

FEATURE DOCUMENT
DIRECT INWARD DIALING
NO. 2 ELECTRONIC SWITCHING SYSTEM
(CENTREX-CO)

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NOTICE

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FEATURE DEFINITION AND DESCRIPTION**1. DEFINITION**

1.01 Direct Inward Dialing (DID) is a centrex feature which allows an incoming exchange network call (not foreign exchange or wide area telephone service type calls) to reach a specific station without attendant assistance. The DID feature is flexible and can be provided according to customer needs by restricting the capabilities of stations in the customer group. Flexibility is further increased if the customer group is equipped with call forwarding and station hunting features.

1.02 In the No. 2 Electronic Switching System (ESS), where DID is provided to the customer on a Centrex-CU basis, a portion of the dialed information is passed from the No. 2 ESS to the Centrex-CU machine (on the customer's premises) for processing a call to the desired station. Where Centrex-CO is provided, the actions required to complete a call take place within the No. 2 ESS. This section will cover the Centrex-CO application of DID. The No. 2 ESS processes the dialed digits and checks are made to determine if the dialed station is busy, restricted from receiving incoming calls, or call forwarded. If the station is idle and not restricted, the station is rung and the calling party hears audible ring. If the dialed station is call forwarded, the call forwarded number is substituted and rung.

1.03 The No. 2 ESS is arranged to provide the DID feature with the EF-1 generic program. No special or additional hardware is required to obtain this feature.

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

2.01 The exchange network customer dials the 7-digit number assigned to the desired station line in the centrex system. This number may be prefixed with the area code and other codes as needed. The 7-digit number consists of an office code and a 4-digit station number unique for the centrex customer group and the desired station.

2.02 The digits dialed provide information for routing the call to the desired centrex station. If the called station is idle and not fully restricted terminating, and the called station is not call

forwarded, the station is rung and the calling party hears audible ringing tone. When the called station answers, the calling party is cut through and charging (if required) starts.

2.03 If the called station is busy and does not have the Station Hunting or the Call Forwarding—Busy Line feature, the calling party hears busy tone and is not charged for the call. If there is a network blockage, the calling party hears reorder tone without being charged.

General Operation

2.04 In order to access a centrex station, the dialed digits are processed by the 4-digit translator and the called party identity is stored in the transient call register (TCR). If the call is an incoming call, the DID bit is set in the TCR and the called party identity is examined to determine if it is denied terminating or fully restricted terminating. If so, the calling party is given call failure treatment. Otherwise, a check is then made to determine if the called party is call forwarded to another station number, whereupon the call forwarded number is substituted for the originally dialed number.

2.05 If the called line is busy when the busy test is made, a check is then made to determine if the called number has Station Hunting or the Call Forwarding—Busy Line feature. The Call Forwarding—Busy Line feature applies only to DID and common control switching arrangement (CCSA) calls; whereas, station hunting applies to all calls. Either feature routes the call to a preselected station or to the attendant when applicable. If neither of these features applies, busy tone is returned to the calling party.

2.06 If the called line is idle, a connection is made between the called party and a regular ringing circuit such that the called party will receive immediate ringing. The calling party is connected to an appropriate junctor and audible ringing is returned by either the junctor circuit or the incoming trunk circuit. When the station answers, a talking connection is established and the call is completed. If the called station has the Call Forwarding—Don't Answer (applicable to DID and CCSA calls only) or the Call Forwarding—Don't Answer—All Calls feature, the call is forwarded to a preselected station or to the attendant if the station does not answer within a designated period. The timing

interval can be specified in translations from 11 seconds to 60 seconds in increments of 3.2 seconds for the centrex customer group. If neither feature applies, the called station will continue ringing until answered or until the calling party abandons.

System Implementation

2.07 Each centrex station with the DID feature has an associated 7-digit directory number, where the low four digits (low two, three, four, or five digits, depending upon the particular centrex customer's numbering plan) correspond to the station's extension number. The first three digits of the 7-digit directory number correspond to a real office code. In the 3-digit translator, this office code is converted to a 4-bit normalized office code (NOC), which is used in conjunction with the low four digits to perform the 4-digit translation.

