5ESS®Switch
MLT Interface Test and Maintenance Guide
5E13 and Later Software Releases

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1. INTRODUCTION

1.1 PURPOSE

The MLT Interface Test and Maintenance Guide provides descriptions of the different MLT configurations used in the testing of *5ESS*® switch subscriber loops from various remote maintenance facilities. Acceptance test procedures that verify the installation and operational readiness of a new MLT interfaced with a switch are also included. It also provides guidelines, references, and procedures to aid in the localization and clearing of faults in the MLT switch interface.

The guide is designed for telephone company personnel at both the MLT and switch sites and for appropriate customer support personnel at both on-site and customer support center locations.

This document does not attempt to duplicate the large volume of documentation that is already available at the mechanized loop test system (MLT) and *5ESS*® switch sites (see Section 1.7). It is primarily designed to provide guidance to personnel at both sites to ensure that the MLT interface to the *5ESS*® switch is operational at the time of installation. This document references other available documentation and provides procedures not duplicated or not readily apparent in other documents.

This document provides the following:

- Descriptions of the different MLT interface configurations (except MLT-1) used in the testing of subscriber loops from a remote maintenance facility
- Answers to frequently asked questions
- The acceptance test that verifies the installation and operational readiness of a new MLT interface to the switch
- Guidelines, references, and procedures to aid in the localization and clearing of faults in the MLT and switch interface.

The document covers software releases 5E13 and later. Where a procedure or parts of a procedure applies to a specific software release, the software release is indicated.

This document is intended for maintenance personnel at both the MLT and *5ESS*® switch sites and for appropriate Lucent Technologies customer support personnel at both on-site and customer support center locations. It is assumed that the procedures that apply to the ***MLT site*** (included in Sections 5 and 7) are performed by the MLT facilities manager (FACMAN) or a representative who has a thorough understanding of the MLT architecture and function (hardware and software) and has a knowledge of installation/repair, Repair Service Bureau (or Maintenance Center), and central office (CO) operations. It is also assumed that the procedures that apply to the ***5ESS*® *switch site*** are performed by the network maintenance supervisor or a representative who has a thorough understanding of the architecture and function (hardware and software) of the switching system and a knowledge of installation/repair, Repair Service Bureau (or Maintenance Center), MLT, and other operations support system operations.

1.2 UPDATE INFORMATION

1.2.1 REASON FOR UPDATE

This document (Issue 9.00B) is being reissued to include information for the No-Test Trunk Unit (NTTU), see Section 2.4 . In general, references using the SN-107 circuit pack have been changed to the term "NTTU interface".

This document is normally updated on a per-page basis. Change bars (|) are used to indicate significant changes. Cosmetic changes are not indicated with change bars.

1.2.2 SUPPORTED SOFTWARE RELEASES

In accordance with the *5ESS*® Switch Software Support Product Plan, the 5E12 software release is rated Discontinued Availability (DA) as of September, 2000. The information supporting 5E12 and earlier software releases is being removed over time, instead of concurrently, from all documentation.

If you are supporting offices that use a software release prior to 5E13 and you have a need for the information that is being removed, retain the associated pages as they are removed from the paper documents,or retain the earlier copy of the CD-ROM.

1.2.3 TERMINOLOGY

1.2.3.1 No-Test Trunk (NTT) Interface

Two different implementations of the NTT interface are provided on the *5ESS*® switch:

(1) The traditional implementation has been via the SN-107 circuit packs in the analog trunk unit. The SN-107 circuit packs terminate to No-Test Trunks and provide metallic test bus (MTB) connections to the MMSU.

(2) The newer implementation is the "Semi-Integrated No-Test Trunk" (NTTU). The NTTU terminates No-Test Trunks, converts the NTT signalling and control to a digital trunk format, connects to the switch via a digital trunk, and provides MTB connections to the MMSU.

With either implementation, the interface to the LTS is the same, therefore the term "NTT interface" is used in this manual for both the SN-107 and the NTTU interfaces to the switch.

1.3 ORGANIZATION

1.3.1 GENERAL

This manual contains the following sections:

- ***SECTION 1 - INTRODUCTION:*** This section contains an introduction to this manual and references for additional MLT and 5ESS switch documentation.

- ***SECTION 2 - SYSTEM DESCRIPTION:*** This section provides an overview of the MLT and *5ESS*® switch interface equipment and software with supporting high-level block diagrams. Different test configurations are described in detail with supporting high-level and detailed block diagrams.

- ***SECTION 3 - QUESTIONS AND ANSWERS:***

  This section provides answers to frequently asked questions that can be valuable in both the performance of the acceptance test and in trouble clearing activities.

- ***SECTION 4 - ACCEPTANCE TEST GUIDELINES:***

  This section provides guideline information for the acceptance test procedures in Section 5 .

- ***SECTION 5 - ACCEPTANCE TEST PROCEDURES:*** This section provides the checks and procedures to be performed on a new MLT interface to the *5ESS*® switch. The checks include verification of essential MLT data files and switch office dependent data (ODD) using recent change views. Successful completion of these checks and procedures provides reasonable assurance that the applicable hardware and software have been correctly installed and can perform their intended functions.

- ***SECTION 6 - CORRECTIVE MAINTENANCE GUIDELINES:***

This section provides the guidelines and references for the procedures in Section 7 .

- ***SECTION 7 - CORRECTIVE MAINTENANCE PROCEDURES:***

  This section provides individual corrective maintenance procedures for the MLT interface. The procedures are provided to aid maintenance, growth, and installation personnel in localizing and correcting faults in the MLT and *5ESS*® switch interface. Two tables containing trouble responses and their probable causes, with emphasis on the *SLC*® carrier systems, are provided. If a problem involving SLC carrier system testing cannot be resolved using these tables, detailed procedures are provided to systematically test the SLC carrier system and its switch and MLT interfaces.

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1.7 REFERENCES

1.7.1 MECHANIZED LOOP TESTING SYSTEM (MLT-4) DOCUMENTATION

The Lucent Technologies Mechanized Loop Testing System (MLT-4) documents are available through CIC. The document set consists of the following user guides:

190-425-900	*MLT-4 Installation Guide*
190-425-905	*MLT-4 System Description*
190-425-906	*MLT-4 Operation, Administration, and Maintenance (OA&M) Guide*
190-425-907	*MLT-4 System Administration Mask (SAM) Usage Guide*
190-425-908	*MLT-4 Local Administration and Maintenance (LAM) Usage Guide*
190-425-909	*MLT-4 Test Requests User Guide*
190-425-910	*MLT-4 Test Results User Guide*
190-425-911	*MLT-4 Error Message Guide*
190-425-912	*MLT-4 Repair Center Instructions Guide*
190-425-913	*MLT-4 Loop Test System (LTS) Diagnostics Usage Guide*
190-425-914	*MLT-4 LTS Diagnostics Test Codes*
190-425-915	*MLT-4 Complete Guide to the Remote Measurement Unit (RMU)*
190-425-916	*MLT-4 Complete Guide to the Compact Measurement Unit (CMU)*
190-425-917	*MLT-4 Local Metallic Access Port (LMAP) Diagnostics Guide*
190-425-918	*MLT-4 Data Communications Network (DCN) Diagnostics Usage Guide*
190-425-919	*MLT-4 Maintenance and Administration (MA) Training Guide*

For copies of the MLT-4 documents, contact your Lucent Technologies Customer Support Representative.

1.7.2 SWITCH SITE DOCUMENTATION

Each *5ESS*® switch office is provided an extensive documentation package to support the testing, operation, administration, and maintenance of the switch. This documentation package includes, but is not limited to, Lucent Technologies manuals, practices, guides, handbooks, and drawings.

The following switch documents may prove valuable in the performance of the procedures in this document:

235-100-125	*System Description*
235-105-110	*System Maintenance Requirements and Tools*
235-105-200	*Precutover and Cutover Procedures*
235-105-210	*Routine Operations and Maintenance Procedures*
235-105-220	*Corrective Maintenance Procedures*

□ 235-105-231	*Hardware Change Procedures - Growth*
□ 235-105-250	*System Recovery*
□ 235-105-500	*Maintenance Reference Handbook*
□ 235-118-2xx	*Recent Change Procedures/Reference*(Value of *xx* is software release dependent)
□ 235-600-700	*Input Messages Manual*
□ 235-600-750	*Output Messages Manual*
□ 235-080-100	*Translation Guide*
□ SD-5D007-01	*Assignment Rules*
□ SD-5D014-02	*Application Schematic for 5ESS® Switch.*

The following associated Lucent Technologies documents may also prove valuable in the performance of procedures in this document:

□ 363-202-100	*SLC® 96 Carrier System - General Description*
□ 363-202-300	*Pair Gain Test Controller and Test Bus Control Unit - Description and Installation*
□ 363-202-400	*SLC 96 Carrier System - Central Office Terminal*
□ 363-202-401	*SLC 96 Carrier System - Remote Terminal*
□ 363-205-100	*SLC Series 5 Carrier System - General Description*
□ 363-205-300	*Extended Test Controller Description, Turnup, and Maintenance Circuits*
□ 363-205-400	*SLC Series 5 Carrier System - Central Office Terminal - Acceptance and Turnup*
□ 363-205-401	SLC Series 5 Carrier System - Remote Terminal Acceptance and Turnup
□ 363-205-406	*SLC Series 5 Carrier System - End-to-End System Tests*
□ 363-205-500	*SLC Series 5 Carrier System - Maintenance and Troubleshooting*
□ 660-168-274	*Maintenance - Preparation and Test Procedures for No-TestTrunk Circuits Using KS-22475 Trunk Test Set With KS-22475 L2 Adapter*

2. SYSTEM DESCRIPTION

2.1 INTRODUCTION

This section includes the following:

- An overview of the mechanized loop testing system (MLT) including a general discussion of the purpose of an MLT and high-level descriptions of the three generations of MLTs in use today
- A brief description of the *5ESS*® Switch metallic network
- A high-level description of a typical loop testing system (LTS) (nonintegrated MLT) metallic test interface to the switch with an accompanying high-level block diagram
- A high-level description of a typical integrated MLT (IMLT) metallic test interface to the switch, including switch software processes, with an accompanying high-level block diagram
- A brief description of the MLT callback feature
- Descriptions of the various hardware units involved in LTS and IMLT metallic testing of switch analog subscriber loops (lines) with accompanying illustrations
- Detailed descriptions of the various IMLT interface configurations and test sequences used in the metallic testing of switch analog lines with accompanying high-level and detailed block diagrams
- High-level descriptions of the various LTS interface configurations and test sequences used in the metallic testing of switch analog lines with accompanying high-level block diagrams
- An overview of the integrated services digital network (ISDN) with emphasis on the major differences between ISDN and analog services that impact MLT testing of switch ISDN digital subscriber lines (loops) (DSLs)
- Brief descriptions of LTS and IMLT metallic tests of ISDN lines
- Description of MLT/ISDN digital testing and analysis with accompanying high-level block diagrams, including the new digital test interface for the LTS application, new switch hardware and software, digital loopback tests, and switch-based digital information.

2.2 MLT OVERVIEW

2.2.1 PURPOSE

The MLT provides the capability to remotely test subscriber loops of various switching systems from a centralized maintenance facility. It is an essential component of the automatic repair service bureau (ARSB) flow-through operations management system for the switch owner. This manual covers the LTS and IMLT configurations used to remotely test the following:

- Lines connected to the switch
- Main distributing frame (MDF)
- Remote equipment such as remote switching modules (RSMs), multimodule RSMs (MMRSMs), optically integrated remote switching modules (ORMs), and two-mile optically remote modules (TRMs)
- Digital loop carrier (DLC) systems.

The IMLT configuration is applicable only to the *5ESS*® switch.

2.2.2 EVOLUTION OF MLT

The three generations of MLT in use today represent evolutions in the MLT software architecture that further the efforts to bring the many ARSB processes together on the same high capacity front end (HCFE). They do not affect the hardware configuration at the *5ESS*® switch level.

The MLT-1 system consists basically of a front end (FE) processor, an 11/34 controller, and the loop testing frame (LTF). It is the LTF that interfaces with the switch, through the no-test trunk (NTT) interface, to perform non-interactive testing of the subscriber loops.

The MLT-2 system is a newer generation software architecture which supports all the features of MLT-1 with the addition of providing interactive testing capability. It incorporates the same FE processor as MLT-1 plus a data communication network (DCN). The DCN links the FE processors with the various test systems, a loop testing system (LTS) for the testing of subscriber loops through the same NTT interface as with the LTF, and/or a directly connected test unit (DCTU) which is the test hardware integrated into the switch to perform essentially the same testing as the LTS. The DCTU is shared with the trunk and line work station (TLWS) for performing manual tests on lines. The DCTU testing interface is also referred to as IMLT.

Note that an LTF can be associated with any *5ESS*® switch and can test lines with either an LTS or a DCTU. When either of these arrangements are provided, the LTF does the noninteractive testing while the LTS or the DCTU does the interactive testing. Although a DCTU is provided in most switches, it may not be used for MLT testing. In this case the LTS is used. Only one or the other may be used for MLT testing. If an LTF is not provided, both interactive and non-interactive testing is performed by either the LTS or the DCTU.

NOTE: The MLT-3 does not contain any new testing hardware. The software architecture is incorporated into the MLT-3 system.

This manual covers the MLT-2 and MLT-3 LTS and IMLT configurations.

Testing the basic POTS customer loop elements of the central office, outside plant, and customer premises equipment was a manual and distributed process in the past. It involved using a trained tester who ran manual tests on the line from a device known as the Local Test Desk.

Loop testing methods became increasingly automated with MLT-1 which employed computerized analysis of the line using the Loop Test Frame (LTF) along with analysis of line records supplied by the Loop Maintenance Operating System (LMOS). The MLT-1 system consisted basically of a front end (FE) processor, an 11/34 controller, and the LTF that interfaced with the switch through the no-test trunk (NTT) interface to perform non-interactive testing of subscriber loops.

In MLT-2, the Loop Testing System (LTS) replaced the LTF with more centralized testing. It supported all features of MLT-1 with the addition of providing interactive testing capabilities. A Data Communications Network was incorporated which linked the FE processors with multiple LTSs for the testing of subscriber loops through the same NTT interface as the LTF. Improvements to MLT-2 continued with the addition of new test heads (CMU and RMU) that employed a dial-up testing capability, and the Directly Connected Test Unit (DCTU) that was integrated into the *5ESS*® switch to perform essentially the same testing as LTS. The DCTU is also referred to as Integrated MLT (IMLT) and is shared with the Trunk and Line Work Station (TLWS). Upgrading continued in MLT-3 as VAX 8600 Series processors replaced the PDP 11/70 and the local *DATAKIT*® network was added.

The LTF can be associated with any *5ESS*® switch and can test lines with either an LTS or DCTU. When either of these arrangements are provided, the LTF does the non-interactive testing while the LTS or DCTU does the interactive testing. Although the DCTU is provided in most switches, it may not be used for MLT testing. In this case, the LTS is used. Only one or the other may be used for MLT testing. If an LTF is not provided, both interactive and non-interactive testing is performed by either the LTS or DCTU.

The MLT-4, upgrades the processor to the more advanced HP 9000 Series computer. Features include the *Oracle*^{SM} database, an improved communications interface to the switch, simplified administrative user interface, and the addition of a local interface to non-Lucent Technologies digital switches such as the DM100.

The MLT test head, the Digital Measurement Unit (DMU) can be used as an LTF replacement [LTF has been Manufacturer Discontinued (MD) and is no longer supported] or to supplement the LTS or DCTU. The MLT communicates with the DMU over the TCP/IP network as shown in Figure 2-1 . It establishes a TCP connection to an Access Server that in turn establishes a connection to the DMU.

Figure 2-1 DMU Metallic Test Interface DMU Metallic Test Interface

2.3 *5ESS*^{TM} SWITCH METALLIC NETWORK

Lines and trunks terminating on the switch are connected to each other through a digital (switching) network. This digital network provides virtually blockage free switching of voice and data. A separate and much smaller network has been designed for metallic access (MA). This metallic network has three users:

(1) Analog call processing uses it for such things as ringing phones and manipulating coin phones.

(2) Switch diagnostics test all circuits related to the metallic network.

(3) Subscriber loop testing uses the metallic network to gain access to the outside plant for metallic testing of subscriber loops.

2.4 LTS METALLIC TEST INTERFACE

Figure 2-2 illustrates the major components of a typical LTS metallic test interface to the switch. This configuration uses an external unit, the LTS, to test switch lines through the NTT interface. The figure shows that the LTS port circuits are directly connected (through wire facilities) to the individual NTT interfaces. Separate exchange keys (EXKs) are required for the LTS to know which NTTs to select, because the same office code (NNX or NXX) can exist simultaneously in the host and any of the remote modules. Note that the NTT interface ports can be connected to any internally accessible subscriber's line through switching in the modular metallic service unit (MMSU). Note that, each remote SM must have its own NTT an MMSU for testing. The exception is the Muilt-Module Remote Switching Module (MMRSM). Since the RSMs of an MMRSM have an interconnected metallic network, one NTT and MMSU can serve the RSM in an MMRSM. An LTS can serve up to 16 NTTs and main distributing frame test trunk circuits (MDF-TTCs) total.

The LTS and NTT circuit units are common to MLT testing of many switching systems and are not covered in this document. A System Description of the LTS is in the MLT-4 document 190-425-902.

> ***NOTE:*** The term "MMSU" is used in this manual for both the MMSU and the MSU. Although the MSU is no longer manufactured, the MSU is still in use in many offices. The MSU is similar to the MMSU, but is limited to a pair of shelves. It is fuctionally similar to a single shelf MMSU. The term "MSU" is used in this manual to denote the MSU software terminal process that is discussed later. The term "MSU" is also used for both the MMSU and the earlier MSU in the master control center (MCC) display pages on the *5ESS*® switch.

Two different implementations of the NTT interface are provided on the *5ESS*® switch:

(1) The traditional implementation has been via the SN-107 circuit packs in the analog trunk unit. The SN-107 circuit packs terminate to No-Test Trunks and provide metallic test bus (MTB) connections to the MMSU.

(2) The newer implementation is the "Semi-Integrated No-Test Trunk" (NTTU). The NTTU terminates No-Test Trunks, converts the NTT signalling and control to a digital trunk format, connects to the switch via a digital trunk, and provides MTB connections to the MMSU.

With either implementation, the interface to the LTS is the same, therefore the term "NTT interface" is used in this manual for both the SN-107 and the NTTU interfaces to the switch.

Figure 2-2 LTS Metallic Test Interface (Typical) Metallic test interface (typical), LTS LTS metallic test interface (typical)

2.5 DIGITAL MEASUREMENT UNIT (DMU) METALLIC TEST INTERFACE

The newest MLT test head, the can be used as an LTF replacement (LTF has been Manufacture Discontinued and is no longer supported) or to supplement the LTS or DCTU.

The DMU can be configured as a Central Office (DMU-C) or Remote (DMU-R) test unit, as shown in Figure 2-1 . When configured as Central Office test units, DMUs are clustered into MLT-managed logical entities known as Expert Measurement Units (EMUs). An EMU can be connected to up to 16 NTT interfaces used by the LTS) or MDF trunks and will have the same testing capabilities as the LTS. When configured as a Remote test unit, the DMU-R functions like a Remote Measurement Unit (RMU) that performs automatic testing of loops served by Digital Loop Carrier Systems (DLCs). A description of the EMU/DMU is in the MLT System Document 190-425-902.

2.6 IMLT METALLIC TEST INTERFACE

2.6.1 HARDWARE

The IMLT interface is the latest configuration available for remote metallic loop testing on subscriber loops/lines. Note in Figure 2-2 that the LTS configuration requires a set of test hardware, the LTS, that is not a part of the switch. A second set of equipment must exist within the switch for the craft to use. This duplication of hardware is costly. In the IMLT interface (Figure 2-3), line testing initiated by the craft shares the same hardware used by MLT, the DCTU, in conjunction with functions that already exist in the switch. This arrangement is less costly. In this configuration both the LTS and NTTs are no longer required. The data link from the DCN connects directly to the switch. As with the NTTs and MMSUs in the LTS interface, the DCTU(s) and MMSUs in the host switch cannot be used to test loops served by remote SMs. With the exception of RSMs in an MMRSM, each remote SM must have its own DCTU and MMSU for testing. One DCTU and MMSU can serve the RSMs in an MMRSM.

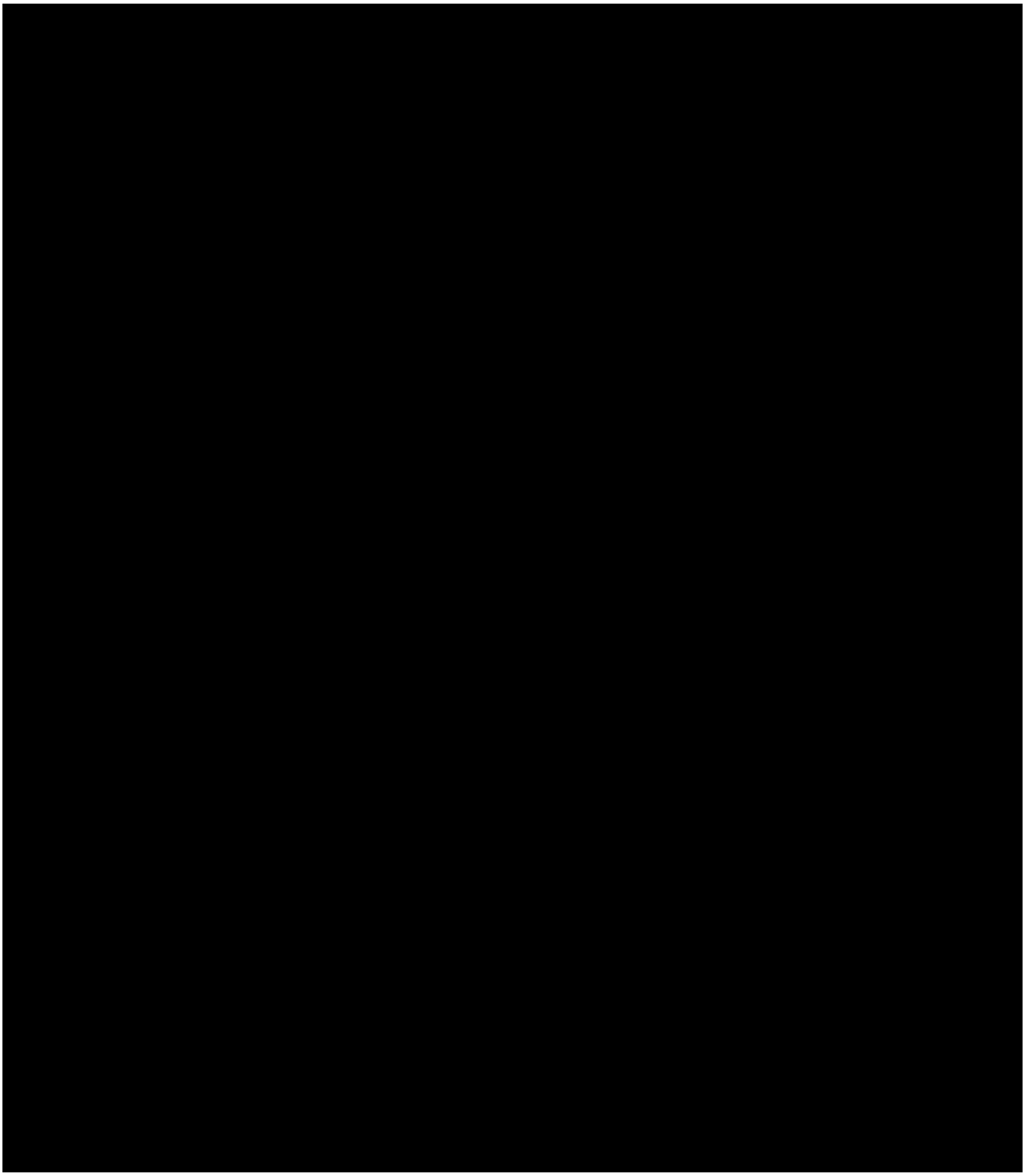

Figure 2-3 IMLT Metallic Test Interface (Typical) Metallic test interface (typical), IMLT IMLT metallic

test interface (typical)

As shown in Figure 2-3 , each switching entity ***MUST have a unique EXK***, except where MDF testing is not used. Unlike the LTS configuration, DCTU ports are not dedicated to NTTs because any DCTU port can be connected to any internally accessible subscriber's line through switching in the MMSU. Any DCTU port can also be connected through the MMSU for MDF access. Thus, any DCTU port may access any line (equivalent to NTT access and referred to as NTT access) or any cable/pair (MDF access).

Each host switch (along with its remote SMs) associated with a particular DCN port has an upper limit of 31 simultaneous MLT accesses, subject to possible blocking of metallic access in the MMSU or in the line units being metallically accessed. This upper limit should allow the expected testing traffic for up to 250,000 lines and is also compatible with the capacity of the data link between the MLT DCN and the switch.

The testing hardware of the DCTU is similar to that of an LTS, except that it is contained completely within the switch. This configuration permits omitting some of the hardware functions that previously required separate circuit packs in the LTS. The switch already has capabilities for such functions as ringing and callback, and these functional capabilities are used wherever possible, instead of using separate hardware.

2.6.2 SOFTWARE

2.6.2.1 Administrative Module

The administrative module (AM) software processes that run under the operating system for distributed switching (OSDS) for IMLT metallic test functions are illustrated in Figure 2-4 . The MLRD (ML read), MLWR (ML write), and MLT are system processes, and OPR (operational) and ADM (administrative) are terminal processes. A system process is software that is always looking for work. A terminal process (TP) is activated by a system process and exists only long enough to perform a specific task. A request from the IMLT data link is scanned by the MLRD TP, which passes what it finds off to the MLT TP. The MLT TP analyzes the message to determine if the MLT request is for data (administrative) or a line test (operational). Administrative requests require data to be passed back up the data link. The ADM TP is created to collect this data, and no hardware is involved. Messages from the MLT TP are returned on the IMLT data link through the MLWR TP.

Line testing requests cause MLT to start the OPR TP and then pass the request to this process. The OPR TP extracts the TN and combines it with a list of suggested hardware. This package is sent down to the switching module (SM/SM-2000) and is treated more like a starting point for finding resources. When OPR TP receives a message from the SM/SM-2000 indicating that a metallic test path has been established to the line to be tested, it dumps the entire IMLT data link message down into the SM/SM-2000. Test results are sent up to the OPR TP. The OPR TP puts them on the data link (through MLWR) for transmission back to MLT. When testing is complete, OPR TP instructs the SM/SM-2000 to tear down the path.

Figure 2-4 Administrative Module Software Processes - IMLT Metallic Testing Software processes - IMLT metallic testing, administrative module Administrative module software processes - IMLT metallic testing

2.6.2.2 Switching Module

For simplicity, a single SM is used to illustrate the SM software processes (Figure 2-5). The SM software processes are all terminal processes (TP): test equipment control (TEC) TP which is associated with the DCTU, MSU TP which controls the MMSU, and port under test (PUT) TP which controls the circuit unit containing the line under test port. The OPR TP, in the AM, creates the TEC TP and then sends its data package to the SM/SM-2000. This starts the path setup. After the metallic path from the DCTU to the line under test is set up through the MMSU, the requested tests are run. Results of the tests are sent to the OPR TP by the TEC TP. Detailed operation of the SM/SM-2000 logic is discussed in the detailed discussions of the IMLT interface configurations.

Figure 2-5 Switching Module Software Processes - IMLT Metallic Testing Switching module software processes - IMLT metallic testing Software processes - IMLT metallic testing, switching module

2.7 MLT CALLBACK FEATURE

2.7.1 GENERAL

The MLT callback feature enables the maintenance administrator (MA) to interact with a subscriber or a repair craft in the field. Callback is used when the maintenance administrator requires a TALK, MON or RING transaction. The MON transaction permits the maintenance administrator to monitor for such things as transmission noise and "room" noise to validate a receiver-off-hook result. The RING and TALK transactions are used to call and talk to the subscriber over the test path. One purpose would be to perform a touch-tone (TT) pad test with the subscriber.

Callback requires a connection between the maintenance administrator's telephone console (callback number) and the subscriber's number. To activate a callback, the maintenance administrator enters the callback number onto the terminal and initiates the request. From this point, the process varies according to the MLT application being used, LTS or IMLT.

To release the callback connection, the maintenance administrator enters **XCB** in the request field of the TV mask and hangs up the callback phone.

2.7.2 LTS APPLICATION

In the LTS application, the LTS receives the callback number from the maintenance administrator's TV mask and dials it over the DDD network (through a spare dial tone source). Then the maintenance administrator answers the callback number (must be within 40 seconds) and within 6 seconds, presses the **0** button on the TT pad holding it down for at least 1.5 seconds. The generated tone is recognized by the LTS which, in turn, connects the maintenance administrator to the subscriber's loop. The maintenance administrator is notified as to the success of this operation.

2.7.3 IMLT APPLICATION

In the IMLT application, the callback number is sent to the switch through the IOP port and the callback request is handled by the conference calling software. No physical callback lines to "talk" boards are required as in the LTS case. The switch conference calling software handles the callback setup. The callback function that formally had to be performed in the LTS is done with existing hardware switch and software. To establish a callback path between the maintenance administrator and the subscriber's loop, callback trunks (software entities) must be setup in the switch data base. The translations required to do this are included in Section 4 of this document. As in the LTS case, the maintenance administrator has 40 seconds to answer the callback telephone, then within 6 seconds, press the **0** button and hold it for at least 1.5 seconds.

> **CAUTION 1:** There are some telephones and PBXs on the market that only provide a timed burst of tone, no matter how long the "0" button is pressed. The short burst of tone is insufficient to guarantee MLT detection and a callback timeout may occur. This type of equipment does not work satisfactorily with MLT.

CAUTION 2: If callback cannot be established, one of the causes may be that the callback phone is a "free" phone (not returning answer supervision). The switch expects an answer from the far end as an indication to start looking for the "0" digit.

2.8 HARDWARE - METALLIC LOOP TESTING

2.8.1 ADMINISTRATIVE MODULE

The AM is basically a computer. In the IMLT configuration, it does the following:

- Acts as a gateway for messages from and to the MLT
- Works with the SM/SM-2000s in the testing of subscriber lines.

The AM contains a Lucent Technologies 3B20D computer. The duplex aspect of this computer provides a high level of reliability to the AM. If one side of the 3B20D experiences a failure, its mate side takes over. The AM also contains data link hardware, the input/output processor (IOP). The IMLT data link is just one of the users of this feature.

2.8.2 COMMUNICATION MODULE

The CM is like a switch within the *5ESS*® switch. Software generated messages from all the modules are directed to the CM. There is one exception: RSMs communicate with their host SM/SM-2000s. The CM in turn passes the messages along to the appropriate destination.

2.8.3 SWITCHING MODULE/SWITCHING MODULE-2000

2.8.3.1 General

An SM/SM-2000 is a grouping of hardware that may contain line testing circuits, metallic network, and/or ports connected to subscriber lines. At least one SM/SM-2000 in each wire center (host or remote switching subsystem such as an RSM, MMRSM, or ORM) contains a no-test trunk (NTT) interface (LTS configuration) or a directly connected test unit (DCTU) (IMLT configuration). Each SM-2000 can have up to 27,520 subscriber lines connected to it.

The metallic buses (MBs) provide a common set of metallic paths for all SM/SM-2000s that require it. Using the MBs, we can locate a piece of test equipment in one SM/SM-2000 yet have metallic access to it from another SM/SM-2000 in the office. The MBs are connected by one or more modular metallic service units (MMSUs).

2.8.3.2 Switching Module Processor

A switching module processor (SMP) exists in each SM/SM-2000, because it controls almost all the hardware within an SM/SM-2000. The SMP duplex architecture permits one service group (SG) to be in control while the other is in standby. During IMLT line testing, the SMP works with the AM, through the CM, and may also work with other SMPs to carry out the tasks necessary to execute the test. Each SMP provides high-level control of most of the units in that SM which are involved in the tests. Each SMP has two interfaces:

- Network control and timing (NCT) links
- Peripheral interface control bus (PICB).

These two types of paths permit communications between the SMP and other hardware in the switch with two exceptions. The pair gain test controller (PGTC) (Section 2.8.4) and test bus control unit (TBCU) (Section 2.8.7) are not controlled through these links.

The NCT links are the data links back to the CM. The SM/SM-2000 gains both a control path and system timing from these links. The PICBs are the control paths down to, with the exception noted, all SM/SM-2000 peripherals. Both the NCT links and the PICBs are duplicated for reliability.

2.8.3.3 Modular Metallic Service Unit (MMSU)

The MMSU provides the switching matrix for the metallic network in switch testing. It has two SGs which are both active at the same time. A failure in one SG does not take down the other. Control is through the PICBs, one per MMSU SG. The MMSU is growable by shelves with a minimum of one and a maximum of four. When the bounds of SGs are combined with shelves, a new entity is formed: the service group/shelf (SG/SH). Figure 2-6 provides a simplified diagram of the internal architecture of a 2-shelf MMSU and shows the connections of a DCTU and two LUs to the unit. Figure 2-7 illustrates the types of circuit packs (CPs) used in an MMSU shelf. (See SD-5D007-01, Assignment Rules, for proper equipage.) The SG/SHs are only related by control path and physical placement. They are interconnected by MTIBs. The MTIB is made up of 14 tip/ring pairs that connect all SG/SHs of all MMSUs together in the host portion of a central office. The metallic network of RSM(s) is independent of the host. The MTBs are tip/ring pairs that connect the MMSU to the various line, trunk, and test hardware units requiring metallic access. The metallic access (MA) and MTIB access (MTIBAX) CPs connect these external tip/ring pairs to service circuits (SCs) within the SG. The bus that joins the metallic access (MA), MTIBAX, and SCs together consists of four tip/ring pairs called metallic access junctors (MAJs).

Up to eight SCs exist in an SG/SH. The first three SC slots can be taken up by metallic access circuit packs (CPs). The remaining slots are available to other SC types such as metallic test and scan and distribute CPs. The metallic test SC involved in this configuration is the gated diode crosspoint compensator (GDXC)

CP.

Although the MSU is not manufactured any more, it does exist in many offices. It is similar to the MMSU but is limited to a pair of shelves. It is functionally similar to a single shelf MMSU. Only the term ``MMSU'' is used in the remainder of this manual for either the MMSU or MSU. The term ``MSU'' is used only for the MSU terminal process (see Section 2.6.2.2). The SM-2000 does not support the MMSU. Therefore, in order to perform metallic testing of any line on any unit on an SM-2000, the MTBs from a collocated SM MMSU must be connected to the unit in the SM-2000.

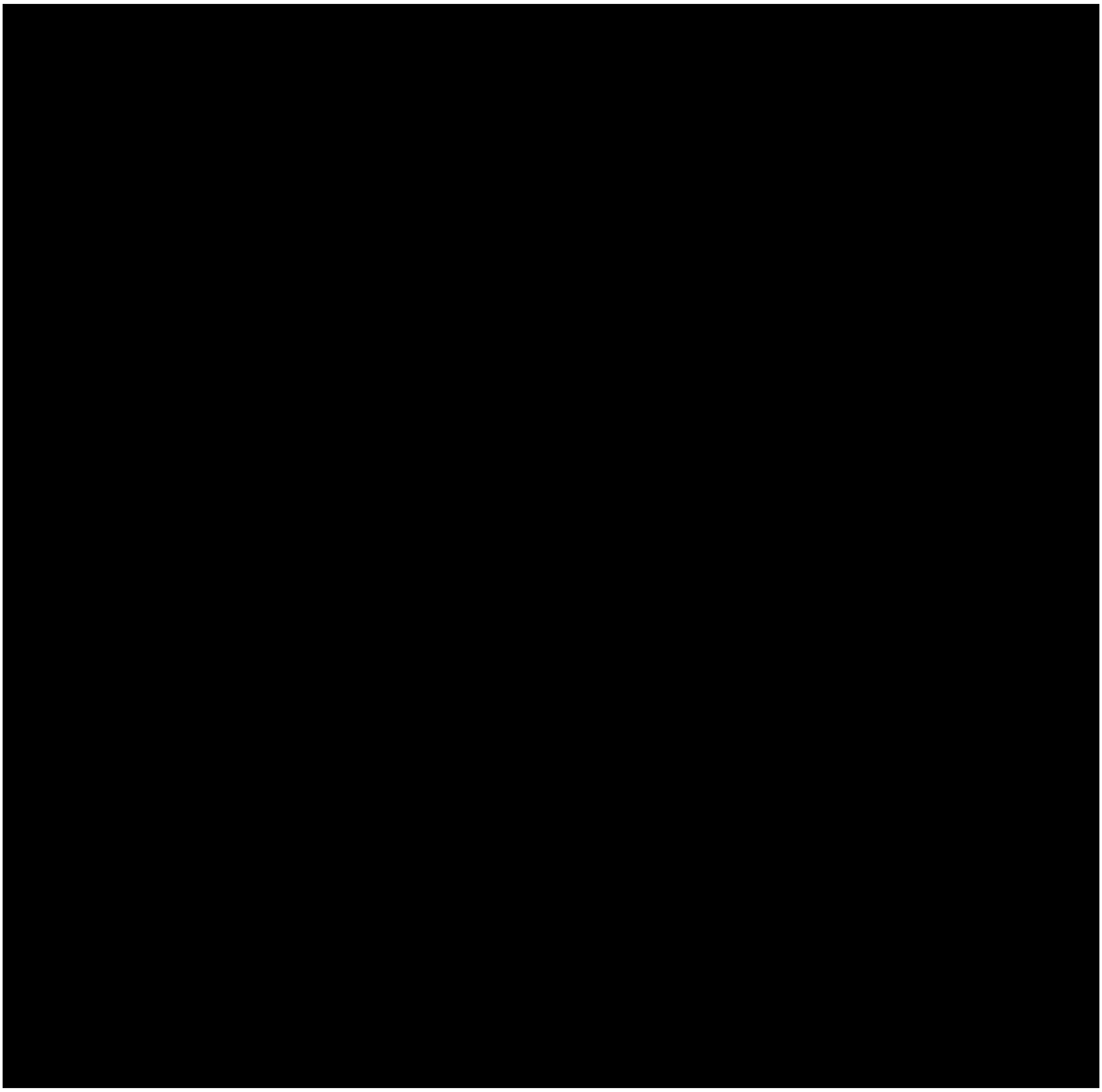

Figure 2-6 Modular Metallic Service Unit Modular metallic service unit (MMSU)

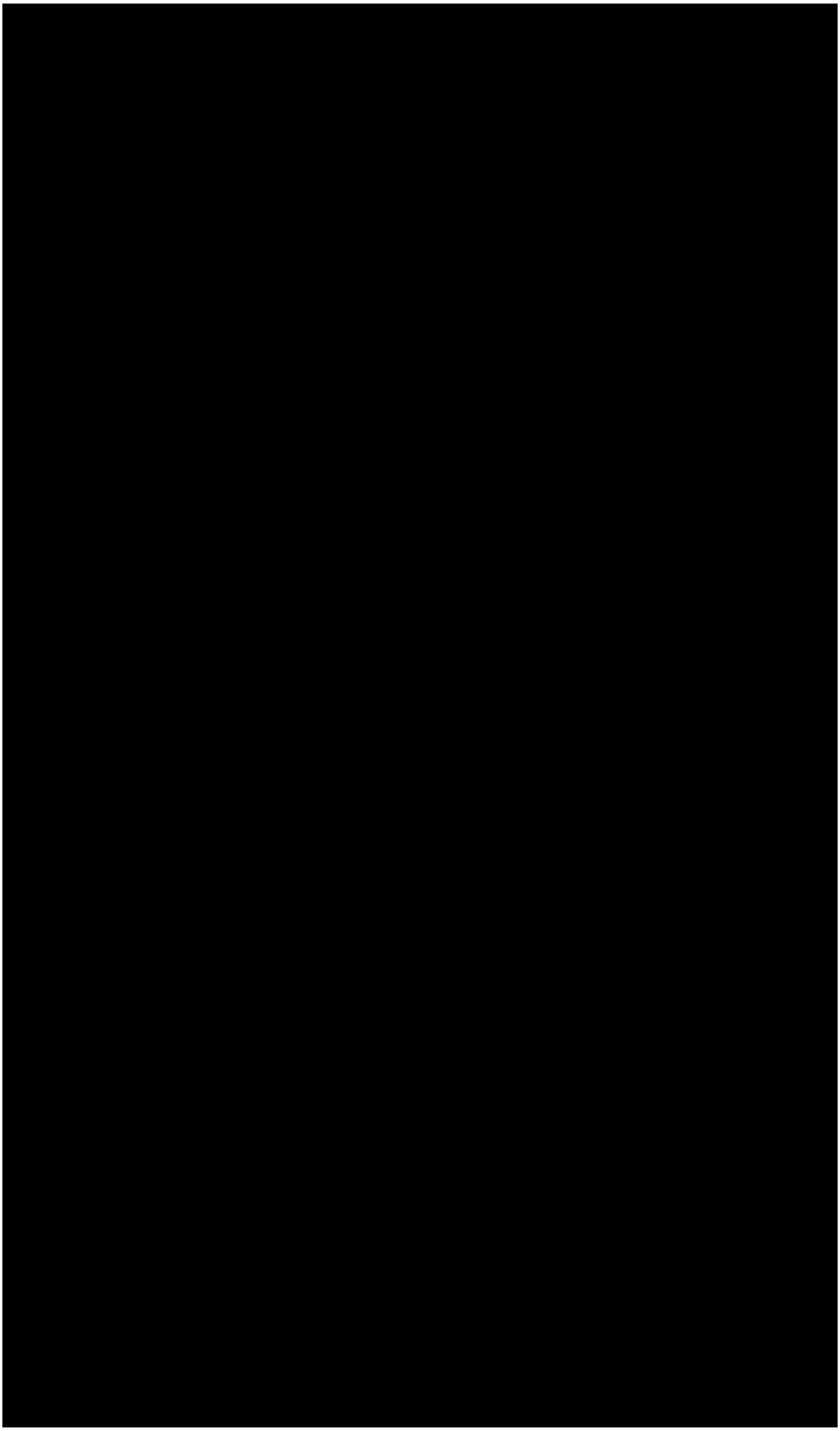

Figure 2-7 Example of MMSU Shelf 0 Circuit Pack Equipage

2.8.3.3.1 Metallic Access (MA) and Metallic Test Interconnect Bus Access (MTIBAX)

The same CP is used for metallic access (MA) and MTIBAX. The CP contains 4 rows of 16 relays each. Operating a relay connects 1 of 16 ports to 1 of the 4 MAs.

