FEATURE DOCUMENT
CALL FORWARDING
(NONCENTREX)
NO. 2 ELECTRONIC SWITCHING SYSTEM

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FIGURES PAGE

TABLES

FEATURE DEFINITION AND DESCRIPTION

1. DEFINITION

1.01 Call forwarding (noncentrex) is an arrangement that allows a local office customer to redirect calls intended for his telephone to another telephone. The customer initiates call forwarding by dialing the call forward activate code followed by the abbreviated number and the directory number to which calls are to be forwarded. The customer cancels call forwarding by dialing the call forward cancel code.

1.02 The call forwarding feature is available in any No. 2 Electronic Switching System (ESS) office which has been equipped with the EF-1 or LO-1 generic programs.

1.03 No special equipment is required to implement this feature.

1.04 This feature document only describes call forwarding for a noncentrex customer. Centrex call forwarding is described in Section 232-190-308.

2. DESCRIPTION

A. Customer (User) Perspective

2.01 To activate the call forwarding feature, the customer using a TOUCH-TONE® instrument supplied with the sharp (#) button, dials the digits 72 plus the sharp sign (#). If the customer is using a dial-type or TOUCH-TONE instrument without the sharp button, the digits 72 are dialed and a 4-second time-out is used in lieu of the sharp sign. The 4-second time-out signifies the completion of the access code for call forwarding.

2.02 After completion of the access code, the customer receives a second dial tone and dials the directory number to which calls are to be forwarded. If the "forward-to" number is answered, call forwarding is activated.

2.03 If the "forward-to" number does not answer, the customer can activate the transfer by redialing the call forward activate code and the same directory number within two minutes. On the second attempt, confirmation tone is returned to the customer indicating that call forwarding is activated.

2.04 When a customer has the call forwarding feature activated and receives a call, a short ring is given to indicate that a call has been received and forwarded.

2.05 To deactivate call forwarding, the customer dials a cancellation code consisting of the digits 73 plus the sharp sign (#) or 73 plus a 4-second time-out. Confirmation tone is returned to the customer indicating that call forwarding has been cancelled.

2.06 In the LO-1, only calls that are in the free calling range of the forwarding line can be forwarded (i.e., charge index (CI) = 01). This disallows forwarding by message rate lines or forwarding to billed numbers. Reorder is returned if such a call is dialed. EF-1 generic has no restrictions.

2.07 The following kinds of lines cannot have the call forwarding feature:

- Coin Lines
- Party Lines
- Message Rate Lines (LO-1 only).

B. System Implementation

Activating Call Forwarding

2.08 The user first dials the access code (72# or 72 plus time-out), then on receipt of the second dial tone, dials the directory number to which calls are to be forwarded. An inactive call forwarding entry is recorded in the call store and a connection is completed to the "forwarded-to" directory number. If answer supervision is received from the called party, the call forwarding entry is activated. The calling party may now verify the correctness of the "forwarded-to" directory number and alert the "forwarded-to" party of his intentions.

2.09 If answer supervision is not received, the inactive call forwarding entry remains in call store for two minutes, after which it is cleared. If the user redials the same directory number within two minutes, confirmation tone is returned indicating the entry has been activated.

2.10 Each time a party with call forwarding activated is dialed, the call forwarded line

is given a short ring to indicate that a call has been forwarded. The call is then completed to the "forwarded-to" directory number as though it had been dialed.

2.11 If the customer attempts to forward calls when the service is already active (search reveals an active entry) and the two directory numbers do not match, the attempt will be routed to a custom calling error announcement.

2.12 If, in a second attempt (search reveals an inactive entry), the two directory numbers do not match, this second attempt is handled as a first attempt. The old call forward entry is cleared, and an inactive entry is set up using the new directory number and a ringing connection is established.

2.13 If the call forwarding list is full on a first attempt, the attempt is routed to reorder.

2.14 On outgoing calls for which no answer supervision is expected, the call forwarding entry is marked active on the first attempt regardless of the final disposition of the call. In particular, this refers to calls that do not require local charging actions. During the time that this feature is active, the station using the call forwarding feature may still be used in the normal manner.

