

FEATURE DOCUMENT
TIE TRUNK AND FOREIGN EXCHANGE SERVICE FEATURES
2-WIRE NO.1 AND NO. 1A ELECTRONIC SWITCHING SYSTEMS

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INTRODUCTION

1. GENERAL INFORMATION

SCOPE

1.01 This document describes the Tie Trunk (TT) Service feature and the Foreign Exchange (FX) Service feature in a No. 1 or No. 1A Electronic Switching System (ESS). Only sendederized outpulsing operation of these features is documented herein. For information concerning nonsenderized outpulsing operation, see reference A(39) in Part 18.

REASON FOR REISSUE

1.02 When this document is reissued, the reason for reissue will be stated in this paragraph.

FEATURE AVAILABILITY

1.03 The Tie Trunk and FX Service features for 2-wire applications are available in all active generic programs. Software for both features is contained in generic program base for 2-wire applications.

2. DEFINITION/BACKGROUND

DEFINITION

2.01 The **Tie Trunk Service** feature provides sendederized private line service between two or more central offices serving separate large business customer groups.

2.02 The **Foreign Exchange (FX) Service** feature provides Message Telecommunications Service out of a central office which is foreign to the normal service area of an individual line customer or business customer.

BACKGROUND

A. Tie Trunk Service Feature

2.03 Tie trunks are sometimes called tie lines. In this document, the terms are used interchangeably. A tie trunk is any voice grade channel used to connect or tie two central offices serving separate large business customer groups. Tie trunks can be arranged for one- or two-way operations, and can be used to transmit voice and/or low-/medium-speed data signals. Tie trunks can be arranged to have tandem or nontandem capability at each large business customer service location.

2.04 Tie trunks can be operated with a sendederized or nonsenderized outpulsing operation. This document addresses sendederized tie trunk operation. Reference A(39) in Part 18 addresses nonsenderized tie trunk operation. Within a customer's nonsenderized network, intermediate switching is allowed to tandem or "cut through" a call through certain tandem switches used by that network, with the calling party directly controlling the routing at each tandem point.

2.05 Sendederized tie trunk operation is used to supply a wide variety of private line services to large business service customers whose locations are geographically separated and/or service area divided. The No. 1/1A ESS uses the Tie Trunk Service feature to provide tie trunk networks of three or more large business customer service locations on a sendederized outpulsing basis. Network switching points may have tandem and/or nontandem capabilities. Tandem capability is the ability of a switch to route and switch an incoming tie trunk call to an outgoing tie trunk. Both tie trunks can be considered tandem tie trunks. Nontandem capability does not allow an incoming tie trunk call to be switched to an outgoing tie trunk. Tandem and nontandem tie trunks may use the transmission facilities of intermediate offices where no intermediate switching is involved.

2.06 When tandem switching of sendederized tie trunks is involved, i.e., when three or more

central offices serving separate large business customer groups are to be connected on a senderized basis, unique private line services are available. In No. 1/1A ESS these large business customer service features are documented separately in other feature documents referenced in Part 18. The following features offer senderized private line service with the capability to tandem switch tie trunks: Common Control Switching Arrangement, Enhanced Private Switched Communication Service, Electronic Tandem Switching, and other multilocation arrangements known as Centralized Attendant Service, Main-Satellite Service, and Multilocation Complex. Each of these features offers certain economic and/or operational conveniences, but the basic purpose of the senderized tie trunk remains the same, that is, to provide private trunking between two large business customer service locations.

2.07 The tandem tie trunk network (TTTN) is the most commonly switched private line arrangement in the Bell System today. TTTNs range in size from those serving as few as three locations to networks interconnecting more than a hundred locations throughout the United States and Canada. (See Fig. 1.) Individual large business customer service locations may be served by key telephone systems, private branch exchanges, or Centrex/ESSX-1s. This feature document addresses the use of No. 1/1A ESS Centrex/ESSX-1 in a TTTN as a large business customer service location.

2.08 In addition to providing private line facilities, tie trunks can be used to provide access to off-network services at different locations within a TTTN. Off-network services include communication services such as the Wide Area Telecommunications System, FX Service, Message Telecommunications Service, etc. (See Fig. 2.)

B. FX Service Feature

2.09 Often the terms "FX line" and "FX trunk" are used interchangeably. However, in this document, these terms are **NOT** considered interchangeable. The FX line arrangement and the FX trunk arrangement are considered as two separate and distinct FX service arrangements. The term FX service is used to refer, in general, to either or both FX line and FX trunk arrangements.

2.10 The FX Service feature is a form of private line service that provides Message

Telecommunications Service out of a central office which is foreign to the normal service area of an individual line customer or business customer. FX service can be arranged for one- or two-way operations and can be used to transmit voice and/or low-/medium-speed data signals. FX service can also have limited outgoing and incoming dialing capability.

2.11 The **FX line** arrangement is used by an individual line customer or business customer, usually small business customers, to provide dedicated FX service for a particular line customer or business customer station. (See Fig. 3A.) The main purpose of an FX line is to provide a line-side switch appearance at another central office (the foreign exchange) to provide Message Telecommunications Service out of that office on a 24-hour per day basis. FX lines are not switch accessed. In fact, they do not even have a line-side switch appearance at the normal serving central office. In the normal serving central office, the customer loop is cross-connected and cabled directly to a trunk. (This trunk is often called an FX trunk, although its function is not a trunk in respect to normal trunk signaling and terminations.) The "FX trunk" routes to the foreign exchange office and is cross-connected and cabled directly to a line-side switch appearance. No intermediate switching is involved. For all practical purposes, this switch appearance appears to the FX switch as any line-side appearance of subscribers within its own service area. Any switching features available by the foreign exchange control office to its subscribers are also available to FX line customers. A listed directory number (LDN) is used for terminating and billing purposes. If more than one FX line is used by a customer to a certain foreign exchange, the Multiline Hunting Group feature may be applied using only one LDN.

2.12 The **FX trunk** arrangement is shown in Fig. 3B. FX trunk arrangements are used to provide FX service for Centrex/ESSX-1 groups. An FX trunk arrangement may have more than one FX trunk, each having a separate line-side switch appearance at the foreign exchange central office. Any Centrex/ESSX-1 group may have FX service to more than one foreign exchange central office.

2.13 FX trunks used for FX trunk arrangements are switch accessed via access codes at the normal serving central office. Like the FX line,

