

**FEATURE DOCUMENT**  
**CALL WAITING**  
**(CENTREX)**  
**NO. 2 AND 2B ELECTRONIC SWITCHING SYSTEMS**

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## INTRODUCTION

### 1. GENERAL INFORMATION

**1.01** This document covers the Call Waiting feature which allows a business customer already involved in a conversation to know by means of an alerting signal when another call is attempting to complete to that station. The No. 2 Electronic Switching System (ESS) office requires the EF-2 or later generic program in order to provide the centrex Call Waiting feature. In this document, when the terms No. 2 ESS and EF-2 are used, they also include No. 2B ESS and 2B-EF-2. In addition, traffic engineered call waiting tone circuits and 3-port conference circuits are required if this feature is to be provided.

**1.02** This is the initial issue of this document. When this document is reissued, the reasons for reissue will be found in this paragraph.

### 2. DEFINITION

**2.01** Call waiting is a centrex feature that provides a burst of tone to a busy centrex station indicating that a second call has been directed to the busy station and that the second call is held waiting.

**2.02** The No. 2 ESS can provide the following centrex Call Waiting features which are covered in this feature document.

- Call Waiting—Originating
- Call Waiting—Originating With Silence Option
- Call Waiting—Terminating

**2.03** *Call Waiting—Originating*—Allows a centrex station with the feature to direct the call waiting tone toward a busy called station within the same centrex group. The busy called station can retrieve the calling station by hanging up and being rung back or by depressing the switchhook momentarily (flashing) to place the existing call on hold, and answering the waiting call. If the called station has the feature call hold, the called station can flash for dial tone, dial the call hold access code to place the existing call on hold, and answer the waiting call.

**2.04** *Call Waiting—Originating With Silence Option*—This option provides silence to call waiting-originating users after 6 seconds of audible ringing while the calling party is in the waiting mode.

**2.05** *Call Waiting—Terminating*—Allows a busy centrex station with this feature to receive a call waiting tone when another call is directed toward the station. The busy station user can retrieve the *waiting* call by flashing to place the existing call on hold, and then answering the waiting call. If the called station has the feature call hold, the called station can flash for dial tone, dial the call hold access code to place the existing call on hold, and answer the waiting call. Also, the busy station user may hang up, be rung back automatically, and upon answer is connected to the waiting call.

**2.06** The No. 2 ESS office requires the EF-2 or later generic program in order to provide the centrex Call Waiting features. In addition, traffic engineered call waiting tone circuits and 3-port conference circuits are required in order for this feature to be provided.

## DESCRIPTION

### 3. USER OPERATION

**3.01** Centrex call waiting is a feature that allows a calling station to be held waiting while a burst of tone is directed to the busy called station indicating that another call is held waiting. The EF-2 generic program of the No. 2 ESS offers two types of centrex call waiting. These options have been listed and defined in the DEFINITION paragraph of this feature document. The following paragraphs describe the functions of each Call Waiting feature.

**3.02** The user operation will be covered from both the called and calling user point of view. In this feature document, the called station will refer to the station that received the call. The calling station refers to the station held waiting. Similarly, the original station refers to the station that was originally connected to the called station.

***Call Waiting—Originating and Call Waiting—Originating With Silence Option***

**3.03** To use the Call Waiting—Originating feature, the station user (calling) dials the call waiting—originating access code and receives a second dial tone. After second dial tone is received, the calling station user dials the desired centrex station number (called). If the called number is a legitimate number in the centrex group, regular audible ring is supplied to the calling station when the called station is ringing normally or when the called station is busy and the call waiting tone has been directed to the called station. If the silence on call waiting—originating option is in effect, audible ring will be turned off after 6 seconds if the called station is busy. If the called station is busy and call waiting is denied (see LIMITATIONS), busy tone will be returned to the calling station.

**3.04** If the called number is not a legitimate number, is outside the centrex group, or is another access code, the call is then given the centrex dialing error treatment.

***Call Waiting—Terminating***

**3.05** Two types of call waiting—terminating are available.

- Call Waiting—Terminating—Incoming Calls—This allows centrex stations on a per-station basis to have the Call Waiting feature for incoming direct inward dialed (DID) and common control switching arrangement (CCSA) calls only.
- Call Waiting—Terminating—All Calls—This allows centrex stations on a per-station basis to have the Call Waiting feature for all calls to the station.

**3.06** The calling station user is allowed to dial a station that is provided with the Call Waiting—Terminating feature in the normal manner. If the called station is not busy, the call will be completed in the normal manner. However, if the called station is busy and is provided with the Call Waiting—Terminating feature, the calling station user will receive an audible ring. In contrast to this, if the called station is busy and is provided with the Call Waiting—Terminating feature, but call waiting is denied as specified in 6.01 and 6.02, the calling station user will receive busy tone.

Also, when the called station is busy and is not provided with the Call Waiting—Terminating feature, the calling station will receive busy tone.

**3.07** The busy called station can receive the call waiting tone for two reasons.

- When the called station is being accessed by another station in the centrex group while the called station is using the Call Waiting—Originating feature.
- The busy called station has the Call Waiting—Terminating feature and is receiving another call.

