NO. 2 ELECTRONIC SWITCHING SYSTEM

SERVICE FEATURES

MOST ECONOMICAL ROUTING (MER)

(CENTREX-CO)

1. GENERAL

1.01 The Most Economical Routing (MER) feature is an arrangement which permits the centrex station user to dial an access code (set of preassigned digits), followed by a directory number, and have the call automatically routed to its destination in a preselected pattern (which is usually the "most economical" route).

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

1.03 The title for each figure includes a number(s) in parentheses which identifies the paragraph(s) in which the figure is referenced.

2. DESCRIPTION

2.01 In a No. 2 Electronic Switching System (ESS), most economical routing is a service that is offered to Centrex-CO (including PBX-CO) customers whereby calls to direct distance dialed (DDD) numbers are automatically routed over customer-owned private facilities or DDD network via a preselected pattern of routing as selected by the customer. The facilities to be used may be selected from foreign exchange (FX), common control switching arrangement (CCSA), and wide area telephone service (WATS).

2.02 The MER feature is provided on a per-centrex customer group basis in a No. 2 ESS office. Since MER is a software feature that makes the best use of existing customer facilities, no special hardware is required for implementing this feature into the system. However, an office data administration (ODA) run is required to set up the proper routing and screening translation information within the No. 2 ESS.

2.03 The EF-1 generic program is required to implement MER in a No. 2 ESS office.

A. Customer (User) Perspective

2.04 The customer uses the MER feature by dialing an access code of one to three digits. A second dial tone is provided if the customer is permitted MER service. The customer then dials a 7- or 10-digit DDD number. Ten digits are required when the call is placed outside of the customer's home numbering plan area (NPA). From this point, the No. 2 ESS processes the call via a preselected routing pattern as described in the following paragraphs.

B. System Implementation

2.05 Implementation of MER requires the customer to define all DDD codes that will be used for each MER access code. During the planning stage, the customer should assist the telephone company in determining the facilities and alternate facilities the customer wishes to use in completing MER calls. If the customer wishes to have more than one way of handling calls to the same DDD code by different groups, these different ways must be defined.

2.06 The actual routes which may be selected by the No. 2 ESS for MER calls include:

- Various FX facilities

- CCSA trunks

- Various WATS bands

- Regular DDD network.

Alternate routing is provided among the above facilities; however, DDD service is used only as a final choice. When all of these facilities have been exhausted without successfully routing the call, the calling customer receives reorder tone.

MER Operation Procedure

2.07 When the centrex customer dials the MER access code, the centrex digit interpretation program is activated to interpret the dialed digits. At this point, the centrex access treatment (CAT) code of the calling party is checked against the restriction code bits to determine whether the station user is allowed access to MER. If access is allowed, a second dial tone is returned to the calling party and control is given to the digit interpretation program (PD-2H204).

2.08 The screening class associated with the MER access code is taken from the terminal entry of the centrex digit interpreter table (DIT) and is used within the 3-digit translator in the same manner as that for a normal noncentrex call or for a centrex "dial 9" call. From this screening class, and the next three digits dialed (refer to note), the 3-digit translator generates a route index (RI) and a charge index (CI) to indicate how to route the call and with what charging treatment. For noncentrex calls (and for centrex "dial 9" calls), the routing is generally to another switching machine via an interoffice trunk. For MER calls, the route index generated is usually a MER route index. (The route index generated can be a normal "non-MER" route index where distinctive MER routing and distinctive MER charging are not necessary.)

> *Note:* "Three digits" in this section refer to the office code dialed or to the 6-digit area code plus office code where six digits are necessary to determine the routing.

2.09 The MER route index can take on one of four forms. These four choices correspond to the four types of routes listed in 2.06:

- FX

- CCSA

- WATS

- DDD

These four can be used (or omitted) in any order with the restriction that if DDD is used, it must be the last choice. For any given 3-digit code, a number of FX choices or WATS choices may apply. For example, the MER routing for a particular 3-digit code for a particular centrex customer might be as follows:

(1) FX Group 1

(2) CCSA Group

(3) FX Group 2

(4) WATS Band 1

(5) WATS Band 2

(6) WATS Band 3

(7) DDD Overflow

Each 3-digit code for each centrex customer with the MER feature may yield a separate MER routing pattern. The MER routing pattern above is more complex than is typically the case, but makes a good example since it illustrates most of the salient points about MER.

