

APPLICATION GUIDE FOR THE PREPARATION OF DETAILED  
DIGITAL CENTRAL OFFICE EQUIPMENT REQUIREMENTS  
(PARTS III AND IV OF REA FORM 522)

CONTENTS

- I. PART III OF REA FORM 522: CENTRAL OFFICE EQUIPMENT DETAILED REQUIREMENTS (HOST)
  1. GENERAL
  2. NUMBERING SCHEME
  3. OFFICE CLOCK
  4. INTEROFFICE TRUNKING DIAGRAM
  5. TRANSLATOR FUNCTION CHART
  6. LINE CIRCUIT REQUIREMENTS
  7. TRAFFIC DATA - LINE ORIGINATING AND TERMINATING TRAFFIC
  8. TRUNK CIRCUIT REQUIREMENTS
  9. CHECKLIST OF FEATURES REQUIRED
  10. MISCELLANEOUS OPERATING FEATURES
  11. MAINTENANCE FACILITY REQUIREMENTS
  12. POWER EQUIPMENT REQUIREMENTS
  13. DISTRIBUTING FRAME REQUIREMENTS
  14. BUILDING AND FLOOR PLAN INFORMATION (HOST OFFICE ONLY)
  15. ALTERNATE REQUESTS
  16. EXPLANATORY NOTES
  
- II. PART IV OF REA FORM 522: DETAILED INFORMATION ON REMOTE SWITCHING TERMINAL (RST)
  1. NUMBER OF SUBSCRIBER LINES
  2. TRAFFIC
  3. SUBSCRIBER LOOP RESISTANCE
  4. RANGE EXTENSION
  5. POWER SUPPLY
  6. EMERGENCY OPERATION
  7. RST DISTRIBUTION FRAME REQUIREMENTS
  8. BUILDING AND FLOOR PLAN INFORMATION
  9. SUBSCRIBER LINE TEST
  10. SPAN LINES TO CENTRAL OFFICE
  11. GROUNDING CONSIDERATIONS
  12. EXPLANATORY NOTES

APPENDIX A

Traffic Example

I. PART III OF REA FORM 522: CENTRAL OFFICE EQUIPMENT DETAILED REQUIREMENTS (HOST)

1. GENERAL

1.1 Purpose

1.1.1 This section provides REA borrowers, consulting engineers, bidders and other interested parties with technical information for use in the design and construction of REA borrowers' telephone systems. It covers, in particular, the preparation of Part III, "Specification for Digital Stored Program Controlled Central Office Equipment Detailed Requirements (Host)" and Part IV "Detailed Information on Remote Switching Terminals (RST's)" of REA Form 522, "General Specification for Digital, Stored Program Controlled Central Office Equipment." The information and recommendations in this section are advisory.

1.1.2 The General Specification, REA Form 522, Part I, which forms a part of REA Digital, Stored Program Controlled Central Office Equipment Contracts, establishes minimum performance requirements and capabilities for digital central office equipment. However, the many variables involved make it impractical to devise a single overall specification for digital central office equipment which will assure the provision of adequate and appropriate facilities to fit every situation. Accordingly, Parts III and IV permit the particular arrangements and requirements for individual offices to be specified. The "Detailed Requirements" are based upon the premise that the central office equipment is in compliance with the General Specification. Therefore, prior to preparation of Parts III and IV "Detailed Requirements," the General Specification should be consulted.

1.1.3 Most of the items covered by Parts III and IV are those that have purposely been left flexible in the General Specification in order to meet the requirements of individual situations. (In some instances, it may become necessary to deviate from the basic requirements established in the General Specification. Such deviation should be strictly limited to obtaining all the features required for each situation. They should be shown in detail in Parts III and IV and will supersede the requirements established in Part I, General Specification.)

1.1.4 In preparing a specification for digital central office equipment, it is helpful for the engineer to review the following sections of the REA Telecommunications Engineering and Construction Manual.

REA TE&CM 205 - "Assembly and Arrangement of an Area Coverage Design"

REA TE&CM 319 - "Interoffice Trunking and Signaling"

REA TE&CM 424 - "Design Guidelines for Telecommunications  
Subscriber Loop Plant"

REA TE&CM 802 - "Electrical Protection Grounding  
Fundamentals"

REA TE&CM 810 - "Electrical Protection of Electronic Analog  
and Digital Central Office Equipment"

REA TE&CM 823 - "Electrical Protection by use of Gas Tube  
Arresters"

1.1.5 The Loan Design (LD), (see 7CFR Parts 1745 and 1749) for the project should be studied carefully and used as a reference. However, because of the possibility that some of the information therein may require updating to include recent changes, current information should be used in preparing Parts III and IV. If this information differs from that in the ACD or Supplemental Loan Proposal, it should be submitted to REA with the plans and specifications for approval.

1.1.6 The engineer should be familiar with the latest issue of Bell Communications Research's "Notes on the BOC Intra-LATA Networks."

1.1.7 Throughout this Guide, wherever some action is suggested to be taken by the "owner," the words "or its engineer" shall be considered to be implied.

1.1.8 Bell Communications Research issued "Notes on the BOC Intra-LATA Networks," which applies to REA borrowers to the extent that partnerships exist. FCC directs how independent telephone companies shall provide equal access. As an American National Standards Institute (ANSI) secretariat, the T1 committees continue to write new standards which will apply to REA borrowers. These and other ongoing changes affect the periodic revision of Part III and Part IV of REA Form 522.

## 1.2 DDD and ANI

1.2.1 Since most stored program controlled central offices are arranged for some form of automatic line identification for charging purposes, and for direct distance dialing, information regarding these features is included in the basic digital stored program controlled specification, REA Form 522 Section III, Items 9.4, 9.5, and 9.6. Specific details and clarifications may be included in item 16.

1.2.2 The REA Form 522 "General Specification for Digital, Stored Program Controlled Central Office Equipment" may also be used for access tandem (toll center), offices. When used for a new access tandem, it may be necessary to include in the same contract a description of the desired traffic service desks, positions, or

consoles, for remote polling equipment. When the specification is used for an end office, recording of the billing information may be either in the end office or in a tandem office (toll center) of the REA borrower or another telephone company.

1.2.3 In some instances borrowers with several end offices will use equipment to forward automatic message accounting information to one central location where their or the service supplier's call data collection equipment is located. In situations of this type, tandem switching of toll calls may be used in the data collecting office, at least for toll calls originating in the borrower's end offices. For transmission purposes, a tandem office should be considered as an access tandem office.

### 1.3 Explanation of Parts III, IV and V

1.3.1 The internal organization of digital central office switching systems may vary among different bidders. Therefore, three sections are included as Parts III, IV, and V of the "General Specification for Digital, Stored Program Controlled Central Office Equipment." Part III and Part IV include all of the information available to the borrower and its engineer for the traffic and equipment requirements for a specific central office. Part V provides space for bidder information in regard to switching network, control equipment quantities and heavy traffic delays.

1.3.2 The borrower or its engineer will complete Part III and when required Part IV and submit a copy of these, together with a blank copy of Part V, to each bidder whom the borrower wishes to bid on the project.

1.3.3 Each bidder is expected to fill out and return Part V with its bid.

1.3.4 When a final decision is made as to which type of equipment is to be ordered, Parts III, IV and V become integral parts of the contract.

### 1.4 Explanation of Numbers in Parentheses

1.4.1 Item numbers shown in parentheses refer to the items in Parts III and IV of the specification.

### 1.5 Attended or Unattended Operation

1.5.1 Each central office should be designated as "attended" or "unattended" by checking the appropriate square in the box at the top of page 1 of Part III. An "attended" office is one where an attendant is available at all times for the purpose of relaying a trouble signal to someone authorized to dispatch a

technician. A dial office located in a building which also houses a toll board would be considered "attended." An office is also considered to be "attended" if the maintenance person lives nearby and has all alarms indicated in their home when not at the office.

## 2. NUMBERING SCHEME (Item 2)

### 2.1 (Item 2.1)

2.1.1 Each wire center must have a separate three-digit numerical office code. This code can be obtained from the Numbering Plan Administrator assigned for that area code (NPA). The administrators name can be determined by calling the Bell Operating Company or Independent Telephone Company serving that area code. This code could be obtained prior to the preparation of this specification. Some smaller capacity switching systems may use the same office code for several small wire centers by translation of the thousands digit. A thorough discussion of the numbering plan used in the United States is contained in Section 3 of "Notes on the BOC Intra-LATA Networks."

2.1.2 As covered in paragraph 1.4.10 of Part I of the General Specification, cases may arise where up to eight different office codes may be required to be served by the stored program controlled switching entity covered by this specification. The need for this may arise as follows: (1) the office may serve different communities, where the rates for calls from distant points may be different; (2) it may be desired to use the same series of four-digit numbers for subscribers in different communities; (3) the office may serve communities in different states, or different numbering plan areas, where trunks from two or more access tandems (toll centers) may be provided; (4) there may be more than 10,000 subscribers in the office. If more than one office code is served, discrimination may be made either by a numbering plan arrangement or by separate trunk groups. Wherever possible, a numbering plan arrangement should be used, since it will be less expensive. Translation of the thousands digit may be used if it is not necessary to provide the same four-digit numbers for subscribers served by the different office codes, and ten thousand numbers are enough to serve all subscribers. Otherwise, where translating facilities are available in the connecting office, a directing digit may be added by the translator, preceding the numerical digits. Where neither of the preceding arrangements can be used, it will be necessary to provide separate trunk groups. In some cases, combinations of separate trunk groups and numbering plan or arbitrary code discrimination may be necessary. Such cases should be indicated in item 2.1 of the specification, and a complete explanation given in item 16.

2.1.3 As covered in paragraph 1.4.4 of Part I of the General Specification, the office is to be equipped to handle the number of digits listed in that paragraph.

2.2 (Item 2.2)

The office names and codes of all the offices which can be reached on an EAS (Extended Area Service) basis by dialing seven digits should be listed.

2.2.1 (Item 2.2.1)

2.2.1.1 The number of digits required to be received on incoming calls will normally be determined by the connecting office, although requirements for discrimination between terminating offices may be controlling, as outlined in paragraph 2.1.2, above.

2.3 (Item 2.3)

2.3.1 The dialing procedures listed in item 2.3 for Station Paid Toll, Interexchange Carriers, Person-to-Person, Special, Directory Assistance, and International Direct Distance Dialing are the procedures recommended in the "Notes on the BOC Intra-LATA Networks." The proper blanks should be checked to indicate which of these procedures are to be used in this office. If any deviations from the recommended procedures are to be used, an explanation is to be given in item 16.

2.3.1.1 With regard to 10XXX dialing to interexchange carriers (Equal Access), the FCC has decided to require equal access in stored program controlled exchanges owned by independents only upon a reasonable request for service from an inter-LATA carrier. Currently three years from the IC request date are allowed for the conversion. REA recommends that equal access be purchased only if the reasonable request has been received. In addition to the dialing plan, the interface protocol for "equal access signaling" is completely different than traditional signaling. ANI is given in 10-digit format instead of seven digits and an overlap pulsing arrangement provides the calling number while the called number is being dialed. If equal access is specified, the explanatory note should make it clear that the operating company (the borrower) should be able to add, delete, and modify via recent change procedures not only the pre-subscription and 10XXX dialing elements but also the interface protocols depending on whether each interexchange carrier is using traditional signaling or equal access signaling. Equal access is described in "Notes on the BOC Intra-LATA Networks," Bellcore Technical Reference TR-NPL-000258 "Compatibility Information for Feature Group D Switched Access Service," and Bell Communications Research "LATA Switching Systems Generic Requirements," FSD #20-24-0000.

2.3.1.2 The numbers to be dialed for wire chief, repair service, business office, etc., should be indicated in item 2.3. It is recommended that the following standard three-digit special service codes be used:

<u>Service</u>	<u>Code</u>
Repair Service	611*, 7-Digit Number, or "800" Number
Business Office	811*, 7-Digit Number, or "800" Number
Emergency	911
Time	844**
Weather	936**
Dial-It Service	976**
Spare Codes	211, 311, 511, and 711

\*The 611 and 811 codes are optional and may be used when necessary to be uniform with a metropolitan or directory serving area.

\*\*It is possible that Time and Weather will be transferred to 976 Dial-It Service as a revenue producing measure.

The number translator will handle converting the three-digit number to a local line terminal where necessary. In end offices, seven-digit numbers are assigned to transmission test lines (100, 102, 105 type). 103 and 107 type test lines may be listed under "Other." Three-digit codes are used in terminating toll centers or equivalent.

## 2.4 (Item 2.4)

2.4.1 In most cases, assistance or special service calls will be handled by operators in the nearest operator center. The items should be filled in to indicate: whether these operators are in the same or a distant building; whether a separate group of operator trunks are to be provided; whether these calls are handled over the regular toll trunks; and the name of the distant office, if one is involved. If there is a special arrangement in the local office, it should be described here.

## 3. OFFICE CLOCK (Item 3)

3.1 If the digital central office has Direct Digital Interfaces to other offices, synchronization is required. Usually the digital central office is slave clock synchronized to a digital office next higher in line in the hierarchy. Details are contained in Section 11 of "Notes on the BOC Intra-LATA Networks." Most end office digital central offices will be Stratum 3 nodes homing on the access tandem. If the central office is a combination end office/access tandem, it might act as a Stratum 2 node having both a slave relationship upward and a master-relationship downward in the hierarchy. In item 16 describe the generic type of switch at the other end (4ESS, GTD-3 EAX, etc.), looking upward in the hierarchy. Include a description of the transmission facilities assigned for the timing signals and the agreement from the master clock site to permit access.

#### 4. INTEROFFICE TRUNKING DIAGRAM (Item 4)

##### 4.1 (Item 4.1)

4.1.1 An interoffice trunking diagram is a very useful aid when setting up requirements for an office, particularly one which is part of a network of offices. Such a diagram should be submitted with the specification. There are many possible variations of trunking plans, and it would be impossible to provide examples of trunking diagrams which would cover all cases. Two representative diagrams are included to illustrate the type of information which should be shown.

4.1.2 Figure 1 shows a Trunking Diagram for end office V, which has one remote switching terminal W. EAS traffic to office Y is served by a high usage group of eight trunks, with an alternate route via tandem office Z, using the same group of 25 trunks as is used for EAS traffic to office Z. Two groups of trunks are provided to office A, which serves as an access tandem. One group of 25 trunks handles the toll (and assistance) traffic, and one group of 15 trunks handles the EAS traffic to subscribers in office A.

4.1.3 Figure 2 is a Toll Trunking Diagram associated with a specification for a combined end office/LATA tandem/access tandem (formerly class 4/5), and shows no trunking for EAS service. If such service should be required from this office, additional routes should be shown, as covered in Figure 1. A trunking diagram for a combined end office/LATA tandem/access tandem should indicate the class of each connecting office, such as end office, LATA tandem, access tandem, or inter-LATA tandem. It should show whether a group is "High Usage" or "Final." It should also show the office code of direct trunk points and the numbering plan area in which each is located. Where separate groups of incoming and outgoing one-way trunks are to be provided, this should be indicated. Quantities of trunks required should be indicated for each group.

#### 5. TRANSLATOR FUNCTION CHART (Item 5)

5.1.1 Digital, stored program central offices have code translation to determine what routes are to be used, and what digits are to be outputted, for each number dialed. In all but the simplest cases, it will be necessary to include in the specification a translator function chart. This chart will be used by the bidders to determine what memory programming should be provided in the translator. The function chart should show the called offices, whether they are EAS or DDD, the digits to be dialed by the subscriber, the required translator action in respect to deletion and prefixing of added digits, and the digits to be outputted by the sender. Alternate routes, if any, should be shown. Any codes which should be blocked should also be shown.

