NETWORK DESIGN ORDER PREPARATION
DIGITAL MULTIPLEX SYSTEM
(DMS-100/200)

CONTENTS PAGE

EXHIBITS

APPENDICES

1. GENERAL

1.01 This Section covers the preparation of a Network Design Order (NDO) for Local Digital Multiplex System-100/200 (DMS-100/200). It specifies a uniform format that should be used for all DMS-100/200 NDO's.

1.02 This practice is being reissued in its entirety to incorporate the vast changes which have occurred in DMS 100/200 switch hardware and capacity-related procedures.

1.03 NDO Preparation (NDOP) requires a knowledge of how the telephone switching equipment functions and full understanding of basic trunking principles. This Practice does not attempt to cover these two items, but assumes that the Network Designers preparing the order have equipped themselves with this knowledge.

1.04 The fundamentals of Network Design as applied to the DMS-100/200 switch are covered in the DMS-100/200 Equipment Questionnaire and Traffic Work Sheets (NT8620). The following practices should also be referred to for additional information:

- o DMS-100/200 Feature Description Manual
- o DMS-100 Technical Specification
- o DMS-200 Technical Specification
- o Northern Telecom Practice (NTP) 297-1001-450 on DMS 100/200 provisioning
- o Southwestern Bell Correspondence File Subject 225.102 and BellCore Letters
- o Remote Line Concentrating Module (RLCM) Equipment Questionnaire, NT8602
- o Remote Switching Center (RSC) Equipment Questionnaire, NT8602

There is a more complete listing, by subject matter, of DMS-100/200 documentation in Appendix A.

1.05 General considerations and Company policies that apply to NDOP are contained herein.

The considerations involved in preparing a NDO may cover all departments, American Telephone and Telegraph (AT&T) Technologies and Northern Telecom, Inc. (NTI). It is important that NDOP be done carefully. This involves:

(a) A full sense of proprietorship.

(b) A full understanding of Company policy as related to quality of service and an 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.

1.06 The art of NDOP 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 NDO are simply one of the tools that the Network Designer may use in applying judgment, and there is no substitute for intelligent judgment. The major decisions made by the Network Designer are in the Basic Data Section, and a NDO can be no better than the Designer's judgment that is applied in the Basic Data Section. COE cannot rectify a poor judgment decision made in the Basic Data Section.

2. ASSUMPTIONS

2.01 This section assumes that the need for a COE job has been determined by recommended Company policy and practices and that it has been properly and accurately scheduled. It is also assumed that a job is included in the current construction budget and that equipment is allocated for it.

3. JOB SIZING AND TIMING

3.01 Every effort shall be made to limit the number of equipment jobs in a given Wire Center to a minimum, with no more than one job within two busy seasons. Trunk relief jobs, integrated digital loop carrier jobs, intraLATA or interLATA switching relief jobs and Operator Services jobs should be coordinated so that they may be scheduled at the same time as the local COE relief job. If the various jobs are scheduled together, close attention must be given to the effect on each job, integrated digital loop carrier, intraLATA, interLATA, etc., before schedule changes are made.

3.02 An engineering period (interval) 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 the equipment involved.

3.03 Two years is the normal engineering interval for a DMS-100/200 switch. This interval should be used as starting point in the design of the DMS-100/200.

The policy on engineering intervals is being reviewed by the Task Force on Market Driven Policies. Its recommendations are scheduled for release during the first quarter, 1988.

The final engineering interval should be based on engineering judgment considering the costs of the various types of equipment, reuse, installation costs, particularly for multiple "re-entry" cost as well as carrying charges for spare equipment.

3.04 The principle of switching component "Harmony" should be considered in sizing a job. The 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 ensure that the job interval, which is based on a switching component exhaust (caused by a common control component), is more economical than if additions or deletions were made to the component which has caused the exhaust.

As an example, if Digitone[R] Receivers are controlling and by adding only one additional Digitone Receiver, the exhaust date will be lengthened by 5 months, it would normally be more economical to lengthen the interval by adding the Digitone Receiver (this assumes that there is no other equipment addition necessary to lengthen the interval and that in five months a major item exhausts or that the other additions are minor enough to still make the longer interval economical). Conversely, if the Digitone Receivers provision breaks over into an additional Trunk Module Equipment Bay by only one receiver, consideration should be given to reducing the provision and shortening the engineering interval if the economics so dictate.

3.05 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. COE 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. A note should be placed in narrative of the NDO face sheet stating a Capacity Exhaust Date (CED) as the first month of the busy season so that the job will be scheduled one month prior to the first month of the busy season. For example, "CED = 1-89" will insure job completion 12-88. Such a note will explain the difference between the calculated exhaust date for the most limiting item and the date the equipment is actually required for service.

3.06 Equipment and facilities are not to be reserved on the basis of the five year forecasts provided by the Interexchange Carrier (ICs). The submission of these forecasts by the IC, following SWBT procedures, improves the likelihood of availability, but does not guarantee it. The forecasts provided by the IC are used as input, compared with SWBT data and combined to form a reasonable forecast which serves as the basis for building an inventory of equipment and facilities consistent with capital constraints and prudent risk.

3.07 If required by the Interexchange Network Access Capacity Coordinator (INACC), the Network Switching Engineering Center (NSEC) will determine switching availability based on inputs from Circuit Administration Center (CAC) and the Demand Forecast Center (DFC). The NSEC will determine whether barriers such as building exhaust might prevent expansion within a two/three year period and evaluate capacity provisioning plans and equipment availability dates in conjunction with the Equipment Engineering Center (EEC). In addition, NSEC should contact Network Administration Center (NAC) to insure that provisioning plans are compatible with office administration.

3.08 The results of the NSEC's analysis will be forwarded to the INACC. Information will include a switching service plan stating how and when capacity will be

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provided (existing or proposed job) or whether special construction is required to satisfy requested service.

3.09 The specific reference to be used by the Network Designers for IC forecasts is the General Trunk Forecast (GTF). The GTF should reflect IC trunk requirements and is the designer's authority for trunk equipment provisioning.

4. TYPES OF NETWORK DESIGN ORDER

4.01 The NDO serves two basic purposes:

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

(b) It is the Network Department's basic record of the equipment and its arrangements relative to the traffic capacity of the equipment and arrangements.

4.02 The NDO is composed of two main components:

(a) The Basic Data section.

(b) The Specification section.

4.03 The Basic Data section of a NDO contains the historical data, future estimates and forecasts, computations, Traffic Growth Chart, Loads and Trends (L&T) Charts and Network Design engineering judgments that determine the basic equipment configurations. In addition, the Basic Data Section quotes the authorities and policies that may be needed for authorization. It also includes the Basic Assumptions which are those elements that define the present and future DMS-100/200 structural arrangements and dependencies. Any other pertinent information of an explanatory nature that may be required for the use of Network Design alone shall be included in the Basic Data Section.

4.04 The Specification section of a NDO covers the detailed equipment quantities and arrangements for those components which are the responsibility of Network Design. The Specification part of a NDO must utilize the standard Northern Telecom DMS-100/200 Equipment Questionnaire, NT8620. The Equipment Questionnaire is to show the Exist (existing), Add (additions, deletions) and Total of DMS-100/200 equipment, usage projections, call projections, etc., determined by Network Design.

4.05 The reproduced copies of the NDO can be made up of pages that have been copied on both the front and back sides. This will eliminate the inefficient use of paper that results from reproducing on only one side of a page.

4.06 There shall be four basic types of NDOs. They are as follows:

A Complete Network Design Order must be issued whenever a physical modification to the office and changes in a Face Sheet capacity occur. It 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 traffic data and equipment quantities of the office. It is easier for the Switching Engineer to work from and insures that essential details of the office will not be overlooked. It is also much simpler for the Network Administrator to use and maintain.

Partial Orders are issued for relatively minor changes or additions to an office when there is no NDO outstanding (unless the outstanding NDO is too close to completion to be supplemented). They are never used when the job will change the Face Sheet capacity or exhaust date of the office. A Partial NDO 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 the changes that were made by Partial Orders issued since the last Complete Order and pages of the Complete Order will be renumbered to eliminate letter suffixes. 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.

A Supplement Order is issued to an outstanding Complete or Partial Order to make corrections, changes and/or minor additions. It shall have the same Order number as the Complete or Partial Order it is 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 can be used to change Talking Channel Capacity, Switching Equipment Capacity, Termination Capacity or Exhaust Dates of an office due to increased (decreased) NAL forecast changes, busy season change for a forecasted usage value etc., on jobs that have not been completed.

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.

4.07 All Complete and Partial NDO's 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 State, Section, or other design group designation. 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

4.08 The Heading of a NDO should always contain the Title, the common Language Location Identification Code, the Service Date, Estimate Request Number and the Construction Management Analysis and Provisioning System (CMAPS) identification number.

Title of a Network Design Order should always contain the following items:

Name of Town and Area
Name of the Central Office
Type of Switching Equipment
A short Descriptive Title

Examples are:

Happytown, OK - Capital, 222 DMS-100/200 add 2000 Lines, 2000 Numbers.

Somewhere, TX - Chestnut, 247 DMS-100 add 1200 Lines, 1500 Numbers.

The Common Language Location Identification - (CLLI) Code, is an 11-character mnemonic code that uniquely identifies a specific location switching equipment is 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 Section 795-000-000 Index listing the Section 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 Department.

Required For Service Date - The date that the job must be in service to fulfill the need for that particular job.

CMAPS identification number is the assigned number of the specific COE job.

Provisioning Forecast [Wire Center Area Forecast(WCAF)] Dated is the date of the Provisioning Forecast used to prepare the NDO. If digital lines involved, list the outside plant forecast date and validation date also. In addition, the date that the forecasts were validated should be entered on this line if the forecasts were issued more than sixty days before the NDO.

Trunk Forecast Dated is the date of the General Trunk Forecast used to prepare the NDO. In addition, the date that the forecast was validated should be entered on this line if the forecast was issued more than sixty days before the NDO. If digital trunks are involved with the job, it should be noted on the NDO facesheet the outside plant forecasts used (T-span and/or Digital Central Office Termination forecast), the dates of these forecasts, and their validation dates.

5. NETWORK DESIGN ORDER PREPARATION POLICIES

5.01 The purpose of this Section is to cover the specific policies and practices that apply to NDOP in Southwestern Bell Telephone Company for DMS-100/200. If there are conflicts between information in this practice and information issued at some earlier date, the information contained in this practice 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 Section-SW includes, however, the policies covering NDOP that were previously set forth in policy letters and memoranda. This Section of the SW replaces and supersedes any such policy letters and memoranda insofar as Network Design Engineering policies are concerned if and only if they conflict with this practice.

5.03 Efficient and effective network design has as its objective the provision of the right kind of equipment at the right place at the right time and in the right quantity to give an objective level (grade) of service to all network customers with a minimum of capital dollar investment. In estimating equipment requirements, the network designer must predict busy hour usage (and/or attempts) at some future point in time, perhaps three or four years away, when the facilities will have been installed and when the growth for which they are provided has been attained.

LOAD SERVICE RELATIONSHIP

5.04 It is the aim, throughout SWBT to provide switching equipment and facilities in such quantity, type and location that there is a reasonable balance between the quality of service rendered and the cost to the Company to give that service. Design methods and the tables which serve as engineering bases have been developed on that relationship.

5.05 Aside from good mechanical and electrical performance in setting up calls and freedom from human error, customers are interested in two principal phases of their telephone service:

(a) The frequency with which connections to the desired telephone are established on the first attempt.

(b) The length of time required to complete the connection.

These areas of customer concern may be restated as several network design considerations:

(a) The elapsed time during which each call occupies switching facilities.

(b) The number of voice channels available in any group to handle the total calls offered.

(c) The efficiency of the groups of channels.

(d) The grade of service which can be provided to a given call load of certain established characteristics.

These considerations must translate to an estimate of future traffic levels that can be handled by the switching office at the desired grade of service. The following service criteria have been authorized in SWBT Central Offices (COs) at the Peak of the engineering interval:

Average Busy Season (ABS) -

Time Consistent Busy Hour

Dial Tone Speed over 3 Seconds	- 1.5%
Originating Matching Loss	- 1.0%
Incoming Matching Loss	- 2.0%

10-High Day

Dial Tone Speed over 3 Seconds - 8.0%

High Day

Dial Tone Speed over 3 Seconds - 20.0%

DEFINITION OF BUSY SEASON

5.06 The busy season for local offices is defined as the three months, not necessarily consecutive, with the highest average time consistent busy hour CCS load per Network Access Line (NAL).

EFFECTIVE USE OF SERVICE RESULT INFORMATION

5.07 Recognition of the fact that network design criteria are based upon averages means that the Network Designer must, as soon as possible after the conversion of a CO, begin to track its service results. These results may indicate a significant deviation in its load/service characteristics from those averages, for which compensation may be indicated in growth additions. For example, an office which is nearing its stated capacity but which consistently performs with 0% matching loss is obviously not as close to its actual switching capacity as one of a similar size and configuration which is experiencing some matching loss. On the other hand, a machine that is continually experiencing noticeable matching loss may need attention even though it has not yet reached the NAL quantity stated as its switching capacity. It is important for the designer to be aware of both the service results condition and its potential effect on customer satisfaction and capital dollar investment. The service results graph for a Central Office can be obtained from the Local Switch Demand and Facility (LSD&F) data base.

LINE, DIRECTORY NUMBER AND SERVICE CIRCUIT PROVISIONING

5.08 Line Equipment - Line terminations will be engineered on the basis of 5% administrative margin for administration and test purposes. In offices requiring lines in excess of the normally provided administrative margin, empirical data should be compiled by Network Administration through regularly scheduled studies as outlined in the appropriate Network Administration practices. In addition, the Line Utilization Monthly Work Sheet - Service Year form should be furnished to Network Design annually or as required for inclusion in the appropriate NDO.

5.09 Line equipment should be provided to service the Provisioning Forecast at the end of the engineering period plus the administrative margin outlined above. In the DMS-100 switch, a Line Concentrating Module (LCM) can terminate a maximum 640 analog lines, including the 1 always set aside for test purposes. The number of lines installed is the total number of line drawer slots for which line cards have been purchased for the job the NDO addresses. "Unusable" or "Unavailable" lines are those wired slots which cannot be used for customer line termination because they are used for: 1 test line/LCM, +48V Power converter cards, Message Waiting Cards, and the additional slot for the type 'D' line cards for IBN data units. If line drawers and slots are wired in excess of what is required for the end of period, but no line cards have been purchased or held in a central location (like the plug-in center), these slots should not be counted as 'installed' or 'unavailable.' If, however, excess line drawers and slots have been wired and equipped with line cards or line cards are being stored in some location (like the plug-in center) until they are needed, these slots should be counted as installed. The plug-in center concept is still under investigation and has not been approved for DMS line cards. Since line cards represent a significant portion of total switch cost, every effort should be made to harmonize equipment provisioning around the LCM breakage.

5.10 The Wire Center Area Forecast (WCAF) as we know it did change January 1, 1984. It is now the Provisioning Forecast and, as such, will reflect the States' Business Plan in addition to the traditional forecasting variables. Prior to January 1, 1984 it was common for Network Designers to apply engineering judgement to the WCAF values and then use those modified values in the NDO. The nature and complexity of Provisioning Forecast requires that NDO modification to it must be approved by the Demand Forecast Center group.

