ROUTINE OPERATIONS AND MAINTENANCE PROCEDURES

CONTENTS PAGE

LIST OF FIGURES

LIST OF TABLES

10. REMOTE OFFICE TEST LINE

10.1 GENERAL

This section describes the functions and equipment of the remote office test line (ROTL) for the 5ESS® switch.

The ROTL is a feature that allows interoffice trunk testing automatically from a Centralized Automatic Reporting on Trunks (CAROT) system. The CAROT system is a computerized system that automatically accesses and tests trunks for a maximum of 14 offices simultaneously. The 5ESS switch ROTL supports the following capabilities:

- Transmission tests—100, 102, and 105 test lines
- Connection appraisal—100, 102, and 105 test lines
- Security callback
- Trunk make-busy and restore
- Trunk status request
- Balance and long-term test.

Note: The 100, 102, and 105 test lines are at the far end of the trunk. Transmission test calls and connection appraisal calls are placed via ROTL toward the distant test lines. The 5ESS switch ROTL supports test calls toward the indicated test lines by providing trunk access and seizure, outpulsing of the digits necessary to reach the test line, and a tone detection capability which recognizes when the indicated test line has answered the test call.

The same transmission tests performed by CAROT/ROTL can be requested locally with the "TST:TRK" input message and with poke commands at the trunk and line work station (TLWS).

The ROTL functions are answering calls from CAROT controller, receiving information in the form of multifrequency (MF) digits, and causing trunks to be accessed and attached to the responder for transmission measurement.

The 5ESS switch should be equipped with at least two ROTL ports. It has the ability to park incoming ROTL calls by returning test progress tone back to the CAROT system while ROTL waits for the resources needed to complete the calls. The tone detector that listens for recycling is the resource that is unavailable. The number of ROTL calls that can be parked is determined by the number of ports assigned to ROTL. The number of ROTL calls that can be served simultaneously is determined by the lesser of the number of ports and the number of transmission test function (TTF) circuits available to ROTL. The minimum TTF configuration contains one measurement circuit pack (TN304). It is capable of supporting one ROTL call. Some of the circuits on this circuit pack are shared with other test features and contention can occur. The most heavily used resource is the responder and ROTL is given a higher priority than other users of this resource. Additional measurement circuit packs may be added in a global digital service unit (DSU) group if unequipped circuit pack locations in the unit are available. Each TN304 circuit pack will accommodate one ROTL call. Two TTFs can be assigned in an switching module (SM) if the SM is equipped with two global digital service units (GDSUs). Any number of SMs can be equipped with TTFs. To make use of the additional TTFs, ROTL ports would have to be assigned across the respective switching modules.

Other ROTL functions are determining the test call instructions, seizing the trunk, and causing outpulsing over the trunk under test to the distant office.

10.2 EQUIPMENT

In the 5ESS switch, the ROTL hardware functions are provided by the TTF which is a group of circuit packs in the global DSU. These circuit packs are not provided exclusively for ROTL, but ROTL utilizes the capability provided by this hardware to perform its functions. The ROTL software uses the TTF to perform the following functions:

- Detect tones from CAROT (not MF-priming digits)
- Perform call disposition analysis for the trunk under test
- Perform measurements, encode the results, and send them to CAROT
- Send a detailed error code to CAROT in response to a ring forward
- Internally connect a digital path from the trunk under test to the CAROT path.

The TTF accesses voice-frequency channels only through the bit stream as provided over the peripheral interface data bus (PIDB). Direct control resides within the module controller of the module in which it is located, and such control is exercised by software interaction over the peripheral interface control bus (PICB).

10.3 TRUNK CONDITIONING

The CAROT Test Center can perform the following functions:

- Perform a security callback
- Remove trunks from service
- Restore trunks to service
- Request the status of a trunk or group of trunks [in-service or out of service (locked out or disabled)].

These functions are requested by the test center via MF commands.

10.3.1 TRUNK MAKE-BUSY AND RESTORE

When the 5ESS switch system software receives a request to make a trunk remote maintenance-busy or a request to restore the trunk to service, the response is as follows:

a. A determination is made whether or not authorization has been established for the make-busy or restore request. If authorization has not been established (that is, a security callback has been performed), a 120-interruptions per minute (IPM) low tone is sent to the control location.

b. If authorization has been established, the trunk identification and the action request (make-busy or restore trunk) is passed to the software controlling trunk status AT&T 3B20D computer memory.

c. When the trunk status has been updated, a message is returned to the ROTL and a message is printed in the 5ESS switch. The printed message lists the action taken.

d. The ROTL then returns a proper tone response to the CAROT controller. Refer to Table 10-1 for proper tone responses.

The make-busy and restore request is handled by the 5ESS switch software and an MF receiver that is shared with call processing.

10.3.2 SECURITY CALLBACK

To prevent unauthorized remote locations from taking trunks out of service, several conditions must be satisfied prior to affecting the condition of a trunk. First, the remote location must identify itself as being on an authorized list. The identification (ID) digit, supplied in the priming, must correspond to a valid entry in the office dependent data (ODD) relation "ROTLCB". Second, the 5ESS switch must place a call to a prestored directory number and connect the tone detector to the callback circuit. Third, the remote location must transmit the unlocking frequency (1004 Hz) to the ROTL over the callback circuit. Fourth, the ROTL (tone detector) must recognize the unlocking frequency and must declare that authorization has been established. The authorization list states whether a particular test center is authorized to exceed the automatic maintenance limit (AML). Currently, only manual test centers are allowed to exceed the AML. The AML limits the total number of trunks in a trunk group which can be in an out-of-service condition at any one time. Once a security callback is performed, it is effective until the caller disconnects.

10.3.3 TRUNK STATUS REQUESTS

In addition to conditioning trunks, any test center can request the maintenance-busy status of either a single trunk or a trunk group. A single-trunk request is followed by the trunk identity (trunk group and member), and it asks if that trunk is currently available to customer traffic. A group request asks if any trunk in the group is maintenance-busy, and if so, if there are more trunks than the AML permits maintenance-busy in the group. The proper tone responses are summarized in Table 10-2.

