

SWITCHING SYSTEMS MANAGEMENT
NO. 2 ELECTRONIC SWITCHING SYSTEMS (2-WIRE)
GENERIC PROGRAM DOCUMENTATION AND FEATURES DESCRIPTION

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processing, input-output, and switching equipment which provides the telephone and administrative functions of a local telephone office. This section describes that portion of the stored program referred to as the **generic**. It provides the network administrator with information pertaining to documentation and features. It also provides some insight into the making and changing of generic programs.

1.02 When this section is reissued, this paragraph will contain the reason for reissue.

1.03 The title for each figure includes a number in parentheses which identifies the paragraph in which the figure is referenced.

2. GENERAL

2.01 In the No. 2 ESS the stored program (software) resides in the physical portion of the system appropriately named the program store. The program store is the larger of two memory units—program store and call store—used in the No. 2 ESS. It is a semipermanent, read-only memory; that is, it contains information that is used by, but is unchanged by, the normal functioning of the system as it processes calls. Two types of information are stored in the program store memory: the generic program and translations.

2.02 Translations contain information for defining the characteristics of the individual offices and each customer within the office. Translations are unique for each No. 2 ESS office.

2.03 The generic program is a group of instructions which direct the normal telephone switching operations of line and trunk interconnections and the maintenance routines for automatic detection of component and package failures. The size of the generic program is determined by the features and services offered and does not change with office growth in terms of the number of lines and trunks served.

2.04 The term **generic** implies **characteristic of a group or class**. A generic program is a group of instructions which can be identified by some characteristic or characteristics which make it different from otherwise similar groups of instructions which may exist.

2.05 Two generic programs are presently available for the No. 2 ESS, and additional generics are planned. The two available programs are the Local Office 1 (LO-1) generic and the Extended Feature 1 (EF-1) generic. The EF-1 generic is capable of providing additional services to the customer over and above those provided by the LO-1 generic. Centrex capability is one generic characteristic of EF-1.

2.06 The generic program is comprised of all the command instructions required for the No. 2 ESS to operate properly. Within the generic the instructions are grouped into smaller, more specialized programs which control the sequencing of a call. These programs are further divided into task oriented subroutines. All the programs are woven into a simple call processing hierarchy which provides program administration by assigning priorities to programs so that the more urgent tasks are performed before those of a less urgent nature.

2.07 The network administrator has no control over generic program preparation. Generic programs are prepared by Bell Telephone Laboratories and are the result of extensive research and development projects. It is, however, the network administrator's responsibility to know the capabilities of the generic program and to maintain accurate and current support documentation. In this interest it is helpful to understand the cataloguing of generic program documentation and the events which influence the program or program documents or both.

3. GENERIC PROGRAM DOCUMENTATION

GENERAL

3.01 For the purpose of administration, a No. 2 ESS generic program is divided into many parts. Associated with most of these parts are three documents: a program specification (PD), a program flowchart (PF), and a program listing (PR). A 5-character base identification consisting of 2H followed by three decimal digits is assigned to each No. 2 ESS program documentation unit, and the three parts of that unit share the same base identification number (eg, PD-2H135, PF-2H135, and PR-2H135).

3.02 In addition, there are some one-of-a-kind documents including the Program System

Description (PD-2H201), the No. 2 ESS 2-Wire Input Message Manual (IM-2H200), the No. 2 ESS 2-Wire Output Message Manual (OM-2H200), and the Office Data Tables Layout Specification (PA-2H200).

3.03 The combinations of programs for a given generic are defined in the Program Store and Documentation Index (PG) for that generic, together with all supporting documentation. The PG also serves as the document against which the generic program changes are written.

3.04 The following paragraphs discuss those documents which are pertinent to the network administrator.

PROGRAM SYSTEM DESCRIPTION

3.05 A PD is a description, largely in prose, of a program or program data. The Program System Description (PD-2H201) constitutes a general No. 2 ESS program specification. It describes the general program plan common to all No. 2 ESS offices arranged for 2-wire, describes all the features available for an office, and introduces the reader to the types and contents of generic program documentation. PD-2H201 is useful as a feature information source for new generic programs.

INPUT MESSAGE MANUAL (IM)

3.06 The No. 2 ESS 2-Wire Input Message Manual (IM-2H200) lists all the TTY messages that can be inputted via the teletypewriters to cause a system action or function. A description of the format and use of each message, as well as precautions to be observed and expected results, is given for each message. The messages are arranged in alphabetical order. A topical index of all messages guides the reader to the specific message to be used. Additional indexes are provided for each TTY channel, each listing only messages applicable to that channel.

OUTPUT MESSAGE MANUAL (OM)

3.07 The No. 2 ESS 2-Wire Message Manual (OM-2H200) lists all the system output messages printed by the TTYs. The document gives a description of each message format, the reason the message was issued, and the actions to be taken, if any, as a result of the message having been issued, as well as alarm indications that should accompany the message. The messages are arranged

in alphabetical order. A topical index of all messages guides the reader to the specific message to be used. Additional indexes are provided for each TTY channel, each listing only messages applicable to that channel.

