NETWORK DESIGN ORDER PREPARATION
NO. 5 CROSSBAR

CONTENTS

EXHIBITS

1. GENERAL

1.01 This section covers the preparation of a Network Design order for local No. 5 Crossbar equipment. It specifies a uniform format that shall be used for all local No. 5 Crossbar Network Design orders.

1.02 This section is reissued to update text, forms and exhibits.

1.03 Network Design order preparation requires a knowledge of how telephone switching equipment functions and full understanding of basic trunking principles. This BSP does not attempt to cover these two items, but assumes that the person preparing the order has equipped theirself with this knowledge.

1.04 The fundamentals of Network Design as applied to local No. 5 Crossbar central office equipment are covered in Bell System Practices 218-060-XXX. The following practices should also be referred to for additional information:

BSP 819-XXX-XXX No. 5 Crossbar Switching System

BSP 958-XXX-XXX General Descriptive Information

1.05 General considerations and company policies that apply to Network Design order preparation are contained herein.

1.06 The considerations involved in preparing a Network Design order may cover all departments and the Western Electric Company. It is important that Network Design order preparation be carefully done. This involves:

(a) A full sense of proprietorship.

(b) A full understanding of company policy as related to quality of service and objective balance between service and cost.

(c) A full knowledge of Network Design operations.

(d) A full knowledge of equipment operation.

(e) A full degree of cooperation and understanding between departments.

1.07 The art of Network Design order preparation is not an exercise in mathematics. There will be occasions when the mathematical computations will give a solution to a problem, and judgment may not be required. However, the mathematical computations involved in preparing a Network Design order are simply one of the tools that the network designer uses in applying judgment, and there is no substitute for intelligent judgment. The major decision made by the network designer are in the basic data section, and a Network Design order can be no better than the judgment applied here. Central office equipment cannot rectify a poor judgement decision made in the basic data section.

2. FURTHER ASSUMPTIONS

2.01 This section assumes that the need for a job has been determined by standard company policy and practices and that it has been scheduled per the routine prescribed by Joint Practice No. 80. It is also assumed that a job is included in the current construction budget and that equipment is allocated for it.

3. SIZE OF JOB

3.01 Joint Practice No. 80, Section II, Part 1, Development of an Exchange Central Office Relief Job, specifies that a line and terminal relief job shall be originated by the engineering manager-planning.

This person shall determine the preliminary size of job, service desired date and current schedule dates. The network designer shall verify job size and desired date prior to issuance of the Network Design order.

3.02 These schedules and job sizes should be followed closely by the network designer. The designer should consult the engineering manager regarding changes in job size or other factors affecting the job.

3.03 Every effort shall be made to limit the number of projects in a given wire center to a minimum, with no more than one project in any 12 month period. Toll terminal installations, intertoll dial switching relief and switchboard jobs should be coordinated insofar as possible in order that they may be scheduled at the same time as the central office local equipment relief job. If local and toll relief jobs are scheduled together, close attention must be given to the effect on both local and toll service before schedule changes are made.

3.04 An engineering period is the interval of time between the planned "in service" date of an equipment addition and the date when the addition is estimated to exhaust. These engineering periods or engineering intervals are established so that each equipment installation will produce the best economic balance between the present worth of carrying charges on spare equipment and the cost of engineering, manufacturing and installing of the equipment involved.

3.05 Following is a table of normal engineering intervals which should be used as a starting point of the design of growth jobs for local dial equipment:

Table of Normal Engineering Interval (Period) in Years

Wire Center Main + Equiv. Main Telephone Growth per year	No. 5 X-Bar
Up to 150	3.0
151 to 500	2.0
501 or more	2.0

The final engineering interval should be based on a judgment decision considering costs of the various types of equipment, reuse, installation costs, particularly for multiple "re-entry" cost as well as carrying charges for spare equipment. This should be an interdepartmental decision involving Network Design, Equipment Engineering and Planning Engineering personnel. In order to ensure that (1) adequate capital and material is available to support the job and (2) the proposed interval is consistent with overall section or company objectives, the Engineering Planning organization should concur in the proposed job interval before work is begun on the appropriate Network Design order.

3.06 The principle of switching component harmony should be considered in sizing a job. Office equipment quantities should be carefully analyzed to determine if a small amount of equipment can be added or deleted to shorten or lengthen a job to a more economical interval. Special care should be used to insure that office exhaust which is based on a switching exhaust (caused by a common control component) would not be more economical by adding or deleting one component which has caused the exhaust. As an example, if originating registers are controlling and, by adding only one additional originating register, the exhaust date will be lengthened by four months, it

would normally be more economical to lengthen the interval by adding the originating register. (This assumes that there is no other addition necessary to lengthen the interval or that the other additions are minor enough to still make the longer interval economical.) Conversely, if the originating register provision breaks over into an additional originating register frame by only one register, consideration should be given to reducing the provision and shortening the engineering interval.

NOTE: The mechanized COEES programs will assist in these determinations.

3.07 When the economical engineering interval has been determined, care should be taken to provide the necessary trunk equipment and all other equipment needed for that point in time. Central office relief projects shall be scheduled to complete one month prior to the exhaust date of the existing equipment unless this occurs during the busy season when maximum switching capacity is required. In this event, jobs should be scheduled to complete one month in advance of the busy season.

4. THE NETWORK DESIGN ORDER

4.01 A Network Design order serves two basic purposes:

(a) It is a requisition for changes in the amounts of and/or arrangements of telephone switching equipment.

(b) It is the basic record of switching equipment and arrangements for Network Administration.

4.02 The Network Design order is made up of two main components:

(a) The basic data section.

(b) The specification section.

4.03 The basic data section of a Network Design order contains the historical data, future estimates, computations, and Network Design engineering judgment that determine the basic configuration of the switching equipment. It also quotes the authorities and policies that may be needed for authorizations. Other information that may be required for Network Design's use alone shall be included here also.

4.04 The specification section of a Network Design order covers the detailed equipment quantities and arrangements for those components which are the responsibilitiy of the Network Design organization. The specification part of a Network Design order should always follow the standard Western Electric Company questionnaire.

4.05 There shall be six basic types of Network Design orders. They are as follows:

4.051 Complete Order

A complete Network Design order is composed of all the pages that go to make up both the basic data section and the specification section. Whenever feasible, the network designer should issue a complete order in preference to other types. A complete order insures a current look at all phases of the office. They are easier for the equipment engineer to work from and insure that essential details of the office will not be overlooked. They are also much simpler for the network administrator to use and maintain.

4.052 Capacity Order

A capacity order is a short order issued to reflect a change in talking channel capacity, switching equipment capacity, termination capacity or exhaust dates of an office due to increased (decreased) terminal requirements (M+EMT forecast change), busy season change for a forecasted usage value, etc. The need for this type order will often occur when actual usage data indicates that the forecasted usage data, upon which the current equipment is designed, no longer appears appropriate.

A capacity order is issued only on completed Network Design orders. An office growth chart will always be attached to the face sheet. Additional data and calculation forms to support the capacity change should be included in the order.

4.053 Partial Order

Partial orders are issued for relatively minor changes or additions to an office when there is no Network Design order outstanding. They are never used when the job will change the face sheet capacity or exhaust dates of the office. A partial Network Design order is composed of only the particular pages of a previous complete order that are added or changed. It is important to note that all pages relating to the change caused by the partial order must be included. The reissued pages of a partial order should be numbered the same as the previous complete order. Added pages would be numbered with a letter suffix; e.g., page 7A. The pages that are reissued are to be shown on the face sheet of the order. The next complete order would incorporate all of these changes made by any partial order issued since the last complete order. A complete order should be issued at least every 18 months to incorporate all partial orders. A partial order should not be issued following another partial order if a complete order has not been issued within the last 18 months. As a general guideline, if more than 25% of the pages of the complete order will be reissued in the partial order, a complete order should be issued rather than a partial order.

4.054 Supplement Order

A supplement order is issued to an outstanding complete or partial order to make corrections, changes and/or minor additions. They shall have the same order number as the complete or partial order they are supplementing. The pages that are reissued shall be listed on the face sheet. A supplement order is also used to cancel an order.

A supplement shall be used to change talking channel capacity, switching equipment capacity, termination capacity or exhaust dates of an office due to increased (decreased) terminal requirements (M+EMT forecast change), busy season change for a forecasted usage value etc., on Network Design orders that have not been completed.

4.055 Revised Order

A revised order is a complete reissue of a complete or partial order when the changes to an open order are so extensive that it is necessary to reissue a complete order for record purposes.

4.056 Annual Order

An annual order is a short order issued annually on nongrowth entities only to update forecast of usage values, and forecast of lines and main plus equivalent main telephones. An office growth chart and forecast of lines and equivalent main telephones will always be attached to the face sheet. An annual order is not used if the CCS/M+EMT trend has changed as a result of current usage. In such a case, a capacity order must be used.

4.06 All complete, partial, capacity and annual Network Design orders shall be numbered serially with a "year-alpha-numeric" code. The "year" shall be the calendar year in which the order is signed out by the approving Network Design authority. The "alpha" shall designate the division involved. The "numerical" shall begin with 1 for each "year." In addition, a suffix "alpha" code shall be used to designate an order other than a complete order.

The alpha suffix shall be used as follows:

P - designates a partial order

S-1, S-2, etc. - designates a supplement and number of supplement

R - designates a revised order

4.07 The heading of a Network Design order should always contain the title, the common language location identification code, the ready for service date, required for service date and the job record sheet number.

4.071 The title of a Network Design order should always contain the following items if it is not local switching equipment:

Name of town and State
Name of the central office
Type of switching equipment
A short descriptive title

Examples are:

ANYTOWN, MO - CApital, 222 #5XB, add 490 lines, 1000 numbers.

SOMEWHERE, KS - CHestnut, 247 #5XB, add 980 lines, 3000 numbers.

4.072 The Common Language Location Identification (CLLI) code is an 11-character mnemonic code that uniquely identifies a specific location switching equipment, as follows:

City - 4 characters
State - 2 characters
Building - 2 characters
Entity - 3 characters

Examples: B L T N M O D I 3 4 1
CITY ST BLDG ENTITY

BELLTOWN, MO - Diamond - 341

Refer to BSP Section 795-000-000 index listing for the BSP, for individual states CLLI codes if one has been established for the switching entity. If one has not been established, contact the CLLI coordinator in the Engineering organization.

4.073 Ready For Service Date is the date the overall job is expected to be ready for service. This date should be obtained from the current service date of the Job Record Sheet.

4.074 Required For Service Date is the date the limiting capacity will exhaust and a job is required to be in service to meet customer needs. This is the service desired date on the Job Record Sheet.

4.075 Job Record Sheet is the assigned number for the specific central office equipment job.

4.076 Growth or Nongrowth mark through the one that does not apply.

Growth entities are those scheduled for periodic additions or removals of lines, numbers, etc.

Nongrowth entities are those where there are no planned equipment additions to either retain, increase or decrease most limiting main plus equivalent main telephone capacity in that entity.

4.077 Commercial Forecast Dated is the date of the Wire Center Area Forecast used to prepare the Network Design order. In addition, the date the forecast was validated should be entered (within 60 days of the Network Design order date).

4.078 TRK Forecast Dated is the date of the Intertoll or Interoffice Trunk Forecast used to prepare the Network Design order. Also, the date this forecast was validated should be entered (within 60 days of the Network Design order date).

5. NETWORK DESIGN ORDER PREPARATION - POLICIES

5.01 The general practices and policies that apply to Network Design order preparation are contained in the Bell System Practices (BSP). These practices also cover many of the detailed applications of these policies. There are, however, questions of policy that apply to Network Design order preparation that are not directly related to the BSP. There are also many interpretations of policies and practices which are unique to the Southwestern Bell Company. The purpose of this section is to cover the specific policies and practices that apply to Network Design order preparation in Southwestern Bell Telephone Company sections. If there are conflicts between this BSP-SW and standard BSPs, the information contained in this BSP-SW shall be controlling.

5.02 No effort has been made to reproduce here the many instructions, practices, Network Design letters, etc., that relate to Network Design engineering. This BSP-SW includes, however, the policies covering Network Design order preparation that were previously set forth in policy letters and memoranda. This section of the BSP-SW replaces and supersedes any such policy letters memoranda insofar as Network Design engineering policies are concerned.

5.03 It is essential that the office call carrying capacity (main telephone plus equivalent main telephones switching capacity) be fully utilized since it represents the major part of the switching machine investment. The following tabulation shows the relative costs for line terminations, call carrying capacity and terminals.

% Distribution of Dial Equipment Costs

	Lines	Call Carrying Capacity	(Numbers) Terminals
Composite - All Systems	20	70	10
No. 5 Crossbar	22	75	3

A thorough understanding of these cost relationships is helpful in making decisions regarding line termination, terminal termination and main telephone plus equivalent main telephone switching capacities.

6. LINE AND TERMINAL PROVISION

6.01 Line Equipment - Line terminations will be engineered on the basis of 5% spare line relays for administration and test purposes. In offices requiring lines in excess of the normally provided administrative spare, empirical data should be compiled by Network Administration through regularly scheduled studies as outlined in BSP 780-200-014. "Line Utilization Monthly Work Sheet - Service Year" form should be furnished to Network Design annually.

6.02 In Crossbar offices, line link frames are always fully provided with line equipment varying in multiples of 50 (multiples of 100 with flat type relays). The

frames are provided on the basis of call carrying capacity being distributed uniformly over all frames. Frame sizes and the total number of equipped lines to be provided are determined from a study of frame sizes and number of frames required for the engineering period and for the future thus resulting in varying percentages of spare line relays.

6.03 Line equipment should be provided in sufficient quantity to service the demand forecast at the end of the engineering period plus the reserves outlined above.

