 GEN-225
2	0C2454	9	SCREW HWHT M6-1 X 16 N WA Z/JS
3	REF	1	CIRCUIT BREAKER
(1)4	0J14770STOR	1	MD1, C/B MOUNTING BRACKET 225
(2)5	022145	4	WASHER FLAT 5/16-M8 ZINC
(2)6	022129	4	WASHER LOCK M8-5/16
7	042907	4	SCREW HHC M8-1.25 X 16 C8.8
8	0J0679	1	DECAL, CANADIAN SAFETY CODE
9	0J0546	1	DECAL, HV CUSTOMER CONN INSIDE
11	053640	4	SCREW RHM #8-32 X 3-1/4
12	038150	4	WASHER FLAT #8 ZINC
13	022264	4	WASHER LOCK #8-M4
14	022471	4	NUT HEX #8-32 STEEL
20	0F8432	1	INSUL CB 225AF
21	0D3719C	REF	DECAL CUSTOMER CONN E1 E2 E3
	0D3719D	REF	DECAL CUSTOMER CONN E1 E3
UL CIRCUIT BREAKER (400AF)			
(1)1	0J1356JSTOR	1	MD1,MODULE COVER 390 GEN-400
2	0C2454	9	SCREW HWHT M6-1 X 16 N WA Z/JS
3	REF	1	CIRCUIT BREAKER
(1)4	0J00680STOR	1	MD2, C/B BACK MOUNTING BRACKET
5	022145	4	WASHER FLAT 5/16-M8 ZINC
6	022129	4	WASHER LOCK M8-5/16
7	042907	4	SCREW HHC M8-1.25 X 16 C8.8
8	0J0679	1	DECAL, CANADIAN SAFETY CODE
9	0J0546	1	DECAL, HV CUSTOMER CONN INSIDE
11	069232	4	SCREW RHM #10-32 X 3-3/4
12	023897	4	WASHER FLAT #10 ZINC
13	022152	4	WASHER LOCK #10
14	022158	4	NUT HEX #10-32 STEEL
15	0D3719C	REF	DECAL CUSTOMER CONN E1 E2 E3
	0D3719D	REF	DECAL CUSTOMER CONN E1 E3
UL CIRCUIT BREAKER (G-FRAME)			
(1)1	0J1356ASTOR	1	MD2, MODULE COVER 520 G-FRM
2	0C2454	9	SCREW HWHT M6-1 X 16 N WA Z/JS
3	REF	1	CIRCUIT BREAKER
(1)4	0J14880STOR	1	MD1, BRACKET MD1 CB G-FRM
5	022145	4	WASHER FLAT 5/16-M8 ZINC
6	022129	4	WASHER LOCK M8-5/16
7	042907	4	SCREW HHC M8-1.25 X 16 C8
8	0J0679	1	DECAL, CANADIAN SAFETY CODE
9	0J0546	1	DECAL, HV CUSTOMER CONN INSIDE
10	0D3719C	REF	DECAL CUSTOMER CONN E1 E2 E3
	0D3719D	REF	DECAL CUSTOMER CONN E1 E3
11	0J4465	4	SCREW SHC M4-0.7 X 80 C8.8
12	043180	4	WASHER FLAT M4
13	022264	4	WASHER LOCK #8-M4
14	051715	4	NUT HEX M4-0.7 G8 YEL CHR
UL CIRCUIT BREAKER (F -FRAME)			
(1)1	0J1356BSTOR	1	MD1, MODULE COVER 520 F-FRM
2	0C2454	7	SCREW HWHT M6-1 X 16 N WA Z/JS
3	REF	1	CIRCUIT BREAKER
(1)4	0J14860STOR	1	MD1, C/B MOUNTING BRACKET F

EXPLODED VIEW: EV MD2 CB MOUNTING KIT

DRAWING #: 0J0386

GROUP A

APPLICABLE TO:

ITEM	PART#	QTY.	DESCRIPTION
5	022145	4	WASHER FLAT 5/16-M8 ZINC
6	022129	4	WASHER LOCK M8-5/16
7	042907	4	SCREW HHC M8-1.25 X 16 C8.8
8	0J0679	1	DECAL, CANADIAN SAFETY CODE
9	0J0546	1	DECAL, HV CUSTOMER CONN INSIDE
10	0D3719C	REF	DECAL CUSTOMER CONN E1 E2 E3
	0D3719D	REF	DECAL CUSTOMER CONN E1 E3
11	0J4899	4	SCREW SHC M4-0.7 X 45 C8.8
12	043180	4	WASHER FLAT M4
13	022264	4	WASHER LOCK #8-M4
14	051715	4	NUT HEX M4-0.7 G8 YEL CHR
UL CIRCUIT BREAKER (JG -FRAME)			
(1)1	0J1356DSTOR	1	MD2, MODULE COVER 520 JG-FRM
2	0C2454	7	SCREW HWHT M6-1 X 16 N WA Z/JS
3	REF	1	CIRCUIT BREAKER
(1)4	0J14860STOR	1	MD1/MD2 C/B MNT BRKT F/JG
5	022145	4	WASHER FLAT 5/16-M8 ZINC
6	022129	4	WASHER LOCK M8-5/16
7	042907	4	SCREW HHC M8-1.25 X 16 C8.8
8	0J0679	1	DECAL, CANADIAN SAFETY CODE
9	0J0546	1	DECAL, HV CUSTOMER CONN INSIDE
10	0D3719C	REF	DECAL CUSTOMER CONN E1 E2 E3
	0D3719D	REF	DECAL CUSTOMER CONN E1 E3
11	0J4466	4	SCREW SHC M4-0.7 X 100 C8.8
12	043180	4	WASHER FLAT M4
13	022264	4	WASHER LOCK #8-M4
14	051715	4	NUT HEX M4-0.7 G8 YEL CHR
UL CIRCUIT BREAKER (J -FRAME)			
(1)1	0J1356CSTOR	1	MD2, MODULE COVER 520 J-FRM
2	0C2454	7	SCREW HWHT M6-1 X 16 N WA Z/JS
3	REF	1	CIRCUIT BREAKER
(1)4	0J00680STOR	1	MD2, C/B BACK MOUNTING BRACKET
5	022145	4	WASHER FLAT 5/16-M8 ZINC
6	022129	4	WASHER LOCK M8-5/16
7	042907	4	SCREW HHC M8-1.25 X 16 C8.8
8	0J0679	1	DECAL, CANADIAN SAFETY CODE
9	0J0546	1	DECAL, HV CUSTOMER CONN INSIDE
10	0D3719C	REF	DECAL CUSTOMER CONN E1 E2 E3
	0D3719D	REF	DECAL CUSTOMER CONN E1 E3
11	049967	4	SCREW SHC M6-1.0 X 70 C12.9
12	022473	4	WASHER FLAT 1/4-M6 ZINC
13	022097	4	WASHER LOCK M6-1/4
14	049813	4	NUT HEX M6-1.0 G8 CLEAR ZINC
UL CIRCUIT BREAKER (K -FRAME)			
(1)1	0J1356FSTOR	1	MD2, MODULE COVER 520 K-FRM
2	0C2454	7	SCREW HWHT M6-1 X 16 N WA Z/JS
3	REF	1	CIRCUIT BREAKER
(1)4	0J00680STOR	1	MD2, C/B BACK MOUNTING BRACKET
5	022145	4	WASHER FLAT 5/16-M8 ZINC
6	022129	4	WASHER LOCK M8-5/16
7	042907	4	SCREW HHC M8-1.25 X 16 C8.8
8	0J0679	1	DECAL, CANADIAN SAFETY CODE
9	0J0546	1	DECAL, HV CUSTOMER CONN INSIDE
10	0D3719C	REF	DECAL CUSTOMER CONN E1 E2 E3
	0D3719D	REF	DECAL CUSTOMER CONN E1 E3
11	046580	4	SCREW SHC M6-1.0 X 45 C12.9
12	022473	4	WASHER FLAT 1/4-M6 ZINC OK
13	022097	4	WASHER LOCK M6-1/4
14	049813	4	NUT HEX M6-1.0 G8 CLEAR ZINC
UL CIRCUIT BREAKER (L -FRAME)			
(1)1	0J1356GSTOR	1	MD2, MODULE COVER 520 L-FRM
2	0C2454	7	SCREW HWHT M6-1 X 16 N WA Z/JS
3	REF	1	CIRCUIT BREAKER
(1)4	0J00680STOR	1	MD2, C/B BACK MOUNTING BRACKET
5	022145	4	WASHER FLAT 5/16-M8 ZINC
6	022129	4	WASHER LOCK M8-5/16
7	042907	4	SCREW HHC M8-1.25 X 16 C8.8
8	0J0679	1	DECAL, CANADIAN SAFETY CODE
9	0J0546	1	DECAL, HV CUSTOMER CONN INSIDE
10	0D3719C	REF	DECAL CUSTOMER CONN E1 E2 E3
	0D3719D	REF	DECAL CUSTOMER CONN E1 E3
11	046580	4	SCREW SHC M6-1.0 X 45 C12.9
12	022473	4	WASHER FLAT 1/4-M6 ZINC OK

EXPLODED VIEW: EV MD2 CB MOUNTING KIT

DRAWING #: 0J0386

GROUP A

APPLICABLE TO:

ITEM	PART#	QTY.	DESCRIPTION
13	022097	4	WASHER LOCK M6-1/4
14	049813	4	NUT HEX M6-1.0 G8 CLEAR ZINC
	UL CIRCUIT BREAKER (LG-FRAME)		
(1)1	0J1356HSTOR	1	MD2, MODULE COVER 520 LG-FRM
2	0C2454	7	SCREW HWHT M6-1 X 16 N WA Z/JS
3	REF	1	CIRCUIT BREAKER
(1)4	0J00680STOR	1	MD2, C/B BACK MOUNTING BRACKET
5	022145	4	WASHER FLAT 5/16-M8 ZINC
6	022129	4	WASHER LOCK M8-5/16
7	042907	4	SCREW HHC M8-1.25 X 16 C8.8
8	0J0679	1	DECAL, CANADIAN SAFETY CODE
9	0J0546	1	DECAL, HV CUSTOMER CONN INSIDE
10	0D3719C	REF	DECAL CUSTOMER CONN E1 E2 E3
	0D3719D	REF	DECAL CUSTOMER CONN E1 E3
11	0J4467	4	SCREW SHC M5-0.8 X 100 C8.8
12	022473	4	WASHER FLAT 1/4-M6 ZINC
13	022097	4	WASHER LOCK M6-1/4
14	051716	4	NUT HEX M5-0.8 G8 CLEAR ZINC

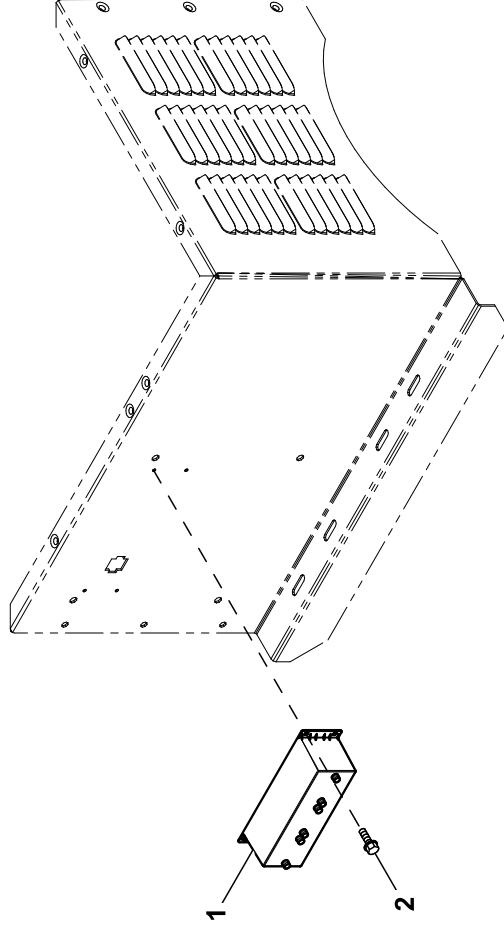
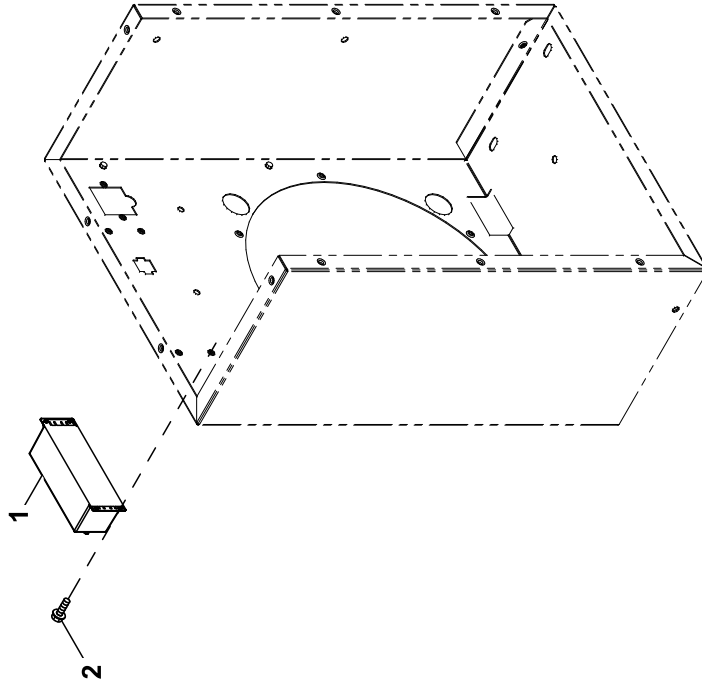
NOTES (UNLESS OTHERWISE SPECIFIED):

(1) SHEET METAL PARTS LISTED IN THE BOM TABLE ARE REPRESENTING GENERIC PARTS (NO COLOR)

- MANUFACTURING: FOR CORRECT MATERIAL AND COLOR REFER TO AS400 BOM.
- CUSTOMER: WHEN ORDERING REPLACEMENT PARTS ENTER BASE NUMBER (FIRST 6 DIGITS ONLY) IN THE SYSTEM FOR CORRECT MATERIAL AND COLOR (FOR REFERENCE SEE GUIDELINE 0H7169).

(2) QTY. REQUIRED FOR 1Ø BREAKER / QTY. REQUIRED FOR 3Ø BREAKER.

GROUP A



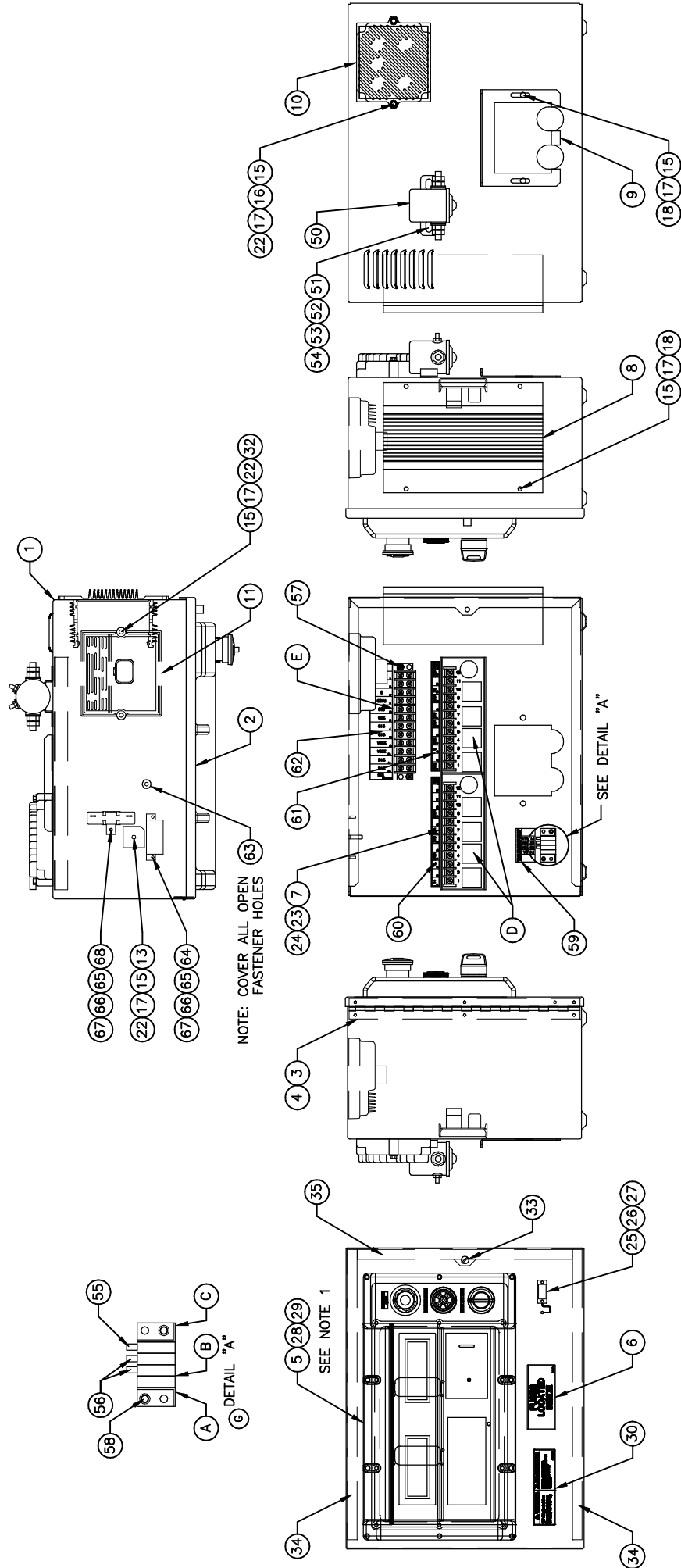
EXPLODED VIEW: EV INTERFACE

DRAWING #: 0J1456

GROUP A

ITEM	PART#	QTY.	DESCRIPTION
1	0J0155	1	INTERFACE 3PH 416/480V
	0J0156	1	INTERFACE 3PH 208/240V
	0J0157	1	INTERFACE 1PH 120/240V
	0J0158	1	INTERFACE 3PH 600V
2	0J5464	4	SCREW THTT M5-0.8 X 16 ZP

GROUP B

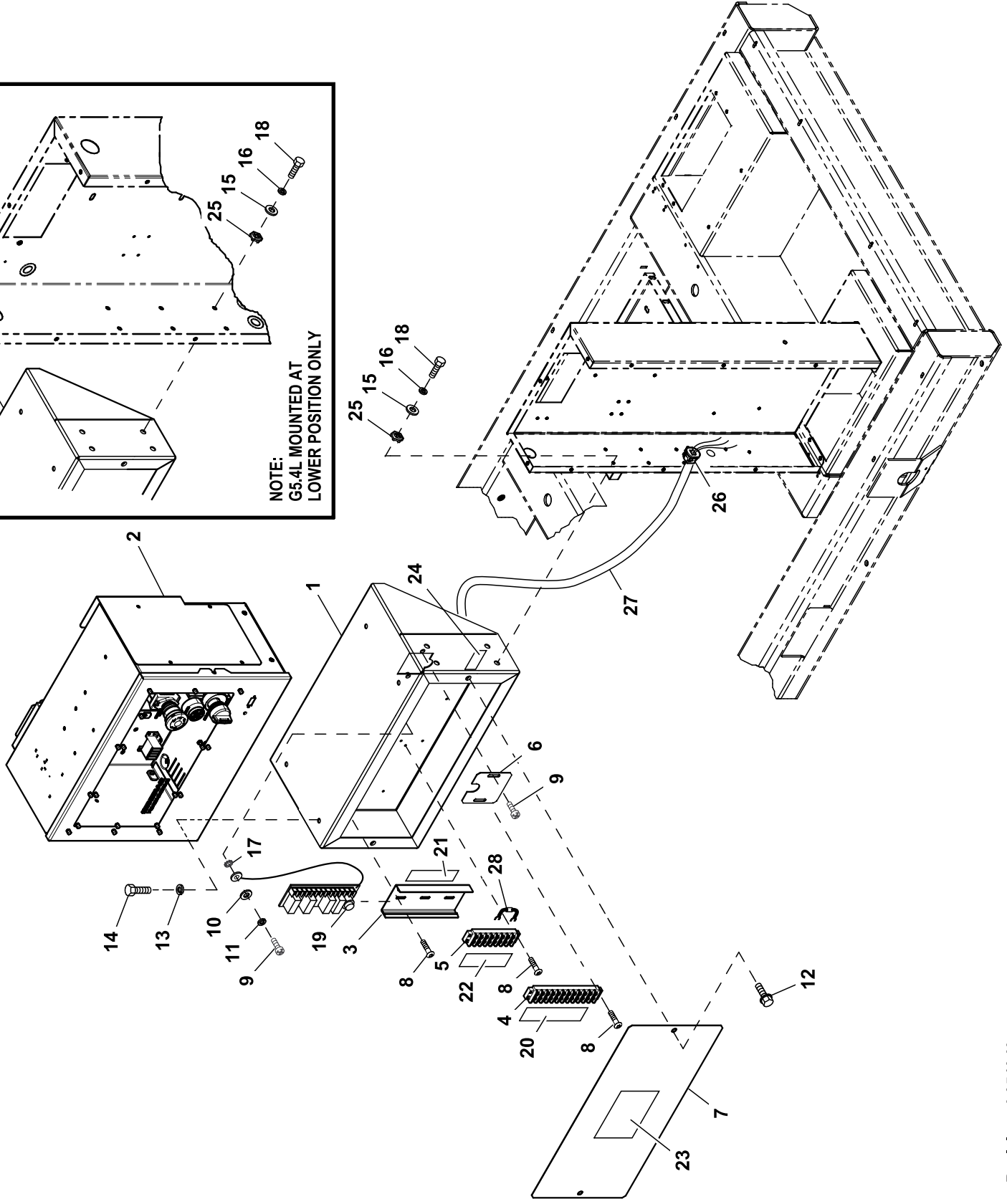
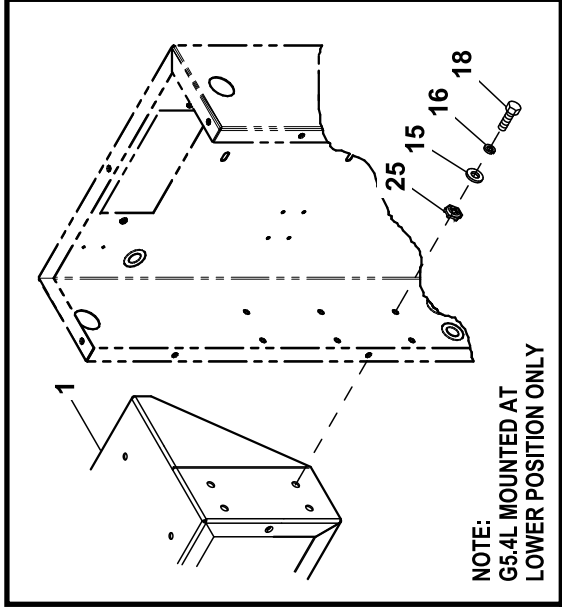


EXPLODED VIEW:
 AV H-PNL 10A BATT C 24V
 DRAWING #: 0G4144D

APPLICABLE TO:

ITEM	PART #	QTY.	DESCRIPTION
COMPONENTS INCLUDED IN 0G4144E			
1	0F1823CST03	1	ENCL H/G CONTROL PANEL
2	0F1824AST03	1	COVER CONTROL PANEL H
3	0F2606	1	HINGE CONTINUOUS H PANEL
4	036261	7	RIVET POP .125 X .275 SS
5	0F5763	1	ASSY PROGRAMMED H-100
6	0F1732	1	DECAL FUSES LOCATED INSIDE
7	0E9764	1	RAIL SNAPTRACK PCB HOLDER BULK (12"LG)
8	0F1740D	1	ASSY PCB 10A UL BATT CHRGR 24V
9	0F1958	1	PLATE HARNESS CLAMP
10	0F2256	1	ASSY PCB PWR AVR W/AMP HEADER
11	0F9581	1	ASSY PCB 12V BOSCH W/24V INPT
12			
13	029673	1	DIO BRIDGE 25A 600V
14			
15	049226	11	WASHER LOCK M5
16	079224	2	SCREW PPHM M5-0.8 X 30 SS
17	051713	13	WASHER FLAT M5
18	0F5886	6	SCREW HHPM M5-0.8 X 12
19			
20			
21			
22	051716	5	NUT HEX M5-0.8 G8 CLEAR ZINC
23	043180	3	WASHER FLAT M4
24	0C3990	3	SCREW PHTT M4-0.7 X 10 ZYC
25	0F4333	1	CONN DUST CAP W/CHAIN DB9
26	0F5883	1	WASHER FLAT M3.5
27	0F5884	1	SCREW PHTT M3.5-0.6 X 10
28	055014	10	SCREW PPHM M4-0.7 X 8 BLX OX
29	022264	10	WASHER LOCK #8-M4
30	0G3546	1	DECAL WRN BATT CHRGR 12/24V BI
31			
32	080823	2	SCREW PPHM M5-0.8 X 50 ZNC
33	0G3648	1	M5-0.8 CAPTIVE PANEL KNLD HD
34	0F6305	2	SEAL COVER 3.18 X 12.7 X 382
35	0F6305A	1	SEAL COVER 3.18 X 12.7 X 283
36	0G4329	1	HARNESS H-PNL INTEGRATED SW (NOT SHOWN)
COMPONENTS INCLUDED IN WIRE HARNESS			
A	0F1263	1	ADPTR RH SIDE WICKMANN 178.6191
B	0F1262	4	HOLDER FUSE WICKMANN 178.6150
C	0F1264	1	ADPTR LH SIDE WICKMANN 178.6192
D	0E9049A	2	ASSY PCB G-PANEL RELAY 24VDC
E	055911	1	BLOCK TERM 20A 12 X 6 X 1100V
COMPONENTS NOT INCLUDED IN 0G4144E OR WIRE HARNESS			
50	082982	1	RELAY CONTACTOR 24VDC
51	022287	2	SCREW HHC 1/4-20 X 3/4 G5
52	022473	4	WASHER FLAT 1/4-M6 ZINC
53	022097	2	WASHER LOCK M6-1/4
54	022127	2	NUT HEX 1/4-20 STEEL
55	0E7403C	1	FUSE ATO TYPE 15 AMP (BLUE)
56	0E7403B	2	FUSE ATO TYPE 10 AMP (RED)
57	0C2323	2	SCREW PHTT #6-32 X 5/8 ZYC
58	0C2699	2	SCREW PHTT #6-32 X 3/8 ZYC
59	0J7646	1	DECAL CONTROL BOX FUSES
60	0J3507	1	DECAL RELAY BD G13 RB2
61	0F5772	1	DECAL H-100 RELAY BD 24V RB1
62	0F7582	1	DECAL 24VDC TB3
63	0F6145	A/R	SEAL WEATHER .45"DIA
64	054450	1	CB 5.5A X IP AUTO
65	043182	3	WASHER LOCK M3
66	051714	3	NUT HEX M3-0.5 G8 CLEAR ZINC
67	052777	3	WASHER FLAT M3
68	0F5752D	1	RES WW 75R 5% 25W QK CONN

GROUP B



EXPLODED VIEW: EV H-PNL 10A BC NO E-GOV DSL24

DRAWING #: 0J0288

GROUP B

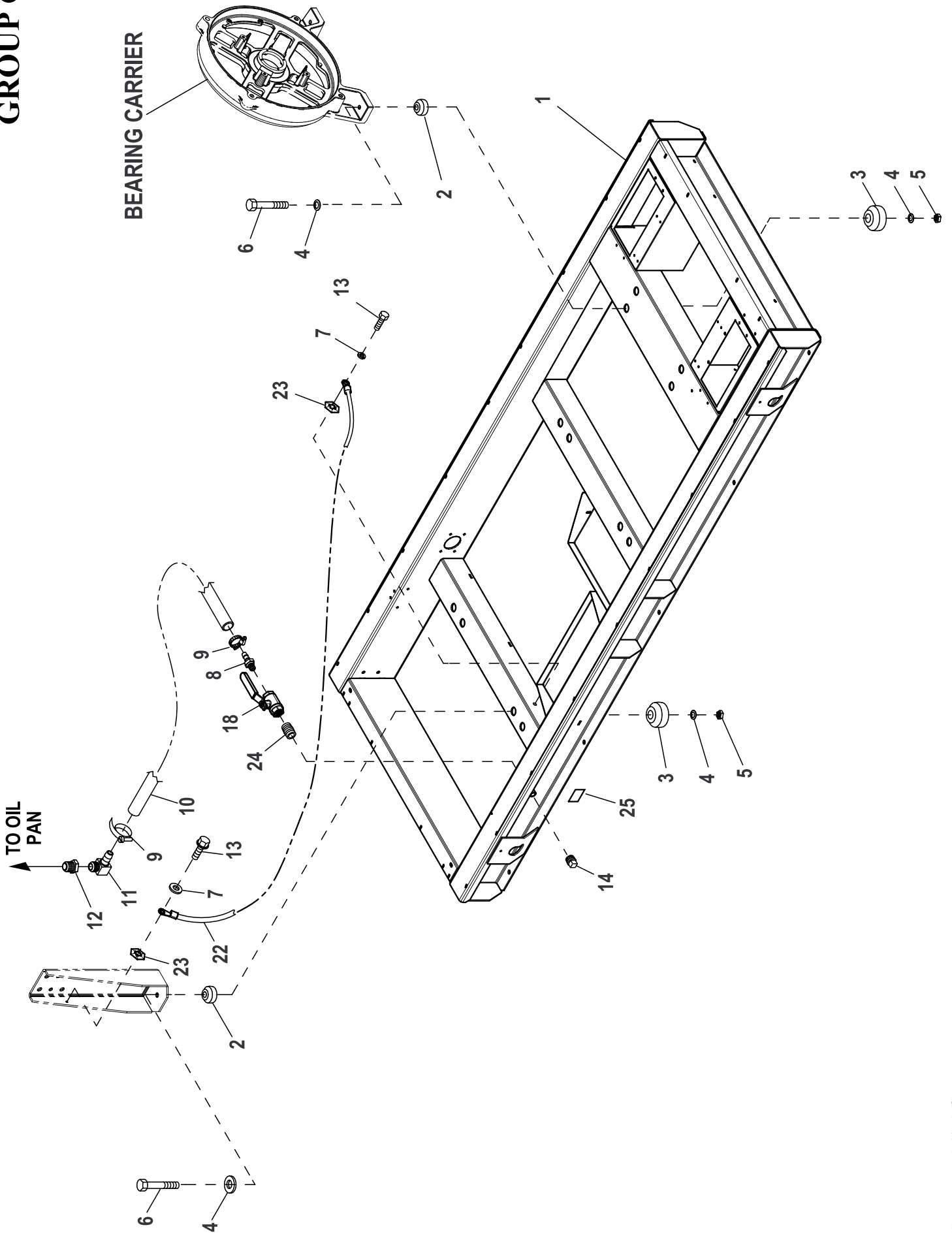
APPLICABLE TO:

ITEM	PART#	QTY.	DESCRIPTION
(1)1	0H84230STOR	1	BRACKET H-PNL MOUNTIN CCI IND
2	0H4733E	1	ASSY H-PANEL 2.5A BATC 12V
	0G4140E	1	ASSY H-PANEL 10A BATC 12V
	0G4141E	1	ASSY H-PANEL NO BATC NO E-GOV
	0G4144E	1	ASSY H-PANEL 10A BATC 24V
3	0E9764	1	RAIL SNAPTRACK PCB HOLDER BULK
(2)4	055911	REF	BLOCK TERM 20A 12 X 6 X 1100V
(2)5	057701	REF	BLOCK TERM 20A 8 X 6 X 1100V
(1)6	0J01360STOR	1	PLATE, WIRE HARN BLOCKOFF
(1)7	0H96870STOR	1	COVER, COSTOMER CONN H-PNL
8	0J5462	6	SCREW THTT M4-0.7 X 16 ZP
9	0J5464	3	SCREW THTT M5-0.8 X 16 ZP
10	051713	3	WASHER FLAT M5
11	049226	3	WASHER LOCK M5
12	0C2454	2	SCREW HWHT M6-1 X 16 N WA Z/JS
13	022097	4	WASHER LOCK M6-1/4
14	047411	4	SCREW HHC M6-1.0 X 16 C8.8
15	022145	4	WASHER FLAT 5/16-M8 ZINC
16	022129	4	WASHER LOCK M8-5/16
17	026850	1	WASHER LOCK EXT 1/4 STL
18	039253	4	SCREW HHC M8-1.25 X 20 C8.8
19	0G6962A	1	ASSY PCB RELAY 24VDC
	0G6962B	1	ASSY PCB RELAY 12VDC
20	0J0392	1	DECAL, TB1 LV CUSTOMER CONN
21	0J0398	1	DECAL, CONTACT RAT 30VAC/30VDC
22	0J0393	1	DECAL, TB2 LV CUSTOMER CONN
23	0J0545	1	DECAL, LV CUSTOMER CONN INSIDE
24	0J0575	1	DECAL, CUSTOMER WIRE #14
25	0C3168	1	WASHER LOCK SPECIAL 5/16
(5)26	0J8896	1	BUSHING, STRAIN RND(.290-.385)
(6)(3)27	0H9845	REF	HARN 390/520 CONBOX H-PANEL
(4)28	0C8065	1	DIODE ASSEMBLY
29	0J5349	REF	HARN 390/520 CONBOX 12V GAS H (NOT SHOWN)

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- (2) PART OF CONNECTION BOX HARNESS
- (3) HARNESS GETS WIRED TO LOAD CENTER IF EQUIPPED.
- (4) REFERENCE WIRE DIAGRAM FOR PROPER LOCATION.
- (5) NOT REQUIRED IF EQUIPPED WITH 0J1594, KIT BATTERY CHARGER POWER CORD.
- (6) HARNESS GETS TIED BACK AND BUNDLED WITH OTHER HARNESS AND LEFT UNCONNECTED IF EQUIPPED WITH 0J1594, KIT BATTERY CHARGER POWER CORD.

GROUP C



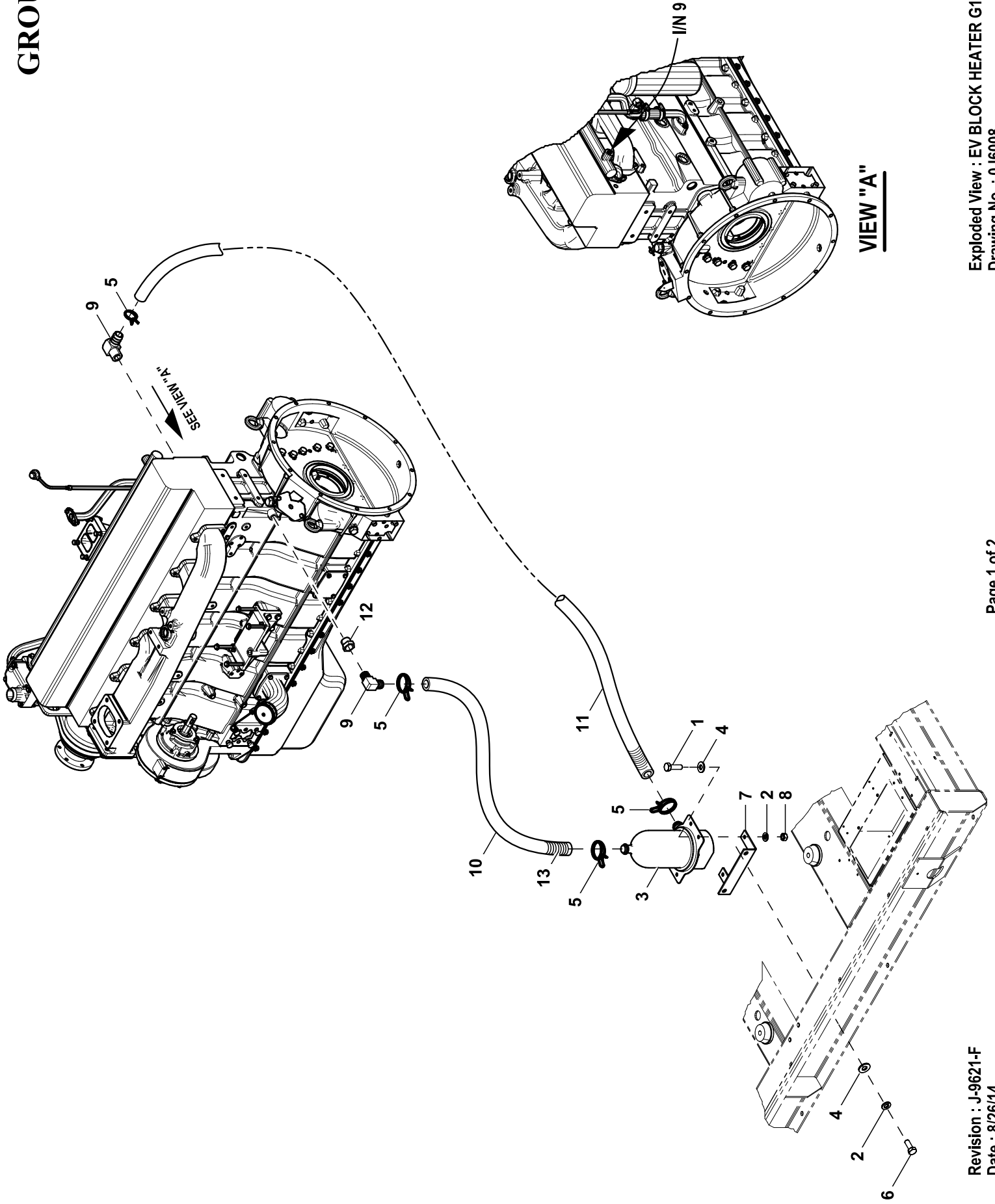
EXPLODED VIEW: EV MTG BASE G12.9L G20**DRAWING #: 0J5962****GROUP C**

ITEM	PART#	QTY.	DESCRIPTION
(1)1	0J59680ST0R	1	MTG BASE 12.9L G20
2	059675	6	MOUNT UPPER VIBRATION
3	059676	6	MOUNT LOWER VIBRATION
4	022247	12	WASHER FLAT 5/8 ZINC
5	089743	6	NUT HEX LOCK 5/8-11 NY INS
6	0H8626	6	SCREW HHC 5/8-11 X 5 G8
7	022145	2	WASHER FLAT 5/16-M8 ZINC
8	044118	1	STRAIGHT BRBD 1/2 NPT X 5/8
9	057822	2	CLAMP HOSE #8 .53 - 1.00
10	065386	1	HOSE COOL 5/8 ID 100R6 (24" LG)
11	056460	1	BARBED EL 90 1/2 NPT X 5/8
12	094992	1	BSHG RDCR HEX 1 TO .5 BRASS
13	024526	2	SCREW HHTT 5/16-18 X 3/4 CZ
14	024310	1	PLUG STD PIPE 1/2 STEEL SQ HD
18	078944	1	VALVE BALL
22	0536210148	1	GRD WIRE 3/0 23.0"
23	0A4456	1	WASHER LOCK SPECIAL 3/8
24	031105	1	NIPPLE PIPE 1/2NPT X 1-3/4
25	050277A	1	DECAL OIL DRAIN TRI

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- CUSTOMER: WHEN ORDERING REPLACEMENT PARTS ENTER BASE NUMBER (FIRST 6 DIGITS ONLY) IN THE SYSTEM FOR CORRECT MATERIAL AND COLOR (FOR REFERENCE SEE GUIDELINE 0H7169).

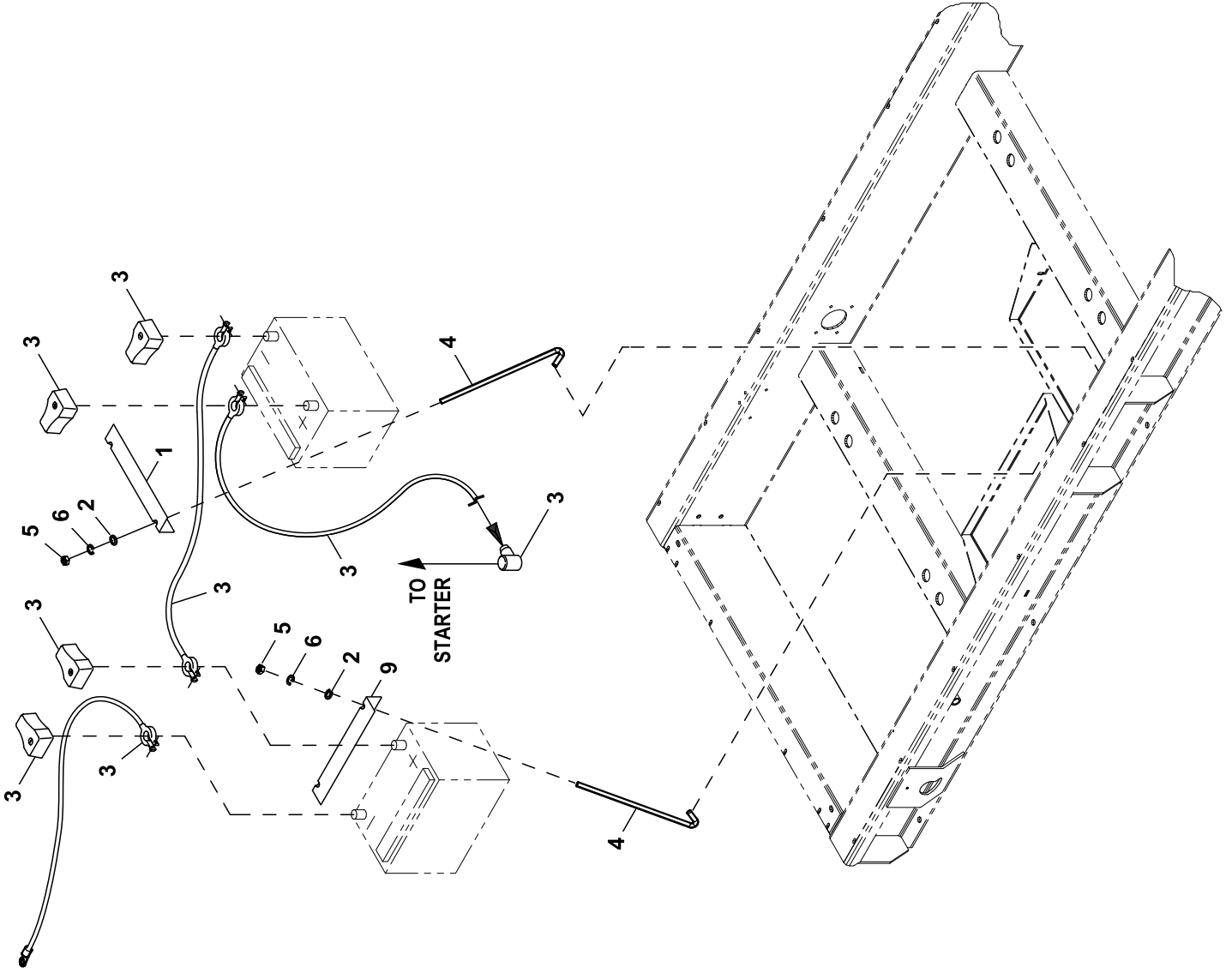
GROUP C



EXPLODED VIEW: EV BLOCK HEATER G12.9L G20**DRAWING #:0J6008****GROUP C**

ITEM	PART#	QTY.	DESCRIPTION
1	042568	2	SCREW HHC M6-1.0 X 20 C8.8
2	022097	4	WASHER LOCK M6-1/4
3	084918N	1	HEATER BLOCK 2000W 240V
4	022473	4	WASHER FLAT 1/4-M6 ZINC
5	0G0015	4	CLAMP HOSE 7/8" OD DOUBLE WIRE
6	047411	2	SCREW HHC M6-1.0 X 16 C8.8
7	084427	1	BRACKET, ENGINE HEATER
8	049813	2	NUT HEX M6-1.0 G8 CLEAR ZINC
9	034339	2	BARBED EL 90 3/8NPT X 5/8
10	050967	1	HOSE COOL 5/8 ID 20R3 (32"LG)
11	050967	1	HOSE COOL 5/8 ID 20R3 (70"LG)
12	062303	1	ADAPTOR 1/4" NPT TO 3/8" NPT
13	077043E	8FT	CONDUIT FLEX, 1"ID

GROUP C



EXPLODED VIEW: EV BATT CABLE/HOLD DOWN G12.9

DRAWING #: 0J7399

GROUP C

ITEM	PART#	QTY.	DESCRIPTION
1	(1)059568	2	BAR BATTERY HOLD DOWN 539MM
	(2)059568B	2	BATT HOLD DOWN BAR 368MM
2	022145	4	WASHER FLAT 5/16 ZINC
3	0H5205C	1	KIT BATT CABLES 3/0 G12.9L G20
4	059567	4	BOLT BATTERY HOLD DOWN
5	022259	4	NUT HEX 5/16-18 STEEL
6	022129	4	WASHER LOCK M8-5/16

(1) FOR 8D BATTERY

(2) FOR 31 BATTERY

EXPLODED VIEW: EV ENGCMPRT G12.9L G20 H-PNL

DRAWING #: 0J5929

GROUP D

ITEM	PART#	QTY.	DESCRIPTION
1	0J5866	1	G12.9L G20 ENGINE LSI
2	0A1492	1	CAP FUEL KELCH# 200314
3	045773	12	NUT HEX M12-1.75 G8 YEL CHR
4	022507	4	SCREW HHC 1/4-20 X 1/2 G5
5	084206A	1	CONTROLLER CDI IGNITION
(3)6	030418	1/2	BSHG RDCR HEX 1/2 TO 3/8
7	0J9058	6	ASSY SPARK PLUG WIRE
8	080823	2	SCREW PPHM M5-0.8 X 50 ZNC
9	057824	2	CLAMP HOSE #16 .87-1.50
(3)10	0E0502	1/2	TEMPERATURE SENDER, DELPHI
12	0J65810ST03	1	BRACKET, IGNITION COIL MOUNT
13	0J7048	8	SCREW SHC M12-1.25 X 30 C12.9
14	0F4612	1	SENDER OIL PRESSURE 1/8"NPT
15	051769	24	WASHER LOCK M12
16	0H2957B	1	ASSY PCB AIR-FUEL SOLENOID 24V
17	0D1307	12	SCREW SHC M12-1.75 X 35 C12.9
18	046526	13	WASHER LOCK M10
19	049226	2	WASHER LOCK M5
20	0D2244M	1	ASSY MAGPICKUP(3/8-24 MALE)
21	052647	4	SCREW SHC M10-1.5 X 25 C12.9
22	0C2454	12	SCREW HWHT M6-1 X 16 N WA Z/JS
23	051716	2	NUT HEX M5-0.8 G8 CLEAR ZINC
24	021406A	5	FLEX PLATE SAE 14 M14 BOLTS
(3)25	022097	5/6	WASHER LOCK M6-1/4
26	0G1573	1	FAN 30" LH ROTATION
27	0G5956	6	SCREW HHC M14-1.5 X 45 C10.9
28	084206B	6	COIL IGNITION
(3)29	0F2776	1/2	BRACKET SIGNAL CONDITIONER
30	0K4739	1	OIL SEPARATOR G12.9 G20
31	0K48490ST03	1	OIL FILL G12.9 G20
32	040479	4	VIB MNT 1.0 X 1.0 X 1/4-20
(3)33	045757	0/1	SCREW HHC M6-1.0 X 25 C8.8
34	084206C	1	MAG PICKUP
35	049814	3	SCREW HHC M10-1.5 X 25 C8.8
36	0C5209	1	HOSE 1ID LOW PRES OIL/WATER (70"LG)
37	0J59320ST03	4	ENGINE FOOT G12.9 G20
(2)38	-	-	-
39	055934D	2	CLAMP STL/VNL 1.06 X .406 Z
40	0A5431	1	PLATE ADAPTOR 13.5MM
41	081816	12	SCREW HHC M12-1.75 X 55 C10.9
(3)42	022473	10/12	WASHER FLAT 1/4-M6 ZINC
43	-	-	-
44	0G5961	6	WASHER STRUCTURAL FLAT M14
45	049808	44	WASHER FLAT M12
(3)46	049813	0/1	NUT HEX M6-1.0 G8 CLEAR ZINC
47	023897	4	WASHER FLAT #10 ZINC
48	022127	4	NUT HEX 1/4-20 STEEL
49	022131	13	WASHER FLAT 3/8-M10 ZINC
51	0J5935	1	FAN SPACER 12.9L G20
52	059355	6	SCREW SHC M10-1.50 X 50 C12.9
53	0J7161	1	ADPTR, 3/4 MPT TO UNF 3/4-16
54	0J7162	1	ADPTR, M18X1.5 TO UNF 3/8-24
55	042574	1	ADAPTOR 1/8NPTF TO 1/8BSPT

EXPLODED VIEW: EV ENGCOMPRT G12.9L G20 H-PNL**DRAWING #: 0J5929****GROUP D**

ITEM	PART#	QTY.	DESCRIPTION
(1)56	022127	1	NUT HEX 1/4-20 STEEL
(1)57	0F1462	1	GND STRAP ECM G-PANEL
(1)58	022129	4	WASHER LOCK M8-5/16
(1)59	022145	4	WASHER FLAT 5/16-M8 ZINC
(1)60	039414	4	SCREW HHC M8-1.25 X 35 C8.8
(1)61	022287	1	SCREW HHC 1/4-20 X 3/4 G5
(1)62	026850	1	WASHER LOCK EXT 1/4 STL
(1)63	0F4649	1	PMGC WITH MODEM 1AMP CT'S
64	022129	3	WASHER LOCK M8-5/16
65	022145	6	WASHER FLAT 5/16-M8 ZINC
66	045771	3	NUT HEX M8-1.25 G8 CLEAR ZINC
(5)67	0G0349	1	HARN OIL TEMP SENDER OPTION
68	0A6928	3	SCREW HHC M8-1.25 X 20 SS
(4)69	0J92950ST0R	2	SPACER ENGINE FOOT
70	0J5943	1	HARN ENG G12.9L G20 PM-PC (NOT SHOWN)
	0J5942	1	HARN ENG G12.9L G20 H-PANEL (NOT SHOWN)
71	0J9555	2	DECAL-OIL FILTER
72	0J9556	1	DECAL-OIL FILL

NOTES(UNLESS OTHERWISE SPECIFIED):

(1) G-PANEL ONLY.

(2) PART IS SUPPLIED WITH ENGINE.

(3) QUANTITY REQUIRED WITHOUT OPT. OIL TEMP KIT / QUANTITY REQUIRED WITH OPT. OIL TEMP KIT

(4) SHEET METAL PARTS LISTED IN THE BOM TABLE ARE REPRESENTING GENERIC PARTS (NO COLOR)

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(5) PART IS SUPPLIED WITH OIL TEMP KIT.

EXPLODED VIEW: EV ENGCOMPRT G12.9L G20 H-PNL

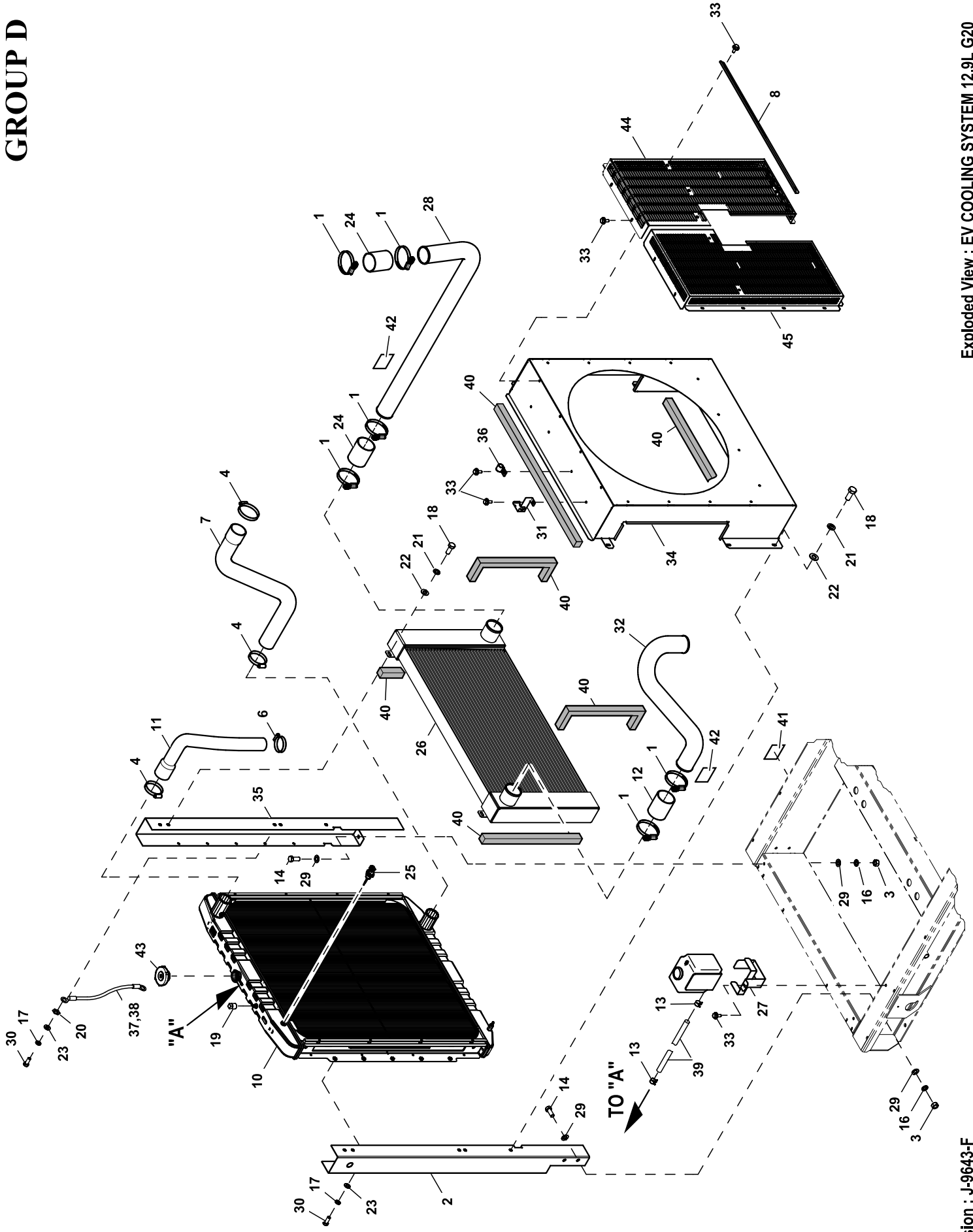
DRAWING #: 0J5929

GROUP D

ITEM	PART#	QTY.	DESCRIPTION
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GROUP D



EXPLODED VIEW: EV COOLING SYSTEM 12.9L G20

DRAWING #:0J5946

GROUP D

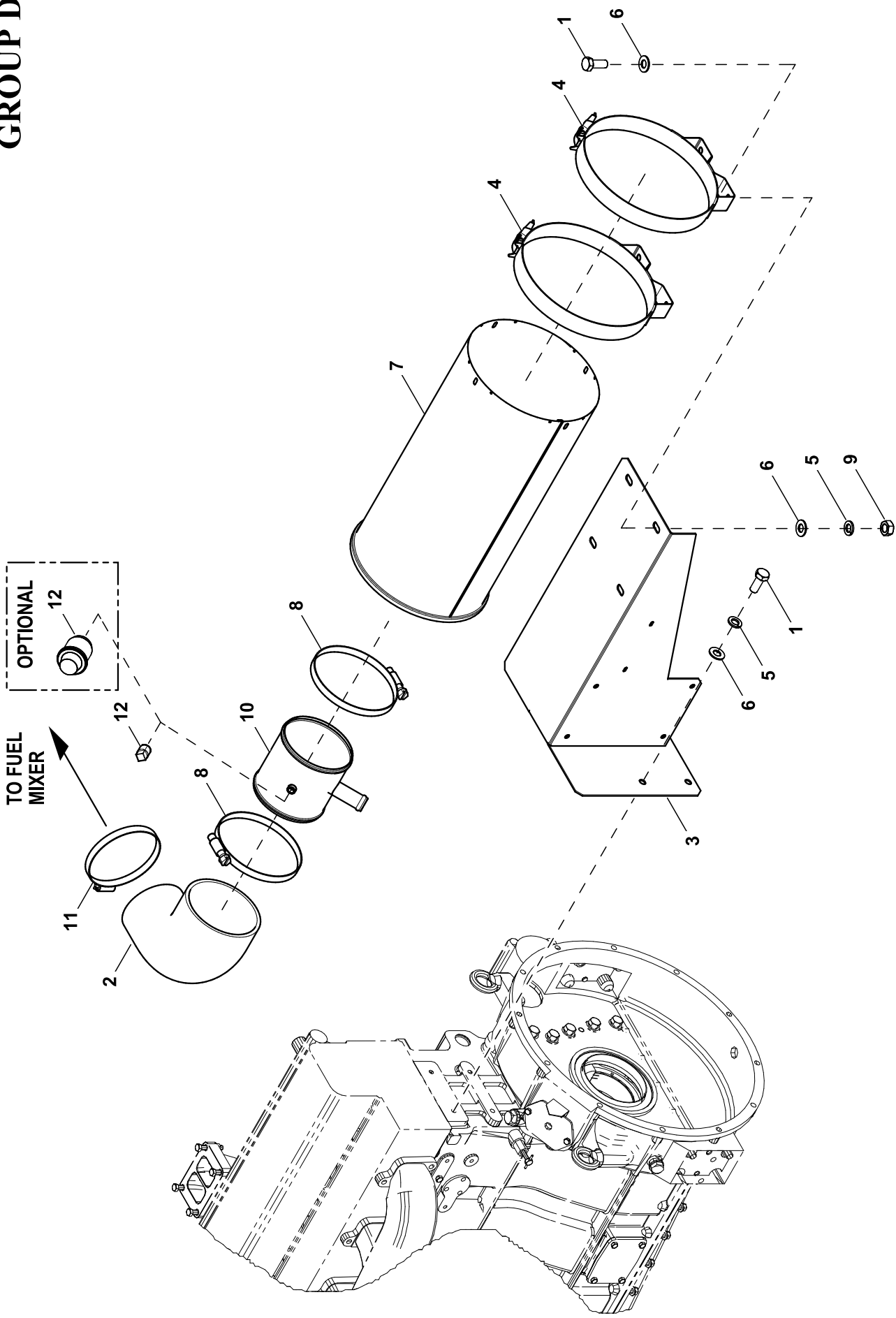
ITEM	PART#	QTY.	DESCRIPTION
1	0G1285E	6	CLAMP CNST TENSION 2.75-3.625
(1)2	0J59590ST0R	1	SUPPORT, LH RADIATOR 12.9L G20
3	045773	6	NUT HEX M12-1.75 G8 YEL CHR
4	086133D	3	CLAMP HI TORQUE 2.25 - 3.125
6	086133C	1	CLAMP HI TORQUE 1.75 - 2.625
7	0J5948	1	HOSE, RAD LOWER 12.9L G20
(1)8	0J5949AST0R	1	FAN GUARD SUPPORT, G12.9L G20
9	076749	1	TANK COOLANT RECOVERY
10	0G1219F	1	RAD RH-IN/OUT DEAERATN BAFFL
11	0J5947	1	HOSE, RAD UPPER 12.9L G20
12	0A5260B	1	HOSE 3"ID X 4.0"LG
13	048031C	2	CLAMP HOSE BAND .50
14	059920	6	SCREW HHC M12-1.75 X 35 C10.9
16	051769	6	WASHER LOCK M12
17	022129	10	WASHER LOCK M8-5/16
18	049814	10	SCREW HHC M10-1.5 X 25 C8.8
19	026073A	1	PLUG STD PIPE 1/4 STEEL SQ HD
20	0C3168	1	WASHER LOCK SPECIAL 5/16
21	046526	10	WASHER LOCK M10
22	022131	10	WASHER FLAT 3/8-M10 ZINC
23	022145	10	WASHER FLAT 5/16-M8 ZINC
24	080773B	2	HOSE 3" ID X 4" LG HIGH TEMP
25	0H1827	1	PROBE COOLANT LEVEL 3/8-18NPTF
26	0H9192	1	CAC, ASEMBLY 1/4" MANIFOLD
27	0D7975	1	WATER BOTTLE BRACKET
28	0J5952	1	CAC PIPE, IN 12.9L G20
29	049808	12	WASHER FLAT M12
30	039253	10	SCREW HHC M8-1.25 X 20 C8.8
31	0F2776A	1	BRACKET SIGNAL CONDITIONER
32	0J5953	1	CAC PIPE, OUT 12.9L G20
33	0C2454	23	SCREW HWHT M6-1 X 16 N WA Z/JS
(1)34	0J59570ST0R	1	VENTURI 12.9L G20
(1)35	0J59580ST0R	1	SUPPORT, RAD R/H SIDE
36	055934H	1	CLAMP STL/VNL .62 X .406 Z
37	0G7895A	1	HARN RADIATOR GND 80"
38	077043H	1	CONDUIT FLEX .25"ID
39	029032	1	HOSE 9/32 ID
40	052250	1	TAPE FOAM 1X (178"LG)
41	050276	1	DECAL RADIATOR DRAIN
42	0G3263A	2	DECAL WARNING HOT SURFACES BI
43	0E4162	1	CAP RADIATOR 20 PSI
(1)44	0J8291AST0R	1	FAN GUARD RIGHT, G12.9L G20
(1)45	0J82910ST0R	1	FAN GUARD LEFT,G12.9L G20

NOTES (UNLESS OTHERWISE SPECIFIED):

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GROUP D



EXPLODED VIEW: EV AIR CLEANER 12.9L G20**DRAWING #: 0J5997****GROUP D**

ITEM	PART#	QTY.	DESCRIPTION
1	049814	8	SCREW HHC M10-1.5 X 25 C8.8
2	059667	1	ELBOW RUBBER 90 5-4 ADAPTER
(1)3	0J688300ST0R	1	BRACKET, AIR CLEANER
4	061702	2	CLAMP MTG BAND 10.19"
5	046526	8	WASHER LOCK M10
6	022131	12	WASHER FLAT 3/8-M10 ZINC
7	084288	1	AIR CLEANER ECO-SE
8	058612	2	CLAMP HOSE #88 5.12-6.00
9	045772	4	NUT HEX M10-1.5 G8 YEL CHR
10	0H2573	1	TUBE AIR INTAKE W/ BEADED TUBE
11	086133H	1	CLAMP HI TORQUE 4.25 - 5.125
12	026073	1	PLUG STD PIPE 1/8 STEEL SQ HD
	(2) 0A4256	1	INDICATOR FILTER MINDER

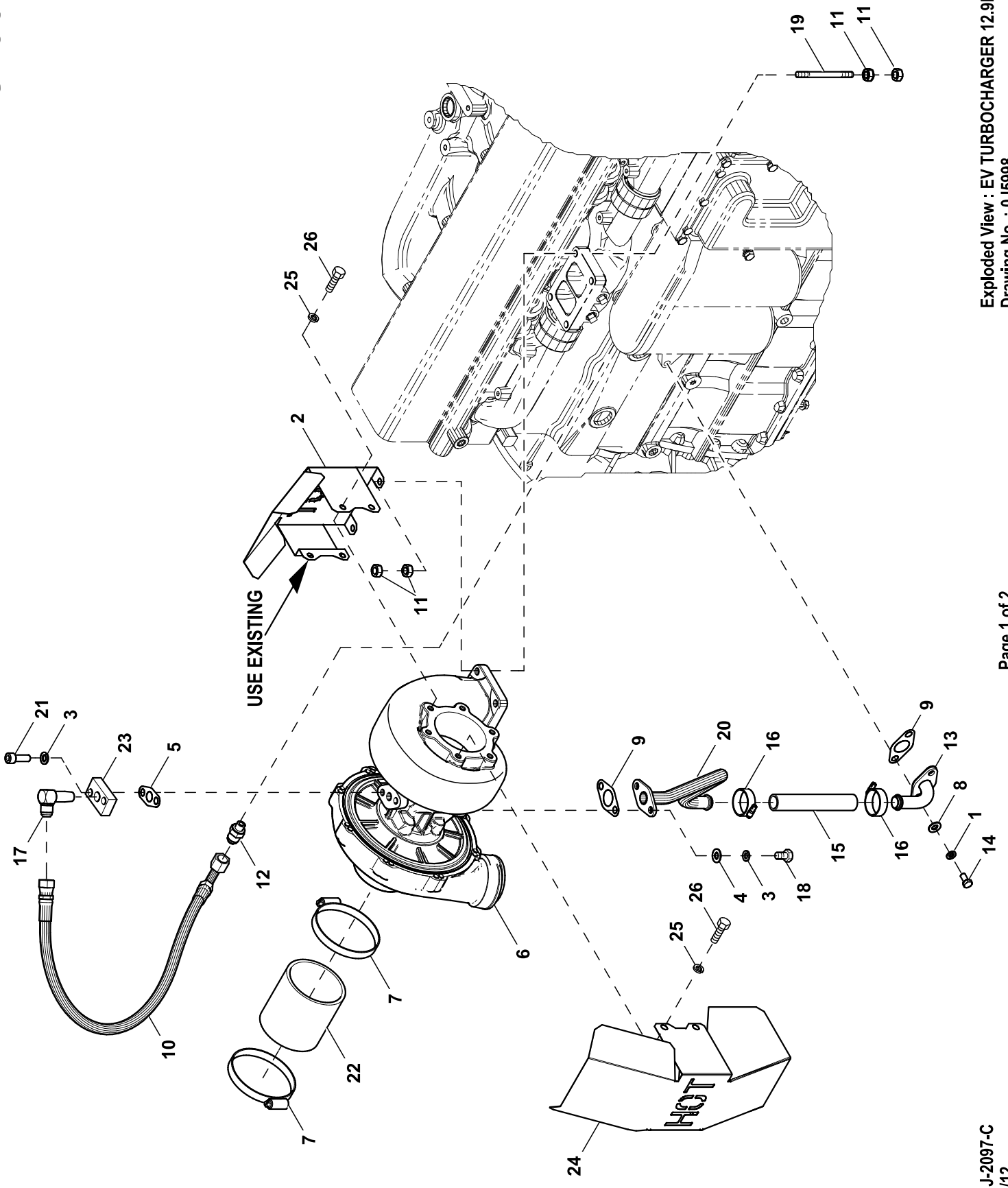
NOTES (UNLESS OTHERWISE SPECIFIED):

(1) SHEET METAL PARTS LISTED IN THE BOM TABLE ARE REPRESENTING GENERIC PARTS (NO COLOR)

- MANUFACTURING: FOR CORRECT MATERIAL AND COLOR REFER TO AS400 BOM.
- CUSTOMER: WHEN ORDERING REPLACEMENT PARTS ENTER BASE NUMBER (FIRST 6 DIGITS ONLY) IN THE SYSTEM FOR CORRECT MATERIAL AND COLOR (FOR REFERENCE SEE GUIDELINE 0H7169).

(2) OPTIONAL

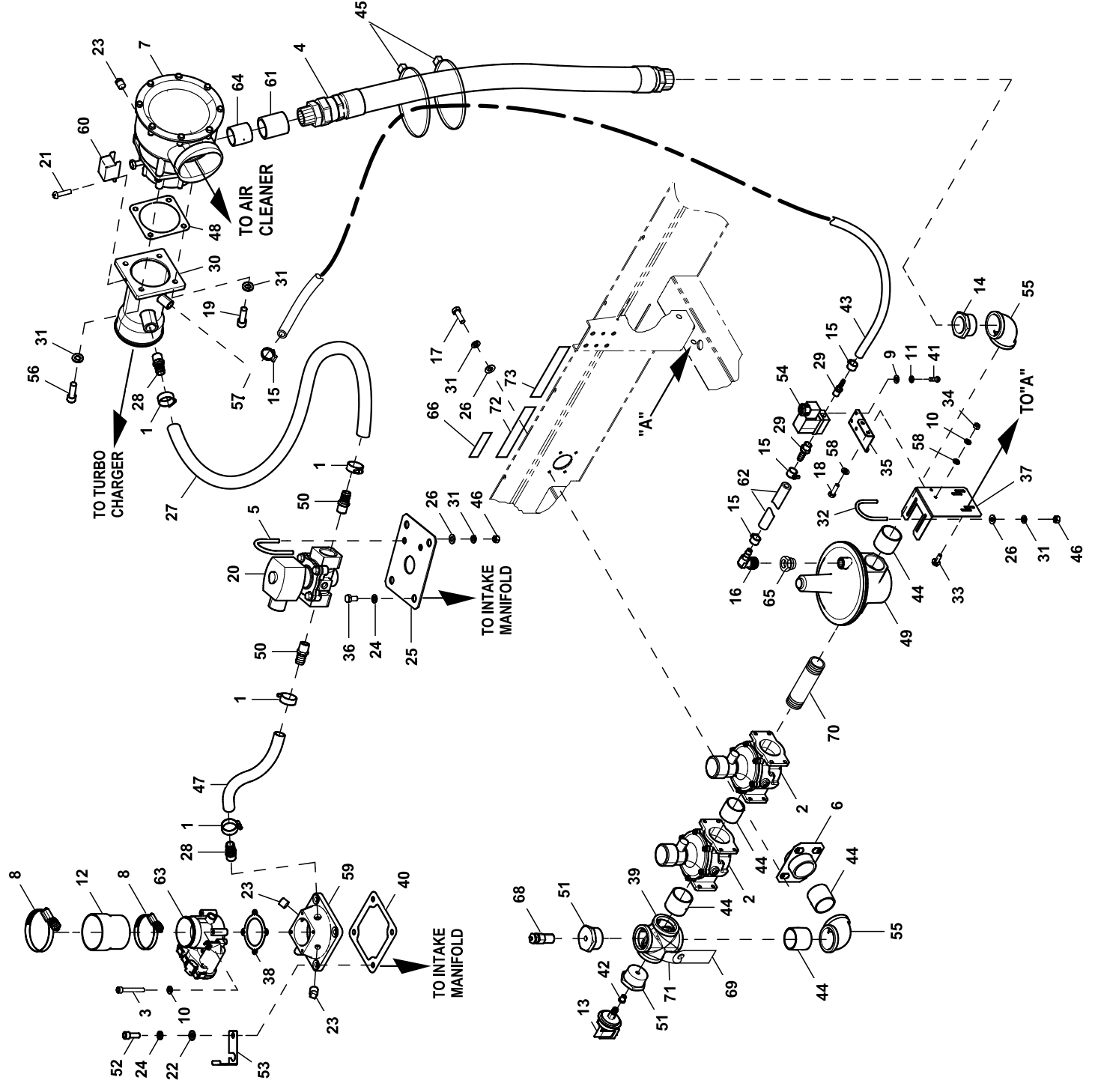
GROUP D



EXPLODED VIEW: EV TURBOCHARGER 12.9L G20**DRAWING #:0J5998****GROUP D**

ITEM	PART#	QTY.	DESCRIPTION
1	022129	2	WASHER LOCK M8-5/16
2	0J6272	1	HEAT SHIELD TURBO REAR 12.9L
3	046526	4	WASHER LOCK M10
4	022131	2	WASHER FLAT 3/8-M10 ZINC
5	064973	1	GASKET OIL INLET FLANGE
6	0F9244	1	TURBO 300KW (230KW AND UP)
	0F9244A	1	TURBO 200KW (150KW THRU 200KW)
7	086133F	2	CLAMP HI TORQUE 3.25 - 4.125
8	022145	2	WASHER FLAT 5/16-M8 ZINC
9	064974	2	GASKET OIL OUTLET FLANGE
10	0J6756	1	HOSE, TURBO OIL INLET
11	088510	16	NUT HEX M10-1.5 SS
12	0J6876	1	ADPTR, MALE JIC X MALE BSPP
13	0J6755	1	TUBE, OIL RETURN
14	042907	2	SCREW HHC M8-1.25 X 16 C8.8
15	085964	1	HOSE 3/4 ID 100R6
16	057824	2	CLAMP HOSE #16 .87-1.50
17	064965	1	ADAPTOR 90 DEGREE JIC-NPT 2501-1-8-6
18	051756	2	SCREW HHC M10-1.5 X 20 C8.8
19	079922B	4	STUD M10-1.50 X 80 SS
20	0J6754	1	TUBE, TURBO OIL RETURN
21	057192	2	SCREW SHC M10-1.5 X 30 C12.9
22	071266B	1	HOSE 3.5"ID X 4.0"LG
23	059660	1	ADAPTOR OIL INLET FLANGE
24	0F9789	1	HEAT SHIELD TURBO FRONT HOT
25	0F4710	4(REF)	WASHER LOCK M10 SS
26	0C9542	4(REF)	SCREW HHC M10-1.5 X 25 SS

GROUP E



EXPLODED VIEW: EV NAT GAS FUEL SYS 12.9L G20

DRAWING #: 0J5999

GROUP E

ITEM	PART#	QTY.	DESCRIPTION
1	035473	4	CLAMP HOSE #12 .50-1.25
2	0E0694D	2	ASSY NATGAS FUEL SOLENOID 24V
3	046580	4	SCREW SHC M6-1.0 X 45 C12.9
4	0J6567	1	NAT GAS FUEL HOSE ASSEM
5	028238	1	BOLT U 5/16-18 X 1.50
(1)6	0G7029ASTOR	1	"WELDMENT,2" COUPLER
7	0A6254	1	FUEL MIXER 400V SIDE DRAFT
8	0G1285E	2	CLAMP CNST TENSION 2.25-3.125
9	043180	4	WASHER FLAT M4
10	022097	6	WASHER LOCK M6-1/4
11	022264	4	WASHER LOCK #8-M4
12	0F0960	1	REDUCER 3.0" TO 2.75" TURBO
13	0G0964	1	SWITCH, PRESSURE GAS 9" RISE
14	0G0570	1	BSHG RDCR HEX 2 TO 1-1/2
15	040173	4	CLAMP HOSE #5.5 .62-.62
16	0H3409B	1	BARBED 90 3/8NPT X 5/16 #29VNT
17	043107	4	SCREW HHC M8-1.25 X 25 C8.8
18	042568	2	SCREW HHC M6-1.0 X 20 C8.8
19	0H4265A	1	SCREW TAMPERPROOF 5/16-18X1"
20	0E0694C	1	ASSY NATGAS FUEL SOLENOID 24V
21	0H4265B	1	"SCREW TAMPERPROOF
22	022131	4	WASHER FLAT 3/8-M10 ZINC
23	026073A	3	PLUG STD PIPE 1/4 STEEL SQ HD
24	046526	8	WASHER LOCK M10
(1)25	0J65140STOR	1	BRACKET, QUICK START SOLENOID
26	022145	6	WASHER FLAT 5/16-M8 ZINC
27	057147	1	HOSE 3/4 ID LPG & NG (30"LG)
28	0J6244	2	BARBED STR 1/2NPT X 3/4
29	058043	2	BARBED STR 1/4 NPT X 5/16
30	0J6070	1	PIPE TURBO ADAPTOR
31	022129	10	WASHER LOCK M8-5/16
32	044208	1	BOLT U 5/16-18 X 2.37
33	024526	2	SCREW HHTT 5/16-18 X 3/4 CZ
34	049813	2	NUT HEX M6-1.0 G8 CLEAR ZINC
(1)35	0K95310STOR	1	BRACKET FTV G20
36	051756	4	SCREW HHC M10-1.5 X 20 C8.8
37	0J7589	1	BRKT, FUEL REGULATOR
38	0E4390	1	GASKET, GOVERNOR ACTUATOR
39	0K4802	1	PIPE CROSS 2 NPT
40	084751	1	GASKET INTAKE ADAPTOR
41	020745	4	SCREW PPHM M4-0.7 X 12
42	035579	1	BSHG RDCR HEX 1/4 TO 1/8
43	052221	1	HOSE 5/16 ID TYP1 SNGL HTR
44	0K4927	3	NIPPLE PIPE 2NPT X 2.5LG ZINC
45	085662	2	TIE WRAP UL 14.6 X .14 BLK
46	022259	2	NUT HEX 5/16-18 STEEL
47	057147	1	HOSE 3/4 ID LPG & NG (13"LG)
48	088896	1	GASKET CARBURETOR MIXER
(2)49	0G0571	1	FUEL REGULATOR 2.0"
50	0J7180	2	BARBED STR 3/4NPT X 3/4 SS
51	0J7448	2	BSHG RDCR HEX 2 X 1/4 GALV
52	057192	4	SCREW SHC M10-1.5 X 30 C12.9
53	0F2776	1	BRACKET SIGNAL CONDITION
54	0F4481A	1	SOLENOID FUEL 24VDC 5MM ORIFIC
55	059933	2	ELBOW 90D 2NPT
56	036291	3	SCREW SHC 5/16-18 X 1 G8.8 NZ
57	059502	1	BARBED EL 90 1/4NPT X 5/16
58	049811	4	WASHER FLAT M6
59	0F9753	1	BOSCH ADAPTER 13.3L GB
60	0H5391	1	COVER TAMPERPROOF 400VF MIXER

EXPLODED VIEW: EV NAT GAS FUEL SYS 12.9L G20**DRAWING #: 0J5999****GROUP E**

ITEM	PART#	QTY.	DESCRIPTION
61	0J8186	1	COUPLING FULL 1-1/4 - 11.5ERED
62	052221	1	HOSE 5/16 ID TYP1 SNGL HTR (32"LG)
63	0E4392	1	ACTUATOR BOSCH 60, GOVERNOR
64	039130	1	NIPPLE CLOSE 1.25NPT X 1.625
65	030418	1	BSHG RDCR HEX 1/2 TO 3/8
66	0K0999	1	DECAL UL FUEL RATING CONFIG
68	0K2340	1	PLUG, PRESSURE GAUGE, 1/4" NPT
69	0K3795	1	HANG TAG FUEL PRESS TEST POINT
70	090765	1	NIPPLE PIPE 2NPT X 6 BLK IRON
71	0H3632	1	TIE WRAP UL 5.6 X .10 BLACK
72	050279B	1	DECAL FUEL INLET NG 2" NPT
73	0D1509	1	DECAL INLET PRESSURE

NOTES (UNLESS OTHERWISE SPECIFIED):

(1) SHEET METAL PARTS LISTED IN THE BOM TABLE ARE REPRESENTING GENERIC PARTS (NO COLOR)

- MANUFACTURING: FOR CORRECT MATERIAL AND COLOR REFER TO XA BOM.
- CUSTOMER: WHEN ORDERING REPLACEMENT PARTS ENTER BASE NUMBER (FIRST 6 DIGITS ONLY) IN THE SYSTEM FOR CORRECT MATERIAL AND COLOR (FOR REFERENCE SEE GUIDELINE 0H7169).

