

FEATURE DOCUMENT
DIRECT INWARD DIALING (DID)
NO. 3 ELECTRONIC SWITCHING SYSTEM

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NOTICE

Not for use or disclosure outside the
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INTRODUCTION

1. GENERAL INFORMATION

1.01 This document describes the Direct Inward Dialing (DID) feature as provided by the No. 3 Electronic Switching System (ESS). This feature may be used only in conjunction with Private Branch Exchange (PBX) equipment which is capable of receiving and translating a telephone number which has been outpulsed over a trunk from the No. 3 ESS. Additionally, the PBX equipment must be capable of returning the appropriate signaling information to the No. 3 ESS. Direct inward dialing to a PBX is commonly called Centrex-CU service.

1.02 When this section is reissued, the reasons for reissue will be included in this paragraph.

FEATURE AVAILABILITY

1.03 The Direct Inward Dialing feature is available with all issues of the No. 3 ESS generic programs. There are some differences in the DID arrangements based on the generic program employed. However, the description provided by this document applies to all generics unless otherwise stated.

2. DEFINITION

2.01 The Direct Inward Dialing feature allows individual PBX stations to be accessed directly from exchange network stations which are external to the PBX. In order to complete a call in this manner, all or a portion of the dialed number is passed from the No. 3 ESS to the PBX where the actual station selection is performed. The PBX equipment then provides audible ringing to the calling party, rings the called station, and completes the talk path upon answer recognition.

DESCRIPTION

3. USER OPERATION

3.01 The exchange network customer dials the 7-digit number assigned to the desired station within the PBX system. This number may be prefixed with the area code and other codes as required. The 7-digit number consists of an office code and a 4-digit station number unique to the PBX group and the desired station.

3.02 The dialed digits provide all the necessary information for routing the call to the desired PBX station. If the called station is idle, it is rung and the calling customer hears audible ringing tone. When the called station answers, the talk path is established, and charging begins (if applicable).

3.03 If the called station is busy, 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 and no charging occurs.

4. SYSTEM OPERATION

4.01 A call to an individual PBX station via the DID feature is processed much like any other terminating call. The usual digit receiving, 3-digit translation, and screening are performed to determine that the call is intended to terminate within the No. 3 ESS service area. However, when the 4-digit translation is performed, it is determined that calls to this "line" require special routing. In this case, the 4-digit translator provides a new route index or code index which ultimately leads to the selection of an outgoing trunk to the PBX. From this point, processing continues as if the call were outgoing to another office. The dialed digits, which are still present in the Transient Call Record (TCR), are outpulsed over the selected trunk after any necessary digit deleting or prefixing. The No. 3 ESS then establishes the talk path and waits for answer supervision from the PBX. Charge timing, if required, begins upon recognition of answer supervision. A flowchart of the operations performed to provide the DID feature is shown in Figure 1.

4.02 PBX arrangements not involving DID require lines defined as a multiline hunt group (MLHG) to interconnect the PBX and the No. 3 ESS. These lines are used for both originating and terminating calls from the PBX. To make an originating call, a PBX customer is normally required to dial an access code (usually the single digit 9). The PBX then selects an idle line to the No. 3 ESS, provides an off-hook indication, and connects the calling station. Upon recognition of the off-hook indication, the No. 3 ESS provides a second dial tone and the calling party is allowed to complete the call by dialing the desired telephone number.

4.03 To complete a terminating call to a PBX station without the use of the DID feature, the No. 3 ESS translates the dialed digits and