2.15 The user may terminate call forwarding by dialing a cancellation code (73# or 73 plus time-out). Confirmation tone is returned indicating that the call forwarding entry has been cleared.

2.16 A reasonable amount of forwarding is allowed with this feature. If station "A", for example, forwards to station "B" who in turn forwards to station "C", a new incoming call destined for station "A" would be forwarded to station "B" and then on to station "C".

2.17 When the No. 2 ESS office is equipped with the LO-1 generic program, call forwarding is not allowed if the forwarded leg involves automatic message accounting (AMA) recording. However, if the No. 2 ESS office is equipped with the EF-1 generic program, call forwarding is allowed when AMA billing is involved, and for sequential transfers each leg is charged to the associated forwarded line. A maximum of three AMA recorded legs are allowed. If this maximum is exceeded, the call is routed to reorder.

Calls to a Forwarded Line

2.18 When a party with the call forwarding feature is dialed, the call forwarding entries are searched to determine if the called party is allowed to have this feature and if the feature is activated. If the search reveals no entry associated with the called line, control passes back to normal call processing for completion.

2.19 If the search reveals an active entry for the called number, the "forward-to" number is inserted into the originating register (OR) associated with the call, which is otherwise initialized to appear as if that number had actually been dialed. Any subsequent calls to the forwarded line during the next minute will receive a busy tone. The calling party may still receive busy tone if the "forward-to" line is actually busy. This timing prevents the call from being routed back to the original station and getting into an endless loop due to two stations being "call forwarded" to each other.

2.20 If the original called line is idle at the time a call is forwarded, a short ringing sequence is also executed. This is an entirely independent action performed in a separate transient call register (TCR). The sequence consists of connecting the line whose calls are forwarded to a special ringer and giving it a 1-second burst of ringing. All supervision is ignored. An off-hook by the customer at this time is not regarded as an answer but as an origination. This ring burst is intended to remind the customer that the call forwarding service is active.

3. FEATURE FLOW DIAGRAM

3.01 The flow diagram illustrated in Figure 1 is a graphical representation of the call forwarding feature.

4. INTERACTIONS

4.01 Activated call forwarding does not interact with normal use of the station for originating calls. Calls will be completed to the "forwarded-to" station even if the call forwarded station is busy.

4.02 If a normal call from the forwarded line to the "forwarded-to" station is a charge call, every call forwarded will be billed to the call forwarded line for that leg of the call. (This

