

NO. 5 CROSSBAR
METHOD OF PROCEDURE (MOP) PREPARATION

CONTENTS	PAGE
1. GENERAL	1
1.01 Purpose	1
1.02 Involvement.....	1
1.03 Recognition of Organizational Structure	1
2. OBJECTIVES OF MOP	2
2.01 General	2
2.02 Continuity of Service	2
2.03 Role of Dial Administrator	3
2.04 Service Protection From Equipment Failures ..	3
2.05 Meetings	4
3. RESPONSIBILITIES ASSOCIATED WITH MOP.	4
3.01 General	4
3.02 Dial Administrator	4
3.03 Engineering Department	5
3.04 Western Electric Company	5
3.05 Plant Department	5
4. DEVELOPMENT OF MOP	6
4.01 General	6
4.02 Format of MOP	6
5. TRANSITIONS AND REARRANGEMENTS ...	7
5.01 General	7
5.02 Line Link Frame and Trunk Link Frame Additions	7
5.03 Paired Trunk Line Frame Operation	9
5.04 Paired Line Link Frame Operation	9
5.05 Permanent Junctor Plan	10
5.06 Common Control Equipment	11
5.07 Utilization	13
6. IN-SERVICE REQUIREMENTS	15
6.01 General	15
6.02 Determination of Quantities	15
6.03 Control Forms	16
7. DATA	17
7.01 Service and Load Measurements	17
7.02 Service Ceilings	18
7.03 Load and Capacity Charts	18
8. OTHER CONSIDERATIONS	19
8.01 Newer Services	19
8.02 Line Transfers	19

8.03 Equipment Testing	19
8.04 Daily Administration	20
9. CONCLUSION	20
10. REFERENCE SOURCES	20

1. GENERAL

1.01 Purpose

1.01.1 This section contains procedures to be followed by personnel responsible for the dial administration of #5 Crossbar Offices when additions to existing facilities are required, when certain modifications and/or improvements are planned, or when any changes and/or transitions are anticipated to change capacity or improve service.

1.01.2 Familiarity with Dial Facilities Management Practices, Division H, Section 1b(8) is essential as is a knowledge of Traffic Engineering, Dial Administrative procedures, and the switching functions of the #5 Crossbar system.

1.02 Involvement

1.02.1 Generally, periods of activity involving equipment additions, transitions and/or modifications require the involvement of groups other than the Traffic Department. Such areas of mutual responsibility are identified to the extent necessary for Traffic Dial Administration personnel to participate effectively in the development of Methods of Procedure (MOP).

1.02.2 The Dial Administrator must become involved with the Traffic Engineer during the design stage of a job to insure orderly implementation and guidance to implement transitional or regrade jobs.

1.03 Recognition of Organizational Structures

1.03.1 Due to differences in organizational structures, specific titles of individuals, groups and departments are avoided. Instead,

general descriptive or functional names are used. This type of format permits the identification by the individual company of a particular organizational level (or sequence or organizational levels) responsible for the procedures described herein.

1.03.2 For the purpose of this practice the following designations will be used:

- (a) The Telephone Company representative normally responsible for the administration of the #5 Crossbar machine will be referred to as the Dial Administrator.
- (b) The Telephone Company representative normally responsible for the maintenance of the #5 Crossbar machine will be referred to as the Plant.
- (c) Western Electric Company's Service Division does the major portion of equipment installation work for Bell System Companies. The installation force will, therefore, be designated WECO.
- (d) The MOP in its final form is a written plan concurred in and signed by WECO and the Telephone Company defining:

- (1) What has to be done:
 - (a) Changes or additions involved.
 - (b) Sequence of addition or changes.
- (2) How the job will be done with provision for:
 - (a) Continuity and quality of service.
 - (b) Efficiency in WECO installation effort.
 - (c) Minimum interference with normal Plant routines.
 - (d) Emergency restoral procedures.

2. OBJECTIVES OF METHOD PROCEDURE

2.01 General

2.01.1 The preparation of the MOP is normally done by WECO; it will include appendices containing In-Service Requirements, Due Dates for Cross-Connection lists, dates for advance turnover, testing, etc.:

2.01.2 An MOP is required whenever WECO activities can be service affecting. Following are examples of work activities needing MOP's:

- (a) Out Sender and/or Incoming Register rearrangements or modifications.
- (b) Marker additions, rearrangements or modifications.
- (c) Relocating trunks on trunk link frames.
- (d) Line link frame pairing.

2.01.3 A proper Method of Procedure involves the following processes:

- (a) WECO develops and proposes a plan.
- (b) In an early MOP meeting, the plan is evaluated by the Telephone Company.
 - (1) The Dial Administrator assesses the impact on service.
 - (2) The Plant Department evaluates the maintenance effort and test requirements.
 - (3) The Engineering Department examines the cost aspect.
 - (4) Other departments are consulted as necessary.
- (c) Adjustments in procedures are made based upon the participation of the groups involved.
- (d) A final MOP is agreed upon.
- (e) The MOP is prepared in writing and is signed by management in the departments involved. District level approval is recommended.

2.02 Continuity of Service

2.02.1 The Telephone Company representative with the primary responsibility for continuity and reliability of switching service is the Dial Administrator. When there is any WECO activity in an office, efforts in connection with this responsibility must be intensified.

2.02.2 Assuring continuity and reliability of service during periods of activity connected with installation of equipment by WECO is the joint interest and responsibility of both the Telephone Company and WECO. The attainment of this objective requires full and continued cooperation prior to and during the installation

period. A procedure generally found practical for attaining this objective involves a full discussion prior to any installation activity of items such as:

- (a) Type of equipment to be added or modified, e.g. senders and registers by type of pulsing; markers, transverters, etc.
- (b) Working equipment that may be affected by planned job activity.
- (c) Selection of periods for taking working equipment out-of-service.
- (d) Whether a change in working hours may be necessary because of service affecting work.
- (e) Method of accomplishing transitional work.
- (f) Amount and duration of equipment out-ages.
- (g) Assignment and cross-connecting information required.
- (h) Tests to be performed.

2.02.3 Continuing attention beginning with the preparation of the Traffic Order is required to insure protection of customer service. It is necessary that the Traffic Engineer and Dial Administrator concur not only with the equipment requirements, but also the configuration of equipment and the methods to place these facilities in service. An appropriate statement regarding any portion of the work involved may be included in the Traffic Order to serve as a guide to the WECO job planner.

For example:

Trunk arrangements by type trunk may be assigned in the Traffic Order to the various sender link and trunk link frames.

2.03 Role of the Dial Administrator

2.03.1 It is the basic responsibility of the Dial Administrator to insure that sufficient equipment is properly arranged to meet the requirements for effective administration over the life of the job while rendering service at or better than objective levels.

2.03.2 Major contributions to the development of the MOP may be made in the following areas:

- (a) Develop load-service charts depicting per-

cent Incoming Matching Loss vs CCS per line link frame and other capacity charts as necessary prior to the first MOP Committee Meeting. These may then be used to determine in-service requirements for MOP purposes with proper applications of recommendations contained in the Traffic Facilities Practices.

- (b) Arrange for monitoring the various load service barometers to insure sufficient equipment quantities are available.
- (c) Establish due dates for cross connect lists for markers, traffic registers, Traffic Usage Recorders, trunks, etc.
- (d) Participate in determining and scheduling interdepartmental tests in which the Dial Administrator would be involved.
- (e) Plan ahead for line transfers from existing line link frames to newly added ones. This must include connection of load and service measurement devices.
- (f) Determine in advance, the preferred time frame for service affecting operations such as:
 - (1) Equipment turn-downs
 - (2) Junctor pattern changes
 - (3) Trunking and/or equipment rearrangements
 - (4) Special service circuit turndowns
- (g) Provide a single contact who will coordinate activities of other Traffic Department groups (Toll, Directory Assistance, Intercept).

2.04 Service Protection from Equipment Failures

2.04.1 The MOP must provide for absolute optimum protection of service. The following items are pertinent:

- (a) The specific location of WECO activity.
- (b) The specific equipment activity with which WECO is involved. Of particular interest would be the "down-time" of any facility.
- (c) Service and load devices must be kept in service during WECO activity. Manual readings may be necessary for immediate analysis and corrective action, hence proper personnel must be trained and provided.

(d) A formalized plan for equipment restoral to service in cases of emergency or unusually high call and/or load volumes.

2.04.2 Practices concerning prevention of service interruptions should be familiar to the Dial Administrator. They include:

(a) BSP 201-112-001, BSP 201-112-005, BSP 201-112-010 which includes WECO Handbook 0, Section 10; BSP 201-112-020 which contains WECO Handbook 3, Section 13; BSP 800-614-150, Issue 4-d.

(b) BSP 201-114-001 explains the record of equipment and trunks out of service.

2.05 Meetings

2.05.1 Before starting any work, an MOP meeting should be arranged by the Telephone Company's representative (usually the Engineering Department; see paragraph 3.03) to discuss the work involved and assign dates and hours for start and completion of the various operations.

These discussions are to be held as frequently as it is found necessary in order to protect equipment and service. Those in attendance should be Plant, Traffic, Engineering and WECO (WECO Installation Handbook 3, Section 5A, paragraph 1.3).

2.05.2 Proposals for establishing controls and follow-up on job progress should be determined at the MOP meeting.

2.05.3 Minutes of all meetings should be kept and distributed as the formal record of inter-departmental or inter-company agreements and decisions.

2.05.4 It is suggested that sub-committees be formed when necessary to assist the MOP Committee. An example of a sub-committee function would be to develop a section for TUR transition and/or addition.

2.05.5 The frequency of committee and sub-committee meetings should be firmly established and followed for job status reports.

3. RESPONSIBILITIES ASSOCIATED WITH MOP

3.01 General

3.01.1 The preparation of the MOP is usually

handled by WECO based upon the job factors previously described.

3.01.2 In placing service above all other considerations, it may well be necessary to subordinate departmental routine.

3.02 Responsibilities of Dial Administrator

3.02.1 It is recommended that the Dial Administrator have the prime administrative responsibility for those areas that normally accrue to the Traffic or Switching Departments. These include:

(a) Review the contents of the Traffic Order to insure that:

(1) The installation interval and date of completion are adequate.

(2) The estimate of equipment requirements reflect the latest view of demand predicated upon dialing and routing arrangements (EAS, new trunk groups, etc.)

(3) The Incoming trunks are distributed equitably over the trunk link frames.

(4) When possible, trunks are distributed over more than one Incoming Register Group for service protection.

(5) The Traffic Department representatives responsible for the Toll, Directory Assistance and Intercept facilities concur in equipment provision and arrangements.

(b) Being familiar with service results (percent dial tone delay over three seconds, percent incoming matching loss, overflow scorings, etc) since the last job.

(c) Determine and evaluate the effect on service of the proposed MOP.

(d) Familiarity with customer demands including Centrex CU customers, Computer Ports, WATS, Touch Tone, Intermediate Switching Points (ISP) etc.

(e) Knowledge of any special studies such as Division of Revenue or trunk base studies.

(f) Arranging for, by providing the appropriate coordination, the following information:

(1) Designation strips and any switchboard assignments.

- (2) Cross-connection lists for:
 - Traffic Usage Recorder
 - Trunk and Marker Work
 - Traffic Registers
- (3) Trunk link frames CCS data to trunk assignment group. (See 4.09.7)
- (g) Understanding of load-service relationships so that proper in-service requirements can be determined by time frames.
- (h) Have a detailed knowledge of the proposed transitional procedures for which data and/or cut sheets must be prepared.
- (i) Have a written transition plan approved by District Level Supervisor.

