

FEATURE DOCUMENT
TANDEM TIE TRUNK DIALING
(CENTREX)
NO. 2 ELECTRONIC SWITCHING SYSTEM

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NOTICE

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FEATURE DEFINITION AND DESCRIPTION**1. DEFINITION**

1.01 A tie trunk is a facility which ties one private branch exchange (PBX) or centrex switching machine to another on a point-to-point basis. A tandem tie trunk network comprises a number of these switching machines tied together with tie trunks in such a way that a given call may tandem through a number of these machines. The calling party controls the route of the call through the network by dialing a series of access codes. Each switching machine in turn supplies dial tone to indicate to the calling party that it is ready to receive the next access code. When the call reaches the desired destination switching machine, the calling party dials the extension number of the called party, and the call completes.

1.02 On the first access code dialed, the No. 2 Electronic Switching System (ESS) can be arranged to provide local dial tone if desired. On subsequent access codes, the dial tones (or other call progress tones) originate from subsequent switching machines.

1.03 Within No. 2 ESS, a special service circuit is used for a tandem tie trunk call originated by a centrex station or attendant. Another special service circuit is needed for a tandem tie trunk call made by an incoming tie trunk. The number of service circuits required is determined by using standard traffic engineering procedures.

2. DESCRIPTION**A. Customer (User) Perspective**

2.01 A centrex customer activates the tandem tie trunk dialing feature by dialing an access code of one to three digits for each different facility the customer wishes to reach. Every time a new switching facility (e.g., No. 2 ESS office) is reached, a call progress tone is returned to the customer. Once the proper facility is reached via the access code(s) the remaining station digits are dialed to complete the tandem tie trunk dialing.

B. System Implementation

2.02 After having dialed the access code, the calling customer is connected to a receiver circuit and then a transmitter circuit in the tie

trunk cut-through service circuit which is in turn connected to an outgoing trunk. A path is reserved from the calling party to the same outgoing tie trunk for the eventual talking path. Dial tone may be returned from the No. 2 ESS service circuit (or from the next switching office) so that the additional digits may be dialed. A transmission path in the receiver-transmitter is closed between the outpulsing of digits so that the calling customer may hear tones from the subsequent offices as the call progresses. After dialing and outpulsing are completed, the receiver-transmitter circuit is released and the calling customer is connected to the outgoing tie trunk using the previously reserved network path. The end of dialing is defined as 10 seconds after the last digit has been dialed. During this interval, the transmission path through the receiver-transmitter circuit may be used for talking purposes. Optionally, the end of dialing can be signified by dialing a “#” digit (from TOUCH-TONE® phones only), which cancels the 10-second timing.

2.03 Using the tandem tie trunk configuration, the No. 2 ESS machine can perform the following:

- (a) Receive digits on a TOUCH-TONE and/or dial pulse (DP) basis and outpulse on a DP-only basis.
- (b) Receive a maximum of 24 digits. These digits can be AMA recorded if required.
- (c) Repeat all digits after the access code. No addition, deletion, or conversion of digits is available.
- (d) Permit receiving to get ahead of outpulsing at any time (after access code) by as much as eight digits. Any more than eight digits may result in reorder tone being returned to the calling party.
- (e) Terminate the call any time an abandon or flash is detected during outpulsing.
- (f) Allow the TOUCH-TONE “#” digit to cancel the 10-second time-out interval and signify the end of dialing.

SECTION 232-190-338

2.04 The tie trunk cut-through service circuit for centrex handles the following calls:

- (a) Centrex station to tie trunk
- (b) Incoming tie trunk to tie trunk
- (c) Centrex attendant to tie trunk

2.05 The following circuits may be required for tandem tie trunk cut-through service:

- (a) Tie trunk cut-through service circuit for **local** originations—This circuit permits local centrex stations, both DP and TOUCH-TONE (as required), and the centrex attendant to gain access to a tandem tie trunk network. It is accessed automatically when the proper access code is dialed. The service circuit consists of four circuits which are wired together and operate in combination as a single 2-port service circuit (Figure 1).

