J86263A, 48-VOLT AND J86263B, 24-VOLT RECTIFIERS
REGULATED METALLIC TYPE
30 AMPERES
OPERATING METHODS

1. GENERAL

1.01 This section covers the operation of J86263A and B booster-controlled, 30-ampere metallic-type rectifiers, used in 110A, J86431, J86453, or J86455 power plants. The J86263A is arranged for charging 23- or 24-cell batteries and the J86263B for charging 11- or 12-cell batteries. The rectifier is suitable for use with single-phase ac power service voltages of 210 ±5 per cent, 230 ±5 per cent, or 250 ±5 per cent at 50 to 60 cycles. It requires an external voltage device to furnish regulating signals. The rectifiers are suitable for operation in room temperatures of 0°F to 104F (18C to 40C).

> Caution: Voltages inside the rectifier case are over 150 volts to ground and between terminals. Avoid all contact with terminals. Do not allow a test pick to touch two metal parts at the same time or destructive and dangerous short circuits may occur. Before doing any work inside rectifiers, remove the ac fuses, the dc CHG fuse, and CHG FA fuse. The studs of dc fuse mountings are connected by unfused leads to battery. If solder or wire clippings drop into the autotransformer, the winding may burn out.

1.02 The section is reissued to refer to a new applique subpanel, to add a temperature requirement on the rectifier stacks, and to add maintenance information on the removal of rectifier stacks, the motor, or the autotransformer.

1.03 The instructions are based on drawings SD-81180-01 for the J86263A, 48-volt rectifier and SD-81181-01 for the J86263B, 24-volt rectifier. For detailed description of the operation, see the corresponding circuit descriptions.

1.04 Additional information on the operation and maintenance of individual pieces of apparatus, such as instruments, keys, and relays, is given in other sections and the attendant should be familiar with them. All relays, etc. shall be adjusted in accordance with these sections and the circuit requirements table on the circuit drawings.

1.05 Routine checks should be made during a period when they will cause the least service reaction.

1.06 A separately mounted 233C inductor must be connected in series with the ungrounded output lead of the rectifier.

1.07 It is essential that the metallic rectifier stacks be kept clean to prevent excessive heating. If any stack fails, all stacks in this rectifier should be replaced. Do not combine stacks from different manufacturers.

