

METHODS & PRACTICES

Network Staff

PACIFIC TELEPHONE



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Review this Flash with all test center provisioning and maintenance personnel. File it in front of Section 309-400-000, Issue 2. Destroy this Flash upon receipt of a Pacific Company addendum or Issue 3 of the main section.

ELECTRONIC TANDEM NETWORKS (ETN)

CLARIFICATION OF ETN TRUNKS

This Flash is issued to clearly define Electronic Tandem Network (ETN) trunks that are controlled by the Plant Control Office (PCO) of the ETN tandem switch indicating proper Common Language Circuit Identification (CLCI) for purposes of tallying work units, inventorying for class of service 14 and for providing test access within the misroute guidelines.

CLCI

IT

TA

SA

ETN DEFINITION

Intertandem Tie trunks connect ETN tandem switches that may be DIMENSION[®] 2000 FP-8 or I/IA ESS generic IE6 or later.

Tandem Access trunks connect subtending main PBXs or Centrexes to the tandem switches. This includes Bypass Access Tie Trunks from a tandem switch that connects to a main PBX or Centrex that is homed to another tandem switch.

Satellite Access trunks can present a problem for ETN configurations. If there is a Main/Satellite configuration when both the Main and Satellite PBXs

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are DIMENSION 2000 FP-8s and one of them is the tandem switch, the SA trunks are part of the ETN. The balance of the SA trunks, not following this definition are separate from the ETN.

OPS

Off Premise Stations can present a problem for ETN configurations. The OPS that are to be included as part of the ETN must meet the following criteria:

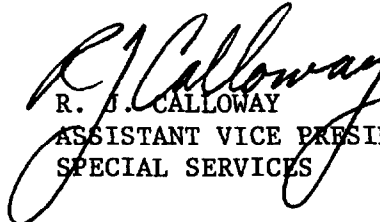
- (a) The OPS must be homed on the ETN tandem switch.
- (b) If the tandem switch is a DIMENSION 2000 FP-8, the OPS must terminate in an LC-361 circuit pack to qualify.

The trunks that are maintained under the ETN maintenance plan, namely IT, TA, (includes Bypass Access trunks) and selected OPS and SA trunks should have test access by the PCO for the tandem switch within the misroute guidelines, inventoried in the Special Services System (SSS) under class of service 14, and tallied for ETN trunk testing work units.

When an ETN is established with these ETN trunks within the same exchange, the same ETN PCO for the tandem switch is designated PCO. The circuits should also have ETN PCO test access, be inventoried as class of service 14 and tallied with the appropriate ETN work units.

All other circuits with connectability to the ETN tandem switch are maintained separately from the ETN maintenance plan. These circuits are Wide Area Telephone Service (WATS), Foreign Exchange (FX), and Central Office trunks.

Any additional information may be obtained by calling your staff representative. My contact on this subject is Frank P. Grasso on (415) 774-9139.


R. J. CALLOWAY
ASSISTANT VICE PRESIDENT
SPECIAL SERVICES

SWITCHED SERVICE NETWORKS

ELECTRONIC TANDEM NETWORK (ETN)

GENERAL DESCRIPTION

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1. INTRODUCTION

A. General

1.01 This section covers general descriptive information for Electronic Tandem Switching (ETS) features used in Electronic Tandem Networks (ETN). Associated Bell System Practices are listed in Part 7 of this section.

1.02 The reasons for reissuing this section are to add the information listed below.

- Network Control Operations Support System (NCOSS)
- Remote Maintenance Station (RMS)
- Automatic Circuit Assurance (ACA)
- Precutover Printer
- Network Control Office (NCO). Access to the Customer Administration Center System (CACS).
- DIMENSION 600 FP8
- LC361 Off-Premises Extension (OPX).

Revision arrows are used to emphasize the more significant changes.

1.03 Descriptive information common to the transmission of data on the Public Switched Network (PSN), private line services, and Switched Service Networks (SSN) is covered in the following sections:

- Data General—Analog Transmission Parameters—Description (Section 314-010-100)
- Data General—Data Testing Principles (Section 314-010-101)
- Data General—Data Services Support (Section 314-010-102)
- Data General—Interconnection/Interpositioning (Section 314-010-103)

A basic understanding of the Data General sections is recommended prior to the use of this section.

1.04 In recent years, growing customer needs and advancing technology have spurred many improvements in private services sophistication. Modern Switched Service Networks (SSNs) have taken on more and more tasks previously requiring attendant supervision, and have provided improved convenience to station users and improved control to communications managers. In keeping with this trend, a new complement of cost control, facility management, and customer convenience features has been developed. ETS is the name given this set of features.

1.05 ETS features will permit customer to use TOUCH-TONE® senderized operation with uniform numbering plans, allocate communications costs to all users via Station Message Detail Recording, automate control of station user privileges, improve intercity facility management, have "hands-on" control of certain PBX/Centrex capabilities, and a number of other features.

B. Glossary

1.06 Some of the terms used in this section have been abbreviated. These are as follows:

ABBREVIATION	TERM
AAR	Automatic Alternate Route
ARS	Automatic Route Selection

CAS	Centralized Attendant Service
CO	Central Office
CP	Customer Premise
CTX	Electronic Switching System Centrex
DDC	Direct Department Calling
DID	Direct-Inward-Dialing
ESS	Electronic Switching System
ETN	Electronic Tandem Network
ETS	Electronic Tandem Switching
FX	Foreign Exchange
LCAS	Local Customer Administration System
LDN	Listed Directory Number
MTS	Message Telecommunications System
NCOSS	Network Control Operations Support System
NID	Network-Inward-Dialing
OP STA	Off-Premises Station
PBX	Private Branch Exchange
RMS	Remote Maintenance Station
TVC	Trunk Verification by Customer
TVS	Trunk Verification by Station
WATS	Wide Area Telecommunications Service

2. DESCRIPTION

2.01 The following paragraphs describe the network elements found in ETN (Fig. 1). These elements consist of PBX/CTX tandem switches and private lines which, for convenience, have been termed intertandem tie trunks, access tie trunks, and by-pass access tie trunks. Foreign Exchange

(FX), PBX/CTX Wide Area Telecommunications Service (WATS), and central office (CO) trunks also may terminate on the PBX/CTX, but are not considered under the ETN maintenance plan.

A. PBX/Centrex Tandem Switch

2.02 The ETN consists of 4-wire private line facilities interconnecting customer PBX/CTX tandems. The tandem switch may be a DIMENSION® 2000 or Custom Feature Package (FP) 8 and/or No. 1 Electronic Switching System (ESS) Centrexes Generic 1E6 or later. These tandems use a stored program controlled switching machine to interconnect intertandem tie trunks, access tie trunks and by-pass access tie trunks terminated in the switch. The PBX/CTX tandem can be configured in a two-level hierarchical structure for configurations consisting of more than two PBX/CTX tandems as shown in Fig. 1.

B. Intertandem Tie Trunks

2.03 The PBX/CTX tandem switches are interconnected with two-way intertandem tie trunks. Intertandem tie trunks can be central office to central office (CO—CO) circuits, central office to customer premises (CO—CP) circuits, or customer premises to customer premises (CP—CP) circuits. These circuits may be long haul with TOUCH-TONE or multifrequency signaling. Relative frequency signaling is used with ESS tandems.

C. Access Circuits

2.04 Access tie trunks connect equipment (PBX, Centrex) to a PBX/CTX tandem switch. The following describes the types of access tie trunks available:

- **Access Tie Trunks to Centrex-CO**—Private line circuit between Centrex-CO switch and a PBX/CTX tandem switch.
- **Access Tie Trunk to PBX**—Private line circuit between a PBX and a PBX/CTX tandem switch.
- **Bypass Access Tie Trunk**—One-way access tie trunk from any PBX/CTX tandem switch to a Centrex-CO switch or a main PBX not homed on that PBX/CTX tandem switch.

