

POWER SYSTEMS  
100 & 700 TYPE PLANTS  
CHARGE CIRCUIT  
USING REGULATED RECTIFIERS  
10-400 AMPERE 44-50 VOLT  
110A & 704C PLANTS

CHANGES

B. CHANGES IN APPARATUS

B.1 J86263A, List 2 rectifier added in  
Fig. 1.

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 ZE option added in Fig. 1.

D.2 ZE option added in Note 111.

D.3 Note 121 added.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 5152-PWC-JMD-YE

POWER SYSTEMS  
100 & 700 TYPE PLANTS  
CHARGE CIRCUIT  
USING REGULATED RECTIFIERS  
10-400 AMPERE 44-50 VOLT  
110A & 704C PLANTS

CHANGES

B. CHANGES IN APPARATUS

- B.1 In Fig. 4, the (RTF) varistor 420G is added with "ZD" option.
- B.2 In Fig. 4, the (RTP2) relay is changed from U152 "ZC" option to U587 "ZD" option.

C. CHANGES IN CIRCUIT REQUIREMENTS OTHER THAN THOSE APPLYING TO ADDED OR REMOVED APPARATUS

- C.1 In Note 4 of Page 4 of CRT, values "53.0V" and "54.0V" were "51.75V" and "52.75V" respectively.

D. DESCRIPTION OF CIRCUIT CHANGES

- D.1 In Fig. 4, "ZD" option replaces "ZC" option.
- D.2 In Note 109, "B" and "E" are added. All other headings, no change.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 5152-WJM-HHS-E2

CIRCUIT DESCRIPTION  
FACILITIES DEVELOPMENT DEPARTMENT

CD-80722-02  
Issue 4-D  
Appendix 1  
Dwg. Issue 17-D

POWER SYSTEMS  
100 AND 700 TYPE PLANTS  
CHARGE CIRCUIT  
USING REGULATED RECTIFIERS  
10-400 AMPERE 44-50 VOLT  
110A AND 704C PLANTS

CHANGES

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 In Figure B "K" and "L" leads inter-  
changed to correct a drawing error  
introduced on the previous issue.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 5232 JTS-JMD-EL

POWER SYSTEMS  
100 & 700 TYPE PLANTS  
CHARGE CIRCUIT  
USING REGULATED RECTIFIERS  
10-400 AMPERE 44-50 VOLT  
110A & 704C PLANTS

CHANGES

A. CHANGED AND ADDED FUNCTIONS

A.1 Information added for increasing capacity of Plant to 400 amps by adding Auxiliary Charge and Discharge Circuits to existing Plant.

A.2 Added facilities for maintaining discharge voltage at nominal 50 or 52 volts with selection under control of key.

A.3 Added lamp which, when discharge voltage is maintained at nominal 52 volts, indicates when discharge voltage is returned to 50 volts for test or other purposes.

B. CHANGES IN APPARATUS

B.1 In Fig. B, (REL TST) jack added.

B.2 In Fig. 4 (50-52 VOLTS) key, (50 V) relay and (50 V TST) lamp added.

B.3 In Fig. 4 (CHG-FLOAT) key is changed from 272A ("B" option) to 272D ("A" option) type.

B.4 In Fig. 4 (RTF) rheostat is changed from 300 ohms ("B" option) to 400 ohms ("A" option).

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 References to Auxiliary Charge Circuit added in order that capacity of Plant may be increased to 400 amps.

D.2 (50-52 VOLTS) key added to provide control of discharge voltage.

D.3 (50 V TST) lamp added which, when discharge voltage is maintained at nominal 52 volts, indicates when discharge voltage is returned to 50 volts for test or other purposes.

D.4 (REL TST) jack added which permits adjustment of (R), (L) and (A) relays without disconnecting any leads.

All other headings under Changes, no change.

1. PURPOSE OF CIRCUIT

1.1 To provide automatic starting and stopping of rectifiers under control of charge circuit load and battery voltage.

1.2 To maintain the battery within the proper voltage limits, during floating and charging, by means of automatic regulation.

2. WORKING LIMITS

2.1 44-50 or 44-52 Volts.

3. FUNCTIONS

3.1 To provide automatic starting and stopping of rectifiers under control of the charge circuit load and battery voltage.

