

REMOTE OFFICE TEST LINE (ROTL) SD-28607-01
DESCRIPTIVE INFORMATION
NO. 1 CROSSBAR OFFICES

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D. Transmission Testing	5	1.01 This section describes the remote office concept of trunk testing used with the Centralized Automatic Reporting on Trunks (CAROT) or a manual test position for the No. 1 crossbar offices.	
E. Operational Testing	5	1.02 This section is reissued to clarify the control location, to include information about the 92A control unit and the H-310-150 ROTL system test set, and to provide a general update. Revision arrows are used to denote significant changes.	
F. Balance and Long Term (BALT) Testing	5	1.03 The CAROT is essentially a computer-driven automatic testing arrangement capable of directing trunk tests in up to 14 remote offices simultaneously. Manually controlled tests can also be performed by the use of a manual test position which	
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can access the ROTL from the switching network or by direct access through the ROTL test port inputs.

1.04 The ROTL equipment, at a No. 1 crossbar remote office, functions under control of the control location (CAROT or the manual test position). The CAROT and ROTL together with a 105-type test line, 52A responder, incoming trunk connector (ITC), and test lines comprise the CAROT-ROTL system (Fig. 1). The 105-type, far-end test line (FETL) responder (Fig. 1) may be a 51B*, 52A, or 56A responder.

1.05 The control location directs the ROTL equipment at the remote office to select outgoing trunks for the purpose of making tests to test lines in a far-end office.

1.06 The ROTL input port circuit provides terminations for a call from the control location on one of its three inputs in the remote office. Two of these inputs are provided in the same hunting group and are used for making transmission, connection appraisal, and operational tests. The third input is not in the hunting group with the other lines and is provided to access a separate originating test line used in making the BALT tests.

1.07 The ROTL can perform operational or transmission tests on outgoing trunks originating from the remote office in which it is installed or another office which is located in the same building. The types of tests which can be made through the ROTL are as follows:

- (a) Transmission tests to 100-, 102-, and 105-type test lines with or without override made busy
- (b) Operational tests to a 103-type intertoll test line, synchronous or nonsynchronous test lines with or without override made busy
- (c) The BALT connection with or without override made busy
- (d) Trunk status interrogation for an individual trunk
- (e) Connection appraisal tests.

* The 51B responder has been rated "manufacture discontinued."

2. EQUIPMENT

A. General

2.01 The CAROT-ROTL testing requires special equipment in the CAROT office, the remote office, and the far-end office (Fig. 1). The central office switching machine for CAROT and the remote office switching machine do not have to be of the same type system. The switching machine for CAROT provides a means only for gaining access to the remote office. No transmission loss or line noise on the access trunk is considered when testing remote office facilities. The access trunk relays information in voice-frequency form from the remote office to CAROT.

B. Control Location Equipment

CAROT Control

2.02 The CAROT controller directs trunk testing. The CAROT controller gains access to ROTL offices from which trunks will be tested via TOUCH-TONE* telephone subscriber loops. Priming information given by CAROT to ROTL provides directions to establish a connection to a specific trunk and to connect measuring equipment to each end of that trunk. Once the measuring equipment (responders) is connected, CAROT directs a 2-way measurement of the trunk selected and provides a printout over the line printer if the trunk does not meet the expected limits. All trunks that cannot be accessed due to service busy conditions, trouble conditions, or maintenance busy conditions are also listed on the printout. The general description for CAROT is provided in Section 951-710-100.

Manual Position Control

2.03 A manual position control test set, such as the 92A control unit or the ROTL system test set (H-310-150), can be used to send priming information to the ROTL. This priming information provides directions to establish a connection to a specific trunk and to connect measuring equipment to each end of the trunk. After the measuring equipment (responders) is connected, the manual position test set is then used to troubleshoot or to perform transmission tests and display the results. Sections 103-251-112 and 100-175-101 provide the description and operation of the 92A control unit and the H-310-150, respectively.

* Trademark of AT&T.

C. Remote Office Equipment

2.04 The ROTL system (Fig. 2) includes a 105-type test line with its associated 52A responder, and a ROTL access unit and a ROTL connector unit which is included in the ITC (SD-25161-01). The ROTL equipment (Fig. 3) in a No. 1 crossbar remote office is comprised of a single frame containing the following:

- The ROTL circuit (SD-28067-01)
- The 8A tone detectors (SD-99551-01)
- The multifrequency (MF) pulsing and receiving circuit (SD-99493-01).

