SWITCHING SYSTEMS MANAGEMENT
CROSSBAR TANDEM
ASSIGNMENT PRACTICES
OFFICE LINK FRAME

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1. GENERAL

1.01 This section is provided to give the crossbar tandem machine administrator uniform guidelines for assigning trunk groups to the office link frames in a "Crossbar Tandem Switching System."

1.02 Whenever this section is reissued, the reason for reissue will be listed in this paragraph.

1.03 The title for each figure includes a number(s) in parentheses which identifies the paragraph(s) in which the figure is referenced.

1.04 The function of the office link and office link extension frames is to interconnect office junctors with outgoing trunks under control of the

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marker. Since the trunks in a specific test group must be divided between two office link or office link extension frames to insure uninterrupted service in case of frame failure, these frames are always furnished and operated in pairs. This 2-bay frame and one-bay office link extension frame, shown in Fig. 1, are the same as the corresponding frames used in No. 1 local crossbar offices.

1.05 In assigning trunk groups to the crossbar tandem office link frames, the machine administrator's primary objective is to obtain, as nearly as practical, a balance of the traffic between pairs of office link frames and approximately equal usage of all switches on these frames. Assignments should be made in such a manner that the markers enter the various switches on each frame approximately the same number of times. In addition, it is advisable to leave spare terminals in such a manner that growth and changes in the size of the trunk groups may be cared for with a minimum of rearrangements.

2. EQUIPMENT ARRANGEMENTS

OFFICE LINK FRAMES

2.01 The office link frame shown in Fig. 1, has a capacity of 200 links. The primary switches serve 200 offices junctors. The secondary switches provide for 100 outgoing trunks if the switches are not split and a maximum of 200 or 300 outgoing trunks if the horizontal multiples of all switches are split. The extension frame has a capacity of 100 outgoing trunks. Extension frames may be used with nonsplit or split office frames on machines having ten or less office frames, either in anticipation of growth or to provide increased outgoing trunk capacity. On installations of 12 or more office link frames, extension frames are normally furnished since, where more than ten office link frames are involved, the levels on the secondaries cannot be split because of insufficient junctor access, and the extension frames are needed to provide the necessary out-trunk capacity.

2.02 On the basis of 200 or 300 trunks per frame and a maximum of 20 office link frames (as limited by the marker), the physical maximum number of outgoing trunks per marker group is 4000 with one extension frame and 6000 with two extension frames. To insure uninterrupted service, a test group of trunks is divided between two office link or extension frames, and the frames are furnished and operated in pairs.

2.03 The secondary side of the office link frame is made up of ten crossbar switches, each switch having ten horizontal terminals to which the outgoing trunks are cross-connected. In order to provide more than 100 trunk terminations per office link frame two methods are used. The secondary switches may be split so that each horizontal level may accommodate two trunks, or extension frames may be provided which will double the number of secondary switches and, therefore, the number of terminals to which trunks may be assigned. The traffic order will indicate whether split secondaries or extensions have been provided.

2.04 With split secondaries, the horizontals may be split in steps of two per switch on each switch on the frame. Horizontals 0 and 1, 2 and 3, etc, form the pairs which may be split. In this way the capacity of the office link frames may be increased in steps of 20 with a maximum of 200 terminals per frame. In other words, the capacity of a frame can be varied between 120 and 200 terminations in steps of 20.

2.05 Provision of extension frames is the more common method of increasing office link frame capacity. They are the equivalent of the secondary switch part of the office link frame, each "C" link from the primary switches being connected to a vertical on a regular secondary switch. Office link frame capacity may be increased to 200 or 300 by provision of one or two extension frames.

MARKER TEST GROUPS

2.06 The procedure for assigning trunk groups to the office link frames is governed by the manner in which the marker performs its functions in testing for an idle trunk. When the marker receives the code to indicate the routing of the call it activates a route relay or route number assigned to that code. This route relay or route number indicates to the marker a pair of office link frames which should be tested to find the desired outgoing trunk group. The marker scans a block of 40 trunk terminals all or part of which may be assigned to the trunk group desired. Trunks to other offices may also be assigned to some of these 40 terminals.

2.07 This block of 40 terminals is known as a "marker test group". A marker test group is composed of two horizontals per switch on each of a pair of regular or extension office link frames. Association of the terminals in a test group with terminals on the secondary switches to which the trunks are assigned is by means of permanent wiring. Therefore, the traffic assignment of trunks to the marker test groups determines the load balance on the various secondary switches of the pair of office link frames.

2.08 The manner in which the 40 terminals of the marker test groups are associated with the horizontals of the office link frame secondary switches is discussed in the following paragraphs. With a given arrangement of office link frame secondary switches, like numbered marker test groups function with each set of 40 trunks appearing in the same corresponding locations on all of the pairs of office link frames in the office.

2.09 If the office secondaries are not split and therefore have a capacity of 100 trunks per office link frame or a total of 200 per pair of frames, five marker test groups 0, 2, 4, 6 and 8 are used with the five sets of 40 trunks involved. As shown in Fig. 2, marker test group 0, used in connection with unsplit office frames, includes the termination which appear on horizontals 0 and 1 of a pair of office link frames. Marker test group 2 is associated with terminations which appear on switch horizontals 2 and 3 of a pair frame, etc.

2.10 If the secondaries are completely split so that a pair of office frames provides access to 400 trunks, ten marker test groups each serving 40 trunks are provided. In this case the five even numbered test groups (0, 2, 4, 6 and 8) are associated with part of the test terminals, and an additional set of test groups, numbered 1, 3, 5, 7 and 9, are used with the remaining test terminals. This arrangement is illustrated in Fig. 3. With this arrangement, marker test group 0 appears on the 0 horizontal of the left half of the secondary switches and on horizontal 1 of the right half of the switches, again making a total of 40 test terminals, which are associated with this marker test group.

2.11 If single extension frames are provided, the second set of marker test groups (ie, 1, 3, 5, 7 and 9) is not used since both the left and right halves of the secondary switches are controlled by the even numbered test group. With a single extension frame, five additional test groups, numbered 10, 11, 12, 13 and 14, are provided for association with the secondary switch horizontals of these extension frames as shown in Fig. 4. When second extension frames are provided, test groups 1, 3, 5, 7, and 9 are associated with horizontals 0-1, 2-3, 4-5, 6-7, and 8-9 on these frames.

2.12 Of the 40 terminals for a marker test group, trunks of a single group may occupy all of these terminals or trunks from as many as 20 different groups may be assigned to a test group. In other words, any combination from a single group of 40 trunks to 20 groups of two trunks each may be assigned to a test group. A trunk group consisting of only one trunk requires two terminals.