1.08 Information in this section is arranged under the following headings:

1.09 List of Tools, Gauges, and Materials (Equivalents may be substituted.)

Tools

Screwdriver, cabiret, 3 inch

Test Set, 35 type

Tool, 265C

Wrench, adjustable, single-end, 6 inch R-1542

Wrench, Allen, socket setscrew 1/4-20, R-2671

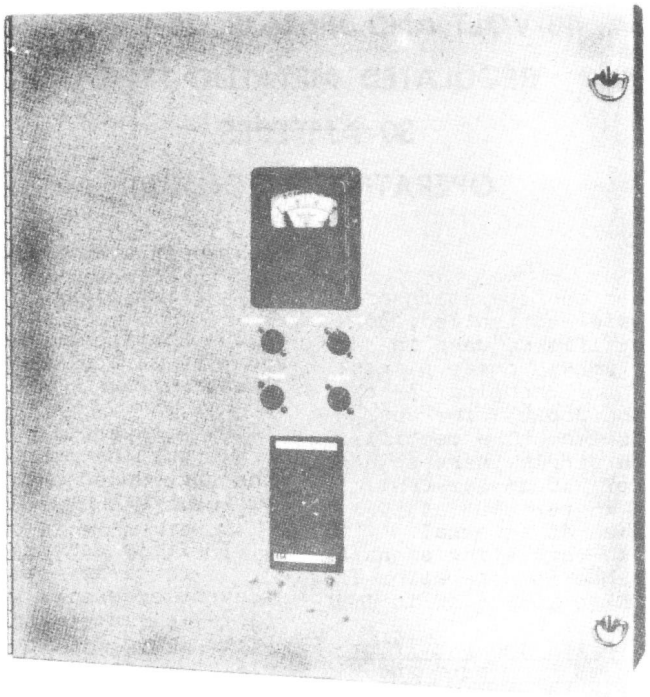

Fig. 1 - Rectifier - Cover Closed

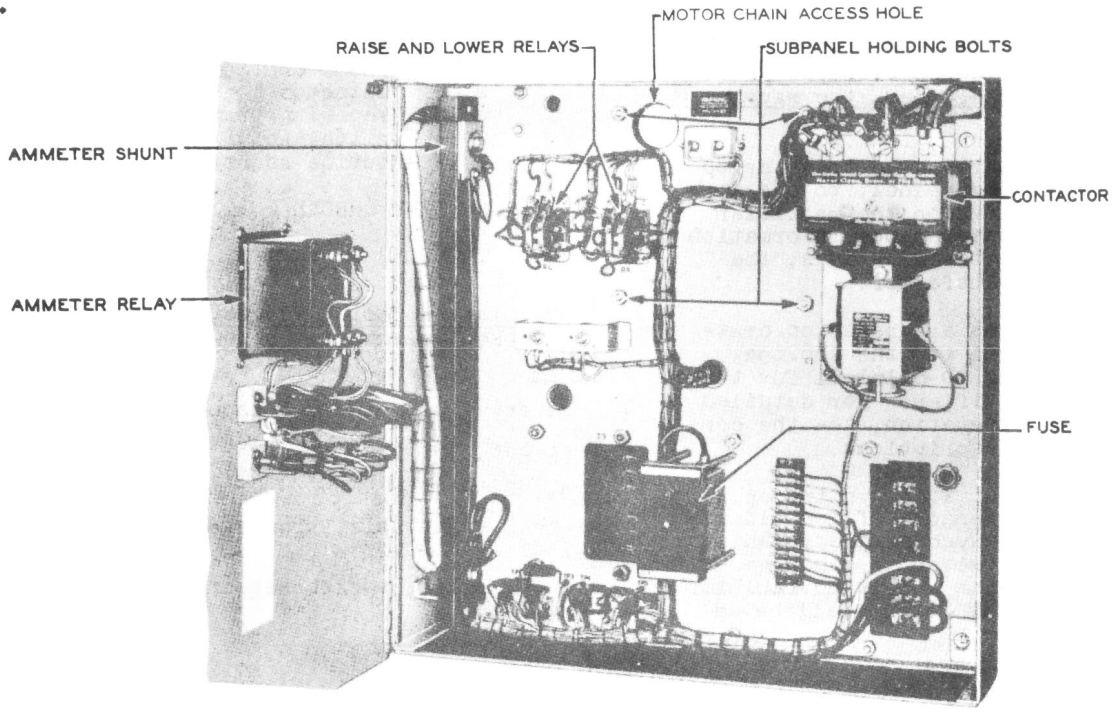

Fig. 2 - Rectifier - Cover Open

Gauges

Volt-ohm-milliammeter, KS-14510
Thermometer, R-1032, Detail 1

Materials

Cloth, cleaning, KS-14666
Grease 260-300 P

2. OPERATION

How the Rectifier Works

2.01 The rectifier uses metallic rectifier stacks connected to give full-wave rectification of single-phase, ac power. Regulation is obtained by varying the voltage to the rectifier stacks with a motor-driven variable autotransformer which responds to signals from the associated power plant. The rectifier is not self-regulating, but depends on some voltage sensitive regulating device to give a raise or lower signal for increase or decrease of output as required to keep the voltage within the operating limits. The raise and lower signals operate relays which in turn control a motor which drives a variable autotransformer TR. This autotransformer is connected to the primary of another transformer T3 whose secondary is in series with the power supply and whose function is to increase the power line voltage furnished to the transformer T1 supplying the rectifier stacks. Therefore, the autotransformer controls the rectifier output varying the boost voltage as required. The autotransformer is equipped with limit switches to prevent the moving contact brush from going beyond the end of the winding in either direction. When operated, the raise limit switch provides ar alarm in case of rectifier stack or transformer failure.

Manual Control Keys

2.02 Rectifier TEST-NORM keys are in the NORM position for normal operation. Operation to the TEST position removes that particular rectifier from the control of the regulator but leaves it connected to the load.

2.03 Rectifier ON-OFF keys are in the ON position for normal operation. Operation to the OFF position disconnects ac power from the rectifier.

2.04 Rectifier RAISE and LOWER keys are self-restoring and so have effect only while held in position manually. They should usually be used only when the rectifier TEST-NORM key is in the TEST position.

Contactor and Relays

2.05 Contactor C1, operated by the control circuit, connects ac power to the rectifier and closes one side of the dc output.

