200-POINT LINE FINDERS
16-, 20-, and 30- CAPACITY LINE FINDER SHELVES
NO. 1 and 350A OFFICES
EQUIPMENT DESIGN REQUIREMENTS
STEP-BY-STEP SYSTEMS

1. GENERAL

SCOPE

1.01 This specification, together with the supplementary information listed herein, covers the equipment design requirements for the manufacture and installation of 200-point line finders and line finder frames for use in No. 1 and 350A offices.

1.02 This specification is reissued:

(a) To add reference to ED-35084-( ) and ED-35021-( ), line finder sleeve relay board.

(b) To add list 5 to J32001D.

(c) To add list 7 to J32001M.

(d) To replace ED-31530-01 with ED-33013-01.

(e) To replace ED-30996-01 with ED-33014-01.

(f) To replace ED-31908-01 with ED-33015-01.

CAPACITY

1.03 The capacities of the shelf units and frames are as follows:

Line Finders per Shelf Unit:

4 Wire	16, 20, or 30
3 Wire	16, 20, or 30
Subscriber Lines per Shelf Unit	200
Shelf Units per 11-foot, 6-inch Frame	3
Shelf Units per 9-foot, 0-inch Frame	2

DESCRIPTION

1.04 The line finder is a concentrating switch used in the step-by-step dial system to connect a larger number of lines to a smaller number of selectors or trunks. Its primary use is to find a calling line and connect it to a selector. Three-wire line finders are employed except where a fourth wire is required for the operation of message registers, in which case four-wire line finders are employed. The latter finders are required for 2-party message rate lines or individual message rate lines where booster battery for the operation of the registers is not provided. (Fig. 1.)

1.05 ***The 200-point line finder*** serves a group of 200 lines. The number of line finders required to serve a 200-line group depends upon the traffic density. All the line finders required for any one group are mounted with their line and cutoff relays and control equipment on units that are available in sizes of 16, 20, and 30 line finders. The units in turn are mounted on single-sided frames either 9 feet, 0 inch or 11 feet, 6 inches high. (Fig. 2.)

1.06 ***There are two types of 3-wire and 4-wire line finders:*** One that is arranged to discriminate between two different classes of service and one that is not. Except as indicated in the following paragraphs a line finder group should serve only one class of lines.

1.07 ***Subscriber lines*** are of the following classes:

Flat Rate—Individual, PBX, or Party Line
Message Rate—Individual
Message Rate—2 Party
Coin Box—Dial Prepayment
Coin Box—Dial Postpayment

