

**PAIR GAIN TEST CONTROLLER
AND TEST BUS CONTROL UNIT
DESCRIPTION AND INSTALLATION
LOOP TRANSMISSION SYSTEMS**

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| AT&T CUSTOMER INFORMATION CENTER Quality Engineering Organization ARCHIVE STATUS II DOCUMENT Signed: <i>[Signature]</i> Date: 5-23-90 |
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1. GENERAL

- 1.01** This document contains the general description and the installation procedures for the pair gain test controller (PGTC) and the test bus control unit (TBCU).
- 1.02** This document is reissued to include the use of the DTTS-2 TEST CONTROLLER SIMULATOR with SLC® Series 5 carrier systems. Revision arrows are used to emphasize significant changes.
- 1.03** The PGTC provides the means to connect test trunks from the repair service bureau (RSB) to the subscriber channel unit in the central office channel bank and by the use of a dc test pair to the subscriber line beyond the remote terminal (RT). However, the PGTC *does not* provide a means for testing special service channel units.
- 1.04** The PGTC is compatible with the SLC 24, SLC 96, and SLC Series 5 carrier systems working on T1 digital lines (metallic) or the SLC 96 and SLC Series 5 carrier systems working on lightguide cable. The PGTC is not required where all SLC carrier systems integrate to 5ESS™ switching equipment. ♦The term "SLC", as used in this document, refers to SLC 24, SLC 96, and SLC Series 5 carrier systems. ♦
- 1.05** If the carrier facility is lightguide cable, ♦(without a remote measurement unit [RMU] located at the RT), ♦a dc test pair must be provided parallel to the lightguide cable, as there are no copper pairs in the lightguide cable.
- 1.06** The dc test pair *must* be loaded in accordance with engineering practices for voice-frequency metallic pairs.
- 1.07** ♦The remote measurement unit (RMU) (Fig. 17) provides mechanized loop testing (MLT) from an RT location to the subscriber station. The RMU is fully compatible with the AT&T Automated Repair Service Bureau (ARSB) concept and with the Loop Maintenance Operations System (LMOS).
- 1.08** The RMU, *unlike* the PGTC and the Test Bus Control Unit (TBCU), *does not* require a dc test pair from the COT to the RT. The fact that the RMU does not require a dc test pair, solves the problem of remote testing when the RT is served by fiber optic cable.
- 1.09** The RMU is compatible with both the universal and the integrated SLC carrier systems. ♦
- 1.10** Secondary or automatic ringing activated from the local test desk (LTD) is not compatible with the PGTC.
- 1.11** In SXS offices, the No. 3 local test cabinet (LTC) must have the following features to be compatible with the PGTC.
- The No. 3 LTC must have sleeve lead control.
 - A signal distributor controller (SD-31349-01 or SD-31401-01) must be installed in the trunk circuit at the input to the signal distributor.
 - +116 volts must be provided to the No. 3 LTC for signaling the carrier channel units.
- 1.12** In SXS offices, the SD-32007-01 signal distributor may have 0.05 mf capacitors across the T and R leads (option Z). These must be removed to be compatible with the PGTC.
- 1.13** In ESS™ switching equipment served by metallic test trunks, the incoming trunk circuit (SD-1A186-01 or 2H109-01) may have 200 ohm resistors in the T and R leads to provide secondary lightning protection. These resistors must be strapped out (option Z) to be compatible with the PGTC. If not already present, an SD-96474-01 ringing circuit with option E must be provided between the incoming RSB trunk circuit and the PGTC to maintain the secondary lightning protection (Fig. 5).
- 1.14** The SLC carrier systems that are served by 5ESS switching equipment may be in one of two configurations. One arrangement is where a SLC central office terminal (COT) and a remote terminal (RT) are interconnected by a digital transmission facility. This arrangement is referred to as the *universal* SLC carrier system. The other configuration is where a RT is connected, through a digital transmission facility, to a digital carrier line unit (DCLU) which interfaces with the 5ESS switching equipment in lieu of a SLC COT. This arrangement is referred to as the *integrated* SLC carrier system. The PGTC is *not* required where all SLC carrier systems are *integrated* into the 5ESS switching equipment. Where the 5ESS switching equipment serves *both*

universal and integrated SLC carrier systems, the PGTC along with the test bus control unit (TBCU) are required. With this arrangement, the dc test pair may be shared for testing derived lines served by universal and integrated RTs located at the same site.

1.15 When used with 5ESS switching equipment, the PGTC *must* be equipped with a SM87C tester unit, and the early production SLC 24 or 96 RT channel banks *must* be equipped with WN11B or C (CTU) circuit packs. Current production channel banks require the WM21 (CTU) circuit packs. The WN11B and C and WM21 CTUs contain a series of resistors and diodes in the circuitry which are used by the metallic service unit (MSU) (Fig. 12) to verify the integrity of the dc test pair before starting the testing procedures.

1.16 AT&T Practice 662-505-507 provides information on testing procedures from the local test desk (LTD) or test cabinet served by test trunks connected to a PGTC. The PGTC may also serve test trunks serving an automated testing system (mechanized loop testing). Refer to AT&T Practices 660-168-244 and 660-168-252.

Note: The B or C series of circuit packs *must* be used if testing is to be performed using the mechanized loop testing system.

2. DESCRIPTION

PGTC

A. Control Shelf and Expansion Shelf

2.01 The equipment arrangement for the PGTC consists of one J1C142A-(), L1 control shelf (Fig. 1), which is always required, plus up to four J1C142A-(), L2 expansion shelves (Fig. 2), depending on the number of test trunks to be served. The two types of shelves are similar in that they are intended to be miscellaneously mounted in 23-inch wide framework. Each shelf is 8 inches high (four, 2-inch mounting plates). If expansion shelves are required, they should be mounted in the same framework as the control shelf.

2.02 All intrashelf wiring is done via printed wiring board (PWB) backplanes. Wire wrap and screw terminals are provided for terminating installation wiring. Cabling, wiring, and connections required

during the installation are:

- Test control circuits from the PGTC to the first channel bank. The test control circuits are electrically connected between the PGTC and the channel bank through a cable which is connectorized at the end that connects to the channel bank.
- Test trunks to a distributing frame (DF).
- Power and ringing voltage leads to a miscellaneous fuse panel.
- Intershelf wiring if multiple shelves are used.
- Connections required to tie the PGTC into the central office alarm system.

2.03 The *control shelf* requires -48 Vdc (signal grade) at 2.5 amperes (maximum) and *uninterrupted* ringing voltages at 0.5 amperes (maximum). The ringing voltages supplied to the control shelf must correspond to the ringing voltages applied to the channel bank (ac-dc, negative superimposed, positive superimposed, or ac-only). Each *expansion shelf* requires only -48 Vdc (signal grade) at 1.2 amperes (maximum).

2.04 The J1C142A-(), L1 control shelf may be equipped with coded circuit packs to accommodate all the common control functions, and up to 12 test trunks. Each J1C142A-(), L2 expansion shelf (maximum of four) can be equipped to accommodate up to 20 additional test trunks. Table A provides a list of the circuit packs associated with the control shelf and the shelf position where these circuit packs are to be installed. Table B provides a list of circuit packs associated with the expansion shelf and the shelf position where these circuit packs are to be installed. Optional trunk unit circuit packs may be used in the control shelf. Part 2C provides additional information on the three types of trunk unit circuit packs.

B. Capabilities and Limitations

2.05 The PGTC will interface between the test trunks serving a repair service bureau (RSB) or a local test desk (LTD) equipped for manual or automated testing. The PGTC is compatible with all testing features of the local test desk, test cabinet, and automated testing arrangements. Most LTDs and test cabinets are equipped with all testing keys required for testing through the PGTC. Locations which do not

| TABLE A | |
|----------------|---|
| SHELF POSITION | EQUIPPED WITH CIRCUIT PACK |
| 01 | SM86() Control Shelf Power Unit |
| 02 | SM87() Tester Unit |
| 03 | Vacant or SM87() Tester Unit |
| 04 | Vacant or SM87() Tester Unit |
| 05 | Vacant or SM87() Tester Unit |
| 06 | SM88() Control Unit |
| 07 | SM91() Trunk Unit (Dedicated) or SM92 Trunk Unit (2x2) or SM94() Trunk Unit (2x4) |
| 08 | Vacant or SM92 Trunk Unit (2x2) or SM94() Trunk Unit (2x4) |
| 09 | Vacant or SM92 Trunk Unit (2x2) or SM94() Trunk Unit (2x4) |
| 10 | Vacant or SM92 Trunk Unit (2x2) or SM94() Trunk Unit (2x4) |
| 11 | Vacant or SM92 Trunk Unit (2x2) or SM94() Trunk Unit (2x4) |
| 12 | Vacant or SM92 Trunk Unit (2x2) or SM94() Trunk Unit (2x4) |

| TABLE B | |
|------------------------------------|---|
| SHELF POSITION | EQUIPPED WITH CIRCUIT PACK |
| 01 | SM89 Expansion Shelf Power Unit |
| 02 | SM90 Fanout Extender Unit |
| 03 Through 12 As Required | Vacant or SM92 Trunk Unit (2x2) or SM94() Trunk Unit (2x4) |

have a functional +STA key on the LTDs or test cabinets must have the +STA key and associated circuitry installed for testing through the PGTC.

2.06 The PGTC is compatible with direct dc test trunks and test trunks derived from remote testing systems. When an RSB serves subscribers being served by a pair gain system, all test trunks should be connected to the PGTC.

2.07 In all cases except one, subscriber channels bridged in the central office (CO) *cannot* be tested with the PGTC unless the bridge is lifted before the test is started. The exception to this is the situation where two subscribers are bridged at the CO with the RING party being served by carrier and the TIP party being served by metallic facilities. If mini-bridge lifters are used, the carrier channel (RING party), can be fully tested by the PGTC, both the drop beyond the RT as well as the automatic test of the carrier channel.

2.08 When the PGTC interfaces with a pair gain system, it provides test capabilities for the subscriber lines as follows:

- Permits standard telephone number access via central office incoming test trunk circuits.
- Accommodates standard test procedures for testing through the central office switching system up to the channel unit of the carrier system.
- Allows recognition that a channel unit in a carrier system is being tested.
- Identifies the specific test trunk over which the test is being applied.

- Applies a distinctive termination to the test trunk when set-up checks are complete (1K ohms leak from tip to ground, full scale deflection on test desk meter).
- Switches the test trunk from the central office switching system to the appropriate channel test unit (CTU) in the central office channel bank which in turn establishes a connection, via the dc test pair, through the associated remote terminal CTU to the subscribers loop. (Figure 3 provides a block diagram of a typical test connection made through a PGTC.)
- Provides a lock-up of the circuit established through the dc test pair to permit standard testing (manual or automated) from the RSB without a time restriction.
- Automatically verifies supervision, signaling, end-to-end loss, and noise of the pair gain channel while tests are being made on the subscriber loop.
- Outputs the test results of the automatic channel test when initiated from the RSB. The test results are outputted as audible tone burst(s), and as measurable dc voltages.
- Accommodates from one to 92 test trunks with simultaneous testing possible on four, separate carrier systems.
- Applies 120 interruptions-per-minute (IPM) reorder indication on the test trunk in the event access to a carrier system is blocked due to other testing on the same system or due to exceeding the number of separate systems which can be tested simultaneously.
- Applies a 60 IPM busy indication on the test trunk in the event test access has been attempted to a line served by a carrier system experiencing a major alarm condition.
- Monitors its own performance and activates the central office alarm system if a trouble condition is detected, and displays status information to aid in trouble locating.

C. Circuit Packs Used in Control Shelf

2.09 The SM86 POWER UNIT has been rated \blacklozenge DA (discontinued availability which replaces

the term Manufacture Discontinued) \blacklozenge and is superseded by the SM86B POWER UNIT. The SM86/86B POWER UNIT provides power for other circuit packs and control signals within the control shelf. The SM86/86B power unit requires a -48 Vdc signal grade battery input to generate outputs of +5, +12, -12, +48, -48, +130, and -130 Vdc. The -48 Vdc output is a filtered talk grade battery supply. The SM86/86B is equipped with two sets of normally closed contacts which serve to interface with an external alarm system. The relay is operated (contacts open) by the -48 Vdc input and will release and activate an alarm when the -48 Vdc input is interrupted or some other trouble condition causes the contacts to close. Test jacks are provided on the face of the SM86/86B circuit pack for the measurement of the input and output voltages. The SM86B circuit pack has an alarm lamp located on the face of the unit. When lighted, the alarm lamp indicates a trouble within the PGTC. The alarm may be retired by operating the ACO (alarm cut off) pushbutton on the SM88/88B (both rated DA) or the SM88C control unit. If the ACO indicator goes out, the trouble has cleared. If the ACO indicator does not go out, the SM88/88B/88C unit will have an alphanumerically coded error display (Fig. 4) according to Procedure J, Table W. The SM88C may have an additional test failure code (TFC) display (Fig. 16). To clear TFC display, refer to Table C.

2.10 The SM87, SM87B (both rated DA) or SM87C TESTER UNIT provides most of the circuitry associated with the automatic testing of the channel and also the circuitry which permits the test trunk to be switched from the central office switching system to the subscriber loop. The SM87C tester unit is required for 5ESS switching equipment. \blacklozenge See Table D for the recommended number of SM87() TESTER UNITS per derived pairs. \blacklozenge

Note: The maximum loop resistance (from PGTC through the switching equipment to the channel unit) using the SM87, SM87B is 130 ohms; using the SM87C (required for 5ESS switching equipment), the maximum loop resistance is 630 ohms.

2.11 The SM88, SM88B, (both rated DA) or SM88C CONTROL UNIT contains common control circuitry for the PGTC. The common control circuitry is in the form of a single device microcontroller

| TABLE C | | | |
|---|-------------------------|---------------------|--|
| TEST FAILED | TEST FAILURE CODE (TFC) | TFC DISPLAY (SM88C) | MOST LIKELY CAUSE OF TROUBLE |
| Check for permanent coin ground or permanent ground on ring | SP1 | 8 | Check wiring PGTC to COT for ground on ring conductor |
| Off-hook detection and echo return loss | SP2 | 8 | Incorrectly wired ringing circuit in ESS office; TRU (COT) or (RT) |
| Place channel unit on-hook | SP3 | 8 | Wiring between PGTC and COT; CTU (COT) or (RT); TRU (COT) or (RT); ACU (COT) or (RT) |
| Remove on-hook signal | SP4 | 8 | CTU (COT) or (RT); TRU (COT) or (RT); ACU (COT) or (RT) |
| Single-party ringing and carrier channel loss | SP5 | 8 | TRU (COT) or (RT); ACU (COT) or (RT); negative ringing supply not connected to PGTC; trunk resistance between PGTC and COT exceeded; wrong type ringing supply; resistor or capacitors between T and R of test trunk |
| Idle channel noise | SP6 | 8 | Noisy signal grade battery to PGTC; noisy 3A battery at RT; TRU (COT) or (RT) LIU (COT) or (RT); SSU (COT) or (RT); LSU (COT) or (RT); noisy ringing generator |
| Check for permanent ANI or coin ground | SP7 | 8 | Check wiring PGTC to COT for ground on tip conductor |
| Single party OK | — | 8 | |
| Place channel unit on-hook | MP1 | 8 | Wiring between PGTC and COT; CTU (COT) or (RT); TRU (COT) or (RT); ACU (COT) or (RT) |

| TABLE C (Contd) | | | |
|--|-------------------------|---------------------|--|
| TEST FAILED | TEST FAILURE CODE (TFC) | TFC DISPLAY (SM88C) | MOST LIKELY CAUSE OF TROUBLE |
| Remove on-hook signal | MP2 | 8 | CTU (COT) or (RT); TRU (COT) or (RT); ACU (COT) or (RT) |
| Ability to apply negative superimposed ringing on tip at RT | MP3 | 8 | CTU (COT) or (RT); wrong type channel unit |
| Ability to detect and reproduce ANI ground | MP4 | 8 | CTU (COT) or (RT) |
| Place channel unit on-hook | MP5 | 8 | Wiring between PGTC and COT; CTU (COT) or (RT); TRU (COT) or (RT); ACU (COT) or (RT) |
| Remove on-hook signal | MP6 | 8 | CTU (COT) or (RT); TRU (COT) or (RT); ACU (COT) or (RT) |
| Ability to apply positive superimposed ringing on ring at RT | MP7 | 8 | SM88 not optioned properly for 2 party or 4 party; positive ringing supply not connected to PGTC |
| Check no TPI ground | MP8 | 8 | Wiring between PGTC and COT |
| Place channel unit on-hook | MP9 | 8 | Wiring between PGTC and COT; CTU (COT) or (RT); TRU (COT) or (RT); ACU (COT) or (RT) |
| Remove on-hook signal | MP10 | 8 | CTU (COT) or (RT); TRU (COT) or (RT); ACU (COT) or (RT) |
| Ability to apply positive superimposed ringing on tip at RT | MP11 | 8 | CTU (COT) or (RT) |

TABLE C (Contd)

| TEST FAILED | TEST FAILURE CODE (TFC) | TFC DISPLAY (SM88C) | MOST LIKELY CAUSE OF TROUBLE |
|--|-------------------------|---------------------|--|
| Multiparty OK | — | No display | |
| Place channel unit on-hook | CN1 | 8 | Wiring between PGTC and COT; CTU (COT) or (RT); TRU (COT) or (RT); ACU (COT) or (RT) |
| Remove on-hook signal | CN2 | 8 | CTU (COT) or (RT); TRU (COT) or (RT); ACU (COT) or (RT) |
| Ability to reproduce positive coin control voltage | CN3 | 8 | SSU (RT); CTU (COT) or (RT); ACU (COT) or (RT) |
| Ability to detect and reproduce coin grounds | CN4 | 8 | Channel unit |
| Place channel unit on-hook | CN5 | 8 | Wiring between PGTC and COT; CTU (COT) or (RT); TRU (COT) or (RT); ACU (COT) or (RT) |
| Remove on-hook signal | CN6 | 8 | CTU (COT) or (RT); TRU (COT) or (RT); ACU (COT) or (RT) |
| Ability to reproduce negative coin control voltage | CN7 | 8 | SSU (RT); ACU (COT) or (RT) |
| Ability to detect and reproduce coin grounds | CN8 | 8 | Channel unit |
| Place channel unit on-hook | CN9 | 8 | Wiring between PGTC and COT; CTU (COT) or (RT); TRU (COT) or (RT); ACU (COT) or (RT) |
| Remove on-hook signal | CN10 | 8 | CTU (COT) or (RT); TRU (COT) or (RT); ACU (COT) or (RT) |

| TABLE C (Contd) | | | |
|--|-------------------------|---------------------|--|
| TEST FAILED | TEST FAILURE CODE (TFC) | TFC DISPLAY (SM88C) | MOST LIKELY CAUSE OF TROUBLE |
| Ability to provide positive talk battery | CN11 | 8 | SSU (COT) or (RT); ACU (COT) or (RT); channel unit |
| Check operator mode | CN12 | 8 | Channel unit |
| Coin OK | — | No display | |

package and the associated interface circuitry. Input controls to the SM88/88B/88C control unit are:

- Tone detect lead common to all trunk units.
- Sleeve leads associated with the four test control circuits which interconnect the PGTC and the carrier system.
- Seize, seize-busy and major alarm leads from the central office terminal (COT) channel test units (CTU).
- Status information (busy or idle) on the four tester units.
- Inputs test responses from the individual tester units.

Output signals from the SM88/88B/88C control units are:

- Select controls to associate a tester unit with a test trunk.
- Signals (proceed and lock) to establish test connections.
- Sweep frequency oscillator (1000- to 2000-Hz at a 125-Hz rate) to tester unit.
- Alarm control (to power unit).
- Reorder and busy control (to trunk unit).
- Separate alarm contact (to *optional* external central office alarm scanning system).
- Outputs test control signals to the individual tester units.

| TABLE D | |
|--|--------------------------------|
| RECOMMENDED NUMBER OF SM87() TESTER UNITS | |
| NUMBER OF DERIVED PAIRS | NUMBER OF SM87() TESTER UNITS |
| 1 — 1000 | 1 |
| 1001 — 2000 | 2 |
| 2001 — 4000 | 3 |
| 4001 — UP | 4 |

2.12 The program stored in the microcontroller directs the operation of the SM88/88B/88C control unit as follows:

- Scans the inputs for task requests.
- Consults its memory for applicable instructions and status information.
- Outputs signals to other units of the PGTC to control their functions.

- Continuously checks its own performance and the performance of connecting circuits.
- Attempts to assign alternate tester units when a trouble condition is detected.
- Operates an alphanumerically coded error display (Fig. 4) on the control unit according to Procedure K, Table W. The corresponding alarm condition is relayed to a connected alarm system when a trouble condition exists. Connected alarms may be retired by operating the ACO (alarm cut off) pushbutton on the control unit. The ACO indicator will be lighted if an active alarm has been retired.

2.13 The SM88C control unit will display an additional test failure code (TFC) indicating which type of test (single party, multiparty, or coin) has failed and its sequence number. The TFC is displayed as follows: The top horizontal segment indicates a single-party failure, the middle horizontal segment indicates a multiparty failure, and the bottom horizontal segment indicates a coin failure. The test sequence number is determined by adding the numbers associated with the four verticle segments as shown in Fig. 16. When the 3WO key is operated, the test failure code will be displayed as shown in Table C.

Note: In Table C, the dark segments indicate illuminated (on).

2.14 The SM88, SM88B, or SM88C control unit has an option requirement for multiparty service which must be set at the time of installation. The option is set by means of an option plug (Fig. 4). Option 4P must be provided to serve multiparty lines with full selective ringing and option 2P is required when multiparty lines are served with ringing arrangements other than full selective ringing.

2.15 The SM91B (rated DA) or 91C TRUNK UNIT is used in the control shelf to provide dedicated access to the test control circuits between the PGTC and a selected carrier system. The SM91B/91C trunk unit is *only* required when the PGTC serves dedicated test trunks required for special testing arrangements, any one of the automated testing systems, or a mechanized loop testing (MLT) system. The SM91B/91C trunk unit provides a means to connect a *maximum* of *two* dedicated test trunks to *two* dedicated test control circuits, respectively. Associated with the SM91B/91C trunk unit is one or two SM87B/87C test units. One SM87B/87C test unit will

be required for each test control circuit which is to be dedicated. A maximum of two control circuits may be arranged for dedicated access. The SM91B/91C trunk unit must be installed in position 07 of the control shelf and an SM87B/87C tester unit *must* be installed in position 04 and/or 05 (04 for trunk 1 and 05 for trunk 2).

2.16 The SM91C TRUNK UNIT contains a modification to prevent false disconnects between the RSB and the station under test, that are caused by harmonic frequencies in the LTD ringing supply.

D. Circuit Packs Used in Expansion Shelf

2.17 The SM89 POWER UNIT in position 01 generates the +5, +12, and -12 Vdc necessary to power all associated circuit packs. The SM89 power unit requires a -48 Vdc signal grade input. Test jacks are provided on the face of the power unit so all input and output voltages may be measured.

2.18 The SM90 FANOUT EXTENDER UNIT is used in position 02 of the expansion shelf. The fanout extender provides buffering (amplification) and additional fanout capability for the common control signals between the control shelf and the expansion shelf. One SM90 fanout extender unit is required in position 02 of *each* expansion shelf.

E. Circuit Packs Common to Control Shelf and Expansion Shelf

2.19 The SM92 TRUNK UNIT (no longer available) provided a means to connect any *two* test trunks to *two* test-control circuits. The SM92 trunk unit may be used in any trunk unit position in either the control or expansion shelves. The SM92 trunk unit was intended to be used in a control shelf which has an SM91B/91C trunk unit serving dedicated test trunks. If an SM92 trunk unit is installed in any position on the control or expansion shelves, it can only access the tester units in positions 02 and 03. The SM92 trunk unit can be replaced with an SM94B or later.

2.20 The SM94, SM94B (both rated DA) or SM94C TRUNK UNIT provides a means to connect any *two* test trunks to any *four* of the test control circuits. The SM94/94B, or 94C trunk unit may be used in any trunk unit position in either the control or expansion shelves. However, if an SM91B/91C trunk unit is installed in position 07 of the control shelf, the SM94B/94C can only access the tester units in positions 02 and 03.

2.21 The SM94C TRUNK UNIT contains a modification to prevent false disconnects between the RSB and the station under test, that are caused by harmonic frequencies in the LTD ringing supply.

F. System Operation

2.22 The PGTC may be equipped to provide various arrangements for interconnecting test trunks between the RSB or local test cabinet and subscriber line beyond the remote terminal (RT). Typical arrangements are as follows:

- A maximum of 92 test trunks may access a single test control circuit between the PGTC and the channel test unit (CTU) of a selected carrier system. With this arrangement, one carrier system may be seized for testing at a time.
- Each of two dedicated test trunks has access to a dedicated test control circuit between the PGTC and the CTU of a selected carrier system. With this arrangement two systems may be seized for testing at one time as long as each system has access to a different dc test pair between the central office and the RT.
- A maximum of 92 test trunks may have access to any one of two test control circuits between the PGTC and the CTU of a selected carrier system. This arrangement is usually provided when only two test control circuits are required or when two test control circuits are dedicated and additional test control circuits are provided for nondedicated test trunks. Two systems may be seized for testing at one time over the nondedicated test control circuits, as long as each system has access to different dc test pairs.
- A maximum of 92 test trunks may have access to any one of four test control circuits between the PGTC and the channel test unit (CTU) of a selected carrier system. With this arrangement four systems may be seized for testing at the same time as long as each system has access to a different dc test pair.

2.23 Even though all test trunks associated with a repair service bureau (RSB) may be connected to the PGTC, these test trunks may be used to test subscriber lines not served by a carrier system. The three leads (tip, ring, and sleeve) of the test trunk pass

through normally made contacts of a relay in the PGTC and are connected through a test trunk circuit to the central office switching system. The circuitry of the PGTC in an idle state does not affect the test procedures or test results when testing subscriber lines which are not derived from a carrier system.

2.24 When initiating a test from the repair service bureau (RSB) on a subscriber line derived from a carrier system, the initial connection is established by dialing the telephone number of the line to be tested. ♦The signature (seizure) of the central office channel unit should be evident from standard test (approximately 40-volts leakage tip-to-ground or 75-volts leakage tip-to-ground and ring-to-ground for coin channel units, with approximately 50-volts ballistic deflection). If a SLC Series 5 special service channel unit (CS2) is used, an 82-volt leakage appears on tip and ring to ground in addition to a 24-volt FEMF on both tip and ring to ground. ♦ After the connection has been established and before the automated tests are initiated, any testing of circuits up to the channel unit in the central office may be made in the normal manner. These tests will be used to verify that the line is good up to the channel unit in the channel bank of the central office terminal.

2.25 After establishing the initial connection to the subscriber line (paragraph 2.24), action may be taken to initiate an automated test of the channel serving that subscriber and to switch the test trunk to a dc test pair for testing the far end of the subscriber line. The action required from the RSB to initiate the channel test and to switch the test trunk to a test pair is to apply +116 Vdc to the *tip* side of the line to be tested. The +116 Vdc is applied from the LTD or test cabinet by operating the REV and +STA keys. When testing coin channels, the G key must also be operated. Testing procedures are the same for cases where the TBCU unit is used with 5ESS switching equipment.