5.11 A "Line Termination Capacity" shall be computed in each office and shown on the Network Design Order Face Sheet (See Exhibit 2). Paragraphs 5.08 and 5.09 should be reflected in the analog line termination capacity calculation as shown in Exhibit 2A. Digital line termination capacity should follow the same basic principle regarding equipped vs. non-equipped line terminations. If the pair gain systems installed are fully equipped, then all terminations should be counted as installed. 'Unavailable' digital lines are those line terminations not available for subscriber assignment due to outside plant forecast/percent fill restrictions. See Exhibit 2A for the calculations.

5.12 Directory Number - A Directory Number Termination Capacity shall be established for each office and shown on the Network Design Order Face Sheet (See Exhibit 2). This capacity should not be controlling.

5.13 Directory Numbers should be provided to service the demand (from the Provisioning Forecast) at the end of the engineering period plus supported administrative margin (i.e., administrative margin must be supported in the NDO).

5.14 Authorized Aging (Intercepting) Intervals - Directory Number Administrative Margin for intercepting, test, and administration should be based on the authorized aging (intercepting) intervals contained in the latest issue of Section 780-200-014.

5.15 Directory Number Administrative Margin - A Directory Number objective of 5% for administrative margin should be used for engineering purposes. In offices requiring an administrative margin other than 5%, actual data regarding disconnect and number change requirements, together with test terminal and administrative margin requirements should be collected by the Administrator and a Terminal Utilization Monthly Work Sheet - Service Year form should be furnished to Network Design annually or as required for inclusion in the NDO.

5.16 The derived % number fill (actual) calculated by Network Administration is not the engineered % number fill (objective). However, Network Design can determine the engineered % number fill using the derived % fill, if provided, and through discussions with Network Administration. The engineered % fill should provide the best economical mix between equipment utilization and administrative margin requirements.

5.17 Trunks and Service Circuits - The provisioning of trunk equipment is explained in Section 6 of the NT8620 Reference Manual. Validated and current analog and digital trunk and T-system/span forecasts should be used to determine analog/ digital trunk peripheral module requirements. (TM, DCM, DTC, MSB, LTC).

5.18 The following criteria should be used to determine quantities for the following service circuits, in conjunction with Section 6 of the NT8620 Questionnaire. Exhibits 2B through 2L are capacity determination worksheets which can be used for determining quantities also.

- MF Receivers - Poisson Table P.01, for ABS; Poisson Table P.05, for HD. (Use greater quantity of MFR's required ABS vs. HD).

- Universal Tone Receivers (UTR's) (for trunks) - Poisson Table P.01, for ABS; Poisson Table P.05, for HD. (Use greater quantity of UTR's required ABS or HD).

- Universal Tone Receivers (UTR's) (for lines) - Poisson Table P.01, for ABS; Poisson Table P.05 for HD. (Use greater quantity of UTR's required ABS vs. HD).

- Digitone Receivers - Poisson Table P.01 for ABS; Poisson Table P.05 for HD. (Use greater quantity required ABS vs. HD).

- Three-Port Conference Circuits - Poisson Table P.01 for ABS.
- Receiver Off-Hook Tone Circuits - Poisson Table P.005 for ABS.
- Digitone Senders - Poisson Table P.01 for ABS.

5.19 Digital Recorded Announcements are required for the recorded announcements in the central office. The memory circuit packs occupy Maintenance Trunk Module (MTM) shelf space and house a maximum of 8 speech memory cards per Digital Recorded Announcement Machine (DRAM). The maximum number of announcements per DRAM is 30, and 64 per office. See Section 6 of the NT8620 for details and use exhibit 2K in this practice to determine capacity.

6. NETWORK DESIGN ORDER ARRANGEMENT

6.01 The NDO should be arranged in the following standard sequence.

(a) Face Sheet

(b) NDO Page Index

(c) Basic Data Section arranged as follows:

- Traffic Growth Chart followed by its supporting data (See paragraph 7.06).
- Local Switch Demand and Facility Chart output from the Local Switch Demand and Facility Data Base System.
- Basic Assumptions, Policies and Authorizations including necessary support data (See paragraph 4.03), as required.
- Summary of the validated Provisioning Forecast used in the engineering of the CO, including outside plant digital line forecasts or forecast summaries. Forecasts/summaries should illustrate cutover through end of period requirements.
- Summary of the validated analog and digital trunk forecasts used in the engineering of the CO. Trunk and facilities summaries should illustrate cutover through EOP requirements.
- Individual hardware component L&T Charts, each followed by their supporting data, as required (See paragraph 7.12).

- o DMS-100/200 Traffic Summary Worksheets, from Section 1 of NT8620. Remote Line Module (RLM)/Remote Line Concentrating Module (RLCM) Traffic Worksheets (if required).

(d) Miscellaneous Information.

(e) Specification section utilizing the standard approved Northern Telecom DMS-100/200 Equipment Questionnaire, NT8620. All sections of the NT8620 should be reviewed carefully, referring to the NT8620 Reference Manual for explanations of each item. Sections normally included in complete orders are: Sections 1, 2, 3 (if TOPS included in job), 4F on AMA and OM information, 5, 6, 7, and 13. The Equipment or Switching Engineer normally completes the other sections.

(f) Specification section utilizing the RLM/RLCM Equipment Questionnaire, NT8602 (if required).

The reproduced copies of the NDO can be made up of pages that have been copied on both the front and back sides.

6.02 The Face Sheet for a DMS-100/200 NDO has two parts which are the Narrative portion and the Summary of Equipment Capacities portion (See Exhibit 1). In addition, see Paragraphs 4.08 for a description of the NDO heading information.

(a) The "Narrative" part of the Face Sheet should state:

- o What is to be done, i.e., major additions, changes or rearrangements.
- o Why it is to be done, i.e., references to approval studies, letters, and authorities.
- o When it is to be done, i.e., current schedules and coordinating jobs.

(b) The "Summary of Equipment Capacities" illustrates the limiting equipment items in the office (See Exhibit 2).

(c) The following definitions apply to Face Sheet terms:

- o Nature of and Necessity for Work. This is the portion of the Face Sheet containing the narrative section. The narrative should identify any special equipment being ordered, i.e., Integrated Digital Loop Carrier, Remote Line Modules, Local Automatic Message Accounting (LAMA), etc., and includes appropriate justification for the item unless the provision of this equipment is covered by policy.

- Lines. This is the portion of the Face Sheet that lists for the present and proposed equipment the following items: the quantity of analog + digital lines installed, the capacity of the installed lines, the NAL capacity of the installed lines and the exhaust date of the installed line equipment. (See Exhibit 2A).

- Numbers. This is the portion of the Face Sheet that lists for the present and proposed equipment the following items: the quantity of directory numbers the office is sized to handle, the NAL capacity of the directory numbers provided and the exhaust date of the directory numbers provided.

- Talking Channels.

  This is the portion of the Face Sheet that lists for the present and proposed equipment the following items:

  The CCS and NAL capacity of analog and digital line talking channels, i.e., CCS capacity of LCM's (Line Concentrating Modules) and SCM's (Subscriber Carrier Modules) provided. See exhibit 2B, "LM & LCM Usage Capacity Worksheets"; and exhibit 2C "SMS Usage Capacity Worksheet."

  See Exhibit 2D for Network CCS and NAL capacity calculations. Should Network NAL capacity end up lower than LCM or SCM talking channel NAL capacity, then Network CCS and NAL capacity should be recorded on the NDO face sheet for Talking Channels. See Exhibit 2E for "Network Termination Capacity Worksheet."

- Switching Equipment

  This is the portion of the Face Sheet that lists for the present and proposed equipment the followng items:

  The CCS and NAL capacity of installed switching equipment, i.e., Digitone receivers, MF receivers, universal tone receivers, data store, or processor.

  Digitone Receivers - Exhibit 2F, "Digitone Receiver for NAL Worksheet," should be used to determine CCS and NAL capacity. See paragraph 5.18 for criteria. (Exhibit 2F-1 is the worksheet for digitone receivers for Mechanized Calling Card Service (MCCS) capacity. TOPS machines only).

  MF Receiver - Exhibit 2G, "MF Receiver Capacity Worksheet," should be used to determine CCS and trunk capacity. See paragraph 5.18 for criteria.

Universal Tone Receivers - Exhibit 2H, "Universal Tone Receivers for Lines Worksheet," should be used to determine CCS and NAL capacity for UTR's - lines. Exhibit 2 I, "Universal Tone Receivers for Trunks Worksheet," should be used to determine CCS and trunk capacity for UTRs - trunks. See paragraph 5.18 for criteria.

Neither MF Receivers nor UTRs should be the limiting item in an office, but, if they are, a NAL capacity will have to be derived for these circuits for the face sheet entry.

Three-Port Conference Circuits - Exhibit 2J, "Three-Port Conference Circuit Capacity Worksheet," should be used to determine CCS and NAL capacity. See paragraph 5.18 for criteria. Three-port conference circuits cannot be a limiting item.

Other service circuit provisioning instructions are detailed in the NT8620, Section 6. These circuits are six-port conference circuits, tone generator circuits, coin detection circuits, receiver off-hook tone circuits, call waiting tone, and digitone senders. These circuits cannot be limiting items.

Processor Capacity - Real time consumption of the main central processing unit and the peripheral processing units can be determined by use of Northern Telecom's PC-based diskette programs. The RTCALC and PRTCALC programs have been distributed to all Network Design groups and should be used to determine main processor (RTCALC) and peripheral processor (PRTCALC) capacity. Instruction binders accompany the programs and should be used for guidance through the programs. Running them requires a personal computer (PC) using LOTUS **1-2-3 software and 640K memory. NTI System Planning Letter 84-03-001, issue #2, dated 11-5-85 explains the manual method for calculating processor capacity. NTI documents explaining peripheral processor capacity calculations are System Application Letter 85-10-001, issue #1, dated 10-21-85 and Switching Engineering Bulletins 86-05-001, issue #1 and 86-05-002 dated 5-5-86 and 5-6-86, respectively. Designers are strongly encouraged to use the computer programs to determine processor capacity. The processor can be a limiting switching item and has a LSD&F letter code (F) associated with it. Section 13 of the NT8620 addresses processor real time and parallels the computer program inputs. Section 13 of the NT8620 should be completed. Designers are also strongly encouraged to review the ACTIVITY (ACT100) data available by command input to a Maintenance and Administration Position (MAP) terminal. This report should be reviewed at least once per month for busy day, busy hour call processing and total processor occupancy. Designers should always be aware of current processor occupancy levels when preparing the NDO.

MEMORY - Northern Telecom, Inc. has an automated dial-up system called MEMCALC which is the basis for program store and data store words/card provisioning. SWBT policy letter 225.1001 dated March 20, 1987 transmitted to all Network Design groups the MEMCALC Manual which explains our inputs and the resulting output of the MEMCALC program. Designers should access the MEMCALC program from a dial up terminal through the Provisioning and Quotation System (PAQS-100) user id and password. Data Store can be a limiting item and has a LSD&F letter code (E) associated with it. Incidentally, the PAQS-100 system is approved by SWBT as a planning tool only--Not as a replacement for the NT8620 order document. A mechanized ordering tool for DMS-100 is currently being developed by NTI.

Talking Channels can be a limiting item for Switching Equipment. If Talking Channels NAL capacity is less than or equal to Switching Equipment NAL capacity, then Talking Channels is shown as the Limiting Switching Equipment Item.

O+T CCS/NAL At Most Limiting Exhaust. This is the portion of the Face Sheet that lists for the present and proposed equipment the 0+T CCS/NAL value at the most limiting exhaust date.

Generic. This is the portion of the Face Sheet that lists the appropriate NTI Batch Change Supplement (BCS) program provided for the present and proposed DMS-100/200 switch.

Most Limiting Component. This is the portion of the Face Sheet that lists for the present and proposed equipment the most limiting item of Lines, Directory Numbers, Talking Channels or Switching Equipment. The Most Limiting Component is the above item that has the earliest NAL exhaust date. If several items have the same exhaust date and NAL capacity, then the most expensive item will be shown as the Most Limiting Component. The code (from the LSD&F Manual) of the most limiting switching item must be entered in the space that is provided. In addition, Directory Numbers, Digitone Receivers, MF Receivers or Universal Tone Receivers must not be the Most Limiting Component unless additional quantities of these items will result in the addition of Trunk Module Equipment frame or Trunk Module.

6.03 Exhibit 2L is a Capacity Analysis Worksheet which can be used to more easily select the Most Limiting Item. Only those items defined in the LSD&F Manual, Section 5, Table 5.02 can be limiting. Until UTR's are listed in the LSD&F Manual, use Digitone Receivers or MF Receivers codes on the face sheet and LSD&F Part B.

7. BASIC DATA SECTION

7.01 The Basic Data section of a NDO contains the historical data, forecasts and future estimates, computations, Traffic Growth Charts, L&T Charts and Network Design engineering judgements that determine the basic equipment configuration. It also quotes the authorizations and policies that may be needed for approvals. Other information that may be required for the use of Network Design alone shall be included in the Basic Data Section.

7.02 The Basic Data Section will contain an array of engineering data. The different data types are the result of the varied engineering requirements of the different components. The measurement terms that are presently in use or proposed for future use in the Design of DMS-100/200 equipment are as follows:

(a) A Study period is defined as one of the following two data collection periods: (1) July-June service months (June 23-June 22), and (2) January-December service months (December 23-December 22). The two data years allow for DMS-100/200 offices with winter or summer busy season. These data years and dates coincide with existing policies for other offices and with the official servicing observing dates.

(b) "Odd Ball" data is defined as data that is not suitable for Network Design purpose and must, therefore, be excluded from the historical data base. The exclusion of data from the historical data base must be coordinated with Network Administration.

(c) Average Busy Season (ABS) is defined as the three months, within the study period, not necessarily consecutive, with the highest average time consistent busy hour load.

(d) Ten (10) High Hour is defined as the ten hours (time consistent) within the study period for which the particular equipment item experienced the highest loads. The highest of the Ten High Hours is referred to as the High Hour for the component in question.

(e) ABS-Busy Hour (BH) is defined as the time consistent hour having the highest average hour load over all business days throughout the busy season.

(f) Component ABS Busy Hour is defined as the time consistent hour having the highest average load throughout the component's busy season. Component and Office ABS and BH need not be the same.

(g) Extreme Value Engineering provides a level of service which is met during the busiest hour of each day for all but three days of the busy season.

(h) Definitions can be found in Section 780-400-230, Section 226-060-400 and Section 226-060-420.

7.03 In order to efficiently and effectively engineer the hardware and software components of a DMS-100, Network Design must have access to the specific types of actual historical call counts and load data that are identified in NT8620 and NT8602. Operational Measurement (OM) data for the DMS-100/200 is available and can be collected and printed on a regularly scheduled basis. Processor occupancy data is also available through generation of the ACTIVITY report discussed in paragraph 6.02. See Appendix A for references on these items. Network Design must coordinate the receipt of the necessary and appropriate historical data from the Network Administration Group that is responsible for the administration of the DMS-100.

7.04 If traffic data is not collected for every potential busy hour of the business day, Network Design must assure that the Network Administration Group is performing the following minimal functions when defining System or Component Study Hours:

(a) Determination of the component busy hour. At least one 5 day study per year should be run during the busy season. This study should be conducted for a minimum of 12 hours for each day of the study.

(b) Determination of the ABS-BH.

7.05 The required engineering data must be forwarded to Network Design at least monthly throughout the study period. In addition, the data should be received, if available, more frequently during the busy season. Receiving the data frequently during the busy season will allow Network Design to react if actual load exceeds previous projected or adjusted projected loads. The work groups that are responsible for the data collection and the data validation function are defined in "Guidelines - Network Data Responsibilities" transmitted February 3, 1982 by the AVP Network Central Office Operations and the AVP Network Central Office Engineering. One task involved in data validation, is the flagging of "Odd Ball" data. However, Network Design as a user of the data should perform data validation reviews on all data that it receives. The validation checks must be performed by Network Design when the data is received. This will permit early correction of identifiable erroneous data.