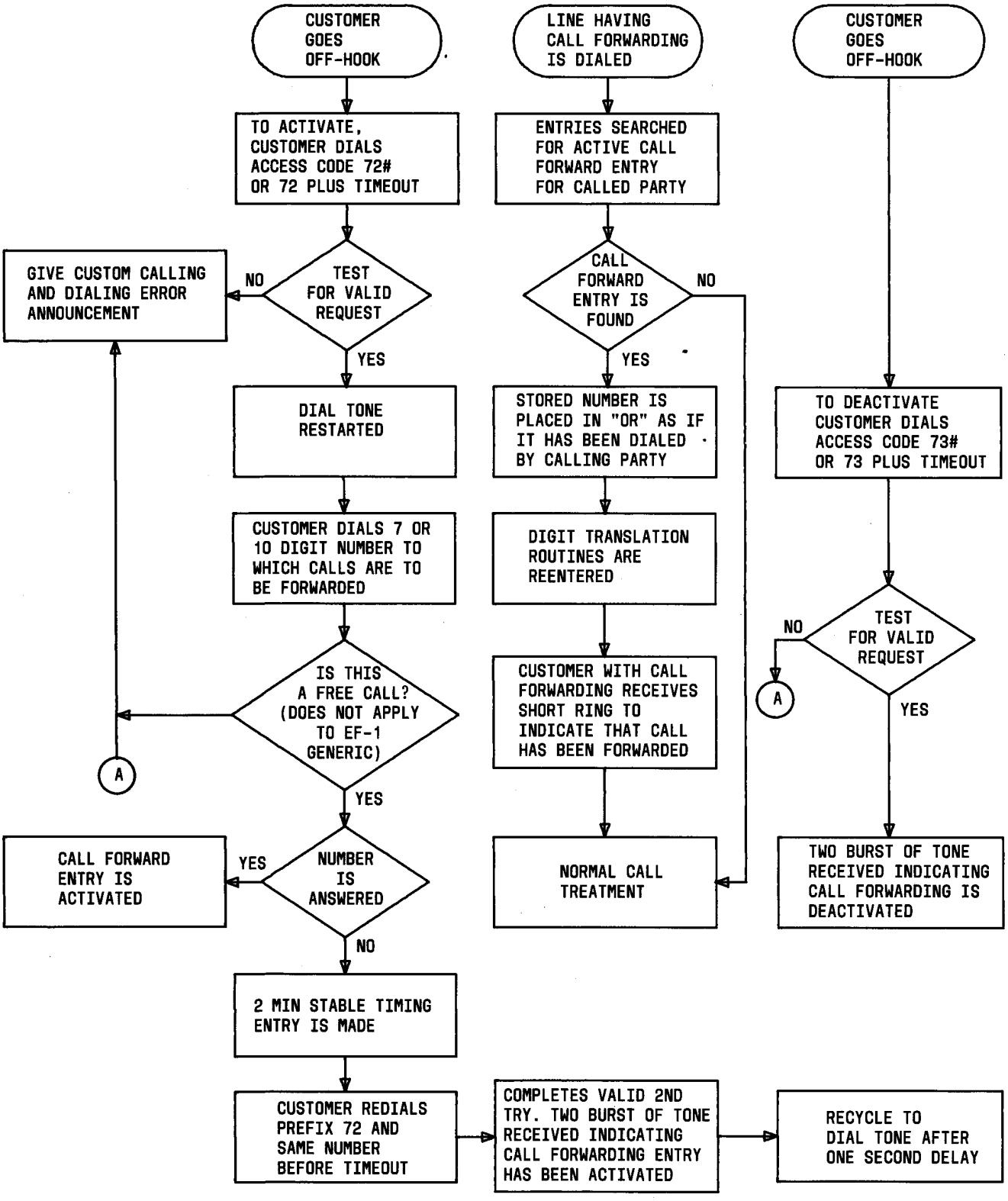

Fig. 1—Feature Flow Diagram—Call Forwarding

applies only to EF-1 since LO-1 does not permit call forwarding when a charge is involved.)

4.03 Call forwarding is not permitted to the operator (0), dial directory assistance (411), or the emergency number (911).

4.04 Call forwarding is not permitted to be activated through the speed calling list. However, calls may be forwarded to a speed calling number.

ATTRIBUTES

5. STATION/SYSTEM

5.01 The call forwarding feature is provided on a station basis.

6. LIMITATIONS

6.01 There is no limit on the number of stations having the call forwarding feature. However, the numer of active call forwarded stations allowed at any one time is based on the number of call store modules in the office. Table A shows the limitations.

TABLE A

NUMBER OF ACTIVE CALL FORWARDING ENTRIES ALLOWED

CS MODULES (FIXED CS LAYOUT)	LO-1	EF-1 EQUIPPED FOR CENTREX	EF-1 NOT EQUIPPED FOR CENTREX
2	32	—	—
3	91	64	128
4 or more	123	128	128

6.02 For an office provided with a flexible call store layout, the number of active call forwarded entries allowed at any one time is either 0, 64, 128, 192, or 256, ***independent*** of the number of call store modules.

6.03 The use of the call forwarding feature is limited to individual residence, business, teletypewriter exchange service (TWX), and mobile radio lines.

6.04 Since party lines do not have full control over their loop signaling, this feature is not offered to two, four, or multiparty customers.

6.05 Series completion lists should not have the call forwarding feature as the activation of this feature will end the hunting of the series. This could result in customer confusion and should be thoroughly explained to the customer.

6.06 This feature may be assigned to the first member (directory number) of the multiline hunt group only.

6.07 If the No. 2 ESS is equipped with the LO-1 generic program, this feature cannot be assigned to message register lines since call forwarding activation will not be allowed for these lines.

