LINE DISTRIBUTING FRAME EQUIPMENT DESIGN REQUIREMENTS NO. 1 CROSSBAR SYSTEM

1. GENERAL

Scope

1.01 This specification, together with the supplementary information listed herein, covers the equipment design requirements for the line distributing frame used in No. 1 crossbar offices.

1.02 This specification replaces the portion of Issue 3-D of J97029 covering the single-sided distributing frame, 10 inch guardrail width, which dealt with the equipment of the single-sided line distributing frame for No. 1 offices. This specification also contains equipment information for the double-sided frame, and the line distributing frame requirements for offices arranged for automatic message accounting (AMA).

1.03 This specification is reissued:

(a) To revise list of drawings to specify WECo Bell System drawings wherever they replace BTL drawings.

(b) To add information under Description to cover the use of traffic usage recorder facilities for recording the total usage of subscriber lines. This is in accordance with SD-25553-01, Issue 19-D.

Description

1.04 The line distributing frame, abbreviated LDF, provides a flexible means of connecting the sleeve and message register leads of the line circuits to the subscriber number sleeves and to message registers. The "S", "M1", and "M2" leads from the line verticals on the line link frames appear on the horizontal portion of the LDF, and the "NS" leads from the block relay frames are terminated on the vertical portion. The operating leads from the message registers are terminated on horizontal terminal strips when the registers are cross-connected; otherwise these leads are terminated directly on the vertical NS terminal strips.

1.05 In offices equipped for AMA, message registers are omitted and the LDF is limited to single-wire cross connections between the line sleeves and the number sleeves. Likewise, in offices arranged for conversion to AMA, the message register jumpers may be placed on a separate frame so as to facilitate their removal at the time of conversion, leaving only the sleeve jumpers on the LDF. In these cases, the line and the number sleeves are terminated two or more circuits deep on the terminal strips, thereby reducing the length of the LDF over that required in message register offices.

1.06 The LDF framework may be single-sided or double-sided as determined by the telephone company. The single-sided distributing frame has the verticals on 8 inch centers and has a 10 inch width across the ladder guardrails to conform with the width of the crossbar frames. The lower half of the frame is arranged for four 50-row, 210-type vertically mounted terminal strips, the upper half for eight 25-row, 211-type horizontally mounted strips. The single-sided frame is normally located parallel to and facing the associated block relay frames, thus placing the jumper fields on these two lines of frames in a common aisle. For a 2-office terminating unit arranged for message register operation, the two LDFs are placed back-to-back for cross frame jumpering, each frame facing its associated line of block relay frames. In this case, the guardrail width of the two LDFs is 2 feet 2 inches. In AMA offices where the sleeve jumper only is involved, the two offices of a combined terminating unit can be accommodated on one line of the single-sided frame.

1.07 The double-sided distributing frame is of conventional IDF construction, except that the base is made of sheet metal to harmonize with the crossbar switch frames. It is arranged for eight 50-row, 210-type terminal strips, also one 8 inch terminal strip, on the vertical side, and for 15 shelves with 20-row, 6-1/2 inch terminal strips on the horizontal side. The width of the frame is 2 feet-2 inches across the guardrails. For a 2-office terminating unit, the double-sided frame affords conventional facilities for cross-connecting a common group of line circuits to the number sleeves of the two offices. For a single office unit, the jumper fields on the block relay frames and the LDF face on two aisles, instead of one as with the single-sided frame.

1.08 In AMA offices and in offices arranged for conversion to AMA, the LDF equipment may be located at the MDF, usually at the headend. No. 183-type terminal strips are used on both sides of the frame, supplementary mounting details per ED-92197-01 being required on the vertical side. The plan is adapted to small buildings and, in general, is limited to the office or pair of offices having the block relay frames on the same floor with the MDF.

In order that the LDF equipment will occupy the minimum number of MDF verticals, the number sleeves are terminated five circuits deep and the line sleeves three or five circuits deep on the vertical and horizontal terminal strips. In this way, the equipment for a 2-office terminating unit occupies 11 verticals on a 14-foot 5-inch MDF and 15 verticals on a 12-foot 5-inch frame.

