INSTRUCTION MANUAL
FOR
VOLTAGE REGULATOR
Model: SR6A & SR9A
Part Number: 9 0177 00 XXX

Basler Electric

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WARNING

To prevent personal injury or equipment damage, only qualified technicians/operators should install, operate, or service this device.

WARNING

All SR6A & SR9A Voltage Regulators are shipped factory preset for 120 Vac sensing.

CAUTION

Meggers and high potential test equipment should be used with extreme care. Incorrect use of such equipment could damage components contained in the device.

CONFIDENTIAL INFORMATION

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It is not the intention of this manual to cover all details and variations in equipment, nor does it provide data for every possible contingency regarding installation or operation. The availability and design of all features and options are subject to change without notice. Should further information be required, call Basler Electric Company, Highland, IL.

REV	A	B	C	D	E	F	G	H
ECA	7383	7709	8065	10196	15619	15959	16057	16195

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SECTION 1

GENERAL INFORMATION

1-1. DESCRIPTION

a. The SR6A and SR9A Voltage Regulators precisely control the output voltage of an ac electric generating system by controlling the amount of current supplied to the exciter (or generator) field. This includes brushless rotary exciters, brush type rotary exciters or direct excitation into the generator field of machines within the regulator's power rating.

b. The regulators consist of silicon controlled rectifiers (SCR's) transistors, transformers, silicon diodes, resistors and capacitors. The voltage regulators contain no electrolytic capacitors and are relatively unaffected by temperature, humidity, vibration and shock.

1-2. SPECIFICATIONS

Voltage Regulation:	Less than ± 1/2% (Average Voltage)
Response Time:	Less than 17 milliseconds
Voltage Adjust Range:	±10% of Nominal Voltage
Ambient Operating Temperature Range:	-55°C to +70°C (-67°F to +158°F) at 3.5 amperes -55°C to +55°C (-67°F to +131°F) at 7.0 amperes
Storage Temperature Range:	-65°C to +100°C (-85°F to +212°F)
Temperature Coefficient (After 20 minutes warm-up):	±1/2% for 20°C (68°F) change
Power Dissipation (Max.):	60 Watts
Vibration:	Tested to withstand 5G's from 20 to 260 Hz
Mounting:	Designed to operate when mounted directly on an engine generator set. It is recommended to be mounted vertically for optimum cooling.
Parallel Compensation (Terminals 1 & 2):	5A at 25VA, Droop Adjustment to 6%
Overall Dimensions:	
Height:	11.5 inches (292.10 mm)
Width:	8.375 inches (212.72 mm)
Depth:	5.0 inches (127.00 mm)
Weight:	13 lb. (5.8 kg)

Table 1-1. Regulator Data.

	SR6A	SR9A
Power Input:*		
Voltage	120 ±10%	240 ±10%
Freq	400	400
VA*	840	1680
Output Rating:		
Maximum Continuous:		
Volts	63	125
Amps	7	7
1 Minute Forcing:		
Volts	90	180
Amps	10	10
Sensing:		
Input Voltage**	Nema Standard 400 Hz: 100-110/ 190-200-208/ 220-230-240/ 380-400-415/ 500 Vac ±10%	Nema Standard 400 Hz: 120-139/ 208/240 416/480/ 600 Vac ±10%
VA Burden (Less than)	10	10
Parallel Compensation:		
Amperes Input	5	5
VA Burden	25	25
Field Resistance:		
Minimum (Ohms)	9	19

NOTES:

- * The actual input VA is equal to the dc current times input voltage.
- ** Sensing voltage may be single or three phase
- *** If correct voltage is not available for power input, a suitable power transformer must be selected. (See paragraph 3.2.c.)

1-3. OPTIONAL FEATURES

The internal voltage regulator optional features listed below are designated by a combination of letters and numbers in the complete model number. (See Table 1-2 and/or contact the factory for additional variations).

a. Parallel compensation
c. Voltage build up relay
b. Single or three-phase sensing.
d. Sensing Voltage
e. Cover
f. Voltage adjust rheostat
g. Type of stability circuit

1-4. ACCESSORIES

a. The following is a partial list of accessories that are available for use with the SR6A and SR9A Voltage Regulators.

(1) EMI suppression filters.
(2) Low and medium voltage power isolation transformers.
(3) Paralleling current transformers.
(4) Voltage regulators operating from 60 hertz power on 400 hertz generators.
(5) Wide range voltage adjust circuit components.
(6) Control switches.
(7) Motor operated controls.

b. Information covering these accessories may be obtained by consulting the applicable instruction manual and product bulletin, or by contacting your nearest Basler Electric Sales Representative or the factory.

c. An external voltage adjust rheostat may be obtained from a source other than Basler Electric. This rheostat must be a minimum of 2 watts in size. The nominal required resistance is 175 ohms. Although any value from 150 ohms to 250 ohms may be used, a slight change in the voltage adjust range will occur.

1-5. MODEL NUMBER DESIGNATION

The model number of the voltage regulator is a combination of letters and numbers indicating the features which are included in the regulator. An example of a model number, showing the manner in which the various features are designated, is shown by Figure 1-1. A complete list of various features and their description is given in Table 1-2.

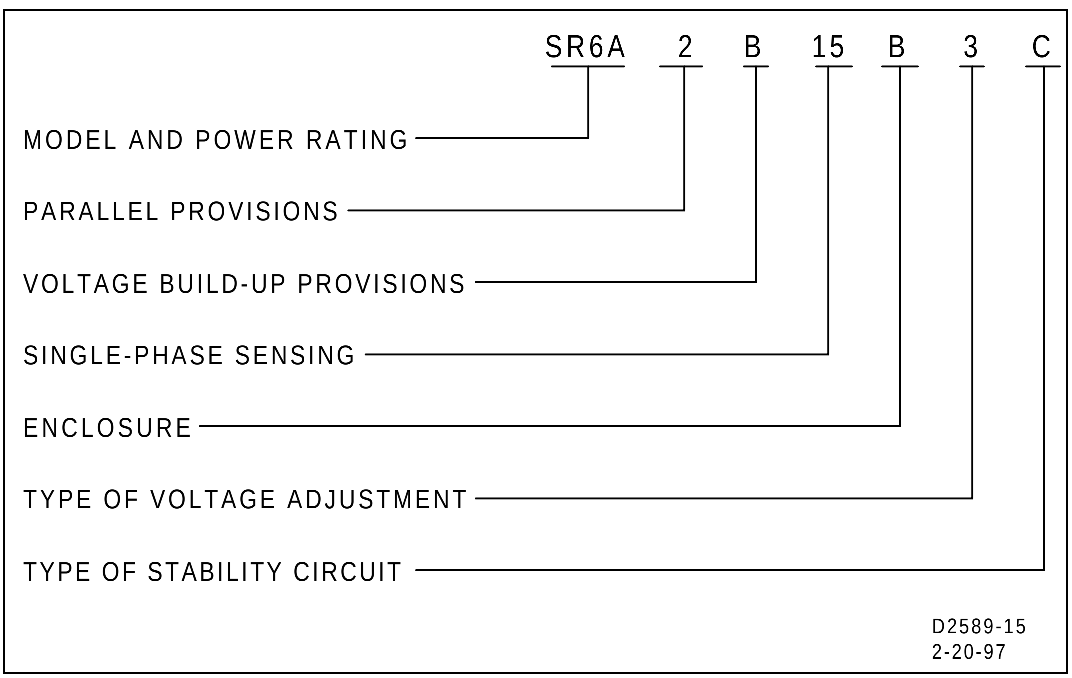


Figure 1-1. Typical Model Number

Table 1-2. Model Number Designations

Sample Model Number							
SR9	A	3	B	15	B	4	C
SR6 SR9	A-Surface mounted	1-No Parallel Provisions 2-Parallel provisions with adjustable slide wire resistor. 3-Parallel provisions with external parallel rheostat.	A-No relay B-Build-up Relay C-Hermetically sealed relay.	15-Selectable 1-phase sensing. 16-Selectable 3-phase sensing w/ Faston connectors	B-Cover	2-Voltage adjust rheostat internally installed. 3-Voltage adjust rheostat, supplied separately with regulator. 4-Voltage adjust rheostat internally installed w/ locking shaft.	C-For use with rotary Exciter (SR6&9). D-For use as static exciter (SR6&9).

SECTION 2

PRINCIPLES OF OPERATION

2-1. FUNCTIONAL CIRCUITS

Refer to the Block Diagram, Figure 2-1. The voltage regulator senses the generator voltage, compares a rectified sample of that voltage with a reference diode (zener) voltage and supplies the field current required to maintain the predetermined ratio between the generator voltage and the reference voltage. This unit consists of five basic circuits. These are a sensing circuit, an error detector, an error amplifier, a power controller and a stabilization network.

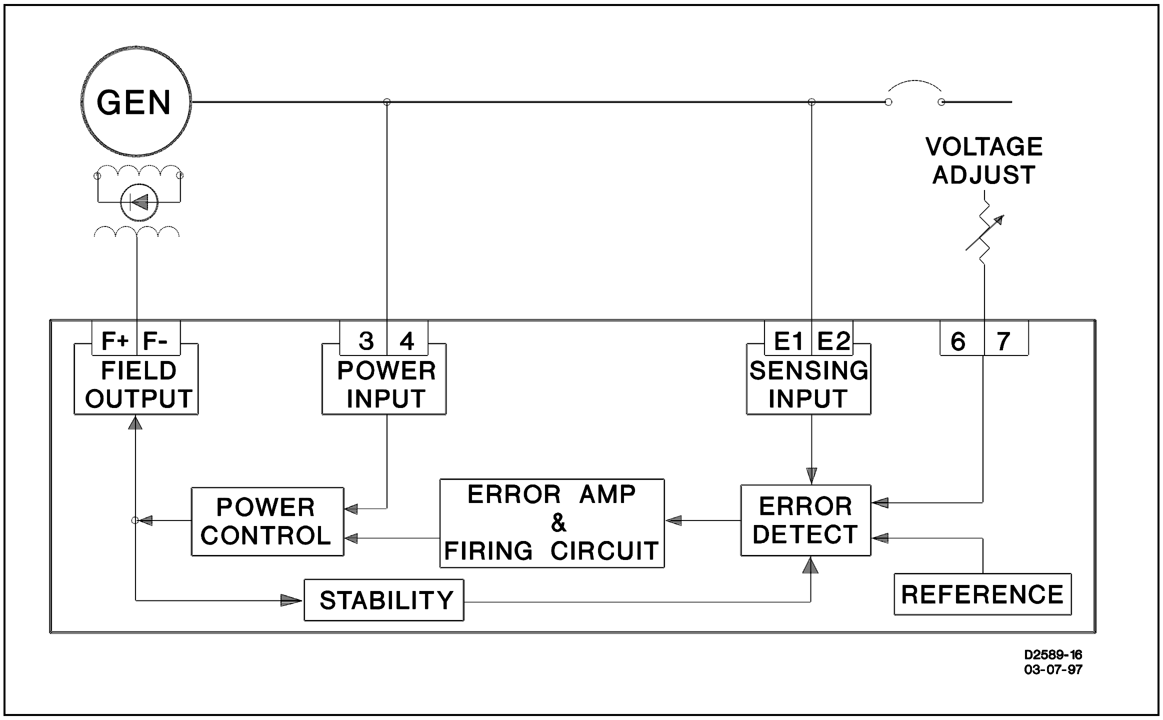


Figure 2-1. Overall Block Diagram.