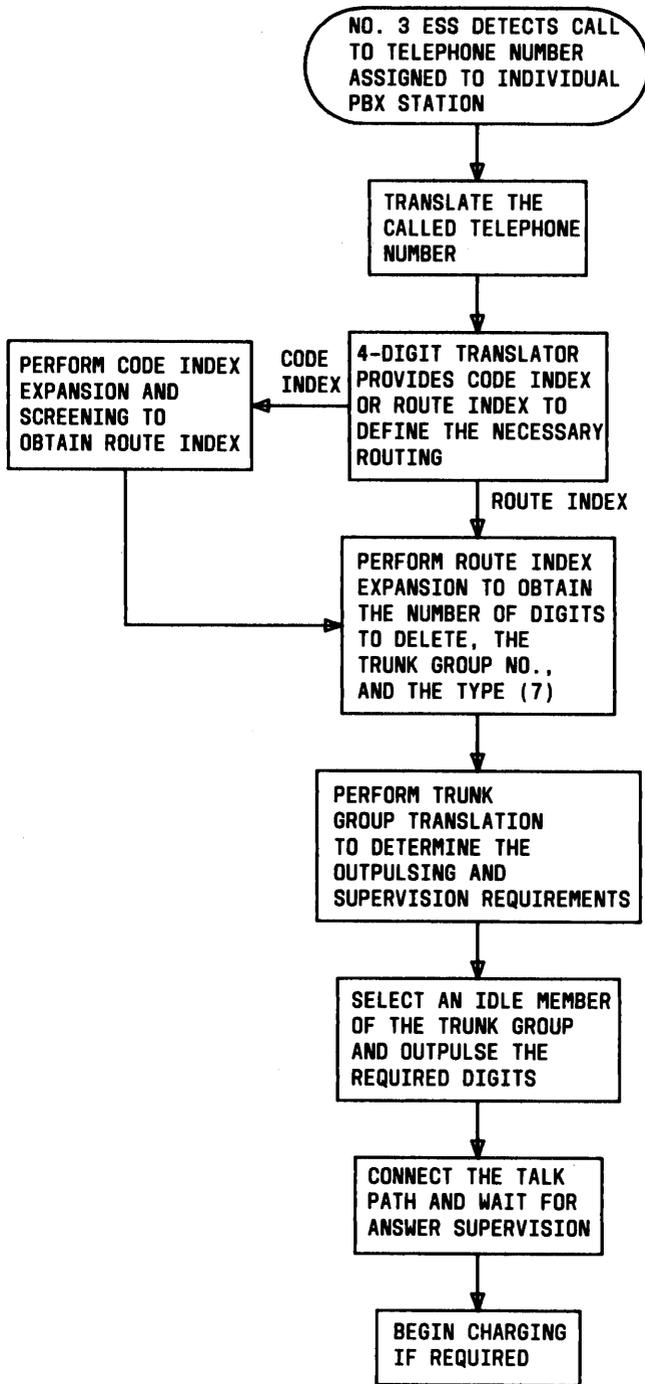


Fig. 1—Flowchart for Direct Inward Dialing Feature

selects an idle member of the MLHG. The selected line is then rung and audible ringing is returned to the calling party. An attendant at the PBX is required to answer the call, to perform the actual station selection, and to establish the connection to the desired station.

4.04 When the DID feature is provided, the originating calls are processed in the same manner previously described. In this case, a group of lines (not necessarily a MLHG) is used for originating calls only, and an outgoing trunk group is required from the No. 3 ESS to complete all terminating calls to the PBX. The interconnecting arrangements for PBX applications with and without DID are shown in Figure 2.

4.05 For terminating calls involving DID, the 4-digit translator can provide a code index based on the thousands group digit of the dialed telephone number. Calls to all telephone numbers in this thousands group are screened a second time to obtain a new route index pointing to the outgoing PBX trunk group. If the 3E3 generic is employed, the 4-digit translator can be arranged to provide a route index based on the hundreds group digit. Calls to telephone numbers in this hundreds group are then routed, via the route index, to the PBX trunk group. Finally, the 4-digit translator can be arranged to provide the new route index based on individual telephone numbers. In this case, a terminating major class of 31 (special routing) is required, but no terminal equipment number (TEN) is associated with the telephone number.

