NO. 1 CROSSBAR

METHOD OF PROCEDURE DOCUMENT PREPARATION

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1. GENERAL

1.01 Purpose

1.01.1 This section contains procedures to be followed by personnel responsible for the dial administration of No. 1 Crossbar offices when additions to existing facilities are required, when certain modifications and/or improvements are planned, or when any changes and/or transitions are anticipated to increase capacity or improve service.

1.01.2 Familiarity with Dial Facilities Management Practices, Division H, Section 1b (8) is essential as is knowledge of traffic engineering, dial administrative procedures, and the switching functions of the No. 1 Crossbar system.

1.02 Involvement

1.02.1 Generally, periods of activity involving equipment additions, transitions and/or modifications require the involvement of groups

other than the Traffic Department. Such areas of mutual responsibility are identified to the extent necessary to participate effectively in the development of Methods of Procedure (MOP).

1.03 Recognition of Organizational Structures

1.03.1 Due to differences in organizational structures, specific titles of individuals, groups and departments are avoided. Instead, general descriptive or functional names are used. This type of format permits the identification by the individual Company of a particular organizational level (or sequence of organizational level) responsible for the procedures described herein.

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

(a) The Telephone Company representative normally responsible for the dial administration of the No. 1 Crossbar machine will be referred to as the *Dial Administrator.*

(b) The Telephone Company representative normally responsible for the maintenance of the Crossbar No. 1 machine will be referred to as the *Plant.*

(c) The Western Electric Company's Service Division does the major portion of equipment installation work for Bell System Companies. The installation force will, therefore, be designated *WECO.*

2. OBJECTIVES OF MOP

2.01 General

2.01.1 An MOP contains a detailed step-by-step plan, with the appropriate references, for the addition of various facilities to existing Crossbar No. 1 equipment.

2.01.2 The MOP will normally be prepared by WECO based upon various inputs from Telephone Company representatives, as well as job requirements and specifications.

2.01.3 Methods of Procedure are required whenever WECO activities involve working equipment. Following are examples of work activities needing Method of Procedures:

(a) Sender additions, rearrangements or modifications.

(b) Marker additions, rearrangements or modifications, e.g., Speed-up, Trunk Group Busy Circuits, etc.

(c) Office and/or Incoming Link work.

(d) District Junctor additions or rearrangements.

2.01.4 A proper Method of Procedure involves the following processes:

(a) WECO *develops* and *proposes* a plan in advance for departmental review.

(b) The plan is evaluated by the Telephone Company:

(1) The Dial Administrator *assesses* the impact on service;

(2) The Plant Department *evaluates* the maintenance effort and test requirements;

(3) The Engineering Department *examines* the cost aspect;

(4) Other departments *are consulted* as necessary.

(c) Adjustments in procedures are made based upon the participation of the groups involved.

(d) A final MOP is agreed upon.

(e) The MOP is prepared in writing and is signed by management in the three departments involved. District level approval is recommended. See Paragraph 2.04.2(c).

2.01.5 The MOP in its final form is a written plan concurred in and signed by WECO and the Telephone Company defining:

(a) What has to be done:

(1) Changes or additions involved;

(2) Sequences of additions or changes.

(b) How the job will be done with provision for:

(1) Continuity and quality of service;

(2) Efficiency in WECO installation effort

(3) Minimum interference with normal plant routines;

(4) Emergency restoral procedures.

2.02 Continuity of Service

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

2.02.2 Assuring continuity and reliability of service during periods of activity connected with installation of equipment by WECO is the joint interest and responsibility of both the Telephone Company and WECO. The attainment of this objective requires full and continued cooperation prior to and during the installation period. A procedure generally found practical for attaining this objective involves a full discussion prior to any installation activity of items such as:

(a) Type of equipment to be added or modified, e.g., senders, by type; markers, etc.

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

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

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

(e) Method of accomplishing transitional work.

(f) Amount and duration of equipment outages.

(g) Assignment and cross-connection information required.

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

2.03 Contributions of the Dial Administrator

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

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

(a) Develop load-service charts. 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 ensure sufficient equipment quantities are available. (Paragraph 7.0)

(c) Arrange for prompt cross-connection lists for traffic registers, Traffic Usage Recorders, line equipment transfers, etc.

(d) Participate in determining and scheduling joint inter-departmental tests in which the Dial Administrator would be a participant.

(e) Plan ahead for trunk transfers from existing incoming link frames and office link frames to newly added ones.

(1) This must include association of load and service measurement devices.

(2) New routings will include certain marker cross-connection work that may require the preparation of orders.

2.04 Service Protection from Equipment Failures

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

(a) The specific location of WECO activity.

(b) The specific equipment activity with which WECO is involved. Of particular interest would be the "down-time" of any facility.

(c) Service and load devices must be kept in service during WECO activity. Manual readings may be necessary for immediate analysis and corrective actions, hence proper personnel must be trained and provided.

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

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

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

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

(c) The Method of Procedure prepared by WECO based upon Installation Engineering Handbook 3, Section 5A should be reviewed by the dial administrator and other involved departments to ensure service protection as outlined in this practice. The Method of Procedure Authorization, from Handbook 3, Sec. 5, Attachmnet I, provides for three Telephone Company approvals; it is recommended that the dial administrator at District Level signify approval of job procedures.

2.05 Meetings

2.05.1 The Method of Procedure should be discussed as early in the job as possible to identify and resolve any basic differences on how the job should be done. This will permit WECO sufficient time to prepare and publish an MOP document prior to any work activity.

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

2.05.3 Proposals for establishing controls and follow-up on job progress should be determined at early MOP meetings.

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

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

3. RESPONSIBILITIES ASSOCIATED WITH MOP

3.01 General

3.01.1 The preparation of the MOP is usually handled by WECO based upon the job factors previously described herein.

3.01.2 Subordination of departmental interests may well be necessary in placing service above all other considerations.

3.01.3 The departmental general responsibilities of MOP are contained in the following paragraphs.

3.02 Responsibilities of Dial Administrator

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

(a) Review of the contents of the Traffic Order to ensure that the estimate of equipment requirements reflect the latest view of demand predicated upon increase in usage, growth in number of main stations, area transfers, etc.

(b) Being familiar with service results since the last job.

(c) The ability to reconcile traffic volumes and loads to service results.

(d) Familiarity with other demands such as trunking, Centrex, and TOUCH-TONE.

(e) Knowledge of any speeial studies such as Division of Revenue or Trunk base studies.

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

(1) Designation strips and any switchboard assignments.

(2) Cross-connection lists for —

— Line Transfers

— Dial Tone Speed Machine

— Traffic Usage Recorder

— Trunk and Marker Work

— Traffic Registers

(g) Understanding of load — service relationships so that proper *in-service requirements* can be determined, by time frames, and presented to WECO for inclusion in the MOP document.

(h) Have a detailed knowledge of the proposed transitional procedures.

(i) Have a written transition plan approved by the District level Supervisor. This plan may be prepared prior to the first MOP meeting described in Paragraph 2.05.

(j) Review as soon as possible all equipment configurations to ensure equitable distribution, e.g., sender, by type, over sender link frame; district junctor subgroups over Line Link Frames.

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

(1) Traffic Orders

(2) Job Specifications

(3) MOP

(4) Various Traffic practices

(5) Trunk Estimates

(6) Data Summaries

3.03 Engineering Department

3.03.1 Many Operating Companies assign an Engineering Department representative to coordinate WECO installation activities.

3.03.2 The Engineering Department representative is normally responsible for:

(a) Scheduling job meeting between WECO and the Telephone Company;

(b) Providing liaison between WECO and the Telephone Company;

(c) Ensuring WECO adherence to MOP;

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

(e) Arranging advance turnover of equipment

(f) Coordinating acceptance, turnover and notification procedures.

3.04 Western Electric Company

3.04.1 WECO is responsible for preparing a MOP.

3.04.2 Adherence to the prescribed MOP by WECO is necessary to ensure proper coordination by all groups.

3.04.3 Removing equipment from service, testing, restoring equipment to service, etc., must be in accordance with WECO Handbook instructions and established procedures contained in various Bell System Practices and done only with the approval of the Dial Administrator.

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

3.05 Plant Department

3.05.1 The Plant Department has the overall responsibility for physically removing equipment from service, testing, and restoring to service, etc., during periods of WECO activity. See Paragraph 3.04.3.

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

3.05.3 The Plant Department participates in joint tests, as necessary.

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

4. DEVELOPMENT OF MOP

4.01 General

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

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

(a) Dates for advance turnover;

(b) Time interval for transition or replacement

(c) Requested procedure for rearrangement;

(d) Maximum equipment quantities that may be released for modification (including time of day);

(e) Where necessary, a detailed step-by-step procedure for doing a transition or a rearrangement;

(f) Traffic measurement requirements.

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

4.01.4 The Dial Administrator is responsible that any special instructions, dates of advance turnover, or unusual measures are included in the MOP.

4.02 Format of MOP

4.02.1 The MOP, prepared by WECO as discussed herein, will include a general outline of the entire equipment affected, work location, major equipment to be added or removed, general notes, special instructions, equipment tests to be performed, etc.

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

4.02.3 All work to be done in a step would follow a logical sequence and should be explained fully with the indication of that portion of the work that will be the responsibility of WECO or Plant.

4.02.4 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 equipment for advance service, if required

(c) The amount of work that can be done and still provide a major margin of safety for returning released equipment to service within the specified time.

(d) Work that can be done without affecting working equipment such as erecting, cabling, wiring, etc.

(e) Work that must be done during lightly loaded (usually night) hours.

(f) Work that must be done on an "in-service" basis.

(g) The type of test and test equipment required during and at the completion of each step.

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

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

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

4.02.8 The Contents of the MOP are:

(1) General Notes

(2) General MOP

(3) Detailed MOP

(4) Approvals

(5) Appendices

5. TRANSITIONS AND REARRANGEMENTS

5.01 General

5.01.1 The following paragraphs describe the various methods to be employed in completing transitions and rearrangements in connection with adding equipment to existing facilities. These methods should appear in the MOP, and adherence to the proposals should be followed by WECO. Any changes would require a revision of the MOP as described in paragraphs 4.02.5 and 4.02.6.

5.01.2 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. The purpose of the MOP is to provide for the protection of service while the transition is accomplished.

5.01.3 Methods of Procedure must be designed for minimum equipment outages or capacity reduction for a minimum period of time, and capacity ***must not be reduced beyond a point which would result in less than System Service Standards.***

5.01.4 The various measurement devices discussed in paragraphs 7.0 and 8.0 must be kept in service during periods of WECO activity. The MOP should contain statements ensuring that these devices not be turned-down during periods of time when data gathering is imperative.

5.02 Line Link Frame Additions

5.02.1 The addition of line link frames will require a redistribution of existing (and new) district junctors and existing (and new) line junctors.

5.02.2 When junctor redistribution of either type is involved, it will be necessary to ensure that a maximum number of junctors are available at the working line link frames to handle the anticipated originating and/or terminating traffic.

5.02.3 Additions of District Junctor Frames and Incoming Link Frames will necessitate rearrangements of junctors at the secondary switches of the Line Link frames. This rearrangement will normally be done at the District Junctor and Line Junctor Grouping Frames.

5.02.4 In the event odd numbers of line link frames are being provided, e.g., 1, 3, 5, etc., an additional Line Link controller will be furnished for mate frame operation.

5.02.5 The MOP document should contain installation notes regarding the line link frames, the classes of service within these line link frames, and other information necessary for mating controllers (line junctor and district junctor redistribution, are covered in detail in Paragraph 5.03).

5.02.6 Dates of completion, particularly advanced or deferred, should be stated in the MOP and all departments notified to ensure that required line equipment work is accomplished coincidentally with the work completion.

5.03 District Junctor and District Link Addition

5.03.1 District junctors (of varying classes of service) are generally added to increase call carrying capacity and to improve access to subscriber senders for dial tone and dial pulsing purposes.

5.03.2 The addition of district junctors may exceed existing spare frame capabilities and will require additional frame space. (District junctors are equipped as groups of 20 and are wired as sub-groups of 10; a district junctor frame can accommodate 100 district junctors). A maximum of 2400 junctors, Message Rate and Coin, may be furnished.

5.03.3 A District Frame is a tripartite configuration consisting of a Subscriber Sender Link Frame, District Link Frame and District Junctor Frame. Connections to a subscriber sender from a district junctor for dial tone and dialing purposes are accomplished through the Sender Link Frame and upon completion of dialing, outpulsing takes place. Subsequent conversation is through the district junctor and link frames.

