FEATURE DOCUMENT

CODE 104-TYPE TEST LINE FEATURE

2-WIRE NO. 1 AND NO. 1A ELECTRONIC SWITCHING SYSTEMS

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INTRODUCTION

1. GENERAL INFORMATION

SCOPE

1.01 This feature document describes the code 104-type test line (104TL) feature when utilized with the No. 1 or No. 1A Electronic Switching System (ESS).

REASONS FOR REISSUE

1.02 The reasons for reissuing this section are listed below. Since this reissue is a general revision, no revision arrows have been used to denote significant changes.

(1) Reformat contents from 23-part to 18-part format

(2) Add coverage for HILO 4-wire switching feature

(3) Add coverage for toll common channel interoffice signaling (CCIS) feature.

FEATURE AVAILABILITY

1.03 The 104TL feature is available in all issues of CTX-7 and later generic programs for No. 1 ESS, and all generic programs for No. 1A ESS.

1.04 The 104TL feature software is contained in generic program base for 2-wire applications. HILO 4-wire and toll CCIS 104TL feature applications are contained in the optional HL4W and CCISTM feature packages, respectively.

2. DEFINITION

2.01 The code 104-type test line (104TL) feature provides a test termination for 2-way transmission testing and one-way noise checking.

DESCRIPTION

3. USER OPERATION

CUSTOMER

3.01 Not applicable.

TELEPHONE COMPANY

3.02 The functional arrangements of the 104TL feature are shown in Fig. 1. No maintenance personnel actions [except routine equipment maintenance of 104-type test line equipment] are required in a No. 1 or No. 1A ESS office containing the 104TL feature at the far end.

3.03 The 104TL feature is activated and controlled from an automatic or manual test frame at the near end. The trunk to be tested is seized and the appropriate directory number or code is dialed. Refer to Table A. The overall operation of the 104TL feature by the near end is shown in Fig. 2 and 3. Refer to the applicable Equipment Test List and Method of Operation BSP documentation for more detailed information.

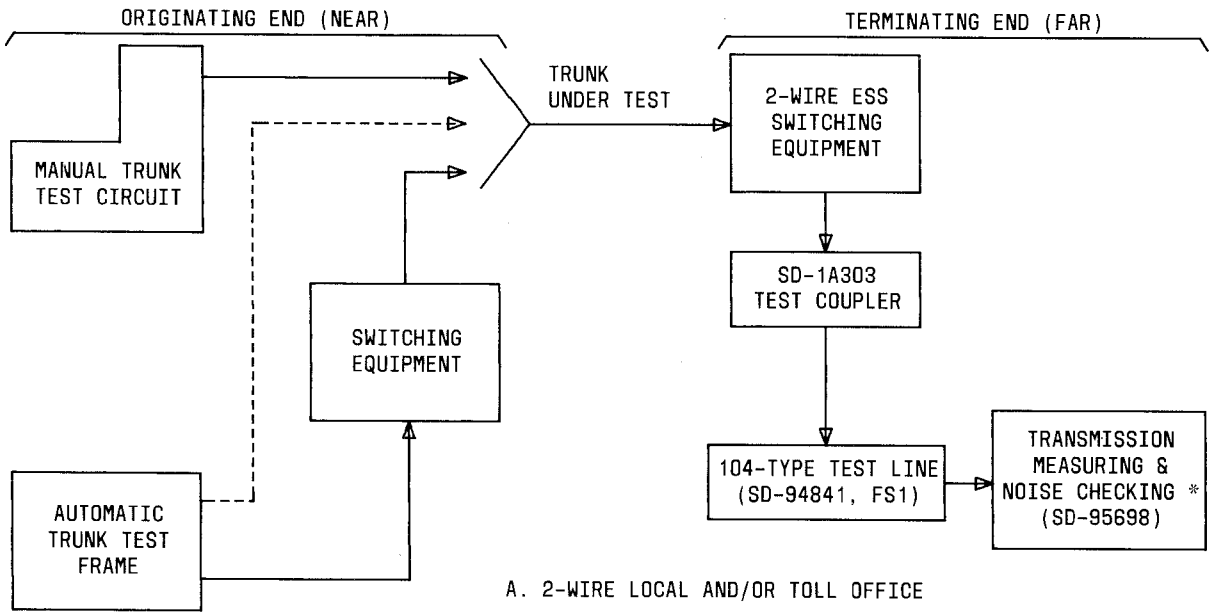
3.04 On non-CCIS trunk test calls, the 60 interruptions per minute (ipm) signal is returned if no idle 104-type test line is available. The 120-ipm signal is returned if the ESS is congested, no incoming trunk test register is available, or a peripheral order buffer failure occurs.

3.05 On toll CCIS trunk test calls, the ESS returns a vacant national number (VNN) message if the digits in the test initial address message (IAM) cannot be validated. If no idle 104-type test line is available, a national trunk congestion message is returned. If the network is blocked, a peripheral order buffer failure occurs, or no incoming trunk test register is available, the national switching congestion (NSC) message is returned.

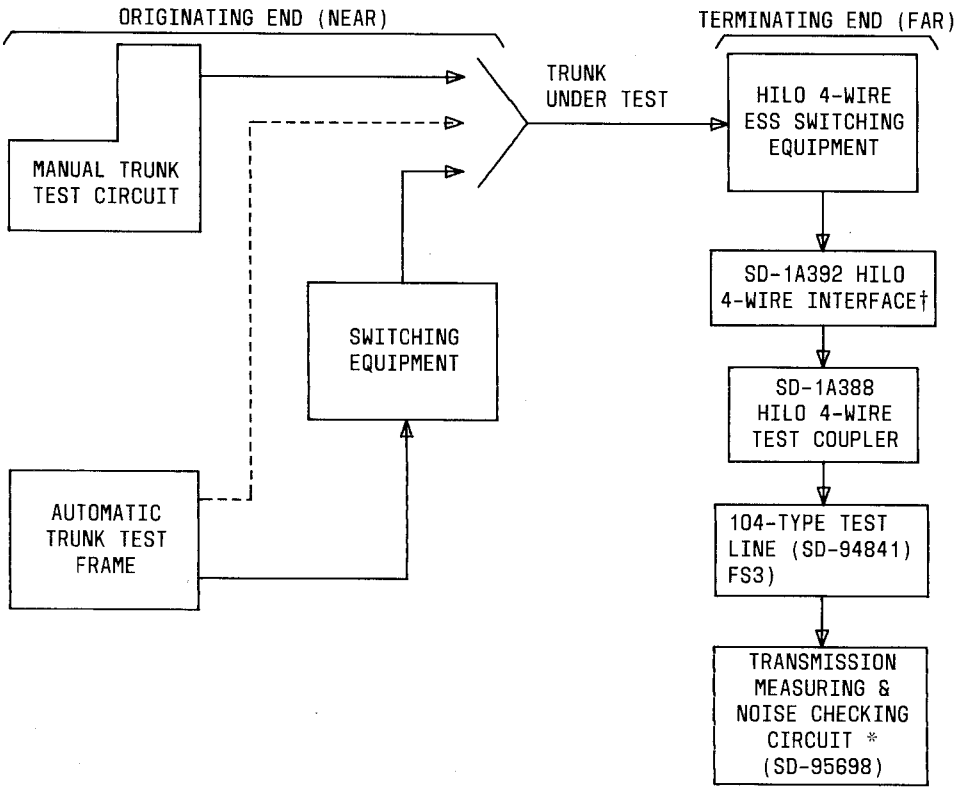
4. SYSTEM OPERATION

HARDWARE

4.01 Hardware associated with the 104TL feature is shown in Table B. The function of a 2-wire test line is to provide a 104-type test termination for testing incoming 2-wire trunks. The function of a HILO 4-wire test line is to provide a 104-type test termination for testing incoming HILO 4-wire trunks. The transmission measuring and noise checking circuit provides automatic test sequence supervision. Test couplers are used to interface between the 104 test line common system and the ESS. More technical information may be found in the appropriate Circuit Description and Equipment Design Requirements BSP documentation.



A. 2-WIRE LOCAL AND/OR TOLL OFFICE



B. TOLL OFFICE WITH HILO FEATURE

* SERVES VARIABLE NUMBER OF 104-TYPE TEST LINES, ONE 104-TYPE TEST CALL AT A TIME. OTHER SIMULTANEOUS 104-TYPE TEST CALLS REMAIN PARKED ON AVAILABLE 104-TYPE TEST LINES.
† INTERFACE CIRCUIT REQUIRED FOR HILO 4-WIRE

