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# 1510, 1520 SERIES VARIABLE TRANSFORMERS Installation & Operating Instructions

## INSPECTION

Prior to installation we recommend the following:

1. Check the nameplate to verify that the unit received matches the rating specified in your order.
2. Check the unit to satisfy yourself there is no damage.
3. Check that the brushes are seated properly on the brush track.
4. Check that the dial, knob and mounting screws are in the package.
5. Report missing or damaged parts to the factory.

### PRECAUTIONS

1. Be absolutely certain that the line voltage, phase frequency, and connections are correct for the unit.
2. If not provided, install fuses in the variable (brush) output lead as shown in the circuit diagrams and as recommended in the fuse tabulation.
3. It is recommended that extra support be provided along the unit or at the end opposite mounting for all ganged units to provide rigidity and to relieve strain on the mounting screws.
4. Be certain that all brush assemblies of ganged units are in alignment.
5. Check that rotors are fastened securely to the shaft.

## INSTALLATION

### SHAFT ADJUSTMENT - AXIAL POSITION

The control shaft may be moved for knob attachment at either rotor or base end by loosening two setscrews in each rotor hub, sliding the shaft to the desired position, and tightening the two setscrews in each hub. The rotors of ganged units must be kept in alignment (all solidly against the stop at the same time). On enclosed ("CT") units access to the hub setscrews is with a long allen wrench through the brush access hole with the rotor at 75% of full clockwise rotation (viewed from rotor end) for one screw and at full counterclockwise rotation for the other screw. The latter should be loosened last and tightened first so that all rotors may be solidly against the stop when screws are tightened on the shaft. After the rotor hub screws are tightened securely with rotors and shaft in proper position, the brush access plates and screws should be replaced. On single manual ("CT") units the 3 hex head screws and round enclosure must be removed and replaced for this adjustment.

### MANUAL, SINGLE UNITS (BENCH OR WALL MOUNTING)

1. Using Template No. 1, locate and drill mounting holes (3 or 4 hole mounting as desired).
2. Place unit in position and mount with 5/16" or No. 10-32 mounting screws, as required.
3. Loosen the two setscrews in the rotor hub and slide the shaft through so it projects from the rotor end. Tighten the setscrews. See shaft adjustment paragraph above.
4. To utilize the dial plate on uncased units, a support must be provided. Mount the dial plate to the support.
5. Attach the knob with pointer set at zero when the brushes are at the zero voltage position.
6. Make connections required for desired direction of rotation to increase output voltage. (See diagrams and tabulation).
7. In addition, on enclosed terminal ("CT") types, remove four screws, the terminal cover, and the required conduit knockouts. Attach conduit or cable and dress the leads. Make the necessary connections to the terminal board and replace the terminal cover and screws.

### MANUAL, SINGLE UNITS (BACK-OF-PANEL MOUNTING)

1. Using Template No. 1, locate and drill mounting holes (3 or 4 hole mounting as desired) and shaft clearance hole. Drill 3 No. 32 drill holes (.116 dia.) for dial plate screws.
2. Mount dial plate with 3 No. 6 screws.
3. Place unit in position and mount with 5/16" or No. 10-32 screws, as required.
4. Loosen the two setscrews in the rotor hub and adjust the shaft position to the panel thickness. Tighten the setscrews. See shaft adjustment paragraph above.
5. Attach the knob with pointer set at zero when the brushes are at the zero voltage position.
6. Make connections required for desired direction of rotation to increase output voltage. (See diagrams and tabulation).
7. In addition, on enclosed terminal ("CT") types, remove four screws, the terminal cover, and the required conduit knockouts. Attach conduit or cable and dress the leads. Make the necessary connections to the terminal boards and replace the terminal covers and screws.

### MANUAL, GANGED UNITS (BENCH OR WALL MOUNTING)

1. Using Template No. 2, locate and drill the mounting holes.
2. Place unit in position and mount with 1/4-28 mounting screws.
3. Provide support for end of unit not supported by the wall.
4. Loosen the two setscrews in each rotor hub and slide the shaft through so it projects from the rotor end. Tighten the setscrews. See shaft adjustment paragraph above.