2.26 After the +116 Vdc is applied to the test trunk, the test connection to the selected carrier system is established as a result of the following sequence of actions and responses. (See Fig. 3.)

- (a) When +116 volts (minimum of +87 Vdc) is applied to the tip side of the channel unit, a 333.3 Hz tone is transmitted by the channel unit between the T and R leads toward the PGTC.

Note 1: The 333.3 Hz tone can be heard with a 1014-type handset across the T and R leads of the channel unit or the corresponding T and R

leads on the PGTC. For T and R pin assignments on the PGTC, see Table Z or SD-97760-01.

Note 2: The 333.3 Hz tone can be applied continuously by removing the SM94() trunk unit before applying the +116 volts to the tip side of the channel unit.

A tone detector on the SM94() trunk unit detects the 333.3 Hz tone and presents logic level information to the SM88() control unit indicating the presence of the tone. When the 333.3 Hz tone is detected by the SM94() trunk unit, the green busy light on the SM94() will light.

(b) When +116 volts is applied to the tip side of the channel unit and the carrier system is in a major alarm condition, the TMAJ lead from the COT CTU to the PGTC will be grounded and shall remain grounded until the +116 volt signal is removed. The PGTC will return a 60 IPM signal to the LTD or LTC when the carrier system is in a major alarm condition.

Note: See SD-97760-01 for the location of all leads on the PGTC.

(c) When +116 volts is applied to the tip side of the channel unit and the INHIBIT lead to the COT CTU is grounded indicating that the DC test pair is in use, the SEZBY lead from the COT CTU to the PGTC will be grounded and shall remain grounded until the +116 volt signal is removed. The PGTC will return a 120 IPM signal to the LTD or LTC indicating that the test pair connection sequence has been terminated.

Note 1: Carrier systems using the PGTC or the TBCU and sharing a common dc test pair *must* have their INHIBIT leads multipled at the MDF. This is the only way the PGTC will know when the dc test pair is in use. The carrier system using the dc test pair will ground the INHIBIT leads of all the other carrier systems causing their CTUs to issue a SEZBY command to the PGTC.

Note 2: When the dc test pair is not in use, the WN10B COT CTU places battery on the dc test pair. When the WN10B CTU receives the NSEIZE command from the COT channel unit, it removes the battery from the dc test pair and places a ground on the INHIBIT lead. The WN10Bs associated with the other systems

sharing the same dc test pair detect the ground on the INHIBIT lead and remove the battery that they have placed on the dc test pair. If battery is still present on the dc test pair after the REV and +STA keys have been released at the LTD or LTC, check the distributing frame wiring to insure that the INHIBIT leads have been multipled at the MDF.

(d) When +116 volts is applied to the tip side of the channel unit, it also initiates NSEIZE in the CO channel unit. An NSEIZE command from the CO channel unit is output to the CTU at the COT (voltage drop: 4 volts to 0 volts). Upon receipt of the NSEIZE command, the CTU outputs a momentary minor alarm to the ACU. The NSEIZE command is also transmitted to the corresponding channel unit at the RT via the A and B signaling bits. Upon receipt of the NSEIZE from the CO channel unit, the RT channel unit outputs an NSEIZE to the RT CTU (voltage drop: 4 volts to 0 volts). The NSEIZE from the RT CTU is transmitted via the DLUs to the CTU at the COT where it outputs a SEIZE command (voltage drop: -48 volts to ground) to the SM88() control unit via the cable that connects the PGTC with the carrier system.

(e) After the 333.3 Hz tone has been detected, the SM88() control unit monitors the SEIZE lead from the COT CTU for a fraction of a second. If the SEIZE command does not appear within the specified time, the PGTC will send a 120 IPM signal to the LTD or LTC indicating that it has terminated the test pair connection sequence.

(f) If the SEIZE command appears within the specified period of time, the SM88() scans the SM87() tester units and selects the first available or nonbusy tester unit (unequipped tester unit positions appear busy). The SM88() then performs a test program on the tester unit to assure its general functioning and calibration. If the tester unit fails the test, the unit is flagged as busy and an office alarm is generated. [The position of the defective tester unit is also indicated on the SM88() maintenance display.] The next available tester is then selected. If none of the SM87() tester units are available, the SM88() will return a 120 IPM signal to the LTD or LTC indicating that it has terminated the test pair connection sequence.

(g) When a suitable tester unit has been selected, the SM88() control unit will send a PROCEED command (voltage drop: -48V to ground) via one of the four PROCEED leads to the COT CTU. The PROCEED lead will remain grounded until the test pair connection sequence is completed or terminated.

(h) Upon receipt of the PROCEED command from the SM88(), the COT CTU transmits a PROCEED command to the RT CTU via the DLUs. Upon receipt of the PROCEED command, the RT CTU will issue an NGATE command to all the RT channel units.

When the NGATE command is issued to an RT channel unit that has already received an NSEIZE command, the test relay on that channel unit operates causing the TIP and RING of that channel unit to be connected to the CTU at the RT. The operation of the test relay on the RT channel unit can be monitored by connecting a voltmeter between the R jack on the faceplate of the channel unit and ground for the channel being tested. Before the test relay is operated, the meter should read -48V RING to ground. After the relay has operated, the -48V will be removed from the ring conductor.

Operation of the test relay on the channel unit causes the TIP and RING of the channel unit to be connected to the CTU. (The TIP and RING connected to the CTU are *not* the same as the TIP and RING on the faceplate of the channel unit. The TIP and RING on the faceplate of the channel unit continue to go to the customers drop beyond the RT.) The impedance of the CTU as seen by the channel unit is low, this low impedance causes the channel unit to go off hook and the BUSY light on the channel unit to light.

Off hook at the RT channel unit is transmitted to the COT channel unit via the A and B signaling bits causing the BUSY light on the COT channel unit to light.

(i) Presence of the correct voltage from the RT channel unit on the CHTT and CHTR leads of the CTU at the RT causes a PROCEED command to be returned to the COT CTU via the DLUs. Upon receipt of the PROCEED command, the COT CTU will output a SLEEVE command (voltage drop: -48V to ground) to the SM88() control unit. Before outputting the SLEEVE

command to the SM88(), the CTU will connect the TIP and RING of tester trunk to the TTT and TTR leads of the dc test pair. If the SLEEVE command is not received within a fraction of a second after the PROCEED command is issued, the PGTC will return a 120 IPM signal to the LTD or LTC indicating that the test pair connection sequence has been terminated.

(j) Upon receipt of the SLEEVE command, the SM88() control unit issues a command to the SM94() trunk unit to open the normally made contacts between the TT, TR, and TS leads on the test desk side and T, R, and S leads on the switching equipment side via the operation of the K1A relay. When the K1A relay operates, it connects the TT, TR, and TS leads into the SM87() tester unit where they serve as control leads and also carry information to the test desk.

The TS lead is connected inside the SM87() tester unit to two detectors set to different levels. These detectors allow the sleeve lead current to be monitored as one of three conditions:

- (1) Below the level of either detector
- (2) Above the level of one detector but below the level of the other detector
- (3) Above the level of both detectors.

When the 3WO key is operated, the sleeve lead is opened which corresponds to condition (1). When the test disconnect (TD) key is operated, a high sleeve lead current condition exists (greater than 16 milliamperes) which corresponds to condition (3). The normal or low sleeve lead current condition (9 to 14 milliamperes) corresponds to condition (2).

Outputs from the two detectors are fed to the SM88 via the data buses. The SM88 acts on the basis of the command represented by the data buses.

The T and R leads on the switching equipment side connect the SM87() to the carrier channel unit through the switching equipment. These leads are used by the SM87() to run automatic tests on the carrier channel. The S lead on the switching equipment side provides approximately 16 milliamperes of current to the sleeve lead of the switching equipment to hold up the

switching equipment in the cut through to the channel unit mode.

(k) Upon receipt of the SLEEVE command, the SM88() control unit outputs a LOCK command (voltage drop: -48V to ground) to the COT CTU. After grounding the LOCK lead, the SM88() removes the ground from the PROCEED lead. The PGTC also applies a 1K-ohm (K = thousand) resistance leak from *tip* to ground on the test trunk to indicate that a test connection has been completed. The carrier system will maintain all the dc test pair connections and will keep the INHIBIT and SLEEVE leads grounded until the PGTC removes the ground from the LOCK lead.

(l) After the LOCK command has been issued by the SM88(), automatic tests can be performed on the carrier channel and the dc test pair can be cut through to the customer. These actions are initiated by releasing the REV and +STA keys at the LTD or LTC.

Note: If the PGTC grounds the TSTALM (test alarm) lead at any time during the test pair connection sequence before it grounds the LOCK lead, the carrier system will return all connections made to normal and will remove any grounds it is applying to test control leads.

(m) After the REV and +STA keys have been released, the SM87() tester unit under the control of the SM88() control unit performs the following automatic tests on all channel units.

(1) The first test checks for a permanent coin ground or permanent ground on the RING. A -48 Vdc is applied to the RING with the TIP open. If current flow is not detected, the test passes and the SM88() and SM87() continue to the next test. If the test fails, the SM88() and SM87() stop all further testing and do not provide a pass tone to the LTD or LTC.

(2) The second test determines whether or not the COT channel unit is off-hook. This test is performed by applying -48 Vdc to the RING of the channel unit with the TIP grounded. If current flows (off-hook), the test passes and the SM88() and SM87() continue

to the next test. If the test fails, the SM88() and SM87() stop all further testing and do not provide a pass tone to the LTD or LTC.

(3) The third test measures the echo return loss of the carrier channel. The return signal is tested to determine whether it falls within certain limits in the SM87(). The results are furnished to the SM88() on logic buses. The echo return loss must be greater than 13 dB.

Note 1: This test will fail if a ringing circuit is incorrectly located between the PGTC and the carrier system.

Note 2: In ESS switching equipment, this test will fail if the incoming trunk circuit (SD-1A186-01 or 2H109-01) has 200 ohm resistors in the T and R leads to provide secondary lightning protection. These resistors must be strapped out (option Z) to be compatible with the PGTC (Fig. 5). The maximum total (loop) resistance in the TIP and RING conductors between the PGTC and the carrier channel unit after a test connection has been established is 130 ohms.

(4) The fourth test applies +48 Vdc to the TIP of the channel unit with the RING open. If current flow is detected, the channel unit is assumed to be a coin channel unit. If no current flow is detected, the channel unit is assumed to be either a single-party or multiparty channel unit. This information is stored in the SM88() controller unit for use later in the testing sequence.

(5) The fifth test places the carrier channel unit on-hook via a command from the SM88() control unit. Ringing is applied to the COT channel unit. This ringing is transmitted to the RT channel unit via the A and B signaling bits. Ringing at the RT channel unit causes the RT CTU to go to an off-hook condition which is transmitted to the COT channel unit via the A and B signaling bits. Presence of off-hook at the COT is passing which allows the SM88() and SM87() to continue to the next test. If off-hook is not detected at the COT channel unit, the test has failed and no pass tone is given to the LTD or LTC.

Note: During this test, the busy light on both the COT and RT channel unit will go off then come back on. If the channel unit busy lights do not come back on, check the ringing supply to the PGTC.

(6) The sixth test measures carrier channel loss. If the channel loss does not exceed the allowable limit, the test will pass and the SM88() and SM87() will continue to the next test. If the test fails, all further testing is terminated and no pass tone is returned to the LTD or LTC. The overall carrier channel loss must be less than 7 dB at the PGTC to allow for the CO switch and wiring losses.

(7) The seventh test measures the idle channel noise of the carrier channel. If the idle channel noise on the carrier channel is less than or equal to 30 dBrc, the test will pass and the SM88() and SM87() will continue to the next test. If the test fails, all further testing is terminated and no pass tone is provided to the LTD or LTC.

Note: The noise level on the signal grade battery to the PGTC must *never* be greater than 55 dBrc.

(8) The eighth test checks for permanent ANI or coin ground. A -48 Vdc is applied to the TIP with the RING open. If current flow is not detected, the test passes and the SM88() and SM87() continue to the next test. If the test fails, all further testing is terminated and no pass tone is provided to the LTD or LTC.

This completes the series of automatic tests that are performed on all channel units. Additional tests are performed on coin and multiparty channel units. If the channel unit being tested is a single-party unit, the SM88() control unit provides a single pass tone to the LTD or LTC after the completion of the above tests.

(n) The automatic test results are obtained by operating the 3WO key at the LTD or LTC. The test trunk may be switched back and forth between the subscriber loop and the output of the PGTC, by operation and release of the 3WO key, to allow dc tests on the loop or to recall automated channel test results. ♦To monitor the tone burst(s), operate the MONITOR key, then the 3WO key.♦

Each time the 3WO key is operated, only the *initial* test results on the subscriber channel are repeated and a new automated test is *not* initiated. To initiate a new automated test of the subscriber channel, a disconnect must be performed and the test arrangement re-established. Results from the automated tests will be recalled as shown in Table E.

| TABLE E | | |
|---|----------------------|----------------------|
| CHANNEL CONDITION | AC SIGNAL OUTPUT | DC SIGNAL OUTPUT |
| Channel no good | None | T: Ground R: +48V |
| Channel good — Single party and SPOTS (WP36 and WP37) Channel Units | Single Tone Burst | T: Ground R: -48V |
| Channel good — Multiparty Channel Unit | Double Tone Burst | T: -48V R: Open |
| Channel good — Coin Channel Unit | Triple Tone Burst | T: +48V R: Open |

(o) When the RSB has completed all tests of the drop beyond the RT and has received the results of the automatic carrier channel tests, it must provide a test disconnect signal to the PGTC. The RSB sends a test disconnect signal by changing to a higher sleeve lead current condition for a minimum of 3 seconds or until current stops flowing in the sleeve lead. A high sleeve condition can be created by operating the TD key (on some LTDs a high sleeve condition can only be created by operating the IN key).

G. 5ESS™ (Integrated SLC® 96 Carrier System) Applications

2.27 When used with the 5ESS switching equipment, the PGTC can perform the same functions for the SLC carrier systems as for any other switching systems, *IF* the SLC carrier system is arranged in the *universal* configuration. Where the SLC carrier system is *integrated* into the 5ESS switching equipment, the TBCU and 5ESS switching equipment perform the *same functions* as the PGTC. Where integrated and

universal SLC carrier systems are both served by the 5ESS switching equipment, the PGTC and TBCU units (Fig. 12) are required to meet the testing needs of the two different SLC carrier arrangements. The TBCU and PGTC can share dc test pairs when the two different SLC carrier arrangements are located at the same remote site. The TBCU and PGTC are both compatible with MLT automated testing systems.

TBCU

H. Test Bus Control Unit (TBCU) Shelf

2.28 The TBCU consists of one J1C189A(), L1 control shelf (Fig. 13) which is 8 inches high and 23 inches long. The control shelf will accommodate one SM499 power unit and 15 SM500 test bus units. The SM499 circuit pack powers the entire control shelf. The SM500 circuit pack contains two circuits which will serve two dc test pairs. Each dc test pair can serve a different remote site of SLC carrier systems. The maximum number of SLC carrier systems served by one dc test pair is 10 with a LTD, and 20 with MLT.

2.29 The inhibit leads used with the TBCU are wired through the MDF, and are multipled to all carrier systems sharing the dc test pair. The inhibit leads prevent more than one testing system from seizing the same dc test pair at the same time as explained in more detail in paragraph 2.26(c).

2.30 The 5ESS switching equipment via the metallic service unit (MSU), operates a series of relays located on the SM500 BUS UNIT(s) by grounding the five distribute points "SEIZE," "POL," "RES," "REV," and "NRES" in different combinations to condition the dc test pair for the particular test being performed.

2.31 The TBCU shelf requires a -48 Vdc signal grade battery input. The voltage range provided must be between -42.5 and -52.5 Vdc. The -48 Vdc for the TBCU shelf is to be provided from a miscellaneous mounted fuse panel and will be fused by a 35B/70B (2 amp) fuse.

I. Circuit Packs Used in TBCU Shelf

2.32 The SM499 POWER UNIT in position 01, requires a -48 Vdc signal grade battery input to

generate outputs of +5, -12, +48T, -48T, -48S Vdc, and a 60 interruptions-per-minute (IPM) +5 Vdc output to all SM500 BUS UNITS in the shelf. Test jacks are provided on the face of the SM499 circuit pack for the measurement of the input and output voltages (Fig. 13). The SM499 is equipped with two sets of normally closed contacts (relay K1) which serve to interface with an external alarm system and to turn on an alarm lamp located on the face of the unit. The K1 relay is operated (contacts open) by the +48T and -48T balanced dc output of the 48 volt dc-to-dc converter. Failure of the 48-volt converter releases relay K1, causing the alarm lamp to light and activating the central office (CO) alarm. The loss of -48 Vdc *input* (CO battery) or the failure of the +5 volt dc-to-dc converter will also cause the release of relay K1, but activating *only* the central office alarm, (*no* alarm lamp on face of unit). The 60 IPM output of the SM499 is used in the SM500 BUS UNIT(s) to signal the MSU to conduct dc test on the subscriber loop.

2.33 The SM500 BUS UNIT(s) (positions 02 through 016) contains two circuits. Each circuit provides an interface between the dc test pair and the MSU. The SM500 allows the testing facility (LTD or MLT) to test integrated SLC 96 carrier systems in the same way universal SLC 96 carrier systems are tested using the PGTC. When the 5ESS switching system requests a dc test pair, the SM500 will ground the INHIBIT lead. A grounded INHIBIT lead makes the dc test pair busy to other testing facilities. A 56K-ohm (K = thousand) network between TT, TR, and ground provides an interface that the MLT recognizes as a testable integrated SLC 96 carrier system. It also provides a diode and resistor (under relay control) between the TT and TR leads, so that the 5ESS switching equipment can verify the integrity of the test trunk. When the testing facility applies +116 Vdc to the TT lead, the SM500 will apply a 1K-ohm resistance leak from TT to ground on the test trunk to indicate that a test connection has been completed. When the test initiate voltage (+116 Vdc) is removed, the MSU is connected to the dc test pair which bypasses the digital line allowing the test facility to conduct dc test of the subscriber loop. The test results reporting circuit is under the control of the MSU through five distribute points. The results of the automatic test performed by the 5ESS switching equipment are transmitted to the testing facility as shown in Table F.

| TABLE F | |
|---|------------------------|
| CHANNEL CONDITION | DC SIGNAL OUTPUT |
| Channel no good | T: Ground R: +48V |
| Channel good — Single party and SPOTS (WP36 and WP37) Channel Units | T: Ground R: -48V |
| Channel good — Multiparty Channel Unit | T: -48V R: Ground |
| Channel good — Coin Channel Unit | T: +48V R: Ground |
| No results available* | T: Ground R: Ground |
| * Release 3W0 key and operate again. | |

3. APPARATUS

PGTC

3.01 The following apparatus is required for the installation of the PGTC.

- 1 — J94003C NOISE MEASURING SET (3CNM) or equivalent (AT&T Practice 103-611-101)
- 1 — KS-14510, L5 Volt-Ohm-Milliammeter (VOM) or equivalent (AT&T Practice 100-520-101)
- 1 — 35D or 70D (5.A) fuse
- 2 — 35F or 70F (0.25A) fuses
- 1 — 35C or 70C (3.A) fuse
- 1 — 500-Type Telephone Set, wired for bridged ringing
- 1 — 1000-ohm resistor (1/4 watt or greater)
- 1 — NA96L1 PORTABLE TEST DESK SIMULATOR (*optional*) or DTTS-1 MINIATURE PORTABLE TEST DESK (*optional*)
- 1 — DTTS-2 TEST CONTROLLER SIMULATOR (*optional*).

TBCU

3.02 The following apparatus is required for the installation of the TBCU.

- 1 — KS-14510, L5 Volt-Ohm-Milliammeter (VOM) or equivalent (AT&T Practice 100-520-101)
- 1 — 1000-ohm resistor (1/4-watt or greater)
- 1 — 35B or 70B (2.A) fuse.

4. INSTALLATION

PGTC

4.01 The following paragraphs provide installation and testing procedures for the PGTC when used with a compatible pair gain system.



The procedures in this document are intended to be used only as specified in Fig. 11. DO NOT ATTEMPT to use the procedures otherwise.

4.02 The test procedures in this document will be performed from the RSB or local test cabinet, if, the test trunks and associated central office equipment is available and wired in. *Optional* portable test sets are available for use where it is desirable to test out the PGTC or the channel test unit (CTU) of the SLC channel bank prior to test trunks being connected or in cases where automated testing is used and more control of the test procedures is desired. *Optional* procedures are provided in this practice for use with the portable test sets. If the *optional* tests of the PGTC using the portable test sets are performed, the incoming test trunks and the associated central office equipment *must* be tested when they are wired in.

4.03 The portable test sets which are available for testing the PGTC and the CTUs of the SLC channel bank are:

- NA96L1 PORTABLE TEST DESK SIMULATOR (Fig. 6)
- DTTS-1 MINIATURE PORTABLE TEST DESK (Fig. 7)
- DTTS-2 TEST CONTROLLER SIMULATOR (Fig. 8).

The NA96L1 PORTABLE TEST DESK SIMULATOR and the DTTS-1 MINIATURE PORTABLE TEST DESK basically provide the same testing features and are used to simulate the functions of a local test desk. The DTTS-2 TEST CONTROLLER SIMULATOR replaces the PGTC and is used to verify that the CTUs at the COT and RT are functioning properly. If the *optional* tests of the PGTC using the portable test sets are performed, the incoming test trunks and the associated central office equipment *must* be tested when they are wired in. The NA96L1 PORTABLE TEST DESK SIMULATOR is supplied by AT&T Technologies, and the DTTS-1 MINIATURE PORTABLE TEST DESK and DTTS-2 TEST CONTROLLER SIMULATOR is supplied by H & P Electronic Assembly. All test sets are supplied complete with the necessary cords (Fig. 6 and 8). When ordering the test sets, per local procedures, it should be noted that the test sets are available from the following suppliers:

NA96L1 PORTABLE TEST DESK SIMULATOR

AT&T
Carolinas Service Center
2901 N. Tryon Street
Charlotte, North Carolina 28206

DTTS-1 MINIATURE PORTABLE TEST DESK

DTTS-2 TEST CONTROLLER SIMULATOR

H & P Electronic Assembly
38 Shawsheen Rd.
Billerica, Mass. 01866

4.04 Fusing for the -48 Vdc signal grade battery feed(s) and for the office ringing supply feed(s) must be provided by a miscellaneous fuse panel. Operation of the fuse panel and its associated alarm circuitry, if any, must be verified in accordance with standard procedures as part of the initial acceptance test.

4.05 To aid in the installation and trouble procedures, Table V is provided, listing the steps in Procedures A through I with test requirements and suggestions or references on what to do if the requirement has not been met. A listing of A-5 corresponds to a requirement associated with Procedure A, Step 5, for example.

A. Acceptance Test of PGTC

| STEP | PROCEDURE |
|------|---|
| | <i>Prerequisite:</i> A functional carrier system is available. The system <i>may</i> or <i>may not</i> be cutover to service. |
| | <i>Note:</i> If a step fails to meet requirements, refer to Table V. |
| 1 | Visually inspect backplane of PGTC for bent, broken, or crossed terminals. |
| 2 | Remove all circuit packs from PGTC. |
| 3 | Insert the 35D/70D (5A) fuse in the A1 position of the miscellaneous fuse panel. |
| 4 | Condition VOM to measure dc volts. |
| 5 | Using the VOM and noting the polarity of the leads as well as the range setting of the VOM, connect the VOM between terminals 2 and 3 on backplane of PGTC (see Table G). |

| TABLE G | |
|----------------------|----------------|
| PGTC TERMINAL NUMBER | FUNCTION |
| 1 | GROUND (Z) * |
| 2 | -48S |
| 3 | -48RTN |
| 4 | -48RTNA |
| 5 | MJVR |
| 6 | MJR |
| 7 | MJ |
| 8 | MJV |
| 9 | SI |
| 10 | -SUP (W) (X) † |
| 11 | +SUP (W) † |
| 12 | SIR |
| 13 | GROUND (Y) * |

* For ground option (Y or Z) see SD-97760-01 (CAD 1).
† For ringing options (W or X), and voltage requirements see SD-97760-01 (CAD 1).

Requirement: Voltage between -42.5 Vdc and -52.5 Vdc.

- 6 On backplane of PGTC, connect + lead of VOM to terminal 1 (ground).
- 7 Using Table H, connect - lead of VOM to terminal to be tested (starting with terminal 16).

| STEP | PROCEDURE |
|------|-----------|
|------|-----------|

Requirement: Voltage between -42.5 Vdc and -52.5 Vdc.

- 8 At rear of COT, ground corresponding terminal on the CTU, (terminal 5 is the corresponding terminal for 16).

Requirement: Voltage drops to 0 Vdc.

- 9 Repeat Steps 7 and 8 for all leads listed in Table H.

| TABLE H | | |
|----------------------------|---------------|-----------------|
| PGTC TERMINAL NUMBER | SLC 96 CTU | SERIES 5 CTU |
| 16 | 5 | 59 |
| 19 | 7 | 60 |
| 22 | 10 | 61 |
| 25 | 9 | 62 |
| 28 | 21 | 69 |
| 29 | 18 | 71 |
| 31 | 19 | 67 |
| 32 | 15 | 65 |
| 35 | 20 | 70 |
| 36 | 13 | 63 |
| 40 | 22 | 68 |
| 41 | 14 | 64 |
| 42 | 16 | 66 |

- 10 Condition VOM to measure resistance (ohms) on the X10 scale.
- 11 On backplane of PGTC, connect one lead of VOM to ground.
- 12 Using Table I, connect other lead of VOM to terminal to be tested (starting with terminal 14).
Requirement: VOM reads open circuit.
- 13 At rear of COT, ground corresponding terminal on the CTU, (terminal 37 is the corresponding terminal for 14).
Requirement: VOM reads grounded circuit.
- 14 Repeat Steps 12 and 13 for all leads listed in Table I.

