REMOTE TRUNK TEST UNIT
DESCRIPTION
1 AND 1A "ESS*" SWITCHES

CONTENTS PAGE

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CONTENTS PAGE

1. GENERAL

1.01 This practice describes the remote trunk test unit (RTTU) (SD-1P173-01) as used with 1 and 1A ESS switches. The RTTU is an integral part of a remote trunk testing system which provides trunk and line and limited switch testing capabilities under control of the Switching Control Center (SCC).

1.02 This practice is reissued to provide information which was not available for issue 1.

1.03 The RTTU provides a facility to both remove and return trunks to service and to test trunks and service circuits. The test repertory includes multimeter tests (voltage, resistance, and capacitance), signaling tests, and transmission tests (loss, noise, gainslope, and balance or return loss). It also provides 105 test lines and remote office test line (ROTL) equivalent testing capabilities. In addition, for 1E7/1AE7 and later generic programs it provides the same line testing capabilities as provided by the trunk and line test panel (TLTP). The RTTU is controlled by a central trunk test unit (CTTU) located at an SCC and is compatible with centralized automatic reporting on trunks (CAROT). The CTTU provides the normal craftsperson interface to the system.

1.04 The RTTU may be located up to 400 cable feet from the 2-wire network junctor grouping frame. There is no change in function when the HILO 4-wire option is used. To determine this option and other options available to the RTTU, refer to Table A.

1.05 The CTTU is an intelligent terminal. It contains a processor for overall control, a cathode ray tube (CRT) display, a keyboard, a mass storage device, a local printer, and the input/output capabilities necessary to communicate with RTTUs and operations support systems (OS). An optional switch permits use of the keyboard and CRT as a terminal of the Switching Control Center System (SCCS) computer.

1.06 Figure 1 displays a block diagram of the RTTU and CTTU. The CTTU normally resides in an SCC where it forms the basis of a trunk work station. The CTTU accesses and controls the RTTU over a dialed-up data link. In addition to the data link, there is a talk and monitor path between a CALL DIRECTOR® telephone at the trunk work station (TWS) and the RTTU over which the craftsperson can listen to the trunk under test (TUT) and talk to other craft personnel. The CTTU is capable of dialing up other OSs such as Trunks Integrated Record Keeping System (TIRKS) and CAROT, using a 202-type data set.

1.07 The following abbreviations are used in this practice:

ASCII	American Standard Code for Information Interchange
B&B	Build-out and Blocking
CA	Connection Appraisal
CAM	Control, Access, and Measurement Unit
CAROT	Centralized Automatic Reporting On Trunks
CPD	Central Pulse Distributor

TABLE A

1 AND 1A ESS SWITCHES REMOTE TRUNK TEST UNITS

OPERATION	REQUIRED FEATURE GROUPS	GENERIC ISSUE AVAILABILITY	FUNCTIONALLY EQUIVALENT TEST PANEL	SUPERVISORY MASTER SCAN POINTS	BIPOLAR CPD POINTS	SIGNAL DISTRIBUTOR POINTS
Equipped for 2-wire trunks testing	9SMTTP	1E(B5) 6 and later or 1AE (C5B5) 5 and later	2-Wire MTTP	29	10	42
Equipped for 2-wire and/or HILO 4-wire operation			4-Wire MTTP	42		
Equipped for 2-wire operation including line testing*	9SMTTP and 9SR2C2	1E(B7) 7 and later 1AE(C7B7) 7 and later	2-Wire MTTP with line testing	46	10	49*
Equipped for 2-wire and/or HILO 4-wire operation including line testing*			4-Wire MTTP with line testing			

* Line testing is an option and requires 7 additional SD points making a total of 49.

CPU	Central Processor Unit	LAT	Line Access Trunk
CRT	Cathode Ray Tube	MF	Multifrequency
CTTU	Central Trunk Test Unit	MTT	Master Test Trunk
DC/OGT	Direct Current/Outgoing Trunk Test Module	MTTP	Manual Trunk Test Position
		OIM	Office Interface Module
DTL	Dual Test Line	OS	Operations Support System
EIA	Electronic Industries Association	PPS	Pulses Per Second
EMI	Electromagnetic Interference	RAM	Random Access Memory
FSK	Frequency Shift Keying	ROM	Read Only Memory
HILO	High-Low	ROTL	Remote Office Test Line