6.04 A "line termination capacity" shall be computed in each office and shown on the Network Design order face sheet.

6.05 Terminal Equipment - A terminal or number termination capacity shall be established for each office and shown on the Network Design order face sheet. This capacity should not be controlling. Telephone number equipment as represented by numbers in Crossbar offices should be all such equipment installed minus that required for test, PBX trunk reserves, administrative purposes and those reserved for trunk terminations.

6.052 Authorized Aging (Intercepting) Intervals - Terminal reserve for intercepting, test, and administration should be based on the following intervals for retaining number changes and disconnects before reassignment:

Residence disconnect and change	3 month
Business disconnect and change	Period of directory

6.052 Terminal Reserve - The terminal reserve objectives shown in the table below should be used for engineering purposes. In offices requiring a terminal fill other than the objectives, actual data regarding disconnect and number change requirements, together with test terminal and administrative reserve requirements should be collected by the administrator and a "Terminal Utilization Monthly Work Sheet - Service Year" form should be furnished to Network Design annually.

	Single & Small Multi-Office	Large Multi-Office Area*
Business - Auxiliary - PBX. . .	65	60
Business - Auxiliary - Non-PBX.	65(1)	65
Business - Non-Auxiliary. . . .	93	90
Coin.	96	94
Rural	96	96
Special Terminals (2)	90	90
Centrex CO.	90	90
TWX	--(3)	--(3)
Other Line Switching.	--(3)	--(3)
Residence	95	94

NOTE 1 -- Residence terminals may be worked in these groups up to a total fill of 75%.

NOTE 2 -- Special Terminals - Night numbers, announcement system trunks, and call distributing system trunks in excess of the number of positions.

NOTE 3 -- Terminal requirements for these services depend on the type of service, type of AMA equipment, etc.

*With three or more wire centers and 50,000 installed terminals

7. OBJECTIVE SERVICE LEVELS

7.01 As stated in BSP 780-400-130, good Network Design engineering has as its objective the providing of facilities of the Right Kind in the Right Place at the Right Time and in the Right Amounts to give high quality telephone service to all customers while at the same time Minimizing Equipment Investment. In order to accomplish this objective, the network designer

must be familiar with and understand the following practices:

BSP	TITLE
780-400-103 (TFP Div. A, Sec. 1a)	Characteristics of Telephone Traffic
780-400-111 (TFP Div. A, Sec. 1b)	Frequency Distribution and Other Factors Affecting Network Design
780-400-140 (TFP Div. A, Sec. 1c)	Survey of Traffic Theories
780-400-120 (TFP Div. A, Sec. 1d)	Sampling and Reliability of Data
780-400-201 (TFP Div. D, Sec. 1a)	Engineering Service Objectives
780-400-211 (TFP Div. D, Sec. 1b)	Load Service Relationships
780-400-221 (TFP Div. D, Sec. 1c)	Dial Office Utilization
780-400-230 (TFP Div. D, Sec. 1d)	Basic Data
780-400-290 (TFP Div. D, Sec. 1g)	Poisson Capacity Tables

7.02 In order that the network designer may translate estimates of future traffic levels into quantities of facilities that will produce the desired grade of service, capacity tables for a wide range of service and quantities have been made available by the Bell Telephone Laboratories and are included in appropriate sections of the Bell System Practices. In Southwestern Bell Telephone Company, the following service criteria have been authorized:

Service Objectives - End of Engineering Period

Average Busy Season - Busy Hour	
Dial Tone Speed over 3 Seconds	- 1.5%
Originating Matching Loss	- 1.0%
Incoming Matching Loss	- 2.0%
Incoming First Failure to Match	- 2.3%
10-High Day	
Dial Tone Speed over 3 Seconds	- 8.0%
High Day	
Dial Tone Speed over 3 Seconds	- 20.0%

7.03 Definitions

Busy Hour - Busy Season

Complete busy hour definitions are found in BSP 780-400-230 (TFP Div. D, Sec. 1-d). Brief definitions are as follows:

Busy Seasons	- Three months, not necessarily consecutive, with the highest average busy hour CCS load per main station.
Busy Season-Busy Hour	- The time consistent hour having the highest average throughout the busy season.
10 High Day Busy Hour	- The time consistent hour with the greatest 10 high day average load.
High Day Busy Hour	- The day with the highest load in the 10 high day average.

7.04 The 10 high day data selected should represent traffic loads which regularly recur from year to year, not necessarily on the same date. Odd ball days, as defined in BSP 780-400-230, are excluded from 10 high day data. The 10 high day distribution should be consistent with the gamma distribution theory.

7.05 Main Telephone plus Equivalent Main Telephone - Switching Equipment Capacity - The switching equipment capacity of an entity is the maximum number of main telephone plus equivalent main telephones that can be served by the "switching equipment" of that entity without exceeding the originating and terminating service objectives for the ABS, 10 HD or HD busy hour in the busy season preceding the exhaust of the addition. Switching equipment is an inclusive term for the various components of central office equipment excepting lines and numbers. Common control equipment which has been provided for maintenance purposes is not to be included in the switching equipment capacity determination.

7.06 Since interoffice trunk engineering and administration is separate from individual wire center engineering, the capacity of a dial entity should not be limited by interoffice trunks. For this reason, up to 5% spare trunk equipment, both outgoing and incoming, should be provided over and above the estimated group busy hour requirements, for each trunk group type. Spare trunks provided should approach the actual administrative requirements at end of engineering period.

8. CENTRAL OFFICE EQUIPMENT ENGINEERING SYSTEM (COEES)

8.01 COEES is a time-share computer system used in designing central office dial equipment installations and additions. It is important to recognize that complete utilization of the system is dependent on an interdepartmental effort involving Network Design, Equipment Engineering and Planning Engineering personnel.

The intent of COEES is to reduce manual procedures, improve calculations speeds and insure consistency in the planning process. Specifically, the system will help network designers and planning engineers determine the following:

(a) How much equipment is required.

(b) The approximate cost of the equipment.

(c) What year the COE relief should be scheduled.

8.02 Although it is not mandatory to create a No. 5 COEES data base for each No. 5 Crossbar office, it is recommended that one be created for No. 5 Crossbar offices that will not be replaced in the near future.

9. FINAL ENGINEERING PERIOD FOR ELECTROMECHANICAL COE

9.01 Every effort should be made to conserve total dollars on the last electromechanical COE job prior to ESS replacement. The intent is to conserve total dollars and not merely transfer "C" dollars to "M" dollars.

9.02 The conservation of total dollars philosophy, as reflected in the following paragraphs, applies only to those offices falling into the "last electromechanical COE addition" category at the time of Network Design order preparation. This philosophy does not contemplate lower service level objectives for these offices nor does it contemplate a denial of essential requirements to perform the administration and maintenance functions. It does, however, contemplate full effort toward the maximum utilization of all capacities and limiting administration and maintenance requirements to only the essentials.

9.03 It is recognized that a bare bone approach to COE provision may result in service degradation in some individual offices if lines, terminals, or CCS/M+EMT exceed the forecasts. This approach may result in another electromechanical COE addition being required due to unforeseen circumstances. In fact, if this does not occur in some instances due to the magnitude of variables involved, the intended degree of conservation has not been achieved.

9.04 The following guidelines are only major areas that deserve special consideration and should not be viewed as all inclusive. There will be many different situations on each particular COE job that offer the opportunity to conserve total dollars and each should be evaluated on its own merit.

9.041 CCS per M+EMT Projections - The CCS/M+EMT must be carefully reviewed in terms of historical data and to insure that only a realistic last busy season requirement in the expected life on the job is covered. Normal growth chart projections may reflect an expected value during the second or third year of the job that will not actually be realized due to the ESS replacement occurring prior to the true busy season for that year.

9.042 Line and Terminal Fills - The BSP-SW percent fills for lines and terminals will not be changed. Every effort must be made to actually achieve these percent fills and historical trends should be checked against the projected requirements. There will be marginal cases where sound Network Design decisions must be made with the conservation of dollars in mind.

9.043 Wire Center Area Forecast - All forecasts must be current and/or recently validated. This includes the validation of the various breakdowns internal to the forecast and should be compared to historical trends of the various components.

9.044 Marker Expansion - The addition of more than 8 completing markers or 4 dial tone markers should be avoided if at all possible due to the large number of connector frames required for marker expansion. Historical data should be carefully reviewed if marker expansion is indicated. Maintenance capacity should be utilized where possible to avoid additional markers.

9.045 Switching Capacities - Every effort should be made to avoid major transition in the internal switching network. Keep in mind that decisions based on future job requirements should not be made in these offices. Existing junctor patterns, etc., should be maintained if at all possible. Originating and terminating capacities should not be increased unless strongly supported by historical data. Absolute maximum utilization of existing switching capacities should be planned before any additional capacity is provided.

9.046 All Network Design decisions regarding switching capacities in these offices should reflect a bias toward the conservation of dollars.

9.047 Consecutive Number Requirements - As previously stated, this component of the forecast should be carefully validated. In addition, the historical records should be reviewed and the numbers being held in reserve evaluated with emphasis on the timing of when they may be required. There should be many cases where this reserve can be reestablished with the ESS replacement and the existing numbers utilized for other requirements prior to conversion.

9.048 Traffic Measuring Capabilities - Additional traffic measuring capabilities should not be provided for additional COE except in those cases where data essential to the basic administration and maintenance functions could not be obtained otherwise. This exception assumes that these essential data have been available historically on existing COE. This approach will require judgment decisions on the rearrangement of existing measuring equipment versus additional measuring equipment to provide capacity for added essential items.

10. ARRANGEMENT OF NETWORK DESIGN ORDER

10.01 The No. 5 Crossbar Network Design order shall contain the following parts and shall be compiled in the sequence indicated:

Face Sheet
Office Growth Chart
Wire Center Area Forecast
Office Service Results
Forecasts of Lines and M+EMT
Originating and Terminating Busy Hour Usage
Basic Data Package
E8000 Questionnaire

11. FACE SHEET

11.01 The information on the face sheet is directed primarily to those persons who have the final authority for approving the work specified by the order. However, it is also used by those persons who schedule relief jobs and plan for growth. The face sheet expresses the official capacity of an office. Form SW-7630, Face Sheet, is shown in Exhibit 1.

11.02 The face sheet for local switching equipment Network Design orders has two parts.

(a) The "Narrative"

(b) The "Summary of Equipment Capacities"

11.03 The "Narrative" part of the face sheet should state:

(a) What is to be done, e.g., major additions, changes or rearrangements.

(b) Why it is to be done, e.g., references to approval studies, letters and authorities.

(c) When it is to be done, e.g., current schedules and coordinating jobs.

The "Narrative" should also identify any special equipment being ordered, e.g., No. 6A recorders, TUR, etc., and appropriate justification for the item unless the provision of this equipment is covered by policy determination. The "Narrative" part of the face sheet should "stand on its own feet." It should contain enough information so that it should not require further justification for approval by final authority. The face sheet should be worded so that when the estimate request is prepared it may become an integral part of it and support the expenditures involved.

11.04 The "Summary of Equipment Capacities" part of the face sheet shall be prepared for all local switching equipment orders.

11.05 The face sheet tells an important story. The network designer who prepares an order is familiar with all of the basic data and what the order will accomplish. During preparation of the face sheet, it must be kept in mind that others who will use the order will not be as familiar with the content as they are. Therefore, the face sheet must give a capsule view of the entire order to an uninitated reader.

11.06 Instructions for preparing "Summary of Equipment Capacities" for the Network Design order face sheet.

(1) Present total of installed line equipment. This figure is computed by multiplying the number of line link frames by the size of the frames. (10LLF x 490 = 4900 lines.)

(2) Proposed total of installed line equipment. Computation same as in (1).

(3) Present installed line capacity. This figure is essentially the installed lines

minus those lines required for administration, trunks, test, dial tone speed, etc.

(4) Proposed line capacity - same as (3).

(5) Present line termination capacity expressed in main plus equivalent main telephone.

(6) Proposed line termination capacity expressed in main plus equivalent main telephone.

(7) The date the present line main telephone capacity will exhaust.

(8) The date the proposed line main telephone capacity will exhaust.

(9) thru (16) Number capacities and exhaust dates same as for lines.

(17) Present line link - trunk link frame configuration. Should be expressed as 24-12, 8P; 32-16, 6T; in which the first figure is the number of line link frames installed, the second is the number of trunk link frames installed and the third is the junctor pattern.

(18) Proposed LLF-TLF configuration - same as for 17. The comparison between (17) and (18) tells whether or not a junctor pattern change is involved on the proposed job.

(19) (20) The present and proposed junctor pattern CCS capacity as computed according to BSP 218-060-130 (Figure 6). (TFP Div. D, Sec. 8b(2)).

(21) (22) The present and proposed junctor pattern capacity expressed in main stations. This figure is computed by dividing (19) and (20) by the present and future CCS/M+EMT.

(23) (24) The dates on which the main telephone capacities of (21) and (22) will be reached.

(25) (26) The present and proposed number of markers installed. The number of flat spring markers should be indicated - 6 (2FS) meaning six total, two of which are flat spring.

(27) (28) The present and proposed CCS capacity of the installed markers. The engineering criteria used should be indicated such as, 155 HD or 142 10 HD.

(29) (30) The capacities of (27) and (28) expressed in telephones.

(31) (32) The dates the capacities of (29) and (30) will be reached.

(33) (34) The present and proposed number of dial tone markers installed.

(35) (36) The present and proposed capacity of installed dial tone markers expressed in attempts.

(37) (38) The dial tone markers attempt capacities expressed in main telephones.

(39) (40) The dates the DTM capacities in (37) and (38) will be reached.

