

425A POWER PLANT
J86439 FILAMENT SUPPLY
12 VOLTS, 800 AMPERES

1. GENERAL

1.01 This section describes the operation of the 12-volt, 800-ampere power supply which is used in the 425A power plant. The plant is rated 12.5 to 13.5 volts for loads from 60 to 800 amperes direct current.

1.02 This section is reissued to delete references to the boost charge timer which is no longer used. Routine checks on a new CO1 rectifier high-voltage shutdown relay are added. This CO1 shutdown circuit will be added on new rectifiers and may be installed on rectifiers now in the field. High- and low-voltage relay tests have been revised.

Caution: Batteries furnished for this plant may be either KS-5553 lead-antimony-type cells or KS-5553-01 or KS-15544 lead-calcium-type cells. Be sure the proper filling funnel is used for the battery provided. The funnel for the lead-calcium cell has an identifying band of green paint. A funnel for a lead-antimony cell, if installed in a lead-calcium cell, will seriously affect the cell characteristics.

1.03 Routine checks should preferably be made during a period when they will cause the least unfavorable reaction to service.

1.04 The instructions are based on drawing SD-81086-01. For detailed description of operation, see the corresponding circuit description.

1.05 Additional information on the operation and maintenance of individual pieces of apparatus, such as keys and relays, is given in other sections and the attendant should be familiar with them. All relays should be adjusted in accordance with these sections and the circuit requirements table on the drawing. Refer also to such sections as:

A301.005 - Continuous Float Charge
A301.336 - J86244 Rectifier
A401.001 - Storage Batteries
A401.562 - Meters and Instruments
A401.574 - KS-5722 Contactor
A462.005 - Voltage Relays

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

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2. OPERATION

Description

2.01 Automatically regulated metallic-type rectifier units are used to convert 60-cycle, single-phase power to 12 volt direct current for loads up to 800 amperes. The rectifier units are rated at 200 amperes each and are permanently connected to the battery with no disconnecting equipment other than the a-c and d-c fuses. The individual rectifier units have ammeters which indicate the output current, and a single ammeter is furnished to indicate the total plant load. The plant has a voltmeter to read battery volts.

2.02 A 6-cell battery provides a reserve supply in case of power failure. Resistances, in series with the load leads during normal operation, are short-circuited in case of low battery voltage to maintain voltage on the equipment. The short-circuiting contactors are automatically operated under control of the low-voltage contact of the float-voltage relay. As a safeguard, these contactors are also operated under control of the low-voltage contact of the high-low voltage relay.

2.03 Provision is made to charge the battery as required by manual operation of a FLT-CHG key, which changes the regulated output voltage of the rectifiers from a floating to a charging voltage.

2.04 If the output current of any rectifier unit is less than 10 amperes, an unbalance lamp RCT is lighted.

2.05 A power failure, in plants not equipped with NV (no voltage) relay circuit, disconnects the rectifier failure office alarm.

2.06 A power failure or a rectifier shut-down in plants equipped with the NV relay circuit results in an immediate rectifier failure office alarm.

2.07 If the battery voltage drops below the limits of the FLOAT relay and remains low for about 3 minutes, this relay lights the FLOAT lamp, gives an alarm, and if the trouble was not due to a power failure, sends a rectifier failure office alarm. The local audible alarms may be cut off by the ACO key leaving the FLOAT lamp lit.

2.08 If the battery voltage rises above the limits of the FLOAT relay and remains high for about 3 minutes, this relay lights the FLOAT lamp, gives an alarm, and shuts down the rectifier causing the high voltage.

2.09 A high-low voltage relay HLV with wider limits than the FLOAT relay gives an immediate alarm and lights the HLV lamp when the battery voltage reaches those limits. If the voltage remains high for about 30 seconds, the rectifiers causing the high voltage are shut down.

2.10 A discharge fuse failure causes audible and visual alarms and lights a lamp FA.

2.11 A charge fuse failure in itself causes no alarm unless the plant voltage becomes low as a result. Under some conditions, a rectifier unit may fail or blow its charge fuse and give no indication of failure except the lighting of unbalance lamp RCT.