STEP

PROCEDURE

| ▶TABLE 14 | | |
|----------------------------|---------------|-----------------|
| PGTC TERMINAL NUMBER | SLC 96 CTU | SERIES 5 CTU |
| 14 | 37 | 58 |
| 15 | 36 | 57 |
| 17 | 34 | 56 |
| 18 | 33 | 55 |
| 20 | 30 | 54 |
| 21 | 29 | 53 |
| 23 | 32 | 52 |
| 24 | 31 | 51 |
| 26 | 51 | 74 |
| 27 | 54 | 73 |
| 30 | 4 | 76 |
| 33 | — | — |
| 34 | 27 | 78 |
| 37 | 52 | 75 |
| 38 | 1 | 77 |
| 39 | 53 | 72 |

- 15 Calibrate a J94003C (3C) noise measuring set equipped with the 497A network (C-message weighting) per AT&T Practice 103-611-101.
- 16 At rear of PGTC, connect the 3C noise measuring set to terminal 2 (-48S) and terminal 3 (-48 RTN), and measure the noise level.
- Requirement:** The noise level must *never* exceed 55 dBmrc.
- 17 Using Table G and SD-97760-01, verify or install ground option (Y or Z) as required.
- 18 Insert the 35F/70F (0.25A) fuse(s) in the A2 (and A3, if required) position(s) of the miscellaneous fuse panel.
- Note:** The A2 position is for ac or negative superimposed ringing. The A3 position is for positive superimposed ringing.
- Requirement:** The fuse(s) does not operate (blow).
- 19 Condition VOM to measure ac volts.
- 20 On backplane of PGTC, connect one lead of VOM to ground.

| STEP | PROCEDURE |
|------|---|
| 21 | If ac ringing is used (option X), proceed to Step 24. |
| 22 | If negative superimposed ringing is used (option X), proceed to Step 25. |
| 23 | If both negative and positive superimposed ringing are used (option W), proceed to Step 26. |
| 24 | For ac ringing, connect other VOM lead to terminal 10. Requirement: Voltage is between 86 and 100 Vac 20 Hz. Note: Proceed to Step 27. |
| 25 | For negative superimposed ringing, connect other VOM lead to terminal 10. Requirement: Voltage is between 86 and 100 Vac 20 Hz, with -42.5 Vdc to -52.5 Vdc superimposed. Note: Proceed to Step 27. |
| 26 | For negative and positive superimposed ringing, connect other VOM lead to terminal 10 (Requirement 1), then move lead to terminal 11 (Requirement 2). Requirement 1: Voltage is between 86 and 100 Vac 20 Hz, with -42.5 Vdc to -52.5 Vdc superimposed. Requirement 2: Voltage is between 86 and 100 Vac 20 Hz, with +42.5 Vdc to +52.5 Vdc superimposed. |
| 27 | Disconnect VOM leads. |
| 28 | On backplane of PGTC, short terminals 5 (MJVR lead) and 8 (MJV lead) together. Requirement: The MJV alarm activated (if provided). |
| 29 | Remove short from terminals 5 and 8. |
| 30 | On backplane of PGTC, short terminals 6 (MJR lead) and 7 (MJ lead) together. Requirement: The MJ alarm activated (if provided). |
| 31 | Remove short from terminals 6 and 7. |
| 32 | On backplane of PGTC, short terminals 9 (SI lead) and 12 (SIR lead) together. Requirement: The SI alarm activated (if provided). |
| 33 | Remove short from terminals 9 and 12. |
| 34 | Remove <i>all</i> fuses (A1, A2, and A3). |

B. PGTC Control Shelf Turn Up (Carrier System Not Cutover to Service)

| STEP | PROCEDURE |
|---|---|
| | <p>Prerequisite: Figure 11 has directed reference to this procedure. A <i>functional</i> carrier system is available, however, the system should <i>not</i> be cutover to customer service. If customers have been cutover to service, use Procedure C.</p> <p>The dc test pair between the central office distributing frame (DF) and the RT has been verified in accordance with standard procedures for voice-frequency pairs. The dc test pair <i>must</i> be loaded in accordance with engineering practices for voice-frequency pairs.</p> |
|  | <p>Verify the TT(), TR(), and TS() leads <i>from</i> the PGTC have been brought to the MDF and are ready for jumpering to the test trunks <i>toward</i> the RSB or local test cabinet. The T(), R(), and S() leads <i>from</i> the PGTC have been brought to the MDF and are ready for jumpering to the <i>incoming</i> test trunk circuits of the office.</p> |
| | <p>Note 1: If the CO is equipped with an SD-96474-01 test trunk ringing circuit, the ringing circuit <i>must</i> be between the PGTC and the test trunks toward the RSB or LTD (Fig. 5).</p> |
| | <p>A test line at the central office, consisting of a temporary telephone number and a subscriber line circuit is available.</p> |
| | <p>Note 2: If a step fails to meet requirements, refer to Table V.</p> |
| 1 | <p>Verify that the J1C142A, L1 control shelf (Fig. 1) and associated power and connecting cables have been properly installed and terminated.</p> |
| 2 | <p>Verify that fuses A1, A2, and A3 (if provided) are removed from the miscellaneous fuse panel.</p> |
| 3 | <p>Verify test desk is equipped with an operational +STA key.</p> |
| 4 | <p>Alert central office personnel that alarm tests are being made.</p> |
| 5 | <p>Plug an SM86() circuit pack (control shelf power unit) into position 01 of the control shelf.</p> |
| | <p>Requirement 1: The office alarm (if provided) is activated.</p> |
| | <p>Requirement 2: The proper aisle and frame indicator lamps light (if provided).</p> |
| 6 | <p>Insert the 35D/70D (5A) fuse in the A1 position of the miscellaneous fuse panel.</p> |
| | <p>Requirement: The fuse does not operate (blow).</p> |

| STEP | PROCEDURE |
|------|-----------|
|------|-----------|

7 Using the VOM and noting the polarity of the leads as well as the range setting of the VOM, measure the voltages at the SM86() test jacks as shown in Table J.

| TABLE J | | | |
|-----------|--------|-----------|-------------------|
| TEST JACK | | VOM RANGE | REQUIREMENT (Vdc) |
| FROM (+) | TO (-) | | |
| BG | -48S | 60 | 45 to 53 |
| LG | -48T | 300/60 | 45 to 65 |
| LG | -130 | 300 | 130 to 195 |
| LG | -12 | 60/12 | 10.8 to 13.2 |
| +5 | LG | 12 | 4.5 to 5.5 |
| +12 | LG | 60/12 | 10.8 to 13.2 |
| +48T | LG | 300 | 60 to 85 |
| +130 | LG | 300 | 130 to 195 |

8 Calibrate a J94003C (3C) noise measuring set equipped with the 497A network (C-Message weighting) per AT&T Practice 103-611-101.

9 Connect the 3C noise measuring set to the -48S and BG test jacks on the SM86() unit, and measure the noise level.

Requirement: The noise level must *never* exceed 55 dBm_c.

10 Insert the 35F/70F (0.25A) fuse(s) in the A2 (and A3, if required) position(s) of the miscellaneous fuse panel.

Note: The A2 position is for ac or negative superimposed ringing. The A3 position is for positive superimposed ringing.

Requirement: The fuse(s) does not operate (blow).

11 Set the option plug (see Fig. 4) on an SM88() circuit pack (control unit) to the appropriate position for the type of ringing supplied in Step 10.

Note: If the A3 fuse position on the miscellaneous fuse panel has been provided and wired, use **4P** option position. Otherwise, use **2P** option position.

12 Plug the SM88() unit into position 06 of the control shelf.

Requirement 1: After a settling period (approximately 5 seconds), the status display on the SM88() (Fig. 4) will clear.

Requirement 2: The ACO lamp on the SM88() unit should be extinguished.

13 Depress ACO button.

| STEP | PROCEDURE |
|------|---|
| | <p>Requirement: Office alarms (if provided) are retired and the ACO lamp does <i>not</i> illuminate.</p> |
| 14 | <p>At the distributing frame (DF), cross-connect the test line to a channel selected in the carrier system.</p> <p>Note: The tests are most effective if the channel selected is equipped with coin service capability units; however, multiparty or single-party service units may be used with less complete test verification [no +130V (coin collect) or -130V (coin return)].</p> |
| 15 | <p>At the DF, cross-connect the dc test pair from the remote terminal (RT) to the central office terminal (COT).</p> <p>Note: The dc test pair (cable pair) must be H88 loaded if required.</p> |
| 16 | <p>At the DF, verify that the INHIBIT lead is multiplied with all carrier systems sharing the same dc test pair (Fig. 3).</p> |
| 17 | <p>At the RT, connect the 500-type telephone set to the subscriber side (drop side) of the corresponding channel unit as selected in Step 14.</p> |
| 18 | <p>At the PGTC, plug a trunk unit [SM91(), SM92, or SM94() circuit pack as specified] into position 07 of the control shelf.</p> <p>Requirement: No fuses operate (blow).</p> |
| 19 | <p> At the DF, cross-connect the TT(), TR(), and TS() leads <i>from</i> the PGTC to the first test trunk <i>toward</i> the RSB or local test cabinet. Cross-connect the T(), R(), and S() leads <i>from</i> the PGTC to the first <i>incoming</i> test trunk circuit of the office (Fig. 3). The previous direct connection between the incoming test trunk circuit and the RSB or local test cabinet test trunks <i>must</i> be removed.</p> |
| 20 | <p>At the RSB or local test cabinet, access the test line via the <i>first</i> test trunk in accordance with standard procedures.</p> <p>Requirement: The signature (seizure) of the central office channel unit should be evident from standard test (approximately 40-volts leakage <i>tip</i> to ground <i>or</i> 75-volts leakage <i>tip</i> to ground and <i>ring</i> to ground for coin channel units, with approximately 50-volts ballistic deflection). If a SLC Series 5 special service channel unit (CS2) is used, an 82-volt leakage appears on tip and ring to ground in addition to a 24-volt FEMF on both tip and ring to ground.</p> |
| 21 | <p>Operate REV and +STA keys (also G key if coin channel unit).</p> <p>Requirement: The VMA meter indicates deflections at a 120 interruptions-per-minute (IPM) rate.</p> <p>Note 1: Busy light will illuminate on the trunk unit and the minor and near end alarm light on the ACU of the carrier system under test may briefly flash.</p> <p>Note 2: The alarm light on the CTU may or may not flash.</p> |
| 22 | <p>Release all keys.</p> |
| 23 | <p>Release test trunk.</p> |
| 24 | <p>Repeat Steps 19 through 23 for each test trunk provided before continuing to Step 25.</p> |

| STEP | PROCEDURE |
|------|-----------|
|------|-----------|

25 If the PGTC has been equipped with an SM91() unit in Step 18, plug an SM87() circuit pack (tester unit) into position 04 of the control shelf. Otherwise, plug the SM87() unit into position 02 of the control shelf.

Requirement 1: No fuses operate (blow).

Requirement 2: The status indicator on the SM88() control unit remains clear.

Note 1: If a status indication appears on the SM88(), remove and reseal the SM88() control card. The microcontroller is now reset and the status indicator is clear (no display).

Note 2: If SM94 unit shows busy, remove and reseal the SM94 unit.

26 At the RSB or local test cabinet, access the test line again via the *first* test trunk.

27 Operate the REV and +STA key (also G key if coin unit).

Requirement 1: The VMA meter indicates a steady deflection of approximately 85 volts or greater.

Requirement 2: At the PGTC, the busy indicator lamp on the trunk unit lights simultaneously with Requirement 1.

28 Release the +STA key (and G key if operated).

Requirement: The VMA meter should indicate approximately 0 volts.

29 By operating (and releasing) the REV key, with and without the G key operated, verify the test connection.

Requirement: The test connection should have approximately 0-volts leakage with a ballistic indication corresponding to one bridged ringer.

30 Release all keys.

31 Operate MONITOR key, then the 3WO key and monitor the tone burst(s) in the headset.

Requirement: The tone burst(s) heard should correspond to the type of channel unit selected in Step 14 as follows:

| CHANNEL TYPE | TONE BURST(S) |
|--|---------------|
| Single-party ♦or SPOTS® (WP36 and WP37) Channel unit♦ | One burst |
| Multiparty | Double burst |
| Coin | Triple burst |

Note: If necessary to reverify the number of tone burst(s), release the 3WO key and then reoperate it.

STEP

PROCEDURE

- 32 With the MONITOR key released and the 3WO key operated, operate the REV, FEMF, and VM REV keys as required to obtain dc response.

Requirement: The VMA meter indications should be as shown for the type of channel unit selected and the keys operated as shown in Table K.

| TABLE K | | |
|--|---------------------------------------|---------------------------------------|
| CHANNEL TYPE | KEY(s) OPERATED | VMA INDICATION |
| Single-party or SPOTS (WP36 and WP37) | (a) REV, 3WO (b) FEMF, 3WO | approx. 100 volts approx. 48 volts |
| Multiparty | (a) FEMF, REV, 3WO (b) 3WO | approx. 48 volts approx. 0 volts |
| Coin | (a) FEMF, REV, VM REV, 3WO (b) 3WO | approx. 48 volts approx. 0 volts |

- 33 Release all keys.

- 34 Release test trunk.

Requirement: At the PGTC, the busy indicator lamp on the trunk unit in position 07 should extinguish.

- 35 At the DF, ground the INHIBIT lead coming from the carrier system.

- 36 At the RSB or local test cabinet, access the test line again.

- 37 Operate the REV and +STA keys (also G key if coin channel unit).

Requirement: The VMA meter indicates deflections at a 120 IPM rate.

- 38 Release all keys.

- 39 Release test trunk.

- 40 At the DF, remove the ground on the INHIBIT lead (placed in Step 35).

- 41 At the COT, cause a major alarm by inserting a pin plug into the R CODE jack on the TRU unit for the shelf containing the channel unit under test.

- 42 At the RSB or local test cabinet, access the test line again.

- 43 Operate the REV and +STA keys (also G key if coin channel unit).

| STEP | PROCEDURE |
|------|---|
| | Requirement: The VMA meter indicates deflections at a 60 IPM rate. |
| 44 | Release all keys. |
| 45 | Release test trunk. |
| 46 | At the COT, remove the pin plug from the R CODE jack to clear the major alarm condition. |
| 47 | If the <i>PGTC</i> has been equipped with an <i>SM91()</i> trunk unit in Step 18 and a second dedicated test trunk is required, plug in an <i>SM87()</i> tester unit into position 05 of the control shelf. |
| 48 | Repeat Steps 26 through 46 for the second test trunk. |
| 49 | Remove the test line connected in Step 14 and the 500-type telephone set connected in Step 17. |

C. PGTC Control Shelf Turn Up (Carrier System Cutover To Service)

| STEP | PROCEDURE |
|------|-----------|
|------|-----------|

Prerequisite: Figure 11 has directed reference to this procedure. A *functional* carrier system is available, and the system *is* cutover to customer service. If customers have *not* been cutover to service, use Procedure B.

The dc test pair between the central office distributing frame (DF) and the RT has been verified in accordance with standard procedures for voice-frequency pairs. The dc test pair *must* be loaded in accordance with engineering practices for voice-frequency pairs.



Verify the TT(), TR(), and TS() leads *from* the PGTC have been brought to the MDF and are ready for jumpering to the test trunks *toward* the RSB or local test cabinet. The T(), R(), and S() leads *from* the PGTC have been brought to the MDF and are ready for jumpering to the *incoming* test trunk circuits of the office.

Note 1: If the CO is equipped with an SD-96474-01 test trunk ringing circuit, the ringing circuit *must* be between the PGTC and the test trunks toward the RSB or LTD (Fig. 5).

A test line at the central office, consisting of a temporary telephone number and a subscriber line circuit is available.

Note 2: If a step fails to meet requirements, refer to Table V.

- 1 Verify that the J1C142A, L1 control shelf (Fig. 1) and associated power and connecting cables have been properly installed and terminated.
- 2 Verify that fuses A1, A2, and A3 (if provided) are removed from the miscellaneous fuse panel.
- 3 Verify test desk is equipped with an operational +STA key.
- 4 Alert central office personnel that alarm tests are being made.
- 5 Plug an SM86() circuit pack (control shelf power unit) into position 01 of the control shelf.

Requirement 1: The office alarm (if provided) is activated.

Requirement 2: The proper aisle and frame indicator lamps light (if provided).

- 6 Insert the 35D/70D (5A) fuse in the A1 position of the miscellaneous fuse panel.

Requirement: The fuse does not operate (blow).

| STEP | PROCEDURE |
|------|-----------|
|------|-----------|

- 7 Using the VOM and noting the polarity of the leads as well as the range setting of the VOM, measure the voltages at the SM86() test jacks as shown in Table L.

| TABLE L | | | |
|-----------|--------|-----------|-------------------|
| TEST JACK | | VOM RANGE | REQUIREMENT (Vdc) |
| FROM (+) | TO (-) | | |
| BG | -48S | 60 | 45 to 53 |
| LG | -48T | 300/60 | 45 to 65 |
| LG | -130 | 300 | 130 to 195 |
| LG | -12 | 60/12 | 10.8 to 13.2 |
| +5 | LG | 12 | 4.5 to 5.5 |
| +12 | LG | 60/12 | 10.8 to 13.2 |
| +48T | LG | 300 | 60 to 85 |
| +130 | LG | 300 | 130 to 195 |

- 8 Calibrate a 3C noise measuring set equipped with the 497A network (C-Message weighting) per AT&T Practice 103-611-101.
- 9 Connect the 3C noise measuring set to the -48S and BG test jacks on the SM86() unit, and measure the noise level.

Requirement: The noise level must *never* exceed 55 dBmC.

- 10 Insert the 35F/70F (0.25A) fuse(s) in the A2 (and A3, if required) position(s) of the miscellaneous fuse panel.

Note: The A2 position is for ac or negative superimposed ringing. The A3 position is for positive superimposed ringing.

Requirement: The fuse(s) does not operate (blow).

- 11 Set the option plug (see Fig. 4) on an SM88() circuit pack (control unit) to the appropriate position for the type of ringing supplied in Step 10.

Note: If the A3 fuse position on the miscellaneous fuse panel has been provided and wired, use **4P** option position. Otherwise, use **2P** option position.

- 12 Plug the SM88() unit into position 06 of the control shelf.

Requirement 1: After a settling period (approximately 5 seconds), the status display on the SM88() (Fig. 4) will clear.

Requirement 2: The ACO lamp on the SM88() unit should be extinguished.

- 13 Depress ACO button.

| STEP | PROCEDURE |
|------|--|
| | <p>Requirement: Office alarms (if provided) are retired and the ACO lamp does <i>not</i> illuminate.</p> |
| 14 | <p>At the distributing frame (DF), cross-connect the test line to an unassigned channel selected in the carrier system.</p> <p>Note 1: The tests are most effective if the channel selected is equipped with coin service capability units; however, multiparty or single-party service units may be used with less complete test verification [no +130V (coin collect) or -130V (coin return)].</p> <p>Note 2: An assigned channel may be used, however, service will be denied to the assigned subscriber during test access. In this case proceed to Step 16.</p> |
| 15 | At the RT, connect the 500-type telephone set to the subscriber side (drop side) of the corresponding channel unit as selected in Step 14. |
| 16 | At the DF, cross-connect the dc test pair from the remote terminal (RT) to the central office terminal (COT). |
| | <p>Note: The dc test pair (cable pair) must be H88 loaded if required.</p> |
| 17 | At the DF, verify that the INHIBIT lead is multiplied with all carrier systems sharing the same dc test pair (Fig. 3). |
| 18 | At the PGTC, plug a trunk unit [SM91(), SM92, or SM94() circuit pack as specified] into position 07 of the control shelf. |
| | <p>Requirement: No fuses operate (blow).</p> |
| 19 | <p> At the DF, cross-connect the TT(), TR(), and TS() leads <i>from</i> the PGTC to the first test trunk <i>toward</i> the RSB or local test cabinet. Cross-connect the T(), R(), and S() leads <i>from</i> the PGTC to the first <i>incoming</i> test trunk circuit of the office (Fig. 3). The previous direct connection between the incoming test trunk circuit and the RSB or local test cabinet test trunks <i>must</i> be removed.</p> |
| 20 | At the RSB or local test cabinet, access the test line via the <i>first</i> test trunk in accordance with standard procedures. |
| | <p>Requirement: The signature (seizure) of the central office channel unit should be evident from standard test (approximately 40-volts leakage <i>tip</i> to ground <i>or</i> 75-volts leakage <i>tip</i> to ground and <i>ring</i> to ground for coin channel units, with approximately 50-volts ballistic deflection). ♦If a SLC Series 5 special service channel unit (CS2) is used, an 82-volt leakage appears on tip and ring to ground in addition to a 24-volt FEMF on both tip and ring to ground.♦</p> |
| 21 | Operate REV and +STA keys (also G key if coin channel unit). |
| | <p>Requirement: The VMA meter indicates deflections at a 120 interruptions-per-minute (IPM) rate.</p> <p>Note 1: Busy light will illuminate on the trunk unit and the minor and the near end alarm light on the ACU of the carrier system under test may briefly flash.</p> <p>Note 2: The alarm light on the CTU may or may not flash.</p> |
| 22 | Release all keys. |

| STEP | PROCEDURE |
|------|---|
| 23 | Release test trunk. |
| 24 | Repeat Steps 19 through 23 using the <i>second</i> test trunk (if provided) before continuing to Step 25. |
| 25 | If the PGTC has been equipped with an SM91() unit in Step 18, plug an SM87() circuit pack (tester unit) into position 04 of the control shelf. Otherwise, plug the SM87() unit into position 02 of the control shelf. Requirement 1: No fuses operate (blow). Requirement 2: The status indicator on the SM88() control unit remains clear. Note 1: If a status indication appears on the SM88(), remove and reseal the SM88() control card. The microcontroller is now reset and the status indicator is clear (no display). Note 2: If SM94 unit shows busy, remove and reseal the SM94 unit. |
| 26 | At the RSB or local test cabinet, access the test line again via the <i>first</i> test trunk. |
| 27 | Operate the REV and +STA key (also G key if coin unit). Requirement 1: The VMA meter indicates a steady deflection of approximately 85 volts or greater. Requirement 2: At the PGTC, the busy indicator lamp on the trunk unit lights simultaneously with Requirement 1. |
| 28 | Release the +STA key (and G key if operated). Requirement: The VMA meter should indicate approximately 0 volts. |
| 29 | By operating (and releasing) the REV key, with and without the G key operated, verify the test connection. Requirement: The test connection should have approximately 0-volts leakage with a ballistic indication corresponding to one bridged ringer. If an assigned channel has been used, the test connection will have the characteristics of the assigned subscriber station. |
| 30 | Release all keys. |
| 31 | Operate MONITOR key, then the 3WO key and monitor the tone burst(s) in the headset. Requirement: The tone burst(s) heard should correspond to the type of channel unit selected in Step 14 as follows: |

| CHANNEL TYPE | TONE BURST(S) |
|--|---------------|
| Single-party or SPOTS® (WP36 and WP37) Channel unit | One burst |
| Multiparty | Double burst |
| Coin | Triple burst |

STEP

PROCEDURE

Note: If necessary to reverify the number of tone burst(s), release the 3WO key and then reoperate it.

- 32 With the MONITOR key released and the 3WO key operated, operate the REV, FEMF, and VM REV keys as required to obtain dc response.

Requirement: The VMA meter indications should be as shown for the type of channel unit selected and the keys operated as shown in Table M.

| TABLE M | | |
|--|---------------------------------------|---------------------------------------|
| CHANNEL TYPE | KEY(s) OPERATED | VMA INDICATION |
| Single-party or SPOTS (WP36 and WP37) | (a) REV, 3WO (b) FEMF, 3WO | approx. 100 volts approx. 48 volts |
| Multiparty | (a) FEMF, REV, 3WO (b) 3WO | approx. 48 volts approx. 0 volts |
| Coin | (a) FEMF, REV, VM REV, 3WO (b) 3WO | approx. 48 volts approx. 0 volts |

- 33 Release all keys.

- 34 Release test trunk.

Requirement: At the PGTC, the busy indicator lamp on the trunk unit in position 07 should extinguish.

- 35 At the DF, ground the INHIBIT lead coming from the carrier system.

- 36 At the RSB or local test cabinet, access the test line again.

- 37 Operate the REV and +STA keys (also G key if coin channel unit).

Requirement: The VMA meter indicates deflections at a 120 IPM rate.

- 38 Release all keys.

- 39 Release test trunk.

- 40 At the DF, remove the ground on the INHIBIT lead (placed in Step 35).

- 41 **Warning:** Inserting a pin plug into the R CODE jack in Step 42 will interrupt service to all subscribers assigned to that shelf. Ensure that no channel busy lights are illuminated before inserting the pin plug. It may be necessary to perform this test during low traffic hours.

- 42 At the COT, cause a major alarm by inserting a pin plug into the R CODE jack on the TRU unit for the shelf containing the channel unit under test.

| STEP | PROCEDURE |
|------|--|
| 43 | At the RSB or local test cabinet, access the test line again. |
| 44 | Operate the REV and +STA keys (also G key if coin channel unit). Requirement: The VMA meter indicates deflections at a 60 IPM rate. |
| 45 | Release all keys. |
| 46 | Release test trunk. |
| 47 | At the COT, remove the pin plug from the R CODE jack to clear the major alarm condition. |
| 48 | If the PGTC has been equipped with an SM91() trunk unit in Step 18 and a second dedicated test trunk is required, plug in an SM87() tester unit into position 05 of the control shelf. |
| 49 | Repeat Steps 26 through 47 for the second test trunk. |
| 50 | Remove the test line connected in Step 14 and the 500-type telephone set connected in Step 15. |

D. Test of Expansion Shelf

| STEP | PROCEDURE | | | | | | | | | | |
|------|--|------|----------------------------|----|------------------|----|-------------------|----|------------------|----|-------------------|
| |  <p>Prerequisite: Figure 11 has directed reference to this procedure. Verify the TT(), TR(), and TS() leads <i>from</i> the PGTC have been brought to the MDF and are ready for jumpering to the test trunks <i>toward</i> the RSB or local test cabinet. The T(), R(), and S() leads <i>from</i> the PGTC have been brought to the MDF and are ready for jumpering to the <i>incoming</i> test trunk circuits of the office.</p> <p>Note: If a step fails to meet requirements, refer to Table V.</p> | | | | | | | | | | |
| 1 | Verify that the J1C142A, L2 Expansion Shelf (Fig. 2) as well as associated power and connecting cables have been properly installed and terminated. | | | | | | | | | | |
| 2 | Insert the 35C/70C (3.A) fuse into position B() of the miscellaneous fuse panel as follows: | | | | | | | | | | |
| | <table> <thead> <tr> <th>FUSE</th> <th>ADDITIONAL EXPANSION SHELF</th> </tr> </thead> <tbody> <tr> <td>B1</td> <td>First J1C142A,L2</td> </tr> <tr> <td>B2</td> <td>Second J1C142A,L2</td> </tr> <tr> <td>B3</td> <td>Third J1C142A,L2</td> </tr> <tr> <td>B4</td> <td>Fourth J1C142A,L2</td> </tr> </tbody> </table> | FUSE | ADDITIONAL EXPANSION SHELF | B1 | First J1C142A,L2 | B2 | Second J1C142A,L2 | B3 | Third J1C142A,L2 | B4 | Fourth J1C142A,L2 |
| FUSE | ADDITIONAL EXPANSION SHELF | | | | | | | | | | |
| B1 | First J1C142A,L2 | | | | | | | | | | |
| B2 | Second J1C142A,L2 | | | | | | | | | | |
| B3 | Third J1C142A,L2 | | | | | | | | | | |
| B4 | Fourth J1C142A,L2 | | | | | | | | | | |
| | Requirement: The fuse does not operate (blow). | | | | | | | | | | |
| 3 | Plug an SM89 circuit pack (expansion shelf power unit) into position 01 of the expansion shelf. | | | | | | | | | | |

| STEP | PROCEDURE |
|------|-----------|
|------|-----------|

Requirement: The B() fuse does not operate (blow).

- 4 Using the VOM and noting the polarity of the leads as well as the range setting of the VOM, measure the voltages at the SM89 test jacks as shown in Table N.

| TEST JACK | | VOM RANGE | REQUIREMENT (Vdc) |
|-----------|--------|-----------|-------------------|
| FROM (+) | TO (-) | | |
| BG | -48S | 60 | 45 to 53 |
| LG | -12 | 60/12 | 10.8 to 13.2 |
| +5 | LG | 12 | 4.5 to 5.5 |
| +12 | LG | 60/12 | 10.8 to 13.2 |

- 5 Calibrate a J94003C (3C) noise measuring set equipped with the 497A network (C-Message weighting) per AT&T Practice 103-611-101.