2.10 This example in 2.09 is described in detail in the paragraphs that follow. Figure 1 illustrates the various offices and trunk groups involved. Figure 2 illustrates the MER routing pattern. The centrex station user in office A wishes to reach the station in office G. For this example, the NPAs are different, so that the centrex station user must dial 10 digits after the MER access code. (The MER access code may be any 1-, 2-, or 3-digit access code. The digits "71" are used in this example.) After the centrex station user dials the MER access code, the station's CAT code is checked against the MER restriction code in the DIT terminal entry. If the centrex station is allowed to dial MER access, second dial tone is returned to the station. (Otherwise, dialing error treatment is given.)

2.11 After receiving the first three digits ("815"), the 3-digit translator determines that three more digits are necessary in order to route the call. After three more digits are dialed ("777"), the 3-digit translator now has enough digits to determine the routing of the call. The 3-digit translator uses the screening class as described in 2.08, and enters the flowchart in Figure 2 at the point labeled "MER Routing from 3-Digit Translator." (Other screening classes may cause the program to enter the flowchart in Figure 2 at the point labeled "Noncentrex and Centrex Dial 9 Routing from 3-Digit Translator.")

2.12 The first MER route in this example is FX Group 1. The FX MER route index indicates the following:

(1) The FX trunk group to use. This FX trunk group is dedicated to this particular centrex customer.

(2) The CI to use. For FX, the CI ultimately yields "Entry Type 01."

(3) Prefix and delete information. For FX trunk group 1, this information is marked "delete 3 digits ("815") with no prefixing."

(4) An indicator which tells the outgoing trunk program to collect 10 digits as opposed to 7 digits ("7D" = 0).

(5) An alternate MER route index.

The program checks FX trunk group 1 to determine if any members are idle. If so, the MER part of the call is finished, and the call completes to office G as a normal FX type of call (with three digits deleted, so that "777-1234" is outpulsed). If all trunks are busy in FX trunk group 1, the program expands the alternate MER route index associated with FX trunk group 1.

2.13 This alternate MER route index is the second route to be tried in this example, and leads to office G through a CCSA network associated with the centrex customer. This CCSA network must provide "off-net" calling to office G over an appropriate FX group (from CCSA switching office C). This MER route index indicates:

(1) The CCSA trunk group to be used. The CCSA trunk group is dedicated to this particular centrex customer.

(2) The CI to be used. (The previous one mentioned in 2.12 is discarded.) For CCSA, this CI ultimately yields "Entry Type 09."

(3) Prefix and delete information. For this route, none applies.

(4) An indicator which tells the outgoing trunk program to collect 10 digits ("7D" = Ø).

(5) An alternate route index.

The program checks the CCSA trunk group to determine if any members are idle. If so, the MER part of the call is finished, and the call completes to office G via offices B and C as a normal CCSA call (with no prefixing or deleting in office A). If all trunks are busy in the CCSA trunk group, the program expands the alternate MER route index.

2.14 This alternate MER route index is the third route to be tried in this example, and leads to office G through intermediate office D. This MER route index indicates:

(1) The FX trunk group to be used. As in 2.12, this FX trunk group is dedicated to this particular centrex customer.

(2) The CI to be used. This CI is probably the same one used in 2.12 and ultimately yields "Entry Type 01."

(3) Prefix and delete information. For sake of example, office D is assumed to be a "1+" office, in that toll calls must be preceded by the digit "1". For FX trunk group 2, the prefix and delete information is marked "prefix one digit ("1") with no deleting."

(4) An indicator which tells the outgoing trunk program to collect 10 digits ("7D" = Ø).

(5) An alternate MER route index.

The program checks FX trunk group 2 to determine if any members are idle. If so, the MER part of the call is finished, and the call completes to office D as a normal FX call with the digit "1" prefixed, and on to office G as an interoffice call. If all trunks are busy in FX trunk group 2, the program expands the alternate MER route index.

2.15 This alternate MER route index (WATS Band 1) is the fourth route to be tried in this example, and leads to office G through the normal Bell System DDD network. This MER route index indicates:

(1) The simulated trunk group to be used for WATS Band 1. (A simulated trunk group is a software device to allow no more than a specified number of calls of a certain variety to be in progress simultaneously. For example, no more than four WATS Band 1 calls can be in progress at any given time.)

(2) The CI to be used. For WATS, this CI ultimately yields "Entry Type 25," and a specific "message billing index" for WATS Band 1. Previous CIs have been discarded.