2.06 Rectifier failure relay RF operates and locks up whenever the autotransfromer raise limit switch is operated. The relay closes a signal circuit which may be used in the plant to shut down the rectifier and cause a plant alarm. If any rectifier stack fails, the rectifier output will drop. This will affect the battery voltage, cause the voltage device in the plant to give a continuous raise signal, and cause the operation of the raise limit switch.

2.07 Ammeter relay AR not only indicates the output current, but closes high and low contacts used for operation in automatic power plants.

2.08 Overload relay OL in conjunction with relay RB operates on overload output current and automatically reduces the current until the output is somewhat less than rated full load.

2.09 Failure of a CHG fuse will cause an alarm in the associated power plant where so connected.

Preparing to Start

2.10 When putting the rectifier into service initially, see that:

(a) Ac fuses are removed.

(b) Artificial load is available.

(c) Correct taps have been used at each transformer (T1 and T3) for the power service voltage.

(d) Motor autotransformer coupling is properly engaged.

(e) Proper dc fuses are in place.

(f) ON-OFF key is in OFF position.

(g) TEST-NORM key is in NORM position.

Initial Adjustments

2.11 With the rectifier turned OFF, put the ac fuses in place.

2.12 Hold the LOWER key depressed until the RL (lower) relay and the motor drive no longer respond. This indicates that the lower limit switch has operated.

2.13 Turn the rectifier control key ON.

2.14 Depress the RAISE key and note that rectifier output in amperes can be increased to approximately full load. In the absence of office load at time of installation, an artificial resistance load may be necessary to keep battery voltage within alarm limits.

2.15 The ammeter relay should have its low contact set at 3 amperes and its high contact set at 30 amperes as indicated by the pointers on the scale.

Note: If over long periods of time the office load varies (a small amount above and below full load for some rectifiers), the frequent starting and stopping of a rectifier can be avoided by setting the high contact of the ammeter relay low enough so that the incoming rectifier will be on continuously during that period.

2.16 The overload relay OL with its associated relay RB and rheostats A and B, should be adjusted as follows in addition to the usual current flow tests for the relays.

(a) Turn rheostat A maximum clockwise

(b) Block control equipment to prevent starting of next rectifier, if provided

(c) Put rectifier keys in ON and TEST position

(d) Using 35-type test set:

(1) Move No. 1 red and black sliders to the right

(2) Open all short-circuiting switches

(3) Operate BATT and GRD CO key

(4) Open G switch

(5) Connect terminals T and R across ammeter relay shunt AR without disturbing present wiring

(6) Close No. 1 short-circuiting switch

(7) Operate key to 15 MIL AMPS position for 35C test set or operate keys to to 3 MA and 15 MIL AMPS position for 35D test set

(8) Move No. 1 red slider to maximum left with black slider set at maximum right

(9) Operate REV key if meter reads reverse

(10) The test set across the shunt is used to determine when 32 amperes are flowing through the shunt since the ammeter relay only reads to 30 amperes

(11) Adjust the test set with No. 1 black slider to read 20 ma on outer scale when 20 amperes are flowing as indicated by the ammeter relay

(e) Cover and cap must be on relay OL

(f) Using RAISE button, increase charging current until relay AR makes its high contact, as indicated by relay operation in any associated control. This is normally between 29.5 and 30.5 amperes

(g) Raise charging current until test set reads 32 ma

(h) Adjust rheostat A counterclockwise until relay OL just operates

(i) Operation of relay OL operates relay RB which lowers the charging current

(j) Relays OL and RB should release at 26 amperes or more

(k) If the current at release is less than 26 amperes, remove strap F, which is connected between terminals 1T and 2T of relay RB and adjust rheostat B so that the relays release when the current is reduced to about 28 amperes.

(l) Recheck operation. OL should operate between 31 and 33 amperes and release between 26 and 30 amperes

(m) Disconnect the test set and remove any blocking used

(n) Operate ON-OFF key to OFF position. Put TEST-NORM key in NORM position. The rectifier is now ready to be placed in service

Routine Adjustments

2.17 The routine operations for starting and stopping the rectifier will depend on the plant in which the rectifier is installed. In general, the functions of the control keys are indicated by their designations and are described more in detail in 2.02 and 2.04.

3. ROUTINE CHECKS

3.01 To check the operation of relays OL and RB, operate the TEST-NORM key to the TEST position. Operate the RAISE key until relay AR indicates full load and hold it for 3 or 4 seconds more. Relays OL and RB should operate and decrease the output even though the RAISE key is operated. Release the RAISE key. Remove the CHG fuse (this will cause the ammeter to drop to 0) and hold key RAISE operated again until relay RF operates and causes a plant alarm. Relays OL and RB should release. Be sure to restore the TEST-NORM key to the NORM position, which automatically lowers the current to normal, and restore the CHG fuse. Momentarily operate ON-OFF key to OFF to release relay RF and so stop the plant alarms.