When plugged into the appropriate SC slot, it becomes a metallic access pack capable of connecting to 15 MTBs. The 16th MTB port has a resistor-diode string connected across it. Diagnostics uses this string to verify other pieces of the MMSU.

When plugged into the MTIBAX position, the CP becomes an MTIBAX pack which is used to gain access to the 14 MTIBs. The other two ports are used by Protocol circuits which are discussed later.

2.8.3.3.2 Gated Diode Crosspoint Compensator (GDXC)

The GDXC circuit is specifically applicable to the LU interface between the outside plant and the switch. Compensation of the test path is required when a LU is involved. These LUs use GDXs. A GDX is a solid-state crosspoint that approximates a relay contact. As with all solid-state devices, small leakage currents tend to flow in them. In the design of the LU, large value resistors are connected from the crosspoints to a negative voltage. The result is a small, variable parasitic current plus a large resistance to office battery. These parasitics have no effect on data or voice, but, if not cancelled out, is highly detrimental to line testing. The GDXC minimizes the leakage currents and resistors to bring the test path through the LU closer to ideal. To prevent line testing blockages (VER Code B0), check the assignment rules for the appropriate number of TN 880 CPs. (See Figure 2-7 and SD-5D007-01, Assignment Rules.)

2.8.3.3.3 Protocol Circuit

The protocol circuit is unique to the base unit, but can be accessed by all the shelves in an MMSU. It does not connect to other MMSUs; each MMSU SG has it own protocol circuit. It is used, in conjunction with a diode-resistor network in each peripheral unit of the MMSU, to verify the integrity of the test path from MMSU to the peripheral unit.

The protocol circuit can tell if continuity exists between two conductors tied to its input and determine if continuity is due to one of the resistor-diode terminations or a metallic short. When a relay is operated in this circuit, the test voltage's polarity is reversed. With the diode present, current only flows with one polarity of test voltage. A metallic short permits current to flow independent of test voltage. This feature is also useful in determining tip/ring reversals in the MTBs and MTIBs and detection of foreign potential.

2.8.3.3.4 Distributing Frame Test Access Circuit (DFTAC)

The DFTAC (TN 1040 CP) is required for IMLT testing of subscriber lines through an MDF test trunk. Because DCTU equipment is integral to the switch, the MDF test trunk circuits (MDF-TTCs) are installed differently from the LTS. Instead of wiring an LTS port directly to an MDF-TTC, the DFTAC in the MMSU is wired to the MDF-TTC. The DFTAC acts as a switching mechanism between the DCTU and the MDF-TTC. It provides the required sleeve lead control and a metallic path from the MMSU to MDF-TTC test shoe located on the MDF (Section 2.8.8). The DFTAC can connect any switched or nonswitched line that terminates in the wire center to the DCTU through a junctor and an MTB for testing or to a dedicated callback line for testing. It also contains a tip-ring pair which is wired to a denied origination line appearance on an LU. This tip-ring pair provides the dedicated line connection for the MLT callback phone feature. A DFTAC is associated with only a single MDF-TTC. Therefore, the office must be equipped with a DFTAC for every MDF-TTC.

> ***NOTE 1:*** When you have DFTAC in a remote SM, there is an attribute field TRK MAINT DA OPT on the RCV 8.1 that is populated. Ensure that the LDIT pointed to (in the DAS field), has been loaded into each RSM, ORM, or TRM with a MMSU and a DFTAC.

NOTE 2: Each DFTAC requires its own dedicated TN.

NOTE 3: The DFTACs should be spread evenly across the SG and shelves where DCTU ports reside.

NOTE 4: The DFTAC translations must agree with the physical wiring, or callback does not work (The MA receives a false "transaction established" message).

2.8.3.4 Directly Connected Test Unit (DCTU)

The DCTU is a central piece of metallic test equipment within an SM. It can make measurements of AC and DC voltages, resistance, capacitance, distance to open, and ringer count, as well as run coin phone tests. These functions, in conjunction with functions already present in the switch, such as ringing and callback, eliminate the need for external test equipment (the LTS) in the IMLT configuration. The DCTU contains the following:

- A DCTU common control (DCTUCOM) circuit
- The Equipment access network (EAN)
- One to three precision measurement units (PMUs)
- 4, 8, or 12 MTB ports (4 per PMU).

Figure 2-8 illustrates a maximum equipped DCTU. The EAN is a matrix of switching circuits that can connect any PMU to any of 12 MTB ports. The even ports go to MMSU service group (SG) 0 and the odd ports to MMSU SG 1. Physically, the DCTU is composed of a control shelf (Figure 2-9) containing the DCTUCOM and EAN circuits and power units, and one to three PMU shelves (Figure 2-10), each containing PMU circuit packs and four port boards.

Data from the PICB comes from the IMLT data link off the AM. Usually the switch acts like a ``pipe line'' from the MLT down to the DCTU. Results from the DCTU are sent back to MLT in a similar fashion. In some cases the DCTU is requested to run a test requiring help from the switch. It then sends a request over the PICB and communicates directly with the switch.

Figure 2-8 DCTU - Maximum Equipage DCTU maximum equipage

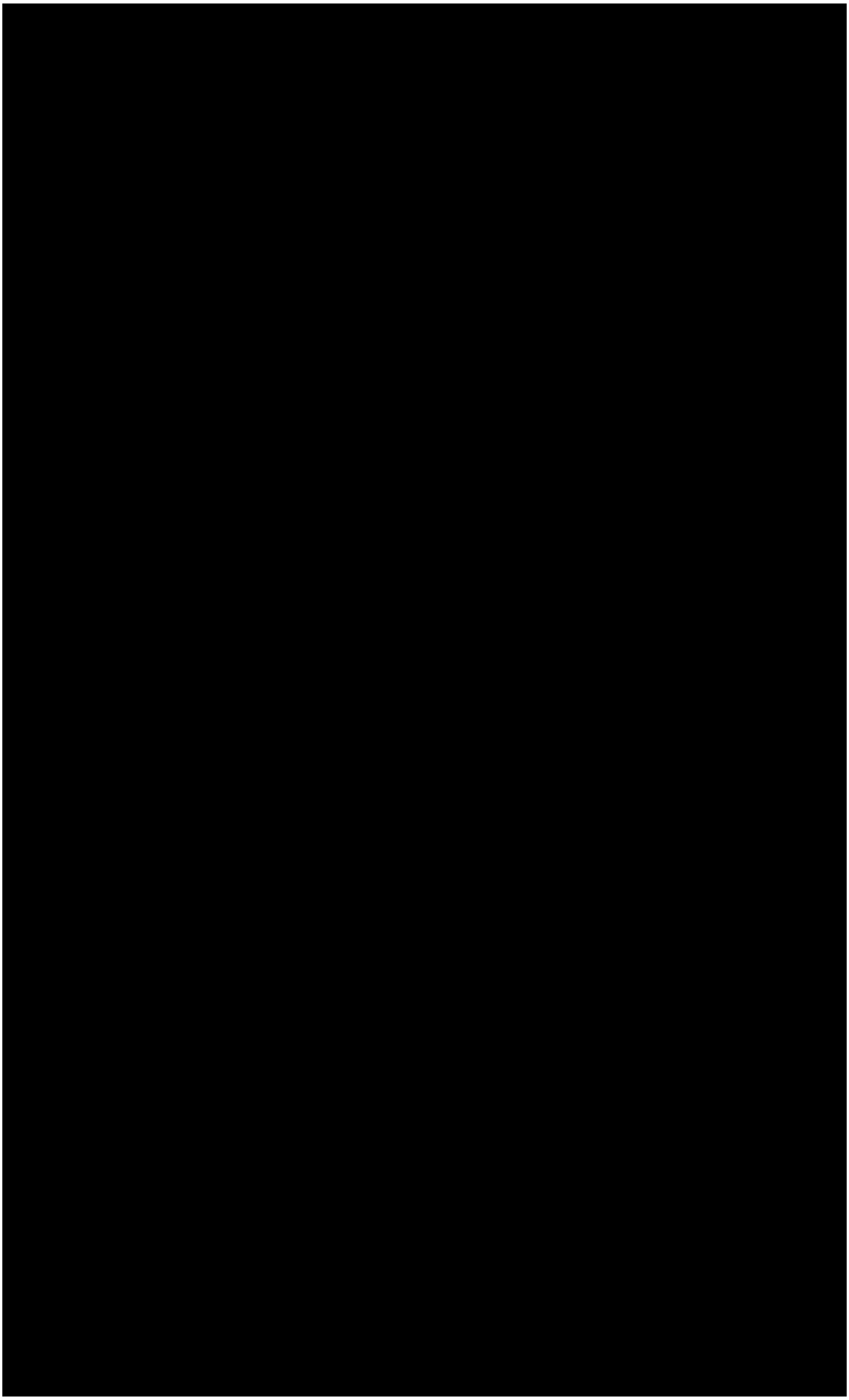

Figure 2-9 Control Shelf - DCTU Control shelf - DCTU DCTU control shelf

[redacted]

Figure 2-10 PMU Shelf - DCTU PMU shelf - DCTU DCTU PMU shelf

2.8.3.5 Line Units

While the LU1, LU2, and LU3 are the same functionally, the LU1 and LU2 interface up to 512 subscriber lines to the switch, while the LU3 can interface up to 640 lines. Figure 2-11 shows how they look to metallic testing. On the left are up to 512/640 ports. A given subscriber line terminates on a given port. On the right are two MTBs that interface with the MMSU.

Each LU also has one linearization circuit associated with each MTB. The linearization circuit has two functions: First it sets up a circulating current to bias the crosspoints away from their zero crossing. Second, it attempts to cancel the DC offset voltage resulting from the GDX diode nature.

NOTE: Information on the circuits that comprise the LUs can be found in 235-100-125.

[redacted]

Figure 2-11 Line Units - Metallic Fabric Line units - metallic fabric Metallic fabric line unit

2.8.3.6 Access Interface Unit (AIU)

The AIU is a replacement for analog line units. The AIU has a capacity of up to 3,584 lines per cabinet (POTS) compared to 1,536 for the LU3. Additional advantages are higher reliability, lower power consumption, and a higher amount of traffic per line (no load balancing).

2.8.3.7 Integrated Services Line Unit (ISLU) and ISLU Model 2 (ISLU2)

The ISLU and ISLU2 are line units serving integrated services digital network (ISDN) digital subscriber lines (DSLs)/loops. The ISLU can also serve analog lines through its Z line card.

The metallic fabric for an ISLU and ISLU2 is shown in Figure 2-12 . The architecture is similar to the LUs. As with LU1 and LU2, the two MTBs have access to a maximum of 512 ports for ISLU or 1024 ports for ISLU2. However, while an LU1/2 level has a 4-port restriction, the half-line group of the ISLU has a 64-port rule. Since only one (of four) line group bus (LGBUS) in a half-line group can be used for testing at a time, only one port in a half-line group can be tested at a time. Only two test buses (TSTBUSs) can be used at a time, so only two metallic access tests can be run at a time.

Notice that no GDX linearization circuits exist in the ISLU or ISLU2. Unlike other LUs that use GDXs, the ISLU uses relay contacts or linear solid-state crosspoints for its metallic fabric. These crosspoints do not require linearization. Their leakage is small enough so that the GDXC circuit in the MMSU is not required. Additional information on the ISLU and ISLU2 can be found in 235-100-125.

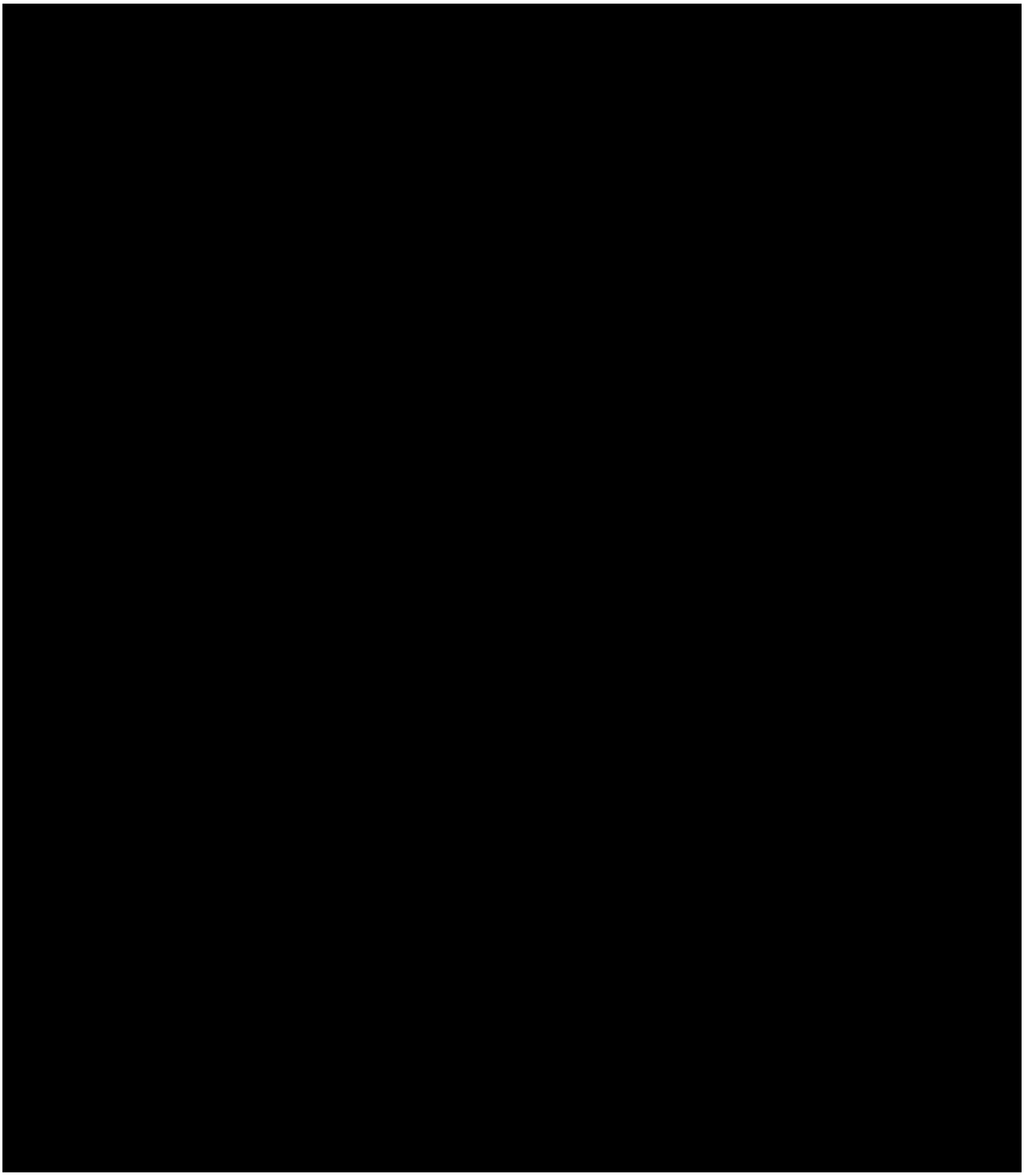

Figure 2-12 ISLU - Metallic Fabric ISLU - metallic fabric Metallic fabric ISLU

2.8.3.8 Digital Carrier Line Unit (DCLU)

The integrated *SLC*® carrier system is similar in many respects to the universal SLC carrier system: both have remote terminals (RT) and digital facilities. However, the integrated carrier system provides a direct digital interface into the switching system without requiring a central office terminal (COT).

The DS1 digital facilities from the carrier system RTs terminate on a DCLU in an SM. A DCLU can terminate up to six Mode 1/Mode 2 RTs and an SM can be equipped with a maximum of eight DCLUs. A Mode 1 RT terminates 96 subscriber lines and places them on 4 DS1 rate digital facilities (24 channels per

DS1). A Mode 2 RT terminates 96 subscriber lines and places them on 2 DS1 rate digital facilities (providing 2-to-1 concentration). The 363-200-100 document is a general information manual for the DCLU Integrated SLC Carrier system.

2.8.3.9 Integrated Digital Carrier Unit (IDCU)

The IDCU may be thought of as a DCLU (Section 2.8.3.8) with the following enhanced capabilities:

- Sophisticated DS1 performance monitoring
- Per-line traffic studies
- An integrated interface with DLC RTs for both analog lines and ISDN *ANSI*™ U-interface (2-wire) DSLs (U-DSLs).

Like the DCLU, an SM can be equipped with a maximum of eight IDCUs. An SM-2000 can be equipped with a maximum of 34 IDCUs. An IDCU in an SM can support a maximum of 40 DS1 carriers and a maximum of 31 RTs. The ISDN application requires a loaded SM. Additional information on the IDCU can be found in 235-100-125.

Bellcore Technical Requirements TR008 and TR303 define the interface formats between the IDCU and RT (see 363-208-000).

The TR008 interface on the IDCU provides POTS and other analog switched services through SLC 96 carrier system (Modes I and II), SLC Series 5 carrier system [with feature package (FP) B, FPB+ (Modes I and II), and FP303G (Modes I and II)], and SLC-2000 access system RTs. In addition, nonswitched services may be nailed-up or hairpinned. Nail-up is a connection in which a time slot is assigned a semipermanent path through the SM (or the SM and CM), between a DS0 port on the IDCU and a DS0 port on another peripheral. Hairpin is a connection in which a time slot is assigned a semipermanent path between two DS0 ports on the same IDCU. The hairpin connection does not use SM or CM time slots.

The TR303 interface on the IDCU supports POTS, other switched services, and ISDN ANSI U-DSLs through SLC Series 5 carrier system and SLC-2000 access system TR303 RTs, and generic TR303 RTs.

2.8.3.10 Digital Network Unit - SONET (DNU-S)

Beginning with the 5E12 software release, the DNU-S provides a TR-TSY-000303, Issue 2 and Supplement 3, December 1992 standard interface similar to that of the IDCU. Non-switched services are supported on the DNU-S via nailup connections only.

An SM-2000 can support two fully equipped DNU-Ss or four partially equipped DNUs and up to 99 TR-TSY-000333 RDTs.

2.8.3.11 Transmission Test Facility (TTF)

The TTF is physically located on the global digital service unit (GDSU) in an SM/SM-2000. The functionality of the TTF in the SM-2000 is physically located in the global digital services function (GDSF). The TTF is required for both LTS and IMLT testing through an integrated SLC carrier system. The TTF performs the voice-band transmission tests on trunks, loops, and switched special services. The RSM(s) uses the TTF (s) in the host. Each TTF can be equipped with three responder cards and each responder requires a corresponding logical test port populated in the switch data base. The number of simultaneous channel tests that can be run equals the number of equipped responders with corresponding logical test ports. The TTF performs the digital channel test portion of the integrated SLC carrier system line test. All measurements and tests are performed on the pulse code modulated (PCM) bit stream but are described by their voice-frequency analog equivalent. The TTF includes tone sources, tone detectors, power and noise measurement capabilities, frequency shift keying detection, and multifrequency receivers. Most TTF measurements are controlled by the SMP. However, measurement sequences that require critical timing are controlled by a microprocessor within the TTF. Note that the TTF is shared by other applications such as the trunk and line work station (TLWS), electronic loop segregation (ELS), and remote office test line (ROTL).

2.8.4 PAIR GAIN TEST CONTROLLER (PGTC)

NOTE: The MLT does not currently allow for the administration of more than one PGTC or one extended test controller (XTC) in the same host office.

The PGTC is a piece of testing hardware that acts as the interface between a universal SLC carrier system and the MLT. It tests the universal SLC carrier channel and sets up the metallic access to allow the MLT to test the subscriber loop beyond the RT. Refer to Figure 2-13 . The PGTC is used to test locally switched lines (POTS, coin, multiparty, PBX/CO trunks) served by a universal SLC carrier system. The PGTC does not provide a means for testing nonswitched or remotely switched special services.

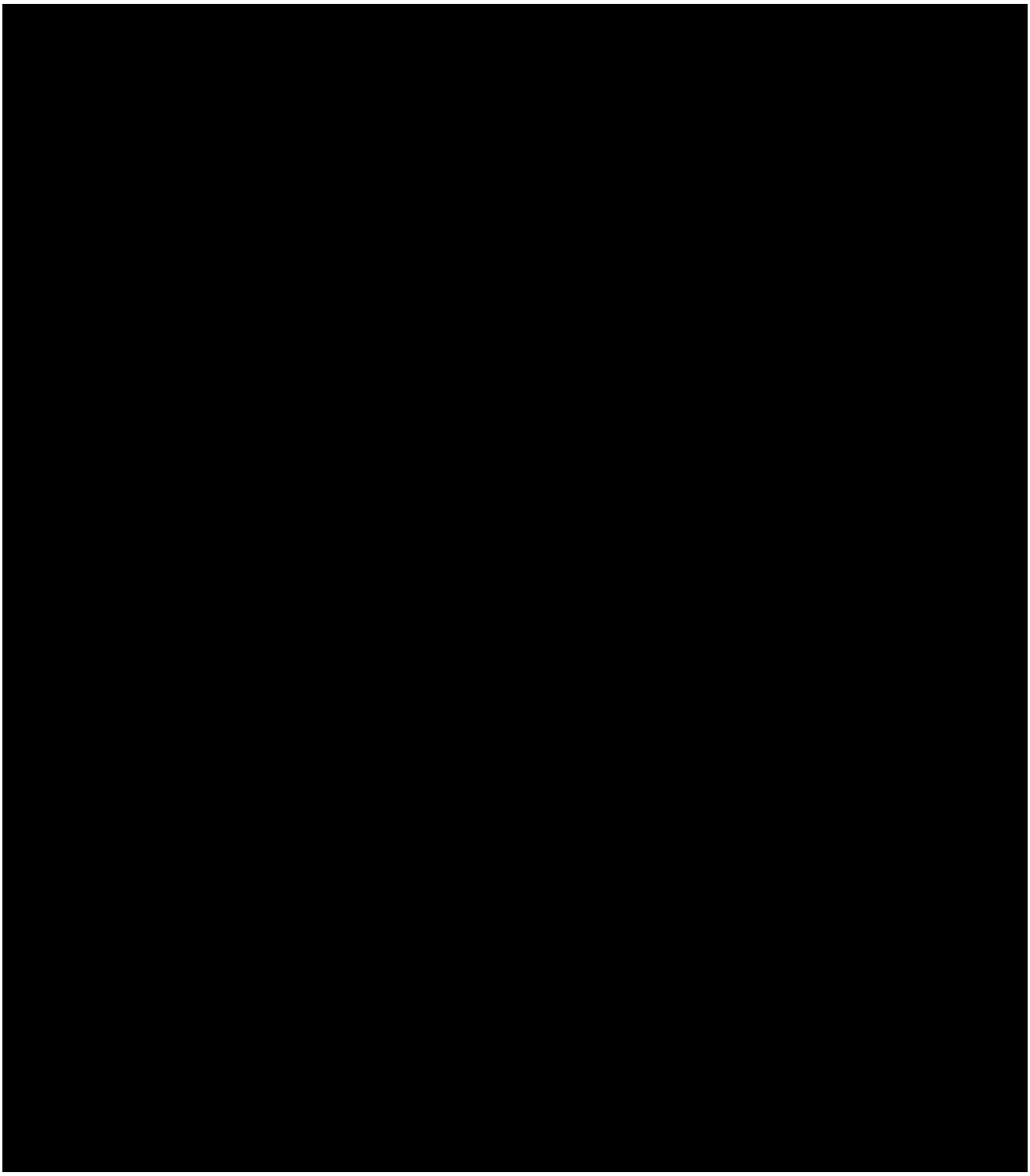

Figure 2-13 IMLT Metallic Testing Via Universal SLC Carrier System - Using the RMU - Simplified Block Diagram IMLT metallic testing through universal SLC carrier system - using the RMU - simplified block diagram Universal SLC carrier system using the RMU - simplified block diagram, IMLT metallic testing through RMU - simplified block diagram, IMLT metallic testing through universal SLC carrier system - using the

In the non-IMLT (LTS) application, the PGTC is wired into the test trunk path between the LTS and the switch NTT interface. In the idle condition, the PGTC provides a direct connection between the LTS and the switch NTT interface allowing normal testing on lines other than SLC carrier lines. When the MLT sends a request to test universal SLC carrier lines, the PGTC is activated. The carrier system and the PGTC sets up the metallic network to allow testing of the universal SLC carrier channel and loop. The PGTC connects the MLT test trunk to the DC test pair which is connected to the subscriber loop beyond the RT by way of the RT channel unit and either a channel test unit (CTU) or, for the SLC-2000 access system, a power test unit (PTU). The MLT tests the loop and the PGTC tests the carrier channel and, when requested by MLT, sends the channel results to the LTS.

There are two ways to connect the PGTC for the IMLT (DCTU) configuration. In the non-directly connected case, the PGTC input side tip and ring (TT and TR leads) connections are connected to the DCTU by an MTB by way of one or more MMSUs. The input side sleeve lead (TS lead) is controlled by way of distribute points in the MMSU. The output sleeve (S) lead termination is left unconnected. These MTBs, for software reasons, must terminate on the same metallic access (MA) pack. Also, at least one DCTU MTB must terminate on the same MMSU shelf as the two MTBs assigned to the PGTC. A detailed description and installation information for the PGTC is provided in 363-202-300.

In the directly connected case, the DCTU MTB would not terminate at the MMSU, but would be connected to the PGTC input side tip and ring. An MTB would then go from the PGTC output side tip and ring to the MMSU. The result is that the PGTC is now directly connected between the DCTU and the MMSU and the metallic path does not need to be rebuilt to add the PGTC when testing universal SLC lines. The wiring of the distribute points for the PGTC would be the same as in the non-directly connected case.

2.8.5 EXTENDED TEST CONTROLLER (XTC)

The XTC is an enhanced version of the PGTC. It provides all the functionality of the PGTC for testing locally switched lines (Section 2.8.4) and is connected in the same manner. It also provides many new features for testing lines served by universal SLC Series 5 carrier systems equipped with the AUB5 and AUB25/30 CTUs at the COT and RT, respectively. These features include the following:

- Test access for both the LTS and the switched access remote test system (SARTS) for special service circuits.
- Channel unit isolation test for locally-switched, remotely switched, and non-switched services. This feature is compatible with SARTS and MLT.

The enhanced capabilities of the XTC are available only with the LTS. The DCTU used for testing in IMLT configurations currently does not have the capability of generating the multifrequency (MF) tones needed to communicate with the XTC for accessing the enhanced features.

The XTC has been designed to allow a PGTC to be easily upgraded to an XTC configuration. 363-205-300 provides a detailed description of the XTC, the requirements for upgrading a PGTC to an XTC, and the XTC installation test and maintenance procedures.

2.8.6 REMOTE MEASUREMENT UNIT (RMU)

The distance of an RT from the switch may exceed the maximum resistance requirements for a DC test pair, or the carrier system may be served by fiber optic links and have no metallic pairs available for DC test pair testing. In either of these cases, an RMU provides test hardware located at the RT site.

The RMU provides all testing functions at the RT end of the line under test. The RMU has no access capability of its own. The communications gateway, which is a part of the MLT FE, dials the RMU over a standard analog telephone line, establishes data communications, and handles transport of messages between the FE and the RMU. The RMU control software provides efficient coordination of the DCTU/LTS and RMU operations. The RMU does all its testing outward over the distribution pair, which runs from the RT to the customer's premises. Facilities for talking, monitoring, and ringing are provided in the RMU for interactive testing. One RMU can test lines of more than one RT so long as the following conditions are satisfied:

- The metallic test pairs between the RMU and the RTs do not exceed the resistance requirements of

MLT

- The corresponding DCLUs share the same TBCU port.

NOTE: Extensive information on the RMU is provided in the ***Facility Manager's Guide to the RMU*** (Module **sad2.rmu_source** in ***MLT TEXT MANAGER***).

2.8.7 TEST BUS CONTROL UNIT (TBCU)

The TBCU is the integrated SLC carrier system metallic test interface. The TBCU permits metallic testing of subscriber lines that terminate on an integrated SLC carrier RT through the DC test pair. The DC test pair is hard wired to the TBCU. A DC test pair can serve several DLC systems (96 lines each). For traffic consideration purposes, it is recommended that this number not exceed 10 (960 lines). The TBCU interfaces an MTB with the DC test pair. The TBCU control is through scan and distribute points from the MMSU and not directly from PICBs as with other units.

The TBCU has four major functions. First, it provides a means by which the DCTU/LTS can tell that an integrated SLC carrier line has been accessed. It does this by connecting a 56 K ohm delta termination across the MTB for identification by the DCTU/LTS. The DCTU/LTS senses this termination and takes appropriate action.

That leads to the second function. One result of this action is to remove the 56 K ohm delta termination and provide a connection from the DC test pair to the MTB. Distribute points are manipulated by the switch software to effect these state changes. This is accomplished by the LTS applying 117 volts DC on the tip lead and checking the response from the TBCU. If the response is 1 K ohms tip-to-ground, the access is considered successful. Major alarm and DC test pair busy (``I'' lead grounded) indications are passed on to the test system.

Another function of the TBCU is to connect the DC test pair to the MTB to give the DCTU/LTS access to the subscriber loop for metallic test purposes.

The fourth function of the TBCU is related to the results of the integrated SLC carrier system's digital facility channel test. The TBCU gets the channel test results from the TTF which performs the channel tests. Since the channel tests take 20-30 seconds to complete, it is strongly recommended that at least two trunk members be provisioned to reduce the incidence of blockage (VER 05, VER 55). Under control of the MSU process, the TBCU transmits the channel test results when requested by MLT.

2.8.8 MDF TEST TRUNK CIRCUIT (MDF-TTC)

The MDF-TTCs are provided in wire centers to allow nonswitched lines to be tested, to determine whether faults are inside or outside the wire center, and to allow a tester to access the switch in the fashion that a subscriber does. Access is achieved by the switch craft manually removing the lightning protection block of the line to be tested and inserting the MDF-TTC jack or ``test shoe''. The MDF-TTC is also referred to as the ``shoe circuit'' and ``stick circuit''.

2.8.9 MLT ENHANCED DCTU/LTS/EMU FEATURE (EDAF)

The MLT Enhanced DCTU/LTS/EMU feature provided the maintenance administrator with capabilities to sectionalize hardware troubles in the NTT, DCTU, and *5ESS*™ Switch test path. Specifically, it enables the maintenance administrator to:

- Select the LTS/EMU NTT or DCTU and port to be used in the access
- Identify the LTS/EMU NTT or DCTU and port used in the access
- Obtain the DCTU port status

- Obtain a list of MA packs, MTBs, and GDXCs which are out-of-service
- Obtain a list of MTBs which are in the "degraded" state
- Place a specific DCTU PMU out-of-service/in-service.

2.9 IMLT METALLIC TESTING VIA LINE UNIT

2.9.1 GENERAL

Figure 2-3 illustrates the circuit units involved in IMLT testing of a subscriber line that terminates on a LU. Only one SM is illustrated for simplicity; up to four SMs could be involved in an LU test.

2.9.2 TEST SEQUENCE

The IMLT testing of subscriber lines terminating on an LU involve software processes in both the AM and one or more SM/SM-2000s. The AM software processes were discussed in Section 2.6.2.1 and the SM software processes were briefly described in Section 2.6.2.2 . A more detailed discussion of the SM processes follows. Again, for simplicity, a single SM is used (Figure 2-5).

The OPR TP in the AM creates the TEC TP and then sends its data package to the SM/SM-2000. This package starts the path setup but contains no DCTU instructions. A piece of software called routing and terminal allocation (RTA) does the actual routing of the path over to the MMSU. The RTA software knows what hardware is available and makes any necessary substitutions. The required port on the DCTU is seized.

The output of RTA starts the MSU TP. Resources within the MMSU necessary for the test are seized by the process. The MTBs are considered part of the MMSU and are also gathered. Since OPR or TEC has already chosen the DCTU port, the corresponding MTB has been predetermined.

Next, the MSU TP performs the first half of the diode protocol test (DPT) on the DCTU-MMSU and MMSU-LU MTBs to ensure that each metallic path goes to the correct place and has no tip/ring reversals nor faults to office battery or ground.

Next, the MSU TP calls RTA and asks for suggested resources within the LU. The RTA starts up the PUT TP. Resources within the LU necessary for the test are seized. The path is set up from the MTB up to but not including the subscriber's line and the diode protocol termination is removed. The PUT TP then indicates to the MSU TP that it is ready for the next step. The MSU TP passes this information to the TEC TP. At this point, TEC and MSU start to work in parallel.

The MSU TP performs the second half of the DPT on the LU's MTB, while TEC is preparing for the second half of the DPT on the DCTU's MTB. It requests the DCTU to remove the termination from the test path port. After DCTU acknowledges the request, TEC passes a ready for DPT message back to the MSU TP. The MSU TP then performs the rest of the DPT on the MTB facing the DCTU.

Next, the MSU TP compensates the test path using the GDXC circuit in the MMSU (see Section 2.8.3.3.2). When compensation is established, the DCTU half of the path is reconnected. When GDXC informs the MSU that compensation is completed, it sends a message to PUT. The PUT TP then connects the line under test to the compensated path. It then returns an acknowledgement to the MSU TP. The MSU TP passes this information to TEC. At this point, we have a test path from the DCTU all the way to the line under test (Figure 2-3). The TEC TP then sends a message back to OPR. The OPR TP then dumps the entire IMLT data link message down into the SM/SM-2000 and has TEC direct it into the DCTU.

The DCTU now starts testing the line. Test results are sent from the DCTU to TEC which sends them up to OPR. The OPR TP puts them on the IMLT data link for transmission back to MLT. The MLT analyzes the test results and either requests further tests or is satisfied with the test results and sends a teardown order.

When testing is complete, OPR instructs TEC to tear down the test path. The TEC TP idles the DCTU and then passes a message to the MSU TP. The MSU TP idles its resources and then informs PUT. The PUT TP idles all its hardware used in the test connection and then informs the MSU TP that it has successfully completed. The PUT is then eliminated. The MSU TP informs the TEC that the path has been cleaned up and is then eliminated. Finally, TEC sends a last message to OPR and is eliminated.

Line testing involving multiple SM/SM-2000s is similar to the single SM/SM-2000 example. Figure 2-14 illustrates the maximum configuration of four SMs. There are now two MMSUs and each hardware unit resides in a different SM/SM-2000. The primary differences are that the two MMSUs are interconnected by the MTIB; there are now two MSU TPs (MSU 1 and MSU 2), and each software process resides in a different SM/SM-2000. The sequence is very similar, except now DPT would also be run for the MTIB and the SM software processes would communicate with each other over the NCT links through the CM.

