SWITCHING SYSTEMS MANAGEMENT
NO. 5 CROSSBAR WITH ELECTRONIC TRANSLATION SYSTEM
METHOD OF PROCEDURE

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1. INTRODUCTION

1.01 When it becomes necessary to add, rearrange, or modify equipment in a working central office, the effect on service will vary according to the way in which the work is performed. Various planning, scheduling and coordinating functions are necessary for the proper provision and installation of equipment. One of the most important functions concerns plans for accomplishing the work involved. This plan is referred to as the Method of Procedure.

1.02 This section describes the Method of Procedure (MOP) as it applies to a No. 5 Crossbar Switching System which has been or is being equipped with an Electronic Translation System (ETS). It contains information pertinent to the Network Administrator when additions to existing facilities are required, when modifications and/or improvements are planned, or when any changes or transitions are planned to change capacity or improve service.

1.03 When this section is reissued, this paragraph will contain the reason for reissue.

1.04 The title of each figure includes a number in parentheses which identifies the paragraph in which the figure is referenced.

1.05 Familiarity with Dial Facilities Management Practices, Division H, Section 1b(8) is essential as is a knowledge of Network Design Engineering, Dial Administrative procedures, and the switching functions of the No. 5 Crossbar and No. 5 ETS systems.

2. GENERAL

2.01 Whenever it becomes necessary to perform work on the equipment of a working central office, consideration must be given to the possible effect of that work on existing services. This is especially true for work which involves the Western

Electric installation forces. The operating company must provide a high grade of service to the customer even during periods of installation and transition. To achieve this, the capabilities of the office and equipment must be known and a plan must be developed which will provide the most efficient utilization of the equipment during the transition period. Knowledge of the office and equipment includes the knowledge of when the demand for office service is the greatest, when the demand is minimal, what the demand will be during transition, and how service would be effected by the loss of any equipment item. The plan which must be developed is the MOP.

2.02 The MOP is a detailed step-by-step procedure covering all phases of the installation activity associated with a particular job. It must be reviewed, agreed upon, and signed by both Telephone Company and Western Electric representatives prior to starting any work on live equipment and other equipment deemed necessary by any of the telephone company representatives. The MOP in its final written form will define:

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

2.03 In addition to defining what must be done and how the job is to be done, the MOP serves as a signed agreement between the Telephone Company and Western Electric. It indicates that, based upon the information available at the time, all concerned parties have concurred as to the manner in which the subject work is to be accomplished. Once signed, the MOP cannot be changed without the signed approval of the responsible Telephone Company and WE representatives, and such changes should be avoided when possible. However, during the course of the job, the MOP may be revised if circumstances so dictate. One requirement for a smooth transition with minimum problems is for each responsible department to review the MOP thoroughly before it is signed and to apply all of the information and experience available at the time to insure that it is adequate.

3. ORGANIZATIONAL STRUCTURE

3.01 Because of differences in organizational structure, specific titles of individual groups and departments are avoided in this section. Instead, general descriptive or functional names are used. This type of format permits identification by the individual company of a particular organizational contact (or sequence of organizational contacts) responsible for the procedures described herein.

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

(a) The telephone company representative normally responsible for administration of the No. 5 ETS machine, or office where the ETS resides, will be referred to as the "Network Administrator."

(b) The telephone company representative normally responsible for the maintenance of the No. 5 ETS machine will be referred to as "Network Maintenance."

(c) The telephone company representative normally responsible for requesting the provision of equipment (preparing the Network Design Order) will be referred to as the "Network Design Engineer."

(d) The telephone company representative actually performing the equipment provision function and producing the output (preparing the authorization, placing the order, coordinating the job, etc.), will be referred to as the "Equipment Engineer".

(e) The Western Electric Company's Service Division does the majority of installation for Bell System companies. The installation force will be referred to as "WE".

4. ORGANIZATIONAL RESPONSIBILITIES

4.01 Responsibility for acceptable service to telephone customers must be shared by all telephone people as a part of their daily job. When it becomes necessary to modify central office equipment, effort may have to be intensified to insure that acceptable service levels are maintained. In placing service above all other considerations, it may well be necessary to modify normal departmental routines.

MOP COMMITTEE

4.02 A MOP Committee is initiated for the purpose of coordinating the work of WE and the telephone company departments and to take care of any problems which arise during the equipment job. The membership of the committee depends on the complexity of the job. The following should be members for all types of jobs.

(a) Equipment Engineer

(b) Maintenance Supervisor

(c) Network Administrator

(d) WE Supervisor

4.03 Before starting any work, a committee meeting should be arranged by the telephone company coordinator (usually the Engineering Department) to discuss the work involved and to assign dates and hours for start and completion of the various operations. The initial meeting of the MOP Committee should be held before the start of the installation at the earliest opportunity, to identify and to resolve any basic differences on how the job should be done. Additional meetings should be held as frequently as necessary in order to protect equipment and service.

4.04 Minutes of all meetings should be kept and distributed as the formal record of interdepartmental or inter-Company agreements and decisions.

4.05 It is suggested that subcommitees be formed when necessary to assist the MOP Committee. An example of a subcommittee function would be to develop a section for TUR transition and/or addition.

4.06 The frequency of committee and subcommittee meetings should be firmly established and followed for job status reports.

4.07 The responsibilities of the MOP Committee include:

(a) Review the MOP with particular emphasis on procedures for preventing service interruptions and emergency restoration of equipment.

(b) Provide and maintain a job schedule covering all work items.

(c) Determine the extent of operating telephone company representation during the installation phase of the job.

(d) Coordinate the field work of the departments represented.

(e) Insure close cooperation and liaison between telephone company and WE representatives in following the MOP.

For additional information concerning the MOP committee (Job Contact Committee), refer to DFMP, Division H, Section 1b(8).

NETWORK ADMINISTRATOR

4.08 It is recommended that the Network Administrator have the prime administrative responsibility for those areas indicated in DFMP, Division A, Section 2. These include:

(a) Review the contents of the Network Design 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.

(b) Preparation of the necessary translation forms for data base generation.

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

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

(e) Familiarity with customer demands, including ESSEX customers, Computer Ports, WATS, TOUCH-TONE®, Intermediate Switching Points (ISP) etc.

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

(g) 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.

(h) Understanding of load-service relationships so that proper in-service requirements can be determined by time frames.

(i) Have a detailed knowledge of the proposed transitional procedures for which data and/or cut sheets must be prepared.

(j) Have a written transition plan approved by District Level Supervisor. This plan may be prepared prior to the first MOP committee meeting 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.

(k) Review as soon as possible, all equipment configurations to ensure equitable distribution.

(l) Have various documents available for easy reference. These may include:

(1) Network Design Orders

(2) Job Specification

(3) MOP

(4) Various Traffic Practices

(5) Trunk Forecasts

(6) Data Summaries

(7) Line and Station Forecasts

(8) Demand & Facilities Charts

(9) Translation Forms for data base generation

(10) Translation Guide

ENGINEERING DEPARTMENT

4.09 Many operating companies assign an Engineering Department representative to coordinate WE installation activities. The Engineering Department representative is normally responsible for the following (see Section 790-100-420 of Bell System Practices):

(a) Scheduling job meetings between WE and the telephone company.

(b) Providing liaison between WE and the telephone company.

(c) Ensuring WE adherence to the MOP.

(d) Economic aspects of the job (i.e., overtime, unusual transition methods, additional effort to avoid equipment outages, etc.).

(e) Arranging advance turnover of equipment.

NETWORK MAINTENANCE DEPARTMENT

4.10 The Network Maintenance Department has the overall responsibility for physically removing equipment from service, testing, and restoring to service, etc., during periods of WE activity. See 4.14.

4.11 A record of equipment outages is maintained by Network Maintenance according to Bell System Practices (Section 201-114-001). This log will include information concerning equipment removed from service for any reason.

4.12 Certain cross-connection work and/or other rearrangements may be done by Network Maintenance.

WESTERN ELECTRIC

4.13 WE is responsible for preparing and following the MOP.

4.14 Testing of equipment removed from service must be in accordance with WE Handbook instructions and established procedures contained in various Bell System Practices. Removing and restoring equipment to service by Network Maintenance may be done with the approval of the Network Administrator.

4.15 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.

5. DEVELOPMENT OF MOP

GENERAL

5.01 The preparation of the MOP is normally done by WE. It will include appendices containing in-service requirements, due dates for cross-connection lists, dates for advance turnover, testing, etc:

5.02 An MOP is required whenever WE activities can be service-affecting. Following are examples of work activities requiring MOPs:

(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.

