CD-32374-01
ISSUE 3B
APPENDIX 9B
DWG ISSUE 16B
DISTN CODE 1D99

STEP-BY-STEP SYSTEMS NO. 1, 350A, 355A OR 35E97 NUMBER NETWORK AND IDENTIFIER CIRCUIT FOR USE WITH AUTOMATIC NUMBER IDENTIFICATION - TYPE C WITH OR WITHOUT TIME-SHARING IDENTIFIER AND CONTROL CIRCUIT AND CLASS DECISION CIRCUIT FOR USE WITH CALL DATA ACCUMULATOR

CHANGES

A. Changed and Added Functions

A.01 This circuit is changed to show connection to the mini-CDA circuit.

D. Description of Changes

D.01 This circuit is changed to provide connection to the Mini-Call Data Accumulator Circuit, SD-32565-01, for use in step-by-step offices equipped with ANI-C or D. The new mini-CDA is especially designed for smaller offices of up to 120 line finder first selector circuits. The connection to the mini-CDA precludes connection to all four of the circuits of the larger CDA: SD-32554-01, SD-32555-01, SD-32557-01, and SD-32558-01, which should tend to simplify its application. The new connections are shown in FS 9 and FS 10. Note 112 is added to document its application on this issue and is included in Note 104. CADs 5, 6, and 7 are changed also.

D.02 A minor correction to the title of the call data accumulator ID relay selector circuit is made on sheet A3. The ST lead of this circuit is not shown as a connection to the mini-CDA.

F. Changes in CD SECTION III

F.01 Under 4. CONNECTING CIRCUITS, add the following:

(k) Mini-Call Data Accumulator Circuit - SD-32565-01.

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DEPT 55212-NAR

AT&T NETWORK SYSTEMS
DEPT 62790-WCR-WEA-TRB

STEP-BY-STEP SYSTEMS
NO. 1, 350A, 355A OR 35E97
NUMBER NETWORK AND IDENTIFIER CIRCUIT
FOR USE WITH
AUTOMATIC NUMBER IDENTIFICATION - TYPE C
WITH OR WITHOUT TIME-SHARING IDENTIFIER
AND CONTROL CIRCUIT AND CLASS DECISION
CIRCUIT OR USE WITH
CALL DATA ACCUMULATOR

CHANGES

A. Changed and Added Functions

A.01 This circuit is arranged to operate with the CDA 2-way auxiliary line circuit to provide a 100 number network group for billing Feature Group A (FGA) lines.

D. Description of Changes

D.01 For use with ANI-AMARS, this circuit is changed to provide a means of detail billing common carrier access via Feature Group A (FGA) lines by the CDA and No. 1A AMARC. The change provides for an assignment of a special theoretical 100 number group that is cabled to a distributing frame, but is not associated with a connector multiple, for cross-connection as S--(00-99) leads to ANI-leads. These ANI- leads are connected to the CDA 2-Way Auxiliary Line Circuit, SD-32563-01. This arrangement provides the CDA with a means of identifying the line while also enabling it to distinguish between calls that originate from a FGA line and those that terminate to the same line. The special theoretical 100 numbers will be assigned by telco on a service order basis using an existing office code and an unassigned 100 number group that may be available for FGA billing purposes.

D.02 For the new FGA feature, Circuit Notes 102 and 104 are changed and Note 111 is added. Equipment Note 211 is added. Information Note 304 is changed to include the CDA 2-way auxiliary line circuit in the diagram. Note 307 is added to reference the S--(00-99) leads, their assignment, and verification methods available to test the FGA feature. Cross Connection Note 423 is added for the method of cross-connecting the FGA feature. Sequence Chart SC 1 is updated with an added sheet Note 4 to reference the use of the CDA 2-way auxiliary line circuit with the new feature. CDA 1 is modified to show the HIDF or HCDF cabling between the number network and the CDA 2-way auxiliary line circuit.

F. Changes in CD Sections

F.01 In SECTION I under 1. PURPOSE OF CIRCUIT, add the following:

1.07 For use with ANI-AMARS, a CDA 2-way auxiliary line circuit may be provided for use with a special 100 number network group, not associated with any connector multiple, to identify calls on both originating and terminating Feature Group A (FGA) lines for detail billing of common carrier access customers. The special 100 number groups and cross connects are specified on telco service orders.

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F.02 In SECTION II under 11. 200 NUMBER UNIT FS7, add the following:

11.03 For use with ANI-AMARS, detail billing of common carrier access vis Feature Group A (FGA) lines can be done by the CDA and the No. 1A AMARC. A special telco assignment of a 100 number network unit in an existing office code must be available or provided which has its S-- leads cabled to a HCDF or HIDF, not associated with a connector multiple, for cross connection as S--(00-99) to ANI- leads for the CDA 2-way auxiliary line circuit. This arrangement provides the CDA a means of both identifying the lines and enabling it to also distinguish between either calls originating from or terminating to a FGA line. On the network unit selected, the same number treatment cross-connect is provided as on any ANI-AMARS individual measured rate line for AMARS service (NT- to IM per Note 413, see also Note 423).

F.03 In SECTION III under 3. FUNCTIONS, add the following:

3.13 To provide a special 100 number network group for billing Feature Group A (FGA) lines using the CDA 2-way auxiliary line circuit.

F.04 In SECTION III under 4. CONNECTING CIRCUITS, add the following:

(j) CDA 2-Way Auxiliary Line Circuit - SD-32563-01.

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DEPT 55212-NAR

WE DEPT 62810-WCR-JCR-LEV

2169

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AMERICAN TELEPHONE AND TELEGRAPH COMPANY

295 NORTH MAPLE AVENUE
BASKING RIDGE, NEW JERSEY 07920

DRAWING NOTICE

TITLE
STEP BY STEP SYSTEMS
NO. 1, 350A, 355A OR 35E97
NUMBER NETWORK AND IDENTIFIER CIRCUIT
FOR USE WITH
AUTOMATIC NUMBER IDENTIFICATION-TYPE C
WITH OR WITHOUT TIME-SHARING IDENTIFIER
AND CONTROL CIRCUIT AND CLASS DECISION
CIRCUIT FOR USE WITH CALL DATA
ACCUMULATOR

SD-32374-01 ISSUE 14B
CD ISSUE 3B APPX 7B ADD.
RATING AT&TCO STD (A&M ONLY FOR
SYSTEM STEP BY STEP 350A &
35E97)
DATE
DRAWING DISTRIBUTION CODE: 1D99
CLEI BASIC CODE:

DESCRIPTION

6.1 COMPONENT ASSEMBLY REMOVED

(a) FUNCTIONAL DESCRIPTION OF CHANGE: This change is required only in offices which provide two party service and ANI-AMARS. The PLS and APC leads to FS 8 (Party Discrimination Control) and App. Fig. 9 are rated Mfr. Disc.

(b) EXTENT OF CHANGE: The Party Discrimination Control component assembly (ED35020-( ) is removed

(c) EQUIPMENT INFORMATION: affected, covered by WE drawing J38941F-( )

(d) EQUIPMENT DESIGN REQUIREMENTS: not affected

(e) TRANSMISSION: not affected

(f) TRAFFIC: not affected

6.2 This change covers only: design improvement - no added service, testing, or maintenance features.

6.3 SUPPLEMENTARY INFORMATION

(a) DIRECT CURRENT DRAIN DATA: is not affected

(b) ALTERNATING CURRENT DRAIN DATA: is not affected

6.4 AFFECTED SHEETS

(a) REISSUED: A1, A4, B3, B5, C3, D1, G2, G3

(TOTAL REISSUED: 8)

10-4-83 CP 2169

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DRAWING NOTICE

TITLE
STEP BY STEP SYSTEMS
NO. 1, 350A, 355A OR 35E97
NUMBER NETWORK AND IDENTIFIER CIRCUIT
FOR USE WITH
AUTOMATIC NUMBER IDENTIFICATION-TYPE C
WITH OR WITHOUT TIME-SHARING IDENTIFIER
AND CONTROL CIRCUIT AND CLASS DECISION
CIRCUIT FOR USE WITH CALL DATA
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SD-32374-01 ISSUE 14B
CD ISSUE 3B APPX 7B ADD.
RATING AT&TCO STD (A&M ONLY FOR
SYSTEM STEP BY STEP 350A & 35E97)
DATE
DRAWING DISTRIBUTION CODE: 1D99
CLEI BASIC CODE:

DESCRIPTION

6.1 COMPONENT ASSEMBLY REMOVED

(a) FUNCTIONAL DESCRIPTION OF CHANGE: This change is required only in offices which provide two party service and ANI-AMARS. The PLS and APC leads to FS 8 (Party Discrimination Control) and App. Fig. 9 are rated Mfr. Disc.

(b) EXTENT OF CHANGE: The Party Discrimination Control component assembly (ED35020-( ) is removed

(c) EQUIPMENT INFORMATION: affected, covered by WE drawing J38941F-( )

(d) EQUIPMENT DESIGN REQUIREMENTS: not affected

(e) TRANSMISSION: not affected

(f) TRAFFIC: not affected

6.2 This change covers only: design improvement - no added service, testing, or maintenance features.

6.3 SUPPLEMENTARY INFORMATION

(a) DIRECT CURRENT DRAIN DATA: is not affected

(b) ALTERNATING CURRENT DRAIN DATA: is not affected

6.4 AFFECTED SHEETS

(a) REISSUED: A1, A4, B3, B5, C3, D1, G2, G3

(TOTAL REISSUED: 8)

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AMERICAN TELEPHONE AND TELEGRAPH COMPANY
295 NORTH MAPLE AVENUE
BASKING RIDGE, NEW JERSEY 07920

02036

DRAWING NOTICE

TITLE
STEP-BY-STEP SYSTEM
NO. 1, 350A, 355A, OR 35E97
NUMBER NETWORKS AND IDENTIFICATION
CIRCUIT
FOR USE WITH
AUTOMATIC NUMBER IDENTIFICATION
TYPE C
WITH OR WITHOUT TIME SHARING IDENTIFIER
AND CONTROL CIRCUIT AND CLASS DECISION
CIRCUIT FOR USE WITH CALL DATA ACCUMULATOR

SD-32374-01 ISSUE 12B
CD ISSUE 3B APPX 5B ADD.
RATING AT&TCO STD A&M ONLY FOR
SYSTEM STEP-BY-STEP 350A & 35E97

DATE APR 03 1981
DRAWING DISTRIBUTION CODE: 1D99
CLE BASIC CODE:

DESCRIPTION

6.1 CIRCUIT IMPROVEMENT

(a) FUNCTIONAL DESCRIPTION OF CHANGE: This change is made to bring this circuit into agreement with Issue 5AC of the call data accumulator identification relay selector circuit. This change reduces the excessive wiring between this circuit and the Call Data Accumulator SD-32557-01).