5.1.2 Figure 3, Translator Function Chart, is included as an example. It shows the translator information required for the trunking diagrams shown in Figures 1 and 2. If there is any EAS traffic from the access tandem, translator information for handling such traffic would also be required. Since the numbering plan is not tied to the switching plan, it is not necessary to show local switch levels in the translator chart. The translator will cause the switching equipment to perform all necessary functions for selecting an outgoing trunk, without requiring any intraoffice pulsing by the sender.

## 6. LINE CIRCUIT REQUIREMENTS (ITEM 6)

### 6.1 Types of Lines Required (Item 6.1)

6.1.1 The data to be entered in items 6.1.1 thru 6.1.14 represent the number and type of central office lines which will be required initially, including the RST units which will later be shown on a site-by-site basis. This, coupled with other factors will enable the bidder to determine the number of class of service marks required for the office.

#### 6.1.2 (Items 6.1.1 and 6.1.2)

6.1.2.1 For example, assume that the number of residence one-party main stations is 730, and that the number of business one-party main stations is 90. Since, for one-party lines, the total number of lines is equal to the number of main stations required, the total number of lines to be entered in item 6.1.1 and 6.1.2 will be the sum of the one-party main stations; that is, 730 plus 90, or 820 lines. This number of lines (820) should be allocated between flat rate and message rate as described in paragraph 6.1.5 below.

#### 6.1.3 (Items 6.1.3, 6.1.4 and 6.1.5)

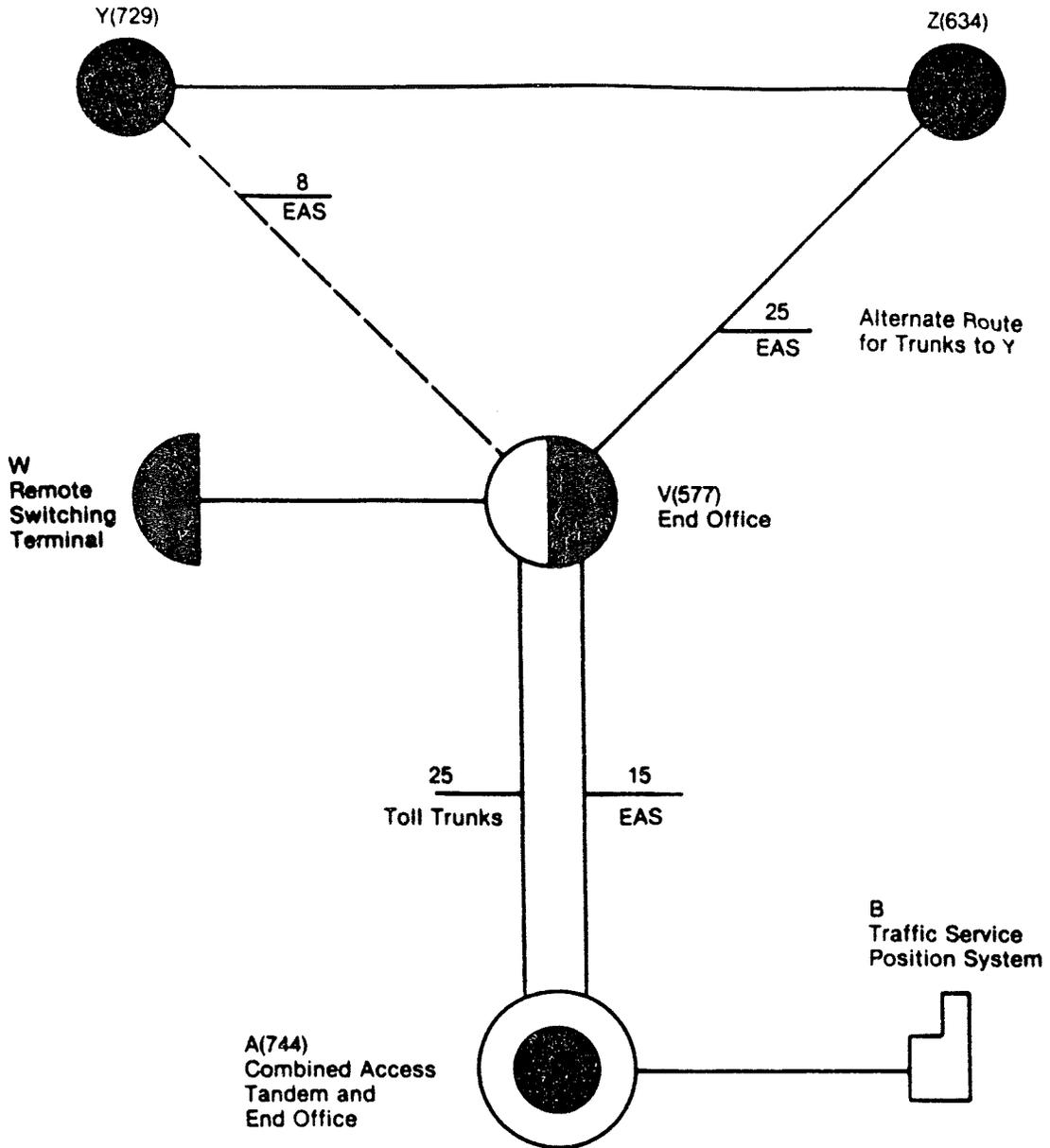
6.1.3.1 Determination of the number of subscribers' lines of each type which will be required should be based on the number of subscribers in the various categories, and the assumed "line fills" (average number of parties served from one line). The estimated total number of establishments in the 5-year forecast (REA Form 569) should be used in preparing this information.

6.1.3.2 If available, the historical line fill may be used. On the basis that an 80 percent line fill can be achieved for all multiparty grades of service by the end of the 5-year period, the following party line fills should be assumed:

<u>Type of Line</u>	<u>Main Stations Per Line</u>
Two-Party	1.6
Four-Party	3.2

Figure 1

End Office Trunking Diagram

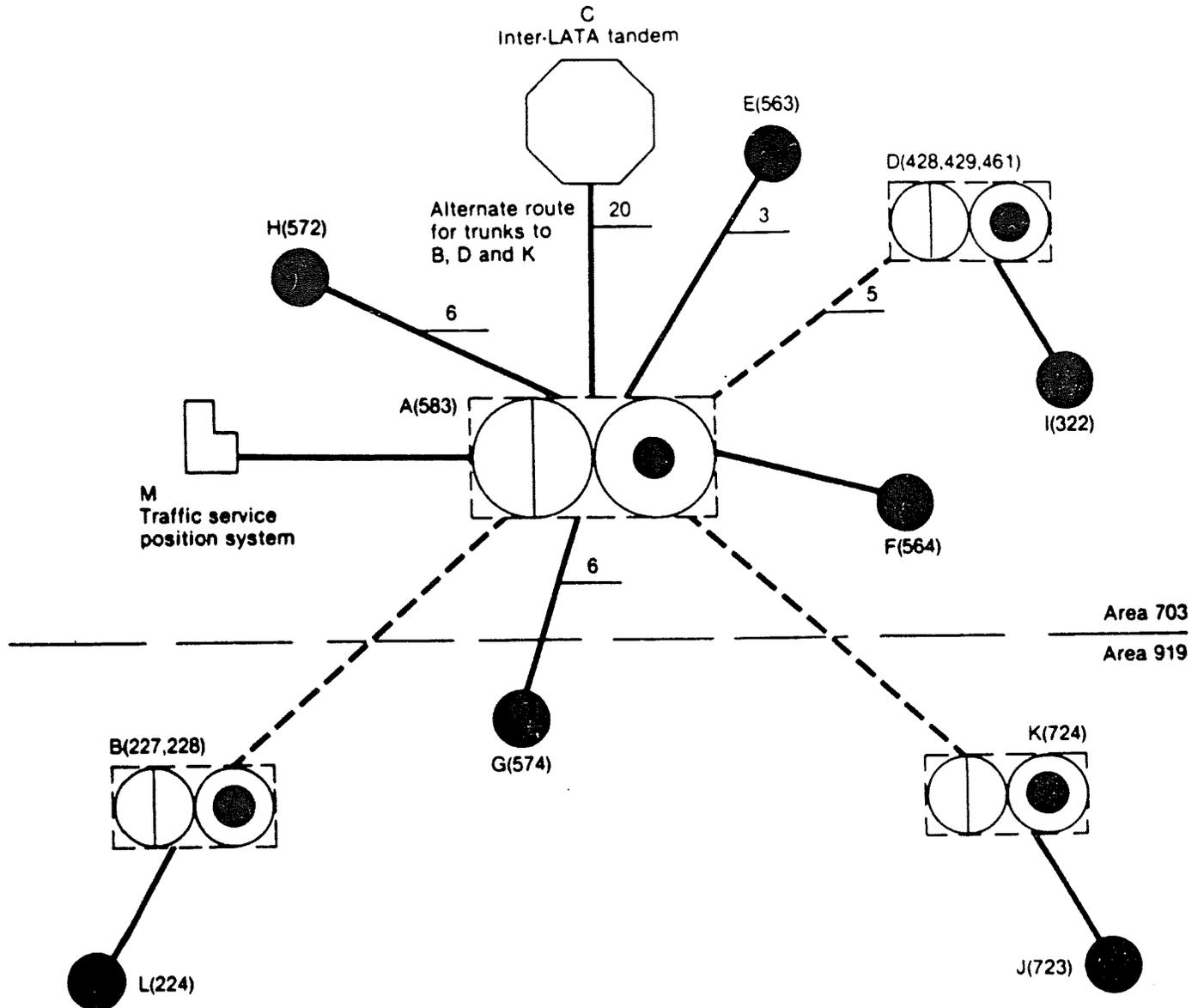


Legend:

- V End Office in specification with Remote Switching Terminal
- W Remote Switching Terminal hosted by V
- Y EAS Office
- Z EAS Tandem and EAS office
- A Access Tandem and EAS Office
- B Location of TSPS
- (NNX) Office Code
- XX Number of Trunks
- Final Trunk Group
- High Usage Trunk Group

Figure 2

Toll Trunking Diagram



- Legend:**
- A Combined end office/LATA tandem/access tandem in specification
  - C Interexchange carrier's inter LATA tandem
  - M Location of TSPS
  - B,D,K Other combined end office/LATA tandem/access tandem
  - E,F,G,H,I,J,K,L End offices
  - (NNX) Office code
  - XX Number of trunks
  - ==== Final trunk group
  - High usage trunk group

Note: Unless otherwise specified, end offices receive last 4 digits

Figure 3  
TRANSLATOR FUNCTION CHART

<u>Called Point</u>	<u>Customer Dials</u>	<u>First Route</u>		<u>Sender Sends</u>	<u>Alternate Route</u>		<u>Sender Sends</u>
		<u>Deletes</u>	<u>Prefixes</u>		<u>Deletes</u>	<u>Prefixes</u>	
<u>End Office</u> (See Figure 1)							
End Office V & RST W	577-XXXX	--	--	*	--	--	--
EAS to Office A Subs.	744-XXXX	744	--	XXXX	--	--	--
EAS Office Y (Direct Trunks)	729-XXXX	729	--	XXXX	--	--	--
(Tandem Alternate Route)					729	--	9-XXXX**
EAS Office Z	634-XXXX	634	--	XXXX	--	--	--
<u>DDD Office</u>							
(Same Area)	1/0-NXX-XXXX	--	--	NXX-XXXX	--	--	--
(Other Areas)	1/0-NO-1X-NXX-XXXX	--	--	NO/1X-NXX-XXXX	--	--	--
<u>Combined End Office/Access Tandem</u> (See Figure 2)							
End Office E	1/0-563-XXXX	563	--	XXXX	--	--	--
End Office F	1/0-564-XXXX	564	--	XXXX	--	--	--
End Office G	1/0-919-574-XXXX	919-574	--	XXXX	--	--	--
End Office H	1/0-572-XXXX	572	--	XXXX	--	--	--
End Office I	1/0-322-XXXX	--	--	322-XXXX	--	--	322-XXXX
End Office J	1/0-919-723-XXXX	919	--	723-XXXX	--	--	919-723-XXXX
End Office L	1/0-919-224-XXXX	919	--	224-XXXX	--	--	919-224-XXXX
Access Tandem A - Local Calls (See Above for EAS Offices)	583-XXXX	--	--	*	--	--	--
Access Tandem B	1/0-919-227-XXXX	919	--	227-XXXX	--	--	919-227-XXXX
	1/0-919-228-XXXX			228-XXXX			-228-XXXX
Access Tandem D	1/0-428-XXXX			428-XXXX	--	--	428-XXXX
	1/0-429-XXXX			429-XXXX			429
	1/0-461-XXXX			461-XXXX			461
Access Tandem K	1/0-919-724-XXXX	919	--	724-XXXX	--	--	919-724-XXXX
Other Dialable Points	1/0-7 Digits or Area Code + 7 Digits - As above. (Charge Calls)						

\*Translator identifies 577 (or 583) as local office code and causes common control circuits to establish connection to XXXX.  
 \*\*For selection at the tandem office, one, two, or three digits may be prefixed to XXXX, or office code may be sent as dialed.

X = Any Digit

N = Any Digit except 0 or 1

6.1.3.3 If historical line fills are used, the predicted number of lines required for each type of service should be listed.

6.1.3.4 Utilizing the line fills or the subscriber data discussed above, the number of lines should be determined for each grade of service, maintaining the separation between business and residence service wherever applicable. The number of lines, in every case, should be rounded off to the next highest whole number.

6.1.4 (Items 6.1.3 and 6.1.4)

6.1.4.1 Continuing the example stated in item 6.1.2, assume that the number of residence two-party main stations is 60.

6.1.4.2 Assume that the number of business two-party main stations is 12.

6.1.4.3 The number of residence two-party lines will be 60 divided by 1.6, or 37.5 lines. This will equate to a total of 38 residence two-party lines.

6.1.4.4 The number of business two-party lines will be 12 divided by 1.6, or 7.5 lines. This will equate to a total of eight business two-party lines.

6.1.4.5 The estimated total number of lines to be entered in items 6.1.3 and 6.1.4 will be the sum of the two-party lines; that is, eight lines plus 38 lines, or 46 lines. This number of lines should be allocated between flat rate and message rate as covered in paragraph 6.1.5.

6.1.5 (Items 6.1.2 and 6.1.4)

6.1.5.1 If message rate service is desired on some lines, the total lines required for such service should be indicated in items 6.1.2 and 6.1.4 with the remaining number of lines required indicated in items 6.1.1 and 6.1.3, respectively. It is necessary to break down line quantities between flat rate and message rate service, because a separate class mark is required for each class of service to ensure recording of all calls from the message rate line (see paragraph 6.1.1).

6.1.6 The subscriber data for the 5-year period, by types of line, should be entered in column (b) of item 7.1. Be sure to separate business and residence subscribers, since the unit calls (CCS) may be different for these two types of service.

6.1.7 When EAS service is provided, different rates may be offered for local base rate and EAS service. Also, more than one type of EAS service may be offered, with different rates for each EAS service offering. The number of lines should be entered in the "Local Service Only" and the "Both Local and EAS Service" columns for each type of line. The totals of these two columns should equal the totals in the "Total Number of Lines Required" column. The number of EAS areas should be entered in the "Number of EAS Areas" column.

6.1.8 (Items 6.1.7 and 6.1.8)

6.1.8.1 The number of "official lines" should be entered for each exchange involved. Any lines not included in the Loan Design, such as business office line(s), manager's line, repairman's line, remote test circuits, etc., should be entered under item 6.1.7. One line should be shown for wire chief, in item 6.1.8.

6.1.9 (Item 6.1.9)

6.1.9.1 The number of "911 Emergency Service Bureau Lines" should be entered under item 6.1.9. An individual calling line requires no special class of service option. Lines to the emergency service bureau require a unique classification. They should be designated as one way terminating only, and optional capabilities required for the emergency service bureau should be noted in item 16.