(e) Converting a No. 5 Crossbar System to a No. 5 ETS.

5.03 A proper MOP involves the following processes.

(a) WE develops and proposes a plan.

(b) In an early MOP committee meeting, the plan is evaluated by the telephone company.

(1) The Network Administrator assesses the impact on service.

(2) The Network Maintenance 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.

OBJECTIVE OF MOP

5.04 The main objective of the MOP is to assure continuity and reliability of service during

periods of activity connected with installation of equipment by WE. 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, electronic translation equipment, etc.

(b) Type of equipment to be removed, e.g., number group frames, connectors, etc.

(c) Working equipment that may be affected by planned job activity.

(d) Selection or periods for taking working equipment out-of-service.

(e) Whether a change in working hours may be necessary because of service-affecting work.

(f) Method of accomplishing transitional work.

(g) Amount and duration of equipment outages.

(h) Assignment and cross-connecting information required.

(i) Data base requirements and recent changes.

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

(k) Tests to be performed.

5.05 Continuing attention beginning with the preparation of the Network Design Order is required to insure protection of customer service. It is necessary that the Network Design Engineer and Network Administrator concur not only with the equipment requirements, but also with 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 Network Design Order to serve as a guide to the WE job planner.

5.06 The Network Administrator should be familiar with the following Bell System Practices:

- Section 201-112-001
- Section 201-112-005
- Section 201-112-010 which includes WE Handbook 0, Section 10
- Section 201-112-020 which contains WE Handbook 3, Section 13
- Section 800-614-150, Issue 4-d
- Section 201-114-001 which explains the record of equipment and trunks out of service.

ROLE OF THE NETWORK ADMINISTRATOR

5.07 The telephone company representative with the primary responsibility for continuity and reliability of service is the Network Administrator. When there is any WE activity in an office, efforts in connection with this responsibility must be intensified. The Network Administrator must 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.

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

(a) Develop load-service charts depicting percent 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) Establish due date for office data base.

(e) Participate in determining and scheduling interdepartmental tests in which the Network Administrator would be involved.

(f) Plan ahead for line transfers from existing line link frames to newly added ones. This must include connection of load and service measurement devices.

(g) Determine in advance, the preferred time frame for service-affecting operations such as:

(1) Equipment turn-downs (see Attachment 1)

(2) Junctor pattern changes

(3) Trunking and/or equipment rearrangements

(4) Special service circuit turndowns

FORMAT OF MOP

5.09 Western Electric Handbook 69E includes sample MOP preprinted forms for No. 5 ETS offices. These forms are used by the WE installer to assist him/her in preparing the initial MOP which will be discussed at the early MOP committee meeting.

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

5.11 The MOP will contain the dates, start and complete time, the type of protection and special precautions for each step of the job.

5.12 The contents of the MOP are:

General Notes

General MOP

Detailed MOP

Approvals

Appendices

5.13 Care should be taken to ensure that all work is done in logical sequence, each step explained fully, and specific responsibility noted (WE or Network Maintenance).

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

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

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

5.16 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.

5.17 When a change in the order of procedure of the work is necessary, due to unforseen circumstances (see 5.14), WE and the telephone

company representatives, principally the Network Administrator, shall be held responsible for determining the extent of the change and its possible effect on service and the job.

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

5.19 All copies of the MOP, original or revised, as described in WE Handbook 3, Section 5A, provide an opportunity for WE and telephone company representatives to approve and concur in proposals.

6. TRANSITIONS AND REARRANGEMENTS

GENERAL

6.01 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 WE. Any changes would require a revision of the MOP as described in 5.17 and 5.18.

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

6.03 Arrangements should be made to clear equipment for WE 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 which 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.

6.04 The various measurement devices discussed later must be kept in service to the maximum extent possible during periods of WE activity. The MOP should contain instructions ensuring that these devices not be turned down during periods when data gathering is imperative. Some ETS-affected traffic registers may provide erroneous data during the time an office is being converted to ETS operation. These registers should be indicated in the MOP along with time frames during which the measurements will be invalid. Generally, these registers will be non-AMA type registers which are normally pegged through the markers. Those traffic registers which are controlled by Traffic Usage Recorder (TUR) equipment are not affected by ETS modifications.

LINE LINK FRAME AND TRUNK LINK FRAME ADDITIONS

6.05 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.

6.06 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.

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

- ***Preliminary Work:*** This involves the erection of all frame-works, 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.

- ***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.

- ***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.

6.08 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.)

6.09 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 than 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.

6.10 The number of junctors in a junctor group may vary from a maximum of 50 to a minimum of 10. They are divided into subgroups of 10 or less for testing by the markers (see Fig. 1).

6.11 When there are more than 10 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 Fig. 2). The first test is always of a full subgroup of 10 junctors.

6.12 Junctor transitions in No. 5 ETS 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. Fig. 3 & 4 are sample forms which may be used to:

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

- ***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.

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

(a) Schedule the transition work out of the busy season, at night or on weekends.

(b) Immediately turn up for service, the originating registers (OR) in new trunk link frames and make ORs on existing frames busy to direct some of the load into the new frames.

(c) Have line and/or trunk cuts ready to be worked as soon as transition is completed.

6.14 WE operates on the premise that pattern normal (one subgroup of 10 junctors/LLF) is adequate to handle busy hour traffic and, therefore, transition work may be done on an in-service basis.

6.15 Handbook 69B contains sample forms and detailed instructions for various transitions. Section 576B is an example of a junctor transition "pattern normal," while Section 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 Network Administrator should determine the method to be used (see Fig. 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.

6.16 By being aware of the effect that junctor transitions can have on service, along with forms visually portraying the change in patterns, the Network 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.

PAIRED TRUNK LINK FRAME OPERATION

6.17 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.

6.18 Engineering capacity tables are based on the following 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 Fig. 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.

6.19 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.

6.20 A capacity table (Fig. 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.

6.21 To determine the CCS/LLF capacity of the example shown in 6.19, refer to Fig. 7. From this figure, 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 Fig. 6 and find where the capacity for 12 installed trunk link frames on a 6-pair pattern is 1200 CCS. .91 x 1200 = 1092 CCS/LLF capacity. The CCS/LLF capacity loss using this arrangement would be: 1200 - 1092 = 108 CCS.

6.22 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.

6.23 The Network Administrator must not only compute the office load and capacity prior to and during the transition but also after the transition is completed.

PAIRED LINE LINK FRAME OPERATION

6.24 With the paired line link frame feature, the completing marker is capable of testing the 10 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, 20 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 percent.

6.25 Dial tone markers are not wired for junctor sharing of the paired line link frame; therefore, dial tone speed may deteriorate before incoming matching loss. The Network Administrator should check percent originating versus terminating traffic and the engineering of dial tone markers and originating registers to protect against dial tone delay.

6.26 Attachment 2 is a suggested Method of Procedure for converting No. 5 ETS 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 TLE 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 Network Administrator to determine if the office can be cut to a full 10 TLF pattern without any adverse service reaction.

6.27 The 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.

- 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.

- If failures to match are not significant, the junctor pattern and paired line link operation can be done simultaneously.

6.28 The Network Administrator should review the junctor pattern with the Equipment Engineer in a "pattern ahead" situation. Too many patterns ahead will result in junctor tie-backs causing a net reduction in CCS capacity.

6.29 For offices about to convert to paired line link frame operation, the MOP to be used should be reviewed jointly by the Equipment Engineer, Network Administrator, and Network Maintenance.

PERMANENT JUNCTOR PLAN

6.30 The permanent junctor plan limits the number of junctor distributions to those with a comparatively high traffic-carrying capacity (see Fig. 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.

6.31 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).

6.32 Similarly, the junctors from the trunk link frames are cabled differently. Two hundred junctors (100 from the trunk link 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.

6.33 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 5 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.

6.34 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.

6.35 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 jumpered junctors need not be added and removed each time frames are added to a given distribution.

(3) Provide a consistently high line link frame traffic carrying capacity due to the marker selection of the junctor distributions and the requirements of providing paired line link operation at the earliest possible time.

COMMON CONTROL EQUIPMENT

6.36 Devices which control the network and switch the traffic in standard patterns and in a balanced manner throughout all equipment are known as "common control".

6.37 A control circuit establishes a path between two points, rather than advancing a connection toward termination.

6.38 The control of the No. 5 ETS machine is concentrated in equipments which are common to the switching frames. The equipments include:

(a) Dial Tone Markers

(b) Originating Registers

(c) Incoming Registers

(d) Outgoing Senders

(e) Connectors

(f) Completing Markers

(g) Distribution and Scanners

(h) 3A Central Control

6.39 The principal unit of common control equipment is the 3A Central Control which directs and controls all of the switching functions. In order to perform its function, the central control must obtain information to process the call. This information is supplied via scanners by the other units of equipment, primarily the markers. The Central Control in turn issues commands via the distributers.