2.13 The marker in searching for an idle trunk in the marker test group tests only between the terminal limits assigned to the particular group. These limits termed "group start" and "group end" are indicated to the marker by the route relay or route number. The group start is always on an even numbered terminal, and the group end is always on an odd numbered terminal.

2.14 The number of terminals between the group start and the group end is known as the "trunk group span" and is composed of working trunks, prewired trunks and spare terminals. Fig. 5 shows that the 40 terminals in a marker test group may be considered as a complete circle. If the highest numbered terminals 38 and 39 (Group A) are assigned to a trunk group and more terminals are needed, the group can be extended over to terminals 0, 1, 2, 3, etc., if they are available.

2.15 The order of selection of an idle trunk is from the lowest to the highest numbered terminal in the test group (16 to 21 for Group B) for calls offered by even numbered trunk link frames and is in the reverse direction (21 to 16) for calls offered by odd numbered trunk link frames. On second trial testing will be in the opposite direction from the original test.

2.16 The ELO, OLO, ER1, etc refer to the plant department's designations of the test terminals. ELO being the even frame, left side of the switch controlling, and located on Switch 0.

3. ASSIGNMENT OF TRUNKS

GENERAL

3.01 For the crossbar tandem to operate at maximum efficiency, the traffic load offered to the various trunks assigned to the office link frames should be distributed fairly evenly between pairs of office link frames, between the two frames of a pair and over the 10 secondary switches of each of those frames. To accomplish this, the trunk groups of various sizes and types (ie, one-way or two-way, final groups or high usage groups), should be distributed between pairs of office link frames so that each pair of office link frames carries approximately the same proportion of the office busy hour load. This is accomplished by assigning the trunk groups, allotted to a pair of frames, to marker test groups, in such a manner that each switch has approximately the same number first choice trunks and last choice trunks.

3.02 Before the actual initial assignment work is started, the following information should be obtained by the machine administrator:

(a) The number of trunks in each group to be assigned for the end of the engineering period and the number expected in each group at the cutover.

(b) The type of group, outgoing or two-way, and high usage or final.

(c) A list of any new trunk groups which may be anticipated shortly after cutover.

(d) The number of office link frames provided, whether or not the secondaries are split and the amount of splitting where this is done, or whether extension frames have been provided. This information determines the number of terminals and marker test groups available for the assignment of trunks.

3.03 The total number of trunks expected to be worked at the end of the engineering period should be determined. This will include the working trunks at cutover plus any prewired trunks within the group spans and any new groups to be placed in service after the cutover. This figure should be subtracted from the total number of terminals available for assignment in order to arrive at the total number of spare terminals. The spare terminals are distributed as follows:

(a) Spare terminals should be allotted to trunk groups where unusual growth, over the engineered expectation, is possible, (eg, final groups and large high usage groups.)

(b) Since the trunk groups must always start on an even numbered terminal and end on an odd numbered terminal, it is occassionally necessary to include a spare terminal, which will probably not be used, within the test span. Single plant test trunks are an example of this.

(c) Intertoll trunks require assignment patch bay appearances. This bay is used to "make good" or establish "short" patches. Each intertoll trunk group appearing on the office link frames should have one or more spare terminals within the span appearing on the assignment patch bay. The final group to the next higher class office (home final) and large high usage groups to other control switching points should be treated more liberally.

(d) The remaining spare terminals not included in the above categories should be apportioned between the various pairs of office link frames in blocks large enough to provide for unexpected new groups or for rebalancing.

3.04 All spare terminals included within the trunk span should be arranged to test busy to the markers.

3.05 The traffic order normally provides a number of spare trunk relays for use in making rearrangements due to unbalances, converting groups from one type operation to another and for use in the assignment patch bay.

OUTGOING TRUNK ASSIGNMENT RECORD

3.06 The permanent office record of the trunks assigned to the office link frames is maintained on the "Outgoing Trunk Assignment Record" (Form E-4359) shown in Fig. 6. This form is printed on both sides: one side being required for each pair of unsplit frames, two sides being required when the switches are split or single extension frames are provided. In the latter case, two facing pages should be used to represent all of the trunks assigned to a pair of frames (ten marker test

groups). When two extension frames are provided, three pages are required.

3.07 Using Fig. 7 as an example, the major points of the Outgoing Trunk Assignment Record are discussed briefly:

(a) The heading of the form provides spaces for entering the name of the office and the pair (even and odd) of office link frames or extension frames.

(b) The body of the form corresponds to the cabling pattern of the marker test groups on the pair of frames. As shown in Figures 2, 3 and 4, the marker test groups are composed of two horizontals on all switches of a pair of frames, (eg, Test Group 0 is on horizontals 0 and 1 of all switches on frames 0 and 1). Therefore, each switch on each frame has two of the 40 terminations of each marker test group. This same pattern can be seen on the assignment form.

(c) The marker test group (TG) numbers should be entered in numerical order from the bottom to the top of the form in the spaces provided.

(d) The trunk group designation is entered on the "assigned" line beside the appropriate marker test group and under the associated terminal numbers for the group. The trunk group span is indicated by arrows and the letters "S" and "E" entered under the terminal numbers associated with the group start and group end of the particular trunk group. Working trunks and prewired trunks, if any, are entered on the "working" line. Prewired trunks are designated with "PW" above the trunk number. Spare terminations within group span are also entered on the "working" line with the designation "Sp". Spare terminations which appear on the assignment patch bay should be designated "APB".

(e) The two lines at the bottom of the form are used to approximate the loading of each switch (vertical file). On the upper line enter twice the number of "Heavy" working trunks in the file. On the lower line enter the actual number of "Light" working trunks. The figures on these two lines are then added and the total entered on the bottom of the form. The use of these figures is discussed later in this section.

INITIAL ASSIGNMENT PROCEDURES

A. Distribution of Trunk Groups

3.08 The first step in assigning outgoing trunks is to distribute all of the trunk groups to be served over the pairs of office link frames and extension frames, where the latter are provided. Most initial installations will provide single extension frames. Second extension frames will ordinarily be added for growth.

3.09 Where single extension frames are provided, the links between primary switches and secondary switches of the office link frames are multipled to the switches of the extension frames, and there is not the same need for load balance between a pair of regular frames and a pair of extension frames. In this situation the primary need for balance is between combinations of four frames consisting of a pair of office link frames and its associated pair of extension frames.

3.10 In spreading the load over the pairs of office link frames, each pair of frames should have an equal proportion of:

(a) Large and small groups.

(b) Intertoll and toll completing groups.

(c) Two-way and one-way outgoing intertoll groups.

(d) High usage and final groups.

(e) Toll completing groups to residential and to business offices.