This plan may be prepared prior to the first MOP meeting described in paragraph 2.05 and consists of:

- (1) Equipment required first.
- (2) Minimum in-service requirements by hour.
- (3) Expected service penalties due to overloads and/or equipment outages.
- (4) Planned line or trunk transfers.
- (5) Cross-connection list and due dates.
- (6) Alternate plan, etc.
- (j) Review as soon as possible, all equipment configurations to ensure equitable distribution.
- (k) Have various documents available for easy reference. These may include:
 - (1) Traffic Orders
 - (2) Job Specification
 - (3) MOP
 - (4) Various Traffic Practices
 - (5) Trunk Forecasts
 - (6) Data Summaries
 - (7) Line and station Forecasts
 - (8) Demand & Facility Charts

3.03 Responsibilities of Engineering Department

3.03.1 Many operating companies assign an Engineering Department representative to coordinate WECO installation activities.

3.03.2 The Engineering Department representative is normally responsible for: (BSP 790-100-420).

- (a) Scheduling job meeting between WECO and the Telephone Company.
- (b) Providing liaison between WECO and the Telephone Company.
- (c) Ensuring WECO adherence to MOP.
- (d) Economic aspects of the job:
 - Overtime, unusual transition methods, additional effort to avoid equipment outages, etc.
- (e) Arranging advance turnover of equipment.

3.04 Responsibilities of Western Electric

3.04.1 WECO is responsible for preparing and following MOP.

3.04.2 Testing of equipment removed from service must be in accordance with WECO Handbook Instructions and established procedures contained in various Bell System Practices. Removing and restoring equipment from service by Plant may be done with the approval of the Dial Administrator.

3.04.3 Transitions, rearrangements, replacements, etc., must be accomplished with a minimum interval of reduced capacity and with a minimum probability of service interruption, but consistent with reasonable job efficiency.

3.05 Responsibilities of Plant Department

3.05.1 The Plant Department has the overall responsibility for physically removing equipment from service, testing, and restoring to service, etc., during periods of WECO activity. See paragraph 3.04.2.

3.05.2 A record of equipment outages is maintained by Plant according to their practices (BSP 201-114-001). This log will include information concerning equipment removed from service for any reason.

3.05.3 Certain cross-connection work and/or other rearrangements may be done by the Plant.

4. DEVELOPMENT OF MOP

4.01 General

4.01.1 Proper planning and continuing follow-up in connection with a Method of Procedures is of primary importance in ensuring that service risks are held to a minimum and job efficiency is at a maximum.

4.01.2 Planning must begin before the Traffic Order is prepared. Information regarding transitions, advance turnover, replacement or rearrangement of any equipment should be included in the Traffic Order, when possible, because it may affect the way in which the WECO Engineer prepares the job specification. Significant information might include:

- (a) Dates for advance turnover.
- (b) Time interval for transition or replacement.
- (c) Requested procedure for rearrangement.
- (d) Maximum equipment quantities that may be released for modification (including time of day).
- (e) Where necessary, a detailed step-by-step procedure for doing a transition or a rearrangement.

4.01.3 The Traffic Order and Job Specification should be compared so that errors or omissions are corrected before WECO Engineering begins.

4.01.4 The Dial Administrator is responsible for inclusion in the MOP any special instructions, dates of advance turnovers, or unusual measures.

4.02 Format of MOP

4.02.1 Western Electric Handbook 69B includes sample MOP preprinted forms for #5 Crossbar Offices. These forms are used by the W.E. Co. Installer to assist him in preparing the initial MOP which will be discussed at the early MOP meeting.

4.02.2 The MOP includes a general outline of all equipment affected, work location, general notes, special instructions, etc.

4.02.3 The MOP will contain the dates, start and

complete time, the type of protection and special precautions for each step of the job.

4.02.4 The contents of the MOP are:

- (1) General Notes
- (2) General MOP
- (3) Detailed MOP
- (4) Approvals
- (5) Appendices

4.02.5 Care should be taken to ensure that all work done is in logical sequence, each step explained fully and specific responsibility noted (WECO or Plant).

4.02.6 The procedures described are standard installations. Be certain that conditions do not exist to prevent their application.

4.02.7 Bases of Western Electric installation as described in WECO Handbook 3, Section 5A are:

- (1) *In-Service*
Equipment cannot be removed from service and extreme caution will be taken during work operation.
- (2) *Out-Of-Service*
Equipment will be removed from service for a period of time that may last through an entire shift or more.
- (3) *Temporary-Out-Of-Service*
Equipment will be removed from service for a short period of time.

4.02.8 The sequence of progress may be based on the following considerations:

- (a) Equipment that will be required first.
- (b) The sequence of steps that will provide advance equipment when required to meet service needs.
- (c) The amount of work that can be done and still provide a major margin of safety for returning released equipment to service within the specified time.
- (d) Work that can be done without affecting working equipment such as: erecting, cabling, wiring, etc.

- (e) Work that must be done during lightly loaded (usually night) hours.
- (f) Work that must be done on an "in-service" basis.
- (g) The type of test and test equipment required during and at the completion of each step.

4.02.9 When a change in the order of procedure of the work is necessary, due to unforeseen circumstances, (see paragraph 4.02.6), WECO and the Telephone Company's representatives, principally the Dial Administrator, shall be held responsible for determining the extent of the change and its possible effect on service and the job.

4.02.10 If changes are necessary and agreement is reached concerning method of implementing the changes, this agreement shall be indicated on a revised and approved Method of Procedure.

4.02.11 All copies of the MOP, original or revised, as described in WECO Handbook 3, Section 5A provide an opportunity for WECO and Telephone Company representatives to approve and concur in proposals.

5. TRANSITIONS AND REARRANGEMENTS

5.01 General

5.01.1 The following paragraphs describe the various methods to be employed in completing transitions and rearrangements in connection with adding equipment to existing facilities. These methods should appear in the MOP and should be followed by WECO. Any changes would require a revision of the MOP as described in paragraphs 4.02.9 and 4.02.10.

5.01.2 Service may be affected by transitions and/or rearrangements because the capacities may be reduced some what by decreasing team-size of facilities or removing equipment from service.

5.01.3 Arrangements should be made to clear equipment for WECO activity so that service is not adversely affected if at all possible. Consideration must be given to other groups and departments in establishing dates for this work; e.g.:

(1) Clearing trunk equipment requires considerable time and effort to prepare and complete trunk orders. Efforts should be made to install new equipment so that working trunks that require relocation to clear trunk equipment can be relocated first.

(2) Special service circuits (WATS, data, private line, etc.) require customer approval for turndown. These should be identified early so that customer contacts can be made without delaying the job while waiting for approval.

5.01.4 The various measurement devices discussed later must be kept in service during periods of WECO activity. The MOP should contain instructions ensuring that these devices not be turned down during periods of time when data gathering is imperative.

5.02 Line Link Frame and Trunk Link Frame Additions.

5.02.1 When a pattern change is involved, the addition of line link and trunk link frames may require a redistribution of junctors since the number of junctors per line link frame per trunk link frame must be correspondingly reduced to provide equal access between all line and trunk link frames.

5.02.2 The addition of trunk link frames may also require the transfer of working trunks from existing trunk link frames onto the newly installed trunk link frames.

5.02.3 Installation work for the addition of line and trunk frames is divided into three categories:

(a) Preliminary Work:
This involves the erection of all frameworks, running in and connecting all cables to the added equipment and installing and connecting miscellaneous apparatus on existing equipment where it will not interfere with working circuits.

(b) Transitional Work:
It is during this phase that added frames are established in the working circuit pattern. Each transition is accomplished by routing existing traffic from the existing line link frames to all (old and new) trunk link frames.

(c) Clean Up Work:

This stage of the installation completes the junctor assignment to the added trunk link frames. (It will also include removal of abandoned cabling and other related wiring to conform to the new junctor distribution). Transfer of traffic to the new equipments will be effected during this stage.

5.02.4 A junctor transition is the rearrangement of the 100 paths spread evenly over the trunk link frame singles, pairs or triple groups. It is the redistribution of junctors that affect the call carrying capacity of the office. (The junctor patterns are designed to serve combinations of line link and trunk line frames that are in exact 2 to 1 ratio to each other. However, the use of a particular pattern in an office does not in itself determine the number of line link frames installed.)

5.02.5 Determination of the next size of the office may decide the number of junctors to be made available following the transition, i.e., the number of junctors may meet the requirements of a future similar addition; during the interim, however, fewer junctors will carry traffic loads then could be made available with the present job. Any reduction in traffic carrying capacity should be avoided; studies will indicate, depending upon office configuration, whether the proposed pattern is satisfactory.

5.02.6 The number of junctors in a junctor group may vary from a maximum of fifty junctors to a minimum of ten junctors. They are divided into subgroups of ten or less for testing by the markers (see Exhibit 1).

5.02.7 When there are more than ten junctors in a group, the marker tests a maximum of two subgroups of the junctor group. A walking and stepping circuit is provided in each marker to rotate the use of various subgroups (see Exhibit 2). The first test is always of a full subgroup of ten junctors.

5.02.8 Junctor transitions in #5 Crossbar Offices may involve a reduction in capacity during transition. The effect of the junctor transition on capacity can be readily explained and also the extent of the loss can be predicted. Exhibits 3 & 4 are sample forms which may be used to:

1. Determine Line Link Junctor Capacity — The quantity of junctors for the present and proposed patterns can be determined from the Bell System Practice 819-220-150. By drawing in the present and proposed pattern arrangements and number of junctors, the change that must take place during the transition becomes evident.

2. Determine Trunk Link Junctor Capacity — This form indicates the number of junctors capable of being connected to a trunk link group. Through calculations, the number of junctors connected before and after the job for the existing frames, and the number of junctors connected to the new Line Link Frames after the job are determined.

5.02.9 Knowing from the forms how much of a loss to expect, the Dial Administrator can develop a plan to reduce the effect of the loss. A few of the plans to be considered are:

1. Schedule the transition work out of the busy season, at night or on weekends.
2. Immediately turn up for service, the originating registers (O.R.) in new Trunk Link Frames and make O.R.'s on existing frames busy to direct some of the load into the new frames.
3. Have line and/or trunk cuts ready to be worked as soon as transition is completed. (See Paragraph 4.09.2)

5.02.10 WECO operates on the premise that pattern normal (one subgroup of ten junctors/L.L.F.) is adequate to handle busy hour traffic and therefore transition work may be done on an in-service basis.

5.02.11 Handbook 69B contains sample forms and detailed instructions for various transitions. Section 576B is an example of a junctor transition "pattern normal," while 576C is an example of an alternate method of the same transition, *assuming no reduction in capacity* during the transition period. This is done by back tapping junctors.

The Dial Administrator should determine the method to be used. (See Exhibit 5)

NOTE: The basic plan of the transition covered in Section 576C consists of establishing the

junctor groups to the added trunk link frames pairs without disturbing the existing junctor pattern. After the new trunk link frame pairs are put in service, each of the existing trunk link frame pairs is converted to the new size.

5.02.12 By being aware of the effect that junctor transitions can have on service along with forms visually portraying the change in patterns, the Dial Administrator can predict the extent of probable loss in call carrying capacity. Having this advance information will permit development of plans for a smooth transition and thereby maintain good service to the customer.

5.03 Paired Trunk Link Frame Operation

5.03.1 Trunk link frames are installed for connecting originating registers, outgoing trunks, incoming trunks and junctors. Pairing trunk link frames is a procedure used to accomodate more trunk link frames by sharing the junctors.

