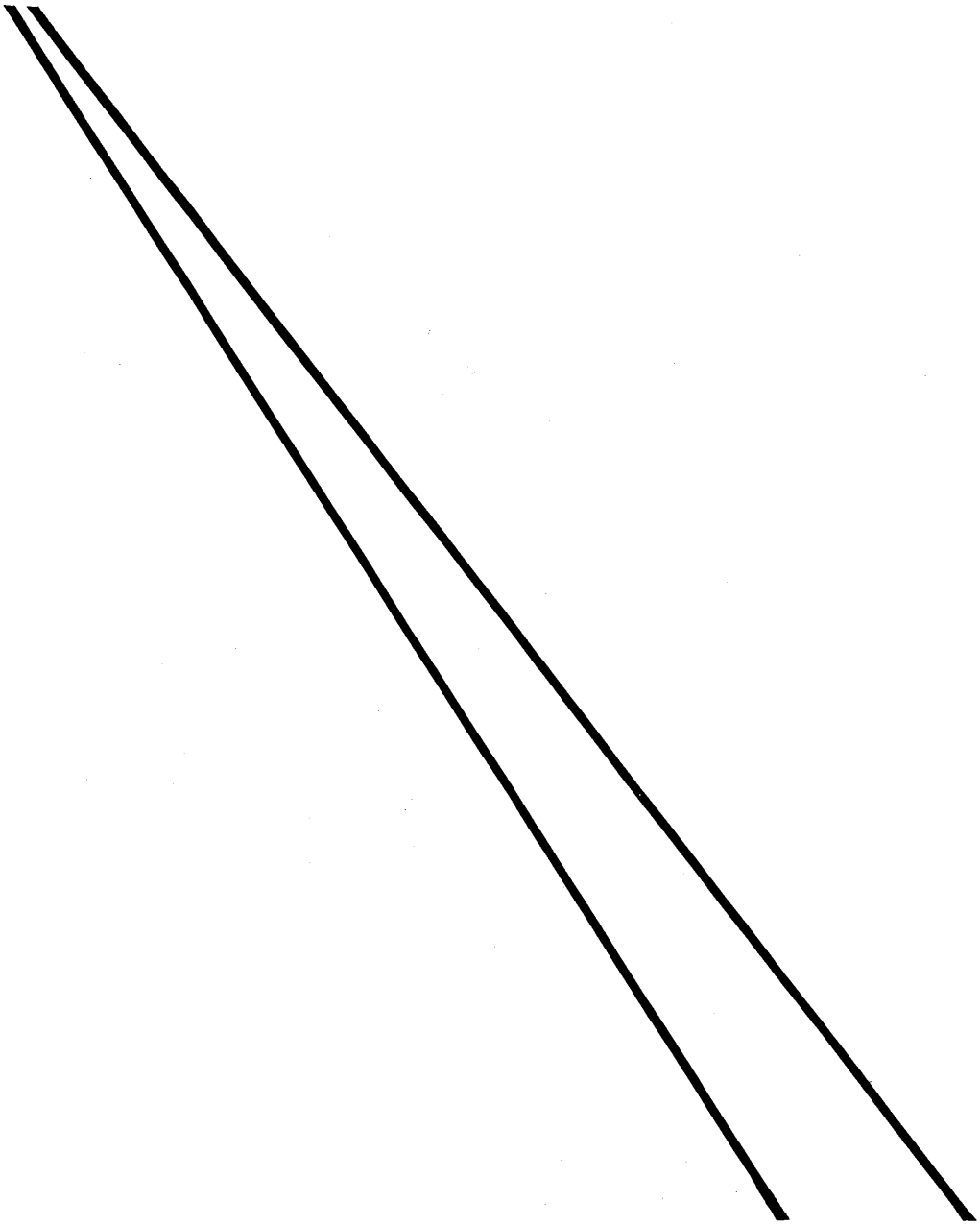
INSTRUCTION MANUAL



Basler Electric
Highland, Illinois

Voltage Regulator
Model: KT-3B
Part Number: 90 24700 101

Publication
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SECTION 1.0

GENERAL INFORMATION

1.1 The voltage regulator herein discussed; maintains the output voltage of an ac generator at a constant value by controlling the current through its field. When a brush type exciter is used with the generator, the regulator then controls the current through the exciter field.