3.11 In addition, in allotting groups to pairs of office link frames or extension frames, groups which are sub-divided into more than one marker test group should have each subgroup of 40 or fewer trunks assigned to a different pair of frames. Furthermore, a group which serves as an alternate route should be assigned to a different pair of frames than the first route or preceeding alternate route groups. Tone and announcement trunk groups, which are individual to each marker, or pairs of markers, should be assigned to different pairs of office link frames.

3.12 When making the initial assignments for the office, balancing will be simplified by

preparing a "Trunk Group Information Card" for each group as shown in Fig. 8. This card contains all of the pertinent information about the group which will be needed for balancing. Spaces are provided for the trunk group name, the date the group will be placed in service, the busy season and the busy hour for the traffic load on the circuit group, its classification (Heavy, Medium or Light) as to the expected outgoing load, any alternate routes and a place for recording the assignment of the various subgroups to the office link frames (marker test levels, group start and group end). The reverse side of the card is used to indicate the number of working and prewire trunks and the number of spare terminations provided within the group span. The remaining space can be used for any remarks or notes concerning te trunk group. Whether these cards are maintained after the initial assignments have been completed is a matter to be determined by the machine administrator based on the use made of them.

3.13 The Trunk Group Information Cards should be filled out as completely as possible. The busy season-busy hour may be obtained by summarizing several past years of performance, if available. The type trunk should be indicated whether it is a high usage or final group, or one of the several types of toll completing groups. The "class" is a combination of the number of trunks in the group, the type traffic it carries, the load on the group, and the type of circuit group. It cannot be determined until the reverse side of the card has been completed.

3.14 The number of working trunks at the end of the engineering period (EEP) is obtained from the List A. It normally indicates the number of trunks expected to be working approximately two years after the cutover. The number working at cutover will usually be less than that shown on List A. This is the figure that should be entered on the "working" line under "cut". The difference between this figure and the List A is the number of prewired trunks. The number of working trunks anticipated at cutover can be obtained from the circuit orders, but it should be verified with the cutover committee.

3.15 When the total number of working trunks at the end of the engineering period has been determined (working plus prewire) the classification (class) on the front side of the trunk group card may be determined. The trunk groups should be classified as "Heavy," "Medium", and "Light" as follows:

(a) ***Heavy***

- One-way final intertoll groups of 30 or more trunks.
- One-way high usage intertoll groups.
- Toll completing groups of 40 or more trunks.

(b) ***Medium***

- One-way final intertoll groups of 29 or less trunks.
- Toll completing groups having from 11 to 39 trunks.
- Operator groups, such as information, inward, rate and route, etc.

(c) ***Light***

- Two-way intertoll groups.
- Toll Completing groups of 10 or less trunks.
- WH operator groups.
- Tone and announcement groups.
- Plant test groups.

3.16 The trunk groups represented by these cards should be arranged according to their classifications, "Heavy", "Medium", and "Light," and also grouped within each classification as to the busy season and the busy hour. For example, several trunk groups having the classification, "Heavy" with a third quarter busy season and a day busy hour should be grouped together. Several other trunk groups might have the classification, "Heavy", first quarter night and would be grouped together.

3.17 All of the cards should then be arranged as follows: "Heavy" trunk groups with busy season occurring outside the "office" busy season should be first, then "Heavy" trunk groups which have the same busy season as the office busy season should be next. This is then repeated for the "Medium" and "Light" classifications. Each

group of cards in each of the above classifications would be further subgrouped into day and night busy hours and arranged in descending order according to trunk group size.

3.18 When the cards have been arranged in the above order, the allotment of the trunk groups to the office link frames can be started. A work sheet should be prepared with a number of columns, one column for each pair of office link frames and pair of extension frames. The trunk groups are then allotted to each pair of office link frames, in sequence, in the order of arrangement, reversing the direction of allotment at the end of each sweep.

3.19 Where extension frames are provided the trunk groups are allotted to regular secondaries on one sweep and to extension frames on the reverse sweep.

3.20 Trunk groups containing over 40 trunks will of necessity require two or more subgroups.

3.21 When all the trunk groups have been allotted to the various frames the individual frames should be checked to see that they have the same proportion of intertoll, toll completing and other groups as outlined previously. This may be done by swapping equal size trunk groups of like classification, busy season and busy hour.

B. Distribution of Spare Trunk Terminals

3.22 The following method should be used to determine the number of spares which should be assigned within the group spans. The total number of trunks to be assigned to the office link frames at the end of the engineering period should be determined. This would include all two-way and one-way outgoing intertoll trunk groups, all trunk groups to tributary offices, toll switching trunk groups, and miscellaneous trunk groups. One-way incoming (intertoll and CAMA) trunks and tandem trunks should be excluded from this list since they are not assigned on the office link frames. The total number of terminals available for assignment on the office link frames should then be determined. The working trunks at the end of the engineering period can then be subtracted from the number of terminals provided which will give the number of spare terminals available. Approximately one-half of these spare terminals should remain outside the group spans for new trunk groups, changes in existing trunk groups, etc. The remaining spare terminals should be apportioned among the various trunk groups. Normally the number of spare terminals assigned within the group span to any particular group will vary between 10 and 50 percent depending on the size of the group. Final routes and growing circuit groups should be treated more liberally. In addition to the spare terminals provided for growth, all two-way multifrequency (MF) and dial pulse (DP), intertoll groups should have spare terminals appearing on the assignment patch bay.

3.23 Since each trunk group or subgroup span must start on an even numbered terminal and end on an odd numbered terminal within the marker test group, the number of spares apportioned to any trunk group must be such that the total group span will be an even number.

3.27 Some of the spare terminals remaining outside of the group span should be apportioned among the various pairs of office link frames in groups large enough for the assignment of new circuit groups. When they are within a marker test group that have several circuit groups assigned, they should be placed between the circuit groups so that future growth in either of the circuit groups can be expanded into these spare terminations.

C. Trunk Assignment Procedures

3.25 Considering the unsplit part of secondary switches or office link frames with extension frames only, the requirements for load balance will be met by assigning trunks to each of the horizontal lines on the assignment record form in a manner so that the trunks assigned in each vertical column will have approximately the same load. In the case of split office links it is desirable, in addition, to secure load balance between the left and right halves of the frames. This may be done by having approximately the same total load for the assignments to the 0 to 19 terminals as for the assignment to the 20 to 39 terminals on each half of the split switches.

3.26 The trunk groups are assigned to the marker test groups in order of their classification. The largest, "Heavy" group, to the lowest numbered marker test group, with the first trunk of the group assigned to the first vertical in this test group (terminal 0) and the remaining trunks assigned in numerical order across the test group. As each

trunk group is assigned the entries should be made on the outpulsing trunk assignment form and opposite the proper marker test group.

