

CALL HOLD
CENTREX
NO. 2 ELECTRONIC SWITCHING SYSTEM

CONTENTS	PAGE	CONTENTS	PAGE
FEATURE DEFINITION AND DESCRIPTION			
1. DEFINITION	3	12. COMPATIBILITY	8
2. DESCRIPTION	3	13. OFFICE DATA	8
3. FEATURE FLOW DIAGRAM	4	14. GROWTH/RETROFIT PROCEDURES	9
4. INTERACTIONS	4	15. TESTING	10
ATTRIBUTES		ADMINISTRATION	10
5. STATION/SYSTEM	5	16. MEASUREMENTS	10
6. LIMITATIONS	5	17. RECORD KEEPING	10
7. RESTRICTION CAPABILITY	8	18. CHARGING	10
8. COST DATA	8	AVAILABILITY	10
INCORPORATION INTO SYSTEM		19. NEW INSTALLATIONS	10
9. PLANNING	8	20. GROWTH/RETROFIT	10
10. HARDWARE ENGINEERING	8	SUPPLEMENTARY INFORMATION	11
11. SOFTWARE ENGINEERING	8	21. GLOSSARY	11
		22. REASONS FOR REISSUE	11
		23. REFERENCES	11

NOTICE

Not for use or disclosure outside the
Bell System except under written agreement

Printed in U.S.A.

5
1
e
01
1
ab

FIGURES

PAGE

Fig. 1—Centrex Scatter Table Entry
Formats 5

Fig. 2—Call Hold Flow Diagram 6

Fig. 3—Digit Interpreter Table Expansion
. 9

Fig. 4—Originating/Terminating 4- or
6-Word Translator 10

ti
d
c
t
ie
ho
l
pr
rie
-ho

w
sta
tea

ress
of a
x dia
has
be
that
eorig
Thre

Pe

FEATURE DEFINITION AND DESCRIPTION

1. DEFINITION

1.01 The **Call Hold** feature allows a centrex station user to place any established call on "hold" by flashing the switchhook and then dialing a call hold access code, thereby freeing the station for the purpose of originating another call or returning to a previously held or camped-on call. Only one call per station may be held at a time. The first held call cannot be added to the second call.

1.02 In a No. 2 Electronic Switching System (ESS), the Call Hold feature is optionally available to centrex customers on a per-station basis. This feature provides the station user an added flexibility of placing one party on hold while conversing in private with a second party. If the originating party hangs up while having a party on hold, the No. 2 ESS rings the originating party back. However, if the held party hangs up, the connection involving only the held party is taken down.

1.03 Call hold may be implemented in a No. 2 ESS either by recent change or by an office data administration (ODA) run. An ODA run is required only when additional 3-port conference circuits are required; otherwise, recent change (RC) messages as defined in OFFICE DATA are used. The 3-port conference circuit SD-2H137, J2H018DN, is used in implementing call hold. In addition, each No. 2 ESS must be equipped with the EF-1 (extended feature) generic program.

2. DESCRIPTION

A. Customer (User) Perspective

2.01 A centrex station equipped with the Call Hold feature initiates hold in the following manner:

- From an existing talking connection (party A to party B), the station user (party A) flashes the switchhook, receives conference dial tone, and then dials the call hold access code of one to four digits. This places the called party (party B) on hold.
- After dialing the call hold access code, the originator (party A) receives a second dial

tone. At this time, the originator dials a new party (party C) or certain other custom calling features to which the originator is permitted access (e.g., call pickup, speed calling, etc.). Refer to the INTERACTIONS paragraph for those features that interact with call hold.

- When the originator finishes the conversation with party C, or any other party that has been reached through the dialing of a custom calling feature, and both parties go on-hook they are disconnected. The originator of the call hold (party A) is then automatically rung back and upon answer is connected to the held party (party B). This assumes that party B is still off-hook and waiting.
- While connected to party C, the originator may flash the switchhook, receive conference dial tone, and dial the call hold access code for a second time. This action places party C on hold and reconnects the originator to party B in a talking connection. The originator may repeat this alternating call hold process between parties B and C but can *never* talk to both simultaneously in a 3-way connection.