(b) EXTENT OF CHANGE: This change brings this circuit into agreement with Issue 5AC of the Call Data Accumulator & reduces the number of leads between this circuit and CDA (SD-32557-01).

(c) COORDINATING CIRCUIT CHANGES: None

(d) EQUIPMENT INFORMATION: not affected

(e) EQUIPMENT DESIGN REQUIREMENTS: not affected

(f) ENGINEERING COMPLAINT: No. none

(g) TRANSMISSION: not affected

(h) TRAFFIC: not affected

6.3 This change covers only design improvement - no added service, testing, or maintenance features.

6.4 SUPPLEMENTARY INFORMATION

(a) DIRECT CURRENT DRAIN DATA: is not affected

(b) ALTERNATING CURRENT DRAIN DATA: is not affected

6.5 AFFECTED SHEETS

(a) REISSUED: A1, A4, B6, D1, G4 (TOTAL REISSUED: 5)

CIRCUIT DESCRIPTION

13

CD-32374-01
ISSUE 3B
APPENDIX 5B
DWG ISSUE 12B
DISTN CODE 1D99

STEP-BY-STEP SYSTEMS
NO. 1, 350A, 355A OR 35E97
NUMBER NETWORK AND IDENTIFIER CIRCUIT
FOR USE WITH
AUTOMATIC NUMBER IDENTIFICATION - TYPE C
WITH OR WITHOUT TIME-SHARING IDENTIFIER
AND CONTROL CIRCUIT AND CLASS DECISION
CIRCUIT FOR USE WITH CALL DATA ACCUMULATOR

CHANGES

D. Description of Changes

D.01 This change is made to bring this circuit into agreement with Issue 5AC of the call data accumulator identification relay selector circuit. This change reduces the excessive wiring between this circuit and the Call Data Accumulator, SD-32557-01.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 55213-DAJ

WE DEPT 45240-JME-JTT-CLC

CIRCUIT DESCRIPTION

APR 4 1980
gmg

CD-32374-01
ISSUE 3B
APPENDIX 4B
DWG ISSUE 11B
DISTN CODE 1D99

STEP-BY-STEP SYSTEMS
NO. 1, 350A, 355A OR 35E97
NUMBER NETWORK AND IDENTIFIER CIRCUIT
FOR USE WITH
AUTOMATIC NUMBER IDENTIFICATION - TYPE C
WITH OR WITHOUT TIME-SHARING IDENTIFIER
AND CONTROL CIRCUIT AND CLASS DECISION
CIRCUIT FOR USE WITH
CALL DATA ACCUMULATOR

CHANGES

D. Description of Changes

D.01 Connecting information for ROTL is provided. Note 422 on sheet D1 is added.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5242-DAJ

WE DEPT 45830-JME-WEA-MAF

CIRCUIT DESCRIPTION

APR 4 1980
gmG

CD-32374-01
ISSUE 3B
APPENDIX 3AR
DWG ISSUE 10AR
DISTN CODE 1D99

STEP-BY-STEP SYSTEMS
NO. 1, 350A 355A or 35E97
NUMBER NETWORK AND IDENTIFIER CIRCUIT
FOR USE WITH
AUTOMATIC NUMBER IDENTIFICATION - TYPE C
WITH OR WITHOUT TIME-SHARING IDENTIFIER
AND CONTROL CIRCUIT AND CLASS DECISION
CIRCUIT FOR USE WITH
CALL DATA ACCUMULATOR

CHANGES

D. Description of Changes

D.01 In order to correct a condition that caused the AMARS LED display to be unstable during line verification tests of subscriber lines. The CLK- and LV-CLK leads shown on SD- sheets B5, 7, 8, and 9 have been shielded.

D.02 Note 53 on ED-32342-30 has been clarified. This ED- drawing covers a method of providing number network illumination.

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DEPT 5242-DAJ

WE DEPT 45830-JME-WEA-MAF

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OCT 31 1975

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
195 BROADWAY, NEW YORK, N.Y. 10007

DRAWING NOTICE

MAR 26 1975

TITLE Step-by-Step Systems - No. 1, 350A, 355A or 35E97 - Number Network and Identifier Circuit - For Use With - Automatic Number Identification - Type C - With or Without Time-Sharing Identifier - and Control Circuit and Class Decision - Circuit for Use With - Call Data Accumulator

SD-32374-01 ISSUE 9B
CD ISSUE 3B APPX 2B ADD.
RATING AT&TCo Standard - A&M Only for 350A and 35E97
SYSTEM SXS
DATE
DRAWING DISTRIBUTION CODE: 1D99

DESCRIPTION

6.1 Project: None

6.2 Reissued sheets: A1, C1, C2, D1, D5
(Total reissued sheets: 5)

6.3 This change for TELCO consideration is to correct a trouble condition.

6.31 During manufacture, installation and testing of this circuit, the number networks could become shorted due to the neon lamp cluster mounting terminals being bent. This problem was caused by lack of space tolerance between the cluster and the terminals.

6.4 The (S-) resistor (KS-13490,L1) is rerated to Manufacture Discontinued and is replaced by an (S-) resistor (KS-16645,L1), rated Standard in App. Figs. 1 and 6. The new, smaller diameter resistor provides the neon lamp cluster with the proper tolerance in relation to the mounting terminals.

6.5 Reference to the resistor change is added to App. Figs. 1 and 6 and in Note 104.

6.6 This B change does require WECO notification to TELCO.

6.7 Direct Current Drain Data is not affected by this issue.

6.8 Equipment information is affected and will be covered by WECO drawings ED-32324-( ), J38941C-( ) and J38941E-( ) which will be available about 2Q75.

6.9 Equipment Design Requirements are not affected.

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DRAWING NOTICE

SD-32374-01 ISSUE 8AR
CD 3B APP. 1A
RATING AT&TCo Std. A&M only
SYSTEM for 350A and 35E97
DATE FEB 26 1975
DWG. DIST. CODE: 1D99

TITLE

Step-By-Step Systems - No. 1, 350A, 355A or 35E97 - Number Network and Identifier Circuit - For Use With - Automatic Number Identification - Type C - With or Without Time-Sharing Identifier - and Control Circuit and Class Decision - Circuit For Use With - Call Data Accumulator

DESCRIPTION

6.1 Project: AMARS No. 1 AMA Recording System

6.2 Reissued sheets: A1, A3, B4-B9, D3, D6, G2-G5
(Total reissued sheets: 14)
Added sheets: D7
(Total added sheets: 1)

6.3 This change requires coordination with other circuits, specifically: SD-35026-01, Circuit Pack Schematic; SD-32379-01, Test and Line Verification Circuit

6.4 This change for TELCO consideration is to correct a trouble condition.

6.41 The time-share identifier sends outputs to an LED display on the test and line verification circuit when a line verification of an individual service subscriber is requested. Individual Measured and Individual Flat indications were not present. Noise pulses from the ANI equipment could cause the LED outputs to change state or disappear, giving inaccurate information readings.

6.5 New wiring is added to supply the Individual Flat and Individual Measured indications to the test and line verification display.

6.6 The wiring for battery-groung and line verification clock leads in the time-share identifier is revised to provide additional noise immunity during line verification.

6.7 Note 421 is added to clarify the use and programming of service mark.

6.8 The title of this drawing is changed to omit reference to the No. 1 AMA Recording System.

6.9 This change affects plug-in devices containing a circuit arrangement, such as a Trunk Unit, Amplifier, Gate, etc., and may require TELCO to notify WECO as to the number and location of devices to be changed.

6.10 Direct Current Drain Data is affected by this issue but is negligible.

6.11 Equipment information is not affected.

6.12 Equipment Design Requirements are not affected.

STEP-BY-STEP SYSTEMS
NO. 1, 350A, 355A OR 35E97
NUMBER NETWORK AND IDENTIFIER CIRCUIT
FOR USE WITH
AUTOMATIC NUMBER IDENTIFICATION-TYPE C
WITH OR WITHOUT TIME-SHARING IDENTIFIER
AND CONTROL CIRCUIT AND CLASS DECISION
CIRCUIT FOR USE WITH
CALL DATA ACCUMULATOR

CHANGES

B. Changes in Apparatus

B.1 Superseded	Superseded By
(S-) resistor, KS 13490L1, App. Fig. 1 + 6	(S-) resistor, KS 16645L1, App. Fig. 1 + 6

D. Description of Changes

D.1 The (S-) resistor in App. Figs. 1 + 6 (KS 13490 L1) is rerated to MFR. DISC. and is replaced by a KS 16645 L1 resistor as standard. This change is made on a line-out basis to allow for a smaller network lamp cluster. This smaller cluster will reduce neon lamp shorting due to bent terminals on the number network unit.

D.2 Reference to this replacement is added to App. Fig. 1 and 6 and circuit note 104.

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DEPT 5245 - HNS
WECO DEPT 5152-JMS-WEA

STEP-BY-STEP SYSTEMS
NO. 1, 350A, 355A OR 35-E-97
NUMBER NETWORK AND IDENTIFIER CIRCUIT
FOR USE WITH
AUTOMATIC NUMBER IDENTIFICATION - TYPE C
WITH OR WITHOUT TIME-SHARE IDENTIFIER
AND CONTROL CIRCUIT AND CLASS DECISION
CIRCUIT FOR USE WITH CALL DATA ACCUMULATOR

Changes

A. Changed and Added Functions

A.1 This circuit will supply indications of individual flat or individual measured rate customers to the Test and Line Verification Circuit when an ANI-AMARS line verification occurs.

D. Description of Changes

D.1 New wiring is added to this drawing to provide individual flat and individual measured party indications to the Line Verification Circuit.

D.2 The wiring for battery-ground and line verification clock leads is revised to provide noise immunity during line verification.

D.3 Note 421 is added to clarify the suggested use of service marks and their cross-connections.

D.4 The title of this drawing is changed to omit reference to the No. 1 AMA Recording System.

D.5 Change CAD's 5 and 6.

