SWITCHING SYSTEMS MANAGEMENT
NO. 2 ELECTRONIC SWITCHING SYSTEM
MEMORY UPDATES

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1. GENERAL

1.01 The purpose of this section is to provide the Network Administrator a description of the memory update methods that are used in a No. 2 ESS office. The applications and limitations

of each memory update method are provided. This section also provides memory update administration procedures for the Network Administrator.

1.02 Whenever this section is reissued, the reason for reissue will be listed in this paragraph.

2. INTRODUCTION

2.01 The No. 2 ESS performs the switching functions of a telephone central office under the control of stored digital data. Virtually all the actions of the system are determined by sequences of coded instructions and other data which are stored in memory. The coded instructions are called programs, and each program contains the data necessary to perform a specific task. The tasks are read from memory and transmitted one at a time to the central processor for execution via wired logic circuitry.

2.02 The programs and other data necessary for system operation are stored in the call store and program store memory areas. The stored data can be functionally divided into the following three categories:

(a) ***Generic Program:*** The generic program is located in program store and is used for controlling all system operations. The generic program is basically identical in all No. 2 ESS offices which have the same issue.

(b) ***Translation Information:*** The translations, located in program store, define a particular line, trunk, or service circuit. Translations provide routing and charging information, as well as the major class of a line, its billing data, the size of a trunk group, etc. Data pertaining to a given office such as equipment quantities and equipment layout are also included in translations.

(c) ***Transient Information:*** This information is located in call store and includes call processing data, data messages in process, and the present state of all lines, junctors, and trunks in the office.

Note: In the No. 2 ESS, parameter information is included in translations and is not a separate function as in other systems.

2.03 Individual definition of an office is done through the use of a series of translation tables. The structure of these areas is fixed, but the information stored there (office size, line and trunk definitions, routing, charging, etc.) is variable. The arrangement allows the standard generic program to interface with the unique characteristics of each individual office. An arrangement of this type has the advantage of a custom program for each office while retaining the efficiency of a single control program source.

2.04 In the No. 2 ESS, data are stored on magnetic memory cards in the program store. However, since some data must be changed frequently, provision is made to store some changes in the recent change (RC) area of call store memory. Recent changes are received as messages from a teletypewriter. When the recent change area approaches its capacity, steps must be taken to transcribe the recent change data to the program store memory cards. The program store memory cards can be updated by using the local or data link update methods described in this section.

2.05 To maintain the system call processing reliability, it is important that the normal operation of the system be affected as little as possible by the updating procedure. The writing of the memory cards using the single card writer does not affect normal operation of the system; but when the cards are being replaced and verified at the off-line program store, the off-line control unit is unavailable for system use, and the on-line control unit is locked on-line. Therefore, the replacement and verification functions, once begun, must be completed as quickly as possible.

2.06 Memory updates can be performed entirely by the local central office or with the assistance of the updating facilties at a remote location. A remote facility update may be used when a large quantity of changes are necessary. An update using the remote facilities can occur by using a data link or by shipment of updated program store card modules. The methods of updating or changing the stored data are described in this section and are outlined below:

(a) Local memory update methods

(1) Recent changes

(2) Updating of program store translation information using the single card writer

(3) Change in program store (CHIPS)

(4) Customer dialed translation changes

(b) Memory update methods assisted by data link to a remote facility

(1) Office data administration (ODA) system

(2) Tape operated memory update system (TOMUS)

(c) Memory update method at a remote facility requiring memory module shipment.

(1) Office data administration (ODA) system.

2.07 A comparison of these update methods is shown in Table A.

3. LOCAL MEMORY UPDATE METHODS

3.01 Memory updates that can be initiated and completed using only the No. 2 ESS office facilities are described in the following paragraphs.

A. Recent Change

Description

3.02 Most new or updated translation information (office data) can be stored in the recent change area of the call store. These changes are initiated and performed by telephone company personnel. A simplified block diagram of the recent change process is shown in Fig. 1.

3.03 When a change or addition is required in the recent change data, an appropriate input message is executed using the teletypewriter. On receiving an input message, an internal program determines if the information is complete. If the input message is complete, the program converts the new or changed information into its binary equivalent. The new binary data is then placed into the recent change buffers at the proper locations. If the update changes existing data, the new binary data are first overlaid onto the old (existing) data. The old data are modified by the new data and then placed into the recent change buffers. By using the overlay technique, the only information required for a recent change is the new or changed data and sufficient information to uniquely define the area to be changed. When completed, the recent change update is stored in the call store of both processors.

Applications

3.04 Memory updates using the recent change procedure affect only the area involved with the update and normally have the least effect on system operation.

3.05 The following are examples of changes that can be performed by recent change inputs:

(a) Information pertaining to telephone service:

(1) Deletion of information on removed lines. (Service to a telephone line can be terminated by a recent change input.)

(2) Change in service information.

(3) Placement of a line onto a given intercept. Unassigned (blank) lines are automatically routed to intercept except when special arrangements are defined.

(4) Internal selective denial of 2-party service.

(5) Reassignment of a terminal equipment number (TEN).

(b) Information regarding certain items in the trunk group:

(1) Changes of a group or member to which a trunk circuit or service circuit belongs.

(2) Reassignment of the terminal equipment number of a trunk or service circuit.

(3) Trunk group data and feature changes (EF-1 Generic Program only).

(4) Carrier group alarm assignment changes (EF-1 Generic Program only).

(c) Alteration of traffic counter assignments:

(1) Counts by screening code.

(2) Line overflow.

(3) Trunk and PBX counts.

(4) Preroute peg counts.

(d) Activation of certain items in the rate and route translations. The 3-digit translation changes may be accomplished by recent change procedures only if the required code index data presently exist in the translations.

(1) New prefixes (NNXs) may be activated.

(2) New code indexes for routing and charging may be activated.

(3) Unassigned code indexes may be activated.

(e) Addition or redefinition of certain route indexes. (Route index expansions are recent changeable for only exit codes 2 through 5.)

(f) Definition of various indicators:

(1) Whether old or new junctor grouping tables are to be used.

(2) Whether an office data administration system run is in progress.

(g) Changing fuse alarm assignments.

(h) Addition or changing of centrex group information in offices equipped with the EF-1 Generic Program, ***excluding*** the following:

(1) More attendant positions cannot be added than the maximum number initially identified.

(2) The number of speed calling lists initially identified cannot be exceeded.

(3) Trunk groups cannot be added unless dummy groups are available.

(4) Attendant control of facilities (ACOF) keys for a centrex group cannot be added.

(5) Trunk groups cannot be added to an ACOF key.

(6) Manual trunk disposition (MTD) and group billing index (GBI) tables cannot be added.

Limitations

3.06 Recent changes are effective in call processing as soon as they are accepted in call store. Some exceptions occur, and the data must be transferred to the program store magnetic memory cards before becoming active. The exceptions include the junctor reassignment flags, traffic work table data, and the line screening code of traffic counter assignments.

3.07 The capacity of the call store recent change area limits the quantity of changes that can be made. A program store word contains 22 bits, and a call store word contains 16 bits. Therefore, each program store change of one word requires two call store words to be used. The recent change buffer contains a maximum of 1024 call store words or an equivalent of 512 program store words. One or more buffers may exist in an office depending on the call store layout and size. The No. 2 ESS is designed to print out, via the service order and maintenance teletypewriter, a message indicating specified percent of fill of the recent change area. A message is printed when a recent change is entered that causes one of the recent change data tables to become filled to one of the following percentages:

(a) ***61 percent***—At this level the following message: AR-RC-ERD-176052 is printed. Out orders with speed calling cannot be removed unless a program store update is performed.

(b) ***81 Percent***—At this level, recent changes can still be entered but should be transferred to program store as soon as possible.

(c) ***93 Percent***—At this level, no recent changes will be allowed except customer dialed changes to the customer speed calling list.

Note: The network administrator should be familiar with recent change fill and program store capacity, especially when a large volume of sevice orders are pending. Also, a punched paper teletypewriter tape of recent change updates should be made because an initialization action may cause a partial or total loss of recent change data.

