# POWER SYSTEMS
# RINGING CIRCUIT
# TRANSISTOR 20~SUPPLY
# 756A PBX
# J86464H

## CHANGES

### A. CHANGED AND ADDED FUNCTIONS

A. The connections to transformer T2 have been changed to permit use of a single winding for both half cycles of the signal and thus permit a higher dc voltage to be used so as to obtain a greater output power as required when tie trunks are used with the PBX.

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

C.1 Under Working Limits the voltage limits have been changed from 75-90 volts ac to 65-90 volts ac.

### D. DESCRIPTION OF CIRCUIT CHANGES

D.1 In FS1 terminal D3 of AMP2 is connected to terminal 1 of capacitor C4 for "Y" option.

D.2 In FS1 terminal 2 of capacitor C4 is connected to terminal 1 of transformer T2 for "Y" option.

D.3 In FS1 terminals 3 & 4 of transformer T2 are strapped together for "Y" option.

D.4 In FS1 terminal E3 of AMP 3 is connected to terminal 5 of transformer T2 for "Y" option.

D.5 In FS1 terminal 5 of transformer T2 is connected to terminal 8 of transformer T1 for "Y" option.

D.6 In FS1 terminals 7 & 9 of transformer T2 have been interchanged for "Y" option.

D.7 In CAD1 & CAD2 leads have been added to terminals 4 & 2 for "Y" option.

D.8 In CD paragraphs 5.3 and 5.6 have been revised.

## 1. PURPOSE OF CIRCUIT

1.1 To provide 20~ ringing current, with audible tone, as required by the 756A PBX.

## 2. WORKING LIMITS

2.1 65-90 Volts ac
45-52 Volts dc

## 3. FUNCTIONS

3.1 To provide 20~ ringing current at the voltage required by the 756A PBX.

3.2 To provide audible tone superimposed on the 20 cycles at the level required by the 756A PBX.

## 4. CONNECTING CIRCUITS

This circuit was originally designed to connect to the following circuit.

4.1 SD-81331-01 Transistor Transfer and Alarm Circuit.

## DESCRIPTION OF OPERATION

## 5. GENERAL

### 5.1 Oscillator

The 20 cps oscillator consists of the network shown in FS2 and capacitors C1 and C2, inductor L1, and potentiometer R1 in FS1. It is an L-C tuned Colpitts type oscillator employing a single pnp junction transistor connected in the common collector configuration. Feedback is taken from the emitter through the ADJ 20 (FS1) potentiometer to the junction of capacitors C1 and C2 (FS1) of the tuned network. The oscillator output is taken from the emitter through capacitor C2 (FS2).

### 5.2 Driver Amplifier

The driver amplifier consists of the network shown in FS3, transformer T1 in FS1 and, AMP 1 shown in FS4. This amplifier is a conventional common emitter type using a pnp junction power transistor. Resistor R1 (FS3) is a voltage dropping resistor to drop 52 volts dc down to about 12 volts for the oscillator and driver amplifier. Capacitor C1 (FS3) is a power supply by-pass capacitor.

### 5.3 Output Stage

The output stage consists of capacitors C3 and C4, resistors R3 and R4 and

transformer T2 shown in FS1 and AMP 2 and AMP 3 shown in FS4. This stage is a push-pull amplifier with the transistors operating as switches. That is, they are driven alternately into saturation and to cutoff by the 20 cps signal from the driver amplifier. Thus the output from this state is a 20 cps square wave. Capacitors C3 and C4 (FS1) and their respective bleeder resistors R3 and R4, (FS1) form a voltage divider to make efficient use of the available 52 volt-dc supply without exceeding the transistor voltage rating. One capacitor is connected in series with the emitter-collector circuit of each transistor. Thus since the applied voltage divides equally, one half of this voltage is applied to each transistor. The high value of the capaci tance (1000UF) sustains the dc voltage during the interval that the transistor is cut off. Resistor R2 (FS1) is a series resistor used to drop 52 volts down to 40 volts so that no more than 20 volts is applied to each transistor when "Z" option is provided. When "Y" option is provided Resistor R2 serves as a voltage adjustment. The TR2 lead connected to transformer T2 secondary (FS1) supplies a 12.5 volt signal for the transfer and alarm circuit.

5.4 Low-Pass Filter

A conventional low-pass filter made up of inductor L2 and capacitor C5 (FS1) is used to attenuate the higher harmonics of the square wave and thus convert it to a sine wave. The filter cutoff frequency is set at about 40 cps.

5.5 Audible Tone Network

The audible tone network consists of two tuned L-C circuits. A series L-C circuit, tuned to about 420 cps, made up of inductor L3 and capacitor C6 picks off higher harmonics ahead of the low-pass filter. This signal is fed to a parallel L-C circuit, also tuned to 420 cps, made up of inductor L4 and capacitor C7. The parallel circuit is shock excited, by the applied signal, at a 40 cps rate with an excitation frequency of about 420 cps. The resulting waveform is approximately 420 cycles double-sideband amplitude modulated with 40 cps. The 40 cps is not sinusoidal. This modulated signal is the actual audible tone, and since it is in series with the generator output it is superimposed on the 20 cycles as required.

5.6 Adjustments

Two adjustments are provided in this circuit. These are the ADJ 20~ and the R2 potentiometers (FS1). With no battery applied to the generator set R2 so that there is 70 ohms in the circuit when "Z" option is provided and zero ohms when "Y" option is provided. Apply 52 volts dc to the circuit. Turn the ADJ 20~ potentiometer completely counterclockwise and then slowly turn it clockwise until an ac voltmeter connected across the generator output reaches a peak. This will be at about 90 volts. A KS-14510, L1 Volt-Ohm-Milliameter, or equivalent, is satisfactory for the voltage and resistance measurements. With these adjustments there will be approximately 38 volts dc across capacitors C3 to C4 (FS1) when "Z" option is provided and 52 volts when "Y" option is provided. If the output voltage is higher than 90 volts increase the resistance of R2 (FS1) until the output voltage drops to the correct value. If the output voltage is too low the resistance of R2 may be reduced to increase the generator output voltage. If the circuit cannot be adjusted to provide 90 volts for "Y" option with zero ohms in resistor R2 the lead connected to terminal 5 on transformer T2 can be moved to terminal 6 and the resistance in resistor R2 increased so that 90 volts is obtained. The adjustment of R2 must be made when the generator is first installed. It should not be necessary to change this adjustment. It may be necessary to readjust the ADJ 20~ potentiometer when networks (printed wire boards) are changed.

5.7 The networks shown in FS2 and FS3 are mounted on 1-1/2 by 4-inch printed wire boards and so may easily be replaced in case of failure of the transistors or other small components. Both the printed wire boards and their respective connectors are keyed so that only the correct board can be inserted in each socket.

The amplifiers shown in FS4 are pnp power transistors mounted on a heat sink. The entire assembly can be replaced with only a screw driver.

Caution: Disconnect the battery supply before removing or inserting any of the networks (printed wire boards) or amplifiers (transistor heat sink assemblies). All continuity tests on the networks or on the circuit when the networks and amplifiers are in place should be made with an ohmmeter.