FEATURE DOCUMENT
MESSAGE REGISTERS
NO. 2 ELECTRONIC SWITCHING SYSTEM

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FEATURE DEFINITION AND DESCRIPTION

1. DEFINITION

1.01 The Message Register feature is an arrangement of hardware and software which provides a means of mechanically recording charging information for customers having measured service. This is done by providing charging information, in terms of message units, on the basis of the duration of each call, the location of the called party, and the type of calling party. The total number of message units to be charged for all measured calls are then accumulated on mechanical counters called message registers.

1.02 In central offices which do not have the Local Automatic Message Accounting (LAMA) feature, the message registers are used within the office to accumulate message units for all message-rate customers. These message registers are read periodically (monthly) so that the customer's telephone bill can be compiled to reflect the charges for the accumulated message units. Refer to Section 232-190-204 for further details concerning the LAMA feature.

1.03 The message registers may also be located on the customer's premises so that the customer can maintain a running account of the accumulated message units. This type of service is used primarily by private branch exchange (PBX) customers such as hotels, motels, hospitals, and other business customers; however, the feature may be applied to any line. The feature, when used in this manner, allows the customer to compute the actual charge of individual measured calls. This is especially important to hotels, motels, and hospitals because it allows them to charge their guests immediately for calls without having to wait for the monthly bill.

1.04 In cases where message registers are located on the customer's premises, the message-unit accumulation can be maintained within the central office by message registers or by AMA recording (LAMA feature). Figure 1 shows the three possible types of message register operation.

1.05 The Message Register feature is available for all No. 2 Electronic Switching System (ESS) systems. To implement the feature into an existing No. 2 ESS,the proper assignments must be made, the message registers must be installed at the customer's premises and/or the central office, and a pair of control wires must be installed which is used to increment the message register. For a PBX/MLHG, there may be one message register for each PBX/MLHG line with one pair of control wires per PBX/MLHG line provided between the customer's premises and the No. 2 ESS, or one message register per PBX/MLHG, or any combination as desired.

2. DESCRIPTION

Customer (User) Perspective

2.01 The customer (user) is not required to perform any special procedures to activate the feature. The call is dialed and completed just like any other call. If message registers are located within the central office, the telephone company personnel must read the registers on a periodic (monthly) basis so that the customer's telephone bill can be compiled.

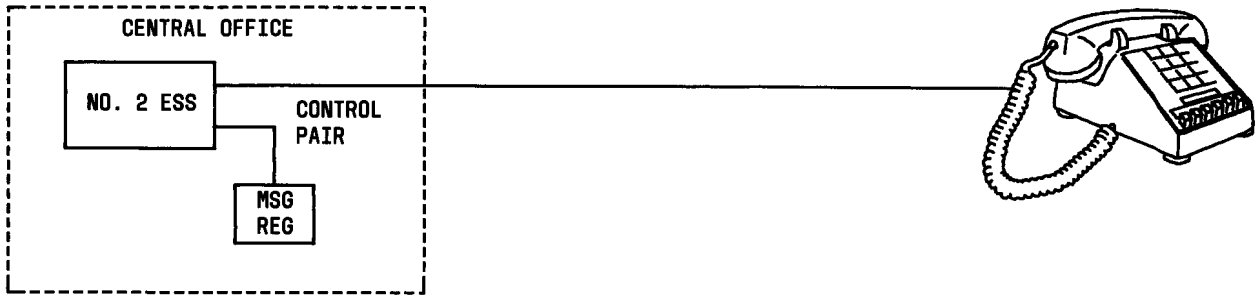
2.02 If the central office has the LAMA feature, the AMA tape must be sent to the proper accounting center at the prescribed intervals.

2.03 In cases where message registers are installed on the customer's premises, the customer may, at the completion of a call, subtract the previous reading from the present reading to determine the total number of message units charged for the call. For a hotel, motel, or hospital, the message registers may be located in an office area instead of the individual rooms and are inspected by the employees rather than the guests. The number of message units is then computed with the cost per message unit (obtained from the operating company's business office) to determine the actual charge for the call. This charge, plus a surcharge (if any), can then be added to the guest's lodging or hospital bill.