Fig. 1—Functional Arrangements of the 104TL Feature

TABLE A

104TL FEATURE ACCESS CODES AND APPLICABLE TRANSLATORS

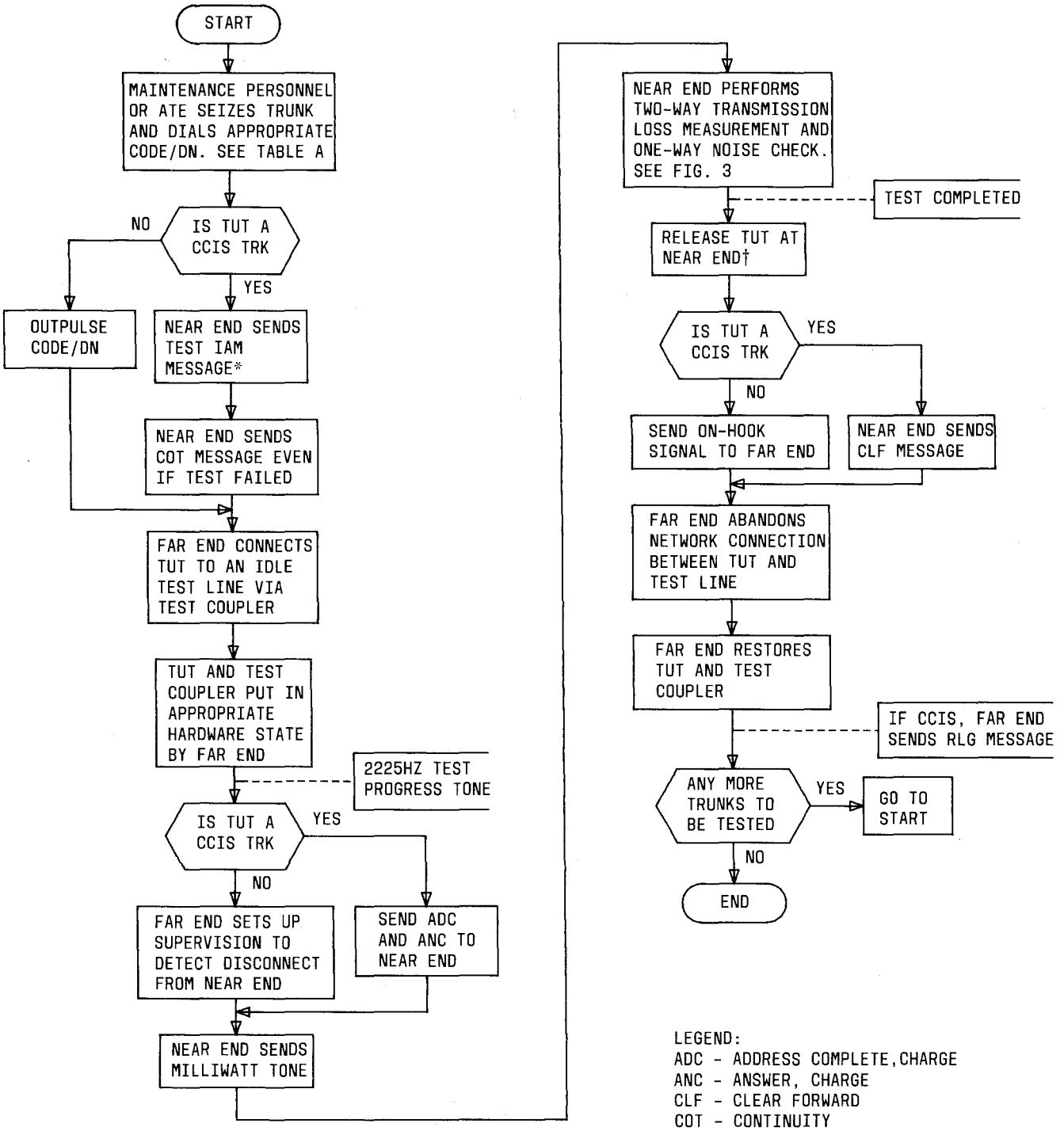
ACCESS CODE	TYPE OF INCOMING TRUNK BEING TESTED	TRANSLATORS USED†
4-, 5-, or 7-digit DN	Local	DN (DN Translator gives RI)
7-digit DN	Intertoll	Toll 3/6-digit, DN—call type 28
	Toll connect*	Toll 3/6-digit or tandem, DN
	Tandem	Tandem, local 3/6-digit, DN (DN translator gives RI)
104 code	Intertoll	Toll 3/6-digit, DN—call type 28 (DN translator gives RI), or call type 3 (CIW gives RI) without DN translator
	Toll connect*	Same as intertoll or tandem—data type 5 (which gives RI)
	Tandem	Tandem data type 5 (which gives RI)
NNX code	CAMA	Local 3/6-digit, DN—call type 28 (DN translator gives RI) or call type 3 (CIW gives RI) without DN translator
7-digit DN NXX-XXXX	CAMA	DN (DN translator gives RI) or toll digit-by-digit—call type 26 with TDXD, R & R pattern table—call type 3 (CIW gives RI)

* When a toll connect trunk is being tested, the trunk must be defined as either a toll or a tandem. This determines which translations are used.

† Effective with CTX-6, Issue 8, CTX-7, Issue 8, and 1E3 toll 3/6-digit translations are combined with local 3/6-digit translations. This is true for all generic programs of No. 1A ESS.

Legend:

DN — directory number
CAMA — centralized automatic message accounting
CIW — call identification word
CTX — centrex
N — any digit 2 through 9
RI — route index
R & R — rate and route
TDXD — toll digit-by-digit
X — any digit 0-9



* ALL CCIS MESSAGES SENT/RECEIVED OVER SIGNALING LINK.
† ASSUMES ALL TESTS PASS. OTHERWISE LEAVE TRUNK OUT OF SERVICE AND FOLLOW NORMAL MAINTNEANCE PROCEDURES.

LEGEND:
ADC - ADDRESS COMPLETE,CHARGE
ANC - ANSWER, CHARGE
CLF - CLEAR FORWARD
COT - CONTINUITY
IAM - INITIAL ADDRESS MESSAGE
RLG - RELEASE GUARD
TRK - TRUNK
TUT - TRUNK UNDER TEST

Fig. 2—User Operation of the 104TL Feature

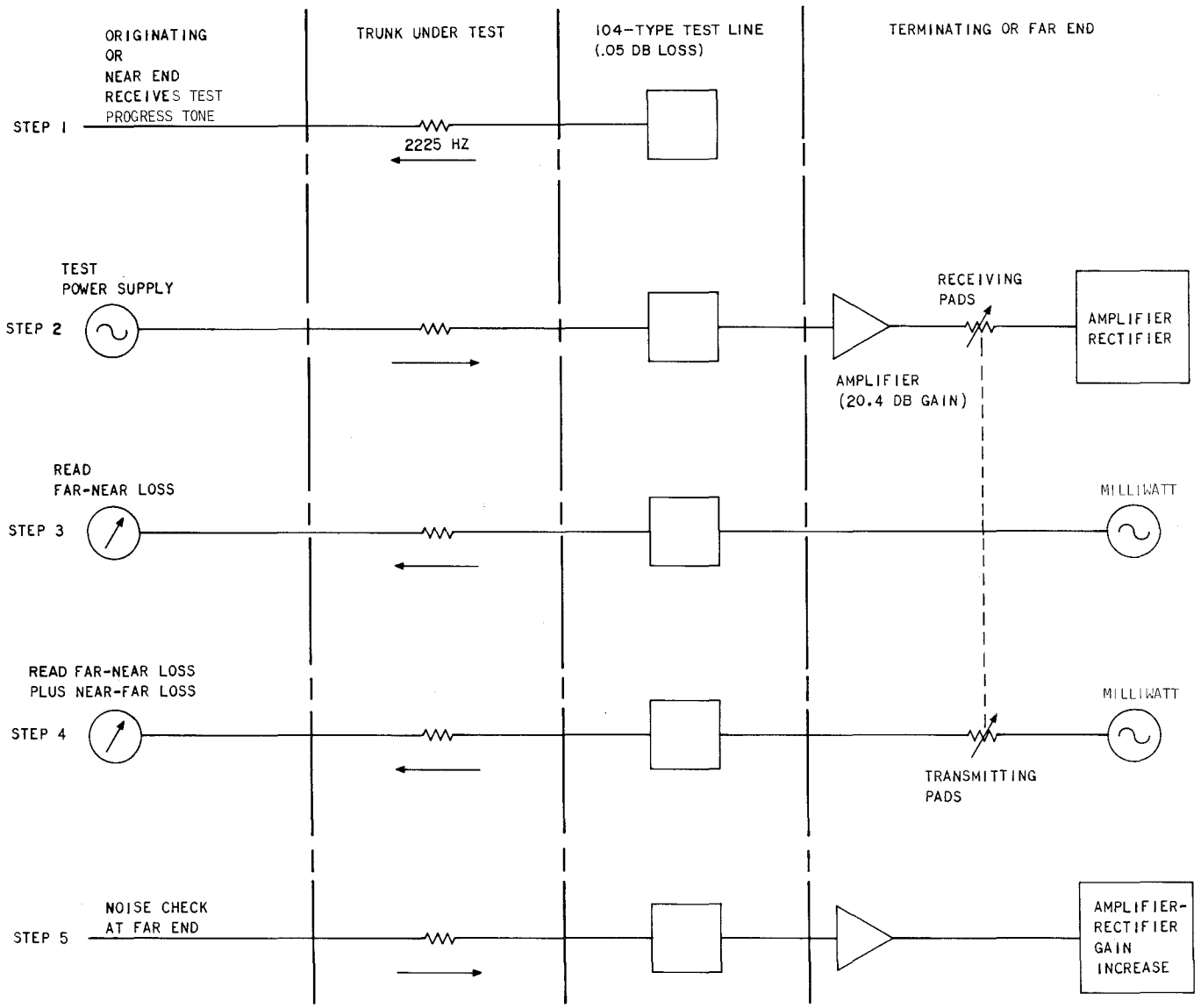


Fig. 3—Two-Way Transmission Test and Noise Check Sequence

OFFICE DATA STRUCTURES

A. Translations

Introduction

4.02 Several translators are required for the different methods used to access the 104TL feature, depending on the type of trunk to be tested. The access codes used for different trunks with appropriate translators are listed in Table A.

Toll 3-Digit Translator

4.03 If the 104 code is received for an intertoll or toll connecting trunk, the 104 code is used along with the toll digit translation index (TLDI) derived from the trunk group number auxiliary block to select the appropriate toll 3-digit subtranslator. The subtranslator yields a rate and route pattern number, part of which is used to index a route pattern expansion table. The remainder of the pattern number is used to obtain a call identification word in the route pattern expansion table (Fig. 4). For CTX-7, Issue 8, 1E3 and later No. 1 ESS generic programs and all No. 1A ESS generic programs, toll 3/6-digit translations are combined with standard (local) 3/6-digit translations.

Standard 3-Digit Translator

4.04 If an NNX code is received for a centralized automatic message accounting (CAMA) trunk under test to access a 104-type test line, the standard 3-digit translator translates the 3-digit access code into call type 28 with a directory number (DN).

Tandem Translator

4.05 An incoming tandem or toll connecting trunk using the 104 code access employs a tandem translator which contains the address of the digit interpreter table. The route index in the data type 5 word of the tandem digit interpreter table (Fig. 5) contains the route index of the appropriate 104-type test lines. Note in Table A that toll connecting trunks may use either the toll 3/6-digit or tandem translation method.

Directory Number Translator

4.06 The 7-digit DN over intertoll trunks also utilizes a toll 3/6-digit translator which yields a DN. Toll connecting trunks may use the same toll 3/6-digit translator or a tandem translator to get the DN. Tandem trunks use a tandem translator which gives a local 3/6-digit translator, which in turn gives a DN.

4.07 For 3-digit access codes, both the standard 3-digit translator (for CAMA) and the toll 3-digit translator (for toll trunks) require a DN subtranslator translation before final routing can be determined. The 7-digit DN (either sent by the originating end or expanded from the 3-digit access codes) is used to index the DN translator. The DN subtranslator entry associated with the DN for testing with the incoming trunk in the tandem state (also expanded DN from the 104 code) yields a fixed route index (RI) of 177 and a program index (PI) of 1 (Fig. 6). A program index of 1 indicates a test call. For testing with the incoming trunk in the local state, the DN subtranslator entry yields a fixed route index (RI) of 176. A terminating major class of 3 (trunk group) must be specified in the associated directory number class word.

