

425A POWER PLANT
J86438 PLATE SUPPLY
250 VOLTS, 20 AMPERES

1. GENERAL

1.01 This section describes the operation of the 250-volt, 20-ampere plate supply plant which is used in the 425A power plant and was designed for use originally in the TD-2 radio relay system. This plant is actually a closely regulated 120-volt power supply which is superimposed on a regulated 130-volt power supply. The plant is regulated from 0.5 to 20 amperes of load except during power failure.

Caution: Voltages in this plant are higher than those usually encountered in telephone power plants, some equipment being normally 250 volts to ground with the possibility of higher voltages to ground during charging or trouble conditions.

1.02 This section is reissued to delete references to the boost charge timer. Newer plants are not equipped with a timer and require manual operation of a CHG-FLT key for a boost charge and for return to the floating voltage condition.

1.03 Routine checks are intended to detect defects particularly in infrequently operated parts of the equipment, and insofar as possible, guard against circuit failures liable to interfere with service. Checks and adjustments, other than those required by trouble conditions, should be made during a period when they will cause the least unfavorable reaction.

1.04 The instructions are based on drawing SD-81085-01.

1.05 Additional information on the operation and maintenance of individual pieces of apparatus, such as keys, relays, etc., is given in other sections and the attendant should be familiar with them. All relays, etc., are assumed to have been 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
A301.332 - J86240 Rectifier
A401.001 - Storage Batteries
A401.562 - Meters and Instruments
A438.961 - Electrolytic Capacitors
A462.005 - Voltage Relays
A462.006 - KS-5635 Relay

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

1. GENERAL

2. OPERATION

2.01 Description
2.06 Preparing to Start Initially
2.07 Initial Adjustments
2.08 Routine Adjustments

3. ROUTINE CHECKS

4. TROUBLES

1.07 List of Gauges
(Equivalents may be substituted)

Receiver, No. 528
Volt-milliammeter, KS-8039

2. OPERATION

Description

2.01 Automatically regulated electron-tube-type rectifier units are used to convert 60-cycle single-phase power to 120-volt direct current to be superimposed on a 130-volt power supply to obtain a 250-volt plate supply for loads up to 20 amperes. The rectifier units are rated at 8 amperes each. The first unit operates continuously unless shut off manually for maintenance, and if the load is under 9 amperes, this unit will be the only one in operation. If the load exceeds about 9 amperes, the first rectifier unit will transfer automatically to current control delivering about 8 amperes, and the second rectifier unit will start, after the time delay for filament heating, and carry the remainder of the load at floating voltage. Similarly other units are started automatically one at a time as required by load conditions, the last unit operating on voltage control and the others on current control. If the load decreases sufficiently, the output of the last unit operating will go to zero and then be shut off when the other units have raised the battery voltage to about 126 volts. Provisions are made for a maximum of four units.

2.02 The rectifier units float and charge a 56-cell battery which is unregulated during power failure, there being no

emergency cells. After a power failure, all rectifier units are started to charge the battery on current control, the units being automatically protected against overload by action of the control equipment in the rectifier unit. Charging continues until the high contacts of the floating voltage relay close shutting off rectifier units one at a time and restoring operation to the floating voltage. Batteries may be given a boost charge by manually operating key CHG-FLT to CHG. Operating this key to FLT will restore the plant to the floating condition.

2.03 The battery for this plant is designed to be connected in series with a negative grounded 130-volt plant battery making the negative end of this plant 130 volts above ground and the positive end roughly 250 volts above ground. For this reason the battery is provided in duplicate 56-cell sections for safety in maintenance work, the sections being normally connected in parallel. Each section is located in a separate cabinet, the doors to which are locked and interlocked with the respective battery switches so that there is no access to a battery section without first turning the switch OFF. This limits the maximum exposure during maintenance to 120 volts. Only one battery switch can be open at a time.

2.04 With normal power service conditions, if the output current of any rectifier unit operating on current control falls below about 1.5 amperes and the condition persists for about 3-1/2 minutes, an alarm is given. With normal power service conditions, if a rectifier unit on voltage control fails, a rectifier failure alarm will be given not more than 3-1/2 minutes after the plant voltage has dropped to the lower limit of the floating voltage relay. Both these alarms will be maintained until the trouble is corrected or until the next succeeding rectifier unit is not required to maintain floating voltage. The alarm lamp RECT will be maintained, however, until extinguished by operation of key ACO. Also if the floating voltage is consistently high or low, an alarm is given if the condition continues for about 3-1/2 minutes. A high-low voltage relay, connected from ground to the 250-volt discharge bus bar, gives an immediate alarm if the combined voltages of the 130-volt and 250-volt plants reaches either the high or low limit. Failure of a discharge fuse causes an alarm by contact with the alarm bar. The charge fuses, while of the alarm type, are not connected to the alarm system. A charge fuse failure causes a rectifier failure. A regulation lead fuse failure causes a float alarm.

2.05 A suppressed zero voltmeter to indicate the voltage of the 56-cell battery and a voltmeter to indicate the discharge bus bar voltage to ground are provided.

Preparing to Start Initially

2.06 If a J86437 plant is used for the 130-volt supply, it should be adjusted before attempting to start this plant. When putting this plant into service, check to see that:

- (a) The rectifier units have been adjusted in accordance with Sections A301.005 and A301.332 for floating voltage, for charging at 125 volts, for transfer from voltage to current control at 8.5-ampere output, and for 8-ampere output on current control at approximately floating voltage. The maximum charging voltage is determined by circuit voltage limitations.
- (b) The correct fuses are available.
- (c) Switch AC on each rectifier is in the OFF position.
- (d) The battery cabinets are closed and battery switches 250VA and 250VB are in the ON position.