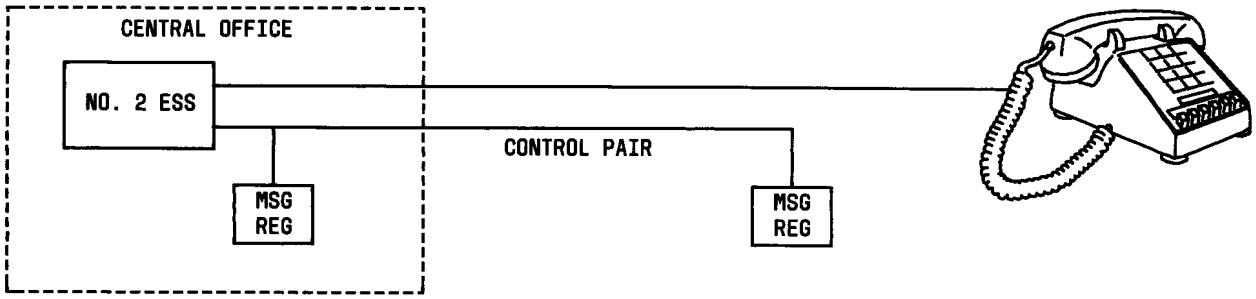
B. System Implementation

Software Operations

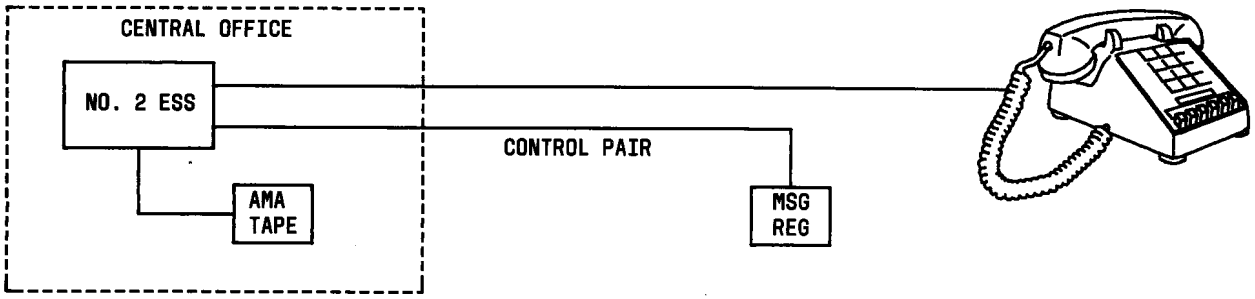
2.04 When a customer with the Message Register feature goes off-hook, normal call processing begins just as with any other call. The originating



A. LOCAL MESSAGE REGISTERS



B. LOCAL AND REMOTE MESSAGE REGISTERS



C. REMOTE MESSAGE REGISTERS WITH LAMA RECORDING

Fig. 1—Usages of Message Registers

translation identifies the calling party and provides the necessary billing information.

2.05 In addition to information related to normal call processing, the originating translation also provides an MSG indicator which signifies that a message register is associated with the customer's line. An associated circuit word is also obtained which is used to locate the message register.

2.06 The associated circuit word identifies the peripheral decoder (PD) point used to pass the charging information to the message register. (If local and remote message registers are employed, the same PD point operates both of the registers.) A portion of the associated circuit word is used to index into the peripheral decoder enable and status table. A call store status address, obtained from this table, is used to address the peripheral decoder status block table. The remainder of the associated circuit word is then used to locate a particular bit within the PD status block table. The bit reflects the status of the PD point associated with the customer's message register.

2.07 If the charge index, obtained from the 3-digit translation, indicates that message register charging is required, an inactive stable timing entry (STE) is set up to time the initial charge interval. The route index, also obtained from the 3-digit translation, must be expanded to determine if the call is an interoffice or an intraoffice type. The 4-digit translation process must be initiated for intraoffice calls in order to locate and identify the called party. Interoffice calls require that the called telephone number be outpulsed to a distant office. When the called party has been located, either within the same central office or through a distant office, the called party's line is rung, audible ringing is returned to the calling party, and an AMA initial entry is made, if AMA recording is required (as indicated by the charge index).

2.08 The charge index is used to access a particular word in the charge information table which indicates that AMA (if applicable) and message register recording are required. If AMA recording is required, an Entry Code (ENTCODE) is provided which indicates the type of billing desired by the customer. The possible types of ENTCODES used for message register billing are as follows:

- 15—Detail Message Rate - No Message Billing Index
- 16—Message Rate (timed) - Bulk Billed
- 18—Complaint Observed Message Rate Calls
- 22—Detail Billing For all Message Rate Calls

The charge information table also provides a message billing index (MBINX) which is used to access the charge index expansion table. This table provides the time (in minutes) and charges (in message units) for the initial period. Additionally, the charge index expansion table provides separate charging schedules for calls made during day, evening, and night calling periods. The actual charging information for the initial period is structured as desired by the operating company within the following limits:

- Initial time = 0 to 6 minutes

  (0 minutes = untimed call)

- Initial charge = 0 to 14 message units

  (0 message units = free call).