(2) TURN REGULATOR ADJUSTING SCREW ALL THE WAY IN AND BACK OUT 2-1/2 TURNS.

EXPLODED VIEW: EV NAT GAS FUEL SYS 12.9L G20

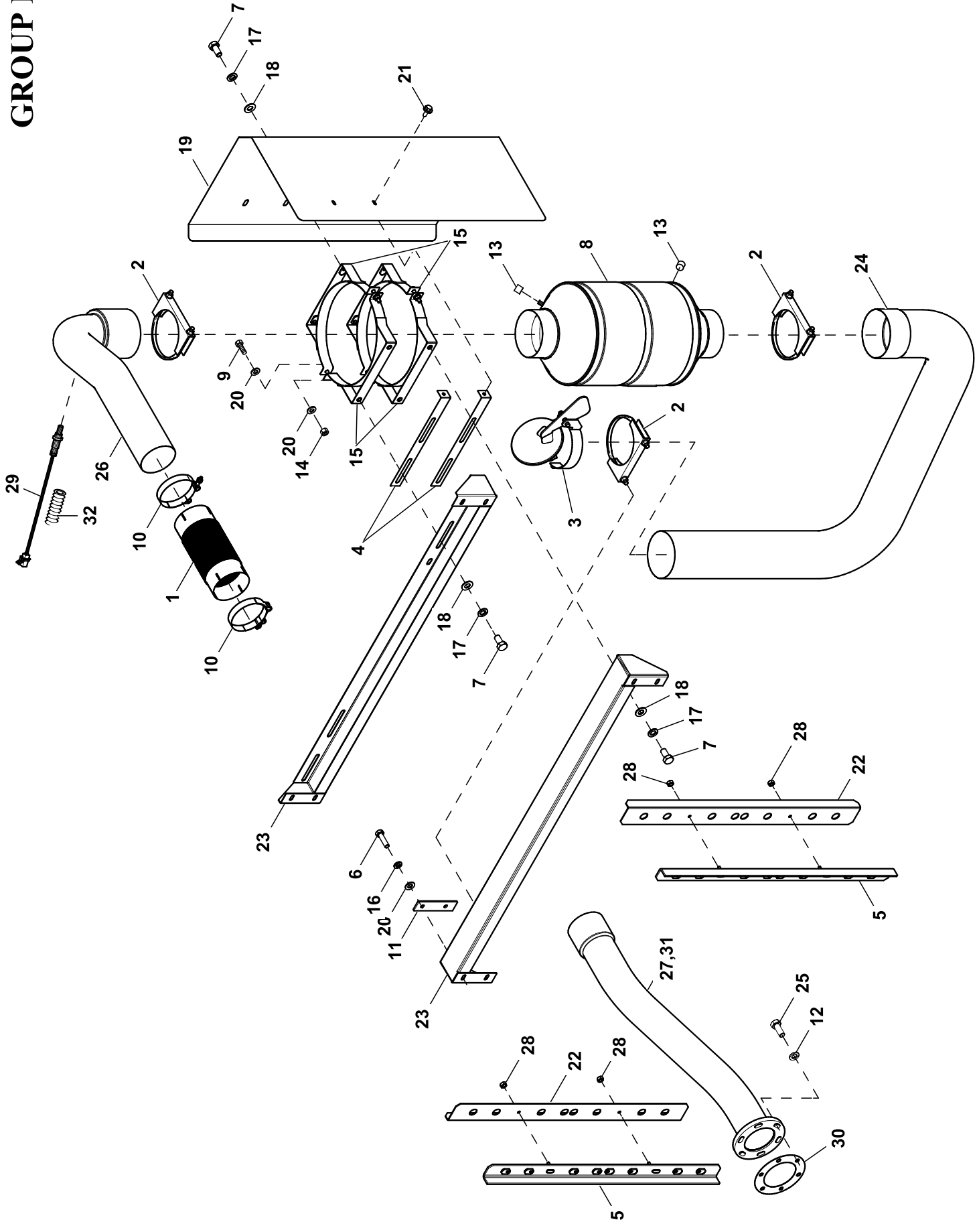
DRAWING #: 0J5999

GROUP E

ITEM	PART#	QTY.	DESCRIPTION
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GROUP F



EXPLODED VIEW: EV EXHSYS CAT ENCL G12.9 G20

DRAWING #:0J7842

GROUP F

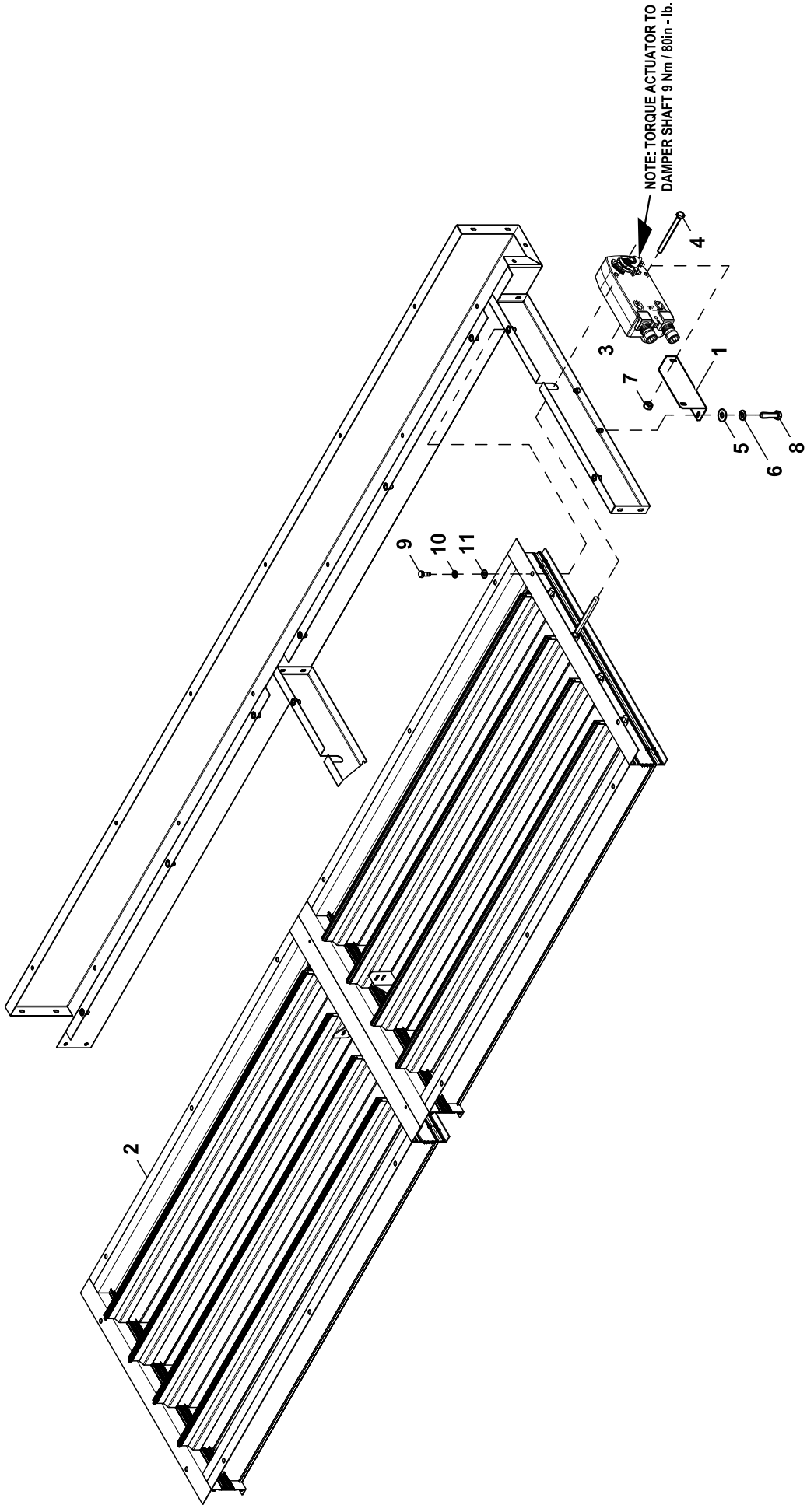
ITEM	PART#	QTY.	DESCRIPTION
1	0A5215D	1	FLEX PIPE 4"
2	0C5668	3	BOLT U 3/8-16 X 5
3	065805	1	RAINCAP 5.00 /15.19
4	0C5737	2	BRACKET, HEAT SHIELD
5	0H8985	2	EXHAUST BRACKET STFNR, INNER
6	042909	8	SCREW HHC M8-1.25 X 30 C8.8
7	051756	8	SCREW HHC M10-1.5 X 20 C8.8
8	0J0145	1	CATALYST MUFFLER 5" IN/OUT
9	039287	4	SCREW HHC M8-1.25 X 45 C8.8
10	0C3433C	2	CLAMP BAND 4.0"
(1)11	0H61650ST0R	4	PLATE MUFFLER SUPPORT
12	0J9347	6	WASHER WEDGELOCK M10 SS
13	050873	2	PLUG STD PIPE 1/4 COUNTERSUNK
14	049820	4	NUT HEX LOCK M8-1.25 NY INS
(1)15	0J39790ST0R	4	EXHAUST CLAMP 11" 13.3L G13
16	022129	8	WASHER LOCK M8-5/16
17	046526	8	WASHER LOCK M10
18	022131	8	WASHER FLAT 3/8-M10 ZINC
19	0J7818	1	HEAT SHIELD, 12.9L CATALYST
20	022145	16	WASHER FLAT 5/16-M8 ZINC
21	0C2454	2	SCREW HWHT M6-1 X 16 N WA Z/JS
(1)22	0D71730ST0R	2	STIFFENER,16L CORNER POSTS
(1)23	0C56270ST0R	2	BRKT, F-GRP MUFFLER
24	0G7231	1	PIPE 5" U EXH EMSN G13.3L G/B
25	0J9107	6	SCREW HHC M10-1.5 X 30 SS
26	0J7814	1	EXHAUST, CATALYST G20 EGRP
27	0J6342	1	EXHAUST, UPPER PIPE G20
28	077992	4	NUT HEX LOCK M6-1.0 SS NY INS
29	0F9071	1	SENSOR OXYGEN
30	0H0512	1	GASKET TURBO 300KW
31	0J9378	1	BLANKET EXHAUST 12.9L 200KW
32	067053	1	SLEEVE UL 7/8 ID (36" LG)

NOTES (UNLESS OTHERWISE SPECIFIED):

(1) SHEET METAL PARTS LISTED IN THE BOM TABLE ARE REPRESENTING GENERIC PARTS (NO COLOR)

- MANUFACTURING: FOR CORRECT MATERIAL AND COLOR REFER TO AS400 BOM.
- CUSTOMER: WHEN ORDERING REPLACEMENT PARTS ENTER BASE NUMBER (FIRST 6 DIGITS ONLY) IN THE SYSTEM FOR CORRECT MATERIAL AND COLOR (FOR REFERENCE SEE GUIDELINE 0H7169).

GROUP F



SALES SPECIAL

Exploded View: EV DAMPER 96 X 24 W/ACT
Drawing No.: 0J9022

Revision: J-7174-D
Date: 04/02/14

EXPLODED VIEW: EV DAMPER 96 X 24 W/ACT

DRAWING #:0J9022

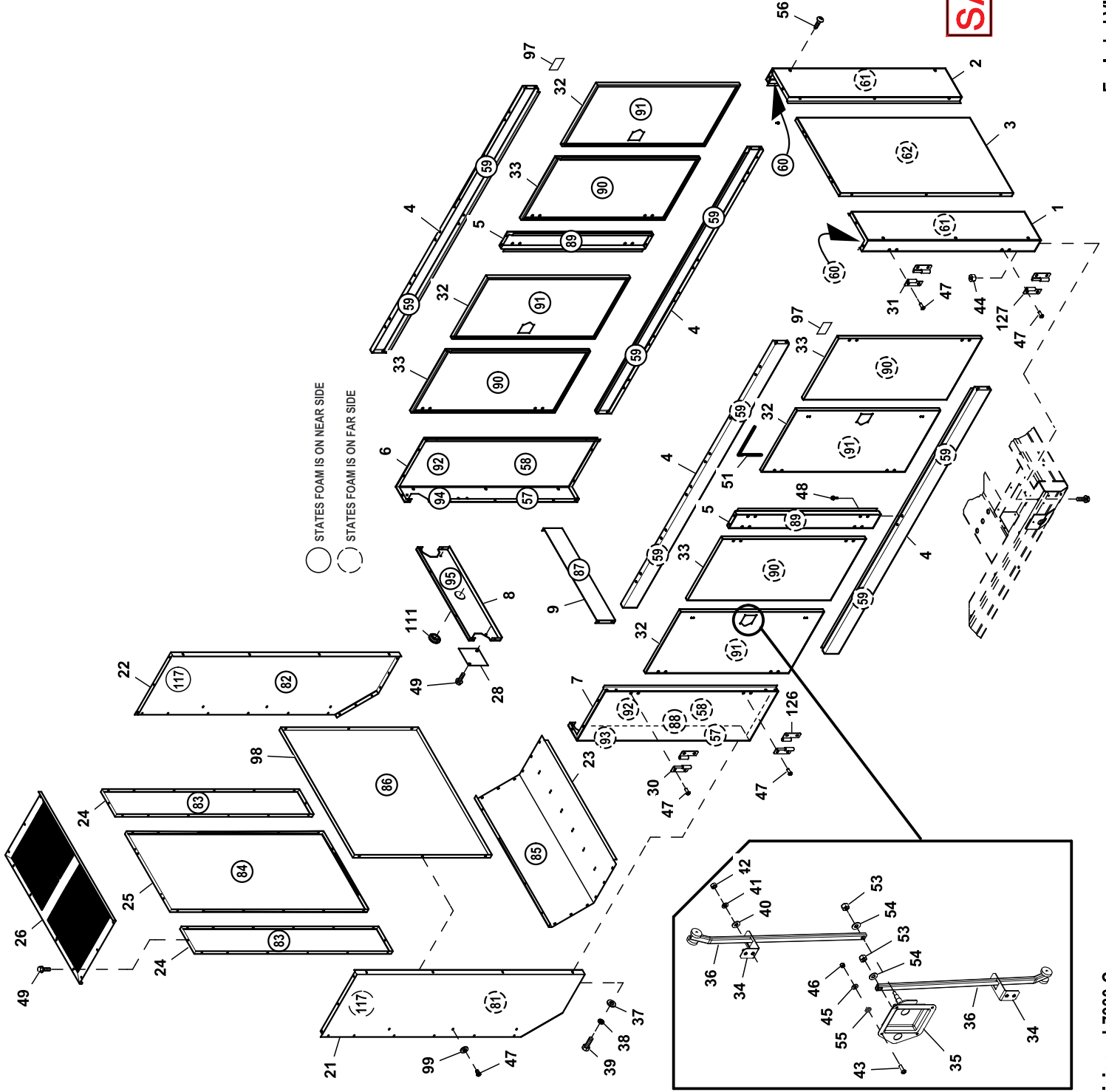
GROUP F

ITEM	PART#	QTY.	DESCRIPTION
(1)1	0J88840ST0R	1	MOUNT ACTUATOR DBL DAMPER
2	0K5036C	1	DAMPER ASM TAMCO 9000 EF 96x24
3	0J8327	1	ACTUATOR BELIMO NFBUP 24-240V
4	055816	2	SCREW HHC M6-1.0 X 70 C8.8
5	022473	2	WASHER FLAT 1/4-M6 ZINC
6	022097	2	WASHER LOCK M6-1/4
7	052857	4	NUT TOP LOCK FL M6-1.0
8	042568	2	SCREW HHC M6-1.0 X 20 C8.8
9	039253	16	SCREW HHC M8-1.25 X 20 C8.8
10	022129	16	WASHER LOCK M8-5/16
11	022145	16	WASHER FLAT 5/16-M8 ZINC

(1) SHEET METAL PARTS LISTED IN THE BOM TABLE ARE REPRESENTING GENERIC PARTS (NO COLOR).

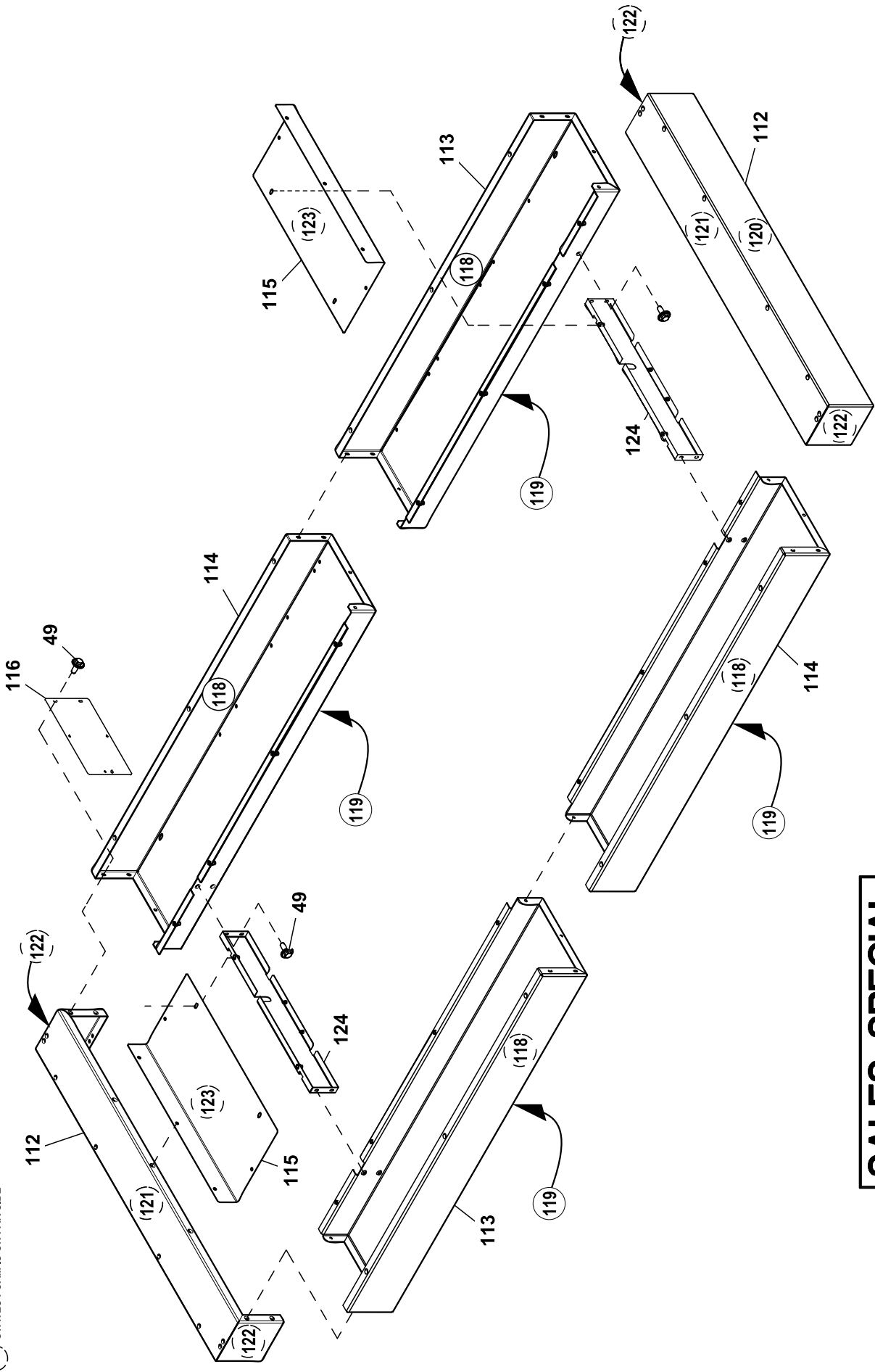
- **MANUFACTURING:** FOR CORRECT MATERIAL AND COLOR REFER TO AS400 BOM.
- **CUSTOMER:** FOR CORRECT MATERIAL AND COLOR OF REPLACEMENT PARTS REFER TO "REPLACEMENT SHEET
- METAL PARTS ORDERING GUIDE-**0H7169**" INCLUDED IN THE MANUAL OR AVAILABLE ON THE GENERAC WEBSITE.

GROUP F



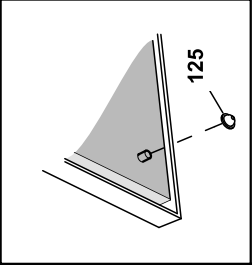
GROUP F

- STATES FOAM IS ON NEAR SIDE
- STATES FOAM IS ON FAR SIDE



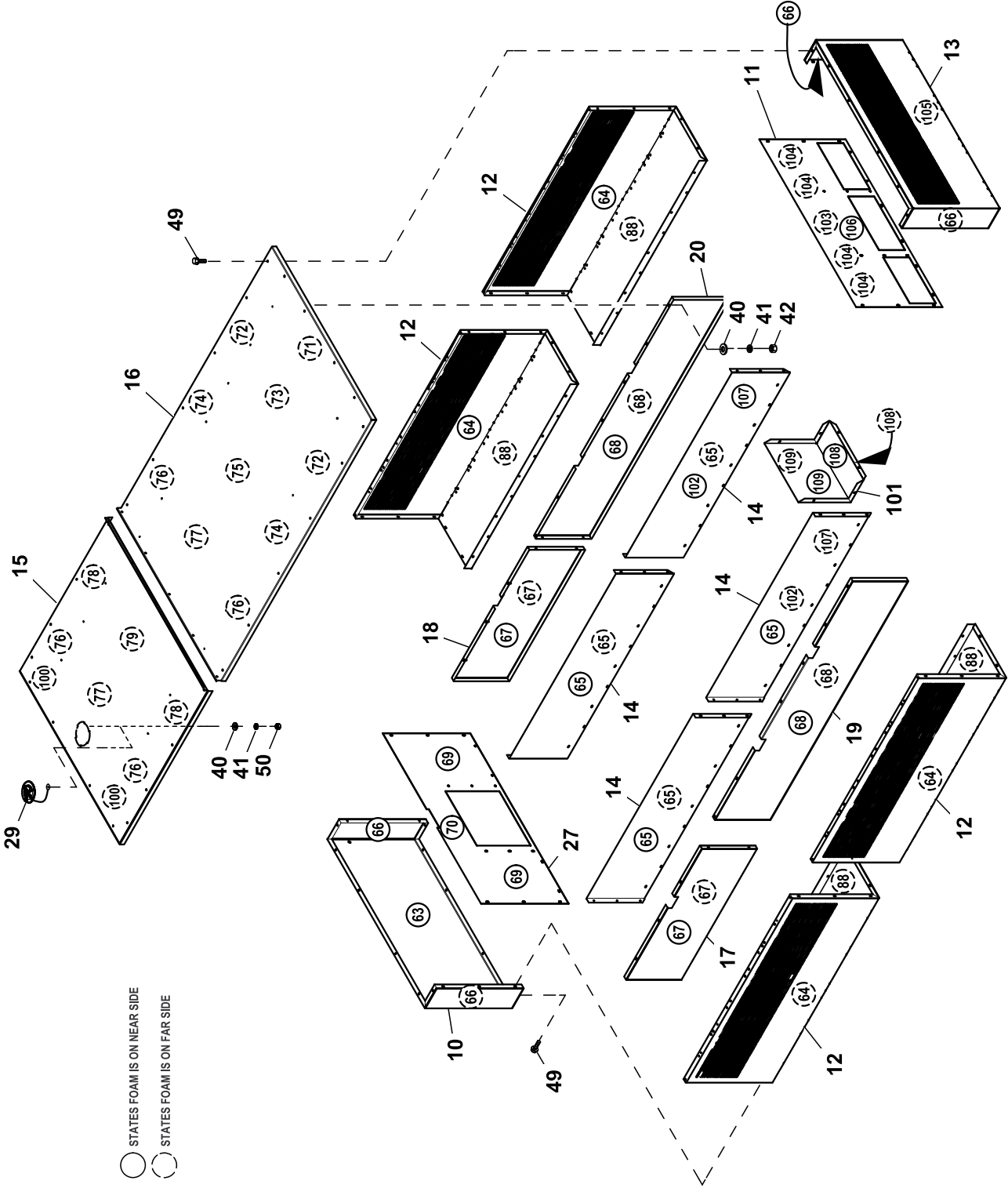
SALES SPECIAL

GROUP F



TYPICAL INSTALLATION OF ROOFTOP INSULATION ONLY

SALES SPECIAL



○ STATES FOAM IS ON NEAR SIDE
 ○ STATES FOAM IS ON FAR SIDE

EXPLODED VIEW: EV ENCL L2A E-GRP DAMPER

DRAWING #: 0K1815

GROUP F

APPLICABLE TO: CO 1463916

ITEM	PART#	QTY.	DESCRIPTION
(1)1	OJ11930STOR	1	CORNER POST LH REAR
(1)2	OJ11920STOR	1	CORNER POST RH REAR
(1)3	OH97860STOR	1	CENTER PANEL D-GRP REAR
(1)4	OJ11940STOR	4	SIDE BRACE, TOP & BTM E-GRP
(1)5	OH97910STOR	2	CENTER DOOR SUPPORT
(1)6	OJ78290STOR	1	CORNER POST, RH FRONT EGRP
(1)7	OJ78300STOR	1	CORNER POST, LH FRONT EGRP
(1)8	OJ63460STOR	1	BLOCKOFF, TOP E-GRP G20
(1)9	OJ63470STOR	1	BLOCKOFF, BOTTOM E-GRP G20
(1)10	OJ29830STOR	1	INTAKE END FRONT L2A E-GRP
(1)11	OJ76630STOR	1	END CAP RH OVRHD MOD SD L2A
(1)12	OJ29840STOR	4	INTAKE OVRHD MODULE L2A E-GRP
(1)13	OJ76610STOR	1	INTAKE END REAR E-GRP L2A G20
(1)14	OF53030STOR	4	OVRHD MOD INNER E-GRP L2A
(1)15	OJ61930ALOR	1	ASSY ROOF FRONT E-GRP
(1)16	OJ12110ALOR	1	ROOF REAR WELDMENT E-GROUP
(1)17	OJ29870ALOR	1	BAFFLE LH FRT INTAKE E-GRP L2A
(1)18	OJ29880ALOR	1	BAFFLE RH FRT INTAKE E-GRP L2A
(1)19	OJ30180ALOR	1	BAFFLE LH REAR INTAKE E-GRP
(1)20	OJ30190ALOR	1	BAFFLE RH REAR INTAKE E-GRP
(1)21	OK18230STOR	1	DUCT FRONT LH EGRP L2A DMPR
(1)22	OK18240STOR	1	DUCT FRONT RH EGRP L2A DMPR
(1)23	OD58560STOR	1	DUCT BOTTOM
(1)24	OK18260STOR	2	DUCT FRNT/SIDES EGP L2A DMPR
(1)25	OK18250STOR	1	DUCT FRNT PANEL EGRP L2A DMPR
(1)26	OF52830ALOR	1	DUCT FRONT TOP OUT E-GRP L2A
(1)27	OJ67670STOR	1	END CAP OVRHD MOD L2A G12.9L
28	OC49260STOR	1	COVER EXHAUST HOLE STL
29	OC2634A	1	ASSY ACCESS COVER
30	OC3595	8	ASSY M8 HINGE
31	OC3595A	8	ASSY M8 HINGE LH
(1)32	OJ00800STOR	4	DOOR LH SOLID
(1)33	OJ00810STOR	4	DOOR RH SOLID
(1)34	OJ16010STOR	8	BRACKET, ROD GUIDE
35	OJ0992	4	T-HANDLE, 2-POINT DBL DOOR
36	OJ0993	8	ROLLER ROD, T-HANDLE
37	022145	8	WASHER FLAT 5/16-M8 ZINC
38	022129	8	WASHER LOCK M8-5/16
39	039253	8	SCREW HHC M8-1.25 X 20 C8.8
40	022473	35	WASHER FLAT 1/4-M6 ZINC
41	022097	35	WASHER LOCK M6-1/4
42	049813	16	NUT HEX M6-1.0 G8 CLEAR ZINC
43	OC6749	16	SCREW PPHM M4-0.7 X 12 SS
44	077992	26	NUT HEX LOCK M6-1.0 SS NY INS
45	080490	16	WASHER FLAT #8 SS
46	OC6748	16	NUT HEX LOCK M4-0.7 SS NYL INS
47	0A5991	66	SCREW BHSC M8-1.25 X 16 SS
48	0E3257	21	SCREW HWHTF M6-1.0 X 16
49	OC2454	236	SCREW HWHT M6-1 X 16 N WA Z/JS
50	022127	19	NUT HEX 1/4-20 STEEL
51	0A9881	1	TRIM VINYL SEAL
52	066760	1	STRIP SEALANT 1/8 X 1 (NOT SHOWN)
(2)53	027529	8	NUT HEX LOCK 1/4-20 NY INS
(2)54	022473	8	WASHER FLAT 1/4-M6 ZINC
(4)55	022769	4	WASHER LOCK INT #10
56	OC3397	6	SCREW RATCHET BLK NYLON

EXPLODED VIEW: EV ENCL L2A E-GRP DAMPER

DRAWING #: 0K1815

GROUP F

APPLICABLE TO:CO 1463916

ITEM	PART#	QTY.	DESCRIPTION
57	OJ0553CG	2	INSUL FRONT CORNER POST
58	OJ0553CH	2	INSUL FRONT CORNER POST
59	OJ0553CI	8	INSUL FRONT CORNER POST
60	OJ0553CJ	2	INSUL REAR CORNER POST
61	OJ0553CK	2	INSUL REAR CORNER POST
62	OJ0553CL	1	INSUL REAR CENTER PANEL
63	OK0328DE	1	INSULOVERHD MODULE
64	OK0328DF	4	INSULOVERHD MODULE SIDE
65	OK0328DG	6	INSULOVERHD MODULE SIDE
66	OK0328DH	4	INSULOVERHD MODULE
67	OK0328DJ	4	INSULOVERHD MODULE BAFFLE
68	OK0328DK	4	INSULOVERHD MODULE BAFFLE
69	OK0328DL	2	INSUL OVERHD MODULE
70	OK0328DZ	1	INSUL OVERHD MODULE
71	OK0328DN	1	INSUL OVERHD MODULE ROOF
72	OK0328DP	2	INSUL OVERHD MODULE
73	OK0328DQ	1	INSUL OVERHD MODULE ROOF
74	OK0328DR	2	INSUL OVERHD MODULE ROOF
75	OK0328DS	1	INSUL OVERHD MODULE ROOF
76	OK0328DT	4	INSUL OVERHD MODULE ROOF
77	OK0328DU	1	INSUL OVERHD MODULE ROOF
78	OK0328DV	2	INSUL OVERHD MODULE ROOF
79	OK0328DW	1	INSUL OVERHD MODULE ROOF
80	OK0328DX	1	INSUL OVERHD MODULE ROOF
81	OJ0553DF	1	INSUL FRONT DUCT LH SIDE
82	OJ0553DG	1	INSUL FRONT DUCT RH SIDE
83	OK1859B	2	INSUL EGRP DMPR FR DUCT SDES
84	OK1859A	1	INSUL EGRP DMPR FR DUCT FR
85	OJ0553DJ	1	INSUL FRONT DUCT BTM
86	OJ0553DK	1	INSUL FRONT DUCT BAFFLE
87	OJ0553DL	1	INSUL FRONT BTM SPT
88	OK0328DY	4	INSUL OVRHD MODULE BTM
89	OJ0553E	2	INSUL CTR DOOR SUPPORT
90	OJ0553K	4	INSUL RH SOLID DOOR
91	OJ0553L	4	INSUL LH SOLID DOOR
92	OJ0621I	2	INSUL HIGH HEAT FRNT CNR P
93	OJ0621J	1	INSUL HIGH HEAT FRNT CNR P
94	OJ0621K	1	INSUL HIGH HEAT FRNT CNR P
95	OJ0621P	1	INSUL HIGH HEAT FRONT SUPPORT
96	OC9724	1	CAULK CLEAR (NOT SHOWN)
97	OE7222	2	RAIN SHIELD,DOOR JAMB
(1)98	OF53080STOR	1	DUCT FRONT INSD PNL E-GRP L2A
99	027958	6	WASHER NYLON .260
100	OK0328EB	2	INSUL OVERHD MODULE
(1)101	OJ76650STOR	1	OVRHD MODULE BAFFLE L2A E-GRP
102	OK0328EC	2	INSUL OVERHD MODULE INSIDE
103	OK0328EG	1	INSUL OVERHD MODULE
104	OK0328EE	4	INSUL OVERHD MODULE
105	OK0328EF	1	INSUL OVERHD MODULE REAR
106	OK0328EA	1	INSUL FRONT BOTTOM SUPPORT
107	OK0328ED	2	INSUL OVERHD MODULE
108	OK0328EJ	2	INSUL OVERHD MODULE
109	OK0328EH	2	INSUL OVERHD MODULE
110	OC3948	8	SPACER,DOOR (NOT SHOWN)
111	072252	1	GROMMET 1.37 X .06 X 1.00

EXPLODED VIEW: EV ENCL L2A E-GRP DAMPER**DRAWING #: 0K1815****GROUP F****APPLICABLE TO:CO 1463916**

ITEM	PART#	QTY.	DESCRIPTION
(1)112	0K18160ST0R	2	END PNL FR/RR EGRP L2A DMPR
(1)113	0K18170ST0R	2	PANEL SIDE RH EGRP L2A DMPR
(1)114	0K18200ST0R	2	PANEL SIDE LH EGRP L2A DMPR
(1)115	0K18210ST0R	2	ACT COVER EGRP L2A DMPR
(1)116	0K18220ST0R	4	ENDPLATE DMPR EGRP L2A
117	0K1859C	2	INSUL EGRP DMPR FR DUCT RH/LH
118	0K1859D	4	INSUL SIDE PANEL DMPR SDES
119	0K1859E	4	INSUL SIDE PANEL DMPR BTTM
120	0K1859F	2	INSUL END PANEL DMPR ENDS
121	0K1859G	2	INSUL END PANEL DMPR TOP
122	0K1859H	4	INSUL END PANEL DMPR SDES
123	0K1859J	2	INSUL ACTUATOR COVER EGRP L2A
(1)124	0J88720ST0R	2	SUPPORT REAR END C-GRP DAMPER
125	078115B	23	WASHER SELF LOCKING BLK #4-40
126	0C3595C	4	ASSY M8 HINGE LH BOTTOM
127	0C3595B	4	ASSY M8 HINGE RH BOTTOM

NOTES (UNLESS OTHERWISE SPECIFIED):

(1) SHEET METAL PARTS LISTED IN THE BOM TABLE ARE REPRESENTING GENERIC PARTS (NO COLOR)

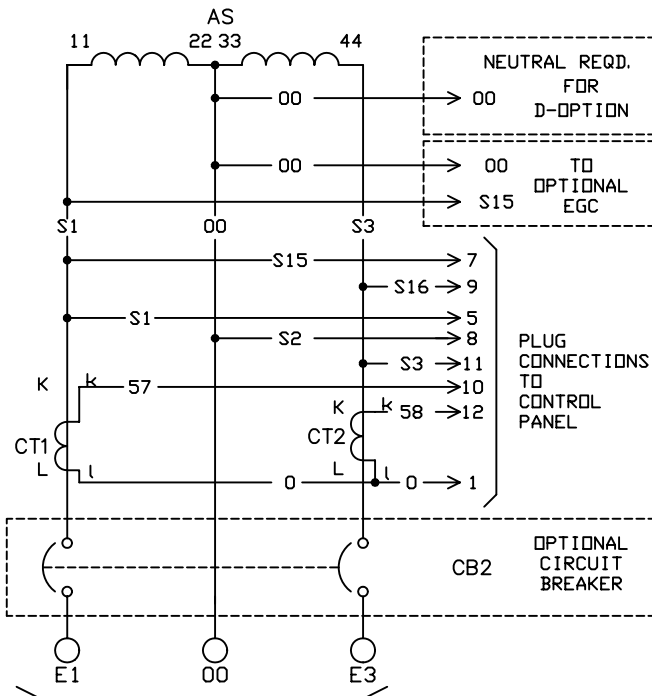
- MANUFACTURING: FOR CORRECT MATERIAL AND COLOR REFER TO XA BOM.
- CUSTOMER: WHEN ORDERING REPLACEMENT PARTS ENTER BASE NUMBER (FIRST 6 DIGITS ONLY) IN THE SYSTEM FOR CORRECT MATERIAL AND COLOR (FOR REFERENCE SEE GUIDELINE 0H7169).

(2) HARDWARE INCLUDED WITH ITEM 35, P/N 0J0992 (T-HANDLE, 2-POINT DOUBLE DOOR).

(3) FOR ALUMINUM ENCLOSURE ONLY.

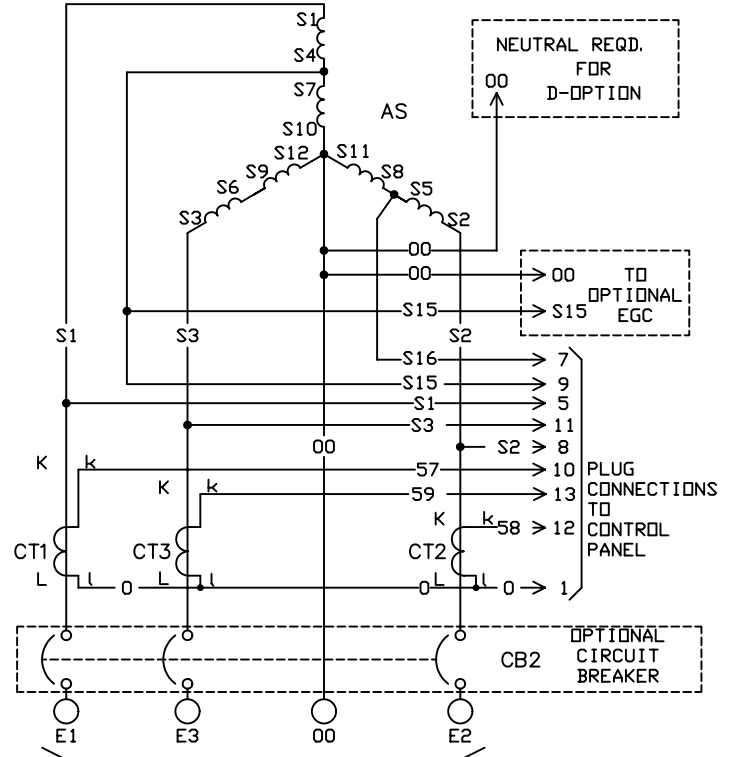
(4) ONE PER HANDLE.

VOLTAGE CODE - A + M
SERIES 4-WIRE



CUSTOMER CONNECTION
120/240V 1-PHASE 60Hz
110/220V 1-PHASE 50Hz

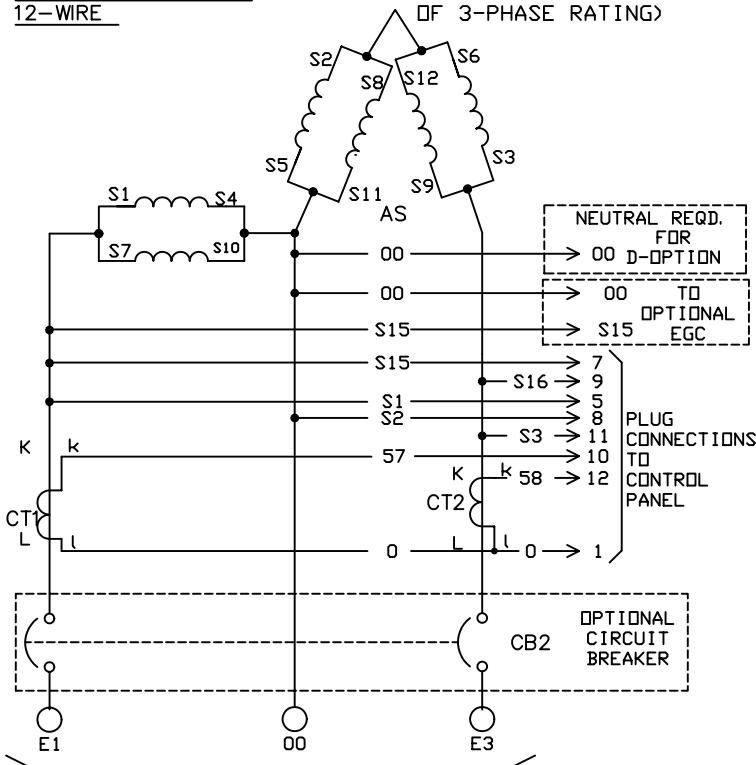
VOLTAGE CODE - K + R
SERIES WYE 12-WIRE



CUSTOMER CONNECTION
277/480V 3-PHASE 60Hz
240/415V 3-PHASE 50/60Hz

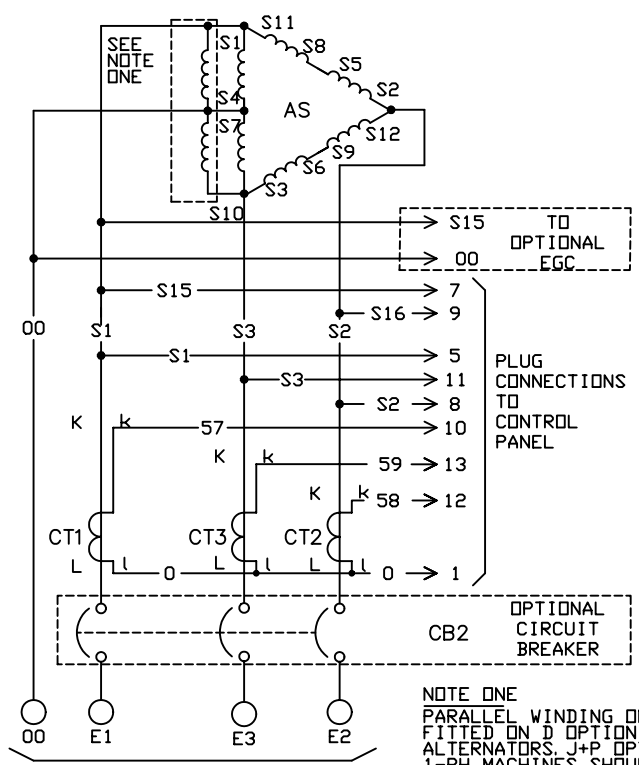
VOLTAGE CODE - A + M
PARALLEL ZIG-ZAG
12-WIRE

(ONLY USED ON 125kW AND ABOVE, OUTPUT IS 66% OF 3-PHASE RATING)



CUSTOMER CONNECTION
120/240V 1-PHASE 60Hz
110/220V 1-PHASE 50Hz

VOLTAGE CODE - D, J + P
SERIES DELTA 12-WIRE



CUSTOMER CONNECTION
120/240V 3-PHASE 60Hz
100/200V 3-PHASE 50Hz

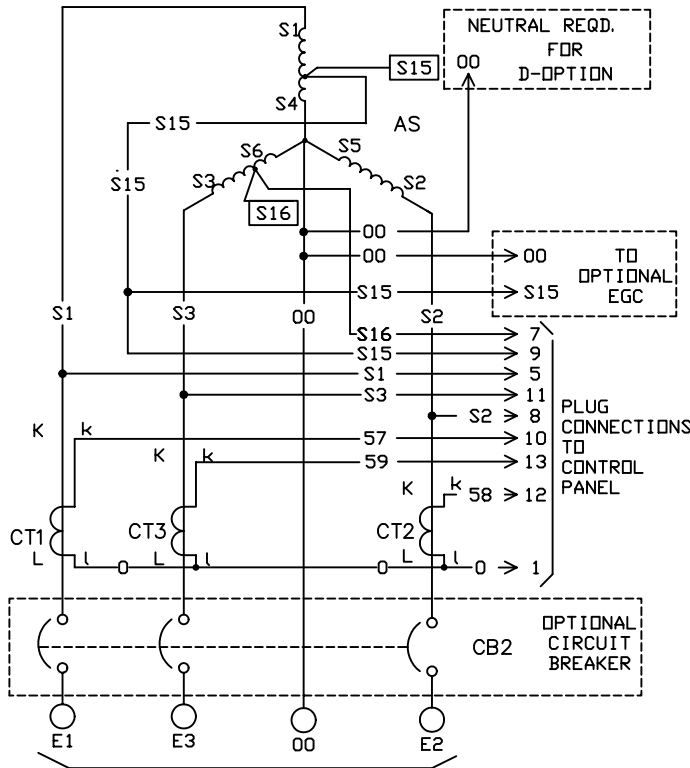
NOTE ONE
PARALLEL WINDING ONLY
FITTED ON D OPTION
ALTERNATORS. J+P OPTION
1-PH MACHINES SHOULD BE
DERATED TO 66% OF THREE
PHASE RATING.

SCHEMATIC - DIAGRAM

GENERATOR AND AC PANEL

DRAWING #: 099389

VOLTAGE CODE - L + S
6-WIRE WYE

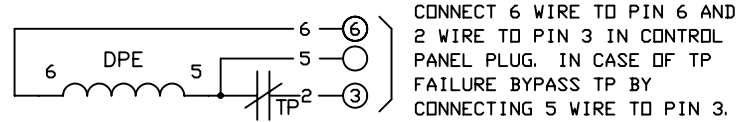


CUSTOMER CONNECTION
346/600V 3-PHASE 60Hz
277/480V 3-PHASE 50Hz

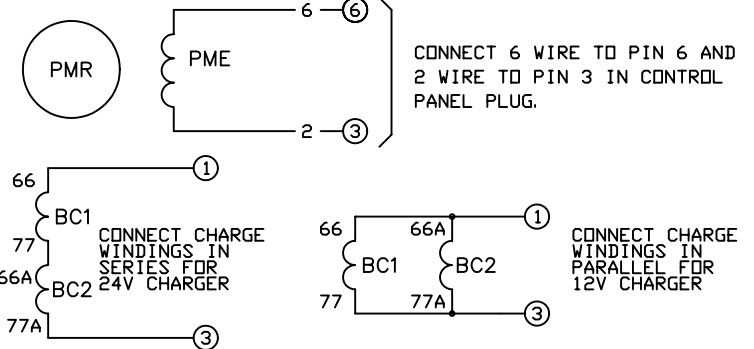
EXCITATION POWER OPTIONS

(USE EITHER OPTION A OR OPTION B ONLY)

OPTION A - DISPLACED PHASE WINDING

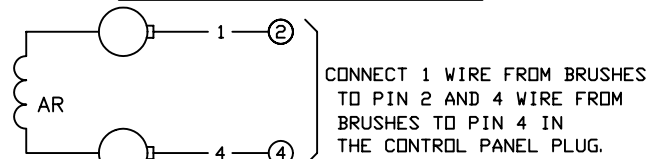


OPTION B - PERMANENT MAGNET GENERATOR (WITH AUXILLIARY BATTERY CHARGE WINDINGS)

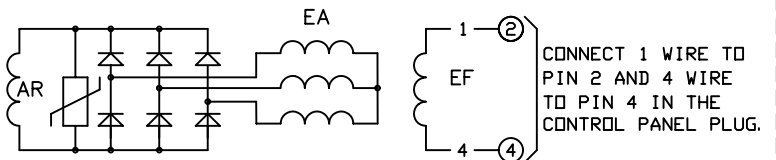


EXCITER FIELD OPTIONS

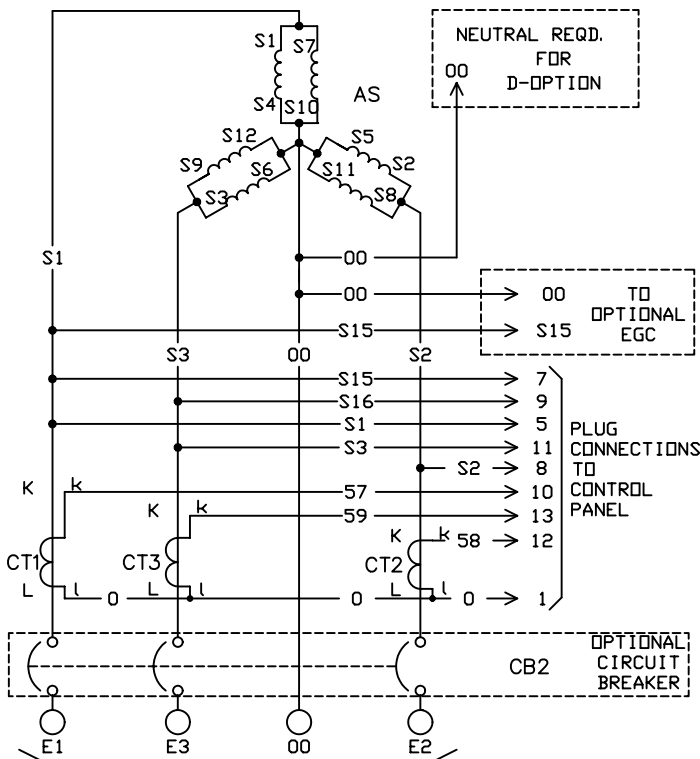
OPTION A - UNITS WITH BRUSHES



OPTION B - BRUSHLESS UNITS

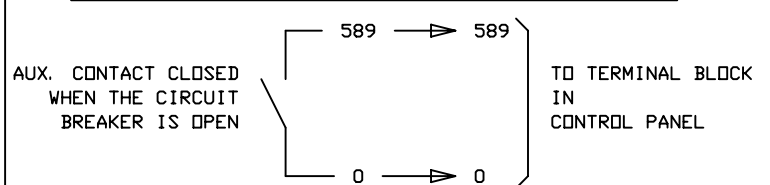


VOLTAGE CODE - G + N
PARALLEL WYE 12-WIRE



CUSTOMER CONNECTION
120/208V 3-PHASE 60Hz 139/240V 3-PHASE 60Hz
115/200V 3-PHASE 50Hz

OPTIONAL CIRCUIT BREAKER STATUS AUXILLIARY CONTACT



LEGEND

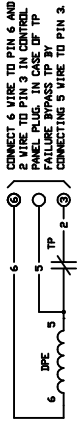
- AR ALTERNATOR ROTOR
- AS ALTERNATOR STATOR
- BC BATTERY CHARGE WINDING
- CB2 MAIN CIRCUIT BREAKER (OPTIONAL)
- CT CURRENT TRANSFORMER
- DPE DISPLACED PHASE EXCITATION WINDING
- EA BRUSHLESS EXCITER ARMATURE
- EF BRUSHLESS EXCITER FIELD
- EGC ELECTRONIC GOVERNOR CONTROL
- PMR PERMANENT MAGNET ROTOR
- PME PERMANENT MAGNET EXCITATION WINDING
- TP THERMAL PROTECTOR (AUTO-RESET)

READ THIS DRAWING IN CONJUNCTION WITH
WIRING DIAGRAMS Nos. 099336 & 099491

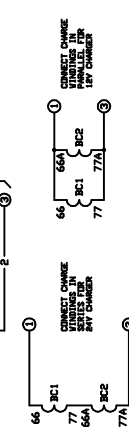
GROUP G

EXCITATION POWER OPTIONS (USE EITHER OPTION A OR OPTION B ONLY)

OPTION A - DISPLACED PHASE WINDING

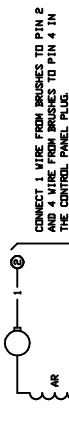


OPTION B - PERMANENT MAGNET GENERATOR (WITH AUXILIARY BATTERY CHARGE WINDINGS)

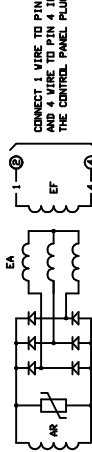


EXCITER FIELD OPTIONS

OPTION A - UNITS WITH BRUSHES



OPTION B - BRUSHLESS UNITS

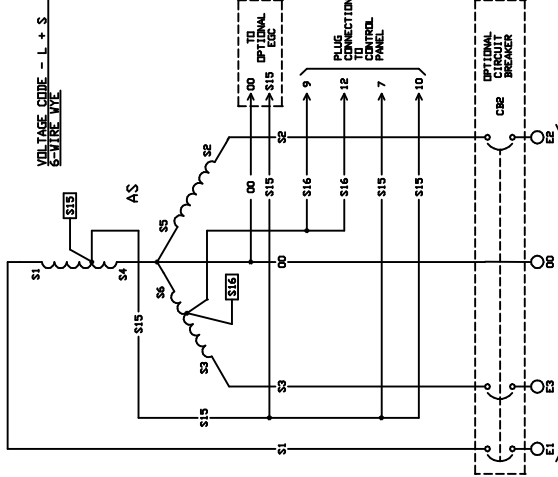


LEGEND

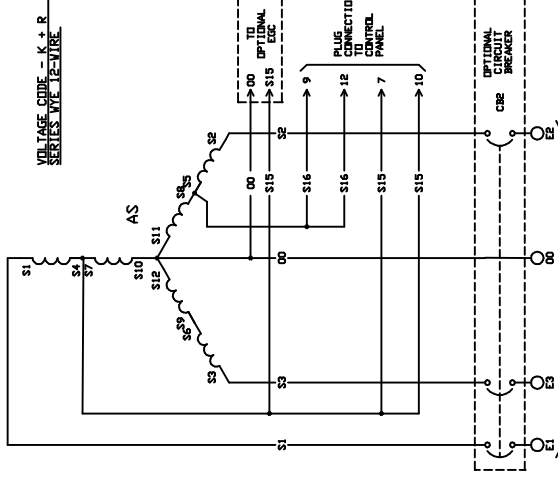
- AR ALTERNATOR ROTOR
- AS ALTERNATOR STATOR
- BC BATTERY CHARGE WINDING
- DE DISPLACED PHASE EXCITATION WINDING
- EA BRUSHLESS EXCITER ARMATURE
- EF BRUSHLESS EXCITER FIELD
- EP PERMANENT MAGNET EXCITER
- PMG PERMANENT MAGNET GENERATOR
- TP THERMAL PROTECTOR (AUTO-RESET)

READ THIS DRAWING IN CONJUNCTION WITH WIRING DIAGRAMS Nos. 99391 + 99490

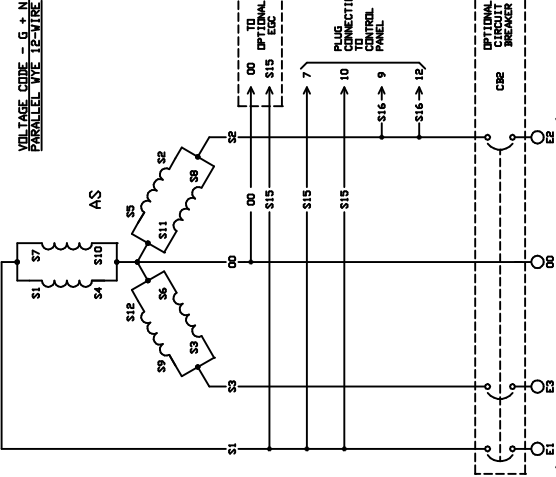
VOLTAGE CODE - L + S
SERIES WYE



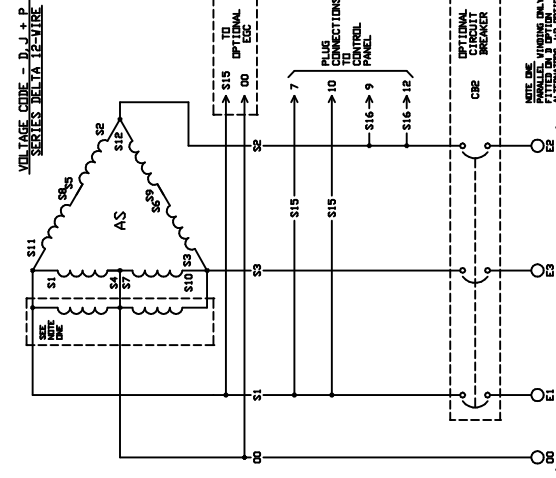
VOLTAGE CODE - K + R
SERIES WYE 12-WIRE



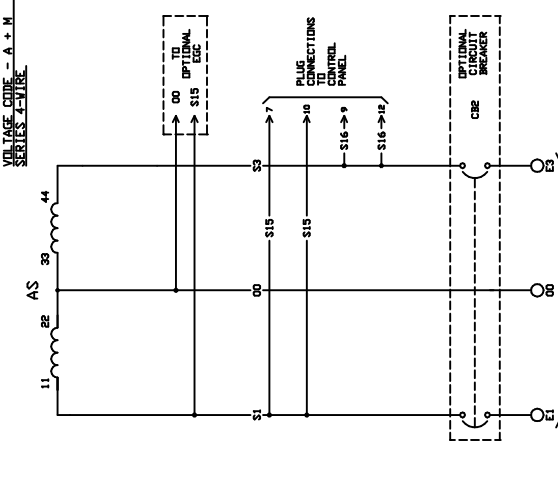
VOLTAGE CODE - G + N
PARALLEL WYE 12-WIRE



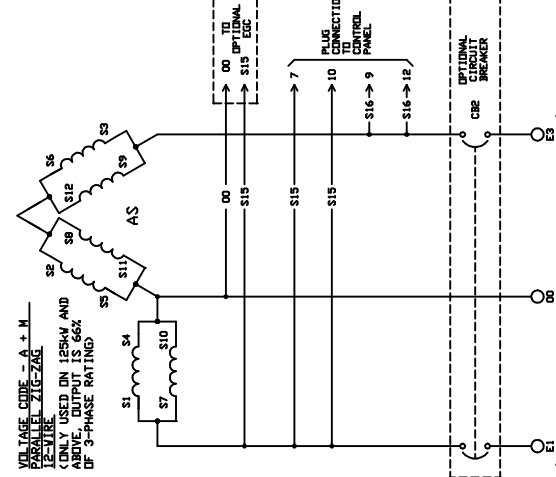
VOLTAGE CODE - D, J + P
SERIES DELTA 12-WIRE



VOLTAGE CODE - A + M
SERIES 4-WIRE



VOLTAGE CODE - A + M
PARALLEL ZIG-ZAG

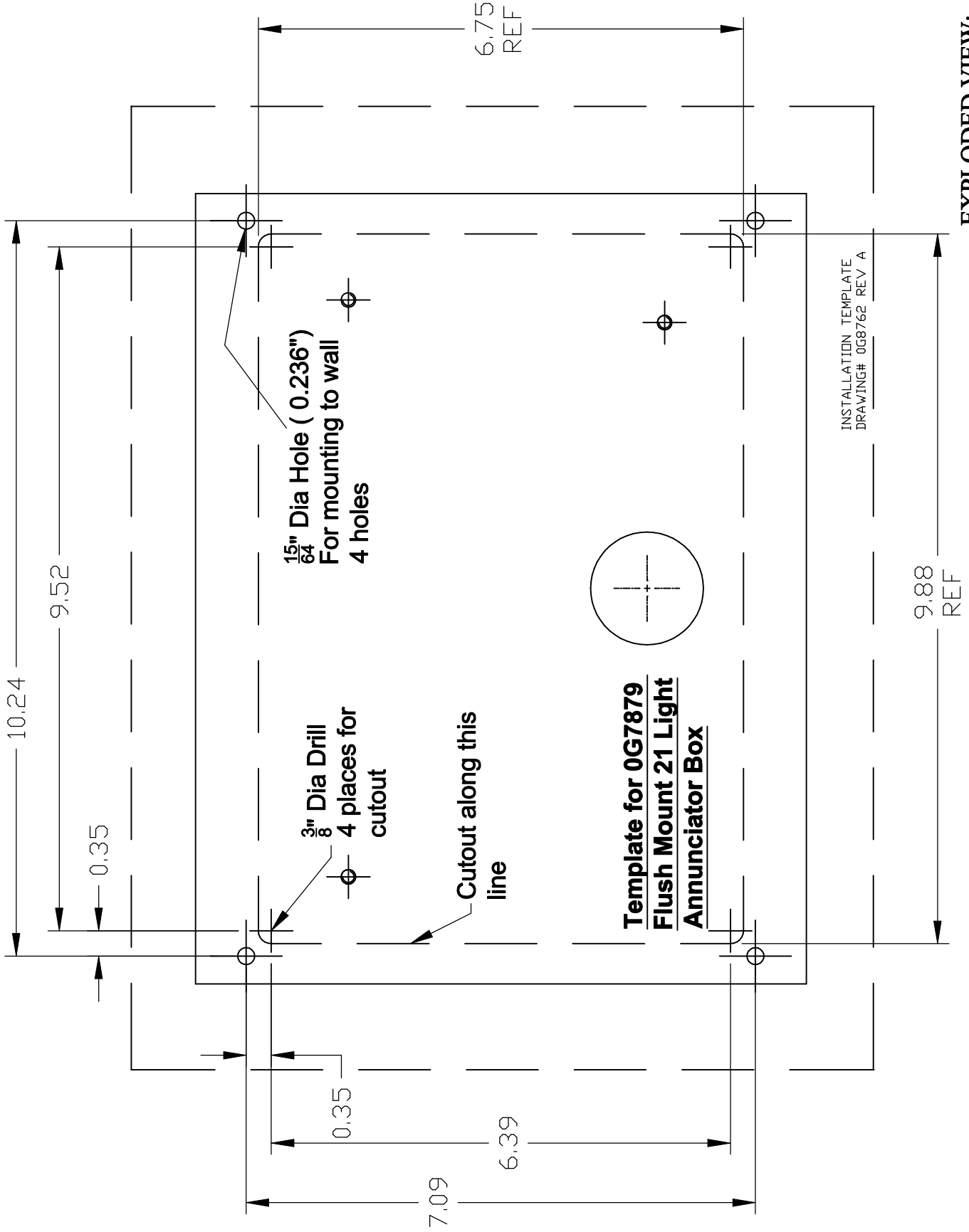


EXPLODED VIEW:
A OPTION GENERATOR AND AC PANEL
DRAWING #: 099392

APPLICABLE TO:

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GROUP G



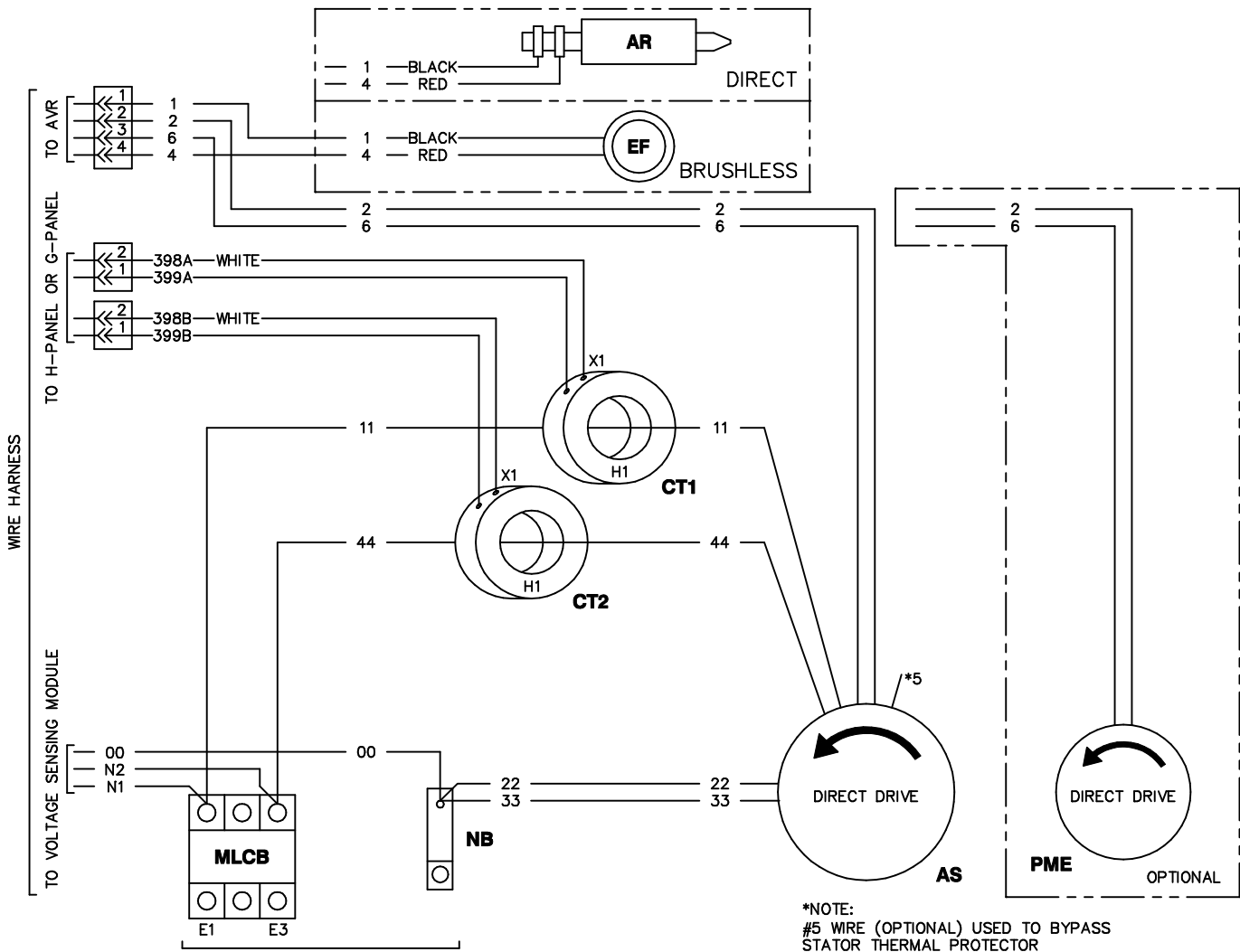
EXPLODED VIEW:
INSTALLATION TEMPLATE
DRAWING #: 0G8762

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GROUP G

OPTION 1 - SINGLE PHASE, H-PANEL OR G-PANEL CONTROL PANEL, DIRECT DRIVE

LEGEND	
AR	- ALTERNATOR ROTOR
AS	- ALTERNATOR STATOR
AVR	- AUTOMATIC VOLTAGE REGULATOR
CT	- CURRENT TRANSFORMER
EF	- EXCITER FIELD
MLCB	- MAIN CIRCUIT BREAKER
NB	- NEUTRAL BLOCK
PME	- PERMANENT MAGNET EXCITER



GENERATOR OUTPUT CUSTOMER CONNECTION

E1-E3 *240VAC

E1-N OR E3-N *120VAC

*NOTE: THE 8TH DIGIT OF THE MODEL NUMBER SPECIFIES OUTPUT VOLTAGE ON UNITS BEFORE 2010

THE 7TH DIGIT OF THE MODEL NUMBER SPECIFIES OUTPUT VOLTAGE ON UNITS 2010 TO PRESENT

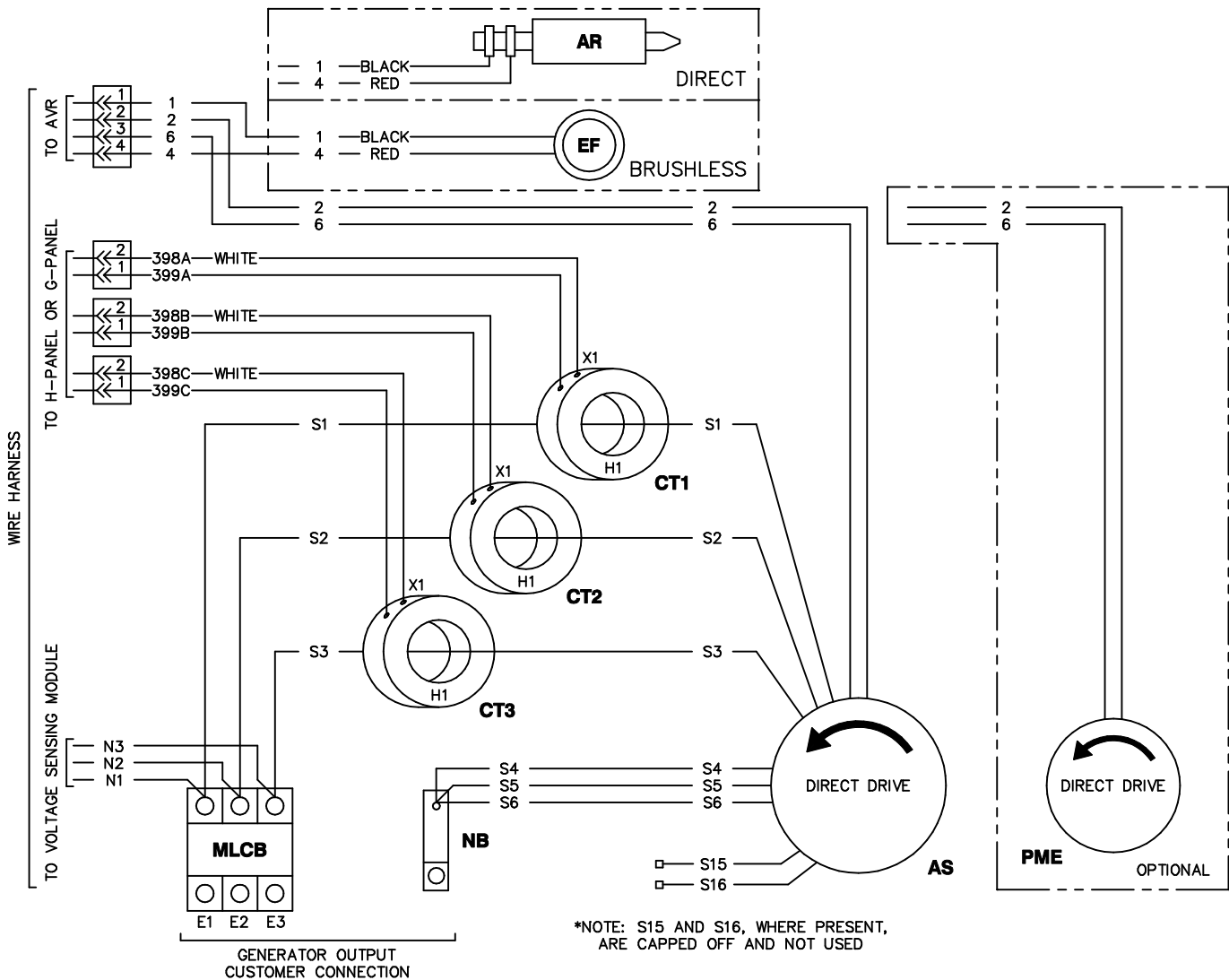
"A" = 120/240VAC 60HZ

"M" = 110/220VAC 50HZ

*NOTE:
#5 WIRE (OPTIONAL) USED TO BYPASS STATOR THERMAL PROTECTOR

OPTION 2 - THREE PHASE, H-PANEL OR G-PANEL CONTROL PANEL, DIRECT DRIVE, 6 LEAD

LEGEND	
AR	- ALTERNATOR ROTOR
AS	- ALTERNATOR STATOR
AVR	- AUTOMATIC VOLTAGE REGULATOR
CT	- CURRENT TRANSFORMER
EF	- EXCITER FIELD
MLCB	- MAIN CIRCUIT BREAKER
NB	- NEUTRAL BLOCK
PME	- PERMANENT MAGNET EXCITER



*NOTE: S15 AND S16, WHERE PRESENT, ARE CAPPED OFF AND NOT USED

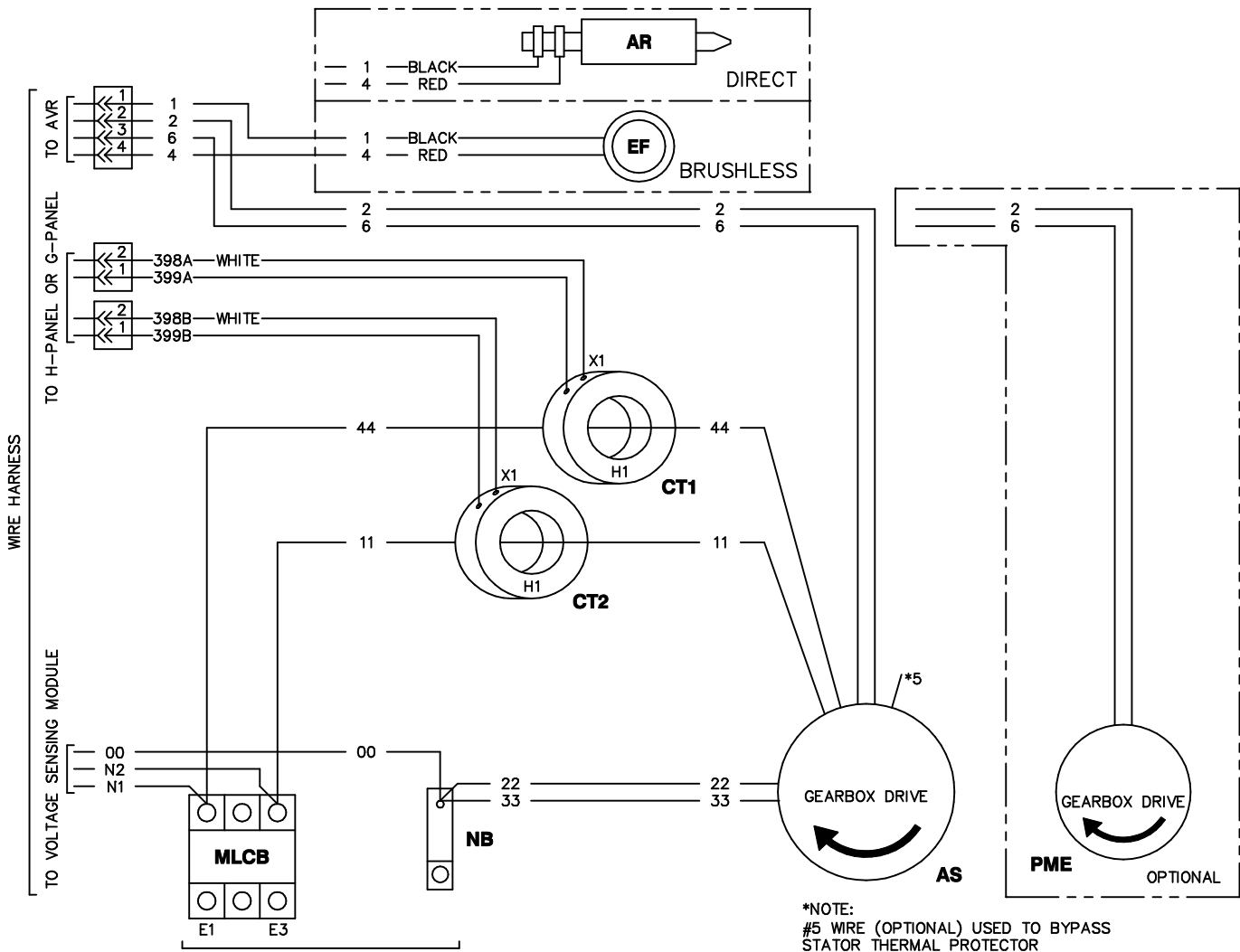
GENERATOR OUTPUT CUSTOMER CONNECTION
 E1 TO E2] *208VAC OR *480VAC OR *600VAC
 E2 TO E3]
 E1 TO E3]

E1, E2 OR E3 TO NB = *120VAC OR *277VAC OR *346VAC
 *NOTE: THE 8TH DIGIT OF THE MODEL NUMBER SPECIFIES OUTPUT VOLTAGE ON UNITS BEFORE 2010
 THE 7TH DIGIT OF THE MODEL NUMBER SPECIFIES OUTPUT VOLTAGE ON UNITS 2010 TO PRESENT
 "G" = 120/208VAC 60HZ
 "K" = 277/480VAC 60HZ
 "L" = 346/600VAC 60HZ