(3) Network route index. The network route index yields the noncentrex routing (including any noncentrex alternate routing) for a given dialed 3-digit code.

(4) An alternate MER route index.

The program checks the simulated trunk group for WATS Band 1 to determine if this call is allowed. If so, the MER part of the call is finished, and the call completes using the network route index, which in this example, means via tandem office E, with overflow to tandem office F. If the maximum number of WATS Band 1 calls are already in progress, the simulated trunk group check fails, and the alternate route index is expanded.

2.16 The alternate MER routes of WATS Band 2 and WATS Band 3 are essentially the same as for WATS Band 1, except that each WATS Band has its own simulated trunk group, its own CI, and its own message billing index.

2.17 The alternate MER route index from WATS Band 3 directs the call to "DDD MER Overflow." This route index indicates:

(1) The network route index, which is the same as in 2.15. (If the network route index happened to be set to all ones, the "direct route index" from the "code index expansion table" would have been used.)

(2) The CI to be used. For DDD MER overflow, this CI yields "Entry Type 01." (This MER route index is necessary so that this CI will be defined, and any previous CIs will be discarded.)

(3) "Dial 9" simulated trunk group. (This does not apply in this example, but would apply if "dial 9" calls used a simulated trunk group.)

There is no alternate MER route index for this DDD MER overflow case. At this point, the MER part of the call is finished, and the call completes using the network route index via tandem office E, with overflow to tandem office F.

2.18 This example illustrates a number of points:

(1) This example is not typical, in that it is not necessary to use all of the four routing choices for any given MER routing pattern. (A single choice of DDD MER overflow could be valid for some particular 3-digit code.)

(2) The order and composition of the routing choices for each 3-digit code is established by the telephone company (in conjunction with the centrex customer), and remains fixed until the next ODA update.

(3) MER alternate routing stops at the point where an appropriate trunk group is found to have an idle member, or where an appropriate simulated trunk group indicates that processing may continue. Blockage beyond this point does not allow the program to reenter the MER routing pattern. These calls are given reorder tone.

> Note: Blockage can occur because the actual trunk selection takes place after the last four digits are dialed ("1234"). This could be many seconds after the initial test to determine that at least one trunk in the appropriate trunk group is idle. Another unrelated call could have selected that trunk in the interim. Another source of blockage is lack of response from the distant end of a trunk once that trunk is selected.

(4) In general, different centrex customers will not share MER routing patterns, since each pattern is comprised of facilities (FX trunk groups, CCSA trunk groups, and WATS simulated trunk groups) which are unique to a single centrex customer.

3. OFFICE DATA

A. Translations

3.01 The translation affected by the addition of the MER feature include the centrex number translator, 3-digit translator, and route index expansion. Figure 3 depicts a typical translation routing of MER calls.

B. ODA Information

3.02 In order to activate the MER feature in the No. 2 ESS office, an ODA run is necessary. This is accomplished by appropriately completing the following ODA ESS input forms:

- *ESS 2101*—Centrex Directory Number Table. This form is used to indicate which centrex lines possess which CAT code, which in turn allows or denies MER access.

- *ESS 2109-2 (9B)*—Centrex Group Table. This form identifies the MER access codes for any given centrex customer.

- *ESS 2202-2*—Trunk Group Table. This form contains information concerning the operating company assigned trunks having groups 070 and higher.

- *ESS 2202-3*—Centrex Trunk Group and Simulated Facilities Group Table. This form is used to define information required for centrex trunk groups identified on ESS 2202-2. Also contained in this form are entries for the simulated facilities group expansions associated with MER.

- *ESS 2301*—Rate and Route Table. This form is used to provide zone indexes for MER routing and charging. Prior to the completion of this form, Charge Tables ESS 2302 and Route Index Expansion Tables ESS 2303 must be completed. The line class code on this form identifies the type of treatment a trunk or line may have for different types of calls.

- *ESS 2302*—Charge Information Table. This form identifies the AMA recording information for both MER and non-MER calls.

- *ESS 2303-1*—Route Index Expansion Table. This form defines the routing information for an office. This form also defines the MER route indexes for MER calls.

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

C. Recent Change (RC) Messages

3.03 The input message A RC:L/ is the RC message for customer line service orders. This message plus the key word CAT is used to recent change the line's access treatment and is used to either allow or deny a line to access MER. Proper restriction code bits must be defined for MER access. Refer to the Input Message Manual

IM-2H200 for further details of key words associated with MER.