5.03.2 Engineering capacity tables are based on this assumption:

When a paired or tripled junctor pattern size is provided and the number of trunk link frames installed is fewer by two or more than a full pattern, more than one pairing arrangement is possible. The CCS shown in the table (Exhibit 6) is based upon every pair being formed by one or two trunk link frames with no pair completely missing.

EXAMPLE: 24 LLF, 12 TLF on 7 pair pattern

Junctors/LLF	Trunk Link Frames		Pair #
15	0	7	Pair 0
15	1	8	Pair 1
14	2	9	Pair 2
14	3	10	Pair 3
14	4	11	Pair 4
14	5		Pair 5
14	6		Pair 6

Although a trunk link frame is missing on Pair 5 and 6, the table requirements have been met — at least one frame is filling out each pair and all 100 junctors are working. CCS capacity for this example is 1220 CCS/LLF.

5.03.3 As previously mentioned more than one arrangement of the trunk link frames is possible and a pair can be left open. (This arrangement is not normally recommended.)

EXAMPLE: 24 LLF, 12 TLF on 7 pair pattern

Junctors/LLF	Trunk Link Frames		Pair #
15	0	6	Pair 0
15	1	7	Pair 1
14	2	8	Pair 2
14	3	9	Pair 3
14	4	10	Pair 4
14	5	11	Pair 5
14	—	—	Pair 6 missing

In this example, there are 86 junctors in use from each line link frame.

5.03.4 A capacity table (Exhibit 7) has been developed for determining CCS/LLF capacity when a pair or triple is missing or if the pair or triple is formed but not filled.

5.03.5 To determine the CCS/LLF capacity of the example shown in paragraph 4.05.3, refer to Exhibit 7. From this table we find that on a 7 pair pattern with 6 pairs filled out, the capacity would be 91% of the 6 pair pattern. Turn to Exhibit 1, find the capacity for 12 installed trunk link frames on a 6 pair pattern is 1200 CCS. $.91 \times 1200 = 1092$ CCS/LLF capacity. The CCS/LLF capacity loss using this arrangement would be: $1200 - 1092 = 108$ CCS.

5.03.6 To take advantage of the full junctor arrangements, immediate assignment into new frames is necessary or the CCS/LLF loss will be the same as that of an open pair.

5.03.7 The Dial Administrator must not only compute the office load and capacity prior to and during the transition but also after the transition is completed. (See 4.09.7).

5.04 Paired Line Link Frame Operation

5.04.1 With the paired line link frame feature, the Completing Marker is capable of testing the ten junctors from each of the two mated frames on a junctor step basis, before encountering a failure to match indication. Thus on originating and terminating calls, twenty channels may be tested before reorder is returned to the customer and a failure to match is encountered. This increase in the number of junctor paths tested will reduce the originating and incoming matching loss and increase the load carrying capacity of a line link frame by approximately 20%.

5.04.2 Dial Tone Markers are not wired for junctor sharing of the paired line link frames, therefore, dial tone speed may deteriorate before incoming matching loss. The Dial Administrator should check percent originating versus terminating traffic and the engineering of Dial Tone Markers and Originating Registers to protect against Dial Tone Delay.

5.04.3 Attachment 1 is a suggested Method of Procedure for converting #5 Crossbar Marker Groups to paired line link operation on full size pattern (10 TLF). This procedure will minimize the impact of the reduced CCS/LLF resulting from the transition to a full size pattern by permitting the markers to operate on a *paired line link basis prior to the actual junctor transition*. The efficiency gained through this pairing will offset the loss of the second and third sub-groups of the 6-7-8-9 TLF patterns and/or missing trunk link frames until the entire transition is completed.

Prior to the conversion to paired line link frame operation, studies should be made by the Dial Administrator to determine if the office can be cut to a full 10 TLF pattern without any adverse service reaction.

5.04.4 Suggested study method is as follows:

Completing Markers are blocked to operate on a 10 TLF pattern during a light load period to determine the *extent of increase* in Incoming Matching Loss.

1. If high failures of Incoming Matching loss are encountered, the pairing of the Line Link Frames should be done prior to the Junctor Pattern change.
2. If failures to match are not significant, the Junctor Pattern and Paired Line Link operation can be done simultaneously.

5.04.5 The Dial Administrator should review the Junctor Pattern with his Engineer in a "pattern ahead" situation. Too many patterns ahead will result in junctor tie-backs causing a net reduction in CCS capacity.

5.04.6 For offices about to convert to paired line link frame operation, the MOP to be used should be reviewed jointly by the Traffic Equipment Engineer, Dial Administrator and Plant.

5.05 Permanent Junctor Plan

5.05.1 The permanent junctor plan limits the number of junctor distributions to those with a comparatively high traffic carrying capacity (see Exhibit 8) and requires that paired line link operations be introduced at the earliest possible time. A maximum of three junctor distributions are used during the life of a new marker group.

5.05.2 With the permanent junctor plan, 50 of the line link junctors are cabled to one vertical and the other 50 are cabled to a different vertical in a Junctor Grouping Frame (JGF).

5.05.3 Similarly, the junctors from the trunk link frames are cabled differently. 200 junctors, 100 from the trunk line frame and 100 from the extension trunk link frame are cabled to JGF 0 and the other 200 junctors, 100 from the trunk link frame and 100 from the extension trunk link frame are cabled to JGF 1. Consequently, if large switch trunk link frames are provided in a marker group with the permanent junctor plan, the extension trunk link frame must also be provided regardless of the junctor distribution.

5.05.4 With the new cabling arrangements, the second and third subgroup junctors required in the 2 - 3 size and the second subgroup junctors required in the five size are provided in shop connected local cables which replace the jumped junctors previously required. These local cables are removed in the 2 - 3 to 5 size and 5 to 10 size transitions. The local cable in the 5 pair size (6 - 10 trunk link frames) provides, in addition to the second subgroup junctors, the pairing of the trunk link frames.

5.05.5 New physical arrangements cannot be used in existing offices, however, the ultimate junctor distribution of the plan can be applied. Once this junctor distribution is implemented in an existing office, no more transitions are required thus permitting the simple addition of line link and trunk link frames.

5.05.6 For new offices, this development will:

1. Reduce the number of junctor distribution transitions to no more than two relatively easy changes.
2. Permit the simple addition of line link and trunk link frames at all other times, since

To perform the work operation described, WECO must remove from service all originating registers associated with connector 2. A review of the 240 drawing reflects 12 OR's presently wired to connector 2.

5.06.11 The Dial Administrator must determine:

- (1) Length of time required to perform the work operation.
- (2) If connector can be returned to service on short notice.
- (3) Projected service levels by hour, with 12 OR's out of service.
- (4) Time period best suited to grant the outage.

Having determined this information prior to an MOP meeting, the Dial Administrator is in a position to guide the outage in it's proper time interval.

5.06.12 The outsender has a very short holding time, so the number provided is not usually great. In many cases, failure of one outsender can cause a significant number of overflows. Senders that are removed from service can cause an overflow problem, also, particularly those groups of small team size.

(The larger a trunk group, the more efficient it operates for a given level of blocking. On the other hand, the higher the efficiency, the less margin available to handle overloads.)

Determination of in-service requirements will be described later in this section.

EXAMPLE:

An MF outsender group has 6 outsenders installed. B.H. TUR data is 63 CCS. From Poisson capacity table 10, the requirements for 63 CCS is 6 outsenders. Assume 2 senders are removed from service. The capacity for the 4 remaining senders would be 29.6 CCS or a 53% reduction in CCS resulting in a calculated 10% overflow.

Consider the effect of one trunk reduction in a group of four trunks.

No. Of Trunks	Engineered CCS At 1% OFL
4	29.6
3	15.7

The capacity loss is 13.9 CCS or 47% of 29.6 CCS.

The effect is shown graphically on Exhibit 9. The curve drops very sharply as the size of the group diminishes. For those who are unaware of the efficiency characteristics of trunk groups, it is easy to assume that removing one trunk of four only reduces capacity by 25%.

Transition work during the busy hour described should be avoided. Service of this type would cause Plant to have excessive stuck sender reports.

5.06.13 The efficiency provided by office design can also be impaired when switching paths are blocked. In No. 5 Crossbar Offices, the switching efficiency of link frames is reduced when links and junctors are out of service. Small trunk groups in busy traffic periods are another example of points of congestion.

Exhibit 10 is a table showing the efficiency in % occupancy at 1% overflow of different sizes of trunk groups. It can be seen by this table that a loss of one trunk from a group of ten trunks reduces the call carrying capacity of the group by 15.6%.

No. Of Trunks	At 1% Overflow	
	Eng. CCS	% Occ.
10	149	41.4
9	126	38.9

The capacity loss is 23 CCS or 15.6% of 149 CCS when compared with only a 10% loss in trunk group size.

5.06.14 Modification recommendations (M.R.'s) or detailed change sheets (D.C.S.'s) may be scheduled during the addition to an office. These are circuit improvements or updates of existing equipment initiated by Bell Labs or WECO. Often they are not descriptive and it is difficult to anticipate the outage time associated with these changes. The Dial Administrator must control these outages as well as any equipment outage and should:

- (1) Coordinate with Plant and WECO to determine detailed work description.
- (2) Determine common control equipment involved.
- (3) Know equipment outage time and duration of the outage.
- (4) Determine effect on service.

5.07 Utilization

5.07.1 Load and service conditions may dictate reassignment of lines and/or trunks upon completion of the addition or rearrangement of facilities. In many cases, however, proper utilization may be accomplished by assigning new lines and trunks to the newer frames thereby avoiding unnecessary or excessive Plant work.

5.07.2 The efficient use of added line and trunk link frames can best be realized by the *timely* preparation of line and/or trunk transfer lists. This will require the Dial Administrator to know the new capacities of the frames based upon the new junctor configuration.

5.07.3 Proposed changes of line and trunk equipments should, as accurately as possible be based on actual CCS data per line and trunk. Studies producing these data should be programmed in advance of the transition.

5.07.4 When an office is to be converted to Touch-Tone service on less than a 100 percent basis, it is recommended that the proposed configuration does not reduce the capacity of Rotary Dial customers. This may require that additional servers be placed into service before transition to two separate groups.

5.07.5 Trunk equipments are identified by type numbers. These numbers describe the essential characteristics of the equipments and the uses for which they have been designed. The Dial Administrator should ensure that the types and the groups to which they are assigned are in reasonable numerical balance over the trunk link frames.

5.07.6 A trunk assignment group usually maintains records by trunk link frame as indicated in TFP Division K, Section 4A, Figure 9 or on a similar locally prepared form. These records include current working trunks as well as future assignments of trunk orders not yet completed.

5.07.7 In offices with paired trunk link frames, consideration must be made in loading "like" frames. CCS data are required to determine present load and estimated load when going to paired operation. When only a portion of the frames are paired, special distribution of light and medium use trunks to the paired frames is necessary to prevent traffic congestion on the junctors accessing the paired frames.