- To utilize the dial plate on uncased units, a support must be provided. Mount the dial plate to the support.
- Attach the knob with pointer set at a zero when the brushes are at the zero voltage position.
- Make connections required for desired direction of rotation to increase output voltage. (See diagrams and tabulation).
- In addition, on enclosed terminal ("CT") types, at each coil remove four screws, the terminal cover, and the required conduit knockouts. Attach conduit or cable and dress the leads. Make the necessary connections to the terminal boards and replace the terminal covers and screws.

### **MANUAL, GANGED UNITS (BRACKET MOUNTING)**

- Using Template No. 2 locate and drill the mounting holes and shaft clearance hole. Drill 3 No. 32 drill holes (.116 dia.) for dial plate screws.
- Mount dial plate with 3 No. 6 screws.
- Place unit in position and mount with 1/4" - 28 mounting screws.
- Provide support for end of unit not supported by the panel.
- Loosen the two setscrews in each rotor hub and adjust the shaft position to the panel thickness. Tighten the setscrews. See shaft adjustment paragraph above.
- Attach the knob with pointer set at zero when the brushes are at the zero voltage position.
- Make connections required for desired direction of rotation to increase output voltage. (See diagrams and tabulation).
- In addition, on enclosed terminal ("CT") types, at each coil remove four screws, the terminal cover, and the required conduit knockouts. Attach conduit or cable and dress the leads. Make the necessary connections to the terminal boards and replace the terminal covers and screws.

### **MOTORIZED, SINGLE AND GANGED UNITS (BENCH OR WALL MOUNTING)**

- Using template no. 2 locate and drill the mounting holes.
- Place unit in position and mount with 1/4"-28 mounting screws.
- Provide support for end of unit not supported by the wall.
- Make connections required for desired direction of rotation to increase output voltage. (See diagrams and tabulation). Motor circuit uses 120 volts, 50/60 Hz with one lead to "C" and the other alternately to "R" and "L" to raise and lower the output voltage. This may be accomplished by normally open push-buttons or by a single-pole, double-throw toggle switch with center "Off". If motor runs the wrong direction for each button, interchange external leads from "R" to "L" and vice versa. Motor may be used at 50 Hz but the speed will be 20% slower.
- In addition, on enclosed terminal ("CT") types, at each coil remove four screws, the terminal cover, and the required conduit knockouts. Attach conduit or cable and dress the leads. Make the necessary connections to the terminal boards and replace the terminal covers and screws.

### **MOTORIZED, SINGLE AND GANGED UNITS (BRACKET MOUNTING)**

- Using Template No. 3, locate and drill the proper set of mounting holes for 3/8" mounting screws.
- Insert two 3/8" mounting screws at the top of the assembly and screw down part way.
- Place unit in position. Insert the two bottom 3/8" screws and tighten all screws.
- Make connections to unit and to motor as in 4 above, Bench or Wall Mounting.
- In addition, on enclosed terminal ("CT") types, at each coil remove four screws, the terminal cover, and the required conduit knockouts. Attach conduit or cable and dress the leads. Make the necessary connections to the terminal boards and replace the terminal covers and screws.

### **MAINTENANCE**

The only servicing required on a variable autotransformer, installed and operated in accordance with these instructions, is periodic inspection of the brushes. Brushes should be replaced when there is less than .06 inch of service length remaining. Use only the correct Staco replacement brush assembly which contains the special material required for satisfactory brush operation.

To replace brushes disconnect the electrical power, remove old brush assembly, and insert replacement. With power off, insert a piece of fine garnet paper (nonmetallic 400 grit) between the brushes and brush track, rough side toward the brushes. Three or four swings of the brushes over the garnet paper will mate the brush contact face to the brush track. Remove the garnet paper and blow away loose particles before applying power.