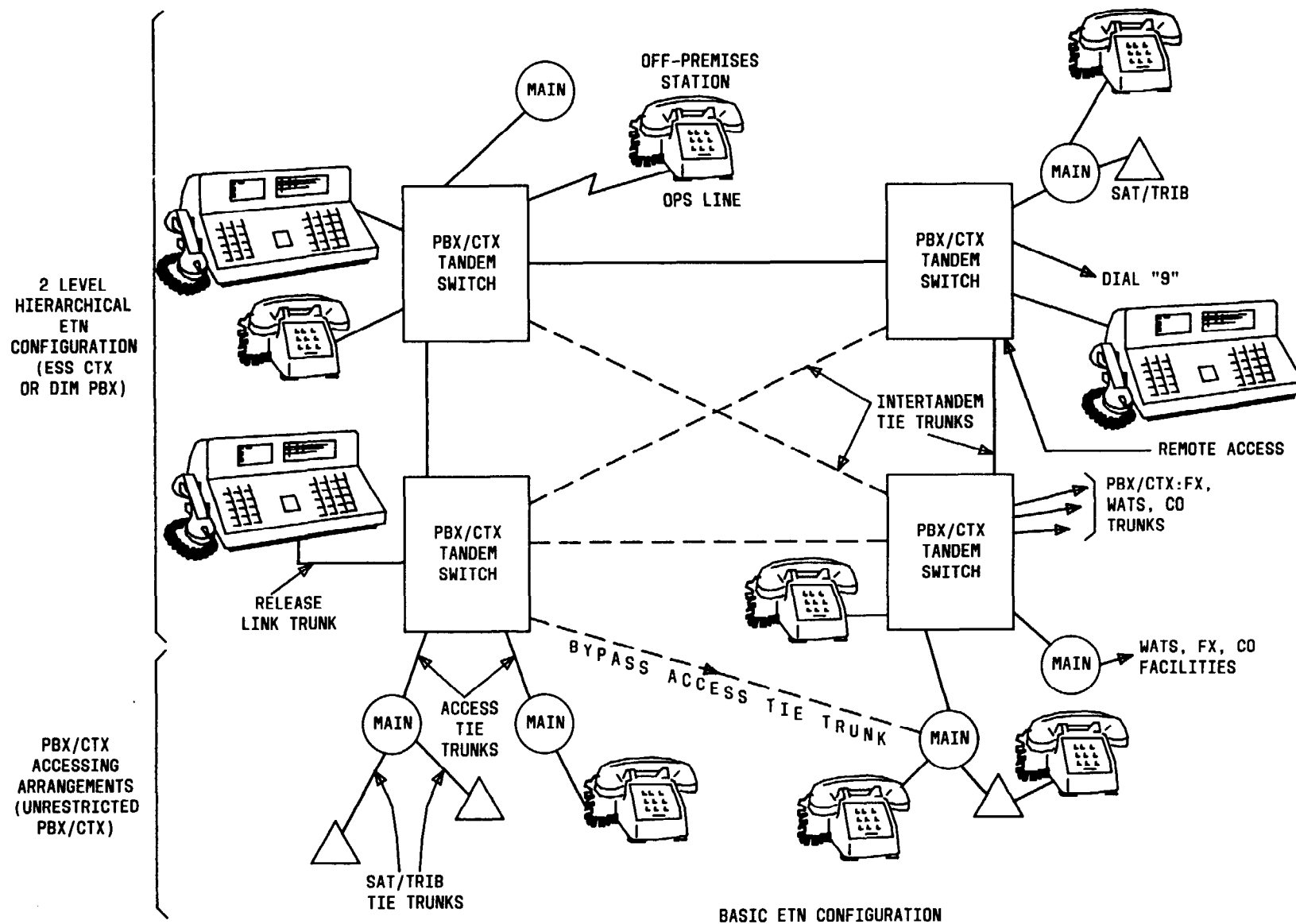


Fig. 1—Basic ETN Configuration

- **Off Premises Station (OPS) Line**—Private line circuit between a PBX/CTX tandem switch and off-premises station sets, key sets, data sets, switchboards, or other attendant position systems.
- **Release Link Trunk**—Circuit between a PBX/CTX tandem switch and an attendant position system arranged for release link operations. The attendant position system is located near the PBX/CTX tandem switch. Release link operations provides the means to release the attendant facilities from the connection after call setup.

D. Off-Net Access Trunks

2.05 Off-Net circuits provide service to the MTS. These circuits may be 1-way circuits in or out or 2-way circuits. The following describes the off-net circuits available:

- **PBX/Centrex Office (CO) Trunk**—Private line circuit between PBX/CTX tandem switch and a class 5 office in the same rate center of the MTS.
- **PBX/Centrex Foreign Exchange (FX) Trunk**—Private line circuits between a PBX/CTX tandem switch and a distant class 5 office in the MTS.
- **PBX/Centrex Wide Area Telecommunications Service (WATS) Trunk**—Private line circuit between a PBX/CTX tandem switch and a class 4 or higher office in the MTS arranged for WATS service.

3. ELECTRONIC TANDEM NETWORK CONFIGURATION

3.01 An ETN is a network configuration of ETS features as provided by FP8 and ESS. It consists of one or more DIMENSION FP8 or ESS Centrex PBXs, and a number of subtending locations, connected via tandem tie trunks. The FP8 and ESS Centrex provide tandem switching as well as station functions. Main/satellite, main/tributary, WATS concentration, and centralized attendant service are described in the following paragraphs.

A. Main/Satellite Configuration

3.02 This configuration permits a multilocation customer to concentrate PBX attendants

and trunks at one PBX called the main. Unattended subtending PBXs are referred to as satellites. All incoming calls are switched through the main over tie trunks to the satellite locations. Outgoing calls from the satellite use the same tie trunks. The main/satellite configuration may use a DIMENSION FP8 or No. 1 ESS Centrex as a main PBX (see Fig. 2).

3.03 This configuration offers (typically) 4-digit dialing (inter-PBX coordinated station numbering) between main and satellite stations. It offers one listed directory number (LDN), call transfer between main and satellite stations, direct-inward-dialing (DID) to satellite stations through the main PBX, as well as network-inward-dialing (NID) to satellite stations from a customer private network. These private networks are Bell System offerings such as the Common Control Switching Arrangement (CCSA) and Enhanced Private Switched Communications Service (EPSCS).

3.04 Inter-PBX coordinated station numbering is primarily a feature of the main/satellite configuration, but may also be provided with the main/tributary configuration. Stations at the main and satellite may dial each other without intervening dial tone. The dialing plan for an inter-PBX call is the same as for an intra-PBX (station-to-station) call.

3.05 Call transfer between main and satellite stations (Inter-PBX call transfer example, Fig. 3) refers to the capability of transferring incoming CO calls among stations at a main PBX and those at a satellite PBX. This is accomplished either by station or attendant transfer, depending on the main/satellite PBX.

B. Main/Tributary Configuration

3.06 This permits a multilocation customer to consolidate tie trunk access facilities at a single location designated the main. Subtending PBXs, called tributaries, receive and place calls via tie trunks between the main and tributary. Each tributary PBX has its own LDN and PBX attendant. Its private network location code will be different from that of the main. The main/tributary configuration may use a DIMENSION FP8 PBX or No. 1 ESS Centrex as a main PBX (see Fig. 2).

3.07 This configuration cannot use inter-PBX coordinated station numbering unless the

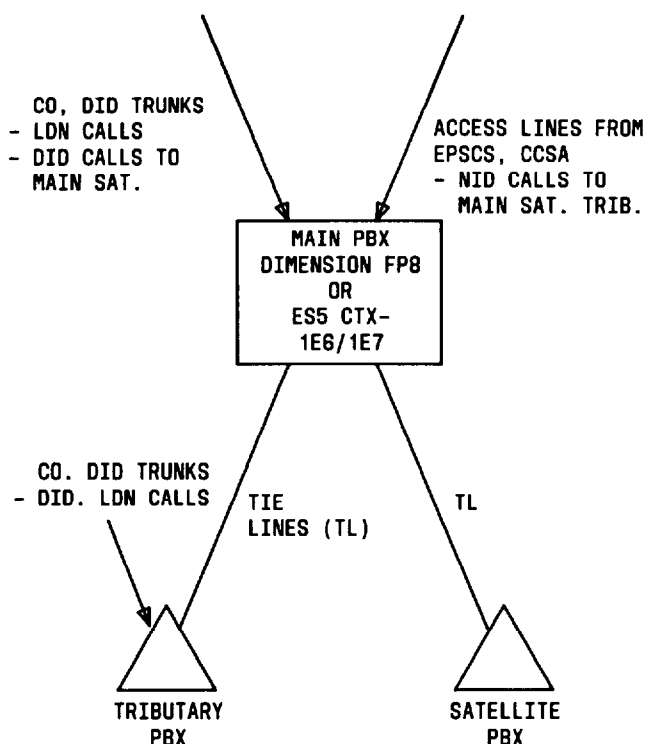


Fig. 2—Typical Main/Satellite and Main/Tributary Configuration

tributary is a DIMENSION FP8, step-by-step PBX, ESS Centrex, or functionally similar system. DID to tributary stations via the FP8 main PBX is not provided.

C. WATS Concentrator Configuration

3.08 The term “WATS concentrator” is simply a descriptive phrase intended to convey an expected market application. This configuration can, in fact, be viewed as a “single-tandem” ETN configuration in that all ETN features, with the exception of automatic alternate routing, can be utilized. This configuration is primarily for customers having large amounts of intercity calling generated by a number of locations in the same general geographic area.