6.08 If the No. 2 ESS is equipped with either the LO-1 or EF-1 generic program, this feature cannot be assigned to coin or party lines since call forwarding activation will not be allowed for these lines.

6.09 If the No. 2 ESS is equipped with the LO-1 generic program, call forwarding is not permitted if the forwarded leg involves AMA recording.

7. RESTRICTION CAPABILITY

7.01 Stations are provided with the ability to call forward by translators on a per-directory number basis. Either a recent change input message, or an office data administration (ODA) run must be provided in order to allow or deny call forwarding for each station.

8. COST DATA

8.01 ***Generic Program:*** Call forwarding requires approximately 110 words.

8.02 ***Translation Memory:*** One bit in each entry is required to define whether the line has call forwarding or not.

8.03 ***Call Store:*** Each active entry in the call forwarding list requires four words in the

call forwarding list. See Table A for the number of entries allowed.

8.04 ***Program Store:*** Four words are required for the Master Table Index (MTI).

8.05 ***Processor Capacity:*** Real time is required to process a call forwarded call. The cost in addition to a normal call, is approximately 35 milliseconds per call.

INCORPORATION INTO SYSTEM

9. PLANNING

9.01 The call forwarding feature operates in the No. 2 ESS environment.

10. HARDWARE ENGINEERING

10.01 No hardware engineering is required for this feature.

11. SOFTWARE ENGINEERING

11.01 ***Program Store:*** Call forwarding requires a 4-word originating and 2-word terminating translation entry.

11.02 ***Call Store:*** The number of call store modules required for call forwarding is shown in Table A. This requirement is based on usage, and an estimate of the usage is necessary. The Traffic Facilities Practices contain some guidelines for determining the call forwarding usage.

11.03 ***Processor Capacity:*** Approximately 35 milliseconds are required to process a call forwarded call, in addition to the time required for a normal terminating call.

12. COMPATIBILITY

12.01 There are no compatibility or equipment interface problems with the call forwarding feature.

13. OFFICE DATA

13.01 ***Call Store Layout for Call Forwarding List***—A call store call forwarding list entry is shown in Figure 2.

- TEN is the terminal equipment number of the call forwarding line.
- D0-D9 are the 10 digits of the dialed number of the "forwarded-to" line.
- Active-bit (ACT): 1—Calls to the TEN should be forwarded to the directory number.
- Active-bit (ACT): 0—Customer is in the process of forwarding calls but has not completed that action.
- Timer: This is a 4-bit register used to time two independent functions. (Two minutes timing during call forwarding activate procedure, and one minute inactive timing after a call has been forwarded.)

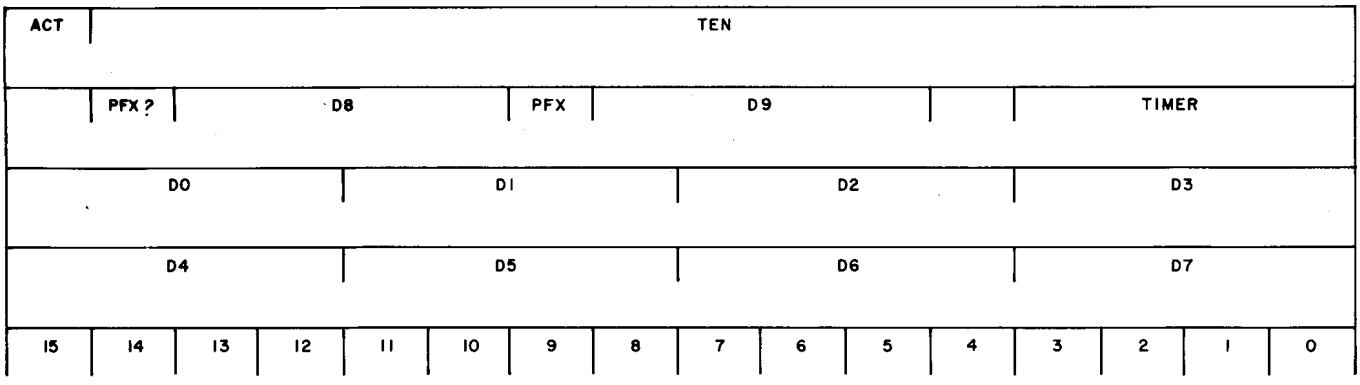

Fig. 2—Call Store—Call Forwarding Entry

- PFX?: When set to 1, this bit indicates there is a prefix.