1.1.2 The regulator is a static control device using a multi-tap sensing transformer silicon semiconductors, capacitors and resistors. All the components are contained in a protective enclosure. The unit is not subject to wear from any moving parts and it is relatively unaffected by temperature, vibration and shock.

1.2 PURPOSE

1.2.1 The voltage regulator is designed for use in an excitation system for ac generators rated up to 75 KW with a rated armature and field winding of 125 volts. The regulator uses the dc armature voltage of the exciter as the source of the regulator power and it is capable of acting as a stepless, infinitely-variable field rheostat.

1.2.2 Cranking exciter applications.

1.2.2.1 The KT-3B voltage regulator can be used for applications using the rotary exciter as a cranking motor during start cycles.

1.2.3 Single phase generators.

1.2.3.1 The voltage regulator can operate properly with single phase generators larger than approximately 1 KVA, and can be operated on reconnectable single or three phase generators and on both two and three wire single phase generators.

1.2.4 Parallel provisions.

1.2.4.1 Standard 25 VA, 5 amperes secondary current transformers (CT's) may be used in conjunction with a Basler APM-300 paralleling module, (three phase generators) or the APM 301 for single phase generators.

1.3 SPECIFICATIONS

Input Sensing: (Terminals E1 and E3)	
Voltage (Vac)	120/208/240/416/480
Frequency (Hz)	50-60
Phase	1
Input Power:	The regulator is designed for use in an excitation system for ac generators rated up to 75 KW with a rated armature and field winding of 125 volts.
Output Power:	
Nominal Voltage	125 Vdc
Forcing Voltage	180 Vdc
Current	.04 to 2 amperes
Current Limiting -	The current is limited by armature saturation voltage and series resistance in field current.
Minimum (Cold) Field Resistance	34 Ohms
Voltage Adjust Range	± 10% of nominal
Voltage Regulation -	Less than ± 1% for 100% alternator loading and for ± 10% frequency changes.
Short Circuit Performance -	Up to 6 amperes continuous duty capability to the exciter field during short circuits and overloads.
Reverse Voltage -	The regulator is not damaged when connected to an exciter with reversed residual voltage.
Ambient Operating Temperature	-30°C to +60°C (-22°F to +140°F)
Mounting -	Unit is designed to operate satisfactorily when mounted on gasoline, diesel or turbine generator installations.
Weight	4.5 lb. (2.04 Kg) Net

SECTION 2.0

2.1 PRINCIPLES OF OPERATION

2.1.1 The regulator acts as an automatic field rheostat which precisely controls the field current in order to maintain a constant output voltage of the ac generator. Initially current flowing through resistors R12 and R10 causes current to flow in transistors Q2, Q3, Q4, Q5, and Q6 (see Figure 1). The ac generator voltage at terminals E1 and E3 in the sensing circuit is stepped down, rectified and filtered to form a dc sensing signal. A fraction of this signal is compared to the voltage across reference diode VR1 to develop an error signal. When the ac generator voltage becomes too high, the sensing circuit produces a positive error signal which is applied to the base of the transistor Q1. This causes an increase in the collector current of Q1 and a corresponding decrease in the current through Q2, Q3, Q4, Q5, and Q6. To minimize power loss, the power transistors operate in a switching manner in variable turn-on duty cycles.

2.1.2 When the regulator is used in a system that includes a conventional rotary inverter the power for the field and regulator is taken from the armature of the exciter (see Figure 3).

2.2 INSTALLATION

2.2.1 A free convection flow of cooling air must be allowed to circulate through the unit. The unit should not be mounted near other heat generating equipment or mounted inside totally enclosed switchgears without ducts to outside cooling air. The regulator can be mounted in any position without affecting its regulating characteristics. The dimensions of the regulator are shown in Figure 2. To obtain maximum cooling, insure the open ends of the regulator are vertical when mounted.

