NO. 1 ELECTRONIC SWITCHING SYSTEM
SERVICE RESULTS
RECEIVER ATTACHMENT DELAY REPORT (RADR)

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1. GENERAL

DEFINITION

1.01 The receiver attachment delay report (RADR) feature provides a No. 1 Electronic Switching System (ESS) central office with an indication that the office is experiencing delays in providing receiver connections for incoming traffic.

1.02 When 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.

1.04 The RADR feature is available with Issue 1 of the SP-CTX-7 and CC-CTX-7 generic programs.

2. DESCRIPTION

A. RADR Operation

2.01 The RADR feature provides the following:

(a) RADR test calls are made under control of the generic program and are attempted at the rate of one call every 4 seconds. The test calls are initiated on trunks which have all of the following attributes:

(1) Assigned

(2) Incoming or 2-way

(3) Use multifrequency (MF), dial pulse (DP), and/or revertive pulse (RP) receivers.

(4) Idle.

(b) A count is kept of the number of RADR test calls initiated. A separate count is kept for MF, DP, and RP trunks.

(c) A count is kept of the number of unsuccessful test calls (failures). A failure is defined as a test call requiring more than 3 seconds to obtain a receiver connection. Failure counts are kept separately for MF, DP, and RP trunks.

(d) In addition to keeping a count of the test initiations and test failures, the RADR feature:

(1) Computes the failure percentage, by trunk type, for the last 50 test calls of the given type.

(2) Keeps a count of the number of 100-ms (millisecond) intervals the RADR feature is inhibited.

(3) Provides an indication, by trunk type, of the test results (all successes or at least one failure) for the preceding 30-second interval.

2.02 The RADR feature is activated in one of two ways:

(a) Manually, by typing RAD-ALLOW-. at the local maintenance, network administration, or network management TTY.

(b) Automatically in system reinitialization phases 4, 5, or 6 when this method is enabled by parameter selection [parameter set card RDSTAT (Fig. 1)].

2.03 The RADR feature may be inhibited in one of two ways:

(a) Manually, by typing RAD-INH-. at the local maintenance, network administration, or network management TTY.

(b) Automatically in system reinitialization phases 4, 5, or 6 when this method is enabled by parameter selection [parameter set card RDSTAT (Fig. 1)].

B. Trunk Link Network Access

2.04 Each ESS trunk link network (TLN) is accessed in ascending numeric order, ie, TLN 0, TLN 1, TLN 2, etc. The initial access to any TLN is through frame 0, grid 0, switch 0, and level 0. After the initial TLN access, subsequent access to the trunks (represented by a frame, grid, switch, and level) within the TLN is one frame, one grid, and one level higher than the previous trunk. After the highest frame of a given TLN has been accessed, the next TLN is accessed using frame 0, grid 0, switch 0, and level 0 as a starting point. When the highest frame of the highest TLN in the office has been accessed, access reverts to TLN 0; however, a different starting point is used. The second access to a TLN is through frame 0, grid 0, switch 0, and level 1. Each TLN is then accessed using this starting point. This incrementing of the starting point is continued until the highest frame, grid, switch, and level of the highest TLN in the office has been accessed. Access then reverts to frame 0, grid 0, switch 0, and level 0 of TLN 0. The procedure is then repeated.

2.05 A trunk selected for use with the RADR feature must be:

(a) Assigned (ie, in service)

(b) An incoming or 2-way trunk

(c) An MF, DP, or RP trunk. (The choice of trunk types to be used is made by parameter set card selection, see Fig. 1.)

(d) Idle at the time it is chosen.

2.06 After a RADR test is performed, the next trunk candidate for a test is normally one frame, one grid, and one level higher than the previous trunk. If all four trunk criteria are met, then this trunk is tested. When criterion (a), (b), or (c) is not satisfied, the next trunk selected will be one frame, one grid, and one level higher than the current trunk. If criteria (a), (b), and (c) are met but criterion (d) is not met (ie, the trunk is busy) then the next trunk candidate for test will be one level higher but on the same frame and grid as the previous trunk. The selection procedure samples all trunk locations in the network and is described in more detail in Bell System Practices Section 231-190-309.