3.2 To regulate the battery voltage by means of automatic regulation.

3.3 To provide facilities for disconnecting any rectifier from service and automatically transferring the starting control of this rectifier to the succeeding rectifier.

3.4 To prevent overloading a rectifier due to low battery voltage or high A.C. voltage conditions.

3.5 To provide a time delay feature to prevent regulation control from increasing the output of an incoming tube rectifier until the rectifier tube filaments have reached operating temperature.

3.6 To provide means for increasing capacity of Plant to 400 amps by adding Auxiliary Charge Circuit to existing Plants.

3.7 To provide facilities for allowing discharge voltage to be maintained at nominal 50 or 52 volts with selection under control of key.

3.8 To provide lamp which, when discharge voltage is maintained at nominal 52 volts, indicates when discharge voltage is returned to 50 volts for test or other purposes.

4. CONNECTING CIRCUITS

- 4.1 SD-80714-01 Regulated Rectifier Circuit.
- 4.2 SD-81180-01 Rectifier Circuit.
- 4.3 SD-80720-02 Discharge Circuit.
- 4.4 SD-81270-01 Auxiliary Charge Circuit.
- 4.5 SD-81271-01 Auxiliary Discharge Circuit.

DESCRIPTION OF OPERATION

5. GENERAL

5.1 Voltage Control Equipment

The apparatus in Fig. 4 serves to control the output of the rectifiers and maintain close battery voltage. The leads (VR+) and (VR-) are connected to the battery to be regulated through the discharge circuit. The (CHG) rheostat, (REG) rheostat and resistances (E) and (F) form a potentiometer across the battery. A positive potential, with respect to the cathode of (V2), is taken off the potentiometer at the (REG) rheostat. This positive potential is opposed by slightly higher 22.5 volt grid battery and the resulting negative potential is applied to the grid of vacuum tube (V2). Variations of the battery voltage then reflect inversely to the grid of the amplifier (V2). The small changes in grid voltage are amplified by vacuum tube (V2). This amplified output voltage appears as a voltage drop across resistance (D) which is applied to the grid of vacuum tube (V1).

Vacuum tube (V1) and resistances (A) and (B) form a bridge circuit, the plate-cathode resistance of (V1) forming the variable in one arm of the bridge. Relays (L), (A) and (R) are connected in series across the galvanometer corners of the bridge. The battery supply to the bridge is connected directly to the (VR-) and (VR+) leads. When the battery voltage is at the regulated value the voltage applied to the grid of (V1) is a value which provides a plate-cathode resistance which balances the bridge and no current flows through the (L), (A) and (R) relays.

If the regulated voltage decreases below the floating range this change in voltage is reflected through the potentiometer to the grid of (V2) which amplifies the change but reduces the magnitude of the voltage applied to the grid of (V1). This change in grid voltage unbalances the bridge to cause current to flow in the relay circuit in a direction to operate the polarized relay (R) but does not operate the polarized relay (L) since

the current flow is opposite to its polarization.

When relay (R) operates it puts battery on the "R" lead to increase the rectifier output. It also connects battery to capacitor (RC1) and a pulse thru (RC1), secondary winding of (R), and capacitor (RC2) to ground causes relay (R) to operate positively. As the capacitors charge, the current in the operating direction thru the secondary winding decreases and the current thru (RR1), secondary winding of (R), in the releasing direction and RR2 to ground causes relay (R) to release. Upon release of the (R) relay the capacitors discharge thru the winding in the direction to hold the relay released. This gives a pulsing operation to the relay when the current in the primary winding is just sufficient to cause the relay to operate. As the current in the primary winding increases, the operated periods become longer and the released periods become shorter. At approximately 5.2 ma. in the primary, the current thru the resistors is not sufficient to cause release of the relay. This type of operation gives a correction rate which is proportional to the amount of error signal from the amplifier circuit and tends to prevent over-correction which causes hunting.

The operation of the (L) relay involves a pulsing circuit like that described for the (R) relay to reduce battery charging current in small steps and thereby prevent hunting. If the voltage of the battery rises or decreases out of the floating range sufficiently to cause an unbalance current in the bridge of approximately twice the magnitude required to operate the (R) or (L) relays, the (A) relay will operate. The operation of the (A) relay provides ground to Fig. 5.