(41) (42) The present and proposed number of installed originating registers.

(43) (44) The present and proposed OR CCS capacity. The engineering criteria used should be shown (GAMA, 10HD, HD).

(47) (48) The dates the DTM main telephone capacities of (45) (46) will be reached.

(49) (50) The present and proposed CCS/M+EMT.

(51) (52) The present and proposed most limiting component (e.g., originating register, completing marker, lines, etc.).

(53) (54) The present and proposed limiting switching equipment code. This code is switching only and will not always agree with the most limiting component such as when lines are limiting.

11.07 The most limiting capacity will be the capacity which is shown for the most limiting component in the summary of equipment capacities table on the face sheet. If an equipment component will exhaust that is not listed on the face sheet, it should be added to the summary of equipment capacities table on the vacant line under originating registers.

12. OFFICE GROWTH CHART

12.01 The "Office Growth Chart" shall be included in all complete, revised, capacity and annual local switching Network Design orders. It is composed of two parts:

(a) Originating plus terminating CCS per main plus equivalent main telephone.

(b) Line and main plus equivalent main telephone capacities and forecasted growth.

A new "Office Growth Chart" shall also be included in all local switching orders if there has been a change in capacities from the last complete order or if a period of 12 months has elapsed since the issuance of a complete or revised order. Form SW-7631, Office Growth Chart, is shown in Exhibit 2.

12.02 The definition of M+EMT is based upon several guiding principles. First, a main or equivalent main telephone must be a usage generating service for which central office switching capacity must be provided. Second, the term M+EMT must be in accordance with the Comptroller's letter, M-222. Third, a service designated as a main or equivalent main in all types of switching systems.

12.021 The main plus equivalent main telephone figure used for capacity determination and for usage projections should be obtained by totaling the following lines and/or numbers:

Main plus Equivalent Main Telephone
Type of Service

Residence		- 1 Pty.
"	Spl. Optional	- 1 Pty.
"		- 2 Pty.
"		- 4 Pty.
"		- 8 Pty.
"	Meas.	- 1 Pty.
"	Meas.	- 2 Pty.
Business		- 1 Pty.
"	Spl. Optional	- 1 Pty.
"		- 2 Pty.
"		- 4 Pty.
"		- 8 Pty.
"	Meas.	- 1 Pty.
Coin		- 1 SP.
"		- 1 PC.
Trunks		
"	PBX	- Flat
"	PBX	- Measured
"	CTX-CU/DIM	- 2W
"	CTX-CO	- Listed No. Trk.
"	CCSA	- 1W IN
"	CCSA	- 2W
"	CTX-CU/DIM	- 1W ODT
"	CTX-CO	- ODT (5XB only)
"	OUTDIALS	- Flat
"	OUTDIALS	- Measured
"	OUTDIALS	- Hotel/Motel
"		- DID
"		- Paging, Radio
"		- Common Carrier, etc.
Miscellaneous		
"	CTX-CO	- Stations (Secondary CTX stations should be counted where served).
"		- FX
"		- COIN FX
"		- Announcements (NOTE: 1) (Time & Temp., etc.)
"		- Info. Terminal
"		- Outwats Flat
"		- Outwats Meas.
"		- Inwats Flat
"		- TWX 3R
"		- TWX 4R
"		- ACD (1W, 2W Trunks)
"		- Mobile (IMTS)
"		- Remote Call Forwarding

NOTE 1: These are trunks for announcement services that require a line/number.

12.03 Probably the most important single decision made by the network designer in preparing a Network Design order is the estimate of busy hour CCS per main plus equivalent main telephone. This estimate is the foundation on which the office is built and determines the basic switching capacity of the office. The CCS per main plus equivalent main telephone estimate is made only after careful analysis of available historical data, consideration of future trends and plans and application of intelligent judgement.

12.04 The "Originating plus Terminating CCS per Main plus Equivalent Main Telephone" chart shows the actual performance for each usage study for the last three to five years. Only the counts made in the three busy months should be posted to the chart. In addition to posting the actual CCS per main plus equivalent main telephone data obtained from studies, the future CCS per main plus equivalent main telephone shall be trended on the chart.

12.05 Instructions for preparing the Office Growth Chart, Form SW-7631.

12.051 Originating CCS per Main plus Equivalent Main Telephone - The upper portion of the chart shows the historical data for CCS/M+EMT and total usage. The junctor capacity from the face sheet should also be shown as the darkened horizontal line on the chart for the life of the job. Historical data as indicated by the solid portion of the "point graph" and the estimate of future usage is indicated by the dotted portion of the curve. The "Tick Marks" on the dotted portion of the chart represents the exhaust date of the present and future equipment.

12.052 The basis for dial office engineering should be the time consistent average usage (CCS per main plus equivalent main telephone) for all business days in the busy season (3 busy months) for the wire center involved. The X represents the average of the 3 busy months.

12.053 The network designer should evaluate all available data and make proper entries on the growth chart. Required data for the office growth chart can be obtained from No. 5 COER output documents. Using these data as a basis, they should project the usage so it represents an estimate of the future 60 day Average Busy Season. The load service relationships involved and the busy hour - busy season service objectives are covered in Paragraph 7.01 of this practice, as well as in BSP 780-400-211 and 780-500-212 (TFP, Div. D, Sec. 1b and 1c).

12.054 Lines and Main plus Equivalent Main Telephones - The lower portion of Form SW-7631 shows the historical trend in line and main telephone growth as well as office capacities. The office capacities to be shown are line terminations and most limiting capacity expressed in lines and main telephones. Actual line and main telephone growth is indicated by the solid portion of the "point graph." The most recent commercial forecast of line and main telephone growth is indicated by the dotted line extension of the actual data from year-end point to year-end point. Previous and proposed capacities should be entered on the chart as illustrated.

12.06 It should be noted that there are six vertical spaces for each block on the graph. Each vertical space should represent a two month period and a year is represented by one block. This makes it possible to show the exhaust data and equipment relief data in the appropriate month on the chart. This also makes it possible to show actual study months and usage data for these months. The need for exact month indication is not so important in the forecast graph except in the case of area cuts involving a particular wire center. However, in evaluating the usage per main plus equivalent main telephone, it is essential to know whether a study was obtained in the busy season or not as this is a requirement to the proper evaluation of the data and its projection to the future.

13. OFFICE SERVICE RESULTS

13.01 In order to appraise the effectiveness of the equipment provision, it is necessary to compare the loads generated by that provision with the service results obtained. The service results are readily obtainable from the source indicated on Form SW-7632, Service Results. Each year's busy season service results will be posted on the form. Form SW7632, Office Service Results, is shown in Exhibit 3.

13.02 In a properly designed office, objective service results will be approached in the end of the engineering period busy season. ORGB registration would be expected in the busy hour - busy season end of engineering period - particularly in the high day results.

14. FORECAST OF LINES AND MAIN PLUS EQUIVALENT MAIN TELS

14.01 The network designer extracts the detailed line and terminal information he needs to prepare a Network Design order from the Wire Center Area Forecast which is prepared by the commercial engineer. A Wire Center Area Forecast is shown in Exhibit 4. This forecast should be validated within 60 days of Network Design order issue.

14.02 The commercial forecast is arranged with end-of-the-year estimates of lines and main plus equivalent main telephones for wire centers. The network designer must rearrange this forecast into a detailed "forecast of lines, main telephones and main plus equivalent main telephones" that will contain the information required to prepare a Network Design order. At times, area cuts are involved between wire center areas and it may be necessary for the network designer to extract information from more than one Wire Center Area Forecast.

14.03 The forecasted annual rate of growth for main plus equivalent main telephones is used as a starting point of the design of the order to determine the most economical length of engineering period to be used.

14.04 The length of engineering period is added to the estimated completion date for the current job schedule to obtain the exhaust date for the order under preparation. The network designer prepares a detailed forecast of lines and main plus equivalent main telephones at this cross-section in time.

14.05 The forecast of main plus equivalent main telephones and lines should show each class of service by type and the lines and terminals required by each. This should include such services as FX, etc. Services forecasted for the wire center area, but not using lines and/or terminals should be shown in parenthesis, e.g., WATS, etc. Form SW-7633, Forecast of Main plus Equivalent Main Telephones and Lines, is shown in Exhibit 5.

14.06 Other forecasted items that determine equipment provisions should be shown, e.g., forecasted consecutive numbers and unavailable lines. The quantity of unavailable lines is an input item in the D and F Data Base.

14.07 A copy of the wire center area forecast will be included in the Network Design order.

15. SUMMARY OF ORIGINATING AND TERMINATING OFFICE BUSY HOUR USAGE

15.01 One of the most important single decisions made by the network designer in preparing a Network Design order is the estimated originating and terminating busy hour usage. This estimate determines the basic switching capacity of the office. It has a direct bearing on the size and quantity of the line link frames.

15.02 Line link frames (LLF), in No. 5 Crossbar office carry originating, terminating and tandem or through traffic. Total LLF usage is obtained in offices with TURs by multiplying the total sample link usage by the ratio of the total channel peg count to sample channel peg count.

15.03 The network designer has made the estimate of originating and terminating BH CCS/main plus equivalent main telephones for the office growth chart. This estimate is made after careful analysis of available historical data, a consideration of future trends and plans and application of good judgment.

15.04 The office busy hour (OBH) usage is determined by applying the estimated BH CCS/main plus equivalent main telephones at the end of the engineering period to the forecasted equivalent main telephones for the same period (from the "Forecast of Lines and Main plus Equivalent Main Telephones"). Then the forecasted lines and main telephones are tabulated by class of originating service, e.g., flat rate, coin, etc., and the total OBH CCS is apportioned to the various classes on a judgment basis and a CCS/main plus equivalent main telephones is computed for each subtotal.

15.05 The OBH usage may be computed by estimating the BH CS/main plus equivalent main telephones for each class of service separately, then proceeding to the sum. More accurate estimating can be done by estimating the whole and breaking it down into its parts.

15.06 Form SW-7634, Summary of Originating and Terminating Office Busy Hour Usage is shown in Exhibit 6.

16. DETERMINATION OF EQUIPMENT QUANTITIES - GENERAL

16.01 Items of equipment that carry conversations such as line link frames, trunk link frames and intra-office trunks should be engineered on an average busy season CCS basis as measured by the TUR equipment.

16.02 With the implementation of the Total Network Data System (TNDS), 10 high day and high day data will be available in the Central Office Equipment Report (COER) format. The 10 high day - high day method of equipment provison will be used when one busy season of COER data is available. Quantities of equipment will be determined by the methods and procedures outlined in the appropriate BSP 218 series.

16.03 Different items of common control equipment may have different busy hours, e.g., originating registers may have a 9-10a busy hour, whereas incoming registers may have a 10-11a busy hour. Also, common control equipment may have a busy hour different than line link or trunk link frames. In such cases, the TUR should be operated as required to obtain the necessary data.

16.04 Derived holding times using measured usage and peg counts should be checked against theoretical holding times for reasonableness. Measured overflows should be checked against overflows predicted by tables for the measured usage.

17. HISTORICAL DATA AND EQUIPMENT CALCULATIONS

17.01 The historical data sheets covered in subsequent sections will be included in the Network Design order. These sheets are necessary for higher management to review the reasonableness of the design judgment; particularly in light of the No. 5XB replacement program.

17.02 All calculations will be in accordance with standard Bell System Practices.

17.03 The following is a summary of No. 5 COER output that will be used for historical data and be the basis of equipment calculations.

COER SUMMARY
INDEX

Summary	Title
0100	Line Link Frame
0300	Line Link Frame Total
0500	Load Service Curve
0800	Dial Tone Speed - TT
1200	Originating Registers - TT
1800	Dial Tone Markers
1810	Completing Markers
2000	Originating Calls/MS
2700	Marker Connectors
3000	Outgoing Sender Groups
3200	Incoming Register Groups
3500	Intraoffice Trunks
3510	Intermarker Group Trunks
3530	Junctors
3550	Reverting Call Trunks
3560	Permanent Signal Trunks
3570	Combination Tone Trunks
3580	Common Overflow Trunks
3800	Office Overflow
3900	Coin Supervisory Circuits
4500	Transverters
4700	Recorders
7500	Miscellaneous Registers

18. LINE LINK FRAME REQUIREMENTS

18.01 References

BSP 218-060-120 (TFP Div. D, Sec. 8b(1)) - Line Link Frames - General Description and Operation

BSP 218-060-130 (TFP Div. D, Sec. 8b(2)) - Line Link Frames - Determination of Quantities

BSP 819-200-150 - Line Link Frames

BSP 819-200-152 - Line Link Frames - Small Crossbar Switches

BSP 756-370-621 - COER USER Guide

BSP 756-370-624 - COER Data Outputs Report TX070, Summary 0100 Line Link Frame CCS/M+EMT and IML

18.02 Line link frame quantity and size will be determined according to BSP 218-060-130. The CCS/M+EMT figure to be used in calculations is the proposed or projected CCS/M+EMT on the office growth chart and on the face sheet.

18.03 Calculations will be made on Form SW-7635, Line Link Frame Determination, shown in Exhibit 7.

18.04 ABS CCS/M+EMT data is available in COER Report TX070 Summary 0100.

18.05 Line fill policies are discussed in Paragraph 6.01 of this practice.

18.06 Any unusual or special situations should be noted under remarks.

19. NUMBER GROUP REQUIREMENTS

19.01 References

BSP 218-060-230 (TFP Div. D, Sec. 8:) - Number Groups

BSP 819-320-150 - Number Group Frames

19.02 Number group frame requirements will be determined in accordance with BSP 218-060-230. Quantities to be provided will be shown on Form SW-7636, Requirements for Equipped Numbers, Exhibit 8. Directory number assignments will be shown on Form SW-7637, Exhibit 9.

