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COMMON SYSTEMS MULTIFREQUENCY SIGNAL GENERATOR CIRCUIT

CHANGES

D. Description of Changes

D.1 Table A is changed to reflect the new tone level requirements for the direct distance dialing improvement program.

D.2 The maximum test potential in Note 104 is changed to accommodate systems with a maximum voltage of 52.5 volts.

F. Changes in CD Section

F.1 Under SECTION I, 1.3, change the last sentence to read:

The F- output resistors prevent overloading of the oscillators and limit the output level applied to a trunk (through an approved network) to -3 dbm, -6 dbm, or -8 dbm per tone, ±1 dbm (45 to 50 volts) or ± 1-1/2 dbm (42.75 to 52.5 volts).

F.2 Under SECTION II, change 2.4 to read:

The F- resistors in the output leads are provided to improve the impedance match with the trunk and reduce the tone levels to the required transmission level. The power supplied by an oscillator to a 600-ohm or 900-ohm load connected to the output of the repeating coil in a sender is -3 dbm per tone for oscillators equipped with "X" option, -6 dbm per tone for oscillators equipped with "V" option, -8 dbm per tone for oscillators equipped with "W" option, and -8 dbm per tone for oscillators equipped with "S" option when the sender is equipped with hybrid coils.

F.3 Under SECTION III, change 1.2 Voltage Limits to:

Voltage	Min	Max	Output Level Tolerance
-48	-45	-50	± 1 db
-48	-42.75	-52.5	± 1-1/2 db

F.4 Under SECTION III, 2. FUNCTIONS, change 2.2 to read:

To provide through a suitable sending circuit, -3 dbm, -6 dbm, or -8 dbm per frequency to a 600-ohm or 900-ohm termination.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5615-JRL-TNL-RH

COMMON SYSTEMS MULTIFREQUENCY SIGNAL GENERATOR CIRCUIT

CHANGES

D. Description of Changes

D.1 On sheet 3 in table A, the manual outgoing trunk test frame test circuit for step by step offices is added as a connecting circuit under option "V".

F. Changes in Description of Operation

F.1 In SECTION III, paragraph 3., add the following"

SXS Systems

3.11 Manual Outgoing Trunk Test Frame Test Circuit - SD-32349-01.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2311-JAH-MFF-LM

COMMON SYSTEMS MULTIFREQUENCY SIGNAL GENERATOR CIRCUIT

TABLE OF CONTENTS

SECTION I - GENERAL DESCRIPTION

1. GENERAL METHOD OF OPERATION

1.1 The Multifrequency Signal Generator Circuit is a set of six transistor oscillators providing the signal frequencies for the transmission of MF signaling through a single signaling circuit such as an auxiliary sender, ANI outpulser, OGT test frame or OGT testboard in a building not equipped with a MF Current Supply and Distribution Circuit.

1.2 Since the Multifrequency Signal Generator is provided on a circuit per signal output basis it is not equipped with a frequency failure alarm, reserve oscillator or automatic oscillator transfer on failure. If twenty or more Multifrequency Signal Generator Circuits are required in one building the provision of an MF Current Supply and Distribution Circuit should be considered.

1.3 Six frequencies from 700 to 1700 cycles per second are generated at a level of approximately 2.4 volts into an 1100 ohm load at terminal 5 of the oscillator transformer. The F- output resistors prevent overloading of the oscillators and limit the output level applied to a trunk (through an approved network) to -3 dbm, -6 dbm or -8 dbm per tone, ±1 dbm.

SECTION II - DETAILED DESCRIPTION

1. START OF GENERATOR

1.1 The power for operating the six transistor oscillators of the MF Signal Generator Circuit is derived from a single potentiometer circuit from 48v battery to ground. With the associated circuit normal the potentiometer is open between leads GS and GS-1. As the associated circuit moves from normal it closes a contact connecting lead GS to lead GS-1 and the six oscillators start. No warmup time is required and the output voltage and wave shape from each oscillator is normal in less than 0.3 millisecond.

2. GENERATION OF FREQUENCIES

2.1 The transistor operates as a current amplifier. A change in current in the emitter will cause a larger change in current in the collector when operating with the normal voltage between the collector and the base. Voltage amplification is also obtained since the emitter circuit

is much lower in impedance than the collector. The emitter current and the collector current are in phase with each other.

2.2 Sufficient amplification is obtained from a transistor for it to be used to drive a tuned circuit and therefore to act as an oscillator. In the arrangement used in this circuit, energy is fed from a winding inductively coupled to the tuned circuit, consisting of the transformer winding and the capacitor C- to the emitter. The transformer is designed so that the collector is connected to the point of proper impedance on the tuned circuit. Bias current for the emitter is obtained by connecting the base to a low negative voltage. The direct current voltage for the emitter is supplied through part of the tuned circuit.

2.3 When the GS1 and GS-1 leads are closed through, direct current voltage is applied to the transistor. The voltage across the tuned circuit will build up to the point where the power losses in the tuned circuit at the various loads connected to it will equal the power supplied by the transistor. Since the power obtainable for a transistor decreases sharply as the peak of the ac voltage applied to the collector closely approaches that of the dc voltage between the collector and the base, the output stabilizes at this point and is approximately the same for all transistors. The output level is also fairly independent of the load applied so long as the ability of the transistor to supply power is not exceeded.