CHARACTERISTICS

5. FEATURE ASSIGNMENT

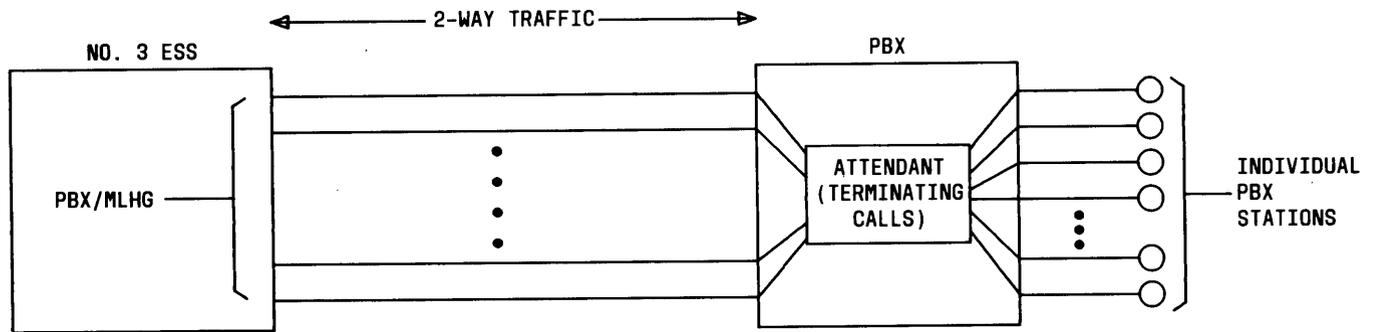
5.01 The DID feature is provided on a per-PBX basis.

6. LIMITATIONS

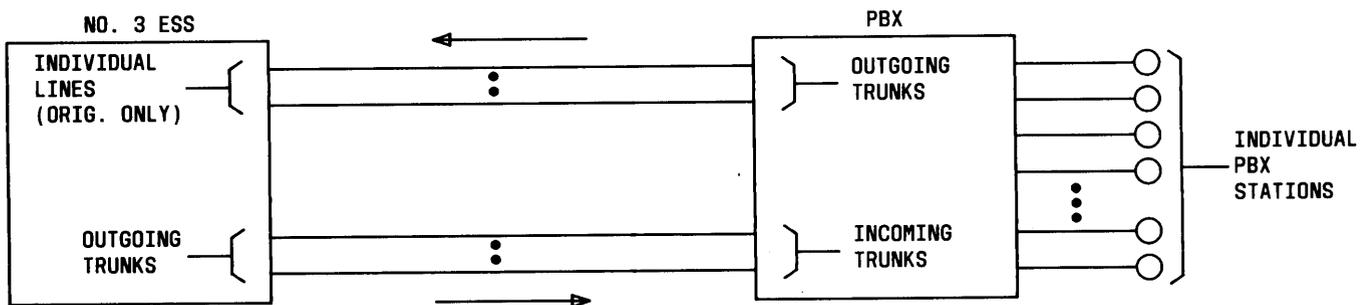
6.01 Outpulsing from the No. 3 ESS to the PBX equipment is limited to dial pulsing (DP) and multifrequency (MF) signaling. Digits cannot be outpulsed in the form of TOUCH-TONE® signaling. The number of simultaneous terminating calls is limited by the number of trunks in the outgoing trunk group to the PBX. No other limitations exist for the DID feature.

7. INTERACTIONS

7.01 PBX lines employing the DID feature are not allowed to have call forwarding since the 4-digit translator contains only a route index or code index. Also, the threeway calling feature cannot be used if the original connection is established via the DID feature. However, it may be possible



A. PBX ARRANGEMENT WITHOUT DIRECT INWARD DIALING



B. PBX ARRANGEMENT WITH DIRECT INWARD DIALING

Fig. 2—Connections Between No. 3 ESS and PBX Equipment

to provide these types of features directly from the PBX equipment.

8. RESTRICTION CAPABILITY

8.01 Restrictions are not applicable to this feature.

INCORPORATION INTO SYSTEM

9. INSTALLATION/ADDITION/DELETION

9.01 In order to install the DID feature, it is necessary to install an outgoing trunk group to the PBX and to make the appropriate assignments in translations. These translation arrangements may be made at the time of the initial installation

by submitting the appropriate ESS input forms as a part of the office data administration (ODA) run. Subsequent changes can be made through the use of recent change messages; however, additional trunks may be required.

10. HARDWARE REQUIREMENTS

10.01 The hardware required to provide the DID feature consists of an outgoing trunk group to the PBX and a DP or MF transmitter. The trunk group may be one of the types listed in Table A.

