CIRCUIT DESCRIPTION

CD-81591-01
ISSUE 3AR
APPENDIX 2B
DWG ISSUE 10B

6

# POWER SYSTEMS
# 100 TYPE PLANTS
# CHARGE AND DISCHARGE CIRCUIT
# POSITIVE OR NEGATIVE 48 VOLTS, 30 AMPERE
# 105E POWER PLANT

## CHANGES

### A. Changed and Added Functions

A.1 "D" option separates discharge fuse alarms and control fuse alarms when required for some PBX applications.

### D. Description of Circuit Changes

D.1 Note 104 was changed.

D.2 Note 115 was added.

D.3 (DFA1) lead was added in FS4 with "D" option.

D.4 (DFA-) lead was added in FS5 with "D" option.

D.5 "TO BAT ALM APPLIQUE CKT" was added in FS6 with "D" option.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5154-KK-WJM

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CIRCUIT DESCRIPTION

CD-81591-01
ISSUE 3AR
APPENDIX 1AR
DWG ISSUE 9AR

# POWER SYSTEMS
# 100 TYPE PLANTS
# CHARGE AND DISCHARGE CIRCUIT
# POSITIVE OR NEGATIVE 48 VOLTS, 30 AMPERE
# 105E POWER PLANT

## CHANGES

C. Changes in Circuit Requirements Other Than Those Caused by Changes in Apparatus

C.1 In circuit requirements table, note 4 was changed to change the method of testing the VR relay.

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DEPT 5154-KK-CSK-EAA

POWER SYSTEMS
100 TYPE PLANTS
CHARGE AND DISCHARGE CIRCUIT
POSITIVE OR NEGATIVE 48 VOLTS, 30 AMPERE
105E POWER PLANT

## SECTION I - GENERAL DESCRIPTION

### 1. PURPOSE OF CIRCUIT

1.01 This circuit was designed to provide a 48 volt positive or negative supply with battery reserve.

## SECTION II - DETAILED DESCRIPTION

### 1. 11 AMP CHARGING UNIT - FS1

1.01 FS1 shows a regulated 11 ampere rectifier. The rectifier has a self-contained high voltage disconnect feature. In the event a rectifier fails, a rectifier fail indication lead is provided and designated either as "PG" or "RFA". When FS6, "V" option is not furnished, the "PG" lead connects resistance battery to FS4 with "F" option and over the "PG" lead from FS4 with "M" option to the office alarm circuit. When FS6, "V" option is furnished, the "PG" lead connects resistance battery to FS6 with "G" and "K" option and over the "PG" lead from FS6 to the office alarm circuit. When the rectifier fail indication lead is used as an "RFA" lead, ground is connected over the "F" lead in FS6 with "G" and "M" option to the office alarm circuit.

### 2. ORIGINATING BATTERY - FS2

2.01 FS2 shows the originating battery with charge leads from the rectifier and discharge leads to the fuse panel. Wiring is shown for connecting one, two or three rectifiers. A maximum of two rectifiers, with the originating batteries, may be mounted in the originating bay. A third rectifier mounted in the auxiliary bay, may be connected to the originating batteries, or an auxiliary battery may be paralleled with the originating battery. A third and fourth rectifier, mounted in the auxiliary bay, may be connected to the auxiliary battery shown in FS3.

### 3. ORIGINATING DISCHARGE CIRCUIT - FS4

3.01 FS4 shows the originating discharge fuses. The VR fuse supplies battery over the "VR1" lead to the alarm circuit in FS6. The FA1 resistor limits the current through the "FA1" lead when battery is connected from an operated discharge fuse. Battery over the "FA1" lead operates the FA relay in FS6. If FS6, "V" option, is not furnished, an operated fuse sends a resistance battery to the office alarm circuit over the "PG" lead with "M" option. FS5 shows the auxiliary discharge circuit. FS5 performs the same function as FS4.

### 4. ALARM CIRCUIT - FS6

4.01 FS6 covers the alarm circuit (for alarm relay adjustment procedure see paragraph 6). The VR relay is normally operated. When the discharge voltage is less than 47.75 volts for "W" option or 46.50 volts for "X" option the VR relay will release. A released relay performs the following functions:

(a) Connects ground over the "A" and "F" leads to send minor alarms to the office alarm circuit.

(b) Lights the ALM lamp.

(c) Sends alarm over the "ATB" lead to the alarm sending circuit with "M" and "N" option.

(d) Sends resistance battery over the "PG" lead to the office alarm circuit, for some PBX alarm circuits, with "K" option.

4.02 If FS7 is furnished, "X" option, a released VR relay will also connect ground to the S contactor and short out the CEMF cell, hence increasing the discharge voltage by the amount of drop across the CEMF cell.