5.03.4 The addition of a District Frame Group (DJ, SLF, and DLF) will require a redistribution of existing or new subscriber senders and office junctors. These rearrangements will be covered in detail in the appropriate portions of this section.

5.03.5 In offices equipped with zone registrations and coin supervisory circuits the association between these, according to class of

service, and the respective district junctors must be planned. In the same fashion, if AMA facilities are provided, the District Group Connector redistribution should be coordinated with the District Junctor redistribution and should be described by the WECO in the Method of Procedure.

5.03.6 The new district junctors, in groups of 20, must be melded into the existing district junctor configuration. This melding should ensure an equal number of appearances over the line link frames and that preferences are arranged in such a way to ensure that each line link frame has ideal opportunity to secure an available district junctor.

5.03.7 The T-XXXX-460 drawing will be used by the WECO (on form ID-481) to describe the work operation according to WECO Handbook 40, Section 60. This drawing may also be used by the Dial Administrator to graphically portray in tabular form the distribution and number of appearances of each group of 20 district junctors.

5.03.8 The table should show all Line Link Frames and their secondary switches along the ordinate and the District frames and Groups as the horizontal axis. The relationship of one to the other will be by appearance within the chain. A sample chart showing only *two* Line Link Frames and *two* District frames are shown:

Line Link Frame No.	*Sec. Sw. No.*
0	0-1
	2-3
	4-5
	6-7
	8-9
1	0-1
	2-3
	4-5
	6-7
	8-9

DISTRICT FRAME GROUPS

	0					1				
	0-1	2-3	4-5	6-7	8-9	0-1	2-3	4-5	6-7	8-9
1								2		

(Other Line Link Secondary Switch Appearances Are Not Shown Here For Purposes Of Clarity)

1

2

The remaining Line Link Secondary Switch assignments will be served by other District Frame and Groups.

5.03.9 Care should be taken to ensure that Line Link preference throughout the office is consistent and that the alternate preference directs the origination to different District Frames and Groups, e.g., Line Link secondary switches 0-2 are wired as preference. At LL#0 the first origination will be directed to DF#0, District Junctors 00-99, the next choice would be DF#1, District Junctors 40-49. Selection thereafter will be in ascending numerical order at the LL secondary switches.

5.03.10 New District Junctors should be wired to the District Junctor Test Frame and to the Traffic Usage Recorder, where provided.

5.03.11 Coin type district junctors should also be associated with Coin Supervisory Circuits for the purpose of collecting and returning coins at the respective Coin Box Stations.

5.03.12 The district junctors, as indicated earlier will also have "primary switch" appearances at both the sender link and district link frames. These are usually arranged in identical numerical order, i.e., DJ#49 will appear at primary switch #4, horizontal #9 at the district link frames. At the sender link frame, however, the DJ will have two "primary switch" appearances to provide sufficient paths for all connectors at the sender. The DJ's will have vertical appearances.

5.03.13 District Junctor capacity, in an office, may be increased by adding 10 to 20 District Junctors to each existing district link frame bringing the maximum complement to 2400. These additional DJ's will be located on an

auxiliary district junctor frame with an auxiliary sender link frame.

5.03.14 This standard arrangement provides for one or two district link primary switches to be mounted on the subscriber sender link frame of the associated group. These additional primary switches furnish linkage with the existing secondary switches of the district link frame. This is done by multipling the links from the new switches to 10 — 20% of the links from the existing primary switches.

5.03.15 During the transition, care should be exercised that originating matching loss is not increased by excessive secondary switch outages. District link and office link frame overflow registrations should be monitored constantly during this work activity.

5.04 Office Link Frame Additions

5.04.1 Office Link Frames are provided in pairs to accommodate outgoing trunks. The number of OLF's provided will equal or be one more than the number of District Frames furnished.

5.04.2 When office link frames are added, an office junctor rearrangement is required to furnish sufficient and equal paths from the District Link Frames to the Office Link Frames.

5.04.3 The transfer of working trunks from existing office link frame pairs to the newly added ones is also necessary to balance the outgoing traffic volumes. This work may be accomplished coincidentally with the addition of new trunks if balance throughout the outgoing fields is maintained.

5.04.4 The percentage of CCS load that may be transferred to each new office link frame pair and the number of office junctors between each District Link Frame and Office Link Frame are shown in Table A following.

TABLE A

	PRESENT OFFICE					
Arrangement No.	*No. of Office Frames*	*Junctors per DLF/OLF*	*Office Frames Being Added*	*Office Size At Completion*	*Available Possible Arrangement Number*	*Percent Office CCS Load to be Transferred to Each OLF Pair*
1	2	100	2	4-4	5-10	50.0
2	2	100	2	6-6	11-16	33.3
3	2	60	2	4-4	5-10	50.0
4	2	60	4	6-6	11-16	33.3
5	4	50	2	6-6	11-16	33.3
6	4	50	4	8-8	17-20	25.0
7	4	40	2	6-6	11-16	33.3
8	4	40	4	8-8	17-20	25.0
9	4	30	2	6-6	11-16	33.3
10	4	30	4	8-8	17-20	25.0
11	6	33-34	2	8-8	17-20	25.0
12	6	33-34	4	10-10	21-24	20.0
13	6	30	2	8-8	17-20	25.0
14	6	30	4	10-10	21-24	20.0
15	6	25	2	8-8	17-20	25.0
16	6	25	4	10-10	21-24	20.0
17	8	25	2	10-10	21-24	20.0
18	8	25	4	12-12	25-28	16.6
19	8	20	2	10-10	21-24	20.0
20	8	20	4	12-12	25-28	16.6
21	10	20	2	12-12	25-28	16.6
22	10	20	4	14-14	29-32	14.3
23	10	16	2	12-12	25-28	16.6
24	10	16	4	14-14	19-32	14.3
25	12	16	2	14-14	29-32	14.3
26	12	16	4	16-16	33-34	12.5
27	12	14	2	14-14	29-32	14.3
28	12	14	4	16-16	33-34	12.5
29	14	14	2	16-16	33-34	12.5
30	14	14	4	18-18	35	11.1
31	14	12	2	16-16	33-34	12.5
32	14	12	4	18-18	35	11.1
33	16	12	2	18-18	35	11.1
34	16	12	4	20-20	36	10.0
35	18	11	2	20-20	36	10.0

5.05 Transfer of Trunks – Outgoing

5.05.1 There are various methods of transferring outgoing only trunks to the added office link frames, the suggested method outlined in the following is the most direct and involves a minimum of time and effort. This work will normally be done *outside* of the Office Busy Hour.

5.05.2 This procedure requires that the trunk groups to be transferred are wired to their new locations at Main Distributing Frame (MDF) or Trunk Distributing Frame (TDF) and that all trunks in the marker test group, maximum of 40, will be re-assigned. The percent load transferred to the new pair of OLF's is recommended in Table A.

5.05.3 It is desirable (if the office frames are in balance), in order to obviate excessive Plant wiring work, to retain the Group Start (GS), Group End (GE) and Trunk Level (TL) of the group to be transferred. This will leave only one wiring change; the Start (ST) lead identifying the new location of the trunk group is actually transferred. The Plant will do the necessary wiring upon the request of the Telephone Company organization responsible for issuing marker cross connection orders.

5.05.4 When the wiring has been accomplished, the following method may be followed:

(a) Trunk Groups with Alternate Routing: The trunks in the group to be moved will be properly made busy by the appropriate Plant person.

(b) One marker is removed from service *(not in Busy Hour)* and the trunk group wiring is changed to the new location.

(c) Step (b) is repeated, one marker at a time, until all markers have been changed. During this period, the unchanged markers will complete calls over the alternate routes, and the rewired markers will then use the trunks at their new location.

(d) The old location may then be released for future reassignment.

5.05.5 Based upon the premise that preliminary wiring has been accomplished as described in paragraph 5.05.2 the following method will be used to transfer trunk groups without alternate routes to the newly added office link frames.

(a) Half of the trunks in the group will be made busy at their old location. (These trunks should be the first to be transferred to the added office frames.)

(b) Half of the trunks in the group will be made busy at the new location.

(c) One marker is removed from service *(not in Busy Hour)* and its wiring changed as required to find the trunks in the new location.

(d) After work (c) is done, the marker is restored to service and step (c) is repeated until all markers are completed. During this period the unmodified markers will use the trunks at the old location and the modified ones will employ the trunks at the new location.

(e) The trunk make busy conditions are removed upon the completion of the marker work.

(f) The trunks at the old location can then be moved to the new OLF locations.

5.05.6 Prior to placing load on added office link frames, the dial administrator should review loads (CCS per trunk group, district link and office link frames) and service overflow registrations at the district link and pairs of office link frames.

5.05.7 If imbalances exist which could cause impairment of service, steps should be taken to re-balance the existing frames as well as efficiently utilizing the added office link frames.

5.05.8 A review of trunk assignments within the GS – GE should be conducted to ensure that load is equitably distributed over *all* secondary switches.

5.05.9 In order to assure an equal spread of traffic over each of the frames of the pairs, care should be taken, where the number of trunks in a trunk group is uneven, i.e., 1, 3, 5, 7, etc. that the unneeded trunk is busied in the middle of the group.

5.05.10 For example, five trunks are required to a destination. The total number of trunk terminations *must* be a minimum of six. Assuming GS-0 and GE-5, the trunk termination that should

be busied-out is either 2 or 3. This will insure, that, regardless of which numbered district link frame is originating the call the traffic will be equally divided between the frames of the pair. (Even numbered district link frames will cause the marker to prefer even numbered office link frames, odd numbered district link frames will cause odd numbered office link frames to be preferred.)

5.05.11 Although conditions which may affect the machine's efficiency should be corrected on an ongoing basis, these conditions must be eliminated at the time of additions and/or re-arrangements to ensure proper utilization of existing as well as the newly added facilities. This includes the number of trunks assigned to route relay which may affect marker holding time.

5.05.12 Route-relay markers can search 240 trunks before reaching "GS-5" which returns on NC-RO signal. This number of trunks can be tested by a marker when special auxiliary relay equipments are furnished to permit 80 trunks to be tested in each of two Ground Supplies, as follows:

GS#1	*GS#2*	*GS#3*	*GS#4*	*GS#5*
40&40	40	40&40	40	NC-RO

5.05.13 Further sub-grouping of trunks to be reached by individual markers is possible by grading trunks to the individual markers. Full efficiency of the trunk is *not* realized however.

5.05.14 Where trunks in a group exceed 40, sub-grouping is utilized by placing trunks in a low numbered Group Supply and alternate route to a higher numbered Group Supply which contains the remaining trunks. Care should be taken however that the *smaller* number of trunks appear in the next higher numbered supply to keep to a minimum the office link frame seizures which add to the marker holding time.

5.05.15 In some cases, intra-building trunking requirements are such that other special arrangements are provided in the originating marker to increase capacity. The Dial Administrator should be familiar with these arrangements as marker outages will be reflected in decreased trunk accessibilities.

5.06 Addition of Subscriber Senders

5.06.1 The addition of senders to the system will require additional marker connector facilities as well as distributing the new senders at sender link frames (either existing and new) in a pattern that will equitably offer calls to all senders. This information should be included in the MOP as described herein.

5.06.2 There are two types of senders for customers' use: Rotary Dial Pulsing and Touch Tone Pulsing. Each type will be separated into groups and may be accessed through the sender link frames predicated upon the class of service of the calling customer, as determined at the Line Link Frame.

5.06.3 A Universal-Type sender which can receive both types of customer pulsing and is capable of Revertive Pulsing and Multi-Frequency Outpulsing is available.

5.06.4 Access to a sender is gained by the District Junctor at the Sender Link Frame. The district junctor is chosen at the Line Link Frame; this selection is made only if a sender is available.

5.06.5 Each sender link frame contains terminations for 100 District Junctors and 100 Subscriber Senders. These senders, as explained later, are multipled over several Sender Link Frames in sub-groups of 10 senders.

5.06.6 Shown in Attachment 1 is the manner that sender sub-groups are arranged over the Subscriber Sender Link (SSL) frames. This is shown on Drawing T-XXXX-5840 and may be graphically portrayed as to appearances in the chain and to the number of appearances.