3.04 The A VY:L/ input message is used to verify that the line has access to MER.

3.05 The A RC:DIT/ is the RC message for a terminal entry in the digit interpreter table. This message and the data type (DTP)—MER is used to change the information contained in the terminal entry. Refer to IM-2H200 for further details.

3.06 The A VY:DIT/ is the RC message used to verify the contents of a specified terminal entry in the digit interpreter table. This message will verify that the data type—MER is contained in the terminal entry for an individual centrex group.

4. GROWTH/RETROFIT PROCEDURES

4.01 The MER feature may be added to any centrex group in a No. 2 ESS office by an ODA run.

4.02 Program and call store provisions must be made for translations in the stores for customer group and per-line requirements that may be needed to engineer MER.

4.03 When MER is to be provided, it will be necessary to reserve sufficient translation memory for the screening tables and route index expansions. In general, 200 words should be sufficient for most applications. Refer to the Traffic Facilities Practices Division D, Section 12, for the details in engineering the stores.

5. MEASUREMENTS

5.01 There are seven registers used for line screening class measurements. Since a screening class is dedicated to a centrex customer MER access code, a line screening class access peg count by the above registers can provide counts of MER access. Refer to Bell System Practices Section 232-120-301, Traffic and Plant Measurements for further details.

6. RECORD KEEPING

6.01 The following translation administration record forms reflecting MER information must be maintained by the operating companies after each ODA run is made:

- ESS 2109-R—Centrex Group Record

- ESS 2202-R—Trunk Group Record

- ESS 2301-R—Rate and Route Record

- ESS 2303-R—Route Index Record

- ESS 2500-5C-R—Master Table Index capacity and Office Options Record

6.02 A record of all RC messages must be maintained as part of office records.

7. CHARGING

7.01 Charging for MER calls is made in accordance with local tariff regulations. MER calls are automatic message accounting (AMA) recorded.

(1) FX—Normally, non-MER FX calls are not AMA recorded. When used as part of a MER routing pattern, FX calls are AMA recorded, with Entry Type = 01. The AMA initial entry is made after outpulsing is complete on FX overlap calls, and before outpusling begins (and before prefixing and deleting, if applicable) on FX nonoverlap calls. The AMA answer entry is made after outpulsing is complete, since answer supervision cannot be guaranteed on FX calls. This means that all three AMA entries are recorded (initial, answer, disconnect) even on FX calls that reach busy, don't answer, etc.

(2) CCSA—There is no difference between the AMA record of a CCSA MER call and a CCSA non-MER call. Both use "Entry Type 09."

(3) WATS—There are two differences between the WATS non-MER AMA initial entry and the WATS MER AMA initial entry:

(a) For WATS non-MER, the calling number recorded on the AMA tape is a WATS billing number associated with the particular WATS-access code dialed. This is always the same number whether the calling party is a centrex station, the centrex attendant, or an incoming tie trunk that has WATS access. For WATS MER, the calling number recorded

is the individual station number when the calling party is a centrex station, the centrex group billing number for the centrex attendant, or a tie trunk group billing number for an incoming tie trunk.

(b) For WATS non-MER, the AMA initial entry does not contain a "message billing index" (MBI). For WATS MER, it does. This MBI is used by any particular WATS MER call.

These two points are what differentiate "Entry Type 11" (WATS non-MER) from "Entry Type 25" (WATS MER) as recorded on the AMA initial entry.

(4) DDD MER Overflow—There is no difference between the AMA record of a DDD MER overflow call and a centrex "dial 9" call. Both use "Entry Type 01."

8. NEW INSTALLATIONS

8.01 The MER feature is available with Issue 3 of the EF-1 (extended feature) generic program.

9. GLOSSARY

9.01 The following is a listing of abbreviations and/or acronyms used in this document:

ACOF—Attendant Control of Facility

AMA—Automatic Message Accounting

CAT—Centrex Access Treatment

CCSA—Common Control Switching Arrangement

CI—Charge Index

CTX-CO—Centralized Exchange-CO is a service where station lines are switched directly by the No. 2 ESS Central Office.

DDD—Direct Distance Dialing

DIT—Digit Interpreter Table

DTP—Data Type

EF-1—Extended Feature Generic Program

FX—Foreign Exchange Trunk Facilities

MBI—Message Billing Index

MER—Most Economical Routing

NPA—Number Plan Area Code

ODA—Office Data Administration System

PBX-CO—Private Branch Exchange-CO is a service where station lines are switched directly by the No. 2 ESS Central Office.