10.4 TESTS PERFORMED BY ROTL

10.4.1 GENERAL

The 5ESS switch ROTL is capable of making test calls to 100-type, 102-type, and 105-type far-end transmission test lines. The transmission measuring circuits perform loss and noise measurements, and self-checks on an originating and terminating basis. Far-to-near transmission loss and near-end noise measurements are made in conjunction with the 100-type test line. Only far-to-near loss measurements are made with the 102-type test line. The 105-type test line provides 2-way transmission loss and noise measurements, noise with tone, gain slope, and return-loss measurements.

The test center (Figure 10-1) originates a call to the ROTL office via a Direct Distance Dialing (DDD) network connection. The call is processed with the central office switching equipment in the same manner as a regular call. When the ROTL has been seized, it returns a 2225-Hz test progress tone to the test center. When the 5ESS switch is prepared to receive test priming information (an MF receiver is connected), the test progress tone is turned off. This is an indication to the test center to transmit priming information to ROTL. This priming information includes the type of action to be performed. Any error detected in the priming information will result in 120 IPM being returned by ROTL. When the action specified is a transmission test, the priming information also includes the trunk under test identity and the far-end test line (FETL) digits. Refer to Table 10-3 for a summary of ROTL priming information. At the conclusion of each action (either successful or unsuccessful), ROTL can be given a recycle command (1 second of 1300 Hz). The ROTL will return to the state of preparing to receive digits. The ROTL will send the test progress tone and when it is ready to receive a new command, the test progress tone will terminate. At the conclusion of all testing, CAROT sends a drop access command (2 seconds of 1300 Hz) which causes ROTL to disconnect. If CAROT disconnects, ROTL will also disconnect and release all resources associated with the call.

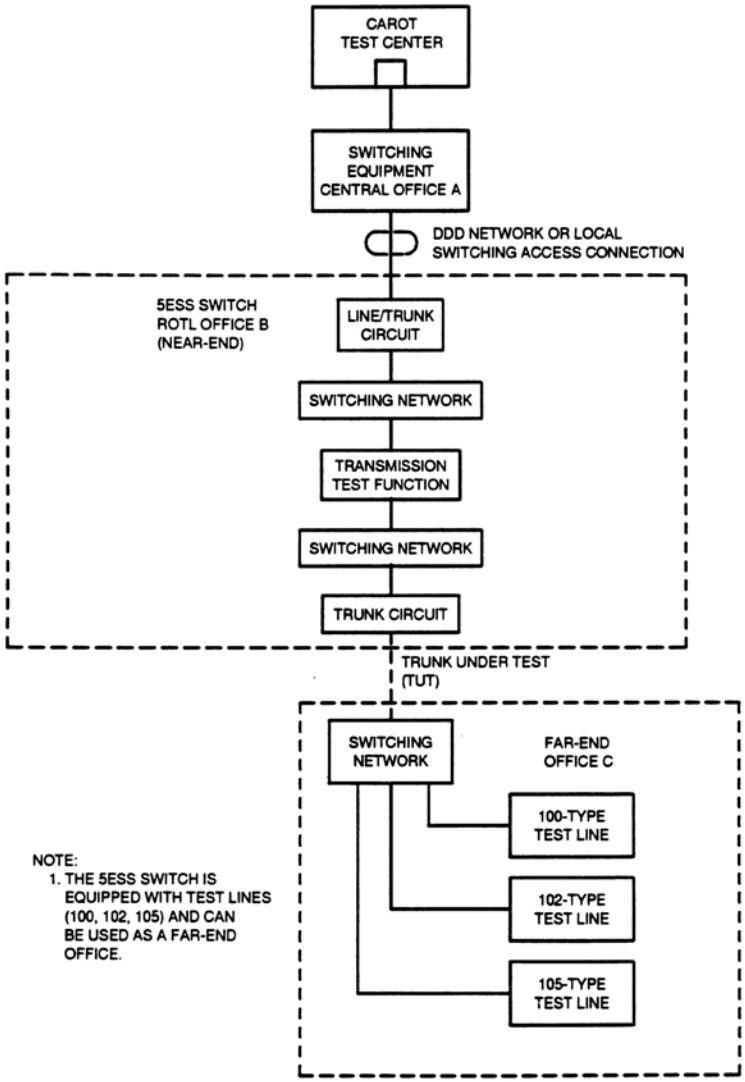


Figure 10-1 — 5ESS Switch ROTL Application

10.4.2 REMOTE OFFICE RESPONDER TESTING

10.4.2.1 Transmission Tests (100-Type Test Line)

This test is a 1-way (far-to-near) loss and/or noise transmission test to a 100-type test line in the far-end office. The test center transmits MF test priming information to the 5ESS switch which is interpreted by the ROTL program. The ROTL program decodes the priming information and connects a TTF tone detector to the trunk under test (TUT) and reserves a TTF responder. If either of these resources are not available, ROTL will queue them. When the TUT is seized, a 0.5-second burst of test progress tone is sent to CAROT by ROTL. The FETL number is outpulsed exactly as received in the priming. The far-end office connects to a 100-type test line. Then, the far-end office transmits a nominal 1004-Hz for a nominal 5.5 seconds to the ROTL office. This tone is followed by a quiet termination. The tone is detected by ROTL and another 0.5-second burst of test progress tone is sent from ROTL to CAROT. If prior to the 1004-Hz tone any audible rings or other signals (low tone) are heard by ROTL, it will send low tone to CAROT that follows the envelope of the received signal. Reorder or busy tone will appear to be heard directly from the far end by CAROT, but actually the tones have been regenerated. If the test progress tone is heard instead of the expected milliwatt tone, reorder will be sent to CAROT. The near-end responder is activated and a third 0.5-second burst of test progress tone is sent to CAROT. This tone is the signal that CAROT can start making measurements. If the responder in the near-end office is requested by the test center to make a 1000-Hz loss measurement, the near-end responder measures the received signal from the trunk under test. The responder then generates a measurement data signal consisting of a 1200-Hz guard tone and a 2200-Hz data tone followed by a 1200-Hz trailing guard tone. The duration of the data tone is proportional to the amplitude of the received signal. The measurement data signal is forwarded to the test center. Then, the ROTL office sends a 1000-Hz signal to the test center for as long as the 1000-Hz signal is present from the far-end office. The near-end responder resets when the tone is turned off by the far-end office to await additional MF commands from the test center. The ROTL will continue to wait for measurement commands until one of the following is received:

- CAROT disconnects
- Recycle
- Release
- Release/make-busy.