- 6 Connect the 3C noise measuring set to the -48S and BG test jacks on the SM89 unit, and measure the noise level.

Requirement: The noise level must *never* exceed 55 dBrc.

- 7 Plug an SM90 circuit pack (fanout extender unit) into position 02 of the shelf.

Requirement 1: The status display on the SM88() unit (Fig. 4) in the control shelf is clear.

Requirement 2: The office alarm (if provided) is not activated.

E. Test of Additional Trunk Units

| STEP | PROCEDURE |
|------|-----------|
|------|-----------|

Prerequisite: Figure 11 has directed reference to this procedure. A *functional* carrier system is available for these tests.

An equipped (but unassigned) channel is available at both the COT and RT.

Note 1: An assigned channel may be used, however, service will be denied to the assigned subscriber during test access. In this case proceed to Step 2.

A test line at the CO, consisting of a temporary telephone number and a subscriber line circuit is available.

Note 2: If a step fails to meet requirements, refer to Table V.

- 1 At the DF, cross-connect the test line to the channel selected for test.

| STEP | PROCEDURE |
|------|-----------|
|------|-----------|

- 2 Also at the DF, remove the protectors or heat coils for the dc test pair for the RT of the system selected for test, and a 1000-ohm resistor *must* be connected from ring to tip on the COT side of the DF.
- 3 Depending on the type of trunk unit to be added and the type of trunk unit already in position 07 of the control shelf (Table O) proceed as follows:

| TABLE O (NOTE) | | |
|--|-----------------------|---------------------------|
| TRUNK UNIT TO BE ADDED | TRUNK UNIT IN POS. 07 | TESTER POSITIONS INVOLVED |
| SM92 | N/A | 02, 03 |
| SM94 SM94B SM94C | SM91B SM91C | 02, 03 |
| SM94 SM94B SM94C | SM94/94B SM94C | 02, 03, 04, 05 |
| <p><i>Note:</i> If an SM92 trunk unit is installed in any position on the control or expansion shelves, the tester units in positions 04 and 05 can only be accessed by an SM91B/91C trunk unit.</p> | | |

- 4 Unplug all SM87() tester units in positions (02, 03, etc) involved according to Step 3.
- 5 Plug the trunk unit [SM92 or SM94() circuit pack] into the trunk position to be equipped.

Requirement: No fuse operates (blows).

- 6  At the DF, cross-connect the TT(), TR(), and TS() leads *from* the PGTC to the first test trunk served by this trunk unit *toward* the RSB or local test cabinet. Cross-connect the T(), R(), and S() leads *from* the PGTC to the first *incoming* test trunk circuit of the office served by this trunk unit.

- 7 At the RSB or local test cabinet, access the test line via the *first* of the two test trunks accommodated by the trunk unit in accordance with standard procedures.

Requirement: The signature (seizure) of the central office channel unit should be evident from standard test (approximately 40-volts leakage *tip* to ground *or* 75-volts leakage *tip* to ground and *ring* to ground for coin channel units, with approximately 50-volts ballistic deflection). ♦ If a SLC Series 5 special service channel unit (CS2) is used, an 82-volt leakage appears on tip and ring to ground in addition to a 24-volt FEMF on both tip and ring to ground.♦

- 8 Operate REV and +STA keys (also G key if coin channel unit).

Requirement: The VMA meter indicates deflections at a 120 interruptions-per-minute (IPM) rate.

- 9 Release all keys.

| STEP | PROCEDURE |
|------|--|
| 10 | Release test trunk. |
| 11 | Plug an SM87() tester unit back into its position (02) in the shelf. |
| 12 | At the RSB or local test cabinet, access the test line again. |
| 13 | Operate the REV and +STA key (also G key if coin unit). |
| | Requirement 1: The VMA meter indicates a steady deflection of approximately 85 volts or greater. |
| | Requirement 2: At the PGTC, the busy indicator lamp on the trunk unit lights simultaneously with Requirement 1. |
| 14 | Release all keys. |
| | Requirement: The VMA meter indicates 0 volts. |
| 15 | Operate G key. |
| | Requirement: The VMA meter indicates 98 volts. |
| 16 | Release G key. |
| 17 | Release test trunk. |
| | Requirement: The busy indicator lamp on the trunk unit extinguishes. |
| 18 | Unplug the tester unit inserted in Step 11. |
| 19 | Repeat Steps 7 through 18 for each of the other tester positions involved, equipped one at a time (see Step 3). |
| 20 | Disconnect from the first test trunk. |
| 21 | Repeat Steps 7 through 19 via the <i>second</i> of the two test trunks accommodated by the trunk unit. |
| 22 | Disconnect from the second test trunk. |
| 23 | Remove the 1000-ohm resistor placed in Step 2 and restore the cross-connection to the dc test pair. |
| 24 | Disconnect the test line placed in Step 1. |
| 25 | Plug all tester units back into their positions. |

F. Test of Additional Tester Units (Carrier System Not Cutover to Service)

| STEP | PROCEDURE |
|------|-----------|
|------|-----------|

Prerequisite: Figure 11 has directed reference to this procedure. A *functional* carrier system is available for these tests (not cutover to customer service).

The dc test pair between the central office (CO) distributing frame (DF) and the RT has been verified in accordance with standard procedures for voice-frequency pairs prior to cross-connecting to the central office terminal (COT). The dc test pair *must* be loaded in accordance with engineering practices for voice-frequency pairs.

A test line at the CO, consisting of a temporary telephone number and a subscriber line circuit is available.

Note: If a step fails to meet requirements, refer to Table V.

- 1 At the distributing frame (DF), cross-connect the test line to a channel selected in the carrier system.

Note: The tests are most effective if the channel selected is equipped with coin service capability units; however, multiparty or single-party service units may be used with less complete test verification [no +130V (coin collect) or -130V (coin return)].

- 2 At the RT, connect the 500-type telephone set to the subscriber side (drop side) of the corresponding channel unit as selected in Step 1.

- 3 If the additional tester unit SM87() is to be added in position 02 of the control shelf, proceed to Step 7. Otherwise, continue to Step 4.

- 4 If the additional SM87() unit is to be added in position 03 of the control shelf, unplug the SM87() unit in position 02 *before* proceeding to Step 7. Otherwise, continue to Step 5.

- 5 If the additional tester unit SM87() is to be added in position 04 of the control shelf, unplug the SM87() units in positions 02 and 03 *before* proceeding to Step 7. Otherwise, continue to Step 6.

- 6 If the additional SM87() unit is to be added in position 05 of the control shelf, proceed to Step 7 *if* position 07 is equipped with an SM91() trunk unit. Otherwise, unplug the SM87() units in positions 02, 03, and 04 *before* proceeding to Step 7.

- 7 Plug an SM87() circuit pack (tester unit) into the additional position to be equipped.

Requirement 1: No fuses operate (blow).

Requirement 2: The status indicator on the SM88() control unit remains clear.

Note: If a status indication appears on the SM88(), remove and reseal the SM88() control card. The microcontroller is now reset and the status indicator is clear (no display).

STEP

PROCEDURE

- 8 At the RSB or local test cabinet, access the test line in accordance with standard procedures via the appropriate test trunk as shown in Table P.

| TABLE P | | |
|------------------------------------|-----------------------------|-------------------------|
| SM87/87B/87C ADDED POSITION NO. | SM91B/91C IN POSITION 07 | ACCESS VIA |
| 02 | Yes | Any trunk but 1 or 2 |
| 02 | No | N/A |
| 03 | Yes | Any trunk but 1 or 2 |
| 03 | No | Any trunk |
| 04 | Yes | N/A |
| 04 | No | Any trunk |
| 05 | Yes | <i>2 Only</i> |
| 05 | No | Any trunk |

Requirement: The signature (seizure) of the central office channel unit should be evident from standard test (approximately 40-volts leakage *tip* to ground *or* 75-volts leakage *tip* to ground and *ring* to ground for coin channel units with approximately 50-volts ballistic deflection). ♦ If a SLC Series 5 special service channel unit (CS2) is used, an 82-volt leakage appears on tip and ring to ground in addition to a 24-volt FEMF on both tip and ring to ground. ♦

- 9 Operate the REV and +STA key (also G key if coin unit).

Requirement 1: The VMA meter indicates a steady deflection of approximately 85 volts or greater.

Requirement 2: At the PGTC, the busy indicator lamp on the appropriate trunk unit lights simultaneously with Requirement 1.

Note: If the VMA meter indicates deflections at a 120 IPM rate, the PGTC may be in use via another test trunk. Release test trunk and repeat Steps 8 and 9 to retry.

- 10 Release the +STA key (and G key if operated).

Requirement: The VMA meter should indicate approximately 0 volts.

- 11 By operating (and releasing) the REV key, with and without the G key operated, verify the test connection.

Requirement: The test connection should have approximately 0-volts leakage with a ballistic indication corresponding to one bridged ringer.

- 12 Release all keys.

| STEP | PROCEDURE |
|------|-----------|
|------|-----------|

13 Operate MONITOR key, then the 3WO key and monitor the tone burst(s) in the headset.

Requirement: The tone burst(s) heard should correspond to the type of channel unit selected in Step 1 as follows:

| CHANNEL TYPE | TONE BURST(S) |
|--|---------------|
| Single-party or SPOTS® (WP36 and WP37) Channel unit | One burst |
| Multiparty | Double burst |
| Coin | Triple burst |

Note: If necessary to reverify the number of tone burst(s), release the 3WO key and then reoperate it.

14 With the MONITOR key released and the 3WO key operated, operate the REV, FEMF, and VM REV keys as required to obtain dc response.

Requirement: The VMA meter indications should be as shown for the type of channel unit selected and the keys operated as shown in Table Q.

| TABLE Q | | |
|--|----------------------------|-------------------|
| CHANNEL TYPE | KEY(S) OPERATED | VMA INDICATION |
| Single-party or SPOTS (WP36 and WP37) | (a) REV, 3WO | approx. 100 volts |
| | (b) FEMF, 3WO | approx. 48 volts |
| Multiparty | (a) FEMF, REV, 3WO | approx. 48 volts |
| | (b) 3WO | approx. 0 volts |
| Coin | (a) FEMF, REV, VM REV, 3WO | approx. 48 volts |
| | (b) 3WO | approx. 0 volts |

15 Release all keys.

16 Release test trunk.

Requirement: At the PGTC, the busy indicator lamp on the appropriate trunk unit should extinguish.

17 At the COT, cause a major alarm by inserting a pin plug into the R CODE jack on the TRU unit for the shelf containing the channel unit under test.

18 At the RSB or local test cabinet, access the test line again.

| STEP | PROCEDURE |
|------|---|
| 19 | Operate the REV and +STA keys (also G key if coin channel unit). Requirement: The VMA meter indicates deflections at a 60 IPM rate. |
| 20 | Release the +STA key (and G key if operated). |
| 21 | Release all keys. |
| 22 | Release test trunk. |
| 23 | At the COT, remove the pin plug from the R CODE jack to clear the major alarm condition. |
| 24 | Plug any SM87() tester unit(s) removed as part of Step 4, 5, or 6 back into their position(s). |
| 25 | Remove the test line connected in Step 1 and the 500-type telephone set connected in Step 2. |

G. Test of Additional Tester Units (Carrier System Cutover to Service)

| STEP | PROCEDURE |
|------|--|
| | <p>Prerequisite: Figure 11 has directed reference to this procedure. A <i>functional</i> carrier system is available for these tests.</p> <p>The dc test pair between the central office (CO) distributing frame (DF) and the RT has been verified in accordance with standard procedures for voice-frequency pairs prior to cross-connecting to the central office terminal (COT). The dc test pair <i>must</i> be loaded in accordance with engineering practices for voice-frequency pairs.</p> <p>A test line at the CO, consisting of a temporary telephone number and a subscriber line circuit is available.</p> <p>Note: If a step fails to meet requirements, refer to Table V.</p> |
| 1 | <p>At the distributing frame (DF), cross-connect the test line to an unassigned channel selected in the carrier system.</p> <p>Note 1: The tests are most effective if the channel selected is equipped with coin service capability units; however, multiparty or single-party service units may be used with less complete test verification [no +130V (coin collect) or -130V (coin return)].</p> <p>Note 2: An assigned channel may be used, however, service will be denied to the assigned subscriber during test access. In this case proceed to Step 3.</p> |
| 2 | At the RT, connect the 500-type telephone set to the subscriber side (drop side) of the corresponding channel unit as selected in Step 1. |
| 3 | If the additional tester unit SM87() is to be added in position 02 of the control shelf, proceed to Step 7. Otherwise, continue to Step 4. |

- | STEP | PROCEDURE |
|------|---|
| 4 | If the additional SM87() unit is to be added in position 03 of the control shelf, unplug the SM87() unit in position 02 <i>before</i> proceeding to Step 7. Otherwise, continue to Step 5. |
| 5 | If the additional tester unit SM87() is to be added in position 04 of the control shelf, unplug the SM87() units in positions 02 and 03 <i>before</i> proceeding to Step 7. Otherwise, continue to Step 6. |
| 6 | If the additional SM87() unit is to be added in position 05 of the control shelf, proceed to Step 7 if position 07 is equipped with an SM91() trunk unit. Otherwise, unplug the SM87() units in positions 02, 03, and 04 <i>before</i> proceeding to Step 7. |
| 7 | Plug an SM87() circuit pack (tester unit) into the additional position to be equipped. |
| | Requirement 1: No fuses operate (blow). |
| | Requirement 2: The status indicator on the SM88() control unit remains clear. |
| | Note: If a status indication appears on the SM88(), remove and reseat the SM88() control card. The microcontroller is now reset and the status indicator is clear (no display). |
| 8 | At the RSB or local test cabinet, access the test line in accordance with standard procedures via the appropriate test trunk as shown in Table R. |

| TABLE R | | |
|------------------------------------|-----------------------------|-------------------------|
| SM87/87B/87C ADDED POSITION NO. | SM91B/91C IN POSITION 07 | ACCESS VIA |
| 02 | Yes | Any trunk but 1 or 2 |
| 02 | No | N/A |
| 03 | Yes | Any trunk but 1 or 2 |
| 03 | No | Any trunk |
| 04 | Yes | N/A |
| 04 | No | Any trunk |
| 05 | Yes | <i>2 Only</i> |
| 05 | No | Any trunk |

Requirement: The signature (seizure) of the central office channel unit should be evident from standard test (approximately 40-volts leakage *tip* to ground *or* 75-volts leakage *tip* to ground and *ring* to ground for coin channel units, with approximately 50-volts ballistic deflection). ♦If a SLC Series 5 special service channel unit (CS2) is used, an 82-volt leakage appears on tip and ring to ground in addition to a 24-volt FEMF on both tip and ring to ground.♦

- 9 Operate the REV and +STA key (also G key if coin unit).

STEP**PROCEDURE**

Requirement 1: The VMA meter indicates a steady deflection of approximately 85 volts or greater.

Requirement 2: At the PGTC, the busy indicator lamp on the appropriate trunk unit lights simultaneously with Requirement 1.

Note: If the VMA meter indicates deflections at a 120 IPM rate, the PGTC may be in use via another test trunk. Release test trunk and repeat Steps 8 and 9 to retry.

10 Release the +STA key (and G key if operated).

Requirement: The VMA meter should indicate approximately 0 volts.

11 By operating (and releasing) the REV key, with and without the G key operated, verify the test connection.

Requirement: The test connection should have approximately 0-volts leakage with a ballistic indication corresponding to one bridged ringer.

12 Release all keys.

13 Operate MONITOR key, then the 3WO key and monitor the tone burst(s) in the headset.

Requirement: The tone burst(s) heard should correspond to the type of channel unit selected in Step 1 as follows:

| CHANNEL TYPE | TONE BURST(S) |
|---|---------------|
| Single-party •or SPOTS® (WP36 and WP37) Channel unit | One burst |
| Multiparty | Double burst |
| Coin | Triple burst |

Note: If necessary to reverify the number of tone burst(s), release the 3WO key and then reoperate it.

14 With the MONITOR key released and the 3WO key operated, operate the REV, FEMF, and VM REV keys as required to obtain dc response.

| STEP | PROCEDURE |
|------|-----------|
|------|-----------|

Requirement: The VMA meter indications should be as shown for the type of channel unit selected and the keys operated as shown in Table S.

| TABLE S | | |
|--|---------------------------------------|---------------------------------------|
| CHANNEL TYPE | KEY(s) OPERATED | VMA INDICATION |
| Single-party or SPOTS (WP36 and WP37) | (a) REV, 3WO (b) FEMF, 3WO | approx. 100 volts approx. 48 volts |
| Multiparty | (a) FEMF, REV, 3WO (b) 3WO | approx. 48 volts approx. 0 volts |
| Coin | (a) FEMF, REV, VM REV, 3WO (b) 3WO | approx. 48 volts approx. 0 volts |

15 Release all keys.

16 Release test trunk.

Requirement: At the PGTC, the busy indicator lamp on the appropriate trunk unit should extinguish.

17 **Warning:** Inserting a pin plug into the R CODE jack in Step 18 will interrupt service to all subscribers assigned to that shelf. Ensure that no channel busy lights are illuminated before inserting the pin plug. It may be necessary to perform this test during low traffic hours.

18 At the COT, cause a major alarm by inserting a pin plug into the R CODE jack on the TRU unit for the shelf containing the channel unit under test.

19 At the RSB or local test cabinet, access the test line again.

20 Operate the REV and +STA keys (also G key if coin channel unit).

Requirement: The VMA meter indicates deflections at a 60 IPM rate.

21 Release the +STA key (and G key if operated).

22 Release all keys.

23 Release test trunk.

24 At the COT, remove the pin plug from the R CODE jack to clear the major alarm condition.

25 Plug any SM87() tester unit(s) removed as part of Step 4, 5, or 6 back into their position(s).

26 Remove the test line connected in Step 1 and the 500-type telephone set connected in Step 2 if an unassigned carrier channel was used for test.

H. Test of Additional Carrier System Interface (Carrier System Not Cutover to Service)

| STEP | PROCEDURE |
|------|---|
| | <p><i>Prerequisite:</i> Figure 11 has directed reference to this procedure. A <i>functional</i> carrier system is available, however, the system should <i>not</i> be cutover to customer service. If customers have been cutover to service, use Procedure I.</p> <p>The dc test pair between the central office (CO) distributing frame (DF) and the RT has been verified in accordance with standard procedures for voice-frequency pairs prior to cross-connecting to the central office terminal (COT). The dc test pair <i>must</i> be loaded in accordance with engineering practices for voice-frequency pairs.</p> <p>Note 1: Carrier systems sharing the same dc test pair <i>must</i> have their INHIBIT leads multipled together at the DF.</p> <p>A test line at the CO, consisting of a temporary telephone number and a subscriber line circuit is available.</p> <p>Note 2: If a step fails to meet requirements, refer to Table V.</p> |
| 1 | <p>At the distributing frame (DF), cross-connect the test line to a channel selected in the carrier system.</p> <p>Note: The tests are most effective if the channel selected is equipped with coin service capability units; however, multiparty or single-party service units may be used with less complete test verification [no +130V (coin collect) or -130V (coin return)].</p> |
| 2 | At the RT, connect the 500-type telephone set to the subscriber side (drop side) of the corresponding channel unit as selected in Step 1. |
| 3 | At the RSB or local test cabinet, access the test line via an available test trunk in accordance with standard procedures. |
| | <p>Requirement: The signature (seizure) of the central office channel unit should be evident from standard test (approximately 40-volts leakage <i>tip</i> to ground <i>or</i> 75-volts leakage <i>tip</i> to ground and <i>ring</i> to ground for coin channel units, with approximately 50-volts ballistic deflection). ♦If a SLC Series 5 special service channel unit (CS2) is used, an 82-volt leakage appears on tip and ring to ground in addition to a 24-volt FEMF on both tip and ring to ground.♦</p> |
| 4 | Operate the REV and +STA key (also G key if coin unit). |
| | <p>Requirement 1: The VMA meter indicates a steady deflection of approximately 85 volts or greater.</p> <p>Requirement 2: At the PGTC, the busy indicator lamp on the trunk unit lights simultaneously with Requirement 1.</p> |
| 5 | Release the +STA key (and G key if operated). |
| | Requirement: The VMA meter should indicate approximately 0 volts. |
| 6 | By operating (and releasing) the REV key, with and without the G key operated, verify the test connection. |

| STEP | PROCEDURE |
|------|-----------|
|------|-----------|

Requirement: The test connection should have approximately 0-volts leakage with a ballistic indication corresponding to one bridged ringer.

7 Release all keys.

8 Operate MONITOR key, then the 3WO key and monitor the tone burst(s) in the headset.

Requirement: The tone burst(s) heard should correspond to the type of channel unit selected in Step 1 as follows:

| CHANNEL TYPE | TONE BURST(S) |
|--|---------------|
| Single-party or SPOTS® (WP36 and WP37) Channel unit | One burst |
| Multiparty | Double burst |
| Coin | Triple burst |

Note: If necessary to reverify the number of tone burst(s), release the 3WO key and then reoperate it.

9 With the MONITOR key released and the 3WO key operated, operate the REV, FEMF, and VM REV keys as required to obtain dc response.

Requirement: The VMA meter indications should be as shown for the type of channel unit selected and the keys operated as shown in Table T.

| TABLE T | | |
|--|---------------------------------------|---------------------------------------|
| CHANNEL TYPE | KEY(S) OPERATED | VMA INDICATION |
| Single-party or SPOTS (WP36 and WP37) | (a) REV, 3WO (b) FEMF, 3WO | approx. 100 volts approx. 48 volts |
| Multiparty | (a) FEMF, REV, 3WO (b) 3WO | approx. 48 volts approx. 0 volts |
| Coin | (a) FEMF, REV, VM REV, 3WO (b) 3WO | approx. 48 volts approx. 0 volts |

10 Release all keys.

11 Release test trunk.

Requirement: At the PGTC, the busy indicator lamp on the trunk unit identified in Step 4 (Requirement 2) should extinguish.

| STEP | PROCEDURE |
|------|--|
| 12 | At the DF, ground the INHIBIT lead coming from the carrier system. |
| 13 | At the RSB or local test cabinet, access the test line again. |
| 14 | Operate the REV and +STA keys (also G key if coin channel unit). Requirement: The VMA meter indicates deflections at a 120 IPM rate. |
| 15 | Release all keys. |
| 16 | Release test trunk. |
| 17 | At the DF, remove the ground on the INHIBIT lead (placed in Step 12). |
| 18 | At the COT, cause a major alarm by inserting a pin plug into the R CODE jack on the TRU unit for the shelf containing the channel unit under test. |
| 19 | At the RSB or local test cabinet, access the test line again. |
| 20 | Operate the REV and +STA keys (also G key if coin channel unit). Requirement: The VMA meter indicates deflections at a 60 IPM rate. |
| 21 | Release all keys. |
| 22 | Release test trunk. |
| 23 | At the COT, remove the pin plug from the R CODE jack to clear the major alarm condition. |
| 24 | Remove the test line connected in Step 1 and the 500-type telephone set connected in Step 2. |

I. **Test of Additional Carrier System Interface (Carrier System Cutover to Service)**

| STEP | PROCEDURE |
|------|---|
| | <p>Prerequisite: Figure 11 has directed reference to this procedure. A <i>functional</i> carrier system is available and cutover to customer service. If customers have not been cutover to service, use Procedure H.</p> <p>The dc test pair between the central office (CO) distributing frame (DF) and the RT has been verified in accordance with standard procedures for voice-frequency pairs prior to cross-connecting to the central office terminal (COT). The dc test pair <i>must</i> be loaded in accordance with engineering practices for voice-frequency pairs.</p> <p>Note 1: Carrier systems sharing the same dc test pair <i>must</i> have their INHIBIT leads multipled together at the DF.</p> <p>A test line at the CO, consisting of a temporary telephone number and a subscriber line circuit is available.</p> |

STEP

PROCEDURE

Note 2: If a step fails to meet requirements, refer to Table V.

- 1 At the distributing frame (DF), cross-connect the test line to an unassigned channel selected in the carrier system.

Note 1: The tests are most effective if the channel selected is equipped with coin service capability units; however, multiparty or single-party service units may be used with less complete test verification [no +130V (coin collect) or -130V (coin return)].

Note 2: An assigned channel may be used, however, service will be denied to the assigned subscriber during test access. In this case proceed to Step 3.

- 2 At the RT, connect the 500-type telephone set to the subscriber side (drop side) of the corresponding channel unit as selected in Step 1.
- 3 At the RSB or local test cabinet, access the test line via an available test trunk in accordance with standard procedures.

Requirement: The signature (seizure) of the central office channel unit should be evident from standard test (approximately 40-volts leakage *tip* to ground *or* 75-volts leakage *tip* to ground and *ring* to ground for coin channel units, with approximately 50-volts ballistic deflection). If a SLC Series 5 special service channel unit (CS2) is used, an 82-volt leakage appears on tip and ring to ground in addition to a 24-volt FEMF on both tip and ring to ground.

- 4 Operate the REV and +STA key (also G key if coin unit).

Requirement 1: The VMA meter indicates a steady deflection of approximately 85 volts or greater.

Requirement 2: At the PGTC, the busy indicator lamp on the trunk unit lights simultaneously with Requirement 1.

- 5 Release the +STA key (and G key if operated).

Requirement: The VMA meter should indicate approximately 0 volts.

- 6 By operating (and releasing) the REV key, with and without the G key operated, verify the test connection.

Requirement: The test connection should have approximately 0-volts leakage with a ballistic indication corresponding to one bridged ringer. If an assigned channel has been used, the test connection will have the characteristics of the assigned subscriber station.

- 7 Release all keys.
- 8 Operate MONITOR key then the 3WO key and monitor the tone burst(s) in the headset.

| STEP | PROCEDURE |
|------|-----------|
|------|-----------|

Requirement: The tone burst(s) heard should correspond to the type of channel unit selected in Step 1 as follows:

| CHANNEL TYPE | TONE BURST(S) |
|--|---------------|
| Single-party or SPOTS® (WP36 and WP37) Channel unit | One burst |
| Multiparty | Double burst |
| Coin | Triple burst |

Note: If necessary to reverify the number of tone burst(s), release the 3WO key and then reoperate it.

- 9 With the MONITOR key released and the 3WO key operated, operate the REV, FEMF, and VM REV keys as required to obtain dc response.

Requirement: The VMA meter indications should be as shown for the type of channel unit selected and the keys operated as shown in Table U.

| TABLE U | | |
|--|---------------------------------------|---------------------------------------|
| CHANNEL TYPE | KEY(S) OPERATED | VMA INDICATION |
| Single-party or SPOTS (WP36 and WP37) | (a) REV, 3WO (b) FEMF, 3WO | approx. 100 volts approx. 48 volts |
| Multiparty | (a) FEMF, REV, 3WO (b) 3WO | approx. 48 volts approx. 0 volts |
| Coin | (a) FEMF, REV, VM REV, 3WO (b) 3WO | approx. 48 volts approx. 0 volts |

- 10 Release all keys.

- 11 Release test trunk.

Requirement: At the PGTC, the busy indicator lamp on the trunk unit identified in Step 4 (Requirement 2) should extinguish.

- 12 At the DF, ground the INHIBIT lead coming from the carrier system.

- 13 At the RSB or local test cabinet, access the test line again.