GROUP G

OPTION 3 - SINGLE PHASE, H-PANEL OR G-PANEL CONTROL PANEL, GEARBOX (REVERSE ROTATION)

LEGEND	
AR	- ALTERNATOR ROTOR
AS	- ALTERNATOR STATOR
AVR	- AUTOMATIC VOLTAGE REGULATOR
CT	- CURRENT TRANSFORMER
EF	- EXCITER FIELD
MLCB	- MAIN CIRCUIT BREAKER
NB	- NEUTRAL BLOCK
PME	- PERMANENT MAGNET EXCITER



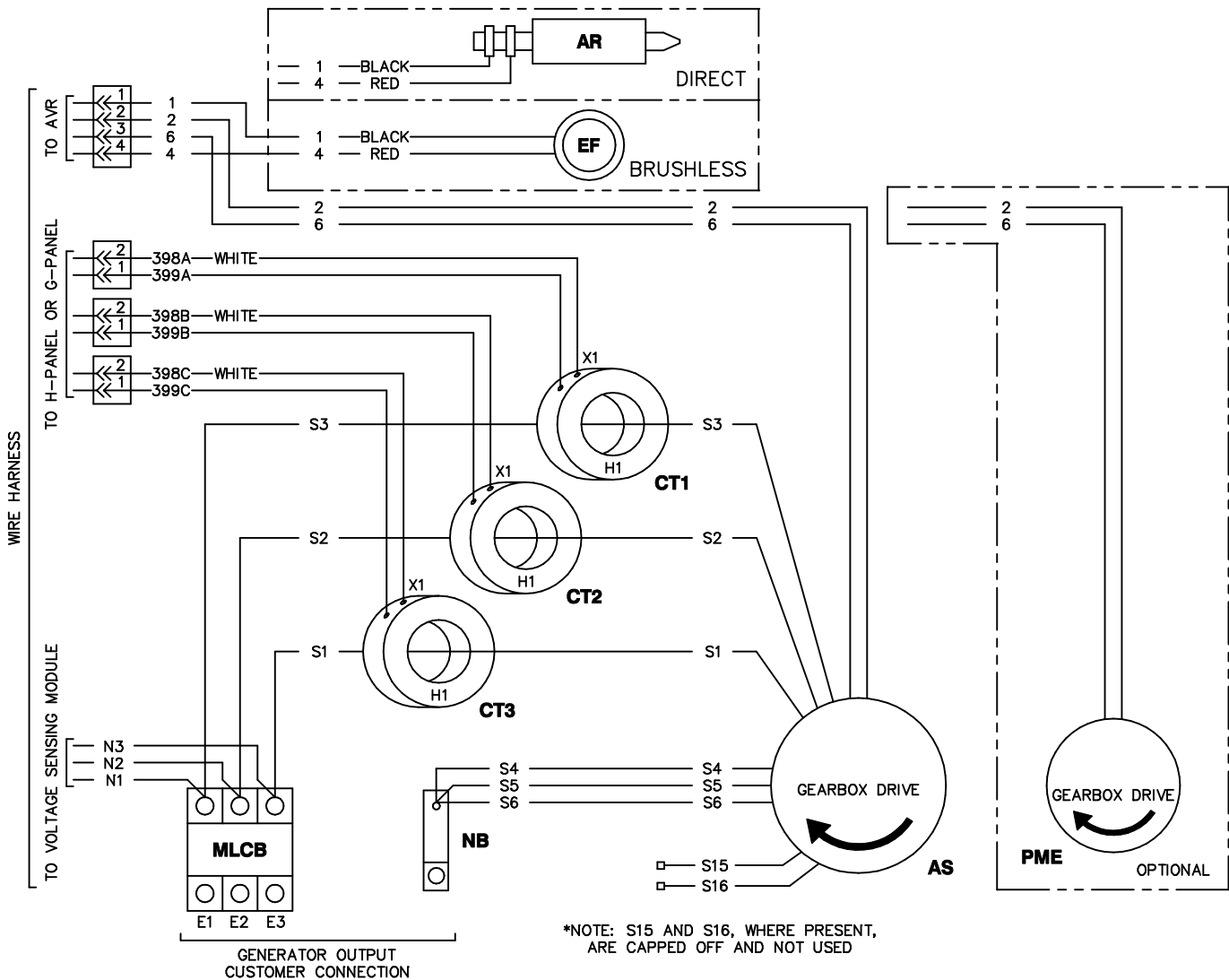
*NOTE:
#5 WIRE (OPTIONAL) USED TO BYPASS
STATOR THERMAL PROTECTOR

GENERATOR OUTPUT
CUSTOMER CONNECTION
E1-E3 *240VAC
E1-N OR E3-N *120VAC
*NOTE: THE 8TH DIGIT OF THE MODEL NUMBER SPECIFIES OUTPUT VOLTAGE ON
UNITS BEFORE 2010
THE 7TH DIGIT OF THE MODEL NUMBER SPECIFIES OUTPUT VOLTAGE ON UNITS
2010 TO PRESENT
"A" = 120/240VAC 60HZ
"M" = 110/220VAC 50HZ

GROUP G

OPTION 4 - THREE PHASE, H-PANEL OR G-PANEL CONTROL PANEL, GEARBOX (REVERSE ROTATION), 6 LEAD

LEGEND	
AR	- ALTERNATOR ROTOR
AS	- ALTERNATOR STATOR
AVR	- AUTOMATIC VOLTAGE REGULATOR
CT	- CURRENT TRANSFORMER
EF	- EXCITER FIELD
MLCB	- MAIN CIRCUIT BREAKER
NB	- NEUTRAL BLOCK
PME	- PERMANENT MAGNET EXCITER



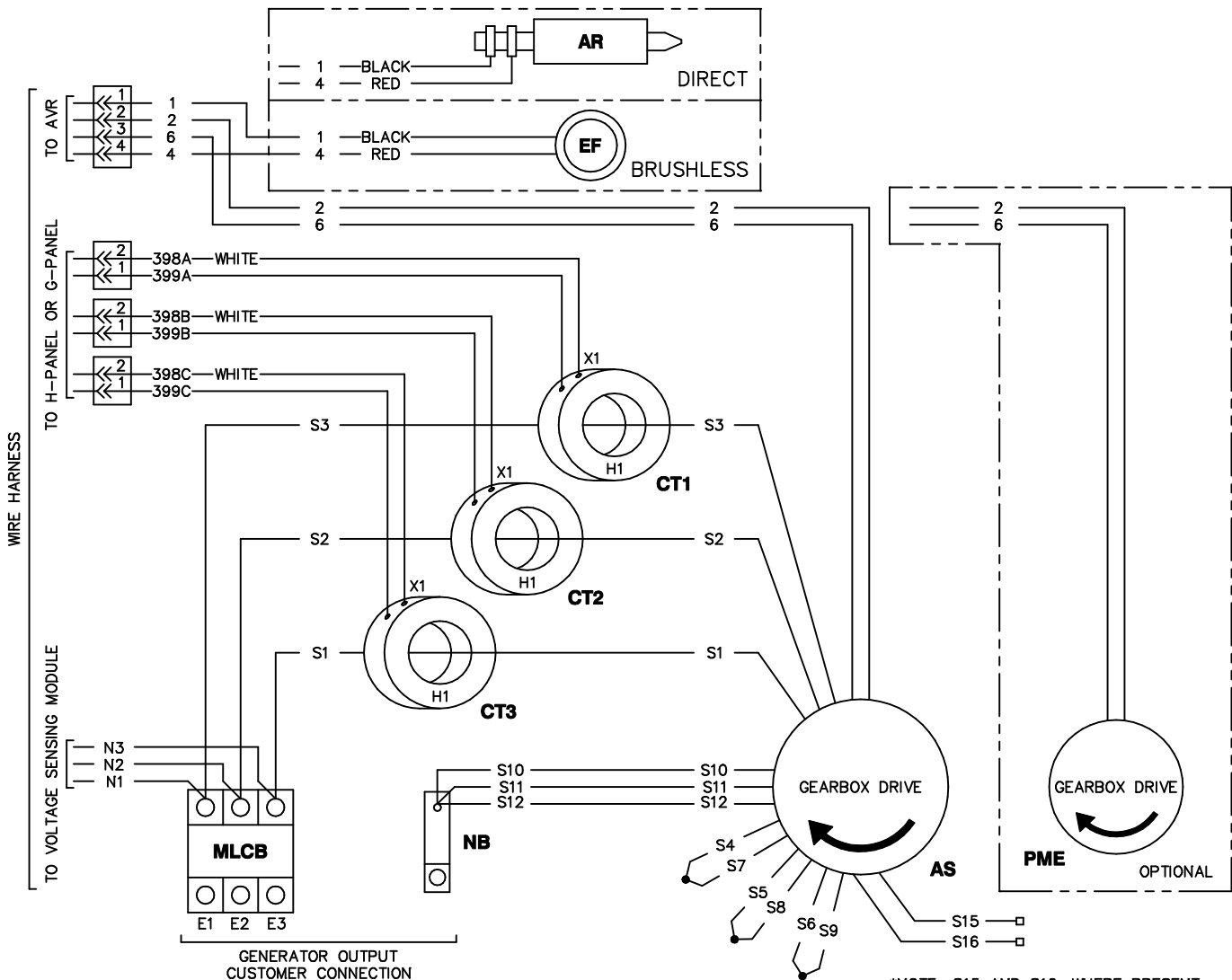
*NOTE: S15 AND S16, WHERE PRESENT, ARE CAPPED OFF AND NOT USED

GENERATOR OUTPUT CUSTOMER CONNECTION
 E1 TO E2] *208VAC OR *480VAC OR *600VAC
 E2 TO E3]
 E1 TO E3]

E1, E2 OR E3 TO NB = *120VAC OR *277VAC OR *346VAC
 *NOTE: THE 8TH DIGIT OF THE MODEL NUMBER SPECIFIES OUTPUT VOLTAGE ON UNITS BEFORE 2010
 THE 7TH DIGIT OF THE MODEL NUMBER SPECIFIES OUTPUT VOLTAGE ON UNITS 2010 TO PRESENT
 "G" = 120/208VAC 60HZ
 "K" = 277/480VAC 60HZ
 "L" = 346/600VAC 60HZ

OPTION 5 - THREE PHASE, H-PANEL OR G-PANEL CONTROL PANEL, GEARBOX (REVERSE ROTATION)

LEGEND	
AR	- ALTERNATOR ROTOR
AS	- ALTERNATOR STATOR
AVR	- AUTOMATIC VOLTAGE REGULATOR
CT	- CURRENT TRANSFORMER
EF	- EXCITER FIELD
MLCB	- MAIN CIRCUIT BREAKER
NB	- NEUTRAL BLOCK
PME	- PERMANENT MAGNET EXCITER



*NOTE: S15 AND S16, WHERE PRESENT, ARE CAPPED OFF AND NOT USED

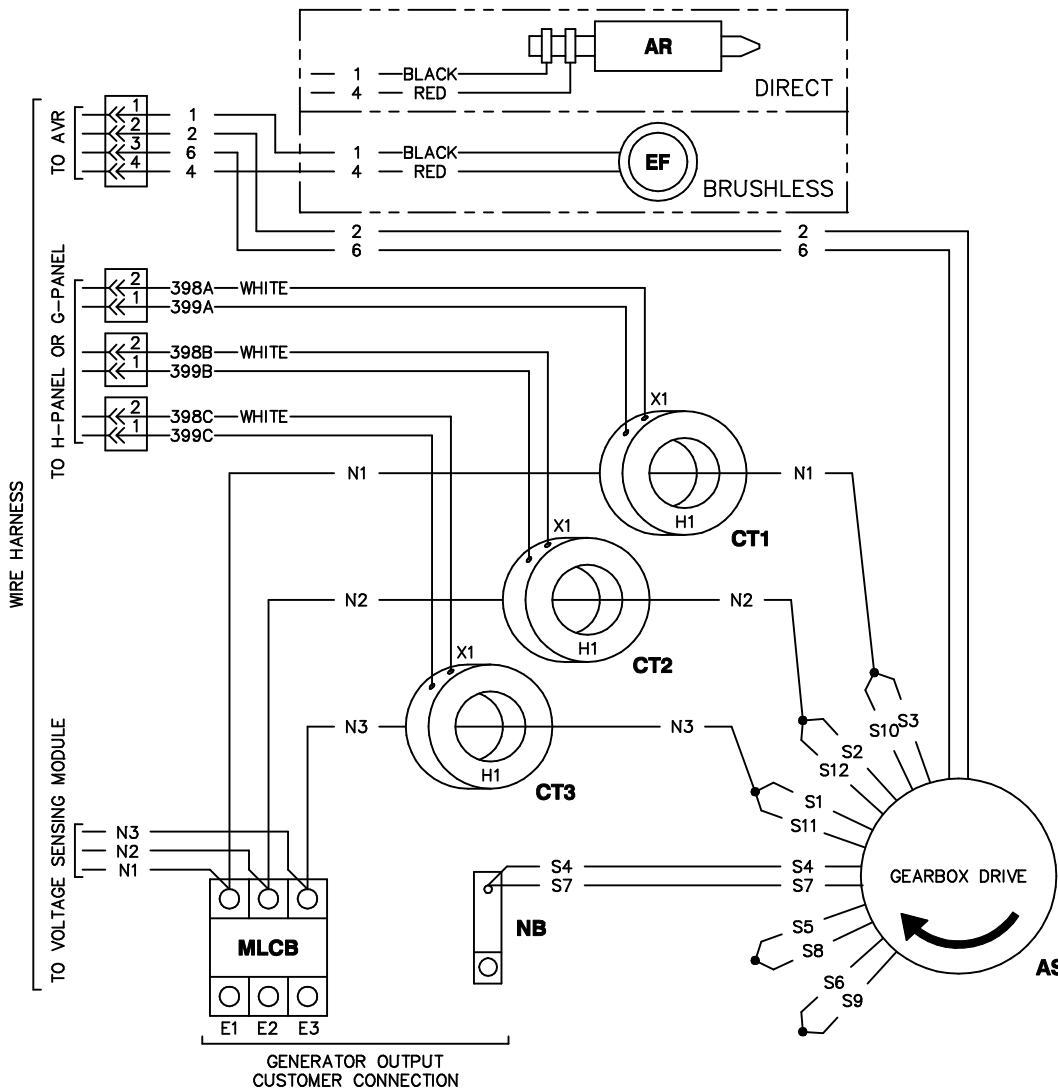
E1 TO E2	E1 TO E2
E2 TO E3	E2 TO E3
E1 TO E3	E1 TO E3

*480VAC *400VAC

E1, E2 OR E3 TO NB = *277VAC E1, E2 OR E3 TO NB = *231VAC
 *NOTE: THE 8TH DIGIT OF THE MODEL NUMBER SPECIFIES OUTPUT VOLTAGE ON UNITS BEFORE 2010
 THE 7TH DIGIT OF THE MODEL NUMBER SPECIFIES OUTPUT VOLTAGE ON UNITS 2010 TO PRESENT
 "K" = 277/480VAC 60HZ
 "R" = 231/400VAC 50HZ

OPTION 6 - THREE PHASE SERIES DELTA, H-PANEL OR G-PANEL CONTROL PANEL, GEARBOX (REVERSE ROTATION)

LEGEND	
AR	- ALTERNATOR ROTOR
AS	- ALTERNATOR STATOR
AVR	- AUTOMATIC VOLTAGE REGULATOR
CT	- CURRENT TRANSFORMER
EF	- EXCITER FIELD
MLCB	- MAIN CIRCUIT BREAKER
NB	- NEUTRAL BLOCK



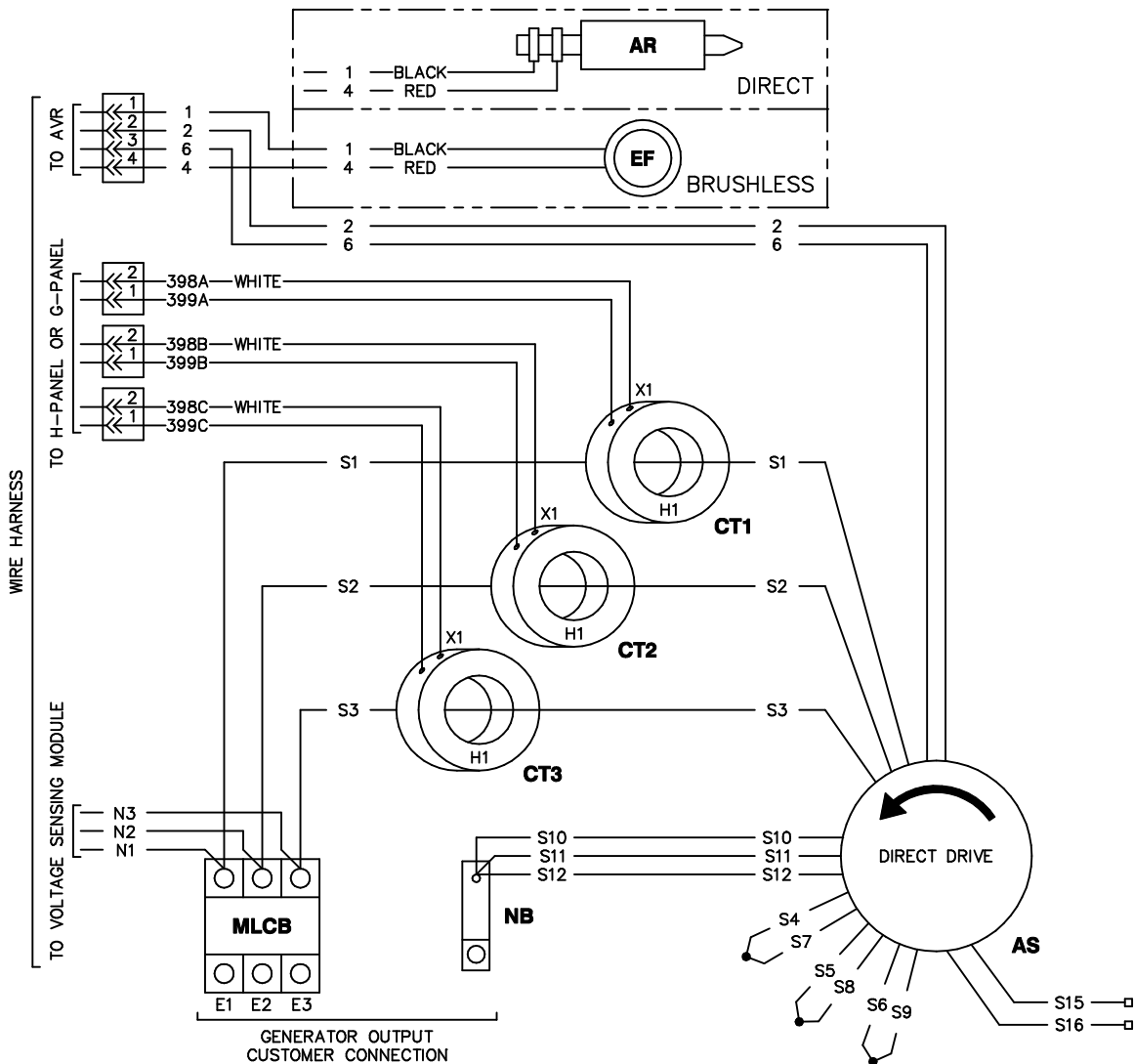
E1 TO E2	E1 TO E2
E2 TO E3	E2 TO E3
E1 TO E3	E1 TO E3

*240VAC *200VAC

E1-N OR E2-N OR E3-N = *120VAC E1-N OR E2-N OR E3-N = *100VAC
 *NOTE: THE 8TH DIGIT OF THE MODEL NUMBER SPECIFIES OUTPUT VOLTAGE ON UNITS BEFORE 2010
 THE 7TH DIGIT ON THE MODEL NUMBER SPECIFIES OUTPUT VOLTAGE ON UNITS 2010 TO PRESENT
 "D" = 120/240VAC 1 ϕ /3 ϕ 60HZ
 "J" = 120/240VAC 60HZ
 "P" = 100/200VAC 50HZ

OPTION 7 - THREE PHASE, H-PANEL OR G-PANEL CONTROL PANEL, DIRECT DRIVE

LEGEND	
AR	- ALTERNATOR ROTOR
AS	- ALTERNATOR STATOR
AVR	- AUTOMATIC VOLTAGE REGULATOR
CT	- CURRENT TRANSFORMER
EF	- EXCITER FIELD
MLCB	- MAIN CIRCUIT BREAKER
NB	- NEUTRAL BLOCK



E1 TO E2] *480VAC
 E2 TO E3] *480VAC
 E1 TO E3]

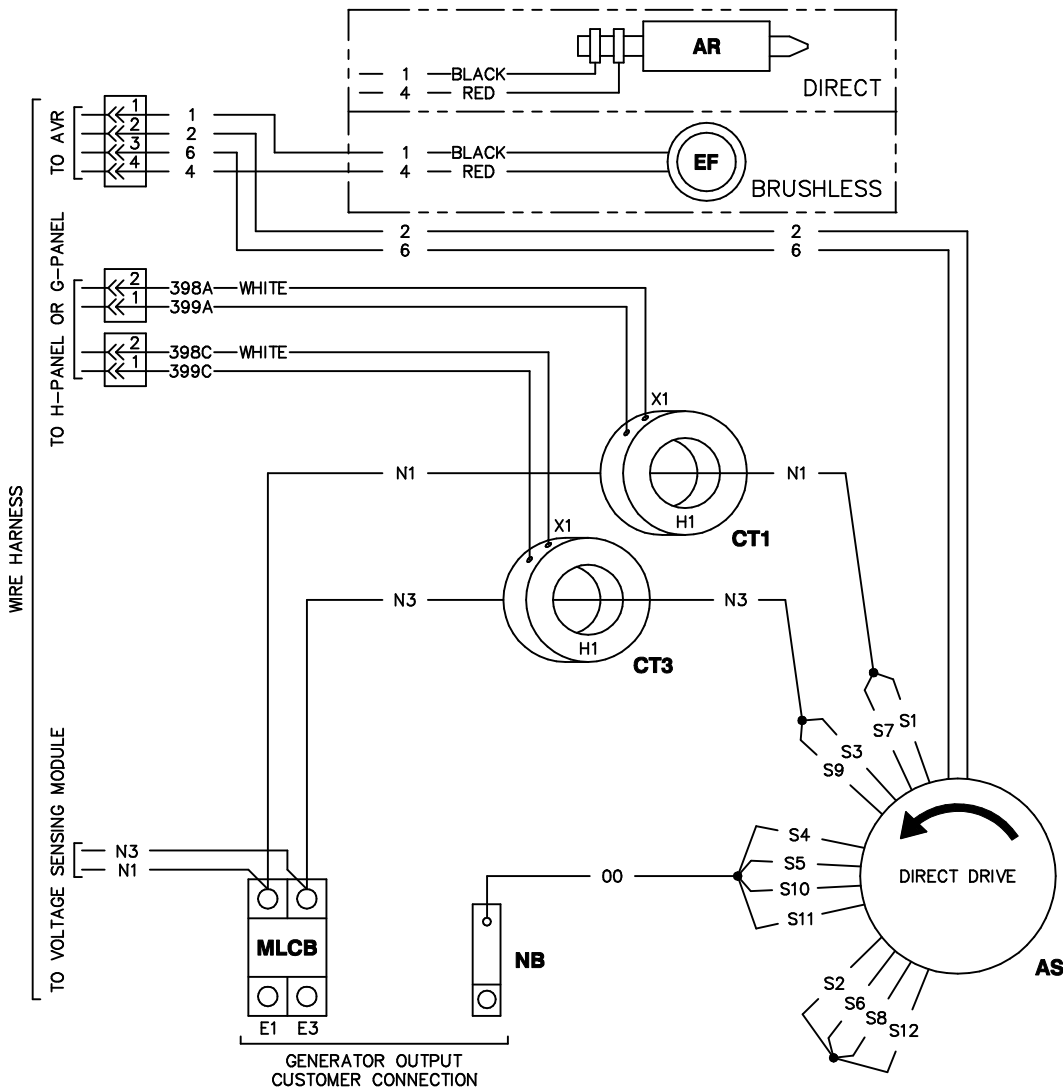
E1 TO E2] *400VAC
 E2 TO E3] *400VAC
 E1 TO E3]

*NOTE: S15 AND S16, WHERE PRESENT, ARE CAPPED OFF AND NOT USED

E1-N OR E2-N OR E3-N = *277VAC E1-N OR E2-N OR E3-N = *231VAC
 *NOTE: THE 8TH DIGIT OF THE MODEL NUMBER SPECIFIES OUTPUT VOLTAGE ON UNITS BEFORE 2010
 THE 7TH DIGIT OF THE MODEL NUMBER SPECIFIES OUTPUT VOLTAGE ON UNITS 2010 TO PRESENT
 "K" = 277/480VAC 60HZ
 "R" = 231/400VAC 50HZ

OPTION 8 - THREE PARALLEL ZIG ZAG, H-PANEL OR G-PANEL CONTROL PANEL, DIRECT DRIVE, 12 LEAD

LEGEND	
AR	- ALTERNATOR ROTOR
AS	- ALTERNATOR STATOR
AVR	- AUTOMATIC VOLTAGE REGULATOR
CT	- CURRENT TRANSFORMER
EF	- EXCITER FIELD
MLCB	- MAIN CIRCUIT BREAKER
NB	- NEUTRAL BLOCK

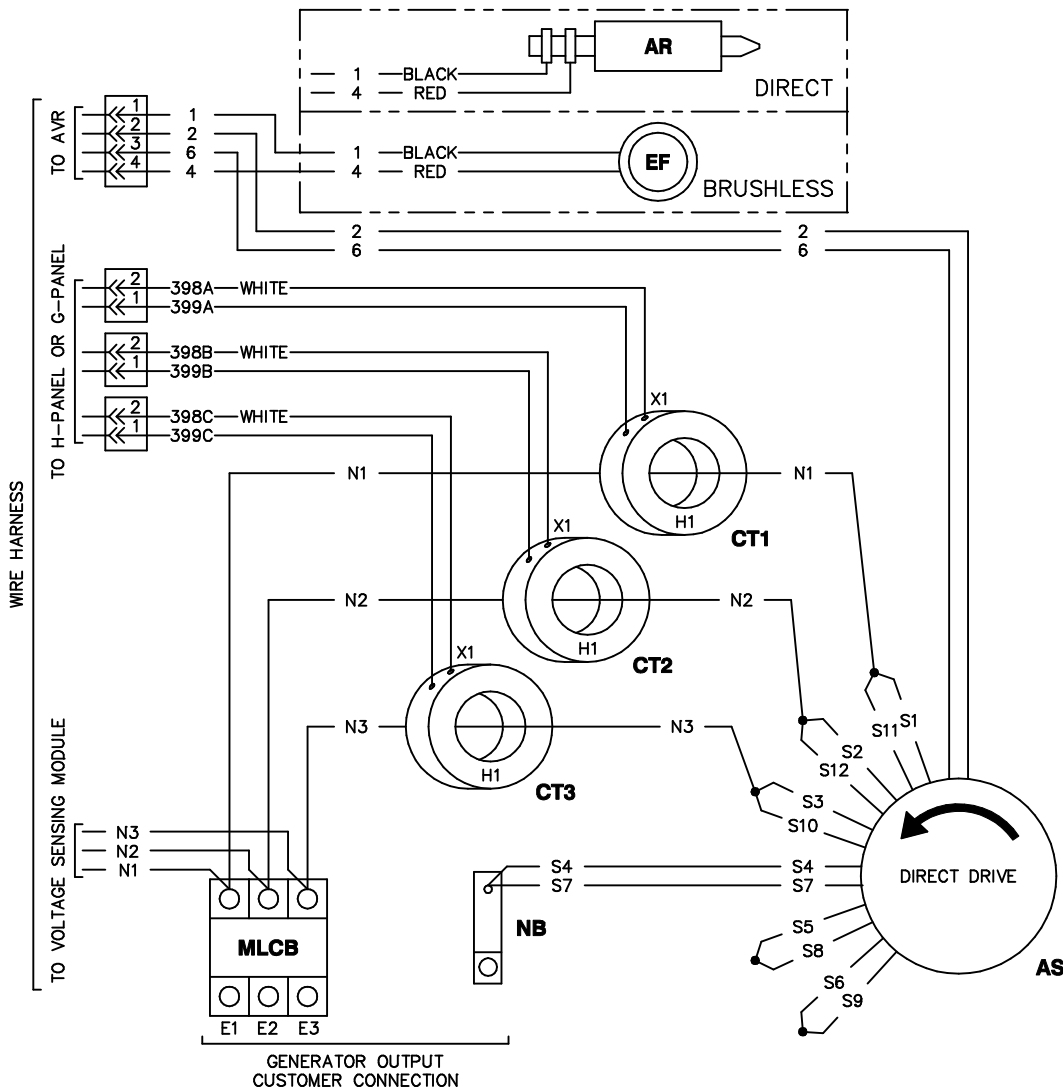


GENERATOR OUTPUT
CUSTOMER CONNECTION
E1 TO 00] *115VAC OR *120VAC
E3 TO 00]
E1 TO E3] *200VAC OR *240VAC

*NOTE: THE 8TH DIGIT OF THE MODEL NUMBER SPECIFIES OUTPUT VOLTAGE ON UNITS BEFORE 2010
THE 7TH DIGIT OF THE MODEL NUMBER SPECIFIES OUTPUT VOLTAGE ON UNITS 2010 TO PRESENT
"A" = 120/240VAC 60HZ
"N" = 115/200VAC 50HZ

OPTION 9 - THREE PHASE SERIES DELTA, H-PANEL OR G-PANEL CONTROL PANEL, DIRECT DRIVE

LEGEND	
AR	- ALTERNATOR ROTOR
AS	- ALTERNATOR STATOR
AVR	- AUTOMATIC VOLTAGE REGULATOR
CT	- CURRENT TRANSFORMER
EF	- EXCITER FIELD
MLCB	- MAIN CIRCUIT BREAKER
NB	- NEUTRAL BLOCK



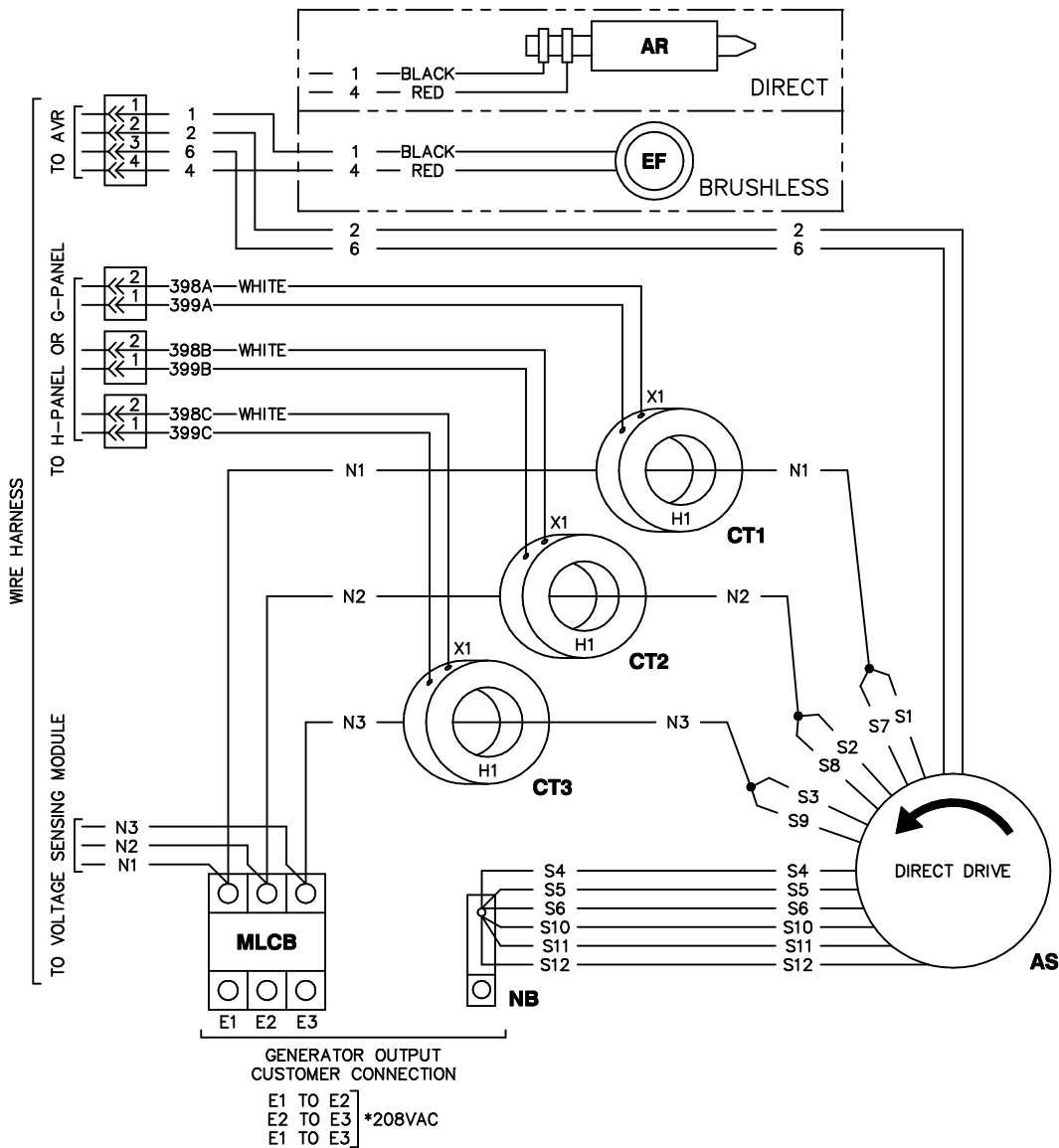
E1 TO E2
E2 TO E3 *240VAC
E1 TO E3

E1 TO E2
E2 TO E3 *200VAC
E1 TO E3

E1-N OR E2-N OR E3-N = *120VAC E1-N OR E2-N OR E3-N = *100VAC
 *NOTE: THE 8TH DIGIT OF THE MODEL NUMBER SPECIFIES OUTPUT VOLTAGE ON UNITS BEFORE 2010
 THE 7TH DIGIT ON THE MODEL NUMBER SPECIFIES OUTPUT VOLTAGE ON UNITS 2010 TO PRESENT
 "D" = 120/240VAC 1 ϕ /3 ϕ 60HZ
 "J" = 120/240VAC 60HZ
 "P" = 100/200VAC 50HZ

OPTION 10 - THREE PHASE PARALLEL WYE, H-PANEL OR G-PANEL CONTROL PANEL, DIRECT DRIVE

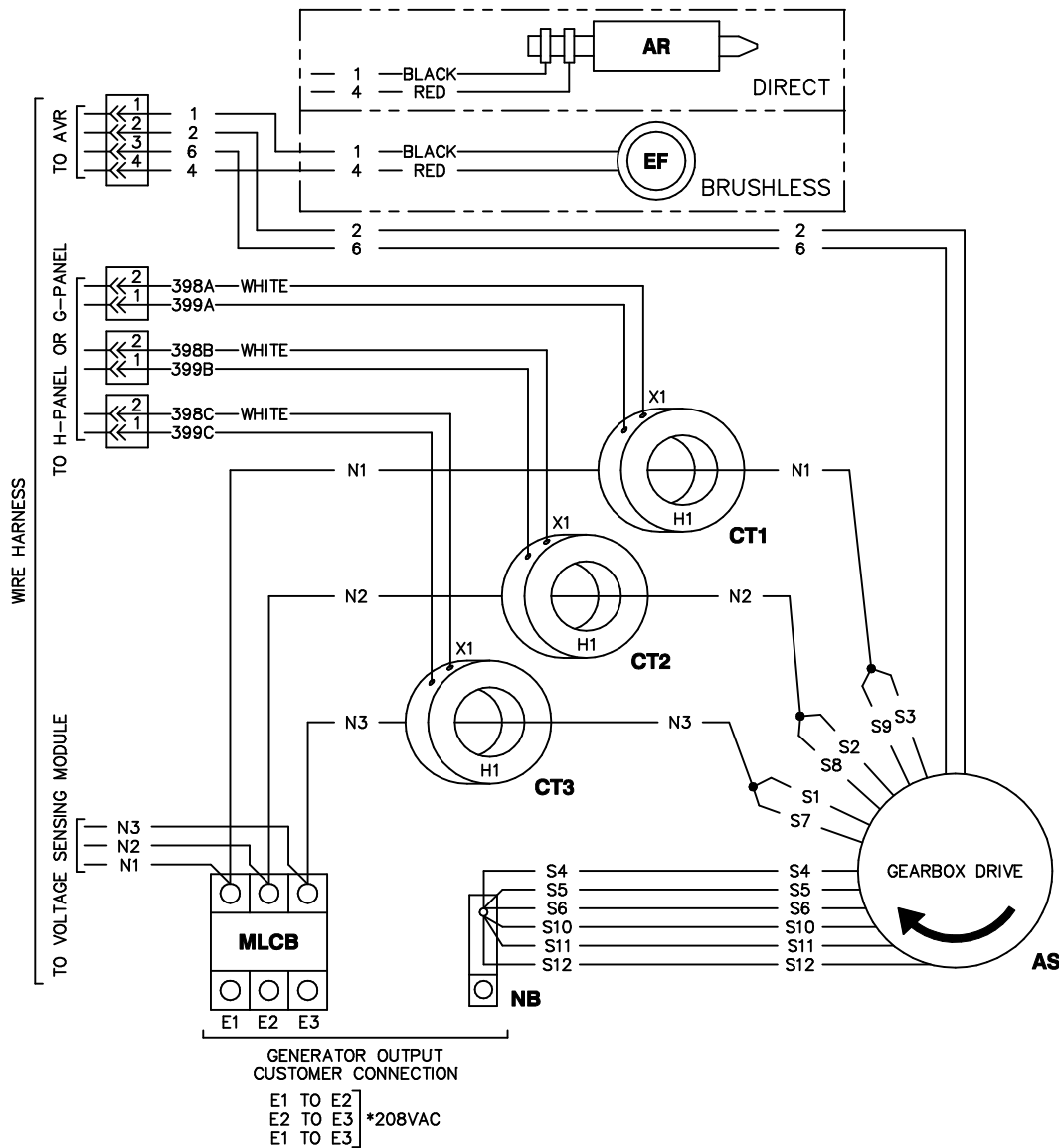
LEGEND	
AR	- ALTERNATOR ROTOR
AS	- ALTERNATOR STATOR
AVR	- AUTOMATIC VOLTAGE REGULATOR
CT	- CURRENT TRANSFORMER
EF	- EXCITER FIELD
MLCB	- MAIN CIRCUIT BREAKER
NB	- NEUTRAL BLOCK



E1-N OR E2-N OR E3-N = *120VAC
 *NOTE: THE 8TH DIGIT OF THE MODEL NUMBER SPECIFIES OUTPUT VOLTAGE ON UNITS BEFORE 2010
 THE 7TH DIGIT OF THE MODEL NUMBER SPECIFIES OUTPUT VOLTAGE ON UNITS 2010 TO PRESENT
 "G" = 120/208VAC 60HZ

OPTION 11 - THREE PHASE SERIES DELTA, H-PANEL OR G-PANEL CONTROL PANEL, GEARBOX (REVERSE ROTATION)

LEGEND	
AR	- ALTERNATOR ROTOR
AS	- ALTERNATOR STATOR
AVR	- AUTOMATIC VOLTAGE REGULATOR
CT	- CURRENT TRANSFORMER
EF	- EXCITER FIELD
MLCB	- MAIN CIRCUIT BREAKER
NB	- NEUTRAL BLOCK

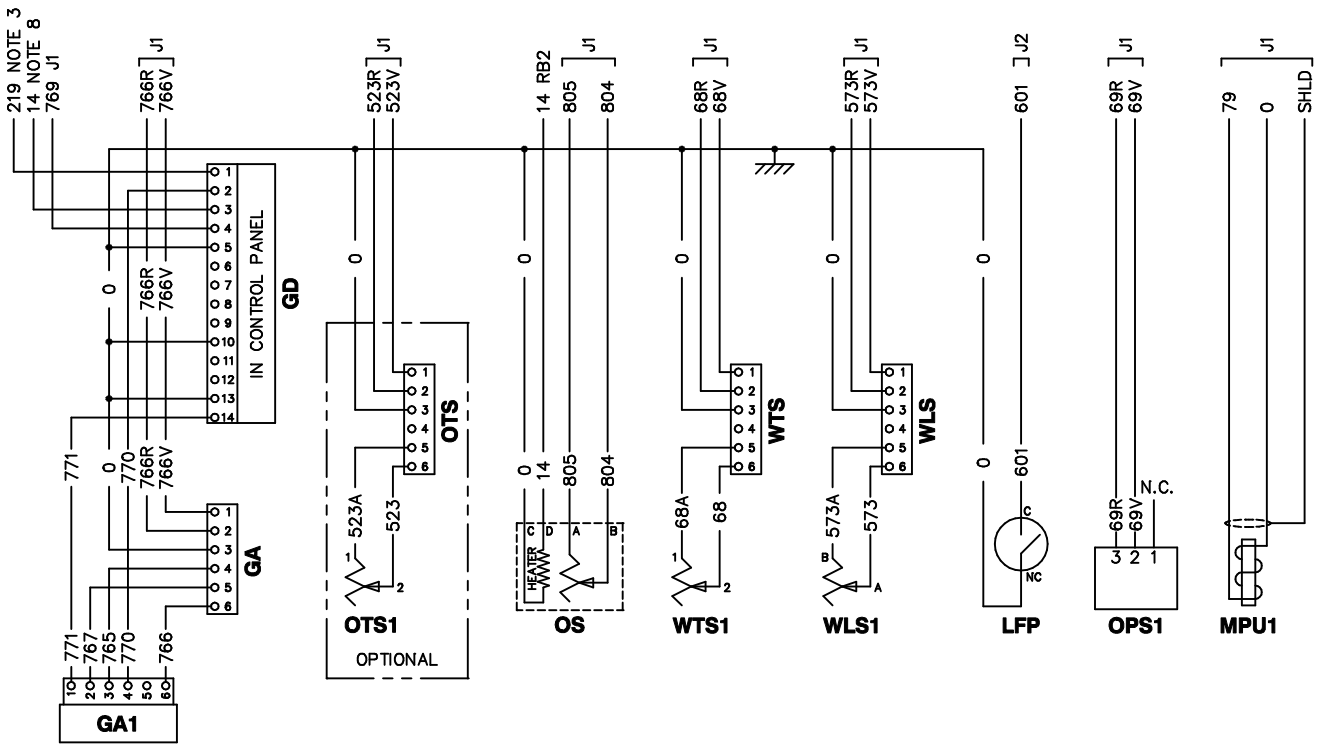
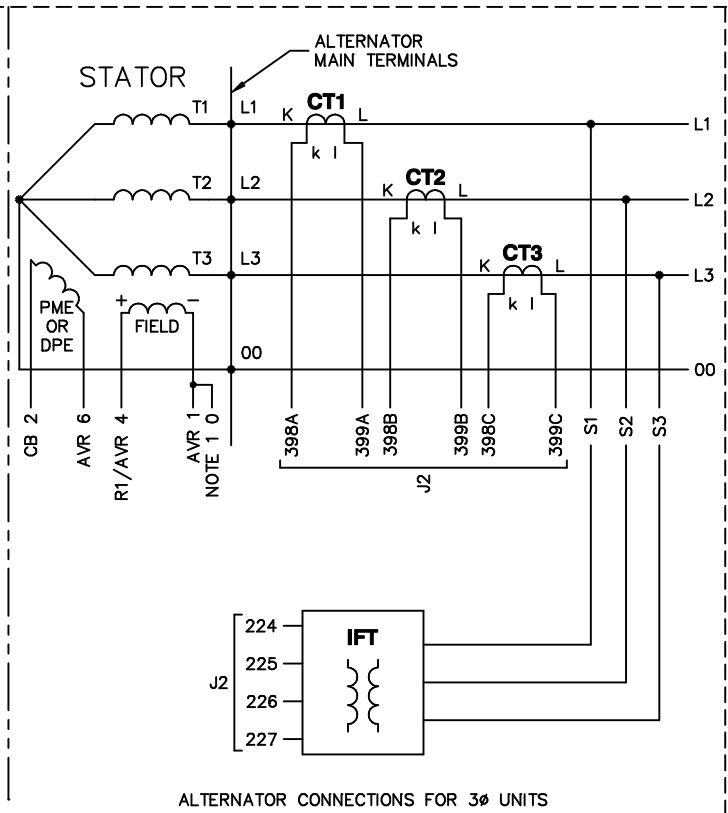
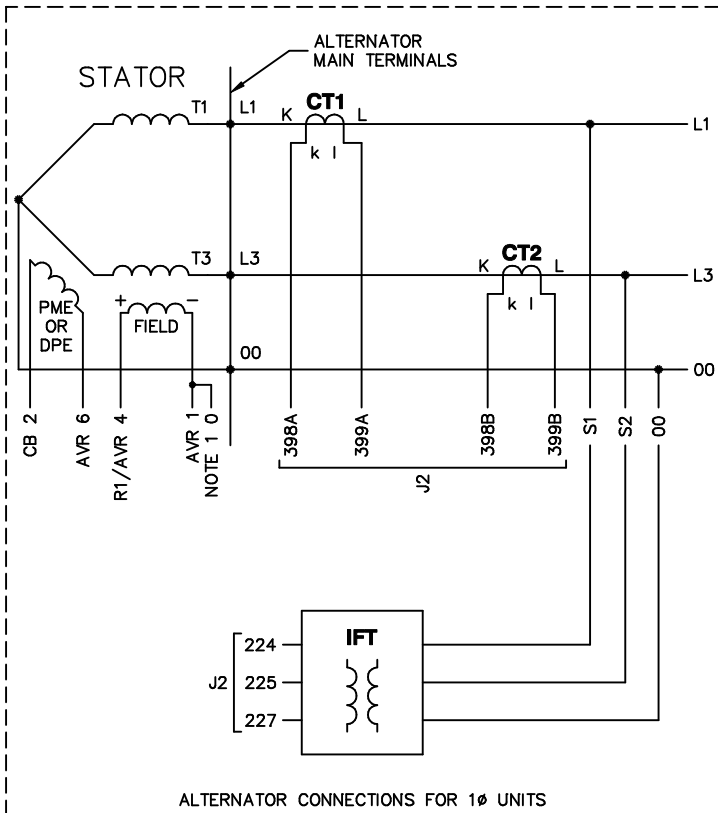


E1-N OR E2-N OR E3-N = *120VAC

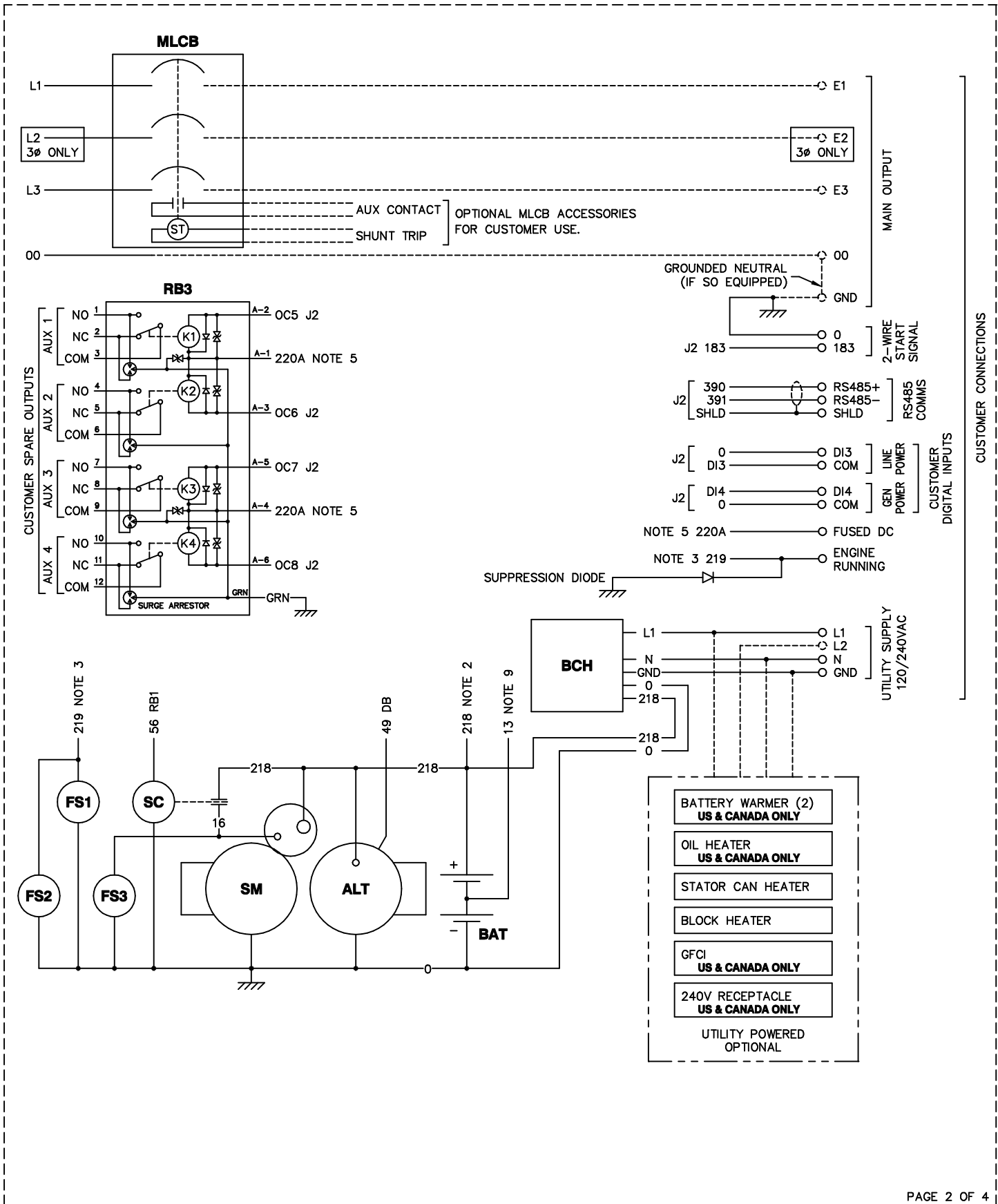
*NOTE: THE 8TH DIGIT OF THE MODEL NUMBER SPECIFIES OUTPUT VOLTAGE ON UNITS BEFORE 2010
 THE 7TH DIGIT OF THE MODEL NUMBER SPECIFIES OUTPUT VOLTAGE ON UNITS 2010 TO PRESENT
 "G" = 120/208VAC 60HZ

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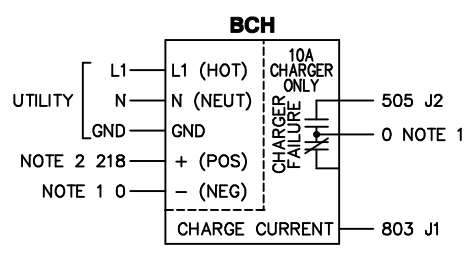
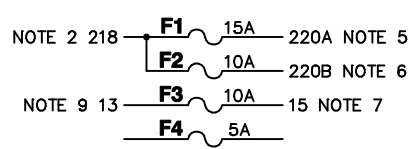
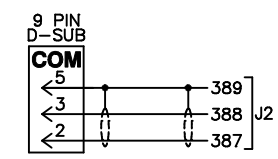
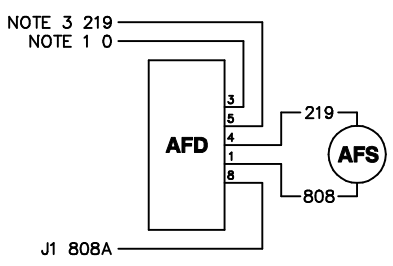
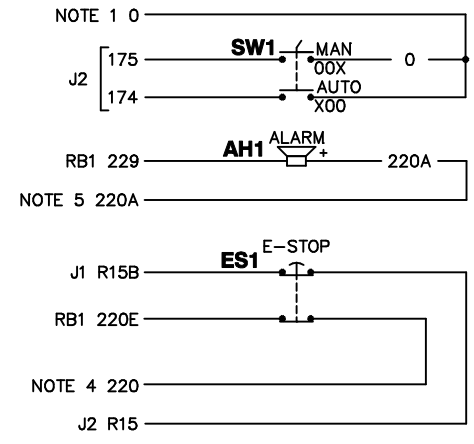
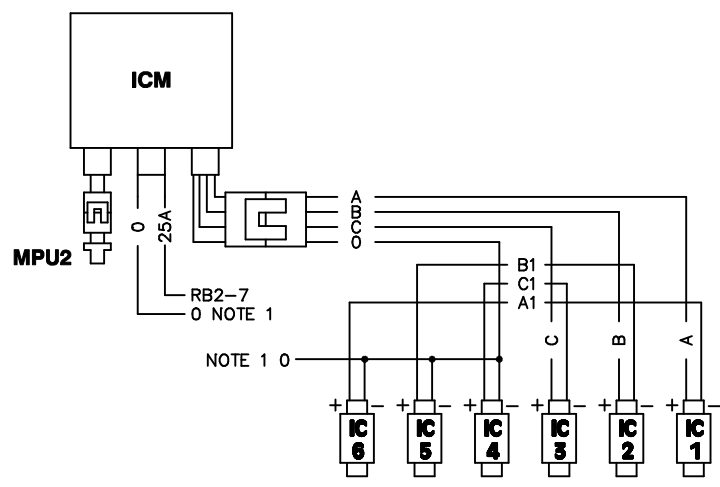
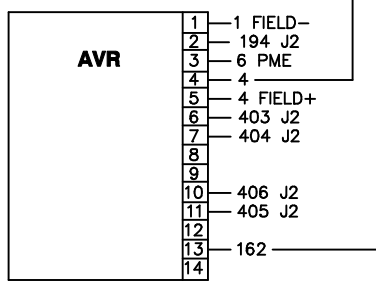
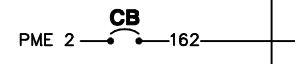
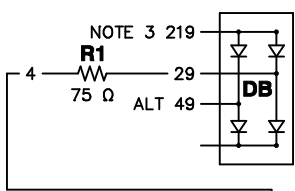
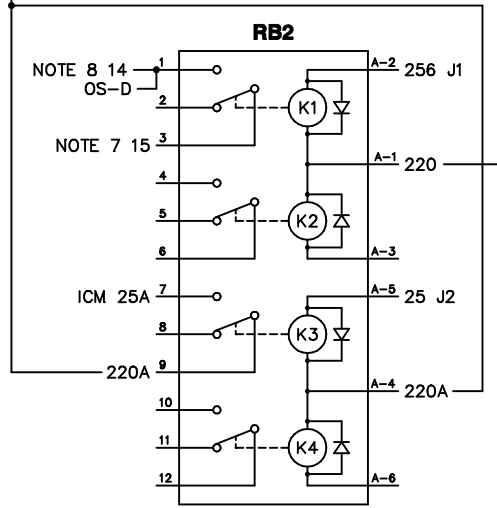
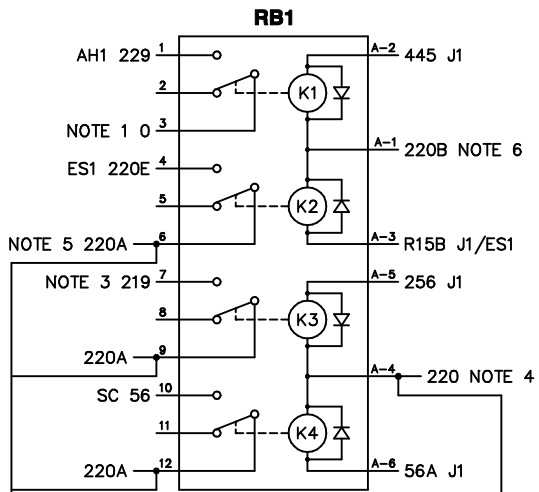
GROUP G



GROUP G



GROUP G



AVR CONNECTOR

PIN	WIRE	TO	FUNCTION
1	1	FIELD	- FIELD
2	194	J2-31	+12VDC
3	6	PME	PME OUTPUT
4	4	R1	+ FIELD
5	4	FIELD	+ FIELD
6	403	J2-8	GATE TRIGGER B
7	404	J2-20	GATE TRIGGER A
10	406	J2-30	ZERO CROSSING I/P
11	405	J2-19	GROUND (ISO)
13	162	CB	PME OUTPUT (AFTER CB)

GD CONNECTOR

PIN	WIRE	TO	FUNCTION
1	219	RB1	NOTE 3
2	770	GA1-4	THROTTLE DRIVE HI
3	14	RB2	NOTE 8
4	769	J1-33	THROTTLE PWM
5	0	GND	NOTE 1
10	0	GND	NOTE 1
13	0	GND	NOTE 1
14	771	GA1-1	THROTTLE DRIVE LO

ENGINE CONTROL MODULE CONNECTIONS

J1

PIN	WIRE	TO	FUNCTION
3	810	MOD-2	MODEM SIGNAL RETURN
4	805	O2	OXYGEN SENSOR RTN (OPTION)
5	804	O2	OXYGEN SENSOR + (OPTION)
8	523R	OTS-2	OIL TEMPERATURE RTN
9	523V	OTS-1	OIL TEMPERATURE +
10	R15B	RB1A-3/ES1	OVERSPEED/WATCHDOG
11	256	RB1A-5	FUEL RELAY
12	0	GND	NOTE 1
14	811	MOD-3	MODEM DATA CARRIER DETECT
15	68V	WTS-1	COOLANT TEMP +
16	803	BCH	BAT CHARGER CURRENT
17	766R	GA-2	THROTTLE POS RTN
18	766V	GA-1	THROTTLE POS +
19	69R	OPS1-3	OIL PRESS RTN
20	69V	OPS1-2	OIL PRESS +
21	808A	AFD-8	AIR/FUEL SOLENOID DRIVER
23	56A	RB1A-6	STARTER RELAY
24	0	MPU1-2	MPU1 SIGNAL (-)
25	79	MPU1-3	MPU1 SIGNAL (+)
26	812	MOD-4	MODEM ENABLE
29	573R	WLS-2	COOLANT LVL RTN
30	573V	WLS-1	COOLANT LVL +
31	68R	WTS-2	COOLANT TEMP RTN
32	809	MOD-1	MODEM 12V POWER
33	769	GD-4	THROTTLE PWM
34	445	RB1A-2	ALARM RELAY
35	220B	F2	NOTE 6

J2

PIN	WIRE	TO	FUNCTION
1	391	CUST CON	RS485- (XFER SW)
2	388	COM-3	RS232 TX (GENLINK)
3	D13	CUST CON	LINE POWER
4	183	CUST CON	REMOTE START
5	174	SW1	"AUTO" START
6	224	IFT	V SENSE GEN A PH
7	227	IFT	V SENSE RTN
8	403	AVR-6	AVR GATE TRIGGER B
* 9	399C	CT3	GEN C PH CURRENT -
* 10	398C	CT3	GEN C PH CURRENT +
11	399A	CT1	GEN A PH CURRENT -
12	398A	CT1	GEN A PH CURRENT +
13	390	CUST CON	RS485+ (XFER SW)
14	387	COM-2	RS232 RX (GENLINK)
15	601	LFP	LOW FUEL PRESSURE
16	R15	ES1	EMERGENCY STOP
* 17	226	IFT	V SENSE GEN C PH
19	405	AVR-11	AVR GROUND
20	404	AVR-7	AVR GATE TRIGGER A
21	OC8	RB3A-6	AUX 4 OUTPUT
22	OC6	RB3A-3	AUX 2 OUTPUT
23	OC5	RB3A-2	AUX 1 OUTPUT
24	SHLD	CUST CON	RS485 DRAIN (XFER SW)
25	389	COM-5	RS232 COM (GENLINK)
26	D14	CUST CON	GENERATOR POWER
27	505	BCH	BAT CHARGER FAIL
28	175	SW1	"MANUAL" START
29	225	IFT	V SENSE GEN B PH
30	406	AVR-10	AVR ZERO CROSSING I/P
31	194	AVR-2	AVR +12VDC
32	25	RB2A-3	12.9L IGNITION POWER (PLC)
33	OC7	RB3A-5	AUX 3 OUTPUT
34	399B	CT2	GEN B PH CURRENT-
35	398B	CT2	GEN B PH CURRENT+

* - CONNECTIONS NOT USED IN 1Ø UNITS.

NOTES:

- 1) WIRE# 0 IS CHASSIS GROUND (BATTERY-) UNLESS NOTED OTHERWISE.
- 2) WIRE# 218 IS UNFUSED +24VDC (BATTERY+).
- 3) WIRE# 219 IS FUSED +24VDC WHEN GENERATOR IS CRANKING OR RUNNING.
- 4) WIRE# 220 IS FUSED +24VDC WHEN E-STOP IS NOT ACTIVATED.
- 5) WIRE# 220A IS FUSED +24VDC FOR GENERAL USE.
- 6) WIRE# 220B IS FUSED +24VDC FOR THE ENGINE CONTROL MODULE.
- 7) WIRE# 15 IS FUSED +12VDC FOR THE IGNITION.
- 8) WIRE# 14 IS FUSED +12VDC WHEN ENGINE IS RUNNING.
- 9) WIRE# 13 IS UNFUSED +12VDC (BATTERY +) FOR O2 SENSOR HEATER POWER. THIS WIRE IS CONNECTED TO THE CENTER JUMPER BETWEEN THE TWO ENGINE STARTING BATTERIES.

LEGEND

AFD - AIR/FUEL DRIVER	CT_ - CURRENT TRANSFORMER	IC_ - IGNITION COIL	OTS_ - OIL TEMPERATURE SENDER
AFS - AIR/FUEL SOLENOID	DB - DIODE BRIDGE	ICM - IGNITION CONTROL MODULE	PME - PERMANENT MAGNET EXCITER
AH1 - ALARM HORN	DPE - EXCITER	IFT - INTERFACE TRANSFORMER	R1 - RESISTOR
ALT - DC CHARGE ALTERNATOR	ES1 - EMERGENCY STOP SWITCH	J_ - ENGINE CONTROL MODULE CONN.	RB_ - RELAY BOARD
AVR - AUTOMATIC VOLTAGE REGULATOR	F_ - FUSE	LFP - LOW FUEL PRESSURE	SC - STARTER CONTACTOR
BAT - BATTERY	FS_ - FUEL SOLENOID	MLCB - MAIN LINE CIRCUIT BREAKER	SM - STARTER MOTOR
BCH - BATTERY CHARGER	GA_ - GOVERNOR ACTUATOR	MPU_ - MAGNETIC PICKUP	SW1 - OFF/AUTO/MANUAL SWITCH
CB - CIRCUIT BREAKER	GD - GOVERNOR DRIVER	OPS1 - OIL PRESSURE SENDER	WLS_ - WATER LEVEL SENSOR
COM - COMMUNICATION CONNECTOR	GFCI - GROUND FAULT CIRCUIT INTERRUPT	OS - OXYGEN SENDER	WTS_ - WATER TEMPERATURE SENDER

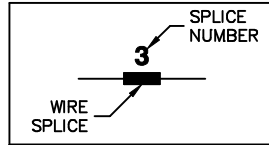
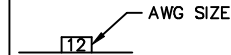
GROUP G

LEGEND

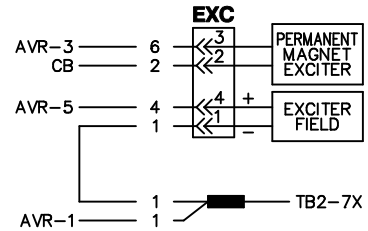
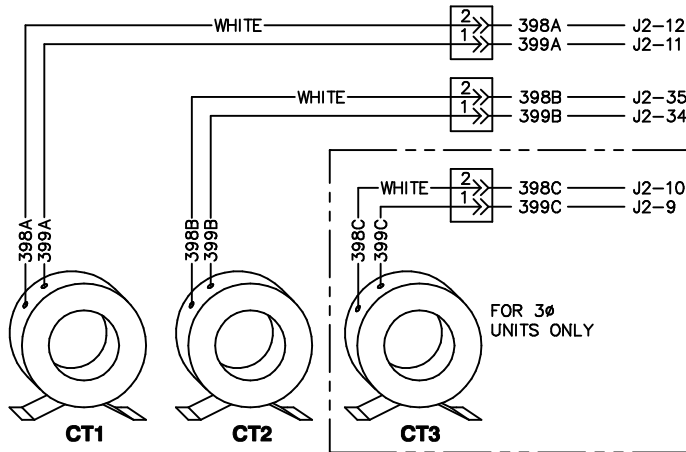
AFD - AIR/FUEL DRIVER	ICM - IGNITION CONTROL MODULE
AFS - AIR/FUEL SOLENOID	IFT - INTERFACE TRANSFORMER
AH1 - ALARM HORN	J_ - ENGINE CONTROL MODULE CONN.
ALT - DC CHARGE ALTERNATOR	LFP - LOW FUEL PRESSURE SWITCH
AVR - AUTOMATIC VOLTAGE REGULATOR	MLCB - MAIN LINE CIRCUIT BREAKER
BCC - BATTERY CHARGER CONNECTOR	MOD - MODEM CONNECTOR
BCH - BATTERY CHARGER	MPU_ - MAGNETIC PICKUP
CB - CIRCUIT BREAKER DPE	OPSI - OIL PRESSURE SENDER
CO - CROSSOVER CONNECTOR	OS - OXYGEN SENSOR
COM - COMMUNICATIONS PORT	OTS_ - OIL TEMPERATURE SENDER
CT_ - CURRENT TRANSFORMER	R1 - RESISTOR
DB - DIODE BRIDGE	RB_ - RELAY BOARD
ES1 - EMERGENCY STOP SWITCH	RB_A - RELAY BOARD CONNECTOR
EXC - EXCITER	SC - START CONTACTOR
F_ - FUSE	SM - STARTER MOTOR
FS_ - FUEL SOLENOID	SW1 - OFF/AUTO/MANUAL SWITCH
GA_ - GOVERNOR ACTUATOR	SWC - OPERATOR SWITCH CONNECTOR
GD - GOVERNOR DRIVER	TB_ - TERMINAL BLOCK
GFCI - GROUND FAULT CURRENT INTERRUPT*	WLS_ - COOLANT LEVEL SENDER
GND - GROUND BAR CONNECTION	WTS_ - COOLANT TEMPERATURE SENDER
IC_ - IGNITION CONTROL	

* - N/A ON INTERNATIONAL PRODUCTS

NOTE: ALL WIRES 18 AWG
300V UL LISTED UNLESS
SHOWN OTHERWISE



COMPONENTS LOCATED IN ALTERNATOR CONNECTION BOX



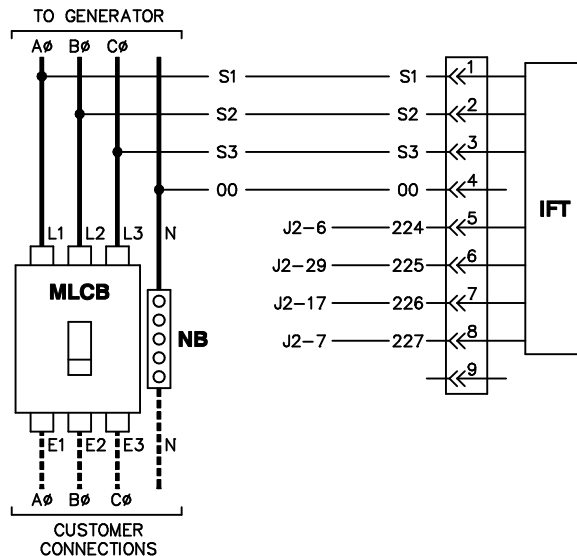
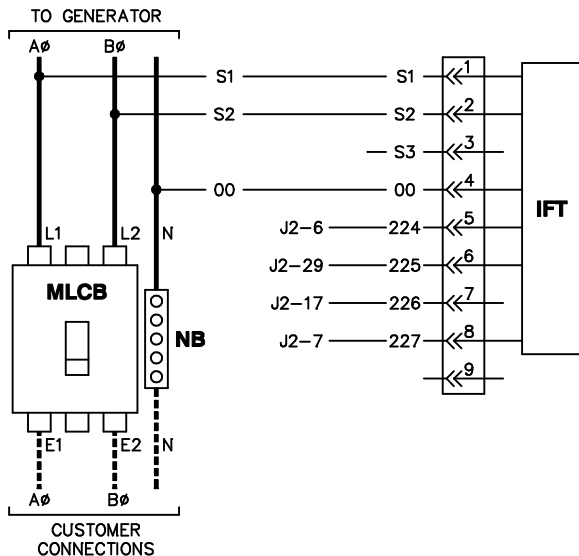
SEE DRAWING OH9846 FOR CT WIRING.