3.27 The next trunk group in order of its size and traffic classification should then be assigned to the highest numbered test group. Since the markers search for idle trunks starting from either end of the group, the trunks at both ends of the group are the busiest and the trunks at the middle of the group are the least busy. Therefore, in assigning a second group the start should be on a terminal (vertical column) with the spare number as one of those in the first group with the lightest loaded trunks. It is assumed for assignment purposes that one half of the group is heavily loaded and the other half lightly loaded. Since a call which originates on an even numbered trunk link frame will test from the group start to the group end, while a call which originates on an odd numbered trunk link frame will test the outgoing trunk group from the group end to the group start, the trunks assigned to the group start and end are the first choice (heaviest) outgoing trunks.

3.28 Because of this unique method of trunk testing in the crossbar tandem, trunks in two-way trunk groups are not assigned in consecutive order across the group spans. In assigning trunks in two-way trunk groups, the procedure is to assign either from the center of the span outward or from the ends of the span toward the center, depending on whether the trunk selection pattern at the distant office is from low numbered trunks to the high numbered trunks or vice versa. The selection pattern between intertoll offices is determined by the alphabetical relationship of the names of the two offices. This can be seen in Figures 7 and 9 with the Alexandria and Monroe groups. Alexandria tests its two-way trunks to Lafayette from low to high because it precedes Lafayette in the alphabetical sequence of offices. In the case of Monroe, the opposite is true. For customer dial offices, the crossbar tandem should test trunks to these offices in reverse of the pattern that these offices use to test their trunks to the crossbar tandem. The reason for these arrangements is to avoid competition for the same first choice trunks.

3.29 It should be noted that the positioning of spare terminals is different for each of these two patterns. The spares in one case are located at the ends of group, and in the other they are in the center of the group. Where the spare terminals are in the center of the group, they should be provided somewhat more liberally, if possible, to avoid extensive rearrangements in order to assign additional trunks in the groups.

3.30 Trunks in one-way groups may be assigned in consecutive order from group start to group end since there is no competition for circuits.

3.31 In order to maintain an equal number of trunks in each of two subgroups associated with flip-flop testing in route relay markers, the even numbered trunks should be assigned as one subgroup and the odd numbered trunks to the other subgroup. In this manner the trunks will be tested in order on alternate calls. The two subgroups should be allotted to different pairs of office link frames.

3.32 In ring marker offices, trunks in subgroups should be assigned in numerical order in each consecutive subgroup. The first subgroup should be completely assigned (40 trunks) before assignments are made in the second subgroup. The same procedure would apply in route relay offices on groups with more than 40 trunks where flip-flop testing is not used.

3.33 The group starts and group ends of the trunk groups should be spread as evenly as possible over the switches (vertical columns) on a pair of frames. If all the group starts for the several groups allotted to a pair of frames were assigned to the same terminals in different marker (test groups), one switch would contain the busiest trunks and the markers would frequently encounter an "all channel busy" or "failure to match" condition. This would result in the markers making excessive second trials to complete the calls thereby decreasing the capacity of the common control equipment. The primary consideration, therefore, is that each switch contain approximately the same number of heavily and the same number of lightly used trunks.

3.34 As stated previously, when terminal 39 in the test group is reached and the terminals at the beginning of the test group are spare the assignment of trunks in a group may be continued from terminal 39 to terminal 0 and so on in numerical order. This feature facilitates the distribution of the load over the various switches.

3.35 The third group, in order of size and traffic classification, would be assigned to the next to the lowest marker test group already assigned. The start and end should not be on a terminal used for a group start or a group end in the assignment of the two preceding trunk groups but intermediate terminals should be used for this purpose. Where office secondaries are split the assignment is, in general, the same as outlined above except that in the case of switches only partially split the "Heavy" groups should be assigned to marker test groups associated with horizontals which are not split.

3.36 Continuing in this manner (alternating between high and low marker test groups) all of the trunk groups in the three categories which have been allocated to the particular pair of frames should be assigned terminals on the frames.

3.37 As mentioned earlier, the "Heavy" trunks on each switch are counted and doubled, for weighting, and this figure is entered on the second to last line on the assignment form. The actual number of "Light" trunks on each switch is entered on the last line. These two lines are totaled and this total figure is entered at the bottom of the form. The totals for each switch should be approximately equal. In addition, the grand total (the sum of the totals of all switches) for each frame should be approximately equal with all other frames.

SUBSEQUENT ASSIGNMENT PROCEDURES

3.38 The same general rules which apply to initial assignments are also applicable to assigning new trunk groups after an office is in service. The main objective is, as with initial assignments, to spread the load as evenly as possible over the various pairs of frames (and extension frames, if provided) and over the swithces on the frames.

3.39 The following items should be considered when adding a new trunk group on the office link frames:

(a) The locations on the office link frames where sufficient spare terminals are available so that the group may be reassigned without changing the location existing groups.

(b) If such locations are available, the effect that the addition of the new group will have on the present frame loads and distribution of types of trunks. (eg, high usage and final, intertoll and toll completing.) In determining the present frame load, traffic usage recorder (TUR) register data should be used in addition to the theoretical weighting factors on the assignment form.

(b) If existing groups must be moved, consideration should be given to the amount of plant central office maintenance time that will be required. Major rearrangements involving large trunk groups should be avoided, if at all possible. Where existing trunk groups must be moved, the necessary cross connections should be furnished to the plant department as far in advance as possible to facilitate their job planning.

(d) The group starts and group ends should be spread as evenly as possible over the switches (vertical columns) on a pair of frames.

3.40 When second extension frames are provided, new trunk groups should be spread as evenly as possible over these frames. Existing trunk groups should not be moved to these frames unless the office is experiencing matching loss or rearrangements are required for growth. With second extension frames, office link frame loading is more critical because more trunks will be competing for the same number of "C" links to the primary bay. Traffic usage recorder data should be used when assigning trunks to these frames.

4. ASSIGNMENT PATCH BAY

4.01 The assignment patch bay (APB) is used to "make good" or establish "short" intertoll circuit patches only. Because of unbalance in transmission characteristics of different circuits, regular circuit orders cannot be established on the assignment patch bay.

4.02 Basically, the assignment patch bay consists of mounting plates, each containing 40 jacks arranged in two rows of 20 each. The upper row, called "trunk" jacks, have a predetermined number of spare trunk relays of various types cabled from the trunk relay frames. The lower row, called "office link" or "OL" jacks, are cabled to a

distribution frame for cross connection to spare terminations within the group span.