To replace brushes on enclosed terminal ("CT") types, disconnect the electrical power. Remove the brush access plates and screws; or remove four screws, the terminal cover, three hex head screws, and the coil enclosure; as applicable. Turn the rotor manually or electrically until the brushes are accessible. Remove and replace the brush assembly. Sand the brushes as described above. Remove the garnet paper and blow away loose particles before applying power. Replace access plate and screws; or terminal cover, coil enclosure, and screws.

The replacement brush assemblies for the 1510 and 1520 series are as follows:

1510	808-0123
1520	808-0124

### **CONNECTIONS AND RATINGS**

Connections and ratings given in these instructions are those most commonly used. Individual units in ganged assemblies may be wired as electrically independent units according to the single unit connection chart. Paralleling chokes may be purchased from the factory with wiring instructions to combine the outputs of ganged units for a single load larger than the capacity of single coil.

The basic coil to terminal board connections for all variable autotransformers included in these instructions are given in figure A and B. The schematic of the motor drive circuit is shown in Figure C.

Derating of output current for ambient temperatures above 50°C and below use the ratings shown in the tabulations.

Derating of output current when operating on half input voltage tap for 1520 series units is shown in Figure E. This is commonly called the voltage doubler connection.

Maximum time units may be subjected to various overloads is shown by the "maximum time on" curve in Figure F. When repeated overloads are applied, time "off" as shown by the "minimum time off" curve must be allowed between loadings to prevent excessive temperatures. If the time "on" is less than the maximum allowable, the time "off" may be reduced in proportion.

BASIC UNIT	RECOMMENDED FUSE (AMPERES)	
	CONSTANT CURRENT LOAD	CONSTANT IMPEDANCE LOAD
1510	15	20
1520	7.5	12

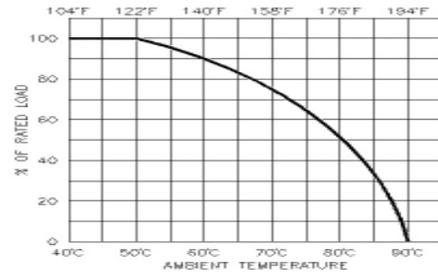


FIGURE D

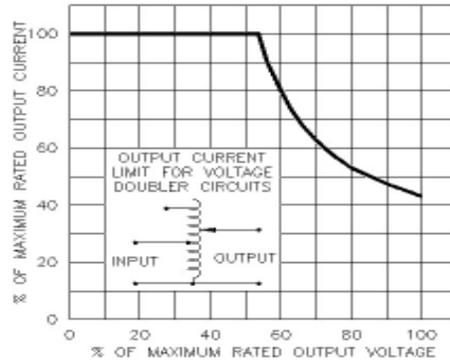


FIGURE E

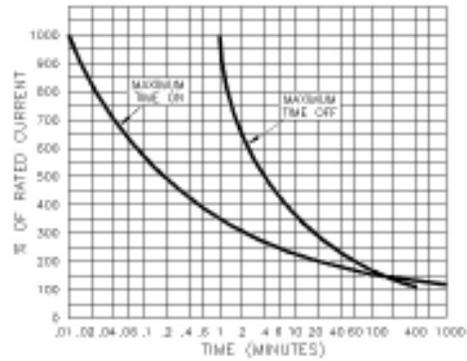


FIGURE F

VIEW FROM BRUSH END

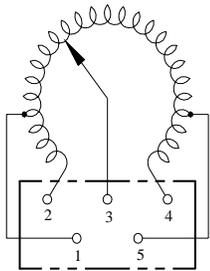


FIGURE A

1510

VIEW FROM BRUSH END

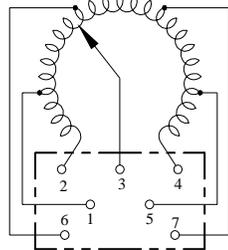


FIGURE B

1520

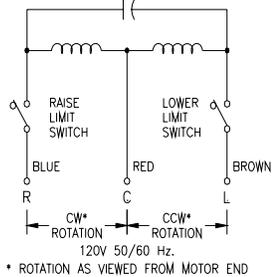
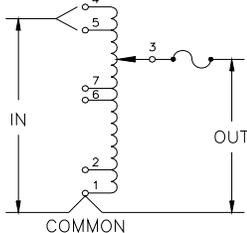