5.06.7 Figure 1 shows Sender Subgroup provision over the Sender Link Frames:

	Subscriber Sender Link Frame Number							
	0	1	2	3	4	5	6	7
Sec. Switch No.	*Sender Sub-Group Number*							
0	4	5	6	0	1	2	3	4
1	3	4	5	6	0	1	2	3
2	2	3	4	5	6	0	1	2
3	1	2	3	4	5	6	0	1
4	0	1	2	3	4	5	6	0
5	4	5	6	0	1	2	3	4
6	3	4	5	6	0	1	2	3
7	2	3	4	5	6	0	1	2
8	6	0	1	2	3	4	5	6
9	5	6	0	1	2	3	4	5

(Figure 1)

5.06.8 From the foregoing table the total number of appearances of each sender subgroup may be determined as follows:

Sender Sub-Group No.	0	1	2	3	4	5	6
No. of Appearances	11	11	12	12	12	11	11

This shows a fairly equitable number of appearances for each sender sub-group.

5.06.9 Another chart may be prepared to show the preference chain of the sub-groups over the SSL's; each SSL should have a different choice of subgroups as first preference.

5.06.10 The number of senders, by type, that may be removed from service and the time periods for these outages may be found in the appropriate portion of this section.

5.07 Addition of Marker Connectors

5.07.1 A marker connector provides the paths for decoding information between ten senders and from three to a maximum of eight originating markers. They are usually installed three to a marker connector frame caring for a maximum of 30 subscriber senders.

5.07.2 Each marker connector prefers markers in a fixed order which differs in the various connectors for the purpose of distributing calls as evenly as possible over all markers. To accomplish this, the MOP will contain appropriate reference to the marker preference chain, and tests should be performed (during night hours) to ensure that equal usage is offered to the markers.

5.07.3 Marker connectors will be added when senders are added; individual connector relays will be added when additional markers are being provided. One marker-connector being busied out will necessitate ten senders being removed from service.

5.08 Originating Marker Additions and Transitions

5.08.1 The originating marker is the major common control component of the originating train. Additions of markers in a No. 1 Crossbar office will require the addition of connector facilities at marker connector frames, District and Office Link Frames and zone registration equipment.

5.08.2 The addition of serving facilities, discussed in the preceding paragraph, will necessitate work at the existing markers, usually on an out-of-service basis.

5.08.3 In-service requirements for markers, discussed later, must be reconciled with the attendant impact on holding time and capacity of

subscriber senders. The MOP should, in all instances, contain specific instructions concerning the duration, the time, and the method for removing markers from service.

5.08.4 After markers have been removed from service and prior to restoral, all leads to the various frames should be tested for reversals, crosses, and continuity. It is advisable to include in the MOP a specific time interval between the time a marker is restored to service and another marker is made busy to determine if any service reactions occur on the multiple or marker previously worked.

5.08.5 The Dial Administrator should determine at the pre-MOP meetings of any circuit modifications will be made according to a Detail Change Sheet (DCS). These will not be normally contained in Specifications but will possibly require markers to be taken out of service.

5.08.6 It is recommended that the MOP be constructed, in time frames, so that the marker changes are made early in the job so that they will be ready for new link frame equipment, etc.

5.08.7 The MOP should also contain reference to cross-connection lists and due dates so that these facilities may be utilized rapidly.

5.08.8 Because connector relays are needed at the district and office link frames and zone registration frames, work should be planned for light traffic hours as these frames will be busied out during the connection period.

5.09 Incoming Frame Additions and Transitions

5.09.1 The Incoming Frame is similar to the District Frame Group in that it contains three functional frames namely: Incoming Trunk, Incoming Link and Terminating Sender Link.

5.09.2 The Incoming Trunk and Terminating Sender Link frames can accommodate 100 trunks of varying types and the Incoming Link frame can handle 160 trunks (100 from its associated trunk frame and 60 from Auxiliary trunk frames which contain only trunk relay equipment).

5.09.3 The addition of Incoming Frames will require Terminating Marker Connector, terminating sender and line junctor work, some of which will necessitate equipment outages, discussed later.

5.09.4 In cases where Line Link Frames are being added, line junctor (the path from the secondary switch of the IL frame to the secondary switch of the LL Frame) work will be done at the line junctor grouping frame and line choice connector.

5.09.5 If the number of incoming link frames or line choices exceed ten, it becomes necessary to provide incoming extension frames, one for each regular incoming link frame. This will require the multipling of the 400 verticals on the regular secondary switch and its entension to be paired in a mate-frame configuration to provide common paths to the line link frame. (See paragraph 4.11.9(b).

5.09.6 Line junctor rearrangement, depending upon the IL-LCC ratio, may temporarily reduce capacity while operating on a reduced pattern. It is recommended that this work be done outside of busy hours and the service (IML) be monitored so that deterioration may be prevented.

5.09.7 Care must be exercised that proper cross-connections are made at the Incoming Link frame to provide for Physical (IP), Theoretical (IT), a combination of both (IPT), Full Selector (FS) or Manual or Toll (MAN) for switch horizontals 2 through 6. Trunks from the auxiliary trunk frames will be assigned horizontals 7—9. The MOP should contain proper reference to trunk decade at the ILF's.

5.09.8 The terminating sender link frame differs greatly from the originating subscriber sender link frame in that it accommodates 100 trunks having access to only 30 terminating senders. The primary switch configuration employs split switches to gain access to the three secondary switches containing the terminating senders which may be of two different varieties, i.e., Full Selector, Dial Pulse, Multi-Frequency and "B" type Senders.

5.09.9 Line junctors from the secondary switches of the Incoming Link Frame to secondary switches of the Line Link Frames can be arranged in one of three configurations depending upon the LLF to ILF ratio. They are:

(a) Single Incoming Frame Operation (SI)

which can accommodate junctors to a maximum of 40LLF's and 10LFS's served by one terminating marker group.

(b) Incoming Group Operation (IG) may serve up to 80LLF's and 20ILF's in one terminating marker group. This configuration permits twice as many incoming trunk and customer line equipment terminations. This must be provided in the initial installation because conversion from SI is not possible at a later date.

(c) Modified Incoming Group Operation (MIGO) is designed to provide additional LLF anf TLF capacities where IG had not been initially installed. It is primarily designed for offices with adequate common control available or where additional common control relief can be provided and where the office is at or near the ultimate size (40LLF—10ILF, 36LLF—9ILF).

(d) MIGO will require extensive wiring work at the Incoming Link Frames, Line Link Frames and Line Choice connectors. Secondary switches made busy for this activity will seriously reduce capacities of junctors and should be done in light load hours. The MOP should contain specific dates and times for each step with proper reference to detailed MOP for wiring instructions.

5.10 Terminating Sender Additions

5.10.1 If individual senders are being added to existing terminating sender sub-groups they must be associated at each sender link frame in which the sub-group appears. Because new senders have to be connected to the selector circuit the entire sub-group will be made busy at the terminating trouble indicator. It is difficult to measure service reactions due to terminating sender shortages because the impact is felt in originating offices, hence it is suggested this work be done during light traffic periods.

5.10.2 Terminating sender sub-group additions will require rearrangements at the terminating sender link frame (See paragraph 5.09.8). WECO will prepare work sheet ID-487 for the LL relay chain; the Dial Administrator should ensure that this work will provide equitable access and distribution to all new sender and existing sender sub-groups.

5.10.3 The addition of sub-groups will require existing sub-groups to be removed from service for LL Chain work. This work should be done during light hours with Plant personnel available.

5.11 Terminating Marker Additions and Transitions

5.11.1 Terminating Markers (a maximum of 10 to an entity) are the major common control components in the terminating train. Additions of terminating markers will require supplementary equipment at Terminating Marker Connector Frames, Incoming Link Frames, Number Groups and Line Choices.

5.11.2 When additions involve incoming link frames, line choice connectors, number group connectors and terminating marker connector units or frames, the terminating marker multiple must be extended with the associated marker being made busy during the work period.

5.11.3 When marker connector units are being worked, the associated terminating sender sub-group also will be made busy; when link frame marker connectors are added, the involved link frame will be removed from service. The MOP should contain dates and hours (preferably light load periods) when this work will be accomplished.

5.11.4 Circuit modifications may be called for in Detail Change Sheets (DCS) which may not normally be described in job specifications. As these will require terminating marker outages, the dial administrator should determine if this work will be performed.

5.12 Number Group Additions and Transitions

5.12.1 A number group's size is normally limited to 800 lines as the size of a block relay frame. A number group's capacity is usually restricted to about 1100 Busy Hour calls, therefore, calls to number groups determine their size, which may vary within the terminating marker entity.

5.12.2 Number group transitions as discussed herein for MOP purposes are divided into four categories:

(a) Paragraph 5.12.4 — New numbers added to existing number groups.

(b) Paragraph 5.12.5 — New numbers added in newly formed number groups.

(c) Paragraph 5.12.6 — Numbers transferred from one existing number group to another.

(d) Paragraph 5.12.7 — New number groups added to allow a reduction in size of existing number groups.

5.12.3 When transitional work involves number groups, the Dial Administrator must determine if the following conditions exist and ensure that the MOP and work operations cares for the proper arrangement.

(a) Split Hundreds: When the twenty-block relays of a split hundred-block fall into more than one number group when regrouping, some of the numbers will have to be reassigned so that the split hundreds HB relay and its associated TB relays will be in the *same* number group.

(b) Extra Hundreds: If extra hundreds are associated with an existing number group, and the group is split so that numbers requiring extra numbers fall into more than one number group, additional extra number HB and TB relays should be provided.

(c) PBX Allotter: If allotting is required after regrouping and numbers fall into the same number group, some of these numbers must be reassigned. However, the Dial Administrator should determine if the reduced size of number groups may permit the discontinuance of the allotter.

(d) Physical and Theoretical: In the regrouping of numbers care must be taken that, in the event physical and theoretical office designations are employed, proper cross-connections at the block relay frame reflect the proper assignment.

5.12.4 When new numbers are added to existing number groups work will be required at the terminating markers and at the Block Relay Frame. It might be required, according to the division of the number group to add Block Relay Frames.

(a) Work involved will consist of adding FH relays at the terminating marker and TB relays at existing block relay frames.

(b) All terminating markers will require downtime for the addition of the HB cross-connections. This should be done in accordance with the in-service requirements and instructions should be included in the MOP document.

5.12.5 New numbers when added in a newly formed number group will need terminating marker work and adding new relay units to existing number group and block relay frames or by adding new number groups and block relay frames or by a combination of both.

(a) Work involved will consist of adding FH relays at the terminating marker and HB and ST cross-connections to enable the markers to reach the new numbers.

(b) Care must be taken that work in the number group connector specifies the appropriate marker preference and lockout relays.

(c) It is recommended that all cross-connection and relay connection work be done in light traffic hours and the MOP should contain all instructions to that effect.

5.12.6 When it becomes necessary to transfer numbers from one existing number group to another to redistribute load over number groups, work will be required at Number Group Frames, Block Relay Frames and terminating markers.

(a) In addition to wiring work at the NG, marker lockout and control circuits must be changed.

(b) The ST and HB cross-connections must be rearranged in accordance with the desired configuration. This will require the markers to be removed from service on a one at a time basis.

(c) The various HB cross-connections at the block relay frame will also be changed to accommodate the new arrangement.

(d) All work should be described in a detailed MOP with time frames for start and completion contained in the General MOP.

(e) At the completion of this work, all markers should have access to all numbers in each number group. This can be tested by using the Terminating Trouble Indicator (TTI) to reach numbers in each number group from *each* marker.

5.12.7 When it becomes desirable to relieve traffic loads on the existing number groups, extensive wiring work is required at the terminating markers, number groups and block relay similar to that discussed in preceding paragraphs. However, due to the complexities of these transitions, careful planning and division of these steps should be reflected in the MOP to ensure all equipment is available for the day busy hours. General planning includes transferring the numbers in the highest numbered existing number group to their new number group connectors and releasing the relieved number group for use in its ultimate location.

5.13 Line Junctor Redistribution

5.13.1 As previously discussed with Line Link Frame additions (Para. 5.02) and Incoming Link Frame additions (Para. 5.09) line junctors are required to ensure access from the incoming trunks to the called line equipments.

5.13.2 Aside from the installation and various connection work, changing the line junctor distribution to conform to the LLF—ILF pattern occurs after the addition of ILF and line choice connectors (LCC) and making the accompanying changes in the terminating marker and LCC circuits.

5.13.3 The terminating sender multiple should be extended to the new terminating sender link frame portion of the new ILF and the existing (and new) terminating marker multiple should be extended to the new ILF and LCC frames. If new markers are added, their respective equipments should be added to the new and existing frame locations.