C. Timing Interval

2.07 Each trunk associated with an ESS office is identified by a trunk network number (TNN). The selection of a TNN (trunk) on which a RADR test is attempted has been described. When a trunk that satisfies all four test criteria is found, it is reserved for a RADR test call, ie, the trunk is made busy to traffic by setting the trunk's T1T2 bits to off-hook, ignore. When a trunk suitable for test cannot be found within 12 attempts, the RADR program will wait 100 ms before making another attempt to find a suitable trunk. After this 100-ms interval (delay), the hunt for a suitable trunk is resumed. If no suitable trunk for test has been found after 12 additional attempts, there is another 100-ms delay. This procedure is repeated until 120 attempts to find a trunk suitable for test have been made. If no suitable trunk has been found after these 120 attempts, the RADR test is canceled for that 4-second interval.

2.08 The RADR test calls are attempted at a rate of one call every 4 seconds; any one of these 4-second intervals is called a RADR test interval. Whether a test call is initiated during any given RADR test interval depends entirely on whether a trunk was reserved during the one second interval prior to test initiation.

2.09 The RADR test call initiation is always made one second into a RADR test interval regardless of the time required to reserve a trunk. When a test call is initiated, the scanner number of the reserved trunk is loaded into the trunk seizure and answer (TSA) hopper; the RADR test call is then handled as a real call up to the point of connecting the receiver.

2.10 When a RADR test call is complete (ready for a receiver connection), a directed scan is made of the trunk selected for the test. If a real seizure of the trunk is detected, a connection is made between the trunk and receiver. If a real seizure is not detected, the receiver is operated and released, and all equipment associated with the test is made idle. A RADR success indicator is set when the test call is completed within 3 seconds from the time it is initiated.

2.11 Three seconds after a RADR test call is initiated, a check is made for the condition of the success indicator. If the success indicator is not set, the test is counted as a failure, and the failure count is incremented. If the success indicator is set, the failure count is not incremented. Regardless of success or failure, the count of initiations is incremented.

2.12 The result of the RADR test call is also moved to a 50-bit result register for the associated trunk type. The least recent test result is removed from the register, and the failure percentage is computed for the 50 most recent tests of that trunk type. The computed percentage is compared with the office threshold of the associated trunk type. If the threshold is exceeded, TOC02 and NM17 messages are generated.

> ***Note:*** A TOC02 message is generated only if the previous percentage of the applicable trunk type did not exceed its threshold; any ***TOC02 message indicates a new failure*** of the applicable trunk type.

2.13 A summary of the timing associated with the RADR feature is given in Fig. 2.

3. NETWORK MANAGEMENT DISPLAYS

3.01 If an ESS office is equipped with a network management indicator circuit, then RADR test results may be displayed at a network management center or similar location.

3.02 RADR displays for a network management center or similar location are optional. If selected, the optional visual displays are as follows:

(a) The failure percentage, by trunk type, of the last 50 RADR tests performed for that trunk type. Separate displays are provided for each trunk type utilized.

(b) A current RADR test results (CRTR) indicator, which displays either all successes (indicator extinguished) or at least one failure (indicator illuminated) for the RADR tests performed in the last 30 seconds. A separate CRTR indicator is provided for each trunk type utilized. All RADR displays are updated every 30 seconds.

3.03 All RADR indications are initiated by the operation (via program control) of signal distributor (SD) points on the miscellaneous trunk frame.

3.04 Refer to Bell System Practices Sections 231-190-305 and 231-190-309 for additional information on RADR test displays or the network management indicator circuit.

4. COST DATA

PROGRAM STORE

A. Generic

4.01 The RADR feature costs approximately 675 generic program store (PS) words.

B. Translations

4.02 The increase in the number of PS words required due to translations is two words (fixed) plus 11 times the number of trunk types displayed to a network management center or similar location. This increased cost will be 13, 24, or 35 words, depending on whether one, two, or three trunk types are displayed.

CALL STORE

4.03 Twenty-one call store (CS) words are required for the RADR feature. These 21 words are utilized as follows:

(a) Three words are used to keep data on the TNNs (trunks) to be tested by the RADR feature.

(b) Nine words are used as shift registers to keep the results of the last 50 MF calls, 50 DP calls, and 50 RP calls.

(c) Nine words are used as accumulators and holding registers for traffic measurements.

The 21-word CS cost is always present, regardless of whether none, one, two, or three of the trunk types are being utilized for the RADR feature.

4.04 If RADR visual displays are provided to a network management center or similiar location, an increased number of CS words is required. This increased cost is six words plus two times the number of trunk types displayed, ie, either 8, 10, or 12 words, depending on whether one, two, or three of the trunk types are displayed.

