

**FEATURE DOCUMENT**  
**PERMANENT SIGNAL AND**  
**PARTIAL DIAL TREATMENT**  
**NO. 2 ELECTRONIC SWITCHING SYSTEM**

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

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FIGURES	PAGE
Fig. 1—Permanent Signal and Partial Dial Feature Flow Diagram . . .	6
Fig. 2—High and Dry Parameter .	8
Fig. 3—High and Dry Threshold .	9

FIGURES	PAGE
Fig. 4—Permanent Signal Operator Trunk Group Data . . . . .	9

**TABLES**

Table A—TCRs for High and Dry List . . . . .	5
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**FEATURE DEFINITION AND DESCRIPTION****1. DEFINITION**

**1.01** Permanent signal and partial dial treatment is used when the customer does not complete dialing when originating calls. If the customer fails to start dialing within a certain interval after receiving dial tone or fails to go on-hook after the other party of a call has disconnected, the customer's line is considered to be in a permanent signal condition. Similarly, after the customer dials one or more digits but fails to dial an appropriate number of digits in the time allotted for completing a call, the customer's line is considered to be in a partial dial condition.

**1.02** In the No. 2 Electronic Switching System (ESS), when a customer's line is either in a permanent signal or partial dial condition, service is restored within a reasonable period of time after the customer goes back on-hook. When the customer fails to go back on-hook, the processing of a permanent signal or partial dial can optionally include any one or all of the following: an announcement, a receiver off-hook tone, and an operator to provide assistance to customers. If the customer is using a coin line, an attempt to return coin is made before the permanent signal and partial dial treatment is started.

**1.03** The Permanent Signal and Partial Dial feature is available in any No. 2 ESS office.

**1.04** Depending upon specific office requirements, additional equipment, including announcement circuits, operator trunks, and call store, may be required to provide permanent signal and partial dial capability in the No. 2 ESS office.

**2. DESCRIPTION****A. Customer (User) Perspective****Permanent Signal**

**2.01** When a customer origination is detected, the No. 2 ESS establishes the dialing connection, returns dial tone to the customer, and waits for the dialed digits.

**2.02** If dialing is not started within 16 seconds (10 seconds under heavy traffic conditions), the line is judged to have a permanent signal

condition and permanent signal treatment is initiated. A centrex line which reaches the Centrex Dialing Error announcement enters the permanent signal program immediately upon time-out from the announcement.

**2.03** An attempt to return the coin is made on all coin lines immediately before permanent signal treatment is started. A stuck coin causes the call to be routed to an operator, if one exists, and a teletypewriter (TTY) message is printed. On all other lines, a 1-second open interval, with battery and ground removed, is initiated in an attempt to release automatic equipment at a customer's location.

**2.04** The line is connected first to an announcement circuit or reorder tone, then to a receiver off-hook tone, and finally to a operator, any of which can be omitted by local office option. If the permanent signal cannot be cleared, the line ferrod is opened and the line is entered in the high and dry list, where it is examined periodically for on-hook.

**Partial Dial**

**2.05** After the customer dials the first digit, each interdigital interval is monitored. If any interdigital interval exceeds the allowable 10-second limit, the No. 2 ESS assumes customer dialing has stopped and an insufficient number of digits has been dialed. The dialing connection is released, and the customer line is connected to a partial dial announcement. After the announcement, the partial dial receives the permanent signal treatment starting with receiver off-hook tone.

**B. System Implementation****Permanent Signal**

**2.06** The permanent signal condition occurs when no digits are received by a customer digit receiver within 16 seconds after an off-hook condition. This time-out period is 10 seconds during periods of heavy traffic. On a centrex line, a permanent signal can also occur immediately after time-out from the Centrex Dialing Error announcement.

**2.07** The following steps are taken, in turn, by the program in an attempt to remove the permanent signal condition. If the line goes on-hook at any time during the following treatment, the

## SECTION 232-190-129

treatment is abandoned and the line is restored to normal.

