

**RTTU/CTTU (REMOTE TRUNK TEST UNIT/CENTRAL TRUNK TEST UNIT)
ENGINEERING AND IMPLEMENTATION METHODS SYSTEM
OPERATIONS SUPPORT SYSTEMS**

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6. RTTU (Remote Trunk Test Unit) Data Form — 1/1A ESS Switches	41	1.01 This practice is intended to be used by tele- phone company planning personnel and engi- neers who have the responsibility for implementing the RTTU/CTTU (remote trunk test unit/central trunk test unit) system. It is meant to serve as an in- formation guide, and is not intended to be a detailed engineering document. A brief description of the RTTU/CTTU system, and discussions of the special features of its major components, system sizing re- quirements, engineering considerations, economic factors and implementation strategy, and other spe- cial considerations are contained in this practice.	
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This practice also contains a glossary of terms that are used throughout.

1.02 This practice is being reissued to include additions and changes to the RTTU/CTTU system. Equipment Test Lists are not affected. Revision arrows are used to denote significant changes. The following are specific reasons for this reissue:

- Update Fig. 1, 2, and 4
- Revise Table A
- Add information on the universal definable monitor and control points
- Delete references to circuit packs that are no longer used
- Make minor corrections.

2. SYSTEM DESCRIPTION

2.01 The primary function of the RTTU/CTTU system (Fig. 1) is to provide a means of centralized trunk and line maintenance for local SPCS (Stored Program Controlled Systems) and EMS (Electromechanical Systems). The RTTU/CTTU system was designed to accomplish the following specific objectives in order to support its primary function:

- Provide a common TWS (trunk work station) that is applicable to all switching machine types served by the SCC (Switching Control Center)
- Support the existing capabilities of the CAROT (Centralized Automatic Reporting on Trunks) system
- Provide the TWS with comprehensive demand trunk testing capabilities that are equivalent to those provided at on-site test panels
- Provide line access and testing capabilities to satisfy the needs of the SCC
- Provide a TWS that is compatible with an operational environment where mechanized records and work administration are used

- Provide the TWS with efficient interfaces to CAROT and the TIRKS (Trunks Integrated Record Keeping System)
- Provide the flexibility that would allow the system to add the required capabilities that would satisfy future needs of the central offices, SCCs, and of the TNOP (total network operations plan).

2.02 The CTTU (Fig. 2), which resides in the SCC, controls the J1P051() RTTU frames (1/1A ESS and 2/2B ESS switches), the J1P060() mini-RTTUs (No. 5 crossbar, step-by-step, and 3 ESS switch offices), and the equivalent RTTU function provided by 5ESS switches. The CTTU accesses and controls the RTTUs over a dialup data link.

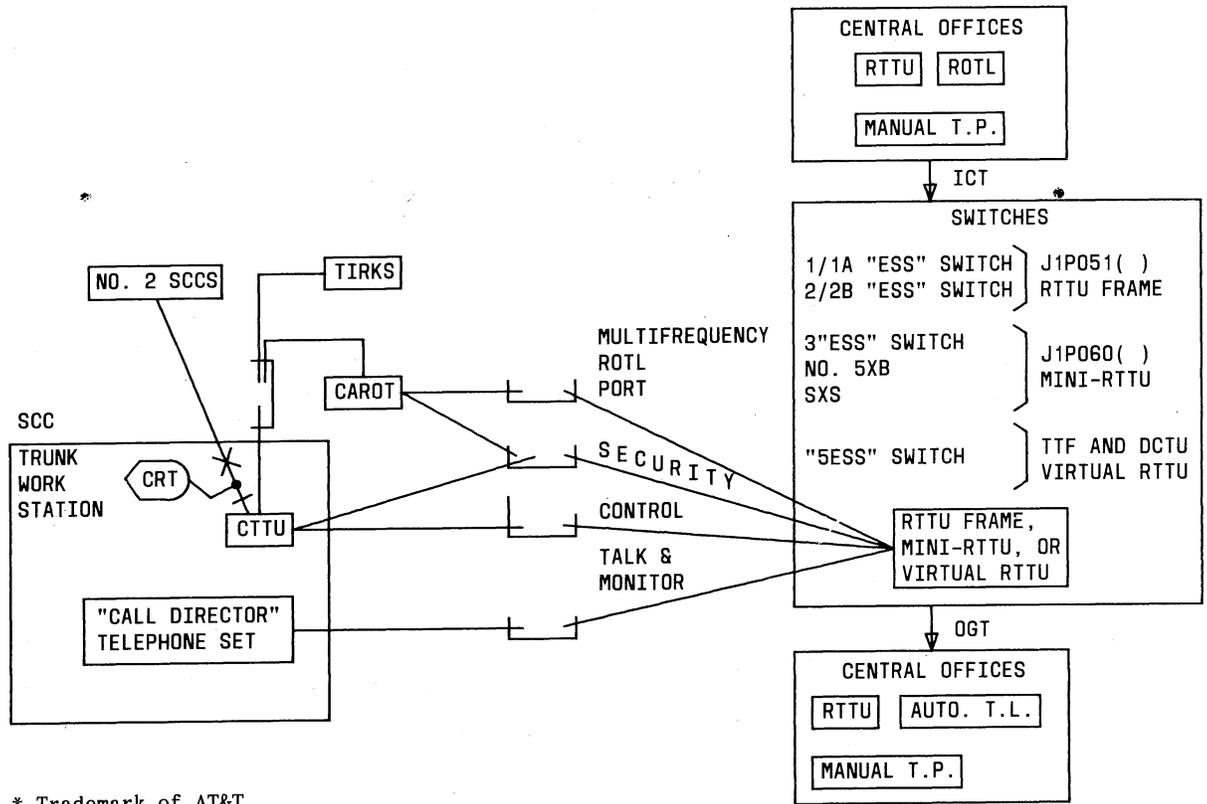
2.03 In addition to the dialup data link, there is a T&M (talk and monitor) connection between a CALL DIRECTOR* telephone at the TWS and the RTTU over which the TWS technician can listen to the trunk under test or talk to another technician.

2.04 The CTTU provides communication ports for interacting with CAROT, TIRKS, and the No. 2 SCCS. The CTTU terminal serves as a remote-user terminal for CAROT and TIRKS and as a local terminal for the No. 2 SCCS.

2.05 The following test capabilities are provided by the RTTU/CTTU system:

- Transmission tests
- Trunk diagnostics
- Multimeter and signaling tests
- Talk and monitor on the trunk under test and order wire
- Office TTY maintenance channel message interpretation
- Miscellaneous line tests
- Basic terminal connection to CAROT, TIRKS, and No. 2 SCCS

* Registered trademark of AT&T.



◆Fig. 1—RTTU/CTTU System Block Diagram◆

- Basic TWM generation, management, and utilization
- Office data base generation, management, and utilization
- Automatic self-diagnostic on power up
- Control of RTTU diagnostics
- Instructions.

2.06 Refer to OSDD (Operations Systems Deliverable Documentation) document OPD-1P033-01 for a more detailed description of the RTTU/CTTU system.

3. RTTU/CTTU SYSTEM MAJOR COMPONENT DESCRIPTION

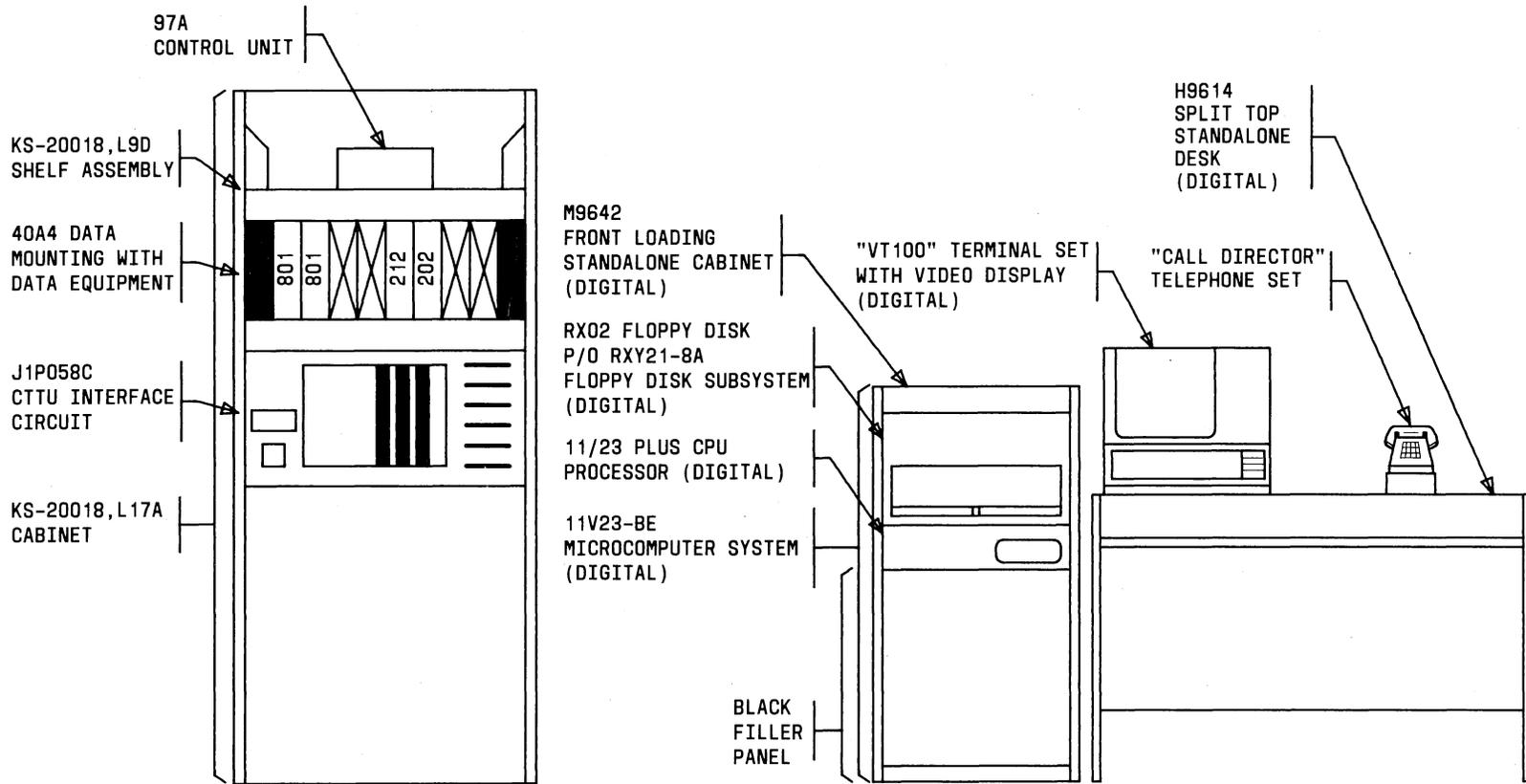
CTTU

3.01 The CTTU (Fig. 2) is an intelligent terminal system that includes a DEC* 11/23 PLUS microcomputer, a DEC VT100† video display terminal, a DEC RX02 dual floppy disc drive, an optional local printer, and the input/output capabilities necessary to communicate with RTTUs and with operations support systems.

3.02 The CTTU software (1CTTU1 generic) serves to control the RTTU over a dialup data link which uses level 2 BX.25 protocol. The CTTU issues commands and receives and interprets responses from the RTTU. The CTTU constructs the command strings required by the RTTU, and accepts the RTTU responses and formats them into a human readable

* Registered trademark of Digital Equipment Corporation.

† Trademark of Digital Equipment Corporation.



◆Fig. 2—CTTU Equipment Configuration◆

form. The 1CTTU1 generic software also serves the following auxiliary functions:

- Diagnostics
- OSS (Operations Support Systems) communications
- Office data base administration
- Training support and instructions
- TWM (trunk work message) generation, management, and utilization.

J1P051() RTTU FRAME

3.03 The J1P051() RTTU frame (Fig. 3) provides remote test features for the CTTU. It also provides 105 test line ports, and an optional ROTL (remote office test line) port.

3.04 The RTTU frame utilizes microprocessor based modules to provide all CAM (control, access, and measurement) features. Control of the RTTU frame resides in the master CPU (central processing unit) module. Office interface operations are controlled by the OIM (office interface module). A different version of the OIM is used for 1/1A and 2/2B ESS switches. Measurement features reside in the responder and DC/OGT modules. Other modules are used to provide interframe and intraframe switching, test line, and talk and monitor features.

3.05 For 2/2B ESS switches, the CAM unit for the RTTU is coded J1P051AA and consists of approximately 20 circuits mounted on 2 shelves. The FASTECH* circuit pack technology is used, with the cards measuring 8 inches by 10 inches. Each circuit pack terminates in a 200-pin connector.

3.06 For 1/1A ESS switches, the CAM unit for the RTTU is coded J1P051BA and consists of 24 FASTECH circuit packs for the 2-wire application, and 31 circuit packs for the 4-wire HILO application. One circuit pack may be added (for a total of two) for the 2-wire DTL (dual test line) and up to three may be added (for a total of four) for the 4-wire HILO application of the DTL.

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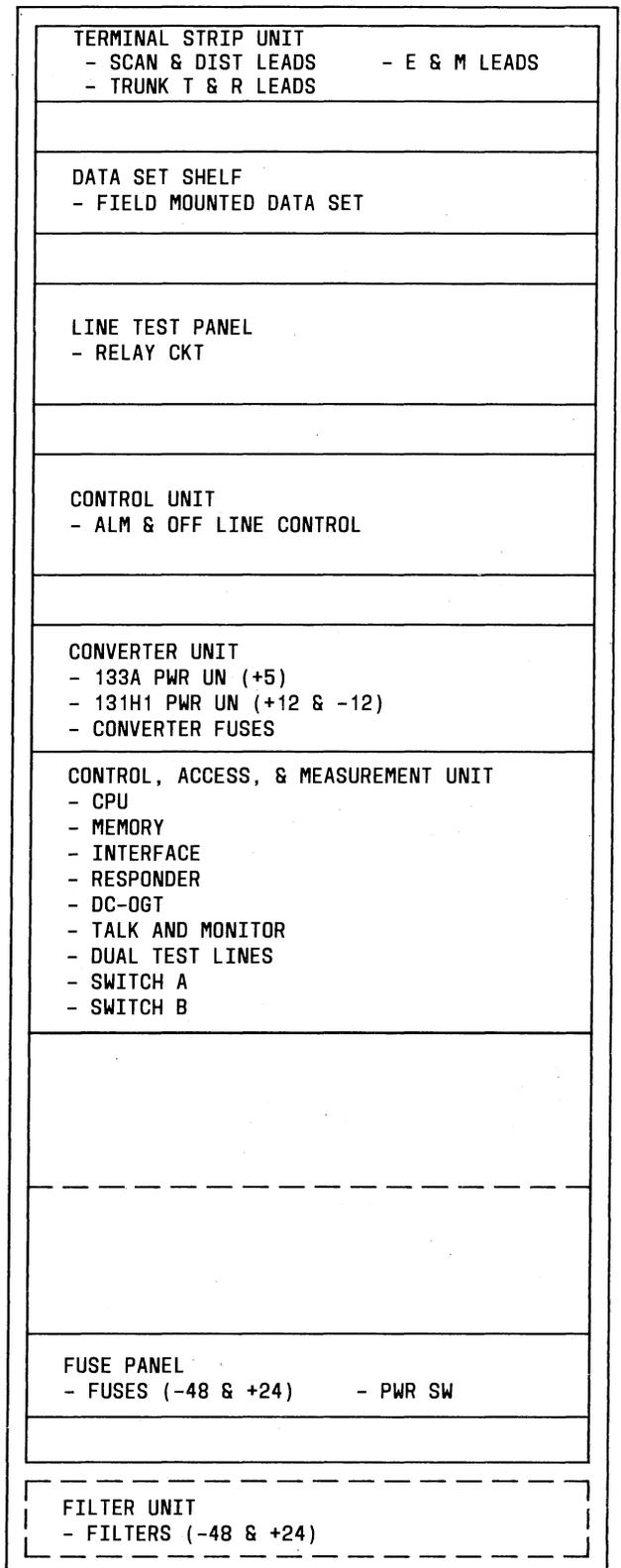


Fig. 3—J1P051() RTTU Frame, Typical Subassembly Arrangements

3.07 Space and power exists within the frame for up to four shelves of circuit packs in the CAM unit.

3.08 The backplane of each shelf is designed to provide power and has a groundplane to prevent EMI (electromagnetic interference) radiation from the unit.