F. Changes in CD Sections

F.1 Add to Section 17.03 as follows:

CPS A5 generates an output on the VMR lead to light the MR diode at the Test and Line Verification Circuit to show a measured rate party.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5245-LCB
WECO DEPT 5152-JMS-WEA

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AMERICAN TELEPHONE AND TELEGRAPH COMPANY
195 BROADWAY, NEW YORK, N.Y. 10007

DRAWING NOTICE

SD-32374-01 ISSUE 7B
CD 3B APP.
RATING AT&TCO Standard
SYSTEM SXS
DATE April 10, 1974
DWG DIST CODE: 1D99

TITLE

Step-By-Step Systems - No. 1, 350A, 355A Or 35E97 - Number Network and Identifier Circuit - For Use With - Automatic Number Identification - Type C - With Or Without Time Sharing - Identifier and Control Circuit - And Class Decision Circuit For Use With - Call Data Accumulator In The No. 1 A.M.A. Recording System

DESCRIPTION

6.1 PROJECT: Automatic Message Accounting Recording System (AMARS)

6.2 Reissued sheets: A1-A4, B1-B3, C1, C2, D1, D2, D5, E1, F1, G1-G6
(Total reissued sheets: 20)
Added sheets: B4-B9, C3, D3, D4, D6, G7
(Total added sheets: 11)

6.3 This change requires coordination with another circuit, specifically: Line Identifier and Control Circuit - SD-32556-01

6.4 This change for TELCO consideration is to add a feature.

6.41 Provisions are added to make this circuit function as a part of the No. 1 AMA Recording System by the time-shared operation and identification of the number networks for local calling number identification with the ANI-C System.

6.5 Option Y is designated and rated Standard as the basic toll ANI system apparatus and wiring. Option X is added and rated Standard as a means of extending information to the call data accumulator circuitry for local billing purposes.

6.51 FS1 is designated as the toll ANI 200 number network using App. Figs. 1 and 2. FS3 is changed with the addition of Options X and Y. FS4 is changed with Options X and Y.

6.52 A new FS7 is added as an ANI-AMARS 200 number network unit using App. Figs. 1 and 8. FS8, FS9, FS10 and FS11 are added on this issue as the AMARS class decision, identifier, power supply and party discrimination control.

6.6 Notes 401, 403, 408 and 411 are rerated to Manufacture Discontinued and are replaced by Notes 413, 414, 415 and 416. Information is added to Notes 101 and 104. Notes 107, 304, 305, 306, 417, 418 and 419 are added on this issue.

6.7 The circuit title is changed to show the new number network functions in the AMARS System. The Supporting Information Table and Options Used Table are also modified.

6.8 This B change does require WECO notification to TELCO.

6.9 Transmission is not affected by changes in this issue.

6.10 Direct Current Drain Data will be available about 2Q74.

6.11 Direct Current Drain Data is affected by this issue and is covered on this drawing.

6.12 Equipment information is affected and will be covered by WECO drawings J38941A, B, C, D, F which will be available about 1Q74.

6.13 Equipment Design Requirements will be available about 4Q74 in J38941, BSP Section 814-203-150, Issue 2, Addendum 3.

8

STEP-BY-STEP SYSTEMS
NO. 1, 350A, 355A, OR 35-E-97
NUMBER NETWORK AND IDENTIFIER CIRCUIT
AUTOMATIC NUMBER IDENTIFICATION - TYPE C
WITH OR WITHOUT TIME - SHARING
IDENTIFIER AND CONTROL CIRCUIT
AND CLASS DECISION CIRCUIT FOR USE WITH
CALL DATA ACCUMULATOR IN THE
NO. 1 AMA RECORDING SYSTEM

MAR 26 1974

TABLE OF CONTENTS

SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 This circuit is part of a system which provides automatic identification of directory numbers assigned to individual and 2-party lines, recognizes calls from 4-party and multiparty lines, and directs that these calls be operator identified at CAMA. Number treatment information is provided for each directory number during identification.

1.02 Each directory number sleeve has permanently associated with it a number network consisting of one resistor and three glow lamps. The directory number is registered on solid state detectors of the identifier which is common to the installation.

✓1.03 When a request for identification is received from the CAMA office, the outpulser causes a positive pulse to be applied to the ANI trunk sleeve. This pulse passes along the switch train and appears at the number network of the directory number. The glow lamps of this network fire and cause registration of the calling number on the identifier detectors in 2-out-of-5 form. Number treatment information is recorded in the identifier as a service mark. This may be tip, ring, operator identification, or special, depending on the cross-connection of the

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number network being identified.

1.04 The 4-digit directory number plus service mark is passed to the outpulser register relays. The information office code of the calling customer. This and the 4-digit directory number is then transmitted to CAMA.

1.05 When a request for local identification is received from the AMAR system, the call data accumulator causes a positive pulse to be applied at the proper line finder through the sleeve relay trunk. The AMARS pulse passes along the switchtrain and appears at the number network of the directory number. The glow lamps of this network fire and cause registration of the calling number on the time-sharing identifier in a 2-out-of-5 form. Number treatment information is recorded in the class decision circuit and the time-sharing identifier as a service mark. This may be individual flat rate or individual measured rate for AMARS service, or tip, ring, operator identification or special service for non-billable local calls, depending on the cross-connection of the number network being identified.

1.06 The 4-digit directory number plus service mark is passed to the line identification and control circuit. The recorded information is used to derive the 3-digit office code which, with the 4-digit directory number is transmitted to the AMAR Central.

SECTION II - DETAILED DESCRIPTION

1. PHYSICAL DESCRIPTION

1.01 One hundred number networks, representing 100 consecutively-numbered directory numbers with identical thousands and hundreds digits, are grouped into a 100 number unit.

1.02 Two of these 100 number units are mounted side by side with pluggable isolation cards and a cross-connection field in between. Complete isolation of a 200 number unit from the rest of the ANI system can be achieved by removal of the two isolation cards. It is important to note that both isolation cards are required even when only one of the 100 number units is furnished, since wiring paths common to both hundreds appear on each card.

1.03 On the front of each 100 number unit, three cross-connections are required for each directory number. The tens and units cross-connections are bare wire, factory installed straps. In the case of pilot number billing, these straps are removed and cross-connections are placed. Number treatment cross-connections are placed at the time of number assignment.

1.04 Between the two 100 number units is a cross-connection field where the proper thousands and hundreds connections are made for each of the hundred number units. All numbers in a hundred number unit must have the same thousands and hundreds digits. No relation need exist between the thousands and hundreds digits of the left and right units. Service mark cross-connections are made on the same terminal block.

1.05 Resistance networks are mounted near the top of each frame. These are used to convert the digital output of the 200 number units into 2-out-of-5 form for presentation to the detectors. The identifier containing up to 33 detectors is mounted on the top of the first frame below the frame terminal strip. It is common to the installation. The individual detectors are replaceable on a plug-in basis for maintenance.

1.06 Jacks are supplied for a maximum of 11 service mark detectors. Two of these service mark detectors are required for each central office code, one for ring parties and one for tip parties. Additional service mark detectors maybe added as required to a maximum of 11 for special treatment.

1.07 When the ANI system is arranged to identify local calling numbers the required time-share identifier is located at the top of the first frame in two card nests on either side of the first frame terminal strips. The class decision circuit is mounted in a card nest at the top of each number network frame as well as in the nest of the first frame. The power supply also mounts in the first frame. The AMARS party discrimination control circuit is mounted on each frame in the network and party discrimination unit.

2. FUNCTIONAL OPERATION - TOLL IDENTIFICATION

2.01 Assume directory number 949-0123 requires identification and that the number network for this number is in the left one-hundred number unit. Also assume that this number is a nonspecial individual line and that service mark 0 has been assigned to ring party numbers with office code 949.

3. 200 NUMBER UNIT FS1

3.01 Glow lamps NT, T, and U have a dc breakdown voltage of 170 to 200 volts. They act to isolate the common circuitry from the sleeve of the subscriber line circuit. When the 340-volt positive identification pulse appears on the S lead, all three lamps fire in approximately 50 microseconds. The pulse attenuated by resistor S and reduced by the 60 to 70 volt sustaining voltage of the glow lamps appears on the C23, D23, and NT23 punchings. The pulse on D23 is conducted through a cross-connection to the T2 punching, through the isolation network left to the T2 lead of the network circuit (FS2). The pulse on C23 is conducted through a cross-connection to the U3 punching through the isolation network right to the U3 lead of the network circuit (FS2). The pulse on the NT punching passes through a cross-connection to the R punching to the left isolation network where INL 3, 6, 9, and 10 direct it to the THL, HL, and RL punchings. In this case, THL connects to THO, HL to H1, and RL to SMO. This completes the pulse path from the sleeve of directory number 0123 to five input leads of FS2.

4. NETWORK FS2

4.01 As a result of the action in the preceding section, pulse voltages appear on the following input leads of FS2: THO, H1, T2, U3, and SMO. The pulse on the THO leads passes through the THOA and THOB resistors and appears on the inputs of the TH4 and TH7 detectors (FS3). The hundreds, tens, and units networks are identical to the thousands network and in each case, the input is converted to a 2-out-of-5 output. The pulse on the SMO lead is passed through the SMO resistor to the SMO detector. The action of FS1 and FS2 in the described example causes a pulse to be present on nine detector circuits (FS3) TH4, TH7, HO, H1, TO, T2, U1, U2, and SMO.

5. DETECTOR FS3 - (OPTION Y)

5.01 Transistors Q1 and Q2 are PNPN transistors which act as switches. With zero potential base to emitter, they present an open circuit collector to emitter. When 0.3 to 0.9 volt positive is applied to the base, they close a low impedance path from collector to emitter. Once they have switched on, the low impedance state is maintained as long as sufficient collector to emitter current flows, even if the base voltage is removed. With both Q1 and Q2 switched on, a path is closed from ground through the outpulser relay, R4, collector to emitter of Q1, R5, collector to emitter of Q2 to -48 volts operating the outpulser relay. The resistor across the outpulser relay is provided to supply holding current for Q1 and Q2 prior to the buildup of current through the inductance of the outpulser relay winding, Two input pulses are required on a detector to cause operation of the outpulser relay. One as previously explained appears on the base of Q2 of the selected detectors. In addition, all detectors receive a pulse, from the pulse generator through the test circuit, on the PLS lead. R3 and R2 act as a voltage divider to provide the proper base voltage for Q1. Q1 acts as a gate to prevent detector operation at any time other than when an identification pulse is present.

5.02 Gating the detectors in this manner reduces the possibility of false operation due to switching transients on the subscriber line sleeve. If such a transient should occur, coincident with the identification pulse, the outpulser would recognize a failure in its 2-out-of-5 check and make a second attempt. C1 and C2 are used to slow down switching of the transistors to approximately 50 usec so that they will not be switched due to random pickup on the input leads. R4, R5, C4, and C5 prevent false switching of the transistors due to transients on the -48 volts and output lead.