6.1.9.2 To facilitate other types of telephone service, ordinary 2-way lines may also terminate at the service bureau for use in receiving and originating regular (non-emergency) type of calls.

6.1.9.3 Refer to paragraphs 1.4.20 thru 1.4.20.9 of REA Form 522 Part I for additional information on 911 emergency service bureau requirements.

6.1.10 (Item 6.1.10)

6.1.10.1 The various sizes of number hunting PBX trunk groups should be entered in item 6.1.10 under the column headed "Number of Lines in Group." The number of groups of each size should be entered in the column headed "Number of Groups." The number of groups of each size which require restricted service should be entered in the column headed "Restricted Service at COE."

6.1.10.2 The possible requirements for number hunting service or key service for non-PBX customers should be considered. Business establishments not large enough to require a PBX can make good use of this type of service. As the use of single-party service increases, it is probable that the use of number hunting service will also increase. Paragraph 3.3.1 of Part I of the specification states that equipment shall be provided for at least one trunk hunting line group in each 100 SDN's (Subscriber Directory Numbers) equipped, and that more may be provided as specified by the owner. However, this has nothing to do with the line equipment required, as the trunk hunting arrangements are a part of the stored program controlled equipment. Accordingly, if the office has no immediate requirements for number hunting groups it will not be necessary to include any reserve line quantities for this purpose in the column headed "Total Number of Lines Required."

6.1.10.3 In cases where PBX's have direct inward dialing, the access from the central office must be other than the usual line circuit arranged for PBX trunk access. With this mode of operation, there must be a means of dialing over the central office connection to the PBX. Further, the senders in the office must be arranged to select the PBX access and then outpulse the rest of the directory number which is not done on calls to local subscribers. Therefore, provisions must be made in the translation chart, item 5, to accommodate this type of PBX operation.

6.1.10.4 Subscribers served by extensions in PBX's may have restricted service, either on a local or a toll basis. PBX extensions to be denied direct dial local service will be screened by the PBX equipment and routed to the PBX attendant. In this case, nothing is involved in the central office circuitry. Hence, nothing need be entered in the "Restricted Service" column for such PBX's. Also, nothing need be entered in that column for number hunting groups.

6.1.10.5 When subscribers served by extensions in dial PBX's are permitted to dial local and/or EAS numbers, but are to be denied toll service, the central office equipment must be arranged to return an audible access denied signal or intercept message to such PBX's when a toll number is dialed. To insure that the bidder will provide this feature, a check mark should be placed in the "Restricted Service at COE" column for such PBX's.

6.1.10.6 The type of city trunk access to the central office should be specified under "ground start" or "loop start." Some COE manufacturers must supply much more expensive line circuits for connection to ground start PBX city trunks than loop start. The ground start city trunk is by far the most common and versatile type of operation. Therefore, it will be the unusual PBX that is equipped with loop start city trunks. This should be coordinated with the COE bidder.

6.1.11 (Item 6.1.11)

6.1.11.1 When WATS service is to be supplied, item 6.1.11 has space to fill in the number of lines for inward WATS (800 service) and outward WATS. A description of WATS is contained in LSSGR Section 8 (TR-TSY-000064).

6.1.12 (Item 6.1.12)

6.1.12.1 If there are any other line requirements which do not fit in the earlier categories, the quantity should be listed here and a description of the requirement added to item 16. Examples are: hot lines (virtual circuits) which automatically connect to a predetermined number when the line goes off hook (useful for reaching hotels from airports, and hot lines for 911 emergency service).

6.1.13 (Item 6.1.13)

6.1.13.1 The "TOTAL" to be entered is the sum of the total number of lines from item 6.1.1 thru item 6.1.12. This total must be broken down by host-remote configuration. Since different bidders provide line equipments in different increments, the total number of line equipments to be provided cannot be determined by the owner. This figure is provided in Part V by the selected bidder.

6.1.13.2 In determining the quantities of line equipments to be provided, the bidder will take into consideration the line equipments required for its system for test purposes, as specified in paragraph 2.8 of Part I of the specification, and any future requirements for additional line appearances which may be specified in notes in item 16.

6.1.14 (Item 6.1.14)

6.1.14.1 For existing groups of subscriber directory numbers that are retained, information should be covered in item 16 with a note to that effect here.

6.1.15 (Item 6.1.15)

6.1.15.1 The type of pay station service (semi-postpay, prepay or prepay dial tone first) should be specified here. The type selected must be coordinated with the connecting company and in some cases may be regulated by the state commission.

6.1.16 (Item 6.1.16)

6.1.16.1 If the owner intends to use a line concentrator, it should be covered in this item. If the owner is to furnish it, check "Yes" in item 6.1.16.1 and describe the concentrator by make and model in item 16.

6.1.16.2 If the owner wants the bidder to furnish a line concentrator with this installation, check "Yes" in item 6.1.16.2 and attach REA Form 397g filled out in accordance with REA TE&CM 341, "Application Guide for the Preparation of Detailed Line Concentrator Requirements."

## 6.2 Data on Lines Requiring Range Extension (Item 6.2)

### 6.2.1 (Item 6.2.1)

6.2.1.1 Equipment purchased under the digital central office equipment specification is capable of serving non-pay station subscriber lines with loop resistances, including the telephone set, up to and including 1900 ohms, under stabilized voltage conditions. The number of lines with a loop resistance greater than 1900 ohms should be indicated in the appropriate loop range space provided in this paragraph. See paragraphs 2.1.1 and 2.6.1, Part I of the specification.

6.2.1.2 The conventional devices for central office equipment range extension are loop extenders which are available from a number of manufacturers. These devices, which use largely solid-state components, incorporate their own power supply, and are less expensive than long line adapters. They do not provide any pulse correction, however. An REA "Specification for Central Office Loop Extenders," PE-61, is issued to establish requirements for these devices, and those which are acceptable are listed in REA Bulletin 344-2.

6.2.1.3 While this method of providing range extension will provide satisfactory supervisory, dialing, and ringing performance, it does not provide transmission gain. Accordingly, voice frequency repeaters may be needed to provide acceptable voice transmission. These voice frequency repeaters may be physically mounted on the same cards as the loop extenders and may or may not have their gain controlled by them. The VFR's may also be purchased as a separate unit. Both types appear on the REA List of Materials. A preference for either the separate or the combined type, or for a device manufactured by a particular supplier, should be stated in item 16. Refer to REA TE&CM 424, "Design Guidelines for Telecommunications Subscriber Loop Plant."

### 6.2.2 (Item 6.2.2)

6.2.2.1 The number of pay station lines with outside plant loop limits, excluding the pay station, greater than 1200 ohms (for prepay) or 1000 ohms (for semi-postpay operation), should be indicated.

### 6.2.3 (Item 6.2.3)

6.2.3.1 (Items 6.2.3.1 and 6.2.3.2)

6.2.3.1.1 Ordinarily, the bidder will be requested by the owner to provide equipment to guarantee proper operation with all lines in the office. Cases may arise, however, where the owner personally wishes to provide range extension equipment (loop extenders and voice frequency repeaters), either to reuse equipment from other offices or to otherwise state the type of equipment to be used. If all equipment is to be provided by either the owner or bidder, the appropriate quantity should be filled in. If some equipment is to be provided by the bidder, and some by the owner, the quantities in both blanks, as well as the "Total," should be filled in. The owner should specify who will install owner-furnished equipment. A bidder is not responsible for operation of its equipment with range extension equipment provided by the owner, but is expected to advise the owner, on request, whether or not the central office equipment will function properly with the equipment the owner provides. The owner should specify manufacturer and part number of equipment being supplied in a note in item 16 of Part III.

6.2.3.2 (Item 6.2.3.2)

6.2.3.2.1 If the bidder is to furnish voice frequency repeaters, the owner should specify cable gauge and loading scheme.

6.2.3.3 (Item 6.2.3.3)

6.2.3.3.1 It may be feasible for the central office bidder to incorporate loop extension and voice frequency gain in its switching system. The reason for doing so is that, by sharing the loop extenders and voice frequency repeaters, the system might be less expensive, particularly if there are an appreciable number of lines with loop resistance beyond 1900 ohms. This type of operation has administrative disadvantages. In a particular situation, item 6.2.3.3 may be marked "Yes" in order to encourage a lower bid.

## 7. TRAFFIC DATA - LINE ORIGINATING AND TERMINATING TRAFFIC

7.1 (Item 7.1)

7.1.1 This item is used to calculate the overall originating busy hour traffic for the office, and also the number of lines required, using the number of main stations for the 5-year period. In the case of types of lines not anticipated in the Loan Design, such as WATS and Data Service, the borrower should provide an estimate for the purposes of the specification to insure that provisions will be made for all types of service which might be required by the end of the 5-year period.

7.1.1.2 As pointed out in paragraph 1.1.5, above, traffic data for CCS per main station (CCS/MS) contained in the Loan Design is likely to be obsolete, so it is extremely desirable that current data be obtained from actual traffic measurements with projection for effects of upgrading, if applicable. If such measurements cannot be made, an attempt should be made to obtain data from similar exchange areas in the vicinity. If this cannot be done, it is recommended that the following calling rates be used to fill column (a) in item 7.1

<u>Class of Service</u>	<u>CCS per MS</u>
Individual - Residence	1.2
Individual - Business	1.8
Two-Party - Residence	1.0
Two-Party - Business	1.5
Four-Party	0.7
Pay Stations	1.8
Number Hunting or PBX Lines	4.0
Telephone Company Official	2.0
Wire Chief	1.2
WATS	16.0
Data Service	16.0
911 Emergency Service	*

NOTE: These rates may be adjusted to respond to local requirements.

\* CCS rate should be established from data obtained from Emergency Service Bureau

7.1.1.3 When an office contains a large number of interoffice trunks, the interoffice trunk traffic, as shown in item 8.1.1, should be compared with the total originating traffic to make sure the CCS station calling rate is high enough. This is especially true if there are EAS trunks.

## 7.2 (Item 7.2)

7.2.1 If the computed originating busy hour CCS per line, using the data from item 7.1 comes to less than 1.7 CCS/L for offices with four-party service, the office should be engineered to handle 1.7 CCS/L. It is recommended that a minimum of 1.3 CCS/L for single-party systems and 1.6 CCS/L for one- and two-party systems be used to ensure adequate traffic handling capacity for these systems. REA believes these figures are the minimum which may be used to ensure that adequate traffic carrying capacity will be provided. The ultimate traffic figures must show a realistic change based on local experience. These figures could have a direct bearing on the type of equipment proposed.

7.3 (Item 7.3)

7.3.1 If it is necessary to increase the originating BH CCS/L to obtain the values as described above, then the terminating BH CCS/L should be increased in the same proportion. In rural offices, the assumption is usually made that the originating and terminating traffic is equal, but this is not always the case. In high density areas where seasonal subscribers predominate, for instance, the originating traffic is usually larger than the terminating traffic. However, unless otherwise specified, the terminating traffic is assumed to be equal to the originating traffic.

7.4.1 (Item 7.4)

7.4.1 The percentage of lines equipped for pushbutton dialing is to be used by the bidder to determine the number of tone receivers to be furnished. See paragraph 12.2.3.1, Part I, of Form 522. Note that the percentage applies to the central office line and not to the subscriber line. The percentage should be a realistic estimate of the probable sales of pushbutton capability on the central office lines. It should be noted in Item 16 that rotary dialing should be assignable to all lines in the office, regardless of the quantity of pushbutton lines required.

7.5 (Item 7.5)

7.5.1 (Item 7.5.1)

7.5.1.1 The ultimate number of lines should be estimated for both host and remotes. In the absence of detailed information, and provided the present population trend is not downward, an ultimate capacity of two to two and a half times the initial number of subscriber lines may reasonably be assumed. It may also be assumed that the service will become totally one-party within 5 years. Also, existing nearby end offices may be considered as future remote switching terminals if appropriate.

7.5.2 Very careful consideration should be given to each situation, since an error in judgment might prove very costly. In particular, every attempt should be made to anticipate types of lines such as WATS lines and Data Service lines which may be required in the future, although not provided initially.

8. TRUNK CIRCUIT REQUIREMENTS

8.1 Interoffice Trunking (Item 8.1)

8.1.1 (Item 8.1.1)

8.1.1.1 General. Also see paragraph 4, Part I.

8.1.1.2 Any trunking information that is not included in REA Form 522, Part III or IV should be included for information purposes with the specification sent to prospective bidders (e.g. Connecting Company Trunking Requirements).

8.1.1.3 Line 1: This is to be completed with the geographical name of the distant office. Each column will be used for a separate trunk group even though they go to the same office. If the borrower is participating in the "Common Language" program, the Common Language designators may be used.

Line 2: Complete with the type of service for which the trunk will be used, i.e., TSPS, Extended Area Service, Busy Verification, CAMA, Pay Stations, Intercept, Super-Combined, etc.

Line 3: Designations of trunk group as indicated in note 1 on page 10 of Part III

Line 4: The quantity of trunks in many cases will be dictated by the agreement between the borrower and the connecting company. Traffic may be determined by how many trunks the interexchange carrier has ordered. Otherwise, the number of trunks will be dictated by the CCS capacity as indicated in the sixth line. (See Part I, paragraph 12.1.6 and 12.5).

Line 5: The percentage of the original number of trunks which can be reasonably expected to be added to the group. Without additional information, the same percentage growth may be shown as is given for subscriber lines.

Line 6: Traffic loads in CCS/BH for interoffice trunk groups are to be listed in the appropriate blanks of line 6, item 8.1.1. This information, if not available, can be estimated for the purpose of calculating the switch quantities from the trunk quantities at B.005, using the Traffic Table. (Paragraph 12.5, REA Form 522, Part I.)

a. Traffic Capacity of Partial Two-Way Trunk Groups

The traffic capacity of partial two-way trunks can be estimated as shown in the following example:

Example: An EAS route consists of 15 one-way outgoing trunks, 20 one-way incoming trunks and five two-way last choice trunks. What is the traffic capacity of the combined group?

The traffic capacity in each direction can be estimated as the traffic capacity of the one-way trunks plus the portion of the

two-way trunks divided between outgoing and incoming in proportion to their quantities. In this example, the five two-way trunks are divided between outgoing and incoming as follows:

$$\begin{aligned} \text{Proportion of Two-Way Trunks} \\ \text{for Outgoing Traffic} &= \frac{5 \times 15}{20 + 15} = 2.1 \\ \text{Proportion of Two-Way Trunks} \\ \text{for Incoming Traffic} &= \frac{5 \times 20}{20 + 15} = 2.9 \end{aligned}$$

The outgoing traffic will use two trunks of the two-way group and the incoming traffic will use three trunks. Traffic capacity of  $15 + 2 = 17$  trunks for outgoing traffic = 318 CCS and the traffic capacity of  $20 + 3 = 23$  trunks for incoming traffic is 483 CCS. When a mixed group is encountered, put the word "combined" in the CCS under two-way trunks.

b. High-Usage Groups

High-usage (HU) groups are designated as follows:  
"10 HU 12," signifying 10 HU trunks in which the last incremental trunk carries 12 CCS (called the "Economic CCS"). Since the use of HU trunks in offices of REA borrowers is rare and since the Economic CCS is not usually specified (although 12 CCS is usually used for short haul trunks), the traffic capacity of high-usage trunks can be estimated from the Traffic Table. (Item 12.5 of REA Form 522 Part I.) The present procedure is set forth to make a conservative estimate of the traffic capacity of high-usage groups by using the Traffic Table. It should be emphasized that we are not setting a new procedure for estimating the quantity of trunks in high-usage routes, but rather a simple procedure for estimating the busy hour CCS required to determine the quantities of the common control units required.

c. Final Groups

Final groups are usually engineered so that an incremental intertoll (or equivalent) trunk carries 30 CCS and an incremental inter-local trunk carries 28 CCS. These values correspond to large final groups consisting of over 20 trunks. Since final routes used in offices of REA borrowers will be small and since they carry peaked traffic which requires more circuits than random traffic, a conservative estimate of the traffic capacity of final routes will be that shown in the Erlang Table at B.005. The traffic capacity of a final group consisting of 15 trunks will be 266 CCS.