Customer Dial Pulse Receiver, SD-2H177-01
TOC 65823

TOUCH-TONE Receiver Applique, SD-1A173-01
TOC 640XX (as required)

Trunk Dial Pulse Transmitter, SD-2H122-01
TOC 618XX

Tie Trunk Cut-Through Service Circuit,
SD-2H178-01 TOC 663XX

The tie trunk cut-through service circuit provides cut-through between the calling party and the outgoing tie trunk for return of dial tone and other tones from subsequent switching points, during the setup of the call. This combination is treated as a 2-port service circuit and may not be used for other traffic applications, (except for centrex foreign exchange (FX) overlap applications). Port 0 is assigned to the customer dial pulse receiver (CDPR), SD-2H177 and port 1 is assigned to the DP transmitter, SD-2H122. An office may have this combination, with or without TOUCH-TONE receiver applique, but not both ways. The controlling ports of these service circuits are assigned to Trunk Group 14. The noncontrolling ports are assigned to trunk groups 64 and/or 65.

- (b) Tie trunk cut-through service circuit for **distant** office originations—This circuit

permits incoming centrex tie trunks access to outgoing tandem tie trunks. It is accessed automatically when an incoming tie trunk dials the proper access code. The service circuit consists of four circuits which are wired together and operate in combination as a single 2-port service circuit (Figure 2).

Trunk Dial Pulse Receiver SD-2H123-01
TOC 619XX

TOUCH-TONE Receiver Applique, SD-1A173-01
TOC 640XX (as required)

Trunk Dial Pulse Transmitter, SD-2H122-01
TOC 618XX

Tie Trunk Cut-Through Service Circuit,
SD-2H178-01 TOC 663XX

This circuit is the same combination as in (a) except for the substitution of a trunk dial pulse receiver (TDPR) for the CDPR. This combination is treated as a 2-port service circuit and may not be used for other traffic applications (except for centrex FX overlap applications). Port 0 is assigned to the TDPR SD-2H123 and port 1 is assigned to DP transmitter SD-2H122. An office may have this combination, with or without TOUCH-TONE applique, but not both. The controlling ports of these service circuits are assigned to Trunk Group 15. The noncontrolling ports are assigned to trunk groups 64 and/or 65.

3. FEATURE FLOW DIAGRAM

3.01 Figure 3 shows a typical tandem tie trunk dialing arrangement at a functional level.

4. INTERACTIONS

4.01 Interactions between the **tandem tie trunk dialing** feature and other No. 2 ESS centrex features are described by the following:

- Centrex access treatment (CAT) code screening may be used to restrict station access, attendant access, or incoming tie trunk access to outgoing tandem tie trunk operation as desired.
- Whenever TOUCH-TONE telephone sets are used by a centrex customer group for tandem tie trunk dialing, a TOUCH-TONE applique