3.09 The RTTU frame may be installed in offices equipped with the 2/2B ESS switch arranged for EF (extended feature) or LO (local office) generics. The RTTU frame may also be installed in offices that are equipped with the 1/1A ESS switch loaded for generics 1E(SP/CCB5)6 or 1AE(C5B5)5 and higher. For offices equipped with the 1/1A ESS switch, line test features are available for the RTTU only if generic 1E7 or 1AE7 or higher is installed in the switching equipment and the R2C2 feature package is loaded.

3.10 The electrical interface to the switching equipment is identical to that used by the TTP (trunk test panel) in offices equipped with the 2/2B ESS switch or the MTTP (manual trunk test panel) in offices equipped with the 1/1A ESS switch. The control leads and the transmission test trunks are also identical.

3.11 For outgoing circuits in offices equipped with the 2/2B ESS switch, three 2-wire transmission interfaces are provided as access trunks AT1, AT2, and AT3 for the RTTU. Three 2-wire TAT (test access trunks) and the master test trunk are provided for RTTUs located in offices equipped with the 1/1A ESS switch. Three additional TATs (two 4-wire and one 2-wire) are required in RTTU offices equipped with the 1/1A ESS switch with the HILO feature. If line testing is desired, an additional LAT (line access trunk) is required for RTTUs located in offices equipped with the No. 1/1A ESS switch and loaded with the R2C2 feature package.

3.12 The J1P051() RTTU frame provides the following test capabilities:

- Trunk diagnostics
- Multimeter tests
- Supervision tests
- Dial pulse tests

- Transmission tests
- Talk and monitor
- 105-type test line
- Trunk status control
- Miscellaneous line tests (2/2B ESS switch and 1/1A ESS switch with R2C2 feature package).

3.13 The RTTU for the 2/2B ESS switch also has the following capabilities:

- To simultaneously access both the T,R pair and the E&M pair of a trunk under test
- To split the E&M pair and signal toward the switch or facility.

3.14 The RTTU for the 1/1A ESS switch additionally provides touch-tone dialing input commands to the master test trunk. This allows for diagnostics, known as task order tests, to be conducted.

RTTU FUNCTION FOR 5ESS SWITCH

3.15 The RTTU for the 5ESS switch is a body of software that provides the functionality necessary for the CTTU to remotely test trunks and lines at a 5ESS switch from a maintenance center such as an SCC. The RTTU software is capable of interpreting requests from the CTTU, perform the appropriate line or trunk tests locally within the 5ESS switch and return the results to the CTTU. The CTTU interface is an option for the 5ESS switch.

3.16 The RTTU for the 5ESS switch provides the following test capabilities:

- Transmission tests
- Multimeter tests
- Supervision tests
- Trunk circuit diagnostics
- Talk and monitor
- Miscellaneous line tests

- Terminate 101-type test line calls.
- 3.17** The following pieces of hardware provide the RTTU function for the 5ESS switch:
- DCTU (directly connected test unit)
 - TTF (transmission test function)
 - BX.25 data link.
- 3.18** The above hardware units are not accessed directly by the RTTU software, but via intermediate software.
- 3.19** The DCTU is incorporated into the 5ESS switch and is used to perform both dc and subaudio ac voltage and current measurements on lines and analog trunks. The DCTU is a common resource for metallic testing. It is also used by the TLWS (trunk and line work station) metallic testing capability. The PMU (precision measuring unit) is the main piece of testing hardware in the DCTU. The PMU generates test signals, applies them to the facility being tested, senses the resulting current flows and provides the necessary signal processing to perform a test. The DCTU can contain from one to three PMUs.
- 3.20** The RTTU software interfaces with the DCTU via the DCTU port control and test logic software.
- 3.21** The TTF performs four functions: tone generation, tone detection, measures loss and noise, and detects and analyzes touch-tone dialing digits. The TTF is shared hardware resource which is accessed by the RTTU software via the TTF port control and test logic software.
- 3.22** The dialup BX.25 data link is terminated on a TN75C PC (peripheral controller) on the 3B IOP (input/output processor). Each TN75C PC has two PC subdevices capable of supporting a full duplex connection. A 212-type data set is required for a 1200-baud data link. The software resident in the TN75C PC provides level 2 of the BX.25 synchronous communication protocol.
- 3.23** The 3B processor does not support an RS-232C interface for dialup data links that use the TN75C PC. Consequently, a special cable is required

for the interface between the 212-type data set and the TN75C PC.

3.24 The RTTU software does not communicate with the PC directly, but with the communication protocol handler of the IODRV (input/output driver) via the standard 3B DMERT I/O (input/output) interface (i.e., open/close, read/write).

J1P060() MINI-RTTU

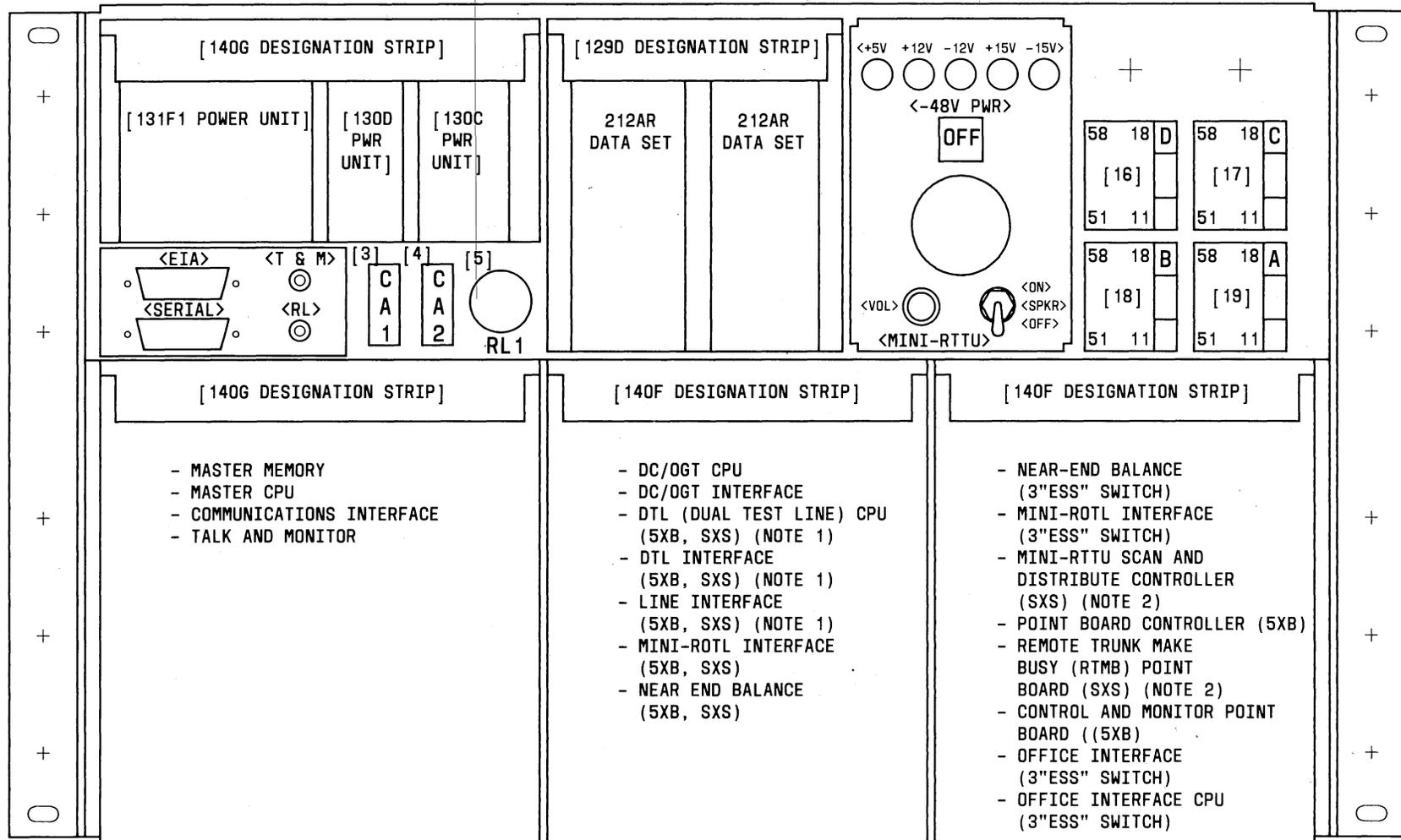
3.25 The mini-RTTU (Fig. 4) modifies and extends the capabilities of the mini-ROTL to provide manual demand testing for the 3 ESS switch and 5XB (No. 5 crossbar), and SXS (step-by-step) switching offices. In addition to the test capabilities available from the mini-ROTL, the CTTU operator at the SCC has the capability to perform multimeter tests, signaling tests, wink tests, pulsing tests, near-end balance tests, and monitor and talk on trunks and lines.

3.26 For step-by-step and No. 5 crossbar mini-RTTUs, the line testing feature is optionally provided. The line testing feature is provided as standard with the mini-RTTU for the 3 ESS switch.

3.27 The RTMB (remote trunk make-busy) feature is optionally available in the step-by-step mini-RTTU. Up to 96 trunks can be made busy by adding up to four circuit packs to the basic mini-RTTU. A supplemental RTMB unit will increase the number of trunks to 1000. In No. 5 crossbar switching systems, the RTMB feature is provided as part of the EOTT (enhanced operational trunk test)/RTMB feature package which also may be controlled by the mini-RTTU. No additional equipment is required to provide the RTMB feature for 3 ESS switches.

3.28 The UDMC (universal definable monitor and control) points option provides 32 user definable general purpose points that may be used to control or monitor office functions remotely. This option is available for the 5XB and SXS mini-RTTUs only. ♦

3.29 For 3 ESS switches, the mini-RTTU connects to the TLTP (trunk and line test panel) via scan and distribute points and to the mini-ROTL. Generic 3E3 is required for 3 ESS switches. In No. 5 crossbar switching systems, the mini-RTTU connects to the No. 5 crossbar mini-ROTL and a dedicated no-test trunk. In step-by-step switching systems, the mini-RTTU connects to the step-by-step mini-ROTL and a test distributor.



NOTES:

1. OPTIONAL FOR 5XB OR SXS
2. OPTIONAL FOR SXS

◆Fig. 4—J1P060() Mini-RTTU Subassembly Arrangements◆

3.30 The hardware required to implement the mini-RTTU consists of a mini-RTTU control unit and a mini-RTTU interface unit in each of the three switching systems. Each unit is mounted on relay rack frames, except for the TLTP interface unit which is mounted in the test frame of the 3 ESS switch.

INSTALLATION TEST KIT

3.31 The following test equipment is required for J1P051() RTTU frame installations:

- ITE-6244 RTTU test set (Order No. 40624400)
- ITE-6246 RTTU test set controller (Order No. 406246600)
- ITE-5706 WILCOM* T 105 B reference level test set (Order No. 41570600)
- ITE-5636 TEKTRONIC† 466 scope (Order No. 41563600 or equivalent)
- ITE-5356 digital multimeter (Order No. 40535600 or equivalent)
- HP‡ -3551A Hewlett-Packard transmission test set.

3.32 An ITE-5356 digital multimeter is required for CTTU installations.

3.33 Mini-RTTU installations require the use of an ITE-5689, List 1 portable teletypewriter (Model 43).

MAINTENANCE KIT

A. CTTU

3.34 Since the CTTU is composed primarily of equipment supplied by the Digital Equipment Corporation, maintenance of the CTTU hardware is generally handled by the Digital Equipment Corporation (via maintenance contract) or by a telephone company computer equipment maintenance group.◀

* Trademark of Wilcom Products, Inc.

† Registered trademark of Tektronic, Inc.

‡ Registered trademark of Hewlett-Packard Company.

3.35 The SCC (or CTTU location) should maintain a set of spare circuit packs for the CTTU interface unit.

B. J1P051() RTTU Frame

3.36 The following equipment is required in order to maintain the J1P051() RTTU frame:

- 1 — Set of spare circuit packs (see Table A)
- 1 — 906A TM extender board
- 1 — Portable data terminal with a male EIA RS232C connector and cabling
- 1 — WILCOM T105B meter or equivalent
- 2 — 33 ohm resistors (± 1 percent)
- 2 — 2 uf, 200V capacitors
- 1 — KS-14510 VOM (volt-ohm-milliammeter) or equivalent
- 2 — Jumper wires
- 1 — Touch-tone dialing detector
- 1 — Oscillator
- 1 — Capacitance meter
- 1 — Oscilloscope
- 1 — Headset.

C. J1P060() Mini-RTTU

3.37 The equipment required to maintain the J1P060() mini-RTTU are as follows:

- 1 — Portable data terminal with a male EIA RS232C connector and cabling
- 1 — KS-14510 VOM or equivalent
- 2 — Jumper wires

D. RTTU Function for 5ESS Switch

3.38 Since the DCTU and the TTF are common pieces of test equipment that are used by other

TABLE A							
SPARE CIRCUIT PACKS FOR RTTU/CTTU SYSTEM							
CIRCUIT PACK CODE	NAME	CTTU EQUIPMENT	RTTU EQUIPMENT				
			"ESS" SWITCHES			5XB	5XS
			1E	2E	3E		
TM201	Switch A	—	2	1	—	—	—
TM202	Switch B	—	2	1	—	—	—
TM203	Interface	1	—	—	—	—	—
TM204	Responder	—	1	1	—	—	—
TM205	Responder	—	1	1	—	—	—
TM206	Responder	—	1	1	—	—	—
TM209 (MC1P009A1)	T&M	—	1	1	—	—	—
TM210 (MC1P008A1)	Responder	—	1	1	—	—	—
TM210	OIM	—		1	—	—	—
TM210 (MC1P010A2)	OIM	—	1	—	—	—	—
TM210 (MC1P023A1)	DC/OGT	—	1	1	—	—	—
TM212	OIM	—	1	1	—	—	—
TM213	OIM	—	1	—	—	—	—
TM214	OIM	—	1	1	—	—	—
TM215 (MC1P006A1)	Master module	1	1	1	—	—	—
TM216 (MC1P007A1)	Master memory	1	1	1	—	—	—
TM216 (MC1P007B1)	Master memory	—	1	1	—	—	—
TM223	OIM	—	1	1	—	—	—

TABLE A (Contd)							
SPARE CIRCUIT PACKS FOR RTTU/CTTU SYSTEM							
CIRCUIT PACK CODE	NAME	CTTU EQUIPMENT	RTTU EQUIPMENT				
			"ESS" SWITCHES			5XB	SXS
			1E	2E	3E		
MC5P009A1	Talk and monitor	—	—	—	1	1	1
MC5P010A1	DTL CPU	—	—	—	—	1	1
MC5P011A1	DC/OGT CPU	—	—	—	1	1	1
TM224 (2-MC1P019A1)	DTL	—	2	1	—	—	—
TM225	DTL	—	2	1	—	—	—
TM226	Buildout and blocking	—	1	1	—	—	—
TM227	OIM	—	1	—	—	—	—
TM228	OIM	—	1	—	—	—	—
TM229	OIM	—	1	—	—	—	—
TM265	DC/OGT	—	1	1	—	—	—
SM416	DTL interface	—	—	—	—	1	1
SM418	DC/OGT	—	—	—	1	1	1
SM419	Line interface	—	—	—	—	1	1
SM420	Near-end balance	—	—	—	1	1	1
SM422	OIM interface	—	—	—	1	—	—
SM437	RTMB signal distributor controller	—	—	—	—	—	1
MC5P004A1	Memory	—	—	—	1	—	—
MC5P005A1	Memory	—	—	—	—	1	—
MC5P006A1	Memory	—	—	—	—	—	1
MC5007A1	CPU	—	—	—	1	1	1
MC5008A1	Communication	—	—	—	1	1	1

♦TABLE A♦ (Contd)							
SPARE CIRCUIT PACKS FOR RTTU/CTTU SYSTEM							
CIRCUIT PACK CODE	NAME	CTTU EQUIPMENT	RTTU EQUIPMENT				
			"ESS" SWITCHES			5XB	SXS
			1E	2E	3E		
MC5P009A1	Talk and monitor	—	—	—	1	1	1
MC5P010A1	DTL CPU	—	—	—	—	1	1
MC5P011A1	DC/OGT CPU	—	—	—	1	1	1
MC5P012A1	MR interface	—	—	—	1	1	1
MC5P013A1	OIM CPU	—	—	—	1		
ED-35150-30, G1	RTMB signal distributor	—	—	—	—	—	1

capabilities, they can be diagnosed from the MCC (master control center) or the SCC and not the CTTU. This restriction impacts the RTTU maintenance plan, since repairing and diagnosing the RTTU will be different for offices equipped with the 5ESS switch and other offices. Since the DCTU is an office option, those offices that do not have a DCTU will be unable to provide metallic measurements or station tests (e.g., coin tests) to the CTTU.