Line 7: This line is to be completed with the information as to the direction of the trunks relative to the office being specified.

Line 8: Enter the total number of digits dialed by a subscriber to complete calls over this group. For instance, if it is a CAMA group dialing "1" + 7/10 digits, write "8/11." On an EAS group, signify 7, even though a translator might add more digits for a tandem situation.

Line 9: The number of digits to be outpulsed, from the office covered in the specification, to complete calls in the distant office is to be inserted in this line. This information will be used to determine the average holding times of the originating register senders.

Line 10: To be completed with the number of digits to be received by this office on incoming trunk calls to local and/or tandem calls. This information will be used to determine the average holding times of incoming registers.

Line 11: Type signaling refers to whether it will be E & M Type I, E&M Type II, loop dial, tone, etc. When direct digital interface is to be used, the type of signaling is D3. If common channel signaling is to be used, so mark and describe system in item 16. See paragraph 4.4 of Part I of Form 522. Section 6 of the "Notes on the BOC Intra-LATA Networks" describes signaling in detail.

Line 12: Type pulsing refers to the mode by which the digital address information is sent. Examples are 20 pulses per second, 10 pulses per second, and multifrequency dialing.

Line 13: If the trunks are to be carrier derived other than PCM carrier, they can be either two-wire or four-wire. In some cases, existing two-wire carrier will be reused which cannot be converted to four-wire operation. In such a case, check line 13. If the group is partially carrier derived, place a number corresponding to the number of carrier channels in the group.

Line 14: If T1 or non-PCM four wire carrier is to be used, check line 14. The preferred method for non-PCM carrier is four-wire, because return loss will be far better. If the group is partially carrier derived, place a number corresponding to the number of carrier channels in the group.

Line 15: Check if trunks are to be on physical circuits. If the group is partially physical, place a corresponding number here. The sum of this, Line 13 and Line 14 should agree with Line 4

Line 16: Complete with number of repeat coils for physical circuits only.

Line 17: When E & M signaling is specified on physical trunks, "DX" signaling should be provided in preference to the CX or SX type signaling except where required for compatibility with a connecting office. Accordingly, the CX and SX types of signaling are not listed under trunking requirements. If such circuits are required for compatibility, a check should be made in line 18, "Other Type Signaling," and the type and quantity of circuit required shall be specified by a note in item 16. Specify the number and whether Type I or Type II (see paragraph 4.3.5, Part I of Form 522) DX circuits on this line.

Line 18: In the absence of DX signaling, the most preferable signaling on physical trunks is loop dial. If loop dial is to be specified, it should be done here. Read REA TE&CM 319 for further information on types of trunk signaling.

Line 19: If the trunk is coming from a distant office which has a sender, then it should be assigned as delay dial. The purpose of this is to stop the distant sender until a local incoming register has been attached to the trunk. The incoming registers can be supplied at a lower grade of service under these conditions. If the distant office is direct driven step-by-step, then the dialing cannot be delayed and registers must be provided in larger quantity.

Line 20: When the interoffice trunks are to be PCM carrier, the central office will be able to interface with this directly without first having to be converted to voice frequency transmission. This line should be checked to indicate this requirement. A direct digital interface can supply up to 24 trunks to the same geographic destination regardless of usage assigned to each of the trunks, e.g., incoming, outgoing, verification, and toll connecting.

Line 21: The feature group required should be checked here. Details are contained in Section 6 of Notes on the BOC Intra-LATA Networks.

8.1.1.4 Additional lines are left for requirements of the trunk or trunk group which are not listed in lines 1 - 21. If there are special signals such as wink start or unusual conditions at the far end which must be met, they are to be listed here.

8.1.2 (Item 8.1.2)

8.1.2.1 When four-wire carrier is specified on a voice frequency interface basis, transmit and receive pads of 7dB and 16dB respectively, are always required for each channel. Fill in the quantities to be furnished by bidder and owner.

8.2 Switched Traffic Data (Item 8.2)

8.2.1 Originating Traffic (Item 8.2.1)

8.2.1.1 The traffic data used in the past for engineering step-by-step central offices has been expressed in terms of CCS only. For determining the quantities of common control type equipment, it is necessary to have information as to the actual number of calls made during the busy hour. If the average call holding time is known, per type of call, the number of busy hour calls can be calculated by dividing the busy hour CCS figure times 100 by the call holding time in seconds. Even if data are given in the Loan Design as to the total number of originating busy hour calls per main station (BHC/MS), by type, such data are likely to be obsolete. It is highly desirable that current data be obtained from actual traffic measurements on the existing switching equipment. If such measurements cannot be made, the call holding times in paragraph 12.3.2 of Form 522, Part I, should be used in figuring out the busy hour calls required for estimating the quantities of common control units. These holding times are conservative and represent the average effective and ineffective calls.

8.2.1.2 It should be emphasized that some of the newer services, such as Data Service, may have extremely short holding times, so that for the same CCS/BH, the BHC/MS for such lines may be much higher than for regular subscriber lines.

8.2.1.3 The busy hour calls for assistance, special service, EAS and toll should be calculated by applying the appropriate holding time to the CCS/BHC data provided for the various outgoing and two-way trunk groups, as listed in item 8.2. The breakdown between station-to-station (prefix "1") and PPCS (prefix "0") traffic should be estimated by the owner if not available from current traffic measurements. In the absence of measured data, the toll busy hour CCS should be broken down between S-S and PPCS in the ratio of 4:1. The PPCS busy hour CCS should be broken down between "0-" and "0+" calls in the ratio of 1:4, and the DDD busy hour CCS should be broken down between 7- and 10-digit calls in the ratio of 2:1.

8.2.1.4 Office Busy Hour vs. Group Busy Hour

8.2.1.4.1 It is well known that due to noncoincidence of group busy hours of the trunk groups, the office busy hour load, that is, the load of the various groups at the same busy hour, will be less than the sum of the group busy hour loads. However, the reduction of the group busy hour load will not be made in any part of the switch calculation. The larger load guarantees a more generous grade of service.

8.2.1.5 The intraoffice (IAO) traffic should be provided by the owner or its engineer, but in the absence of such information the IAO and 0- traffic can be estimated from the subscribers' originating calling rates and the trunk quantities using the following assumptions:

- a. The subscribers' originating and terminating traffic are equal.
- b. Where two-way trunks are provided, the originating and terminating EAS traffic are equal.
- c. The originating intraoffice traffic equals the difference between the total subscribers' originating traffic and the outgoing trunk traffic.

Since the amount of intraoffice traffic calculated in this manner tends to be underestimated, it will be assumed that the intraoffice traffic shall not be less than 40 percent of the originating traffic in order to assure provision of sufficient intraoffice paths.

- d. Without TSPS operation, the operator assistance traffic equals one half the difference between the CCS capacity of the two-way toll connecting trunks and the CAMA trunks.
- e. In case of TSPS operation in which "0+", "0-" are combined in one route, the operator assistance traffic (0-) can be estimated as 20 percent of the total TSPS traffic, unless specific data are available.
- f. Busy hour attempts are the number of busy hour calls increased by a factor of at least 40 percent to allow for false register seizures when dialing is not completed or busies are encountered. The local originating registers must be proportioned to include this traffic. The figure "40 percent" is used in the absence of true information.

#### 8.2.2 Terminating Traffic (Item 8.2.2)

8.2.2.1 The data provided in item 8.2.2 will be used by the bidder in determining the quantities of incoming registers or equivalent circuits required. The number of terminating calls of various types may be obtained as described for originating calls in paragraph 8.2.1.5, above. The CCS/BH figures given in item

8.1.1 may be used with the HT/BHC used for DDD and EAS calls, and for local incoming and intraoffice calls, in obtaining the overall number of terminating calls. Intraoffice call traffic (same value as used in 8.2.1) will not be utilized in calculating incoming register quantities except in the case of systems using incoming registers or the equivalent in the process of completing intraoffice calls. The same will hold for toll switch calls where the incoming toll from a distant office is automatically switched through to the connecting company's toll trunks without dialing.

#### 8.2.2.2 Tandem Traffic

8.2.2.2.1 It is necessary to indicate the volume of tandem EAS traffic, if any. Since the usual method of calculating the intraoffice traffic requires a knowledge of the tandem traffic, the most practical method is to measure the equivalent of the tandem traffic as it exists in the present system. If data are not available, the tandem EAS traffic can be approximated from the trunk quantities, provided the intraoffice traffic is known from another source, as explained in the following example:

	<u>CCS</u>
Given: Subscriber's Originating Traffic	= 3050
Intraoffice Traffic	= 1230
Outgoing Traffic, Non-EAS: (Operator Assistance + CAMA + Special Service)	= 245
Total Outgoing EAS, Including Tandem	= 1800
 EAS Traffic Originated by Subscribers	
= 3050 - (1230 + 245)	= 1575
 Therefore, EAS Tandem = 1800 - 1575	= 225

### 8.3 Traffic Example

8.3.1 Appendix A shows a method of obtaining the necessary information using an imaginary office. Shown are suggested work sheets for completion of the traffic portion of a stored program controlled specification.

## 9. CHECKLIST OF FEATURES REQUIRED (ITEM 9)

### 9.1 Alternate Routing (Item 9.1)

9.1.1 If item 9.1 is checked the stored program controlled equipment is to be arranged to provide for at least two alternate routes to the desired destination(s) functioning as covered in paragraph 3.1.7 of Part I, Form 522. This should be spelled out in detail in item 16.

### 9.2 Data Service (Item 9.2)

9.2.1 When subscribers wish to connect business machines to their telephone lines and have access to other business machines through automatic connections through the switching network on a class of service basis, then item 9.3 should be checked. A detailed description of what is desired should be given in item 16.

9.3.1 (Item 9.3.1, 9.3.2, 9.3.3)

9.3.1.1 These items are self-explanatory and should be filled in to meet the particular requirements.

9.4 Billing Data (Item 9.4)

9.4.1 If AMA Recording is to be used in this office, only this item should be completed. Feature group and type of system (i.e.) pollable or nonpollable) shall be checked here. Details may be explained in item 16.

9.4.2 When this office is to perform billing for remote switches or other tributaries, this item should be completed. Details should be explained in Item 16.

9.4.3 When Local Automatic Message Accounting (LAMA) is required, this item should be checked.

9.5 Pollable Systems (Item 9.5)

9.5.1 If the owner intends to use a polling device, it should be checked here and details of the protocol, etc., provided in item 16.

9.5.1.1 If the bidder is to supply the polling device, "Required" should be checked. If the owner is to supply the device, "Not Required" should be checked.

9.5.1.2 If no polling device is to be used, this item is not to be checked.

9.5.2 If a polling system is to be used, this item should be checked.

9.6 AMA Format (Item 9.6)

9.6.1 If the stored program controlled central office is to have automatic message accounting equipment in conjunction with it, then this item is to be checked. Provide details in item 16.

10. MISCELLANEOUS OPERATING FEATURES (ITEM 10)

10.1 Busy Verification (Item 10.1)

10.1.1 Busy verification is a feature which permits a toll operator or switch person to override a busy line condition to determine if a line is out of order or in use. It also permits an operator to verify the charge number given by a subscriber on a

toll call. It is essential that precautions be taken to ensure that under no conditions can the busy verification facilities be used by anyone except an operator or supervisory switch person, such as a wire chief or chief switch person.

10.1.2 The preferred arrangement for busy verification is the use of a separate trunk or trunks dedicated to the verification function only, from the operator position to the dial office. Access from the nationwide network directly to busy verification is thereby made impossible. If it is desired to use a two-way trunk for busy verification by the operator, the same trunk can be used in the opposite direction (from the dial office to the operator switchboard) for intercept or alarm service. If it is desired to use a dedicated trunk or trunks for busy verification, check item 10.1.1.1 or 10.1.1.2. Access to the busy verification facilities under this condition by the wire chief or chief switchman will be by a multiple appearance of these trunks or by separate dedicated trunks from their location, so indicated by check marks in the proper blanks in item 10.1.3.

10.1.3 In the past in smaller offices where separate busy verification trunks would have been too expensive, it was customary to provide busy verification from the operator by using the regular toll completing trunks with the operator prefixing the directory number with a digit or digits, such as "0", "00", or "000". The idea was to stop a customer from reaching busy verification. This was done by filling the registers with too many digits or invalid codes in the originating exchange, CAMA center, or intermediate tandem. With the advent of international dialing and deregulation of inter-LATA service (and in some cases intra-LATA service), the argument for separate busy verification trunks is much more persuasive. However, if the owner and the connecting company determine that the prefix method is feasible in a given situation, the agreed upon code should be entered in item 10.1.2.

## 10.2 Revertive Calls - Directory Number Only (Item 10.2)

10.2.1 The "Directory Number" method is simply the dialing of the called subscriber's directory number; in processor-controlled systems it is possible to recognize revertive calls by comparing the line equipment location of the calling line with that of the called directory number. When seized, the switch should be arranged to give a recorded announcement to the calling subscriber and ring the called station when the calling subscriber hangs up. On answer, either a recorded announcement or a distinctive (tick) tone is given to the called party. The recorded announcement is desirable, but the tick tone is less expensive and probably less of a maintenance problem. If there is a preference for either the tone or the recorded announcement to the called party, it should be indicated in item 10.2.1.

## 10.3 Intercept Facilities (Item 10.3)

10.3.1 The present suggested criteria for adequate intercepting service for direct distance dialing are: changed number intercept is to be either by an operator or by a recorded announcement with cut-through to an operator; intercept service is to be provided in all cases for vacant codes, disconnected numbers and unassigned numbers, but a recorded announcement will be satisfactory for this service. However, wherever operator intercept can be provided economically, it should be specified since it gives the calling subscriber the most satisfactory service.

10.3.2 The latest method of handling intercepted calls is via Automatic Intercept Systems (AIS). When this is available, it is the preferred method. With this type of service the intercept is divided as to types, such as vacant level and changed directory numbers. Where there has been a number change, the called directory number is forwarded to the AIS office by MF tones in a manner similar to ANI. The number change is returned in voice via recording and then, if necessary, a cut-through to an operator after a timeout interval.

10.3.3 When AIS is not available, a similar method of operation is used in handling intercepted calls with a minimum amount of operator work time. It consists of a general message requesting checking of the directory followed by a cut-through to an operator after a timeout interval.

10.3.4 The proper blanks in items 10.3.1 and 10.3.2 should be checked to indicate the selected method of handling intercepted traffic. The method to be used for reaching the intercept operator should be indicated by checking the proper blank in item 10.3.3. When the operator is in the same building, a separate trunk group is preferable. Otherwise, regular interoffice trunks may be used, with a minimum of three trunks arranged for handling intercept. AIS is always accessed over a dedicated trunk group.

10.3.5 When intercept is handled over regular interoffice trunks, the additional CCS/BH are so low that in most cases additional trunks will not be needed. Where a separate trunk group is provided, one trunk should be specified for each 500 lines or fraction thereof in the office (with a minimum of two trunks). The proper figure should be entered in item 10.3.4.

10.3.6 If the owner wishes the bidder to furnish cassettes or other recording media with Special Information Tones (SIT's), place a note in item 16 to that effect. Details of SIT are contained in Section 6 of "Notes on the BOC Intra-LATA Networks."