- 14 Operate the REV and +STA keys (also G key if coin channel unit).

| STEP | PROCEDURE |
|------|---|
| | Requirement: The VMA meter indicates deflections at a 120 IPM rate. |
| 15 | Release all keys. |
| 16 | Release test trunk. |
| 17 | At the DF, remove the ground on the INHIBIT lead (placed in Step 12). |
| 18 | Warning: Inserting a pin plug into the R CODE jack in Step 19 will interrupt service to all subscribers assigned to that shelf. Ensure that no channel busy lights are illuminated before inserting the pin plug. It may be necessary to perform this test during low traffic hours. |
| 19 | At the COT, cause a major alarm by inserting a pin plug into the R CODE jack on the TRU unit for the shelf containing the channel unit under test. |
| 20 | At the RSB or local test cabinet, access the test line again. |
| 21 | Operate the REV and +STA keys (also G key if coin channel unit). |
| | Requirement: The VMA meter indicates deflections at a 60 IPM rate. |
| 22 | Release all keys. |
| 23 | Release test trunk. |
| 24 | At the COT, remove the pin plug from the R CODE jack to clear the major alarm condition. |
| 25 | Remove the test line connected in Step 1 and the 500-type telephone set connected in Step 2. |

J. Installation Trouble-Locating Guide

is provided with suggestions or references on what to do if a step fails to meet requirements.

4.06 The installation trouble-locating guide (Table V)

| TABLE V | | | |
|-----------|------|--------------------|---|
| PROCEDURE | STEP | REQT. (SEE NOTE 1) | MOST LIKELY CAUSE OF TROUBLE (SEE NOTE 2) |
| A | 5 | | Fuse panel wiring to PGTC |
| A | 7 | | Wrong terminal |
| A | 8 | | Wrong terminal grounded on CTU; cable lead transposed; cable lead open |
| A | 12 | | Grounded or crossed leads in cable |
| A | 13 | | Wrong terminal grounded on CTU; cable lead open; cable lead transposed |
| A | 16 | | Battery lead too close to noise source (generators, rectifiers); noisy battery supply |
| A | 18 | | Shorted or grounded lead |
| A | 24 | | Blown fuse; open lead; VOM connected to wrong terminal |
| A | 25 | | Blown fuse; open lead; VOM connected to wrong terminal |
| A | 26 | 1 | Blown fuse; open lead; VOM connected to wrong terminal; if dc voltage reads positive, leads to terminals 10 and 11 transposed |
| | | 2 | Blown fuse; open lead; VOM connected to wrong terminal; if dc voltage reads negative, leads to terminals 11 and 10 transposed |
| A | 28 | | Wrong terminals shorted together; MJV alarm not provided |
| A | 30 | | Wrong terminals shorted together; MJ alarm not provided |
| A | 32 | | Wrong terminals shorted together; SI alarm not provided |
| B | 5 | 1 | Office alarm wiring; SM86() |
| B | 5 | 2 | Office alarm wiring |
| B | 6 | | Fuse panel wiring to PGTC; SM86(); shelf wiring |
| B | 7 | | SM86(), fuse panel wiring to PGTC; shelf wiring |
| B | 9 | | Battery lead too close to noise source (generators, rectifiers); noisy battery supply |
| B | 10 | | Fuse panel wiring to PGTC; shelf wiring |
| B | 12 | 1, 2 | SM88(); shelf wiring |
| B | 13 | | SM88(); SM86() |
| B | 17 | | SM91(); SM92 or SM94(); shelf wiring; wiring to PGTC |
| B | 19 | | SM91(); SM92 or SM94(); DF wiring; wiring to PGTC; SM88(), shelf wiring; channel unit; wiring from DF to COT |
| B | 20 | | SM91(), SM92 or SM94(); SM88(); shelf wiring |
| B | 24 | 1, 2 | SM87(); wiring to PGTC; shelf wiring |
| B | 26 | 1 | SM88(); SM87(); SM91(); SM92; or SM94(); channel unit (COT) or (RT); CTU (COT) or (RT); wiring from COT to PGTC; shelf wiring |
| B | 26 | 2 | SM91(), SM92 or SM94() |
| B | 27 | | SM87(); SM88(); wiring from COT to PGTC; CTU (COT) or (RT); shelf wiring |
| B | 28 | | DF wiring; wiring from COT to PGTC; test pair connections at RT |
| B | 30 | | SM88(); SM87(); SM86(); shelf wiring; channel unit (COT) or (RT); CTU (COT) or (RT); incorrect ringing voltage |
| B | 31 | | SM87(); SM88(); SM86(); shelf wiring |
| B | 33 | | SM87(); SM88(); SM91(); SM92 or SM94() |
| B | 36 | | DF wiring; wiring from COT to PGTC; CTU (COT); SM88(); SM91(), SM92 or SM94(); shelf wiring |
| B | 42 | | SM88(); SM87(); wiring from COT to PGTC; CTU (COT); shelf wiring |

Notes:

- Requirement number.
- Refer to paragraph 2.26 for more detailed information on the operation of the PGTC.

TABLE V (Contd)

| PROCEDURE | STEP | REQT. (SEE NOTE 1) | MOST LIKELY CAUSE OF TROUBLE (SEE NOTE 2) |
|-----------|------|--------------------|---|
| C | 5 | 1 | Office alarm wiring; SM86() |
| C | 5 | 2 | Office alarm wiring |
| C | 6 | | Fuse panel wiring to PGTC; SM86(); shelf wiring |
| C | 7 | | SM86(); fuse panel wiring to PGTC; shelf wiring |
| C | 9 | | Battery lead too close to noise source (generators, rectifiers); noisy battery supply |
| C | 10 | | Fuse panel wiring to PGTC; shelf wiring |
| C | 12 | 1, 2 | SM88(); shelf wiring |
| C | 13 | | SM88(); SM86() |
| C | 17 | | SM91(); SM92 or SM94(); shelf wiring; wiring to PGTC |
| C | 19 | | SM91(); SM92 or SM94(); DF wiring; wiring to PGTC; SM88(); shelf wiring; channel unit; wiring from DF to COT |
| C | 20 | | SM91(); SM92 or SM94(); SM88(); shelf wiring |
| C | 24 | 1, 2 | SM87(); wiring to PGTC; shelf wiring |
| C | 26 | 1 | SM88(); SM87(); SM91(); SM92 or SM94(); channel unit (COT) or (RT); wiring from COT to PGTC; shelf wiring |
| C | 26 | 2 | SM91(); SM92 or SM94() |
| C | 27 | | SM87(); SM88(); wiring from COT to PGTC; CTU (COT) or (RT); shelf wiring |
| C | 28 | | DF wiring; wiring from COT to PGTC; test pair connections at RT |
| C | 30 | | SM88(); SM87(); SM86(); shelf wiring; channel unit (COT) or (RT); CTU (COT) or (RT); incorrect ringing voltage |
| C | 31 | | SM87(); SM88(); SM86(); shelf wiring |
| C | 33 | | SM87(); SM88(); SM91(); SM92 or SM94() |
| C | 36 | | DF wiring; wiring from COT to PGTC; CTU (COT); SM88(); SM91(); SM92 or SM94(); shelf wiring |
| C | 43 | | SM88(); SM87(); wiring from COT to PGTC; CTU (COT); shelf wiring |
| D | 2 | | Fuse panel wiring to shelf; shelf wiring; wiring from expansion shelf to control shelf |
| D | 3 | | SM89; fuse panel wiring to shelf; shelf wiring |
| D | 4 | | SM89; fuse panel wiring to shelf; shelf wiring |
| D | 5 | 1, 2 | SM90; shelf wiring; wiring from expansion shelf to control shelf |
| E | 5 | | SM92, SM94(); DF wiring; wiring to PGTC |
| E | 7 | | SM92, SM94(); DF wiring; wiring to PGTC; shelf wiring; channel unit; wiring from DF to COT |
| E | 8 | | SM92; SM94(); shelf wiring; SM88(); wiring to PGTC |
| E | 13 | 1, 2 | SM92, SM94(); shelf wiring; wiring to PGTC; SM87(); |
| E | 14 | | SM92, SM94(); wiring to PGTC; shelf wiring; SM87(); |
| E | 15 | | SM92, SM94(); shelf wiring; DF wiring |
| E | 17 | | SM92, SM94(); shelf wiring; SM88(); SM87(); |
| F | 7 | 1, 2 | SM87(); wiring to PGTC; shelf wiring |
| F | 8 | | Wrong test trunk; DF wiring; channel unit; wiring from DF to COT |
| F | 9 | 1, 2 | SM87(); SM88(); wiring to PGTC; SM91(); SM92, SM94(); shelf wiring |

Notes:

1. Requirement number.
2. Refer to paragraph 2.26 for more detailed information on the operation of the PGTC.

| TABLE V (Contd) | | | |
|-----------------|------|--------------------|---|
| PROCEDURE | STEP | REQT. (SEE NOTE 1) | MOST LIKELY CAUSE OF TROUBLE (SEE NOTE 2) |
| F | 10 | | SM87(); SM88(); SM91(); SM92, SM94(); shelf wiring; wiring from COT to PGTC; wiring from COT to DF; DF wiring |
| F | 11 | | SM91(); SM92, SM94(); SM87(); shelf wiring; DF wiring; CTU (COT) or (RT) |
| F | 13 | | SM87(); SM88(); shelf wiring; channel unit (COT) or (RT) |
| F | 14 | | SM87(); SM88(); SM86() |
| F | 16 | | SM87(); SM88(); SM91(); SM92; SM94(); |
| F | 19 | | SM87(); SM88(); shelf wiring; wiring from COT to PGTC; CTU (COT) |
| G | 7 | 1, 2 | SM87(); wiring to PGTC; shelf wiring |
| G | 8 | | Wrong test trunk; DF wiring; channel unit; wiring from DF to COT |
| G | 9 | 1, 2 | SM87(); SM88(); wiring to PGTC; SM91(), SM94(); shelf wiring |
| G | 10 | | SM87(); SM88(); SM91(), SM92, shelf wiring; wiring from COT to PGTC; wiring from COT to DF; DF wiring |
| G | 11 | | SM91(), SM92, SM94(), SM87(); shelf wiring; DF wiring; CTU (COT) or (RT) |
| G | 13 | | SM87(); SM88(); shelf wiring; channel unit (COT) or (RT); CTU (COT) or (RT) |
| G | 14 | | SM87(); SM88(); SM86() |
| G | 16 | | SM87(); SM88(); SM91(); SM92; SM94() |
| G | 20 | | SM87(); SM88(); shelf wiring; wiring from COT to PGTC; CTU (COT) |
| H | 3 | | DF wiring; channel unit, wiring from DF to COT |
| H | 4 | 1, 2 | Channel unit (COT) or (RT), CTU (COT) or (RT); wiring to PGTC; |
| H | 5 | | Wiring to PGTC; CTU (COT) |
| H | 6 | | DF wiring; test pair connections at RT, RT channel unit; CTU at both COT and RT |
| H | 8 | | Channel unit (COT) or (RT); wiring COT to PGTC; CTU (COT) or (RT) |
| H | 14 | | DF wiring; wiring from COT to PGTC; CTU (COT); SM88() |
| H | 20 | | Wiring from COT to PGTC; CTU (COT) |
| I | 3 | | DF wiring; channel unit; wiring from DF to COT |
| I | 4 | 1, 2 | Channel unit (COT) or (RT); CTU (COT) or (RT); wiring to PGTC |
| I | 5 | | Wiring to PGTC; CTU (COT) |
| I | 6 | | DF wiring; test pair connections at RT; RT channel unit; CTU at both COT and RT |
| I | 8 | | Channel unit (COT) or (RT); wiring COT to PGTC; CTU (COT) or (RT) |
| I | 14 | | DF wiring; wiring from COT to PGTC; CTU (COT); SM88() |
| I | 21 | | Wiring from COT to PGTC; CTU (COT) |

Notes:

1. Requirement number.
2. Refer to paragraph 2.26 for more detailed information on the operation of the PGTC.

K. SM88() Maintenance Codes and Clearing Procedures

4.07 Table W provides an alphanumeric trouble indicator index for the SM88, SM88B, or SM88C. The additional test failure codes (TFC) displayed by the SM88C are listed in Table C.

| TABLE W | | |
|-----------------|---------------------------------------|--------------------------------|
| DIGIT DISPLAYED | MEANING | CLEARING PROCEDURE STEP NUMBER |
| 0 | Controller Not Operating Properly | 1 |
| 1 | Permanent Seize | 2 |
| 2 | Permanent Seize Busy | 2 |
| 3 | Permanent Maj Alarm (TMA) | 2 |
| 4 | Permanent Tone Detect | 3 |
| 5 | Permanent Dedicated Tone Detect | 4 |
| 6 | Permanent SLV A | 5 |
| 7 | Permanent SLV B | 5 |
| 8 | Permanent SLV C | 5 |
| 9 | Permanent SLV D | 5 |
| A | Tester "A" Failed Self-Test | 6 |
| b | Tester "B" Failed Self-Test | 6 |
| C | Tester "C" Failed Self-Test | 6 |
| d | Tester "D" Failed Self-Test | 6 |
| E | Tester "C" Failed Self-Test Dedicated | 7 |
| F | Tester "D" Failed Self-Test Dedicated | 7 |

| STEP | PROCEDURE |
|------|---|
| 1 | If the maintenance display indicates a zero (0), the controller is not operating properly. Remove and reinsert the SM88() control card. If this does not clear the display, replace the SM88() control card. |
| 2 | A maintenance display of one (1), two (2), or three (3) indicates a stuck seize, seize busy, or T Maj respectively in the interface between the PGTC and the carrier system. To clear, successively remove the CTU units (WN10) from the carrier systems until the alarm retires. Replace the CTU (WN10) that causes the alarm to retire. If removing all CTUs fails to retire the alarm, replace the SM88() control card in the PGTC. If the alarm persists, the indicated wire is grounded in the interface cable and appropriate dc troubleshooting methods must be used. |
| 3 | A maintenance display of four (4) indicates a permanent tone detect condition. Remove the SM92 or SM94() trunk cards one at a time until the alarm clears. Replace the SM92 or SM94() that causes the alarm to clear. If removing all SM92 or SM94() units fails to clear the alarm, replace the SM88() control card. |
| 4 | A maintenance display of five (5) indicates a permanent tone detect condition from the SM91() trunk card. To clear replace the SM91(). If this fails to clear the alarm or if no SM91() is used in the system, replace the SM88() control card. |

| STEP | PROCEDURE |
|------|--|
| 5 | A maintenance display of six (6), seven (7), eight (8), or nine (9) indicates that SLVA, SLVB, SLVC, or SLVD, respectively, is stuck in the interface between the PGTC and the carrier system. To clear, successively remove the CTU units (WN10) from the carrier systems until the alarm clears. Replace the WN10 that causes the alarm to retire. If removing all CTUs fails to retire the alarm, replace the SM88() control card in the PGTC. If the alarm persists, the indicated wire is grounded in the interface cable between the PGTC and the carrier system and appropriate dc troubleshooting methods must be used. |
| 6 | A maintenance display of A, B, C, or D indicates that the SM87() tester card in locations P02, P03, P04, or P05 respectively, has failed. To clear the alarm, replace the indicated SM87() tester card. |
| 7 | At maintenance display of E or F indicates that the SM87() tester card in locations P04 or P05 respectively has failed when dedicated to an SM91() trunk card. Replace the indicated SM87() and clear the alarm by removing and reinserting the SM91() trunk card. |

L. Optional PGTC Test Using the NA96L1 PORTABLE TEST DESK SIMULATOR OR DTTS-1 PORTABLE TEST DESK

| STEP | PROCEDURE |
|------|-----------|
|------|-----------|

Prerequisite: A functional carrier system is available, however, the system **must not** be cutover to customer service. (Vacant trunk unit and vacant channel unit **must** be used.)

The dc test pair between the central office distributing frame (DF) and the RT has been verified in accordance with standard procedures for voice-frequency pairs. The dc test pair **must** be loaded in accordance with engineering practices for voice-frequency pairs.

Note: If a step fails to meet requirements, refer to Table X.

| TABLE X | | | |
|-----------|------|------------------|---|
| PROCEDURE | STEP | REQT. (SEE NOTE) | MOST LIKELY CAUSE OF TROUBLE |
| L | 4 | 1 | Office alarm wiring; SM86() |
| L | 4 | 2 | Office alarm wiring |
| L | 5 | | Fuse panel wiring to PGTC; SM86(), shelf wiring |
| L | 6 | | SM86(); fuse panel wiring to PGTC; shelf wiring |
| L | 8 | | Battery lead too close to noise source (generators, rectifiers); noisy battery supply |
| L | 9 | | Fuse panel wiring to PGTC; shelf wiring |
| L | 11 | 1, 2 | SM88(); shelf wiring |
| L | 12 | | SM88(); SM86() |
| L | 15 | | SM91(); SM92 or SM94(); shelf wiring; wiring to PGTC |
| L | 21 | | SM91(); SM94(); DF wiring to PGTC; channel unit; wiring from DF to COT |
| L | 22 | | SM91(); SM94() or SM88(); shelf wiring |
| L | 26 | 1, 2 | SM87(); wiring to PGTC; shelf wiring |
| L | 28 | 1 | SM88(); SM87(); SM91(); SM92; or SM94(); channel unit (COT) or (RT); CTU (COT) or (RT); wiring from COT to PGTC; shelf wiring |
| L | 28 | 2 | SM91(); SM92; or SM94() |
| L | 29 | | SM87(); SM88(); wiring from COT to PGTC; CTU (COT) or (RT); shelf wiring |
| L | 30 | | DF wiring; wiring from COT to PGTC; test pair connections at RT |
| L | 32 | | SM88(); SM87(); SM86(); shelf wiring; channel unit (COT) or (RT); CTU (COT) or (RT); incorrect ringing voltage |
| L | 33 | | SM87(); SM88(); SM86(); shelf wiring |
| L | 35 | | SM87(); SM88(); SM91(); SM92 or SM94() |
| L | 37 | | DF wiring; wiring from COT to PGTC; CTU (COT); SM88(); SM91(); SM92 or SM94(); shelf wiring |
| L | 42 | | SM88(); SM87(); wiring from COT to PGTC; CTU (COT) shelf wiring |

Note: Requirement number.

- 1 Verify that the J1C142A, L1 control shelf (Fig. 1) and associated power and connecting cables have been properly installed and terminated.

| STEP | PROCEDURE |
|------|---|
| 2 | Verify that fuses A1, A2, and A3 (if provided) are removed from the miscellaneous fuse panel. |
| 3 | Alert central office personnel that alarm tests are being made. |
| 4 | Plug an SM86() circuit pack (control shelf power unit) into position 01 of the control shelf. Requirement 1: The office alarm (if provided) is activated. Requirement 2: The proper aisle and frame indicator lamps light (if provided). |
| 5 | Insert the 35D/70D (5A) fuse in the A1 position of the miscellaneous fuse panel. Requirement: The fuse does not operate (blow). |
| 6 | Using the VOM and noting the polarity of the leads as well as the range setting of the VOM, measure the voltages at the SM86() test jacks as shown in Table Y. |

| TEST JACK | | VOM RANGE | REQUIREMENT (Vdc) |
|-----------|--------|-----------|-------------------|
| FROM (+) | TO (-) | | |
| LG | -48S | 60 | 45 to 53 |
| LG | -48T | 300/60 | 45 to 65 |
| LG | -130 | 300 | 130 to 195 |
| LG | -12 | 60/12 | 10.8 to 13.2 |
| +5 | LG | 12 | 4.5 to 5.5 |
| +12 | LG | 60/12 | 10.8 to 13.2 |
| +48T | LG | 300 | 60 to 85 |
| +130 | LG | 300 | 130 to 195 |

- 7 Calibrate a J94003C (3C) noise measuring set equipped with the 497A network (C-Message weighting) per AT&T Practice 103-611-101.
- 8 Connect the 3C noise measuring set to the -48S and BG test jacks on the SM86() unit, and measure the noise level.

Requirement: The noise level must *never* exceed 55 dBrc.
- 9 Insert the 35F/70F (0.25A) fuse(s) in the A2 (and A3, if required) position(s) of the miscellaneous fuse panel.

Note: The A2 position is for ac or negative superimposed ringing. The A3 position is for positive superimposed ringing.

| STEP | PROCEDURE |
|--|---|
| | Requirement: The fuse(s) does not operate (blow). |
| 10 | Set the option plug (see Fig. 4) on an SM88() circuit pack (control unit) to the appropriate position for the type of ringing supplied in Step 9. Note: If the A3 fuse position on the miscellaneous fuse panel has been provided and wired, use <i>4P</i> option position. Otherwise, use <i>2P</i> option position. |
| 11 | Plug the SM88() unit into position 06 of the control shelf. Requirement 1: After a settling period (approximately 5 seconds), the status display on the SM88() (Fig. 4) will clear. Requirement 2: The ACO lamp on the SM88() unit should be extinguished. |
| 12 | Depress ACO button. Requirement: Office alarms (if provided) are retired and the <i>ACO</i> lamp does <i>not</i> illuminate. |
| 13 | At the DF, cross-connect the dc test pair from the remote terminal (RT) to the central office terminal (COT). Note: The dc test pair (cable pair) must be H88 loaded if required. |
| 14 | At the RT, connect the 500-type telephone set to the subscriber side (drop side) of the channel unit selected for test. |
| 15 | At the PGTC, plug a trunk unit [SM91(), SM92, or SM94() circuit pack as specified] into position 07 of the control shelf. Requirement: No fuses operate (blow). |
| Using NA96L1 PORTABLE TEST DESK SIMULATOR | |
| | Note: If using DTTS-1 PORTABLE TEST DESK, proceed to Step 18. |
| 16 | Plug multilead test cord (Fig. 6) into rear of the NA96L1 test set (Fig. 6) and starting with test trunk 1 position, connect the other end of cord to the terminals on the rear of the PGTC per Table Z and Fig. 14. |
| 17 | Using frame wire and pin plugs (obtain locally), establish connection between T and R jacks of test set and T and R jacks on the faceplate of channel unit selected in Step 14. Set PWR switch to ON. Requirement: With all test set keys normal (down position), no deflection on meter. Note: Proceed to Step 21. |
| Using DTTS-1 PORTABLE TEST DESK | |
| 18 | Plug cord 1 (Fig. 9) into rear of the DTTS-1 test set (Fig. 7) and starting with test trunk 1 position, connect the other end of cord 1 to the terminals on the rear of the PGTC per Table Z and Fig. 10. |

STEP

PROCEDURE

| TABLE Z | | | | | | | |
|------------|------------|-------------|-----------------|------------|------------|-------------|-----------------|
| TEST TRUNK | LEAD COLOR | LEAD DESIG. | TERMINAL NUMBER | TEST TRUNK | LEAD COLOR | LEAD DESIG. | TERMINAL NUMBER |
| 1 | ORANGE | T | 47 | 7 | ORANGE | T | 83 |
| | VIOLET | R | 46 | | VIOLET | R | 82 |
| | BLUE | TT | 53 | | BLUE | TT | 89 |
| | YELLOW | TR | 52 | | YELLOW | TR | 88 |
| | BROWN | TS | 48 | | BROWN | TS | 84 |
| 2 | ORANGE | T | 44 | 8 | ORANGE | T | 80 |
| | VIOLET | R | 43 | | VIOLET | R | 79 |
| | BLUE | TT | 50 | | BLUE | TT | 86 |
| | YELLOW | TR | 49 | | YELLOW | TR | 85 |
| | BROWN | TS | 45 | | BROWN | TS | 81 |
| 3 | ORANGE | T | 59 | 9 | ORANGE | T | 95 |
| | VIOLET | R | 58 | | VIOLET | R | 94 |
| | BLUE | TT | 65 | | BLUE | TT | 101 |
| | YELLOW | TR | 64 | | YELLOW | TR | 100 |
| | BROWN | TS | 60 | | BROWN | TS | 96 |
| 4 | ORANGE | T | 56 | 10 | ORANGE | T | 92 |
| | VIOLET | R | 55 | | VIOLET | R | 91 |
| | BLUE | TT | 62 | | BLUE | TT | 98 |
| | YELLOW | TR | 61 | | YELLOW | TR | 97 |
| | BROWN | TS | 57 | | BROWN | TS | 93 |
| 5 | ORANGE | T | 71 | 11 | ORANGE | T | 126 |
| | VIOLET | R | 70 | | VIOLET | R | 125 |
| | BLUE | TT | 77 | | BLUE | TT | 149 |
| | YELLOW | TR | 76 | | YELLOW | TR | 148 |
| | BROWN | TS | 72 | | BROWN | TS | 127 |
| 6 | ORANGE | T | 68 | 12 | ORANGE | T | 123 |
| | VIOLET | R | 67 | | VIOLET | R | 122 |
| | BLUE | TT | 74 | | BLUE | TT | 146 |
| | YELLOW | TR | 73 | | YELLOW | TR | 145 |
| | BROWN | TS | 69 | | BROWN | TS | 124 |

- 19 Plug cord 3 (Fig. 9) into the TONE jack of the face of the DTTS-1 test set.
- 20 Using cord 2 (Fig. 9), establish connection between T and R jacks of test set and T and R jacks on the faceplate of channel unit selected in Step 14. Set PWR switch to ON.
- Requirement:** With all test set keys normal (up position), no deflection on meter.
- 21 Operate REV key.

Requirement: The signature (seizure) of the central office channel unit should be evident from standard test (approximately 40-volts leakage *tip* to ground *or* 75-volts leakage *tip* to ground and *ring*

| STEP | PROCEDURE |
|------|---|
| | to ground for coin channel units, with approximately 50-volts ballistic deflection). ♦If a SLC Series 5 special service channel unit (CS2) is used, an 82-volt leakage appears on tip and ring to ground in addition to a 24-volt FEMF on both tip and ring to ground.♦ |
| 22 | Operate REV and +STA keys (also G key if coin channel unit). Requirement: The VMA meter indicates deflections at a 120 interruptions-per-minute (IPM) rate. Note 1: Busy light will illuminate on the trunk unit and the minor and the near end alarm light on the ACU of the system under test may briefly flash. Note 2: The alarm light on the CTU may or may not flash. |
| 23 | Release all keys. |
| 24 | Release test trunk (operate and release TD key). |
| 25 | Repeat Steps 16 through 24 for each test trunk position provided before continuing to Step 26. |
| 26 | If the PGTC has been equipped with an SM91() unit in Step 15, plug an SM87() circuit pack (tester unit) into position 04 of the control shelf. Otherwise, plug the SM87() unit into position 02 of the control shelf. Requirement 1: No fuses operate (blow). Requirement 2: The status indicator on the SM88() control unit remains clear. Note 1: If a status indication appears on the SM88(), remove and reseat the SM88() control card. The microcontroller is now reset and the status indicator is clear (no display). Note 2: If SM94 unit shows busy, remove and reseat the SM94 unit. |
| 27 | Using cord 1, Table Z, and Fig. 10, (DTTS-1 test set), or multilead cord, Table Z, and Fig. 14 (NA96L1 test set), reconnect to the test line again via the <i>first</i> test trunk position. |
| 28 | Operate the REV and +STA key (also G key if coin unit). Requirement 1: The VMA meter indicates a steady deflection of approximately 85 volts or greater. Requirement 2: At the PGTC, the busy indicator lamp on the trunk unit lights simultaneously with Requirement 1. |
| 29 | Release the +STA key (and G key if operated). Requirement: The VMA meter should indicate approximately 0 volts. |
| 30 | By operating (and releasing) the REV key, with the G key operated and then without the G key operated, verify the test connection. Requirement: The test connection should have approximately 0-volts leakage with a ballistic indication corresponding to one bridged ringer. |

| STEP | PROCEDURE |
|------|-----------|
|------|-----------|

- 31 Release all keys.
- 32 Operate MONITOR key, then the 3WO key and monitor the tone burst(s) in the headset.