4. ENGINEERING CONSIDERATIONS

CTTU SIZING

4.01 For initial sizing purposes, it should be assumed that one CTTU is required for every 6,000 OGT (outgoing trunk) terminations. This number is based on the assumption that one trunk tester can effectively handle the work load imposed by 6,000 trunks. This work load further assumes that there are 13 hard troubles (leading to hands-on repair activity) per 1,000 OGTs per month and 40 trunk orders per 1,000 OGTs per month. For 6,000 OGTs, these activity rates require that the tester carry out detailed and thorough testing on 15 trunks per day or about 30 minutes per trunk. This time also includes coordination and administrative efforts that are a part of the total job.

4.02 The following circumstances could lead to exceptions to the sizing rule:

- (a) The NTF (no-trouble-found) rate is assumed to be about 2 times greater; (i.e., 26 NTFs per 1,000 OGTs per month) than the hard-trouble rate. A significant upward deviation from this would imply a higher than assumed work load.
- (b) In switch service networks (e.g., CCSA [common control switching arrangement] networks), the trunks may be considerably more complex than normal message trunks, and the trouble rates and order rates may be considerably higher. This would lead to the need for more CTTUs.
- (c) If the trunks terminating on a 5ESS switch are carried on digital facilities, troubles should be on a facility basis and not on a per-trunk basis, thereby reducing the need for per-trunk testing. Under these conditions, the initial sizing should assume one CTTU for every 12,000 OGTs terminating on the 5ESS switch.

CTTU PRINTER (OPTIONAL)

4.03 The CTTU printer has two uses with generic 1CTTU1. One, it can serve as the CAROT re-

mote printer that receives routine test results once a day. Two, it can be used to print hard copies of the TWM (trunk work message) within the CTTU that stores temporary test results.

4.04 It is recommended that the first CTTU installed in an SCC be equipped with the printer, and that printers be added onto subsequent CTTUs if an evaluation of their usefulness in printing TWMs is validated by experience.

RTTU SIZING

A. J1P051() RTTU Frame

4.05 Once installed, an RTTU can access any trunk (or line, if the RTTU frame is equipped) in the office. Therefore, only one RTTU frame will normally be required per office equipped with the 1/1A or 2/2B ESS switch. However, offices that are equipped with the 1/1A ESS switch have the option of adding additional RTTU frames (up to 14) if desired.

B. RTTU Function for 5ESS Switch

4.06 Initially, only one RTTU will be provided per 5ESS switch. The RTTU function is implemented primarily via software. One BX.25 dialup data link is provided per 5ESS office.

C. J1P060() Mini-RTTU

4.07 Only one mini-RTTU is permitted per office (5XB, SXS, or 3 ESS switch) since each office will normally only have one mini-ROTL.

ROTL FEATURE

A. J1P051() RTTU Frame

4.08 The CAROT 2 controller is capable of accessing RTTU frames that are located in offices that have either the 1/1A ESS switch or the 2/2B ESS switch in order to perform required routine transmission measurements. The RTTU port dedicated for this purpose is referred to as the CAROT/ROTL port. The CAROT system can communicate with an RTTU using MF (multifrequency) digits and control signals just as it does with current ROTLs.

4.09 Trunk and connection appraisal transmission test capabilities are provided. Security callback, remote make busy, and service busy

restoral features are also supported. Home office test line tests, balance and long term port tests, and trunk group status tests are not provided. The tandem 2 trunk state is not permitted in RTTU offices that are equipped with the 2/2B ESS switch.

4.10 In offices equipped with the 1/1A ESS switch and loaded with 1E7/1AE7 and later generics, the ROTL feature of the RTTU is arranged to be serviced similar to the 105 test line. The second RTTU 105 test line port is converted by switch settings to operate as the ROTL port. This port is interfaced to the 104/105-type test line applique and should have the translations set up to use the 10R test line call processing, which is the same as the 105 test line call processing.

4.11 In offices equipped with the 2/2B ESS switch, the RTTU ROTL port is also arranged similar to the 105 test lines. A single member trunk group with 105-type test line attributes is arranged for the ROTL port.

4.12 The CAROT/ROTL port appearance has its own directory number associated with it which CAROT uses to dial the ROTL. Switches located on circuit pack TM224 identify that it has been arranged as the ROTL access port.

B. RTTU for 5ESS Switch

4.13 The ROTL for the 5ESS switch supports the following capabilities:

- Transmission tests
- Connection appraisal
- Security callback
- Make-busy and restore
- Trunk status request
- BALT (balance and long term) tests.

4.14 The only interaction between the ROTL and the RTTU for the 5ESS switch is that they use common TTF hardware resources.

4.15 The ROTL function is that of answering calls from the CAROT controller, receiving information in the form of MF digits, and causing trunks

to be accessed and attached to the responder for transmission measurement.

4.16 The 5ESS switch is equipped with at least two ROTL ports and has the ability to return test progress tone back to the CAROT system while the ROTL waits for the resources needed to complete the calls.

4.17 Another function of the ROTL is to determine the disposition of the test call. This is accomplished by first seizing the trunk and then causing outpulsing over the TUT (trunk under test) to the distant office.

4.18 The ROTL hardware functions for the 5ESS switch are provided by the TTF which is a group of circuit packs in the global DSU (digital service unit). These circuit packs are not provided specifically for ROTL, but the ROTL utilizes the capability provided by this hardware to perform its functions.

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

C. J1P060() Mini-RTTU

4.20 The two general categories of transmission tests that can be performed by the mini-ROTL for the mini-RTTU are manual and automatic test line type. Self-checks can be made for each measurement. The transmission measuring circuits of the mini-ROTL performs loss and noise measurements similar to a 52A responder.

4.21 When the mini-ROTL is equipped with a mini-RTTU, it is also capable of performing singing return loss low, echo return loss, and singing return loss high measurements at frequencies and levels described in American Telephone and Telegraph Company Publication 41009. A mini-ROTL without a mini-RTTU provides only a quiet termination for these measurements.

4.22 Connection appraisal testing is also provided by the mini-ROTL. This is accomplished over an originating only or denied termination line ap-

pearance at the mini-ROTL. The mini-RTTU will invoke the use of this line by the mini-ROTL in dialing a test line and making tests. Connection appraisal test requirements exist only for class 5 offices.

105 TEST LINE FEATURE

A. J1P051() RTTU Frame

4.23 The RTTU provides the 105 test line feature for offices equipped with both the 1/1A and the 2/2B ESS switches. Both 2- and 4-wire trunks may be terminated to make all expanded tests.

4.24 A maximum of four 105-type test line ports are provided for RTTU offices that are equipped with the 2/2B ESS switch. For RTTU offices equipped with the 2-wire 1/1A ESS switch, a maximum of six 105 type test lines ports are possible. For RTTU offices equipped with the 1/1A ESS switch with the HILO feature, a maximum of eight 105-type test line ports are possible. Incoming calls are answered, parked (by return of TPT), and are served in arrival order as the responder module becomes available. A ROTL call will always receive the next user service.

4.25 One DTL module that provides two ports is standard for all RTTU frames. In RTTU offices equipped with the 2/2B ESS switch, one additional module may be installed to bring the total to four ports. For RTTU offices equipped with the 1/1A ESS switch, three optional DTL modules are available, two of which are 2-wire only and one of which is 4-wire only. The standard module can be arranged as either 2- or 4-wire. In RTTU offices equipped with the 1/1A ESS switch with the HILO feature, three modules may be added to bring the total to eight test lines. Of the eight test lines, four must be 2-wire, two 4-wire, and the remaining two may be either.

Note: Test line port 2 can be arranged to provide the ROTL-like MF control access to the RTTU.

4.26 The telephone company must determine the number of test line circuits to provide for each installation. Test lines must be arranged in trunk groups whose size is determined by traffic considerations. Separate trunk groups must be installed for each combination of 2 or 4 wires, TLP (transmission level point), and impedance that the office provides.

A separate 1-member group must be installed if the ROTL feature is desired.

4.27 The 105-type test line supports all normal 52A responder test capabilities.

B. RTTU for 5ESS Switch

4.28 The TTF, which is located in the DSU (digital service unit), contains the responder circuits which provide the 105 test line function for the 5ESS switch. The responder circuit is functionally equivalent to a 52A responder. The only interaction with the RTTU is that the responder hardware is a common resource. The number of 105 test lines for a 5ESS office is an engineered quantity.

C. J1P060() Mini-RTTU

4.29 In all mini-RTTU installations, 105 test lines are provided by the associated mini-ROTL units and do not interact with the mini-RTTU. In No. 5 crossbar and step-by-step offices, optional provision is made for one DTL module which can provide two 105-type test lines. These additional test lines support all present 52A responder test capabilities and provide toll termination capabilities.

LINE TESTS

A. J1P051() RTTU Frame

4.30 All transmission and multimeter tests can be performed on lines. The line interface includes a repeat coil that adds an additional loss similar to that encountered at the trunk and line test panel of offices equipped with the 1/1A ESS switch. The line test feature is available (standard) for use in offices equipped with the 2/2B ESS switch, and also in offices equipped with the 1/1A ESS switch loaded with the R2C2 feature package which is available with 1E7/1AE7 or later generics. The line test feature is not supported in earlier generics of the 1/1A ESS switch.

4.31 Special line tests can be made to coin stations, and station line circuits. Coin station tests include coin collect and coin return.

4.32 Ringing tests include single party, or two party.

4.33 Tip and ring leads may be reversed for testing purposes.

4.34 Cutoff release tests can be made in offices equipped with the 1/1A ESS switch loaded with the R2C2 feature package.

4.35 The line test panel also contains E&M bus exclusion circuitry for RTTU offices equipped with the 2/2B ESS switch.

4.36 Ringing voltages and coin collect and return voltages are supplied by the RTTU frame. The CTTU operator must specify the form of ringing to be used.

4.37 Access trunk AT2 is designed to be the line test access in RTTU offices equipped with the 2/2B ESS switch. The line test circuit can apply signals to AT2 or it can be bypassed, thereby connecting AT2 directly to the RTTU for multimeter or transmission testing.

4.38 In RTTU offices equipped with the 1/1A ESS switch with the R2C2 feature package, line tests can be made on the line access trunk to which the LTP (line test panel) is wired.

B. RTTU for 5ESS Switch

4.39 The RTTU for the 5ESS switch is capable of performing a small number of line control functions and tests. These tests are needed to help ascertain whether a known fault is within the switch or part of the facility. The line tests that can be performed are as follows:

- Coin collect—response is coin present or coin not present
- Coin return—response is coin present or coin not present
- Manual ring (for 2 seconds)
- Ring “ring” party (for 2 seconds)
- Ring “tip” party (for 2 seconds).

C. J1P060() Mini-RTTU

4.40 Some of the tests performed by the mini-RTTU also require access to lines. In the step-

by-step system, this is accomplished by providing a dedicated or shared test distributor. A dedicated no-test trunk is required for the No. 5 crossbar system. No additional equipment is required to meet this need in mini-RTTU offices equipped with the 3 ESS switch.

4.41 Line testing capability is optional in step-by-step and No. 5 crossbar mini-RTTUs. All transmission and multimeter tests can be performed on lines.

4.42 Special line tests can be made to coin stations and station line circuits. Coin station tests include coin collect and return (± 130 Vdc). Ringing tests include single party or 2-party lines.

4.43 The tip and ring leads may be reversed for testing purposes. Cutoff release tests can be made in step-by-step mini-RTTU offices only.

SECURITY AND VOICE COMMUNICATION LINKS

A. Functional Overview

4.44 An RTTU must be assigned two "originate only" line appearances in the central office where it is installed, except for central offices equipped with the 5ESS switch. Both lines must be assigned the Speed Calling feature available in offices equipped with a 1/1A ESS, 2/2B ESS, or 3 ESS switch. One of the two lines is used to make connection appraisal calls across the DDD (direct distance dialing) network and to call back the CTTU to establish security. The other line is used to provide a talking and listening path from the TWS CALL DIRECTOR telephone to another technician or to monitor the circuit under test.

4.45 The 5ESS switch uses logical test ports to originate security callback and talk and monitor. No "originate only" lines are required.

4.46 Upon accessing the RTTU, the CTTU (class A and B users [paragraph 4.50]) sends a message to the RTTU requesting a security callback. The RTTU will then place a call over a second DDD link to a special security circuit at the CTTU. The RTTU waits until it detects two complete audible rings, and then sends a message back to the CTTU that it has heard these rings. The CTTU then allows the security circuit to answer, and the security circuit will generate a 1004 Hz (-9 dBm0) tone. The RTTU detects the

tone, sends a message to the CTTU that security is established, and then both the RTTU and the CTTU disconnect from the security link. If any of the steps in the security sequence fail, the RTTU will simply send a message to the CTTU saying that security is not passed without giving details of failure. The entire process should take between 30 and 45 seconds (up to 120 seconds for offices equipped with the 5ESS switch). The CTTU-RTTU control link will remain connected during this time.

4.47 The security callback algorithm for the class C user (CAROT) is the same as for existing ROTLs and CAROT. That is, the CAROT security circuit is armed immediately and the RTTU will not wait for two cycles of ringing. The RTTU for the 5ESS switch always wait for two cycles of audible ringing.

4.48 The process for establishing the T&M connection can be invoked in either of two ways. One, the technician at the CTTU can request that the RTTU call back to a telephone in the SCC and connect this voice path to the circuit under test or to a different circuit. This allows the CTTU technician to converse with a remote central office technician, monitor the progress of test calls, or to monitor traffic busy circuits for the purpose of busy verification. The second way that the T&M connection can be invoked is by a distant central office technician making a 101 test line call into the office equipped with an RTTU. The RTTU answers the call, automatically calls the primary CTTU telephone at the SCC, and connects the two links together so that the distant technician can hear the call progress. When completed, this process allows the distant technician to converse with a technician in the SCC.