The called station will hear a 100-millisecond burst of call waiting tone. After the burst of the call waiting tone has been applied, the called station is able to perform one of the following actions:

- Hold the existing call and pick up the call that is held waiting.
- Hang up on the existing call and pick up the call that is held waiting.
- Ignore the held waiting call and continue with the existing call.
- Ignore the held waiting call and take other dialing action.

**3.08** ***Hold the Existing Call and Pick Up the Call That is Held Waiting***—If the called station user flashes, the original party is put on hold and the called station will be connected to the calling station. If the called station user wishes to return to the original call, the called station user can flash, placing the call waiting party on hold and retrieving the original call. If the called station has the Call Hold feature, the called station can flash for dial tone and dial the call hold access code to place the existing call on hold and answering the waiting call. If the called station wishes to return to the original call, the called station must flash, receive dial tone, dial the call hold access code, and be connected to the original call.

**3.09** ***Hang Up on the Existing Call and Pick Up the Call Held Waiting***—After the called station receives the call waiting tone, the original call can be torn down by going on-hook.

The called station is then automatically rung back and upon answer is connected to the calling station.

**3.10 Ignore the Call Held Waiting and Continue With the Existing Call**—

The called station is given the call waiting tone once to indicate that a second call is held waiting. The called station user can ignore the second call and complete the original call. After the called station user completes the original call, and if the calling station is still held waiting, the called station is rung and upon answer, is connected to the call held waiting.

**3.11 Ignore the Held Waiting Call and Take Other Dialing Action**—

(Applies to stations with the Call Hold feature only)—After receiving the call waiting tone, the called station can flash and use the features Call Transfer—Individual or Call Transfer—Individual—All Calls (Section 232-190-301) in the normal manner. If the Call Hold feature is accessed, the call held waiting will not be ignored, but will be connected to the called station.

**4. SYSTEM OPERATION**

**4.01** The flow diagram illustrated in Figure 1 is a graphical representation of the centrex Call Waiting feature.

**Call Waiting—Originating (CWO)**

**4.02** When any centrex station, trunk, or attendant dials the call waiting—originating access code, the routine CWO-Dialed (CWO\_DLD) in the centrex call waiting program (CTXCWT) is given control. Routine (CWO\_DLD) insures that the dialing party is a centrex station that is allowed to dial the CWO access code. If the dialing party is allowed to access the CWO feature, bits are set in the transient call record (TCR) extension and in the originating register (OR) extension to indicate that the CWO access code has been dialed. Finally, the TCR is set up to collect the station digits of the station that the original centrex station wishes to call wait upon. When the station dialed is found to be busy, control is passed to the call waiting-originating (CW\_ORG) routine in CTXCWT. The CW\_ORG routine does the CWO traffic count, and then control is passed to the call waiting—begin (CW\_BEG) routine.

**Call Waiting—Terminating (CWT)**

**4.03** Whenever any incoming DID or CCSA call dials a busy centrex station and the centrex station has the Call Waiting—Terminating feature, control is passed to the call waiting—terminating (CW\_TERM) routine in the CTXCWT program. CW\_TERM pegs the call waiting—terminating traffic counter and passes control to the CW\_BEG routine.

**Call Waiting—Terminating—All Calls**

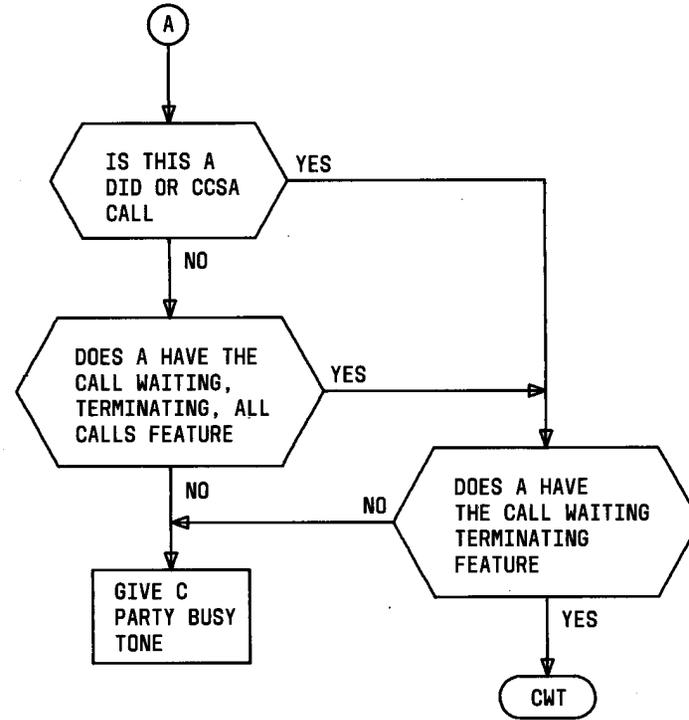
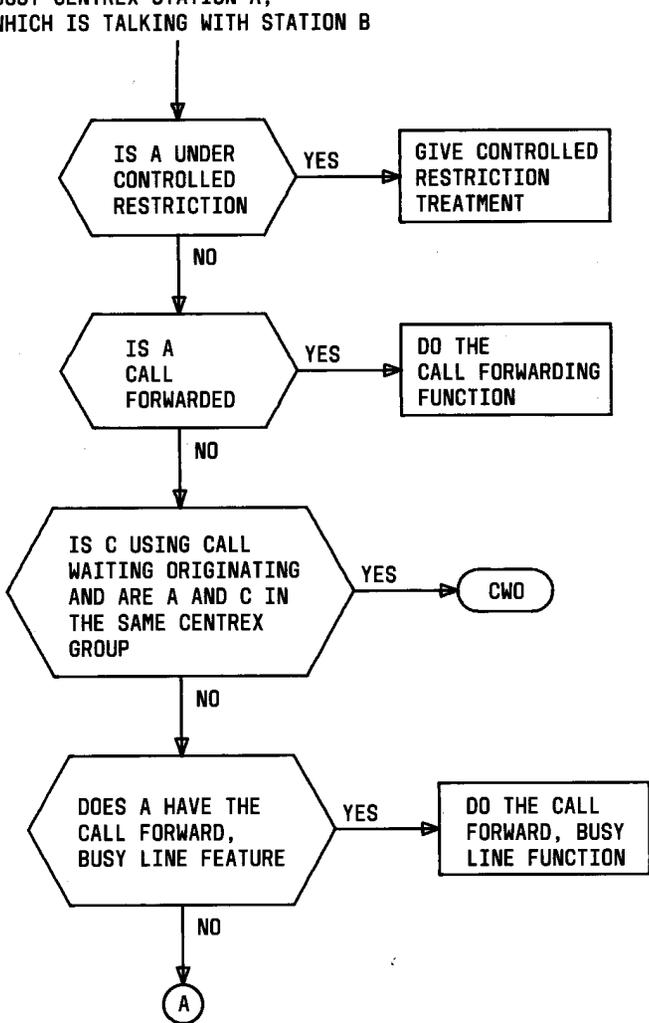
**4.04** Whenever any party dials a busy centrex station and the centrex station has the Call Waiting—Terminating—All Calls feature, control is passed to the CW\_TERM routine in the CTXCWT program. The CW\_TERM routine pegs the CWT traffic counter and passes control to the CW\_BEG routine.