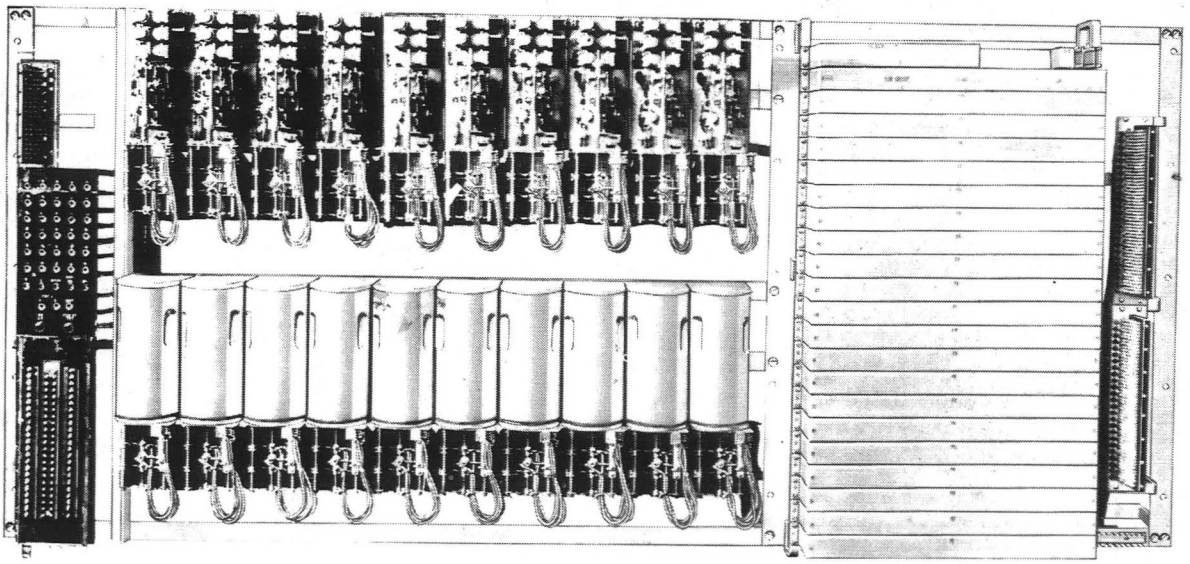

Fig. 1—3-Wire, 200-Point Line Finder Unit—20 Capacity—Wiring Side—J32001F

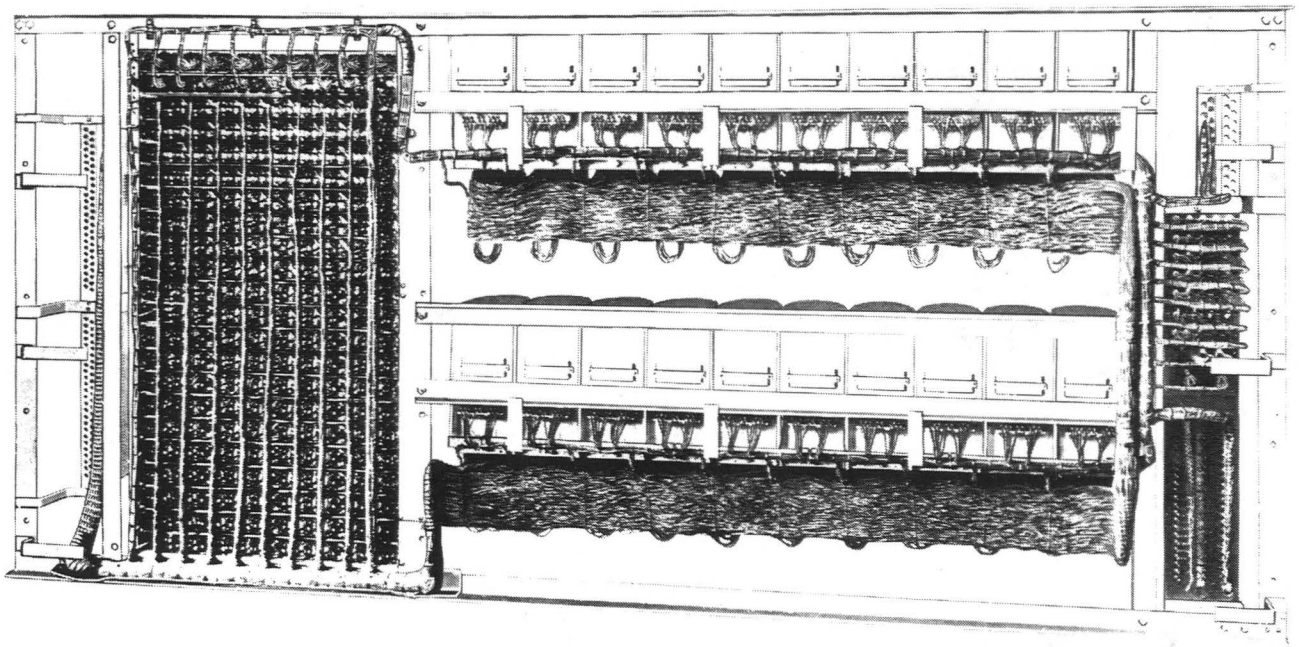

Fig. 2—3-Wire, 200-Point Line Finder Unit—20 Capacity—Equipment Side—J32001F

1.08 ***Each line finder in a group of flat rate lines*** is connected directly to a selector, while those line finders for message rate and those for coin box lines are connected to selectors through message register trunks and coin box trunks, respectively.

1.09 ***Flat rate lines*** may be placed in a group for individual message rate lines when this is found to be economical. However, all line finders in the group must be connected through message register trunks.

1.10 ***Combination Flat Rate and Postpayment Coin Box Lines:*** With the use of line finders that discriminate by levels, flat rate lines may be combined in a group with dial postpayment coin box lines. In this case, all line finders in the group must be connected to coin box trunks.