Preparing to Start Initially

2.12 When putting the plant into service, check to see that:

- (a) The correct fuses are available.
- (b) The discharge resistors have been connected in accordance with SD-81086-01 for each of the loads.
- (c) Each rectifier unit has been adjusted as closely as practicable for floating at 13.0 volts at any load from 50 to 150 amperes and charging at 13.5 volts at any load between 50 and 150 amperes. See Section A301.336. The maximum charging voltage is determined by circuit voltage limitations.
- (d) The rectifier adjustments have been made in accordance with Section A301.336
- (e) The load contactors will operate as required. To check this, manually hold relay L1 operated. This should cause operation of relay L2, all LC-relays, and all C contactors in that order. Release relay L1.

Initial Adjustments

2.13 The plant adjustments, other than those required by the individual pieces of apparatus, are to equalize the load on the rectifiers provided. To put the plant in service, put the d-c charge fuses in place first and then the a-c supply fuses to the rectifier units. Maintaining the plant voltage at 13 volts, use the ADJ VOLTS potentiometer on each rectifier unit, if necessary, to make the outputs as nearly equal as practicable.

3. ROUTINE CHECKS AND ADJUSTMENTS

3.01 The plant is entirely automatic and should require no operating attention other than a periodic check of the floating voltage, the maximum current adjustment, and periodic charging. To start the rectifier units after all fuses are in place, operate the control circuit breaker REGULATOR to the ON position. This breaker in the OFF position does not disconnect power from the main transformers and other parts of the rectifier. When a rectifier unit is to be left at no load for any reason, both the a-c supply fuses and the d-c charge and regulation fuses associated with the rectifier unit should be removed.

3.02 Make the routine checks and adjustments of the rectifier in accordance with Part 3 of Section A301.336.

3.03 Periodically give the battery a boost charge at 13.5 volts in accordance with Section A301.005. Operate key CHG-FLT to CHG to charge the battery and restore to FLT when charging is done. Maintain the battery and battery records in accordance with Sections A301.005 and A401.001.

3.04 Such routine checks of the power plant relays as are consistent with operating conditions should be made monthly until operating experience indicates a longer interval or whenever operation indicates doubtful adjustment or trouble conditions.

3.05 To check a 70-type fuse alarm, insert a 266C tool (wire burnisher) held in a 265C burnishing tool holder, through the aperture in the front of the 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 use body thus causing alarm FA. 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.

3.06 Check the rectifier failure and low-voltage alarms as follows:

(a) Insulate top contacts 1, 3, and 5 on relay L1. This will prevent the load contactors from operating and thus avoid large filament voltage changes in the associated radio system. Insulate contacts with a piece of paper folded over the contact so that it will not fall out as the relay operates and releases.

(b) Operate key NOR-TST 1 to TST 1 with potentiometer MAN turned completely counterclockwise, on enough rectifiers to secure closing of voltage relay FLOAT low contacts and thus cause relay L1 to operate. As soon as relay L1 operates, immediately restore rectifier NOR-TST 1 keys to NOR to avoid low filament operation. When any rectifier output drops below 10 amperes, lamp RCT should light. As the plant voltage rises again and opens the low contact of voltage relay FLOAT, relay L1 should release.

(c) Leave top contacts 3 and 5 insulated but remove the insulator from top contact No. 1 on relay L1. Block relay L1 operated and within 1-1/2 to 3-1/2 minutes later, alarms FLOAT and RECT FAIL should be given. Operate key ACO to silence audible alarms. Remove the blocking first and contact insulators next from relay L1 to retire the alarms.

(d) Insulate top contacts 1, 3, and 5 on relay L3. Remove fuse VR2. Relay L3 should operate and alarm HLV should be given immediately. Restore fuse VR2 first and remove the contact insulators from relay L3 next. Relay L3 should release and retire the alarm.