2-2. APPLICATION INFORMATION

a. *Starting large motors or providing fault current for selective breaker tripping*.

(1) For generators equipped with brushless exciters or for static excited generators the field power is taken from the generator output voltage. A heavy load, such as a large motor, can cause the generator voltage to decrease substantially at the first few cycles after load applications. A short circuit on the generator output could reduce the voltage from the generator to zero. Either of these conditions can cause reduction of the available field power to a level which will not sustain generator voltage. Accessory excitation support systems are available which take advantage of the generator line currents as a source of excitation power during either condition.

(2) For brush-type rotation excited generators, the exciter armature connections can be used as an alternate source of excitation during either of the conditions described above to provide excitation support. See Figure 3-3 for a typical interconnection diagram. This scheme uses the other contact on the buildup relay to connect dc voltage from the exciter armature directly to the exciter field. As an alternative, the regulator could be used as described above.

2-3. PARALLEL COMPENSATION

a. *Reactive Droop Compensation (Droop) or Reactive Differential Compensation (Cross-Current)*

(1) Parallel operation requires additional components in the regulating system. These are resistor R25, transformer T3 and a current transformer CT1. Two of the components are included in a parallel equipped voltage regulator. These are R25 and T3. Current transformer CT1 is a separate item and must be interconnected as shown in Figures 3-3 or 3-4.

(2) These components allow the paralleled generators to share reactive load and reduce circulating reactive currents between them. This is accomplished in the following manner.

(3) A current transformer CT1 is installed in phase B of each generator. It develops a signal that is proportional in amplitude and phase to the line current. This current signal develops a voltage across resistor R25. A slider on R25 supplies a part of this voltage to the primary of the transformer T3. The secondaries of T3 are connected in series with the leads from the secondary of the sensing transformer T1, and the sensing rectifiers located on the printed circuit board. The ac voltage applied to the sensing rectifier bridge is the vector sum of the stepped down sensing voltage (terminals E1 and E3) and the parallel CT signal supplied through T3 (terminals 1 and 2). The voltage supplied to the sensing rectifiers by the parallel CT is very small in relation to the signal supplied by the sensing voltage. The regulator input sensing voltage (terminals E1 and E3) and the parallel compensation signal (terminals 1 and 2) must be connected to the generator system so as to provide the correct phase and polarity relationship.

(4) Regulators with single-phase sensing provide about 8% maximum droop while three-phase sensing regulators provide 6% droop. When generators are paralleled on the same bus and have different type sensing, care must be taken to compensate for these differences using the slide wire adjustment on the droop resistor R25.

(5) When a resistive load (unity P.F.) load is applied to the generator, the voltage that appears across R25 (and T3 windings), leads the sensing voltage by 90°, and the vector sum of the two voltages is nearly the same as the original sensing voltage; consequently, almost no change occurs in generator output voltage.

(6) When a lagging power (inductive) load is applied to the generator, the voltage across R25 becomes more in phase with the sensing voltage and the combined vectors of the two voltages results in a larger voltage being applied to the sensing rectifiers. Since the action of the regulator is

to maintain a constant voltage at the sensing rectifiers, the regulator reacts by decreasing the generator output voltage.

(7) When a leading power factor (capacitive) load is applied to the generator, the voltage across R25 becomes out of the phase with the sensing voltage and the combined vectors of the two voltages results in a smaller voltage being applied to the sensing rectifiers, then the regulator reacts by increasing the generator voltage.

(8) When two generators are operating in parallel, if the field excitation on one generator should become excessive and cause a circulating current to flow between generators, this current will appear as a lagging power factor (inductive) load to the generator with excessive field current and a leading power factor (capacitive) load to the other. The parallel Compensation circuit will cause the voltage regulator to decrease the field excitation on the generator with the lagging power factor load, and increase the field excitation on the generator with the leading power factor load, so as to minimize the circulating currents between the generators.

b. *Reactive Droop compensation (Droop)*. This action and circuitry is called reactive droop compensation (droop). It allows two or more paralleled generators to proportionally share inductive loads by causing a decrease or droop in the generator system voltage.

c. *Reactive differential compensation (cross-current)*.
(1) Reactive differential compensation allows two or more paralleled generators to share inductive reactive loads with no decrease or droop in the generator system output voltage. This is accomplished by the action and circuitry described previously for reactive droop compensation, and the addition of cross connecting leads between the parallel CT secondaries as shown is Figure 3-5. By connecting the finish of one parallel CT to the start of another, a closed series loop is formed, which interconnects the CT's of all generators to be paralleled. The signals from the interconnected CT's cancel each other when the line currents are proportional and in phase. No system voltage decrease occurs. These regulators provide the necessary circuit isolation so that parallel reactive differential compensation can be used. The reactive differential circuit can only be used when all the generators connected in parallel have identical paralleling circuits included in the loop.

(2) Reactive differential compensation cannot be used when paralleled with the utility or other infinite (utility) bus. When reactive differential compensation is to be used on an isolated bus that may parallel with the utility bus, an auxiliary contact on the breaker used to connect the isolated bus to the utility bus must be used to open the reactive differential interconnecting loop any time the isolated system is connected to the utility. Contact the factory for additional information.

SECTION 3

INSTALLATION

3-1. MOUNTING

The voltage regulator will operate when mounted in any position, however, it should be vertically mounted to obtain optimum cooling when operating near its full rated output. The regulator can be mounted in any location where the ambient temperature does not exceed its ambient operational limits. Due to its rugged construction, the regulator can be mounted directly on the generator. The overall and mounting dimensions are shown in Figure 3-1.

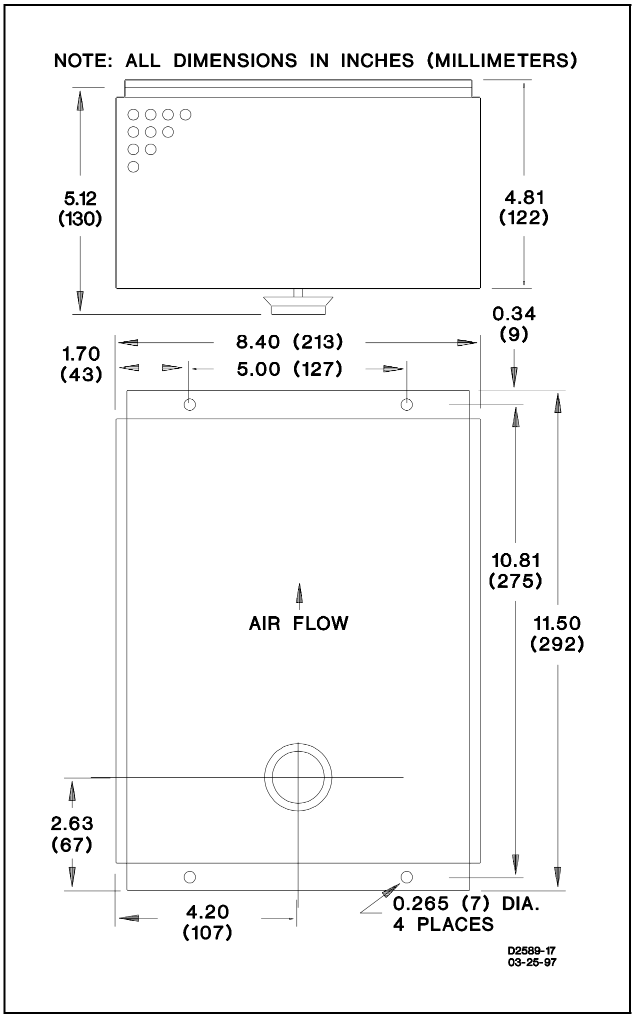


Figure 3-1. Outline Drawing.

3-2. INTERCONNECTION

CAUTION

Meggers and high potential test equipment must not be used. Incorrect use of such equipment could damage the semiconductors contained in the regulator.

a. *General*. The regulator must be connected to the generator system as instructed in this section and as shown in the basic interconnection diagrams (Figures 3-3 and 3-4). Number 16 gauge wire (or larger) should be used for all connections to the regulator.

b. *Regulator Sensing (Terminals El, E2, and E3)*.

WARNING

The SR6A & SR9A Voltage Regulators are shipped factory preset for 120 Vac sensing.

(1) The voltage regulator(s) contain an internal sensing transformer(s) T1 (T2) provided with taps for various input sensing voltages. These sensing voltages are: 120, 208, 240, 416, 480, and 600 Vac (refer to Figure 3-2). The model number of the unit designates single-phase (T1) or three-phase (T1 and T2) sensing. For operation with generator voltages above 600 Vac, a potential transformers(s) must be used to supply the regulator sensing voltage. The regulator sensing circuit load is less than 10 VA and correct polarity must be maintained to the regulator sensing input.

(2) On single-phase sensing models, the voltage sensing leads are connected to terminals E1 and E3. For three-phase sensing, terminals E1, E2 and E3 are used. For precise voltage regulation, the sensing leads should be connected as close as possible to the point where regulation is desired.

(3) SR6A and SR9A Voltage Regulators are factory preset for 120 Vac sensing voltage. If the sensing voltage needs to be changed for your installation, perform the following steps.

Step 1. Remove the cover if applicable.

Step 2. Remove 9 hex screws.

Step 3. Remove the printed circuit board without disconnecting the wires.

Step 4. Locate transformer(s) T1 for single-phase sensing units (T1 and T2 for three-phase sensing units). These transformers are equipped with Faston connectors for changing sensing taps.

Step 5. For single-phase sensing units, move the wire that is factory connected to T1-**120** terminal to the T1 terminal labeled with the desired sensing voltage.

Step 6. For three-phase sensing units, move the wire that is factory connected to T1-**120** terminal to the T1 terminal labeled with the desired sensing voltage. Also, move the wire from T2-**120** terminal to the T2 terminal labeled with the desired sensing voltage.