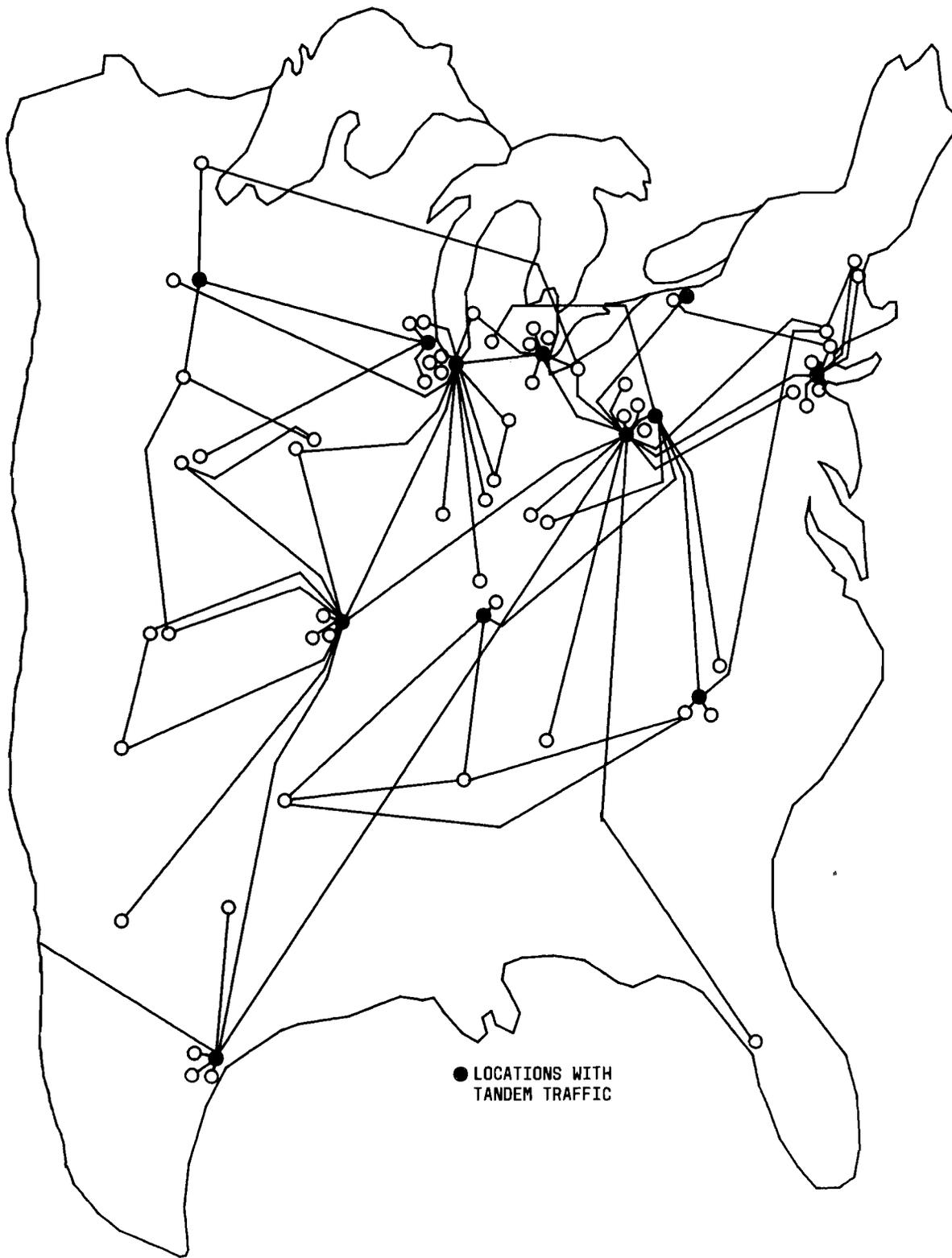


Fig. 1—Typical Tandem Tie Trunk Network

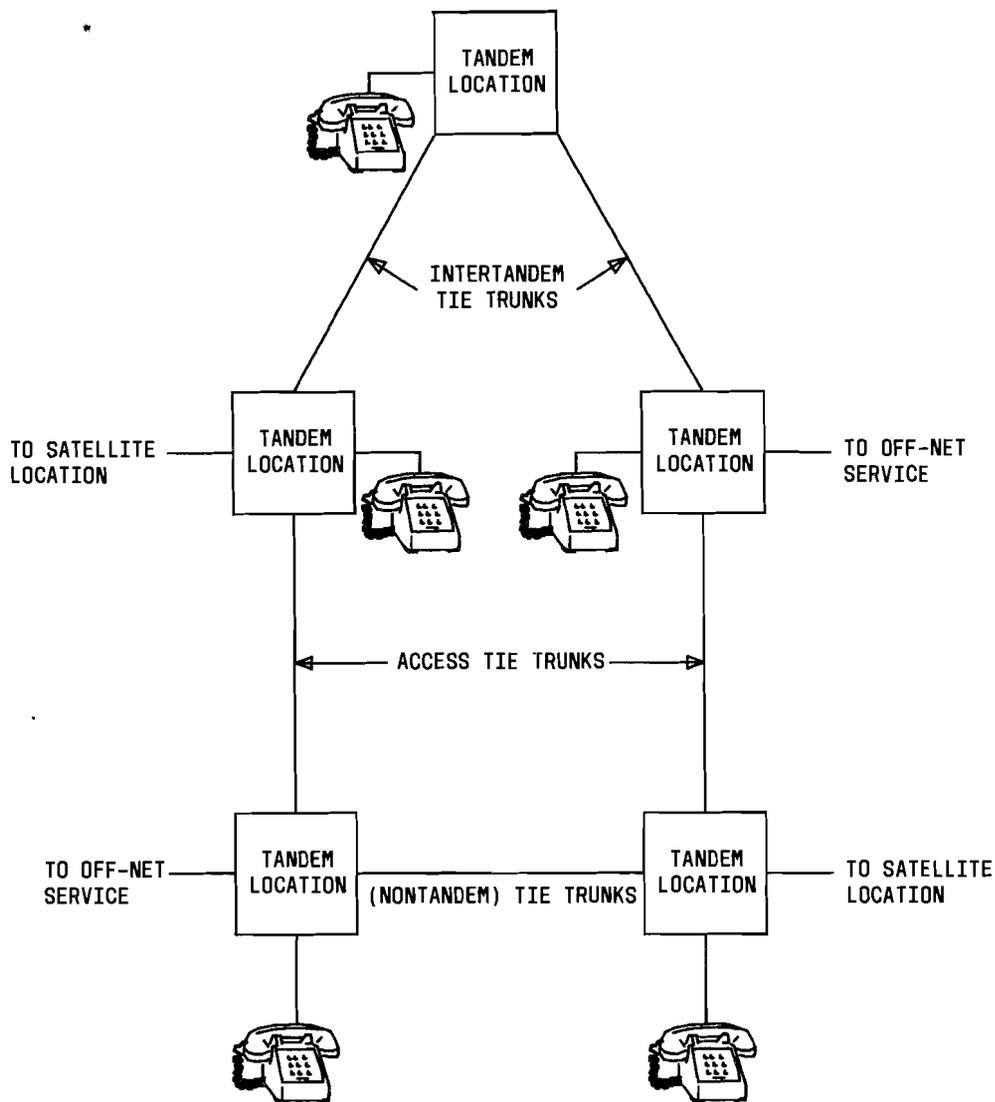


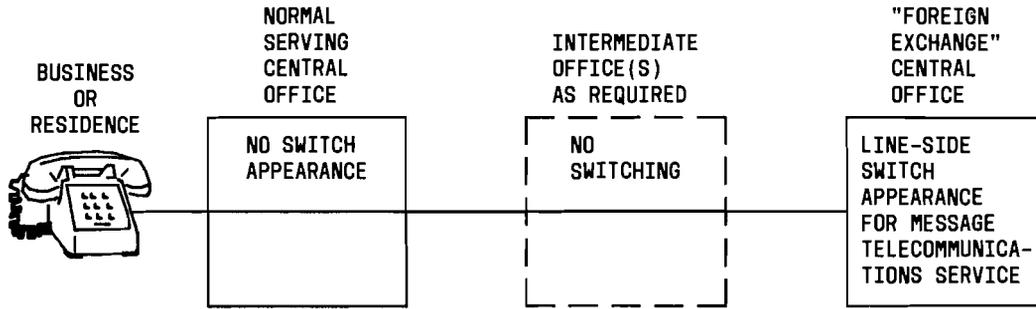
Fig. 2—TTN Functional Segment Example

FX trunks route to the foreign exchange central office, where they are cross-connected and cabled directly to line-side switch appearances. No intermediate switching is involved. Any switching features available by the foreign exchange central office to its subscribers are also available to FX trunk customers.

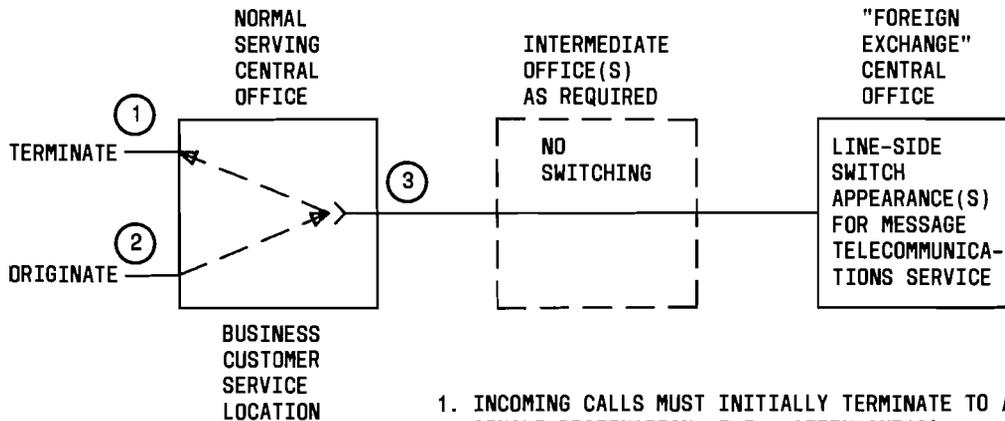
2.14 Like the FX line arrangement, the FX trunk arrangement has a LDN for terminating and billing purposes. The Multiline Hunting Groups Feature, using only one LDN, can also be applied at the foreign exchange central office. Any incoming call to a FX trunk arrangement LDN is switched

to a single destination at the normal serving central office. This single destination is usually the Centrex/ESSX-1 group attendant, but can be any station within the group. The Direct Connect feature can also be used to terminate incoming calls. See reference A(31) in Part 18.

2.15 An FX trunk arrangement user (i.e., business customer group station) may dial directly into the FX trunk after switch access, or the dialed digits may be collected for outpulsing by a customer digit receiver. An FX trunk arrangement may also be accessed at the normal serving central office via other Centrex/ESSX-1 features, such as the



A. FX LINE ARRANGEMENT



1. INCOMING CALLS MUST INITIALLY TERMINATE TO A SINGLE DESTINATION, I.E., ATTENDANT(S) OR DIRECT CONNECT FEATURE.
2. CENTREX/ESSX-1 STATIONS OR ATTENDANT(S).
3. CENTREX/ESSX-1 TRUNK-SIDE SWITCH APPEARANCE(S).

B. FX TRUNK ARRANGEMENT

Fig. 3—FX Service

nonsenderized Tandem Tie Trunk Service feature, by another large business customer group location within a network.

2.16 An FX trunk arrangement can be used to connect two Centrex/ESSX-1 groups served by different central offices. This arrangement is an alternative for tie trunks and is sometimes referred to as an FX tie trunk. The FX tie trunk arrangement is similar to Fig. 3B, with the exception that the "line-side switch appearance(s)" at the FX central office appears on the switch as a Centrex/ESSX-1 line-side appearance instead of Message Telecommunication Service. Incoming calls from

the other Centrex/ESSX-1 group over FX tie trunks appear as station originations at the Centrex/ESSX-1 location served by the FX central office. Outgoing calls from this Centrex/ESSX-1 group over FX tie trunks appear as station terminations. The call must initially terminate to a single destination at the far-end central office Centrex/ESSX-1 group. This latter use is not recommended.

2.17 FX trunk arrangement trunk hardware also has application in telephone company maintenance systems, which access a remote office test line (ROTL) located in a tandem or toll office. See reference A(37) in Part 18.

DESCRIPTION**3. USER OPERATION****CUSTOMER****A. Tie Trunk Service Feature**

3.01 In the senderized mode, there are many dialing pattern variations in the use of the Tie Trunk Service feature. This is due to the multiplicity of tie trunk networks connecting three or more offices. This is the result of different switching capabilities such as the prefixing and deleting of digits, the provision or not of second dial tone, the methods to tandem switch tie trunks, and the ability to access other private line services or off-network services within a tie trunk network. Because tie trunk networks are unique, each is considered to have a nonfixed dialing pattern. As a general rule, no more than 12 digits may be dialed after the initial access code. (The tie trunk call may terminate to a Centrex/ESSX-1 station, attendant, or an office which provides off-network and/or other private line services.) Access codes may range from one to five digits. Alternative access to tie trunks may be made via an attendant. Normally, users of the Tie Trunk Service feature must be specifically instructed by the telephone company concerning the engineered dialing operation of their tie trunk network.