4.03 When the discharge voltage increases above 50.75 volts the VR relay will operate and disconnect alarms from "A", "F", "PG", and "ATB" leads. Also, an operated VR relay will extinguish the ALM lamp and remove the short from the CEMF cell. The ALM diode acts as a transient suppressor for the ALM lamp when the S contactor releases in FS7. The S diode blocks false signals from operating the S contactor. When a fuse operates battery is connected to the "FA1", "FA" or "D" leads and the FA relay operates. An operated FA relay lights the ALM lamp and connects ground over the "D" and "DF" leads to send major alarms to the office alarm circuit and with "N" option sends alarms over the "ATA" lead to the alarm sending circuit. An operated fuse also sends resistance battery over the "FA1" or "FA-" lead, through the PG diode, and

over the "PG" lead with "K" option to the office alarm circuit. The PG diode prevents false operation of the FA relay when multiple "PG" leads are used. FS6 also shows wiring for the "PG" lead, "K" and "G" option, and "RFA" lead "G" and "M" option to the rectifier, FS1, see paragraph 1.01.

## 5. CEMF CIRCUIT - FS7

5.01 FS7 covers an optional CEMF circuit which may be provided in addition to the alarm circuit of FS6. The CEMF unit of FS7 provides a voltage drop of two to three volts during float operation giving a normal discharge voltage of 49 to 50 volts.

5.02 If the CEMF unit fails open, the "VR1" lead voltage drops, releasing the VR relay to operate the S contactor which would apply battery to the discharge bus and "VR1" lead to reoperate the VR relay to release the S contactor, etc. To prevent this cycling the "VR2" lead provides a path through which the load will be supplied to operate the VR fuse. With the VR fuse open, the VR relay stays released keeping the S contactor operated.

5.03 Before replacing an operated VR fuse, the CEMF cell should be disconnected and checked for continuity in both directions.

## 6. ALARM RELAY ADJUSTMENT PROCEDURE FOR FS6

6.01 Before installing the VR fuse and with the rectifier floating the battery at 52.1 volts, block VR relay released.

(a) Connect voltmeter to discharge bus and ground bus.

(b) Connect strap or clip lead across R8 resistor.

(c) Rotate R6 rheostat full clockwise (CW).

(d) Rotate R7 rheostat full counterclockwise (CCW).

(e) Insert VR fuse and remove block from VR relay. If relay does not stay released, adjust it per circuit requirement table to meet non-operate requirement.

(f) Adjust rectifier voltage until voltmeter indicates 51.0 volts.

(g) Rotate R6 CCW to operate VR relay, (With CEMF option "X", voltmeter will drop to approximately 48.75 due to the voltage drop across the CEMF cell). If full CCW does not operate VR relay check relay adjustment per circuit requirement table to meet operate requirement.

(h) If VR relay stays operated proceed to (k).

(i) If VR relay releases or chatters clip or strap out R3 resistor.

(j) If chatter continues strap out R1 resistor.

(k) Lower rectifier adjustment to 47.50 for "W" option and 46.25 for "X" option.

(l) If relay released above 47.50 for "W" option or above 46.25 for "X" option, follow steps (i) and (j).

Note: Dummy load will hasten voltage decrease.

(m) Rotate R7 CW to release VR relay (with CEMF option "X", voltmeter will increase by approximately 2 volts.)

(n) If full CW on R7 does not release VR relay, move strap to increase resistance:

(1) Remove strap from R8 resistor and Strap R1 and R3 resistors.

(2) Remove strap from R1 resistor.

(3) Remove strap from R3 resistor.

After each step, rotate R7 full CCW and manually reoperate VR relay. Repeat step (m).

(o) Increase voltage to reoperate VR relay at 50.75 to 51.00. (Minor changes of operate value may be made with R6 - CCW to operate at lower voltage)

(p) Decrease voltage to release VR relay at 47.75 to 47.50 "W" option and 46.50 to 46.25 "X" option. (Minor changes may be made with R7 for release - CCW to release at lower voltage).

(q) If clip leads were used, strap permanently and repeat (o) and (p).

## SECTION III - REFERENCE DATA

### 1. WORKING LIMITS

1.01 The normal discharge limits are 44 to 52 volts or 44 to 50 volts.

### 2. FUNCTIONAL DESIGNATIONS

None

### 3. FUNCTIONS

3.01 The following functions are provided by this plant:



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(a) Rectifier Fail Indication

(1) In the event of a rectifier failure, ground over the "RFA" lead sends minor alarms with "G" and "M" option.

(2) With "G" and "K" option resistance battery is connected to the "PG" lead (FS6) for rectifier fail alarm.

(3) With "F" option, resistance battery is connected to the "PG" lead (FS4) for rectifier fail alarm.

(b) Fuse Alarm

(1) An operated fuse connects resistance battery over the "PG" lead, "M" option.