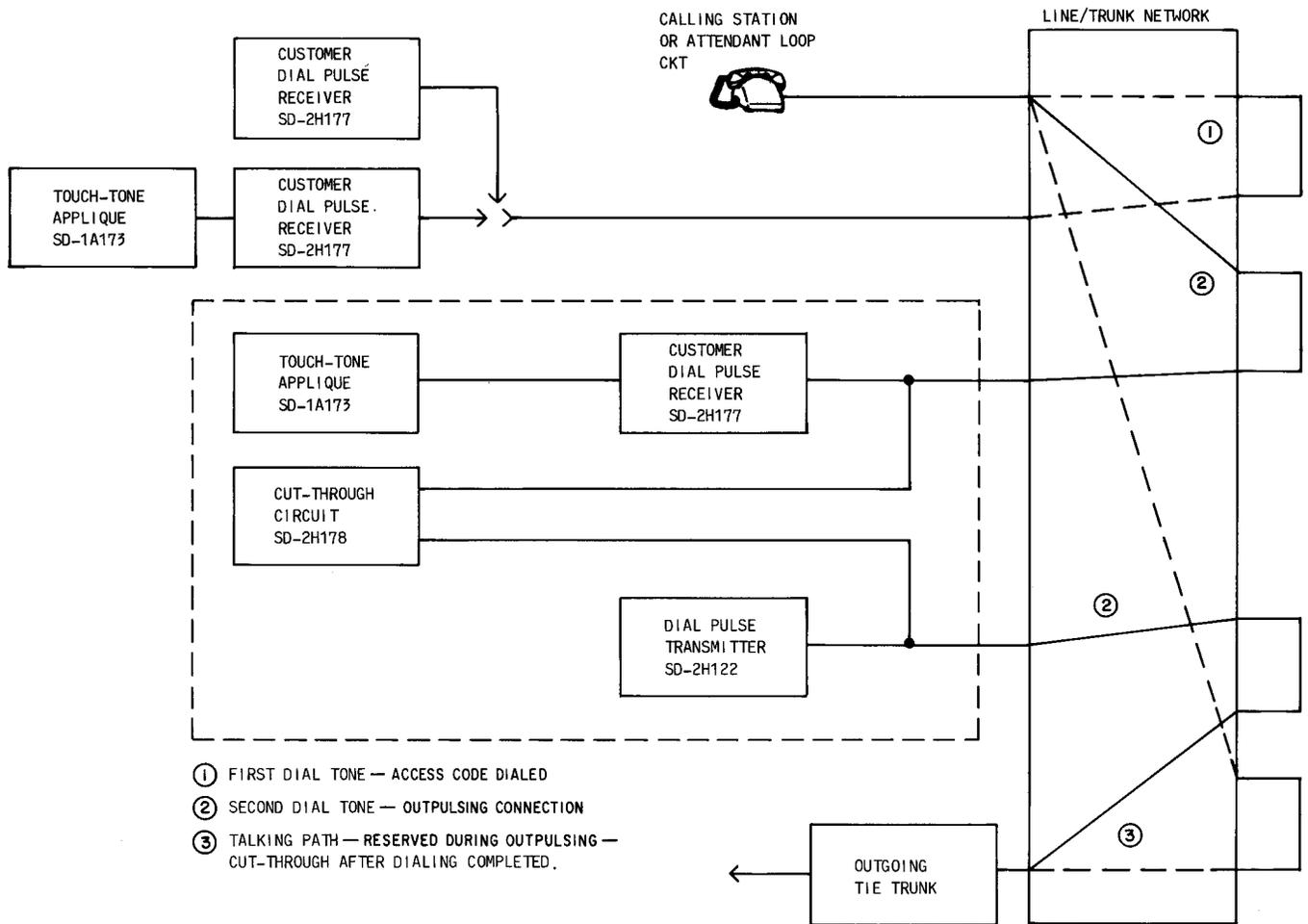


Fig. 1—Tandem Tie Trunk Cut-Through Service—Local Origination

- circuit must be provided. Refer to the DESCRIPTION paragraph for details on this circuit.
- Forwarding calls over outgoing tie trunks is not possible in No. 2 ESS with the Call Forwarding—Variable feature.
 - Automatic Message Accounting (AMA) recording is permitted on tandem tie trunk calls of up to 24 digits (entry type 27 must be used).
 - Direct Inward Dialing (DID) cannot be used to reach tandem tie trunk access codes.
 - Tandem tie trunk operation cannot be used as one of the possible routes for the most economical routing (MER) feature.
 - Speed calling of tandem tie trunk dialed calls is not recommended since there is no provision in the No. 2 ESS to wait for call progress tones returned from subsequent switching points.

ATTRIBUTES

5. STATION/SYSTEM

- 5.01** Tandem tie trunk dialing is provided on a per centrex group basis. Each centrex line may have access to tandem tie trunk dialing based on the individual line's CAT code.

