SECTION 660-420-010
Issue 1, January, 1970
AT&TCo Standard

AUTOMATIC TRUNK TEST FRAMES ASSOCIATED WITH ATMS CENTRAL OFFICE ADMINISTRATION

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1. GENERAL

1.01 This section covers the use of automatic test frames associated with the Automatic Transmission Measuring System (ATMS). Some test frames are controlled by tapes and some by cards. This instruction applies to both except where otherwise indicated.

1.02 With automatic testing, it is possible to detect and record operational troubles and deviations from transmission loss and noise requirements.

1.03 An automatic test frame is a costly piece of equipment and should be used to maximum advantage by keeping it in continuous operation. The primary purpose of the test frame is to find troubles, preferably before they degrade service to customers. The results obtained from the transmission tests will also be used for the Trunk Transmission Maintenance Index, as covered in the 301 and 660 Divisions of Bell System Practices.

1.04 Listed below are descriptive sections for automatic test frames used with the ATMS.

Automatic Progression Trunk Test Frame (APTT) for No. 5 Crossbar
Section 218-262-502

Automatic Outgoing Trunk Test Frame (AOTT) for No. 4 Crossbar Toll Connecting Trunks
Section 212-512-101

Automatic Outgoing Trunk Test Frame (AOTT) for Step-by-Step
Section 226-591-101

Automatically Directed Outgoing Intertoll Trunk Test Frame (ADOIT) for No. 4 Crossbar Intertoll Trunks
Section 212-514-101

2. ARRANGEMENT OF TRUNK TESTING SEQUENCE

2.01 The trunks may be tested in various sequences, as determined by the office responsible for the trunks or as recommended by the appropriate Plant organization. It is possible for an office to have more than one sequence of accessing the trunks which will be used to make different tests at different times. Periodic trunk testing is made for the primary purpose of identifying troubles so that they can be cor-

rected at the earliest possible moment. A secondary purpose is to obtain data for the Trunk Transmission Maintenance Index.

2.02 To identify troubles, it is desirable to arrange the trunks for testing in such a manner that trouble common to a trunk group or facility is evident from a visual inspection of a full printout.

Operational Tests

2.03 For operational testing, it is desirable to arrange the trunks by terminating office and to list them in order of the trunk numbers. This arrangement will provide a printout which permits troubles common to a trunk group or equipment common to a part of the group to be easily detected. Such an arrangement will also provide a sequence desirable for testing and locating an intermittent operational trouble on a trunk group.

Transmission Tests

2.04 For transmission tests, the most desirable sequence is by facility (carrier system or cable). In most cases, when a facility trouble is noted, it will not be necessary to work on a single trunk. Instead, the trouble can be referred directly to the carrier or other responsible organization for clearance. When the trouble is cleared on the carrier or other transmission system, all the special services as well as the trunks assigned to that system benefit. There will also be less tendency to maladjust individual trunks, thereby masking the real trouble.

2.05 Normally, when arranging trunks by facility, the first facility out of the originating office is used when trunks are routed over more than one facility in tandem. There will be exceptions to this procedure when the first facility is not the major facility in the trunk. In grouping trunks by facility for tests, it may be advantageous to test them in the order of channel numbers rather than trunk numbers. This may help in the analysis of trouble and in determining what action should be taken.

2.06 For transmission index purposes, the trunks should be grouped so that the deviation register readings can be used directly for computing the index. For example, a separate index is computed for trunks with E-repeatered and nonrepeatered facilities and another for trunks with carrier and other than E-type repeatered facilities. Also, on the office report, a separate index is computed for trunks measured at different intervals. Therefore, after grouping the trunks by facilities, they should be subgrouped by the required test intervals. It is necessary that one tape or card deck contain only those trunks that have facilities for only one component of the Trunk Transmission Index and that are to be measured at the same measuring interval. For example, if trunks with one type of carrier are measured weekly and those with another type are measured semimonthly, separate tapes or card decks should be used for each type. In this way, the ATMS deviation registers can be read at the conclusion of the tests for a particular tape or card deck, and the readings can be used directly in the computation of the index.

3. TEST INTERVALS

3.01 To provide the quality of service required, it is necessary to perform operational and transmission tests as often as practical.