3.08 An update of the program store cards can be performed at any time; however, once

the 81 percent full buffer indication has been given, an update of the program store memory cards should be initiated ***as soon as possible.*** A program store update with recent change data causes the old information in the call store recent change buffers to be zeroed, allowing additional recent changes to be made.

3.09 The generic program modules of program store and certain areas of parameter and translation data are not recent changeable. Additional recent change information and detailed recent change procedures are given in the Translation Guide, TG-2H.

B. Updating Program Store Translation Information Using the Single Card Writer

Description

3.10 The process of transferring recent change data from the call store memory to the program store memory is called "updating program store translation information." The transfer is performed under the control of card writing programs contained in the No. 2 ESS generic program. An attendant directs the use and initiation of the programs with teletypewriter messages. The attendant's role in the procedure consists primarily of handling memory cards, operating control panel keys, and processing input and output messages at the maintenance teletypewriter.

3.11 This update method causes the recent change buffers of the call store to clear and become available for additional office changes. A simplified block diagram of the program store translation update method is given in Fig. 2. After the update process is initiated by the attendant, (a) the contents of the recent change call store buffer are analyzed by the program and (b) the address of the affected set of permanent magnet twistor cards (128 words per card) is identified in a teletypewriter output message. These cards are individually inserted in the single card writer, and the entire card is magnetized by a card writing program. The program copies the old card data from the program store memory. The appropriate new call store buffer recent change entries are incorporated. When the affected cards have been magnetized, they are inserted in the off-line program store and verified against the on-line program store plus call store recent change buffers. If successful, the processors are switched. The above procedure is repeated, and the call store buffers are cleared to allow for the accumulation of the next group of changes.

3.12 The permanent magnet twistor (PMT) cards removed from the duplicate program store are retained as backup cards until another update is necessary. The detailed procedures for updating program store translation information are given in Bell System Practices, Section 232-004-301, Updating Program Store Translation Information Using the Single Card Writer.

Application

3.13 The updating procedure using the single card writer can be used by the telephone company at their discretion. This procedure can be used as an emergency update method when it becomes necessary to clear the call store recent change buffers so that additional recent changes can be made. The speed of this method is primarily dependent on the speed and skill of the attendant performing the procedure and the quantity of changes.

Limitations

3.14 Updates made by this procedure are limited to the use of data that is stored in the recent change area of call store (ie, only the permanent magnet twistor cards that are affected by recent changes can be updated by this method).

> ***Note:*** Any change in the program store memory is subject to error, and errors in either address or data can affect service.

3.15 The generic program and some areas of the translations cannot be updated with this method.

C. Change in Program Store

Description

3.16 The change in program store (CHIPS) procedure can be used by a telephone company to change the contents of any program store permanent magnet twistor card without restriction. This procedure uses the single card writer and a sequence of teletypewriter inputs to change the contents of a card. This procedure is not recommended for translations or other recent change

data updates except in an emergency. A simplified block diagram of the change in program store update method is shown in Fig. 3. The CHIPS process begins with an attendant checking the single card writer for proper operation and using the teletypewriter to initialize the CHIPS procedure. A card requiring an update is inserted in the single card writer. Sequentially, each word address, the old word, and the new word are inputted to the system via the teletypewriter. After all words in the card have been inputted and an end of change message is typed, the system instructs the operator to operate the single card writer to rewrite the card. Each card requiring a change is processed in this manner until all have been updated. The updated cards are then inserted into the off-line program store, and data verification is performed. The duplicate program store is updated in a similar manner. The detailed CHIPS procedure is given in Bell System Practices, Section 232-004-303, Change in Program Store Word Procedures.

Application

3.17 The CHIPS procedure is intended for use only by experienced central office maintenance personnel as an emergency method of changing the semipermanent program store memory. Troubles which are service-affecting and require immediate correction may require this emergency procedure. Also, program store memory corrections may be distributed as No. 2 ESS ***emergency broadcast*** warning transmissions (BWTs) from a ***Western Electric Product Engineering Control Center (WEPECC).*** These warnings can contain updates which may apply to a currently installed or new generic program issue, or to the translations. The ***broadcast warning*** will indicate the program issue on other information to which a change applies. In addition to the ***broadcast warnings,*** other special updates can be generated by Bell Telephone Laboratories ***(BTL)*** or ***WEPECC*** and distributed by ***WEPECC*** to a particular office. The insertion of overwrites (changes) in offices which have been turned over (cut) is the responsibility of the telephone company. Each update request that is applicable to the issue of program currently installed in an office should be inserted. The program store memory updates should be performed in sequence, and it is recommended that they be installed as they are received.

> ***Note:*** CHIPS word changes should not be attempted by office personnel except in response to a broadcast warning or other special update or through direct consultation with a No. 2 ESS diagnostic center.

Limitations

3.18 Changes made by the CHIPS procedure should be limited to the cards associated with the generic program or as directed by the warning notice.

> ***Note:*** Any change dealing with program store memory is vulnerable to error, and any error in either address or data can affect service. Telephone company personnel should exercise more than the normal amount of caution in verifying the results of any program update by CHIPS procedures. Verification procedures are given in Bell System Practices, Section 232-004-303, Change in Program Store Word Procedures.

D. Customer Dialed Translation Changes

Description

3.19 The customer has the ability to perform a limited number of translation changes when certain service features are allowed. A simplified block diagram of this update method is shown in Fig. 4. Either a TOUCH-TONE® or rotary dial phone can be used to perform the changes. The translation changes are initiated when the customer dials a special 2- or 3-digit code. The special code allows a customer access to an area of call store that has been reserved for the service feature information (a list or a table). After dialing the code and receiving a response by the system, the customer can add or change telephone numbers related to the service feature. The updated data will remain in the call store until a program store update is performed, or the data are changed.

Application

3.20 Customer-dialed translation changes are used for one- or 2-digit speed calling and for call forwarding. These service features are described as follows:

(a) Speed calling allows a customer to dial a one-or 2-digit code to have the No. 2 ESS machine select and call a preassigned telephone number. The customer can assign and change

a list of up to 30 telephone numbers with the 2-digit code and 8 telephone numbers for the one-digit speed calling feature.

(b) Call forwarding allows a customer to transfer incoming calls to another telephone number. The customer can assign and change the forwarding telephone number.

Additional information concerning these customer dialed changes is provided in the No. 2 ESS Translation Guide, TG-2H.

Limitations

3.21 Customer-dialed translation changes are limited by the following conditions:

(a) A service feature must have been previously designated in translations as being allowed for a line. A customer-dialed change must originate from the line having the feature(s).

(b) The speed calling change feature must have been previously designated in translations as being allowed for the line. Changes to a customer speed calling list must be performed by the telephone company when the change feature is not allowed.

(c) The forwarding telephone number must not have a charging condition (LO-1 program). This limitation is not in the EF-1 program.

Note: A punched paper teletypewriter tape of the service feature updates should be generated. (A paper tape is automatically generated if an on-line paper tape punch is provided on the service order teletypewriter channel.) The tape provides a record of the changes if a system initialization or other action causes the data to be destroyed before it can be updated into the permanent memory of the program store.

4. MEMORY UPDATE METHODS ASSISTED BY DATA LINK

4.01 The following paragraphs describe the administrative data link and the data link memory update systems, office data administration (ODA) and tape operated memory update system (TOMUS).

A. Data Link Description

4.02 The No. 2 ESS data link (Fig. 5) serves as a data communication link between the No. 2 ESS office and a general-purpose computer such as one in a Western Electric regional center or product engineering conrol center (PECC). The No. 2 ESS end of the data link consists of a data communications terminal circuit mounted on a miscellaneous trunk frame, a 201A3 data set (reference Bell System Practices, Section 592-011-101, for additional information), and an 804A data auxiliary set (reference Bell System Practices, Section 598-030-100, for additional information). The data link operates over a standard voice-grade telephone line dialed up via the data auxiliary set. The opposite end of the data link will consist of equivalent equipment with an appropriate terminal to interface with a general-purpose computer.

4.03 The following functions can be performed via a data link.

- ***Program Store Memory Dump:*** An image of the on-line store can be transmitted from a No. 2 ESS office to a regional center or PECC over a data link in preparation for a memory update or for office record generation.