2.05 The ROTL circuit (SD-28067-01) includes the following units:

(a) **Input and Balance Test Control Unit (J28555AA)**: This unit contains the circuitry for access and preference control for the three test access ports, the control relays for supervision, and cut-through for the ♦BALT♦ port.

(b) **Transmission Test Control Unit (J28555AB)**: This unit contains the circuitry to provide test sequence and control during transmission and operational tests.

(c) **Incoming Line Unit (J28555AC)**: This unit contains the circuitry for accessing the ROTL from No. 1 crossbar or other systems in the same or distant buildings. It also contains the circuitry for manual test access to the three test ports by a manual test position.

(d) **Input Port Unit (J28555AD)**: This unit provides the circuitry for initial seizure of the three test ports, and also provides the test progress tone and 60-ipm and 120-ipm low tones for test status information to the ♦control location.♦

(e) **Insteering Registration and Trunk Identity Unit (J28555AE)**: This unit contains the register circuit which accepts and stores up to 16 MF digits from the control location. It provides the fundamental pulsing and outpulsing unit with the far-end test line. It also provides the circuit for identifying and selecting the trunk to be tested.

(f) **Signal Receiving and Trunk Control Unit (J28555AF)**: This unit contains the circuitry to do the following.

- Steer successive received digits into their respective registers
- Time the register seizure until the registration of priming information is complete
- Transmit 120 ipm to the control location if a time-out occurs
- Time the circuit from priming information to the ITC switch seizure
- Wait to receive a recycle signal from the control location if a time-out occurs
- Provide a trunk override made-busy feature to test a maintenance busy trunk.

(g) **Type of Test Unit (J28555AG)**: This unit contains the circuitry to register and store the type of test priming information.

(h) **Class-of-Service and Selection Progress Unit (J28555AH)**: This unit contains the circuitry to register and store the class of service, the type of outpulsing, and the connection appraisal information.

(i) **Fundamental Pulsing and Outsteering Control Unit (J28555AJ)**: This unit contains the circuitry for the ROTL which captures the appropriate digits from the ROTL register circuit. The J28555AJ unit outpulses these digits over the trunk to be tested by direct dial pulses, MF pulses, compensated loop dial pulses, or battery-and-ground pulses to terminating step-by-step selectors or the ♦dial pulse (DP)♦ sender. After outpulsing, the sender signals the test port to cut-through to the outgoing trunk and then restores to normal.

(j) **Pulsing Control and Generator Unit (J28555AK)**: This unit contains more circuitry for the fundamental pulsing and outpulsing circuit and a pulse generator for MF, dial pulse, or call indicator pulsing. The timing of the pulses is controlled by the pulse generator circuit.

(k) **Counting Relay Unit (J28555AL)**: This unit contains the counting relay circuitry for the fundamental pulsing and outpulsing circuit. ♦The counting relay circuitry♦ is designed so that pulses are counted down from a primed relay to a

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lower-primed relay. This count down continues until all digits have been outpulsed.

2.06 The 8A tone detector circuit (SD-99551-01) provides three 1300-Hz tone detectors which allow recycle and disconnect signals to be detected when transmitted from the control location. A low-tone detector is provided to detect call progress signals over the trunk under test during preliminary stages of test setup. A 2225-Hz tone detector is provided to check that the incoming signal is 2225 Hz and to provide a closure for as long as the signal is present. When the 2225-Hz tone is removed, a closure is provided signaling the ROTL to connect to the responder.

2.07 The MF receiver circuit (SD-99493-01) provides a receiver that detects and converts priming digits from MF to dc signals. It also checks that only two frequencies are received for each MF digit.

2.08 The 105-type test line ROTL access circuit (SD-96601-01) provides dedicated high-priority access for the ROTL to a 52A responder. The 105-type test line and ROTL access circuits description are provided in Section 103-250-101.

2.09 The 52A responder (SD-1C399-01) provides a means of making automatic transmission measurements on trunks. The description and operation of the 52A responder are provided in Section 103-252-100.

2.10 The ITC (SD-25161-01) provides a shared access to the trunks for the incoming trunk test (ITT) circuit and the ROTL circuit. The regular test access and the BALT test access of the ROTL, plus the existing ITT access, total three accesses through the ITC. The connector is arranged on a 'connector switch' basis. While one test access is using a particular switch, that switch is not available to the other accesses. All other switches are available and any one may be used. Two or three tests may proceed simultaneously, testing different trunks, provided the trunks are accessed through different connector switches.

