COMMON SYSTEMS
OSCILLATOR CIRCUIT
AUTOMATIC NUMBER IDENTIFICATION - TYPE B
CROSSBAR NO. 1, PANEL OR STEP BY STEP OFFICE

CHANGES

B. Changes in Apparatus

B.01 Added

OSC - 533K Diode App Fig. 1, Option Q

D. Description of Changes

D.01 When the SD-95810-01 identifier is arranged with the oscillator lead cross detection feature and if an oscillator is plugged busy, a false oscillator cross indication will occur. This is prevented by providing an option Q OSC diode, replacing R wiring, in the OSC lead via the outgoing trunks to the identifiers.

D.02 Circuit Notes 102 and 104 are revised, Circuit Note 108 is added, and CAD 1 is changed to reflect D.01 improvements.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5413-DAJ

WE DEPT 45240-WCR-JTT-SVB

COMMON SYSTEMS
OSCILLATOR CIRCUIT
AUTOMATIC NUMBER IDENTIFICATION - TYPE B
CROSSBAR NO. 1, PANEL OR STEP BY STEP OFFICE

CHANGES

B. Changes In Apparatus

B.01

Superseded	Superseded By
CPS-D39 Tone Gate App Fig. 1, Option W	CPS-D39 Tone Gate App Fig. 1, Option W
QI, QZ 51B Transistor CPS Option Z	Q1, Q2 51T Transistor CPS Option Y
Q3 - 6B or 9B Transistor, App Fig. 1, Option T	Q3 - 58B Transistor, App Fig. 1, Option S

D. Description of Changes

D.01 The D39 tone gate, option W for use with No. 1 AMARS and toll identifiers in step-by-step offices, is revised to:

(a) Improve the reliability margin of the Q1 and Q2 transistors in the CPS-D39 tone gate by providing a higher sustain voltage 51 type.

(b) Specify the 108A for the 107A Q3 and Q4 transistors on a no-record basis in agreement with physical design considerations and in accordance with WE drawings.

(c) Bring the CPS Record of Changes Table up-to-date to show the last CPS series number and the added options.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5242-DAJ

WE DEPT 45830-WCR-GWC-MAF

COMMON SYSTEMS
OSCILLATOR CIRCUIT
AUTOMATIC NUMBER IDENTIFICATION - TYPE B
CROSSBAR NO. 1, PANEL OR STEP BY STEP OFFICE

CHANGES

B. Changes in Apparatus

B.01	Superseded	Superseded By
	CPS-D-39 Tone Gate App Fig. 1, Option W, per SD Sheet 5	CPS-D-39 Tone Gate App Fig. 1, Option W, per SD Sheet 6

D. Description of Changes

D.01 The D-39 tone gate, option W for use with No. 1 AMARS and toll identifiers in step-by-step offices, is revised on sheet 6, replacing the same circuit pack shown on sheet 5. The purpose of the change was to reduce costs, increase circuit reliability, and to offer greater protection against breakdown. On sheet 5, the former 912A connector is shown replaced with the 910A to correct a drafting error.

D.02 Notes 106 and 302 on sheet 1 are revised for clarity.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5242-DAJ

WE DEPT 45830-WCR-WEA-VK

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COMMON SYSTEMS
OSCILLATOR CIRCUIT
AUTOMATIC NUMBER IDENTIFICATION - TYPE B
CROSSBAR NO. 1, PANEL OR STEP BY STEP OFFICE

CHANGES

D. Description of Changes

D.01 Drafting corrections are made to the manufacturing test requirements table parts B and C on sheet 5 to bring the schematic into agreement with the information shown on the CPS-D39 tone gate drawing, A-250711. On the same sheet, the C1 capacitor code is changed from a 608B to a 614C, also in agreement with Issue 4 of the A drawing.

D.02 In FS1, the internal paired leads are removed from the schematic on sheet 2 because it was discovered WE never applied this type of wiring to the circuit and that such paring is not required. The external pairing, which is important, is revised in the FS and CAD 1 to clarify its use. Also for clarity, option V is added to CAD 1 on sheet 4.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5245-GFC

WE DEPT 25120-WCR-WEA-VK

COMMON SYSTEMS
OSCILLATOR CIRCUIT
AUTOMATIC NUMBER IDENTIFICATION - TYPE B
CROSSBAR NO. 1 PANEL OR STEP BY STEP OFFICE

CHANGES

D. Description of Changes

D.1 Circuit Note 102 is revised to place a limit on the quantity of automatic intercept trunks for step-by-step or panel offices, to include the new step-by-step local directory assistance trunks, and to include other existing ANI-B trunks, all within the terminology of: "frames equipped with trunks requiring connection to this oscillator."