The maximum elapsed time is 3 minutes.

10.4.2.2 Transmission Tests (102-Type Test Line)

This test is a 1-way loss test (far-to-near) to a 102-type test line in the far-end office. It follows a pattern similar to the 100-type test line. The test center transmits MF test priming information to the 5ESS switch which is interpreted by the ROTL program as a request to connect to the trunk under test. The terminating 102-type test line directory number is then outpulsed to the far-end office over the trunk under test. Unlike the 100 test, no TTF responder is reserved at this point. When the test line is seized at the far-end office, the 102-type test line transmits 1000 ±10 Hz at 0 dBm to the ROTL office. When this tone is detected, the second burst of test progress tone is sent to CAROT as in the 100-type test line call. At this point, ROTL requests a TTF responder. The third burst of test progress tone is started when the responder is requested, terminated, available, and ready to make measurements. These types of test lines interrupt the signal periodically at approximately 10-second intervals. The responder in the ROTL office makes a loss measurement only when the tone is present so that the interruption in the 1000 Hz from the 102-type test line does not cause any error in the measurement.

10.4.3 RESPONDER-TO-RESPONDER TESTING

10.4.3.1 Transmission Tests (105-Type Test Line)

10.4.3.1.1 General

Responders provide 2-way transmission loss and noise measurements and a variety of other measurements of the trunk under test. The test center controls the measurements of trunks between the near-end office and a far-end office containing the 105-type test line. All measurement results on the trunk under test are sent back to the test center in the form of frequency-shift data signals.

The 105 call follows a pattern similar to the 100-type and 102-type test line calls. When the trunk under test has been seized, the first burst of test progress tone is sent and the directory number of the far-end 105-type test line is outpulsed. The far-end sends back test progress tone while it is queuing for a responder. The test progress tone is terminated when the far-end responder is ready. The termination of this test progress tone causes the second burst of test progress tone to be sent to CAROT by ROTL. After the connection has been established and the far-end responder has been connected, ROTL makes a bid for the near-end responder at the ROTL office. The third burst of test progress tone is sent to CAROT while waiting on a responder as in the 102-type test line call. When the responder is available, control is given to the CAROT Test Center. The test center controls the action of the responder.

10.4.3.1.2 Loss Measurements

Loss measurements are initiated when the test center sends a 2/6-MF command signal, which requests loss measurements, to the ROTL responder and to the far-end responder.

The ROTL responder sends the 1200-Hz guard tone to the test center. Simultaneously, the far-end responder sends a 1004-Hz (1-mw) test tone over the trunk under test. This tone level is to be measured by the ROTL responder.

The ROTL responder measures the 1-kHz signal received from the far-end responder. It converts the measured loss to a 2200-Hz data tone. Then, the ROTL responder transmits the 2200-Hz data tone to the test center immediately following the 1200-Hz guard tone. The 2200-Hz data tone is followed by a second 1200-Hz guard tone. The ROTL responder also transmits a 1000-Hz (1-mw) test tone to the far-end responder after the far-to-near transmission test has been made. The 1000-Hz test tone transmitted to the far end from the ROTL responder allows the near-to-far loss on the trunk under test to be measured.

The far-end responder measures the level of the 1000-Hz signal from the ROTL responder. The received signal is converted to a 2200-Hz data signal which is transmitted back toward the test center along with guard tone on both sides of the data signal. The value of the measurement is indicated by the length of time that the responder sends 2200 Hz. The relationship between the measurement and length of the 2200-Hz signal is logarithmic. The ROTL responder detects the 1200-Hz guard tone. When the guard tone is detected, the trunk under test is bridged to the access connection. The access connection routes the measurement results to the test center. After completing the loss measurements, the responders return to a signal-receive state awaiting further command signals from the test center.

10.4.3.1.3 Noise Measurements

Noise measurements are initiated when the test center sends the appropriate 2/6-MF command signals to the ROTL responder and far-end responder.

The far-end responder terminates the trunk under test. The ROTL responder measures the near-end noise, converts the measurements into a 2200-Hz data signal, and transmits this signal (as guard-data-guard) to the test center. The test center then sends a second 2/6-MF signal to the responders.

The far-end responder recognizes the MF signal and measures the far-end noise. During the measurement, the ROTL responder provides a termination for the trunk under test. The far-end responder transmits a 1200-Hz guard tone, followed by the 2200-Hz data signal, and then 1200-Hz guard tone toward the test center. The ROTL responder detects the 1200-Hz guard tone and bridges (cuts through) the trunk under test to the access connection, so that the guard-data-guard (2200-Hz data signal) from the far-end responder can be sent to the test center. The responders then return to a signal-receive state awaiting further MF command signals from the center.

The test center causes self-checks to be made on both near-end (simulated) and far-end responders for loss, noise, and other tests that are requested. The results of the self-checks are transmitted back to the test center. These tests consist of the following:

- Return-loss measurement
- Noise with tone measurement
- Gain-slope measurements.