4.49 If the T&M connection at the CTTU is in use at the time the RTTU call arrives, a message will be displayed on the CTTU screen explaining that there is an incoming 101 test line call. The CTTU technician will then have the option of accepting the call. If the call is not answered, the far-end technician will be disconnected after 2 minutes.

B. Security Classes

4.50 The four classes of users of the RTTU are as follows:

- Class A - This class of users can exercise all of the capabilities of the RTTU. These capa-

bilities include unrestricted trunk and service circuit state control, the ability to monitor traffic busy circuits, and the ability to control the maintenance states of the RTTU itself.

- Class B - This class of users has limited capabilities. These users can make one trunk temporarily busy and can monitor the trunk under test during a test call.
- Class C - This user is the CAROT system which performs routine trunk testing. The CAROT system has the authority to take trunks out of service up to the AML (automatic maintenance limit) of an office. (This feature is not available in offices equipped with the 2/2B ESS switch). The CAROT system has no need for invoking the T&M callback feature.
- Class D - This class of users is only allowed to test traffic idle circuits and cannot invoke the T&M callback. The CAROT system is of this class if the RTTU record in the CAROT data base denies the CAROT "remote make busy" feature.

C. Speed Calling Number List Implementation

Speed Calling Feature for ESS Switches

4.51 There are two varieties of Speed Calling lists: 1- and 2-digit lists. A 1-digit list allows the customer to dial a single digit between 2 and 9*. The ESS switch translates the entered digit to a normal DDD directory number that has been prestored in the list. (The 5ESS switch translates the user number into a directory number by using the system data base). The 2-digit list allows the customer to dial a pair of digits between 20 and 49. A single telephone line is allowed to have either or both lists assigned to it. Assigning or removing the Speed Calling feature to a line is done via "recent change" messages. Entering or changing the numbers stored in the list can be done either via "recent change" messages or by the customer over the Speed Calling line itself by using the customer's touch-tone dialing pad. For security reasons the RTTU will not pass more than two digits to the ESS switch. Hence, the numbers stored in the

* The digit "8" is not allowed for lines on a private switched service network, and the digit "9" is not allowed for centrex lines.

list cannot be changed via the RTTU touch-tone telephone. Changes can only be made via "recent change" or "recent change/verify" messages. This affects the ability of the telephone company to change numbers frequently, but assures control over the lists.

4.52 The directory numbers stored in the Speed Calling list can be verified by entering the appropriate TTY message into the ESS switch. If there is to be no entry for a given number slot, then either the directory number of the Speed Calling line itself or the office busy test line number must be entered.

4.53 For the mini-RTTU associated with the 3 ESS switch, callback is initiated from the mini-RTTU by using the mini-ROTL security callback feature. The mini-RTTU callback numbers are stored as the mini-ROTLs security callback numbers.

Callback Feature for 5XB and SXS Mini-RTTUs

4.54 For the step-by-step mini-RTTU, callback is accomplished via the connection appraisal facility of the mini-ROTL. For the No. 5 crossbar mini-RTTU, callback is completed via the talk and monitor facility of the mini-RTTU. For both step-by-step and No. 5 crossbar systems, callback telephone numbers are stored in the mini-RTTU's nonvolatile read/write memory (EEPROM) and are alterable via the local TTY port of the mini-RTTU.

Security Callback Line Number Assignments

4.55 This part describes the use of the Speed Calling feature for the RTTU line which sets up the security callback connection (Fig. 11). As noted earlier, the 5ESS switch uses logical test ports to set up the security callback connection.

Assumptions

4.56 The following is a list of assumptions that have been made in order to derive the number assignment scheme described in subsequent paragraphs.

- A given CTTU operates under one security user number at a time. This number can easily be changed by the technician. A single CTTU cannot address different RTTUs with different user numbers without changing this number.

- All CTTUs in a given work center are equivalent. They will all have the same user number and security class for all the RTTUs under their jurisdiction. This arrangement can be modified to better suit specific telephone company circumstances.
- All RTTUs must have at least the 1-digit Speed Calling list assigned. Individual RTTUs may have the 2-digit list assigned in addition. Within the 1-digit list, user numbers 2, 3, and 4 are always assigned class A security, user number 5 is always assigned class C security, and user numbers 6 through 9 are always assigned class B security. For RTTUs with a 2-digit Speed Calling list, all the user numbers (20 through 49) are assigned class B security. Users cannot change this arrangement.
- One goal of the number assignment scheme should be to minimize the number of times a callback telephone number must be changed.

Number Assignments for Primary SCCs

4.57 In Fig. 11, SCC #1 has primary responsibility for the set of RTTU offices as indicated. (For illustrative purposes, 12 such offices are assumed). This SCC is assumed to have responsibility for trunk testing during the daytime only. Switching control center #2 assumes the responsibility for trunk testing for SCC #1s offices during the nighttime. All of the RTTUs under the jurisdiction of SCC #1 have a common telephone number (949-2000) entered in the security callback line Speed Calling list for user number 2. Hence, only a single telephone number needs to be assigned to SCC #1 for receiving security calls, and any of the CTTUs can answer such calls provided they are expecting one.

4.58 This number assignment scheme should be replicated for all primary SCCs which have daytime-only responsibility for trunk testing. That is, they should all claim to be user number 2 when requesting a security callback. However, each SCC should have its own security callback telephone number, and all RTTUs under a given SCC's jurisdiction should have that particular telephone number entered in the security Speed Calling list slot associated with user number 2.

Number Assignments for Nighttime SCCs

4.59 If an SCC assumes the responsibility for trunk testing and control during the nighttime, it should also be assigned as a class A user as far as the RTTUs are concerned. For RTTUs that are under daytime jurisdiction of SCC #1, a second class A user must be defined in the security Speed Calling list. Therefore, the CTTUs in the nighttime center (SCC #2) are assigned user number 3 when they address SCC #1s RTTUs. These RTTUs may then call the security callback telephone number (842-3000) assigned to SCC #2.

4.60 When a CTTU in SCC #2 wants to access one of the RTTUs under daytime jurisdiction of SCC #1, the user number for that CTTU has to be changed to 3.

Note: It is important to realize that there is no time-of-day discrimination built into the RTTU. Hence, SCC #2 has class A security status with SCC #1s RTTUs 24 hours a day, not just at nighttime. If this arrangement is not operationally acceptable to the telephone company, an alternative implementation plan exists and is described beginning with paragraph 4.67.

Trunk Operations Support Center Number Assignments

4.61 The TOSC (trunk operations support center) is responsible for administering the CAROT System. Since the CAROT controller can use RTTUs to perform routine and demand trunk transmission testing, it must also be assigned a security class. The CAROT controller can be either class C (make trunks busy up to the AML) or class D (testing only). The CAROT controller decides which security class it has on the basis of the RTTU record in its own data base. If the remote make-busy flag is set to "1", then the CAROT controller requests that security class C be established as soon as it detects the first Q2 result for the test group under test. The RTTU must make a security callback to a telephone number assigned for this purpose at the CAROT controller. In Fig. 11, it is assumed that all RTTUs that are used for CAROT testing can be loaded with the same number (747-5000) for user number 5, the CAROT controller. If having only one telephone number at the CAROT controller causes security callback blockages due to busy conditions, then additional telephone numbers

can be assigned to the CAROT controller, and the RTTU community can be split among them.

4.62 If the remote make-busy flag in the RTTU record is set to "0", the CAROT controller will have class D security and no security callback will be attempted.

4.63 The responsibilities of the TOSC include the maintenance of the trunk testing data base and the generation and dissemination of routine test results, and may also include maintenance responsibility for RTTUs and for existing ROTLs. Since the CAROT controller does not presently have a BX.25 data link capability for communicating with RTTUs, many of the RTTUs testing and self-diagnostic features will not be accessible through the CAROT controller. Therefore, the TOSC may require a CTTU of its own. As shown in Fig. 11, the CTTU in the TOSC would probably be either a class A or class D user. It is more likely that the CTTU will be a class A user since that will allow the TOSC/CTTU technician to remotely invoke the RTTUs self-diagnostic features, which is a capability that is absolutely necessary if the TOSC has RTTU maintenance responsibility. Also, this CTTU is designated user number 4, and all the RTTUs which the CTTU can access have the security telephone number 747-6000 loaded in user number slot 4 in the security Speed Calling list.

Number Assignments for Other Work Centers

4.64 Other work centers may need to use the RTTUs to test circuits. Examples are the SSC (Special Service Center), which could use the RTTU to test trunk terminated special service circuits and to test special service lines; the SEC (Service Evaluation Center), which could use the RTTU to perform connection appraisal studies; the FMAC (Facility Maintenance and Administration Center), which could use the RTTU for testing facility performance, etc. Because the RTTU cannot discern one trunk from another, or one line from another, in terms of the work center that has PCO (plant control office) responsibility, all these types of centers would probably be either class B or class D users. Otherwise, unrestricted control over the trunks and service circuits of a switching machine would be too widely dispersed. However, it is up to the telephone company to decide which centers are given which level of security.

4.65 Figure 11 shows a center that may have one or more CTTUs, presumably all of the same security class. The CTTUs in this center are all identified as user number 7. Hence, all the RTTUs that this center's technicians will use will have the same security telephone number (671-7000) loaded in the slot associated with user number 7. If there is no need for this center to access a particular RTTU, then that RTTU need not have a security callback number entered in that slot.

4.66 If there are several centers of the type described above, that need to access the same community of RTTUs, then the family of CTTUs in each center should be assigned a separate user number.

Number Assignment Alternatives

4.67 There are alternative ways to assign user numbers and security callback telephone number. For instance, if there are three CTTUs in the primary SCC (SCC #1 in Fig. 11), then they could each have separate class A user numbers: 2, 3, and 4. Presumably, each security user number in the Speed Calling list would have a different telephone number to call at the SCC. This arrangement would only make sense where security callback connections are frequently blocked due to busy conditions (competition among the RTTUs to reach a single SCC telephone). In large metropolitan SCCs, where there may be many CTTUs, this arrangement could be modified to split the CTTUs into three groups, each with a separate security user number. Since all the RTTUs could load separate numbers for each user, this would still allow any CTTU in the SCC to call any RTTU under its jurisdiction, while reducing the number of blocked calls.

4.68 As noted earlier, the nighttime SCC would actually have 24-hour class A control if the RTTUs security Speed Calling list were loaded appropriately. An alternative would be to not allow the nighttime SCC to be a class A user for the primary SCCs RTTUs, but rather to be a class B user (e.g., user number 6). If it became necessary to change the maintenance states of trunks, the nighttime SCC technician could do so via the No. 2 SCCS (No. 2 Switching Control Center) system TTY (teletypewriter) channels. The nighttime SCC technician would change the CTTU to user number 6 whenever it was desired to test a "foreign" RTTU. If the technician did not make the change and sent the user num-

ber associated with class A security, the foreign RTTU would dial a telephone not assigned to the nighttime SCC, or it would not dial at all if the list slot were null, and security would not be established.

4.69 It would also be possible to require that the nighttime SCCs class A security callback telephone number be added to the Speed Calling list each night and deleted each morning for each RTTU. This is cumbersome, and violates one of the assumptions that were used to derive the number assignment scheme.

Talk and Monitor Callback Line Number Assignments

4.70 This part describes the use of the Speed Calling feature for the RTTU line which sets up the talk and monitor callback connection.

Assumptions

4.71 The following assumptions have been made in order to derive the number assignment scheme discussed in subsequent paragraphs.

- The T&M user number is always the same as the security user number for a given CTTU. This cannot be modified by the user.
- Since the T&M connections will impose long holding times, it is impractical to have a single telephone callback number at the primary SCC for the entire community of RTTUs under its jurisdiction.
- Incoming 101 test line calls to the RTTU will always be forwarded to the telephone number associated with T&M user number 2. This arrangement cannot be modified by the user.
- A goal of the number assignment scheme should be to minimize the number of times a callback number must be changed.

Number Assignments for Primary SCCs

4.72 In Fig. 11, SCC #1 (12 RTTU offices) has 12 incoming T&M telephone lines assigned. Each RTTU T&M Speed Calling list is loaded with a different T&M callback telephone number for user number 2; i.e., the RTTU in office #1 is loaded with 949-1001, the RTTU in office #12 is loaded with 949-1012. Hence, when an RTTU places a call to the SCC, the

CTTU technician will know which RTTU is actually calling. This is useful for identifying the calling RTTU when it is forwarding an incoming 101 test line call.

4.73 If all the SCCs CTTUs are assigned user number 2, then all of the T&M callback telephone numbers must be loaded in the slots associated with user number 2. If the CTTUs are split among user numbers 2, 3, and 4, then a given RTTU should have the same T&M callback telephone number entered into all three slots.

4.74 With this arrangement, any CTTU in the SCC will be able to answer an incoming T&M call from any of the RTTUs with no blocking due to other RTTU T&M calls to the SCC. If some blocking is acceptable, then fewer T&M callback telephone numbers can be used.

Number Assignment for Nighttime SCCs

4.75 In Fig. 11, it has been assumed that SCC #2 has 13 RTTUs under its full-time jurisdiction, and that SCC #1s 12 RTTUs are under its nighttime jurisdiction. A separate incoming T&M telephone number has been assigned to the SCC for each of the 13 RTTUs under its full-time jurisdiction and one for all the RTTUs under its nighttime jurisdiction. The Speed Calling lists in the 13 RTTUs under full-time jurisdiction of the SCC are each loaded with a different T&M telephone number (842-1001) through (842-1013) into user slot number 2, while the same T&M telephone number (842-1014) is loaded into user slot number 3 for the 12 RTTUs under the SCCs nighttime jurisdiction.

Number Assignments for TOSC

4.76 Since the CAROT controller does not have a need for a T&M capability, the T&M Speed Calling list slot associated with user number 5 is null. It cannot be assigned to a CTTU since the CTTU data base update program prohibits the entry of user number 5.

4.77 For the CTTU which might be in the TOSC, there could be a very large number of RTTUs to which it might establish a T&M connection. It is impractical to assign a different T&M callback telephone number for each RTTU, and, if there is only one CTTU in the TOSC, there is no reason to assign more than one such TOSC telephone number. The

lone TOSC CTTU technician can only have one T&M connection up at a given time. Therefore, all RTTUs shown in Fig. 11 have the same T&M callback telephone number (747-1001) associated with user number 6. This number is, of course, different for each TOSC.

Number Assignments for Other Work Centers

4.78 The telephone number scheme for other work centers is similar to that for the TOSC. If, however, such a center has several CTTUs addressing the same community of RTTUs, the assignment of a single T&M callback telephone number to the work center could lead to excessive blockage due to busy conditions. Under such circumstances, the work center could establish a set of incoming T&M telephone numbers and divide the RTTUs into subcommunities. Within each subcommunity of RTTUs, a common T&M callback telephone number would be associated with the work center's user number.

Number Assignment Alternatives

4.79 Figure 11 assumes a widely deployed network of RTTUs and CTTUs. In the early stages of deployment, however, the circumstances will be much different. In particular, even within a primary SCC, there may be a few RTTUs and a single CTTU. Under these conditions, one T&M callback telephone number may suffice for all the RTTUs. The only disadvantage here is that incoming 101 test line calls to the RTTUs may be blocked because another RTTU is connected to the SCC telephone. A further refinement would suggest that the CTTU be identified as user number 3 and that two T&M callback telephone numbers be established. This would allow the RTTUs to call back the CTTU technician on user number 3's telephone if the CTTU technician initiates the process, and to call back a different telephone if the call is the result of an incoming 101 test line call.