The (CHG) rheostat is normally shorted by the (CHG) key when the battery is being floated. If the key is thrown to the (CHG) position the rheostat is connected into the potentiometer circuit which raises the mean value of the regulated voltage for overcharging the battery without disturbing the setting of the (REG) rheostat.

The (50-52 VOLT) key, when furnished, controls the limits of the Plant. The (CHG-FLOAT) key operates as described above regardless of the position of the (50-52 VOLT) key.

The grid battery, has an average voltage of 22.5 volts. The voltage of the battery should not be measured with a voltmeter but its condition can be determined by means of the (REG) rheostat. When the battery is new the (REG) rheostat will be near its counterclockwise end and when it is in its maximum clockwise position and the floating voltage cannot be obtained, the grid battery should be renewed. The

condenser (E) serves to filter the voltage supplied to the grid of (V1) since the amplifier tube (V2) amplifies any pulsating or A.C. voltages that appear on the battery voltage.

The varistor (H), condenser (C) and secondary of the transformer (T1) serve as a small half wave rectifier to provide a d-c plate voltage for the amplifier tube (V2).

5.2 Adjustment of Voltage Control Equipment

With the (REG) key in (MAN) position, (CHG-FLOAT) key in (FLOAT) position and (REG) rheostat in maximum counterclockwise position, adjust battery voltage by means of manual control until float voltage is obtained.

With the above float voltage move (REG) rheostat in a clockwise direction until both the (R) and (L) relays are released.

With the (REG) rheostat set as above and (REG) key in (MAN) position and (CHG) rheostat in maximum counterclockwise position, operate the (CHG-FLOAT) key to the (CHG) position, then slowly rotate (CHG) rheostat in a clockwise direction to a point where both the (R) and (L) relays are released. The battery voltage at which these relays must release will vary depending upon the circuit options used and the position of the (50-52 VOLT) key. The voltages for each of the various combinations of options and the position of the (50-52 VOLT) key are listed below.

Options Used on Discharge Circuit SD-80720-02	Position of (50-52 VOLT) Key (See Note)	Battery Voltage (Volts Per Cell)
G&J	50	2.2 or as close below this value as possible and still prevent the operation of the voltage alarms during charging.
G&K	50	2.3
F&J	50	2.2
F&K	50	2.3
G&J	52	2.25
F&J	52	2.25

Note: Operation with (50-52 VOLT) key in (50 VOLT) position is the same as operation with "B" option. [No (50-52 VOLT) key].

6. CIRCUIT OPERATION

6.1 General

For the purpose of describing the operation of this circuit, let us assume we have four rectifiers each arranged per Fig. 1. Rectifier 1 being associated with Fig. 2, Rectifiers 2, 3 and 4 being associated with first, second and third Figs. 3 respectively.

6.2 Normal Operation

With the rectifier keys in the "Normal" and "ON" positions, battery over the "TR" lead causes the operation of the (TR) relay. Relay (TR) operated, completes the circuit from battery through contacts of the (G1) relay to the rectifier over the "CT" lead, causing the rectifier circuit to function and connect power service voltage to the rectifier. The operation of the (TR1) relay also puts battery on the winding of the (ST1) relay, through contacts on the (ST1) and (G1) relays. Operation of the (ST1) relay closes the "R" lead from Fig. 4 through contacts of the (VRC-) relays, (ST1), (OC1) and (G1) relays to the rectifier. The battery voltage being low, the (R) relay will be operated, and will connect battery through its contacts and contacts of the (REG) key to the "R" lead, causing the rectifier to increase its output. Contacts on relay (ST1) shunt the contacts on (TR1). Relay (ST1) locks up through contacts on relays (ST1), (G1) and (PF2). Each time the load increases sufficiently to cause the battery voltage to decrease to its low floating value the (R) relay operates, thereby increasing the rectifier output. Similarly if the load decreases and the battery voltage increases to its upper floating value, the (L) relay operates, connecting battery through its contacts of (REG) key, contacts of (VRC-) relays and over (L) lead to Rectifier 1 causing it to function and decrease its output and lower the battery voltage.