Operational Tests

3.02 Schedules should be set up to perform a supervision and ringing operational test (including rering test if available) on each trunk at least once a month. This test is also referred to as a 103, test line supervision, synchronous test line or nonsynchronous test line test. Also schedules should be set up to make all the other types of operational tests available for each trunk. There will be wide variations in the frequency at which the different tests are scheduled due to the type of trunk, type of switching system at the originating end, and the features to be tested. Trunk groups should be tested more often than scheduled, where excessive failures are noted.

Transmission Tests

3.03 Recommended transmission intervals are covered in Section 660-402-300. Shorter intervals can be scheduled, and in some cases this will be desired. Section 660-402-300 also specifies that trunks having more than one mode of operation should be measured in all modes. For example, two-way trunks can be accessed from either end and different office wiring paths are involved. Initiating calls and measuring from both ends ensures that both incoming and outgoing machine appearances of the trunk are satisfactory. The mode which the noncontrol office accesses the trunk should be measured at the same frequency as a trunk without gain devices.

3.04 The Trunk Transmission Maintenance Index requires that the measurements for each measuring interval must be summarized separately by each central office. Otherwise the many measurements on those trunks measured most frequently would overbalance those measured less frequently. One restriction that the system computer program for summarizing transmission results for index purposes (available in 1970) imposes is that it will not accept any interval for automatic tests with a frequency interval longer than monthly or shorter than weekly.

3.05 On trunks scheduled weekly, monthly, and semimonthly, the deviation register readings will be submitted separately for the three intervals. When offices schedule and measure a given set of trunks ***more often than weekly,*** one of the following methods in submitting register readings for index purposes must be used.

Method 1: When ***all*** trunks are measured more than once per week, ***all*** deviation register readings can be submitted as if they were all weekly measurements.

Method 2: When there is a combination of: (1) trunks measured only once a week and (2) trunks measured more often than once per week, the following rule is applicable: Only one deviation register reading per trunk per week can be submitted for any trunk. This is to prevent the index from being overbalanced by numerous measurements from the trunks measured most frequently. Therefore, control cards and tapes should be arranged to facilitate the obtaining of separate single register readings for ***only one run per week*** for trunks measured more often than once per week.

4. TEST SCHEDULES

4.01 Automatic tests should be scheduled so that a minimum number of busy trunks are encountered. Therefore, it is recommended that tests be scheduled during the trunk nonbusy hours.

4.02 Generally, operational tests should be scheduled during the evening hours Sunday through Saturday and during days on Saturdays, Sundays, and holidays that do not have heavy traffic. Transmission tests should be scheduled nights Sunday through Saturday.

4.03 Because of the small amount of data which can be obtained, schedules for routine operational or transmission tests are not desirable during the normal trunk busy hours of the day tour. During this period, test frames can be used for special tests on intermittent and chronic troubles and for making special printouts. However, when the test frame is not being used for scheduled or special tests, it should be kept in operation with some type of operational test.

4.04 Most of the test frames can be operated on an unattended basis and arranged to start at a predetermined time. Hence, they can be used even though coverage of the office is limited or is not provided.

5. RESULTS ANALYSIS

5.01 Results must be analyzed to determine where corrective action should be applied. Results should be appraised on an individual trunk, facility, and trunk group basis.

5.02 The output data for operational failures and deviations (loss and noise) beyond the established cue limits should be held for a period of time after the initial investigation, and compiled for analysis. Analysis of information over a period of time may detect trouble patterns that develop in test lines and trunks which is not detectable on a day-to-day basis. For example, it may be found that the operational failure indications are obtained frequently when testing to a particular 104-type test line, but the failures may not be occurring on the same trunk each time. This could indicate an intermittent test line trouble. On the other hand, it may be found that an operational failure indication is obtained frequently on one trunk to a 104-type test line, but does not fail when tested manually. This could indicate an intermittent trouble on the trunk.

Operational Tests

5.03 When the associated typing unit is being used in the off-line condition to produce special printouts, an output record will not be made automatically. Instead, the test frame will stop and alarm when a test fails on a trunk. These failures should be recorded manually and used with the printout information for analysis.

5.04 During operational tests, corrective action should be started on service-affecting failures immediately. The investigation of one trunk trouble may result in clearing a trouble that affects several trunks. Normally, intermittent troubles can be found with less effort when trouble clearance is started immediately.