2.02 In the preceding example, when the station user with a call on hold times out of dial tone, that station is connected to a circuit junctor and given silence. The station remains in this state indefinitely, or until the station user retrieves the held call, or until the held party goes on-hook. Similarly, when a station user with a held call times out of a tone, such as busy tone or reorder, silence is provided until the station user retrieves the held call or until the held party goes on-hook.

2.03 If a call is camped-on to a station when the station dials the call hold code, the station user is connected to the camped-on call instead of receiving second dial tone.

2.04 If a station user has a call in progress and dials an unassigned code instead of a call hold access code, the user receives centrex dialing error treatment. Since the original call has not been placed on hold, the user will not be rung back after going on-hook. To recover that call, the user would have to hang up and reoriginate the call. However, if the controller has Threeway

the controller can flash twice and retrieve held call.

If a station user dials a call hold code from an idle state inadvertently, the user receives reorder tone (fast busy).

2. System Implementation

Call Hold Origination

2.06 If a centrex station has an established stable call and has the Call Hold feature, the station user can flash the switchhook, get conference dial tone, and dial the call hold access code.

2.07 When the dialed access code is recognized as a call hold code by the centrex digit interpretation routine, the DLDHLD branch of the centrex custom calling (CTXCC) program checks the station's centrex scatter table entry (CSTE). The CSTE is used to keep track of the state of the station that originated the Call Hold feature. Its function is to allow two transient call records (TCRs), processing two separate calls, to communicate with each other. Refer to Figure 1 for a layout of the CSTE format used for Call Hold and Attendant Camp-on features. The Attendant Camp-on feature is described in another feature document (Section 232-190-302) and is not discussed in this document.

2.08 The CSTE with a high bit (bit 15) equal to 1 in word 0 (refer to Figure 1) indicates that a station is involved in a call. Word 1 of the CSTE may have any one of the configurations shown in Figure 1. For example, when bits (15-14) are set to "00", the station has no previously held call or a camp-on call. When a station has a held call, or is camped-on, the code is changed to "01" in word 1. (In addition to the codes indicating the state of a station, the CSTE entries also include the scan point number (SPN) or pseudo scan point number (PSPN) of the circuit to which the station is connected.)

2.09 The reserved path from the station to port 0 of the 3-port conference circuit is idled and the HLDMON progress mark is written into the permanent call record (PCR) that monitors the status of the held call. HLDMON also monitors the station's CSTE every half second to determine if the station has gone on-hook or has flashed and dialed the call hold access code again to retrieve

the held call. If the station has gone on-hook, it is rung back. If the station user flashes and dials the call hold access code, the second call goes on hold while the station is connected to the first call.

2.10 After the station has dialed the call hold access code, the station is given dial tone and can dial a completely independent call, that is, anything that the station could normally dial. The only link between the originating station and the held call is the station's CSTE.

Call Hold Retrieval

2.11 When the station with a held call goes on-hook, that station's CSTE is placed into the retrieve on-hook state. HLDMON discovers the change in state and selects a talking path from port 0 to the station and a ringer. The ringer is connected to the station and audible ring is turned on for the party on port 1 of the conference circuit. Upon answer, the station is disconnected from the ringer, connected to port 0, and audible ring is removed from port 1. The conference circuit is dropped and the two parties are placed in a 2-way connection.

2.12 Instead of going on-hook from the second call, the originating station may wish to put the second call on hold and go back to the first call. To accomplish this, the station user flashes the switchhook and dials the call hold access code. The station's CSTE is placed into the retrieve off-hook state. HLDMON discovers the change in state and disconnects the station from the receiver and connects the station to port 0 of the first call's 3-port conference circuit. The two parties on this 3-port circuit then drop off and go to a 2-way connection. In the meantime, the reserved path is idled from the station to port 0 of the second call's 3-port conference circuit. The second call is now on hold. This process may be repeated whenever the station user wishes to hold one call and go back to the other.