5.13.4 Forms ED-25713-01 and ED-25714-01 may be used to describe the junctor changes and may be included as part of the detailed MOP.

5.13.5 Western Electric Handbook 40 Sections 90 through 115 describe the testing and transitional procedures for each LLF—ILF configuration. It is recommended that the Dial Administrator become familiar with the appropriate steps and equipment involved in order to prevent degradation of incoming service.

5.13.6 Trunk and line equipment transfers should be prepared in advance of the transition so that the newly installed frames can be utilized rapidly and to provide a degree of balance over all junctor groups.

5.13.7 Subsequent to placing the new distribution of junctors in service, the dial administrator should monitor the percentage Incoming Matching Loss (IML) and, if available, study overflow registrations at the Incoming Link Frames and Line Link frames for potential blockage.

6. DETERMINATION OF IN-SERVICE REQUIREMENTS

6.01 General

6.01.1 The determination of in-service requirements is the prime responsibility of the dial administrator.

6.01.2 The quantities of equipment which may be removed from service and the time in which they may be removed shall be agreed upon by all groups involved in the transition, e.g., Plant, Engineering and WECO. These quantities and time frames should be discussed prior to the preparation of the MOP and be included as appendicies to the MOP document.

6.01.3 No deviation from minimum in-service requirements ***should be tolerated;*** facilities removed from service due to circuit troubles must be included as a portion of total outage. Hence, the dial administrator should work closely with Plant to determine that maintenance outages are included as part of the allowable unavailable equipment.

6.01.4 Equipment outages, previously discussed, i.e., junctors, switches, will adversely affect the office's capacity and it has been recommended that this work be accomplished during light load hours. The addition of district junctors, originating subscriber senders, and terminating senders will necessitate wiring at the accompanying controller frames for gating, access, and preference.

This type of work will be done during light load periods too, with restoral planned well before the next busy period.

6.01.5 The calculation of in-service requirements as discussed herein will be for modification work described in Engineering Change Procedures (ECP) or for other modification work to bring the circuitry to system standards. This work may be programmed for normal business hours as dictated by the equipment needs for service. Additional outages will be required for multiple extensions, inclusion in the chains, etc.

6.02 Originating Subscriber Senders

6.02.1 Calculation of the number of originating subscriber senders required to render satisfactory service (% DTD over 3 seconds) should be made by pulsing, i.e., Rotary Dial or Touch-Tone, if two groups exist.

6.02.2 Senders will require turndown when new senders are being extended to new or existing sender link frames (paragraph 4.08) or for modification for new services (Dial Tone First) or for replacement (Wire Spring Universal). These senders will be made busy at the Sender Make-Busy Board; additional protection may be made at the Sender MB relay.

6.02.3 The provision of senders is based on high day and ten-high day Dial Tone Speed Service criteria. In-service requirements for transitional periods, however, must be computed for Busy Season-Busy Hour and for all side hours of all days so that the proper time frames for accomplishing the work may be determined. A distribution of traffic as it applies to busy hour empirical data may be obtained from studies prior to the preparation of in-service requirements for MOP purposes. It will be assumed that no work will be performed during periods when High Day Traffic is anticipated or experienced.

6.02.4 Attachment 2 is a recommended format for recording data and for stating in-service requirements. Attachment 3 is a completed sample for illustrative purposes. Attachment 4 is a suggested control form for summarizing equipment needs. The information shown on Attachment 3 and 4 should be included as an appendix to the MOP document and should be employed for determination of work hours to be shown under the steps of the General and/or Detailed MOP.

6.02.5 Hourly distribution of load-service data will be required for the completion of these requirement calculations; although judgment will be exercised on a day-to-day basis depending upon local traffic volume conditions, empirical data should be the foundation for decision making.

6.02.6 Dial Tone can be affected be a shortage of district junctors while a shortage of Originating Markers may increase sender holding times to the point where dial tone is impaired. The MOP document should consider these three component items as "additives" and where work is necessary on two or three, consideration should be given to performing work during extremely low traffic periods.

6.02.7 Instructions for preparing Sender In-Service Requirements are contained in the following:

(1) *Lines 1–6* — Self-explanatory

(2) *Lines 7–9* — Use empirical data for High Day and for the Average Busy Season Busy Hour.

(3) *Lines 10 & 11* — These calculations will provide the Dial Administrator with an overview of occupancy of Originating Subscriber Senders and may be used to verify CCS/SDR as shown in line 14.

(4) *Line 12* — Originating Peg Count (Originating Marker P.C. or where not available, D.J. Peg Count).

(5) *Line 13* — The calculation of holding time may be compared with calculated sender holding time showing the impact of stuck senders, marker delay, etc.

(6) *Line 14* — CCS/SDR which may be reconciled with % Dial Tone Delay over 3 seconds.

(7) *Line 15* — Total D.J. load from

TUR or D.J. Test Frame, where modified for usage scanning.

(8) *Line 16* — CCS/DJ which can be studied for impact on service and comparison with Sender load.

(9) *Line 17* — Actual % DTD over three seconds for each of the three service criteria.

(10) *Line 18* — Total number of senders installed and contained on line 3.

(11) *Line 19* — Total CCS capacity to render satisfactory service from load-service curves. T.F.P., Div. D, Section 2-) may be used in the absence of empirical data but this tends to overstate capacity by about 3%.

(12) *Line 20* — A comparison of BH load with capacity expressed in a percentage of the BH CCS.

(13) *Line 21* — A calculation of sender needs based upon actual average load carried.

(14) *Line 22-29* — For varying percentages of BH load, these lines will reflect sender needs for various distributions.

(15) *Line 31* — Based upon office loads, this line will contain the number of DJ's needed to maintain dial tone service at or better than objective levels. (See Paragraph 5.03.2)

(16) *Line 32* — This will contain calculated In-Service Marker Requirements, discussed later.

6.02.8 The information contained on lines 21, 23, 25, 27 and 29 will be the basis for extrapulation which will be shown on a form similar to Attachment 4.

6.02.9 Discussion with Plant concerning normal Maintenance Requirements plus senders to be held for struck-sender tracing will result in the input for Plant column.

6.02.10 Western Electric Co. Handbook 40 Section 1 stresses that at no time can more than one subgroup (10 senders) be taken from service for Subscriber Sender Link Frame work.

6.03 District Junctors

6.03.1 District Junctors may be removed from service individually at the District Junctor Frame, groups of 20 at the Sender Link Frame, or groups of 20 at Line Link Frame Secondary Switches (these will appear unavailable at the individual line link frame).

6.03.2 Traffic Facilities Practices, Division D, Section 2-o will be used as the guide to determine district junctor needs predicated upon experienced CCS load during the busy hour and side hours as reflected in the percentage of load distribution.

6.03.3 It must be kept in mind that district junctor shortages caused by excessive equipment outages will contribute to service degradation.

6.03.4 Work on district junctor sub-groups at the line link frame controllers should be avoided if excessive sender outages are anticipated.

6.03.5 Arrangements should be made with Plant for use of the District Junctor Test Frame arranged for scanning where TUR's are not used to gather DJ usage.

6.04 Originating Markers

6.04.1 Traffic Facilities Practices, Division D, Section 2e and Division D, Section 2-k, was once used for determining originating Marker in-service requirements. However with TUR data and office link frame seizure information a more detailed computation is available comprehending the office configuration and trunking.

6.04.2 Marker turndown will be required when additions to district link frames, office link frame pairs and senders are made. Markers will also be made busy for trunk group wiring changes, route relay additions, or circuit modifications

under ECP provisions. The MOP will contain time frame periods for this work based upon marker needs.

6.04.3 If markers are being added on the same job with district link and office link frame pairs, consideration must be given to the sequence of installation. The addition of markers to an existing DLF-OLFP configuration will increase marker holding times due to queuing. The new markers, to be efficient, will also be arranged for the old junctor pattern. The subsequent addition of DLF-OLFP's will necessitate changes at the markers requiring down-time. On the other hand if the new DLF-OLFP's are added initially, trunks can be transferred and the new markers with the new junctor patterns can be installed permitting turn-down of existing markers for trunk and pattern wiring.

6.04.4 It is recommended that after a marker is restored to service, a suitable time interval be observed before another marker is taken from service to ensure continuity of leads, absence of short circuits, etc. which may not be detected when testing markers from The Originating Trouble Indicator (OTI).

6.04.5 Attachment 5 is a suitable format for determining marker needs for inclusion in the MOP document. This format, however, is based on empirical usage data and requires the calculation of the office link frame seizures ratio. Where these data are not available, the peg count data and instructions contained in Figure 5, Section 2k, of Division D of Traffic Facilities Practices may be used.

6.04.6 Following are step-by-step instructions for providing marker in-service guidelines for transition and MOP purposes.

(1) *Lines 1–6* — Self explanatory.

(2) *Line 7* — Total Marker Usage (Depending upon the season of year or local traffic expectations, this figure may represent high day data).

(3) *Line 8* — Total Marker Peg Count for corresponding period of Line 7.

(4) *Line 9* — Usage (CCS) per Marker — Total CCS (Line 7) divided by Number of Markers (Line 3).

(5) *Line 10* — Peg Count per Marker — Total Marker Peg Count (Line 8) divided by Number of Markers (Line 3).

(6) *Line 11* — Usage per Marker (Line 9) multiplied by 100 divided by Line 10.

(7) *Lines 12–14* — This adjustment to marker holding time corrects for TUR data.

(8) *Line 15* — This figure is used to determine the percent occupancy. The figure entered here is the product of Markers (Line 3) multiplied by 36CCS.

(9) *Line 16* — The percent occupancy may be derived from the following computation.

$$\frac{\text{Total Marker Usage (Line 7)}}{\text{Maximum Usage (Line 15)}} \times 100$$

(10) *Line 17* — For the corresponding period of Lines 7 and 8, the total of all office link frame seizures peg count divided by Total Marker Peg Count (Line 8) will produce this ratio. (For validity purposes a ratio of over 1.30 should be investigated. A large number of small trunk groups with many alternate routings may explain a high ratio figure.)

(11) *Line 18* — The marker theoretical holding time is determined by the OLF seizures ratio and the No. 1 Crossbar DLF-OLFP and Marker configuration. Shown as Appendices 1—5 are charts which may be consulted to develop a theoretical

holding time at 100% occupancy which may then be adjusted by the actual percent occupancy (Line 16) read into Appendix 6 which is a guide to reduced holding time as it relates to marker occupancy.

(12) *Line 19* — Markers Installed (Line 3).

(13) *Line 20* — Markers not available is a hypothetical figure representing 0 (a), 1 (b), or 2 (c) markers removed from service for any reason. The calculations shown on the following lines are to produce a marker requirement for various time frames.

(14) *Line 21* — Number of Markers available for Traffic (Line 19 less Line 20).

(15) *Line 22* — Markers multiplied by 28.8CCS which represents 80% occupancy.

(16) *Line 23* — OLFS Ratio (Line 17).

(17) *Line 24* — Consulting the appropriate Chart — based upon DLF-OLFP shown as Appendices 1—5, calculate the Marker Holding Time for 100% occupancy. For example, Appendix 1 shows 12DLF-60LFP, by reading the abscissa at 1.3 OLFS ratio to the point where it intersects 5 markers, the holding time is .79 seconds.

(18) *Line 25* — Appendix 7 shows the percentage reduction in holding time predicated on the percent marker occupancy. 80% occupancy produces a 7% reduction in H.T.

(19) *Line 26* — A new call capacity may then be produced by dividing the marker load at 80% by the calculated holding time multiplied by 100.

(20) *Line 27* — This space can be annotated BH, or particular hours for which markers will be required.

(21) *Line 28* — Recorded here are the markers needed for the time frames shown on Line 27.

6.04.7 The Dial Administrator should monitor the load and service devices during these transitional periods to ensure that sender holding times are not increased to the point where dial tone service is affected.

6.05 Terminating Senders

6.05.1 Traffic Facilities Practices, Division D, Section 2-g may be used as a basis for determining Terminating Sender in-service requirements. The table contained in TFP, Division D, Sec. 2-k, Figure 7 will indicate the number required for traffic purposes.

6.05.2 Terminating Senders will be removed from service at the Terminating Trouble Indicator (T.T.I.) frame for circuit modification work, changes in sub-grouping arrangements, and additions to sender sub-groups.

6.05.3 Although no service reaction may be evidenced at the office in which the work is being done, a shortage of terminating senders may cause increased holding times of originating office equipment thereby degrading dial tone and completions at the originating end office.