7.06 Traffic Growth Chart. Probably the most important single decision made by the Network Designer in preparing a Network Design Order is the estimate of ABS BH 0+T CCS per NAL. This estimate is the foundation on which the office is built and determines the basic Switching Capacity of the office. The 0+T CCS/NAL estimate is made only after careful analysis of available historical data, consideration of future trends and plans and the application of intelligent judgment.

7.07 The "Originating plus Terminating CCS per Network Access Line" 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 and their average should be posted to the chart. In addition to posting the actual CCS per Network Access Line data obtained from the studies, the future ABS - BH CCS per Network Access Line shall be trended on the chart.

Instructions for preparing the Traffic Growth Chart.

Originating + Terminating CCS per Network Access Line - The upper portion of the chart shows the historical and trended data for 0+T CCS/NAL. Historical data is 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 vertical "tick marks" on the dotted portion of the chart represents the exhaust date of the present and proposed equipment.

The basis for dial office engineering should be the average time consistent busy hour usage (CCS per Network Access Line) for all business days in the Busy Season (3 busy months) for the Wire Center involved. For offices collecting data on a manual basis, normally five business days of data is all that is provided per month. The X on the Traffic Growth Chart represents the average of the 3 busy months.

NOTE: Business days may be days other than Monday thru Friday.

The trended ABS BH 0+T CCS/NAL must be posted to the End of Engineering Period (EOP) in addition to the three to five years of validated historical data used to develop the trend.

(a) Initial Job

(1) Historical ABS BH CCS/NAL values are developed from the existing office's measured data. The historical ABS BH CCS/NAL values are used to develop a trend of future ABS BH O+T CCS/NAL demand.

(2) Trended ABS BH O+T CCS/NAL, in addition to historical ABS BH O+T CCS/NAL, data are posted to the traffic growth chart.

(3) When historical data is not available and a comparable (similar) DMS-100/200 office's data is used in the NDO, that data must be included as supporting data within the NDO and identified as such in the NDO and on the Traffic Growth Chart.

(b) Growth Job

(1) Measured DMS-100/200 ABS BH O+T CCS/NAL values are used to develop a trend of future ABS BH O+T CCS/NAL demand. Both measured and trended data must be posted to the Traffic Growth Chart.

(2) On growth jobs where three to five years of actual validated DMS-100/200 O+T CCS/NAL data are not available, either previously calculated equivalent DMS-100/200 data or previously used comparable (similar) DMS-100/200 office's data must be used to supplement the available DMS-100/200 actual data.

7.08 Local Switch Demand and Facility Chart Data Base System - The Local Switch Demand and Facility Chart Data Base System (LSD&F DBS) is a computer storage vehicle for COE data as well as a time sharing system utilizing a BCR program. The LSD&F chart is a summary of the COE additions for each switching entity. The LSD&F data base is used to produce LSD&F charts and numerous reports in order to evaluate various aspects of COE planning and capacity management.

7.09 All DMS-100/200 capacity changes will be reflected on the LSD&F charts. It is imperative that changes in COE schedules and capacity be kept up-to-date and as accurate as possible in the LSD&F DBS. In most areas, local policy requires inclusion of the LSD&F Part B and/or Part A graph. Local policy should be followed for these items.

7.10 Lines and Directory Numbers - The lower portion of Exhibit 3 shows the historical trend in Lines and Directory Numbers growth as well as office capacities. The office capacities to be shown are Line Terminations; integrated digital loop carrier lines and analog lines shown separately. In addition, capacities expressed in Lines and Directory numbers are to be shown. Actual Lines and Directory Numbers growth are indicated by the solid portion of the "point graph." The most recent Provisioning Forecast of Lines and Directory Numbers growth are 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 (in Exhibit 4).

7.11 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 required for service date of the job that is being written and the required for service date of the next job in the appropriate month on the chart. This also makes it possible to show actual study months and usage data for these months. In evaluating the Usage per Network Access Line, 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.

7.12 Load and Trend (L&T) Charts should be provided in the NDO for all traffic load sensitive items. The charts should be done for all service circuits listed in paragraph 7.15.

A minimum of three (3) to five (5) years of historical data is required to be posted to the L&T Charts. To facilitate the posting of the historical data to the L&T Charts, the following must be performed.

(a) A Study Period must be defined for the DMS-100/200.

(b) The appropriate data is collected during the Study Period. The data is then posted and summarized (either in tabular form or graphically) for each month of the study period. Exhibit 5 can be used to post and summarize historical and projected Load and Load/NAL data.

(c) The appropriate Study Period load data (ABSBH, ABS Component Busy Hour, etc.) are posted on the L&T chart along with their associated ABS NAL and CCS/NAL. Exhibit 6 illustrates a completed form.

(1) Load data is entered on the L&T Chart (Exhibit 5) as a graphical data point and as a tabular value.

(2) NAL data is entered on the L&T Chart (Exhibit 5) as a tabular value.

(3) Component load/NAL data is obtained by dividing the appropriate study period load by the appropriate study period NAL. Component load/NAL derived data is posted as a tabular value and as a graphical data point on the L&T Chart.

7.13 When historical load and/or Load/NAL data is not available, data from comparable (similar) DMS-100/200 office may be used to engineer the DMS-100/200. When such data is used in the engineering of the DMS-100/200, that data must be included within the NDO as supporting data as if it were from the actual site, but identified as comparable data in the NDO and on the L&T Charts.

Projected loads posted to the L&T Charts are determined as follows:

(a) Historical loads/NAL (actual or similar DMS-100/200 office derived values are trended from Cutover to five years in the future.

(b) Historical NAL and projected NAL (projected NAL from the Wire Center Area Forecast) are entered to cover the historical and projected data years.

(c) Projected loads for each projection period are derived by multiplying the trended load/NAL by the projected NAL.

7.14 A capacity line must be drawn on the L&T Chart for each hardware item. The capacity line is determined using the capacity of the components provided for traffic; i.e., service circuits provided for service protection are not included when determining capacity.

Historical data must be projected (trended) from the Job Completion Date to five years in the future. Embodied in the trending and the eventual use of the trended data is the assumption that factors that affected the historical demands will similarly affect future demands. However, if the historical factors are changing, adjustments (decreases or increases) must be made to the projected load.

Example: The usage demand on Multi-frequency receivers is trendable, and SXS Central Office replacements occur during the job life. Adjustments must then be made to the trended MF Receiver usage to account for the additional usage that will result from the SXS to ESS Central Office conversions.

Also, adjustments for additional loads or reductions of loads that are the result of new service offerings must be made in the projected loads.

7.15 Whenever possible, projected loads must be calculated from projected NAL and load/NAL data. These loads must be adjusted for changing historical factors and/or new service offerings or managerial judgements (see previous paragraphs). Sometimes it is not possible to derive projected loads from trended historical data. Such situations arise from the installation of new types of service circuits, new site without similar site data, and/or lost/destroyed data. These situations require the use of formulas to determine future quantities. Supporting data must be provided to justify all components (call counts, holding times, acceptance rates, etc.), used in the formulas. The values used in the formula must be supported in the NDO for the future period. The supporting data consists of the formula variables' historical data, trends and adjustments, growth rates, calculations, etc., and appropriate managerial judgements.

Supporting data in addition to the L&T Charts, must be provided in accordance with Paragraph 7.16.

Equipment Components that require L&T Charts.

(a) Hardware L&T Charts

(1) MF Receivers

(2) Digitone Receivers

(3) Conference Circuits

(4) Universal Tone Receivers

7.16 Supporting data including calculations and worksheets justifying the projected loads, NAL terminations, lines, memory quantities, etc., and adjustments to these projected items should be included in the NDO. This supporting data should include previous years' measurements, developed historical growth factors, explanations of variation in past trends, forecasted growth factors used, etc. Appropriate projections should be adjusted for new features, as well as new policies and procedures.

In addition, this data, adjustments, explanations, etc., should be summarized, perhaps in narrative paragraphs, in such a way as to clearly justify the forecasted loads, ratio, etc. Supporting data older than three (3) previous busy seasons is highly desirable even if it is the data of the replaced office converted to DMS-100/200 equivalent type data.

8. DETERMINATION OF EQUIPMENT QUANTITIES

8.01 Supporting data requirements for the provisioning of DMS-100/200 equipment quantities are defined in earlier paragraphs of this Section-SW. In addition, the capacity line drawn on the service circuit L&T Charts is the capacity of the circuits provided for traffic (i.e., service circuits provided for service protection are not used to determine capacity). The policy is to provide one additional service circuit pack of each type for service protection.

8.02 Network Design uses the NT8620 to determine equipment quantities and capacities. In addition, Network Design must satisfactorily resolve through Switching Engineering any discrepancies that exist between the equipment that is determined (provided) by NTI and the equipment that was determined by Network Design using the NT8620. An interdepartmental meeting of SWBT groups (Network Design, Swg. Engrg., Ntwk. Admin. & Mtce.) with NTI Engineering should be held at least six weeks prior to the ship date to resolve any conflicts with the pending job.

8.03 Trunk summaries, calculations and supporting data for trunk provisioning must be included in the NDO. Trunk quantities contained in the General Trunk Forecast must be validated with the trunk forecaster before inclusion in the NDO if the forecast is older than sixty days. In addition, up to 5% additional trunk circuits (in excess of the Trunk Forecast) may be provided for administrative margin. This 5% administrative margin is not to be applied on a trunk group by trunk group basis, but by trunk circuit type. Also, any digital trunk or line forecasts should be included in the NDO and validated if older than sixty days. The same spare requirements can be applied to these digital forecasts. Validation dates should be noted on the NDO face sheet for all demand and facility forecasts used if older than sixty days.

8.04 The following list of interesting DMS-100/200 facts are provided for your use and information. This list is by no means all inclusive:

- Each input (receive) and output (transmit) of DMS carries 32 time division multiplexed channels of speech and signalling information. 30 Channels (PCM) + 2 Channel Control Messages, i.e., DS30 links.

- Speech Links are the talking paths between the various peripheral modules and the network. They are provided as follows:

  Line Module (LM) - 2 to 4 DS30. See Exhibit 2B.

  Line Concentrating Module (LCM) - 2 to 6 DS30A. See Exhibit 2B.

  Trunk Module (TM) - 1 DS30

  Digital Trunk Controller (DTC) - 4 to 16 DS30

  Maintenance Trunk Module (MTM) - 1 DS30

  Subscriber Carrier Module (SCM) - 3 to 16 DS30. See Exhibit 2C.

  Digital Carrier Module (DCM) - 4 DS30

  Message Switch Buffer (MSB) - 3 to 4 DS30 for Signalling System 7 (SS7)

- The LCM and MSB interface with the Line Group Controller (LGC). The LGC then interfaces the network modules via 3 to 16 DS30 links. Details on the above mentioned peripherals can be found in NTP 297-1001-450 or the DMS100 Technical Specification document. The NT8620 Reference Manual should also be used when completing the NT8620.

- The designer should read these documents to become familiar with each equipment component, how each component interfaces each other, and how to calculate quantities. However, here is a summary of quantity determination guidelines.

- LM - Line Module - earlier vintage which terminates 639 subscriber analog lines. Number of speech links to the LGC based on CCS per line. Number of line modules based on subscriber terminations required to meet end of period forecast plus spare and the CCS per line limitations. See Section 5 of NT8620 and associated NT8620 reference manual. Number of speech links determines line concentration ratio.

- LCM - Line Concentrating Module - latest vintage which also terminates 639 subscriber analog lines. Quantity considerations similar to those for LM, but different speech link capacity tables for interfacing to LGC. Different line cards - types A, B, C, and D - are provided for subscriber terminations as well as E type cards for message waiting lamps.

- LGC - Line Group Controller - the peripheral which interfaces the LCM/Remote LCM, RSC's to the network. The number of LGCs provided is based on the number of LCMs, RLCMs and RSCs and the CCS per line generated by these components. Table 5C in Section 5 of the NT8620 Reference Manual explains speech link and LGC port provisioning.

The NTI LGC (peripheral) processor real time calculation program should be used to assess real time available in LGC processor.

- SCM - Subscriber Carrier Module - terminates either DS-1 remote concentrator terminals (RCT) or SLC-96 digital subscriber line facilities. Interfaces with the network via speech links whose quantities are based on the number of digital systems and the desired concentration ratio. See Section 5 of NT8620.

- TM - Trunk Module - terminates up to 30 analog trunks. No concentration. See Section 6 of NT8620.

- DTC - Digital Trunk Controller - terminates up to 480 digital trunks. No concentration. See Section 6 of NT8620.

- MTM - Maintenance Trunk Module - terminates test and service circuits and digital announcements. Maximum 24 circuits per MTM. See Section 6 of NT8620. Digital Recorded Announcements (DRAM) also occupy MTM's. See Section 6 of NT8260 and paragraph 5.19 of this practice for details.

NOTE: TM's and MTMs have restrictions for assigning both types of modules on the trunk module equipment frame. This is due to heat dissipation. Again, see Section 6 of NT8620.

- Memory - The DMS 100/200 has two main memory components - Program Store for the generic and basic program information; and Data Store, for transient call data information. Memory is provided by using Northern Telecom's MEMCALC program. This program requires inputs of switch data by the designer with the assistance of Network Administration. The output of the program estimates the number of program and data store cards required. See paragraph 6.02C of this practice.

- Input/Output Controllers - Provide interface for magnetic tape units, disk drive units, and video display terminals and printers. Section 4 of the NT8620 and associated reference manual contain information on providing

this equipment. Normally, the switching engineer completes this section, but the designer should coordinate with the switching engineer. Input/output devices can affect the real time of the processor.

- The Network Designer is responsible for completing the NT8620. However, some of the inputs such as the type and quantity of test circuits, must be obtained from the Switching Engineer. In addition, trunk quantities are obtained from the General Trunk Forecast.

- Whenever possible, actual busy hour ratios and holding times should be used in place of the representative values that are provided.

- DMS Service Circuits are packaged in printed circuit cards which generally mount on Maintenance Trunk Modules (MTM). With the exception of Digital Echo Suppression Cards, service circuits are not plug-in provisionable and specified quantities should reflect requirements for the busy season prior to exhaust.

- Peripheral Module Types. With four exceptions, all service circuit cards mount on MTMs only. The exceptions are:

  - Digital Echo Suppression cards which mount on Digital Echo Suppressor Shelves (DES).

  - Three-port Conference Circuit cards and MF and Digitone Receiver cards which mount both on TMs and MTMs. (Note: Six-port Conference Circuit cards mount only on MTMs.)

- Service Circuits (Not a complete list).

  - MF receivers.
  - Digitone receivers.
  - Universal tone receivers.
  - Receiver Off-Hook Tone Circuit.
  - Call Waiting Tone.
  - 3 port conference.
  - Six-port conference.
  - Scan Circuits.
  - Signal Distributor Circuits.
  - Digital Recorded Announcements.

- The service circuit blocking criteria are listed in para. 5.18 of this practice.

- o NT8602 Questionnaire - RLCM & RSC Questionnaire. Provisioning guidelines for Remote Switching Centers and Remote Line Concentrating Modules are in the NT8602.

