

RINGING AND TONE POWER PLANT
808A (J86834)
THEORY

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1. GENERAL	
A. Introduction	
1.01 This section provides information which explains the operation and maintenance of the 808A ringing and tone power plant.	
1.02 Whenever this section is reissued, the reason for reissue will be given in this paragraph. The Equipment Test List is not affected.	
1.03 This section explains the following:	
• Functions of Ringing Inverter Circuit	
• Functions of Ringing Control and Distribution Circuit	
• Functions of 400A (ROH) Tone Generator Circuit	
• Functions of Tone Oscillator Circuit	
• Functions of Tone Amplifier Circuit	
• Functions of Tone Interrupter, Control, and Distribution Circuit.	
1.04 This issue of the section is based on the following schematic drawings (SDs):	
SD-81717-02, Issue 12D	
SD-99303-01, Issue 18D	
SD-81654-01, Issue 9B	
SD-81655-01, Issue 13B	
SD-81709-01, Issue 12B	
SD-81652-01, Issue 26B	

APS-843212, Issue 1.

If this section is to be used with equipment or apparatus reflecting an earlier or later issue(s) of the SD(s), reference should be made to the SDs and circuit descriptions (CDs) to determine the extent of the changes and the manner in which the section may be affected.

B. Purpose of the 808A Ringing and Tone Plant

1.05 The 808A (J86834) power plant provides 6.0 amperes of ringing current, tones, and signaling interruptions for the No. 1/1A Electronic Switching System (No. 1/1A ESS). For reserve ringing and tone power, the plant includes duplicate oscillators and amplifiers (tone generators), J87266 inverters (ringing generators), interrupters and monitors, as well as distribution, transfer, and fuse alarm circuits. Reserve receiver-off-hook power is not provided. Refer to Fig. 1 for an interface diagram of the 808A ringing and tone power plant.

C. Power Plant Configuration

1.06 The fully equipped 808A ringing and tone plant is designed to mount on two types of ESS standard frameworks—single bays and double bays.

1.07 AC-DC Office (J86834A): This office requires a double bay and two single bays located to the left of the double bay in the lineup.

Note: A single bay may be added to the right of the double bay for the addition of splitting resistors for maximum growth of the office.

1.08 Superimposed Office (J86834B): The office requires two double bays and one single bay located to the right of the double bay in the lineup.

2. RINGING INVERTER CIRCUIT (SD-81717-02)

A. Introduction

2.01 The purpose of the J87266E inverter (see Fig. 2) is to supply high capacity ringing power in large central offices. Duplicate ringing generators (GEN 1 and GEN 0) are provided for regular and reserve service.

B. Description of Operation

2.02 The inverter circuit consists of a 20-Hz transistor core inverter, and a 2-coil ferroresonant regulator with optional filtering arrangements. This circuit provides three mutually isolated 20-Hz ac outputs. Two of the outputs are 86V rms; the third output is 105V rms. The following subcircuits comprise the inverter circuit (see Fig. 2):

- Low Pass DC Input Line Filter
- 20-Hz Oscillator Inverter
- Driver Inverter
- Power Inverter
- Ferroresonant Regulator
- 105V Output Filter.

2.03 Low Pass DC Input Line Filter: The J87266J low pass dc input line filter is electrically located between the central office battery and the inverter. The filter is connected to the ringing distribution circuit. The purpose of the filter is to reduce noise from the battery to the inverter, and to reduce the source impedance presented to the inverter by the battery.

2.04 20-Hz Oscillator Inverter: The J87266H 20-Hz oscillator inverter determines the frequency of the circuit. The inverter also supplies base drive power to the transistors in the driver inverter.

2.05 Driver Inverter: The driver inverter part of J87266H supplies base drive power to the transistors in the power inverter. The driver inverter is required because the 20-Hz oscillator inverter is not capable of furnishing the power required to drive the transistors in the power inverter.

2.06 Power Inverter: The power inverter is electrically connected between the output side of the driver inverter and the input side of the ferroresonant regulator. Two amplifiers (A and B), convert the dc voltage at the filter output to an ac voltage at the ferroresonant regulator input.

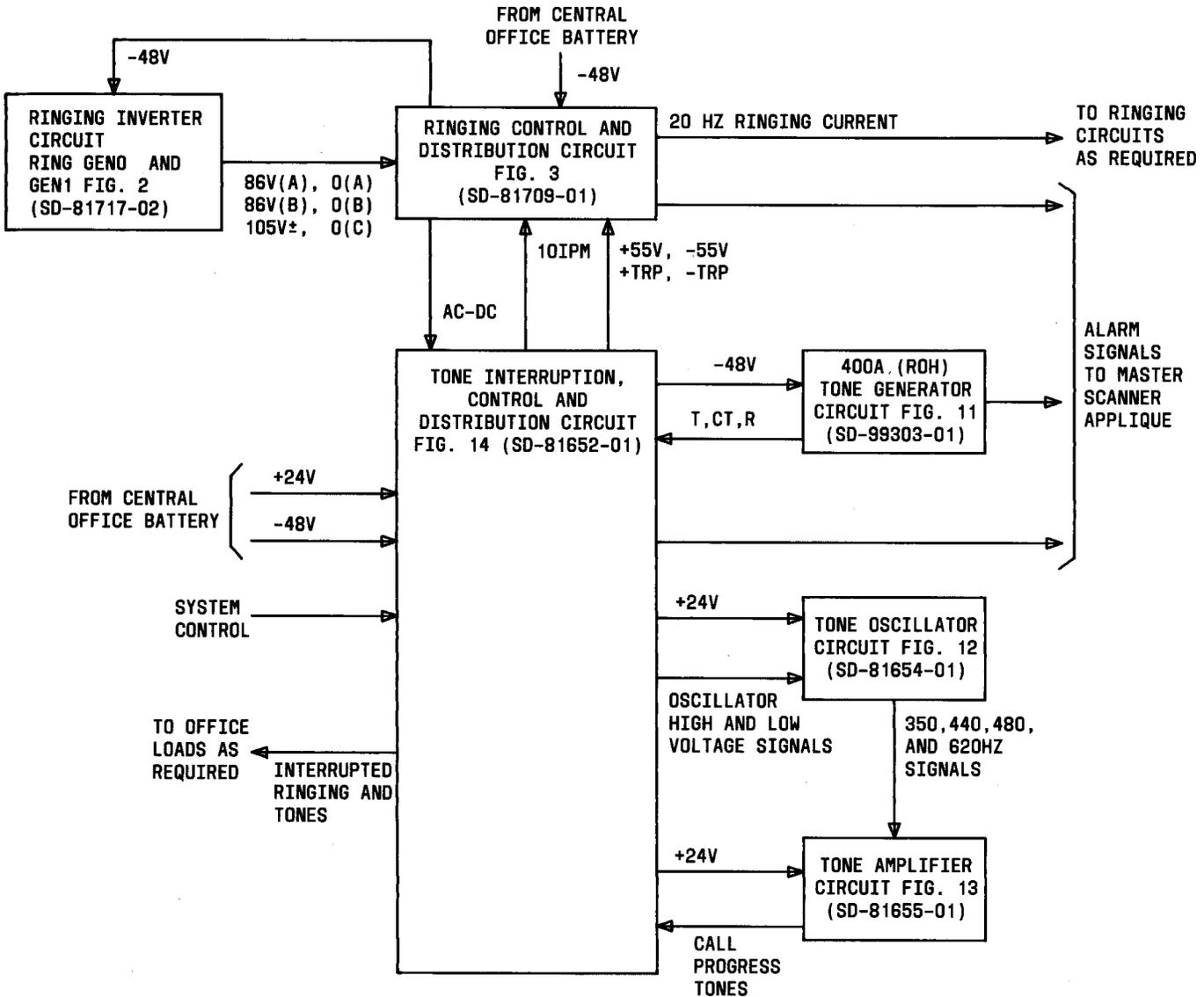


Fig. 1—808A Ringing and Tone Power Plant—Interface Diagram

2.07 Ferroresonant Regulator: The ferroresonant regulator converts the unregulated ac square-wave output voltage of the power inverter into three mutually isolated ac voltages which are regulated for central office battery and load current variations.

2.08 105V Output Filter: The 105V output filter is electrically connected across the 105V ac output of the regulator. The output filter works in conjunction with the ferroresonant regulator

to produce a nearly sinusoidal voltage at all three outputs.

3. RINGING CONTROL AND DISTRIBUTION CIRCUIT (SD-81709-01)

A. Introduction

3.01 The purpose of the ringing control and distribution circuit (see Fig. 3) is to deliver 6.0A of continuous and interrupted ringing current at the voltages to the No. 1/1A ESS offices.