(a) An attempt to return coin is automatically made by the program on all coin lines immediately before a permanent signal treatment is started. A stuck coin causes the call to be routed via a stuck coin trunk to an operator, if one exists, and a TTY message to be printed.

(b) An attempt is automatically made by the program to clear permanent signals on all lines by removing battery and ground from the lines for a 1-second period immediately before the next step. This releases holding bridge equipment at certain customer key telephone stations and clears this type of permanent signal.

(c) The line is given the treatment defined by route index (RI) 017 (usually an announcement or tone) for 30 seconds. If there are no idle members in the group defined in RI 017, or if the group is defined without any members at all, or if the connection is blocked, Step (d) is omitted and treatment proceeds to Step (e).

(d) If the 30-second time period expires and the line remains off-hook, it is connected to a tone. A regular line or a centrex line is connected to the receiver off-hook (ROH) tone (RI 017) for a period of 40 seconds. However, a private branch exchange (PBX) line is connected to the reorder tone for 40 seconds. This step is omitted if the tone group (ROH or reorder) has no idle members, or if the connection is blocked. This treatment for PBX lines prevents the possibility of returning the high level ROH tone to an operator while wearing a headset. A centrex attendant gets no tone, and proceeds to Step (g).

(e) The line is then connected, via an outgoing trunk circuit, to an operator who may listen and talk on the line. This connection is controlled by RI 15 for noncoin phones and by RI 16 for coin phones. The purpose of the operator is to provide assistance to customers, especially in an emergency situation. When a customer line is connected to a switchboard, one of two lamps associated with coin and noncoin trunk groups lights. The lamps are designated as PS COIN and PS NONCOIN to indicate the class of the customer line. If the operator does not answer the call within 60 seconds, or when the operator

disconnects after answering the call, the lamp is extinguished, and the call is advanced to Step (f). A line that cannot be connected to an operator due to blocking or a busy condition, or if no other member exists in the group, advance to Step (f).

(f) All network connections associated with the line are taken down, the line ferrod is left unconnected (with its associated cutoff ferreed opened), and the line is entered on the call store (CS) High and Dry List. The line last-look bit (LLB) in CS memory remains marked busy so that a termination cannot be made to the line. After the line has been entered on the high and dry list, the line ferrod is connected (and its associated cutoff ferreed is closed) every 16 to 64 seconds and then scanned. If when the line is scanned, the line is on-hook, the LLB is idled, and the line is removed from the high and dry list. If the line is off-hook, the ferrod is disconnected and the line is left on the high and dry list.

(g) With a centrex attendant, all network connections associated with the port of the attendant loop that had dial tone are disconnected and the status bit of that port is marked idle. The other port and the attendant trunk are not changed. Since the attendant is still on the loop, the attendant is still busy to incoming calls.

### Partial Dial Calls

**2.08** Partial dial calls are calls that are not completely dialed, and therefore, time-out after the reception of at least one digit. The time-out period is the same as permanent signal time-out.

**2.09** Partial dial calls are treated like permanent signals (2.07) except that RI 018 is used in place of RI 017 in 2.07(c).

### High and Dry List

**2.10** When more than a certain number of permanent signal or partial dial lines (the number is set by the operating company and is a recent changeable item) enter the high and dry list in less than five minutes, a message that the number has been exceeded is printed on the local test desk (LTD) TTY and the maintenance TTY. The minor alarm is then sounded.

2.11 A TTY printout of the associated directory number occurs on the LTD teletypewriter after a line has been on the high and dry list for a period of time predetermined by the operating company. The directory number is printed out only once. The predetermined period of time is called **office time** and can be 15, 30, 45, or 60 minutes. A line is not printed on the LTD teletypewriter until it has been on the high and dry list for at least the specified time.