3.02 If all outgoing tie trunks are busy, a 120-IPM reorder signal is returned to the call originator. A reorder signal is also returned if digit time-out occurs during dialing. Invalid dialing can result in reorder treatment or connection to an attendant.

3.03 Originating tie trunk calls can be attendant assisted on a delayed basis. This is advantageous for reattempted calls and conference calls. When setting up the call, the attendant calls the originator to announce the call attempt. The originator may stay off-hook or go on-hook. The attendant completes the call to the terminating parties. If the originator has gone on-hook, the line remains busy to incoming calls for the attempt duration. The attendant operates a signal source key to ring back the originator.

B. FX Service Feature**FX Line Arrangement**

3.04 After the call originator receives dial tone, a seven-digit local directory number (DN) or a ten-digit DN for toll calls may be dialed. Toll capability may be fully or partially restricted for an FX line arrangement. Restricted dialing violations result in operator intercept or reorder treatment. If applicable, the Speed Calling feature, as well as any other applicable call originating type features, may be used.

3.05 Incoming calls to an FX line arrangement DN result in normal telephone connection and ringing. Any applicable call terminating type features, such as call forwarding, may be used to terminate the incoming call.

FX Trunk Arrangement

3.06 After the call originator receives initial dial tone, an attendant may be dialed to request an FX trunk or an access code may be dialed to automatically access an FX trunk. If an attendant is used, the call may either be completed to termination by the attendant, or the attendant may connect the Centrex/ESSX-1 station to an idle FX trunk, at which time the originator receives second dial tone. If an access code is dialed by the attendant or the originator, second dial tone may be returned before completing dialing as described in paragraph 3.04. The code contains two to five digits. In offices not equipped for the second dial tone option, the access code, plus the appropriate DN, is dialed upon initial dial tone. If no idle FX trunk is available, reorder treatment is returned to the attendant or originator.

3.07 Originators of FX trunk arrangements are not limited to the Centrex/ESSX-1 group served by the normal serving central office. Other network business customer groups having private line service to a normal serving central office of an FX trunk arrangement have the capability to access these FX trunk arrangements on the same basis. In addition, the Flexible Route Selection (FRS) feature [see reference A(27) in Part 18] may be used to allow outgoing Centrex/ESSX-1 calls access to FX trunk arrangements.

3.08 Incoming calls to an FX trunk arrangement DN at the FX central office result in initial

termination to a single destination in the Centrex/ESSX-1 group served by the normal serving central office. The single destination may be an attendant or another station in the customer group. The single destination may be alternated. In any event, the incoming call is initially terminated, and then, it may be transferred within the customer group as required. Any applicable call terminating type features, such as the Direct Connect feature, may be used to terminate the incoming call. This applies to both central offices. If all FX trunks are busy, a 60 IPM busy signal is returned to the calling party.

3.09 In an FX tie trunk arrangement, user operation from the normal serving central office is similar to that described in paragraphs 3.06 and 3.07. However, to reach a station served by the FX central office, a maximum of four digits must be dialed in addition to the access code. Also, any applicable business customer feature at either business customer service location is available to the originating user, that is, the origination of the call at the normal serving central office, as well as the origination at the FX central office. Incoming calls (from the FX central office to the normal serving central office) are processed as described in paragraph 3.08. However, the FX tie trunk can be used by the dialing of up to four digits from the customer group stations.

TELEPHONE COMPANY

3.10 Not applicable.

4. SYSTEM OPERATION

HARDWARE

4.01 Hardware associated with the Tie Trunk and FX Service features is shown in Table A.

OFFICE DATA STRUCTURES

A. Translations

Introduction

4.02 Unique translation data for the Tie Trunk and FX Service features is discussed below. For detailed information on these translation words, as well as common translation data used to process

a call, refer to references C(1), C(2), and/or C(3) in Part 18.

Centrex Translator

4.03 Data type 3 centrex translations are used to access tie and FX trunks by a Centrex/ESSX-1 group. A word type 3 is used in the centrex common block as word 6. (See Fig. 4.) A digit interpreter auxiliary block is required when the access code is to be saved, when the route index increment exceeds 63, or when attendant control of facilities is provided. (See Fig. 5.)

Route Index Expansion Table Translator

4.04 Access to a trunk group can be gained only through a route index. Route indexes are required for outgoing tie trunks and FX trunk arrangements. (Refer to Fig. 6.)

Trunk Network Number to Peripheral Equipment (TNN-to-PEN) Translator

4.05 Tie and FX trunks require TNN-to-PEN auxiliary blocks. (See Fig. 7.)

Trunk Class Code Expansion Table Translator

4.06 The trunk class code expansion table translation words shown in Fig. 8 are required for the Tie Trunk and FX Service features.

B. Parameters/Call Store

4.07 Tie Trunk and FX Service features require no unique parameter or call store data to function in a No. 1/1A ESS office. The parameter set cards involved are listed in paragraph 9.02.

FEATURE OPERATION

A. Tie Trunk Service Feature

4.08 In a No. 1/1A ESS office, tie trunk hardware cannot be readily distinguished from other trunk hardware. Trunk control and operation is identical. On incoming tie trunks, digit analysis is used due to the inherent nonfixed dialing patterns. A digit-by-digit analysis is done. An incoming tie trunk call can terminate to a Centrex/ESSX-1 station, attendant, or tandem to an outgoing tie trunk. A screening line equipment number is assigned to the incoming tie trunk trunk group to

TABLE A

TRUNK CIRCUITS USED FOR THE TIE TRUNK AND FX SERVICE FEATURES

SD NO.	J NO.	FRAME	SUPVN	USE	REMARKS
1A163	1A033CA 1A088CA	MT CMT	E&M	Tie trunk 2-way DP	Outgoing, incoming, or 2-way; can be used with main satellite
1A165	1A032BB 1A088BB	UT MUT	Rev bat	Tie trunk 1-way OGT local	Outgoing loop type calls
1A166	1A032AB 1A084AB	UT MUT	Rev bat	Tie trunk 1-way ICT local	Incoming loop type calls
1A220	1A033AB 1A088AB	MT CMT	Rev bat	Tie trunk ICT from SXS	2000/4000Ω loop battery and ground start
1A236	1A033CB 1A088CB	MT CMT	E&M	Tie trunk 2-way MF	Outgoing, incoming, or 2-way; has switchable 2DB pad
1A237	1A033CC 1A088CC	MT CMT	E&M	Tie trunk 2-way DP 4-wire	Outgoing, incoming, or 2-way; has switchable 2DB pad; can be used with main satellite
1A239	1A033JD 1A088JD	MT CMT	S lead	Tie trunk Dial pulse repeater	Code calling and recorded dictation access for tie trunks
1A240	1A033CK	MT	GND start	FX trunk long haul	Provides access to distant central office or tandem/toll office (ROTL access)
1A241	1A033CF or 1A033JS	MT	GND start	FX trunk short haul	Same as above. Also used for Automatic Call Distribution feature along with SD-1A342
1A252	1A032CC 1A084CC	UT MUT	E&M	Tie trunk 2-way MF	Outgoing, incoming, or 2-way
1A264	1A033CG	MT	Hi-lo out rev bat in	Tie trunk 2-way	Can be arranged for MF, DP, TT, or non-pulsing
1A360	1A033CP	MT	GND start	FX trunk long haul	Used for Automatic Call Distribution feature
1A396	1A090BJ	H(U)	GND start	FX trunk HILO 4-wire 2-way long haul	Used for Remote Office Test Line access and specialized common carrier

TABLE A (Contd)

TRUNK CIRCUITS USED FOR THE TIE TRUNK AND FX SERVICE FEATURES

SD NO.	J NO.	FRAME	SUPVN	USE	REMARKS
1A415	1A088CK	CMT	GND start	FX trunk 4-wire long haul	Without ringdown
1A416	1A088CF	CMT	GND start	FX trunk 4-wire short haul	Without ringdown

LEGEND:

bat — battery	ICT — incoming trunk	Rev — reverse
DB — decibel	MF — multifrequency	ROTL — remote office test line
DP — dial pulse	MT — miscellaneous truck (frame)	S — sleeve
FX — foreign exchange	MUT — minaturized universal trunk (frame)	SXS — step by step
GND — ground	OGT — outgoing trunk	TT — TOUCH-TONE®
H(U) — HILO minaturized universal frame		

	23	22	21	20	12	11	10	5	4	3	0
TYPE 3	*	1	1	TREATMENT CODE	TS DT	ROUTE INDEX INCREMENT (CXRI)		P I	NO. DIGITS TO COLLECT		

NOTE: BIT 23 EXISTS IN NO. 1A ONLY.

LEGEND:

- PI - PROGRAM INDEX FOR MESSAGE DETAIL RECORDING ON TIE TRUNKS FEATURE (TAMA); YES = 1, NO = 0
 CXRI - ROUTE INDEX INCREMENT. THIS IS THE DIFFERENCE BETWEEN THE ROUTE INDEX AND BASE ROUTE INDEX. IF DIFFERENCE IS GREATER THAN 63, SET TO 111111.
 TSDT - SECOND DIAL TONE OPTION; YES = 1, NO = 0

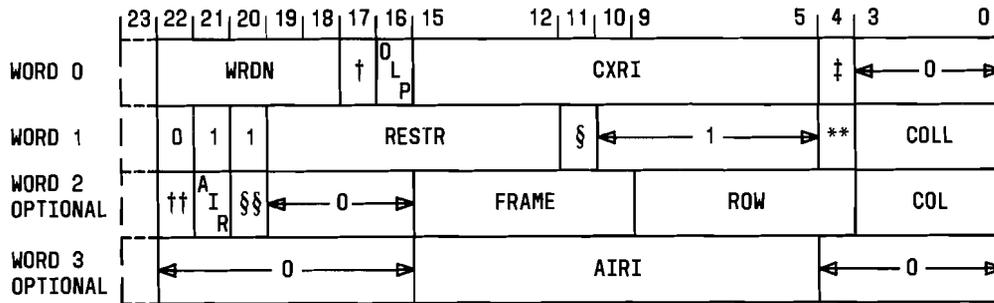
Fig. 4—Centrex Translator—Common Block—Word 6

control tandem capability. The centrex digit interpreter tables are used to terminate the call to the customer group. Any applicable features for terminating the call, including other Centrex/ESSX-1 services, may be used.