4.80 As suggested earlier (paragraphs 4.64 through 4.66), the communities of RTTUs can be broken into subcommunities in order to provide a sufficiently high probability of successful completion of a T&M callback without assigning an excessive number of incoming telephone numbers to a given work center. The tradeoff between cost and congestion is left up to the individual telephone companies.

4.81 Finally, since incoming 101 test line calls to the RTTUs are always forwarded to the tele-

phone number assigned to user number 2, it is possible that far-end office technicians would become frustrated in their attempts to reach an SCC technician when there is no one present (i.e., nighttime and weekends). If the SCC is served by a central office that provides the call-forwarding feature, then it is possible to assign a call-forwarding telephone number (nighttime SCC) to each of the incoming T&M telephone numbers in the primary SCC. This assignment would have to be turned on and off daily, at the appropriate times each day.

5. ECONOMIC FACTORS AND IMPLEMENTATION STRATEGY

GENERAL

5.01 This part provides an economic model for applying the RTTU/CTTU system to support trunk and line testing operations. It further provides information on composite economic results for application of the RTTU/CTTU system to its switching entities, and an implementation strategy to maximize the benefits of RTTU/CTTU application. The discussions in this part are based on a 'model' company.

5.02 The relevant benefits that have not been quantified in this economic model are included for consideration. These benefits may be included in the economic studies done by individual telephone companies in planning for RTTU/CTTU implementation.

MODEL COMPANY SWITCH CATEGORY DEFINITIONS

5.03 As a first step in creating a company specific model, telephone company engineers and planners should gather the information necessary to categorize each switching system in their company into the proper switch category. The switch categories are defined below.

A. J1P051 () RTTU Frame and RTTU for 5ESS Switch

5.04 *New Starts for the 1/1A ESS Switch:*

These are defined as switching machines that will be installed after June, 1982. Because these machines are new switching entities, there will be no existing ROTLs or ITMP (interim trunk maintenance position) equipment in place.

5.05 *Retrofits Without the Interim Trunk Maintenance Position for the 1/1A ESS Switch:*

These are defined as existing machines that have ROTLs installed, but do not have the central office equipment required to support the ITMP for the 1/1A ESS switch.

5.06 *Retrofits With the Interim Trunk Maintenance Position for the 1/1A ESS Switch:*

These are defined as existing machines that have both the ROTL and the central office equipment necessary to support the ITMP for the 1/1A ESS switch.

5.07 *New Starts for the 2/2B ESS Switch:*

These are defined as switching machines that will be installed after June, 1982. Because these machines are new entities, there will be no ROTLs installed in these offices.

5.08 *Local Office Retrofits for the 2/2B ESS Switch:*

These are defined as all the existing switching machines that run on the LO generic. This generic does not support the existing 2/2B ESS ROTL. The RTTU, however, provides the ROTL function independent of the 2/2B ESS generic.

5.09 *Extended Feature Retrofits for the 2/2B ESS Switch:*

These are defined as existing switching machines that run on the EF and later generics. These generics support the existing ROTLs. For this model, it is assumed that all existing offices that run the EF or later generic are equipped with ROTLs.

5.10 *New Starts for the 5ESS Switch:*

All 5ESS switches are defined to be in this category. The hardware and software that provide the RTTU functions for the 5ESS switch will be integrated within the switch and shared among several users.

B. J1P060() Mini-RTTU Applications

5.11 There are three categories of switching machines to which the mini-RTTU can be applied. These categories are discussed in paragraphs 5.12 through 5.14.

5.12 ***Retrofits for 3 ESS Switch:*** All 3 ESS switches are defined to be in this category. The installation of a mini-RTTU in this switch re-

quires that a mini-ROTL also be installed, and that the switch be running on generic 3E3.

5.13 *No. 5 Crossbar Retrofits:*

All No. 5 crossbar switches are defined to be in this category. The installation of a mini-RTTU in this switch requires that a No. 5 crossbar mini-ROTL also be installed. In general, the mini-ROTL will be found in small No. 5 crossbar switching machines. Medium and large switching machines are probably equipped with the small or expanded No. 5 crossbar ROTLs, which do not support the mini-RTTU.

5.14 *Step-By-Step Retrofits:*

All step-by-step switching machines are defined to be in this category. The installation of a mini-RTTU in this switch requires that a step-by-step mini-ROTL also be installed. In general, the mini-ROTL will be found in small step-by-step switching machines. Medium and large step-by-step switching machines are probably equipped with the small or expanded ROTLs which do not support the mini-RTTU.

EXPENSE SAVINGS

5.15 Tables B and C show the expense savings associated with the application of the RTTU/CCTU system to the major switch categories. The savings are in terms of hours per OGT-year (hours/OGT-year). This unit was chosen because plant control office responsibility is assigned to the SCC controlling the office from which the trunk originates. The values provided should be considered default values. If a company has different projections for these categories of expense savings, then those projections should be used.

A. J1P051() RTTU Frame and RTTU for 5ESS Switch

5.16 Categories of expense savings are shown in Table B.

5.17 ***Centralization:*** The first category is the expense savings of 0.40 hours/OGT-year due to centralization of the trunk maintenance job. These savings are realized in an environment where switch maintenance is already centralized. The areas that contribute to these savings are as follows:

- Greater productivity due to better management, supervision, and control of the trunk maintenance work group. This applies to both the SCC technician and the central of-

TABLE B			
RTTU/CTTU SYSTEM EXPENSE SAVINGS BY SWITCH CATEGORY			
SWITCH CATEGORY	EXPENSE SAVINGS BENEFITS (HRS/OGT-YR)		
	TRUNK TESTING CENTRALIZATION	COMMONALITY AND HUMAN ENGINEERING	ROTL FUNCTIONS
1/1A ESS switch new starts	0.40	0.08	0.56
1/1A ESS switch retrofits without existing ITMP	0.40	0.08	—
1/1A ESS switch retrofits with existing ITMP	—	0.08	—
2/2B ESS switch new starts	0.40	0.08	0.56
2/2B ESS switch retrofits with LO generic	0.40	0.08	0.56
2/2B ESS switch retrofits with EF generic	0.40	0.08	—
5ESS switch new starts	0.20	—	—

TABLE C			
MINI-RTTU/CTTU SAVINGS			
SWITCH CATEGORY	SAVINGS		
	TRUNK TESTING CENTRALIZATION TECHNICIAN HRS/OGT-YR	TECHNICIAN TRAVEL TIME (HRS/OGT-YR)	VEHICLE EXPENSE (MILES/OGT-YR)
3E switch	0.31	0.19	8.55
5XB	1.23	0.21	9.25
SXS	1.21	0.20	9.12

office technician because of the ability to more efficiently load the technicians

- A decrease in the testing time required to sectionalize trunk troubles due to greater expertise on the part of the SCC technician, and due to the greater availability of the SCC technician (as opposed to the central office technician) to perform coordinated testing with other technicians in the field
- A reduction in the number of dispatches to the central office due to better trouble sectionalization. This includes the reduction in dispatches due to line troubles that are thought to be due to central office faults.

5.18 While these benefits were derived in an environment that consisted of the 1/1A ESS switch, it has been assumed that they can be directly applied to an environment that includes the 2/2B ESS switch, and in modified form to an environment that contains a 5ESS switch, as discussed below.

5.19 Commonality and Human Engineering:

The second category is the expense savings of 0.08 hours/OGT-year due to the productivity benefits of the RTTU/CTTU system over and above the 1/1A ESS ITMP. These savings are due to the following:

- Common trunk testing methods and procedures for the different types of offices supported by the RTTU/CTTU system. Specifically, the TWS technician will not need to know all the differences in accessing, testing, and controlling trunks in different switching system types (e.g., 1 ESS switch versus 2 ESS switch), or between different generics of the same switching system type.
- A hierarchical set of CRT (cathode ray tube) displays that can support TWS technicians by leading them through test step-by-step sequences, thereby reducing training requirements. This is particularly important in SCCs where there is a high rate of turnover among technicians at the TWS.
- A human interface that explicitly and clearly presents the TWS technician with the full range of test capabilities so that the technician can thoroughly test trunks before referring the troubles to central office technicians

for repair. This should reduce the amount of time spent by central office technicians in troubleshooting activities.

- Combining the SCCS terminal and the trunk test console into a single device, thereby eliminating the requirement that a technician invoke actions via the trunk test console and monitor the SCCS terminal for the response from the ESS switch (i.e., TTY output messages).

5.20 Again, due to the similarity of trunk testing in offices equipped with the 2/2B ESS switch and those equipped with the 1/1A ESS switch, it is assumed that these benefits can be applied directly to the 2/2B ESS switch. This is not true for the 5ESS switch, as is discussed in paragraphs 5.21 through 5.23.

5.21 ROTL Function: The third category is the expense savings of 0.56 hours/OGT-year due to the ROTL function. These savings are the same as those assigned to any ROTL used by the CAROT system. These benefits are due to the following (see Practice 865-203-101):

- Routine, mechanized transmission testing of the trunks that are accessible to the RTTU
- Demand testing of trunks, particularly for the testing of trunk groups
- Testing of trunks to complete circuit orders
- Centralized administration and report generation needed to manage and support transmission quality.

5.22 As shown in Table B, the three major categories of expense savings should be applied differently to each switch category. This can be done in a straightforward manner by referring to the description of the switch categories given above.

5.23 The commonality and human engineering benefits do not apply to the 5ESS switch because the TLWS (trunk and line work station) supplied with the switch is similar to the CTTU in terms of its ease of use, although its CRT displays differ from the displays of the CTTU CRT. Centralization benefits for offices equipped with the 5ESS switch are estimated to be half of what they are for analog

trunk centralization (ESS switches) because it is assumed that the benefits of connecting a digital switch to digital facilities will reduce the total trunk maintenance effort required. Lastly, the ROTL functions are provided as an integral part of the 5ESS switch, and therefore, the RTTU/CTTU system cannot claim the ROTL function savings.

B. J1P060() Mini-RTTU Benefits

5.24 The savings derived from centralization, travel time, and vehicle expense (Table C) for the mini-RTTU are due to the following areas:

- Greater productivity due to better supervision and control of the trunk maintenance group. This applies to both the SCC technician and to the central office technician because of the ability to more efficiently load the technician with productive work.
- A decrease in the testing time required to sectionalize trunk troubles due to greater expertise on the part of the SCC tester, and due to greater availability of the SCC tester (as opposed to central office technician) to perform coordinated testing with other technician in the field.
- A reduction in the number of dispatches to the central office due to better trouble verification and sectionalization. This includes the reduction in dispatches due to line troubles that are thought to be due to central office faults.

UNQUANTIFIED EXPENSE SAVINGS

5.25 There are a number of benefits that support the deployment of the RTTU/CTTU system which have not been quantified. It is anticipated that the TWS environment in the SCC will become more dependent on mechanized systems for trunk trouble data, trunk order information, trunk record storage, and work administration. The CTTU has been designed to provide the flexibility to adapt to the needs of the TWS technician as the mechanized environment grows and changes. Other areas where additional benefits may be found are presented below.

A. J1P051() RTTU Frame

5.26 *1/1A ESS Switch:* There are four areas where the RTTU/CTTU system can provide additional benefits. These areas are as follows:

- The RTTU can serve users from different work centers. If CTTUs are installed in the other work centers, much of the administrative overhead associated with center-to-center operational interface can be eliminated.
- Because the RTTU interface is fully integrated with the switch, the RTTU/CTTU system will be upwardly compatible with generics in offices equipped with the 1/1A ESS switch. When new trunk maintenance features are added to offices equipped with the 1/1A ESS switch, they will always be added to the MTTP and RTTU switch interfaces, and not always to the TLTP of STTP (supplementary trunk test panel) interfaces. As generics for the 1/1A ESS switch evolve, the test capabilities provided in the generic will be available to the RTTU.
- The RTTU/CTTU system can provide uniformity of trunk testing procedures in a single SCC. Application of the RTTU/CTTU system to central offices currently equipped with the ITMP would eliminate difficulties associated with operating in a dual mode (i.e., CTTU and ITMP), thereby requiring the technician in the trunk maintenance group to know both sets of testing procedures.
- Currently many telephone companies maintain the ITMP equipment using local procedures. With the RTTU/CTTU system, this work effort can be incorporated into standard AT&T Company maintenance arrangements.

5.27 *2/2B ESS Switch:* The primary area where the RTTU/CTTU system can provide additional benefits is generalized testing accessibility to the RTTU that allows other work centers to test trunk terminated special service circuits appearing in 2/2B ESS switches independently of the SCC, thereby reducing the overhead associated with these operational interfaces. This is the same as for the 1/1A ESS switch as discussed previously.

B. J1P060() Mini-RTTU

5.28 Additional benefits derived from the deployment of the mini-RTTU in the RTTU/CTTU system are as follows:

- Provide an improved grade of service for those areas where a limited work force can now be more productive.
- Consolidation of stored program controlled and electro-mechanical trunk operations into one combined SCC.
- Reduced training requirements due to common trunk testing methods and procedures for the different types of offices supported by the RTTU/CTTU system. Specifically, the TWS technician will not need to know all the differences in accessing, testing, and controlling trunks in different switching system types.

- Use of the RTMB function has not been quantified. Each company should use its own projection for expense savings relating to the RTMB feature.

OTHER EQUIPMENT COSTS

5.29 When a telephone company purchases a J1P051() RTTU frame for an office or a CTTU for an SCC, there is a potential to avoid the purchase of ROTLs, STTPs (supplemental trunk test panels) or MTTPs (1/1A ESS switch), TTPs (2/2B ESS switch), ITMP equipment, and SCCS terminals (see Table D).

IMPLEMENTATION STRATEGY

5.30 Table E shows the internal rate of return for each switch category. The implementation strategy that the customer derives should be based not only on the rate of return, but also on other factors such as the number of trunks in each office, the extent of existing coverage by the SCC, and other

TABLE D			
OTHER EQUIPMENT COSTS (1981 DOLLARS)			
ITEM	FURNISH PRICE	AT&T TECHNOLOGIES E&I	TELEPHONE COMPANY E&I
ROTLs			
1/1A ESS switch	\$21.7K	\$6.5K	\$1.0K
2/2B ESS switch	\$15.6K	4.6K	\$1.0K
STTP (1/1A ESS switch)	\$5.5K	\$2.1K	—
Aux. frame and TTY	\$12.1K	\$2.1K	—
MTTP (1/1A ESS switch)	\$12.0K	\$4.0K	—
Aux. frame and TTY	\$15.2K	\$2.0K	—
TTP (2/2B ESS switch)	\$9.4K	\$4.1K	—
Interim TMP (1/1A ESS switch)			
Badger remote	\$7.0K	\$4.5K	\$1.0K
Badger central	\$8.0K	—	\$1.8K
SCCS terminals	\$2.2K	\$0.54K	—

local factors such as the travel distance to small offices and offices that may have a large number of special service circuits.

5.31 Telephone company engineers and planners should include the unquantified benefits (paragraphs 5.25 through 5.28) to modify its priority ranking when developing a final implementation strategy.