19.03 Number group frame relays (SC, A, TB, etc.) will be shown on the appropriate chart in the "M" section of the E8000 questionnaire.

20. TRUNK LINK FRAME REQUIREMENTS

20.01 References

BSP 218-060-140 (TFP Div. D, Sec. 8c(1)) Trunk Link Frames - General Description

BSP 218-060-150 -(TFP Div. D, Sec. 8c(2)) - Trunk Link Frames - Determination of Quantities

BSP 819-201-150 - Trunk Link Frames

BSP 819-201-152 - Trunk Line Frames - Small Crossbar Switches

BSP 819-220-150 - Junctor Grouping Frames and Distribution Procedures

20.02 Trunk link frame quantities will be determined according to the principles in BSP 218-060-150. Special attention must be given to pairing and tripling of trunk links and the balancing of trunks and originating registers across the trunk link singles, pairs or triples. The proper charts in the "M" section of the E8000 questionnaire must be completed to insure that the frames are paired or tripled and trunks assigned as engineered. Calculations will be made on Form SW-7638, Trunk Link Frame calculations, as shown in Exhibit 10.

20.03 The design load CCS in the calculations is that used in the line link frame calculations; that is, the proposed CCS/M+EMT times the proposed number of main telephones.

20.04 The junctor pattern capacity is the total pattern capacity (total LLFs x CCS/LLF) provided according to BSP 218-060-130, Figure 6 - No. 5 Crossbar Line Link Frame Capacity Table.

20.05 Because of the fundamental design of the No. 5 Crossbar system, the number of line link frames provided should be twice the number of trunk link frames. This is because the total line link frame load is approximately equal to the total trunk link frame load and there are 100 junctors on each line link frame and 200 junctors on each trunk link frame. There are situations, however, where a large number of small trunk groups (low CCS/trunk) terminate in an office. This may require trunk line frame terminations out of proportion to the 2:1 ratio. There may be other situations. Should the ratio vary by more than one frame from the 2:1 ratio, the designer should investigate and determine if there is a legitimate reason for the variance. It is extremely important that this be done, because with TNDS TFS, data is no longer available for validation of total originating and terminating distribution of traffic.

21. ORIGINATING REGISTER REQUIREMENTS

21.01 References

BSP 218-060-170 (TFP Div. D Sec. 8e(1)) Dial Tone Markers and Originating Registers

BSP 218-060-180 (TFP Div. D Sec. 8e(2)) - Dial Tone Markers and Originating Registers - Determination of Quantities

BSP 819-401-150 - Register Frames

BSP 819-401-151 - Register Equipment Units

BSP 819-401-152 - Control Equipment Units

BSP 819-401-153 - Pulse Counting Equipment Units

BSP 819-401-154 - Timing Equipment Units

BSP 819-401-155 - Coin and 2 Party Test Equipment

BSP 819-403-150 - TOUCH-TONE® Receiver and Control Frame

BISP 756-370-621 - COER USER Guide

BISP 756-370-624 - COER Data Outputs Report TX070 Summary 1200 (TT) Summary 1400 (DP)

21.02 Originating register requirements will be determined in accordance with BSP 218-060-180. The data necessary for quantity determination will be compiled on Form SW-7639, Originating Register Data. Calculations will be made on Form SW-7640, Originating Register Calculations. See Exhibits 11 and 12.

21.03 The ABS, 10 HD and HD CCS/M+EMT will be posted in the lower half of Form SW-7639. The data is available on COER Report TX070 Summary 1200. The ratios are calculated and posted in the upper half of the form. Using the 10 HD/ABS ratio and the 10 HD distribution chart (Figure 1a and 1b of BSP 218-060-180), the theoretical or gamma ratio is determined for the high day and posted on the forms. If the actual high day ratio is higher than the theoretical or gamma ratio, an investigation should be made (according to BSP 218-060-180 Paragraph 3.08) to eliminate the possibility of invalid data or "ODD-BALL" day. The ratios posted on Form SW-7639 are those calculated after all data adjustments have been made.

21.04 With one busy season 10 HD data, originating registers will be provided on the end of period 90% gamma high day CCS. As more data is collected a determination can be made on the highest recurring day and the end of period high day CCS projected from actual data. Provisions will then be made using either the 10 HD or HD CCS depending on which is controlling.

21.05 10HD, HD and Gamma CCS should be read into the originating register

provisioning table to determine dial tone speed delay for each CCS value. The controlling CCS should be the one that will provide dial tone speed objectives as listed in Paragraph 7.02 of this practice.

22. DIAL TONE MARKER REQUIREMENTS

22.01 References

BSP 218-060-170 (TFP Div. D, Sec. 8e(1)) - Dial Tone Markers and Originating Registers

BSP 218-060-180 (TFP Div. D, Sec. 8e(2)) - Dial Tone Markers and Originating Registers - Determination of Quantities

BSP 819-300-150 - Marker Frames

BSP 819-300-151 - Marker Units

BISP 756-370-621 - COER USER Guide

BISP 756-370-624 - COER Data Outputs Report TX070 Summary 1800 Dial Tone Markers

GL 74-05-002 - Dial Tone Marker - Full Access to Fifth and Sixth Marker

22.02 Dial tone marker requirements will be determined in accordance with BSP 218-060-180. The data necessary for quantity determination will be compiled on Form SW-7641, Dial Tone Marker Data (Exhibit 13). Dial tone marker data is available on COER Report TX070 Summary 1800. Calculations of dial tone marker quantities will be made on Form SW-7642 (Exhibit 14).

22.03 Data is posted to Form SW-7641 similar to originating register data. With one busy season data, dial tone markers will be provided on the end of period 90% gamma high day attempts. As more data is collected a determination can be made on the highest recurring day and the high day ratio projected from actual data. Dial tone markers would then be provided from this projection.

23. COMPLETING MARKER REQUIREMENTS

23.01 References

BSP 218-060-190 (TFP Div. D, Sec. 8f(1)) - Completing Marker General Description

BSP 218-060-200 (TFP Div. D, Sec. 8f(2)) - Completing Marker Determination of Quantities

BSP 819-300-150 - Marker Frames

BSP 819-300-151 - Marker Units

BSP 819-300-150 - Completing Marker Frames

BISP 756-370-621 - COER USER Guide

BISP 756-370-624 - COER Data Outputs Report TX070 Summary 1810 Completing Marker

23.02 Completing marker requirements will be determined in accordance with BSP 218-060-200. The data necessary for quantity determination will be trended on Form SW-7643, Completing Marker Data (Exhibit 15). Completing marker data is available on COER Report TX070 Summary 1810. Calculations will be made on Form SW7644 shown in Exhibit 16. While attempt data is not used in quantity determination, attempts per main telephone is a good validation tool for CCS/M+EMT evaluation. For this reason, the attempt data is maintained on the completing marker data form.

24. OUTGOING SENDER REQUIREMENTS

24.01 References

BSP 218-060-210 (TFP Div. D, Sec. 8g) - Outgoing Senders

BSP 819-420-150 - Outgoing Sender Frames

BISP 756-370-621 - COER USER Guide

BISP 756-370-624 - COER Data Outputs TX070, Summary 3000-3012, 3030-3038, 3050-3058 Outgoing Sender Groups

24.02 Outgoing sender requirements will be determined in accordance with BSP 218-060-210. The 10 high day CCS per working trunk will be projected to the end of engineering period and total CCS per group

calculated. CCS per working trunk data will be maintained on Form SW-7645, Outgoing Sender Data (Exhibit 17). Calculations will be made on Form SW-7646, Outgoing Sender Calculations (Exhibit 18).

24.03 The quantitiy of outgoing sender link frames required is determined by the physical trunk capacity of the outgoing sender link frame, trunk assignment restrictions and sender group CCS requirements. Engineering principles for outgoing sender link frames are covered in BSP 218-060-210 (TFP Div. D, Sec. 8g).

24.04 The appropriate outgoing sender link frame assignment charts in the "M" section of the E-8000 questionnaire should be completed to assist in quantity determination.

25. INCOMING REGISTER REQUIREMENTS

25.01 References

BSP 218-060-220 (TFP Div. D, Sec. 8h) - Incoming Registers

BSP 819-401-150 - Originating and Incoming Registers

BISP 756-370-621 - COER USER Guide

BISP 756-370-624 - COER Data Outputs TX070 Summary 3200. 3217, 3230-3234, 3250-3254 Incoming Registers

25.02 Incoming register requirements will be determined in accordance with BSP 218-060-220. The 10 high day CCS per working trunk will be projected to the end of engineering period and total CCS per group calculated. CCS per working trunk data will be maintained on Form SW-7646, Incoming Register Data (Exhibit 19). Calculations will be made on Form SW-7648, Incoming Register Calculations (Exhibit 20).

25.03 The number of incoming register link frames required is governed by the trunk capacity of the individual incoming register link frame, register requirements and trunk assignment restrictions. Incoming register link group engineering recommendations are covered in BSP 218-060-220 (TFP Div. D, Sec. 8h).

25.04 Final incoming register link frame quantity determination will depend on trunk loading on incoming register link frames after trunk assignment to trunk link frames. Any rearrangements necessary on the trunk link frames for balancing purposes will also influence frame and switch quantities.

25.05 The appropriate incoming register link frame assignment charts in the "M" section of the E-8000 questionnaire should be completed to assist in quantity determination.

26. COIN SUPERVISORY LINK FRAME REQUIREMENTS

26.01 References

BSP 218-060-100 (TFP Div. D, Sec. 8a(1)) - General Description and Planning

BSP 819-902-152 - Coin Supervisory Link Frame

BISP 756-370-624-COER Data Outputs TX060 Summary 3900

26.02 Coin supervisory link frame requirements will be determined in accordance with BSP 218-060-100. Associated coin supervisory circuits shall be provided in accordance with BSP 218-060-160 (TFP Div. D, Sec. 8d).

26.03 The appropriate coin supervisory link frames assignment chart in the "M" section of the E-8000 questionnaire should be completed to assist in quantity determination.

27. CONNECTOR AND MARKER CONNECTOR REQUIREMENTS

27.01 References

BSP 218-060-200 (TFP Div. D, Sec. 8f(2)) - Markers and Marker Connectors

BSP 218-060-210 (TFP Div. D, Sec. 8g) - Outgoing Senders and Connectors

BSP 218-060-220 (TFP Div. D, Sec. 8h) - Incoming Registers and Marker Connectors

BISP 756-370-624-COER Data Outputs TX060 Summary 2700

27.02 The quantities of originating register and incoming register marker connectors are jointly determined since their combined usage is the total completing marker usage plus the delay encountered in securing a completing marker. The provision of marker connectors should be twice the number of completing markers with a minimum of two connectors of each type. This 2:1 ratio insures minimum delay by providing each completing marker a first preference in the connectors.

27.03 Outgoing sender connector quantities should be determined in accordance with BSP 218-060-210. Careful consideration needs to be given to the rate of growth and the ultimate office size when determining connector provision. As a general rule, a pair of outgoing sender connectors are provided per 30 senders.

28. AMA REQUIREMENTS

28.01 References

BSP 218-060-240 (TFP Div. D, Sec. 8j(1)) - AMA - General Description

BSP 218-060-250 (TFP Div. D, Sec. 8j(2)) - Equipment - Determination of Quantities

BSP 218-060-290 - AMA - Billing Data Transmitter

BISP 756-370-621 - COER USER Guide

BISP 756-370-624 - COER Data Outputs Report TX070 Summary 4500 Lama Transverters Summary 4700-4729 Recorder Summary

28.02 Transverter, translator, recorder, call identity indexer and billing indexer requirements will be determined in accordance with BSP 218-060-250. Billing data transmitter requirements will be determined in accordance with BSP 218-060-290.

28.03 Transverter calculations will be made on Form SW-7650, Transverter Calculations (Exhibit 22). Generally, the trended end of period ABS transverter CCS will be adjusted by the end of period 10 high day ratio. Using the ten high day busy hour loading per transverter table of BSP 218-060-250, the number of transverters are calculated. The transverter table of BSP 218-060-250 provides transverter quantities to include a margin to maintain an acceptable grade of service with one transverter unavoidably out of service. In an effort to avoid the unnecessary provision of transverters, transverter quantities will also be calculated based on 70% occupancy. The quantity of transverters to be provided should be the table value unless the office is to be replaced in the near future, in which case, the 70% occupancy quantity should be provided.

28.04 The transverter main telephone capacity is also calculated on Form SW-7650. This capacity will be greater than the most limiting capacity of the office.

28.05 Data projections will be made from historical data on Form SW-7649, Transverter Data (Exhibit 21). Data is available on COER Report TX070 Summary 4500. The CCS figure to be trended is that which has been adjusted for occupancy. This is the "ADJ CCS" column on Summary 4500.

28.06 The total AMA lines for the 10 high day busy hour of the end of period busy season must be determined in order to not exceed the 60,000 AMA lines of entry capacity of the billing data transmitter.

This can be done by projecting the 10HD AMA lines/M+EMT. The method for determining the number of AMA lines per main telephone is covered in BSP 218-060-290.

28.07 EL 5878 (GL 78-06-152) provides one traffic registration per recorder to count the number of lines of data offered to the billing data transmitter. A standard No. 5 COER output report is not available for the billing data transmitter. However, a miscellaneous EMC code may be assigned and data received on a daily basis. The 10 high day data can then be calculated on a manual basis.

28.08 Until COER 10 high day data is available, AMA 10 HD lines per main telephone should be computed manually and a straight line projection made to the end of period. When COER 10 HD data is available, the end of period AMA lines per main telephone will be determined from the 10 HD/ABS ratio in the normal manner.