4.03 The trunk relays (spare drop relays) appearing in the assignment patch bay also appear in the circuit patch bay. In establishing a "patch order", a patching cord is placed in the "line" jack of the circuit patch bay which disassociates the incoming circuit from its regularly assigned trunk relay or drop. The other end of the patching cord is then placed in the jack associated with the proper type of spare drop. The same spare drop in the assignment patch bay is then patched to the proper "OL" jack associated with the particular circuit group designated by the patch order. Since the spare drop relay appears on the trunk link and sender link frames, the new circuit has all the required appearances in the office.

4.04 Each two-way intertoll circuit group should have at least one spare of the terminals within the group span assigned to assignment patch bay. The following table may be used in estimating spare terminal requirements for assignment patch bay jack appearances:

NO. OF TWO-WAY TRUNKS IN GROUP	*NO. OF APB JACKS*
1 — 9	1
10 — 29	2
30 — 49	3
50 — 74	4
75 — 99	5
100 and up	6 % of working circuits

Spare terminals provided for the APB should be in addition to those provided for growth.

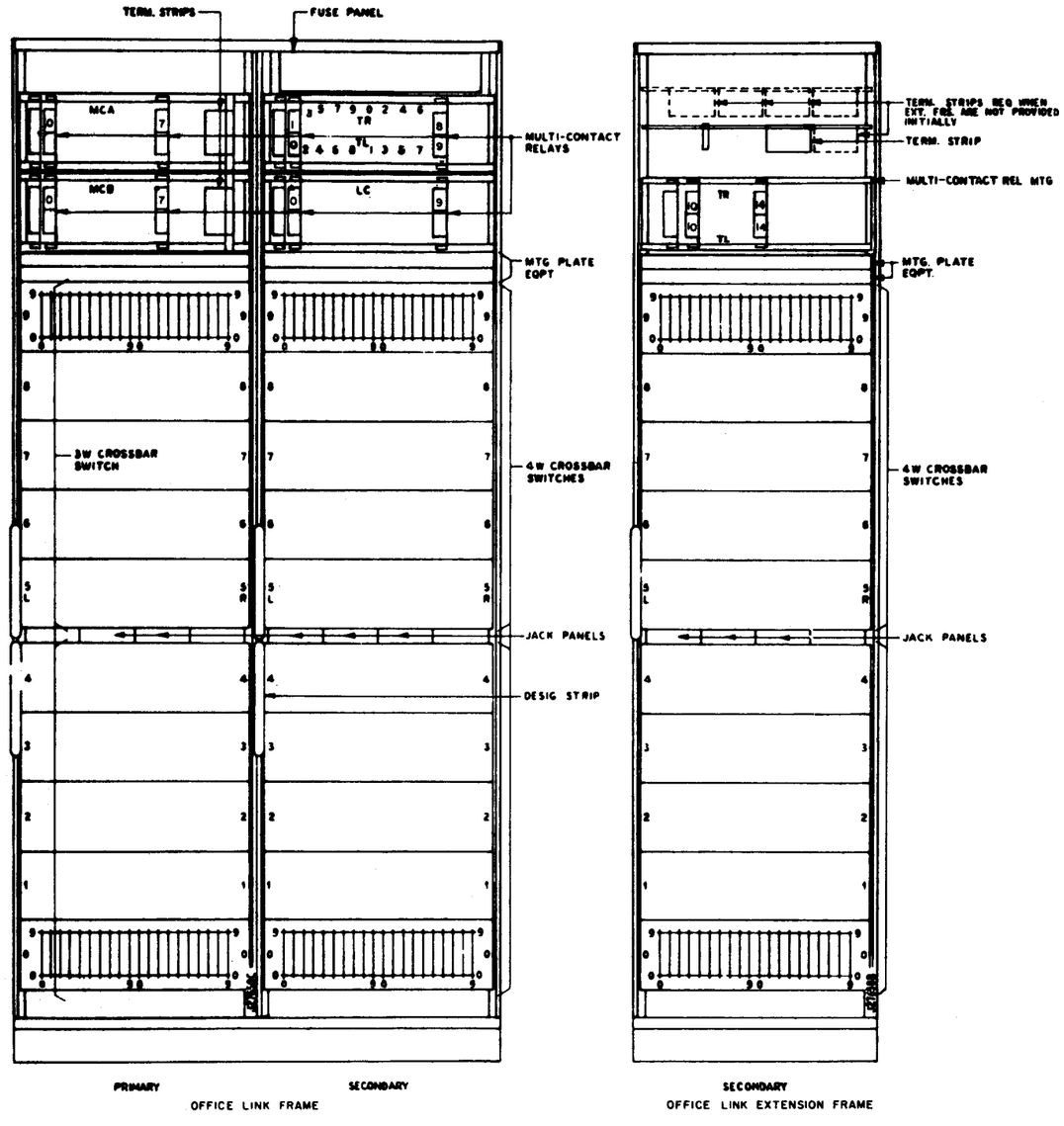
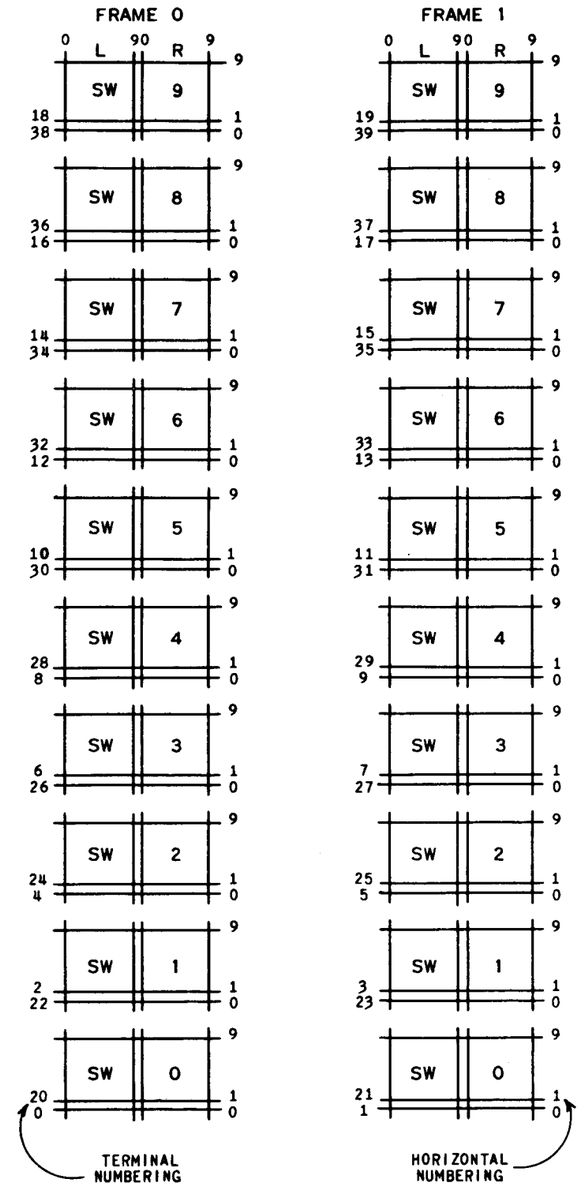