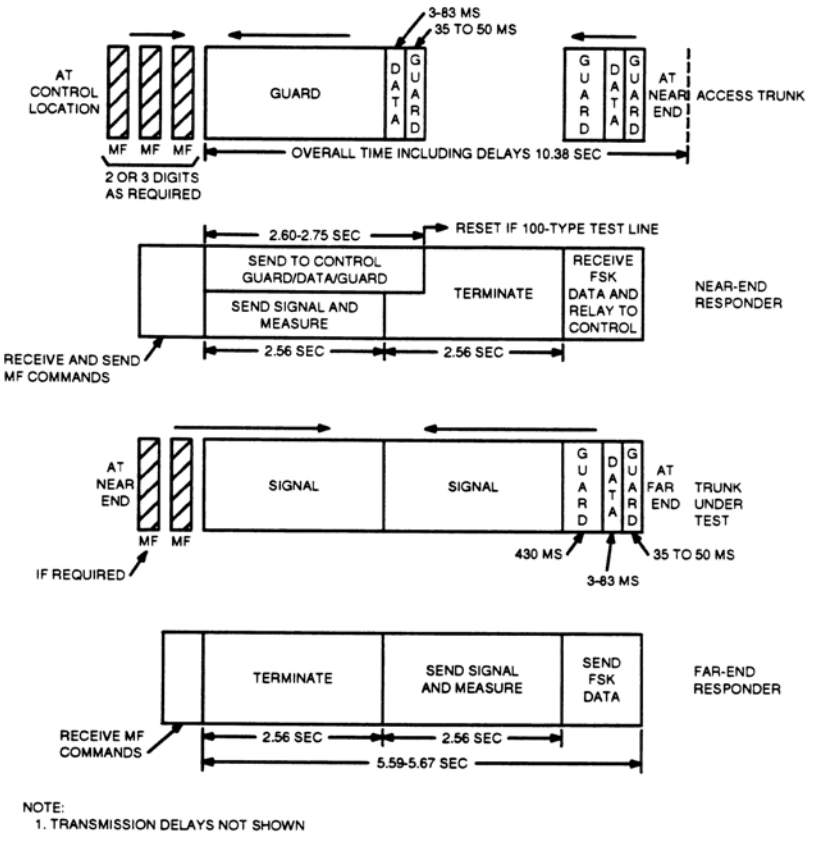
The return-loss measurement is initiated when the near-end responder receives 2 or 3 MF digits as a request for a return-loss measurement. It relays the layer 2 (and 3, if required) MF digit(s) which denote the test desired to the far-end responder (Table 10-4). The far-end responder applies quiet termination for 2.56 seconds upon receipt of the MF command. The three return-loss tests are: echo return-loss, singing return-loss, and singing return-high loss. All three tests have the same timing.

As soon as the near-end responder receives the test request, it starts sending a guard tone (1200 Hz) to the control location. A guard tone is sent for 2.6 to 2.75 seconds. At the same time, the near-end starts transmitting the proper signal to the far end and also measuring the return-loss. The "return-loss" signal is not a signal sent by the far-end responder but is the portion of the transmitted signal which is reflected back. The transmit-measure process lasts for 2.56 seconds. Note that the 2.56-second quiet termination provided by the far-end responder will not be in exact synchronism with the near-end quiet termination due to transmission delays.

After the near-end responder completes the measurement, it sends data (2200 Hz) to the control location. The duration of the data signal is proportional to the return-loss measurement. Then the near-end sends a guard tone for 25 to 50 milliseconds. As soon as the near-end completes the measurement, it also applies a quiet termination to the trunk under test. This quiet termination lasts for 2.56 seconds. At the end of the 2.56-second quiet termination interval, the near-end is ready to receive data from the far-end. It will wait for data for 2.56 seconds, and if none is received in that period, the near-end resets. If data is received, the near end relays it to the control location, and at the end of the signal, resets.

After the far-end receives the test request (MF) digit, it applies a quiet termination for 2.56 seconds as previously described. It then transmits the test signal (according to which return-loss test is being performed) and measures the return signal for 2.56 seconds. It then transmits the measurement to the near-end in the guard-data-guard format as described for the near-end responder. The far-end responder then resets.

Note that the time intervals as shown in (Figure 10-2) for the far- and near-end responders are not synchronous. Transmission delays are not shown.



NOTE:
1. TRANSMISSION DELAYS NOT SHOWN

Figure 10-2 — Timing Interval for Return Loss Measurements

The noise with tone measurement is the same as the loss measurement described in Part 10.4.3.1.2 of this section except for the following:

- The received tone is processed in the noise measurement path with the addition of a 1000-Hz band rejection filter.
- The transmitted tone from the far-end responder toward the near end is always 1004 Hz at -16 dBm. This is the first action that the far-end responder takes after satisfactorily receiving a command to make the noise with tone measurement.

The gain slope measurements involve making loss measurements at the following three frequencies and levels:

- 404 Hz at -16 dBm
- 1004 Hz at -16 dBm
- 2804 Hz at -16 dBm.

The three frequencies are used to measure the bandwidth of the trunk which is the range of frequencies that the trunk can transmit.

Table 10-4 summarizes the ROTL responder interpretation of the MF signals from CAROT or other locations. The column labeled "MF Signals" shows the sum of two frequencies. The power of the two tones is measured as though the tones were continuous.

There are four columns called "LAYER" numbered 0 through 3. These indicate the state of the MF receiver in the responder. The first two layers, 0 and 1, are used only for a near-end responder interfacing with a ROTL. The purpose of layer 0 is to inform the responder (in the ROTL office only) that the impedance of the trunk under test is 600 ohms, that the office is arranged for testing at test point 0, and that the far-end test line is code 100, 102, or 105. This information is transmitted via the first MF pulse received in the 0 layer of the MF receiver. When the responder in the ROTL office is in the 0 or 1 layer, no MF information is forwarded to the far end of the trunk under test.

The release MF signal in any layer causes the responder to signal the test line that the trunk under test should be released. If the two pulses are received in succession, then the responder will signal the ROTL that the trunk under test should be made busy and then released. A delay of 200 ms is begun, after the receipt of the first 900 Hz plus 1300 Hz MF signal, to check for the occurrence of another 900 Hz plus 1300 Hz MF signal within that interval.

The layer MF pulse causes the MF detector in the responder to go to the next higher state (for example, from layer 0 to layer 1). When an MF signal other than RL or layer is received with the MF receiver in layer 0, it must shift to layer 2 so that the next MF will be interpreted as a test instruction and be transmitted to the far end of the trunk under test. Note that the far-end responder is initially in layer 2. Layers 0 and 1 signals are not transmitted to the far end.