28.09 Billing data transmitter data will be trended and calculations made on Form SW-7651, BDT Data and Calculations (Exhibit 23).

29. IAO AND MISCELLANEOUS TRUNKS

29.01 References

BSP 218-060-160 (TFP Div. D, Sec. 8d) - Trunks

BSP 819-600-150 - Trunk Tables

29.02 Calculation of IAO and miscellaneous trunk quantities will be in accordance with BSP 218-060-160. Quantities will be shown on Form SW7652, IAO and Miscellaneous Trunk Data (Exhibit 24). It will not be necessary to include trending charts for trunk data in the Network Design order.

29.03 Trunk types and features can be determined from the No. 5 Crossbar trunk tables in BSP 819-600-150 and up. The switching engineer should be consulted when ordering a new trunk type for the first time.

30. SPECIFICATION SECTION

30.01 The specification part of Network Design order consists of the standard E-8000 Western Electric Company questionnaire. Issue 9 or later of this questionnaire is acceptable. The network designer has a joint responsibility with the switching engineer to keep the E-8000 questionnaire complete and accurate. This will insure a comprehensive record of office features and equipment quantities for both the telephone company and Western Electric.

30.02 The network designer is responsible for completing sections B, M, D, A and C of the E-8000 questionnaire. If the designer is unable to complete a part of these sections, the switching engineer should be consulted. The equipment quantities in the "B" section should reflect equipment calculations made in the basic data section of the Network Design order. In addition, connectors and marker connectors required for the addition of common control equipment must also be ordered.

30.03 The "M" section of the E-8000 questionnaire contains assignment charts which the network designer must complete. It is essential that these charts are accurate and complete before additions and reassignments are made. A comparison to Western Electric's job drawings for a central office should be made and any differences resolved. The following list of charts are those required in a complete order:

Chart	Title
A,586A	Trunk Summary
A1,577A	Link Frame Description

Chart	Title
B1A,586C	Assignment Trunk Link Frame, App. A
B1B,5860	Assignment Trunk Link Frame, App. B
C,579A	Originating Register Assignment
D,580A	Incoming Register Assignment
E,579B	Outgoing Sender Assignment
F,586G	Incoming Register Link Groups and Assignment
F1,590A	Incoming Register Link, By-Link Trunk Number Association
F2,590B	Incoming Register Link, Non By-Link Trunk Number Association
G,586H	Coin Supervisory Link Frame Assignment
H,523A	Assignment of Vertical Groups for Tip Translation
J-J1,578A	Number Group Equipment
K,526A	Traffic Usage Recorder No. 4A - Frame Type
Q,574A	Cabling of Sleeve Leads from LL to MDF
R,523C	LAMA-ANI Translator Frame Office Index Units Coin Assignment
S,523D	LAMA-ANI Translator Frame Office Index Tens Coil Assignment
W,586I	Outgoing Sender Link Arrangement - 1st to 5th Switches
W1,586I	Outgoing Sender Link Arrangement- 6th to 10th Switches
W2,586IA	Trunk Distribution to Outgoing Sender Link Frames and Sender Groups
Y,577B	Trunk Link Frame Association - Paired or Tripled Junctor Distribution
522A	Transverter Connector, Sender Assignment Chart
524A	AMA Recorder Group Assignment
581A	Dial Tone Marker - LLMC Preference
586M	Call Identity Indexer Trunk Assignment

NOTE: Charts A through Z are found in the E-8000 questionnaire, Issue 9. Charts 522A, 523A, etc., are found in Issue 10 and higher of the E-8000 questionnaire.

30.04 The trunk summary of coded trunks is determined from the latest trunk forecast. This forecast should be validated prior to Network Design order preparation. The types of trunks to order should be determined from BSP 819-600-150 and up, No. 5 Crossbar Trunk Tables. The switching engineer should be consulted when a new trunk type is being ordered or when the designer is uncertain which type of trunk to order.

30.05 The "D" section of the E-8000 questionnaire contains miscellaneous items such as traffic measuring devices and traffic registrations for added equipment and trunks and make required assignments. The network designer should also assign the appropriate equipment measuring code (EMC), to each registration required. Reference should be made to BSP 218-040-022 (DFMP Div. H, Sec. 5e(2)) for the correct EMC.

30.06 Calculations for determining additional traffic measuring equipment should be shown in the "D" section.

30.07 The "A" section of the E-8000 questionnaire contains general information concerning office features and characteristics. This section should be reviewed with each Network Design order.

30.09 The various sections of the E-8000 questionnaire and the assignment charts are explained in detail in the equipment notes E-8000A. The E-8000A is mainly referenced to Issue 9 of the E-8000 questionnaire. Later issues of the questionnaire have notes for preparing the charts contained within the questionnaire itself.

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EXHIBIT 1

SW-7630 - NO. 5

NETWORK DESIGN ORDER FACE SHEET

Southwestern Bell

Form SW-7630
(Rev. 7/80)

NETWORK DEPARTMENT
NETWORK ENGINEERING
St. Louis AREA

NETWORK DESIGN ORDER
NO. 79-130
DATE 7-2-79

TITLE St. Louis, Mo-Chestnut, 247 #5XB add 980 lines, 2000 Nos.

CLLI: STLSMO 12 24 7
CITY STATE BLDG. ENTITY

GROWTH [redacted]

COMMERCIAL FORECAST DATED 6-1-79 VALIDATED 6-15-79

TRK FORECAST DATED 2-1-79 VALIDATED 6-12-79

READY FOR SERVICE DATE 11-30-80

REQUIRED FOR SERVICE DATE 11-30-80

JOB RECORD SHEET 2035

NATURE OF AND NECESSITY FOR WORK:

This complete order provides for 980 lines and 2000 numbers. This order is being written to provide relief for switching capacity which is projected to exhaust 12/80.

SUMMARY OF EQUIPMENT CAPACITIES

EQUIPMENT TYPE	QUANTITY INSTALLED		CAPACITY		M + EMT CAPACITY		EXHAUST DATE	
	PRES	PROP	PRES	PROP	PRES	PROP	PRES	PROP
LINES	(1) 16660	(2) 17640	(3) LINES 15400	(4) 16452	(5) 15554	(6) 16551	(7) 12/80	(8) 9/83
NUMBERS	(9) 16000	(10) 18000	(11) NUMBERS 15650	(12) 17069	(13) 15650	(14) 17069	(15) 3/81	(16) 12/84
LLF-TLF	(17) 34-17/9P	(18) 36-18/9P	(19) CCS 47940	(20) 51176	(21) 15565	(22) 16350	(23) 12/80	(24) 12/82
COMPLETING MARKER	(25) 6	(26) 6	(27) CCS 155HD	(28) 155HD	(29) 17614	(30) 17416	(31) 4/86	(32) 8/85
DIAL TONE MARKER	(33) 2	(34) 3	(35) HR ATTEMPTS 20350	(36) 32350	(37) 15654	(38) 23273	(39) 4/81	(40) A/85
ORIGINATING REGISTER	(41) 58	(42) 63	(43) HR CCS 1870	(44) 2033	(45) 16167	(46) 16515	(47) 6/82	(48) 5 /83
CCS/M + EMT			(49) 3.08	(50) 3.13				

MOST LIMITING COMPONENT

PRESENT		PROPOSED	
Lines (51)	CODE C (53)	JTRP (52)	CODE C (54)

PREPARED BY: _____

CHECKED BY: _____

CHECKED BY: _____

RECOMMENDED: _____

APPROVED: _____

EXHIBIT 2

SW-7631

OFFICE GROWTH CHART

Southwestern Bell

Form SW-7631
(Rev. 7/80)

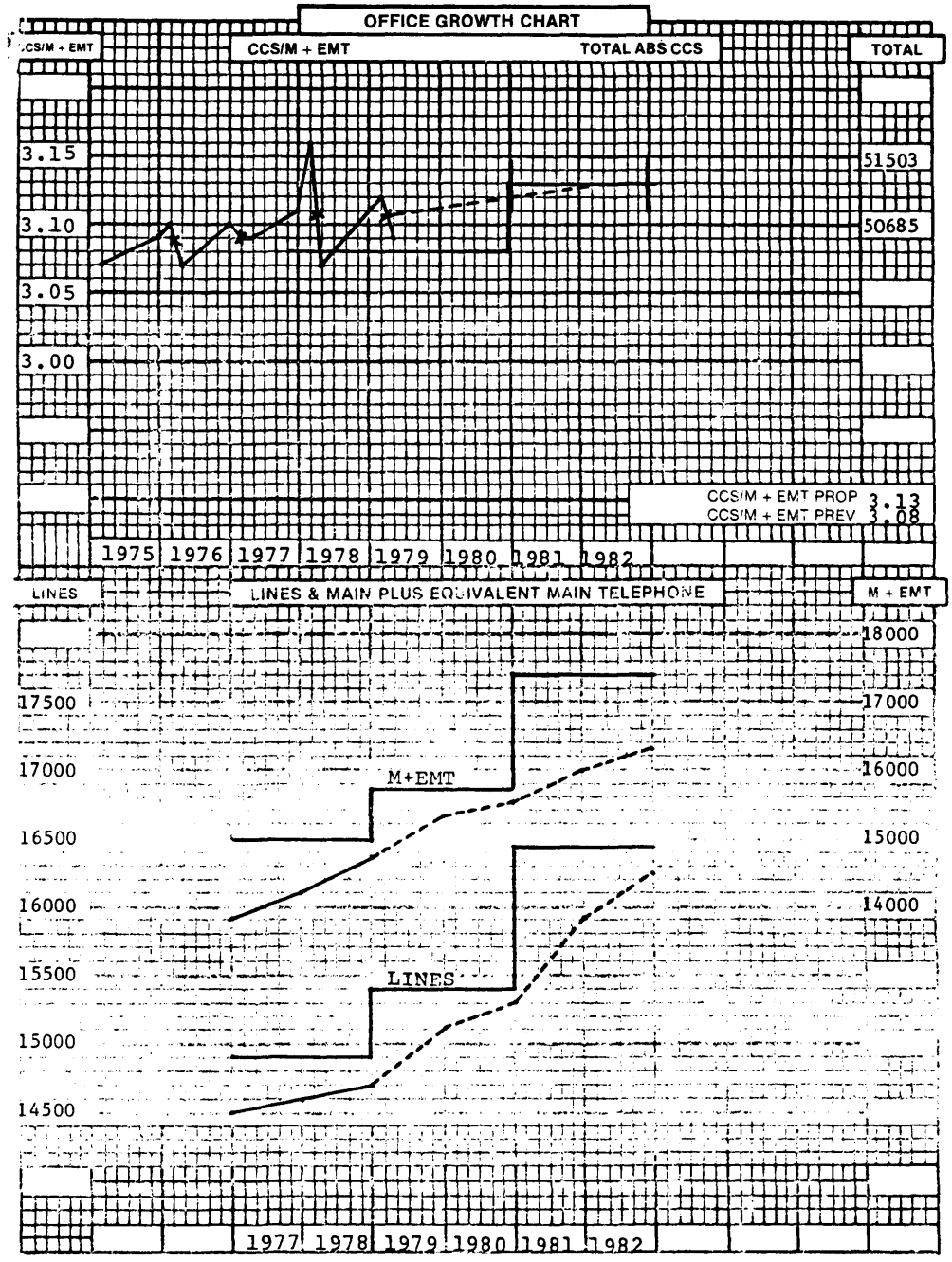


EXHIBIT 3
SW-7632
OFFICE SERVICE RESULTS -
BUSY SEASON

Southwestern Bell

Form SW-7632
(Rev. 1-82)

OFFICE SERVICE RESULTS-
BUSY SEASON

		Obj.	Source	Year									
					1977	1978	1979						
ABS	DTS	1.5	1200*		.3	.55	.1						
	IML	2.0	0100*		.6	1.6	.15						
	OML	1.0	9102**		.1	.5	.1						
	IFFM	2.3	0100*		.8	1.9	.2						
HD DTS		20.0	1200*		7	10	5						
10 HD DTS		8.0	1200*		6	7	3						
HD ORGB		—	1200*		6	11	3						
10 HD ORGB		—	1200*		2	5	1						
ABS ORGB		—	1200*		2	4	1						

*TNDS TX070 Report Summary Number (MLSS)
**TNDS TX090 Office Administration Analysis Report

Remarks:

WIRE CENTER AREA FORECAST
ST.LOUIS AREA

WIRE CENTER: MELROSE
DISTRICT: KIRKWOOD
DIVISION: SOUTH

ISSUE DATE: 2/1/79
CONTROL NO : B413252
PRINT FILE NAME: MEL631

(FIGURES ARE AS OF 12/31)