Elimination of DN Subtranslator Requirement (No. 1 ESS Only)

4.08 Simulated dialing of an interoffice DN via call type 28 results in excessive use of memory, especially in trunk-only offices. To eliminate this requirement, the call identification word in the rate and route pattern expansion table is redefined for call type 3 only for CTX-6, Issue 8 and later generic programs (Fig. 7). Item OLP (overlap operation) in word 1 type 2 of the auxiliary block is redefined as item TST (test) for call type 3 only in a type 8 word. If item TST=1, the call is a test call.

4.09 Test line access code 104 should be translated into call type 3 with item TST=1. The NXX of the 7-digit DN access codes may be translated into call type 26 with the toll digit-by-digit (TDXD) index (Fig. 8). The digit-by-digit translation of the next four or less digits yields a rate and route pattern number which is used to obtain the call identification word with call type 3 and item TST=1.

4.10 When using call type 3 and item TST=1, it is recommended that CAMA calls to 104-type test lines be marked as free calls. The final rate and route pattern should indicate a free

TABLE B

104TL FEATURE HARDWARE DATA

ITEM	2-WIRE		COMMON	HILO 4-WIRE*	
	TEST COUPLER	104-TYPE TEST LINE		TEST COUPLER	104-TYPE TEST LINE
Name	Test Coupler Circuit	Common Systems, 104 and 104-Type Trunk Transmission Test Line Circuit for Use with Electronic Switching System	Common Systems, Transmission Measuring and Noise Checking Circuit (TMNCC)	104/105 Test Coupler, HILO 4-wire Switching	Common Systems, 104 and 104-Type Trunk Transmission Test Line Circuit for Use with Electronic Switching System
SD Number	SD-1A303	SD 94841†	SD-95698	SD-1A388	SD-94841†
J Number	J1A033JK	J93020BT	J93020	J1A033ME	J93020BW
Frame	Miscellaneous Trunk Frame (MTF)	TMNCC Frame	TMNCC Frame	MTF	TMNCC Frame
Mounting Space	2 inches	4 inches	11′-6″ Frame (23″ wide)	2 inches	4 inches
Cable Length Limit	75 Feet	NA	NA	595 Feet	NA
Number of Circuits per Unit	2 or 4	1	1	2	1

* A HILO Interface Circuit is an integral part of HILO 4-wire trunk circuits for the HILO 4-wire switching feature, but is presented here for information purposes: SD-1A392; J1A090BH-1; Trunk Order Code 14200; HILO MTF or HILO Universal Trunk Frame; plug-in; two circuits per unit.

† Provide X wiring for TP2 operation.

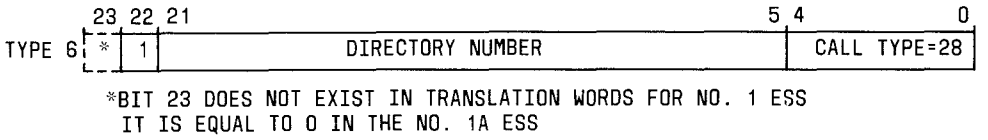


Fig. 4—Rate and Route Pattern Table Translator—Call Identification Word for Call Type 28

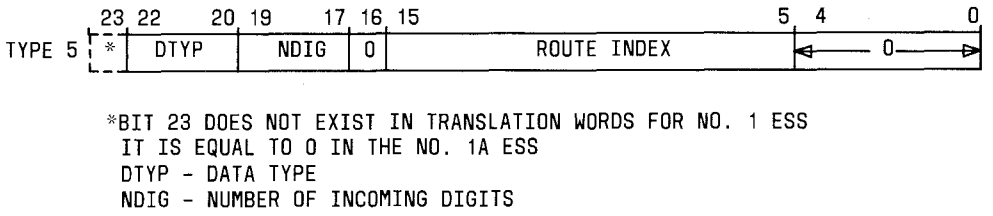


Fig. 5—Tandem Translator—Tandem Common Block, Tandem Digit Interpreter Table

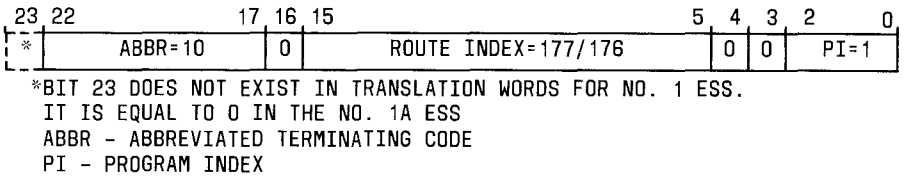


Fig. 6—DN Translator—DN Subtranslator—Type 4 Entry—(Trunk)

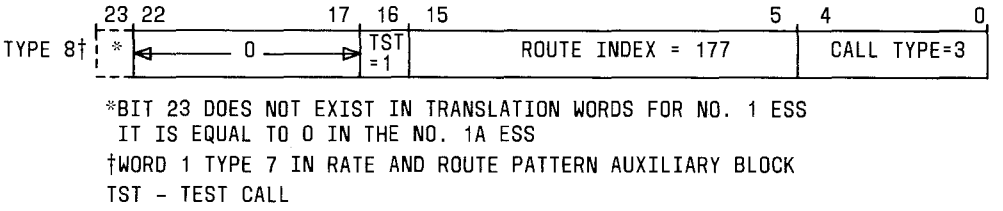


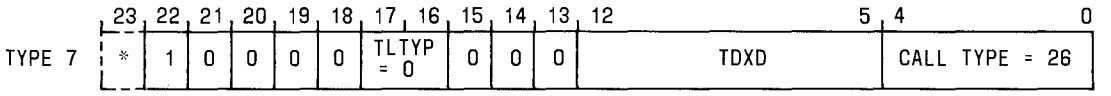
Fig. 7—Rate and Route Pattern Table Translator—Call Identification Word for Call Type 3

call. This is necessary so that no CAMA operator connection is made on 104-type test calls.

Trunk Group Number Supplementary Translator

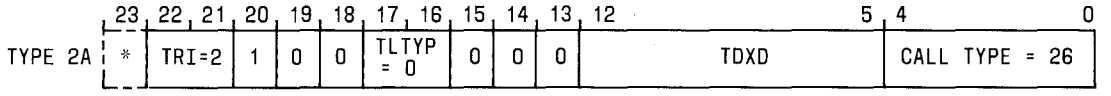
4.11 With CTX-7 and later No. 1 ESS generic programs and all No. 1A ESS generic programs, item TGTPRP of the type 2 word in the trunk group number supplementary translator for the incoming trunk group (Fig. 9) is checked for testing at TP0 (0 dBm) or TP2 (-2 dBm). When item TGTPRP is set to 2, TP2 is used; when item TGTPRP is set to 1, TP0 is used.

4.12 On 2-wire incoming trunks, route index 177 (test in the tandem state) or 176 (test in the local state) provides a 2-wire 104-type test line at TP0. When a TP2 test is required on the



RATE AND ROUTE PATTERN TABLE TRANSLATOR

A. CALL IDENTIFICATION WORD FOR CALL TYPE 26

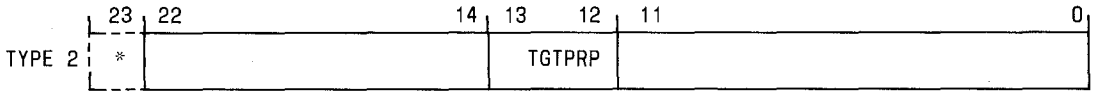


SUPPLEMENTARY CALL IDENTIFICATION WORD TRANSLATORS - CHART CLASS COLUMN TABLE

B. SUPPLEMENTARY CALL IDENTIFICATION WORD FOR CALL TYPE 26

* BIT 23 DOES NOT EXIST IN TRANSLATION WORDS FOR NO. 1 ESS
IT IS EQUAL TO 0 IN THE NO. 1A ESS
TDXD - TOLL DIGIT BY DIGIT TRANSLATOR
TRI - TREATMENT INDICATOR
TLTYP - TOLL TYPE INDICATOR

Fig. 8—Translations for Call Type 26



* BIT 23 DOES NOT EXIST IN TRANSLATION WORDS FOR NO. 1 ESS.
IT IS EQUAL TO 0 IN THE NO. 1A ESS.

TGTPRP - TRUNK GROUP TEST PAD REFERENCE POINT
0 - INVALID
1 - TEST AT TP0
2 - TEST AT TP2
3 - INVALID

Fig. 9—Trunk Group Number Supplementary Translator

incoming trunk, RI 177 or 176 is expanded to the next route index which points to another trunk group containing 2-wire 104-type test lines at TP2.

Route Index Expansion Table Translator

4.13 When testing at the TP2 level is specified, the fixed RI (177 or 176) is expanded through the route index expansion table (Fig. 10) to obtain the trunk group number of the trunk group containing the 2-wire 104-type test lines equipped for testing at the TP2 level. Item RS (return supervision) in word 1 type 1 is required to be set to 1 to indicate that the trunk circuit being used returns answer supervision, but the call should be free.

4.14 On incoming HILO 4-wire trunks RI 177 provides HILO 4-wire 104-type test lines at TP0 via pseudo route index (PRI) 008. PRI 008 contains a nonfixed RI which routes to the trunk group containing HILO 4-wire 104-type test lines at TP0 (Fig. 10). If TP2 is required, the expansion of the nonfixed RI will yield the TGN for HILO 4-wire 104-type test lines at TP2. On CAMA HILO 4-wire trunks, the NNX code(s) must always yield RI 177.