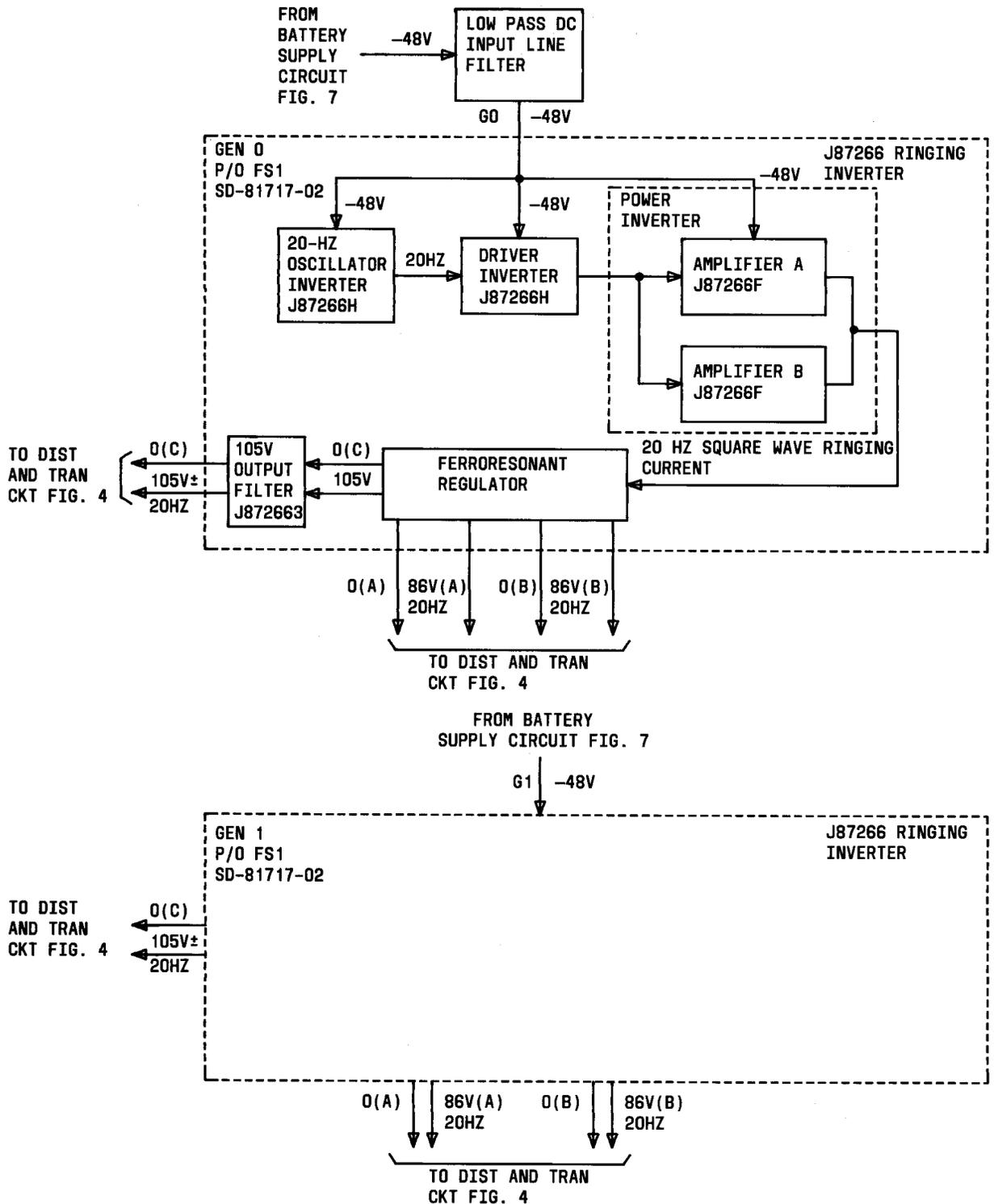


Fig. 2—Ringing Inverter Circuit—Functional Block Diagram

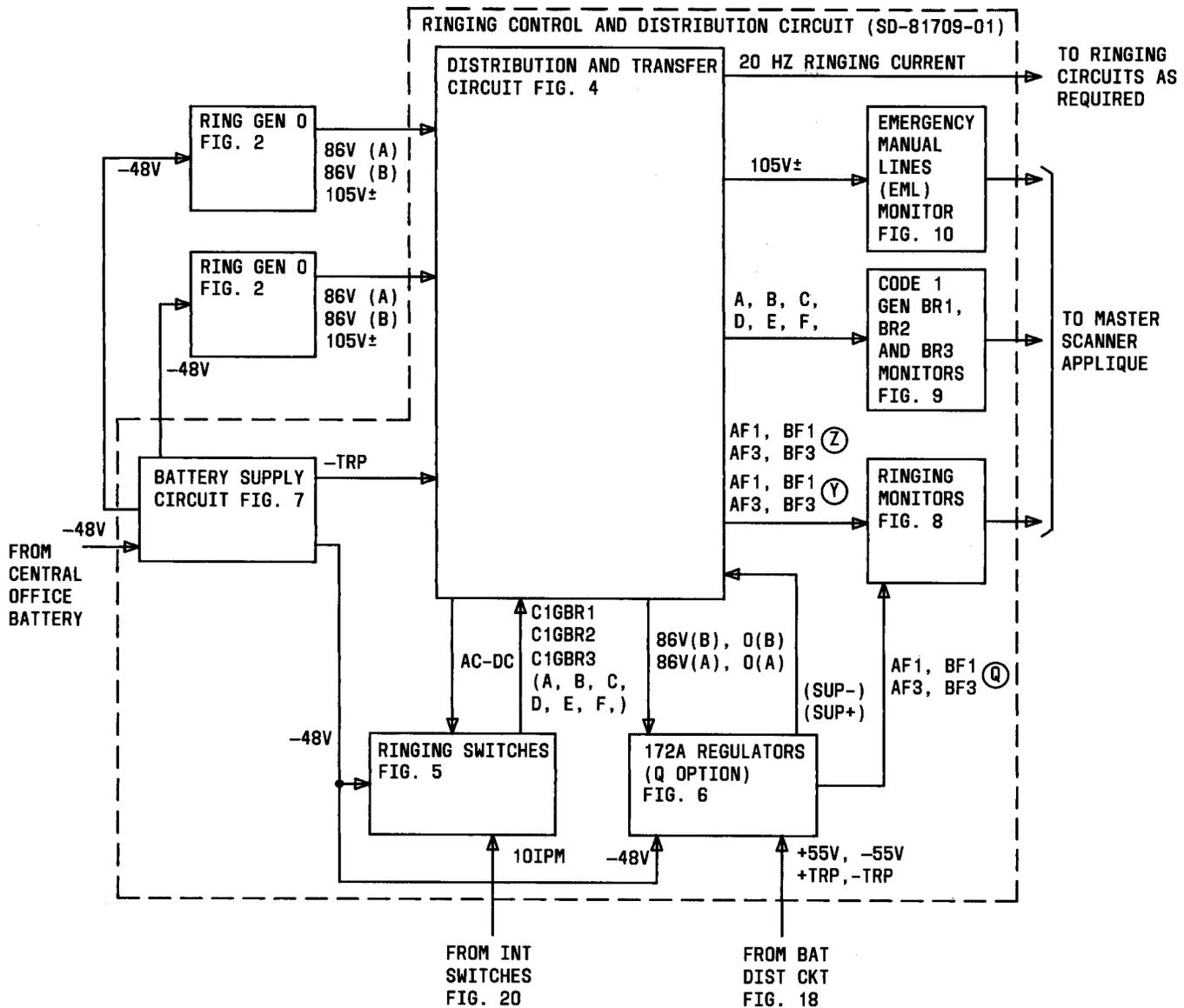


Fig. 3—Ringing Control and Distribution Circuit—Functional Block Diagram

B. Description of Operation

3.02 The main components of the ringing control and distribution circuit are as follows:

- Ringing Generators
- Distribution and Transfer Circuit
- Ringing Switches

- 172A Regulators
- Battery Supply Circuit
- Alarm Circuit.

3.03 Ringing Generators: A 20-Hz ringing current is provided by the ringing inverter circuit (see Fig. 2). Both generators are powered—one supplying the load under system control. Each generator provides two 86V outputs and one 105V

output. The 20-Hz outputs do not have an audible component.

3.04 *Distribution and Transfer Circuit:*

The distribution and transfer circuit (Fig. 4) receives signals from the ringing generators, ringing switches, and 172A regulators to provide continuous and interrupted ringing current at the voltages required by the particular ESS office. This circuit also provides transfer from GEN 0 to GEN 1 when necessary.

3.05 The GEN 0 outputs are connected to the ringing distribution fuses by operation of the T0 and K1 relays for AC-DC offices, and by operation of the T0, K1, and K3 relays for superimposed offices. The GEN 1 outputs are connected to the ringing distribution fuses by operation of the T1 and K2 relays for AC-DC offices, and by operation of the T1, K2, and K3 relays for superimposed offices. All of these relays are controlled from the tone distribution circuit.

3.06 For AC-DC offices (Z option), continuous AC-DC (not audible), -TRP, and $\pm 105V$ are fed to connecting office circuits through ringing distribution fuses. For superimposed offices (Y option and Q option Zone 16 service), AC-DC, -TRP and $\pm 105V$ are provided. In addition, positive tripping (+TRP), superimposed negative (SUP-), superimposed positive (SUP+), SUP- (97V), and SUP+ (97V) are provided. The positive tripping is obtained from the battery distribution circuit (Fig. 18) via the 610D converter. The SUP+ and SUP- are derived in the following manner (see Fig. 4). The +48V is connected to the 0(A) lead and -48V is connected to the 0(B) of both GEN 1 and GEN 0. The 0(A) and 0(B) leads are fed to DB0 and DB1 varistor strings which act to drop the dc voltage to +40V and -40V. The 86V(A) and 86V(B) outputs from GEN 1 and GEN 0 are fed through DB0 and DB1 varistor strings where the +40V and -40V are superimposed upon them. A superimposed ringing current is then fed to the corresponding ringing distribution fuse. During an ac power failure, the PF0 and PF1 relays in the alarm circuit short out part of the varistor string to hold the dc component to approximately +40V or -40V. The SUP+ (97V) and SUP- (97V) are obtained as follows: SUP+ (97V) +48V is superimposed on the 86V(A) leads (from both GEN 0 and GEN 1) through TR1 transformer which steps up the 86V to 97V rms. SUP- (97V) is

obtained in a similar manner with the 86V(B) leads and -48V connected to TR2 transformer.

3.07 *Ringing Switches:* When the solid-state interrupter timing switches are provided in the tone distribution circuit, the ringing switches of Fig. 5 are required. These switches, which provide the CODE 1 GEN BR1, BR2, and BR3 interrupted ringing, take the place of the older semiconductor-type interrupter circuit (SD-81703-01).

The AC-DC signals from both generators act to drive the ringing switches. The 10 IPM outputs from the interrupter timing switches (Fig. 19) provide the necessary 2 seconds ON and 4 seconds OFF timing. The C1GBR1, C1GBR2, and C1GBR3 outputs from the ringing switches are connected to the ringing distribution fuses by the K1 and K2 transfer relays of the distribution and transfer circuit.

3.08 *172A Regulators:* The 172A regulators (Fig. 6) are used in superimposed offices with Zone 16 service (Q option). The regulators replace the DB0 and DB1 varistor strings in the distribution and transfer circuit (Fig. 4). The 172A regulators provide modified SUP+, SUP-, +TRP, and -TRP outputs at the voltages required by Zone 16 service (see Table A).

3.09 The SUP- (CM1) and SUP+ (CM2) voltage regulators perform the same function. However, there are some minor differences in the regulator circuits. In the SUP- circuit, the dc part of the superimposed input (-48V) is furnished from the battery supply circuit, while the SUP+ circuit is furnished +55V from the battery distribution circuit. The -55V, also from the battery distribution circuit, acts as a bias voltage for a portion of the regulator (CM1).

3.10 In both CM1 and CM2, the 86V is bypassed and the -48V and +55V are fed through a diode-capacitor dropping circuit. The dropping circuit reduces the -48V and +55V to -39V and +39 $\pm 1V$, respectively. The TR1 and TR2 transformers provide a dc voltage to TR1 and TR2 transformers in the distribution and transfer circuit. The two voltages act in the same way as those for the regular superimposed office to produce SUP- (97V) and SUP+ (97V). The +TRP and -TRP voltages are fed directly to the ringing distribution fuses. Relays K6, K7, K8, and K9

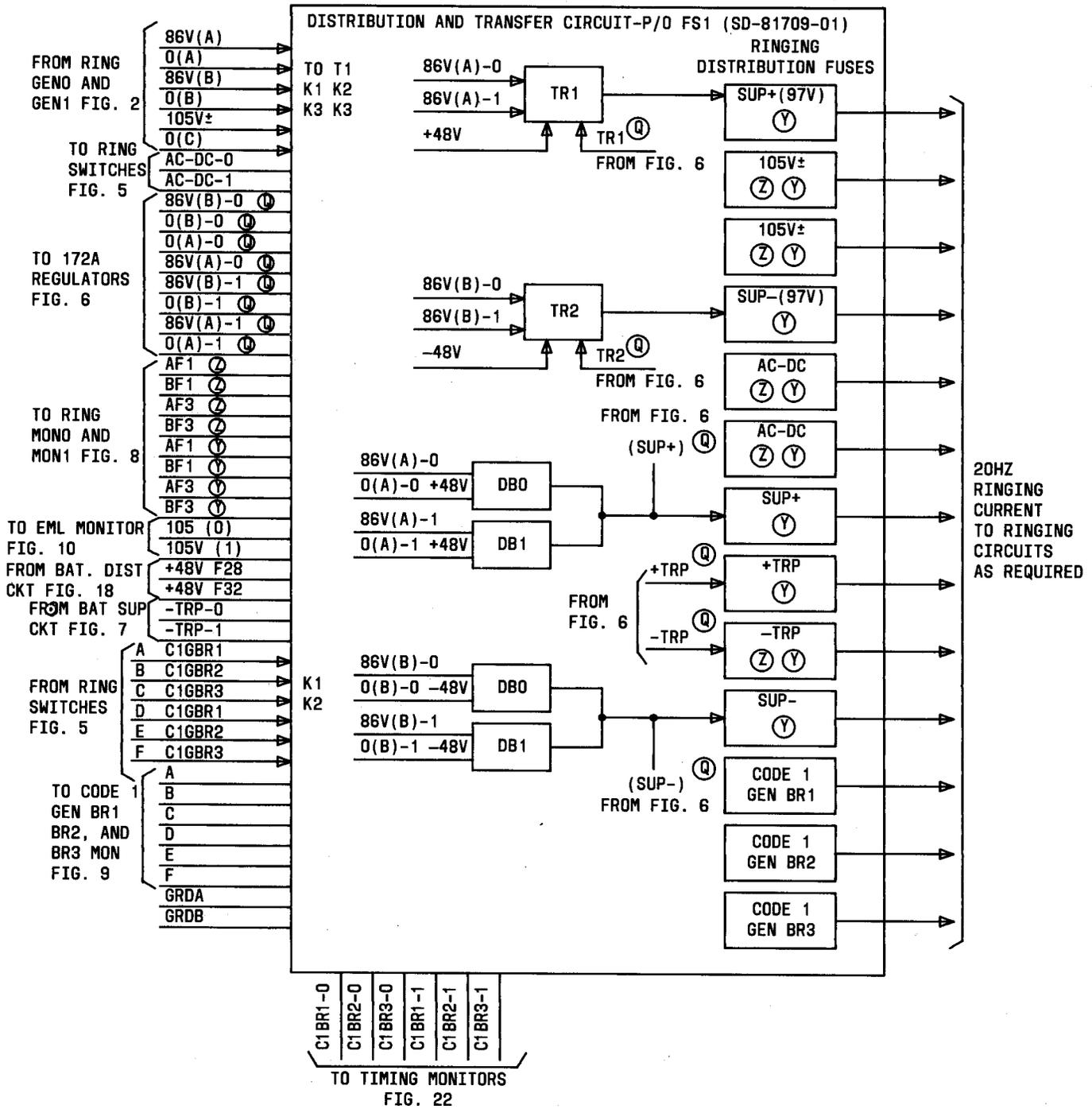


Fig. 4—Distribution and Transfer Circuit—P/O FS1

provide a means for switching the load between REG-0 and REG-1.

3.11 Battery Supply Circuit: The battery supply circuit (refer to Fig. 7) provides -48V

to ringing GEN 0 and GEN 1, ringing switch 0 and switch 1, -TRP to the distribution and transfer circuit, and -48V to the 172A regulators (Q option). The -48V dc is obtained from the power distribution frame (PDF) fed by the central office battery.

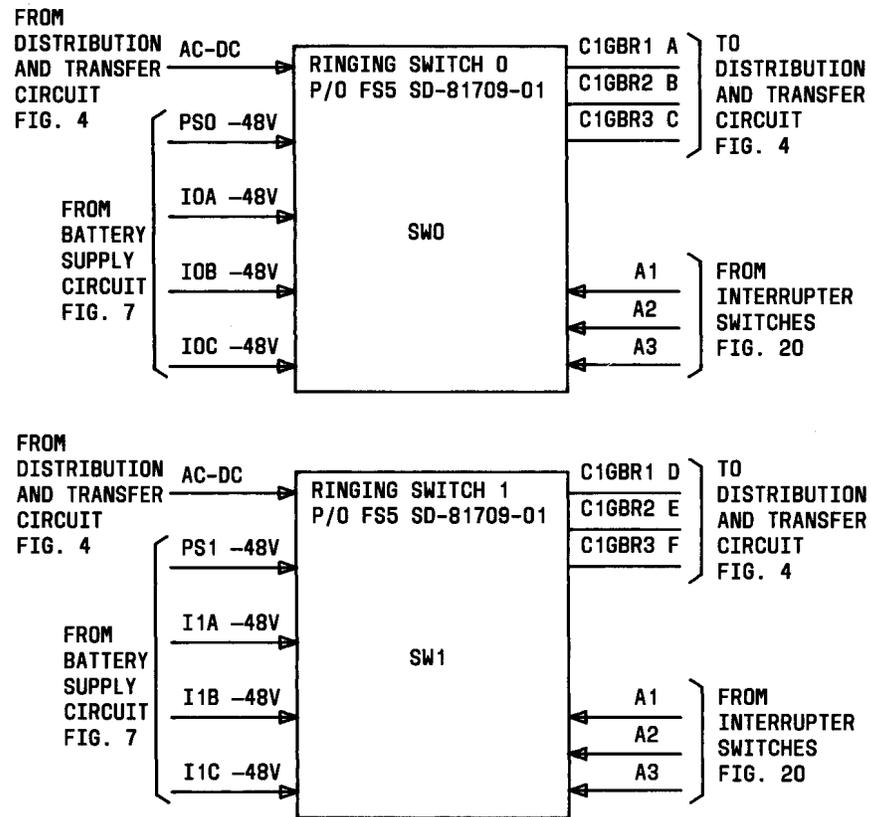


Fig. 5—Duplicate Ringing Switching—P/O FS5

Relays P0 and P1 provide a means of transferring the load from GEN 0 to GEN 1. These relays are controlled from the transfer circuit in the tone distribution circuit.

3.12 Alarm Circuit: The following alarm circuits are contained in the ringing control and distribution circuit to indicate an alarm condition to the office alarm circuit:

- Ringing Monitors
- CODE 1 GEN BR1, BR2, and BR3 Monitors
- Emergency Manual Lines Monitor.

3.13 In Fig. 8, PF0 and PF1 power failure monitors on RING MON 0 and MON 1 check the -48V A and B buses to operate the PF0 and PF1 relays when the battery is off float during an ac power failure. Monitors are provided only in superimposed offices to short a portion of the diodes in the DB0

and DB1 varistor strings to hold the voltage level close to 40 Vdc.