2.09 When the called party answers, a connection is established between the calling and called parties and a 700-ms waiting period must elapse to verify that the called party ***has*** actually answered. At the end of this period, the STE is activated to time the initial period (unless the call is untimed), the message register is incremented to reflect the charges for the initial period and an Answer Entry is made into the AMA buffer (if applicable).

2.10 Next, the transient call record (TCR) is released and supervision is maintained for the occurrence of on-hook. When on-hook occurs, the call is disconnected.

2.11 In the case of a timed call, if on-hook does not occur before the initial period has ended, a TCR is selected for the overtime period and the charge index is translated to obtain the overtime charges and the length of the overtime period. The overtime charging and timing are structured as desired by the operating company within the following limits:

- Overtime period = 1 to 6 minutes
- Overtime charges = 1 to 14 message units.

2.12 When the overtime charging information has been obtained, an STE is activated to time the overtime period and the message register is incremented to reflect the message units for the period. Finally, the TCR is released and supervision is maintained for the length of the overtime period. If on-hook should occur, the disconnect process is begun.

2.13 If on-hook does not occur before the end of the overtime period, an additional overtime period is required. This overtime period is processed identically to the first, and further unlimited overtime periods are processed until on-hook occurs.

2.14 When on-hook occurs, the call is disconnected and, if applicable, a Disconnect Entry is made into the AMA buffer.

Hardware Operations

2.15 The on-line control unit continually interrogates the line/trunk scanner through the input-output control unit to determine the status of the customer's line. When the customer goes off-hook, the program

performs the call processing previously described. When the called line answers, the program transfers the first message unit pulse through the input-output control to the central pulse distributor (CPD) which addresses the proper PD and sends the pulse to it. The PD then causes the appropriate relay to operate in a particular peripheral decoder applique circuit (SD-2H117 or SD-2H130). When this relay operates, -48 volts (typically) is applied to the message register via the control wires. This causes the message register to increment one message unit. The process is repeated until all message units for the initial period are shown on the message register.

2.16 When the initial period has ended, and if an overtime period is required, a similar procedure is performed so that the message register contains the overtime charges. The process continues through as many overtime periods as necessary until the call is disconnected. A block diagram showing the message register control circuit is shown in Figure 2.

3. FEATURE FLOW DIAGRAM

3.01 A feature flow diagram explaining the functional operation of the Message Register feature is shown in Figure 3.

4. INTERACTIONS

4.01 The Message Register feature cannot be provided for the centrex attendant or for 4- or 8-party lines. No other interactions exist for this feature.

ATTRIBUTES

5. STATION/SYTEM

5.01 The Message Register feature is provided on a per-line basis. The LAMA feature, if provided, is used for recording all local charges within the central office. The remote message registers provide charging information to the customers for each individual station. Local message registers may be provided on a per-line basis.