D. End Office Equipment

2.11 An end office may be any type of office to which the remote office has outgoing trunks and which can provide switched test line terminations. The type test lines (Table A) may be as follows:

- (a) 105-, 102-, or new 100-type test lines for transmission testing
- (b) Synchronous, nonsynchronous, or 103-type test lines for operational testing.

3. METHOD OF OPERATION

A. General

3.01 Remote office testing is described in terms of the types of test calls that can be made. Figure 1 displays the No. 1 crossbar remote office testing arrangement. Table B lists the type of signals used to pass information for remote office testing, and Table C lists the types of test calls and their priming digits.

B. ROTL Seizure and Priming

3.02 The ROTL is seized when a call is placed to one of its two test port inputs or to its BALT test port input. A call to the test port inputs will be originated by the control location (CAROT or from a manual test position equipped with an appropriate control device). The trunks between the central office for CAROT and the remote office are regular service trunks and are generally referred to as access trunks (Fig. 1). A call to the BALT test port input will in general be originated by a manual TEST position in a toll office to which the balance test on the toll connecting trunk will be terminated.

3.03 Upon seizure of the ROTL access circuit, a 2225-Hz test progress tone (TPT) is returned to the control location and a bid is made for the ROTL register circuit. At the end of this tone, the register has been seized and attached. The control location will send a maximum of 16 digits plus a key pulse (KP) to the ROTL as required for the particular test to be performed. At the end of these digits, the control location sends a start pulse signal to indicate that the entire number has been transmitted.

C. Trunk Selection

3.04 Upon receipt of a start pulse signal, the register circuit will seize and transmit outsteering information. The register control circuit will seize the trunk to be tested by way of the ITC. During these functions, a 2225-Hz TPT is transmitted to the control location and continues until functions are completed. The ROTL will outpulse over the trunk to be tested to seize and attach the appropriate FETL.

Note: The TPT is transmitted to the control location only if the trunk can be seized for test.

3.05 A 120-ipm low tone will be transmitted to the control location if any of the following troubles occur:

- (a) Register time-outs awaiting receipt of the KP pulse (occurs in 1 to 3 minutes)
- (b) Register received mutilated digits
- (c) Register received various pulsing errors
- (d) ITC is busy and control location has recycled.

D. Transmission Testing

100-Type Test Line

3.06 The new 100-type test line sends 5.5 seconds of 1004-Hz milliwatt tone during which time a loss measurement is made. After this 5.5 seconds of milliwatt tone, a quiet termination of 900-ohms plus 2 μ F is provided for a noise measurement. Because of the timed milliwatt tone, the remote office responder must be available immediately when the distant test line is reached. To accomplish this, the remote office responder is seized and made busy to other users at the same time the trunk to be tested is seized.

102-Type Test

3.07 This test is a 1-way transmission test to a 1004-Hz milliwatt test line in the far-end office. After the trunk under test is connected to the FETL, a 1 milliwatt 1004-Hz tone is returned to the near-end 52A responder for a period of approximately 9 seconds followed by a quiet termination for 1 second for determining the far-end to near-end loss. The measurement result is returned to the control location via frequency shift keying by the responder.

105-Type Test

3.08 This provides 2-way transmission and noise tests through a remote office equipped with ROTL to a 105-type test line and responder in the far-end office. The FETL transmits a 2225-Hz TPT toward the ROTL. When the far-end responder is seized, the TPT is removed and the responder is connected to the trunk under test. The ROTL now connects the near-end responder to the trunk under test, and the two responders perform 2-way trans-

mission and noise tests as directed by the control location.

E. Operational Testing

103-Type Test

3.09 The 103-type intertoll test line is arranged to respond to a ring forward flash generated by the control location. When the FETL is accessed, steady off-hook supervision is received from the 103-type test line and ROTL returns TPT to the control location. The control location transmits 100 milliseconds of 1300-Hz tone as a ring forward command to the ROTL which an on-hook flash on the trunk under test. If the trunk under test repeats the on-hook signal, the 103-type test line goes on-hook and ROTL removes TPT. A second ring forward signal is transmitted. The 103-type test line responds by transmitting 120-ipm supervision flashes, and the ROTL repeats these to the control location in the form of TPT for off-hook intervals.

Synchronous Test Line

3.10 This test is a supervisory test to a far-end office equipped with a synchronous test line. The test checks the ring tripping and timing of the relays in the incoming trunk circuit at the far-end office, except when the distant test line is in a toll office. The test line alternately transmits a distinct pattern of on-hook and off-hook signals to the ROTL. The ROTL follows the changes in supervision from the test line and transmits TPT to the control location for the off-hook condition.