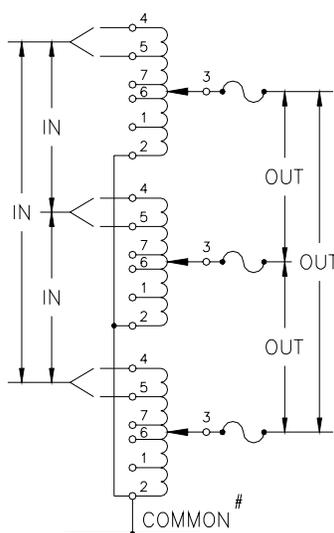
FIGURE C

MOTOR CIRCUIT

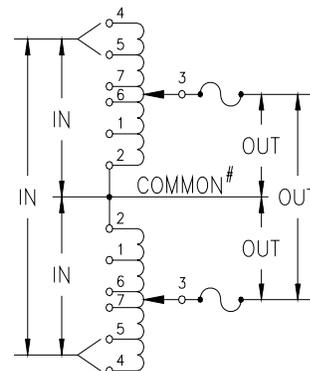


SINGLE UNIT

FUSE RECOMMENDED BUT NOT SUPPLIED



3-GANG ASSEMBLY



2-GANG ASSEMBLY

FUSE RECOMMENDED BUT NOT SUPPLIED

\*Fuses recommended but not supplied.

# Common used as third leg in 3-phase open delta or neutral in 3-wire single-phase and 4-wire 3-phase wye; not used in 2-wire series or 3-wire wye connections.

## SINGLE UNITS

TYPE	WIRING	INPUT		OUTPUT				SHAFT ROTATION FOR VOLTAGE INCREASE	TERMINAL CONNECTIONS (FOR INCREASING VOLTAGE)				
		VOLTS	HERTZ	VOLTS	CONSTANT CURRENT LOAD		CONSTANT IMPEDANCE LOAD		AS VIEWED FROM BRUSH END		AS VIEWED FROM BASE END		
					MAX. AMP.	MAX. KVA	MAX. AMP.		MAX. KVA	INPUT	OUTPUT	INPUT	OUTPUT
1510 1510CT M1510* M1510CT*	SINGLE PHASE	120	50/60	0-120	15	1.8	20	2.4	CW	2-4	2-3	2-4	3-4
									CCW	2-4	3-4	2-4	2-3
				0-140	15	2.1	--	--	CW	2-5	2-3	1-4	3-4
									CCW	1-4	3-4	2-5	2-3
1520 1520CT M1520* M1520CT*	SINGLE PHASE	240	50/60	0-240	9.5	2.3	12.5	3.0	CW	2-4	2-3	2-4	3-4
									CCW	2-4	3-4	2-4	2-3
				0-280	9.5	2.6	--	--	CW	2-5	2-3	1-4	3-4
									CCW	1-4	3-4	2-5	2-3
		120	50/60	0-280	9.5** -4 VD	1.2+ VD	--	--	CW	2-6	2-3	4-7	3-4
									CCW	4-7	3-4	2-6	2-3

\* Motor driven types use connections for CW shaft rotation as viewed from brush end.

\*\* Maximum output current in output voltage range from 0 to 25 percent above line voltage. At higher output voltages output current must be reduced according to rating curve. Figure e

+ Maximum KVA at maximum output voltage. Maximum KVA at lower output voltages may be calculated from rating curve. Figure E.

VD Voltage double.