1.09 There are thus five LDF arrangements that may be specified by the telephone company.

(a) Single-sided LDF arranged for sleeve and message register jumper for use in message register offices.

(b) Double-sided LDF for same condition.

(c) Single-sided LDF arranged for sleeve jumper only for use in offices equipped for AMA or arranged for conversion to AMA.

(d) Double-sided LDF for same condition.

(e) Location of LDF equipment at the MDF sleeve jumper only.

1.10 A point to be noted, especially in using the double-sided LDF and the MDF arrangements, is that the length of the sleeve cables from the block relay frames should not exceed 115 feet. These cables, with lengths predetermined, are shipped with the block relay frames and have their block relay ends formed with the frame local cable at the 20-block relays. This is done to avoid wiring congestion and to reduce installing effort. The 115-foot maximum is made necessary by assembly and testing limitations in the factory. Another factor to observe in this connection is the sleeve resistance as covered in J20151 covering, limiting conductor lengths for crossbar system No. 1.

1.11 Facilities are provided for temporarily connecting to any subscriber line in an office, in limited groups, so that the total usage of each line can be recorded individually. The equipment, required for this purpose, consists of 20-terminal Cinch-type jacks, which are furnished in sets of seven mounted on a special channel mounting. This mounting is fastened to a support assembly which is clamped to the uprights near the top of the horizontal section of the LDF. A maximum of 138 usage leads are cabled from the traffic usage recorder frame to the first set of seven jacks and multipled at suitable intervals along the HLDF. A set of seven W20F cords is used to connect the usage leads to the desired lines. These cords are 25 feet long and are equipped at one end with a 20-contact plug and at the other end with 20 individual alligator type clips. The end of the cord, to which the clips are attached, appears as 20 individual conductors for a lenght of six feet. By means of these clips, connection can be made to the sleeve terminal of any desired subscriber line. The connecting arrangement is shown, schematically, in Fig. 147 of subscriber line, line link and control circuit SD-25553-01. The above described facilities have been made available for use on single and double sided LDF. However, no arrangements have been made for mounting them on LDF equipment when it is located at the MDF since it is felt that where this arrangement is used, the office would be too small to warrant the expense of a traffic usage recorder frame and the telephone company would prefer to use the portable traffic usage recorder equipment.

2. SUPPLEMENTARY INFORMATION

816-000-000 - No. 1 Crossbar System Index
Engineering Information BSP - Traffic Usage Recorder - Common Systems

Floor Plan Data - Single-sided Frame - Section 9.4, Sheet 4
Floor Plan Data - Double-sided Frame - Section 9.4, Sheet 7

3. DRAWINGS

WECo J drawings listed should be ordered by referring to the prefix and base number and requesting the highest suffix dash (-) number.

Circuits

SD-25287-01 - Miscellaneous Circuits for LDF
SD-25553-01 - Subscriber Line, Line Link, and Controller Circuit
SD-90122-01 - Test Battery and Ground Supply - MDF - 33B Connecting Block

Framework

ED-26353-70 - Assembly of Double-sided Distributing Frame
ED-91519-70 - Assembly of Single-sided Distributing Frame
ED-92197-01 - Details for Mounting Terminal Strips on Vertical Side of MDF

Equipment

ED-25343-11 - Single-sided Frame - Sleeve and Message Register Jumper
ED-26336-11 - Single-sided Frame - Sleeve Jumper Only
ED-26346-11 - LDF at Main Distributing Frame - Sleeve Jumper Only
ED-26347-11 - Double-sided Frame - Sleeve Jumper Only
ED-26351-11 - Double-sided Frame - Sleeve and Message Register Jumper

Cabling and Miscellaneous

ED-25341-10 - Switchboard Cabling Plan - Single-sided Line Distributing Frame
ED-25431-10 - Switchboard Cabling Plan - Double-sided Line Distributing Frame

ED-90046-01 - Mounting of 33-type Connecting Blocks
ED-91236-01 - Switchboard Cabling Plan - MDF
ED-91265-01 - Double Sided LDF Designation Plate
ED-91315-01 - Support for 7F Buzzer
ED-91441-01 - Supports for Jack Boxes at MDF