- PFX: When set to 1, this bit indicates the DDD prefix. When set to 0, it indicates direct dial operator assistance prefix.

13.02 ***Translation Data Layout***—Four words of translations are required in the office parameter area to reserve space in the call store for the call forwarding tables (refer to Figure 3).

13.03 Figures 4 through 7 illustrate the call forwarding line translation layouts.

13.04 For new installations, the following input forms should be prepared and submitted to the WECo Regional Center. The call forwarding feature must be indicated in the features portion of the line class information for each line to be assigned the feature.

- ***ESS 2100 Directory Number Table***

- ***ESS 2104 Trunk Test Panel Table***

- ***ESS 2105 Multiline Hunt Group Table***

13.05 Recent change messages are available for adding and deleting the call forwarding features for a main station.

RC MESSAGE	FUNCTION
A RC:L/	To add or delete a feature to a line. FWD is the key word for all call forwarding.
A RC:MLH/	To add or delete a feature to a multiline hunt group.
A VY:L/	May be used to verify a lines feature.
A VY:MLH/	May be used to verify a multiline hunt group.

14. GROWTH/RETROFIT PROCEDURES

14.01 At certain times, such as when retrofitting a generic program change or changing translations resulting from an ODA run, it is necessary to clear areas of the call store which will include the call forwarding lists. When this occurs, it is necessary to punch out the call forwarding list on paper tape before the call store clears, and reinsert the list after the clear is accomplished. The following input messages aid in this procedure. (Refer to IM-2H200 for full details.)