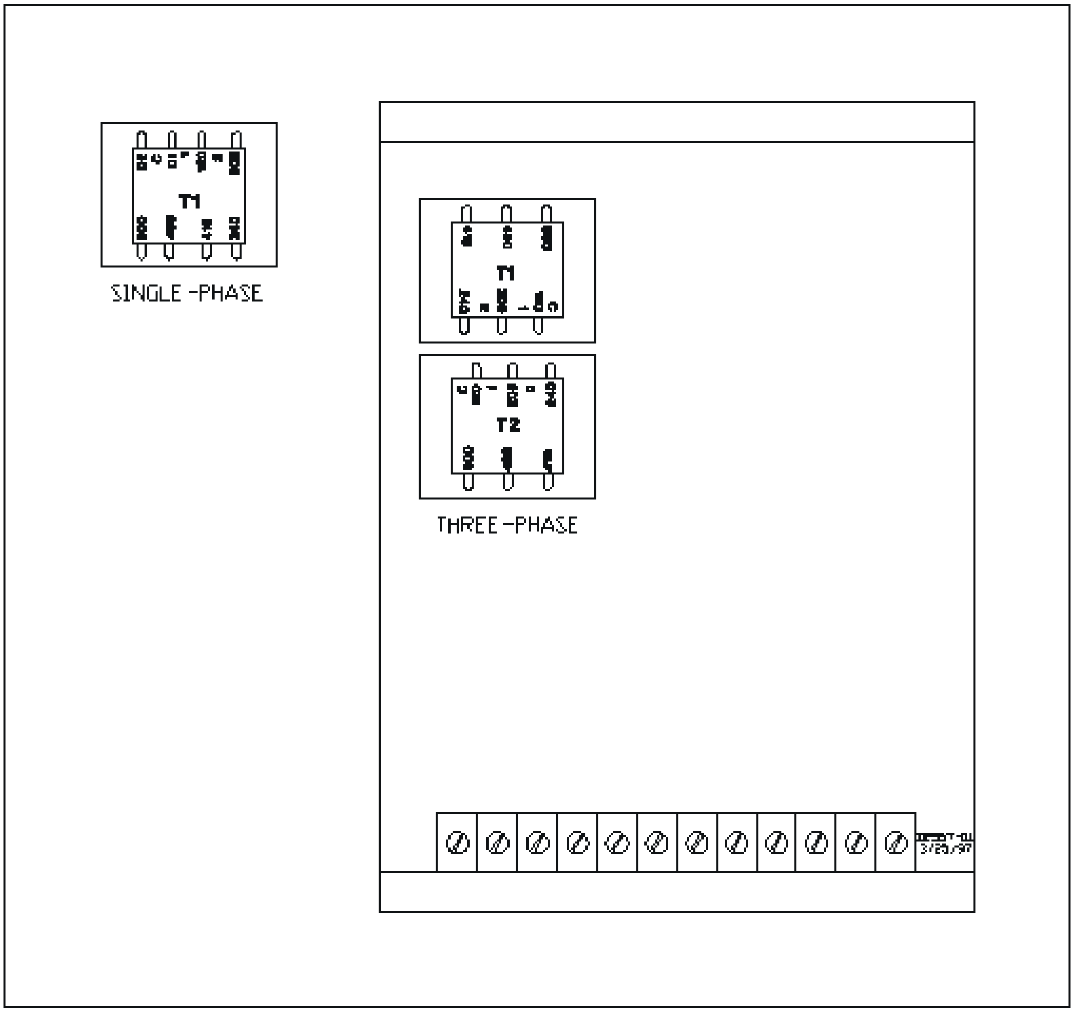


Figure 3-2. Top View of Voltage Regulator.

(4) The regulator regulates the voltage that is applied to its sensing terminals. Therefore, it cannot correct for voltage drop in leads that may occur at points other than where the regulator sensing leads are connected. The leads that supply regulator sensing should not be used to supply power to any other equipment or to the regulator power stage (terminals 3 and 4).

(5) If the generator is to be operated in parallel with other generators, the phase relationship of sensing voltage and the paralleling current transformer is very important. (See paragraph 3-3 for further information.)

c. ***Field Power (Terminals F+ and F-).***

(1) The model number prefix (SR6A or SR9A) of the regulator, defines the amount of power the unit is capable of delivering (See Table 1-1).

(2) The dc resistance of the field to which the regulator is connected (terminals F+ and F-) must be equal to, or greater than, 9 Ω for an SR6A and 18 Ω for an SR9A. If the resistance is less than the specified minimum, a resistor must be added in series with the field. This resistor value plus the field resistance, must exceed the minimum preceding values.

(3) Good generator voltage stability usually results when the regulator output is above 10 Vdc at no load (20 Vdc SR9A). Should the voltage be less and a voltage stability problem exists, it may be

necessary to add resistance in series with the field. This resistance raises the regulator output voltage, thereby increasing the stability signal.

(4) When adding resistance in series with the field, the resistor value must not restrict field forcing during full load conditions. The following example explains how to compute the proper resistance:

EXAMPLE: An SR6A voltage regulator is required to operate into an exciter field that has a dc resistance of 4 Ω and current requirement of 2.5 Adc at no load and 6 Adc at full load. Since the SR6A requires a minimum field resistance of 9 Ω, a resistor of at least 5 Ω must be connected in series with the field. The regulator output will be 9 Ω times 2.5 A or 22.5 Vdc at no load, and 9 Ω times 6 A or 54 Vdc at full load. This conforms to the 10 volt minimum at no load and provides a sufficient amount of forcing at full load (up to 90 Vdc).

d. ***Interconnecting Regulator with Brush Type Rotary Exciters (Terminal A-)*.**
(1) When making connections on brush type rotary exciter applications, **it is very important to observe the polarities of the exciter field, exciter output and the generator field as shown in Figure 3-3.** If these polarities are not known, the system should be operated on manual voltage control and the polarities accurately determined, before connecting the voltage regulator into the system. The voltage regulator could be damaged if interconnection is attempted before this data is known.

(2) When manual voltage control is desired on brush type exciter applications, a **MANUAL-OFF-AUTO** switch and a field rheostat are used. (See Figure 3-3.) When this feature is not desired, the output of the exciter can be connected directly to the regulator (terminal A-), to allow self-excitation during short-circuit or overloads.

(3) When large motor starting or short circuit sustaining capability is not required it is not necessary to use A- terminal.

e. ***Input Power (Terminals 3 and 4)*.**
(1) The model number prefix (SR6A or SR9A) of the regulator defines the maximum input power requirements. The current requirement of the field, to which the regulator is operating into, will determine the actual input current. The nominal voltage applied to the regulator input power stage (terminals 3 and 4) must be 120V for the SR6A and either 208 or 240V for SR9A. The input power may be taken from any generator lines that provide the correct voltage (line to line or line to neutral). The phase relationship of this input in relation to other circuits is not important.

(2) When the generator output voltage is different than the preceding values and exceed the values specified in Table 1-1, a power transformer must be used to match the generator voltage to the regulator input. If excessive voltage is applied to the regulator input (terminals 3 and 4), the regulator may be damaged.

CAUTION

Without the use of this transformer, a ground at any point in the field circuit and another ground in the generator output, could result in failure of the regulator.

(3) If the field or field flashing circuit is grounded, a power transformer must be used to isolate the regulator input from ground.

3-3. PARALLEL COMPENSATION (Terminals 1 and 2)

a. In addition to the regulator provisions, a 25 VA current transformer (CT) is required (See Figure 3-3 and 3-4). This CT is connected in a generator line and should deliver from 3 to 5 A secondary current at rated load.

b. The phase relationship of CT signal to the regulator sensing voltage must be correct or the system will not parallel properly. On three-phase sensing models the CT must be installed in the line that supplies sensing voltage to regulator terminal E2. For single-sensing phase models it must be installed in the line of the three-phase generator that does not supply sensing to the regulator.

c. Figures 3-3 and 3-4 show the correct CT polarity for A-B-C phase rotation sequence. If the phase rotation sequence is A-C-B, the CT's secondary leads must be interchanged.

3-4. REACTIVE DROOP COMPENSATION (DROOP)

a. For reactive droop compensation, connect the CT to its respective regulator as shown on Figures 3-3 and 3-4.

b. A unit-parallel switch shorts the parallel CT secondary to prevent any droop signal from being injected into the regulating system during single unit operation. The switch may not be required on parallel droop compensation applications where a voltage drop is not objectionable.

3-5. REACTIVE DIFFERENTIAL COMPENSATION (CROSS CURRENT)

a. On parallel reactive differential compensation applications a contact should be used to short out the paralleling CT secondary when that generator is not paralleled to the bus. If the switch is not used, a voltage droop will be introduced into the system. This is due to the unloaded generator parallel CT not supplying its compensating signal, but allowing a voltage drop to occur across it. Lack of this shorting contact will also cause the voltage of the incoming generator to fluctuate prior to paralleling. Ideally, this contact is an auxiliary on the circuit breaker contactor that opens when the circuit breaker is closed.

b. For reactive differential compensation, connect each CT to its respective regulator. Then connect the finish of the first CT to the start of the second CT, the finish of the second CT to the start of the third CT, etc. Continue until all CT's are connected in series. The final step will be to connect the finish of the last CT to the start of the first CT. (See Figure 3-5).

c. Reactive differential compensation cannot be used when paralleled with the utility or any infinite bus. If this compensation system is used, a switching circuit must be used to convert the system to a reactive droop compensation system. Contact the factory for additional information.