3. FEATURE FLOW DIAGRAM

3.01 The feature flow diagram for the Call Hold feature is shown in Figure 2.

4. INTERACTIONS

4.01 A centrex station that has a held call cannot be camped-on; however, a station user can

SCATTER TABLE NORMAL ENTRY STATES												
15										0	ESS BIT POS	
W0	1 (15)	TEN (14-0)										
W1	SEE DESCRIPTION BELOW (15-0)											
W1 STATES												
15										0		
	0 (15)	0 (14)	SPN/PSPN (13-0)								NO HELD CALL OR CAMP-ON	
15										0		
	0 (15)	1 (14)	SPN/PSPN (13-0)								HAS HELD CALL OR IS CAMPED ON OR CALL RETRIEVED SIGNAL	
15										0		
	1 (15)	1 (14)	SPN/PSPN (13-0)								MAY NOT BE CAMPED ON	
ATTENTION STATES												
15										0		
	1 (15)	0 (14)	0 (13)	0 (12)	0 (11)	0 (10)	CDPR NO. (9-0)				RETRIEVE STATE, OFF HK	
15										0		
	1 (15)	0 (14)	0 (13)	1 (12)	DON'T CARE (11-0)						RETRIEVE STATE, ON HK	
15										0		
	1 (15)	0 (14)	1 (13)	DON'T CARE (12-0)							NOT RETRIEVED OR RELEASE HOLD/CAMP-ON FOR POB FAILURE, W(0)=1000000000000000	

Fig. 1—Centrex Scatter Table Entry Formats

pick up a camped-on call by using the call hold access code.

4.02 Call forward activate and deactivate are not permitted with a call on hold.

4.03 Call transfer of a held call is not allowed.

4.04 Call forward—don't answer does not apply to ring back on call hold.

ATTRIBUTES

5. STATION/SYSTEM

5.01 The Call Hold feature is provided to centrex customers on a per-station basis.

6. LIMITATIONS

6.01 Total number of 3-port conference circuits in a No. 2 ESS is limited to 256 with the EF-1 generic program. This limitation must be considered during traffic engineering of call hold.