A CF:PUN/ Punch call forwarding list

A CF:PR/ Print call forwarding list

A CF:ENT/ Add entries to list

A CF:RMV/ Remove an entry from list

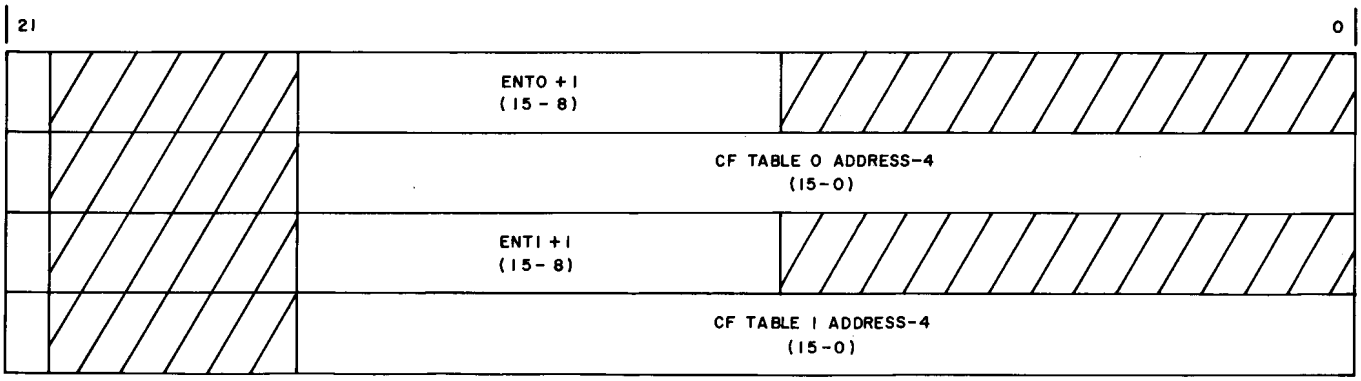

Fig. 3—Call Forwarding Parameters

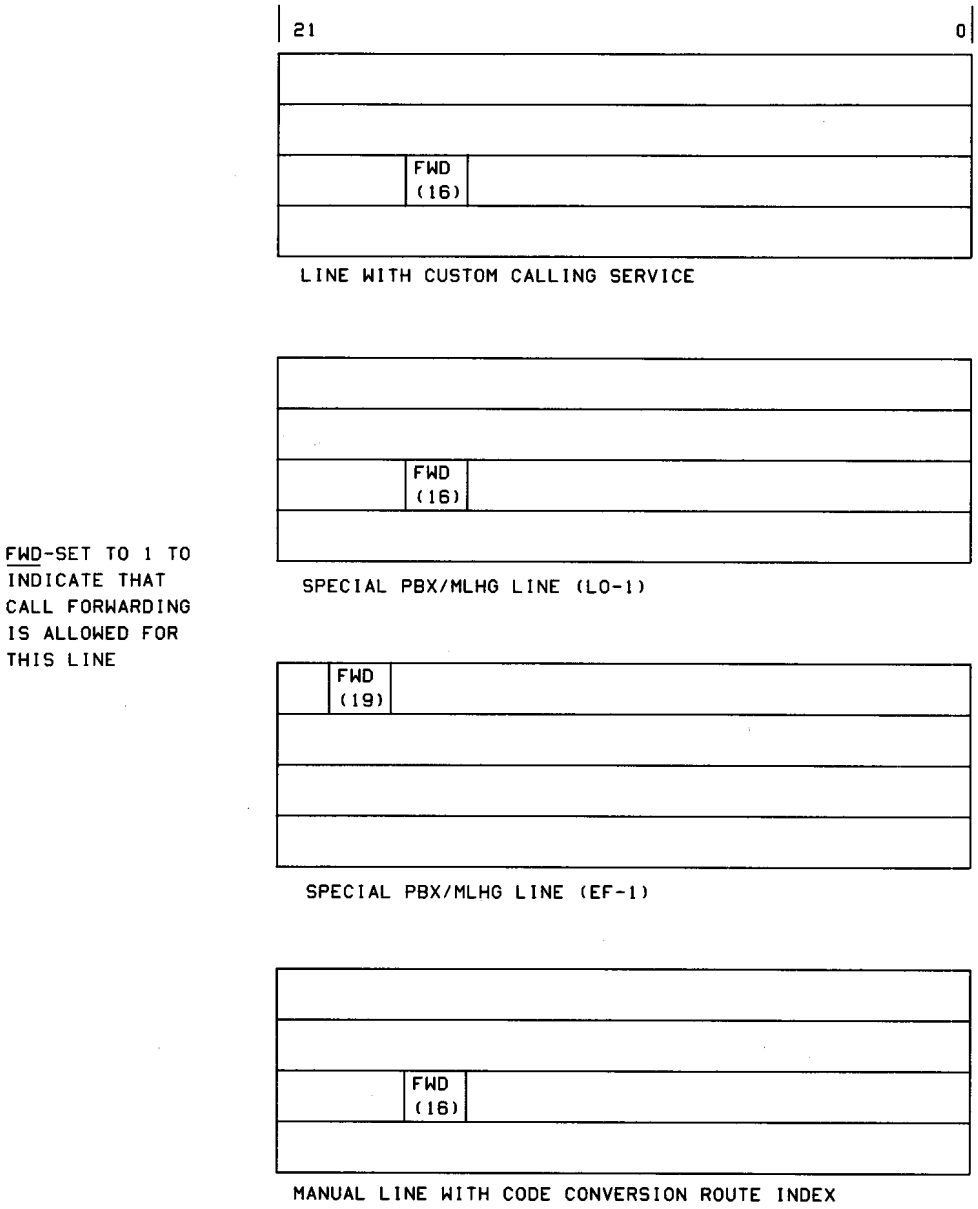

Fig. 4—Line Originating Translations

15. TESTING

15.01 No special testing is required for this feature other than placement of a test call to verify that the call forwarding feature is operating correctly.

15.02 The call forwarding list audit scans the list searching for nonzero entries. When a busy entry is located, the following criteria must be met.

- The forwarded line must be allowed this feature.
- If the entry is inactive, the timer must be active.