REAL TIME

4.05 The real-time cost (in machine cycles per second) of a RADR test call equals one-fourth the real time of an incoming terminating or incoming tandem call; ie, four test calls cost the same as one incoming call. Additionally, each incoming call has eight cycles added to it because of the RADR feature; and if queueing occurs, another five cycles are added to the incoming call. The percentage of real time attributable to the RADR feature is approximately 0.20 percent of real time without queueing and approximately 0.35 percent of real time with queueing. This cost is present whether the RADR feature is active or inactive.

5. PLANNING

5.01 It is expected that the RADR feature will be very useful in tandem, toll, and local/toll offices. Additionally, this feature should be a useful indicator of terminating overload in local offices. Therefore, it is recommended that the ***RADR feature be active in all No. 1 ESS offices.***

5.02 The trunk types tested by RADR are established by parameters (see 6.02 of this section and Fig. 1). However to meet the requirements of the network switching performance measurement plan, it will be necessary to specify all trunk types which are provided in the ESS control group.

5.03 If a network management center is associated with an office, it may be desirable to include the optional visual displays as a part of the RADR feature. Inclusion or exclusion of the optional visual displays ***should be coordinated*** with network management personnel.

6. OFFICE DATA

A. Translations

6.01 New translations are required only if visual displays are provided by the indicator circuit.

B. Parameters

6.02 Two new parameters are required to administer the RADR feature. Six set cards are required to build the parameters (Fig. 1).

7. ADMINISTRATION

A. Measurements

7.01 If the RADR test calls initiated on any given trunk type (MF, DP, or RP) exceed a predetermined failure threshold (see Fig. 1 for threshold settings), a TOC02 output message is printed immediately on the network administration TTY. This message identifies the trunk type which exceeded its threshold. The parts of the TOC02 message applicable to the RADR feature are given in Table A.

7.02 Within 5 minutes after the TOC02 message, an NM17 message is printed. This message gives the RADR failure percentages as they exist at the time of the NM17 output (Table A). The percentages given on the NM17 message are for the last 50 test calls of each trunk type being utilized for the RADR feature, ie, 50 MF calls, 50 DP calls, and 50 RP calls if all three trunk types are being used.

7.03 The NM17 message is available, on demand, by typing RAD-STATUS-. on the network administration TTY. The requested NM17 message is printed on the TTY at which the request was typed. The system response to the RAD-STATUS-. request will be one of the following:

(a) ***PF*** followed by the NM17 message.

(b) ***NO*** if the TTY output buffer is full. (The request cannot be executed.)

(c) ***NG*** if the RADR feature is inhibited or if the RADR feature is not active in that ESS office.

7.04 A TC15 message is printed at 15-minute intervals on the network administration TTY. This message gives the number of RADR test calls initiated and the number of RADR test failures compiled during the report period. Separate initiation and failure counts are given for the MF, DP, and RP trunks (Table B).

7.05 The TC15 message is available, on demand, by typing LS-QUARTER-MON on the network maintenance TTY or by typing LS-QUARTER-TON on the network administration TTY. The system response to the LS-QUARTER- request is ***OK*** followed by the TC15 message. The message is printed on the TTY at which the request is received and contains the test results for the most recent 15-minute clock interval; eg, a requested TC15 message at 3:12 would contain the results for the 2:45 to 3:00 interval.

7.06 A count of the number of RADR test initiations and the number of RADR test failures is available on the hourly (H or C) schedule. Since the peg count, overflow and usage measurements for receivers will generally be on the H schedule, ***it is recommended that the RADR measurements also be assigned to the H schedule. Results for all incoming receiver types in the control group are required for the network switching performance measurements plan.*** The RADR counts are entered on the ESS 1400 Form (Fig. 3) with type measurement code (TMC) 05 and the following office count numbers:

RADR COUNT	OFFICE COUNT NUMBER
MF Tests	217
MF Delays	220
DP Tests	223

RADR COUNT	OFFICE COUNT NUMBER
DP Delays	226
RP Tests	229
RP Delays	232

7.07 RADR counts may also be assigned to the selected quarter hour (DA15) schedule. The input form for the DA15 output is referred to as schedule A. Any entries selected for schedule A ***must*** be contained on schedule H or C.

7.08 RADR tests are included in traffic measurements (peg count, overflow, and usage) on the receiver groups tested.

7.09 Both daily and monthly plant measurements contain the following RADR data:

(a) Total number of RADR tests that failed, ie, the combined MF, RP, and DP failures.