6.40 The 10 high day engineering method is used to determine the requirements for "common control" equipment in all No. 5 ETS offices equipped with a TUR. Items of common control may have different busy hours. The Network Administrator must determine the proper busy hour for each major item of equipment to determine its service requirements.

6.41 No. 5 ETS is a hybrid system containing both crossbar and electronic switching technology. In 6.38, items (a) through (f) are from crossbar technology and items (g) and (h) are of electronic technology. The 3A Central Control assumes the decision-making role of the markers; and, therefore, some marker circuitry required for crossbar operation is not required for ETS operation. In addition, most electromechanical AMA equipment, number group frames, trunk number group frames, and their respective connectors are made obsolete by ETS equipment and will be removed after cutover.

A. Transition to ETS Operation

6.42 The transition sequence to ETS operation involves installation of all new ETS hardware, interconnection of the new added hardware to the electromechanical circuitry, and modification of the existing No. 5 Crossbar hardware where and when required. Fig. 9 is a flow diagram of a typical No. 5 Crossbar to No. 5 ETS transition sequence. As the installation proceeds, each piece of hardware is fully tested with the ETS and is then returned to service to function without ETS. Cutover is first accomplished for AMA only. Then, after the ETS is providing the official billing data, the markers are placed in full ETS operation one marker at a time. This technique permits a partial cutover of only one or two markers to full ETS functions without endangering service. Out-of-service time required for any phase of installation, test, or cutover must be indicated on the MOP. WE installation instructions should be so written as to allow any markers taken out of service to be returned to service at the completion of each instruction page, and this should be so indicated on the MOP.

6.43 The ETS will replace existing electromechanical AMA equipment with the exception of the transverter connectors which are retained and used for the automatic number identification feature. AMA recording with No. 5 ETS will be done at a centralized AMA recording center (AMARC). During transition, either the electromechanical or ETS

AMA records will be considered official but not both or any combination thereof. Due to the differences between the two AMA operations, combined operation could result in a loss of revenue. For this reason, completing markers should not be exposed to originating service in ETS mode until the AMA function has been cut over to full ETS operation, including AMA traffic registers.

6.44 Of specific concern to the Network Administrator will be additions and changes made to the traffic registers and the generation of the office data base. Retraining of office personnel will be necessary in both areas to familiarize responsible parties with the new methods required for administering the ETS office.

B. Data Base Generation

6.45 Data Base Generation (DBG) for No. 5 ETS occurs in two major parts. The first part is pimarily the responsibility of the Network Administrator. It consists of completing a number of forms which describe the particular central office features and parameters. The WE regional engineer also has some responsibility for form completion but only to a minimum extent. The second part is the responsibility of installers. It consists of using the previously completed forms along with DBG software and the ETS hardware in the office to translate the office characteristics into a data base which the processor can understand and which can be used by the call processing software.

6.46 The Network Administrator and WE Regional Engineer should order the set of DBG forms, along with the No. 5 ETS Office Translation Guide, in sufficient time for the forms to be completed and provided to the WE installer at the central office at the required dates as shown in Fig. 10. As noted in the illustration, the total set of forms is divided into two parts. The first part contains those forms which are required to build enough of the data base tables to allow the first stages of testing of the ETS installation; thus, this initial set is required at site by the job start date. The second, or final, set of forms allows completion of the DBG activities and is needed at about the 35 percent point of the installation. It is the responsibility of the Network Administrator to insure that both packages are at the central office at the required dates.

6.47 It is anticipated that there will be a total of about 35 unique forms ultimately required for data base generation. Some forms will be used repeatedly to contain all of the data required to characterize a particular office (e.g., Form 17 must be completed separately for each multiline hunt group in an office). Thus, a typical office may require as many as 400 or more forms to be completed. Such a task may present a formidable work load on administrative forces unfamiliar with ETS methodology. The No. 5 ETS Office Translation Guide will contain detailed instructions for completing each form.

6.48 The completed forms will describe the particular central office features and parameters so as to allow the data base to be constructed. Since ETS will be integrated into existing offices, the forms were designed so that their required information can be obtained from existing office records. ***Mistakes in completing the forms have the possibility of entering errors in the data base which may evade the rigorous audits and tests performed during installation. Also, after the forms have been completed and sent to site, it is the Network Administrator's responsibility to maintain a record of all office changes which will affect data on the forms.*** These changes must be entered into the data base prior to the "office access mode" of DBG. Hopefully, the record keeping and changes are minimized by having the forms which are most likely to change delivered to site in the second set of forms.

6.49 When the data base has been completely built and has passed all audits, the installer will request the set of office records to be printed out. The records presently defined include:

- A list of all telephone numbers (TN) to originating equipment (OE) translations (includes both assigned and unassigned TNs)
- A list of all OE to TN translations
- A list of all multiline hunt group assignments
- A list of all trunk group assignments.

These records will form the basis of the description of the office data base. It is important to note that when the data base is complete, ***all*** changes to the office from that time forth (even ***before***

ETS is in service) must ***also*** be made in the ETS data base. As recent changes are made, these records will be updated by the recent change (RC) procedures as described in the Translation Guide.

C. ETS Traffic Measurements

6.50 Traffic measurements are made by the ETS for system administration, plant maintenance, traffic engineering, billing, and division of revenue studies. They include measurements for ETS administration plus certain measurements previously obtained from the electromechanical circuits replaced by the ETS. The latter includes: (a) AMA peg counts, (b) subscriber line overflow for individual lines and hunt groups (associated with the terminating translation feature), and (c) route peg counts and overflow and preroute peg counts (associated with the route translation feature).

6.51 All registrations provided by the ETS are distributed by the measurement registration connector (MRC) circuit to existing data collection equipment. The MRC can be equipped with either 8 groups of 56 leads each (448 leads) or 16 groups of 56 leads each (896 leads). The first group is dedicated to maintenance registrations which have fixed lead assignments. Traffic registrations are assigned to leads in the remaining 7 or 15 groups as required. The assignment of a specific traffic registration to a particular lead is made in the data base via either the traffic or maintenance terminals. The proper scale factor (1, 10, or 100) for each plant or traffic registration must also be selected and entered in the data base such that high day busy hour counts will not exceed 1800.

6.52 MRC lead assignments are not critical. Any traffic register may be assigned to any MRC traffic lead. The only restriction on the total number of traffic registrations is the number of output leads from the MRC, namely 392 with seven traffic groups or 840 with 15 traffic groups.

6.53 ETS measurements are distributed by the MRC during ETS operation, and similar measurements are pegged via the marker during Crossbar operation. Traffic registers cannot be arranged to gather data via both methods simultaneously. Therefore, since the markers are cut over to the full ETS mode of operation one at a time, some registers will be gathering data from only a portion of the office during marker cutover, and the data will not represent the total office count. This is not the case for registers gathering AMA type counts. AMA registers should be cut over to full ETS operation at the same time the office is cut over to full ETS AMA operation, which is prior to cutting any markers to full ETS operation. All AMA registers should at that time be arranged to gather data via the MRC only.

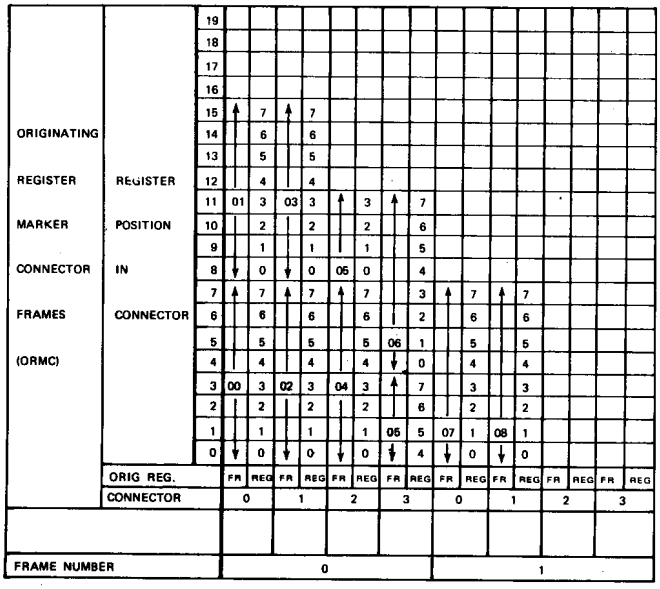
D. Common Control Equipment Growth

6.54 Growth in No. 5 ETS offices will primarily involve electromechanical growth and growth in ETS interface equipment. The amount of ETS equipment required for a given installation is basically dependent upon the number of markers, lines, trunks, and junctors that must be scanned. Additional factors, namely translating, routing and screening requirements unique to each office, affect the main store requirements. The 3A processor is capable of serving all full size No. 5 Crossbar marker groups.