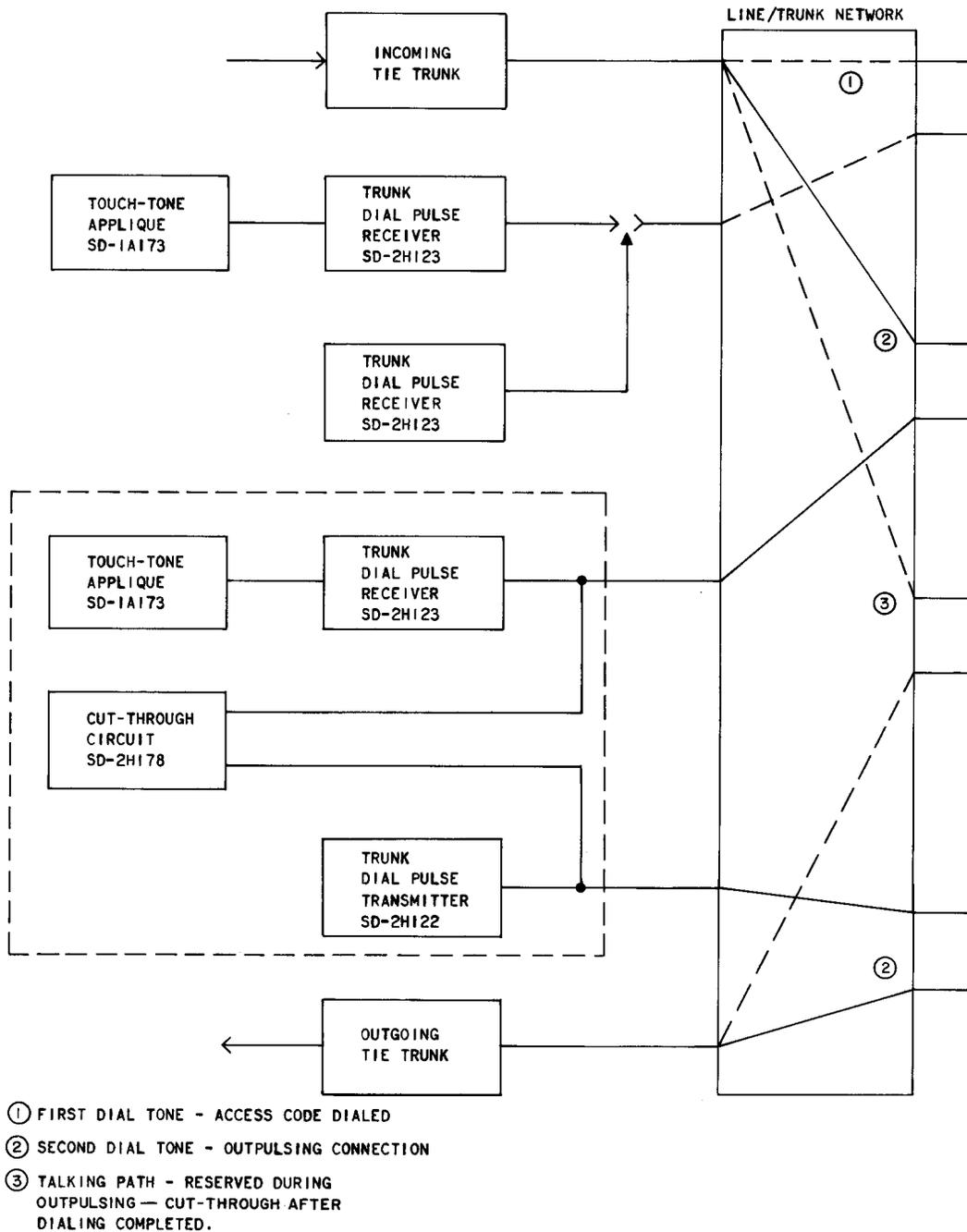


Fig. 2—Tandem Tie Trunk Cut-Through Service—Distant Origination

6. LIMITATIONS

6.01 Tandem tie trunk cut-through service circuits are engineered per office, and are not dedicated to individual customer groups.