D.2 Note 107 is added to reduce the quantity of step-by-step automatic intercept trunks to that included on three or less adjacent AIS frames in order to reduce identifier failures by improving the signal to noise ratio.

D.3 The auxiliary circuit for calling line identification is removed from the feature table of Note 102 and rated Mfr Disc. in FS1 and CAD 1.

D.4 To agree with the identifier circuit for AMARC on a no-record basis, the S1 lead is added to the tone multiplexer and power transfer unit in FS1 and CAD 1. The term, "Remote Unit," is dropped from Circuit Note 102 to simplify the application of option V for this purpose by referencing the identifier circuit only.

F. Changes in CD Section III

F.1 In 4. CONNECTING CIRCUITS, change (m) to read Common Systems - Auxiliary Circuit - ANI-B for CLI - SD-1C208-01, (Mfr Disc.) and add

(n) Outgoing Intercept Trunk for AIS - SD-32532-01.

(o) Local Directory Assistance Trunk Circuit for ANI-B or ANI-C - SD-35029-01.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5245-GFC

WE DEPT 25830-WCR-GWC-VK

COMMON SYSTEMS
OSCILLATOR CIRCUIT
AUTOMATIC NUMBER IDENTIFICATION - TYPE B
CROSSBAR NO. 1 PANEL OR STEP BY STEP OFFICE

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SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 The oscillator circuit generates a 2.2-volt signal with a frequency of 5800 Hz and applies it to the sleeve of the outgoing trunk to enable the ANI identifier to identify the calling customers directory number.

1.02 The oscillator circuit is divided into four major functional parts - the oscillator, the buffer amplifier, the power amplifier, and the auxiliary apparatus used to hold the connection and cut through the output of the oscillator circuit to the trunk.

(a) The function of the oscillator is to provide a 5800-Hz signal, stable in frequency and amplitude to the amplifier sections. It consists primarily of a network N1 (tank circuit), a transistor Q1, and a transformer T1. The latter couples the oscillator to the buffer amplifier.

(b) The function of the buffer amplifier is to isolate the oscillator from the load and provide linear voltage gain It consists mainly of potentiometer B, isolating resistor R5, a transistor Q2, biasing resistors, and a transformer T2. The latter couples the buffer amplifier and power stages.

(c) The function of the power amplifier is to provide power gain with low distortion. It consists of a power transistor Q3, an output transformer T3, and provision for biasing the transistor.

(d) The HD inductor provides a low resistance ground to hold the switches in the connection. However, its impedance td the 5800-Hz signal is very high so as not to overload the oscillator output.

The oscillator (OSC) relay (option X provided) or the tone gate (option W provided) permits the generated signal to be cut through to the trunk when needed. When the circuit is idle, the generated 5800-Hz signal does not appear at the output of the oscillator circuit. Where option V is furnished, the OSC relay, the D-39 circuit pack, and the HD inductor are not provided and the generated signal appears at the output at all times.

SECTION II - DETAILED DESCRIPTION

1. APPLICATION OF SIGNAL TO TRUNK SLEEVE

CUT THROUGH

1.01 When the called number has been sent to the distant office, and the outgoing trunk detects district cut through in crossbar No. 1 and panel offices and when it receives a start identification signal from a distant office, it seizes an outpulser through a link. Later, the outpulser seizes an identifier and operates a relay in the trunk to cut the sleeve through to the oscillator circuit and prepare to operate the OSC relay (option X provided), or to enable the tone gate (option W provided). When the identifier is ready to make an identification, it applies a signal to the oscillator lead to operate the OSC relay or enable the tone gate; this causes the 5800-Hz tone to be applied to the sleeve.

SLEEVE HOLDING CIRCUIT

1.02 As soon as the relay in the outgoing trunk operates, it connects the sleeve to the oscillator circuit. This sleeve holds the connection back through the central office switches and must be kept grounded. The HD inductor provides this ground without shorting the output of the oscillator.

RELEASE

1.03 When the identifier completes its functions, it is released by the outpulser. This results in the removal of the signal that holds the OSC relay operated (option X provided) or the tone gate enabled (option W provided). Then, the outpulser releases the outgoing trunk relay and the sleeve is disconnected from the oscillator circuit. At about the same time, the outpulser releases the relay in the outgoing trunk and the sleeve is disconnected from the oscillator circuit.