**CW\_BEG Routine**

**4.05** The CW\_BEG routine is given control whenever a centrex call waiting configuration is to be set up. The routine begins by searching the stable information entries (SIEs) (see Figure 2) for an SIE associated with the centrex called station. If an SIE cannot be found, the calling party is given busy tone. If the SIE is found, a check is made to insure that neither end of the connection that call waiting is to take place upon is intended for data service. If either end is intended for data service, the calling party is given busy tone and the original connection is not affected. If the called centrex station does not have the Call Hold feature, control is passed to the CTX\_CW\_NO HOLD routine.

**4.06** A 3-port conference circuit is selected for centrex stations with the Call Hold feature. Once the 3-port conference circuit is selected, the calling party is connected to port 1 and audible ringing tone is returned to the calling party. The called party is given the call waiting tone for 100 milliseconds and the calling party connected to port 1 is configured to look exactly like a call held for the called centrex station. At this point, it is possible for the called party to use the Call Hold feature to answer the waiting call. The called party can flash and get conference dial tone; then, dial the call hold access code or the called station can go on-hook and be rung back.

CALLING PARTY C DIALS  
BUSY CENTREX STATION A,  
WHICH IS TALKING WITH STATION B



- A - CALLED PARTY (PARTY UPON WHICH CALL WAITING WILL TAKE PLACE).
- B - PARTY CONNECTED TO CALLED PARTY (ORIGINAL PARTY)
- C - CALLING PARTY
- DID - DIRECT INWARD DIALING
- CCSA - COMMON CONTROL SWITCHING ARRANGEMENT
- CWO - CALL WAITING ORIGINATING
- CWT - CALL WAITING TERMINATING
- SIE - STABLE INFORMATION ENTRY

Fig. 1—Feature Flow Diagram Centrex Call Waiting (Sheet 1 of 5)