8.05 Digital Loop Carrier - The process required for provisioning Digital Central Office (DCO) line equipment capacity when integrated Digital Loop Carrier (DLC) is involved is more complex than the traditional analog central office process. It is more complex than the current process because there are two line equipment networks to equip, one for lines served via integrated DLC and one for analog line terminations (non-integrated DLC and analog subscriber lines). The demand in terms of lines served by each network depends on the amount of integrated DLC deployed. This means that an increased, ongoing, interactive provisioning and tracking effort between the Distribution Services Planning Center (DSPC) and the Network Switching Engineering Center (NSEC) will be required to support the NSEC DCO line equipment provisioning process.

8.06 Information Letter (IL) 83-10-091 contained recommendations to efficiently and effectively integrate DLC/DCO technology. The letter identified six major areas to consider when a DLC is working out of a DCO. First, the NSEC has two networks of line equipment to manage with the size of each dependent on planning decisions. Second, integrated DLC is generally economic (in terms of first cost) relative to non-integrated DLC regardless of switch utilization impact. However, this statement applies to typical DCO based on full allocated costs, and does not reflect certain costs such as breakage costs associated with investments in large equipment capacities for relatively small demand and existing Central Office Terminal (COT) reuse cost factors. In addition, the first cost comparisons do not include any additional administrative costs, such as those costs associated with the methods outlined here and/or further described in IL 83-10-091. IL 85-07-008 dated 7-15-85 and GHQ letter 225.0801 dated 5-14-84 further discuss the impact of IDLC on traffic sensitive components. These later letters further emphasize the points made in IL 83-10-091.

8.07 The third area addressed in IL 83-10-091, DCO line utilization, job sizing and job timing are directly impacted by DSPC planning activities. Joint up front coordination by Network Planning, DSPC and the NSEC will result in efficient use of Company resources and reduce the cost of implementing integrated DLC. One method that can be used to institute this joint provisioning process is for the DSPC and the NSEC to notify each other and Network Current Planning when either one is starting to design a future job/installation. This can help eliminate some of the costs associated with:

(1) Accelerated integrated DLC growth that results in trapped analog line termination capacity. Through joint coordination by the DSPC and the NSEC the DSPC may be able to bring in non-integrated DLC, thereby utilizing the trapped analog line termination capacity and reducing the associated cost.

(2) Timing of the DLC jobs such that analog capacity is provided for short duration time-periods and that the increased analog capacity provided with a DCO job addition would not be utilized through-out the engineering period. Joint provisioning would time the DLC jobs so that any additional analog DCO capacity provided would be minimized and utilized through-out the engineering period.

(3) A DCO equipment addition that is the result of integrated DLC line termination exhaust only. Through up front provisioning by the DSPC and the NSEC, the DSPC may be able to increase the percent fill at relief at the DLC without affecting customer service. This increase in the percent fill at the DLC could postpone the need for a DCO addition and thereby eliminate some of the costs associated with an interim job.

8.08 The fourth area addressed in IL 83-10-091 is that NSEC engineers will be working with two forecasts, neither of which may be as accurate as the previous single wire center forecast. Fifth, there is a clear need for DSPC and NSEC engineers to establish an improved, ongoing working relationship. And sixth, there is a need to educate people regarding the economic deployment of integrated DLC/DCO technology.

Three major recommendations that were not listed in the above paragraph are:

(1) The DSPC should provide five-year forecasts of integrated DLC system, DLC systems' mode of operation, and associated lines served on each system to the NSEC.

(2) The NSEC should track both analog and integrated digital lines on the Central Office (CO) D&F Facility Chart in addition to the total number of lines per IL 83-10-091.

(3) The use of different authorized compatible vendors' integrated DLC equipment in a DCO to increase equipment utilization. For example, if the ultimate forecasted line growth is 80-100 lines, it may prove economical, as well as efficient to install a 100 line size pair gain system instead of one sized for 200 lines or greater.

If the forecasted line growth on an integrated DLC does not materialize and the overall DCO line growth is as forecasted, the result will most likely be shortage of analog line terminations. To reduce the risk of an equipment shortage the recommendations listed in above paragraphs should be implemented.

However, if a shortage does result the NSEC must balance service quality against cost as it determines how to resolve the shortage.

8.09 Because the split of analog and digital lines is a function of Distribution Services' planning decisions and customer growth patterns, there is some flexibility to manage this analog and digital line split. This flexibility is expected to develop into an important aspect of provisioning and utilizing the DCO line equipment. The increased forecasting uncertainties will result in increased potential for central office line equipment exhaust problems earlier than planned. Rather than add lines or advance a costly general addition to a DCO, it may be economical and desirable to "influence" the split in analog and integrated carrier lines by taking advantage of the dual connectivity or by providing some increased line equipment margin or by providing adequate standby equipment at a centralized inventory location. Several questions may be posed to resolve the split in the lines forecasted. Two such questions are:

(1) Is it more economical to delay the installation of additional integrated DLC until all available analog capacity is utilized?

(2) Is it better to go ahead and make a digital switch addition to accommodate new integrated DLC?

There are many issues that must be considered by both the NSEC and DSPC, not the least of which are the demands of our customers. Therefore, it is imperative that these groups work together at each decision point to make the most economical and practical choice.

(1) Manage the analog and integrated DLC line split. A situation that may require management of the analog/digital split is that of noncoincident exhaust of the analog and digital capacity components which could result in premature exhaust of the DCO (all DCO equipment capacities considered). A carrier serving area (CSA) may have dual connectivity back to the digital switch, that is, there is the option of connecting a circuit via copper pair (analog) or a digital loop (carrier). If the analog and digital capacities exhaust at different times, then an economic decision should be jointly reached by NSEC, DSPC and Network Planning.

(2) Advance a Central Office Equipment (COE) job or portions of a COE job.

(3) Provide spare COE analog and/or integrated DLC COE frames.

(a) Frames may be fully equipped.

(b) Frames may be equipped when needed to provide service.

(4) Provide spare pair gain facilities.

(a) Placing an integrated DLC unit in the CO with terminations on the MDF is one method of eliminating a shortage of analog CO line terminations.

(b) Placing a Central Office Terminal (COT) unit in the CO is one method of utilizing excess CO analog line terminations.

NOTE: Alternative 4b could also apply to routes served by fiber because the T1 lines can be pulled off at the multiplexer and directed to COT's or digital CO terminations.

(5) Advance a Distribution Services job or portions of a job.

(a) Shortage of digital equipment.

(1) Advance outside digital carrier facilities.

(2) Advance integrated DLC equipment.

(b) Shortage of CO analog lines.

(1) Advance integrated DLC jobs in other sectors of the Wire Center.

Network Planning, Network Design and Distribution Services must economically choose between the above items as well as any other feasible alternatives. In addition, services requirements may also be a factor in selecting alternatives.

8.11 Though equipment shortages can and do at times result in a decrease in the quality of service we offer to our customers, we must also be concerned about the affects of underutilized equipment. If it is not possible to coordinate DCC and integrated DLC jobs and this inability results in underutilized equipment, then consideration should be given to removing frames that cannot be used during the life of the office.

9. CAPACITY DETERMINATION

9.01 The rules for determining component capacities for a DMS-100/200 switch are outlined in the NTI-8620 series documents. Quantities used in the NDO to determine capacities must be supported in the NDO. In addition, capacity determination is also addressed in Paragraph 6.02 (b-c) and Exhibit 2.

9.02 The initial NAL capacity of the custom calling features in the DMS-100/200 is determined by the amount of memory that was provided for the forecasted quantity of the specific custom calling service. In addition, if the custom calling service requires hardware service circuits, that circuit may impose a NAL capacity that is different from the one set by memory. In this case, the most restrictive NAL capacity is limiting.

Because the Most Limiting Component's NAL value sets an upper limit for central office capacity, the NAL capacity of any custom calling service (speed calling 8, speed calling 30, 3-way calling, call waiting, call forwarding, remote call forwarding or Touch Tone^{R}) should not be greater than the Most Limiting Component NAL capacity.

9.03 Several methods exist for determining the capacity of the custom calling services. The methods that are listed below are for determining the capacity of custom calling services for an office that has been designed using the appropriate design criteria. Custom calling services capacity determination methods are not to be used for determining equipment quantities.

METHOD 1

(a) Assume 100% acceptance of all custom call features, i.e., each Main Telephone (MT) at most limiting exhaust has every custom calling feature.

(b) Recalculate EOP equipment quantities, but substituting the EOP MT value for each of the custom calling features MT requirements. If the amount of DS memory required is less than or equal to the quantity that is to be provided then each EOP main telephone can have every custom calling feature. Main Telephones with the 3-way calling feature and/or the Digitone feature are exceptions, since service circuits are required to offer these features. However, if sufficient pack vacancies exist to provide the appropriate service circuit, then the exception can be removed by writing a NDO to add the appropriate circuit pack. The addition of equipment must be supported in the NDO (i.e., equipment is not added just for capacity, equipment is added to handle forecasted service demand throughout the engineering interval).

METHOD 2

(a) Assume that the percent acceptance for each custom calling service is equal and is less than 100%. Also assume that the number of MTs that have every custom calling service is less than the EOP MT capacity of the office.

(b) From (a) above, the number of MTs having each customer calling feature are equal (i.e., /2132 MTs with speed calling, /2132 MTs with 3-way calling etc.). In addition, the number of MTs for each custom calling feature is less than EOP MT capacity of the office. As in Method 1, recalculate EOP equipment quantities, but substituting the number of MTs (from (a) above) that will be assumed to require the specific custom calling features. If the amount of DS memory required is less than or equal to the quantity that is to be provided then MTs used above will be one limit for custom calling service. For a realistic limit the MTs used should be as close to EOP MT limit of the office as possible without exhausting DS memory requirements.

In addition, the custom calling service limitation may be less than that indicated in the above if the service requires a hardware service circuit, since the hardware service circuit may be limiting. However, if pack vacancies exist to provide the appropriate circuit packs, the circuit may not be limiting. The addition of equipment must be supported in the NDO (i.e., equipment is not added just for capacity, equipment is added to handle forecasted service demand throughout the engineering interval).

METHOD 3

(a) A different percent acceptance can be assumed for each custom calling service and this acceptance applied against the offices EOP MT capacity. These values can then be applied to the process outlined in Method 2(b) with the understanding that the number of MTs having each custom calling feature may not be equal. The three methods are shown in the order of lease difficult to most difficult; Method 1, Method 2 then Method 3. If the conditions in Method 1 hold then the capacity of each custom calling feature is equal to the EOP MT capacity of the office. If the conditions in Method 1 do not hold, then either Method 2 or Method 3 can be used to determine custom calling service capacities. However, in no case should the custom calling service percent acceptance that is used yield a custom calling service MT quantity that is less than the project EOP working custom calling MT forecasted (from Wire Center Area Forecast). Custom calling service must be included in the NDO, Exhibit 7 can be used for this purpose.

10. REMOTE LINE CONCENTRATING MODULE NETWORK DESIGN ORDER

10.01 A Remote Line Concentrating Module (RLCM) NDO must be issued for installation of a new RLCM, modifications to an existing RLCM and for the removal of a RLCM. These orders must be separate from the DMS-100/200 order. However, the information required to construct the RLCM NDO must be contained in the latest DMS-100/200 NDO, including calculations, historical data, questionnaire, etc., and need only be duplicated as required for inclusion in the RLCM NDO. The Face Sheet for the RLCM should contain the following:

(a) The RLCM NDO Basic Data Section requirements are defined in paragraph 7 of this Section.

(b) Summary of Equipment Capacities - Lines is determined using equipped lines at the RLCM.

(c) Summary of Equipment Capacities - Directory Numbers is defined as the quantity of RLCM Directory Numbers allocated in DMS-100/200 memory.

(d) Summary of Equipment Capacities - Blank can be used as you so desire.

Exhibit 8, "RLCM Usage Capacity Worksheet," can be used to determine RLCM capacity and provisioning requirements.

10.02 Remote Switching Center (RSC) Network Design Order - An RSC NDO must be issued for the same reasons as for RLCM. The NT8602 is the correct order document to use. Exhibit 9, "RSC Usage Capacity Worksheet," can be used to determine RSC capacity and provisioning requirements.

11. SPECIFICATION SECTION

11.01 The Specification section of a NDO covers the detailed equipment quantities and arrangements for those components which are the responsibility of Network Design. The Specification part of a NDO must utilize the standard NT8620 or NT8602 Equipment Questionnaire, whichever is applicable. The Equipment Questionnaire shows the existing, additions or deletions, and proposed quantities for DMS-100 usage projections, call projections, equipment quantities, etc., determined by Network Design.

12. DMS-100/200 NETWORK DESIGN ORDER FORMS

12.01 Blank forms, Face Sheets, and Exhibits 1, 2, 2A-2L, 3 and 5, referred to in this Section are available for use by Network Design in the construction of the DMS 100/200 NDO. Exhibits 2A-2L, 3, and 5 will not be stocked. However, blank forms have been provided in this practice, and can be duplicated locally as required.

13. ILLUSTRATIONS OF SUPPORTING DATA

13.01 Examples of some methods used to provide supporting data in the NDO are included in Exhibit 7 for your information. When utilizing the examples and blank forms in Exhibit 7, the Network Designer must validate, using the appropriate practices, that the examples and forms are still current and up-to-date. In addition, the reproduced copies of the NDO can be made up of pages that have been copied on both the front and back sides.

14. TRAFFIC OPERATOR POSITION SYSTEM (TOPS)

14.01 Network Design Order guidelines for DMS200 with TOPS will be included in what is now numbered Section 821-100-900SW. That SWBT practice will be renumbered in the SW 241-060-XXX series. Section 3 of the NT8620 covers TOPS provisioning, however, and should be completed when TOPS is being added or changed. The TOPS NDO practice is expected third quarter, 1987. See Appendix A for TOPS documentation listing.

15. DMS-200 TANDEM NETWORK DESIGN ORDER

15.01 Provisioning for a DMS 200 (or combined local/toll DMS-100/200) toll office is covered in the NT8620. However, in the straight DMS-200, there would be no line peripherals, only trunking peripherals interfacing with the network modules. The DMS-200 connects incoming trunks to outgoing trunks, both analog and digital. For analog trunks, trunk modules (TM) are used. For digital trunks, digital trunk controllers (DTC) are used. Section 6 of the NT8620 covers provisioning rules for these peripherals. Network Design data is still required, but total CCS will not be calculated on a per NAL basis. CCS per trunk data and the General Trunk Forecast become the critical Basic Data Section items to include in the NDO.

15.02 The recommended NDO arrangement for a DMS200 is as follows:

- Face Sheet - See exhibit 1, but the summary of equipment capacities would be left blank. A locally devised face sheet may also be used.

- Basic Data - This section should include the traffic summary from Section 1 of the NT8620. Also include a copy of the General Trunk Forecast and T-Span forecast from the facilities planner or equivalent. Validation rules as stated in paragraph 4.08.

- The rest of the DMS200 NDO should follow the NT8620 Sections 2 through 13, excluding those sections normally done by the switching engineer and excluding Section 5 on lines. Of course, those items required for line side input would be left blank unless the order was for a DMS-100/200 local/toll machine.

- It is especially important in the tandem application to complete Section 13 of NT8620 on real time and to run NTI's RTCALC program to assess processor real time exhaust. This is due to the variety of services offered via the DMS tandem which consume heavy amounts of processor real time.

16. MERIDIAN DIGITAL CENTREX (formerly IBN)

The Meridian Digital Centrex, formerly called Integrated Business Network, consists of station equipment on the business customer's premise and the DMS-100 (or DMS-100/200) equipped with IBN (MDC) software feature packages and hardware. Equipment provisioning guidelines are specific to the features desired by the customer, except for the software feature packages required in the DMS 100/200 office. The NT8620 order document allows the designer to fill in those items of information related to centrex service. The network designer should obtain centrex (or ESSEX) customer data and hardware information from the Network Point of Contact (NPOC) through locally established channels. Reference documentation is listed in Appendix 1.