1.04 The oscillator circuit continues generating the 5800-Hz signal as long as battery supply is furnished. This signal does not go beyond the OSC relay (option X provided) or the tone gate (option W provided) when the oscillator circuit is not in use.

2. GENERATION OF 5800-HZ SIGNAL

OSCILLATOR

2.01 The oscillator stage of the oscillator circuit generates the 5800-hertz signal. This stage includes the Q1 transistor, tuned network N1, interstage transformer T1, feedback resistor R1, biasing resistors R2 and R3, bypass capacitor C2, biasing varistor D. The transistor is used in the common collector connection. This gives current gain and power gain but no voltage gain. The voltage gain required for oscillation is obtained by transformer action in the inductor of the network N1. The base of the transistor is biased at -40 volts by making use of the breakdown voltage characteristic of varistor D.

2.02 Current flows from the emitter to the base and causes a voltage drop in the R2 resistor that places the emitter at a slightly lower negative voltage than the base. The difference is small. In oscillation the emitter goes toward a larger negative voltage and it carries with it, through resistor R1, the tap on the L1 inductor in network N1. By transformer action in the inductor the voltage of the base increases to a larger negative value. Part of the current change in the emitter is fed through resistor R1 and the inductors in the network to the base. This is amplified in the transistor to cause the current to increase even more. This continues until the transistor saturates. Then the gain of the stage goes to zero and the emitter current stops increasing. During the increase of base current the capacitor in the network was charging toward a greater negative voltage. When the base current stops increasing the inductor current diverts to the capacitor, which starts charging so that the end of the capacitor toward the base goes in a positive direction. This results in a decrease of base current and the transistor starts to turn off. The transistor alternately turns off and on in this manner and the tuned network N1 causes the currents and voltages to be sinesoidal.

2.03 The changing emitter current, which flows in the primary winding of transformer T1, induces a voltage in the secondary winding that drives the buffer stage. This transformer is connected so as to step down the voltage and impendace and step up the current. This avoids loading the oscillator stage.

2.04 The tuning of the oscillator circuit is done in the first or oscillator stage. Part of the inductance in the parallel tuned network N1 is variable. This can be adjusted by inserting an adjusting tool through the opening in the end of the network and turning the adjusting screw. This is covered in detail later under the heading Adjustment Procedure.

BUFFER AMPLIFIER

2.05 The buffer amplifier stage includes transistor Q2, potentiometer V, isolating resistor R5, dc isolating capacitor C3, biasing resistors R6, R7, and R8, feedback resistor R9, load stabilizing resistor R10, and interstage coupling transformer T2. The transistor is used in the common emitter connection. This gives both current and voltage gain. Potentiometer V is provided to give control of the output voltage. The adjustment of this potentiometer is covered in detail under the heading Adjustment Procedure. Resistor R5 decreases the effect of changing load and changing potentiometer setting on the loading of the oscillator. The signal passes from transformer T1 through the potentiometer, resistor R5, and capacitor C3 to the base of the Q2 transistor. Here it is amplified and fed through transformer T2 to the output stage. Across the primary winding of transformer T2 is a resistor, R10, that loads the stage with a fixed load so as to overshadow changes in load resistance reflected through the transformer.

2.06 Part of the output current is fed back to the input through resistor R9. This decreases the input and output impedance of the buffer stage and stabilizes the gain.

2.07 Resistors R6 and R7 provide a bias voltage for the base of the Q2 transistor of approximately -39 volts. Capacitor C3 isolates the base from the potentiometer for direct current to avoid changing the bias as the output voltage is changed.

2.08 Resistor R8 provides a dc voltage drop to bias the emitter at -38.5 volts. This resistor is bypassed by capacitor C4 so that it has no effect on the ac signal.

POWER AMPLIFIER

2.09 The power amplifier stage includes transistor Q3, biasing resistors R11, R12, R13, and R14, bypass capacitor C5, and transformer T3. The transistor is used in the common collector connection to obtain a low output impedance. Again this gives current and power gain but no voltage gain. If a voltmeter is applied to the base and then to the emitter of this stage, there may appear to be a voltage gain. This effect is caused by the difference in loading effect of the meter between the high-impedance base circuit and the low-impedance collector circuit. The signal passes from the secondary winding of the T2 transformer directly through the transistor, where the current is amplified, to the T3 transformer where the voltage is stepped down and the current stepped up.