4.09 An incoming tie trunk may tandem to an FX trunk arrangement (trunk switch appearance end). Again, the data type 3 centrex translation

is used. With the 1E4/1AE4 and earlier generic programs, senderized dial pulse inpulsing and outpulsing is used. If 1E5/1AE5 and later generic programs are applicable, senderized TOUCH-TONE® outpulsing can be used through the Local and HILO TOUCH-TONE Outpulsing feature.

4.10 Incoming tie trunks are supervised at the trunk circuit. Customer group stations are



NOTE: BIT 23 EXISTS IN NO. 1A ESS ONLY.

WORD 0

- WRDN - NUMBER OF WORDS IN AUXILIARY BLOCK
- † - ATTENDANT CONTROL OF FACILITIES; YES = 1, NO = 0
- OLP - OVERLAP OUTPULSING; YES = 1, NO = 0
- CXRI - ROUTE INDEX INCREMENT. EQUALS DIFFERENCE BETWEEN SPECIFIED ROUTE INDEX AND BASE ROUTE INDEX
- ‡ - SAVE ACCESS CODE; YES = 1, NO = 0

WORD 1

- RESTR - TREATMENT CODE
- § - SECOND DIAL TONE; YES = 1, NO = 0
- ** - PROGRAM INDEX FOR MESSAGE DETAIL RECORDING ON TIE TRUNKS FEATURE (TAMA); YES = 1, NO = 0
- COLL - NUMBER OF DIGITS TO COLLECT

WORD 2

- †† - ATTENDANT CONTROL OF NIGHT RESTRICTION. EQUAL 1 IF ACOF USED, OTHERWISE 0
- AIR - ATTENDANT CONTROL INTERCEPT ROUTING
- §§ - ANNOUNCEMENT FOR CALL FORWARDING OVER PRIVATE FACILITIES
- FRAME - MASTER SCANNER NUMBER FRAME
- ROW - MASTER SCANNER NUMBER ROW
- COL - MASTER SCANNER NUMBER COLUMN

WORD 3

- AIRI - ATTENDANT CONTROL INTERCEPT ROUTE INDEX

Fig. 5—Centrex Translator—Digit Interpreter Auxiliary Block

supervised at the receiver until outpulsing is complete and connection is made to a trunk circuit when the second dial tone option applies. Data type 3 centrex translations are used for customer group access to tie trunks. Tie trunks are not seized until all digits have been received, analyzed, and accepted. Software analyzes dialed digits as they are received. Any applicable customer group features for originating the call, including other Centrex/ESSX-1 services, may be used.

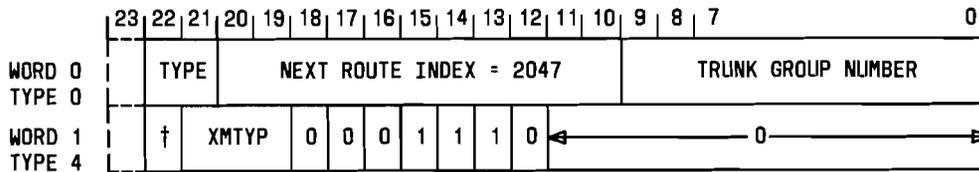
4.11 There are several suboptions which vary the operation of the Tie Trunk Service feature. These are the following: second dial tone option (second dial tone is always returned from the serving central office), fixed or variable digit dialing pattern (depends on network engineering

and complexity), start dial outpulsing immediately, save access code, and the Message Detail Recording on Tie Trunks (TAMA) feature.

B. FX Service Feature

FX Line Arrangement

4.12 For an FX line arrangement, there is no switching activity involved at the normal serving central office. If the customer's phone is equipped for multiline service, the customer manually selects the appropriate FX line. Originating calls are treated the same as service requests for Message Telecommunications Service at the FX central office. Normal call processing using the DN translator is used at a No. 1/1A ESS FX central office, along



NOTE: BIT 23 EXISTS IN NO. 1A ESS ONLY.

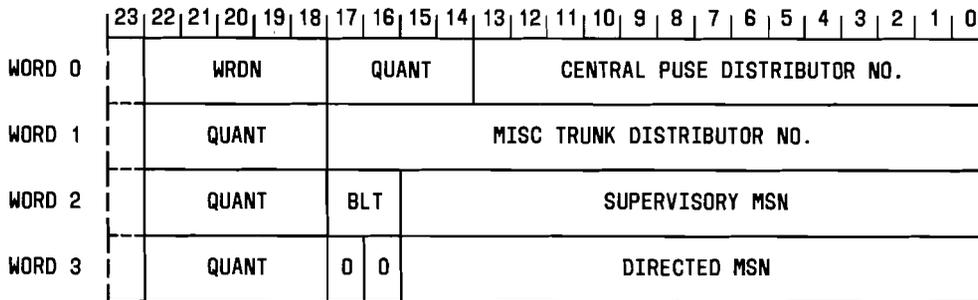
WORD 0

TYPE -- TYPE OF ROUTE INDEX EXPANSION TABLE:
 CUT-THROUGH SERVICE CIRCUIT = 01
 CUT-THROUGH TYPE TRUNKS = 10

WORD 1 TYPE 4

† -- TRANSFER OKAY; YES = 1 , NO = 0
 XMTYP -- TRANSMITTER TYPE:
 MULTIFREQUENCY = 001 TOUCH-TONE = 101
 DIAL PULSE = 010

Fig. 6—Route Index Expansion Table Translator—Route Index Expansion Table



NOTE: BIT 23 EXISTS IN NO. 1A ESS ONLY

WORD 0

WRDN -- NUMBER OF WORDS IN AUXILIARY BLOCK = 4
 QUANT -- QUANTITY OF CENTRAL PULSE DISTRIBUTOR POINTS
 FOR THE MISCELLANEOUS TRUNK ASSOCIATED WITH
 THE TRUNK NETWORK NUMBER

WORD 1

QUANT -- QUANTITY OF SIGNAL DISTRIBUTOR POINTS

WORD 2

QUANT -- QUANTITY OF SUPERVISORY MASTER SCANNER LEADS
 BLT -- BY-LINK TRUNK ITEM. SET TO EITHER 00 OR 01

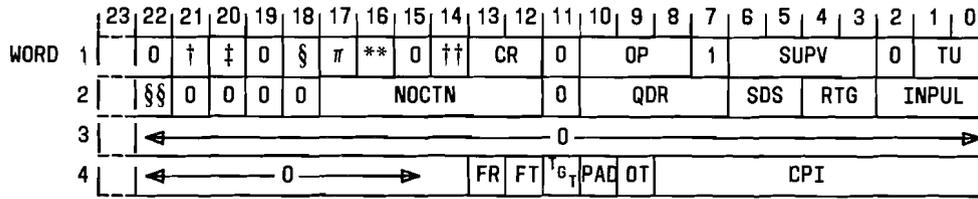
WORD 3

QUANT -- QUANTITY OF DIRECTED MASTER SCANNER POINTS

LEGEND:

BLT -- BY-LINK TRUNK
 MISC -- MISCELLANEOUS
 MSN -- MASTER SCANNER NUMBER
 NO. -- NUMBER
 QUANT -- QUANTITY
 WRDN -- WORD NUMBER

Fig. 7—TNN-to-PEN Translator—TNN-to-PEN Auxiliary Block



NOTE: BIT 23 EXISTS IN NO. 1A ESS ONLY.

WORD 1:

- † - CONFERENCE RESTRICTED; YES = 1, NO = 0
- ‡ - START DIAL SIGNAL TIMING; YES = 1, NO = 0
- § - START DIAL SIGNAL ON DGT; YES = 1, NO = 0
- π - WINK START DIAL = 1; DELAY DIAL = 0
- ** - FLASH EXPECTED; YES = 1, NO = 0
- †† - STOP-GO FINAL HEAVY POSITIVE PULSE; YES = 1, NO = 0
- CR - COMPENSATING RESISTANCE: 00 - NONE OR NO DIAL PULSE
01 - 300 OHM
10 - 600 OHM OR DIAL PULSE
11 - 900 OHM
- OP - OUTPULSING: 001 - MULTIFREQUENCY
010 - DIAL PULSE
101 - TOUCH-TONE
- SUPV - SUPERVISION: 0011 - ESM
0100 - HILO REV BAT
1011 - GROUND START
- TU - TRUNK USAGE: 00 - OUTGOING
01 - INCOMING
10 - TWO-WAY (RECOMMENDED)
11 - MISCELLANEDUS

WORD 2

- §§ - CHARGE ON FREE NUMBER; YES = 1, NO = 0
- NOCTN - NORMALIZED OFFICE CODE NUMBER OR TABLE
- QDR - QUANTITY OF DIGITS RECEIVED:
0000 - NONE, 2, OR 3
0100 - 4
0101 - 5
0111 - 7

WORD 2 (CONTINUED)

- SDS - START DIAL SIGNAL: 00 - NONE
01 - DELAY DIAL
10 - WINK
11 - DIAL TONE
- RTG - ROUTING; NONE = 00, LOCAL = 01
- INPUT - INPULSING: 001 - MULTIFREQUENCY
010 - DIAL PULSE
101 - TOUCH-TONE/DIAL PULSE

WORD 4

- FR - FLASH REPEATING; YES = 1, NO = 0
- FT - FLASH TIMING; YES = 1, NO = 0
- TGT - TRUNK GUARD TIMING; LONG = 1, REGULAR = 0
- PAD/OT - 000 - SERVICE, TONE & ANNOUNCEMENT
001 - NOT USED
100 - MESSAGE TRUNK
110 - SWITCHABLE 2DB PAD
- CPI - CIRCUIT PROGRAM INDEX:
SD-1A163 - 049 SD-1A241 - 031/159
SD-1A165 - 002 SD-1A252 - 007
SD-1A166 - 004 SD-1A264 - 024
SD-1A220 - 003 SD-1A360 - 158
SD-1A236 - 021 SD-1A396 - 146
SD-1A237 - 022/048 SD-1A415 - 162
SD-1A239 - 035 SD-1A416 - 163
SD-1A240 - 030

Fig. 8—Trunk Class Code Expansion Table Translator—Trunk Class Code Expansion Tables

with any applicable individual line features, for call originating. Calls terminating to the DN for the FX line arrangement also use the DN translator, along with any applicable individual line features, for terminating calls. Service request dial tone and power ringing signal are provided by the FX central office.