1.11 ***Association of Lines and Line Finder Bank Terminals for 3-Wire Line Finders:*** The 200 lines of each unit are connected through the line and cutoff relays to the banks of the line finders. The subscriber lines and associated relays are given numbers corresponding to the numbers of their associated terminals in the banks of the line finder in position 1. Lines 11, 12, 13, 14, 15, 16, 17, 18, 19, and 10 have their S leads connected to the lower terminals of the first level of the top or sleeve bank and their R and T leads connected to the upper and lower terminals, respectively, of the first level of the bottom bank that contains the R and T leads for lines 00 through 99. Lines 21, 22, 23, 24, 25, 26, 27, 28, 29, and 20 have their S, R, and T leads similarly connected to the second level of these banks, etc. Lines 111, 112, 113, 114, 115, 116, 117, 118, 119, and 110 have their sleeve leads (designated S1) connected to the upper terminals of the first level of the top or sleeve bank and their ring, R1, and tip, T1, leads connected to the upper and lower terminals, respectively, of the first level of the middle bank which contains the R1 and T1 leads for lines 100 through 199. Lines 121, 122, 123, 124, 125, 126, 127, 128, 129, and 120 have their S1, R1, and T1 leads similarly connected to the second level of the top and middle banks, etc.

1.12 ***Association of Lines and Line Finder Bank Terminals for 4-Wire Line Finders:*** On units arranged for 4-wire switches, the upper three banks are arranged as outlined in 1.11. In addition, a fourth bank is provided below the other three and lines 11 and 10 have their fourth or A lead connected to the lower terminals of the first level of this fourth bank. Lines 21 and 20 have their A leads similarly connected to the second level of the bank, etc. Lines 111 and 110 have their fourth or A1 leads connected to the upper terminals of the first level of the fourth bank. Lines 121 and 120 have their A1 leads similarly connected to the second level of the bank, etc.

1.13 ***A slip is provided in the bank-to-bank multiple*** in order to reduce the average hunting time. On account of this slip, lines 21 and 20 and 121 and 120 appear on the first level of line finders No. 2, 12, and 22, and lines 31 and 30 and 131 and 130 appear on the first level of line finders No. 3, 13, and 23, etc. The last digit of a line finder is the same as the 10s digit of the line appearing on the first level of its bank. While any line finder can find any line, the start circuit is arranged so that the calling line is served by the first finder that has the line on its first level, or if this finder is busy, the line finders are selected in the following order until an idle finder is found: other line finders in order having the line on their first level, the line finders in order having the line on their second level, and so on to the line finders having the lines on their tenth level. In this way, the hunting time is minimized and uniform for all lines.

1.14 ***Line Load Control Equipment:*** The purpose of the line load control equipment is to safeguard the service of certain lines by denying originating service temporarily to others during an overload. It provides a means for denying originating service in two steps, called called class B and class C, each step making up about 40 per cent of the total lines. The remaining 20 per cent of the lines called class A will not be subject to denial of service and will therefore include those lines considered more important.

(a) Common control equipment consisting of keys, lamps, and relays will be located at a central point in a wall cabinet with an associated relay rack unit. A class B and a class C lamp will be provided per line finder unit in the wall cabinet, together with a master key and lamp for each class.

(b) In each line finder unit, two R-type relays, one lamp, and one toggle switch are furnished for class B and the same for class C. The purpose of the relays is to open the G leads corresponding to the line finder levels to be denied service. Since the G leads for all levels except 1 and 6 will be looped at the positions of both the B and C relays, the lines corresponding to the various levels 2 through 5 and 7 through 10 can be put in either class B or class C by connecting the particular G

lead at the corresponding relay. When the G lead is not connected at either relay, the lines are in class A.

1.15 *Ten-Cent Initial Charge Coin Lines:* The ten-cent initial charge coin collector, for use on prepayment coin lines only, is arranged for ground start or coin-first operation of the line relay in order to prevent the 95-ohm magnet in the coin collector from operating until the proper coin deposit has been made. In No. 1 and 350A offices it is necessary that a minor wiring change in the line circuit be made together with a new adjustment of the line relay to provide for ground start operation as shown on the line circuit schematic. In addition to these line circuit modifications required for 10-cent initial charge coin operation, modifications of the associated auxiliary line and coin long line circuits are covered in the appropriate specifications.