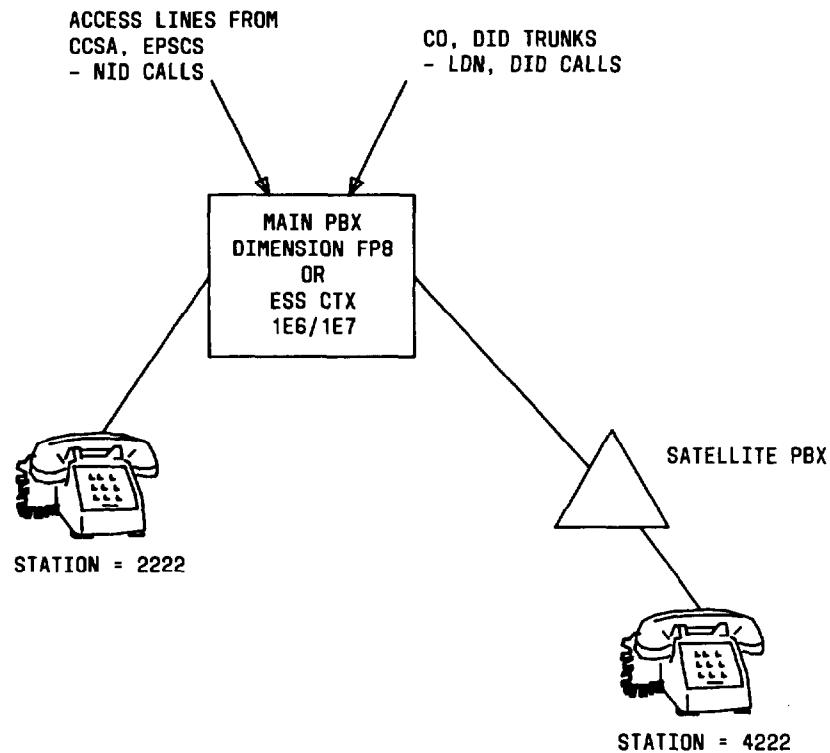
3.09 A single DIMENSION FP8 PBX or ESS Centrex (Fig. 4) may be used to centralize or concentrate traffic from a number of subtending locations onto various intercity facilities (FX, WATS, MTS). Station users at the PBX/CTX tandem as well as those at subtending PBXs and off-premises extensions access these facilities automatically via the ARS-deluxe feature or AAR feature. Facility

restriction levels, authorization codes, and deluxe queuing can be employed to more fully utilize the least costly facilities and to prevent unauthorized calling.

D. Centralized Attendant Service Configuration

3.10 The centralized attendant service (CAS) configuration permits multilocation customers to concentrate attendants at single location, usually the PBX/CTX tandem switch. These attendants perform ETN-related services for the PBX/CTX tandem switch and the subtending PBXs. Incoming LDN calls (DID, FX, INWATS) come into branch location PBX directly from the local central office and are switched to the centralized attendant position (Fig. 5) over release link trunks. These are temporary connections between attended and unattended locations established to enable the attendant to complete call routing. Once the call is routed, the release link trunk is disconnected to permit use in processing other calls.

3.11 The appropriate PBX/CTX tandem RNX followed by a 4-digit attendant extension that is normally the same for all PBX/CTX tandem

**EXAMPLE**

- NID OR DID CALL COMPLETES TO STATION = 4222
- USER AT STATION = 4222 FLASHES SWITCH HOOK AND DRAWS DIAL TONE
- STATION USER = 4222 DIALS. 2222 - CALL IS TRANSFERRED

Fig. 3—Example of Inter-PBX Call Transfer

locations is dialed to gain access to the ETN attendant by station users. The attendant at a specific location is reached by dialing the ETN access code, the appropriate RNK location code, and the standard ETN attendant extension. The RNK code is a unique 3-digit code to access a given network location and is an integral part of the uniform numbering feature.

4. NETWORK FEATURES

4.01 The following paragraphs describe and explain the network features provided for an ETN configuration.

A. Uniform Numbering

4.02 This feature permits each station set in ETN (PBX/CTX tandems, main, or satellite/tributary PBXs) to be accessed with the

same address code from any other station set via tie trunks. The numbering plan provides for the termination of each station set with a unique 7-digit RNK-XXXX address code. The RNK code is similar to the NNX codes in use on the public exchange (MTS) network. The special first digit restriction (R) is due to the reservation of any digits 4 through 9 (for example, 4, 5, 6, 7, 8 or 9). The digits 2 and 3 are reserved for other uses. The N is any of the digits 2 through 9, and X is any digit 0 through 9. The last four digits identify a station number and may be the same for the ETN and regular message network use.

4.03 Station users access the ETN by dialing the designated ETN access code. Users terminated on a tandem or a main PBX dial the access digit and receive a dial tone prior to dialing the 7-digit address code. Station users terminated on satellite/tributary PBXs dial the main PBX/CTX

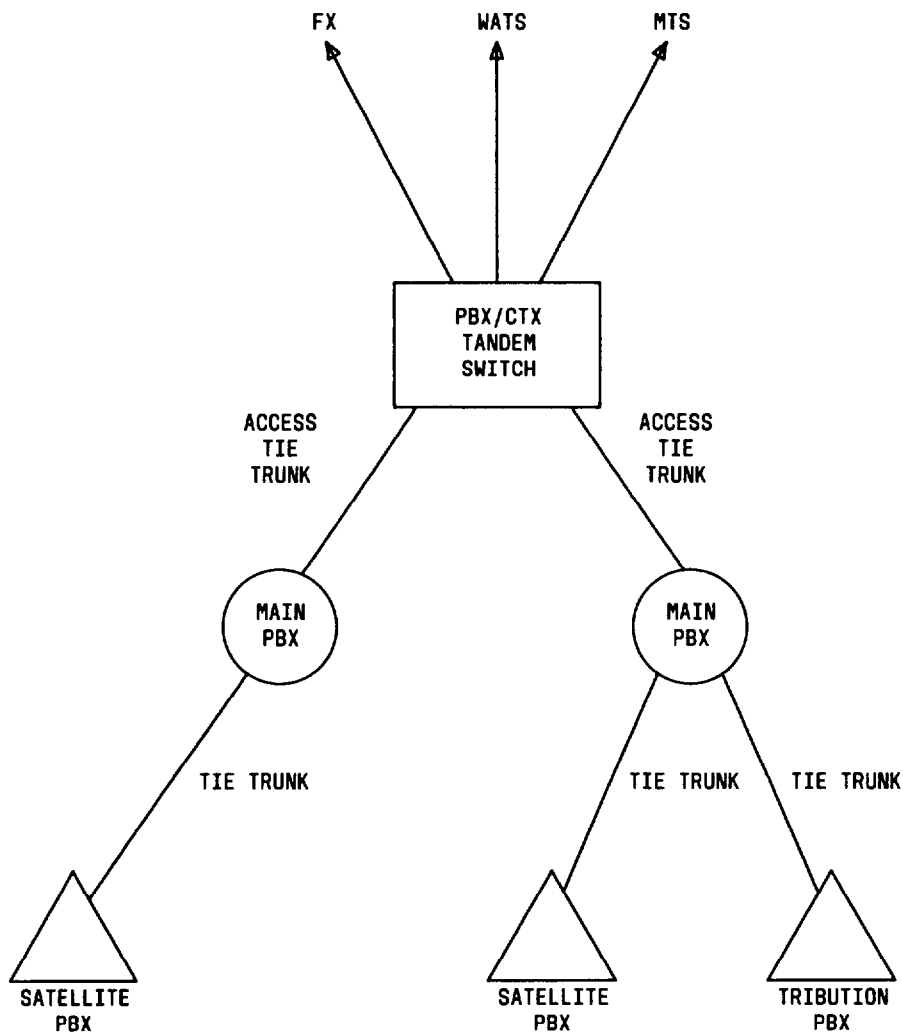


Fig. 4—Typical WATS Concentrator Configuration

access code, receive dial tone and then dial the ETN access code followed by the proper location number. When a No. 5 crossbar Centrex is used as a main PBX, the use of a 1XX code in place of single digit access may be required, depending on the generator of the No. 5 crossbar.

4.04 Figure 6 shows an example of an on-network call made from an originating station. Station A is served by a satellite/tributary PBX and is destined for a station (Station B) served by a main PBX RNX (533).