FX Trunk Arrangement

4.13 At the normal serving central office of a Centrex/ESSX-1 group, a service request (user dialed access code) for an FX trunk is processed as a data type 3 centrex translation. Service

requests may be initiated from those allowed by the centrex access treatment (CAT) codes. The data type 3 translation yields the route index for the FX trunk group of the assigned access code dialed. Subsequent dialed digits are collected and outpulsed over the trunk upon receiving a start-dial signal from the FX central office. Supervision is set up on the trunk circuit. Any applicable Centrex/ESSX-1 originating call features may be used, such as second dial tone, immediate outpulsing, TAMA, etc.

4.14 Outpulsed digits from the normal serving central office are received by the FX central

office and stored in a customer digit receiver. To the FX central office, the incoming call is now treated as a service request for Message Telecommunications Service for originating lines. Normal call processing using the DN translator is used to complete the call. Any applicable individual line originating call features may be used at the FX central office.

4.15 Calls terminating to the FX central office DN(s) eventually use the DN translator, along with any applicable individual line features, for terminating calls. Screening translations are used.

4.16 Calls terminating to the FX central office are trunked to the normal serving central office. At the normal serving central office, trunk translations are initially involved after seizure. Line translations are then employed to check if the Speed Calling feature is applicable. If the Speed Calling feature is not applicable, the call is terminated by a data type 6 centrex translation after line translations force dial 0. A data type 6 translation also allows for routing to an alternative DN within the Centrex/ESSX-1 group. The Direct Connect feature may also be used to terminate the call.

FX Tie Trunk Arrangement

4.17 At the normal serving central office, service requests for FX tie trunks are identical to that described in paragraph 4.13. Call terminating from FX tie trunks are described in paragraph 4.16. At the FX central office, which serves the other Centrex/ESSX-1 group, centrex translations are used to originate or terminate a call, along with any applicable Centrex/ESSX-1 features.

CHARACTERISTICS

5. FEATURE ASSIGNMENT

5.01 An FX line arrangement is assigned to any individual line or business customer on a per dedicated line basis. The FX service (i.e., FX trunk arrangement) and/or the Tie Trunk Service feature is assigned on a per access code basis in each Centrex/ESSX-1. FX tie trunk arrangements may be assigned to central offices providing main satellite service or a multilocation complex arrangement. FX trunk arrangement trunk hardware is used to connect a central office to a tandem or toll office

for remote office test line access located at the latter.

6. LIMITATIONS

OPERATIONAL

6.01 Trunk dial transfer for the Tie Trunk Service feature is available for two-way tie trunks if both ends have flash timing and flash repeating capability. For one-way tie trunks, either, but not both capabilities, must be provided. Refer to reference A(23) in Part 18.

6.02 Due to technical complexities, toll service transmission quality to other numbering plan areas (NPAs) other than the NPA of a foreign exchange central office cannot be guaranteed for FX service.

6.03 Tandem tie trunk networks have the following limitations: dialed digits after initial access code cannot exceed 12 digits, only one stop dial signal can be used, and the stop dial signal must be dial tone if used.

6.04 If applicable, second dial tone is returned from the serving central office. Second dial tone is returned if an idle tie trunk is available at that time. The trunk is not seized until all digits have been received and processed.

6.05 Centrex/ESSX-1 attendants have only switched access to tie and FX trunks. The Busy-Verify feature allows an attendant with a 51A type console to enter a conversation on a tie or FX trunk. See reference A(22) in Part 18.

6.06 An attendant has the capability to connect an incoming call over an FX trunk to an outgoing FX trunk.

6.07 Prefixing and deleting of dialed digits are permissible, regardless of any stored translation data. Route advance can also be used if the alternate route(s) has the same second dial tone arrangements.

ASSIGNMENT

6.08 If tie or FX trunks are replaced or canceled, they can be reassigned to other private line or message network service via translation data changes.

6.09 The recommended dial access code for FX and tie trunks is of the form 1XXXX. The second digit cannot be a 1 if a group speed calling list exists and uses the prefix 11. Normally, two-digit access codes are assigned. Refer to reference A(44) in Part 18.

7. INTERACTIONS

STATIC

7.01 Not applicable.

DYNAMIC

7.02 The Speed Calling feature may be assigned to tie and FX trunks only when second dial tone is not required.

7.03 Unique combinations of other features may produce conflicts with access codes used for the Tie Trunk and/or FX Service features. Refer to reference C(1) in Part 18.

8. RESTRICTION CAPABILITY

8.01 The Attendant Control of Trunk Group Access feature, also referred to as the Attendant Control of Facilities (ACOF) feature, allows the attendant to restrict dial access of all stations to certain centrex trunk groups, simulated facilities, and special services by operating specific keys. When ACOF is activated, calls to these facilities may be routed to the attendant for subsequent completion, to a recorded announcement, or to an intercept tone trunk. See reference A(20) in Part 18.

8.02 The Selective Customer Control of Facilities (SCCOF) feature gives the attendant the ability to make an individual facility group inaccessible to all outgoing traffic. The SCCOF feature is activated and deactivated under key control. One key controls one facility group. A facility group is either a trunk group (TG) or simulated facility group (SFG). When SCCOF is active, the facility being controlled is inaccessible to all outgoing traffic, regardless of origin or dialed digits. Calls affected by SCCOF simply alternate route to the next facility group. If there is no alternate route, the call receives normal reorder treatment.

8.03 The centrex access treatment (CAT) code allows or denies use of tie and FX trunks

associated with data type 3 translations. CAT codes are associated with final entries located in the centrex digit interpreter tables. CAT group information can vary from one customer group to another, depending on particular customer requirements.

INCORPORATION INTO SYSTEM

9. INSTALLATION/ADDITION/DELETION

9.01 Figure 9 illustrates the procedure to add the Tie Trunk and/or FX Service features.

9.02 These features affect the following set cards:

CDQ	CDR Queue Entries
DRR	Master Scanner Rows Used for Receiver Circuits
NAX	Transmitter Outpulsing Annexes
NDO	Trunk Dial Pulse Transmitter Junior Registers
QRWii	Master Scanner Row Addresses for Trunk TOUCH-TONE® —Dial Pulsing Receiver Rows
TDH	Trunk Dial Pulse Digit Receiver Hopper Entries
TDT	Trunk Dial Pulse Receiver Use
TQQ	Trunk TOUCH-TONE Receiver Queues
TQT	Incoming Tie Trunk and Cut-Through Rows
TRR	Ringing Circuits Test
TTH	TOUCH-TONE Hopper Entries
TTQ	TOUCH-TONE Receiver Queue Entries.

In addition, FX service uses set card FXOR, foreign exchange registers, as discussed in Part 11.