2.2.2 The voltage regulator must be connected to the generator system exactly as indicated in the interconnection diagram (Figure 3). A thorough check and test should be made to determine that all connections are made to all terminals in the manner specified. An electrical test using an ohmmeter is the preferred method of checking for correct connections. Number 18 gauge wire or larger should be used to connect the voltage regulator in order to carry the required currents.

SECTION 3.0

OPERATION

3.1 GENERAL INFORMATION

3.1.1 The voltage regulator should be operated only at voltages and frequencies specified for the equipment. The speed of the prime mover should be the normal operating speed corresponding to the normal output frequency of the generator. If operation at reduced speed is required, then place switch SW1 in the OFF position in order to prevent possible damage to the regulator and the load equipment. (See Figure 3.)

3.2 FIELD FLASHING

3.2.1 Normally there is a sufficient amount of residual output voltage (3-5 Vdc) for the exciter to initiate a build-up of generator voltage. For new installations or for operation after prolonged shutdowns, it may be necessary to flash the field to obtain build-up. Figure 3 shows the preferred field flashing set up, incorporating a pushbutton switch in addition to the SPDT switch (SW 1), which allows momentary applications of the field flashing voltage when SW1 is in the OFF position. Switch SW1 should be placed in the ON position immediately after the generator output voltage begins to build up.

3.2.2 Voltage in excess of 120 volts direct current must not be used as a field flashing source. Contact the factory for further information.

3.4 ADJUSTMENT

CAUTION

DURING THE VOLTAGE ADJUSTMENT, INSURE THAT THE METAL SHANK OF THE SCREWDRIVER DOES NOT TOUCH THE SIDES OF THE OPENING OR ANY OTHER METALLIC OBJECT.

3.4.1 An internal variable resistor (R6) is provided for adjusting the regulated voltage over a range of $\pm$ 10% of the nominal voltage. The adjustment can be made with a screwdriver inserted through the opening in one side of the unit. A variable resistor can be series connected in either sensing line (terminals E1 and E3) to provide an external voltage adjustment (see Figure 3).

3.5 PARALLEL OPERATION

The APM 300 and APM 301 Paralleling Modules are available to provide parallel operation of two or more regulators.

SECTION 4.0

4.1 PREVENTIVE MAINTENANCE

4.1.1 The voltage regulator should give years of trouble-free service with reasonable care. The following preventive maintenance should be performed:

a. Dust the unit periodically and keep air screens, vents or ducts free of accumulated dust and other foreign material. Use a soft bristle brush or an air line with a filter and a moisture trap.

b. Insure that the air supply is not blocked. The unit will overheat if the air flow is cut off.

4.2 CORRECTIVE MAINTENANCE

4.2.1 Simple repairs to the unit can be made following the schematic diagram (Figure 1). Because of the complexity of the printed circuit board in the regulator, complicated repairs should be performed only by the manufacturer. It is recommended that a spare unit be stocked to avoid shut-down time in the event the original unit requires repair. Basler Electric Company maintains a supply of the units and components parts in stock at all times.

4.3 TROUBLESHOOTING

4.3.1 Some of the possible malfunctions that could occur during the installations of the voltage regulator and the appropriate corrective procedures are listed on the next page.

4.4 TROUBLESHOOTING CHART

SYMPTOM	PROBABLE CAUSE	SOLUTION
No voltage build-up	Residual magnetism too weak or improper polarity.	Flash the field with correct polarity following the procedure of paragraph 4.3.
Generator output voltage rises to maximum voltage.	Open leads between input terminals E1 and E3 of regulator and generator terminals.	Correct open circuit.
	Terminals E1 connected to wrong terminals on transformer T1.	Make correct connection.
Generator voltage constant but below normal.	Terminal E1 connected to wrong terminals on transformer T1.	Make correct connection.
Generator output erratic.	Badly worn dirty or improperly seated brushes.	Replace, clean or reseat brushes.
	Dirty commutator.	Clean commutator.