2.12 The permanent signals in the high and dry list are stored in transient call registers (TCR). Up to six permanent signals are stored in one TCR. The number of TCRs that may be associated with the high and dry list varies with the number of available TCR blocks. See Table A for the maximum number of TCRs that can be used with the high and dry list.

TABLE A

TCRs FOR HIGH AND DRY LIST

TCR BLOCKS	NUMBER OF AVAILABLE TCRs FOR HIGH AND DRY
1, 2	10
3, 4	24

2.13 Each TCR can store permanent signals in one of three supervisory classes and one nonsupervisory class. Each supervisory class TCR is distinguished by the length of time the associated lines have been on the high and dry list as follows:

- **Minimum Class:** This class of TCR contains lines that have been on the list for less than office time (15, 30, 45, or 60 minutes)
- **Medium Class:** This class of TCR contains lines that have been on the list for less than twice the office time
- **Maximum Class:** This class of TCR contains lines that have been on the list for longer than twice the office time.

Lines contained in minimum and medium class TCRs are scanned every 16 seconds. Lines contained

in maximum class TCRs are scanned every 64 seconds. A line is removed from the list and returned to service if it is found on-hook during a scan.

2.14 If a line is to be entered in a supervisory class TCR, and there is no space available in the proper class, a printout occurs identifying the directory number of the line and the class of TCR into which it should have been entered. An attempt is then made to enter the line in one of the other supervisory classes of TCRs.

2.15 The fourth class of TCR that can be entered on the high and dry list is a **nonsupervisory** class. A line is entered in a nonsupervisory class of TCR because of a power cross failure, or a maintenance request. Lines in a nonsupervisory class TCR are not scanned and can only be removed by a maintenance request.

2.16 When the high and dry list is full, the minor alarm is sounded. A printout of the directory numbers of the lines is made at the LTD and maintenance TTY. No additional lines can be added to the list until an entry is deleted from the list. For lines that cannot be added to the list, the line last-look bits are left marked busy and the ferrod is disconnected. The audit program restores the nonstored lines to service only after the high and dry list becomes partially empty.

2.17 A printout may be requested of the directory numbers of all permanent signal lines presently in the high and dry state by using the maintenance or LTD teletypewriter. The system responds by printing out, on the TTY, the directory numbers of all lines in the high and dry state (refer to 13.07).

2.18 Since the directory number does not uniquely identify a multiline hunting group line, the member number for the multiline hunting group line is also printed out. If a multiparty line is involved, the directory number of the first defined party is printed out with a code indicating a party line.

### 3. FEATURE FLOW DIAGRAM

3.01 The flow diagram illustrated in Figure 1 is a graphical representation of permanent signal and partial dial treatment.