6.55 WE has very few options on how they can add common control equipment without taking something out of service. For example: When adding connectors, markers must be taken out of service, usually one at a time, while the marker leads are extended to the new connector (see Attachment 1). If a new marker is being added, and marker capacity is high, it may be possible to get the new marker into service before adding marker connectors.

6.56 Interconnections between a marker and various frames or equipment units are accomplished by means of connectors. The XXX-240 drawing gives the connector arrangements in a No. 5 ETS office. The Network Administrator should become very familiar with them and understand the effect that any connector outage might have on load and service.

– 240 DRAWING – ORMC FRAME



6.57 To enable the originating register (OR) to access the completion marker, the OR must be wired to a position on the originating register marker connector (ORMC). Likewise, the incoming register (IR) must be wired to a position on the incoming register marker connector (IRMC).

6.58 A typical MOP work operation description is "Make ORMC Frame 0, connector 2, busy to add new originating registers." To perform the work operation described, WE must remove from service all originating registers associated with connector 2. A review of the 240 drawing reflects 12 ORs presently wired to connector 2.

6.59 The Network 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 ORs out of service.

(4) Time period best suited to grant the outage.

Having determined this information prior to a MOP meeting, the Network Administrator is in a position to guide the outage in its proper time interval.

6.60 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 also cause an overflow problem, 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.)

Example:

An MF outsender group has six outsenders installed. BH TUR data is 63 CCS. From Poisson capacity Table 10, the requirements for 63 CCS is six outsenders. Assume two senders are removed from service. The capacity for the four 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 in Fig. 11. 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 network maintenance to have excessive stuck sender reports.

6.61 The efficiency provided by office design can also be impaired when switching paths are blocked. In No. 5 ETS offices, the swiching 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. Fig. 12 shows the efficiency in percent 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 10 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.

6.62 Modification recommendations (MRs) or detailed change sheets (DCSs) may be scheduled during the addition to an office. These are circuit improvements or updates of existing equipment initiated by Bell Labs or WE. Often they are not descriptive and it is difficult to anticipate the outage time associated with these changes. The Network Administrator must control these outages as well as any equipment outage and should:

(1) Coordinate with Network Maintenance and WE 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.

UTILIZATION

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

6.64 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 Network Administrator to know the new capacities of the frames based upon the new junctor configuration.

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

6.66 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.

6.67 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 Network Administrator should ensure that the types and the groups to which they are assigned are in reasonable numerical balance over the trunk link frames.

6.68 A trunk assignment group usually maintains records by trunk link frame as indicated in Traffic Facilities Practices (TFP), Division K, Section 4A, Fig. 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.

6.69 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 (see Fig. 13).

7. IN-SERVICE REQUIREMENTS

GENERAL

7.01 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 Network Administrator

to determine in-service requirements and the effect that removals of equipment might have on service.

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

7.03 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 accessed early and schedules arranged so that service is not seriously affected.

7.04 When the Network Design Order for the job is issued, the Network 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 Network Maintenance, Network Administration, and WE. 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.

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

7.06 These quantities and time frames should be discussed at MOP Committee meetings (see 4.03), and plans should be formulated at that time to ensure sufficient work force and scheduling of work force so that the MOP proposals can be followed.

7.07 Deviation from minimum equipment requirements should not be tolerated. Facilities removed from service due to circuit trouble must be included in the total outage.

7.08 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.

DETERMINATION OF QUANTITIES

7.09 The following paragraphs contain suggested methods for calculating required capacity and the means for properly recording these data for MOP purposes.

7.10 Traffic Facilities Practices are the source documents used to provide facilities for Central Office relief at the exhaust period. They may also be used by the Network Administrator to calculate current in-service requirements. These practices become exceptionally useful in preparing requirements for transition purposes.

7.11 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.

7.12 Reference sources are as follows:

- ***Line Link Frames—TFP, Division D, Section 8-b:*** Efficient frame loading contemplates meeting service standards and proper utilization of the junctor arrangement.

- ***Dial Tone Markers and Originating Registers—TFP, Division D, Section 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 ORs required to render satisfactory service during transitional periods must be made by time frames and by each OR group where separate groups of ORs exist. A small overrun of the projected OR 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 OR requirements be based on the Gamma prediction of the highest day load using a 90% assurance that this load will not be exceeded.

- ***Incoming Registers—TFP, Division D, Section 8h:*** 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.

- ***Completing Markers (TFP, Division D, Section 8-f(2)***
- ***Senders—TFP Division D, Section 8-g***
- ***AMA—TFP Division D, Section 8-j(2)***
- ***Trunks—TFP Division K, Section 4-a***

Methods for determining in-service requirements for all of the various equipment components are explained in the TFP reference given.

7.13 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 determing 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.

CONTROL FORMS

7.14 The following paragraphs explain control forms to be used for in-service requirements. These requirements must be monitored by the Network Administrator. Any deviation could result in service degradation.

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

7.16 Fig. 14 illustrates a control form that can be used to depict equipment component requirements from Monday through Sunday between the hours of 8 AM to 10 PM.

7.17 To determine the amount of equipment that can be turned down at any given time on any day, subtract the number in the SERV column (equipment required for service) from the number of installed equipment at the top of the page. The difference can be entered in red pencil in the MANT column for ease of reference. As indicated in Fig. 14, the usual practice is to remove only one marker at a time for maintenance.

7.18 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.

7.19 Load Distribution Charts are another type of 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.

7.20 Following is an example reflecting the difference in requirements when applying the percent distribution to installed equipment versus BH CCS. Maintenance requirements should be discussed with Network Maintenance.

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

Hour	*(1) Installed Equipment*	*(2) % of BH*	*(3) Req'd Based on % Eqpt*	*(4) BH CCS*	*(5) CCS/FOR BH % DIST*	*(6) Required TABLE 10*
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 requirement in column 6 is equal to or greater than the requirement in column 3.

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

8. DATA

SERVICE AND LOAD MEASUREMENTS

8.01 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.

8.02 There are two categories of measurement in a No. 5 ETS office:

- ***Service***
  - (a) Dial Tone Speed
  - (b) Incoming Matching Loss
  - (c) Various NC & Reorder Registers (stuck senders)
  - (d) Group Busy Timing Registers
- ***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 WE activity, the devices which produce service results must ***be kept in service*** to the maximum extent possible.

8.03 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 may 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.

8.04 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. DFMP, Division H, Section 19F(2) is an easy comprehensive reference for determining what is in the data and when the register operates.

8.05 The Network 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. The following tests can be made in the office to assure proper wiring, measuring device operation and cross-connections.

They are:

(a) Register tests

(b) Continuity tests

(c) Detector tests

(d) False busy and false operation tests

(e) Dial tone speed tests

8.06 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:

(a) Comparison of related sets of registers

(b) Comparison of usage with service

(c) Comparison of usage and peg count

(d) Consistency with past values

For more detail on data validation, refer to DFMP, Division E, Section 5.

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

8.08 During transition from crossbar to ETS operation, some registers, such as those previously scored via the markers, may record data for only a part of the office as the equipment is converted to the ETS mode. The Network Administrator must be aware of the registers affected and the time frame in which inaccurate data will be collected.

8.09 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:

- ***Loading:*** Is present loading consistent with past loading?

- ***Derived holding time:*** Using measured usage and actual peg count, check for general order of magnitude against published holding times.

- ***Sender overflows:*** Check actual sender overflows against the overflows predicted by the TFP tables for the measured usage.

- ***Originating Register:*** Check OR usage against the incidence of dial tone delays.

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

SERVICE CEILINGS

8.11 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:

- Dial Tone Speed

ABS-BH	1.5% >3"
ATHD-BH	8% >3"
HD-BH	20% >3"

- Originating Matching Loss 1% ABS-BH

- Incoming Matching Loss 2% ABS-BH

8.12 Incoming matching loss is normally controlling, insofar as frame loads that a No. 5 ETS 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 1.5% >3".

LOAD AND CAPACITY CHARTS

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

8.14 Network 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.

8.15 It is strongly recommended that the usage data be obtained coincident with the service data described in 8.02 for reconciliation purposes.

