TRANSLATIONS

SOFTWARE SUBSYSTEM DESCRIPTION (SSD)

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

SWITCHING SYSTEMS

NOTICE

Printed in U.S.A.

1. GENERAL

INTRODUCTION

1.01 This section describes the software associated with the translation subsystem operating in the No. 1 and No. 1A Electronic Switching Systems (ESSs).

1.02 When this section is reissued, the reason for reissue will be stated in this paragraph.

1.03 Part 5 of this section provides a defined list of abbreviations and acronyms used in this section.

PURPOSE OF THE TRANSLATION SUBSYSTEM

1.04 The purpose of the translation subsystem is to store, retrieve, and interpret office dependent data. As with any processing system, an ESS must have certain information available as a basis for logical decisions. This information is called a "data base" in general computer science terms. The No. 1 and No. 1A ESSs have a data base composed of office parameters and translations. This section is concerned with how the information in translations is accessed by the central processor.

SCOPE OF SECTION

1.05 The information provided in this section includes a description of:

(a) The organization and operation of the translation subsystem at the system level

(b) The translation subsystem PIDENTS (see Table A).

Information unique to the No. 1A ESS application is so noted. Applications which are unique to No. 1 ESS are not described in this document.

PIDENTS DESCRIBED IN THIS SECTION

1.06 Table A provides a PIDENT to program a number cross-reference for the translation subsystem PIDENTS described in this document.

2. SYSTEM LEVEL DESCRIPTION AND INTERFACES

BACKGROUND

2.01 In early electromechanical telephone systems, switchers were directly controlled by the dialed digits. Digit storage and interpretation were not needed since the switcher was under *direct control* of the customer. As telephone service expanded, this simple approach became unsuitable and it became necessary to store incoming digits for faster and more economical interpretation. The first digit translators were electromechanical and were made of small groups of relay circuits known as "decoders". These decoders changed the input information (dialed digits) into a form

usable by the newer switchers. This illustrates the translation function which, by definition, is *the changing of information from one form to another.* Translators were first used in this capacity in *common control* switchers such as panel and crossbar. But with the advent of *stored program control,* the translation function was greatly expanded. In the No. 1 ESS, the translators were administered by a program simply called the "translation program". However, with advancements in programming techniques, the translation program has been replaced by a translation subsystem, made of many PIDENTS. This translation subsystem is used in both the No. 1 and No. 1A ESSs, giving these systems even broader capabilities.

SUBSYSTEM DESCRIPTION

2.02 The translation subsystem is a collection of routines that provide specific kinds of translation information at the request of other programs. Other programs which use the services of the translation subsystem are called **clients** of the translation subsystem. When a client requires translation data, the client supplies the necessary input data. The specific areas of **main memory** (program store and call store for No. 1 ESS and unduplicated call store for No. 1A ESS) are interrogated like a dictionary by the translation subsystem. The translation data is found, put into a standard form, and stored at a specific location for the client's use. See PK-1A120, the Translation User's Manual, for details on standard forms and locations.

2.03 Figure 1 highlights the role of the translation subsystem. Translation data can be grouped into three types:

(1) Addresses of equipment numbers

(2) Numerical quantities and call processing data

(3) Special data output.

2.04 Addresses of equipment numbers are required by client programs for specific jobs such as: operating a relay, using a central pulse distributor or a signal distributor, reading a line or trunk scan point, etc.

2.05 Numerical quantities specify directory numbers, trunk group numbers, billing indexes, etc. These types of quantities have the same number

TABLE A

TRANSLATION SUBSYSTEM PIDENTS

PIDENT	TITLE	NO. 1 PR	NO. 1A PR
	LINE AND JUNCTOR TRANSLATIONS		
NEJR	Junctor Translations	1A120	6A120
TRBD	Basic Digit Analysis and Conversion	1A120	6A120
TRBL	Basic Line and Directory Number	1A120	6A120
TRCD	Centrex Digit Analysis	1A120	6A120
TRCL	Centrex Line and Directory Number	1A120	6A120
TRLC	Line Cutover	1A120	6A120
TRML	Multiline Hunt Arrangements	1A120	6A120
	TRUNK TRANSLATIONS		
TRBT	Basic Trunk	1A120	6A120
TRUR	Universal Subroutines	1A120	6A120
TRCT	Centrex Trunk	1A120	6A120
	TRANSLATION DATA VERIFICATION MESSAGE PROGRAMS		
TVBD	Basic Digit Analysis	1A120	6A120
TVBL	Basic Line and Directory Number	1A120	6A120
TVBT	Basic Trunk	1A120	6A120
TVCD	Centrex Digit Analysis	1A120	6A120
TVCL	Centrex Line	1A120	6A120
TVMN	Main Control Program	1A120	6A120
TRANCOMN	1A Processor Unit Translations	1A120	6A120

of bits in all offices but may lead to different actions in each office. Call processing data has fixed numerical quantities which have the same meaning in all offices. Originating and terminating major classes are examples of call processing data.

2.06 Special output data is the result of special conditions of the system. Cutover, growth, and higher level interrupts are examples of when the translation subsystem may yield special information.

BASE LEVEL PROCESSING

2.07 The No. 1A ESS generic program is designed primarily to handle the call processing requirements of an office and to provide for other operational, maintenance, and recovery functions. In the absence of interrupts, the system operates on the base or L level. Base level processing is composed of frequency classes A through E and interject. (See Fig. 2.) The executive control main program (ECMP) schedules these classes of jobs to be performed at a predetermined time.