B. Automatic Alternate Routing

4.05 The automatic alternate routing (AAR) feature of ETN can be configured for call routing

in a two-level hierarchical network structure when more than two PBX/CTX tandems are used. The objective of AAR is to make optimum use of trunks in the network. AAR provides up to four possible alternate paths when dialing an ETN number.

4.06 First choice routes are designated as “high usage” (intertandem trunks) groups. Final trunk groups are alternate routes selected when “bypass” and “high usage” groups are busy.

4.07 Figure 7 is an example of AAR being used to route a call to a distant or subtending location employing first choice and final trunk groups.

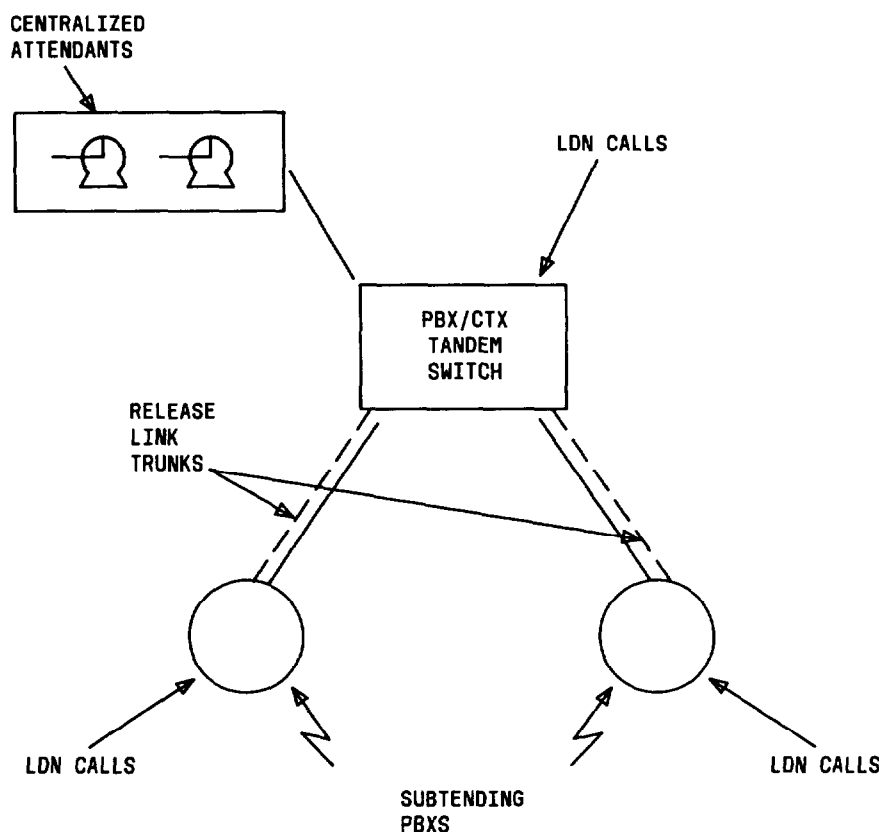


Fig. 5—Typical Centralized Attendance Service (CAS) Configuration

4.08 As a customer option, when all tie trunks are busy, calls can overflow to the MTS. These calls may be routed via the local CO trunk group to the LDN at the called location, or to the station if that PBX has direct in-dialing. The PBX/CTX translates the 7-digit on-net number to a 10-digit MTS number for routing. This feature can be used to help insure call completion and elimination of continual retrials. Calls may overflow to the MTS either at the head-end tandem or tail-end tandem depending on customer requirements and where the tie trunk configuration occurs.

C. Automatic Route Selection (ARS)—Deluxe

4.09 When uniform numbering is used, ETN calls destined for MTS are automatically routed through the PBX/CTX tandem ARS-deluxe feature without an intermediate access digit. The ARS feature automatically selects the most economic available route based on the dialed number.

4.10 Dialing sequence consisting of "Access Code + 7D" is interpreted as an on-net call in an ETN configuration (see uniform numbering). All calls consisting of an access code plus ten digits are interpreted as off-net calls. When dialing from a substanding PBX, the access code followed by ten digits is used for all public exchange calls routed through the tandem (requires dialing the NPA for both home NPA and foreign NPA calls). "Dial 9 + 7D" calls access the local CO for MTS calls in the same NPA. Additionally, "dial 9" trunks can be provided at substanding PBXs for local calls if desired. (See Table A for dialing sequences associated with uniform numbering with ARS-deluxe.)

4.11 Automatic Route Selection Patterns:

These patterns can be used to route calls to various public exchange destinations. Each pattern can contain as many as ten route choices. Three such groups of patterns can be engineered (stored) in a PBX/CTX selectable on a time-of-day basis by the customer.

BASIC DIALING SEQUENCES
TO REACH STATION 1234 AT MAIN PBX RNX(533)

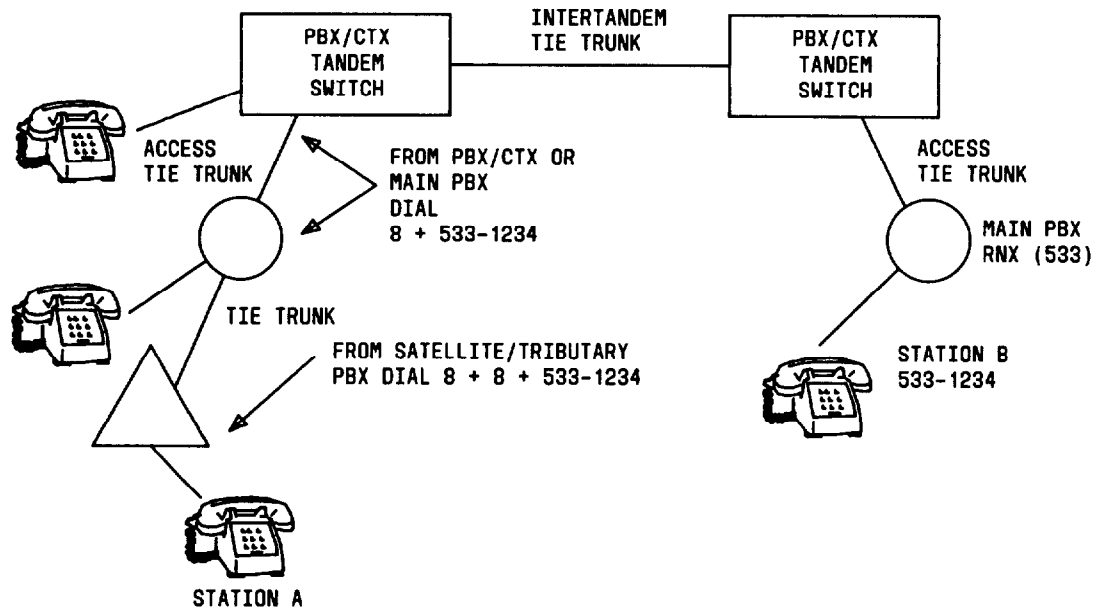


Fig. 6—Uniform Numbering Applied to ETN Configuration

4.12 Time of Day Routing: Three time(s) of day ARS patterns can be selected automatically (by using a preset internal clock) or manually. If selection is automatic, it can be overridden using customer administrative control features or, at customer option, by the attendant.

4.13 Tie Trunks in ARS: Tie trunks to other tandems or main PBXs can be included among the facilities choices in each ARS pattern. This permits calls to public exchange destinations to route part way over tie trunks before accessing the exchange network. Partial routing of public exchange call over network tie trunks is sometimes referred to a "tail-end hop-off".

4.14 When a "tail-end hop-off" call is routed to a main PBX for access to the public exchange network, "programmed pause in outpulsing" is employed where necessary. That is, the PBX/CTX tandem seizes a tie trunk to the main PBX, pauses for dial tone from the main, outpulses an exchange access digit (eg, 9) to seize an exchange facility, pauses again to permit the main to "cut-through" and CO dial tone to return, and then outpulses the destination 7- or 10-digit number. Conventional

wink-start and delay-dial signals will also be used when available. Some connections may be prohibited by local tariffs and are permissive (not supported) in any case.

4.15 Six-Digit Translators: This permits the facility choices for calls to different NPAs to be made a function of the dialed NPA-NNX combination. With FP8, as many as 32 translators are used to route ARS calls, as many as 64 6-digit translations are available in ESS for ARS.