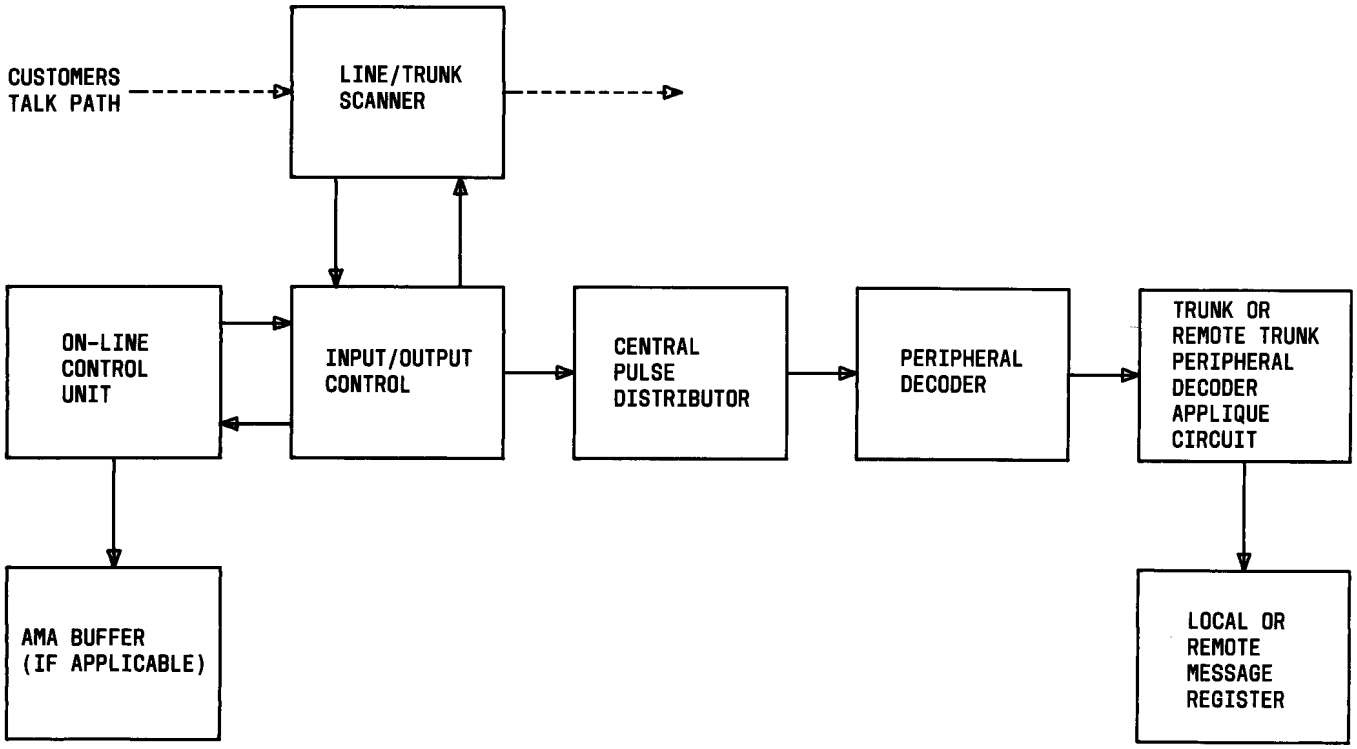


Fig. 2—Block Diagram of Message Register Control Circuit

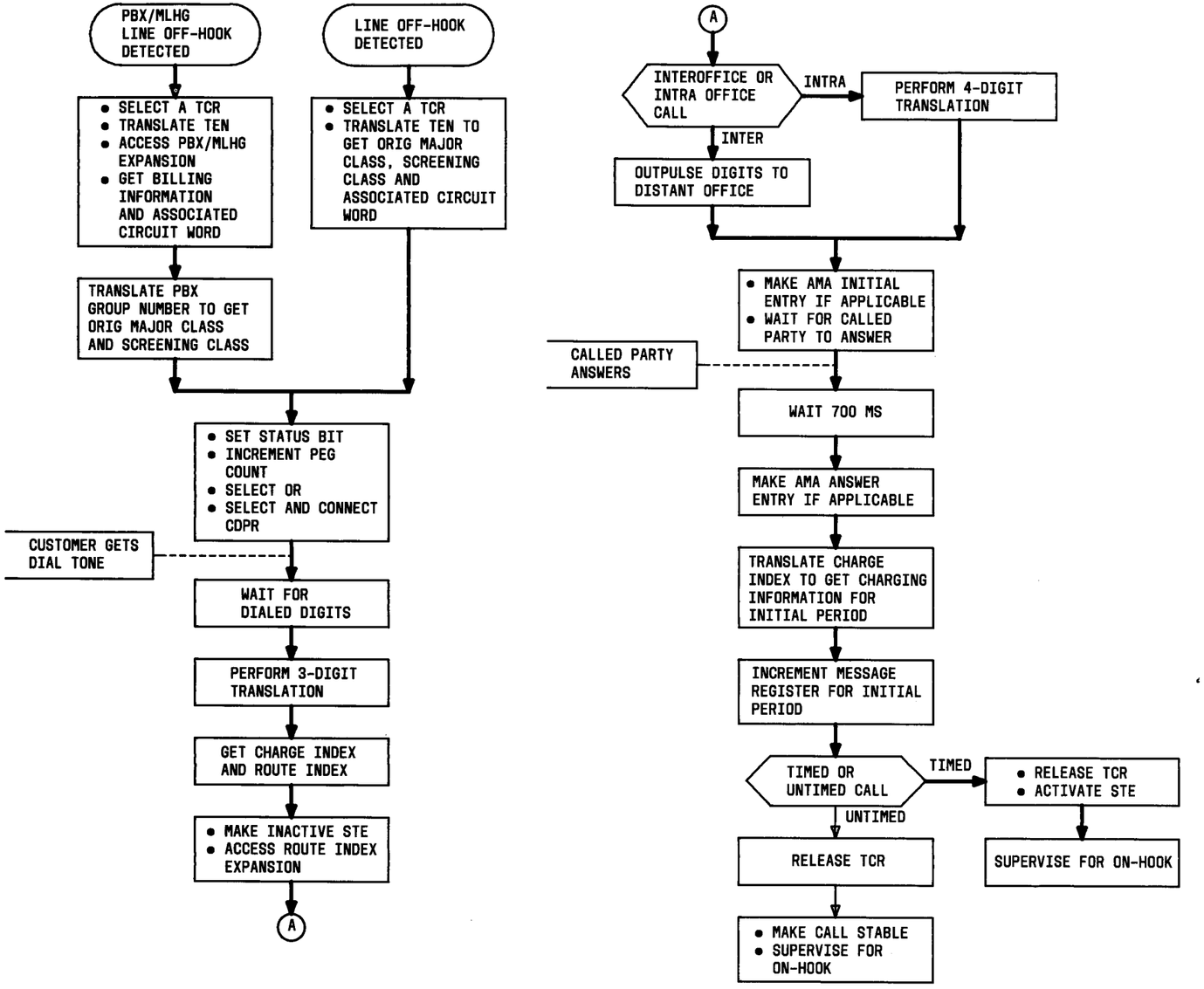


Fig. 3—Message Register Flow Diagram

Several lines may be assigned to the same message register. In the case of a PBX/MLHG, all lines associated with the PBX/MLHG may be assigned to the same message register, or each PBX/MLHG line may have its own dedicated message register.

6. LIMITATIONS

6.01 Message registers may be equipped as desired as long as peripheral decoder and peripheral decoder applique circuit assignment rules are maintained. These assignment rules are explained in SD-2H166, SD-2H130, and SD-2H117.

6.02 The LAMA feature can accommodate any desired number of message register customers.

6.03 As indicated in Part 2 of this section, the initial and overtime intervals are limited to a maximum of six minutes. No more than 14 message units may be charged for the initial or overtime period.

7. RESTRICTION CAPABILITY

7.01 Restrictions are not necessary for this feature.

8. COST DATA

Hardware

8.01 In terms of hardware, the cost data varies depending on the type of message register operation employed (see Figure 1).

8.02 For local message register operation, one message register must be provided for each line (unless it is desired to assign more than one line to a message register). A pair of control wires must be provided for each message register equipped within the central office from the trunk PD applique circuit (SD-2H117).

8.03 For local and remote message register operation, a message register must be installed on the customer's premises and one within the central office. Control wires must also be installed to operate each message register from the Remote PD applique circuit (SD-2H130).

8.04 For remote message registers combined with the LAMA feature, a message register must be installed on the customer's premises, a control pair must be installed to operate the register from a Remote PD applique circuit (SD-2H130), and the central office must be equipped with the hardware associated with the LAMA feature.