1.16 In offices where either TOUCH-TONE® calling or controlled outpulsing or both are added, it is necessary to add equipment electrically between the line finder and associated first selectors for those units serving flat rate or individual message rate lines. In order to preserve existing outgoing cable runs from the line finder jack terminal strips and maintain line finder-first selector associations, it is recommended that the switchboard cable from the converter trunks on register trunk and links be connected at both the line finder jacks and their unit jack terminal strips in such a manner as to interpose the trunks electrically between these two points. This necessitates the removal of existing local cable terminations at the terminals involved.

1.17 In offices where automatic message accounting recording (AMAR) is added, a line finder sleeve relay board per ED-35021-( ) or ED-35084-( ), and its associated hardware, shall be added to the jack of each line finder. The connecting information is shown on the sleeve relay board trunk circuit SD-35031-01.

2. SUPPLEMENTARY INFORMATION

814-000-000—Numerical Index—Step-by-Step Systems
800-600-000—Checking List—General Equipment Requirements
Floor Plan Data—Section 5.2, Sheets 11, 13, and 14
Current Drain Data—SD-31359-02—No. 1 Office and SD-31364-02—No. 350A Office

3. DRAWINGS

WE J drawings should be ordered by referring to the prefix and base number and requesting the current dash (-) number.

Keysheets

SD-31359-01—No. 1 Office
SD-31364-01—350A Office

Circuits

SD-31530-01—200 Point Line or Trunk Finder—No. 355A or No. 360A
SD-31531-01—Subscriber Line Circuit
SD-31908-01—No. 1 or 350A Line or Trunk Finder Circuit No. 355A
SD-32133-01—Subscriber Line Circuit

Framework

ED-30055-( )—Bank Supports
ED-30235-( )—Switch Frame—9 Feet, 0 Inch High—Arranged for Low-Type Auxiliary Framing
ED-30360-( )—Switch Frame—11 Feet, 6 Inches High—Arranged for Low-Type Auxiliary Framing
ED-30374-( )—Miscellaneous Details for Frames Mounting 20 and 30 Line Finder (3-Wire) Units and 16, 20, and 30 Line Finder (4-Wire) Units
ED-30420-01—Combined Fuse and Jack Panel Assembly—For 20 and 30 Line Finder (3-Wire) Units and 16, 20, and 30 Line Finder (4-Wire) Units
ED-30430-01—Fuse Panel Assembly—For 16 Line Finder (3-Wire) Units
ED-31178-( )—Switch Frame—6 Feet, 0-1/2 Inch Wide for Units of 16 Line Finder (3-Wire) Capacity
ED-31240-01—Line and Trunk Finder Frame—20 or 30 Switch Capacity Line Finder Units or 20 Switch Capacity Trunk Finder Units
ED-32370-( )—Miscellaneous Equipment—For Universal Switch Frame
ED-90144-01—End Guards for Switch Frames

Equipment

ED-30283-01—Designation Cards
ED-30818-01—Line Load Control and Group Busy Indicating Relay Rack Frame
ED-30819-( )—Line Lead Control Wall-Mounted Cabinet
ED-33013-01—3-Wire Line or Trunk Finder Equipment
ED-33014-01—3-Wire Line Finder Equipment—For Operation with High Sleeve Resistance
ED-33015-01—4-Wire Line Finder
ED-35021-( )—Line Finder Sleeve Relay Board
ED-35084-( )—Line Finder Sleeve Relay Board
J32001D-( )—Subscriber Line Relay Equipment for Lines Other than Manual Prepayment Coin Box (R-Type Relays)
J32001M-( )—Subscriber Line Relay Equipment (EA-Type Relay)
J33017BG-( )—Line Load Control Relay Rack Unit
J33017CM-( )—Remote Control Line Load Control