Requirement: The tone burst(s) heard should correspond to the type of channel unit selected in Step 14 as follows:

| CHANNEL TYPE | TONE BURST(S) |
|--|---------------|
| Single-party or SPOTS® (WP36 and WP37) Channel unit | One burst |
| Multiparty | Double burst |
| Coin | Triple burst |

Note: If necessary to reverify the number of tone burst(s), release the 3WO key and then reoperate it.

- 33 With the MONITOR key released and the 3WO key operated, operate the REV, FEMF, and VM REV keys as required to obtain dc response.

Requirement: The VMA meter indications should be as shown for the type of channel unit selected and the keys operated as shown in Table AA.

| TABLE AA | | |
|--|---------------------------------------|---------------------------------------|
| CHANNEL TYPE | KEY(s) OPERATED | VMA INDICATION |
| Single-party or SPOTS (WP36 and WP37) | (a) REV, 3WO (b) FEMF, 3WO | approx. 100 volts approx. 48 volts |
| Multiparty | (a) FEMF, REV, 3WO (b) 3WO | approx. 48 volts approx. 0 volts |
| Coin | (a) FEMF, REV, VM REV, 3WO (b) 3WO | approx. 48 volts approx. 0 volts |

- 34 Release all keys.
- 35 Release test trunk (operate and release TD key).

Requirement: At the PGTC, the busy indicator lamp on the trunk unit in position 07 should extinguish.

| STEP | PROCEDURE |
|------|--|
| 36 | At the DF, ground the INHIBIT lead coming from the carrier system. |
| 37 | Operate the REV and +STA keys (also G key if coin channel unit). Requirement: The VMA meter indicates deflections at a 120 IPM rate. |
| 38 | Release all keys. |
| 39 | Release test trunk (operate and release TD key). |
| 40 | At the DF, remove the ground on the INHIBIT lead (placed in Step 36). |
| 41 | At the COT, cause a major alarm by inserting a pin plug into the R CODE jack on the TRU unit for the shelf containing the channel unit under test. |
| 42 | Operate the REV and +STA keys (also G key if coin channel unit). Requirement: The VMA meter indicates deflections at a 60 IPM rate. |
| 43 | Release all keys. |
| 44 | Release test trunk (operate and release TD key). |
| 45 | At the COT, remove the pin plug from the R CODE jack to clear the major alarm condition. |
| 46 | If the PGTC has been equipped with an SM91() trunk unit in Step 15 and a second dedicated test trunk is required, plug in an SM87() tester unit into position 05 of the control shelf. |
| 47 | Repeat Steps 27 through 45 for the second test trunk. |
| 48 | Remove the 500-type telephone set connected in Step 14. |
| 49 | Remove all test set connections to PGTC. |

M. Optional PGTC Test Using the DTTS-2 TEST CONTROLLER SIMULATOR (SLC 96 Carrier System)

| STEP | PROCEDURE |
|------|---|
| | <i>Prerequisite:</i> Procedure L has been completed. |
| | Note: The simulator is used to verify that the channel test units (CTUs) at the COT and RT are functioning properly. |
| 1 | Plug cord 4 (Fig. 9) into rear of the DTTS-2 test set (Fig. 8). |
| 2 | At channel bank, disconnect P109. |
| 3 | Connect J109 (cord 4) of test set to P109. |

| STEP | PROCEDURE |
|---|--|
| 4 | Using cord 5 (Fig. 9), connect +RING of test set to pin 11 on backplane of PGTC and -RING of test set to pin 10. |
| 5 | Connect GND of test set (cord 5) to frame ground. |
| 6 | Connect power cord to test set and turn PWR SW to ON. |
| Single-Party Channel Unit Tests | |
| 7 | Using cord 2 (Fig. 9), establish connection between TIP and RING jacks of test set and T and R jacks on the faceplate of channel unit. |
| 8 | Set TEST TRK switch to position A. |
| 9 | Operate the +STA key. |
| Requirement: SZ lamp ON. | |
| 10 | Operate the PROC key. |
| Requirement 1: SLV lamp on test set ON. | |
| Requirement 2: BUSY lamp on channel unit ON. | |
| 11 | Release the +STA key. |
| 12 | Operate the LOCK key. |
| 13 | Release the PROC key. |
| Requirement 1: SLV lamp remains ON. | |
| Requirement 2: SZ lamp goes OFF. | |
| 14 | Operate the OH key momentarily. |
| Requirement: BUSY lamp on channel unit goes OFF. | |
| 15 | Operate the RING key. |
| 16 | Operate the -RING key momentarily. |
| Requirement: BUSY lamp on channel unit goes ON. | |
| 17 | Release the LOCK key. |
| Requirement: BUSY lamp on channel unit goes OFF. | |
| 18 | Set TEST TRK switch to B, then C, then D and repeat Steps 9 through 17 at each setting. |

| STEP | PROCEDURE |
|--|--|
| Multiparty Channel Unit Tests (Two-Party Service) | |
| 19 | Using cord 2 (Fig. 9), establish connection between TIP and RING jacks of test set and T and R jacks on the faceplate of channel unit. |
| 20 | Set TEST TRK switch to position A. |
| 21 | Operate the +STA key. |
| | Requirement: SZ lamp ON. |
| 22 | Operate the PROC key. |
| | Requirement: SLV lamp on test set ON. |
| 23 | Release the +STA key. |
| | Requirement: BUSY lamp on channel unit ON. |
| 24 | Operate the LOCK key. |
| 25 | Release the PROC key. |
| | Requirement 1: SLV lamp remains ON. |
| | Requirement 2: SZ lamp goes OFF. |
| 26 | Operate the OH key momentarily. |
| | Requirement: BUSY lamp on channel unit goes OFF. |
| 27 | Operate the RING key. |
| 28 | Operate the -RING key momentarily. |
| | Requirement: BUSY lamp on channel unit goes ON. |
| 29 | Operate the OH key momentarily. |
| | Requirement: BUSY lamp on channel unit goes OFF. |
| 30 | Operate the TIP key. |
| 31 | Operate the -RING key momentarily. |
| | Requirement: BUSY lamp on channel unit goes ON. |
| 32 | Release the LOCK key. |
| | Requirement: BUSY lamp on channel unit goes OFF. |
| 33 | Set TEST TRK switch to B, then C, then D and repeat Steps 21 through 32 at each setting. |

| STEP | PROCEDURE |
|---|--|
| Multiparty Channel Unit Tests (Four-Party Service) | |
| 34 | Using cord 2 (Fig. 9), establish connection between TIP and RING jacks of test set and T and R jacks on the faceplate of channel unit. |
| 35 | Set TEST TRK switch to position A. |
| 36 | Operate the +STA key. |
| | Requirement: SZ lamp ON. |
| 37 | Operate the PROC key. |
| | Requirement: SLV lamp on test set ON. |
| 38 | Release the +STA key. |
| | Requirement: BUSY lamp on channel unit ON. |
| 39 | Operate the LOCK key. |
| 40 | Release the PROC key. |
| | Requirement 1: SLV lamp remains ON. |
| | Requirement 2: SZ lamp goes OFF. |
| 41 | Operate the OH key momentarily. |
| | Requirement: BUSY lamp on channel unit goes OFF. |
| 42 | Operate the RING key. |
| 43 | Operate the -RING key momentarily. |
| | Requirement: BUSY lamp on channel unit goes ON. |
| 44 | Operate the OH key momentarily. |
| | Requirement: BUSY lamp on channel unit goes OFF. |
| 45 | Operate the TIP key. |
| 46 | Operate the -RING key momentarily. |
| | Requirement: BUSY lamp on channel unit goes ON. |
| 47 | Operate the OH key momentarily. |
| | Requirement: BUSY lamp on channel unit goes OFF. |
| 48 | Operate the +RING key momentarily. |

| STEP | PROCEDURE |
|------|--|
| | <i>Requirement:</i> BUSY lamp on channel unit goes ON. |
| 49 | Operate the OH key momentarily. |
| | <i>Requirement:</i> BUSY lamp on channel unit goes OFF. |
| 50 | Operate the RING key. |
| 51 | Operate the +RING key momentarily. |
| | <i>Requirement:</i> BUSY lamp on channel unit goes ON. |
| 52 | Release the LOCK key. |
| | <i>Requirement:</i> BUSY lamp on channel unit goes OFF. |
| 53 | Set TEST TRK switch to B, then C, then D and repeat Steps 36 through 52 at each setting. |
| | Coin Channel Unit Tests |
| 54 | Using cord 2 (Fig. 9), establish connection between TIP and RING jacks of test set and T and R jacks on the faceplate of channel unit. |
| 55 | Set TEST TRK switch to position A. |
| 56 | Operate the G key. |
| 57 | Operate the +STA key. |
| | <i>Requirement:</i> SZ lamp ON. |
| 58 | Operate the PROC key. |
| | <i>Requirement:</i> SLV lamp on test set ON. |
| 59 | Release the +STA key. |
| | <i>Requirement:</i> BUSY lamp on channel unit ON. |
| 60 | Operate the LOCK key. |
| 61 | Release the PROC key. |
| | <i>Requirement:</i> SZ lamp goes OFF. |
| 62 | Release the G key. |
| 63 | Operate the OH key momentarily. |
| | <i>Requirement:</i> BUSY lamp on channel unit OFF. |
| 64 | Operate the +COIN (+130V) key. |

| STEP | PROCEDURE |
|------|--|
| | Requirement: BUSY lamp on channel unit ON. |
| 65 | Operate the OH key momentarily. |
| | Requirement: BUSY lamp on channel unit OFF. |
| 66 | Operate the -COIN (-130V) key. |
| | Requirement: BUSY lamp on channel unit ON. |
| 67 | Operate the OH key momentarily. |
| | Requirement: BUSY lamp on channel unit OFF. |
| 68 | Operate the RING key. |
| 69 | Operate the -RING key momentarily. |
| | Requirement: BUSY lamp on channel unit ON. |
| 70 | Release the LOCK key. |
| | Requirement: BUSY lamp on channel unit OFF. |
| 71 | Set TEST TRK switch to B, then C, then D and repeat Steps 56 through 70 at each setting. |
| | Note: If alarm tests are to be performed, proceed to Step 73, if alarm tests are <i>not</i> to be performed proceed to Step 72. |
| 72 | Remove all test set connections to PGTC and reconnect P109 at the channel bank. |
| | Alarm Test - TST ALM, TMAJ |
| 73 | Operate TST ALM switch. |
| | Requirement: CTU alarm lamp ON (COT and RT). |
| 74 | Restore TST ALM switch. |
| 75 | At the COT, cause a major alarm by <i>removing</i> the TRU unit on shelf B, C, or D of system being tested. |
| 76 | Operate the +STA key (also G key if coin channel unit). |
| | Requirement: SZ and TMAJ lamps ON. |
| 77 | Release +STA key. |
| 78 | At COT, restore the TRU unit. |
| | Requirement: SZ and TMAJ lamps OFF. |
| 79 | Remove all test set connections to PGTC and reconnect P109 at the channel bank. |

N. Optional PGTC Test Using the DTTS-2 TEST CONTROLLER SIMULATOR (SLC Series 5 Carrier System)

| STEP | PROCEDURE |
|------|-----------|
|------|-----------|

Prerequisite: Procedure L has been completed.

Note: The simulator is used to verify that the channel test units (CTUs) at the COT and RT are functioning properly.



The DTTS-2 is completely compatible with a SLC 96 COT working with a SLC Series 5 FPB (Mode 96) RT. The DTTS-2 will work with a FPA or FPC SLC Series 5 System when the carrier system is equipped with an AUB2 COT CTU and an AUB22 RT CTU. The DTTS-2 will not work with a FPC SLC Series 5 system when the carrier system is equipped with a AUB5 COT CTU and a AUB25 RT CTU. The keys must be operated at a rapid pace (but not simultaneously) to insure that the SLC Series 5 systems receive the signals in the proper sequence and in the proper time frame.

- 1 Plug cord 4 (Fig. 9) into rear of the DTTS-2 test set (Fig. 8).
- 2 At channel bank, disconnect P109.
- 3 Connect J109 (cord 4) of test set to P109.
- 4 Using cord 5 (Fig. 9), connect +RING of test set to pin 11 on backplane of PGTC and -RING of test set to pin 10.
- 5 Connect GND of test set (cord 5) to frame ground.
- 6 Connect power cord to test set and turn PWR SW to ON.

Single-Party Channel Unit Tests

- 7 Using cord 2 (Fig. 9), establish connection between TIP and RING jack of test set and T and R jacks on the faceplate of channel unit.
- 8 Set TEST TRK switch to position A.
- 9 Operate the keys in the following order:



The keys must be operated at a rapid pace (but not simultaneously) to insure that the SLC Series 5 system receives the signals in the proper time frame. It may take several attempts before you get a good set-up.

+STA
PROC
LOCK

Requirement 1: The SZ lamp lights. Then the SLV lamp lights and the SZ lamp goes off.

Requirement 2: The BUSY light on the channel unit will light.

Requirement 3: The BUSY lamp on the AUB2 COT CTU will light.

| STEP | PROCEDURE |
|--|--|
| 10 | Release the +STA key. |
| 11 | Release the PROC key. |
| 12 | Operate the OH key momentarily. Requirement: BUSY lamp on channel unit goes OFF. |
| 13 | Operate the RING key. |
| 14 | Operate the -RING key momentarily. Requirement: BUSY lamp on channel unit goes ON. |
| 15 | Release the LOCK key. Requirement: BUSY lamp on channel unit goes OFF. |
| 16 | Set TEST TRK switch to B, then C, then D and repeat Steps 9 through 15 at each setting. |
| Multiparty Channel Unit Tests (Two-Party Service) | |
| 17 | Using cord 2 (Fig. 9), establish connection between TIP and RING jacks of test set and T and R jacks on the faceplate of channel unit. |
| 18 | Set TEST TRK switch to position A. |
| 19 | Operate the keys in the following order:  <i>The keys must be operated at a rapid pace (but not simultaneously) to insure that the SLC Series 5 system receives the signals in the proper time frame. It may take several attempts before you get a good set-up.</i> +STA PROC LOCK |
| Requirement 1: The SZ lamp lights. Then the SLV lamp lights and the SZ lamp goes off. | |
| Requirement 2: The BUSY light on the channel unit will light. | |
| Requirement 3: The FAIL lamp on the AUB2 COT CTU will light. | |
| 20 | Release the +STA key. |
| 21 | Release the PROC key. |
| 22 | Operate the OH key momentarily. Requirement: BUSY lamp on channel unit goes OFF. |

| STEP | PROCEDURE |
|------|--|
| 23 | Operate the RING key. |
| 24 | Operate the -RING key momentarily. Requirement: BUSY lamp on channel unit goes ON. |
| 25 | Operate the OH key momentarily. Requirement: BUSY lamp on channel unit goes OFF. |
| 26 | Operate the TIP key. |
| 27 | Operate the -RING key momentarily. Requirement: BUSY lamp on channel unit goes ON. |
| 28 | Release the LOCK key. Requirement: BUSY lamp on channel unit goes OFF. |
| 29 | Set TEST TRK switch to B, then C, then D and repeat Steps 19 through 28 at each setting. |

Multiparty Channel Unit Tests (Four-Party Service)

- 30 Using cord 2 (Fig. 9), establish connection between TIP and RING jacks of test set and T and R jacks on the faceplate of channel unit.
- 31 Set TEST TRK switch to position A.
- 32 Operate the keys in the following order:



The keys must be operated at a rapid pace (but not simultaneously) to insure that the SLC Series 5 system receives the signals in the proper time frame. It may take several attempts before you get a good set-up.

+STA
PROC
LOCK

Requirement 1: The SZ lamp lights. Then the SLV lamp lights and the SZ lamp goes off.

Requirement 2: The BUSY light on the channel unit will light.

Requirement 3: The BUSY lamp on the AUB2 COT CTU will light.

- 33 Release the +STA key.
- 34 Release the PROC key.

| STEP | PROCEDURE |
|--------------------------------|--|
| 35 | Operate the OH key momentarily. Requirement: BUSY lamp on channel unit goes OFF. |
| 36 | Operate the RING key. |
| 37 | Operate the -RING key momentarily. Requirement: BUSY lamp on channel unit goes ON. |
| 38 | Operate the OH key momentarily. Requirement: BUSY lamp on channel unit goes OFF. |
| 39 | Operate the TIP key. |
| 40 | Operate the -RING key momentarily. Requirement: BUSY lamp on channel unit goes ON. |
| 41 | Operate the OH key momentarily. Requirement: BUSY lamp on channel unit goes OFF. |
| 42 | Operate the +RING key momentarily. Requirement: BUSY lamp on channel unit goes ON. |
| 43 | Operate the OH key momentarily. Requirement: BUSY lamp on channel unit goes OFF. |
| 44 | Operate the RING key. |
| 45 | Operate the +RING key momentarily. Requirement: BUSY lamp on channel unit goes ON. |
| 46 | Release the LOCK key. Requirement: BUSY lamp on channel unit goes OFF. |
| 47 | Set TEST TRK switch to B, then C, then D and repeat Steps 32 through 46 each setting. |
| Coin Channel Unit Tests | |
| 48 | Using cord 2 (Fig. 9), establish connection between TIP and RING jacks of test set and T and R jacks on the faceplate of channel unit. |
| 49 | Set TEST TRK switch to position A. |
| 50 | Operate the G key. |

| STEP | PROCEDURE |
|------|-----------|
|------|-----------|

51 Operate the keys in the following order:



The keys must be operated at a rapid pace (but not simultaneously) to insure that the SLC Series 5 system receives the signals in the proper time frame. It may take several attempts before you get a good set-up.

+STA
PROC
LOCK

Requirement 1: The SZ lamp lights. Then the SLV lamp lights and the SZ lamp goes off.

Requirement 2: The BUSY light on the channel unit will light.

Requirement 3: The BUSY lamp on the AUB2 COT CTU will light.

52 Release the +STA key.

53 Release the PROC key.

54 Release the G key.

55 Operate the OH key momentarily.

Requirement: BUSY lamp on channel unit OFF.

56 Operate the +COIN (+130V) key.

Requirement: BUSY lamp on channel unit ON.

57 Operate the OH key momentarily.

Requirement: BUSY lamp on channel unit OFF.

58 Operate the -COIN (-130V) key.

Requirement: BUSY lamp on channel unit ON.

59 Operate the OH key momentarily.

Requirement: BUSY lamp on channel unit OFF.

60 Operate the RING key.

61 Operate the -RING key momentarily.

Requirement: BUSY lamp on channel unit ON.

62 Release the LOCK key.

| STEP | PROCEDURE |
|------|--|
| | Requirement: BUSY lamp on channel unit OFF. |
| 63 | Set TEST TRK switch to B, then C, then D and repeat Steps 50 through 62 each setting. |
| | Note: If alarm tests are to be performed, proceed to Step 65, if alarm tests are <i>not</i> to be performed proceed to Step 64. |
| 64 | Remove all test set connections to PGTC and reconnect P109 at the channel bank. |
| | Alarm Test - TST ALM, TMAJ |
| 65 | At the COT, cause a major alarm on the digroup being tested by denying protection and removing the LIU associated with the digroup. |
| 66 | Operate the +STA key (also G key if coin channel unit). |
| | Requirement: TMAJ lamps ON. |
| 67 | Release +STA key. |
| 68 | At COT, restore the LIU unit. |
| | Requirement: TMAJ lamps OFF. |
| 69 | Remove all test set connections to PGTC and reconnect P109 at the channel bank.♦ |

O. Acceptance Test of TBCU

| STEP | PROCEDURE |
|------|---|
| | SM499 Power Unit |
| 1 | Visually inspect backplane of TBCU for bent, broken, or crossed terminals. |
| 2 | Remove all circuit packs from TBCU. |
| 3 | Remove the 35B/70B fuse from the A1 position of the miscellaneous fuse panel, if installed. |
| 4 | Condition VOM to measure volts on 60 Vdc scale. |
| 5 | On backplane of TBCU, connect VOM between frame ground and -48 RTN terminal lug. |
| | Requirement: 0 volts. |
| 6 | Condition VOM to measure resistance (ohms) on the X10 scale. |
| 7 | On backplane of TBCU, connect VOM between terminals 022 and 023. |
| 8 | Insert SM499 circuit pack into position 01. |

STEP

PROCEDURE

- Requirement:** VOM indicates short circuit (contacts on alarm relay K1 closed).
- 9 Disconnect VOM leads from terminals 022 and 023.
- 10 Insert the 35B/70B (2A) fuse into the A1 position of the miscellaneous fuse panel.
- Requirement:** Alarm lamp on SM499 off.
- 11 Condition VOM to measure dc voltage on 60 Vdc scale.
- 12 Connect + lead of VOM to frame ground.
- 13 Connect - lead of VOM to -48S Vdc power terminal lug.
- Requirement:** Voltage between -42.5 and -52.5 Vdc.
- 14 Condition VOM to measure dc voltage on 300 Vdc scale.
- 15 On faceplate of SM499, connect + lead of VOM to LG test jack.
- 16 Connect - lead of VOM to -48S test jack.
- Requirement:** Voltage between -42.5 and -52.5 Vdc.
- 17 Move - lead of VOM to -48T test jack.
- Requirement:** Voltage between -40 and -85 Vdc.
- 18 On faceplate of SM499, connect - lead of VOM to LG test jack.
- 19 Connect + lead of VOM to +48T test jack.
- Requirement:** Voltage between +40 and +85 Vdc.
- Note:** The *maximum* difference in voltage readings between the -48T and +48T is ± 2 volts dc.
- 20 Condition VOM to measure dc voltage on 12 Vdc scale.
- 21 Connect + lead of VOM to +5A test jack.
- Requirement:** Voltage between +4.75 and +5.25 Vdc.
- 22 Condition VOM to measure dc voltage on 300 Vdc scale.
- 23 On backplane of TBCU, connect + lead of VOM to terminal 121 (ground).
- 24 Connect - lead of VOM to terminal 025.
- Requirement:** Voltage between -42.5 and -52.5 Vdc.
- 25 Connect - lead of VOM to terminal 027.
- Requirement:** Voltage between -40 and -85 Vdc.
- 26 Connect - lead of VOM to terminal 121.

| STEP | PROCEDURE |
|------|---|
| 27 | Connect + lead of VOM to terminal 029. Requirement: Voltage between +40 and +85 Vdc. |
| 28 | Condition VOM to measure dc voltage on 12 Vdc scale. |
| 29 | Connect - lead of VOM to terminal 121. |
| 30 | Connect + lead of VOM to terminal 011. Requirement: Voltage swinging between +1 and +5 Vdc, average reading of +2.5 Vdc at a 60 IPM rate. |



SM500 Bus Unit

There will be multiple connections made to the RTN lead on the DF, Fig. 15. Leave *all* connections in place until instructed to remove them.

- 31 Condition VOM to measure resistance (ohms) on X100 scale.
- 32 At DF, connect one lead of VOM to ground and other lead to one side (tip or ring) of the dc test pair for side "A" or "B" of SM500 under test.
Requirement: Open circuit.
- 33 At TBCU, using Table AB and SD-97791-01, ground corresponding terminal.
Note: Terminal 008 is the corresponding terminal for the *tip* side of the dc test pair for side "A" of the SM500. Terminal 007 is the *ring* side.
Requirement: At DF, VOM reads grounded circuit.
- 34 At DF and TBCU, repeat Steps 32 and 33 for all leads listed in Table AB.