COMPONENTS LOCATED IN HIGH VOLTAGE CUSTOMER CONNECTION MODULE

CONNECTIONS FOR 1Ø UNIT

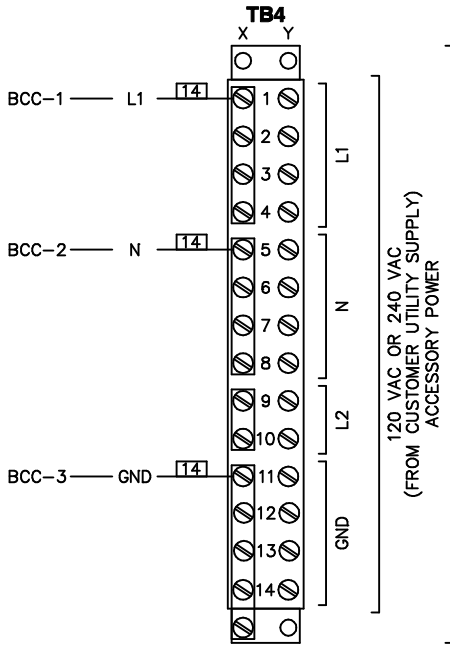
NOTE: ALL WIRES IN THIS SECTION ARE 600V RATED

CONNECTIONS FOR 3Ø UNIT

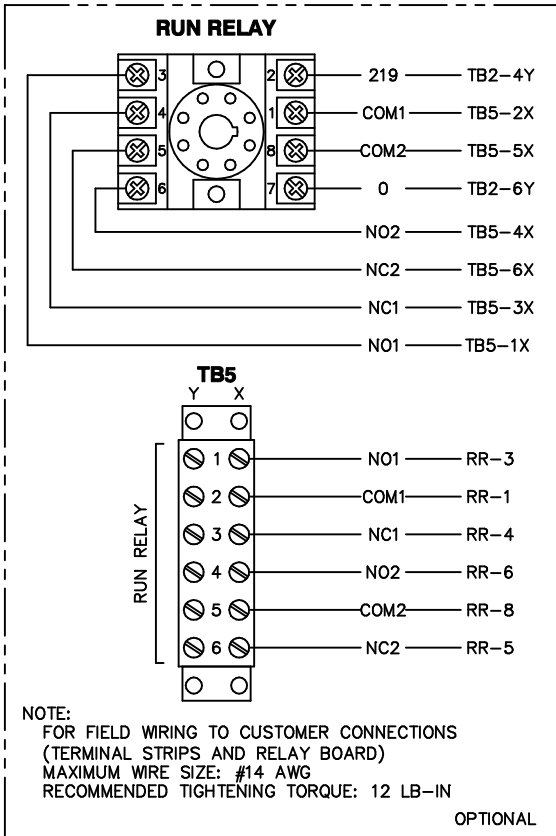
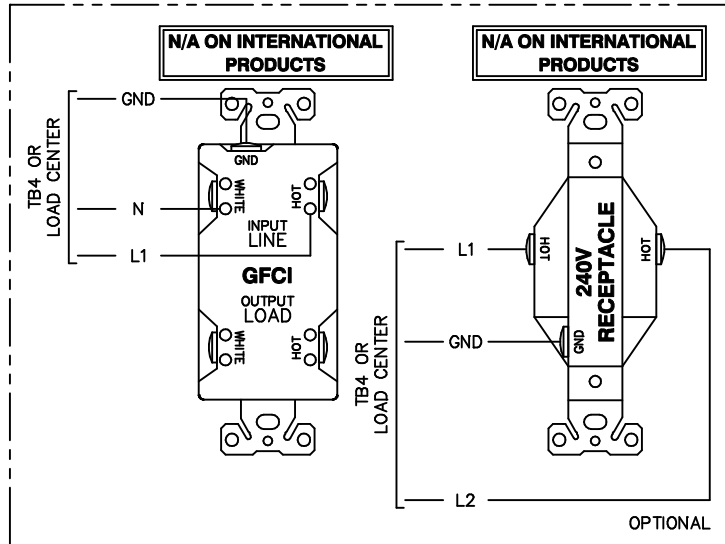
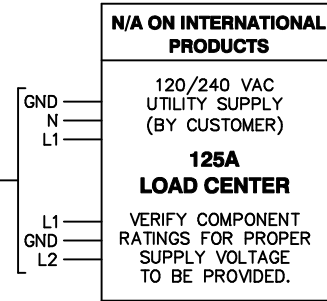


COMPONENTS LOCATED IN HIGH VOLTAGE CUSTOMER CONNECTION MODULE

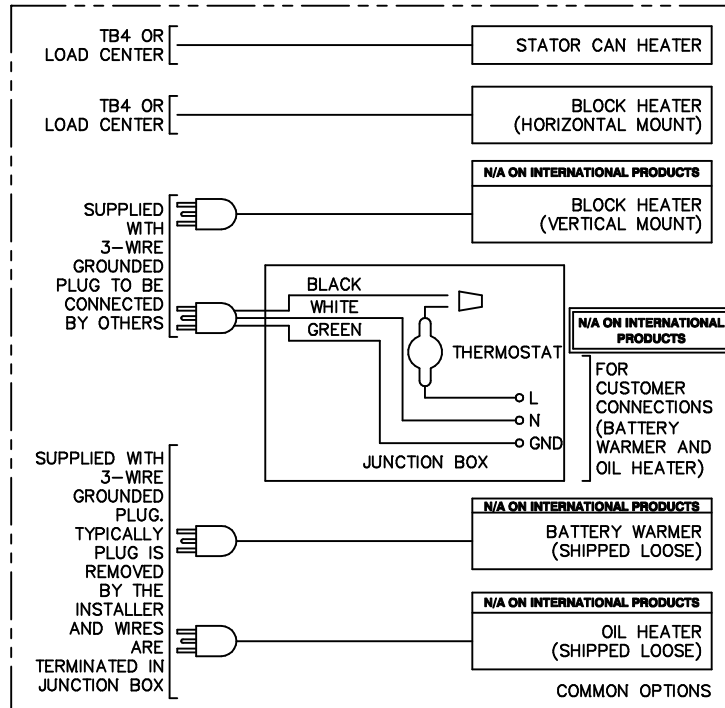
NOTE: ALL WIRES ON THIS PAGE ARE 600V RATED



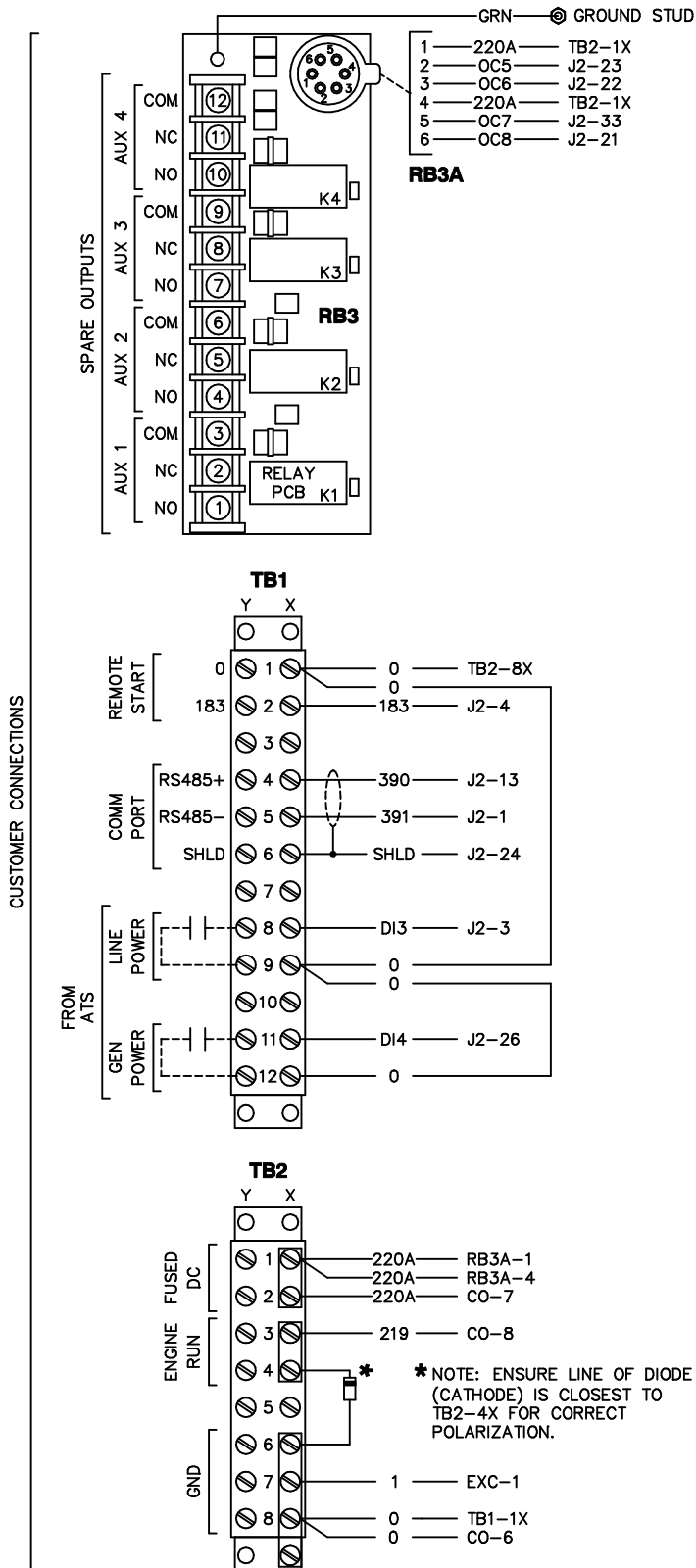
NOTE:
FOR FIELD WIRING TO CUSTOMER CONNECTIONS (TERMINAL STRIP)
MAXIMUM WIRE SIZE: #10 AWG
RECOMMENDED TIGHTENING TORQUE: 14 LB-IN



NOTE:
FOR FIELD WIRING TO CUSTOMER CONNECTIONS (TERMINAL STRIPS AND RELAY BOARD)
MAXIMUM WIRE SIZE: #14 AWG
RECOMMENDED TIGHTENING TORQUE: 12 LB-IN



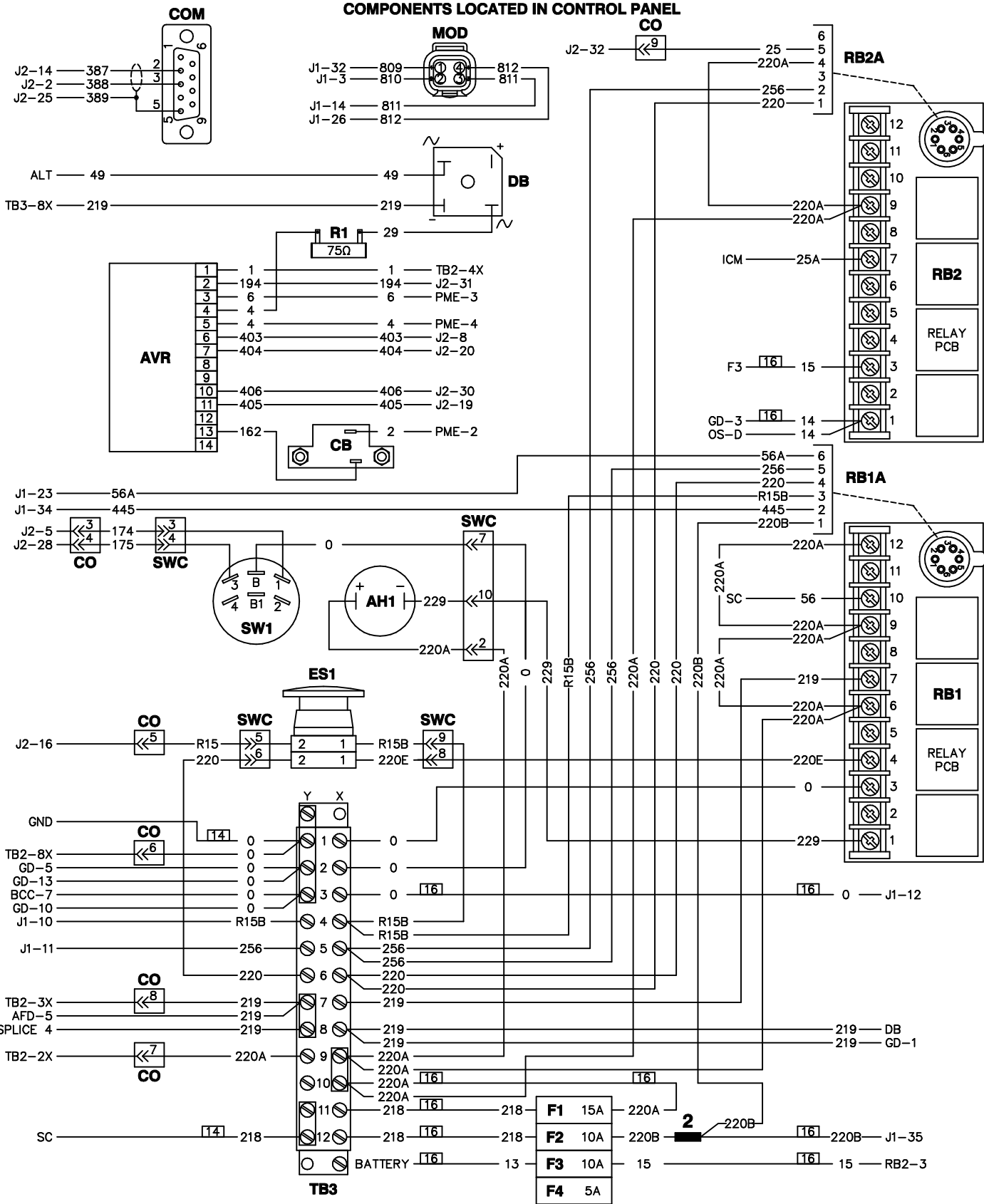
COMPONENTS LOCATED ON LOW VOLTAGE CUSTOMER CONNECTION PANEL



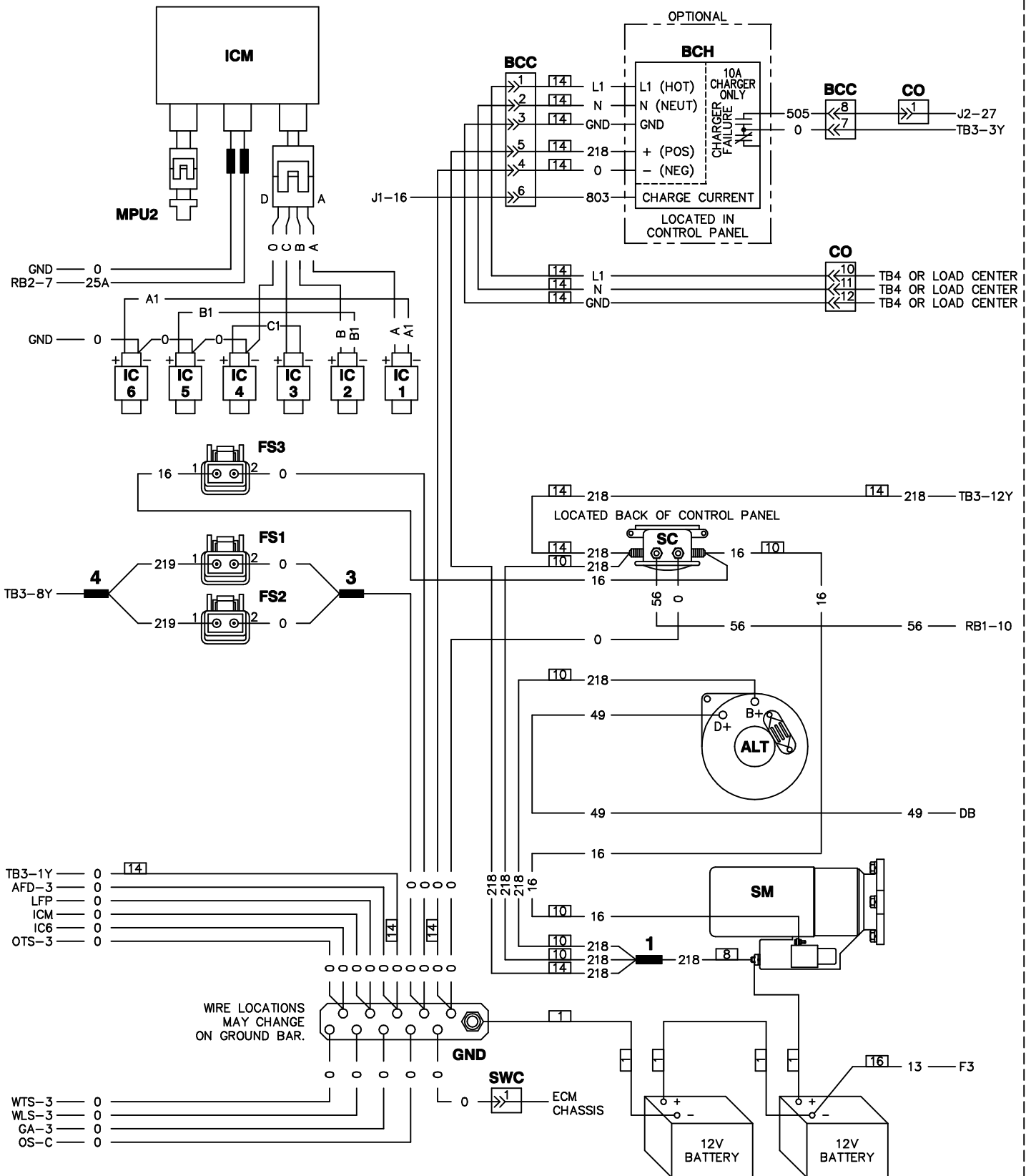
NOTE:
 FOR FIELD WIRING TO CUSTOMER CONNECTIONS
 (TERMINAL STRIPS AND RELAY BOARD)
 MAXIMUM WIRE SIZE: #14 AWG
 RECOMMENDED TIGHTENING TORQUE: 12 LB-IN

GROUP G

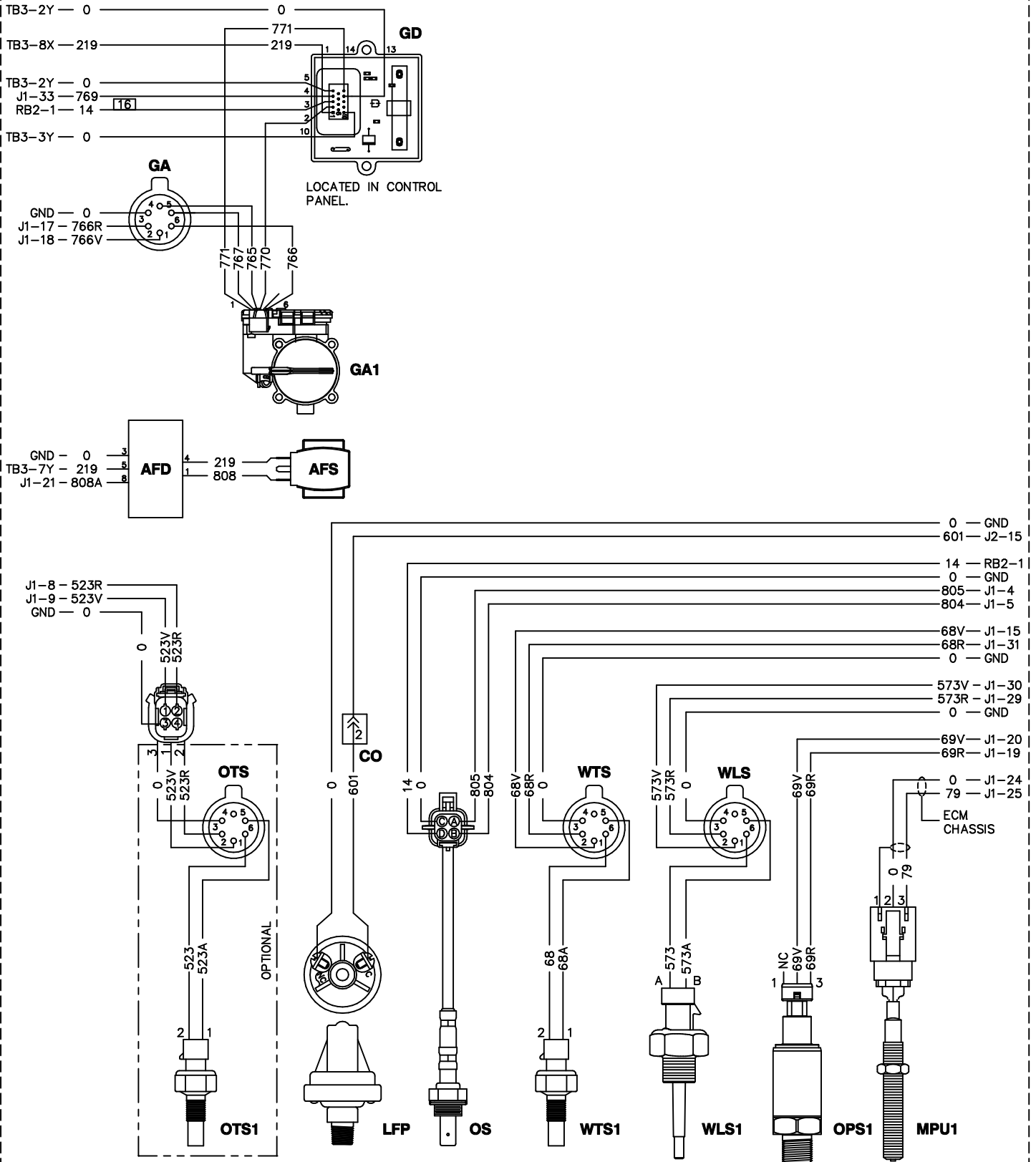
COMPONENTS LOCATED IN CONTROL PANEL



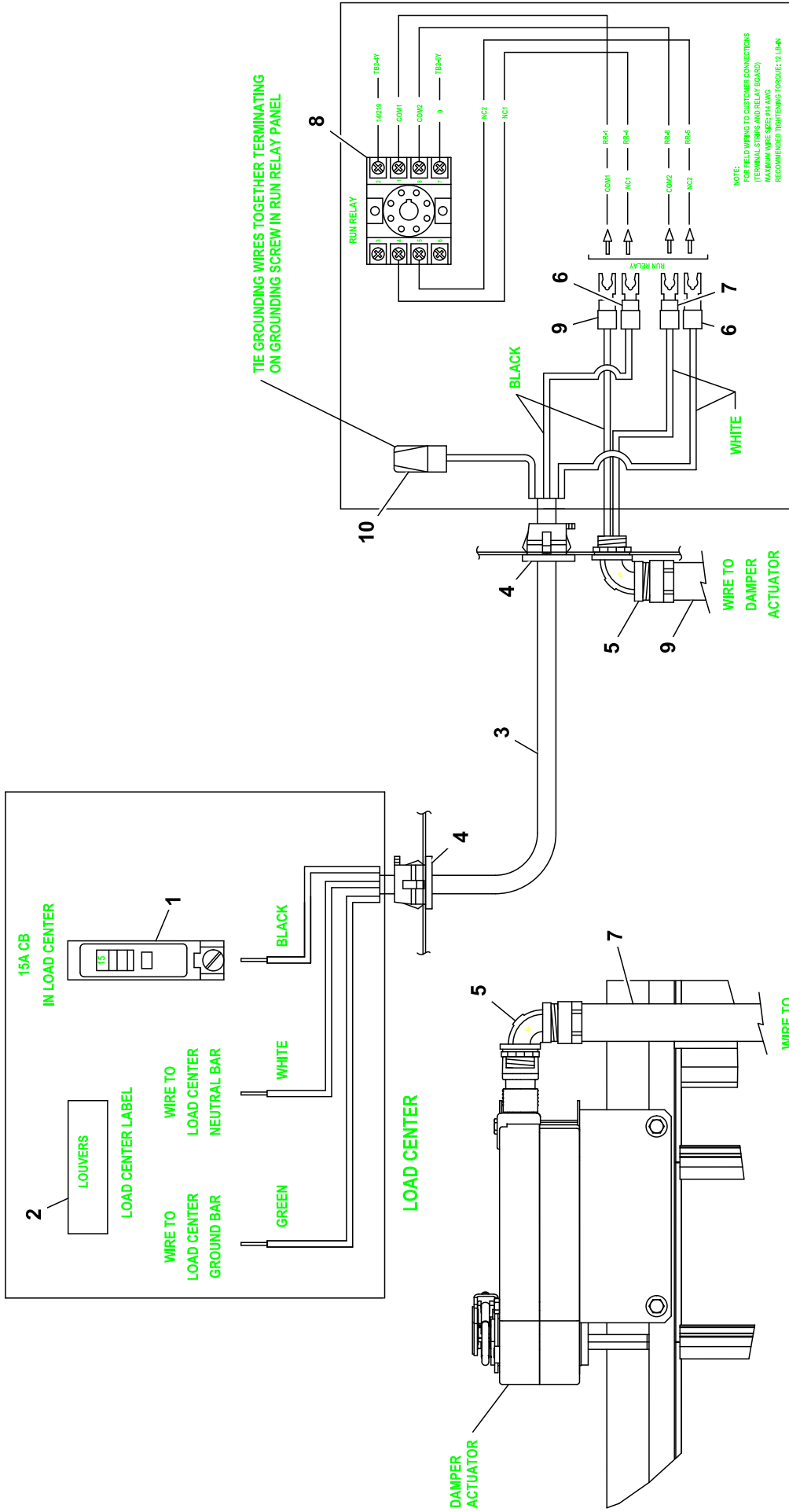
COMPONENTS LOCATED ON ENGINE



COMPONENTS LOCATED ON ENGINE



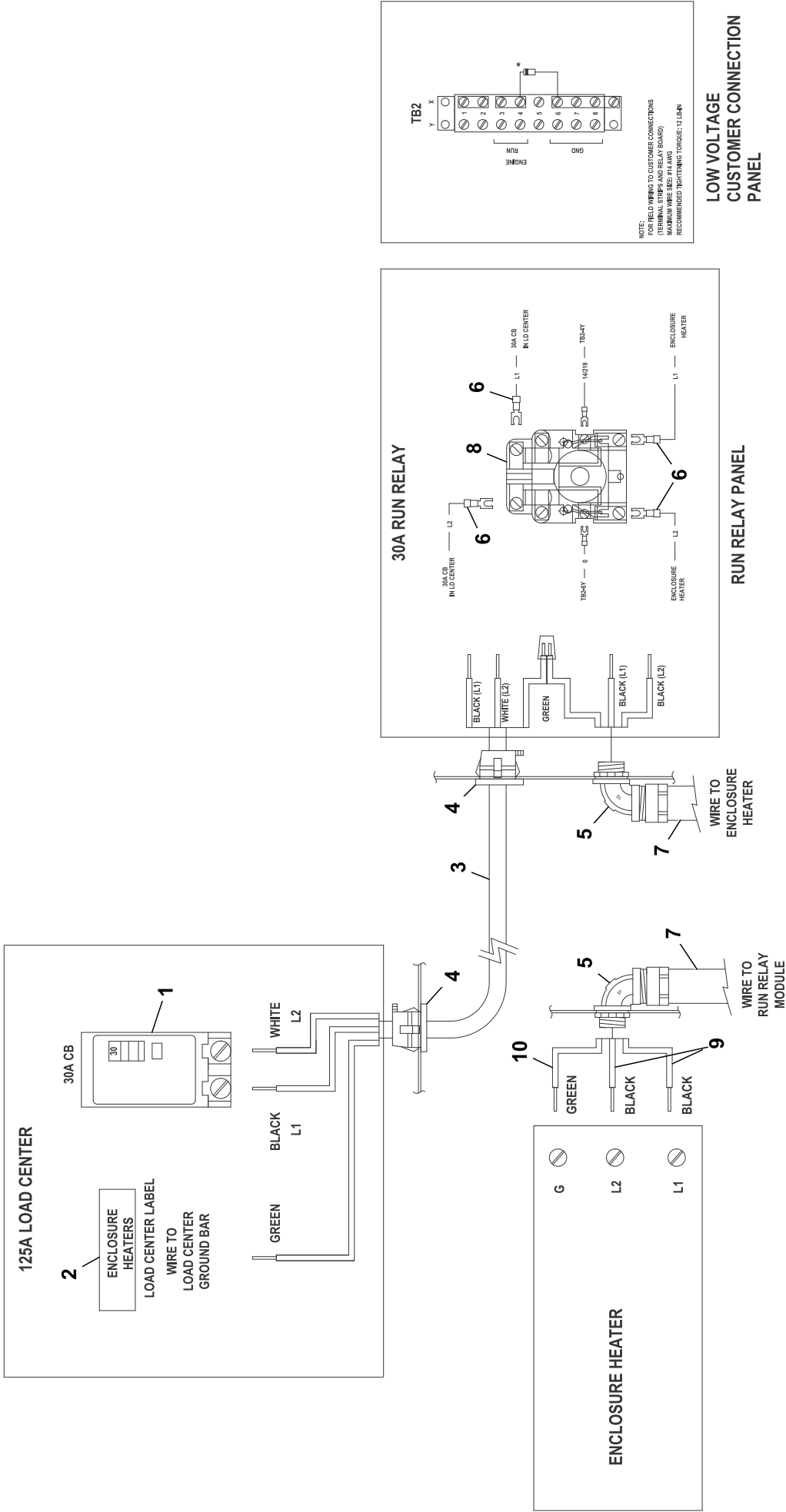
GROUP G



SALES SPECIAL

EXPLODED VIEW: WD ENCL DAMPER RELAY MOD LC**DRAWING #: 0J8716B****GROUP G**

ITEM	PART#	QTY.	DESCRIPTION
1	0E7888B	1	CB 0015A 1P PLUG IN SIEMENS
2	0F9521C	1	DECAL LOUVERS
3	0J8181	REF	CABLE 16-3 TYPE SE00W/ST00W
4	0J8897	2	BUSHING, STRAIN RND(.340-.430)
5	020107	2	FITTING CONDUIT 90D 1/2" METAL
6	061531	2	LUG SNPSPD INS 16-14 X.27 X.87
7	0A9219	REF	TUBE FLEX SELTIT CONDUIT 1/2
8	0C3211E	1	RELAY PNL 12VDC DPDT 8PIN
	0C3211F	1	RELAY 24VDC DPDT 8 PIN
	0C3211G	1	SOCKET RELAY 8 PIN
	0C3211H	2	SPRING RELAY RETAINING
9	061446	2	LUG SNPSPD INS 22-18 X.27 X.87
10	027959	REF	WIRE NUT #30-451 YEL



SALES SPECIAL

EXPLODED VIEW: WD 30A/2P 5K HTR RELAY W/LC

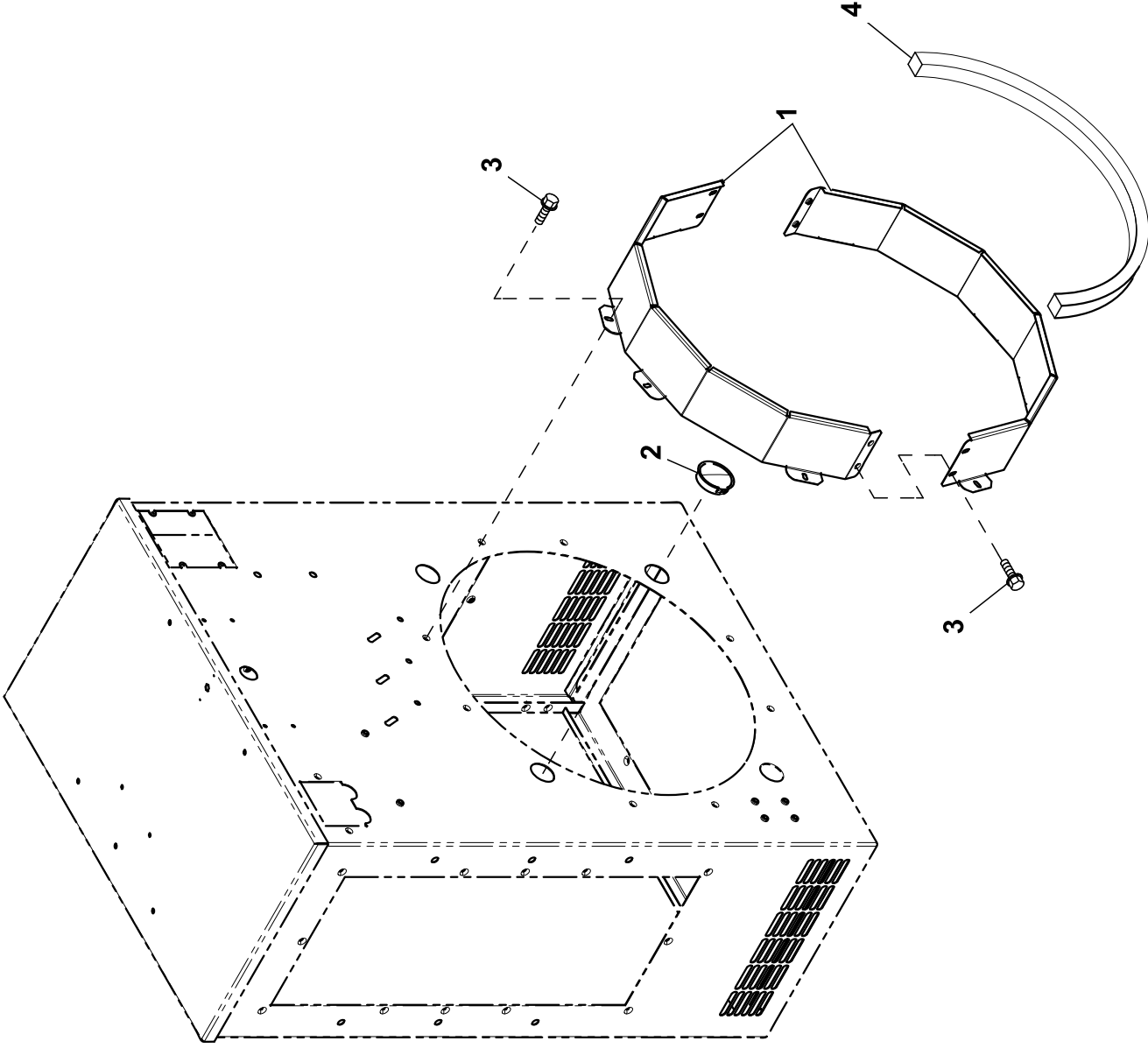
DRAWING #: 0J8844B

APPLICABLE TO: CO 1449405

GROUP G

ITEM	PART#	QTY.	DESCRIPTION
1	0E7888A	1	CB 0030A 2P PLUG IN SIEMENS
2	0C4738E	1	DECAL ENCLOSURE HEATER
3	0J8179	REF	CABLE 12-3 TYPE SE00W/ST00W
4	0F8899	2	BUSHING, STRAIN RND(.600-.700)
5	020107	2	FITTING CONDUIT 90D 1/2" METAL
6	0E6883	4	LUG SNPSPD INS 12-10 X.26 X.995
7	0A9219	REF	TUBE FLEX SELTIT CONDUIT 1/2
8	0E4771B	1	RELAY,DPDT,24DC COIL,30A 300AC
9	055199D	REF	WIRE 600V 12AWG BLK
10	055199P	REF	WIRE 600V 12AWG GRN

GROUP H



EXPLODED VIEW: KIT 520MM ALT SHROUD

DRAWING #: 0H4953

GROUP H

APPLICABLE TO:

ITEM	PART#	QTY.	DESCRIPTION
(2)1	0H47980ST0R	2	SHROUD 520 ALT X 100MM
	0H96190ST0R	2	SHROUD 520 ALT X 65MM
2	0E1534A	4	PLUG PLASTIC 1.50"
3	0C2454	12	SCREW HWHT M6-1 X 16 N WA Z/JS
(1)4	052250	REF	TAPE FOAM 1X1 (55"LG)

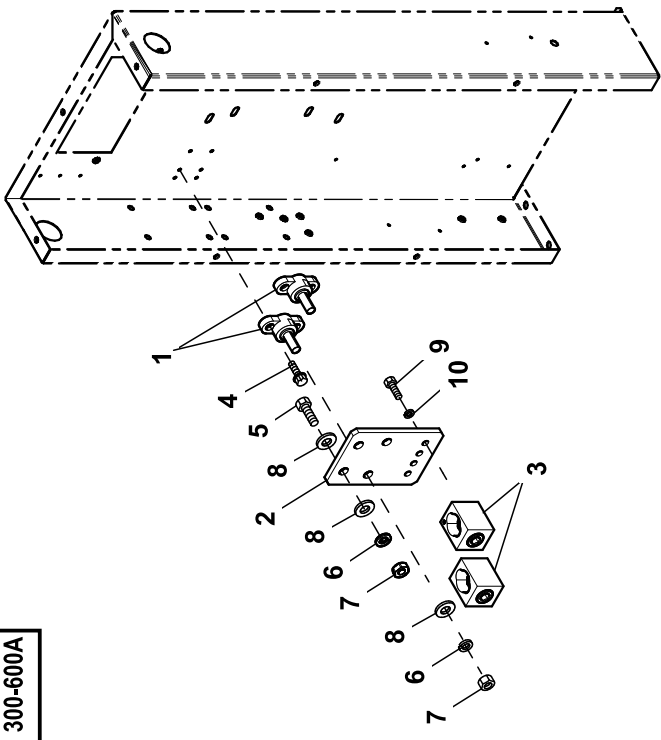
(1) SUPPLIED WITH CONNECTION BOX

(2) SHEET METAL PARTS LISTED IN THE BOM TABLE ARE REPRESENTING GENERIC PARTS (NO COLOR).

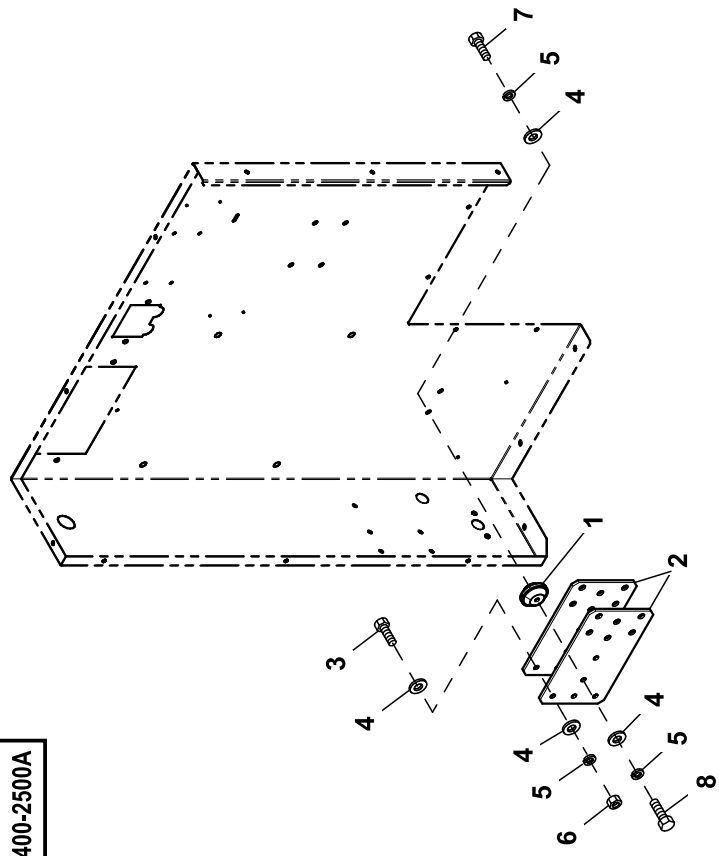
- **MANUFACTURING:** FOR CORRECT MATERIAL AND COLOR REFER TO AS400 BOM.
- **CUSTOMER:** FOR CORRECT MATERIAL AND COLOR OF REPLACEMENT PARTS REFER TO "REPLACEMENT SHEET METAL PARTS ORDERING GUIDE-0H7169" INCLUDED IN THE MANUAL OR AVAILABLE ON THE GENERAC WEBSITE.

GROUP H

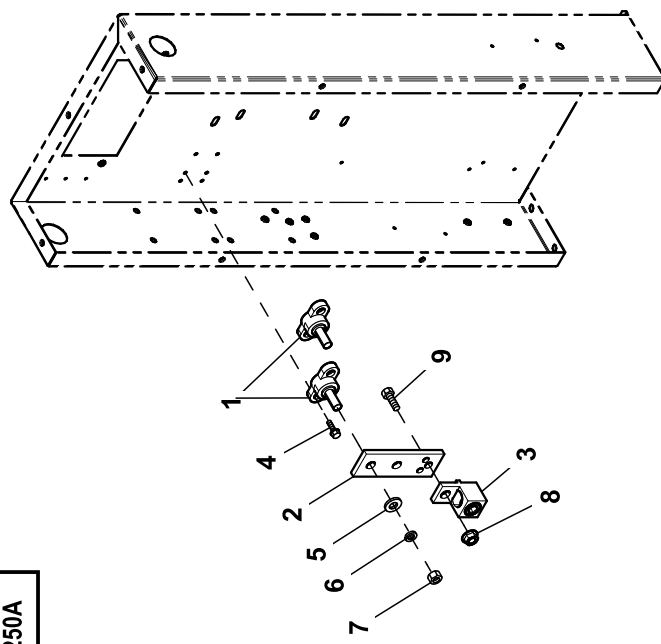
300-600A



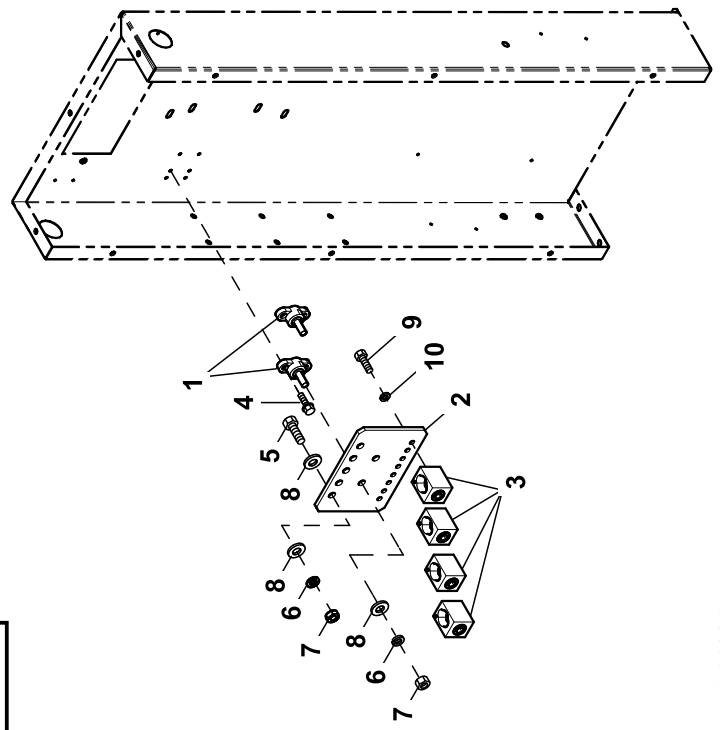
1400-2500A



250A



700-1200A



EXPLODED VIEW: EV, NEUTRAL BLOCK 0-250A

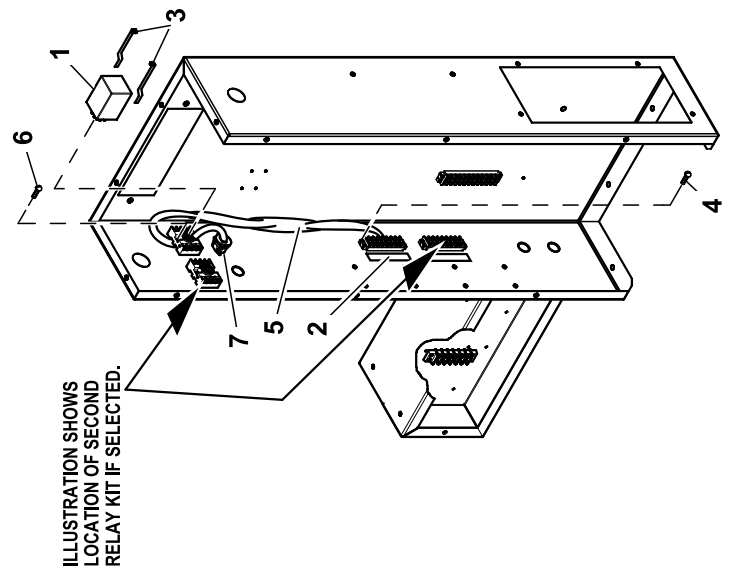
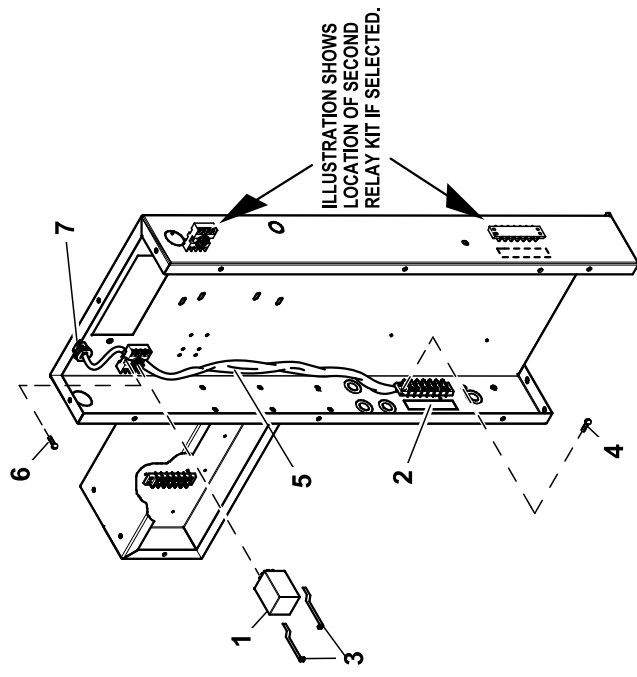
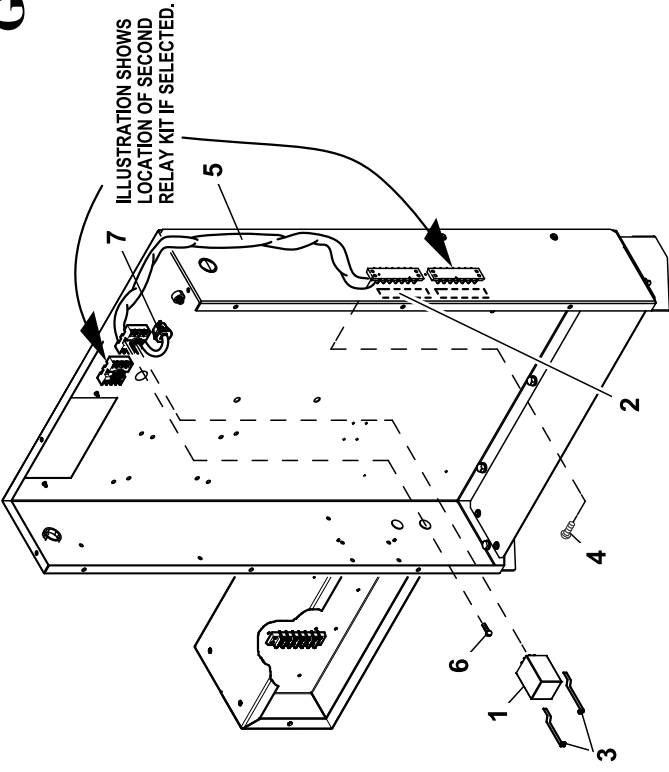
DRAWING #: 0J1047

GROUP H

APPLICABLE TO:

ITEM	PART#	QTY.	DESCRIPTION
NEUTRAL BLOCK (250A)			
1	057073	2	JUNCTION BLOCK 3/8-16
2	0H9690	1	NEUTRAL, BRACKET (60-100A)
3	0F8451	1	LUG SLDLSS 300 MCM-6 AL/CU
4	0C2266	4	SCREW PHTT M5-0.8 X 16 ZP
5	022131	2	WASHER FLAT 3/8-M10 ZINC
6	022237	2	WASHER LOCK 3/8
7	022241	2	NUT HEX 3/8-16 STEEL
8	067989	1	NUT HEX FL WHIZ M8-1.25
9	043107	1	SCREW HHC M8-1.25 X 25 C8.8
NEUTRAL BLOCK (300A - 600A)			
1	057073	2	JUNCTION BLOCK 3/8-16
2	0H9689A	1	BUS BAR, NTRL BLK 520 0-600A
3	0A7822	2	LUG SLDLSS 600/250-1/0X1/4-28
4	0C2266	4	SCREW PHTT M5-0.8 X 16 ZP
5	022511	2	SCREW HHC 3/8-16 X 1-1/4 G5
6	022237	4	WASHER LOCK 3/8
7	022241	4	NUT HEX 3/8-16 STEEL
8	022131	6	WASHER FLAT 3/8-M10 ZINC
9	045335	4	SCREW HHC 1/4-28 X 3/4 G5
10	022097	4	WASHER LOCK M6-1/4
NEUTRAL BLOCK (700A - 1200A)			
1	057073	2	JUNCTION BLOCK 3/8-16
2	0H9689	1	BUS BAR, NTRL BLK 520 600-1600
3	0A7822	4	LUG SLDLSS 600/250-1/0X1/4-28
4	0C2266	4	SCREW PHTT M5-0.8 X 16 ZP
5	022511	5	SCREW HHC 3/8-16 X 1-1/4 G5
6	022237	7	WASHER LOCK 3/8
7	022241	7	NUT HEX 3/8-16 STEEL
8	022131	12	WASHER FLAT 3/8-M10 ZINC
9	045335	8	SCREW HHC 1/4-28 X 3/4 G5
10	022097	8	WASHER LOCK M6-1/4
NEUTRAL BLOCK (1400A - 2500A)			
1	0C6937M	2	INSULATOR, STANDOFF 600V3/8-16
2	0J4583	2	BUS BAR, 1/4"X6"X10"
3	031578	3	SCREW HHC 3/8-16 X 1-1/2 G8
4	022131	10	WASHER FLAT 3/8-M10 ZINC
5	022237	7	WASHER LOCK 3/8
6	022241	3	NUT HEX 3/8-16 STEEL
7	023152	2	SCREW HHC 3/8-16 X 3/4 G5
8	029745	2	SCREW HHC 3/8-16 X 1 G5

GROUP H



EXPLODED VIEW: EV KIT 12/24V RUN RELAY

DRAWING #: 0J1171

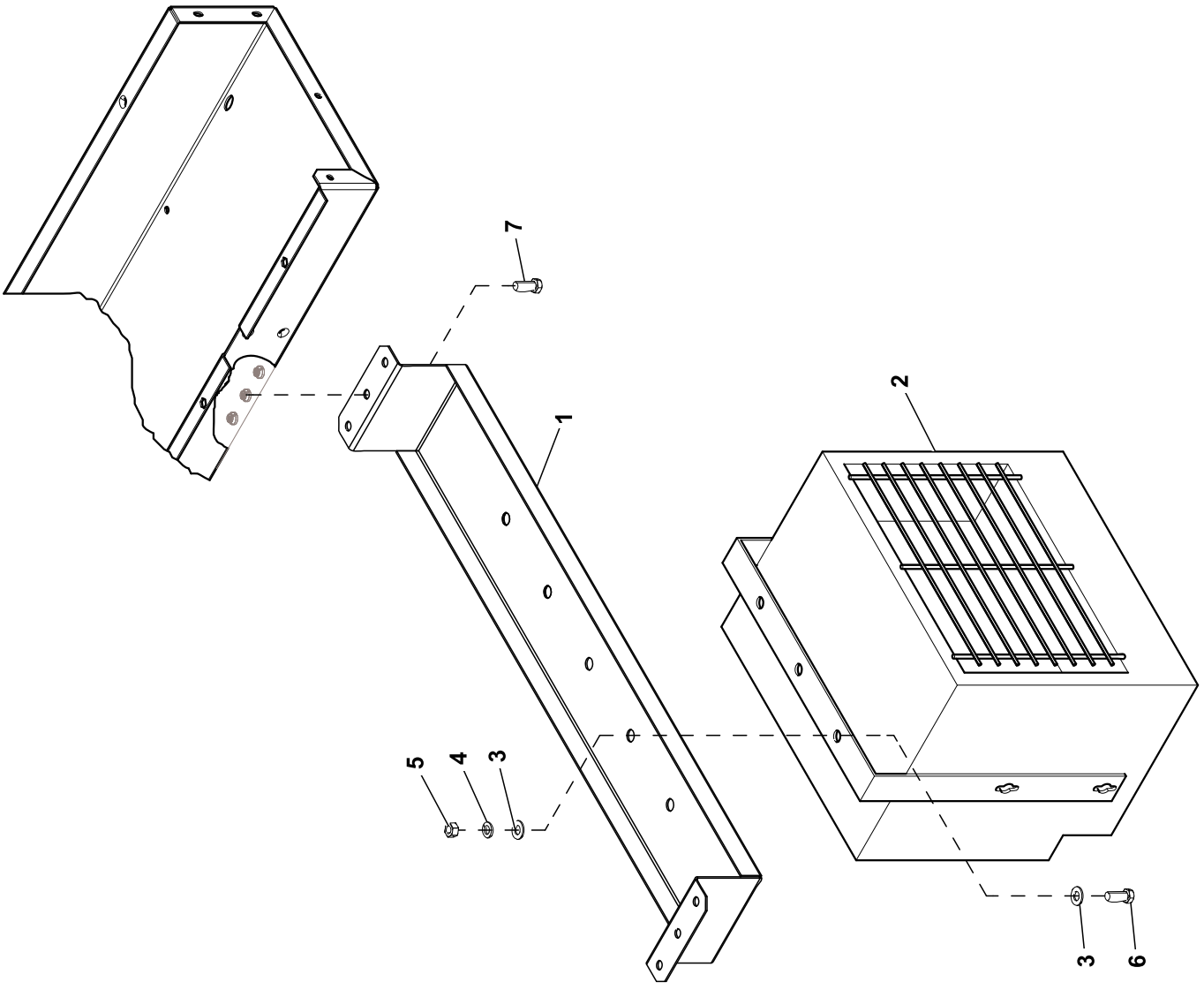
GROUP H

APPLICABLE TO:

ITEM	PART#	QTY.	DESCRIPTION
1	0C3211E	1	RELAY PNL 12VDC DPDT 8PIN
	0C3211F	1	RELAY 24VDC DPDT 8 PIN
(1)2	0J0400	1/2	DECAL, HV CONNECTION RUN RELAY
3	0C3211H	2	SPRING RELAY RETAINING
(1)4	0J5462	2/4	SCREW THTT M4-0.7 X 16 ZP
5	0J0836	1	HARN RUN RELAY H-PANEL
(1)6	0F5828	2/4	SCREW PHTT M4-0.7 X 25 ZP
7	0J8896	1	BUSHING, STRAIN RND(.290-.385)

(1) QTY. MAY CHANGE BASED ON OPTION OFFERED.

GROUP F



SALES SPECIAL

EXPLODED VIEW: EV ENCL HTR 5000W L2A

DRAWING #:0J4786F

APPLICABLE TO:CO 1413933

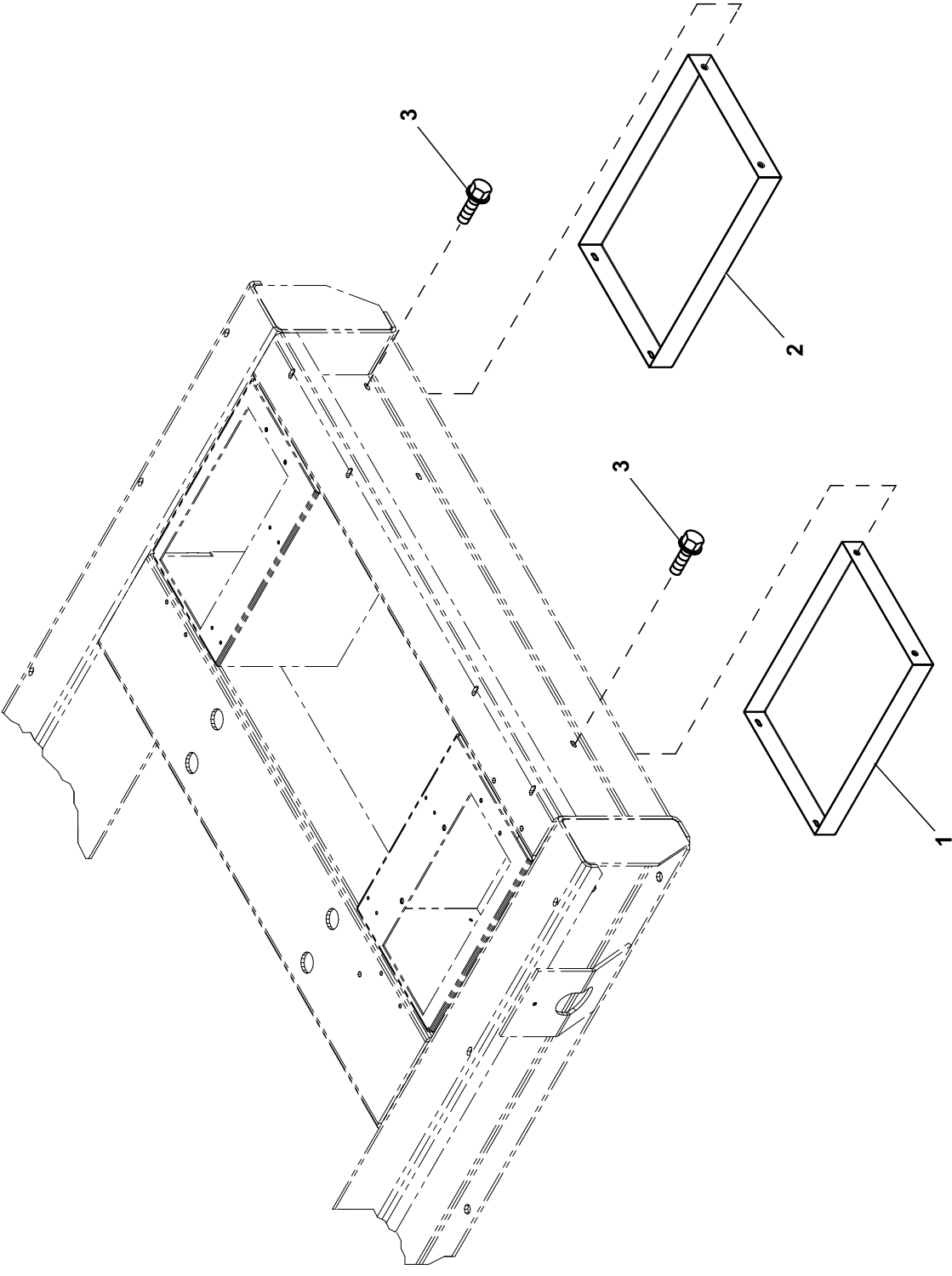
GROUP F

ITEM	PART#	QTY.	DESCRIPTION
(1)1	0J96740ST0R	1	HTR MNT BRKT 5000W L2A DMPR
2	0D8896A	1	HEATER ENCL 5KW 240V W/THERMST
3	022131	4	WASHER FLAT 3/8-M10 ZINC
4	022237	2	WASHER LOCK 3/8
5	022241	2	NUT HEX 3/8-16 STEEL
6	036833	2	SCREW HHC 3/8-16 X 1 G8
7	0C2454	6	SCREW HWHT M6-1 X 16 N WA Z/JS

(1) SHEET METAL PARTS LISTED IN THE BOM TABLE ARE REPRESENTING GENERIC PARTS (NO COLOR).

- **MANUFACTURING:** FOR CORRECT MATERIAL AND COLOR REFER TO AS400 BOM.
- **CUSTOMER:** FOR CORRECT MATERIAL AND COLOR OF REPLACEMENT PARTS REFER TO "REPLACEMENT SHEET METAL PARTS ORDERING GUIDE-0H7169" INCLUDED IN THE MANUAL OR AVAILABLE ON THE GENERAC WEBSITE.

GROUP C



NOTE:
GLAND PLATE (ITEM 1 & 2), TO BE INSTALLED UNDER EACH
HIGH VOLTAGE CONNECTION TOWER.

EXPLODED VIEW: EV, GLAND PLATE G12.9L E-GRP

DRAWING #: 0J7982

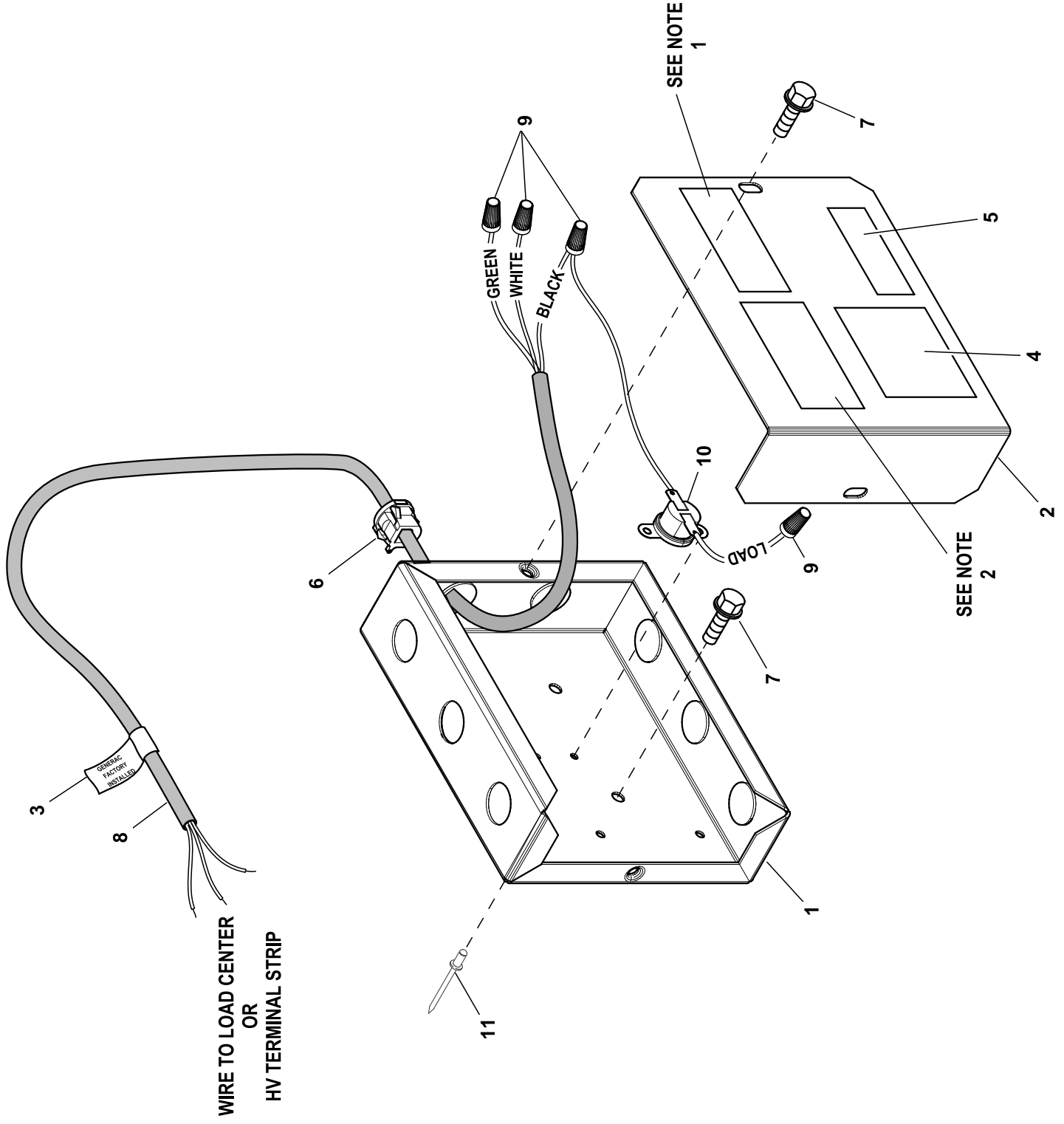
GROUP C

APPLICABLE TO:

ITEM	PART#	QTY.	DESCRIPTION
1	0J6507	1	GLAND PLATE, G12.9L LH SIDE
	(2)0J2378AA	1	GLAND PLATE, CCI LH G12.9L 250
2	0J6507A	1	GLAND PLATE, G12.9L RH SIDE
	(2)0J2378AB	1	GLAND PLATE, CCI RH G12.9L 250
(1)3	0C2454	4/8	SCREW HWHT M6-1 X 16 N WA Z/JS

(1) QTY. REQUIRED FOR SINGLE CIRCUIT BREAKER / QTY. REQUIRED FOR DUAL CIRCUIT BREAKER.
(2) USED ON 230/250KW UNITS.

GROUP H



WIRE TO LOAD CENTER
OR
HV TERMINAL STRIP

EXPLODED VIEW: EV HEATER PREP KIT INSTALLED**DRAWING #: 0J9037****GROUP H**

ITEM	PART#	QTY.	DESCRIPTION
(3)1	0H55060ST0R	1	JUNCTION BOX
(3)2	0H55070ST0R	1	JUNCTION BOX COVER
(4)3	0J9273	1	LABEL FACTORY INSTALLED
4	0G3546A	1	DECAL WRN BATT CHRГ 120VAC TRI
5	0H8147	1	DECAL HEATER PREP KIT
6	0J8896	1	BUSHING, STRAIN RND(.290-.385)
7	0E3257	4	SCREW HWHTF M6-1.0 X 16
8	0J8182	1	CABLE 18-3 TYPE SE00W/ST00W (120"LG)
9	027959	4	WIRE NUT #30-451 YEL
10	052010	1	ASSY THERMOSTAT AND LEAD
11	036261	2	RIVET POP .125 X .275 SS

NOTES (UNLESS OTHERWISE SPECIFIED):

(1)PARTS INCLUDED IN OPTIONAL BATTERY WARMER KIT.

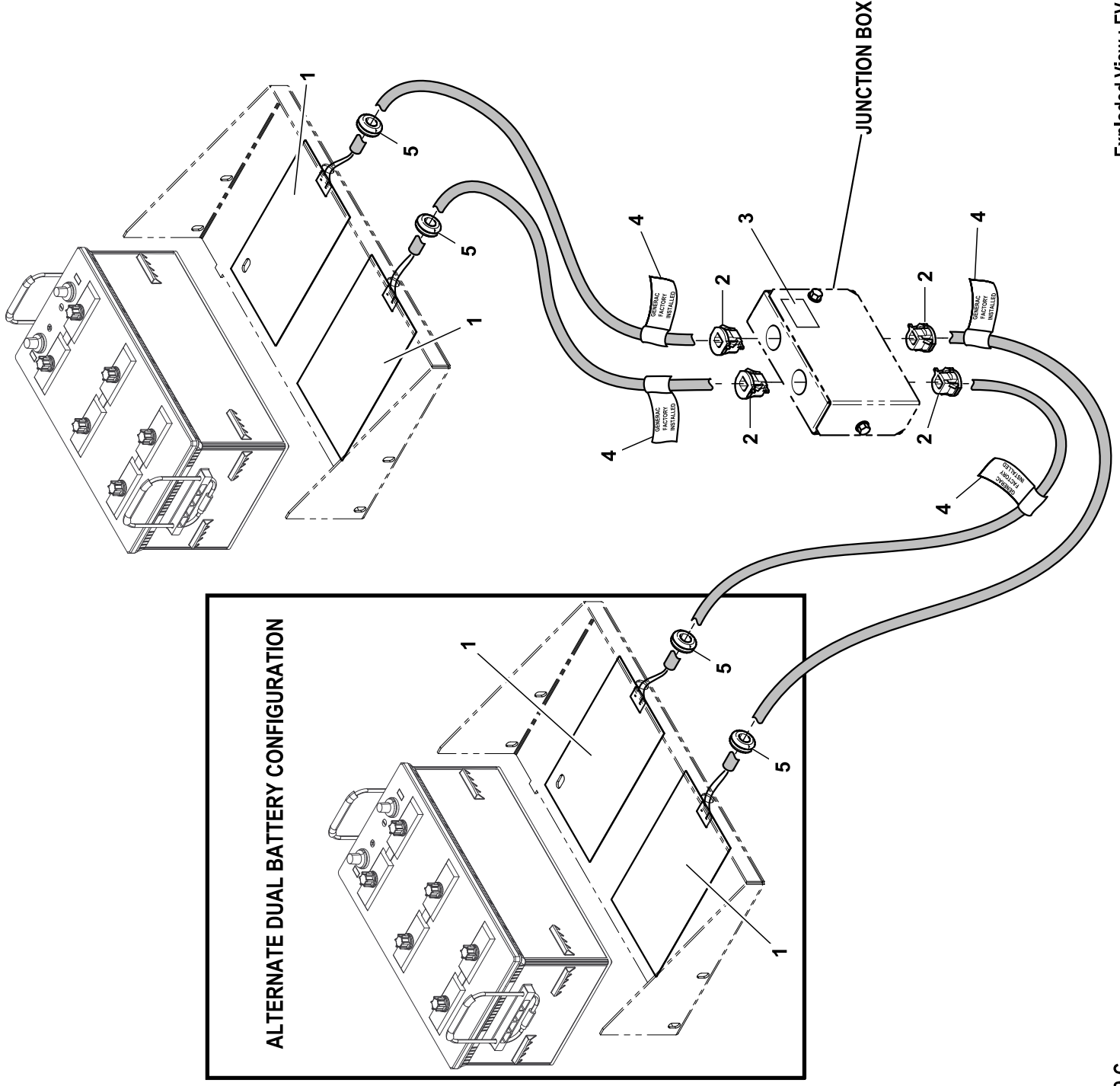
(2)PARTS INCLUDED IN OPTIONAL OIL WARMER

(3) SHEET METAL PARTS LISTED IN THE BOM TABLE ARE REPRESENTING GENERIC PARTS (NO COLOR)

- MANUFACTURING: FOR CORRECT MATERIAL AND COLOR REFER TO XA BOM.
- CUSTOMER: WHEN ORDERING REPLACEMENT PARTS ENTER BASE NUMBER (FIRST 6 DIGITS ONLY) IN THE SYSTEM FOR CORRECT MATERIAL AND COLOR (FOR REFERENCE SEE GUIDELINE 0H7169).

(4) ONLY INCLUDED IF KIT IS FACTORY INSTALLED.

GROUP H



EXPLODED VIEW: EV 72" BATTERY PAD KITS

DRAWING #: 0J9039

GROUP H

ITEM	PART#	QTY.	DESCRIPTION
(1)1	0J3259	2 / 4	HEATING PAD 120VAC 75W 6X10
(1)2	0J8896	2 / 4	BUSHING, STRAIN RND(.290-.385)
3	0G5704	1	DECAL BATT WARMER CONNECTION
(1)(2)4	0J9273	2 / 4	LABEL FACTORY INSTALLED
5	030809	2 / 4	GROMMET 11/16 X 1/8 X 7/16

(1) QUANTITY REQUIRED FOR SINGLE BATTERY CONFIGURATION / QUANTITY REQUIRED FOR DUAL BATTERY CONFIGURATION.

Battery Heater Connection

1. Disconnect battery cables to prevent accidental start-up. Disconnect the negative battery cable first from the battery post indicated by (-) or NEG.
2. Make sure power is off from the appropriate power source.
3. Install grommet(s) (item 5) into battery tray. Push wires thru grommet (item 5).
4. To connect the wires, hold the bare metal leads together and place a wire nut over them, then twist clockwise until tight. For all these connections, use the wires nuts provided.
5. Connect the ground wire from 120V power source to the ground wire from battery heater.
6. Using wire nuts provided connect the white wire and black wire from the battery heater as follows:
 - The white (common) power wire from 120V power source to 1st wire from the battery heater.
 - The wire from load side of thermostat to 2nd wire from the battery heater.

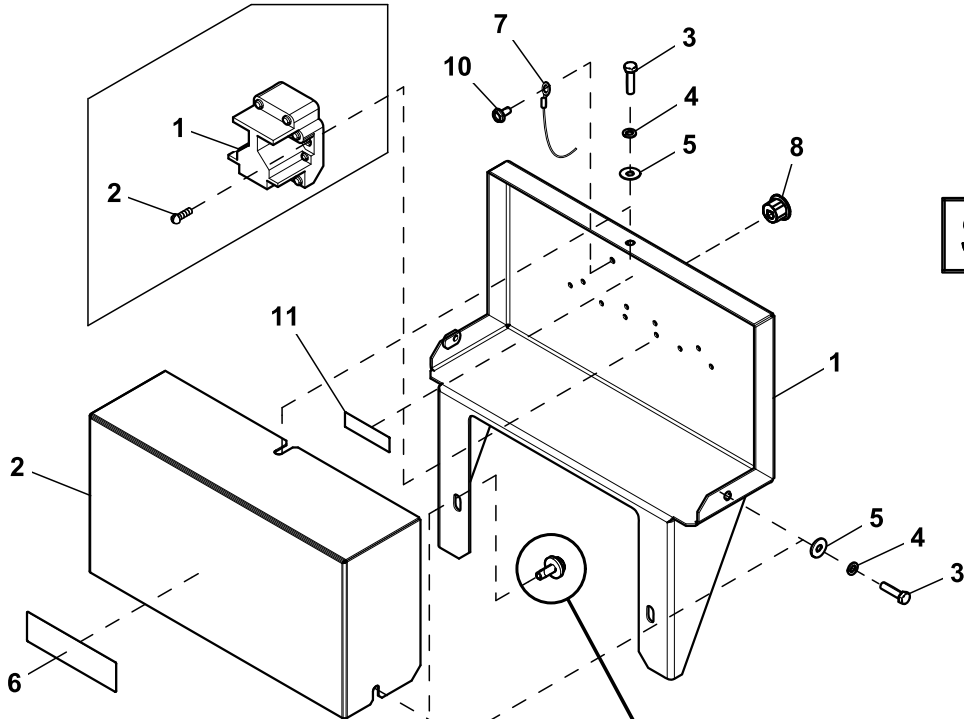
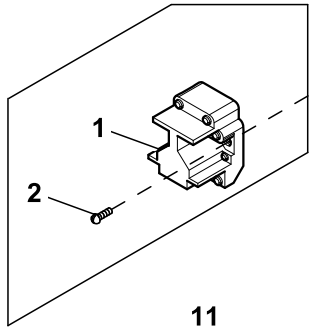
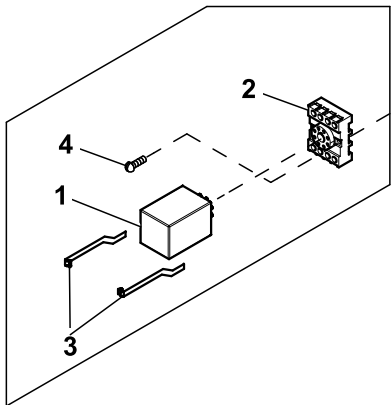
CAUTION: Be sure no bare wire or wire strands are visible after making connections.

7. Push all wires and wire nuts into junction box.
8. Assemble junction box cover to junction box.
9. Reconnect battery cables to battery posts. Connect the positive cable first to the battery post indicated by (+) or POS.

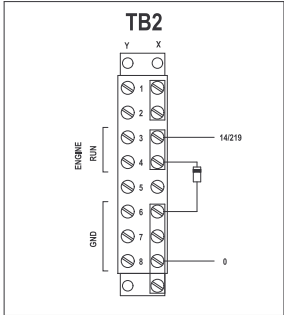
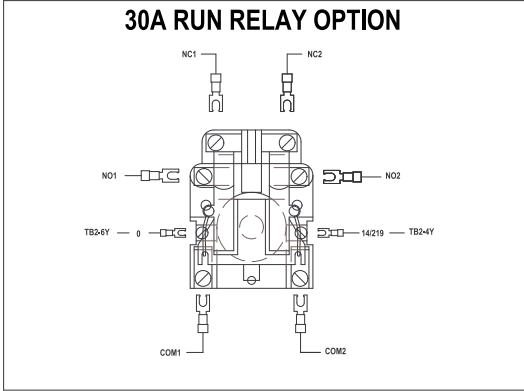
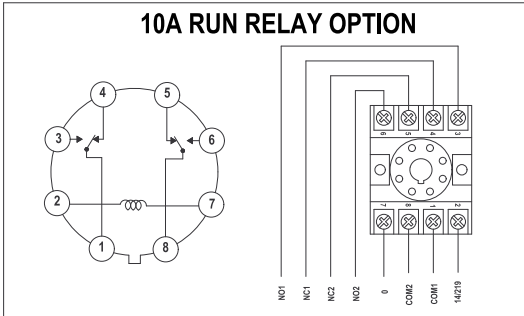
SALES SPECIAL

10A RUN RELAY OPTION

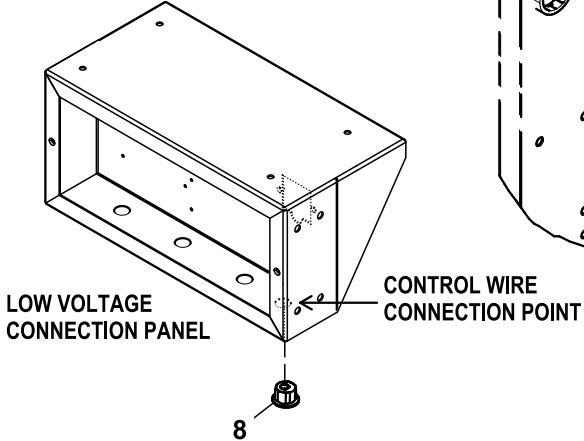
30A RUN RELAY OPTION



USE EXISTING HARDWARE



TB2 IS LOCATED IN THE LOW VOLTAGE CUSTOMER CONNECTION PANEL.



LOW VOLTAGE CONNECTION PANEL

CONTROL WIRE CONNECTION POINT

IF MORE THAN ONE RELAY, JUMPER CONTROL WIRES (14/219,0) BETWEEN RELAYS.

EXPLODED VIEW: EV RUN RELAY PANEL 520 MOUNT**DRAWING #: 0K0994****GROUP F****APPLICABLE TO: CO 1444355**

ITEM	PART#	QTY.	DESCRIPTION
1	0K0433AST03	1	BRACKET RUN RELAY PNL MTG 520
2	0K0434AST03	1	COVER RUN RELAY PNL MTG 520
3	052619	3	SCREW HHC M5-0.8 X 20 G8.8
4	049226	3	WASHER LOCK M5
5	023897	3	WASHER FLAT #10 ZINC
6	0G3546	1	DECAL WRN BATT CHRGR 12/24V BI
7	0K3047	1	WIRE HARNESS RUN RELAY PANEL
8	0J8896	2	BUSHING, STRAIN RND (.290-.385)
9	027959	1	WIRE NUT #30-451 YEL (NOT SHOWN)
10	024469	1	HHTT #10-32 X 3/8 CZ
11	067210B	1	GROUND DECAL

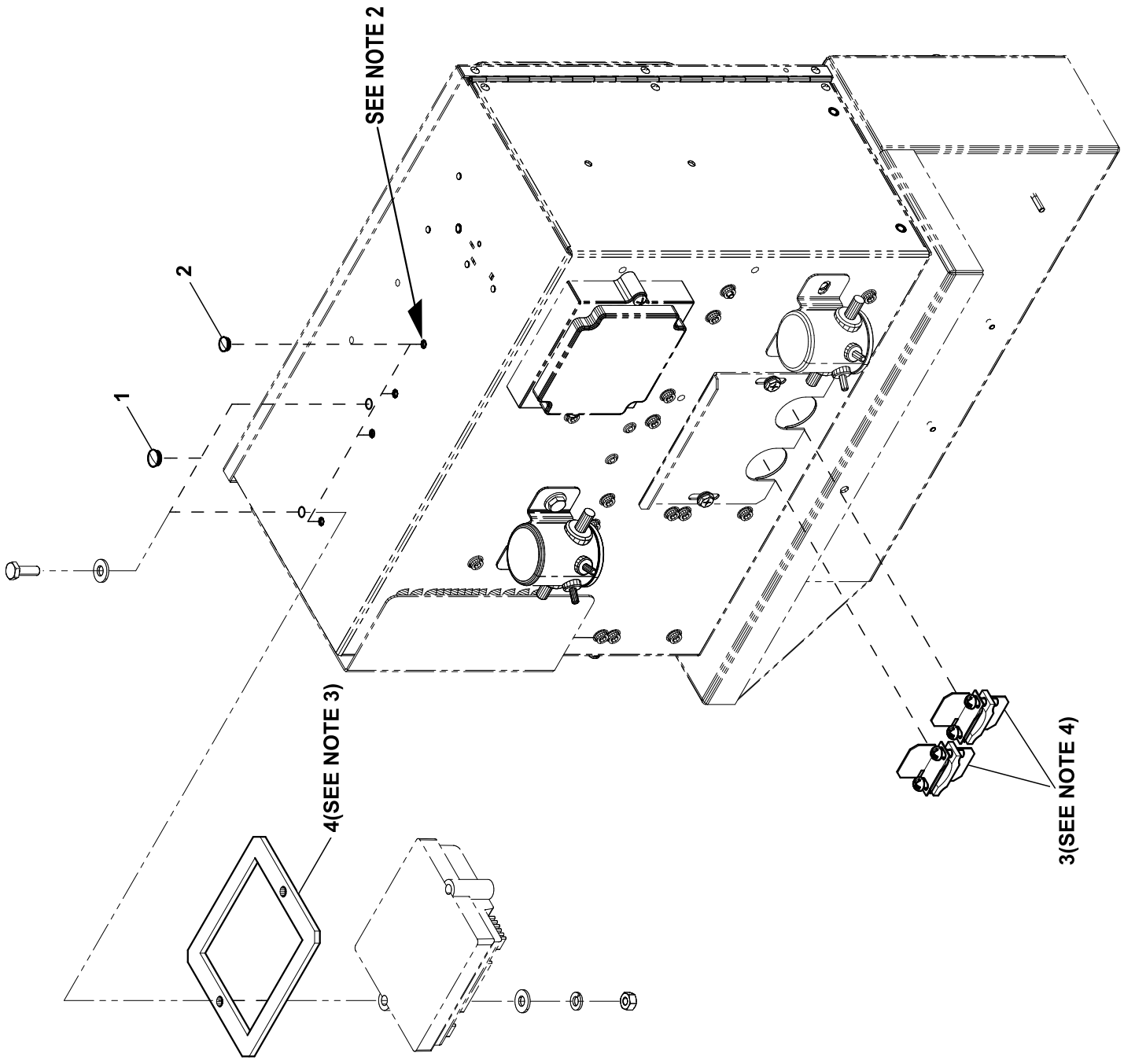
10A RUN RELAY OPTION 12V, OR 24V (REF)

1	0C3211E	1	RELAY PNL 12VDC DPDT 8PIN
	0C3211F	1	RELAY 24VDC DPDT 8 PIN
2	0C3211G	1	SOCKET RELAY 8 PIN
3	0C3211H	2	SPRING RELAY RETAINING
4	0F5828	2	SCREW PHTT M4-0.7 X 25 ZYC

30A RUN RELAY OPTION 12V, OR 24V (REF)

1	0E4771B	1	RELAY, DPDT, 24DC COIL, 30A 300AC
	0E4771C	1	RELAY, DPDT, 12DC COIL, 30A 300AC
2	0F5828	2	SCREW PHTT M4-0.7 X 25 ZYC

GROUP H



EXPLODED VIEW: EV G/H PANEL ETL PLUG/RESTRAIN**DRAWING #: 0K2591****GROUP H**

ITEM	PART#	QTY.	DESCRIPTION
(1)1	0K2707	REF	PLUG PLASTIC 0.281
(1)2	092592	REF	PLUG PLASTIC 0.229
(1)3	0K2590	REF	CLAMP CONNECTOR 2PC .75" K.O.
	0K2590A	REF	CLAMP CONNECTOR 2PC 1.25" K.O.
	0K2590B	REF	CLAMP CONNECTOR 2PC 1.50" K.O.
(3)4	0K27080ST0R	REF	SPACER FOR G/H PANEL

NOTE:

(1) REFER TO BILL OF MATERIAL FOR QTY.

(2) ALL OPEN HOLES ON TOP ARE TO BE FILLED AS SHOWN AND IN BILL OF MATERIAL.

(3) INSTALL WHEN REQUIRED WITH EXISTING HARDWARE.

(4) DO NOT OVERTIGHTEN CLAMPS. CLAMPS SHOULD ONLY BE TIGHT ENOUGH TO HOLD CABLE IN PLACE SO IT DOES NOT SLIDE IN OR OUT OF ENCLOSURE.