- ***Writing Program Store Memory Cards:*** Updated memory can be transmitted from a regional center to a No. 2 ESS office via a data link, in lieu of shipping program store memory cards. Cards from the program store memory modules are magnetized, one card at a time, on the single card writer as the new memory data are received. A simplified block diagram for writing program store memory cards using the data link is shown in Fig. 6.

- ***Verifying Updated PS Memory Cards:*** Updated memory data are retransmitted to the local office over the data link after the program store card update. The retransmitted memory data are compared with the updated program store memory in the off-line processor. If no mismatches occur between the updated cards and the retransmitted memory, verification will occur. A simplified block diagram of the verification procedure is shown in Fig. 7.

4.04 Data are transmitted over the data link facilities in binary form at a rate of 2000 bits per second. A normal data link transaction involves transmission between two stations: the master and the slave. The station that transmits the data is designated the master station; the station that will receive the data is the slave station. These designations remain for the duration of a data link transaction. A completed data link transaction evolves through several phases of transmission as indicated below.

- ***Establishment Phase:*** Initial voice contact is made between two data link stations via the 804A data auxiliary set and the dialed-up line. The data mode is then entered by both sections, and a transmission "handshaking" sequence takes place. The sequence is an automatic character exchange over the data link line that determines the operational ability of each station.

- ***Data Transmission Phase:*** After the handshaking sequence is successfully completed, data are automatically transmitted from the master station to the slave station.

- ***Termination Phase:*** After the master station has completed transmitting data to the slave station, the master station will automatically initiate a mandatory disconnect sequence. During this sequence, both data link stations go on-hook and the data link operation is terminated.

- ***Data Link Abort:*** A data link abort will automatically occur when a series of transmission errors are detected during either the establishment phase or the data transmission phase. A data link abort will initiate a mandatory disconnect sequence.

B. Office Data Administration System

Description

4.05 Updates to the translation (office data) areas of the program store can be performed by using the office data administration (ODA) system. The ODA program is executed on a Western Electric regional center or product engineering control center (PECC) general-purpose computer. The ODA program can assemble new program store memory data for both the initial loading and updating of the No. 2 ESS program store memory.

4.06 The ODA update (Fig. 8) starts with a memory dump (via data link) from the No. 2 ESS office to the computer center. The new or changed data are then inputted to the computer center and processed with the old memory data to update the program store memory. The new memory data are then transmitted via the data link to the No. 2 ESS office. (Updated cards may be shipped to the office. See Part 5.) As the data are received, the program store permanent magnet twistor cards are remagnetized using the single card writer.

4.07 The ODA update process includes using the ODA system of programs to perform either partial or full program store module updates and to provide office records on request.

ODA System of Programs

4.08 The ODA system of programs is actually a composite of six program subsystems. The subsystems are run independently but may be executed in a prescribed sequence since some are used in the processing of others. The subsystems are used in making office data updates and in providing office record printouts. The ODA subsystems are as follows:

(a) ***Junctor Assignments Program Generation Subsystem (JAP)*** This subsystem is designed to custom engineer the circuit junctor and wire junctor interconnect pattern for an office.

(b) ***Office Assignments Data Records Generation Subsystem (OADRGS):*** This subsystem is used to create and maintain office assignment and trunk layout records.

(c) ***Translations Data Error Check Subsystem (TDEC):*** This subsystem analyzes and checks input data. It checks for keypunch errors, engineering rule violations, data inconsistencies, and completeness.

(d) ***Translation Data Tables Generation/ Update Subsystem (TDTG):*** This subsystem encodes the input information into the proper data format for the program store translation tables. Structure of the tables is

fixed by the interface requirements of the generic program. Information in the tables defines characteristics, line definitions, and other variable features of the office.

(e) ***Translations Office Records Generation Subsystem (TORG):*** This subsystem is used to provide various records such as directory number record, class of service record, trunk equipment, etc. The records are generated from the program store data, rather than from manual records.

(f) ***2A Combined Distribution Frame (CDF) Cross-Connect Work Sheet Generation Subsystem:*** This subsystem is designed specifically for No. 2A ESS offices to generate a work sheet which aids in running jumpers between the network and trunk/service circuits.

(Reference the No. 2 ESS Translations Guide, TG-2H, for additional information on these subsystems.)

Initial ODA

4.09 An initial ODA run is defined as an ODA run in which the ODA program constructs the complete initial office data loading solely from new inputs (using the forms provided in the TG-2H, Division 4). The initial ODA loading is run only once in the life of a No. 2 ESS office, ie, when the office data are first specified in a precutover office. An initial set of office records can be made after the initial ODA run.

ODA Update

4.10 An ODA update is recommended when a large volume of program store memory changes are necessary. When an ODA run is desirable, one of two ODA update modes may be chosen: the partial ODA or the full ODA run.

4.11 ***Partial ODA Update:*** A partial ODA update is defined as an ODA run in which the ODA program is constrained to change the present location of translation tables only if required. The relocation of tables is minimized to reduce the number of permanent magnet twistor cards that have to be remagnetized. In a partial ODA update, selected permanent magnet twistor cards are updated (not all cards of a module). The decision to do a partial ODA update should be determined on scheduling of personnel, computer time, transmission time, cost, etc. The major characteristics of a partial ODA update are as follows:

- The new data and the present program store data are merged into a new loading on a card-by-card basis.
- Table movement is minimal.
- A recent change update must be performed before the ODA run is made.
- New office records can be generated by the WEPECC upon telephone company request.

Note: Recent change updates are forbidden during the update interval, since the recent change buffers are cleared to bring the new transmissions on-line. Any recent change messages generated during the update interval (including punched tapes of customer-dialed speed calling list changes) must be reinserted after the update has been completed.

4.12 ***Full ODA Update:*** A full ODA update run is defined as an ODA run in which the ODA program is free to completely repack the office data memory. In a full ODA update, full program store translation modules are updated. The major characteristics of a full ODA update are as follows:

- The new data and the present program store data are merged into a complete new loading on a module basis (entire modules are updated).
- Table movement is performed as required.
- A recent change update must be performed before the ODA run is made.
- New office records can be generated upon telephone company request.

Note: Recent change updates may be made during the ODA interval but are discouraged unless essential. Any recent change messages inserted during the ODA interval, which may span several RC updates (including punched

tapes of customer-dialed speed calling list changes), must be reinserted after the updated translations are brought on-line. (The recent change buffers are cleared to bring the new translations on-line.)

Translations Office Records Generation (TORG)

4.13 Office records which can be used in the operation and administration of the No. 2 ESS office are available after an ODA run. The office records are produced by the same computer process that generates the permanent magnet twistor card updates. The computer-generated records reflect the contents of the office program store translations, as modified by a partial or full ODA update. The records have the legibility of a typewritten copy. Unlike hand-produced records, entire ODA office records can be generated whenever requested.

4.14 Remarks and notations normally found on hand-produced office records can be placed on the TORG records. Such remarks may include trunk group names, the old directory number in office changes, etc.

4.15 The following are some of the TORG office records available for office data administration. (Reference the Translation Guide, TG-2H, for additional information.)

(a) Line records such as directory number, multiline hunt group (MLHG), speed calling, series completion, terminal equipment number, abbreviated class, line class, etc.

(b) Trunk, service circuit, and junctor records.

(c) Routing and charging records such as 3- and 6-digit, rate and route, daily charge, code group, etc.

(d) Scanner records such as line, trunk, scan point, alarm monitor data, etc.

(e) Traffic worktable and traffic variable assignment records

(f) Centrex records

(g) Miscellaneous records, eg, master table index capacity, network definition, office code, teletypewriter channel assignment, recorded announcement, etc.

(h) Other records such as office equipment assignment, junctor assignment, and No. 2A ESS combined distribution frame (CDF) cross-connect work sheets are also available from the translations office records generation (TORG) system.

4.16 The translation office record generation (TORG) system is also available to provide computer-generated office records when an ODA update is not desirable. This system allows office record production without requiring an office update. The system provides the same records that are available after the ODA update.

Application

4.17 The ODA process is intended to provide timely memory updates for a No. 2 ESS office. Listed below are some of the items that can be altered by the ODA process.