RC—Recent Change Message

RI—Route Index

WATS—Wide Area Telephone Service

10. REFERENCES

10.01 The following are major references used as the supporting documentation for this document:

- PD-2H305-01 No. 2 ESS Centrex Trunk Program

- Translation Guide, TG-2H

- IM-2H200 Input Message Manual No. 2 ESS

- OM-2H200 Output Message Manual No. 2 ESS

- Traffic Facilities Practices, Division D, Section 12, No. 2 ESS

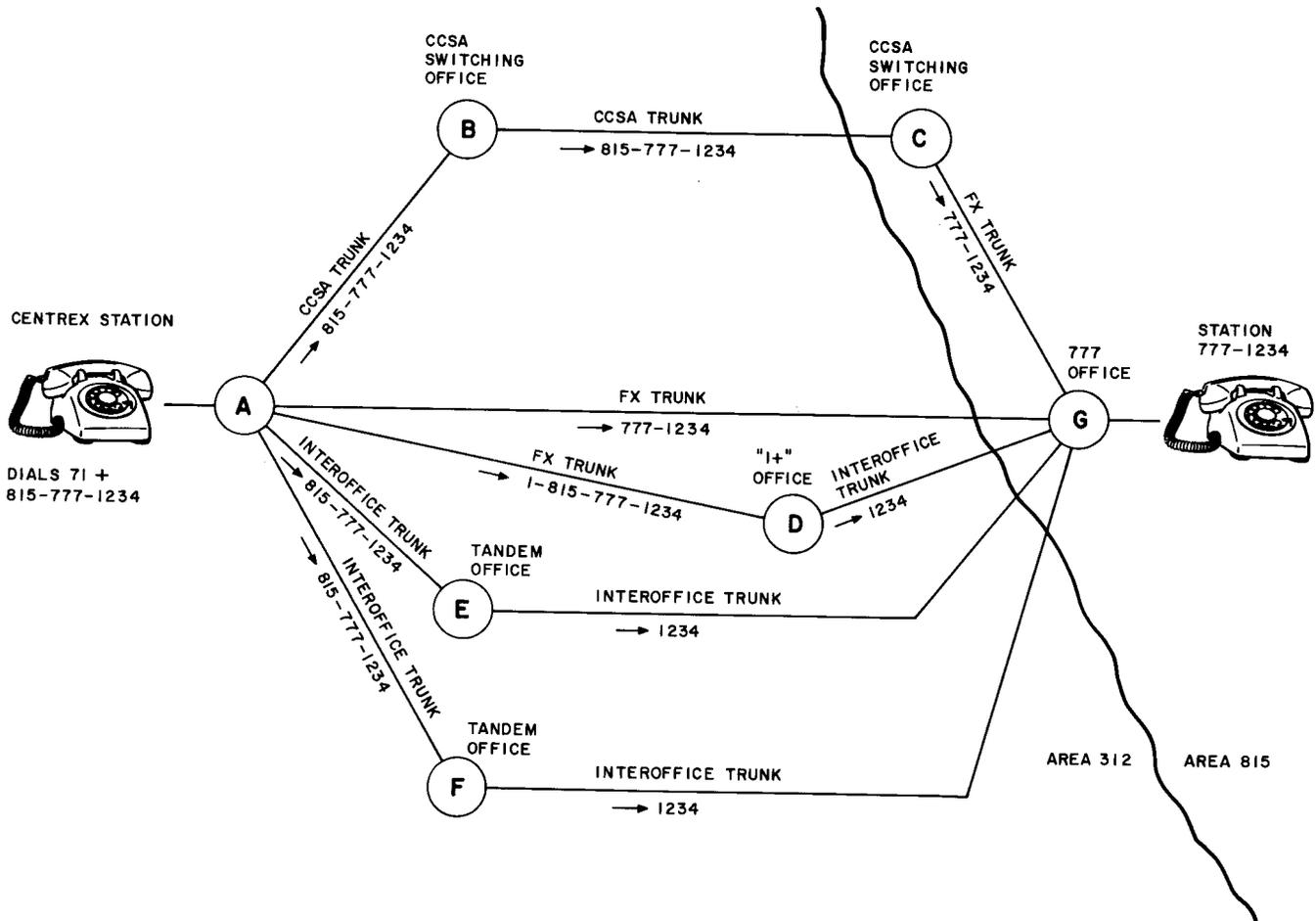- Bell System Practices Section 232-120-301, Traffic and Plant Measurements