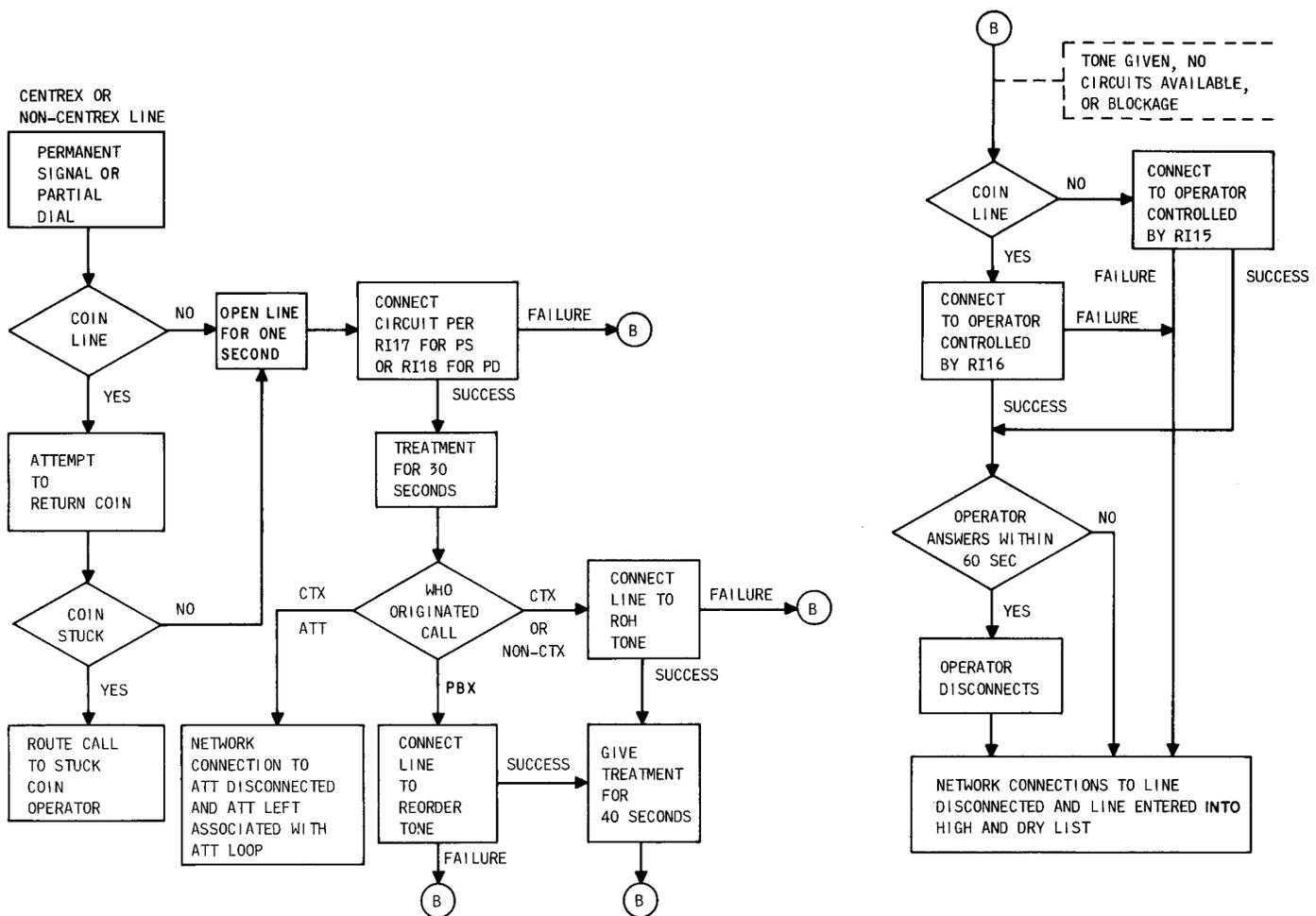


Fig. 1—Permanent Signal and Partial Dial Feature Flow Diagram

#### 4. INTERACTIONS

4.01 The permanent signal and partial dial treatment interacts with the **high and dry** program as described in System Implementation.

4.02 Some key telephone sets and other customer premises apparatus are designed to release with a 1-second open circuit on the tip and ring. The permanent signal routine described in Section 2 includes a 1-second open interval which is intended to release a hold state on a key telephone set or other equipment with a hold state. Some equipment, however, is released with an open interval of less than 350 milliseconds. Open signals of this duration occur during the normal processing of a call and if the equipment releases automatically as a result, the customer premises apparatus must be isolated

from the No. 2 ESS with a Dial Long Lines (DLL) or similar circuit. DLL circuits will not transmit on open circuits, therefore, the 1-second open interval provided by the No. 2 ESS will be ineffective. See E.L. 2646 for a full description of the open interval problem with the No. 2 ESS.

4.03 A line that stays off-hook and is given the permanent signal processing, described in Section 2, is not able to originate a call until sufficient time is spent on-hook. This allows the slow scan to detect the on-hook and the No. 2 ESS to restore the line to idle. A time lapse as long as 64 seconds may be required.