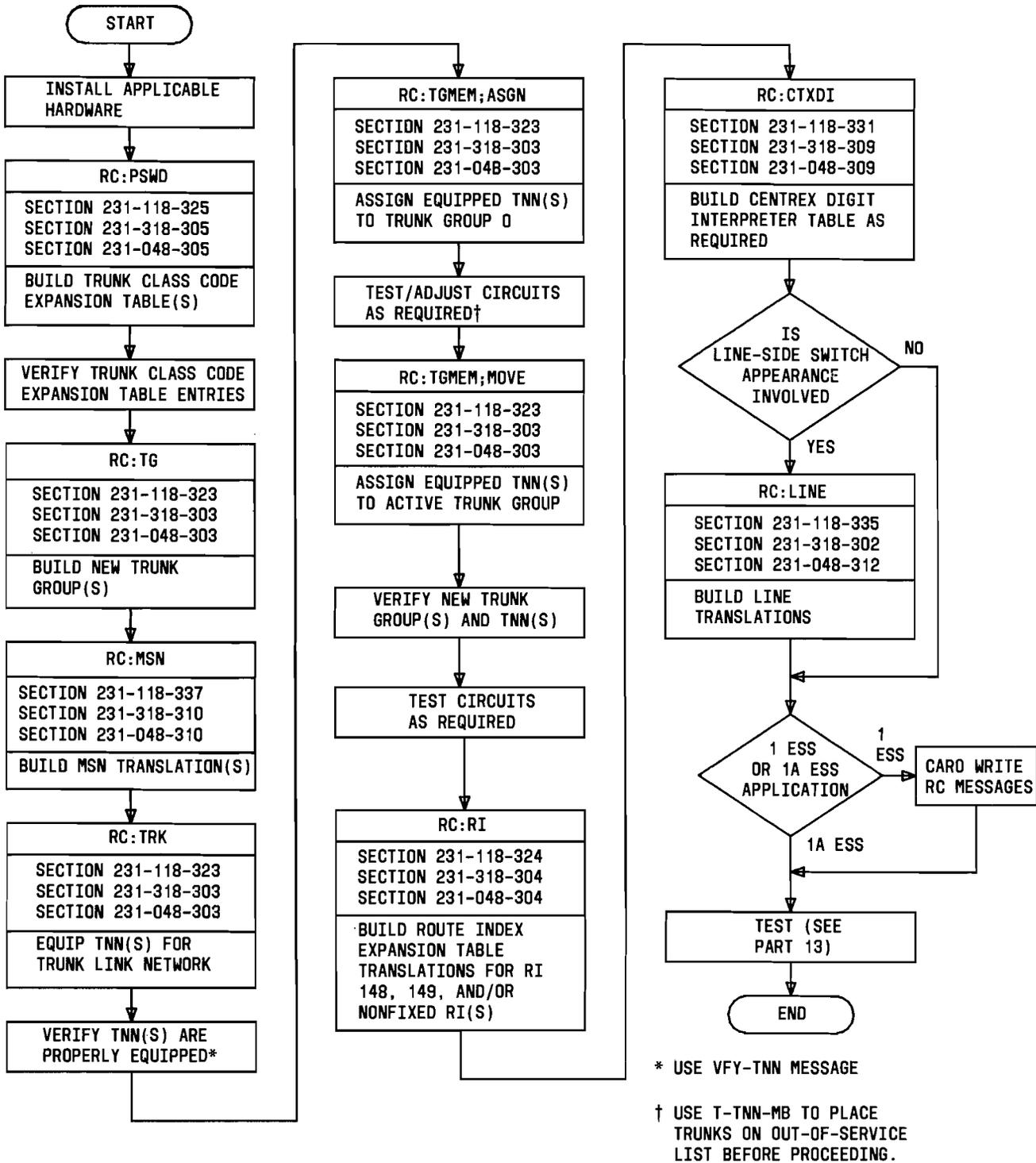


Fig. 9—Procedure to Install Tie Trunk or FX Features

10. HARDWARE REQUIREMENTS

Note: This part contains cost factors and determination of quantities. Central Office Equipment Engineering System (COEES) Planning and Mechanized Ordering Modules are the recommended procedures for developing these requirements. However, for planning purposes of if COEES is not available, the following guidelines may be used.

10.01 Hardware usage costs for FX service are shown in Table B. Hardware usage costs for tie trunk service are shown in Table C.

10.02 FX line arrangements are engineered on a per line basis. Tie trunk and FX service feature applications are engineered on a Centrex/ESSX-1 group basis.

11. SOFTWARE REQUIREMENTS

Note: This part contains cost factors and determination of quantities. Central Office Equipment Engineering System (COEES) Planning and Mechanized Ordering Modules are the recommended procedures for developing these requirements. However, for planning purposes or if COEES is not available, the following guidelines may be used.

MEMORY**A. No. 1 ESS****Fixed**

11.01 The following memory is required whether or not these features are used:

- **Generic (program store):** 2000 words for centrex digit analysis software (common for all digit interpretation for Centrex/ESSX-1).

Conditional

11.02 The following memory is required when these features are activated but not yet applied:

- **Call store:** Additional peripheral order buffers should not be required in a No. 1 ESS office due to these features. FX trunks (except SD-1A396-01) require set card FXOR at a No. 1 ESS office serving the customer group, that is, at the normal serving central office. Refer to paragraph 9.02 for other set cards affected by these features. These set cards are engineered on a per office basis of which these features may or may not have a significant impact in a particular No. 1 ESS office.

TABLE B**HARDWARE USAGE COSTS FOR FX SERVICE**

SD NO.	SCAN POINTS	SIGNAL DISTRIBUTOR POINTS	CIRCUITS PER UNIT	TRUNK ORDER CODE	REMARKS
SD-1A240-01	3	5	1	03020	Long haul
SD-1A241-01	3	5	1	03122	Short haul
	3	5	1	15900	Short haul used with ACD feature
SD-1A360-01	3	5	1	15800	Long haul used with ACD feature
SD-1A396-01	2	3	2	14600	Long haul HILO 4-wire
SD-1A415-05	2	5	1	16200	Long haul 4-wire
SD-1A416-05	2	5	1	16300	Short haul 4-wire

TABLE C

HARDWARE USAGE COSTS FOR TIE TRUNK SERVICE

SD NO.	SCAN POINTS	SIGNAL DISTRIBUTOR POINTS	CIRCUITS PER UNIT	TRUNK ORDER CODE	REMARKS
SD-1A163-02	3	5	1	01602	2-way dial pulse (incoming by-link)
	3	5	1	04905	2-way dial pulse, wink service
SD-1A163-05	3	5	1	01603	2-way dial pulse (incoming by-link)
	3	5	1	04909	2-way dial pulse, wink service
SD-1A165-02	2	3	2	00200*	Outgoing local & tandem
	2	3	2	00240*	Outgoing to operator
SD-1A165-05	2	3	2	00206	Outgoing local & tandem
	2	3	2	00207	Outgoing to operator
SD-1A166-02	3	3	2	00410	Incoming local & tandem
SD-1A166-05	3	3	2	00406	Incoming local & tandem
SD-1A220-01	2	3	1	0031C*	0-2K Ω conductor loop with bat-grd pulsing or 0-1.2K Ω with loop pulsing (incoming step by step)
	2	3	1	0039C*	2-4.2K Ω conductor loop with bat-grd pulsing or 1.2K Ω with loop pulsing (incoming step by step)
SD-1A220-05	2	3	2	00303	Incoming step by step
SD-1A236-02	3	5	1	02105	2-way MF wink
	3	5	1	021E5	2-way MF wink for extra echo suppression
	3	5	1	02106	2-way MF delay dial
	3	5	1	021E6	2-way MF delay dial for extra echo suppression
SD-1A236-05	3	5	1	02107	2-way MF wink
	3	5	1	021E7	2-way MF wink for extra echo suppression
	3	5	1	02108	2-way MF delay dial
	3	5	1	021E8	2-way MF delay dial for extra echo suppression

*Manufacture discontinued.

TABLE C (Contd)

HARDWARE USAGE COSTS FOR TIE TRUNK SERVICE

SD NO.	SCAN POINTS	SIGNAL DISTRIBUTOR POINTS	CIRCUITS PER UNIT	TRUNK ORDER CODE	REMARKS
SD-1A237-02	3	5	1	02207	2-way DP wink
	3	5	1	022E7	2-way DP wink for extra echo suppression
	3	5	1	02208	2-way DP delay dial
	3	5	1	022E8	2-way DP delay dial for extra echo suppression
	3	5	1	04802	2-way DP (incoming by-link)
SD-1A237-05	3	5	1	02210	2-way DP wink
	3	5	1	022E0	2-way DP wink for extra echo suppression
	3	5	1	02211	2-way DP delay dial
	3	5	1	022E1	2-way DP delay dial for extra echo suppression
	3	5	1	04803	2-way DP (incoming by-link)
SD-1A239-01	3	2	2	03571	DP repeating for Code Calling and Recorded Dictation features
SD-1A239-05	3	2	1	03577	Same as above
SD-1A252-01	3	4	1	00700*	2-way MF
SD-1A252-05	3	4	1	00702	2-way MF
SD-1A264-01	4	2	1	02400*	2-way reverse battery incoming, hi-lo outgoing. Can be MF, DP, TT or nonpulsing

*Manufacture discontinued.

Variable

11.03 The following memory is required when these features are applied:

• **Translations (program store):**

(a) 4 words per access code for centrex digit interpreter auxiliary block, if required

(b) 2 words per outgoing trunk group for each route index expansion table

(c) 4 words per trunk group for each TNN-to-PEN auxiliary block

(d) 4 words per trunk group for trunk class code expansion table

(e) 3 words per trunk for master scanner words

- (f) 1 word per trunk for primary translation word of the trunk group number primary tables translator
- (g) 1 word per trunk group for primary translation word of the trunk network number to trunk group number translator
- (h) 4 or more words per FX service line switch appearance for line equipment number translator auxiliary block (depends on other line features and options)
- (i) 3 or more words per FX service line switch appearance for directory number translator auxiliary block (depends on other line features and options).

B. No. 1A ESS

Fixed

11.04 The following memory is required whether or not these features are used:

- **Generic (program store, file store):** 2400 words for centrex digit analysis software (common for all digit interpretation for Centrex/ESSX-1).

Conditional

11.05 The following memory is required when these features are activated but not yet applied:

- **Duplicated Call Store:** Additional peripheral order buffers should not be required in a No. 1A ESS office due to these features. FX trunks (except SD-1A396-01) require set card FXOR at a No. 1A ESS office serving the customer group, that is, at the normal serving central office. Refer to paragraph 9.02 for other set cards affected by these features. These set cards are engineered on a per office basis of which these features may or may not have a significant impact in a particular No. 1A ESS office.

Variable

11.06 The following memory is required when these features are applied:

- **Translations (unduplicated call store, file store):**

- (a) 4 words per access code for centrex digit interpreter auxiliary block, if required
- (b) 2 words per outgoing trunk group for each route index expansion table
- (c) 4 words per trunk group for each TNN-to-PEN auxiliary block
- (d) 4 words per trunk group for trunk class code expansion table
- (e) 3 words per trunk for master scanner words
- (f) 1 word per trunk for primary translation word of the trunk group number primary tables translator
- (g) 1 word per trunk group for primary translation word of the trunk network number to trunk group number translator
- (h) 4 or more words per FX service line switch appearance for line equipment number translator auxiliary block (depends on other line features and options)
- (i) 3 or more words per FX service line switch appearance for directory number translator auxiliary block (depends on other line features and options).