(a) Scan point number and peripheral decoder address for trunks and service circuits.

(b) Abbreviated class expansion.

(c) The 3-digit translator:

(1) Line screen class expansion

(2) Screening tables

(3) Charge expansion

(4) Creation of a new treatment (from two separate existing treatments or from scratch)

(5) Addition of new foreign area translators.

(d) Trunk and service circuit group data (except traffic assignments). These data are recent changeable with the EF-1 program, but groups cannot be needed.

(e) Storage allocations or restructuring of data layouts.

(f) Network and junctor assignments.

(g) Scanner, CPD, or PD assignments.

(h) Trunk testing codes.

(i) MLHG/PBX group additions or size increase.

(j) Various parameters:

(1) The number of program stores, call stores, scanners, supplementary CPDs, etc. (major equipment growth)

(2) Teletypewriter options

(3) Local office options.

4.18 An ODA memory update may be necessary when excessive changes are necessary or when special situations occur. Some examples include the following:

- Major equipment growth (ie, network, CPD, storage, trunk frames, etc.)
- Screening treatment additions or changes
- New foreign area translators
- New charge situations (eg, WATS, extended area service, change in base rate)
- Area cutovers
- New or updated generic program
- Restructuring of data layouts
- Junctor reassignments.

Limitations

4.19 An office data update is primarily concerned with maintaining continuous service in a working office. This imposes a restriction on the time lag between input of data for ODA processing and the actual loading of the changed data. In the update of an in-service No. 2 ESS, the changed office data must be activated with as little service deterioration as possible. Two guidelines have been established as follows:

(a) Documentation of the office data updates must be in the No. 2 ESS office when the new data are activated.

((b) The interval of any restricted recent change activity (freeze) must be minimized.

The data link equipment and software are part of a No. 2 ESS office and should be used to meet these objectives.

4.20 When the need for any ODA subsystem update has been determined, a letter of intent stating the schedule of events should be sent to each concerned local organization (office personnel, service orders, traffic, etc). The assigned regional computation center will schedule the time for an ODA or TORG office record run over the data link.

Note: In the case of an ODA update to allow for office growth, all additions and revisions are recorded on input forms and forwarded to the computation center by the line and traffic engineering organizations prior to the scheduled update.

4.21 When an ODA run is started, a period of time called an ***ODA interval*** begins. This is the time between the last recent change update, just before the transmission of the old data to the regional computation center, and the insertion of the newly magnetized permanent magnet twistor cards into the program store. During the ODA interval, recent change activity (service orders, etc) should be kept to an absolute minimum. Punched paper tapes of customer-dialed recent changes, as well as all service orders, should be maintained during the ODA interval for reinsertion in the exact original order.

4.22 ***At the present time, only translations (office data) memory is changed during a data link ODA run.*** Program store modules containing the generic program are not changed using the ODA procedure. Reference should be made to the following Bell System Practices for more detailed procedures on the data link ODA run: Section 232-008-302, Administrative Data Link Procedures and Section 232-124-301, Office Update Procedures Using Regional Office Data Administrative Program No. 2 ESS.

C. Tape Operated Memory Update System (TOMUS)

4.23 TOMUS is a computer-controlled, stand alone, high capacity facility for writing and verifying data on program store permanent magnet twistor

cards. This system can provide updates to both the generic program and the translation memory cards. Both single cards and complete memory modules can be updated using the TOMUS. The TOMUS is capable of data communication over an administrative data link. The system can receive information via the data link and store the data on magnetic tape for use in subsequent card writing operations. Optional verification equipment is available for use in verifying that the data on the permanent magnet twistor card(s) are the equivalent of the data stored on the magnetic tape.

4.24 The TOMUS may be located in a No. 2 ESS office or in a central location such as a technical assistance center (TAC). A technical assistance center location enables a TOMUS to service a group of nearby No. 2 ESS offices.

TOMUS Update

4.25 An update using TOMUS procedures is recommended whenever changes are considered too large for the No. 2 ESS single card writer. TOMUS is used most efficiently whenever more than 14 memory cards require changes. The TOMUS update can be performed independently of the NO. 2 ESS office. This minimizes the No. 2 ESS office time and responsibility for memory updates. The TOMUS has three basic modes of operation:

(a) Receiving data link information

(b) Writing cards

(c) Verifying data

Detailed procedures and additional information on these modes of operation are given in Bell Sytem Practices Sections 232-007-101, TOMUS Description and 232-007-301, TOMUS Operating Procedures. A description of the TOMUS equipment is also provided in Division H, Section 10v of the Dial Facilities Management Practices.

A brief description of each mode is provided below:

Receiving Data Link Information

4.26 When the TOMUS is used to receive data link information, an attendant must enable the TOMUS to communicate over the data link facilities and to initiate the card writing process. In the data linking mode, TOMUS acts as a slave station and receives information from a data source (ie, a No. 2 ESS office). Teletypewriter message inputs are used to prepare the TOMUS for either single card or module reception and for the type of data to be received (ie, translation or generic).

4.27 During the receiving process, the data link is used to receive data in a binary form at a rate of 2000 bits per second. The received data are stored on magnetic tape by the TOMUS equipment. A teletypewriter message signals the attendant when the receiving process is complete.

Card Writing

4.28 Using the 1A card loader, a module of permanent magnet twistor cards is attached to the TOMUS. After loading the cards, an attendant ensures that the system is properly initialized and loads the appropriate magnetic tape on the tape unit. Teletypewriter input messages are used to initiate either the single card or the module writing process and the appropriate store and module data. When a single card is to be written, a special card writing unit (overwrite tray) must be attached to the module card writing unit.

4.29 After initiating the card writing process, the attendant observes the TOMUS for proper operation. During the card writing process, data stored on a magnetic tape are used to update each permanent magnet program store card. The data are read from the tape, buffered, formatted, and presented to the module card writer. (The magnetic tape files may be generated by the TOMUS in a previous data link operation, or generated at a separate computation facility and transported to the TOMUS facility.) A teletypewriter output message indicates the completion of the card writing process. After the cards have been written, the newly written data should be verified for accuracy. When the optional verifier subsystem is provided, the memory cards are loaded in the 2B memory module located on the verifier frame.

Verification

4.30 Verification of the data written on the memory cards will ensure that the information on the cards is the same as that on the magnetic tape. The cards can be verified either by placing the updated cards in the applicable No. 2 ESS

program store and using the ESS verification procedures or by using the optional TOMUS verification procedure.

4.31 When the TOMUS is used for verification, an attendant performs the necessary tape and card loading operations. The verification process is initiated with a TTY input message. During the verification, the data written on the cards are compared with the information on the tape. The verification is performed under program store margins which certify that the information is correctly located on the cards and also gives an indication of the quality of the magnetization. A teletypewriter response for either correct or incorrect magnetization alerts the attendant as each card is verified. Faulty cards are remagnetized and reverified.

Applications

4.32 The TOMUS is easily added when and where needed. It can be centrally located where it can be shared by several No. 2 ESS central offies. The use of TOMUS facilities is most effective when a large quantity of memory changes are necessary. The writing and verification of program store memory modules can be performed rapidly and independently (of a No. 2 ESS office). The single card writing feature is used most effectively when card magnetizing error corrections are necessary.

Limitations

4.33 TOMUS usage is currently limited to memory data reception, card writing, and data verification (when the verifier subsystem is provided). Shipment of memory modules to and from No. 2 ESS locations is required when the TOMUS is in a centralized location and when it serves several No. 2 ESS offices.

4.34 Since TOMUS updates will normally be for modules of program store cards, sufficient quantities of spare card modules must be available to support any large scale memory update. Adequate transportation and careful handling of the updated modules must be arranged and coordinated.

5. MEMORY UPDATE AT A REMOTE FACILITY—OFFICE DATA ADMINISTRATION SYSTEM

5.01 Updates to the translation (office date) areas of the program stores (memory modules) can be performed at a Western Electric regional center or product engineering control center without the use of a data link to return new translation modules to an office. This method of update requires considerably more time for completion and requires shipment of the program store permanent magnet memory cards (in modules) to the No. 2 ESS location. Update inputs and documentation must be prepared and sent by the requesting office to the Westen Electric computation center. Reference Bell System Practices, Section 232-124-301, Office Update Procedures Using Regional Office Data Administration Program, for additional information on office data administration updates.