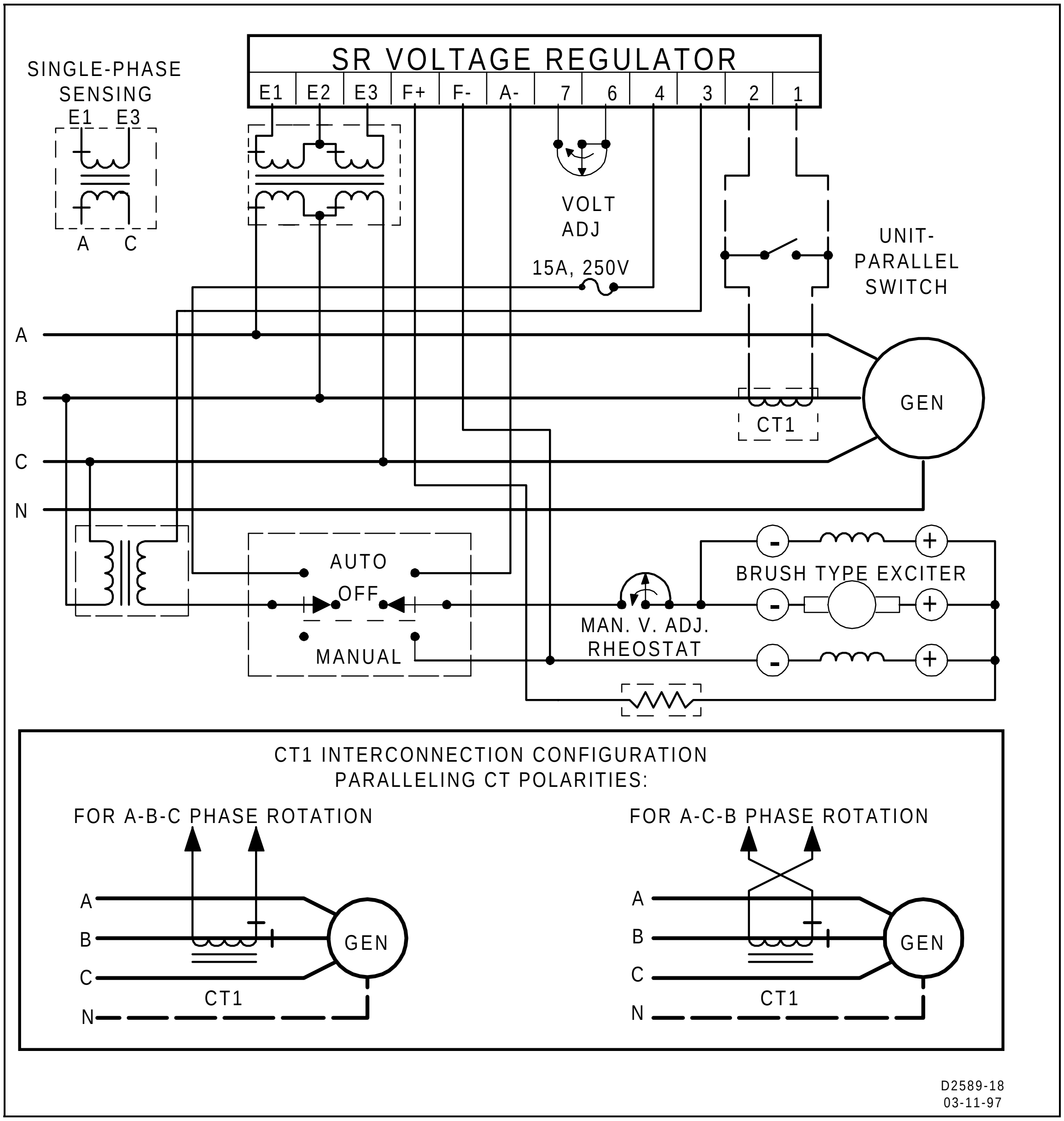


Figure 3-3. Interconnection - Brush Type Rotary Exciter.

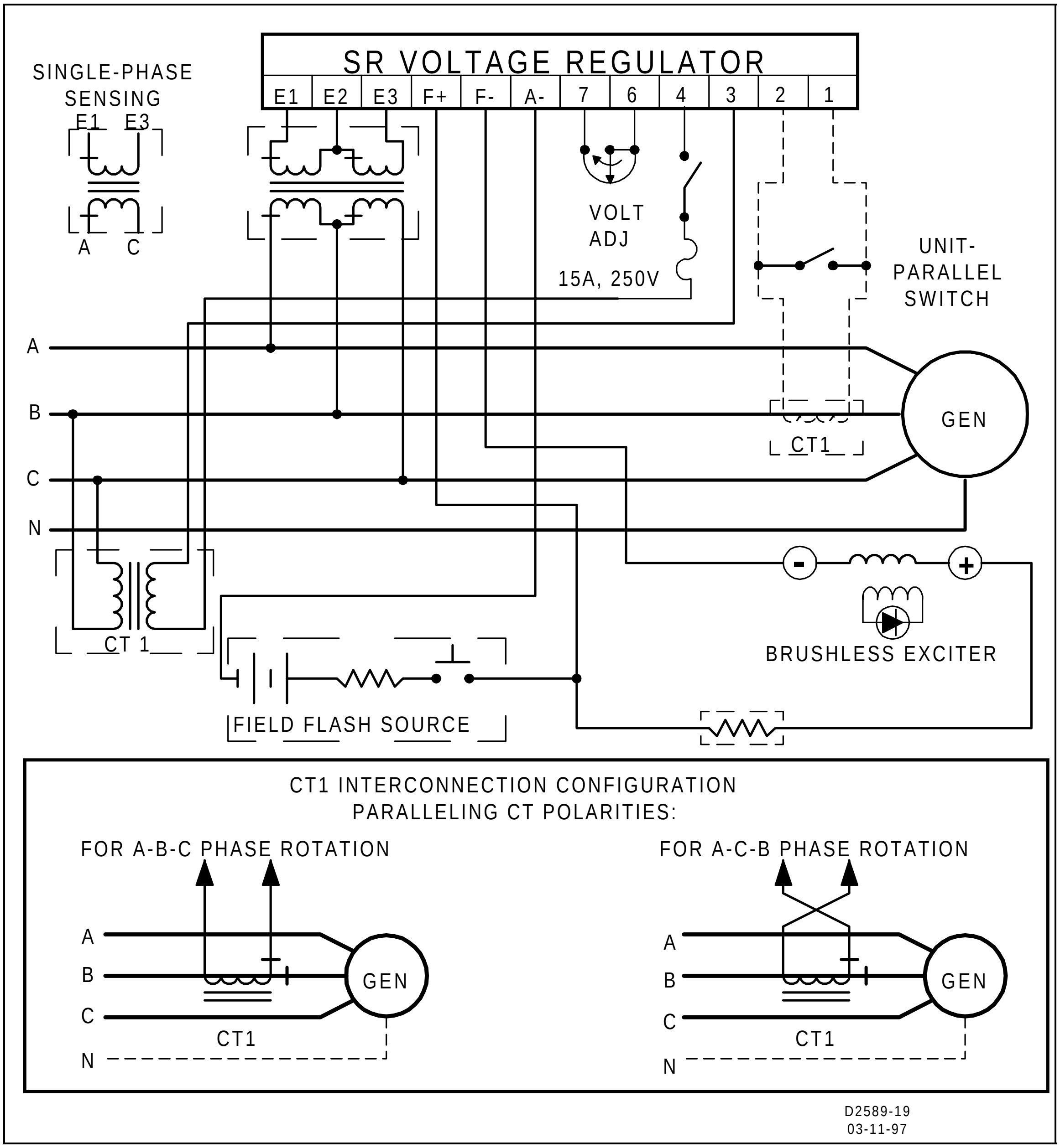
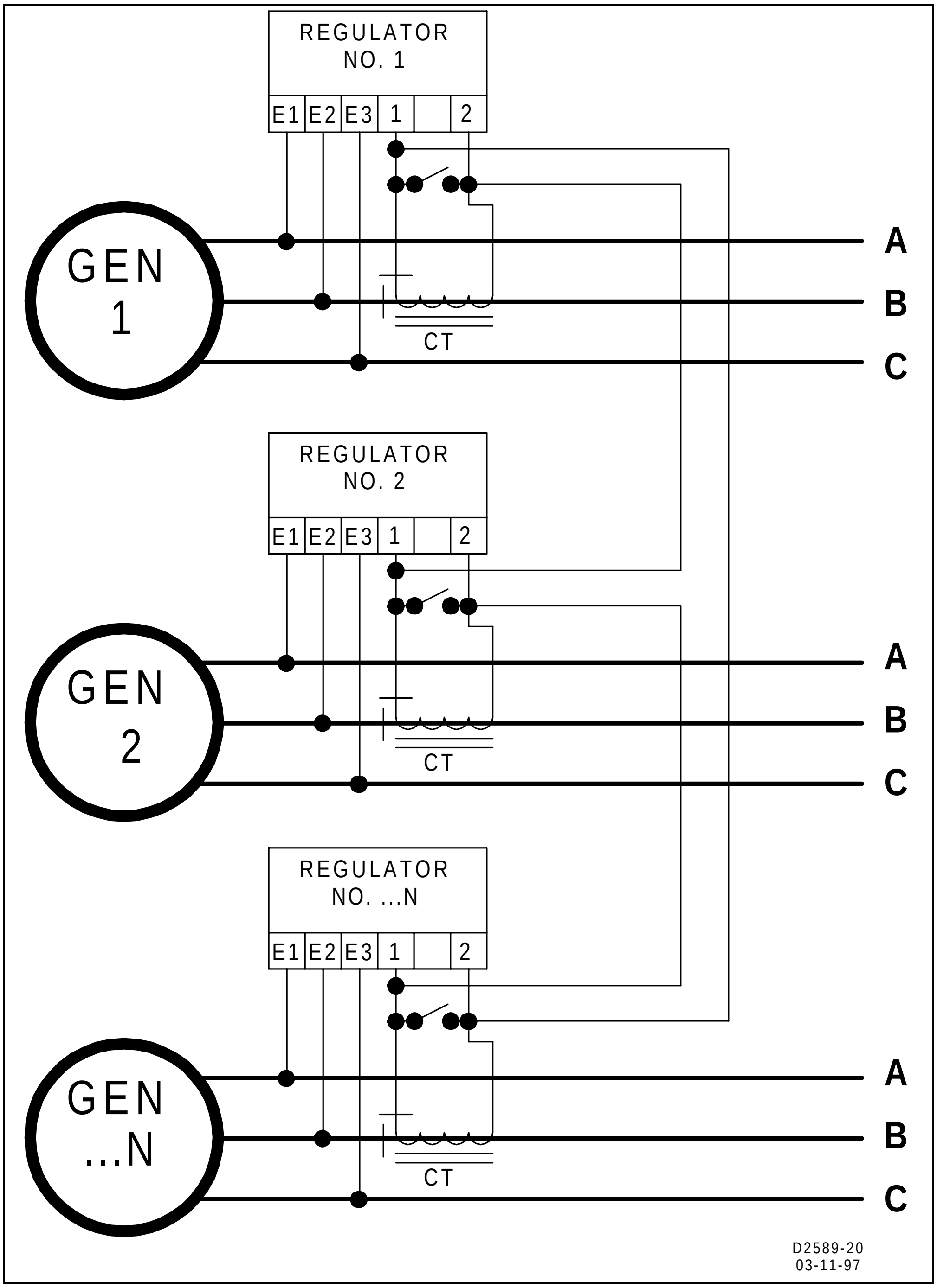


Figure 3-4. Interconnection Brushless Rotary Exciter (or Static Exciter).



NOTES:

1) When more than 3 generators are to be paralleled, continue connections as shown.
2.) Paralleling CT polarities are shown A-B-C phase rotation.

Figure 3-5. Reactive Differential (cross-current) Compensation CT's Interconnection.

SECTION 4

OPERATION

4-1. GENERAL

The initial operating procedures are outlined in paragraph 4-6 through 4-7 and should be reviewed before operation is attempted.