Fig. 1—Office Link Frames

UNSPLIT SECONDARIES WITH
200 OUTGOING TRUNKS



TEST GROUP #0 ASSOCIATED WITH TERMINALS 0–39 ON REGULAR SECONDARY HORIZONTALS 0 AND 1

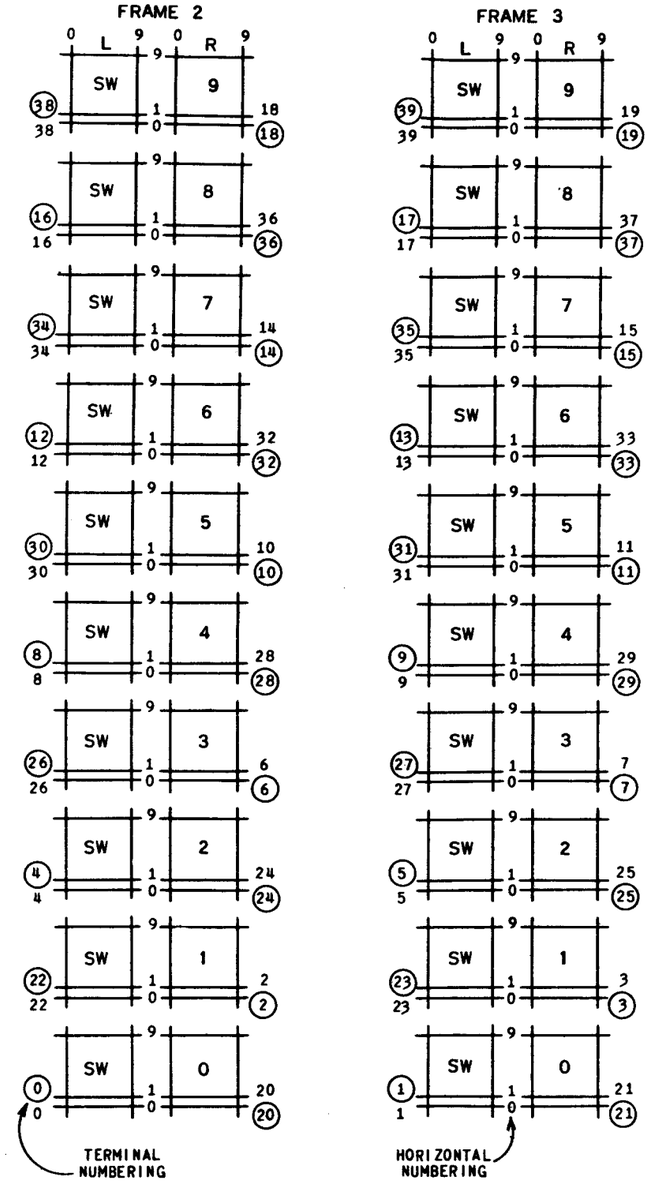
TG #2 ASSOCIATED WITH TERMINALS 0–39 ON REGULAR SECONDARY HORIZONTALS 2 AND 3

TEST GROUP	HORIZONTALS
4	4 AND 5
6	6 AND 7
8	8 AND 9

PAIR OF OFFICE LINK FRAME SECONDARY SWITCHES (UNSPLIT) AND LOCATIONS OF THE 40 OUTGOING TRUNKS FORMING A MARKER TEST GROUP

Fig. 2—Unsplit Secondaries With 200 Outgoing Trunks

FULLY SPLIT SECONDARIES
WITH 400 OUTGOING TRUNKS



TEST GROUP #0 ASSOCIATED WITH TERMINALS 0–39 ON SECONDARY HORIZONTALS 0 LEFT AND 1 RIGHT

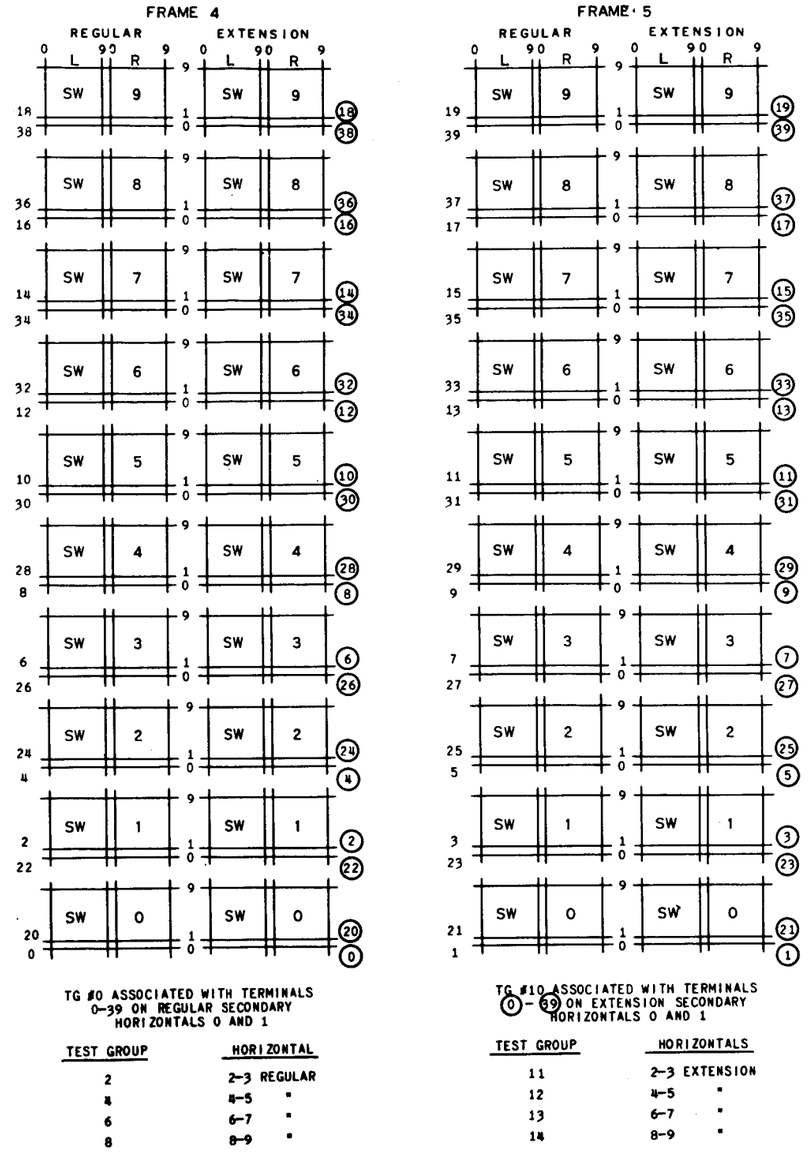
TG #1 ASSOCIATED WITH TERMINALS (0) – (39) ON SECONDARY HORIZONTALS 1 LEFT AND 0 RIGHT

