COMMON SYSTEMS
60A CONTROL UNIT CIRCUIT

10

CHANGES

D. Description of Changes

D.1 Note 203 has been revised to add the following connecting circuit:

"or Master Scanner Applique Circuit (SD-1A133-01)."

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DEPT 5111-EVK-CEP

COMMON SYSTEMS
60A CONTROL UNIT

CHANGES

B. Changes in Apparatus

B.1 In FS1:

Removed	Replaced By
R1, R2 Resistors, 145A, 898 ohms	R1, R2 Resistors, 221A, 898 ohms

B.2 In FS2:

Removed	Replaced By
Q101 through Q106 and Q108 Transistors - 16A	Q101 through Q106 and Q108 Transistors - 16F
Q107, Q109 Transistors - 16B	Q107, Q109 Transistors - 16K

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COMMON SYSTEMS
60A CONTROL UNIT CIRCUIT

CHANGES

D. Description of Changes

D.1 In CAD1, leads A and B were added.

BELL TELEPHONE LABORATORIES, INCORPORATED

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COMMON SYSTEMS
60A CONTROL UNIT CIRCUIT

CHANGES

D. Description of Changes

D.1 Marking of relays had been erroneously changed from S and T to SP and TN. Markings changed back to T and S on FS 1, App Fig. 1, SC-1, Circuit Requirements, and CAD 1.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5111-WWG-CEP

COMMON SYSTEMS
60A CONTROL UNIT CIRCUIT

CHANGES

D. Description of Changes

D.1 Note 203 is added.

D.2 In FS1, lead designations A and B for terminals 17 and 18, respectively, are added, along with reference to Note 203.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5111-EVK-CEP

COMMON SYSTEMS
60A CONTROL UNIT
CIRCUIT

CHANGES

A. Changed or Added Functions

A.1 Make contact 12 (SP relay) has been added. Contact 12 is to be wired to TB1-17-18 for ESS application. Terminal 17 is to be wired to swinger of contact 12, SP relay.

D. Description of Changes

D.1 The SD has been reissued to indicate J99329 code.

D.2 Note 105 has been changed to indicate change from apparatus to equipment.

D.3 ED-99653-30 has been added for A-152907 assembly.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5111-WWG-CEP

COMMON SYSTEMS
CONTROL CIRCUIT
60A CONTROL UNIT

CHANGES

D. Description of Changes

D.1 Added Equipment Note 202.

D.2 Added Circuit Note 105.

D.3 Added 185A networks across S and T relays.

D.4 Added battery range -42.75 to -52.5 volts.

D.5 Added "or to connecting circuit as required" to connecting circuit information associated with leads T, R, T1, and R1.

D.6 Added under SECTION III, Paragraph 4, CONNECTING CIRCUITS: No. 1 ESS Combined Milliwatt and Loop Around Test Circuit - SD-1A225-01.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5112-MCN-FFR

COMMON SYSTEMS
CONTROL CIRCUIT
60A CONTROL UNIT

D. Description of Changes

D.1 Added Equipment Note 201.

D.2 Renumbered TB1 terminals.

D.3 Added relay contact S8 omitted in error on Issue 1.

D.4 Added reference to J94004.

D.5 Added CAD 1.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5112-MCN-FFR

COMMON SYSTEMS
CONTROL CIRCUIT
60A CONTROL UNIT

SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

This circuit, when installed with loop-around test facilities (covered by SD-98100-01), provides a means of eliminating unauthorized telephone service connections.

2. GENERAL METHOD OF OPERATION

This circuit provides facilities for detecting a 1000-cps (±2%) test tone and closing the loop-around path when the test tone on either line exceeds -15 dbm. The circuit will open the loop-around path and terminate both lines upon detection of any signal (such as speech) other than the 1000-cps test tone that falls within the voice frequency range and that exceeds -45 dbm. A control is provided to reduce the circuit sensitivity.

The detector circuit bridges the test line with approximately 100,000 ohms to introduce less than 0.1-db transmission loss to the test tone. When the loop-around path is opened, the transmission loss is approximately 85 db.

SECTION II - DETAILED DESCRIPTION

1. GENERAL

The disabling circuit which functions on 48-volt central office battery, is contained on a 2-inch mounting plate intended for 23-inch relay rack mounting. It consists basically of a test signal level detecting circuit which operates a relay to close the loop-around path, and a 1000-cps rejection filter followed by a second level detector circuit which operates a relay to open the loop-around connection.