6.02 Tandem tie trunk dialing allows for up to 24 digits to be dialed. More than 24 digits dialed is not allowed.

6.03 Prefixing and deleting of digits are not allowable with tandem tie trunk operations.

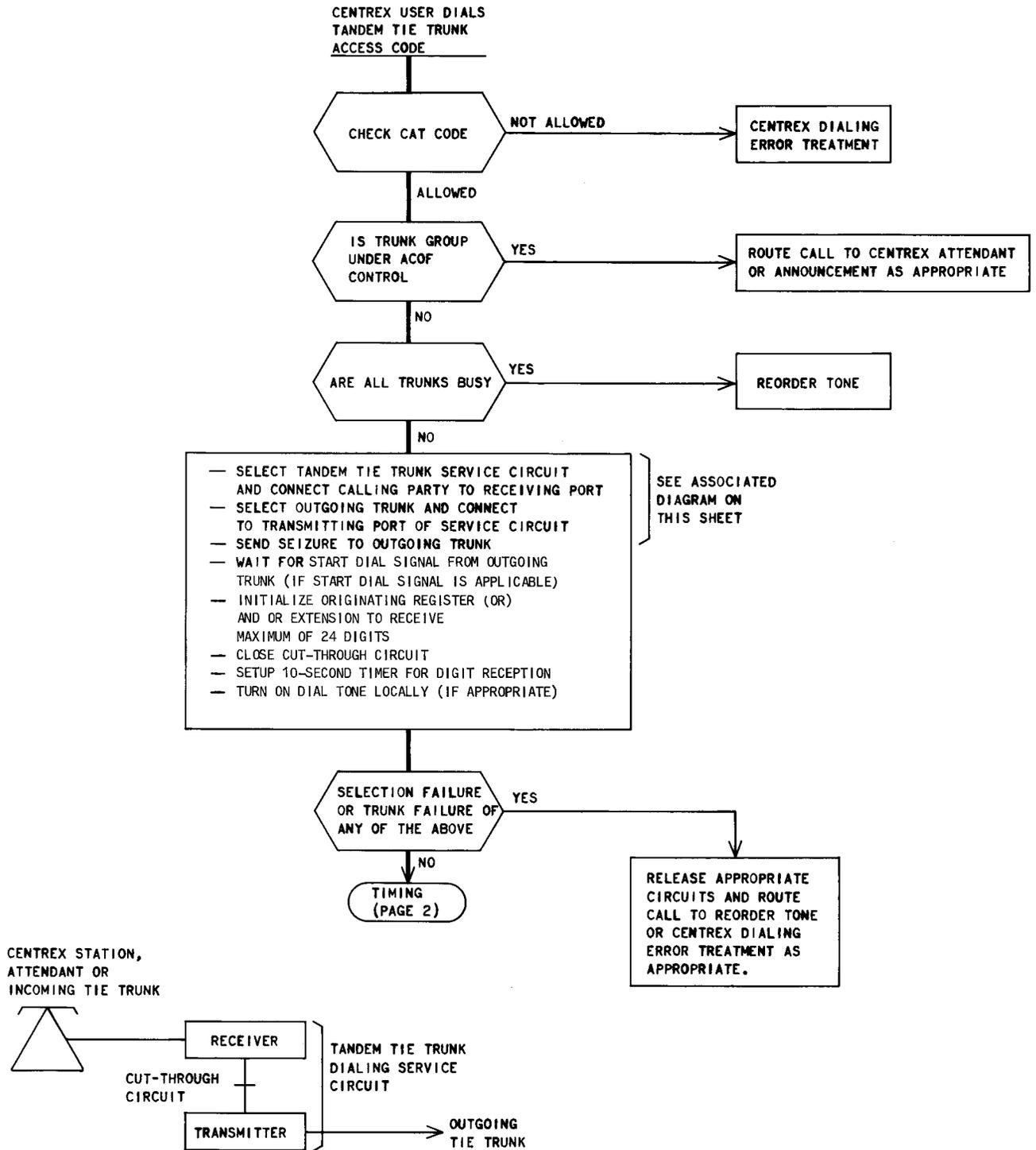


Fig. 3—Typical Tandem Tie Trunk Dialing Flow Diagram (Sheet 1 of 2)

7. RESTRICTION CAPABILITY

7.01 The station's or incoming tie trunk's CAT code defines the access codes that may be dialed. Tie trunk access may be restricted by assigning a CAT code that allows or denies the station or incoming tie trunk the capability of dialing the access code.