10.4 Line Load Control (Item 10.4)

10.4.1 As covered in paragraph 3.12 of Part I of the specification, there may be cases where the owner wishes to specify facilities for giving preference for outgoing service to a limited group of subscribers during emergencies which might stimulate such heavy traffic that essential calls could not be completed. The proper blank in item 10.4.1 should be checked to indicate whether or not line load control facilities are required.

10.4.2 Line load control facilities, if required, may be activated either manually, or automatically with heavy traffic after manually setting a key to put line load control into effect. The method of operation of line load control is not an option which can be specified by the owner; rather, it is determined by the bidder in the design of the bidders system.

#### 10.5 Service Observing Facilities (Item 10.5)

10.5.1 Some operating companies require facilities to be provided to measure the quality of service being given the subscribers by the central office equipment and by the operators. Such measurements are usually on a statistical basis and are obtained by observing the quality of service on a certain percentage of the connections established through the office. Since there are no REA standards established for equipment for providing such facilities, the owner desiring them should discuss their provision with the REA area office and various potential bidders, explain the details in a note in item 16, and check the proper blank in item 10.5.1.

#### 10.6 Hotel-Motel Arrangements (Item 10.6)

10.6.1 Some operating companies offer a service to hotel and motel owners whereby message registers on the premises are provided for each hotel or motel room. The register is operated over the PABX trunk by either line reversal or a separate conductor from the central office whenever the room occupant completes a directly-dialed local call. There are no REA standards established for such arrangements, so the owner desiring them should discuss their provision with the REA area office and various potential bidders, and check the "Required" blank in item 10.6.1. If some other system is required, check "Other" and explain in item 16. If hotel-motel arrangements are not required, the "Not Required" blank in item 10.6.1 should be checked.

#### 10.7 Nailed Up Connections Required (Item 10.7)

10.7.1 A nailed up connection is a permanent connection through the digital switching network, connecting two ports or channels. Nailed up connections are established by data base entries into the processor. The most common application is to connect permanently a given line and a given trunk channel, so that the line can be used as a special service line over the trunk channel to some other location.

10.7.2 Alternatively, the same service can be provided by separately purchased drop and insert equipment, which does not use up traffic capacity in the switch.

10.7.3 If nailed up connections are required, check item 10.7 and describe the requirement in item 16.

#### 10.8 Vertical Services (Item 10.8)

10.8.1 If vertical services are required, the bidder must be able to determine the memory requirements. Specify only as much as can be sold in 5 years. Equipment can be added later as demand justifies it.

##### 10.8.1.1 Call Waiting (Item 10.8.1)

10.8.1.1.1 This feature tells the subscriber by a burst of tone that another call has arrived. The customer can flash, placing the original call on hold, to talk to the new caller. Also, the customer can hang up, in which case the telephone will ring, and when answered be connected to the new call. Fill in the initial and ultimate number of lines to have this feature. Be sure to include lines in the RSTs.

##### 10.8.2 Call Forwarding (Item 10.8.2)

10.8.2.1 Call forwarding allows a subscriber to activate a feature which forwards incoming calls to a directory number which the subscriber dials in the activation sequence. The subscriber can deactivate the feature by dialing a deactivation code from the subscriber's line. Forwarded calls should be blocked to existing CAMA centers which do not return answer supervision. Fill in number of lines required initially and ultimately. Note: Calls forwarded to a directory number reached via toll will be billed to the forwarding subscriber.

##### 10.8.3 Abbreviated Dialing (Item 10.8.3)

10.8.3.1 In order to size the memory, the bidder must know how many lines are to have abbreviated dialing and how many codes that they can use. For example, you may wish to indicate eight codes for 20 lines and 30 codes for 50 lines. This means that 20 lines can use a series of eight codes to reach their individual lists of eight frequently called numbers, and 50 lines can use a series of 30 codes to reach their individual lists of 30 frequently called numbers.

##### 10.8.4 Three-Way Calling (Item 10.8.4)

10.8.4.1 Three-way calling allows a subscriber to add a third party to an existing call. Fill in the number of lines and the CCS per line. When calculating CCS/line for this feature the percentage of feature use should be used rather than the

CCS/line shown in Part III item 7.2. With 1.5 CCS/line (item 7.2) and a 15 percent feature use this would be calculated as  $1.5 \times .15 = .34$  CCS/line required for this feature. In determining the quantity of conference bridges required the bidder must know CCS/line required for this feature and not the CCS/line shown in Item 7.2.

## 11. MAINTENANCE FACILITY REQUIREMENTS (ITEM 11)

### 11.1 Alarm Signals (Item 11.1)

11.1.1 When alarm signals are to be handled locally, it is assumed that someone will always be in attendance to receive them, or else the signals can be sent over a local telephone to the residence of a nearby switch person which we assume will always be attended. It should be kept in mind, in the latter case, a failure of all ringing supplies will prevent transmission of alarms, unless a special alarm circuit is specified for use along with the local telephone, and dc signaling is accomplished over a third conductor. If alarm signals are to be handled locally, a description of the method to be used should be given in item 11.1.1.

### 11.1.2 (Item 11.1.2)

11.1.2.1 When stored program digital central offices are to be arranged for unattended operation, they will be equipped with alarm sending and checking equipment as described in 11.1, Part I, of the General Specification unless otherwise specified by the owner and its engineer. When alarm sending is to be accomplished via operator trunks, item 11.1.2 should be checked.

11.1.2.2 The complexity of the digital switching system will require a great deal more alarm information than did the electromechanical switches when there is a failure. It is doubtful that a connecting company will wish to handle this; therefore, if the office is unattended, the alarms should be sent to a location where a printout or other type of display device will be attended full time. Such a center would normally be used for a number of offices. This, of course, is the preferred method; but if it is not economical, then the alarms to the toll operator will have to suffice.

11.1.3 When operator trunks are used for alarm sending, a distinctive tone is given to the operator to indicate that the call being answered is an alarm sending call. The customary tone used for this purpose is the tick tone, and if this is to be used, item 11.1.2.3.1 should be checked. Cases may arise in certain areas where the use of some other type of tone is considered desirable. In such a case, an explanation of what is required should be given in item 11.1.2.3.2.

### 11.1.4 (Item 11.1.3)

11.1.4.1 Carrier and mobile radio groups are sometimes divided into two categories: low priority and high priority. The low priority groups should be assigned a minor alarm, and the high priority groups should be assigned a major alarm. If only one category is required, a decision should be made as to what alarm signal is required, and either item 11.1.3.1 or 11.1.3.2 should be checked. If priorities are not assigned at the time of the initial installation but may be assigned at a future time, item 11.1.3.3 should be checked.

## 11.2 Trouble Location and Test (Item 11.2)

### 11.2.1 Outside Plant and Stations (Item 11.2.1)

#### 11.2.1.1 Subscriber's Loop Test Circuit (Item 11.2.1.1)

11.2.1.1.1 A subscriber's loop test circuit is an essential item of test equipment required in every office. It will probably be convenient to include the subscriber's loop test circuit as part of the maintenance center, in which case item 11.2.1.1.1 should be checked. If the subscriber's loop circuit is to be supplied separately, item 11.2.1.1.2 should be checked. If the owner wishes to reuse a subscriber's loop circuit, no check should be made in either item 11.2.1.1.1 or 11.2.1.1.2, and an explanation should be provided in a note in item 16.

#### 11.2.1.2 Remote Test Set (Item 11.2.1.2)

11.2.1.2.1 This test set is for testing subscriber lines in remote offices (usually unattended CDO's) from a test position in a centrally located office. It provides about the same test facilities for the remote point as the subscriber's loop test circuit provides for the local central office, including dc tests for grounds and leakage on tip and ring, loop resistance, foreign potentials (ac and dc), and capacitance from tip and ring to ground and between wires. Test commands and test data are transmitted as tones in the voice band over any available voice grade trunk connection (voice, carrier, or radio, or combinations thereof). If this test set is to be provided by the bidder, item 11.2.1.2 should be checked and a description of the equipment to be used is to be made in item 16.

#### 11.2.1.3 Dial Speed Test Circuit (Item 11.2.1.3)

11.2.1.3.1 There are several types of dial speed test sets. The integrated type is one which is permanently mounted in the central office and is accessed by dialing a particular digit or code. It will return to the calling party readily identifiable signals to indicate that the dial speed is slow, normal or fast. The portable type, when used at the central office, requires someone to read it as well as someone at the telephone to operate the dial. One of these units may be used to serve several central offices.

The integrated type dial speed test circuit is preferred for digital central offices, and if such a set is to be provided by the bidder, item 11.2.1.3 should be checked. If a portable set is to be provided by the bidder, item 11.2.1.3 should be checked and a notation should be placed in item 16 to the effect that a portable unit is required. If the bidder is not to provide a dial speed test circuit, item 11.2.1.3 should not be checked.

#### 11.2.1.4 Pushbutton Dialing Test Circuit (Item 11.2.1.4)

11.2.1.4.1 When the office is arranged for pushbutton dialing, item 11.2.1.4 should be checked to ensure that facilities will be provided by the bidder for permitting a technician to test for proper functioning of the pushbutton dialing equipment at the subscriber station.

#### 11.2.1.5 Howler (Item 11.2.1.5)

11.2.1.5.1 A howler circuit is a useful means for alerting a subscriber that his receiver is off-hook. See paragraph 11.2.3.2, Part I of the General Specification.

The tones to be provided for this office are required to meet the limits specified in the "Notes on the BOC Intra-LATA Networks" for the Precise Tone Plan. Accordingly, any howler equipment specified will be of the type which is compatible with the Precise Tone Plan. When a howler circuit is provided, it will operate through the subscriber's loop test circuits and be arranged to remove tone and restore the line to a serviceable condition automatically when the receiver is replaced.

### 11.3 Transmission Tests (Item 11.3)

#### 11.3.1 Transmission Test Circuit (Item 11.3.1)

Close coordination with the requirements of the connecting company is required in specifying these items.

11.3.1.1 It is desirable to provide transmission test circuits to permit testing of trunk circuits to and from a distant toll office without any assistance in the local dial office. This is particularly true where the trunks include electronic equipment such as carrier, microwave, or voice frequency repeaters. The equipment is also useful for testing EAS trunks, subscriber loops and station carrier circuits. A detailed description of the testing facilities and the operating requirements is given in paragraph 11.3, Part I, of the General Specification.

11.3.1.2 If the reference tone circuit is required, check "Yes" in item 11.3.1; otherwise, check "No." The frequency or frequencies required and the time interval for application of each frequency should be coordinated with the connecting company and listed in item 11.3.1.

### 11.3.2 Test Lines (Item 11.3.2)

The use of test lines should be coordinated with the connecting company. Details of the use of various test lines are contained in "Notes on the BOC Intra-LATA Networks," Section 8.

#### 11.3.2.1 Test Line 100 (Item 11.3.2.1)

100 type is for Balance Test.

#### 11.3.2.2 Test Line 102 (Item 11.3.2.2)

102 type is for Milliwatt Test.

#### 11.3.2.3 Test Line 104 (Item 11.3.2.3)

104 type is for Transmission Measuring and Noise Checking.

#### 11.3.2.4 Test Line 105 (Item 11.3.2.4)

105 type is for Automatic Transmission Measuring Test Line.

#### 11.3.2.5 Test Line 107 (Item 11.3.2.5)

107 type is for Data Transmission Test Line.

#### 11.3.2.6 Remote Office Test Line (Item 11.3.2.6)

11.3.2.6.1 The remote office test line (ROTL) is the device that accesses each trunk to make automatic transmission measurements, usually in conjunction with a 105 type test line and responder. In an end office the only purpose of the ROTL is to reach trunks that are not available from the ROTL in the access tandem. For example, there may be EAS trunks between end offices or one-way CAMA trunks. Be sure to include a note in item 16 which describes the exact arrangement required, including whether the responder is to be supplied.

### 11.4 Line Testing (Item 11.4)

There are a number of arrangements by which the test train may be used to make automatic tests on the condition of the subscriber loops.

#### 11.4.1 Automatic Line Insulation Testing (Item 11.4.1)

Check "Yes" if the bidder is to furnish means to test automatically for line insulation condition. Identify in item 16 all locations to be served by the ALIT, e.g., host, RSTs, LCs, subscriber carrier terminal locations, etc.

#### 11.4.2 Owner Supplied Equipment (Item 11.4.2)

There are a number of different systems on the market for making various automatic tests on subscriber lines. If the owner already has or intends to buy separately one of these systems, check "Yes."

##### 11.4.2.1 Vendor Supplied Interface Only (Item 11.4.2.1)

If the owner intends to supply the line testing system, it usually is necessary for the bidder to provide an interface device between the line testing system and the switch. Check "Yes" here and describe the system thoroughly in item 16 so that the bidder can determine what interface is required.

#### 11.5 Remote Control (Item 11.5)

11.5.1 When the system is to be controlled via teleprinter or CRT equipped with keyboard and display from a remote location, this item is to be checked "Yes." If the control will be in the building with the switching equipment, then check "No." Some companies may have a central location for controlling a number of digital offices. Give a description of the purchaser's particular situation in item 16, identifying the location of the system control center, the transmission facilities assigned, and responsibilities for supplying equipment.

#### 12. POWER EQUIPMENT REQUIREMENTS (ITEM 12)

##### 12.1 Central Office Battery (Item 12.1) (See Paragraph 15, Part I)

###### 12.1.1 Battery Reserve (Item 12.1.1)

A battery reserve of 8 busy hours will be adequate for offices located in areas where ac power failures are infrequent and where such power interruptions usually last less than 5 hours. If an emergency ac power plant is to be used, a battery reserve of 3 busy hours is sufficient.

###### 12.1.1.1 Standby Generator (Item 12.1.1.1)

If the central office equipment requires float voltage to meet the 1900 ohm untreated loop limit or in offices over 1000 lines, or offices including a toll board, or where there are frequent power failures, permanent engine generator units should be provided. Standby engine generators will be purchased separately and not included in the central office equipment specification. Check item 12.1.1.1 to show whether an engine generator is to be permanently installed, and fill in the blanks in item 12.1.1 to indicate the desired battery reserve for an estimated line capacity coincident with the life of the type of battery specified in item 12.1.2.

###### 12.1.2 Type of Battery (Item 12.1.2)

12.1.2.1 Both lead antimony and lead calcium batteries are available in the range of capacities required in REA borrowers' central offices.

12.1.2.2 Lead antimony batteries have an average useful life of approximately 10 years when properly maintained and cost about 15 to 20 percent less than the lead calcium type. If they are specified, the ampere hour capacity should be just ample to serve the office 10 years from the time they are installed.

12.1.2.3 Lead calcium batteries have been estimated to have a life as long as 20 years and, therefore, lend themselves for use in those central offices only where future requirements for a 20-year period can be closely predicted.

12.1.2.4 It appears that maintenance of the two types of batteries is about equal, except that water additions are much less frequent for the lead calcium battery.

12.1.2.5 The lead calcium type battery gasses slightly and, therefore, the electrolyte does not get thoroughly mixed for some time after the cells have been on charge following a discharge condition. For this reason, stratification of the electrolyte occurs and a specific gravity reading taken from the top of the cell will not be representative of the condition of the overall cell. Cell voltage readings are usually taken to determine the condition of the battery, instead of specific gravity readings.

#### 12.1.3 Voltmeter (Item 12.1.3)

12.1.3.1 The voltmeter should be ordered if no suitably accurate meter is already available whenever a lead calcium battery is specified and also when a lead antimony battery is specified if it is contemplated that voltage readings will be used in the battery maintenance.

#### 12.1.4 Hydrometer and Hydrometer Holder (Item 12.1.4)

12.1.4.1 A hydrometer is required if a lead antimony battery is specified. It is not as desirable for use with a lead calcium battery.