6. PARTY DISCRIMINATION FS4 (OPTION Y)

6.01 On 2-party flat rate lines two number networks are connected to the same subscriber line sleeve. The party discrimination circuit prevents registration of the unwanted directory number but permits registration of the calling party directory number. On 2-party message rate lines the tip number networks are connected to the message register lead rather than the sleeve lead. Therefore the party discrimination feature is not required.

6.02 Capacitor C5 and C6 are charged from -48 volts through L lamp, R6, 12 break RP, 12 break TP, to C5 and C6. Ground is supplied through 2 break RP and 2 break TP. The normal voltage across C5 and C6 is 48 volts without Z option. With Z option, the voltage is 36 volts (the regulation voltage of CR1 and 2). Z option is required if any message rate lines exist in the office in order to prevent the possible firing of any glow lamps when the message register pulse is applied.

6.03 When an ANI call is made the ANI trunk circuit makes party test and determines whether the tip or ring party has made the call. This information is passed to the outpulser and then to the party discrimination circuit FS4 operating the TP relay if the call was placed by the tip party or the RP relay if the call was placed by the ring party. For this explanation assume the ring party placed the call and that RP is operated. Operated RP opens

the charging path to C5 and C6 with battery being opened at contact 12 and ground at contact 2. Contacts 2 and 12 are preliminary break contacts which assures that they are open before any make contacts are closed. A -48 volt battery is then connected through L lamp and 1 make RP to the positive end of C5 and C6. The negative end of C5 and C6 is connected to the TA, TB, TC, and TD punchings through 3, 5, 7, and 11 make of the RP. This action causes -96 volts to be present on punchings TA, TB, TC, and TD (-84 volts with Z option).

6.04 All NT glow lamps (FS1) associated with tip parties are connected to this -96 or -84 volt potential. The path is from NT- punchings to T punching, through INL5 or INR5 to TL or TR punching to SM-punching to FS2 to SMA-punching FS4 to TA, TB, TC, or TD punchings. The T and U glow lamp are connected through FS2 and FS3 to -48 volts as previously described. When an identification pulse appears on the S lead of any of these tip party number networks the NT lamp fires first since the overvoltage on this lamp is 48 volts (36 volts Z option) greater than that on the T and U lamps. Once the NT lamp has fired neither the T nor U lamps can fire since the voltage across their terminals is held below their ionization voltage by the sustain voltage of the NT glow lamp. Since the T and U lamps do not fire the T and U detectors do not operate. The TH, H, and SM detectors are prevented from operating by the -96 or -84 volts held in the NT lamp.

6.05 The calling party directory number, ring party in this example, is identified in the normal manner as previously described.

6.06 On a tip party call the TP relay is operated causing all ring party networks to be shunted down in the manner described above. The tip party is then identified in the normal manner.

7. ONE-WAY ORIGINATING LINE FS5

7.01 The number network for a one way originating line is identical to that used for a regular directory number. A cross-connection must be made on the appropriate distributing frame to connect the S lead to the sleeve of the subscriber line circuit. The NT, C, and D punchings are cross-connected to the similar punchings of a working directory number. When a call is made by a one-way originating line an identification is made of the directory number to which the NT, C, and D punchings are cross-connected. The one-way originating line number network must be on the same frame as the billing directory number because of capacitance limitations on the NT, C, and D cross-connections.

8. SERVICE OBSERVING FS6

8.01 On an observed line, the identification pulse appearing on the subscriber line circuit sleeve, or A lead in the case of a 2-party MR line, is passed through the service observing line circuit and the service observing circuit and appears on one of the leads ORO, ORE, OTO, or OTE. Glow lamp OR or OT fires and causes operation of the SO detector FS3 which operates the SO relay in the outpulser. Detector operation is identical to that previously described for the other detectors. This operation is in addition to the normal directory number identification. Four leads ORO, ORE, OTO, and OTE are supplied, even though two would be sufficient, in order to prevent need for modification of the service observing circuit which was arranged for use with ANI type B.

9. OPERATOR IDENTIFICATION

9.01 When it is desired to have a customer line operator identified, such as on multi-party lines, the NT punching is connected to OI. The tens, units, and OI detectors operate as previously described. No thousands or hundreds detectors operate. Resistor A acts as a load to replace that of the TH and H detectors which are not connected on this type of call. The operated OI detector signals the outpulser on the OI lead and the outpulser transmits the proper information to CAMA requesting operator identification. The operated tens and units detectors cause the operation of similarly designated relays in the outpulser but they provide no useful function since the outpulser ignores all other registration when operator identification is requested.

10. FUNCTIONAL OPERATION - LOCAL IDENTIFICATION

10.01 Assume directory number 949-0123 requires a local call identification, and that this number is an individual line requiring a measured rate timing of local calls. Assume that service mark 0 is assigned to ring parties of the 949 office code and that the 949 office code is assigned as SPC2 in the AMARS identifier and control circuit (FS10).

11. 200 NUMBER UNIT FS7

11.01 Circuit operation of the glow lamps is the same as described in section 3.01, with the tens and units pulses connected through the isolation net (FS8) to the network circuit (FS2). However, the NT- lead cross-connects to the NT program-

ming buss IM, which connects to the IM punching on the left isolation network where it connects to an input of photodetector LIC1, protected from reverse voltage by INL11. Photodetector LIC1 conducts and the pulse is passed to INL12, 9 and INL 10 to provide thousands and hundreds digits and INL3 to the service mark cross connect IML, which is programmed to any service mark of the 949 office code. The service mark cross-connection should follow the rules for toll identification; therefore the number in this example would be programmed to SMO. Thus, the TH0, H1, T2, U3 and SMO leads are obtained.

11.02 The conduction of photodetector LIC1 causes an output signal from the phototransistor side. This output is used to send information to the class decision circuit over the IS- leads. In the example, photodetector LIC1 transmits an output via the IS1L lead.

12. CLASS DECISION CIRCUIT FS9

12.01 This circuit receives inputs from the photodetectors in a frame on the IS1L lead causes a reversal on the MR-MRA lead pair.

13. NETWORK FS2

13.01 The network performs as described earlier in Section 4.01 with outputs occuring on the TH4, TH7, H0, H1, T0, T2, U1, U2 and SMO leads.

14. DETECTOR FS3 (OPTION X)

14.01 The input leads connect through external resistors (option X) to the detectors which receive the information pulses. However, the gate pulse which normally operates the Q1 transistor is not supplied, thus preventing the operation of all detectors. The external resistors connect the input signals from the detectors to FS10.

15. PARTY DISCRIMINATION FS4 (OPTION X) AND CONTROL CIRCUIT FS8

15.01 When a customer sleeve is being monitored for local billing purposes) any party discrimination from the toll billing system must be disabled. The party discrimination control (FS8) is operated by the toll gate pulse applied to the detectors during a toll call (see sections 5.01, 5.02 and 14.01).

15.02 The toll gate pulse appears on the input diode CR1, which prevents any noise impulses from feeding back to the FS3 gating transistors. Resistors R1 and R2 form a voltage divider to provide the proper base voltage for Q1 while capacitor C2 slows the Q1 transistor switching time to appromimately 50 microseconds. The output of Q1 is protected by the R3 load resistor and capacitor C1 from transients generated on the -48 volts and output leads.

15.03 The toll gating pulse operates the party discrimination control which connects -48 volts to the C5 and C6 capacitors thru the TP and RP relay make contacts (FS4) in order to generate the -96 volt (84 volts with Z option) for toll party discrimination. On a local AMARS call, the party discrimination control does not operate, thus preventing the inhibit voltage.

16. AMARS IDENTIFIER AND CONTROL CIRCUIT FS10 AND POWER SUPPLY FS11

16.01 The AMARS identifier and control circuit (FS10) receives input signals from the FS3 detector external resistors (option X). The service mark signals connect to CPS A4 where they are converted to 5 volt logic levels and connected to the cross-connect field of CPS A1 as SMB signals. In the example, SMO enters CPS A4 to be processed into the SMB0 lead, which is cross-connected to SPC2 on the CPS A1 board. (see section 10.01). The SPC2 punching connects to CPS A2 as an input used to determine the calling subscriber office code for the call data accumulator.

16.02 The four CPS A3 boards are used for the processing of the thousands, hundreds, tens and units digits. Each of the four boards receives the standard 2-out-of-5 inputs for their respective digit and processes the information into a useable form for the call data accumulator.

16.03 The CPS A6 board develops the timing and gating pulses necessary for the proper operation of the other CPA- borads. The power supply converts the -48 volt input into the +5 volt logic level voltage for all CPA- boards and for the isolation net (FS8).

17. CALL PROCESSING/LINE VERIFICATION

17.01 The external resistor of the SMO detector reflects a signal on the SMO-SMOA input leads to CPS A4, causing a high output on the SMB0 lead. SMB0 cross-connects to SPC2 on CPS A1 to connect the signal on the SPC2 lead to CPS A2. The TH4, TH7, H0, H1, T0, T2, U1 and U2 resistors connect their signals to the four CPS A3 boards.

17.02 When the FS10 identifier and control circuit is operating in a call processing mode, lead reversals occur on the CPS A2 and the four CPS A3 boards to indicate the calling number to the call data accumulator. For the giver example, the reversals occur on the OF2-OF2A pair from CPS A2, the TH4-TH4A and TH7-TH7A pairs from CPS A3 thousands, H0-H0A and H1-H1A from CPS A3 hundreds, T0-T0A and T2-T2A from CPS A3 tens and the U1-U1A and U2-U2A pairs on CPS A3 units. The class decision circuit also operates (see section 12.01).

17.03 When the identifier is in a line verification mode, various outputs from the CPS A2 and the four CPS A3 boards will shift from high (+5 volts) to low (ground). These shifted outputs will operate on LED display at the test and line verification circuit. In the case of the example, grounds would occur on the VOF2 lead from CPS A2, VTH4 and VTH7 leads from CPS A3 thousands, VH0 and VH1 from CPS A3 hundreds, VT0 and VT2 from CPS A3 tens and the VU1 and VU2 leads from CPS A3 units. These indications should match the ANI line verification outputs.