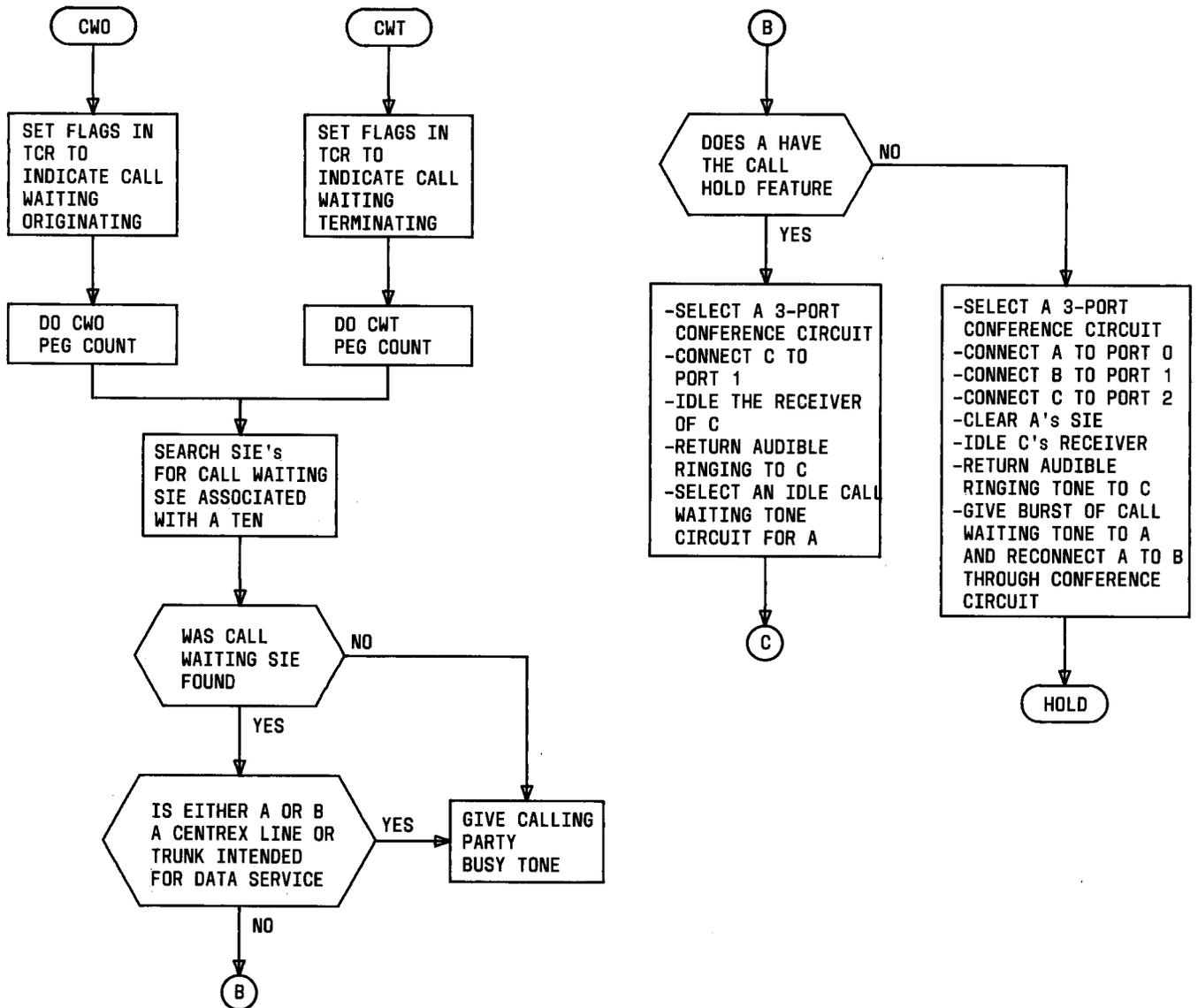


Fig. 1—Feature Flow Diagram Centrex Call Waiting (Sheet 2 of 5)