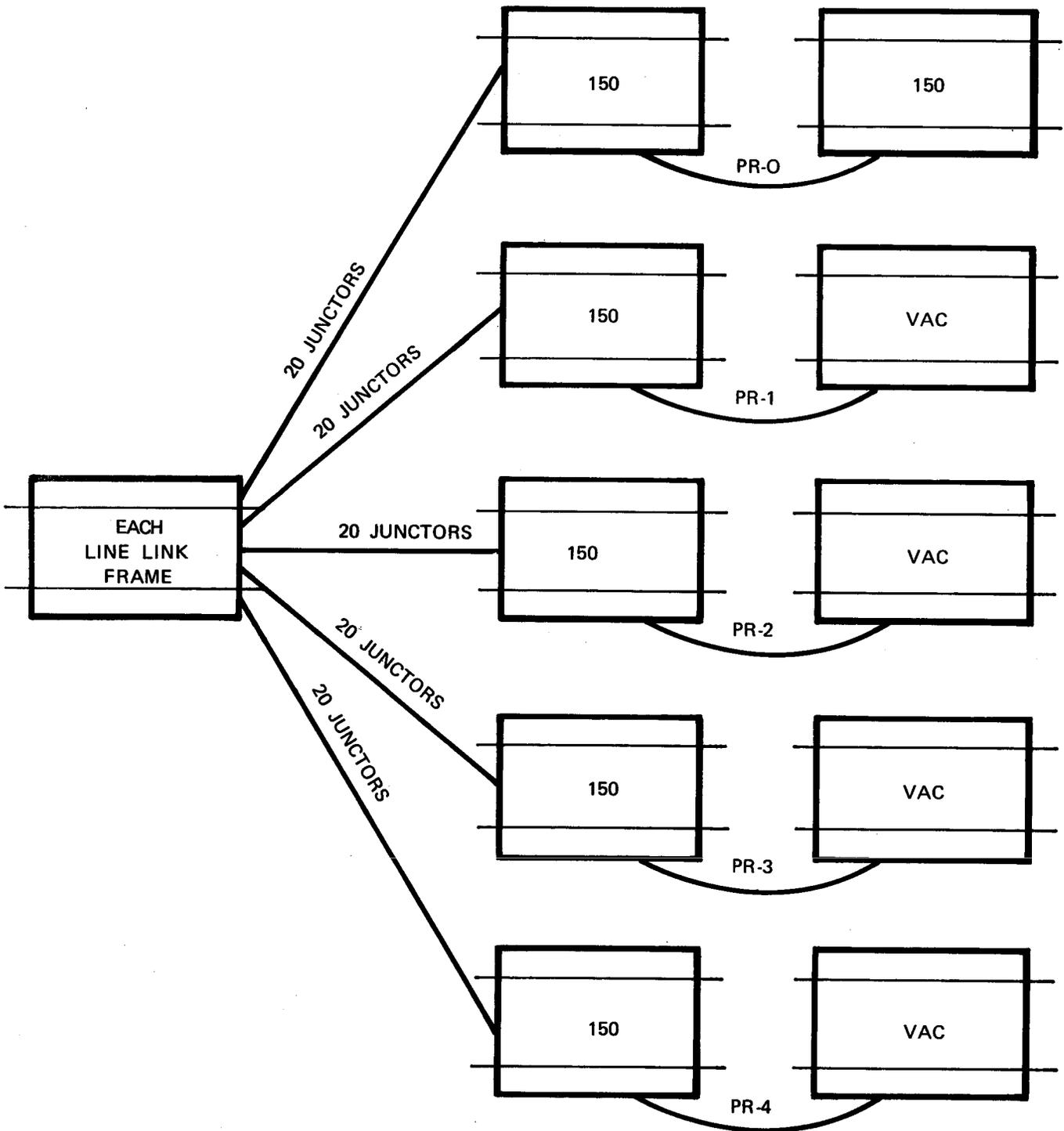


FIGURE 2

Light and Medium Use Trunks Should Be Assigned To Pair 0 Which Terminates 300 Trunks On 20 Junctor Access While All Other Pairs Terminate 150 Trunks On 20 Junctors.

6. IN-SERVICE REQUIREMENTS**6.01 Determination of In-Service Requirements. — General**

6.01.1 Trunks and switching equipment represent considerable capital investment and are provided in amounts such that service ceilings are not exceeded. While it is true that a certain hour may be said to be the busy hour for a given group of equipment or trunks, the call load on the equipment during other hours may be almost as great. This is especially true in the "side hours". Because of this variation in the load which is carried by the various groups of trunks and equipment, it is the responsibility of the Dial Administrator to determine in-service requirements and the effect that removals of equipment might have on service.

6.01.2 The Dial administrator needs to know what margin exist in the call carrying capacity of each office at different hours of the day, days of the week or months, etc. When this is known, the effect on service of equipment failures, capacity reductions during transitions and reductions for routine maintenance can be gauged accurately.

6.01.3 Central Office additions, retrunking jobs, changes in office arrangements, etc., are usually planned far in advance of the actual work. The effect such jobs will have on capacity can be assessed early and schedules arranged so that service is not seriously affected.

6.01.4 When the Traffic Order for the job is issued, the dial administrator's careful analysis should reveal what is needed to maintain call carrying capacity while work is in progress. The protection of service during installation periods is the joint responsibility of Plant, Traffic, and WECO. The quantities of equipment which can be taken out of service and the time in which they may be removed should be agreed upon by all groups involved in the transitional period.

6.01.5 Because the amounts of equipment have a significant effect on service levels, the recommendations prepared by the dial administrator (and agreed to by other groups) should be included in the MOP.

6.01.6 These quantities and time frames should be discussed at MOP Committee meetings (see paragraph 2.05) and plans should be formu-

lated at that time to ensure sufficient work force and scheduling of work force so that the MOP proposals can be followed.

6.01.7 Deviation from minimum equipment requirements *should not be tolerated*; facilities removed from service due to circuit trouble must be included in the total outage.

6.01.8 Outage times can be determined and held to a minimum by use of control forms. The load and service results during the outage period should be recorded and used for backup data on future jobs of similar description.

6.01.9 The following paragraphs of this section contains suggested methods for calculating required capacity and the means for properly recording these data for MOP purposes.

6.02 Determination of Quantities

6.02.1 Traffic Facility Practices are the source documents used to provide facilities for Central Office relief at the exhaust period. They may also be used by the dial administrator to calculate current in-service requirements.

They become exceptionally useful in preparing requirements for transition purposes.

6.02.2 It is strongly recommended that the data that was used to design the relief job be compared to the most recent empirical data.

Estimated main stations at job exhaust should also be checked against actual main stations recorded at that period of time, any differences might effect the order of priority in the job installation.

6.02.3 Reference Sources

(1) Line Link Frames — TFP DIV. D, SEC. 8-b
Efficient frame loading contemplates meeting service standards and proper utilization of the junctor arrangement.

(2) Dial Tone Markers and Originating Registers
TFP DIV. D, SEC. 8-e

Dial tone marker requirements are obtained by reading the estimated dial tone attempts for the highest normally recurring day into the capacity table contained in this section.

Calculation of the number of O.R.'s re-

quired to render satisfactory service during transitional periods must be made by time frames and by each O.R. group where separate groups of O.R.'s exist.

A small overrun of the projected O.R. data may result in serious deterioration of highest day dial tone service. To allow for statistical variations in the collected data and in the trending techniques involved, it is recommended that determination of O.R. requirements be based on the Gamma prediction of the highest day load using a 90% assurance that this load will not be exceeded.

(3) Incoming Registers — TFP DIV. D, SEC. 8 h

There are several types of Incoming registers (Dial Pulse, Multi-Frequency, Revertive Pulse & Shift Pulsing). The busy hour for each incoming register group needs to be determined and the estimated usage applied to the appropriate table contained in this section to determine traffic requirements.

(4) Completing Markers & Combined (TFP DIV. D, SEC. 8-f(2))

(5) Senders — TFP DIV. D, SEC. 8-g

(6) AMA — TFP DIV. D, SEC. 8-j(2)

(7) Trunks — TFP DIV. K, SEC. 4-a

Methods for determining in-service requirements for all of the various equipment components are explained in the TFP reference given. The information is so important that it should not be trusted to memory. Reference sources should be consulted when needed.

6.02.4 Load charts and capacity charts are useful guides in determining equipment requirements during the transition period.

The capacities may be matched against estimates of load for varying periods of time, to determine the most suitable time for reducing capacity in the office and for determining quantities of equipment that may be safely removed from service.

Charts should be made as necessary prior to the MOP and should be made available to all interested groups.

6.02.5 The next section explains control forms to be used for in-service requirements. These requirements must be monitored by the dial administrator. Any deviation, could result in service degradation.

6.03 Control Forms

6.03.1 Capacities should be shown for all components involved in WECO installation activity and for varying quantities of equipment.

6.03.2 Exhibit 11 is a control form that can be used to depict equipment component requirements from Monday through Sunday between the hours of 8AM to 10PM.

6.03.3 To determine the amount of equipment that can be turned down at any given time on any day, subtract the required for service in the TFC column from the number of installed equipment at the top of the page. The difference can be entered in red pencil in the PLT column for ease of reference.

6.03.4 Separate capacities should be shown where a change in capacity occurs during an installation interval i.e., additional equipment is placed in service ahead of time to augment overloaded facilities.

6.03.4 Load Distribution Charts as shown in DFMP. DIV. H, SEC. 1b-8, Appendix 2 is another control form that could be used. Caution should be exercised when working with percent of busy hour. Be sure to apply the percentage to the busy hour CCS and *not* the installed equipment.

6.03.6 Following is an example reflecting the difference in requirements when applying the % distribution to installed equipment versus B.H. CCS. Maintenance requirements should be discussed with Plant.

Example: DP Incoming Register Group of 10 installed registers and a BH load of 124 CCS.

<u>Hour</u>	<u>(1) Installed Equipment</u>	<u>(2) % of BH</u>	<u>(3) Req'd Based on % Eqpt</u>	<u>(4) BH CCS</u>	<u>(5) CCS/FOR BH % DIST</u>	<u>(6) Required TABLE 10</u>
10-11A	10	100	10	124	124	9
11-12N	10	80	8	XXX	99	8
2-3P	10	50	5	XXX	62	6

Column 3 represents the equipment required for service when % distribution is applied to the installed equipment and column 6 represents the equipment required for service when % distribution is applied to the busy hour CCS. In one case, when reading the CCS in column 5 into Poisson Capacity table 10 the requirements in column 6 is equal to or greater than the requirement in Column 3.

6.03.7 The various distribution of load and relationship of each hour to the B.H. may be determined from previous B.H. determination studies, from special studies, or from any source of available historical data.

7. DATA

7.01 Service and Load Measurements

7.01.1 Service may be affected by transitions, capacities may have to be reduced, and measured results may be affected in varying degrees, according to the loads generated during the period of capacity reductions. The purpose of the MOP is to provide for the protection of service while the transition is taking place.

7.01.2 There are two categories of measurement in a #5 Crossbar Office, these are:

1. *Service*
 - (a) Dial Tone Speed
 - (b) Incoming Matching Loss
 - (c) Various NC & Reorder Registers (stuck senders)
 - (d) Group Busy Timing Registers
2. *Load*
 - (a) Peg Count
 - (b) Usage
 - (c) Load Indicating

The scoring of the registers will be measuring the service to the customer or the load on the machine. During periods of WECO activity, the devices which produce service results must *be kept in service*.

7.01.3 Data obtained from the registers have many and varied uses, however during transition, data will be the governing or guiding factor in the daily administration of the office. Usage results must be checked to ensure an equal grade of service for all subscribers and the installation of additional trunks could involve rearrangement of existing trunks in order to ensure that all traffic offered would be evenly spread over the switching frames.

7.01.4 In order to make appropriate use of the data, it is imperative to know what is included in the data and whether or not the data is valid. Traffic Facilities Practice, Division D, Section 8M is an easy comprehensive reference for determining what is in the data and when the register operates.

7.01.5 The dial administrator is responsible for providing timely and accurate data. The only way that inaccuracies can be eliminated is through validation, even on a sample basis. The necessity for prompt validation cannot be stressed too strongly. The interval between collection of data and the investigation of questionable data is critical and should be as short as possible. There are several tests which can be made in the office to assure proper wiring, measuring device operation and cross connections.