Note: Relays RB, OL, and RF are mounted on the rear of the rectifier.

3.02 Check the CHG fuse alarm by inserting a 266C tool (wire burnisher) held in a 265C tool (contact burnisher holder) through the aperture in the front of the 70-type fuse holder through which the colored fuse bead protrudes. Insert the tool far enough to short the brass collar in the fuse holder cap to the fuse body, thus causing a plant alarm. Withdraw the tool.

Caution: When shorting fuse parts to cause an alarm, the exposed metal parts of the 265C burnishing tool holder are at voltage to ground. Avoid shock by firmly attaching the cap to the tool holder barrel and holding the cap only.

3.03 The ON-OFF key opens the ac supply to the rectifier when operated to the OFF position but does not disconnect the rectifier control circuit. If the rectifier is to stand idle or work is to be done, remove the ac and dc fuses.

3.04 When relubricating the motor gear case or some motor bearings in accordance with Section 159-426-701, care should be taken to avoid dripping oil on the autotransformer which is located just below the motor. Place a cloth under the motor to catch excess oil. When sure that oil dripping ceases and before turning the rectifier on, remove the cloth.

3.05 Periodically check the temperature of the rectifier stacks with a thermometer. With the rectifier cover on, insert the thermometer through a cover hold located near the middle of an upper stack. Place the thermometer bulb in contact with one of the plates about halfway between the edge of the plate and the center bolt. If the temperature approaches 90C (194F), the stack is probably nearing the end of its useful life and replacement should be considered. See 1.07.

Note: If a thermometer other than the the R-1032 is used which will not fit through a cover hole, select an appropriate hole and ream it out.

3.06 In rectifiers that have been modified to provide the 2-inch chain access hole, lubricate the chain periodically. [See caution note in 4.04(e)].

4. TROUBLES

4.01 Before installing a new ac or dc fuse, turn ON-OFF key to OFF.

4.02 KS-5563 rheostat is totally enclosed. If it becomes defective in any way, it should be replaced.

4.03 Removal of Parts

(a) If trouble develops in the variable autotransformer or rectifier stacks, it will be necessary to remove the entire subpanel on which these parts are mounted in order to replace them. Where the rectifier chassis has not been modified to provide the motor chain access hole, removal of the motor will also involve removing the subpanel (see Figs. 4 and 5).

(b) To remove the subpanel first disconnect the wiring from the rectifier stacks, motor terminal strip, micro switches, and terminals of the autotransformers. Then remove the four nuts fastening the subpanel to the chassis (see Fig. 2). Finally back the subpanel away from the chassis, feeding the wires through the wiring holes in the subpanel. When the subpanel is off the chassis, grease the chain lightly.

(c) To remove a rectifier stack from the subpanel, remove the nut (see Fig. 5) and pull the stack out from the other side.

(d) To remove the autotransformer from the subpanel, disengage the chain from the autotransformer sprocket (see Fig. 5), remove sprocket (keyed and 1/4-20 allen socket setscrew), remove the three autotransformer fastening nuts while holding the autotransformer, and slide the autotransformer out from the other side.

(e) To remove the motor from the subpanel when the subpanel is off the rectifier chassis, disconnect the motor wiring, loosen the motor mounting bracket screws, disengage the chain from the motor sprocket, remove the four motor bracket mounting screws, and slide the motor out.

4.04 Where the rectifier chassis has been modified to provide the 2-inch motor chain access hole, it is possible to remove the motor, without taking the subpanel off the chassis, as follows:

(a) Remove the subpanel rear cover

(b) Disconnect the motor wiring

(c) Loosen the motor mounting plate screws

(d) Open the rectifier front door

(e) Insert a finger into the 2-inch access hole and while tilting the motor up from the rear to release the chain tension, disengage the chain from the motor sprocket, pull it out of the hole and tie it with a piece of string to