Trunk Class Code Expansion Table Translator

4.15 For 2-wire incoming trunks, the trunk class code expansion table of the 104TL feature must provide trunk usage (TU)=3 and circuit

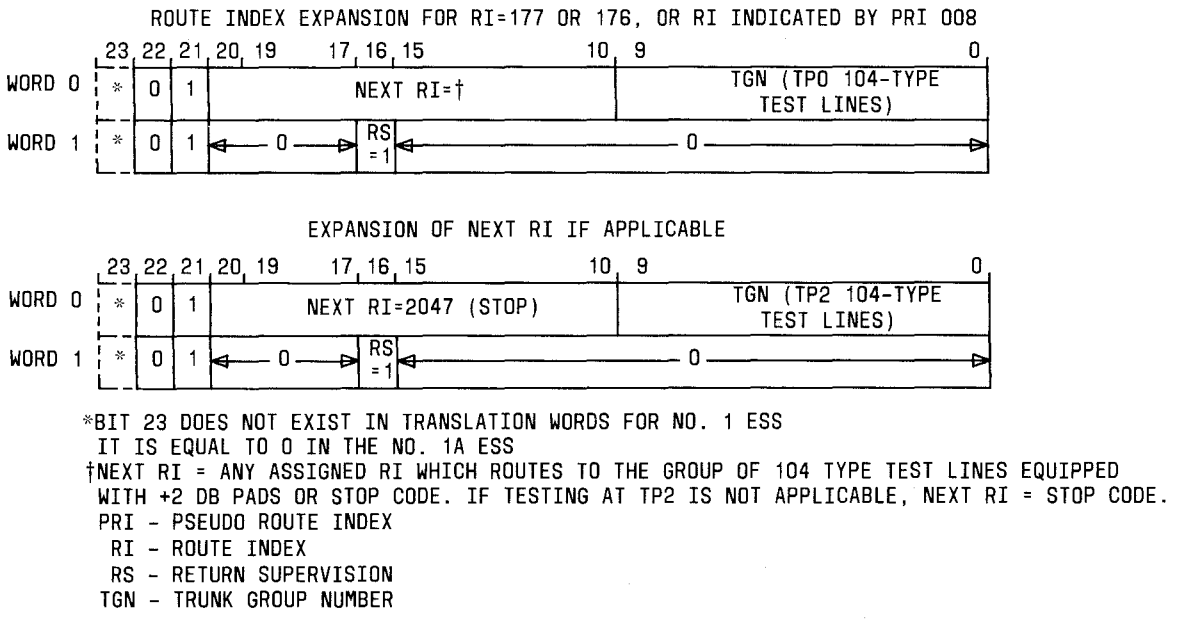


Fig. 10—Route Index Expansion Table Translator

program index (CPI) 033. For HILO 4-wire trunks, the trunk class code expansion table of the 104TL feature must provide TU=3 and CPI=138. See Fig. 11.

Trunk Network Number to Peripheral Equipment Number Translator

4.16 The trunk network number to peripheral equipment number (TNN-to-PEN) auxiliary block contains the master scan point and signal distributor information shown in Fig. 12.

Master Scanner Translator

4.17 The master scanner translator (Fig. 13) provides the trunk network number (TNN) of the test coupler circuit and the trunk program index (TPI)=9.

B. Parameters/Call Store

4.18 Incoming trunk test registers are required for processing trunk test calls. Refer to Fig. 14 for layout of the registers.

FEATURE OPERATION

A. 2-Wire Trunk Testing (Non-CCIS Trunks)

4.19 Incoming 104-type test calls over 2-wire trunks are initially received and analyzed by call processing. From the applicable DN subtranslator type 4 entry word or call indicator

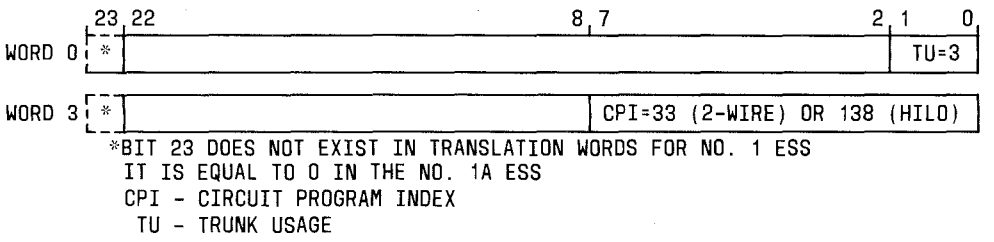


Fig. 11—Trunk Class Code Expansion Table Translator

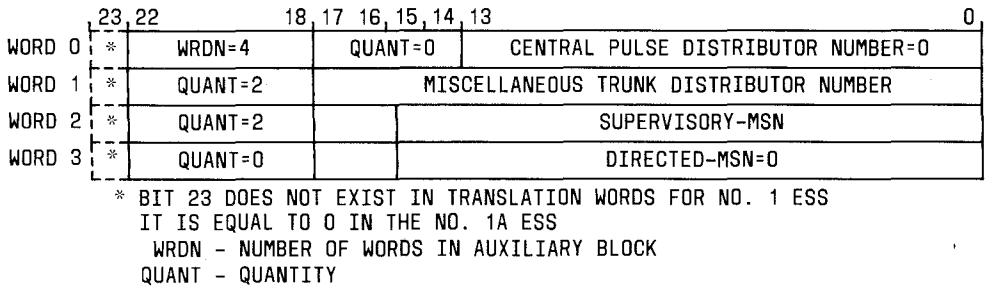


Fig. 12—TNN-to-PEN Auxiliary Blocks

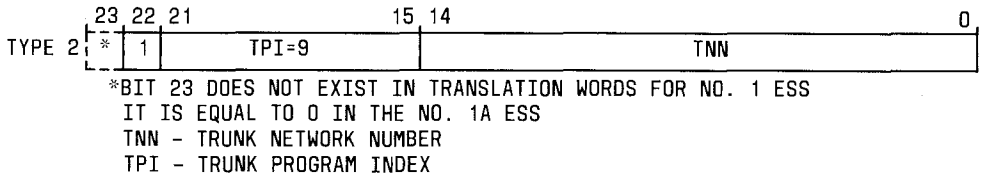


Fig. 13—Master Scanner Translator

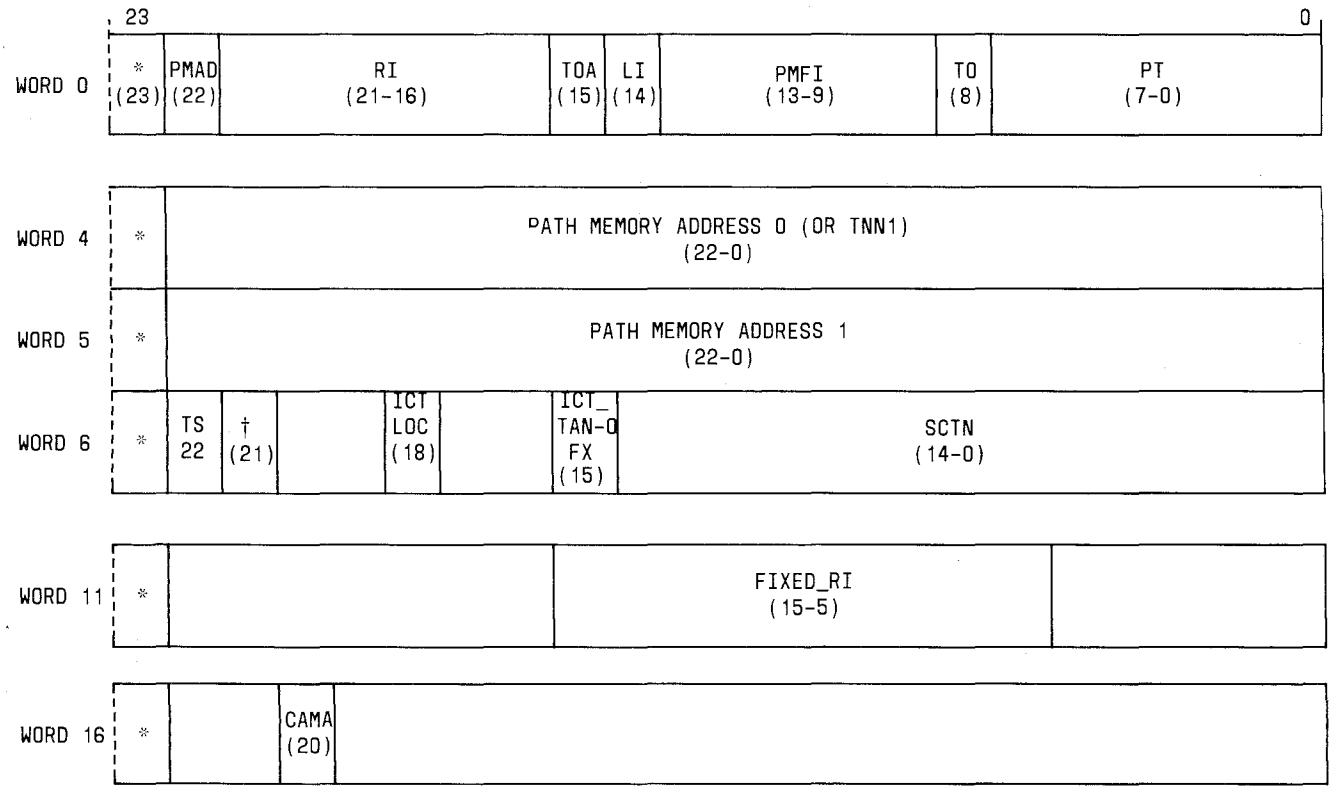
word for call type 3, the call is identified as an incoming test call requiring route index (RI) 176 or 177. See Table C. The applicable incoming register is released, and an idle incoming trunk register is seized.

4.20 If TP2 testing is applicable to an office, the associated trunk group number supplementary translator is then used to determine if the trunk under test (TUT) is to be tested at TP0 (0 dBm) or TP2 (-2 dBm). See Table C. If TP0 is specified, RI 176 or RI 177 is used. If TP2 is specified, the next RI found in the route index expansion table is used. RI 176 or RI 177 normally uses the same next RI. RI 176 or RI 177 points to a trunk group containing 2-wire 104-type test lines at TP0, and the next RI points to a trunk group containing 2-wire 104-type test lines at TP2. The receiver connection is abandoned, and connection is made to the SD-1A303 test coupler of a 2-wire 104-type test line. The TUT and test coupler are put into the appropriate hardware state by the ESS. And finally, supervision for disconnect is set up on the TUT.

4.21 When a 104-type test line is accessed, the test line circuits provide a 2225-Hz test progress tone for signaling to the near end until the 104-type test line is cut through to the transmission measuring and noise checking circuit. This tone is applied to the trunk under test to inform the near end of the progress of the tests (Fig. 3, Step 1).

4.22 After the 104-type test line is connected to the transmission measuring and noise checking circuit, the test progress tone is removed from the trunk under test. This signals the near end to connect a one milliwatt, 1000-Hz test tone to the trunk under test (Fig. 3, Step 2). This tone is connected either automatically by an automatic test circuit or manually by maintenance personnel from a test position for a period long enough for the transmission measuring circuit to measure and store the near-to-far trunk transmission loss (not to exceed 6 seconds). This tone is also used by the far end to adjust the pads in the transmitting and receiving arms of the measuring circuit. These pads are adjusted so that the loss in the transmitting arm is equal to the measured near-to-far trunk loss when less than 10 dB, or is equal to the measured near-to-far trunk loss minus 10 dB when the trunk loss is greater than 10 dB.