8.16 In the process of developing load service curves, questionable data indications will show up on the curves. There 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 components, there are many reasons for a particular office to differ from the average values of another office.

8.17 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) days with abnormal load situations which might not be included for engineering purposes might, in the judgement of the network administrator, be included. The effect of the occurrence and not the occurrence itself might be recurring.

8.18 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.

The two most common load-service curves in a No. 5 ETS Office are:

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

The use of load service curves are covered in TFP, Division D, Section 1b.

8.19 During transition periods, for daily application, ABS load service curves should not be used. The greater the systematic variation (non-random—see TFP, Division A, Section 1b) in day to day, week to week, etc., loads such as Monday BH always being higher than Tuesday BH, the higher the percent IML will be at a given load.

9. OTHER CONSIDERATIONS

NEWER SERVICES

9.01 Although intended primarily for local dial switching, No. 5 ETS can be arranged as a tandem or toll center or serve as any combination of the three.

9.02 Design work on the No. 5 ETS system is still continuing so that newer customer services may be offered.

9.03 The Network 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.

LINE EQUIPMENT TRANSFERS

9.04 The Network Administrator is responsible for the loading of new frames and equipment groups. Prompt and appropriate utilization of new equipment will ensure optimum service.

9.05 Line equipment transfers necessary to balance an office before, during, and after an addition must be planned well in advance. A plan should be prepared showing the ***required*** transfers spread over a recommended time interval.

9.06 Network Maintenance should be consulted for concurrence in the timing and volume of additional work load.

EQUIPMENT TESTING

9.07 The results of tests conducted by Network Maintenance, insuring equal access and equitable distribution, should be furnished to the Network Administrator.

9.08 These tests may include:

(a) Wiring and operational integrity of the connector preference chains and master traffic control circuitry.

(b) Marker to trunk link frame seizure.

(c) Line link frame to marker seizure, etc.

DAILY ADMINISTRATION

9.09 Network Administrators must advise Network Maintenance about the equipment situation in each office before, during, and after transition (see 4.08). 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 Network Maintenance forces at all times. Control forms such as those described earlier can be used for transmitting this information to Network Maintenance.

9.10 The procedures recommended for transition purposes can be easily applied to daily administration. However, before any capacity reduction in minimum amounts is permitted, a release should be requested from the Network Administrator.

10. CONCLUSION

10.01 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 Network Administration personnel to clearly recognize.

10.02 It is not the intent of this section to assign responsibility to other groups or departments or to dictate changes in their existing practices or procedures. It is intended that this information be used to simplify the transition, reduce work effort, protect equipment and maintain good service.

10.03 No amount of written material can describe or anticipate every condition that might occur. In addition to good planning, "judgement" will be the most valuable tool that the Network Administrator will use in final analysis. Attachment 3 is a MOP check list which the Network Administrator can use as a guide during periods of MOP activity.

11. REFERENCES

Dial Facilities Management Practices

Division H, Section 1b(8), General Administration—MOP
Division H, Section 1b(5), Facilities Capacity Determination
Division G, Section 2, Traffic Measuring Devices

Traffic Facilities Practices

Division K, Section 4a, Trunks

Western Electric Handbook

WE Handbook 3, Section 5A, Methods of Procedure—WE
WE Handbook 0, Section 10-14, Prevention of Service Interruption
WE Handbook 69A, Section 50, Junctor Transitions—No. 5 Crossbar
WE Handbook 69B, Book of Standard MOP Forms—No. 5 Crossbar
WE Handbook 69E, Book of Standard MOP Forms—No. 5 ETS

Bell System Practices

201-112-001, Methods of Procedure—Plant
819-220-150, Junctor Transitions—No. 5 Crossbar
201-114-001, Equipment and Trunk Out of Service
800-614-150, General Installation Requirements

Junctor Pattern Size	Number of Junctor Groups From Each Line Link Frame	Maximum Channels Per Junctor Group Test	Junctors Subgroup Numerical Durignation Number in Column Heading Is 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	17	10	7			
	2 groups of 16	13	10	3	3		
24 LL – 6 TL Pairs	1 group of 18	14	10	4	4	(See Note 2)	
	2 groups of 17	17	10	7			
	3 groups of 16	13	10	3	3		
36 LL – 6 TL Triples	Same as 6 TL Singles						
14 LL – 7 TL Singles	2 groups of 15	15	10	5			
	4 groups of 14	14	10	4			
	1 group of 14	12	10	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	13	10	3			
	4 groups of 12	12	10	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	12	10	2			
	8 groups of 11	11	10	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.

Fig. 1—Number of Junctors (6.10)

SINGLE PAIR TRIPLE	JUNCTOR 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.

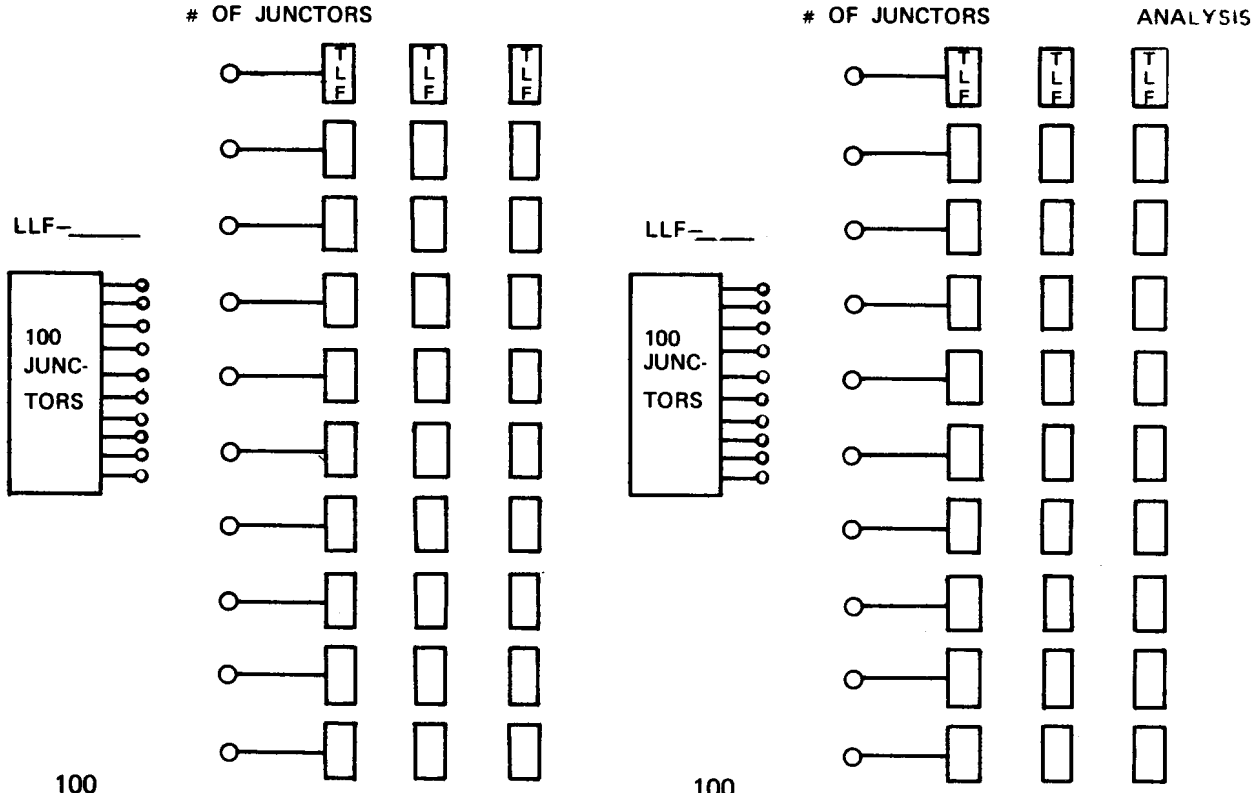
Note 2: Where three junctor subgroups exist.