8.05 A remote message register may be installed for each PBX line. If local message registers are employed, a message register may be installed for each PBX line or all PBX trunks may be assigned to the same message register.

8.06 A PD applique circuit must be provided for either type of message register operation. The trunk PD applique circuit (SD-2H117) is used to operate local message registers, and the remote PD applique circuit (SD-2H130) is used to operate remote message registers. The remote PD applique circuit is also capable of operating a local message register in addition to the remote message register.

Software

8.07 Each line or PBX/MLHG line using the message register feature requires one translation word in the line or special PBX/MLHG expansion, respectively. An additional bit is required in these expansions to indicate the existance of a message register. Each line or PBX/MLHG line also requires two words in the peripheral decoder enable and status table, and a single bit in the PD status block area of call store. Each office providing the Message Register feature requires a maximum of 32 words in the charge index expansion table to store charging information for timed or untimed message register customers.

INCORPORATION INTO SYSTEM

9. PLANNING

9.01 Care should be taken to insure that adequate memory space is available for translations. Refer to COST DATA for detailed usage.

10. HARDWARE ENGINEERING

10.01 Adequate remote trunk peripheral decoder applique circuits must be equipped and properly assigned to provide pulse distribution to the message registers. The message registers must be installed along with the control pair associated with each individual line or PBX/MLHG line. If it is desired to use message registers within the central office only, the trunk peripheral decoder applique circuit (SD-2H117) should be used

instead of the remote trunk peripheral decoder applique circuit (SD-2H130).

11. SOFTWARE ENGINEERING

11.01 Refer to Traffic Facilities Practices, Division D, Section 12 for information concerning software engineering and processor time usage for this feature.