## GANGED ASSEMBLIES

TYPE	WIRING	INPUT		OUTPUT				SHAFT ROTATION FOR VOLTAGE INCREASE	TERMINAL CONNECTIONS (FOR INCREASING VOLTAGE)						
		VOLTS	HERTZ	VOLTS	CONSTANT CURRENT LOAD		CONSTANT IMPEDANCE LOAD		AS VIEW FROM BRUSH END			AS VIEWED FROM BASE END			
					MAX. AMP.	MAX. KVA	MAX. AMP.		MAX. KVA	INPUT	JUMPER	OUTPUT	INPUT	JUMPER	OUTPUT
1510-2 1510CT-2 M1510-2* M1510CT-2*	SINGLE PHASE SERIES	240	50/60	0-240	15	3.6	20	4.8	CW	4-4	2-2	3-3	2-2	4-4	3-3
									CCW	2-2	4-4	3-3	4-4	2-2	3-3
				0-280	15	4.2	--	--	CW	5-5	2-2	3-3	1-1	4-4	3-3
	THREE PHASE OPEN DELTA	120	50/60	0-120	15	3.1	20	4.1	CW	4-2-4	2-2	3-2-3	2-4-2	4-4	3-4-3
									CCW	2-4-2	4-4	3-4-3	4-2-4	2-2	3-2-3
				0-140	15	3.6	--	--	CW	5-2-5	2-2	3-2-3	1-4-1	4-4	3-4-3
1520-2 1520CT-2 M1520-2* M1520CT-2*	SINGLE PHASE SERIES	480	50/60	0-480	9.5	4.6	12.5	6.0	CW	4-4	2-2	3-3	2-2	4-4	3-3
									CCW	2-2	4-4	3-3	4-4	2-2	3-3
				0-560	9.5	5.3	--	--	CW	5-5	2-2	3-3	1-1	4-4	3-3
									CCW	1-1	4-4	3-3	5-5	2-2	3-3
		240	50/60	0-560	9.5** -4 VD	2.3+ VD	--	--	CW	6-6	2-2	3-3	7-7	4-4	3-3
									CCW	7-7	4-4	3-3	6-6	2-2	3-3
	THREE PHASE OPEN DELTA	240	50/60	0-240	9.5	3.9	12.5	5.2	CW	4-2-4	2-2	3-2-3	2-4-2	4-4	3-4-3
									CCW	2-4-2	4-4	3-4-3	4-2-4	2-2	3-2-3
				0-280	9.5	4.6	--	--	CW	5-2-5	2-2	3-2-3	1-4-1	4-4	3-4-3
		120	50/60	0-280	9.5** -4 VD	1.91+ VD	--	--	CW	6-2-6	2-2	3-2-3	7-4-7	4-4	3-4-3
									CCW	7-4-7	4-4	3-4-3	6-2-6	2-2	3-2-3
1510-3 1510CT-3 M1510-3* M1510CT-3*	THREE PHASE WYE	240	50/60	0-240	15	6.2	20	8.3	CW	4-4-4	2-2-2	3-3-3	2-2-2	4-4-4	3-3-3
								CCW	2-2-2	4-4-4	3-3-3	4-4-4	2-2-2	3-3-3	
			60	0-280	15	7.3	--	--	CW	5-5-5	2-2-2	3-3-3	1-1-1	4-4-4	3-3-3
		480	50/60	0-480	9.5	7.9	12.5	10.0	CW	4-4-4	2-2-2	3-3-3	2-2-2	4-4-4	3-3-3
									CCW	2-2-2	4-4-4	3-3-3	4-4-4	2-2-2	3-3-3
				60	0-560	9.5	9.2	--	--	CW	5-5-5	2-2-2	3-3-3	1-1-1	4-4-4
240	60	0-560	9.5** -4 VD	3.9+ VD	--	--	CW	6-6-6	2-2-2	3-3-3	7-7-7	4-4-4	3-3-3		
							CCW	7-7-7	4-4-4	3-3-3	6-6-6	2-2-2	3-3-3		

\* Motor-driven types use connection for CW shaft rotation as viewed from brush end.