When the responder is used with a code 105-type test line or a miniresponder is used at the terminating end of the trunk under test, the initial state of the MF receiver must be layer 2. This is necessary because the first MF pulse will contain test rather than conditioning information.

At the conclusion of a transmission test, CAROT normally sends a release digit (MF 5 digit) to accomplish the following:

- Release the test equipment
- Return the trunk to its prior test condition
- Recycle ROTL in preparation for a new set of priming.

The CAROT can also send a release/make-busy command (two MF 5 digits). This command recycles ROTL but leaves the trunk in an out-of-service/maintenance/CAROT (OOS/MTCE/CAROT) state. The CAROT can also send a recycle command (1 second, 1300 Hz) which has the same effect as the release. The recycle command can be given at any time and is also used at the conclusion of each nontransmission test command to recycle ROTL. The ROTL responses to the above three commands are summarized in Tables 10-5 and 10-6.

10.4.4 BALANCE AND LONG-TERM TEST

The terminal balance function of the ROTL involves connecting a tone-and-quiet source to a selected outgoing trunk from the ROTL central office. Upon receipt of the same information as a transmission test, except for a different request code, a call is originated by the ROTL over the selected trunk. When the call terminates, a 1000-Hz start test tone burst is expected by ROTL. After it occurs, the tone-and-quiet source is attached to the trunk in the ROTL office. This source provides 10 seconds of 1004-Hz (0 dBm) tone followed by a 30-minute period of quiet balance termination during which balance measurements or adjustments can be made at the far end of the CAROT trunk or line. The test is terminated by receiving a disconnect on the trunk under test. After 60 seconds of quiet termination, the ROTL is no longer associated with this test, and a recycle signal from the test center will have no effect. Prior to this, a recycle will be accepted.

10.4.5 CONNECTION APPRAISAL TEST

The Connection Appraisal feature provides for conducting a transmission test on a connection setup from the 5ESS switch office to a test line in a distant office with normal routing and trunk selection. More than one trunk may be used in a built-up connection. The directory number of the far-end transmission test line is included in the priming information. When priming is complete, a test line in a far-end office is dialed up. When the test line is seized, the test sequence proceeds in a manner similar to a routine transmission test.

For a connection appraisal test, the ROTL originates a call in a subscriber-like manner by using digits contained in the priming information sent from the control location. The sequence of signals is identical to that for trunk transmission tests with the following variations:

- Call processing trunk hunting mechanisms are used to determine the trunk to be used for the call.
- There is no monitoring for supervisory hits.
- The overall connection, instead of a particular trunk, is measured.
- There is no make-busy capability.

10.5 OFFICE DEPENDENT DATA REQUIREMENTS

Office dependent data is required in the 5ESS switch for the ROTL feature. The CAROT accesses ROTL through the DDD network by dialing a directory number assigned to ROTL which will terminate at test software in the 5ESS switch. Since a directory number is assigned to ROTL, the ROTL directory number must be associated with a unique route index. A route index defines how a call is to be routed. The route index associated with the ROTL directory number routes to a trunk group of ROTL test ports. The ROTL test ports must be assigned in the switching modules with transmission test functions.

The 5ESS switch data base must contain the callback directory number of the CAROT and any directory number of authorized manual location(s) for the ROTL security callback. The ROTL security call is described in Part 10.3.2 of this section. This list of authorized locations must be defined in the 5ESS switch. The list also contains the authority for each directory number (none, manual, or automatic). The "none" maintenance test mode inhibits any and all callers from a given CAROT from changing the trunk status of the tested trunks. All "manual" mode locations have the authority to remove trunks from service allowing the automatic maintenance limit to be exceeded. The "auto" maintenance test mode indicates that the CAROT or control location can automatically remove trunks from service if they fail specific tests. The automatic maintenance limit with the "auto" mode cannot be exceeded. The automatic maintenance limit is established by the operating telephone company customer and states the number of trunks that can be removed from service.

The screening index and digit analysis selector that will be used for ROTL security callback and connection appraisal calls must be defined. The screening index and digit analysis selector are accessed during digit analysis of ROTL calls.

The assignment of office dependent data is made via the initial office data administration run or recent change menus and view. The data assignments required for ROTL consist of the following:

- A trunk group and trunk group member for ROTL test ports
- Route index to the trunk group of ROTL test ports
- Line class code for ROTL
- ROTL test line
- Digit analysis selector and screen index data
- CAROT code and security callback data.

The data assignments in the 5ESS switch can be made via the video display terminal, TELETYPE® 4025BS teletypewriter terminal, VT*-100 video terminal, or equivalent, by using the interactive process provided by the recent change menus and views. With systems using program documentation standards commands, use the following input messages to access the recent change menus and views.

- RCV:MENU:APPRC!—5E1(1A) software release
- RCV:MENU:APPRC;PRINT!—5E1(2) and later software releases.

With systems using the man-machine language (MML) commands [5E1(2) and later software releases], use RCV:MENU,DATA APPRC,PRINT; to access the recent change menus and views. Refer to the 5ESS Input Message Manual [AT&T 235-600-700 (formerly IM-5D000-01)] for further details.

The recent change view transition procedures differ depending on the software release in the office. If you are not familiar with the procedures for going from one view to another, refer to the appropriate section for further details concerning the recent change menus and views. The appropriate documents are listed in the REFERENCES paragraph of this section.

The recent change views that are necessary to make the data assignments for ROTL and examples showing data assignments are as follows:

- TRUNK GROUPS—TRUNK GROUP VIEW (View 5.1) (Figure 10-3)
- TRUNKS—GROUPS AND MEMBER VIEW (View 5.5) (Figure 10-4)
- ROUTING AND CHARGING—ROUTE INDEX VIEW (View 10.2) (Figure 10-5)
- LINE MISC-LINE CLASS CODE VIEW (View 4.1) (Figure 10-6)
- LINES-PBX DIRECT INWARD DIALING AND TEST VIEW (View 1.5) (Figure 10-7)
- MISC-OFFICE PARAMETERS VIEW (View 8.1) (Figure 10-8)
- MISC-REMOTE OFFICE TEST LINE VIEW (View 14.2) (Figure 10-9).