| TABLE AB | | |
|------------------|-----------------------|----------|
| LEAD DESIGNATION | SM500 TERMINAL NUMBER | |
| | SIDE "A" | SIDE "B" |
| Dc Test Pair | | |
| T | 008 | 040 |
| R | 007 | 039 |
| INHIB | 010 | 042 |
| SG | 024 | 024 |
| SEIZE (SD1) | 118 | 150 |
| POL (SD2) | 117 | 149 |
| RES (SD3) | 116 | 148 |
| REV (SD4) | 115 | 147 |
| NRES (SD5) | 114 | 146 |
| RTN | 113 | 145 |
| SP | 111 | 143 |
| SPR | 110 | 142 |

| STEP | PROCEDURE |
|------|---|
| 35 | At DF and TBCU, disconnect VOM and ground straps. |
| 36 | At TBCU, plug an SM500 into position to be tested (P02 – P16). |
| 37 | At DF, strap the INHIBIT lead (for side under test, "A" or "B") to the SG lead (ground). |
| 38 | If Signal Distribute points (SD), Scan Points (SP), and test pair <i>are not</i> connected, proceed to Step 40. |
| 39 | If Signal Distribute points (SD), Scan Points (SP), and test pair <i>are</i> connected, proceed to Step 42. |
| 40 | Condition VOM to measure resistance on the X100 scale. |
| 41 | Connect the VOM – lead to SP() and + lead to SPR(). |
| | Requirement: Less than 1000 ohms. |
| | Note 1: If VOM indicates greater than 1000 ohms, reverse VOM leads (transistor in circuit). |
| | Note 2: Proceed to Step 44. |
| 42 | Condition VOM to measure dc voltage on 3 Vdc scale. |
| 43 | Connect VOM + lead to SP() and – lead to SPR(). |
| | Requirement: Less than 1 volt. |
| | Note: Proceed to Step 45. |
| 44 | Condition VOM to measure dc voltage on 3 Vdc scale. |
| 45 | Connect one lead of VOM to ground. |
| 46 | Connect other VOM lead to the ring side of dc test pair. |
| | Requirement: Less than 1 volt. |
| 47 | Disconnect VOM lead from ring side and connect it to the tip side. |
| | Requirement: Less than 1 volt. |
| 48 | At DF, connect a 1000-ohm resistor across tip and ring of dc test pair under test. |
| 49 | At DF, strap SEIZE() (SD1) lead to the RTN() lead. |
| 50 | Condition VOM to measure resistance (ohms) on X1000 scale. |
| 51 | Connect one VOM lead to TT() and other VOM lead to TR(). |
| | Requirement: VOM reads between 30K and 50K ohms (K = Thousand). |
| 52 | Condition VOM to measure resistance on X100 scale. |

| STEP | PROCEDURE |
|------|--|
| 53 | Strap POL() (SD2) lead to the RTN() lead (multiple connection, Fig. 15). VOM across TT() and TR(). Requirement: VOM reads between 900 and 1100 ohms. |
| 54 | Strap REV() (SD4) lead to the RTN() lead. VOM across TT() and TR(). Requirement: VOM reads between 900 and 1100 ohms. |
| 55 | Remove VOM lead from TR() and connect it to ground. |
| 56 | Remove one end of 1000-ohm resistor from T() and connect it to ground. Requirement: VOM reads between 900 and 1100 ohms. |
| 57 | Condition VOM to measure resistance on X10000 scale. |
| 58 | Disconnect strap from REV() (SD4) lead and RTN(). Requirement: VOM reads greater than 1000K ohms. |
| 59 | Condition VOM to measure resistance on X1000 scale. |
| 60 | Disconnect strap from POL() (SD2) lead and RTN(). Requirement: VOM reads between 30K and 50K ohms. |
| 61 | Remove VOM lead from TT() and connect it to TR(). Requirement: VOM reads between 30K and 50K ohms. |
| 62 | Remove one end of 1000-ohm resistor from R() and connect it to T(). Requirement: VOM reads between 30K and 50K ohms. |
| 63 | Condition VOM to measure resistance on X10000 scale. |
| 64 | Strap POL() (SD2) lead to RTN(). Requirement: VOM reads greater than 1000K ohms. |
| 65 | Condition VOM to measure resistance on X100 scale. |
| 66 | Strap REV() (SD4) lead to RTN(). Requirement: VOM reads between 900 and 1100 ohms. |
| 67 | Condition VOM to measure resistance on X1 scale. |
| 68 | Strap NRES() (SD5) lead to RTN(). |

| STEP | PROCEDURE |
|------|--|
| | Requirement: VOM reads between 0 and 10 ohms. |
| 69 | Remove VOM lead from TR() and connect it to TT(). |
| | Requirement: VOM reads between 0 and 10 ohms. |
| 70 | Disconnect the NRES() (SD5) and the REV() (SD4) leads from RTN(). |
| 71 | Strap RES() (SD3) lead to RTN(). |
| | Requirement: VOM reads between 0 and 10 ohms. |
| 72 | Condition VOM to measure resistance on X100 scale. |
| 73 | Disconnect the RES() (SD3) lead from RTN(). |
| | Requirement: VOM reads between 900 and 1100 ohms. |
| 74 | Remove VOM lead from TT(). |
| 75 | Condition VOM to measure dc voltage on 3 Vdc scale. |
| 76 | Connect VOM lead removed in Step 74, to TR(). |
| | Requirement: VOM reads between 0 and 1 volt dc. |
| 77 | Condition VOM to measure dc voltage on 300 Vdc scale. |
| 78 | Strap RES() (SD3) lead to RTN(). |
| | Requirement: VOM reads between +40 and +85 Vdc. |
| 79 | Disconnect the RES() (SD3), SEIZE() (SD1), and POL() (SD2) leads from RTN(). |
| 80 | Remove VOM lead from ground and connect it to TT(). |
| 81 | Condition VOM to measure resistance on X10000 scale. |
| | Requirement: VOM reads greater than 1000K ohms, <i>or</i> between 1K and 5K ohms. |
| 82 | Reverse VOM leads on TT() and TR(). |
| | Requirement: VOM reads greater than 1000K ohms, <i>or</i> between 1K and 5K ohms (alternate result from Step 81). |
| 83 | Remove strap from INHIBIT lead to SG lead (ground). |
| 84 | Condition VOM to measure dc voltage on 60 Vdc scale. |
| 85 | Connect VOM – lead to INHIBIT lead, and + lead to SG. |

| STEP | PROCEDURE |
|------|--|
| | Requirement: Voltage between -42.5 and -52.5 Vdc. |
| 86 | At DF, strap SEIZE() (SD1) lead to RTN() lead. |
| | Requirement: Less than 1 volt. |
| 87 | Disconnect strap from SEIZE() (SD1) lead. |
| | Requirement: Voltage between -42.5 and -52.5 Vdc. |
| 88 | At DF, strap REV() (SD4) lead to RTN() lead. |
| | Requirement: Less than 1 volt. |
| 89 | Remove strap from REV() (SD4) lead. |
| | Requirement: Voltage between -42.5 and -52.5 Vdc. |
| 90 | Repeat this procedure starting at Step 31 for other side ("A" or "B") of SM500 under test. |
| 91 | Remove 1000-ohm resistor placed in Step 48, disconnect and remove all straps connected to RTN(). |
| 92 | At the DF, cross-connect the distribute, scan points, and test pair from the MSU to the TBCU (as required). Refer to SD-97791-01 for wiring details. |

P. TBCU Shelf Turn-Up

| STEP | PROCEDURE |
|------|---|
| | Prerequisite: A <i>functional</i> carrier system is available. |
| | The dc test pair between the central office (CO) distributing frame (DF) and the RT has been verified in accordance with standard procedures for voice-frequency pairs prior to cross-connecting to the central office terminal (COT). The dc test pair <i>must</i> be loaded in accordance with engineering practices for voice-frequency pairs. |
| | Note 1: Carrier systems sharing the same dc test pair <i>must</i> have their INHIBIT leads multiplied together at the DF. |
| | A test line assigned to the intergrated SLC carrier system, consisting of a temporary telephone number is available. |
| | Note 2: If a step fails to meet requirements, replace the SM500. |
| | Note 3: The tests are most effective if the channel selected is equipped with coin service capability units; however, multiparty or single-party service units may be used with less complete test verification [no +130V (coin collect) or -130V (coin return)]. |
| 1 | At the RT, connect the 500-type telephone set to the subscriber side (drop side) of the channel selected for test. |

| STEP | PROCEDURE |
|------|-----------|
|------|-----------|

2 At the RSB or local test cabinet, access the test line via an available test trunk in accordance with standard procedures.

Requirement: The signature (seizure) of the central office channel unit should be evident from standard test (75-volts leakage *tip* to ground and *ring* to ground, with approximately 50-volts ballistic deflection). ♦If a SLC Series 5 special service channel unit (CS2) is used, an 82-volt leakage appears on tip and ring to ground in addition to a 24-volt FEMF on both tip and ring to ground.♦

3 Operate the REV and +STA key (also G key if coin unit).

Requirement: The VMA meter indicates a steady deflection of approximately 85 volts or greater.

4 Release the +STA key (and G key if operated).

Requirement: The VMA meter should indicate approximately 0 volts.

5 By operating (and releasing) the REV key, with and without the G key operated, verify the test connection.

Requirement: The test connection should have approximately 0-volts leakage with a ballistic indication corresponding to one bridged ringer.

6 Release all keys.

7 With the MONITOR key released and the 3WO key operated, operate the REV, FEMF, and VM REV keys as required to obtain dc response.

Requirement: The VMA meter indications should be as shown for the type of channel unit selected and the keys operated as shown in Table AC.

| ♦TABLE AC♦ | | |
|---------------------------------------|---------------------------------------|---------------------------------------|
| CHANNEL TYPE | KEY(s) OPERATED | VMA INDICATION |
| Single-party or SPOTS (WP36 and WP37) | (a) REV, 3WO (b) FEMF, 3WO | approx. 100 volts approx. 48 volts |
| Multiparty | (a) FEMF, REV, 3WO (b) 3WO | approx. 48 volts approx. 0 volts |
| Coin | (a) FEMF, REV, VM REV, 3WO (b) 3WO | approx. 48 volts approx. 0 volts |

8 Release all keys.

9 Release test trunk.

10 At the DF, ground the INHIBIT lead coming from the carrier system.

| STEP | PROCEDURE |
|------|--|
| 11 | At the RSB or local test cabinet, access the test line again. |
| 12 | Operate the REV and +STA keys (also G key if coin channel unit). <i>Requirement:</i> The VMA meter indicates deflections at a 120 IPM rate. |
| 13 | Release all keys. |
| 14 | Release test trunk. |
| 15 | At the DF, remove the ground on the INHIBIT lead (placed in Step 10). |
| 16 | Remove the test line and the 500-type telephone set connected in Step 1. |

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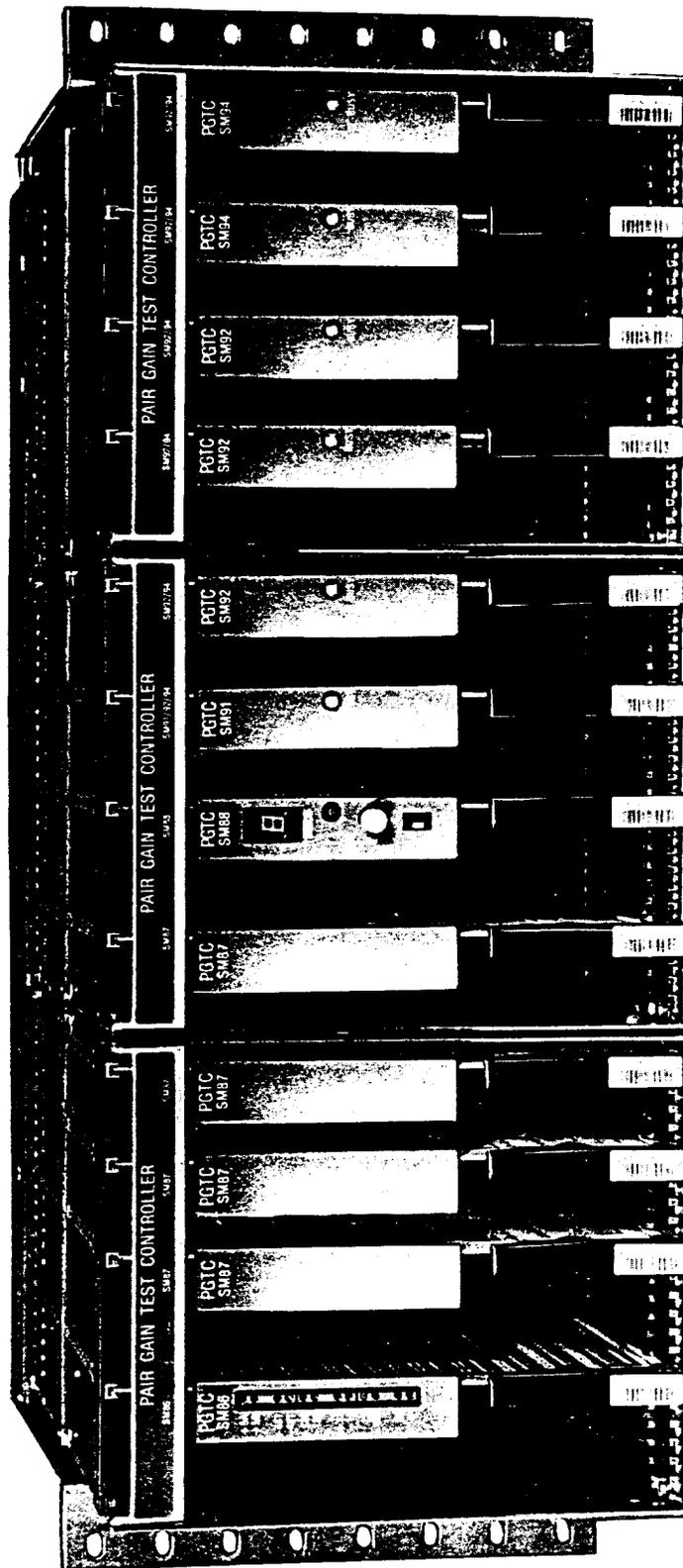


Fig. 1—J1C142A-(), L1 PGTC Control Shelf

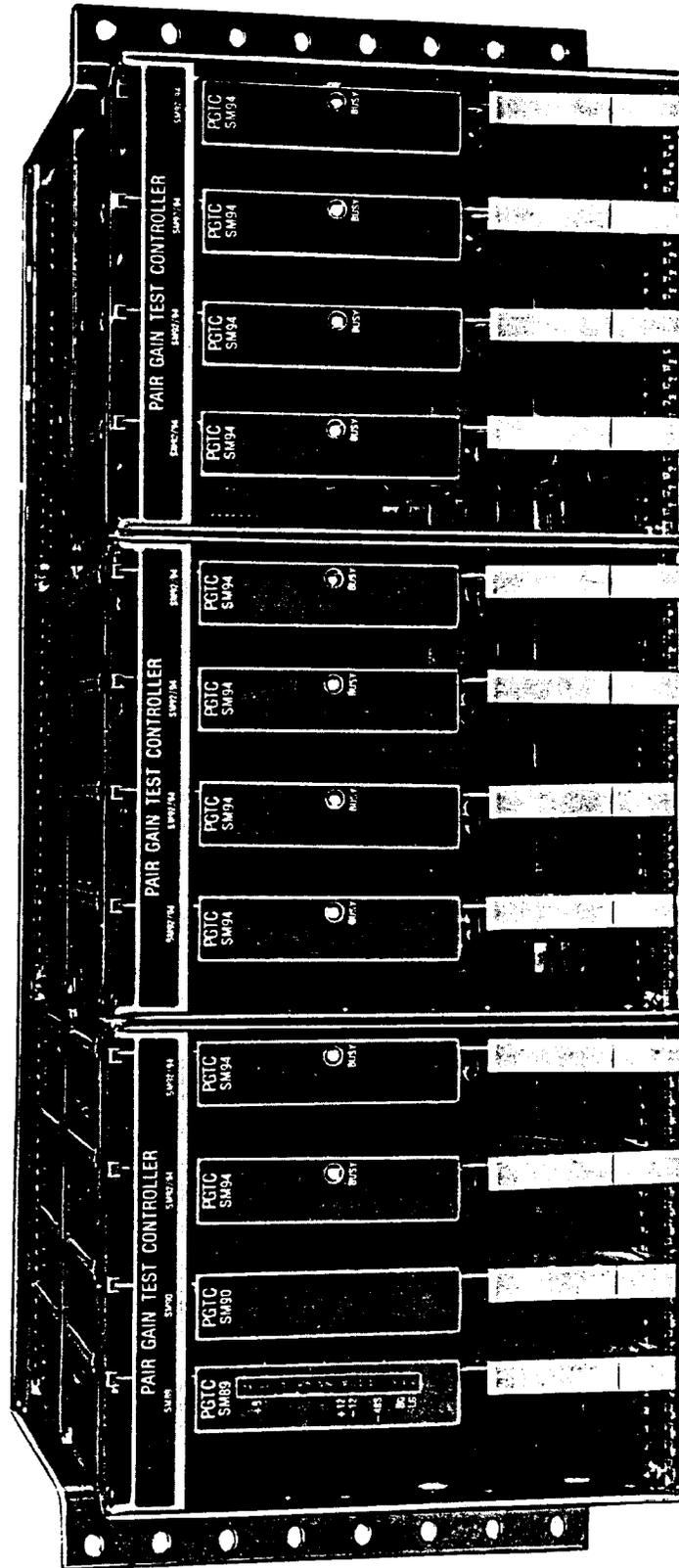
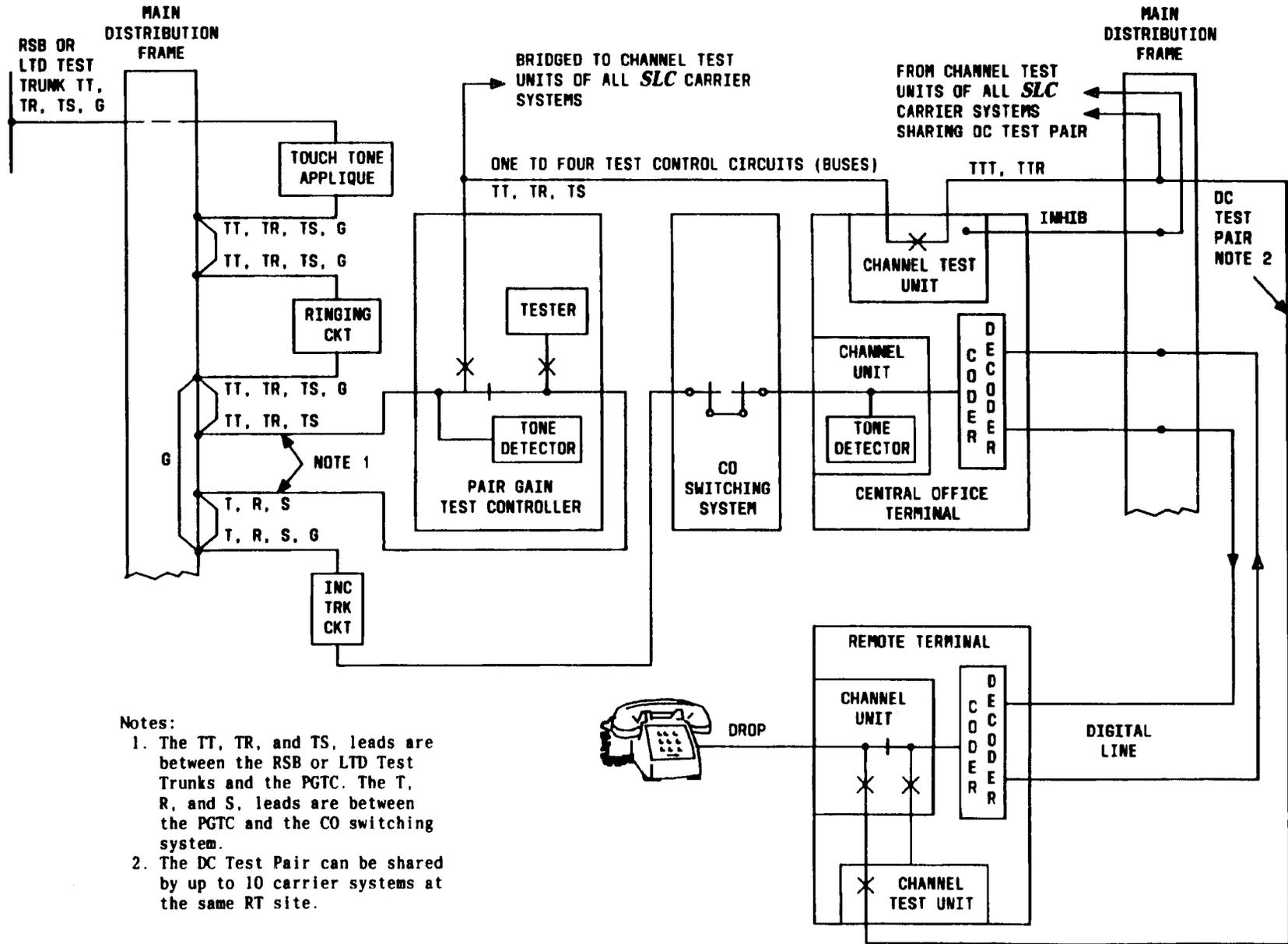


Fig. 2—J1C142A(-), L2 PGTC Expansion Shelf



Notes:

1. The TT, TR, and TS, leads are between the RSB or LTD Test Trunks and the PGTC. The T, R, and S, leads are between the PGTC and the CO switching system.
2. The DC Test Pair can be shared by up to 10 carrier systems at the same RT site.