When the output of the rectifier increases to its full load ampere rating, ground is connected over the "ST" lead, operating the (OC1) relay. Under this condition when the battery voltage decreases to its low floating value the (R) relay will operate but since the (OC1) relay is operated, the circuit to the (R) lead is open at the (OC1) relay and no further increase in rectifier output will be obtained. With a slight further decrease in battery voltage the (A) relay will operate, completing a circuit from ground through its contacts, winding of (CI) relay in Fig. 5, thence to battery through contacts of (L) relay, operating the (CI) relay. The (CI) relay operated completes a circuit from battery through contacts of the (OC1), (G2), (TR2), (C1) relays and winding of

(ST2) relay, operating the latter relay which locks up through its contacts and contacts of relays (SP2) and (G2) to battery.

The operation of the (ST2) relay connects battery to the (CT) lead to Rectifier 2 causing the rectifier to function and connect to the battery. Operation of the (ST2) relay puts battery on the winding of (VRC2) relay, operating the latter relay which locks up under control of the (ST2) relay. The (VRC2) relay operated, transfers the "L" and "R" leads to rectifier 2.

Under these conditions when the (R) relay closes its contacts battery is connected over (R) lead to rectifier 2 through contacts of the (VRC-) relays, and contacts of the (OC2) relay.

Likewise when the (L) relay closes its contacts battery is connected through contacts of (VRC-) relays, and over "L" lead to rectifier 2. When the output of rectifier 2 reaches its full load ampere output the (OC2) relay will operate and when the battery voltage decreases sufficiently to operate the (A) relay the third rectifier will be connected to the battery in the same manner as outlined above for the second rectifier except that relay (ST3) will operate and lock up under control of the (SP3) and (G3) relays.

When the third rectifier reaches its full load output the (OC3) relay operates and causes the fourth rectifier to function and connect across the battery.

As the load decreases the voltage will increase and each time the (L) relay operates it will cause the last rectifier to function and reduce its output. When the rectifier reduces its output to a value where the associated ammeter relay closes its low contact, ground will be connected to the (SP-) lead of that rectifier. When the battery voltage rises slightly above the floating value the (A) relay will operate. The (A) relay operated completes a circuit from ground through its contacts and winding of (CO) relay to battery through contacts of the (R) and (PF2) relays, operating the (CO) relay, which in turn completes a circuit from ground on the "SP" lead through contacts of (CO) relay and winding of (SP-) relay to battery through contacts of (ST-) relay, operating the (SP-) relay. The (SP-) relay operated opens the locking circuit to (ST-) relay, releasing the latter. The (ST-) relay released disconnects battery from the "CT" lead and releases the (VRC-) relay which in turn transfers the (L) and (R) relays to the preceding rectifier. Disconnecting battery from the "CT" lead causes the rectifier to disconnect from the battery. When battery voltage decreases to the floating value the

(A) relay releases and in turn releases the (CO) relay. As the load continues to decrease the preceding rectifiers will be disconnected from the load in the same manner as outlined for the fourth rectifier until all rectifiers with the exception of the first have been disconnected. The first rectifier, being arranged for continuous operation, will remain in operation to carry the load during the light load period.

In plants having five or more rectifiers and without the auxiliary charge circuit, the succeeding rectifiers will operate in the same manner as outlined above for rectifiers two, three, and four, except the circuit to the "H", "J", "K" and "L" leads will be completed through contacts of (CO2) and (C12) relays which operate in the same manner as the (CO) and (CI) relays.

In the event that a J86207S rectifier using tubes is employed in this plant, "K" apparatus and wiring must be furnished in Fig. 4 and "K" wiring for the Fig. 3 (or Fig. 2) associated with the tube type rectifier. Under this condition the (ST1) relay in Fig. 2 or the (VRC-) relay in Fig. 3 will not operate as soon as battery is connected to the "CT" lead, but its operation will be delayed until the (DS) relay has operated. The (DS) relay is provided to allow the filaments of the rectifier tubes to reach operating temperature before being brought into service. The operate time of the (DS) relay is 3 to 5 minutes. Operation of the (ST1) relay and the (VRC-) relays connects the "R" lead from Fig. 4 thru to the associated rectifiers and causes the rectifiers to increase their voltage.

In plants using the Auxiliary Charge Circuit the operation is very similar to that described above. The rectifiers in the Auxiliary Charge Circuit follow in sequence of operation, the first rectifier in this circuit. When Rectifier 1 in this circuit has reached full load, the first rectifier in the Auxiliary Charge Circuit will be started. If all of the rectifiers in the Auxiliary Charge Circuit reach full load, the second rectifier, associated with the first Fig. 3, in this circuit will start.