6.05.4 Similarly, a shortage of terminating markers, to be discussed later, will create additional terminating sender holding time reducing capacity to originating offices.

6.05.5 The incoming busy hour may not be coincident with the originating busy hour. Studies should be conducted to determine terminating load and hour. Further, if different type senders are furnished (FS-RP-MF-"B"). Care must be taken to determine the "type-busy-hour".

6.06 Terminating Markers

6.06.1 Terminating Markers had been generally provided on the basis of terminating office busy hour calls and the number of Incoming Link Frames, Line Choices and Number Groups. A maximum of six or ten may be furnished depending upon the type of Terminating Marker Connector (TMC) frames.

6.06.2 Terminating Markers will be removed from service at the Terminating Trouble Indicator (TTI) frame when circuit modifications are formed or when there are additions to Incoming Link Frames, Line Link Frames, Number Groups and/or Line Choice Connectors.

6.06.3 The determination of in-service requirements should be predicated upon usage data obtained from the Traffic Usage Recorder (TUR). The requirements should be established and recorded for MOP purposes on a day-of-the-week and hour-of-the-day schedule. Although no service reaction can be directly attributed to Terminating Marker shortages, increased Terminating Sender holding time results which could adversely affect the trunking network and originating office outpulsing facilities.

6.06.4 The calculation of TM requirements during a transitional period should also take into consideration the sequence of the job, i.e., Incoming Link Frame addition with new working trunks should be programmed after the addition of new Terminating Markers.

6.06.5 For in-service requirement purposes a maximum of 80% occupancy (28.8 CCS) may be used during the hour for which work is scheduled. However, during the time frame, surveillance of Terminating Sender Group Busy Lamps is recommended to ensure that Terminating Sender queueing does not adversely affect incoming service.

6.06.6 It may be desirable to cancel certain test features of the TM (Continuity, False Ground, etc) to decrease the TM holding time.

6.06.7 The estimated CCS usage of the TM must consider the number of incoming trunks that are working or will be working as well as the other attendant components.

6.06.8 A sample calculation for a terminating office equipped for eight markers which will require marker turn-down is shown in the following:

Time	Estimated TM Usage	*CCS per* TM	% Occupancy	CCS/MKR @80% Occ.	TM Required	Planned %OCC.
BH (10:30A 11:30A)	191	23.9	66.5	28.8	6.6(7)	76
SIDE (9:30A 10:30A)	162	20.3	56.3	28.8	5.6(6)	75

6.06.9 The assumption that may be drawn from the preceding example is that during the terminating office busy hour a total of seven markers are required for traffic purposes and that six are needed for a side hour period. Consultation with Plant for maintenance needs should take place; if an additional maintenance marker is required this need should be so stated.

6.06.10 It is recommended that after tests have been completed on the turned-down marker that a suitable time interval be observed after restoral to service and before removing another.

6.07 Zone Registration Circuits

6.07.1 In some offices with message registration of multi-unit calls, zone registration circuits are provided for both individual and two-party message rate customers.

6.07.2 Although calls requiring these facilities will be completed as local calls if insufficient equipment is available, loss of revenue will result.

6.07.3 Zone Registration circuits will be associated with district junctors under control

of the originating marker. Each district junctor will have access to 10 zone registrations either on a direct or graded multiple basis. If requirements for zone registration exceed 10, the multiple wiring at the zone switches will be split to produce sufficient capacity. It is imperative, therefore, when adding zone registration circuits or when removing zone registration circuits from service on a temporary basis, that the Dial Administrator know the existing grade to assure adequate access.

6.07.4 Traffic Facilities Practices, Division D, Sec. 2-k Figure 9 may be used to determine in-service requirements predicated upon the number of circuits installed and the arrangement of the grade into individual and common circuits. Care must be taken to ensure that total CCS usage of message and two-party customers is considered for busy-hour total need and this should be incorporated into the MOP document.

6.07.5 Typical timing schedules are described in Traffic Facilities Practices, Division D, Section 2k, Figure 10.

6.08 Coin Supervisory Circuits

6.08.1 In offices serving coin-box customers, coin district junctors will be furnished according to coin CCS usage. These coin junctors will require coin supervisory circuits for collecting and returning coins, for overtime purposes and for routing calls to operator or announcement for overtime periods.

6.08.2 The number of coin supervisory circuits required is predicated on the Coin busy hour CCS usage. Traffic Facilities Practices, Division D, Section 2k, Figure 2 indicates the number of circuits required and describes the holding times where TUR data is not available.

6.08.3 Unlike zone registration circuits, described in paragraph 6.07, a shortage of coin supervisory circuits reduce the availability of coin district junctors which may cause dial tone delays and affect coin box operation rendering the station inoperative.

6.08.4 Coin supervisory alarm circuits are located in the equipment terminal room to indicate to Plant personnel when this condition exists. If caused by equipment outages due to transition, every effort must be made to restore facilities to service. Weather, time frames, or other unique community characteristics must be considered when citing in-service requirements for MOP purposes.

6.09 Auxiliary Senders

6.09.1 Auxiliary Senders will be removed from service if additions to the group necessitates rearrangement at the Auxiliary Sender Link Frame. The determination of in-service requirements are based on busy hour Auxiliary Sender load read into Poisson Table 10 (Traffic Facilities Practices, Division D, Section 1-e).

6.09.2 Where TUR data are not available, calls registered on seven-digit and ten-digit peg counts may be used with holding times, as shown, for the development of CCS.

Type of Call	*Holding Time (Seconds)*
7-Digit	3.8
8-Digit	5.3
10-Digit	8.9

6.09.3 Shortages of Auxiliary Senders may result in increased holding times of subscriber senders causing dial tone delays. No Overflow or All Circuit Busy registers are furnished for Dial Administrative analysis. Visual lamp signals are provided in the maintenance center, these should be monitored during transitional periods to ensure adequate facilities are available.

6.10 Automatic Number Identification (ANI)

6.10.1 Description of operation and facilities involved for Automatic Number Identification (ANI) are contained in Traffic Facilities Practices, Division D, Section 2-n.

6.10.2 After initial installation of ANI facilities, additions to the system will be required when Number Network Frames will be provided based upon Directory Numbers. Additional trunk equipment may also be added when estimates indicate increased need. These additions will not necessitate special transitional work.

6.11 Record of Equipment Outages

6.11.1 Pursuant to BSP Section 201-114-001, Plant will complete Forms E-4255 (Trunk Outage) and E-4256 (Equipment Outage). These outages may be reconciled with determined in-service requirements for modification of need.

7. SERVICE MEASUREMENTS

7.01 General

7.01.1 There are several service measurements which must be monitored by the Dial Administrator during and immediately after any transition work. The devices which produce service data must be kept in an operative mode during periods of WECO activity. These include:

(1) Speed of Dial Tone Machine

(2) Various Peg Count Registers

(a) Originating and Terminating Markers

(b) Line Link Originating and Terminating

(c) District Junctor (MR & CN)

(d) Auxiliary Sender (By type register)

(e) Incoming Link Frame

(3) Incoming First Failure To Match (IFFM)

7.01.2 Various link frame and trunk group overflow registers will permit the calculation, with the appropriate peg count registers, of percentage of calls which may be considered as ineffective attempts or overflow.

7.01.3 When registers are mounted under camera and development time may preclude rapid assessment of service, the Dial Administrator should arrange for manual readings. This may require preparation of forms and training of clerical personnel before the beginning of the transitional phase.

7.02 Speed of Dial Tone Machine

7.02.1 One of the major elements of service measurements is the percentage of dial tone delay over three seconds which is obtained from the automatic speed of dial tone machine.

7.02.2 These data, accumulated hourly, will indicate to the Dial Administrator that facilities are available at the various line link frame locations at which test terminations are placed.

7.02.3 When new line link frames are placed in service, the Dial Administrator should ensure that test line equipments are placed on the newly added frames. For partial Touch-Tone, test lines for rotary dial and Touch-Tone Horizontal Groups should be connected to separate arcs.

7.03 Peg Count and Other Registers

7.03.1 Cross-connection lists for all new facilities provided should be prepared before the equipments are placed into operation. Dates for transmittal to the Plant and/or WECO should be contained in the MOP General Notes or General MOP section.

7.03.2 Program Timer and other non-TUR register wiring should also be coordinated so that all data can be obtained for load-service evaluation.

8. LOAD MEASUREMENTS

8.01 General

8.01.1 In addition to the various traffic (Peg Count) and Service measurements previously discussed, there are other devices which permit the registration of usage on various No. 1 Crossbar components.

8.01.2 Although there are several devices that can produce usage data, e.g., Esterline-Angus Recorders, Alston Scanners, Call Second Recorders, etc., the principal measurement tool is the Traffic Usage Recorder (TUR).

8.01.3 The TUR, together with certain peg counts, produces the necessary ratios and data for load-balance and load-service relationships.

8.01.4 It is imperative that the TUR remain in service during periods of transition and that the new switching components are added when they become operational. Care should be taken that the MOP contain instructions so that sequence of WECO work will permit TUR availability.

8.02 Peg Counts

8.02.1 There are various peg count registers which may be used for the calculation or indication of load. They include, in part:

(a) Office Link Frame Seizures Registers

(b) Terminating Marker Total and Sample Channel PC

(c) Number Group Peg Count

(d) Line Controller Traffic Delay Peg Count

(e) Terminating Attempts to Busy Lines (PCB)

8.03 Usage

8.03.1 Usage measurement from the TUR in units of CCS or tenths of CCS (frequent scanning used with short holding time equipment components).

8.03.2 Most equipment components in the No. 1 Crossbar System are compatible with TUR detection. Insofar as possible measurements should be obtained for administration and engineering purposes on all facilities, particularly during WECO activity.

8.03.3 During transitional periods, the gathering of usage data should be on an hourly basis and reconciled with service results to ensure any equipment outages, changes in junctor patterns, or modification of equipment arrangement does not tend to adversely affect dial service or completion.

8.03.4 It is essential that all load data be validated for reliability and consistency. Any questionable data should be investigated and causes determined and corrected.

8.04 Other Load Indicators

8.04.1 As discussed in paragraph 7.01.2 certain overflow registers will indicate that attempts have failed to complete. These include trunk group, Line Link, District Link, Office Link, and Incoming Link Frames Overflow.

8.04.2 The calculation of percentage Originating Matching Loss (% OML) and percentage IFFM and percentage IML on an hourly basis and reconciled against CCS load, where applicable, is a responsibility of the Dial Administrator.

8.04.3 Load registers which score on a timed basis when a pre-determined number of facilities may also be available for study.