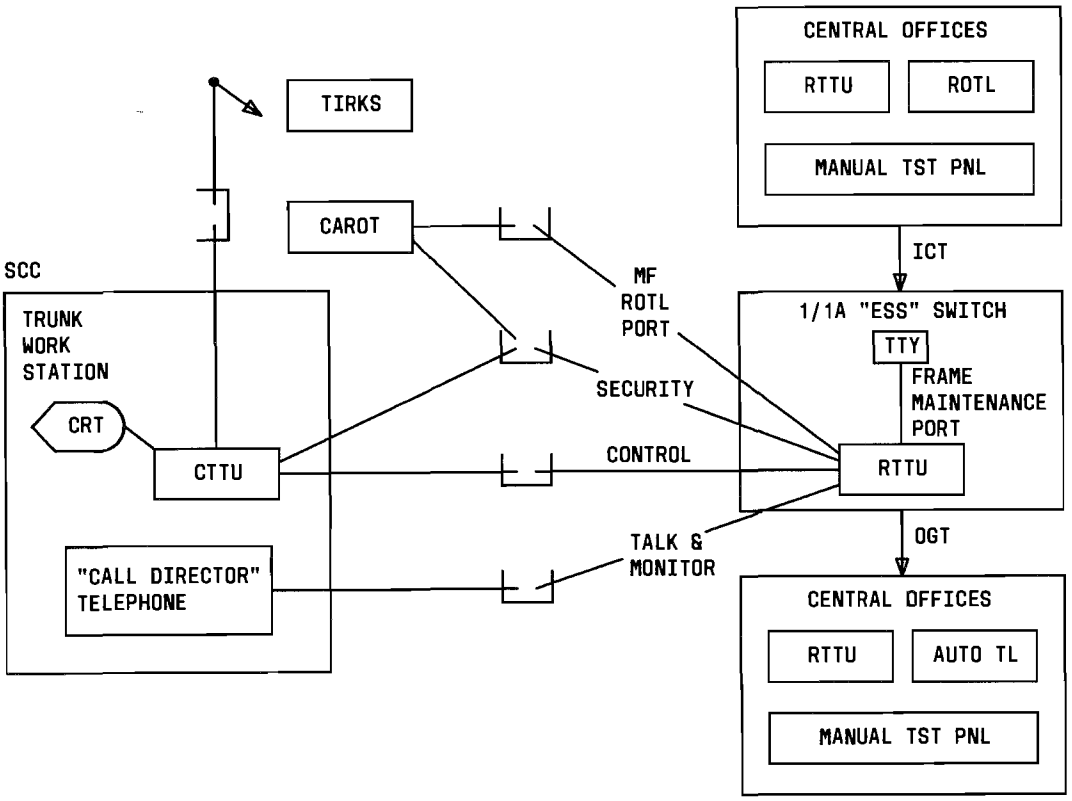

Fig. 1—RTTU and CTTU System Block Diagram

RTTU	Remote Trunk Test Unit
SCC	Switching Control Center
SCCS	Switching Control Center System
T&M	Talk and Monitor Module
TAT	Test Access Trunk
TGN	Trunk Group Number
TIRKS	Trunks Integrated Record Keeping Systems
TL	Test Line
TLP	Transmission Level Point
TLTP	Trunk and Line Test Panel
TNN	Trunk Network Number
TST	Test Panel
TUT	Trunk Under Test
TWS	Trunk Work Station.

2. EQUIPMENT DESCRIPTION

2.01 The RTTU (Fig. 2) occupies a standard one-bay frame containing the following subassemblies:

- Control, access, and measurement (CAM) unit
- Line Test Panel
- Data Set Mounting Shelf

- Terminal Strip Unit
- Control Unit
- Power Circuit
- Fuse Panel.

CONTROL, ACCESS, AND MEASUREMENT CIRCUIT

2.02 The CAM unit contains all of the frame electronics for measurements, access, and communications. It consists of 24 cards for the 2-wire application, and 31 cards for the HILO application. Two cards may be added for the 2-wire dual test line (DTL) module and up to four may be added for the high-low (HILO) application DTL. These cards are mounted on three shelves. Table B provides a complete list of CAM circuit packs. Each card measures 8 inches by 10 inches and terminates in a 200-pin connector.

2.03 In order to add new modules to the frame, the RTTU data bus must be wired to the module, and a transmission pair must be wired to the B switch card. The master central processor unit (CPU) control program must also be upgraded. Power is provided at all card slots—filled or empty. No wiring changes are needed to add the optional DTLs.

2.04 Space and power exist within the frame for up to four shelves of circuit packs in the CAM unit. The backplane of each shelf is designed to provide power and a ground plane to prevent electromagnetic interference (EMI) radiation from the unit.

LINE TEST CIRCUIT

2.05 The line test unit contains the logic necessary to provide coin collect, ringing, cutoff release, and access for performing voltmeter tests. It is located beneath the data set shelves.

DATA SET SHELF

2.06 The data set houses the 212AR data set for the primary control port. If other data sets are to be used, they will be mounted on this shelf. The ac power is furnished for the data sets on this shelf. The CAM circuit connectors P1, P2, and P3 terminate at this shelf for connection to data sets or to the local frame maintenance terminal.

TERMINAL STRIP UNIT

2.07 Most frame or ESS switch connections and strap options appear on this connector located at the top of the RTTU.

POWER CIRCUIT

2.08 Power is supplied to the RTTU from a power distributing frame via connectors located in the upper rear of the frame. Power is cabled from the connectors through hollow frame uprights down to the filters located in the base of the frame. The frame has one -48 volt and one +24 volt feeder cable. Filter inputs are connected to the fuse blocks located on the lowest mounting plate. The ac power leads are fused at the miscellaneous power frame.

3. FUNCTIONAL DESCRIPTION

MODULE FUNCTIONS

3.01 Overall frame control of the RTTU is provided by the master CPU module (Fig. 3). Communication and control are provided over a 21-lead digital bus that links all other modules to the master module. The master provides a 212 data set access for CTTU. A maintenance terminal port is provided for local access and control at the frame. The connector, CAM circuit connector P3, for this access appears at the data set shelf.

3.02 Switch access control is provided by the office interface module (OIM). This module interfaces to the switch via scan, distribute, and central pulse distributor (CPD) points. Three transmission access connections are provided on the test access trunks (TATs)—TAT1, TAT2, and TAT3—associated with the RTTU. The module also controls the line test circuit which terminates a line access trunk (LAT). The HILO frame options add two 4-wire TATs and one 2-wire TAT. The connection appraisal and security callback line control and a terminal monitor connection are also provided.