(2) When the alarm circuit, "V" option, is furnished and any fuse operates, alarms are sent over the "D" and "DP" leads. Alarms are also sent over the "PG" lead with "K" option and over the "ATA" lead with "N" option.

(c) Low Voltage Alarms, "V" Option: When the discharge bus reaches a predetermined low voltage, alarms are sent over the "A" and "F" leads. Alarms are also sent over the "PG" lead with "K" option and over the "ATB" lead with "N" or "M" option.

(d) Voltage dropping silicon CEMF cells are available for providing 50 volts to loads when required, with "X" option. "V" option must be used with "X" option. Same alarms are sent as described in (c) when the CEMF cells are shorted.

(e) The ALM lamp, "V" option, lights when a fuse is operated or the discharge bus reaches a predetermined low voltage.

## 4. CONNECTING CIRCUITS

4.01 This circuit is designed to function with the following circuit.

(a) SD-81540-01 - 11 Ampere Rectifier

## SECTION IV - REASONS FOR REISSUE

CHANGES

### B. Changes in Apparatus

B.1 Removed

PG Diode, 446A - FS4, FS5 & APP Fig. 1, 2, 5, 6 and 7

B.2 Added

PG Diode 446A - "K" Option - FS6 and APP Fig. 3

### D. Description of Changes

D.1 Circuit notes 104 and 107 were changed.

D.2 Sheet index and option index tables were changed.

D.3 Circuit note 114 was added to drawing.

D.4 The following changes were made in FS1:

(a) "K" option was added to the "PG" lead and "M" option was added to the "RFA" lead.

(b) "PG" lead was added with "F" option.

(c) 6 or 10 amp fuse ratings were removed.

D.5 The following changes were made in FS4 and FS5:

(a) PG diode was removed.

(b) "PG" lead with "G" option was removed.

(c) "M" option was added to the "PG" lead and reference to FS6 was removed.

(d) "PG" lead was added with "F" option.

D.6 In FS4, the "FA1" lead was formerly shown as "FA-".

D.7 The following changes were made in FS6:

(a) PG diode was added with "K" option.

(b) "PG" lead was added with "K" and "G" option.

(c) "RFA" lead was added with "M" and "G" option.

(d) The R11 resistor was formerly shown as 500.

D.8 The PG diode, 446A, was removed from APP Fig. 1, 2, 5, 6 and 7.

D.9 The PG diode was added in APP Fig. 3 with "K" option.

D.10 In APP Fig. 3, "5W" was formerly not shown for R11 resistor.

D.11 The following changes were made in Cad 1:

(a) "M" option was added to "PG" lead.

(b) "PG" lead was added to punching 7 with "M" option.

D.12 The following changes were made in Cad 2:

(a) Punchings 7,8,9, and 10 and associated wiring was added to TS(5).

(b) TS(6) with punchings 1,2,3, and 4 and associated wiring was added.



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D.13 The following changes were made in Cad 3:

(a) "PG" lead was removed from punching 7 of TS(2).

(b) "M" option was added to the "ATB" lead

(c) TS(7) was formerly shown as TS(3).

(d) "PG" lead with "K" option was added to punching 2 of TS(7).

D.14 The following changes were made in Cad 4:

(a) Two No. 8 leads were added to punching 1 of TS(1).

(b) A lead to the "D1 VAR" was added to punching 2 of TS(1) with "J" option.

(c) A No. 8 lead was added to punching 2 of TS(1).

(d) "PG" lead was removed from punching 7 of TS(2).

(e) "M" option was added to the "ATB" lead.

(f) TS(7) was formerly shown as TS(3).

(g) "PG" lead was added with "K" option to punching 2 of TS(7).

(h) Punching 10 with associated wiring was added to TS(2).

D.15 The following changes were made in Cad 7:

(a) "PG" lead was removed from punching 7 of TS(2).

(b) Punchings 9 and 10 and associated wiring was removed from TS(2).

(c) TS(7) with punchings 1 and 2 and associated wiring was added.

D.16 The following changes were made in Cad 8:

(a) Strap was added between punchings 1 and 2.

(b) No. 6 lead was added to terminal 1.

(c) TS(8) was formerly shown as TS(13).

D.17 The following changes were made in Cad 9:

(a) Strap was added between punching 1 and 2.

(b) No. 6 lead was added to terminal 1.

(c) TS(9) was formerly shown as TS(14).

D.18 The following changes were made in Cad 10:

(a) "PG" lead was removed from punching 7.

(b) Strap was added between punching 7 and 8.

(c) "FA-" lead was added to punching 8.

(d) "ATA" lead connecting to the FA relay was removed from punching 8.

(e) Punching 11 and associated wiring was removed.

(f) TS(2) was formerly shown as TS(7).

(g) TS(7) with punching 1 and associated wiring was added.

(h) A lead to the "D1 VAR" was added to punching 10 of TS(2) with "H" option.

D.19 Cad 11 was added.

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