GENERAC® POWER SYSTEMS, INC.
211 MURPHY DR. • P.O. BOX 310
EAGLE, WI 53119

**O & M Manual for the Generac ATC-300
Breaker Based Transfer Switch**

Instruction Booklet

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 **WARNING**

READ AND UNDERSTAND THE INSTRUCTIONS CONTAINED HEREIN-AFTER BEFORE ATTEMPTING TO UNPACK, ASSEMBLE, OPERATE, OR MAINTAIN THIS EQUIPMENT.

HAZARDOUS VOLTAGES ARE PRESENT INSIDE TRANSFER SWITCH ENCLOSURES THAT CAN CAUSE DEATH OR SEVERE PERSONAL INJURY. FOLLOW PROPER INSTALLATION, OPERATION, AND MAINTENANCE PROCEDURES TO AVOID THESE VOLTAGES.

TRANSFER SWITCH EQUIPMENT COVERED BY THIS INSTRUCTION BOOK IS DESIGNED AND TESTED TO OPERATE WITHIN ITS NAME-PLATE RATINGS. OPERATION OUTSIDE OF THESE RATINGS MAY CAUSE THE EQUIPMENT TO FAIL RESULTING IN DEATH, SERIOUS BODILY INJURY, AND/OR PROPERTY DAMAGE. ALL RESPONSIBLE PERSONNEL SHOULD LOCATE THE DOOR MOUNTED EQUIPMENT NAMEPLATE AND BE FAMILIAR WITH THE INFORMATION PROVIDED ON THE NAMEPLATE. A TYPICAL EQUIPMENT NAMEPLATE IS SHOWN IN FIGURE 1.

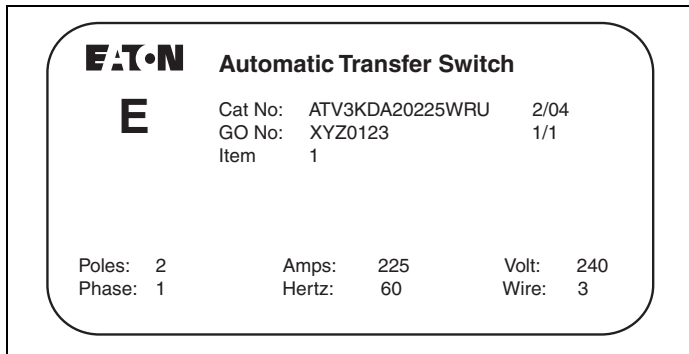


Figure 1. Typical Automatic Transfer Switch (ATS) Equipment Nameplate.

All possible contingencies that may arise during installation, operation, or maintenance, and all details and variations of this equipment do no purport to be covered by these instructions. If further information is desired by the purchaser regarding a particular installation, operation, or maintenance of particular equipment, please contact an authorized Generac Sales Representative or the installing contractor.

Section 1: Introduction

1.1 Preliminary Comments and Safety Precautions

This technical document is intended to cover most aspects associated with the installation, application, operation, and maintenance of the Automatic Transfer Controller (ATC-300) Controlled ATS with ratings from 30 through 1000 amperes (A). It is provided as a guide for authorized and qualified personnel only. Please refer to the specific WARNING and CAUTION in Section 1.1.2 before proceeding. If further information is required by the purchaser regarding a particular installation, application, or maintenance activity, please contact an authorized Generac sales representative or the installing contractor.

1.1.1 Warranty and Liability Information

No warranties, expressed or implied, including warranties of fitness for a particular purpose of merchantability, or warranties arising from course of dealing or usage of trade, are made regarding the information, recommendations and descriptions contained herein. In no event will Generac be responsible to the purchaser or user in contract, in tort (including negligence), strict liability or otherwise for any special, indirect, incidental or consequential damage or loss whatsoever, including but not limited to damage or loss of use of equipment, plant or power system, cost of capital, loss of power, additional expenses in the use of existing power facilities, or claims against the purchaser or user by its customers resulting from the use of the information and descriptions contained herein.

1.1.2 Safety Precautions

All safety codes, safety standards, and/or regulations must be strictly observed in the installation, operation, and maintenance of this device.

 **WARNING**

THE WARNINGS AND CAUTIONS INCLUDED AS PART OF THE PROCEDURAL STEPS IN THIS DOCUMENT ARE FOR PERSONNEL SAFETY AND PROTECTION OF EQUIPMENT FROM DAMAGE. AN EXAMPLE OF A TYPICAL WARNING LABEL HEADING IS SHOWN ABOVE TO FAMILIARIZE PERSONNEL WITH THE STYLE OF PRESENTATION. THIS WILL HELP TO INSURE THAT PERSONNEL ARE ALERT TO WARNINGS, WHICH APPEAR THROUGHOUT THE DOCUMENT. IN ADDITION, WARNINGS AND CAUTIONS ARE ALL UPPER CASE AND BOLDFACE.

 **CAUTION**

COMPLETELY READ AND UNDERSTAND THE MATERIAL PRESENTED IN THIS DOCUMENT BEFORE ATTEMPTING INSTALLATION, OPERATION, OR APPLICATION OF THE EQUIPMENT. IN ADDITION, ONLY QUALIFIED PERSONS SHOULD BE PERMITTED TO PERFORM ANY WORK ASSOCIATED WITH THIS EQUIPMENT. ANY WIRING INSTRUCTIONS PRESENTED IN THIS DOCUMENT MUST BE FOLLOWED PRECISELY. FAILURE TO DO SO COULD CAUSE PERMANENT EQUIPMENT DAMAGE.

ATC-300 Breaker Based Transfer Switch

1.2 General Information

Transfer switches are used to protect critical electrical loads against loss of power. The load's Source 1 power source is backed up by a Source 2 power source. A transfer switch is connected to both the Source 1 and Source 2 power sources and supplies the load with power from one of the two sources. In the event that power is lost from Source 1, the transfer switch transfers the load to the Source 2 power source. This transfer can be automatic or manual, depending upon the type of transfer switch equipment being used. Once Source 1 power is restored, the load is automatically or manually transferred back to the Source 1 power source, again depending upon the type of transfer equipment being used (Figure 2).

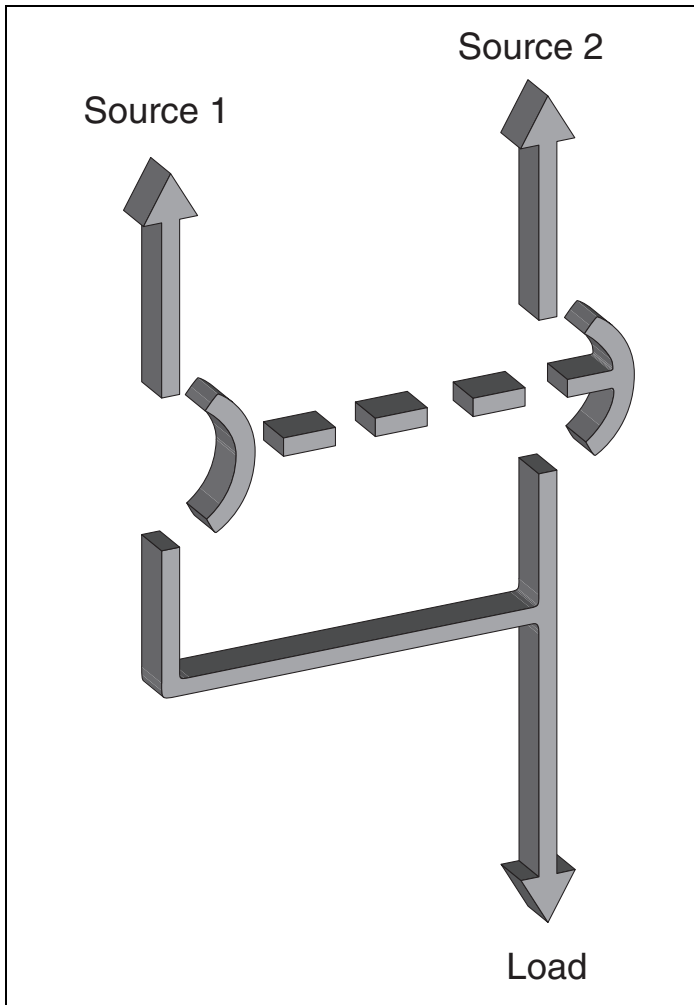


Figure 2. Typical Load Transfer Switch (Circuit Breaker Type) Schematic.

In ATS equipment, the switch's intelligence system initiates the transfer when the Source 1 power fails, falls below, or rises above a preset voltage. If the Source 2 power source is a standby generator, the ATS initiates generator startup and transfers to the Source 2 power source when sufficient generator voltage is available. When Source 1 power is restored, the ATS automatically transfers back and initiates generator shutdown. In the event the Source 1 power source fails and the Source 2 power source does not appear, the ATS remains connected to the Source 1 power

source until the Source 2 power source does appear. Conversely, if connected to the Source 2 power source and the Source 2 power source fails while the Source 1 power source is still unavailable, the ATS remains connected to the Source 2 power source.

ATSs automatically perform the transfer function, and include three basic elements:

1. Main contacts to connect and disconnect the load to and from the power source.
2. A mechanism to transfer the main contacts from source to source.
3. Intelligence/supervisory circuits to constantly monitor the condition of the power sources and thus provide the intelligence necessary for the switch and related circuit operation.

1.2.1 Design Configuration

The Generac ATS is a rugged, compact design that uses molded case switches and/or circuit breakers to transfer essential loads from one power source to another (Figures 3 [225-1200 A] and 4 [30-150 A]). Molded case switches are mechanically and electrically interlocked to prevent both switching devices from being closed at the same time.

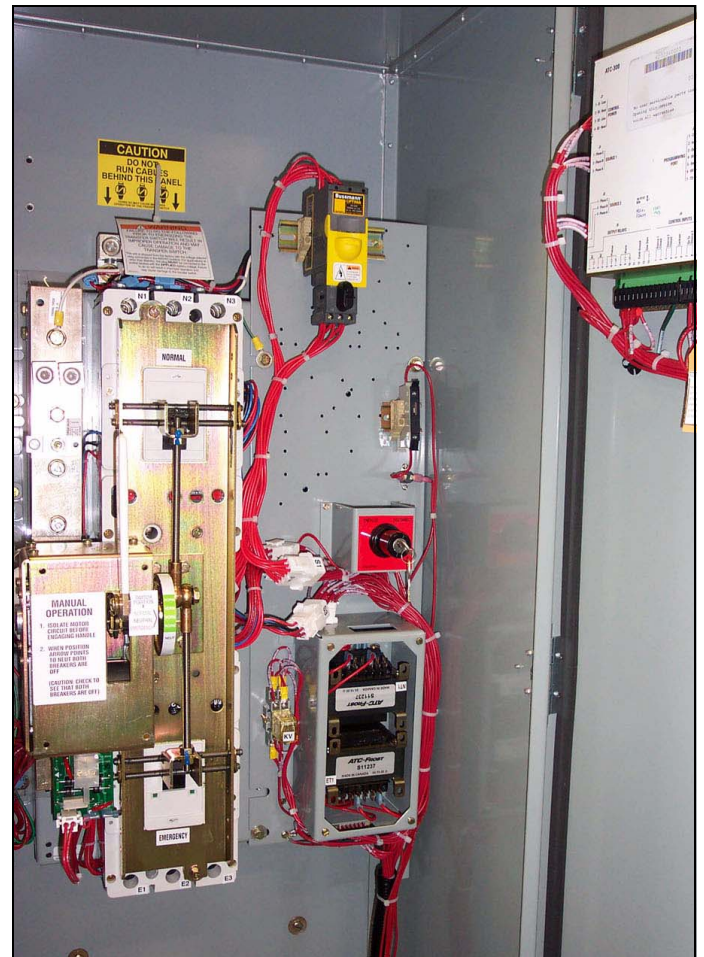


Figure 3. Typical Power Panel for 225-1200 A Models (Deadfront Covers Removed).

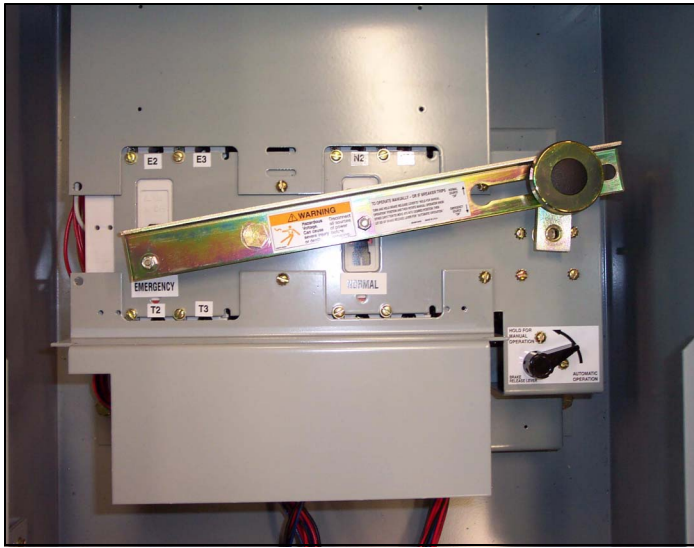


Figure 4. Typical Power Panel for 30-150 A Models (Deadfront Cover Installed).

Molded case switches and the associated transfer mechanisms are mounted vertically to save space in the assembly. The compact, vertical configuration uses a positive, metallic transfer and interlocking system between the molded case switches.

The Generac ATS was designed with easy installation and simplified maintenance in mind. Three main panels compromise the transfer switch design:

1. Power panel;
2. Voltage selection and transformer panel (if required); and
3. Microprocessor-based logic panel.



Figure 5. Vertical Design Transfer Switch with the Deadfront Cover in Place Over the Power Panel (225-1200 A).

Each panel is independently mounted with interconnecting wiring terminated at the connector receptacles on the ATC-300 Controller. Door or individual panel removal is achieved without disturbing critical connections by removing the connectors from the receptacles and cutting the wire ties that secure the wires to the door.

Mounting the enclosure is simple using top and bottom mounting flanges with elongated (teardrop) mounting holes. These mounting holes, along with power panel positioning bolts and pre-tapped inserts, insure proper power panel mounting after the initial enclosure installation or when switching from top to bottom or bottom to top entry. Refer to Section 4 for specific mounting and modification details.

Table 1. Withstand Ratings

UL 1008 WITHSTAND AND CLOSE-ON RATINGS (kA)

Switch Rating Amperes	UL 1008 3-Cycle "Any Breaker" Rating			Rating When Used With Upstream Fuse		
	240 Vac	480 Vac	600 Vac	Maximum Fuse Rating	Fuse Type	600 Vac
30-100	100	65	25	200	J, T	200
150	100	65	25	400	J, T	200
150-225	100	65 (240 Vac)	25	400	J, T	200
225	100	65	25	400	J, T	200
300	100	65	25	400	J, T	200
400	100	65	25	600	J, T	200
600	100	65 ①	25	1200	J, T	200
800	65	50 ①	25	1600	L	200
1000	65	50 ①	25	1600	L	200

① 4 pole 480 Vac are rated 35 kA

ATC-300 Breaker Based Transfer Switch

1.3 ATS Catalog Number Identification

Transfer switch equipment catalog numbers provide a significant amount of relevant information that pertains to a particular piece of equipment. The Catalog Number Identification Table (Table 2) provides the required interpretation information. An example is offered here to initially simplify the process.

Example: Catalog Number (circled numbers correspond to position headings in Table 2):

① to ② ③ ④ ⑤ to ⑥ ⑦ ⑧ ⑨ to ⑫ ⑬ ⑭ ⑮
 AT V 3 KD A 2 0225 W R U

The catalog number ATV3KDA20225WRU describes an ATS with the switching devices mounted vertically in the enclosure. The intelligence represented by the control panel is ATC-300 logic. The Generac Series C Type HKD is used as the switching device and is in the form of a 2-pole molded case switch on each source. The continuous current rating of this equipment is 225 A and applicable at 240 Vac, 60 Hz. The transfer switch equipment is enclosed in a NEMA 3R enclosure and is listed for UL applications.

Table 2. Transfer Switch Catalog Number Explanation

POSITIONS 1 TO 2 BASIC DEVICE		POSITION 3 SWITCHING DEVICE ORIENTATION		POSITION 4 CONTROL PANEL		POSITIONS 5 TO 6 SWITCHING DEVICE			
Automatic Transfer Switch	AT	Vertical	V ¹	ATC-300	3	HFD	Generac Series C	FD	
		Horizontal	H ²	Controller		HKD	Generac Series C	KD	
						HLD	Generac Series C	LD	
						HMDL	Generac	MD	
						NB	Generac	NB	
						HND ³	Generac Series C	ND	

POSITION 7 SWITCHING DEVICE ARRANGEMENT		POSITION 8 NUMBER OF POLES		POSITIONS 9 TO 12 AMPERE RATING		POSITION 13 VOLTAGE/FREQUENCY		POSITION 14 ENCLOSURE		POSITION 15 LISTING	
Fixed Mount Molded Case	A	Two	2	30 A –	0030	600 Vac/60 Hz	E	Type 12	J	*UL/CSA Listing	U
Switches Both Power Sources		Three	3	70 A –	0070	480 Vac/60 Hz	X	Type 3R	R	No Listing	X
Fixed Mount Molded Case	B	Four	4	100 A –	0100	240 Vac/60 Hz	W	Open	K		
Circuit Breakers Both Power Sources				150 A –	0150	208 Vac/60 Hz	B				
Fixed Mount Molded Case	C			225 A –	0225	120 Vac/60 Hz	A				
Circuit Breaker Source 1 Power Source,				300 A –	0300	220 Vac/50 or 60 Hz	G				
Molded Case Switch Source 2				400 A –	0400	600 Vac/50 Hz	K				
Power Source				600 A –	0600	415 Vac/50 Hz	O				
Fixed Mount Molded Case	D			800 A –	0800	401 Vac/50 Hz	N				
Switch Source 1 Power Source,				1000 A –	1000	380 Vac/50 Hz	H				
Molded Case Circuit Breaker				1200 A –	1200	365 Vac/50 Hz	Z				
Source 2 Power Source						230 Vac/50 Hz	M				

- Notes:** 1 Vertical orientation (225-1200 A)
 2 Horizontal orientation (30-150 A)
 3 Consult factory for availability.
 *CSA will only be applied to molded case switches, both power sources.

1.4 Environmental Conditions

1.4.1 Seismic

With proper installation, and by including the appropriate optional feature that includes specially designed cleats (optional feature #42), the ATSS have a seismic capability which exceeds the worst case Zone 4 required levels, per both the Uniform Building Code and the California Building Code.

1.4.2 Operational Conditions

Normally, an ATS is applied indoors in an electrical equipment room. In the appropriate enclosure, it can be used for outdoor applications where the equipment is subject to falling rain, freezing temperatures, and no greater than 90% humidity (non-condensing). The ambient temperature range for operation is between -20 and 70°C (-4 to 158°F).

1.5 Glossary

With respect to their use within this document and as they relate to transfer switch and controller operation, the following terminology is defined.

Available

A source is defined as “available” when it is within its under-voltage/overvoltage/ underfrequency/overfrequency (if applicable) setpoint ranges for the nominal voltage and frequency setting.

Connected

Connected is defined as when the input is shorted by an external contact or connection.

Failed or Fails

A source is defined as “failed” when it is outside of the applicable voltage and frequency setpoint ranges for the nominal voltage and frequency setting for a time exceeding 0.5 seconds after the time delay emergency fail (TDEF) time delays expires.

Failsafe

Failsafe is a feature that prevents disconnection from the only available power source and also forces a transfer or re-transfer operation to the only available power source.

Re-Transfer

Re-transfer is defined as a change of the load connection from the Source 2 to the Source 1.

Source 1

Source 1 is the primary source (normal source, normal power source, or normal).

Source 2

Source 2 is the secondary source (emergency source, emergency power source, emergency, standby, or backup source).

Source 1: Failed or Fails

Source 1 is defined as “failed” when it is outside of its under-voltage/overvoltage/ underfrequency/overfrequency (if applicable) setpoint ranges for the nominal voltage and frequency setting.

Source 2: Failed or Fails

Source 2 is defined as “failed” when it is outside of its under-voltage/overvoltage/ underfrequency/overfrequency (if applicable) setpoint ranges for the nominal voltage and frequency setting for a time exceeding 0.5 seconds after the Time Delay Emergency Fail (TDEF) time delay expires.

Transfer

Transfer is defined as a change of the load connection from the Source 1 to the Source 2 power source, except when specifically used as “Transfer to Neutral”.

Transfer to Neutral

Transfer to Neutral is defined as when the load circuits are disconnect from both the Source 1 and Source 2 power sources.

Unconnected

Unconnected is defined as when the input is not shorted by an external contact or connection.

Section 2: Receiving, Handling, and Storage

2.1 Receiving

Every effort is made to ensure that the ATS equipment arrives at its destination undamaged and ready for installation. Packing is designed to protect internal components as well as the enclosure. Care should be exercised, however, to protect the equipment from impact at all times. Do not remove the protective packaging until the equipment is ready for installation.

When the ATS equipment reaches its destination, the customer should inspect the shipping container for any obvious signs of rough handling and/or external damage that occurred during transportation. Record any external and internal damage for reporting to the transportation carrier and Generac, once a thorough inspection is complete. All claims should be as specific as possible and include the Shop Order and General Order numbers.

A shipping label affixed to the shipping container includes a variety of equipment and customer information, such as General Order Number and Customer Number. Make certain that this information matches other shipping paper information.

Each transfer switch enclosure is bolted through its top and bottom mounting flanges to a rigid wooden pallet. The pallet is open at two ends for movement by a forklift. Heavy-duty cardboard sides surround the enclosure and are further supported with reinforced cardboard corner posts. An egg crate design cardboard protector covers the entire top of the enclosure with additional cardboard protectors over the indicating light panel and operating handle. A heavy-duty cardboard lid covers the entire opening. The shipment is secured and further protected with shrink-wrap. Do not remove or discard the packing material until the equipment is ready for installation.

Once the top packaging is removed from the shipment, the enclosure door can be opened. A plastic bag of documents will be found in the enclosure, usually attached to the inside of the door. Important documents, such as test reports, wiring diagrams, and appropriate instruction leaflets, are enclosed within the bag and should be filed in a safe place.

2.2 Handling

As previously mentioned, ATS equipment is packaged for forklift movement. Protect the equipment from impact at all times and DO NOT double stack.

Once the equipment is at the installation location and ready to be installed, packaging material can be removed and discarded. Once the enclosure is unbolted from the wooden pallet, it can be hand moved to its installation position. Be careful not to damage the top or bottom enclosure mounting flanges. Refer to Section 4 of this manual for specific installation instructions.

ATC-300 Breaker Based Transfer Switch

2.3 Storage

Although well packaged, this equipment is not suitable for outdoor storage. The equipment warranty will not be applicable if there is evidence of outdoor storage. If the equipment is to be stored indoors for any period of time, it should be stored with its protective packaging material in place. Protect the equipment at all times from excessive moisture, construction dirt, corrosive conditions, and other contaminants.

It is strongly suggested that the package-protected equipment be stored in a climate-controlled environment with temperatures from -30 to 85°C (-22 to 185°F) and with a relative humidity of 80% or less. **DO NOT**, under any circumstance, stack other equipment on top of a transfer switch equipment enclosure, whether packaged or not.

Section 3: Equipment Description

3.1 General

The ATS consists of three basic panels:

1. The power panel;
2. The voltage selection and transformer panel; and
3. The microprocessor-based logic panel.

These panels are interconnected via connector plugs and mounted in an enclosure (Figure 6).

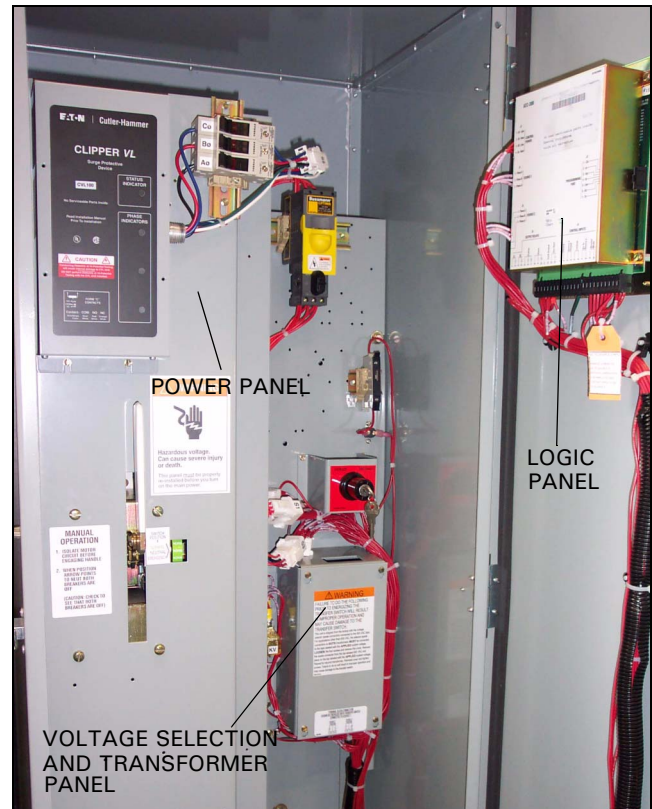


Figure 6. Three Basic Panels of the ATS (225-1200 A).

3.2 Power Panel

The power panel is used for making load, power, and neutral connections. The main contacts and the transfer mechanism are all on one steel frame (Figures 7 and 8).

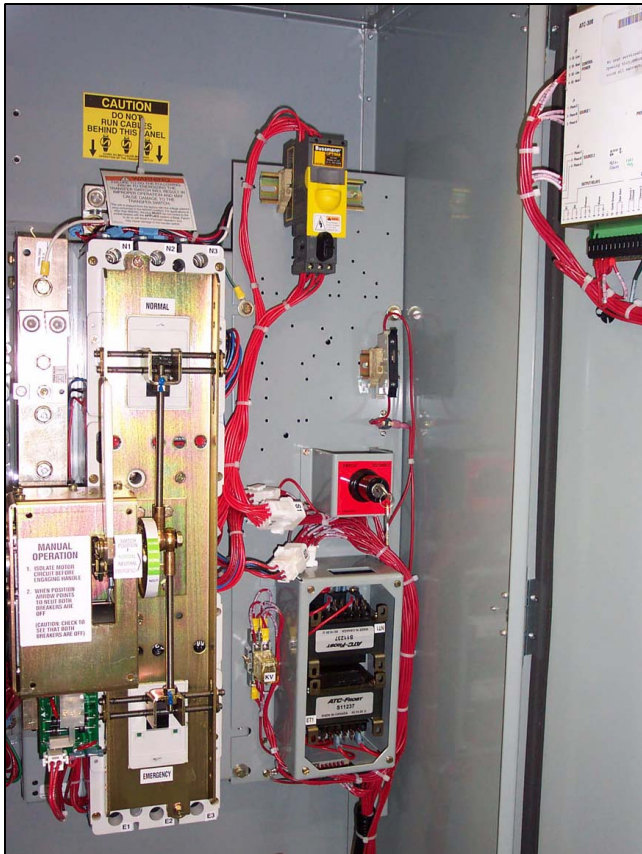


Figure 7. Typical Power Panel for 225-1200 A Models.



Figure 8. Typical Power Panel for 30-150 A Models.

3.2.1 Steel Base Plate

The steel base plate design (225-1200 A models only) permits the power panel to be moved vertically within the enclosure to accommodate top or bottom cable entry. Elongated holes on either side of the base plate ensure proper positioning. The bottom set of elongated holes positions the power panel higher in the enclosure, thus permitting bottom cable entry. The top set of elongated holes positions the power panel lower in the enclosure for top cable entry. Section 4 discusses equipment mounting and load lug location in detail.

3.2.2 Main Contacts

This ATS incorporates Generac-type molded case switches. The main contacts connect and disconnect the load to and from the different power sources. High-withstand molded case switches are the main contacts for the Source 1 and Source 2 power sources in standard switch ATSs (Figure 9 and Section 3.7). These continuous duty transfer switches are rated for all classes of loads, open or enclosed.

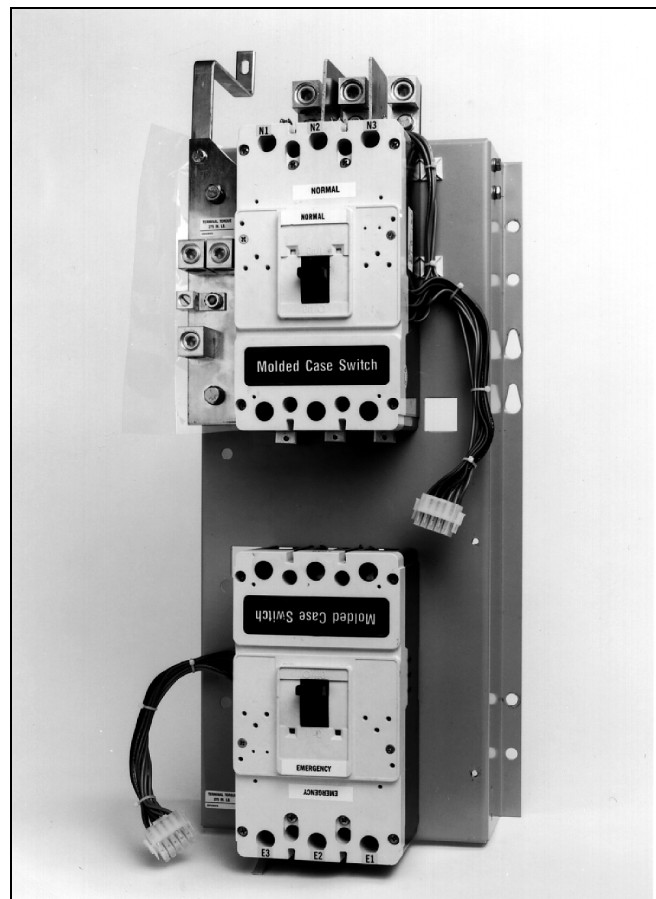


Figure 9. Mounted Molded Case Switches with the Transfer Mechanism Removed for Clarity (225-1200 A Models).

In addition, they have high dielectric strength, heavy-duty switching, high-withstand capabilities, and high interruption capacity.

The switching devices are mechanically and electrically interlocked to prevent the two sets of main contacts from being closed simultaneously. The load side contacts of each switching device are joined with a bus bar assembly to form a common load terminal location, either top or bottom (Figures 10 and 11).

ATC-300 Breaker Based Transfer Switch

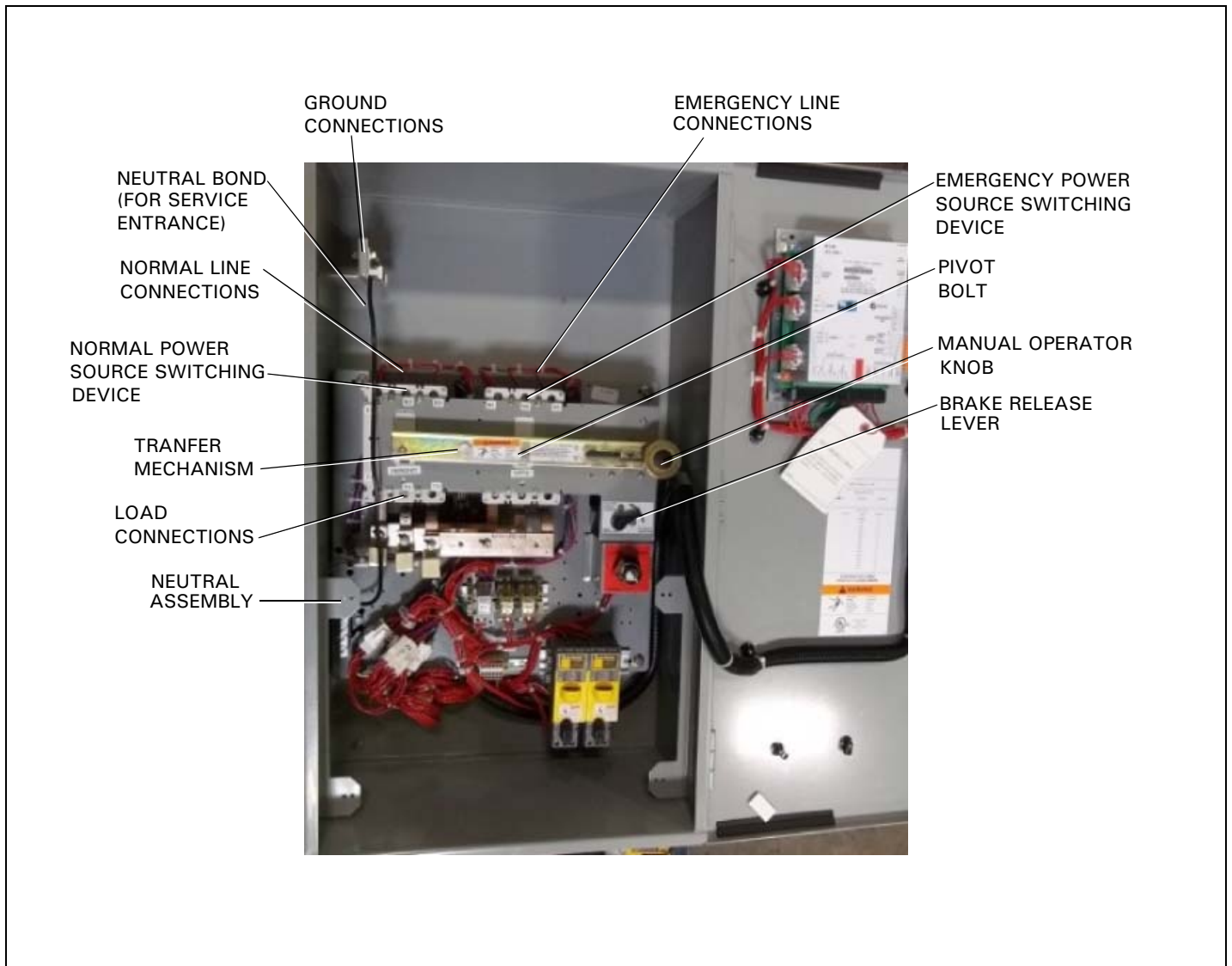


Figure 10. Typical (30-150 A) Horizontal Design Transfer Switch Equipment (Door Open).

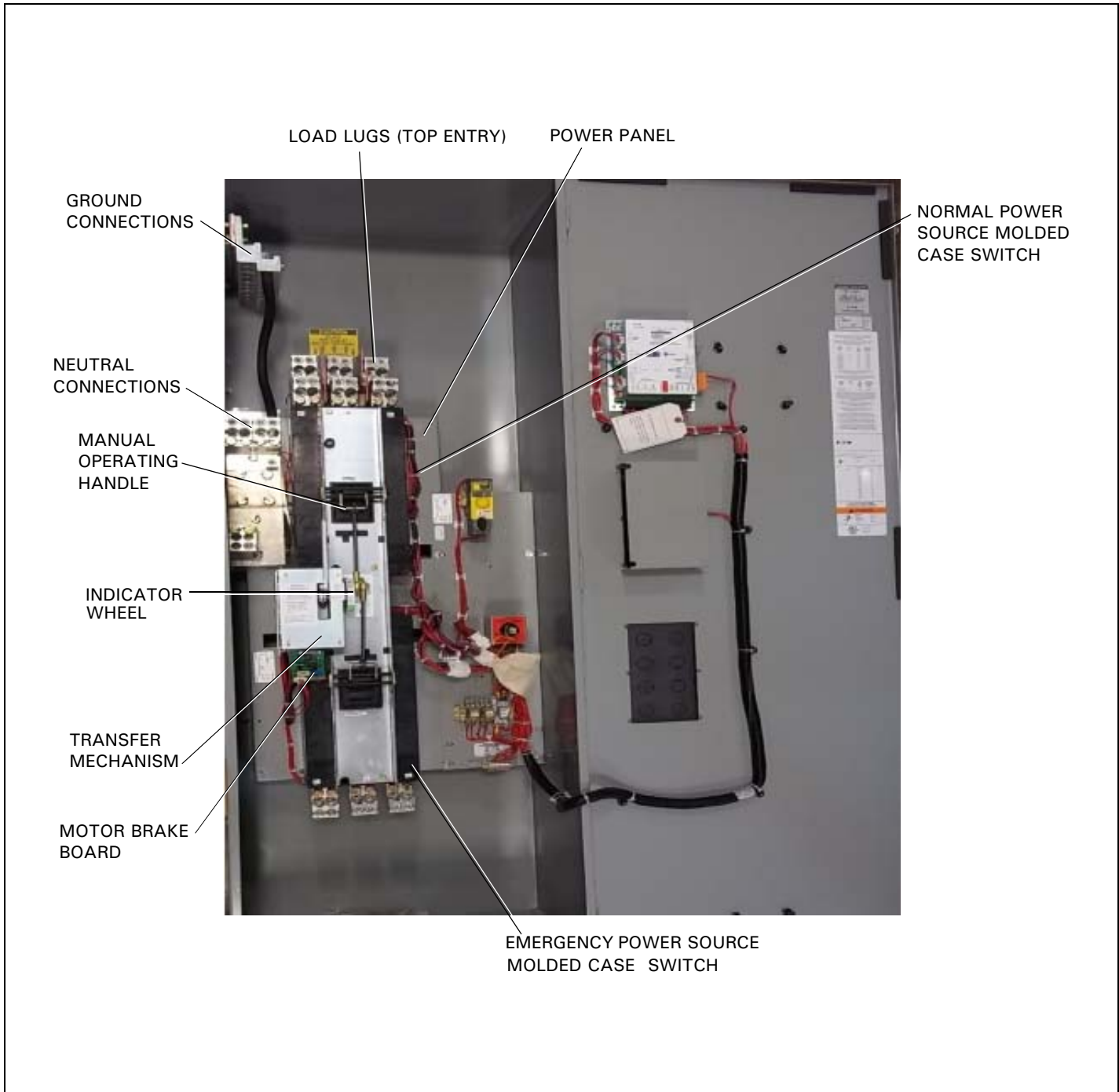


Figure 11. Typical (225-1200 A) Vertical Design Transfer Switch Equipment (Door Open and Deadfront Cover Removed).

3.2.3 Transfer Mechanism (225-1200 A)

The transfer mechanism transfers between power sources through a motor-driven, ratchet-type operation. A rotational motion is created on an indicator wheel by the ratchet's operation. The indicator wheel is attached to rigid shafts that convert the rotary motion into vertical linear motion. Opening and closing the switching devices is accomplished as a result of this vertical linear motion. The transfer mechanism is mounted in front of the molded case switches (Figure 6).

ATC-300 Breaker Based Transfer Switch

A solid steel shield (Deadfront Cover) attached to the ratchet assembly permits viewing of the rotary switch position indicator while restricting access to other parts of the power panel (Figure 12).

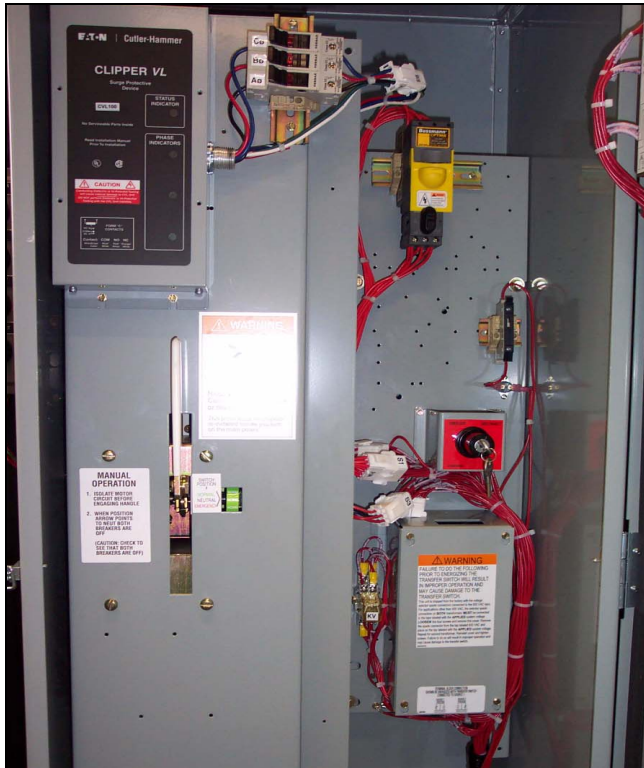


Figure 12. Vertical Design ATS Equipment with Deadfront Cover in Place Over the Power Panel (225-1200 A)

3.2.4 Transfer Mechanism (30-150 A)

This mechanism transfers between power sources using a motor-driven arm that connects to a lever that operates both the Source 1 and Source 2 switches (Figure 8).

3.3 Voltage Selection

3.3.1 North American Voltage Selection (120, 208, 240, 480, and 600 V, - 60 Hz)

The North American market voltage selection panel consists of multi-tap transformers, contained in a steel case mounted in the enclosure (Figure 13). The cover has “teardrop” holes for the screws to allow easy access to the transformers. The voltage is selected by simply removing the wires from the default primary taps of both transformers and installing them on the primary taps for the desired voltage. Taps are provided for 120 to 600 Vac to satisfy any required North American market application voltage. The factory default position is 600 Vac.

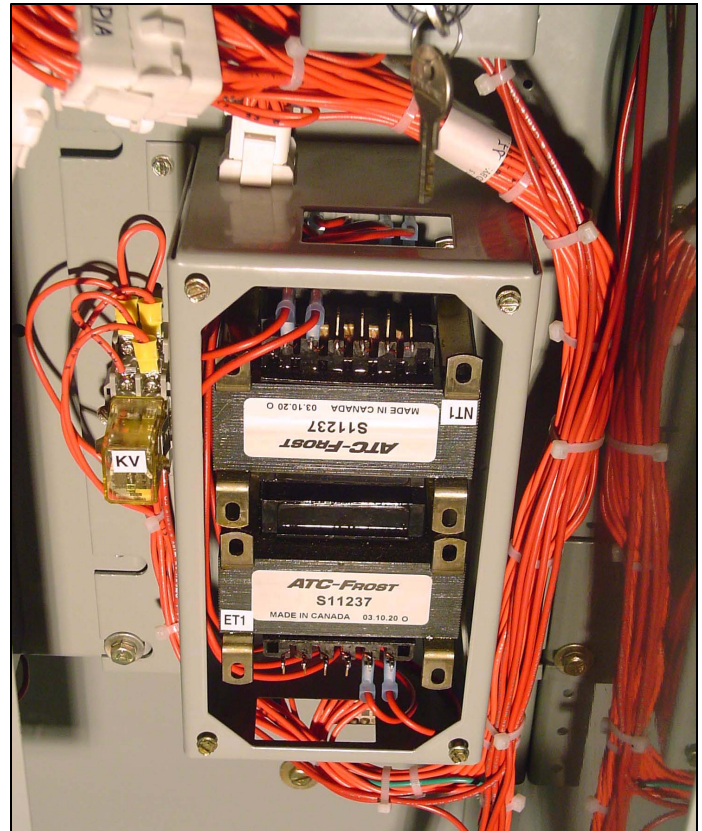


Figure 13. North American Market Voltage Selection Terminals (Shown Connected to the 120 Vac Taps).

⚠ CAUTION

WHEN CHANGING THE SELECTED VOLTAGE, THE POWER MUST BE REMOVED FROM THE ATS AND THE WIRES MUST BE MOVED ON THE TAPS OF BOTH TRANSFORMERS.

3.3.2 International Voltage Selection (208, 220, 240, 380, 415, and 600 V - 50-60 Hz)

The International market voltage selection panel is a multi-tap, enclosed transformer mounted in the enclosure (Figure 14). Seven front accessible voltages taps from 208 to 600 Vac satisfy any required International market application voltage. A quick-change capability from one voltage to another is provided by a small disconnect plug. The factory default position is 600 VAC.

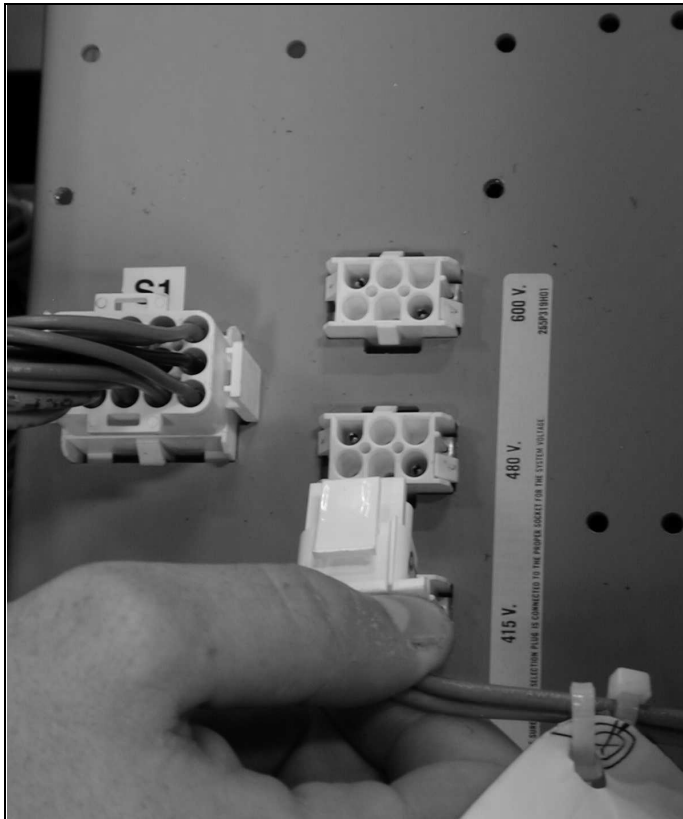


Figure 14. International Market Vertical Design Voltage Selection Panel with Voltage Being Selected.

3.4 ATC-300 Logic Panel

The ATC-300 is a microprocessor-based transfer switch logic control package. The hardware and software of the controller contain the intelligence/supervisory circuits that constantly monitor the condition of the power sources. It provides the intelligence necessary for the operation of the ATS (Figure 15).



Figure 15. ATC-300 Logic Control Panel.

The ATC-300 controller has an operating temperature of -20 to 70°C (-4 to 158°F).

The controller circuit board is protected by an insulating conformal coating.

The specifications, under normal operating conditions, are as follows:

- Tolerance for voltage sensing function: ± 1% of setting
- Tolerance for frequency sensing function: ± 0.3 Hz of setting

ATC-300 Breaker Based Transfer Switch

3.5 Features

A variety of standard and optional features are available for Generac ATSS. **All features or combinations of features may not be available on specific ATSS.** All features and/or accessories are Underwriters Laboratories (UL) listed unless noted.

3.5.1 Standard Features

The following is a list of the standard features for the ATC-300 Controlled ATS.

1. Time Delay Normal to Emergency (TDNE)

This feature provides a time delay when transferring from the Source 1 to the Source 2 power source. Timing begins when Source 2 becomes available. It permits controlled transfer of the load circuit to Source 2.

Adjustable 0 - 1800 Seconds

2. Time Delay on Engine Starting (TDES)

This feature provides a time delay of the signal to initiate the engine/generator start cycle in order to override momentary power outages or voltage fluctuations of Source 1.

Adjustable 0 - 120 Seconds

3. Time Delay Emergency to Normal (TDEN)

This feature provides a time delay of the re-transfer operation to permit stabilization of Source 1. Timing begins when Source 1 becomes available. If Source 2 fails during timing, then re-transfer is immediate overriding the time delay.

Adjustable 0 - 1800 Seconds

4. Time Delay for Engine Cool-down (TDEC)

This feature provides a time delay of the signal to initiate the engine/generator stop cycle after the re-transfer operation. This allows the engine/generator to cool down by running unloaded. Timing begins on completion of the re-transfer cycle.

Adjustable 0 - 1800 Seconds

5. Source 2 Monitoring and Protection

This feature provides monitoring and protection based on the Source 2 voltage and/or frequency setpoints. All feature 5 functions are "failsafe" operations.

5B. 1-Phase Undervoltage and Underfrequency Protection

Adjustable Undervoltage:
Dropout: 50 - 97% of nominal
Pickup: (Dropout + 2%) to 99% of nominal

Adjustable Underfrequency:
Dropout: 90 - 97% of nominal
Pickup: (Dropout + 1Hz) to 99% of nominal

5C. 1-Phase Overvoltage/Overfrequency

Adjustable Overvoltage:
Dropout: 105 - 120% of nominal
Pickup: 103% to (Dropout - 2%) of nominal

Adjustable Overfrequency:
Dropout: 103 - 110% of nominal
Pickup: 101% to (Dropout - 1Hz) of nominal

5D. 1-Phase Undervoltage

Adjustable Undervoltage:
Dropout: 50 - 97% of nominal
Pickup: (Dropout + 2%) to 99% of nominal

5E. 1-Phase Overvoltage

Adjustable Overvoltage:
Dropout: 105 - 120% of nominal
Pickup: 103% of to (Dropout - 2%) of nominal

5F. 3-Phase Undervoltage

Adjustable Undervoltage:
Dropout: 50 - 97% of nominal
Pickup: (Dropout + 2%) to 99% of nominal

5G. 3-Phase Overvoltage

Adjustable Overvoltage:
Dropout: 105 - 120% of nominal
Pickup: 103% to (Dropout - 2%) of nominal

5H. Phase Reversal

For a 3-phase wye source, this feature monitors the phase sequence of the sources. If a source does not have the same ABC or CBA sequence as the setpoint value, that source will be considered "Unavailable."

For a 3-phase delta source, this feature should be turned off via the PHASE REV setpoint.

5J. 3-Phase Undervoltage and Underfrequency Protection

Adjustable Undervoltage:
Dropout: 50 - 97% of nominal
Pickup: (Dropout + 2%) to 99% of nominal

Adjustable Underfrequency:
Dropout : 90 - 97% of nominal
Pickup: (Dropout + 1Hz) to 99% of nominal

5K. 3-Phase Overvoltage/Overfrequency

Adjustable Overvoltage:
Dropout: 105 - 120% of nominal
Pickup: 103% to (Dropout -2%) of nominal

Adjustable Overfrequency:
Dropout: 103 - 110% of nominal
Pickup: 101% to (Dropout -1Hz) of nominal

5L. Source 2 3-Phase Voltage Unbalance

For a 3-phase wye source, this feature monitors phase voltage ratios. Voltage unbalance (%) is calculated as the difference between the maximum and minimum phase voltage, divided by the minimum phase voltage. User-selectable setpoints are available for dropout and pickup unbalance settings (minimum 2% differential). Dropout is adjustable from 5 to 20%. Pickup is adjustable from 3 to (Dropout -2%). A setpoint for user-selectable time delay from 10 to 30 seconds is provided. The factory default setpoints are: 5% dropout, 3% pickup, and 30 seconds time delay. A user-selectable setpoint for enable and disable is also provided.

When an unbalance condition is detected on Source 2, the Unbalance Timer (TD UNBAL) starts timing. After TD UNBAL times out, Source 2 is declared "failed".

For a 3-phase delta source, this feature should be turned off via the VOLT UNBAL setpoint.

6. Test Operators

Generac ATSS are provided with a Test Pushbutton that simulates a loss of the Source 1 power source as standard (Feature 6B). All programmed time delays (TDNE, TDEN, etc.) will be performed as part of the Test. Engine run time of the Test is equal to the Plant Exerciser (Feature 23) programmed setpoint. All Tests are Failsafe protected.

6B. Test Pushbutton

Programmable Setpoints include:

1. Load or No Load Testing, or Disabled
2. Engine run time equal to the plant exerciser (Feature 23) setting

7. Time Delay Emergency Fail (TDEF)

This feature provides a time delay that prevents a connected Source 2 power source from being declared "Failed" in order to override momentary generator fluctuations. If the Source 2 power source remains in the failed state then, 0.5 seconds after the TDEF timer expires, the transfer switch will proceed with the programmed sequence for retransfer. This time delay is only implemented when the Source 2 power source is a generator.

Adjustable 0 - 6 Seconds

8. Time Delay Bypass Pushbutton

This feature provides a way (by pushing the Help and Step pushbutton simultaneously) to bypass the TDNE (Feature 1) and/or TDEN (Feature 2) time delays. The Time Delay Bypass function, when activated by pushing the Help and Step pushbutton simultaneously, will reduce any or all of the programmed time delay to zero.

8C. Bypass TDEN

This feature provides one set of pushbuttons to bypass the TDEN time delay.

8D. Bypass TDNE

This feature provides one set of pushbuttons to bypass the TDNE time delay.

12. Power Source Annunciation

This feature provides LEDs to give switch position and power source availability indications.

Switch Position

Provides LEDs to indicate the switch position.

12C. Source 1 - Source Connected

This feature provides a green LED that, when lit, indicates the load is connected to Source 1.

12D. Source 2 - Source Connected

This feature provides a red LED that, when lit, indicates the load is connected to Source 2.

Power Source Availability

Provides LEDs to indicate if a power source is available. LEDs may be integral or separate from the controller.

12G. Source 1 - Available

This feature provides a white LED that, when lit, indicates Source 1 is available.

12H. Source 2 - Available

This feature provides an amber LED that, when lit, indicates Source 2 is available.

14. Relay Auxiliary Contacts

14G. Source 1 Present: Provides two (2) normally open and two (2) normally closed contacts. The relay is energized when Source 1 is available.

14H. Source 2 Present: Provides two (2) normally open and two (2) normally closed contacts. The relay is energized when Source 2 is available.

15. Switch Position Indication Contact

This feature provides a contact that indicates if the power switching device is in the "Open" or "Closed" position.

15E. Source 1 Position Indication Contact

This feature provides 1 dry form "C" contact that indicates the position of the Source 1 power switching device.

15F. Source 2 Position Indication Contact

This feature provides 1 dry form "C" contact that indicates the position of the Source 2 power switching device.

ATC-300 Breaker Based Transfer Switch

23. Plant Exerciser (PE)

This feature provides a means for automatic testing of the engine generator set or standby power system. All programmed time delays will be performed during plant exerciser operations.

23K. Plant Exerciser Selectable – Disabled/1/7/14/28 Day Interval

This feature provides for automatic test operation of the generator. Available test cycles are daily, 7, 14, or 28 days with duration equal to the programmed engine test time.

Programmable setpoints allow for selection of three test cycles:

- Engine Start/Run Only (No Load);
- Exercise with Load Transfer; or
- Disabled

This is a “Failsafe” operation.

26. Source 1 - Monitoring and Protection

This feature provides Source 1 monitoring and protection functions. If the Source 1 power supply fails, then the ATC-300 will begin the sequence of operations necessary to transfer the load circuit to the Source 2 power source. All Feature 26 monitoring and protection functions are “fail-safe” operations.

26A. All Phase Undervoltage Protection

This feature provides all phase undervoltage monitoring and protection.

Adjustable Undervoltage:
Dropout: 50-97% of nominal
Pickup: (Dropout +2%) to 99% of nominal

26C. All Phase Overvoltage Protection

Provides all phase overvoltage monitoring and protection.

Adjustable Overvoltage:
Dropout: 105-120% of nominal
Pickup: 103% to (Dropout -2%) of nominal

26D. Go to Source 2

This feature provides the capability for an external contact opening to initiate a load power transfer to the Source 2 power source. This includes starting the engine/generator, performing the programmed time delays, and the transfer operation. Re-transfer will occur when the external contact is closed or under a “failsafe” condition. A connection point on the controller for the connection of an external contact is included.

26E. All Phase Underfrequency Protection

Provides all phase underfrequency monitoring and protection.

Adjustable Underfrequency:
Dropout: 90-97% of nominal
Pickup: (Dropout + 1Hz) to 99% of nominal

26F. All Phase Overfrequency Protection

Provides all phase overfrequency monitoring and protection.

Adjustable Overfrequency:
Dropout: 103-110% of nominal
Pickup: 101% to (Dropout -1Hz) of nominal

26H. Phase Reversal Protection

For a 3-phase wye source, this feature monitors the phase sequence of the sources. If a source does not have the same ABC or CBA sequence as the phase reversal setpoint, the source will be considered “Unavailable”.

For a 3-phase delta source, this feature should be turned off via the PHASE REV setpoint.

26L. Source 1 3-Phase Voltage Unbalance

For a 3-phase wye source, this feature monitors phase voltage ratios. Voltage unbalance (%) is calculated as the difference between the maximum and minimum phase voltage, divided by the minimum phase voltage. User-selectable setpoints are available for dropout and pickup unbalance settings (minimum 2% differential). Dropout is adjustable from 5 to 20%. Pickup is adjustable from 3 to (Dropout -2%). A setpoint for user-selectable time delay from 10 to 30 seconds is provided. The factory default setpoints are: 5% dropout, 3% pickup, and 30 seconds time delay. A user-selectable setpoint for enable and disable is also provided.

When an unbalance condition is detected on Source 1, the Unbalance Timer (TD UNBAL) starts timing. After TD UNBAL times out, Source 1 is declared “failed”.

For a 3-phase delta source, this feature should be turned off via the VOLT UNBAL setpoint.

29. Alternate Transfer Modes of Operation

Provides standard or optional transfer modes, mode selection devices, and operational methods for Transfer Switches.

29A. Automatic Operation

Provides fully automatic transfer, re-transfer, and engine/generator startup and shutdown operations.

32. Delayed Transition Transfer Modes for Open Transition Transfer Switches

This feature provides delayed transition transfer modes for an open transition transfer switch. Often used in systems with inductive loads, a delayed transition transfer switch may prevent or reduce inrush currents due to out of phase switching of inductive loads.

32A. Time Delay Neutral

This feature provides a time delay in the neutral position during the transfer and re-transfer operations during which both Source 1 and Source 2 are disconnected from the load circuit. The time delay is programmable and is the same for both transfer and re-transfer operations.

Adjustable 0 - 120 Seconds

35. Pre-Transfer Signal

This feature provides a signal to a remote device prior to a re-transfer operation. It provides one Form "C" contact (NO/NC) for interface with other equipment (typically elevator controls). The contacts close/open on a timed basis prior to transfer in either direction. After TDNE/TDEN times out, this relay closes and the Pre-transfer Timer (TPRE) starts timing. After the TPRE times out, the transfer proceeds by starting the TDN timer if enabled. The pre-transfer relay opens after the transfer is complete.

Adjustable 0 - 120 Seconds

35A. Pre-Transfer Signal with 1 N.O. and 1 N.C. Contacts

This feature provides pre-transfer signal and includes 1 N.O. and 1N.C. contacts.

42. Seismic Certification

This feature provides a Seismic certified Transfer Switch with certificate for application in Seismic Zone 4 under the California Building Code, the Uniform Building Code, and BOCA.

3.5.2 Optional Features

The following is a list of the optional features for the ATC-300 Controlled ATS. **All features or combinations of features may not be available on specific ATSS**

12. Power Source Annunciation

This feature provides LEDs to give switch position and power source availability indications.

Overcurrent Trip Indication

Available only with integral Overcurrent Protection (Feature 16). (Shown on Automatic Transfer Controller Display.)

12L. Source 1 Tripped (Requires Feature 16) Via ATC-300 LDC-Based Display

The Automatic Transfer Controller LCD display will read "Lockout" if the Source 1 circuit breaker is in the "tripped" position.

12M. Source 2 Tripped (Requires Feature 16) Via ATC-300 LDC-Based Display

The Automatic Transfer Controller LCD display will read "Lockout" if the Source 2 circuit breaker is in the "tripped" position.

16. Integral Overcurrent Protection

This feature provides thermal-magnetic overcurrent protection integral to the power switching device(s). All Feature 16 options include a "Lockout" function. If the power switching breaker trips on an overcurrent condition, then "Lockout" is displayed on the Automatic Transfer Controller display and automatic operation is prevented until the appropriate source is manually reset.

16B. Integral Overcurrent Protection on Both Power Source Switching Devices

This feature provides integral overcurrent protection on both Source 1 and Source 2 power switching devices.

16E. Integral Overcurrent Protection on the Source 2 Power Switching Device

This feature provides integral overcurrent protection on the Source 2 power switching device.

16N. Integral Overcurrent Protection on the Source 1 Power Switching Device

This feature provides integral overcurrent protection on the Source 1 power switching device.

18. Metering

Feature 18 metering options include all required external devices (CTs, etc.) for a fully functioning metering system.

18W. Ammeter

A single ammeter is a true RMS sensing device that displays single phase current only

The ammeter can be mounted on Source 1, Source 2, or load. The meter can also be configured for 1, 2, or 3-phase sensing by supplying one meter per phase for Source 1, Source 2, or load. Ammeters for both Source 1 and Source 2 can also be grouped together.

21. Optional Power Cable Connection Terminals

Generac Transfer Switches are provided as standard with Source 1, Source 2, and Load Circuit solderless screw-type terminals for power cable connection. Alternate terminal wire sizes may be available dependant on transfer switch type and ampere rating.

21A. Optional Power Cable Connection Terminals

This feature provides alternate power cable connection terminals. Consult Generac for available optional terminal sizes.

29. Alternate Transfer Modes of Operation

Provides standard or optional transfer modes, mode selection devices, and operational methods for Transfer Switches.

29G. Automatic/Manual Operation with Selector Switch

This feature provides a 2-position selector switch (labeled Auto/Manual) that permits selection of the automatic or manual transfer operation mode. When in the "Auto" position, the transfer switch operates with fully automatic transfer, re-transfer, and engine/generator start up and shut down operations. When in the "Manual" position, manual start-up of the engine/generator and manual transfer are required (see Section 5 for manual operation of the transfer switch). Manual shutdown of the engine/generator are also required. The selector switch for manual operation is provided.

Note: Transfer switches with Feature 29G MUST be labeled as Non-Automatic Transfer Switch Equipment.

37. Service Equipment Rated Transfer Switch

This feature provides the label "Suitable for use as Service Equipment" and the features necessary to meet the requirements for the label. It includes the service disconnect with visible indication and neutral assembly with removable link. **Features 16B or 16N must be selected separately.**

ATC-300 Breaker Based Transfer Switch

37A. Service Equipment Rated Transfer Switch Without Ground Fault Protection (30 – 1000 A)

This feature provides Service Equipment rating for an application that does not require ground fault protection.

37B. Service Equipment Rated Transfer Switch With Ground Fault Protection (800 – 1000 A)

This feature provides Service Equipment rating for an application that requires ground fault protection.

38. Stainless Steel Covers

Provides an added level of security by providing a pad lockable stainless steel cover for use with standard transfer switch logic controllers and/or associated device panels. These covers function with Generac’s ATC series logic controllers and device panels. The covers are designed for NEMA 1, 3R, 4X, and 12 applications.

39. Feeder Breakers

39A. Two 200 A Feeder Breakers

This feature provides two (2) 200 A feeder breakers for the 200 A ATH3 transfer switch.

39B. Three 200 A Feeder Breakers

This feature provides three (3) 200 A feeder breakers for the 300 A ATH3 transfer switch.

39C. Four 200 A Feeder Breakers

This feature provides four (4) 200 A feeder breakers for the 400 A ATH3 transfer switch.

41. Space Heater With Thermostat

This feature provides a space heater and non-adjustable thermostat. External control power is not required.

41A. Space Heater With Thermostat - 100 Watt

This feature provides a 100 watt (W) space heater with a non-adjustable thermostat.

51D1. 50kA CVX Surge Device

This feature gives protection for surge current capacity rating 50kA, upto 480VAC by providing a low impedance surge path to ground while supporting rated voltage. It provides LED indication.

51F1. 100kA CVX Surge Device

This feature gives protection for surge current capacity rating 100kA, upto 480VAC by providing a low impedance surge path to ground while supporting rated voltage. It provides LED indication.

3.6 Enclosure

The rugged steel ATS enclosure is supplied with three door hinges, regardless of enclosure size. They ensure proper support of the door and door mounted devices (Figure 16). The hinges have removable hinge pins to facilitate door removal. Certain procedures, such as switch mounting, are simplified with the door removed. The doors are supplied as standard with pad-lockable latches.



Figure 16. Typical Type 1 Enclosure (Door Closed).

The door is used to mount a variety of lights, switches, and push-buttons, depending upon the options required for a particular ATS. All lights and switches are mounted in the plastic door-mounted panel.

The rear of the enclosure is supplied with teardrop shaped holes in the top and bottom mounting flanges to facilitate mounting. It is also supplied with two positioning bolts and various pre-tapped inserts to insure proper positioning of the power panel anytime the power panel must be repositioned to accommodate a different cable entry position. Cable entry holes are the responsibility of the customer.

ATS enclosures and all internal steel mounting plates, such as the power panel mounting plate, go through a pretreatment cleaning system prior to painting to ensure a durable finish.

The standard ATS enclosure is NEMA 1 Type for general use. However, a variety of enclosures are available to address almost any environmental circumstance (see Table 3).

Table 3. Transfer Switch Equipment Enclosures

NEMA TYPE	DESIGN	PROTECTION
Open	Indoor	
1	Indoor	Enclosed Equipment
3R	Outdoor	Rain, Ice Formation
4/4X	Outdoor	Hose Down, Non-corrosive
12	Indoor	Dust, Dirt and Non-Corrosive Liquids

3.7 Standards

Generac ATS equipment, enclosed in any of the enclosures listed in Table 3, is listed for application by UL and ULC. In addition, Generac ATSs are listed in File E38116 by Underwriters Laboratories, Inc. under Standard UL 1008. This standard covers requirements for automatic transfer switches intended for use in ordinary locations to provide lighting and power as follows:

- a. In emergency systems, in accordance with articles 517 and 700 in the National Electrical Code, ANSI/ NFPA 70, and the National Fire Protection Association No. 76A; and/or
- b. In standby systems, in accordance with article 702 of the National Electrical Code; and/or
- c. In legally required standby systems in accordance with article 701 of the National Electrical Code.

Generac ATSs are available to meet NFPA 110 for emergency and standby power systems, and NFPA 99 for health care facilities when ordered with the appropriate options.

Since Generac ATSs use specially designed molded case switches or circuit breakers the main power switching contacts, these devices must also be listed under the additional UL Standards 1087 and 489. UL uses two basic types of listing programs - label service and reexamination.

UL1087 and 489 employs a label service listing program which requires an extensive follow-up testing program for listed devices. Standard UL 1008 for ATSs lists devices under the reexamination program which only require a continual physical reexamination of the components used in the product to ensure consistency with the originally submitted device. Follow-up testing is not required by UL 1008.

Representative production samples of molded case switches and molded case circuit breakers used in Generac ATSs are subjected to a complete test program identical to the originally submitted devices on an ongoing, periodic basis per UL 1087 and 489. The frequency of such a re-submittal can be as often as every quarter for a low ampere device.

ATC-300 Breaker Based Transfer Switch

Section 4: Installation and Wiring

4.1 General

Generac ATs are factory wired and tested. Installation requires solidly mounting the enclosed unit and connecting power cables and auxiliary pilot circuits. Physical mounting procedures and power cable connections are covered in this section. All other required wiring or electrical connection references are covered in a separate Customer Wiring Booklet packaged with the ATS.

Locate the wiring schematic, review it, and keep it readily available for reference purposes during installation and testing. Once an ATS is properly installed and wired, it should be mechanically and electrically checked for proper installation and operation. The procedures for these initial mechanical and electrical checks are outlined in Section 6 of this instruction manual.

NOTICE

TO FACILITATE THE PROCEDURES DESCRIBED IN THIS SECTION, THE SOLID STEEL SHIELD OVER THE POWER PANEL SHOULD BE REMOVED. THE SHIELD IS ATTACHED TO THE RATCHET ASSEMBLY WITH FOUR SCREWS. REMOVE THE FOUR SCREWS AND SHIELD UNTIL THE PROCEDURES ARE COMPLETED.

WARNING

BE CERTAIN THAT THE SOLID STEEL POWER PANEL SHIELD IS PROPERLY INSTALLED BEFORE THE TRANSFER SWITCH EQUIPMENT IS PUT INTO SERVICE. THE SHIELD PROVIDES PROTECTION FROM DANGEROUS VOLTAGES AT THE LINE AND LOAD TERMINALS WHEN THE EQUIPMENT IS IN OPERATION. FAILURE TO DO SO COULD RESULT IN PERSONAL INJURY OR DEATH.

4.2 Mounting Location

Choose a location that offers a flat, rigid mounting surface capable of supporting the weight of the enclosed ATS equipment. For standard ATs, avoid locations that are moist, hot, or dusty. However, Generac offers optional enclosure designs that can be used in special environments. If there are any doubts as to a location's suitability, discuss them with your Generac representative.

Check to make certain that there are no pipes, wires, or other mounting hazards in the immediate mounting area that could create a problem.

Carefully remove all packing material from the ATS at the mounting location. Even though an equipment inspection should have been made when the equipment was received, make another careful inspection of the enclosure and the enclosed ATS components as the packing material is removed and the enclosure readied for mounting. Be especially alert for distorted metal, loose wires, or damaged components.

4.3 Mounting Procedure

CAUTION

SINCE THE ENCLOSED ATS MUST BE LIFTED INTO PLACE FOR MOUNTING, BE CERTAIN THAT ADEQUATE RESOURCES ARE AVAILABLE FOR LIFTING TO AVOID PERSONNEL INJURIES OR EQUIPMENT DAMAGE.

All vertical design ATS equipment enclosures and power panels are of the same design. Only the overall physical dimensions change. Note that the enclosure is provided with four teardrop (elongated) mounting holes, two in the top mounting flange and two in the bottom. Also notice that the power panel has two sets of mounting holes. One set positions the power panel for top entry of cables and one set for bottom entry. This will be covered in more detail in Section 4.4.

Generac ATS equipment is assembled and supplied as standard for top entry (see Figure 17), although equally adaptable to bottom entry. Cable entry holes are not part of the enclosure when shipped from the factory and must be provided in the field, either before or after mounting the enclosure.

CAUTION

EXTREME CARE SHOULD BE TAKEN TO PROTECT THE TRANSFER SWITCH FROM DRILL CHIPS, FILINGS, AND OTHER CONTAMINANTS WHEN MAKING THE CABLE ENTRY HOLES. EXTREME CARE SHOULD ALSO BE TAKEN WHEN MOUNTING THE ENCLOSURE TO PREVENT COMPONENT DAMAGE OR A FUTURE MALFUNCTION.

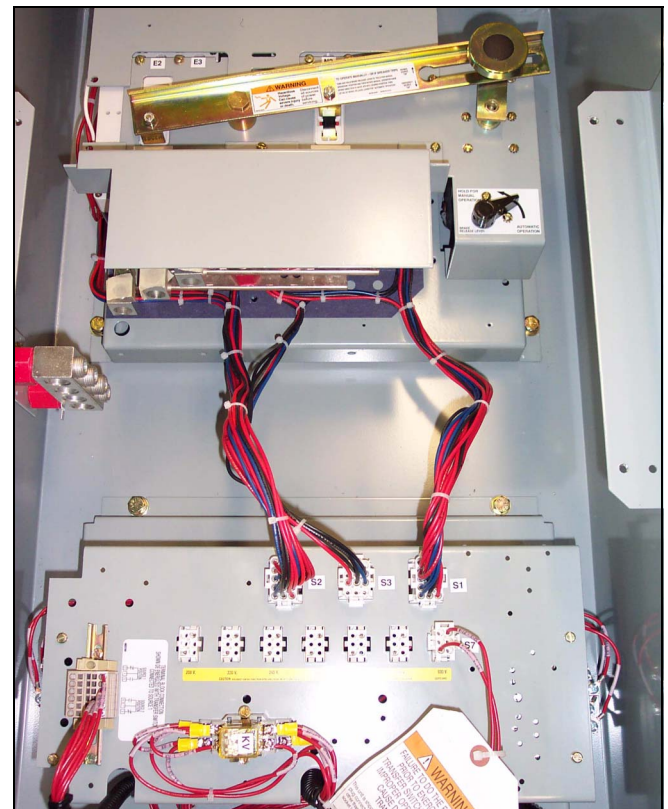


Figure 17. Typical (30-150 A) Horizontal Design ATS Equipment (Door Open).

With the enclosed ATS equipment unpacked and ready for mounting, proceed with the following steps.

- Step 1:** The ATS enclosure door is hinge mounted with removable hinge pins. To simplify the mounting procedure and avoid damaging the door-mounted logic panel, it is strongly suggested that the door be carefully removed and put it in a safe place until mounting is complete. To remove the door, open the door and disconnect the connectors at the back of the ATC-300 logic panel. Remove the wire ties securing the harness to the inside of the door. Carefully remove the hinge pins then the door from the enclosure.
- Step 2:** Install the required upper and lower mounting bolt anchors and the two upper mounting bolts in the mounting surface.
- Step 3:** Gently lift the enclosure and guide the teardrop holes in the upper mounting flange over the upper mounting bolts. Do not completely tighten the bolts at this time.
- Step 4:** While still supporting the enclosure, install the two lower mounting bolts in the lower mounting flange. Again, do not completely tighten the bolts at this time. Use shims, if required, to prevent deformation of the enclosure if the mounting surface is distorted.
- Step 5:** Tighten all four mounting bolts after any required shimming is completed.

4.4 Load Lug Location

This section applies only to the 255-1200 A switches. The load lugs for the 30-150 A switch are fixed.

ATS equipment is supplied from the factory with the load terminal lugs at the top. If the load lugs are to be repositioned to the bottom, do it at this time before wiring the unit or making power cable connections.



WARNING

IF THE LOAD LUG LOCATION IS BEING CHANGED ON ALREADY INSTALLED TRANSFER SWITCH EQUIPMENT, MAKE SURE THAT THE SOURCE 1, SOURCE 2, AND OTHER POWER SOURCES CONNECTED TO THE EQUIPMENT ARE DE-ENERGIZED. HAZARDOUS VOLTAGES ARE PRESENT INSIDE ATS EQUIPMENT THAT CAN CAUSE SEVERE PERSONAL INJURY OR DEATH.

With the solid steel shield removed, proceed with the following steps for bottom feed load termination. Refer to Figure 19 for transfer switch component names and locations.

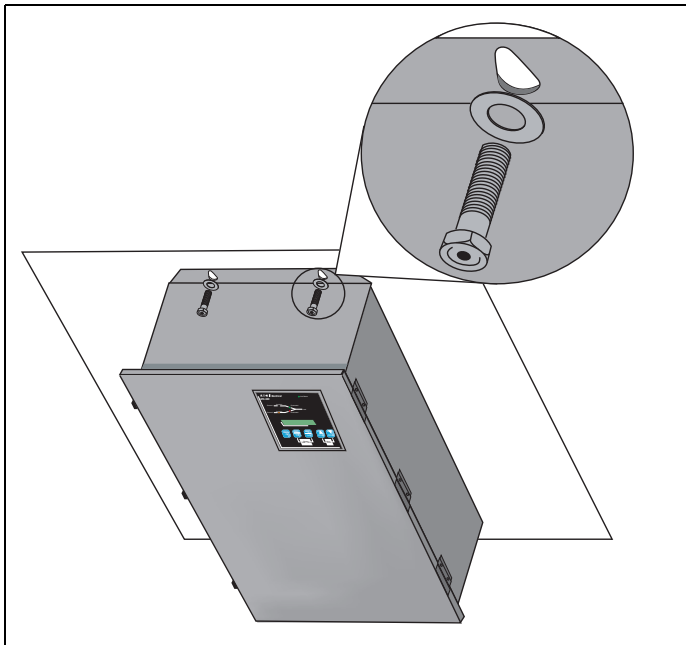


Figure 18. Typical Mounting of the ATS to a Mounting Surface.

- Step 6:** Double check to ensure that all packing and shipping materials have been removed.