2.10 Resistors R11 and R12 provide a biasing voltage to the base of about -35 volts. Resistors R13 and R14 bias the emitter to a negative voltage very slightly less than the voltage of the base or approximately -35 volts.

2.11 Care must be used in testing this stage to AVOID GROUNDING THE CASING OF TRANSISTOR Q3 OR THE METAL PLATE TO WHICH IT IS ATTACHED. Grounding the emitter, the casing, or the metal plate connected to the emitter terminal will instantly burn out the transistor. Avoid touching the ground lead of electronic voltmeters to these points. Many of these voltmeters are internally grounded.

2.12 Capacitor C5 bypasses the emitter biasing resistors for ac signals.

2.13 This power amplifier stage supplies enough power to the load to maintain the voltage of 2.2 $\pm$ 0.2 volts for the range of load impedances encountered in central offices.

AUXILIARY APPARATUS

2.14 In oscillators used on trunk frames only one HD inductor is provided for two oscillators. Since only one oscillator is used at a time, only one HD inductor is

required to hold the connections to the trunk circuits in that frame or the two adjacent frames.

2.15 Each oscillator of a pair corresponds to an identifier in an identifier group. When identifier 0 is in use it enables oscillator 0. When identifier 1 is in use it enables oscillator 1. If an oscillator is made busy, the control is automatically transferred to the other oscillator so that the other oscillator serves both identifiers. When an oscillator is used for line verification, permanent signal identification or for testing, there is only one oscillator on the frame. This oscillator is then enabled by either of the two identifiers.

3. TESTING AND ADJUSTING THE OSCILLATOR

TEST OF THE OSCILLATOR

3.01 The voltage and frequency of the oscillator circuit are measured by inserting a cord in the TST jack with a vacuum tube voltmeter and/or frequency meter attached to the cord. Plugging into the TST jack connects a dummy load across the output of the oscillator in addition to giving access to the output leads for the meters.

3.02 The voltage measured by the vacuum tube voltmeter plugged into the TST jack should be 2.2 volts with option X or V provided. With option W provided and the D-39 pack installed, the output voltage is not checked at the TST jack; it is checked at the TP1 test point on the D-39 pack and should read 22 volts. See 3.04 for testing oscillator with the D-39 pack provided. The frequency generated by the oscillator should be 5800 $\pm$5 Hz. When the 72A frequency meter is used for measuring frequency, it should be set for 2900 Hz. If a stationary pattern with two loops is obtained, the oscillator output is exactly on its proper frequency. The oscillator should be adjusted to its proper frequency if a stationary pattern of two loops cannot be obtained at some setting of the frequency meter between 2897.5 and 2902.5 Hz.

3.03 Typical ac and dc voltages with respect to ground are shown in the schematic drawing. These are meant to serve as a guide and variations of $\pm$10 percent from these values can be tolerated without adversely affecting the circuit. In checking voltages throughout the oscillator circuit a high-impedance electron tube voltmeter should be used for ac signals and a meter having a resistance of 20,000-ohms per volt should be used to measure dc voltages. Care should be taken to avoid grounding the emitter terminal of transistor Q3. This terminal is connected to a metal plate which also should not be grounded. Terminals 3, 4, 7, and 8 of transformer T3 should not be grounded because these are connected to the emitter terminal by a low resistance. Grounding of any of these terminals will immediately burn out the transistor.

3.04 The output of the oscillator with the D-39 circuit pack installed (option W provided) is tested by removing the pack from the 912A connector on the oscillator unit. An 804A tool is inserted in the 912A connector and the D-39 pack is inserted in the 804A tool. At TP1 an electron tube voltmeter should read 2.2 volts.

ADJUSTMENT PROCEDURE

3.05 With option X or V provided the voltage of the oscillator may be set by adjusting the V potentiometer until the voltage at the TST jack reads 2.2 volts.

3.06 With option W provided remove the D-39 circuit pack from the 912A connector and connect an electron tube voltmeter to the TST jack. Adjust the potentiometer V until the voltage reads 2.0 volts. Remove the voltmeter connection from the TST jack. Insert an 804A tool into the 912A connector and insert the D-39 circuit pack into the 804A tool. Connect the input of the voltmeter to a test point (TP1) on the D-39 circuit pack, connect the ground terminal of the voltmeter to TP2 on the D-39 circuit pack. The voltmeter should read between 2.1 and 2.3 volts. Readjust potentiometer V until the voltmeter reads 2.2 volts. Remove the 804A tool and reinsert the D-39 circuit pack into the 912A connector on the oscillator unit. The output voltage at TP1 should be zero volts.