4.23 After complete adjustment of the pads and the disconnection of the milliwatt test tone at the near end of the trunk, the transmission measuring circuit proceeds to apply a one milliwatt,



* BIT 23 DOES NOT EXIST IN THE TRANSLATION WORD
FOR NO. 1 ESS IT IS EQUAL TO 0 IN THE NO. 1A ESS.

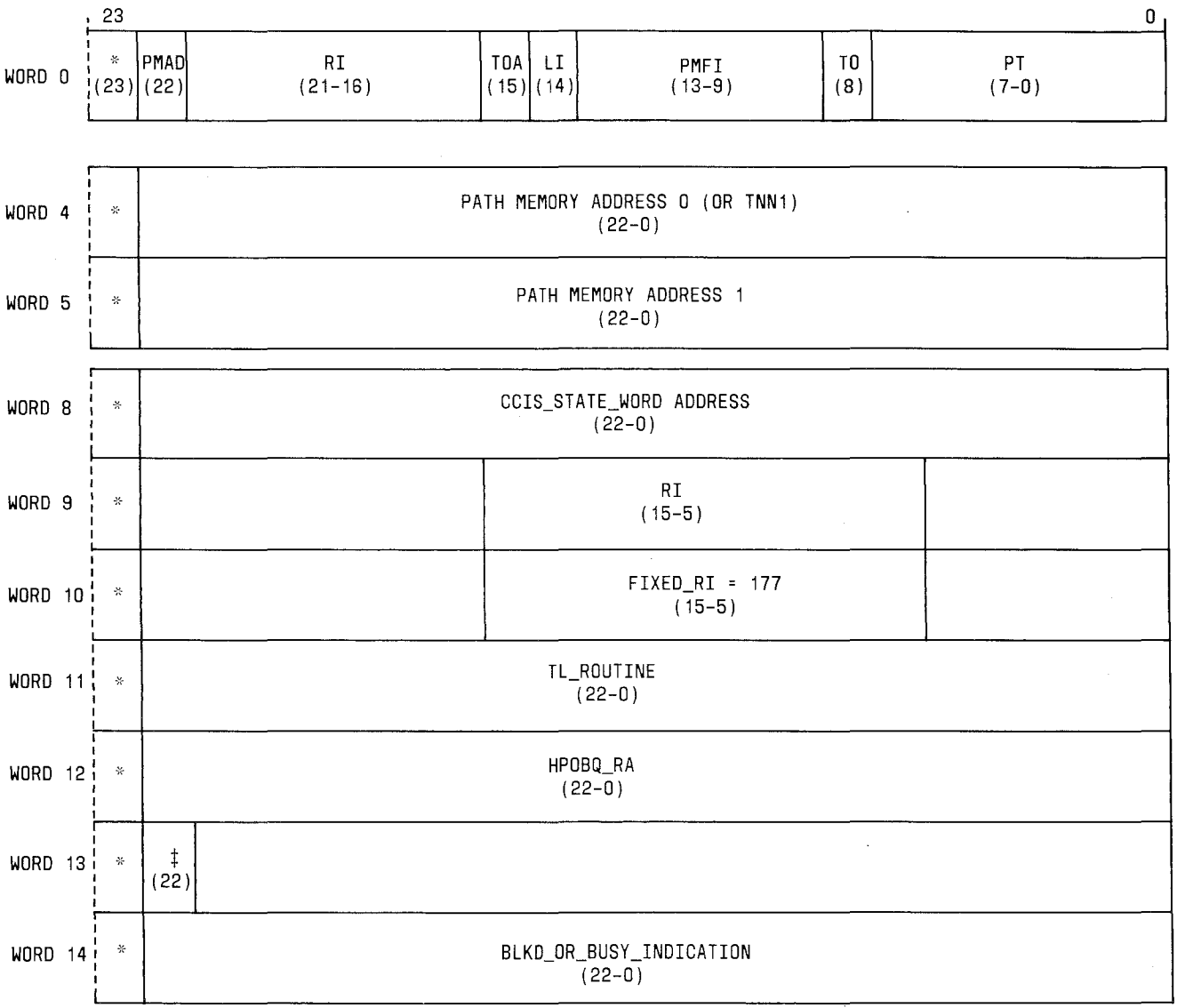
WORD 0 (STATE WORD)
PT - PROGRAM TAG
TO - REGISTER TIMEOUT FLAG
PMFI - PATH MEMORY FORMAT INDICATOR
LI - LINK WORD INDICATOR
TOA - TIMEOUT ANNEX
RI - REGISTER IDENTIFIER
PMAD - PATH MEMORY ANNEX DISPLACED

WORD 6
SCTN - TNN OF TEST LINE
ICT_TANOFX - ICT IN TANOFX=1; LOCOFF, TANOFF, OR TANON=0
ICTLOC - INCOMING TRUNK LOCAL STATE=1; TANDEM=0
† - HILO 4-WIRE ICT=1; 2-WIRE ICT=0
TS - TRUNK STATE INDICATOR; TANOFX =1; NON TANOFX =0

WORD 11
FIXED_RI - FIXED RI GIVEN TO ITTT PROGRAM

WORD 16
CAMA -ICT CAMA=1; ICT NON-CAMA=0

A. NON-CCIS TRUNKS



WORD 0
REFER TO PART A

WORD 9
RI - NONFIXED ROUTE INDEX USED FOR CCT8 TU COMPLETE CONNECTION TO 104-TYPE TEST LINE AT TP2

WORD 10
FIXED_RI - FIXED RI OF 104-TYPE TEST LINE

B. TOLL CCIS TRUNKS

WORD 11
TL_ROUTINE - ADDRESS OF APPROPRIATE TEST LINE ROUTINE

WORD 12
HPOBQ_RA - RETURN ADDRESS FOR HUNT A POB ROUTINE

WORD 13
‡ - ICT TOLL CCIS HILO TRUNK=1; ICT TOLL CCIS NOT HILO=0

WORD 14
BLKD_OR_BUSY_INDICATION - INDICATES WHETHER CIN (CHANGE IN NETWORK) ENCOUNTERED BLOCKED OR BUSY CONDITION

Fig. 14—Layout of Incoming Trunk Test Registers

TABLE C

104TL FEATURE TRANSMISSION LEVEL POINT ASSIGNMENT AND TEST STATE

TRUNK GROUP TYPE	TRANSMISSION TEST TONE LEVEL	TRUNK TEST STATE‡ (RI 177-TANDEM† RI 176-LOCAL)
Local	TP0	Local and/or Tandem
Tandem	TP0 or TP2*	Tandem
Toll Connect	TP0 or TP2*	• DDD Access — Tandem • Toll Completing — Local and/or Tandem
Intertoll	TP2	Tandem and/or Talk
CAMA	TP0 TP0 or TP2* TP2	Local Tandem Talk

* All trunks of the same type must be tested at the same level.

† RI 177 may also be initially used for the talk test state used on HILO 4-wire trunks.

‡ Toll CCIS 2-wire trunks are tested in the tandem-talk-on-hook-with-transformer-or-2-dB-pack (TANONX) state. Toll CCIS HILO 4-wire trunks are tested in the continuity-check-state-on-hook-toward-trunk-HILO-4-wire (CNTN4) state.

1000-Hz test tone directly to the far-to-near transmission path. This test tone is measured at the near end as the far-to-near end trunk transmission loss (Fig. 3, Step 3).

4.24 Following the far-to-near trunk transmission loss measurement, the near-to-far trunk transmission loss measurement is sent to the near end (Fig. 3, Step 4). This is done by applying one milliwatt, 1000-Hz tone through the transmitting arm pads to the far-to-near channel of the trunk. This measurement is actually one milliwatt minus the attenuator transmitting arm loss (measured N-F loss or N-F loss minus 10 dB) minus the far-to-near trunk loss. Therefore, the far-to-near trunk loss must be subtracted from the total measurement in Fig. 3), Step 4, to obtain the near-to-far trunk loss. When the transmitting arm loss is equal to the measured near-to-far loss minus 10 dB, an over-ten signal is transmitted to the near end before the tone is connected indicating that the transmission is being made at a level of 10 dB higher than it should be. The add 10 dB feature avoids transmitting low levels over trunks and therefore minimizes the possibility of error due to noise.

4.25 Upon completion of the near-to-far loss measurement, a near-to-far noise test is made by the far end noise checking circuit (Fig. 3, Step 5). If the noise level exceeds 41 dBrnc at the trunk terminal, a test progress tone at 120 interruptions per minute is sent to the near end. If the noise level is satisfactory, a steady test progress tone is sent to the near end. The applicable tone remains until near end disconnect.

4.26 Upon near-end disconnect, the ESS effects the following actions: idles the TUT and SD-1A303 test coupler hardware; abandons network connections; restores the trunk and test coupler software; and releases the applicable incoming trunk test register.

B. HILO 4-Wire Trunk Testing (Non-CCIS Trunks)

4.27 The operation of the 104TL feature in a No. 1 or No. 1A ESS equipped with the HILO

4-wire switching feature is very similar to the 2-wire trunk testing described above. However, certain exceptions must be noted.

(a) Incoming HILO 4-wire trunks are only tested in the talk state.

(b) Only RI 177 is used which correlates to pseudo route index 008 which contains a nonfixed RI for the trunk group containing HILO 4-wire 104-type test lines at TP0.

(c) If TP2 is specified by the trunk group number supplementary translator, the applicable route index expansion table contains another nonfixed RI for the trunk group containing HILO 4-wire 104-type test lines at TP2.

(d) Supervision for disconnect is set up by scanning the SD-1A388 test coupler.

(e) Certain translation word data differs.

C. Toll CCIS Trunk Testing (Intertoll Trunks Only)

4.28 In this operation description of the 104TL feature for a No. 1 or No. 1A ESS equipped with the toll CCIS feature, it should be remembered that an ESS may switch 2-wire and/or HILO 4-wire trunks, depending on how it is equipped, and that all interactive communications (except test performance) between offices is done over signaling links instead of toll trunks.

4.29 After the near-end maintenance personnel or automatic test equipment seizes the trunk and dials the appropriate digits, a test initial address message (IAM) is formatted and sent over the signaling link to the far end. The ESS validates the digits. If invalid, a vacant national number message is returned. If valid, a continuity check circuit is connected to the TUT. A continuity test is then automatically performed by the near-end switcher. Regardless of the results, the near end sends a continuity message, and the far end proceeds with the 104-type test call. The check circuit is abandoned, the incoming register released, and an idle incoming trunk test register seized. [If none is available, ESS sends the national switching congestion (NSC) message. The near end must send the clear forward (CLF) message by releasing the TUT. The ESS then sends the release guard (RLG) message, and the test call is terminated.]