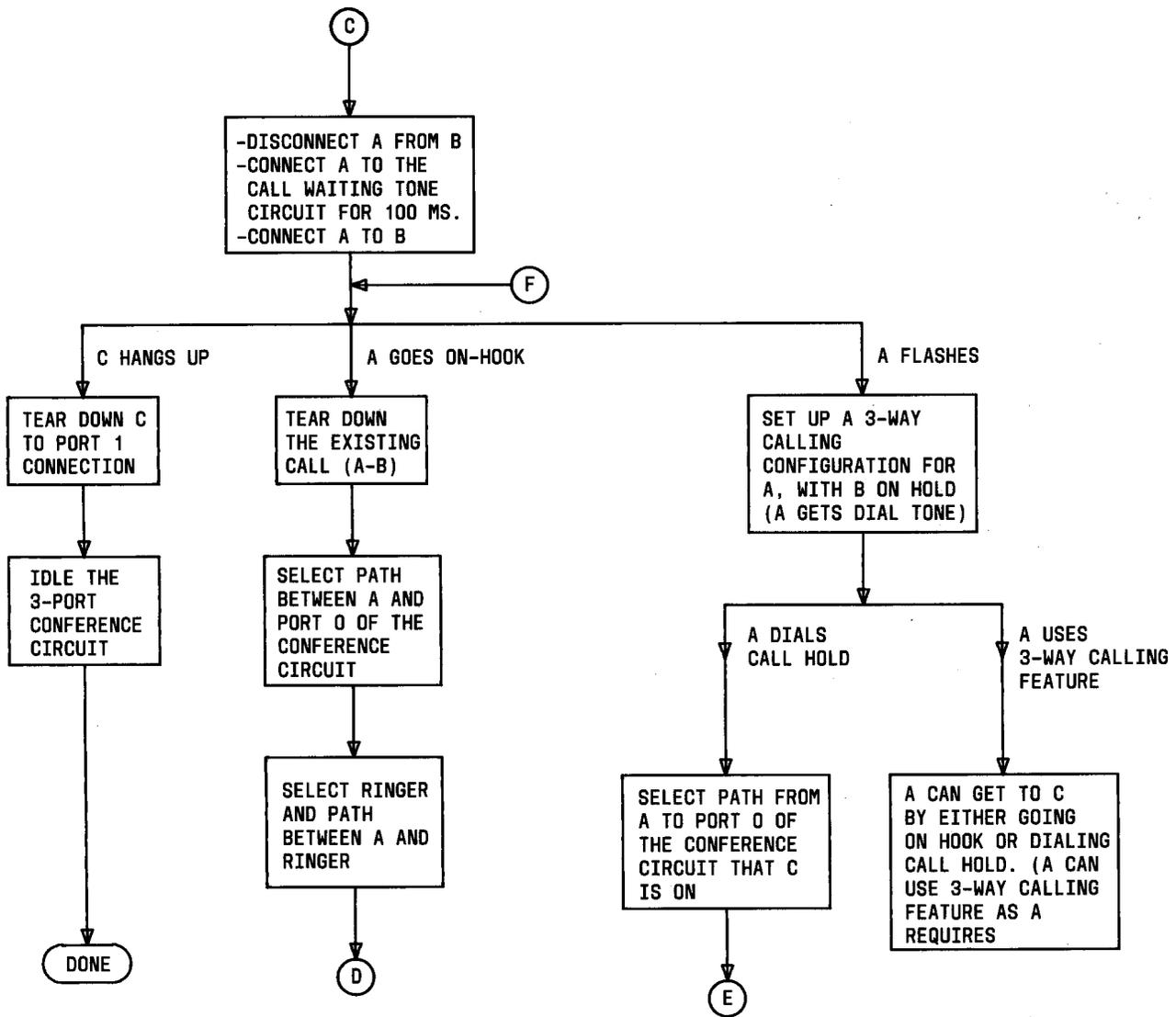


Fig. 1—Feature Flow Diagram Centrex Call Waiting (Sheet 3 of 5)

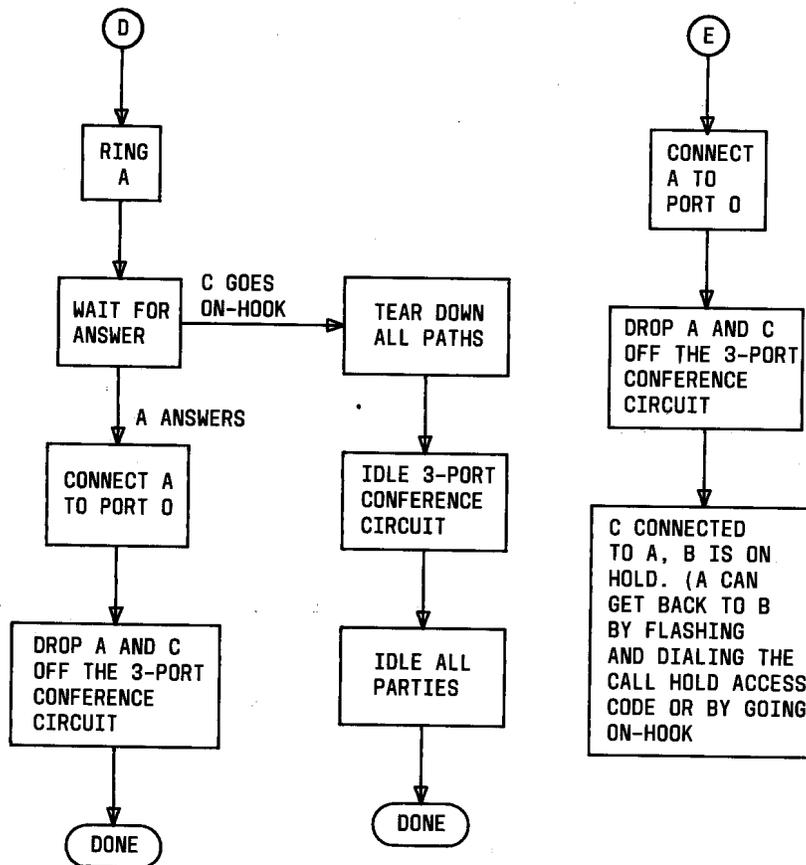


Fig. 1—Feature Flow Diagram Centrex Call Waiting (Sheet 4 of 5)