2.08 Certain centrex stations may be defined as not having the DID feature. For one of these stations, the low four digits correspond to the station's extension number, as with a DID station. The non-DID station must also have an office code but not one that is valid for dialing purposes. This office code is called a pseudo office code and corresponds to a 4-bit pseudo normalized office code (pseudo NOC). This pseudo NOC is required by the 4-digit translator in order to perform the 4-digit translation. The pseudo NOC is also used by the recent change programs and the local test desk to identify a non-DID station. The pseudo NOC allows station-to-station intracentrex calling, but prevents DID calls.

3. FEATURE FLOW DIAGRAM

3.01 A feature flow diagram giving the functional operation of the DID feature is shown in Figure 1.

4. INTERACTIONS

4.01 If the centrex customer has DID, the following features are interactive:

- Call Forwarding—Don't Answer—An optional centrex feature which automatically routes incoming DID or CCSA calls to the attendant or a preselected centrex station when the called station remains unanswered after a preset amount of time (intracentrex calls continue to ring).

- Call Forwarding—Busy Line—Automatically routes incoming DID or CCSA calls to the attendant or a preselected centrex station when the called station is busy (intracentrex calls are routed to busy tone).
- Call Transfer—Individual—Station user can transfer incoming DID, CCSA, and certain incoming tie trunk calls to another station line within the same centrex system without the assistance of the attendant.
- Consultation Hold—Station user can hold incoming DID, CCSA, and certain incoming tie trunk calls by flashing the switchhook, and on the same line, originate a call to another party for consultation. After consultation, the station user can return to the original call.
- Add-On—Enables the station user to add another party to an existing DID call, incoming CCSA call, and certain incoming tie trunk calls to establish a 3-party conference. This can be accomplished without attendant assistance by flashing the switchhook after utilizing the Consultation Hold feature.
- Call Transfer—Attendant—Allows the called station user, while connected to a DID or CCSA call and certain designated incoming tie trunk calls, to reach (recall) the attendant by flashing the switchhook so that the attendant may transfer the call to another station line in the centrex group.

ATTRIBUTES

5. STATION/SYSTEM

5.01 The DID feature is provided on a per-station basis.

6. LIMITATIONS

6.01 A DID call is not allowed direct access to the following centrex features:

- Outgoing tie trunks, including tandem tie trunk operation
- Outgoing FX trunks
- Outgoing WATS access

- Outgoing CCSA access
- Most economical routing
- Paging
- Recorded telephone dictation
- Code call.

However, when a DID call completes to a centrex station, that station may employ add-on or Threeway Calling to access the preceding features. (Refer to Section 232-190-301 for details of call transfer, add-on, Threeway Calling, etc.)

6.02 DID stations and non-DID stations cannot be mixed in the same hundreds group in translations; nor can they be mixed in the same thousands group, since a DID station requires a real office code and a non-DID station requires a pseudo office code. Access to DID stations and to non-DID stations (by a centrex station) requires separate terminal entries in the centrex digit interpreter tables. That is, a centrex customer with both types of stations must have at least two terminal entries defining station dialing. (The above does not apply to the features of "fully restricted terminating" or "denied terminating," since these features are assigned on a per-station basis by assigning the proper line class code (LCC).

6.03 A DID calling party is not allowed to pick up another call through the use of any of the following centrex pickup features:

- Call Pickup
- Code Call Pickup
- Directed Call Pickup
- Trunk Answer from Any Station

However, a DID call to a suitable centrex station can be picked up by another centrex station using one of the preceding features.

7. RESTRICTION CAPABILITY

7.01 A DID call is allowed to complete to a DID centrex station, provided that the station is not marked as being denied terminating (not allowed to receive any calls) or marked fully restricted

terminating (not allowed to receive any but intracentrex, station-to-station calls), and provided that the whole hundreds group (of which the DID centrex station is a member) is not marked fully restricted terminating.

