CD-95102-02
ISSUE 2B
APPENDIX 5B
DWG ISSUE 10B
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COMMON SYSTEMS
TRANSMISSION MEASURING
1W NOISE AMPLIFIER RECTIFIER CKT.
FOR MEASURING NOISE ON TRANSMISSION
CIRCUITS ON A MESSAGE WEIGHTING BASIS

CHANGES

B. Changes in Apparatus (Components)

B.1 Remove	Replace By
Capacitor A 475BU (option S)	Capacitor A 535AG (option R)
Capacitor B 475BU (option S)	Capacitor B 535AG (option R)
Capacitor E 475BT (option S)	Capacitor E 535JP (option R)

D. Description of Changes

D.1 Option R was added to cover capacitors A, B, and E. Option S is rated Mfr Disc.

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DEPT 9233-EJR-EJR

COMMON SYSTEMS
TRANSMISSION MEASURING
1W NOISE AMPLIFIER-RECTIFIER CKT.
FOR MEASURING NOISE ON TRANSMISSION
CIRCUITS ON A MESSAGE WEIGHTING BASIS

CHANGES

B. Changes in Apparatus

B.1 Removed	Replaced By
No. 14832A Adaptor	TLC 894 Adaptor Unit

D. Description of Changes

D.1 The 14832A Adaptor has been Mfr Disc by Altec Lansing Co. It is replaced by TLC 894 Adaptor Unit (ITI Electronics, Inc.).

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 9235-JJC-CER

COMMON SYSTEMS
TRANSMISSION MEASURING
1W NOISE AMPLIFIER RECTIFIER CIRCUIT
FOR MEASURING NOISE ON TRANSMISSION
CIRCUITS ON A MESSAGE WEIGHTING BASIS

CHANGES

D. Description of Changes

D.1 Circuit Note 112 is added to clarify adjustment of the filament circuit in those amplifier rectifiers using 310A and 311A type tubes.

D.2 Note 111 was expanded for circuit adjustment using 328 and 329 type tubes.

D.3 Circuit Note 109 was changed to show fusing information for Fig 2. Battery leads designated FB between Fig. 1 and Fig. 2 were added to Figs 1 and 2, assigned option T and rated Mfr Disc. These leads had been removed on issue 7B.

F. Changes in CD Sections

F.1 To summarize filament voltage wiring options, under SECTION III change 1.01 to read:

1.01 Types 328A and 329A tubes are preferred for both 24-volt or 48-volt battery supply in new installations. Option V which is the wire strap on the T resistor and is part of option Y, is required when using 328 and 329 type tubes. The Y wiring strap on resistors U, V, and W may have to be removed as determined by circuit Note 111. If types 310A and 311A vacuum tubes are used, neither options Y or V are used. Resistors U, V, and W are adjusted in accordance circuit Note 112.

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DEPT 4142-PJK-TCA

COMMON SYSTEMS
TRANSMISSION MEASURING
1W NOISE AMPLIFIER-RECTIFIER CIRCUIT
FOR MEASURING NOISE ON TRANSMISSION CIRCUITS
ON A MESSAGE WEIGHTING BASIS

CHANGES

B. Changes in Apparatus

B.1 Added

1 - Resistor, R3, KS-13491, L1 1200 ohms

B.2

Superseded	Superseded By
1 - Capacitor D Aerovox type EE, 12μf	1 - Dual Capacitor KS-13974, 2-25μf
1 - Capacitor L Aerovox type EE, 12μf	

D. Description of Changes

D.1 Option B is added to Fig. 2 to cover the addition of R3. Resistor R3 provides for operation of Fig. 2 directly from -48 volt battery. Connection directly to -24 volt battery is also shown in Fig. 2. Corresponding designations were changed in Fig. 2K. This change cancels that described in D.1, App 1B of CD Issue 2B. Note 109 was added.

D.2 The KS-13974 dual capacitor is shown as a replacement for capacitors D and L, Aerovox type EE for newly manufactured amplifier-rectifiers, and for older units as maintenance information since the Aerovox type EE capacitor is not readily available. Circuit Note 108 was added.

D.3 Designations on L1 and J1 in Fig. 2 were changed. The change in J1 list number from L2 to L5 provides for solder wrap corrections to J1.

D.4 Types 328A and 329A tubes were shown as the preferred type for both 24-volt and 48-volt office battery. This change simplifies filament circuit information. Circuit Notes 101, 103, 104, and 105 were rated Mfr Disc. Notes 110, 111, 301, and option V were added to cover the checking and adjustment of filament voltage on the tubes rather than filament current.