D. Data Transmission

4.16 Data transmission on the ETS network will be possible at speeds ranging from 300 bps to 4800 bps. Type I, 300 bps, will generally be possible between any two on-net stations. As the bit-speed increases to Type II (1200 to 2400 bps) and Type III (4800 bps), certain restrictions become necessary.* The higher the speed, the more restrictions are required. Data may be restricted to three links by assigning "DATA RNX" to preclude automatic alternate routing of data calls destined for a particular tandem or subtending PBX. A

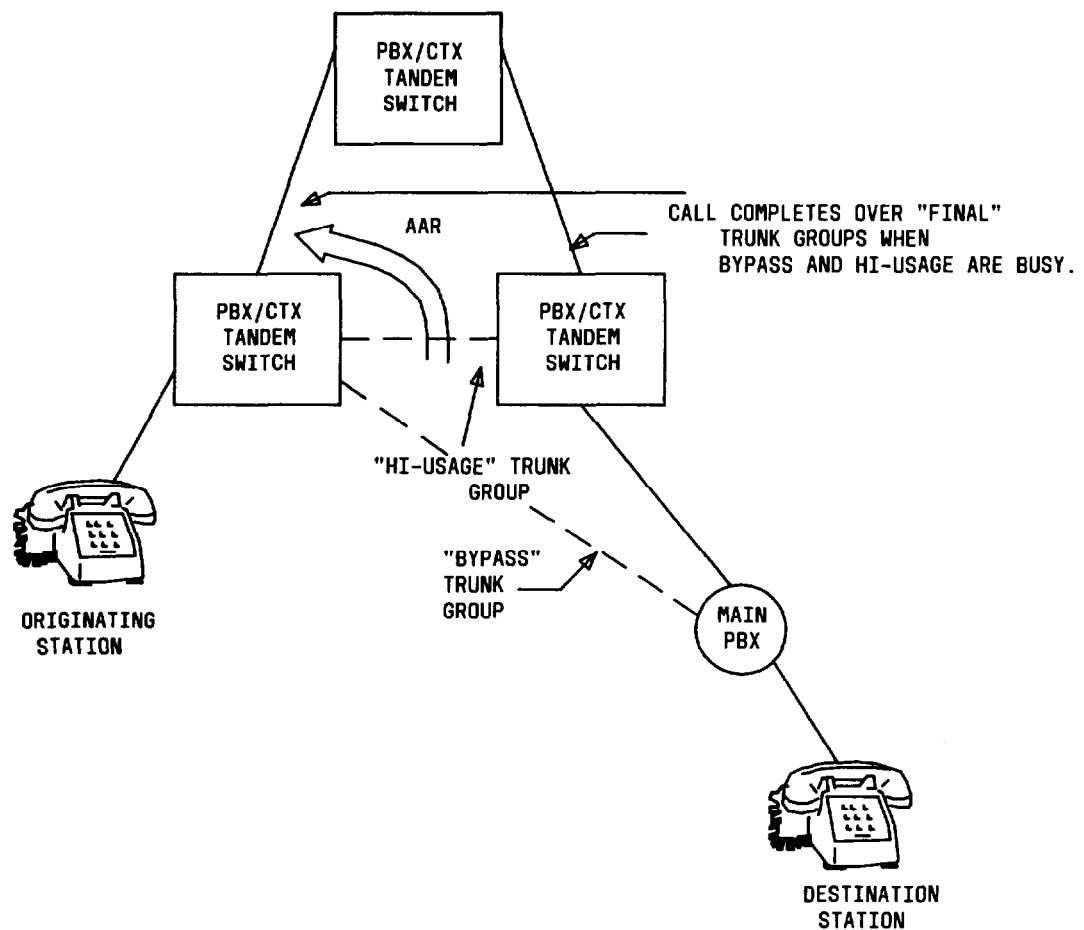


Fig. 7—Example of Automatic Alternate Routing (AAR)

link can be either an access tie trunk, an intertandem trunk, or a satellite/tributary trunk.

*With no conditioning, only data at speeds of 300 bps or less will be supported over connections with up to five tie trunks in tandem; 2400 bps will be supported with two trunks in tandem and 4800 bps with one trunk connection. An OPS is considered a trunk for data transmission.

E. Network Control Operations Support System (NCOSS)

4.17 The NCOSS is a computer based system for the provision of network operations and traffic network administration support functions for ETNs. For the network operations support function, the NCO responsible for a particular ETN is the NCOSS client and the key functions supported are pre-cutover network testing, customer reported trouble screening and localization, and

network performance evaluation. For the traffic network administration support function, the business services organization responsible for a particular ETN is the NCOSS client and the key function of NCOSS is the generation of a suitably formatted data tape for downstream Enhanced Network Administration System (ENADS) processing. The backbone NCOSS function is the collection and processing of network data from the tandem switches in an ETN.

4.18 Dial-up connections on the public network are established for the collection of the raw data by NCOSS from the tandems and the Customer Administration Center System (CACS) in a particular ETN, and for the request and retrieval of data reports by the NCOSS clients.

4.19 Each ETN is supported by NCOSS only at critical times in the lifetime of that ETN.

TABLE A

UNIFORM NUMBERING SUMMARY OF DIALING SEQUENCES

- ETN/WATS CONCENTRATOR CONFIGURATIONS
(SINGLE TANDEM)

Destination †Dialing From		PBX/CTX, Main. Or Sat/Trib	"Off-Net" To Home NPA	"Off-Net" To Foreign NPA	Treated Identically
PBX/CTX		8 + 7D	9 + 7D or 8 + 10D	9 + 10D or 8 + 10D	
Main PBX		8 + 7D	8 + 10D (9 + 7D)*	8 + 10D (9 + 10D)*	
Sat/Trib PBX		8 + 8 + 7D	8 + 8 + 10D (9 + 7D)*	8 + 8 + 10D (9 + 10D)*	

- MAIN/SATELLITE AND MULTIPLE PBX/CTX CONFIGURATIONS

Destination †Dialing From		Any PBX Station	Home NPA	Foreign NPA
Any PBX Station		4D	9 + 7D or 8 + 10D	9 + 10D 8 + 10D

* Applies only if "Dial 9" trunk provided at subtending PBX. Such trunks would typically be toll restricted to force local calls through usage screening at the PBX/CTX.

† Digit "8" is access code for main and Satellite/Tributary PBXs.

For network operations support functions these times are for approximately a one-month period prior to cutover, and a two- or three-month period after network cutover. Subsequent revisits are on an as-required basis as dictated by network performance. For traffic network administration, these times are approximately two to three months after network cutover to provide data for an initial

end-to-end network traffic design. Periodically thereafter, NCOSS may be used for individual circuit group and queue resizing as well as new network redesigns.

4.20 NCOSS provides powerful message detail search and patterning algorithms enabling the NCOs to rapidly and knowledgeably respond

to customer reports of trouble and determine whether a network trouble exists. These same capabilities enable the NCO to localize troubles during pre-cutover testing of the network. The NCO has access to NCOSS reports that allows them to assess network performance and more quickly detect discrete network troubles.

5. ETN CAPABILITIES/FEATURES

5.01 The capabilities and features provided in ETN offerings are described in the following paragraphs.

A. Facility Restriction Level

5.02 Call routing privileges in ETN are achieved through a combination of features. One such feature is the facility restriction level. It is a parameter associated with each authorization code, each subscriber line, and each incoming tandem tie trunk. It is used to determine:

- If a call attempt is permitted
- Which facilities are to be made available to that attempt, and which are to be denied.

5.03 Facility restriction level is similar to the previously available code restriction level. Up to eight different restriction level values can be employed by the customer, with certain calling privileges assigned to each. An example of possible level assignment is shown in Table B.

5.04 A default facility restriction level that determines the routing privileges for calls originating at a PBX/CTX tandem and its subtending PBX is assigned to each subscriber line and each access trunk group. A facility restriction level is also assigned to each authorization code. The default facility restriction level associated with the calling station line or access trunk group determines the routing privileges for a call originating from that station line or access trunk group.

5.05 Facility restriction levels can be upgraded or downgraded under the control of the customer attendant using the "controlled alternate facility restriction level" feature. The attendant dials a special code to do this. Thus, a user could be allowed access to ARS-deluxe during the day and prohibited from ARS-deluxe at night. For example, level = 4 (day) becomes level = 2 (night).