2.4 The F- resistors in the output leads are provided to improve the impedance match with the trunk and reduce the tone levels to the required transmission level. The power supplied by an oscillator to a 600-ohm or 900-ohm load connected to the output of the repeating coil in a sender is -3 dbm per tone for ±1 db for oscillators equipped with X option, -6 dbm per tone ±1 db for oscillators equipped with V option, -8 dbm per tone ±1 dbm for oscillators equipped with W option and -8 dbm per tone ±1 dbm for oscillators equipped with S option when the sender is equipped with hybrid coils.

2.5 The cross connection to V- to V- points on the voltage divider are made so that the proper output voltage will be available. The potentiometers P- vary feedback in the oscillators, therefore controlling the oscillator output impedance. The output voltage of an oscillator into an 1100 ohm load is approximately 2.4 volts and is within 0.15 volts of any other oscillator. The minimum output voltage is 2.15 volts.

3. MULTIFREQUENCY PULSING

3.1 Six frequencies in steps of 200 cycles from 700 to 1700 cycles are used. The first five are assigned on a two out of five basis to the digits 0 to 9 and the sixth is used in combination with others of the first five for a gate opener or key pulse signal and for a "start" or "end" of pulse signal. These frequencies are assigned designations 0, 1, 2, 4, 7, and 10 so as to fit in with standard additive two out of five code. The frequencies and their assignments are as follows:

	Frequency					
	700	900	1100	1300	1500	1700
	Designation					
Digit	0	1	2	4	7	10
0				x	x	
1	x	x				
2	x		x			
3		x	x			
4	x			x		
5		x		x		
6			x	x		
7	x				x	
8		x			x	
9			x		x	
Key Pulse			x			x
Start Pulse					x	x

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.1 Pulse Lead Length

The Multifrequency Signal Generator Circuit, shall be mounted as closely as possible to the circuit with which it is associated; under no circumstance shall the length of the 0, 1, 2, 4, 7, and 10 signal leads exceed 20 feet.

1.2 Voltage Limits

Voltage	Min.	Max
-48	-45	-50

2. FUNCTIONS

2.1 To provide 700, 900, 1100, 1300, 1500 and 1700 cycle ±1 per cent frequencies for a single signaling circuit for MF signal pulsing.

2.2 To provide through a suitable sending circuit, -3 dbm, -6 dbm or -8 dbm (±1 db) per frequency to a 600 ohm or 900 ohm termination.

2.3 To provide full output voltage and optimum wave shape after the first half cycle of oscillation, when dc voltage is applied to the oscillators.

2.4 To cease oscillation when the dc voltage is removed from the oscillators.

2.5 To have the cross modulation products of any two frequencies fed into a linear load be at a level not higher than -36 dbm.

3. CONNECTING CIRCUITS

When this circuit is listed on a keysheet, the information thereon is to be followed.

This circuit will function with the following circuits:

Common Systems

3.01 Auxiliary Sender Circuit - SD-96479-01.

3.02 ANI Outpulser Circuit - SD-95811-01.

3.03 Pulse Converter Circuit DP to MF - SD-96453-01.

3.04 Line Concentrator No. 1A - Control End - SD-95971-01.

3.05 Line Concentrator No. 1A - Remote End - SD-95972-01.

Toll Systems

3.06 2-Way Trunk Circuit - SD-56475-01.*

3.07 Recording and Completing Trunk - SD-56478-01.*

3.08 Toll Switching Trunk - SD-56509-01.*

Panel Systems

3.09 Outgoing Trunk Testboard - SD-21610-01.

Crossbar System No. 1

3.10 Outgoing Trunk Test Frame - SD-25177-01.

*Typical

4. MANUFACTURING TEST REQUIREMENTS

The sender shall be capable of performing all the functions listed in this circuit description and shall meet the requirements listed in the Circuit Requirements table and Circuit Note.

5. TAKING EQUIPMENT OUT OF SERVICE

When the MF Signal Generator Circuit is to be removed from service for calibration or repair, make busy the associated auxiliary sender, ANI outpulser etc., in accordance with the TEOS information in the associated circuit CD.

6. ALARM INFORMATION

If the fuse alarm functions, make busy the associated auxiliary sender, ANI outpulser etc., until the trouble is cleared and the fuse replaced.

SECTION IV - REASONS FOR REISSUE

CHANGES

B. CHANGES IN APPARATUS

B.1 Added

F- Resistor 145A, 536 ohms, Option S.

B.2

	Superseded	Superseded By
P- Pot. KS-13750, L25	1500 ohms, Option Z	500 ohms, Option R
D5 Resistor, 0.75 ohms	111A	227C

D. DESCRIPTION OF CHANGES

D.1 Option S and Option R are added.

D.2 Option X is rated Standard.

D.3 Option R is added and Option Z is rated MD.

D.4 Note 104 is corrected.

D.5 Note 107 is changed.

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DEPT. 2319-DG-LF-RE