17. OTHER SUPPORT SYSTEMS (OSS)

The DMS 100/200 is compatible with the following major OSS:

EADAS - With BCS20, EADAS data collection is possible. USER COER, the downstream data report format, is under development by BELLCORE presently. A USER COER format is expected for the DMS 100 family switches by July, 1987. However, that format will probably have to be adjusted to fit SWBT needs. (EADAS is Engineering and Administrative Data Acquisition System. COER is Central Office Equipment Report.)

There are other OSS with which the DMS-100/200 is also compatible:

- COSMOS - Computer System for Mainframe Operations;
- CAROT - Centralized Automatic Reporting on Trunks;
- ROTL - Remote Office Test Line;
- TIRKS - Trunk Integrated Record Keeping System;
- PICS - Plug-in Inventory Control System;
- No. 2 SCCS - Switching Control Center System;
- SCC E2A - SSC Telemetry Channel;
- RMAS - Remote Memory Administrative System;
- AMATPS - AMA Teleprocessing System;
- MLT 1/2 - Mechanized Loop Testing;
- ALIT - Automatic Line Insulation Testing.

Southwestern Bell

EXHIBIT 1
(Paragraph 6.02)

Form SW 7626 (Rev 12-83)

Retention Period-See J.P. 47

NETWORK DEPARTMENT
NETWORK ENGINEERING
_____SECTION

NETWORK DESIGN ORDER NO. _____
APPROVAL DATE _____

Entity Name/Equipment Type _____

CLLI |____|____|____|____|
City State Bldg Entity

Estimate Request No. _____

WCAF Dated_____ Validated _____ CMAPS ID No. _____

Trunk Forecast Dated _____ Validated _____ Required For Service Date _____

Nature and Necessity For Work:

SUMMARY OF EQUIPMENT CAPACITIES		PRESENT	PROPOSED
GENERIC			
LU:LLN/LTN CONCENTRATION RATIO			
SWITCHING EQUIPMENT	CCS CAPACITY - SW		
	NAL CAPACITY - SW		
TALKING CHANNELS	CCS CAPACITY - TC		
	NAL CAPACITY - TC		
LINES	INSTALLED		
	TERMINATION CAPACITY (LINES)		
	TERMINATION CAPACITY (NAL)		
	EXHAUST DATE		
TERMINALS OR NUMBERS	INSTALLED		
	TERMINATION CAPACITY (NAL)		
MOST LIMITING SWITCHING ITEM			
	_____		
	_____		
MOST LIMITING	ITEM		
	OFFICE NAL CAPACITY		
	DATE OF OFFICE EXHAUST		
____ CCS/NAL AT OFFICE EXHAUST			

Signature and Title — Telephone Number

PREPARED: _____ ( )_____
CHECKED: _____ ( )_____
RECOMMENDED: _____ ( )_____
APPROVED: _____ ( )_____

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Southwestern Bell

EXHIBIT 2
(Paragraph 6.02 & 9.01)

Form SW 7626 (Rev. 12-83)

Retention Period-See J.P. 47

NETWORK DEPARTMENT
NETWORK ENGINEERING
_____ SECTION

NETWORK DESIGN ORDER NO. _____
APPROVAL DATE _____

Entity Name/Equipment Type _____

CLLI [City] [State] [Bldg.] [Entity]

Estimate Request No. _____

WCAF Dated _____ Validated _____ CMAPS ID No. _____

Trunk Forecast Dated _____ Validated _____ Required For Service Date _____

Nature and Necessity For Work:

This Complete Order provides for a new Digital Multiplex System No. 100/200 which replaces the 5XB equipment presently serving the Happy Town Wire Center.

The engineering period is 24 months which provides equipment to the nearest break in peripheral equipment.

Trunk requirements are based on the General Trunk Forecast, as dated above. Exhaust dates are based on the Wire Center Area Forecast, as dated above.

SUMMARY OF EQUIPMENT CAPACITIES		PRESENT	PROPOSED
GENERIC			BCS16
LU/LLN/LTN CONCENTRATION RATIO 3 PORT LM			7.3:1
SWITCHING EQUIPMENT	CCS CAPACITY - SW		294
	NAL CAPACITY - SW		16865
TALKING CHANNELS	CCS CAPACITY - TC		67900
	NAL CAPACITY - TC	-	24078
LINES	INSTALLED	-	17406
	TERMINATION CAPACITY (LINES)	-	16534
	TERMINATION CAPACITY (NAL)	-	16750
	EXHAUST DATE		8-87
TERMINALS OR NUMBERS	INSTALLED		20000
	TERMINATION CAPACITY (NAL)		19000
MOST LIMITING SWITCHING ITEM			Digitone Receiver DR
MOST LIMITING	ITEM		Lines
	OFFICE NAL CAPACITY		16750
	DATE OF OFFICE EXHAUST		8-87
O+T CCS/NAL AT OFFICE EXHAUST			2.82

Signature and Title — Telephone Number

PREPARED: _____ ( ) _____

CHECKED: _____ ( ) _____

RECOMMENDED: _____ ( ) _____

APPROVED: _____ ( ) _____

Exhibit 2A

Office Name: _____

N.D.O. Number: _____

Page Number: _____

Issue Date: _____

DMS-100

LINE TERMINATION CAPACITY WORKSHEET

Analog Lines

1) Installed Lines (No. of LCM's X 640 OR per SW241-060-900, para. 5.09) _____

2) Unavailable Lines

a) 1 Test Line per LCM _____
b) 2 (No. of +48V Power Conv. Cards) _____
c) 2 (No. of Message Waiting Cards) _____
d) (No. of 'D' Type Line Cards) _____
e) Other (1 per 911 TRK, 2 per ATT cons) _____

Total Unavailable Lines (Sum 2a thru 2e) _____

3) Available Installed Lines (Line 1 minus Line 2) _____

4) Administrative Spare (Line 3 X 5%) _____

5) Analog Line Termination Capacity (Line 3 minus Line 4) _____

6) NAL Capacity of Analog Lines (Line 5 X NAL/LN Ratio) _____

7) Exhaust Date - Analog NALs _____

Digital Lines

1) Installed Lines (No. of SLC's X 96 or)
No. of DMS-1's X 256 _____

2) Available Lines (Line 1 X _____% Outside Plant Fill) _____

3) Unavailable Lines (Line 1 minus line 2) _____

4) Administrative Spare (Line 2 X 5%) _____

5) Digital Line Termination Capacity (Line 2 minus Line 4) _____

6) NAL Capacity of Digital Lines (Line 5 X NAL/LN Ratio) _____

7) Exhaust Date - Digital NALs _____

Total Analog and Digital NALs at ML Exhaust _____

NOTES ON EXHIBITS 2B THRU 2L, 8, AND 9

These exhibits are included in this practice with the permission of Bellcore Technical Education Center. These capacity determination Worksheets and the associated "DMS Capacity Cruncher" PC-based program diskette are distributed to students of the DMS CAPACITY training class. The designer can input values requested by the program which will then do the calculations and results sections automatically. The designer can also use these worksheets to do the inputs, calculations, and results manually.

The inputs section of each worksheet contains several abbreviations in parentheses ( ). These abbreviations are Operational Measurement (OM) group and field names. OM data is actual machine usage, peg count, and overflow data which can be scheduled and printed for use by Network Design and other groups. OM data also contains installed quantities of machine components and software. NTI practice NTP 297-1001-114 should be consulted for an explanation of OM data.

Bell Communications Research Technical Education Center, Bellcore TEC, provides training on the use of these worksheets. For further information, contact the Bellcore TEC coordinator on 214-739-7600.

Exhibit 2B

PAGE 1 or 3

DATE_____

OFFICE NAME: _____
OFFICE CLLI: _____
ENGINEER: _____
E.O.P.: _____

LM & LCM USAGE CAPACITY WORKSHEET

INPUTS:

_____ (1) Number of load-balanced line modules installed in office. From office report, (LMINV).

_____ (2) Links per load-balanced line module. From office report (LMINV).

_____ (3) Number of non-load-balanced line modules installed in office. From office report (LMINV).

_____ (4) Links per non-load-balanced line module. From office report (LCMINV).

_____ (5) Number of blocking line concentrating modules installed. From office report (LCMINV).

_____ (6) Links per blocking line concentrating module. From office report (LCMINV).

_____ (7) Number of non-blocking line concentrating modules installed. From office report (LCMINV).

_____ (8) Links per non-blocking line concentrating module. From office report (LCMINV).

_____ (9) Engineering criteria: 1=ABS, 2=High Day, 3=Both ABS and HD.

_____ (10) ABS line module and line concentrating module usage in CCS. From (LMD) group, sum of (LMTRU) fields in (OM).

_____ (11) High day line module and line concentrating module usage in CCS. Same data source as input #10, having determined the high day to ABS ratio.

_____ (12) Network access line requirements for study period.

Exhibit 2B

DATE_____

OFFICE NAME: _____
OFFICE CLLI: _____
ENGINEER: _____
E.O.P.: _____

LM & LCM USAGE CAPACITY WORKSHEET

CALCULATIONS:

_____ (1) ABS engineered load-balanced line module capacity. From NT 297-1001-450/2 Table G, using input #2.

_____ (2) ABS engineered non-load-balanced line module capacity, from NT 297-1001-450/2 Table G, using input #4.

_____ (3) HD engineered load-balanced line module capacity, from NT 297-1001-450/2 Table G, using input #2.

_____ (4) HD engineered non-load-balanced line module capacity. From NT 297-1001-450/2 Table G, using input #4.

_____ (5) ABS engineered blocking line concentrating module capacity. From NT 297-1001-450/2 Table T, using input #6.

_____ (6) ABS engineered non-blocking line concentrating module capacity. From NT 297-1001-450/2 Table S, using input #8.

_____ (7) HD engineered blocking line concentrating module capacity. From NT 297-1001-405/2 Table T, using input #6.

_____ (8) HD engineered non-blocking line concentrating module capacity. From NT 297-1001-450/2 Table S, using input #8.

_____ (9) ABS balanced line module talk channel CCS capacity. Input #2 X CALC #1.

_____ (10) HD balanced line module talk channel CCS capacity. Input #2 X CALC #3.

_____ (11) ABS non-balanced line module talk channel CCS capacity. Input #3 X CALC #2.

_____ (12) HD non-balanced line module talk channel CCS capacity. Input #3 X CALC #4.

Exhibit 2B

DATE_____

OFFICE NAME: _____
OFFICE CLLI: _____
ENGINEER: _____
E.O.P.: _____

LM & LCM USAGE CAPACITY WORKSHEET

CALCULATIONS (CONT)

_____(13) ABS blocking line concentrating module talk channel CCS capacity. Input #5 X CALC #5.

_____(14) HD blocking line concentrating module talk channel CCS capacity. Input #5 X CALC #7.

_____(15) ABS non-blocking line concentrating module talk channel CCS capacity. Input #7 X CALC #6.

_____(16) HD non-blocking line concentrating module talk channel CCS capacity. Input #7 X CALC #8.

_____(17) ABS office line talk channel CCS capacity. CALC #9 + CALC #11 + CALC #13 + CALC #15.

_____(18) HD office line talk channel CCS capacity. CALC #10 + CALC #12 + CALC #14 + CALC #16.

****

RESULTS:

_____ (1) ABS line talk channel NAL capacity. CALC #17/(Input #10/Input #12)

_____ (2) HD line talk channel NAl capacity. CALC #18/(Input #11/Input #12)

_____ (3) ABS percent utilization. Input #12/Result #1.

_____ (4) HD percent utilization. Input #12/Result #2.

Exhibit 2C

DATE_____

OFFICE NAME: _____
OFFICE CLLI: _____
ENGINEER: _____
E.O.P.: _____

SMR USAGE CAPACITY WORKSHEET

INPUTS:

_____ (1) SMR identifier. From traffic order, or table (LTCINV), fields (XPMTYPE) and (XPMNO).

_____ (2) Number of RCT systems per SMR. From traffic order, or table (RCTINV), fields (PMNO).

_____ (3) Number of links per SMR. From traffic order, or table (LTCINV), field (CSLNKTAB).

_____ (4) ABS SMR usage. Sum of all group (LMD), fields (LMTRU) for involved SMRs.

_____ (5) High day SMR usage. Same source as input #4.

_____ (6) Working digital NAL per SMR. From outside plant engineer or table (LNINV), fields (SITE), (CARDCODE), and (STATUS).

****

CALCULATIONS:

_____ (1) SMR ABS CCS capacity. Enter tables SLC1 in student reference binder, using inputs #2 and 3.

_____ (2) SMR high day CCS capacity. Same source as CALC #1.

****

RESULTS:

_____ (1) ABS digital NAL talk channel capacity per SMR. CALC #1/(Input #4/Input #6).

Exhibit 2C

SMR USAGE CAPACITY WORKSHEET

_____ (2) High day digital NAL talk channel capacity per SMR. CALC #2/(Input #5/ Input #6).

_____ (3) ABS percent utilization. (Input #4/Result #1) X 100.

_____ (4) High day percent utilization. (Input #5/Result #2) X 100.

Exhibit 2C
PAGE 1 OF 2

DATE_____

OFFICE NAME: _____
OFFICE CLLI: _____
ENGINEER: _____
E.O.P.: _____

SMS USAGE CAPACITY WORKSHEET

INPUTS:

_____ (1) SMS identifier. From traffic order, or table (LTCINV), fields (XPMTYPE) and (XPMNO).

_____ (2) Number of SLC-96 MODE 1 Systems per SMS. From traffic order, or table (RCSINV), fields (PMNO) and (MODE).

_____ (3) Number of SLC-96 MODE 2 per SMS. Same source as input #2.

_____ (4) Number of links per SMS. From traffic order, or table (LTCINV), field (CSLNKTAB).

_____ (5) ABS SMS usage. Sum of all group (LMD), fields (LMTRU) for involved SMRs.

_____ (6) High day SMS usage. Same source as input #5.

_____ (7) Working digital NAL per SMS. From outside plant engineer or table (LNINV), fields (SITE), (CARDCODE), and (STATUS). See Note A.

****

CALCULATIONS:

_____ (1) SMS ABS CCS capacity. Enter tables SLC1-5 in student reference binder, using inputs #2, 3, and 4.

See Note B

_____ (2) SMS high day CCS capacity. Same source as CALC #1.

****

Exhibit 2C-1

SMS USAGE CAPACITY WORKSHEET

RESULTS:

_____ (1) ABS digital NAL talk channel capacity per SMS. CALC #1/(Input #5/Input #7).

_____ (2) High day digital NAL talk channel capacity per SMS. CALC #2/(Input #6/ Input #7).

_____ (3) ABS percent utilization. Input #5/Result #1.

_____ (4) High day percent utilization. Input #6/Result #2.

(A) There are three card codes associated with SLC-96;

1. Single Party - SCD203.
2. Mulit-Party - SCD221.
3. Coin - SCD233.

To determine total working digital lines for an SMS, find all (site) fields associated with that SMS, then sum the (cardcode)s with a (status) of "working".