B. Authorization Codes (AC)

5.06 A default facility restriction level can be overridden for a particular call by incorporating an authorization code in the dialing sequence upon request. A station user can dial a code which overrides the facility restriction level associated with his station line (PBX/CTX tandem user) or incoming tie trunk (main, satellite or tributary PBX user). The PBX/CTX tandem automatically requests dialing of the authorization code when the default level (the level associated with the station line or incoming tie trunk) has insufficient privileges to complete the call. The tandem requests the authorization code by giving the station recall

TABLE B

ILLUSTRATIVE FACILITY RESTRICTION LEVEL ASSIGNMENT

LEVEL VALUE	RELATED PRIVILEGES	ALTERNATE LEVEL VALUE
0	No Calls (Intercom only)	0
1	Local Calls Only	1
2	FRL #1 + Tie Line Calls	2
3	FRL #2 + Local Public Calls	2
4	FRL #3 + FX	2
5	FRL #4 + WATS, Band 1	2
6	FRL #5 + WATS, (All Bands)	2
7	FRL #6 + MTS	2

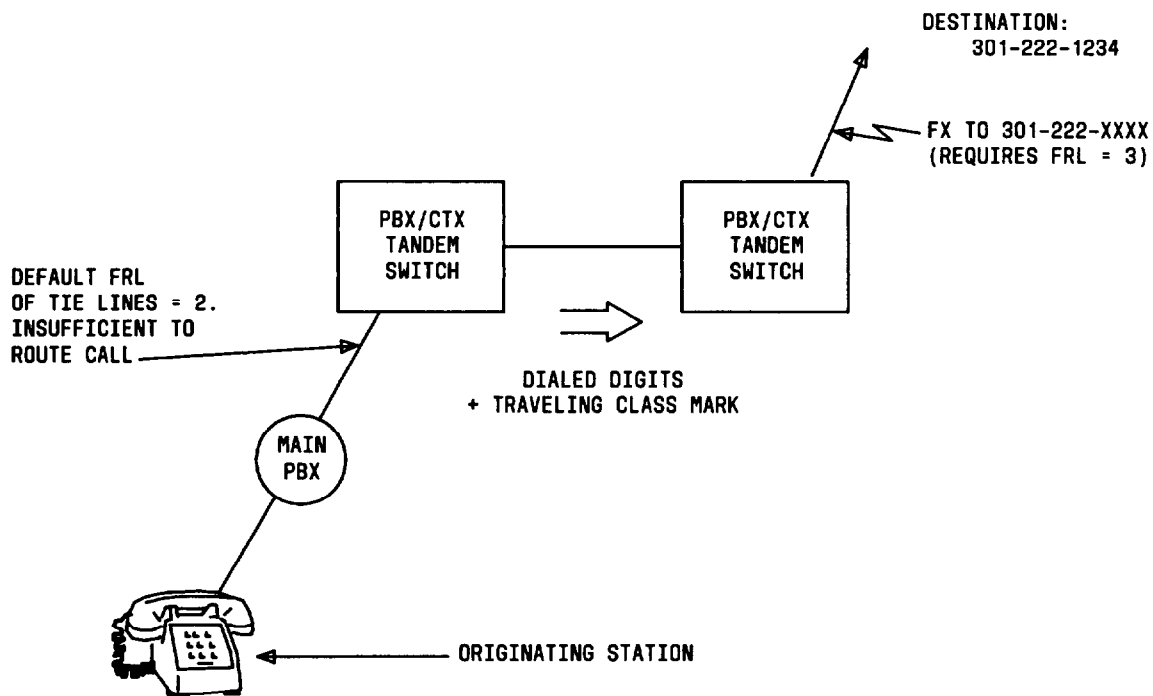
SECTION 309-400-000

dial tone. The authorization code is recorded as part of the message detail record.

5.07 Authorization codes can be any combination of digits not beginning with the digit "1". Activation, deactivation, and change of these codes may be controlled by the customer. The customer will assign authorization codes and the associated restriction levels.

5.08 The ESS Centrex tandem requests an authorization code as a function of the calling

station line or access trunk group and the called address. If both are class-marked for authorization codes, the code is always requested of the caller; otherwise, the default restriction level is used. The DIMENSION PBX tandem translates the called address to a route list prior to code request and attempts to place the call on a circuit corresponding to the default level of the call. If this cannot be done, an authorization code that would permit a higher level is requested for both PBX/CTX tandems. Figure 8 shows an example of screening used to route a call to a distant location.



SEQUENCE OF EVENTS

- STATION USER DIALS 8 + 301-222-1234
- TONE INFORMS USER THAT DEFAULT FRL NOT SUFFICIENT
- USER ENTERS AUTHORIZATION CODE (WITH ASSIGNED FRL ≥ 3)
- DIALED DIGITS + TCM SENT TO DISTANT PBX/CTX TANDEM
- CALL COMPLETES OVER FX

Fig. 8—Example of Call Screening

5.09 Each authorization code can be designated as valid or invalid for remote access to PBX features. Facility restriction levels associated with authorization codes can be appended to designate certain authorization codes as having the

capability to use this feature. This option for authorization codes which are valid for remote access is denoted below by an asterisk. When alternate restriction levels are employed, remote access restriction is not affected.

AUTHORIZATION AUTHORIZATION CODE	ASSOCIATED FACILITY RESTRICTION LEVEL	* = VALID FOR REMOTE ACCESS
2 4 5 6	2	*
2 3 5 6	3	*
2 5 6 7	3	

5.10 An example of the dialing sequence used follows:

ACCESS DIGIT	CALLED NUMBER				AUTHORIZATION CODE
8	DT	NPA - NNX - XXXX	RDT	2 3 4 5	

(DT = Dial tone, RDT - Recall Dial Tone)

C. Traveling Class Mark (TCM)

5.11 The facility restriction level is encoded into a traveling class mark (TCM) for calls routed from an originating PBX/CTX tandem to a distant tandem. The TCM, a single TOUCH-TONE or MF digit, is relayed to the distant PBX/CTX tandem together with the called number. This one-digit code (0-7) informs a distant PBX/CTX tandem what facility choices are to be afforded the routing of the call on MTS (tail-end hop-off). TCMs can be used to limit MTS overflow to certain users.

5.12 A call accessing ETN (see example in Fig. 8) is screened at the originating tandem using the called number, the facility group or the calling station identification, and the user-dialed authorization code. This information determines the routing of the call. The original TCM passes from one tandem to another until call completion.

D. Deluxe Queuing

5.13 This feature permits station users to be placed in a queue whenever all allowed routes for completing a particular call are busy. Queuing permits the users to wait for an idle trunk or to wait in lieu of retrials. Queues can be placed on intertandem trunks, access tie trunks, FX, and WATS trunks at a PBX/CTX tandem on a per-trunk group basis. Figure 9 shows an example of a call using ARS placed in queue. If an idle trunk cannot be found equivalent to the call facility restriction level, the call is queued also.

Queuing on any given call takes place on the first choice trunk group.

5.14 Two types of queuing are possible—off-hook queuing in which the caller remains off-hook while waiting for an idle trunk, and ring-back queuing in which the caller hangs up after being placed in queue and is called back when a trunk becomes available. Stations at tandem, main, and satellite PBXs may be designated either ringback or off-hook queuers. Stations at tributary PBXs are limited to off-hook queuing. When main or satellite PBX stations use ringback queuing, the user dials his extension number when entering the queue, so that callback can be provided by the switch.

5.15 The customer can select one of four options:

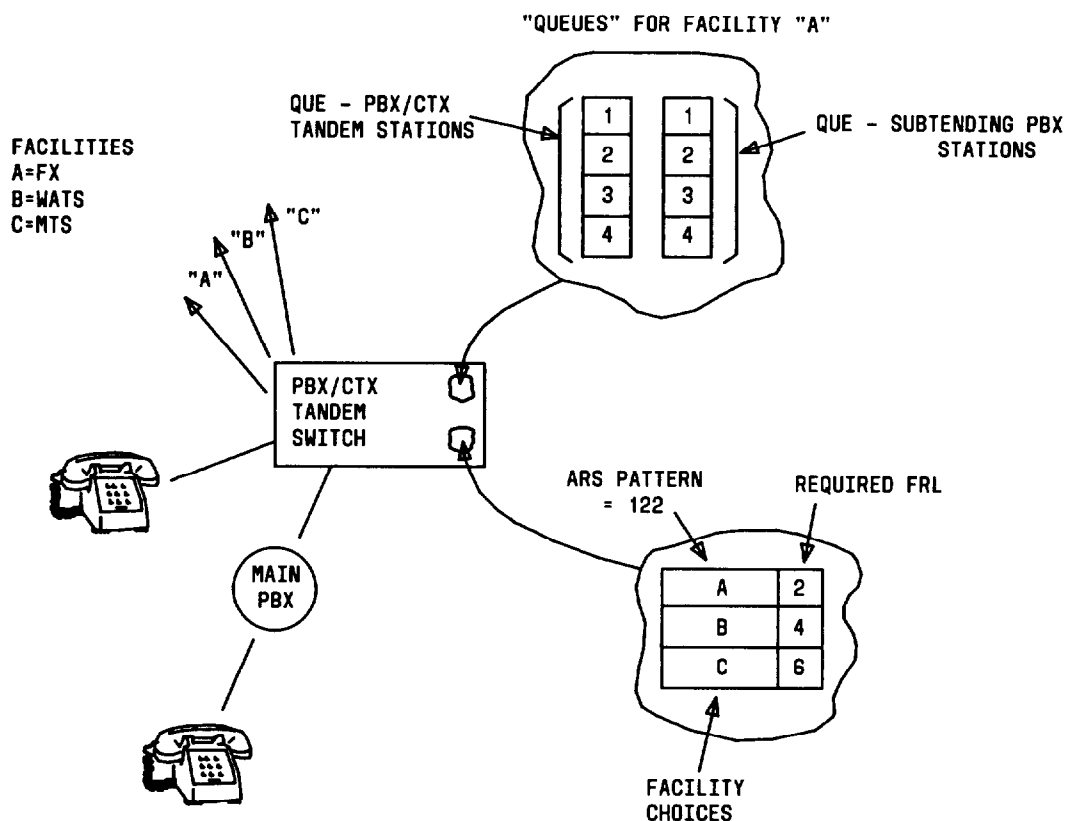
- (a) All off-hook queuing at tandem, main, satellite and tributary locations. All calls use a single queue.
- (b) All ring-back queuing at tandem, main and satellite locations. No queuing at tributary. All calls use a single queue.
- (c) All off-hook queuing at tandem, main, satellite and tributary locations. Calls at main, satellite and tributary locations use a nonpriority queue.
- (d) Mixed with ring-back queuing at tandem locations and off-hook queuing at main, satellite and tributary locations. Two queues with off-hook queuing calls using priority queue. Ring-back queue calls use non-priority queue.