4.04 A line that goes to permanent signal when the TCRs allotted for the feature are full is marked busy and the supervisory ferrod disconnected.

This places the line in a high and dry state. The line is restored by an emergency audit, a routine audit, or by the Line Insulation Test. Until the line ferrod is restored, it is out of service. When the condition that caused the flood of permanent signals subsides, it is reasonable to initiate a line status audit by a type in on the MTC TTY. However, if this is done while many lines are in this state, serious dial tone delay could result due to the faulty lines. Therefore, this action should be carefully considered before attempting.

### **ATTRIBUTES**

#### **5. STATION/SYSTEM**

**5.01** The Permanent Signal and Partial Dial feature is provided in every No. 2 ESS system.

#### **6. LIMITATIONS**

**6.01** The number of lines that can be stored in the high and dry list is limited by the number of TCRs used for permanent signal. Normally, up to 60 or 144 lines may be stored in the high and dry list. See SOFTWARE ENGINEERING for details.

#### **7. RESTRICTION CAPABILITY**

**7.01** There are no restrictions that apply to this feature.

#### **8. COST DATA**

##### ***Program Store***

**8.01** Generic program cost for the permanent signal and partial dial program is 700 words. One hundred words are used exclusively for permanent signal and partial dial and 600 words are shared with other functions.

##### ***Call Store***

**8.02** The generic program requires call store for providing a list of TCR addresses. This list is a fixed assignment of call store words and is assigned by the office data administration (ODA). For systems with 1 or 2 TCR blocks, the list is 11 words long. For systems with 3 or 4 TCR blocks, the list is 25 words long.

### ***High and Dry List***

**8.03** TCRs are required by the system to record the terminal equipment numbers (TENs) of lines after the connection to tones, announcements, and to operators are completed. In systems with 1 or 2 TCR blocks, a maximum of 10 TCRs may be needed for this storage, and in systems with 3 or 4 TCR blocks, a maximum of 24 TCRs may be needed. Guidelines for determining the engineering requirements are contained in the Traffic Facilities Practices, Division D, Section 12f(3). In general, about five CCS of TCR usage per expected permanent signal should be provided.

**8.04** For information pertaining to real time cost, refer to the Traffic Facilities Practices Division D, Section 12f(3).

### **INCORPORATION INTO SYSTEM**

#### **9. PLANNING**

**9.01** The Permanent Signal and Partial Dial feature always operates in the No. 2 ESS environment. See 11.01 and 11.02.

#### **10. HARDWARE ENGINEERING**

**10.01** Information necessary to engineer the high and dry use of TCRs, ROH tone, permanent signal and partial dial announcements, and coin and noncoin operator trunks is required. Refer to the Traffic Facilities Practices for additional hardware engineering information.

#### **11. SOFTWARE ENGINEERING**

**11.01** Provisions must be made for the Permanent Signal and Partial Dial feature in the program and call store. Refer to the Traffic Facilities Practices, Division D, Section 12f and TG-2H, Division 4, Sections 2a, 2b, and 2c for additional software engineering information.

**11.02** A requirement of 60 CCS for permanent signal usage on TCRs is adequate to handle most offices. When there is evidence of abnormal usage, the permanent signal requirements should be evaluated with approximately 5 CCS per permanent signal, with 60 permanent signals and a maximum of 260 CCS for offices with 1 or 2 TCR blocks, and 144 permanent signals, and a maximum of 600 CCS for offices with 3 or 4 TCR blocks. However,

**SECTION 232-190-129**

it must be recognized that cost penalties could result because of inaccurate appraisal of excessive permanent signals.