CLIENT
PROGRAMS

MAIN
MEMORY

CALL PROCESSING
SOFTWARE

MAINTENANCE
SOFTWARE

INTERRUPT AND
RECOVERY
SOFTWARE

TRANSLATIONS
SOFTWARE
SUBSYSTEM

ADDRESSES
OF EQUIPMENT
NUMBERS

NUMERICAL
QUANTITIES AND
CALL PROCESSING
DATA

SPECIAL
DATA
OUTPUT
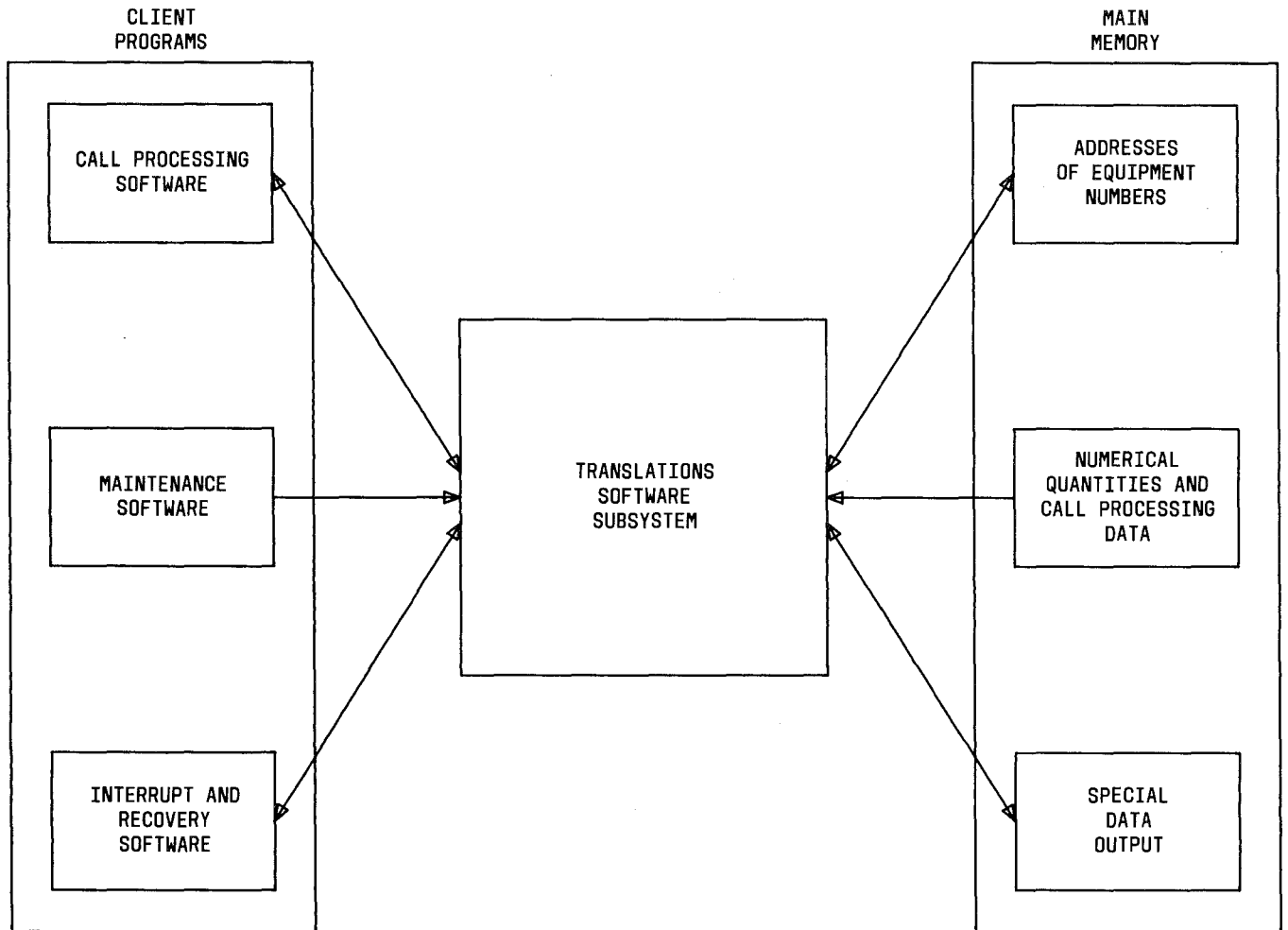
Fig. 1—System Level Interface

2.08 The translation subsystem is used by client programs as the clients require information for continued operation. This makes the **scheduled** use of the translation subsystem impossible. However, the translation subsystem does interact with base level processing by printing messages to verify changes in the translation data base.

2.09 The No. 1A ESS translation routines interface with the outside environment via the input/output (I/O) subsystem. This subsystem handles the input messages received into the 1A processor I/O subsystem and passes the service request to the appropriate program (see Table A). When a class E job is entered by ECMP, the message is processed by the No. 1A ESS application software (ie, not 1A processor software).

2.10 Output messages are processed in response to an input message, or they are generated internally by a client program. The No. 1A ESS application software formats and generates the message data for output and gives control to the 1A Processor I/O subsystem. When another class E job is entered by ECMP, the message is sent to a designated I/O terminal. For complete details of I/O processing for No. 1A ESS, refer to Section 231-310-265.

GENERAL TRANSLATION SEQUENCE

2.11 Unfortunately, not all translation routines follow a set pattern when deriving information from main memory. Many routines use the actions of other routines in order to avoid redundant programming. However, a general sequence of
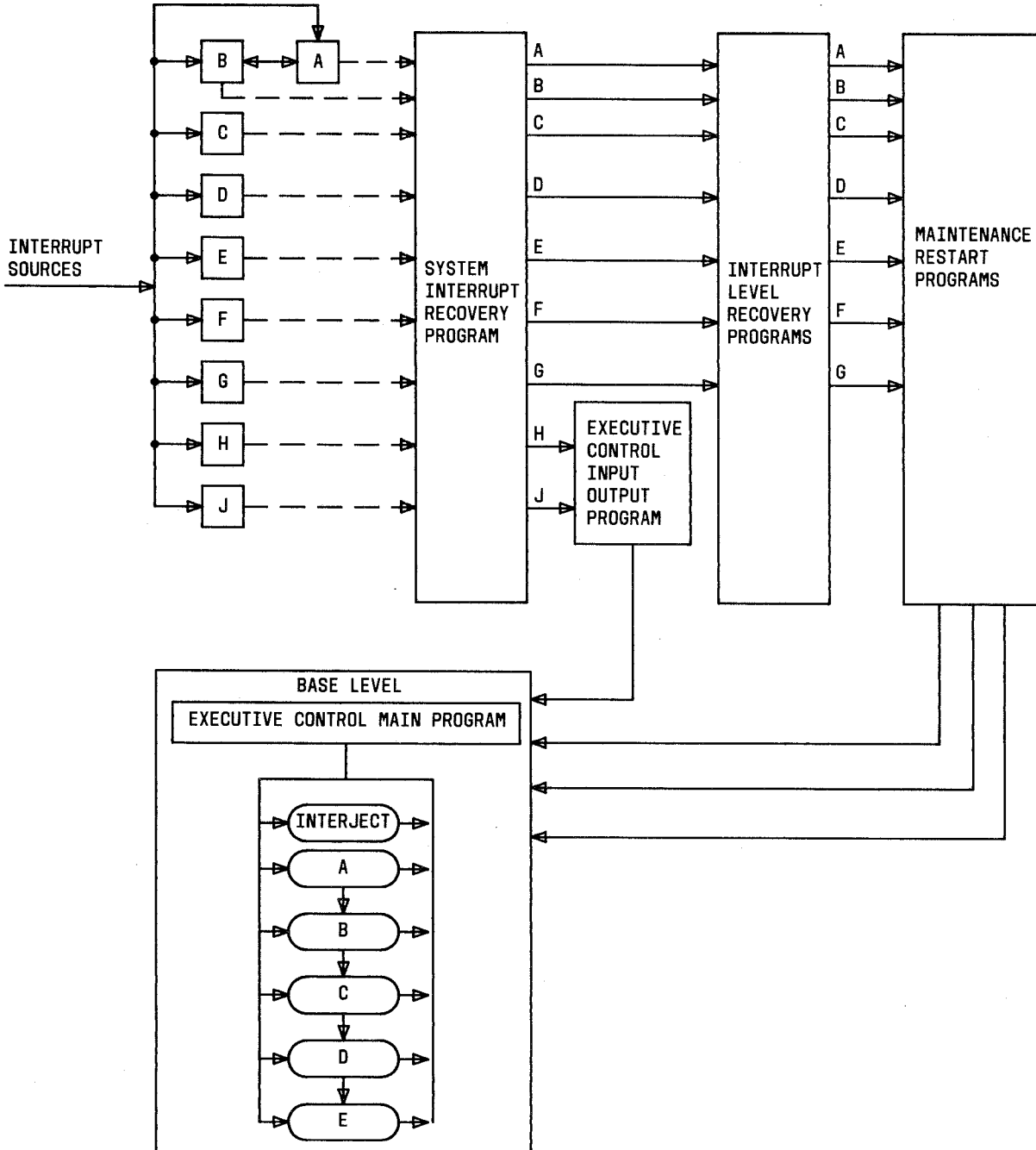
Fig. 2—No. 1A ESS Control Software

events can be described for most translation routines. Figure 3 shows a simplified view of a TNN-PEN translation.