TEST GROUP	HORIZONTALS
2	2L – 3R
3	3L – 2R
4	4L – 5R
5	5L – 4R
6	6L – 7R
7	7L – 6R
8	8L – 9R
9	9L – 8R

PAIR OF OFFICE LINK FRAME SECONDARY SWITCHES (FULLY SPLIT) AND LOCATIONS OF THE 40 OUTGOING TRUNKS FORMING A MARKER TEST GROUP

Fig. 3—Fully Split Secondaries With 400 Outgoing Trunks

SECONDARIES USING EXTENSIONS
WITH 400 OUTGOING TRUNKS



TG #0 ASSOCIATED WITH TERMINALS 0–39 ON REGULAR SECONDARY HORIZONTALS 0 AND 1

TEST GROUP	HORIZONTAL
2	2–3 REGULAR
4	4–5 "
6	6–7 "
8	8–9 "

TG #10 ASSOCIATED WITH TERMINALS (0)–(39) ON EXTENSION SECONDARY HORIZONTALS 0 AND 1

TEST GROUP	HORIZONTALS
11	2–3 EXTENSION
12	4–5 "
13	6–7 "
14	8–9 "

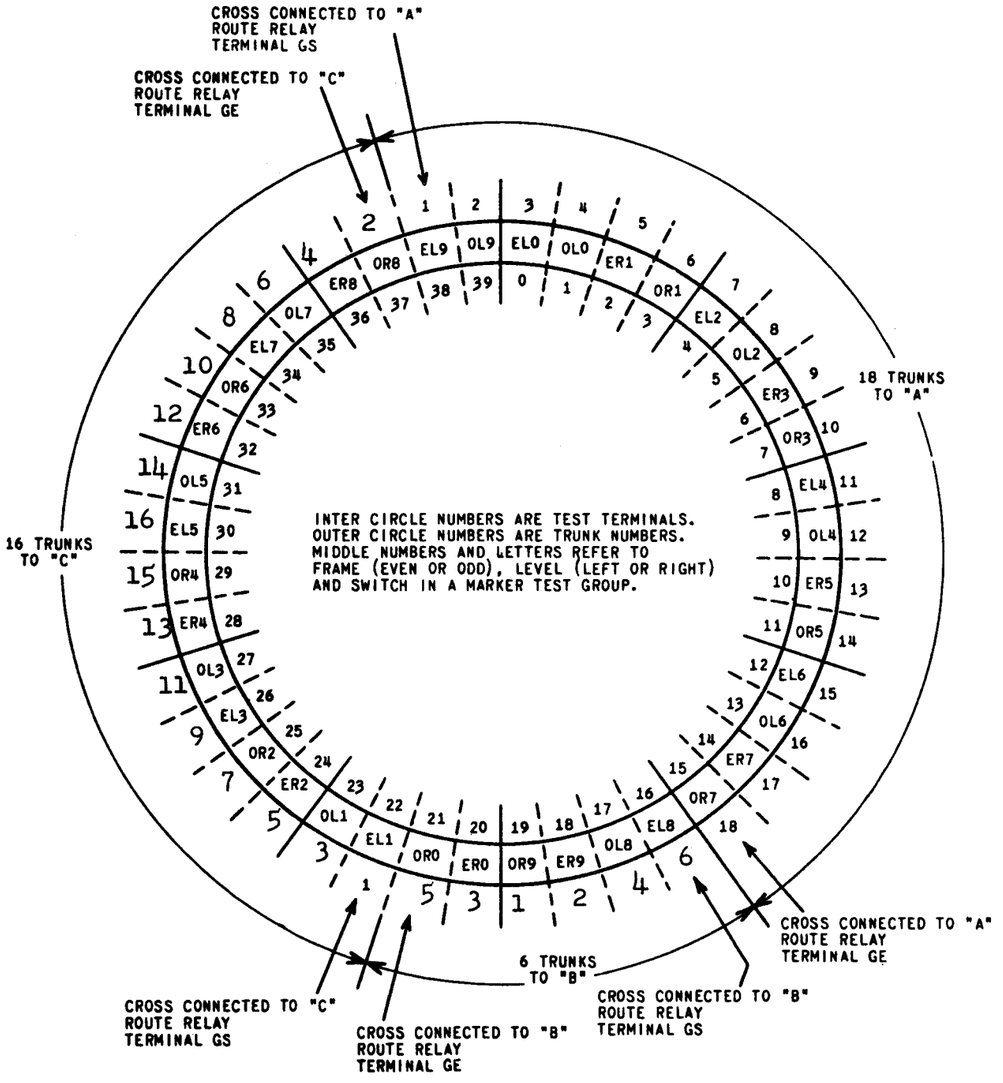
PAIR OF OFFICE LINK FRAME SECONDARY SWITCHES WITH EXTENSION FRAMES AND LOCATIONS OF THE 40 OUTGOING TRUNKS FORMING A MARKER TEST GROUP

Fig. 4—Secondaries Using Extensions With 400 Outgoing Trunks

Office A - 1-way outgoing trunks

Office B - 2-way outgoing trunks
Our office selects high to low

Office C - 2-way outgoing trunks
Our office selects low to high



MARKER TEST GROUP ASSIGNMENT -
ASSUMING THREE TRUNK GROUPS
TO A PAIR OF FRAMES ON MARKER
TEST GROUP O

Fig. 5—Marker Test Group Assignment

Printed in U.S.A.