3.08 In the previous discussion the input and output message manuals were defined as a part of the generic program documentation. As such, they are subject to change if and when some change is made to the generic. These manuals are of paramount importance to the network administrator because they alone contain the coded messages which the network administrator needs to communicate with the system. The network administrator must therefore ensure that the manuals in use are compatible with the generic program issue currently in the program store. This can be achieved through the use of the Program Store and Documentation Index.

PROGRAM STORE AND DOCUMENTATION INDEX

3.09 Each generic program has its own Program Store and Documentation Index (PG). These PGs are respectively PG-2H001 and 2H002 for the current LO-1 and EF-1 generic programs. Barring any change in documentation procedures, the PGs for future generics will be assigned as 2H003, 2H004, etc. The PG provides a cross reference between the generic program issue and the issues of all program documents. It is the document which should be referenced whenever a question arises as to the compatibility of any generic program document to the generic program issue in service.

OFFICE DATA TABLES LAYOUT SPECIFICATION (PA-2H200)

3.10 This document provides all the tables which are built for translations. It consists primarily of schematic representations of the tables in the program store. It is a part of the No. 2 ESS Translation Guide (TG-2H) and is used in the preparation of office translations.

3.11 Copies of the Input Message Manual, the Output Message Manual, and the Office Data Tables Layout Specification are retained by the network administrator. The remaining documents are available from plant maintenance personnel, but it is advised that they also be ordered and retained by the network administrator.

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4. PROGRAM GENERATION AND CHANGES

NEW PROGRAMS

4.01 As stated previously, a new generic program is the result of an extensive research and development program. It usually contains features not previously available either in total or in the specific switching system it controls. The first version of a new generic is denoted Issue 1. Later versions carry sequentially higher issue numbers.

4.02 When a new generic is developed to the point where it is practical to place it in service, a cutoff is established for Issue 1. Work then begins for Issue 2 as preparations are made to deliver the new generic program. The first official information will become available at this time in the form of a general letter (GL) from the American Telephone & Telegraph Company. The GL will include information on new developments, services and features, availability, first application offices, and features planned for future issues. It is recommended (Division H, Section 10r) that a reference file of GLs be readily available to the network administrator.

4.03 The generic program documentation will be delivered to the local office plant maintenance personnel along with the generic program. When it is received, PD-2H201 should be compared with the GL to check for any changes in the features forecast.

4.04 The translation area of the program store is affected by a new generic program. Whether the office is new or being retrofitted, a new generic will require a full rework of the translation data. This is accomplished with an Office Data Assembly (ODA). Although not discussed here, the responsibility for office translations lies with the network administrator and is performed with the aid of the No. 2 ESS Translation Guide.

POINT CHANGES

4.05 As software problems are discovered and solved, they are corrected in the program store by the use of overwrites. Overwrites get their name from the fact that when generic programs are assembled and written on the program store cards, the instructions are packed tightly together and any change to the program requires some existing instruction to be overwritten by a new

instruction. Also, if instructions must be added, they must be added in some unused area of generic program memory. Overwrites are then used to transfer to and from the added instructions.

4.06 Overwrites are a quick and easy method of making generic program changes. They do, however, have some drawbacks. Overwrites tend to unnecessarily use up the program store and add to call processing time. Also, overwrites are inserted at the local office, and this can be a problem if the office is new. As the number of overwrites increases, so does the time required to insert them.

4.07 The point change succeeds in eliminating the need to insert overwrites in the generic program at a new local office by having those overwrites inserted at the Western Electric card writing location. The cards then shipped do not require modification at the local office.

ISSUE CHANGES

4.08 An issue change is a complete reassembly of the generic program instructions by BTL. It will eliminate any instructions previously required by overwrites but not needed after the reassembly. Minor feature changes may also be involved. The purpose of an issue change is to reassemble the program into a more efficient mechanism for call processing.

DOCUMENTATION CHANGES

4.09 Each change to the generic program will result in some documentation changes. The network administrator should keep abreast of the documentation changes to ensure that all documents retained are compatible with the issue of the generic program in service. The following paragraphs discuss the changing of documents pertinent to the network administrator.

4.10 The PG is the single most important cross reference document for the generic program. Any formal change to the generic program requires a change to the PG. It can be determined quickly from the PG which documents are changed as a part of a generic program change, along with the new issue numbers.

4.11 PD-2H201 is usually reissued only if some major program change occurs, such as the

inclusion of a new generic. It is not usually reissued after a point or issue change to an existing program.

4.12 The input and output message manuals are the most frequently changed generic documents with which the network administrator deals. Changes to these manuals are published as issue changes or as addendums to an issue. A new issue will occur as a part of a generic program point or issue change. Addendums, however, are published independently and cannot be related to generic program point or issue changes. Each new addendum to an issue will include all the changes included in any previous addendums; therefore, only the most recent addendum needs to be retained.

4.13 The Office Data Tables Layout Specification may be changed by a point or issue change to an existing program and will also be changed if a new generic program is introduced. Again, the PG will indicate what issue corresponds with the generic program in use.

4.14 An administration center could be responsible for a number of No. 2 ESS local offices. Each No. 2 ESS will be using only one issue of one generic program. The particular issue in use in one office may not be the same as that in another office; in some offices an entirely different generic may be in use. The center could then be responsible for administering a variety of generic programs and program issues. To be capable of performing this task, the center must be flexible in the use of program documentation. An accurate file of documentation must be kept to ensure that the generic documentation being used for any one No. 2 ESS is compatible with the particular issue of the generic in use in that system. A number of issues of the same document may have to be kept on file to achieve this.