3.03 ▶The terminal monitor connection sends ESS switch messages from the ESS switch to the RTTU. The RTTU will receive and forward the messages to the CTTU. The CTTU will display these messages on the CTTU screen. The information contained in these ESS switch messages include:

- Trunk-in/out-of-service state

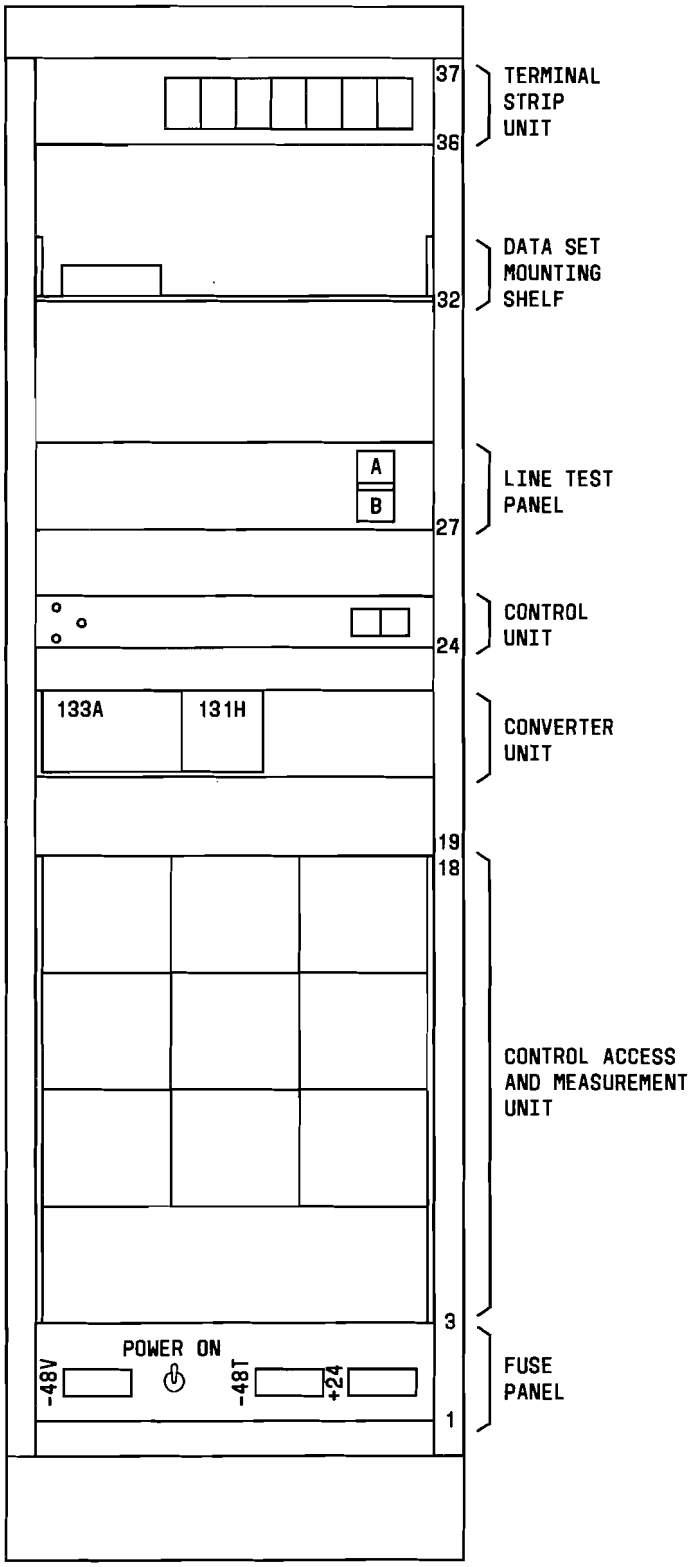

Fig. 2—RTTU Frame

TABLE B

CONTROL, ACCESS, AND MEASUREMENT CIRCUIT PACKS

SHELF	MODULE NAME	NUMBER OF CIRCUIT PACKS
UPPER	Talk and Monitor	1
	Memory A, B, C	3
	Master CPU	1
	Office Interface	6-7
MIDDLE	DC/OGT	2
	Switches	4
	Test Line Interface 5-6*	2
	Test Line Interface 7-8*	2
	Build-out & Blocking	3
LOWER	Responder	4
	Switches	0-4
	Test Line Interface 3-4	2
	Test Line Interface 1-2	2
	Build-out & Blocking*	0-3

* Optional

- Task order output
- Trunk troubles.◀

3.04 The talk and monitor (T&M) module provides callback and voice communications for incoming and outgoing testing purposes.