(B) Choose capacity tables according to the following:

SLC SYSTEM TYPE		SLC
MODE I	MODE II	TABLE
1-4	0	1
0	1-6	2
1	1-5	3
2	1-3	4
3	1	5

Exhibit 2D

PAGE 1 OF 5

DATE_____

OFFICE NAME: _____

OFFICE CLLI: _____

ENGINEER: _____

E.O.P.: _____

NEW NETWORK USAGE CAPACITY WORKSHEET

INPUTS:

_____ (1) Number of network modules per plane installed. From group (TS) in OM, or traffic order.

_____ (2) ABS network CCS. Two-way CCS, ORIG + OTG + INC + TERM. From traffic order or group (TS).

_____ (3) Network access line demand for the study period.

_____ (4) High day Network CCS. Same source as input #2.

_____ (5) Ten high day Network CCS. Same source as input #2.

****

CALCULATIONS:

_____ (1) ABS network CCS per NAL. Input #2/Input #3.

_____ (2) High day network CCS/NAL. Input #4/Input #3.

_____ (3) Ten high day network CCS/NAL. Input #5/Input #3.

_____ (4) Local ABS engineered network capacity. Lookup in Table 7A, from NT8620 Section 7, Column 0.1%, using Input #1 in Column #1. Multiply by Input #1. Note 1.

_____ (5) Local high day engineered network capacity. Lookup in Table 7A, from NT8620 Section 7, Column 1.0%, using Input #1 in Column #1. Multiply by Input #1. Note 1.

_____ (6) Toll ten high day engineered network capacity. Lookup in Table 7B, from NT8620 Section 7, Column 0.5%, using Input #1 in Column #1. Multiply by Input #1. Note 1.

DATE_____

OFFICE NAME: _____
OFFICE CLLI: _____
ENGINEER: _____
E.O.P.: _____

NEW NETWORK USAGE CAPACITY WORKSHEET

CALCULATIONS: (CONT)

_____ (7) Toll high day engineered network capacity. Lookup in Table 7B, from NT8620 Section 7, Column 2.0%, using Input #1 in Column #1. Multiply by Input #1. Note 1.

RESULTS:

_____ (1) Local ABS network NAL capacity.
CALC #4/CALC #1.

_____ (2) Local high day network NAL capacity.
CALC #5/CALC #2.

_____ (3) Toll ten high day network NAL capacity.
CALC #6/CALC #3.

_____ (4) Toll high day network NAL capacity.
CALC #7/CALC #2.

_____ (5) Local ABS percent utilization.
(Input #3/Result #1) X 100

_____ (6) Local high day percent utilization.
(Input #3/Result #2) X 100.

_____ (7) Toll ten high day percent utilization.
(Input #3/Result #3) X 100.

_____ (8) Toll high day percent utilization.
(Input #3/Result #4) X 100.

NOTE 1. For capacities resulting from tables 7A and 7B, see "Enhanced Network Capacities" table at end of Tab 4.

Exhibit 2D
PAGE 3 OF 5

DATE_____

OFFICE NAME: _____
OFFICE CLLI: _____
ENGINEER: _____
E.O.P.: _____

OLD NETWORK USAGE CAPACITY WORKSHEET

INPUTS:

_____ (1) Number of old network modules per plane installed. From group (TS) in OM, or traffic order.

_____ (2) ABS network CCS. Two-way CCS, ORIG + OTG + INC + TERM. From traffic order or group (TS) for old networks.

_____ (3) Old network access line demand for the study period.

_____ (4) High day Network usage in CCS. Same source as input #2.

_____ (5) Ten high-day Network usage in CCS. Same source as input #2.

****

CALCULATIONS:

_____ (1) ABS network CCS per NAL. Input #2/Input #3.

_____ (2) High day network CCS/NAL. Input #4 X Input #3.

_____ (3) Ten high day network CCS/NAL. Input #5 X Input #3.

_____ (4) Local ABS engineered network capacity. Lookup in NT 297-1001-450/2 Table E, old nets, Column 0.1%, using Input #1 in Column #1. Multiply by Input #1. Note 1.

_____ (5) Local high day engineered network capacity. Lookup in NT 297-1001-450/2 Table E, old nets, Column 1%, using Input #1 in Column #1. Multiply by Input #1. Note 1.

_____ (6) Toll Ten High Day Engineered Network Capacity. Lookup in NT297-1001-4501/2 Table F, Old Nets, Column 0.5%, using input #1 in column #1 multiply by input #1. Note 1.

DATE_____

OFFICE NAME: _____
OFFICE CLLI: _____
ENGINEER: _____
E.O.P.: _____

OLD NETWORK USAGE CAPACITY WORKSHEET

CALCULATIONS:

_____ (7) Toll high day engineered network capacity. Lookup in NT 297-1001-450/2 Table F, old nets, Column 2%, using Input #1 in Column #1. Multiply by Input #1. Note 1.

RESULTS:

_____ (1) Local ABS network NAL capacity.
CALC #4/CALC #1.

_____ (2) Local high day network NAL capacity.
CALC #5/CALC #2.

_____ (3) Toll ten high day network NAL capacity.
CALC #6/CALC #3.

_____ (4) Toll high day network NAL capacity.
CALC #7/CALC #2.

_____ (5) Local ABS percent utilization.
(Input #3/Result #1) X 100

_____ (6) Local high day percent utilization.
(Input #3/Result #2) X 100.

_____ (7) Toll ten high day percent utilization.
(Input #3/Result #3) X 100.

_____ (8) Toll high day percent utilization.
(Input #3/Result #4) X 100.

NOTE 1: For capacities resulting from Tables E and F, see "Expanded Network Capacities - OLD" Table at end of Tab 4, student binder.

Exhibit 2D
PAGE 5 OF 5

DATE_____

OFFICE NAME: _____
OFFICE CLLI: _____
ENGINEER: _____
E.O.P.: _____

NETWORK USAGE CAPACITY WORKSHEET
COMBINED OLD AND NEW NETWORK MODULES

NOTE: COMPLETE THIS WORKSHEET ONLY IF YOU HAVE BOTH TYPES OF NETWORKS (OLD LAND NEW).

RESULTS:

_____ (1) Local ABS network NAL capacity.
Old result #1 + new result #1.

_____ (2) Local high day network NAL capacity.
Old result #2 + New result #2.

_____ (3) Toll ten high day network NAL capacity.
Old result #3 + New result #3.

_____ (4) Toll high day network NAL capacity.
Old result #4 + New result #4.

_____ (5) Local ABS percent utilization.
(Old Input #3 + New Input #3)/Combined result #1) X 100

_____ (6) Local high day percent utilization.
((old Input #3 + New Input #3)/Combined result #2) X 100

_____ (7) Toll ten high day percent utilization.
((Old Input #3 + New Input #3)/Combined result #3) X 100

_____ (8) Toll high day percent utilization.
((Old input #3 + New Input #3)/Combined result #4) X 100

Exhibit 2E
PAGE 1 OF 1

DATE_____

OFFICE NAME: _____
OFFICE CLLI: _____
ENGINEER: _____
E.O.P.: _____

NETWORK TERMINATION CAPACITY WORKSHEET

INPUTS:

_____ (1) Number of duplicated networks. Number of network modules per plane. From traffic order, or group (TS) in OM.

_____ (2) Number of LM ports. From traffic order, or Table (LMINV).

_____ (3) Number of LGC ports. From traffic order or Table (LTCINV).

_____ (4) Number of LTC ports. From traffic order or Table (LTCINV).

_____ (5) Number of DCM ports. From traffic order or Table (DCMINV).

_____ (6) Number of DTC ports. From traffic order or Table (LTCINV).

_____ (7) Number of TM ports. From traffic order or Table (TMINV).

_____ (8) Number of MTM ports. From traffic order or Table (TMINV).

_____ (9) Number of SMR ports. From traffic order or Table (LTCINV).

_____ (10) Number of SMS ports. From traffic order or Table (LTCINV).

****

RESULTS:

_____ (1) Total ports required (sum of inputs #2-#10)

_____ (2) Spare ports (Inputs Item #1 X 64 - Result Item #1)

_____ (3) Percent utilization (Result #1/(Input #1 X 64))*100

Exhibit 2F
PAGE 1 OF 1

DATE_____

OFFICE NAME: _____
OFFICE CLLI: _____
ENGINEER: _____
E.O.P.: _____

DIGITONE RECEIVER FOR NAL WORKSHEET

INPUTS:

_____ (1) Digitone receivers for traffic. From (RCVR) GRP, (RCVR_INFO) field in (OM) minus service protection margin.

_____ (2) Digitone NAL demand for study period.

_____ (3) Digitone receiver ABS CCS usage. From (RCVR) GRP, (RCVTRU) field.

_____ (4) Digitone receiver high day CCS usage. Same field as Input #3.

****

CALCULATIONS:

_____ (1) ABS CCS capacity. From Table P.01 using Input #1.

_____ (2) HD CCS capacity. From Table P.05 using Input #1.

_____ (3) ABS CCS/NAL. Input #3/Input #2.

_____ (4) High day CCS/NAL. Input #4/Input #2.

****

RESULTS:

_____ (1) Digitone ABS NAL capacity. CALC #1/CALC #3.

_____ (2) Digitone high day NAL capacity. CALC #2/CALC #4.

_____ (3) Digitone ABS percent utilization. Input #2/Result #1.

Exhibit 2F-1
PAGE 1 OF 1

DATE_____

OFFICE NAME: _____
OFFICE CLLI: _____
ENGINEER: _____
E.O.P.: _____

DIGITONE RECEIVER FOR MCCS WORKSHEET

INPUT:

_____ (1) Number of circuits for traffic. Total less service protection margin.

_____ (2) MCCS trunk demand. Quantity of incoming 0+ and 0- trunks, from (TRK) GRP, (NWCCT) field in (OM), as well as GTF or equivalent, to identify trunk groups.

_____ (3) Ten high day digitone receiver usage in CCS. From (RCVR) GRP, (RCVTRU) field.

****

CALCULATIONS:

_____ (1) Ten high day digitone receiver CCS capacity. Table lookup P.001 using Input #1.

_____ (2) Ten high day CCS per trunk. Input #3/Input #2.

****

RESULTS:

_____ (1) Ten high day digitone trunk capacity.
CALC #1/CALC #2.

_____ (2) Ten high day digitone percent utilization.
Input #2/Result #1.

Exhibit 2G
PAGE 1 OF 1

DATE_____

OFFICE NAME: _____
OFFICE CLLI: _____
ENGINEER: _____
E.O.P.: _____

MF RECEIVER CAPACITY WORKSHEET

INPUTS:

_____ (1) Number of circuits for traffic. From OM report, fields (RCVR) GRP, (RCVR_INFO), less service protection margin.

_____ (2) Number of incoming plus 1/2 the two-way MF trunks. Include incoming DP transmitting ANI. From (TRK) GRP, (NWCCT) field in (OM) plus GTF (general trunk forecast, or equiv)

_____ (3) ABS MF receiver usage in CCS. From (RCVR) GRP, (RCVTRU) field.

_____ (4) High day MF receiver usage in CCS. Same fields as Item 3.

CALCULATIONS:

_____ (1) ABS MF receiver CCS capacity. From table P.01 using Input #1.

_____ (2) ABS MF receiver CCS/trunk. Input #3/Input #2.

_____ (3) High day MF receiver CCS capacity. From table P.05 using Input #1.

_____ (4) High day MF receiver CCS/trunk. Input #4/Input #2.

RESULTS:

_____ (1) ABS incoming MF trunk capacity. CALC #1/CALC #2.

_____ (2) High day incoming MF trunk capacity.
CALC #3/CALC #4.

_____ (3) ABS percent utilization. (Input #2/Result #1) X 100.

Exhibit 2H
PAGE 1 OF 1

DATE_____

OFFICE NAME: _____
OFFICE CLLI: _____
ENGINEER: _____
E.O.P.: _____

UNIVERSAL TONE RECEIVER FOR LINES INPUT WORKSHEET

INPUTS:

_____ (1) Number of circuits for traffic. From Traffic Order or from group (UTR), Field (No.__UTR__EQ).

_____ (2) Digitone NAL demand.

_____ (3) UTR ABS usage in CCS. From group (UTR), Field (UTRTRU).

_____ (4) UTR high day usage in CCS. From group (UTR), Field (UTRTRU).

****

CALCULATIONS:

_____ (1) UTR ABS CCS capacity. Table lookup P.01 using Input #1.

_____ (2) UTR high day CCS capacity. Table lookup P.05 using Input #1.

_____ (3) Digitone ABS CCS/NAL. Input #3/Input #2.

_____ (4) Digitone high day CCS/NAL. Input #4/Input #2.

****

RESULTS:

_____ (1) Digitone ABS NAL capacity. CALC #1/CALC #3.

_____ (2) Digitone high day NAL capacity. CALC #2/CALC #4.

_____ (3) UTR ABS percent utilization. (Input #2/Result #1)*100

_____ (4) UTR high day percent utilization. (Input #2/Result #2)*100

Exhibit 2I
PAGE 1 OF 1

DATE_____

OFFICE NAME: _____
OFFICE CLLI: _____
ENGINEER: _____
E.O.P.: _____

UNIVERSAL TONE RECEIVER FOR TRUNKS INPUT WORKSHEET

INPUTS:

_____ (1) Number of circuits for traffic. From Traffic Order or from group (UTR), Field (No.__UTR__EQ).

_____ (2) MF trunk demand. Incoming plus 1/2 two-way.

_____ (3) UTR ABS usage in CCS. From group (UTR), Field (UTRTRU).

_____ (4) UTR high day usage in CCS. Same source as input #3.

****

CALCULATIONS:

_____ (1) UTR ABS CCS capacity. Table lookup P.01 using Input #1.

_____ (2) UTR high day CCS capacity. Table lookup P.05 using Input #1.

_____ (3) ABS CCS/MF trunk. Input #3/Input #2.

_____ (4) High day CCS/MF trunk. Input #4/Input #2.

****

RESULTS:

_____ (1) ABS INC MF trunk capacity. CALC #1/CALC #3.

_____ (2) High day INC MF trunk capacity. CALC #2/CALC #4.

_____ (3) UTR ABS percent utilization. (Input #2/Result #1)*100

_____ (4) UTR high day percent utilization. (Input #2/Result #2)*100

Exhibit 2J
PAGE 1 OF 1

DATE_____

OFFICE NAME: _____
OFFICE CLLI: _____
ENGINEER: _____
E.O.P.: _____

THREE-PORT CONFERENCE CIRCUIT CAPACITY WORKSHEET

INPUTS:

_____ (1) Number of circuits for traffic. From (OM): (CF3P)GRP, (CONF_OM_INFO) field, less sum of: service protection margin, QTY IBN attendant consoles, QTY reserved for tops.

_____ (2) Three-port NAL demand.

_____ (3) Three-port ABS usage. From (CF3P) GRP, (CNFTRUT) field, minus (TOPSTRU) field and (WRKTMU) field in (IBNSG) GRP.

****

CALCULATIONS:

_____ (1) Three-port ABS CCS capacity. Table lookup P.01 using Input #1.

_____ (2) Three-port ABS CCS/NAL. Input #3/Input #2.

****

RESULTS:

_____ (1) Three-port ABS NAL capacity. CALC #1/CALC #2.

_____ (2) Three-port ABS percent utilization. (Input #2/Result #1) X 100.

NOTE: The same procedures and worksheet exist for six-port conference circuits.

Exhibit 2K
PAGE 1 OF 1

DATE_____

OFFICE NAME: _____
OFFICE CLLI: _____
ENGINEER: _____
E.O.P.: _____

DRAM USAGE CAPACITY WORKSHEET

INPUTS:

_____ (1) Number of deloaded ports. From matrix using table (LMINV), (DCMINV), and LTCINV). Max of 7 for old networks, 15 for new networks.