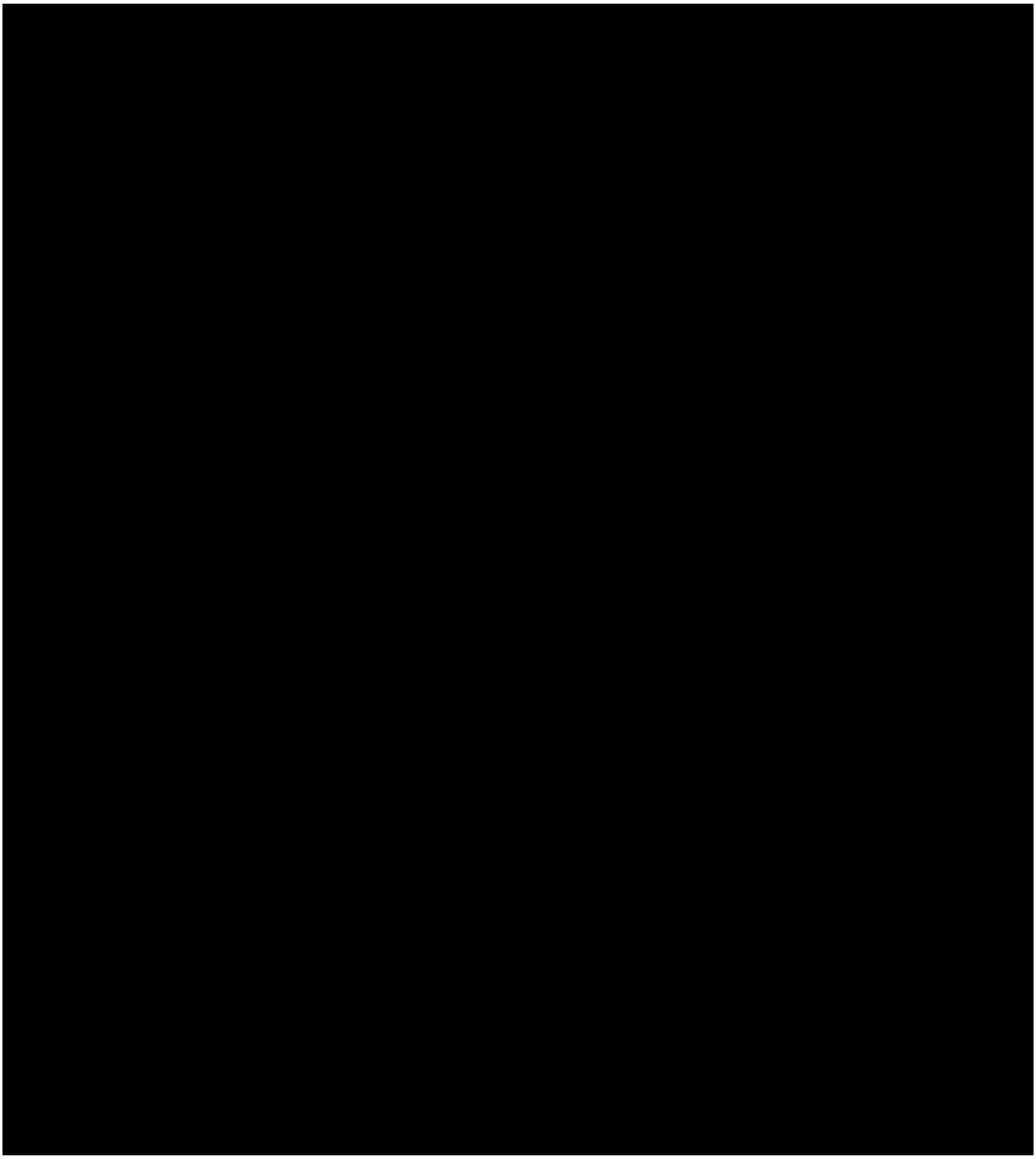

Figure 2-14 IMLT Metallic Testing - Maximum Configuration Metallic testing - maximum configuration, IMLT IMLT metallic testing maximum configuration

2.10 IMLT METALLIC TESTING OF ANALOG LINES VIA ISLU

2.10.1 GENERAL

The circuit units involved in IMLT testing of an analog line terminating on an ISLU are essentially the same as for LUs (Figure 2-3). The metallic fabric for an ISLU is described in Section 2.8.3.7 and illustrated in Figure 2-12 .

2.10.2 TEST SEQUENCE

The software processes and sequence for testing an analog line terminating on the ISLU are the same as for an LU (Section 2.9.2), with one exception; the GDXC circuit in the MMSU is not connected in the metallic path.

2.11 IMLT METALLIC TESTING OF ANALOG LINES VIA UNIVERSAL *SLC*® CARRIER SYSTEM

2.11.1 GENERAL

The SLC 96 carrier system and SLC Series 5 carrier system can multiplex up to 96 analog voice or data signals for transmission on digital facilities at the DS1 rate of 1,544 Mb/s. The analog-to-digital conversion of voice signals is done at the remote terminal (RT). In a universal SLC carrier system, digital-to-analog conversion of voice signals takes place in the central office terminal (COT), so that the lines can be connected to either an analog or digital switch by way of conventional Tip and Ring (T and R) interface.

Figure 2-15 is a simplified block diagram illustrating the IMLT interface involved in the standard IMLT test configuration for analog lines that terminate on a universal SLC carrier system. Figure 2-16 illustrates the same thing as figure 2-15 , except the PGTC is now directly connected between the DCTU and the MMSU. Figure 2-17 is a detailed block diagram illustrating the metallic network for this switch wire center. As in the *5ESS*® switch, the DC test pair is run physically along side of the digital path connecting the COT and the RT. The RT has a metallic network capable of joining any subscriber's line to the DC test pair. Figure 2-18 is the same as figure 2-17 , except the PGTC is now directly connected between the DCTU and the MMSU. Figure 2-13 is a simplified block diagram illustrating the circuit units involved in IMLT test configuration using the RMU. Figure 2-19 is a detailed block diagram illustrating the metallic network of this switch wire center.

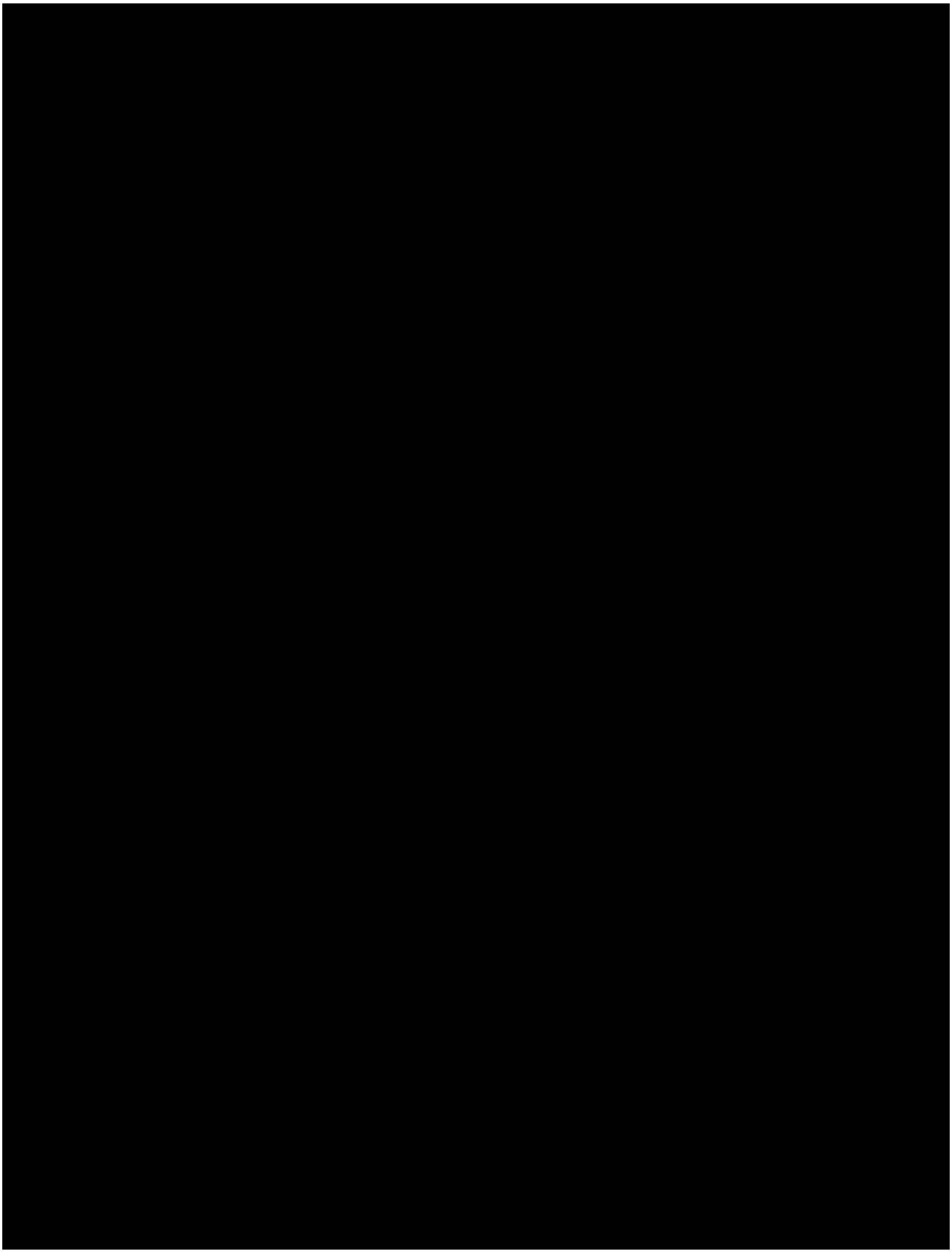

Figure 2-15 IMLT Metallic Testing Through Universal SLC Carrier System - Simplified Block Diagram IMLT metallic testing through universal SLC carrier system - simplified block diagram Universal SLC carrier system simplified block diagram, IMLT metallic testing through

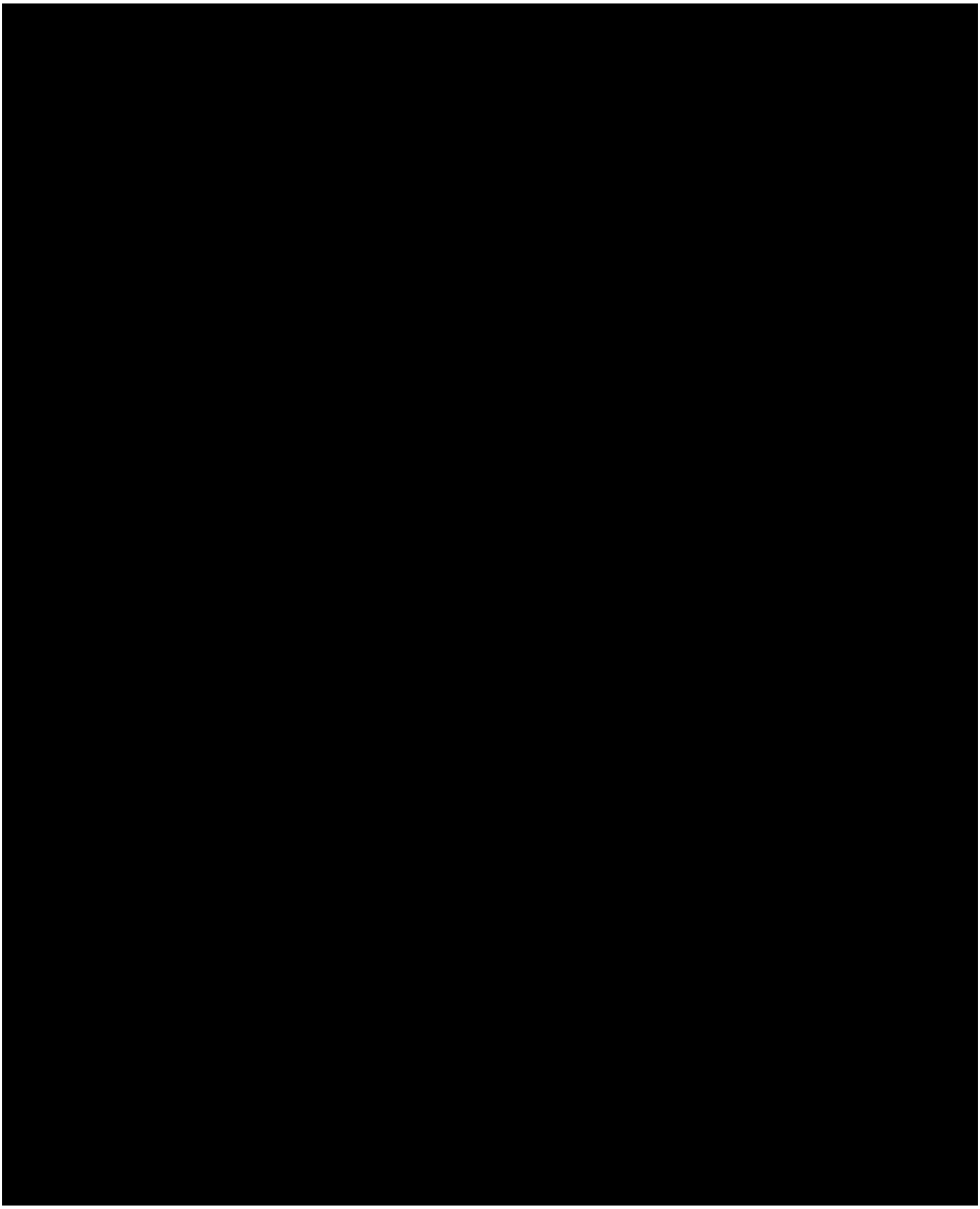

Figure 2-16 IMLT Metallic Testing Through Universal SLC Carrier System - Directly Connected PGTC IMLT metallic testing through universal SLC carrier system - directly connected PGTC Universal SLC carrier system directly connected PGTC, IMLT metallic testing through

Figure 2-17 IMLT Testing Through Universal SLC Carrier System (Metallic Network) IMLT metallic testing through universal SLC carrier system (metallic network) Universal SLC carrier system (metallic network), IMLT testing through

Figure 2-18 IMLT Testing Through Universal SLC Carrier System - Directly Connected PGTC (Metallic Network) IMLT metallic testing through universal SLC carrier system Universal SLC carrier system -

Figure 2-19 IMLT Testing Via Universal SLC Carrier System - Using the RMU (Metallic Network)
IMLT metallic testing through universal SLC carrier system - using the RMU (metallic network)
Universal SLC carrier system using the RMU (metallic network), IMLT testing through RMU (metallic network), IMLT testing through universal SLC carrier system - using the

2.11.2 TEST SEQUENCE

2.11.2.1 Standard Test Configuration (Without the RMU)

This test sequence starts off the same as the LU sequence (Section 2.9.2). Half way through the sequence, the PGTC or XTC is added. An abbreviated sequence emphasizing the differences from the LU sequence is presented here.

The sequence starts when the IOP in the AM receives a request to test a line. No mention is made that this is a universal SLC carrier line. The MLT starts a copy of the OPR TP which, in turn, begins the sequence in the SM/SM-2000. The DCTU is connected to the LU through the MMSU (and its GDXC) in a sequence that is the same as if the line were connected directly to the LU. The DCTU is looking directly into whatever is tied to the specified port of the LU. The MLT instructs the DCTU to take resistance measurements between tip, ring, and ground. These values verify that this is a testable type universal SLC carrier channel unit in the COT.

The MLT instructs the DCTU to initiate the CO tests. These tests verify that the switch equipment is operational. The DCTU sends a message directly to the switch to perform the draw/break dial tone tests. After these tests are completed, the DCTU reports back to MLT. The MLT then sends a collection of three commands to the DCTU. The first command read by the DCTU results in a request to the switch for the addition of the PGTC/XTC port. The DCTU can be connected to the input of the PGTC/XTC port either directly or through the MMSU. The PGTC/XTC port output (tip and ring of channel unit) is connected to the COT through the MMSU (and its GDXC) and the LU.

After the PGTC/XTC port is successfully added, the switch sends an acknowledgment to the DCTU. The DCTU recognizes this message and proceeds with the second command: to apply 117 V DC on the tip lead. This voltage goes to the line under test's port at the COT through the MMSU, PGTC/XTC, MMSU, and LU. This signal informs the COT that a test is desired for this particular line. The COT acknowledges with a 333.3 Hz tone which is sensed by the PGTC/XTC. The COT also reconfigures the RT so that the line under test is connected to the DC test pair. A channel test circuit in the PGTC/XTC is connected to the COT through the MMSU and LU, then the DCTU is connected to the DC test pair through the MMSU and PGTC/XTC. Both the channel test and the metallic test now start.

The third command sent to the DCTU is to perform the open circuit foreign electromotive force (FEMF) test to check for voltages that could harm the DCTU. The remaining sequence for metallic testing by the MLT is the same as for the LU example.

When MLT channel test results are desired, MLT sends a message to the IOP requesting the results of the channel test (by opening up the sleeve lead toward the PGTC/XTC). Channel test results appear as a voltage on tip and ring in the PGTC/XTC port which the DCTU can read. The DCTU reports these measured values back to the MLT which translates them into channel test results. With testing complete, the MLT informs the switch to tear down the test paths.

2.11.2.2 Test Configuration Using the RMU

The test sequence for the RMU configuration follows the test sequence for the standard configuration with the major exception of how the line under test is tested through the RT. When the COT reconfigures the RT, the line under test is connected to the RMU metallic test pair through the RT metallic network. The communications gateway in the MLT establishes data communications with the RMU over an analog telephone line and handles messages between the MLT and the RMU. The RMU performs tests on the line in response to tests requests from the MLT and returns test results to the MLT through the analog line. The CO access and testing by the DCTU and PGTC/XTC is the same as for the standard configuration.

2.12 IMLT METALLIC TESTING OF ANALOG LINES VIA INTEGRATED *SLC*® CARRIER SYSTEM

2.12.1 GENERAL

Figure 2-20 is a simplified block diagram illustrating the IMLT interface involved in testing subscriber analog lines that terminate on an integrated SLC carrier system interface to the switch. Figure 2-21 is a detailed block diagram illustrating the metallic network of this switch wire center. An integrated SLC carrier system consists of only the remote terminal (RT) which connects directly to the outside plant and the carrier facility that provides the digital path between the RT and the switch.

Functions of the COT are embedded in the switch. The switch interface is either a DCLU (Section 2.8.3.8) or an IDCU (Section 2.8.3.9) or an DNU-S (Section 2.8.3.10) on an SM. Note to make sure that it is obvious that the DNU-S is only supported on SM-2000s. Note also that no GDXC in the MMSU is used in integrated SLC carrier metallic testing.

Figure 2-22 is a simplified block diagram illustrating the circuit units involved in integrated SLC carrier system testing using an RMU. Figure 2-23 is a detailed block diagram illustrating the metallic network of this switch wire center.

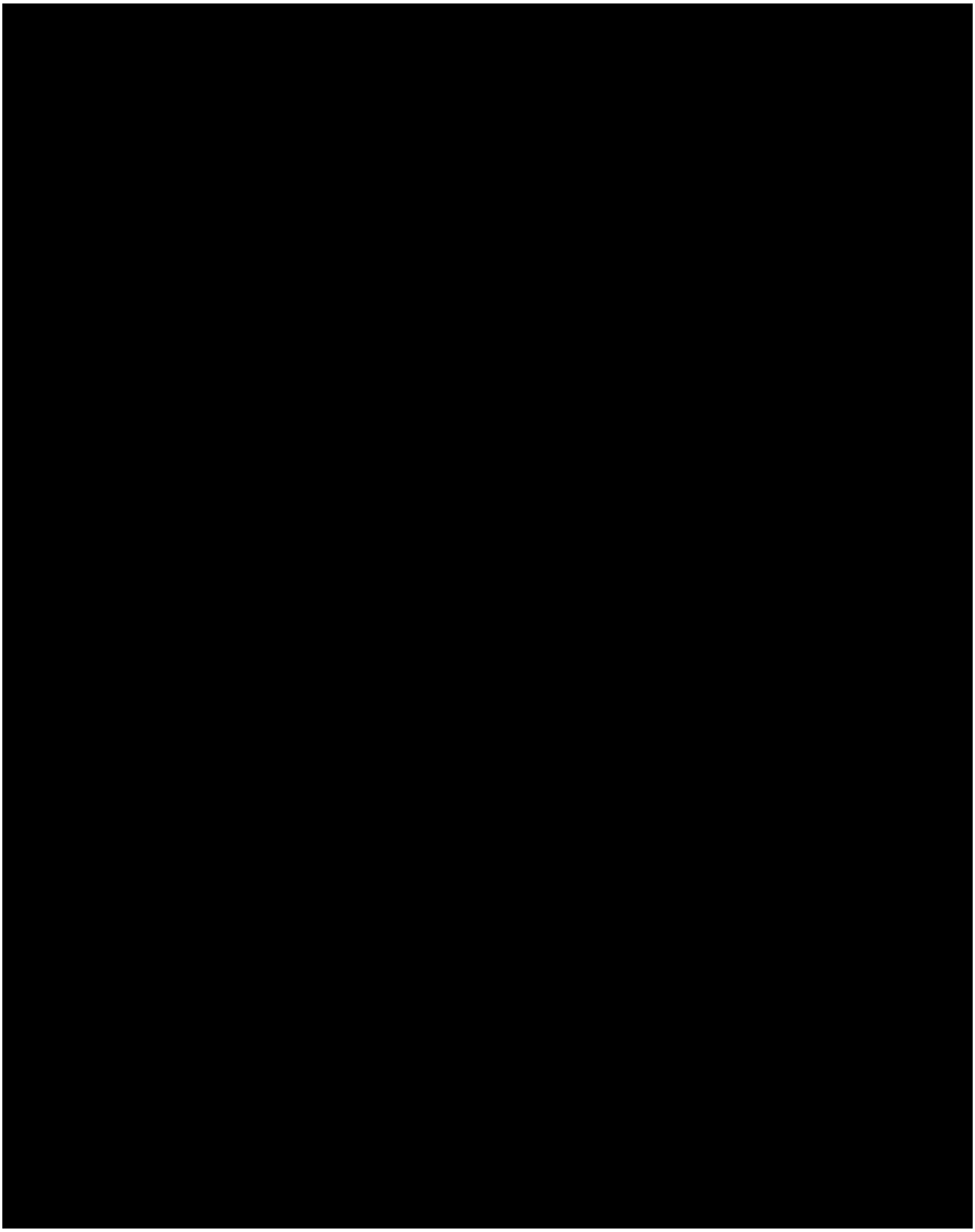

Figure 2-20 IMLT Metallic Testing Via Integrated SLC Carrier System - Simplified Block Diagram IMLT metallic testing through integrated SLC carrier system - simplified block diagram Integrated SLC carrier system simplified block diagram, IMLT metallic testing through

Figure 2-21 IMLT Testing Via Integrated SLC Carrier System (Metallic Network) IMLT metallic testing through integrated SLC carrier system (metallic network) Integrated SLC carrier system (metallic network), IMLT testing through

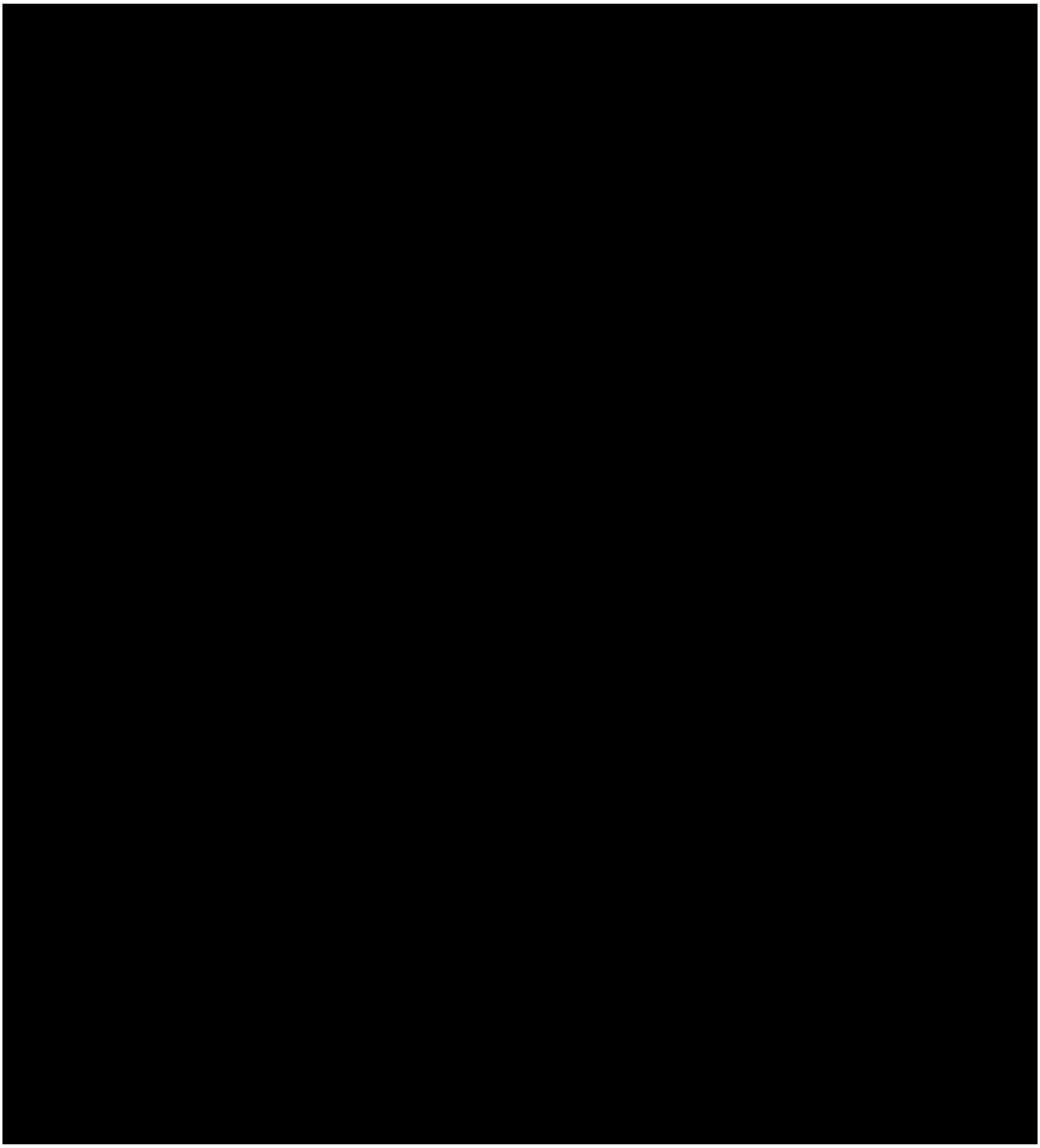

Figure 2-22 IMLT Metallic Testing Via Integrated SLC Carrier System - Using the RMU - Simplified Block Diagram IMLT metallic testing through integrated SLC carrier system - using the RMU - simplified block diagram Integrated SLC carrier system using the RMU - simplified block diagram, IMLT testing through

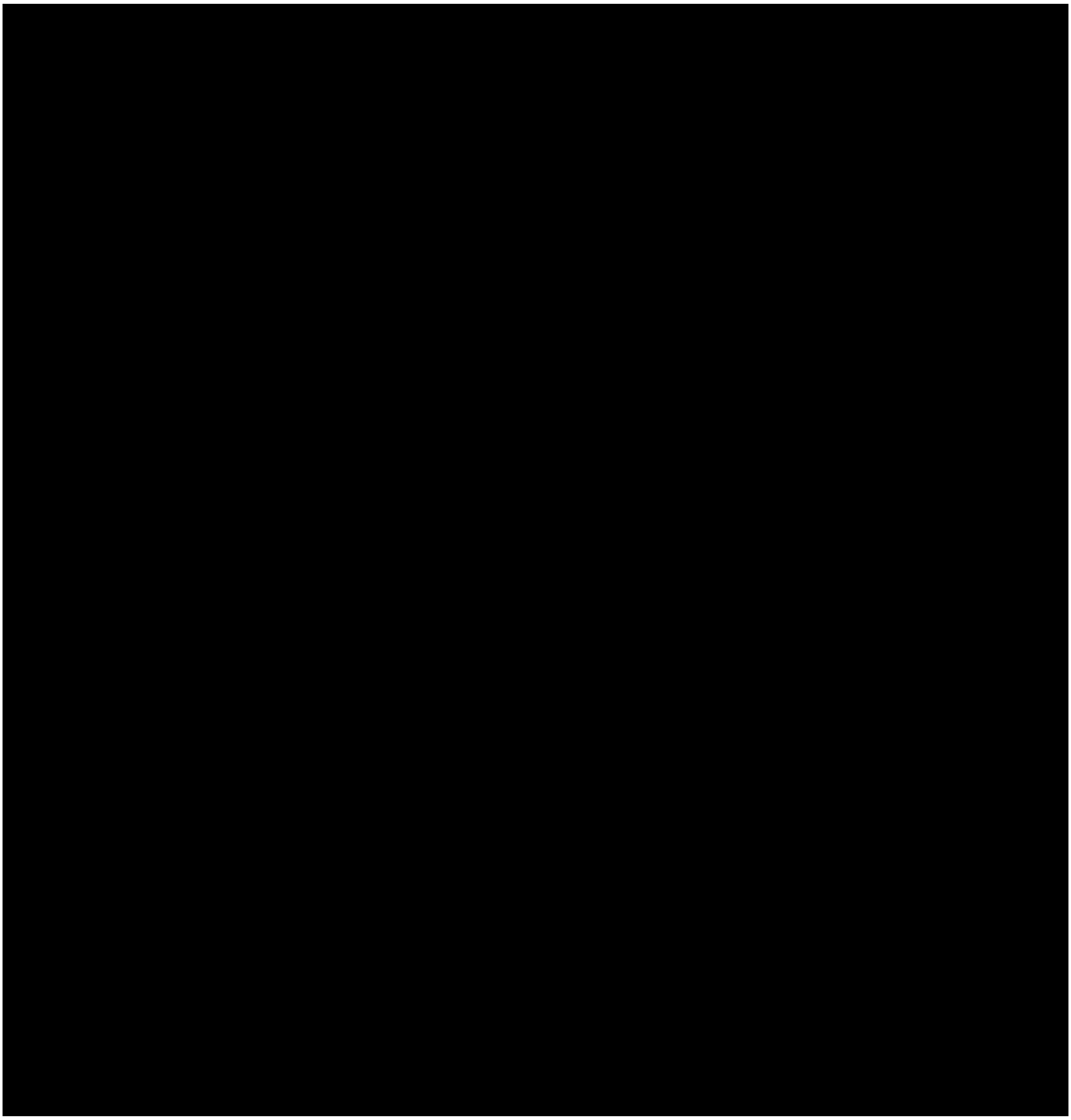

Figure 2-23 IMLT Testing Via Integrated SLC Carrier System - Using the RMU (Metallic Network) IMLT testing through integrated SLC carrier system - using the RMU (metallic network) Integrated SLC carrier system using the RMU (metallic network), IMLT testing through RMU (metallic network), IMLT testing through integrated SLC carrier system - using the

2.12.2 TEST SEQUENCE

2.12.2.1 Standard Test Configuration (Without the RMU)

Testing of subscriber analog lines that terminate on an integrated SLC carrier system interface to the switch use essentially the same software processes as the LU termination. There are a number of differences in the hardware involved and the test sequence. An abbreviated test sequence emphasizing these differences is provided in the following paragraphs.

Work begins when MLT sends an access request to the switch. This request contains the directory number

(DN) to be tested. The switch determines that this is an integrated SLC carrier line by doing a conversion on the DN. This initiates a switch software function which provides for checking the continuity of the MTBs associated with the TBCU. Multiple failures results in the metallic access boards (TN 138) being removed from service (MLT VER Code B0). This check can be inhibited through the use of the **ALW:S96MTBOVR** input message. If the continuity check is successful, then the DCTU is connected to the TBCU by an MTB through one or more MMSUs. The TTF is connected to the DCLU/IDCU/DNU-S through the switch's digital network. After a time delay, MLT responds with a request to the DCTU to read the 56 K ohm delta signature. The signature indicating an integrated SLC line is returned to MLT.

When the signature is received, MLT commands the DCTU to apply 117 V DC to the tip lead on the TBCU. When this voltage is sensed by the TBCU, it connects the MTB from the DCTU to the DC test pair. The state change in the TBCU is also sensed by the switch. Upon recognizing the state change, the switch software informs the DCLU/IDCU/DNU-S to change the state of the RT. This results in connection of the DC test pair to the line under test through the RT metallic network. The DCTU is then looking into the line under test through one or two MMSUs, a TBCU, the DC test pair, and the RT. The state change in the TBCU also results in the connection of the carrier channel to the RT analog hardware used in the channel test.

The channel is tested while the DCTU is performing various metallic tests, because the channel is isolated from the drop during metallic bypass. The channel test is automatically initiated upon access. Channel test results are sent back to the MSU process which controls the TBCU transmission of the results. During this process, metallic tests are performed and the results are sent from the DCTU to the TEC which sends them up to OPR. The OPR puts them on the IMLT data link for transmission back to MLT. The MLT requests the channel test results from the switch software. When testing is completed, all resources are then idled.

2.12.2.2 Test Configuration Using the RMU

The test sequence for the RMU configuration follows the test sequence for the standard configuration with the major exception of how the line under test is tested through the RMU at the RT.

When the DCLU/IDCU/DNU-S changes the state of the RT, the line under test is connected to the RMU metallic test pair through the RT metallic network. The communications gateway in the MLT FE establishes data communications with the RMU over the analog telephone line and handles messages between the FE and the RMU. The RMU performs tests on the line in response to test requests from the FE and returns test results to the FE through the analog line. The CO access and channel testing by the DCTU/TTF is the same as for the standard configuration.

2.13 IMLT METALLIC TESTING VIA MDF TEST TRUNK

2.13.1 GENERAL

Figure 2-24 illustrates the circuit units of a switch wire center involved in IMLT testing of subscriber loops through the MDF-TTC. Note that the AM, CM, and SMP are not illustrated. Except for the DFTAC required in the IMLT interface, MDF testing in both the IMLT and MLT environments is virtually identical. Using an MDF-TTC allows the testing of loops that are connected to CO equipment that are not MLT-testable. Also, a fault can be sectionalized in or out of the CO by testing ``IN'' or ``OUT'' using the MDF test trunk.

Because the MDF-TTC is not calibrated for length, it is important that it be located on the same floor as the MDF. This aids in keeping the cross connections between the DFTAC and the MDF trunk circuit as short as possible. Excessively long cross connections may result in the MLT incorrectly diagnosing opens in the switch (VER Code 3) as open outs (VER Code 41).

Figure 2-24 IMLT Metallic Testing Via MDF Test Trunk IMLT metallic testing through MDF test trunk MDF test trunk IMLT metallic testing through

2.13.2 TEST SEQUENCE

The MLT maintenance administrator (MA) must first establish communications with the switch craft over a loudspeaker or phone line accessed through the communications console. The maintenance administrator tells the switch craft the TN of the line to be tested and the number of the MDF-TTC to be accessed. The craft then removes the lightning protection block of the line to be tested and inserts the shoe of the designated MDF-TTC. The maintenance administrator can then access the line at the MDF and initiate any applicable tests.

This test sequence starts off the same as for the LU sequence (Section 2.9.2). An abbreviated sequence emphasizing the differences from the LU sequence is presented here.

The sequence starts when the IOP in the AM receives the request to access the MDF-TTC. The MLT starts a copy of OPR which, in turn, begins the sequence in the SM/SM-2000. The DCTU is connected to the MDF-TTC through the MMSU (and its DFTAC) in a sequence that is essentially the same as the sequence that connects the DCTU to an LU. The MDF-TTC completes the connection to the line at its MDF termination. Thus, the DCTU is looking directly into the line at its MDF termination. Testing in or out of the CO can now be performed.

2.14 LTS METALLIC TESTING VIA LINE UNIT

2.14.1 GENERAL

Figure 2-2 illustrates the circuit units involved in MLT testing of subscriber lines that terminate on LUs.

Only one MMSU is shown for simplicity. The LTS is connected to the metallic fabric of the LU through an NTT interface and one or two MMSUs. The LTS is wired to the NTT circuit which is, in turn, connected to an MMSU through MTBs, one per MMSU SG. If the GDXC is located in a different shelf in the same MMSU, the two MMSU shelves are connected through the MTIB. The LTS and NTT units are common to MLT testing of many switching systems and is not included in this document. A description of the LTS in ***MLT TEXT MANAGER*** module **fac.ltsdes**.

2.14.2 TEST SEQUENCE

It is assumed that maintenance personnel are familiar with the test sequence for LTS testing of subscriber lines terminating on LUs; therefore, it is not discussed in this manual.

2.15 LTS METALLIC TESTING OF ANALOG LINES VIA ISLU

The ISLU can serve an analog line through a Z line card in the ISLU. A discussion of the ISLU metallic fabric is provided in Section 2.8.3.7 . The circuit units involved in LTS tests on an analog line terminating on an ISLU are the same as for an analog line terminating on an LU (Figure 2-2). The test sequence is also the same (Section 2.14), except the GDXC circuit in the MMSU is not connected in the metallic path.

2.16 LTS METALLIC TESTING OF ANALOG LINES VIA UNIVERSAL *SLC*® CARRIER SYSTEM

2.16.1 GENERAL

Figure 2-25 illustrates the standard test configuration involved in LTS testing of subscriber lines that terminate on a universal SLC carrier system interface to the switch. Figure 2-26 illustrates the universal SLC carrier system test configuration using the RMU.