They are:

1. Register tests
2. Continuity tests
3. Detector tests
4. False busy and false operation tests
5. Dial tone speed tests

7.01.6 In addition to these physical checks, it may also be necessary to make validation checks on the actual data gathered. Some of the methods which can be used are:

1. Comparison of related sets of registers
2. Comparison of usage with service
3. Comparison of usage and peg count
4. Consistency with past values

For more detail on data validation refer to DFMP, DIV. E, SEC. 5.

7.01.7 Although there are many devices that can produce data for dial administration purposes, e.g., Esterline-Angus Recorders, Alston Scanners, Line Insulation Tests, etc., the principle measurement tool is the Traffic Usage Recorder which must be kept in service during transition periods.

7.01.8 In order to ensure that faulty TUR operation is recognized with reasonable promptness, data for each item of common control equipment should be checked for reasonableness at least once a week. Checks that can be made are:

1. Loading
Is present loading consistent with past loading?
2. Derived holding times
Using measured usage and actual peg count, check for general order of magnitude against published holding times.
3. Sender overflows
Check actual sender overflows against the overflows predicted by the TFP tables for the measured usage.
4. Originating Register
Check O.R. usage against the incidence of dial tone delays.

7.01.9 None of these checks can be made with a degree of precision but results should be in reasonable order of magnitude range.

7.02 Service Ceilings

7.02.1 Experience has shown that our subscribers ordinarily do not expect perfect service. However, they do expect and deserve an excellent grade of service. To ensure rendering this grade of

service, service ceilings have been established for the Busy Season of exhaust. They are:

1. Dial Tone Speed

ABS-BH	1.5% > 3"
ATHD-BH	8% > 3"
HD-BH	20% > 3"
2. Originating Matching Loss
1% ABS-BH
3. Incoming Matching Loss
2% ABS-BH

7.02.2 Incoming matching loss is normally controlling, insofar as frame loads that a #5 office can carry are concerned. When the service ceiling of 2.0% incoming matching loss is reached, originating match loss is normally well below 1.0%. Experience indicates that when 10 high day or high day service measurement ceilings are met. ABS dial tone speed is usually substantially less than than 1.5% > 3".

7.03 Load and Capacity Charts

7.03.1 Load and Capacity charts or load service curves are tools to assist in predicting future service after projecting future load.

7.03.2 Dial administration techniques dictate that usage data after proper validation, be used to develop meaningful load service relationships. The use of these techniques become increasingly important during periods of additions to existing facilities because capacities of equipment may be affected by transition work.

7.03.3 It is strongly recommended that the usage data be obtained coincident with the service data described in paragraph 7.01 for reconciliation purposes.

7.03.4 In the process of developing load service curves, questionable data indications will show up on the curves. These are two types of curves, actual and theoretical. The type to use depends upon the data being checked. For certain types of components, it is known that all offices operate very close to the table values and the theoretical curve can be used with confidence. For other types of component, there are many reasons for a particular office to differ from the average values of another office.

7.03.5 In both methods, any plot that falls fairly

close to the line is assumed to be reasonable. Any plot point that is isolated from other results and the line, is assumed to require investigation. However, (because of some recent experience) odd ball days that might not be included for engineering purposes, might, in the judgement of the dial administrator, be included. The effect of the occurrence and not the occurrence itself might be recurring.

7.03.6 When using a theoretical curve, if almost all points fall on one side of the line, the data may be valid and the office unbalanced. However, the cause for this type of distribution should be thoroughly investigated.

7.03.7 The two most common load-service curves in a #5 Crossbar Office are:

1. Line Link Frame Usage versus Incoming Matching Loss (actual).
2. Originating Register Usage versus Dial Tone Speed (theoretical).

The use of load service curves are covered in TFP, DIV. D, SEC. 1b.

7.03.8 During transition periods, for daily application, *ABS load service curves should not be used.*

The greater the systematic variation (non-random — see TFP, DIV. A, SEC. 1b) in day to day, week to week, etc., loads such as Monday B.H. always being higher than Tuesday B.H., the higher the % IML will be at a given load.

8. OTHER CONSIDERATIONS

8.01 Newer Services

8.01.1 Although intended primarily for local dial switching, #5 Crossbar Offices can be arranged as a tandem or toll center or serve as any combination of the three.

8.01.2 Design work on the No. 5 Crossbar System is still continuing so that newer customer services may be offered.

8.01.3 The dial administrator must become familiar with "new features", determine the effect that they might have on transitions and determine the studies required to prepare for the transition.

EXAMPLE: Call-Waiting Designed for Crossbar

Description — Using a design modification developed by Bell Laboratories, the #5 frames will enable a customer whose line is in use to be alerted by a distinctive tone when another party tries to reach him. The customer will have the option of ignoring the tone signal or using a switch hook flash to reach the second party. This will automatically place the first party on hold. Subsequent switch-hook flashes will permit the customer to transfer back and forth between the two connections.

8.01.4 The modifications entail the installation of a number of new frames at the #5 Crossbar Office as well as minor modifications to existing equipment. Line assignments procedures must be such that imbalance of line link frames is prevented.

8.01.5 Close coordination with the Traffic Engineer and a detailed knowledge of transitional procedures are required in an example such as the one given. The effect on service will vary according to the way in which the work is done.

8.02 Line Equipment Transfers

8.02.1 The dial administrator is responsible for the loading of new frames and equipment groups. Prompt and appropriate utilization of new equipment will ensure optimum service. See Paragraph 5.07.

8.02.2 Line equipment transfers necessary to balance an office before, during and after an addition must be planned well in advance.

8.02.3 A plan should be prepared showing the *required* transfers spread over a recommended time interval.

8.02.4 The Plant Department should be consulted for concurrence in the timing and volume of additional work load.

8.02.5 Where possible, Plant work at the Number Group frames may be reduced by changing only the LLF connection and leaving VG-HG and VF-RC leads intact.

8.03 Equipment Testing

8.03.1 The results of tests conducted by Plant,

insuring equal access and equitable distribution, should be furnished to the dial administrator.

8.03.2 These tests may include:

1. Wiring and operational integrity of the connector preference chains and master traffic control circuitry.
2. Marker to trunk link frame seizure.
3. Line link frame to marker seizure, etc.

8.04 Daily Administration

8.04.1 Dial administrators must advise Plant about the equipment situation in each office before, during and after transition (see paragraph 3.02.1). Information showing the minimum amount of equipment needed to maintain good service at various load levels, related to hours of the day, should be available to Plant forces at all times. Control forms such as those described in paragraph 6.03 can be used for transmitting this information to Plant for routine maintenance.

8.04.2 The procedures recommended for transition purposes can be easily applied to daily administration. However, before any capacity reduction in minimum amounts specified by Traffic is permitted, a release should be requested from the dial administrator.

9. CONCLUSION

9.01.1 The most effective method that can be used for a successful transition is good communication and group involvement. Areas of mutual responsibility have been identified to the extent necessary for Dial Administration personnel to clearly recognize.

9.01.2 It is not the intent of this Dial Facilities Management Practice Material to assign responsibility to other groups or departments or to dictate changes in their existing practice or procedures. It is intended that this information be used to simplify the transition, reduce work effort, protect equipment and maintain good service.

9.01.3 No amount of written material can describe or anticipate every condition that might occur. In addition to good planning, "judgment" will be the most valuable tool that the dial administrator will use in the final analysis.

10. REFERENCE SOURCES

10.01.1 Reference should be made to other Traffic Practices, other sections of the Dial Facilities Management Practices, Plant and Engineering Bell System Practices, W.E.C.O. Handbooks, etc., as necessary for the proper preparation of a Method of Procedure for #5 Crossbar Installation.

10.01.2 The W.E.C.O. Installation Engineering Handbooks are the practice which guide their people in installing central office equipment. Familiarity with the procedures to be used by W.E.C.O. will guide the Dial Administrator when:

1. Determining in-service requirements.
2. Estimating service levels and the effect of installation on various equipment components.

10.01.3 The attachments are by no means all encompassing and are to be used as guides by the dial administrator. They are:

1. Suggested Method of Procedure — Paired Line Link Operation.
2. M.O.P. check list.
3. List of various work operations that require equipment turndown time.

REFERENCE SOURCES

Reference

DFMP DIV. H, SEC. 1b 8
DFMP DIV. H, SEC. 1b 5
DFMP DIV. G, SEC. 2
TFP DIV. D, SEC. 8
TFP DIV. K, SEC. 4a
WECO Handbook 3 SEC. 5A
WECO Handbook 0 SEC. 10-14
WECO Handbook 69A SEC. 50
WECO Handbook 69B
BSP Section 201-112-001
BSP Section 819-220-150
BSP Section 201-114-001
BSP Section 800-614-150

Subject

General Administration — MOP
Facilities Capacity Determination
Traffic Measuring Devices
#5 Crossbar
Trunks
Methods of Procedure — WECO
Prevention of Service Interruptions
Juncture Transition #5 Crossbar
Book of Standard MOP Forms #5 Crossbar
Methods of Procedure Plant
Juncture Transitions #5 Crossbar
Equipment and Trunk Out of Service
General Installation Requirements

EXHIBIT 1

NUMBER OF JUNCTORS

Junctors Pattern/Size	Number of Junctors From Each	Maximum Channels Per Junctor	Junctors				
			Subgroup Numerical Durignation				
			Number in Column Heading Is				
Line Link Frame	Group Test	0	1	2	3	4	
4 LL - 2 TL Singles	2 groups of 50	20	10	10	10	10	10
8 LL - 2 TL Pairs	Same as 2 TL Singles						
12 LL - 2 TL Triples	Same as 2 TL Singles						
6 LL - 3 TL Singles	3 groups of 30	20	10	10	10		
12 LL - 3 TL Pairs							(See Note 1)
18 LL - 3 TL Triples	Same as 3 TL Singles						
8 LL - 4 TL Singles	4 groups of 25	15	10	10	5		
16 LL - 4 TL Pairs	Same as 4 TL Singles						
24 LL - 4 TL Triples	Same as 4 TL Singles						
10 LL - 5 TL Singles	5 groups of 20	20	10	10			
20 LL - 5 TL Pairs	Same as 5 TL Singles						
30 LL - 5 TL Triples	Same as 5 TL Singles						
12 LL - 6 TL Singles	4 groups of 17 and 2 groups of 16	17 13	10 10	7 3		3	
24 LL - 6 TL Pairs	1 group of 18. 2 groups of 17 3 groups of 16	14 17 13	10 10 10	4 7 3		4 3	(See Note 2)
36 LL - 6 TL Triples	Same as 6 TL Singles						
14 LL - 7 TL Singles	2 groups of 15 4 groups of 14 1 group of 14	15 14 12	10 10 10	5 4 2		2	
28 LL - 7 TL Pairs	Same as 7 TL Singles						
42 LL - 7 TL Triples	Same as 7 TL Singles						
16 LL - 8 TL Singles	4 groups of 13 and 4 groups of 12	13 12	10 10	3 2			
32 LL - 8 TL Pairs	Same as 8 TL Singles						
48 LL - 8 TL Triples	Same as 8 TL Singles						
18 LL - 9 TL Singles	1 group of 12 and 8 groups of 11	12 11	10 10	2 1			
36 LL - 9 TL Pairs	Same as 9 TL Singles						
54 LL - 9 TL Triples	Same as 9 TL Singles						
20 LL - 10 TL Singles	10 groups of 10	10					
40 LL - 10 TL Pairs	Same as 10 TL Singles						
60 LL - 10 TL Triples	Same as 10 TL Singles						

Note 1 - Prior to P.E.L. 6464, dated February 19, 1960, this pattern consisted of 2 groups of 33 and group of 34 junctors, and instead of 20 channels only 13 or 14 was the maximum per junctor group test, thereby being less efficient although having more junctors per group.