6. ADMINISTRATION OF MEMORY UPDATES

Memory Change Directives

6.01 Certain program problems may be service-affecting and may require immediate corrective action. A program problem identified by Bell Telephone Laboratories (BTL) is assigned a trouble report (TR) and a temporary change (TC) number. The formal correction of these program problems is by software change notices (CNs), also called generic program updates or restarts. Each software change notice has associated Laboratory Design Information (LDI) which lists the trouble reports corrected in the change notice. AT&T also issues a Program Notice which is essentially the same as the Laboratory Design Information. When BTL closes a program issue to new trouble reports, there may be an interval of several months before the change notice is installed in the individual offices by Western Electric. During this time, there could be some service-affecting program problems discovered that result in corrections or updates that may not be included in the new program. The correction may apply to the currently installed issue, the new issue, or both issues of a program.

6.02 Corrections to service-affecting problems that require immediate corrective action may be distributed as No. 2 ESS broadcast warning transmissions (BWTs). The broadcast warning will usually contain an update for the generic program and will indicate the applicable issue(s) affected.

Each broadcast warning is serially numbered to aid in identification and administration.

6.03 In addition to broadcast warnings, special updates occur (with associated trouble report and temporary change numbers) that do not get general distribution. This could be due to a coordinated change in hardware and software, special circumstances for a particular office, or the office being the trial office for an update prior to its distribution. These special updates are distributed by the Western Electric product engineerng control center to those offices affected. In the case of a coordinated hardware-software change, the update will be included with the installer information for the hardware change. Such changes will be distributed by the hardware change notice.

6.04 All updates which apply to the issue of the program currently installed in an office should be performed in a timely manner. Applicable updates should be installed in sequence, and it is recommended that they be installed as they are received.

6.05 A method of administering updates and recording their insertion is given in the following paragraphs. The method for actually checking the updates, inserting the change messages, and verifying the inserted message is given in Bell System Practices, Section 232-004-303, Change in Program Store Word Procedures Using The Single Card Writer or the Bell System Practices, Section 232-004-304, Tape Operated Memory Update System.

A. Program Store Updates

6.06 The insertion of program store updates due to memory change directives may require some knowledge of previous updates. The status and system location of an update must be clearly documented, so that all changes are immediately evident. In addition, when software change notices are used to update the memory, all previous updates must be reverified for inclusion in the new change notice. Therefore, a record of each memory update is necessary to provide background information for any new update.

Procedures for Administering New Updates

6.07 All broadcast warnings should be inserted when they affect the generic program issue currently installed in the office. Each broadcast warning is entered on a broadcast log (Fig. 9), and the associated information (eg, trouble report and temporary change numbers and trouble nature) is entered. If a broadcast warning is reissued to supersede all or any part of a previous warning, the previous warning may either be withdrawn or corrected by a reissued warning. When the update is implemented, a hard copy of the teletypewriter message is labeled with the broadcast warning and/or change number and kept with the log. The date inserted and the corrected program issue must be entered on the log.

6.08 Each of the original program store cards that are removed from the program store module is to be tagged with string or sticker tags and cross-referenced to the broadcast log. The cards should be stored in a card storage rack, and retained until the update is proven effective. All updated program cards must be similarly tagged and cross-referenced before insertion into the program store.

6.09 The telephone company should also have a copy of the broadcast log at a technical assistance center (TAC). If no technical assistance center has been established, a central staff or group should have a current log for each office. The technical assistance center or equivalent should require a positive feedback of the status of each update in all offices involved. Therefore, each office should either reproduce the broadcast log sheets or use some other positive feedback procedure to inform the technical assistance center whenever changes are made on the log. This will enable the technical assistance center to have a complete and accurate status file of the updates in each office.

Procedures for Administering Existing Updates When a Software CN Is Applied

6.10 The following types of documentation are required to properly perform an update using a software change notice:

(a) A log of existing updates in the machine (the broadcast log).

(b) The Laboratory Design Information (LDI) associated with the new update. This will list the trouble reports included in the new program and can be obtained from the Western Electric installer.

(c) The reissued broadcast warnings associated with the new generic program issue. (The BTL and WEPECC have agreed to provide the addresses and data, via the broadcast warning routine, for updates which are not included in a new generic program issue.)

6.11 Prior to the scheduling of the installation of a new generic program issue, check each trouble report listed in the broadcast log against the trouble reports listed in the Laboratory Design Information (LDI). Any trouble reports not found in the Laboratory Design Information (LDI) have not been included in the new program. For these trouble reports, contact WEPECC for resolution of the problems before proceeding.

6.12 After the update is performed, the broadcast log should be updated and appropriate data sent to the technical assistance center or staff to indicate the program issue status.

Preturnover and Program Retrofit Offices

6.13 The preturnover period and program retrofit period may pose special problems to the telephone company. The Western Electric installer is presently responsible for turning over a working machine with a standard generic program installed. However, there may be some updates which should be installed by the Western Electric installer. To accomplish this, the WEPECC, will assign a "point" change number to each broadcast update using the change number assigned to the previous issue of the affected generic program. The "point" change number will be applicable to installing offices, retrofits and generic restarts only. Updates installed by the installer should be entered in the broadcast log and reported to the technical assistance center or equivalent.

Special Situations

6.14 In some rare cases, an installer may have obtained an update for which trouble report or temporary change numbers have been assigned but were not distributed via the broadcast warning routine. (The update may be needed for one particular office but is not considered to have application elsewhere.) The update may become part of a future generic or a coordinated hardware and software change. In this instance, the installer must notify the telephone company of the existence of the update(s). Telephone company personnel must record the update(s) on the broadcast log prior to turnover.

Summary

6.15 The use of the broadcast log should result in an orderly accounting and administration of memory updates. Extreme care must be taken by the central office forces and technical assistance centers to administer, insert, and verify the updates.

6.16 Strict adherence to this procedure should eliminate system troubles resulting from improper or omitted updates. The important fact to recognize is that mistakes in the update can lead to total system failure and loss of service to the customer.

6.17 All card writing should be done in the low traffic period of the day because the action requires duplicated equipment to be removed from service.

B. Call Store Updates

6.18 More frequent memory change directives include service orders, customer-dialed changes, traffic inputs, and maintenance requests. These directives can be service-affecting and can require immediate action for implementation. Changes caused by these directives affect the call store memory and are inputted to the system via a teletypewriter message or punched paper tape through a teletypewriter paper tape reader.

6.19 Before an update is made, a verify request should be performed to check the current status. This check will avoid unnecessary delays and will reduce errors.

6.20 If the system responds with an error message, action must be taken to correct the error. There are three general error responses of special interest:

(a) A message to indicate that the recent change is full. Since the recent change will hold only a certain amount of information, the system will indicate when the recent change buffer of call store is approximately 81 percent filled. At this time, a program store memory update should be initiated. (A memory update can be performed prior to the 81 percent fill when desirable.) At 93 percent fill, all recent changes

except for the abbreviated dialing list and the "in ODA mode" bit are blocked. A program store memory update must be performed as soon as possible at this point.

(b) A message to indicate that no additional translation tables are available. When the error message indicates that there are no more translation tables available, a program store (ODA) update must be made to allocate more tables for the particular function. The update must be made before any further inputs can be made that require a table. Examples are as follows:

(1) If a line is to be assigned the speed calling feature, but all the speed calling lists are being used, the line will be denied a speed calling list. A program store (ODA) update must be initiated to define more speed calling lists.

(2) If a change is attempted which requires an expansion block and no unused expansion blocks can be found, the change will not be made. A program store (ODA) update must be made to define more expansion blocks. Other changes might be entered, but any requiring expansion blocks will not be successful.

(c) An error message to indicate that a translation error has been found. If an error message indicating that a translation error has been detected is returned, a piece of data has been translated to get a second piece of data. This second piece of data is then translated and indicates that it is not for the same item as the first. If this error is indicated, it is strongly recommended that the entire line be removed and then corrected before any further change is attempted.