5.32 Some additional implementation considerations are as follows:

- If an RTTU is targeted for a particular office, the installation date should coincide with an office growth job or generic upgrade in order to minimize engineering and installation costs.
- If a particular 1/1A ESS switch will serve to terminate OCC (other common carrier) trunks and/or other trunk terminated special services, the installation of the RTTU will allow the appropriate work centers (SCC or the SCC/TRCO (special service center/trouble reporting control office) to test those circuits for which they are responsible. This will result in expense savings that are not quantified in this model.
- Within a given switch category, offices that have the largest trunk field (or trunk terminated special service circuit field) should be equipped first.
- If most of the central offices covered by a particular SCC are equipped with RTTUs, then the remaining, uncovered offices should

TABLE E			
ECONOMIC RESULTS BY SWITCH CATEGORY—1981 DOLLARS			
(NOTE)			
SWITCH CATEGORY	ECONOMIC FACTOR		
	PRORATED CAPITAL INVESTMENT	EXPENSE SAVINGS (HRS/OGT-YR)	INTERNAL RATE OF RETURN
1/1A ESS switch:			
New starts	\$39.0K	1.04	87.4%
Retrofits w/o ITMP	\$39.0K	0.48	45.6%
Retrofits w/ITMP	\$36.9K	0.08	7.5%
2/2B ESS switch:			
New start	\$24.2K	1.04	24.8%
LO retrofits	\$24.2K	1.04	24.8%
EF retrofits	\$24.2K	0.48	9.5%
5ESS switch			
New starts	\$1.9K	0.20	128.6%
Mini-RTTU	\$15.0K	1.44*	47.0%
Note: These results do not include the unquantified benefits.			
* For smaller unattended offices (5XB, SXS, and 3 ESS switches), the vehicle expenses saved will be 9 miles/OGT-yr.			

be equipped as well in order to provide uniform methods within the SCC. This is particularly important for retrofit offices.

5.33 All No. 5 crossbar, step-by-step, and 3 ESS switches currently equipped with mini-ROTLs and a projected life of 3 years or longer should be considered as candidates for RTTU/CTTU system application. Because of wide range in the number of OGTs per office, mini-RTTUs should not be evaluated on a per office basis, but on a combined office basis for a geographic area. This allows those offices with a larger number of OGTs to aid the economics of the mini-RTTU/CTTU application to offices having fewer OGTs. One CTTU will be required to support trunk testing operations for every 4000 OGTs in No. 5 crossbar and step-by-step offices and for every 6000 OGTs in offices equipped with the 3 ESS switch.

5.34 A geographic area may be defined as a single SCC or taken on an area that would include several SCCs.

5.35 To maximize the economic benefits for a geographical area, achieve uniformity of trunk operations in an SCC, and receive the full benefits provided by mini-RTTU/CTTU, it is recommended that all equipment required for mini-RTTU/CTTU application be placed in service in the first year of the project. Implementation of the mini-RTTU/CTTU should be made in conjunction with the RTTUs and CTTUs for the 1/1A ESS, 2/2B ESS, and 5ESS switches.

6. SPECIAL CONSIDERATIONS

CTTU SITE SELECTION AND PREPARATION CONSIDERATIONS

6.01 The CTTU was intended to be located in the SCC.

6.02 The design of the messages between the CTTU and RTTU is such that the SCCS computer must be provided (as an input) some of the messages that would normally be seen at the RTTU local maintenance teletype. This can be accomplished either by providing a new separate channel from the central office to the SCCS using the data set on the RTTU TTY circuit, or by using the TK-MSG function to divert the RTTU TTY messages to another channel already monitored by the SCCS. In the latter case, care should be exercised not to overload the basic channel.

6.03 Physical space is required for two equipment cabinets, the terminal, and the printer, which is optional. The CTTU CPU cabinet dimensions are 21 1/2 inches wide, 30 inches deep, and 42 1/2 inches high. The CTTU interface cabinet is 24 inches wide, 19 inches deep, and 72 inches high. Both cabinets require 6 inches of wall clearance at the rear for cooling. While the DEC cabinet is provided with rollers and may be moved for maintenance, it may be desirable to leave 3 feet of space at the rear for maintenance access. The terminal should be placed on a table that allows the CRT screen to be viewed while the keyboard is manipulated at standard keyboard height. The optional DEC split top desk satisfies this requirement. The terminal should be placed within 50 cable feet of the processor equipment cabinet unless the optional long distance cable kit is provided for the terminal. The optional long distance cable permits remoting the terminal up to 4000 cable feet. The optional printer must be located within 50 cable feet of the processor.

6.04 The CTTU equipment is powered by 110 Vac. The CTTU equipment cabinet will draw a maximum of 12 amperes; the CTTU interface cabinet a maximum of 4 amperes; the terminal, 2.2 amperes; and the optional printer, 1 1/2 amperes. A 120 Vac power control panel is supplied with the cabinets, and the appropriate cabling to bring this power to the CTTU will be provided by the telephone company. The recommended operating conditions for the CTTU shall be per normal building planning for Operations Systems. These values are as follows:

- *Maximum*—60 to 80 degrees Fahrenheit temperature and 20 to 80 percent relative humidity
- *Recommended*— 65 to 75 degrees Fahrenheit temperature and 40 to 60 percent relative humidity

J1P051 () RTTU FRAME CONSIDERATIONS

A. 2/2B ESS Switch

Retrofit and Installation Considerations

6.05 The RTTU frame requires no generic upgrade of the 2/2B ESS switch and may be used to provide CAROT ROTL capability as well as RTTU capability to all LO and EF generic offices.

6.06 The RTTU frame is installed at the TTP1 appearance. If TTP1 is already installed, then it must be disconnected. An ODA (office data administrator) update is required to provide translations for the RTTU.

6.07 Two denied termination line appearances equipped with Speed Calling feature (for security) are required; one for the talk and monitor function, and one for the security callback function.

6.08 For the 105-type test line function, one to four network appearances and their associated directory numbers must also be defined. One appearance for the optional ROTL access port must also be provided.

6.09 The RTTU frame should be located in the office at a place where all voltages are conveniently provided. Limiting conductor conditions as specified in SD-2H229-01 shall be observed.

Terminating Test Line Arrangements

6.10 The four ways in which RTTU test lines can be arranged are as follows:

- (1) Test lines (1 and 2) arranged as 105-type test lines
- (2) Test lines (1, 2, 3, and 4) arranged as 105-type test lines
- (3) Test lines (1, 3, and 4) arranged as 105-type test lines with test line 2 arranged to provide ROTL port
- (4) Test line 1 arranged as 105-type test line and test line 2 arranged to provide the ROTL port.

6.11 Test lines that are shown in parenthesis in the above arrangements must be in a trunk group with one or more members to provide 105-type test line service. Each group must have homogeneous characteristics of wires, TLP, and impedance. Test lines 1 and 2 are furnished with the RTTU frame. Test lines 3 and 4 may be ordered as a list option.

6.12 When arrangement number 3 above is desired, then test line 2 must have a separate 7-digit access number in a 1-member trunk group, while test lines 1, 3, and 4 must be in a 3-member trunk group.

However, test lines 1, 3, and 4 may be assigned to different groups if desired.

Connecting Circuits

6.13 Table F lists all connecting circuits needed to interconnect the RTTU frame.

B. 1/1A ESS Switch

Retrofit and Installation Considerations

6.14 Two origination-only line appearances equipped with Speed Calling feature (for security) are required; one for the talk and monitor function, and one for the security callback function. In addition, a line with major class MCC shall be provided as a directory number for the RTTU.

6.15 The RTTU frame should be located in the office where power can be easily supplied.

6.16 The 2-wire transmission leads must be no further than 400 feet from the JGF (juncture group frame). If these leads are wired using T2LOCAP cable or equivalent, then the distance from the RTTU to the JGF may be extended to 733 feet. These cabling restrictions arise from the requirements to measure return loss at a 400 foot equivalent electrical distance from the JGF.

6.17 The RTTU frame may be added using TOA or growth procedure.

Terminating Test Line Arrangements

6.18 For 1/1A ESS switches, test lines 1, 2, 3, and 4 are used to provide 4-wire service, while test lines 5, 6, 7, and 8 are used to provide 2-wire service. Only test lines 1 and 2 are furnished as standard with the frame. Test lines 1 and 2 may be arranged for 2-wire service if the office is 2-wire only. The other test lines are optional and are ordered as list options.

6.19 The possible test line arrangements for 4-wire are as follows:

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

TABLE F	
RTTU CONNECTING CIRCUITS FOR 2/2B "ESS" SWITCH	
CONNECTING CIRCUIT	COMMENTS
SD-1A209-01	29 scan points
SD-2H117-01	7 peripheral decoder points
SD-2H136-01	5 interrupter applique points
SD-2H184-01	Pair test line interfaces for DTL Terminate only line for each 105-type test line ordered
SD-2H184-01	ROTL port feature Terminate-only line for ROTL
SD-2H075-01	E&M control at TTP0
SD-2H163-01	Access trunks
Line service	Speed-dialing line, denied termination service for T&M callback
Line service	Speed-dialing line, denied termination service for security and CA line
SD-1C905-01 SD-2H010-01	2B ESS switch TTY 2 ESS switch TTY

(3) Test lines (1, 3, and 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 and test line 2 arranged as a ROTL port.

6.20 The possible test line arrangements for 2-wire are as follows:

(1) Test lines (5 and 6) arranged as 105-type test lines.

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

6.21 For 2-wire only installations, the possible test line arrangements are as follows:

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

(2) Test line 1 arranged as a 105-type test line and test line 2 arranged as a ROTL port.

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

(4) Test lines (1, 5, and 6) arranged as 105-type test lines and test line 2 arranged as a ROTL port.

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

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

6.22 When the ROTL feature is desired, test line 2 must have its own 7-digit access number in a 1-member trunk group and must not be part of any 105-type test line trunk group.

Connecting Circuits

6.23 Table G lists all connecting circuits needed to interconnect the RTTU frame.

5ESS SWITCH

A. Recent Change and Verify for the CTTU Interface

6.24 The RCV (recent change and verify) support of CTTU involves creation, maintenance, and deletion of one static relation, a global office data item, and some trunk data. The static data associated with CTTU is in the G1cttu global office data item and the RLcttuch relation. The office data provides an indication that the office is equipped to use the CTTU interface. The RLcttuch contains security and callback information used in establishing security protocol and talk and monitor connections. Refer to Practice 235-118-105.

6.25 In all the other switching systems (2/2B, 1/1A, No. 5 crossbar, step-by-step, and 3 ESS switches), a CTTU located at an SCC or a SSC (special service center) interfaced with the switch via the RTTU. In offices equipped with the 5ESS switch, the CTTU interfaces directly to the switch, with the RTTU function implemented in the generic software. The RTTU software interprets requests from the CTTU, performs the appropriate line or trunk tests locally, and returns the results to the CTTU. A technician at the CTTU runs tests by making selections from menus. The CTTU communicates with the 5ESS switch over a synchronous dialup data link, operating at 1200 bits per second (baud rate). The dialup line must be defined as a denied originating line and is connected to an appropriate slot in the AM (administrative module) input/output processor.

6.26 The steps that should be followed in building the ODD (office dependent data) for the CTTU interface via the RCV are as follows:

- (1) Define global parameters for logical test port digit analysis and screening
- (2) Define the logical test port trunk group and members for the callback function
- (3) Define the security and callback data.

6.27 Removal of the ODD for the CTTU should take place in the reverse order.

6.28 In addition to the three steps listed in paragraph 6.26, it is also necessary to equip a CTTU data link. A corresponding change to the switch ECD (equipment configuration data) is also necessary. The physical equipping of the CTTU data link may be done either before or after the ODD is populated.

J1P060() MINI-RTTU CONSIDERATIONS

A. Modification Information

6.29 Each mini-ROTL unit requires replacement of the CPU (central processing unit) and memory circuit packs and the addition of a new interunit communication circuit pack. The mini-ROTL for step-by-step also requires an additional power supply circuit pack and a new alarm circuit pack. In addition to these new circuit packs, a small amount of wiring changes is required.

6.30 The new circuit packs that are required are shown in Table H.

B. 3 ESS Switch Mini-RTTU Considerations

Retrofit and Installation Considerations

6.31 For proper termination of transmission tests, restrictions on the location of mini-RTTU with respect to the associated mini-ROTL exists. The recommended configuration is for the mini-RTTU and the mini-ROTL to be resident in the same frame. Cables carrying the T-R bus between the two units shall have a resistance of no more than 1.3 ohms per lead. This restriction results in the following cable lengths: 31 feet of 26-gauge wire, 49 feet of 24-gauge wire, and 78 feet of 22-gauge wire. If possible, the

TABLE G

**RTTU CONNECTING CIRCUITS
FOR 1/1A "ESS" SWITCH (NOTE)**

CONNECTING CIRCUIT	COMMENTS
SD-1A272-01 SD-6A272-01	45 scan points 1 ESS switch 46 scan points 1A ESS switch
SD-1A270-01 SD-6A270-01	10 CPD points 1 ESS switch 10 CPD points 1A ESS switch
SD-1A271-01 SD-1A271-01	42 signal distribution points—1 ESS switch 42 signal distribution points—No. 1A ESS switch
SD-1A271-01 SD-6A271-01	7 signal distribution points, line test option—1 ESS switch 7 signal distribution points, line test option—1A ESS switch
SD-1A303-01 or SD-1A49301 SD-1A388-01	105 test line interface; 2-wire with option z; use appropriate number for installation 105 test line interface, HILO; use appropriate number for installation
SD-1A303-01 or SD-1A49301 SD-1A361-01	ROTL port interface; 2-wire with option z ROTL port interface for HILO installation
SD-1A322-01 SD-1A397-01 and SD-1A36101	TAT interface; 2-wire with option y TATs for HILO
SD-99774-01, FS4	E&M access circuit (TAT1, TAT2) for HILO
SD-1A192-05 or SD-1A19201 SD-1A367-01	MTT for 2-wire ESS switch offices MTT for HILO
SD-1A176-05 or SD-1A17601	Line test access 1E7, 1AE7, and later generics
Line service	Speed-dialing line, originating service only for T&M callback
Line service	Speed-dialing line, originating service only for security and CA line
Line service	Directory number for 212AR data set
Line service	DN for RTTU as test panel (MCC, FREE)
Line service	DN for each 105TL group, DN for ROTL

TABLE G (Contd)	
RTTU CONNECTING CIRCUITS FOR 1/1A "ESS" SWITCH (NOTE)	
CONNECTING CIRCUIT	COMMENTS
SD-1A147-02 SD-6A001-01	MTCE TTY for 1 ESS switch 1A I/O terminal connection circuit
Directory numbers	RTTU data port; RTTU as test panel, major class MCC, FREE; each 105TL group; ROTL port, if ordered
<p>Note: In order to provide dial tone and DPMF capability on the MTT, an SD-1A178-01 must be installed with SD-1A173-01 in the office with route index of decimal 69 and a trunk group of its own. These are required for 1E6/1AE6 and are optional for 1E7/1AE7 and later. In HILO, an SD-1A390-01 replaces the SD-1A178-01 and a pseudo route index of 29 is used for all generics.</p>	

TABLE H		
NEW MINI-ROTL CIRCUIT PACKS		
SWITCHING SYSTEM	CIRCUIT PACK CODE	CIRCUIT PACK NAME
3E	MC5P015A1	CPU
	MCP016A1	Mini-ROTL memory
	MC5P003A1	Interunit communication
5XB	MC5P015A1	CPU
	MCP017A1	Mini-ROTL memory
	MC5P002A1	Interunit communication
SXS	MC5P015A1	CPU
	MCP018A1	Mini-ROTL memory
	MC5P002A1	Interunit communication
	ED-35163-()G1	Alarm
	208F	Power unit

mini-RTTU should be installed no lower than 4 feet 8 inches from the floor.

6.32 The mini-RTTU requires five -48 volt office battery fuses, with four fused at 1 1/3 amps and one at 3 amps, supplied from the fuse block in the miscellaneous frame. One terminating test line appearance equipped with the Speed Calling feature is required for the talk and monitor function. The CL (communications line) of the TLTP needs to be equipped with the Speed Calling feature. The mini-ROTL access number must be loaded into the CL Speed Calling digit 2.