### 6.3 Removing a Rectifier from Service

If the rectifier is operating, operate the (TEST-NOR) key to the "test" position and then by means of the (LOWER) key on rectifier panel, lower the output slowly to allow time for the delay feature to function if the following rectifier is of the tube type, and regulation control to build up the next rectifier which will start and operate under load conditions which would normally control the rectifier which is being removed from service. When the regulation control increases the output of the succeeding rectifier, continue to

slowly decrease the output of the rectifier being removed from service until it has been reduced to no load, then operate the (ON-OFF) key to the (OFF) position.

If the rectifier to be removed from service is not operating, it will only be necessary to operate the (ON-OFF) key to the (OFF) position.

For the purpose of describing the detailed operation under the above condition let us assume that (RECT 1) is the only one operating and it is desired to remove it from service. Operating the (TEST-NORM) key to the (TEST) position connects ground over the "T" lead, operating the (G1) relay which removes battery from the (CT) lead, and connects battery to the (A) lead to the succeeding rectifier. The (G1) relay operated, opens the circuit to the winding of the (ST1) relay causing this relay to release. When the output of the rectifier is reduced sufficiently to cause the battery voltage to decrease and operate the (A) relay, the (CI) relay will operate completing a circuit from battery through contacts of the (G1), (G2), (TR2) and (CI) relays operating the (ST2) relay and causing the rectifier to function in the same manner as outlined above under "Normal Operation." If it is desired to run a routine test on a rectifier, it should be removed from service in the same manner as outlined above. Then with (TEST-NORM) key in "TEST" position, operate the (ON-OFF) key to the (ON) position. The rectifier will then operate without automatic voltage regulation and the output can be raised and lowered by means of the (RAISE) and (LOWER) keys on the rectifier. When operating the rectifier in this manner the rectifier should not be started until the regulating transformer has been operated to maximum lower position. If the rectifier is of the tube type allow at least 3 minutes time for the tubes to heat up before increasing the rectifier output. If the rectifier is being operated across the battery, changes in output should also be made slowly so that the regulation control can function and make the necessary adjustments in output of succeeding rectifiers. When restoring a rectifier to service operate the rectifier control to the no load position by means of the (LOWER) key then restore (TEST-NORM) key to the (NORM) position and the (ON-OFF) key to the (ON) position. In the case where (RECT 1) is being restored to service it will function immediately and connect to the battery. In the case of succeeding rectifiers they will not function until the (A) relay operates. The operation of the circuit when restoring (RECT 1) to service is as follows. When the keys on the rectifier are restored to the normal positions ground is removed from the "T" lead and the (G1) relay releases, connecting battery to the "CT" lead and causing the rectifier to

connect to the battery. Battery through contacts of relays (VRC-2), (G2), (ST1), (OG1) and (G1) over lead "R" to rectifier 1 will cause (RECT 1) to function and increase its output. Increasing the output of (RECT 1) will raise the battery voltage and operate the (L) relay which will cause the output of the last operating rectifier to be decreased until such time that the output of the rectifiers are adjusted to a suitable value to carry the load.

#### 6.4 Power Failure

In the event of a service failure, the a-c supply to the rectifiers will be discontinued, causing the output of the rectifiers to reduce to zero and connect ground to the (SP) lead of each rectifier associated with a Fig. 3. At the same time, failure of a-c supply to transformer (T1) of Fig. 4 will release the (PFI) relay which through its contacts operates the (PF2) relay. The (PF2) relay operated, disconnects battery from contact of (R) relay and connects battery to the "CO" lead and ground to "VA" lead. The (PF2) relay operated, opens the locking circuit to and releases the (ST1) relay. Battery on the "CO" lead operates the (CO) relay, which through its contacts completes circuits from "SP" leads to all (SP-) relays which operate and release the associated (ST-) and (VRC-) relays. Battery from (ST1) relay will be connected over (L) lead to the first rectifier causing it to operate to its no-load position when power service is restored. The release of the (VRC-) relays will connect battery over "L" leads to associated rectifiers causing them to operate to their no-load positions when power service is restored if they have not already attained that position.