9. REFERENCES

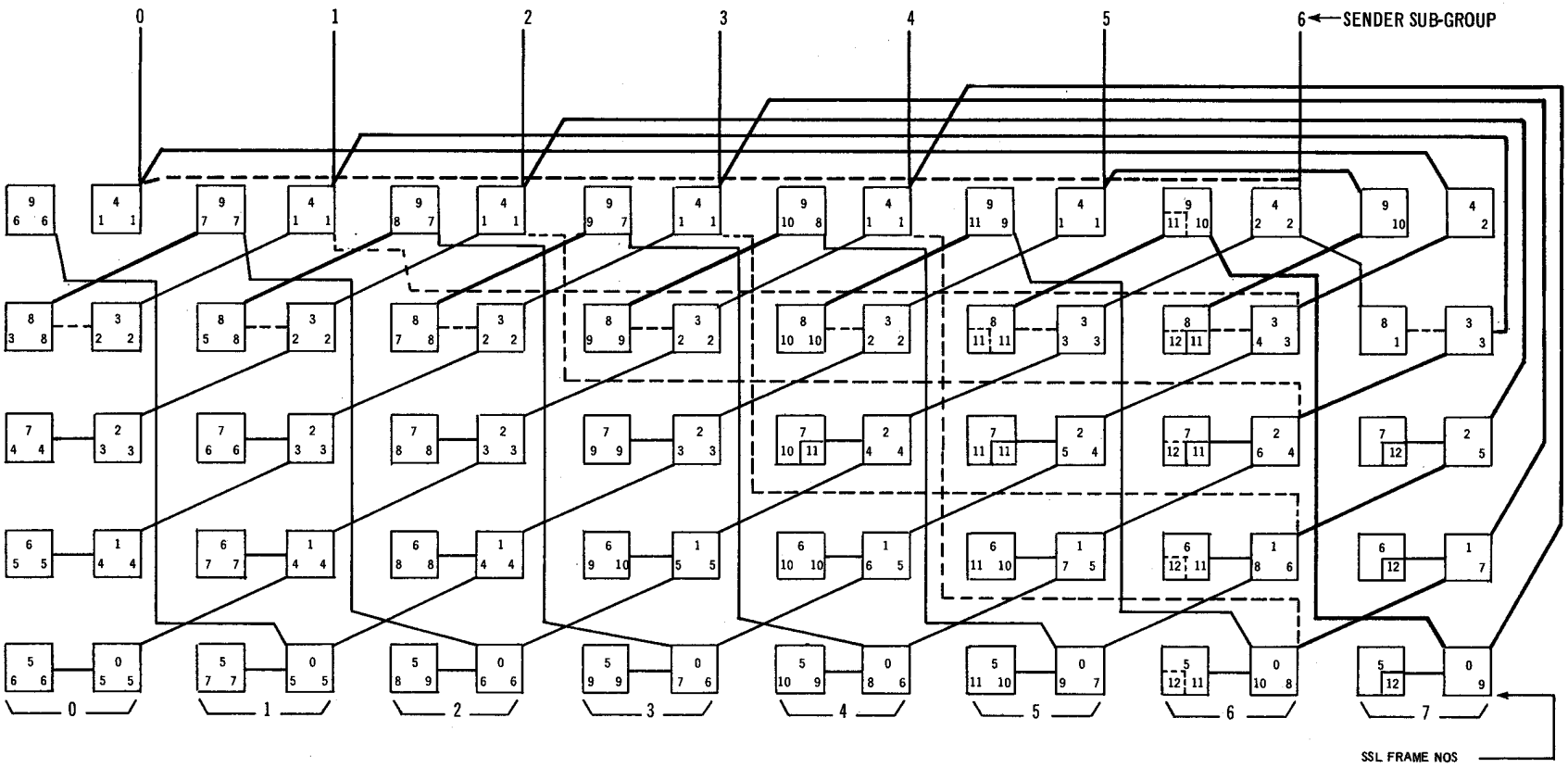
9.01 Sources

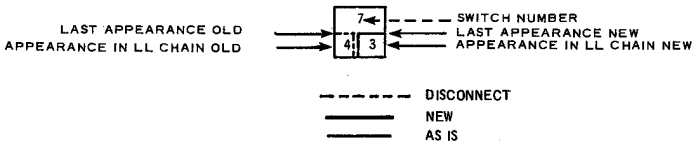
9.01.1 Reference should be made to other written Traffic Practices including other sections of the Dial Facilities Management Practices (DFMP), Traffic Facilities Practices (TFP), Bell System Practices (BSP), Western Electric Handbooks, etc.

9.01.2 Some of the sources may be found in the following listing:

Reference	*Subject*
DFMP, Div. H, Sec. 1b(8)	General-Administration — MOP
TFP, Div. D, Section 2-	No. 1 Crossbar
BSP, Section 800-614-150	Installation Requirements-General
BSP, Section 201-114-001	Record of Equipment Out-of-Service
WECO Handbook 40	Table of Contents for No. 1
WECO Handbook 3, Section SA	Crossbar Transition Procedures Method of Procedure

SDR MULT SEC SWS





TYPICAL COMPOSITE ARRANGEMENT OF OLD AND NEW
SENDER MULTIPLE AT SECONDARY SWITCHES
ON THE SL FRAMES

Attachment 2

IN-SERVICE REQUIREMENTS

CROSSBAR NO. 1 SENDERS						
1	BUILDING:		3	NO. SENDERS	5	NO. MARKERS
2	ENTITY:		4	TYPE: (PULSING)	6	NO. DISTRICT JUNCTORS
		HISTORICAL PERFORMANCE				
		OPERATION	HIGH DAY	10 HIGH DAY	AVERAGE BUSY SEASON	REMARKS
7	TOTAL USAGE					
8	MTCE USAGE					
9	TFFC USAGE	7 – 8				
10	MAXIMUM USAGE	3X36 CCS				
11	% OCCUPANCY	7÷10(X100)				
12	ORIG. PEG COUNT					
13	HOLDING TIME	9 ÷ 12				
14	CCS/SDR	7 ÷ 3				
15	TOTAL DJ CCS					
16	CCS PER DISTRICT JUNCTOR	15 ÷ 6				
17	% DTD > 3"					
			REQUIREMENTS – ABS –			
18	NO. INSTALLED	3				
19	CCS CAPACITY					
20	% BH LOAD OF CAPACITY	7 ÷ 19				
21	SENDERS REQ'D – TFFC.	9 ÷ 14				
22	10% – BH – CCS	7 ÷ 1.10				
23	SENDERS REQ'D – TFFC.	22 ÷ 14				
24	20% – BH – CCS	7 ÷ 1.20				
25	SENDERS REQ'D – TFFC.	24 ÷ 14				
26	30% – BH – CCS	7 ÷ 1.30				
27	SENDERS REQ'D – TFFC.	26 ÷ 14				
28	50% – BH – CCS	7 ÷ 1.50				
29	SENDERS REQ'D – TFFC.	28 ÷ 14				
30						
31	DIST. JUNCTOR REQMTS					
32	MARKER REQMTS					

IN-SERVICE REQUIREMENTS

CROSSBAR NO. 1 SENDERS						
1	BUILDING: MAIN ST.	3	NO. SENDERS 110	5	NO. MARKERS 5	
2	ENTITY: 226	4	TYPE: (PULSING) ROTARY	6	NO. DISTRICT JUNCTORS 1200	

		HISTORICAL PERFORMANCE				
		OPERATION	HIGH DAY #	10 HIGH DAY	AVERAGE BUSY SEASON @	REMARKS
7	TOTAL USAGE		3182	X	2508	@ JAN-FEB-APRIL
8	MTCE USAGE		72		96	
9	TFFC USAGE	7 – 8	3110		2412	
10	MAXIMUM USAGE	3X36 CCS	3960		3960	# SNOW STORM
11	% OCCUPANCY	7÷10(X100)	79		64	
12	ORIG. PEG COUNT		18241		15008	
13	HOLDING TIME	9 ÷ 12	17.5		16.7	
14	CCS/SDR	7 ÷ 3	28.8		22.8	
15	TOTAL DJ CCS		35568		31807	
16	CCS PER DISTRICT JUNCTOR	15 ÷ 6	29.6		26.5	
17	% DTD > 3"		5.1		1.5	
			REQUIREMENTS – ABS –			
18	NO. INSTALLED	3	110			
19	CCS CAPACITY		2376			
20	% BH LOAD OF CAPACITY	7 ÷ 19	106%			10 30A - 11 30A
21	SENDERS REQ'D – TFFC.	9 ÷ 14	110			
22	10% – BH – CCS	7 ÷ 1.10	2258			
23	SENDERS REQ'D – TFFC.	22 ÷ 14	99			9 30A - 10 30A
24	20% – BH – CCS	7 ÷ 1.20	2008			
25	SENDERS REQ'D – TFFC.	24 ÷ 14	92			1P - 2P
26	30% – BH – CCS	7 ÷ 1.30	1758			
27	SENDERS REQ'D – TFFC.	26 ÷ 14	78			3P - 4P
28	50% – BH – CCS	7 ÷ 1.50	1254			
29	SENDERS REQ'D – TFFC.	28 ÷ 14	50			
30						
31	DIST. JUNCTOR REQMTS		1180			
32	MARKER REQMTS		4*			* 5 for Hi Day

Attachment 3

Attachment 4

REQUIRED FOR SERVICE
COMMON CONTROL EQUIPMENT

Office: MAIN ST. 226
Equipment: OSS
No. Installed: 110

	MON		TUES		WED		THURS		FRI		SAT		SUN	
	TFC	PLT	TFC	PLT	TFC	PLT	TFC	PLT	TFC	PLT	TFC	PLT	TFC	PLT
8– 9 AM	50		50		50		50		50		50		50	
9–10	99		99		99		99		99		60		50	
10–11	110		110		110		110		110		60		50	
11–12	110/100		110/100		110/100		110/100		110/100		60		50	
12– 1 PM	90		90		90		90		90		60		50	
1– 2	92		92		92		92		100		60		50	
2– 3	90		90		90		90		100		60		50	
3– 4	80		80		80		80		100		60		50	
4– 5	80		80		80		80		90		60		50	
5– 6	80		80		80		80		70		50		50	
6– 7	80		80		80		80		60		50		50	
7– 8	60		60		60		60		50		50		50	
8– 9	50		50		50		50		50		50		50	
9–10	50		50		50		50		50		50		50	

Prepared By: JED
Date: 5-25-73

Attachment 5

No. 1
CROSSBAR
Marker In-Service Requirements

1.	Building:	4.	No. Route Relays:
2.	Office:	5.	No. of District Link Frames:
3.	Number of Markers Installed:	6.	No. of Office Link Frame Pairs:

Historical Data

		Operation	Calculation Results
7.	Total Marker Usage	From Data	
8.	Total Marker Peg Count	From Data	
9.	Usage per Marker	Line 7 ÷ Line 3	
10.	Peg Count per Marker	Line 8 ÷ Line 3	
11.	Holding time per Marker	Line 9x100 ÷ Line 10	
12.	TUR Adjustment	Add .05 Seconds	
13.	Adjusted Holding Time	Line 11 + Line 12	
14.	Adjusted Usage	Line 13 + Line 8 ÷ 100	
15.	Maximum Usage	Line 3x36 CCS	
16.	% Occupancy	Line 14 ÷ Line 15x100	
17.	Office Link Frame Seizures Ratio	From Data	
18.	Theoretical Holding Time	See Instruction	

Capacity Study

19.	No. of Markers Installed	Line 3			
20.	Markers Not Available	Hypothetical	(a) 0	(b) 1	(c) 2
21.	Traffic Markers	Line 19 – Line 20			
22.	80% Load	Line 21 x 28.8 CCS			
23.	Office Link Frame Seizures Ratio	Line 17 or NEW			
24.	Calculated Holding Time	@ 100% Occupancy			
25.	Holding Time @ 80% Occ.	Line 24 x .80			
26.	Marker BH Call Capacity	Line 22 ÷ Line 25 x 100			
27.	Time Frames	BH, Side Hours, Nights, etc.			
28.	No. of Markers Req'd				

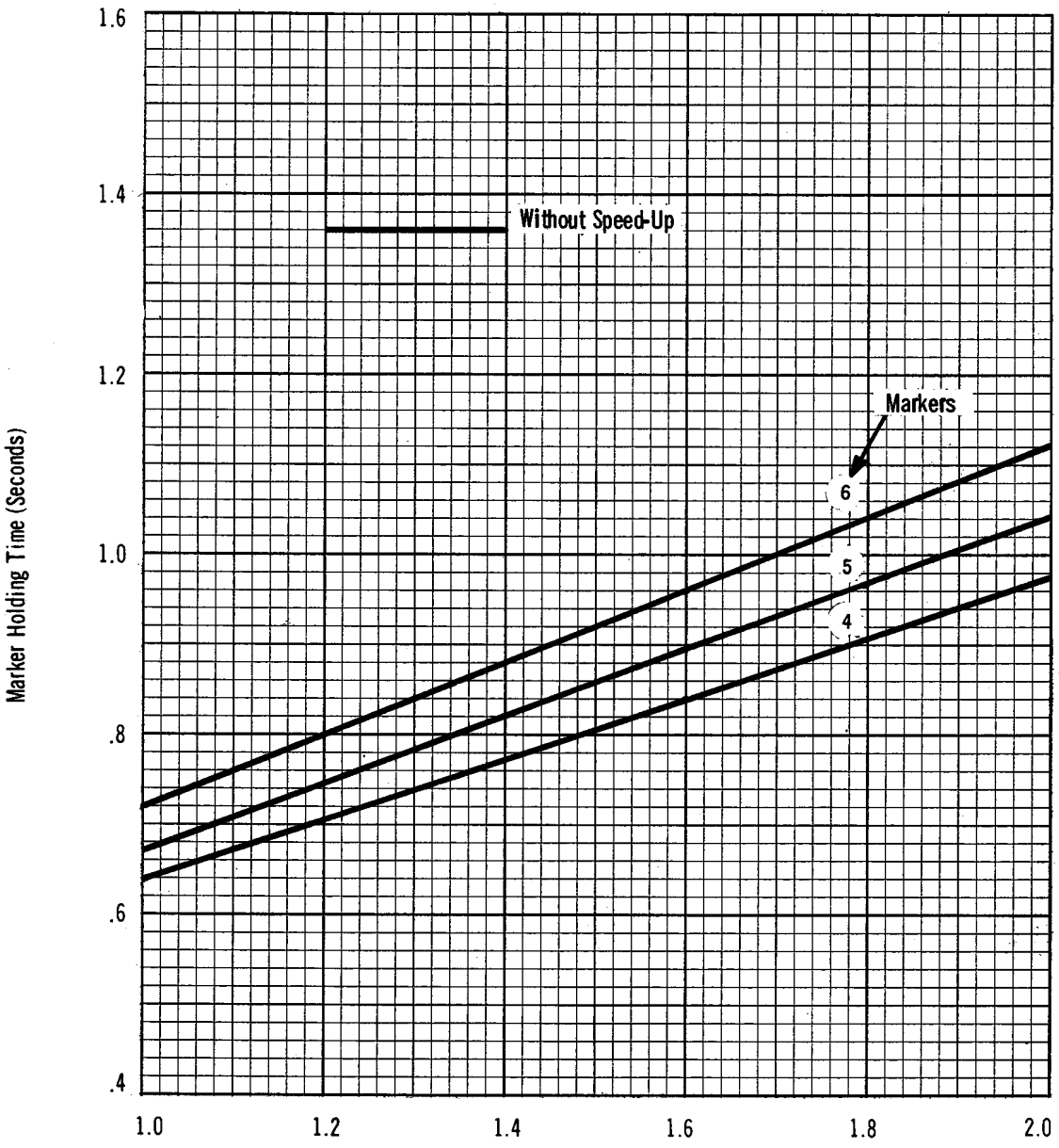
Notes:

Appendix 1

NO. 1 CROSSBAR

CALCULATED MARKER HOLDING TIME CHART
100% OCCUPANCY

DLF–OLFP
12-6

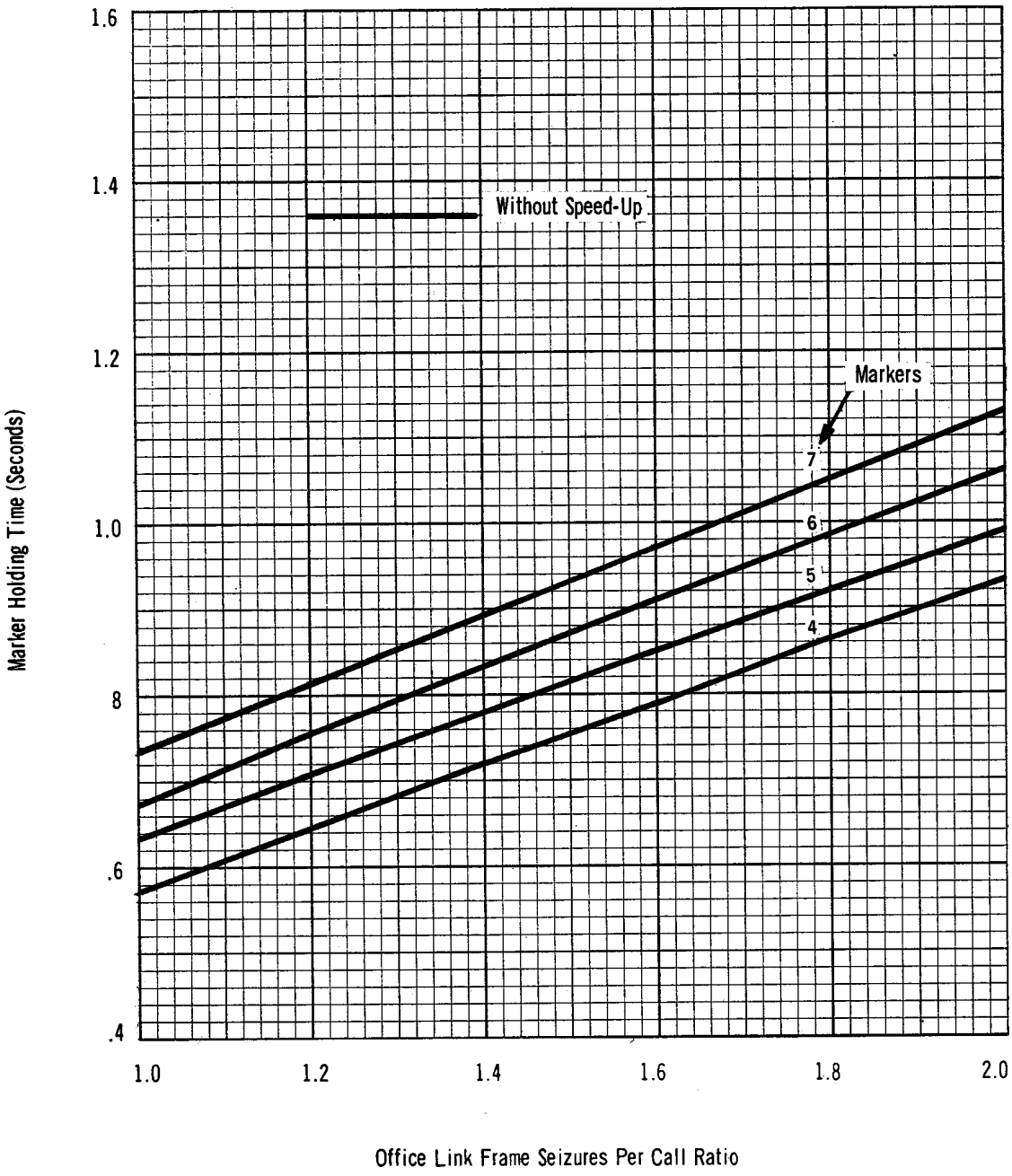


Appendix 2

NO. 1 CROSSBAR

CALCULATED MARKER HOLDING TIME CHART
100% OCCUPANCY

DLF–OLFP
14-7

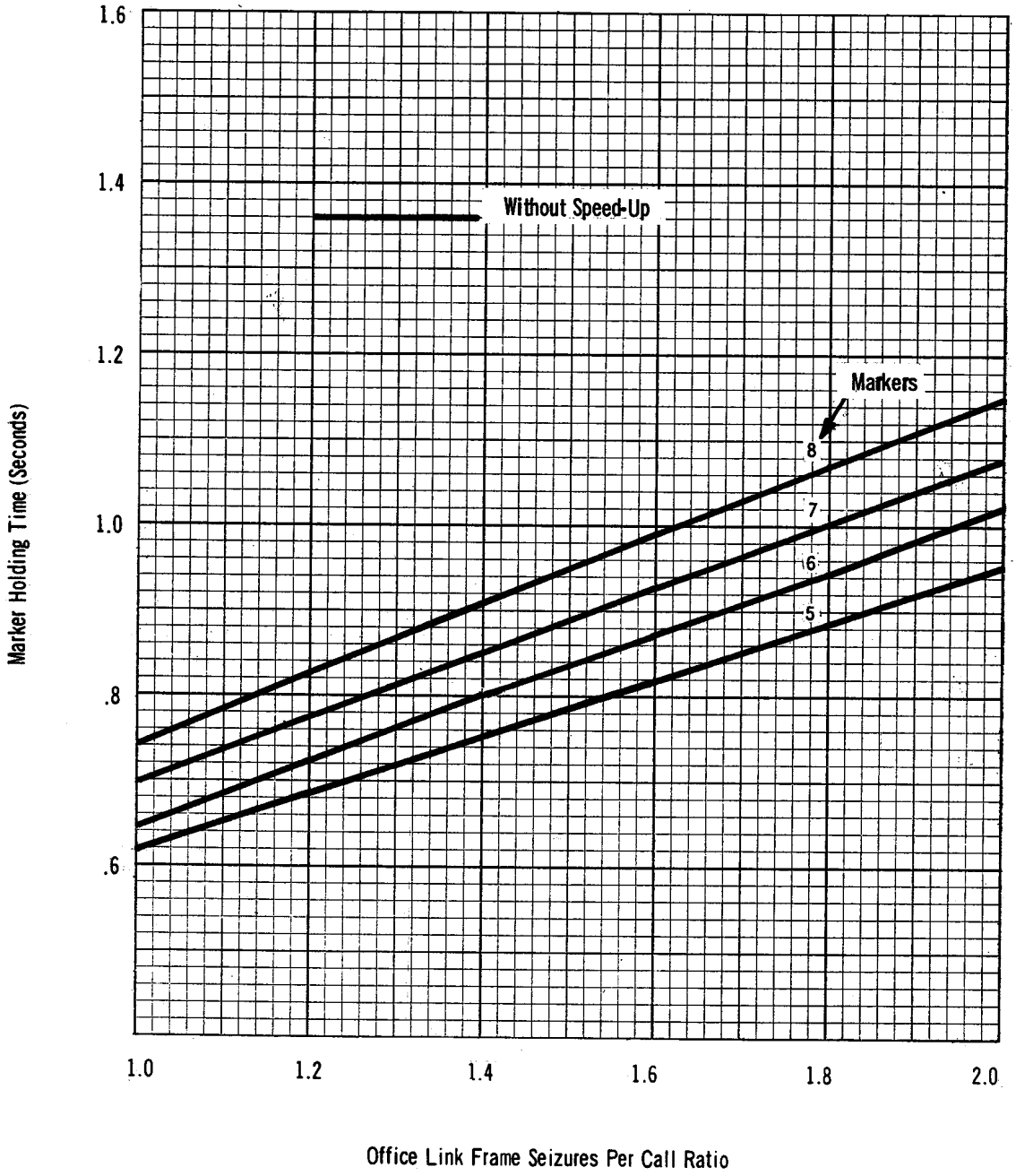


Appendix 3

NO. 1 CROSSBAR

CALCULATED MARKER HOLDING TIME CHART
100% OCCUPANCY

DLF-OLFP
16-8

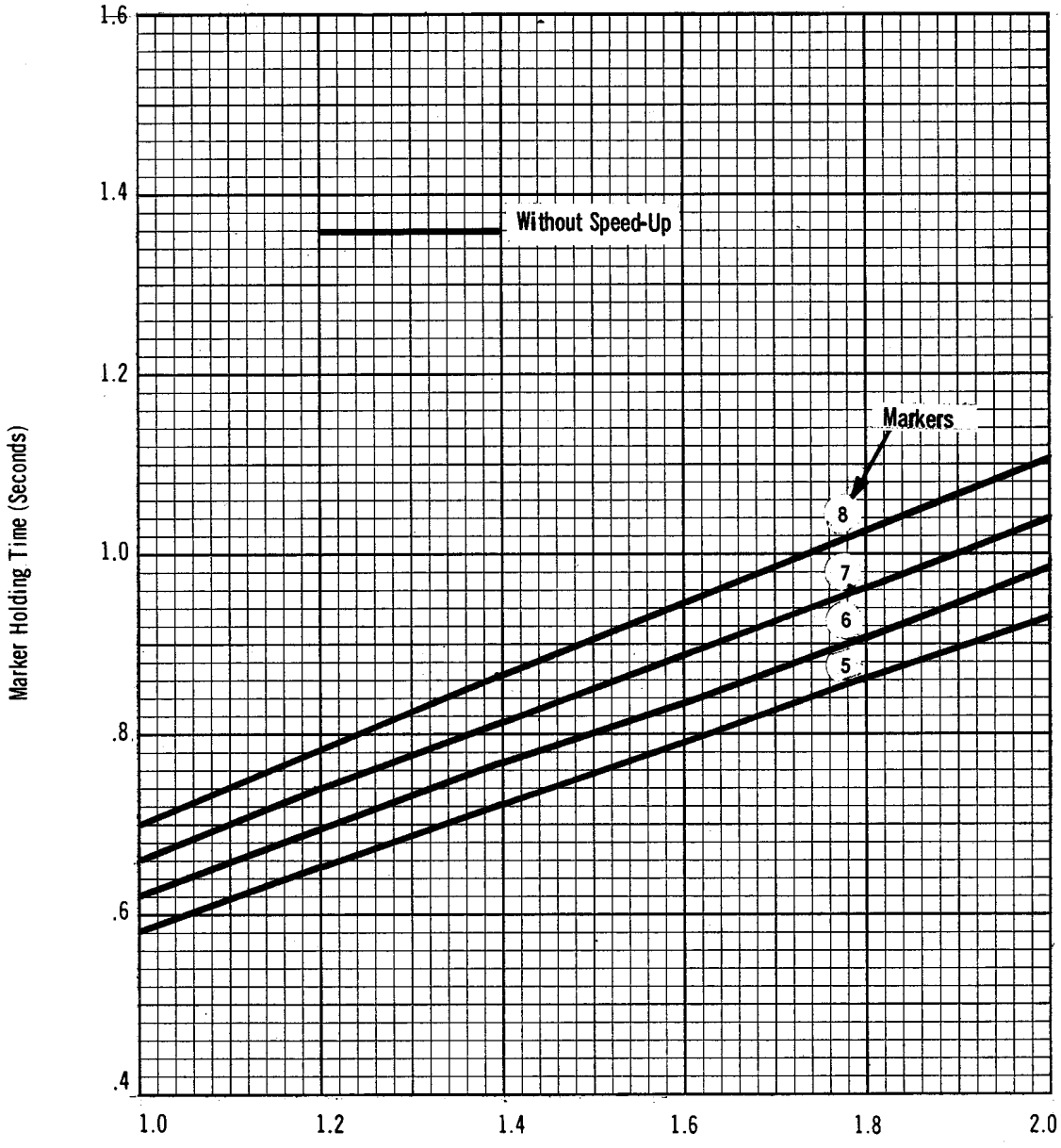


Appendix 4

NO. 1 CROSSBAR

CALCULATED MARKER HOLDING TIME CHART
100% OCCUPANCY

DLF–OLFP
18-9

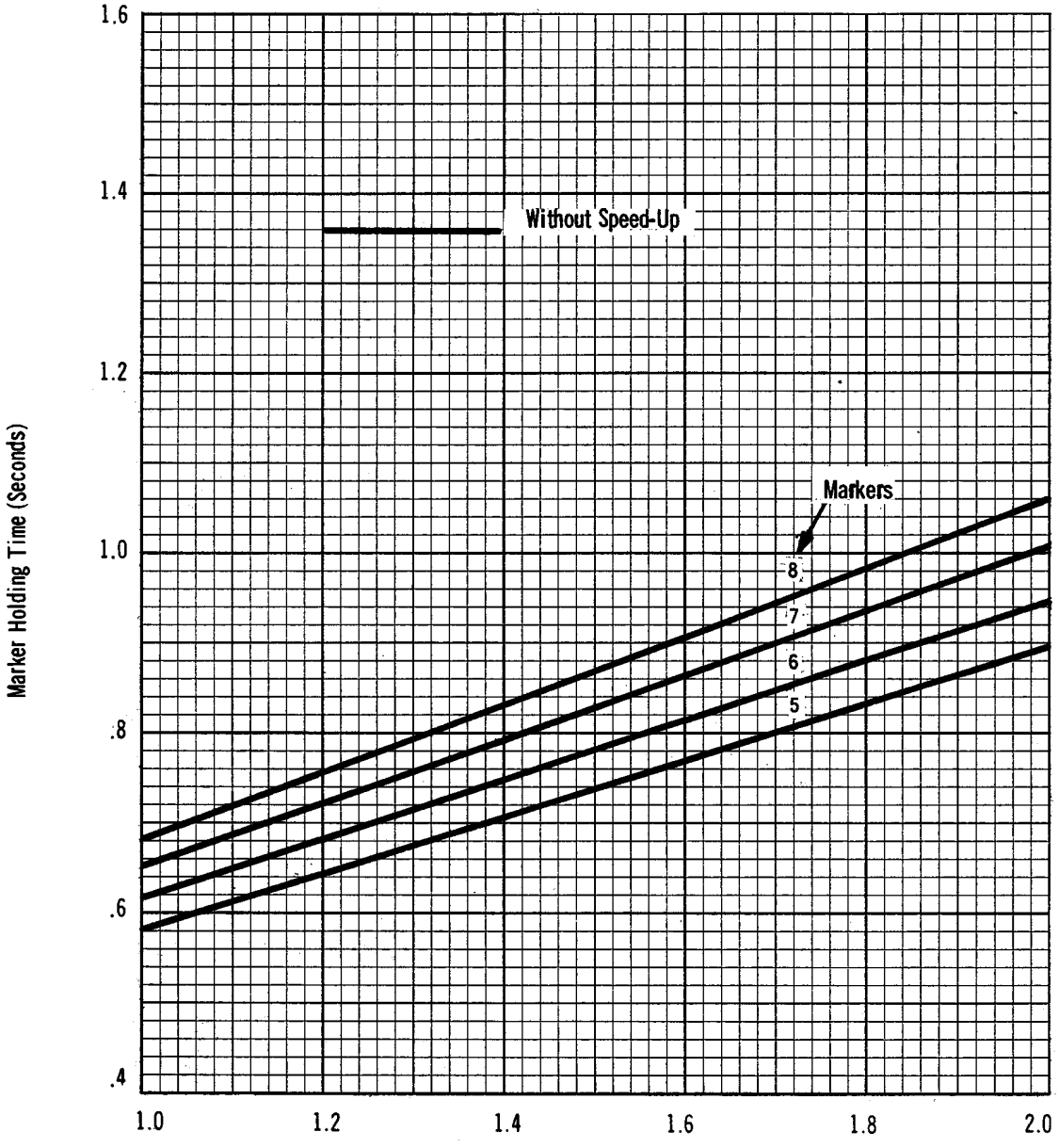


Appendix 5

NO. 1 CROSSBAR