5.16 If the customer opts for an all ring-back queuing operation, the following limitations will apply:

- (a) Tributary PBXs cannot use queuing
- (b) Attendant completed outgoing calls cannot utilize queuing
- (c) Queuing cannot be provided on 2-way tie trunks.

E. Automatic Circuit Assurance

5.17 This feature assists the customer in identifying possible trunk malfunctions. A DIMENSION



SEQUENCE OF EVENTS

- PBX/CTX OR MAIN STATION DIALS 8 + NPA-NXX-XXX + AUTH. CODE (WITH ASSOCIATED FRL = 6)
- ARS TRANSLATES TO PATTERN = 122
- FACILITIES ARE ALL BUSY, CALL PLACED IN QUE FOR FACILITY "A"
- CALL HANDLED ON "A" BEFORE TIME OUT, OR
- CALL ROUTES OVER "B" OR "C" AS AVAILABLE

Fig. 9—Example of Deluxe Queuing With ARS

FP8 PBX identifies trunks with incremented short holding times or with long holding times. This feature is available only when an attendant console is associated with FP8. The feature does not work if console is on "night connection".

5.18 The FP8 monitors all trunks for both long-holding and short-holding fault detection on a per call basis. A counter is incremented on the short holding times for each short holding time call and decremented for a normal length call. An exception report on the trunk is made when the counter reaches 24 short holding time calls. Long-holding time tests measure the call duration on each trunk and a trunk referral is made when a call holding time exceeds a preset but variable referral limit. A short holding time referral may

indicate a permanent seizure. The referral is initiated to the PBX attendant on the attendant console, identifying the trunk group, trunk member and whether it is a short or long holding time. The threshold times (short holding time and long holding time) are variable and are set by the ETN customer.

5.19 When alerted, the attendant can access the trunk and make a test call to determine if the trunk is actually in trouble. The attendant can use the trunk verification by console (TVC) features to determine the trunk condition. A record of such alarms and resulting attendant action is stored and can be retrieved by the customer. The Trunk Verification by Station (TVS) may also be used but no record is generated.

5.20 Two maintenance-busy indicators are provided for ESS Centrex. One indicator is used to identify trunks locked out or disabled for the past two hours, nonusage trunk scan (NUTS). The second indicator is used to identify those trunks in a locked-up condition for the past two hours—locked-up trunk scan (LUTS). Neither of these conditions are automatically forwarded to the customer. However, the customer can get the information via CACS.

F. Trunk Verification by Station (TVS)

5.21 This FP8 feature permits a designated station line or centralized attendant service release link trunk station to access individual trunks to determine their condition. If a defective one-way outgoing trunk is found, it can be put in a maintenance-busy condition. In addition, a TVS-type feature is provided for each plant control office (PCO) SSC/STC associated with the PBX/CTX tandem switch. This feature in the PCO is called a remote maintenance station (RMS).

G. Remote Access to PBX (Using Authorization Codes)

5.22 This feature enables users who are "off network" (ie, not at a tandem or subtending location) to access and use the ETN by dialing in an individual authorization code. The user dials into a tandem (via CO, FX, or INWATS), draws dial tone and dials a barrier code, and then proceeds with the dialing sequence (destination number plus authorization code if needed). A second choice allows the caller to proceed with dialing until requested to dial an authorization code in lieu of the barrier code. This allows the customer to be more individually restrictive in the use of the remote access to the ETN. As stated under facility restriction level each authorization code can be made valid for "on-premise" use only, or for remote access as well.

5.23 Calls originating off-premises can be handled by the attendant at the tandem location. In this case, the user reaches the attendant via FX, INWATS, or CO trunks and verbally gives the authorization code (if required) and called number. The attendant then completes the dialing of the call. Remote access calls, either user dialed or attendant dialed, are considered to be permissive and voice transmission is not supported as part of ETN.

H. Station Message Detail Recording (SMDR)

5.24 The station message detail recording (SMDR) provides a record of all ETN calls for which a proper set of address digits has been received. The output record of SMDR is available on magnetic tape or direct output. Detailed information on centralized SMDR will be found in Section 309-400-003, when this feature is made available.

5.25 When calls are made from tandem stations, the originating station will be recorded. For calls from tie trunks, the group number is recorded. For intertandem calls, records are created at both the originating and terminating tandems. The call event code indicates whether the call is queued, blocked due to all circuits busy, or blocked due to insufficient restriction levels.

5.26 The major difference in content between the DIMENSION and ESS record is that the DIMENSION records call times in duration while the ESS records the actual event time (as indicated in Table C).

I. Uniform Call Distribution

5.27 This feature is similar to automatic call distribution. It provides for incoming DID calls and LDN calls (via CO, FX, INWATS, etc) to be directed to the "most idle" of a station hunting group of attendants, clerks, etc. If all members of this hunting group are busy, the incoming call will queue until it can be handled.

5.28 FP8 provides for a maximum of 12 uniform call distribution hunting groups, four of which can contain up to 40 stations, and the remaining groups to 24 stations. ESS does not have the same restrictions. It can provide a maximum of 255 groups in an office with as many as 2047 lines in a group.

J. Direct Department Calling

5.29 This feature is similar to uniform call distribution in that certain incoming calls are directed to various hunt groups with call queuing available when all answering positions are busy. However, only non-DID (ie, LDN type) trunks are involved, and each such trunk is directed to a specific station which may be in a hunting group.

TABLE C

STATION MESSAGE DETAIL RECORD CONTENTS

MESSAGE DETAIL ELEMENT	DIMENSION	ESS
Calling Number	x	x
Called Number	x	x
Incoming Trunk Group ID	x	x (5)
Outgoing Trunk Group ID	x	x (5)
Account Code (if entered)	x	x (5)
Authorization Code	x	x
Facility Restriction Level	x	x
Call Event Code	x	x
ARS Pattern Group in Effect	(1)	x
Queue Duration (2)	x	
Call Duration (3)	x	
Time of Day (4)	x	
End of Dialing Time		x
End of Outpulsing Time		x
Answer Time		x
Disconnect Time		x
Midnights Passed (6)		x
Trunk Group Dialed (Typically "8")	x	

Notes:

- (1) Special record created when change is made in ARS pattern group
- (2) From placement in queue to trunk seizure
- (3) From trunk seizure to disconnect
- (4) Placed in record by SMDR formatter
- (5) SSS CTX also indicates trunk group member ID.
- (6) Record of calls lasting longer than 24 hours.

5.30 In FP8, as many as 28 groups (less the number of uniform distribution groups used) can be arranged for direct department calling with up to 24 stations in each group. For example, if ten uniform call distribution groups were employed, the maximum number of direct department calling groups would be 18. In ESS a maximum of 255 groups (less the number of uniform distribution groups used) can be provided in an office. A maximum of 2047 lines are provided in a group.

K. Code Calling Access

5.31 This feature provides the capability for users at PBX/CTX stations, or subtending PBXs to page selected individuals. The user, after drawing dial tone, dials a code to activate the feature, and then dials a second code which identifies the individual to be reached. Using an electronic

chime mechanism, the PBX/CTX can audibly signal the wanted individual who is on-premise. The paged individual can then respond from any convenient station, by dialing an answer code. The paged party is then automatically connected to the calling party.