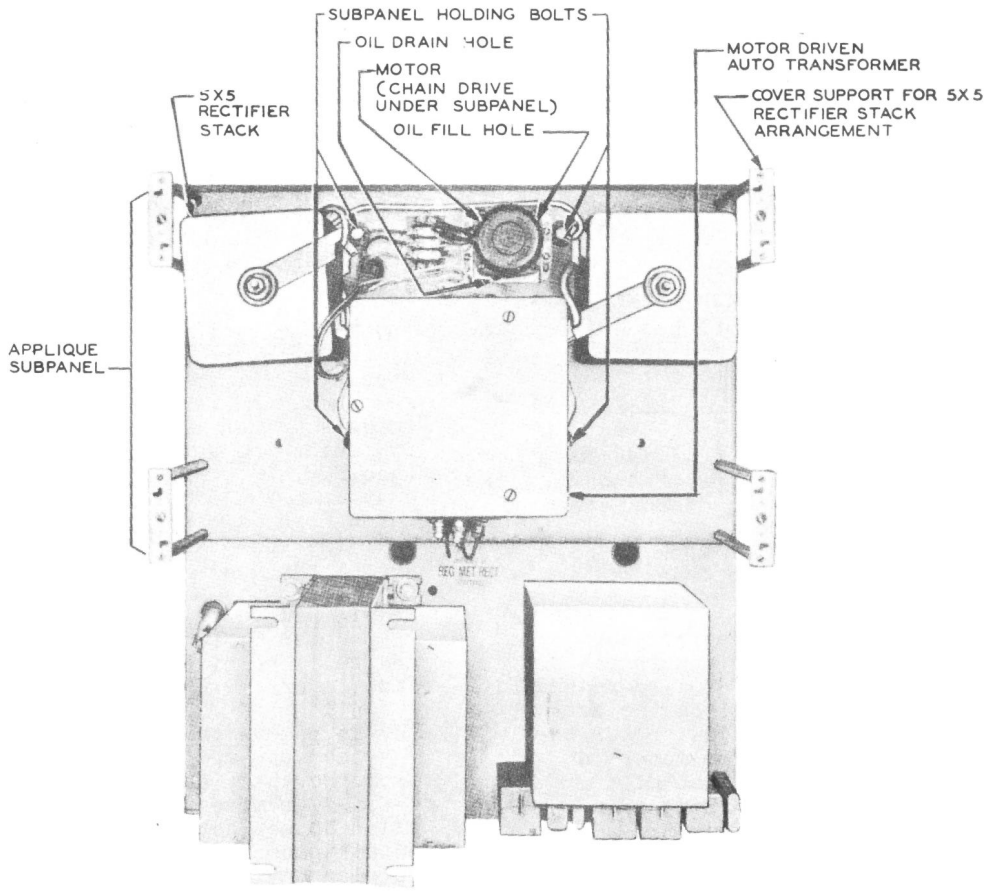

Fig. 3 - 24-volt Rectifier With 5 X 5 Rectifier Stacks - Rear View - Cover Off

prevent it from slipping down between the rectifier chassis and the subpanel.

Caution: Do not insert fingers into the hole unless the motor wiring is disconnected or the ac fuses are removed, as the motor may start unexpectedly and catch a finger between the chain and the sprocket teeth.

(f) Remove the motor mounting plate screws and slide the motor out from the subpanel.

4.05 When reinstalling the motor, ascertain that the chain is properly adjusted. The motor mounting plate has slotted holes to permit moving the motor up or down to adjust the chain, so that there is as little backlash as possible without placing a shearing strain on the motor shaft or causing the chain to bind.

4.06 If the rectifier is taken out of service and later reinstalled, make sure that the charge lead is not energized when disconnecting or connecting it at the rectifier fuse block. The proximity of the terminal to ground is close and a dangerous short circuit may result if the lug or tools touch ground. If the charge lead cannot be de-energized at the power plant, remove it from the 233C inductor.

4.07 In the J86263A rectifiers, when the voltage applied to the ac input terminals of the stacks, as measured at terminals 1 and 3 of transformer T1, increases to 155 volts with 52 volts at the battery and 30 amperes out of the rectifer, it is probable that replacement will be necessary before long. If the raise limit switch (R) is operated before the ac voltage on the stacks reaches 155 volts, the line voltage into the rectifier should be measured and the taps on the transformers should be checked. The autctransformer coast, lead drops, and all power connections should also be checked.