7.02 The CAT code assignment may be recent changed.

8. COST DATA

8.01 There are no costs attributable to tandem tie trunk dialing aside from the translation space and call store space for trunk groups 14 and 15 and for outgoing tie trunk groups.

8.02 Translation space is required for the access code(s) in the digit interpreter table.

8.03 For hardware requirements refer to **HARDWARE ENGINEERING**.

INCORPORATION INTO SYSTEM

9. PLANNING

9.01 Planning for the number of centrex customer groups and the number of stations requiring tandem tie trunk dialing should be made to provide translation space in the program store and proper space in the call store. An office data administration (ODA) run may be required to define the tandem tie trunk dialing feature.

9.02 Hardware planning—The number of circuits required for each customer group should be planned for in advance for the installation of these circuits. Refer to Part 10, **HARDWARE ENGINEERING**, for the required circuits. Also, some planning for access codes and CAT codes is required. Enough room in the numbering plan should be left for growth situations. Customers should be consulted as to the required number of access codes and the associated restriction codes. Only 16 CAT codes are allowed.

9.03 Coordination between Western Electric Company and operating companies should be made to determine whether or not *pad switching* will be required for certain trunk groups. Pad switching is only used for trunk-to-trunk connections

and is provided only with the EF-1 generic program. Refer to Section 232-208-301, Impedance Balance Tests, for the description of the circuits used for pad switching.

10. HARDWARE ENGINEERING

10.01 The following circuits with associated trunk order code (TOC) may be required to implement the tandem tie trunk dialing feature:

(a) Tandem tie trunk cut-through circuit—distant origination consists of the combination of the following circuits:

- (1) Tandem Tie Trunk Cut-Through Circuit SD-2H178-01. (TOC 663XX)
- (2) Trunk Dial Pulse Receiver SD-2H123-01. (TOC 619XX)
- (3) TOUCH-TONE Receiver Applique Circuit SD-1A173-01 if required. (TOC 640XX)
- (4) Trunk Dial Pulse Transmitter Circuit SD-2H122-01. (TOC 618XX)

(b) Tandem tie trunk cut-through circuit—local origination consists of the combination of the following circuits:

- (1) Tandem Tie Trunk Cut-Through Circuit SD-2H178-01. (TOC 663XX)
- (2) Customer Dial Pulse Receiver SD-2H177-01. (TOC 65823)
- (3) TOUCH-TONE Receiver Applique Circuit SD-1A173-01 if required. (TOC 640XX)
- (4) Trunk Dial Pulse Transmitter Circuit SD-2H122-01. (TOC 618XX)

10.02 Refer to Traffic Facilities Practices, Division D, Section 12-n for the Traffic Design Worksheets in determining circuit quantities.

11. SOFTWARE ENGINEERING

11.01 For the call store and program store calculations refer to Traffic Facilities Practices, Division D, Section 12.

11.02 An ODA run may be required to implement tandem tie trunk dialing. See OFFICE DATA for details on ESS input forms.

12. COMPATIBILITY

12.01 Tandem tie trunk operation is not compatible with attendant speed calling or centrex station speed calling.

13. OFFICE DATA

A. Translations

13.01 The translation layout for a tandem tie trunk dialed call is shown in Figure 4.

13.02 Translators affected by the addition of tandem tie trunk dialing include the centrex number translator, the scan point translator, and the trunk group translator.

B. Recent Change (RC) Messages

13.04 The A RC:L/ message is used for station feature additions or changes.

13.05 The A RC:DIT/ message is used to change the digit interpreter table to define tandem tie trunk dialing access codes.

13.06 The A RC:GRP/ message is used to change a given word in the trunk group or service circuit group data for tandem tie trunk dialing.

13.07 The A VY:L/ message is used to verify that tandem tie trunk dialing feature is specified for a centrex station in the translations.