Note: ***EXTREME CAUTION*** must be used when memory changes are performed and verified.

6.21 The No. 2 ESS has no provision for delayed messages. The teletypewriter messages enter the appropriate information in call store immediately. Thus, this information becomes active immediately. Some exceptions to this are the junctor reassignment flags, the line screening code, and traffic counter assignments. These must be placed into the program store before becoming active. Reference the Input Message Manual (IM-2H200) for details of each message.

6.22 Between program store updates, a continuous record of each call store update is necessary. The record is needed should some malfunction cause the call store information to be erased. It is recommended that a teletypewriter punched paper tape record be made of each service-affecting update. By establishing and maintaining a master punched tape, each update can be rapidly reinserted into the call store memory in its original sequence should a call store update be necessary.

7. REFERENCES

7.01 Additional information related to detailed procedures and other information is available in the following references:

(a) Bell System Practices, Section 232-124-301, Office Update Procedures Using Regional Office Data Administration Program—No. 2 ESS

(b) Bell System Practices, Section 232-118-101, Basic Translation Data Description—No. 2 ESS

(c) Bell System Practices, Section 232-008-101, Administrative Data Link Description—No. 2 ESS

(d) Bell System Practices, Section 232-008-301, Administrative Data Link Procedures

(e) Bell System Practices, Section 232-004-301, Updating Program Store Translation Information Using the Single Card Writer—No. 2 ESS

(f) Bell System Practices, Section 232-004-303, Change in Program Store Word Procedures

(g) TG-2H, Translation Guide-TG-2H

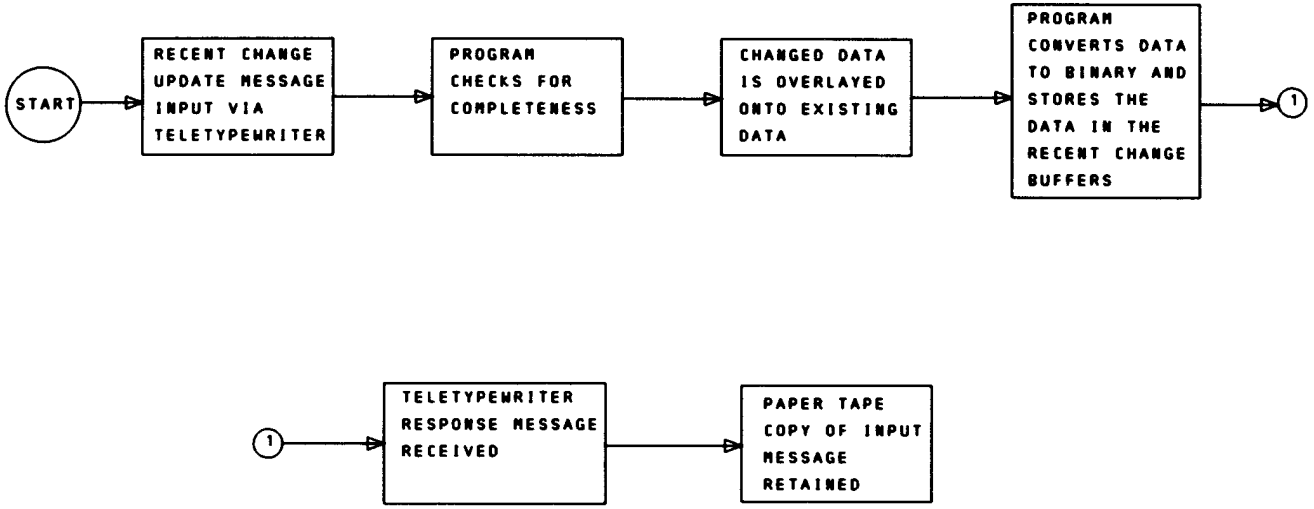

Fig. 1—Recent Change Block Diagram

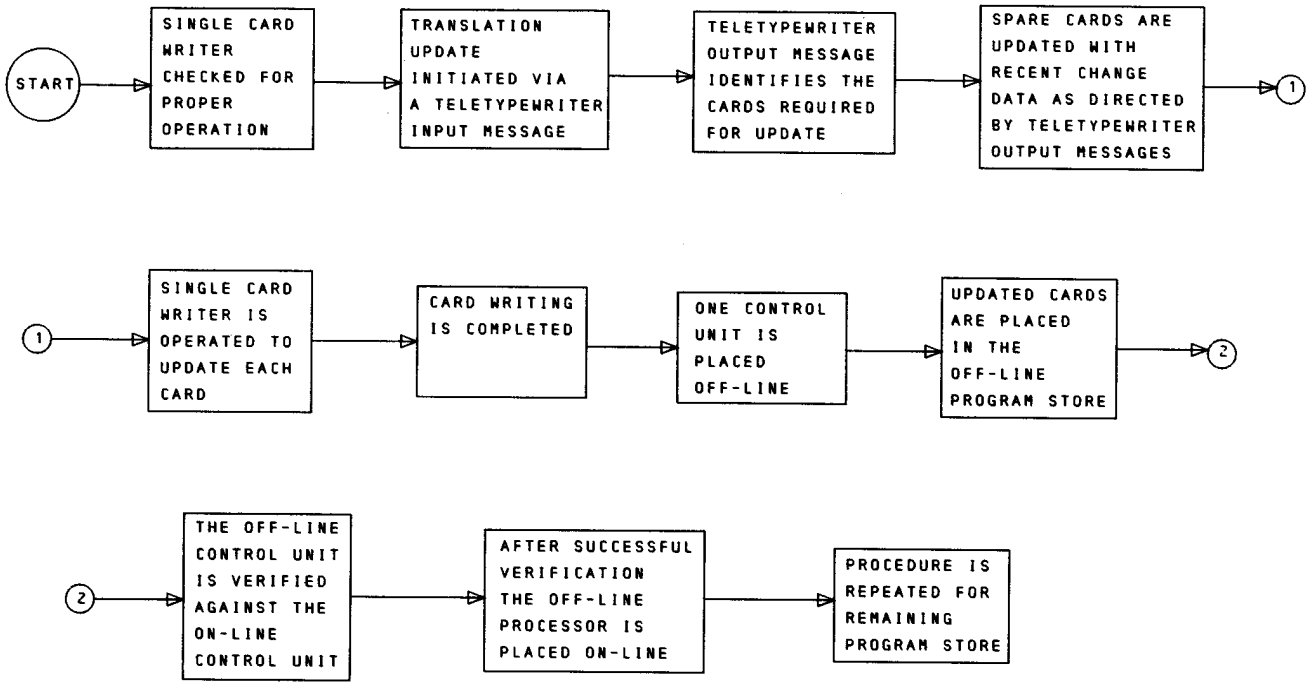

Fig. 2—Updating Program Store Translation Information Using the Single Card Writer Block Diagram