L. NCO Access to CACS

5.32 To aid the NCO, a terminal with remote access to the CACS will be provided which will allow the NCO to have capabilities similar to the customer. These capabilities will assist the NCO in verifying trouble reports via the data received from the CACS and query the tandems on the network for information.

5.33 The NCO terminal will be used in the maintenance process primarily to obtain (1)

the TMB list, (2) the ACA audit trail, and (3) facility traffic data. Methods for obtaining the above data via the CACS are contained in the CACS users guide.

5.34 The TMB list will provide the NCO with a list of circuits out of service due to customer or TELCO busy-out and circuits automatically removed from service by the tandem. The ACA audit trail is a record of ACA referrals made to the attendant and indicates if testing was performed. Facility traffic measurements will provide information on the amount of traffic on the network.

5.35 To obtain more information and to assist in the analysis procedures it will be necessary for the NCO to make regular use of the NCO terminal. The data required must be requested periodically during the day for use later in the analysis process. In this manner an historical file will also be developed.

M. SMDR Printer

5.36 For precutover testing and call-throughs, a direct teletype printout of the Station Message Detail Recording (SMDR) is used instead of the nine-track magnetic tape output.

5.37 The printer is installed only for precutover testing and call-through, and is removed prior to cutover.

N. Remote Maintenance Station (RMS)

5.38 On DIMENSION FP8 tandems, a station is extended to the PCO to facilitate network maintenance and is called an RMS. The RMS provides the same basic function as the TVS features. The difference between TVS for the customer and RMS for the PCO is the capability with RMS to busy out both 1-way outgoing trunks and the outgoing portion of 2-way trunks. The TVS feature allows a busy to be placed on 1-way outgoing trunks only.

5.39 When RMS is used to busy out the outgoing portion of a 2-way trunk, the distant end must be made busy also. Failure to busy out the distant end will result in "high and dry" problems on the incoming portion of that trunk.

5.40 The RMS feature provides the following:

- (a) Permits the PCO to dial and determine whether individually selected trunks terminating on the PBX are working (ie, the trunk can be selected and checked to see if it generally meets transmission objectives).
- (b) Provides an override option when the trunk under test is busy (1-way incoming trunks may be checked with RMS only when they are in the busy condition).
- (c) Provides a trunk maintenance busy routine when trouble is verified on a given trunk.

5.41 With this feature, all trunks terminated at the PBX can be tested. This includes CO, FX, WATS, direct inward dialing (DID), tie, and release-link trunks (RLTs) for centralized attendant service. Special trunks, such as recorded dictation, code call, and paging cannot be accessed with this feature.

5.42 With the RMS, both busy and idle trunks can be tested. When a trunk under test is idle, a normal test call placed over that trunk will provide adequate verification. When a trunk circuit selected for testing is busy, a per trunk group option to override the busy call is provided. This override option directs an executive override tone (2 to 4 seconds of steady tone) to both parties on the active call and then establishes a 3-way connection (bridge-on). The bridge-on option is not provided on RLTs or trunk-to-trunk connections.

5.43 DID and other 1-way incoming type trunks (other than incoming RLTs) can be accessed with the RMS only when the trunk is busy. Incoming trunks **cannot** be selectively seized and tested when idle.

O. Off-Premises Extension (LC361)

5.44 An off-premises extension (OPX) line connects an extension station to a PBX, CTX, or tandem. The extension is terminated at a customer site remote from the main location.

5.45 LC361—Loop Signaling Interface Trunk: The LC361, when used for OPX terminations at DIMENSION FP8s, provides SMDR capabilities. When the LC361 is used, station features inherent with the FP8 are not applicable.

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Transmission losses through the DIMENSION PBX vary if OPXs are terminated on an LC361 versus a station termination (LC02).

P. Selective Customer Control of Facilities (SCCOF)

5.46 This feature, similar to authorization codes, allows the customer to deny access to a trunk group or simulated facility group. All calls are denied access when this key is activated. This feature is also available to non-ETN Centrex/ESSX-1 customers.

6. CUSTOMER ADMINISTRATIVE CONTROLS

6.01 Customer administrative controls will be provided in ETN in connection with option peripheral arrangements—the Customer Administration Center System (CACS), Customer Administrative Panel (CAP) for DIMENSION and the Local Customer Administration System (LCAS) for ESS. The features associated with customer control are described in the following paragraphs. Detailed information for CACS/CAP/LCAS can be found in Section 309-400-002.

A. Customer Administration Center System (CACS)

6.02 This centralized system permits the customer to administer station and electronic tandem switching features and to obtain traffic measurements and recent circuit assurance data from one or more switching locations. An interactive user terminal provides inputs/outputs. The following features may optionally be provided:

- Station rearrangement and change
- Facilities administration and control
- Trunk made busy list
- Traffic data to customer
- Facilities assurance reports.

B. Customer Administration Panel (CAP)

6.03 This panel is a simplified noncentralized *alternative to the CAC*. With this panel, the customer has plug-in access to the local DIMENSION PBX for the purpose of performing administration of station features and/or electronic

tandem switching capabilities. The following features may optionally be provided:

- Station rearrangement and change
- Facilities administration and control
- Traffic data to customer.

C. Local Customer Administration System (LCAS)

6.04 The LCAS, directly terminated on the No. 1/1A ESS Centrex/ESSX-1 tandem via a dial-up connection to the local customer premises, is a keyboard/display/printer. The LCAS accesses the same port on the No. 1/1A ESS Centrex/ESSX-1 accessible by the CACS. The LCAS operator uses the same basic language as the CACS does in interfacing with the No. 1/1A ESS Centrex/ESSX-1.

D. Customer Control Features

6.05 The following paragraphs describe the optional features provided at the CACS, CAP and LCAS.

Facilities Administration and Control

6.06 This feature is provided in connection with the CAC and CAP. The customer can administer the assignment of parameters which determine user calling privileges, such as facilities restriction levels and authorization codes. Manual control (override) of time-of-day routing is provided. Activation and deactivation of trunk group queues is also provided.

Facilities Assurance Reports

6.07 This feature is provided in connection with the CACS for FP8. The customer can obtain an audit trail of the referrals generated by the automatic circuit assurance feature. The audit trail indicates the identity of the trunk circuit, time of referral, nature of the referral (ie, short holding time failure or long holding time failure) and whether a test was performed by the PBX attendant in response to the referral. A maximum of 32 referrals will be recorded.

Station Rearrangement and Change

6.08 This feature is provided in connection with the CACS and CAP. The customer can

administer the class of service assignments for individual station lines and make changes in the hunting and pickup group assignments. The capability to administer button assignments and signaling options on DIMENSION customer telephone sets is included. Also provided is the ability to make station number changes.

Traffic Data to Customer

6.09 This feature is provided in connection with the CACS and the CAP. With the CACS, the customer may automatically poll switching locations on a daily or hourly basis to obtain traffic measurements (including peg counts) usage, and overflow data. Summary reports, exception reports, and complete traffic register inputs may be obtained. The status of time-of-day routing is included in the traffic data. The customer may use the CAP to display the contents of DIMENSION PBX traffic registers, which provide hourly peak readings of peg counts, usage, and overflow measurements. The LCAS is used to display the contents of ESS traffic registers for peg counts, usage and overflow data.

Trunk Made Busy List

6.10 This feature is available via CACS for DIMENSION FP8 tandem switches. The customer or the NCO can obtain the listing of "made busy" trunks. The listing also indicates if the trunk was made busy by the customer or TELCO/automatic.

7. DIMENSION 600 PBX

7.01 The DIMENSION 600 can employ the same features as the DIMENSION 2000 FP8. The DIMENSION 600 is used when a smaller number of trunks and lines are to be served.

8. REFERENCES

8.01 The following is a list of references that may be helpful in the ETN. This is not intended to be all inclusive.

SECTION	TITLE
309-400-001	Procedures and Responsibilities
309-400-002	CACS/CAP/LCAS Description
309-400-004	Trouble Reporting
309-400-005	Network Analysis
309-400-007	Network Identification
309-400-300	Service Maintenance
554-010-140	DIMENSION Customer Administration Center System
554-010-141	DIMENSION PBX Customer Administration Panel—General Description
554-111-110	DIMENSION 2000 Custom PBX-Maintenance and System Administration
554-191-169	DIMENSION PBX Customer Administration Center System—Feature
554-191-172	DIMENSION PBX Customer Administration Panel—Feature
GL 78-01-243	DIMENSION PBX FP8
GL 78-01-238	Customer Administration Center (CAC)/Customer Administration Panel (CAP)