Nonsynchronous Test Line

3.11 This test is a supervisory test to a step-by-step or a No. 5 crossbar office equipped with a nonsynchronous test line. The test checks the ring tripping and timing of the relays in the incoming trunk circuit at the far-end office, except when the distant test line is in a toll office. The test line alternately transmits a pattern of on-hook and off-hook signals to the ROTL. The ROTL follows the changes in supervision from the test line by transmitting TPT for off-hook to the control location.

F. Balance and Long Term (BALT) Testing

3.12 The BALT tests are performed in a toll office on toll connecting trunks which are termi-

nated at the far-end office in a 600- or 900-ohm plus 2 μF termination.

3.13 The ROTL \blacklozenge BALT \blacklozenge test port is seized by a manual test position. The ROTL establishes a connection to the toll trunk to be tested and outpulses to the distant office to a test position control. It provides 10 seconds of 1-milliwatt, \blacklozenge 1004-Hz tone \blacklozenge and then a 900-ohm, 2 μF quiet termination toward the far-end office. The test measurements are performed by the far-end test position control.

G. \blacklozenge Remote Outgoing Trunk (ROGT) Test

3.14 The ROGT test is a dc test over a trunk from the electromechanical switching control center (SCC) using the ROTL at the No. 1 crossbar office. This test can indicate open tip and ring leads, approximate location of open tip lead, shorted tip lead, or a no-wink condition.

3.15 The ROGT test is made from the SCC using a 92A control unit and a model 816 ROGT unit. These units are mounted in a KS-22321, L1 console (Fig. 4) that provides a bench- or desk-top mounting arrangement and the electrical interconnecting circuitry. This console is intended for use at the trunk maintenance position (TMP) in the electromechanical SCC for the No. 1 crossbar office.

3.16 The test request code for the ROGT test is 85. ROTL priming information for the ROGT test is shown in Table C. Section 103-251-112 gives further information and a procedure for performing the ROGT test.

H. Home Office Test Line (HOTL) Test

3.17 The HOTL test checks the access to a test line located in the same No. 1 crossbar office containing the ROTL. This test is applicable to 100-, 102-, 103-, and 105-type test lines as well as synchronous and nonsynchronous test lines. ROTL priming infor-

mation for the various HOTL tests is shown in Table C. Section 103-251-112 provides further information about HOTL tests and gives a procedure for performing these tests. \blacklozenge

I. Recycle and \blacklozenge Disconnect \blacklozenge Features

3.18 \blacklozenge When the recycle tone detector \blacklozenge recognizes the 1300-Hz tone for 1 second sent by the control location, it operates a recycle relay. The operation of a recycle relay will cause the tone detector and the ROTL port to release, which releases the trunk under test. The ROTL register is then seized and awaits new priming information.

3.19 If a 2-second burst of 1300 Hz is sent by the control location, the tone detector will recognize this as a disconnect signal. The tone detector will operate relays to release the entire ROTL circuit including the test input port and the testing will terminate. These relays operated are as follows:

- (a) The RLA or the RLB relays for the transmission and operational tests
- (b) The RLD relay for the \blacklozenge BALT \blacklozenge tests.

4. TROUBLE LOCATING

4.01 The CAROT system contains a feature for performing trouble diagnostic procedures to localize a trouble to the ROTL circuit. \blacklozenge These procedures are implemented by the CAROT operator. Section 190-103-500 contains the CAROT 2 \blacklozenge system trouble-locating procedures.

4.02 When the CAROT diagnostic system locates trouble in the ROTL circuit, a manual \blacklozenge control unit, \blacklozenge such as \blacklozenge the 92A control unit or \blacklozenge the ROTL system test set (H-310-150), can be used for trouble locating.

♦TABLE A♦

TEST LINES AND TYPES OF TESTS

TYPE OF TEST LINE	MEASUREMENT OF TEST (NOTE)					
	NEAR-TO-FAR LOSS MEAS	FAR-TO-NEAR LOSS MEAS	NEAR-END NOISE MEAS	FAR-END NOISE MEAS	FAR-END NOISE CHECK	OPERATIONAL TST TRK SUPV
Modified 1000	—	X	X	—	—	—
102	—	X	—	—	—	—
103	—	—	—	—	—	X
105*	X	X	X	X	—	—
Synchronous or Nonsynchronous	—	—	—	—	—	X

Note: Near-end is the remote office and far-end is the end office.