3.14 For AC-DC offices (Z option), RING MON 0 and MON 1 are provided to check the AC-DC and $\pm 105V$ outputs. The AC-DC monitor checks for loss of either the 20 Hz or its dc component. The $\pm 105V$ monitor checks for the loss of the 105V 20-Hz output. The monitors operate on release of ferrod sensors in the master scanner circuit to provide an alarm signal to the system. The AC-DC monitor is connected to the AF1 lead (GEN 0) and the AF3 lead (GEN 1). The $\pm 105V$ monitor is connected to the BF1 lead (GEN 0) and the BF3 lead (GEN 1).

3.15 In superimposed offices (Y option), RING MON 0 and MON 1 are provided to check the SUP+ and SUP- outputs. These monitors are the same as those described in paragraph 3.14. The SUP+ is connected to the BF1 lead for GEN 0 and to the BF3 lead for GEN 1. The SUP- is

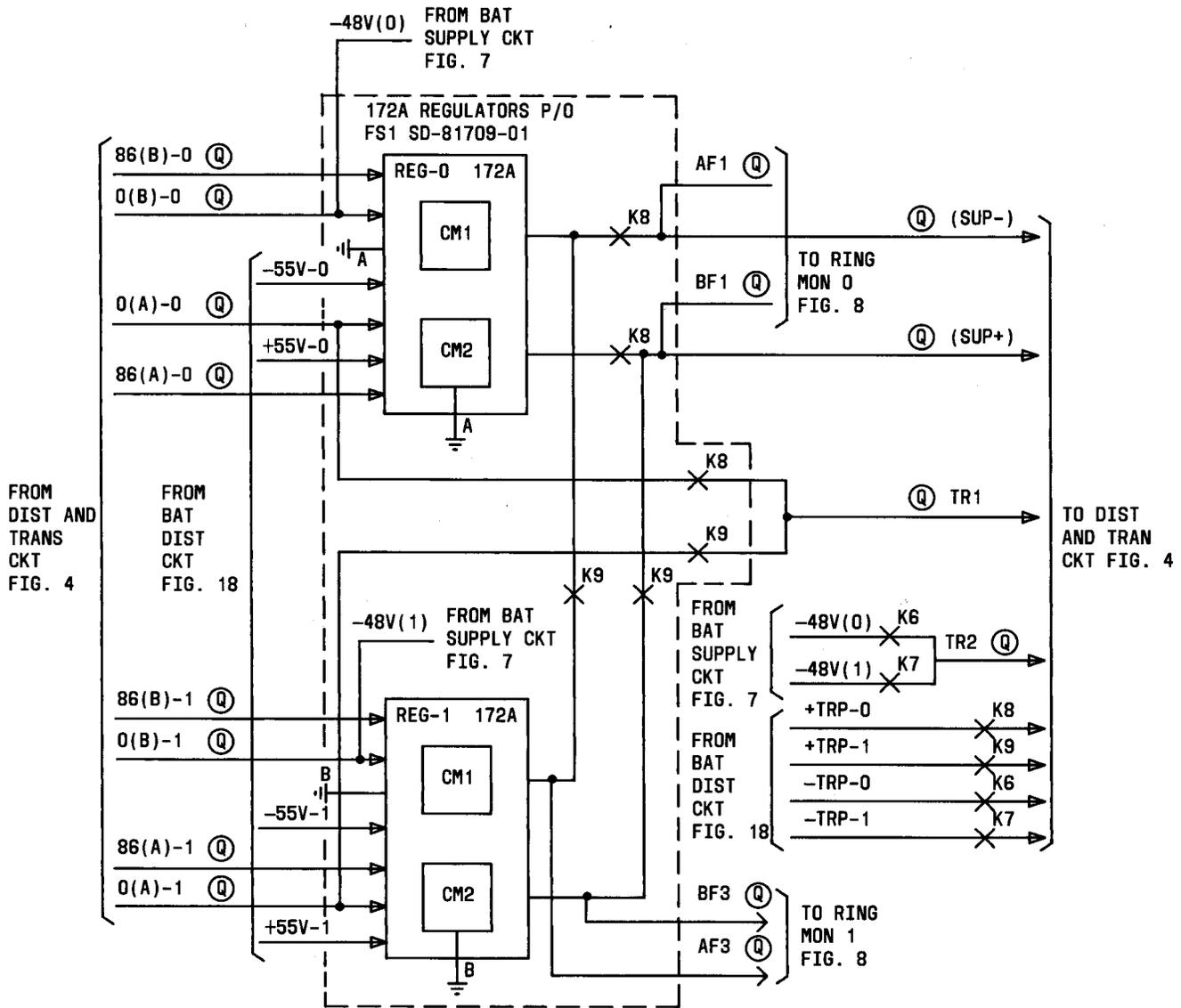


Fig. 6—Duplicate 172A Regulators—Functional Block Diagram—P/O FS1

connected to the AF1 lead for GEN 0 and to the AF3 lead for GEN 1.

3.16 Monitors for checking the CODE 1 GEN 1 BR1, BR2, and BR3 outputs are provided as the MR MON- monitors (see Fig. 9). Each monitor contains a rectifier and a filter. When the outputs from the ringing switches are normal, the current fed to the ferrod in the master scanner circuit is greater than 3.9 mA, both during the ringing interval and silent interval. If the ringing switch fails, then the current drops below 1.8 mA.

An alarm signal is initiated when the current drops below 1.8 mA.

3.17 The 105V output from GEN 0 is monitored by the emergency manual lines (EML) monitor (Fig. 10). When GEN 0 is operating, K5 relay is operated and connects ±105V from GEN 0 to distribution fuses for the emergency manual lines circuit. If GEN 0 fails, the ±105V from GEN 1 is connected to the fuses. In order for the system to determine that the first monitor is operating properly, a much faster monitor made up of R24 through R26 resistors, and D11 through D13 diode

TABLE A

MODIFIED OUTPUT VOLTAGES FOR ZONE 16 SERVICE
(SUPERIMPOSED PLANTS ONLY)

FOR THE NORMAL BATTERY RANGE OF -48 THROUGH -52.5 VOLTS				
OUTPUT DESIG	FROM		TO	
	AC SUPERIMPOSED VOLTAGE (VRMS) ZONE 13 SERVICE	VOLTS (DC)	AC SUPERIMPOSED VOLTAGE (VRMS) ZONE 16 SERVICE	VOLTS (DC)
SUP+	84 to 88	+36 to +40.0	84 to 88	+39 ±1V
SUP-	84 to 88	-36 to -40.0	84 to 88	-39 ±1V
+TRP	—	+48 to +52.5	—	+55 ±1V
-TRP	—	-48 to -52.5	—	-55 ±1V

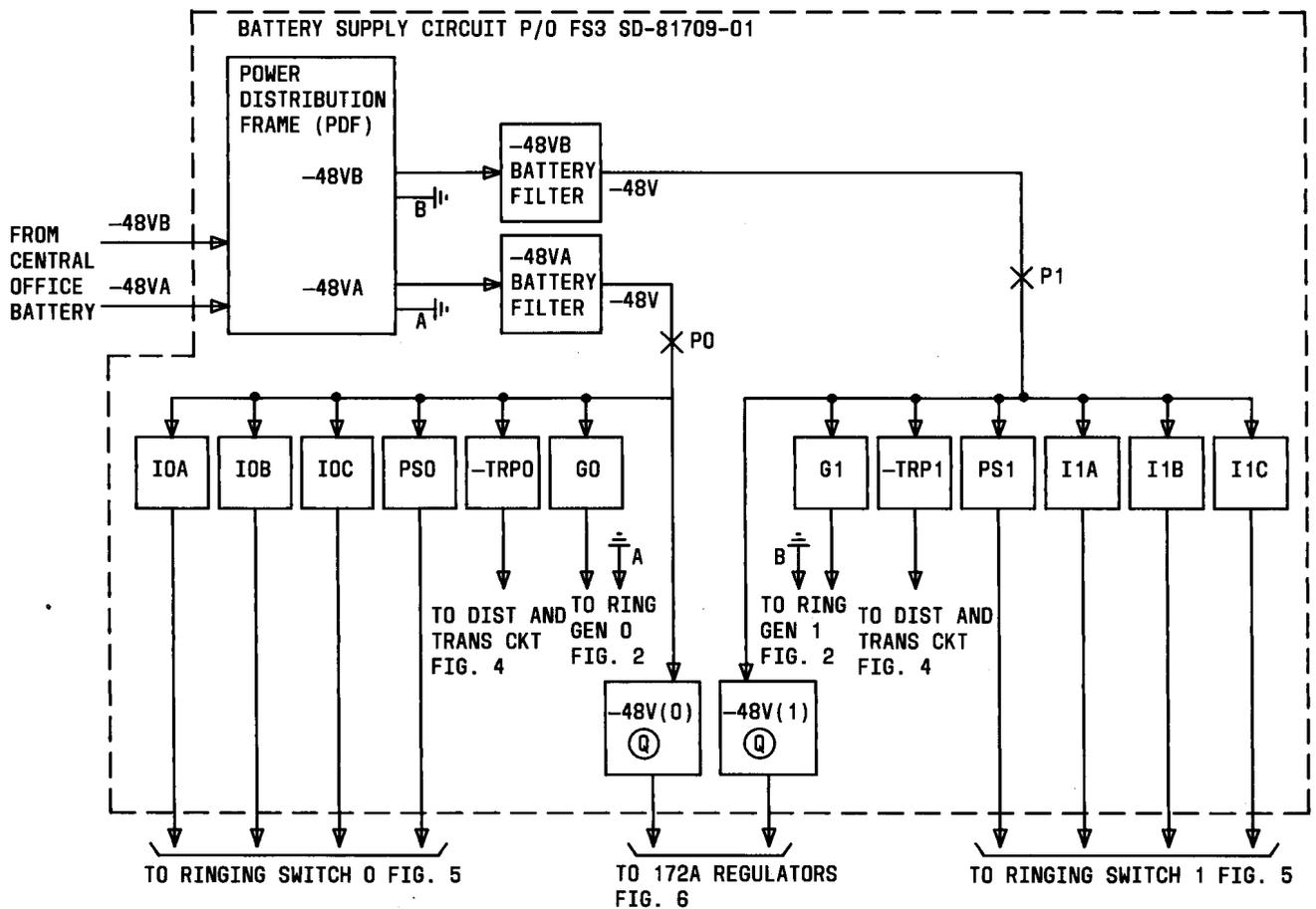


Fig. 7—Battery Supply Circuit—P/O FS3

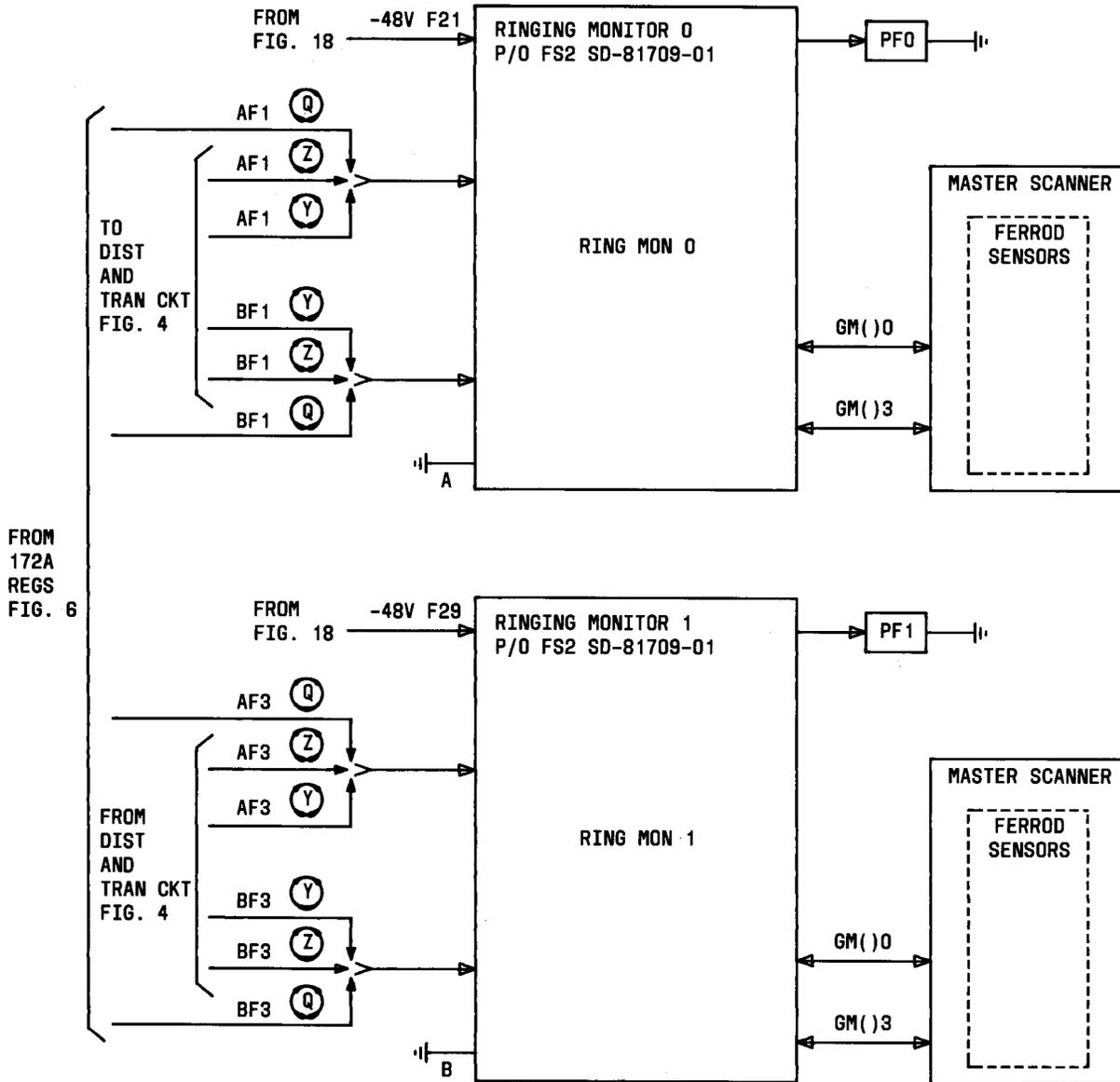


Fig. 8—Duplicate Ringing Monitors—P/O FS2

bridge is provided. With $\pm 105V$ being fed to the load, current is fed to the ferrod in the master scanner circuit. If power to GEN 0 is removed, no current will be fed to the ferrod. This will happen during the time that it takes for K5 relay to release. Therefore, the system can automatically test to see that the slow monitor is operating properly.