3.07 Check the FLOAT and HLV high voltage alarms and consequent rectifier shutdowns. The following procedure is arranged so that high voltage is applied only once to each voltage relay and each rectifier shutdown is checked individually thereafter by blocking relays. Checking the rectifier shutdowns individually should prevent excessive drops in plant voltage and thus avoid operating the load contactors. Some rectifiers may be equipped with an applique unit consisting of timer TD-1 and relay CO-1. This unit functions in parallel with the rectifier CO relay to open the rectifier circuit breaker and shut down the rectifier for a high-voltage condition if the CO relay fails to operate. Each of the rectifier shutdown features is checked individually. Where rectifiers are not equipped with this applique unit, disregard references to it.

(a) Remove timer TD-2. Divide the total load by the number of rectifiers and adjust each rectifier to approximately this computed load while on manual

operation. (Operate TST 1 switch and adjust clockwise with the MAN potentiometer) Turn the MAN potentiometer further clockwise, on a few rectifiers as necessary to raise the plant voltage enough to close the high contact of voltage relay FLOAT and thus operate relay H1 (do not exceed 13.7 volts). Restore all rectifier NOR-TST 1 keys to NOR. When the voltage drops enough to open the high contact of voltage relay FLOAT, restore timer TD-2.

(b) Block the CO relays released on all but the first rectifier. Where the rectifiers are equipped with an applique unit containing timer TD-1 and relay CO-1, remove timer TD-1 from each rectifier (take off applique unit plastic cover to remove timer TD-1).

(c) Block relay H1 operated and within 1-1/2 to 3-1/2 minutes later alarm FLOAT should be given, the circuit breaker in the "first rectifier" should open and thus shut down that rectifier, and an office alarm RECT FAIL should be given. Remove the blocking from relay H1 first and then manually close the rectifier circuit breaker.

Note: For these tests, rectifiers should be adjusted so that the output is sufficiently high to keep the low contact of the rectifier ammeter relay open.

(d) Where rectifiers are equipped with the applique unit consisting of timer TD-1 and relay CO-1, block relay CO released on the "first rectifier" and restore timer TD-1 only in that rectifier (CO relays in other rectifiers still blocked released). Repeat (c). When done, remove timer TD-1.

(e) Remove the blocking from relay CO in the second rectifier and block relay CO released in the rectifier previously tested. Repeat (c) and (d) except to substitute "second rectifier" whenever "first rectifier" is referred to.

(f) Where more than two rectifiers are provided, repeat (e) substituting "third rectifier," "fourth rectifier," or "fifth rectifier" for the one previously referred to.

(g) When the last rectifier high FLOAT voltage shutdown has been checked and with the circuit still blocked for shutdown of the last rectifier only, remove timer TD-2, operate key NOR-TST 1 to TST 1 on all rectifiers, and turn the MAN potentiometer clockwise on as few rectifiers as necessary to raise the voltage enough to close the high contact of voltage relay HLV (do not exceed 14.2 volts).

Relay H2 should operate, alarm HLV should be given immediately, and within 30 seconds the circuit breaker on the last rectifier should open and shut down the rectifier. Restore the rectifier NOR-TST1 keys to NOR. When the voltage drops enough to open the high contact of voltage relay HLV, manually close the rectifier circuit breaker. Turn all rectifier MAN potentiometers completely counter-clockwise. Remove blocking from all rectifier CO relays. When the voltage drops enough to open the high contact of voltage relay FLOAT, restore timer TD-2. Where rectifiers are equipped with the applique unit, restore all TD-1 timers and put back the applique unit cover.

Caution: When putting the plant back to normal, check that all relay blocking and insulators are removed so that automatic operation of the plant is not impaired.

3.08 Check that the RCT alarm on the plant functions for each rectifier failure

by manually opening the REGULATOR circuit breaker on each rectifier with the other rectifiers operating. On plants equipped with NV relay circuit, also check that an immediate rectifier failure office alarm is given when the circuit breaker is opened. At the same time, check that the other rectifiers carry the load and maintain the float voltage with one rectifier shutdown. Close each circuit breaker after each test.

4. TROUBLES

4.01 Troubles in this plant should be limited largely to the rectifier units. For these troubles, see Section A301.336. Possible troubles in the alarm circuits should be picked up by following the routine checks in Part 3. Time delay relays TD1, TD2, and TD3 require no maintenance. They should be replaced with new units, if they become defective in any way. In case of high or low voltage, output voltage varying, etc., check the rectifier adjustments.