RECENT CHANGE AND TRANSLATION DATA (NO. 1A ESS)

2.12 Unlike No. 1 ESS, which stores translation data on read-only magnetic memory cards in program store and saves recent change (RC) data in a call store buffer called the RC area, the No. 1A ESS stores its translation data in writeable

unduplicated call stores and uses all RC information to directly make all RCs immediately effective. *Thus, in No. 1A ESS, there is no primary RC area, no primary RC-hunting, and no memory card writing procedures as there is in No. 1 ESS.* In some cases (such as customer changeable speed calling and customer activated call forwarding) customer dialing provides the input. There are three kinds of recent changes in No. 1A ESS:

    (1) Permanent

TNN-PEN TRANSLATION
REQUESTED BY DCNT

CLIENT PROGRAM (DCNT)

STORE TNN IN K REGISTER OF CENTRAL CONTROL

ENTER PIDENT TRBT AT GLOBAL ENTRY POINT, TRTNNP

READ HEAD TABLE ADDRESS AT FIXED MASTER HEAD TABLE LOCATION

ADD SUBTRANSLATOR SELECTOR

TRANSLATION SUBROUTINES

READ SUBTRANS-LATOR ADDRESS AT COMPUTED ADDRESS IN HEAD TABLE

ADD INDEX

READ RECENT CHANGE INDICATOR

POSSIBLE TEMPORARY RC — NO / YES

TEMPORARY RC HUNT

WAS RECENT CHANGE FOUND — NO / YES

READ PRIMARY TRANSLATION WORD FROM FOUND RECENT CHANGE REGISTER

READ PRIMARY TRANSLATION WORD AT GIVEN ADDRESS IN MAIN MEMORY

TRANSLATION SUBROUTINES

STORE PRIMARY TRANSLATION WORD OUTPUT IN K REGISTER OF CENTRAL CONTROL

TO CLIENT PROGRAM (DCNT)

Fig. 3—Simplified Translation Routines for No. 1A ESS

(2) Temporary

(3) Delayed.

A. Permanent

2.13 Permanent RCs result in a direct overwrite, addition to, or deletion from translation data in call store, as well as the two disk backup copies. A **rollback block** is created for each permanent RC and stored on disk file in the **rollback area.** This rollback information is needed in case it becomes necessary to remove the RC. The rollback block associated with a permanent RC message contains the address and the old contents of every translation word overwritten or in any way altered as a result of the RC.

B. Temporary

2.14 Temporary RCs (such as call forwarding, service observing, plugup) are stored in a special buffer in the translations call store area called the temporary RC area. A temporary RC on a subtransla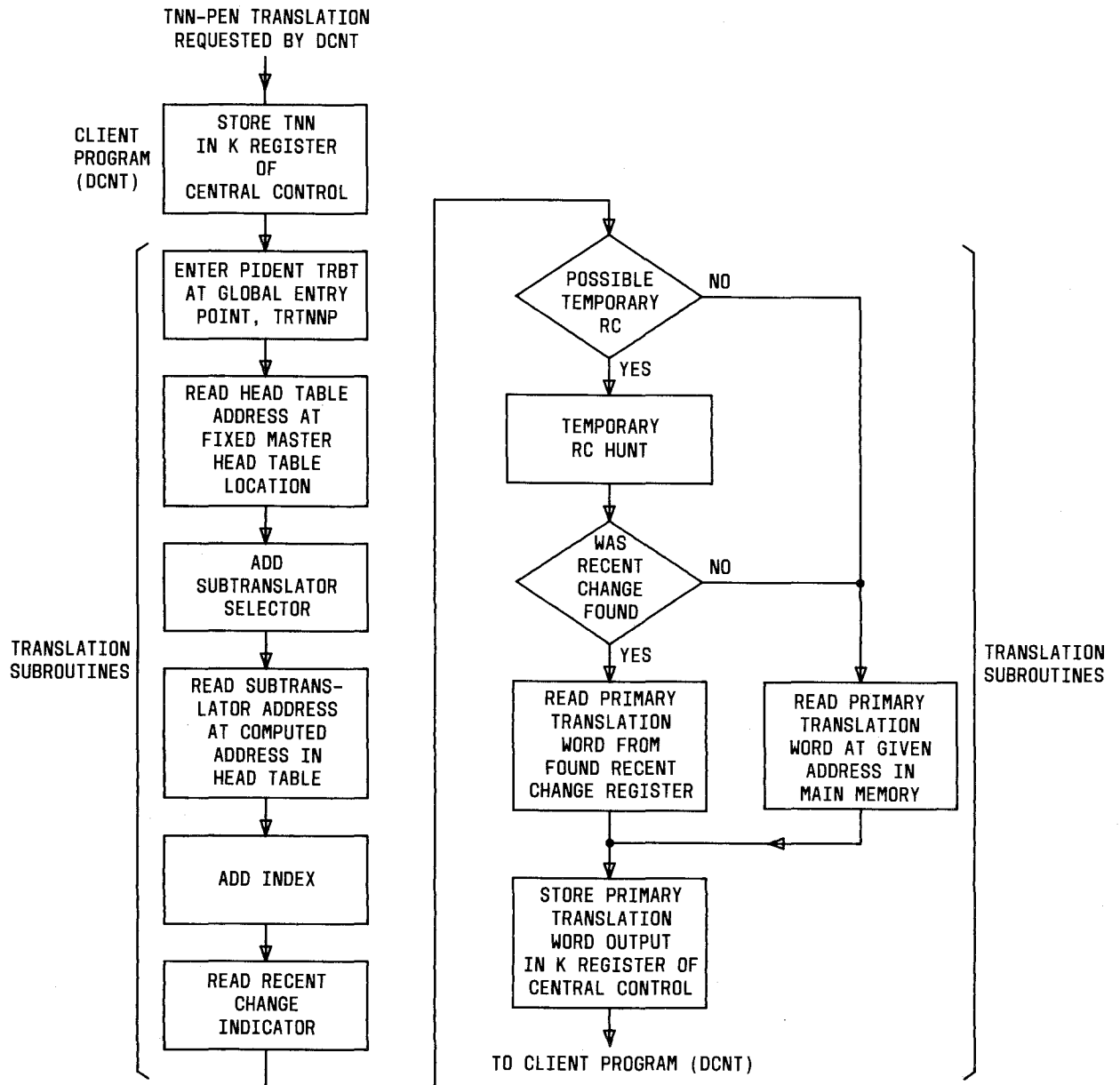tor primary translation word exists as one or more three-word entries in the temporary RC area, linked together and pointed to from the subtranslator primary translation word (PTW). Each three-word temporary RC entry except the last in the chain contains:

- A back pointer

- A temporary data primary translation word

- A forward pointer (to the next temporary entry).

The last entry on the chain contains the permanent PTW instead of a forward pointer. Temporary RCs **do not** generate rollback information.

C. Delayed

2.15 An RC order with delayed status is entered by an RC message that specifies DELAY. The message is stored on disk in the **delayed RC area.** Activation is accomplished by a separate RC message using the teletypewriter (TTY), or by keying certain digits into the ESS from a telephone set assigned a special class of service for RC delayed order activation. Activating a delayed RC has the same effect as entering the same message via a TTY except without the DELAY specified.

3. TRANSLATION SUBSYSTEM ROUTINES

LINE TRANSLATIONS'

3.01 Line translations are basically concerned with data associated with line equipment numbers (LENs) and directory numbers (DNs). The LEN translation provides originating information about the calling customer's line. The DN translation provides terminating information about the called DN.

3.02 An **LEN translation** is called after a service request to provide information that establishes the next logical action to be performed on the call. The LEN translation must provide the class of service and the DN of the originating line as well as the following information:

(a) Identity of any special initial actions required.
A manual originating line must be routed to an operator while a denied line is not connected to anything.

(b) Special characteristics of the line equipment.
A line with a TOUCH-TONE® set must be connected to a TOUCH-TONE digit receiver, etc.

(c) Recognition of complaint or service observing.
If a line is on complaint or service observing, a number of special connections and special actions must be performed.

(d) Custom calling features associated with the line, whether or not the line has a speed calling list, three-way calling, and call forwarding.

(e) Identity of centrex group number for centrex service. This identification determines to which centrex group the line belongs.

(f) Identity of the chart class column for screening purposes. This identification determines the routing and charging treatment to be given to the line originating the call.