WARNING

All SR6A & SR9A Voltage Regulators are shipped factory preset for 120 Vac sensing.

4-2. OPERATION AT REDUCED SPEEDS

CAUTION

Do not operate the generating system at reduced speeds for an extended period of time with the voltage regulator in operation.

Prolonged operation at speeds lower than normal can damage the voltage regulator and/or exciter and generator field. If operation at reduced speed is essential, input power should be removed from the regulator or an underfrequency overvoltage protection module (UFOV Module) should be added to the system.

4-3. VOLTAGE SHUTDOWN

a. The regulator may be equipped with a switch to allow removal of excitation from the field in an emergency or when the generator prime mover must be operated at reduced speed. If this switch is not used, it is recommended it be temporarily installed for initial operation.

CAUTION

When used, this switch must always be installed in the input power line to the regulator (terminal 3 or 4). A high flyback voltage could develop and damage the regulator and/or the exciter field if this switch is installed in the dc field circuit (terminal F+ or F-).

b. If the A- terminal is used, a double pole switch must be used for voltage shut down.

CAUTION

To avoid high voltage arcing, the field circuit must never be opened during operation. Also a shutdown circuit using field discharge resistors in the exciter field circuit should not be used. Safe shutdown can be accomplished by interrupting regulator ac power to regulator terminals 3 and 4.

4-4. ADJUSTMENTS

The adjustments pertaining to the regulator and system operation are described in the following paragraphs. These adjustments are made during initial operation and normally do not have to be repeated during the life of the unit.

a. ***Stability Adjustment R4*****.** This adjustment provides stable regulating operation. It controls the amount of feedback that is applied to the error amplifier stage. Normally it is factory set in the 75% rotation (CW) position. This setting normally assures good stability, but tends to slow the response time of the generator. If rotated counterclockwise (CCW), the generator response time becomes faster. However, if rotated too far CCW, the generator voltage may oscillate (hunt). It should then be rotated CW well above the point where oscillating occurs. The system voltage instability is likely to occur at no load. If a setting is desired that provides the fastest possible voltage response with stability, an oscilloscope or some voltage recording device should be used.

b. ***Generator Voltage Adjust Rheostat R1*****.** The adjustment is provided to control the generator voltage. When adjusted to its maximum resistance position (CCW), minimum generator voltage is obtained. Maximum generator voltage is obtained with minimum resistance (CW).

c. ***Nominal Voltage Range Set Adjust R3*****.** This adjustment is provided to vary the limits of R1. Normally R3 is set to provide R1 with an adjustment range of ±10% of rated.

4-5. WIRING

Before initial operation is attempted, verify that the regulator is connected for the proper application as shown in either Figure 3-2 or 3-3. Figure 6-3 refers to the wiring diagram for the regulator.

4-6. INITIAL OPERATION

The initial operating instructions are contained in the following paragraphs. These procedures should be completely reviewed and understood, before system operation is attempted. Also, locating controls and adjustments pertinent to system operation would be beneficial.

a. ***Single Unit Operation (No Load)*****.**

a. Start the prime mover and bring up to rated speed. If a voltage shutdown switch is used (see paragraph 4-3), close switch to apply excitation. When this switch is not used, generator voltage will build up automatically. (If field flashing is necessary, refer to paragraph 4-7.)

b. Verify generator voltage. (Any of the following conditions may occur.)

   (1) Overvoltage (+20% or more) - If this condition occurs, open the shutdown switch immediately and/or stop the prime mover. Determine the cause of overvoltage. If necessary, refer to the troubleshooting chart.

   (2) No voltage build Up - If this condition exists, field flashing may be required, refer to paragraph 4-7.

   (3) Undervoltage (-15% or more) - If this condition exists, stop the prime mover and determine the cause of undervoltage. If necessary, refer to the troubleshooting chart.

   (4) Voltage Builds Up and Collapses - If this condition exists, stop the prime mover and determine the cause of collapse. If necessary, refer to the troubleshooting chart.

   (5) Oscillating Voltage (Hunting) - If this condition exists, refer to the troubleshooting procedures. (Voltage hunting can be caused by an unstable prime mover.)

c. If the voltage is unstable, perform the following steps:

   (1) Loosen the locking nut on R4.

   (2) Rotate R4 clockwise (CW) approximately 30° beyond the point that stable operation is obtained. (If stability cannot be obtained by performing these steps, see paragraph 3-2c.)

   (3) Tighten lock nut on R4.

d. To adjust the voltage range for ±10%, verify R1 is adjusted to the center of its travel and perform the following steps:

   (1) Loosen the locking nut on R3 and adjust to obtain the rated generator voltage.

   (2) Tighten lock nut on R3.

e. The voltage regulator is now ready for load test.

f. Apply load to generator.

g. Verify the voltage regulation is within ±1/2%. If it is not within these limits, refer to the troubleshooting chart.

h. Alternately remove and apply load to determine if the generator voltage is stable.

i. If the generator voltage becomes unstable, adjust R4 for stable operation. When stability cannot be obtained by performing these steps, refer to the troubleshooting chart.

b. *Instability*. Instability may occur when the no load field requirements of the exciter or generator is near the minimum working voltage of the regulator. Increased stability may be obtained by adding a resistor in series with the field. (See paragraph 3-2c.)

NOTE

Unstable governors are frequently the cause of generator voltage instability. If a stability problem still exists after performing the procedure in paragraph 4-6a., steps f and g, a thorough check of the governor should be made.

4-7. FIELD FLASHING

a. The following procedures is for use on systems where the generator voltage does not build up and no field flash provisions are incorporated. (There is usually sufficient residual magnetism to allow the generator voltage to build up without additional flashing circuit.)

b. With the prime mover at rest (not rotating) apply a dc flashing source across terminals F+ and A- on the regulator. The positive of the flashing source must be connected to F+ and negative to A-.

> **CAUTION**
>
> The flashing source cannot be grounded unless a power isolation transformer is used.

c. When automatic field flashing is required, a dc source not in excess of 125 V should be used and the circuit must be interconnected as shown in Figure 3-5. A series limiting resistor may also be required to limit flashing current. Typically flashing current is limited to approximately 50% of the no-load exciter field current. An internal blocking diode (CR9) in series with the regulator A- terminal prevents the regulator output from flowing into the flashing source.

4-8. PARALLEL OPERATION

The following paragraphs describe the procedures to be followed to operate two or more generator sets in parallel. In order to insure proper parallel operation, the following requirements must be met:

(1) The voltage regulating systems must cause the generators to share the total KVAR load.

(2) The speed governing system must make the generators share the total kW load.

a. *Preliminary Instructions*.

(1) It is recommended, before proceeding, that the operation of the components in (and external to) the regulator which facilitates parallel operation be reviewed (paragraph 2-3).

(2) It is essential that the paralleling signal at terminals 1 and 2 of the regulator, have the proper phase relationship with that of the sensing voltages at terminals E1, (E2 must be connected on 3 phase models), and E3. Verify the connections to these terminals are made exactly as shown in Figures 3-3 and 3-4. If reactive differential (cross-current) compensation is desired, the paralleling CT's must be connected as described in paragraph 2-4b. A CT must be selected which will furnish 3 to 5 amperes at rated generator load current.

(3) Prior to operation, the slide adjustment of resistor R25 (on all regulators) should be set to identical positions, near the end of R25 (farthest from the terminal strip). This adjustment will provide maximum reactive droop compensation (droop) signal.

b. *Preliminary Operation*.

(1) Before attempting to parallel two or more generator sets, it is recommended individual sets be tested to verify that the paralleling features, function properly. The following test may be used:

(a) Place each set in operation in accordance with paragraph 4-6a.

(b) Verify the paralleling CT secondary is not shorted. (Unit parallel switch in **PARALLEL** position.)

(c) Apply 25 to 100% unity power factor load to the set under test. Generator voltage should not change more than 1% and the frequency should decrease if the governor is set for droop operation.

(d) Apply a 25 to 100% 0.8 P.F. (inductive load; voltage should droop from 4 to 6% with rated load. If the voltage rises instead of drooping, reverse the CT sensing leads.

(2) During these tests, verify the voltage and speed do not drift or jump erratically. Also, the generator voltage sequence can be verified at this time.

(3) When the preceding tests has been satisfactorily completed, the sets should parallel properly.

c. ***Conditions Necessary for Paralleling*****.** In order to prevent damage to the generator and/or prime mover, paralleling should be attempted only when the speeds (frequencies) are equal and at the instant when the generator voltages are equal. That is, they have the same phase sequence of voltage and the voltages are in phase.

d. ***Metering*****.** In order to initiate paralleling and to check for proper parallel operation, all generators should be equipped with the following monitoring equipment:

(1) AC Voltmeter (1 or 2).

(2) Frequency Meter (1 or 2).

(3) Synchroscope or a set of lights, etc. (indicates an in-phase condition).

(4) Ac Ammeter (1 per set).

(5) kW Meter (1 per set).

(6) KVAR or Power Factor Meter (1 per set).

(7) Field Current Ammeters.

e. ***Sequence of Operation (Parallel)*.**

(1) The following instructions describe the procedures to be followed for paralleling generators on an isolated bus. These procedures should be completely reviewed and understood, before paralleling is attempted.

(a) Start generator set No. 1.

(b) Close the circuit breaker connecting it to the bus.

(c) Adjust its voltage and frequency to nominal.

(d) Apply the load. (If possible, load should be 10% or more of its kW rating.

(e) Start generator set No. 2.

(f) Adjust its voltage to nominal.

(g) Adjust its speed slightly higher than that of No. 1's.

(h) Observing the synchroscope (or lights), close the circuit breaker (No. 2), when the set is in phase with No. 1.

(i) Immediately after closing the breaker, verify the indication on the ammeter for set No. 2. They should read well within the rating of the generator. If they do not, shut down the system and refer to the troubleshooting chart 5-3. If unstable operation is indicated, see paragraph 4-8. If stable, see next step.

(j) Adjust the speed of No. 2 to the point where each set is carrying the desired share of kW load.

(k) Adjust the voltage of No. 2 until the ammeter reading, of both sets, are near minimum.

(l) If KVAR or power factor meters are available, adjust voltage adjust rheostat for equal or proportional KVAR or power factor reading.

(m) If the sets are equipped with power factor meters instead of kW meters, alternately adjust the speed and voltage on No. 2 until the ammeter reading are proportional and the power factor readings are equal.

NOTE

To obtain the best results, final adjustments should be made with full load on the bus.

(n) With full load applied, readjust the speed and voltage on No. 2 until the desired load division is obtained.

(2) The best adjustment is obtained when both sets are supplying the same percent of rated current, the kW (or power factor) readings are equal, or the sum of the ammeter currents of the two sets, is minimum.