12. COMPATIBILITY

12.01 For the remote trunk PD applique circuit (SD-2H130), the -48 volts dc required to operate the message registers is switched directly through the peripheral decoder applique circuit. No external power or relays are required to operate the message registers. If desired, this same circuit can provide a contact closure so that battery can be supplied at the remote location.

12.02 The trunk PD applique circuit (SD-2H117) provides a contact closure only. Circuits external to this circuit must provide the required battery and contact protection.

13. OFFICE DATA

13.01 The translation organization required to perform the functions of the Message Register feature is shown in Figure 4. Figure 5 shows the charge information table. Changes in this organization may be made through the use of recent change messages or by an office administration (ODA) run.

Recent Change

13.02 When message register functions are changed via recent change messages, the A RC:L message is used with the MSG keyword to assign a register to a line. For a PBX/MLHG line, use the A RC:MLH message with the MSG keyword. Refer to IM-2H200 for complete details on the use of these messages.

ODA Run

13.03 The MR indicator bit shown in Figure 5 is not recent changeable; however, it is defined by the message billing index which is assigned during the ODA process on form ESS 2302-2.

13.04 When a message register function is incorporated via an ODA run, the following ESS input forms must be completed and submitted to the Western Electric Regional Data Center.

- ***Form ESS 2100—Directory Number Table*** is completed to indicate that a directory number has an associated message register.
- ***Form ESS 2101—Centrex Directory Number Table*** is used to assign message registers to centrex lines.
- ***Form ESS 2105—Multiline Hunting Group Table*** is used to associate a message register with a PBX/MLHG line.
- ***Form ESS 2107—Supplementary Information Table*** is required if more than one supplementary item is needed on the 2100 or 2101 form.
- ***Form ESS 2301—Rate and Route Table*** is used to coincide the appropriate line or trunk class code with its proper charge index and route index.
- ***Form ESS 2302—Charge Table*** is used to define all required local charging instructions.
- ***Form ESS 2303—Route Index Expansion Table*** is used to define routing information for outgoing calls.
- ***Form ESS 2511—Spare Applique Definitions*** is used to define spare applique circuits which can later be assigned for message register use.

14. GROWTH/RETROFIT PROCEDURES

14.01 Adding a message register in an existing office is accomplished in the same manner as a new installation. Refer to HARDWARE ENGINEERING and OFFICE DATA for requirements for incorporation of this feature.

15. TESTING

15.01 This feature can be tested by making the appropriate test calls and by using the A VY:MSG verification message which verifies the