2. AUTOMATIC CONTROL (SC1)

In the standby condition (no test signal present on either line) relays T and S are both released and the bridging circuit introduces approximately 85-db loss to impede any unauthorized transmission. A 1000-cps ±2% test signal appearing on either line above -15 dbm is transmitted through the bridging circuit with approximately 44-db loss to input transformer T1. The signal is then amplified by transistors Q101, Q102, and Q106 and rectified by CR104. The positive dc voltage across C125 is applied to the base of transistor Q109. When the voltage across capacitor C125 exceeds approximately 1.5 volts, transistor Q109 is forward-biased sufficiently to operate relay T. The line signal level required to cause operation of relay T is determined by adjusting the TONE control, R106.

Relay T operated:

(a) Disconnects termination consisting of R1 and C1 from leads "T" and "R".

(b) Disconnects termination consisting of R2 and C2 from leads "T1" and "R1".

(c) Connects leads "T" to "T1" and "R" to "R1" permitting transmission of the 1000-cps test tone.

Relay T remains operated as long as the tone is present unless speech (or other signal outside of the notch filter frequency limits) appears.

A 1000-cps rejection filter is provided in the speech channel to reject the 1000-cps test signal but permit the transmission of speech or other out-of-band signals. The rejection circuit is composed of two highly selective notch filters. The first filter composed of capacitor C105, FF-1 control L101 (adjustable inductor), and FN-1 control R108 is tuned for maximum rejection at 985 cps. The second filter section composed of capacitor C106, FF-2 control L102 (adjustable inductor), and FN-2 control R113 is tuned for maximum rejection at 1015 cps. The composite filter provides approximately 50 db of rejection over the desired frequency range.

If speech appears on the line at a level above -45 vu in the presence of the 1000-cps tone, it will be transmitted through the bridging circuit to input transformer T1, amplified by transistors Q101 and Q102, and transmitted through the notch filters to remove the 1000-cps signal. The remaining signal is further amplified by transistors Q103, Q104, and Q105 and rectified by CR101 to trigger the monostable multivibrator consisting of Q107 and Q108 thereby operating relay S. The speech level required to operate relay S is determined by adjusting the SENS control R114. When the dc voltage across capacitor C121 exceeds approximately 1.5 volts, transistor Q107 conducts to operate relay S. The drop in the collector voltage of transistor Q107 is transmitted

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as a negative pulse by capacitor C124 to the base of transistor Q108. Transistor Q108 is thereby turned off and remains nonconducting for approximately 3 seconds until capacitor C124 discharges through resistor R139. During the period that Q108 is nonconducting, transistor Q107 is held on (forward-biased) by current flowing through resistor R141. After the 3-second delay, transistor Q108 starts to conduct and the bias current through R141 from the collector of Q108 to the base of Q107 reverses polarity to turn Q107 off and release relay S. However, if a speech signal is still present on the line, the resulting positive voltage across C121 will hold Q107 on until the speech level is reduced below -45 vu.

Relay S operated:

(a) Releases relay T.

Relay T released:

(a) Opens connection between leads "T" and "T1" and leads "R" and "R1".

(b) Connects R1 and C1 across leads "T" and "R" for line termination.

(c) Connects R2 and C2 across leads "T1" and "R1" for line termination.

When relay S releases, relay T operates (if 1000-cps tone is still present) and the transmission path is restored. Relay S will operate to release relay T whenever speech or other signal outside of the notch-filter limits appears on either line. Each time relay S operates, the transmission path is opened for at least 3 seconds. The attack time of the circuit is fast enough to prevent any intelligible speech above -45 vu from being transmitted in the presence of the tone.

3. MANUAL CONTROL

The 2-position key on the 60A control unit provides for manual control of the loop-around connection. When key LCT is turned to the LCT (loop cut-through) position, the loop-around path is closed through contacts on the key to remove the control circuit from the loop-around, for example, during maintenance or to permit transmission testing at frequencies other than 1000 cps. With the key in the normal (NOR) position, the loop-around connection is automatically controlled by the 60A control unit.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

None.

2. FUNCTIONAL DESIGNATIONS

Designation	Meaning
FF	Filter Frequency
FN	Filter Null
LCT	Loop Cut-Through
NOR	Normal
S	Speech
T	Tone
SENS	Sensitivity

Designations not included in the above list are reference designations and have no functional meaning.

3. FUNCTIONS

This circuit provides:

(a) Facilities for closing a loop-around path when a 1000-cps ±2% tone on either test line is present at a level of -15 dbm or higher.

(b) Facilities for opening the loop-around path established by the presence of the 1000-cps test tone when any audio signal other than the 1000-cps test tone appears on either line at a level higher than -45 dbm.

(c) A key for closing the loop-around path as may be required, for example, during maintenance or transmission testing at frequencies other than 1000-cps.

4. CONNECTING CIRCUITS

When this circuit is listed on a key-sheet, the connecting information thereon is to be followed. A typical connecting circuit is: Transmission Test Line or Test Trunk Circuit SD-98100-01.

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