3.05 Two terminating 105 test line (TL) interfaces are furnished by the first standard DTL module. Additional DTL modules are optional. ▶Existing 105 test lines cannot be used with RTTU 105-type test lines as they use the same route index. When these 105 test lines are added to an ESS switch which already has conventional 105 test lines, the conventional test line must be removed. The new 105-type test lines are then put in the same trunk group as the original test lines.◀The second port of the standard DTL module can be switch optioned to provide a multifrequency (MF) ROTL control port. A frame connector option strap is also required. The ROTL control port will normally be desired in ESS switches not equipped with a stand-alone ROTL to permit CAROT control of the frame. ▶When the ROTL feature is desired, then testline 2 must have its own seven-digit access number in a one member trunk group and must not be part of any 105-type testline trunk group.◀

3.06 There are two measurement modules in the RTTU frame. The responder provides both manual (camp-on) and automatic transmission test

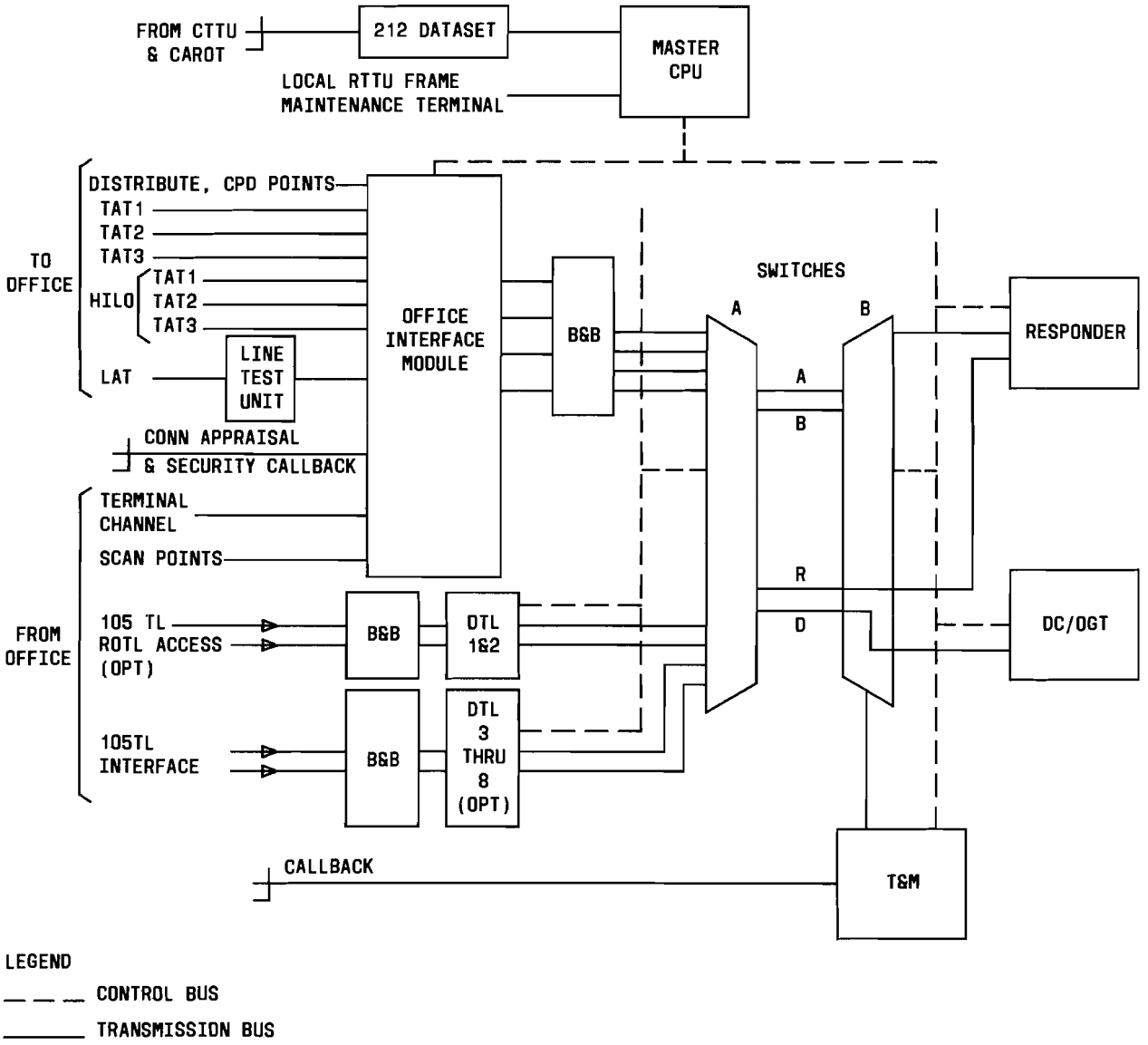

Fig. 3—RTTU Functional Block Diagram

capabilities. The direct current/outgoing trunk test (DC/OGT) circuit provides multimeter, signaling, and pulsing test functions.

3.07 The build-out and blocking (B&B) modules provide resistive build-out, drop build-out, and dc blocking for transmission access from the interface modules. Additional A and B switches are furnished with the HILO feature.

3.08 The A and B switches provide the internal transmission connection from the interface modules to the measurement modules.

CONTROL PORTS

A. RTTU Port

3.09 The primary port into the RTTU is known as the CTTU port. It uses a 1200 baud, 212AR type data set. The protocol used is BX.25 level 2.

3.10 The RTTU/CTTU command language consists of strings of American Standard Code for Information Interchange (ASCII) commands. These strings may be transmitted as a single buffer or a block of data. The RTTU is capable of simultaneously conducting several tests. The communication between RTTU and CTTU is organized by the use of a job number that the RTTU assigns to each test. Initial commands use the new job symbol (**) in the initial transmission. All responses from the RTTU will contain the assigned number. After the job is initiated, a new job may be started by using the ** job number in a new transmission.