* Provides access to end office responder.

♦TABLE B♦

SIGNALS USED FOR CAROT-ROTL TESTING

SIGNAL	FROM	TO	MEANING	
2225 HZ (1-second burst)	Remote office	Control office	Sent after ROTL seizure to indicate ROTL ready for priming	Test progress tone
1000 Hz (Milliwatt)	End office	Remote or control office	Used for transmission measurements and to indicate test progress	Detected by ROTL responder or tone detector
1300 Hz (2 seconds)	Control office	Remote office	Disconnect ROTL (drop access trunk)	Drop access trunk signal
1300 Hz (1 second)	Control office	Remote office	Release trunk under test (hold access trunk, reset ROTL)	Recycle signal
1300 Hz (100 ms)	Control office	Remote office	Ring forward to 103-type test line	Ring Forward
1200-, 2200-, 1200-Hz freq. shift	Remote office responder	Control office	Transmission measurement data	Data
120-IPM low tone	Remote office	Control office	Priming error, circuit failure, or connector switch busy	—
60-IPM busy tone	End office	Remote office	Far-end busy	Detected by tone detector in remote office and relayed to control office by interrupted low tone
120-IPM reorder tone	End office	Remote office	Circuit busy, reorder	
Announcement	End office	Remote office	Recorded announcement encountered in setting up test calls	

♦TABLE C♦

PRIMING INFORMATION

TESTS			DIGITS TRANSMITTED TO ROTL MF RECEIVER (NOTE)																
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Transmission	—	100-Type	KP	0	0	Trunk identity as required including make-busy, access mode, trunk class, etc. Far-end test line number [ST]													
		102-Type	KP	0	2														
		105-Type	KP	0	5														
	Override made busy	100-Type	KP	1	0														
		102-Type	KP	1	2														
		105-Type	KP	1	5														
Operational	—	103-Type	KP	2	3														
		Synchronous	KP	2	1														
		Nonsynchronous	KP	2	0														
	Override made busy	103-Type	KP	3	3														
		Synchronous	KP	3	1														
		Nonsynchronous	KP	3	0														
Balance	—	KP	4	0															
	Override made busy	KP	4	1															
Trunk status interrogation	Individual trunk	KP	5	2	Trunk or trunk group identity including trunk class if needed [ST]														
Connection appraisal	100-Type	KP	6	0	Far-end test line phone number including marker group if needed [ST]														
	102-Type	KP	6	2															
	105-Type	KP	6	5															

Note: Number of digits varies with the type of switching system.

TABLE C (Contd)

PRIMING INFORMATION

TESTS			DIGITS TRANSMITTED TO ROTL MF RECEIVER (NOTE)														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Home office test line	Transmission test lines	Code 100	KP	7	0	Trunk identity [ST]											
		Code 102	KP	7	2	Trunk identity [ST]											
		Code 105	KP	7	5	Trunk identity [ST]											
	Operational test lines	Code 103	KP	7	3	Trunk identity [ST]											
		Synchronous	KP	7	1	Trunk identity [ST]											
		Nonsynchronous	KP	7	4	Trunk identity [ST]											
ROGT (dc testing from an SCC using ROTL)			KP	8	5	Trunk identity [ST]											

Note: Number of digits varies with the type of switching system.