REAL TIME IMPACT

11.07 Originating and terminating calls at an FX central office, as well as terminating calls from an incoming tie trunk, consume approximately the same amount of cycles as routine originating and terminating calls, respectively. Other applicable features and options have their own impacts. Real time requirements for access and use of the Tie Trunk and FX Service features are shown in Table D. Cycle time for No. 1 and No. 1A ESS is 5.5 and 0.7 microseconds, respectively.

TABLE D

**PROCESSOR TIME FOR TIE TRUNK/FX SERVICE
NUMBER OF PROCESSOR CYCLES**

ITEM	NO. 1 ESS	NO. 1A ESS
Fixed Cycles per Call (Two-Digit Access Code)	6,350	12,700
Extra Cycles for Local Second Tone	80	160
Cycles Per Digit Dialed After Access Code	175	350
Extra Cycles Fixed for TAMA Feature	1,225	2,450
Extra Cycles Per Digit Dialed After Access Code if TAMA Feature Applies	45	90

12. DATA ASSIGNMENTS AND RECORDS**TRANSLATION FORMS**

12.01 ESS translation forms, found in reference C(1) in Part 18, requiring completion are as follows:

- (a) ESS 1101—Directory Number Record: This form is used to record directory number assignments and other related information.
- (b) ESS 1109A/B—Centrex Group Record: These forms contain centrex class information plus access code data for a centrex group.
- (c) ESS 1201A/B—Miscellaneous Trunk Frame Record: These forms relate the equipment location on a frame basis with the trunk network number, trunk group, trunk number, trunk class code, signal distributor point, and supervisory scan points.
- (d) ESS 1202—Trunk Group Record: This form provides trunk group number to trunk

network number and trunk member number translations.

- (e) ESS 1203—Trunk Network Number Record: This form relates the trunk network number to the trunk group and trunk frame location.
- (f) ESS 1204—Trunk Class Code Report: This form specifies data for the trunk class code expansion tables.
- (g) ESS 1208A/B—Trunk Screening Group Record: These forms associate trunk groups with pseudo line equipment numbers.
- (h) ESS 1303A/B/C—Trunk and Service Circuit Route Index Record: These forms specify data for the route index expansion table entries.
- (i) ESS 1306—Line Class Code Record: This form provides major originating and terminating class information, as well as rate and route chart column information.
- (j) ESS 1400—Traffic Register Assignment Record: This form provides type measurement counts for peg, usage, and overflow counts.

RECENT CHANGES

12.02 Not applicable.

13. TESTING

13.01 Verification that either the Tie Trunk or FX Service feature has been properly installed and assigned can be accomplished by the following input/output messages (abbreviated from the appropriate input/output message manual referenced in Part 18B). System response should be checked against the applicable ESS translation form data.

- For No. 1 ESS, TAG-TNN-TGN and T-READ input messages are used to verify trunk class code expansion table entries. System response should be the TR21 and TW02 output messages. For No. 1A ESS use DUMP:CSS,ADR—to verify the call indicator words. The system response is DUMP:CSS output message.

- VFY-EXP input message is used to verify route index entries. System response should be a TR05 output message.
- VFY-MSN input message is used to verify master scan translations. System response should be a TR12 output message.
- VFY-TKGN input message is used to verify one or all trunk group numbers. System response should be a TR10 output message.
- VFY-TNN input message is used to verify a trunk network number translation. System response should be a TR14 output message.
- VFY-XDGNT input message is used to verify access codes. System response should be a TR18 output message.
- VFY-DN input message is used to verify one or a group of directory numbers assigned to foreign exchange service. System response should be a TR01 output message.
- VFY-LEN input message is used to verify one or more line equipment numbers assigned to foreign exchange service. System response should be a TR03 output message.

13.02 Tie Trunk or FX Service feature calls should be made over the applicable trunk groups to verify proper operation of the feature. These calls should be made both from Centrex/ESSX-1 stations and from attendant positions. Tie Trunk or FX Service feature calls over applicable incoming trunk groups should also be executed to verify proper operation of the feature when a No. 1/1A ESS is used to tandem an incoming call through the office or to terminate an incoming call.

13.03 Testing of trunks is done manually, via test positions, or on a periodic and/or trouble report basis. Also, the Attendant Call-Through Test on Centrex Trunks (ACTT) features permits a Centrex/ESSX-1 attendant in a 51A Customer Premises System environment to verify the operation of any selected trunk by making a test call. See reference A(19) in Part 18.

14. OTHER PLANNING TOPICS

14.01 Signaling compatibility among different small noncentrex business customer locations

and large centrex business customer locations is a major problem area in tandem tie trunk networks (TTTNs). Certain combinations of small business customer locations have compatibility problems which can impair service during call setup, even though all equipment individually functions properly. Impairments range from inconveniences to misdirected and high-and-dry calls. Reference C(9) in Part 18 provides basic technical information on signaling compatibility among all types of business customer service locations used in TTTNs.

ADMINISTRATION

15. MEASUREMENTS

15.01 No unique traffic measurements are required or available for the Tie Trunk of FX Service features. These features use normal office traffic schedules. These counts are type measurement code (TMC) 05, and they are available on the H, C, DA15, S1, S2, and S3 schedules.

16. CHARGING

AUTOMATIC MESSAGE ACCOUNTING

16.01 Charging does not apply to the Tie Trunk or FX Service features. However, the TAMA feature provides an automatic message accounting record of tie-or FX-trunk originations on a per access code basis. See reference A(45) in Part 18.

UNIFORM SERVICE ORDER CODES

16.02 Due to the varieties and diverse applications of the Tie Trunk and FX Service features, refer to the Uniform Service Order Code (USOC) Manual and/or telephone company USOC coordinator.

SUPPLEMENTARY INFORMATION

17. GLOSSARY

Foreign Exchange Line—As used in this feature document, the transmission facility arrangement to provide foreign exchange service on a per line basis. A line subscriber has *unswitched* access to and/or termination from the transmission facility connected to a line-side switch appearance at a foreign exchange central office.

Foreign Exchange Line Arrangement—A form of foreign exchange service to provide such on a per line basis.

Foreign Exchange Service—A service which provides Message Telecommunications Service out of a central office which is foreign to the normal service area of an individual line or business customer group.

Foreign Exchange Tie Trunk—A foreign exchange trunk arrangement used to connect two central offices serving separate Centrex/ESSX-1 groups. Essentially, each group has switch appearances at the other's switch. But one has centrex trunk appearances, and the other has centrex line appearances.

Foreign Exchange Trunk—As used in this feature document, the transmission facility arrangement to provide foreign exchange service on a Centrex/ESSX-1 group basis. Stations have switched access to and/or termination from (via attendant) the transmission facilities connected to line-side switch appearances at a foreign exchange central office.

Foreign Exchange Trunk Arrangement—A form of foreign exchange service to provide such on a Centrex/ESSX-1 basis.

Senderized—A switching method whereby a business customer user cannot control the routing of an outgoing call over tie or foreign exchange trunk facilities nor through any intermediate switch points. Outpulsed signals are transmitted in response to information received from another part of the system.

Tandem Tie Trunk Network—A private network of tie trunks and switching locations of a large business service customer with the ability to tandem switch tie trunks in at least one switch location.

Tie Trunk (Also called Tie Line)—A voice grade channel used to connect or tie two business customer service locations.

Tie Trunk Service—A service which provides senderized private line service between two or more central offices serving separate business customer groups.

18. REFERENCES

18.01 The following documentation contains information pertaining to or affected by the Tie Trunk and/or FX Service features.

A. Bell System Practices

- (1) Section 231-048-303—Trunk Translations Recent Change Formats for TG, TGBVT, TRK, CFTRK, TGMEM, CCIS, and TKCONV (1E6 and 1AE6 Generic Programs), 2-Wire No. 1 and No. 1A Electronic Switching Systems
- (2) Section 231-048-304—Rate and Route Translation Recent Change Formats for NOCNOG, DNHT, NOGRAC, RATPAT, DIGTRN, COL, RI, CHRCX, DITABS, TNDM, IDDD, TDXD, and RLST (1E6 and 1AE6 Generic Programs), 2-Wire No. 1 and No. 1A Electronic Switching Systems
- (3) Section 231-048-305—Recent Change Formats for GENT, PSBLK, PSWD, and SUBTRAN (1E6 and 1AE6 Generic Programs), 2-Wire No. 1 and No. 1A Electronic Switching Systems
- (4) Section 231-048-309—Centrex-CO and ESSX-1 Recent Change Formats for CTXCB, CTXDI, CTXEXR, CXDICH, DITABS, DLG, FLXDG, FLXRD, and FLXRS (1E6 and 1AE6 Generic Program), 2-Wire No. 1 and No. 1A Electronic Switching Systems
- (5) Section 231-048-310—Recent Change Formats for ANIDL, CAMA, CFG, CPD, CLAM, JUNCT, MSN, NMTGC, PLM, ROTL, SIMFAC, TMBCGA, LRE, PUC, RSSCB, RSSCH, and RSP (1E6 and 1AE6 Generic Programs), 2-Wire No. 1 and No. 1A Electronic Switching Systems
- (6) Section 231-048-312—Line RC Formats for LINE, TWOPTY, MPTY, SCLIST, MLHG, ACT, CFV, and VSS (1E6 and 1AE6 Generic Programs)—2-Wire No. 1 and 1A Electronic Switching Systems
- (7) Section 231-060-210—Service Circuits—Network Switching Engineering—No. 1 and No. 1A Electronic Switching Systems
- (8) Section 231-060-220—Trunks and Miscellaneous Circuits—Network Switching Engineering—No. 1 and No. 1A Electronic Switching Systems