ITEMS	1978	1979	1980	1981	1982	1983	1984	1985	1986
1FR	11753	12064	12474	12812	13147	13498	13894	14174	14403
2FR	862	760	670	590	520	460	410	350	310
2MR	1739	1640	1550	1460	1390	1330	1270	1210	1150
TOT RES MAIN	14354	14464	14694	14862	15057	15288	15574	15744	15863
ANN'L GAIN		110	230	168	195	231	286	170	119
RES 2 PTY LINES	1662	1412	1306	1206	1124	1053	983	924	959
TOT RES MN+EQ	14354	14464	14694	14862	15057	15288	15574	15744	15863
ANN'L GAIN		110	230	168	195	231	286	170	119
TOT RES M+E LNS	13415	13476	13730	14018	14271	14551	14882	15093	15252
ANN'L GAIN		61	304	238	253	280	331	215	154
RES NON-MAIN	8620	9020	9395	9745	10095	10445	10745	11045	11345
TOT RES TELS	22974	23484	24089	24607	25152	25733	26319	26789	27208
ANN'L GAIN		510	605	518	545	581	586	470	419
1FB	953	983	1008	1031	1051	1071	1091	1105	1121
1MB	453	443	443	438	433	428	423	413	415
COIN	176	176	176	176	176	176	176	176	176
TOT BUS MAIN	1582	1607	1627	1645	1660	1675	1690	1700	1712
ANN'L GAIN		25	20	18	15	15	15	10	12
BUS EXT	1150	1225	1275	1325	1375	1425	1475	1525	1575
FLAT PBX TKS	134	136	137	138	139	140	141	117	118
MEAS PBX TKS	31	33	34	35	36	37	38	39	40
CTX-CU 2 WAY	42	47	51	54	56	58	60	62	64
TOT PBX/CTX TKS	207	216	222	227	231	235	239	218	222
PBX/CTX-CU TEL	1156	1162	1150	1153	1150	1147	1142	1020	1017
ODT FLAT	21	21	21	21	21	21	21	21	21
CTX-CU ODT	15	16	16	17	17	18	18	19	19
CTX-CO MAIN	0	0	0	0	0	0	0	350	450
TOT CTX-CO MAIN	0	0	0	0	0	0	0	350	450
ANN'L GAIN		0	0	0	0	0	0	350	100
CTX-CO LINES	0	0	0	0	0	0	0	350	450
CTX-CO EXT	0	0	0	0	0	0	0	53	58
NIGHT NOS.	21	21	21	21	21	21	21	21	21
WATS-F	2	2	2	2	2	2	2	2	2
WATS-M	18	25	30	35	40	43	45	49	52
INWATS-M	11	15	16	17	18	19	20	21	22
TOT BUS EQ MN	274	295	307	319	329	338	346	630	738
ANN'L GAIN		21	12	12	10	9	8	334	108
TOT BUS MN+EQ	1856	1902	1934	1964	1989	2013	2036	2330	2500
ANN'L GAIN		46	32	30	25	24	23	344	120
TOT BUS M+E LNS	1856	1902	1934	1964	1989	2013	2036	2330	2500
ANN'L GAIN		46	32	30	25	24	23	344	120
CONS. NOS.	887	920	945	970	995	1020	1040	1055	1090
BUS NON-MN	2306	2397	2425	2478	2525	2572	2617	2593	2550

EXHIBIT 5

SW-7633 - FORECAST OF LINES,
MAIN AND EQUIV. MAIN TELS

Southwestern Bell

Form SW-7633
(6-79)

FORECAST OF LINES, MAIN AND EQUIV. MAIN TELEPHONES
AS OF 12/82
PER WIRE CENTER AREA FORECAST DATED 6-1-79
AND VALIDATED ON 6-15-79

CLASS	LINES	MAIN TEL.	MAIN PLUS EQUIV. MAIN TEL.
FR 1	13,224	13,224	13,224
FR 2	103	201	201
FB 1	2,053	2,053	2,053
MB 1	270	270	270
COIN	449	449	449
PBX-F	30	30	30
PBX-M	25	25	25
OD LINES	98	-	98
FX LOCAL			
NN-ANN-AUX			
Total	16,252	16,252	16,350
Consecutive Nos.	760		
Touch Tone Lines	10,888		

Unavailable Lines	-	Trunks	
	-	Trunks	
	-	Trunks	
	- Coin	Junctors	87
	-	Junctors	
	- Test, DTS, Etc.		100
	Total		187

EXHIBIT 6

SW-7634 - ORIGINATING AND
TERMINATING OFFICE BH USAGE

Southwestern Bell

Form SW-7634
(6-79)

SUMMARY OF
ORIGINATING AND TERMINATING
OFFICE BUSY HOUR USAGE
AS OF 12/82

CLASS	LINES	M & EMT	OBH CCS PER LINE	OBH CCS PER M & EMT	OBH CCS
NON COIN	15803	15901	3.12	3.10	49243
COIN	449	449	3.50	3.50	1572
JUNCTORS	(87)	(87)	4.15	4.15	361
TRUNKS					
TOTAL	16252	16350	3.15	3.13	51176
INTRAOFFICE	16252	16350	.34	.34	5585

OFFICE SUMMARY OF CALLS

CCS/M + EMT × M + EMT ≅ 2 IAO CCS + OGT CCS + INC CCS

EXHIBIT 7

SW-7635 - LINE LINK
FRAME DETERMINATION

Southwestern Bell

SW-7635
(Rev. 6-80)

NO. 5 CROSSBAR
LINE LINK FRAME DETERMINATION

End of Period 12/82

M + EMT	16,350		
CCS/M + EMT	3.13		
Design CCS			51,176
Line Terminations - Subscriber	16,252		
- Unavailable	187		
- Total			16,439
CCS/Line			3.11
Design Junctor Pattern LLF 36P TLF 9P Capacity			1,420
Lines Available Per LLF on a CCS Basis			457
LLF Size		490	
LLF Size Minus Unavailable Lines/LLF		485	
Lines Available/LLF@ 95% Line Fill		461	
Total Line Termination Capacity			16,452 *
Total Lines Unavailable			187
Total Administrative Spares			1,001
Total Lines Provided			17,640 *
LLF's - Present		34	
- Proposed		36 *	

Remarks:

* Face Sheet Item

Exhaust Date 9/83 *

EXHIBIT 8

SW-7636 - REQUIREMENTS FOR
EQUIPPED NUMBERS

SW-7636
(Rev. 1-82)

Southwestern Bell

NO. 5 CROSSBAR
REQUIREMENTS FOR EQUIPPED NUMBERS

End of Period 12/82

Type	Forecast	OBJ Fill	Terms Req'd
Residence	13425	95	14132
Business	2323	93	2498
Term Hunt — PBX	55	65	85
— Non PBX			
Centrex Co.			
In-Wats			
Coin	449	96	468
Total M + EMT	16252	95	17183
Trunks (Jctrs & Misc)	87		87
Total Required			17270
Total Provided			18000 *
Nonforecasted	730		
M + EMT Capacity	17069		

Exhaust Date 12/84 *

*Face Sheet Item

EXHIBIT 9

SW-7637 - DIRECTORY
NUMBER ASSIGNMENTS

Southwestern Bell

SW-7637
(8-79)

NO. 5 CROSSBAR
DIRECTORY NUMBER ASSIGNMENT

Number Group Frame	NNX	Directory Number	Type	Quantity
00	221	0000-0999	Non-Coin	1000
01		1000-1999		1000
02		2000-2999		1000
03		3000-3999		1000
04		4000-4799		800
04		4800-4999	Trks & Jctrs	200
05		5000-5999	Non-Coin	1000
06		6000-6999		1000
07		7000-7999		1000
08		8000-8999		1000
09		9000-9499		500
09		9500-9599	Coin	100
09		9600-9699	Coin	100
09		9700-9799	Coin	100
09		9800-9999	Non-Coin	200
10	223	0000-0999	Non-Coin	1000
11		1000-1999		1000
12		2000-2999		1000
13		9000-9099	Coin	100
13		9100-9899	Non-Coin	800
13		9900-9999	Coin	100
14		3000-3999	Non-Coin	1000
15		4000-4999		1000
16		5000-5999		1000
17		6000-6999		1000

EXHIBIT 10

SW-7638 - TRUNK LINK

FRAME REQUIREMENTS

Southwestern Bell

SW-7638
(8-79)
Page 1 of 2

NO. 5 CROSSBAR
TRUNK LINK FRAME CALCULATIONS

End of Period 12/82

APPEARANCES REQUIRED

Type	Present Inst	Present Working	Proposed Addl	Proposed Total	Total Appearances
Intra Office	198	198	19	217	434
Orig. Reg.	58	58	2	60	60
Outgoing	1036	1027	70	1106	1106
Incoming	691	687	44	735	735
Junctors	80	80	7	87	9
Misc.	152	152	18	170	170
Total					2514

NOTE: If present number of working trunks is less than 90% of the total installed trunks, explain by trunk type.

EXHIBIT 10 (Cont'd)

FORM SW-7638

Southwestern Bell

SW-7638
(8-79)
Page 2 of 2

PROVISION

Appearances 2514 ÷ (.90 × Frame Type 160) = 18 Fr Req'd

CCS/LLF 1420 × 2 = 2840 CCS/TLF

Design Load CCS 51,176 ÷ CCS/TLF 2840 = 18 Fr Req'd

TLF Provided 18 *

No. LLF 36 No. TLF 18 Pattern 36P 18P *

Junctor Pattern Capacity = 51,176 * CCS

NOTE: If LLF To TLF Ratio is different from 2 to 1 by more then 1 frame —explain

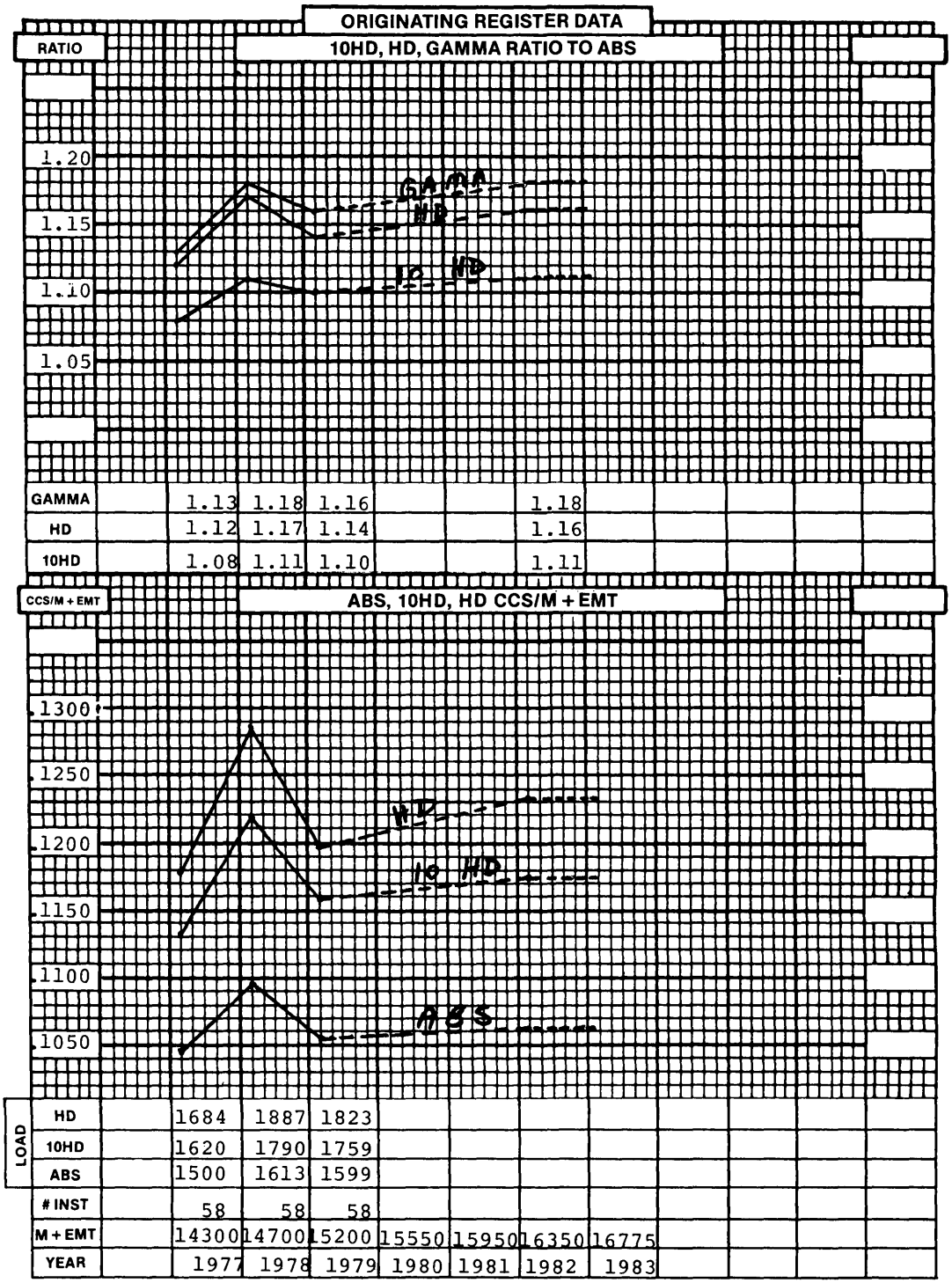
* Face Sheet Item

EXHIBIT 11

SW-7639 - ORIGINATING
REGISTER DATA

Southwestern Bell

SW-7639
(8-79)



GAMMA		1.13	1.18	1.16			1.18				
HD		1.12	1.17	1.14			1.16				
10HD		1.08	1.11	1.10			1.11				
LOAD HD		1684	1887	1823							
LOAD 10HD		1620	1790	1759							
LOAD ABS		1500	1613	1599							
# INST		58	58	58							
M + EMT		14300	14700	15200	15550	15950	16350	16775			
YEAR		1977	1978	1979	1980	1981	1982	1983			

EXHIBIT 12

SW-7640 - ORIGINATING
REGISTER CALCULATIONS

Southwestern Bell

SW-7640
(Rev. 1-82)

NO. 5 CROSSBAR
ORIGINATING REGISTER CALCULATIONS

End of Period 12/82

CCS/M + EMT ABS = .1061

CCS/M + EMT ABS .1061 × M + EMT 16,350 = 1735 CCS ABS

10 HD Ratio 1.11 × ABS CCS 1735 = 1926 CCS 10 HD

HD Ratio 1.16 × ABS CCS 1735 = 2013 CCS HD

90% Gamma Ratio 1.22 × ABS CCS 1735 = 2117 CCS Gamma

PROVISION

Criteria	Table DTS 10HD	HD	GAMA	Quantity* Required	Capacity CCS*
10 HD	5	16	60	60	1940
HD	1.5	4	16	63	2033
GAMA	.5	1	4	66	2138