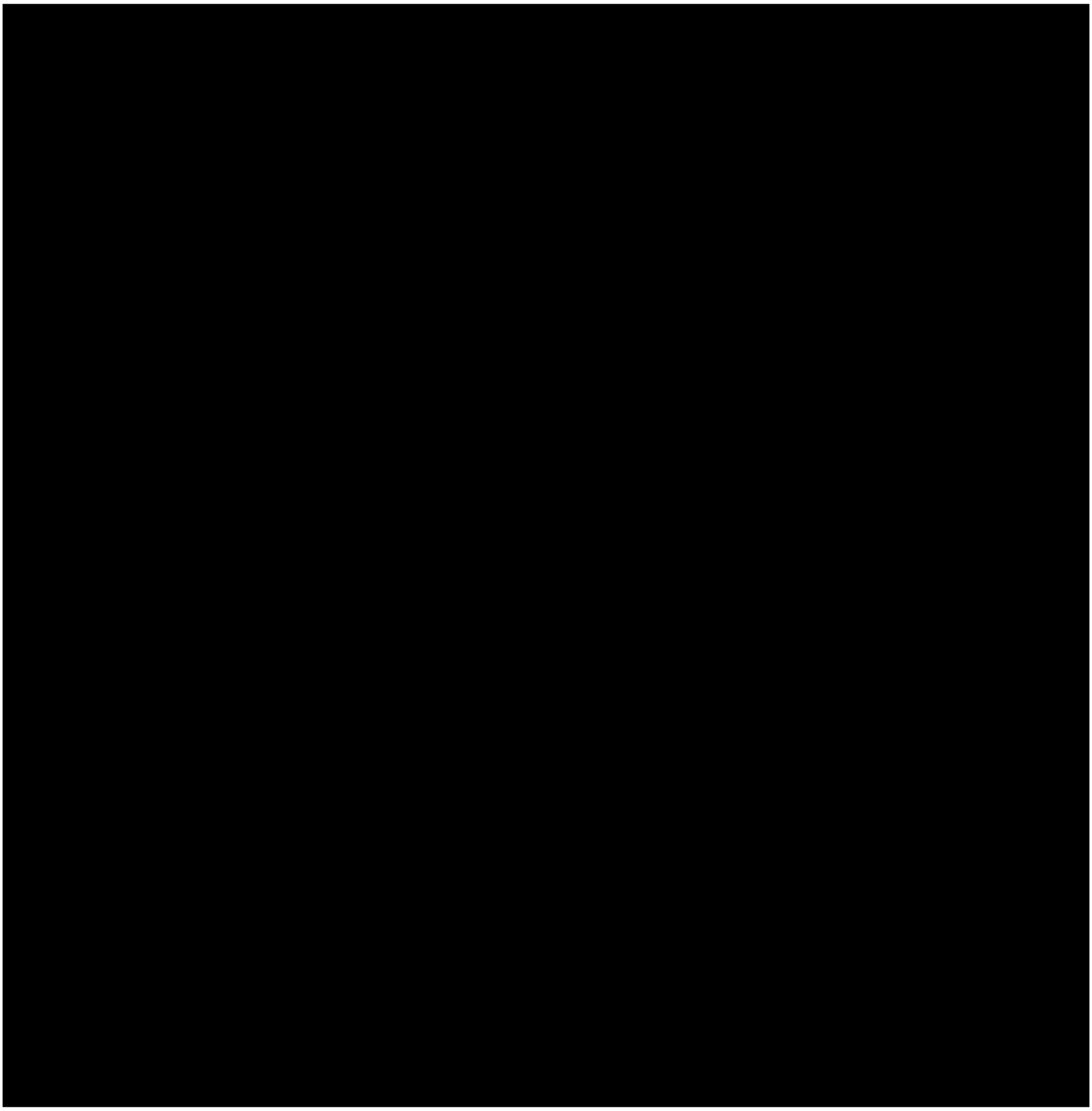

Figure 2-25 LTS Metallic Testing Via Universal SLC Carrier System LTS metallic testing through universal SLC carrier system Universal SLC carrier system LTS metallic testing through

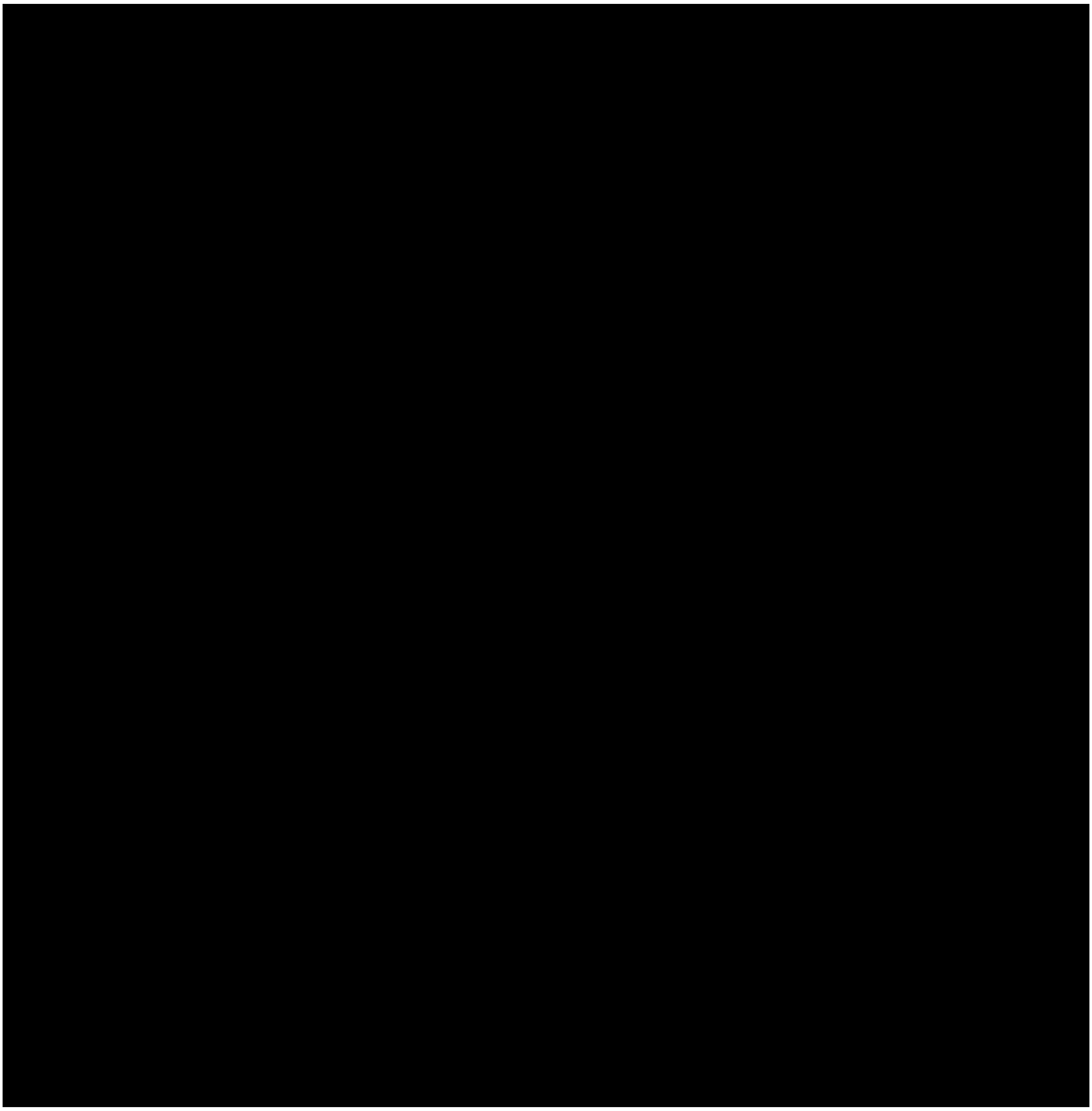

Figure 2-26 LTS Metallic Testing Via Universal SLC Carrier System - Using the RMU LTS metallic testing through universal SLC carrier system - using the RMU Universal SLC carrier system using the RMU - LTS metallic testing through RMU, using the LTS metallic testing through universal SLC carrier system

2.16.2 TEST SEQUENCE

2.16.2.1 Standard Test Configuration (Without the RMU)

This test sequence starts off the same as for the LU sequence. During the test sequence, the PGTC or XTC is activated. An abbreviated sequence emphasizing the differences from the LU sequence is presented here.

The sequence starts when the LTS receives a request to test a line. No mention is made that this is a universal SLC carrier line. The LTS is connected to the LU through the NTT and one or two MMSUs in a sequence that is the same as if the line were connected directly to the LU. The LTS is looking directly into whatever is tied to the specified port of the LU. The LTS takes resistance measurements between tip, ring, and ground. These values verify that this is a testable type universal SLC carrier channel unit in the COT.

Next, the LTS initiates the CO tests. These tests verify that the switch equipment is operational. The PGTC/XTC output (tip and ring of channel unit) is connected to the COT through the NTT, MMSU(s), and the LU.

After the LTS successfully completes the CO tests, it applies 117 V DC to the tip lead. This voltage goes to the line-under-test channel unit at the COT through the PGTC/XTC, NTT, MMSU, and LU. This signal informs the COT that a test is desired for this particular line. The COT acknowledges with a 333.3 Hz tone which is sensed by the PGTC/XTC. The COT also reconfigures the RT so that the line under test is connected to the DC test pair. A channel test circuit in the PGTC/XTC is connected to the COT through the NTT, MMSU, and LU; then the LTS is connected to the DC test pair through the PGTC/XTC and the COT. Both the channel test and the metallic test now start.

Next, the LTS runs the open circuit foreign electromotive force (FEMF) test to check for voltages that could harm the LTS. The remaining sequence for metallic testing by the MLT is the same as for the LU example.

When MLT is done, it sends a message to the LTS requesting the results of the channel test (by opening up the sleeve lead). The request goes to TEC which causes a state change in the PGTC/XTC's sleeve lead. Channel test results appear as a voltage on tip and ring in the PGTC/XTC which the LTS can read. The LTS reports these measured values back to MLT which translates them into channel test results. With testing complete, the MLT informs the switch to tear down the test paths.

2.16.2.2 Test Configuration Using the RMU

The test sequence for the RMU configuration follows the test sequence for the standard configuration with the major exception of how the line under test is tested through the RT.

When the COT reconfigures the RT, the line under test is connected to the RMU metallic test pair through the RT's metallic network. The communications gateway in the MLT FE establishes data communications with the RMU over the analog telephone line and handles messages between the FE and the RMU. The RMU performs tests on the line in response to tests requests from the FE and returns test results to the FE through the analog line. The CO access and channel testing by the LTS and PGTC/XTC is the same as for the standard configuration.

2.17 LTS METALLIC TESTING OF ANALOG LINES VIA INTEGRATED *SLC*® CARRIER SYSTEM

2.17.1 GENERAL

Figure 2-27 illustrates the standard test configuration involved in LTS metallic testing of subscriber analog lines that terminate on an integrated SLC carrier system interface to the switch. Figure 2-28 illustrates the integrated SLC carrier system test configuration using the RMU.

Figure 2-27 LTS Metallic Testing Via Integrated SLC Carrier System LTS metallic testing through integrated SLC carrier system Integrated SLC carrier system LTS metallic testing through

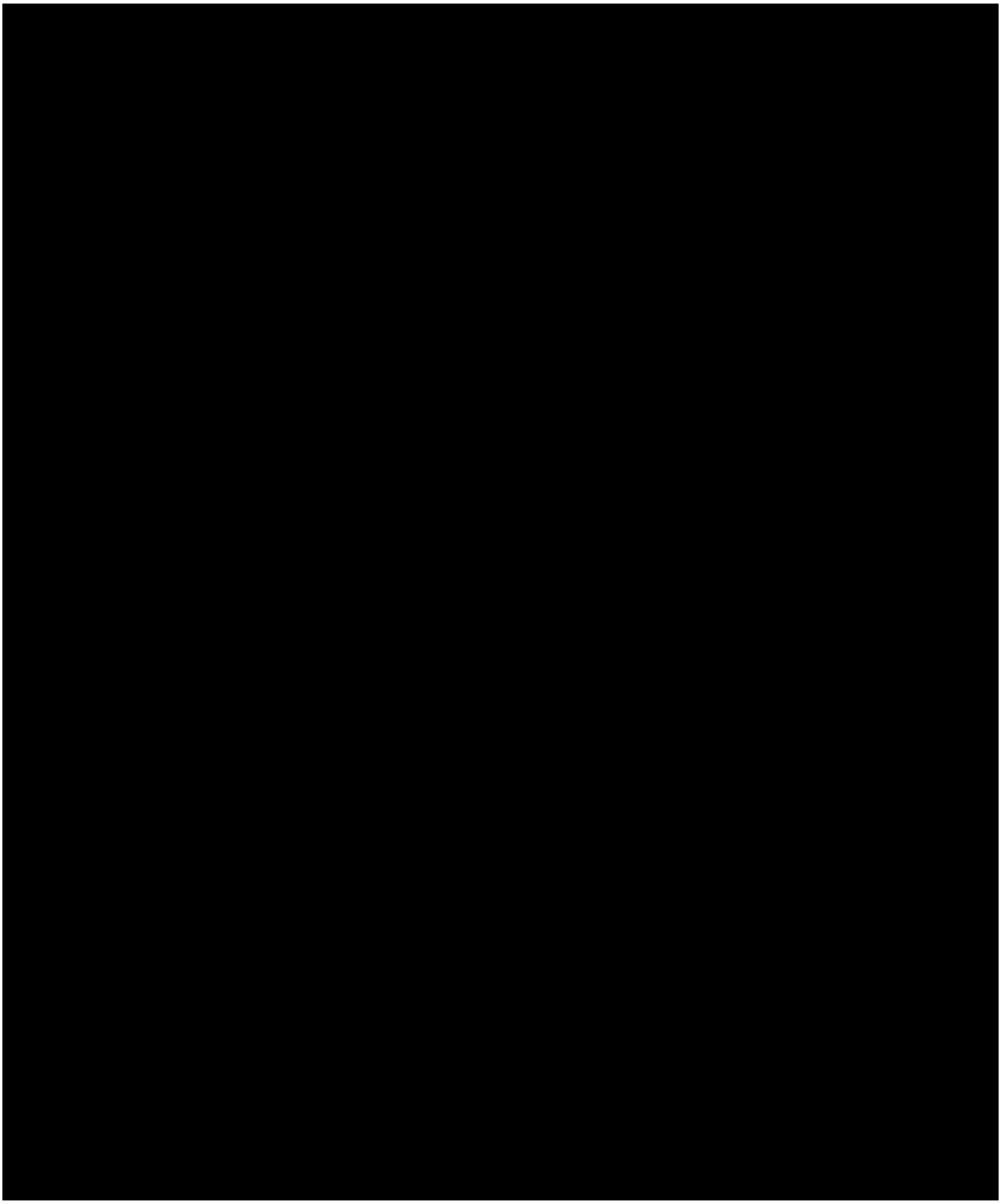

Figure 2-28 LTS Metallic Testing Via Integrated SLC Carrier System - Using the RMU LTS metallic testing through integrated SLC carrier system - using the RMU Integrated SLC carrier system - using the RMU LTS metallic testing through RMU, using the LTS metallic testing through integrated SLC carrier system

2.17.2 TEST SEQUENCE

2.17.2.1 Standard Test Configuration (Without the RMU)

Testing of subscriber analog lines that terminate on an integrated SLC carrier system interface to the switch (Figure 2-27) is similar to the test sequence for the LU termination. There are a number of differences in the hardware involved and the test sequence. An abbreviated test sequence emphasizing these differences is provided in the following paragraphs.

Work begins when the MLT sends an access request to the LTS. This request contains the directory number (DN) to be tested. The switch determines that this is an integrated SLC carrier line by doing a conversion on the DN. The LTS is connected to the TBCU by an MTB through the NTT and one or more MMSUs. The TTF is connected to the DCLU/IDCU/DNU-S through the switch digital network. When these analog and digital paths are completed, MLT is notified. The MLT responds with a request to the LTS to read the signature. The signature indicating an integrated SLC carrier line is returned to MLT.

When the signature is received, MLT commands the LTS to apply 117 V DC to tip lead on the TBCU. When this voltage is sensed by the TBCU, it connects the MTB from the LTS to the DC test pair. The state change in the TBCU is also sensed by the switch. Upon recognizing the state change, the switch software requests the DCLU/IDCU/DNU-S to change the state of the RT. This results in connection of the DC test pair to the line under test through the RT's metallic network. The LTS is then looking into the line under test through the NTT, one or two MMSUs, a TBCU, the DC test pair, and the RT. The state change in the TBCU also results in the connection of the carrier channel to the RT analog hardware used in the channel test.

The channel is tested while the LTS is performing various metallic tests. The channel test is automatically initiated by the switch software upon access. Channel test results are sent back to the TBCU from the software controlling the TTF. During this process, metallic tests are performed and the results sent from the LTS to the MLT. Some time later, MLT asks the LTS for the channel test results by giving an ``open sleeve'' request. This request instructs the switch software to return the electrical channel test results to the LTS over the MTB. These electrical signals are measured by the LTS and the results are returned to the MLT. When MLT is satisfied with the test results, all resources are idled.

2.17.2.2 Test Configuration Using the RMU

The test sequence for the RMU configuration (Figure 2-28) follows the test sequence for the standard configuration with the major exception of how the line under test is tested through the RT.

When the DCLU/IDCU/DNU-S changes the state of the RT, the line under test is connected to the RMU metallic test pair through the RT's metallic network. The communications gateway in the MLT FE establishes data communications with the RMU over the analog telephone line and handles messages between the FE and the RMU. The RMU performs tests on the line in response to test requests from the FE and returns test results to the FE through the analog line. The CO access and channel testing by the LTS/TTF is the same as for the standard configuration.

2.18 LTS METALLIC TESTING VIA MDF TEST TRUNK

2.18.1 GENERAL

Figure 2-29 illustrates the circuit units involved in MLT testing of switch subscriber loops through the MDF test trunk. In this configuration, an LTS port is wired directly to an MDF-TTC (SD 90070-01). Using an MDF-TTC allows the testing of loops that are connected to CO equipment that are not MLT-testable. Also, a fault can be sectionalized in or out of the CO by testing ``IN'' or ``OUT'' using the MLT test jack on the MDF. In this discussion, the MLT FE and DCN of the centralized maintenance center are treated as black boxes.

Figure 2-29 LTS Metallic Testing through MDF Test Trunk LTS metallic testing through MDF test trunk MDF test trunk LTS metallic testing through

2.18.2 TEST SEQUENCE

The maintenance administrator must first establish communications with the switch craft over a loudspeaker or phone line accessed through the communications console. The maintenance administrator tells the craft the TN of the line to be tested and the number of the MDF-TTC to be accessed. The craft then removes the lightning protection block of the line to be tested and inserts the shoe of the designated MDF-TTC. The maintenance administrator can then access the line at the MDF and initiate any applicable tests.

The sequence starts when the LTS receives the request from the MLT FE to access a MDF-TTC. The LTS selects the port that is wired to the designated MDF-TTC. The MDF-TTC completes the connection to the line at its MDF termination. Thus, the LTS is looking directly into the line at its MDF termination. Testing in or out of the CO can now be performed.

2.19 INTEGRATED SERVICES DIGITAL NETWORK OVERVIEW

2.19.1 GENERAL

The ISDN provides a single integrated network carrying switched voice and data services, enhanced packet data, facsimile and other services. By utilizing evolving digital technology, ISDN services are provided over the same copper loop that currently provides analog service. On ISDN multipoint service, eight points of contact are provided from a single ISDN line. That is, a single user or multiple users can connect up to eight station sets (ISDN ``telephones''), facsimile machines, and/or terminals to a single ISDN line. All eight users can use the loop simultaneously when most are using packet data service. The ISDN line allows two simultaneous circuit-switched voice or data calls. This type of service requires sophisticated sectionalization techniques involving metallic loop testing and/or digital testing to isolate troubles.

The major differences between ISDN service and analog service that impact MLT testing of subscriber lines include the following:

- Transmission
- Signaling
- Basic DSL Configurations
- Universal SLC Carrier System DSL Applications
- Integrated Digital Carrier Unit ANSI U-DSL Application
- Customer Premises Equipment (CPE)
- MLT/ISDN Software
- Line Specifications
- New Digital Test Interface for the LTS Application
- New Switch Hardware
- New Switch Software
- DNU-S ANSI U-DSL Application.

2.19.2 TRANSMISSION

Transmission on ISDN DSLs is ***digital*** rather than analog. Digital transmission sends a sequence of discrete states (ones and zeros) rather than a continuous wave form. Loop testing for analog lines is primarily metallic, because problems on these lines are mostly metallic faults. Although the same metallic faults can occur in ISDN DSLs, digital transmission problems can also be caused by switching, transmission, and/or CPE faults, or by other factors such as load coils or excessive loss. Digital transmission responds differently to light faults on the line. For example, 100 K ohms T-R does not degrade digital transmissions. On ISDN lines, if the transmission path is free of faults, signaling or protocol problems may interfere with service.

Digital transmission is not possible on a loop with load coils. They cause a total loss of transmission at the high digital frequencies. Metallic testing is not affected by load coils, so it cannot be used to detect loaded loops.

Bridged taps can cause signal distortion and loss on ISDN DSLs unless they are fairly short and meet some other conditions. Neither metallic nor digital testing can detect bridged taps on ISDN DSLs.

2.19.3 SIGNALING

Analog lines use in-band signaling which means that the signals are carried in the same path as the transmission. Someone monitoring the line can actually hear signals such as dial tone, a busy signal or the multifrequency tones used for dialing. Signaling for ISDN DSLs can be ***out-of-band*** and handled by messages between the switch and the CPE. The station set itself creates the dial tone, busy signal, etc. The signals are not audible on the line. The switch sometimes provides the tones but they cannot be monitored because they are digitized audio. Therefore, some MLT requests such as Monitor, Talk, and other interactive test requests do not work for ISDN DSLs.

2.19.4 BASIC DSL CONFIGURATIONS

2.19.4.1 General

The DSL is the ISDN physical connection between the switch and the CPE. The basic rate interface (BRI) is the Telecommunication Standardization Sector (TSS) standard interface between the ISLU line termination or the IDCU or DNU-S TR303 interface (Section 2.19.6) in the switch and the DSL for ISDN service. The BRI provides two B channels and one D channel.

There are two basic types of DSLs that can be used in ISDN service:

- U-Interface DSL (U-DSL)
- T-Interface DSL (T-DSL).

2.19.4.2 U-DSL

Both metallic and digital tests are used to sectionalize faults on U-DSLs. The basic U-DSL (Figure 2-30) is an ordinary 2-wire loop that runs from a U line card in the ISLU to a Level 1 network termination (NT1) on the customer premises. The NT1 makes the transition between 2-wire and 4-wire transmission to interface with the CPE. The network side of the NT1 is called the U-interface (2-wire) and customer side is called the T-interface (4-wire). The NT1 also plays an important role in both metallic and digital testing.

There are two types of NT1s:

(1) **AMI NT1 -** This prestandard NT1 is in use with 5E9(2) and later software releases. The AMI stands for Alternate Mark Inversion, which is the line coding technique used by the AMI NT1. The AMI NT1 was developed by Lucent Technologies for the *5ESS*® switch before the ANSI developed standards that would be used by all vendors for the production of NT1s.

(2) **ANSI NT1 -** This is the standard NT1 that is compatible with all types of switches.

Each NT1 type has its unique signature that is recognized by MLT/ISDN (Section 2.19.8). Both the AMI and ANSI NT1s require a matching U line card in the ISLU. Both MI and ANSI NI1s can coexist.

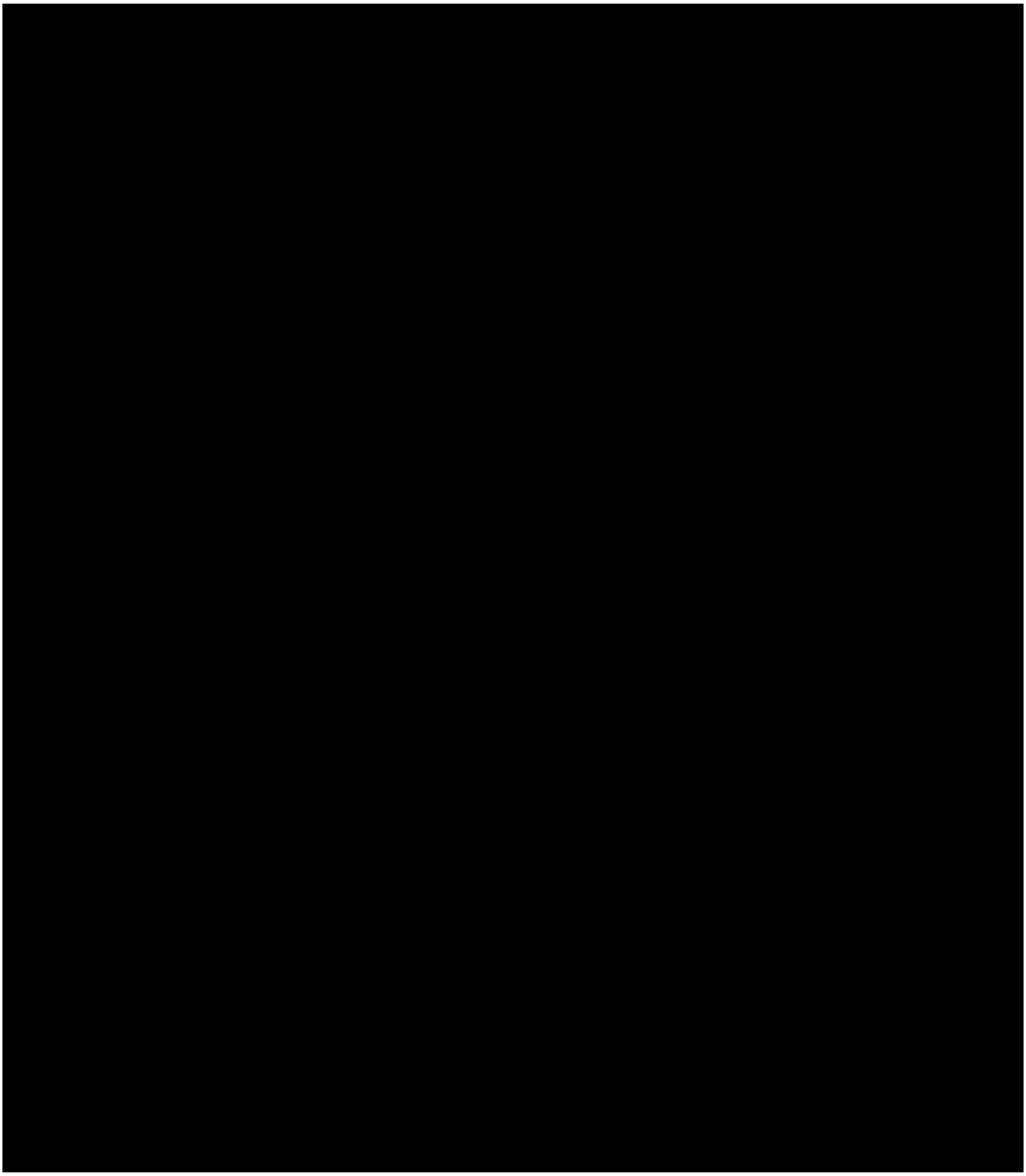

Figure 2-30 ISDN Digital Subscriber Lines/Loops ISDN digital subscriber lines/loops Digital subscriber lines/loops, ISDN

2.19.4.3 T-DSL

The T-DSL is a 4-wire facility from a T line card in the ISLU directly to the ISDN CPE (Figure 2-30). An NT1 is not required on a T-DSL. The T-DSL is restricted to inside wiring and must be less than 3100 feet or 1 km in length for single point applications, or 310 feet or 100 meters for multipoint. Because of this length limitation, ordinarily T-DSL service is provided using an RSM, ORM, TRM, or RISLU at the customer premises. The RSM application is illustrated in Figure 2-30 . Metallic testing is not possible for the T-DSL because the switch cannot get metallic access to the loop; only digital tests are used to sectionalize faults.

2.19.4.4 National ISDN (NI1)

National ISDN (NI1) establishes a standard Q.931 interface which enables multi- vendor switches to be compatible with terminals from different manufacturers. The Standard Interface is available on ANSI U or T DSLs. The *5ESS*® switch supports both the Standard [5E9(2) and later releases] and pre-Standard (Custom) Interfaces.

2.19.5 UNIVERSAL *SLC*® CARRIER SYSTEM DSL APPLICATIONS

2.19.5.1 General

A universal SLC carrier system (SLC 96 carrier system or SLC Series 5 carrier system) can also be used to support an ISDN U-DSL, T-DSL, or mixed U-DSL and T-DSL (Figure 2-31). This requires the appropriate basic rate interface transmission extension (BRITE) channel unit (CU) in both the COT and RT. Multiple DSLs are run from the switch to the BRITE CU in the COT. The DSLs are multiplexed on to DS1 carrier facilities which connect the COT to the RT. At the RT, the DS1 carrier facilities are demultiplexed to BRITE CUs. There is a one-to-one mapping of COT BRITE CUs to RT BRITE CUs.

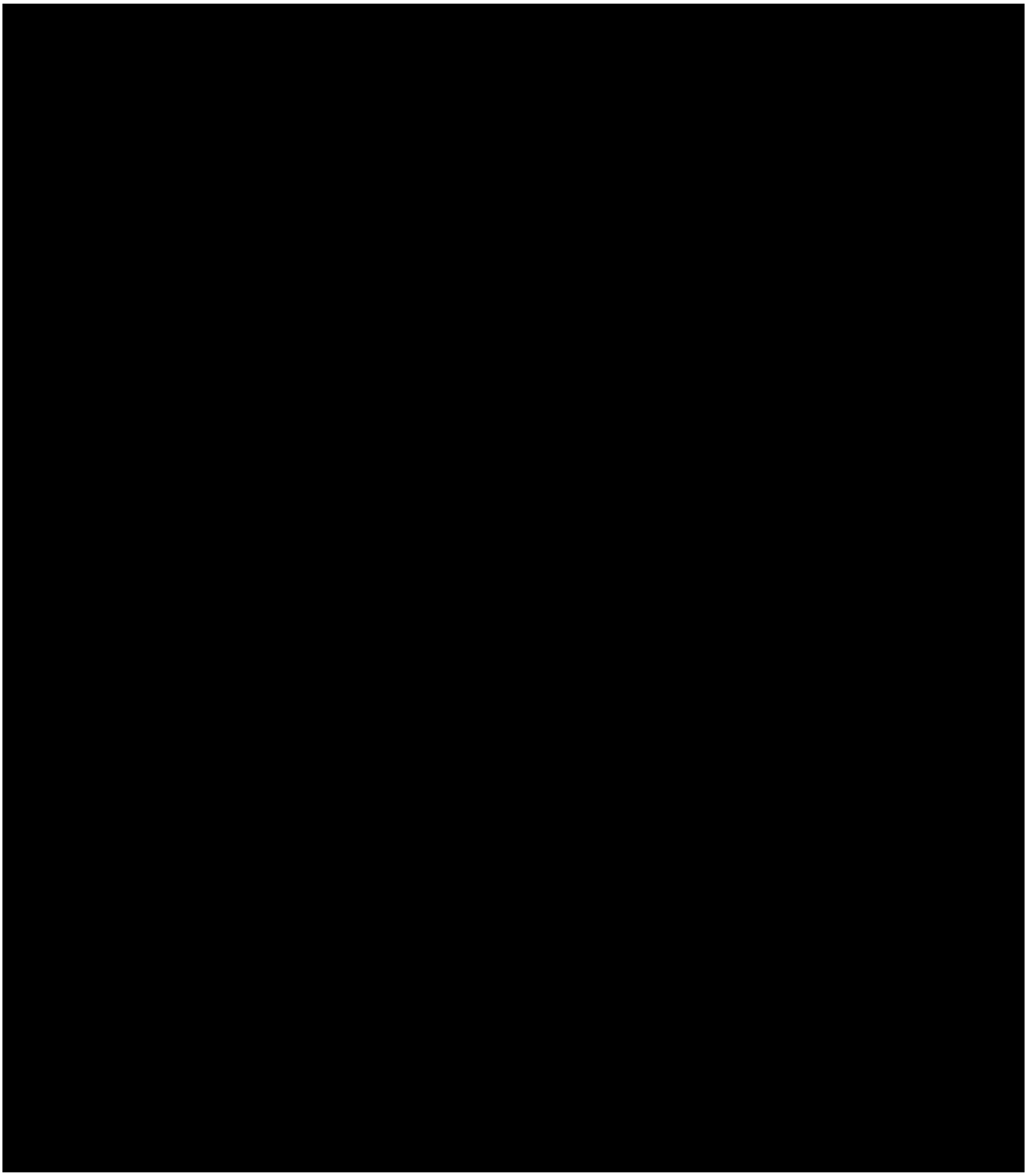

Figure 2-31 Universal SLC Carrier System in ISDN DSLs ISDN DSLs, universal SLC carrier system in Universal SLC carrier system in ISDN DSLs

2.19.5.2 U-DSL Applications

2.19.5.2.1 General

In the U-DSL applications (matching U-BRITE CUs in the COT and RT), the DSL connectivity is as follows: from the ISLU line termination to the COT CU, through the SLC carrier system, from the RT CU to the NT1, and then to the CPE. Metallic access to the DSL is available for the connection from the ISLU line termination to the NT1.

2.19.5.2.2 *ANSI*® U-DSL Application

In the ANSI U-DSL application (ANSI U-BRITE CUs at both the COT and RT), both metallic and digital testing are used to sectionalize faults in the line. The PGTC/XTC is required for the metallic access beyond the RT CU (see Figures 2-15 and 2-13). Metallic test access to the DSL is available for the connection from the ISLU line termination to the COT CU and also for the connection from the RT CU to the NT1. As with the basic U-DSL, metallic testing is performed only to the NT1.

2.19.5.2.3 AMI U-DSL Application

In the AMI U-DSL application (AMI U-BRITE CUs at both the COT and RT), limited metallic and digital testing are used to sectionalize faults in the line. Metallic testing is available ***only*** to the COT, because metallic bypass is ***not*** available for AMI U-BRITE CUs. Logical digital loopbacks are not supported by MLT on AMI U-BRITE CUs but can be made with some portable test sets. These loopbacks are discussed in Section 2.21.2 . The ISLU2 does not support the AMI U-DSL.

2.19.5.3 T-DSL Application

In T-DSL applications (T-BRITE CUs at both the COT and RT), metallic testing is not supported. Only digital testing is used to sectionalize faults on the line.

2.19.5.4 Mixed U-DSL and T-DSL Application

In the mixed application, a U line card is in the ISLU, U-BRITE CU in the COT, and T-BRITE CU in the RT. Thus from the switch to the COT is a U-interface and from the RT to the CPE is a T-interface. One cost advantage of this configuration is that the distance restrictions for T-DSLs are overcome without the addition of an NT1. However, MLT testing of this configuration is not supported. Therefore, no further discussion of the mixed U-DSL and T-DSL application is provided.

2.19.6 INTEGRATED DIGITAL CARRIER UNIT *ANSI*® U-DSL APPLICATION

An integrated DLC system (SLC Series 5 carrier system or SLC-2000 access system TR303 RT or generic TR303 RT) can also support ANSI U-DSLs when using an IDCU or DNU-S (Figures 2-32 and 2-33). This requires a TR303 interface in the IDCU/DNU-S. The DSL connectivity is as follows: (1) from the IDCU/DNU-S through the DLC system, (2) from the RT CU to the NT1, and then (3) to the customer premises equipment. Both metallic and digital testing are used to sectionalize faults in a line.

Figure 2-32 Integrated Digital Carrier Unit (IDCU) In ISDN ANSI U-DSLs Integrated digital carrier unit in ISDN ANSI U-DSLs Integrated digital carrier unit (IDCU)

Figure 2-33 Digital Networking Unit - SONET (DNU-S) In ISDN ANSI U-DSLs Digital networking unit - SONET in ISDN ANSI U-DSLs Digital networking unit - SONET (DNU-S)

2.19.7 CUSTOMER PREMISES EQUIPMENT

The ISDN transmission requires special equipment on the customer premises. A standard telephone (analog station set) cannot be used on an ISDN line unless a terminal adapter is used. Conversely, ISDN station sets cannot be used on an analog line. Terminals and facsimile machines can connect directly to an ISDN line if they have an appropriate NT1 (Section 2.19.4) or ISDN terminal adapter built into them. Otherwise, they can be connected to an external ISDN terminal adapter.

2.19.8 MLT/ISDN SOFTWARE

The MLT/ISDN support for ISDN DSL testing was originally provided in three feature packages that are ***not*** an integral part of MLT, but are added features. Enhanced algorithms for metallic testing on DSLs and new

VER codes and summary messages are a part of MLT/ISDN Feature Package 1 (FP1) and FP2. The MLT/ISDN FP3 provides new, comprehensive test algorithms and new VER codes, summary messages, and output screens on the trouble verification (TV) mask to integrate digital and metallic testing and further automate the testing and analysis for DSLs. Now MLT/ISDN FP2 and FP3 are combined into one package, MLT/ISDN FP2/FP3.

The MLT/ISDN FP1 supports metallic tests on DSLs terminating on AMI NT1s. The MLT/ISDN FP2/FP3 does the same for DSLs terminating on ANSI NT1s and supports digital testing and analysis on ***all*** DSLs on the Custom Interface. A separate MLT/ISDN feature, MLT/ISDN NI1, provides the digital testing capabilities for ANSI U and T DSLs on the Standard Interface. The MLT/ISDN FP1, FP2/FP3 and NI1 are compatible with MLT-3. Additional information on MLT/ISDN FP1, FP2/FP3 and NI1 can be found in the description of MLT/ISDN digital testing and analysis (Section 2.21).

- With ***only FP1 ON***, the MLT tests as if all DSLs are AMI lines. Therefore an ANSI NT1 signature results in a fault indication.
- With ***only FP2/FP3 ON***, the MLT tests as if all DSLs are ANSI lines. Therefore, an AMI NT1 signature results in a fault indication.
- With ***both FP1 and FP2/FP3 ON***, the MLT has all capabilities of the combined packages plus the capability to recognize line card and NT1 mismatches.
- With both FP2/FP3 and NI1 ON, the MLT has all capabilities of testing DSLs on Custom and Standard Interfaces.

2.19.9 LINE SPECIFICATIONS

The primary identifier of the line record for an analog line is the TN. This works well because there exists a stable, one-to-one relationship between the telephone number and the facilities (cable pair) for that number. Changes are infrequent and typically require a service order.

For ISDN lines, this relationship is neither one-to-one nor stable. A single facility may be associated with several TNs, and may change without service orders. This dynamic nature of ISDN circuit information requires two separate line records in the MLT front end (FE): one for facility information and another for service information. The facility information is contained in the ***DSL Line Record***. It contains cable and pair information, as well as most of the information MLT uses for testing. The key identifier for this line record is the *Common Language*® codes serial number.

A sample DSL line record is shown as follows:

DSL LINE RECORD		INTERPRETATION
123ABC45678	PLID	Primary Line Identifier is the COMMON LANGUAGE codes serial number 123ABC45678
201202L44.0.6.21 or 201202I44.0.6.21	SECID	Secondary Line Equipment Identifier made up of the Exchange key (201202), the single character originating equipment (OE) type (L if ISLU, K if ISLU2, I if IDCU, E if AIU, or A if DNU-S), and the OE number (OEN) (044-0-06-21) stripped of leading zeros and separated by periods instead of dashes
ISDN	SC	Service Class is ISDN
04400621	OEN	The OEN for a line served by an ISLU, ISLU2, IDCU, AIU, or an DNU-S (each subscriber has a unique OEN)
CA 1 PR 1	FAC	Facility is Cable 1, Pair 1
CA 2 PR 2		Facility is Cable 2, Pair 2

The OEN is used to identify the appearance of the BRI in the switch. The AIU OEN is the Access Interface Unit Equipment Number (AIUEN). The INEN is the IDLC network equipment number. The DNU-S is the Digital Networking Unit - SONET. The ISLU OEN is the line card equipment number (LCEN), the ISLU2 OEN is the line circuit equipment number (LCKEN), the IDCU OEN is the IDCU line equipment number (ILEN), and INEN is the IDLC network equipment number.

The LCEN consists of 8 digits (AAABBDDEGG), defined as follows:

AAA =	001 - 192	= SM
B =	0 - 7	= ISLU
CC =	00 - 15	= Line Group Controller
DD =	00 - 31	= Line Card

The LCKEN consists of 10 digits (AAABBDDEGG), defined as follows:

AAA =	001 - 192	= SM
BB =	00 - 42	= ISLU2
DD =	00 - 15	= Line Group Controller
E =	0 - 7	= Line Pack Number (Line Board)
GG =	00 - 77	= Line Circuit Number

The ILEN consists of 11 digits (AAABBCCDDDD), defined as follows:

AAA =	001 - 192	= SM
BB =	0 - 42	= IDCU on which the RT terminates
CC =	01 - 31	= RT serving the line
DDDD	0001 - 2048	= Subscriber line at RT

The INEN consists of 10 digits (AAABCCDDDD), defined as follows:

AAA =	001 - 192	= SM
B =	0 - 7	= DNU-S on which the RT terminates
CC =	01 - 99	= RT serving the line
DDDD =	0001 - 2048	= Subscriber line at RT

The AIUEN consists of 10 digits (AAABBBDDGG), defined as follows:

AAA =	001 - 192	= SM
BBB =	0 - 125	= AIU
DD =	01 - 19	= Application pack
GG =	00 - 31	= Line Circuit Pack Number

The record containing service information is called the ***DN Line Record***. A sample DN line record is as follows:

DN LINE RECORD		INTERPRETATION
555 6371	PLID	Primary Line Identifier in the DN (the TN, 555-6371)
ISDN	SC	Service Class is ISDN
NONE	OEN	The OEN is not stored in this record
NONE	FAC	Facility information is not stored in this record

The MLT/ISDN FP1 uses line record information from the DN line record for testing. The MLT uses information from the switch in conjunction with the DN line record information to do the test. For the IMLT interface, if the line record is unavailable, the MLT still determines from the switch whether the line is wired for ISDN. For the LTS interface, if the line record is unavailable, only default information is used. Even in that case, the MLT/ISDN algorithms recognize the NT1. When IMLT/ISDN FP2/FP3 is used, the ***Dynamic Record Linking*** feature links line record information from both the DN and DSL line records. The originating equipment number (OE) is accessed from the switch and used for dynamic linking of the DN and DSL line records. This provides complete line record data for metallic and digital testing.