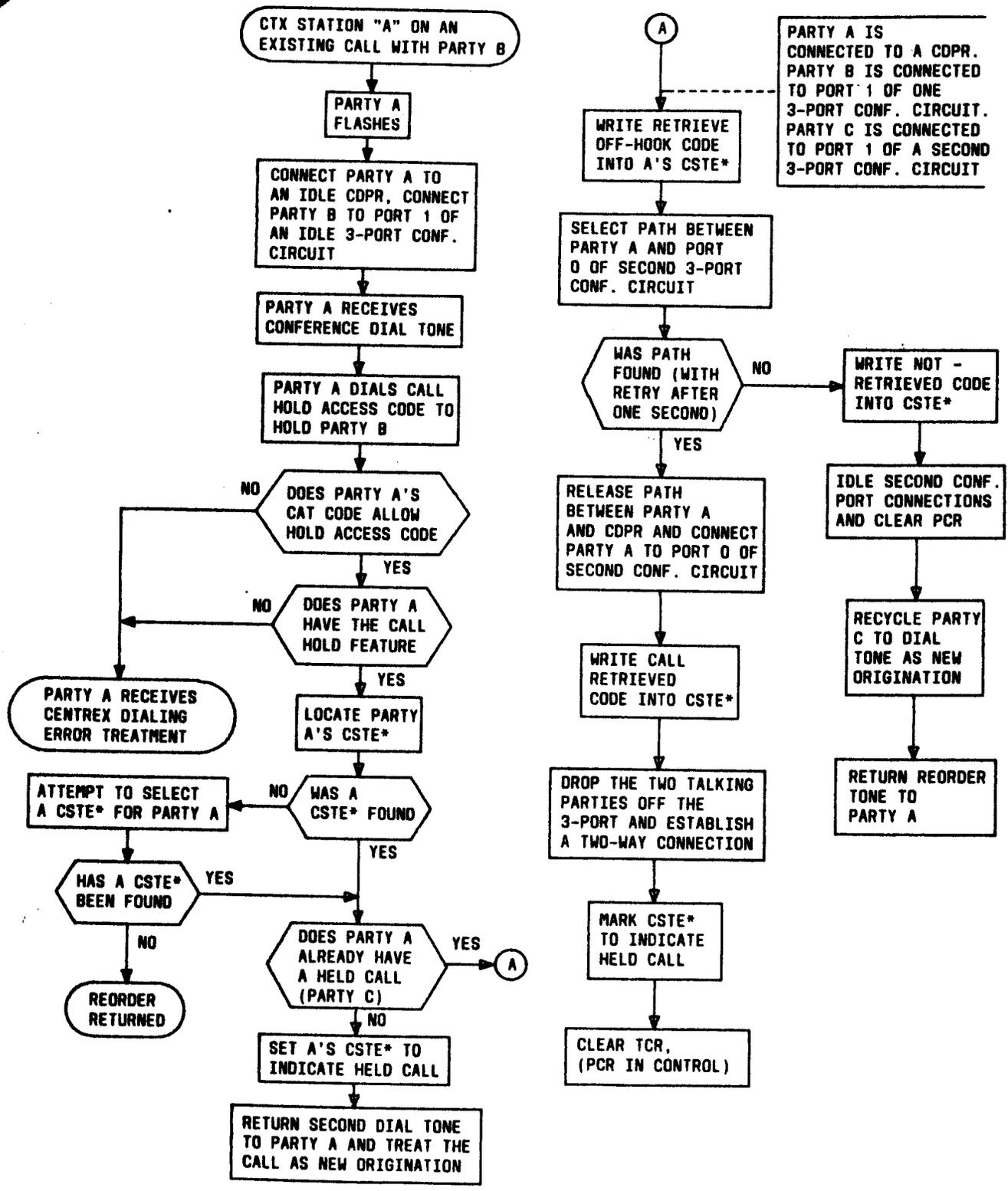
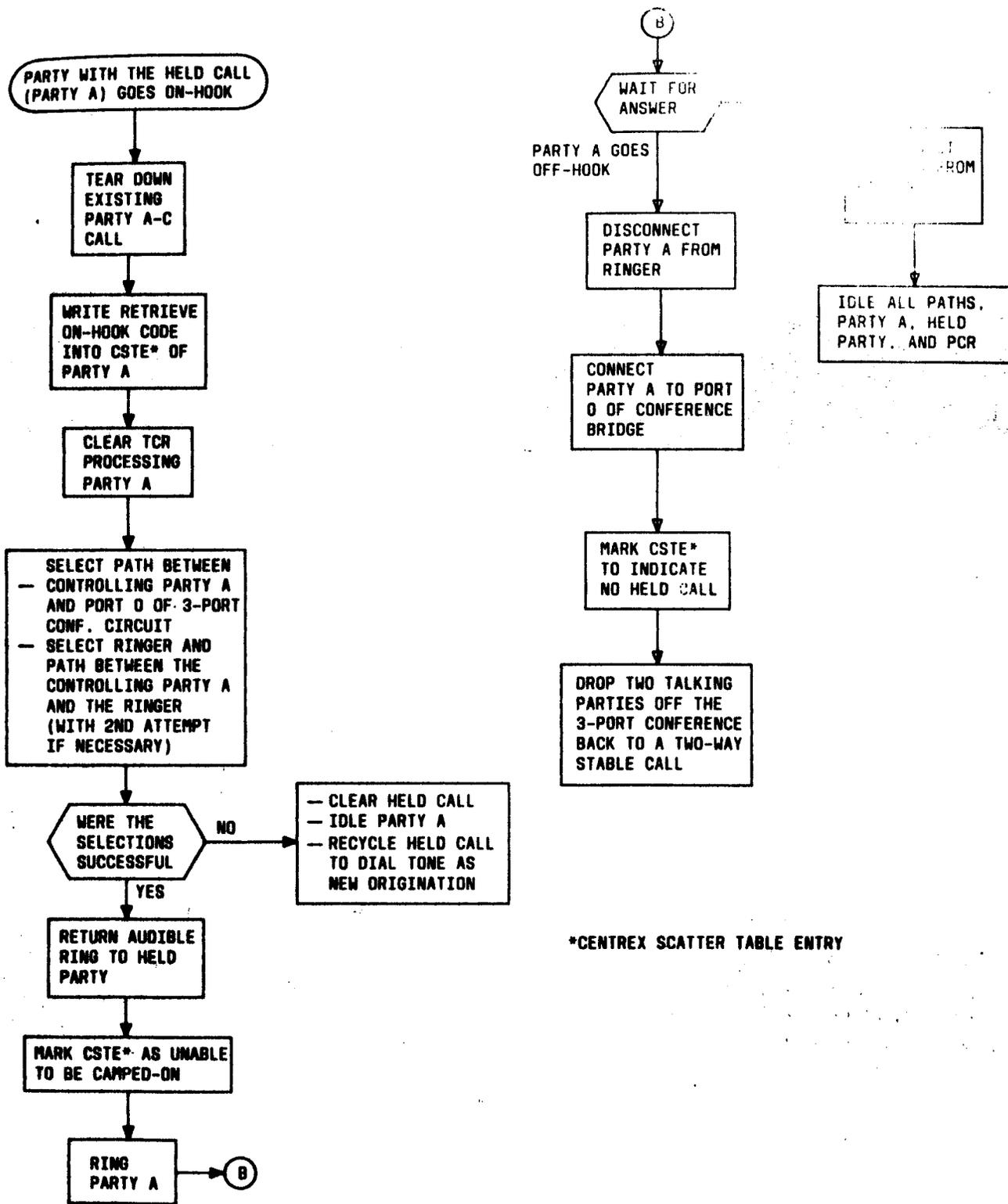