3.03 A **DN translation** is made on a terminating call to furnish the terminating class of service, the LEN, the type of ringing required, the indication of the privileges associated with the

terminating party, the type of hunting required for an idle line, and the alternate DN if the call is to be transferred.

3.04 In general, the LEN or the DN translation sequence contains the following steps:

(a) The client program supplies the input parameter.

(b) The program store address of the **PTW** is derived.

(c) A temporary RC hunt is performed.

(d) The PTW is read and interpreted. If there is an auxiliary address, the **translation words (TWs)** in the auxiliary address are read.

(e) The output information is stored for use by the client program. Different situations encountered result in the selection of different return addresses to the client program.

3.05 All customer lines have line link network appearances and class-of-service translation memory information associated with them. Normally, this information is stored in the translation area of the unduplicated call store as a line class code.

3.06 The classes of service provide types of information that identify privileges, restrictions, and call processing associated with a customer's line. The following three basic types of information make up a customer's class of service.

(1) **Major Class:** This class includes any special originating and terminating actions required for a particular line or a DN. The major class is divided into originating and terminating major classes. These latter two classes are basically independent of each other [except in **multiline hunting (MLH)** and hotel-motel service] in system operation.

(2) **Equipment and Special Feature Class Options:** These options indicate equipment classes and feature classes that a particular line may be given during originating and terminating actions.

(3) **Chart Class:** This class prescribes the routing and charging aspects for a particular line.

Note: The originating and terminating major classes and the equipment and special feature class options are documented in the Translations Guide TG-1A, Volume I, Division 3.

LEN TRANSLATIONS

3.07 The input parameter for the LEN translation is the LEN. The outputs of the LEN translation are the DN (a numeric quantity) and the originating class-of-service information (a combination of generic information and numeric quantity).

3.08 The DN is used for call charging purposes. The generic part of the originating class-of-service information consists of an originating major class and a group of bits representing the presence or the absence of some particular equipment or feature (TOUCH-TONE telephone, rotary dial telephone, dial conference, etc). The originating major class is the same in all offices and represents one of the mutually exclusive categories, such as individual line, 2-party line, coin line, etc.

3.09 The originating class-of-service information occupies two TWs called the **LEN class word 1 (LENCL 1)** and the **LEN class word 2 (LENCL 2).** The most frequently occurring combinations of the LENCL 1 and LENCL 2 may be represented by an abbreviated class code. Using the abbreviated class code as an index into the originating class expansion table, the translation program finds the expanded class words LENCL 1 and LENCL 2. If an abbreviated class code does not exist for a particular class of service, the expanded class words LENCL 1 and LENCL 2 appear in the auxiliary block for this LEN. The originating class expansion table is composed of groupings of LENCL 1 and LENCL 2. The use of the abbreviated class code makes it possible to store originating information in a LEN PTW located in an LEN subtranslator. Therefore, all customers with the same equipment and feature options require only one PTW.

3.10 The information associated with an LEN as an initial address forms a file of variable length. A DN is always associated with the LEN either directly or indirectly through a multiline hunt group (MLHG) number. Depending on the class of service of the LEN, there may be sleeve lead information, an abbreviated dial list, or a transfer list.

3.11 Several translation sequences are based directly or indirectly on the LEN as the input parameter. They are the originating class and automatic message accounting (AMA) translation, the party line translation, and the disconnect translation. The party line translation is performed using information supplied by the originating class and AMA translation.

3.12 The translation of the input parameter into the PTW includes an unconditional recent change hunt. In most instances, the translation is immediately completed after furnishing the client program with the class words, the DN word, and the auxiliary address (if any). In some instances, the translation is continued either immediately or after a return to the client program.

DN TRANSLATIONS

3.13 The input parameter for the DN translation is the DN of the called party. The output information of the DN translation provides the terminating class-of-service information and the equipment location of the called DN. The equipment location may be either an LEN or a route index. If the equipment location is a route index, the route index routes the call. By the use of four separate route indexes, the ESS provides considerable flexibility in the handling of calls for nonworking DNs. The route index categories are temporary disconnect, changed number, unassigned number, and blank number. Each route index may be arranged to terminate on an individual trunk group, or one or more indexes may be combined on a common group.

3.14 The object of the DN translation is to find the equipment location of a line associated with the called intraoffice number and to provide any special information necessary to complete a call to such a line. The translation subsystem checks the busy/idle bit associated with the called line and, if it is idle, marks it busy. If the line associated with the called DN is busy and if the line has the series completion feature, the translation subsystem makes a translation for the next DN in the series. If the called DN has the call transfer service in effect, calls are transferred to the remote DN. If the remote DN is not in the local office, the output is simply the interoffice number to which the call is to be transferred.

TRUNK TRANSLATIONS

3.15 Trunk translation is defined as the means for converting known trunk data into coded information that can be recognized and used by the central processing equipment. This coded information is stored in the main memory and is retrieved by the system whenever the information is needed.

3.16 Trunk translation data is required by the system for the following purposes:

- To identify a trunk group associated with a given trunk network termination

- To locate an idle trunk within a given trunk group

- To seize and disconnect a trunk circuit

- To update trunk group records (busy-idle status) in a call store and for various maintenance operations.

3.17 Known trunk data consists primarily of the information used for ordering trunk equipment, the wiring terminations and switches involved in establishing paths through the trunk link networks, and the various options and services provided by the various trunk groups. A trunk group is a number of trunks all having the same origin and destination, type of pulsing, and type of circuit, except for digital carrier trunks which may use a variety of pulsing methods and trunk circuits. Otherwise, any trunk in a given group may be treated by the data processing system exactly the same as any other trunk in the group.

3.18 Trunk translations are divided into two main categories corresponding to the universal and miscellaneous trunks. Universal trunk circuits are related in a fixed manner to the scan points and signal distributor (SD) points. These points are defined by the plug-in location of the package on the universal trunk frame. Miscellaneous trunk and service circuits are controlled by the master scanner, SD, and central pulse distributor (CPD) points. There are no fixed relationships between the plug-in packages and the miscellaneous trunk and service circuits. Translations are required to find the points necessary for controlling a particular circuit in the miscellaneous trunk frame. For this reason, universal trunk translations are relatively

simple as compared with miscellaneous trunk translations.

A. Universal Trunk Translations

3.19 A trunk distributing frame allows any universal trunk circuit to be connected to any position in the switching network. This connection requires that the processing program be able to associate trunk equipment locations with trunk network numbers (TNNs) and to know which trunks belong to which trunk group. Since all trunks in a trunk group are identical, any idle trunk in the group may be seized.

3.20 Since one of the requirements of a universal trunk is that it contains only SD controlled relays, a trunk scanner number implies that it is a trunk SD number. Universal trunk circuits do not have CPD points. Translations must be made from the trunk scanner number to the TNN and vice versa. The trunk scanner number is the source of information concerning a seizure or disconnect. The TNN must be obtained in order to set up a connection to this trunk circuit. A translation from the TNN to the trunk scanner and SD numbers is required in order to operate the trunk circuit relays when a particular trunk is seized as a result of a hunt based on TNNs. A translation from the TNN to the trunk group number (TGN) is required since the administration of available trunks within a group is made on the basis of the TGN. The processing program must be able to find the class of any trunk. This processing is done most conveniently with a translation from the TGN to trunk class code and from the TNN to trunk class code.

3.21 Other translation functions associated with trunks include the hunt for an idle trunk. In the case of the directory number translation, it is convenient for the translation subsystem to make the busy check because the translation subsystem has all necessary equipment numbers already generated. It is equally convenient for a translation function to make the hunt for an idle trunk and to make such a trunk busy, to hunt for an outgoing transmitter associated with a particular trunk, to hunt for an idle terminal in a conference trunk, and to restore trunks in memory to the idle state after a disconnect or after the discovery of a blockage in the network.