#### 12.1.5 Battery Rack (Item 12.1.5)

12.1.5.1 The type of battery rack specified should be determined by space considerations. In most cases, a two-tier rack will be the best for use in small offices.

#### 12.1.6 Special Equipment Power Requirements (Item 12.1.6)

12.1.6.1 Any 48-volt dc power requirements necessary for the operation of carrier, voice frequency repeaters, loop extenders, toll board or any other equipment not considered as part of the dial central office equipment should be set forth

under this item. The total 48-volt direct current drain of the special equipment in amperes (drain required during ac power failure) is required. These current drains should be the estimated requirements coinciding with the life of the battery.

12.1.6.2 Specify in item 12.1.6.1 battery and fusing requirements for connecting company equipment and special equipment that is not part of the dial equipment, based on current drain as specified in item 12.1.6. Indicate any special fuse operation wanted (e.g., slo blo).

## 12.2 Charging Equipment (Item 12.2)

### 12.2.1 Size of Rectifier (Item 12.2.1)

12.2.1.1 The solid-state ferroresonant rectifier has become widely used in charging central office storage batteries of the type found in REA borrowers' offices. This type rectifier has an average life of about 15 years; therefore, the rectifier supplied should have sufficient capacity to handle the office 15 years after the date of installation.

12.2.1.2 Most types of digital, stored program controlled central office equipment are not guaranteed to meet the subscriber loop limits of this specification except at float voltage. Therefore, there must be redundancy in the battery charging equipment. In view of this, the requirements of the office should be carefully estimated as additional charging capacity will be provided by the bidder for backup in case of failure of a charging unit. See paragraph 15.3.8 of Part I of 522.

12.2.1.3 The blank in item 12.2.1 should be filled in to indicate the estimated number of lines in the host office at the end of the rectifier's estimated life. The same applies to item 5.1.1 for each RST specified in Part IV.

### 12.2.2 Charger Input Rating (Item 12.2.2)

12.2.2.1 The data entered in this item should provide all pertinent information regarding the characteristics of the commercial ac power supply since it will be utilized by the equipment manufacturer in selecting the type of charging equipment with the specified input rating.

12.2.2.2 Where a choice of supply is available, the preferred type is 120/240 volt, three-phase, 60 Hz, except for very small systems, in which case single-phase is acceptable.

## 12.3 Ringing Equipment (Item 12.3) (See Paragraph 15.5, Part I of 522)

Solid-state ringing current generators are required by this specification. This type of generator operates directly from the central office battery and is available in any series of frequencies.

### 12.3.1 Sizing by Ultimate Lines (Item 12.3.1)

12.3.1.1 It is expected that the ringing generator will last throughout the useful life of the switch. The blank in item 12.3.1 should be filled in to indicate the estimated number of lines in the host office at the end of 20 years.

#### 12.3.2 Frequency Required and Frequency Sizing (Item 12.3.2)

12.3.2.1 Only the required frequencies should be specified. Where possible, the use of the highest frequency should be avoided to reduce ringing problems from 60 Hz power induction. In single-party offices, the usual practice is to specify 20 Hz. In two-party offices, REA recommends 20 Hz and 30 Hz, although some telephone companies may already be using a single frequency ringing current with ringing on tip and ring for two-party selective ringing.

12.3.2.2 For each of the frequencies specified, enter the estimated number of telephones connected to the host switch either at the ultimate 20-year time or such other time that the particular frequency might have its maximum use. The same applies to item 5.6.2 for each RST specified in Part IV.

#### 12.3.3 Frequency Meters (Item 12.3.3)

12.3.3.1 It is necessary to have a means of checking the frequency and the output voltage of each ringing frequency generator. When a telephone company has only one central office, and on all large (1000 lines or more) central offices, a set of panel-mounted frequency meters and voltmeter is desirable. In cases where a telephone company operates several offices under 1000 lines, it may be desirable to have portable meters. The proper blank should be checked in item 12.3.3. If the system is equipped to internally measure ringing voltage and frequency outputs and print the results then a frequency meter is not required.

#### 12.4 Power Board (Item 12.4) (See Paragraph 15.7, Part I of 522)

##### 12.4.1 (Item 12.4)

12.4.1.1 The bidder will provide a power board containing battery and charger control switches, dc voltmeters, dc ammeters, fuses or circuit breakers, supervisory and timer circuits, as required for proper monitoring and operation of the power equipment. Form 522 requires that the power board be of the "dead front" type.

12.4.1.2 Form 522 requires the power board and associated wiring to be designed initially to handle the exchange when it reaches its ultimate capacity at 20 years. The number of lines expected to be served by this host office when it reaches its ultimate capacity should be entered in the blank in item 12.4. The same applies to item 5.1.1 for each RST specified in Part IV.

13. DISTRIBUTING FRAME REQUIREMENTS (ITEM 13) (SEE PARAGRAPH 16,  
PART I OF FORM 522)

General

The standard type of main distributing frame for use on REA borrowers' projects is not equipped with heat coils. All outside plant lines are terminated on protector blocks on the vertical side and are either equipped with arresters or are grounded. All cables to the switch are terminated on the horizontal side. This provides means for connecting inside and outside plant facilities together by jumper wires. The specification requires that the frame be of the "dead front" type and that adequate facilities for testing all lines be provided. Modern frames of this kind have wire wrapped terminals on both the vertical and horizontal sides. Floor type frames should be provided for digital central offices. Main frame protector makes and types shall be selected only from REA Bulletin 344-2, "List of Materials Acceptable for Use on Telephone Systems of REA Borrowers." Items 13.1 through 13.3 cover the system as a whole. The central office and Remote Switching Terminals specific MDF requirements are shown in items 13.4 and 7.4, Parts III and IV, respectively.

13.1 (Item 13.1)

13.1.1 All pairs included in the 5-year figure should be provided with terminations on the main frame initially. The number of pairs of terminals to be provided initially should be entered in item 13.1.

13.1.1.1 (Item 13.1.1)

13.1.1.1.1 The gauge of the outside plant cable at the splice to the tip cable, if one is supplied; otherwise, the gauge at the protector block is to be entered here. The gauge of the outside plant cable is critical in the new high density protectors as there is not room for conductors larger than 22 gauge.

13.2 (Item 13.2)

13.2.1 All working outside plant pairs must be equipped with acceptable protector mountings and arresters. The number of pairs to be equipped should be entered in item 13.2. All pairs which are terminated but not equipped with protectors are to be grounded. It is desirable to provide protector mountings and arresters on all spare pairs if a reasonable quantity is involved. With most designs a detent position is provided in the terminal base portion of the main frame for each arrester pair assembly or each "module" enclosing a pair of arresters. In the detent position, the outside pair is disconnected from the switch pair, but the arresters and the ground connections are maintained on the outside pair. Where a large number (100 or more) of spare

pairs is involved, a reasonable number of spare pairs should be equipped with arrester assemblies or modules and the remainder of the spare outside pairs should be grounded, preferably by placing wire wrapped grounding straps on the appropriate terminals. The number of terminated but unequipped pairs to be grounded should be entered in item 13.4.3.

### 13.3 Item (13.3)

13.3.1 If the connecting company requires any additional protectors, terminal blocks or verticals on the MDF, specify and explain in this item.

### 13.4 Main Frame Details (Item 13.4)

13.4.1 If present MDF is to be reused, check "Yes" and give complete details of its construction and location assignments. Indicate responsibility for supply and installation of any additional connectors, protectors, verticals, etc. It is also possible that the bidder might declare that existing protectors are not adequate for the proposed central office.

#### 13.4.2 (Items 13.4.1 and 13.4.2)

13.4.2.1 The total number of arrester units will be the same as the number of protector mountings and cable terminals, unless the grounding of unequipped pairs is done other than by placing arrester assemblies or modules in the detent position. In this latter case it will be necessary to show only the actual number of pairs to be equipped with protectors. If certain types of special electronic or switching equipment are sensitive to surge voltages of less than those specified in REA Form 522, Part I, or if the CO is unattended and located in a high lightning area (see TE&CM 823), then gas tube protectors should be considered. Insert the number of gas tube protectors in Item 13.4.2. For additional information on protection see TE&CM 823.

13.4.2.1.1 Gas tubes are rated as light, medium, heavy or maximum duty according to their energy handling ability. Their cost is usually directly proportional to this characteristic. Unless extensive power contact exposures or severe lightning problems are anticipated, light or medium duty tubes should be sufficient. Enter in item 13.4.2.1.

13.4.2.2.1 When there are electrical surges on the outside plant, gas tubes serve as switches to transfer the energy to ground. Eventually, gas tubes fail. When they do so, it is desirable that the design guarantees that the failure is in a shorted or low resistance breakdown mode.\* Even though the subscriber's line is not suitable for service, subsequent surges are conducted to ground, preventing damage to the equipment the gas tube is protecting. Generally speaking, in areas of higher incidence of lightning the initial higher cost of the more expensive tubes can be

justified by reduced maintenance cost of damaged equipment. The gas tubes that should be used are listed in Bulletin 344-2 "List of Materials Acceptable for use on Systems of REA Telephone Borrowers" Item Designation nm "Mainframe Protectors." The selection of which type should be indicated in item 13.4.2.2.

13.4.2.3.1 If gas tube protection is required because the protected equipment is sensitive to surge voltages less than those listed in REA Form 522, Part I, insert the dc breakdown voltage recommended by the equipment manufacturer in item 13.4.2.3. If tubes are being specified only to reduce maintenance (as described in TE&CM 823), specify a dc breakdown of 350V.

13.4.3 Enter in item 13.4.3 the number of terminated spare pairs to be grounded by means other than the use of arrester assemblies or modules placed in the detent position in the main frame. If none, write "0".

13.4.4 (Item 13.4.4)

13.4.4.1 Factory assembled tip cables tend to reduce craft person caused troubles and may be less costly than those assembled on the job site. Also, termination of outside plant cables on the modern compact MDF's may be difficult, due to the congested wiring, unless the MDF is prestubbed. See paragraph 16.1.6.1, Part I of the General Specification. Check the appropriate box in item 13.4.4 to indicate whether or not a factory assembled tip cable is required.

13.4.4.1.1 The standard length of factory assembled tip cable is 20 feet. If a different length is desired, specify in item 13.4.4.1.

13.4.4.2.1 The tip cable can be formed either up or down depending on which direction the entrance cable will approach the MDF. Indicate which in item 13.4.4.2.

13.4.5 Items 13.4.5, "Pairs per Vertical," and 13.4.6, "Height of Vertical," are self-explanatory and should be filled in to meet the particular requirements.

---

\*These tubes are presently described as "Fail-Safe" by the manufacturer. Due to confusion over this term, its use is being discouraged in favor of the above-mentioned failure modes.

14. BUILDING AND FLOOR PLAN INFORMATION (HOST OFFICE ONLY) (ITEM 14)

The General Specification requires that the bidder submit a tentative floor plan drawing showing the layout of equipment. See paragraph 20.1, Part I, of the General Specification.

14.1 (Item 14.1)

14.1.1 If the equipment is to be placed in an existing building, item 14.1 should be checked and a drawing of the room (or rooms) should be attached. The drawing should show the clear ceiling height, location of any pillars, doorways, windows, radiators, air conditioner or heater ducts, etc., and room dimensions. Show size of door through which equipment will be taken into building. The location of existing equipment, if any, should also be shown.

14.2 (Item 14.2)

14.2.1 If a new building or an addition to an existing building is planned, item 14.2 should be checked, and a sketch of the tentative building plan should be shown in item 14.2.1. Dimensions need not be included, but all available detailed information should be given as to any size and/or shape restrictions which may apply due to lot size, lot location or any other reason, and also to any other restrictions such as floor loading limitations.

14.2.2 If the ultimate equipment requirements are very uncertain, buildings are sometimes constructed so that an inside or outside wall can be removed, or a floor added, after 10 to 12 years of growth, to permit further expansion.

14.3 Detailed Arrangements (Item 14.3)

14.3.1 (Item 14.3.1)

14.3.1.1 Some operating companies provide partitions to isolate the switching equipment from the space occupied by the MDF, battery, charger and other equipment to which frequent access is required. This keeps out much of the dust and dirt, helps to meet the rather stringent environmental requirements of digital switching equipment, and reduces maintenance. The appropriate box in item 14.3.1 should be checked to indicate whether or not a partition is to be provided.

14.3.2 (Item 14.3.2)

14.3.2.1 Some companies provide a vestibule to prevent dust and dirt from being blown or tracked into the equipment room. The appropriate box in item 14.3.2 should be checked to indicate whether or not a vestibule is to be provided on the floor plan.

4.3.2.2 If "Yes" is checked either in items 14.3.1 or 14.3.2, the bidder will take this into consideration when arranging the floor plan.

14.3.3 (Item 14.3.3)

14.3.3.1 The appropriate blank should be checked in item 14.3.3 to indicate whether the cable entrance is overhead or underground. This will assist the bidder in arranging the floor plan.

14.3.4 (Item 14.3.4)

14.3.4.1 Any floor space which may be required for carrier, repeater, or any other equipment not furnished by the bidder should be listed under this item. Complete connecting company requirements are to be made available. Show location on floor plan if existing equipment is being retained in place.

14.3.5 (Item 14.3.5)

14.3.5.1 The use of computer type flooring is more expensive than regular flooring with overhead cable racks. The computer type floor was designed for computer equipment which is similar in design to a digital central office. Check which type of cabling is required.

14.3.6 (Item 14.3.6)

14.3.6.1 The building codes in some areas require earthquake bracing. Check "Yes" if it is required. Indicate seismic risk area in item 16, as defined by the local building code.

14.3.7 (Item 14.3.7)

14.3.7.1 List the actual measured ground resistance if available. See REA TE&CM 802, "Electrical Protection Grounding Fundamentals" and 810, "Electrical Protection of Electronic Analog and Digital Central Office Equipment," for details.

14.3.8 (Item 14.3.8)

14.3.8.1 The proper category is to be checked for lightning damage probability based on the Figure-1 map of REA TE&CM 823 or based on local information which may indicate the environment is more volatile than that shown for the general area on Figure 1 of TE&CM 823. Refer to Part I, paragraph 17.2 for a discussion regarding special bidder consideration for an unusually hostile central office operating environment.

14.3.9 (Item 14.3.9)

14.3.9.1 Additional information is to be provided regarding structures, such as a tower in the vicinity, and the central office building being in a high exposure location, etc., that should be considered in determining the central office equipment protection requirements.

15. ALTERNATE REQUESTS (ITEM 15)

15.1 The number of alternate requests should be kept to a minimum. Bidders will provide price estimates if required. If there is an expectation that the feature will be purchased, it should be included in the base bid. Only where the purchase of the alternate is entirely dependent on price should the feature be listed as an alternate.

16. EXPLANATORY NOTES (ITEM 16)

16.1 Special arrangements of wiring or equipment not covered in Parts I or III of the specification, but desired in some special situations, should be specifically described under item 16.

16.2 Clarification statements should be included in item 16. For example, item 16 might contain a description of equipment items to be furnished by the owner.

16.3 REA recommends that the owner (or the owner's engineer) make an acceptance test using a load box. If a load box is not available to the borrower (or the borrower's engineer), it would be appropriate to state in item 16 that the bidder should provide a load box during the acceptance test. Item 16 should state who is responsible for performing the load box acceptance test and how the costs shall be handled.

16.4 Any carrier equipment, voice frequency repeaters, standby power plants or other ancillary equipment to be reused and not to be included by the bidder in the bidder's basic bid should be listed under item 16, identified by manufacturer, catalog number, etc. Assign responsibility for moving, reinstalling, etc.

16.5 If earthquake bracing is required, identify the seismic risk area as defined by the local building code. See item 14.3.6

16.6 Any of the preceding items in this Application Guide which require further explanation should be covered in item 16.