B. Local Terminal Port

3.11 A local terminal port is provided for frame maintenance purposes at the RTTU (Fig. 4). This port electrically provides an Electronic Industries Association (EIA) RS232C connector wired as a data communication equipment appearance. The local terminal port accepts 300 or 1200 baud asynchronous ASCII characters generated by a terminal. A special editor provided by this port allows up to ten command strings to be entered and executed. The local terminal port also provides basic control of the RTTU, and it will accept the RTTU/CTTU command language for frame maintenance purposes. The local terminal port is not intended to be an efficient man-machine interface, and it should not be used for routine or demand tests.

C. CAROT/ROTL Port

3.12 An optional MF ROTL-like port can be installed at the RTTU. Operations via this port will take approximately 6 seconds longer per test code than the RTTU input with its high speed ASCII data interface. One of the standard 105 test line accesses must be converted to provide this function.

D. Control Port Security Classes

3.13 The RTTU access to the ESS switch provides all of the capabilities that the test panel in the ESS switch provides. Four levels of security are used by the RTTU to provide security and restricted test access to remote users like the CTTU and CAROT. The four security classes are class A (Primary CTTU), class B (Secondary CTTU), class C (CAROT), and class D (Login). Upon login, the lowest level of security (class D) is assigned. No maintenance busy or service busy restoral functions may be performed until a higher security level has been granted. Security qualification is satisfied when a user requests a security callback to control. Upon request, the RTTU will speed dial the security callback number. After the RTTU detects ringing, it will request control to arm the callback port. Control must then answer and transmit the unlock tone. The RTTU will grant the desired security level when the unlock tone is received.

3.14 The talk and monitor functions have implicit security because a separate speed dial code is assigned to the talk and monitor line. Only the primary CTTU (and in some instances the secondary CTTU) should have speed dial codes assigned.

3.15 The CAROT system is qualified to make trunks busy up to the automatic maintenance limit for the ESS switch. The secondary CTTU is able to busy out up to ten trunks per session for maintenance test purposes only. The primary CTTU is able to busy out or restore trunks to service without explicit limit. Messages are returned when the automatic maintenance limit for the trunk group has been exceeded.

OUTGOING ACCESS PORT CIRCUITS

A. Trunk

3.16 Three 2-wire transmission interfaces are provided as test access trunks (TAT1, TAT2, and TAT3) associated with the RTTU. Three 4-wire HILO TATs are provided for HILO testing (Fig. 4). The master test trunk (MTT) (SD-1A192 for 2-wire or SD-1A367 for HILO 4-wire) is used to obtain access to the trunk to be tested. Incoming calls directed to the RTTU are initially connected to the MTT before being transferred to a TAT.

B. Line

3.17 In a 1/1A ESS switch with 1E7/1AE7 generic, line tests can be made using the line access trunk (LAT)(SD-1A176).

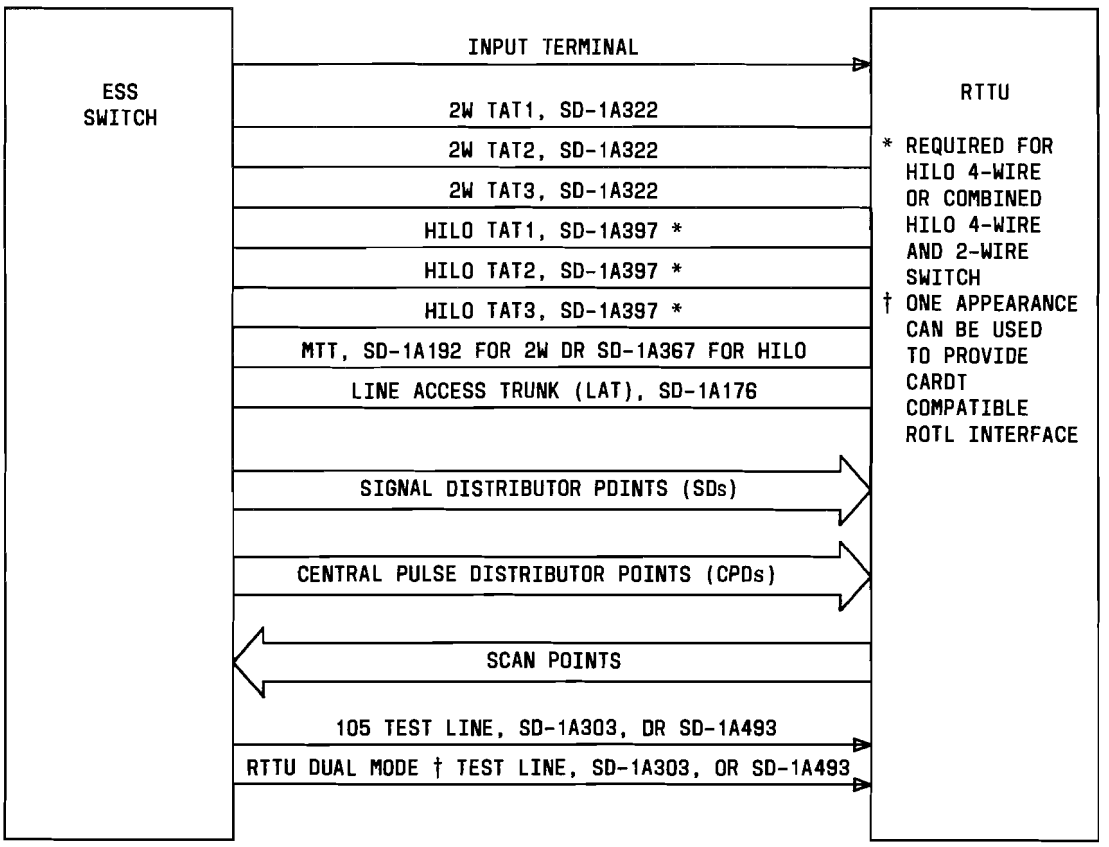

Fig. 4—RTTU ESS Switch Interface

C. Connection Appraisal (CA) and Security Callback

3.18 An outgoing line appearance is provided for CA testing. Transmission tests to 100, 102, 105 test lines may be made for network evaluation of transmission. The RTTU uses this line to dial a TL and make tests.