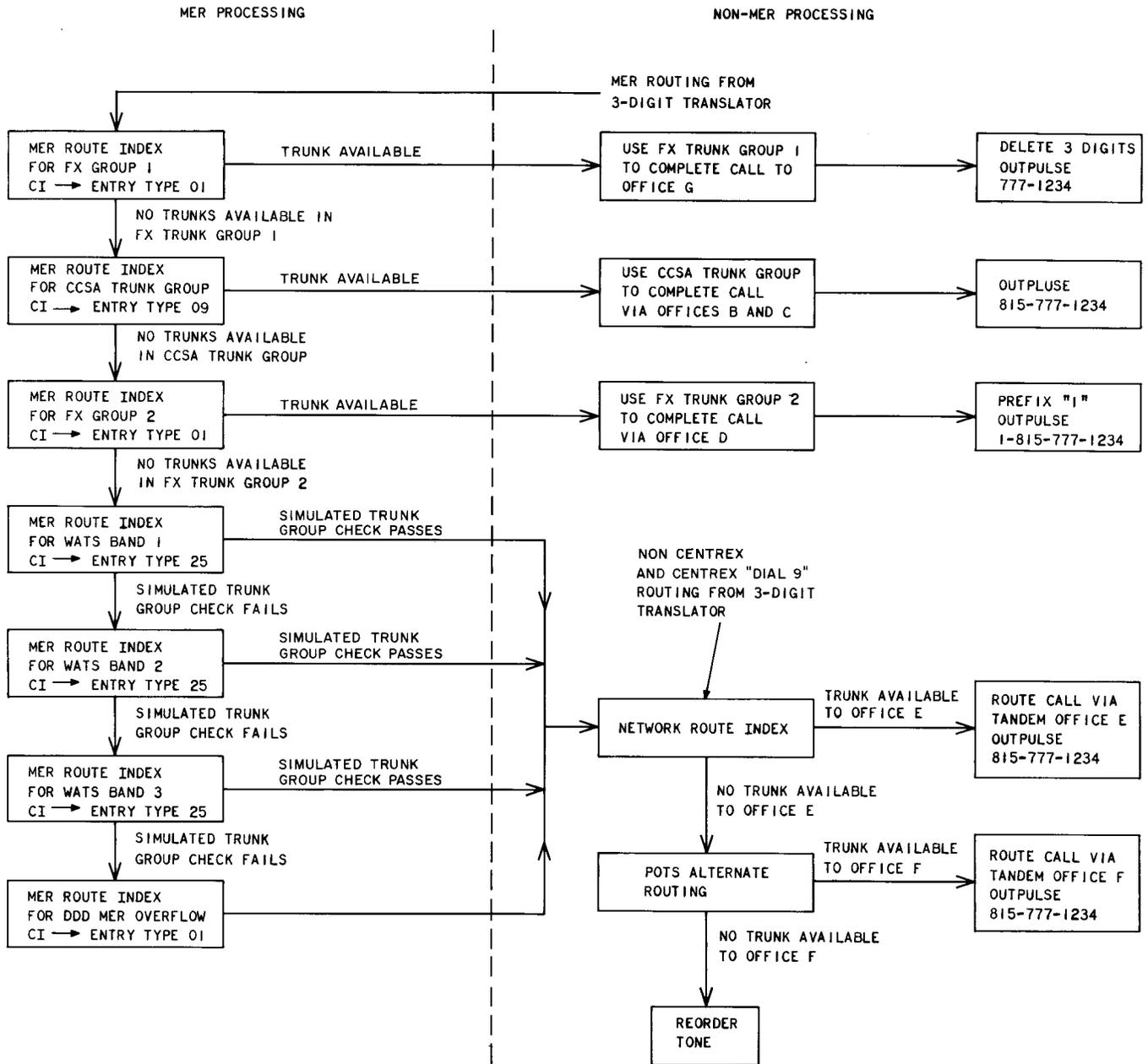**Fig. 1—MER Routing Example (2.10)**

MER PROCESSING

NON-MER PROCESSING

MER ROUTING FROM
3-DIGIT TRANSLATOR

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┌──────────────────────┐                           ┌──────────────────────┐      ┌──────────────────┐
│ MER ROUTE INDEX      │  TRUNK AVAILABLE          │ USE FX TRUNK GROUP I │      │ DELETE 3 DIGITS  │
│ FOR FX GROUP I       ├──────────────────────────>│ TO COMPLETE CALL TO  ├─────>│ OUTPULSE         │
│ CI ──► ENTRY TYPE 01 │                           │ OFFICE G             │      │ 777-1234         │
└──────────┬───────────┘                           └──────────────────────┘      └──────────────────┘
           │ NO TRUNKS AVAILABLE IN
           │ FX TRUNK GROUP I
           ▼
┌──────────────────────┐                           ┌──────────────────────┐      ┌──────────────────┐
│ MER ROUTE INDEX      │  TRUNK AVAILABLE          │ USE CCSA TRUNK GROUP │      │ OUTPULSE         │
│ FOR CCSA TRUNK GROUP ├──────────────────────────>│ TO COMPLETE CALL     ├─────>│ 815-777-1234     │
│ CI ──► ENTRY TYPE 09 │                           │ VIA OFFICES B AND C  │      │                  │
└──────────┬───────────┘                           └──────────────────────┘      └──────────────────┘
           │ NO TRUNKS AVAILABLE
           │ IN CCSA TRUNK GROUP
           ▼
┌──────────────────────┐                           ┌──────────────────────┐      ┌──────────────────┐