2.19.10 NEW DIGITAL TEST INTERFACE FOR THE LTS APPLICATION

The MLT/ISDN FP2/FP3 digital test capability does not add any new hardware to the IMLT interface. It does introduce a ***new*** digital test interface to the switch for the LTS application. This digital port is added to the tables within MLT. This dedicated data link from the MLT DCN to the switch is equivalent to the IMLT data link. It makes use of the same hardware and software processes used for digital testing of ISDN lines as does the IMLT application. Thus, the MLT interface requirements for digital testing of ISDN lines are the ***same*** for IMLT and LTS applications (Figure 2-34).

2.19.11 NEW SWITCH HARDWARE

2.19.11.1 General

The switch circuit units involved in metallic testing of ISDN lines are the same as those involved in metallic testing of analog lines. Thus, descriptions of the AM (Section 2.8.1), CM (Section 2.8.2), and SM (Section 2.8.3.2) circuit units are also applicable to MLT metallic testing of ISDN lines.

The switch circuit units involved in MLT/ISDN digital analysis and testing of ISDN lines are illustrated in Figure 2-34 . The IDCU analog line application was briefly described in Section 2.8.3.9 . The IDCU ISDN line applications were briefly described in Section 2.19.6 . The following additional SM circuit units are also involved in MLT/ISDN digital analysis and testing of ISDN lines:

- Integrated Services Test Facility (ISTF)
- Protocol Handler (PH).

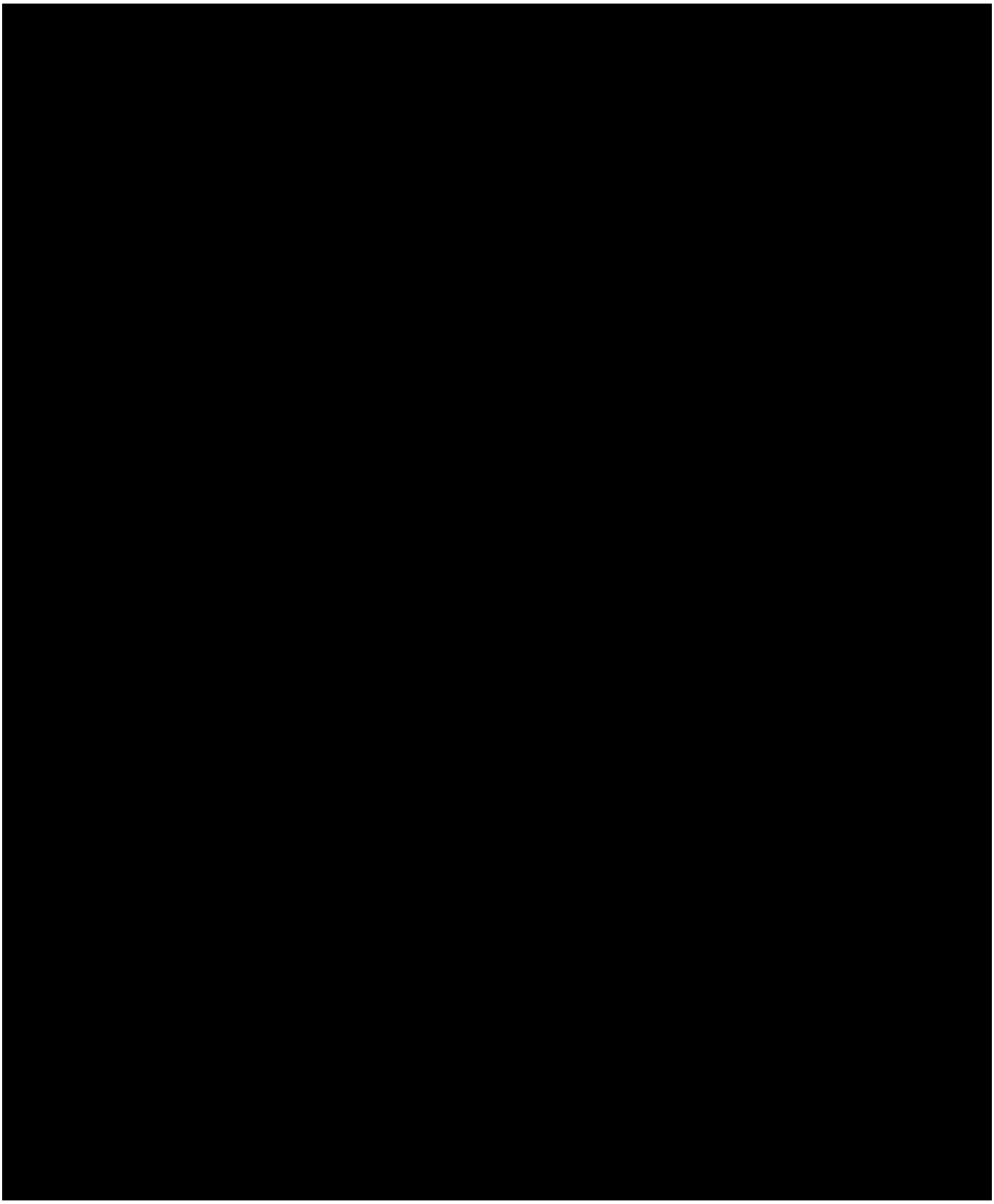

Figure 2-34 MLT/ISDN Digital Test Interface - ISLU/RISLU MLT/ISDN digital test interface Digital test interface, MLT/ISDN

2.19.11.2 Integrated Services Test Facility

The ISTF is physically located in the digital service unit model 2 (DSU2) shelf in an SM. Each DSU2 shelf can have up to four ISTF units. The functionality provided by the ISTF may also be provided by the GDSF.

The ISTF is a global unit that can serve SMs that do not have such units. The ISTF provides the following functions:

- Digital loopback of the bits received (loopback function)
- Transmission of a pseudo-random number (PRN) (XMIT function).

The loopback function is used only by digital trunk testing and is not discussed here. The XMIT function is, in effect, a digital loopback test for the circuit-switched B-channels of a DSL. The unit transmits a TSS recommended 11-bit shift register PRN. It expects a far-end device to loop back the bits so the receive side can tell if any bits were altered during transmission. Each ISTF can perform up to three simultaneous XMIT loopbacks. Logical loopbacks, for example, require the use of only one ISTF trunk member. Physical loopback (involving both B-channels), however, require two trunk members. This means that MLT can only perform one physical loopback at a time if only one ISTF is provisioned with three trunk members. To reduce the incidence of blocking, it is recommended that all three trunk members available for the ISTF XMIT function be provided. Additional ISTF units may also be required to handle the traffic load. Refer to the digital ordering and planning system (DOPS) for engineering guidelines.

Insufficient provisioning may result in the following response:

VER B7: ISTF UNAVAILABLE.

2.19.11.3 Protocol Handler

The PH is physically located on the packet switch unit (PSU). There is one PSU in every ISDN SM. The PSU provides a centralized high bandwidth interface to support packetized signaling messages and packet data switching. It can support a maximum of 128 D-channels or 32 packet switched B-channels. A packet-switched test uses the PH to perform the digital loopback.

2.19.12 NEW SWITCH SOFTWARE

2.19.12.1 General

Just as the MLT interface requirements for digital testing and analysis are the same for IMLT and LTS applications (Section 2.19.10), the required AM and SM software processes are the same for either application.

2.19.12.2 Administrative Module

The AM software processes that run under OSDS for MLT/ISDN digital test functions are illustrated in Figure 2-35 . The MLRD, MLWR, and MLT system processes were discussed in Section 2.6.2.1 . The new terminal process (TP) for MLT/ISDN digital testing is ISDN_CI. A digital line test request causes the MLT system process to start the ISDN_CI TP and then pass the request to this process. The ISDN_CI TP looks at the test request type and calls the appropriate functions to process the command request. If needed, the TN or LCEN/ILEN/INEN/AIUEN is extracted within the called command request. Test results and/or error messages are sent up to the ISDN_CI TP. The ISDN_CI TP puts them on the data link (through MLWR) for transmission back to MLT.

Figure 2-35 Administrative Module Software Processes - MLT/ISDN Digital Testing and Analysis Software processes - MLT/ISDN digital testing and analysis, administrative module MLT/ISDN digital testing and analysis - administrative module software processes Integrated services digital network digital testing and analysis - AM software processes Integrated services digital network software processes - digital testing and analysis, AM

2.19.12.3 Switching Module

The SM software processes that run under OSDS for MLT/ISDN digital test functions are illustrated in Figure 2-36 . There are two different routes taken to process digital line test requests. One route is used when requesting digital loopback tests and the other route is used when requesting switch-based digital information for analysis.

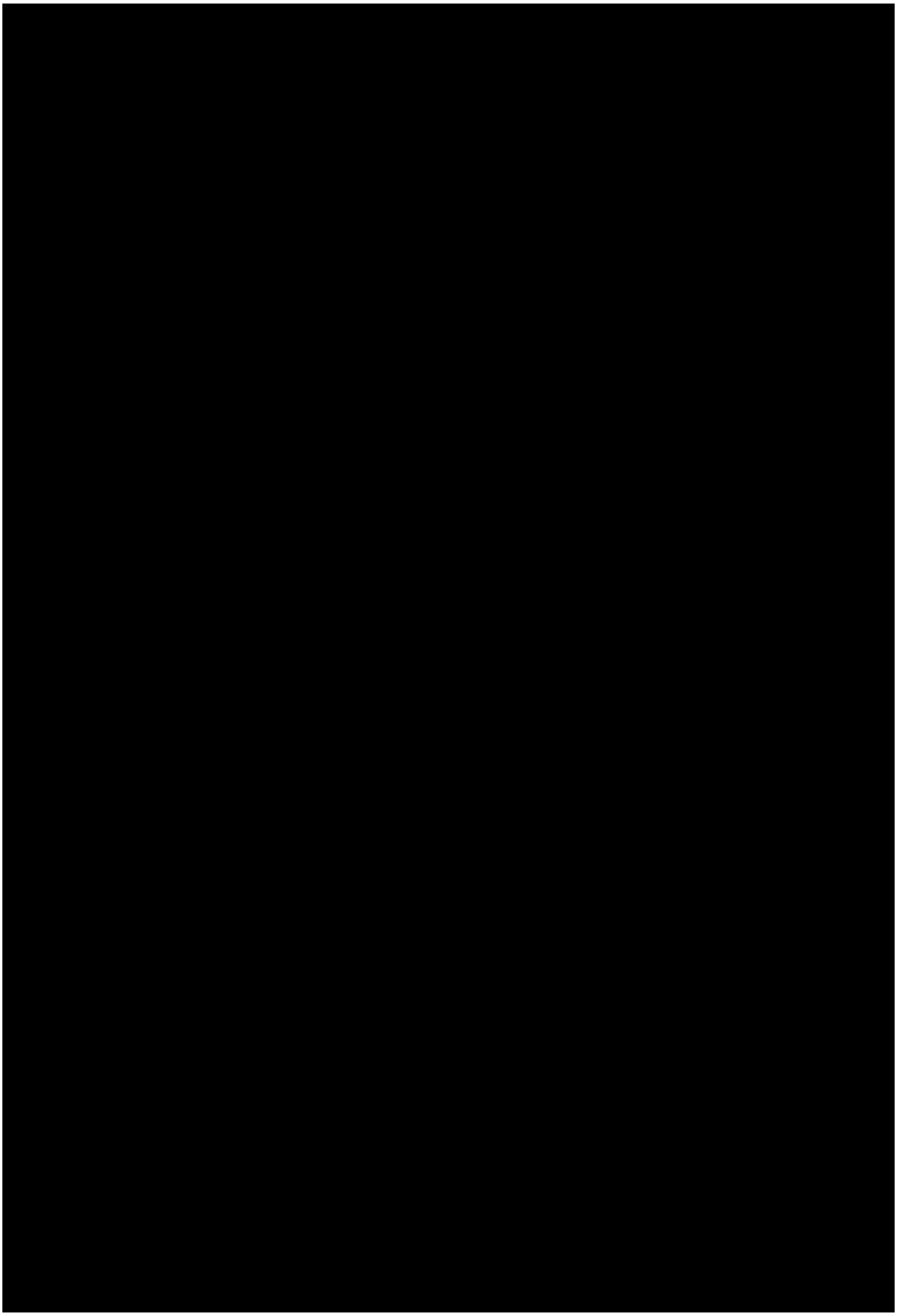

Figure 2-36 Switching Module Software Processes - MLT/ISDN Digital Testing and Analysis Software processes - MLT/ISDN digital testing and analysis, switching module MLT/ISDN digital testing and Analysis - switching module software processes Integrated services digital network digital testing and analysis - SM software processes Integrated services digital network software

processes - digital testing and analysis, SM

2.19.12.3.1 Digital Loopback Request

A digital loopback request is sent from the ISDN_CI TP in the AM to the existing port status administrator in the interface module (PSIM) system process in the SM. The PSIM process creates the integrated services port administrator (ISPA) TP upon receiving the test request. The ISPA TP then processes the test request and creates the PUT TP. The TEC TP is created by the RTA subsystem.

NOTE: A TEC TP is created internal to the PH and external to the ISTF (The ISTF may not be in the same SM as the test is called from; therefore RTA handles creation and routing to an available ISTF in another SM).

The TEC TP uses the existing test software and hardware in the ISTF and/or PH to perform the loopback tests. The TEC TP returns the test results to the PUT TP which, in turn, sends the results to the ISDN_CI TP in the AM.

Since the ISTF used could be in a different SM from the line being tested, the loopback test may be run across an umbilical between an RSM and the host SM (HSM). This is especially true if the service is off an RSM which does not have its own ISTF. If the umbilical cannot support the data rate of the loopback, then the test fails. To minimize the chances of this occurring, MLT has provided a group description file (GDF) option which allows the customer to choose between data rates of 56 kilobits per second (56 Kbps), 64 Kbps restricted, or 64 Kbps clear. The data rate to use should match the data rate of the umbilical.

2.19.12.3.2 Switch-Based Digital Information Request

A switch-based digital information request is sent from the ISDN_CI TP in the AM to the existing PSIM process in the SM. The PSIM process creates the new MLT SM TP to process the request and return the results to the MLWR process in the AM for return to the MLT. The types of switch-based digital information [the **STATUS & PM DATA** (status and performance monitoring data) in Figures 2-34 and 2-36] that may be requested are described in Section 2.21.3 .

2.20 MLT/ISDN METALLIC TESTING ON ISDN LINES

2.20.1 GENERAL

Although there are many fundamental differences between ISDN and analog services (Section 2.19), there are many similarities in the metallic testing of ISDN and analog lines.

2.20.2 MLT/ISDN METALLIC TESTING OF ISDN LINES VIA ISLU

The metallic testing of a U-DSL terminating on an ISLU uses essentially the same hardware interfaces and software processes that are used for the applicable IMLT (Section 2.6) or LTS (Section 2.14) metallic testing of analog lines terminating on an LU. The test sequence is also essentially the same, with the following exceptions:

(1) The GDXC circuit in the MMSU is not connected in the metallic path.

(2) The NT1 signature is analyzed to determine the NT1 type.

(3) If both MLT/ISDN FP1 and FP2/FP3 are ON, a line card-NT1 mismatch test is performed.

(4) Metallic testing is possible ***only*** to the NT1. The MLT does not have access for metallic testing of customer wiring beyond the NT1.

(5) Metallic testing is automatically inhibited on ISDN lines that are in use, either voice or data, because such tests could interfere with service.

(6) Monitor, Talk and other interactive test requests do not work for ISDN lines.

2.20.3 MLT/ISDN METALLIC TESTING OF ISDN LINES VIA UNIVERSAL *SLC*® CARRIER SYSTEM

2.20.3.1 General

The metallic testing of U-DSLs served by a universal SLC carrier system (SLC 96 carrier system or SLC Series 5 carrier system) uses essentially the same hardware interfaces and software processes that are used for the applicable IMLT (Section 2.11) or LTS (Section 2.16) metallic testing of analog lines served by a universal SLC carrier system. The test sequence is also essentially the same, with some major exceptions that are discussed for each application.

2.20.3.2 *ANSI*® U-DSL Application

The major exceptions in the metallic testing of ANSI U-DSLs and analog lines served by a universal SLC carrier system are as follows:

(1) The GDXC circuit in the MMSU is not connected in the metallic path.

(2) The NT1 signature is analyzed to determine the NT1 type.

(3) If both the MLT/ISDN FP1 and FP2/FP3 are ON, a line card-NT1 mismatch test is performed.

(4) Metallic testing is performed ***only*** to the NT1. The MLT does not have access for metallic testing of customer wiring beyond the NT1.

(5) Metallic testing is automatically inhibited on ISDN lines that are in use, either voice or data, because such tests could interfere with service.

(6) Monitor, Talk, and other interactive test requests do not work for ISDN lines.

2.20.3.3 AMI U-DSL Application

The major exceptions in the metallic testing of AMI U-DSLs and analog lines served by a universal SLC carrier system are as follows:

(1) The GDXC circuit in the MMSU is not connected in the metallic path.

(2) Metallic testing is available ***only*** to the COT, because metallic bypass is ***not*** available for AMI U-BRITE CUs.

(3) Metallic testing is automatically inhibited on ISDN lines that are in use, either voice or data, because such tests could interfere with service.

(4) Monitor, Talk, and other interactive test requests do not work for ISDN lines.

2.20.4 MLT/ISDN METALLIC TESTING OF ISDN LINES VIA IDCU

2.20.4.1 General

The metallic testing of U-DSLs served by a IDCU/DNU-S uses essentially the same hardware and software processes that are used for the applicable IMLT (Section 2.11) or LTS (Section 2.16) metallic testing of analog lines through the Integrated SLC Carrier System. The test sequence is also essentially the same with the following exceptions:

(1) The NT1 detection is performed and the signature is analyzed to determine NT1 type.

(2) Metallic testing is only performed to the NT1. MLT does not have access for metallic testing of customer wiring beyond the NT1.

(3) Metallic testing is automatically inhibited on ISDN lines that are in use, either voice or data, because such tests could interfere with service.

(4) Monitor, Talk, and other interactive test requests are not applicable for ISDN lines.

2.21 MLT/ISDN DIGITAL TESTING AND ANALYSIS

2.21.1 GENERAL

Digital testing and analysis are important parts of the sophisticated sectionalization techniques required to isolate a trouble in the ISDN service.

Digital loopback tests verify the digital transmission and sectionalize faults to the switch, CPE, or a segment of the loop. The switch contains the hardware and software to run the tests; MLT/ISDN FP2/FP3 makes use of its interface to the switch to provide the user with easy access to and analysis of the digital test results. The user also has access to switch-based digital information for analysis. The MLT/ISDN FP2/FP3 combines the digital loopback test results and switch-based digital information with metallic test results for a complete automated trouble analysis of the DSL on the Custom Interface. The addition of an MLT/ISDN NI1 extends the testing capabilities to the Standard Interface.

2.21.2 MLT/ISDN DIGITAL LOOPBACK TESTS

2.21.2.1 General

Digital loopback tests are run at specific points by looping back a digital bit stream and analyzing the returned bits. Digital loopback tests can be either circuit-switched tests or packet-switched tests. Performing both circuit-switched and packet-switched loopback tests provides a higher possibility of determining the cause of a problem on an ISDN line.

The following types of loopback tests are available for digital testing:

(1) A ***Physical Loopback*** is an ordinary loopback that loops back both B and D channels simultaneously. Service is prevented when a physical loopback is in use.

NOTE: The PH cannot handle more than one loopback task at a time. For example, if there is another test system, or another IMLT test session testing the same DSL, only one can test a packet channel on that DSL at a time. Another more detrimental scenario is if one DSL had more than one type of packet service provisioned and each of the packet services used the same PH. In this case, physical loopbacks (2B+D) always fail.

(2) A ***Logical Loopback*** can be performed on in-service ISDN lines without disrupting service. It only tests one of the B channels without disrupting the other B channel or the D channel, and it only performs this test if the B channel is not in use.

2.21.2.2 MLT/ISDN Digital Loopback Test Via ISLU

Digital loopback tests are available to both U-DSLs and T-DSLs. The U-DSL is described in Section 2.19.4.2 and the T-DSL is described in Section 2.19.4.3 .

The loopback points, where available, for MLT/ISDN digital tests on ISDN DSLs are as follows (Figure

2-30):

- ISLU line card
- PH (for packet channels, logical loopback only)
- NT1 (if U-DSL)
- CPE (logical loopback only, if loopback capability is provided by the CPE).

NOTE: All Lucent Technologies ISDN station sets and terminals with CPE FP2 or later firmware provide the loopback capability.

2.21.2.3 MLT/ISDN Digital Loopback Test Via ISLU and Universal SLC Carrier System

The U-DSL, T-DSL, and mixed U-DSL and T-DSL applications for a universal SLC carrier system serving ISDN lines are described in Section 2.19.5 and illustrated in Figure 2-31 .

NOTE 1: In the U-DSL application, logical loopback is not supported by AMI at the COT and RT.

NOTE 2: Testing of the mixed U-DSL and T-DSL application is not supported.

NOTE 3: Digital loopback tests are supported at only two channel units (CU).

The loopback points, where available, for MLT/ISDN digital tests on ISDN lines served by a universal SLC carrier system are as follows:

- ISLU line card
- BRITE CU in the COT
- BRITE CU in the RT
- NT1 (U-DSL)
- CPE (logical loopback only, if loopback capability is provided by the CPE).

2.21.2.4 MLT/ISDN Digital Loopback Test Via IDCU/DNU-S

The ANSI U-DSL application for the IDCU/DNU-S is described in Section 2.19.6 and illustrated in Figure 2-34 . The loopback points for MLT/ISDN digital tests on ISDN lines served by the IDCU/DNU-S are as follows:

- CU in the RT
- NT1
- CPE (Custom Interface only - Logical loopback only if CPE has the loopback capability).

2.21.3 SWITCH-BASED DIGITAL INFORMATION

2.21.3.1 General

In addition to the results of digital loopback testing, MLT/ISDN has access to the following switch-based digital information from the switch:

- Status Information
- Performance Monitoring (PM) Information
- Protocol Error Records.

2.21.3.2 Status Information

The status information accessed from the switch provides a high-level description of the status of the circuit and its logical and physical network components. Status may be given for the following components:

- D Channel Status
- B Channel Status
- User Status
- NT1 Status
- Switch Equipment Status.

Status is reported as In Service (IS) or Out of Service (OOS). The cause of the OOS status is reported as determined by the switch.

2.21.3.3 Performance Monitoring Information

The PM information accessed from the switch data base is used by MLT/ISDN along with status information to obtain a nonintrusive view of the recent state of the circuit. The PM information is available for protocol levels one (physical level), two (data link level), and three (network level) (see Section 2.21.3.4). Level 1 PM data is available in the form of errored seconds. Level 2 PM data is given in terms of errored frames, and Level 3 PM data provides counts of X.25 and Q.931 protocol error records (PERs) contained in the switch buffer. The exact PM information format differs according to whether the line is ANSI or AMI, and according to the switch software release.

2.21.3.4 Protocol Error Records

Digital transmission is defined in terms of "protocol levels" to help distinguish and track different "kinds" of troubles on the line. These levels are important for maintenance of ISDN lines because the switch tracks errors in transmission according to the level in which the error occurs. The ISDN defines three protocol levels as follows:

(1) ***Level 1*** is referred to as the ***physical level***. It deals with the electrical and mechanical characteristics of the line. The physical level is responsible for the transmission at the bit rate. For example, if a 1 is transmitted and 0 is received, that is a Level 1 error.

(2) ***Level 2*** is called the ***data link level***. This level groups the bits into "frames". Included in the frame are certain "framing bits" to designate boundaries (starts and ends), identify the type and destination of the frame, and detect transmission errors. The rules for putting together the frame and framing bits are called the Level 2 protocols.

(3) ***Level 3*** is called the ***network level***. Within each Level 2 frame, between the start and end bits, exists a "packet" of data that contains the real information being transmitted. The packet is formed according to a set of rules called the Level 3 protocols.

Whenever a Level 2 or Level 3 protocol violation is detected, the switch creates a PER of the event and logs it in the PER table. These records are stored as a circular buffer, which means that the newest PERs overwrite the oldest. A detection mechanism limits the number of PERs stored for any single port. Each PER contains the following data about the protocol error event:

- The port where the error occurred
- The protocol state of the switch
- The Q.931 message type
- The timestamp of the event
- Protocol Error Code (PEC) which specifies the exact cause of the protocol error.

The MLT/ISDN FP2/FP3 enables the tester to access PERs stored in the switch. The MLT/ISDN also attempts to process PERs to identify a common error or common user to aid in fault isolation.

3. QUESTIONS AND ANSWERS

3.1 INTRODUCTION

Following are groups of frequently asked questions and their answers. A review of these questions and answers may aid in detecting and correcting a possible error condition or misconception. Doing so enhances the probability of a successful acceptance test run.

3.2 QUESTIONS ABOUT RMU INSTALLATIONS

(1) How far can we test from the RT to a number and still have a good test?

A. Testing from the RT to a number would have the same limitations as with a DCTU or LTS. That is 100,000 feet or 3000 ohms from the RMU to the station set.

(2) Can you home the totalizer on a coin test from the RMU?

A. In the DCTU/*LTS-RMU-SLC*® carrier system environment, you can do loop and full type testing on coin lines. However, such tests as coin collect, coin return, and totalizer tests are done by the DCTU/LTS at the CO through the SLC carrier channel. These requests must be made on the initial access (prior to bypass).

(3) What is a ``TONECA'' test?

A. This is a test which applies longitudinal tracing tone. It is done by the LTS in the CO before the remote access (metallic test pair) is established and done on the wiring and equipment within the CO. The RMU cannot apply ``TONECA'', but can use the ``TONE/TONE+'' transactions which provides a high-level metallic tracing tone on the test path.

(4) What is the life expectancy of the RMU battery?

A. The unit is equipped with a 5-V Lithium battery which is good for three years with no power. If the RMU is under power, the life expectancy is 10 years under normal operation.

(5) Can we test with the RMU if power is lost at the SLC carrier system hut?

A. The RMU battery provides a power source for the RMU only to keep its memory refreshed while there is a power outage. If power is lost at the site, ***no*** testing can be performed by the RMU.

(6) Can the RMU test integrated services digital network (ISDN) lines?

A. No.

(7) Is the RMU compatible with the DCTU and all SLC configurations?

A. Yes, except for ISDN, the RMU and DCTU are completely compatible as is the RMU and LTS. The RMU is also completely compatible with all universal and integrated SLC carrier system configurations.

(8) Can the RMU test integrated digital carrier unit (IDCU/DNU-S) RTs?

A. Only if the IDCU/DNU-S RT contains POTS and/or other analog switched services lines, because the RMU can not test ISDN lines. The TR303 RTs, which may contain ISDN lines, require a DC test pair from the switch for metallic tests on ISDN lines.

3.3 QUESTIONS ABOUT BOTH DCTU AND LTS INSTALLATIONS

(1) Which configurations require a separate EXK for an RSM?

A. All testing configurations, DCTU or LTS, require that each RSM and the *5ESS*® switch host office have unique exchange keys. With the DCTU configuration, MDF testing mandates the need for a unique EXK. If you do not need MDF testing, such as at a small RSM with few lines, you can get by without a separate EXK only if the RSM is tested through a DCTU.

(2) Can I use my existing LTS to test a *5ESS*® switch host office, but also use the data linked DCTU to test RSMs from that host?

A. Yes, you can. The RSMs are treated as separate offices in the loop maintenance operations system (LMOS)/MLT data bases. What you cannot do is MLT testing with both an LTS and a DCTU at a given RSM or switch host office.

(3) If an RSM is served from a switch host office, what is the metallic loop limit from host to RSM?

A. A DCTU installed in a host cannot test lines emanating from an RSM. You must have either a DCTU installed in the RSM or an LTS connected through a no-test trunk (NTT) to the RSM within range. The limit for metallic testing is: less than 3,000 ohms and 100,000 feet between the test hardware and the farthest station termination.

(4) If an LTS is placed at the host switch and accesses the NTT interface, then how is access to the SLC carrier system pair gain test controller (PGTC) achieved?

A. There are three cases:

(a) <u>If you have a universal SLC carrier system, wire the PGTC between the LTS and the NTT interface.</u>

(b) If you have an integrated SLC carrier system, then the PGTC is not needed and the LTS is wired directly to the <u>NTT interface</u>. This is because the switch emulates the actions of the usual PGTC, so that the differences to MLT are minimal.

(c) If you have both universal and integrated SLC carrier systems, then all wires from the LTS must go through the PGTC before connecting to the <u>NTT interface</u>.

(5) Are test trunk ringing circuits (TTRCs) required for the LTS test trunks?

A. Yes. Independent of whether the LTS is collocated with the switch (host or remote), a TTRC is required in series with each NTT interface. The TTRC is required in order to effectively ring a subscriber phone under maximum loop resistance conditions and with the maximum number of phones on the loop.

(6) How many simultaneous line accesses can there be with SLC carrier systems.

A. The number of simultaneous line accesses are limited by the number of tester cards equipped in the PGTC (maximum of four), with the following limitations:

(a) Universal SLC carrier system:

- ***With a DCTU:*** One per PGTC trunk assignment (maximum of one per service group per shelf; the PGTC assignment ***must*** be on a shelf with a DCTU port termination)
- ***With an LTS:*** One per NTT per DC test pair.

(b) Integrated SLC carrier system:

- ***With a DCTU:*** One per DC test pair per TBCU port assignment
- ***With an LTS:*** One per DC test pair per TBCU port assignment.

NOTE: Only one access per RT cluster sharing the same DC test pair.

(7) Could you summarize the ***lowest*** trunk group member number required to build a MLT-related trunk group and the ***highest*** member number allowed?

A. Yes, as follows:

For DFTAC : 0 -- 31
For CALLBACK : 0 -- 31
For SN-107 NTT interface: 0 -- (no limit)
For NTTU NTT interface: 0 -- 11 (See Note)
For DCTU ports: 0 -- 11
For PGTC ports: 1 -- 256

NOTE: Each Semi-Integrated No-Test-Trunk Unit (NTTU) supports up to 12 NTTs which must be assigned in a single trunk group. When more than 12 NTTs are to be implemented, multiple NTTUs must be equipped and a separate trunk group must be assigned for the NTTs associated with each NTTU.

(8) How many simultaneous integrated SLC carrier system channel tests can be run?

A. This is dependent upon the number of responders in the transmission test facility (TTF) (three maximum). More than one TTF can be installed. It is recommended that a minimum of two responders be equipped to reduce the incidence of blockage in performing the channel tests (**VER 55: CHANNEL STATUS NOT IDENTIFIED**).

(9) Do you need a TTF at an RSM to perform channel tests on SLC carrier lines?

A. No, because the TTF at the host is used perform the channel test. This is a digital test that does not have the length limitations of a metallic test.

(10) With MLT/ISDN FP2/FP3, how many data links are required to the data communication network (DCN)?

A. With a ***DCTU***, the same data link currently used for metallic tests of POTS lines is also used for metallic and digital tests of ISDN lines.

With an ***LTS***, two data links are required:

- The data link now used for metallic tests on POTS lines is used for metallic tests on ISDN lines
- The second data link, connected between the DCN and the IOP of the switch (the same as for the DCTU), is used for digital tests on ISDN lines.

(11) Can MLT test remote ISLU (RISLU) lines?

A. Yes, MLT performs both metallic and digital tests over the MTB going out to the RISLU, provided the MTB conforms to the length and resistance limitations for metallic testing.

(12) Can MLT test an ISDN lines in the universal SLC mixed U-DSL and T-DSL configuration (U line card in the ISLU, U-BRITE CU in the COT, and T-BRITE CU in the RT)?

A. No, the mixed U-DSL and T-DSL configuration is not supported by MLT (see Section 2.19.5.4 and Figure 2-31).

(13) Can ALIT testing be performed on universal SLC carrier lines?

A. No, ALIT testing on universal SLC carrier lines is not possible because it does not have the PGTC access capability. To prevent the ALIT test voltage from causing false seizures of the PGTC, each universal SLC carrier line's RC View 1.6 should have the **PLIT** (prohibit ALIT testing) attribute field populated with **Y**. This prohibits ALIT testing from accessing the universal SLC carrier lines.

(14) How many integrated services test facility (ISTF) trunk members are necessary for ISDN testing?

A. There are three trunk members per ISTF available to perform the ISTF transmit function. It is recommended that all three be built to guard against blockages. Logical loopbacks, for example, require the use of only one ISTF trunk member. Physical loopbacks (involving both B-channels), however, require two trunk members. This means that MLT can only perform one physical loopback at a time if only one ISTF is provisioned with three trunk members. Additional ISTFs may also be required to handle the traffic load. Insufficient provisioning of trunk members may result in a **VER B7: ISTF UNAVAILABLE** response.

(15) When there is more than one integrated DLC system at an RT site, how should the systems be assigned to the TBCU?

A. All integrated DLC systems at an RT site should be assigned to the same DC test pair (MTB). Also, there are only 30 TBCU assignments allowed per switch.

3.4 QUESTIONS ABOUT DCTU INSTALLATIONS

(1) Where I have a cluster of ORMs, that is, more than one collocated in a single building, can I use one DCTU to test loops served by all of them?

A. Yes, you can use one DCTU to test lines in a maximum of four collocated ORMs

(2) How many separate DCTUs can be placed in a switch office? Can we have one DCTU dedicated to ARSB?

A. Each switch processing entity could have more than one DCTU. Only the largest host offices need more than one DCTU, and RSMs and ORMs are generally much smaller so they require only one each. Because the DCTU is a switch testing resource designed to be shared, it is not possible to dedicate a DCTU to ARSB use only. Therefore, the traffic sizing of the DCTU should be based on the needs of all users who do metallic testing.

(3) Why does each DCTU associated with a Host switch (RSM, MMRSM, ORM, TRM) require a unique dedicated TN in the MLT LTSxxx.d file?

A. A unique dedicated TN (10 digits) is required for each DCTU location in the LTSxxx.d file to enable individual location calibration data to be stored. When a DCTU is installed, calibration data must be obtained as described in Procedure 5.4 and placed in the LTSxxx.d file. When a DCTU is downloaded, all DCTUs associated with the Host are downloaded together, and the calibration data for each DCTU goes with it.

(4) The list structure for the DCTU requires a second PMU if more than four ports are required, even though the CO line count does not. Why is this true?

A. The DCTU design is different from that of the LTS. Specifically, each PMU of the DCTU comes with four ports. If you order one PMU, then you get four ports; two PMUs, eight ports, etc. Each PMU, with four port circuits, resides in one shelf of the DCTU. Note that each PMU can access all ports. For example, with 2 PMUs, each PMU can access any of the 8 ports.

(5) How does one do MDF testing in the switch with the DCTU?

A. Any DCTU port in the switch can be connected metallically to an MDF-TTC (DF-TTC, shoe, or stick, or whatever) to satisfy testing needs at the MDF. There is a 4-wire metallic termination at one of the circuit packs in the MMSU/MSU of the switch to support the MDF-TTC. The 4-wire termination corresponds to the tip, ring, sleeve, and sleeve ground wires. The necessary switch circuit pack is called a distributing frame test access controller (DFTAC) circuit and is designated TN1040. Each TN1040 is dedicated to one MDF-TTC. Note that no DCTU port is ever dedicated to only MDF testing.

(6) How would ARSB personnel ``cord or MDF'' loops served by the RSM?

A. For the case where the DCTU is deployed at the RSM, there is metallic access provided from the DCTU port to the MDF-TTC. The RSM must have a unique EXK (not shared with the host switch or other RSM).

(7) How is metallic access from the DCTU achieved to the PGTC to test a universal SLC carrier system?

A. For testing a universal SLC carrier system, there are two ways metallic access is achieved to the PGTC. In the directly connected case, the DCTU port is wired directly to the input port of the PGTC and the output port of the PGTC is connected to the MMSU. So the PGTC is already in the metallic path and just needs to be activated in this case. For the non-directly connected case, the DCTU port (tip and ring leads) is switched through the PGTC to the switch MMSU when requested by IMLT. Furthermore, the switch simulates sleeve wires for each PGTC port. Unlike analog switches, where the sleeve leads from the LTS are wired through the PGTC then connected from the switch's MMSU to the input side of the PGTC. There is no connection required for the sleeve wires from the switch (output) side of the PGTC to the switch. All remaining protocol controls reside with the switch's software.

(8) How should DCTU ports be assigned to the MMSU?

A. A minimum of one DCTU port per service group per MMSU shelf where peripheral metallic access units are assigned. If there is more than one shelf, or where shelves are added, it is recommended that the DCTU ports be spread across as many service group shelves as possible to reduce the incidence of blockage because of MTIB unavailability.

If your office has the 5E14 feature(99-5E-4720 allowing flexible assignment of DCTU/PMU ports to MMSU shelves then the following applies:

Whenever a DCTU/PMU MTB is assigned to a metallic shelf it will be duplicated on all subsequent metallic shelves. ED5D500-21 Group 140A cable may be used in connection with this feature to wire MTBs directly to the MDF or may be spliced in the back of the MMSUs using existing PMU/MTB cables. An ED5D500-21 Group A or Group 140B cable is used for a direct connection from DCTU/PMU to MMSU service group 0 and 1. If you do not use the full complement of these cables for non-metallic shelves, you must tie back the unused portion (connectors) in the back of the MMSU for future growth.

(9) How should PGTC ports be assigned to the MMSU with IMLT and universal SLC carrier system.

A. In the non-directly connected case, one PGTC port per service group per MMSU shelf where DCTU ports reside should be assigned. If there are service groups containing DCTU ports and without a PGTC port assigned to it, the MLT user may experience blockages (VER F0, VER B0) due to the lack of available MAJ paths that are required to complete the connection. If you wish to check the assignments, display RC View **14.7** for the PGTC and check each member for MTB assignment. Verify that all shelves and service groups containing DCTU ports have an assignment to a PGTC port.

For the directly connected case, each assigned DCTU port would be wired directly to the PGTC port and the PGTC would be wired to the MMSU. RC View **14.7** for the PGTC would not be used at all for this configuration. RC View **20.9**, which defines the DCTU, would contain all the necessary information. The MTB number for the DCTU port would be the MTB connecting the the PGTC to the MMSU (the connection between the DCTU port and the PGTC is just an extension of this MTB).

A "LO DPN" would contain the low distribute point number used to control the PGTC (the high distribute point number is calculated from the low distribute point number). The "LO DPN" attributes on RC View **20.9** are only used in the directly connected case. If the DCTU port connects to the PGTC port through the MMSU, the "LO DPN" attribute on RC View **20.9** should be left empty and all of the PGTC information should be filled into RC View **14.7**.

(10) If I have the DCTU configuration in an office and I have only integrated SLC carrier system(s), do I still need to install a test bus control unit (TBCU)?

A. Yes, the TBCU is required for testing integrated SLC carrier system loops regardless of the type of test equipment configuration.

(11) Will the switch host support both the 1.2 KB asynchronous 202T and 2.4 KB synchronous 201C data set configurations?

A. No, the switch host supports only a 2.4 KB synchronous data link. You could use the 201C data set, *DATAPHONE*® 2024 data set, or DDS 500A equipment. The DCN in the MLT system supports both protocols mentioned previously.

(12) Can I use the same dedicated telephone line for MLT-1 calibration and for the DCTU?

A. No, because the 1A NTU needed for the DCTU has test characteristics significantly different from the open required for the MLT-1. The MLT-1 would not be able to calibrate properly on a line terminated by the 1A NTU.

(13) How many callbacks can I have up? Is it 32, the same as the maximum number of simultaneous test accesses?