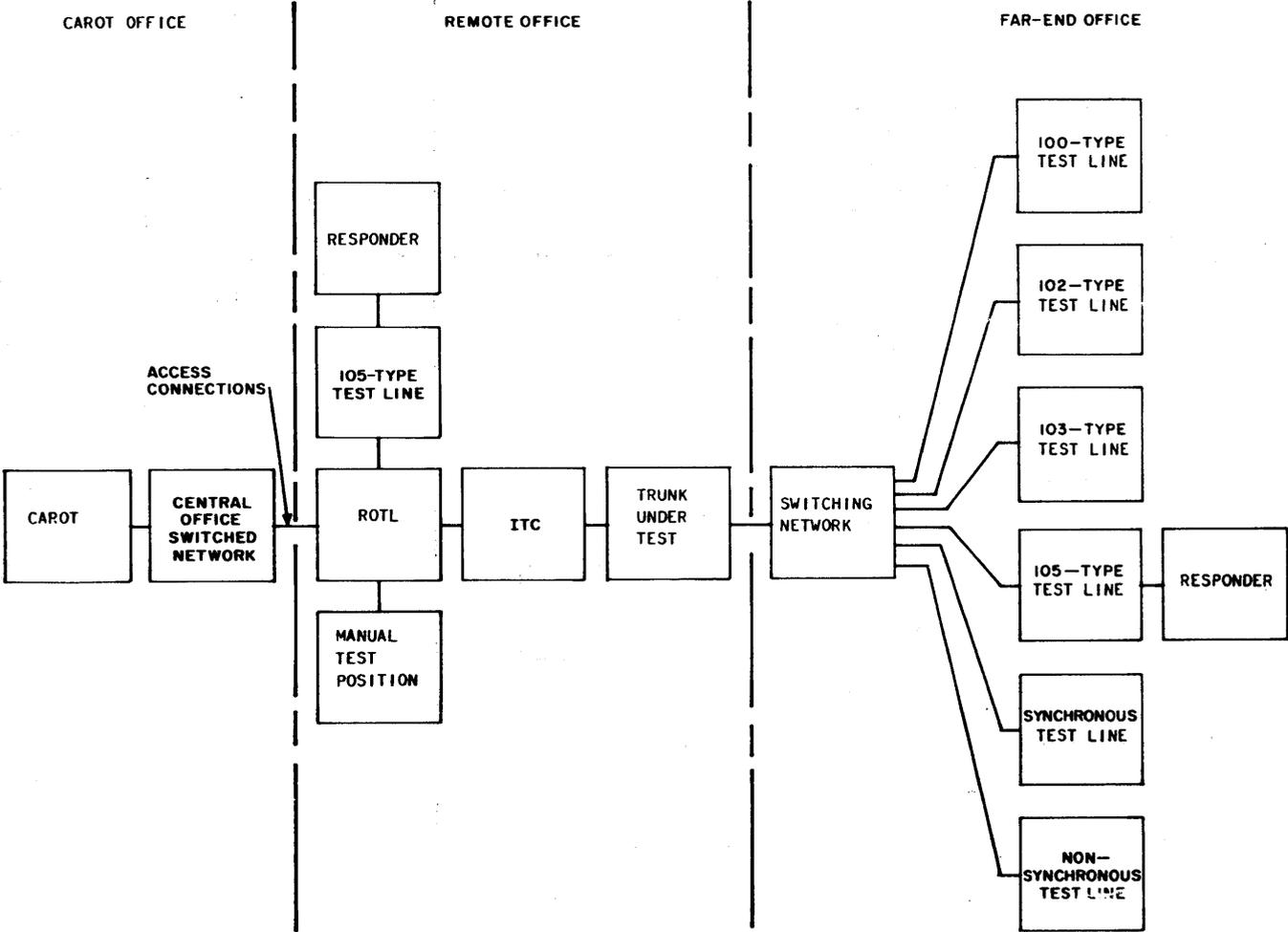


Fig. 1—Remote Office Trunk Testing Arrangement for No. 1 Crossbar Offices