II. PART IV OF REA FORM 522: DETAILED INFORMATION ON REMOTE SWITCHING TERMINAL (RST)\*

1. NUMBER OF SUBSCRIBER LINES (ITEM 1)

Item numbers shown in parentheses refer to the items in Part IV of the specification REA Form 522.

The information to follow is for one RST. There must be a complete set of this information for each RST which is being purchased.

1.1 (Items 1.1 thru 1.3)

1.1.1 The number of subscriber lines shown here for each category have been included in item 6 of Part III. The purpose of recounting them here is to dimension the particular RST unit. If the host central office subscribers are on message rate, then the remote subscribers should be too.

1.4 (Items 1.4 thru 1.5)

1.4.1 Pay stations of either type should be handled the same at a remote as at the central office. There is a possibility of traffic problems (see discussion below in paragraph 1.6).

1.6 (Item 1.6)

1.6.1 PABX lines with either loop start or ground start should be for small PABX's, as large PABX's should have direct access to the host office except in the case where the RST is larger than the host. The larger office (one with more subscriber lines) offers better opportunities for balancing traffic from systems that generate much higher traffic than the residential subscriber.

1.7 (Item 1.7)

1.7.1 As described in item 7.4 for Part III, this item specifies the percentage of central office lines in the remote switch that will be set up to receive pushbutton dialing. The bidder will use this percentage to determine the number of tone receivers to be furnished. The percentage should be a realistic estimate of the probable sales of pushbutton capability on the central office lines. It should be noted in Item 12 that rotary dialing should be assignable to all lines in the remote office regardless of the quantity of pushbutton lines required.

---

\*By definition, a remote switching terminal is a part of the host central office but located at a subordinate wire center. It has hardware interchangeable with the host office. See paragraph 19.1 of Part I of Form 522. By contrast, if line concentrators are desired, use REA Form 397g and TE&CM 341.

1.8 (Item 1.8)

1.8.1 The number of 911 emergency lines required in the remote switching terminal (RST) should be specified here.

1.8.2 Established 911 emergency calls in the remote should not be lost when Emergency Stand Alone (ESA) is invoked unless the call is using the disabled links to the host office.

1.9 (Item 1.9)

See paragraph 7.5 of this TE&CM covering Part III of Form 522.

2. TRAFFIC (Item 2)

2.1 (Items 2.1, 2.2)

2.1.1 There is the possibility that the per line traffic in each RST unit will be different, either higher or lower, from the overall office averages calculated in Part III item 7.1 and shown in items 7.2 and 7.3. The CCS for this RST is to be shown here even if it is the same as the overall office average.

3. SUBSCRIBER LOOP RESISTANCE (Item 3)

3.1 (Item 3.1)

3.1.1 The number of subscriber loops exceeding the office limit may be reduced by the fact that the remote line equipment may be closer to the distant subscriber. This, of course, does not have to be true, particularly if a central office is being replaced by an RST. The lower loop limit is started at 1501 ohms as some bidders still do not guarantee 1900 ohm loop limits without the batteries being held at float voltage which may not be practical at small remote installations.

3.2 (ITEM 3.2)

3.2.1 Pay Station Loop

See paragraph 6.2.2 of this TE&CM covering Part III of Form 522.

4. RANGE EXTENSION (Item 4)

See paragraph 6.2.3 of this TE&CM covering Part III of Form 522.

5. POWER SUPPLY (Item 5)

5.1 Powerboard (Item 5.1)

See paragraph 12.4 of this TE&CM covering Part III of Form 522.

5.2 Charger Input Rating (Item 5.2)

See paragraph 12.2 of this TE&CM covering Part III of Form 522.

5.2.1 Charger Size (Item 5.2.1)

See paragraph 12.2.1.3 of this TE&CM covering Part III of Form 522.

5.2.2 (Item 5.2.2)

5.2.2.1 If 300 or more lines are being served by the remote, then the battery charger should be redundant. If the number of lines is below 300, the service continuity requirements of the particular subscribers being served should be taken into account. A medical facility or other emergency service would warrant redundant chargers at any number of lines on the remote. Further, if standby power is being supplied for service continuity then it should be accompanied by redundant chargers. This would also be the case where a standby generator is supplied for the purpose of extending the range of the subscriber loops to 1900 ohms.

5.3 (Item 5.3)

5.3.1 The battery reserve should be no less than 8 busy hours unless there is standby power available. With standby power, a reserve of 3 busy hours is practical. The battery in no case should have a reserve capacity in ampere hours less than four times the current capacity of the charger. Fill in the ultimate number of lines in the RST.

5.4 Standby Power (Item 5.4)

5.4.1 If standby power will be available at the remote site, then check here. The use of standby power is considered to be most desirable in all electronic telephone installations if just to operate environmental control devices.

5.5 Special Equipment Power Requirements (Item 5.5)

See paragraph 12.1.6 of this TE&CM covering Part III of Form 522.

5.6 Ringing (Item 5.6)

5.6.1 (Items 5.6.1 thru 5.6.3)

5.6.1.1 There may be cases where an existing central office is being replaced by a remote switching terminal and the retained station equipment is designed for ringing frequencies other than the ones at the host office. In any case, fill in the frequencies, maximum number of telephones per frequency, and the number of lines for which the ringing generator is to be sized as described in paragraph 12.3.2 of this TE&CM covering Part III of Form 522.

5.6.4 Frequency Meter (Item 5.6.4)

5.6.4.1 If a portable frequency meter is available, check "Not Required." If not, check "Panel Mounted."

6. EMERGENCY OPERATION (Item 6)

6.1 This item is to be used when the remote unit is to supply emergency local service between the lines connected to the remote unit. The possibility should be considered of the connection to the host office being opened and the need for local and emergency number service during an outage. It may be advantageous to use diverse facility routes where they may be available. If the option is required, the type of emergency service desired is to be explained in item 12. The requirements for stand alone should be coordinated with the bidders as each has different features available.

7. RST DISTRIBUTION FRAME REQUIREMENTS (Items 7.1 thru 7.4.7)

See Section 13 of this TE&CM covering Part III of Form 522.

8. BUILDING AND FLOOR PLAN INFORMATION (ITEM 8)

8.1 RST to be Mounted in Building (Item 8.1)

It is to be expected that the usual installation for an RST will be in a building, complete with environmental control.

8.1.1 Earthquake Bracing (Item 8.1.1)

8.1.1.1 The building codes in some areas require earthquake bracing. Check "Yes" if it is required. Indicate seismic risk identity for this site.

8.1.2 Supply Building Floor Plan (Item 8.1.2)

8.1.2.1 The RST may not be the only equipment or material operated in the building; therefore, information should be given to the bidder describing the equipment that will share this space or environment. This information should be included in item 12 in order to prevent future problems with the installation. If the equipment is to be installed in a building it will be necessary that a plan of the building showing the location of the equipment, available floor space, ceiling height, permissible floor loading, electrical outlets, environmental conditions, etc., be supplied.

8.2 RST Cabinet Mounted (Item 8.2)

8.2.1 If the unit is to be mounted outside, a cabinet is to be furnished by the bidder. This cabinet is required to be a type accepted by REA. It will be the responsibility of the purchaser to supply the space and mounting facilities for the cabinet. If the checked spaces in item 8.2.1 do not completely describe the installation, further explanation should be added under item 12. Assign responsibility for placing concrete slab if required.

9. SUBSCRIBER LINE TEST (ITEM 9)

9.1 Remote Testing of Subscriber Lines (Item 9.1)

9.1.1 Remote testing is the ideal way of handling the remote unit line maintenance. If there is equipment for remote testing which is to be reused or purchased separately with this installation, this item or item 9.2 should not be checked, but a complete description of the separate test equipment should be shown in item 12 with a request for the bidder to make a statement of compatibility as a part of its bid.

9.2 Subscriber Loop Test Set (Item 9.2)

9.2.1 If there will be no provision for remote testing of subscriber lines, a regular subscriber loop test set will be necessary for testing of subscriber lines beyond the remote unit. In this case, check item 9.2.

10. SPAN LINES TO CENTRAL OFFICE (Item 10)

10.1 The connection between the host office and the RST is required by Part I of REA Form 522 to be compatible with any T1 type span line using DS-1 interface. Therefore, the owner or the bidder will furnish span lines compatible with REA Specification PE-60. Describe diverse routes if used.

10.1.2 If the bidder is to supply the span line, it will be necessary to complete the applicable portions of REA Form 397b. TE&CM 904 "Application Guide for Trunk Carrier Specifications, REA Form 397b," should be reviewed.

11. GROUNDING CONSIDERATIONS (ITEM 11)

11.1 List the actual measured ground resistance if available. See REA TE&CM 802, "Electrical Protection Grounding Fundamentals" and 810, "Electrical Protection of Electronic Analog and Digital Central Office Equipment," for details.

11.2 The proper category is to be checked for lightning damage probability based on the Figure-1 map of REA TE&CM 823 or based on local information which may indicate the environment is more volatile than that shown for the general area on Figure 1 of TE&CM 823. Refer to Part I, paragraph 17.2 for a discussion regarding special bidder consideration for an unusually hostile RST operating environment.

11.3 Additional information is to be provided regarding structures, such as a tower in the vicinity, and the remote switching terminal (RST) building being in a high exposure location, etc., that should be considered in determining the RST equipment protection requirements.

12. EXPLANATORY NOTES (ITEM 12)

See Section 16 of this TE&CM covering Part III of Form 522.

APPENDIX A

TRAFFIC WORK SHEET #1  
GENERAL TRAFFIC DATA

By AHM Date 4/15/86 Project No. 500  
Checked By CCC Date 4/20/86 Office Name Deer Park, WA.

1. Telephone Company Deer Park Telephone Cooperative
2. Office Name Deer Park, Washington
3. Area Code 206 Office Code 447
4. Number of Lines (Including RST's):  
Initial 3273  
Ultimate 6600
5. Number of Lines: Rotary Dial Telephone 2182  
Pushbutton Telephone 1091
6. Originating Calling Rate - CCS/Line 1.41
7. Originating Traffic - CCS
  - 7.1 From Lines (Item 7.1.(d), Adjusted<sup>1</sup>) 4608
  - 7.2 For Operator Assist. Traffic<sup>2</sup>  $345 \times 0.2 = 69$
8. Outward Traffic - CCS<sup>3</sup>  $69 + 1144 + 895 + 276 - 280 = 2104$   
Originating from Lines
9. Intraoffice Traffic - CCS<sup>4</sup>  $4608 - 2104 = 2504$
10. Adjusted Intraoffice Traffic - CCS or  
40% of (7), whichever is larger 2504

<sup>1</sup>Item 7.1 should be adjusted upward to minimum CCS per line, as described in item 7.2.1 of TE&CM 322.

<sup>2</sup>0.5 x (2-Way Toll-CAMA) or .2 x TSPS Traffic

<sup>3</sup>Operator Assistance + Outgoing EAS + CAMA + PPCS - Tandem

<sup>4</sup>(7) - (8)

Office Name  
(By Location) Deer Park, WA.

6.2.3 Range extension equipment is to be provided:

6.2.3.1 Loop Extenders: Total Quantity \_\_\_\_\_

By Bidder - Quantity \_\_\_\_\_  
By Owner - Quantity \_\_\_\_\_ (Explain in Item 16)

6.2.3.2 VF Repeaters: Total Quantity \_\_\_\_\_

By Bidder - Quantity \_\_\_\_\_  
(Bidder must have information on loading and cable size.)

By Owner - Quantity \_\_\_\_\_ (Explain in Item 16)

6.2.3.3 May be furnished as an extended range line circuit at the option of the supplier. If this option is used, the quantities of loop extenders and VF repeaters will be different from the quantities listed above (see Part V, item 6.1,a).

\_\_\_ Yes      \_\_\_ No

7. TRAFFIC DATA - LINE ORIGINATING AND TERMINATING TRAFFIC

7.1 Originating Line Traffic - Estimated per Busy Hour (Includes all lines associated with RST's):

	(a) CCS Per Main Station	(b) No. of Main Stations	(axb) Total CCS	No. of Lines Required <sup>(1)</sup>
Ind. - Res.	<u>1.3</u>	<u>2610</u>	<u>3393</u>	<u>2610</u>
Two-Party - Res.				
Ind. - Bus.	<u>1.8</u>	<u>610</u>	<u>1098</u>	<u>610</u>
Two-Party Bus.				
Four-Party				
Special Lines				
Pay Station	<u>1.8</u>	<u>40</u>	<u>72</u>	<u>40</u>
Telco Official	<u>2.0</u>	<u>2</u>	<u>4</u>	<u>2</u>
Wire Chief	<u>1.2</u>	<u>1</u>	<u>1.2</u>	<u>1</u>
No. Htg. or PBX	<u>4.0</u> <sup>(2)</sup>	<u>10</u> <sup>(3)</sup>	<u>40</u>	<u>10</u>
WATS				
Data Service				
911 Emerg. Service				
TOTAL		<u>3273</u> (c)	<u>4608</u> (d)	<u>3273</u> <sup>(4)</sup> (e)

<sup>(1)</sup> See Part III, item 6.1.

<sup>(2)</sup> This figure is the CCS per PBX trunk.

<sup>(3)</sup> This figure is the number of PBX trunks.

<sup>(4)</sup> This is the total of line equipments required. The number to be provided will be determined by the equipment design of the system of the selected bidder. See Part V, item 3.1.1.2.

Office Name  
(By Location) Deer Park, WA.

## 7.2 Average Originating CCS per Line per Busy Hour

$$(d)/(e) = 4608/3273 = \underline{1.41} \text{ CCS/Line}$$

This office shall be engineered to handle an initial average originating busy hour traffic of 1.41 CCS per line. It is anticipated that the average originating busy hour traffic will increase to 1.68 CCS per line.

Originating Traffic Attributed to Host Only 1.41 CCS/Line<sup>(1)</sup>

## 7.3 Terminating Traffic - Estimated CCS per Busy Hour

It is assumed that the total CCS for terminating traffic is the same as for originating traffic. Since digital switch networks are on a terminal per line basis, the terminating CCS per line will be the same as the originating CCS per line as shown in item 7.2.

Terminating Traffic Attributed to Host Only 1.41 CCS/Line

7.4 Percent of Push Button Lines 33

## 7.5 Anticipated Ultimate Capacity (20 years)

## 7.5.1 Subscriber Lines

Host	<u>6000</u>	( Incl. DDI Concentrator Lines)
RST 1	<u>600</u>	
RST 2	<u>0</u>	
RST 3	<u>0</u>	
TOTAL	<u>6600</u>	

<sup>(1)</sup> This figure is derived by subtracting the total originating line traffic of all remote switching terminals (RSTs) from the total estimated originating traffic calculated in 7.1 (item 7.1 (d) and dividing the remainder by the number of initial lines in the host. In this example: 4608 CCS - 381 CCS (280 x 1.36) = 4228 CCS/2993 lines = 1.41 CCS.

Office Name  
(By Location) Deer Park, WA.