│ MER ROUTE INDEX      │  TRUNK AVAILABLE          │ USE FX TRUNK GROUP 2 │      │ PREFIX "I"       │
│ FOR FX GROUP 2       ├──────────────────────────>│ TO COMPLETE CALL     ├─────>│ OUTPULSE         │
│ CI ──► ENTRY TYPE 01 │                           │ VIA OFFICE D         │      │ I-815-777-1234   │
└──────────┬───────────┘                           └──────────────────────┘      └──────────────────┘
           │ NO TRUNKS AVAILABLE
           │ IN FX TRUNK GROUP 2
           ▼
┌──────────────────────┐  SIMULATED TRUNK
│ MER ROUTE INDEX      │  GROUP CHECK PASSES
│ FOR WATS BAND I      ├──────────────────────
│ CI ──► ENTRY TYPE 25 │
└──────────┬───────────┘
           │ SIMULATED TRUNK
           │ GROUP CHECK FAILS
           ▼
┌──────────────────────┐  SIMULATED TRUNK
│ MER ROUTE INDEX      │  GROUP CHECK PASSES
│ FOR WATS BAND 2      ├──────────────────────
│ CI ──► ENTRY TYPE 25 │
└──────────┬───────────┘
           │ SIMULATED TRUNK
           │ GROUP CHECK FAILS
           ▼
┌──────────────────────┐  SIMULATED TRUNK
│ MER ROUTE INDEX      │  GROUP CHECK PASSES
│ FOR WATS BAND 3      ├──────────────────────
│ CI ──► ENTRY TYPE 25 │
└──────────┬───────────┘
           │ SIMULATED TRUNK
           │ GROUP CHECK FAILS
           ▼
┌──────────────────────┐
│ MER ROUTE INDEX      │
│ FOR DDD MER OVERFLOW │
│ CI ──► ENTRY TYPE 01 │
└──────────────────────┘
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NON CENTREX
AND CENTREX "DIAL 9"
ROUTING FROM 3-DIGIT
TRANSLATOR