4.30 From the digits 104 in the test IAM, the ESS determines RI 177. If the TUT is HILO 4-wire, RI 177 correlates pseudo route index 008 to obtain the nonfixed RI contained in the pseudo route index table. Since TP2 is applicable, the next RI in the applicable route index expansion table is used to point to the appropriate TP2 trunk group. The continuity check circuit is abandoned, and connection made to the test coupler of a 104-type test line. The TUT and test coupler are put into the appropriate hardware state, and an address complete, charge and answer, charge message returned to the near end.

4.31 The 104 test is then performed as described in paragraphs 4.21 through 4.25. Toll CCIS trunks are tested in different states from non-CCIS trunks. Toll CCIS 2-wire trunks are tested in the tandem-talk-on-hook-with-transformer- or-2-dB-pack (TANONX) state. Toll CCIS HILO 4-wire trunks are tested in the continuity-check-state-on-hook-toward-trunk-HILO-4-wire (CNTN4) state.

4.32 Upon testing completion, maintenance personnel or automatic test equipment release the TUT which causes a CLF message to be sent to the far end. The ESS effects the following actions: idles the trunk and test coupler hardware; abandons network connections; restores trunk and test coupler software; releases the applicable incoming trunk test register; and returns a RLG message.

CHARACTERISTICS

5. FEATURE ASSIGNMENT

5.01 The 104TL feature is provided on a per office basis for testing incoming trunks from offices equipped with either the Automatic Transmission Test and Control Circuit or the Automatic Transmission Measuring System associated with automatic trunk test frames. It may also be used for manual "one person," 2-way transmission measurements from a testboard or a maintenance center.

6. LIMITATIONS

OPERATIONAL

6.01 The 104TL feature should not be used in testing trunks containing type "M" carrier channels. Any testing power at a level higher than -20 dBm at the input of the "M" channel

causes the limiting action of the terminal equipment to affect the measurement. This results in erroneous measurements on these channels.

6.02 Only one 104-type test can be served at any one time by the transmission measuring and noise checking circuit. If the transmission noise and measuring circuit is busy, test progress tone is returned to any other 104-type test calls (parked on 104-type test lines awaiting execution). If all applicable 104-type test lines within a switching office are seized, busy tone is returned to the near end.

ASSIGNMENT

6.03 Each 2-wire 104-type test line installed in an office must be assigned to one of two possible trunk groups. One trunk group is for 2-wire testing at TP0, and the other for TP2. Each HILO 4-wire 104-type test line installed in an office must also be assigned to one of two other possible trunk groups. An ESS office may or may not require all four trunk groups. The number of trunk groups will depend upon which type(s) of 104-type tests are needed, as well as their intended level(s) of testing. For example, trunk group A may be assigned to test 2-wire trunks at TP0; trunk group B to test 2-wire trunks at TP2; trunk group C to test HILO 4-wire trunks at TP0; and trunk group D to test HILO 4-wire trunks at TP2. The trunk groups assigned must not contain any other type of circuits.

6.04 All 2-wire 104-type test lines must be connected to the transmission reference network. There are no restrictions on the assignment of DNs or CAMA codes from available ones within an office. Refer to Table A. The 104 code is reserved for incoming 104-type test calls.

7. INTERACTIONS

7.01 Not applicable.

8. RESTRICTION CAPABILITY

8.01 Not applicable.

INCORPORATION INTO SYSTEM

9. INSTALLATION/ADDITION/DELETION

9.01 Figure 15 illustrates the procedure to add the 104TL feature.

10. HARDWARE REQUIREMENTS

COST FACTORS

10.01 Hardware usage costs for the 104TL feature are shown in Table D.

DETERMINATION OF QUANTITIES

10.02 Hardware associated with the 104TL feature is shown in Table B.

10.03 Theoretically, any number of 104-type test lines (with associated circuits) can be connected to a transmission measuring and noise checking circuit, but in actual use, there is a limit. This limit is determined by the maximum length of time it is tolerable to delay the originating automatic test circuit or testboard access to the transmission measuring and noise checking circuit.

10.04 The length of time for completing a transmission measurement and making a noise check varies from 19 to 35 seconds depending upon whether the test is made automatically or manually. Therefore, if all 104-type test lines are being continuously seized, the delay time produced is the number of 104-type test lines times 19 to 35 seconds. For example, three transmission test lines can produce an approximate delay of from 1 to 1-1/2 minutes.

11. SOFTWARE REQUIREMENTS

COST FACTORS

A. Memory—No. 1 ESS

Fixed

11.01 The following memory is required whether or not the 104TL feature is used:

- ***Generic (program store):*** Refer to Table E.

- ***Translation (program store):***

(a) 1 word for pseudo route index (PRI) 008 (all offices equipped with 1E4 and later generic programs)

(b) 4 words for route index expansion table for route indexes 176 and RI 177.

Conditional

11.02 The following memory is required only when the 104TL feature is activated:

- ***Generic Program (program store):*** Refer to Table E.

- ***Translation (program store):***

(a) 4 words for each trunk class code expansion table (4 for 2-wire and 4 for HILO 4-wire applications, as required)

(b) 1 word for tandem digit interpreter table

(c) 1 word for each call identification word in the rate and route pattern auxiliary block

(d) If HILO, 2 words for route index expansion table for each nonfixed RI (maximum of 4 words; 2 for TP0 and 2 for TP2, as required)

(e) 1 word per incoming trunk group for trunk group number supplementary translator entry if TP2 is applicable

(f) 2 words per 104-type test coupler circuit for master scanner translator

(g) 4 words per 104-type test coupler circuit for TNN-to-PEN auxiliary block

(h) 1 word for each applicable directory number subtranslator entry, that is, one for local and/or one for tandem/talk trunk test states.

- ***Call Store:***

(a) 18 words for each incoming trunk test register for each 104-type test line. Set card NITT defines the total number of incoming trunk test registers required by an office. A minimum of four incoming trunk test registers is required for all types of test lines in an office.

(b) Peripheral order buffers are required to perform connection and disconnection between incoming trunks and the 104-type test lines. They are also used to place the trunk under test and test coupler in the appropriate state during set up and release. These additions alone should not require any additional peripheral order buffers to be engineered for an office.

Variable

11.03 Not applicable.

B. Memory—No. 1A ESS

Fixed

11.04 The following memory is required whether or not the 104TL feature is used:

- ***Generic (program store, file store):*** Refer to Table F.

- ***Translation (unduplicated call store, file store):***

(a) 1 word for pseudo route index (PRI) 008 (all offices)

(b) 4 words for route index expansion table for route indexes 176 and 177.