D.5 Designations (A) and (B) were added to the terminal strips in Fig. 1K and 2K, respectively.

F. Changes in CD Section

F.1 Disregard changes F.1 and F.2 in App 1B of CD issue 2B since these changes no longer apply.

F.2 Disregard 1.01, Section III since this information no longer applies.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 4634-PJK-BCB

COMMON SYSTEMS
TRANSMISSION MEASURING
1W NOISE AMPLIFIER-RECTIFIER CIRCUIT
FOR MEASURING NOISE ON TRANSMISSION CIRCUITS
ON A MESSAGE WEIGHTING BASIS

CHANGES

B. Changes in Apparatus

B.1 REMOVED

1-Res, R3, 228A, 1470 ohms

D. Description of Changes

D.1 Resistor R3, which provided operation of Fig. 2 direct from -48V battery, is removed as a no-record change. Battery for Fig. 2 is obtained by connection to Fig. 1.

F. Changes in CD Section

F.1 Change the third sentence of 2.04 in SECTION II to read:

The amplifier is powered by connection to the electron tube filament supply circuit of Fig. 1.

F.2 Delete 1.02 in SECTION III.

F.3 Change the third sentence of 3.02 in SECTION II to read:

... when the meter is used with the 1U amplifier-rectifier.

F.4 Change the sequence of Step (7) in 5.01 of SECTION II to follow Step (3).

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DEPT 2194-PJK-BCB

COMMON SYSTEMS
TRANSMISSION MEASURING
1W NOISE AMPLIFIER-RECTIFIER CIRCUIT
FOR MEASURING NOISE ON TRANSMISSION CIRCUITS
ON A MESSAGE WEIGHTING BASIS

TABLE OF CONTENTS

SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 The purpose of this circuit is to measure voice-frequency noise on transmission circuits. Used with the Transmission and Noise Measuring Circuits, SD-59433-01 and SD-95900-01, this circuit is capable of measuring noise on a C-message weighting basis over a range of 15 to 55 dbrn.

2. GENERAL DESCRIPTION OF OPERATION

2.01 The circuit on which noise is measured is patch connected to the 1W noise amplifier-rectifier through jacks as shown on SD-95900-01 and SD-59433-01. The measured noise is amplified by Fig. 2 and 1, rectified, and read on a db meter connected at the output of Fig. 1. The 1W noise amplifier-rectifier may be bridged across the measured circuit or serve as the 600-ohm termination on the measured circuit.

2.02 Noise measurements are made in terms of dbrnc (db above reference noise using C-message weighting). Reference noise of 0 dbrn corresponds to -90 dbm (90 db below 1 milliwatt).

2.03 In sections of this circuit description, SD-59433-01 or SD-95900-01 will be referred to as the "noise measuring circuit."

SECTION II - DETAILED DESCRIPTION

1. AMPLIFIER-RECTIFIER PANEL

1.01 The amplifier-rectifier panel contains a 3-stage electron tube amplifier shown in Fig. 1. The gain of this amplifier is adjustable by means of the A, C, and D relays in five steps of 5 db. The windings of these relays are connected to signal battery and energized when grounded by sensitivity control keys or switches in the connecting noise measuring circuit. When operated, these relays increase the amount of coupling between the amplifier stages and increase the amplifier gain as follows:

Relay Operated	Increase in Amp Gain	Output Meter Sensitivity On A-Scale
	db	dbrnc
NONE	-	40 to 55
D	5	35 to 50
C	10	30 to 45
A	15	25 to 40
A&D	20	20 to 35
A&C	25	15 to 30

Operation of relay B connects the A resistor across the input T and R leads so that the amplifier presents a 600-ohm termination for the circuit on which noise is measured. In some cases, a 600-ohm or 900-ohm termination is provided in the connecting noise measuring circuit. In such cases, the 1W noise amplifier-rectifier is operated

on a bridging basis. Relay B is not operated when measurements are made on a bridging basis.

1.02 The gain and sensitivity of the amplifier are also adjusted by means of the two potentiometers in the last stage designated SENS ADJ and SCALE ADJ. Both these potentiometers are adjusted during the calibration procedure to obtain the desired output meter readings at a specified input power level. The calibration procedure is given in 5.01 of SECTION II.

1.03 The filament current jack provides a means of measuring the filament current of the three electron tubes. Potentiometers U, V, and W in the filament jack circuit are used to adjust the filament current at values of filament voltage as specified in the Circuit Notes.