ATC-300 Breaker Based Transfer Switch

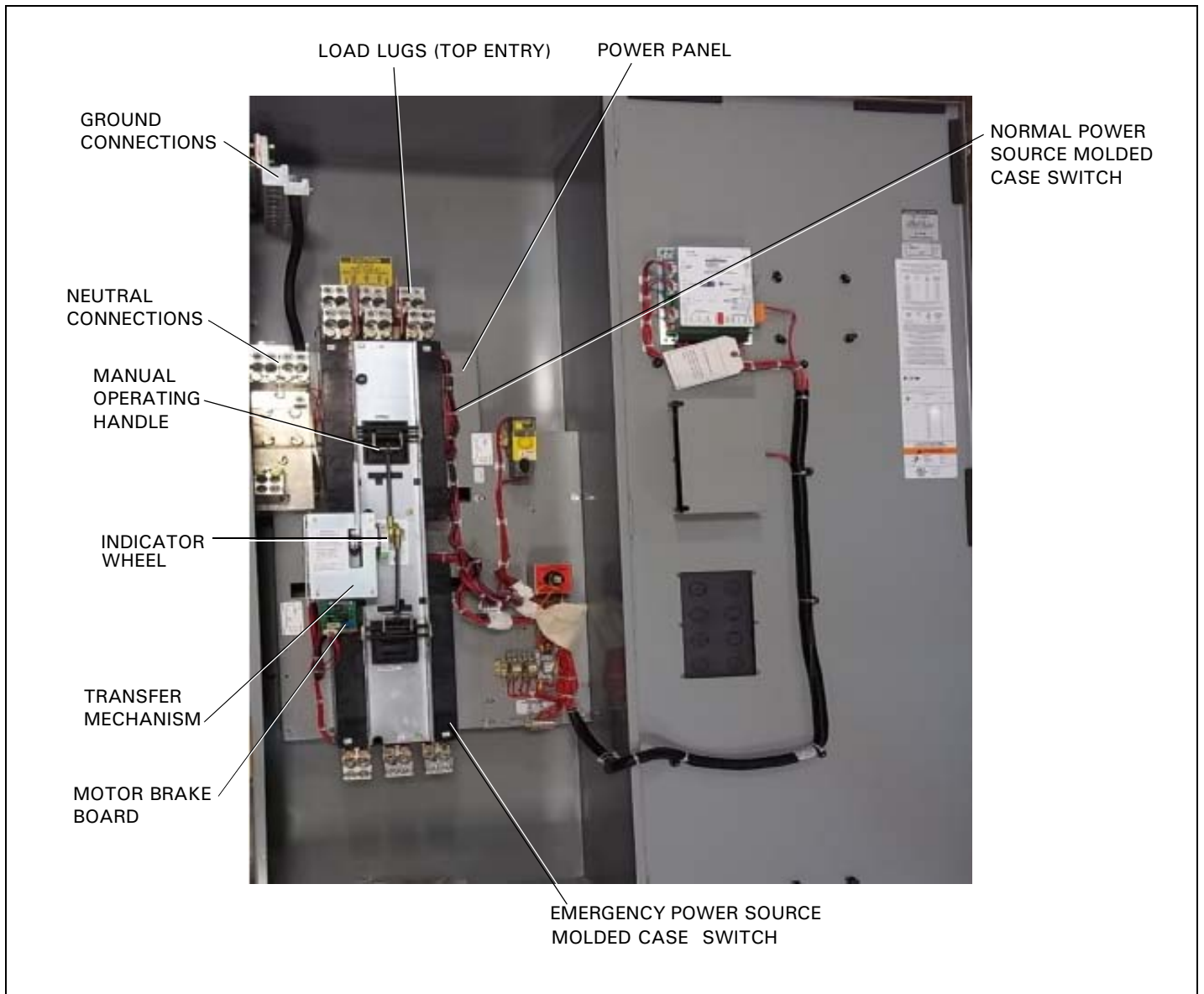


Figure 19. Typical (225-1200 A) Vertical Design Transfer Switch Equipment (Door Open and Deadfront Cover Removed).



Figure 19A. 4 Pole Neutral Bond for Service Entrance

Step 1: Disconnect the power panel from the rest of the transfer switch by unplugging the connector plugs P1, P2, and P3 (Figures 20 and 21).

ATC-300 Breaker Based Transfer Switch

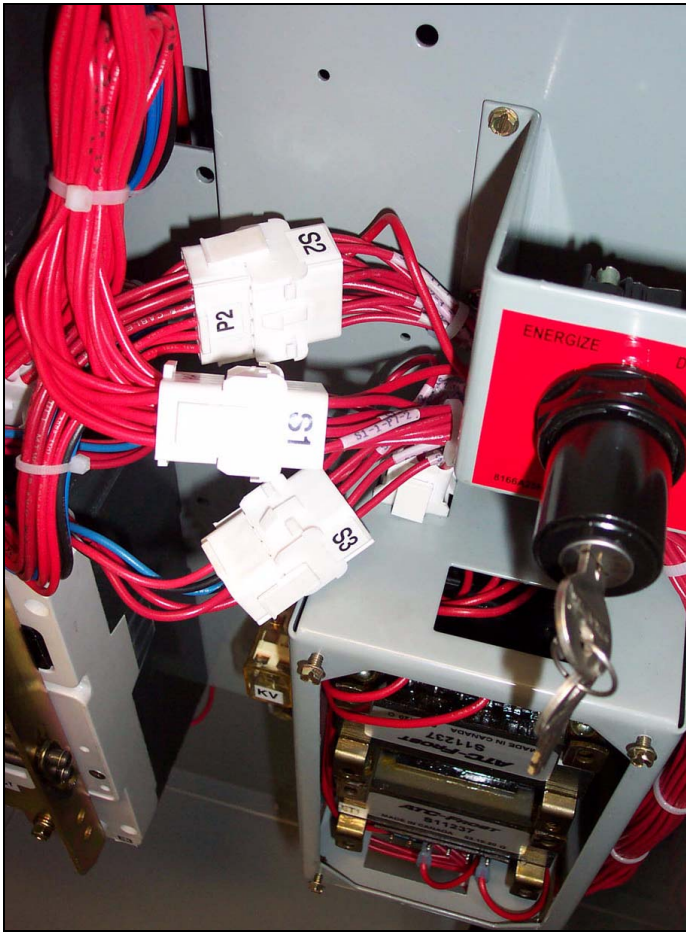


Figure 20. Location of the P1, P2, and P3 Connector Plugs for ATCs with the North American Market Transformer Panel.

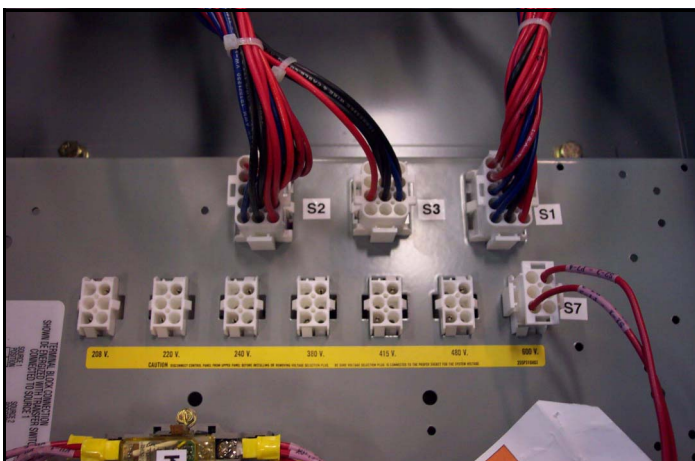


Figure 21. Location of the P1, P2, and P3 Connector Plugs for ATCs with the International Market Transformer Panel.

Step 2: Remove the bolt that bonds the neutral strap to the rear of the enclosure, if it is in place.

Step 3: Remove the four bolts that secure the power panel in the enclosure. Depending upon the size of the panel, it may be advisable to have assistance with the removal. Once the power panel is free, carefully move it to a solid work surface (Figure 22).

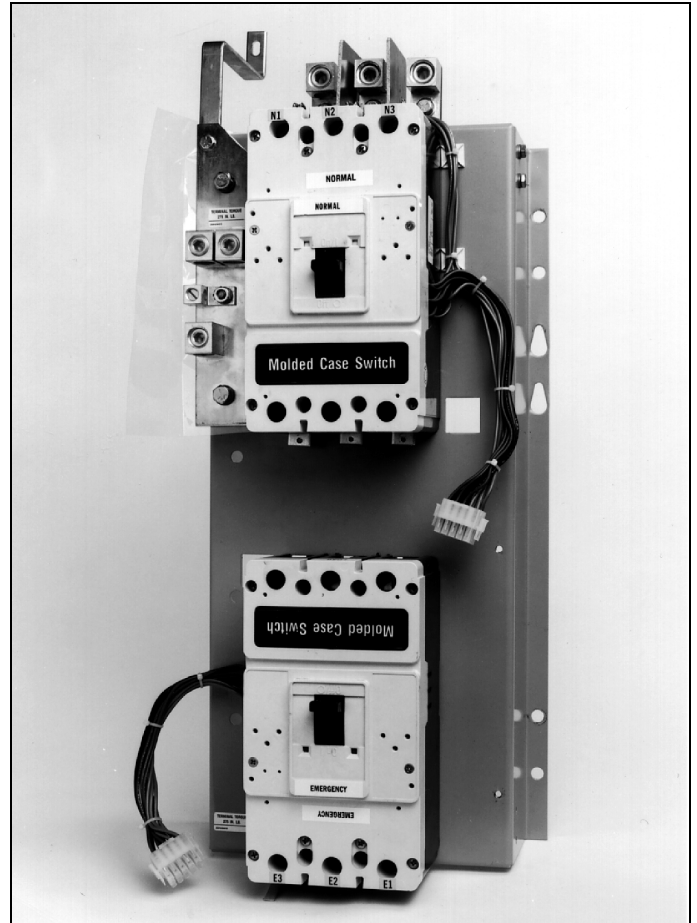


Figure 22. Power Panel Removed from the Enclosure (with the Transfer Mechanism Removed for Clarity - 225-1200 A Models).

NOTICE

AT THIS POINT, TAKE THE TIME TO REFER TO FIGURE 23 AND BECOME FAMILIAR WITH THE INSIDE REAR OF THE ENCLOSURE AND THE POWER PANEL MOUNTING PROVISIONS AVAILABLE FOR BOTH TOP AND BOTTOM ENTRY. IT WILL FACILITATE REINSTALLATION OF THE POWER PANEL.

Step 4: Remove the operating mechanism from the front of the power panel by removing the six bolts holding the mechanism in position. The molded case switches or optional circuit breakers should not be removed (Figure 23).

NOTICE

THE REAR-MOUNTED LOAD LUGS, DIP-INSULATED BUS BARS, STANDOFF INSULATORS, GLASS POLYESTER PHASE BARRIERS, AND METAL MOUNTING BRACKET ARE DESIGNED TO BE REMOVED AS ONE LOAD LUG ASSEMBLY (FIGURE 23).



Figure 23. Mounted Load Lug Assembly (225-1200 A Models).

Step 5: The load lug assembly is removed by first removing the four, six, or eight bolts securing the pieces of insulated bus to the back of the power panel. The number of mounting bolts depends upon whether 2-, 3-, or 4-pole devices are installed. Mounting bolts are accessed through holes in the load end of the molded case switches or optional circuit breakers.

Step 6: Remove the four bolts holding the mounting bracket to the upper rear portion of the power panel. The load lug assembly can now be removed as one unit. Note that there are grooves in the back of the power panel and in the mounting bracket that keep the polyester phase barriers in their proper positions.

Step 7: Turn the load lug assembly 180° with the lugs at the bottom and remount the assembly by reversing the procedures described in Steps 5 and 6. The mounting bracket will now be bolted to the bottom of the power panel. Make certain that all glass polyester phase barriers are in place and positioned properly in the grooves. When making any bolted connection to the bus, comply with the torque requirements as outlined in Table 4.

Table 4. Bolted Bus Connection Torque Requirements.

POWER PANEL SWITCHING DEVICE	TORQUE FT-LB (NM)
Type FD	10 (14)
Type KD	20 (27)
Type LD	25 (34)
Type MD	25 (34)
Type ND	25 (34)
Type NB	25 (34)

- Step 8:** Remount the operating mechanism to the front of the power panel with the six bolts removed previously in Step 4.
- Step 9:** Position the power panel in the enclosure such that the two upper elongated holes, one on either side of the power panel, fit over the two positioning bolts located in the rear of the enclosure. This will line up the four correct mounting holes in the power panel with the pre-tapped inserts in the rear of the enclosure.
- Step 10:** With the power panel held securely against the back of the enclosure, replace and tighten the four mounting bolts removed previously in Step 3.
- Step 11:** If applicable, attach the neutral strap, removed in Step 2, to the back of the enclosure through the upper bonding hole.
- Step 12:** Reconnect the P1, P2, and P3 connector plugs that were disconnected in Step 1.

4.5 Power Cable Connections

! WARNING

POWER CONDUCTORS MAY HAVE VOLTAGE PRESENT THAT CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. DE-ENERGIZE ALL POWER OR CONTROL CIRCUIT CONDUCTORS TO BE CONNECTED TO THE ATS EQUIPMENT BEFORE BEGINNING TO WORK WITH THE CONDUCTORS AND/OR TERMINATING THEM TO THE EQUIPMENT.

! CAUTION

USE OF CABLE LUGS NOT DESIGNED FOR THE ATS MAY CAUSE HEATING PROBLEMS. BREAKER LUGS ONLY MOUNT TO THE BREAKER, WHILE TRANSFER SWITCH LUGS MOUNT TO BOTH THE BREAKER AND THE BUS BAR BEHIND THE BREAKER. FOR INSTALLATION INSTRUCTIONS, REFER TO THE INSTRUCTION LEAFLET SUPPLIED FOR THE SPECIFIC LUGS.

ATC-300 Breaker Based Transfer Switch

CAUTION

TO HELP PREVENT COMPONENT DAMAGE OR FUTURE MALFUNCTIONS, USE EXTREME CARE TO KEEP CONTAMINANTS OUT OF THE ATS EQUIPMENT WHEN MAKING POWER CABLE CONNECTIONS.

CAUTION

RUN THE POWER CABLE THROUGH THE GUTTER SPACE PROVIDED TO THE RIGHT OF POWER PANEL. DO NOT ROUTE THE POWER CABLES BEHIND OR TO THE LEFT OF THE POWER PANEL. RUNNING THE CABLES BEHIND OR TO THE LEFT OF THE POWER PANEL COULD INTERFERE WITH THE PROPER OPERATION OF THE TRANSFER SWITCH.

Test all power cables prior to connection to the unit to ensure that the conductors or cable insulation have not been damaged while being pulled into position.

Power cables are to be connected to solderless screw type lugs located on the ATS switching devices. Refer to the separate Customer Wiring Booklet supplied with the ATS equipment for power termination. Verify that the lugs supplied will accommodate the power cables being used. Also verify that the cables comply with local electrical codes. Standard ATS equipment, as supplied from the factory, will accommodate the wire sizes shown in Table 5.

Carefully strip the insulation from the power cables to avoid nicking or ringing of the conductor strands. Prepare the stripped conductor termination end by cleaning it with a wire brush. If aluminum conductors are used, apply an appropriate joint compound to the clean conductor surface area.

WARNING

IMPROPER POWER CABLE CONNECTIONS CAN CAUSE EXCESSIVE HEAT AND SUBSEQUENT EQUIPMENT FAILURE.

Tighten the cable lugs to the torque identified on the label affixed to the door of the unit.

Table 5. Transfer Switch Equipment Wire Sizes

TRANSFER SWITCH AMPERE RATING	WIRE SIZE RANGES	NUMBER OF CABLES PER PHASE	TERMINAL TEMPERATURE RATING °C (°F)
30-100	#14-3/0	1	75 (167)
150	#6-300KCMIL	1	75 (167)
225-300	#3-350KCMIL	1	75 (167)
400	#3-350KCMIL	2	75 (167)
600 (3P)	#1-500KCMIL	2	75 (167)
600 (4P)	3/0-400KCMIL	3	75 (167)
800-1200	3/0-500KCMIL	4	75 (167)

4.6 Wiring

WARNING

POWER CONDUCTORS AND CONTROL WIRING MAY HAVE VOLTAGE PRESENT THAT CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. DEENERGIZE ALL POWER OR CONTROL CIRCUIT CONDUCTORS BEFORE BEGINNING TO PERFORM ANY WIRING ACTIVITY TO OR WITHIN THE ATS EQUIPMENT.

Power sources, load conductors, and control wiring should be connected to locations as indicated in the Customer Wiring Booklet supplied with the ATS equipment.

CAUTION

ENSURE THE ATS VOLTAGE IS SET CORRECTLY. IT SHOULD BE THE SAME AS THE SOURCE 1 AND SOURCE 2 LINE VOLTAGES. OPERATING THE EQUIPMENT ON IMPROPER VOLTAGE CAN CAUSE EQUIPMENT DAMAGE.

Once the ATS equipment has been installed and wired, perform the initial mechanical and electrical procedures as outlined in Section 6 to verify that the equipment is installed and operating properly.

NOTICE

REMEMBER TO REATTACH THE SOLID STEEL POWER PANEL SHIELD TO THE RATCHET ASSEMBLY AFTER COMPLETING ANY OF THE PROCEDURES DESCRIBED IN THIS SECTION.

4.7 Engine Start Connection

The engine control contact connections are located on the logic panel of the ATS. Connect the engine start wires to the terminals marked 13 and 14 on J-5 connector on the ATC-300 Controller (see Figure 24). A contact closes between these terminal when an engine start signal is provided by the ATS logic. The wiring diagram provides additional engine start connection information. Use the proper wire size as listed by the generator set (Genset) manufacturer.

NOTICE

PRIOR TO MAKING THE ENGINE START CONNECTION TO THE SWITCH, SET THE ENGINE GENERATOR CONTROLS SELECTOR SWITCH IN THE OFF POSITION TO PREVENT AN UNWANTED ENGINE START. IT IS RECOMMENDED THAT CONTROL WIRING, SUCH AS THE ENGINE START WIRES, BE RUN IN A SEPARATE CONDUIT FROM THE POWER CABLES.

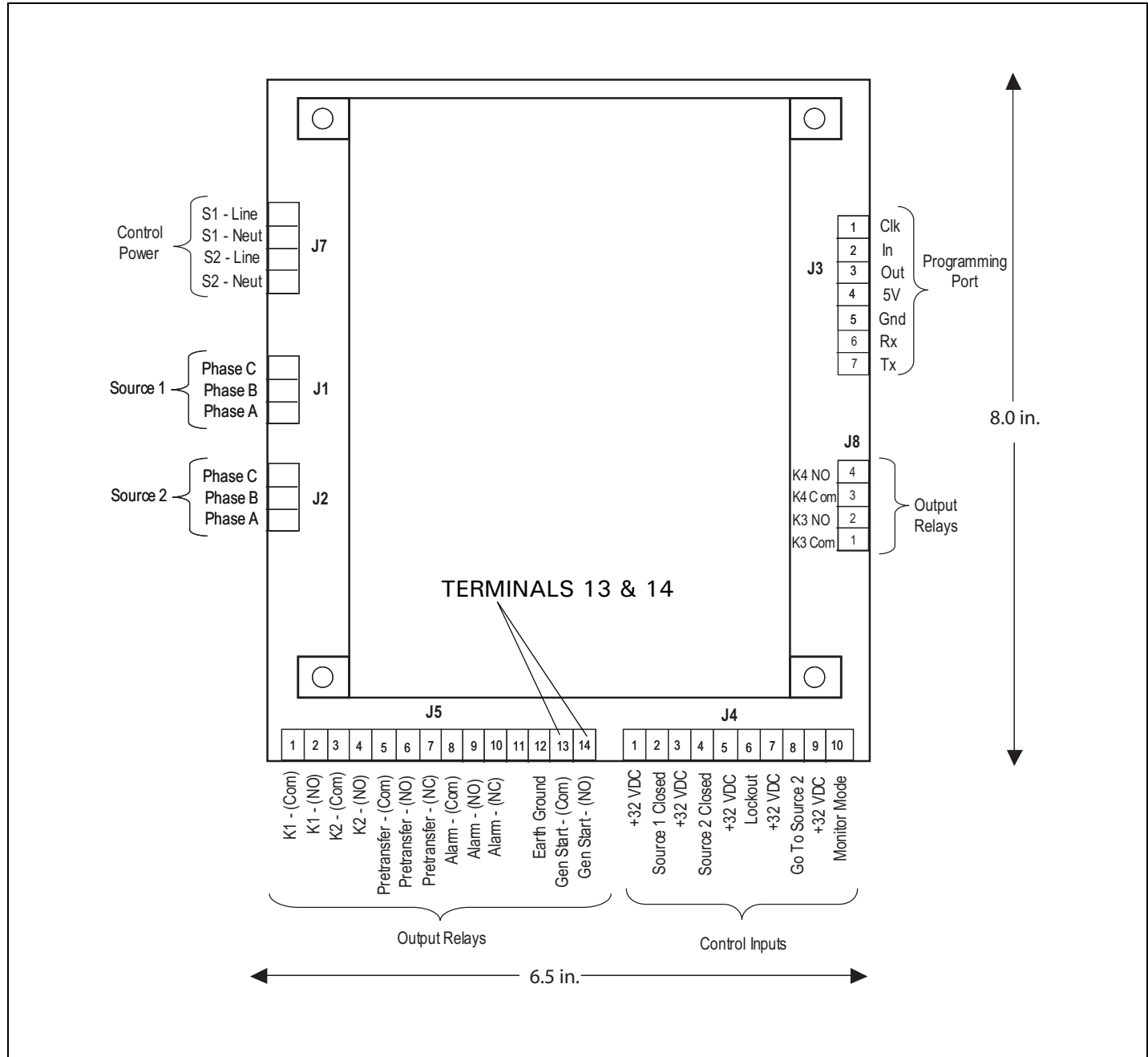


Figure 24. Location of Terminals 13 and 14 on the J-5 Connector of ATC-300 Controller.

ATC-300 Breaker Based Transfer Switch

4.8 Voltage Selection Adjustments

Certain devices, such as the Voltage Selection Panel, sensing relays, and timers, need to be set and/or calibrated prior to placing the ATS equipment in service. Adjustments for logic devices are described in the separate instructional document dedicated to the specific logic being used. Voltage selection adjustments are described in this section.

CAUTION

BE SURE THAT THE CORRECT VOLTAGE IS SELECTED TO MATCH THE SYSTEM VOLTAGE. AN IMPROPER SELECTION AND/OR CONNECTION COULD RESULT IN EQUIPMENT DAMAGE.

4.8.1 North American Market Voltage Selection Panels (120, 208, 240, 480, and 600 V, - 60 Hz)

Vertical and Horizontal Design Voltage Selection

The North American market Voltage Selection Panel consists of multi-tap transformers, contained in a steel case mounted in the enclosure. The cover has “teardrop” holes for the screws to allow easy access to the transformers. To change the voltage from the factory default 600 Vac, follow the steps detailed below.

Step 1: Loosen the four screws securing the cover of the Voltage Selection Transformer case. Slide the cover up, then away from the case.

Step 2: Remove the wires from the primary taps of both transformers and installed them on the taps for the desired voltage (Figure 25). Note that only one wire per transformer is moved since the second wire is the zero reference.

CAUTION

WHEN CHANGING THE VOLTAGE, ONE WIRE MUST BE MOVED ON THE PRIMARY TAPS OF BOTH TRANSFORMERS.

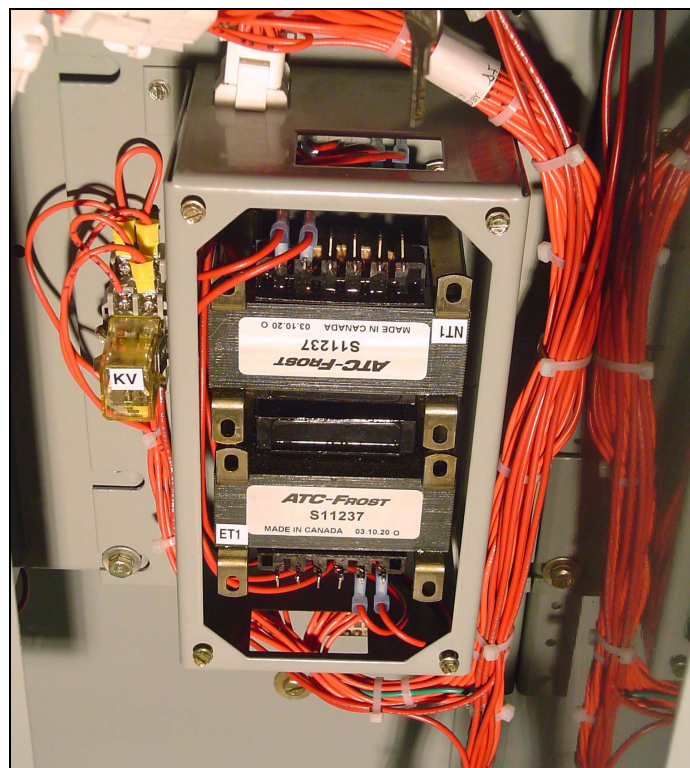


Figure 25. North American Market Voltage Selection Panel with Voltage Being Selected.

Step 3: Reinstall the cover and tighten the four screws.

4.8.2 International Market Power Panels (208, 220, 240, 380, 415, and 600 V - 50-60 Hz)

Vertical Design Voltage Selection

The vertical design transfer switch is furnished with a multi-tap Voltage Selection Panel to the right of the power panel. Seven front accessible taps from 208 to 600 Vac are provided (Figure 26). A small disconnect plug is provided to change from one voltage to another. The transfer switch is shipped with the plug in the 600 Vac position.

Horizontal Design Voltage Selection

Horizontal design transfer switches are furnished with an adjustable line voltage plug and receptacles below the power panel. To change the line voltage, insert the plug in the desired receptacle (Figure 26). The transfer switch is shipped with the plug in the 600 Vac position.

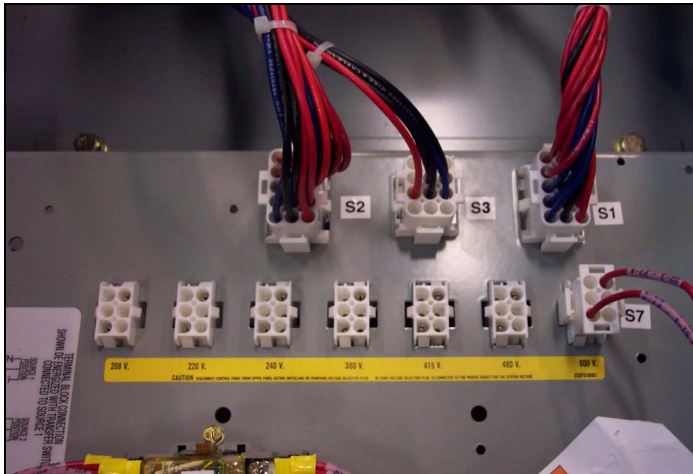


Figure 26. Line Voltage Plug and Receptacles for Horizontal Design.

4.9 Terminal Block Wire Installation and Removal

Proceed with the following steps and associated figures to install or remove terminal block wiring.

Step 1: Figure 27 shows two tension clamp terminal blocks. There is a large one and small one, but the operation is the same for both. A small tool, such as a screwdriver, will be pushed into the square hole next to the wire hole and a wire will be inserted into the larger circular hole on the outer edge.

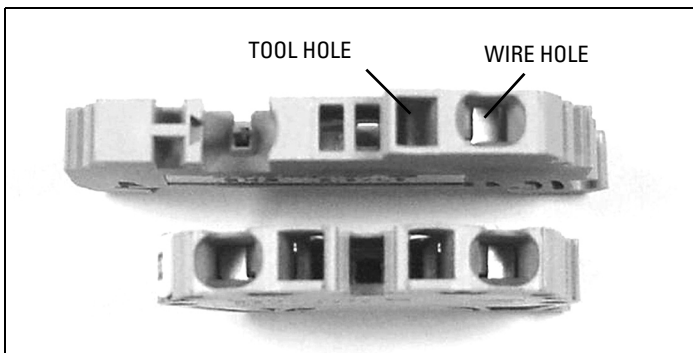


Figure 27. Tension Clamp Terminal Blocks.

Step 2: Begin by inserting a small, flathead screwdriver into the square (tool) hole with the flat surface of the screwdriver against the back wall of the hole. With a little bit of force, push the screwdriver in on a slight angle toward the center of the clamp. Be sure to slide it in until it clicks. You will then see the clamp open in the wire hole.

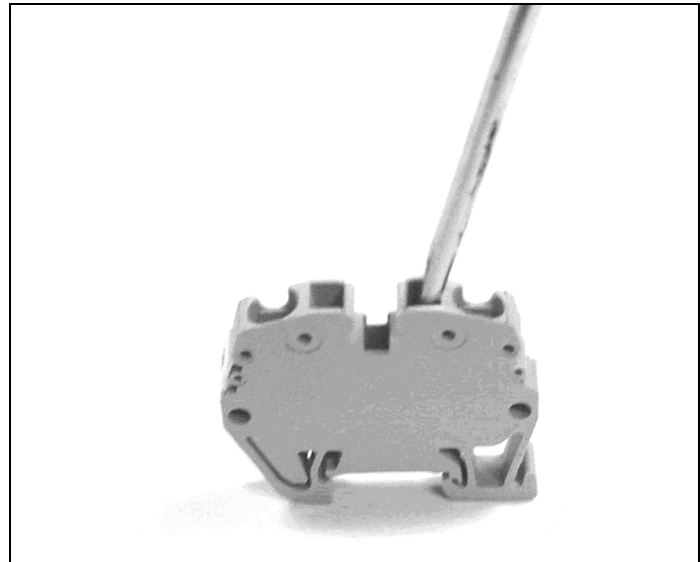


Figure 28. Screwdriver Inserted in the "Tool" Hole.

Step 3: Once the screwdriver is in place, obtain a stripped wire (strip about 1/4 in.) and insert it into the larger circular wire hole. Push the wire in until it can go no further.

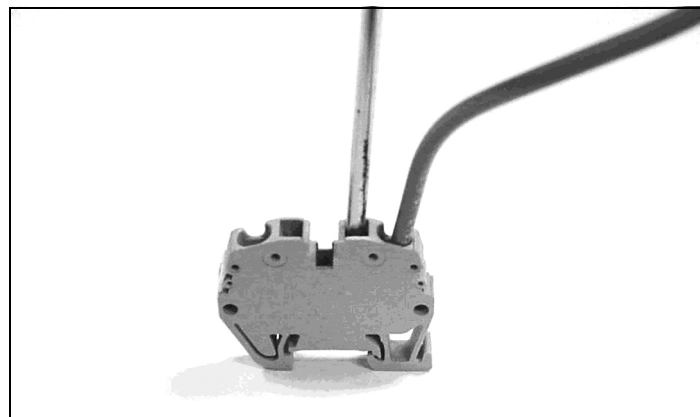


Figure 29. Wire Inserted in the "Wire" Hole.

ATC-300 Breaker Based Transfer Switch

Step 4: While holding the wire in place, pull the screwdriver out. The wire will now be held securely in the terminal block. Pull on the wire to insure that it is correctly inserted into the clamp.

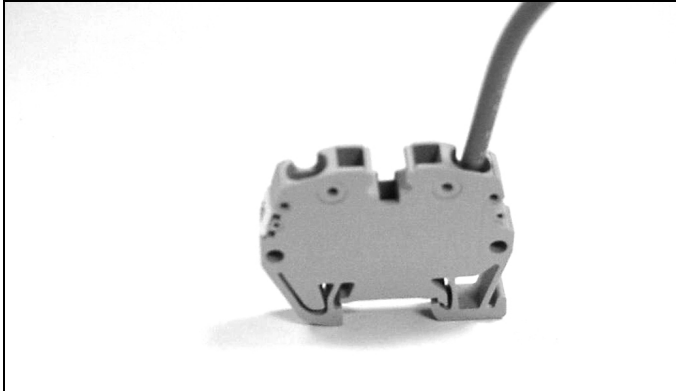


Figure 30. Wire Securely Installed in the Terminal Block.

Section 5: Operation

5.1 General

An ATS provides main contacts to connect and disconnect the load to and from the Source 1 and Source 2 power sources (Section 3.2.2). Each transfer mechanism provides the mechanical motion required to open and close the mechanically interlocked main contacts (Section 3.2.3).

Note that the transfer mechanisms for the two types of ATSs described in this booklet (30-150 A and 225-1200 A) are different for both the manual and automatic modes.

NOTICE

IF AN ATS WITH ANY TYPE OF ELECTRICAL OPERATING CAPABILITIES IS TO BE OPERATED UTILIZING THE MANUAL OPERATING HANDLE, IT IS STRONGLY RECOMMENDED THAT THE TRANSFER MOTOR CIRCUIT FIRST BE ISOLATED. THIS IS ACCOMPLISHED BY UNPLUGGING THE (P3) PLUG MARKED MOTOR DISCONNECT (FIGURE 31). ANY ATTEMPT TO USE THE MANUAL OPERATING HANDLE WITHOUT FIRST ISOLATING THE MOTOR CIRCUIT CAUSES AN AUTOMATIC TRANSFER.

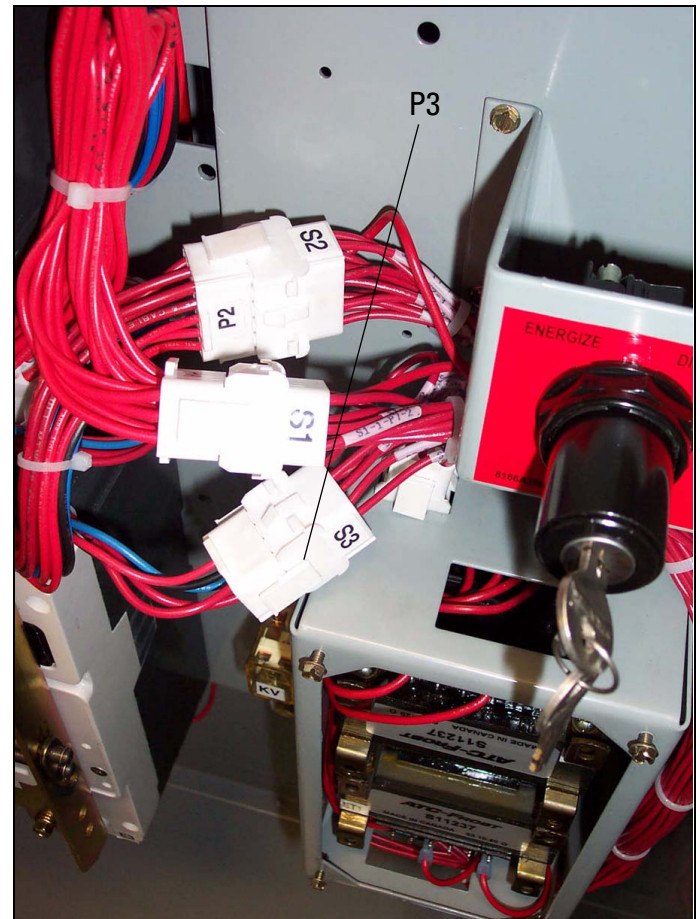


Figure 31. Motor Disconnect P3 must be disconnected.

5.2 Manual Operation (225-1200 A)

The manual operating handle can be used to create the rotational motion required to open and close the main contacts through a rigid mechanical interlocking system (Figure 32). An indicator wheel attached to the operating handle and mechanical interlocking system rotates with each movement of the handle to open and/or close the main contacts (Figures 33). Three distinct switch positions are provided and indicated visually on the indicator wheel (Figure 34).



Figure 32.ATS Manual Operating Handle in Use (225-1200 A Models).



Figure 34.Indicator Wheel in Neutral Position (225-1200 A Models).

The three distinct switch positions or contact conditions are:

- Source 1:** The contacts associated with the Source 1 power source are closed and the Source 2 power source contacts are open.
- Neutral:** The contacts associated with both the Source 1 and Source 2 power sources are open. This position allows for load circuit maintenance.
- Source 2:** The contacts associated with the Source 1 power source are open and the Source 2 power source contacts are closed.

To manually operate the ATS, the manual operating handle is ratcheted until the desired switch position is indicated on the indicator wheel. The operating handle, no matter what design or type of switch operation, is always electrically "dead" and the indicator wheel free-wheels should a particular switch have a motor and be capable of electrical operation. This feature ensures no operator problems should the switch automatically operate while the manual handle is being used.

5.3 Manual Operation (30 - 150 A)

To operate the breaker manually, or if the breaker trips, unplug P3 from S3 to disconnect the motor circuit (Figure 35). Turn and hold the break release lever to "HOLD FOR MANUAL OPERATION" position, and then rotate the manual operator knob in either direction to move the ATS into the desired position. Let go of the brake release lever for "AUTOMATIC OPERATION" after P3 and S3 are reconnected.

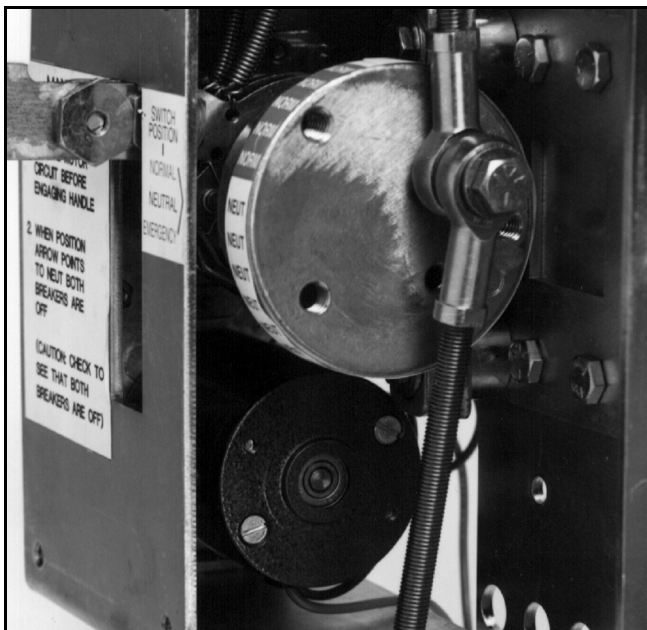


Figure 33.Indicator Wheel Mounted in the Switch with Motor Under the Wheel (225-1200 A Models).

ATC-300 Breaker Based Transfer Switch

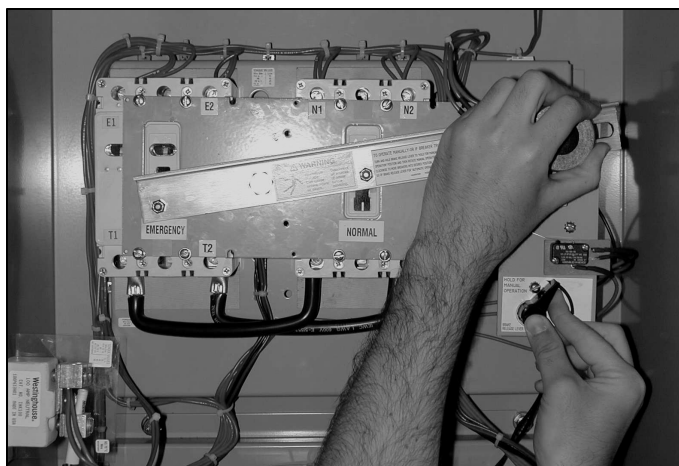


Figure 35. Switch Being Manually Operated (30-150 A Model).

5.4 Automatic Transfer

The operating sequence of an ATS is dictated by the switch's standard features and selected options. Operation of an ATS during Source 1 power source failure and Source 1 power source restoration will be described here with only standard options included on the switch. Additional options, as described in Section 3, can change sequences and timing, depending upon the options selected. It is strongly suggested that you become familiar with additional options selected with the particular ATS and their effect on the normal operation of an ATS.

5.4.1 Source 1 Power Source Failure

Standard Source 1 power source failure is defined as a reduction or loss of voltage. If this occurs, the sequence of operation is as follows.

1. Failure of Source 1 is detected by the controller intelligence.
2. When the controller detects a failure, the engine contacts close (after delay if programmed) and start the engine-driven generator.
3. When the Source 2 voltage reaches its operation rating, the K2 relay closes, starting the transfer operation. This operating sequence opens the Source 1 switch and closes the Source 2 switch.
4. The load is now transferred to the Source 2 power source.

5.4.2 Source 1 Power Source Restoration

1. A return to the Source 1 power source begins when the voltage in all phases of a three-phase sensing unit, or phase-to-phase in a single sensing unit, is restored to a preset value.
2. At the present voltage, the controller will cause the K1 relay to change state. This starts the return to the Source 1 power source and Source 1 transfer switch operation.
3. During this sequence, the Source 2 power source switch is opened and the Source 1 power source switch is closed.
4. Simultaneously, the engine cool-down timer initiates the shut down of the engine driven generator.
5. Transfer of the load back to the Source 1 power source is now complete.

Section 6: Testing and Problem Solving

6.1 Testing

After the ATS equipment is initially installed or during planned outages, the installation should be tested to ensure that all equipment operates properly. This attention to detail will help avoid unexpected malfunctions. Mechanical and/or electrical tests should be performed as described in this section.

The frequency of subsequent testing should be based on recommendations of the Genset manufacturer. Use the test pushbutton to check the electrical operation of the switch.

WARNING

HIGH VOLTAGES ASSOCIATED WITH OPERATIONAL TRANSFER SWITCH EQUIPMENT PRESENT A SHOCK HAZARD THAT CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. USE EXTREME CAUTION TO AVOID TOUCHING ELECTRICAL CONNECTIONS WHENEVER INSPECTING OR TESTING THE EQUIPMENT.

IN ADDITION, IMPROPER OPERATION OF THE GENERATOR SET PRESENTS A HAZARD THAT CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. OBSERVE ALL SAFETY PRECAUTIONS IN YOUR GENERATOR SET OPERATIONS AND INSTALLATION MANUALS.

6.1.1 Mechanical and/or Electrical Testing

NOTICE

SINCE FEATURE 4 (TIME DELAY ENGINE COOL-OFF), AS DESCRIBED IN SECTION 3, IS A STANDARD FEATURE, AN ENGINE START SIGNAL WILL BE PRESENT FOR A PERIOD OF TIME WHEN THE SWITCH IS FIRST ENERGIZED. THE PERIOD OF TIME IS EQUAL TO THE TIMER SETTING. TO AVOID STARTING THE ENGINE DURING THIS TIME PERIOD, TURN THE GENERATOR CONTROLS TO THE OFF POSITION.

Energize the ATS equipment as described in Sections 6.1.2 through 6.1.6. Insure that all safety precautions are taken and that all **WARNINGS** and **CAUTIONS** are observed.

6.1.2 No Voltage Steps

With no voltage available on either power source, proceed as follows.

- Step 1:** Check to make sure that both the Source 1 and Source 2 power switching devices are in the OPEN position. The switching devices can be put into the OPEN position using of the manual operating handle, stopping in the NEUTRAL position.
- Step 2:** The generator engine start controls should be in the OFF position to prevent an undesired start.
- Step 3:** Ensure that the ATS has been set to the proper applied system voltage (See Section 4.8).
- Step 4:** Check all ATS loads to ensure that they are ready to be energized.

6.1.3 Connecting the Power Sources

- Step 1:** Close the Source 1 power source upstream protection device. The Source 1 power switching device should close
- Step 2:** Connect the engine start battery cable.

Step 3: With the emergency generator in the OFF position, close the Source 2 power source upstream protective device, assuming such a device used.

NOTICE

AT THIS POINT, AND PRIOR TO MAKING ANY ATTEMPT TO ENERGIZE THE ATS EQUIPMENT, THE ENGINE-DRIVEN GENERATOR SHOULD BE OPERATED. IF NECESSARY, THE VOLTAGE REGULATOR ON THE GENERATOR SHOULD BE ADJUSTED ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS. THE ATS EQUIPMENT WILL RESPOND ONLY TO THE RATED VOLTAGE AND FREQUENCY PROGRAMMED INTO THE CONTROLLER.

Step 4: Close any generator engine-start controls opened as a result of actions taken in Step 4, Section 6.1.2.

Step 5: Where required, use an accurate voltmeter to check phase-to-phase and phase-to-neutral voltages present at the transfer switch Source 1, Source 2, and/or load terminals.

6.1.4 Operational Checks

Step 1: Check to ensure that the Source 1 switching device is in the CLOSED position. This should have been done in Section 6.1.3, Step 1.

Step 2: Initiate an automatic transfer operation from the Source 1 to the Source 2 power source by pressing the <Engine Test> pushbutton two times.

Note:The ATC-300 Logic Controller provides the capability to set the Engine Test function to:

- 1. No Load Engine Test;
- 2. Load Engine Test; or
- 3. Disabled.

The factory default is set to:

- 1. Load Engine Test
 - a. After the Time Delay Engine Starting (TDES) has timed out, the engine should start, run, and build up to normal voltage and frequency.
 - b. The transfer switch will transfer to the Source 2 power source (the Source 1 switching device opens and Source 2 switching device closes) after the Time Delay Normal to Emergency (TDNE) times out.

Step 3: Initiate an automatic transfer operation back to the Source 1 power source by pressing the <Engine Test> pushbutton one time.

- 1. After the Time Delay Emergency to Normal timer (TDEN) has timed out, the transfer switch will transfer back to the Source 1 power source (the Source 2 switching device opens and the Source 1 switching device closes).
- 2. The Time Delay for Engine Cool-Off (TDEC - Feature 4) will allow the engine to run unloaded for a preset time after transfer to the Source 1 power source is completed.

6.1.5 Alternate Tests

- 1. Alternate operational tests may be possible depending upon the options provided with any given ATS. Refer to the schematic diagram provided with the ATS equipment, along with the specification nameplate, to determine the exact options provided.
- 2. If you attempt to manually operate the ATS with the Source 1 power source connected and available, the ATC-300 logic will cycle the ATS back to the Source 1 power source since it is the preferred source. The ATS was designed with this safety feature in case a manual transfer is attempted while the switch is in automatic mode and under load.

6.2 Problem Solving



WARNING

HAZARDOUS VOLTAGES IN AND AROUND ATS EQUIPMENT DURING THE PROBLEM SOLVING PROCESS CAN CAUSE SEVERE PERSONAL INJURY AND/OR DEATH. AVOID CONTACT WITH ANY VOLTAGE SOURCE WHILE PROBLEM SOLVING.



WARNING

ONLY PROPERLY TRAINED PERSONNEL, FAMILIAR WITH THE ATS EQUIPMENT AND ITS ASSOCIATED EQUIPMENT, SHOULD BE PERMITTED TO PERFORM THE PROBLEM SOLVING FUNCTION. IF AN INDIVIDUAL IS NOT QUALIFIED TO PERFORM THE PROBLEM SOLVING FUNCTION, THE INDIVIDUAL SHOULD NOT ATTEMPT ANY OF THESE PROCEDURES.

A basic problem-solving effort is the first step to take prior to calling for assistance. Frequently, the effort will successfully address most problems encountered. The problem solving procedure is presented in the Troubleshooting Guide (Table 3, Section 7 of ATC-300 Controller Instruction Booklet IB01602009E). Remember, only qualified individuals familiar with the ATS equipment and the system in which it is applied should attempt these problem solving procedures.

If a problem persists after having completed the problem solving procedure, contact a Generac representative for further assistance. When calling for assistance, the following is the minimum information required to properly address the need:

- 1. Style number of ATS, if applicable;
- 2. Catalog number of ATS;
- 3. Actual location of the ATS (type of facility, address, etc.);
- 4. Company name and name and position of individual representing company;
- 5. Basic description of the situation as it exists; and
- 6. Any results of the problem solving steps taken and/or readings taken.

ATC-300 Breaker Based Transfer Switch

Section 7: Adjustments

7.1 General

Refer to I.B. 01602009E, supplied with the ATS for ATC-300 Controller adjustments and programming.

Section 8: Maintenance

8.1 Introduction



WARNING

HIGH VOLTAGES ARE PRESENT IN AND AROUND ATS EQUIPMENT. BEFORE INSPECTING OR MAINTAINING THIS EQUIPMENT, DISCONNECT THE LINE POWER FROM, THEN LOCK OUT, IF POSSIBLE, THE NEXT HIGHEST DISCONNECT DEVICE. FAILURE TO FOLLOW THIS PROCEDURE COULD CAUSE SEVERE PERSONAL INJURY AND/OR DEATH.

In general, ATS switch equipment is designed to be relatively maintenance free under normal usage. However, because of the variability of application conditions and the importance placed on dependable operation by this type of equipment, inspection and maintenance checks should be made on a regularly scheduled basis. Since equipment maintenance will consist mainly of keeping the equipment clean, the frequency of maintenance will depend to a large extent on the cleanliness of the equipment's surroundings. If a significant amount of dust or foreign matter is present, a more frequent maintenance schedule should be followed.

It is suggested that visual inspections of the equipment be made on a regular basis, not just during scheduled periods. Always be alert for an accumulation of dirt in and around the structure; loose parts; and/or hardware, cracks, and/or discoloration to insulation; and damaged or discolored components.

8.2 Procedures

A suggested maintenance procedure is outlined in Table 6.

Table 6. Periodic Maintenance Procedures

STEP	ACTION
a. Make the ATS equipment safe for inspection and/or maintenance.	Disconnect the line power from equipment being serviced by opening the next highest disconnect device. Make certain that any accessory control power is switched off by disconnecting all control plugs.
b. Inspect the structure area for safety hazards or potential maintenance problems.	Inspect the area, especially where molded case switching devices are installed, for any safety hazards, including personnel safety and fire hazards. Exposure to certain chemical vapors can cause deterioration of electrical connections. Inspect for accumulated dirt, loose hardware, or physical damage. Examine the primary insulation for evidence of cracking or overheating. Overheating will show as discoloration, melting, or blistering of conductor insulation, or as pitting or melting of conductor surfaces due to arcing. Inspect the secondary control connections for damage and the control wiring for insulation integrity.
c. Inspect the molded case switching devices for dust, dirt, soot, grease, moisture, or corrosion.	Remove dust, dirt, soot, grease, moisture, and corrosion contamination from the surface of the switching device using a dry soft lint-free cloth, dry soft bristle brush, and vacuum cleaner. Do not blow debris into the circuit breaker or nearby breaker structure. If contamination is found, look for the source and fix the problem.
d. Check for material integrity, uneven wear, discoloration, or loose hardware.	Severe material cracking will require replacement and loose hardware will need to be tightened.
e. Check the terminals and connectors for looseness or signs of overheating.	Overheating will show as discoloration, melting, or blistering of the conductor insulation. Connections that do not have signs of looseness or overheating should not be disturbed.
f. Exercise the molded case switching devices if they are not often exercised while in operation. This will permit a "wiping" action by the contacts.	If a switching device is used for frequent switching during normal operation, this step can be disregarded.
g. Return the ATS equipment to service.	Make certain all barriers are in place and doors closed. Reapply secondary and primary power.

Section 9: Renewal Parts Guide

9.1 General

Refer to Figure 36A and B for assistance with selecting and ordering selected ATS renewal parts. For more information please see Renewal Parts Publication (RP01603002E).

Example: To order the transformer panel for an **ATH3FDA30150XSU** transfer switch, order Catalog Number as shown in Figures 36 B.

COMPLETE POWER PANEL -
PLEASE NOTE THE ORIGINAL
CATALOG NUMBER OF
TRANSFER SWITCH, AS IT IS
REQUIRED TO COMPLETE THE
CATALOG NUMBER OF A
POWER PANEL.

EXAMPLE: **ATV3KDA30300WSU**
ATH3FDB20200BSU

VERTICAL POWER PANEL CAT#:
PPV3KDA30300XKU

NOTE THAT THE SECOND TO
THE LAST CHARACTER WILL
ALWAYS BE A "K" WHEN
ORDERING A REPLACEMENT
POWER PANEL.

HORIZONTAL POWER PANEL
CAT#: PPH3FDB20200BKU
(NOT SHOWN)

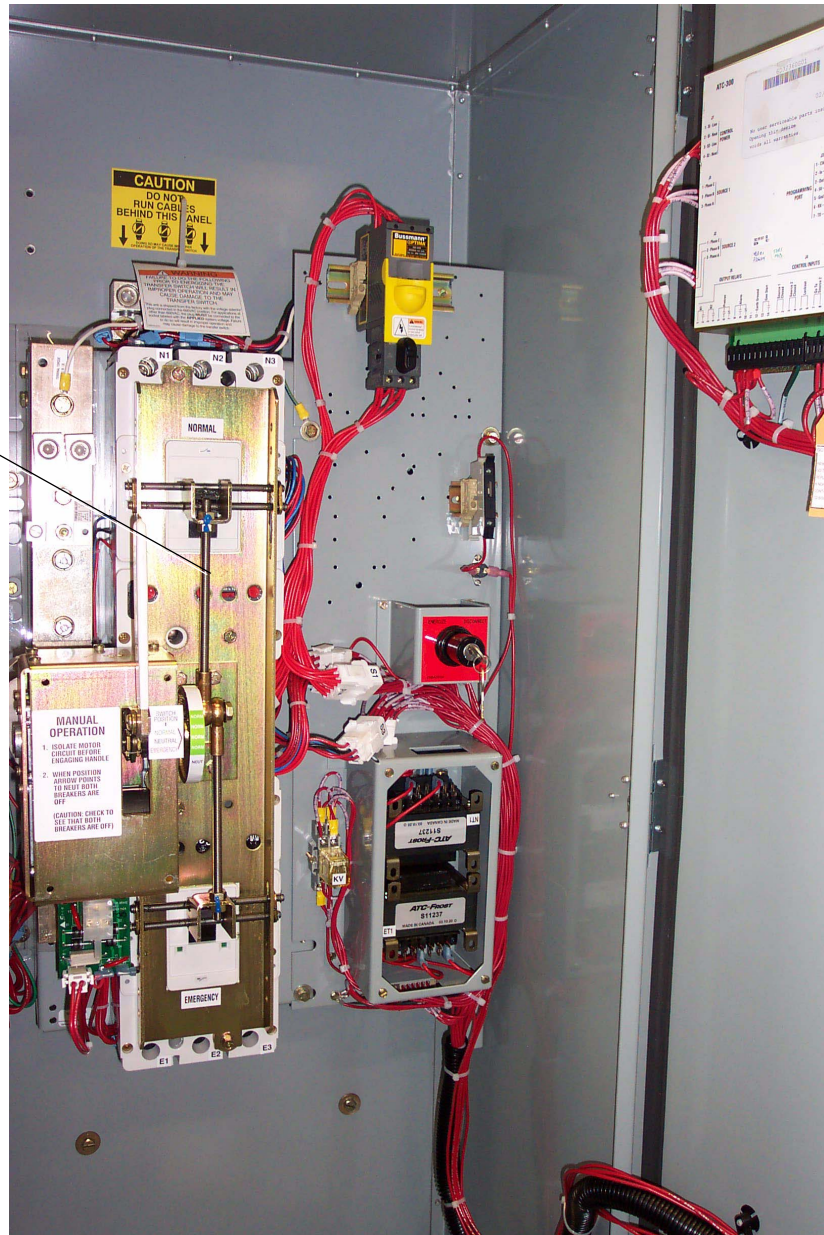


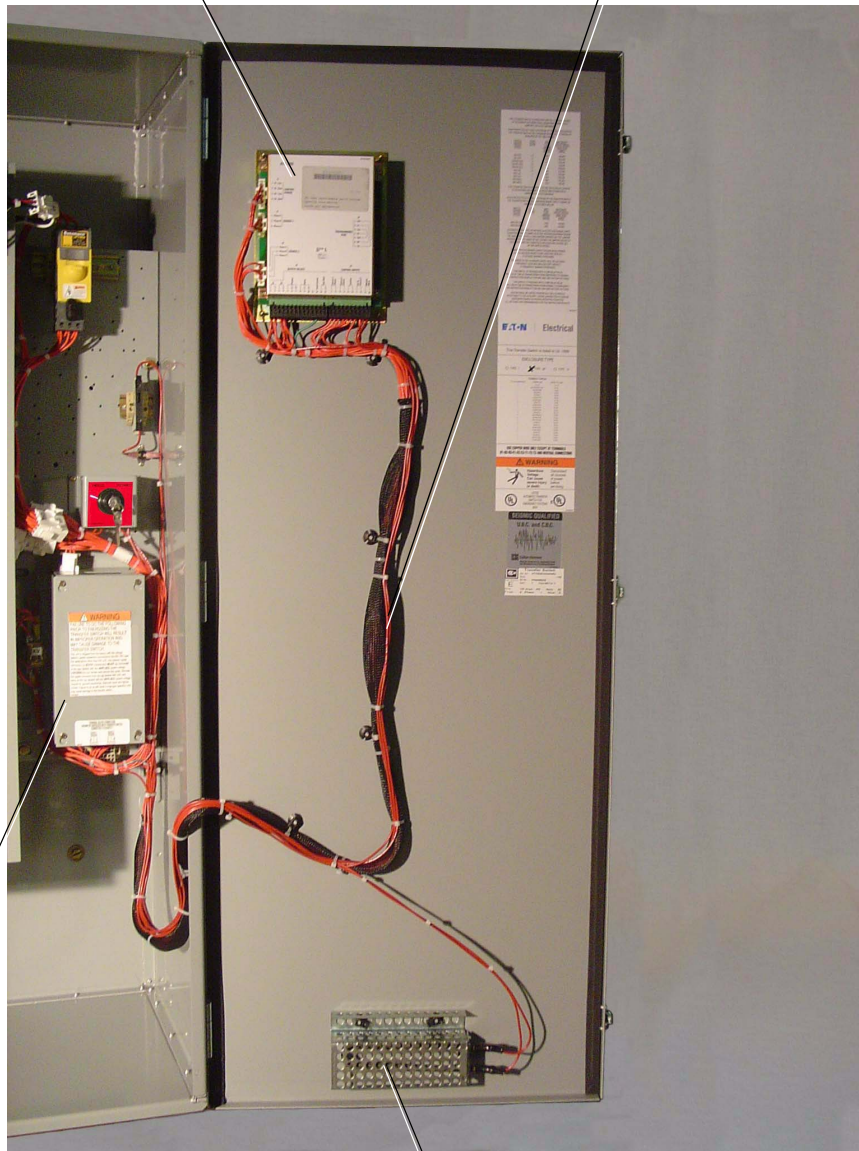
Figure 36A Typical ATC-300 Controlled Breaker Based ATS.

ATC-300 Breaker Based Transfer Switch

ATC-300 CONTROLLER-BREAKER TYPE (TDN)-CAT# 8160A00G22

WIRE HARNESS (ATH3/ATV3)

DOMESTIC SWITCH-CAT# 68C8097G03
INTERNATIONAL SWITCH-CAT# 68C8097G01
AG SWITCH-CAT# 68C8097G02



100W SPACE HEATER

DOMESTIC/INTERNATIONAL SWITCH-CAT# 8160A41G52
AG SWITCH-CAT# 8160A41G53

TRANSFORMER PANEL

DOMESTIC SWITCH, ATH3 (HORIZONTAL)-CAT# 8885C45G35
DOMESTIC SWITCH, ATV3 (VERTICAL)-CAT# 8885C45G34
INTERNATIONAL SWITCH, ATH3 (HORIZONTAL)-CAT# 8885C45G31
INTERNATIONAL SWITCH, ATV3 (VERTICAL)-CAT# 8885C45G30
AG SWITCH, ATH3 (HORIZONTAL)-CAT# 8885C45G33
AG SWITCH, ATV3 (VERTICAL)-CAT# 8885C45G32

Figure 36B. Typical ATC-300 Controlled Breaker Based ATS.

**Section 10: ATC-300 Controlled ATS
Quick Start Instructions**



WARNING

THESE QUICK START INSTRUCTIONS ARE NOT A COMPLETE SOURCE OF INFORMATION ON THE ATC-300 CONTROLLED ATS EQUIPMENT. INSTALLATION SHOULD NOT BE STARTED UNTIL THE ENTIRE INSTRUCTION BOOK HAS BEEN REVIEWED AND UNDERSTOOD. FAILURE TO FOLLOW THE FULL INSTRUCTIONS CAN RESULT IN DEATH, SEVERE PERSONAL INJURY, OR PROPERTY DAMAGE.



WARNING

THESE QUICK START INSTRUCTIONS ARE PROVIDED FOR USE ONLY BY TECHNICIANS HIGHLY FAMILIAR AND EXPERIENCED WITH ATC-300 CONTROLLED ATS EQUIPMENT INSTALLATION, SET UP, AND TESTING. IT IS STRONGLY SUGGESTED THAT THE FULL INSTRUCTIONS BE FOLLOWED FOR ALL INSTALLATIONS, SET UP, AND TESTING.

Step 1: Mount the ATS on a flat rigid surface (Figure 37). Shim if necessary. For seismic mounting requirements, check the main instruction sections of this manual.

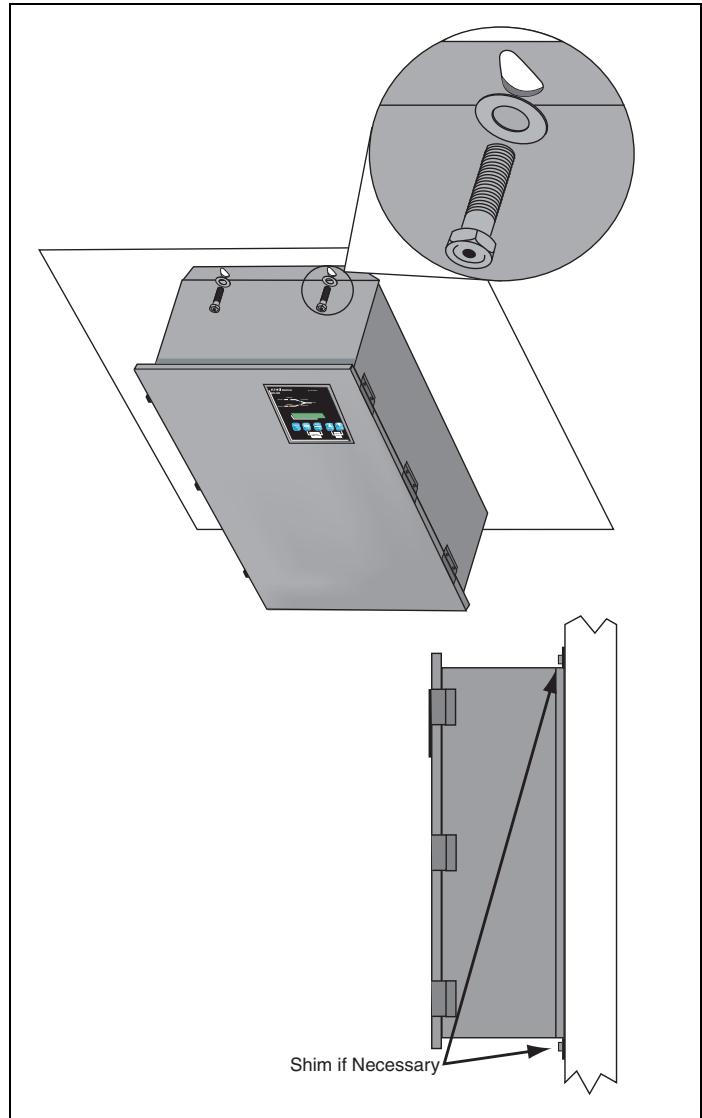


Figure 37. Mounting Details.

Step 2: Install the power cables. Cables must be sized and installed per National Electrical Code, refer to NFPA70. The cables must be sized within the specified cable size range on the side of the cable connectors.

Connect the cables and torque to the correct value indicated on the label near the lugs in the following order:

1. Load Cables* (T1, T2, T3);
2. Source 1 or Utility Supply (N1, N2, N3); and
3. Source 2 or Generator Supply (E1, E2, E3).

For 4 pole transfer switches, connect the load cables (TN), Source 1 or utility supply (NN), and Source 2 or generator supply (EN). Refer to Figure 38 for the location of all parts discussed in this document.

* Load cables on switches using the vertical design MUST be connected and torqued BEFORE installing the SUPPLY cables (Figures 38 and 39).

ATC-300 Breaker Based Transfer Switch

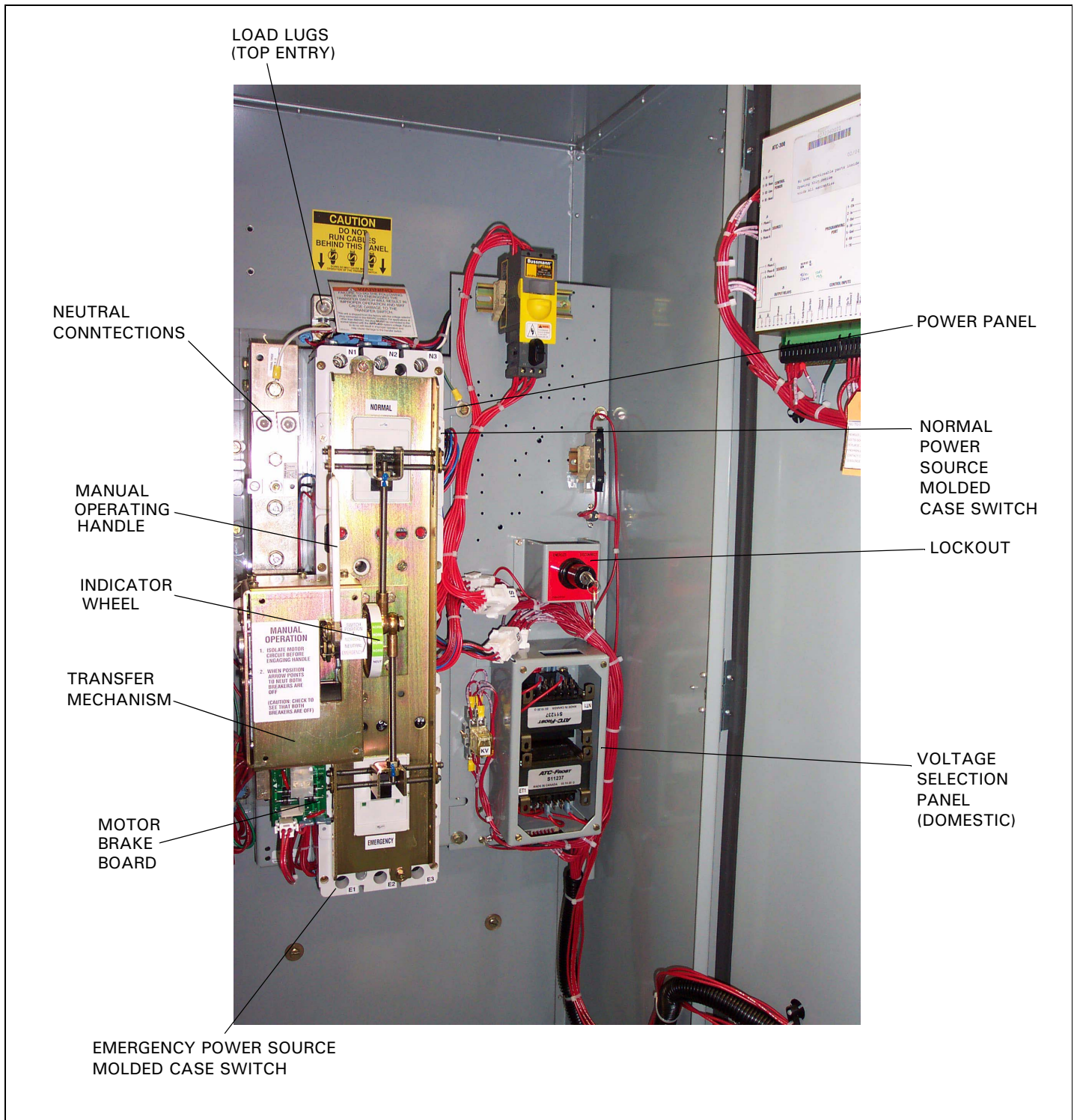


Figure 38.300 A, 3-Pole, ATS Interior Components.

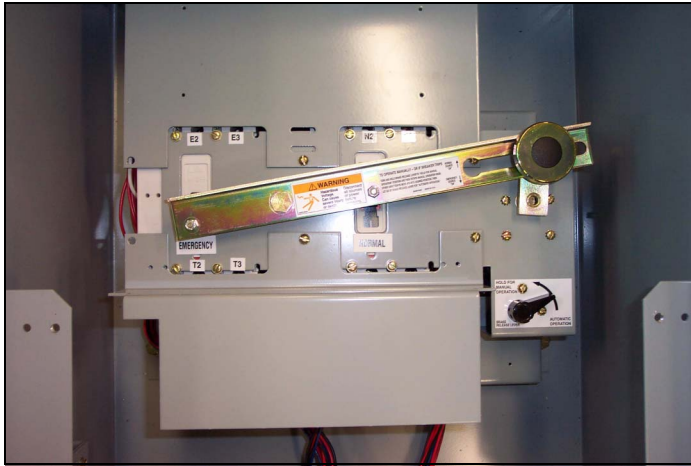


Figure 39. Horizontal Power Panel

- Step 3:** Turn the generator OFF at the generator control panel. This will prevent unexpected activation of the generator.
- Step 4:** Connect the Engine Generator Start wires to terminals 13 and 14 on the J-5 connector on the ATC-300 Controller (Figure 40). This contact is CLOSED whenever the engine generator is needed, and should be connected to a generator controller. **NEVER** connect directly to a starter solenoid or ignition system. See the Genset manufacturer instruction leaflet for recommended wire sizes and location procedures.
- Step 5:** Apply Utility (Source 1) power. If the switch is properly applied for the system voltage ordered, the display should work and the Source 1 Available white LED should light (Figure 41). Using a voltmeter, check for proper system voltage on Source 1 and load terminals. Check all phases on a 3-phase switch. Voltage measurements should be taken phase to phase and phase to neutral.

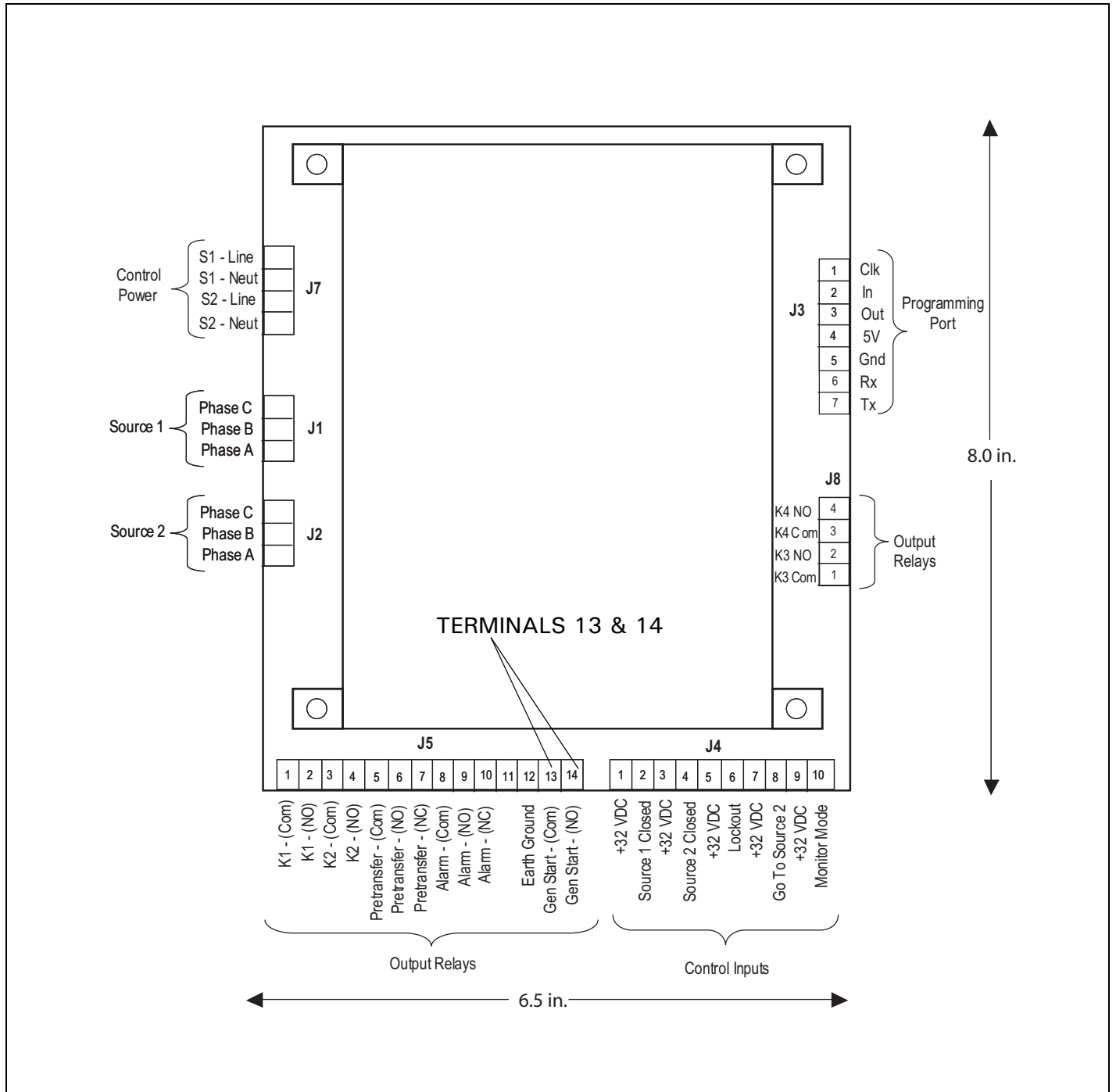


Figure 40. Engine Generator Control Connection

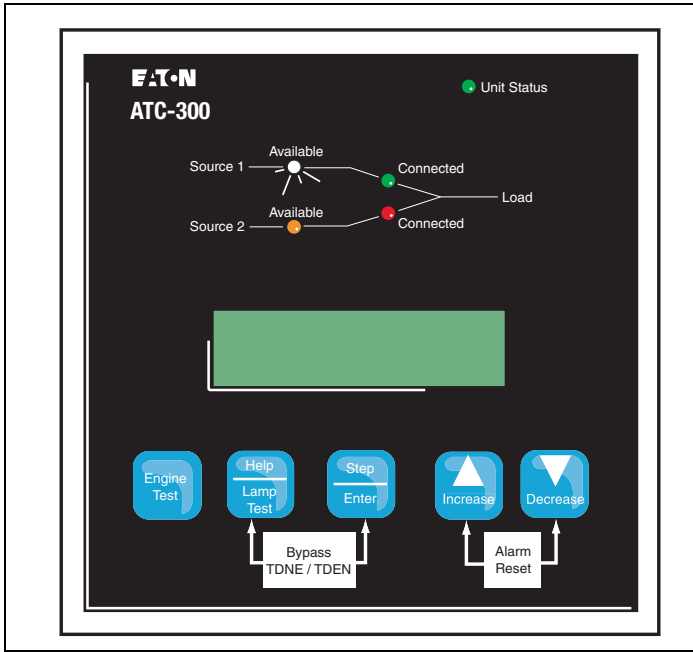


Figure 41. ATC-300 Logic (Utility Supplying Load)

Step 6: To view the setpoints, press the <Step/Enter> pushbutton and enter the Password.

Note: The factory default Password is 0300. Once all installation and testing is complete, the Password should be changed by authorized personnel to a unique Password for the equipment.

After entering the password, press the <Step/Enter> pushbutton until the VIEW SETPOINTS menu appears. Select YES. Press the <Step/Enter> pushbutton to scroll through the setpoints (Figures 42 through 43 and Table 7).