4.5 REPLACEMENT PARTS LIST

Description	Reference	Basler Part Number
Transformer	T1	BE 01315 001
Printed Circuit Board Assembly	- -	90 24703 101
Transistor	Q3, Q5	05249
Transistor	Q4, Q6	05250
Diode	CR3, CR8, CR9	06721
Voltage Adjust Rheostat	R6	03483

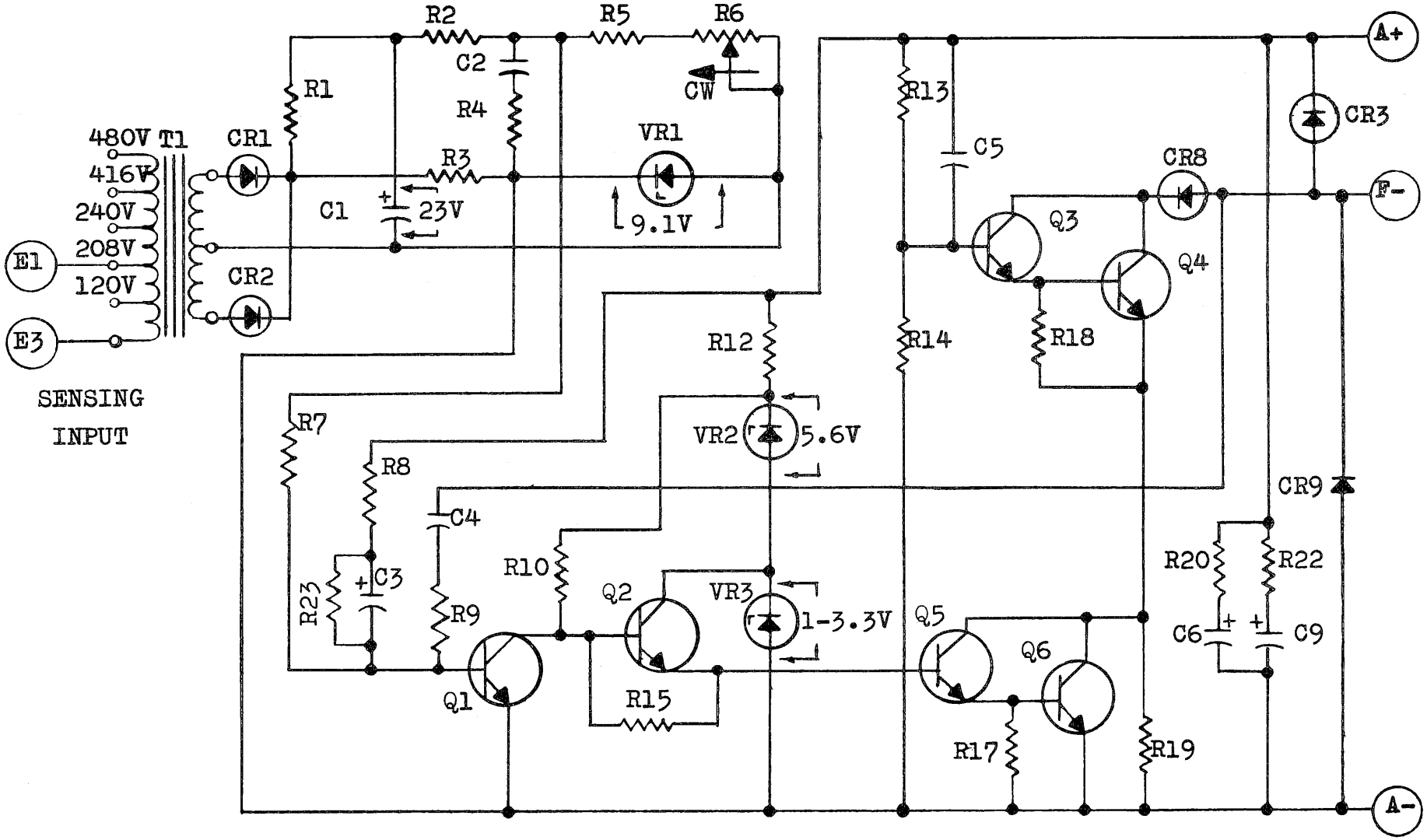

FIGURE 1 - SCHEMATIC DIAGRAM

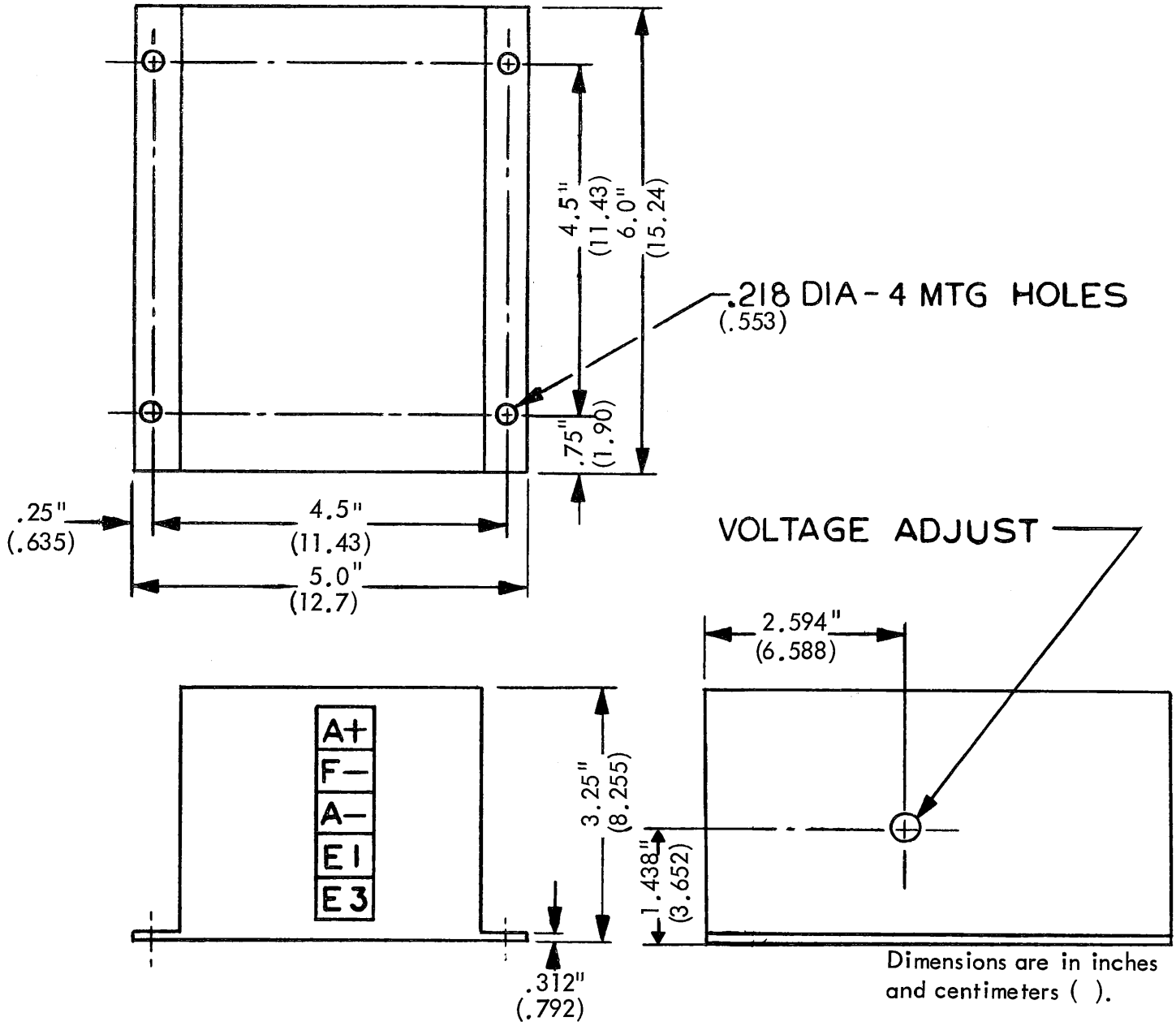