A. Yes, 32 is the correct number, provided you have established that many call-back trunks. You may choose to have a smaller maximum number by establishing fewer call-back trunks, if you do not need that many.

(14) What special switch hardware, if any, is required to do touch-tone tests?

A. The transmission test facility (TTF) is required. This is normally installed switch equipment whose use is shared with MLT, much as the DCTU is. The MLT touch-tone test requests cause the switch to apply the TTF circuit.

(15) Are there trouble counters for a DCTU? Can the FACMAN set thresholds for them?

A. You can set trouble counter thresholds, just as in the LTS case. The counters that can be set are the PMU thresholds and the port thresholds. These trouble counters are completely independent of any counters that may be used by the switch maintenance personnel.

(16) If a DCTU component exceeds a threshold, what indication does the FACMAN get?

A. Exceeding the threshold causes an equipment status report (ES) to be printed out on the FACMAN's terminal, similarly to the LTS case. Trouble counter overflow is indicated in the **REQUEST** field. In contrast to the LTS case, exceeding the trouble counters set by the FACMAN does not cause the equipment to be taken out of service.

(17) What other users use the DCTU besides IMLT?

A. The trunk and line work station (TLWS), switching control center (SCC), and centralized trunk test unit (CTTU) all share the same DCTU. By attempting a metallic connection from one of these users, it can be verified that the DCTU and MMSU are operational.

(18) How can I verify the callback phone?

A. From the switch, place a call by dialing the callback phone. This establishes that the telephone number (TN) is a working TN and, if the number is outside the switch office, that a trunk path can be established.

(19) Why should the MDF test trunk circuit (MDF-TTC) be located near the MDF?

A. Locating the MDF-TTC (SD-90070-01) near the MDF, particularly in buildings where the DFTAC (TN 1040) is on another floor, aid in keeping the cross connections between the MDF test trunk and the DFTAC as short as possible. Excessively long cross connections may cause the MLT to incorrectly report opens in the office (VER Code 3) as open outs (VER Code 41).

(20) How should the GDXC be equipped in the MMSU with IMLT?

A. You should provide for a minimum of two GDXC CPs for each service group and shelf where DCTU ports reside.

4. ACCEPTANCE TEST GUIDELINES

4.1 GENERAL

This section provides guidline information for the acceptance test procedures (Section 5) that verify the operational readiness of the IMLT or LTS interface. The acceptance test peocedures may be run on one DCTU/LTS or simultaneously on several DCTUs/LTSs. It is recommended that the entire test be run, including the data communication network (DCN) tests, even if only one DCTU or LTS is being added to an existing DCN. Perform the procedures after installation and/or growth activities affecting the IMLT/LTS interface have been completed. Some examples of such activities are:

- Conversion from an LTS to the IMLT configuration
- Addition of a *5ESS*® Switch to the IMLT/LTS interface
- Addition of a DCTU or LTS to an existing DCN.

When growth activities do not affect the overall IMLT/LTS interface, run only those procedures that are applicable. Examples of such activities include:

- Growth within an existing DCTU or LTS
- Conversion of an existing pair gain test controller (PGTC) to an extended test controller (XTC) in the universal *SLC*® carrier system environment
- Replacement of digital carrier line units (DCLUs) in the integrated SLC carrier system environment.

Successful completion of the applicable tests provide reasonable evidence that the equipment has been correctly manufactured and installed, and that it can perform effectively in the remote testing of subscriber loops.

4.2 REQUIREMENTS

4.2.1 General

READ: It is strongly recommended that you perform the acceptance test before the installation and/or growth team leaves the premises. If a fault detected during these tests indicate an error in the hardware that was involved in the installation or growth activities, the appropriate team can correct the error.

Report any fault detected during these tests to the MLT Facilities Manager or *5ESS*® Switch supervisor, as applicable, for disposition. Use Section 6 , Corrective Maintenance Guidelines, and Section 7 , Corrective Maintenance Procedures, for guidance in isolating and clearing faults.

At least one person who is knowledgeable in the operation and maintenance of the switch should be on site during these tests, even though a large portion of the tests do not require active participation by this person.

4.2.2 Records

Retain all records and any supporting evidence of all test results for final analysis. Describe all test, maintenance, and abnormal activities adequately in log entries. Maintain these logs at the automated repair service bureau (ARSB) and *5ESS*® Switch sites. In addition, save all printouts, all reporting forms, and all measurements generated during these tests to provide a complete record of the system's performance.

5. ACCEPTANCE TEST PROCEDURES

GENERAL

This section provides individual acceptance test procedures that verify the operational readiness of the IMLT or LTS interface.

Procedure 5.1: VERIFY ACCEPTANCE TEST PREREQUISITES

OVERVIEW

The following prerequisites are essential to ensure that the MLT and *5ESS*® Switch interface is prepared for acceptance testing.

PROCEDURE

1. Verify that all applicable installation/growth procedures have been successfully completed and signed off by the authorized installation/growth representative(s).
2. Obtain the following telephone numbers (TNs) from the MLT facilities manager (FACMAN) for the *5ESS*® Switch (host and, if applicable, remote switching subsystems):
   - ☐ The trunk calibration number - if IMLT, should be terminated with a maintenance termination unit (MTU) such as the Lucent Technologies 1A MTU at the MDF
   - ☐ Single-party line terminating on a line unit (LU), equipped with a touch-tone pad
   - ☐ One working single-party line, terminating on an LU, equipped with a rotary dial
   - ☐ One telephone number which is on intercept
   - ☐ A coin TN
   - ☐ A denied originating TN
   - ☐ A denied terminating TN
   - ☐ A denied originating and terminating TN
   - ☐ A line served by an integrated *SLC*® carrier system
   - ☐ A line served by an integrated SLC carrier system with a remote measurement unit (RMU)
   - ☐ A line served by a universal SLC carrier system
   - ☐ A line served by a universal SLC carrier system with an RMU
   - ☐ One TN for each type of party line
   - ☐ A working single-party line opened at the MDF
   - ☐ If LTS, the office overflow test number.
3. If the office has ISDN service, obtain the following directory numbers (DNs), as applicable, from the MLT FACMAN for the *5ESS*® Switch:
   - ☐ An AMI U-DSL
   - ☐ An ANSI U-DSL
   - ☐ A T-DSL
   - ☐ An AMI U-DSL served by a universal SLC carrier system

- ☐ An ANSI U-DSL served by a universal SLC carrier system
- ☐ A T-DSL served by a universal SLC Series 5 carrier system.

4. Obtain the following items to facilitate the running of these test procedures.
   - ☐ Cable kit, or other cable simulation equipment (build-out boxes) used for resistive fault sectionalization tests
   - ☐ Resistors to be used for the resistive fault sectionalization and SOAK tests (two 5-Kohm 1/4-watt and one 50-Kohm 1/4-watt resistors minimum)
   - ☐ A copy of the data elements form.

5. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.2: VERIFY OFFICE DEPENDENT DATA - MLT CONFIGURATION

OVERVIEW

Use this procedure to verify that the switch's office dependent data (ODD) related to MLT is correct for the following, as applicable:

- MLT Configuration in Office Parameters
- Automatic Line Insulation Testing (ALIT) (used by MLT only to help verify the metallic fabric)
- Integrated *SLC*® carrier system
- Modular Metallic Service Unit (MMSU)
- No-Test Trunk (NTT) interface
- Directly Connected Test Unit (DCTU)
- Callback Telephone
- Pair Gain Test Controller/Extended Test Controller (PGTC/XTC)
- Distributing Frame Test Access Circuit (DFTAC)
- Input/Output Processor (IOP)
- Integrated Services Test Facility (ISTF).

The applicable ODD attributes are displayed on recent change (RC) views and verified against the original input form source documents. The procedure is normally run on a recent change and verify (RC/V) video display terminal (VDT) or equivalent so that the master control center (MCC) VDT is free to monitor and maintain the switch.

NOTE: To prevent ``clutter,'' all illustrations of RC views show entries only in those attribute fields that apply to the specific procedure. Because RC views may differ from one software release to another, the RC views in this manual (marked as "samples") may not match what you see on your RC/V or equivalent terminal.

PROCEDURE

1. Verify office parameters ODD for MLT configuration.

   Reference: Procedure 5.2.1

2. Verify ALIT ODD.

   Reference: Procedure 5.2.2 Procedure 5.2.2 [5.2.2]

3. Verify Integrated *SLC*® carrier system ODD.

   Reference: Procedure 5.2.3 Procedure 5.2.3 [5.2.3]

4. Verify MMSU ODD.

   Reference: Procedure 5.2.4 Procedure 5.2.4 [5.2.4]

5. Which MLT configuration supports this office?

   If **IMLT**, go to step 10.

   If **LTS**, continue with step 6.

6. Verify NTT ODD

   Reference: Procedure 5.2.5 Procedure 5.2.5 [5.2.5]

7. Does MLT/ISDN FP2/FP3 support this office?

   If **YES**, continue with step 8.

   If **NO**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

8. Verify IOP ODD.

   Reference: Procedure 5.2.10 Procedure 5.2.10 [5.2.10]

9. Now go to Step 16.

10. Verify DCTU ODD.

    Reference: Procedure 5.2.6 Procedure 5.2.6 [5.2.6]

11. Verify callback ODD.

    Reference: Procedure 5.2.7 Procedure 5.2.7 [5.2.7]

12. Verify PGTC/XTC ODD.

    Reference: Procedure 5.2.8 Procedure 5.2.8 [5.2.8]

13. Verify DFTAC ODD.

    Reference: Procedure 5.2.9 Procedure 5.2.9 [5.2.9]

14. Verify IOP ODD.

    Reference: Procedure 5.2.10 Procedure 5.2.10 [5.2.10]

15. Does MLT/ISDN FP2/FP3 support this office?

    If **YES**, continue with step 16.

    If **NO**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

16. Verify ISTF ODD.

Reference: Procedure 5.2.11

17. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.2.1: VERIFY OFFICE PARAMETERS ODD FOR MLT CONFIGURATION

PROCEDURE

1. At RC/V VDT or equivalent, access RC View **8.1**, **OFFICE PARAMETERS (MISCELLANEOUS)** (Figure 5.2.1-1).

2. Type and enter official office ID (example: **NV220001**) in attribute field **OFFICE ID**.

3. Which MLT configuration is in use?

   If **IMLT**, continue with step 4.

   If **LTS**, go to step 6.

4. Verify that **Y** is in attribute field **IMLT2** (example in Figure 5.2.1-1).
   STOP. YOU HAVE COMPLETED THIS PROCEDURE.

5. Verify that **N** is in attribute field **IMLT2**.

```
                        5ESS SWITCH
SCREEN 1 OF 13                  RECENT CHANGE  8.1
(5509)                  OFFICE PARAMETERS (MISCELLANEOUS)

*1. OFFICE ID NV220001    13. IMPLD NPA ___       APT TESTING
 2. IMLT2     Y          14. SPLIT OFC _       22. HRSTART  __
 3. EXSIG     _          15. PERC1SILC ____    23. MNSTART  __
 4. MANROUT   ___        16. PERC2SILC ____    24. DURATION _
 5. POTENT    _____      17. HOME NPA  ___     25. RUNSUN   _
 6. TIMEZONE  ___        18. TD WINDOW ___     26. RUNMON   _
 7. DST       _          19. RMSOPT    _       27. RUNTUE   _
 8. CUTTRANS  _                                28. RUNWED   _
 9. HOLIDAY   ___         TRK MAINT DA OPT     29. RUNTHR   _
10. SES       ____       20. LTP SCR ____      30. RUNFRI   _
11. POFFLOSS  _          21. LTP DAS __        31. RUNSAT   _     12. RING TOT  _____
```

Figure 5.2.1-1 Sample RC View 8.1, OFFICE PARAMETERS (MISCELLANEOUS) - MLT Configuration

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.2.2: VERIFY ALIT ODD

PROCEDURE

1. ***NOTE:*** The automatic line insulation testing (ALIT) is used here only to verify that it is possible to establish a metallic path from the MMSU to the line under test.

2. At the recent change and verify (RC/V) video display terminal or equivalent, do Steps 3 through 6.

3. ***NOTE:*** The ALIT route index (RTI) is assigned only to the SM equipped with a modular metallic service unit (MMSU) with ALIT circuit pack(s).

   Using RC View **18.1**, **SWITCHING MODULE** (Figure 5.2.2-1), verify that the **ALITRTI** field contains the correct ALIT RTI for (each) MMSU equipped with ALIT circuit pack(s).

```
                         5ESS SWITCH
SCREEN 1 OF 5                    RECENT CHANGE  18.1
(57001)                    SWITCHING MODULE

 *1.SM          2       11.EVEN NCT LINK ___         ROUTE INDEXES
 #2.SM TYPE     LSM     12.ODD NCT LINK  ___          -------------
 #3.UNIT TYPE    ______  13.DLI 0 CLI      ________  20.DCTURTI  61
  4.EQSTAT       _       14.DLI 1 CLI     ________  21.SLIM RI  65
 #5.IIA NORMAL  _______ 15.MCTSI 0 CLI    ________  22.ALITRTI  ___
 #6.AISLE        ____    16.MCTSI 1 CLI   ________  23.PPMTC RI 51
   HSM          ___     17.BTSR CLI      _______   24.MAJRTI   ___
  8.POST PUMP   _       18.CI 0 CLI      ________
 #9.EVEN NCT CTS___      19.CI 1 CLI      ________  MULTIFREQ RINGING
#10.ODD NCT CTS ___                              -----------------
                                   25.FCLASS  _____
```

Figure 5.2.2-1 Sample RC View 18.1, SWITCHING MODULE

4. Using RC View **10.2**, **ROUTE INDEX (ROUTING)** (Figure 5.2.2-2), verify that the correct RTI type is assigned for each ALIT equipped MMSU.

```
                            5ESS SWITCH
                           RECENT CHANGE  10.2
(5303)                      ROUTE INDEX (ROUTING)

*1. RTI        65          13. ANI II DIGITS __    23. SPEECH ALT RI
____
#2. ETYP       HUNT        14. LTDRI          _
 3. TGN        929         15. CSTLRI        _      DATARATE ALT RI
 4. DIG DLTD   0           16. LEC OS         _     24. 56K       ____
 5. PREF DIG   __________                           25. R64K      ____
 6. NEXT RTI   ____        CCS7 EQUAL ACCESS        26. 64K       ____
 7. SIG PRO    _____       17. CKT CODE  __         27. 384K      ____
 8. FGD CIC 4  _           18. CPN SUBSC  _         28. 1536K     ____
 9. ANI IND    _           19. CSI SUBSC  _         29. MULTIRATE ____
10. OVLAP IND  _           20. ATP SUBSC  _         30. PSN  ___
11. RT DES TYP ________    21. UUI SUBSC  _
   PACKET SWITCHIN         22. CICP SUBSC _
```

12. RMK LTPALIT SM2

Figure 5.2.2-2 Sample RC View 10.2, ROUTE INDEX (ROUTING) - ALIT

5. ***NOTE:*** One logical test port (LTP) trunk group is assigned to each ALIT equipped MMSU. The LTP assignment must be in the same SM equipped with the MMSU.

Using RC View **5.1**, **TRUNK GROUP** (Figure 5.2.2-3), verify that the correct trunk group type has been assigned to (each) MMSU ALIT circuit.

```
                        5ESS SWITCH
SCREEN 1 OF 11               RECENT CHANGE  5.1
(5200,5202,5213)             TRUNK GROUP

(*)1.TGN        929        13.CARRIER ID  288  25.FREE ANS_
(*)2.TRUNK CHAR  _____________  14.FEAT GRP   _   26.PBX ID
____
(*)3.FEND CLLI   ___________   15.INC TND WNK _   27.PRIVACY _
  4.TRK CHAR     _____________  16.ATTTN     ___  28.INSEP      ____
  5.FAR CLLI    ___________    17.TERA RCVY  ___  29.MODULE
___
  6.RMK       LTPALIT SM2   18.IAPT      _
 #7.TRK DIR    LTP        19.CALLMON INH _     VERIFY ONLY

 #8.HUNT TYPE   FIFO__       20.INPLS      ________GRP SIZ
____
  9.SCR        ____        21.OUTPLS     ________ACT SIZ
____
 10.GLARE ACTION ________     22.FAR END NPA ___    SATELLITE_
 11.DAS          __       23.GL ANN TGN ____    TERM SFG _
#12.TRK CLASS   LTPALIT      24.BRCS        _
```

Figure 5.2.2-3 Sample RC View 5.1, TRUNK GROUP - ALIT

6. ***NOTE:*** One LTP trunk group member is assigned for each ALIT circuit pack.

Using View **5.5**, **TRUNK MEMBER** (Figure 5.2.2-4), verify trunk group member assignments for (each) MMSU ALIT circuit.

```
                          5ESS SWITCH
SCREEN 1 OF 6                    RECENT CHANGE  5.5
(5204)                        TRUNK MEMBER

 *1. TGN         929        23. HOLD BUSY   _
 *2. MEMB NBR      0           24. SATELLITE   _
(*)9. QTY         __         25. TRF SAMPLE  _
#12. OE          P 001020     26. CAMOPTLK TEN _______
 15. CLCI TRK ID  ____         27. CAMOPTLK DEN ________
 16. TRANS CLASS   __          28. CAMOPTLK NEN __________
 17. SUPV          ___        29. ACTN         _
 18. IDLE STATE    ___         30. OTODPN1      _________
 19. IN START DIAL ________     31. OTODPN2      _________
 20. OUT START DIAL ____       32. SLC OTODPN3  _________
 21. STOPGO        _          33. SLC OTODPN4 _________
 22. CGA SPN       _________     34. MAXCALLS     __
```

Figure 5.2.2-4 Sample RC View 5.5, TRUNK MEMBER -ALIT

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.2.3: VERIFY INTEGRATED *SLC*® CARRIER SYSTEM ODD

PROCEDURE

1. RC View **20.5**, **DIGITAL SERVICE UNIT** (Figure 5.2.3-1 is needed to verify the number of Transmission Test Facility (TTF) responders that are installed. A minimum of two is recommended to reduce the incidence of blocking should more than one channel test request come in at the same time. (VER 05 or VER 55 :CHANNEL STATUS NOT IDENTIFIED) is the Mechanized Loop Test System (MLT) message if there is no responder available.

   NOTE: For every responder, there must be a Logical Test Port (LTP) built.

```
                      5ESS SWITCH
                       VERIFY    20.5
(57402)              DIGITAL SERVICE UNIT (PACKS)

*1. SM ___         TYPE   RPCKTS   EQSTAT    CLI      CLEI
*2. DSU _
*3. SG  _   PACK 0 _______  __      _    ________  __________
            PACK 1 _______  __      _    ________  __________
            PACK 2 _______  __      _    ________  _________
            PACK 3 _______  __      _    ________  __________
            PACK 4 _______  __      _    ________  __________
            PACK 5 _______  __      _    ________  __________
            PACK 6 _______  __      _    ________  __________
            PACK 7 _______  __      _    ________  __________
```

Figure 5.2.3-1 Sample RC View 20.5, DIGITAL SERVICE UNIT

2. At recent change and verify (RC/V) video display terminal (VDT) or equivalent, do Steps 2 through 7.

3. Using RC View **10.1**, **FIXED ROUTE (ROUTING)** (Figure 5.2.3-2), verify that the correct fixed route has been inserted for the integrated SLC carrier channel test LTP trunk group.

```
                         5ESS SWITCH
                       RECENT CHANGE  10.1
(53011)                  FIXED ROUTE (ROUTING)

*1. TRMT     S96CTST
 2. TONE     N
 3. TONE TYPE _______
 4. RTI      20
 5. CHGI     1
 6. PLAY ANNC N
```

Figure 5.2.3-2 Sample RC View 10.1, FIXED ROUTE (ROUTING) - Integrated SLC Carrier System Channel Test

4. Using RC View **10.2**, **ROUTE INDEX (ROUTING)** (Figure 5.2.3-3), verify that the correct route index has been inserted for the integrated SLC carrier channel test LTP trunk group.

```
                         5ESS SWITCH
```

```
                              RECENT CHANGE  10.2
(5303)                         ROUTE INDEX (ROUTING)

*1.RTI        20         13.ANI II DIGITS __   23. SPEECH ALT RI
___
#2.ETYP       HUNT        14.LTDRI        _
 3.TGN        937        15.CSTLRI        _     DATARATE ALT RI
 4.DIG DLTD   0           16.LEC OS        _    24.56K      ____
 5.PREF DIG   __________                        25.R64K      ____
 6.NEXT RTI   ____        CCS7 EQUAL ACCESS     26.64K       ____
 7.SIG PRO    _____        17.CKT CODE  __     27. 84K      ____
 8.FGD CIC 4  _          18.CPN SUBSC  _     28.1536K     ____
 9.ANI IND    _         19.CSI SUBSC  _     29.MULTIRATE ____
10.OVLAP IND  _           20.ATP SUBSC  _
11.RT DES TYP ________     21.UUI SUBSC  _     PACKET SWITCHING
12.RMK FIXRT  TMS9 CTST    22.CICP SUBSC_     30.PSN ___
```

Figure 5.2.3-3 Sample RC View 10.2, ROUTE INDEX (ROUTING) - Integrated SLC Carrier System Channel Test

5. **CAUTION:** The integrated SLC carrier channel test trunk group logical test port (LTP) must be in the same switching module (SM) containing the transmission test facility (TTF).

NOTE: A minimum of two LTP members are recommended.

Using RC View **5.1**, **TRUNK GROUP** (Figure 5.2.3-4), verify that the correct integrated SLC carrier channel test LTP trunk group has been inserted.

```
                              5ESS SWITCH
SCREEN 1 OF 11                     RECENT CHANGE  5.1
(5200,5202,5213)                   TRUNK GROUP

(*)1.TGN        937          13.CARRIER ID 288   25.FREE ANS _
(*)2.TRUNK CHAR ______________14.FEAT GRP   _     26.PBX ID   ____
(*)3.FEND CLLI   ___________   15.INC TND WNK_    27.PRIVACY  _
   4.TRK CHAR    ______________16.ATTTN      ___   28.INSEP    ___
   5.FAR CLLI    ___________   17.TERA RCVY  ___   29.MODULE   ___
   6.RMK        LTP S96CT    18.IAPT        _
  #7.TRK DIR     LTP         19.CALLMON INH_      VERIFY ONLY
  #8.HUNT TYPE   FIFO__       20.INPLS      _______  GRP SIZ   ____
   9.SCR        ____         21.OUTPLS     _______  ACT SIZ   ____
  10.GLARE ACTION________      22.FAR END NPA___      SATELLITE _
  11. DAS        __          23.GL ANN TGN ____     TERM SFG  _
 #12. TRK CLASS  LTPS96TF      24.BRCS          _
```

Figure 5.2.3-4 Sample RC View 5.1, TRUNK GROUP - Integrated SLC Carrier System Channel Test

6. Using RC View **5.5**, **TRUNK MEMBER** (Figure 5.2.3-5), verify that the correct integrated SLC carrier channel test LTP trunk group members have been inserted.

```
                              5ESS SWITCH
SCREEN 1 OF 6                      RECENT CHANGE  5.5
```



```
(5204)                         TRUNK MEMBER

 *1. TGN          937         23. HOLD BUSY    _
 *2. MEMB NBR      0          24. SATELLITE    _
(*)9. QTY          1         25. TRF SAMPLE   _
 #12. OE          P 00001044   26. CAMOPTLK TEN _______
 15. CLCI TRK ID    ____        27. CAMOPTLK DEN ________
 16. TRANS CLASS    __          28. CAMOPTLK NEN __________
 17. SUPV          ___         29. ACTN         _
 18. IDLE STATE     ___         30. OTODPN1      _________
 19. IN START DIAL  ________      31. OTODPN2      _________
 20. OUT START DIAL ____        32. SLC OTODPN3  _________
 21. STOPGO         _           33. SLC OTODPN4  ____
 22. CGA SPN     _________        34. MAXCALLS     __
```

Figure 5.2.3-5 Sample RC View 5.5, TRUNK MEMBER - Integrated SLC Carrier System Channel Test

7. ***NOTE:*** The **RT-EX** attribute is the remote terminal (RT) external name.

NOTE: If the remote measurement unit (RMU) is being used, ensure that the **MTP PROTOCOL** attribute field is **N** to inhibit the protocol test.

Using RC View **18.10, REMOTE TERMINAL ASSIGNMENT** (Figure 5.2.3-6), verify that the **SLC ID** [SLC carrier system maintenance identification (ID) number] and **MTB** (metallic test bus) attributes agree with office records.

```
                          5ESS SWITCH
                         RECENT CHANGE  18.10
(5106)                  REMOTE TERMINAL ASSIGNMENT

 *1. SM     001                    SHELF ASSIGNMENTS
 *2. DCLU   0                      -----------------
 *3. RT EX  1                     MODE         S-DFI
 #4. SLC ID 0001                    ----        -----
  5. MTB    001000101       SHELF-A #6. ______      #7. __
                      SHELF-B  8. ______       9. __
 15. PWR MISC MAJ _        SHELF-C 10. ______      11. __
 16. MTP PROTOCOL N        SHELF-D 12. ______      13. __
 17. SLC ID DPN    _________              PROT LIN   14. __
```

Figure 5.2.3-6 Sample RC View 18.10, REMOTE TERMINAL ASSIGNMENT

8. RC View **18.15**, **REMOTE TERMINAL** (Figure 5.2.3-7 is needed in the channel test for the Integrated Digital Carrier Unit (IDCU) and the Digital Networking Unit - SONET (DNU-S) and provides for various options for the Circuit Test Method (CKT TST MTH).

NOTE: The diode option is for Lucent Technologies Remote Terminals (RTs) and the Remote Test Unit (RTU) option is for Remote Measurement Units (RMUs) and RTs that do not have a diode (most all non-Lucent Technologies RTs).

```
                        5ESS SWITCH
SCREEN 1 OF 7              RECENT CHANGE  18.15
(5174)                    REMOTE TERMINAL
```

```
*1.SM           ___       13.SUP METHOD _____
*2.UNIT TYPE     ____       14.RT VENDOR  _________________________
*3.UNIT NUMBER   __
*4.RT EX         __              TR303 REMOTE TERMINAL
#5.RT INTERFACE _____       15.RT EQSTAT     _
#6.RT SID        ____       16.RT LINE SIZE   ____
 7.RT MTB        _________  17.TR303 BK OUT   _
 8.RT ID DPN     _________  18.INH DSL MAINT  _
 9.PWR ALM CLASS _____
10.PROT LINE     __
11.CKT TST MTH   ____
12.BER THRES     _
```

Figure 5.2.3-7 Sample RC View 18.15, REMOTE TERMINAL

9. Using RC View **18.12, REMOTE TERMINAL MTB** (Figure 5.2.3-8), verify that the **SCAN** (scan point) and **DIST1** through **DIST5** (distribute points 1 through 5) attributes agree with office records.

```
                    5ESS SWITCH
                  RECENT CHANGE  18.12
(5811)              REMOTE TERMINAL MTB

*1. MTB   001000101
#2. SCAN  001000201
#3. DIST1 001000301
#4. DIST2 001000302
#5. DIST3 001000303
#6. DIST4 0010003
#7. DIST5 001000305
```

Figure 5.2.3-8 Sample RC View 18.12, REMOTE TERMINAL MTB

10. ***NOTE:*** Steps 9 through 12 verify that the correct ODD for the integrated SLC carrier touch tone test has been entered.

    At recent change and verify (RC/V) video display terminal (VDT) or equivalent, do Steps 9 through 12.

11. Using RC View **10.1**, **FIXED ROUTE (ROUTING)** (Figure 5.2.3-9), verify that the correct fixed route has been inserted for the integrated SLC carrier touch tone test LTP trunk group.

```
                    5ESS SWITCH
                  RECENT CHANGE  10.1
(53011)             FIXED ROUTE (ROUTING)

*1. TRMT      IC SRTT
 2. TONE      N
 3. TONE TYPE _______
 4. RTI       40
 5. CHGI      1
 6. PLAY ANNC N
```

Figure 5.2.3-9 Sample RC View 10.1, FIXED ROUTE (ROUTING) - Integrated SLC Carrier System Touch Tone Test

12. Using RC View **10.2**, **ROUTE INDEX (ROUTING)** (Figure 5.2.3-10), verify that the correct route index has been inserted for the integrated SLC carrier touch tone test LTP trunk group.

```
                          5ESS SWITCH
                        RECENT CHANGE  10.2
(5303)                   ROUTE INDEX (ROUTING)

*1.RTI       40         13.ANI II DIGITS __  23.SPEECH ALT RI
____
#2.ETYP      HUNT        14.LTDRI        _
 3.TGN       903        15.CSTLRI       _    DATARATE ALT RI
 4.DIG DLTD   0          16.LEC OS       _   24.56K     ____
 5.PREF DIG   __________                     25.R64K     ____
 6.NEXT RTI   ____        CCS7 EQUAL ACCESS   26.64K      ____
 7.SIG PRO    _____       17.CKT CODE  __    27.384K     ____
 8.FGD CIC 4  _          18.CPN SUBSC  _    28.1536K    ____
 9.ANI IND    _          19.CSI SUBSC  _    29.MULTIRATE ____
10.OVLAP IND _           20.ATP SUBSC  _
11.RT DES TYP ________    21.UUI SUBSC  _     PACKET SWITCHING
12.RMK       TTTL        22.CICP SUBSC _     30.PSN ___
```

Figure 5.2.3-10 Sample RC View 10.2, ROUTE INDEX (ROUTING) - Integrated SLC Carrier System Touch Tone Test

13. **CAUTION:** The integrated SLC carrier touch tone test trunk group logical test port (LTP) must be in the same switching module (SM) containing the transmission test facility (TTF).

NOTE: A minimum of two LTP members are recommended.

Using RC View **5.1**, **TRUNK GROUP** (Figure 5.2.3-11), verify that the correct integrated SLC carrier touch tone test LTP trunk group has been inserted.

```
                          5ESS SWITCH
SCREEN 1 OF 11                RECENT CHANGE  5.1
(5200,5202,5213)              TRUNK GROUP

(*)1.TGN       903        13.CARRIER ID ____  25.FREE ANS _
(*)2.TRUNK CHAR ______________14.FEAT GRP  _    26.PBX ID   ____
(*)3.FEND CLLI  ___________  15.INC TND WNK_    27.PRIVACY  _
   4.TRK CHAR   ______________16.ATTTN      ___   28.INSEP    ___
   5.FAR CLLI   ___________  17.TERA RCVY ___   29.MODULE   ___
   6.RMK       TTTL        18.IAPT      Y
  #7.TRK DIR    LTP         19.CALLMON INH_      VERIFY ONLY
  #8.HUNT TYPE  FIFO        20.INPLS     NOSIGNAL GRP SIZ ____
   9.SCR        ____        21.OUTPLS    NOSIGNAL ACT SIZ ____
  10.GLARE ACTION________      22.FAR END NPA___     SATELLITE_
  11.DAS        __          23.GL ANN TGN ____    TERM SFG _
 #12.TRK CLASS  LTPICTC      24.BRCS       _
```

Figure 5.2.3-11 Sample RC View 5.1, TRUNK GROUP - Integrated SLC Carrier System Touch Tone Test

14. Using RC View **5.5**, **TRUNK MEMBER** (Figure 5.2.3-12), verify that the correct integrated SLC

carrier touch tone test LTP trunk group members have been inserted.

```
                         5ESS SWITCH
SCREEN 1 OF 6                  RECENT CHANGE  5.5
(5204)                        TRUNK MEMBER

 *1. TGN          903        23. HOLD BUSY    _
 *2. MEMB NBR      0           24. SATELLITE    _
(*)9. QTY          __          25. TRF SAMPLE   _
 #12. OE           P 00001052   26. CAMOPTLK TEN _______
 15. CLCI TRK ID    ____         27. CAMOPTLK DEN ________
 16. TRANS CLASS    __           28. CAMOPTLK NEN __________
 17. SUPV          RB          29. ACTN         _
 18. IDLE STATE     ___          30. OTODPN1      _________
 19. IN START DIAL  WINK         31. OTODPN2      _________
 20. OUT START DIAL ____         32. SLC OTODPN3  _________
 21. STOPGO         _            33. SLC OTODPN4  _________
 22. CGA SPN        _________    34. MAXCALLS     __
```

Figure 5.2.3-12 Sample RC View 5.5, TRUNK MEMBER - Integrated SLC Carrier System Touch Tone Test

15. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.2.4: VERIFY MMSU ODD

PROCEDURE

1. At the recent change and verify (RC/V) video display terminal or equivalent, do Steps 2 through 7.

2. If your office has the 5E14 feature 99-5E-4720 that allows flexible assignment of DCTU/PMU ports to the MMSU, then verify that RC View **19.7** (Figure 5.2.4-1) field 12 is set to Y on a per service group basis. Also, to take advantage of the MMSUcontroller speed up, set the CLI field (13) to 1 or greater.

```
                              5ESS SWITCH
                            RECENT CHANGE  19.7
(57501)                        METALLIC SERVICE UNIT

*1. SM            ___      #13. CLI ________
*2. MSU             _
*3. SG             _
 4. TYPE            ___
 5. EQSTAT            _
#6. CI             _
#7. PICB            __
#8. EQLBAY             ___
#9. EQLUNVER            __
#10. EQLAISLE            ____
 11. CSU             _
 12. FLEX DCTU CON _
```

Figure 5.2.4-1 Sample RC View 19.7 (5E14), METALLIC SERVICE UNIT

3. ***NOTE:*** Each SM equipped with an MMSU must have the route indexes (RTIs) assigned for ALIT (attribute **ALITRTI**), the metallic access junctor (attribute **MAJRTI**), and, if applicable, the DCTU (attribute **DCTURTI**). All SMs ***not*** equipped with an MMSU must have the **DCTURTI** assigned, if applicable. The **ALITRTI** and **MAJRTI** fields should be blank.

   Using RC View **18.1**,**SWITCHING MODULE**, (Figure 5.2.4-2), verify that the correct RTIs have been assigned for each SM.

```
                            5ESS SWITCH
SCREEN 1 OF 5                  RECENT CHANGE  18.1
(57001)                       SWITCHING MODULE

 *1.SM         2      11.EVEN NCT LINK___       ROUTE INDEXES
 #2.SM TYPE    LSM    12.ODD NCT LINK ___        -------------
 #3.UNIT TYPE  ______  13.DLI 0 CLI    ________ 20.DCTURTI  61
  4.EQSTAT      _      14.DLI 1 CLI    ________ 21.SLIM RI  65
 #5.IIA NORMAL _______ 15.MCTSI 0 CLI ________ 22.ALITRTI  ____
 #6.AISLE      ____    16.MCTSI 1 CLI ________ 23.PPMTC RI 51
   HSM        ___     17.BTSR CLI     ________ 24.MAJRTI   ____
  8.POST PUMP  _      18.CI 0 CLI     ________
 #9.EVEN NCT CTS___    19.CI 1 CLI     ________ MULTIFREQ RINGING#1
 #10.ODD NCT CTS ___                    ----------------
```

```
                    25.FCLASS   _____
```

Figure 5.2.4-2 Sample RC View 18.1, SWITCHING MODULE

4. Using RC View **10.2, ROUTE INDEX (ROUTING)** (Figure 5.2.4-3) verify that the correct RTI type has been assigned for each MMSU equipped SM.

```
                      5ESS SWITCH
                    RECENT CHANGE  10.2
(5303)               ROUTE INDEX (ROUTING)

*1.RTI      51       13.ANI II DIGITS __   23.SPEECH ALT RI ____
#2.ETYP     HUNT       14.LTDRI        _
 3.TGN      928      15.CSTLRI       _    DATARATE ALT RI
 4.DIG DLTD  0        16.LEC OS       _   24.56K       ____
 5.PREF DIG  __________               25.R64K      ____
 6.NEXT RTI  ___      CCS7 EQUAL ACCESS   26.64K       ____
 7.SIG PRO   _____     17.CKT CODE __     27.384K      ____
 8.FGD CIC 4 _        18.CPN SUBSC _     28.1536K     ____
 9.ANI IND   _       19.CSI SUBSC _     29.MULTIRATE ____
10.OVLAP IND _        20.ATP SUBSC _
11.RT DES TYP________   21.UUI SUBSC _    PACKET SWITCHING
12.RMK      LTPMSU SM2 22.CICP SUBSC _    30. PSN ___
```

Figure 5.2.4-3 Sample RC View 10.2, ROUTE INDEX (ROUTING) - MMSU Equipped SM

5. Use the number in the **TGN** (trunk group number) field of (each) View **10.2** to index into RC View **5.1, TRUNK GROUP**.

6. ***NOTE:*** One logical test port (LTP) trunk group is required for each SM equipped with an MMSU.

Using View **5.1**, **TRUNK GROUP** (Figure 5.2.4-4), verify that the correct trunk group is assigned for each MMSU equipped SM.

```
                      5ESS SWITCH
SCREEN 1 OF 11              RECENT CHANGE  5.1
(5200,5202,5213)            TRUNK GROUP

(*)1.TGN       928       13.CARRIER ID ____   25.FREE ANS_
(*)2.TRUNK CHAR ______________14.FEAT GRP  _     26.PBX ID ____
(*)3.FEND CLLI  ___________  15.INC TND WNK_    27.PRIVACY _
   4.TRK CHAR   ______________16.ATTTN     ___   28.INSEP  ___
   5.FAR CLLI   ___________  17.TERA RCVY ___   29.MODULE ___
   6.RMK       LTPMSU SM2   18.IAPT       _
  #7.TRK DIR    LTP        19.CALLMON INH_      VERIFY ONLY
  #8.HUNT TYPE  FIFO        20.INPLS     _______   GRP SIZ ____
   9.SCR       ____        21.OUTPLS    _______   ACT SIZ ____
  10.GLARE ACTION________    22.FAR END NPA___      SATELLITE_
  11.DAS        __          23.GL ANN TGN ____    TERM SFG _
 #12.TRK CLASS  LTPMSU      24. BRCS      _
```

Figure 5.2.4-4 Sample RC View 5.1, TRUNK GROUP - MMSU Equipped SM

7. ***NOTE:*** Eight LTP trunk group members are required per MMSU shelf, 32 members per fully equipped MMSU (4 shelves). One member must be assigned per MMSU junctor.

Using RC View **5.5**,**TRUNK MEMBER** (Figure 5.2.4-5), verify that the correct LTP trunk group members are assigned for each MMSU.

```
                          5ESS SWITCH
SCREEN 1 OF 6                 RECENT CHANGE  5.5
(5204)                        TRUNK MEMBER

 *1. TGN          928        23. HOLD BUSY    _
 *2. MEMB NBR      0         24. SATELLITE    _
(*)9. QTY          1         25. TRF SAMPLE   _
 #12. OE          P 00002008  26. CAMOPTLK TEN _______
 15. CLCI TRK ID   ____      27. CAMOPTLK DEN ________
 16. TRANS CLASS   __        28. CAMOPTLK NEN __________
 17. SUPV          ___       29. ACTN         _
 18. IDLE STATE    ___       30. OTODPN1      _________
 19. IN START DIAL ________  31. OTODPN2      _________
 20. OUT START DIAL ____     32. SLC OTODPN3  _________
 21. STOPGO        _         33. SLC OTODPN4  _________
 22. CGA SPN       _________ 34. MAXCALLS     __
```

Figure 5.2.4-5 Sample RC View 5.5, TRUNK MEMBER - MMSU Equipped SM

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.2.5: VERIFY NTT ODD

PROCEDURE

1. ***NOTE:*** One incoming (INCOM) trunk group is required for each wire center location. For example if the host switch is equipped with two RSMs, three INCOM trunk groups would be required, one for the host and one each for two RSMs.