_____ (2) Maximum number of channels (8, 16, 24, or 30). From table (ANNS). Count number of announcements, then round up to next highest setting.

_____ (3) Old or new network. Old = 1, New = 2.

_____ (4) Network access line requirement for study period.

_____ (5) ABS dram usage in CCS. From network administration data, or from table (ANN), sum of fields (ANNTRU).

****

CALCULATION:

_____ (1) Engineered CCS capacity. Using Inputs #1, #2, and #3, enter NTP 297-1001-450 Section 450/2, Table "Q" for old networks, or Table "R" for new networks.

****

RESULTS:

_____ (1) Network access line capacity. CALC #1/(Input #5/Input #4).

_____ (2) ABS percent utilization. (Input #4/Result #1) X 100.

Exhibit 2L

PAGE 1 OF 1

DATE_____

OFFICE NAME: _____

OFFICE CLLI: _____

ENGINEER: _____

E.O.P.: _____

OFFICE CAPACITY ANALYSIS WORKSHEET

ITEM	NAL CAPACITY	NAL DEMAND	% UTILIZATION
Network ABS - Local.....			
Network HD - Local.....			
Network 10HD - Toll.....			
Network HD - Toll.....			
Line Talk CHNL ABS.....			
Line Talk CHNL HD.....			
Digitone/NAL ABS.....			
Digitone/NAL HD.....			
3-Port ABS.....			
UTR ABS DGTN.....			
UTR HD DGTN.....			
DRAM ABS.....			
NAL Terminations.....			
MF Rcvr. NAL ABS.....			
MF Rcvr. NAL HD.....			
CPU.....			

EXHIBIT 3
(Paragraph 7.04)

Southwestern Bell

Form 3

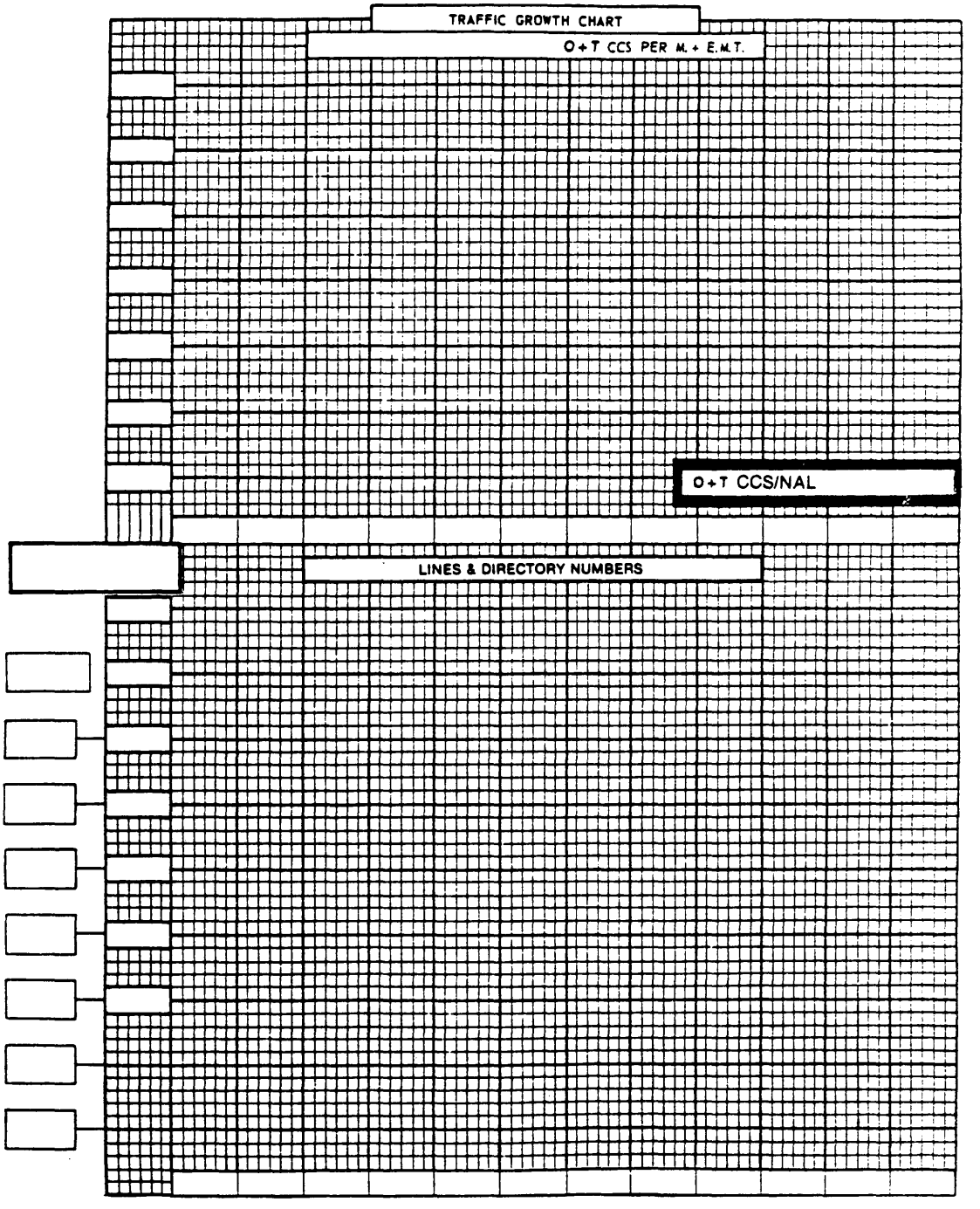


EXHIBIT 4

(Paragraph 7.04)

Southwestern Bell

N.D.O.
PAGE 2
12-21-82

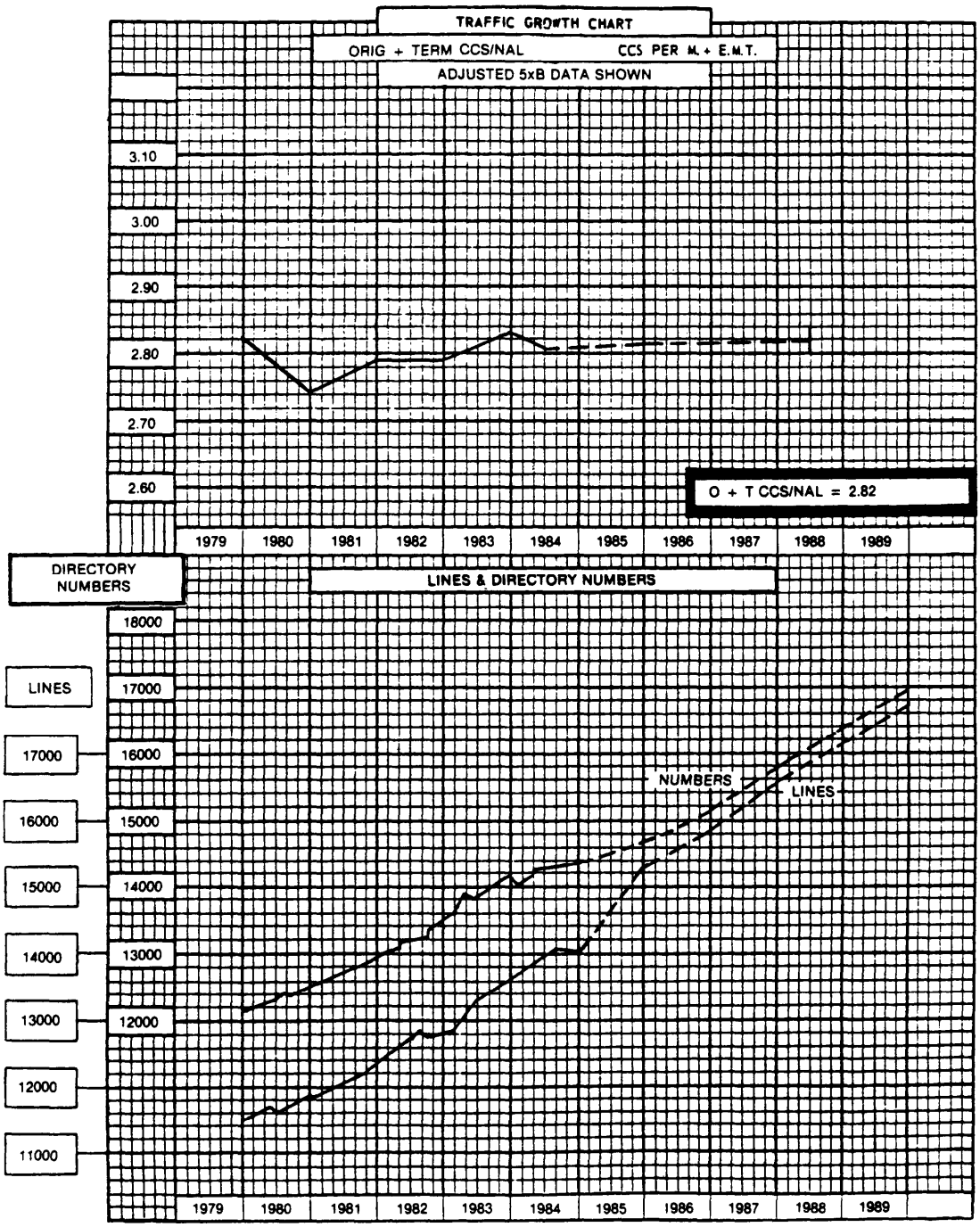


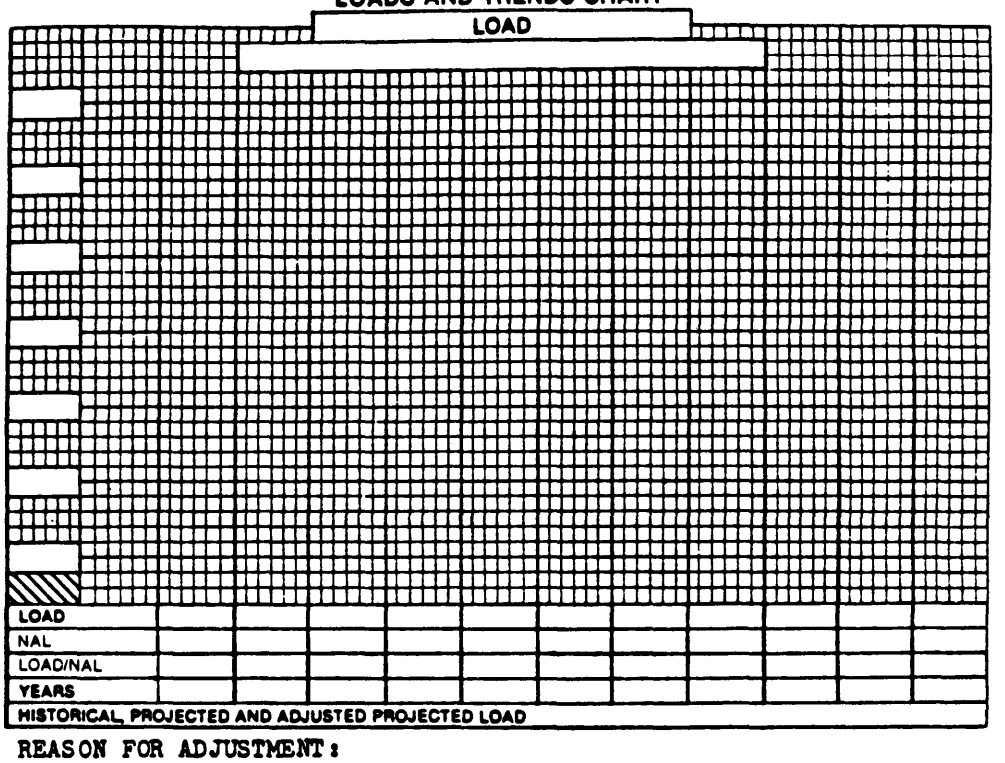
EXHIBIT 5

(Paragraph 7.05 B & C)

Southwestern Bell

Form 4

LOADS AND TRENDS CHART



REASON FOR ADJUSTMENT:

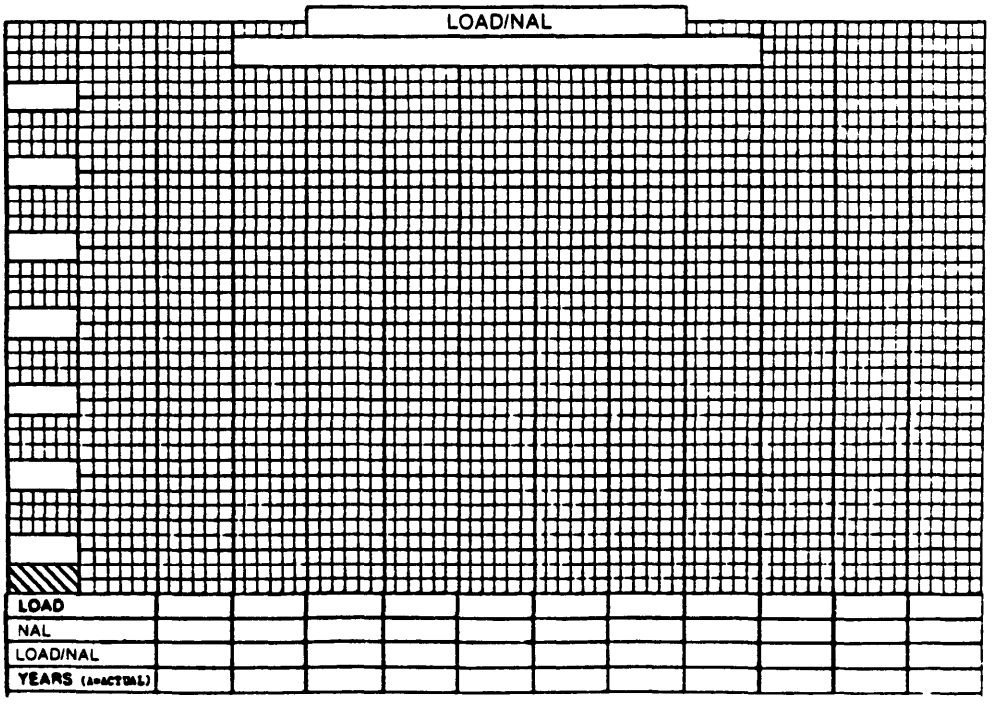


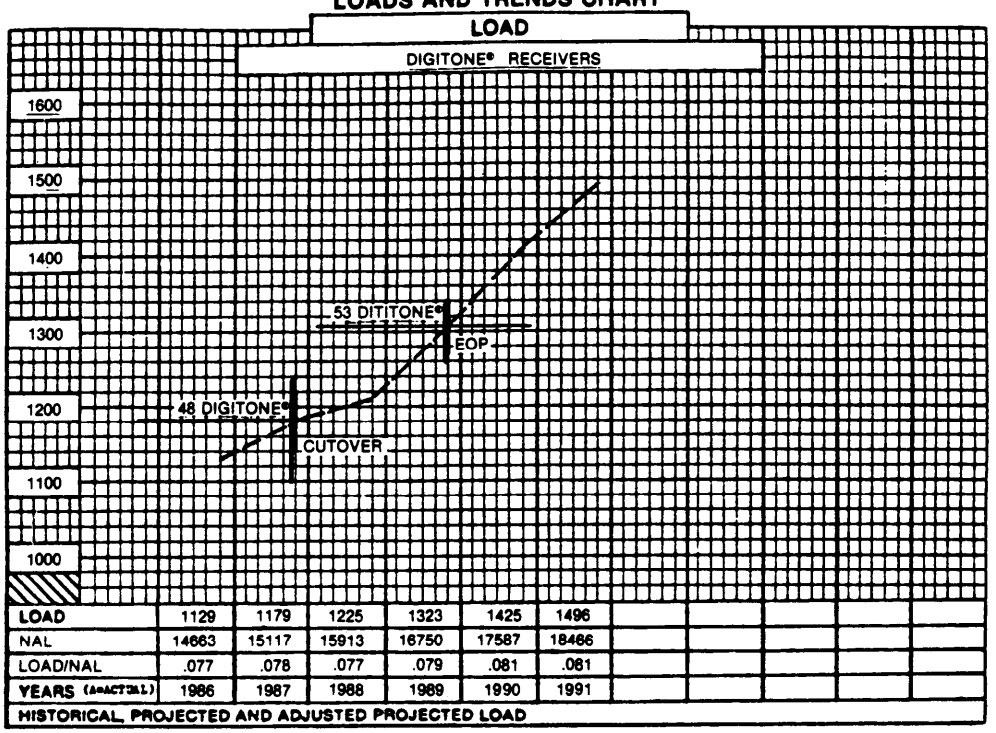
EXHIBIT 6

(Paragraph 7.05 B & C)