TABLE A

**TRUNK CIRCUIT TYPES FOR THE
DIRECT INWARD DIALING FEATURE**

CIRCUIT PACK OF SD-3H220	SIGNALING	DIRECTION
FB399	Loop	1-Way Outgoing
FB382	E&M	2-Way *

*Although FB382 is actually a 2-way trunk circuit, it must be defined in translations as 1-way outgoing.

11. SOFTWARE REQUIREMENTS

11.01 All the necessary software for the DID feature is provided as a part of the No. 3 ESS generic program. The translations required may be arranged through the use of recent change messages or ESS input forms as described in DATA ASSIGNMENTS AND RECORDS.

11.02 The processor time required to complete a call via the DID feature is the same as any outgoing call.

12. DATA ASSIGNMENTS AND RECORDS

12.01 The translations necessary to provide the DID feature are shown in Figure 3. These translation arrangements may be made via ESS input forms or recent change messages depending on when the feature is to be implemented. If the DID feature is to be implemented at the time of the initial installation, the following ESS input forms must be completed and submitted to the WECO regional data center as a part of the ODA run.

- ESS 3100 Telephone Number Table—This form is used to assign all telephone numbers associated with the PBX stations when routing is to be by individual telephone numbers. No Office Equipment (OE) number is required, but the proper route index must be provided to point to the PBX trunk group. A line class code must be specified which indicates special routing (terminating major class 31) and indicates that the line is unassigned for originating purposes (originating major class 0). For the incoming lines from the PBX, a line class code which

denies termination must be specified. These incoming lines must be assigned telephone numbers and OE numbers.

- ESS 3201-2 Trunk Assignment Table—This table is used to associate scan point numbers with individual members of the PBX trunk group.
- ESS 3202-3 Trunk Group Table—This form is used to establish a trunk group number for the PBX trunk group. One-way and outgoing must be specified.
- ESS 3204 Trunk Feature Table—This form is used to indicate trunk direction (outgoing), supervision (E&M or loop), and disconnect supervision (regular hold) for the purpose of routing calls to a PBX by means of the DID feature. It is also necessary to indicate trunk type (regular), start dial (no start), and outpulsing (DP or MF).
- ESS 3303-3 Route Index Expansion Table—This table is used to define routing information for the outgoing trunk group to the PBX. The trunk group number must be specified on this form along with any necessary digit prefixing or deleting information.
- ESS 3304 Code Index Table—This form may be used to specify a code index if routing to the PBX is to be based on the thousands digit. The appropriate route index must be specified for the assigned code index.
- ESS 3306 Line Class Code Table—The line class code for the PBX station numbers must be defined on this form. The originating major class code (0) and terminating major class code (31) must also be specified. A line class code must be defined for the incoming lines from the PBX. This line class code must deny termination (terminating major class 30).
- ESS 3501 Office Code Table—This form is used to assign a code index for routing DID calls based on the thousands group digit or to assign a route index for routing calls based on the hundreds group digit.

Refer to Translation Guide TG-3 for further description concerning the completion of these forms.

12.02 If the DID feature is to be implemented after the initial installation, the following recent change messages may be employed in order to establish the necessary translations.

- **RC:CDI**—This message is used to define a code index to be used for routing calls to the PBX based on the thousands digit. The route index which points to the PBX trunk group must be specified in association with this code index.
- **RC:GRP**—The trunk features required for the PBX trunk group must be specified with this message. The group number, supervision type (loop or E&M), circuit code, direction (outgoing only), and outpulsing type must also be specified.
- **RC:LCC**—This message is used to associate a line class code with the appropriate terminating major class (31) and originating major class (0) to be assigned to the PBX station numbers. Another line class code must be defined for the incoming lines from the PBX. These lines require a terminating major class of 30.
- **RC:LINE**—This message is used to assign telephone numbers to individual PBX stations when routing is to be by individual route index. The route index required to provide routing to the PBX trunk group must be specified along with the appropriate line class code. The incoming PBX lines must also be assigned telephone numbers and a line class code which denies termination.
- **RC:NG**—This message may be used to specify a code index for routing based on the thousands digit. If the 3E3 or later generic is employed, this message may be used to specify a route index if it is desired to route the calls based on the hundreds digit.
- **RC:RTI**—This message is used to define a route index for routing to the PBX trunk group. The trunk group number and digit prefixing or deleting information must be specified.