5. FEATURES

LOCAL OFFICE 1 (LO-1)

5.01 The following list of features has been provided in the LO-1 generic program. The list has been divided into the following categories: line, trunk, maintenance and administration, routing and connecting circuits, features not available, and noncompatible systems.

A. Line Features

5.02 The numerous types of lines available in the No. 2 ESS are as follows:

- Single party residence or business.
- Manual originating—Route to operator.
- MLHG PBX—Multiline hunt group private branch exchange.
- Coin—Prepay and dial tone first.
- TWX—Teletypewriter Exchange Service.
- Mobile Radio—Individual mobile lines terminated on the line trunk network. No. 2 ESS can recognize all channels busy from mobile equipment.
- INWATS—Full time measured.
- 2-Party—Full selective ringing.
- 4-Party—Full selective ringing.
- 4-Party—Semiselective ringing.
- 8-Party—Semiselective ringing.

5.03 Figure 1 cross-references the features available with the various types of lines. The following list defines each of the features:

- **Automatic Number Identification (ANI):** Both calling and called numbers are outpulsed to the Centralized Automatic Message Accounting (CAMA) office with ANI. Only multifrequency (MF) outpulsing is available from a No. 2 ESS to a CAMA office.
- **Billing to Listed Number:** This is an Automatic Message Accounting (AMA) recording of listed directory number calls.
- **Call Forwarding:** This feature allows a customer to have his incoming calls transferred to another directory number which he has specified by dialing into the temporary call store memory. This feature is available to individual customer lines and to the first member only of a multiline hunting group which has an associated directory number.

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This feature is not available to customers with the **Message Register** feature.

- **Call Tracing:** On both intraoffice and interoffice calls, call tracing provides originating line identification or incoming trunk identification on calls completed to the specified line arranged for call tracing.
- **Call Waiting:** This feature allows a customer who is engaged in a telephone conversation to be alerted via an audible tone that another caller is attempting to reach him. It also has a hold feature allowing the call waiting customer to alternately talk to the original and to the new calling party. This feature is only available to individual customer lines.
- **Class A Line:** A customer line assigned as a class A essential line is given preferential treatment during line scanning and for connection to dial tone when dynamic service protection is activated. The assignment of this feature in No. 2 ESS is governed by the line terminal equipment number on the network.
- **Complaint Observing:** This provides detailed recording of AMA entries for a line that is ordinarily bulk billed.
- **Denied Originating:** This prohibits a line from originating a call.
- **Denied Terminating:** This prohibits a line from receiving a call.
- **Dial Pulse:** The dial pulse has ten pulses per second from customer lines and incoming trunks. Dial pulse outpulsing to PBXs and other switching machines is also at a rate of ten pulses per second. It allows 20 pulses per second from PBX lines only.
- **Dynamic Service Protection:** Preference will be provided to lines assigned to a class A terminal for connecting to dial tone under heavy traffic conditions, when allowed.
- **Emergency Manual Line:** This is a line which is given temporary manual service under emergency conditions. When the service is activated, the customer is connected directly to an operator position.
- **Free Terminating:** No charge is recorded on Local Automatic Message Accounting (LAMA) calls; no deposit is collected on coin box calls; or answer signal is returned when this type of line is called.
- **Ground Start:** Line origination is detected as the result of completing an electrical circuit by applying a ground to one side of the loop facilities at the customer location.
- **Hotel-Motel:** Message registers are located on the customer premises that are used to indicate calls from individual rooms.
- **Immediate Ring:** This is a reduction of the 1.33-second average delay before the ringing is encountered in existing step-by-step and crossbar systems.
- **LAMA:** Local automatic message accounting has a 9-track magnetic tape, triple entry, initial entry, and answer and disconnect formats.
- **Loop Start:** Line origination is detected as the result of completing an electrical circuit between the tip and ring of the loop facilities at the customer location.
- **Make Busy:** This feature makes designated lines look busy to the central office by means of a key operation.
- **Message Rate:** This is a procedure for billing each individual local call. The initial and overtime periods are defined in message units. Up to 16 conditions of the variable initial and overtime periods are available.
- **Message Register:** This provides mechanical registration of message units used by a customer.
- **Multiline Hunt:** This allows a call to be routed to an idle line in a group of lines designated by one or more directory numbers.