6.33 The TTY controller port must be equipped with the monitor feature for the mini-RTTU. The peripheral decoder point specified for the mini-RTTU must be equipped in the office to enable or disable the mini-RTTU.

6.34 A DDD line appearance is required for the CTTU port and an additional DDD line appearance is required when the optional remote TTY is specified. A ground start line appearance is required for the talk and monitor.

Connecting Circuits

6.35 Table I shows the connecting circuits needed to interconnect the mini-RTTU.

C. No. 5 Crossbar RTTU Considerations

Retrofit and Installation Considerations

6.36 Restrictions exist on the location of the mini-RTTU with respect to the associated mini-ROTL for proper termination of transmission tests. The recommended configuration is for the mini-RTTU and the mini-ROTL to be resident in the same frame. Cables carrying the T-R bus between the two units shall have a resistance of no more than 1.3 ohms per lead. This restriction results in the following cable lengths: 31 feet of 26-gauge wire, 49 feet of 24-gauge wire; from the floor would be no lower than 4 feet 8 inches.

6.37 The mini-RTTU requires four -48 volt office battery fuses; three at 1 1/3 amps and one at 3 amps.

6.38 Two DDD line appearances are required for the mini-RTTU. One line is equipped for data service and one ground start line is used for the talk

TABLE I	
MINI-RTTU CONNECTING CIRCUITS FOR 3"ESS" SWITCH	
CONNECTING CIRCUIT	DESCRIPTION
SD-3H235-01	TLTP interface circuit
SD-3H520-01	Peripheral test circuit
SD-3H904-01	Test frame circuit
SD-1C905-01	Teletypewriter controller unit.
SD-99392-01	Mini-ROTL
Line service	Ground start line service for talk and monitor callback and security callback
Line service	Data line for CTTU communications
Line service	Data line for remote TTY communications (optional)

and monitor function. One additional DDD line appearance is required when the optional remote TTY is specified.

6.39 The dc access T-R pair obtained from the trunk by the mini-ROTL and designated to terminate at the EMSCC (Electromechanical Switching Control Center) shall be dedicated for use by the mini-RTTU. Any circuits previously connected to this pair must be disconnected. If the optional transmission test lines are to be installed, two network appearances and their associated directory numbers must be defined.

Connecting Circuits

6.40 The connecting circuits required to interconnect the No. 5 crossbar mini-RTTU are shown in Table J.

D. Step-by-Step Mini-RTTU Considerations

Retrofit and Installation Considerations

6.41 For proper termination of transmission tests, restrictions on the location of the mini-RTTU with respect to the associated mini-ROTL exists. The recommended configuration is for the mini-RTTU and the mini-ROTL to be resident in the same frame. Cables carrying the T-R bus between the two units shall have a resistance of no more than 1.3 ohms per lead. This restriction results in the following cable

lengths: 31 feet of 26-gauge wire, 49 feet of 24-gauge wire, and 78 feet of 22-gauge wire. A desirable installation height from the floor would be no lower than 4 feet 8 inches.

6.42 The step-by-step mini-RTTU requires four -48 volt office battery fuses; three at 1 1/3 amps and one at 3 amps.

6.43 Two DDD line appearances are required for the mini-RTTU. One is equipped for data service and one is used for originate-only and ground-start operation for the talk and monitor function. One additional DDD line appearance is required when the optional remote TTY is specified.

6.44 If the optional transmission test lines are to be installed, two network appearances and their associated directory numbers must be defined.

Connecting Circuits

6.45 Table K shows the connecting circuits needed to interconnect the step-by-step mini-RTTU.

E. Terminating Test Line Arrangements

6.46 The optional test lines of the mini-RTTU can be ordered in the following arrangements for the step-by-step and No. 5 crossbar applications only:

- (1) Two local 105-type test line appearances

TABLE J	
MINI-RTTU CONNECTING CIRCUITS FOR NO. 5 CROSSBAR SWITCHING SYSTEMS	
CONNECTING CIRCUIT	DESCRIPTION
SD-28132-01	No. 5 crossbar mini-ROTL CCU
SD-28133-01	No. 5 crossbar mini-ROTL interface
SD-26136-01	Incoming trunk circuit (no-test trunk)
Line service	Originate-only, ground start line service for talk and monitor callback
Line service	Data line for CTTU communications
Line service	Data line for remote TTY communications (optional)

TABLE K MINI-RTTU CONNECTING CIRCUITS FOR STEP-BY-STEP SWITCHING SYSTEMS	
CONNECTING CIRCUIT	DESCRIPTION
SD-35065-01	ROTL-3 CCU circuit
SD-35066-01	ROTL-3 trunk access switch circuit
SD-32007-01	Test distributor circuit
Line service	Originate-only, ground start line service for talk and monitor callback
Line service	Data line for CTTU communications
Line service	Data line for remote TTY communication (optional)

- (2) Two intertoll 105-type test line appearances
- (3) Two local/toll 105-type test line selector appearances
- (4) One intertoll 105-type test line appearance and one local/toll 105-type selector appearance.

7. DATA BASE CONSIDERATIONS

SYSTEM DATA BASE RESPONSIBILITY

7.01 The CTTU and RTTU data bases are very small and contain only site-dependent data. The CTTU data base includes the CLLI (common language location identification), local name, telephone number, impedance, level, and office type for each office under its jurisdiction. The RTTU data base includes a list of security and T&M callback numbers. The SCC is responsible for administering both the CTTU and RTTU data bases.

SYSTEM DATA FORMS

7.02 Figures 5, 6, 7, 8, 9, and 10 show the forms that are used to record pertinent information about the RTTU/CTTU system. The intent of the forms is to allow the work center with primary responsibility for initial implementation of the RTTU/

CTTU system and those who use or maintain the specific units of the system to have a ready reference to support administration.

8. SYSTEM MAINTENANCE RESPONSIBILITY

8.01 Detailed procedures for isolating and clearing troubles associated with the CTTU microcomputer, printer, video display terminal and disk drive unit are provided by the manufacturer. All troubles that are suspected in vendor supplied equipment should be referred to the responsible maintenance group.

8.02 Section OPM-1P037-01 contains the overall system maintenance tests for the RTTU/CTTU System.

8.03 If the RTTU is determined to be faulty, then the RTTU maintenance and trouble locating procedures should be performed as specified in the appropriate maintenance document listed below:

- OPM-1P038-01 (2/2B ESS switch)
- OPM-1P039-01 (1/1A ESS switch)
- OPM-1P041-01 (Mini-RTTUs).

CENTRAL TRUNK TEST UNIT DATA FORM

1. CTTU Line Appearances (telephone numbers):
 - A. _____ RTTU Control Port (212 AR data set)
 - B. _____ Security Circuit (97A Control Unit)
 - C. _____ Does the 97A Control Unit support two or three CTTUs in a daisy chain arrangement? (yes/no)
 - D. _____ For 97A Control Units that are dedicated to individual CTTUs, is the security line appearance shared with other 97As as extensions? (yes/no)
 - E. _____ CAROT port (202S data set)
2. Miscellaneous
 - A. _____ Long line video option installed (yes/no)?
 - B. _____ Optional printer installed (yes/no)?

Fig. 5—Central Trunk Test Unit Data Form

RTTU (REMOTE TRUNK TEST UNIT) DATA FORM - 1/1A "ESS" SWITCHES

1. Host Machine:

- A. _____ Common Language Location Identifier
 B. _____ Type (1, 1A, 2-wire, 4-wire HILO)
 C. _____ Generic
 D. _____ Impedance (600, 900 ohms)
 E. _____ Transmission Level Point (0, -2 dBm0)

2. RTTU Line Appearances (telephone numbers):

- A. _____ CTTU Control Port (212AR data set)
 B. _____ Security Call-Back/Connection Appraisal Line
 C. _____ Talk-and-Monitor Call-Back Line
 D. _____ ROTL Port (if used)
 E. _____ 105 Test Lines - local mode (if used)
 F. _____ 105 Test Lines - toll/tandem mode (if used)

3. RTTU Frame Configuration:

- A. _____ Miscellaneous Distributor Point for remote off-line function
 B. _____ Miscellaneous Distributor Point for remote reset function
 C. _____ Test panel position number in lineup
 D. _____ Line Test Panel enabled (yes/no, RTTU hardware plus 'R2C2 Line Testing' feature)
 E. _____ ROTL Port enabled? (yes/no)
 F. _____ Number of 2-wire 105 Test Lines enabled
 G. _____ Number of 4-wire 105 Test Lines enabled

4. 1-Digit Speed Call List:

SECURITY CLASS	SPEED DIGIT	CALLED NUMBER		CALLED LOCATION	CONTACT NUMBER
		SECURITY CALL BACK LINE	TALK & MONITOR CALL-BACK LINE		
A	2				
A	3				
A	4				
C	5				
B	6				
B	7				
B	8				
B	9				

Fig. 6—RTTU (Remote Trunk Test Unit) Data Form — 1/1A ESS Switches (Sheet 1 of 2)

RTTU - 1/1A "ESS" SWITCH

5. 2-Digit Speed Call List:

SECURITY CLASS	SPEED DIGIT	CALLED NUMBER		CALLED LOCATION	CONTACT NUMBER
		SECURITY CALL BACK LINE	TALK & MONITOR CALL-BACK LINE		
B	20				
B	21				
B	22				
B	23				
B	24				
B	25				
B	26				
B	27				
B	28				
B	29				
B	30				
B	31				
B	32				
B	33				
B	34				
B	35				
B	36				
B	37				
B	38				
B	39				
B	40				
B	41				
B	42				
B	43				
B	44				
B	45				
B	46				
B	47				
B	48				
B	49				

Fig. 6—RTTU (Remote Trunk Test Unit) Data Form — 1/1A ESS Switches (Sheet 2 of 2)

RTTU (REMOTE TRUNK TEST UNIT) DATA FORM - 2/2B "ESS" SWITCHES

1. Host Machine:

- A. _____ Common Language Location Identifier
- B. _____ Type (2, 2B)
- C. _____ Generic
- D. _____ Impedance (600, 900 ohms)
- E. _____ Transmission Level Point (0, -2 dBm0)

2. RTTU Line Appearances (telephone numbers):

- A. _____ CTTU Control Port (212AR data set)
- B. _____ Security Call-Back/Connection Appraisal Line
- C. _____ Talk-and-Monitor Call-Back Line
- D. _____ ROTL Port (if used)
- E. _____ 105 Test Lines - local mode (if used)
- F. _____ 105 Test Lines - toll/tandem mode (if used)

3. RTTU Frame Configuration:

- A. _____ Miscellaneous Distributor Point for remote off-line function
- B. _____ Miscellaneous Distributor Point for remote reset function
- C. _____ Test panel position number in lineup (usually '1', where the TTP is '0')
- D. _____ ROTL Port enabled? (yes/no)
- E. _____ Number of 2-wire 105 Test Lines enabled

4. 1-Digit Speed Call List:

SECURITY CLASS	SPEED DIGIT	CALLED NUMBER		CALLED LOCATION	CONTACT NUMBER
		SECURITY CALL BACK LINE	TALK & MONITOR CALL-BACK LINE		
A	2				
A	3				
A	4				
C	5				
B	6				
B	7				
B	8				
B	9				

Fig. 7—RTTU (Remote Trunk Test Unit) Data Form — 2/2B ESS Switches (Sheet 1 of 2)

RTTU - 2/2B "ESS" SWITCH

5. 2-Digit Speed Call List:

SECURITY CLASS	SPEED DIGIT	CALLED NUMBER		CALLED LOCATION	CONTACT NUMBER
		SECURITY CALL BACK LINE	TALK & MONITOR CALL-BACK LINE		
B	20				
B	21				
B	22				
B	23				
B	24				
B	25				
B	26				
B	27				
B	28				
B	29				
B	30				
B	31				
B	32				
B	33				
B	34				
B	35				
B	36				
B	37				
B	38				
B	39				
B	40				
B	41				
B	42				
B	43				
B	44				
B	45				
B	46				
B	47				
B	48				
B	49				

Fig. 7—RTTU (Remote Trunk Test Unit) Data Form— 2/2B ESS Switches (Sheet 2 of 2)

MINI-RTTU/ROTL (MINI-REMOTE TRUNK TEST UNIT/REMOTE OFFICE TEST LINE) DATA FORM
FOR 3 "ESS" SWITCHES

1. HOST MACHINE:

- A. _____ COMMON LANGUAGE LOCATION IDENTIFIER
 B. _____ IMPEDANCE (600, 900 OHMS)
 C. _____ TRANSMISSION LEVEL POINT (0, -2dBm0)

2. MINI-RTTU LINE APPEARANCES (TELEPHONE NUMBERS):

- A. _____ CTTU CONTROL PORT (212AR DATA SET)
 B. _____ TALK AND MONITOR

3. MINI-ROTL:

- A. _____ ROTL-IN (TELEPHONE NUMBER)
 B. _____ 105 TEST LINE A (TELEPHONE NUMBER)
 C. _____ 105 TEST LINE B (TELEPHONE NUMBER)
 D. _____ (TUT) SECURITY CALL BACK
 E. _____ CONNECTION APPRAISAL LINE

4. 1-DIGIT SPEED CALL LIST:

SECURITY CLASS	MINI RTTU SPEED DIGIT	MINI ROTL TUT	CALLED NUMBER		CALLED LOCATION	CONTACT NUMBER
			SECURITY CALL BACK LINE	TALK & MONITOR CALL-BACK LINE		
A	2	2				
A	3	3				
A	4	4				
B	6	0				
B	7	5				
C	-	1				

NOTES:

1. The Security call back line is associated with the mini-ROTL and shared with the mini-RTTU.
2. The Talk and Monitor line is associated with the mini-RTTU.
3. CAROT calls only the mini-ROTL, and the Class C user (#5) is not defined as a valid mini-RTTU user.

Fig. 8— Mini-RTTU/ROTL (Mini-Remote Trunk Test Unit/Remote Office Test Line) Data Form 3 ESS Switches

5XB MINI-RTTU (MINI-REMOTE TRUNK TEST UNIT)/ROTL
(REMOTE OFFICE TEST LINE) DATA FORM

1. HOST MACHINE:

- A. _____ COMMON LANGUAGE LOCATION IDENTIFIER
- B. _____ IMPEDANCE (600, 900 OHMS)
- C. _____ TRANSMISSION LEVEL POINT (0, -2dBm0)

2. MINI-RTTU LINE APPEARANCES (TELEPHONE NUMBERS):

- A. _____ CTTU CONTROL PORT (212AR DATA SET)
- B. _____ SECURITY CALL BACK/TALK AND MONITOR LINE
- C. _____ 105 TEST LINE A (LOCAL OR TOLL/TANDEM)
- D. _____ 105 TEST LINE B (LOCAL OR TOLL/TANDEM)

3. MINI-ROTL:

- A. _____ ROTL-IN (TELEPHONE NUMBER)
- B. _____ ORIGINATING TEST LINE (TELEPHONE NUMBER)
- C. _____ 105 TEST LINE A (TELEPHONE NUMBER)
- D. _____ 105 TEST LINE B (TELEPHONE NUMBER)

4. MINI-RTTU/MINI-ROTL CONFIGURATION:

- A. _____ ENHANCED OPERATIONAL TRUNK TEST (EOTT) LINE (TELEPHONE NUMBER)
- B. _____ REMOTE TRUNK MAKE BUSY (RTMB)
- C. _____ MAKE BUSY POINTS (NUMBER EQUIPPED)
- D. _____ LINE TEST

5. 1-DIGIT SPEED CALL LIST:

SECURITY CLASS	SPEED DIGIT	CALLED NUMBER		CALLED LOCATION	CONTACT NUMBER
		SECURITY CALL BACK LINE	TALK & MONITOR CALL-BACK LINE		
A	2				
A	3				
A	4				
B	6				
B	7				

NOTES:

1. Both the security and Talk and Monitor call back lines are associated with the mini-RTTU.
2. CAROT calls only the mini-ROTL, and the Class C user (#5) is not defined as a valid mini-RTTU user.