4. 400A (ROH) TONE GENERATOR CIRCUIT (SD-99303-01)

A. Introduction

4.01 The 400A tone generator provides a distinctive tone signal which is applied to a subscriber line on which the handset has been left off-hook.

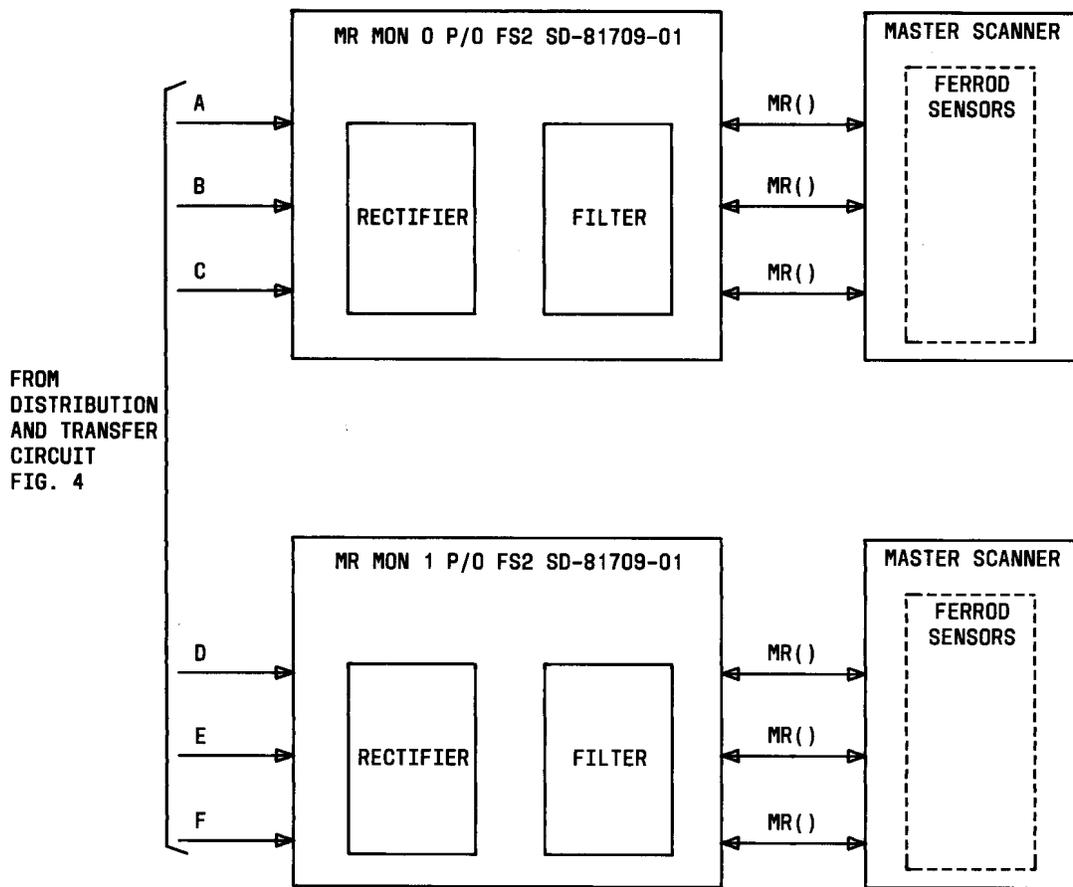


Fig. 9—Duplicate CODE 1 GEN BR1, BR2, and BR3 Monitors—P/O FS2

The acoustic output of the receiver is intended to alert the subscriber to replace the handset on-hook.

B. Description of Operation

4.02 The ROH tone generator circuit combines and amplifies outputs from four oscillators to generate a pulsating signal. The four main components of the ROH generator circuit are as follows (see Fig. 11):

- Oscillator Circuit
- Pulse Generator
- Preamplifier and Power Amplifier
- Tone Level Alarm Circuit.

4.03 Oscillators: The four main oscillator circuits are similar in circuit arrangement,

but the frequency determining elements are different. The frequencies generated are 1400, 2060, 2450, and 2600 Hz. A pulsating collector supply voltage for the oscillators is provided by the pulse generator circuit. The oscillators supply tones only for the duration of the applied pulse of collector voltage, thus generating pulsing tones. The output of these oscillators are of equal amplitude and are linearly combined to synthesize the desired tone.

4.04 Pulse Generator: The pulse generator circuit is a multivibrator that alternately applies and removes the oscillator supply voltage, thereby producing a pulsing of the combined signal. The pulse generator and the preamplifier are both located on the same printed wiring board and share the same collector supply voltage, -48 Vdc, which is derived from the battery distribution circuit.

4.05 Preamplifier and Power Amplifier: The preamplifier provides the necessary gain

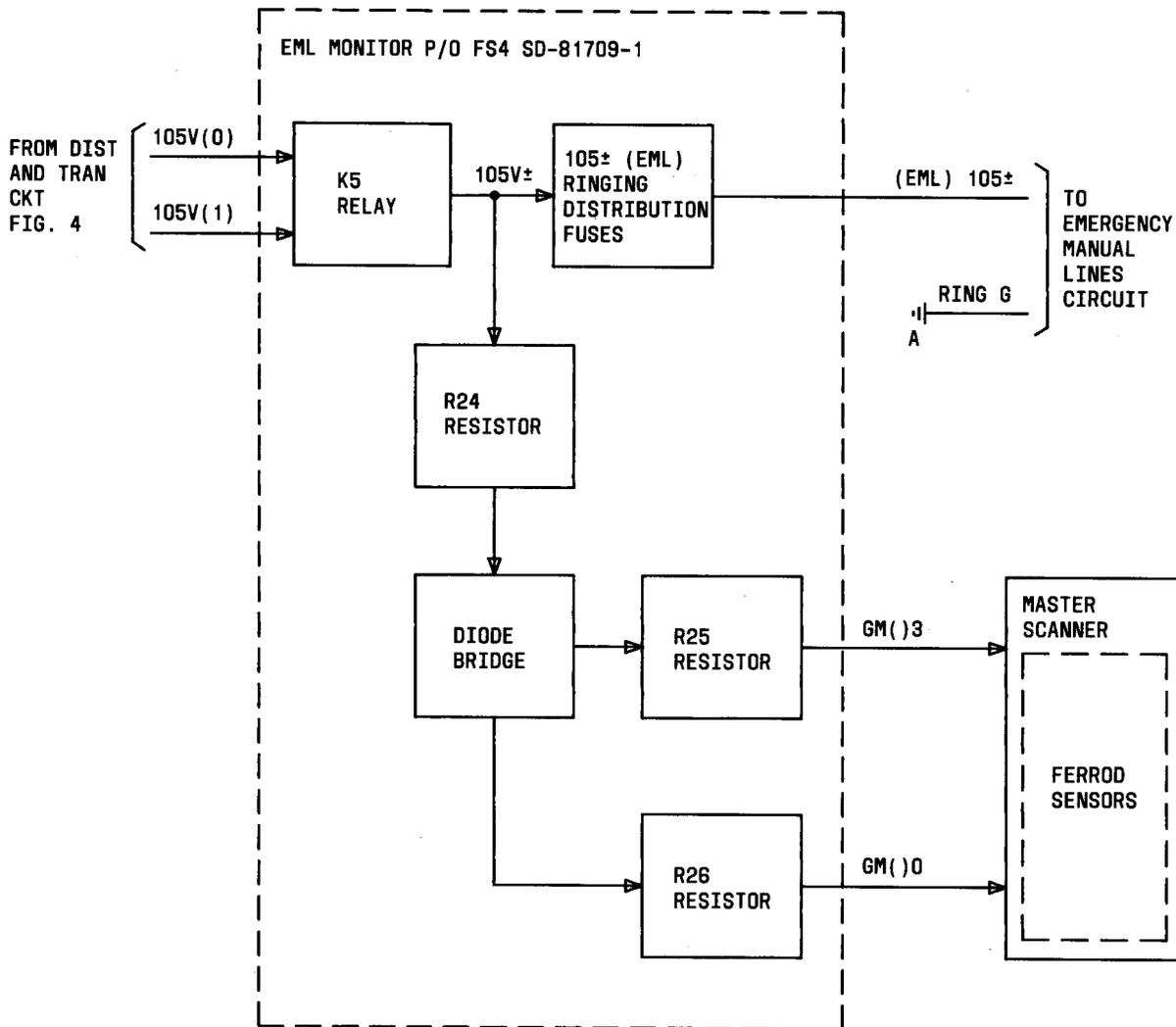


Fig. 10—Emergency Manual Lines Monitor—Functional Block Diagram—P/O FS4

for the power amplifier input. The main components of the preamplifier circuit are two direct coupled transistors, Q303 and Q304. The input to the preamplifier is the combined output of the individual oscillators. A potentiometer, R313, is provided so that the level of the tone signal may be adjusted. The output of the preamplifier is taken from resistor R312 and is applied to the power amplifier. The KS-19221, List 1, power amplifier provides the amplification of the pulsed signal from the preamplifier. The ROH tone output from the power amplifier is fed to the tone distribution circuit for distribution to loads as required.

4.06 Tone Level Alarm: The tone alarm circuit monitors the output of the power

amplifier. This circuit indicates an alarm condition when the tone signal falls below a predetermined level, fails completely, or during a power failure.

5. TONE OSCILLATOR CIRCUIT (SD-81654-01)

A. Introduction

5.01 The purpose of the tone oscillator circuit is to provide regular and reserve precision oscillators at 350, 440, 480, and 620 Hz for No. 1 ESS and No. 1 TSPS tone power plants.

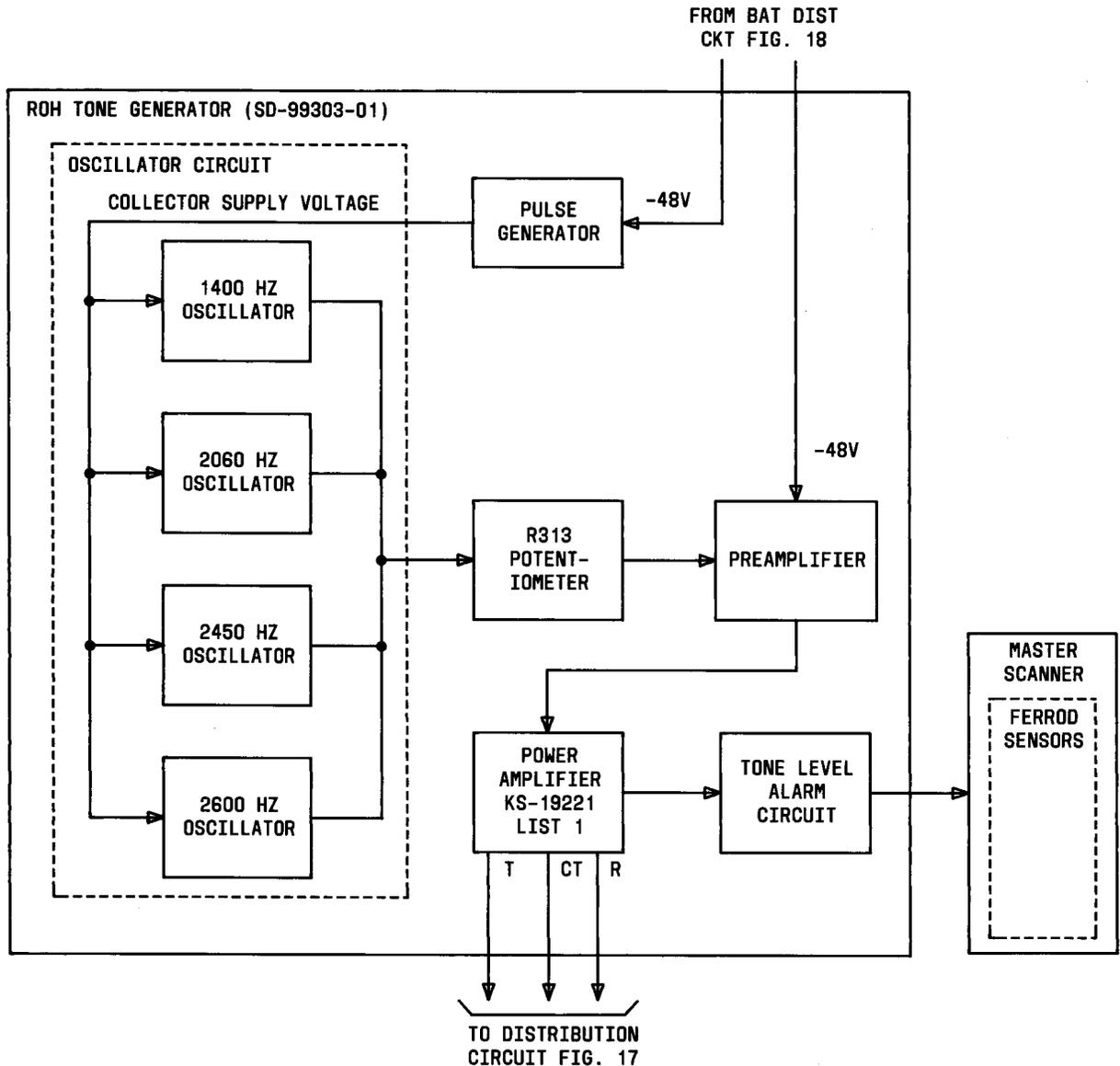


Fig. 11—400A (ROH) Tone Generator Circuit—Functional Block Diagram

B. Description of Operation

5.02 Duplicate oscillators for four frequencies are provided for regular and reserve operation. The oscillators, fed from +24V obtained from the battery distribution circuit utilize tuned reed selectors in feedback amplifiers to obtain the precise frequencies. The tone oscillator circuit consists of the following (see Fig. 12):

- Bridge Oscillator

- Feedback Amplifier

- Bandpass Filter.