- **Night Stop:** This allows calls to any multiline hunt group listed directory number to be routed to a single member. It also limits the members to which calls may be completed.
 - **Operator Number Identification (ONI):** Calls requiring charging may be routed through the CAMA operator for recording of the calling number after outpulsing of the called number.
 - **Originating:** These lines are connected to the office having the capability to initiate intraoffice and outgoing calls.
 - **Plug-Up List:** Calls to lines on this list are routed to trouble intercept.
 - **Range Extension:** The normal conductor loop extension limit is 1300 ohms. The extended range feature inserts amplification and battery boost to permit a 2500-ohm limit using the uniguage plan: ie, the amplifier impedance is matched to 15,000 feet of nonloaded 26-gauge cable.
 - **Reverting Call:** This call takes place between customers who share the same party line.
 - **Series Completion:** This allows calls to be routed to another designated directory number if the original is busy. A call may be routed through a maximum of eight directory numbers.
 - **Sleeve Lead:** This is the third wire used for controlling an external device, ie, service observing, busy indication, etc.
 - **Speed Calling:** This allows a customer with this service to dial a 1- or 2-digit code and be completed to the number associated with the speed calling code. It also provides a customer with the capability to make his own changes to his repertory by dialing a new 7- or 10-digit number associated with each of his speed calling codes. These features are available to individual customer lines, to a complete multiline hunting group, or to individual members of MLHG.
 - **Special Billing:** This is oral identification by a customer to the operator of a special billing number assigned to the PBX extension placing the call.
 - **Stop Hunt:** This allows the size of a multiline hunt group to be decreased by means of a key operation.
 - **Terminating:** This feature can receive incoming and intraoffice calls.
 - **Three-Way Calling:** A customer may add a third customer to an existing telephone conversation. This feature is available to individual customer lines or to a complete multiline hunting group.
 - **Toll Diversion:** This feature restricts the calling area of PBX extensions using dial 9 trunks by rerouting calls to the PBX attendant when a restricted code is dialed.
 - **Toll Network Protection:** This feature denies outgoing calls over predesignated trunk groups to all but toll essential lines when activated.
 - **Toll Restriction:** PBX customers with this class of service are permitted to dial telephone numbers directly only in a limited area.
 - **TOUCH-TONE® Calling:** No. 2 ESS accepts TOUCH-TONE signal 0 through 9, *, and #. Any customer line may be equipped for this feature.
 - **WATS—Wide Area Telephone Service:** Free calling within the allowable band or bands for flat rate service or AMA is recorded for measured service.
- 5.04 Figure 2 shows the possible arrangements between the two types of coin lines and the various features available.
- **Prepay:** An initial deposit is required before a dial tone is received.
 - **Dial Tone First:** No deposit is required for 0, 0+, or X11 calls.
 - **Local Overtime:** After a timed initial period following an initial deposit, the coin is collected. Then the coin test is made for the overtime charge and overtime is

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timed. The operator is called in if no overtime deposit is detected.

- **Coin Zone:** This feature provides for variable charging and timing for both initial periods and overtime periods on local calls originating at a coin station.

B. Trunk Features

5.05 These are the types of trunks available in a No. 2 ESS:

- Outgoing, both local and tandem
- Incoming, both local and tandem
- 2-Way, both local and tandem
- Recording completing outgoing to operator at No. 3CL or equivalent switchboard
- Toll switch incoming from operator at No. 3CL or equivalent switchboard
- CAMA, Traffic Service Position (TSP), or Traffic Service Position System (TSPS)
- Outgoing to local test desk No. 14
- Incoming from local test desk No. 14
- Permanent signal to operator at No. 3CL or equivalent switchboard
- Coin zone to operator at No. 3CL or equivalent switchboard
- Outgoing to intercept or directory assistance operator.

5.06 Figure 3 cross-references the features available with the various types of trunks. The following list defines each of the features:

- **Audible Ringing:** Audible ringing is supplied from the trunk circuit.
- **Class of Service Tone:** On operator trunks, a short burst of tone is applied to identify the type of calling party (eg, coin or noncoin).
- **Controlled Ring:** Controlled ringing is applied after a signal from the switchboard.

- **Delay Dial (Method A):** This is an off-hook to on-hook transition to start pulsing.

- **Delay Dial (Method B):** The trunk goes off-hook in less than 50 milliseconds. Then the off-hook to on-hook transition starts the pulsing.

- **Dial Pulse Signaling:** The dial pulse signaling is 10 pulses per second in and out.

- **E&M Lead:** This method is used for signaling over a separate circuit.

- **Immediate Start:** From the step-by-step office where incoming pulsing cannot be delayed, the No. 2 ESS is ready to receive pulsing in less than 60 milliseconds.

- **Inband Coin and Rering:** The coin is collected, the coin is returned, and the rering is signaled by wink start, followed by a multifrequency signal.

- **MF Signaling:** MF signaling is multifrequency signaling.

- **No-Test Access:** The trunk is bridged to an existing connection.

- **Reverse Battery:** This is a supervisory arrangement in which the trunk battery is supplied to the terminating end and supervisory signals are furnished to the originating end.

- **Stop-Go:** This is an off-hook condition returned from a distant office during an interdigital interval to delay pulsing.

- **Wink Start:** Wink start is 150 milliseconds of off-hook signal returned from a distant office to start pulsing.