Wiring and Cabling

ED-30025-01—Method of Cross-connecting Line Finders to Selectors
ED-30278-01—M1R Tinsel Wiper Cords
ED-30294-01—Method of Wiring Banks (3 Wire)
ED-30309-01—Traffic Diagram
ED-30334-01—Cross-connection of Line Circuits at CDF Arranged for Cross- connection of Protectors to Connector Terminals
ED-30334-02—Cross-connection of Line Circuits at CDF Arranged for Cross- Connection of Protectors to Line Circuits
ED-30411-01—Cross-connection of Line Circuits Where HMDF Is Cabled to VIDF
ED-30427-06—Cross-connection of Line Circuit Where HMDF Is Cabled to HIDF
ED-30689-01—Method of Wiring Banks (4 Wire)
ED-30732-( )—Line and Trunk Finder Frame Switchboard Cabling and Power Feeder Wiring
ED-31531-01—Wiring of Line Circuit
ED-32133-01—Wiring of Line Circuit

4. EQUIPMENT

ED-33013-01—AT&TCo Std—3-Wire Line or Trunk Finder Equipment

ED-33014-01—AT&TCo Std—3-Wire Line Finder Equipment—For Operation with High Sleeve Resistance

ED-33015-01—AT&TCo Std—4-Wire Line Finder

J32001D—A&M Only—Subscriber Line Relay Equipment for Lines Other Than Manual Prepayment Coin Box (R-Type Relays)

List 3—One mounting plate equipped with L and CO relays for ten subscriber lines per SD-31531-01, Fig. 1 or SD-31581-01, Fig. 1, and strapped per ED-31531-01.

List 4—One mounting plate equipped with L and CO relays for nine subscriber lines per SD-31531-01, Fig. 1 or SD-31581-01, Fig. 1, and strapped per ED-31531-01 (line 10 omitted).

List 5—Wiring and equipment per SD-31531-01, option ZJ, required in addition to list 1 or 2 when office is arranged for receiver off-hook tone feature and a reduced level of tone is required on a chosen line.

J32001M—A&M Only—Subscriber Line Relay Equipment (EA-Type Relays)

List 5—One mounting plate equipped with L and CO relays for ten subscriber lines per SD-32133-01, Fig. 9, with P apparatus, and strapped per ED-32133-01.

List 6—One mounting plate equipped with L and CO relays for nine subscriber lines per SD-32133-01, Fig. 9, with P apparatus, and strapped per ED-32133-01 (line 10 omitted).

List 7—Wiring and equipment per SD-32133-01, option ZC, required in addition to list 5 or 6 when office is arranged for receiver off-hook tone feature and a reduced level of tone is required on a chosen line.

5. GENERAL NOTES

5.01 Line finders shall be numbered from 1 up on each unit beginning with the line finder in the left position of the lower shelf and proceeding left to right on that shelf, and then continuing left to right on the upper shelf. In order to permit an even distribution of traffic over all line finders in partially equipped groups, the line finder positions shall be equipped in the following order:

16LF Unit 1, 6, 4, 9, 2, 7, 3, 8, 5, 10, 11, 16, 12, 15, 13, and 14

20LF Unit 1 to 11 same as 16LF unit, then 16, 14, 19, 12, 17, 13, 18, 15, and 20

30LF Unit 1 to 20 same as 20LF unit, then 21, 26, 24, 29, 22, 27, 23, 28, 25, and 30

5.02 When the full capacity of lines in a unit is not required, they should be assigned in the order 01 to 00, 11 through 19, 21 to 20, etc., up to 91 to 90; then 101 to 100, 111 through 119, 121 to 120, etc. Lines 10 and 110 are used for test purposes and are not to be equipped with L and CO relays. The other lines are to be equipped as required by specifying J32001M, L5 (10 lines) or L6 (9 lines).

5.03 Line circuits to be arranged for operation with trunks from selector levels of 700C, 701A, 702A, 710C, 711A, 740A, 740B, 740C, or 740E PBXs either with or without PBX long trunk circuits shall be modified by the installer as follows: on relay L remove the strap between terminals 1T and LT1. Disconnect the local cable lead from 2RT and reconnect this lead to LT1. Disconnect the local cable lead from 1T of relay CO and reconnect this lead to 2RT of relay L.

5.04 The 16 and 20 line finder units are wired and equipped with one release signal relay, and one peg count register shall be provided for the unit. The 30 line finder unit is wired for two release signal relays but is equipped with only one relay and one register unless otherwise specified. In this unit, one release signal lead for each shelf is provided, and where only one relay is furnished the jack springs of the upper and lower shelf shall be connected by a lead in the local cable. One overflow register shall be provided for each unit and mounted with the other traffic registers in the office. Line and traffic registers are mounted on message register and traffic register racks, respectively, as covered in the specifications for these racks.