(b) The number of 100-second intervals that the RADR feature was inhibited during the report period.

7.10 The daily measurements output message, PM01, is printed at 2:30 am on the local maintenance TTY. The monthly plant measurements output message, PM02, is printed on the 23rd of each month on the local maintenance TTY. The monthly PM02 message is printed immediately after the daily PM01 message.

7.11 RADR data appears in the base and service measurements section of the PM01 and PM02 outputs. These sections may be requested at the network administration TTY by typing PLNT-MEAS-DBS. for the daily results or PLNT-MEAS-MBS. for the cumulative monthly results (see ESS Input Message Manual, IM-1A001).

B. Interpretation of Data

7.12 The 15-minute peg counts contained on the TC15 and DA15 messages and TOC02 and NM17 exception outputs can be used to determine when network congestion or a shortage of facilities (receivers, POBs, etc.) is beginning. The hourly (H) schedule output can be used in conjunction with other traffic measurements and plant measurements to determine when facilities are being occupied at close to their capacity.

7.13 Total RADR tests on the TC15 report should be 225. If the total is not equal to 225, the reason is that incoming or 2-way trunks (idle, assigned, MF, DP, or RP) could not be found during the one second prior to the test initiation. Therefore the test for that RADR interval was skipped. This could result from many trunks being busy or a large number of unassigned TNNs.

C. Recording of Data

7.14 A form for recording RADR data and calculating the percent delay for each receiver group measured is included in Dial Facilities Management Practices, Division H, Section 6k(4).

8. GLOSSARY

8.01 The following glossary of terms is provided.

DP—***Dial Pulsing:*** A system of DC pulsing requiring the use of a trunk dial pulse receiver. The digits are transmitted over a trunk by the interruption of the DC circuit a number of times, one to ten, corresponding to the digits 1 to 0.

MS—***Millisecond:*** One thousandth of a second.

MF—***Multifrequency:*** A system of AC pulsing where the identity of each digit is determined by a specific pair of two-out-of-six frequencies to represent each of the ten digits, one to ten (zero on the dial), and the various start and end signals.

MTDN—***Miscellaneous Trunk Distributor Number:*** Identifies a specific point on a miscellaneous trunk frame.

RP—***Revertive Pulsing:*** A system of direct current pulsing in which the originating end presets itself in a condition representing the number of pulses required, and in a condition to count the pulses received from the terminating end. After being signaled by the originating end, the terminating end transmits a series of pulses until the originating end indicates that the required number of pulses has been counted.

TLN—***Trunk Link Network:*** The part of the switching network that connects trunks to junctors.

TNN—***Trunk Network Number:*** Identifies the location of a trunk within the trunk switching network.

TSA Hopper—***Trunk Seizure and Answer Hopper:*** An area of call store to which connect and disconnect data is reported by supervisory scanning.

TSN—***Trunk Scanner Number:*** Identifies the scanner that is monitoring a given trunk. The system can convert any TNN into a TSN.

T1T2—State bits for a trunk that tell the supervisory scan program the state of a trunk (changes and whether to report or ignore the changes).

SET CARD	VALUE	DESCRIPTION
NMSTAT	0, 1	NETWORK MANAGEMENT INDICATOR CIRCUIT IS PROVIDED (VALUE = 1) OR IS NOT PROVIDED (VALUE = 0) FOR THE ESS OFFICE.
RDSTAT	0, 1	THE RADR FEATURE IS ACTIVE (VALUE = 1) OR INACTIVE (VALUE = 0) IN SYSTEM REINITIALIZATION PHASE 4, 5, OR 6. (Note 1)
RDTYPE	0—7	VALUE INDICATES THE TRUNK TYPES ON WHICH RADR TESTS ARE PERFORMED. THE VALUE IS DETERMINED AS FOLLOWS: 0 = NONE 1 = MF ONLY 2 = DP ONLY 3 = MF AND DP ONLY 4 = RP ONLY 5 = MF AND RP ONLY 6 = DP AND RP ONLY 7 = MF, DP, AND RP.
RDMFMX	00—99	MF FAILURE PERCENTAGE THRESHOLD. A THRESHOLD OF 3 PERCENT IS RECOMMENDED (Note 2).
RDDPMX	00—99	DP FAILURE PERCENTAGE THRESHOLD. A THRESHOLD OF 3 PERCENT IS RECOMMENDED (Note 2).
RDRPMX	00—99	RP FAILURE PERCENTAGE THRESHOLD. A THRESHOLD OF 3 PERCENT IS RECOMMENDED (Note 2).