C. Maintenance and Administration

5.07 The following maintenance and administrative features are available in the No. 2 ESS:

- Station ringer and TOUCH-TONE telephone test

- Trunk test panel—with panel phone for central office communicating system

- Incoming trunk test lines
 - Continuity, loop-around, open circuit, loop checker generator, short circuit, and balance tests
 - Automatic line insulation testing—controlled from local test desk teletypewriter
 - System status display—local maintenance center
 - Diagnostic programs—automatic fault recognition and trouble diagnosis of all major system components
 - Automatic switching to replace faulty duplicated equipment
 - Automatic operational trunk and service circuit testing
 - Manual line and trunk testing arrangements
 - TTY printout of maintenance busy equipment at the maintenance teletypewriter
 - Regular office alarm—attended and nonattended alarm extended to remote maintenance teletypewriters
 - False cross and ground tests, power cross tests, ringing and network continuity tests
 - Master scanner applique for miscellaneous alarms
 - Emergency action panel to provide manual intervention when system is not operating properly.
- 5.08 The six teletypewriter channels available in the No. 2 ESS are as follows:
- **Local Maintenance:** This is for all maintenance control and results. It is also used to implement trunk and routing recent changes.
 - **Remote Maintenance:** This is for an unattended office and backup.

- **Service Order:** All line and PBX information can be changed by using the universal service order code format.
- **Local Test Desk:** This consists of permanent signals and line insulation test control and results.
- **Network Administration (Traffic):** This consists of traffic measurement data, translation verification, dynamic service protection activation (see 5.10—**Dynamic service protection**—for provisions), and variable traffic schedule assignments.
- **Trunk Test:** This is the result of automatic trunk testing, trunks made busy. It is only needed when more than one trunk test panel is required in the office.

Measurements

- Dial tone speed test
- Plant measurements
- Traffic measurements

5.09 Figure 4 shows the traffic peg count, usage, and overflow measurements that are available.

Overload Control Features

5.10 The following features are available in the No. 2 ESS to control overloads:

- **Dynamic service protection** gives preference to class A lines without denying service to other lines. It may be allowed or disallowed via the local or remote maintenance teletypewriter. Generic programs LO-1, Issue 4.6 and EF-1, Issue 3.4 will also provide the allow or disallow capability at the network administration teletypewriter.
- **Toll network protection** permits toll calls only to selected lines on designated trunk groups. It is activated by local or remote key control.
- **Reduced time-out periods** are for permanent signal and partial dials during system overloads.

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- **System overload control programs** prevent system overloads by controlling call inputs and call processing.
- **Lamp displays** at the maintenance control center and **printouts** on the maintenance control center and network administration teletypewriter indicate machine status.

D. Routing and Connecting Circuits

5.11 The No. 2 ESS can serve as a local class 5 end office with the following features:

- 0 with or without time-out to operate
- Separate routing for 0+, 1+, and nonprefixed traffic
- Interchangeable office and area codes including conflicting NPA and NNX codes
- X11 or 11X service codes (originating only)
- Directory assistance with optional AMA record reached with the following:

411

1+555-1212

NPA+555-1212

1+NPA+555-1212

- Deletion and prefixing of up to 7 digits for outpulsing
- Acceptance of 3, 4, 5, 6, 7, or 10 digits on incoming trunk groups
- Up to six foreign area translators
- Up to five alternate routes
- Standard Bell System tones and announcements.

5.12 The No. 2 ESS can serve as a local tandem with the following features:

- Connect through from one class 5 office only to another class 5 office
- Provide one-way direct in-dialing to a PBX.

5.13 Connections can be made to the following:

- Directory assistance operator
- Repair service desks
- Automatic Intercept System (AIS)
- Service observing sets (7B only)
- Regular and trouble intercept operators
- Remote 6A announcement machines
- Local announcement machines
- Verification request operator.

E. Features Not Available

5.14 Figure 5 provides a list of features not provided by the LO-1 generic. Adjacent to some of the features are possible alternative solutions for providing the same general function.

F. Noncompatible Systems

5.15 The following switching systems are not compatible with the No. 2 ESS:

- Panel (except when arranged for multifrequency outpulsing)
- Panel sender tandem
- Office selector tandem
- Crossbar tandem with revertive pulsing senders only
- No. 1 toll switchboard
- No. 12 local test desk
- No. 12 service observing desk.

EXTENDED FEATURE 1 (EF-1)

5.16 The Extended Feature generic provides the No. 2 ESS with centrex capabilities. The features provided are the same as those in the Local Office generic, with additional features as described below. The additional features can be classified as centrex features or extended features.

5.17 Centrex gives a group of stations (usually associated with a business customer or other agency) the ability to perform the following:

- Dial one another using 2-, 3-, 4-, or 5-digit dialing.
- Reach a distant but related group of stations over tie trunks or other private facilities.
- Reach a centrex attendant console for whatever assistance may be necessary.
- Place local toll calls through the local central office.
- Place local toll calls to a foreign central office via FX trunks.

5.18 Other centrex features are also provided. These features are separated into centrex line features, centrex attendant features, and centrex group features.

A. Centrex Line Features

5.19 The following centrex line features are available in the No. 2 ESS:

- **Station-to-Station Calling**—The station user can dial other stations directly within the same centrex system without the assistance of the attendant.
- **Flexible Numbering of Stations**—Allows the station numbers to be assigned to lines at the time of installation in accordance with a customer desired numbering plan.
- **Miscellaneous Trunk Restriction**—Denies attendants and/or stations and/or incoming tie trunks the ability to use certain access codes to gain access to various types of trunks or features. This is accomplished by the use of the centrex access treatment codes.
- **Fully Restricted Terminating Station**—Denies selected station lines the ability to receive any but station-to-station calls.