ATC-300 Breaker Based Transfer Switch

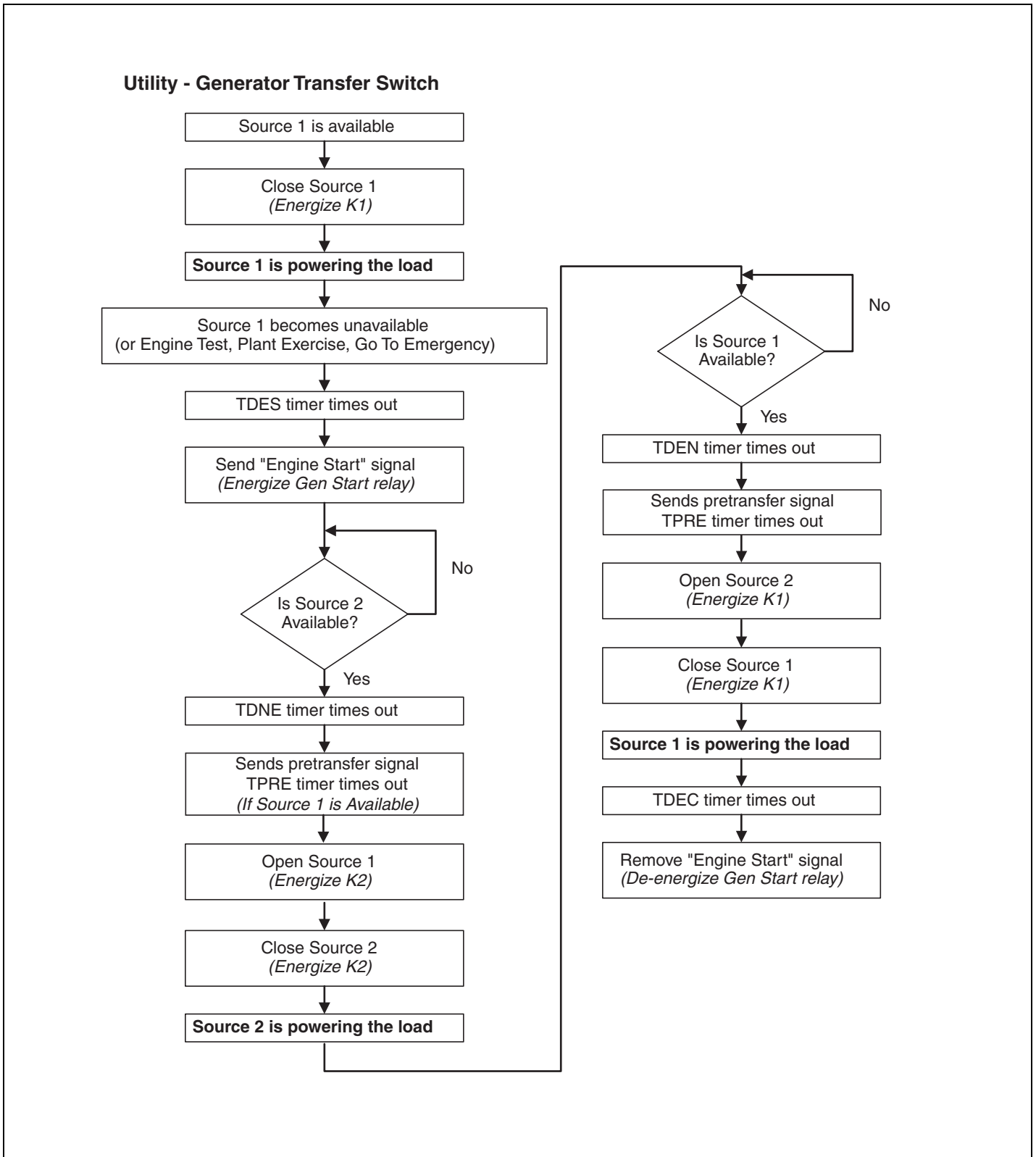


Figure 42. Utility - Generator Transfer Switch

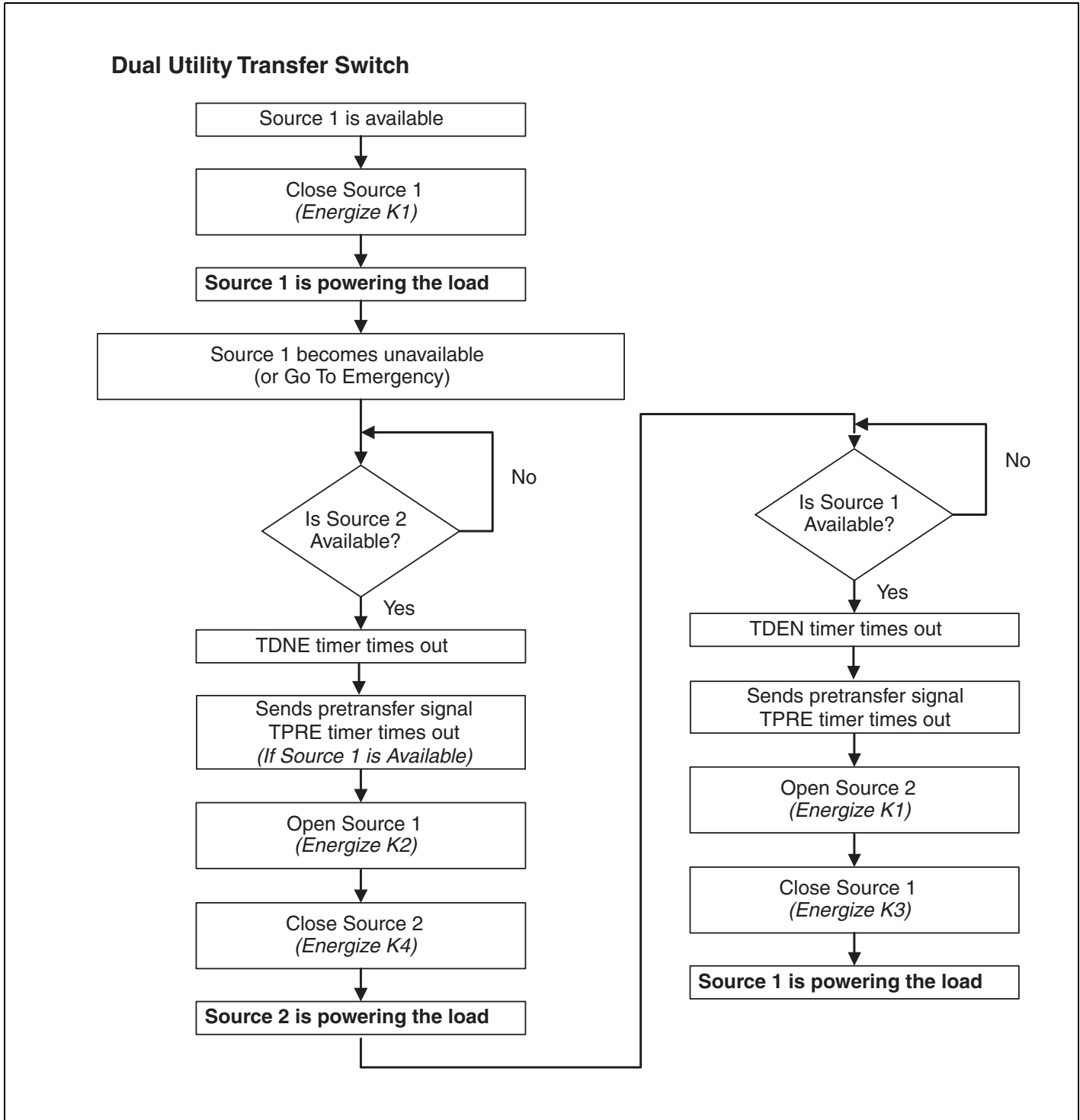


Figure 43. Dual Utility Transfer Switch

ATC-300 Breaker Based Transfer Switch

The following setpoints are programmable if the corresponding feature is programmed.

Table 7. Programmable Features and Setpoints

SETPOINT	SETPOINT UNITS	DESCRIPTION	RANGE	FACTORY DEFAULT
New Password	Four Digits	Set New Password	0000 to 9999	0300
TDES	Minutes: Seconds	Time Delay Engine Start	0 to 120 seconds	0:03
TDNE	Minutes: Seconds	Time Delay Normal to Emergency	0 to 1800 seconds	0:00
TDEN	Minutes: Seconds	Time Delay Emergency to Normal	0 to 1800 seconds	5:00
TDEC	Minutes: Seconds	Time Delay Engine Cool-off	0 to 1800 seconds	5:00
NOM FREQ	Hertz	Nominal Frequency	50 or 60 Hz	As ordered
NOM VOLTS	Volts	Nominal Voltage	120 to 600 volts	As ordered
S1 UV DROP	Volts	Source 1 Undervoltage Dropout Range: Breaker/Switch Style ATS	50 to 97% of Nominal System Voltage	80%
S2 UV DROP	Volts	Source 2 Undervoltage Dropout Range: Breaker/Switch Style ATS	50 to 97% of Nominal System Voltage	80%
S1 UV PICK	Volts	Source 1 Undervoltage Pickup Range: Breaker/Switch Style ATS	(Dropout + 2%) to 99% of Nominal System Voltage	90%
S2 UV PICK	Volts	Source 2 Undervoltage Pickup Range: Breaker/Switch Style ATS	(Dropout + 2%) to 99% of Nominal System Voltage	90%
S1 OV DROP	Volts	Source 1 Overvoltage Dropout Range: Breaker/Switch Style ATS	105 to 120% of Nominal System Voltage	115%
S2 OV DROP	Volts	Source 2 Overvoltage Dropout Range: Breaker/Switch Style ATS	105 to 120% of Nominal System Voltage	115%
S1 OV PICK	Volts	Source 1 Overvoltage Pickup Range: Breaker/Switch Style ATS	103% to (Dropout -2%) of Nominal System Voltage	110%
S2 OV PICK	Volts	Source 2 Overvoltage Pickup Range: Breaker/Switch Style ATS	103% to (Dropout -2%) of Nominal System Voltage	110%
S1 UF DROP	Hertz	Source 1 Underfrequency Dropout Range: Breaker/Switch Style ATS	90 to 97% of Nominal System Frequency	94%
S2 UF DROP	Hertz	Source 2 Underfrequency Dropout Range: Breaker/Switch Style ATS	90 to 97% of Nominal System Frequency	94%
S1 UF PICK	Hertz	Source 1 Underfrequency Pickup Range: Breaker/Switch Style ATS	(Dropout + 1 Hz) to 99% of Nominal System Frequency	96%
S2 UF PICK	Hertz	Source 2 Underfrequency Pickup Range: Breaker/Switch Style ATS	(Dropout + 1 Hz) to 99% of Nominal System Frequency	96%
S1 OF DROP	Hertz	Source 1 Overfrequency Dropout Range: Breaker/Switch Style ATS	103 to 110% of Nominal System Frequency	106%
S2 OF DROP	Hertz	Source 2 Overfrequency Dropout Range: Breaker/Switch Style ATS	103 to 110% of Nominal System Frequency	106%
S1 OF PICK	Hertz	Source 1 Overfrequency Pickup Range: Breaker/Switch Style ATS	101% to (Dropout -1 Hz) of Nominal System Frequency	104%
S2 OF PICK	Hertz	Source 2 Overfrequency Pickup Range: Breaker/Switch Style ATS	101% to (Dropout -1 Hz) of Nominal System Frequency	104%
TDN	Minutes: Seconds	Time Delay Neutral	0 to 120 seconds	0:00
PLANT EXER	Days	Plant Exerciser Programming	OFF, DAILY, 7-DAY, 14-DAY or 28 DAY	OFF
PE LOAD XFR		Plant Exerciser Load Transfer	0 or 1 (1 = yes)	0
PE DAY	Days	Plant Exerciser Day of the Week	1 SUN, 2 MON, 3 TUE, 4 WED, 5 THU, 6 FRI or 7 SAT	
PE HOUR	Hours	Plant Exerciser Hour	0 to 23	0
PE MINUTE	Minutes	Plant Exerciser Minute	0 to 59	0
TEST MODE		Test Mode	0, 1 or 2 (0 = No Load Engine Test, 1 = Load Engine Test, 2 = Disabled)	0
TER	Hours: Minutes	Engine run test time	0 min to 600 min	5:00
TPRE	Minutes: Seconds	Pretransfer delay timer	0 sec to 120 sec	0:00
PHASES		Three phase or single phase	1 or 3	AS ORDERED
VOLT UNBAL	Volts	Voltage Unbalanced	0 or 1 (1 = Enabled)	1
UNBAL DROP %	Percent	Percent for Unbalanced Voltage Dropout	5 to 20% of Phase to Phase Voltage Unbalance	20%

Table 7 Programmable Features and Setpoints (Cont.)

SETPOINT	SETPOINT UNITS	DESCRIPTION	RANGE	FACTORY DEFAULT
UNBAL PICK %	Percent	Percent for Unbalanced Voltage Pickup	Dropout minus (UNBAL DROP % -2) to 3%	10%
UNBAL DELAY	Seconds	Unbalanced Delay Timer	10 to 30	0:20
TDEF	Seconds	Time Delay Emergency Fail Timer	0 sec to 6 sec	6
PHASE REV		Phase Reversal	OFF, ABC, or CBA	OFF
DST ADJUST		Day Light Savings	0 or 1 (1 = Enabled)	1
LANGUAGE		Selected Language	English, French, or Spanish	English
CHANGE TIME/DATE?		Set Time and Date		
	Hours	Set Hour	0 to 23	Eastern Standard Time
	MINUTES	Set Minute	0 to 59	Eastern Standard Time
	WEEKDAY	Set Weekday	SUN, MON, TUE, WED, THU, FRI or SAT	Eastern Standard Time
	MONTH	Set Month	JAN or 01	Eastern Standard Time
	DAY	Set Day	1 to 31	Eastern Standard Time
	YEAR	Set Year	Current Year	Eastern Standard Time
RESET SYSTEM COUNTERS?			Yes or No	No
RESET ALL?		Resets all System Counters	Yes or No	No
RESET ENGINE RUN?	Hours	Resets ENGINE RUN Counter	0 to 9999	XXXX
RESET S1 CONN	Hours	Resets S1 CONN Counter	0 to 9999	XXXX
RESET S2 CONN	Hours	Resets S2 CONN Counter	0 to 9999	XXXX
RESET S1 AVAIL	Hours	Resets S1 AVAIL Counter	0 to 9999	XXXX
RESET S2 AVAIL	Hours	Resets S2 AVAIL Counter	0 to 9999	XXXX
RESET LOAD ENERG	Hours	Resets LOAD ENERG Counter	0 to 9999	XXXX
RESET TRANSFERS	Hours	Resets TRANSFERS Counter	0 to 9999	XXXX
SAVE SETPOINTS?		Save Changed Setpoints	Yes or No	Yes

See tables in the appendix for Voltage and Frequency Pickup and Dropout settings.

ATC-300 Breaker Based Transfer Switch

Step 7: To change or add a setpoint, select **Yes** when the "Change Setpoints" message appears on the screen. Use the **<Step/Enter>** pushbutton to step through the setpoints.

Use the **<Increase>** and **<Decrease>** pushbuttons to change the setpoint.

When finished scrolling through and changing the desired setpoints, answer **Yes** when the "Save Setpoints?" question appears on the screen. The display will return to the default screen.

Step 9: Initiate a Load Test from the front panel of the ATC-300 (Figure 45). This may be done by setting the engine test setpoint to:

1 Load Test

then saving the setpoints. Once the engine test setpoint has been changed and saved, press the **<Engine Test>** pushbutton twice. The generator should start, the ATS should transfer and run on the generator for the set test interval, then proceed to a TDEN countdown and return to Source 1. While the ATS is connected to Source 2, use a voltmeter to check for correct system voltage on the load terminals of the ATS. Check all phases on a 3-phase system. Voltage measurements should be taken phase to phase and phase to neutral. A load test will cause a momentary power outage during transfer.

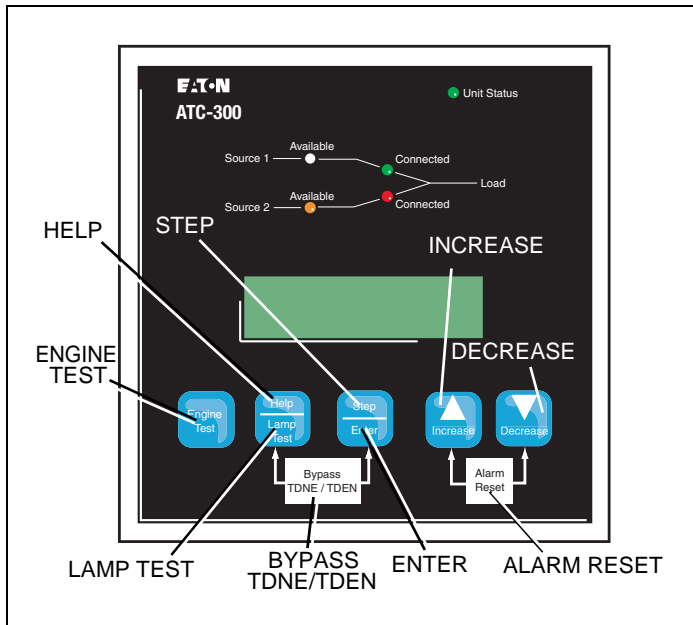


Figure 44. ATC-300 Pushbuttons

WARNING

THE GENERATOR SHOULD BE MANUALLY STARTED AND THE OUTPUT CHECKED AND VERIFIED BEFORE PROCEEDING TO STEP 8. IF IMPROPER VOLTAGE/FREQUENCY IS APPLIED TO THE LOAD, THE ATS MAY BE DAMAGED.

Step 8: Manually start the engine generator at the generator controller (Figure 44). Check that the generator is running and the **Source 2 Available** amber LED is lit. Press the **<Step/Enter>** pushbutton, step through the phase voltages, frequency, and message display. If the source message indicates that the source is Good, shut down the generator and place the Genset controller in the Auto-operating position. If the message indicates a problem with the source, the setpoints should be reviewed and the generator checked for proper voltage and frequency output.

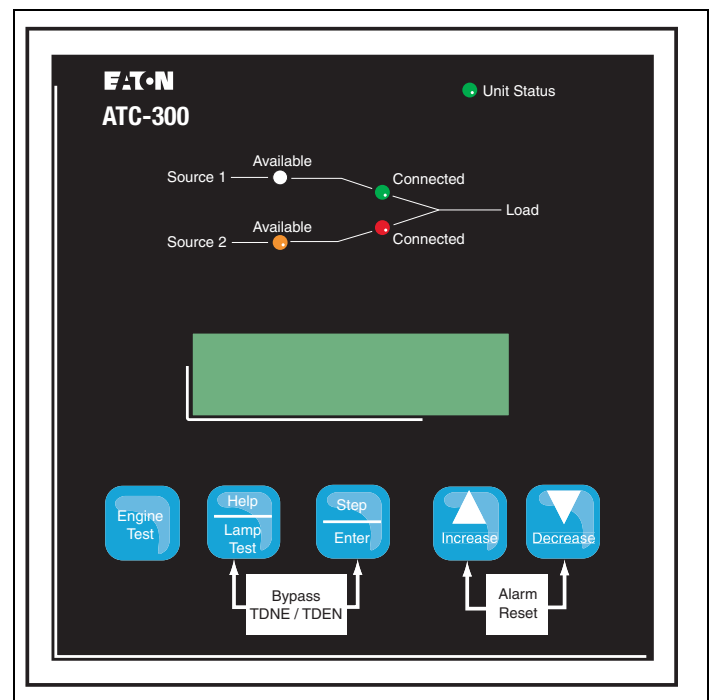


Figure 45. ATC-300 Logic.

Step 10: ATH3/ATV3 Controlled ATS Power Failure Test - Initiate a Load Test by simulating an actual power failure.

1. This should be done by opening the upstream breaker or fused disconnect switch.
2. If the ATS is Service Equipment Rated with no upstream disconnect, use the Source 1 Control Circuit Fused Disconnect to simulate a power failure (Figure 46).

The Source 1 Control Circuit Fused Disconnect can be found in one of two places. The first would be located directly beside the Source 1 breaker. The second would be located on the transformer panel/customer connection panel. The Source 1 Control Circuit Fused Disconnect is the disconnect marked Source 1. The disconnect switch should be in the ON position for Source 1 operation. Turning the switch to the OFF position will simulate a Source 1 power outage.

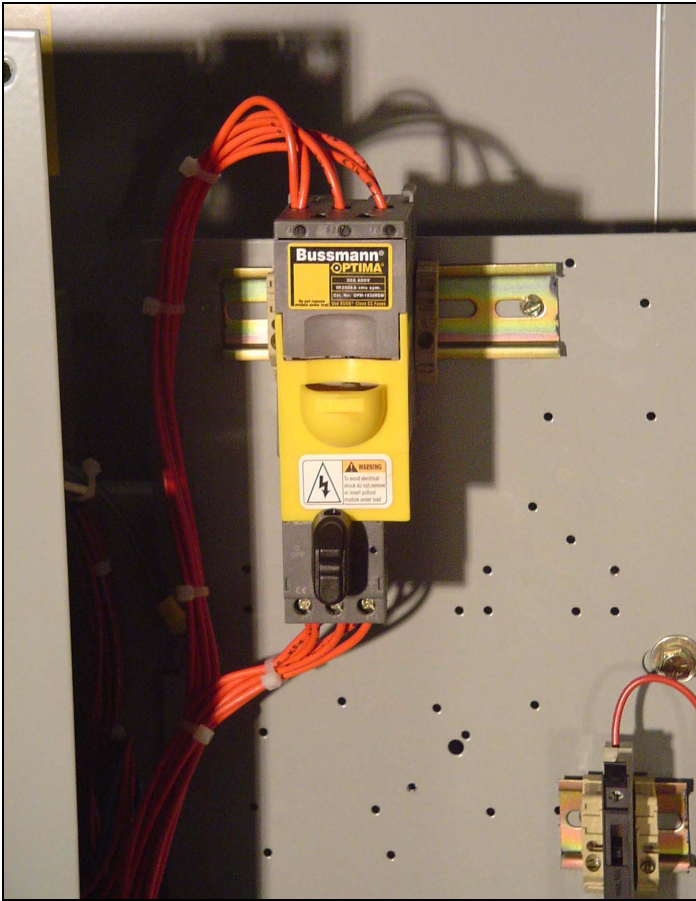


Figure 46. Source 1 Control Disconnect in the ON Position.

3. The generator should start and the ATS should transfer to Source 2.
4. After transfer, close the upstream breaker, or close the Source 1 Control Circuit Fused Disconnect. The TDEN timer should begin counting, and, when complete, the ATS should transfer to Source 1. The TDEC should time out and shut the Source 2 power unit down.

NOTICE

WHILE PERFORMING TESTING, IF AN UNDESIRED OR UNDOCUMENTED RESULT OCCURS, CONTACT THE GENERAC SALES REPRESENTATIVE.

ATC-300 Breaker Based Transfer Switch

Appendix A: Pickup / Dropout Tables

UNDERVOLTAGE PICKUP / DROPOUT TABLE

PERCENTAGE	VOLTAGE							
	120	208	220	240	380	415	480	600
97	116	202	213	233	369	403	466	582
96	115	200	211	230	365	398	461	576
95	114	198	209	228	361	394	456	570
94	113	196	207	226	357	390	451	564
93	112	193	205	223	353	386	446	558
92	110	191	202	221	350	382	442	552
91	109	189	200	218	346	378	437	546
90	108	187	198	216	342	374	432	540
89	107	185	196	214	338	369	427	534
88	106	183	194	211	334	365	422	528
87	104	181	191	209	331	361	418	522
86	103	179	189	206	327	357	413	516
85	102	177	187	204	323	353	408	510
84	101	175	185	202	319	349	403	504
83	100	173	183	199	315	344	398	498
82	98	171	180	197	312	340	394	492
81	97	168	178	194	308	336	389	486
80	96	166	176	192	304	332	384	480
79	95	164	174	190	300	328	379	474
78	94	162	172	187	296	324	374	468
77	92	160	169	185	293	320	370	462
76	91	158	167	182	289	315	365	456
75	90	156	165	180	285	311	360	450
74	89	154	163	178	281	307	355	444
73	88	152	161	175	277	303	350	438
72	86	150	158	173	274	299	346	432
71	85	148	156	170	270	295	341	426
70	84	146	154	168	266	291	336	420
69	83	144	152	166	262	286	331	414
68	82	141	150	163	258	282	326	408
67	80	139	147	161	255	278	322	402
66	79	137	145	158	251	274	317	396
65	78	135	143	156	247	270	312	390
64	77	133	141	154	243	266	307	384
63	76	131	139	151	239	261	302	378
62	74	129	136	149	236	257	298	372
61	73	127	134	146	232	253	293	366
60	72	125	132	144	228	249	288	360
59	71	123	130	142	224	245	283	354
58	70	121	128	139	220	241	278	348
57	68	119	125	137	217	237	274	342
56	67	116	123	134	213	232	269	336
55	66	114	121	132	209	228	264	330
54	65	112	119	130	205	224	259	324
53	64	110	117	127	201	220	254	318
52	62	108	114	125	198	216	250	312
51	61	106	112	122	194	212	245	306
50	60	104	110	120	190	208	240	300

ATC-300 Breaker Based Transfer Switch

OVERVOLTAGE PICKUP / DROPOUT TABLE

PERCENTAGE	VOLTAGE								
	120	208	220	240	380	415	480	600	
120	144	250	264	288	456	498	576	720	
119	143	248	262	286	452	494	571	714	
118	142	245	260	283	448	490	566	708	
117	140	243	257	281	445	486	562	702	
116	139	241	255	278	441	481	557	696	
115	138	239	253	276	437	477	552	690	Dropout
114	137	237	251	274	433	473	547	684	
113	136	235	249	271	429	469	542	678	
112	134	233	246	269	426	465	538	672	
111	133	231	244	266	422	461	533	666	
110	132	229	242	264	418	457	528	660	Pickup
109	131	227	240	262	414	452	523	654	
108	130	225	238	259	410	448	518	648	
107	128	223	235	257	407	444	514	642	
106	127	220	233	254	403	440	509	636	
105	126	218	231	252	399	436	504	630	

UNDERFREQUENCY PICKUP / DROPOUT TABLE

PERCENTAGE	FREQUENCY		
	50	60	
97	49	58	
96	48	58	Pickup
95	48	57	
94	47	56	Dropout
93	47	56	
92	46	55	
91	46	55	
90	45	54	

OVERFREQUENCY PICKUP / DROPOUT TABLE

PERCENTAGE	FREQUENCY		
	50	60	
110	55	66	
109	55	65	
108	54	65	
107	54	64	
106	53	64	Dropout
105	53	63	
104	52	62	Pickup
103	52	62	

ATC-300 Breaker Based Transfer Switch

Notes:

Notes:

ATC-300 Breaker Based Transfer Switch

Notes:

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**O & M Manual for the Generac ATC-300 +
Automatic Transfer Switch Controller**

Instruction Booklet

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 **CAUTION**

THE ATC-300+ CONTROLLER IS FACTORY PROGRAMMED FOR A SPECIFIC AUTOMATIC TRANSFER SWITCH. DO NOT ATTEMPT TO INTERCHANGE ATC-300+ CONTROL DEVICES WITHOUT CONSULTING GENERAC.

All possible contingencies that may arise during installation, operation, or maintenance, and all details and variations of this equipment do no purport to be covered by these instructions. If further information is desired by the purchaser regarding a particular installation, operation, or maintenance of particular equipment, please contact an authorized Generac Sales Representative or the installing contractor.

Section 1: Introduction

1.1 Preliminary Comments and Safety Precautions

This technical document is intended to cover most aspects associated with the installation, application, operation, and maintenance of the Automatic Transfer Controller (ATC)-300 Controller. It is provided as a guide for authorized and qualified personnel only in the selection and application of the ATC-300+ Controller. Please refer to the specific WARNING and CAUTION in Section 1.1.2 before proceeding. If further information is required by the purchaser regarding a particular installation, application, or maintenance activity, please contact an authorized Generac sales representative or the installing contractor.

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1.1.2 Safety Precautions

All safety codes, safety standards, and/or regulations must be strictly observed in the installation, operation, and maintenance of this device.

 **WARNING**

THE WARNINGS AND CAUTIONS INCLUDED AS PART OF THE PROCEDURAL STEPS IN THIS DOCUMENT ARE FOR PERSONNEL SAFETY AND PROTECTION OF EQUIPMENT FROM DAMAGE. AN EXAMPLE OF A TYPICAL WARNING LABEL HEADING IS SHOWN ABOVE TO FAMILIARIZE PERSONNEL WITH THE STYLE OF PRESENTATION. THIS WILL HELP TO INSURE THAT PERSONNEL ARE ALERT TO WARNINGS, WHICH APPEAR THROUGHOUT THE DOCUMENT. IN ADDITION, WARNINGS AND CAUTIONS ARE ALL UPPER CASE AND BOLDFACE.

 **CAUTION**

COMPLETELY READ AND UNDERSTAND THE MATERIAL PRESENTED IN THIS DOCUMENT BEFORE ATTEMPTING INSTALLATION, OPERATION, OR APPLICATION OF THE EQUIPMENT. IN ADDITION, ONLY QUALIFIED PERSONS SHOULD BE PERMITTED TO PERFORM ANY WORK ASSOCIATED WITH THIS EQUIPMENT. ANY WIRING INSTRUCTIONS PRESENTED IN THIS DOCUMENT MUST BE FOLLOWED PRECISELY. FAILURE TO DO SO COULD CAUSE PERMANENT EQUIPMENT DAMAGE.

1.2 Background

Transfer switches are used to protect critical electrical loads against loss of power. The load's Source 1 power source is backed up by a Source 2 power source. A transfer switch is connected to both the Source 1 and Source 2 power sources and supplies the load with power from one of the two sources. In the event that power is lost from Source 1, the transfer switch transfers the load to the Source 2 power source. This transfer can be automatic or manual, depending upon the type of transfer switch equipment being used. Once Source 1 power is restored, the load is automatically or manually transferred back to the Source 1 power source, again depending upon the type of transfer equipment being used.

In automatic transfer switch (ATS) equipment, the switch's intelligence system initiates the transfer when the Source 1 power falls below or rises above a preset voltage or frequency. If the Source 2 power source is a standby generator, the ATS initiates generator start up then transfers to the Source 2 power source when sufficient generator voltage is available. When Source 1 power is restored, the ATS automatically transfers back to the Source 1 power source and initiates generator engine shutdown.

An ATS consist of three basic elements:

1. Main contacts to connect and disconnect the load to and from the power sources.
2. A mechanism to transfer the main contacts from source to source.
3. Intelligence/supervisory circuits to constantly monitor the condition of the power sources and thus provide the intelligence necessary for the switch and related circuit operation.

This manual deals with the third basic element of the ATS, the required intelligence/supervisory circuits. Earlier ATSs were controlled by relay logic type or a solid-state, single board controllers. In either case, the control panel consisted of a number of individually mounted and wired devices offering a limited amount of system flexibility, especially in the case of the relay logic design. The ATC-300+ Controller advances the application of intelligence, supervisory, and programming capabilities for ATS equipment.

1.3 Product Overview

The ATC-300+ Controller is a comprehensive, multi-function, microprocessor based ATS controller. It is a compact, self-contained, panel mounted device designed to replace traditional relay and solid-state logic panels.

ATC-300+ Automatic Transfer Switch Controller

Designed to meet the needs of markets worldwide, the ATC-300+ Controller:

- Is a UL Recognized Component
- Complies with UL 1008/ CSA 22.2-178
- Meets the Intent of UL 991
- Meets IEC 1000-4-2, 1000-4-3, 1000-4-4, 1000-4-5, 1000-4-6, and 1000-4-11
- Meets CISPR 11, Class A
- Complies with FCC Part 15, Class A
- Meets European Standards Conformance (CE mark)

The ATC-300+ Controller provides an unmatched degree of programmed flexibility to address the needs of any system. It operates from all system voltages between 120 and 600 Vac, single-phase and 3-phase, at 50 or 60 Hz. In addition, a period of no control power operation is provided. The ATC-300+ Controller monitors the condition of the 3-phase line-to-line voltage and frequency of both the Source 1 and Source 2 power sources. It can also be programmed for single-phase operation. The ATC-300+ Controller provides the necessary intelligence to insure that the switch operates properly through a series of programmed sensing and timing functions.

A standard ATC-300+ Controller will:

- Monitor Source 1 and Source 2 power source voltages and frequencies;
- Provide undervoltage monitoring of the Source 1 and Source 2 power sources;
- Permit customer programming;
- Display real-time and historical information;
- Permit system testing;
- Store customer/factory established parameters in nonvolatile memory; and
- Provide faceplate source status indications.

1.4 Glossary

With respect to their use within this document and as they relate to ATS and controller operation, the following terminology is defined.

Available

A source is defined as "available" when it is within its undervoltage/overvoltage/ underfrequency/overfrequency (if applicable) setpoint ranges for the nominal voltage and frequency setting.

Connected

Connected is defined as when the input is shorted by an external contact or connection.

Failed or Fails

A source is defined as "failed" when it is outside of the applicable voltage and frequency setpoint ranges for the nominal voltage and frequency setting for a time exceeding 0.5 seconds after the time delay emergency fail (TDEF) time delays expires.

Failsafe

Failsafe is a feature that prevents disconnection from the only available power source and also forces a transfer or re-transfer operation to the only available power source.

Re-Transfer

Re-transfer is defined as a change of the load connection from the Source 2 to the Source 1.

Source 1

Source 1 is the primary source (normal source, normal power source, or normal).

Source 2

Source 2 is the secondary source (emergency source, emergency power source, emergency, standby, or backup source).

Source 1: Failed or Fails

Source 1 is defined as "failed" when it is outside of its undervoltage/overvoltage/ underfrequency/overfrequency (if applicable) setpoint ranges for the nominal voltage and frequency setting.

Source 2: Failed or Fails

Source 2 is defined as "failed" when it is outside of its undervoltage/overvoltage/ underfrequency/overfrequency (if applicable) setpoint ranges for the nominal voltage and frequency setting for a time exceeding 0.5 seconds after the TDEF time delay expires.

Transfer

Transfer is defined as a change of the load connection from the Source 1 to the Source 2 power source, except when specifically used as "Transfer to Neutral".

Transfer to Neutral

Transfer to neutral is defined as when the load circuits are disconnect from both the Source 1 and Source 2 power sources.

Unconnected

Unconnected is defined as when the input is not shorted by an external contact or connection.

$V_{IN, RMS}$

Refers to the operating input voltage (Vac, RMS).

1.5 Functions/Features/Options

The primary function of ATC-300+ Controller is to accurately monitor power sources and provide the necessary intelligence to operate an ATS in an appropriate and timely manner. In addition, the ATC-300+ Controller provides programming through the device's faceplate or communication option.

1.5.1 Operational Simplicity

From installation to programming to usage, the ATC-300+ Controller was designed with operational simplicity in mind. Only one style needs to be considered, regardless of input/output requirements or system voltages and frequencies. The ATC-300+ Controller provides the functionality of numerous other devices combined in one package that mounts in 6.5 by 8.5 inches of panel space.

The user-friendly front panel interface simplifies routine operation, programming, data presentation, and setting adjustments. An LCD-based display provides the flexibility of a back-lit display for enhanced visibility. The operation of the front panel membrane pushbuttons move the ATC-300+ Controller display from function to function or step to step within a function.

1.5.2 Standard and Optional Features

A variety of programmable features are available with the ATC 300 Controller to meet a wide variety of application requirements. Individual features or feature combinations provide the intelligence required to tailor ATSS to individual needs.

The features are factory activated, depending upon customer requirements. The specific variable setpoints associated with standard and factory activated features are stored in nonvolatile memory. Activated feature setpoints are available for customer adjustment. Any feature not selected and factory activated cannot be viewed or adjusted.

1.5.2.1 Standard Features

The following is a list of the standard features of the ATC-300+ Controller.

1. Time Delay Normal to Emergency (TDNE)

This feature provides a time delay when transferring from the Source 1 to the Source 2 power source. Timing begins when Source 2 becomes available. It permits controlled transfer of the load circuit to Source 2.

Adjustable 0 - 1800 Seconds

2. Time Delay on Engine Starting (TDES)

This feature provides a time delay of the signal to initiate the engine/generator start cycle in order to override momentary power outages or voltage fluctuations of Source 1.

Adjustable 0 - 120 Seconds

3. Time Delay Emergency to Normal (TDEN)

This feature provides a time delay of the re-transfer operation to permit stabilization of Source 1. Timing begins when Source 1 becomes available. If Source 2 fails during timing, then re-transfer is immediate, overriding the time delay.

Adjustable 0 - 1800 Seconds

4. Time Delay for Engine Cool-down (TDEC)

This feature provides a time delay of the signal to initiate the engine/generator stop cycle after the re-transfer operation. This allows the engine/generator to cool down by running unloaded. Timing begins on completion of the re-transfer cycle.

Adjustable 0 - 1800 Seconds

5. Source 2 Monitoring and Protection

This feature provides monitoring and protection based on the Source 2 voltage and/or frequency setpoints. All feature 5 functions are "failsafe" operations.

5H. Phase Reversal

For a 3-phase wye source, this feature monitors the phase sequence of the sources. If a source does not have the same ABC or CBA sequence as the setpoint value, that source will be considered "Unavailable".

For a 3-phase delta source, this feature should be turned off via the PHASE REV setpoint.

5J. 3-Phase Undervoltage and Underfrequency Protection

Adjustable Undervoltage:

Dropout (Breaker Style): 50 - 97% of nominal
Dropout (Contactor Style): 78 - 97% of nominal
Pickup: (Dropout + 2%) - 99% of nominal

Adjustable Underfrequency:

Dropout (Breaker Style): 90 - 97% of nominal
Dropout (Contactor Style): 90 - 97% of nominal
Pickup: (Dropout + 1Hz) - 99% of nominal

5K. 3-Phase Overvoltage/Overfrequency

Adjustable Overvoltage:

Dropout (Breaker Style): 105 - 120% of nominal
Dropout (Contactor Style): 105 - 110% of nominal
Pickup: 103% - (Dropout - 2%) of nominal

Adjustable Overfrequency:

Dropout (Breaker Style): 103 - 110% of nominal
Dropout (Contactor Style): 103 - 105% of nominal
Pickup: 101% - (Dropout - 1Hz) of nominal

5L. Source 2 3-Phase Source 2 Voltage Unbalance

For a 3-phase wye source, this feature monitors phase voltage ratios. Voltage unbalance (%) is calculated as the difference between the maximum and minimum phase voltage, divided by the minimum phase voltage. User-selectable setpoints are available for dropout and pickup unbalance settings (minimum 2% differential). Dropout is adjustable from 5 to 20%. Pickup is adjustable from 3 to (Dropout - 2%). A setpoint for user-selectable time delay from 10 to 30 seconds is provided. The factory default setpoints are: 5% dropout, 3% pickup, and 30 seconds time delay. A user-selectable setpoint for enable and disable is also provided.

When an unbalance condition is detected on Source 2, the Unbalance Timer (TD UNBAL) starts timing. After TD UNBAL times out, Source 2 is declared "failed".

For a 3-phase delta source, this feature should be turned off via the VOLT UNBAL setpoint.

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6. Test Operators

Generac ATCs are provided with a Test Pushbutton that simulates a loss of the Source 1 power source as standard (Feature 6B). All programmed time delays (TDNE, TDEN, etc.) will be performed as part of the Test. Engine run time of the Test is equal to the Plant Exerciser (Feature 23) programmed setpoint. All Tests are Failsafe protected.

6B. Test Pushbutton

Programmable setpoints include:

1. Load, No Load Testing, or Disabled and
2. Engine run time is equal to the Plant Exerciser (Feature 23) setting.

7. Time Delay Emergency Fail (TDEF)

This feature provides a time delay that prevents a connected emergency source from being declared "failed" in order to override momentary generator fluctuations. If the Source 2 power source remains in the failed state then, 0.5 seconds after the TDEF timer expires, the transfer switch will proceed with the programmed sequence for re-transfer. This time delay is only implemented when the Source 2 power source is a generator.

Adjustable 0 - 6 Seconds

8. Time Delay Bypass Pushbutton

This feature provides a way (by pushing the Help and Step pushbutton simultaneously) to bypass the TDNE (Feature 1) and/or TDEN (Feature 2) time delays. The Time Delay Bypass function, when activated by pushing the Help and Step pushbutton simultaneously, will reduce any or all of the programmed time delay to zero.

8C. Bypass TDEN

This feature provides a membrane pushbutton to bypass the TDEN time delay.

8D. Bypass TDNE

This feature provides a membrane pushbutton to bypass the TDNE time delay.

12. Power Source Annunciation

This feature provides LEDs to give switch position and power source availability indications.

Switch Position

Provides LEDs to indicate the switch position.

12C. Source 1 - Source Connected

This feature provides a green LED that, when lit, indicates the load is connected to Source 1.

12D. Source 2 - Source Connected

This feature provides a red LED that, when lit, indicates the load is connected to Source 2.

Power Source Availability

Provides LEDs to indicate if a power source is available. LEDs may be integral or separate from the controller.

12G. Source 1 - Available

This feature provides a white LED that, when lit, indicates Source 1 is available.

12H. Source 2 - Available

This feature provides an amber LED that, when lit, indicates Source 2 is available.

23. Plant Exerciser (PE)

This feature provides a means for automatic testing of the engine/generator set or standby power system. All programmed time delays will be performed during plant exerciser operations.

23K. Plant Exerciser Selectable – Disabled/1/7/14/28 Day Interval

This feature provides for automatic test operation of the generator. Available test cycles are daily, 7, 14, or 28 days with duration equal to the programmed engine test time.

Programmable setpoints allow for selection of three test cycles:

- Engine Start/Run Only (No Load);
- Exercise with Load Transfer; or Disabled
- This is a "Failsafe" operation.

26. Source 1 - Monitoring and Protection

This feature provides Source 1 monitoring and protection functions. If the Source 1 power supply fails, then the ATC-300+ will begin the sequence of operations necessary to transfer the load circuit to the Source 2 power source. All Feature 26 monitoring and protection functions are "failsafe" operations.

26D. Go to Source 2

This feature provides the capability for an external contact opening to initiate a load power transfer to the Source 2 power source. This includes starting the engine/generator, performing the programmed time delays, and the transfer operation. Re-transfer will occur when the external contact is closed or under a "failsafe" condition. A connection point on the controller for the connection of an external contact is included.

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Transfer Switch Controller**

26H. Phase Reversal Protection

For a 3-phase wye source, this feature monitors the phase sequence of the sources. If a source does not have the same ABC or CBA sequence as the phase reversal setpoint, the source will be considered "Unavailable".

For a 3-phase delta source, this feature should be turned off via the PHASE REV setpoint.

26J. 3-Phase Undervoltage and Underfrequency Protection

Adjustable Undervoltage:

Dropout (Breaker Style): 50 - 97% of nominal

Dropout (Contactor Style): 78 - 97% of nominal

Pickup: (Dropout + 2%) - 99% of nominal

Adjustable Underfrequency:

Dropout (Breaker Style): 90 - 97% of nominal

Dropout (Contactor Style): 90 - 97% of nominal

Pickup: (Dropout + 1Hz) - 99% of nominal

26K. 3-Phase Overvoltage/Overfrequency

Adjustable Overvoltage:

Dropout (Breaker Style): 105 - 120% of nominal

Dropout (Contactor Style): 105 - 110% of nominal

Pickup: 103% - (Dropout - 2%) of nominal

Adjustable Overfrequency:

Dropout (Breaker Style): 103 - 110% of nominal

Dropout (Contactor Style): 103 - 105% of nominal

Pickup: 101% - (Dropout - 1Hz) of nominal

26L. Source 1 3-Phase Voltage Unbalance

For a 3-phase wye source, this feature monitors phase voltage ratios. Voltage unbalance (%) is calculated as the difference between the maximum and minimum phase voltage, divided by the minimum phase voltage. User-selectable setpoints are available for dropout and pickup unbalance settings (minimum 2% differential). Dropout is adjustable from 5 to 20%. Pickup is adjustable from 3 to (Dropout - 2%). A setpoint for user-selectable time delay from 10 to 30 seconds is provided. The factory default setpoints are: 5% dropout, 3% pickup, and 30 seconds time delay. A user-selectable setpoint for enable and disable is also provided.

When an unbalance condition is detected on Source 1, the Unbalance Timer (TD UNBAL) starts timing. After TD UNBAL times out, Source 1 is declared "failed".

For a 3-phase delta source, this feature should be turned off via the VOLT UNBAL setpoint.

29. Alternate Transfer Modes of Operation

Provides standard or optional transfer modes, mode selection devices, and operational methods for ATSSs.

29J. Type of Operation (MANTR) Operation (new feature)

This feature provides for a selection between an automatic transfer and re-transfer mode or a manual pushbutton re-transfer to Normal from the Emergency Source mode. If this option is not selected the factory default selection is automatic.

32. Delayed Transition Transfer Modes for Open Transition Transfer Switches

This feature provides delayed transition transfer modes for an open transition transfer switch. Often used in systems with inductive loads, a delayed transition transfer switch may prevent or reduce in-rush currents due to out of phase switching of inductive loads.

32A. Time Delay Neutral

This feature provides a time delay in the neutral position during the transfer and re-transfer operations during which both Source 1 and Source 2 are disconnected from the load circuit. The time delay is programmable and is the same for both transfer and re-transfer operations.

Adjustable 0 - 120 Seconds

32F. In-Phase Transition

Provides In-phase transition, which is a feature that will permit a transfer or re-transfer between 2 available sources that have a phase angle difference of 8 degrees or less. The In-phase transition feature includes permissible frequency difference and synchronization time setpoints. In the event source 1 and source 2 fail to synchronize within a specified amount of time, due to excessive phase angle difference or frequency difference, then the transfer will take place under delayed transition. Alarm relay will energize and failure will be logged into the transfer history as either "Sync Fail - Freq" or "Sync Fail - Phase" depending on whether the frequency difference or the phase difference was excessive. The adjustable frequency difference is 0.0 to 3.0 Hz.

35. Pre-Transfer Signal

This feature provides a signal to a remote device prior to a re-transfer operation. It provides one Form "C" contact (NO/NC) for interface with other equipment (typically elevator controls). The contacts close/open on a timed basis prior to transfer in either direction. After TDNE/TDEN times out, this relay closes and the Pre-transfer Timer (TPRE) starts timing. After the TPRE times out, the transfer proceeds by starting the TDN timer if enabled. The pre-transfer relay opens after the transfer is complete.

Adjustable 0 - 120 Seconds

35A. Pre-transfer Signal with 1 N.O. and 1 N.C. Contacts

This feature provides pre-transfer signal and includes 1 N.O. and 1 N.C. contact.

36. Emergency Inhibit (new feature)

This feature enables the Emergency inhibit control input to inhibit transfers to the Emergency Source. See Control Inputs section for more information.

48F. RS-485 with Modbus Option

Provides communications for the ATC-300+ via Modbus through an integrated RS-485 port. Registers are available to read back status, voltages, frequencies, and historical data. Registers are also available for transfer switch control. Setpoints may be read back and/or programmed via a pass-through command. See the ATC-300+ Modbus Communication Guide pn: 66A7787.

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1.5.2.2 Optional Features

The following is a list of the optional features of the ATC-300+ Controller.

12. Power Source Annunciation

This feature provides LEDs to give switch position and power source availability indications.

Overcurrent Trip Indication

Available only with integral Overcurrent Protection (Feature 16). (Shown on Automatic Transfer Controller Display.)

12L. Source 1 Tripped (Requires Feature 16) Via ATC-300+ LDC-Based Display

The Automatic Transfer Controller LCD display will read "Lockout" if the Source 1 circuit breaker is in the "tripped" position.

12M. Source 2 Tripped (Requires Feature 16) Via ATC-300+ LDC-Based Display

The Automatic Transfer Controller LCD display will read "Lockout" if the Source 2 circuit breaker is in the "tripped" position.

Section 2: Hardware Description

2.1 General

The purpose of this section is to familiarize the reader with the ATC-300+ Controller hardware, its nomenclature, and to list the unit's specifications. The information presented is divided into the following three parts:

- Operator Panel;
- Rear Access Area; and
- Specification Summary.

2.2 Front (Operator) Panel

The front panel, depending on the installation, is normally accessible from the outside of a panel or door. The front panel provides a means to:

- Alert the user to specific conditions;
- Program the controller; and
- Set and monitor the operating parameters.

The ATC-300+ Controller front panel serves two primary functions: output and input. The output function consists of:

- A two-line, 16 character LCD display module
- Five LED outputs
 - 1 Unit Status
 - 2 Source 1 Available
 - 3 Source 1 Connected
 - 4 Source 2 Available
 - 5 Source 2 Connected

There are seven input functions accessible through the pushbuttons:

- 1 Help/Lamp Test
- 2 Engine Test
- 3 Step/Enter
- 4 Increase
- 5 Decrease
- 6 Alarm Reset
- 7 Bypass Time Delay

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Figure 1. The ATC-300+ Controller Front Panel.

2.2.1 The Output Function Components

The Display

A 2-line, 16-character alphanumeric LCD Display module is used to display all ATC-300+ Controller monitored parameters, setpoints, and messages in easy to read formats. The display has a green high contrast background that allows clear visibility of any information displayed. The display is continuously lit for clear visibility under poorly lit or no light conditions.

Six different displays can be presented via the LCD Display:

- Status Display
- Source 1 Display
- Source 2 Display
- Time/Date Display
- History Display
- Setpoints Display

As a default when there are no active commands or timers being displayed, the display shows information from the source that is connected to the load. This is referred to as the "Home" screen.

Line 1: Source 1 or 2	Metered Voltage
Line 2: Date	Time

Example: Source 1 480V
 1/20/06 3:35PM

See Section 3 for more detailed information.

The LEDs

Unit Status

The green Unit Status LED blinks at a rate of once per second while in the ATC-300 Controller is in the "Run" Mode. This indicates that the ATC-300+ has completed a self-diagnostic and system diagnostic cycle. The self-diagnostic cycle checks include the:

- Microprocessor operation and
- Memory operation.

The system diagnostic cycle checks include the:

- Output relay operation;
- Control input operation; and
- Transfer switch operation.

The Unit Status LED blinks at an increased rate while the ATC-300+ Controller is in the "Program" Mode.

Source 1 Available

The white Source 1 Available LED illuminates if the Source 1 power source meets the criteria to be considered "available". That is, when it is within its undervoltage/overvoltage/underfrequency/overfrequency/voltage unbalance/phase reversal (if applicable) setpoint ranges for the nominal voltage and frequency setting.

Source 1 Connected

The green Source 1 Connected LED illuminates when the Source 1 switching device and its associated position indicating auxiliary contact are closed.

Source 2 Available

The amber Source 2 Available LED illuminates if the Source 2 power source meets the criteria to be considered "available". That is, when it is within its undervoltage/overvoltage/underfrequency/overfrequency/voltage unbalance/phase reversal (if applicable) setpoint ranges for the nominal voltage and frequency setting.

Source 2 Connected

The red Source 2 Connected LED illuminates when the Source 2 switching device and its associated position indicating auxiliary contact are closed.

2.2.2 The Input Function Components

The Pushbuttons and Combinations

Help/Lamp Test Pushbutton

The Help/Lamp Test pushbutton serves two functions. If the Help/Lamp Test pushbutton is pressed when a message is present on the LCD Display, a detailed description of the message will appear. The detailed message description will scroll across the bottom of the display. The detailed description can be aborted by pressing Help/Lamp Test key a second time.

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If the LCD Display is displaying the Home screen when the Help/Lamp Test key is pressed, all of the LED's will momentarily illuminate, then the following information will scroll across the display:

- Serial number of the ATC-300+ Controller;
- Hardware revision number (= parts list revision number);
- Software version and revision number;
- Feature code – a decodable string listing all optional features programmed in the ATC-300+ Controller; and
- Firmware version.

Engine Test Pushbutton

The Engine Test pushbutton allows the user to test the Source 2 (generator) engine. The engine test function can be set with the ATC-300+ Controller to one of three setpoint modes to allow flexibility in how the test is run:

- 0 No Load Engine Test;
- 1 Load Engine Test; or
- 2 Disabled.

The factory default is set to 0 - No Load Engine Test.

For complete information on the Engine Test function, see Section 5.7.

Step/Enter Pushbutton

The Step/Enter pushbutton allows the user to scroll through the information and setpoint displays. By pressing the Step/Enter pushbutton, the information on the LCD Display will advance through the voltage(s), frequency, and status condition of Source 1, then Source 2, then the time and date information, then the history information, then the setpoints. The information on the LCD Display advances one step through the displayed information cycle with each depression of the Step/Enter pushbutton.

Increase Pushbutton

The Increase pushbutton allows the user to increase the value of the setpoints. When ATC-300+ Controller is in the "Program" Mode (to change setpoint values), each time the Increase pushbutton is pressed, the value of the displayed item will increase by one.

Decrease Pushbutton

The Decrease pushbutton allows the user to decrease the value of the setpoints. When ATC-300+ Controller is in the "Program" Mode (to change setpoint values), each time the Decrease pushbutton is pressed, the value of the displayed item will decrease by one.

Alarm Reset Function (Increase + Decrease Pushbuttons)

Pressing the Increase and Decrease pushbuttons simultaneously will reset the Alarm function. In addition, if both pushbuttons are pressed simultaneously while viewing any of the historical logged values in the program mode, the value of the current item displayed resets to zero.

Bypass Time Delay Function (Step/Enter + Help/Lamp Test)

Pressing the Step/Enter and Help/Lamp Test pushbuttons simultaneously will bypass the TDNE or TDEN functions when they actively counting. The "Bypass TDNE/TDEN" function does not have a user accessible, programmable setpoint for enable or disable.

2.3 Rear Access Area

The rear access area of the ATC-300+ Controller is normally accessible from the rear of an open panel door (Figure 2).

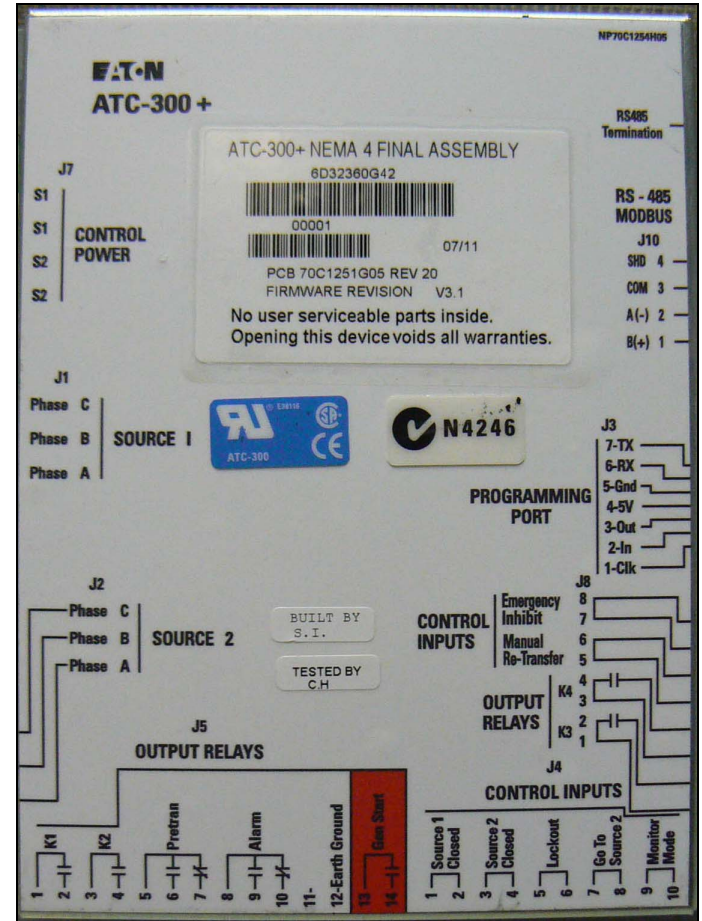


Figure 2. ATC-300+ Controller (Rear View).

All wiring connections to the ATC-300+ Controller are made at the rear of the chassis.

Note: To allow for uniform identification, the frame of reference when discussing the rear access area is with the panel door open and the User facing the back of the ATC-300+ Controller.

Located at the left rear of the chassis are connectors J1, J2, and J7. J1 and J2 provide for voltage monitoring of Source 1 and Source 2 respectively. J7 is provided for Sources 1 and Source 2 control power input. Located at the right rear of the chassis is the J3 programming port connector. The J4 and J5 connectors are located at the bottom of the controller. The J4 connector provides DC wetted connections for various control inputs. The J5 and J8 connectors provide dry relay contacts for primary control outputs.

See Section 5.5.1 for contact ratings.

2.4 Specification Summary

Table 1. ATC-300 + Controller Specifications

Input Control Voltage	65 to 145 Vac 50/60 Hz	
Voltage Measurements of	Source 1 VAB Source 1 VBC Source 1 VCA	Source 2 VAB Source 2 VBC Source 2 VCA
Voltage Measurement Range	0 to 790 Vac RMS (50/60 Hz)	
Voltage Measurement Accuracy	± 1% of Full Scale	
Frequency Measurements of	Source 1 and Source 2	
Frequency Measurement Range	40 Hz to 70 Hz	
Frequency Measurement Accuracy	± 0.3 Hz Over the Measurement Range	
Undervoltage Dropout Range: Breaker/Switch Style ATS Contactor Style ATS	50 to 97% of the Nominal System Voltage 78 to 97% of the Nominal System Voltage	
Undervoltage Pickup Range: Breaker/Switch Style ATS Contactor Style ATS	(Dropout + 2%) to 99% of the Nominal System Voltage (Dropout + 2%) to 99% of the Nominal System Voltage	
Overvoltage Dropout Range: Breaker/Switch Style ATS Contactor Style ATS	105 to 120% of the Nominal System Voltage 105 to 110% of the Nominal System Voltage	
Overvoltage Pickup Range: Breaker/Switch Style ATS Contactor Style ATS	103% to (Dropout -2%) of the Nominal System Voltage 103% to (Dropout -2%) of the Nominal System Voltage	
Underfrequency Dropout Range: Breaker/Switch Style ATS Contactor Style ATS	90 to 97% of the Nominal System Frequency 90 to 97% of the Nominal System Frequency	
Underfrequency Pickup Range: Breaker/Switch Style ATS Contactor Style ATS	(Dropout + 1Hz) to 99% of the Nominal System Frequency (Dropout + 1Hz) to 99% of the Nominal System Frequency	
Overfrequency Dropout Range: Breaker/Switch Style ATS Contactor Style ATS	103 to 110% of the Nominal System Frequency 103 to 105% of the Nominal System Frequency	
Overfrequency Pickup Range: Breaker/Switch Style ATS Contactor Style ATS	101% to (Dropout -1Hz) of the Nominal System Frequency 101% to (Dropout -1Hz) of the Nominal System Frequency	
Operating Temperature Range	-20 to +70°C (-4 to +158°F)	
Storage Temperature Range	-30 to +85°C (-22 to +185°F)	
Operating Humidity	0 to 95% Relative Humidity (Non-condensing)	
Operating Environment	Resistant to Ammonia, Methane, Nitrogen, Hydrogen, and Hydrocarbons	
Generator Start Relay	5 A, 1/6 HP @ 250 Vac 5 A @ 30 Vdc with a 150 W Maximum Load	
K1, K2, Pretransfer, Alarm Relays K3, K4	10 A, 1-3 HP @ 250 Vac 10 A @ 30 Vdc	
Applicable Testing	UL Recognized Component Meets UL 1008 Meets Intent of UL 991, Meets IEC 1000-4-2, 1000-4-3, 1000-4-4, 1000-4-5, 1000-4-6, 1000-4-11 Meets CISPR 11, Class A Complies with FCC Part 15, Class A	
Enclosure Compatibility	NEMA 1, NEMA 3R, and NEMA 12 UV Resistant ATC-300+ Faceplate	

ATC-300+ Automatic Transfer Switch Controller

Section 3: Status Monitoring and Setpoints

NOTICE

ALTHOUGH A WIDE VARIETY OF PARAMETERS AND SETPOINTS CAN BE DISPLAYED, THEY ARE NOT DISPLAYED IF THEY WERE NOT ORIGINALLY ORDERED AND PROGRAMMED.

NOTICE

WHETHER VIEWING OR PROGRAMMING, THE DISPLAY RETURNS TO THE HOME SCREEN IF NO PUSHBUTTON ACTIVITY IS DETECTED FOR APPROXIMATELY 2.5 MINUTES.

3.1 Status Display

The Status Display provides messages regarding anything that is presently changing or happening to the ATS's status, including source information, timer countdown, and failure reports. Refer to Appendix A for a complete list of Status Display messages.

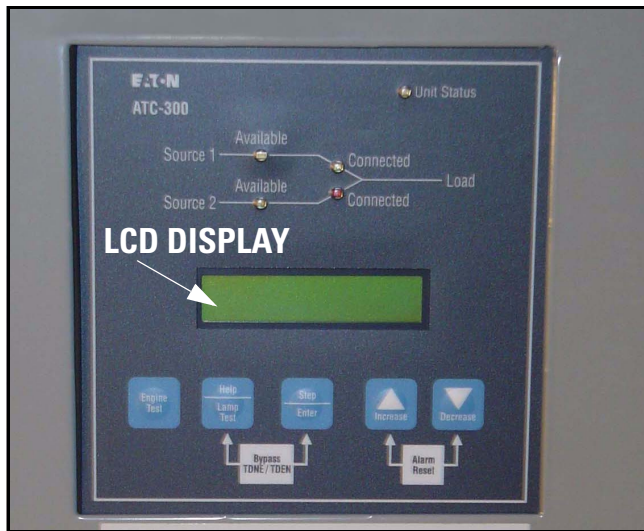


Figure 3. The LCD Display.

3.1.1 Source 1 and Source 2 Displays

The Source 1 and Source 2 displays indicate the present status of the sources in terms of voltage and frequency. If the source is available, the condition display will be "SOURCE 1 GOOD" or "SOURCE 2 GOOD". If it is unavailable, one of the following possible conditions will be shown:

SOURCE 1 U-V SOURCE 2 U-V

The source voltage has dropped below the dropout setting and not risen above the pickup setting.

SOURCE 1 O-V SOURCE 2 O-V

The source voltage has risen above the dropout setting and not dropped below the pickup setting.

SOURCE 1 U-F SOURCE 2 U-F

The source frequency has dropped below the dropout setting and not risen above the pickup setting.

SOURCE 1 O-F SOURCE 2 O-F

The source frequency has risen above the dropout setting and not dropped below the pickup setting.

SOURCE 1 UNBAL SOURCE 2 UNBAL

The voltage unbalance has risen above the dropout setting and not dropped below the pickup setting.

S1 PHASE REVERSE S2 PHASE REVERSE

The phase sequence does not agree with the setpoint value, indicating that the phase sequence is reversed.

3.1.2 Time/Date Display

The Time/Date Display indicates real time in terms of hours, minutes, and seconds; and month, day, and year. It also indicates individual time and date items for programming purposes. The day of the week can also be set with 1 = Sunday, 2 = Monday, etc. The time, date, and day of the week can be set in the Program Mode.

3.1.3 History Display

The History Display indicates historical and cumulative counter values as follows:

Engine Run Time

This counter will log the generator run time in hours. Time will start being logged at the time the GEN START contacts are closed, and it will stop as soon as they are opened. This counter will count up to 9999 hours and then turn over to 0000. It can be reset to zero in the Program Mode.

Source 1 Connected Time

This counter logs the time in hours that Source 1 has been connected to the load. Time will be logged while the SOURCE 1 CLOSED control input is in the "connected" state. This counter will count up to 9999 hours and then turn over to 0000. It can be reset to zero in the Program Mode.

Source 2 Connected Time

This counter logs the time in hours that Source 2 has been connected to the load. Time will be logged while the SOURCE 2 CLOSED control input is in the "connected" state. This counter will count up to 9999 hours and then turn over to 0000. It can be reset to zero in the Program Mode.

Source 1 Available Time

When Source 1 meets the voltage and frequency setpoint criteria, this counter logs the time in hours. This counter will count up to 9999 hours and then turn over to 0000. It can be reset to zero in the Program Mode.

Source 2 Available Time

When Source 2 meets the voltage and frequency setpoint criteria, this counter logs the time in hours. This counter will count up to 9999 hours and then turn over to 0000. It can be reset to zero in the Program Mode.

Load Energized Time

When either of the two sources is connected to the load and the connected source is available, this counter will start logging the time in hours. This counter will count up to 9999 hours and then turn over to 0000. It can be reset to zero in the Program Mode.

Total Number of Transfers

This counter logs the number of transfer cycles that occur. This counter will count up to 9999 cycles and then turn over to 0000. It can be reset to zero in the Program Mode.

Reason/Date/Time for the 16 Most Recent Transfers

The 16 most recent transfer events are stored in history and may be viewed at the LCD Display as follows:

- Use the Step/Enter pushbutton to step to the "TRANSFER HISTORY" message.
- Press the Increase pushbutton to display the most recent transfer event (T01) along with the type and cause of the event.
- Press the Decrease pushbutton to display the date and time of the event. Continually pressing the Decrease pushbutton will cycle the display between the event display and the date/time of event display.
- Press the Increase pushbutton to display the next most recent transfer event (T02).
- Pressing the Step/Enter pushbutton, while viewing any of the transfer history displays, will exit the Transfer History displays.

3.1.4 Setpoints Display

The Setpoints Display indicates presently programmed setpoints. The setpoints can be altered with valid password entry. Keep in mind; if an optional ATC-300+ Controller feature was not originally ordered and programmed, it will not be displayed. Refer to Section 6 for more details on setpoints.

3.1.5 Help Display

This display presents moving language messages, explanations, and prompts to assist the operator. When the Help/Lamp Test Pushbutton is pressed and released a second time during the scrolling of a message, the message is aborted.

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Section 4: Typical Function of the ATC-300+ Controller

The ATC-300+ Controller operates as follows.

The input connections of the ATC-300+ controller are wetted and work on an opening or closure of an external contact. The output connections are dry contacts and function depending on input connections and / or source availability.

120 Vac, 60 Hz is required to power the ATC-300+ controller. Power is supplied to either pins 1 and 2 or 3 and 4 on the J-7 connector.

Source 1 (S1) sensing is supplied on the J-1 connector; Source 2 (S2) sensing is supplied on the J-2 connector.

K1 and K2 relays, located on pins 1 and 2 (K1) or pins 3 and 4 (K2) on the J-5 connector, along with the K3 and K4 relays, located on pins 1 and 2 (K3) and pins 3 and 4 (K4) on the J8 connector, are used to control device position. S1 and S2 inputs are located on pins 1 and 2 (S1) or pins 3 and 4 (S2) on the J-4 connector and are used to sense device position.

K1 and K3 close until the S1 input is satisfied but no longer than 6 seconds before the S1 device Alarm is triggered and the K1 and K3 relays are deenergized. The K2 and K4 relays function the same as the K1 relay in that they close until the S2 input is satisfied (closed) but no longer than 6 seconds before the S2 device Alarm is triggered and the K2 and K4 relays are deenergized. Either input **MUST** be satisfied prior to resetting the Alarm. The S1 and S2 connected inputs are wetted inputs that require a contact closure in order to be satisfied.

The S1 device Alarm will occur if the switch is commanded to go from S1 to S2 and the S1 connected input is **NOT** removed within 6 seconds after the command to transfer. The S1 device Alarm will also occur if the switch is commanded to go from S2 to S1 and the S1 connected input is **NOT** connected within 6 seconds after the command to transfer from the neutral position. That is the K2 relay closes **AFTER** TDNE or after TD PRE-TRAN times out, if the S1 connected input is **NOT** opened within 6 seconds the K2 relay will open and an S1 device error message, "SOURCE 1 DEVICE", will be displayed.

A typical transfer request will begin with an S1 outage (S1 becomes unavailable per the programmed setpoints), Engine Test, or Plant Exercise function. After TDES, if programmed, counts down, the Generator Start contact will close. For a Plant Exercise or Engine Test, the S2 available light **MUST** become available within 90 seconds or the generator start contacts will reopen. Once S2 meets the requirements to be considered available, then TDNE, if programmed, will time down. The pretransfer relay will energize if S1 is available. TD PRE-TRAN will time down if programmed and if S1 is available (Engine Test or Plant Exercise). The K2 relay will energize. The S1 connected input **MUST** open within 6 seconds (see above). K2 will open IF TDN is programmed. TDN will then time down and K2 and K4 will energize until the S2 connected input is closed (this **MUST** happen within 6 seconds of K2/K4 closure or the S2 device alarm will trigger and the K2 and K4 relays will deenergize). Once the S2 connected input is satisfied, K2 and K4 will open and the pretransfer relay will de-energize.

When S1 returns and becomes available per the programmed setpoints, TDEN, if programmed, will time out. The pretransfer relay will energize. TD PRE-TRAN, if programmed, will time out. K1 will energize for no longer than 6 seconds or until the S2 connected input is removed. If the 6 seconds times out, then an S2 device Alarm will trigger and K1 will open. Once the input is removed, then K1 will open if TDN is programmed. TDN will time down and K1 and K3 will reclose until the S1 input is satisfied, but for no longer than 6 seconds. If the 6 seconds is reached, then an S1 device Alarm will be triggered and the K1 and K3 relays will open. If the S1 connected input is satisfied, then K1 will open, the pretransfer relay will de-energize, and TDEC will time down and open the engine start contact.

The Go To Source 2 input (normally closed, open to initiate) causes the Engine Start contacts to close. Once the S2 sensing satisfies the setpoints programmed, then a transfer is initiated. The transfer functions as described above. The controller will maintain the Engine Start contacts and the S2 connected as long as the Go To Source 2 input is maintained. Once it is removed, a retransfer to S1, if S1 is available per the setpoints, will occur and functions as described above. "Go To Source 2" is displayed on the controller.

The Monitor Mode input (normally open, close to initiate) is utilized to put the controller in a "Monitor" only state. No other inputs will affect the operation of the controller when the Monitor Mode input is initiated. The controller will **ONLY** monitor the voltage and frequency of the S1 and S2 inputs. Changing of the setpoints of the controller **MAY** be accomplished while in Monitor Mode. All setpoints are accessible and all timers can be reset. "ATS Not In Automatic" is displayed on the controller.

The Lockout input (normally closed, open to initiate) is utilized to place the controller in a state where it will **NOT** supply any outputs regardless the inputs. It is used to monitor the state of any fault indicating devices. If the fault device trips due to an over current or over load condition, then a contact opening will place the controller in the Lockout state. The Alarm contact will change state when the lockout signal is sensed. "Lockout" is displayed on the controller. The fault indicating device **MUST** be reset before the controller can be reset or the Alarm will continue to indicate.

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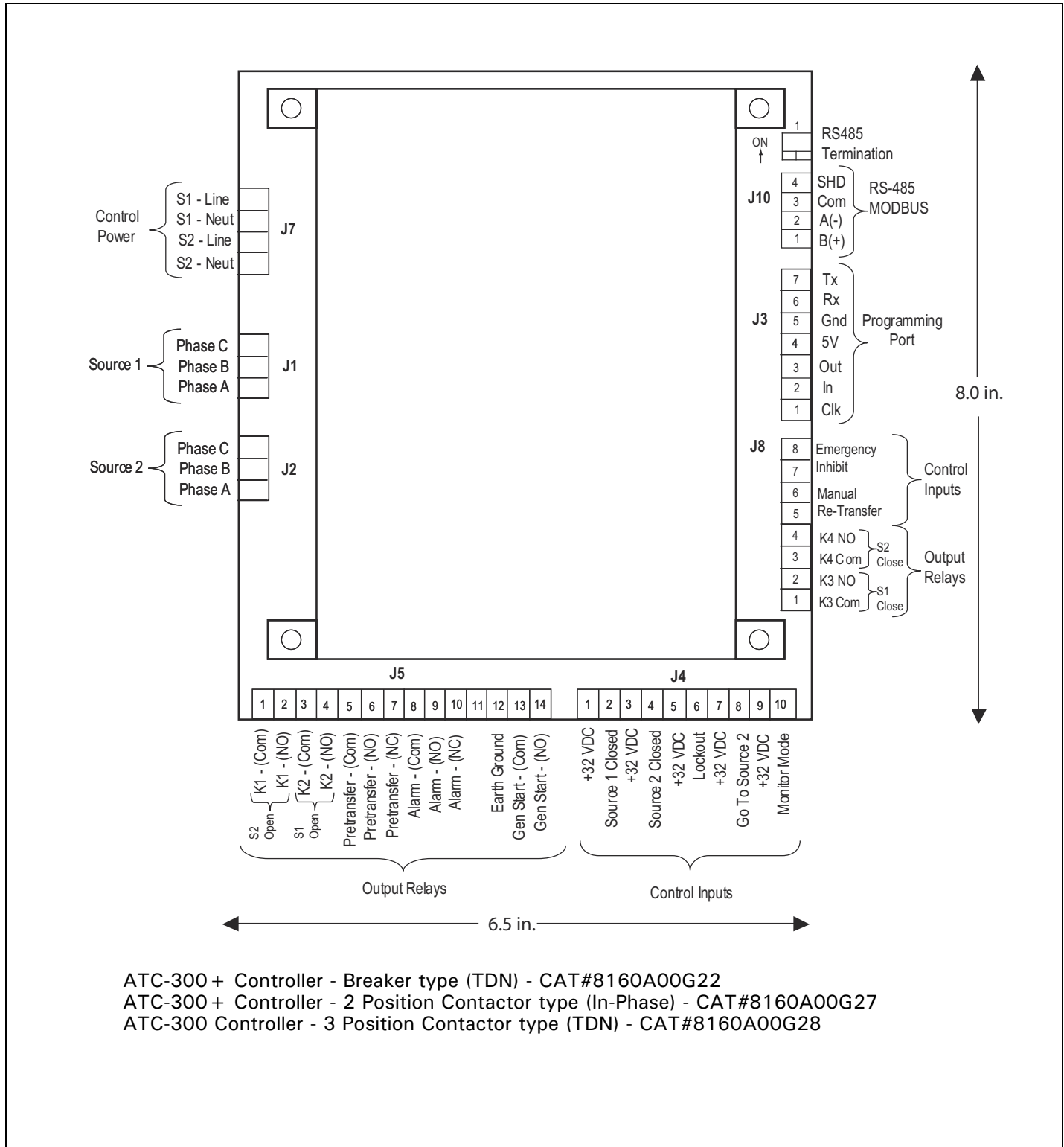


Figure 4. Connectors on the ATC-300+ Controller.

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Section 5: Operation

5.1 General

This section specifically describes the operation and functional use of the ATC-300+ Controller. The practical use of and operation within each category will be discussed. In this section, it is assumed that prior sections of this manual were reviewed and that the operator has a basic understanding of the hardware.

5.2 Automatic Mode

The Automatic Mode of the ATC-300+ Controller provides for automatic transfer and re-transfer from Source to Source as dictated by the features supplied and their programmed setpoint values. It provides a summary of the ATC-300+ Controller intelligence and supervisory circuits that constantly monitor the condition of both the Source 1 and Source 2 power sources, thus providing the required intelligence for transfer operations. These circuits, for example, automatically initiate an immediate transfer of power when the power fails or the voltage level drops below a preset value. Exactly what the ATC-300+ Controller will initiate in response to a given system condition depends upon the combination of standard and selected optional features.

5.3 Monitor Mode

Monitor Mode is a special operating mode in which the ATC-300+ Controller does not provide control for transfer operations. The ATC-300+ will, however, continuously monitor both Source 1 and Source 2 voltages and frequencies.

The ATC-300+ will be in Monitor Mode when the "Monitor Mode" control input is in the "Connected" state as described in Section 5.4. While in the Monitor Mode of operation, the ATC-300+ LCD Display will display "ATS NOT IN AUTOMATIC".

5.4 Control Inputs

The ATC-300+ has five individual input control signals. The inputs are DC wetted with the unregulated DC supply and appropriate current limiting to provide a nominal current of 10 mA per channel.

5.4.1 Control Input Descriptions

The Control Input "State" definitions are as follows.

Connected - When the input is shorted by an external contact or connection.

Unconnected - When the input is NOT shorted by an external contact or connection.

The Control Input operations are defined as follows.

Source 1 Closed

When this input is in the "Connected" state, it indicates to the ATC-300+ Controller that the Source 1 device is closed. When this input is in the "Unconnected" state, it indicates to the ATC-300+ that the Source 1 device is open. This input is typically wired to the Source 1 device auxiliary contact that is closed when the Source 1 device is closed. The "Source 1 Closed" input is always enabled.

Source 2 Closed

When this input is in the "Connected" state, it indicates to the ATC-300+ Controller that the Source 2 device is closed. When this input is in the "Unconnected" state, it indicates to the ATC-300+ that the Source 2 device is open. This input is typically wired to the Source 2 device auxiliary contact that is closed when the Source 2 device is closed. The Source 2 input is always enabled.

Lockout

When the "Lockout" input is in the "Unconnected" state, the ATC-300+ Controller will not permit an automatic transfer operation. When the "Lockout" input is in the "Unconnected" state, the LCD Display will be active continuously. It will read "Lockout" on Line 2 of the LCD Display screen immediately, regardless of any controller or switching device operation. When the "Lockout" input is in the "Connected" state and the Alarm is reset, the ATC-300+ will permit automatic transfer operation. This input is typically wired to the normally closed Source 1 and Source 2 device alarm contact that opens when one of the devices has tripped due to a fault current. The "Lockout" input is selectable as enabled or disabled via factory control only.

Go To Source 2

When the "Go to Source 2" input is in the "Connected" state, the ATC-300+ Controller is in a normal, automatic operation mode. When the "Go To Source 2" input is in the "Unconnected" state, the ATC-300+ controller will initiate a generator start and then transfer to the Source 2 power source. The ATC-300+ will maintain the connection to Source 2 until the input changes to the "Connected" state, upon which it will initiate a re-transfer to the Source 1 power source. When the "Go To Source 2" input is in the "Unconnected" state, the LCD Display will be active continuously. Active time delays will be constantly displayed on Line 1, with real-time remaining countdown to zero status. It will constantly read "Go To Source 2" on Line 2 of the LCD Display. This operation is "failsafe". The "Go To Source 2" input is always enabled. The "Go To Source 2" input does not have a user accessible programmable setpoint for enable or disable.

Monitor Mode

When the "Monitor Mode" input is in the "Unconnected" state, operation of the ATC-300+ Controller will not be effected. When the "Monitor Mode" input is in the "Connected" state, the ATC-300+ will monitor the Source 1 and Source 2 voltages and frequencies but will not provide any control capabilities. When the "Monitor Mode" input is in the "Connected" state, the ATC-300+ LCD Display will be active continuously and will constantly read "ATS" on Line 1 and "NOT IN AUTOMATIC" on Line 2 of the LCD Display. The "Monitor Mode" input is selectable as enabled or disabled via factory control. The "Monitor Mode" input does not have a user accessible programmable setpoint for enable or disable. This is NOT a "failsafe" operation.

Manual Re-Transfer

With manual operation set, momentary closure on Pins 5 and 6 of Connector J8 allows ATC-300+ to proceed with a re-transfer operation at the operators discretion. Should a failure of the emergency source occur while waiting for the manual return, the re-transfer proceeds automatically.

Emergency Inhibit

This input is located on Pins 7 and 8 of Connector J8 and is enabled when the Emergency Inhibit optional feature (36) is enabled. The contact is closed for normal operation. Opening this contact will activate the Emergency Inhibit input.

If the Emergency Inhibit contact is opened when the load is connected to the Normal Source, no action will be taken if the Normal Source is available. If the Normal Source is not available, an immediate transfer to the neutral position will occur.

If the Emergency Inhibit contact is opened when the load is connected to the Emergency Source, the ATC-300+ will transfer the load to the Normal Source if it is available. If the Normal Source is not available, an immediate transfer to the neutral position will occur.

The Emergency Inhibit input is only active when either Source 1 or Source 2 is preferred. This input is not active when the Preferred Source selection is set to None.