Fig. 9—5XB Mini-RTTU/ROTL (Mini-Remote Trunk Test Unit/Remote Office Test Line)
Data Form

SXS MINI-RTTU (MINI-REMOTE TRUNK TEST UNIT)/ROTL (REMOTE OFFICE TEST LINE) DATA FORM

1. HOST MACHINE:

- A. _____ COMMON LANGUAGE LOCATION IDENTIFIER
 B. _____ IMPEDANCE (600, 900 OHMS)
 C. _____ TRANSMISSION LEVEL POINT (0, -2dBm0)

2. MINI-RTTU LINE APPEARANCES (TELEPHONE NUMBERS):

- A. _____ CTTU CONTROL PORT (212AR DATA SET)
 B. _____ TALK AND MONITOR
 C. _____ 105 TEST LINE A (LOCAL OR TOLL/TANDEM)
 D. _____ 105 TEST LINE B (LOCAL OR TOLL/TANDEM)

3. MINI-ROTL:

- A. _____ ROTL-IN (TELEPHONE NUMBER)
 B. _____ CONNECTION APPRAISAL/SECURITY CALL BACK
 (TELEPHONE NUMBER)
 C. _____ 105 TEST LINE A (TELEPHONE NUMBER)
 D. _____ 105 TEST LINE B (TELEPHONE NUMBER)

4. MINI-RTTU/MINI-ROTL CONFIGURATION:

- A. _____ REMOTE TRUNK MAKE BUSY
 B. _____ MAKE BUSY POINTS (NUMBER EQUIPPED)
 C. _____ LINE TEST

5. 1-DIGIT SPEED CALL LIST:

SECURITY CLASS	SPEED DIGIT	CALLED NUMBER		CALLED LOCATION	CONTACT NUMBER
		SECURITY CALL BACK LINE	TALK & MONITOR CALL-BACK LINE		
A	2				
A	3				
A	4				
B	6				
B	7				

NOTES:

- Both the security and Talk and Monitor call back lines are associated with the mini-RTTU.
- CAROT calls only the mini-ROTL, and the Class C user (#5) is not defined as a valid mini-RTTU user.

Fig. 10—SXS Mini-RTTU/ROTL (Mini-Remote Trunk Test Unit/Remote Office Test Line)
Data Form

9. REFERENCES

9.01 The following documents supplement this practice.

AT&T DOCUMENTS

A. Operations System Deliverable Documents

DOCUMENT	TITLE
OPD-1P033-01	Operations Support Systems Remote Trunk Test Unit/Central Trunk Test Unit (RTTU/CTTU)- Overall System Description
OPD-1P034-01	Operations Support Systems Remote Trunk Test Unit (RTTU) Frame Description—2-Wire 1/1A ESS—1/1A ESS HI-LO and 2/2B ESS Switch
OPD-1P040-01	Operations Support Systems Mini-RTTU (Mini-Remote Trunk Test Unit)—Description—5XB, SXS, and 3 ESS Switches
OPG-1P032-01	Operations Support Systems Remote Trunk Test Unit/Central Trunk Test Unit RTTU/CTTU— System Index
OPM-1P037-01	Operations Support Systems Remote Trunk Test Unit/Central Trunk Test Unit (RTTU/CTTU)— Overall System Maintenance and Tests
OPM-1P039-01	Operations Support Systems Remote Trunk Test Unit (RTTU)—Maintenance and Trouble Locating Procedures—2-Wire 1/1A ESS Switches and 1/1A ESS Switches With HILO 4-Wire Features
OPM-1P038-01	Operations Support Systems Remote Trunk Test Unit (RTTU)—Maintenance and Trouble Locating Procedures—2/2B ESS Switch

DOCUMENT	TITLE
OPM-1P041-01	Operations Support Systems Mini-Remote Trunk Test Unit (Mini-RTTU)—Maintenance and Trouble Locating Procedures— 5XB, SXS, and 3 ESS Switches

OPA-1P036-01	Operations Support Systems—CTTU (Central Trunk Test Unit)—User Guide (Sections 1 Through 7)
OPO-1P036-01	Operations Support Systems Central Trunk Test Unit (CTTU)—Methods of Operations
OPP-1P035-01	Operations Support Systems Remote Trunk Test Unit/Central Trunk Test Unit (RTTU/CTTU)— Performance Test Requirements

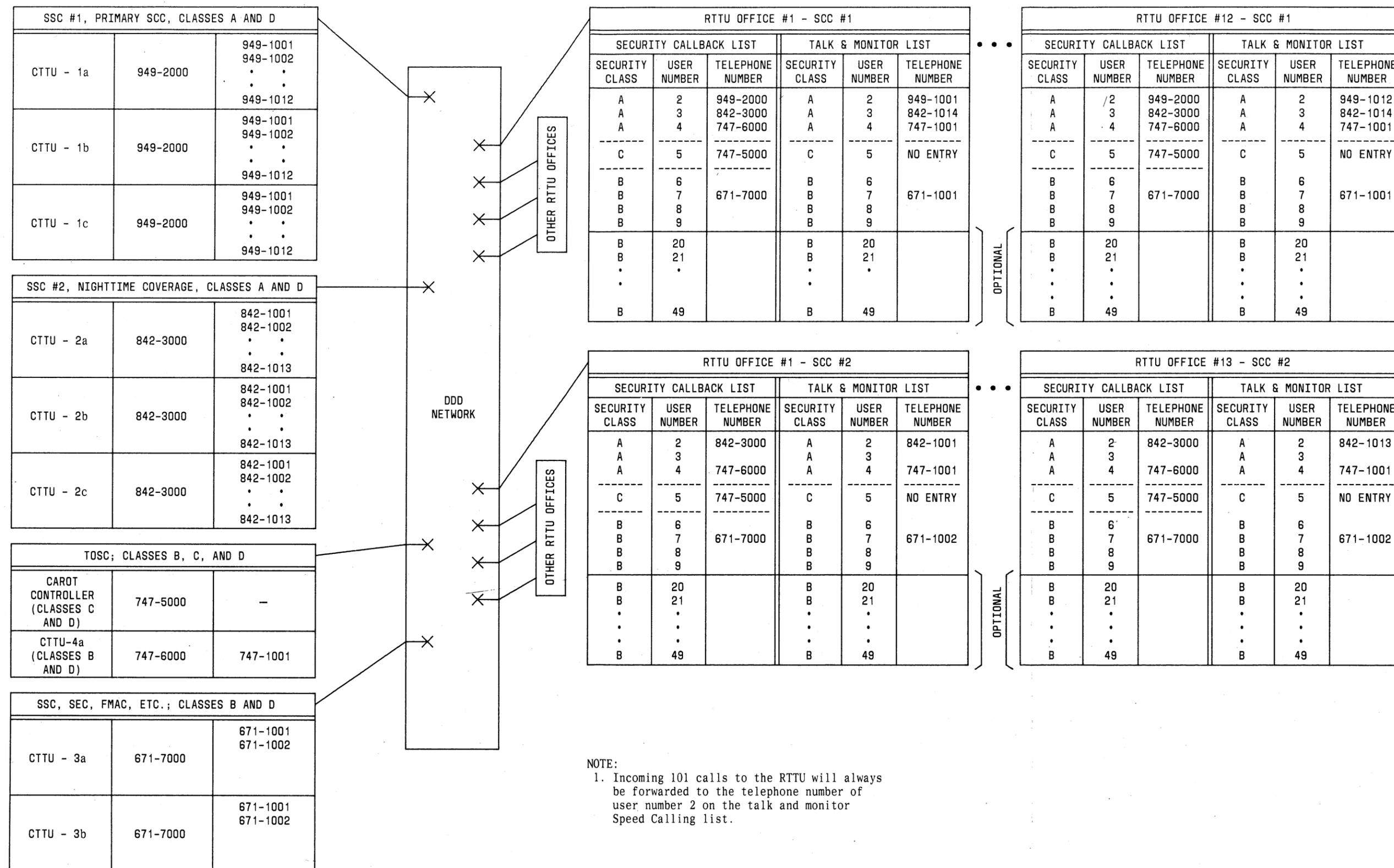
B. Practices Used by Telephone Companies

PRACTICE	TITLE
190-104-302	Operations Support Systems—CTTU (Central Trunk Test Unit)—User Guide Operating Procedures for 1/1A ESS Switches
190-104-503	Operations Support Systems—Mini-RTTU (Mini-Remote Trunk Test Unit)—Maintenance and Trouble Locating Procedures—5XB, SXS, and 3 “ESS” Switch
201-844-100	97A Control Unit—Description and Maintenance—Common Systems
218-743-703	Adjustment of Line Buildout Network— Mini-Remote Office Test Line (Mini-ROTL)—No. 5 Crossbar Offices

PRACTICE	TITLE	PRACTICE	TITLE
226-834-700	Adjustment of Line Buildout Network— Remote Office Test Line (ROTL-3)		Generic Programs—5“ESS” Switch
231-032-025	Remote Trunk Test Unit (RTTU)— Description—2-Wire No. 1 and No. 1A Electronic Switching System	824-101-001	Operations Support Systems— Mini-Remote Trunk Test Unit (Mini-RTTU)—Transmission— Equipment Design Requirements
231-049-305	Remote Trunk Test Unit (RTTU)— Growth Procedure— 2-Wire No. 1 and No. 1A Electronic Switching System	824-101-118	Operations Support Systems Remote Trunk Test Frame (RTTU)—Transmission Measuring Equipment and Design Requirements
231-049-306	Remote Trunk Test Unit (RTTU)— Buildout Procedure— 2-Wire No. 1 and No. 1A Electronic Switching System	824-101-124	Operations Support Systems— Central Trunk Test Unit— Transmission—Equipment Design Requirements
231-090-366	Interface with Switching Control Center System Feature— HILO 4-Wire Switching Feature—2-Wire No. 1/1A Electronic Switching System	865-205-100	RTTU/CTTU (Remote Trunk Test Unit/Central Trunk Test Unit)— Engineering Implementation Methods Systems Operations Support System
231-190-405	Interface with Switching Control Center System Feature— 2-Wire No. 1 Electronic Switching System	951-700-100	RTTU/CTTU (Remote Trunk Test Unit) System/Central Trunk Test Unit (RTTU/CTTU)— General Descriptive Information
231-390-405	Interface with Switching Control Center System Feature— 2-Wire No. 1A Electronic Switching System		
232-090-032	Remote Trunk Test Unit (RTTU)—No 2/2B Electronic Switching System		
232-132-102	Remote Trunk Test Unit (RTTU)—Description—No. 2/2B Electronic Switching System Remote Office Test Line (ROTL)—No. 3 Electronic Switching System		
235-118-105	Recent Change Description of Procedures—Multimodule Offices—5E1(2).1 and Later		
		C. Schematic and J-Coded Drawings	
		DRAWING	TITLE
		J1P051A()	Operations Support Systems— Transmission—Remote Trunk Test Bay for No. 2/2B ESS (2-wire) System
		J1P051B()	Operations Support Systems— Transmission—Remote Trunk Test Bay for No. 1 ESS and 1A ESS (2 and 4-wire HILO) System
		J1P058A()	Operations Support Systems— Transmission— Central Trunk Test Unit

DRAWING	TITLE	DRAWING	TITLE
J1P058B-()	Operations Support Systems—Transmission—Central Trunk Test Unit—Generic 1 Software Equipment Specification	SD-1P191-01	Operations Support Systems—Transmission—CTTU Interface Unit
J1P058C-()	Operations Support Systems—Transmission—Central Trunk Test Unit—CTTU Interface Unit	D. System Letters	
J1P060()	Operations Support Systems—Transmission—Mini-Remote Trunk Test Unit Circuit for No. 5 Crossbar, Step-By-Step, and No. 3 Electronic Switching System Offices Equipped with Mini-Remote Office Test Line	NUMBER	TITLE
SD-1P045-01	Operations Support Systems—Transmission—Mini-Remote Trunk Test Unit Circuit for No. 5 Crossbar, Step-By-Step and No. 3 Electronic Switching System Offices Equipped with Mini-Remote Office Test Line	IL 79-01-258	Information Letter Recommending Establishment of TMPs
SD-1P171-01	Operations Support Systems—Transmission—Remote Trunk Test Frame—Control, Access, and Measurement Circuit for use with No. 2 ESS, 2-Wire Operation	RL 80-12-006	Planning Information for Centralized Trunk Testing via the Remote and Central Trunk Test Units (RTTU/CTTU)
SD-1P173-01	Operations Support Systems—Transmission—Remote Trunk Test Frame—Control, Access, and Measurement Circuit for No. 1/1A ESS, 2- and 4-Wire HILO Operation	IL 82-12-063	Economic Model and Implementation Guidelines for Remote Trunk Test Unit/Central Trunk Test Unit (RTTU/CTTU)
SD-1P181-01	Operations Support Systems—Transmission—Remote Trunk Test Frame—Line Test Circuit	10. ABBREVIATIONS AND ACRONYMS	
SD-1P183-01	Operations Support Systems—Transmission—Remote Trunk Test Power Circuit	10.01 The following is a list of abbreviations and acronyms that are used in this practice.	
SD-1P187-01	Operations Support Systems—Transmission—Central Trunk Test Circuit	ac	Alternating current
		AM	Administrative module
		AML	Automatic maintenance limit
		AT	Access trunk
		BALT	Balance and long term
		CAROT	Centralized automatic reporting on trunks
		CCSA	Common control switching arrangement
		CL	Communications line
		CTTU	Central trunk test unit
		dc	Direct current
		DDD	Direct distance dialing

DSU	Digital service unit	PIDB	Peripheral interface data bus
DTL	Dual test line	RCV	Recent change and verify
ECD	Equipment configuration data	ROTL	Remote office test line
EF	Enhanced feature	RTMB	Remote trunk make-busy
EMI	Electromagnetic interference	RTTU	Remote trunk test unit
EMSCC	Electromechanical Switching Control Center	SCC	Switching Control Center
EOTT	Enhanced operational trunk test	SCCS	Switching Control Center System
FMAC	Facility Maintenance and Administration Center	SPCS	Stored Program Control System
Hz	Hertz	SSC	Special service center
ITMP	Interim trunk maintenance position	STTP	Supplemental trunk test panel
JGF	Junctor group frame	SXS	Step-by-step
LTP	Line test panel	T&M	Talk and monitor
MCC	Master Control Center	TAT	Test access trunk
MF	Multifrequency	TIRKS	Trunk Intergrated Record Keeping System
MTTP	Manual trunk test panel	TLP	Transmission level point
NTF	No trouble found	TLTP	Trunk and line test panel
OCC	Other common carrier	TLWS	Trunk and line work station
ODA	Office data administration	TNOP	Total network operations plan
ODD	Office dependent data	TOSC	Trunk Operations System Center
OGT	Outgoing trunk	TPT	Test progress tone
OIM	Office interface module	TRCO	Trouble reporting control office
OSDD	Operations systems deliverable documentation	TTF	Transmission test function
OSS	Operations Support Systems	TTP	Trunk test panel
PCO	Plant control office	TWM	Trunk work message
PICB	Peripheral interface control bus	TWS	Trunk work station
		VOM	Volt-ohm-milliammeter.



NOTE:
 1. Incoming 101 calls to the RTTU will always be forwarded to the telephone number of user number 2 on the talk and monitor Speed Calling list.

Fig. 11—Recommended Security and Voice Communication Arrangements