* Trademark of Digital Equipment Corporation

10.6 REFERENCES

The following documents may be consulted for additional information:

- ***AT&T 235-600-700:*** Input Message Manual—5ESS Switch (formerly IM-5D000-01)
- ***AT&T 235-600-750:*** Output Message Manual—5ESS Switch (formerly OM-5D000-01)
- ***AT&T 235-080-100:*** 5ESS Switch Translation Guide (formerly TG-5)
- ***AT&T 235-118-200:*** Recent Change Procedures—Menu Mode—5E2(1) and later Software Releases—5ESS Switch
- ***AT&T 235-118-201:*** Recent Change Procedures—Batch Release—5E2(1) and later Software Releases—5ESS Switch
- ***AT&T 235-118-202:*** Recent Change Procedures—Text Interface—5E2(1) and later Software Releases—5ESS Switch

```
SCREEN 1 OF 4                5ESS SWITCH
                             TRUNK GROUP

 *1. TGN            ____     #15. IAPT          _
  4. CLCI GRP ID    _____     16. INSEP         __
 #5. TRK DIR        ____      17. RMK           ____________
 #6. HUNT TYPE      ____      18. FAR END NPA   ___
  7. SCR            ____      19. INPLS         _____
  8. GLARE YLD      _         20. OUTPLS        _____
  9. DAS            __        21. MODULE        __
*10. TRK CLASS      _____     22. BRCS          _
 11. CARRIER ID     ___      #23. NCD SCRN      _____
 12. INC TNDWNK     _         24. ORIG LATA     __
 13. FREE ANS       _
 14. ATTTN          __
```

Figure 10-3 — Example of Trunk Group Assignments (Sheet 1 of 4)

```
SCREEN 2 OF 4                5ESS SWITCH
                             TRUNK GROUP

    ANNC TRUNKS        35. GL ANN TGN ____
26. ANNC CYCL _        36. BILLING DN ____________
27. BARGE IN  _        37. CUTTHRU    _    48. CAMAQ          _
                       39. VALNPA     ___  49. DIR CON DN     _____
    OPERATOR TRUNKS    40. VALNXX1    ___  50. BUSY LAMP      ____
28. OUTPL REQ _        41. VALNXX2    ___  51. MK BUSY KEY    ____
29. AUDIBLE   _        42. VALNXX3    ___  52. FGB BILL       _
30. SIGNAL    _____    43. VALNXX4    ___  53. CMC            _
31. FREE TERM _        44. VALNXX5    ___  54. BLK NO ANI     _
32. INIT      _        45. VALNXX6    ___  55. ATT BILL       _
33. FINAL     _        46. VALNXX7    ___  56. CMC ID         _
34. TSPS TYPE _____    47. VALNXX8    ___
```

Figure 10-3 — Example of Trunk Group Assignments (Sheet 2 of 4)

```
SCREEN 3 OF 4                5ESS SWITCH
                             TRUNK GROUP

     VERIFY ONLY
57. GRP SIZ    ____
58. ACT SIZ    ____
59. SATELLITE  _
60. TERM SFG   _
```

Figure 10-3 — Example of Trunk Group Assignments (Sheet 3 of 4)

```
SCREEN 4 OF 4                5ESS SWITCH
                             TRUNK GROUP
WARNING: These fields will update all members in the group if
not left blank or if "CHange" fields are marked "Y". The data
displayed are fefault values and does not reflect existing data.

61. TRANS CLASS    __    69. STOPGO       _  77. SUPV        ___
62. CH TRAN CLASS  _     70. CH STOPGO    _  79. ANI         _
63. IDLE STATE     ___   71. HOLD BUSY    _  80. CH ANI      _
64. CH IDLE STATE  _     72. CH HOLD BUSY _
65. IN START DIAL  ___   73. SATELLITE    _
66. CH IN START    _     74. CH SATELLITE _
67. OUT START DIAL ____  75. TRF SAMPLE   _  81. START MBR   ___
68. CH OUT START   _     76. CH TRF SAMP  _  82. END MBR     ___
```

Figure 10-3 — Example of Trunk Group Assignments (Sheet 4 of 4)

```
SCREEN 1 OF 2              5ESS SWITCH
                           TRUNK NUMBER

*1. TGN            ____      20. CGASPN        _______
*2. MEMB NBR       ____      21. HOLD BUSY     _
10. TEN            _____     22. SATELLITE     _
11. DEN            ______    23. TRF SAMPLE    _
12. LTP            ____      24. CAMOPTLK TEN  _____
13. CLCI TRK ID    ____      25. CAMOPTLK DN   _______
14. TRANS CLASS    __        26. ACTN          _
15. SUPV           ___       27. OTODPN1       _______
16. IDLE STATE     ___       28. OTODPN2       _______
17. IN START DIAL  _____     29. SLC OTODPN3   _______
18. OUT START DIAL ____      30. SLC OTODPN4   _______
19. STOPGO         _         35. BRCS          _
```

Figure 10-4 — Example of Trunk Group Member Assignments (Sheet 1 of 2)

```
SCREEN 2 OF 2              5ESS SWITCH
                           TRUNK MEMBER

36. AUTO           _
37. SLVLD SPN      __________
38. ANI            _
```

Figure 10-4 — Example of Trunk Group Member Assignments (Sheet 2 of 2)

```
                          5ESS SWITCH
                    ROUTE INDEX (ROUTING)

*1. RTI            ____      12. LTDRI         _
*2. ETYP           _____     13. CSTLRI        _
 3. TGN            ____
*4. DIG DLTD       __
 5. PREF DIG       _____
*6. NEXT RTI       ____
 7. SIG PRO        ____
 8. ANI IND        _
 9. OVLAP IND      _
10. RT DES TYP     _______
11. RMK            _________________
```