Initial Adjustments

2.07 Install all a-c and d-c fuses. Turn the AC switch on each rectifier to the ON position beginning with the lowest numbered rectifier unit. Sufficient rectifiers should start, after their respective time delays, to bring the battery to the floating voltage and carry the load.

Routine Adjustments (Normal Operation)

2.08 The plant is entirely automatic and should require no operating attention other than a periodic check of the floating voltage and periodic charging and maintenance of the battery. To stop a rectifier unit, turn switch AC to the OFF position. This disconnects most but not all of the a-c equipment. If a rectifier unit is to be out of service for some time, both the a-c supply fuses and the d-c charge and regulation fuses should be removed. The rectifier unit may be restored to service by replacing any fuses removed and operating switch AC to the ON position. The unit should operate on current control and the highest numbered unit in operation should stop when the floating voltage relay high contacts close.

2.09 Periodically give the battery a boost charge at 125 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

2.10 In connection with battery maintenance, each section or string of batteries is mounted in a separate locked cabinet, and a

key interlocking system is employed to prevent access to a cabinet without disconnecting its battery from the circuit. Individual battery cell readings, therefore, cannot be taken with current flowing. Each section is equipped with a switch which must be thrown before a key can be obtained to open either the front or rear cabinet doors. A key must be obtained to unlock the switch, and with the switch once thrown to its off position, this key is seized so that the switch on the other battery section cannot be opened. This feature guards against opening the load, which could happen if both switches could be operated simultaneously. When one of the cabinet doors is opened, its key is seized until the door is again closed and locked. This prevents reclosing the switch with the cabinet doors open. With the switch off, the battery section is ungrounded and the maximum voltage obtainable is less than 120 volts.

3. ROUTINE CHECKS

3.01 Such routine checks of the power plant relays as are consistent with operating conditions should be made periodically or whenever operation indicates doubtful adjustment or trouble conditions. Periodically shut off enough rectifier units in the plant to cause the idle rectifier units to start to be sure the normally idle plant equipment will operate correctly. On completion of the check, turn on all rectifier units. The plant conditions should return to normal.

3.02 Discharge fuse alarms may be checked by inserting a blown fuse in a spare fuse holder. This should light lamp FA and put ground on the alarm circuits to give audible and visual alarms.

3.03 To check the rectifier failure alarms of the rectifier units, turn the rectifier AUTO/MANUAL switch of the lowest numbered unit until it just snaps into the MANUAL position. If this unit was on current control, after a delay not exceeding 3-1/2 minutes, lamp RECT should be lighted and ground should be connected to the alarm circuits to give audible and visual alarms. If the load is such that the first rectifier unit was operating on voltage control, the alarm should occur not more than 3-1/2 minutes after the battery voltage drops to the lower limit of the float voltage relay.

3.04 In normal operation when the trouble has been corrected, the alarms will stop. Lamp RECT can be extinguished only by operating key ACO. Repeat the tests as outlined in 3.03 for each succeeding rectifier unit in turn until each rectifier

failure alarm has been checked. After checking the failure alarm of a unit, insulate the bottom 5-6 contacts of relay A- of the same number as the unit and operate key ACO. Then proceed in a similar manner with the other units. Be sure to remove all insulators used in the 5-6 contacts of the A- relays and to turn the switches from the MANUAL to the AUTO position on all units when the check is completed.

3.05 To check the floating voltage alarm, operate the AUTO/MANUAL switch to the MANUAL position on the highest numbered rectifier unit operating on voltage control (rectifying tubes glowing and lamp RC not lighted) and operate to the OFF position switch AC on all succeeding units. With MANUAL control, adjust the output to a value somewhat less than the output had been on AUTO control. When the battery voltage has dropped to the low limit of the floating voltage relay FLOAT and the low contacts have been closed for not more than 3-1/2 minutes, the FLOAT lamp should be lighted and ground should be connected to the alarm circuits to give audible and visual alarms. The local audible alarms may be silenced by operation of key ACO, leaving the FLOAT lamp lighted. Restore all AC switches to the ON position and all control switches to AUTO control.

3.06 To check the high-low voltage alarm, momentarily strap terminal C1 of relay VR2 to terminal L. Lamp HLV should be lighted and ground should be connected to the alarm circuits to give audible and visual alarms. Momentarily strap terminal C and H of relays VR1 and VR2 which should give the same signals.

4. TROUBLES

4.01 Plant troubles listed are only those in connection with the control which automatically starts and stops the rectifier units. Troubles in the rectifier units are covered in Section A301.332

4.02 Time delay relays TD2 and TD3 require no maintenance. If they become defective in any respect, they should be replaced.

Trouble Chart

4.03 Should any of the following troubles occur, it is suggested that the possible causes be checked. If the trouble is not found in this way, look for open connections.

<u>Trouble</u>	<u>Possible Cause</u>
Battery voltage low	Power failure. Floating voltage adjustment of rectifier unit. Relay FLOAT out of adjustment or failing to close the low contacts.

<u>Trouble</u>	<u>Possible Cause</u>
Battery voltage high	Floating voltage adjustment of rectifier unit. Relay FLOAT out of adjustment or failing to close high contacts.
Plate supply noisy	One or more capacitors C1 to C5 aged, open, or fuse open.
Hunting	Rectifier out of adjustment.