OUTGOING TRUNK ASSIGNMENT RECORD

CROSSBAR TANDEM

Form E 4359 (6-55)

Office ______________ Crossbar Office Frames (E) ________ (O)________

	SWITCH	0		1		2		3		4		5		6		7		8		9	
	FRAME	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O
		MARKER TEST GROUP TERMINALS																			
MKR T.G. NO.	NO.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	ASSG'D																				
	W'K'G																				
	NO.	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
	ASSG'D																				
	W'K'G																				
MKR T.G. NO.	NO.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	ASSG'D																				
	W'K'G																				
	NO.	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
	ASSG'D																				
	W'K'G																				
MKR T.G. NO.	NO.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	ASSG'D																				
	W'K'G																				
	NO.	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
	ASSG'D																				
	W'K'G																				
MKR T.G. NO.	NO.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	ASSG'D																				
	W'K'G																				
	NO.	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
	ASSG'D																				
	W'K'G																				
MKR T.G. NO.	NO.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	ASSG'D																				
	W'K'G																				
	NO.	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
	ASSG'D																				
	W'K'G																				

Fig. 6—Outgoing Trunk Assignment Record Sample Outgoing Trunk Assignment Record

OUTGOING TRUNK ASSIGNMENT RECORD
CROSSBAR TANDEM

FORM E-4359 (6-55)

OFFICE LAFAYETTE, LA — CROSSBAR OFFICE FRAMES (E) 0 (O) 1

SWITCH		0		1		2		3		4		5		6		7		8		9	
FRAME		E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O
		MARKER TEST GROUP TERMINALS																			
MKR TG NO.	NO.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
8	ASSG'D					S ←						HOUSTON 2-W									
	W'K'G					APB SP	SP	SP	SP	PN 48	PN 46	PN 42	38	34	30	26	22	18	14	10	6
	NO.	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
	ASSG'D					HOUSTON 2-W										→ E					
	W'K'G	2	4	8	12	16	20	24	28	32	36	PN 40	PN 44	SP	SP	SP	SP				
MKR TG NO.	NO.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
6	ASSG'D			S ←		ARN AUDVILLE 2-W						→ E						S ←	1150 UNIV OPR		
	W'K'G			9	7	5	3	1	2	4	6	8	SP					1	2	3	4
	NO.	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
	ASSG'D	—	1150 UNIV OPR	→	E			S ←	1112 WH OPR				REG.	→	E						
	W'K'G	5	6	SP	SP			1	2	3	4	5	6	SP	SP						
MKR TG NO	NO.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
4	ASSG'D	—	120 MKRS OPI	IPM TONE		→ E														S ←	TUL-SA 2-W
	W'K'G	5	6	7	8	9	10													1	3
	NO.	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
	ASSG'D	TUL 2-W	SA	→	E													S ←	120 IPM MKRS OPI		
	W'K'G	SP	APB SP	4	2													1	2	3	4
MKR TG NO	NO.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
2	ASSG'D															S ←	ALEXANDRIA 2-W				
	W'K'G															APB SP	SP	SP	SP	34	30
	NO.	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
	ASSG'D	—						ALEXANDRIA 2-W											E		
	W'K'G	26	22	18	14	10	6	2	4	8	12	16	20	24	28	32	36	SP	SP		
MKR TG NO	NO.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
0	ASSG'D	S ←						JACKSON 2-W													
	W'K'G	APB SP	SP	SP	66	62	58	54	50	46	42	38	34	30	26	22	18	14	10	6	2
	NO.	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
	ASSG'D	—						JACKSON 2-W												→	E
	W'K'G	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	SP	SP	SP	APB SP
	HWY	4	4	4	6	4	6	6	4	6	8	6	8	6	6	6	6	4	4	4	2
	LGT	3	3	4	4	4	3	3	4	3	2	2	1	1	1	1	1	2	2	4	5
		7	7	8	10	8	9	9	8	9	10	8	9	7	7	7	7	6	6	8	7

Fig. 7—Sample Outgoing Trunk Assignment Record

GROUP _____ SERV.DATE _____

B.S.-B.H. _____ OPRN. _____

CLASS _____ RT.RLY. _____

ALT.RT'S. _____ , _____ , _____

SUB.GRP.	1	2	3	4	5	6
OLF						
TL						
GS						
GE						

Front

GROUP _____

ORDER NO. _____

TRUNKS

	EEP	CUT
WKG		
P.W.	X	
SPARE		
SPAN		

REMARKS:

Back

TRUNK GROUP INFORMATION CARD

Fig. 8—Trunk Group Information Card

OUTGOING TRUNK ASSIGNMENT RECORD
CROSSBAR TANDEM

FORM E-4389 (6-58)

OFFICE LAFAYETTE, LA. CROSSBAR OFFICE FRAMES (E) 0 EXT. (O) 1 EXT.

SWITCH	0		1		2		3		4		5		6		7		8		9	
FRAME	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O
	MARKER TEST GROUP TERMINALS																			
MKR T.G NO.	NO.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
14	ASSG'D	→	E	S	←					TOLL		SW.		CE-4							
	W'K'G	SP	SP	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	NO.	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
	ASSG'D							TOLL		SW.		CE-4									
	W'K'G	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	SP	SP	SP	SP
MKR T.G NO	NO.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
13	ASSG'D		MONROE			2-W	→	E								S	←	KAPLAN			
	W'K'G	5	7	SP	ARB SP	8	6	4	2							SP	SP	17	15	13	11
	NO.	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
	ASSG'D					KAPLAN				2-W					→	E				S ←	MRJ 2-W
	W'K'G	9	7	5	3	1	2	4	6	8	10	12	14	16	18	SP	SP			1	3
MKR T G NO	NO.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
12	ASSG'D	S ←	104 TRNK TST	→ E	S	←		115A		LO	OPR		→	E							
	W'K'G	1	2	3	4	1	2	3	4	5	6	7	8	9	10						
	NO.	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
	ASSG'D															S	←	PARKS		→	E
	W'K'G															1	3	5	SP	4	2
MKR T G NO	NO.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
11	ASSG'D																	S	← N. IE.		1-W
	W'K'G																	01	02	03	04
	NO.	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
	ASSG'D				NEW	IBERIA					1-W								→	E	
	W'K'G	05	06	07	08	09	010	011	012	013	014	015	016	PW 017	PW 018	PW 019	SP	SP	APB SP		
MKR T G NO	NO.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
10	ASSG'D	S ←						LAKE		CHARLES				2-W							
	W'K'G	2	6	10	14	18	22	26	30	34	38	42	46	50	54	58	62	SP	SP	SP	APB SP
	NO.	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
	ASSG'D							LAKE		CHARLES				2-W							→ E
	W'K'G	APB SP	SP	SP	SP	64	60	56	52	48	44	40	36	32	28	24	20	16	12	8	4
	HVY	4	2	4	6	6	6	6	6	6	6	6	6	8	8	6	4	6	6	8	10
	LGT	4	5	4	3	5	5	5	5	4	4	4	4	2	2	2	3	2	1	2	1
		8	7	8	9	11	11	11	11	10	10	10	10	10	10	8	7	8	7	10	11

Fig. 9—Sample Extension Office Link Frame Outgoing Trunk Assignment Record