Figure 10-5 — Example of Route Index Assignments

```
                    5ESS SWITCH
                LINE CLASS CODE

*1. LCC          ___
*2. RAX          __
*3. SERVCL       _______
*4. TERM         _______
*5. SCR          ____
 6. LINESCRN     _
 7. DAS          __
*8. INSEP        ___
*9. DESEP        ___

11. RMK          ________________________
```

Figure 10-6 — Example of Line Class Code Assignments

```
                    5ESS SWITCH
            PBX-DID LINE (LINE ASSIGNMENT)

 *1. TN      ______     46. TSTCODE    ____
*12. PTY     _          48. TMK        ______________
*16. MFRI    _          49. TRC        _
*20. RAX     __         62. PCSRED     ____
*21. LCC     ___        63. CSRCOUNT   ___
 32. RTI     _____      64. MBDN       __________
```

Figure 10-7 — Example of Test Assignments

```
SCREEN 1 OF 4              5ESS SWITCH
                OFFICE PARAMETERS (MISCELLANEOUS)

*1. OFFICE ID _____   13. IMPLD NPA ___        APT TESTING
 2. IMLT2     _       14. SPLIT OFC _          ___________
 3. EXSIG     _       15. PERC1SILC ____   20. HRSTART  __
 4. MANROUT   ___     16. PERC2SILC ____   21. MNSTART  __
 5. POTENT    _____   17. HOME NPA   ___    22. DURATION _
 6. TIMEZONE  ___     18. TD-WINDOW ___    23. RUNSUN   _
 7. DST       _       19. CCS       _      24. RUNMON   _
 8. CUTTRANS  _                            25. RUNTUE   _
 9. HOLIDAY   ___                          26. RUNWED   _
10. SES       ____                         27. RUNTHR   _
11. POFFLOSS  _                            28. RUNFRI   _
12. RING TOT  _____                        29. RUNSAT   _
```

Figure 10-8 — Example of Screen Index and Digit Analysis Selector Assignments (Sheet 1 of 4)

```
SCREEN 2 OF 4              5ESS SWITCH
                OFFICE PARAMETERS (MISCELLANEOUS)
 ALIT TESTING
 ___________
30. ALITHRSTART  __      37. SST        _    44. LOCSUPV    _
31. ALITMNSTART  __      38. LOCANSW    _    45. TOLLSUPV   _
32. ALITDURATION _       39. LOCABND    _    46. ICSUPV     _
33. LITRANGE     _       40. TOLLABND   _    47. ALLSUPV    _
34. LITTYPE      _______ 41. SPECABND   _    48. AMAOPTION  _____
                         42. ALLABND    _
TRK MAINT DA OPT         43. ICTERM     _
_______________
35. SCR          ____
36. DAS          __
```

Figure 10-8 — Example of Screen Index and Digit Analysis Selector Assignments (Sheet 2 of 4)

```
SCREEN 3 OF 4                5ESS SWITCH
                  OFFICE PARAMETERS (MISCELLANEOUS)

    EADAS/RMAS OPTIONS        PERM SIG & COIN          TOUCH TONE FRAUD

49. EADASOPT      _       55. 5 MIN PST     __     62. ALLOW TTF      _
50. RMASOPT       _       56. VAR PST       ___    63. PRINT TTF      _
                          57. VAR INT       __     64. SIGI           _
    CAMA OPTIONS          58. COIN INT      __
                                                     OPEN CKT TEST LINE
51. TRKTRCD1      _____
52. TRKTRCD2      _____       DIVISION OF REVENUE
53. TRKTRCD3      _____                              65. TONE DUR       ___
54. TRKTRCD4      _____   59. DRON          _        66. OPEN INT       ___
                          60. DRHRLY        _
                          61. DRCOUNTTYPE   ____
```

Figure 10-8 — Example of Screen Index and Digit Analysis Selector Assignments (Sheet 3 of 4)

```
SCREEN 4 OF 4                5ESS SWITCH
                  OFFICE PARAMETERS (MISCELLANEOUS)

   CI OPTIONS              ALARM REPORTS

67. CARRID        ___     70. REPORT SUMMARY    __
68. INC WINK      _

MULTIFREQ RINGING         COMMUNICATION MODULE

69. REVMAN        _       71. SIDE 0        ___
                          72. SIDE 1        ___
                          73. CONV          _
```

Figure 10-8 — Example of Screen Index and Digit Analysis Selector Assignments (Sheet 4 of 4)

```
                    5ESS SWITCH
               REMOTE OFFICE TEST LINE
*1. ROTL CODE     _
#2. ROTL DN       ____________
 3. ROTL MODE     ____
 4. CARRIER ID    ___
```

Figure 10-9 — Example of Control Location Assignments

TABLE 10-1
ROTL RESPONSE FOR MAKE-BUSY OR RESTORE

RESPONSE	CONDITION
Test Progress Tone-2225 Hz	Trunk made busy or restored.
Two Burst Test Progress Tone* (2225 Hz)	Trunk made busy and automatic maintenance limit has been exceeded.
60-IPM Low Tone	Request refused because automatic maintenance limit would be exceeded or trunk is traffic busy.
120-IPM Low Tone	Security call back for ROTL unlock was not successful.

* Each tone and quiet separation period is 520 ± 80 ms.

TABLE 10-2
ROTL RESPONSE FOR TRUNK OR TRUNK GROUP STATUS REQUEST

RESPONSE	CONDITION
Two Burst Test Progress Tone* (2225 Hz)	Some trunks in group are made busy, but automatic maintenance limit has not been reached.
60-IPM Low Tone	Individual Trunk - Trunk out of service.
60-IPM Low Tone	Trunk Group - The number of trunks in the group out of service at or above the automatic maintenance limit.
120-IPM Low Tone	Priming information error.
Test Progress Tone-2225 Hz	Individual Trunk - Trunk in service.
Test Progress Tone-2225 Hz	Trunk Group - All trunks in group in service.

* Each tone and quiet separation period is 520 ± 80 ms.