4. EQUIPMENT

ED-91519-70 - Assembly of Single-sided Distributing Frame

Group 1 - Unit of 5 verticals - originating unit, when cabled from above

Group 2 - Unit of 4 verticals - supplementary unit, when cabled from above

Group 3 - Adapter details for mounting end guard at left end of frame

Group 4 - Adapter details for mounting end guard at right end of frame

Group 5 - Unit of five verticals - originating unit, when cabled from below

Group 6 - Unit of four verticals - supplementary unit, when cabled from below

Group 7 - Guardrail cover plate between two originating units back to back

Group 8 - Guardrail cover plate between two supplementary units back to back

Group 9 - Cast iron V-type distributing ring with mounting bolts and nuts

Group 10 - One closed-type distributing ring with mounting bolt and nut

ED-26353-70 - Assembly of Double-sided Distributing Frame

Group 1 - Unit of six verticals - originating unit

Group 2 - Unit of ten verticals - supplementary unit

Group 3 - Unit of five verticals - supplementary unit

Group 4 - One end guard - right end of frame

Group 5 - One end guard - left end of frame

Group 6 - One adapter for mounting 224A jack mounting on vertical side

Group 7 - One adapter for mounting 224A jack mounting on horizontal side

Group 8 - Unit of six verticals - supplementary unit

5. GENERAL NOTES

Location of Frame

5.01 The single-sided frame is designed to be located parallel to and facing the same aisle as the associated block relay frames. For combined terminating units where the line link frames are common to two offices, the two LDF's required in offices with message registers are placed back to back so as to permit jumpering between subscriber numbers of one office and subscriber lines on the opposite frame. In this case, a sheet metal plate is furnished on top of the rear guardrails as coverd for the 6 inch gap between the two frames. The back-to-back floor plan arrangement may also be used for two single offices with message registers or two pairs of offices with AMA. In message register offices, the groups of 800 subscriber numbers on successive sets of four verticals on the single-sided LDF are cabled to the associated block relay frames for both the single and multioffice condition. In AMA offices, successive pairs of verticals are cabled to associated block relay frames. The double-sided frame likewise is located near the associated block relay frames and the line link frames. As previously mentioned, the plan of locating the LDF equipment at the head end of the MDF is limited, in the usual case, to the office or pair of offices having their block relay frames on the same floor with the MDF. In all cases, the cabling limits covered in paragraph 1.09 apply.

Numbering and Arrangement of Equipment

5.02 The number sleeves from the block relay frames are terminated in groups of 100 across two terminal strips on the vertical side of the frame. The individual circuits are numbered 00-99 bottom up across the two strips, and the hundreds groups are numbered bottom up on each vertical. The subscriber line circuits from the line link frames are terminated on the horizontal side in groups of 100 lines or by columns across four terminal strips on the single-sided frame, across five strips on the double-sided frame, and across two strips on the MDF. The individual circuits are numbered 00-99 left to right and the hundreds groups are numbered bottom up by shelves. The direction of the latter follows the growth of the frame, either left to right or right to left.

5.03 On the single-sided frame, the groups of 100 number sleeves are numbered consecutively over the two pairs of terminal strips per vertical in all cases. On the double-sided frame, the hundreds groups are numbered consecutively over two or four pairs of vertical terminal strips. The first plan limits the number sleeves to the lower or top half of the frame and is used in slow growing offices to keep the jumper work for the first office at the best level. The second plan of numbering over the full height of the verticals reduces the length of frame needed for the first unit, but necessitates a greater use of ladders.

5.04 The number sleeves are usually placed in their proper location on the frame regardless of the sequence of installing the numbers. This may necessitate furnishing a complete frame initially for a partial installation. Where, due to space limitations, the complete frame cannot be installed initially, the higher-numbered terminals, such as those usually assigned to coin and official lines may, when specified, be located at the growing end of the partial frame. In this case, the numbers which are not in consecutive order may or may not be moved when the ultimate frame is installed, as determined by the telephone company.