Note 2 - The 24 LL - 6 TL Pair pattern is less efficient than the pattern ahead and is not recommended.

EXHIBIT 2

JUNCTOR GROUP TESTING ARRANGEMENT

Single Pair Triple	Juncture Test Step	Marker Walk						
		0	1	2	3	4	5	
2	1	0	1	2	0	1	2	
	2	3	4	3	4	3	4	
3	1	0	1	2	0	1	2	
	2	1	2	0	1	2	0	
4	1	0	1	0	1	0	1	
	2	2	2	2	2	2	2	
5	1	0	1	0	1	0	1	
	2	1	0	1	0	1	0	
6	1	0	0	1	0	0	1	Note 1
	2	1	2	1	2	1	2	
6	1	0	0	0	0	0	0	Note 2
	2	1	2	1	2	1	2	
7	1	0	0	0	0	0	1	Note 1
	2	1	1	1	1	1	0	
7	1	0	0	0	0	0	0	Note 2
	2	1	2	1	2	1	2	
8	1	0	0	0	0	0	0	
	2	1	1	1	1	1	1	
9	1	0	0	0	0	0	0	
	2	1	1	1	1	1	1	
10	1	0	0	0	0	0	0	

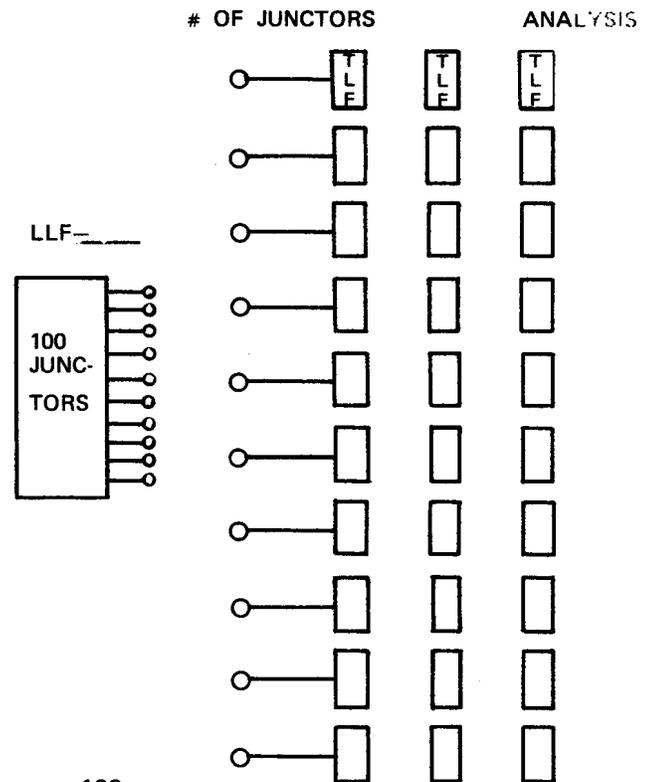
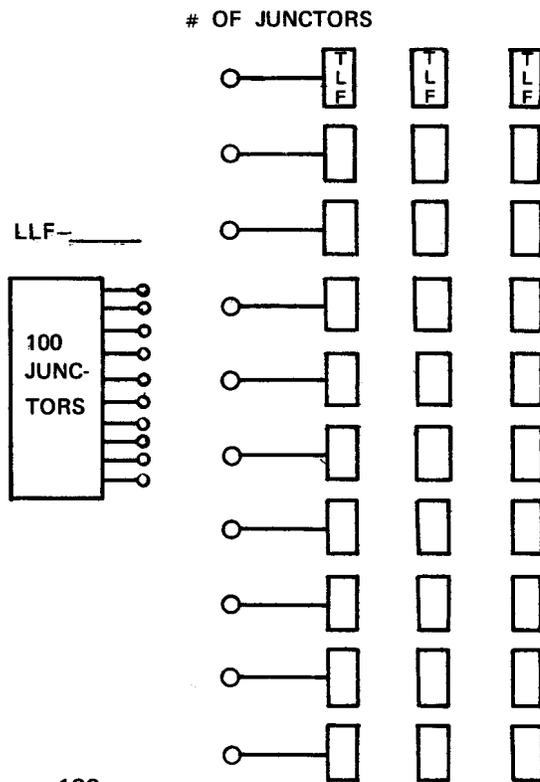
Note 1 – Where two junctor subgroups exist.

Note 2 – Where three junctor subgroups exist.

LINE LINK JUNCTOR CAPACITY

PRESENT PATTERN
JOB # _____
_____ TLF SINGLE/PAIR/TRIPLE

FUTURE PATTERN
JOB # _____
_____ TLF SINGLE/PAIR/TRIPLE



100
JUNCTORS
LLF CAPACITY
CCS
TOTAL LLFS

100
JUNCTORS
LLF CAPACITY
CCS _____ APPROXIMATE RANGE
% _____ FROM NO TRUNKS
LLF CAPACITY _____ CONNECTED AFTER
W.E. TURNOVER TO
A BALANCED TLF
CONDITION

ENTITY _____
ENGINEER _____

TOTAL LLF'S _____

TRUNK LINK-JUNCTOR CAPACITY

PRESENT JOB _____
PROVIDED
LLF 00 TO _____ LLF'S

FUTURE JOB _____
PROPOSED
LLF 00 TO _____ LLF'S

LLF'S X 100 JCTRS LLF = _____ JCTRS TL
_____ TL (SINGLE-PAIR-TRIPLE) (S-P-T)

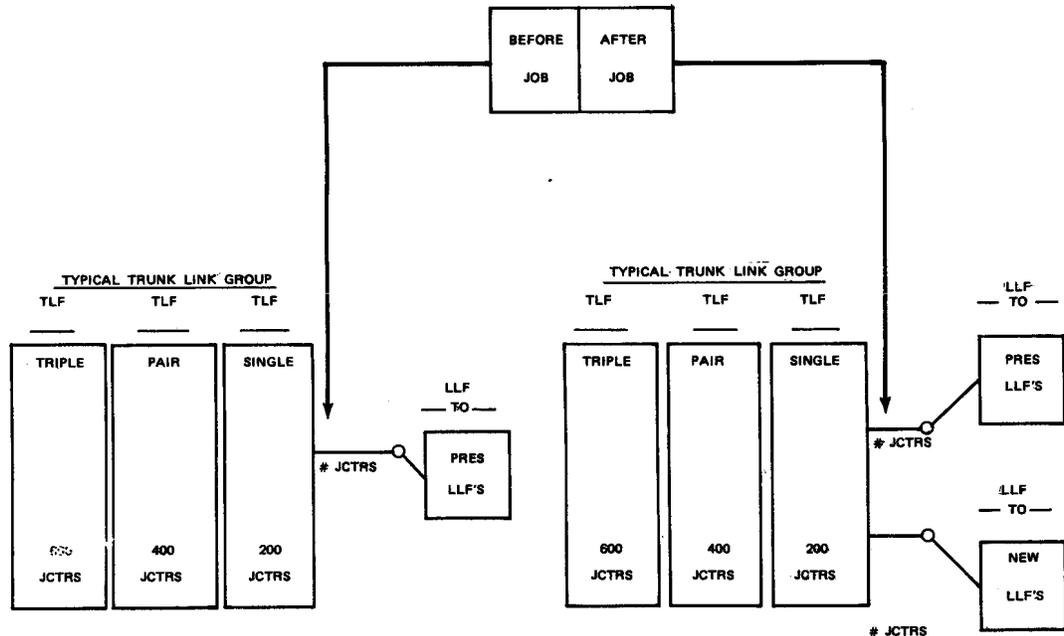
LLF'S X 100 JUNCTORS LLF = _____ JCTRS, TL
_____ TL (SINGLE-PAIR-TRIPLE) (S-P-T)

NEW LLF'S TO _____ LLF'S

NEW LLF'S X 100 JCTRS/LLF = _____ JCTRS, TL
_____ TL (SINGLE-PAIR-TRIPLE) (S-P-T)

JCTRS/TL FOR EXISTING LLF'S = _____
(S-P-T)

TLF USABLE JUNCTORS RANGE FROM _____ TO _____
DEPENDENT UPON LOADING OF NEW LLF'S



_____ JUNCTORS AVAILABLE AFTER THE JOB (FOR EXISTING LLF'S) X 100 = _____ %
_____ JUNCTORS AVAILABLE BEFORE THE JOB

ENTITY _____
ENGINEER _____
TELEPHONE _____

Exhibit 5

I. Capacity Table - "Pattern Normal"

This table represents the CCS/LLF capacity of a Number 5 crossbar office while it is operating on "pattern normal" with the markers using only the first subgroup of junctors.

<u>Pattern</u>	<u>% of Pattern Capacity</u>	<u>No. of Junctors In use on LLF</u>
5 PR or TRPL	60%	50
7 PR or TRPL	80%	70
8 PR or TRPL	87%	80
9 PR or TRPL	94%	90

Example:

28-14 (7pr) pattern capacity = 1260 CCS/LLF

Pattern normal = .80 x 1260 = 1008 CCS/LLF

II. Capacity Table - "Back Tap Method"

This table represents the CCS/LLF capacity of a Number 5 crossbar office while it is operating with one pair of trunk links on pattern normal throughout the back tap method of junctor transition.

<u>Pattern</u>	<u>% of Pattern Capacity</u>
5 PR.	74%
6 PR.	93%
7 PR.	96%
8 PR.	98%
9 PR.	99%

Example:

28-14 (7 PR.) pattern capacity = 1260 CCS/LLF

Back Tap Capacity = .96 x 1260 = 1210 CCS/LLF

AVERAGE CCS PER LINE LINK FRAME
AT 2% INCOMING MATCHING LOSS

EXHIBIT 6

Number of Installed TLF's	CCS/LLF for LLF-TLF Ratio of 2 to 1 Installed Pattern (Singles, Pairs or Triples)										CCS/LLF Adjustment Per LLF Difference From 2 to 1 Ratio			
	2	3	4	5	6	7	8	9	10	LLF's	Singles	Pairs	Triples	
1														
2	1480										4	34		
3		1410	1440								6	32		
4		TLF Pairs	1290	1360							8	30	17	
5		Note 2		1500	1210						10	28	17	
6		1400		1350	1310	1200	1100				12	26	16	
7			1200	1390	1070	1270	1180	1100			14	24	16	11
8			1280	1430	1090	1140	1230	1150	1070		16	22	15	11
9		1390		1460	1120	1140	1110	1190	1120		18	20	15	11
10				1490	1150	1170	1110	1100	1160		20	18	14	10
11			1250	1430	1180	1200	1120	1080	1070		22		14	10
12			1270	1430	1200	1220	1140	1190	1050		24		13	10
13				1450	1250	1240	1160	1100	1060		26		13	10
14				1470	1250	1260	1190	1120	1070		28		12	10
15		TLF Triples		1480	1250	1220	1210	1140	1080		30		12	9
16					1270	1210	1220	1160	1090		32		11	9
17					1280	1210	1180	1170	1110		34		11	9
18					1290	1220	1170	1180	1130		36		10	9
19						1230	1180	1150	1140		38		10	8
20						1240	1180	1140	1150		40		9	8
21							1250	1180	1140	1120	42			8
22								1190	1150	1120	44			8
23								1200	1150	1110	46			8
24								1210	1160	1120	48			7
25									1160	1120	50			7
26										1170	1120	52		7
27										1170	1130	54		7
28											1130	56		6
29												1140	58	6
30													1140	60

EXHIBIT 7

CAPACITY TABLE — PAIR MISSING

This table represents the CCS/LLF capacity of a Number 5 Crossbar when a pair or triple is not formed of one or two trunk link frames or if the pair or triple is formed but not loaded.