Fig. 2—Junctor Group Testing Arrangement (6.11)

LINE LINK JUNCTOR CAPACITY

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

FUTURE PATTERN
JOB #_____
__TLF SINGLE/PAIR/TRIPLE



ENTITY_____
ENGINEER_____

TOTAL LLF'S_____

Fig. 3—Line Link Junctor Capacity (6.12)

TRUNK LINK JUNCTOR CAPACITY

PRESENT JOB _____
PROVIDED
LLF 00 TO ____ = _____ LLF'S

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

FUTURE JOB _____
PROPOSED
LLF 00 TO _____ = _____ LLF'S

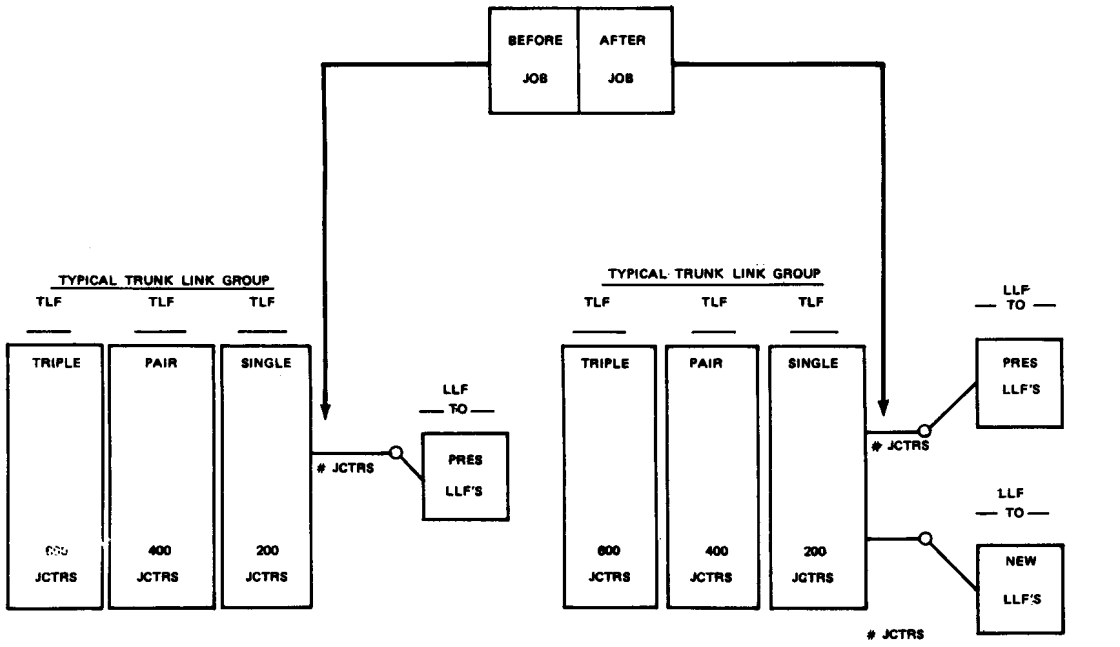
_____ LLF'S X 100 JUNCTORS LLF = _____ JCTRS, TL
_____ TL (SINGLE-PAIR-TRIPLE) (S-P-T)

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 _____

Fig. 4—Trunk Link Junctor Capacity (6.12)

I. CAPACITY TABLE – "PATTERN NORMAL"

This table represents the CCS/LLF capacity of a No. 5 crossbar office while it is operating on "pattern normal" with the markers using only the first subgroup of junctors.

PATTERN	% OF PATTERN CAPACITY	NO. OF JUNCTORS IN USE ON LLF
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 No. 5 crossbar office while it is operating with one pair of trunk links on pattern normal throughout the back tap method of junctor transition.

PATTERN	% OF PATTERN CAPACITY
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

Fig. 5—Junctor Pattern Capacity Tables (6.15)

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					TLF Singles				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			6

Fig. 6—Average CCS Per Line Link Frame at 2 Percent Incoming Matching Loss (6.18)

This table represents the CCS/LLF capacity of a No. 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 Fig. 4, TEP, DIV. D, Sec. 8 B(2) capacities, and can be used when only one pair or triple is missing or not loaded.

PATTERN	NO. OF PAIRS FILLED OUT	NO. OF JUNCTORS IN USE	CAPACITY
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

Fig. 7—Capacity Table—Pair Missing (6.20, 6.21)

CCS/LLF For LLF-TLF Ratio of 2 To 1

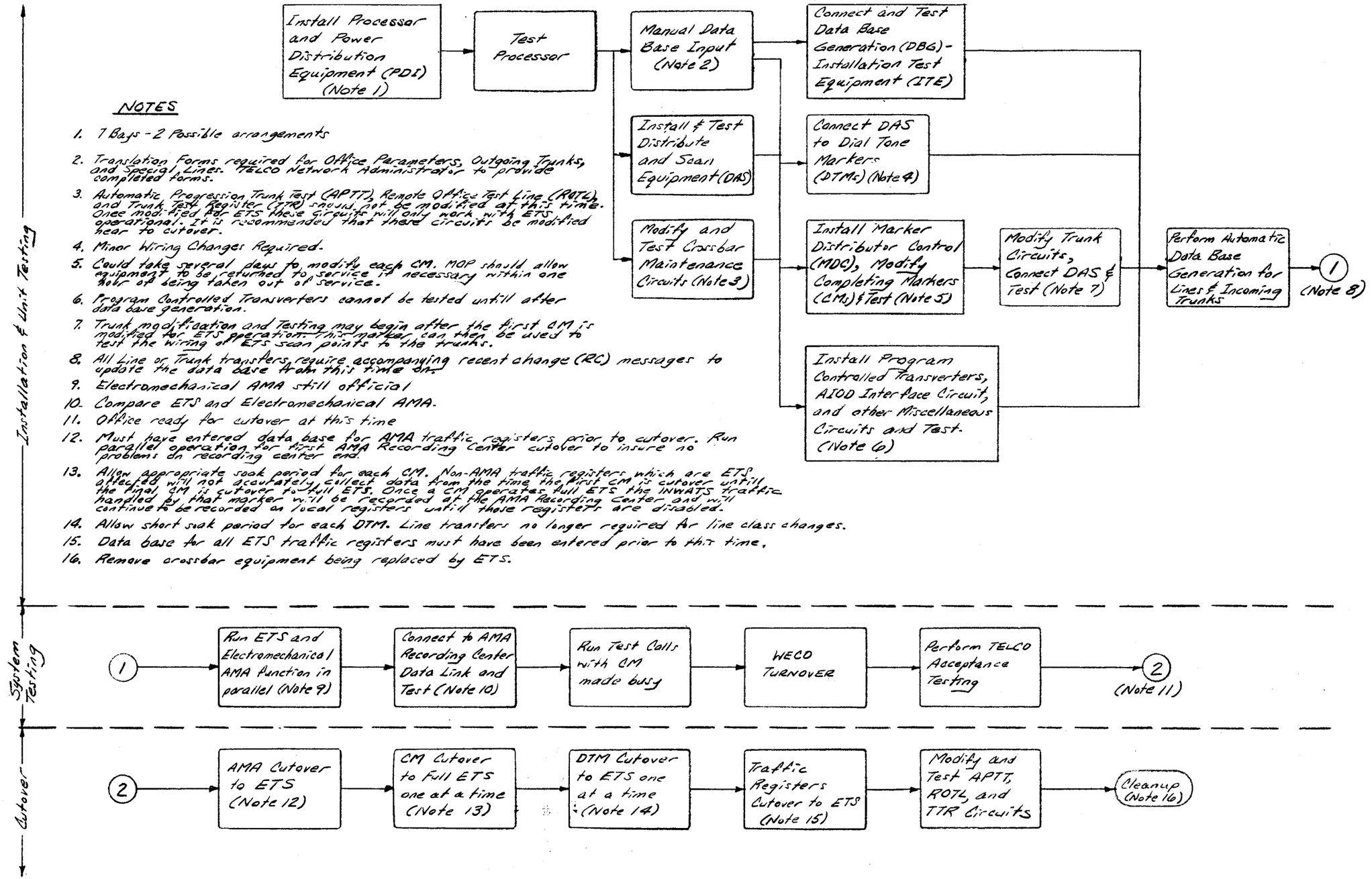
NO. OF TLFs	PERMANENT JUNCTOR PLAN PATTERN SIZE 2-3	5	10*	PRESENT ARRANGEMENTS PATTERN SIZE 2	3	4	5	6	7	8	9	10	NO. OF TLFs
2	1000			1480									2
			TLF Singles							TLF Singles			
3	1410				1410	1140							3
4		1360				1290	1360						4
5		1500					1500	1210					5
6		1350			1400		1350	1310	1200	1100			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

Fig. 8—Average CCS Per Line Link at 2 Percent Incoming Matching Loss—Permanent Junctor Plan (6.30)



NOTES

1. 7 Bays - 2 Possible arrangements
2. Translation Forms required for Office Parameters, Outgoing Trunks, and Special Lines. TELCO Network Administrator to provide completed forms.
3. Automatic Progression Trunk Test (APTT), Remote Office Test Line (ROTL) and Trunk Test Register (TTR) equips not be modified at this time. Once modified for ETS these circuits will only work with ETS operational. It is recommended that these circuits be modified near to cutover.
4. Minor Wiring Changes Required.
5. Could take several days to modify each CM. MOP should allow equipment to be returned to service if necessary within one hour of being taken out of service.
6. Program Controlled Transverters cannot be tested until after data base generation.
7. Trunk modification and Testing may begin after the first CM is modified for ETS operation. This marker can then be used to test the wiring of ETS scan points to the trunks.
8. All Line or Trunk transfers require accompanying recent change (RC) messages to update the data base from this time on.
9. Electromechanical AMA still official
10. Compare ETS and Electromechanical AMA.
11. Office ready for cutover at this time
12. Must have entered data base for AMA traffic registers prior to cutover. Run parallel operation for first AMA Recording Center cutover to insure no problems on recording center end.
13. Allow appropriate soak period for each CM. Non-AMA traffic registers which are ETS affected will not accurately collect data from the time the first CM is cutover until the final CM is cutover to full ETS. Once a CM operates full ETS the INWATS traffic handled by that marker will be recorded at the AMA Recording Center and will continue to be recorded on local registers until those registers are disabled.
14. Allow short soak period for each DTM. Line transfers no longer required for line class changes.
15. Data base for all ETS traffic registers must have been entered prior to this time.
16. Remove crossbar equipment being replaced by ETS.