Fig. 2—Call Hold Flow Diagram (Sheet 1 of 2)



*CENTREX SCATTER TABLE ENTRY

Fig. 2—Call Hold Flow Diagram (Sheet 2 of 2)

An additional limitation is imposed on call hold by the number of available centrex scatter table entries. The No. 2 ESS with EF-1 generic is limited to two tables. The 2B-EF-1 generic is limited to four tables. Each centrex scatter table has 520 two-word centrex scatter table entries.

RESTRICTION CAPABILITY

7.01 A bit in the centrex station's line translations is used to restrict the Call Hold feature on a per-line basis.

8. COST DATA

8.01 Implementation of the Call Hold feature requires one bit in the line translation to define call hold for a line.

8.02 Each held call requires a minimum of two words of call store for the associated scatter table entries.

8.03 Special service code must be defined in the digit interpreter table to allow call hold access.

8.04 Sufficient number of SD-2H137 must be engineered to incorporate call hold.

INCORPORATION INTO SYSTEM

9. PLANNING

9.01 The Call Hold feature is provided to centrex customers as part of the EF-1 generic program in a No. 2 ESS.

9.02 In planning for this feature, completion of the 2101 and 2109 translation input forms is required to indicate whether or not each station in a centrex group is allowed call hold. Specification of the call hold access code is also made on these forms.

9.03 An appropriate number of SD-2H137 circuits must be traffic engineered to incorporate the Call Hold feature.

10. HARDWARE ENGINEERING

10.01 Ordering of SD-2H137 circuits (J2H018DN), to accommodate the anticipated number of

call hold calls is required. The circuit trunk order code (TOC) is 63300. The procedures for engineering the appropriate number of SD-2H137 circuits is included in Network Design Section 232-060-816 Centrex Worksheets

11. SOFTWARE ENGINEERING

11.01 The procedures for the engineering of the software for the Call Hold feature are outlined in Network Design Sections 232-060-840 Program Store/Main Store Worksheets and 232-060-842 Call Store Worksheets.

12. COMPATIBILITY

12.01 There are no compatibility or equipment interface problems associated with the Call Hold feature.

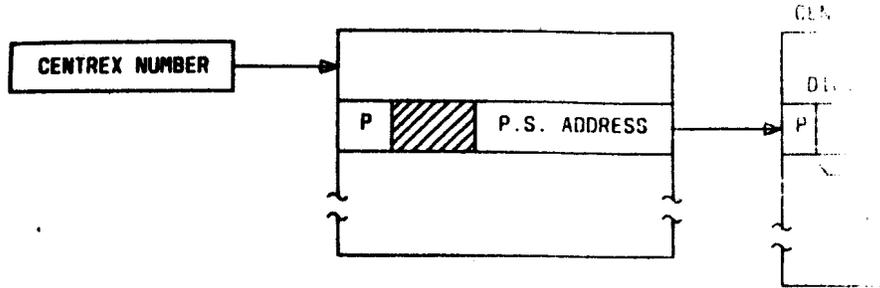
13. OFFICE DATA

A. Translations

13.01 The translators affected by the addition of the Call Hold feature include the centrex digit interpreter table and the centrex originating/terminating 4- or 6-word expansion translator. Figures 3 and 4 depict these translator layouts.