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┌──────────────────────┐  TRUNK AVAILABLE       ┌──────────────────┐
│ NETWORK ROUTE INDEX  │  TO OFFICE E           │ ROUTE CALL VIA   │
│                      ├───────────────────────>│ TANDEM OFFICE E  │
│                      │                        │ OUTPULSE         │
└──────────┬───────────┘                        │ 815-777-1234     │
           │ NO TRUNK AVAILABLE                 └──────────────────┘
           │ TO OFFICE E
           ▼
┌──────────────────────┐  TRUNK AVAILABLE       ┌──────────────────┐
│ POTS ALTERNATE       │  TO OFFICE F           │ ROUTE CALL VIA   │
│ ROUTING              ├───────────────────────>│ TANDEM OFFICE F  │
│                      │                        │ OUTPULSE         │
└──────────┬───────────┘                        │ 815-777-1234     │
           │ NO TRUNK AVAILABLE                 └──────────────────┘
           │ TO OFFICE F
           ▼
      ┌──────────┐
      │ REORDER  │
      │ TONE     │
      └──────────┘
```
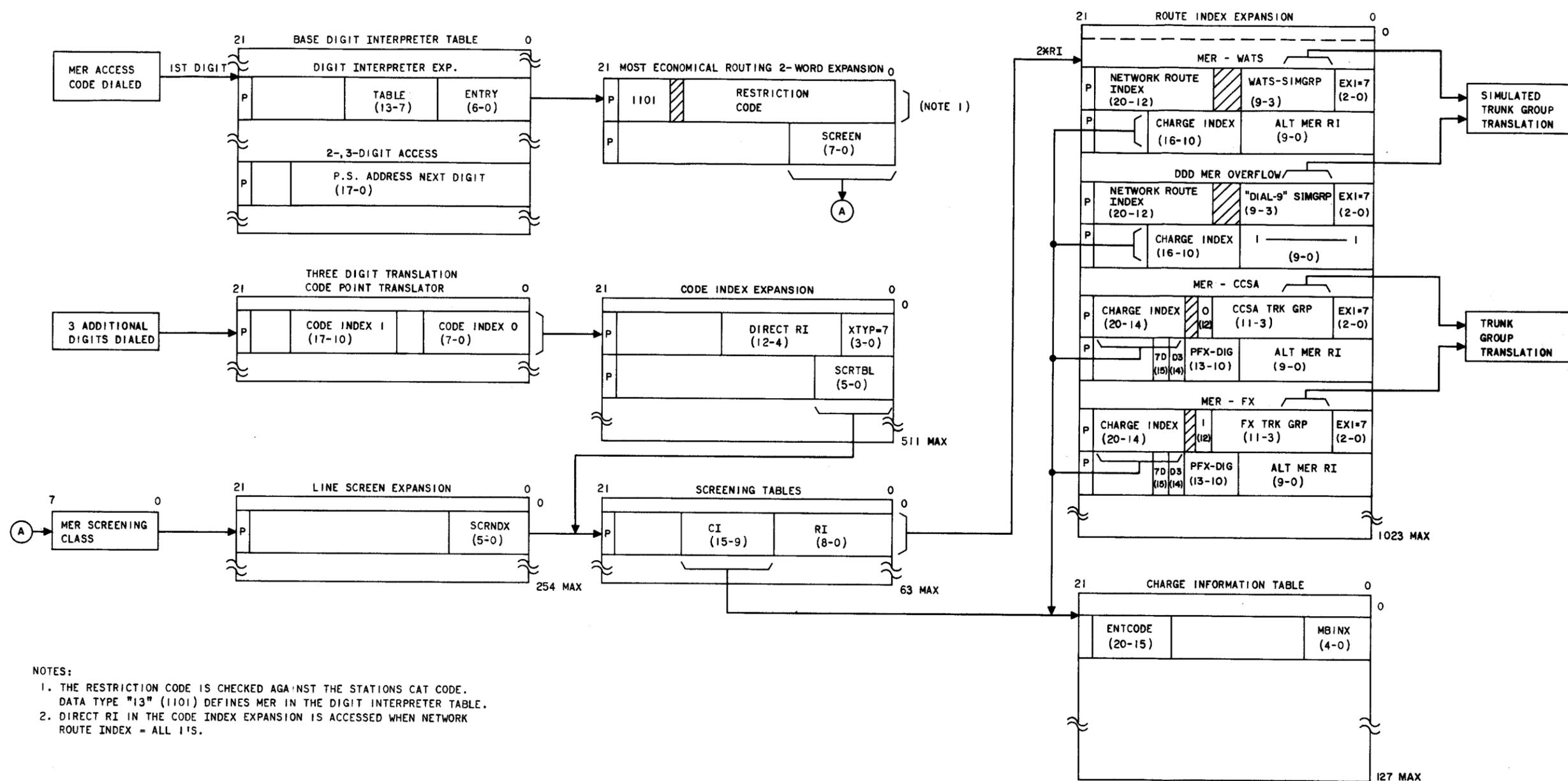
Fig. 2—MER Routing Flowchart Example (2.10, 2.11)

Fig. 3—Translation Layout of MER (3.01)

NOTES:
1. THE RESTRICTION CODE IS CHECKED AGAINST THE STATIONS CAT CODE. DATA TYPE "13" (1101) DEFINES MER IN THE DIGIT INTERPRETER TABLE.
2. DIRECT RI IN THE CODE INDEX EXPANSION IS ACCESSED WHEN NETWORK ROUTE INDEX = ALL 1'S.