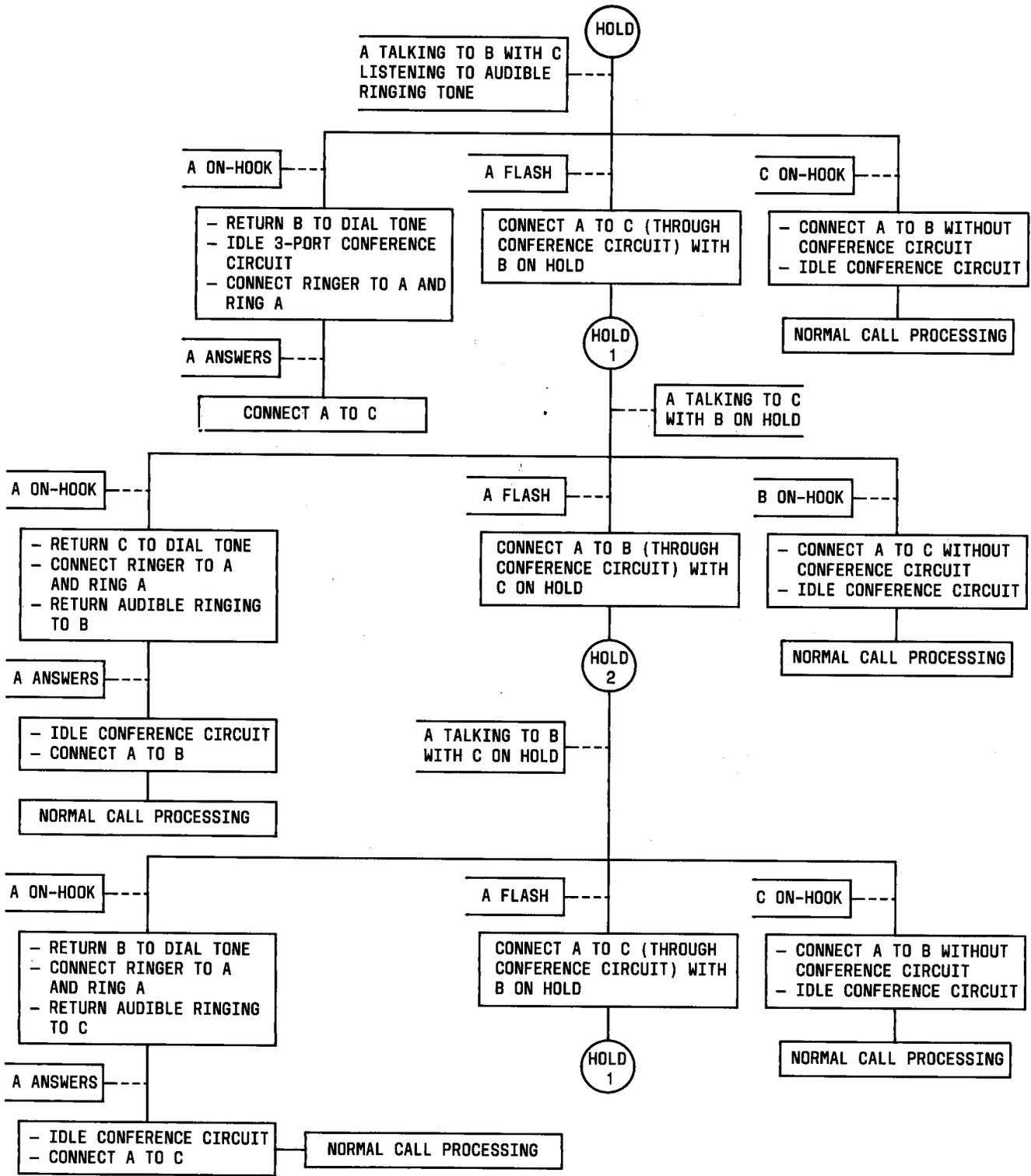


Fig. 1—Feature Flow Diagram Centrex Call Waiting (Sheet 5 of 5)

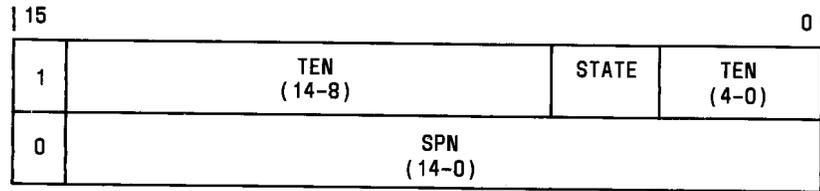


Fig. 2—Stable Information Entry

***CTX\_CW\_NO\_HOLD Routine***

**4.07** A 3-port conference circuit is used to implement call waiting for a centrex station without the Call Hold feature. Three parties may be connected to the circuit and the states of the call changed by changing states in the conference circuit. A split relay in each port isolates the party on the port from the other conferees when it is operated and bridges the party into the conference when released. A relay state on each port gives tone to the party directly from a conference port, eliminating the need for a connection to a tone circuit. Port 0 is used to return call waiting tone to the called station. The original station is connected to port 1 and the calling station is connected to port 2 and call waiting tone is applied to the called station.

**4.08** Call waiting tone to the controlling party lasts 100 milliseconds. After the controlling party has heard the call waiting tone and flashes, bridging to the calling party is accomplished by releasing the split relay in port 2 and operating the split relay in port 1. Each successive flash will cause the controlling party to be bridged to the party that was split.

**4.09** Call waiting is terminated by an on-hook from any of the involved parties. However, an on-hook from the called party with a party in a split state causes the called party to be rung. When the called party answers, the party that was split and the called parties are connected in a stable talking connection.

**CHARACTERISTICS****5. FEATURE ASSIGNMENT**

**5.01** Each station in a centrex group can be provided with one of the following call waiting options:

- No call waiting services.
- Call waiting—terminating incoming DID and CCSA calls only.
- Call waiting—terminating—all calls
- Call waiting—originating.
- Call waiting—terminating incoming DID and CCSA calls only and originating.
- Call waiting—terminating all calls and originating.

**5.02** Any centrex station or trunk can be provided with an option that denies the application of the call waiting tone to either end of the connection.

**6. LIMITATIONS**

**6.01** The Call Waiting feature is denied to any station involved in a call that has a predefined meaning. When call waiting is denied, the calling station receives busy tone. These stations are as follows:

- Stations that are connected to a Bell System operator.

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- Stations connected to universal attendant consoles.
- Stations participating in universal attendant 6-port conference calls.
- Stations that are controllers in 3-port or dialed 6-port conference calls.
- Stations that are in process of dialing.
- Stations that are listening to a call progress tone, ie, dial tone, busy tone, reorder tone, intercept tone, recorded announcement, and audible ring. However, if the station is making a free call over an outgoing trunk and is receiving audible ring, call waiting will not be denied.
- The station has been entered on the High and Dry list.

**6.02** The Call Waiting feature is also denied in cases where it would be confusing to the station user or when it would be ambiguous.