(3) Upon closing the circuit breaker for set No. 2 (paragraph 4-8e.(1)(h)) improper operation may result. This condition may be accompanied by a very high ammeter reading, the circuit breaker may open, due to current overload, or it may be opened by the reverse power relay. In order to isolate this problem to the faulty speed or voltage regulating system, perform the following steps:

(a) Parallel the generators as instructed in paragraph 4-8e, steps (a) through (h).

(b) Immediately after closing the circuit breaker, observe the kW and KVAR, or power factor meters. The following conditions may occur:

(a) A high ammeter reading accompanied by a large kW unbalance. When this condition exists, the speed regulating system is faulty.

(b) A high ammeter reading accompanied by a KVAR or power factor unbalance but a constant kW. When this condition exists, the voltage regulating system is faulty.

(4) Another method of isolating the preceding trouble is to parallel the generators using manual voltage control (if available). If proper operation is obtained, the voltage regulating system may be at fault.

NOTE

Sometimes a stability problem or fighting of these two high gain control systems (governor and voltage regulator) causes paralleling problems that cannot be isolated using manual voltage control.

SECTION 5

MAINTENANCE, REPLACEMENT PARTS, AND TROUBLESHOOTING

5-1. PREVENTIVE MAINTENANCE

Periodic inspection should be made on this unit to insure it is kept clean and free from dirt and moisture. Also, it is recommended the connections between the regulator and the system be checked and tightened at this time.

5-2. CORRECTIVE MAINTENANCE

Due to a protective transparent conformal coating, repair on the printed circuit board is difficult and should only be attempted by qualified personal. An effective test, used to determine if the regulator is basically operational, given below. Refer to Figure 5-1.

5-3. REPLACEMENT PARTS

The following figure (Figure 5-1) and tables (Table 5-1 and 5-2) contains only those parts and assemblies which are maintenance significant. Figure 6-3 shows the wiring diagram. When ordering replacement parts, from Basler Electric always specify description of the item, the part number, and the quantity.

5-4. WARRANTY AND REPAIR SERVICE

a. Basler SR6A and SR9A are warranted against defective material and workmanship for 18 months from the date of shipment from our factory. Units submitted for warranty repair should be returned to the factory in Highland, Illinois, freight prepaid, with complete description of the installation (See Attachment A) and the reported troubles. Pre-arrangement with either the nearest Basler Sales Office or the Factory will assure the fastest possible turn around time.

b. Out-of-warranty units should also be returned, freight prepaid, to the factory in Highland, Illinois. Repairs to regulators are made at a nominal charge, unless the unit is so extensively damaged that complete replacement is required.

5-5. TROUBLESHOOTING

The more common generator system malfunctions and the appropriate repair procedure are listed in Table 5-3.

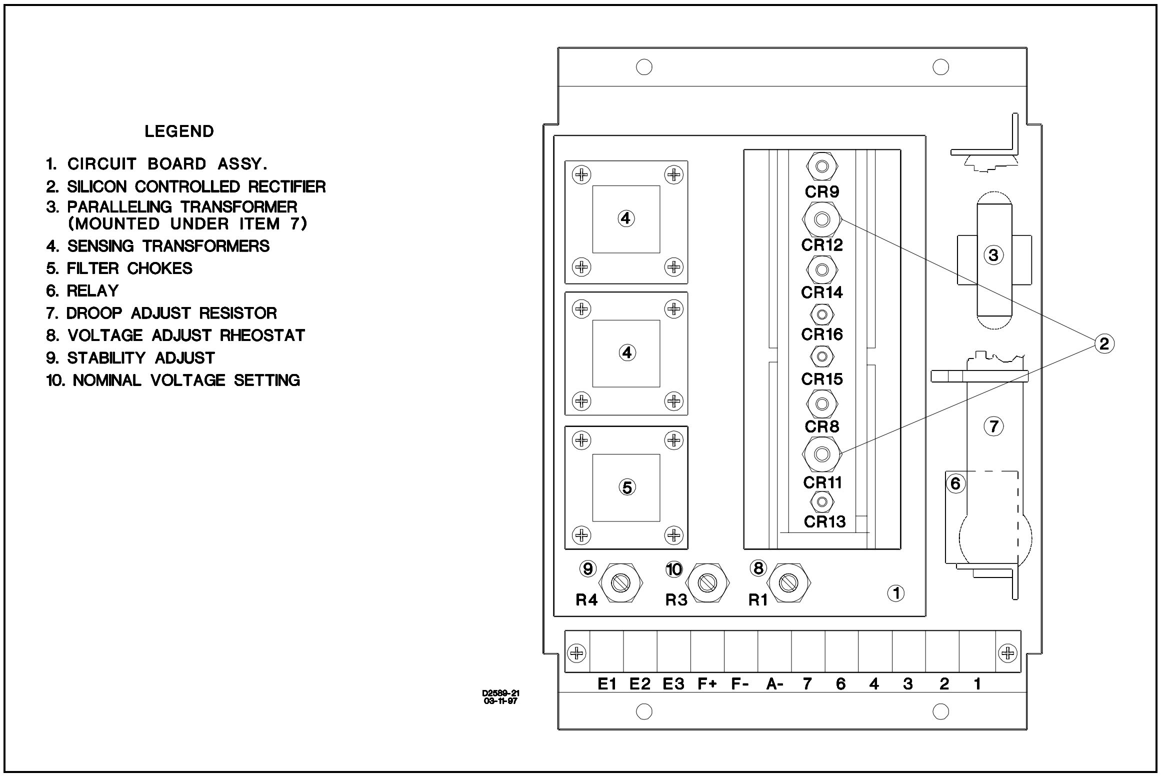


Figure 5-1. Component Location and Identification.

Table 5-1. SR6A Replacement Parts

Figure 5-1 Legend No.	Reference Designation	Basler Part Number	Description
1	CB1 CB1	9 0177 09 104 9 0177 09 104	SR6A - C Circuit Board Assembly SR6A - D Circuit Board Assembly
2	CR11, CR12	07321	Silicon Controlled Rectifier, 6.3A, 10 A RMS, 400PIV
----	CR8, CR9, CR13, CR14, CR15, CR16	02677	Diode, 12 A, 800 PIV
3	T3	BE 09024-001	Transformer, Paralleling
4	T1, T2 T1, T3	BE 00309-001 BE 00310-001	Transformer, Sensing, Single-Phase Transformer, Sensing, Three-Phase
5	L1	BE 08794-003	Choke, Filter
6	K1 K1	02686 13598	Relay Non-Hermetically Sealed Relay, Hermetically Sealed
7	R25 R25	02662 03469	Resistor, Adj., Int.; 1 ohm, ±10%, 100W Resistor, Adj., Ext.; 1 ohm, ±10%, 100W
8	R1 R1 R1	03456 02629 04768	Rheostat, Ext., 175 ohm, ±10%, 25W Rheostat, Ext., 150 ohm, ±10%, 5W Rheostat, Int. w/Locking Shaft, 150 ohm, ±10%, 4W

Table 5-2. SR9A Replacement Parts

Figure 5-1 Legend No.	Reference Designation	Basler Part Number	Description
1	CB1 CB1	9 0177 09 106 9 0177 09 107	SR9A - C Circuit Board Assembly SR9A - D Circuit Board Assembly
2	CR11,CR12	02625	Silicon Controlled Rectifier, 16 A, 16 A RMS
----	CR8, CR9, CR13, CR14, CR15, CR16	02677	Diode, 12 A, 800 PIV
3	T3	BE 09024-001	Transformer, Paralleling
4	T1, T2 T1, T2	BE 00309-001 BE 00310-001	Transformer, Sensing, Single-Phase Transformer, Sensing, Three-Phase
5	L1	BE 08794-003	Choke, Filter
6	K1 K1	02686 13598	Relay, Non-Hermetically Sealed Relay, Hermetically Sealed
7	R25 R25	02662 03469	Resistor, Adj., Int.; 1 ohm, ±10%, 100W Resistor, Adj., Ext.; 1 ohm, ±10%, 100W
8	R1 R1 R1	03456 02629 04768	Rheostat, Ext., 175 ohm, ±10%, 25 W Rheostat, Int., 150 ohm, ±10%, 5 W Rheostat, Int. w/Locking Shaft, 150 ohm, ±10%, 4 W

Table 5-3. Troubleshooting Chart

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1. VOLTAGE DOES NOT BUILD UP TO RATED VALUE.

Step 1. Check for low residual voltage and/or incorrect polarity relationship between exciter output and generator field.

If either condition exists, flash the generator field.

If neither condition exists, proceed to Step 2.

Step 2. Verify that the Voltage Shutdown Switch is closed.

If the Voltage Shutdown Switch is open, close the switch.

If the Voltage Shutdown Switch is closed, proceed to Step 3.

Step 3. Verify that the prime mover is operating at rated speed.

If the prime mover is not operating at rated speed, adjust speed.

If prime mover is operating at rated speed, proceed to step 4.

Step 4. Incorrect or missing voltage at regulator power input terminals (3 & 4).

If this condition exists, repair wiring.

If this condition does not exist, proceed to step 5.

Step 5. Verify regulator output voltage at terminals F+, F-, and A-.

If voltage is incorrect or missing, repair wiring and/or adjust/repair regulator.

If voltage is correct, proceed to step 6.

Step 6. Verify that generator output is neither shorted nor overloaded.

If generator output is shorted, remove short and repair wiring.

If generator is overloaded, shed excess load.

If generator output is not overloaded or shorted, proceed to step 7.

Step 7. Verify that the External Voltage Adjust Potentiometer (R1) is properly wired.

If the External Voltage Adjust Potentiometer is incorrectly wired, reconnect wiring properly.

If the External Voltage Adjust Potentiometer is correctly wired, proceed to step 8.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1. VOLTAGE DOES NOT BUILD UP TO RATED VALUE - Continued.

Step 8. Verify that the exciter wiring is correct.

If the exciter wiring in incorrect, reconnect the exciter.

If the exciter wiring is correct, proceed to step 9.

Step 9. Check for a defective exciter.

If exciter is defective, repair or replace the exciter.

If the exciter is not defective, proceed to step 10.

Step 10. Verify the regulator's sensing transformers are on the correct taps.

Change taps for the correct nominal voltage.

Step 11. If the above steps fail to correct the malfunction, replace or repair the voltage regulator.

2. VOLTAGE BUILDS UP UNTIL RELAY ACTUATES, THEN DECAYS.

Step 1. Check for a defective Voltage Adjust Rheostat (R1) and/or defective associated circuitry.

If the circuitry is defective, repair the circuit/wiring.

If the rheostat is defective, replace the rheostat.

If neither the rheostat or the circuit is defective, proceed to step 2.

Step 2. Check for input power to terminals 3 and 4 (Brush-type Rotary Exciters ONLY. All others proceed to step 3.)