18. CIRCUIT PACK SCHEMATIC DRAWING

18.01 The CPA- boards of FS9 and FS10 are described in detail on the circuit pack schematic which is associated with this drawing.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

NONE

2. FUNCTIONAL DESIGNATIONS

Designation	Meaning
AL	Special Treatment A Left
ALV_	AMARS Line Verification
APC	AMARS Pulse Control
AR	Special Treatment A Right
BL	Special Treatment B Left
BR	Special Treatment B Right
CLK	Clock
FR_, FR_A	Flat Rate Pair
GATE	Gate Pulse
GRF	Ground Removal Failure
H0-9	Hundreds Digit
H0,1,2,4,7	Hundreds Digit
H0A,1A,2A,4A,7A	Hundreds Digit Return
HL	Hundreds Left
HR	Hundreds Right
IF	Individual Flat Rate
IFL	Individual Flat Left
IFR	Individual Flat Right
IM	Individual Measured Rate
IML	Individual Measured Left
IMR	Individual Measured Right
INL	Isolation Network Left
INR	Isolation Network Right
IS_L	Individual Service Left
IS_R	Individual Service Right
LV CLK	Line Verification Clock
MR_,MR_A	Measured Rate Pair
NN	Number Network
OF 0-10	Office Code Mark
OF 0A-10A	Office Code Mark Return
OI	Operator Intercept
PLS	Pulse - Toll
PLS A	Pulse - AMARS
R	Ring
RL	Ring Left
RR	Ring Right
RP	Ring Party
SM	Service Mark
SM 0-10	Service Mark
SM 0A-10A	Service Mark Return
SMB_	Service Mark (Local)
SO	Service Observing
SON	Service Observing Network

Designation	Meaning
SPA	Special Treatment A
SPB	Special Treatment B
SPC	System Process Code
TO-9	Tens Digit
TO,1,2,4,7	Tens Digit
TOA,1A,2A,4A,7A	Tens Digit Return
T	Tip
TL	Tip Left
TR	Tip Right
TP	Tip Party
THO-9	Thousands Digit
THO,1,2,4,7	Thousands Digit
THOA,1A,2A,4A,7A	Thousands Digit Return
THL	Thousands Left
THR	Thousands Right
UO-9	Units Digit
UO,1,2,4,7	Units Digit
UOA,1A,2A,4A,7A	Units Digit Return
VOF 1-9	Verification Office Code Digit
VHO,1,2,4,7	Verification Hundreds Digit
VTO,1,2,4,7	Verification Tens Digit
VTHO,1,2,4,7	Verification Thousands Digit
VUO,1,2,4,7	Verification Units Digit
2PR	Two Party Ring
2PRL	Two Party Ring Left
2PRR	Two Party Ring Right
2PT	Two Party Tip
2PTL	Two Party Tip Left
2PTR	Two Party Tip Right

3. FUNCTIONS

3.01 To recognize a 340-volt 150-usec identification signal on the subscriber line circuit sleeve and to translate this into the calling party directory number for delivery to the outpulser or call data accumulator.

3.02 To deliver a service mark indication dependent on the number treatment cross-connection, to the outpulser or call data accumulator.

3.03 To prevent registration of any information on tip party networks when a call has been originated by a ring party.

3.04 To prevent registration of any information on ring party networks when a call has been originated by a tip party.

3.05 To provide distinctive service mark indications on special lines.

3.06 To recognize lines requiring operator identification and to signal the outpulser on the OI lead.

3.07 To respond to a pulse on the subscriber line sleeve only during the time a gate pulse is present on the PLS or PLSA lead.

3.08 To recognize a line that is being service observed and to signal the outpulser on the SO lead.

3.09 To provide for the identification of a one-way outgoing line as a working directory number.

3.10 To provide for PBX pilot number billing.

3.11 To provide a class decision indication to the call data accumulator for lines requiring local billing.

3.12 To allow line verification comparisons between the toll and local identifiers.

4. CONNECTING CIRCUITS

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

(a) Subscriber Line Circuit - SD-32133-01 (typical).

(b) Pulse Generator Circuit - SD-32378-01.

(c) Test and Line Verification Circuit - SD-32379-01.

(d) Outpulser Circuit - SD-32375-01.

(e) Miscellaneous Circuit Outpulser and Test Frame - SD-32381-01.

(f) Trunk Make Busy Circuit for Limiting Access to PBX - SD-32337-01.

(g) Line Identification and Control Circuit - SD-32556-01.

(h) Circuit Pack Schematic - SD-35026-01.

(i) Service Observing Circuit - SD-90647-01.

5. MANUFACTURING TESTING REQUIREMENTS

5.01 The number network and identifier shall be capable of performing all the service functions specified in this circuit description and meeting all the requirements of the Circuit Requirements Table.

5.02 The local identifier and control circuit and the class decision circuit shall be capable of performing all functions and meeting all requirements set forth in this circuit description and in the circuit pack schematic on which the various packs are detailed.

SECTION IV - REASONS FOR REISSUE

A. Changed and Added Functions

A.1 This circuit has been modified to function as a part of the No. 1 A.M.A. Recording System.

B. Changes in Apparatus

B.1 Added

ATHO,1,2,4,7
AHO,1,2,4,7
ATO,1,2,4,7
AUO,1,2,4,7,ASMO-10
Resistors - Option X
App. Fig. 5

Added (Cont.)
App. Fig. 8
App. Fig. 9
App. Fig 10
App. Fig. 11
App. Fig. 12

D. Description of Changes

D.1 Provisions are made to allow this circuit to function as a part of the No. 1 A.M.A. Recording System by the time-shared identification and operation of the number networks for local calling number identification and billing purposes.

D.2 Option Y is designated and rated standard while option X is added and rated standard for the addition of AMARS equipment to existing circuitry.

D.3 FS7 is added to show a typical 200 number unit for ANI-AMARS Service. This figure shows a new arrangement for NT- lead programming busses and the ANI-AMARS diode isolation cards.

D.4 Existing figures FS3 and FS4 are modified to add options X and Y. Table B is added to FS3 as a sheet note describing the A_ resistors (option X).

D.5 FS8 is added to control the party discrimination inhibit pulse during identification FS9, FS10 and FS11 are added as a means of identifying the subscriber directory number and class of service required for billing purposes.

D.6 Notes 102, 401, 403, 408 and 411 are rerated to Mfr. Disc. and are replaced by notes 107, 413, 414, 415 and 416. Information is added to notes 101, 104, the Supporting Information Box and the Options Used Index. Notes 108, 304, 305, 306, 417, 418, 419, and 420 are added.

D.7 The title of the circuit is changed to include reference to the added functions for AMARS.

NOTE: This reissued circuit description also incorporates all appendixes added to the previous circuit description.

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DRAWING NOTICE

SD-32374-01 ISSUE 6D
CD 2A APP. 3D
RATING AT&TCo Standard
SYSTEM SXS
DATE February 21, 1973
DWG DIST CODE: 1D99

TITLE

Step-By-Step Systems - No. 1, 350A, 355A Or 35E97 - Number Network And Identifier Circuit - Automatic Number Identification - Type C

JUL 5 1973 C

DESCRIPTION

6.1 PROJECT: None

6.2 Reissued sheets: 1, 2, 7, 9, 13, 14
(Total reissued sheets: 6)

6.3 This change for TELCO consideration, is to rate Manufacture Discontinued the connections for service observing to check billing accuracy.

6.31 FS6 and App. Fig. 7 are rated Manufacture Discontinued. A record of this rating is made in Note 104, Record of App. Fig. Changes Table.

6.32 Reference to the above was removed from Note 102, Standard Feature and Option Table and added to Note 106, Manufacture Discontinued Feature and Option Table.

6.33 This change requires the deletion of Observing Network (ED-32317-30, G4).

6.4 This D change does not require WECO notification to TELCO.

6.5 Transmission is not affected by changes in this issue.

6.6 Direct Current Drain Data is not affected by this issue.

6.7 Equipment information is affected and will be covered by WECO drawings J38941D, J38941F which will be available about 3Q73.

6.8 Equipment Design Requirements will be available about 3Q73 in J38941, BSP Section 814-203-150, Issue 2, Addendum 2.

STEP-BY-STEP SYSTEMS
NO. 1, 350A, 355A OR 35-E-97
NUMBER NETWORK AND IDENTIFIER CIRCUIT
AUTOMATIC NUMBER IDENTIFICATION - TYPE C

CHANGES

D. Description of Changes

D.1 Reference to Service Observing is removed from note 102, Standard Feature Option Table, and added to note 106, MD Feature and Option Table.

D.2 FS6 and App. Fig. 7 are rated MD. A record of the rating is made in note 104.

D.3 CAD 5 and 7 are changed in accordance with the change referred to in D.2.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5225-LCB
WECo DEPT 5152-RAF-WEA

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OCT 9 1967

D/L

DRAWING NOTICE

SD-32374-01 ISSUE 5D
CD 2A APP. 2D
RATING AT&TCo. Std.
SYSTEM Step-By-Step
DATE August 1, 1967

TITLE

Step-By-Step Systems - NO.1, 350A, 355A, or 35E97 - NUMBER NETWORK AND IDENTIFIER CIRCUIT - Automatic Number Identification - Type C

DESCRIPTION

6.1 Reissued sheets: 1, 2, 4, 5, 7, 12. Total reissued sheets 6.

6.2 This change is made to provide more information about cross-connections required when this circuit is used in an office arranged for PBX-AIOD.

6.21 This is covered by the addition of Notes 105 and 412 and the modification of Notes 403 and 410 and CAD 1. No apparatus or wiring changes are involved.

6.3 Information within a double line box is FS 3, which shows information on a connecting circuit, is corrected to show schematic information as it is shown on the test and line verification circuit.

6.31 No apparatus, wiring or circuit operation changes are involved.

6.4 The Current Drain Data for this circuit is not affected by changes in this issue.

6.5 D change. Does not require WECo notification to Tel. Co.

6.6 Equipment information is not affected.

6.7 Equipment Design Requirements are not affected.

SEP 15 1967
CD-32374-01
ISSUE 2A
APPENDIX 2D
DWG ISSUE 5D

STEP-BY-STEP SYSTEMS
NO. 1, 350A, 355A, OR 35E97
NUMBER NETWORK AND IDENTIFIER CIRCUIT
AUTOMATIC NUMBER IDENTIFICATION - TYPE C

CHANGES

D. Description of Changes

D.1 Circuit Note 105 is added, Cross-Connection Notes 403 and 410 are modified, and 412 is added to give more information about the cross-connections required when this circuit is used in an office arranged for PBX-AIOD. Reference to Note 412 is added to FS1.

D.2 In FS3, the information within the double line box at 7A2 is corrected to agree with the schematic as it is shown on the test and line verification circuit. This does not affect circuit operation.