5.05 On the single-sided frame, the subscriber lines are assigned over all eight shelves in an office having no message register terminal strips, the miscellaneous terminal strips being located at the end of the frame. When message register terminal strips are furnished, they should be placed on the top shelf and the subscriber lines extended over the remaining seven shelves. In this case, the miscellaneous terminal strips are placed on the top shelf with the message register equipment, any excess overflowing on the lower shelves at the end of the frame. These arrangements will minimize jumper pile-up.

5.06 On the double-sided frame, the subscriber line equipment is, in general, assigned to all shelves, less those needed for message registers, 4-party bunching blocks, and miscellaneous. An exception to this rule may occur in slow growing areas when the equipment for the first office of a 2-office terminating unit occupies the lower half of the frame so as to place the jumper work at a better level.

Single-sided LDF for 2-office Units

5.07 Where two single-sided frames are used for a 2-office terminating unit and provision is made for full cross-connection flexibility between the two offices, the even-numbered columns of the common group of line circuits are cabled to one of the LDFs and the odd-numbered columns are cabled to the other LDF, both in consecutive order beginning at the same end of the two frames. This arrangement results in an approximately equal distribution of the line circuits and different classes of service over the two LDF s, and makes possible a desirable traffic distribution over the respective line link frames with a minimum amount of cross-frame jumpering. Where provision for cross-connection flexibility between the two offices is not required, odd and even columns are terminated consecutively on the first LDF and are continued in order on the second LDF, as for single-office units.

5.08 Where the rate of growth of the first office is slow and the second office will not be required for some time, the first LDF only will be installed initially, in which case both odd and even column numbers will be cabled in consecutive order as for a single-office unit. Likewise, where one and a fraction offices are involved and the rate of growth is slow, the consecutive method of cabling may be used. This arrangement avoids the installation of the second LDF prior to the starting of the second office with consequent cross-frame jumpering during the initial period. Where the rate of growth is more rapid and cross-connection flexibility between the first office and the second office will be required at an early date, the second LDF may be installed initially, in which case the even-numbered columns will be cabled to the first LDF and the odd-numbered columns to the second LDF, similar to the arrangement where both full frames are installed initially. This arrangement will result in cross-frame jumpering during the initial period but brings about a desirable ultimate arrangement. The full framework for the second office LDF will be required in this case.

Cross-connection Facilities

5.09 A wide range of terminal strip arrangements are available to care for varying classes of service, varying numbers of message registers, and automatic message accounting. These are shown on the different equipment drawings, and in the line circuit cross-connection figures on SD-25553-01. There are four groups of cross-connection figures shown on the latter drawing.

(a) Fig. 51 to 55 are for 4-wire line link frames not having the message register leads cabled to the LDF, such as flat rate line groups.

(b) Fig. 61 to 75 are for offices having a high proportion of message registers where the registers are cabled directly to the subscriber number terminal strips on the vertical portion of the frame.

(c) Fig. 80 to 94 are for offices having the message registers cabled to separate terminal strips for cross-connection to the subscriber number terminal strips.

(d) Fig. 151 to 157 are for offices equipped for AMA, or arranged for conversion to AMA where the message registers are cabled to a separate message register distributing frame.

Offices With Message Registers

5.10 Message Register Service: Where all or substantially all subscribers in the office require the use of message registers or where the message rate lines are assigned to a particular block of numbers, the message registers are terminated directly on the subscriber number terminal strips. Where the message register development is small or does not warrant assigning a register to each number terminal, a group of terminal strips is located on the horizontal portion of the frame above the subscriber line terminal strips, for the termination of the message registers. One-wire jumpers are run from these strips to the "M" terminal of the subscriber number terminals requiring message register service. Any register in a common group is thus available to any subscriber number in the office. A variation of these plans occurs in message rate offices arranged for conversion to AMA, where the message register jumpers are placed on a separate distributing frame. Here the "M" leads from the line circuits are terminated on the horizontal portion of the frame and the message registers on the vertical portion.

When the registers are cabled directly to the directory number terminals, they are numbered to agree with the number terminals.

When the registers are cross-connected, it is usual to start the number series with a number having 1 as the units digit; except in offices having a separate message register distributing frame, where units and tens digits of each hundreds group must start with 00.