3.19 The CA port doubles as the security callback port for the RTTU and, for this reason, the CA port is required for all RTTUs regardless of the class of switch they serve. Security-line access must be provided when maintenance busy or restoral functions are performed. The proper security unlock tone must be received from control before the maintenance state of a trunk or trunk group may be altered.

INCOMING ACCESS PORT CIRCUITS

A. 101-Type Calls

3.20 Incoming calls, after being initially answered at the MTT, can be transferred to TAT1, TAT2, or TAT3. Upon receipt of a 101-type call, the RTTU answers by returning off-hook supervision on the MTT. At the same time, the unit will originate a call to the SCC CTTU CALL DIRECTOR telephone and allow the caller to speak with the SCC craftsperson. If the CTTU is already connected to the RTTU and the T&M path is in use, a message is sent to the CTTU informing the craftsperson that a call has arrived. The CTTU craftsperson then has 2 minutes to connect the T&M path to the incoming call before the port is returned to idle (on-hook). Prior to returning idle, five bursts of test progress tone are sent to the caller to indicate that no craftsperson assistance is available at the SCC.

B. 105-Type Test Line Ports

3.21 ▶The RTTU provides up to six 105-type test ports in 2-wire only 1 and 1A switches, up to four in HILO only offices and eight in combined 2-wire HILO switches.◀ One incoming, 2-wire TL port can be arranged to provide the ROTL-like MF control access to RTTU. The 105 TL supports all normal 52A responder test capabilities. See paragraph 3.22 for possible test port configurations.

3.22 ▶The following TL arrangements are possible:

(a) 2-Wire Only Installations

(1) Test lines (1,2) arranged as 105-type test lines

(2) Test lines (1,2,5,6) arranged as 105-type test lines

(3) Test lines (1,2,5,6,7,8) arranged as 105-type test lines

(4) Test lines (1,5,6,7,8) arranged as 105-type test lines when test line (2) is arranged to provide the ROTL port

(5) Test line (1) arranged as 105-type test lines when test line (2) is arranged to provide the ROTL port

(6) Test lines (1,5,6) arranged as 105-type test lines when test line (2) is arranged to provide the ROTL port

(b) For HILO Only Installations

(1) Test lines (1,2) arranged as 105-type test lines

(2) Test lines (1,2,3,4) arranged as 105-type test lines

(3) Test lines (1,3,4) arranged as 105-type test lines when test line (2) is arranged to provide 2-wire ROTL port

(4) Test line (1) arranged as 105-type test line when test line (2) is arranged to provide 2-wire ROTL port

(c) For 2-Wire/HILO Combined Installations

(1) Test lnes (1,2) arranged as 105-type test lines

(2) Test lines (1,2,3,4) arranged as 105-type test lines

(3) Test lines (1,3,4) arranged as 105-type test lines when test line (2) is arranged to provide 2-wire ROTL port

(4) Test line (1) arranged as 105-type test line when test line (2) is arranged to provide 2-wire ROTL port

(5) Test lines (5,6) arranged as 105-type test lines

(6) Test lines (5,6,7,8) arranged as 105-type test lines.◀

4. RTTU COMMAND FUNCTIONS

ADMINISTRATIVE COMMANDS

4.01 The administrative commands provide login/logoff capability, invoke the security callback process, and display the status of the interface ports as well as the measurement modules. The administrative commands are also used to take terminating transmission ports out of service for maintenance or return them to service.

RESOURCE COLLECTING COMMANDS

4.02 These commands cause the RTTU to collect all of the resources needed to perform a test. The measurement module, talk and monitor, test mode, impedance, and transmission level point (TLP) are specified at this time. The test mode specifies the nature of the test which may be transmission, multimeter, signaling, balance, order wire, or monitor mode. Order wire is a basic talk mode without intent to make tests. The resources associated with a seized trunk may be changed using special commands.

CIRCUIT ACCESSING COMMANDS

4.03 The circuit accessing command causes the switching machine to access either a trunk, line, junctor, or connection appraisal line. Trunk group tests may also be specified at this time. The circuit identification code [trunk network number (TNN), group number, or directory number] specifies

the specific trunk, group, or line to be accessed. The far-end test line is also specified so that the proper call disposition analysis may be made. Allowable TL types are 100, 102, 105, and manual test board (101).

4.04 The initial state of the trunk is specified upon seizure. It may be changed later by issuing a trunk state command. Allowable states include tandem, local talk, bypass, pulsing (with or without E&M leads loop), and signaling tests (with or without E&M leads loop). The call may be monitored if successful far-end call disposition occurred. If desired, unsuccessful far-end call dispositions may be monitored by the CTTU operator. Calls to manual test positions always involve a talk path. A traffic busy trunk may be monitored for purposes of busy state verification if it appears to be permanently busy.