Transmission Tests

5.05 During scheduled transmission tests, the full printout mode should be used.

5.06 Before any corrective action is taken on the individual trunk, a check of the full printout should be made for trouble patterns on the facilities, common equipment, or trunk group. This may prevent the maladjustment of the individual trunk equipment. For example, assume that a maintenance limit of 1.0 dB deviation is being used (cue 1). While only one or two trunks assigned to the channel group have a cue 1, an inspection of the full printout may show that the trunks on the other channels have deviations of 0.7 to 0.9 dB. This indicates that the carrier system is in trouble. When the carrier system trouble is cleared, all the trunks are improved. If channel lineups had been made on the one or two trunks, they would have to be readjusted when the carrier trouble was cleared. The same procedure can be used for detecting noise patterns affecting the carrier or cable facility.

5.07 Individual trunks that deviate more than ±3.7 dB for loss or beyond immediate action limits for noise must be removed from service immediately for corrective action. The full printout should be examined for evidence of system trouble affecting other trunks to a lesser degree on the system. In this case, the carrier system trouble should be cleared and then the trunk that had over 3.7 deviation should be investigated and brought within limits, if it is not already there.

5.08 All trunks that measure above the noise maintenance limit should be entered on Form E-593D, as covered in Section 660-403-010 or equivalent record. This information is necessary for control and index purposes. Care should be taken that the same trunk is not entered more than once on Form E-593D.

A. Card Controlled Test Frames

5.09 For automatic test frames using card control, the output cards should be sorted after each test run. This is necessary in order to separate the different types of operational and transmission troubles and to determine their disposition for trouble clearance. A review of output information may show that troubles can be referred to more than one maintenance group, thereby expediting trouble clearance.

5.10 Output cards can be sorted by visual inspection or by use of a card sorter, or both. For example, when the ADOIT is operating with the COM switch in the B012 position (busys, operationals, Q1, Q2), output cards will be produced that can be sorted on columns 33

and 80. (See Chart I attached.) Sorting on column 33 will separate transmission failures from operational failures. Output cards with a cue number punched in column 33 can be separated into pockets numbered on the card sorter that correspond to transmission cues in Table A. The cards that fall into pockets 1 and 2 will have to be visually inspected to determine if the deviation exceeded is noise or loss. In most cases, visual sorting will be faster than re-sorting these cards on the noise and loss columns with the card sorter. Output cards that have no punches in column 33 will fall into the reject pocket. Cards in the reject pocket are due to operational failures. Trunks that test busy or go to reorder or announcement will cause a 0 (zero) to be punched in column 80. A sort on column 80 for 0 (zero) will remove these cards from the reject stack. All operational failures will cause a 3-letter code to be punched in columns 34, 35, and 36 of the output card. For example, announcement will print ANN and high-and-dry will print HAD. After sorting on column 80 for 0 (zero), the cards that fall into pocket 0 (zero) of the card sorter must be inspected visually to separate the three types of troubles. The remaining cards in the reject stack can be visually inspected to separate cards into trouble classes, or a sort can be made on columns 34, 35, and 36. Normally, visual sorting at this point will be less time-consuming than using the card sorter.

5.11 Card sorting procedures are covered in Section 212-514-303 and instruction manuals are furnished with the card sorter.

B. Tape Controlled Test Frames

5.12 For automatic test frames using tape control, the output information must be taken from the printout for trouble clearance. The sequence that the information is removed may vary between offices or trunk groups within an office. The following sequence could be used with a printout resulting from ***transmission tests.***

First – Scan the printout for Q2 symbols. These are loss and noise deviations beyond immediate action limits.

Second – Scan the printout for operational cues other than busy. These cues indicate that the trunks may be inoperative.

Third – Scan the printout for cue 1 symbols. These are trunks where the loss or noise deviations have exceeded the maintenance limit.

Fourth – Check the printout for indications of test line trouble.

Before taking corrective action on the individual trunks, check for trouble patterns, as covered in 5.06.

5.13 When the printout shows a trunk failure during operational tests, it should be manually tested and removed from service immediately if service-affecting trunk trouble is indicated.

6. RETESTING

6.01 Retesting is necessary to: (1) verify that corrective action is necessary and (2) that corrective action was effective.

6.02 Trunks indicating individual trunk trouble from the printout during the scheduled tests should be retested automatically at the test frame or retested manually. Due to the lapse of time between the scheduled automatic test and the pick-up time, the trouble may have cleared out. Also, retesting after the scheduled test will result in only the solid troubles being referred to the proper force group for corrective action. Printout results that indicate facility trouble can be referred directly to facility groups for corrective action.