The percentages given are approximate values based upon Interpolation of Figure 4, TEP, DIV. D, Sec. 8 B(2) capacities, and can be used when only one pair or triple is missing or not loaded.

<u>Pattern</u>	<u># of Pairs Filled Out</u>	<u># of Junctors In Use</u>	<u>Capacity</u>
6 PR	5	83-84	81% of 5 PR Pattern
7 PR	6	85-86	91% of 6 PR Pattern
8 PR	7	87-88	92% of 7 PR Pattern
9 PR	8	88-89	93% of 8 PR Pattern
10 PR	9	90	94% of 9 PR Pattern

EXHIBIT 8

NO. 5 CROSSBAR
AVERAGE CCS PER. LINE LINK FRAME
2% INCOMING MATCHING LOSS

		CCS/LLF For LLF:TLF Ratio of 2 To 1															
		PERMANENT JUNCTOR PLAN			PRESENT ARRANGEMENTS												
TLFs	No. of Frames	PATTERN SIZE			PATTERN SIZE										No. of Frames	TLFs	
		2-3	5	10*	2	3	4	5	6	7	8	9	10				
	2	1000			1480												2
			TLF Singles									TLF Singles					
	3	1410				1410	1140										3
	4		1360				1290	1360									4
	5		1500					1500	1210								5
	6		1350				1400	1350	1310	1200	1100						6
			TLF Pairs				TLF Pairs										
	7		1390				1200	1390	1070	1270	1180	1100					7
	8		1430	1390			1280	1430	1090	1140	1230	1150	1070				8
	9		1460	1420			1390	1460	1120	1140	1110	1190	1120				9
							TLF Triples										
	10		1490	1460				1490	1150	1170	1110	1100	1160				10
	11			1350			1250	1430	1180	1200	1120	1080	1070				11
	12			1340			1270	1430	1200	1220	1140	1090	1050				12
	13			1350				1450	1250	1240	1160	1100	1060				13
	14			1360				1470	1250	1260	1190	1120	1070				14
	15			1380				1480	1250	1220	1210	1140	1080				15
	16			1390					1270	1210	1220	1160	1090				16
	17			1410					1280	1210	1180	1170	1110				17
	18			1420					1290	1220	1170	1180	1130				18
	19			1430						1230	1180	1150	1140				19
	20			1440						1240	1180	1140	1150				20
	21			1410						1250	1180	1140	1120				21
			TLF Triples														
	22			1410							1190	1150	1120				22
	23			1400							1200	1150	1110				23
	24			1410							1210	1160	1120				24
	25			1410								1160	1120				25
	26			1420									1170	1120			26
	27			1420									1170	1130			27
	28			1420										1130			28
	29			1430										1140			29
	30			1440										1140			30

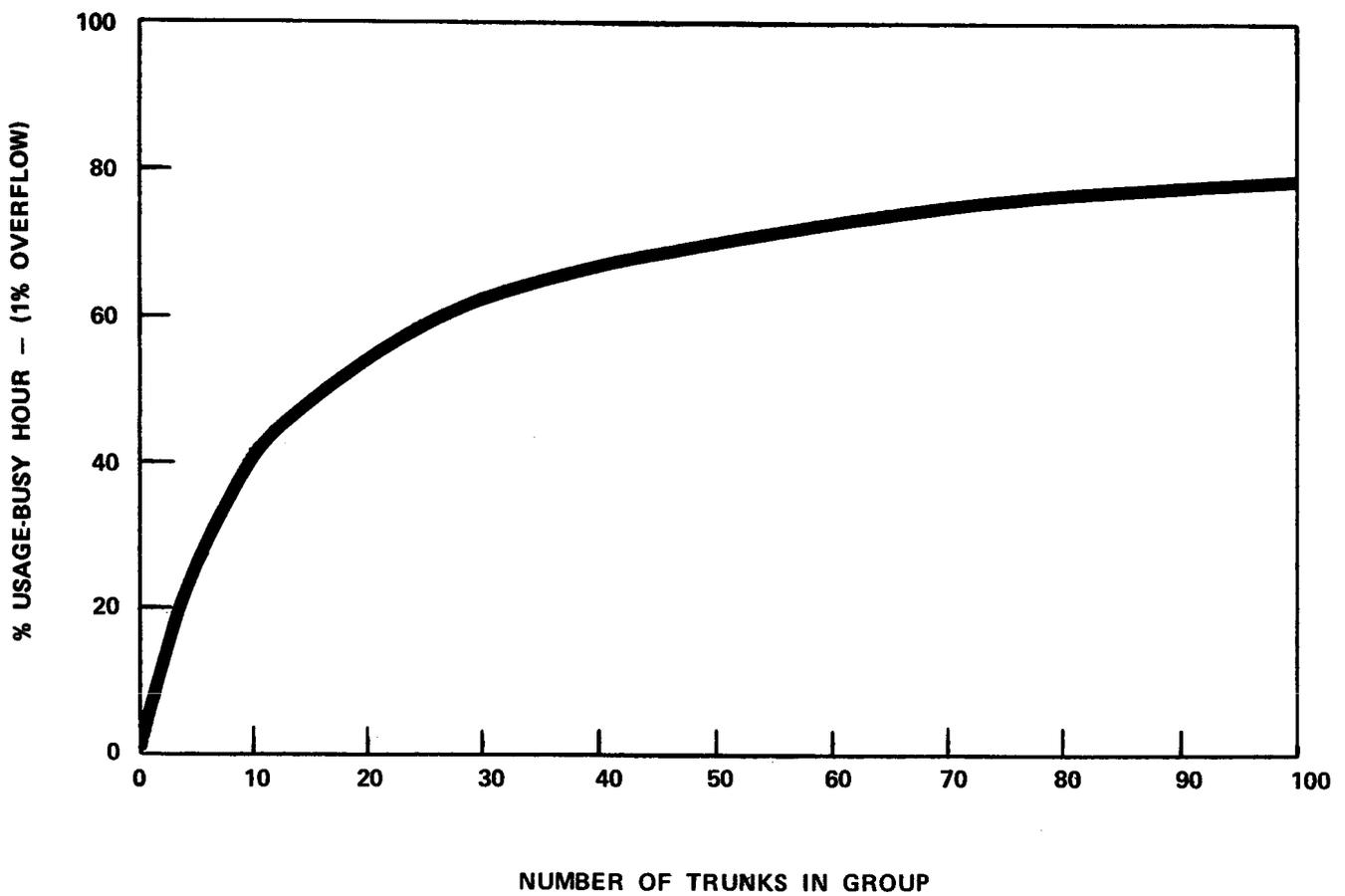
* With paired line links

Note: All TLF pairs must be represented by one or two frames

All TLF triples must be represented by two or three frames

EXHIBIT 9

EFFICIENCY OF TRUNKING RELATED TO SIZE OF GROUP
(POISSON PROBABILITY CURVE)



EFFICIENCY TABLE

TRUNKS	MAX CCS (100% OCC)	ENG. CCS 1% OFL.	% OCC. @ 1% OFL.
1	36	.4	1.0
2	72	5.4	7.5
3	108	15.7	14.5
4	144	29.6	20.6
5	180	46.1	25.6
6	216	64.4	29.8
7	252	83.9	33.3
8	288	105	36.5
9	324	126	38.9
10	360	149	41.4
15	540	269	49.8
20	720	399	55.4
25	900	535	59.4
30	1080	675	62.5
35	1260	818	64.9
40	1440	964	66.9
45	1620	1112	68.6
50	1800	1261	70.1
60	2160	1565	72.4
70	2520	1873	74.3
80	2880	2184	75.8
90	3240	2499	77.1
100	3600	2816	78.2

Exhibit 11

REQUIRED FOR SERVICE
COMMON CONTROL EQUIPMENT

Office: PINE ST. - MGO
Equipment: COMP. MARKERS
No. Installed: 8

	MON		TUES		WED		THURS		FRI		SAT		SUN	
	TFC	PLT	TFC	PLT	TFC	PLT	TFC	PLT	TFC	PLT	TFC	PLT	TFC	PLT
8- 9 AM	4	1	4	1	4	1	4	1	4	1	2	1	2	1
9-10	7	1	6	1	7	1	7	1	7	1	2	1	2	1
10-11	8	1	7	1	7	1	7	1	7	1	3	1	3	1
11-12	7	1	7	1	7	1	7	1	7	1	3	1	3	1
12- 1 PM	4	1	4	1	4	1	4	1	4	1	2	1	2	1
1- 2	5	1	5	1	5	1	5	1	5	1	2	1	2	1
2- 3	6	1	6	1	6	1	6	1	6	1	2	1	2	1
3- 4	6	1	6	1	6	1	6	1	6	1	2	1	2	1
4- 5	5	1	5	1	5	1	5	1	5	1	2	1	2	1
5- 6	4	1	4	1	4	1	4	1	4	1	2	1	2	1
6- 7	2	1	2	1	2	1	2	1	3	1	2	1	2	1
7- 8	3	1	3	1	3	1	3	1	4	1	2	1	2	1
8- 9	3	1	3	1	3	1	3	1	4	1	2	1	2	1
9-10	2	1	2	1	2	1	2	1	2	1	1	1	1	1

Prepared By: SW
Date: 5-30-73

PAIRED LINE LINK OPERATION

SUGGESTED METHOD OF PROCEDURE:

The following procedure is recommended for converting #5 Crossbar Marker Groups from 6-7-8-9 (single, paired, or tripled) trunk link patterns to paired line link operation on a full size (10 TLF) pattern.

Prerequisite:

1. Modify Master Test Frame for paired line link operation.
2. Install and cable all auxiliary line link frames.
3. Install and wire all necessary equipment in markers for paired line link operation:
 - a. Wire Spring Marker — SD-26002-01, Issue 33D — The existing mounting plate (Bay Com. Eqpt. L-plate, pos. 9) should be raised one position and the new mounting plate with the pairing relays can be installed. Standing cross-test relays can then be physically relocated down to the new mounting plate. Block PRL relay “normal” so that marker will function in the regular manner for two or more junctor subgroups.
4. Cut one marker into paired line link operation for testing. Make BSP tests, Sec. 218-112.503:
Test H — Mate frame junctor availability and level selection (paired line link frames).
Test I — Crosses on XLV, XLV leads (paired line link frames).

Procedure for Cutting Marker to Paired Operation: (Wire Spring Markers SD-26002-01-B13, Issue 33D)

- Step 1. Insulate 2 and 4 break contacts of JGO relay.
- Step 2. Insulate 4 break contact of JGI relay.
- Step 3. Insulate 2 make contact of GC relay.
- Step 4. Connect straps between the 4 fixed contacts of the JGO relay and the 4 fixed contacts of the JGI relay.
- Step 5. Block 10 TLF relay “operated” and block “normal” the 6-7-8-9 TLF relay associated with the existing junctor pattern.
- Step 6. Release the blocked PRL relay to initiate paired line link operation.
NOTE: Where (during the testing procedure) it is felt that the marker may have to be restored to a non-paired line link operation, under extreme short notice, procedure steps 1 through 6 can be worked in reverse order to restore the marker to non-paired line link operation.
- Step 7. After successfully testing all auxiliary line line frames, repeat Steps 1 through 6 on remaining markers. The office is now working on paired line link operation.
- Step 8. Trunk link connection transition:
 - a. Remove GI to JC cross-connects and P tp L cross-connects in all trunk link connections.
 - b. Place GI to JC in all trunk link connections to agree with the *standard AT&T paired line link procedures*.