QTY PROVIDED 63 *

MAIN STATION CAPACITY

Capacity CCS 2033 ÷ (ABS CCS/M + EMT .1061 × 10 HD or HD Ratio) = 16515 M + EMT*

EXHAUST DATE

(M + EMT CAP. 16515 − Forecasted M + EMT B.E.P. 15550) ÷ Growth Rate M + EMT/MO 33 = 29 Months Growth

Exhaust Date 5/83 *

* Face Sheet Item

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EXHIBIT 13

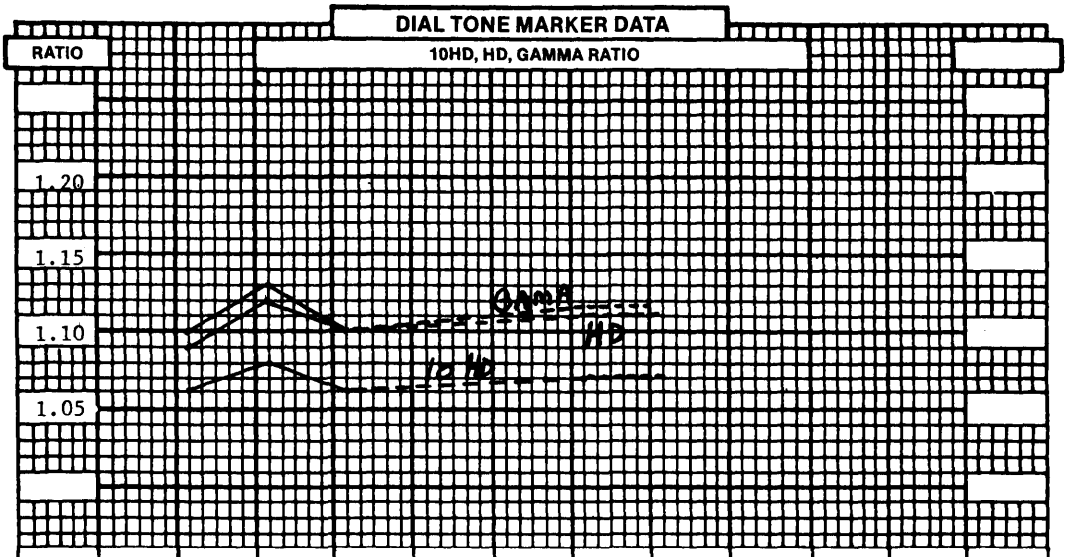
SW-7641 - DIAL TONE
MARKER DATA

Southwestern Bell

SW-7641
(8-79)

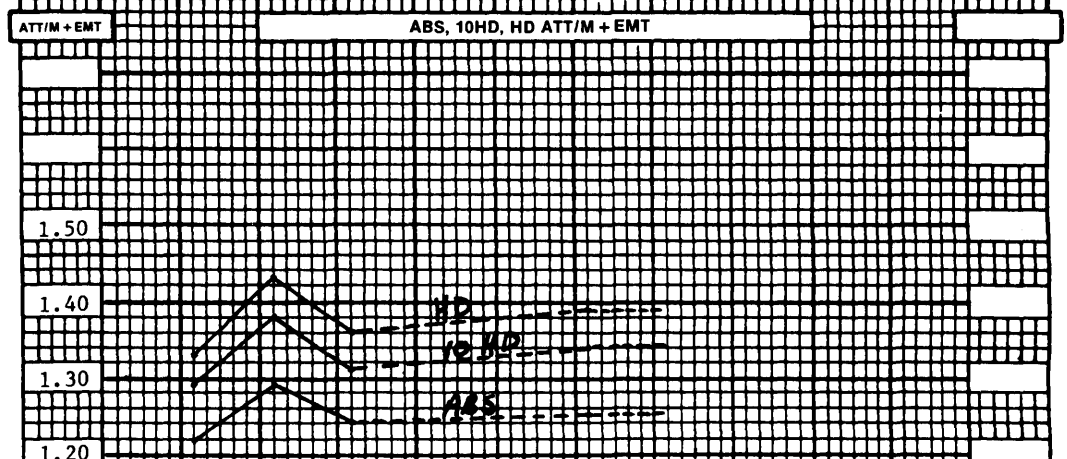
DIAL TONE MARKER DATA

RATIO — **10HD, HD, GAMMA RATIO**



GAMMA		1.10	1.13	1.10			1.115				
HD		1.09	1.12	1.10			1.11				
10HD		1.06	1.08	1.06			1.07				

ATT/M + EMT — **ABS, 10HD, HD ATT/M + EMT**



ATTS											
HD		19035	21041	20689							
10HD		18511	20290	19936							
ABS		17463	18787	18808							
# INST		2	2	2							
M + EMT		14300	14700	15200	15550	15950	16350	16775			
YEAR		1977	1978	1979	1980	1981	1982	1983			

EXHIBIT 14

SW-7642 - DIAL TONE
MARKER CALCULATIONS

Southwestern Bell

SW-7642
(8-79)

NO. 5 CROSSBAR
DIAL TONE MARKER CALCULATIONS

End of Period 12/82

ATT/M + EMT ABS = 1.25

ATT/M + EMT ABS 1.25 × M + EMT 16350 = 20,438 ABS ATT

10 HD/ABS Ratio = 1.07

HD Ratio 1.11 × ABS ATT 20,438 = 22,686 HD ATT

90% Gamma Ratio 1.115 × ABS ATT 20,438 = 22,788 Gamma ATT

Dial Tone Markers Req'd = 3

MAIN STATION CAPACITY

BSP ATT CAP 32,350 ÷ HD ATT/M + EMT 1.39 = 23,273 M + EMT*

EXHAUST DATE

(M + EMT CAP 23,273 − Forecasted M + EMT B.E.P. 15,550) ÷ Growth Rate M + EMT/MO = 232 Months Growth

Exhaust Date A-85 *

* Face sheet Item

EXHIBIT 15

SW-7643 - COMPLETING
MARKER DATA

Southwestern Bell

SW-7643
(8-79)

COMPLETING MARKER DATA

ATT/M + EMT — HD, 10HD, ABS ATT/M + EMT, HD/ABS, 10HD/ABS RATIO — ABS RATIO

1.60
1.40
1.20
1.40
1.30
1.20

HD/ABS RATIO
10HD/ABS RATIO
HD ATT/M+EMT
10HD/ATT/M+EMT
ABS ATT/M+EMT

TOT PC				
HD	21793	23879	23551	
10HD	21450	23514	23365	
ABS	17160	18228	18544	

CCS/M + EMT — HD, 10HD, ABS CCS/M + EMT, HD/ABS, 10HD/ABS RATIO — ABS RATIO

.0095
.0085
.0075
.0065
1.40
1.30
1.20

HD/ABS RATIO
10HD/ABS RATIO
HD CCS/M+EMT
10HD CCS/M+EMT
ABS CCS/M+EMT

LOAD								
HD	122	139	133					
10HD	118	134	130					
ABS	94	103	102					
# INST	6	6	6					
M + EMT	14300	14700	15200	15550	15950	16350	16775	
YEAR	1977	1978	1979	1980	1981	1982	1983	

EXHIBIT 16

SW-7644 - COMPLETING
MARKER CALCULATIONS

Southwestern Bell

SW-7644
(8-79)

NO. 5 CROSSBAR
COMPLETING MARKER CALCULATIONS

End of Period 12/82

CCS/M + EMT ABS = .0068

CCS/M + EMT .0068 × M + EMT 16350 = 111 CCS ABS

10 HD Ratio 1.28 × ABS CCS 111 = 142 CCS 10 HD

HD Ratio 1.31 × ABS CCS 111 = 145 CCS HD

Markers Required – 10 HD = 6

– HD = 6

Markers Provided = 6

MAIN STATION CAPACITY

Controlling CCS 155 ÷ (ABS CCS/M + EMT .0068 × 10 HD or HD Ratio 1.31) = 17416 M + EMT*

EXHAUST DATE

(M + EMT CAP 17416 – Forecasted M + EMT B.E.P. 15550) ÷ Growth Rate M + EMT/MO 3333 = 56 Months Growth

Exhaust Date 8/85 *

* Face Sheet Item

EXHIBIT 17

SW-7645 - OUTGOING
SENDER DATA

Southwestern Bell

SW-7645
(Rev. 7-82)

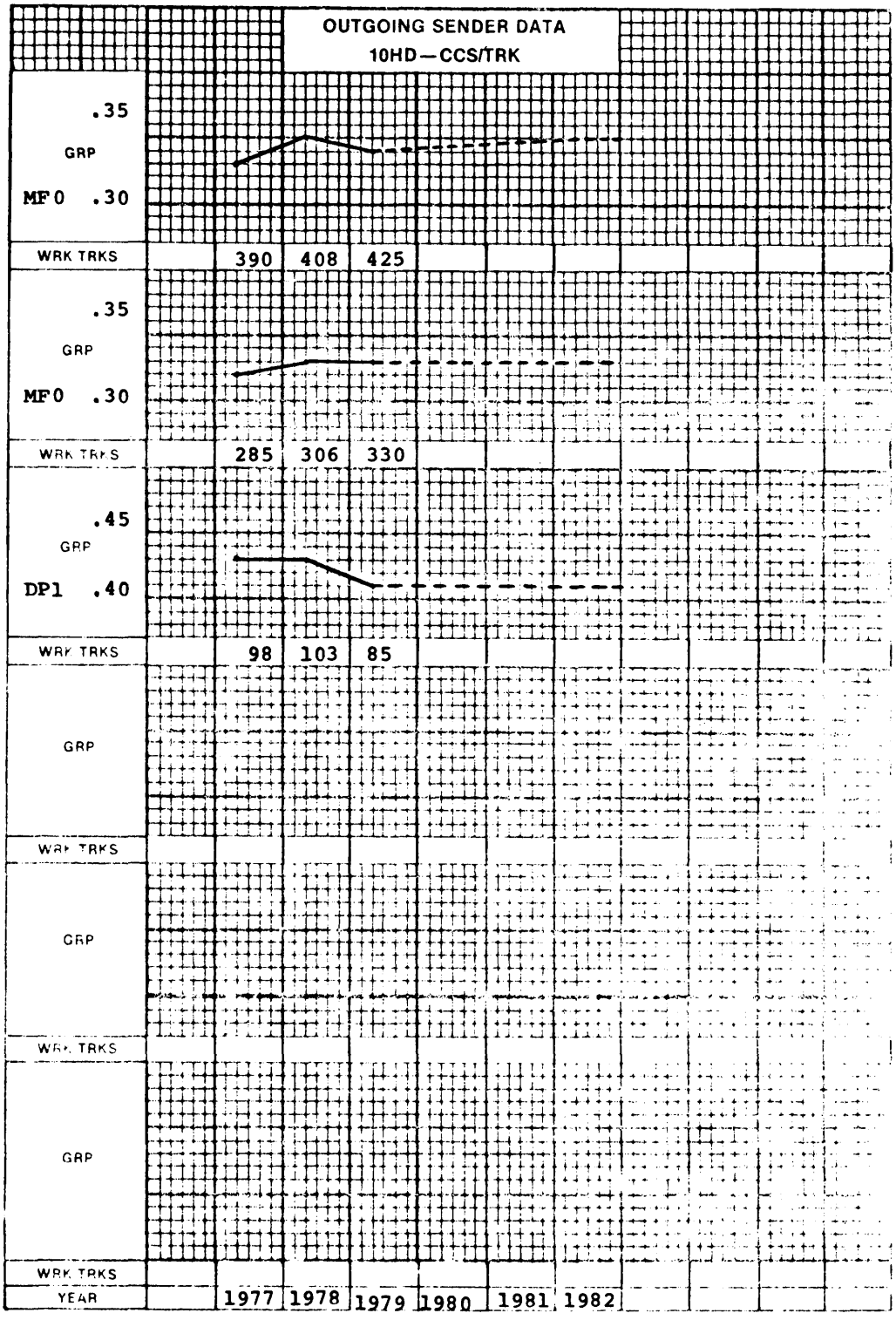


EXHIBIT 18

SW-7646 - OUTGOING
SENDER CALCULATIONS

Southwestern Bell

SW-7646
(8-79)

NO. 5 CROSSBAR
OUTGOING SENDER CALCULATIONS

End of Period 12/82

Sender Group	(MF)0	(DP)1	(MF)2	( )3	( )4	( )5
10 HD CCS/Working Trunk	.35	.36	.33			
Estimated Working Trunks	470	405	85			
CCS/SDR Group	165	146	28			
Senders Required	10	10	4			