Fully Restricted Terminating Stations

7.02 A fully restricted terminating station line is denied the ability to receive any but intracentrex calls. Hence, a fully restricted terminating centrex station cannot receive DID calls, incoming tie trunk calls, etc. Fully restricted terminating stations are so designated by the LCC. DID calls to a fully restricted terminating centrex station typically result in the calling party being routed to an announcement (Route Index 19).

Denied Terminating

7.03 A denied terminating centrex station is not allowed to receive calls of any type. Denied terminating centrex stations are so designated by the LCC. DID calls to a denied terminating centrex station typically result in the calling party being routed to an announcement (Route Index 19).

Temporary Service Suspension

7.04 Temporary suspension of service for a given centrex station is accomplished by changing the class of service (LCC) to deny originations, terminations, or both.

Inward Restricted Stations

7.05 Inward restricted centrex stations cannot receive DID calls. Inward restrictions can be assigned by marking the appropriate centrex stations as fully restricted terminating or by assigning the desired station numbers which possess pseudo office codes.

8. COST DATA

8.01 The costs of providing DID are as follows:

Software

Generic Program:

Program Store Words—Programs required are a part of the generic program required for providing basic centrex service (EF-1)

Call Store Words—None

Translations: Same number of translation words as are required for an intracentrex call.

INCORPORATION INTO SYSTEM

9. PLANNING

9.01 Planning is required for determining pseudo office codes and nonconflicting extension numbers where a mixture of DID and non-DID stations is needed by a centrex customer.

10. HARDWARE ENGINEERING

10.01 No special circuitry or hardware is required to obtain this feature.

11. SOFTWARE ENGINEERING

11.01 None required.

12. COMPATIBILITY

12.01 There are no hardware compatibility or interface requirements since hardware changes or additions are not required to obtain DID.

13. OFFICE DATA

13.01 For initial No. 2 ESS, installations where an office data administration (ODA) run is required and DID is offered with the system, the following ESS forms must be completed and submitted to the WEC Co Regional Center for processing:

- ESS 2101 Centrex Directory Number Table—Relates Centrex Directory Numbers to Centrex Groups, the Terminal Equipment Number, equipment, features, and restrictions associated with those directory numbers.
- ESS 2300 Three- and Six-Digit Translation Table—Defines all dialable codes into code groups that are routed and charged identically for each given line class code.
- ESS 2303-1 Form Code 3D, Route Index Expansion Table—This form is used to define

the real and pseudo normalized office codes to be used in a given office.

- ESS 2306 Line Class Code Table—Used to furnish information required by the system for processing calls to and from customers with various classes of service and the service restrictions or types of service associated with these customers (i.e., deny originating, deny terminating, fully restricted terminating, etc.).
- ESS 2501 Office Code Table—Used by the ODA to provide memory space for directory number translations for both DID and non-DID numbers.

Details for completing the above forms are in the No. 2 ESS Translation Guide, TG-2H.

13.02 The primary translator affected by the DID feature is the 4-digit translator. See Figure 2 for the DID translation flow and layout.

13.03 If required, individual station lines may be allowed or denied DID by proper assignment of the fully restricted terminating or denied terminating features via the LCC. See Figure 3 for a layout of the line class code table and refer to the following section for information concerning the use of recent change messages to LCCs.

Recent Change (RC) Messages

13.04 Recent change messages may be used to add, change, or delete the DID feature for individual stations or groups of stations. The following messages are required to alter the DID feature:

- A RC:L—This message used in conjunction with keywords TN, NTN, or LCC will change the office code or line class code for a given station and determine the availability of the DID feature.
- A RC:HRI—This message may be used for giving up to 100 centrex station lines fully restricted terminating status. Stations that are fully restricted terminating are disallowed receiving any calls except station-to-station centrex calls.