3.07 The frequency is adjusted by tuning of the N1 network. The N1 network is adjusted, or tuned, by inserting an adjusting tool in the hole provided for access at the end of the network and turning the screw inside until the frequency meter shows a frequency of 5800 Hz. When the 72A frequency meter is used, it should be set for 2900 Hz. Then adjust the network until the pattern that has two loops wide and one loop high appears on the display tube. Be sure to provide ample time for warm up of the frequency meter.

SECTION III - REFERENCE DATA

WORKING LIMITS

1.01 Voltage Limits

Voltage	Min	Max
-48	-45	-50

2. FUNCTIONAL DESIGNATIONS

2.01 None.

3. FUNCTIONS

3.01 To provide a 5800-Hz, 2.2-volt signal to the sleeve of the trunk.

3.02 To provide a low-resistance ground to hold the switches in the switch train.

3.03 When oscillator circuits are supplied in pairs each one is arranged to function with one of the two identifiers in an identifier group. However, if one oscillator circuit is made busy the other will serve both identifiers.

4. CONNECTING CIRCUITS

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

(a) Panel System - ANI MF Outgoing Trunk - SD-21972-01.

(b) Panel System - ANI PCI Outgoing Trunk - SD-21974-01.

(c) Crossbar System No. 1 - ANI MF Outgoing Trunk - SD-26209-01.

(d) Crossbar System No. 1 - PCI Outgoing Trunk - SD-26210-01.

(e) Step-by-Step System - ANI Outgoing Trunk - E and M leads Signaling - SD-32244-01

(f) Step-by-Step System - ANI outgoing Trunk - Loop Pulsing - SD-32245-01.

(g) Step-by-Step System - ANI Line Verification Circuit - SD-32246-01.

(h) Identifier Circuit for Use with No. 1 AMARC and Toll (Step-by-Step Offices) - SD-1C593-01.

(i) Panel and Crossbar No. 1 Systems - Permanent Signal Identification Circuit - SD-95817-01.

(j) Panel and Crossbar No. 1 Systems - Line Verification Connector and Display Circuit - SD-95828-01.

(k) Call Data Accumulator (CDA) Miscellaneous Circuit for use with No. 1 AMARC - SD-32558-01.

(l) Panel System - Trunk Finder and Outgoing Trunk Circuit - SD-21560-01.

(m) Common Systems - Auxiliary Circuit - ANI-B for CLI - SD-1C208-01.

5. MANUFACTURING TEST REQUIREMENTS

5.01 The oscillator circuit shall be capable of performing the functions listed in this Circuit Description and shall meet the requirements listed in the Circuit Requirements table and in the Circuit Notes.

5.02 In addition, the output voltage shall be adjustable, using the V potentiometer, from 0 to 3.5 volts with an 85-ohm load resistance connected between terminals 2 and 5 of the T3 transformer. When making this measurement, there should be no plug in the TST jack. The high side of the voltmeter should be connected to terminal 2 of transformer T3 with the other side of the voltmeter connected to terminal 5.

5.03 With the output voltage adjusted by the standard adjustment specified in 3.05 through 3.07, the voltage should not drop below 2.16 volts with the 85-ohm load described in the above paragraph and no plug in the TST jack. With no plug in the test jack and no load across the transformer, the voltage across the T3 transformer should read approximately 2.6 volts with the oscillator adjusted in accordance with the standard adjustment.

6. TAKING EQUIPMENT OUT OF SERVICE

6.01 When the oscillator circuit is to be removed from service for calibration or repair, insert a plug in the associated make-busy jack.

SECTION IV - REASONS FOR REISSUE

B. Changes in Apparatus

B.1 Added in App Fig. 1

Circuit Pack

OSC - D-39 - Option W

B.2

Superseded	Superseded By
All 145A Resistors - FS1, App Fig. 1	All KS-20810,L1A Resistors - FS1, App Fig. 1
MB 469B Jack - FS1, App Fig. 1	MB 469A Jack - FS1, App Fig. 1
TST 241C Jack - FS1, App Fig. 1	TST 241CM Jack - FS1, App Fig. 1

D. Description of Changes

D.1 In FS1 options V, W, X are added. In App Fig. 1 the OSC relay and network, previously not designated, are designated option X. In CAD 1 option V has been added.

D.2 Circuit Notes 102, 104, and 106 have been revised and Equipment Note 203 has been added.

D.3 The CPS D-39 has been added.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5245-LCB

WE DEPT 367-WCR-EER-PN