6.03 All trunks worked on should be retested manually immediately after corrective action is completed. An automatic retest of the trunk should be done, when possible. This generally provides a better check of the trunk than a manual test, and provides a printed record of it. On tape-controlled test frames, it is not economically feasible to make a retest tape to retest the trunks automatically, because of the time required. If the number of retests is not

too great, it may be possible with some test frames to operate the appropriate keys on the test frame to test individual trunks.

6.04 Busy output tapes or cards produced during transmission testing can be rerun at the completion of the regular run or prior to the start of the regular scheduled transmission tests at night. The objective is to provide a period for retests when a minimum of busy trunks are encountered. Obviously this same theory could be used to perform automatic retests of trunks that were worked on during the day.

7. TEST LINE CHECKS AND REFERRALS

7.01 Offices with automatic test frames should use the test frames to check the accuracy and operation of their own transmission and noise measuring test lines daily.

7.02 These test lines are used by many offices but not by the office where they are located. Faulty operations or inaccuracy of the equipment can seriously affect the validity of transmission and noise measurements of many offices.

7.03 Requirements that the 104-type test line should meet are covered in Section 103-235-300. These test lines in offices with automatic transmission test frames should be checked automatically at the beginning of the daily run.

7.04 An automatic self-check of the responder is provided when testing to the 105-type test line. This is done automatically at the beginning of the measurements on a new trunk group. The requirements are covered in Section 103-250-100. The 105-type test line in the home office should be tested automatically at the beginning of each routine transmission run where the feature to do so has been provided in the test frame.

7.05 Any time trouble, intermittent or solid, is observed on a test line (operational or transmission), it should be referred to the proper office for clearance. A record should be kept of the referral showing time, date, trouble referred, and to whom it was referred. There should be a record of follow-up each day, unless arrangements are made for a return report at a specific time on corrective action taken.

8. INPUT UPDATING AND VERIFICATION

8.01 Control tapes and cards are expected to be supplied, updated, and verified from a centralized location. Verification can be done locally and still may be desirable, depending on the completeness of the centralized verification. There should be a well-defined procedure for referring errors or omissions to the centralized card and tape preparation center for correction.

Control Cards

8.02 Controls should be set up to record trunk circuit order additions, rearrangements, changes, and deletions as they are received in the office. It is desirable that the card deck be updated on the due date of the circuit order. If the cards are available when circuit order tests are made, use them for preservice tests with the automatic test frame.

8.03 Verification of the control deck should be made annually to ensure that all trunks are included and that the correct information is assigned for each trunk.

8.04 Since circuit layout record cards are filed by trunk group, the card decks arranged by trunk groups need only to be run for a printout. Facility decks must be sorted in trunk group sequence for the printout, and then back to facility grouping. The printout then can be checked against the circuit layout records to verify that all trunks are included, and that the correct facilities (carrier system or cable) and priming information are assigned.

Control Tapes

8.05 Controls should be set up to record trunk circuit order additions, rearrangements, changes, and deletions as they are received in the office. Updated tapes should be available at least once a month. Discontinued trunks left on the tapes beyond the effective date will test busy and should be noted as discontinued