Southwestern Bell

Form 4

LOADS AND TRENDS CHART

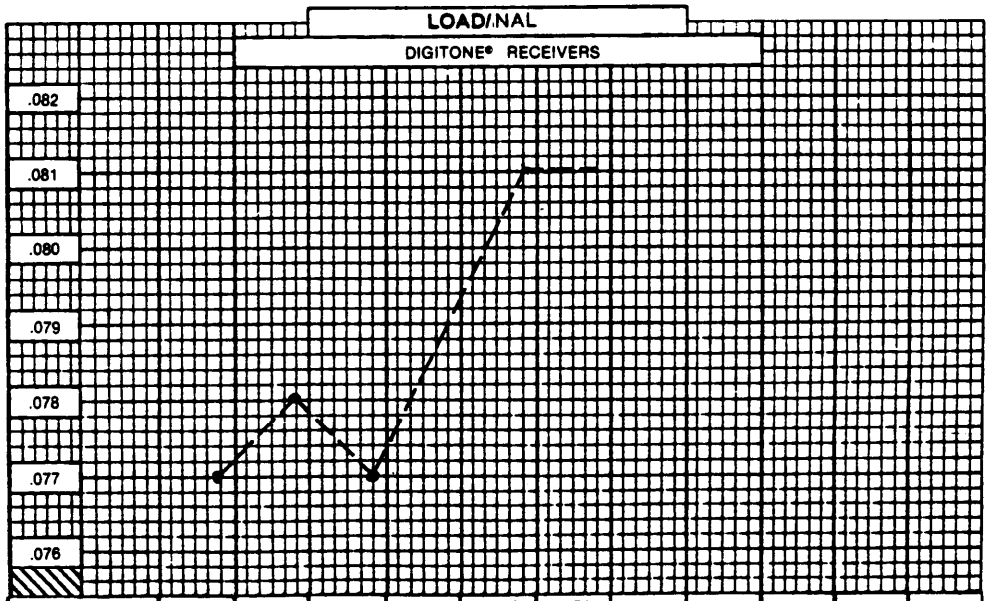


LOAD	1129	1179	1225	1323	1425	1496					
NAL	14663	15117	15913	16750	17587	18466					
LOAD/NAL	.077	.078	.077	.079	.081	.081					
YEARS (ACTUAL)	1986	1987	1988	1989	1990	1991					

HISTORICAL, PROJECTED AND ADJUSTED PROJECTED LOAD

REASON FOR ADJUSTMENT:

® Registered Trademark of NTI



LOAD	1129	1179	1225	1323	1425	1496					
NAL	14663	15117	15913	16750	17587	18466					
LOAD/NAL	.077	.078	.077	.079	.081	.081					
YEARS (ACTUAL)	1986	1987	1988	1989	1990	1991					

EXHIBIT 7
Page 1 of 7
Paragraph 13.01

GENERAL NOTES

1. This specification is for the ----- office and provides for dial with dial replacement with 17406 installed lines.

2. The switching machine is a DMS-100/200 Digital Multiplex System for combined local an toll.

3. The NNX codes are 223 and 226.

4. There will be 20,000 Directory Numbers in this control group to accommodate CO number reservations. They will be arranged as follows:

NNX	DIRECTORY NUMBERS
223	0000-9999
226	0000-9999

5. The following desks and switchboards are associated with this office:

PURPOSE	BOARD
Vacant Code	Rec. Annc.
Verification Request	TSPS
InterLATA Switch	4E
IntraLATA Switch	
Repair	CRS
Directory Assist.	No. 5ACD
Intercept	Mis.-ANI
Local Test Desk	MLT II
TSPS	TSPS Console

6. This office is engineered for the following Busy Hour calls:

Originating	18425
Intraoffice	12228
Outgoing	11725
Incoming	10720
Tandem	7035

EXHIBIT 7
Page 2 of 7

7. The following numbers are reserved:

IMTS: NNX-226; 0100-0199, 1100-1199 & 6600-6699
COIN: NNX-223; 9000-9399
INWATS: NNX-226; 1000-1099
CAROT: NNX-226; 0000-0099

8. Twenty eight Line Modules with 112 total ine shelves are provided.

9. This office is engineered for the following service features:

Local Exchange Service
Flat Rate and Coin
Measured Rate, INWATS and OUTWATS
LAMA and CAMA
Toll Service for CDO's
TSPS thru the Local RTA
Seven and Ten Digit Dialing
XII Service Codes
AIOD and DID (FUTURE)
0+, 0- and 1+ Calling
Intercepted Trunk Arrangements to MIS-ANI and Recorded Announcements
Station Signaling
Dial Pulse Rotary DIal
Digitone
Special Service Features
  Add-On Conference
  Speed Calling
  Call Forwarding
  Call Waiting
Line Load Control
Toll Center Switching
Tandem Switching Point
Digitone Outpulsing on DID Trunks (Future)

10. The NNX code 083, numbers 0000-9999 will be assigned only for INWATS and plant test.

EXHIBIT 7
Page 3 of 7

11. The following service codes are assigned:

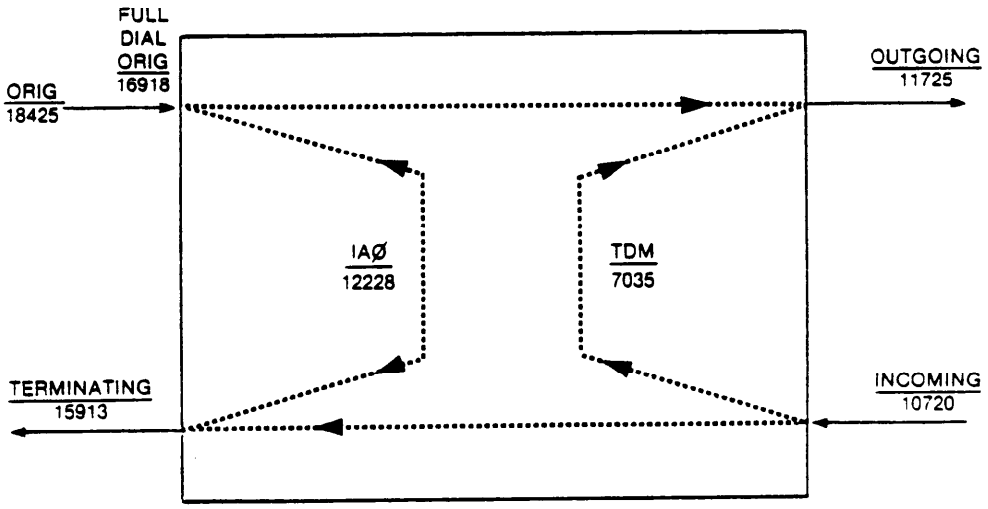
Operator	: 0-, 0+
Attendant	: --
DDD	: 1+
Direct Ass't	: 1+411
Repair	: 1+678-XXXX
LTD	: 7 Digit No.
Revertive	: 7 Digit No.
Emergency	: 7 Digit No.
CCSA	: None
Centrex	: None

EXHIBIT 7

PAGE 4 OF 7

Southwestern Bell

SUMMARY OF CALLS



DMS-100/200

PROPOSED DISTRIBUTION OF BUSY HOUR TRAFFIC

8-87

NAL = 16750

EXHIBIT 7
PAGE 5 OF 7
DATA CONVERSION WORKSHEET
USING 5XB DATA

	1982 BS	1983 BS	1984 BS
MT Avg. BS	13210	13632	14222
DTM Attempts	(17926)	17018	18727
Orig. PC	13246	14366	15729
Partial Dial			
Abandon	(775)	870	965
Perm. Sign.	(125)	201	165
FDO PC	12346	13113	14599
IAO PC	(9780)	8486	10519
Inc. Calls	8151	8966	8602
Bylink PC	2351	2490	2125
MF PC	5800	6476	6477
Orig. Outg. PC	2566	4627	4080
Outgoing PC	7630	9939	9731
DP Sender PC	2353	2452	1966
MF Sender PC	5277	7487	7765
Tandem PC (Calculated)	5064	5312	5651
Inc. Term. (Calculated)	3087	3654	2951
Term. PC (Calculated)	14844	12140	13470
Orig. CR/MT	1.002	1.05	1.11
IAO CR/MT	.74	.62	.74
Inc. - TDM CR/MT	.23	.27	.21

EXHIBIT 7
PAGE 6 OF 7
DATA CONVERSION WORKSHEET (CONT'D)
USING 5XB DATA

	1982 BS	1983 BS	1984 BS
IAO CCS	11420	(11371)	11420
IAO HT Sec.	117	134	108
O+T CCS 5XB	40701	42394	44914
Junctor & Perm. Sig.	3840	4300	4715
O+T CCS ESS	36861	38094	40199
Orig. CCS	17784	19927	21467
Inc. Term. CCS	7657	6796	7312
Term. CCS	19077	18167	18732
O+T CCS/MT	2.79	2.79	2.83
(ESS/5XB O+T)	.90	.90	.90

1978 5XB O+T = 3.28 — 12104 MT
1978 ESS O+T x .86 = 2.82
1979 5XB O+T = 3.15 — 12401 MT
1979 ESS O+T x .89 = 2.74

Ratio lower for preceeding years due to a large percent of CAMA traffic. Presently relieved by several C.D.O's using their own LAMA.

Based on the historical data as projected, EOP distribution was made as follows:

Attempts - 1.34 CR Attempts/MT
Orig. CCS - 1.48
Term. CCS - 1.34
O+T CCS - 2.82
Orig. CR - 1.10
Inc. CR - .64
O+I CR - 1.74

NOTE: ( ) Essential data not available, but estimated.

EXHIBIT 7
PAGE 7 OF 7

FORECAST OF LINES, NAL AND SERVICES

Based on the Wire Center Area Forecast Dated

CLASS	LINES	NAL
FR1	11864	11864
FR2	7	10
FR4	106	313
FB1	3542	3542
FB4	3	9
PBX-F	308	308
PBX-M	57	57
ODT-F	11	11
FX	23	23
NN	-	(2)
HO-MO	101	101
WATS-F	8	8
WATS-M	91	91
INWATS-F	-	-
INWATS-M	63	63
Coin	273	273
Coinless	77	77
	16534	16750

Touch Tone Lines	10862
Call Waiting	2735
Call Forwarding	2566
3-Way Calling	2492
Speed Calling-8	1771
Speed Calling-30	539
Consecutive No.	1670

Exhibit 8

DATE_____

OFFICE NAME: _____

OFFICE CLLI: _____

ENGINEER: _____

E.O.P.: _____

RLCM USAGE CAPACITY WORKSHEET

INPUTS

_____ (1) Site identifier. CLLI code of remote site.

_____ (2) Number of host links. Quantity of DS-1 links to host LGC/LTC. Refer to (LCMINV) GRP, (LINKMAP) field.

_____ (3) ABS intra-site calls. From (site) GRP, (INTRASIT) field.

_____ (4) High day intra-site calls. From (SITE) GRP, (INTRASIT) field.

_____ (5) ABS inter calls. From (SITE) GRP, field (INTERSIT) plus field (RORIGOUT) plus field (INRTERM).

_____ (6) High day inter calls. Same source as Input #5.

_____ (7) ABS usage. From GRP (LMD), field (LMTRU).

_____ (8) High day usage. Same source as Input #7.

_____ (9) NAL demand. Working NAL, from report of access lines in service.

****

Exhibit 8
PAGE 2 of 2

DATE_____

OFFICE NAME: _____
OFFICE CLLI: _____
ENGINEER: _____
E.O.P.: _____

CALCULATIONS

_____ (1) ABS total calls. Input #3 + Input #5.

_____ (2) High day total calls. Input #4 + Input #6.

_____ (3) ABS percent calls intra. Input #3/CALC #1.

_____ (4) High day percent calls intra. Input #4/CALC #2.

_____ (5) ABS CCS capacity. Table lookup 1A from NT8620, Page 17, using input #2 and CALC #3.

_____ (6) High day CCS capacity. Table lookup 1B from NT8620 Page 17, using Input #2 and CALC #4.

****

RESULTS

_____ (1) ABS NAL capacity. CALC #5/(Input #7/Input #9).

_____ (2) High day NAL capacity. CALC #6/(Input #8/Input #9).

_____ (3) ABS percent utilization. (Input #9/Result #1) X 100.

_____ (4) High day percent utilization. (Input #9/Result #2) X 100.

Exhibit 9

PAGE 1 OF 2

DATE_____

OFFICE NAME: _____

OFFICE CLLI: _____

ENGINEER: _____

E.O.P.: _____

RSC USAGE CAPACITY WORKSHEET

INPUTS

_____ (1) Site identifier. CLLI code of remote site.

_____ (2) Number of host links. Quantity of DS-1 links to host LGC/LTC. Refer to (RCCINV) GRP, (CSLK1-8) field.

_____ (3) Sum of ABS intra-site calls. From (SITE) GRP, (INTRASIT) field.

_____ (4) Sum of high day intra-site calls. From (SITE) GRP, (INTRASIT) field.

_____ (5) Sum of ABS inter calls. From (SITE) GRP, field (INTERSIT) plus field (RORIGOUT) plus field (INRTERM).

_____ (6) Sum of high day inter calls. Same source as Input #5.

_____ (7) Sum of ABS usage. From GRP (LMD), Field (LMTRU).

_____ (8) Sum of high day usage. Same source as Input #7.

_____ (9) NAL demand. Working NAL, from report of access lines in service.

****

Exhibit 9
PAGE 2 OF 2
RSC

DATE_____

OFFICE NAME: _____
OFFICE CLLI: _____
ENGINEER: _____
E.O.P.: _____

CALCULATIONS

_____ (1) ABS total calls. Input #3 + Input #5.

_____ (2) High day total calls. Input #4 + Input #6.

_____ (3) ABS percent calls intra. Input #3/CALC #1.

_____ (4) High day percent calls intra. Input #4/CALC #2.

_____ (5) ABS CCS capacity. Table lookup 1C from NT8620 Page 17, using Input #2 and CALC #3.

_____ (6) High day CCS capacity. Table lookup 1D from NT8620 Page 17, using input #2 and CALC #4.

****

RESULTS

_____ (1) ABS NAL capacity. CALC #5/(Input #7/Input #9).

_____ (2) High day NAL capacity. CALC #6/(Input #8/Input #9).

_____ (3) ABS percent utilization. (Input #9/Result #1) X 100.

_____ (4) High day percent utilization. (Input #9/Result #2) X 100.