These cases are as follows:

- Stations that have calls held.
- The station has a call held waiting.
- The station is controlled terminating restricted (calling station receives controlled terminating treatment).
- The station is fully terminating restricted (calls from stations in the centrex group are completed in the normal manner and could possibly cause call waiting to be invoked. However, calls from outside the centrex group will be given centrex dialing error treatment).
- The station has the Do Not Disturb feature in effect. (Calling station user receives do not disturb treatment.)
- The station has the data line restriction.
- The station is connected to a line or centrex trunk that has the data line restriction.

## 7. INTERACTIONS

**7.01** The Call Waiting—Originating and Call Waiting—Terminating features interactions with other No. 2 ESS centrex features are described as follows:

- A busy verification attempt to a station with call waiting—terminating will not wait upon the station, but will be completed in the normal manner.
- A busy verify connection to a station with a call held waiting will be completed in the normal manner.

• The Call Waiting—Terminating and Call Forwarding—Busy Line features should not be provided to the same centrex station. The use of both features would be ambiguous. However, if both features are provided, the Call Forwarding—Busy Line feature takes precedence over call waiting. If a “forward-to” station is busy and is not provided with the Call Forwarding—Busy Line feature, the original called station will receive the call waiting treatment, if it has the Call Waiting—Terminating feature. If the “forward-to” station is idle, it is rung, even though original called station is busy and has call waiting—terminating.

- When a called station has the Call Forwarding—Variable feature activated, operation of the call waiting—originating towards the “forwarded to” station depends on whether or not the Call Waiting feature would operate if the station user had dialed the “forwarded-to” station directly.
- If a centrex station with the Call Waiting—Originating feature dials another centrex station that has the Call Forwarding—Busy Line feature, call waiting treatment will be given to the called station. If call waiting is denied, busy tone is returned to the calling station.
- When a called station with the Call Forwarding—Don't Answer feature does not answer within the specified time period, the call is routed to the “forwarded-to” station. If the “forwarded-to” station is busy, the call waiting treatment is not given

and the original called station continues to ring.

- The features Call Pickup, Code Call Pickup, and Trunk Answer Any Station cannot be accessed from a station with a call held waiting.
- Centrex stations with the Call Waiting—Terminating feature can be camped-on and receive camp-on treatment.
- If the station is part of a Flexible Station Hunt (FSH) group, and all lines in the FSH group are busy, the Call Waiting feature will be applied to the original station hunted.

## 8. RESTRICTION CAPABILITY

**8.01** The following station types are not permitted to have the Call Waiting feature:

- Key telephone sets whose release times are less than about 150 milliseconds cannot use call waiting unless open switching interval protection (OSIP) is provided (see Section 232-190-206).

**8.02** There is no limit on the number of stations having the centrex Call Waiting feature. However, the number of stations with call waiting in progress at any one time is limited to the number of available stable information entries (SIE) and 3-port conference circuits. An office equipped with the EF-2 generic program is limited to 8192 SIEs.

**8.03** The option to provide silence to calls in the waiting mode can only be assigned on a centrex group basis with all members having the feature.

## INCORPORATION INTO SYSTEM

### 9. COST FACTORS

#### Program or Data Related

**9.01 Generic Program:** Call waiting requires approximately 400 words.

**9.02 Translation Memory:** Three bits per line in the Centrex Line Translation.

**9.03 Call Store:** Each line with the Call Waiting feature uses an SIE while involved in a talking connection and a permanent call register while a call is held waiting. Additional information on call store engineering of the Call Waiting feature may be found in Network Design Practice Section 232-060-842 Call Store Worksheets.

#### Hardware Related

**9.04** Additional cost includes ordering of SD-2H137-01 (J2H018DN) 3-port conference circuits to accommodate the anticipated number of call waiting calls. The TOC for the SD-2H137-01 circuit is 63300. This circuit requires 4 inches of mounting space per each circuit. Also, a tone circuit SD-2H118-01 (J2H018) will be required. The TOC for the SD-2H118-01 circuit is 61400. This circuit requires 2 inches of mounting space per each circuit. The tone circuit is required for the type of call waiting that applies to a centrex station with call hold.

**9.05** The procedure for engineering the SD-2H137-01 and the SD-2H118-01 circuits is included in the Network Design Practices Section 232-060-820 Service Circuit Worksheets.

### 10. DATA ASSIGNMENTS AND RECORDS

**10.01** Figures 3 and 4 illustrate the line translation layout for stations with the Call Waiting feature.

**10.02** In order to incorporate the Call Waiting feature in a No. 2 ESS office, an office data administration (ODA) run can be utilized. When an ODA run is needed, the following input forms should be prepared and submitted to the WECO Regional Center. Normal scheduling procedures should be observed in preparing these input forms.

- **ESS 2101 - Centrex Directory Number Table**—This form is used to define the directory numbers associated with the centrex Call Waiting feature. In addition, this form is used to assign OSIP and the associated PD point to a particular line.

- **ESS 2107 - Supplementary Information Table**—This form is used by the Dial Administrator to provide additional information for directory numbers, supplementing data entered on ESS 2101.