Fig. 9—ETS Installation Sequence (6.42)

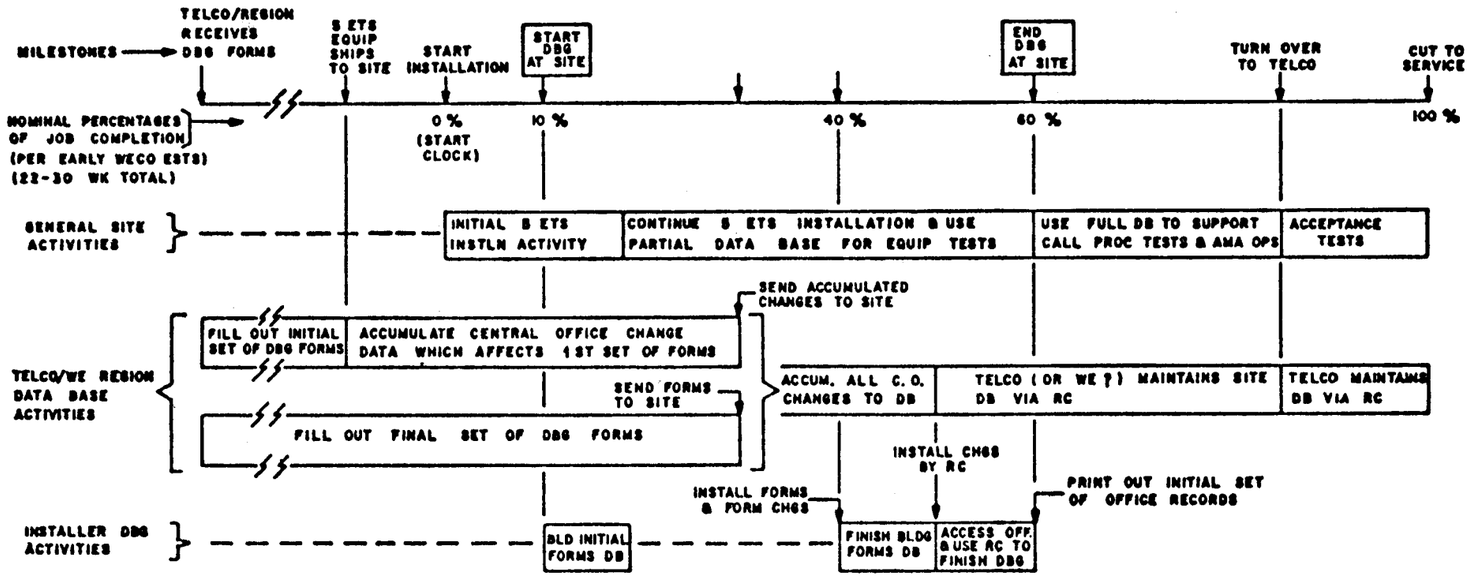


Fig. 10—Data Base Generation Activities (6.45, 6.46)

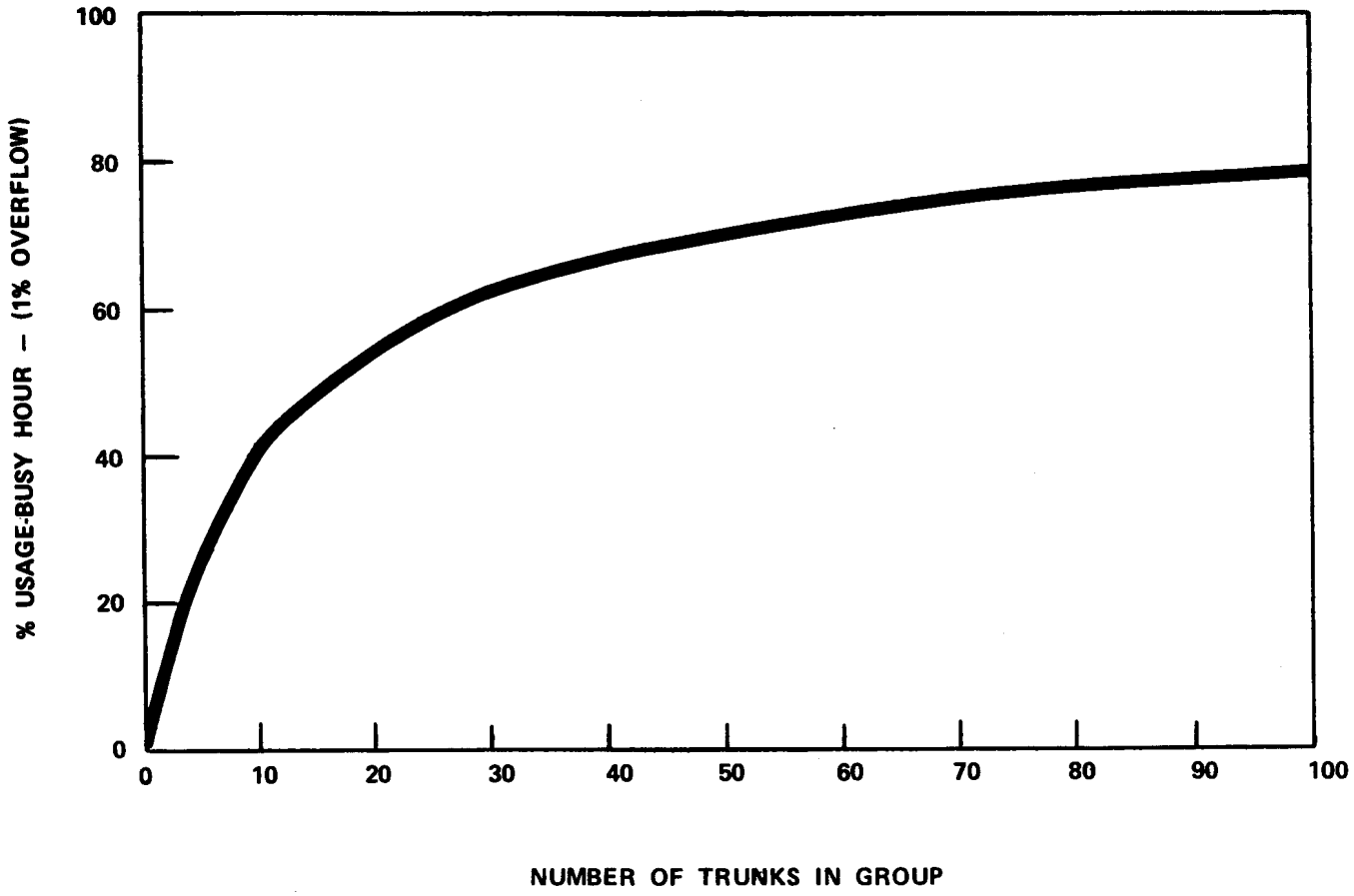
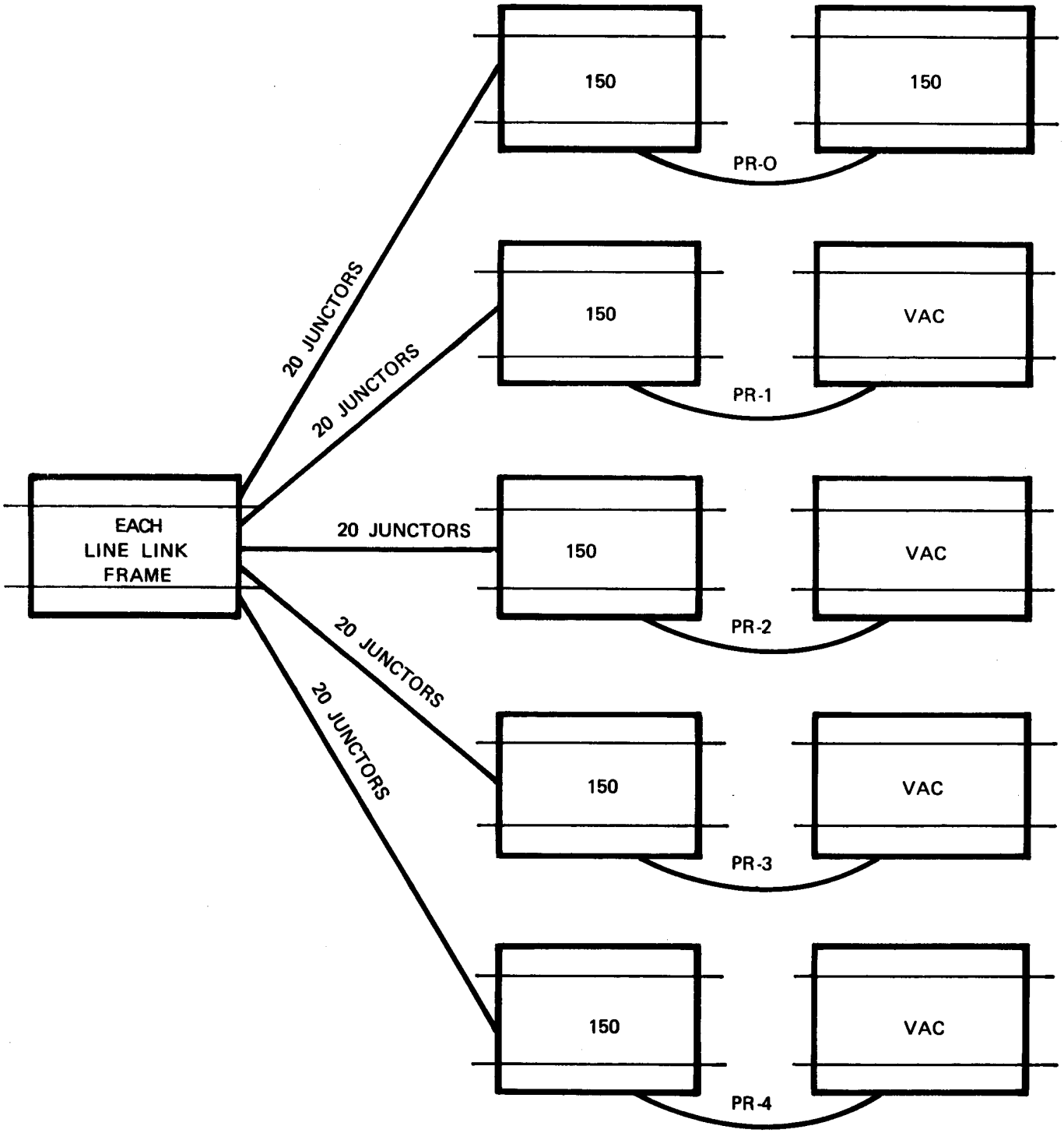