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DEPT 5641-RIN-RMW

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SEP 22 1965

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
195 BROADWAY, NEW YORK, N.Y. 10007

DRAWING NOTICE

SD-32374-01 ISSUE 4AR
CD 2A APP. 1AR
RATING AT&TCo Standard
SYSTEM Step-By-Step
DATE June 29, 1965

TITLE

Step-By-Step Systems - No. 1, 350A, 355A Or 35E97 - NUMBER NETWORK AND IDENTIFIER CIRCUIT - Automatic Number Identification-Type C

DESCRIPTION

6.1 Reissued sheets 1, 2, 4, 7, 9, 11, 12, 13, 14.
Total reissued sheets 9.

6.2 This circuit is reissued to add contact protection networks to the windings of the TP and RP relays. Prior to this addition a possibility existed for false operation of the operator identification (OI) detector on first attempt identification failure due to the high surge voltage produced by the release of these relays. This false operation of the OI detector would cause the call to be routed to the operator with a multi party rather than identification failure indication.

6.3 Various notation changes which do no affect circuit operation or manufacture are also included in this reissue.

6.4 The Current Drain Data for this circuit is not affected by changes on this issue.

6.5 Equipment information is not affected.

6.6 Equipment Design Requirements are not affected.

No engineering letter will be issued.

STEP-BY-STEP SYSTEMS
NO. 1, 350A, 355A, OR 35E97
NUMBER NETWORK AND IDENTIFIER CIRCUIT
AUTOMATIC NUMBER IDENTIFICATION - TYPE C

CHANGES

B. Changes in Apparatus

B.1 ADDED

RP 185A network
TP 185A network

D. Description of Changes

D.1 Contact protection networks are added to the TP and RP relay windings to prevent the occurrence of a high-voltage surge at the time either of these relays is released. This surge, if uncontrolled, may cause false operation of the OI detector on a first attempt identification failure.

F. Changes in Description of Operation

F.1 In Section III, 4. CONNECTING CIRCUITS add:

(g) Service Observing Circuit - SD-90647-01.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2364-HRM-JEM

NOV 2 1964

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
195 BROADWAY. NEW YORK 7

DRAWING NOTICE

SD-32374-01 ISSUE 3A
CD 2A APP.
RATING AT&TCo Standard
SYSTEM Step-by-Step
DATE July 23, 1964

TITLE

Step-by-Step Systems - No. 1, 350A, 355A Or 35E97 - NUMBER NETWORK AND IDENTIFIER CIRCUIT - Automatic Number Identification - Type C

DESCRIPTION

6.1 Reissued sheets 1, 6, 7, 8
Total reissued sheets 4

6.2 This circuit is reissued to add a resistor which will prevent false detector operation on operator identified calls and to add equipment notes.

6.3 The Current Drain Data for this circuit is not affected by changes on this issue.

6.4 Equipment information is affected and will be covered by drawing J38941F.

6.5 Equipment Design Requirements are not affected.

An engineering letter will be issued - P.E.L. 7331.

STEP-BY-STEP SYSTEMS
NO. 1, 350A, 355A, OR 35E97
NUMBER NETWORK AND IDENTIFIER CIRCUIT
AUTOMATIC NUMBER IDENTIFICATION - TYPE C

TABLE OF CONTENTS

SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 This circuit is part of a system which provides automatic identification of directory numbers assigned to individual and 2-party lines, recognizes calls from 4-party and multiparty lines, and directs that these calls be operator identified at CAMA. Number treatment information is provided for each directory number during identification.

1.02 Each directory number sleeve has permanently associated with it a number network consisting of one resistor and three glow lamps. The directory number is registered on solid state detectors of the identifier which is common to the installation.

1.03 When a request for identification is received from the CAMA office, the outpulser causes a positive pulse to be applied to the ANI trunk sleeve. This pulse passes along the switch train and appears at the number network of the directory number. The glow lamps of this network fire and cause registration of the calling number on the identifier detectors in 2-out-of-5 form. Number treatment information is recorded in the identifier as a service mark. This may be tip, ring, operator identification, or special, depending on the cross-connection of the number network being identified.

1.04 The 4-digit directory number plus service mark is passed to the outpulser register relays. The information thus recorded is used to derive the 3-digit office code of the calling customer. This and the 4-digit directory number is then transmitted to CAMA.

SECTION II - DETAILED DESCRIPTION

1. PHYSICAL DESCRIPTION

1.01 One hundred number networks, representing 100 consecutively-numbered directory numbers with identical thousands and hundreds digits, are grouped into a 100 number unit.

1.02 Two of these 100 number units are mounted side by side with pluggable isolation cards and a cross-connection field in between. Complete isolation of a 200 number unit from the rest of the ANI system can be achieved by removal of the two isolation cards. It is important to note that both isolation cards are required even when only one of the 100 number units is furnished, since wiring paths common to both hundreds appear on each card.

1.03 On the front of each 100 number unit, three cross-connections are required for each directory number. The tens and units cross-connections are bare wire, factory installed straps. In the case of pilot number billing, these straps are removed and cross-connections are placed.

Number treatment cross-connections are placed at the time of number assignment.

1.04 Between the two 100 number units is a cross-connection field where the proper thousands and hundreds connections are made for each of the hundred number units. All numbers in a hundred number unit must have the same thousands and hundreds digits. No relation need exist between the thousands and hundreds digits of the left and right units. Service mark cross-connections are made on the same terminal block.

1.05 Resistance networks are mounted near the top of each frame. These are used to convert the digital output of the 200 number units into 2-out-of-5 form for presentation to the detectors. The identifier containing up to 33 detectors is mounted on the top of the first frame below the frame terminal strip. It is common to the installation. The individual detectors are replaceable on a plug-in basis for maintenance.

1.06 Jacks are supplied for a maximum of 11 service mark detectors. Two of these service mark detectors are required for each central office code, one for ring parties and one for tip parties. Additional service mark detectors may be added as required to a maximum of 11 for special treatment.

2. FUNCTIONAL OPERATION

2.01 Assume directory number 949-0123 requires identification and that the number network for this number is in the left one-hundred number unit. Also assume that this number is a nonspecial individual line and that service mark 0 has been assigned to ring party numbers with office code 949.

3. 200 NUMBER UNIT FS1

3.01 Glow lamps NT, T, and U have a dc breakdown voltage of 170 to 200 volts. They act to isolate the common circuitry from the sleeve of the subscriber line circuit. When the 340-volt positive identification pulse appears on the S lead, all three lamps fire in approximately 50 microseconds. The pulse attenuated by resistor S and reduced by the 60 to 70 volt sustaining voltage of the glow lamps appears on the C23, D23, and NT23 punchings. The pulse on D23 is conducted through a cross-connection to the T2 punching, through the isolation network left to the T2 lead of the network circuit (FS2). The pulse on C23 is conducted through a cross-connection to the U3 punching through the isolation network right to the U3 lead of the network circuit (FS2). The pulse on the NT punching passes through a cross-connection to the R punching to the left isolation network where INL 3, 6, 9, and 10 direct it to the THL, HL, and RL punchings. In this case, THL connects to TH0, HL to H1, and RL to SM0. This completes the pulse path from the sleeve of directory number 0123 to five input leads of FS2.

4. NETWORK FS2

4.01 As a result of the action in the preceding section, pulse voltages appear on the following input leads of FS2: TH0, H1, T2, U3, and SM0. The pulse on the TH0 leads passes through the TH0A and TH0B resistors and appears on the inputs of the TH4 and TH7 detectors (FS3). The hundreds, tens, and units networks are identical to the thousands network and in each case, the input is converted to a 2-out-of-5 output. The pulse on the SM0 lead is passed through the SM0 resistor to the SM0 detector. No conversion is made in the SM network. The action of FS1 and FS2 in the described example causes a pulse to be present on nine detector circuits (FS3) TH4, TH7, H0, H1, T0, T2, U1, U2, and SM0.

5. DETECTOR FS3

5.01 Transistors Q1 and Q2 are PNPN transistors which act as switches. With zero potential base to emitter, they present an open circuit collector to emitter. When 0.3 to 0.9 volt positive is applied to the base, they close a low impedance path from collector to emitter. Once they have switched on, the low impedance state is maintained as long as sufficient collector to emitter current flows, even if the base voltage is removed. With both Q1 and Q2 switched on, a path is closed from ground through the outpulser relay, R4, collector to emitter of Q1, R5, collector to emitter of Q2 to -48 volts operating the outpulser relay. The resistor across the outpulser relay is provided to supply holding current for Q1 and Q2 prior to the buildup of current through the inductance of the outpulser relay winding. Two input pulses are required on a detector to cause operation of the outpulser relay. One as previously explained appears on the base of Q2 of the selected detectors. In addition, all detectors receive a pulse, from the pulse generator through the test circuit, on the PLS lead. R3 and R2 act as a voltage divider to provide the proper base voltage for Q1. Q1 acts as a gate to prevent detector operation at any time other than when an identification pulse is present.

5.02 Gating the detectors in this manner reduces the possibility of false operation due to switching transients on the subscriber line sleeve. If such a transient should occur, coincident with the identification pulse, the outpulser would recognize a failure in its

2-out-of-5 check and make a second attempt. C1 and C2 are used to slow down switching of the transistors to approximately 50 µsec so that they will not be switched due to random pickup on the input leads. R4, R5, C4, and C5 prevent false switching of the transistors due to transients on the -48 volts and output lead.

6. PARTY DISCRIMINATION FS4

6.01 On 2-party flat rate lines two number networks are connected to the same subscriber line sleeve. The party discrimination circuit prevents registration of the unwanted directory number but permits registration of the calling party directory number. On 2-party message rate lines the tip number networks are connected to the message register lead rather than the sleeve lead. Therefore the party discrimination feature is not required.

6.02 Capacitor C5 and C6 are charged from -48 volts through L lamp, R6, 12 break RP, 12 break TP, to C5 and C6. Ground is supplied through 2 break RP and 2 break TP. The normal voltage across C5 and C6 is 48 volts without Z option. With Z option, the voltage is 36 volts (the regulation voltage of CR1 and 2). Z option is required if any message rate lines exist in the office in order to prevent the possible firing of any glow lamps when the message register pulse is applied.

6.03 When an ANI call is made the ANI trunk circuit makes party test and determines whether the tip or ring party has made the call. This information is passed to the outpulser and then to the party discrimination circuit FS4 operating the TP relay if the call was placed by the tip party or the RP relay if the call was placed by the ring party. For this explanation assume the ring party placed the call and that RP is operated. Operated RP opens the charging path to C5 and C6 with battery being opened at contact 12 and ground at contact 2. Contacts 2 and 12 are preliminary break contacts which assures that they are open before any make contacts are closed. A -48 volt battery is then connected through L lamp and 1 make RP to the positive end of C5 and C6. The negative end of C5 and C6 is connected to the TA, TB, TC, and TD punchings through 3, 5, 7, and 11 make of the RP. This action causes -96 volts to be present on punchings TA, TB, TC, and TD (-84 volts with Z option).