1.04 The amplified noise from the amplifier of Fig. 1 is rectified by varistors and connected to the output meter. The rectification characteristic is approximately linear in that, with the proper adjustment of the SENS ADJ and SCALE ADJ potentiometers, the meter indicates accurately to within 0.2 db on the uppermost 10-db range of the scale.

1.05 F1A frequency weighting is provided in the amplifier of Fig. 1 by the characteristics of interstage coupling, feedback, and the varistor-type rectifier.

1.06 The networks connected across the windings of the A, C, and D relays (option A) serve to suppress the interference transients which result when these relays are de-energized.

2. C-MESSAGE FREQUENCY WEIGHTING (FIG. 2)

2.01 When Fig. 2 and option W are used, the T and R input leads are connected through the C-MSG OUT key and through R1 and R2 to the input of the amplifier in Fig. 2. The output of the amplifier is then fed through the frequency shaping filter (FL1), back through the C-MSG OUT key (T2 and R2) to the input of the amplifier in Fig. 1.

2.02 The shaping filter in Fig. 2 alters the amplitude-frequency characteristic of the band of noise measured so that when combined with the F1A weighting of the amplifier of Fig. 1, the resulting response is C-message frequency weighting.

2.03 The plug-in amplifier in Fig. 2 compensates for the 1000-cycle loss of the frequency-shaping filter and the loss due to resistors R1 and R2 in the T1R1 leads. The total gain provided by the amplifier of Fig. 2 is approximately 26 db and is adjusted by means of a screwdriver adjustment in the initial line-up and calibration procedure. Resistors R1 and R2 provide an input impedance to the amplifier of about 10 kilohms when making bridging measurements.

2.04 Inductors L1 and L2 and capacitors C1 and C2 comprise a filter to suppress office-battery noise which may otherwise influence the accuracy of noise measurements. The amplifier may be powered by either 24-volt or 48-volt office battery. Resistor R3 reduces the supply voltage at the filter to 24 volts when the 48-volt battery is used. The amplifier current drain is about 18 ma.

2.05 The C-MSG OUT key when operated opens the T leads at the input and output of the C-message panel, and connects leads T1 to T2 and R1 to R2. This operation disconnects Fig. 2 from the measuring circuit and connects the input T and R leads directly to the amplifier of Fig. 1. The input terminating resistor A is connected across the input T and R leads when the B relay is operated regardless of the position of the C-MSG OUT key. The C-MSG OUT key is operated only during initial calibration as described in 5.01, SECTION II, and if trouble is encountered during the routine calibration.

3. OUTPUT METER

3.01 The output meter which indicates the measured noise level is connected to terminals designated A and B on the amplifier-rectifier panel of Fig. 1. A projection-type or panel bracket-mounted meter is used, both of which are electrically the same. The meter resistance is about 180 ohms; full scale current is approximately 1.5 ma.

3.02 The meter has two scales. One scale, designated B, is marked in black and reads 15 to 0 db from left to right. This scale is used in making transmission loss measurements when the meter is used with the 1W amplifier-rectifier. The other scale, designated A and marked in red, is used when measuring transmission gain or noise and reads from 0 to 15 db full-scale. The A-scale meter reading is added to the db designation of the keys or dial switch of the noise measuring circuit which controls the sensitivity of the 1W noise amplifier-rectifier.

4. DESCRIPTION OF OPERATION

4.01 Access to the 1W noise amplifier-rectifier from the circuit on which noise is measured is through either of two connecting circuits: SD-95900-01 (Transmission and Noise Measuring Circuit) for toll testboards and maintenance centers, or SD-59433-01 (Noise Measuring Circuit) for use at voice-frequency patching bays and repeater bays.

4.02 The measured noise level is determined by the output meter A-scale reading added to the designation on those sensitivity controls in the noise measuring circuits which must be operated to obtain the reading. The following tables give the various sensitivity control designations and the corresponding output meter sensitivity.

Designation of Sensitivity Control	Output Meter Sensitivity on A-Scale
	dbrnc
A+15 A+20 A+25	15 to 30 20 to 35 25 to 40
A+30 A+35 A+40	30 to 45 35 to 50 40 to 55

5. INITIAL AND ROUTINE CALIBRATION FOR C-MESSAGE WEIGHTING

5.01 The following is the calibration procedure for the 1W noise amplifier-rectifier panel when Fig. 2 and option W are used to measure noise on a C-message weighting basis. When calibrated as described below, the 1W amplifier-rectifier reads noise directly in dbrnc.