2. At a recent change and verify (RC/V) video display terminal (VDT) or equivalent, using RC View **5.1, Screen 1, TRUNK GROUP** (Figure 5.2.5-1), verify that the correct NTT INCOM trunk group is assigned for each wire center.

   NOTE: When the NTT interface is implemented with the NTTU, the NTT INCOM trunk group may have up to 12 members. In addition, a one member trunk group must be established for the control trunk to each NTTU. That trunk group is an outgoing (OUTGO) trunk group with a TRK CLASS of TSTK. That trunk serves only the NTTU and does not extend outside of the switch.

```
                         5ESS SWITCH
SCREEN 1 OF 13                RECENT CHANGE  5.1
(5200,5202,5213)              TRUNK GROUP

(*)1. TGN          ____          13. CARRIER ID ____     25. BRCS     _
(*)2. TRUNK CHAR   _______________  14. FEAT GRP    _      26. FREE ANS _
(*)3. FEND CLLI    ___________     15. INC TND WNK _     27. PRIVACY  _
   4. TRK CHAR     _______________  16. ATTTN     ___     28. INSEP    ___
   5. FAR CLLI     ___________     17. TERA RCVY  ___    29. MODULE   ___
   6. RMK          ________________ 18. IAPT        _     30. BICC GRP ____
  #7. TRK DIR      _______       19. CALLMON INH _
  #8. HUNT TYPE    ______          20. INPLS      ________   VERIFY ONLY
   9. SCR          ____          21. OUTPLS     ________   GRP SIZ   ____
  10. GLARE ACTION ________        22. FAR END NPA ___       ACT SIZ   ____
  11. DAS          ___           23. GL ANN TGN ____      SATELLITE _
 #12. TRK CLASS    ________        24. PBX/CPE ID ____       TERM SFG  _
```

Figure 5.2.5-1 Sample RC View 5.1, Screen 11, TRUNK GROUP - NTT

3. Using RC View **5.1, TRUNK GROUP - Screen 11,** (Software Release 5E15) (Figure 5.2.5-2), The field labeled "MLT ISLC OPT" (Mechanized Loop Test System, Integrated Services Line Card, Option), must be populated with a "Y" to correct a VER B0 problem with the No-Test Trunk (NTT) interface. Refer to Figure 5.2.5-2 . The "Y" option must only be used if MLT is running MLT Generic G7I2 or G6I2 (or later generics).

   With the option set to "Y", Pair Gain System Busy and Major Alarm occurrences are correctly reported as VER 53 and VER 54, respectively, in place of VER B0: Test Equipment Busy.

```
                         5ESS SWITCH
SCREEN 11 OF 13               RECENT CHANGE  5.1
(5200,5202,5213)              TRUNK GROUP

      MISCELLANEOUS                MISCELLANEOUS
230. DATARATE     ____        241. SPA BILL DN __________
231. INVERSION    _          242. SDN STAT GRP _
```

```
232. WB RATE        _________       243. SPA SUPV     _
233. WB TSA TYPE    _____           244. ANI6         _
234. INTER SM TRK  _            245. ANI7         _
235. DIR CON DN     _______________     246. TOPAS TPNUM  __
236. FACILITY TYPE ___            247. ASI PROXY    _
237. FACILITY NBR  _____           248. FGD CIC SZ   ____
238. RTE NBR PLAN  ____            249. SPEECH TRMTS _
239. BILLING DN     __________        250. MLT ISLC OPT _
240. ACP SDN       _           251. MAI          _
```

Figure 5.2.5-2 Sample RC View 5.1, Screen 11, TRUNK GROUP - NTT

4. ***NOTE:*** The members in each NTT INCOM trunk group must start with **0**. Notice that the attribute field **OE** that contains the equipment number (EN) of the incoming NTT interface trunk circuit.

At RC/V VDT or equivalent, using RC View **5.5, TRUNK MEMBER** (Figure 5.2.5-3), verify that the **OE** field contains the equipment number of the incoming NTT interface trunk circuit.

For an NTT interface that is implemented on an SN-107 circuit, the OE type will be "T" (Analog Trunk Unit equipment number). For an NTT interface that is implemented on the NTTU, the OE type will be either "D" or "N" (DLTU equipment number or DNU-S equipment number).

```
                          5ESS SWITCH
SCREEN 1 OF 6                   RECENT CHANGE  5.5
(5204)                        TRUNK MEMBER

 *1. TGN          140        23. HOLD BUSY    _
 *2. MEMB NBR       0          24. SATELLITE    _
(*)9. QTY          __         25. TRF SAMPLE   _
 #12. OE           T 00001052   26. CAMOPTLK TEN _______
 15. CLCI TRK ID   ____       27. CAMOPTLK DEN ________
 16. TRANS CLASS   __         28. CAMOPTLK NEN __________
 17. SUPV          RB         29. ACTN         _
 18. IDLE STATE    ___        30. OTODPN1      _________
 19. IN START DIAL  WINK      31. OTODPN2      _________
 20. OUT START DIAL ____      32. SLC OTODPN3  _________
 21. STOPGO        _          33. SLC OTODPN4  _________
 22. CGA SPN       _________  34. MAXCALLS     __
```

Figure 5.2.5-3 Sample RC View 5.5, TRUNK MEMBER - NTT

5. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.2.6: VERIFY DCTU ODD

PROCEDURE

1. At recent change and verify (RC/V) video display terminal or equivalent, do Steps 2 through 6.

2. ***NOTE:*** The directly connected test unit (DCTU) route index (RTI) must be assigned in each SM. The DCTU RTI must be different for the host and each remoted wire center [remote SM (RSM), optically integrated remote switching module (ORM), etc.].

   Using RC View **18.1**, **SWITCHING MODULE** (Figure 5.2.6-1), verify that the correct RTI number (**DCTURTI** field) is assigned to each SM in the host wire center and each remoted wire center.

```
                      5ESS SWITCH
SCREEN 1 OF 5               RECENT CHANGE  18.1
(57001)                 SWITCHING MODULE

 *1.SM         2      11.EVEN NCT LINK ___        ROUTE INDEXES
 #2.SM TYPE    LSM    12.ODD NCT LINK  ___        -------------
 #3.UNIT TYPE  ______  13.DLI 0 CLI    ________  20.DCTURTI  61
  4.EQSTAT     _      14.DLI 1 CLI    ________  21.SLIM RI  65
 #5.IIA NORMAL _______ 15.MCTSI 0 CLI ________  22.ALITRTI  ____
 #6.AISLE      ____   16.MCTSI 1 CLI  ________  23.PPMTC RI 51
   HSM         ___    17.BTSR CLI     ________  24.MAJRTI   ____
  8.POST PUMP  _      18.CI 0 CLI     ________
 #9.EVEN NCT CTS___   19.CI 1 CLI     ________  MULTIFREQ RINGING
#10.ODD NCT CTS ___                              -----------------
                                    25.FCLASS  _____
```

Figure 5.2.6-1 Sample RC View 18.1, SWITCHING MODULE

3. Using RC View **10.2**, **ROUTE INDEX (ROUTING)** (Figure 5.2.6-2), verify that the correct RTI type is assigned for each wire center.

```
                     5ESS SWITCH
                    RECENT CHANGE  10.2
(5303)               ROUTE INDEX (ROUTING)

*1.RTI       61       13.ANI II DIGITS __  23.SPEECH ALT RI ____
#2 ETYP      HUNT     14.LTDRI        _
 3.TGN       951      15.CSTLRI       _    DATARATE ALT RI
 4.DIG DLTD  __       16.LEC OS       _    24.56K     ____
 5.PREF DIG  __________                    25.R64K    ____
 6.NEXT RTI  ____     CCS7 EQUAL ACCESS    26.64K     ____
 7. SIG PRO  _____    17.CKT CODE  __      27.384K    ____
 8. FGD CIC 4 _       18.CPN SUBSC  _      28.1536K   ____
 9. ANI IND  _        19.CSI SUBSC  _      29.MULTIRATE ____
10. OVLAP IND _       20.ATP SUBSC  _
11. RT DES TYP________ 21.UUI SUBSC _      PACKET SWITCHING
12. RMK      LTPDCTU SM2 22.CICP SUBSC _   30.PSN ___
```

Figure 5.2.6-2 Sample RC View 10.2, ROUTE INDEX (ROUTING) - DCTU

4. Using RC View **5.1**, **TRUNK GROUP** (Figure 5.2.6-3), verify that the correct logical test port (LTP)

trunk group has been assigned to each DCTU equipped switching module (SM).

```
                              5ESS SWITCH
SCREEN 1 OF 11                RECENT CHANGE  5.1
(5200,5202,5213)              TRUNK GROUP

(*)1.TGN        951        13.CARRIER ID ____ 25.FREE ANS _
(*)2.TRUNK CHAR _______________14.FEAT GRP  _   26.PBX ID  ____
(*)3.FEND CLLI  ___________   15.INC TND WNK_   27.PRIVACY  _
  4.TRK CHAR    _______________16.ATTTN     ___  28.INSEP   ___
  5.FAR CLLI    ___________   17.TERA RCVY ___  29.MODULE   ___
  6.RMK       LTPDCTU SM2    18.IAPT       _
 #7.TRK DIR    LTP         19.CALLMON INH_      VERIFY ONLY
 #8.HUNT TYPE  FIFO         20.INPLS     ___     GRP SIZ  ____
  9.SCR        ____       21.OUTPLS    ________ACT SIZ  ____
 10.GLARE ACTION________      22.FAR END NPA___    SATELLITE _
 11.DAS        __        23.GL ANN TGN ____     TER
#12.TRK CLASS  LTPDCTU      24.BRCS       _
```

Figure 5.2.6-3 Sample RC View 5.1, TRUNK GROUP - DCTU

5. ***NOTE:*** One LTP trunk group member must be assigned per DCTU port equipped in each location (host, remoted modules). Each precision measurement unit (PMU) has 4 DCTU ports; a fully equipped DCTU has 12 DCTU ports (3 PMUs). The LTP must be assigned to the SM equipped with the DCTU.

NOTE: A recent cabling design change now allows assignment of only one DCTU port to a service group or shelf. This permits the DCTU ports to be spread more evenly over the MMSU shelves. Cabling information is found in ED-5D503-30, Group 37A, 38A.

Using RC View **5.5**, **TRUNK MEMBER** (Figure 5.2.6-4), verify DCTU LTP trunk group member assignments.

```
                                5ESS SWITCH
SCREEN 1 OF 6                     RECENT CHANGE  5.5
(5204)                         TRUNK MEMBER

 *1. TGN         951         23. HOLD BUSY   _
 *2. MEMB NBR      0          24. SATELLITE   _
(*)9. QTY          1          25. TRF SAMPLE  _
#12. OE          P 00002000   26. CAMOPTLK TEN _______
 15. CLCI TRK ID   ____        27. CAMOPTLK DEN ________
 16. TRANS CLASS   __          28. CAMOPTLK NEN __________
 17. SUPV        ___          29. ACTN        _
 18. IDLE STATE    ___        30. OTODPN1     _________
 19. IN START DIAL ________     31. OTODPN2     _________
 20. OUT START DIAL ____      32. SLC OTODPN3  _________
 21. STOPGO        _          33. SLC OTODPN4 _________
 22. CGA SPN       _________    34. MAXCALLS    __
```

Figure 5.2.6-4 Sample RC View 5.5, TRUNK MEMBER - DCTU

6. If your office has the 5E14 feature 99-5E-4720 that allows flexible assignment of DCTU/PMU ports to the MMSU, then use RC View **20.9**(Figure 5.2.6-5) to verify PMU MTB assignments. For DCTUs

that do not have this feature, A1-A3, B1-B3, C1-C3, and D1-D3 will not be assigned.

```
                           5ESS SWITCH
SCREEN 1 OF 2                      RECENT CHANGE  20.9
(5752)              DIRECTLY CONNECTED TEST UNIT (SM MODULE PACKS)

*1. SM       192;      #6. PORT A   0           #12. PORT B   1
*2. PMU      0;        #7. MTB A0   192000013    #13. MTB B0   192010013
 3. EQSTAT   O              MTB A1   192000813         MTB B1   192010813
 4. DCTU     0             MTB A2   192001613         MTB B2   192011613
 5. CLI      0            MTB A3   192002413         MTB B3   192012413
                  11. LO DPN A _________      17. LO DPN B _________
```

```
                           5ESS SWITCH
SCREEN 2 OF 2                      RECENT CHANGE  20.9
(5752)              DIRECTLY CONNECTED TEST UNIT (SM MODULE PACKS)

#18. PORT C   2            #24. PORT D   3
#19. MTB C0   192000014    #25. MTB D0   192010014
    MTB C1   192000814         MTB D1   192010814
    MTB C2   192001614         MTB D2   192011614
    MTB C3   192002414         MTB D3   192012414
 23. LO DPN C _________       29. LO DPN D _________
```

Figure 5.2.6-5 Sample RC View 20.9 (5E14), DIRECTLY CONNECTED TEST UNIT (SM MODULE PACKS)

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.2.7: VERIFY CALLBACK ODD

OVERVIEW

The CALLBACK trunk group (TG) is located only in the host SM. The CALLBACK TG is used to digitally connect the line under test to the CALLBACK phone. The CALLBACK phone could be assigned within the same *5ESS*® switch or at a distant office. If the CALLBACK phone is within the switch, the CALLBACK TG would digitally connect to a line unit LEN. If the CALLBACK phone is physically located outside the switch, the CALLBACK TG would digitally connect to an outgoing TG.

With the exception of multimodule remote switching modules (MMRSMs), for callback to work with remoted SMs (such as RSMs, ORMs, and TRMs), each must be equipped as follows:

(a) For the IMLT configuration, an MMSU [including distributing frame test access circuits (DFTACs)], and a DCTU.

(b) For the LTS configuration, an MMSU, and an NTT interface.

One properly equipped MMSU and one DCTU/NTT can serve all RSMs in an MMRSM.

CAUTION: Most of the data shown in this procedure is essential for CALLBACK to operate. If any of the RC views are not populated correctly, obtain higher technical assistance to correct the data. Changing data on some of these forms affects customer call routing.

NOTE 1: All requests that would require a callback path are denied on ISDN lines. However, an ISDN line can be used as a callback path for requests on analog lines.

NOTE 2: **Callback in DCTU applications does not permit 800 numbers.**

PROCEDURE

1. At RC/V VDT or equivalent, do Steps 2 through 5.

2. Access RC View **10.1**, **FIXED ROUTE (ROUTING)** (Figure 5.2.7-1), and do the following:

   (1) Type and enter **CALLBACK** in the **TRMT** attribute field.

   (2) Verify that the attribute field **RTI** (routing index) has the correct routing index number (Example: **140**) for the CALLBACK phone.

```
                         5ESS SWITCH
                        RECENT CHANGE  10.1
(53011)                  FIXED ROUTE (ROUTING)

*1. TRMT      CALLBACK
 2. TONE      N
 3. TONE TYPE _______
 4. RTI       140
 5. CHGI      1
 6. PLAY ANNC _
```

Figure 5.2.7-1 Sample RC View 10.1, FIXED ROUTE (ROUTING) - Callback

3. Access RC View **10.2**, **ROUTE INDEX (ROUTING)** (Figure 5.2.7-2), and do the following:

   (1) Type and enter RTI number, from Step 2, in **RTI** attribute field.

   (2) Verify that the correct CALLBACK phone LTP TG (Example: **201**) is in the attribute field **TGN** (trunk group number).

```
                      5ESS SWITCH
                    RECENT CHANGE  10.2
(5303)               ROUTE INDEX (ROUTING)

*1.RTI      140       13.ANI II DIGITS__  23.SPEECH ALT RI____
#2.ETYP     HUNT       14.LTDRI       _
 3.TGN      201       15.CSTLRI      _   DATARATE ALT RI
 4.DIG DLTD  0         16.LEC OS      _   24.56K     ____
 5.PREF DIG  __________                  25.R64K     ____
 6.NEXT RTI  ____      CCS7 EQUAL ACCESS  26.64K     ____
 7.SIG PRO  _         18.CPN SUBSC _    28.1536K   ____
 9.ANI IND  _         19.CSI SUBSC _    29.MULTIRATE____
10.OVLAP IND _         20.ATP SUBSC _
11.RT DES TYP________   21.UUI SUBSC _    PACKET SWITCHING
12.RMK      MLT       22.CICP SUBSC_    30.PSN___
```

Figure 5.2.7-2 Sample RC View 10.2, ROUTE INDEX (ROUTING) - Callback

4. Access RC View **5.1** (Figure 5.2.7-3), **TRUNK GROUP**, and do the following:

   (1) Type and enter TGN obtained from Step 3 in the **TGN** attribute field.

   (2) Verify that attribute fields **RMK**, **TRK DIR**, **HUNT TYPE** and **TRK CLASS** are correctly populated as in the sample view.

```
                         5ESS SWITCH
SCREEN 1 OF 11               RECENT CHANGE  5.1
(5200,5202,5213)             TRUNK GROUP

(*)1.TGN       201_        13.CARRIER ID 288   25.FREE ANS_
(*)2.TRUNK CHAR ___________    15.INC TND WNK_     27.PRIVACY _
  4.TRK CHAR    _______________16.ATTTN     ___    28.INSEP  ___
  5.FAR CLLI    ___________    17.TERA RCVY ___    29.MODULE  ___
  6.RMK       CALLBACK      18.IAPT       _
 #7.TRK DIR    LTP          19.CALLMON INH_        VERIFY ONLY
 #8.HUNT TYPE  FIFO         20.INPLS       ________  GRP SIZ____
  9.SCR        ____         21.OUTPLS      ________  ACT SIZ____
 10.GLARE ACTION________      22.FAR END NPA___       SATELLITE_
 11.DAS        __          23.GL ANN TGN ____      TERM SFG_
 #12.TRK CLASS  LTPCLBCK      24.BRCS_
```

Figure 5.2.7-3 Sample RC View 5.1, TRUNK GROUP - Callback

5. Are CALLBACK calls routed out of the office over a carrier interconnect (CI) trunk group?

   If **YES**, continue with step 6.

If **NO**, go to step 17.

6. On the same RC View **5.1** (Figure 5.2.7-3), verify that **CARRIER ID** attribute field contains the correct CALLBACK carrier ID number (Example: **288**).

7. **CAUTION:** If the CALLBACK is routed to a CI TG that expects automatic number identification (ANI) billing information to be sent, the billing DN is required. If the billing is missing, an MDII report is generated with an **ACK** failure. This 10-digit number (Example: **3122200001**) is usually the MLT calibration number.

   Is billing DN required?

   If **YES**, continue with step 8.

   If **NO**, go to step 9.

8. On same RC View **5.1** (Figure 5.2.7-4) verify that **BILLING DN** attribute field contains the correct billing DN (Example: **3122200001**).

```
                      5ESS SWITCH
SCREEN 10 OF 11              RECENT CHANGE  5.1
(5200,5202,5213)             TRUNK GROUP

      MISCELLANEOUS           MISCELLANEOUS     MISCELLANEOUS
199.DATARATE     ____         210.SDN STAT GRP_  221.EON MC RI____
200.WB RATE      _________     211.SPA SUPV   _
201.WB TSA TYPE  _____         212.ANI6       _
202.INTER SM TRK _            213.ANI7       _
203.DIR CON DN   _______________214.TOPAS TPNUM __
204.FACILITY TYPE___          215.ASI PROXY   _
205.FACILITY NBR _____         216.FGD CIC SZ  ____
206.RTE NBR PLAN ____          217.SPEECH TRMTS_
207.BILLING DN   3122200001    218.MLT ISLC OPT_
208.ACP SDN      _            219.MAI        _
209.SPA BILL DN  __________     220.API CODE    ____
```

Figure 5.2.7-4 Sample RC View 5.1, TRUNK GROUP - Callback

9. At RC/V VDT or equivalent, do Steps 10 through 16.

10. Access RC View **8.1, OFFICE PARAMETERS (MISCELLANEOUS)** (Figure 5.2.7-5), and do the following:

    (1) Type and enter official office ID in **OFFICE ID** attribute field (Example: **NV220001**; see Procedure 5.2.1). Procedure 5.2.1 [5.2.1]).

    (2) Observe the following caution:

    CAUTION: If the **POFFLOSS** attribute [2 dB digital loss indicator for electronic loop segregation (ELS)] is not set to **N**, then callback always drop on DFTAC access.

    (3) Verify that **POFFLOSS** attribute field contains **N**.

    (4) Verify that **SCR** attribute field contains the correct screening index number (Example: **2025**).

    (5) Verify that **DAS** attribute field contains the correct digit analysis selector number (Example:

25).

```
                         5ESS SWITCH
SCREEN 1 OF 13                   RECENT CHANGE  8.1
(5509)               OFFICE PARAMETERS (MISCELLANEOUS)

*1. OFFICE ID NV220001    13. IMPLD NPA ___       APT TESTING
 2. IMLT2     _          14. SPLIT OFC _      22. HRSTART   __
 3. EXSIG     _          15. PERC1SILC ____    23. MNSTART  __
 4. MANROUT   ___         16. PERC2SILC ____    24. DURATION _
 5. POTENT    _____       17. HOME NPA  ___     25. RUNSUN   _
 6. TIMEZONE  ___         18. TD WINDOW ___     26. RUNMON   _
 7. DST       _          19. RMSOPT    _      27. RUNTUE   _
 8. CUTTRANS  _                             28. RUNWED   _
 9. HOLIDAY   ___         TRK MAINT DA OPT     29. RUNTHR   _
10. SES       ____       20. LTP SCR 2025     30. RUNFRI   _
11. POFFLOSS  N          21. LTP DAS 25       31. RUNSAT   _
12. RING TOT  _____
```

Figure 5.2.7-5 Sample RC View 8.1, OFFICE PARAMETERS (MISCELLANEOUS) - Callback

11. Access RC View **9.1, DIGIT ANALYSIS SELECTOR (OFFICE DIALING)** (Figure 5.2.7-6) and do the following:

    (1) Type and enter DAS number, from Step 10, in **DAS** attribute field.

    (2) Verify that **PDIT** attribute field contains the correct preliminary digit interpreter table number (Example: **125**).

    (3) Ensure that **INC DIT** attribute field is ***not*** populated (blank).

    (4) Verify that **LDIT** attribute field contains the correct local digit interpreter table number (Example: **225**).

```
                         5ESS SWITCH
                        RECENT CHANGE  9.1
(53001)              DIGIT ANALYSIS SELECTOR (OFFICE DIALING)

*1. DAS     25
 2. PDIT    125
 3. INC DIT ___
 4. LDIT    225
 5. PKT SW  _
 6. ESCO    ___
 7. RMK     CALLBACK
```

Figure 5.2.7-6 Sample RC View 9.1, DIGIT ANALYSIS SELECTOR (OFFICE DIALING) - Callback

12. Access RC View **9.2, PREFIX / FEATURE DIGIT (OFFICE DIALING)** (Figure 5.2.7-7) and do the following:

    (1) Type and enter PDIT number, from Step 11, in **PDIT** attribute field.

(2) In the field **DIGITS TO INTERPRET**, type and enter Digit **1** and the first digit of the area code where the callback is routing (Example: **7**).

(3) Verify that **DIGITS TO BE DELETED** field contains the Digit **1**.

```
                        5ESS SWITCH
                     RECENT CHANGE  9.2
(53002)          PREFIX / FEATURE DIGIT (OFFICE DIALING)

*1. PDIT              125       15. NATURE OF NBR ____
*2. DIGITS TO INTERPRET  17       16. TRIG NBR      ___
#3. CALL TYPE          _______    17. ESC CODE      _
 5. TYP CI CALL        _____     18. DFLT RT       ____
 7. FEATURE            ________   19. INH OBL       _
 8. ACTION             ________   20. INH ONA       _
 9. RTI                ____     21. ANI BYPASS    _
10. POLYGRD             _        22. RMK         CALLBACK
11. CODE INDEX          ____
12. DESEP              ___
13. PREFIX             ____
14. DIGITS TO BE DELETED 1
```

Figure 5.2.7-7 Sample RC View 9.2, PREFIX / FEATURE DIGIT (OFFICE DIALING) - Callback

13. Access RC View **9.3, LOCAL DIGIT (OFFICE DIALING)** (Figure 5.2.7-8), and do the following:

(1) Type and enter LDIT number, from Step 11 (Example: **225**), in **LDIT** attribute field.

(2) Type and enter 1 or 2 digit(s), as applicable, of the office code where the CALLBACK is routed (Example: **12**) in **INCOMING DIGITS** attribute field.

(3) Verify that the attribute field **NBR OF DIGITS** contains the correct number (Example: **10**).

(4) Verify that attribute field **RMK** contains **CALLBACK**.

```
                        5ESS SWITCH
SCREEN 1 OF 5                  RECENT CHANGE  9.3
(53003,53005)             LOCAL DIGIT (OFFICE DIALING)

*1.LDIT        225     *2.INCOMING DIGITS 12

 3.CALL TYPE    _______  15.DESEP        ___    25.ANI BYPASS _
 5.TYP CI CALL  _____   16.PREFIX       ____   26.RMK CALLBACK
 7.RTI          ____   17.WZ1 REGION   _
 8.POLYGRD       _      18.SAC OWNER    ____
 9.NPA          ___    19.NATURE OF NBR ____
10.OFFCOD       ___    20.TRIG NBR     ___
11.TERM LATA    __     21.ESC CODE     _
12.NBR OF DIGITS 10    22.DFLT RT      ____
13.RDIT         ___    23.INH OBL      _
14.CODE INDEX   ____   24.INH ONA      _
```

Figure 5.2.7-8 Sample RC View 9.3, LOCAL DIGIT (OFFICE DIALING) - Callback

14. **CAUTION:** For callback to work with properly equipped remoted SMs (RSMs, ORMs, or TRMs), each must be assigned to the callback LDIT as are the SMs of the host.

NOTE: Screens 2 and 3 of RC View **9.25** are continuations of the **LIST OF SWITCHING MODULES (SMLIST)** attribute field.

At RC/V VDT or equivalent, access RC View **9.25**, **LDIT AND ASSOCIATED SM LIST** (Figure 5.2.7-9), and do the following:

(1) Type and enter LDIT number, from Step 11. (Example: **225**), in **LDIT** attribute field.

(2) Use the RC View **9.25** screens, as required, to verify that ***ALL*** SMs, including properly equipped remoted SMs, are on the SMLIST.

```
                         5ESS SWITCH
SCREEN 1 OF 3                 RECENT CHANGE  9.25
(5315)                  LDIT AND ASSOCIATED SM LIST

*1. LDIT   225
 2. PKT SW _
 3. FAT    _
 4. RCLOG  _
 5. LIST OF SWITCHING MODULES (SMLIST)
ROW SM  ROW SM  ROW SM  ROW SM  ROW SM  ROW SM  ROW SM  ROW SM
 1 ___   7 ___  13 ___  19 ___  25 ___  31 ___  37 ___  43 ___
 2 ___   8 ___  14 ___  20 ___  26 ___  32 ___  38 ___  44 ___
 3 ___   9 ___  15 ___  21 ___  27 ___  33 ___  39 ___  45 ___
 4 ___  10 ___  16 ___  22 ___  28 ___  34 ___  40 ___  46 ___
 5 ___  11 ___  17 ___  23 ___  29 ___  35 ___  41 ___  47 ___
 6 ___  12 ___  18 ___  24 ___  30 ___  36 ___  42 ___  48 ___
```

Figure 5.2.7-9 Sample RC View 9.25, LDIT AND ASSOCIATED SM LIST - Callback

15. Access RC View **10.3, INTERLATA CARRIER** (Figure 5.2.7-10), and do the following:

(1) Type and enter **CARRIER ID** number, from Step 6 (Example: **288**), in **CARRIER ID** attribute field.

(2) Type and enter **D** in **FEAT GRP** attribute field.

```
                         5ESS SWITCH
SCREEN 1 OF 2                 RECENT CHANGE  10.3
(5305)                     INTER-LATA CARRIER

*1. CARRIER ID   228            FEATURE GROUP B ONLY
*2. FEAT GRP     D            12. FGB CDI       ____
#3. ACCESS TYPE  _____        13. FGB RTI       ____
 4. LONG REC     _            14. TRANS CARRIER ___
 5. MEASUREMENT  _
 6. DIG ROUTING  _
 7. LEC SERVICE  _
 9. CARRIER NAME _______
```

10. SEND ANI II _
11. REMARKS ________________

Figure 5.2.7-10 Sample RC View 10.3, INTERLATA CARRIER - Callback

16. On the same RC View **10.3**, go to the next screen (Figure 5.2.7-11) and verify that **DOMES CDI** attribute field contains the correct domestic code index number (Example: **425**).

```
                              5ESS SWITCH
SCREEN 2 OF 2                RECENT CHANGE  10.3
(5305)                       INTER-LATA CARRIER

FEATURE GROUP D ONLY  FEATURE GROUP D ONLY FEATURE GROUP D ONLY
15.CARRIER TYPE   ______ 26.ASP TRIG NBR___  37.INTL OP CDI_
16.INTRA LATA     _     27.DOMES CDI   425  38.INTL OP RTI_
17.CI CUT         _     28.DOMES RTI   ___  39.NS CDI     ___
18.OVERLAP        _     29.INTL CDI    ___  40.NS RTI     ___
19.SAC OVERLAP    _     30.INTL RTI    ___  41.ASP CDI    ___
20.CAC SCRNING    _     31.ZMINUS CDI  ___  42.ASP RTI    ___
21.SCD SCRNING    _     32.ZMINUS RTI  ___  43.ASP TF CDI ___
22.SENT PAID OVLAP_     33.CI CUT CDI  ___  44.ASP TF RTI ___
23.AC ICLATA OVR  _     34.CI CUT RTI  ___  45.OFC OBL INH_
24.ZPLUS OPT      _     35.ZPLUS CDI   ___  46.OFC ONA INH_
25.ZMINUS OPT     _     36.ZPLUS RTI   ___
```

Figure 5.2.7-11 Sample RC View 10.3, INTERLATA CARRIER - Callback

17. Access RC View **10.10**, **SCREENING (CHARGING)** (Figure 5.2.7-12), and do the following:

    (1) Type and enter SCR number, from Step 10, in **SCR** attribute field.

    (2) Type and enter DOMES CDI number, from Step 15, in **CDI** attribute field.

    (3) Observe the following note:

    NOTE: The entries in the sample view for attributes **PFX**, **RTI** and **CBLK** are the ***only*** valid combinations.

    (4) Verify that **PFX**, **RTI** and **CBLK** attribute fields are correctly populated, per office records.

```
                              5ESS SWITCH
                           RECENT CHANGE  10.10
(5301)                     SCREENING ( CHARGING )

*1. SCR 2025
*2. CDI 425

 3. SCREENING DATA (SCRNDATA)
ROW PFX  NPA OFFCOD RTI  CHGI TDV CST  IECR CBLK CONF
 1  NONE ___ ___   REGL ____ ___ ____  _    N   _____
 2  0+   ___ ___   REGL ____ ___ ____  _    Y   _____
 3  1+   ___ ___   REGL ____ ___ ____  _    Y   _____
20. RMK CALLBACK
```

Figure 5.2.7-12 Sample RC View 10.10, SCREENING (CHARGING) - Callback

18. At RC/V VDT or equivalent, access RC View **5.5**, **TRUNK MEMBER** (Figure 5.2.7-13), and do the following:

    (1) Type and enter TGN number, from Step 3, in **TGN** attribute field (Example: **201**).

    (2) Observe the following caution:

    CAUTION: The CALLBACK phone LTP TG members must always begin with **0**.

    (3) Type and enter CALLBACK phone LTP TG member number in **MEMB NBR** attribute field.

    (4) Verify that the correct LTP TG member equipment number (Example: **P 00048012**) is entered in one of these attribute fields, **OE**.

    NOTE: Six CALLBACK phone LTP TG members (0 through 5) are recommended.

    Repeat (1) through (4) until all CALLBACK phone LTP TG members have been verified.

```
                          5ESS SWITCH
SCREEN 1 OF 6                  RECENT CHANGE  5.5
(5204)                        TRUNK MEMBER

 *1. TGN          201         23. HOLD BUSY    _
 *2. MEMB NBR       0         24. SATELLITE    _
(*)9. QTY           1         25. TRF SAMPLE   _
 #12. OE          P 00048012  26. CAMOPTLK TEN _______
 15. CLCI TRK ID   ____       27. CAMOPTLK DEN ________
 16. TRANS CLASS    __        28. CAMOPTLK NEN __________
 17. SUPV          ___        29. ACTN         _
 18. IDLE STATE    ___        30. OTODPN1      _________
 19. IN START DIAL ________   31. OTODPN2      _________
 20. OUT START DIAL ____      32. SLC OTODPN3  _________
 21. STOPGO         _         33. SLC OTODPN4  _________
 22. CGA SPN       _________  34. MAXCALLS     __
```

Figure 5.2.7-13 Sample RC View 5.5, TRUNK MEMBER - Callback

19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.2.8: VERIFY PGTC/XTC ODD

PROCEDURE

1. For the **Pair Gain Test Controller/XTC Directly Connected to MMSU** case, perform Steps 2 through 5 at a recent change and verify (RC/V) video display terminal or equivalent. For the **DCTU In-line Pair Gain Test Controller/XTC** case, perform Steps 7 through 11. If you have 5E14 feature 99-5E-4720 allowing flexible assignment of DCTU/PMU ports to the MMSU then perform Steps 13 through 16 **(Verify In-line Pair Gain Test Controllert/XTC with Feature 4720).**

2. **Verify Pair Gain Test Controller/XTC directly connected to MMSU**

   NOTE: The RC View **14.7**, **PAIR GAIN TEST CONTROLLER** (Figure 5.2.8-1) is applicable to either the PGTC or XTC.

   NOTE: The PGTC/XTC frame number is 1 for the host switch. For a remoted wire center such as an RSM, ORM, or TRM, the PGTC/XTC frame number is the number of the RSM, ORM, or TRM. For an MMRSM cluster, the PGTC/XTC frame number is the lowest RSM number in the cluster.

   Using RC View **14.7**, **PAIR GAIN TEST CONTROLLER** (Figure 5.2.8-1), enter the correct PGTC/XTC frame number in the **PGTC FRAME** attribute field.

```
                      5ESS SWITCH
                    RECENT CHANGE  14.7
(5503)              PAIR GAIN TEST CONTROLLER

*1. PGTC FRAME  1
*2. PGTC NUMBER 125
#3. MTB IN      002001510
#4. DIST LOW    002001715
```

Figure 5.2.8-1 Sample RC View 14.7, PAIR GAIN TEST CONTROLLER

3. ***NOTE:*** The PGTC/XTC trunk number is numbered from 1 to 256. One is required per service group, per MMSU shelf where the DCTU terminates. It is suggested that wherever a DCTU resides, a minimum of one pair test controller should be assigned.

   On View **14.7**, enter the correct PGTC/XTC trunk number in the **PGTC NUMBER** attribute field.

4. ***NOTE:*** The metallic test buses (MTBs) for the PGTC is assigned in sequential pairs. The **MTB IN** is the lower number of the MTB in the pair. The next MTB number of the MTB pair is the MTB OUT of the PGTC/XTC. The highest number for **MTB IN** is **13**.

   On View **14.7**, verify that the correct **MTB IN** number has been entered.

5. ***NOTE:*** The PGTC/XTC distributor points are assigned in sequential pairs. The PGTC/XTC LOW distribute point number (**DIST LOW**) is the ***high*** value resistor for the PGTC/XTC sleeve assignment. The next distribute point is for the PGTC/XTC ***low*** value resistor sleeve assignment.

   On View **14.7**, verify that the correct **DIST LOW** number has been entered.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. **Verify DCTU In-line Pair Gain Test Controller/XTC**

   On RC View **20.9**(Figure 5.2.8-2), Directly Connected Test Unit, verify that that the correct MTB A0 through D0 have appropriate MTB assignments. Verify LO DPD distribution points A-D where appropriate.

8. ***NOTE:*** The PGTC/XTC distribute points are assigned in sequential pairs. The PGTC/XTC LOW distribute point number (LO DPN A) is the high value resistor for the PGTC/XTC sleeve assignment. The next distribute point is for the PGTC/XTC low value resistor sleeve assignment.

   On RC View **20.9** (Figure 5.2.8-2), verify that the correct LO DPN A number has been entered.

9. Repeat Step 7 for MTB B, MTB C and MTB D. None of the MTB attributes should contain the same MTB number.

10. Repeat Step 8 for LO DPN B, LO DPN C, and LO DPN D. None of the distribute point attributes should be the same. If any one of LO DPN A, LO DPN B, LO DPN C, or LO DPN D contains distribute point number, they all must have distribute point numbers assigned.

11. RC View **14.7** should not contain any data at all for this directly connected PGTC/XTC. Verify that this is the case.

```
                        5ESS SWITCH
SCREEN 1 OF 2                  RECENT CHANGE  20.9
(5752)           DIRECTLY CONNECTED TEST UNIT (SM MODULE PACKS)

*1. SM       192;     #6. PORT A   0          #12. PORT B   1
*2. PMU      0;       #7. MTB A0   192000013   #13. MTB B0   192010013
 3. EQSTAT   O            MTB A1   _________       MTB B1   _________
 4. DCTU     0            MTB A2   _________       MTB B2   _________
 5. CLI      0            MTB A3   _________       MTB B3   _________
                  11. LO DPN A 192001700     17. LO DPN B 192001702


                        5ESS SWITCH
SCREEN 2 OF 2                  RECENT CHANGE  20.9
(5752)           DIRECTLY CONNECTED TEST UNIT (SM MODULE PACKS)

#18. PORT C   2           #24. PORT D   3
#19. MTB C0   192000014    #25. MTB D0   192010014
    MTB C1   _________       MTB D1   _________
    MTB C2   _________       MTB D2   _________
    MTB C3   _________       MTB D3   _________
 23. LO DPN C 192001704      29. LO DPN D 192001706
```

Figure 5.2.8-2 Sample RC View 20.9 (5E14), DIRECTLY CONNECTED TEST UNIT

12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

13. **Verify In-line Pair Gain Test Controller/XTC (with Feature 4720)**

NOTE: The PGTC/XTC distribute points are assigned in sequential pairs. The PGTC/XTC LOW distribute point number (LO DPN A) is the high value resistor for the PGTC/XTC sleeve assignment. The next distribute point is for the PGTC/XTC low value resistor sleeve assignment.

On RC View **20.9** (Figure 5.2.8-3), verify that the correct LO DPN A number has been entered.

```
                        5ESS SWITCH
SCREEN 1 OF 2                  RECENT CHANGE  20.9
(5752)          DIRECTLY CONNECTED TEST UNIT (SM MODULE PACKS)

*1. SM      192;    #6. PORT A   0        #12. PORT B   1
*2. PMU      0;     #7. MTB A0   192000013   #13. MTB B0   192010013
 3. EQSTAT   O          MTB A1   192000813       MTB B1   192010813
 4. DCTU     0          MTB A2   192001613       MTB B2   192011613
 5. CLI      0          MTB A3   192002413       MTB B3   192012413
                11. LO DPN A 192001700    17. LO DPN B 192001702


                        5ESS SWITCH
SCREEN 2 OF 2                  RECENT CHANGE  20.9
(5752)          DIRECTLY CONNECTED TEST UNIT (SM MODULE PACKS)

#18. PORT C   2          #24. PORT D   3
#19. MTB C0   192000014    #25. MTB D0   192010014
    MTB C1   192000814        MTB D1   192010814
    MTB C2   192001614        MTB D2   192011614
    MTB C3   192002414        MTB D3   192012414
 23. LO DPN C 192001704     29. LO DPN D 192001706
```

Figure 5.2.8-3 Sample RC View 20.9 (5E14), DCTU/Pair Gain Test Controller/MMSU In-line Capability

14. Verify that the MTB is appropriately assigned to all metallic shelves (A1-3, B1-3, C1-3,D1-3). For example, board X MTB equals same as reported on A0 through D0.