5.05 A card holder is provided as part of the switch into which the installer shall insert a card containing the maintenance information as shown on the equipment drawing.

5.06 A bank support shall be provided for each unequipped line finder position.

5.07 A ground lead shall be run from the fuse panel on the unit to the ground terminal strip on the unit.

5.08 It will not be necessary to provide a wire connected to ground for the line finder frames. The cable rack connection to the frame will provide a satisfactory ground.

5.09 The line finder frames shall be equipped from top down.

5.10 Line finder frames are designated by a number prefixed by the letters LF. The frames shall be numbered consecutively from 1 up, LF-1, LF-2, etc, starting with the frame nearest the originating end of the intermediate distributing frame (IDF) and numbering at right angles to or parallel to the IDF, and in the direction of growth of the IDF. Where floor plan layout does not permit locating line finder frames in the same building bays occupied by the IDF or where the IDF is located on another floor, the frames may be numbered consecutively without reference to the location of the IDF. Economy in cabling and floor space and visibility of alarm pilots will generally control the numbering and growth of frames under these circumstances. When line finder frames are located on more than one floor in a central office building, a factor of 50 shall be allowed for numbering the frames on each floor; that is, the lowest floor of line finder frames shall be numbered LF-1, LF-2, etc, the next higher floor LF-51, LF-52, etc. The first 100-point line finder frame shall bear the next higher number to the preceding 200-point line finder frame. The frame, group, and class-of-service designations shall be stamped on the front of the uprights as shown on the equipment drawing.

5.11 Aisle designation plates attached to the line finder frame end guard assembly at one end of each line of frames in the main cross aisle, where the aisle pilot lamps are located, shall be furnished for indicating the frames in a lineup. The requirements for this equipment are covered in the office alarms specification.

5.12 A terminal strip of the required capacity shall be mounted on the end guard for each row of line finder frames and shall be known as a distributing power terminal strip (DPTS). It shall be located at the end of the row of frames at the cross aisle in which the aisle pilot lamps are located in central offices, and always at the end adjacent to the main cross aisle in offices having no aisle pilots. The power punching list shall be mounted on a pressboard mounting P-49513 and hung on the card hook attached to the end guard.

5.13 The alarm and switchman talking line jack leads shall be run in a No. 1451 cable from the DPTS to each line finder frame. The talking line jack leads are run directly to the talking jack terminals and all other leads are terminated on the incoming terminal strip of each unit. This cable shall be butted at the top of the frame and run loose to the succeeding units.

5.14 The equipment for the coin box trunk and message register trunk circuits is mounted on relay racks.

5.15 The requirements for cross-connecting and cabling of line circuits are covered on the cross-connection drawings listed under Part 3 instead of on the line circuit drawings.

5.16 Line finders in coin box and 2-party message rate groups are cabled to the IDF or combined distributing frame (CDF) for cross-connection to the coin box trunks and message registers, while line finders in individual message rate groups may be cabled directly or through an IDF or CDF to message rate trunks, and the message rate trunks are cabled to the IDF or CDF for cross-connection to the selectors. Cabling and frame space for individual message rate units shall be furnished on the basis of fully-equipped line finder units in all cases. Message rate trunks corresponding to unequipped line finders shall be omitted from the trunk units as initially installed.

5.17 Due to the slip in the bank wiring of the line finder units, the same line will appear on different levels of different line finders. It will, therefore, be necessary, where line finders arranged for discrimination between two different classes of lines are provided, to use care to see that the normal post springs operate on the proper level for each line finder. Line finders cannot be moved from one position to another in a unit without a readjustment of the normal post springs.

5.18 The relay rack unit mounting the relays and resistances for the line load control common equipment is shown on J33017BG-( ) or J33017CM-( ). The wall cabinet for the lamps and master keys is illustrated on ED-30819-( ). The relay rack unit may be located at any convenient point on a 23-inch relay rack. The wall cabinet, however, should be located in a prominent place in the office where the lamps can be readily seen at all times and at a convenient height for operating the keys.