B. Miscellaneous Trunk Translations

3.22 Miscellaneous trunk translations are significantly different from universal trunk translations because the miscellaneous trunk and service circuits are controlled by the master scaner, SD, and CPD. There are no fixed relationships between these plug-in units and the locations of the circuits on the miscellaneous trunk frame.

3.23 Miscellaneous trunk circuits require the same basic translations as universal trunk circuits with the following additions:

(a) Since the master scanner is used for miscellaneous trunk circuits, it is necessary to substitute a master scanner to TNN translation and vice versa for the original trunk scanner number to TNN translation.

(b) Because the miscellaneous trunks and service circuits are controlled from SD and CPD points which have no relation to the master scanner number, a translation is required to find the SD and CPD numbers necessary for controlling a particular trunk circuit.

3.24 A portion of the translation memory for the trunk and service circuits consists of special constants referred to as the supervisory program index (SPI) and the trunk program index (TPI) values. These constants are stored in the appropriate scanner-to-TNN translation tables. The values stored in memory depend upon the scan point function and the function of the trunk and must be updated when trunk equipment or translation changes are made.

ROUTING AND CHARGING TRANSLATIONS

3.25 The purpose of the routing and charging translations is to make it possible for a 3- or 6-digit translation to function in any central office by providing in a standard form information specific to this office concerning lines, access codes, area codes, office codes, routing and charging procedures, etc.

3.26 The information entered in main memory provides data for all routing and charging translations. This data is for all classes of service to all subscriber dialed points including operator and other miscellaneous calls. All combinations of digits must have matching translations for a 3- or

6-digit translation served by a particular No. 1A ESS office.

3.27 From an input-output point of view, the first three digits (six digits only if first three digits indicate that a 6-digit translation is needed) are dialed; full routing and charging information is supplied. A number of translations take place internally before the final results are given.

3.28 A special characteristic of routing and charging translations is that the translation depends not only on which number was dialed but also on the services provided the customer who dialed it. The chart column of the originating customer has an effect on the routing and charging. For example, a customer whose toll calls are denied has a different route when trying to dial a toll call from that of a regular individual service customer.

A. Normalized Office Code and Number Group Number Tables

3.29 Of the seven digits of a DN, the first, second, third, and fourth digits are used to perform the conversion of the normalized code to the number group number (NOGR). The first, second, and third digits of the office code correspond directly to a normalized office code (NOC). After the NOC is found, it is multiplied by 10 and the fourth digit is added to it. This value is then translated by the NOGR table (one of two tables addressed by the same master head table word) into a 7-bit NOGR. The first ten words of this 7-bit table are not used because the NOC cannot be zero. The NOC table expands the NOGR into digits 1 through 4.

B. Rate Center Table

3.30 The number group number to rate center (RAC) translation consists of a table storing for each NOGR, the rate center, a route index (if required), and cutover data for use of the cutover program. The NOGR indexes a selected rate center number within the rate center table. The rate center number is used as a selector in a 3-digit translator.

C. 3-/6-Digit Code Translation

3.31 The 3-digit code translation is performed with the first three digits used as the index

and the rate center number as the selector. If the first three digits represent an area code, the translation enters into a 6-digit sequence specified by a foreign area translator (FAT) number used as a second selector and the next three digits as the index. The three office code digits or the three area code digits provide routing and call type information for all chart classes provided in an office.

3.32 The selector chooses a subtranslator. If the particular No. 1A ESS has only one rate center number, it is always 00. If more than one rate center number is served, each subtranslator is numbered sequentially. For example, a No. 1A ESS office may have two rate centers and three FATs that would be numbered 00, 01 (for rate centers) and 02, 03, 04 (for FATs). Each of the numbers is used to select a subtranslator (00 through 31) within the head table. The D1, D2, D3 or D4, D5, D6 dialed digits (office code or area code) index a route pattern word containing a route pattern number within a selected subtranslator.

D. Rate and Route Pattern Translator

3.33 The route pattern number is translated into routing and charging information. Its seven most significant bits represent the selector that may choose a route pattern expansion table or a conflict table. A 1 in the sign bit of any head table word will be used to indicate a conflict table rather than a route pattern expansion table. The seven least significant bits of the route pattern number are the index portion. They index one of the 128 *PTWs* within a route pattern expansion table or one of 128 two-word entries within a conflict table.

MISCELLANEOUS TRANSLATIONS

A. Master Scanner Number Translations

3.34 The master scanner number translator consists of a head table and a subtranslator for each master scanner frame. The subtranslator has 1024 *PTWs,* one for every scan point on the frame. The scan points are either trunk or miscellaneous scan points. The PTW for a trunk scan point contains the trunk network number and a trunk program index. The data for a miscellaneous scan point consists of a unit type, a member number, a nontrunk program index, and sometimes associated data (random make-busy key number, stop hunt

number, etc). If there is associated data or if the member number exceeds 127, a 2-word auxiliary block is required.

B. Unit Type Translations

3.35 Equipment that is not identified by a network appearance (line equipment number or trunk network number) such as call stores, program stores, TTY, etc, is identified by a unit type number. Each item of the same unit type is given a member number. The unit type number translator has a subtranslator for every unit type number. The head table for this translator, 64 words long, is in the fixed location table. The unit type table lengths, a second 64-word table in the fixed location table, specify the length of the subtranslators for each unit type. The subtranslators are built to ultimate size, one PTW for every member number planned. The PTW is an auxiliary address referenced to an auxiliary block or is all zeros if the member number is unassigned.

C. Universal Service Order Code Translations

3.36 The universal service order code translator, also called the *line class code (LCC)* table, contains information associated with the LCCs. The LCCs classify or identify a customer's class of service relating to billing.

D. Central Pulse Distributor Translations

3.37 The central pulse distributor translator contains information associated with the unit type and member number. The translator relates the unipolar central pulse distributor points to a unit type and a member number. Central pulse distributor translations actually provide parameter-type data. For this reason, no recent change hunt is performed when these translations are executed.

4. TRANSLATION SUBSYSTEM PIDENTS

PIDENT NEJR

4.01 The Junctor translations PIDENT (NEJR) has seven global entry points. Two of the seven (NEJQJ2, NEJTJ2) are used to translate junctor network number 1 (JNN1) to JNN2, depending on whether the JNN1 is assigned to a line link network (LLN) or a trunk link network (TLN). Three more global entries (NEJLJG, NEJTJG, NEJGJL) are used as temporary tieoffs to provide

for the elimination of partial equipping generic logic (9GNTWK). Two other global entries (NEJSNN, NEJLJ2) are used by the auxiliary test program. NEJSNN will translate a junctor scanner number (JSN) to a JNN and a trunk scanner number (TSN) to a trunk network number (TNN) or a service link network number (SNN). NEJLJ2 will translate TNN1 to a TNN2 and a JNN2. Also, the NEJLJ2 will translate the JNN2 to a JNN1. Finally, global entry point NEJNNS will translate a JNN to a JSN and will also translate either a TNN or a SNN to a TSN.

PIDENT TRBD

4.02 Translation routines for basic digit analysis and conversion (TRBD) are functionally grouped into nine parts within the PIDENT.

A. Rate and Route Translations

4.03 TRBD contains global entries to derive routing information, charging information, call types, prefix and timing information, the calling line's chart column (CCOL), number group (NOG), and RAC for the following activities:

- Toll 3-/6-digit analysis

- Toll digit-by-digit analysis

- Plain old telephone service (POTS) non-NXX codes

- POTS foreign area (6-digit) analysis

- POTS 3-digit analysis.