TABLE 10-3
ROTL PRIMING INFORMATION

ROTL USAGE			DIGITS TRANSMITTED TO ROTL MF RECEIVER					
			1	2	3	4	. . . . . 24 (max)	
Transmission Test		100-type	KP*	0	0	MODIFIER	Trunk Group (4) Trunk Member (4)	
		102-type	KP	0	2			
		105-type	KP	0	5			
	Override Made Busy	100-type	KP	1	0		Trunk Identifier†	Far-End Test Line Number‡ + ST† (≤ 11 digits)
		102-type	KP	1	2			
		105-type	KP	1	5			
Balance and Long Term Tests			KP	4	0			
	Override Made Busy		KP	4	1			
Make Busy and Restore	Make Trunk Remote Busy		KP	5	0		Trunk Identifier†	ST
	Restore Trunk Made Remote Busy		KP	5	1			
Trunk Status Request	Individual Trunk		KP	5	2			
	Trunk Group by Trunk		KP	5	3			
	Trunk Group by Group		KP	5	4		Trunk Group Identifier + ST	
Callback Unlock Request			KP	5	5	ID	ST	
Connection Appraisal	100-type		KP	6	0	Far-End Test Line Number§ +ST (≤ 15 digits)		
	102-type		KP	6	2			
	105-type		KP	6	5			

* KP = Key Pulse (Start Pulse)
† ST = Stop Pulse
‡ Exact digits to be outpulsed
§ 7, 10, or 11 digit directory number of far-end test line.

TABLE 10-4 (NOTE)
INTERPRETATION OF RESPONDER MF COMMANDS

MF SIGNALS Hz	LAYER 0	LAYER 1	LAYER 2	LAYER 3
700 + 900	600, 0, 105	-	Loss Self-Check: The responder closes a loop to measure its input and output of 1004 Hz (0 dBm)	High frequency return self-check measurement
700 + 1100	600, 0, 102	-	Loss Measurement at 1004 Hz (0 dBm)	High frequency return loss measurement
700 + 1300	600, 0, 100	-	Noise Self-Check: Far-end responder checks itself (1004 Hz at -67 dBM)	-
700 + 1500	-	-	-	-
700 + 1700	-	-	Echo return loss measurement	Echo return loss self-check measurement
900 + 1100	-	-	C-noise measurement with far-end responder	-
900 + 1300	Release	Release	Release	Release
900 + 1500	-	-	Low frequency return loss measurement	Low frequency return loss self-check measurement
900 + 1700	-	-	Loss measurement at 1004 Hz at -16 dBm	Self-check measurement at 1004 Hz at -16dBm
1100 + 1300	-	-	Loss measurement at 404 Hz at -16 dBm	Self-check measurement at 404 Hz at -16dBm
1100 + 1500	-	-	Noise self-check measurement on responder in the ROTL office	-
1100 + 1700	Layer	Layer	Layer	-
1300 + 1500	-	-	Noise measurement with the responder in the ROTL office	-
1300 + 1700	-	-	Loss measurement at 2804 Hz at -16 dBm	Self-check measurement at 2804 Hz at -16 dBm
1500 + 1700	-	-	Noise measurement in the presence of a 1004-Hz tone at -16 dBm	Noise with tone self-check measurement through the appropriate filters

Note: Dashes indicate unassigned code-state combinations.

TABLE 10-5 (NOTE)
ROTL RESPONSES TO RECYCLE, RELEASE, AND RELEASE/MAKE BUSY AFTER TRANSMISSION TESTS

CAROT COMMAND SENT TO ROTL	ROTL RESPONSE TO COMMAND	MEANING
Release or recycle	Test progress tone	Normal, trunk release, ready for new priming at end of test progress tone.
	60-IPM low tone (busy)	A supervisory hit or disconnect was detected on the trunk under test during testing. (A recycle command is normally sent by CAROT to recycle ROTL after this response is receive.)
Release make busy	Test progress tone	Normal, trunk make busy, ready for new priming at end of test progress tone.
	120-IPM low tone (reorder)	No authorization to remove trunks (security call back not performed).
	60 IPM (busy)	Could not busy trunk, probably due to AML being exceeded.
	Silence	A recycle authorization sent by CAROT. ROTL will return 60 IPM indicating that a hit or disconnect was detected on the trunk under test. A second recycle is required to recycle ROTL.

Note: There is no monitoring for supervisory hits or disconnects on 102-type tests, or on connection appraisal. At any time, ROTL sends 120-IPM low tone (reorder) to CAROT; there may be additional information available from ROTL. This information can be requested by sending a ring forward request (1300 Hz for 100 ms). Ring forward is not used by the 5ESS switch ROTL in normal testing as it does not perform operational tests. The response to ring forward will be in the guard-data-guard format. An alternative is to request a noise measurement. It will also trigger the guard-data-guard reply, which can be interpreted as a noise reading and converted to the error code. Table 3-6 lists the 5ESS switch ROTL errors.

TABLE 10-6
RING FORWARD ERROR REPLIES

92A PULSE LENGTH (milliseconds)	H310 NOISE READING* (dB)	MEANING
9	18	Unknown, no further information
17	22	Route failure to test trunk
25	26	Failed to set up path to trunk
33	30	Failure during call disposition analysis
41	34	Failure at trunk under test
49	38	Failure to close path to trunk
57	42	Could not understand priming
65	46	No answer supervision received on trunk
73	50	Security callback has not been completed
81	54	Hardware failure
89	58	Failed to activate (seize) trunk
97	62	Failure during outpulsing
105	66	Glare seen on trunk
113	70	Interrupt seen at trunk process
121	74	TTF CUT tone detector detected wrong tone
129	78	Data base error
137	82	Failed to get a wink
153	90	Failed to send milliwatt on a BALT test

* The noise readings are taken using either the 92A or H310 test sets, the two common test sets used for ROTL. The H310 test set is only capable of determining the ring forward error by making a noise measurement. The error reply is converted into an equivalent noise reading in dB. The 92A test set can make the noise measurement, or it has provisions for measuring the duration of the error tone directly in milliseconds.