**12. COMPATIBILITY**

**12.01** There are no compatibility or equipment interface problems with the Permanent Signal and Partial Dial feature.

**13. OFFICE DATA**

**Translations**

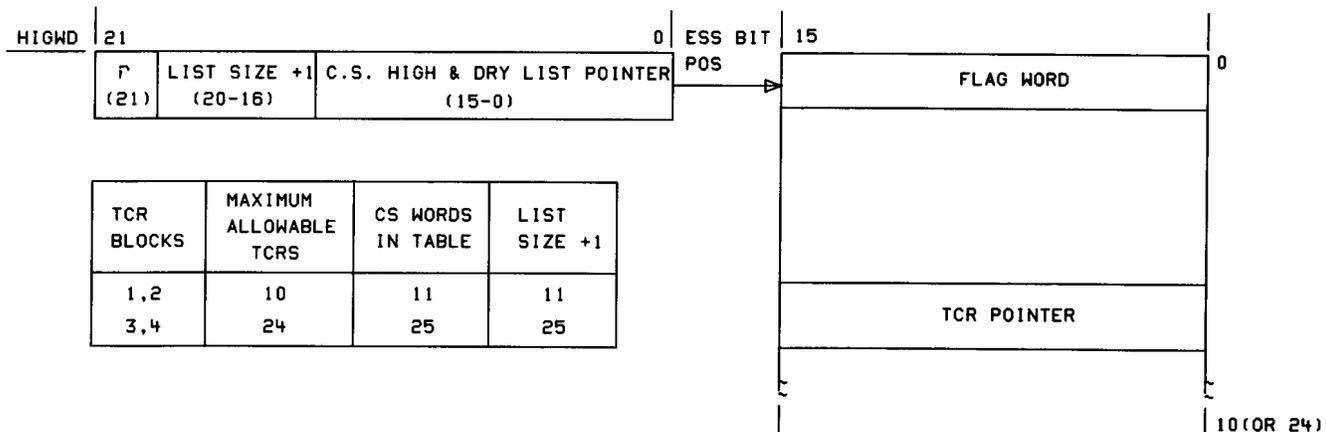
**13.01** The high and dry list is assigned in an ODA assignable call store area, the list size +1 is stored in binary. The list size +1 is 11 for offices with 1 or 2 TCR blocks and 25 for offices with 3 or 4 TCR blocks. (Refer to Figure 2.)

**13.02** The high and dry threshold governs the TTY output of lines on the high and dry list. If the number of lines entering the high and dry list during a 5-minute period exceeds the threshold, the list is printed on the maintenance TTY. 'OUT' is a code for the high and dry list output schedule (for periodic printing of the list). Refer to Figure 3.

**13.03** Figure 4 illustrates the permanent signal operator condition in the trunk group translations.

**13.04** For new installations, the following input forms should be prepared and submitted to the WECO Regional Center:

- **ESS 2201**—Trunk Assignment Group. This form is used to define the service circuits, ROH group, Permanent Signal and Partial Dial Coin and Noncoin operator trunk groups associated with Permanent Signal and Partial Dial in the Trunk and Service Circuit Group. Division 4, Section 2b of the Translation Guide, TG-2H, specifies the appropriate column and group numbers associated with this feature.
- **ESS 2202**—Trunk Group Table. This form is used to define the service circuits, ROH group, Permanent Signal and Partial Dial Coin and Noncoin operator trunk groups associated with Permanent Signal and Partial Dial in the Trunk and Service Circuit Group. Division 4, Section 2c of the TG-2H specifies the appropriate column and group numbers associated with this feature.
- **ESS 2204**—This form is used to define the groups and features available to a particular trunk group. Division 4, Section 2e of the Translation Guide, TG-2H, specifies the appropriate column for indicating a permanent signal trunk to a switchboard.
- **ESS 2303**—Route Index Expansion Table. Used to define route index RI 15, RI 16, RI 17, and RI 18 to specify the operator