6.04 All NT glow lamps (FS1) associated with tip parties are connected to this -96 or -84 volt potential. The path is from NT- punchings to T punching, through INL5 or INR5 to TL or TR punching to SM-punching to FS2 to SMA-punching FS4 to TA, TB, TC, or TD punchings. The T and U glow lamp are connected through FS2 and FS3 to -48 volts as previously described. When an identification pulse appears on the S lead of any of these tip party number networks the NT lamp fires first since the overvoltage on this lamp is 48 volts (36 volts Z option) greater than that on the T and U lamps. Once the NT lamp has fired neither the T nor U lamps can fire since the voltage across their terminals is held below their ionization voltage by the sustain voltage of the NT glow lamp. Since the T and U lamps do no fire the T and U detectors do not operate. The TH, H, and SM detectors are prevented from operating by the -96 or -84 volts held on the NT lamp.

6.05 The calling party directory number, ring party in this example, is identified in the normal manner as previously described.

6.06 On a tip party call the TP relay is operated causing all ring party networks to be shunted down in the manner described above. The tip party is then identified in the normal manner.

7. ONE-WAY ORIGINATING LINE FS5

7.01 The number network for a one way originating line is identical to that used for a regular directory number. A cross-connection must be made on the appropriate distributing frame to connect the S lead to the sleeve of the subscriber line circuit. The NT, C, and D punchings are cross-connected to the similar punchings of a working directory number. When a call is made by a one-way originating line an identification is made of the directory number to which the NT, C, and D punchings are cross-connected. The one-way originating line number network must be on the same frame as the billing directory number because of capacitance limitations on the NT, C, and D cross-connections.

8. SERVICE OBSERVING

8.01 On an observed line, the identification pulse appearing on the subscriber line circuit sleeve, or A lead in the case of a 2-party MR line, is passed through the service observing line circuit and the service observing circuit and appears on one of the leads ORO, ORE, OTO, or OTE. Glow lamp OR or OT fires and causes operation of the SO detector FS3 which operates the SO relay in the outpulser. Detector operation is identical to that previously described for the other detectors. This operation is in addition to the normal directory number identification. Four leads ORO, ORE, OTO, and OTE are supplied, even though two would be sufficient, in order to prevent need for modification of the service observing circuit which was arranged for use with ANI type B.

9. OPERATOR IDENTIFICATION

9.01 When it is desired to have a customer line operator identified, such as on multi-party lines, the NT punching is connected to OI. The tens, units, and OI detectors operate as previously described. No thousands or hundreds detectors operate. Resistor A acts as a load to replace that of the TH and H detectors which are not connected on this type of call. The operated OI detector signals the outpulser on the OI lead and the outpulser transmits the proper information to CAMA requesting operator identification. The operated tens and units detectors cause the operation of similarly designated relays in the outpulser but they provide no useful function since the outpulser ignores all other registration when operator identification is requested.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

None.

2. FUNCTIONAL DESIGNATIONS

Designation	Meaning
HO-9	Hundreds Digit
HO,1,2,4,7	Hundreds Digit
HL	Hundreds Left
HR	Hundreds Right
INL	Isolation Network Left
INR	Isolation Network Right
NT	Number Treatment
OI	Operator Identification
PLS	Pulse
R	Ring
RL	Ring Left
RR	Ring Right
RP	Ring Party
S	Sleeve
SM	Service Mark
SO	Service Observing
SON	Service Observing Network
SPA	Special A
SPB	Special B
TO-9	Tens Digit
TO,1,2,4,7	Tens Digit
T	Tip
TL	Tip Left
TR	Tip Right
THO-9	Thousands Digit
THO,1,2,4,7	Thousands Digit
THL	Thousands Left
THR	Thousands Right
TP	Tip Party
UO-9	Units Digit
UO,1,2,4,7	Units Digit

3. FUNCTIONS

3.01 To recognize a 340-volt 150-μsec identification signal on the subscriber line circuit sleeve and to translate this into the calling party directory number for delivery to the outpulser.

3.02 To deliver a service mark indication to the outpulser dependent on the number treatment cross-connection.

3.03 To prevent registration of any information on tip party networks when a call has been originated by a ring party.

3.04 To prevent registration of any information on ring party networks when a call has been originated by a tip party.

3.05 To provide distinctive service mark indications on special lines.

3.06 To recognize lines requiring operator identification and to signal the outpulser on the OI lead.

3.07 To respond to a pulse on the subscriber line sleeve only during the time a gate pulse is present on the PLS lead.

3.08 To recognize a line that is being service observed and to signal the outpulser on the SO lead.

3.09 To provide for the identification of a one-way outgoing line as a working directory number.

3.10 To provide for PBX pilot number billing.

4. CONNECTING CIRCUITS

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

(a) Subscriber Line Circuit - SD-32133-01 (typical).

(b) Pulse Generator Circuit - SD-32378-01.

(c) Test and Line Verification Circuit - SD-32379-01.

(d) Outpulser Circuit - SD-32375-01.

(e) Miscellaneous Circuit Outpulser and Test Frame - SD-32381-01.

(f) Trunk Make Busy Circuit for Limiting Access to PBX - SD-32337-01.

5. MANUFACTURING TESTING REQUIREMENTS

5.01 The number network and identifier shall be capable of performing all the service functions specified in this circuit description and meeting all the requirements of the Circuit Requirements Table.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2364-HRM-JEM

SECTION IV - REASONS FOR REISSUE

A. Changed and Added Functions

A.1 A load is added to prevent false detector operation on operator identified calls.

B. Changes in Apparatus

B.1 ADDED

221A Resistor (A) 18.7 k

D. Description of Changes

D.1 Resistor A provides a load equivalent to that of the TH and H detectors which are not connected on an operator identified call. This prevents the possibility of false detector operation.

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AMERICAN TELEPHONE AND TELEGRAPH COMPANY

195 BROADWAY, NEW YORK 7

DRAWING NOTICE

SD-32374-01 ISSUE 2D
CD 1 APP. 1D
RATING AT&TCo Standard
SYSTEM Step-by-Step
DATE July 23, 1964

TITLE

Step-by-Step Systems - No. 1, 350A, 355A, Or 35E97 - NUMBER NETWORK AND IDENTIFIER CIRCUIT - Automatic Number Identification-Type C

DESCRIPTION

6.1 Reissued sheets 1, 2, 3, 4, 6, 7, 8, 9, 12, 13
Total reissued sheets 10

6.2 This circuit is reissued to give component assemblies functional designations and to add a crossconnection information note.

6.3 The Current Drain Data for this circuit is as follows:

CURRENT DRAIN IN AMPERE HOURS PER BUSY HOUR OR CCS

	-48V		
	Bat	Grd	NOTE
LIST 1 (AH/CCS)	.046	---	1
LIST 2	.933	---	1
LIST 1 (AH/CCS)	.005	---	1,2
LIST 2	.097	---	1,2

Note 1: Fuses are on Outpulser frame
Note 2: Add per APP FIG 4

6.4 D change. Does not require WECo notification to Tel Co.

6.5 Equipment information is not affected.

6.6 Equipment Design Requirements are not affected.

An engineering letter will be issued - P.E.L. 7331.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
195 BROADWAY, NEW YORK 7

DRAWING NOTICE

SD-32374-01 ISSUE 1
CD 1 APP.
RATING AT&TCo. Standard
SYSTEM Step-By-Step
DATE January 24, 1964

TITLE

Step-By-Step Systems - NO. 1, 350A, 355A OR 35E97 - NUMBER NETWORK AND IDENTIFIER CIRCUIT - Automatic Number Identifier - Type C

DESCRIPTION

6.1 This drawing covers a number network and identifier circuit for use in the small office automatic number identification system (ANI-Type C). It recognizes an identification pulse on the sleeve of the subscriber line circuit and translates this into the calling party directory number.

6.2 The Current Drain Data for this circuit will be furnished on a project basis.

6.3 Equipment information is affected and is covered by drawings LJ38941A, B, C, D, E and LED32315-( ) and LED32317-( ).

6.4 Equipment Design Requirements will be covered in B.S.P. (J38941) Issue 1.

An engineering letter will be issued.

STEP-BY-STEP SYSTEMS
NO. 1, 350A, 355A, OR 35E97
NUMBER NETWORK AND IDENTIFIER CIRCUIT
AUTOMATIC NUMBER IDENTIFICATION - TYPE C

TABLE OF CONTENTS

SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 This circuit is part of a system which provides automatic identification of directory numbers assigned to individual and 2-party lines, recognizes calls from 4-party and multiparty lines, and directs that these calls be operator identified at CAMA. Number treatment information is provided for each directory number during identification.

1.02 Each directory number sleeve has permanently associated with it a number network consisting of one resistor and three glow lamps. The directory number is registered on solid state detectors of the identifier which is common to the installation.

1.03 When a request for identification is received from the CAMA office, the outpulser causes a positive pulse to be applied to the ANI trunk sleeve. This pulse passes along the switch train and appears at the number network of the directory number. The glow lamps of this network fire and cause registration of the calling number on the identifier detectors in 2-out-of-5 form. Number treatment information is recorded in the identifier as a service mark. This may be tip, ring, operator identification, or special, depending on the cross-connection of the number network being identified.

1.04 The 4-digit directory number plus service mark is passed to the outpulser register relays. The information thus recorded is then transmitted to CAMA.

SECTION II - DETAILED DESCRIPTION

1. PHYSICAL DESCRIPTION

1.01 One hundred number networks, representing 100 consecutively-numbered directory numbers with identical thousands and hundreds digits, are grouped into a 100 number unit.

1.02 Two of these 100 number units are mounted side by side with pluggable isolation cards and a cross-connection field in between. Complete isolation of a 200 number unit from the rest of the ANI system can be achieved by removal of the two isolation cards. It is important to note that both isolation cards are required even when only one of the 100 number units is furnished, since wiring paths common to both hundreds appear on each card.

1.03 On the front of each 100 number unit, three cross-connections are required for each directory number. The tens and units cross-connections are bare wire, factory installed straps. In the case of pilot number billing, these straps are removed and cross-connections are placed. Number treatment cross-connections are placed at the time of number assignment.