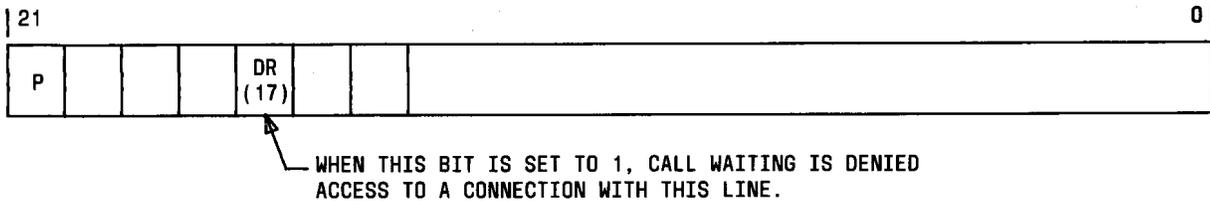


Fig. 3—Word 3 of Centrex Line 6-Word Expansion

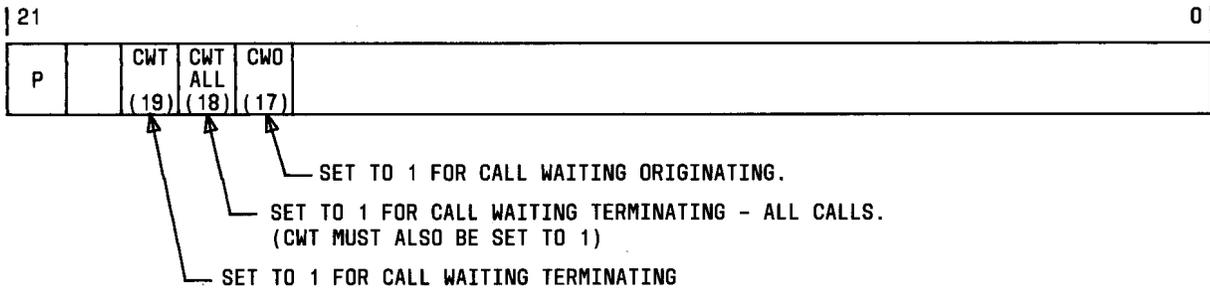


Fig. 4—Word 4 of Centrex Line 6-Word Expansion

- **ESS 2109 - Centrex Group Table**—This form is used to build portions of the centrex number translators.

10.03 For additional information and copies of reproducible forms, see Division 11, Section 1, of the Translation Guide, TG-2H.

10.04 The **A RC:L** message and the keywords **CWT** for call waiting—terminating, **CWTA** for call waiting—terminating—all calls, and **CWOR** for call waiting—originating are used with either **ADD** or **DLT** to assign or delete this feature for a customer line.

11. **HARDWARE RESTRICTIONS**

11.01 There are no hardware restrictions that apply to the feature described in this document.

12. **INSTALLATION/ADDITION/DELETION**

12.01 The centrex Call Waiting feature may be implemented into any No. 2 ESS office equipped with the EF-2 generic program by using a recent change input message or an ODA run to assign the feature to centrex stations.

13. **TESTING**

13.01 No special testing is required for this feature other than placement of test calls to verify that the centrex Call Waiting feature is operating correctly.

14. **OTHER PLANNING TOPICS**

14.01 The centrex Call Waiting feature is provided as part of the EF-2 generic program in the No. 2 ESS.

14.02 When planning for the Call Waiting feature, completion of the appropriate translation guide forms is required to indicate whether or not a line is allowed the Call Waiting feature. In addition, an appropriate number of 3-port conference circuits (SD-2H137-01) and tone circuits (SD-2H118-01) must be planned for in order to implement the Call Waiting feature. Refer to 9.04 for ordering details of these circuits.

**ADMINISTRATION**

15. **MEASUREMENTS**

15.01 The following traffic measurements are available for the centrex Call Waiting

feature. Refer to Section 232-120-301 for additional details.

- CXD 5 Peg count of the number of call waiting—terminating—all calls attempted.
- CXD 4 Peg count of the number of call waiting—originating calls attempted.

## 16. CHARGING

16.01 There are no special charging requirements for the Call Waiting feature.

### *SUPPLEMENTARY INFORMATION*

## 17. GLOSSARY

17.01 For definitions of all nonstandard or ambiguous acronyms, abbreviations, and terms used in this document, see Section 232-190-003.

## 18. REFERENCES

18.01 The following documents may be referred to for supplementary information concerning the centrex Call Waiting feature.

- Section 232-103-101, Call Processing Description, No. 2 Electronic Switching Systems

- Section 232-118-102, Recent Change Procedures (Central Office Changes) LO-1
- Section 232-118-103, Recent Change Procedures (Central Office Changes) EF-1
- Section 232-120-301, Traffic and Plant Measurements, 2-Wire, No. 2 Electronic Switching Systems
- Section 232-190-107 Call Waiting (Noncentrex), No. 2 Electronic Switching System
- IM-2H200-1 Input Message Manual
- OM-2H200-1 Output Message Manual
- PA-2H204 No. 2 Electronic Switching System Office Assembler and Translations Program
- PA-2H205 No. 2B Electronic Switching System Office Data Assembler and Translations Program
- Traffic Facilities Practices, Division D
- Translation Guide, TG-2H
- Network Design Practices Sections 232-060-820 Service Circuit Worksheets; 232-060-842 Call Store Worksheets