Fig. 3—Typical Test Connection Through PGTC

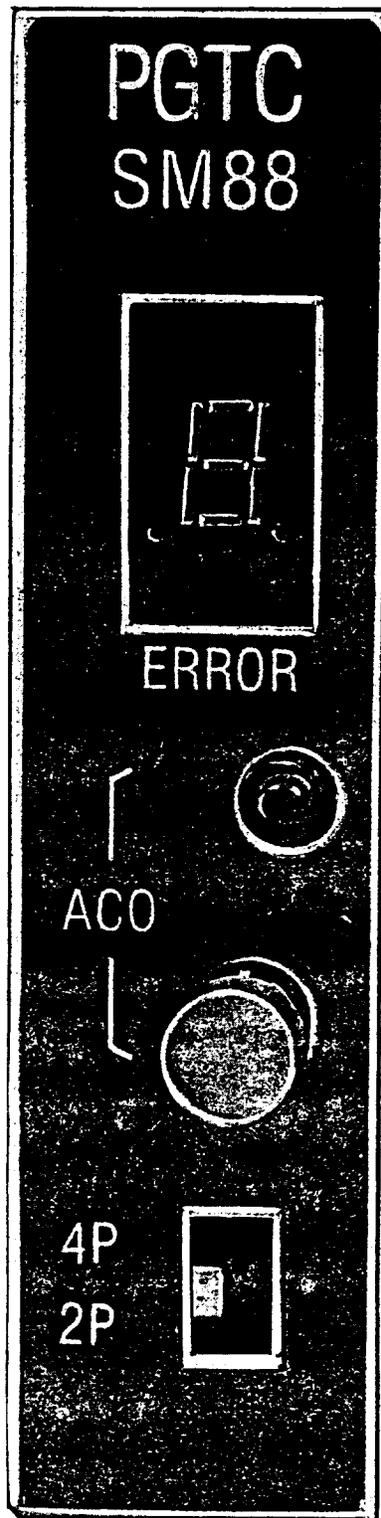


Fig. 4—PGTC—Error (Trouble) Display

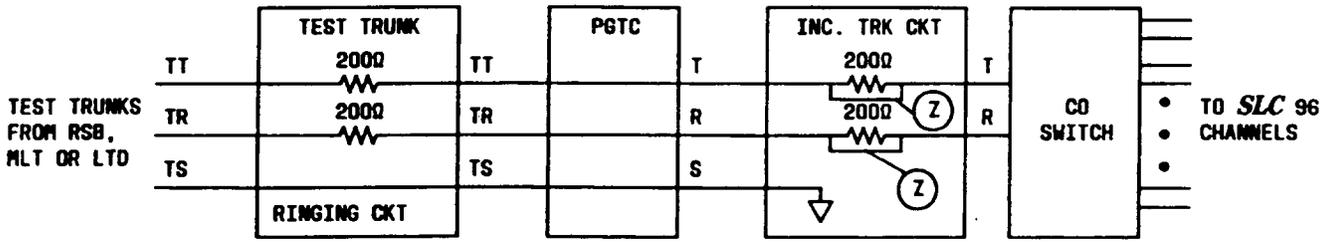


Fig. 5—CO Equipped With SD-96474-01 Ringing Circuit

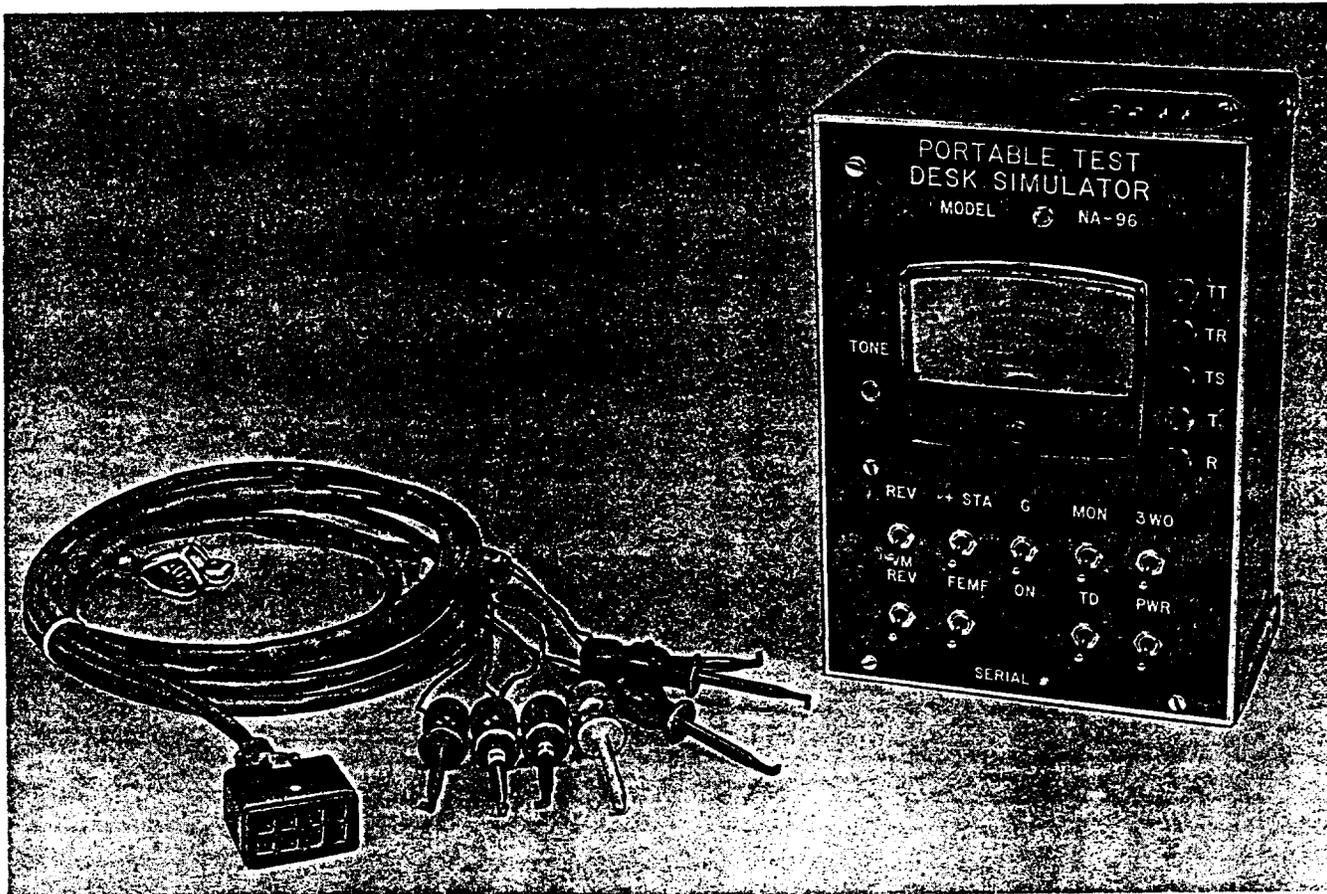


Fig. 6—NA96L1 PORTABLE TEST DESK SIMULATOR

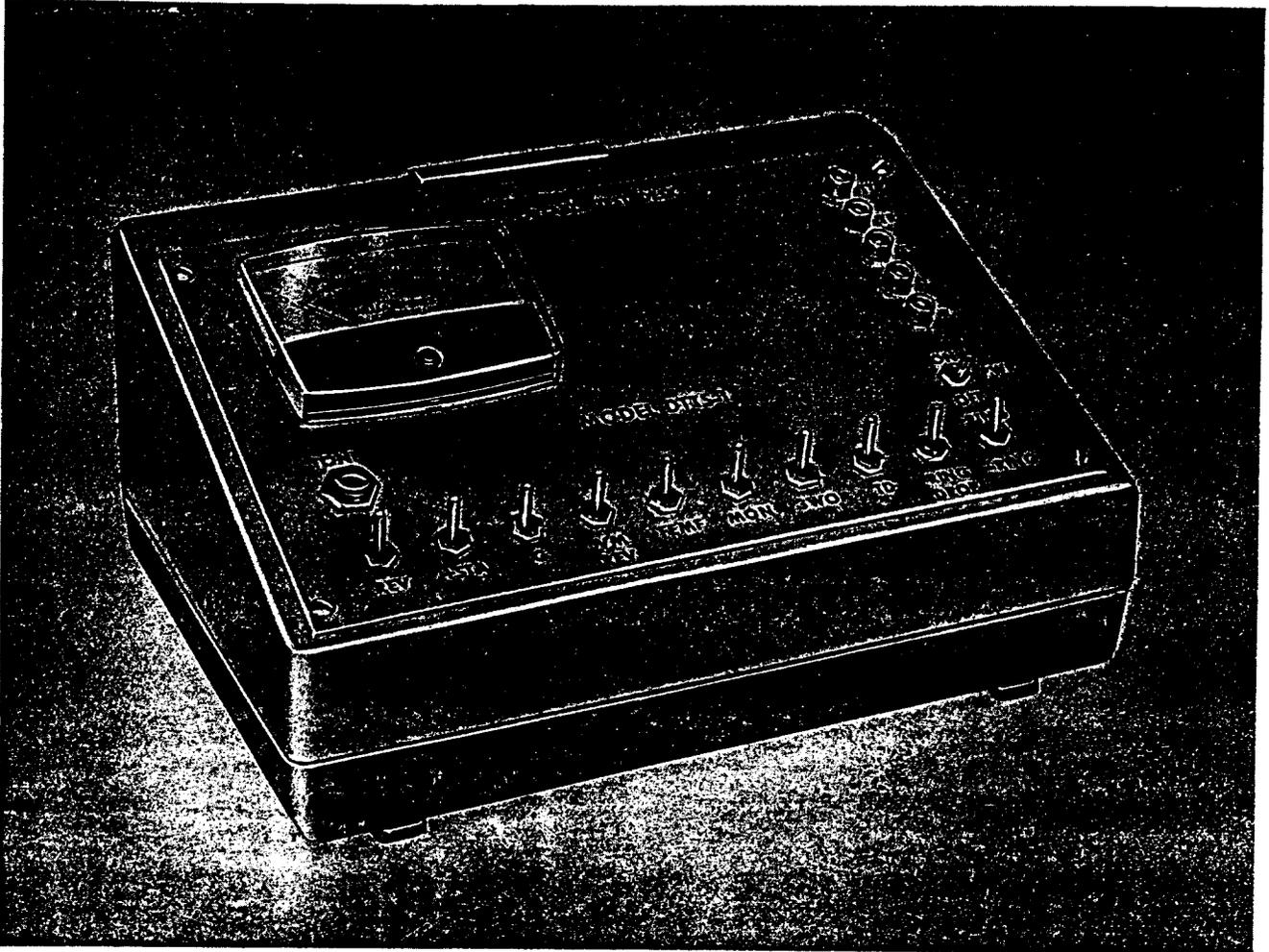


Fig. 7—DTTS-1 MINIATURE PORTABLE TEST DESK

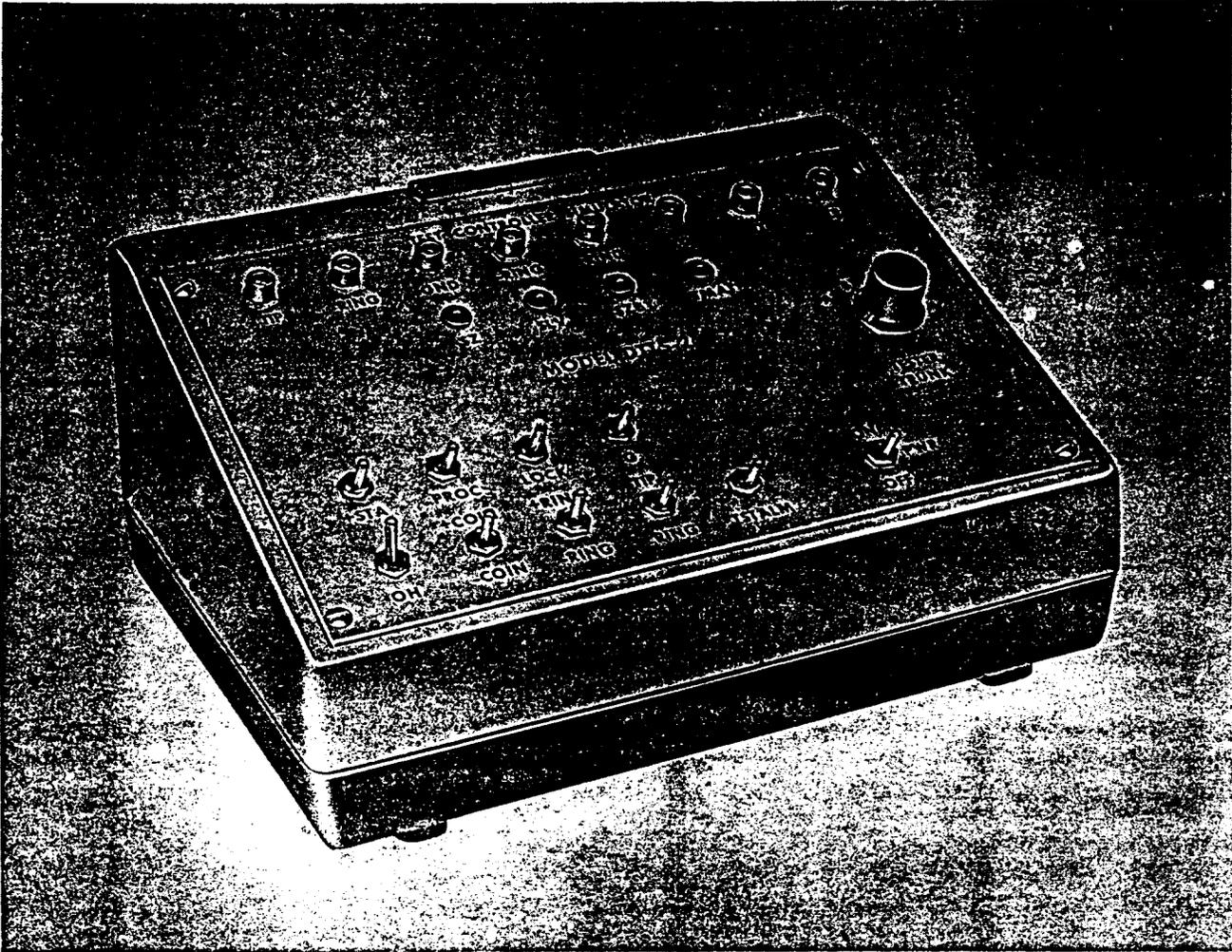


Fig. 8—DTTS-2 TEST CONTROLLER SIMULATOR

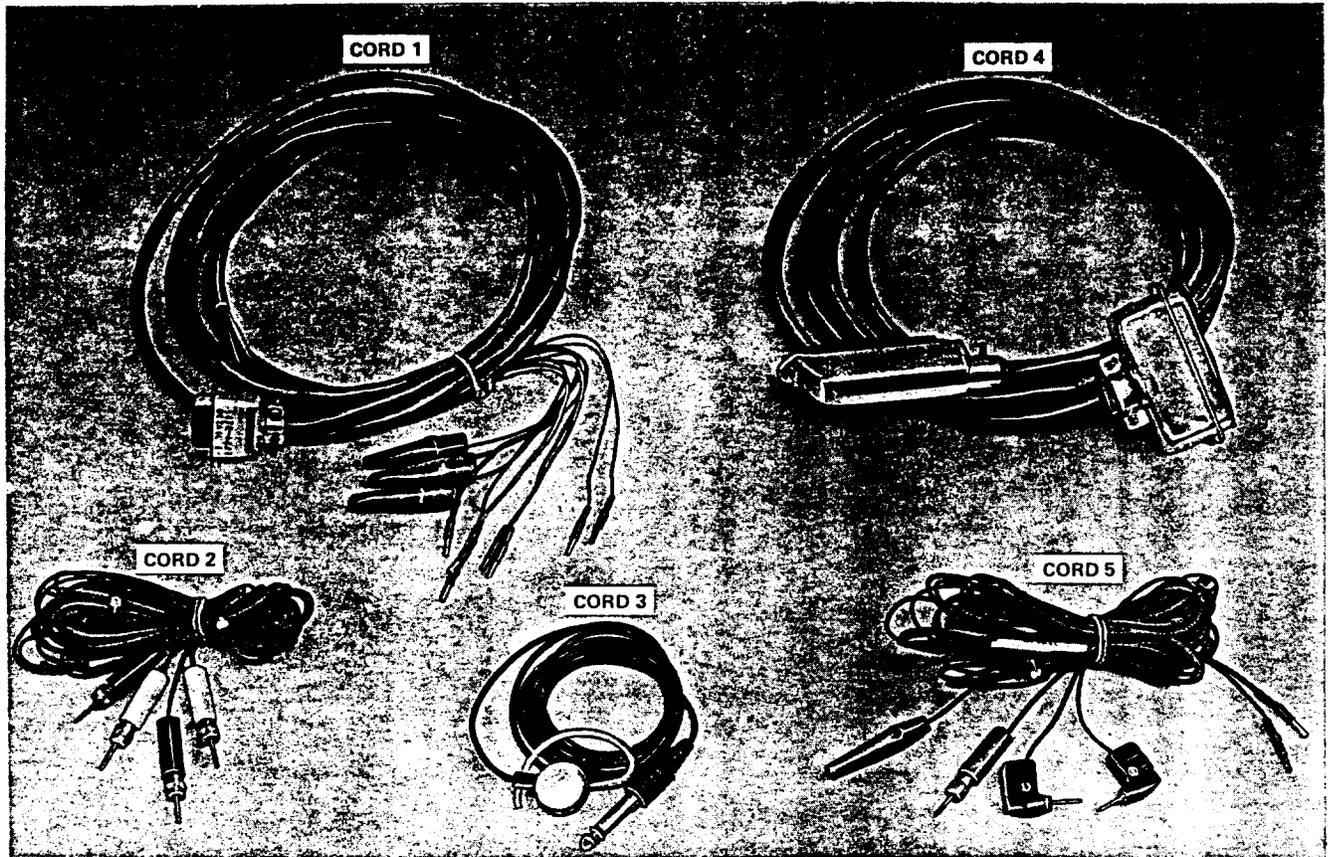


Fig. 9—Test Cords for DTTS-1 and DTTS-2 Test Sets

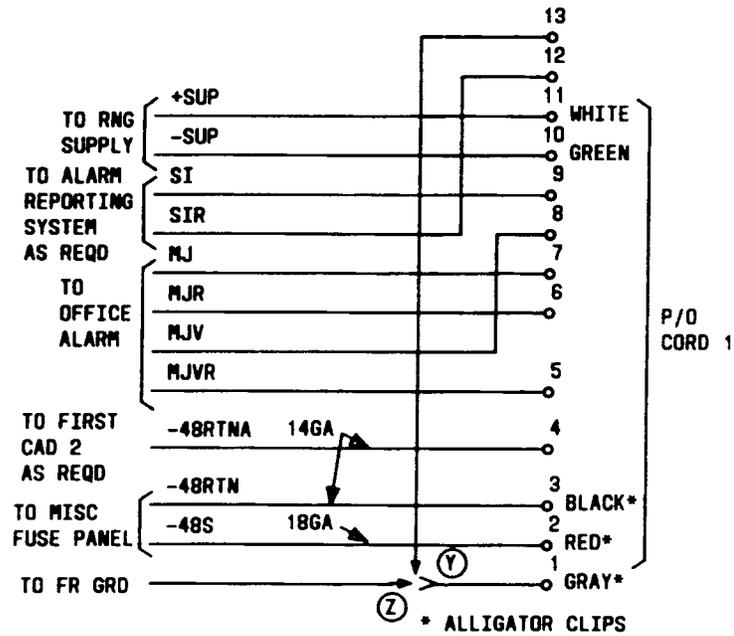


Fig. 10—Cord 1 Connections to PGTC

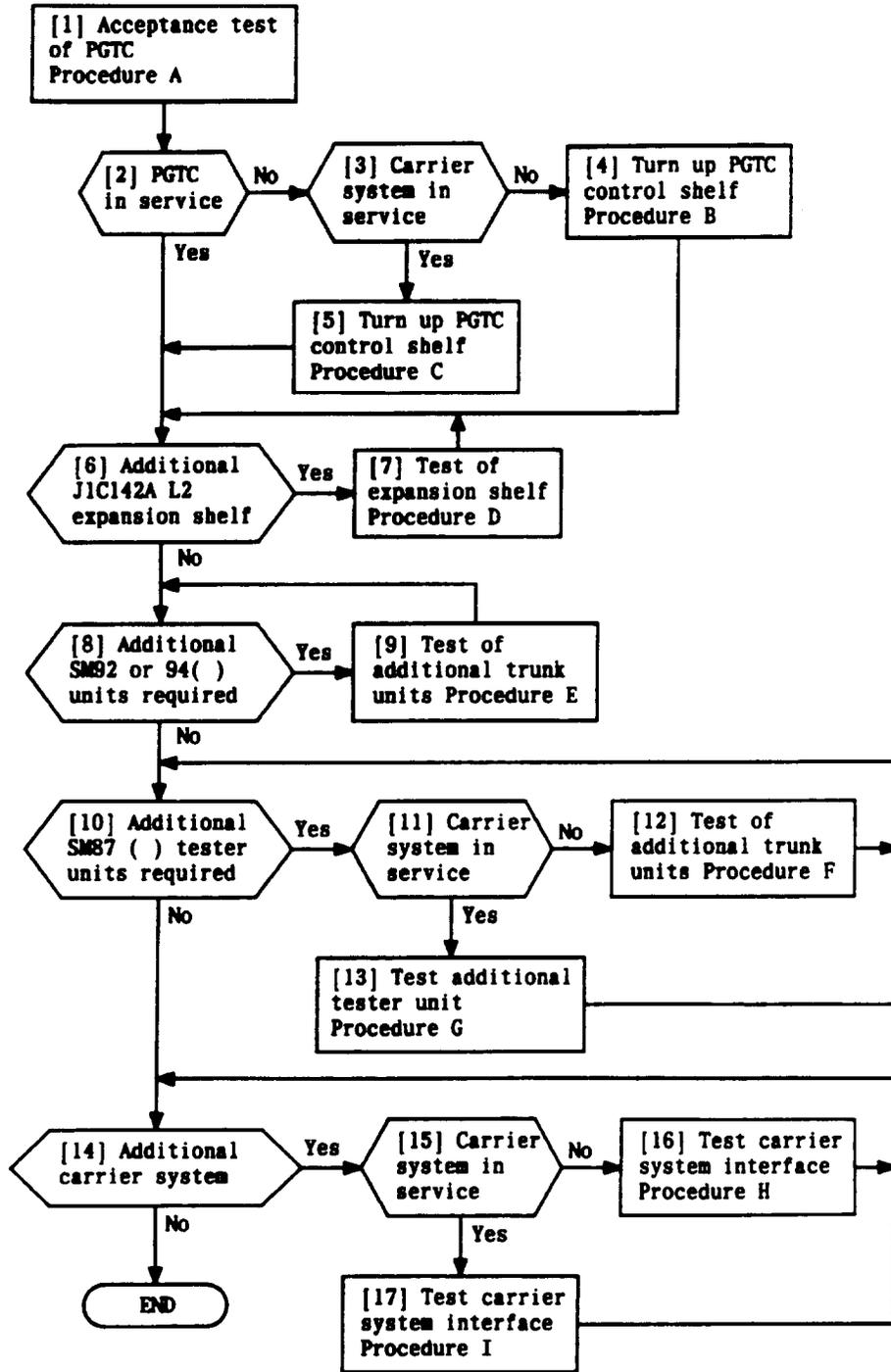


Fig. 11—PGTC Test Procedures Flowchart

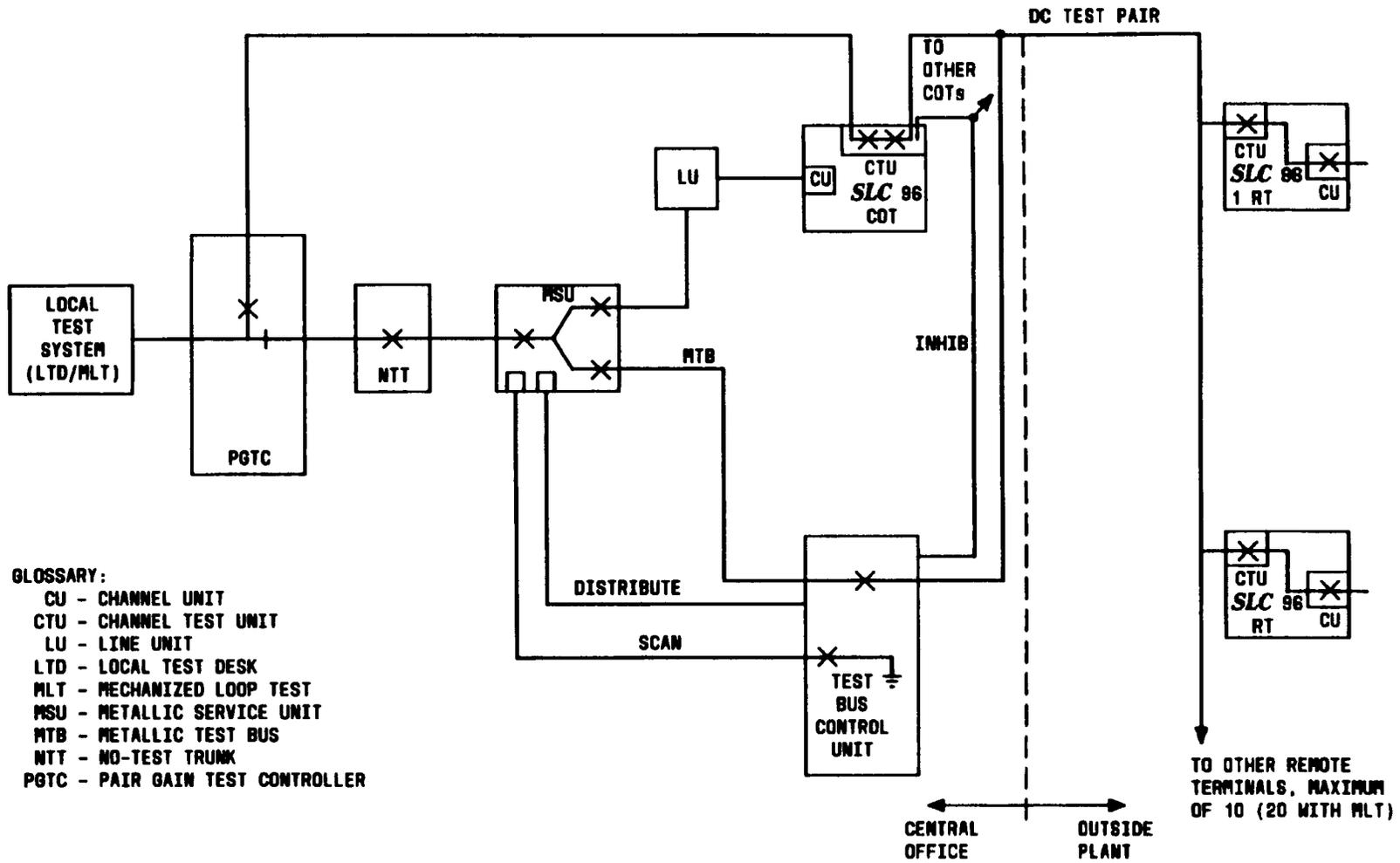


Fig. 12—Test Circuit Using PGTC and Test Bus Control Unit

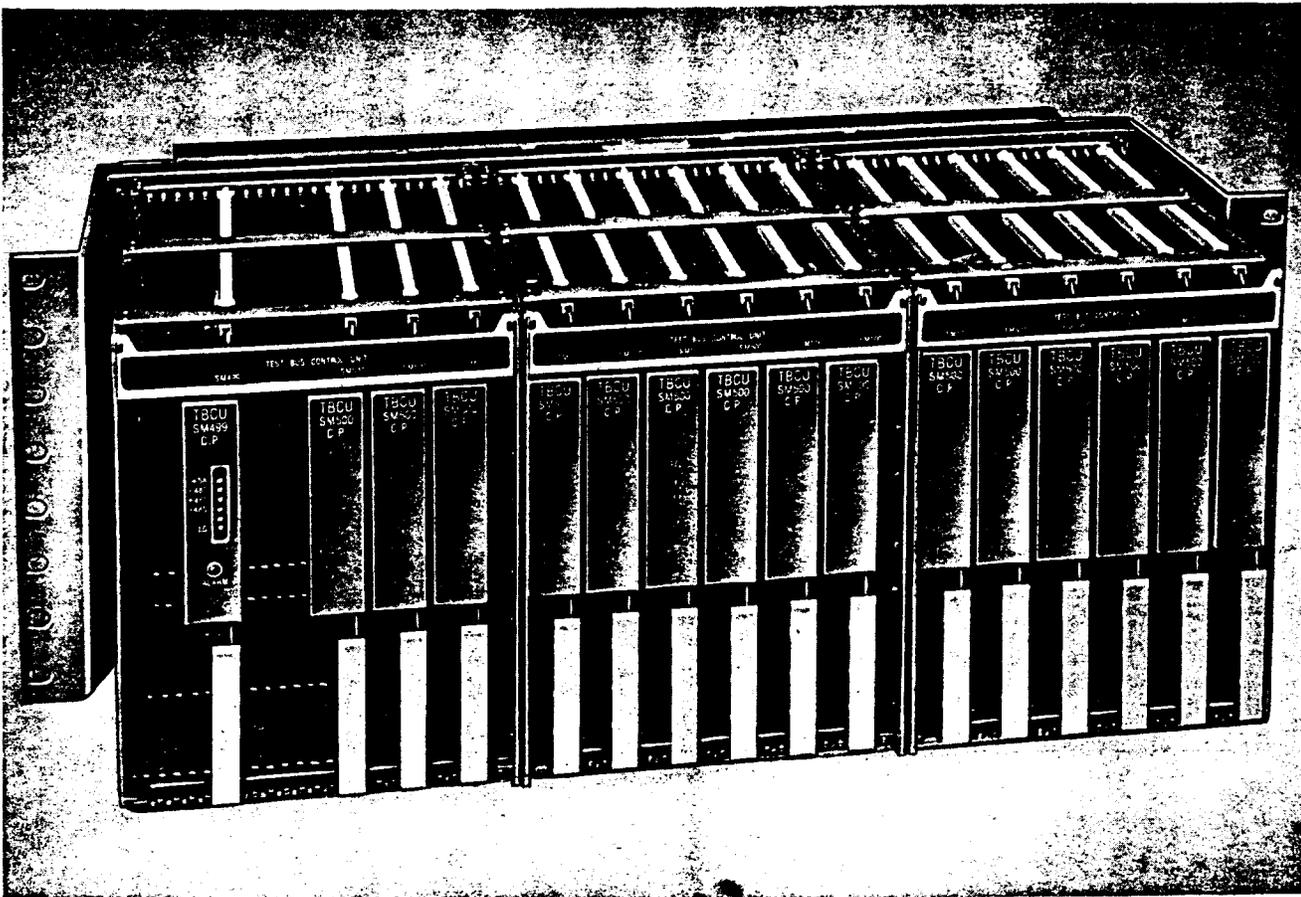


Fig. 13—Test Bus Control Unit

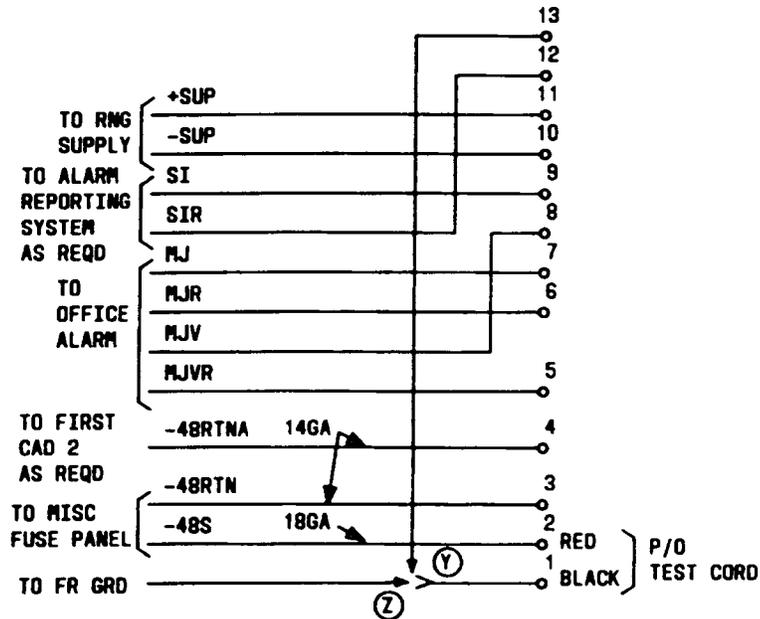


Fig. 14—NA96 Test Cord Connections to PGTC

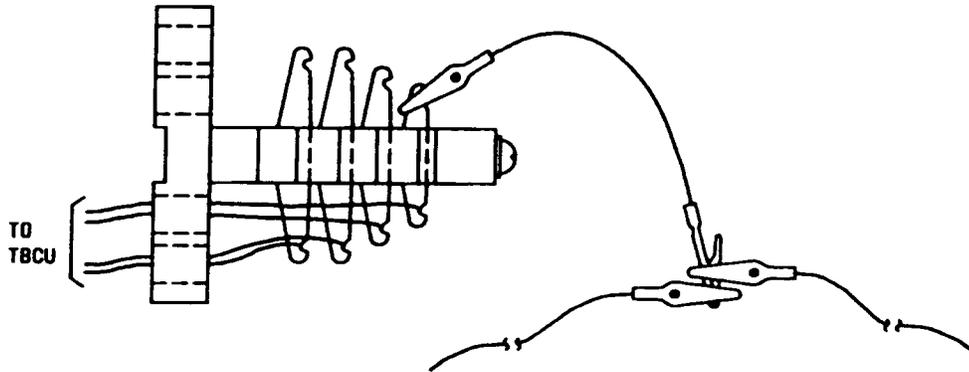


Fig. 15—Example—Multiple Connections to RTN Lead

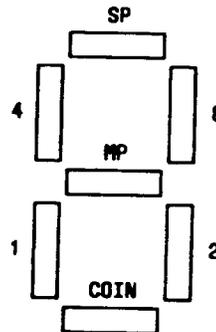


Fig. 16—SM88C Test Failure Codes

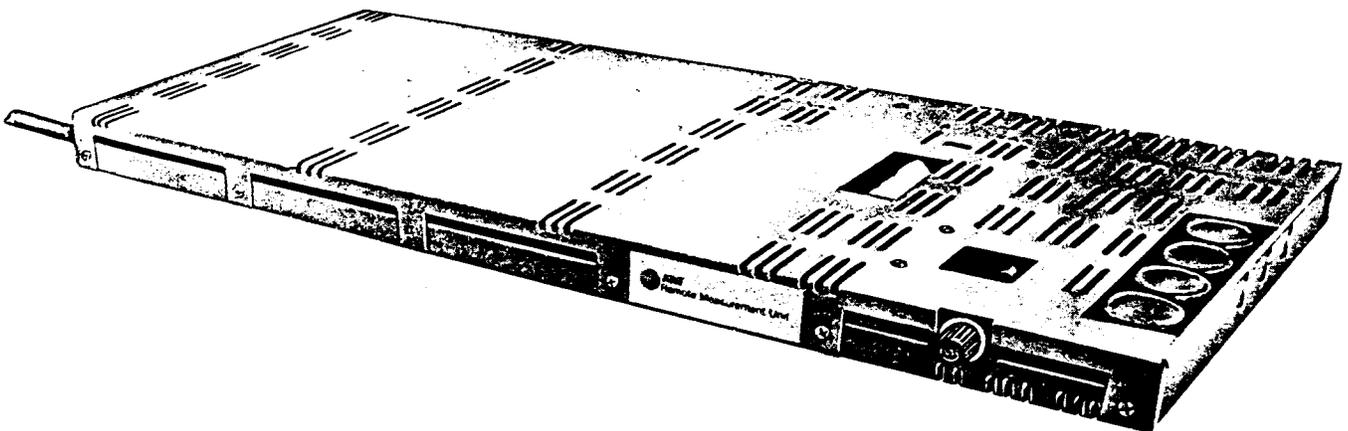


Fig. 17—ED-7C654-30, G1 Remote Measurement Unit (RMU)