5.11 Message Rate Individual Lines: Fig. 61 of SD-25553-01 covers a usual case for message rate individual lines where the message registers are cabled to the subscriber number terminal strips. Here a 2-wire jumper is required for connecting a line circuit with a subscriber number and associated message register. Fig. 80 shows the corresponding arrangement when the message registers are cross-connected. In this case, besides the 2-wire jumper between the line circuit and directory number, a single-wire jumper is required for the message register. This extends between a separate message register terminal strip and a second lug on the "M" punching associated with the directory number termination. Cross-connecting the message registers to the number terminals instead of to line circuits makes it unnecessary to disturb this jumper in the event the subscriber is assigned a different line circuit for any reason.

5.12 Figs. 69, 86, and 93 of SD-25553-01 show the method of terminating MRI line groups when arranged for a large percentage of 4-party stations without the use of bunching blocks. Figs. 71 and 88 show corresponding arrangements for MRI line groups arranged to serve 2-party flat rate stations.

5.13 Message rate 2-party lines are usually terminated per Fig. 63 and 82, using 4-point terminal strips. Where such groups are arranged for 4-party lines, 6-point terminal strips are used as shown in Fig. 75 and 92.

5.14 Flat-rate Individual and 2-party Lines: Figs. 51 and 52 of SD-25553-01 show the method of terminating 4-wire line link frames when not cabled for message register operation, as for flat-rate line groups. The horizontal terminal strips in this case are provided with the "M" punchings so that the message register leads can be cabled later if required.

5.15 When flat-rate lines are assigned to message rate groups, it may be necessary to ground the "M" lead. There are several ways of doing this, as shown by Fig. 62 and 81. In Fig. 62, the ground is obtained at separate ground terminal strips on the horizontal side of the frame or it may be obtained at the "M" punchings on the number terminal strips for particular blocks of numbers. Fig. 81 includes as an option a ground punching associated with each directory number termination. Under this plan, the grounding is accomplished with a strap instead of with a separate jumper. Another method available is shown in Fig. 94, where the ground punching is included on the line circuit terminal strip. The grounding method used will depend on the proportion of lines in the office requiring this operation. If small, jumpers connecting to separate ground terminal strips are used, or ground punchings are furnished on the line strips per Fig. 94. If the proportion is considerable, the directory number terminal strips are provided with ground punchings so that straps can be used. Besides the three figures mentioned above, other figures showing the "M" lead grounded for flat-rate stations are: Fig. 72 and 89, 67 and 84, 70 and 87, 75 and 92. No ground is required if the flat-rate lines are arranged to give a separate class-of-service indication to the marker, and none is required for lines in flat-rate groups. Any flat-rate lines arranged for zone registration should of course be cross-connected in accordance with Fig. 61, 80, etc.

5.16 Flat-rate 4-party service is provided by the use of bunching blocks or by furnishing four sleeve punchings with each line termination in specified line groups. The latter method is shown in Fig. 53, 70, 75, 87, 92, and 94. Two types of bunching

blocks are available: the conventional type as shown by Fig. 54 and 55, and one with ground punchings as shown in Fig. 68, 73, 74, 85, 90, and 91. The ground punchings permit 4-party lines in message rate groups to be cross-connected uniformly with other lines in the group using a 2-wire jumper.

Automatic Message Accounting Offices

5.17 In offices equipped for AMA, 3-wire line link frames are used, making it necessary to terminate only the sleeve lead at the LDF. Cross-connection figures for this condition are shown in Fig. 151-157 on SD-25553-01. On both the single-sided and double-sided LDF, the number sleeves and the line circuit sleeves in the usual cases are terminated two circuits deep on the LDF terminal strips, thereby doubling the capacity of the terminal strips and reducing the length of the frame by one-half. This permits a 2-office terminating unit to be accommodated in one line of single-sided frame, thereby avoiding cross frame jumpering when this type of framework is specified. For the case where the LDF equipment is placed on the MDF, the sleeve leads are terminated three or five circuits deep for most line groups. This is made possible by the jumper and cabling capacity of the MDF, and is done for the purpose of compressing the length of the LDF equipment as much as possible. The "sleeve" LDF conditions discussed above apply also to offices arranged for conversion to AMA where the message register jumpers are located on a separate message register distributing frame.