- **Manual Line Service**—Station lines which alert the attendant when the station user goes off-hook for service.
- **Toll Restriction**—Permits station users to access the local central office and dial local service area calls but prevents completion of toll calls or calls to the toll operator without the assistance of the attendant.
- **Station Hunting**—Routes a call to an idle station line in a prearranged group when the called station is busy. Limit of 12 stations in one group.
- **Add-On**—Add another station, within the same centrex system, to an existing incoming call to establish a 3-party conference, without attendant assistance.
- **Call Forwarding (Variable)**—Calls intended for a station line automatically route to any other station line selected within the same centrex system.
- **Call Forwarding—Don't Answer**—Automatically routes incoming Direct Inward Dialing (DID) or Common Control Switching Arrangement (CCSA) calls to the attendant or a preselected station when the called station does not answer within a specified time limit.
- **Call Forwarding—Busy Line**—Automatically routes incoming DID or CCSA calls to the attendant or a preselected station when the called station line is busy.
- **Call Hold**—Allows a station user to **hold** any call in progress to originate another call.
- **Call Pickup**—A station can answer any call directed to another station line within its own preset pickup group.
- **Call Transfer—Attendant**—Allows the called station user to signal the attendant by flashing the switchhook.
- **Call Transfer—Individual**—A station user can transfer incoming calls to another station

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line within the same centrex system without the assistance of the attendant.

- **Call Transfer—Individual—All Calls**—A station user can transfer any established call to another station within or outside the centrex system without the assistance of the attendant.
- **Consultation Hold**—A station user can hold incoming calls and originate a call to another station within the same centrex system for private consultation.
- **Consultation Hold—All Calls**—A station user can hold any existing call and originate a call to another station within or outside the centrex system for private consultation.
- **Directed Call Pickup**—A station user can answer calls directed to any other station line in the centrex system by dialing the unique answer code of the station to be answered.
- **Speed Calling**—Allows station users to assign abbreviated codes to certain called numbers and permits dialing the selected numbers using fewer digits than normally required.
- **Three-Way Calling**—A station user can add a third party to any established call for a 3-party conference without assistance of the attendant.

B. Centrex Attendant Features

5.20 The following centrex attendant features are available in the No. 2 ESS:

- **Attendant Restriction**—Denies attendant access to preselected access codes.
- **Dial Access to Attendant**—Allows station users to reach the centrex attendant by dialing a code, usually a single digit 0.
- **Attendant Position**—A console from which the listed directory number and other calls requiring assistance can be answered and completed by the attendant.
- **Switched Loop**—An attendant position feature whereby the trunk facility requiring attendant assistance is automatically switched to one of a limited number of idle loops appearing as keys on an idle console attendant position.
- **Timed Reminders**—After a prescribed time interval, the attendant is automatically alerted to a camped-on or unanswered call.
- **Incoming Call Identification (ICI)**—Allows an attendant to identify visually the type of service associated with a call directed to the attendant.
- **Trunk Group Busy Lamp**—Provides the attendant at a switched-loop console position with a visual indication when all trunks in a trunk group are busy.
- **Trunk Answer from Any Station**—Incoming calls, normally directed to the attendant, activate a common alerting signal on the customer's premises when the attendant positions are in night service. By dialing a special code, any station can answer the incoming call.
- **Attendant Control of Trunk Group Access**—An attendant can restrict dial access by all station lines to FX, WATS, and/or tie trunk groups by dialing a code. Calls to trunk groups so restricted will be routed to the attendant or to an announcement.
- **Night Service**—Provides arrangements to route incoming calls normally directed to the attendant to preselected station lines within the centrex system.
- **Attendant Conference**—Allows the attendant to establish a conference connection of up to five conferees.
- **Listed Directory Number (LDN) Service**—Incoming calls to the centrex attendant are placed via the assigned listed local telephone directory number. The attendant may complete these calls to station lines within the system or to certain trunk facilities.
- **Attendant Camp-On**—An incoming call is held waiting until the called busy station

becomes idle. The called station is then automatically rung and connected to the incoming call upon answer.

- **Indication of Camp-On**—Provides an audible burst of tone to the busy called station line connection to indicate that the incoming call is camped on.
- **Two-Way Splitting**—The attendant can consult privately with either party on a call completed through and held on the attendant console.
- **Through Dialing**—Station users can complete dialing on other than station-to-station calls after the attendant selects the trunk facility on attendant handled outgoing calls.
- **Power Failure Transfer—Attendant**—Calls to the attendant are routed to a preassigned night station line during a power failure at a customer location where the reserve power is not provided or, where battery reserve is provided, the reserve is depleted. Service to and from the station lines is maintained by the power facilities at the central office (CO) location.
- **Reserve Power**—Provides an alternate, independent source of power to maintain attendant telecommunications service for a limited time during a power failure at the customer's location.
- **Attendant Call Trace**—Provides a mechanism for determining what circuit is connected to a particular attendant console and loop.
- **Attendant Maintenance**—Provides for console key and lamp exercise, as well as attendant loop and trunk and data link maintenance.
- **Direct Outward Dialing (DOD)**—Allows a centrex station user ability to gain access to the exchange network without the assistance of the attendant.
- **Identified Outward Dialing (IOD)**—Provides either automatic (on LAMA only) or operator (centrex attendant) identification of the calling station line on toll calls.
- **Foreign Exchange (FX) Trunks**—Permit station user to place local calls to a foreign area.
- **Wide Area Telephone Service (WATS)**—Permits station users unlimited service to various areas.
- **Tie Trunks**—Provide ringdown, automatic or dial repeating, one-way or 2-way circuits interconnecting two PBX or centrex systems.
- **CCSA Access**—Provides access to a private CCSA network. Also provides for AMA recording of CCSA calls.
- **Paging—Loudspeaker**—Dial access to customer-owned loudspeaker paging equipment.
- **Paging—Radio**—Dial access to customer-owned radio paging equipment to alert individuals carrying pocket radio receivers.
- **Recorded Telephone Dictation**—Permits access to and control of customer-owned dictating equipment by station users within the centrex system.
- **Code Call**—Allows station users to dial an access code and a called party code to activate signaling devices with a coded signal corresponding to the called code.
- **Tandem Tie Trunk Dialing**—A method of allowing station users to dial private tie trunk facilities while in a cut-through mode.
- **Pad Switching**—Allows for switching transmission pads in or out on calls involving via net loss (VNL) facilities.
- **Most Economical Routing (MER)**—Allows the switching machine to select the most economical route when the station user dials