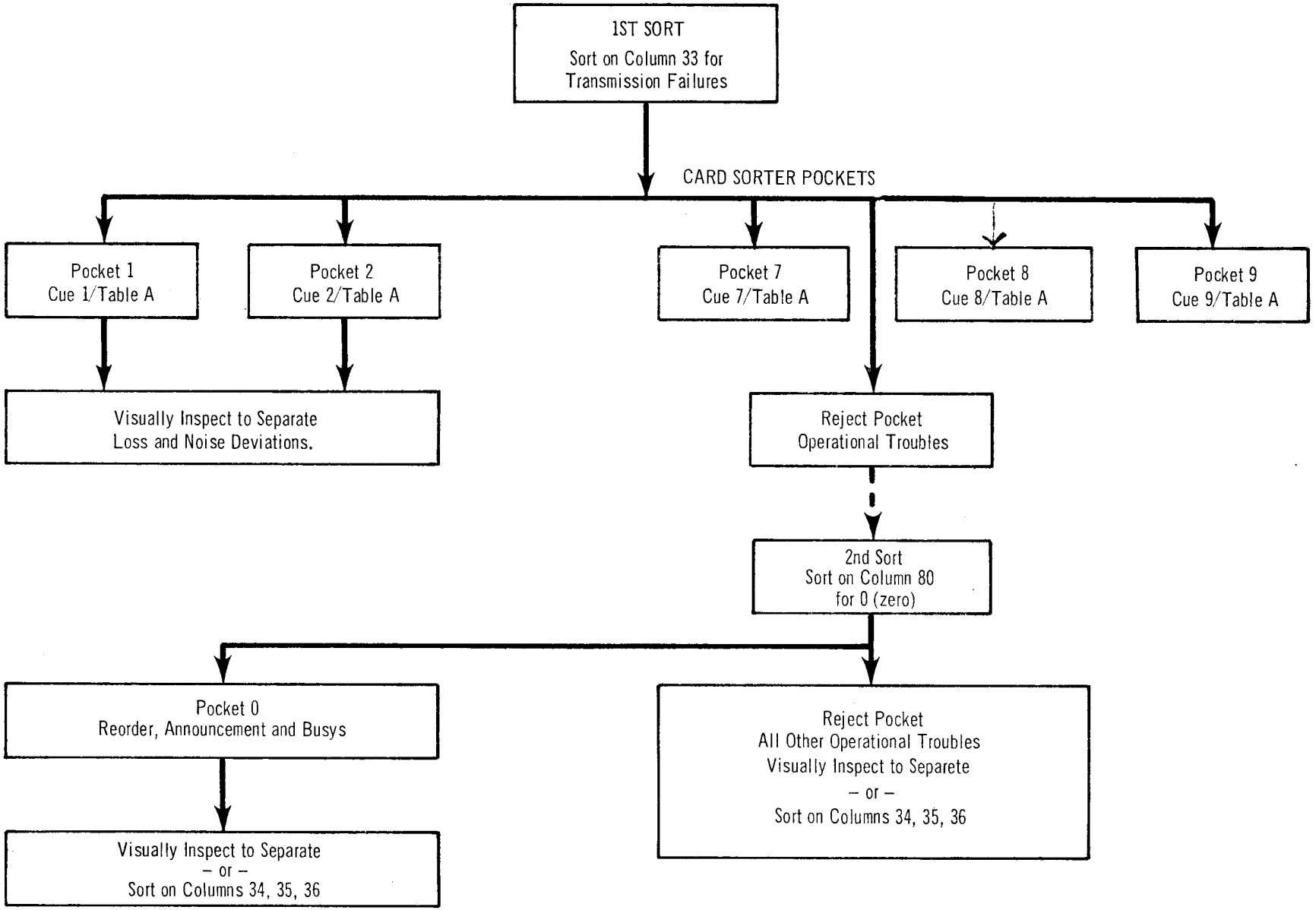
trunks on the printout. It may be desirable to remove these trunks from the tapes on the due date, using the rubout feature of the teletype machines.

8.06 Verification of the control tapes should be made annually to ensure that all trunks are included, and that the correct information for each trunk is on the tape. Control tapes must be run to provide a printout. The printout could then be checked against the circuit layout records to determine the accuracy of the tapes.

TABLE A – TRANSMISSION CUES

CUES	INDICATION
0	Successful ATMS self check (Director and Responder).
1	Loss or noise deviation exceeded maintenance limit. If any of the four measured values exceeds a maintenance limit, but not the immediate action limit, this cue is printed on the repeat test if the trunk is tested twice or on the initial test if tested only once.
2	Loss or noise deviation exceeded immediate action limit. If any of the four measured values exceeds the immediate action requirement for loss or noise, this cue is printed on the repeat test if the trunk is tested twice or on the initial test if tested only once.
7	Failure of ATMS to complete normal functions on transmission test.
8	On 104-type; receipt of repeat signal from TMANC (Transmission Measuring and Noise Checking Circuit). On 105-type test; failure to receive data signal from responder.
9	ATMS self check failure (Director or Responder).

CHART I


1ST SORT
Sort on Column 33 for
Transmission Failures
CARD SORTER POCKETS
Pocket 1
Cue 1/Table A
Pocket 2
Cue 2/Table A
Pocket 7
Cue 7/Table A
Pocket 8
Cue 8/Table A
Pocket 9
Cue 9/Table A
Visually Inspect to Separate
Loss and Noise Deviations.
Reject Pocket
Operational Troubles
2nd Sort
Sort on Column 80
for 0 (zero)
Pocket 0
Reorder, Announcement and Busys
Visually Inspect to Separate
– or –
Sort on Columns 34, 35, 36
Reject Pocket
All Other Operational Troubles
Visually Inspect to Separete
– or –
Sort on Columns 34, 35, 36