Standard Wiring of Markers for Paired Line Link Operations:

- A. Make busy one completing marker and remove paper and strap from contacts of relays as described in Steps 1 – 4.
- B. Remove blocking tools from 10 TLF and 6-7-8-9 TLF relay.
- C. Remove existing office size cross-connect and connect office size to 10 TLF. Repeat steps A through C on all completing markers.

The junctor transition to the full size (10 TLF) pattern should then be completed and the new Trunk Link Frames rearranged.

MOP CHECK-LIST

I. MEETINGS

- A. Are the following Meetings conducted?
 - 1. Field Review of Traffic Order Study
(To determine the need for Transition Equipment)
 - 2. Traffic Order or Estimate Case Approval Meetings
 - 3. Pre-MOP or Pre-Contact Meetings
 - 4. Method of Procedure Meetings
 - 5. Status of Job Meetings
 - 6. Cutover and Analysis Meetings
 - 7. Critique Meetings
- B. How frequently are Status and Cutover and Analysis Meetings held?
- C. Who attends the meetings? (A above)
 - 1. Are all departments represented?
 - 2. At what management level is the representation?
- D. Who serves as the Chairman and Secretary?
- E. Are minutes of all meetings published regularly?
 - 1. Are they distributed to all departments?
 - 2. Are they properly retained?

II. METHOD OF PROCEDURE (MOP) DOCUMENT

- A. Who prepares the MOP document?
- B. Is the MOP prepared based on the discussions held at MOP meetings?
(See Question 1-A-3)
- C. Are In-Service Requirements contained in the MOP?
 - 1. Are they based on Load-Service Curves or TFP tables?
 - 2. Did the Dial Administrator prepare the traffic volume and service result estimates?
 - a. Are they based on realistic empirical data?
 - 3. Are proper Time Frames (Days and Hours) established?
 - a. Are they based on current empirical data?
 - b. Are they based on the time required to restore to service if need arises?
- D. Are priorities for equipment restoral to service determined?
 - 1. Busy Hour
 - 2. Average Business Week

3. Emergency Conditions
 4. Job Completion
 5. Needs of Special Customer, e.g., State Capital, Military Installations, Colleges, Large Corporations, Special Services (WATS, DATA, PRIVATE LINE).
- E. Are provisions made in the MOP for transferring traffic to newly installed facilities?
1. In what fashion are these provisions made?
- F. Are Advance Turnover Dates included in the MOP?
1. Who requests advance date?
 2. Who has responsibility for status of advance completion work?
- G. Are all completion dates contained in the MOP?
1. If delay is anticipated, who approves delay?
 2. Is a revised MOP prepared?
 3. Is TUR work given prime consideration so that data is not lost?
- H. Is a "Telco" contact appointed and named in the MOP?
1. Who is it?
- I. Is MOP approval given by the Telephone Company's Plant, Traffic and Engineering Department Representatives?

III. ADMINISTRATIVE ITEMS

- A. Does the Dial Administrator possess a current Western Electric Co. Job Schedule?
- B. Does the Dial Administrator monitor load-service relations?
1. Before, during and after job?
 2. Does the D.A. have the necessary tools?
- C. If In-Service requirements are stipulated in MOP, who is responsible for adherence? (See Question II-C)
1. If this activity is supervised, is feedback handled informally or formally?
- D. Does the Dial Administrator furnish the following Cross-Connection lists?
1. Line Equipment Transfers or Connection List
 2. Trunk Orders
 3. TUR Cross-Connection and/or Traffic Register Lists
 4. Speed of Dial Tone
 5. Routing Changes

If not, who does? Does the Dial Administrator receive copies?

E. Does the Dial Administrator have ready access to the following material?

1. Western Electric Co. Handbooks
2. Bell System Practices (BSP)
3. Traffic Facilities Practices (TFP)
4. Dial Facilities Management Practices (DFMP)
5. Traffic Order and Job Specification
6. Required Prints

If not, who does?

F. Who coordinates Traffic Switchboard Activities?

G. Who prepares designating strips or tags for equipment "tracing ahead"?

1. When is it done?

H. Who coordinates testing procedures?

1. Is Dial Administrator included in joint tests?
2. Are results given to Dial Administrator?

EQUIPMENT TURN-DOWNS

During job installation, there will be many requests for turn-down of equipment. Some equipments may have to be turned down on more than one occasion. Some for short periods of time and some for longer periods of time.

A list of standard MOP work operations that require "out of service" time is attached. The information included, is intended to be used as a guide. The work description may not always indicate the various equipments affected, i.e., item 8, where adding a connector in ORLM frame for New TLC, a Dial Tone Marker must be taken out of service.

The Dial Administrator should never agree to a Method of Procedure before first determining the effect on other equipment components.

Only those work descriptions requiring "Temporary Out of Service" time is included in this attachment. A detailed list of standard WECO work operations can be found in WECO Installation Engineering Handbook 69B.

- (1) Equip Transverter Connector with Multi-Contact Relays for Added Senders.
This work will be performed on a "Temporary out of service basis." *All the senders in the connectors where the new relays are being added will be made busy.*
- (2) Equip Transverter Connector with S.S. Relays for Added Senders.
This modification will be performed on a "Temporary out of service basis" and will require *all the senders associated with a connector* turned down to service.
- (3) Equip Transverters with R. F. and T.F. Relays for Added Line Links.
This modification will be performed on a "Temporary out of service basis," *one transverter at a time.*
- (4) Add Connector in Transverter Connector Frame for Added Senders.
This work operation will be performed on a "Temporary out of service basis", *one transverter at a time.*
- (5) Extend Transverter Multiple to New Translator Frames.
This work operation will be performed on a "Temporary out of service basis," *one transverter at a time.*
- (6) Modify Originating Registers
This work operation will be performed on an "out of service basis." The number of *originating register* to be removed from service will be determined by traffic conditions and agreed upon by Plant, Traffic and WECO.
- (7) Modify Outgoing Senders
This work operation will be performed on an "out of service basis." The number of *outgoing Senders* to be removed from service will be determined by traffic conditions and agreed to by Plant, Traffic and WECO.
- (8) Add Connector in ORLM Frame for New TLC.
This work consists of connecting local cable form leads to the marker side of multi-contact relays. This work is on a "Temporary out of service basis." It will require removing one *dial tone marker* from service at a time.
- (9) Add Originating Registers to Existing Pretranslaor Connector.
This work will be done on a "Temporary out of service basis." It will require *all originating registers in a pretranslator connector subgroup* to be made busy.
- (10) Extend ORMC RS Relay Chain for new Originating Registers.
This work operation will be performed on a "Temporary out of service basis," removing from service all *Originating Registers* in one connector at a time.
- (11) Modify Incoming Registers
The work operation will be performed on an "Out of Service basis". The number of *incoming registers* to be removed from service will be determined by traffic conditions and agreed upon by both the Telephone Company and WECO.
- (12) Extended Incoming Register Marker Connector RS Relay Chain for addition of IMGS at End of Chain.
This work will be done on a "Temporary out of service basis" removing from service at one time *all IR's and IMG's* from the connector being worked.

- (13) Add Connectors in Line Link Marker Connector Frame for new Line Link Frames.
This work will be done on a "Temporary out of service basis" and will require making busy one *dial tone marker* at a time.
- (14) Add Connector in Originating Marker Connector Frame for new O.R. Frames.
This work will be done on a "Temporary out of service basis" and will require making busy one *Completing Marker* at a time.
- (15) Add Connector in Incoming Register Marker Connector Frame for New I.R. Frames.
This work will be done on a "Temporary out of service basis" and will require making busy one *completing marker* at a time.
- (16) Extend Marker Multiple to New Line Link Marker Connector Frames.
This work operation consists of adding cables to L.L.M.C. frames on a "Temporary out of service basis". This will require removing from service one *dial tone marker* at a time.
- (17) Extend Marker Multiple to New Originating Register Marker Connector Frames.
This work operation consists of adding cables to ORMC frames on a "Temporary out of service basis". This will require removing from service one *completing marker* at a time.
- (18) Extend Marker Multiple to New Incoming Register Marker Connector Frames.
This work operation consists of adding cables to Incoming Register Marker Connector frames on a "Temporary out of service basis." This will require removing from service one *completing marker* at a time.
- (19) Add CB and MS Relay Unit in Line Link Marker Connector for new Line Link Frames.
This work will be done on a "Temporary out of service basis." It will require removing one *dial tone marker* from service at a time.
- (20) Rearrange Marker Preference Chains in Line Link Marker Connector for new Line Links.
This work consists of removing and adding cross connections at dial tone marker and at line link marker connector. Work is performed on a "Temporary out of service basis" one *dial tone marker* at a time.
- (21) Rearrange Marker Performance Chains in Originating Register Marker Connector and Incoming Register Marker Connector for new Connectors.
This work consists of removing and adding cross connections at completing marker and at ORMC and IRMC frames. Work is performed on a "Temporary out of service basis," one *completing marker* at a time.
- (22) Equip ADRMC with RE Multi-Contact Relays.
Work operation performed on a "Temporary out of service basis." *All OR's in an ORMC* must be made busy.
- (23) Add Connector in Trunk Link Connector Frame for new Trunk Link Frames.
Work will be done on a "Temporary out of service basis" and will require making one *completing marker* busy at a time.
- (24) Extend Marker Multiple to New Trunk Link Connector Frames.
Work operation consists of adding cables to TLC frames on a "Temporary out of service basis." This will require removing from service one *completing marker* at a time.

- (25) Connect Trunk Link Connector Control Circuits into Working Markers.
Work is done on a "Temporary out of service basis" and will require *one marker* at a time.
- (26) Add Connector in Line Link Connector Frame for new Line Link Frames.
This work will be done on a "Temporary out of service basis" by removing from service *one completing marker* at a time.
- (27) Add Connector in Number Group Connector Frame for New Number Group Frames.
Work will be done on a "Temporary out of service basis" and will require making busy *one completing marker* at a time.
- (28) Add Connector in Out Sender Connector Frame for New Out Sender Frames.
Work will be done on a "Temporary out of service basis" and will require making busy *one completing marker* at a time.
- (29) Extend Marker Multiple to New Line Link Connector Frames.
The work operation consists of adding cables to Line Link Connector frames on a "Temporary out of service basis." This will require removing from service *one completing marker* at a time.
- (30) Extend Marker Multiple to New Number Group Connector Frames.
The work operation consists of adding cables to NGC frames on a "Temporary out of service basis." This will require removing from service *one completing marker* at a time.
- (31) Extend Marker Multiple to New Out Sender Connector Frames.
Work will be done on a "Temporary out of service basis." This will require removing from service *one completing marker* at a time.
- (32) Connect Line Link Connector Control Circuits into Working Markers.
This work is performed on a "Temporary out of service basis" and will require *one marker* made busy at a time.
- (33) Connect Number Group Connector Control Circuits into Working Markers.
This work operation will be performed on a "Temporary out of service basis" and will require *one marker* made busy at a time.
- (34) Connect Out Sender Connector Control Circuits into Working Markers.
This work operation will be performed on a "Temporary out of service basis" and will require *one marker* made busy at a time.
- (35) Equip Out Sender Connector with S Relays for Added Senders.
This work will be done on a "Temporary out of service basis" and will require *one marker* made busy at a time.
- (36) Modify Trunk Circuits
This work operation will be performed on a "Temporary out of service basis." The number of trunks to be removed from service will be determined by traffic conditions and as agreed by both the Telephone Company and WECCO.
- (37) Modify Marker Frames.
This work operation will be performed on a "Temporary out of service basis." This will require making *one marker* busy at a time.