C. Centrex Group Features

5.21 The following centrex group features are available in the No. 2 ESS:

- **Direct Inward Dialing (DID)**—Allows an incoming call to reach a specific centrex station line without attendant assistance.

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the MER access code. Will select over FX trunk groups, CCSA trunk groups, WATS, or direct toll routing.

- **Simulated Facilities**—A method of bookkeeping to limit the number of simultaneous WATS calls.
- **Traffic Measurements**—Extensive traffic measurements are provided on a per centrex group basis. These include originating calls, station-to-station calls, dial 0, dial 9, many custom calling features individually, attendant usage measurements, incoming DID attempts, centrex trunk group peg, usage, and overflow counts, plus various other group measurements.

D. Extended Features

5.22 The following extended features are available on the No. 2 ESS:

- **Charging on Call Forwarding**—Allows call forwarding outside of a free call area. Additionally, this allows message rate lines to have call forwarding.
- **DC Operator**—Arrangement for providing for nearby operators with new operator trunk using DC signals on tip and ring and a third wire.
- **Ringback Call Waiting**—Provides for automatic ringback of call waiting customer when he disconnects from one party when another party is on hold.
- **15-Network AMA Capability**—Removes the present limit of 11 networks for offices with AMA recording. Allows AMA recording for a full 15-network office and eliminates the need for a **change CII** entry on the AMA tape.
- **WATS Band Indication on AMA Calls**—Provides ability to mark AMA tape with actual WATS band used coded as a special telephone number.
- **Miscellaneous AMA Improvements**—This feature provides a printout of the number of AMA tape entries on the maintenance TTY. It also provides improved test of longitudinal parity circuit in AMA.

- **Transient Call Trace**—Capability for tracing all calls, including those in the transient or the nontalking state.

- **Carrier Group Alarm**—Allows for automatic removal and restoral of trunks associated with a carrier group alarm.

6. SUMMARY

6.01 A No. 2 ESS generic program is a group of stored instructions which direct data manipulation and switching in the system. The network administrator has no control over the development of a generic program, but must be familiar with its capabilities to effectively administer a local office.

6.02 The primary concerns of the network administrator relating to the generic are the features available and the appropriate documentation. A file must be maintained of documents which are compatible with the generic in use. If more than one version of the generic is in use, then more than one set of documents may be required.

6.03 There are a limited number of generic documents which concern the network administrator, and copies of these should be kept on hand for quick reference. These documents are as follows:

- PG-* Program Store and Documentation Index
- PD-2H201 Program System Description
- IM-2H200 Input Message Manual
- OM-2H200 Output Message Manual
- PA-2H200 Office Data Tables Layout Specification

* For LO-1, see 2H001; for EF-1, see 2H002.

6.04 One of the most important generic documents is the PG. The PG provides a cross-reference between any generic program issue and the issues of its supporting documents. It is also the document against which all generic changes are written; as such, it is modified to reflect all changes, point or issue.

6.05 The Program System Description is a useful document for general generic program information. It is useful for feature information in lieu of more recent publications, such as Dial Facilities Management Practices or feature documents.

6.06 The Input Message Manual and the Output Message Manual are the network administrator's means of communicating with the system via the network administration teletypewriter. These

documents are changed frequently by addendum or reissue. The most recent addendum to any issue must be retained to keep the document current.

6.07 The Office Data Tables Layout Specification is used by the network administrator in conjunction with the No. 2 ESS Translation Guide in the preparation of the office translations.