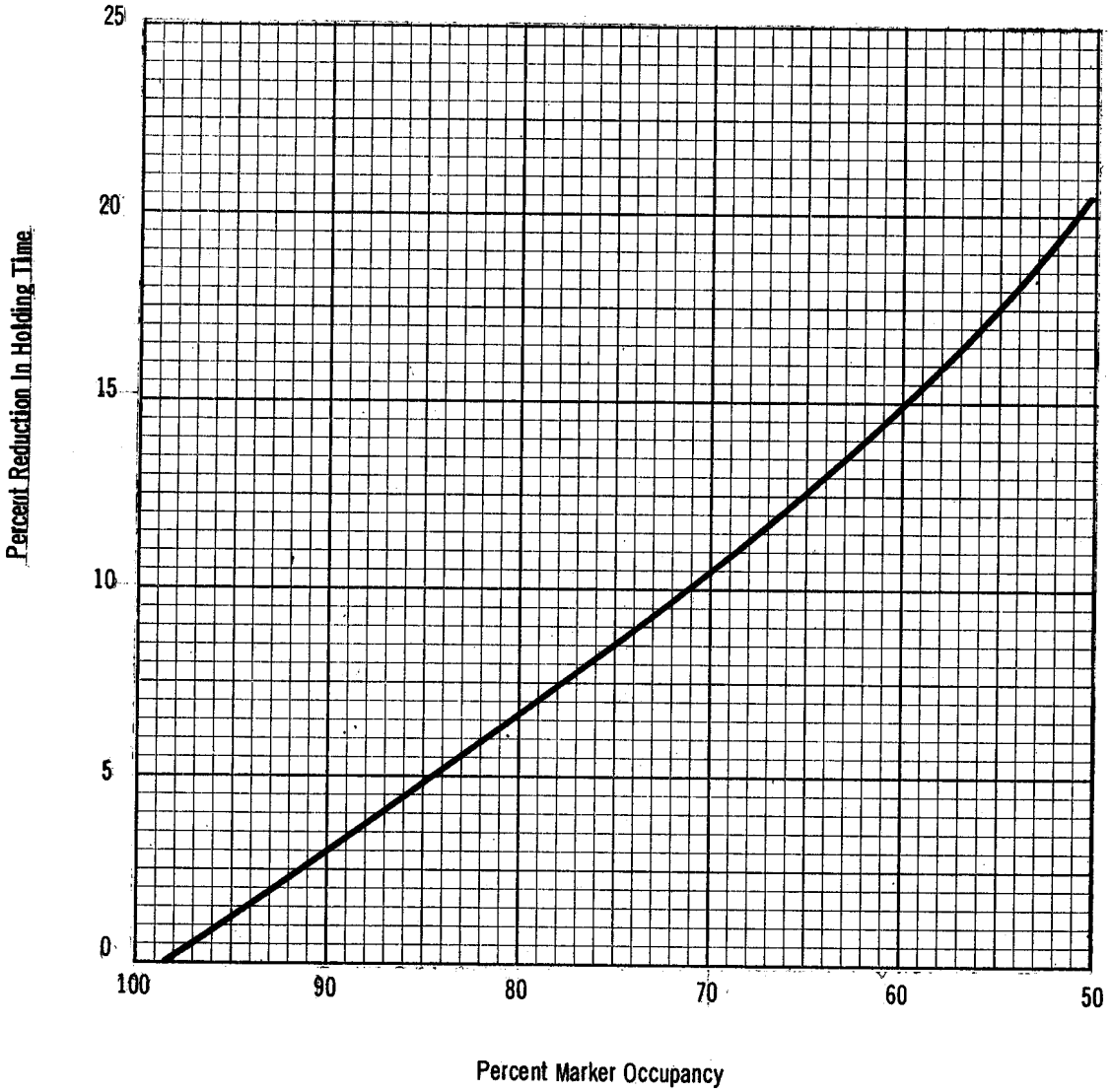
CALCULATED MARKER HOLDING TIME CHART
100% OCCUPANCY

DLF–OLFP
20-10



Appendix 6

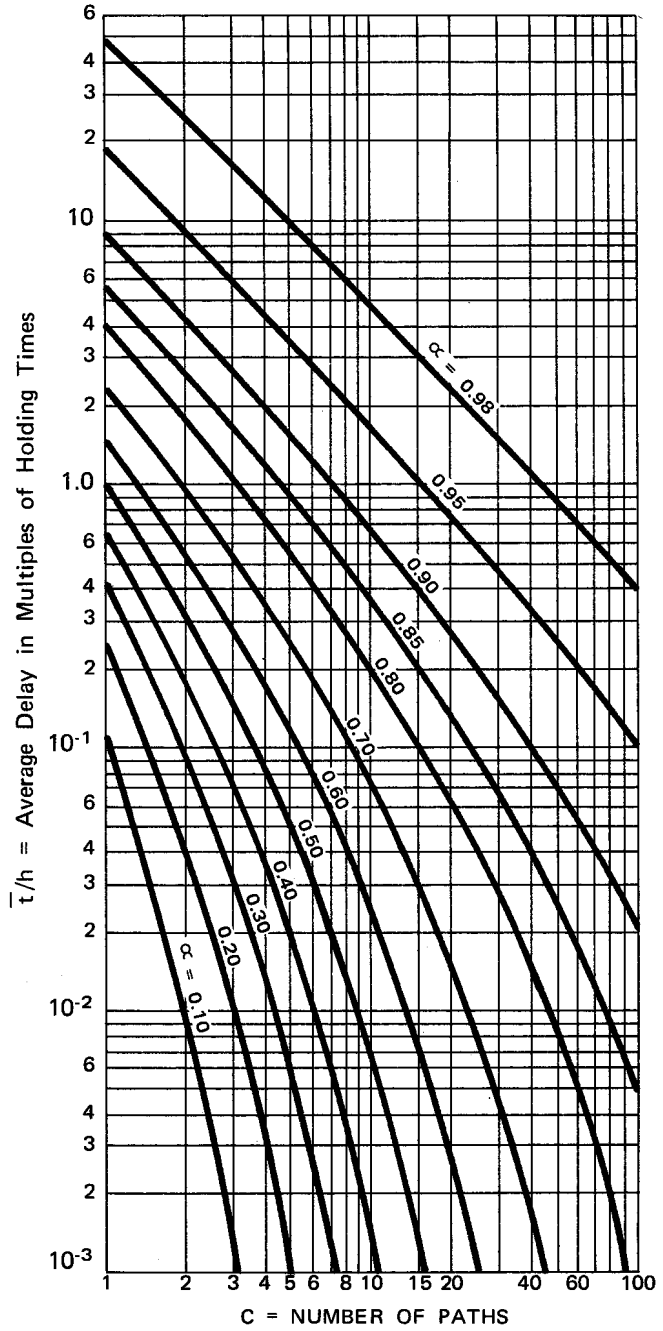
MARKER HOLDING TIME OCCUPANCY
NO. 1 CROSSBAR
ORIGINATING MARKERS



This Chart provides the approximate percent change in Marker Holdings, in relation to Change in occupancy for the following office sizes:

Mkrs	DLF	OLFP
8	20	10
7	18	9
6	16	8
5	14	7
4	10	5
3	6	3

Appendix 7



Average delay on all calls, exponential holding times.

$\bar{t}$ = Average Delay

h = Marker Holding Time

c = No. of Markers

α = Occupancy