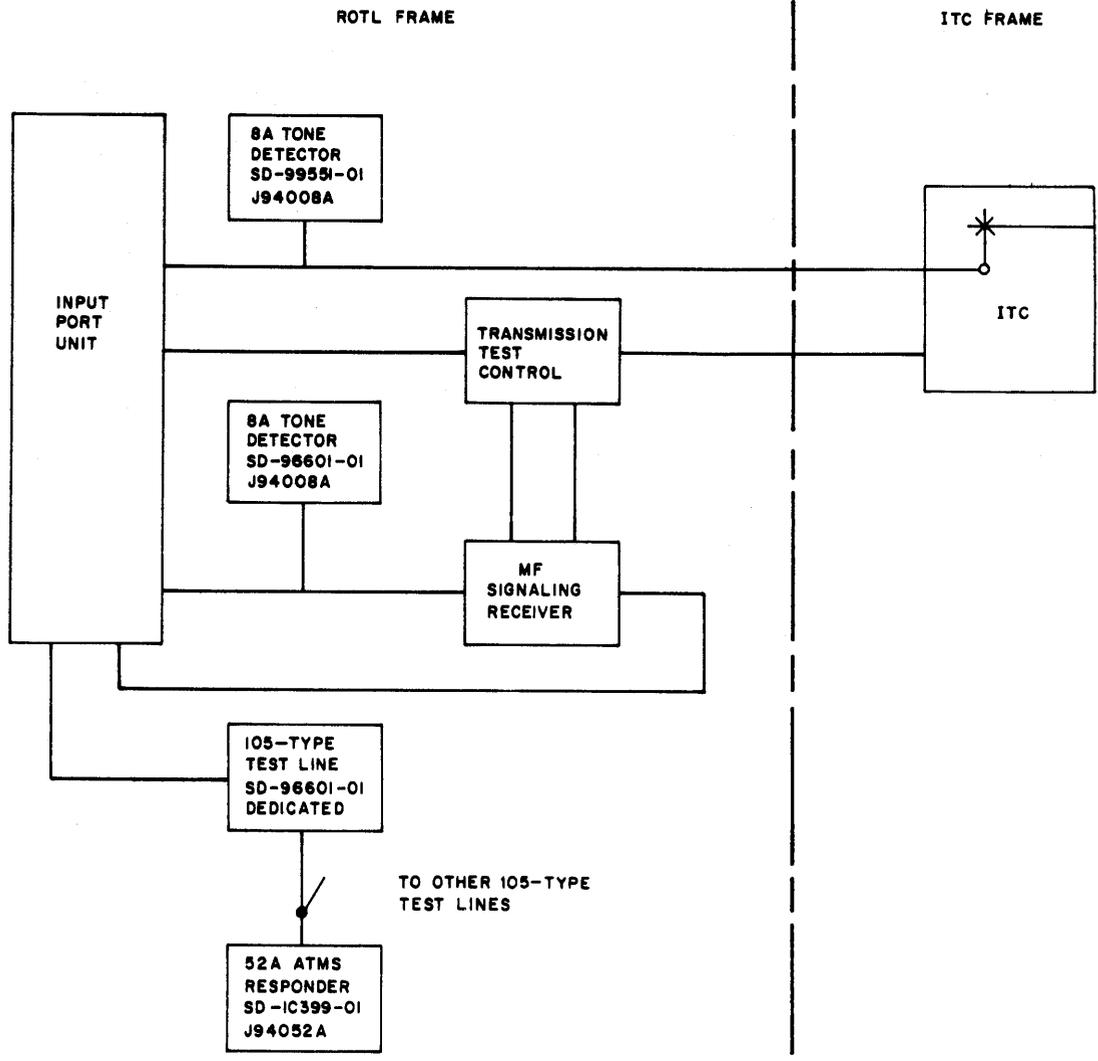


Fig. 2—No. 1 Crossbar ROTL System Diagram

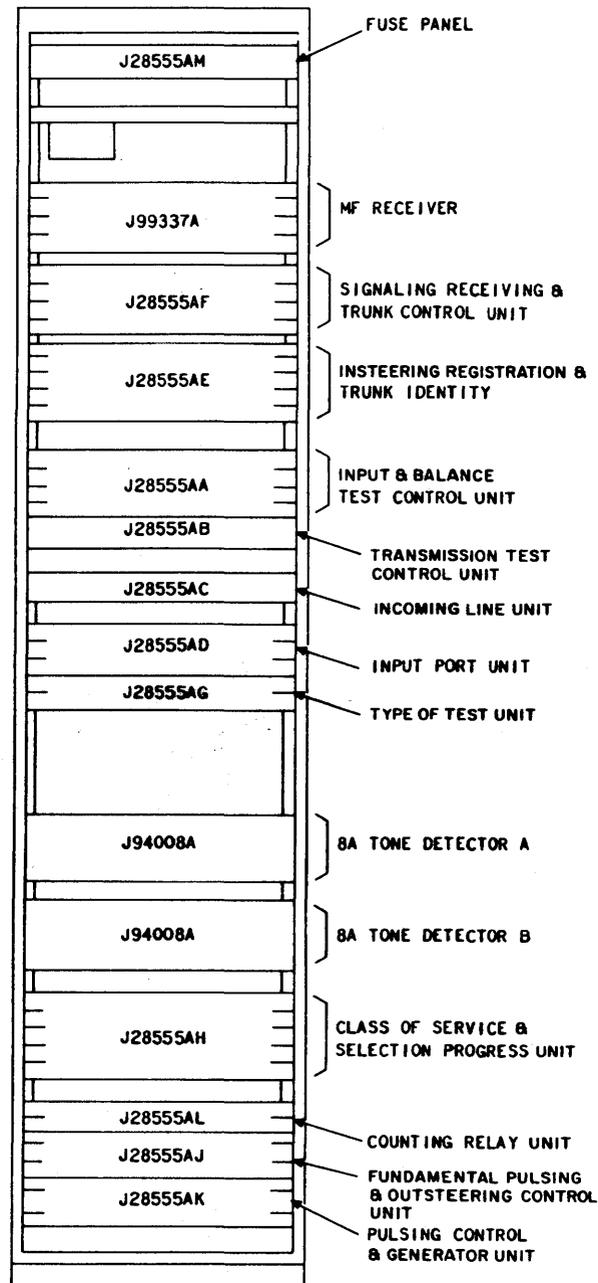