TYPE LINES	ANI	BILLING TO LISTED NUMBER	CALL FORWARDING	CALL TRACING	CALL WAITING	CLASS A	COMPLAINT OBSERVING	DENIED ORIGINATING	DENIED TERMINATING	DIAL PULSE	DYNAMIC SERVICE PROTECTION	EMERGENCY MANUAL LINE	FREE TERMINATING	GROUND START	HOTEL-MOTEL	IMMEDIATE RING	LAMA	LOOP START	MAKE BUSY	MESSAGE RATE	MESSAGE REGISTER	MULTILINE HUNT	NIGHT STOP	ONI	ORIGINATING	PLUG UP LIST	RANGE EXTENSION	REVERTING CALL	SERIES COMPLETION	SLEEVE LEAD	SPEED CALLING	SPECIAL BILLING	STOP HUNT	TERMINATING	3-WAY CALLING	TOLL DIVERSION	TOLL NETWORK PROTECTION	TOLL RESTRICTION	TOUCH-TONE® CALLING	WATS		
Residence-Business	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	X	X	X	-	X	X	-	-	X	X	X	X	-	X	X	X	-	-	X	X	-	X	X	X	X	X	
Manual Originating	-	X	-	X	-	X	X	X	X	-	X	X	X	X	-	X	-	X	-	X	X	-	-	X	X	X	X	-	X	X	-	-	-	X	-	-	X	-	-	-	-	
Multiline Hunt Group — PBX	X	X	X	X	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	X	-	-	X	X	X	X	X	X	-	X	X	X	X	X	X
Coin	X	-	-	X	-	X	X	-	X	X	X	X	-	X	-	X	X	X	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	X	-	-	X	X	X	X	-	
TWX	X	X	X	X	-	X	X	X	X	X	X	X	-	X	-	X	X	X	X	X	-	X	X	X	X	X	-	-	X	X	X	-	X	X	-	X	X	X	X	X	X	-
Mobile Radio	X	X	X	X	-	-	X	X	X	X	X	X	-	X	-	X	X	X	-	X	-	-	-	X	X	X	-	-	X	-	X	-	-	X	X	X	X	X	X	X	X	
INWATS	-	-	-	X	-	-	X	X	-	-	-	-	X	-	-	X	-	X	X	-	-	X	X	-	-	-	-	-	X	X	-	-	X	X	-	-	-	-	-	-	-	
2-Party	X	X	-	X	-	X	X	X	X	X	X	-	-	-	-	X	X	X	-	X	-	-	-	X	X	X	X	X	-	X	-	-	-	X	X	-	-	X	-	X	-	
4- and 8-Party	-	-	-	X	-	X	X	-	X	X	X	-	-	-	-	X	-	X	-	-	-	-	-	X	X	X	-	X	-	-	-	-	X	X	-	-	X	-	X	-		

X - Available

- - Not available

Fig. 1—Line Feature Combinations (5.03)

FEATURES	PREPAY	DIAL TONE FIRST
Ground Start	X	-
Loop Start	X	X
Retain Coin on 0 or X11	X	-
LAMA Records for Division of Revenue	X	X
Local Overtime	X	X
Coin Zone	X	X
Stuck Coin Operator Connection	X	X

X - Available

- - Not available

Fig. 2—Coin Features (5.04)

FEATURES	LOCAL & TANDEM			OPERATOR		OGT TO CAMA OR TSP/TSPS	LOCAL TEST DESK #14	
	OGT	ICT	2-WAY	REC COMP	TOLL SWITCH		OGT	ICT
Audible Ringing	-	X	X	-	X	-	-	-
Class of Service Tone	-	-	-	X	-	-	-	-
Controlled Ring	-	-	-	-	X	-	-	-
Delay Dial (Method A)	X	X	X	-	X	X	-	-
Delay Dial (Method B)	-	X	-	-	-	-	-	-
Dial Pulse 10 PPS	X	X	X	-	X	-	-	X
E & M Lead	X	X	X	X	X	X	-	-
Immediate Start	X	X	-	-	-	-	-	-
Inband Coin & Rering	-	-	-	X	X	X	-	-
MF Signaling	X	X	X	-	X	X	-	X
No Test Access	-	-	-	-	X	-	-	X
Reverse Battery	X	X	-	X	X	X	X	X
Stop-Go	X	-	X	-	-	-	-	-
Wink Start	X	X	X	-	X	X	-	X

OGT - Outgoing Trunk

ICT - Incoming Trunk

X - Available

- - Not available

REC COMP - Recording Completing

TSP/TSPS - Toll Service Position

Fig. 3—Trunk Feature Combinations (5.06)

FEATURES	PEG COUNT	USAGE	OVERFLOW COUNT	MAINTENANCE BUSY COUNT
Call Types (orig, term, etc)	X	-	-	-
Class of Service	X	-	-	-
Junctor Groups	-	X	-	-
Lines	-	X	X	-
Networks	X	X	X	-
Network Concentrators	-	X	-	-
Office Counts	X	-	-	-
PBX	X	X	X	-
Preroute	X	-	-	-
Service Circuit Groups	X	X	X	X
Trunk Groups	X	X	X	X

X - Available
 - - Not available

Fig. 4—Traffic Measurement Availability (5.09)

NOT PROVIDED	POSSIBLE ALTERNATIVE SOLUTIONS
Centrex CO AIOD	Centrex CU using one way DID and operator identified out-dialing
Revertive and PCI Pulsing	Multifrequency or Dial Pulse
Operator coin and rering signals using d-c on tip and ring or third wire	Inband signaling
Toll Connecting Tandem with CAMA	-
Automatic Removal of Trunks with Carrier Group Alarm	Normal failure routines
International Direct Distance Dialing	-

Fig. 5—Features Not Available (5.14)