5.03 The basic oscillators are fed from +24V which is derived from the battery distribution circuit in the tone distribution circuit. The **bridge oscillator**, containing a tuned reed selector, produces the basic oscillation frequency of the circuit. The output of the bridge oscillator is fed to the **feedback amplifier** which produces the necessary amplification of the signal. The output

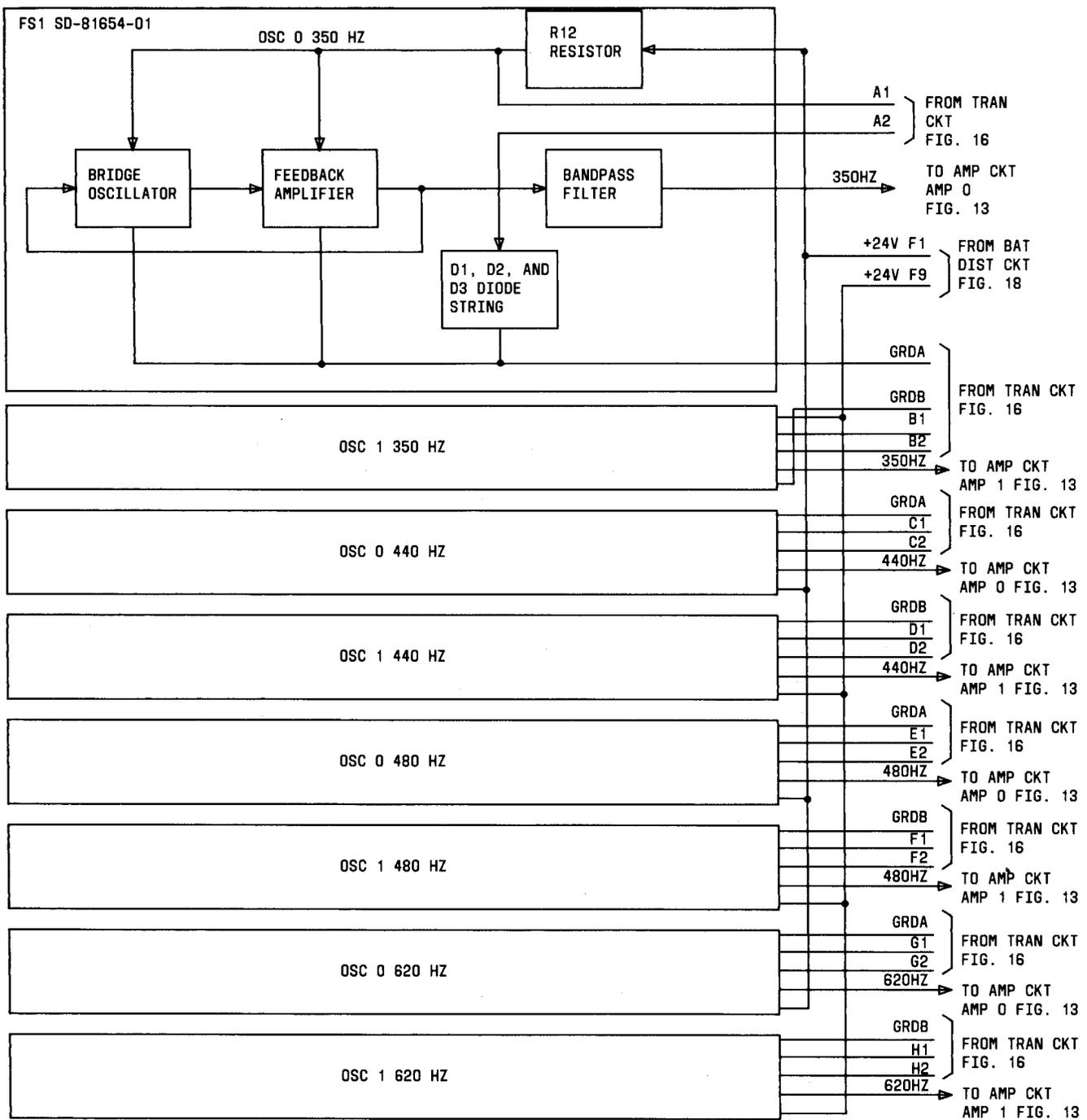


Fig. 12—Tone Oscillator Circuit—Functional Block Diagram

of the feedback amplifier is a basic square wave which is fed to a **bandpass filter**. The filter transforms the signal to a sine wave with a fixed amplitude and very low harmonic distortion. Each filter is tuned to the required frequency to the degree that harmonics are reduced more than 50 dB from the fundamental. A signal from the output of the feedback amplifier is fed back to the input of the bridge oscillator. The bridge causes a phase-shift in the signal to produce continuous oscillation of the tuned reed selector.

C. High- and Low-Voltage Operation

5.04 The oscillator high- and low-voltage control circuit in the tone distribution circuit makes it possible to raise or lower the oscillator output voltage by at least 3 dB. To send the voltage high, D1, D2, and D3 diode string is opened and R12 resistor is shorted out. This increases the peak-to-peak output to 26V. To reduce the oscillator output voltage, R12 resistor is connected in parallel with the D1, D2, and D3 diode string. This reduces the output voltage to less than 13V peak-to-peak.

6. TONE AMPLIFIER CIRCUIT (SD-81655-01)

A. Introduction

6.01 The tone amplifier circuit operates from +24V dc derived from the battery distribution circuit in the tone distribution circuit. This circuit mixes or adds signals received from the tone oscillator circuit to produce the various tones used for distribution in the 808A ringing and tone plant.

B. Description of Operation

6.02 The amplifiers in the tone amplifier circuit mix and add signals from the tone oscillator circuit as follows (refer to Fig. 13):

- 350 and 440 Hz are added to provide TOUCH-TONE® dial tone.
- 440 and 480 Hz are mixed to provide precedence audible ringing tone.
- 480 Hz, a single frequency, is used to provide high tone.
- 480 and 620 Hz are added to produce low tone to be used for various busy tones.

- 440 and 620 Hz are mixed to provide preempt tone
- 440 Hz, a single frequency tone, is used for conference notification tone, call waiting tone, and busy verification tone.

All amplifiers are duplicated to provide regular and reserve service.

6.03 All amplifiers in this circuit function in the same way. Therefore, only the TOUCH TONE (TT) dial tone amplifier will be discussed. The two input signals from the oscillators are fed through R1 and R2 potentiometers into the input stage, Q1, of the power amplifier. The R1 and R2 potentiometers provide individual adjustments of the two input signals. The input stage provides voltage gain and, when two input signals are present, adds or mixes them to provide the desired output tone. The signal is then fed to the power amplifier push-pull stages made up of Q2, Q3, Q4, and Q5. Negative feedback, (A), (Fig. 13) is fed back from the output to the base of Q1 amplifier. Both dc and ac feedback, (B), are provided through resistor R8 and potentiometer R7. Potentiometer R7 sets the dc level at output, as well as adjusting the amount of ac feedback. An additional path for ac feedback, (C), is provided through potentiometer R5. Since potentiometer R5 varies the negative ac feedback, it provides a level adjustment for the combined output. The output from the tone amplifier is fed to the tone transformers in the distribution circuit.

7. TONE INTERRUPTION, CONTROL, AND DISTRIBUTION CIRCUIT (SD-81652-01)

A. Introduction

7.01 The purpose of this circuit is to provide dial tone, busy tone, high tone, preempt tone, audible ring tone, miscellaneous tone (conference notification tone, call waiting tone, and busy verification tone) signaling interruptions, and tone distribution as required for No. 1/1A ESS offices.

B. Description of Operation

7.02 The main components of the tone interruption, control, and distribution circuit are as follows (refer to Fig. 14):

- Tone High- and Low-Voltage Monitors

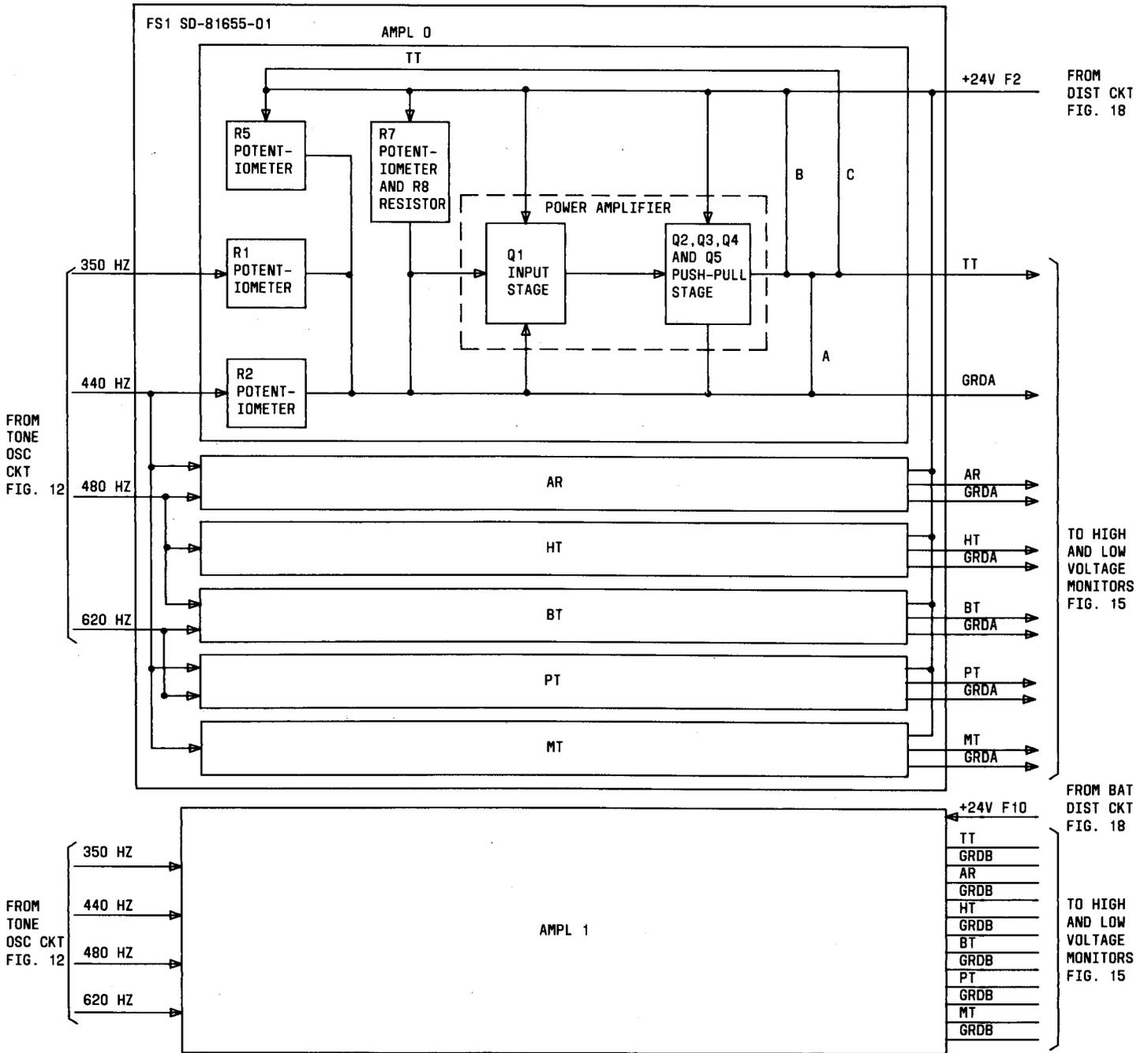


Fig. 13—Tone Amplifier Circuit—Functional Block Diagram

- Transfer Circuit
- Distribution Circuit
- Battery Distribution Circuit
- Interrupter Timing Switches
- Interrupter Switches
- Distribution and Transfer Circuit for Interrupters.

C. Tone High- and Low-Voltage Monitors

7.03 The tone monitors (TONE MON 0 and TONE MON 1) check each of the tone signals from the amplifier circuit for high- and low-voltage failure (see Fig. 15). These monitors are provided in duplicate with one set for the regular amplifiers and the other for the reserve amplifiers. The monitors for the dial tone signal (TT) will only be discussed.

7.04 Low-Voltage Monitor: The test signal (TT) is fed through the R1 potentiometer, LEV ADJ LV, through a voltage doubler rectifier to the base of Q1 transistor. With the tone level normal, Q1 transistor is turned on. Current in excess of 3.9 mA will flow from the +24V battery through the ferrod in the master scanner, back through Q1 transistor. If one of the oscillators feeding the amplifier should fail, or if the amplifier itself should fail, the input voltage to the monitor will decrease and Q1 transistor will be turned off. The current which feeds the ferrod will decrease from 3.9 mA to less than 1.8 mA. The result is a low-voltage alarm indication in the master scanner circuit.

7.05 High-Voltage Monitor: The high-voltage monitor operates as follows. With the input signal normal, Q1 transistor is turned off; and the current through the master scanner is less than 1.8 mA. If one or both of the oscillators feeding the amplifier should fail because of high voltage, the input voltage to the monitor would increase. The increase in current would cause Q1 to be turned on, and the current to the ferrod would increase to more than 3.9 mA. This would result in a high-voltage alarm indication in the master scanner circuit.

D. Transfer Circuit

7.06 The input tones (see Fig. 16), dial tone (TT), audible ringing tone (AR), high tone (HT), busy tone (BT), preempt tone (PT), and miscellaneous tone (MT) are fed from the tone amplifier to the K1 and K2 transfer relays. Operation of K1 relay connects the outputs TT, HT, BT, PT, and MT from AMP 0 to the distribution circuit. Operation of K2 relay connects these outputs from AMP 1 to the distribution circuit. The outputs BT, HT, and AR from AMP 0 and AMP 1 are fed to the interrupter switch via the distribution and transfer circuit for interrupters.

7.07 Load transfer control relays T0 and T1 and power off relays P0 and P1 are provided. These relays are under control of the system as to whether the 0 or 1 generators will feed the load and for automatic transfer. Manual transfer is provided via the plant control panel. The manual transfer supersedes the system control. The receiver off-hook (ROH) generator is also manually controlled via the plant control panel. The I0 and I1 relays are used to control the 0C1B and 1C1B timing monitors in the distribution and transfer circuit for interrupters. Only the monitor corresponding to the side feeding the load is powered. Through the operation of these relays and corresponding timing monitors, the system knows whether or not the relays which transfer the plant between the 0 side and the 1 side are operating properly.