OFFICE TESTS

A. Administrative Commands

4.05 The administrative commands allow for trunk maintenance state changes, scan point control and display, the ability to cause the position to appear busy to potential incoming manual (Code 101) test calls, and the ability to disable defective 105 TL ports. Distribute points and register display characters may be monitored for a specified length of time or number of changes.

B. Trunk State

4.06 All trunk states that are recognized by the switch may be selected. These include tandem I and II, local talk, bypass, signaling, and pulsing states.

C. E&M Leads Test

4.07 The TATs may be used to set up E&M lead trunks for supervision testing. The DC/OGT then may be used to operate and monitor E&M leads toward the facility. The trunk may be returned to service for an in-service monitor of E&M leads.

D. Circuit Release Command

4.08 The circuit release command causes a circuit to be released in a specified maintenance state or in its original state (idle, locked out, or disabled). All RTTU frame resources assigned to the test are normally released at this time.

5. TEST CAPABILITIES

TRANSMISSION TESTS

5.01 Transmission tests are made by the responder module within the RTTU. Two categories of tests that can be made are manual or automatic TL type tests. Self checks can be made for each measurement. These tests are listed in Table C. Manual (camp on) test commands may be either transmit or measure (or both as in the case of the Return Loss Tests). Manual tests may be made on either outgoing or incoming trunks. Automatic outgoing tests (CAROT responder type) may be made to 100, 102, or 105 TLs. Automatic incoming tests are done as a 105 TL would make them. Commands are received as MF digits when either ROTL-like outgoing tests using the port-to-CAROT or when 105 TL incoming tests are to be made. In those cases, results are reported as timed frequency shift keying (FSK) signals. When accessed by the RTTU control port, the commands and results are ASCII character strings.

E&M LEADS MONITOR TESTS

5.02 An E&M leads monitor of in-service trunks may be performed using the RTTU. The E&M leads are sampled every 200 ms and time-stamped on- or off-hook changes are reported to the CTTU.

SUPERVISORY AND WINK TESTS

5.03 Supervisory tests are permitted only under the control of the CTTU. Manual control of outgoing supervision allows for forced on- or off-hook supervision as either the originating or terminating end of the trunk. The types of trunk supervision that may be used are: high-low, reverse battery (normal polarization), reverse battery (reverse polarization), and reverse high-low or E&M leads.

5.04 Incoming supervision may also be monitored. The RTTU returns a time-stamped message indicating the change of state of the trunk. Time accuracy is $\pm$ 5 ms. The range is from 0 to 99.990 ms. Wink tests indicate the timing of wink response. Accuracy is $\pm$ 1 ms of the reported time. Measurements are collected for 15 seconds prior to displaying the results.

TABLE C

TRANSMISSION TESTS

TEST	FREQ	TRANSMIT LEVEL	RECEIVE RANGE	ACCURACY
Signal Power (Level)	1004	0 dBm0	+2 to −15.8 dBm	±0.1 dB
Gainslope Low	404	−16 dBm0	−14 to −36.8 dBm	±0.2 dB
Gainslope Medium	1004	−16 dBm0	−14 to −36.8 dBm	±0.2 dB
Gainslope High	2804	−16 dBm0	−14 to −36.8 dBm	±0.2 dB
C Message Noise	0.3kHz	Quiet	15 to 55 dBRNC	±1.0 dB
C Notch Noise	1004	−16 dBm0	34 to 74 dBRNC	±1.0 dB
Singing Return Loss	—	*	0 to 40 dB	±1.0 dB
Echo Return Loss	—	*	0 to 40 dB	±1.0 dB
Singing Return Loss High	—	*	0 to 40 dB	±1.0 dB

* −15 to −16.5 dBm0 for 2-wire and −16.5 dBm0 for 4-wire

DIAL PULSE TESTS

5.05 The RTTU is capable of either sending or measuring dial pulse test signals. The transmitted signal may be a specified number or a continuous stream of pulses. The percent break (30 percent to 90 percent) and speed of pulsing (8 to 12 pulses per second) may be specified. Accuracy is 0.1 pulses per second (PPS), and 2.5 units or 1/2 percent on percent break, whichever is greater. Four types of signaling may be specified: start dial, delay dial, wink, and immediate start. Four test conditions can be used: leak-D1, leak-0, short loop, and long loop battery and ground. The response to the measurement request includes percent break only. Speed is not reported.

MULTIMETER TESTS

5.06 Multimeter tests are done by the DC/OGT module. These tests are all for metallic access loop trunks or lines. The measurements include ac, dc, resistance, and capacitance. All readings may be taken R-T, R-G, T-G (where T indicates tip, R indicates ring, and G indicates ground). In the multimeter mode, a quasi-continuous display of readings will be generated until the RTTU is commanded to stop. A voltage analysis test can be requested that will generate T-R, T-G, and R-G voltage readings for ac and dc. If the voltage readings are low enough, then three resistance readings will also be made. Table D lists multimeter measurement characteristics.