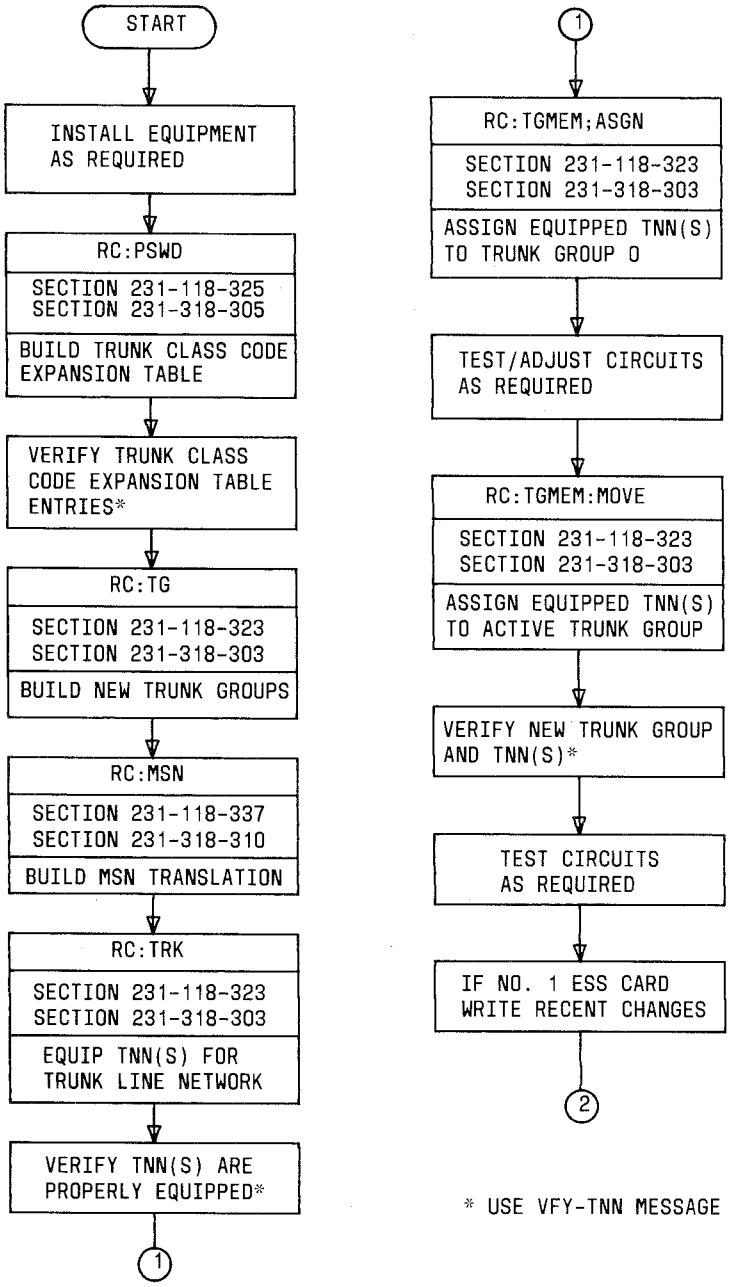
Conditional

11.05 The following memory is required only when the 104TL feature is activated:

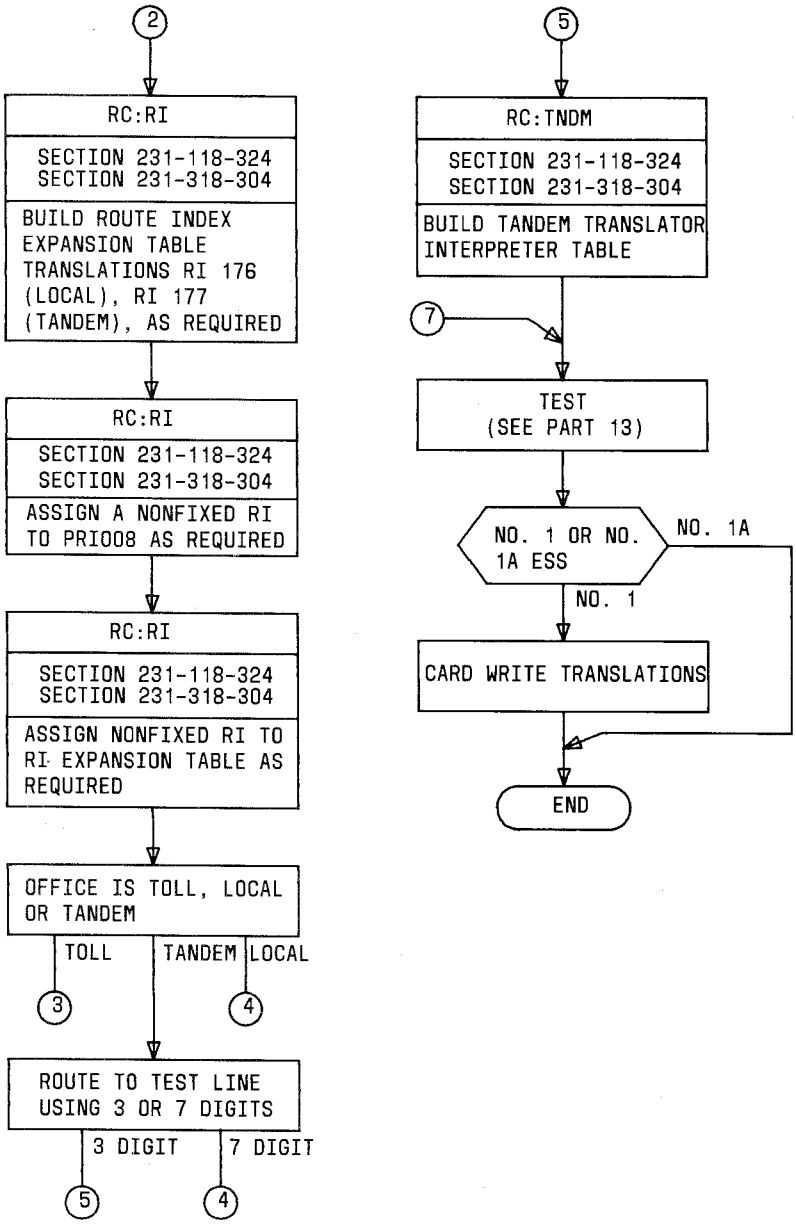
- ***Translation (unduplicated call store, file store):***

(a) 4 words for each trunk class code expansion table (4 for 2-wire and 4 for HILO 4-wire application, as required)

(b) 1 word for tandem digit interpreter table



* USE VFY-TNN MESSAGE


2
RC:RI
SECTION 231-118-324
SECTION 231-318-304
BUILD ROUTE INDEX EXPANSION TABLE TRANSLATIONS RI 176 (LOCAL), RI 177 (TANDEM), AS REQUIRED
RC:RI
SECTION 231-118-324
SECTION 231-318-304
ASSIGN A NONFIXED RI TO PRIOO8 AS REQUIRED
RC:RI
SECTION 231-118-324
SECTION 231-318-304
ASSIGN NONFIXED RI TO RI EXPANSION TABLE AS REQUIRED
OFFICE IS TOLL, LOCAL OR TANDEM
TOLL
TANDEM
LOCAL
3
4
ROUTE TO TEST LINE USING 3 OR 7 DIGITS
3 DIGIT
7 DIGIT
5
4
5
RC:TNDM
SECTION 231-118-324
SECTION 231-318-304
BUILD TANDEM TRANSLATOR INTERPRETER TABLE
7
TEST
(SEE PART 13)
NO. 1 OR NO. 1A ESS
NO. 1A
NO. 1
CARD WRITE TRANSLATIONS
END

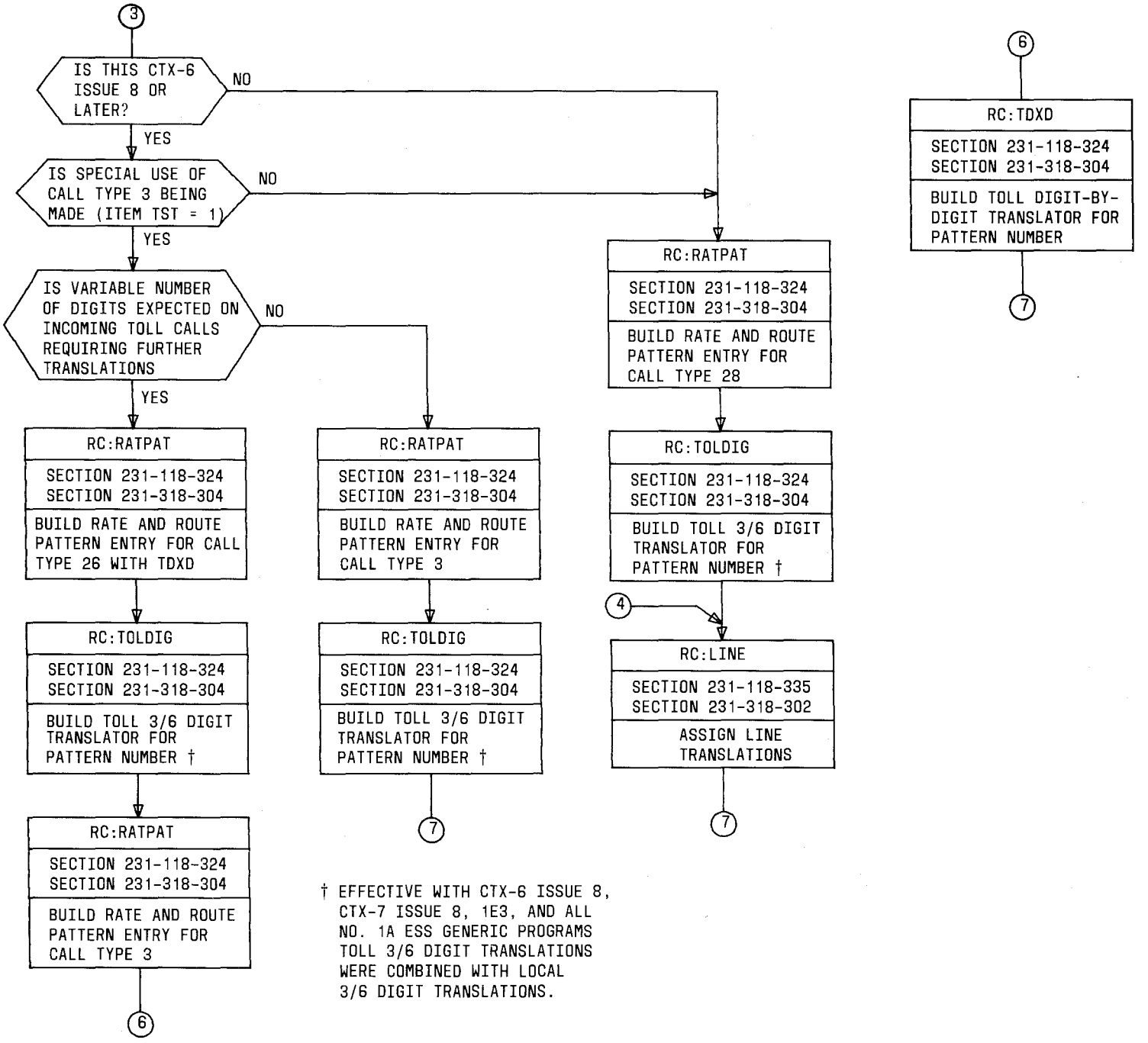


Fig. 15—Procedure for Adding the 104TL Feature

(c) 1 word for each call identification word in the rate and route pattern auxiliary block

(d) If HILO, 2 words for route index expansion table for each nonfixed RI (maximum of 4 words; 2 for TP0 and 2 for TP2, as required)

(e) 1 word per incoming trunk group for trunk group number supplementary translator entry if TP2 is applicable

(f) 2 words per 104-type test coupler circuit for master scanner translator

(g) 4 words per 104-type test coupler circuit for TNN-to-PEN auxiliary block

(h) 1 word for each applicable directory number subtranslator entry, that is, one for local and/or one for tandem/talk trunk test states.

TABLE D

HARDWARE USAGE COSTS PER 104-TYPE TEST COUPLER

HARDWARE USAGE	SD-1A303 2-WIRE QUANTITIES	SD-1A388 HILO 4-WIRE QUANTITIES
Signal Distributor Points	2	2
Master Scan Points	2	2
Network Appearances	1*	1†
Required Trunks	1	1
Trunk Order Codes:		
2 circuits per unit	03300	13800
4 circuits per unit	03370	NA

* Transmission Reference Network

† Via HILO Interface Circuit, Trunk Order Code 14200

TABLE E

NO.1 ESS GENERIC PROGRAM WORDS (104TL)

GENERIC PROGRAM	FIXED	CONDITIONAL		
	2-WIRE (BASE)	HILO 4-WIRE (HL4W)*	TOLL CCIS (CCISTM)*	TOTAL
Prior to 1E4	10	—	—	10
Effective with 1E4	10	30	—	40
Effective with 1E5	10	30	30	70

* Optionally loaded feature package.

• ***Duplicated Call Store:***

(a) 18 words for each incoming trunk test register for each 104-type test line. Set card NITT defines the total number of incoming trunk test registers required by an office. A minimum of four incoming trunk test registers is required for all types of test lines in an office.

(b) Peripheral order buffers are required to perform connection and disconnection between incoming trunks and the 104-type test lines. They are also used to place the trunk under test and test coupler in the appropriate state during set up and release. These additions alone should not require any additional peripheral order buffers to be engineered for an office.

Variable

11.06 Not applicable.

TABLE F

NO.1A ESS GENERIC PROGRAM WORDS (104TL)

GENERIC PROGRAM	FIXED	CONDITIONAL		
	2-WIRE (BASE)	HILO 4-WIRE (HL4W)*	TOLL CCIS (CCISTM)*	TOTAL
Prior to 1AE4	15	—	—	15
Effective with 1AE4	15	35	—	50
Effective with 1AE5	15	35	35	85

* Optionally loaded feature package.

DETERMINATION OF QUANTITIES

11.07 Refer to COST FACTORS above.

PROCESSOR TIME

11.08 Real time requirements for No. 1 and No. 1A ESS are shown in Table G. Cycle time for No. 1 ESS is 5.5 microseconds and for No. 1A ESS is 0.7 microsecond.