Upon restoration of the power service supply battery over "L" lead to each rectifier will cause the rectifiers to operate to their no-load position and connect battery over the "TR" lead operating all (TR) relays. The (PFI) relay will also operate and in turn release the (PF2) relay which in releasing connects battery to (G1) and (R) relays and disconnects battery from the "CO" lead and ground from (VA) lead. (RECT 1) will start immediately and connect to the load in the same manner as outlined under "Normal Operation." The battery voltage being low the (R), (A) and (CI) relays will be operated. When the rectifier reaches its full load ampere output ground will be connected over the "ST" lead, operating the (OG1) relay. The second rectifier starts in the same manner as outlined under operation and connects across the battery.

As the battery voltage rises the output of (RECT 1) will decrease and each time the ground is removed from the "ST" lead the (OG1) relay releases completing a circuit

from battery through contacts of the (VRC2), (G2), (ST1) and (OC1) to the "R" lead to the first rectifier causing this rectifier to increase its output to rated full load amperes. In the case of succeeding rectifiers, this function is completed through contacts of succeeding (VRC-) relays, contacts of the succeeding (G-) relay, other contacts of the succeeding (VRC-) relay, contacts of the (OC-) relay associated with the rectifier and over the "R" lead to the rectifier. This function will continue until the battery reaches its floating value and all operating rectifiers except the last one is operating at full load, after which the operation will be the same as that outlined for normal operation.

### 6.5 Regulator Tube Failure

If the (V1) tube should fail the bridge will be unbalanced in such a manner to cause both the (A) and (L) relays to operate. The operation of the (L) relay will cause the rectifiers to operate to their no-load position and disconnect with the exception of RECT 1 which will not disconnect but stay in its no-load operating position.

If the (V2) tube fails the bridge will be unbalanced and cause both the (R) and (A) relays to operate. The (R) relay will cause all rectifiers to increase their outputs to full load. When the discharge circuit voltage increases to approximately 51 volts for 50 volt operation and 52.5 volts for 52 volt operation, ground will be removed from the "RS" lead disconnecting ground from one side of the (RTF1) relay. The (RTF1) relay will be operated if the trouble is not corrected before the discharge voltage increases to approximately 52.5 volts for 50 volt operation with (G&J) or (G&K) options. For 50 volt operation with (F&J) or (F&K) options and 52 volt operation with (G&J) or (F&J) options, the (RTF1) will operate when the discharge voltage increases to approximately 54 volts. With (N) option, operation of (RFT1) relay operates (RFT2). With (M) option, the (RFT1) relay must be operated and the (R) relay operated, i.e. calling for higher voltage, before the (RFT2) will operate. This prevents the rectifiers from being shut-down due to a temporary high voltage condition such as could be caused by a line voltage surge.

The (RTF2) relay operated, with either option, locks up under control of the (REG) key and also connects ground to the "T" lead of each rectifier causing all rectifiers to disconnect. On plants having more than four rectifiers, the operation of the (RTF2) relay, will operate the (RTF3) which through its contacts connects ground to the "T" leads of rectifiers, 5, 6, 7 and 8. When the trouble has been corrected it will be necessary to operate the (REG) key to the (MAN) position and then restore same to its (AUTO) position.

Failure of the regulator is indicated in 110A plants by the power plant high-low voltage alarm, and in 704-C plants by the regulator failure alarm (ground over "VA" lead).

### 6.6 Rectifier Failure Alarm

In the event of failure of the rectifying element or a fuse associated with a rectifier, battery will be connected over the "AL" lead, operating the (G-) relay and causing this rectifier to disconnect and a succeeding rectifier to start and operate under the same load conditions. Battery on the "AL" lead is also connected through contacts of (G-) relay and over "RFA" lead, causing an audible and visual alarm to be given. When the fuse is replaced, the rectifier will again function in the same manner as outlined under "Normal Operation."

### 6.7 50-52 Volt Operations

Operation of the (50-52 VOLT) key changes the range of the voltmeter relays on the Discharge Circuits to the appropriate range and controls the operation of the CEMF contactors thru the operation of the (50 V) relay. Detailed description of this operation is explained in CD-80720-02 and in CD-81271-01 for the Discharge Circuit and Auxiliary Discharge Circuit respectively.

The (50 V TST) lamp is also controlled by the (50-52 VOLT) key. If the discharge voltage is to be maintained at a nominal 50 volts, the lamp should be removed from its mounting. For 52 volt operation, the lamp indicates that the discharge voltage has been changed to 50 volts for test or other purposes.

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DEPT. 5232-JTS-JMD-MO