SECTION 231-090-256

- (9) Section 231-061-450—Program Stores, Network Design—No. 1 Electronic Switching System
- (10) Section 231-061-460—Call Stores, Network Design—No. 1 Electronic Switching System
- (11) Section 231-061-510—Centrex General Description, Network Administration—No. 1/1A Electronic Switching Systems (when published)
- (12) Section 231-061-850—Network Design Worksheets—Centrex—No.1/1A Electronic Switching Systems
- (13) Section 231-062-460—Processor Community Engineering, Program Stores, Network Design—No. 1A Electronic Switching System
- (14) Section 231-062-465—Processor Community Engineering, Duplicated Call Store, Network Design—No. 1A Electronic Switching System (when published)
- (15) Section 231-062-470—Processor Community Engineering, Unduplicated Call Store, Network Design—No. 1A Electronic Switching System
- (16) Section 231-062-475—Processor Community Engineering, File Stores, Network Design—No. 1A Electronic Switching System
- (17) Section 231-070-630—Centrex and ESSX-1 General Description—Network Administration—No. 1/1A Electronic Switching Systems
- (18) Section 231-070-635—Centrex Planning and Cutover—Network Administration—No. 1/1A Electronic Switching Systems
- (19) Section 231-090-055—Feature Document—Attendant Call Through Test on Centrex Trunks Feature—51A Customer Premises System—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (20) Section 231-090-058—Feature Document—Attendant Control of Trunk Group Access Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (21) Section 231-090-060—Feature Document—51A Customer Premises System Attendant Position—Universal Cordless Telephone Console with Data Link and Switched Loop Features—No. 1 and No. 1A Electronic Switching Systems
- (22) Section 231-090-070—Feature Document—Busy-Verification of Station Lines (BVL) and Centrex Trunks (BVT) Features—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (23) Section 231-090-079—Feature Document—Call Transfer Features—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (24) Section 231-090-085—Feature Document—Common Control Switching Arrangement Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (25) Section 231-090-092—Feature Document—Code calling Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (26) Section 231-090-105—Feature Document—Combined TOUCH—TONE® and Dial Pulse on Incoming Tie Trunks Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (27) Section 231-090-142—Feature Document—Flexible Route Selection Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (28) Section 231-090-145—Feature Document—Full ESSX-1 Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (29) Section 231-090-169—Feature Document—Selected Customer Control of Facilities Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (30) Section 231-090-171—Feature Document—Centralized Attendant Service Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (31) Section 231-090-173—Feature Document—Manual Line Services Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (32) Section 231-090-177—Feature Document—50B CPS Attendant Position Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems (when published)

- (33) Section 321-090-178—Feature Document—50A CPS Attendant Position Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (34) Section 231-090-179—Feature Document—Series Completion Line Hunting Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (35) Section 231-090-180—Feature Document—Multiline Groups—Hunting and No Hunting Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (36) Section 231-090-186—Feature Document—Night Service Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (37) Section 231-090-219—Feature Document—Remote Office Test Line (ROTL) and Processor Controlled Interrogator (PCI) Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (38) Section 231-090-229—Feature Document—Simulated Facilities Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (39) Section 231-090-254—Feature Document—Tandem Tie Trunk Service (Nonsenderized) Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (40) Section 231-090-260—Feature Document—Trunk Answer From any Station Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (41) Section 231-090-269—Feature Document—Basic ACD Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (42) Section 231-090-359—Feature Document—Semirestricted Centrex Station Class Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (43) Section 231-090-366—Feature Document—HIL0 4-Wire Switching Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (44) Section 231-090-401—Feature Documents—Speed Calling Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (45) Section 231-090-417—Feature Document—Message Detail Recording on Tie Trunks Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems
- (46) Section 231-118-102—Line Translation Data Description—2-Wire No. 1 Electronic Switching System
- (47) Section 231-118-103—Trunks Translation Data Description—2-Wire No. 1 Electronic Switching System
- (48) Section 231-118-323—Trunk Translation Recent Change Procedures for TG, TGBVT, TRK, CFTRK, and TGMEM (CTX-6) through 1E5 Generic Programs), 2-Wire No. 1 Electronic Switching System
- (49) Section 231-118-324—Rate and Route Translation Recent Change Procedures for NOCNOG, DNHT, NOGRAC, RATPAT, DIGTRN, TOLDIG, CCOL, RI, CHRGX, DITABS, TNDM, IDDD, and TDXD (CTX-6 through 1E5 Generic Programs), 2-Wire No. 1 Electronic Switching System
- (50) Section 231-118-325—RC Procedures for PSWD, GENT, PSBLK, SUBTRAN (CTX-6 through 1E5 Generic Programs), 2-Wire No. 1 Electronic Switching System
- (51) Section 231-118-331—Centrex-CO RC Procedures for CTXCB, CTXDI, CTXERX, CHDICH, DITABS, DLG, FLXDG, FLXRD, and FLXRS (CTX-6 through 1E5 Generic Programs), 2-Wire No. 1 Electronic Switching System
- (52) Section 231-118-333—Overall procedures for Adding or Removing a Centrex-CO or PBX-CO Customer (All Generic Programs), 2-Wire No. 1 Electronic Switching System
- (53) Section 231-118-335—Line Recent Change Procedure—For Line, TWOPTY, MPTY, SCLIST, MLHG, ACT, and CFV (CTX-7, CTX-8, IE4, and 1E5 Generic Programs), 2-Wire No. 1 Electronic Switching System
- (54) Section 231-118-337—RC Procedures for ANIDL, CAMA, CFG, CPD, MSN, NMTGC, PML, ROTL, SIMFAC, and TMBCGA (CTX-6 through 1E5 Generic Programs), 2-Wire No. 1 Electronic Switching System

(55) Section 231-128-510—Incoming Trunk Circuits SD-1A184-01, SD-1A184-05, SD-1A186-01, SD-1A220-01, SD-1A220-05, SD-1A224-01, and SD-1A224-05—Operational Tests

(56) Section 231-128-541—Foreign Exchange Trunk Circuit—SD-1A241-01—Operational Test

(57) Section 231-130-101—Trunk Test Capabilities Description, 2-Wire No. 1 Electronic Switching System

(58) Section 231-190-127—Feature document—Enhanced Private Switched Communications Service (EPSCS) Description, 2-Wire No. 1 Electronic Switching System

(59) Section 231-318-302—Line Recent Change Procedures for Line, TWOPTY, MPTY, SCLIST, MLHG, CFV, and OBS (Through 1AE5 Generic Program)—2-Wire No. 1A Electronic Switching System

(60) Section 231-318-303—Trunk Translation Recent Change Procedures for TG, TGBVT, TRK, CFTRK, and TGMEM, CCIS, and TKCONV (Through 1AE5 Generic Program), 2-Wire No. 1A Electronic Switching System

(61) Section 231-318-304—Rate and Route Translation Recent Change Procedures for NOCNOG, DNHT, NOGRAC, RATPAT, DIGTRN, TOLDIG, CCOL, RI, CHRGX, DITABS, TNDM, IDDD, and TDXD (Through 1AE5 Generic Program), 2-Wire No. 1A Electronic Switching System

(62) Section 231-318-305—RC Procedures for PSWD, PSBLK, SUBTRAN, and GENT (Through 1AE5 Generic Program), 2-Wire No. 1A Electronic Switching System

(63) Section 231-318-309—Centrex-CO ESSX-1 Recent Change Procedures for CTXCB, CTXDI, CTXEXR, CXDICH, DITABS, DLG, FLXDG, FLXRD, and FLXRS (Through 1AE5 Generic Program), 2-Wire No. 1A Electronic Switching System

(64) Section 231-318-310—RC Procedures for ANIDL, CAMA, CFG, CPD, JUNCT, MSN, NMTGC, PLM, ROTL, SIMFAC, CFG, TMBCGA,

and CLAM (Through 1AE5 Generic Program), 2-Wire No. 1A Electronic Switching System

(65) Section 660-440-010—Codes—Test Line Circuits and Communications Trunks Nationwide Distance Dialing Plan

(66) Section 759-100-000—Index of Central Office Equipment Estimation System (COEES) Practices

(67) Section 851-300-100—Transmission Design Considerations and Objectives—Switched Special Services and Private Branch Exchange (PBX)/Automatic Call Distribution (ACD)/Centrex Station Services

(68) Section 851-300-170—Standard Design of Switched Special Services Circuits—Signaling Range Information

(69) Section 981-010-100—Private Branch Exchange Information

(70) Section 981-012-100—Centralized Attendant Service for 770A PBX, DIMENSION® 400 PBX, and No. 1 ESS, General Description Information

(71) Section 996-102-100—2-Wire No. 1 and No. 1A Electronic Switching System—Business Customer Service—General Description Information.

B. TTY Input and Output Manuals

(1) Input Message Manual IM-1A001, No. 1 Electronic Switching System

(2) Input Message Manual IM-6A001, No. 1A Electronic Switching System

(3) Output Message Manual OM-1A001, No. 1 Electronic Switching System

(4) Output Message Manual OM-6A001, No. 1A Electronic Switching System.

C Other Documentation

(1) Translation Guide TG-1A, No. 1—Electronic Switching System—2-Wire

(2) Translation Output Configuration PA-591003, No. 1 Electronic Switching System

- (3) Translation Output Configuration PA-6A002, No. 1A Electronic Switching System
- (4) Office Parameter Specification PA-591001, No. 1 Electronic Switching System
- (5) Office Parameter Specification PA-6A001, No. 1A Electronic Switching System
- (6) Parameter Guide PG-1, No. 1 Electronic Switching System, 2-Wire
- (7) Parameter Guide PG-1A, No. 1A Electronic Switching System, 2-Wire
- (8) Growth Recent Change (GRC) Form Manual, 2-Wire No. 1 and 1A Electronic Switching System, PA-591099
- (9) American Telephone and Telegraph Company General Letter 74-11-030, Dated November 8, 1974; Subject: Tandem Tie Trunk Network PBX Compatibility.