(1) Operate the CAL or CAL NOISE key associated with the noise measuring circuit.

(2) Operate the C-MSG OUT key.

(3) Adjust the SENS ADJ potentiometer (and SCALE ADJ potentiometer if necessary) on the 1W panel for a reading of 15 on the A scale. (Operation of the CAL key in Step 1 causes the sensitivity control relays in the 1W amplifier to be inoperative thereby ensuring the proper sensitivity range during these adjustments.)

(4) Operate the A5 key and adjust the SCALE ADJ potentiometer on the 1W panel for a meter reading of 5 on the A scale.

(5) Repeat Steps (3) and (4) until no further adjustment of the SENS ADJ and SCALE ADJ potentiometers is required.

(6) Restore the A5 key to normal.

(7) Release the C-MSG OUT key and adjust the gain of the amplifier on the C-message panel for a meter reading of 15 on the A scale.

(8) Restore the CAL or CAL NOISE key to normal.

5.02 Routine calibration check may omit Steps (2) and (7) above.

5.03 If in the calibration procedure the range of the SENS ADJ and SCALE ADJ potentiometers is not sufficient, change the electron tubes in the 1W panel. If this does not result in a satisfactory adjustment range, the circuit should be investigated for trouble.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 If nonregulated 24-volt battery or 48-volt battery is used for filament power to the electron tubes in Fig. 1, the type tubes specified in Circuit Note 101 and wiring option Y must be used. For the regulated 24-volt filament battery, the type tubes specified in Circuit Note 101 and wiring option X must be used.

1.02 When available, either 24-volt or 48-volt quiet filament battery should be used for Fig. 2.

1.03 To minimize pickup and its effects on the output meter reading, each pair of T and R leads (T1R1 and T2R2) between Fig. 1 and 2 should be as short as possible and no longer than 10 pair-feet.

2. FUNCTIONAL DESIGNATIONS

2.01 When the C-MSG OUT key in Fig. 2 is in its normal position, Fig. 2 is connected as part of the 1W noise amplifier-rectifier measuring circuit.

2.02 When the C-MSG OUT key is operated, Fig. 2 is removed from the measuring circuit to facilitate calibration. The gains of the amplifiers in Fig. 1 and in Fig. 2 can thereby be adjusted independently as outlined in the calibrate and line-up procedure in 5.01, SECTION II.

3. FUNCTIONS

3.01 Fig. 1 is designed to amplify and rectify noise in the voice-frequency range so that it can be read on an associated db meter connected to the output terminals. The frequency characteristics of Fig. 1 are such that F1A frequency weighting is obtained. The gain provided in Fig. 1 is variable in steps of 5 db as covered in 1.01 of SECTION II.

3.02 Fig. 2 is designed to amplify the band of noise measured and alter its amplitude-frequency characteristics so that when combined with the F1A frequency weighting of Fig. 1, C-message weighting may be read on the output meter. The total range of noise which can be measured is 15 to 55 dbrnc.

3.03 A 600-ohm termination is provided to terminate the circuit on which noise is measured by the 1W noise amplifier-rectifier when no external termination is used. The 1W may also be bridged across the circuit. The bridging impedance is approximately 10 kilohms.

4. CONNECTING CIRCUITS

4.01 This circuit may be connected to the following:

(a) Noise Measuring Circuit SD-59433-01

(b) Transmission and Noise Measuring Circuit SD-95900-01

SECTION IV - REASONS FOR REISSUE

A. Changed and Added Functions

A.1 Fig. 2 is added so that when used with the noise amplifier-rectifier in Fig. 1, the 1W is capable of measuring noise on C-message weighting basis. When calibrated in accordance with 5.01 of SECTION II, noise measured with the 1W noise amplifier-rectifier may be read directly in dbrnc without correction factors. Formerly, Fig. 1 provided F1A LINE weighting and the measured noise was read in dba.

B. Changes in Apparatus

B.1 Added:

Fig. 2

D. Description of Changes

D.1 The Circuit Description (Issue 2B) is completely rewritten with Issue 5B of the drawing to more completely describe the operation of Fig. 1 and also to describe Fig. 2.

D.2 Option W is added to cover the addition of Fig. 2.

D.3 Fig. 2K was added.

D.4 Designations were added to Fig. 1K for wiring connections.

D.5 Note 107 was added.

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DEPT 2194-PJK-BCB