4.08 In the J86263B rectifiers, when the voltage applied to the ac input terminals of the stacks increases to

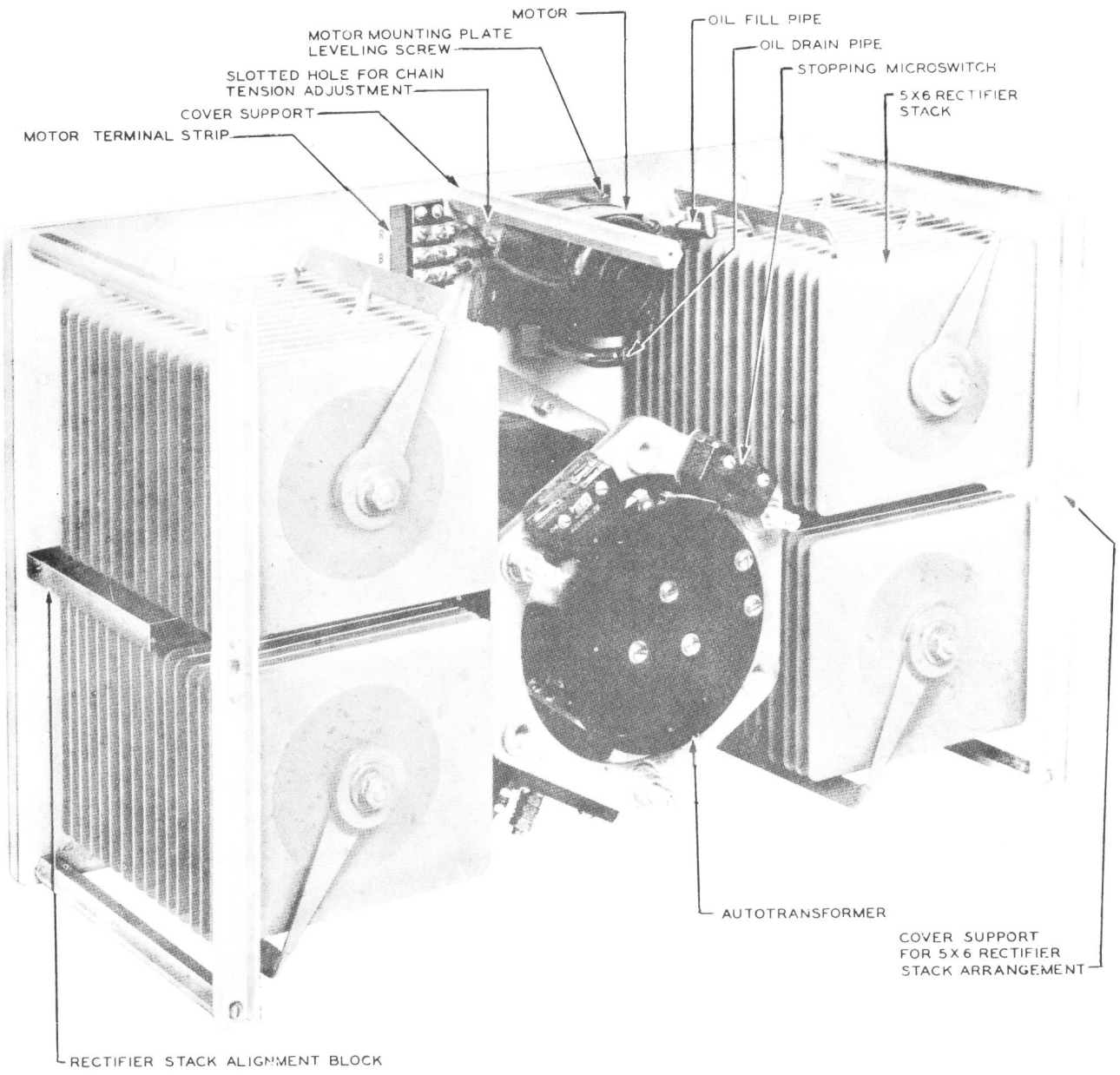

Fig. 4 - Applique Subpanel - 48-volt Rectifier With 5 X 6 Rectifier Stacks

80 volts with the battery voltage 29 volts or less and the rectifier output is 30 amperes, it is probable that stack replacement will be necessary before long. If the raise limit switch (R) is operated before the stack voltage increases to 80 volts, the same checks as specified for the J86263A should be made.

4.09 Should any of the following troubles develop, it is suggested that the possible causes be checked in the order listed. If the trouble is not found, look for open connections.