Fig. 3—ROTL Equipment Frame

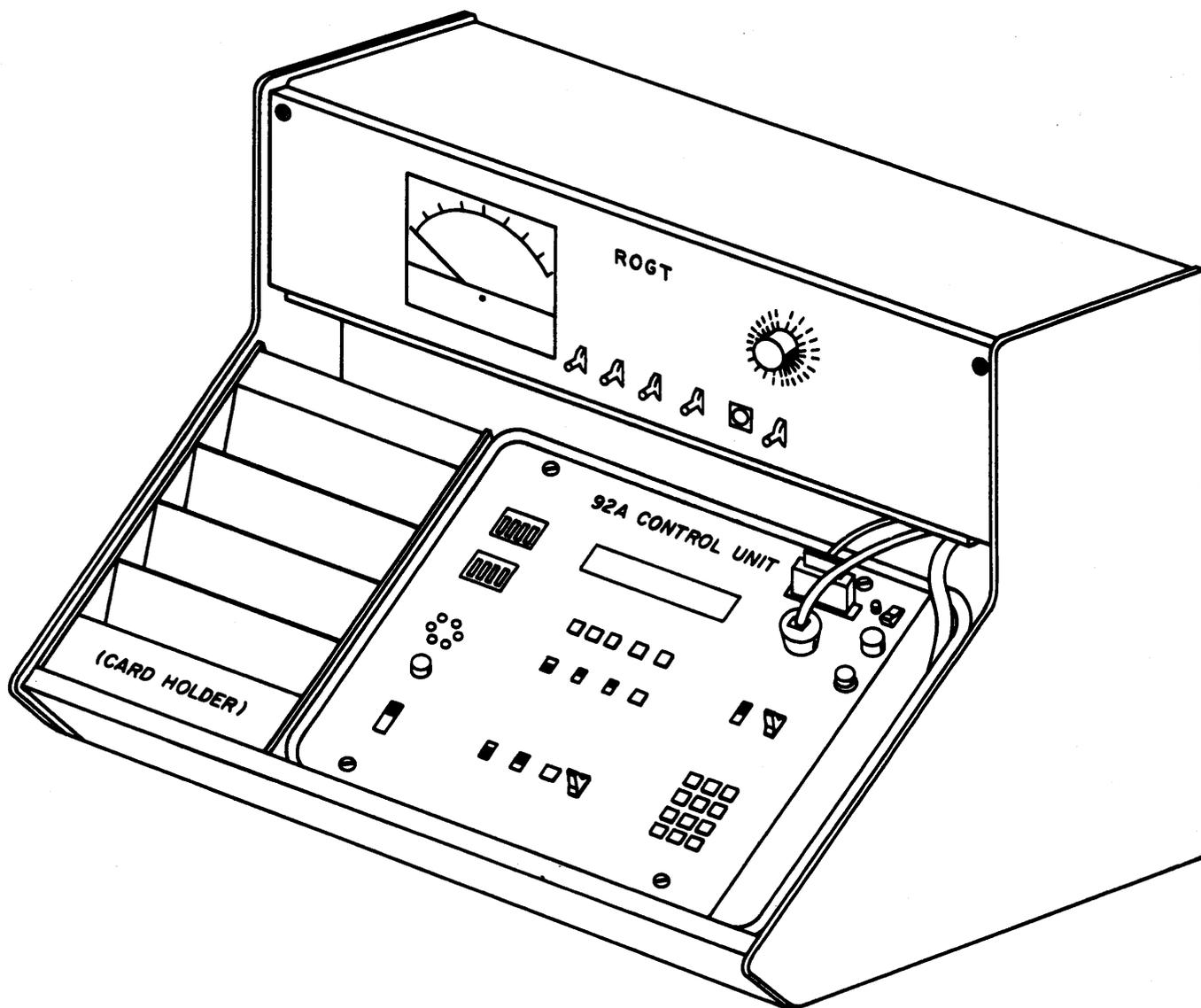


Fig. 4—KS-22321, L1 ROGT Console With 92A Control Unit Installed