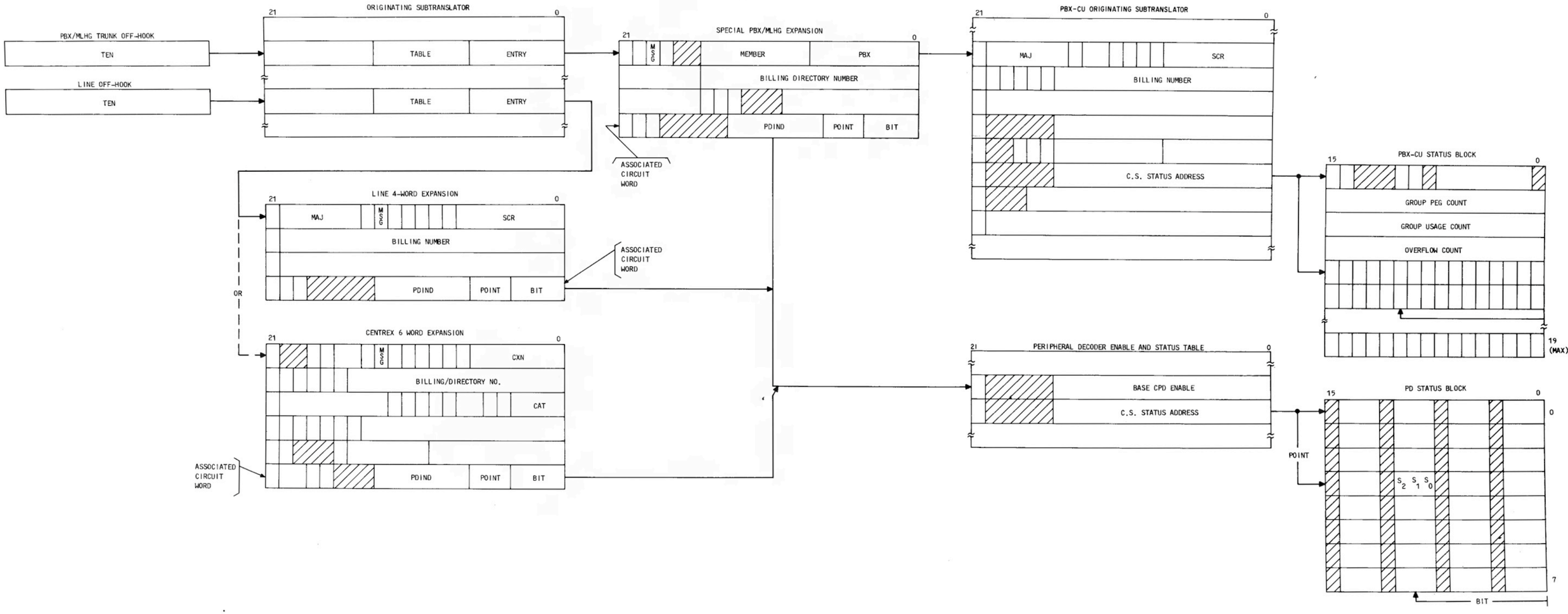


Fig. 4—Message Register Translation Layout

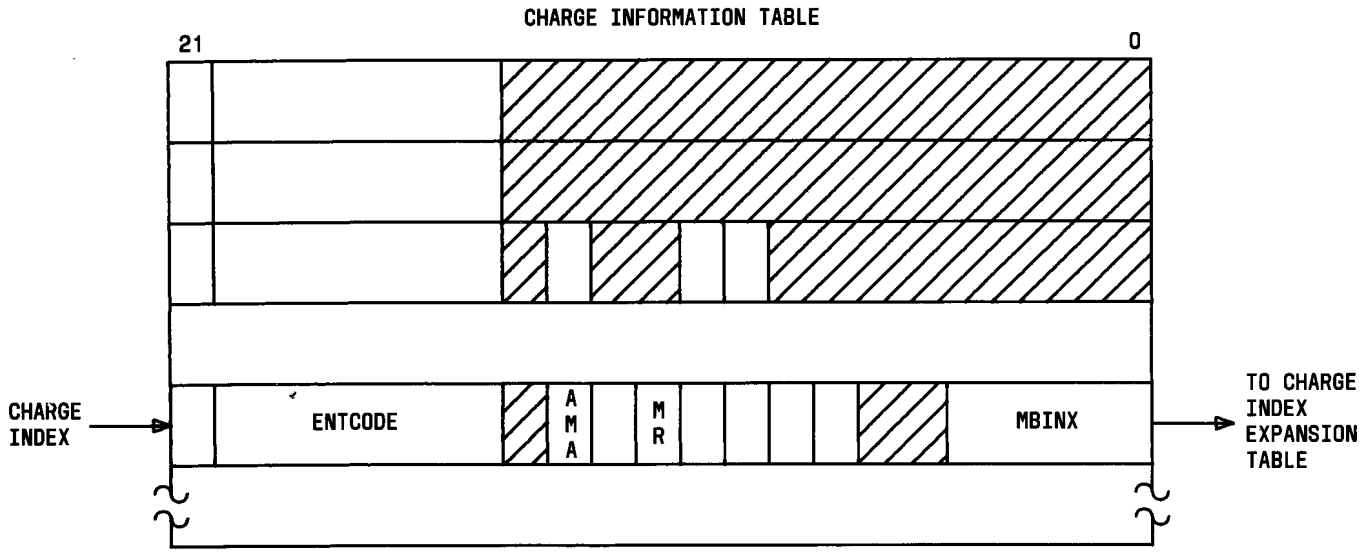


Fig. 5—Charge Information Table

proper assignment of the Message Register feature. Refer to IM-2H200 for complete details of this verification message.

ADMINISTRATION

16. MEASUREMENTS

16.01 This part is not applicable to the Message Register feature.

17. RECORD KEEPING

17.01 All output forms resulting from the ODA run should be maintained as part of the office records. If changes were made by recent change, the appropriate forms should be marked to indicate the change.

18. CHARGING

18.01 As described in the System Implementation section, all message register charging is handled by the operating company assigned charge index and by entries 16 through 31 of the charge index expansion table. Separate day-, evening- and night-rate charges, as well as initial and overtime charges for each of these categories are provided by this table. The Operating Company can enter the desired charges for these periods through the ODA process by completing form ESS 2302. The allowable charges for day, evening or night periods are as described in the System Implementation part of this section.