7.08 Oscillator High- and Low-Voltage Control Circuit: The oscillator high- and low-voltage control circuit is incorporated into the transfer circuit (Fig. 16). The function of the circuit is to send the oscillators in the tone oscillator circuit to either a high- or low-voltage condition. The L10, L20, L11, and L21 relays provide a means, under system control, to force the oscillators to a low-voltage condition. The L10 relay operates on the OSC 0 350-Hz and 480-Hz oscillators. The L20 relay operates on the OSC 0 440-Hz and 620-Hz oscillators. The L11 and L21 relays perform the same function for the OSC 1 oscillators. The H10 and H11 relays provide a means of making the OSC 0 and OSC 1 oscillator, respectively, go to a high-voltage condition. Break contacts on these relays are in the operate path of the L() relays to prevent operation of the H- and L-relays at the same time.

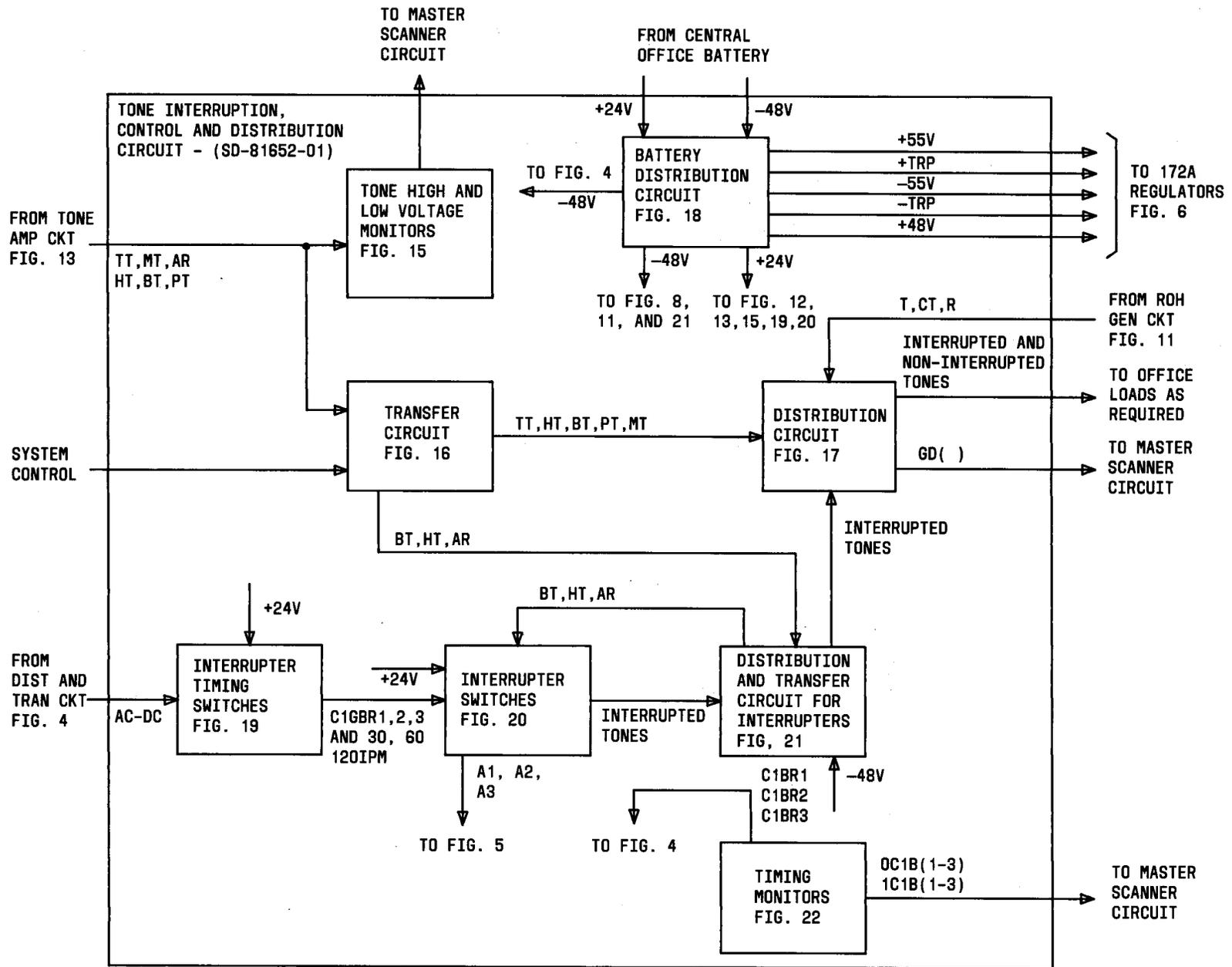


Fig. 14—Tone Interruption, Control, and Distribution Circuit—Functional Block Diagram

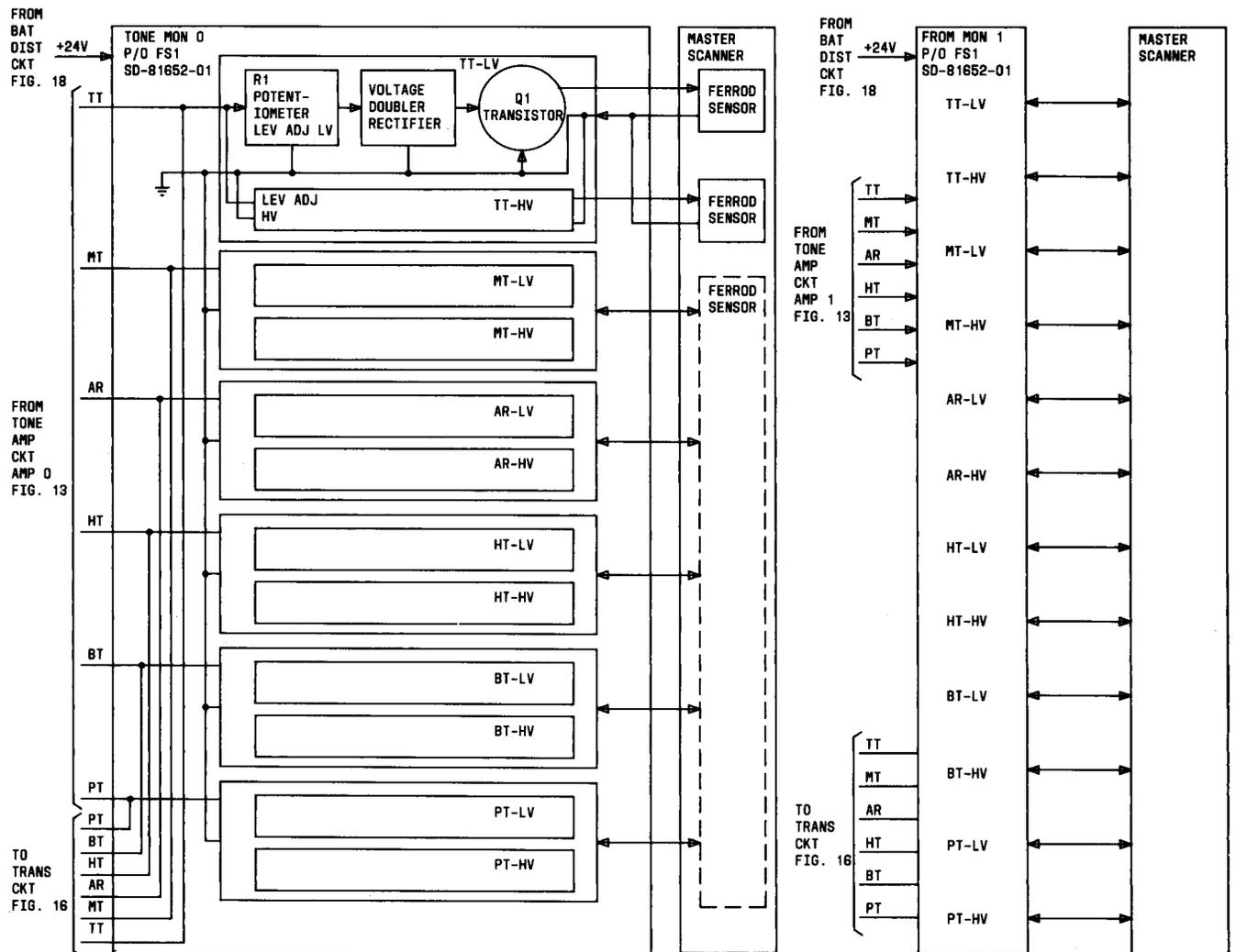


Fig. 15—Tone High- and Low-Voltage Monitors— Functional Block Diagram—P/O FS1

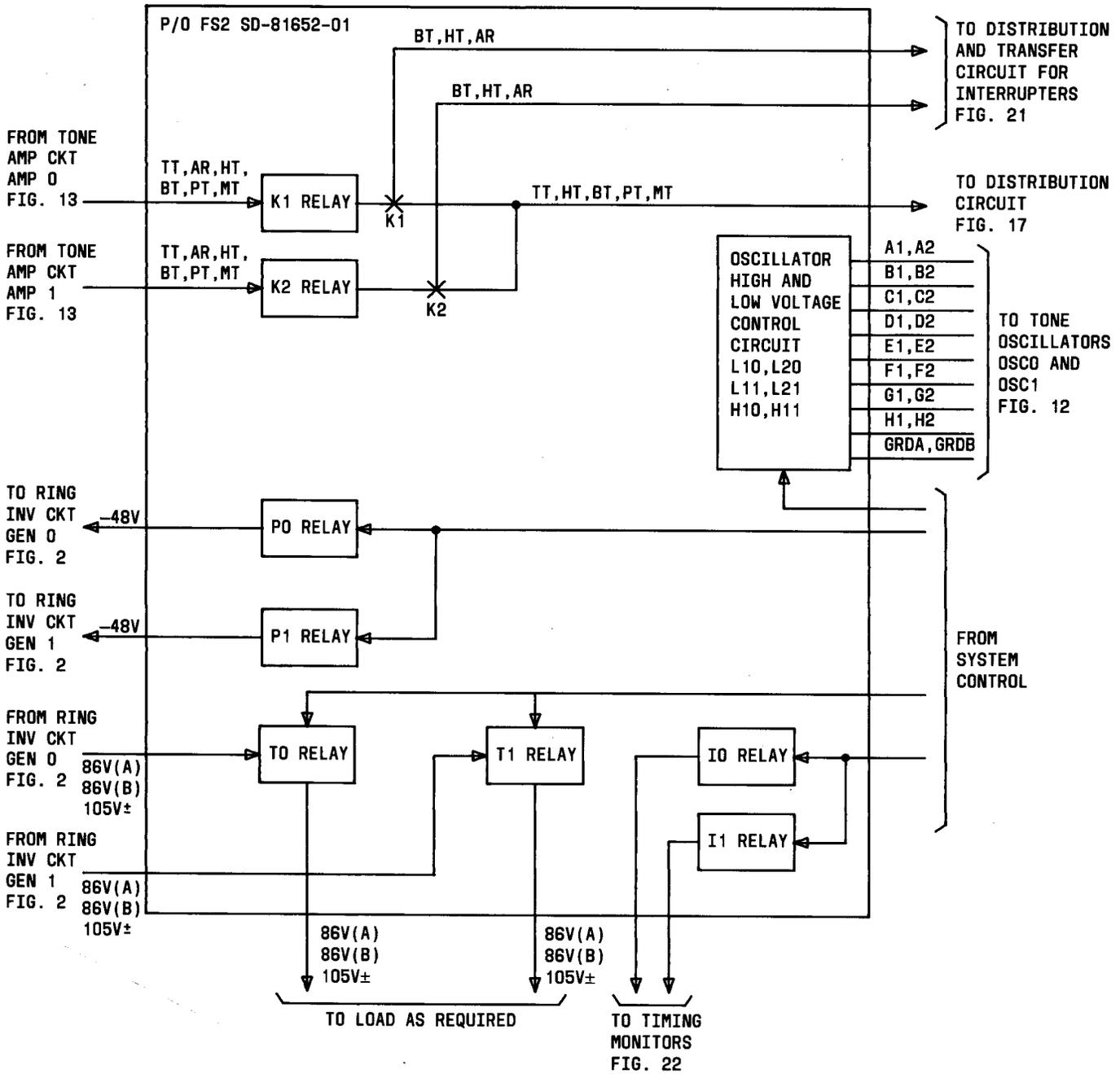


Fig. 16—Transfer Circuit—P/O FS2

E. Distribution Circuit

7.09 The various ringing and tone outputs from within the 808A plant are fed to this circuit for distribution to office loads as required (see Fig. 17). Output transformers and 450Ω (ohm) distribution resistors for balanced output of the tones are provided in the distribution circuit. The splitting

resistors for the ROH tone are also furnished. The output transformers are connected to either the "0" generator or the "1" tone generator through transfer relays in the distribution and transfer circuit for interrupters.

7.10 The GD0, GD1, and GD2 relays, and the associated resistors on the center taps of

the tone output transformers provide a ground cross detection circuit. A ground on one of the output leads beyond the splitting resistors will operate a GD relay and provide an alarm to the system through the master scanner circuit.

F. Battery Distribution Circuit

7.11 Battery distribution of +24V, -48V, and +48V for the complete ringing and tone plant is provided by the battery distribution circuit (see Fig. 18). The -48V and +24V are obtained from the power distribution frame (PDF) supplied by the central office battery. In superimposed ringing and tone plants with the Zone 13 service feature, the -48 volt tripping supply is obtained from the battery and the +48 volt tripping supply from the 610D converter. In superimposed plants with the Zone 16 service feature, the 610D converter is not used and the +55 and -55 volt tripping supplies are obtained from 132AE power units. FA1, FA2, NV1, NV2, NV3, and NV4 fuse alarm relays are provided to indicate an alarm condition to the office alarm circuit in the event of a failed battery distribution fuse.

G. Interrupter Timing Switches

7.12 The interrupter timing switches (Fig. 19) are solid-state interrupters which are designed to perform the functions previously requiring rotating mercury drum interrupters. The 20-Hz AC-DC output from the ringing generator serves as a clock to drive the timing circuit. This circuit provides the 2 seconds ON and 4 seconds OFF (10 IPM) timing to drive the ringing switches in the ringing control and distribution circuit. The ringing switches provide the actual CODE 1 GEN 1 BR1, BR2, and BR3 interrupted ringing. The interrupter timing switches also provide the 30 IPM, 60 IPM, and 120 IPM interruptions for the tone outputs.