TABLE G

PROCESSOR TIME FOR 104TL FEATURE

ACCESS CODE	NUMBER OF PROCESSOR CYCLES	
	NO. 1 ESS	NO. 1A ESS
3-digit	3300	6600
7-digit	3650	7300

FEATURE DEFINING SET CARDS

11.09 Not applicable.

12. DATA ASSIGNMENTS AND RECORDS

TRANSLATION FORMS

12.01 ESS translation forms, found in reference C(1) in Part 18, requiring completion are as follows.

(a) ESS 1101—Directory Number Record: This form assigns program index for directory numbers employing a route index for completion.

(b) ESS 1201—Miscellaneous Trunk Frame Record: This form relates the equipment location on a frame basis with the trunk network number, trunk group, trunk number, trunk class code, signal distributor points, and supervisory scan points.

(c) ESS 1201—Trunk Group Record: This form is used to furnish trunk network numbers to trunk group and trunk number translations for trunks in the transmission reference network.

(d) ESS 1203—Trunk Network Number Record: This form relates trunk network number to trunk group and trunk frame location.

(e) ESS 1204—Trunk Class Code Record: This form associates the arbitrarily assigned 3-digit trunk class code with a 4-word trunk class code expansion in memory, which associates the circuit program index with trunk usage.

(f) ESS 1209A—Trunk Group Tandem Record: This form is used to enable the system to receive, interpret, and route 104 code and will convert 104 code into a regular route index for access to the 104-type test line(s).

(g) ESS 1209B—Tandem Table Record: This form builds the digit interpreter table to provide route index from three levels of digit interpretation.

(h) ESS 1216—Trunk Group Supplementary Record: This form builds the TGN supplementary translator to mark trunk groups for testing at either the TP0 or TP2 reference level.

(i) ESS 1217—Trunk Group Toll Record: This form enables an ESS to handle plant test code 104 via TLDI index.

(j) ESS 1218—Toll Digit by Digit Record: This form is the means by which data is recorded for performing translations on the fourth through eighth incoming toll digits, one at a time, to produce the desired route and rate pattern number.

(k) ESS 1220—Universal Trunk Frame (HILO) Record: Relates the HILO universal trunk equipment locations on a frame basis to the corresponding trunk network appearances and the HILO universal trunks assigned to these equipment locations.

(l) ESS 1300A—Three-Digit Translations: This form routes code 104 through a rate and route pattern number to a vacant code route index.

(m) ESS 1303A/B/C—Trunk and Service Circuit Route Index Record: These forms assign route index, next route index, and return supervision to trunk groups containing test lines.

(n) ESS 1303D—Pseudo Route Index Record: Specifies data for pseudo route indices.

(o) ESS 1304—Rate and Route Chart: This form provides screening instructions to the ESS program for routing calls via TDXD index for call type 26 in the supplementary call identification word.

(p) ESS 1305—Rate and Route Pattern Record: This form enables simulated dialing of 7-digit directory numbers after receiving a 104-type test code via call type 28 in call identification word, provides a route index to complete the call for special use of call type 3, or points to a TDXD index for call type 26.

(q) ESS 1311—Toll Three/Six-Digit Translations: This form establishes routings for incoming 3- and 6-digit toll codes via rate and route pattern number pointing to a call identification word (ESS 1305).

RECENT CHANGES

12.02 Not applicable.

13. TESTING

13.01 Verification that the 104TL feature has been properly installed and assigned can be accomplished by the following input/output messages (abbreviated from the appropriate input/output message manual referenced in Part 18B). System response should be checked against the applicable ESS translation form data.

- For No. 1 ESS T-READ and TAG-TNN input messages are used to verify trunk class code expansion table entries. System responses should be the TW02 and TR21 output messages. For No. 1A ESS use DUMP:CSS,ADR— to verify the call indicator words. The system response is the DUMP:CSS output message.

- VFY-EXP input message is used to verify route index or pseudo route index. System response should be a TR05 output message.

- VFY-MSN input message is used to verify master scan number. System response should be a TR12 output message.

- VFY-TKGN input message is used to verify one or all trunk group numbers. System response should be a TR10 output message.

- VFY-TNN input message is used to verify one or all trunk network numbers on a trunk switch frame. System response should be a TR14 output message.

13.02 Incoming 104-type test calls should be made over the various trunk groups to verify proper operation of the 104TL feature.

14. OTHER PLANNING TOPICS

14.01 Currently the transmission measuring and noise checking circuit SD-95698 used with the 104-type test line is available only on an 11 feet 6 inch-frame. This circuit, which now employs vacuum tubes, requires ±130 volts. Refer to the

applicable SD drawing for particulars concerning power requirements.

ADMINISTRATION

15. MEASUREMENTS

15.01 Not applicable.

16. CHARGING

16.01 Not applicable.

SUPPLEMENTARY INFORMATION

17. GLOSSARY

17.01 Not applicable.

18. REFERENCES

18.01 The following documentation contains information pertaining to or affected by the 104TL feature.

A. Bell System Practices

(1) Section 103-235-100—Far-End Transmission Measuring and Noise Checking Circuit and Associated 104-Type Test Lines

(2) Section 103-235-501—Far-End Transmission Measuring and Noise Checking Circuit and Test Lines Employing Test Program Tone Equipment Tests

(3) Section 103-251-105—Processor Controlled Interrogator General Description

(4) Section 103-335-515—Milliwatt Distributing Systems and Test Lines, 2-Wire No. 1 Electronic Switching System Offices—Check of Transmission Test Lines

(5) Section 231-061-210—Service Circuits, Network Design—No. 1 Electronic Switching System

(6) Section 231-061-220—Trunk and Miscellaneous Circuits, Network Design—No. 1 Electronic Switching System

(7) Section 231-061-450—Program Stores, Network Design—No. 1 Electronic Switching System

(8) Section 231-061-460—Call Stores, Network Design—No. 1 Electronic Switching System

(9) Section 231-062-210—Service Circuits, Network Design—No. 1A Electronic Switching System

(10) Section 231-062-220—Trunks and Miscellaneous Circuits, Network Design—No. 1A Electronic Switching System

(11) Section 231-062-460—Processor Community Engineering, Program Stores, Network Design—No. 1A Electronic Switching System

(12) Section 231-062-465—Processor Community Engineering, Duplicated Call Store, Network Design—No. 1A Electronic Switching System (when published)

(13) Section 231-062-470—Processor Community Engineering, Unduplicated Call Store, Network Design—No. 1A Electronic Switching System

(14) Section 231-062-475—Processor Community Engineering, File Stores, Network Design—No. 1A Electronic Switching System

(15) Section 231-090-366—Feature Document—HILO 4-Wire Switching Feature, 2-Wire No. 1 and No. 1A Electronic Switching Systems

(16) Section 231-090-416—Feature Document—Toll Common Channel Interoffice Signaling Feature, 2-Wire No. 1 and No. 1A Electronic Switching Systems

(17) Section 231-118-321—General Recent Change Information (CTX-6 through 1E5 Generic Programs), 2-Wire No. 1 Electronic Switching System

(18) Section 231-118-323—Trunk Translation Recent Change Procedures for TG, TGBVT, TRK, CFTRK, and TGMEM (CTX-6 through 1E5 Generic Programs), 2-Wire No. 1 Electronic Switching System

(19) Section 231-118-324—Rate and Route Translation Recent Change Procedures for NOCNOG, DNHT, NOGRAC, RATPAT, DIGTRN, TOLDIG, CCOL, RI, CHRGX, DITABS, TNDM, IDDD, and TDXD (CTX-6 through 1E5 Generic

Programs) 2-Wire No. 1 Electronic Switching System

(20) Section 231-118-325—RC Procedures for PSWD, GENT, PSBLK, SUBTRAN (CTX-6 through 1E5 Generic Programs), 2-Wire No. 1 Electronic Switching System

(21) Section 231-118-337—RC Procedures for ANIDL, CAMA, CFG, CPD, MSN, NMTGC, PLM, ROTL, SIMFAC, and TMBCGA (CTX-6 through 1E5 Generic Programs), 2-Wire No. 1 Electronic Switching System

(22) Section 231-130-101—Trunk Test Capabilities Description, 2-Wire No. 1 Electronic Switching System

(23) Section 231-318-301—General Recent Change Information, 2-Wire No. 1A Electronic Switching System (when published)

(24) Section 231-318-303—Trunk Translation Recent Change Procedures for TG, TGBVT, TRK, CFTRK, and TGMEM (Through 1AE5 Generic Program), 2-Wire No. 1A Electronic Switching System

(25) Section 231-318-304—Rate and Route Translation Recent Change Procedures for NOCNOG, DNHT, NOGRAC, RATPAT, DIGTRN, TOLDIG, CCOL, RI, CHRGX, DITABS, TNDM, IDDD, and TDXD (Through 1AE5 Generic Program), 2-Wire No. 1A Electronic Switching System

(26) Section 231-318-305—RC Procedures for PSWD, PSBLK, SUBTRAN, and GENT (Through 1AE5 Generic Program), 2-Wire No. 1A Electronic Switching System

(27) Section 231-318-310—RC Procedures for ANIDL, CAMA, CPD, JUNCT, MSN, NMTGC, PLM, ROTL, SIMFAC, CFG, and TMGCGA, (Through 1AE5 Generic Program), 2-Wire No. 1A Electronic Switching System

(28) Section 660-440-010—Codes—Test Line Circuits and Communication Trunks Nationwide Distance Dialing Plan

(29) Section 801-250-167—Transmission Measuring and Noise Checking System, Automatic Transmission Measuring System, Equipment Design Requirements, Common Systems.

B. TTY Input and Output Manuals

(1) Input Message Manual IM-1A001, No. 1 Electronic Switching System

(2) Input Message Manual IM-6A001, No. 1A Electronic Switching System

(3) Output Message Manual OM-1A001, No. 1 Electronic Switching System

(4) Output Message Manual OM-6A001, No. 1A Electronic Switching System.

C. Other Documentation

(1) Translation Guide TG-1A, No. 1 and No. 1A Electronic Switching Systems, 2-Wire

(2) Translation Output Configurations PA-591003, No. 1 Electronic Switching System

(3) Translation Output Configurations PA-6A002, No. 1A Electronic Switching System

(4) Office Parameter Specification PA-591001, No. 1 Electronic Switching System

(5) Office Parameter Specification PA-6A001, No. 1A Electronic Switching System

(6) Parameter Guide PG-1, No. 1 Electronic Switching System, 2-Wire.