13.08 The A VY:DIT/ message is used to verify a terminal entry of the digit interpreter table for a given centrex group.

C. ODA Information

13.09 To incorporate tandem tie trunk dialing into a No. 2 ESS office, an ODA run may be required for initial installations. The following ESS input forms must be completed by the dial administrator of the operating companies and submitted to the WECO Regional Center for processing. Normal scheduling procedures should be observed in the preparation of these forms.

- **ESS 2109-2—Centrex Group Table**—The station's CAT code is specified on this form. Data type 03 with subtype 06 on this form specifies tandem tie trunk access. Data type 09 with subtype 06 is used to indicate AMA recording.

- **ESS 2202-1—Trunk Group Table**—Trunk groups 14 and 15 are specified by this form to identify tandem tie trunk cut-through circuit for local origination or distant origination, respectively.

- **ESS 2202-2—Trunk Group Table**—This form defines the trunk groups.

- **ESS 2202-3—Centrex Trunk Group and Simulated Facilities Group Table**—A number of centrex related attributes concerning outgoing tie trunks are specified on this form.

- **ESS 2204—Trunk Feature Table**—This form is used on initial and update cases and defines trunk features.

13.10 Copies of reproducible input forms for the above ESS forms are in Division 11, Section 1 of the Translation Guide, TG-2H.

14. GROWTH/RETROFIT PROCEDURES

14.01 The tandem tie trunk dialing feature can be incorporated into a No. 2 ESS office only if the office is equipped with the EF-1 generic program. An ODA run may be required to define those centrex customer groups subscribing to tandem tie trunk dialing.

14.02 The recent change messages discussed in OFFICE DATA may be used to add or delete tandem tie trunk dialing to centrex stations in customer groups that have been defined by an ODA run.

15. TESTING

15.01 There are no special tests to be performed other than operational tests. The customer dials the tandem tie trunk dialing access code and listens for the second dial tone. Once the second dial tone is heard, dialing of subsequent access codes and/or station digits is performed.

ADMINISTRATION**16. MEASUREMENTS**

16.01 Refer to Section 232-120-301—Traffic and Plant Measurements for the detailed description of traffic measurements.

17. RECORD KEEPING

17.01 Record of the ESS-R forms must be maintained by each office whenever an ODA run is made.

17.02 A record of all recent change messages must be maintained in addition to the R-forms.

18. CHARGING

18.01 AMA recording of up to 24 digits of tandem tie trunk dialing is allowed. These digits are recorded using entry type 27.

AVAILABILITY**19. NEW INSTALLATIONS**

19.01 Tandem tie trunk dialing is being made available only as part of Issue 3 or later of the EF-1 generic program.

20. GROWTH/RETROFIT

20.01 Those offices that are equipped with the local office (LO-1) generic programs must be retrofitted with Issue 3 or later of the EF-1 generic program in order to implement tandem tie trunk dialing.

SUPPLEMENTARY INFORMATION**21. GLOSSARY**

21.01 The following list identifies acronyms and abbreviations used in this document:

- AMA—Automatic Message Accounting

- CAT—Centrex Access Treatment code
- CDPR—Customer Dial Pulse Receiver
- DID—Direct Inward Dialing
- DP—Dial Pulse
- EF-1—Extended Feature generic program
- FX—Foreign Exchange trunks
- LO-1—Local Office generic program
- MER—Most Economical Routing
- ODA—Office Data Administration
- TDPR—Trunk Dial Pulse Receiver

22. REASONS FOR REISSUE

22.01 This is the initial issue of this section.

23. REFERENCES

23.01 The following documents are major references used in the preparation of this document.

- Translation Guide, TG-2H
- PD-2H305-01 Centrex Trunk Program
- PF-2H305-01 Centrex Trunk Program
- IM-2H200—Input Message Manual No. 2 ESS
- OM-2H200—Output Message Manual No. 2 ESS
- PA-2H200—Office Data Tables Layout Specification
- Traffic Facilities Practices, Division D, Section 12
- Section 232-120-310—Traffic and Plant Measurements, No. 2 Electronic Switching System