B. Digit Conversion Routines

4.04 The 1A processor, by design, must use numbers in binary form. For this, and other reasons, many conversion routines exist to convert binary coded decimal (BCD) numbers to binary numbers. Also, special conditions will arise when it is necessary to divide and convert numbers to other forms in order for information to be derived through product and insertion masking operations.

C. International Direct Distance Dialing (IDDD) Code Translations

4.05 Given one, two, or three digits of a country code, the final data may be extracted from

the IDDD translator. The digits are stored in call store locations (see PK-1A120), and program control is given to global TRIDDD. The routines that follow include rate and route translations and digit conversion routines in order to find the final data.

D. Tandem Digit Interpretation

4.06 The tandem digit interpretation routine will find the final data from the tandem translator. Program actions follow the same general flow as shown in Fig. 3. Initial entry is made at global TRTNDR. If no hunt of the temporary RC area is required, program flow will branch at global TRTAND.

E. Speed Calling Digit Interpretation

4.07 The speed calling digit interpretation routine has global entries for 2-digit speed calling (TRSC2D) and 1-digit speed calling (TRSC1D). At these entries, a check is made for valid digits dialed. If valid, the LEN PTW is used to examine LENCL words 1, 2, and 3, which contain the major class. The major class is used to transfer to the appropriate leg of program execution through the major class vector table resident in TRBD. Major classes which provide for speed calling include:

- Individual line

- Two-party lines

- Multiline hunt group A

- Multiline hunt group B

- Hotel multiline hunt groups A and B

- Hotel individual

- Centrex manual line

- Network access line—intrastate

- Network access line with centrex interstate and intrastate.

4.08 The last four parts of TRBD contain code, included in segments, for feature packages which are optionally activated per office. They are:

- TOUCH-TONE Key Signaling

- Coin Line Activity Monitoring

- Enhanced Private Switching Communication Service

- Advanced Communication Service.

PIDENT TRBL

4.09 The translation routines for basic line and directory number (TRBL) are a collection of subroutines designed to extract information from the directory number translator and the LEN translator. TRBL can be divided into five parts.

4.10 The purpose of DN translations is to provide data specifying how to correctly terminate a call. Terminating class data includes:

(a) The major class, which puts the DN in one of the mutually exclusive categories. It is used to select the program branch for the appropriate category. The TG-1A, Volume 3 provides an explanation of each major class.

(b) Line data comprised of:

(1) Single bits, which indicate the existence or nonexistence of certain features or equipment, such as series completion, add-on, call waiting, etc.

(2) Ring code

(3) Disconnect guide, which specifies the actions necessary at disconnect time.

(c) Trunk data, consisting of a route index if the DN is associated with a trunk group.

A. Directory Number Entry Points

4.11 The input parameter to the DN translator is the DN. The DN consists of a 3-digit code (representing a 2-digit NOC) and a 4-digit DN numeric or a standard 17-bit binary code. TRBL will be entered at different globals, depending upon which form the DN is received in. If the DN is received in the format specifing the NOC plus digits 4, 5, 6, and 7 in binary coded decimal, then entry is made at global TRDNXN. If the DN is received in standard binary form, then entry is made at global TRBINA. In some cases, the PTW of the DN has already been extracted from the

DN subtranslator, and in this case, entry is made to TRBL at global TRDNPW.

B. Main Leg

4.12 The main leg of TRBL is concerned with indexing into the subtranslators, auxiliary blocks, and expansion tables in order to find the final data. This indexing is clearly shown in PA-6A002, Section 0000.

4.13 Once the PTW is found, an expansion of the abbreviated code is performed if necessary. The final data is found and saved, and this data consists of the DN PTW, the LEN or route index or MLHG, which ever applies, and DN class words (DNCLs) 1 and 2. Then the terminating major class is extracted from DNCL 1 and used to transfer through the DN major class vector table to the correct program branch.

C. DN Major Class Vector Table

4.14 The DN major class vector table consists of transfers to locals within TRBL, depending upon the major class of the terminating line. Program action at these locals further examine the auxiliary blocks and expansion tables to derive all applicable data for correct termination. Table B shows the major classes and associated local routines.

PIDENT TRCD

4.15 The translation routines for centrex digit analysis (TRCD) are concerned with examining the centrex common block and associated digit interpreter tables and auxiliary blocks to find the final data. The input to the centrex translator is the LEN PTW (from a previous translation), the dialed digits, and the centrex number (CXTN).

4.16 TRCD can be functionally divided into four parts. The first three parts make up the centrex translation routines, and the last part is concerned with flexible route selection.

4.17 Centrex service is a feature independent of any special hardware because it is controlled by the translation subsystem. This requires digit interpretation beyond the 3-/6-digit analysis or DN translations for the many dialing patterns and routing instructions available in centrex service.

4.18 There are eight global entries to the prefix and extension digit interpretation routines. Their purpose is to inhibit special actions of the line during the translating and to set indicators prohibiting certain features. Program control is passed to the data type vector table (PAECC) to find the common block and digit interpreter tables. Starting with the first digit, each digit is interpreted through its digit interpreter table. If no final data is found and if another digit is available, the next digit dialed is interpreted through the next digit interpreter table and so on until the final data is found. This digit analysis is accomplished by indexing into vector tables with special numbers such as:

- Data types

- Subtypes

- Sub-subtypes.

Each time the specified vector table is indexed, program control is passed to locals within TRCD for further action in processing the call. Information yielded in this analysis provides both originating and terminating program actions. For further details on centrex call processing, see Section 231-045-106.

PIDENT TRCL

4.19 The translation routines for the centrex line and directory number (TRCL) are routines in addition to those found in TRCD and TRBD. In addition to the major classes investigated in TRBD, TRCL has provisions for four more major classes. They are:

- Attendant or listed directory number

- Nondirect inward dialing

- Semirestricted

- Centrex range of unassigned directory numbers.

4.20 TRCL contains routines to derive information used to administer a given centrex data link group. These include translations for:

- Automatic call distribution (ACD) lamp groups

TABLE B

DN MAJOR CLASS VECTOR TABLE
PIDENT TRBL

LOCAL	MAJOR CLASS AND/OR TREATMENT
DNINTC	Disconnected Number and Intercept
DNSLLD	Sleeve Lead
DNTGF	Trunk Group or Trunk Group With Ringing
DNMLHCK	Individual Line, Two-Party, Regular Coin
DNBICK	Multiparty
DNMLHA	MLH Group A
DNMLHB	MLH Group B
DNHMLHA	Hotel MLH Group A
DNHMLHB	Hotel MLH Group B
DNDCFO	Call Forward to Interoffice DN
DNDCFI	Call Forward to Intraoffice DN
DNSBLO	Subscriber Line Overflow
DNMCC	Master Control Center
DNRIDT2	Denied Termination
DNHOMO	Hotel Individual
DNNDIDA	MLH Group A Without Direct Inward Dialing
DNNDIDB	MLH Group B Without Direct Inward Dialing
DNMDN	Remote Call Forwarding

- ACD ports and keys

- Visual displays

- ACD status displays.

4.21 TRCL also contains miscellaneous routines based on LENs or DNs for centrex traffic purposes.

PIDENT TRLC

4.22 The translation routines for line cutover (TRLC) are used at cutover and yield special output data needed at this time. TRLC contains six global entries.

4.23 Global SAALTN is used by the automatic line insulation test program to check the activity of a DN, either precutover or post-cutover.

4.24 Global SAORIG is part of an LEN translation, used to determine if the active or inactive status of an LEN is in agreement with a given DN.

4.25 Global SATERM is part of a DN translation, used to determine if the active or inactive status of the given DN agrees with the RAC, the alternate DN head table, or the DN exception list.

4.26 Global TRLCGL is part of the line cutover audit and used to determine if the LEN or LENs associated with a given DN are part of a MLHG and their audit status.