13.02 In order to activate the Call Hold feature in a No. 2 ESS, an ODA run may be made. This is accomplished by appropriately completing the following ODA ESS input forms:

- **ESS 2101**—Centrex Directory Number Table—This form is used to define the centrex directory numbers that may have the Call Hold feature. Division 4, Section 1 of the Translation Guide, TG-2H specifies the appropriate column numbers and associated feature abbreviations and numerical values assigned to the Call Hold feature.
- **ESS 2109**—Centrex Group Table—This form is used to build portions of the centrex number translator which identifies the feature options for all lines associated with a specific centrex group. Form code 9B of this table specifies the data type and sub type that are required to identify the Call Hold feature. Data type 10, sub type 06 is used for call hold.



DIGIT INTERPRETER TABLE EXP.
SPECIAL SERVICES ACCESS

P (21)	1010 (20-17)	RESTRICTION CODE (15-0)
P (21)	SSC (3-0)	

SSC - SPECIAL SERVICE CODE
 SSC = 0110 - INDICATES CALL HOLD ACCESS CODE
 RESTRICTION CODE-SHOULD EQUAL ALL ONE'S.

Fig. 3—Digit Interpreter Table Expansion

13.03 The preceding forms must be completed by the Telephone Company Network Administration and submitted to WECO Regional Center for processing. Normal scheduling procedures should be observed. The reproducible ESS input forms are in Division 11, Section 1 of the TG-2H.

B. Recent Change (RC) Messages

13.04 The A RC:L/ message with the keyword CHD ADD/ is used to add the Call Hold feature to an existing centrex station. To remove the Call Hold feature from an existing centrex station, the RC message A RC:L/ with the keyword CHD DLT/ is used.

13.05 The A RC:DIT/ message is used to add call hold terminal entry to the dialing tree.

13.06 The A VY:L/ message is the verify message for customer line originating and terminating translations. The use of this message and the keyword CHD verifies whether or not a centrex station has call hold.

13.07 The A VY:DIT/ message is used to verify that a call hold terminal entry has been properly defined in the dialing tree.

13.08 For more details on the RC messages, refer to the Input/Output Message Manuals (IM/OM-2H200) for the No. 2 ESS.

14. GROWTH/RETROFIT PROCEDURES

14.01 The Call Hold feature may be added to any centrex station by either an ODA run or RC message. Refer to OFFICE DATA for the proper ODA input forms and the RC messages.

14.02 The definition of the call hold access code in the digit interpreter tables may be made for any centrex station by either an ODA run or RC message. Refer to OFFICE DATA for the proper ODA input forms and the RC messages.