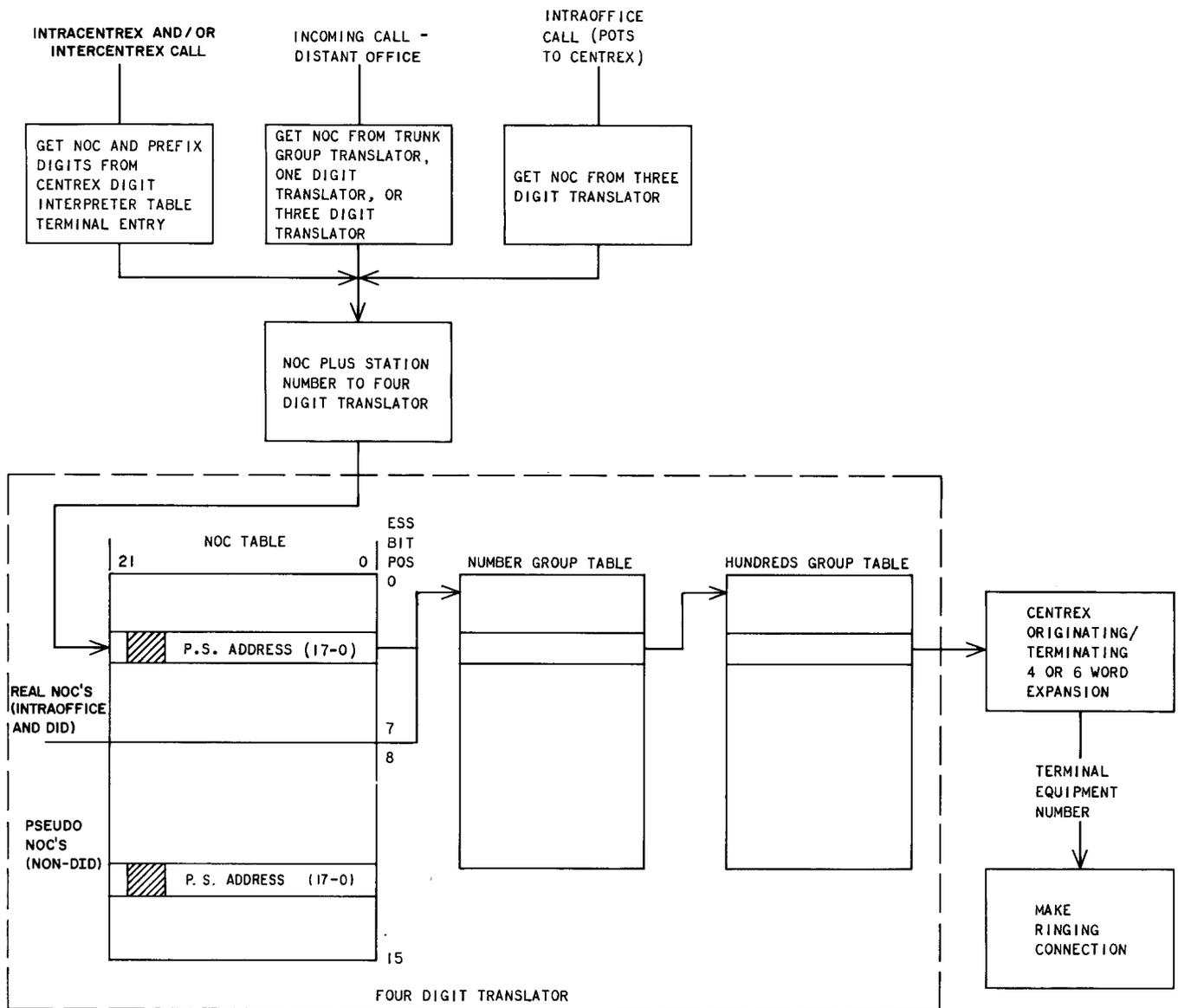


Fig. 2—Translation of DID Calls

CENTREX LCC													
P (21)	PRM (20)				I (16)	W (15-14)	CHAR 1 (13-7)				CHAR 2 (6-0)		
P (21)	FR (20)	FT (19)	UNV (18)	PBX (17)			DT (14)	CHAR 3 (13-7)				0000 (6-3)	RA (2-0)
P (21)			ØR (19)	CØN (18)				DØ (14)	O (13)			O (8)	SCR (7-0)

Fig. 3—Centrex Line Class Code Table

Refer to IM-2H200 for details concerning the format and use of the above recent change input messages.

