

CIRCUIT DESCRIPTION

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POWER SYSTEMS
RINGING CIRCUIT
TRANSISTOR 20~ SUPPLY
756A PBX & 800A PBX
J85464H

CHANGES

D. Description of Changes

- D.1 Option "X" was rated A&M Only as a result of 756A PBX being rated Mfr Disc.
- D.2 Circuit Note 104 changed as of D.1.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2426-COR

WE DEPT 81450-SDL-JK

POWER SYSTEMS
RINGING CIRCUIT
TRANSISTOR 20~ SUPPLY
756A PBX & 800A PBX
J86464H

SECTION I - GENERAL DESCRIPTION1. PURPOSE OF CIRCUIT

1.01 To provide 20 Hz ringing current with audible tone, as required by the 756A PBX and 800A PBX.

2. GENERAL DESCRIPTION

2.01 A 20 Hz Colpitts oscillator provides a signal to drive the preamplifier. The output of the preamplifier provides sufficient power to drive the output stage. The square wave output signal is filtered to provide a sine wave. Harmonics from the square wave are fed around the filter to add audible ringing tone.

SECTION II - DETAILED DESCRIPTION1. OSCILLATOR

1.01 The 20 Hz oscillator consists of the network shown in FS2 and C1 and C2 capacitors, L1 inductor, and R1 potentiometer 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 C1 and C2 capacitors (FS1) of the tuned network. The oscillator output is taken from the emitter through C2 capacitor (FS2).

2. DRIVER AMPLIFIER

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

3. OUTPUT STAGE

3.01 The output stage consists of C3 and C4 capacitors, R3 and R4 resistors and T2 transformer shown in FS1, and AMP 2 and AMP 3 shown in FS4. This stage is a pushpull amplifier with the transistors operating as switches. That is, they are driven alternately into saturation and to cutoff by the 20 Hz signal from the driver amplifier.

Thus the output from this stage is a 20 Hz square wave. C3 and C4 capacitors (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 capacitance (1000 μ F) sustains the dc voltage during the interval that the transistor is cut off. The R2 resistor (FS1) is a series resistor used to drip 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 R2 resistor serves as a voltage adjustment. The "TR2" lead connected to T2 transformer secondary (FS1) supplies a 12.5-volt signal for the transformer and alarm circuit.

4. LOW-PASS FILTER

4.01 A conventional low-pass filter made up of L2 inductor and C5 capacitor (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 Hz.

5. AUDIBLE TONE NETWORK

5.01 The audible tone network consists of two tuned L-C circuits. A series L-C circuit, tuned to about 420 Hz, made up of L3 inductor and C6 capacitor picks off higher harmonics ahead of the low-pass filter. This signal is fed to a parallel L-C circuit, also tuned to 420 Hz, made up of L4 inductor and C7 capacitor. The parallel circuit is shock excited, by the applied signal, at a 40 Hz rate with an excitation frequency of about 420 Hz. The resulting waveform is approximately 420 Hz double-sideband amplitude modulated with 40 Hz. The 40 Hz 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 Hz as required.

6. ADJUSTMENTS

6.01 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, 11 Volt-Ohm-Milliameter, or equivalent is satisfactory for the voltage and resistance measurements. With these adjustments there will be approximately 38 volts dc across C3 to C4 capacitors (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 R2 resistor the lead connected to terminal 3 on T2 transformer can be moved to terminal 2 and the resistance in R2 resistor 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 ADJ20~ potentiometer when networks (printed wire boards) are changed.

6.02 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.

6.03 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.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

- 1.01 65-90 volts ac
45-52 volts dc

2. FUNCTIONAL DESIGNATIONS

- 2.01 None

3. FUNCTIONS

- 3.01 To provide 20 Hz ringing current at the voltage required by the 756A PEX and 800A PEX.
- 3.02 To provide audible tone superimposed on the 20 Hz at the level required by the 756A PEX, and 800A PEX.

4. CONNECTING CIRCUITS

- 4.01 This circuit was originally designed to connect to the following circuit:

SD-81331-01 Transistor Transfer and Alarm Circuit

SD-81971-01 Power Supply Circuit for the Battery Reserve 800A PEX

SECTION IV - REASONS FOR REISSUE

A. CHANGED AND ADDED FUNCTIONS

- A.1 The 20 Hz output is shown superimposed on the ground for the battery reserve version of the 800A PEX.

D. DESCRIPTION OF CHANGES

- D.1 In FS1, reference to note 106 has been added.
- D.2 In FS1 terminal 7 of transformer T2 is shown connected to ground per "W" option.
- D.3 CAD 3 is added for 800A PBX application.
- D.4 NOTE 203 has been added.
- D.5 NOTE 106 has been added.

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