If power is not present, check and repair wiring as necessary.

If power is present, proceed to step 3.

Step 3. If the above steps do not correct the malfunction, replace or repair the voltage regulator as necessary.

Table 5-3. Troubleshooting Chart - Continued.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

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3. VOLTAGE HIGH AND UNCONTROLLABLE WITH VOLTAGE ADJUST RHEOSTAT -

Step 1. Check for sensing voltage at terminals E1, E2, and E3.

If sensing voltage is not present, repair wiring.

If sensing voltage is present, proceed to step 2.

Step 2. Check that the transfer switch (if used) is in AUTO position. (If transfer switch is not used, proceed to step 3.)

If transfer switch is not in AUTO position, place in AUTO.

If transfer switch is in AUTO position, proceed to step 3.

Step 3. Check for a shorted external Voltage Adjust Potentiometer (R1).

If Voltage Adjust Potentiometer is shorted, replace Voltage Adjust Potentiometer.

If Voltage Adjust Potentiometer is not shorted, proceed to step 4.

Step 4. Verify that the sensing transformer is set to the proper tap.

If transformer tap is improperly selected, reconnect to proper tap.

If transformer tap is properly selected, proceed to step 5.

Step 5. Check for a faulty relay (K1).

If relay K1 is defective, replace relay.

If relay K1 is not defective, proceed to step 6.

Step 6. If the above steps fail to correct the malfunction, replace or repair the voltage regulator as necessary.

4. VOLTAGE HIGH AND CONTROLLABLE WITH VOLTAGE ADJUST RHEOSTAT.

Step 1. Check that the sensing transformer is set to the proper tap.

If transformer tap is improperly selected, reconnect to proper tap.

If transformer tap is properly selected, proceed to step 2.

Step 2. Check that Voltage Range Adjust Potentiometer (R3) is not set too high.

If Voltage Range Adjust Potentiometer is set too high, adjust potentiometer.

If Voltage Range Adjust Potentiometer setting is within limits, proceed to step 3.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

4. VOLTAGE HIGH AND CONTROLLABLE WITH VOLTAGE ADJUST RHEOSTAT - Continued.

Step 3. Check that the Voltage Adjust Potentiometer (R1) resistance is not too low.

If the Voltage Adjust Potentiometer resistance is too low, replace potentiometer with one of the proper value.

If the Voltage Adjust Potentiometer resistance is proper, proceed to step 4.

Step 4. Verify that the sensing leads are properly connected to the generator and regulator.

If the sensing leads are improperly connected, reconnect properly.

If the sensing leads are properly connected, proceed to step 5.

Step 5. Verify that three-phase sensing is applied to regulator. (Three-phase sensing models only. For single-phase sensing models, proceed to step 6.)

If single-phase sensing is applied, reconnect for three-phase sensing.

If three phase sensing is applied, proceed to step 6.

Step 6. Verify the accuracy and connection of the voltmeter.

If voltmeter is improperly connected, reconnect voltmeter properly.

If voltmeter is defective, replace voltmeter.

If voltmeter is connected properly and not defective, proceed to step 7.

Step 7. If the above steps fail to correct the malfunction, replace or repair the voltage regulator as necessary.

5. VOLTAGE LOW AND CONTROLLABLE WITH VOLTAGE ADJUST RHEOSTAT.

Step 1. Check that the sensing transformer is set to the proper tap.

If transformer tap is improperly selected, reconnect to proper tap.

If transformer tap is properly selected, proceed to step 2.

Step 2. Check that Voltage Range Adjust Potentiometer (R3) is not set too low.

If Voltage Range Adjust Potentiometer is set too low, adjust potentiometer.

If Voltage Range Adjust Potentiometer setting is within limits, proceed to step 3.

Table 5-3. Troubleshooting Chart - Continued.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

5. VOLTAGE LOW AND CONTROLLABLE WITH VOLTAGE ADJUST RHEOSTAT - Continued.

Step 3. Check that prime mover is operating at rated speed.

If prime mover is operating below rated speed, adjust prime mover speed to rated.

If prime mover is operating at rated speed, proceed to step 4.

Step 4. Verify that the sensing leads are properly connected to the generator and regulator.

If the sensing leads are improperly connected, reconnect properly.

If the sensing leads are properly connected, proceed to step 5.

Step 5. Verify the accuracy and connection of the voltmeter.

If voltmeter is improperly connected, reconnect voltmeter properly.

If voltmeter is defective, replace voltmeter.

If voltmeter is connected properly and not defective, proceed to step 6.

Step 6. If the above steps fail to correct the malfunction, replace or repair the voltage regulator as necessary.

6. POOR REGULATION.

Step 1. Verify that exciter/generator field requirements are not in excess of voltage regulator capability.

If regulator application is incorrect for regulator, contact Basler Electric.

If regulator application is within regulator limits, proceed to step 2.

Step 2. Verify that input voltage at terminals 3 and 4 is of the correct value.

If input voltage is incorrect, apply correct voltage to terminals 3 and 4.

If input voltage is correct, proceed to step 3.

Step 3. Check that the voltmeter is connect to the same location as the regulator sensing.

If voltmeter is not connected to same location as the regulator sensing, reconnect voltmeter.

If voltmeter is properly connected, proceed to step 4.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

6. POOR REGULATION - Continued.

Step 4. Check that the generator output waveform is not distorted due to harmonic content (Regulator senses average voltage; meter may be indicating RMS values.)

If this condition exists, consult the generator manufacturer.

If this condition does not exist, proceed to step 5.

Step 5. Check that the UNIT/PARALLEL switch (if installed, if not go to step 6) is in the PARALLEL position when the generator is paralleled and in the UNIT position when the generator is operating alone. Also check that the switch functions properly.

If the switch is not in the proper position, set switch to correct position.

If the switch is defective, replace switch.

If the switch is set to the proper position, proceed to step 6.

Step 6. Check that load is not unbalanced as regulator averages all three phases together. (Three-Phase Sensing ONLY. All others proceed to step 7.)

If load is unbalanced, balance load.

If load is balanced, proceed to step 7.

Step 7. Verify that prime mover is operating at rated speed.

If prime mover is not operating at rated speed, change prime mover speed to rated.

If prime mover is operating at rated speed, proceed to step 8.

Step 8. Check for fault in either exciter or generator.

If a fault exists, correct fault condition.

If a fault does not exist, proceed to step 9.

Step 9. If the above steps fail to correct the malfunction, replace or repair the voltage regulator as necessary.

7. POOR VOLTAGE STABILITY.

Step 1. Verify that the generator frequency is stable.

If the frequency is unstable, consult with the governor manufacturer.

If the frequency is stable, proceed to step 2.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

7. POOR VOLTAGE STABILITY - Continued.

Step 2. Verify that voltage does not fluctuate to the point when K1 either energizes or de-energizes.

If this condition occurs, refer to MALFUNCTION 2.

If this condition does not exist, proceed to step 3.

Step 3. Verify that the sensing voltage and input power are not taken from the same power isolation transformer secondary.

If the above condition exists, reconnect sensing to a separate source.

If the above condition does not exist, proceed to step 4.

Step 4. Verify that R4 is not maladjusted.

If R4 is maladjusted, adjust R4 to proper setting.

If R4 is not maladjusted, proceed to step 5.

Step 5. Verify that the no-load field voltage is at rated.

If the no-load field voltage is below rated, refer to paragraph 3-2c,

If the no-load field voltage is at rated, proceed to step 6.

Step 7. Check for fault in either exciter or generator.

If a fault exists, correct fault condition.

If a fault does not exist, proceed to step 8.

Step 8. If the above steps fail to correct the malfunction, replace or repair the voltage regulator as necessary.

8. VOLTAGE RECOVER SLOW WITH LOAD CHANGE.

Step 1. Verify that the correct regulator is being used for the application.

If the incorrect regulator is being used, contact Basler Electric.

If the correct regulator is being used, proceed to step 2.

Step 2. Verify that R4 is not maladjusted.

If R4 is maladjusted, adjust R4 to proper setting.

If R4 is not maladjusted, proceed to step 3.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

8. VOLTAGE RECOVER SLOW WITH LOAD CHANGE - Continued.

Step 3. Verify that the generator frequency is stable.

If the frequency is unstable, consult with the governor manufacturer.

If the frequency is stable, proceed to step 4.

Step 4. If the above steps fail to correct the malfunction, replace or repair the voltage regulator as necessary.

9. PARALLEL GENERATORS DO NOT DIVIDE REAL kW LOAD EQUALLY.

Consult with the governor manufacturer for improving the power sensing of the governor and/or adjustment of the governor droop setting.

10. NO REACTIVE DROOP COMPENSATION CAN BE OBTAINED FOR PARALLEL GENERATORS.

Step 1. Verify that the tap on R25 is not set to the minimum position.

If the tap is set to the minimum position, adjust R25 to obtain the required droop.

If the tap is set properly, proceed to step 2.

Step 2. Verify that the Parallel CT provides the required 3 to 5 A secondary current.

If the CT does not provide the required 3 to 5 A secondary current, refer to paragraph 3-3.

If the CT does provide the required 3 to 5 A secondary current, proceed to step 3.

Step 3. Verify that terminals 1 and 2 of the regulator are not shorted by the UNIT/PARALLEL switch.

If the switch is set to UNIT, set switch to PARALLEL.

If the terminals are shorted, replace the switch and/or repair the wiring.

If the terminals are shorted, proceed to step 4.

Step 4. If the above steps fail to correct the malfunction, replace or repair the voltage regulator as necessary.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

11. PARALLEL GENERATORS DO NOT DIVIDE REACTIVE KVAR LOAD EQUALLY. (Circulating Reactive Current Between Generators.

Step 1. Verify that the tap on R25 is not set to the minimum position.

If the tap is set to the minimum position, adjust R25 to obtain the required droop.

If the tap is set properly, proceed to step 2.

Step 2. Verify that the Parallel CT provides the required 3 to 5 A secondary current.

If the CT does not provide the required 3 to 5 A secondary current, refer to paragraph 3-3.

If the CT does provide the required 3 to 5 A secondary current, proceed to step 3.

Step 3. Verify that the paralleling CT's polarity is correct.

If the CT's polarity is incorrect, reverse the CT secondary leads.

If the CT's polarity is correct, proceed to step 4.

Step 4. Verify that the paralleling CT is in the correct generator phase (line).

If the CT is not in the correct phase, place CT in correct line.

If the CT is in the correct phase, proceed to step 5.

Step 5. Check that all paralleled generators have the same type of sensing (either single-phase or three-phase).

If all paralleled generators do not have the same type of sensing, adjust R25 to compensate.

If all paralleled generators do have the same type of sensing, proceed to step 6.