13.05 The A VY:L message may be used to verify that any changes made per the A RC:L recent change input messages are defined correctly in translations. The A VY:HRI message is used to verify the A RC:HRI input message.

Refer to OM-2H200 for information on interpreting the verify printout.

14. GROWTH/RETROFIT PROCEDURES

14.01 Growth/retrofit considerations for the DID feature center primarily on the ODA run and the use of recent change messages. Refer to the OFFICE DATA section for the ESS input forms and recent change messages required.

15. TESTING

15.01 The DID feature does not require special testing when incorporated into a No. 2 ESS system. The following tests can be performed to verify that the feature has been correctly defined and is operating properly:

- A test call may be placed to selected stations having the DID feature to determine if the call is processed per the translations defined.

- The verify message can be examined to check for a station(s) having the attributes that were assigned in translations.
- A test call may be placed to selected stations not having the DID feature to determine if the appropriate call failure treatment is given.

ADMINISTRATION

16. MEASUREMENTS

16.01 Traffic measurements are available in the standard form of a peg count. For details concerning the measurements available with the DID feature refer to Section 232-120-301, Traffic and Plant Measurements.

17. RECORD KEEPING

17.01 No special record keeping is required for DID other than maintaining the applicable ESS-R forms (2100-R, 2300-R, 2501-R) as a part of the office records.

18. CHARGING

18.01 Charging for DID is controlled per local tariff regulations.

AVAILABILITY**19. NEW INSTALLATIONS**

19.01 This feature is available with all issues of the EF-1 generic program.

20. GROWTH/RETROFIT

20.01 The DID feature is contained in the EF-1 generic program and is available at the present time.

SUPPLEMENTARY INFORMATION**21. GLOSSARY**

21.01 The following list identifies terms and abbreviations that may be unfamiliar to the reader.

- CTX (Centrex)—A type of service similar to PBX where the stations have direct inward dialing (DID) and station identification on outgoing calls by either automatic identified outward dialing (AIOD) or operator.
- CCSA (Common Control Switching Arrangement)—A switched services network which provides telpak or private line facilities between customer locations via common control switching machines which are shared with other users.
- Denied Terminating—Centrex stations that are denied terminating are not allowed to receive calls of any type.
- EF-1—Extended feature generic program.
- FX (Foreign Exchange Service)—A classification of exchange service furnished under tariff provisions by means of a circuit connecting a subscriber's centrex system with a central office of an exchange other than that which regularly serves the exchange area in which the subscriber is located.
- Fully Restricted Terminating—Centrex stations so designated are denied the ability to receive any calls except intracentrex station-to-station calls (e.g., DID calls cannot be made to these centrex stations).
- LCC (Line Class Code)—A 3-character alpha-numeric code assigned by the operating company to represent a class of service.
- ODA (Office Data Administration)—Mechanism by which translation information may be changed in the No. 2 ESS office. Information from the ESS input forms is inputted into the regional ODA computer, assembled, and sent back to the No. 2 ESS.
- IOD (Identified Outward Dialing)—A PBX or Centrex service feature for obtaining the identity of a calling station.
- AIOD (Automatic Identified Outward Dialing)—A method of automatically sending the identity of a calling station over a separate data link for use in automatic message accounting.

22. REASONS FOR REISSUE

22.01 This is the initial issue of this document.

23. REFERENCES

23.01 The following documents contain the source material for the DID feature:

- IM-2H200
- OM-2H200
- Translation Guide, TG-2H
- PD-2H204 Digit Interpretation Program
- PD-2H304 Centrex Digit Interpretation Program