An entry is zeroed if it fails either check. See OM-2H200 for description of output message resulting from the call forwarding audit. The message for initiating the audit of the call forwarding list is

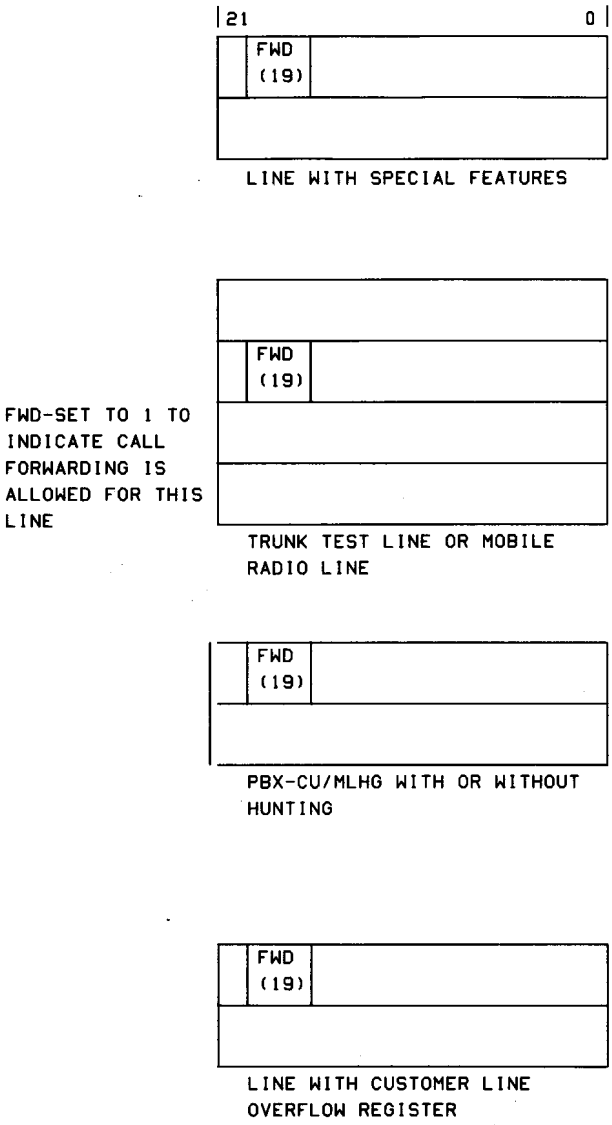

Fig. 5—Terminating Translations

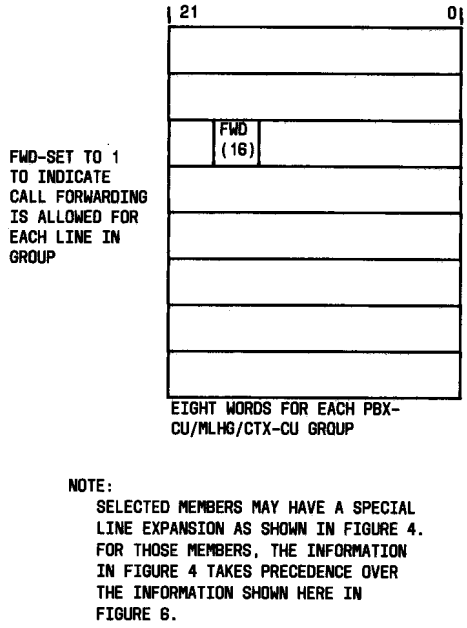

Fig. 6—PBX-CU Originating Subtranslator

M AU:FWD. Refer to IM-2H200 for a full description of this message and data fields.

15.03 The following messages may be useful for monitoring the call forwarding list:

- A CF:PR/ Print call forwarding list
- A CF:ENT/ Add entries to call forwarding list
- A CF:RMV/ Remove an entry from the call forwarding list.

ADMINISTRATION

16. MEASUREMENTS

16.01 The following traffic measurements are available for the call forwarding feature. Refer to Section 232-120-301 for the applicable register.

- ***Call forwarding attempts***—Number of times custom calling service customers attempt to activate call forwarding.