8. TRUNK CIRCUIT REQUIREMENTS

8.1 Interoffice Trunking

8.1.1 Trunking Requirements

1. Connecting Office	North	North	North
2. Use of Trunk	EAS	EAS	EAS
3. Trk Grp. Ntwk. Connection <sup>(1)</sup>	IL	IL	IL
4. Quantity Equipped	5	15	12
5. Ultimate % Growth	100	100	100
6. CCS Capacity	Combined	345	240
7. Direction	Two-way	Out	In
8. No. Digits Dialed	7	7	
9. No. Digits Outpulsed	5	5	
10. No. Digits Impulsed	5		5
11. Type Signaling	Loop	Loop	Loop
12. Type Pulsing	Dial	Dial	Dial
13. Carrier Type (2-Wire)			
14. Carrier Type (4-Wire)			
15. Physical	X	X	X
16. Repeat Coils <sup>(2)</sup>	X	X	X
17. DX Signaling Set			
18. Other Type Signaling			
19. Delay Dial			
20. Direct Digital Interf.			
21. a. Feature Group B			
b. Feature Group C			
c. Feature Group D			

8.1.2 For 4-Wire Carrier, the 7dB and 16dB Pads

Total Quantity \_\_\_\_\_  
By Bidder Quantity \_\_\_\_\_  
By Owner Quantity \_\_\_\_\_

Refer to the attached information for connecting company trunk circuit drawing numbers and name of manufacturer.

<sup>(1)</sup> Designation of trunk group network connection involves the following categories:

- IC - Direct Inter-LATA Connecting Trunk = (IC/POP)
- TC - Tandem Connecting Trunks
- IT - Intertandem Connecting Trunks
- IL - Intra-LATA Connecting Trunks
- TIC - Tandem Inter-LATA Connecting Trunks
- Misc. - Intercept, Busy Verification, etc.

<sup>(2)</sup> Omit repeating coils for carrier derived trunks.

Office Name  
(By Location) Deer Park, WA.

8. TRUNK CIRCUIT REQUIREMENTS

8.1 Interoffice Trunking

8.1.1 Trunking Requirements

1. Connecting Office	<u>East</u>	<u>West</u>	<u>West</u>
2. Use of Trunk	<u>EAS</u>	<u>EAS</u>	<u>EAS</u>
3. Trk Grp. Ntwk. Connection <sup>(1)</sup>	<u>IL</u>	<u>IL</u>	<u>IL</u>
4. Quantity Equipped	<u>32</u>	<u>21</u>	<u>25</u>
5. Ultimate % Growth	<u>100</u>	<u>100</u>	<u>100</u>
6. CCS Capacity	<u>744</u>	<u>427</u>	<u>540</u>
7. Direction	<u>Two-way</u>	<u>Out</u>	<u>In</u>
8. No. Digits Dialed	<u>7</u>	<u>7</u>	
9. No. Digits Outpulsed	<u>5</u>	<u>5</u>	
10. No. Digits Impulsed	<u>5</u>		<u>5</u>
11. Type Signaling	<u>Loop</u>	<u>PCM</u>	<u>PCM</u>
12. Type Pulsing	<u>Dial</u>	<u>Dial</u>	<u>Dial</u>
13. Carrier Type (2-Wire)			
14. Carrier Type (4-Wire)		<u>T1</u>	<u>T1</u>
15. Physical	<u>X</u>		
16. Repeat Coils <sup>(2)</sup>	<u>X</u>		
17. DX Signaling Set			
18. Other Type Signaling			
19. Delay Dial			
20. Direct Digital Interf.		<u>X</u>	<u>X</u>
21. a. Feature Group B			
b. Feature Group C			
c. Feature Group D			
<u>Tandem CCS (Included in traffic above)</u>		<u>280</u>	<u>140</u>

8.1.2 For 4-Wire Carrier, the 7dB and 16dB Pads

Total Quantity \_\_\_\_\_  
By Bidder Quantity \_\_\_\_\_  
By Owner Quantity \_\_\_\_\_

Refer to the attached information for connecting company trunk circuit drawing numbers and name of manufacturer.

<sup>(1)</sup> Designation of trunk group network connection involves the following categories:

- IC - Direct Inter-LATA Connecting Trunk = (IC/POP)
- TC - Tandem Connecting Trunks
- IT - Intertandem Connecting Trunks
- IL - Intra-LATA Connecting Trunks
- TIC - Tandem Inter-LATA Connecting Trunks
- Misc. - Intercept, Busy Verification, etc.

<sup>(2)</sup> Omit repeating coils for carrier derived trunks.

Office Name  
(By Location) Deer Park, WA.

8. TRUNK CIRCUIT REQUIREMENTS

8.1 Interoffice Trunking

8.1.1 Trunking Requirements

1. Connecting Office				
2. Use of Trunk	CAMA	TSPS	Toll Comp	Verif.
3. Trk Grp. Ntwk. Connection <sup>(1)</sup>	TC	TC	TC	Misc.
4. Quantity Equipped	37	18	47	1
5. Ultimate % Growth	100	100	100	
6. CCS Capacity	895	345	1202	
7. Direction	Out	Out	In	In
8. No. Digits Dialed	8/11	1 or 8/11		
9. No. Digits Outpulsed	7/10	7/10		
10. No. Digits Impulsed			4	4
11. Type Signaling	PCM	PCM	PCM	PCM
12. Type Pulsing	MF	MF	MF	MF
13. Carrier Type (2-Wire)				
14. Carrier Type (4-Wire)	TI	TI	TI	TI
15. Physical				
16. Repeat Coils <sup>(2)</sup>				
17. DX Signaling Set				
18. Other Type Signaling				
19. Delay Dial			X	
20. Direct Digital Interf.	X	X	X	X
21. a. Feature Group B				
b. Feature Group C	X	X		
c. Feature Group D				

8.1.2 For 4-Wire Carrier, the 7dB and 16dB Pads

Total Quantity \_\_\_\_\_  
By Bidder Quantity \_\_\_\_\_  
By Owner Quantity \_\_\_\_\_

Refer to the attached information for connecting company trunk circuit drawing numbers and name of manufacturer.

<sup>(1)</sup> Designation of trunk group network connection involves the following categories:

- IC - Direct Inter-LATA Connecting Trunk = (IC/POP)
- TC - Tandem Connecting Trunks
- IT - Intertandem Connecting Trunks
- IL - Intra-LATA Connecting Trunks
- TIC - Tandem Inter-LATA Connecting Trunks
- Misc. - Intercept, Busy Verification, etc.

<sup>(2)</sup> Omit repeating coils for carrier derived trunks.

Office Name  
(By Location) Deer Park, WA.

8.2 Switched Traffic Data

8.2.1 Originating Traffic

Type	CCS	H.T. Secs.	BHC	No. Digits Outpulsed	Sender Sig. Mode	Remarks
Toll "0"- <sup>(1)</sup>	69	300	23			
Toll "0"+7 <sup>(1)</sup> <sup>(2)</sup>	184	270	68	7	MF	
Toll "0"+10 <sup>(1)</sup> <sup>(2)</sup>	92	270	34	10	MF	
Toll S-S "1"+7 <sup>(2)</sup>	597	240	249	7	MF	
Toll S-S "1"+10 <sup>(2)</sup>	298	240	124	10	MF	
Toll Other						Over "0"-
Special Service						Over "0"-
Intercept						
Intraoffice	2504	120	2087			
EAS North	345	150	230	5	DP	
EAS East	232	150	155	5	DP	
EAS West	287	150	191	5	DP	
Tandem	280	150	187	5	DP	
Tandem						
Tandem						
911 Emerg. Service						
TOTAL	4888		3348			

Busy Hour Attempts = BHC Total x 1.4 = 4687

<sup>(1)</sup> PPCS traffic assumed to be divided 20 percent "0"- and 80 percent "0"+ if unknown.

<sup>(2)</sup> Toll calls assumed to be divided two-thirds 7 digits and one-third 10 digits.

Office Name  
(By Location) Deer Park, WA.

8.2.2 Terminating Traffic

Type	CCS	H.T. Secs.	BHC	No. Digits Impulsed	Receiver Sig. Mode	Remarks
Toll Compl.	1202	240	501	4	MF	
Test & Ver.				4	MF	
Intraoffice	2504	120	2087			
EAS North	240	150	160	5	DP	
EAS East	232	150	155	5	DP	
EAS West	400	150	267	5	DP	
Tandem	280	150	187	5	DP	
Tandem						
Tandem						
TOTAL	4858		3357			

9. CHECKLIST OF FEATURES REQUIRED

- 9.1 Alternate Routing (Explain in Item 16) \_\_\_\_\_
- 9.2 Data Service (Explain in Item 16) \_\_\_\_\_
- 9.3 This office shall be:
  - 9.3.1 End Office Only \_\_\_\_\_
  - 9.3.2 End Office and Intermediate Tandem (Explain in Item 16) \_\_\_\_\_
  - 9.3.3 End Office and Access Tandem (Explain in Item 16) \_\_\_\_\_

RST Designation Hurricane Ridge  
Host Office Deer Park, WA.

PART IV

DETAILED INFORMATION ON REMOTE SWITCHING TERMINALS (RST'S)

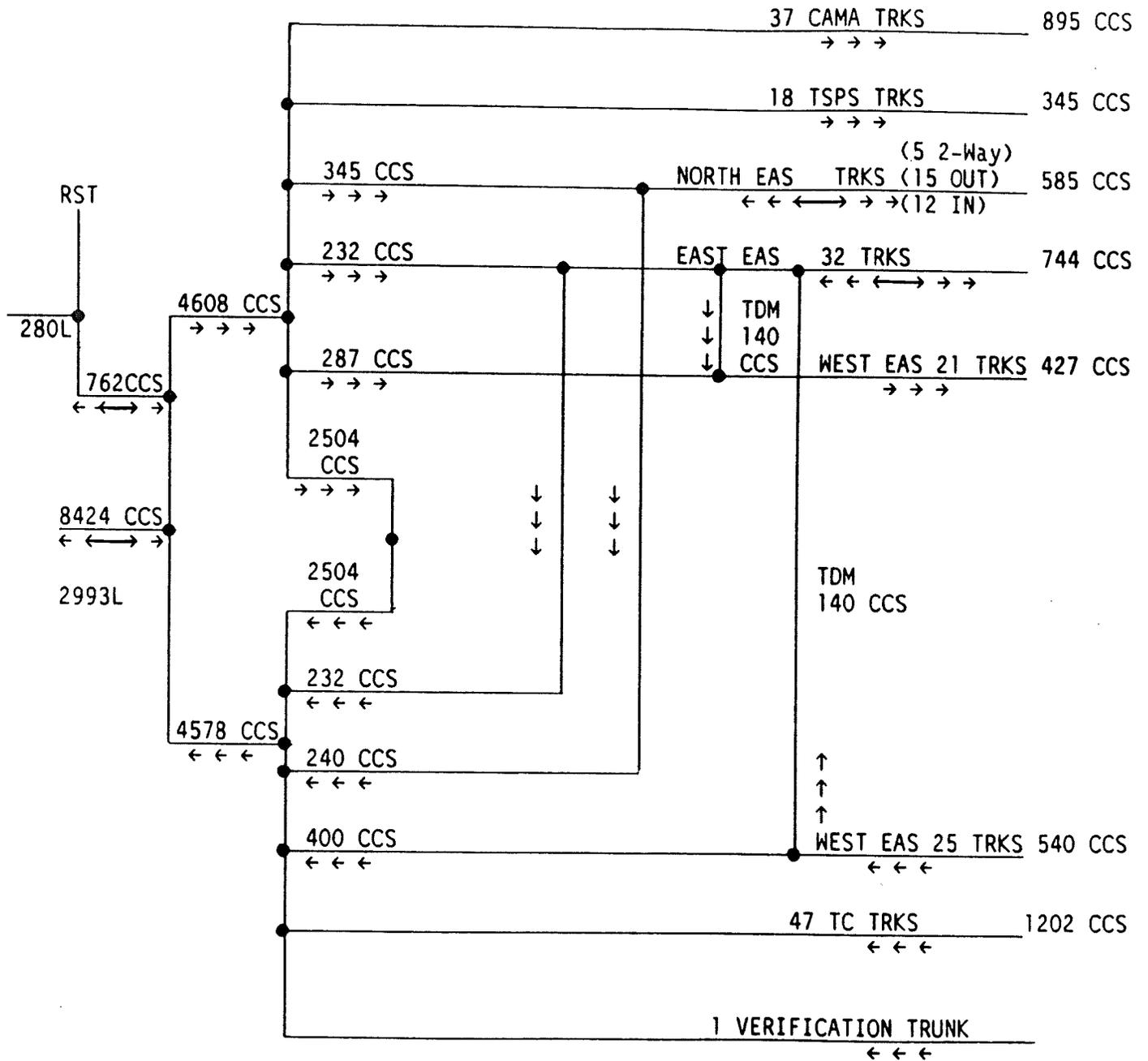
(Complete One Form For Each RST)

1. NUMBER OF SUBSCRIBER LINES (These lines included in totals in Part III, item 6.)
- 1.1 Single-Party: 262 Flat Rate \_\_\_\_\_ Message Rate \_\_\_\_\_
- 1.2 Two-Party: \_\_\_\_\_ Flat Rate \_\_\_\_\_ Message Rate \_\_\_\_\_
- 1.3 Four-Party: \_\_\_\_\_ Flat Rate \_\_\_\_\_
- 1.4 Semi-Postpay Pay Station 15
- 1.5 Prepay Pay Station \_\_\_\_\_
- 1.6 PABX Lines 3 Loop Start  Ground Start \_\_\_\_\_  
Restricted at Office \_\_\_\_\_ Other \_\_\_\_\_ (Describe in Item 12, Part IV.)
- 1.7 Number of lines to be pushbutton 93
- 1.8 911 Emergency Lines \_\_\_\_\_
- 1.9 Anticipated ultimate capacity (20-Year) 600
2. TRAFFIC
- 2.1 Originating traffic per line - CCS/BH: 1.36 Initial<sup>(1)</sup>  
1.6 Ultimate
- 2.2 Terminating traffic per line - CCS/BH: 1.36 Initial  
1.6 Ultimate
- 2.2.1 Terminating will be made equal to originating if it is not known to be different.

<sup>(1)</sup>This figure is derived from dividing the total originating RST line traffic in CCS by the number of initial lines in the remote switching terminal (RST). In this example: 380 CCS/280 Lines = 1.36 CCS

# TRAFFIC FLOW

## WASHINGTON 500 DEER PARK



WORK SHEET #1

ORIGINATING TRAFFIC

CAMA 895 CCS

TSPS 345

EAS - East 232

$$\frac{1}{2} (\text{Total CCS}) - \frac{1}{2} \text{TDM}$$

$$\frac{1}{2} ( 744 ) - 140$$

EAS - West 287

$$\text{Total CCS} - \frac{1}{2} \text{TDM}$$

$$427 - 140$$

EAS - North 345

$$\text{Equivalent \# Trunks} = \frac{2W ( \frac{1W}{OG} ) + 1W}{(1W/OG + 1W/IN)}$$

$$\text{Equivalent \# Trunks} = \frac{5 ( \frac{15}{15} ) + 15}{(15 + 12)} = 18 \text{ Trunks}$$

Equivalent 345 CCS @ B.005

Total Outward CCS 2104

Originating Traffic from Lines = 4608 CCS

Intraoffice CCS = 4608 - 2104 = 2504 CCS

WORK SHEET #2

TERMINATING TRAFFIC

<u>Type of Trunk</u>	<u>CCS</u>
Toll Compl.	1202
EAS - East	232
$\frac{1}{2} (\text{Total CCS}) - \frac{1}{2} \text{TDM}$ $\frac{1}{2} ( 744 ) - 140$	
EAS - West	400
$\text{Total CCS} - \frac{1}{2} \text{TDM}$ $540 \quad - 140$	
EAS - North	240
$\text{Equivalent \# Trunks} =$ $\frac{2(W) \frac{1W}{IN}}{1W/OG + 1W/IN}$	
$\text{Equivalent \# Trunks} =$ $5 \left( \frac{12}{15 + 12} \right) + 12 = 14 \text{ Trunks}$ $(15 + 12) \text{ Equiv. } 240 \text{ CCS @ B.005}$	
Tandem	280
	<u>2354</u>

Terminating Intraoffice Traffic = Originating IAO Traffic

IAO = 2504