5.19 The relay rack unit mounting the relays and resistances for the line load control common equipment is shown on ED-30818-01. The wall cabinet for the lamps and master keys is illustrated on ED-30819-01. The relay rack unit may be located at any convenient point on a 23-inch relay rack. The wall cabinet, however, should be located in a prominent place in the office where the lamps can be readily seen at all times and at a convenient height for operating the keys.

5.20 When the resistance of the sleeve lead between the line finder and the holding ground (connector or trunk) causes a minus voltage in excess of -2.4 volts at the line finder sleeve terminal of a busy line, another line finder in the same group may, when attempting to pass over the busy terminal, stop and not proceed to the calling line terminal. This line finder ***will not*** cut through and the calling line will not receive dial tone. J32001U,L4, J32001T,L4, J32001N,L5, J32001W,L5, J32001P,L7 or J32001R,L7 provides standard or field modification of line finder (SD-31530-01 and SD-31908-01) to permit satisfactory operation with a negative voltage as high as -4.3 volts at the line finder sleeve terminal by adding a resistor on the ground lead of each line finder jack position. The line finder will not have to be removed from its jacks for this modification.

List of A&M Only and Mfr Disc. Equipment

EQUIPMENT	RATING	DETAILS LAST SHOWN IN ISSUE	REPLACING EQUIPMENT
J32001A	Mfr Disc.	2	J32001E
J32001B	Mfr Disc.	2	J32001F
J32001C	Mfr Disc.	2	J32001G
J32001D,			—
			J32001D,
L1			L3
L2	Mfr Disc.	3	L4
J32001E,	Mfr Disc.	9	J32001N
			J32001E,
L1	Mfr Disc.	8	L8*
			J32001E,
L2 to L5	Mfr Disc.	3	L1
J32001F,	Mfr Disc.	9	J32001P
			J32001F,
L1	Mfr Disc.	8	L9
			J32001F,
L2 to L5	Mfr Disc.	3	L1
L6	Mfr Disc.	8	L10

EQUIPMENT	RATING	DETAILS LAST SHOWN IN ISSUE	REPLACING EQUIPMENT
J32001G,	Mfr Disc.	9	J32001R
			J32001G,
L1 & L6	Mfr Disc.	8	L9 & L10
J32001H,	Mfr Disc.	9	J32001S
			J32001H,
L1 & L2	Mfr Disc.	8	L5 & L6
J32001J,	Mfr Disc.	9	J32001T
			J32001J,
L1	Mfr Disc.	8	L3
J32001K,	Mfr Disc.	9	J32001U
			J32001K,
L1	Mfr Disc.	8	L3
J32001L,	Mfr Disc.	9	J32001W
			J32001L,
L1	Mfr Disc.	8	L4
J32001M,			J32001M,
L1 & L2	Mfr Disc.	9	L3 & L4
			J32001M,
L3 & L4	Mfr Disc.	10	L5 & L6
J32001N	Mfr Disc.	11	J32007A
J32001P	Mfr Disc.	11	J32007A
J32001R	Mfr Disc.	11	J32007C
J32001S,	Mfr Disc.	10	J32007A
L1**			L5
L2**	Mfr Disc.	10	L6
J32001T	Mfr Disc.	11	J32007B
J32001U	Mfr Disc.	11	J32007B
J32001W	Mfr Disc.	11	—
J32001AA	Mfr Disc.	1	J32001A,L2
J32001AB	Mfr Disc.	1	J32001A,L3
J32001AC	Mfr Disc.	1	J32001A,L4
J32001AD	Mfr Disc.	1	J32001A,L5
J32001BA	Mfr Disc.	1	J32001B,L2
J32001BB	Mfr Disc.	1	J32001B,L3
J32001BC	Mfr Disc.	1	J32001B,L4
J32001BD	Mfr Disc.	1	J32001B,L5

Note: J32002A, L4 and L6, formerly used with this equipment have been discontinued without replacement.

* Use J32001E, L8, only where space is available on existing frame; otherwise use J32001H, L5.

** Never shown in J specification. See WE J drawing.

The above equipment has been replaced as indicated. Where A&M Only items appear, the issue numbers shown are those of the issue in which the rating was first applied.

Bell Telephone Laboratories, Incorporated

Dept 5245-GFC
WE Dept 2313-WJF-GWC