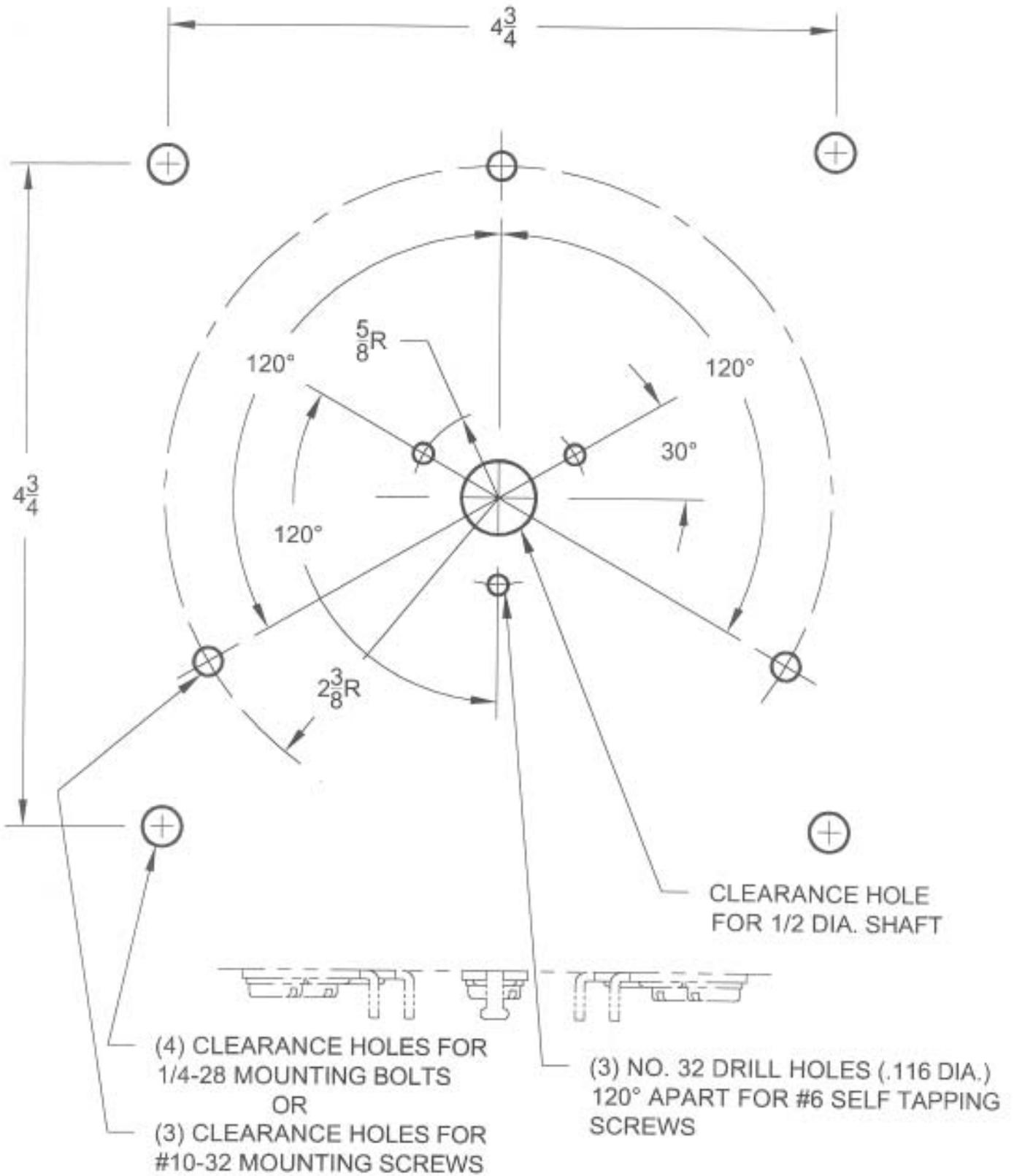
\*\* Maximum output current in output voltage range from 0 to 25 percent above line voltage. At higher output voltages output current must be reduced according to rating curve. Figure E

+ Maximum KVA at maximum output voltage. Maximum KVA at lower output voltages may be calculated from rating curve. Figure E.

VD Voltage doubler.

# TEMPLATE No. 1

## 1510 and 1520



TEMPLATE No. 2  
1510-2, 1510-3, 1520-2, 1520-3