Note 1: It is recommended that the RADR feature be active in all No. 1 ESS offices. Set card RDSTAT should have a value of 1.

Note 2: When the 3 percent threshold is set as recommended, 2 failures during the last 50 tests on any given trunk type will cause the threshold to be exceeded; ie, the threshold is exceeded when the actual failure rate is 4 percent.

Fig. 1—Required Set Cards (2.02, 2.03, 2.05, 5.02, 6.02, 7.01)

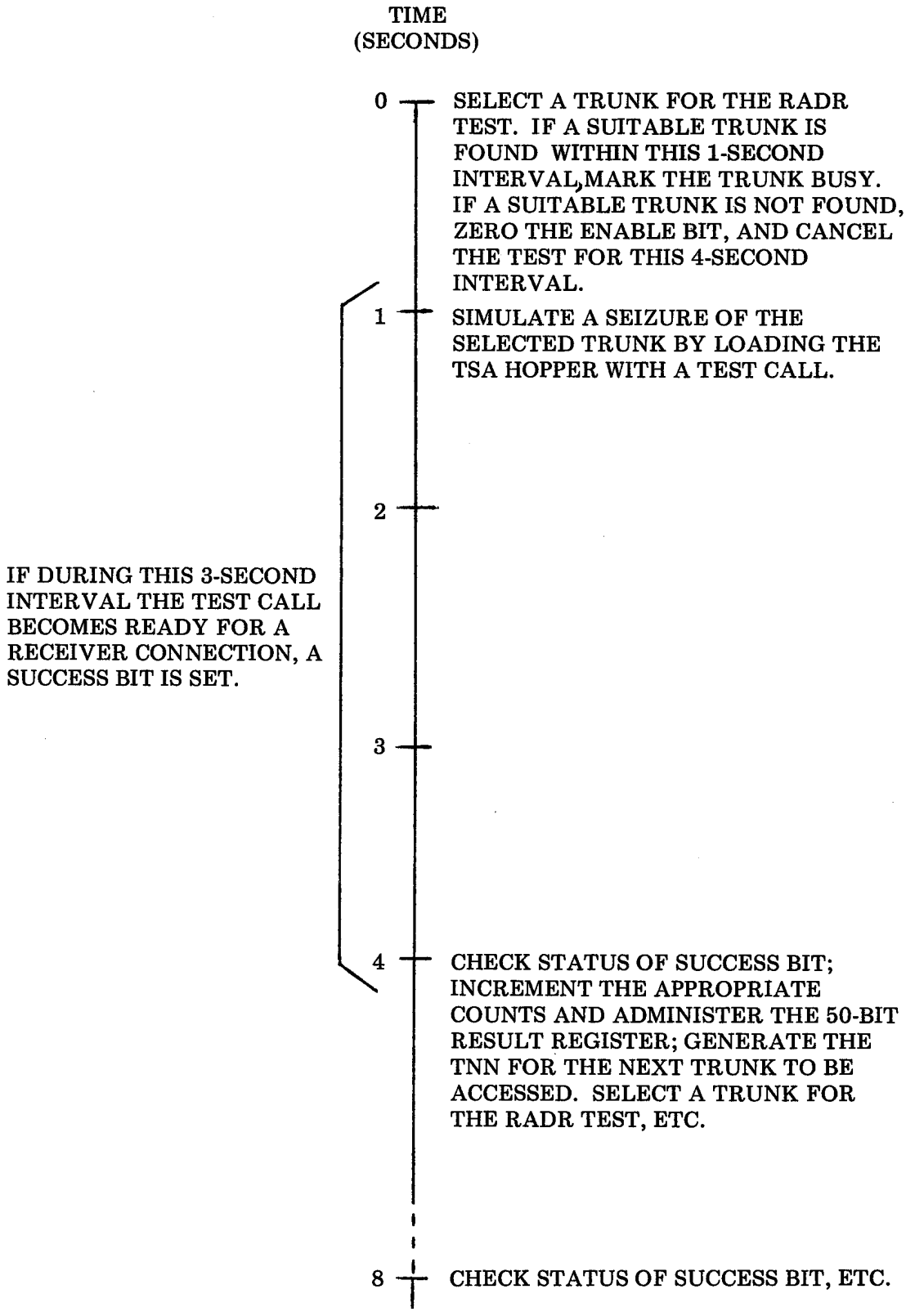

Fig. 2—RADR Timing Summary (2.13)