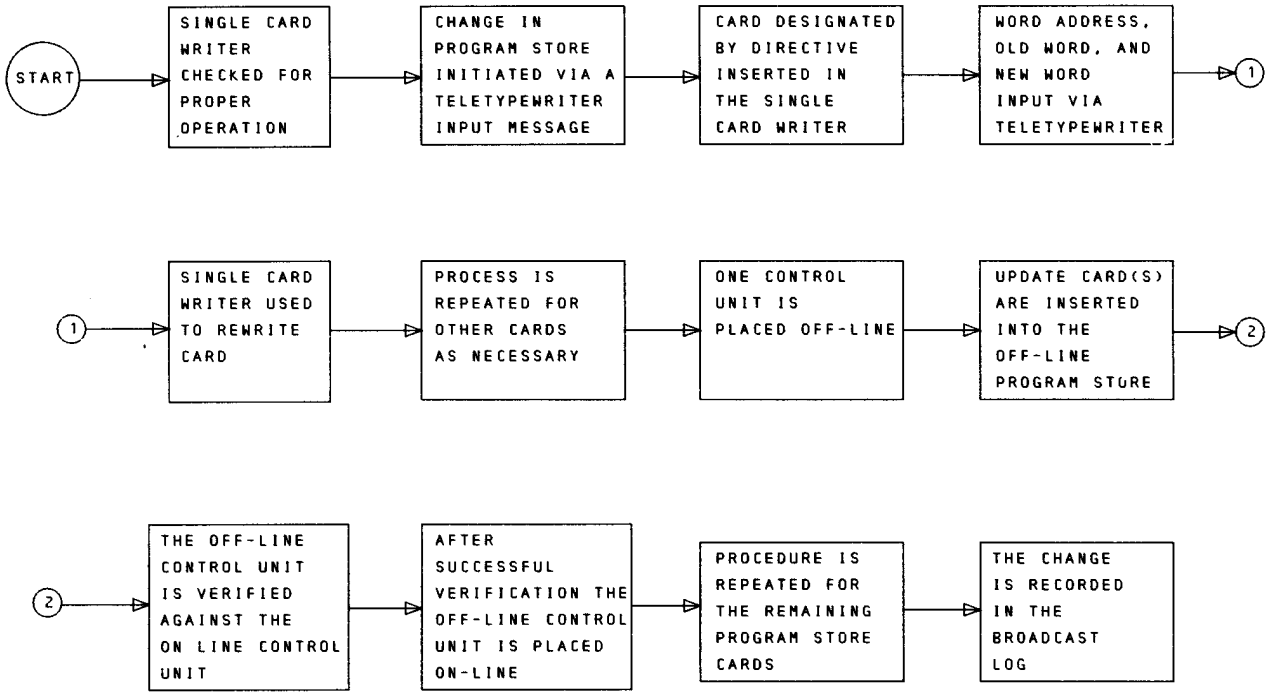

Fig. 3—Change in Program Store Block Diagram

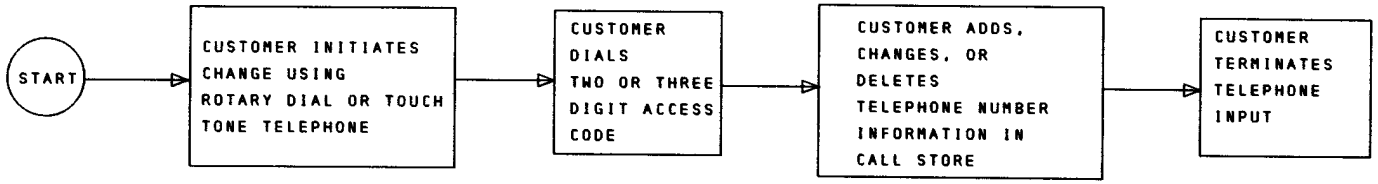

Fig. 4—Customer-Translation Changes Block Diagram

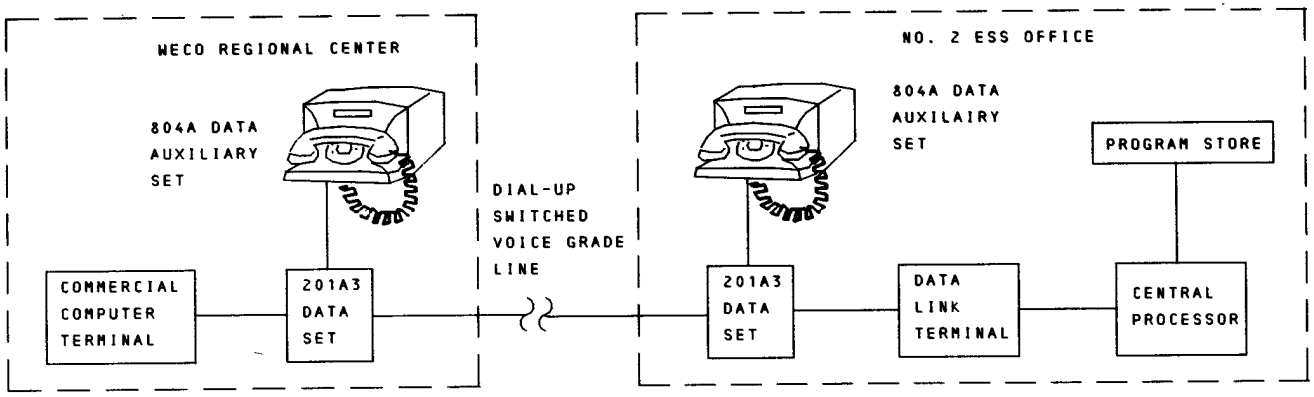

Fig. 5—Block Diagram of No. 2 ESS Data Link

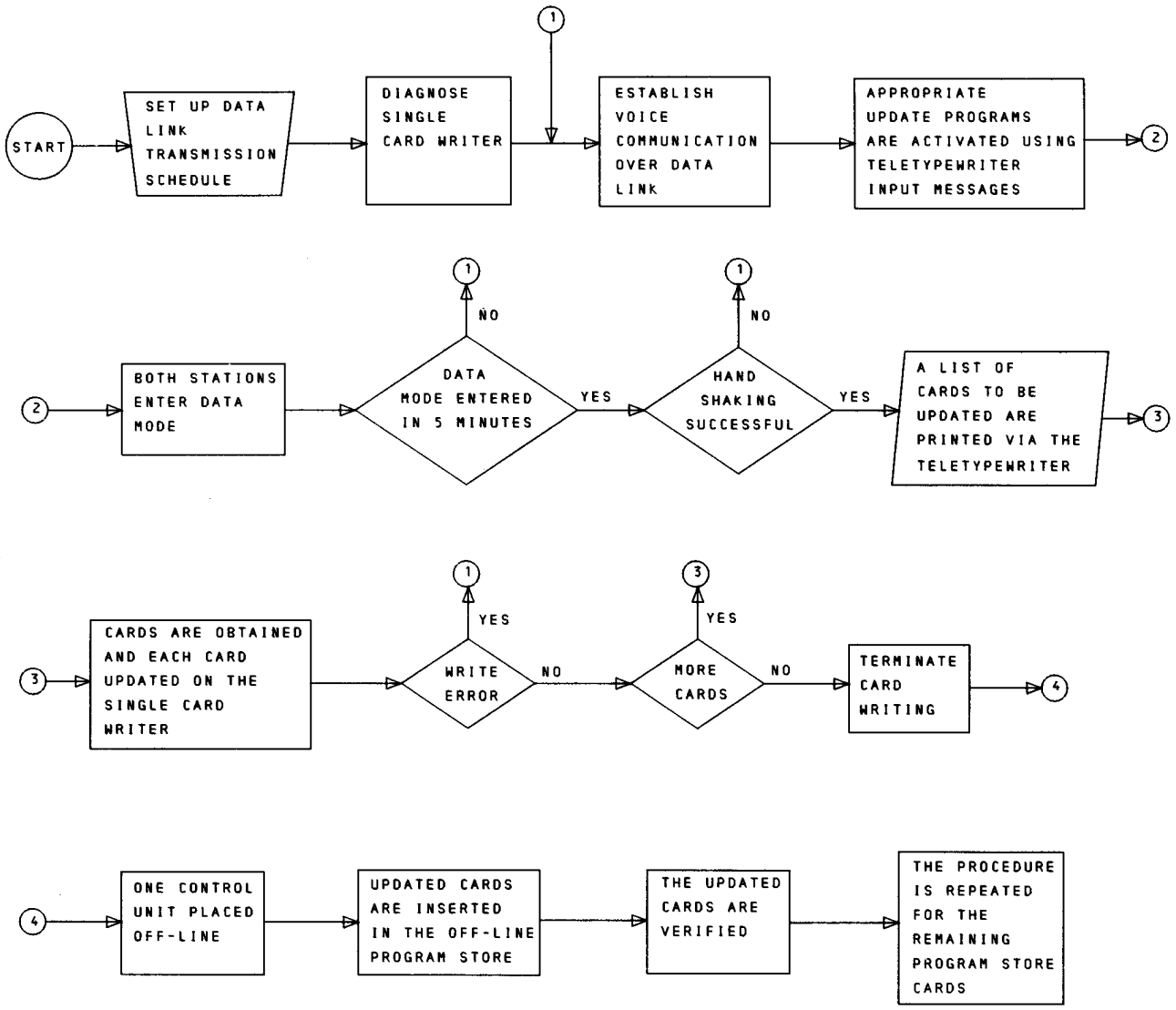

Fig. 6—Block Diagram for Writing Program Store Memory Cards via Data Link

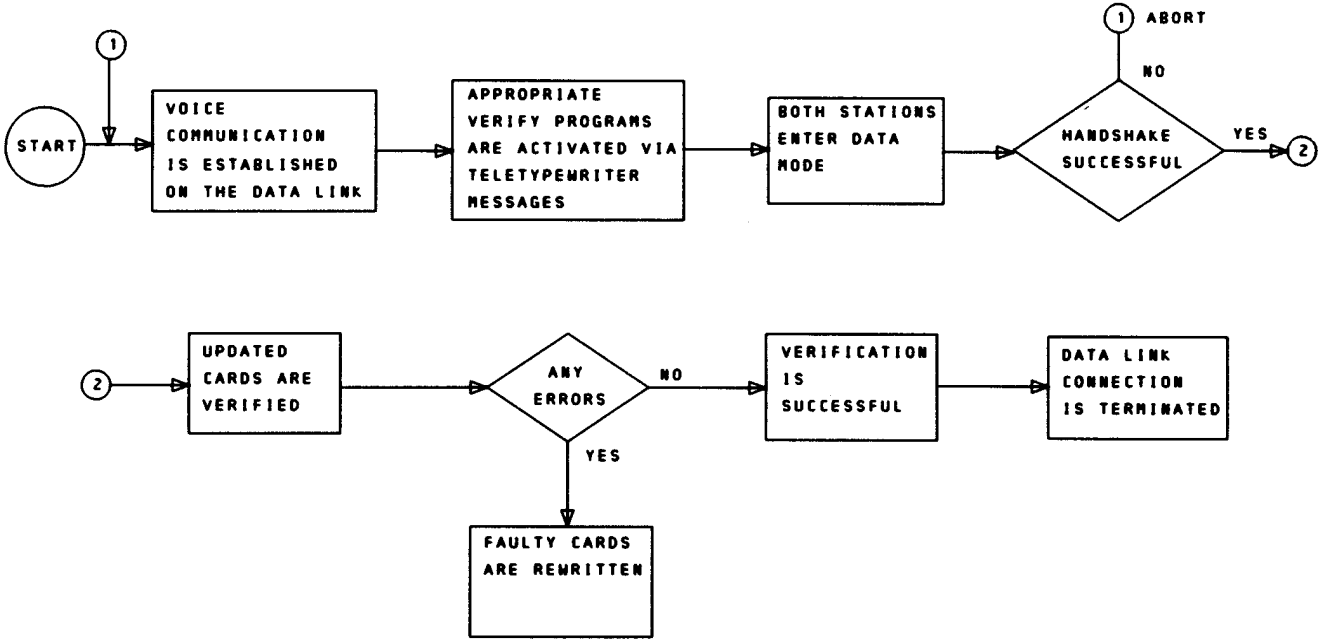

Fig. 7—Block Diagram for Verifying Updated Program Store Memory Cards via the Data Link

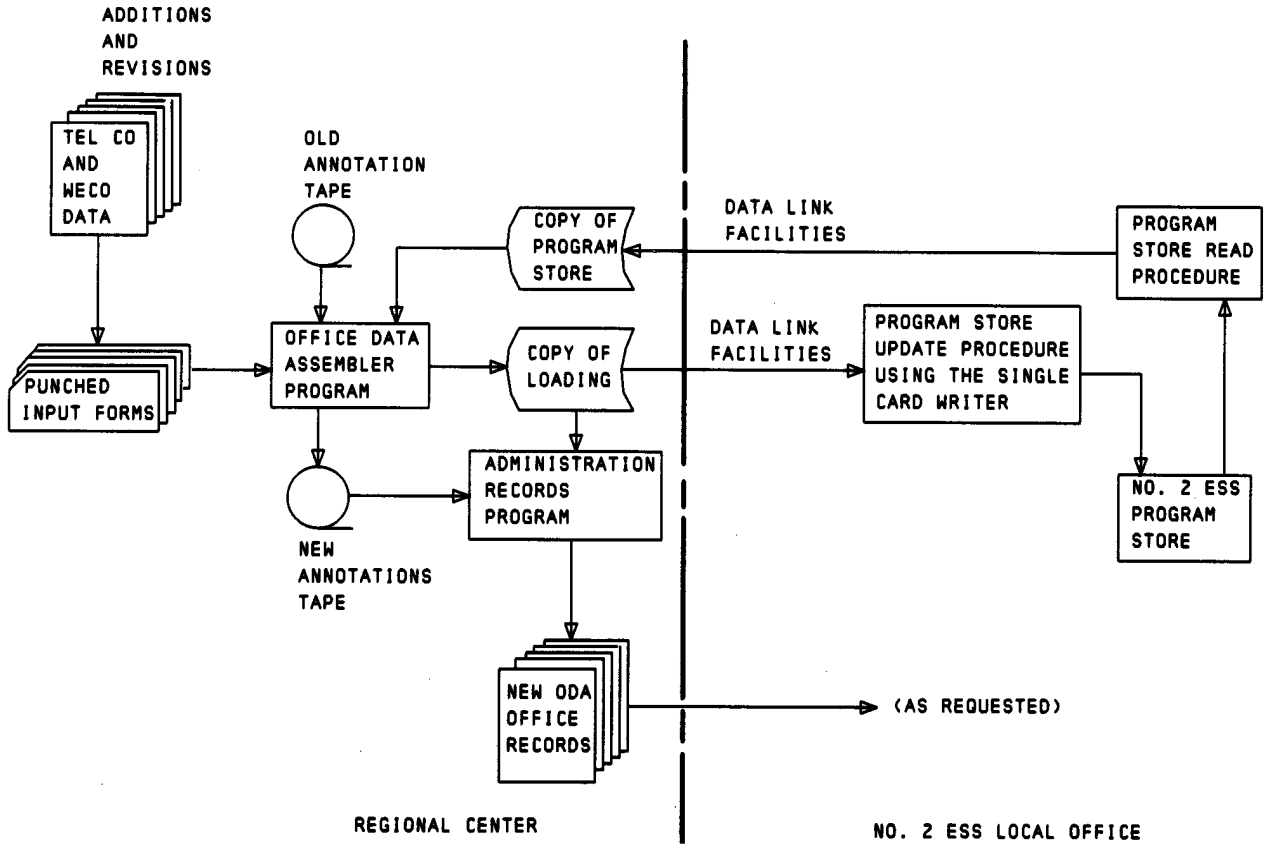

Fig. 8—Block Diagram of a Data Link ODA Update Run

OFFICE GENERIC ISSUE

BROAD-CAST WARNING NUMBER	CN NUMBER	PR NUMBER	PR NAME	NATURE OF TROUBLE	DATE INSERTED	TR NUMBER	TC NUMBER	TO BE CORRECTED IN ISSUE	DATE WITHDRAWN

Fig. 9—No. 2 ESS Broadcast Log (Example)

TABLE A

COMPARISON OF MEMORY UPDATE METHODS

	UPDATE METHOD	INPUT VIA	MEMORY UPDATED	REQUIRES USE OF CARD WRITER	CLEARS RECENT CHANGE AREA OF CALL STORE
1.	Recent Change	Teletypewriter	Call Store	No	No
2.	Updating Program Store Translation Information Using the Single Card Writer	Teletypewriter	Program Store	Yes	Yes
3.	Change in Program Store	Teletypewriter	Program Store	Yes	No
4.	Customer Dialed Translation Changes	Rotary Dial or TOUCH-TONE® Telephone	Call Store	No	No
5.	Office Data Administration System/Data Link	Data Link/ Supplemented with completed forms	Program Store	Yes	Yes
6.	Office Data Administration System/Module Shipment	Module Shipment/ Supplemented with completed forms	Program Store	No — Update performed at remote facilities	Yes — When performed in a timely manner
7.	Tape Operated Memory Update System	Data Link (card module shipment necessary for remote offices)	Program Store	TOMUS Procedure uses the Module Card Writer (No. 2 ESS Single Card Writer is not used)	Yes — When performed in a timely manner