**Fig. 2—High and Dry Parameter**

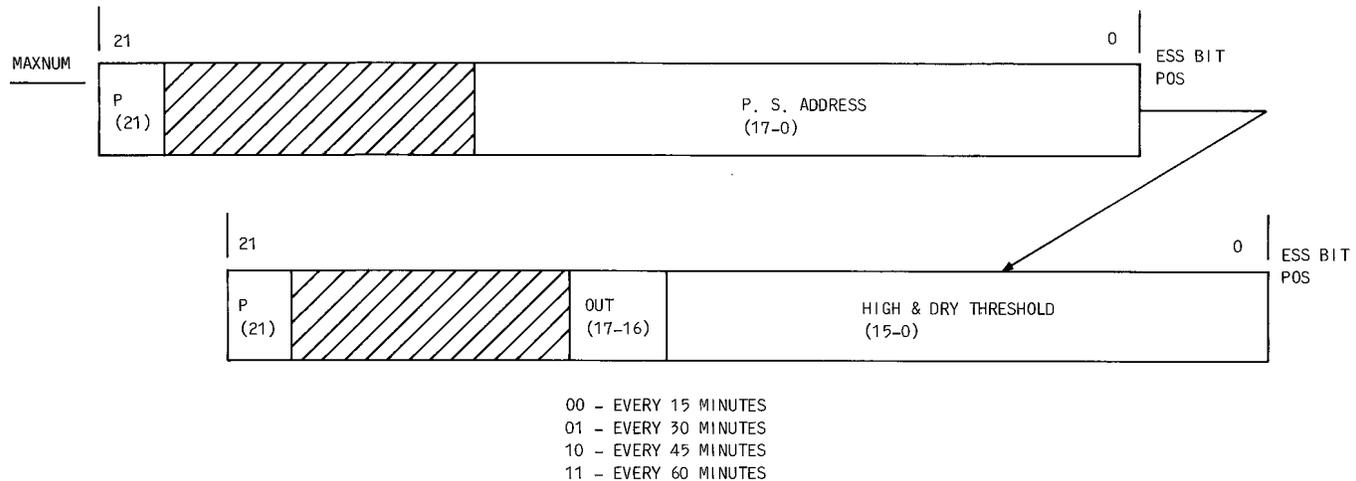


Fig. 3—High and Dry Threshold

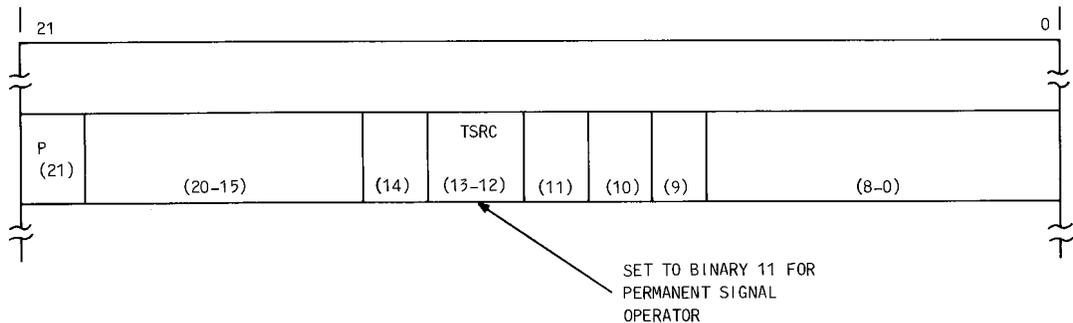


Fig. 4—Permanent Signal Operator Trunk Group Data

and announcement treatment. If the trunks terminate on switchboards or desks, an identifying tone may be desired. A choice of a spurt of high or low tone is available. An H for high tone or an L for low tone is placed in the tone column.

**13.05** The above forms must be completed by the Telephone Company Dial Administrator and submitted to the WECO Regional Center for processing. Normal schedule procedures should be observed. The reproducible input forms are in Division 11, Section 1 of the Translation Guide, TG-2H.