H. Interrupter Switches

7.13 The interrupter switches (see Fig. 20) consist of relays which are driven from the interrupter timing circuit. The relays provide the actual interruption of ringing, tones, and grounds. Duplicate sets of relays (INT 0 and INT 1) are provided for regular and reserve operation.

I. Distribution and Transfer Circuit for Interrupters

7.14 The tone and ringing outputs from the interrupter switches are fed through transfer relays in this circuit to the distribution circuit for distribution to office loads as required (see Fig. 21). Samples of the CODE 1 GEN BR1, BR2, and BR3 interrupted ringing are fed to the timing monitors 0C1B and 1C1B (see Fig. 22). The monitor output signals, which follow the CODE GEN sequence, are fed to the master scanner. This provides the system with information as to which CODE 1 GEN brush is feeding the load, and approximately how long it has been on so that "immediate ring" can be furnished.

8. THEORY—OPERATION AND MAINTENANCE

A. Introduction

8.01 The 808A ringing and tone plant normally operates automatically to supply ringing current, tones, and signaling interruptions at the voltage and power levels required by the No. 1 ESS. When the plant NOR key is depressed, the system control determines whether the "0" or "1" side of the plant is supplying power to the load. The ROH OFF or NOR keys determine if ROH power is supplied.

Note 1: The OFF-1—NOR—OFF-0 (S1) and the ROH OFF—ROH NOR (S2) keys are equipped with mechanical interlocks so that only one position of each key can be depressed at a time.

Note 2: The 808A plant can be manually controlled. Manual control overrides the automatic control of the plant.

B. Operation

8.02 Under normal operating conditions, the following must be met before starting the 808A plant:

- (1) All associated fuses are installed in their respective fuse holders except the +24 and -48 volt PD0 and PD1 power distribution fuses. If the plant is used in superimposed offices with Zone 13 service, verify that the F1 fuse in the 610D power plant is *not* installed in its respective fuse holder.

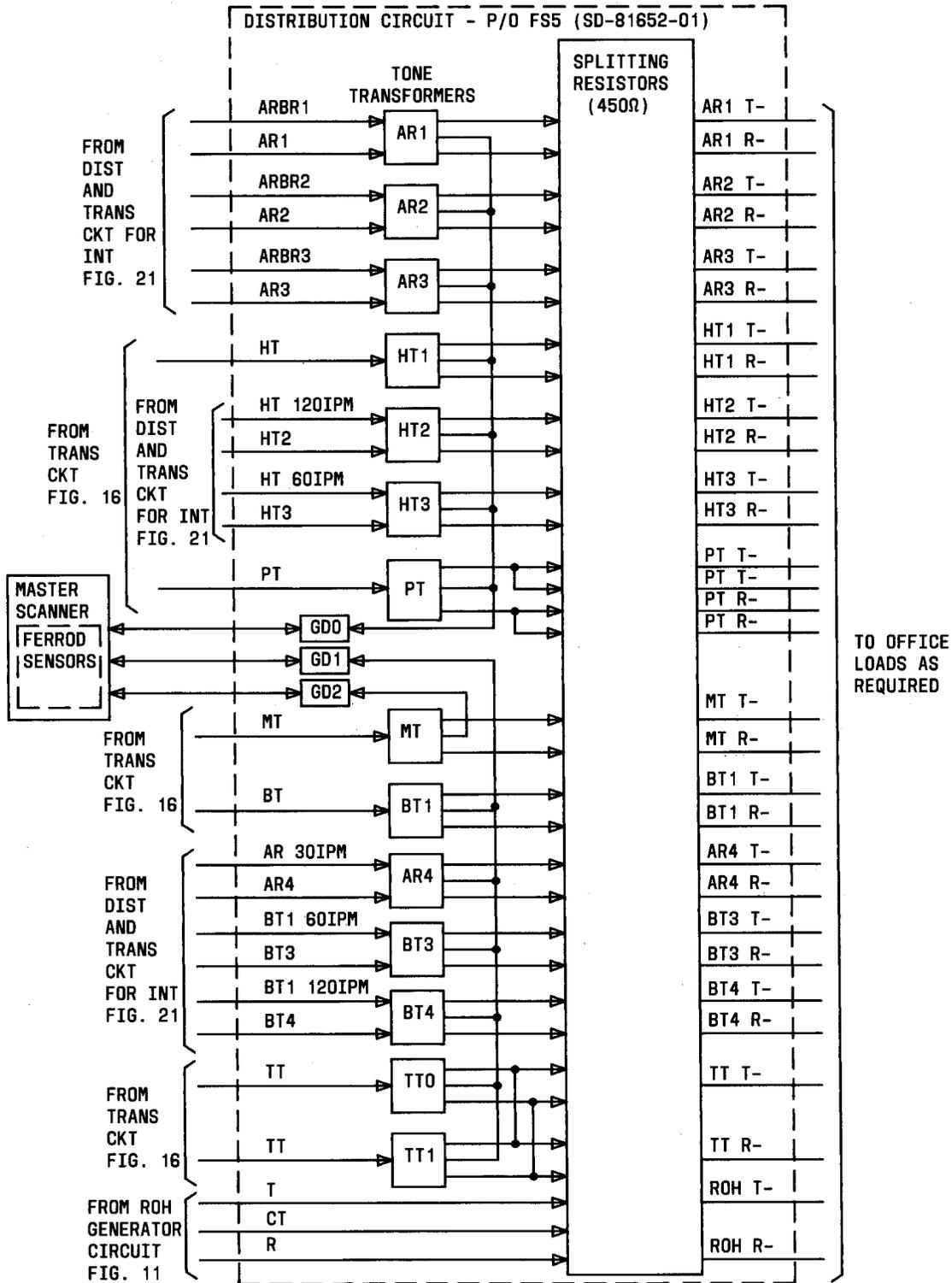


Fig. 17—Distribution Circuit—P/O FS5

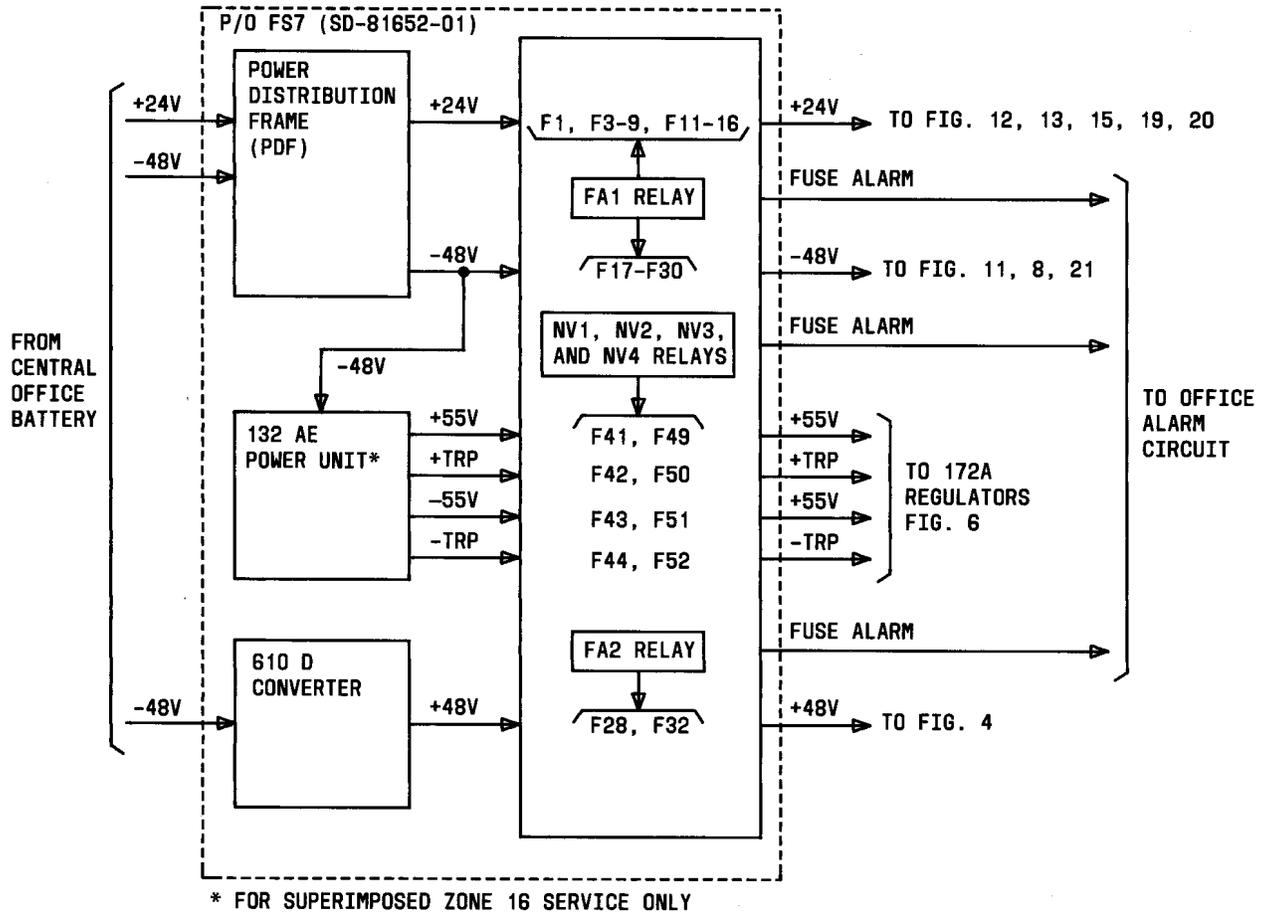


Fig. 18—Battery Distribution Circuit—P/O FS7

- (2) The ac input power service fuses are *not* installed in their respective fuse holders.
- (3) All external connections are made in accordance with the associated circuit schematic drawings.
- (4) The proper reed selector is connected to the oscillators associated with each tone generator (see SD-81654-01) and the positive (+) and negative (-) terminals of the reed selector are not connected backwards.

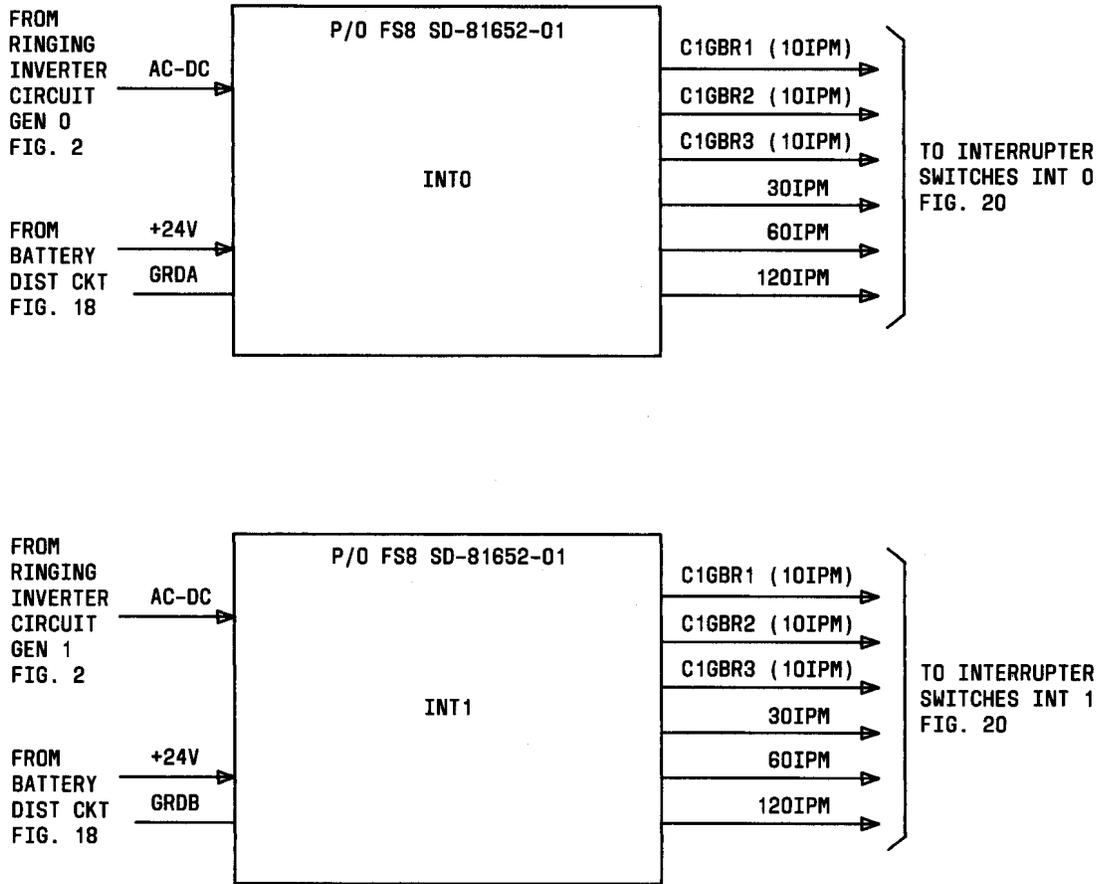


Fig. 19—Duplicate Interrupter Timing Switches—P/O FS8

- (5) All associated plug-in units are properly inserted into the plant.
- (6) If a KS-15634, L8, interrupter is provided, verify that the interrupter is lubricated in accordance with Section 163-220-701 and that the interrupter is connected to the ac input power.
- (7) The plant NOR and ROH NOR keys are depressed.

8.03 Starting: To start the power plant, proceed as follows:

- (1) Verify that the procedures in paragraph 3.01 have been followed.
- (2) Install the +24 and -48 volt PD0 and PD1 power distribution fuses in their respective fuse holders.

- (3) If the plant is used in superimposed offices with Zone 13 service, install the F1 fuse in its respective fuse holder in the 610D power plant.
- (4) Install the ac input power service fuses in their respective fuse holders.

8.04 Manual Plant Operation:

Caution: This power plant is under system control. Do not attempt any load transfers or perform any maintenance on the plant without prior consultation with No. 1/1A ESS master control center (MCC) personnel, as local practices dictate.