5.18 Because the line sleeves are terminated more than one circuit deep on the horizontal side of the LDF in AMA offices, both individual and 2-party lines may appear on the same set of terminal strips, and since the line link frames may have a variable number of columns, the break between the two classes of lines may occur at any point in the column numbering. The equipment drawings cover the different terminal strip combinations encountered in such offices for the single- and double-sided LDFs and for the case where the LDF is located at the MDF. A row of unequipped punchings is left between individual and 2-party columns appearing on the same set of terminal strips as an aid in identifying the point of separation.

5.19 Coin Lines: If 4-wire line link frames are used for coin groups and the "M1" leads are cabled to the LDF for possible association with message registers, Fig. 61 or 80 on SD-25553-01 are used, depending on whether or not the registers are cabled to the number terminal strips. Ordinarily however, 3-wire line link frames are used for coin groups, and Fig 51 or 154 are specified.

5.20 MRI Lines Bridged to X-Number Terminals: Where X-number terminals are provided in an office, it is necessary that they be made accessible to the test and maintenance men. This may be done in one of two ways.

(a) The X-numbers may be reached by the maintenance people as numbers "over 10,000".

(b) Each used X-number must be bridged to an unused terminal in the regular number series, except in the case referred to in the next paragraph.

Cross-connection Fig. 64, 65, and 83 cover condition (b) and illustrate several ways of associating a message register with the X-number terminal.

5.21 Jump Hunting: When jump hunting to an X-number, a regular number is used to indicate the hunting condition. The regular number so used is not available for connection to a working line. Fig. 66 on SD-25553-01 covers this condition for the case where the message register connected to the regular number is used for the first X-number.

Test Jack Equipment

5.22 The following equipment is furnished on the LDF in accordance with directions given on the various equipment drawings.

(a) Frame talking line jacks.

(b) Battery supply jack.

(c) Message register test jacks.

(d) Message register test buzzer.

(e) PBX line make-busy jacks.

(f) Permanent signal tone key and lamp.

In AMA offices, the message register test facilities and the PS tone key and lamp are omitted. In offices arranged for conversion to AMA and having a separate message register distributing frame, the message register test equipment is located on the MRDF.

5.23 Test cord and plug assemblies are furnished in accordance with the requirements given on SD-25287-01.

Connecting Blocks

5.24 A source of battery and ground for testing purposes using 33B connecting blocks is furnished at regular intervals on the LDF as covered by the various equipment drawings. Signaling battery is obtained at

a miscellaneous fuse bay using a fuse per LDF or per two single-sided LDF's placed back to back. Ground is obtained either at the relay rack or at the fuse bay.

5.25 Closed distributing rings instead of V-shaped rings are required on the single-sided frame where jumpers approach a horizontal shelf from above, as for horizontal jumpers to such miscellaneous circuits as the auxiliary line sleeves and 4-party bunching blocks. Directions for locating the closed rings with reference to the miscellaneous terminal strips are given on ED-25341-10.

Distributing Frame Wire

5.26 Distributing frame wire is furnished only when specified by the telephone company.

Jumper Pile-up

5.27 Requirements for avoiding excessive jumper pileup on the shelves of the single sided frame are covered in 5.05. A further point to be noted in this connection is that with message registers terminated 100 per terminal strip, some restriction on the part of the telephone company in their assignment to number terminals may be necessary to avoid jumper congestion, where this equipment extends over all or a considerable portion of a shelf, especially on the longer frames. The same is true of bunching blocks in offices having a large 4-party development with a high station fill. These precautions apply to the double-sided frame as well as to the single-sided frame. They do not apply to the MDF, since the shelf capacity here is ample.

Cabling

5.28 The arrangement of the cables entering the frame and the method of running, placing, butting, and fanning the cables within the frame are covered on the switchboard cabling drawings listed herein. Included in the cabling drawing for the single-sided LDF is an option showing the cables from the line link frames and the message register rack brought up from the floor below through openings in the base of the frame. This plan is intended for multifloor jobs where it is economical to cable through sleeves in the floor instead of through a cable hole to racks above the LDF.

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