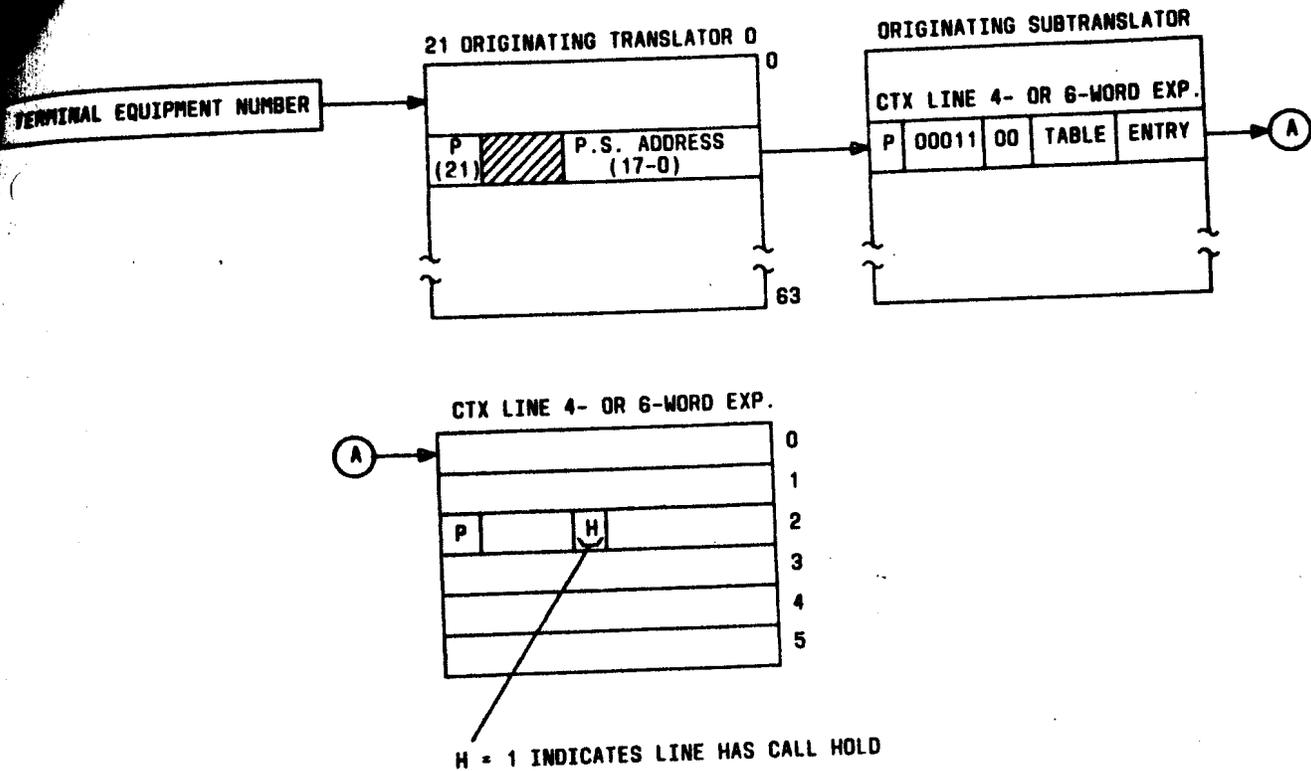


Fig. 4—Originating/Terminating 4- or 6-Word Translator

15. TESTING

15.01 No special tests are required. A verify message specified in OFFICE DATA may be used to determine if call hold has been properly defined in the translations for a specific centrex station. An additional test may be made by making a test call to a centrex station and then placing that call on hold as described in the Customer Perspective paragraph.

ADMINISTRATION

16. MEASUREMENTS

16.01 A peg count of the number of calls that are held by the use of the Call Hold feature is measured by the register CTX12.

17. RECORD KEEPING

17.01 A record of all RC messages and ODA output records where applicable should be maintained.

18. CHARGING

18.01 No automatic message accounting (AMA) recording is done for the Call Hold feature.

AVAILABILITY

19. NEW INSTALLATIONS

19.01 The Call Hold feature is available with the EF-1 (extended feature) generic program as part of the centrex offering.

20. GROWTH/RETROFIT

20.01 The Call Hold feature may be implemented in any No. 2 ESS office having the EF-1 generic program. Refer to OFFICE DATA for the required RC messages and ODA input forms.

SUPPLEMENTARY INFORMATION**21. GLOSSARY**

21.01 The following list defines acronyms and abbreviations that are peculiar to this feature. For definition of other terms, refer to Section 232-190-003, Glossary of Terms, No. 2 ESS.

- **CSTE**—Centrex Scatter Table Entry—an area in the call store of a No. 2 ESS that stores data associated with a centrex station while involved in a call.

22. REASONS FOR REISSUE

22.01 This document is being reissued as Issue B to reflect a change that was made in the EF-1 generic program that allows a held call to be retrieved after time-out of tone (i.e., dial tone, busy, reorder, etc.).

23. REFERENCES

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

- **SD-2H137**—3-Port Conference Circuit
- **PD-2H303-01**—Centrex Custom Calling Program (CTXCC)
- **Translation Guide, TG-2H**
- **IM-2H200**—Input Message Manual No. 2 ESS
- **OM-2H200**—Output Message Manual No. 2 ESS
- **PA-2H2XX**—Office Data Tables Layout Specification
- **Network Design Series 232-060-XXX**
- **Section 232-120-301**—Traffic and Plant Measurements, No. 2 ESS
- **Section 232-190-302**—Attendant Camp-on and Indication of Camp-on, No. 2 ESS.

CALL HOLD
CENTREX
NO. 2 ELECTRONIC SWITCHING SYSTEM

Comments concerning content, usability, and adequacy of this feature document will be welcomed. This sheet may be removed and mailed directly to Bell System Practices Organization.