The Emergency Inhibit input takes priority over the Go To Emergency input if both inputs are activated at the same time. In this case, the generator will start but a transfer to the Emergency Source will be inhibited until the Emergency Inhibit input is deactivated. A jumper must be included between Pins 7 and 8 of connector J8 when a two position contactor is being used. The Inhibit function transfers to the open position which is on a three position contactor.

5.5 Output Relay

The primary control outputs of the ATC-300+ Controller are dry relay contacts. These relays are comprised of one latching “Form A” relay to provide the generator start contacts, and six conventional coil “Form C” relays (four of which implement only the Form A contact) necessary to complete the electrical control function. Since the outputs were tested per the UL 1008 Dielectric Test, the dielectric rating for each output is a minimum of 1500 Vac. The output relays are pulsed to eliminate error caused by software “races” between Lockout and Source 1 or Source 2 Closed inputs.

The latched coil relay is UL/CSA rated at 5 A, 1/6 HP, 250 Vac. The DC rating is 5 A, 30 Vdc, with a 150 W maximum load. The remaining conventional relays are UL/CSA rated at 10 A, 1/3 HP, 250 Vac. The DC rating is 10 A at 30 Vdc.

Note: The ATC-300+ Controller MUST BE properly grounded at J-5, Pin 12 for proper operation.

The Output Relay functions are divided into two categories:

- Customer Connections and
- Transfer Operation Contacts.

5.5.1 Output Relay Descriptions

Specifically the relay functions are as follows.

5.5.1.1 Customer Connections



CAUTION

THE ATC-300+ CONTROLLER MUST BE PROPERLY GROUNDED AT J-5, PIN 12 FOR PROPER OPERATION.

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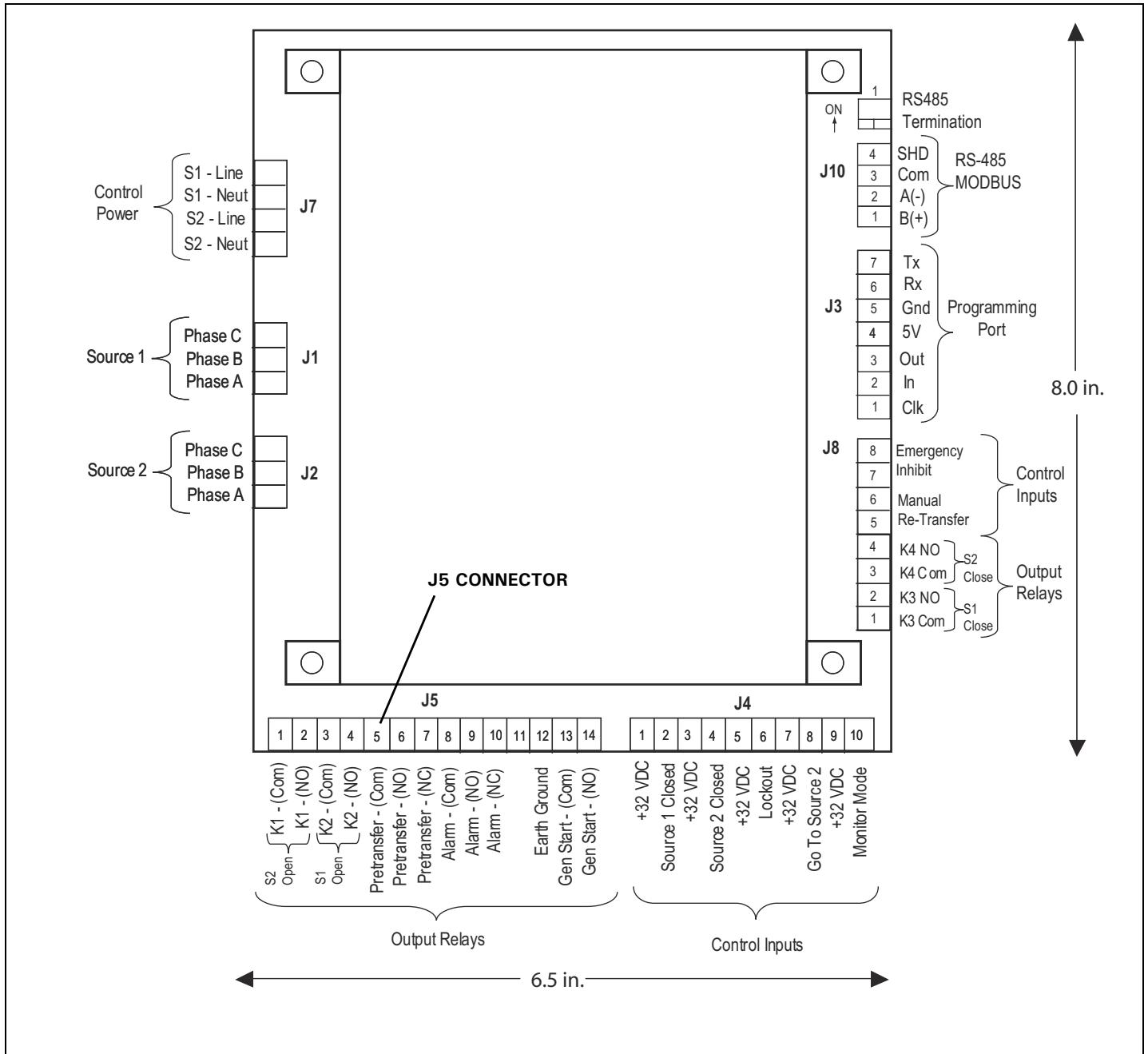


Figure 5. Connector Output Relay Connections.

Generator Start Relay

This latching relay is the generator start relay for system configurations that employ a generator as the Source 2 power source. This relay provides a Form A contact of silver alloy with gold flashing for closure of the generator start circuit.

The Form A contact is implemented with the Common Pin (J-5, Pin 13) and the Normally Open Pin (J-5, Pin 14). The generator start relay contacts are rated for 5 A, 1/6 HP @ 250 Vac. The DC rating is 5 A @ 30 Vdc with a 150 W maximum load.

Alarm Relay

The alarm relay is de-energized to indicate an absence of an alarm state and energized to indicate the presence of an alarm condition. Alarm conditions include the following.

1. Improper circuit breaker (or contactor) operation (breaker [or contactor] fails to open or close within six [6] seconds)
2. Motor operator failure (Breaker Type ATS only)
3. Lockout
4. Failsafe condition
5. Aborted engine test due to Source 2 unavailability
6. Aborted plant exerciser test due to Source 2 unavailability
7. Unsuccessful in-phase transition

The alarm relay will remain energized until "Alarm Reset" is pressed.

The full Form C contact of this relay may be wired to an alarm annunciator panel to indicate a problem with the ATS. The full Form C contact of this relay is implemented with the Common Pin (J-5, Pin 8), the Normally Closed Pin (J-5, Pin 10), and Normally Open Pin (J-5, Pin 9). The alarm relay contacts are rated for 10 A, 1-3 HP @ 250 Vac. The DC rating is 10A @ 30 Vdc.

Pre-transfer Relay

This Form C relay opens/closes on a timed basis (adjustable from 1 to 120 seconds) prior to the transfer operation between two available sources to allow the load to be de-energized prior to transfer in either direction. After TDNE/TDEN times out, this relay energizes and the Pre-transfer timer (TD PRE-TRAN) starts timing. After TD PRE-TRAN times out, the transfer proceeds. The pre-transfer relay de-energizes after the transfer is complete.

The full Form C contact of this relay is implemented with the Common Pin (J-5, Pin 5), the Normally Closed Pin (J-5, Pin 7), and the Normally Open Pin (J-5, Pin 6). The pre-transfer relay contacts are rated for 10 A, 1-3 HP @ 250 Vac. The DC rating is 10 A @ 30 Vdc.

5.5.1.2 Transfer Operations Connections

K1, K2, K3, and K4 are factory wired to operate the transfer switch. The relay contacts for each are rated for 10 A, 1/3 HP @ 250 Vac. The DC rating is 10 A @ 30 Vdc. K1 - K4 are Form C relays but only the Form A contacts are used to operate the transfer switch.

Note: The ATC-300+ Controller MUST BE properly grounded at J-5, Pin 12 for proper operation.

Output Relay K1

This Form A relay is used for control of the transfer switch motor to close the Source 1 breaker/switch for breaker/switch style transfer switches. The K1 relay momentarily energizes until the ATC-300+ senses that the Source 1 breaker/switch is closed, then K1 de-energizes. For contactor style transfer switches, this relay opens the Source 2 contactor via its trip coil. The K1 outputs are common pin (J-5, pin 1) and Normally Open pin (J-5, pin 2).

Output Relay K2

This Form A relay is used for control of the transfer motor to close the Source 2 breaker/switch for breaker/switch style transfer switches. The K2 relay momentarily energizes until the ATC-300+ senses that the Source 2 breaker/switch is closed, then K2 de-energizes. For contactor style transfer switches, this relay opens the Source 1 contactor via its trip coil. The K2 outputs are common pin (J-5, pin 3) and Normally Open pin (J-5, pin 4).

Output Relay K3

This Form A output is used for control of the close coil of the Source 1 contactor for contactor style switches. The K3 relay momentarily energizes until the ATC-300+ senses that the Source 1 contactor is closed, then K3 de-energizes. The K3 outputs are common pin (J-8, pin 1) and Normally Open pin (J-8, pin 2).

Output Relay K4

This Form A output is used for control of the close coil of the Source 2 contactor for contactor style switches. The K4 relay momentarily energizes until the ATC-300+ senses that the Source 2 contactor is closed, then K4 de-energizes. The K4 outputs are common pin (J-8, pin 3) and Normally Open pin (J-8, pin 4).

5.6 Operating Voltage and Measurements

The ATC-300+ Controller operates with control power from 65 to 145 Vac. The ATC-300+ operates on single and three phase systems with selectable frequency settings of 50 or 60 Hz depending on the system ordered.

The ATC-300+ can perform the time delay engine start function without control power. This is accomplished by the use of a supercap and a latching control relay. The supercap stays charged for several minutes to power the logic circuitry that provides the start pulse to the latching control relay. The latching control relay, which controls the generator, only changes state when it receives start or stop pulses. The coil voltage for the latching relay comes from another capacitor that also stays charged for several minutes.

The ATC-300+ Controller operates directly from the line sensing inputs of the Source 1 and Source 2 power sources. The nominal operating system inputs are from 120 to 600 Vac. The standard system assumes that neutral is available and that the transfer mechanism can therefore be powered from an available 120 Vac source. If a neutral conductor is not available, a 120 Vac supply is created by an external transformer.

All voltage monitoring and measurements are true RMS measurements.

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5.7 Engine Test

The Engine Test is intended to permit the periodic performance of tests of the system. The exact test conditions are determined by the programmed setpoints. The operator-selected parameters include setting the engine run time and the Test Mode. Refer to Table 2 for test programming details.

There are three test modes:

- 0 No Load Engine Test;
- 1 Load Engine Test; or
- 2 Disabled.

The factory default is set to 0 - No Load Engine Test

Note: If the Source 2 power source is not programmed as a generator, this function will be inactive.

NOTICE

IF THE ATS IS UNABLE TO PROCESS A ENGINE TEST REQUEST DUE TO THE ATS STATUS, THE REQUEST IS IGNORED.

When the Engine Test pushbutton is pressed, the following message will appear on the LCD Display:

Line 1: Password 0 0 0 0
Line 2: Use Inc/Dec & Step

After entering the 4-digit password and pressing the Step/Enter pushbutton, the ATC-300+ will display the Time Delay on Engine Starting (TDES) timer countdown. Once the TDES countdown reaches zero, the ATC-300+ Controller will initiate an engine start. The engine run duration will be per the Engine Run Test Time setpoint.

If the (0) No Load Engine Test Mode has been selected, the transfer from Source 1 to Source 2 will not occur. If the (1) Load Engine Test Mode has been selected, the transfer from Source 1 to Source 2 will occur after the generator output has reached the specified setpoints. If the (2) Disabled Mode has been selected, or if the "Number of Generators" setpoint is programmed to zero, the Engine Test will not occur.

All enabled and programmed time delays will be performed per the setpoints during an engine test. The time delays will appear on the LCD Display with "countdown to zero" when active. Depending on the setpoints and the optional features selected with the ATC-300+ Controller, these can include:

- TDES;
- Time Delay Normal to Emergency (TDNE);
- Time Delay Emergency to Normal (TDEN);
- Time Delay for Engine Cooldown (TDEC);
- Time Delay Neutral (TDN); and
- Pre-transfer Delay Signal (TD PRE-TRAN).

All operations are "Failsafe", that is they prevent disconnection from the only available power source and also force a transfer or re-transfer operation to the only available power source.

During an engine test, if the Engine Test pushbutton is pressed a second time before the Engine Test is complete and correct password has been entered; the Engine Test will be terminated. An engine test may also be aborted in the following ways:

1. If the Emergency Source does not become available within 90 seconds of the ATC-300+ providing the engine start command;
2. If, during the TDNE countdown, the Emergency Source goes unavailable more than three times (Each time, TDNE will restart);
3. If the Emergency Source is powering the load and it goes unavailable for more than the TDEF setting; and
4. If the Normal source becomes unavailable.

When an engine test is aborted due to an unavailable source during TDNE countdown, the Alarm relay will energize, a "TEST ABORTED" message will appear on the display, and the event will be logged into the Transfer History as "Aborted Test".

5.8 Plant Exerciser

NOTICE

THE PLANT EXERCISER FEATURE ALLOWS FOR AUTOMATIC PROGRAMMING OF THE DESIRED TEST CYCLE ON A DAILY, 7-DAY, 14-DAY, OR 28-DAY BASIS. IF THE ATS IS UNABLE TO PROCESS A PLANT EXERCISER REQUEST DUE TO THE ATS STATUS, THE REQUEST IS IGNORED.

The plant exerciser is a feature that provides an automatic test of the generator. The test can be run daily, every 7 days, every 14 days, or every 28 days with durations equal to the programmed engine test time. Two optional modes of plant exercising are available:

- No Load Exercise; and
- Load Exercising with "Failsafe".

The ATC-300+ Controller allows the user to program the exact day, hour, and minute that the Plant Exercise will occur. This allows for the Plant Exercise to take place at the most opportune time for the specific facility.

The hour and minute that the Plant Exerciser is performed are programmed with the "PE HOUR" and "PE MINUTE" setpoints where "PE HOUR" is in military time (1:00 PM = 13:00) and the "PE MINUTE" can be set from 0 to 59. The test day is programmed with the "PE DAY" setpoint. The ATC-300+ Controller compares the "PE DAY" setpoint with the "WEEKDAY" setting, which is set along with the time and date. If a 7-day plant exercise is programmed, the selections are from "1 SUN" through "7 SAT".

If a 14-day plant exercise is programmed, the "PE DAY" setpoint can be set from "1 SUN" to "14 SAT" where "1 SUN" is the first Sunday of the 14-day period and "14 SAT" is the second Saturday of the 14-day period.

If a 28-day plant exercise is programmed, the "PE DAY" setpoint can be set from "1 SUN" to "28 SAT" where "1 SUN" is the first Sunday of the 28-day period and "28 SAT" is the fourth Saturday of the 28-day period.

If desired, the Plant Exerciser can be disabled by choosing "OFF" for the "Plant Exer-" setpoint.

Plant Exercising in the Load Exercising Mode is "Failsafe". If the generator fails during testing for any reason, the ATC-300+ will signal the transfer switch to return to the Source 1 power source. The ATC-300+ will display "FAILSAFE" until a pushbutton is pressed.

5.9 In-phase Transition (Optional Feature 32F)

The In-phase transition feature permits a transfer or re-transfer only between 2 available sources that have a phase angle difference of eight (8) degrees or less. The In-phase transition feature includes user-adjustable permissible frequency difference setpoint (0.0 - 3.0 Hz) and a programmable Sync timer. The Sync times will count down and be displayed while waiting for the two sources to synchronize.

In-phase transition is an open transition with both sources in-phase. An anticipatory scheme is used for controlling the circuit breakers. The advance angle is calculated based on the frequency difference between the two sources and also the response time of the breaker. This results in the optimum reconnect angle of 0 degrees for all of the frequency difference values.

Both sources must be available and the frequency difference must be less than the in-phase transition frequency difference setpoint (0.0 to 3.0 Hz). When these conditions are met, the ATC-300+ Controller will monitor the phase difference between the two sources. The synchronization timer will count down and be displayed as "SYNC TIME" while waiting for synchronization to be detected. When the phase difference is within the advance angle window, the "transfer" command is given. This is an open transition but both sources will be in-phase when the transfer occurs.

In the event source 1 and source 2 fail to synchronize within a specified amount of time, due to excessive phase angle difference or frequency difference, then the transfer will take place under delayed transition. Alarm relay will energize and failure will be logged into the transfer history as either "Sync Fail - Freq" or "Sync Fail - Phase" depending on whether the frequency difference or the phase difference was excessive.

5.10 Program Mode

The ATC-300+ Controller is fully programmable from the device's faceplate once the Password has been correctly entered. Any operator associated with programming the ATC-300+ Controller will quickly discover that ATC-300+ programming is just a matter of simple, repetitive steps. However, because of the importance placed on this function and its critical relationship to the proper functioning of the system, Section 6 of this manual is dedicated to the Program Mode. Refer to that section and Table 2 for details.

Section 6: Programming

6.1 Introduction

NOTICE

ALTHOUGH ALL ATC-300 CONTROLLER PROGRAMMABLE FEATURES ARE ADDRESSED IN THIS SECTION, ONLY THOSE ORDERED BY THE CUSTOMER AND INITIALLY PROGRAMMED AT THE FACTORY WILL APPEAR IN THE DISPLAY FOR PROGRAMMING CHANGES IN THE FIELD.

The ATC-300 Controller is fully programmable from the device's faceplate or remotely through the communications port. Users can reprogram setpoints as well as other parameters. The time, date, and setpoints can only be changed while the device is in the Program Mode.

Program Mode is achieved by entering a valid password when prompted by the Setpoints screens. The Unit Status LED will blink at a faster rate when viewing the setpoints while in Program Mode.

NOTICE

WHILE IN THE PROGRAM MODE, THE ATC-300+ CONTROLLER IS NEVER OFF-LINE AND CONTINUES TO FUNCTION IN ACCORDANCE WITH PREVIOUSLY PROGRAMMED SETPOINTS.

6.2 Password

To enter the Program Mode, the ATC-300+ Controller requires a password to prevent unauthorized persons from modifying setpoint values.

There are five screens related to the password, which is a four-digit number from 0000 to 9999.

1.

VIEW SETPOINTS?	YES
-----------------	-----

Use the Increase or Decrease pushbuttons to select Yes, then use the Step/Enter pushbutton to enter the selection and move to the next screen

2.

CHANGE SETPOINTS?	YES
-------------------	-----

Use the Increase or Decrease pushbuttons to select Yes or No, then use the Step/Enter pushbutton to enter the selection and move to the next screen. If No is selected, the user will be able to review the setpoints but not make any changes. If Yes is selected, the Password screen will appear.

3.

PASSWORD (Use Inc/Dec)	0000
---------------------------	------

Use the Increase or Decrease keys to scroll to the desired value (0 - 9) for the first digit, then use the Step/Enter key to enter the value and move to the next digit. Repeat for remaining three digits. After all four numerals of the password are entered, press the Step/Enter pushbutton to enter the password and proceed to the next screen. If an invalid password is entered, the LCD Display shall read "Invalid Password" and the user must press the Step/Enter pushbutton to initiate another password entry sequence.

Note: The factory default password is "0300". If the password is forgotten, contact the factory for the backdoor password.

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4.

CHANGE PASSWORD?	YES
---------------------	-----

Use the Increase or Decrease pushbuttons to select Yes or No, then use the Step/Enter pushbutton to enter the selection and move to the next screen. If No is selected, the first Setpoint screen will appear. If Yes is selected, the following screen will appear.

5.

NEW PASSWORD 0000 (Use Inc/Dec)

Use the Increase or Decrease pushbuttons to scroll to the desired value (0 - 9) for the first digit of the new password, then use the Step/Enter pushbutton to enter the value and move to the next digit. Repeat for remaining three digits.

The user then steps through the setpoint screens and can change the setpoint values. During this time, the Unit Status LED will blink at a faster rate. At the end of the setpoint screens, the user will be prompted to save the setpoints.

6.3 Display Only Mode

In the Display Only Mode, the ATC-300+ Controller allows the user to view all setpoints and their programmed values. Each press of the Step/Enter pushbutton will advance the program to the next setpoint. Setpoint values CANNOT be changed while in the Display Only Mode.

6.4 Change Setpoints Mode

In the Change Setpoints Mode, the user can step through the Setpoint screens and change the Setpoint values using the Increase and Decrease pushbuttons. During this time, the Unit Status LED will blink at a faster rate to indicate Program Mode. At the end of the setpoint screens, the LCD Display will read Save Setpoints? Either the Increase or Decrease pushbutton may be used to select either Yes or No". The Step/Enter pushbutton is then pressed to enter the selection. If Yes is selected at the Save Setpoints? Screen, the ATC-300+ shall save the Setpoint settings and the LCD Display shall read Programming Setpoints to confirm entry. If "No" is selected, then all Setpoints will remain unchanged.

6.5 Programmable Features and Setpoints



CAUTION

CHANGING THE SYSTEM NOMINAL VOLTAGE OR FREQUENCY SET-POINT WILL AUTOMATICALLY CHANGE ALL THE PICKUP AND DROPOUT SETTINGS TO THE NEW DEFAULT VALUES.

All ATC-300+ Controller programmable features and associated setpoint possibilities with any required explanations are presented in Table 2. Remember that only features originally ordered and factory programmed will appear in the display.

The following setpoints are programmable if the corresponding feature is programmed.

Table 2. Programmable Features and Setpoints

SETPOINT	SETPOINT UNITS	DESCRIPTION	RANGE	FACTORY DEFAULT
New Password	Four Digits	Set New Password	0000 to 9999	0300
TDES	Minutes: Seconds	Time Delay Engine Start	0 to 120 seconds	0:03
TDNE	Minutes: Seconds	Time Delay Normal to Emergency	0 to 1800 seconds	0:00
TDEN	Minutes: Seconds	Time Delay Emergency to Normal	0 to 1800 seconds	5:00
TDEC	Minutes: Seconds	Time Delay Engine Cool-off	0 to 1800 seconds	5:00
NOM FREQ	Hertz	Nominal Frequency	50 or 60 Hz	As ordered
NOM VOLTS	Volts	Nominal Voltage	120 to 600 volts	As ordered
S1 UV DROP	Volts	Source 1 Undervoltage Dropout Range: Breaker/Switch Style ATS Contactor Style ATS (2-position/3-position)	50 to 97% of Nominal System Voltage 78 to 97% of Nominal System Voltage	80% 85%
S2 UV DROP	Volts	Source 2 Undervoltage Dropout Range: Breaker/Switch Style ATS Contactor Style ATS (2-position/3-position)	50 to 97% of Nominal System Voltage 78 to 97% of Nominal System Voltage	80% 85%
S1 UV PICK	Volts	Source 1 Undervoltage Pickup Range: Breaker/Switch Style ATS Contactor Style ATS (2-position/3-position)	(Dropout + 2%) to 99% of Nominal System Voltage (Dropout + 2%) to 99% of Nominal System Voltage	90% 90%
S2 UV PICK	Volts	Source 2 Undervoltage Pickup Range: Breaker/Switch Style ATS Contactor Style ATS (2-position/3-position)	(Dropout + 2%) to 99% of Nominal System Voltage (Dropout + 2%) to 99% of Nominal System Voltage	90% 90%
S1 OV DROP	Volts	Source 1 Overvoltage Dropout Range: Breaker/Switch Style ATS Contactor Style ATS (2-position/3-position)	105 to 120% of Nominal System Voltage 105 to 110% of Nominal System Voltage	115% 110%
S2 OV DROP	Volts	Source 2 Overvoltage Dropout Range: Breaker/Switch Style ATS Contactor Style ATS (2-position/3-position)	105 to 120% of Nominal System Voltage 105 to 110% of Nominal System Voltage	115% 110%
S1 OV PICK	Volts	Source 1 Overvoltage Pickup Range: Breaker/Switch Style ATS Contactor Style ATS (2-position/3-position)	103% to (Dropout -2%) of Nominal System Voltage 103% to (Dropout -2%) of Nominal System Voltage	110% 105%
S2 OV PICK	Volts	Source 2 Overvoltage Pickup Range: Breaker/Switch Style ATS Contactor Style ATS (2-position/3-position)	103% to (Dropout -2%) of Nominal System Voltage 103% to (Dropout -2%) of Nominal System Voltage	110% 105%
S1 UF DROP	Hertz	Source 1 Underfrequency Dropout Range: Breaker/Switch Style ATS Contactor Style ATS (2-position/3-position)	90 to 97% of Nominal System Frequency 90 to 97% of Nominal System Frequency	94% 90%
S2 UF DROP	Hertz	Source 2 Underfrequency Dropout Range: Breaker/Switch Style ATS Contactor Style ATS (2-position/3-position)	90 to 97% of Nominal System Frequency 90 to 97% of Nominal System Frequency	94% 90%
S1 UF PICK	Hertz	Source 1 Underfrequency Pickup Range: Breaker/Switch Style ATS Contactor Style ATS (2-position/3-position)	(Dropout + 1 Hz) to 99% of Nominal System Frequency (Dropout + 1 Hz) to 99% of Nominal System Frequency	96% 95%
S2 UF PICK	Hertz	Source 2 Underfrequency Pickup Range: Breaker/Switch Style ATS Contactor Style ATS (2-position/3-position)	(Dropout + 1 Hz) to 99% of Nominal System Frequency (Dropout + 1 Hz) to 99% of Nominal System Frequency	96% 95%
S1 OF DROP	Hertz	Source 1 Overfrequency Dropout Range: Breaker/Switch Style ATS Contactor Style ATS (2-position/3-position)	103 to 110% of Nominal System Frequency 103 to 105% of Nominal System Frequency	106% 105%
S2 OF DROP	Hertz	Source 2 Overfrequency Dropout Range: Breaker/Switch Style ATS Contactor Style ATS (2-position/3-position)	103 to 110% of Nominal System Frequency 103 to 105% of Nominal System Frequency	106% 105%
S1 OF PICK	Hertz	Source 1 Overfrequency Pickup Range: Breaker/Switch Style ATS Contactor Style ATS (2-position/3-position)	101% to (Dropout -1 Hz) of Nominal System Frequency 101% to (Dropout -1 Hz) of Nominal System Frequency	104% 102%
S2 OF PICK	Hertz	Source 2 Overfrequency Pickup Range: Breaker/Switch Style ATS Contactor Style ATS (2-position/3-position)	101% to (Dropout -1 Hz) of Nominal System Frequency 101% to (Dropout -1 Hz) of Nominal System Frequency	104% 102%
TDN	Minutes: Seconds	Time Delay Neutral	0 to 120 seconds	0:00
BAUD RATE		Modbus Baud Rate	9600 or 19200	9600
ADDRESS		Modbus Address	1 to 247	1
PLANT EXER	Days	Plant Exerciser Programming	OFF, DAILY, 7-DAY, 14-DAY or 28 DAY	OFF
PE LOAD XFR		Plant Exerciser Load Transfer	0 or 1 (1 = yes)	0

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Table 2 Programmable Features and Setpoints (Cont.)

SETPOINT	SETPOINT UNITS	DESCRIPTION	RANGE	FACTORY DEFAULT
PE DAY	Days	Plant Exerciser Day of the Week	1 SUN, 2 MON, 3 TUE, 4 WED, 5 THU, 6 FRI or 7 SAT	
PE HOUR	Hours	Plant Exerciser Hour	0 to 23	0
PE MINUTE	Minutes	Plant Exerciser Minute	0 to 59	0
TEST MODE		Test Mode	0, 1 or 2 (0 = No Load Engine Test, 1 = Load Engine Test, 2 = Disabled)	0
TER	Hours: Minutes	Engine run test time	0 min to 600 min	5:00
TPRE	Minutes: Seconds	Pretransfer delay timer	0 sec to 120 sec	0:00
PHASES		Three phase or single phase	1 or 3	AS ORDERED
VOLT UNBAL	Volts	Voltage Unbalanced	0 or 1 (1 = Enabled)	1
UNBAL DROP %	Percent	Percent for Unbalanced Voltage Dropout	5 to 20% of Phase to Phase Voltage Unbalance	20%
UNBAL PICK %	Percent	Percent for Unbalanced Voltage Pickup	Dropout minus (UNBAL DROP % -2) to 3%	10%
UNBAL DELAY	Seconds	Unbalanced Delay Timer	10 to 30	0:20
TDEF	Seconds	Time Delay Emergency Fail Timer	0 sec to 6 sec	6
IN-PHASE	Hertz	In-Phase Transition	0 or 1 (1 = Enabled)	1
IP FREQ DIFF	Hertz	In-phase Transition Frequency Difference	0.0 Hz to 3.0 Hz	1.0
SYNC TIME	Minutes	In-phase Transition Synchronization Timer	1 min to 60 min	5
PHASE REV		Phase Reversal	OFF, ABC, or CBA	OFF
DST ADJUST		Day Light Savings	0 or 1 (1 = Enabled)	1
MAN RETRAN		Manual Retransfer	0 or 1 (1 = Enabled)	0
LANGUAGE		Selected Language	English, French, or Spanish	English
CHANGE TIME/DATE?		Set Time and Date		
	Hours	Set Hour	0 to 23	Eastern Standard Time
	MINUTES	Set Minute	0 to 59	Eastern Standard Time
	WEEKDAY	Set Weekday	SUN, MON, TUE, WED, THU, FRI or SAT	Eastern Standard Time
	MONTH	Set Month	JAN or 01	Eastern Standard Time
	DAY	Set Day	1 to 31	Eastern Standard Time
	YEAR	Set Year	Current Year	Eastern Standard Time
RESET SYSTEM COUNTERS?			Yes or No	No
RESET ALL?		Resets all System Counters	Yes or No	No
RESET ENGINE RUN?	Hours	Resets ENGINE RUN Counter	0 to 9999	XXXX
RESET S1 CONN	Hours	Resets S1 CONN Counter	0 to 9999	XXXX
RESET S2 CONN	Hours	Resets S2 CONN Counter	0 to 9999	XXXX
RESET S1 AVAIL	Hours	Resets S1 AVAIL Counter	0 to 9999	XXXX
RESET S2 AVAIL	Hours	Resets S2 AVAIL Counter	0 to 9999	XXXX
RESET LOAD ENERG	Hours	Resets LOAD ENERG Counter	0 to 9999	XXXX
RESET TRANSFERS	Cycles (Counts)	Resets TRANSFERS Counter	0 to 9999	XXXX
SAVE SETPOINTS?		Save Changed Setpoints	Yes or No	Yes

See tables in the appendix for Voltage and Frequency Pickup and Dropout settings.

Section 7: Troubleshooting and Maintenance

7.1 Level of Repair

This manual is written with the assumption that only ATS troubleshooting will be performed. If the cause of malfunction is traced to an ATC-300+, the unit should be replaced with a new unit. The malfunctioning unit should then be returned to Generac for factory repairs.

7.2 ATC-300+ Controller Troubleshooting

The Troubleshooting Guide (Table 3) is intended for service personnel to identify whether a problem being observed is external or internal to the unit. For assistance with this determination, contact Generac. If a problem is identified to be internal, the unit should be returned to the factory for replacement.

NOTICE

WHILE PERFORMING TESTING, IF AN UNDESIRED OR UNDOCUMENTED RESULT OCCURS CONTACT THE GENERAC SALES REPRESENTATIVE.

Table 3. Troubleshooting Guide

SYMPTOM	PROBABLE CAUSE	POSSIBLE SOLUTION(S)
All front panel indicator LED's are off.	Control power is deficient or absent.	Verify that control power is connected at J7 and that it is within specifications.
	ATC-300+ is malfunctioning.	Replace the unit.
"Unit Status" LED is not blinking.	Control power is deficient or absent.	Verify that control power is connected at J7 and that it is within specifications.
	ATC-300+ is malfunctioning.	Replace the unit.
One or more voltage phases read incorrectly.	Incorrect wiring.	Verify voltage with multimeter. Check wiring. Replace the unit.
	ATC-300+ is malfunctioning.	Verify ground connection at J-5, Pin 12
Front panel pushbuttons do not work.	Bad connection inside the ATC-300+.	Replace the unit.
Unit did not accept new setpoints via front panel.	Operator error.	Enter the correct Password and change the setpoints.
	No pushbuttons pressed for 2.5 minutes.	Avoid intervals of 2.5 minutes of inactivity with pushbuttons when changing setpoints.
Source 1 or Source 2 is not available when it should be.	Voltage and/or frequency are not within setpoint values.	Verify voltage and/or frequency with multimeter. Check the programmed setpoint values.
Unit displays "LOCK-OUT".	Circuit breaker tripped.	Check for a overload/short circuit condition
	Lockout circuit wiring problem.	Check lockout circuit wiring.
Unit displays "INHIBIT".	No contact closure at Emergency Inhibit Input	Check Emergency Inhibit Wiring at J8, Pins 7 and 8.
Unit displays "SOURCE 1 DEVICE".	Source 1 breaker/contactator did not open when it was commanded to open (within 6 seconds).	Check the Source 1 circuit breaker shunt trip (ST) wiring.
	Source 1 breaker/contactator did not close when it was commanded to close (within 6 seconds).	Check the Source 1 circuit breaker spring release (SR) wiring.
	Source 1 closed contacts did not open when Source 1 breaker opened (within 6 seconds).	Check the Source 1 closed control input wiring on J-4, Pins 1 and 2 and J-8, Pins 1 and 2.
	Source 1 closed contacts did not close when Source 1 breaker closed (within 6 seconds).	Check the Source 1 closed control input wiring on J-4, Pins 1 and 2 and J-8, Pins 1 and 2.
Unit displays "SOURCE 2 DEVICE".	Source 2 breaker/contactator did not open when it was commanded to open (within 6 seconds).	Check the Source 2 circuit breaker shunt trip (ST) wiring.
	Source 2 breaker/contactator did not close when it was commanded to close (within 6 seconds).	Check the Source 2 circuit breaker spring release (SR) wiring.
	Source 2 closed contacts did not open when Source 2 breaker opened (within 6 seconds).	Check the Source 2 closed control input wiring on J-4, Pins 3 and 4 and J-8, Pins 3 and 4.
	Source 2 closed contacts did not close when Source 2 breaker closed (within 6 seconds).	Check the Source 2 closed control input wiring on J-4, Pins 3 and 4 and J-8, Pins 3 and 4.

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Table 3. Troubleshooting Guide (Cont.)

SYMPTOM	PROBABLE CAUSE	POSSIBLE SOLUTION(S)
Unit will not perform an Engine Test.	Engine Test pushbutton was not pressed.	Press the Engine Test pushbutton to initiate the test.
	Display is not displaying the Home screen before initiating the test.	Use the Step/Enter pushbutton to step to the Home screen. If a timer is timing down, wait until it is done.
	Engine Test setpoint is set to Disable (Value of "2").	Re-program the Engine Test setpoint.
	Number of generators setpoint is set to 0.	Re-program the number of generators setpoint.
	Generator became unavailable when connected to the load.	Increase the Time Delay Emergency Fail (TDEF) timer setpoint.
	Generator became unavailable before connecting to the load.	Check the generator for proper function.
Plant Exerciser failed to exercise.	Generator voltage and/or frequency did not become available within 90 seconds of engine starting.	Verify the voltage and/or frequency with a multimeter. Check the programmed setpoint values. Check the engine maintenance.
	Incorrect date or time setting.	Verify real time clock settings for the time and date.
	Incorrect setpoint programmed for the PE DAY, PE HOUR, and/or PE MINUTE.	Re-program the PE DAY, PE HOUR, and/or PE MINUTE setpoint.
	Generator voltage and/or frequency did not become available within 90 seconds of engine starting.	Verify the voltage and/or frequency with a multimeter. Check the programmed setpoint values. Check the engine maintenance.
	Generator became unavailable when connected to the load.	Increase the TDEF timer setpoint.
Engine fails to start after the TDES times out.	Generator became unavailable before connecting to the load.	Check the generator for proper function.
	Incorrect wiring.	Check the wiring between the Gen Start relay (J-5, Pins 13 and 14) and the engine.
	Gen Start relay contacts are not closed.	Replace the unit.
	Engine did not start.	Check the generator for proper function.

7.3 ATC-300 + Replacement

Follow these procedural steps to replace the ATC-300 +.

- Step 1: Turn off the control power at the main disconnect or isolation switch of the control power supply. If the switch is not located within view from the ATC-300 +, lock it out to guard against other personnel accidentally turning it on.
- Step 2: Verify that all "foreign" power sources wired to the ATC-300 + are de-energized. These foreign power sources may also be present on some of the terminal blocks.
- Step 3: Before disconnecting any wires from the unit, make sure they are individually identified to assure that reconnection can be correctly performed. Make a sketch to help with the task of terminal and wire identification.
- Step 4: Remove all wires and disconnect plug-type connectors.

- Step 6: Remove the unit from the door or panel. Lay the original mounting screws aside for later use.
- Step 7: Align the unit with the opening in the door or panel.
- Step 8: Using the original mounting hardware, secure the replacement unit to the door or panel.
- Step 9: Using the sketch mentioned in Step 3, replace each wire at the correct terminal and make sure each is secure. Make certain that each harness plug is securely seated.
- Step 10: Restore control power to the unit.

7.4 Maintenance and Care

The ATC-300 + is designed to be a self-contained and maintenance-free unit. The printed circuit boards are calibrated and conformally coated at the factory. They are intended for service by factory-trained personnel only.



CAUTION

SUPPORT THE ATC-300 + FROM THE REAR WHEN THE SCREWS ARE LOOSENED OR REMOVED IN STEP 5. WITHOUT SUCH SUPPORT, THE UNIT COULD FALL OR THE PANEL COULD BE DAMAGED.

- Step 5: Remove the four (4) mounting screws, located on the four corners, which hold the unit and trim plate against the door or panel. These are accessed from the front of the unit. Support the unit and remove the two center screws.

Appendix A: Display Message for Status and Timers

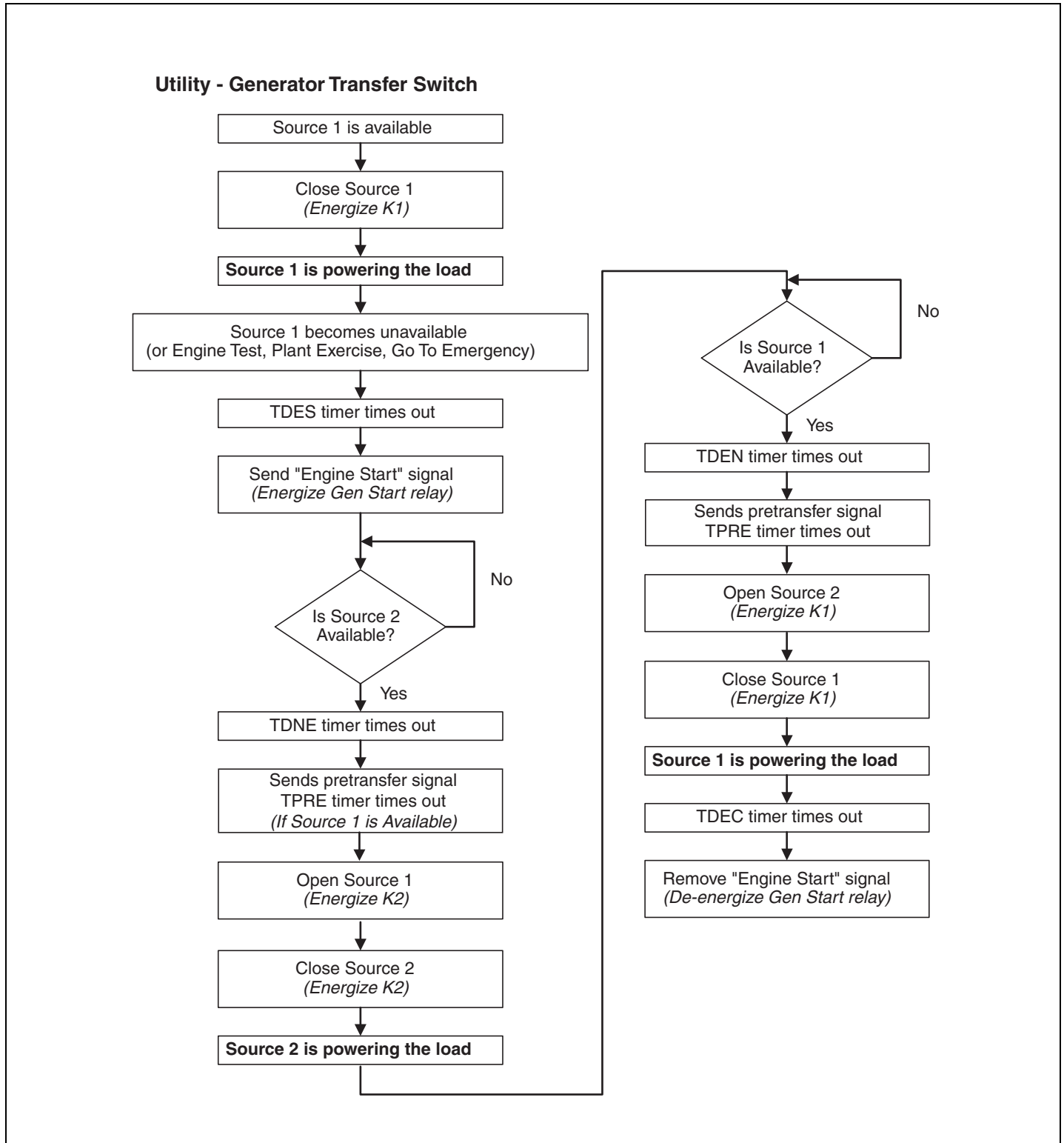
Display Message

TDEC	Countdown cool-off timing before the generator contacts are opened.
TDES	Countdown timing before the generator contacts are closed.
TDNE	Countdown timing before Source 1 is disconnected before transferring to Source 2. Timing begins when Source 2 is available.
TDN	Countdown timing with both sources disconnected from the load.
TDEN	Countdown timing before Source 2 is disconnected before transferring to Source 1. Timing begins when Source 1 becomes available.
TRANSFER	Waiting for the switch to make the transfer from the neutral position to the intended source.
ATS NOT IN AUTOMATIC	Control input for monitor mode is closed.
LOCK-OUT OVERCURRENT TRIP	A trip condition has been detected by either breaker, and the system is locked-out from further transfers.
MANUAL	Waiting for an input signal to complete the manual re-transfer
INHIBIT	Indicates that a transfer to the Emergency Source is inhibited because the Emergency inhibit input is activated.
ENGINE RUN	The engine run test timer is counting down before the test is completed. Pressing the Engine Test pushbutton will abort this timer and the test.
START TEST?	To initiate an engine test sequence, press the Engine Test pushbutton again, or press Increase and Decrease pushbuttons simultaneously to clear.
WAIT FOR S2	Waiting for the Source 2 source voltage and frequency to become available.
TD PRE-TRAN	Countdown timer while waiting for a pre-transfer acknowledge input.
SYNC TIME	Countdown timing in minutes while waiting for sources to synchronize during an in phase transition.
SOURCE 1 DEVICE	Indicates that the Source 1 device (i.e. circuit breaker, contactor) failed to open or close
SOURCE 2 DEVICE	Indicates that the Source 2 device (i.e. circuit breaker, contactor) failed to open or close.
TDEF	Countdown timing before declaring Source 2 unavailable (accounts for momentary generator fluctuations).
TD UNBAL	Countdown timer before declaring a source unavailable due to a voltage unbalance condition.
TEST ABORTED	Indicates that an engine test or plant exercise was aborted after three unsuccessful attempts. Source 2 did not remain available while TDNE was timing.
GO TO SOURCE 2	Indicates that the load is connected to Source 2 because the Go To Source 2 control input is in the "unconnected" state.
FAILSAFE	Indicates that the load was connected to Source 2 but Source 2 became unavailable so the load transferred back to Source 1.
SETPOINTS ERROR	Memory problem with the setpoints. Contact the factory.
OPTIONS ERROR	Memory problem with the factory options. Contact the factory.
PROGRAMMING SETPOINTS	Setpoints are being saved in memory.
WAITING FOR NEUTRAL	Waiting for the neutral position to be reached by the switch.
WAITING FOR S1 TO OPEN	Waiting for the Source 1 device (i.e. circuit breaker, contactor) to open.
WAITING FOR S2 TO OPEN	Waiting for the Source 2 device (i.e. circuit breaker, contactor) to open.
WAITING FOR S1 TO CLOSE	Waiting for the Source 1 device (i.e. circuit breaker, contactor) to close.
WAITING FOR S2 TO CLOSE	Waiting for the Source 2 device (i.e. circuit breaker, contactor) to close.

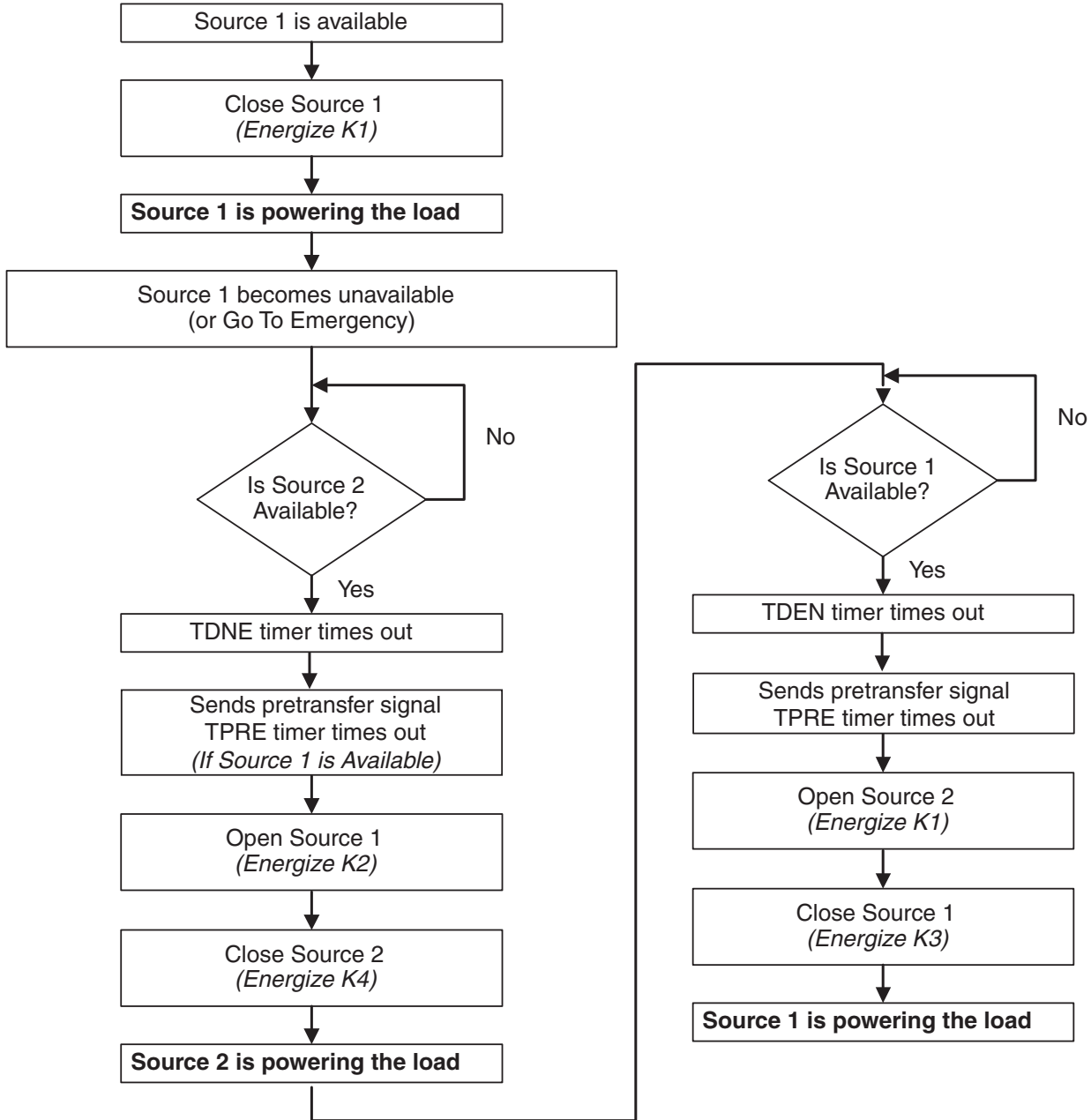
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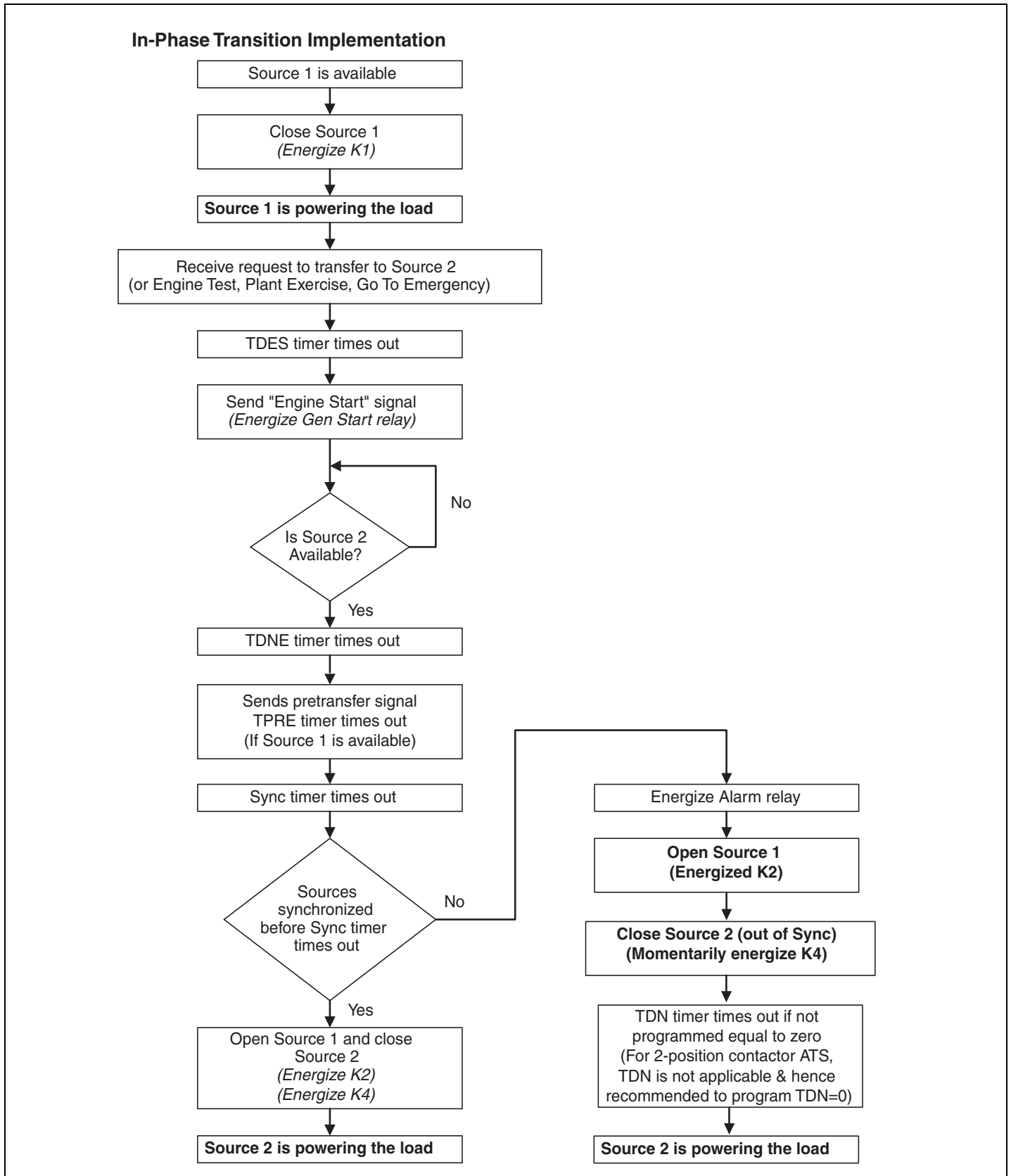
Appendix B: Operational Flowcharts

- Utility - Generator Transfer Switch
- Dual Utility Transfer Switch
- In-phase Transition Implementation



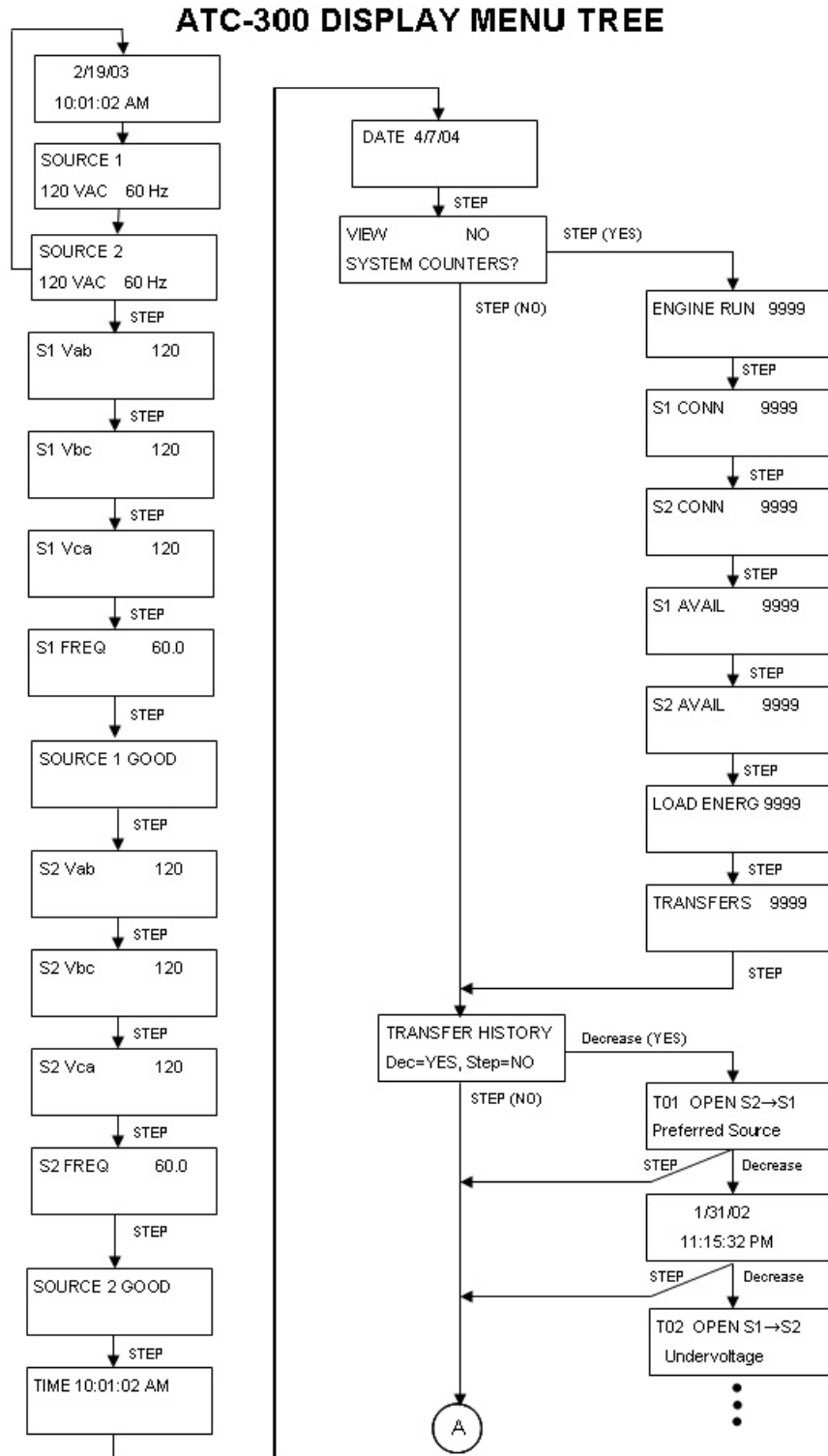
Dual Utility Transfer Switch



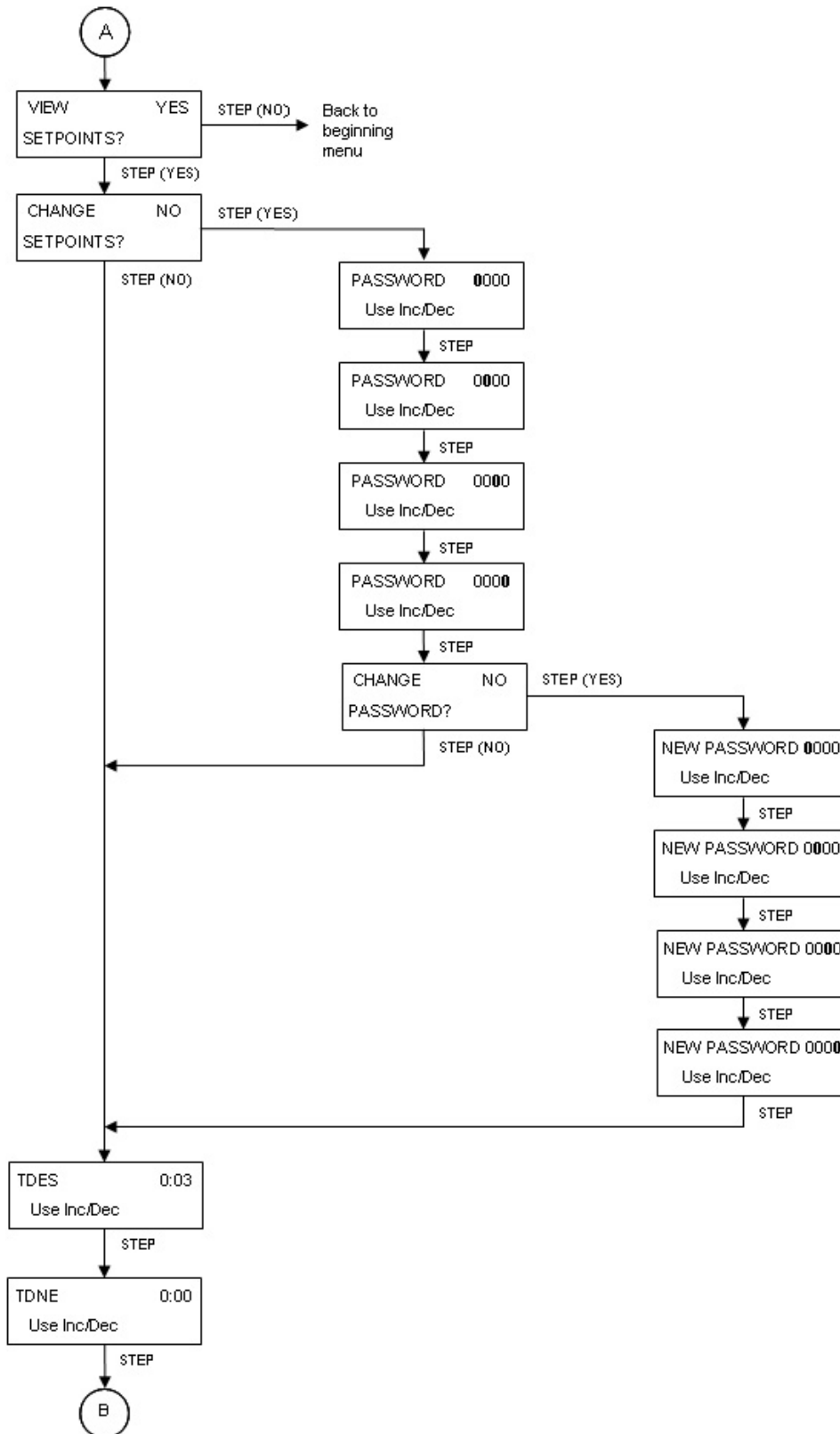


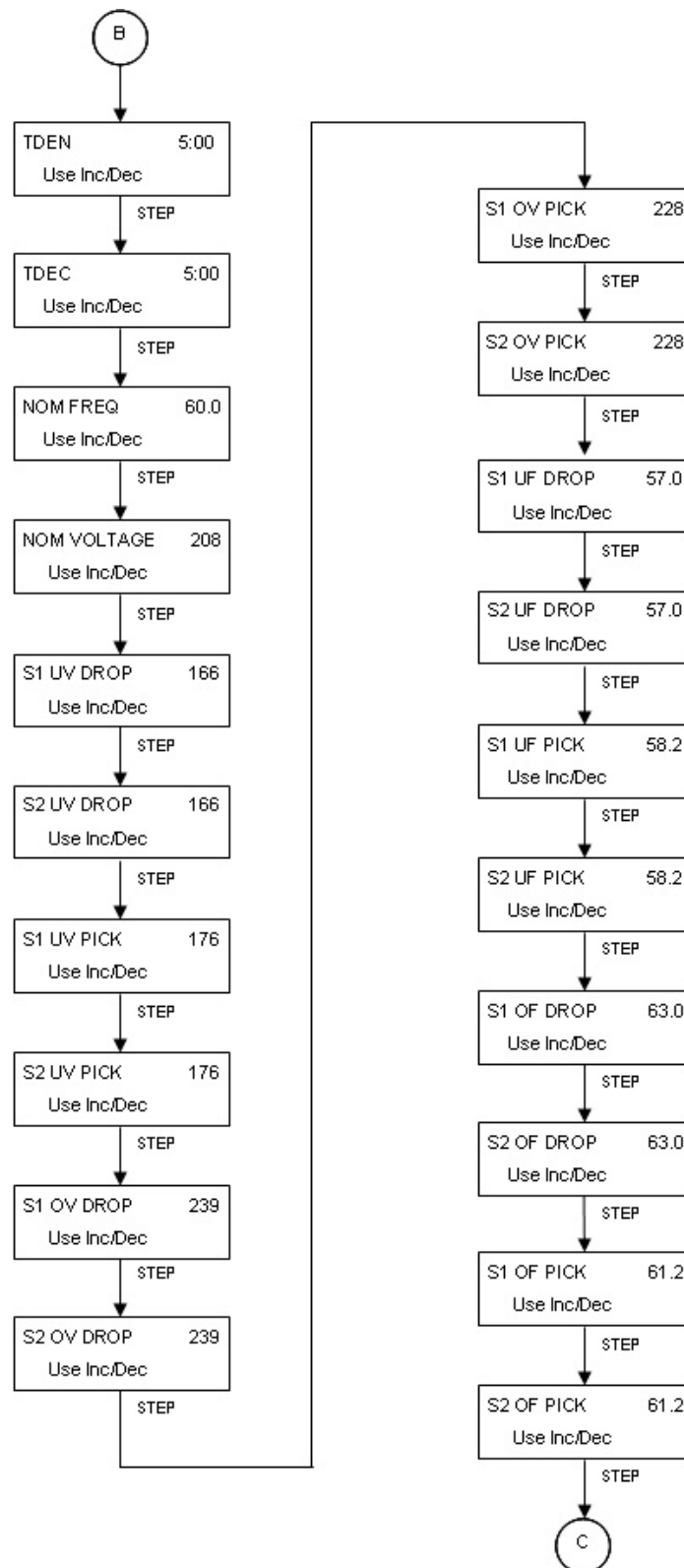
Appendix C: Display Menu Tree

Note: Only standard and programmed optional Features will appear on the LCD Display. Optional Features that are not programmed will be skipped and will not appear on the LCD display.

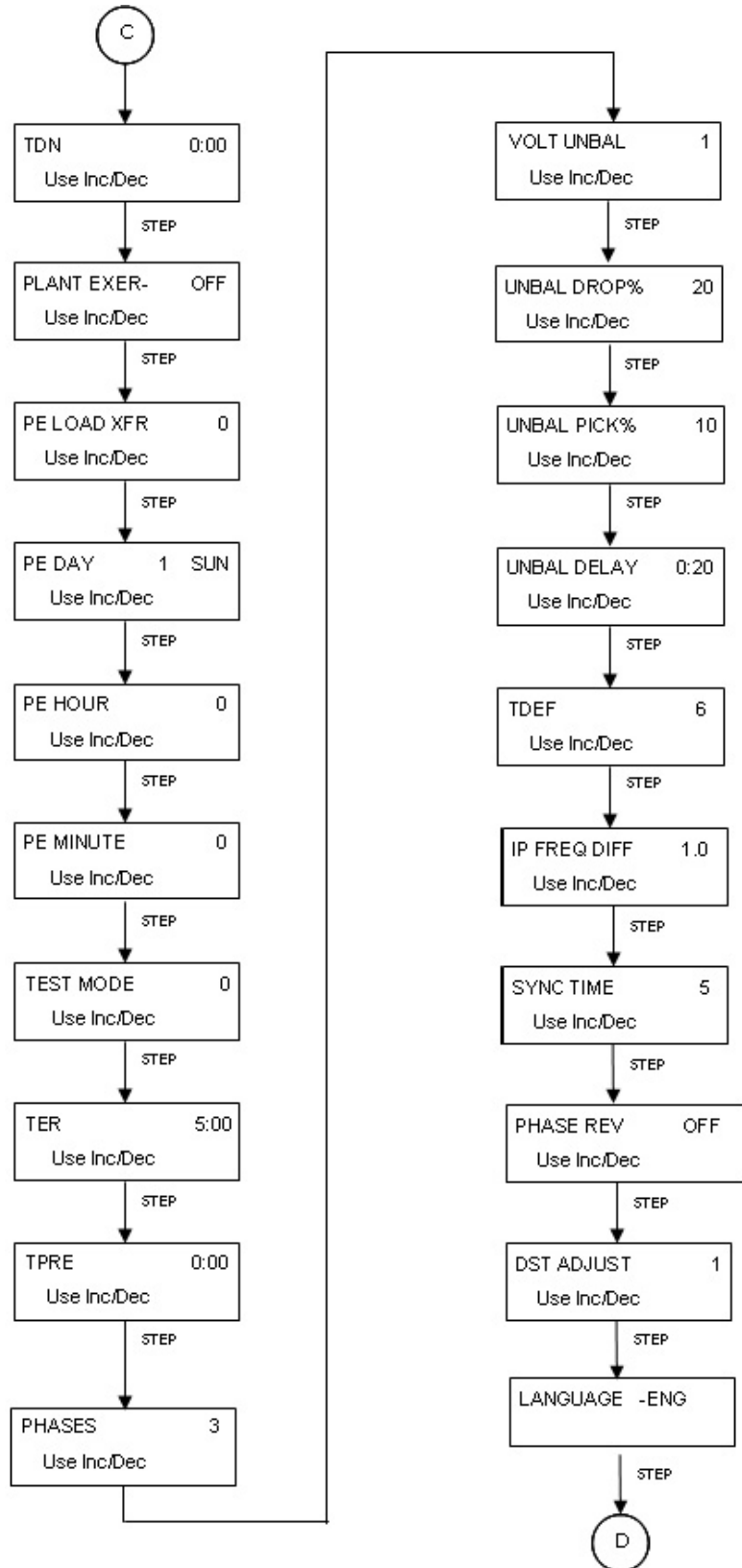


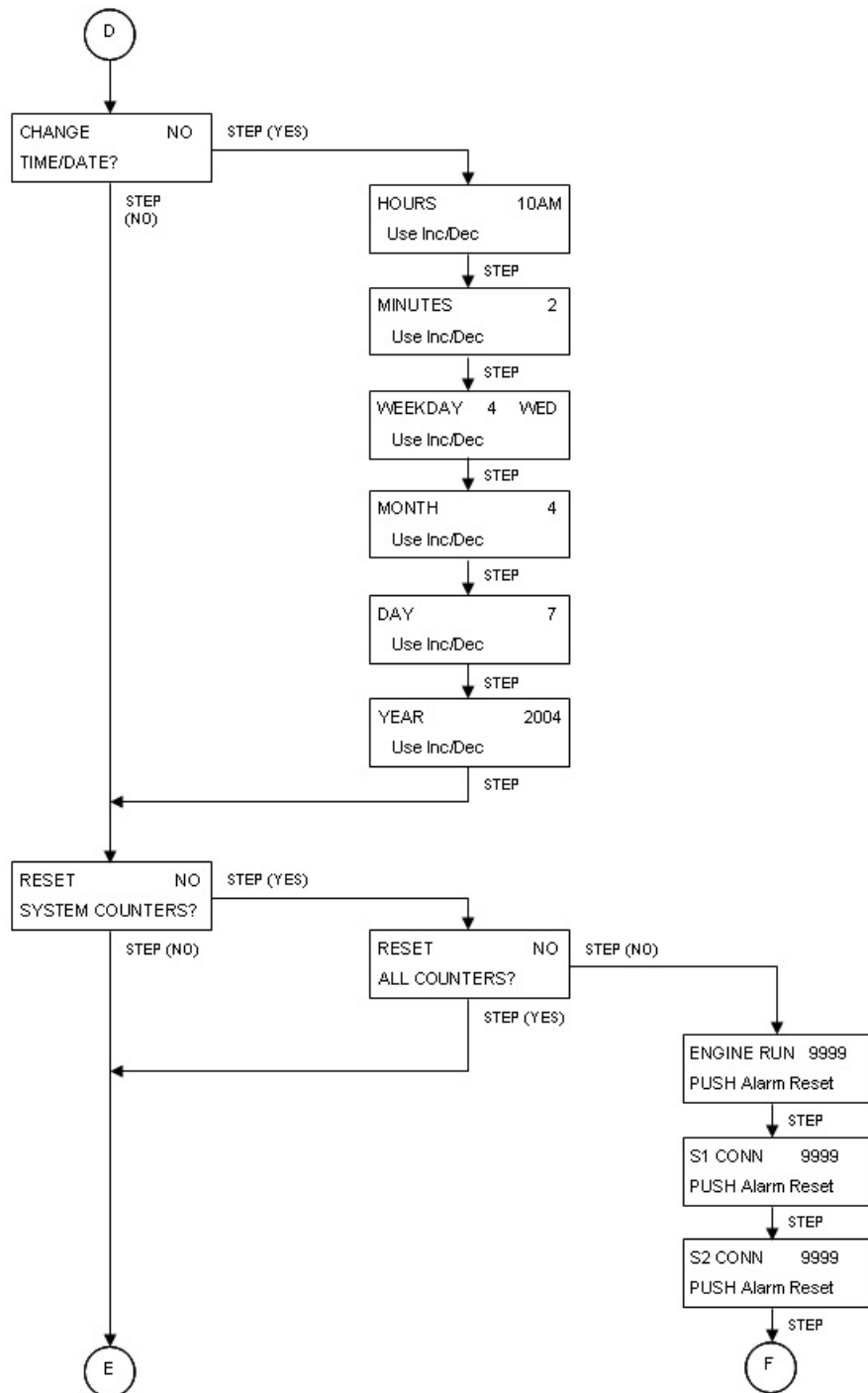
ATC-300+ Automatic Transfer Switch Controller



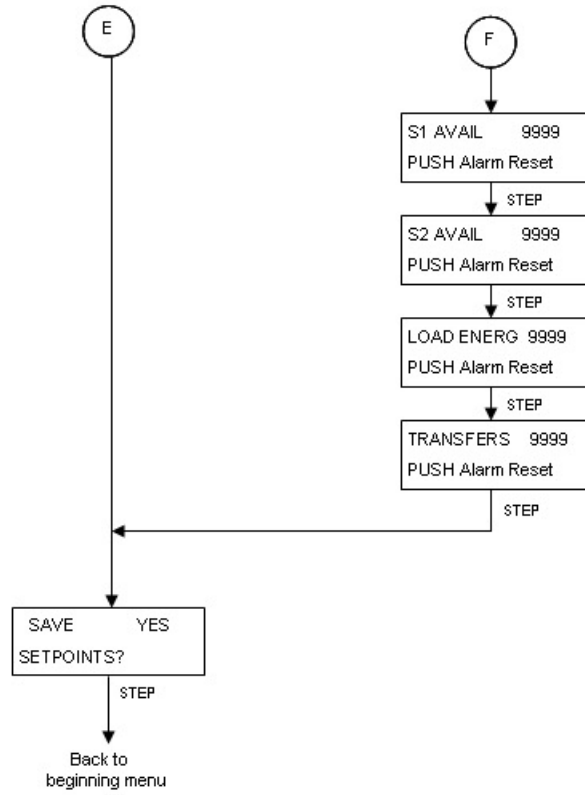


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Appendix D: Pickup / Dropout Tables

UNDERVOLTAGE PICKUP / DROPOUT TABLE

PERCENTAGE	VOLTAGE								
	120	208	220	240	380	415	480	600	
97	116	202	213	233	369	403	466	582	
96	115	200	211	230	365	398	461	576	
95	114	198	209	228	361	394	456	570	
94	113	196	207	226	357	390	451	564	
93	112	193	205	223	353	386	446	558	
92	110	191	202	221	350	382	442	552	
91	109	189	200	218	346	378	437	546	
90	108	187	198	216	342	374	432	540	Pickup-Breaker, Contactor (2-position/3-position)
89	107	185	196	214	338	369	427	534	
88	106	183	194	211	334	365	422	528	
87	104	181	191	209	331	361	418	522	
86	103	179	189	206	327	357	413	516	
85	102	177	187	204	323	353	408	510	Dropout- Contactor (2-position/3-position)
84	101	175	185	202	319	349	403	504	
83	100	173	183	199	315	344	398	498	
82	98	171	180	197	312	340	394	492	
81	97	168	178	194	308	336	389	486	
80	96	166	176	192	304	332	384	480	Dropout-Breaker
79	95	164	174	190	300	328	379	474	
78	94	162	172	187	296	324	374	468	
77	92	160	169	185	293	320	370	462	
76	91	158	167	182	289	315	365	456	
75	90	156	165	180	285	311	360	450	
74	89	154	163	178	281	307	355	444	
73	88	152	161	175	277	303	350	438	
72	86	150	158	173	274	299	346	432	
71	85	148	156	170	270	295	341	426	
70	84	146	154	168	266	291	336	420	
69	83	144	152	166	262	286	331	414	
68	82	141	150	163	258	282	326	408	
67	80	139	147	161	255	278	322	402	
66	79	137	145	158	251	274	317	396	
65	78	135	143	156	247	270	312	390	
64	77	133	141	154	243	266	307	384	
63	76	131	139	151	239	261	302	378	
62	74	129	136	149	236	257	298	372	
61	73	127	134	146	232	253	293	366	
60	72	125	132	144	228	249	288	360	
59	71	123	130	142	224	245	283	354	
58	70	121	128	139	220	241	278	348	
57	68	119	125	137	217	237	274	342	
56	67	116	123	134	213	232	269	336	
55	66	114	121	132	209	228	264	330	
54	65	112	119	130	205	224	259	324	
53	64	110	117	127	201	220	254	318	
52	62	108	114	125	198	216	250	312	
51	61	106	112	122	194	212	245	306	
50	60	104	110	120	190	208	240	300	

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OVERVOLTAGE PICKUP / DROPOUT TABLE

PERCENTAGE	VOLTAGE								
	120	208	220	240	380	415	480	600	
120	144	250	264	288	456	498	576	720	
119	143	248	262	286	452	494	571	714	
118	142	245	260	283	448	490	566	708	
117	140	243	257	281	445	486	562	702	
116	139	241	255	278	441	481	557	696	
115	138	239	253	276	437	477	552	690	Dropout-Breaker
114	137	237	251	274	433	473	547	684	
113	136	235	249	271	429	469	542	678	
112	134	233	246	269	426	465	538	672	
111	133	231	244	266	422	461	533	666	
110	132	229	242	264	418	457	528	660	Pickup-Breaker Dropout-Contactor (2-position/3-position)
109	131	227	240	262	414	452	523	654	
108	130	225	238	259	410	448	518	648	
107	128	223	235	257	407	444	514	642	
106	127	220	233	254	403	440	509	636	
105	126	218	231	252	399	436	504	630	Pickup-Contactor (2-position/3-position)

UNDERFREQUENCY PICKUP / DROPOUT TABLE

PERCENTAGE	FREQUENCY		
	50	60	
97	49	58	
96	48	58	Pickup-Breaker
95	48	57	Pickup-Contactor (2-position/3-position)
94	47	56	Dropout-Breaker
93	47	56	
92	46	55	
91	46	55	
90	45	54	Dropout-Contactor (2-position/3-position)

OVERFREQUENCY PICKUP / DROPOUT TABLE

PERCENTAGE	FREQUENCY		
	50	60	
110	55	66	
109	55	65	
108	54	65	
107	54	64	
106	53	64	Dropout-Breaker
105	53	63	Dropout-Contactor (2-position/3-position)
104	52	62	Pickup-Breaker
103	52	62	
102	51	61	Pickup-Contactor (2-position/3-position)

NOTES:

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NOTES:

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