ESS 1400 (03) TG-1A

TRAFFIC REGISTER ASSIGNMENT RECORD

NO. 1 ESS 2 WIRE

DATE _____

TEL CO 0 1 2 (3 4 5)

BASE 1 2 3 4 (6 7 8 9) CONT. GR. C 0 (10 11)

SCHEDULE H (19)

FORM CODE 8 0 (14 15)

ESS UNIT DISTRICT

LIST NUMBER 1ST & 2ND DIGITS 0 1 (20 21)

TEN'S UNITS (22 23)	TYPE MEASUREMENT CODE (25 26)	EQUIPMENT GROUP OR OFFICE COUNT NUMBER (27 28 29 30 31 32)	FAST SCAN (33)	5 MINUTE COLLECT (34)	2 WORD ITEM	REMARKS
00	0 5	2 1 7				ME RADR Tests
01	0 5	2 2 0				ME Failure Count
02	0 5	2 2 3				DP RADR Tests
03	0 5	2 2 6				DP Failure Count
04	0 5	2 2 9				RP RADR Tests
05	0 5	2 3 2				RP Failure Count
06						
07						
08						
09						
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TEN'S UNITS (22 23)	TYPE MEASUREMENT CODE (25 26)	EQUIPMENT GROUP OR OFFICE COUNT NUMBER (27 28 29 30 31 32)	FAST SCAN (33)	5 MINUTE COLLECT (34)	2 WORD ITEM	REMARKS
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Fig. 3—ESS 1400 Form—Typical Entries (7.06)

TABLE A

TOC02 AND NM17 OUTPUT MESSAGES

TOC02

aaa

aaa = RDM, RDD, RDR, or RDI. The output given is determined as follows:

RDM if the MF trunk failures exceeded their threshold.

RDD if the DP trunk failures exceeded their threshold.

RDR if the RP trunk failures exceeded their threshold.

RDI if the RADR feature is inhibited.

NM17 MF nn% DP nn% RP nn% ,

nn = Failure percentage at the time of output.

TABLE B

TC15 TRAFFIC DATA OUTPUT FORMAT

TC15	aaaaaa	b	cccc	dd:dd	ee/ee/ee
INC	TA	IO	DT	TT	OR
ffffff	hhhhhh	jjjjjj	llllll	nnnnnn	pppppp
gggggg	iiiiii	kkkkkk	mmmmmm	oooooo	
EE/LS	PO/EX	RM	RD	RR	CB/TGC
qqqqqq	ssssss	uuuuuu	wwwwww	yyyyyy	222222
rrrrrr	tttttt	vvvvvv	xxxxxx	zzzzzz	333333
0/0 0:00					

aaaaaa = Office identifying number

b = Originator of printout
- O = Office overload program
- L = Line load control program
- T = Request from traffic TTY
- M = Request from maintenance TTY

cccc = Cause of printout
- MISC = Other than receiver Q overflow
- CDPR = Customer dial pulse receiver queue
- CTTR = Customer TOUCH-TONE® receiver queue
- MF = Multifrequency receiver queue
- RV = Revertive pulse receiver queue
- DP = Dial pulse receiver queue

dd:dd = Time of collect

ee/ee/ee = Date of collect

ffffff = Incoming calls peg count

gggggg = Incoming calls first failure to match

hhhhhh = Tandem calls peg count

iiiiii = Tandem calls first failure to match

jjjjjj = Intraoffice calls peg count

kkkkkk = Intraoffice calls overflow

llllll = Dial tone speed tests, dial tone receivers

mmmmmm = Dial tone delays, dial tone receivers

TABLE B (Cont)

nnnnnn	=	Dial tone speed tests, TOUCH-TONE receivers
oooooo	=	Dial tone delays, TOUCH-TONE receivers
pppppp	=	Originating calls peg count
qqqqqq	=	E-E program cycles
rrrrrr	=	Line scan completion peg count
ssssss	=	POB queue peg count
tttttt	=	Extended dial tone speed test failures
uuuuuu	=	MF receiver attachment tests
vvvvvv	=	MF receiver attachment delays (failures)
wwwwww	=	DP receiver attachment tests
xxxxxx	=	DP receiver attachment delays (failures)
yyyyyy	=	RP receiver attachment tests
zzzzzz	=	RP receiver attachment delays (failures)
222222	=	Network management code block affected calls peg count
333333	=	Network management trunk group control affected calls