Step 6. If the above steps fail to correct the malfunction, replace or repair the voltage regulator as necessary.

SECTION 6

DRAWINGS

6.1 GENERAL

This section contains drawings and diagrams to facilitate the installation, operation, and maintenance of the voltage regulator.

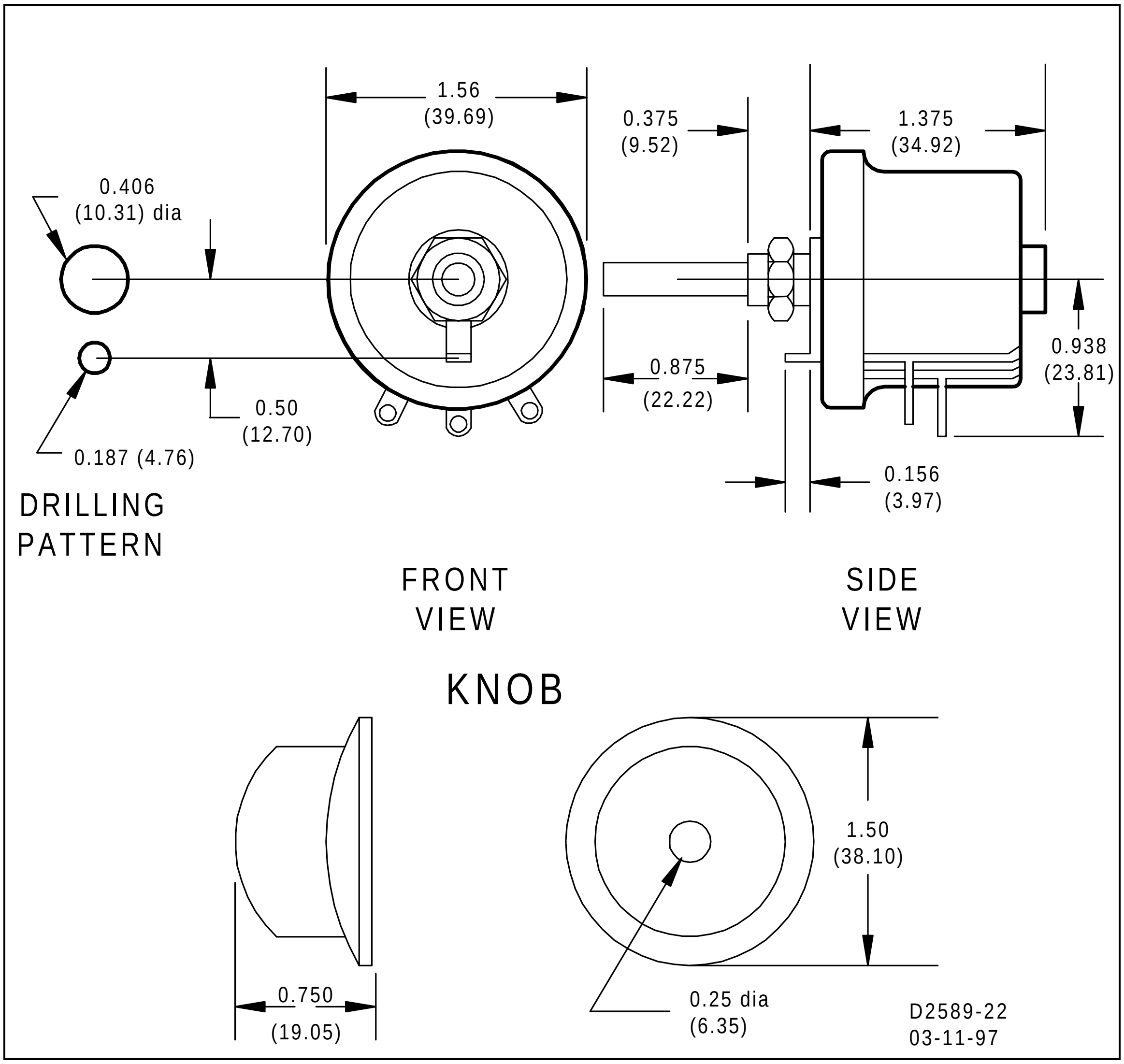

Figure 6-1. Outline Drawing - Voltage Adjust Rheostat (P/N 03456).

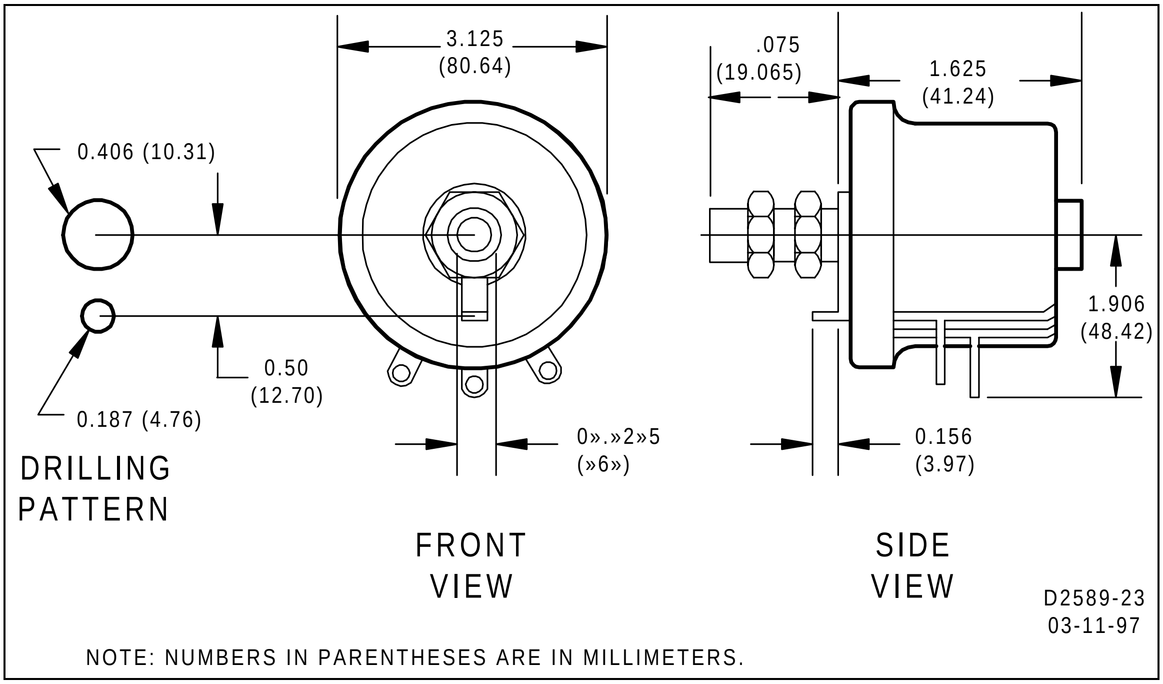

Figure 6-2. Outline Drawing - Paralleling Rheostat (P/N 03469).

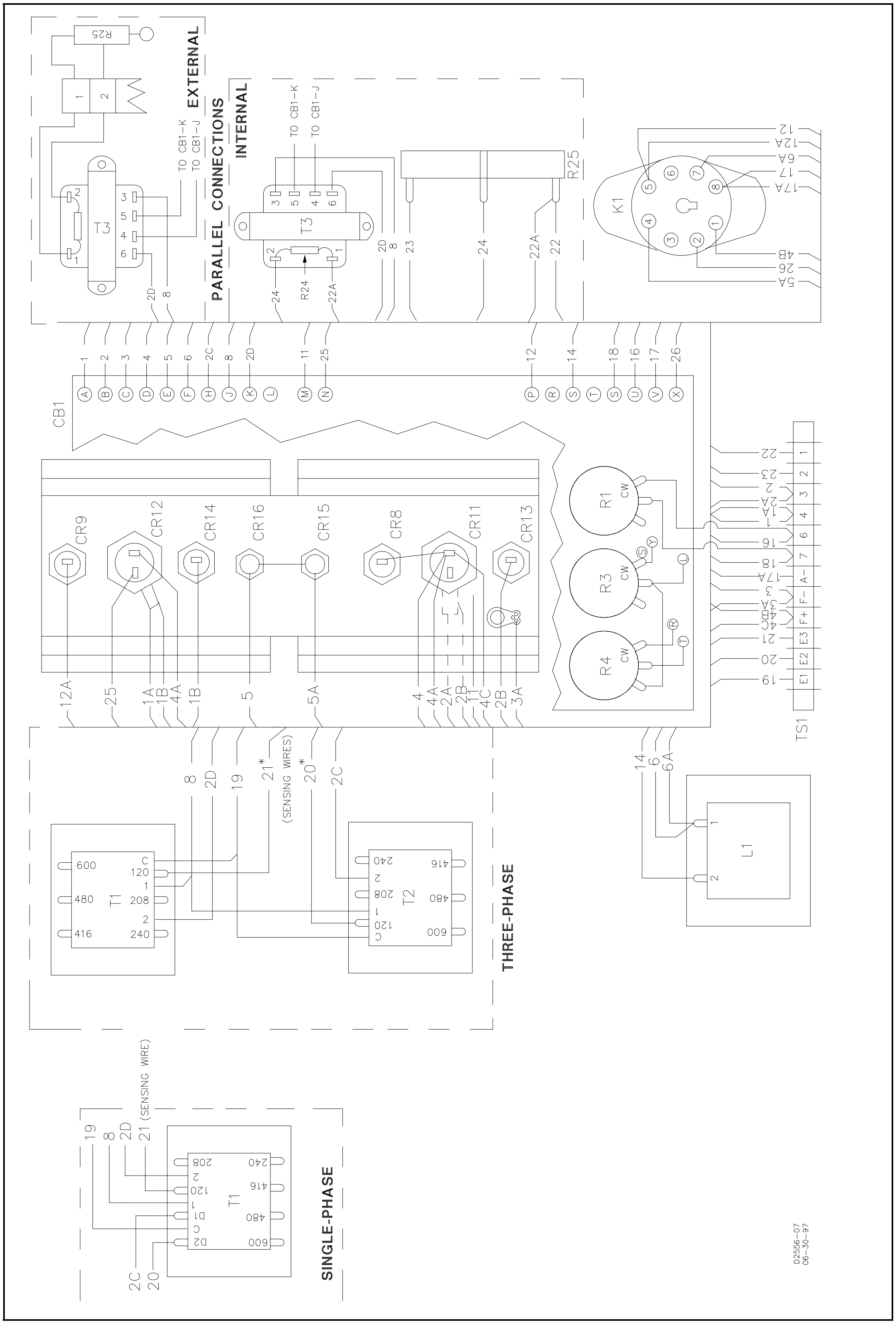

Figure 6-3.Wiring Diagram.