Note: The OFF-1—NOR—OFF-0 (S1) and ROH OFF—ROH NOR (S2) keys are both provided with mechanical interlocks so that

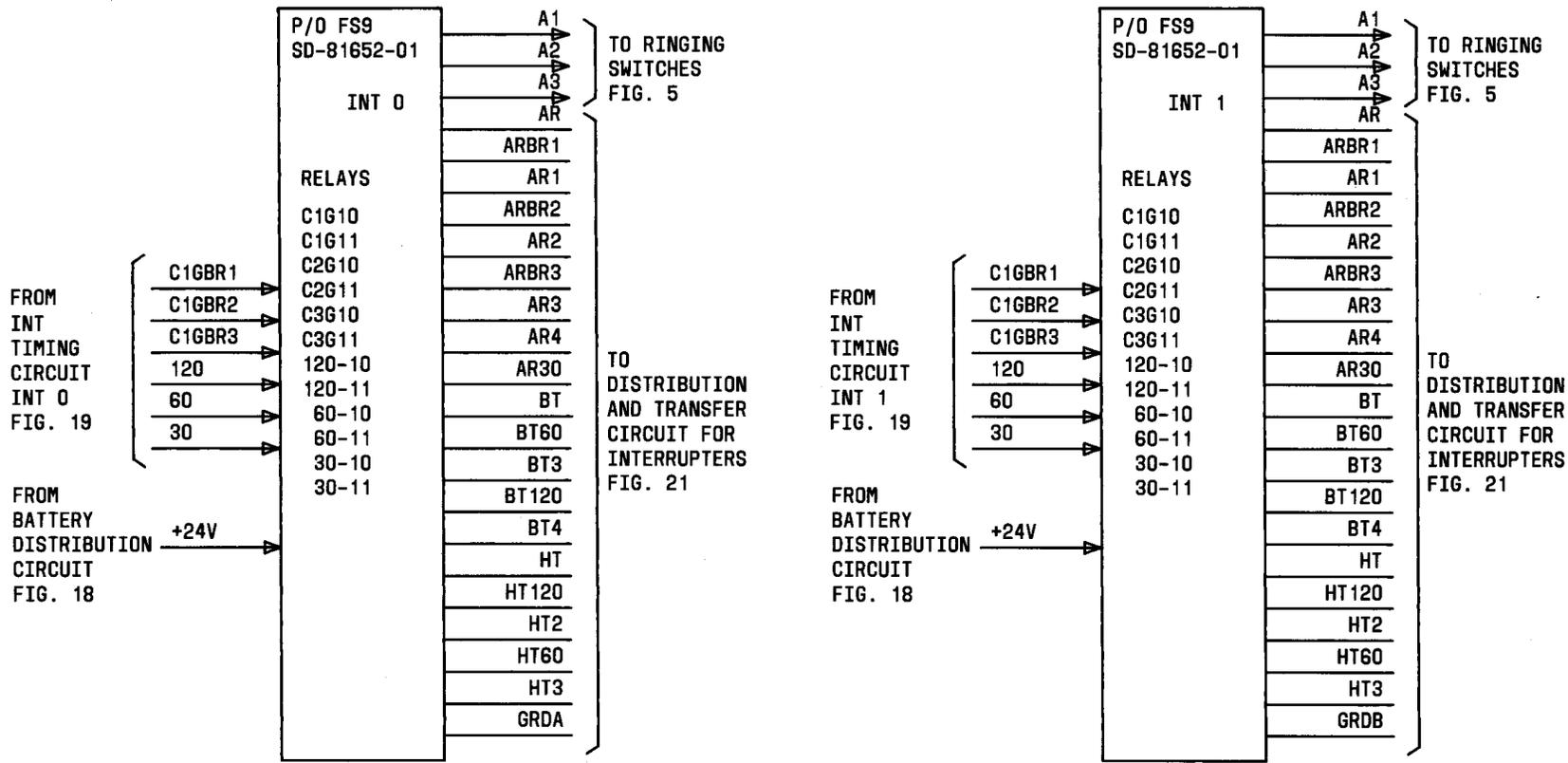


Fig. 20—Interrupter Switches—P/O FS9

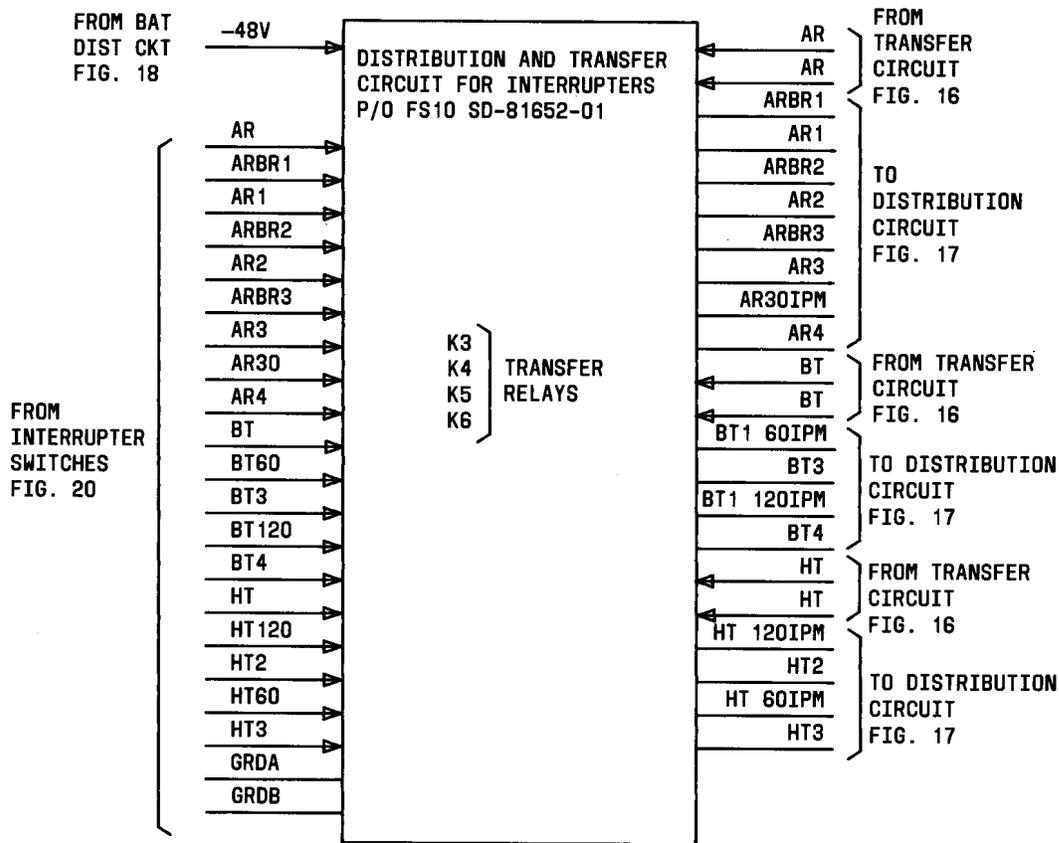


Fig. 21—Distribution and Transfer Circuit for Interupters

only one position of each key can be depressed at a time.

8.05 If maintenance is to be performed on the "0" side of the plant, proceed as follows:

- (1) Type in the "RT-REQ-1." message to transfer the load to the "1" side of the plant.

Requirement: After approximately 2 minutes, the system should have completed all necessary actions and printed out one of the following messages.

OK—The system will attempt to carry out the request, followed by another message of RT03 and/or RT04.

NA—The request cannot be carried out.

NG—The action is redundant.

- (2) Verify that the load has been transferred to the "1" side by observing the T0 and T1 transfer relays.

Requirement: The T0 relay releases and the T1 relay operates.

- (3) Depress the OFF-0 key on the ringing and tone panel.

Requirement: The OFF NOR, PWR OFF, and OS-0 lamps light and the office audible and visual alarms are activated. The S (secondary) lamp is lighted on the MCC.

- (4) Depress the ALM RLS key on the MCC to extinguish the office audible and visual alarms.

Note 1: The teletype printer confirms transfer with RT03 and/or RT04 message.

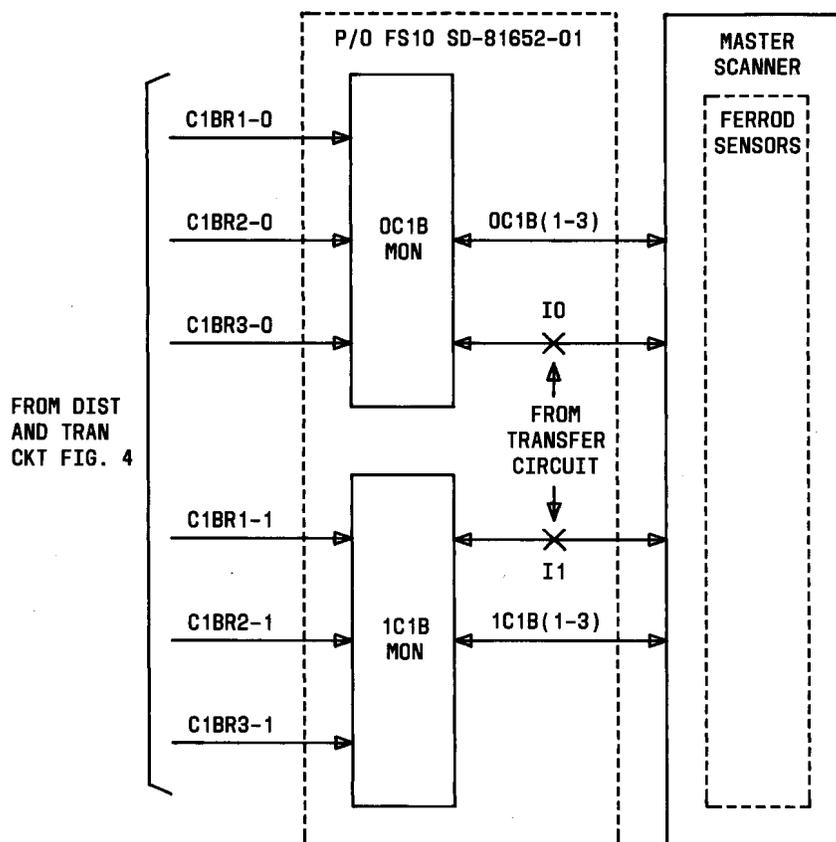


Fig. 22—Timing Monitors—P/O FS10

Note 2: The ac and dc input power to the "0" units is now disconnected. The input power to the receiver-off-hook tone generator has *not* been disconnected since the generator is *not* duplicated.

- (5) Perform the desired maintenance on the "0" units.
- (6) Verify that all associated maintenance has been completed.
- (7) Depress the NOR key on the ringing and tone panel.

Requirement: The OFF NOR, PWR OFF, and OS-0 lamps and the office audible and visual alarms extinguish. The ringing and tone S (amber) lamp is extinguished on the MCC.

Note: The teletype printer verifies restoration.

8.06 If maintenance is to be performed on the "1" side of the plant, proceed as follows.

- (1) Type in the "RT-REQ-0." message to transfer the load to the "0" side of the plant.

Requirement: After approximately 2 minutes, the system should have completed all necessary actions and printed out one of the following messages.

OK—The system will attempt to carry out the request, followed by another message of RT03 and/or RT04.

NA—The request cannot be carried out.

NG—The action is redundant.

- (2) Verify that the load has been transferred to the "0" side by observing the T0 and T1 transfer relays.

Requirement: The T0 relay operates and the T1 relay releases.

- (3) Depress the OFF-1 key on the ringing and tone panel.

Requirement: The OFF NOR, PWR OFF, and OS-1 lamps light and the office audible and visual alarms are generated. The ringing and tone S lamp is lighted on the MCC.

- (4) Depress ALM RLS key on MCC to extinguish the office audible and visual alarms.

Note 1: The teletype printer verifies transfer.

Note 2: The ac and dc input power to the "1" units is now disconnected. The input power to the receiver-off-hook tone generator has **not** been disconnected since the generator is **not** duplicated.

- (5) Perform the desired maintenance on the "1" units.
- (6) Verify that all associated maintenance has been completed.
- (7) Depress the NOR key on the ringing and tone panel.

Requirement: The OFF NOR, PWR OFF, and OS-1 lamps and the office audible and visual alarms and the S lamp on the control panel are extinguished.

Note: The teletype printer verifies the restoration.

8.07 If maintenance is to be performed on the receiver-off-hook tone generator, proceed as follows.

Caution: *The receiver-off-hook tone generator is not duplicated. If the generator is removed from service, the receiver off-hook tone power to the ESS will be lost. Before performing any maintenance on the receiver-off-hook tone generator, notify MCC personnel of your intended actions.*

- (1) Depress the ROH OFF key on the ringing and tone panel.

Requirement: The OFF NOR and PWR OFF lamps light, the input power to the generator is disconnected, and the office audible and visual alarms are activated.

- (2) Depress the ALM RLS key on MCC.

Requirement: The office audible and visual alarms are extinguished and the ALARMS EXTINGUISHED lamp is lighted.

- (3) Perform the desired maintenance on the receiver-off-hook tone generator

- (4) Verify that all associated maintenance has been completed and then depress the ROH NOR key on the ringing and tone panel.

Requirement: The OFF NOR and PWR OFF lamps extinguish, the input power to the generator is restored, and the office audible alarm retires and visual alarms extinguish.

C. Maintenance

8.08 Circuit Tests and Adjustments:

Scheduled maintenance should be performed periodically to allow for proper operation of the 808A ringing and tone plant. Refer to the procedures in the **Task Oriented Practice (TOP)** for the appropriate system.

9. REFERENCES

9.01 The following listing provides additional information concerning the 808A ringing and tone power plant.

SECTION	TITLE
167-726-100	808A Ringing and Tone Power Plant Description
231-370-001	808A Ringing and Tone Power Plant (J86834)
CD-81717-02	J87266 20 Hz DC to AC Inverter Circuit
CD-81703-01	Interrupter Circuit
CD-99303-01	400A Tone Generator Circuit

CD-81654-01	Oscillator Circuit No. 1 ESS and No. 1 TSPS Offices Ringing and Tone Power Plant	CD-81709-01	Ringling Circuit Control and Distribution for No. 1 ESS Offices
CD-81655-01	Amplifier Circuit No. 1 ESS and No. 1 TSPS Offices Ringing and Tone Power Plant	CD-81652-01	Tone Circuit Interruption, Control and Distribution for No. 1 ESS Office
		APS-843212	172A Regulator Circuit.