4.27 The cutover audit enters TRLC at global TRLCML to derive any other LENs associated with a given DN in a MLHG after the initial LEN has been found.

4.28 Global TRLCDC is part of an LEN translation, used to determine the active or inactive status of the line and whether there is a sleeve lead associated with that line.

PIDENT TRML

4.29 The translation routines for multiline hunt arrangements (TRML) consist of routines to further translate the LENs and DNs associated with a MLHG. Global TRDNML is a common entry point from the DN translation for MLHG. Here the MLHG number and common block are found and DNCL 1 and DNCL 2 are extracted. DNCL 2 contains the type of MLHG, and it is used to index the MLHG transfer vector table. Transfers are made to locals within TRML, depending on the MLHG type. They include:

- Regular hunt

- Uniform call distribution

- Multiple position hunt

- Preferential hunt

- ACD hunt

- Nonhunt.

4.30 Global TRLNML is a common entry point from the LEN translation for MLHG. Program action will extract and store LENCLs 1, 2, and 3

and the billed DN for the MLHG. This information is stored for output, and a return is made to the client.

4.31 Global TRLDML is a common entry point for the LEN disconnect translation. It is used to determine the terminal number from the input and save the activity bits, LENCLs 1, 2, and 3, and the main DN. This information is used in later routines to derive all the necessary actions for proper disconnect.

4.32 TRML also contains a collection of routines, which are based on the MLHG translator. These routines will:

- Find the main DN and last X_ numbers

- Derive the address of the MLHG common block

- Derive the address of the main (hunt) list head table

- Derive the address of the preferential lists head table

- Derive the program store (PS) address of the main or outdial list for X_ numbers

- Extract temporary and permanent data for the main list word

- Determine if the start hunt number is a terminal or nonterminal number

- Extract the LEN main or outdial list for X_ number

- Retrieve hunt list

- Derive MLHG and terminal numbers from raw data.

4.33 TRML will derive data for the administration of MLHG make-busy keys. This is accomplished by indexing into a transfer vector table with the key type.

PIDENT TRBT

4.34 The basic trunk translation routines (TRBT) are composed of trunk and peripheral equipment routines, route transfer routines, trunk

hunt and rehunt routines, trunk restore routines, and trunk idle list manipulation routines.

A. Trunk and Peripheral Equipment Routines

4.35 The trunk and peripheral equipment translation routines include:

- TGN primary translator

- TGN supplementary translator

- TGN optional word for supplementary auxiliary blocks

- TNN to peripheral equipment number (PEN) translator

- TNN to TGN translator

- Master scanner number translator

- Universal trunk scanner number to TNN translator

- Central pulse distributor number translator

- Unit type to member number translator

- Automatic trunk test table translator.

These translation routines follow the general translation sequence of Fig. 3. The functions and final data found in these translators are explained in PA-6A002.

B. Trunk Hunt and Restore Routines

4.36 The object of these routines is to find an idle trunk in a group or to restore or update the busy/idle record of a trunk. This may be accomplished by regular trunk hunt routines that are given either a TGN or a route index. Global TRTGNH is entered when the TGN is known. Global TRTHDD is entered when the route index is given. These routines validate the information that is known about a trunk in order to correctly administer the busy/idle record and seize or restore the proper trunk. This includes a TGN range check, type of trunk (outgoing, two-way, multiport, etc.), alternate routing indicator check, queueing indicator check, and a check of whether the toll network protection is active. Given this kind of data, a transfer can be made to points in the main

leg of the trunk hunt and restore routines to find an idle trunk or update the busy/idle record.

PIDENT TRCT

4.37 The translation routines for centrex trunks (TRCT) are routines used to administer the trunk-busy lamps associated with centrex trunks. When the last trunk in a group is seized, the trunk-busy lamp is lighted for the attendant. Conversely, when the first idle trunk is restored to the group, the lamp is turned off. This is accomplished for one-way and two-way trunks by four global entries. Global TRLOF1 will examine the idle list of a one-way trunk group, and if idle trunks exist, subroutine CXTBOF in PIDENT CXIO is called to turn off the console lamp. If all one-way trunks in a group are busy, the global TRLON1 will call subroutine CTXBON in PIDENT CXIO to turn on the console lamp. Globals TRLOF2 and TRLON2 take similar actions for two-way trunks.

PIDENTS TRUR AND TRANCOMN

4.38 Universal translation routines (TRUR) include routines for a recent change hunt of the temporary RC area and routines to assemble and store information for a TW02 output message.

4.39 Common translators (TRANCOMN) are routines that are common to ESSs using the 1A processor. These routines will translate unit type numbers to member numbers for 1A processor units such as central controls, I/O unit controllers, I/O unit selectors, etc.

TRANSLATION DATA VERIFICATION MESSAGE PIDENTS

4.40 A translated printout of the stored translation data can be requested via the TTY so that its correctness can be verified. The input messages are described in the Input Message Manual IM-6A001, and the resulting output messages are described in the Output Message Manual OM-6A001. Figure 4 shows the interface between the translation data verification message PIDENTS and the ESS I/O subsystem.

PIDENT TVMN

4.41 The translation data verification messages—main control program (TVMN) is a client program of the I/O application software. When the I/O
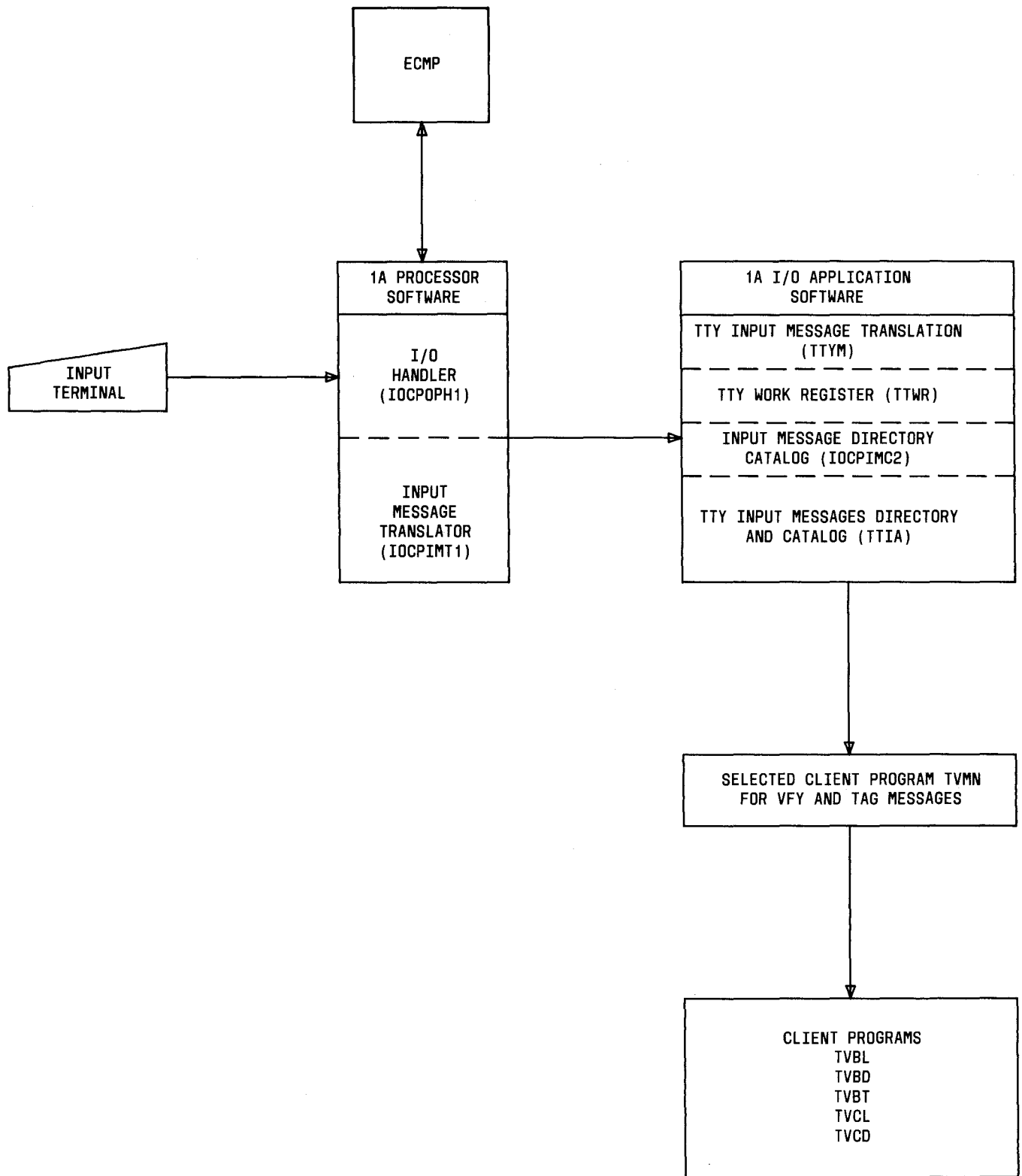
Fig. 4—Translation Data Verification Message I/O System