Refer to IM-3H300 for further description concerning the use of these messages.

13. TESTING

13.01 The DID feature may be tested by making test calls to each PBX station to verify that the calls are completed properly. Additionally, the verification and office records messages shown in Table B may be used to verify that the software assignments are correct. The data verified with each verification message is the same data assigned with the associated recent change message. Refer to IM-3H300 for further description concerning the use of these messages.

TABLE B

VERIFICATION AND OFFICE RECORDS ASSOCIATED WITH THE DID FEATURE

VERIFICATION MESSAGE FOR SO-2, ISSUE 4A	OFFICE RECORDS MESSAGE FOR 3E3 AND LATER
	KEYWORD FOR OP:OFR MESSAGE
VER:CDI	CDI
VER:GRP	GRP
VER:LCC	LCC
VER:LINE*	TN
VER:RTI	RTI

*This message may also be used with the 3E3 generic.

14. OTHER PLANNING TOPICS

14.01 Adequate trunks should be provided in order to handle the expected number of simultaneous calls to the PBX stations. No other special planning is required.

ADMINISTRATION

15. MEASUREMENTS

15.01 The outgoing trunk group to the PBX has the usual peg count, usage, overflow, and maintenance busy counts associated with it. No other measurements are required for the DID feature.

16. CHARGING

16.01 Not applicable.

SUPPLEMENTARY INFORMATION

17. GLOSSARY

17.01 The following list defines terms used in this section which may be unfamiliar to the reader.

- Area Code—A 3-digit code which indicates the geographical area used in nationwide dialing.
- Audible Ringing—A signal sent to the calling party to simulate the ringing signal being sent to the called party.
- Centrex-CU Service—A centralized exchange service where a switching system (ie, a PBX) is located on the customer premises and each individual station may be dialed directly from outside of the exchange (direct inward dialing).
- DP—Dial Pulsing
- Exchange Network—All telecommunications exchanges, offices, trunks, etc, throughout the North American continent, outside of a given PBX.
- MF—Multifrequency
- MLHG—Multiline Hunt Group
- PBX—Private Branch Exchange—A telephone system installed for the benefit of a private organization. The system is usually located on the customer premises. Facilities are provided to connect the customer telephone stations through trunks to the central office, or to connect the stations to another PBX or switched services network, via tie trunks.
- Reorder—An audible signal, interrupted at a 120-ipm rate, sent to the calling party to indicate that the call cannot be completed

due to busy or unavailable equipment. Reorder tone is sometimes called fast busy.

- TCR—Transient Call Record—A block of temporary storage used to control the progress of a call from origination until an answer signal has been received and the connection has been placed in the talking state. It is also used to control the actions taken to disconnect a call.

18. REFERENCES

18.01 The following documents may be referred to for supplementary information concerning operations related to the Direct Inward Dialing feature.

- CD- and SD-3H220—Universal Trunk Circuit, No. 3 ESS
 - (a) CPS-FB382—Two-Way E&M Trunk Type Two Interface
 - (b) CPS-FB399—Outgoing Reverse Battery Trunk and Outgoing Reverse Battery High-Low
- Sections 233-060-XXX—Network Switching Practices, No. 3 ESS
- TOP 233-142-100—No. 3 ESS Maintenance Volume
- Section 233-190-010—System Features, No. 3 ESS
- Section 233-190-024—Trunking Arrangements, No. 3 ESS
- Section 233-154-130—Recent Change Users Guide
- IM-3H300—Input Message Manual
- OM-3H300—Output Message Manual
- TG-3—Translation Guide
- PA-3H3XX—Layout Specification

- PR-3H157—Equipment Selection Subroutines (EQPSEL)
- PR-3H165—Outgoing Call Program (OUTCAL)
- PR-3H175—Completion of Incoming and Interoffice Calls (TERM)
- PR-3H182—Four-Digit Translation Program (XSL4DG)