EXHIBIT 19

SW-7647 - INCOMING
REGISTER DATA

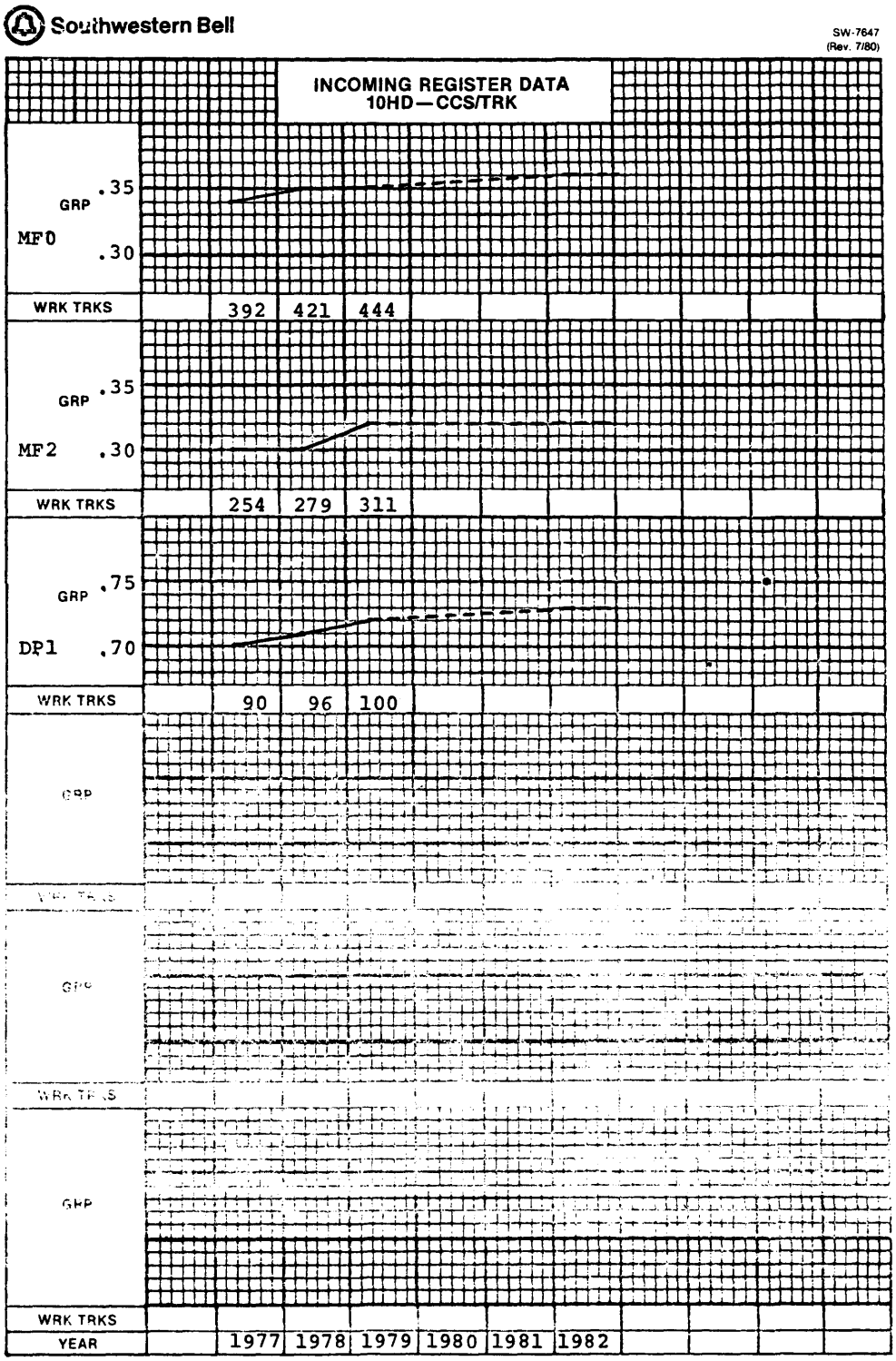


EXHIBIT 20

SW-7648 - INCOMING
REGISTER CALCULATIONS

Southwestern Bell

SW-7648
(8-79)

NO. 5 CROSSBAR
INCOMING REGISTER CALCULATIONS

End of Period 12/82

Inc. Reg. Group	(MF)0	(DP)1	(MF)2	( )3	( )4	( )5
10 HD CCS/Working Trunk	.36	.73	.37			
Estimated Working Trunks	500	123	411			
CCS/IR Group	180	90	152			
Inc. Reg. Required	10	9	9			

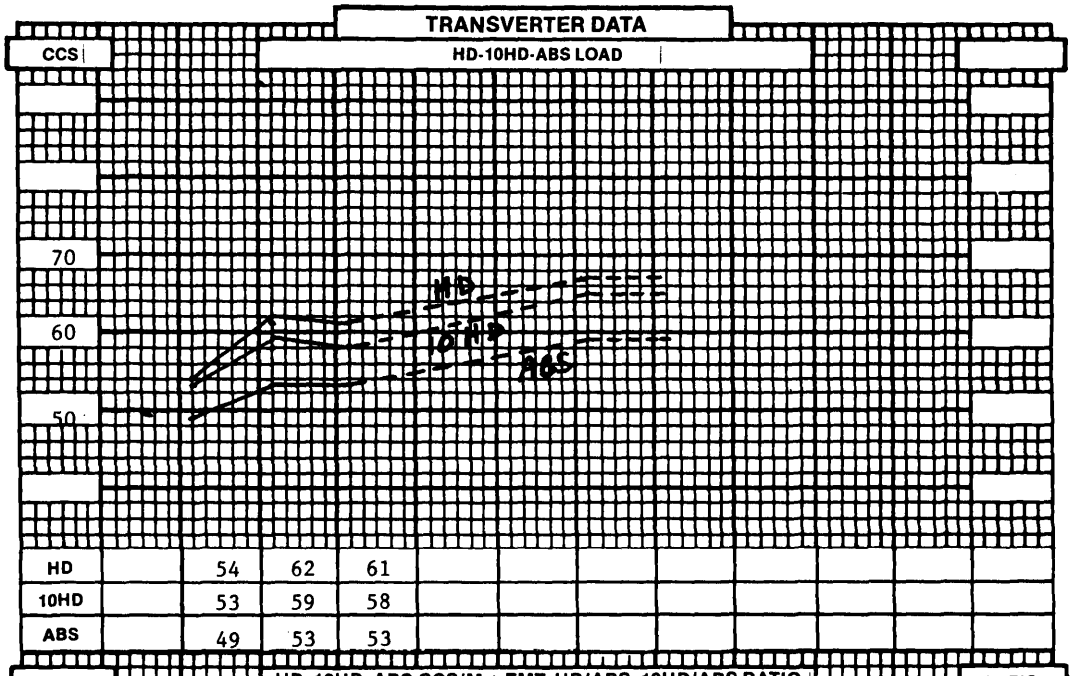
EXHIBIT 21

SW-7649 - TRANSVERTER DATA

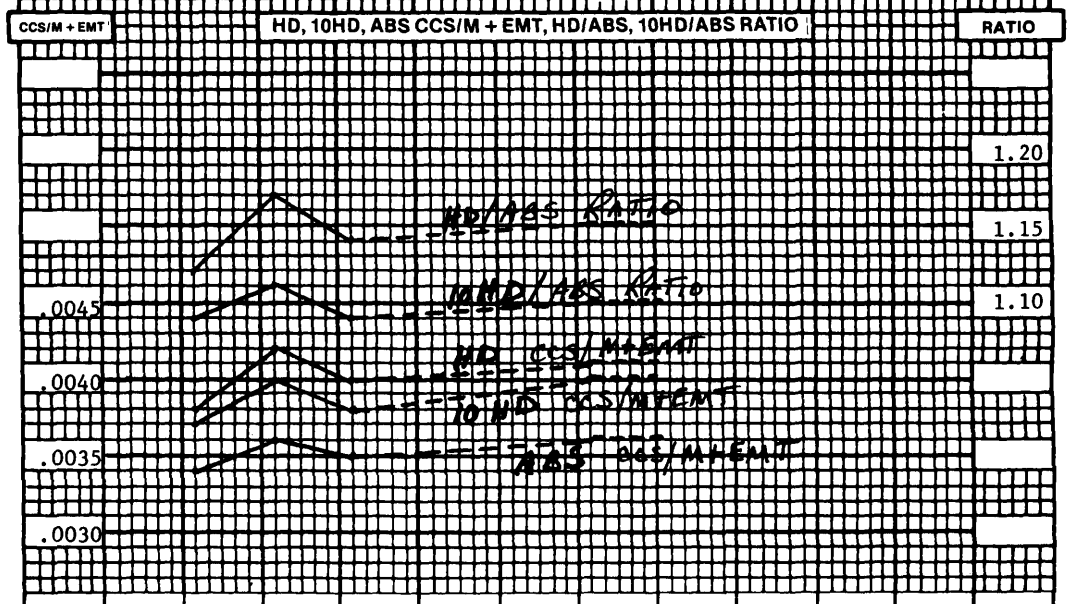
Southwestern Bell

SW-7649
(8-79)

TRANSVERTER DATA



HD	54	62	61
10HD	53	59	58
ABS	49	53	53



HD		.0038	.0042	.0040							
10HD		.0037	.0040	.0038							
ABS		.0034	.0036	.0035							
# INST		3	3	3							
M + EMT		14300	14700	15200	15550	15950	16350	16775			
YEAR		1977	1978	1979	1980	1981	1982	1983			

EXHIBIT 22

SW-7650 - TRANSVERTER CALCULATIONS

Southwestern Bell

SW-7650
(Rev 1-82)

NO. 5 CROSSBAR
TRANSVERTER CALCULATIONS

End of Period 12/82

CCS/M + EMT ABS = .0036

CCS/M + EMT .0036 × M + EMT 16350 = 59 CCS ABS

10 HD Ratio 1.10 × ABS CCS 59 = 65 CCS 10 HD

PROVISION

10 HD CCS 65 = 4 TV WITH 4 TVC*

10 HD CCS 65 ÷ CCS/TV 25.2 = 2.6 TV**

TV PROVIDED = 4

MAIN STATION CAPACITY

NO. TV 4 WITH 4 TVC = 72 TV CCS

TV CCS 72 ÷ TV CCS/M + EMT .0040 = M + EMT CAP. 18000

* Quantities Per BSP 218-060-250 Fig. 1-TV, TVC Capacity Table
** Quantities Per 70% Occupancy

EXHIBIT 23

SW-7651 - BDT DATA AND CALCULATIONS

Southwestern Bell

SW-7651 (8-79)

NO. 5 CROSSBAR
BDT DATA & CALCULATIONS

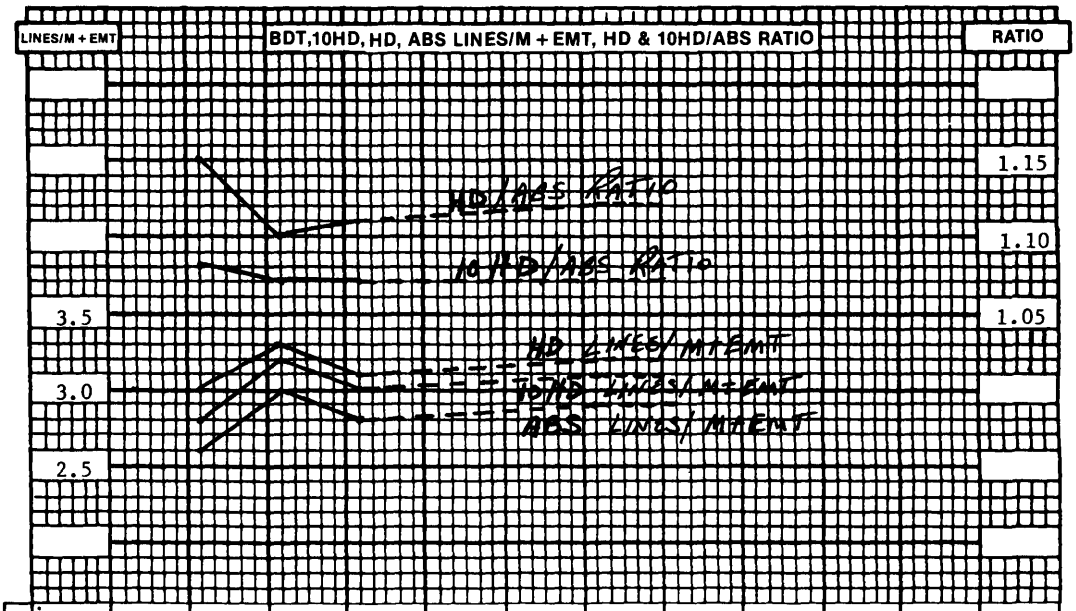
End of Period 12/82

AMA Lines/M + EMT 2.9 × M + EMT 16350 = 47415 AMA Lines

AMA Lines 47415 ÷ 60,000 AMA Lines = .79 BDT'S

No. Recorders 9 ÷ 10 Recorders = .9 BDT'S

BDT'S Provided = 1



LINES												
HD		42900	48510	47120								
10HD		40040	47040	45600								
ABS		37180	44100	42560								
# INST		1	1	1								
M + EMT		14300	14700	15200	15550	15950	16350	16775				
YEAR		1977	1978	1979	1980	1981	1982	1983				

EXHIBIT 24

SW-7652 - IAO AND MISCELLANEOUS TRUNK DATA

Southwestern Bell

SW-7652
(Rev. 1-82)

NO. 5 CROSSBAR
IAO AND MISCELLANEOUS TRUNK DATA

End of Period 12/82

Trk Group	Eng Method	CCS/M + EMT	M + EMT	CCS	Trks Provided
IAO-FR	ABS TAB 10	.313	15408	4823	172
-CN	ABS TAB 10	1.09	449	489	24
-MR	ABS TAB 10	.30	493	148	10
REV CALL	10 HD TAB 1	.375	333	125	11
VAC CODE	10 HD TAB 10	.0039	16350	64	6
INTERCEPT	10 HD TAB 10	.008	16350	131	10
COMB TN-FR	10 HD TAB 1	.019	15901	302	20
-CN	10 HD TAB 1	.218	449	98	10
COM OVFL	10 HD TAB 1	.155	16350	2534	99
PERM SIG	40/MG		16350		20
PERM SIG OVFL	*				
COIN	**				
COIN SUPV	**	.045	449	20	5
COIN JCTR	**				

* BSP 218-060-160 Para 4.15
** BSP 218-060-160 Para 4.19