Trouble	Possible Cause
No output current	Power failure
	Blown ac supply fuse
	Blown CHG fuse
	Blown battery supply fuse for control equipment

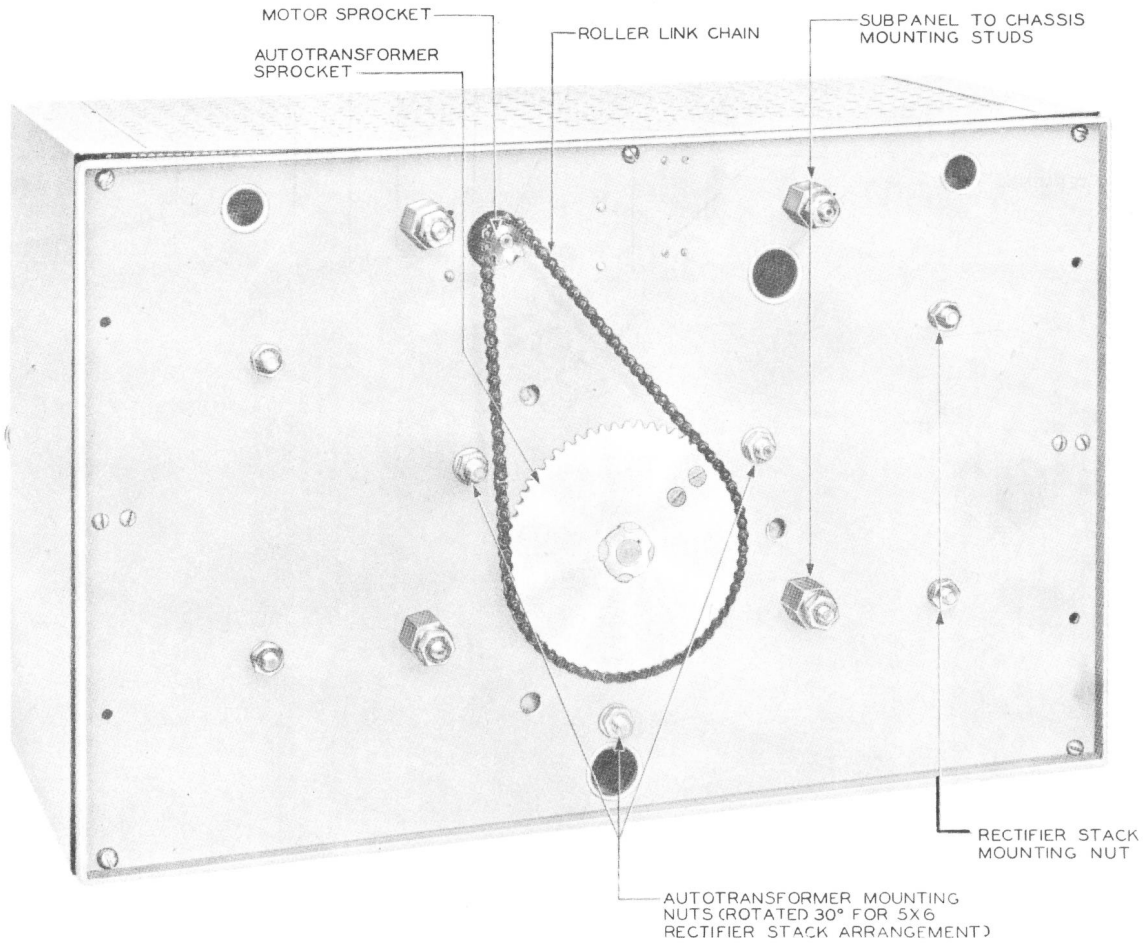

Fig. 5 - Applique Subpanel - 5 X 6 Rectifier Stack Arrangement - Chain Side

Trouble	Possible Cause
No output current	Failure of rectifier stacks
	Failure in control equipment causing continuous lower signal or failure to operate the line contactor C1
	Defective capacitor E
Low output current (less than load requires)	Regulator in plant out of adjustment
	Aged rectifier stacks
	Low-line voltage
	Raise relay RR or its control failing
	Failure of ammeter relay AR low contact

Trouble	Possible Cause
Low output current (less than load requires)	Defective capacitor E
	Incorrect transformer taps
	Regulator in plant out of adjustment
	Lower relay RL or its control failing
High output current (more than load requires or more than full load)	Overload relay OL and its associated relay RB failing
	Failure of ammeter relay AR high contact
	High-line voltage
	Defective capacitor E
	Incorrect transformer taps