FIGURE 2 - OUTLINE DRAWING

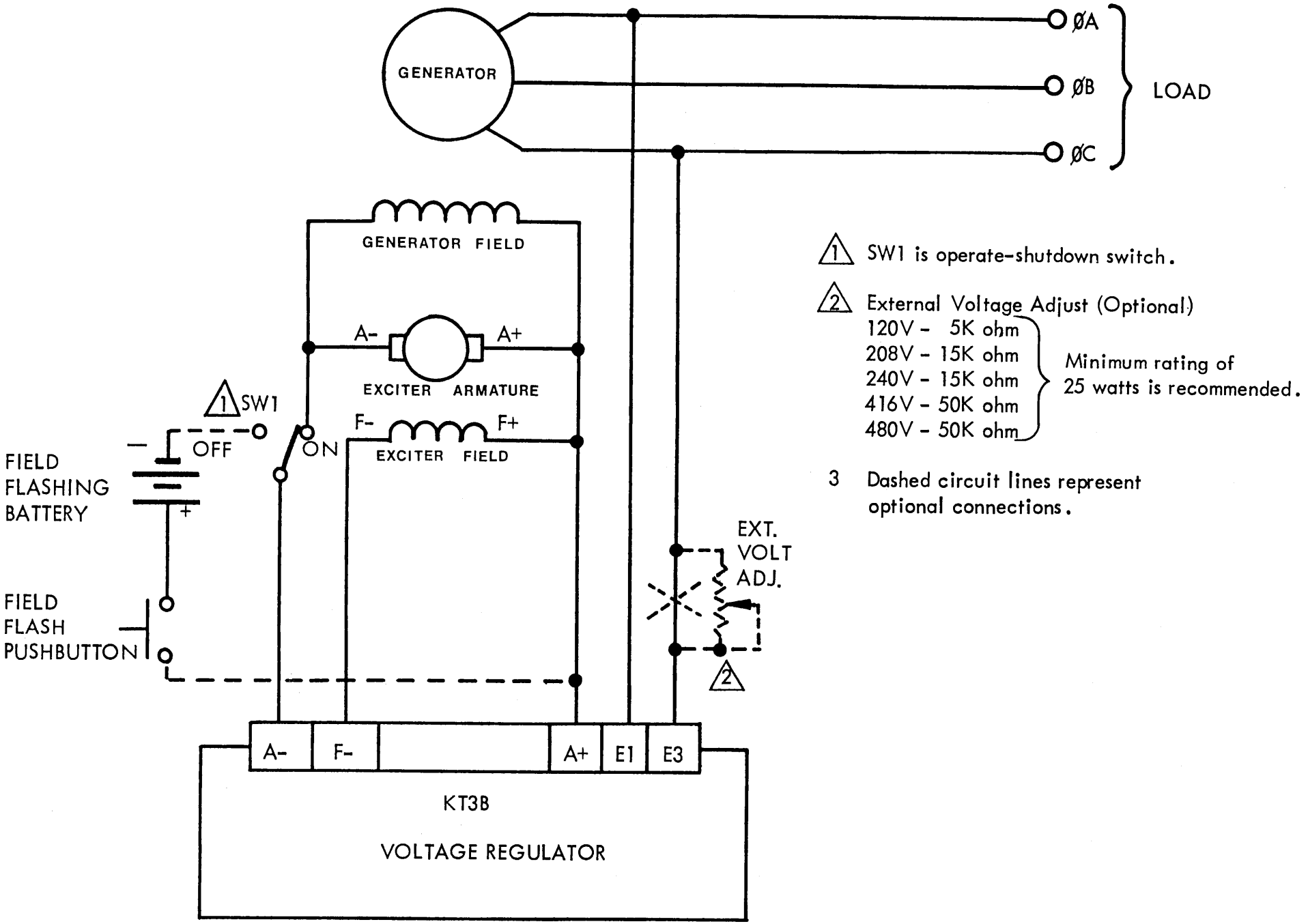

FIGURE 3 - INTERCONNECTION DIAGRAM

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