**14. GROWTH/RETROFIT PROCEDURES**

**14.01** This feature has no growth or retrofit requirements.

**15. TESTING**

**15.01** Tests may be performed on a line in the permanent signal or partial dial condition by using the 14- or 16-type LTD. With the connection to the LTD established, any of the following tests may be applied to the customer line:

- Voltmeter Tests
- Ringing
- Receiver Off-Hook Tone (ROH)

**15.02** Tests may be performed on a line in the permanent signal or partial dial condition by using the No. 3 Local Test Cabinet. Refer to

the appropriate 662-division section for No. 3 Local Test Cabinet Operating and Testing Methods.

## ADMINISTRATION

### 16. MEASUREMENTS

**16.01** The following traffic measurements are available for the Permanent Signal and Partial Dial feature. Refer to Section 232-120-301 for additional information.

#### *Office Total Measurements*

- **OFT 21-Partial dial abandons**—A peg count of the number of originating line disconnects after one or more digits have been dialed.
- **OFT 22-Partial dial time-outs**—A peg count of the number of digit receiver time-outs after one or more digits have been received.
- **OFT 23-Permanent signals**—A peg count of the number of time-outs when no digits have been received.

#### *Base and Service Measurements*

- **BSM 10-Permanent signals lost by system**—Overflow count of permanent signals which occurred while the permanent signal list was filled and the line status bit audit was temporarily turned off.

### 17. RECORD KEEPING

**17.01** ODA output records 2201R, 2202R, and 2303R provide information concerning trunk assignment records, trunk group records, and route expansion. Therefore, these records should be retained as part of the office records.

### 18. CHARGING

**18.01** Not applicable.

## AVAILABILITY

### 19. NEW INSTALLATIONS

**19.01** The Permanent Signal and Partial Dial feature is available for application with all No. 2 ESS generic programs.

### 20. GROWTH/RETROFIT

**20.01** Not applicable.

## SUPPLEMENTARY INFORMATION

### 21. GLOSSARY

**21.01** The following list identifies terms used in this feature document:

- **Hundred Call Seconds (CCS)**—A measure of telephone traffic load obtained by multiplying the number of calls in an hour by the average holding time per call in seconds and dividing the product by one hundred.
- **Call Store (CS)**—The equipment unit of the No. 2 ESS that provides temporary memory storage of information pertaining to call processing, maintenance, and traffic measurement data.
- **Centrex**—A type of service similar to PBX where the stations have Direct Inward Dialing and station identification on outgoing calls by either Automatic Identified Outward Dialing or operator.
- **Dial Long Line (DLL)**—Circuit used to buffer the customer premises equipment from the switching system and provide a steady source of battery and ground.
- **Local Test Desk (LTD)**—A desk equipped for performing primary testing. It may also be used to test parts of the toll plant for which the testing facilities of the desk are suitable.
- **Office Data Administration System (ODA)**—Mechanism by which translation information may be assembled or changed for a No. 2 ESS. Information from the ESS input forms is inputted into the regional ODA computer, assembled, then sent to the No. 2 ESS.
- **Private Branch Exchange (PBX)**—A switching system which provides internal telephone communication between stations located on a customer's premises as well as between these stations and exterior networks.

- **Receiver Off-Hook (ROH) Tone**—An audible steady signal sent over the customer's line to attract attention when there is a continuing off-hook condition but the station is not in use.
- **Transient Call Record (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 Permanent Signal and Partial Dial feature:

- E.L.2646 No. 2 ESS—Open Switching Interval
- PD-2H203-01 Line Origination and Digit Reception Program

- PD-2H206-01 Incoming Trunk Origination Program
- PD-2H207-01 Administration of Translation Data Program
- PD-2H208-02 Outgoing Trunk Program
- PD-2H224-01 High and Dry Program
- Translation Guide, TG-2H
- Traffic Facilities Practices, Division D, Section 12
- Bell System Practices:

Section 232-116-101 Handling Permanent Signals and Partial Dials

Section 232-120-301 Traffic and Plant Measurements No. 2 Electronic Switching System