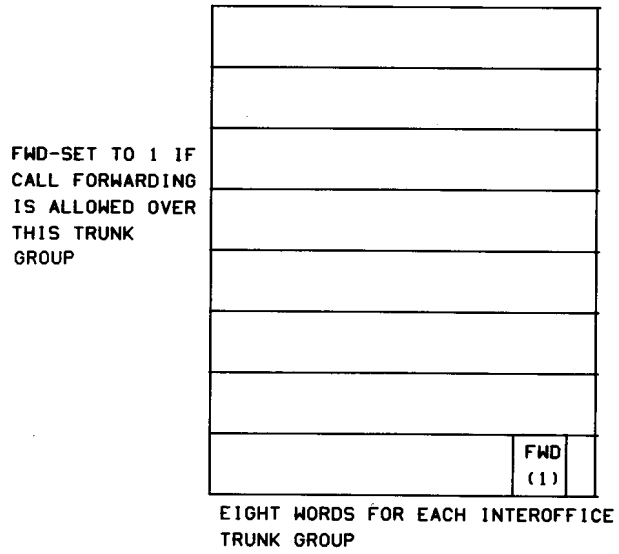

Fig. 7—Trunk Group Data

- ***Call forwarding overflow***—The number of call forwarding attempts which fail because there was no room in call forwarding tables to make call forwarding entry.

- ***Lines in call forwarding state***—The number of lines which are in the call forwarded state at the time of the printout.

- ***Calls forwarded***—A count of the number of calls forwarded to another line from a call forwarded line.

17. RECORD KEEPING

17.01 ODA output records, 2100-R, 2104-R, and 2105-R, provide information as to which lines have the call forwarding feature. In addition, verify message A VY L/ and A VY MLH/ may be used to verify any line to determine if call forwarding has been assigned.

18. CHARGING

18.01 If the No. 2 ESS office is equipped with the EF-1 generic program, calls that are forwarded and require AMA recording are limited to three AMA recorded legs. A reorder tone is returned to the calling party if a call is forwarded to a fourth leg which requires charging.

18.02 When the office is equipped with the LO-1 generic program, call forwarding is not allowed if AMA recording or message register pegging is required on the call forwarded leg (i.e., the CI for the forwarded call must = 01). If an attempt is made to forward such a call, a reorder tone will be returned to the customer.

AVAILIBILITY

19. NEW INSTALLATIONS

19.01 The call forwarding feature is available for application with the LO-1 or EF-1 generic program.

20. GROWTH/RETROFIT

20.01 The call forwarding feature may be retrofitted into any working office by simply using a recent change input message or an ODA run to assign the call forwarding feature to stations.

SUPPLEMENTARY INFORMATION

21. GLOSSARY

21.01 The following list identifies terms used in this feature document.

- ***Automatic Message Accounting (AMA):*** A mechanized system used to record charging information in telephone switching systems located in the office it serves.

- ***Charge Index (CI):*** A code in the 3-digit translator that indicates or points to information concerning the type of charging to be done on a particular call.

- ***EF-1:*** Extended feature generic program

- ***LO-1:*** Local office generic program

- ***Multiline Hunt Group (MLHG):*** A customer optional feature which allows calls to hunt over a group of customer facilities in order to connect a calling party with an idle facility within the group.

- ***Originating Register (OR):*** A call register used to collect and store digits received from a customer dial pulse receiver or TOUCH-TONE receiver.

- ***Terminal Equipment Number (TEN):*** A 6-digit number representing the physical location of a line, link, trunk, or service circuit in the switching network.

- ***Time-Out:*** Time-out occurs if no action is taken by the customer for a period of four seconds after dialing one or two digits. It is used to signify the completion of dialing for 1- and 2-digit access codes on dial-type telephones. It is also an alternative to the sharp (#) button on a TOUCH-TONE receiver.

- ***Transient Call Register (TCR):*** A call store register designated for storage of information concerning calls in progress.

22. REASONS FOR REISSUE

22.01 This is the initial issue of this document.

23. REFERENCES

23.01 The following documents may be referred to for supplementary information concerning the call forwarding feature:

- PD-2H211-01, Program Specification—Custom Calling Service Program

- Translation Guide, TG-2H

- Traffic Facilities Practices, Division D, Section 12a

- Bell System Practices:

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

  Section 966-200-100, General Description No. 2 Electronic Switching System.