application software subsystem receives a request for translation data verification, a search is made of the TTY input messages directory and catalog (TTIA) for the correct client program. In this case TVMN will be selected.

4.42 TVMN takes the necessary actions to verify the request as valid. TVMN sets the main program flag for ECMP to process the message at the appropriate time. TVMN has five client programs (Fig. 4), which search the translation data base for information required to build the output message. Relevant data for the output message is stored by the client programs in main memory locations which are specified in the Translation User's Manual PK-1A120.

4.43 TVMN also contains routines for general equipment number conversion for information associated with output message (OM) TR03, to print primary recent change information for a program store word (TR34), to list available space in program store (TR13), and for detailed information on delayed activation blocks (TR50 and TR51).

4.44 Clients of TVMN are responsible for gathering data for OMs and requesting the print routines. Tables C, D, E, F and G show the client programs and the messages associated with them.

5. ABBREVIATIONS AND ACRONYMS

ACD	Automatic Call Distribution
BCD	Binary Coded Decimal
CCIS	Common Channel Interoffice Signaling
CCOL	Chart Column
CFG	Customer Facility Group
CPD	Central Pulse Distributor
DCNT	Dialing Connection Program
DN	Directory Number
DNCL	Directory Number Class Word
ECMP	Executive Control Main Program
ESS	Electronic Switching System
FAT	Foreign Area Translator
IDDD	International Direct Distance Dialing
I/O	Input/Output
JNN	Junctor Network Number
JSN	Junctor Scanner Number
LCC	Line Class Code
LEN	Line Equipment Number
LENCL	Line Equipment Number Class Word
LNN	Line Link Network
MLH	Multiline Hunting
MLHG	Multiline Hunt Group
NOC	Normalized Office Code
NOG	Number Group
NOGR	Number Group Number
POTS	Plain Old Telephone Service
PTW	Primary Translation Word
RAC	Rate Center
RC	Recent Change
SD	Signal Distributor
SF	Simulated Facilities
SFGN	Simulated Facilities Group Number
SNN	Service Network Number
SPI	Supervisory Program Index
SSD	Software Subsystem Description
TGN	Trunk Group Number
TLN	Trunk Link Network

TABLE C

TRANSLATION DATA VERIFICATION MESSAGES
PIDENT TVBL

MESSAGE	INFORMATION PRINTED OR FUNCTION
TR01	All information pertaining to a DN
TR20	Input DN and address of PTW
TR03	All information pertaining to a LEN
TR19	Input LEN and address of PTW
TR08	DN, MLHG, and terminal number billed to the DN
TR07	DN associated with a customer abbreviated dial list
TR48	Input DN, the final data, and the level of interpretation
TR06	Requested to deactivate temporary transfer when no transfer is active
TR43	All DNs with active variable call forwarding
TR64	Error detected in CFG
TR69	Indicates verification is proceeding normally
TR15	All information pertaining to a MLHG
TR35	SFGN and SF auxiliary block
TR47	Information pertaining to the multiline hunt or outdial terminal
TR16	Hunting and outdial lists of a MLHG
TR39	Preferential hunt list for MLHG terminal
TR41	MLHG terminals assigned to given ACD mask block
TR44	Alternate server pool number and associated auxiliary block
TR45	Input coin DN and associated data
TR66	Header portion of auxiliary block for a traffic group
TR7D+71	Emergency service number data

TNN — Trunk Network Number

TPI — Trunk Program Index

TSN — Trunk Scanner Number

TTY — Teletypewriter

TW — Translation Word.

6. REFERENCES

BELL SYSTEM PRACTICES

SECTION	TITLE
231-048-001	Basic Concepts of Translations
231-012-101	Basic Concepts of Translations
231-070-410	Concepts of Translations
231-118-102	Line Translation Data

TABLE D

TRANSLATION DATA VERIFICATION MESSAGES
PIDENT TVBT

MESSAGE	INFORMATION PRINTED OR FUNCTION
TR49	Trunk class code, route index, or charge index and program store address of an expansion block
TR05	Information for route index expansion
TR14	All information pertaining to a TNN
TR10	All information pertaining to a TGN
TR11	All information pertaining to a trunk circuit number
TR12	All information pertaining to a master scanner number
TR13	All information pertaining to a unit type number and member number
JN03	All information pertaining to a junctor network number or junctor scan point number
TR21	Input TNN and associated PTW
TR23	Input master scanner number and associated PTW
TR24	Input universal trunk circuit number and associated PTW
TR25	Input junctor network number and associated PTW
TR26	Input junctor scan point number and associated PTW
TR27	Input unit type and member number and associated PTW
TR33	Contents of AUTOVON trunk group number to TGN translator
TR65	Format for all TNNs for nonusage trunk scanning
TR62	Information from CCIS band subtranslator and related TNNs

TABLE E

TRANSLATION DATA VERIFICATION MESSAGES
PIDENT TVCD

MESSAGE	INFORMATION PRINTED OR FUNCTION
TR17	Centrex common block, excluding digit interpreter tables
TR46	Centrex supplementary translator data
TR18	Centrex digit interpreter tables to level requested or final data word
TR37	Flexible route selection information
TR36	Input console group number and address of the console group number head cell.

TABLE F

TRANSLATION DATA VERIFICATION MESSAGES
PIDENT TVBD

MESSAGE	INFORMATION PRINTED OR FUNCTION
TR04	All routing and charging information associated with the input 3- or 6-digit code
TR22	Input 3-digit office code and the program store address of the PTW
TR40	Final data for a tandem group and the digits to interpret
TR38	Routing information associated with a toll digit translation index and a chart column
TR42	Input signal digit analysis number and associated auxiliary block information

TABLE G

TRANSLATION DATA VERIFICATION MESSAGE
PIDENT TVCL

MESSAGE	INFORMATION PRINTED OR FUNCTION
TR55	Format for information from status display translator
TR54	Format for information from the remote data interface key signal translator
TR53	Format for information from the remote data interface port translator
TR52	Format above the visual display data
TR63	Input CFG number and associated auxiliary block
TR73	Centrex numbers assigned to directory numbers in a specific 1000's group

231-118-103	Trunk Translation Data	**OTHER**	
231-118-104	Routing and Charging Translations	PD-1A120	Translation Program
231-118-105	Miscellaneous Translation Data	PK-1A120	Translations User's Manual
231-310-265	Input/Output Application Software		
231-045-106	Call Processing-Centrex.	PA-6A002	Translations Output Configuration.