1.04 Between the two 100 number units is a cross-connection field where the proper thousands and hundreds connections are made for each of the hundred number units. All numbers in a hundred number unit must have the same thousands and hundreds digits. No relation need exist between the thousands and hundreds digits of the left and right units. Service mark cross-connections are made on the same terminal block.

1.05 Resistance networks are mounted near the top of each frame. These are used to convert the digital output of the 200 number units into 2-out-of-five form for presentation to the detectors. The identifier containing up to 33 detectors is mounted on the top of the first frame below the frame terminal strip. It is common to the installation. The individual detectors are replaceable on a plug-in basis for maintenance.

1.06 Jacks are supplied for a maximum of 11 service mark detectors. Two of these service mark detectors are required for each central office code, one for ring parties and one for tip parties. Additional service mark detectors may be added as required to a maximum of 11 for special treatment.

2. FUNCTIONAL OPERATION

2.01 Assume directory number 949-0123 requires identification and that the number network for this number is in the left one-hundred number unit. Also assume that this number is a nonspecial individual line and that service mark 0 has been assigned to ring party numbers with office code 949.

3. 200 NUMBER UNIT FS1

3.01 Glow lamps NT, T, and U have a dc breakdown voltage of 170 to 200 volts. They act to isolate the common circuitry from the sleeve of the subscriber line circuit. When the 340-volt positive identification pulse appears on the S lead, all three lamps fire in approximately 50 microseconds. The pulse attenuated by resistor S and reduced by the 60 to 70 volt sustaining voltage of the glow lamps appears on the C23, D23, and NT23 punchings. The pulse on D23 is conducted through a cross-connection to the T2 punching, through the isolation network left to the T2 lead of the network circuit (FS2). The pulse on C23 is conducted through a cross-connection to the U3 punching through the isolation network right to the U3 lead of the network circuit (FS2). The pulse on the NT punching passes through a cross-connection to the R punching to the left isolation network where INL 3, 6, 9, and 10 direct it to the THL, HL, and RL punchings. In this case, THL connects to THO, HL to H1, and RL to SMO. This completes the pulse path from the sleeve of directory number 0123 to five input leads of FS2.

4. NETWORK FS2

4.01 As a result of the action in the preceding section, pulse voltages appear on the following input leads of FS2: THO, H1, T2, U3 and SMO. The pulse on the THO leads passes through the THOA and THOB resistors and appears on the inputs of the TH4 and TH7 detectors (FS3). The hundreds, tens, and units networks are identical to the thousands network and in each case, the input is converted to a 2-out-of-5 output. The pulse on the SMO lead is passed through the SMO resistor to the SMO detector. No conversion is made in the SM network. The action of FS1 and FS2 in the described example causes a pulse to be present on nine detector circuits (FS3) TH4, TH7, HO, H1, TO, T2, U1, U2, and SMO.

5. DETECTOR FS3

5.01 Transistors Q1 and Q2 are PNPN transistors which act as switches. With zero potential base to emitter, they present an open circuit collector to emitter. When 0.3 to 0.9 volt positive is applied to the base, they close a low impedance path from collector to emitter. Once they have switched on, the low impedance state is maintained as long as sufficient collector to emitter current flows, even if the base voltage is removed. With both Q1 and Q2 switched on, a path is closed from ground through the outpulser relay, R4, collector to emitter of Q1, R5, collector to emitter of Q2 to -48 volts operating the outpulser relay. The resistor across the outpulser relay is provided to supply holding current for Q1 and Q2 prior to the buildup of current through the inductance of the outpulser relay winding. Two input pulses are required on a detector to cause operation of the outpulser relay. One as previously explained appears on the base of Q2 of the selected detectors. In addition, all detectors receive a pulse, from the pulse generator through the test circuit, on the PLS lead. R3 and R2 act as a voltage divider to provide the proper base voltage for Q1. Q1 acts as a gate to prevent detector operation at any time other than when an identification pulse is present.

5.02 Gating the detectors in this manner reduces the possibility of false operation due to switching transients on the subscriber line sleeve. If such a transient should occur, coincident with the identification pulse, the outpulser would recognize a failure in its 2-out-of-5 check and make a second attempt. C1 and C2 are used to slow down switching of the transistors to approximately 50 μsec so that they will not be switched due to random pickup on the input leads. R4, R5, C4, and C5 prevent false switching of the transistors due to transients on the -48 volts and output lead.

6. PARTY DISCRIMINATION FS4

6.01 On 2-party flat rate lines two number networks are connected to the same subscriber line sleeve. The party discrimination circuit prevents registration of the unwanted directory number but permits registration of the calling party directory number. On 2-party message rate lines the tip number networks are connected to the message register lead rather than the sleeve lead. Therefore the party discrimination circuit has no effect.

6.02 Capacitor C5 and C6 are charged from -48 volts through L lamp, R6, 12 break RP, 12 break TP, to C5 and C6. Ground is supplied through 2 break RP and 2 break TP. The normal voltage across C5 and C6 is 48 volts without Z option. With Z option, the voltage is 36 volts (the regulation voltage of CR1 and 2). Z option is required if any message rate lines exist in the office in order to prevent the possible firing of any glow lamps when the message register pulse is applied.

6.03 When an ANI call is made the ANI trunk circuit makes party test and determines

whether the tip or ring party has made the call. This information is passed to the outpulser and then to the party discrimination circuit FS4 operating the TP relay if the call was placed by the tip party or the RP relay if the call was placed by the ring party. For this explanation assume the ring party placed the call and that RP is operated. Operated RP opens the charging path to C5 and C6 with battery being opened at contact 12 and ground at contact 2. Contacts 2 and 12 are preliminary break contacts which assures that they are open before any make contacts are closed. -48 volt battery is then connected through L lamp and 1 make RP to the positive end of C5 and C6. The negative end of C5 and C6 is connected to the TA, TB, TC, and TD punchings through 3, 5, 7, and 11 make of the RP. This action causes -96 volts to be present on punchings TA, TB, TC, and TD (-84 volts with Z option).

6.04 All NT glow lamps (FS1) associated with tip parties are connected to this -96 or -84 volt potential. The path is from NT- punchings to T punching, through INL5 or INR5 to TL or TR punching to SM-punching to FS2 to SMA- punching FS4 to TA, TB, TC, or TD punchings. The T and U glow lamp are connected through FS2 and FS3 to -48 volts as previously described. When an identification pulse appears on the S lead of any of these tip party number networks the NT lamp fires first since the overvoltage on this lamp is 48 volts (36 volts Z option) greater than that on the T and U lamps. Once the NT lamp has fired neither the T nor U lamps can fire since the voltage across their terminals is held below their ionization voltage by the sustain voltage of the NT glow lamp. Since the T and U lamps do not fire the T and U detectors do not operate. The TH, H, and SM detectors are prevented from operating by the -96 or -84 volts held on the NT lamp.

6.05 The calling party directory number, ring party in this example, is identified in the normal manner as previously described.

6.06 On a tip party call the TP relay is operated causing all ring party networks to be shunted down in the manner described above. The tip party is then identified in the normal manner.

7. ONE-WAY OUTGOING LINE FS5

7.01 The number network for a one way outgoing line is identical to that used for a regular directory number. A cross-connection must be made on the appropriate distributing frame to connect the S lead to the sleeve of the subscriber line circuit. The NT, C, and D punchings are cross-connected to the similar punchings of a working directory number. When a call is made by a one-way outgoing line an identification is made of the directory number to which the NT, C, and D punchings are cross-connected. The one-way outgoing line number network must be on the same frame as the billing directory number because of capacitance limitations on the NT, C, and D cross-connections.

8. SERVICE OBSERVING

8.01 On an observed line, the identification pulse appearing on the subscriber line circuit sleeve, or A lead in the case of a 2-party MR line, is passed through the service observing line circuit and the service observing circuit and appears on one of the leads ORO, ORE, OTO, or OTE. Glow lamp OR or OT fires and causes operation of the SO detector FS3 which operates the SO relay in the outpulser. Detector operation is identical to that previously described for the other detectors. This operation is in addition to the normal directory number identification. Four leads ORO, ORE, OTO, and OTE are supplied, even though two would be sufficient, in order to prevent need for modification of the service observing circuit which was arranged for use with ANI type B.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

None.

2. FUNCTIONAL DESIGNATIONS

Designation	Meaning
HO-9	Hundreds Digit
HO, 1, 2, 4, 7	Hundreds Digit
HL	Hundreds Left
HR	Hundreds Right
INL	Isolation Network Left
INR	Isolation Network Right
NT	Number Treatment
OI	Operator Identification
PLS	Pulse
R	Ring
RL	Ring Left
RR	Ring Right
RP	Ring Party
S	Sleeve
SM	Service Mark
SO	Service Observing
SON	Service Observing Network
SPA	Special A
SPB	Special B
T 0-9	Tens Digit
T 0, 1, 2, 4, 7	Tens Digit
T	Tip
TL	Tip Left
TR	Tip Right
TH 0-9	Thousands Digit
TH 0, 1, 2, 4, 7	Thousands Digit
THL	Thousands Left
THR	Thousands Right
TP	Tip Party
U 0-9	Units Digit
U 0, 1, 2, 4, 7	Units Digit

3. FUNCTIONS

3.01 To recognize a 340-volt 150-μsec identification signal on the subscriber

line circuit sleeve and to translate this into the calling party directory number for delivery to the outpulser.

3.02 To deliver a service mark indication to the outpulser dependent on the number treatment cross-connection.

3.03 To prevent registration of any information on tip party networks when a call has been originated by a ring party.

3.04 To prevent registration of any information on ring party networks when a call has been originated by a tip party.

3.05 To provide distinctive service mark indications on special lines.

3.06 To recognize lines requiring operator identification and to signal the outpulser on the OI lead.

3.07 To respond to a pulse on the subscriber line sleeve only during the time a gate pulse is present on the PLS lead.

3.08 To recognize a line that is being service observed and to signal the outpulser on the SO lead.

3.09 To provide for the identification of a one-way outgoing line as a working directory number.

3.10 To provide for PBX pilot number billing.

4. CONNECTING CIRCUITS

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

(a) Subscriber Line Circuit - SD-32133-01 (typical).

(b) Pulse Generator Circuit - SD-32378-01.

(c) Test and Line Verification Circuit - SD-32379-01.

(d) Outpulser Circuit - SD-32375-01.

(e) Miscellaneous Circuit Outpulser and Test Frame - SD-32381-01.

5. MANUFACTURING TESTING REQUIREMENTS

5.01 The number network and identifier shall be capable of performing all the service functions specified in this circuit description and meeting all the requirements of the Circuit Requirements Table.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2364-HRM-JEM