Fig. 11—Efficiency of Trunking Related to Size of Group (Poisson Probability Curve) (6.60)

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

Fig. 12—Trunk Efficiency Table (6.61)



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.

Fig. 13—Partial Paired Trunk Link Frame Loading (6.69)

REQUIRED FOR SERVICE
COMMON CONTROL EQUIPMENT

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

	MON		TUES		WED		THURS		FRI		SAT		SUN	
	SERV.	MANT	SERV	MANT	SERV	MANT	SERV	MANT	SERV	MANT	SERV	MANT	SERV	MANT
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	0	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: S.W.
Date: 5-30-73

Fig. 14—Common Control Equipment Control Form (7.16, 7.17)

ATTACHMENT 1

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 shown below. 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 6, where adding a connector in ORLM frame for new TLC, a dial tone marker must be taken out of service.

The Network 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 list. A detailed list of standard WE work operations can be found in WE Installation Engineering Handbook 69B or 69E.

(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) ***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.***

(4) ***Modify Originating Registers:*** This work operation will be performed on an "out-of-service basis." The number of ***originating registers*** to be removed from service will be determined by traffic conditions and agreed upon by Network Maintenance, Network Administration, and WE.

(5) ***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 upon by Network Maintenance, Network Administration, and WE.

(6) ***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.***

(7) ***Add Originating Registers to Existing Pretranslator 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.

(8) ***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.

(9) ***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 Network Maintenance, Network Administration and WE.

(10) ***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 IRs and IMGs from the connector being worked.***

(11) ***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.

(12) ***Add Connector in Originating Marker Connector Frame for new OR Frames:*** This work will be done on a "temporary-out-of-service basis" and will require making busy ***one completing marker*** at a time.

(13) ***Add Connector in Incoming Register Marker Connector Frame for New IR Frames:*** This work will be done on a "temporary out-of-service basis" and will require making busy ***one completing marker*** at a time.

(14) ***Extend Marker Multiple to New Line Link Marker Connector Frames:*** This work operation consists of adding cables to LLMC frames on a "temporary out-of-service basis". This will require removing from service ***one dial tone marker*** at a time.

(15) ***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.

(16) ***Extend Marker Multiple to New Incoming Register Marker Connector Frames:*** This work operation consists of adding cables to IRMC frames on a "temporary out-of-service basis." This will require removing from service ***one completing marker*** at a time.

(17) ***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.

(18) ***Rearrange Marker Preference Chains in Line Link Marker Connector for new Link 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.

(19) ***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.

(20) ***Equip ADRMC with RF Multi-Contact Relays:*** This work operation will be performed on a "temporary out-of-service basis." ***All ORs in an ORMC*** must be made busy.

(21) ***Add Connector in Trunk Link Connector Frame for new Trunk Link Frames:*** This work will be done on a "temporary out-of-service basis" and will require making ***one completing marker*** busy at a time.

(22) ***Extend Marker Multiple to New Trunk Link Connector Frames:*** This 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.

(23) ***Connect Trunk Link Connector Control Circuit into Working Markers:*** Work is done on a "temporary out-of-service basis" and will require ***one marker*** at a time.

(24) ***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.

(25) ***Add Connector in Outsender Connector Frame for New Outsender Frames:*** This work will be done on a "temporary out-of-service basis" and will require making busy ***one completing marker*** at a time.

(26) ***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.

(27) ***Extend Marker Multiple to New Outsender Connector Frames:*** This will be done on a "temporary out-of-service basis." This will require removing from service ***one completing marker*** at a time.

(28) ***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.

(29) ***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.

(30) ***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 Network Maintenance, Network Administration and WE.

(31) ***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.

(32) ***Add Memory to Processor:*** This work operation will be performed are a "temporary out-of-service basis" by removing from service ***one 3ACC*** at a time.

ATTACHMENT 2

PAIRED LINE LINK OPERATION

SUGGESTED METHOD OF PROCEDURE

The following procedure is recommended for converting No. 5 ETS 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:

   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 using Bell System Practices Section 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, 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 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 to 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.*

ATTACHMENT 2 (Cont)

PAIRED LINE LINK OPERATION

SUGGESTED METHOD OF PROCEDURE

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 through 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.

ATTACHMENT 3

MOP CHECK-LIST

I. MEETINGS

A. Are the following meetings conducted?

1. Field Review of Network Design Order Study (To determine the need for Transition Equipment)
2. Network Design 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 I-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 Network 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

ATTACHMENT 3 (Cont)

MOP CHECK-LIST

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 Network Maintenance, Network Design, and Engineering Department Representatives?

III. ADMINISTRATIVE ITEMS

A. Does the Network Administrator possess a current Western Electric Co. Job Schedule?

B. Does the Network Administrator monitor load-service relations?
   1. Before, during and after job?
   2. Does the he/she 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 Network 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 Network Administrator receive copies?

ATTACHMENT 3 (Cont)

MOP CHECK-LIST

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

1. Western Electric Handbooks
2. Bell System Practices (BSP)
3. Traffic Facilities Practices (TFP)
4. Dial Facilities Management Practices (DFMP)
5. Network Design Order and Job Specification
6. Required Prints
7. No. 5 Translation Guide

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 Network Administrator included in joint tests?
2. Are results given to Network Administrator?