LINE TESTS

5.07 Line tests can be made in ESS switches with the 1E7/1AE7 and later generics. All transmission and multimeter tests can be performed on lines. Special line tests can be made to coin stations and station line circuits. Coin tests include coin collect and release (±130 Vdc). Ringing capabilities include loop, ring party, and tip party. Cutoff release

TABLE D

MULTIMETER MEASUREMENT CHARACTERISTICS

TEST	FORMAT	RANGE	ACCURACY*	RESTRICTIONS
DC	Signed Volts	0-200V	1V or 2%	120 Vac MAX
AC	Volts	0-150V	2V or 5%	100 Vdc MAX
Resistance	Three Digits Plus Exponent	0-999 Kohms	25 ohms or 5%	5 Vac or 5 Vdc MAX
Capacitance	x.yz Microfarads	0-5 μF†	0.01 μF or 2%	10 Vac, 2 Vdc MAX and 50 kohms Minimum‡

* Accuracy is determined by whichever number is the larger.

† The measurement accuracy depends on the nature of shunt resistance and voltage present.

Shunt Resistance 4% at 500 Kohms, 2% at 52 Kohms

DC Voltage 2 volts dc: 31% at 110 Kohms shunt, 60% at 51 Kohms shunt.

AC Voltage 1% at 2 volts peak-to-peak, 5% at 10 volts peak-to-peak

‡ The capacitance test will not be made if either the shunt resistance is less than 50 Kohms, or the dc voltage exceeds 2 volts, or the ac voltage exceeds 10 volts.

tests and ground-start signaling tests may also be made.

DIAGNOSTIC SELF TESTS

5.08 The RTTU consists of a number of access and measurement modules. Diagnostic tests are provided for each module in the form of operational and analog measurement tests. Operational tests include CPU, read only memory, (ROM) and random access memory (RAM) tests, as well as per module circuit tests. Analog tests involve continuity and tone tests done within modules and between modules on the transmission and dc bus within the RTTU. Interface diagnostics provide for exercising all scan and distribute points, as well as transmission interfaces to the ESS switch.

TALK AND MONITOR

5.09 For outgoing trunk tests, the talk and monitor function can be started when the test resources have been collected. The RTTU frame will call the CTTU CALL DIRECTOR telephone using a 1- or 2-digit speed dial code to either the primary or secondary CTTU. Security is provided by use of the speed dial code on callback.

5.10 On incoming calls, the talk and monitor function is needed for communication with the CTTU operator. When the incoming call arrives, the RTTU initiates a call to the trunk work station (TWS). If the T&M circuit is already in use, a message indicating that a call is waiting is sent to the CTTU. The CTTU operator may then connect the talk and monitor path to converse with the caller. If a transfer command is not received within 2 minutes, the call is terminated.

5.11 Special commands are provided to switch between several jobs or buses within the unit. For local, on-site work at the frame, a speaker and volume control are provided. Special commands must be entered to enable the speaker. Access to the internal RTTU buses is provided by jacks on the front plate of the module.

6. REFERENCES

6.01 Operation System Deliverable Documents to be used for reference are:

OPG-1P032	Operations Support Systems—Central Trunk Test Unit (CTTU) and Remote Trunk Test Unit (RTTU)—System Index
OPD-1P033-01	Operations Support Systems—Central Trunk Test Unit (CTTU) and Remote Trunk Test Unit (RTTU—Overall System Description)
OPD-1P034-01	Operations Support Systems—Remote Trunk Test Unit (RTTU) Feature—System Description — 1 and 1A ESS Switch, 1 and 1A ESS Switch HILO, and 2 and 2B ESS Switch
OPP-1P035-01	Operation Support System—Central Trunk Test Unit (CTTU) and Remote Trunk Test Unit (RTTU)—Performance Test Requirements
OPO-1P036-01	Operation Support Systems—Central Trunk Test Unit (CTTU) and Remote Trunk Test Unit (RTTU)—System Operations Guide
OPM-1P037-01	Operation Support Systems—Central Trunk Test Unit (CTTU) and Remote Trunk Test Unit (RTTU—RTTU/CTTU Overall System Maintenance and Tests
OPM-1P039-01	Operation Support System—Remote Trunk Test Unit (RTTU) for 1 and 1A ESS Switches and 1 and 1A ESS Switches HILO—Trouble Locating Procedures
824-101-124	CTTU Equipment Design Requirements

6.02 AT&T practices to be used for reference are:

190-130-200	SCC/SCCS Centralized Trunk Operations, Switching Control Centers, Operations Systems
190-130-203	1 and 1A ESS Switches Remote Trunk and Line Test Procedures using Remote Trunk Test Interface (DS-1A485-01) Switching Center Operations Systems
231-090-219	Remote Office Test Line (ROTL) and Processor Controlled Interrogator (PCI) Feature—1 and 1A ESS Switches
231-032-025	Remote Trunk Test Unit Description — 1 and 1A ESS Switches
231-090-366	HILO 4-Wire Switching Feature
231-090-099	Code 105-Type Test Line Feature — 1 and 1A ESS Switches
231-032-000	Remote Office Test Line (ROTL) Description — 1 and 1A ESS Switches
231-055-008	Remote Office Test Line — 1 and 1A ESS Switches
231-049-305	Remote Trunk Test Unit—Growth—1 and 1A ESS Switches
231-049-306	Remote Trunk Test Unit—Build-Out—1 and 1A ESS Switches
231-190-405	Interface with Switching Control Center System—ESS Switches
231-390-405	Interface with Switching Control Center System—1A ESS Switch
824-101-118	RTTU Equipment Design Requirements
865-205-100	RTTU/CTTU Engineering Implementation Methods System.