AVAILABILITY

19. NEW INSTALLATIONS

19.01 The Message Register feature is available for all new No. 2 ESS installations.

20. GROWTH/RETROFIT

20.01 The Message Register feature may be retrofitted into any existing No. 2 ESS through use of the ODA process.

SUPPLEMENTARY INFORMATION

21. GLOSSARY

21.01 The following is an explanation of terms used in this section that may be unfamiliar to the reader.

- ***Automatic Message Accounting (AMA)***—A mechanized system used to record charging information in telephone switching systems.

- ***AMA Buffer***—A block of call store memory used to temporarily store the charging details associated with a telephone call. This stored

information is later transferred to magnetic tape.

- ***Call Store Status Block***—A block of call store that stores the present state of various equipment (e.g., busy/idle status of trunks in a group or operated/released states of relays).

- ***Central Pulse Distributor (CPD)***—A No. 2 ESS equipment unit that readies (enables) peripheral units to receive data from the control unit and provides facilities for transmitting information to peripheral decoders for controlling relays.

- ***CPD Enable***—A pulse from the CPD that readies peripheral units to receive information from the control unit.

- ***Customer Dial Pulse Receiver (CDPR)***—A circuit that provides dial tone to the customer and detects the dialed digits.

- ***Ferrod Sensor***—A current sensing device used in scanners to detect the status of a unit or circuit.

- ***Interoffice Call***—A call involving two or more switching offices to establish a talk path.

- ***Intraoffice Call***—A call connection involving two subscribers assigned to the same switching office.

- ***Line***—Any connection to a network terminal that is not classified as a trunk or service circuit or centrex attendant.

- ***Local Automatic Message Accounting (LAMA)***—AMA recording equipment which is located in the office it serves.

- ***Message Register***—A mechanical counter used to store charging information for customers having measured service.

- ***Multiline Hunt Group (MLHG)***—A customer feature that allows calls to hunt over a specified group of lines or PBX lines in an attempt to connect the calling party to an idle line or PBX line within the group.

- ***Office Data Administration (ODA) Run***—Mechanism by which No. 2 ESS office data may be changed. Information from the ESS input forms are inputted into the WECo Regional Data Center computer, assembled, then sent to the No. 2 ESS and installed into the system.

- ***Originting Register (OR)***—A call register used to collect and store digits received from a CDPR.

- ***Private Branch Exchange (PBX)***—A set of equipment located on the customer's premises which allows intragroup calling on an extension dialed basis. Access to PBX lines from the regular telephone network is through a limited number of listed directory numbers. This service is provided by the No. 2 ESS via the MLHG feature.

- ***Peripheral Decoder (PD)***—An equipment unit that decodes orders from the control unit into operate and release information for relays.

- ***Peripheral Decoder Applique Circuit***—A circuit which allows the processor, under the direction of the generic program and acting through the CPD and PD circuits, to operate a message register.

- ***Peripheral Order***—A command sent out by the control unit to operate a peripheral equipment unit.

- ***Recent Change***—A teletypewriter input message that makes changes to the office translation data.

- ***Remote Message Register***—A message register located on the customer's premises.

- ***Remote Trunk PD Applique Circuit***—An applique circuit that allows the PD to control up to six circuits external to the ESS.

- ***Stable Timing Entry (STE)***—A 2-word area of call store used to time a coin or message register call in a stable state.

- ***Terminal Memory Record (TMR)***—A 2-word block of temporary storage containing

the identity of the calling and called parties and network path while the call is stable.

- ***Transient Call Record (TCR)***—An 8-word block of temporary storage assigned to monitor calls in a transient state.

- ***Translation***—The conversion of information from one form to another in ESS, for example, conversion of dialed digits into routing and terminating information.

22. REASONS FOR REISSUE

22.01 This is the initial issue of this section.

23. REFERENCES

23.01 The following documents may be consulted for additional information related to the Message Register feature.

- Translation Guide, TG-2H
- PD, PR, PF-2H213—Translation Program
- PD, PR, PF-2H113—Automatic Message Accounting Program
- PD, PR, PF-2H218—Local Charging Program
- SD, CD-2H117—Trunk Peripheral Decoder Applique Circuit
- SD, CD-2H130—Remote Trunk Peripheral Decoder Applique Circuit
- SD, CD-2H166—Peripheral Decoder Assignment Rules
- Section 232-190-204—Local Automatic Message Accounting (LAMA) No. 2 Electronic Switching System
- IM-2H200—Input Message Manual
- OM-2H200—Output Message Manual
- PA-2H2XX—Office Data Tables Layout Specification