15. Verify LO DPN distribution points A-D where appropriate.

16. RC View **14.7** should not contain any data at all for this directly connected PGTC/XTC. Verify that this is the case.

17. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.2.9: VERIFY DFTAC ODD

PROCEDURE

1. At recent change and verify (RC/V) video display terminal (VDT) or equivalent, perform Steps 2 through 6.

2. Using RC View **1.6**, **COMPOSITE LINE (LINE ASSIGNMENT)** (Figure 5.2.9-1), verify that one denied origination line per distributing frame test access circuit (DFTAC) has been correctly assigned.

```
                      5ESS SWITCH
SCREEN 1 OF 4              RECENT CHANGE  1.6
(5109,5111,5111A)       COMPOSITE LINE (LINE ASSIGNMENT)

(*)1.TN   2204010          18.MFRI      N        30.BRCS   _
(*)2.OE   P 00100000        19.BTN (NOT=TN__________ 31.BAUTO  _
(*)5.PTY  I                MULTIDN    _        32.SHARED _
(*)6.MLHG ____               DEPENDN    _        33.SAUTO  _
(*)7.MEMB ____              22.RAX       __       34.FLS    _
                  23.LCC       ___      35.SUSO   Y
  9.CHNG TN   __________     LATA       ___      36.SUST   _
 10.CHNG OE   _ ___________ 25.COIN      ___      37.ICP    _
 13.CHNG PTY  _          26.GST       _        38.RTI    ____
 14. CHNG MLHG____         27.EL        _           HRI    ____
 15. CHNG MEMB____         28.SERHLN    __________ 40.BCK LNK_
 16. NEW TN   __________    29.TTC       _         41.NODL   ___
```

Figure 5.2.9-1 Sample RC View 1.6, COMPOSITE LINE (LINE ASSIGNMENT)

3. ***NOTE:*** One logical test port (LTP) trunk group is required for each wire center location. For example, if the host switch is equipped with two RSMs, three LTP trunk groups would be required, one for the host and one for each of the two RSMs.

   Using RC View **5.1**, **TRUNK GROUP** (Figure 5.2.9-2), verify that the correct DFTAC LTP trunk group is assigned for each wire center.

```
                      5ESS SWITCH
SCREEN 1 OF 11              RECENT CHANGE  5.1
(5200,5202,5213)            TRUNK GROUP

(*)1.TGN      23          13.CARRIER ID 288   25.FREE ANS_
(*)2.TRUNK CHAR _______________ 14.FEAT GRP   _     26.PBX ID  ____
(*)3.END CLLI   ___________    15.INC TND WNK_     27.PRIVACY _
  4.TRK CHAR   _______________ 16.ATTTN      ___   28.INSEP   ___
  5.FAR CLLI   ___________    17.TERA RCVY  ___   29.MODULE  ___
  6.RMK       IMLT2 MDF DFTAC 18.IAPT       _
 #7.TRK DIR    LTP   _       19.CALLMON INH_      VERIFY ONLY
 #8.HUNT TYPE  FIFO          20.INPLS      ________GRP SIZ   ____
  9.SCR        ____          21.OUTPLS     ________ACT SIZ   ____
 10.GLARE ACTION________       22.FAR END NPA___     SATELLITE _
 11.DAS        __           23.GL ANN TGN ____    TERM SFG_
```

```
 #12.TRK CLASS  LTPDFTAC        24.BRCS       _
```

Figure 5.2.9-2 Sample RC View 5.1, TRUNK GROUP - DFTAC

4. On RC View **5.1** (Figure 5.2.9-3) verify that **BILLING DN** attribute field contains the correct billing DN (Example: **3122200001**).

```
                        5ESS SWITCH
SCREEN 10 OF 11                RECENT CHANGE  5.1
(5200,5202,5213)               TRUNK GROUP

      MISCELLANEOUS             MISCELLANEOUS     MISCELLANEOUS
199.DATARATE     ____          210.SDN STAT GRP_  221.EON MC RI
____
200.WB RATE      _________      211.SPA SUPV    _
201.WB TSA TYPE  _____          212.ANI6        _
202.INTER SM TRK _            213.ANI7        _
203.DIR CON DN   _______________ 214.TOPAS TPNUM __
204.FACILITY TYPE___           215.ASI PROXY   _
205.FACILITY NBR _____          216.FGD CIC SZ  ____
206.RTE NBR PLAN ____           217.SPEECH TRMTS_
207.BILLING DN   3122200001     218.MLT ISLC OPT_
208.ACP SDN      _            219.MAI         _
209.SPA BILL DN  __________     220.API CODE    ____
```

Figure 5.2.9-3 Sample RC View 5.1, TRUNK GROUP - Miscellaneous

5. ***NOTE:*** The members in each DFTAC LTP trunk group must start at **0**.

Using RC View **5.5**, **TRUNK MEMBER** (Figure 5.2.9-4), verify that the correct LTP trunk group member is assigned for each DFTAC.

```
                          5ESS SWITCH
SCREEN 1 OF 6                   RECENT CHANGE  5.5
(5204)                        TRUNK MEMBER

 *1. TGN          0023        23. HOLD BUSY    _
 *2. MEMB NBR       0000        24. SATELLITE    _
(*)9. QTY          1          25. TRF SAMPLE   _
 #12. OE          P 001020     26. CAMOPTLK TEN _______
 15. CLCI TRK ID     ____        27. CAMOPTLK DEN ________
 16. TRANS CLASS     __          28. CAMOPTLK NEN __________
 17. SUPV          ___          29. ACTN         _
 18. IDLE STATE      ___         30. OTODPN1      _________
 19. IN START DIAL  ________      31. OTODPN2      _________
 20. OUT START DIAL ____         32. SLC OTODPN3  _________
 21. STOPGO        _           33. SLC OTODPN4  _________
 22. CGA SPN        _________     34. MAXCALLS     __
```

Figure 5.2.9-4 Sample RC View 5.5, TRUNK MEMBER - DFTAC

6. Using RC View **20.7, METALLIC SERVICE UNIT (SM MODULE PACKS)** (Figure 5.2.9-5), verify that the correct MSU assignment has been made for each DFTAC circuit.

```
                         5ESS SWITCH
```

```
                        RECENT CHANGE  20.7
(57502)              METALLIC SERVICE UNIT (SM MODULE PACKS)

*1. SM         001
*2. MSU         0
*3. SG         0
*4. POSITION   10
#5. TYPE       DFTAC
 6. EQSTAT     0
 7. CLI        0
```

Figure 5.2.9-5 Sample RC View 20.7, METALLIC SERVICE UNIT (SM MODULE PACKS) - DFTAC

7. **CAUTION:** The TTC FRAME number on RC View 14.6 (Figure 5.2.9-6 must be the same as the DFTAC LTP trunk group number (View 5.1). The TTC NUMBER on View 14.6 must be the same number as the DFTAC LTP group member number (View 5.5).

   Using RC View **14.6, MDF TEST ASSIGNMENTS** verify that one MDF test assignment has been correctly populated for each equipped DFTAC.

```
                          5ESS SWITCH
                         RECENT CHANGE  14.6
(5502)                   MDF TEST ASSIGNMENTS

 *1. TTC FRAME       023
 *2. TTC NUMBER      000
 #3. DEDICATED LEN   P 00100000
 #6. DFTAC LTP       001020
 #7. DFTAC SM        001
 #8. DFTAC MSU       0
 #9. DFTAC SG        0
#10. DFTAC POSITION  3
```

Figure 5.2.9-6 Sample RC View 14.6, MDF TEST ASSIGNMENTS - DFTAC

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.2.10: VERIFY IOP ODD

PROCEDURE

1. Is RC/V or MCC video display terminal (VDT) to be used?

   If **RC/V**, continue with step 3.

   If **MCC**, go to step 5.

2. At RC/V VDT, enter message:
   RCV:MENU,RCVECD;

   Response: **RCV ECD Parameter Info** (rcvparams) form displayed with the cursor at the **database name** attribute field.

3. Now go to Step 5.

4. At MCC VDT in command mode, enter command **199**

   Response: **RCV ECD Parameter Info** (rcvparams) form is displayed with cursor at the **database name** attribute field.

5. At selected VDT, do Steps 6 through 15.

6. Enter **INCORE**

   Response: Cursor moved to **review only** field.

7. Enter **Y**

   Response: Cursor moved to **journaling** field.

8. Type and enter *

   Response: **RCV INITIALIZATION IN PROGRESS** message displayed.

   UNIX RTR RCV (ODIN) - Data Entry form is displayed.

   Cursor at **Enter Form Name:** prompt.

9. Enter **UCB**

   Response: The **Information About Each Physical Device (review only)** (ucb) form appears.

10. Move cursor to **k_unit_name:** field and enter **SDL**

    Response: The **k_unit_name:** field value is now **SDL**.

    Cursor moves to **k_unit_number**: field.

11. ***NOTE:*** The IOP synchronous data link (SDL) supporting IMLT and/or MLT/ISDN is SDL2.

Enter **2**

Response: The **k_unit_number:** field value is **2**.

The remaining applicable fields are populated.

12. Access screen two of the ucb form.
13. Verify that **major_status:** field is populated with **ACT** (active).
14. To exit the ECD form, enter **<**.
15. To exit the RC/V session, enter **<** again.
16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.2.11: VERIFY ISTF ODD

PROCEDURE

1. ***NOTE:*** Since only the ISTF transmit (XMIT) function is used by MLT, ODD associated with the ISTF loopback function is not covered here.

2. From office records record the number of (each) SM equipped with ISTF(s) and their ISTF number(s).

3. At RC/V VDT, perform Steps 4 through 14.

4. Access RC View **19.11, INTEGRATED SERVICES TEST FUNCTION** (Figure 5.2.11-1).

5. Enter number of SM containing ISTF(s) (Example: **8**).

   Response: **SM** field filled with entered SM number.
   Cursor moved to **ISTF** field.

6. Enter number of an ISTF (**0** to **3**) that is in the selected SM (Example: **0**).

   Response: **ISTF** field filled with entered ISTF number.
   Remaining attribute fields are filled.

```
                              5ESS SWITCH
                            RECENT CHANGE  19.11
(5823)                INTEGRATED SERVICES TEST FUNCTION

 *1. SM          8          #13. LOOPBACK  __
 *2. ISTF        0          #14. XMIT      3
  3. EQSTAT      O
  4. CLI         0
 #5. CI          0
 #6. PICB        20
 #7. DI          1
 #8. PIDB        0
    UNIT OFFSET  4
#10. EQLBAY      _
#11. EQLUNVER    __
#12. EQLAISLE    ____
```

Figure 5.2.11-1 Sample RC View 19.11, INTEGRATED SERVICES TEST FUNCTION

7. Verify that **EQSTAT** (equipment state) field equals **O** (operational).

8. Verify that **CLI** field equals correct change level indicator number (hexadecimal **0**to **7FFFFFFF**) per office records (Example: **0**)

9. Verify that **CI** field equals correct control interface number (**0** or **1**) per office records (Example: **0**)

10. ***NOTE:*** If **CI** field equals **0**, then **PICB** (peripheral interface control bus) field must not equal **00** or **01**.

    Verify that **PICB** field equals correct PICB number (**0** to **22**) per office records (Example: **20**).

11. Verify that **DI** field contains correct data interface number (**0** or **1**) per office records (Example: **1**).

12. ***NOTE:*** If **DI** field equals **1**, then **PIDB** (peripheral interface data bus) field must not equal **15**.

    Verify that **PIDB** field equals correct PIDB number (**0** to **15**) per office records (Example: **0**).

13. ***NOTE:*** The **UNIT OFFSET** number is determined by the the **ISTF** field as follows:

    - If **ISTF** equals **0**, then **UNIT OFFSET** equals **4**.
    - If **ISTF** equals **1**, then **UNIT OFFSET** equals **13**.
    - If **ISTF** equals **2**, then **UNIT OFFSET** equals **8**.
    - If **ISTF** equals **3**, then **UNIT OFFSET** equals **17**.

    Verify that **UNIT OFFSET** field contains correct number per office records (Example: **4**).

14. Verify that remaining attribute fields are correct per office records.

15. Does another ISTF remain to be verified in the selected SM or does ISTF(s) remain to be tested in another SM?

    If **YES**, go to step 3.

    If **NO**, continue with step 16.

16. At MCC VDT, perform Steps 17 through 26.

17. Access RC View **10.1, FIXED ROUTE (ROUTING)** and enter **ISTFXMIT** in **TRMT** field (ISTF transmit) (Figure 5.2.11-2).

```
                      5ESS SWITCH
                    RECENT CHANGE  10.1
(53011)               FIXED ROUTE (ROUTING)

*1. TRMT       ISTFXMIT
 2. TONE       _
 3. TONE TYPE   _______
 4. RTI        542
 5. CHGI       ____
 6. PLAY ANNC   _
```

Figure 5.2.11-2 Sample RC View 10.1, FIXED ROUTE (ROUTING) - ISTF Transmit Function

18. Record the route index number in the **RTI** field.

19. Access RC View **10.2, ROUTE INDEX (ROUTING)** and enter the RTI number recorded in Step 17 (Figure 5.2.11-3).

```
                      5ESS SWITCH
                    RECENT CHANGE  10.2
(5303)                ROUTE INDEX (ROUTING)
```

```
*1.RTI       542          13.ANI II DIGITS__ 23.SPEECH ALT RI ____
#2.ETYP      HUNT          14.LTDRI       _
 3.TGN       954          15.CSTLRI      _   DATARATE ALT RI
 4.DIG DLTD  __            16.LEC OS      _  24.56K       ____
 5.PREF DIG  __________                     25.R64K       ____
 6.NEXT RTI  ____          CCS7 EQUAL ACCESS  26.64K      ____
 7.SIG PRO   TRAD          17.CKT CODE  __   27.384K      ____
 8 FGD CIC 4 _            18.CPN SUBSC _    28.1536K     ____
 9.ANI IND   _            19.CSI SUBSC _    29.MULTIRATE ____
10.OVLAP IND _             20.ATP SUBSC _
11.RT DES TYP________       21.UUI SUBSC _     PACKET SWITCHING
12.RMK       ISTF TRANSMIT  22.CICP SUBSC_     30.PSN ___
```

Figure 5.2.11-3 Sample RC View 10.2, ROUTE INDEX (ROUTING) - ISTF Transmit Function

20. Record the TGN number in the **TGN** field.

21. Verify that the **SIG PRO** = **TRAD**.

22. Access RC View **5.1, TRUNK GROUP** and enter recorded TGN number in **(*)TGN** field. (Figure 5.2.11-4).

```
                          5ESS SWITCH
SCREEN 1 OF 11                 RECENT CHANGE  5.1
(5200,5202,5213)               TRUNK GROUP

(*)1.TGN        954          13.CARRIER ID ____ 25.FREE ANS_
(*)2.TRUNK CHAR _______________14.FEAT GRP   _    26.PBX ID  ____
(*)3.FEND CLLI  ___________    15.INC TND WNK_    27.PRIVACY_
   4.TRK CHAR   _______________16.ATTTN       ___  28.INSEP  ___
   5.FAR CLLI   ___________    17.TERA RCVY   ___ 29.MODULE __
   6.RMK        ISTF XMTR      18.IAPT         _
  #7.TRK DIR    LTP          19.CALLMON INH_      VERIFY ONLY
  #8.HUNT TYPE  FIFO          20.INPLS        ________GRP SIZ  ____
   9.SCR        ____          21.OUTPLS       ________ACT SIZ  ____
  10.GLARE ACTION________       22.FAR END NPA__     SATELLITE _
  11.DAS        __           23.GL ANN TGN ___     TERM SFG_
 #12.TRK CLASS  LTPISTFX      24.BRCS_
```

Figure 5.2.11-4 Sample RC View 5.1, TRUNK GROUP - ISTF Transmit

23. Verify that:

    - ☐ **TRK DIR** = **LTP**
    - ☐ **HUNT TYPE** = **FIFO**
    - ☐ **TRK CLASS** = **LTPISTFX**
    - ☐ **RMK** = **ISTF XMTR** or equivalent
    - ☐ **INPLS** = **NOSIGNAL**
    - ☐ **OUTPLS** = **NOSIGNAL**

24. Access RC View **5.1** (Figure 5.2.11-5) and verify that:

- VPA TYPE = NOVPA
- CCS7 TYPE = RBOC

```
                         5ESS SWITCH
SCREEN 3 OF 11               RECENT CHANGE  5.1
(5200,5202,5213)             TRUNK GROUP

  LEASED NETWORK             CCS              LATA/CAMA
65.LN TYPE _____     74.DEST PT CODE_________  82.ORIG LATA__
66.LN VIRT _        75.ORIG PT CODE_________  83.NCD SCRN ________
67.LN GROUP________  76.CONTROL TYPE______
68.LN CRIT Q_       77.CCS7 TYPE   RBOC        CCS7 EA
                78.CFN RSTRCT  _        84.CPN RSTRCT   _
        CCS      79.RCD 3PT1 ITC_______    85.CHG RSTRCT   _
69.TRK QUERY _      80.ISUP MLD    _       86.ATP IC RSTRCT_
70.TRANS TEST_      81.MAX HOP CNT __      87.UUI IC RSTRCT_
71.VPA RATE  ___                       88.NI ANNC      _
72.VPA TYPE  NOVPA                        89.NI IW REL    _
73.NEAR CLLI ___________
```

Figure 5.2.11-5 Sample RC View 5.1, TRUNK GROUP - ISTF Transmit Function

25. Access RC View **5.5**, **TRUNK MEMBER** and enter recorded TGN in the **TGN** field and **0** in the **MEMB NBR** field (Figure 5.2.11-6).

```
                              5ESS SWITCH
SCREEN 1 OF 6                         RECENT CHANGE  5.5
(5204)                           TRUNK MEMBER

  *1. TGN           954           23. HOLD BUSY    _
  *2. MEMB NBR       0             24. SATELLITE    _
(*)9. QTY           3           25. TRF SAMPLE   _
 #12. OE            P 00007002    26. CAMOPTLK TEN _______
  15. CLCI TRK ID    ____         27. CAMOPTLK DEN ________
  16. TRANS CLASS    __           28. CAMOPTLK NEN __________
  17. SUPV          ___          29. ACTN        _
  18. IDLE STATE     ___          30. OTODPN1      _________
  19. IN START DIAL  ________      31. OTODPN2      _________
  20. OUT START DIAL ____        32. SLC OTODPN3  _________
  21. STOPGO        _           33. SLC OTODPN4 _________
  22. CGA SPN       _________     34. MAXCALLS     __
```

Figure 5.2.11-6 Sample RC View 5.5, TRUNK MEMBER - ISTF Transmit Function

26. Verify that:
    - **QTY** = **3**
    - **OE** = the logical port in the form **P** XXXXXXXX (in example: **P 00007002**).

27. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.3: VERIFY MLT DATA BASE ELEMENTSPROCEDURE 5.3 - VERIFY MLT DATA BASE ELEMENTS

OVERVIEW

This procedure does not attempt to verify the large complex data base resident in the MLT front end (FE). It concentrates on specific data elements that are essential to MLT testing of subscriber loops of the switch.

PROCEDURE

1. Verify the LTS Data Base file for IMLT.

   Reference Procedure 5.3.1

2. Verify the MLTACC (MLT Access) Table data file.

   Reference: Procedure 5.3.2

3. Verify the WC2FTN (Wire Center to Frame Telephone Number) Table data file.

   Reference: Procedure 5.3.3 Procedure 5.3.3 [5.3.3]

4. Verify the CP2TG (Cable Pair to Trunk Group) Table data file.

   Reference: Procedure 5.3.4 Procedure 5.3.4 [5.3.4]

5. Will the acceptance test include digital loopback tests of integrated services digital network (ISDN) digital subscriber lines/loops (DSLs) (MLT/ISDN Feature Package 2/3)?
   If **YES**, then continue with Step 6.
   If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

6. Verify table data files essential to MLT/ISDN digital testing.

   Reference: Procedure 5.3.5

7.

Procedure 5.3.1: VERIFY LTS DATA BASE FILE FOR IMLT

OVERVIEW

The LTSxxx.d data base file reflects the equipment configuration and stores relevant information required to process MLT transactions. The ``xxx'' of the LTSxxx.d data base file is the data communication network (DCN) port number for the host switch or one of its remoted switching modules or the DCN port number for that LTS. This data base reflects the equipment configuration and stores relevant information required to process MLT transactions. This source file is built from applicable entries in the appropriate data elements form. The program ``ltsdb'' compiles the source file to generate the object file, LTSxxx. Since the LTSxxx file for the LTS configuration is a long established data file, the procedures for creating and maintaining it should be common knowledge to responsible MLT personnel.

This procedure concentrates on the LTSxxx.d data file for the IMLT configuration. The LTSxxx.d data file entries are verified by comparing them with the corresponding entries in the appropriate data elements form. An example of the LTSxxx.d data base file for the IMLT is illustrated in Figure 5.3.1-1 . A detailed description of LTSxxx can be found in the MLT TEXT MANAGER file **sad2.ltsdb**, LTS Data Base.

PROCEDURE

1. Obtain the appropriate **5ESS/DCTU DATA ELEMENTS FORM** and the EXKs for this IMLT configuration.

2. At a regular *UNIX*® system terminal attached to the front end (FE), access the LTSxxx.d source file.

3. ***NOTE:*** Steps 4 through 9 verify the data under each **ENTRY = ESS5_AM** heading in the source file. This data defines the dedicated telephone number (TN) used to identify an exchange key (EXK) served by the host switch or by one of its remoted modules.

   Do Steps 4 through 9 for each **ENTRY = ESS5_AM** heading in the source file applicable to this switching system.

4. **CAUTION:** Each TN used to identify an EXK must be 10 digits and it has to be a TN that is defined in the *5ESS*®-2000 Switch data base for the host or remoted module. In recent change (RC) View 1.6 for this TN, the RMK (remarks) field should contain DED TN DCTU.

   NOTE 1: The **DEDTN** entry in the data elements form is the TN used to identify the EXK. The location of the **EXK** entry in the data elements form determines the row where the **DEDTN** and the other entries are located.

   NOTE 2: The tip and ring of the DED TN should be terminated with a maintenance termination unit (MTU) (1A or 6A) at the MDF. The TN should also be given a denied originating class of service.

   Using the **EXK**, locate the **DEDTN** entry in the data elements form.

5. Verify that the **ded_tn** entry in the source file and **DEDTN** are the same.

6. ***NOTE:*** The **delcap**, **trk_res**, and **trk_len** entries in the source file are defined in Procedure 5.4 and are not discussed here.

   Verify that the **DELTA** entry in the data elements form is the same as the **delcap** entry in the source file.

7. Verify that the **TRK RES** entry in the data elements form is the same as the **trk_res** entry in the

source file.

8. Verify that the **TRK LEN** entry in the data elements form is the same as the **trk_len** entry in the source file.

9. ***NOTE:*** Steps 10 through 14 verify the data under each **ENTRY = E5MDF_GRP** heading in the source file. This data defines a main distributing frame (MDF) LTP trunk group associated with the *5ESS*®-2000 Switch. One MDF LTP trunk group is required for each wire center.

   Do Steps 10 through 14 for each **ENTRY = E5MDF_GRP** heading in the source file.

10. Using the **m2wc** entry in the data file on the **TRUNKS MDF** page of the data elements form, locate the same number in the **WC** column to identify the row(s) to be checked.

11. **CAUTION:** Each MDF LTP trunk group must be defined in the *5ESS*®-2000 Switch data base (see Figure 5.2.7-3).

    Verify that the **groupid** entry in the data file agree with the **MDF TRUNK GROUP NOS. (MTG)** entry in the data elements form.

12. Verify that the members entry in the data base agrees with the **MDF TRKS IN GROUP (AMOUNT)** entry in the data elements form.

13. **CAUTION:** The **e5tid** entry is an ID assigned for use by the switch. This must be assigned sequentially starting at zero and must be singularly defined within the MDF trunk group.

    Verify that the **e5tid** entry agrees with the switch's input source documentation.

14. **CAUTION:** The **mdftid** entry is a physically tagged ID assigned by the OTC and is stenciled on the MDF. It must be singularly defined within a wire center.

    Verify that the **mdftid** entry agrees with the switch's input source documentation.

```
ESS5
ENTRY = ESS5_AM
     ded_tn = 3122210000
     delcap = 650
     trk_res = 26
     trk_len = 120
ENTRY = E5MDF_GRP
     groupid = 123
     members = 6
          e5tid = 0
               mdftid = 10
          e5tid = 1
               mdftid = 11
          e5tid = 2
               mdftid = 12
          e5tid = 3
               mdftid = 13
          e5tid = 4
               mdftid = 14
          e5tid = 5
               mdftid = 15
```

```
ENTRY = E5MDF_GRP
        groupid = 230
        members = 5
                e5tid = 2
                        mdftid = 20
                e5tid = 5
                        mdftid = 21
                e5tid = 9
                        mdftid = 22
                e5tid = 19
                        mdftid = 23
                e5tid = 29
                        mdftid = 24
```

Figure 5.3.1-1 Example of LTS Data Base for IMLT

15. **STOP. YOU HAVE COMPLETED THIS PROCEDURE**

Procedure 5.3.2: VERIFY MLT ACCESS TABLE DATA FILE

OVERVIEW

The MLTACC (MLT Access) table contains data required for all MLT and MLT/ISDN transactions. The table entries are based on EXK (exchange key) and NNX and contain information relative to the test system available to that EXK/NNX. The MLTACC table can be accessed by the TIP (test interface process), the system administration and maintenance (SAM) process, and the diagnostics process.

The MLTACC table is generated by the in-core table procedures available on the front-end machine. First, a source file called ``mltacc.scr'' is created using applicable entries from the **5ESS/DCTU DATA ELEMENTS FORM** for IMLT or the **LTS DATA ELEMENTS FORM** for LTS and placed in the official source directory for in-core tables. Next, the source file is compiled by executing **ITBCOMPILE mltacc.src**. This procedure compiles the source and creates the MLTACC table in the official in-core tables directory.

In this procedure, each applicable MLTACC table entry and the corresponding data elements form entry are checked for agreement.

NOTE: In the Source File Examples for the DCTU and LTS configurations (Figure 5.3.2-1), all null entries must be represented by a dash (-) and all entries must be separated by tabs. All entries that are not applicable to the MLT interface are not covered.

PROCEDURE

1. Obtain the applicable data elements form and the EXK numbers for this MLT interface.

2. At a regular *UNIX*® system terminal attached to the MLT front end (FE), do Steps 4 through 16.

3. Access the ``mltacc.scr'' source file (Figure 5.3.2-1).

4. ***NOTE:*** The EXK is the unique 6-digit number used to identify the switch serving the nnx. The applicable **EXK** row in the data elements form and the corresponding **lrexk** row in the source file are used to verify the elements in the MLTACC table.

   Locate the EXK number in the data elements form's **EXK** column and the source file's corresponding **lrexk** column.

5. ***NOTE:*** The **alphid** entry is the alphanumeric (six alphanumeric characters) identifier for MDF trunk groups. It allows mapping to an exchange key just like an NNX. Each **alphid** entry must be unique in the mltacc table. This feature allows more range and flexibility in identifying MDF trunk groups.

   Verify that the **alphid** entry is correct for this DCTU/LTS interface.

6. ***NOTE:*** Entry **NNX** (data elements form)/**nnx** (source file) is the 3-digit NNX served by the EXK. An NNX may be associated with more than one EXK. Also, EXKs may have one or more NNXs associated with them. A unique entry requires specification of both EXK and NNX.

   Verify that the **NNX** and **nnx** entries are the same.

7. ***NOTE:*** In the source file's **lrexk** row, **m1mid** is an MLT-1 entry.

   In the source file, verify that the **m2dcn** entry [MLT DCN (data communication network)] is the same as the **DCN number** entry on Page 1 of the data elements form.

8. ***NOTE:*** In the source file, **m1line**, **m1ctl**, and **m1ltf** are MLT-1 entries. The **m2lts** source file entry is the ID number of the DCTU or LTS used for testing the exchange key/NNX under MLT-2/3.

   Verify that the **m2lts** entry is the correct ID number for this DCTU/LTS.

9. ***NOTE:*** The **NTG** (data elements form)/**m2ntg** (source file) entry is the ID number associated with a group of no-test trunks (NTTs) used for gaining test access to lines associated with the LTS EXK/NNX. Trunk group IDs must be unique with respect to a single LTS. Although the IMLT configuration does not use NTTs, the **m2ntg/NTG** number is always a **1** for the DCTU.

   Do one of the following:

   (A) If IMLT configuration, verify that the **m2ntg/NTG** entry is a **1**.

   (B) If LTS configuration, in the source file, verify that the **m2ntg** entry is the same as the corresponding **NTG** entry in the data elements form.

10. In the source file, verify that the **m2utg** entry is a dash (-).

11. ***NOTE:*** The **m2sdig** (steering digits) entry for the DCTU is always three digits.

    Verify that the **m2sdig** entry in the source file agrees with the corresponding **STDIG** entry in the data elements form.

12. ***NOTE:*** The **m2styp** entry indicates the switching machine type for the switch associated with the EXK. For the *5ESS*®-2000 Switch, it also indicates the type of MLT interface, as follows:
    If LTS, then **m2styp** = **7**
    If DCTU, then **m2styp** = **8**

    In the source file, verify that the **m2styp** entry is correct for this MLT interface.

13. ***NOTE:*** The **WC** (data elements form)/**m2wc** (source file) entry (three alphanumeric characters) is the unique number used to identify the wire center containing the switching machine associated with the EXK. It is used as a key when accessing the ``wc2ftn'' table data file.

    Verify that the **WC** and **m2wc** entries are the same.

14. ***NOTE:*** The **MTG** (data elements form)/**m2mtg** (source file) entry (**1-16**, **1-255**, or use **?**) identifies the group of MDF trunks used to gain MDF access to lines associated with the EXK/NNX and terminated on a particular MDF in the wire center. For the LTS configuration, a maximum of 16 MDF trunk groups are allowed (1-16). In the IMLT configuration, a maximum of 31 MDF trunk groups are allowed and the valid range is 1-255. If an NNX is terminated on more than one MDF, this field contains a **?** to indicate that additional tables based on cable and pair are required to resolve the ambiguity and determine the proper trunk group. Note that this number ***must*** be the same as the **TGN** in associated recent change View **5.1**.

    Verify that the **MTG** and **m2mtg** entries are the same.

15. ***NOTE:*** The **COIN** (data elements form)/**m2coin** entry (coin service) indicates whether the coin service associated with the switch is one of the following:
    C - coin first
    D - dial tone first

M - mixture of **C** and **D**
P - post pay
N - no coin service.

Verify that the **COIN** and **m2coin** entries are the same.

16. ***NOTE:*** The **4PTY** (data elements file)/**m24pty** entry indicates the type of ringing signal required for 4-party service on the switch. Permissible values are as follows:
F - full service
S - semi-selective
N - no 4-party service.

Verify that the **4PTY** and **m24pty** entries are the same.

17. Verify that the **m1bkup** field contains a dash.

18. ***NOTE:*** The **digport** entry (1-768) directs MLT/ISDN to the correct DCN data port to be used for digital testing. For the IMLT (DCTU) configuration, this is the same IMLT data port used for metallic testing; therefore, the entry in the **digport** field is always equal to the entry in the **m2lts** field. For the LTS configuration, the data port is a new requirement of MLT/ISDN Feature Package 3 and is always different from the **m2lts** entry.

Do one of the following:

(A) If IMLT configuration, verify that the **digport** entry is equal to the **m2lts** entry.

(B) If LTS configuration, verify that the **digport** entry is ***not*** equal to the **m2lts** entry and that it agrees with the data elements form.

SOURCE FILE EXAMPLE - DCTU

```
lrexk   nnx    alphid  m1mid   m2dcn   m1line  m1ctl   m1ltf   m2lts   m2ntg
-----   ---    ------  -----   -----   ------  -----   -----   -----   -----
```

(continuation of line)

```
m2utg   m2sdig  m2styp  m2wc   m2mtg   m2coin  m24pty  m1bkup  digport
-----   ------  ------  ----   -----   ------  ------  ------  -------
201267  267     -       N      1       -       -       -       1       1
-       267     8       333    2       C       F       -       1
```

SOURCE FILE EXAMPLE - LTS

```
lrexk   nnx    alphid  m1mid   m2dcn   m1line  m1ctl   m1ltf   m2lts   m2ntg
-----   ---    -----   -----   ------  -----   -----   -----   ------  -----
```

(continuation of line)

```
m2utg   m2sdig  m2styp  m2wc   m2mtg   m2coin  m24pty  m1bkup  digport
```

```
-----   ------  ------  ----    -----   ------  ------  ------   ------
201387  341     -       N       1       -       -       -        2       2
-       1       7       334     9       M       S       -        768
```

Figure 5.3.2-1 MLT Access Table Source File Examples

19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.3.3: VERIFY WC2FTN TABLE DATA FILE

OVERVIEW

The WC2FTN table is used to find frame information for the TV transaction on a given wire center and frame id. The source file for this table is ``wc2ftn.src''. The keys to this are the **lts**, **wc**, and **mtg** columns.

PROCEDURE

1. ***NOTE:*** The wc2ftn.src data file is verified with the **WC's** page of the **5ESS/DCTU DATA ELEMENTS FORM** or the **LTS DATA ELEMENTS FORM**.

   Obtain the applicable data elements form and the DCTU/LTS number(s) to be verified.

2. Access the wc2ftn.src data file.

3. In the **lts** column of the wc2ftn.src data file, locate the applicable DCTU/LTS number to identify the row in the file to be verified.

4. Verify that the **wc** (wire center identifier) entry in the data file is the same as the **WC** entry in the data elements form.

5. Verify that the **mtg** (MDF trunk group) entry in the data file is the same as the **MTG** entry in the data elements form.

6. Verify that the **name** (name of the wire center) entry in the data file is the same as the **NAME** entry in the data elements form.

7. Verify that the **loc** (location of the MDF frame in the wire center) entry in the data file is the same as the **LOCATION** entry in the data elements form.

8. Verify that the **ftn** (frame telephone number) entry in the data file is the same as the **MDFTN** entry in the data elements form.

9. Verify that the **atn** (assignment telephone number) entry in the data file is the same as the **ASNTN** entry in the data elements form.

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.3.4: VERIFY CP2TG TABLE DATA FILE

OVERVIEW

The CP2TG table is used to find which mtg (MDF trunk group) serves a given cable and pair on an LTS/DCTU. The source data file for this table is ``cp2tg.src''. The key to this table is the **lts** and **wc** columns.

PROCEDURE

1. ***NOTE:*** The **WC's** and **CP2MTG** pages of the **5ESS/DCTU DATA ELEMENTS FORM** or the **LTS DATA ELEMENTS FORM** are used to verify the cp2tg.src data file.

   Obtain the applicable data elements form and the DCTU/LTS number(s) to be verified.

2. Access the cp2tg.src data file.
3. In the data file's **lts** (DCTU/LTS number) column, locate the DCTU/LTS number to identify the row of data entries to be verified.
4. Using the **mtg** entry in the data file, locate the corresponding **MTG** entry in the **WC's** page of the data elements form to identify the row of data entries to be verified.
5. In that row, verify that the **WC** (wire center identifier) is the same as the **wc** entry in the data file.
6. Using the same **mtg** entry, locate the corresponding **MTG** entry on the **CP2MTG** page of the data elements form to identify the row of data entries to be verified on that page.
7. Verify that the **cable** (cable identifier) entry in the data file is the same as the **CABLE** entry on the **CP2MTG** page of the data elements form.
8. Verify that the **pair** (pair number) in the data file is the same as the **PAIR** entry on the **CP2MTG** page of the data elements form.
9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.3.5: VERIFY TABLE DATA FILES ESSENTIAL TO MLT/ISDN DIGITAL TESTING

OVERVIEW

This procedure verifies the following table data files that are essential to the digital testing of *5ESS*® switch ISDN DSLs:

- EXK2NNX (Exchange Key to NNX)
- EXKCONV (Exchange Key Conversion)
- OE2EXK (Originating Equipment Number to Exchange Key).

The EXK2NNX table is used to map an exchange key to an NNX for requests that come to MLT/ISDN with an originating equipment number (OE), but without a primary directory number (PDN). The table is used to find an NNX on the switch identified by the exchange key (EXK). When the NNX is identified, the MLTACC (Procedure 5.3.2) and CP2TG (Procedure 5.3.4) tables are accessed to provide information about the hardware and resources available for the specific OE being tested. Note that the CP2TG table must be kept updated to ensure that in cases of multiple NNXs for one EXK, EXK2NNX returns the correct one. The EXK2NNX source file is ``exk2nnx.src''.

Tables EXKCONV (``exkconv.src'') and OE2EXK (``oe2exk.src'') work in conjunction to determine the EXK of a switching module (SM) for a specific OE. This information is necessary when the MLT/ISDN tests a line on a switch with remote SMs (RSMs). In such instances, the EXK used to access the host switch for digital testing may not be the correct exchange key for metallic testing. The exkconv.src data file is used to determine the host SM (HSM) EXK. The MLT/ISDN then accesses the oe2exk.src data file to determine the correct EXK for the requested PDN.

PROCEDURE

1. Obtain the appropriate Data Elements Form and the EXKs for this IMLT/LTS interface.
2. At a regular *UNIX*® system terminal attached to the MLT front end (FE), do Steps 3 through 8.
3. Access the exk2nnx.src data file.
4. ***NOTE:*** The following is an example of an exk2nnx.src data file:

```
lrexk      nnx
_____      ___
201267     267        201268     268
201269     269        201ABC     265
```

The first column shows the EXK value and the second column shows the NNX to which that EXK maps.

Verify that each applicable EXK maps to the correct NNX.

5. Access the exkconv.src data file.

6. ***NOTE:*** The following is an example of an exkconv.src data file:

subexk	hostexk
201267	201267
201268	201267
201269	201269
301280	301280
201ABC	301280

The first column shows all the EXKs that map to the host EXK and the second column shows the EXK of the host switch to which all associated EXKs are mapped.

Verify that each associated EXK maps to the correct host switch EXK.

7. Access the oe2exk.src data file.

8. ***NOTE:*** The following is an example of an oe2exk.src data file:

hostexk	lsm	hsm	subexk
201267	1	4	201267
201268	1	9	201268
301280	1	72	301280
201267	5	48	201270
301280	73	192	305ABC

The first column indicates the host switch EXK that all associated EXKs are mapped to. The second column indicates the low end of the SM range associated with an EXK. The third column indicates the high end of the SM range associated with an EXK. The SM ranges for a specific host EXK must not overlap. The fourth column shows the sub-EXK associated with the SM range for the particular host EXK. Sub-EXKs must be unique and should not appear more than once in the table.

Verify that each assigned sub-EXK is correct and has the correct SM range.

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.4: PERFORM DCTU TRUNK CALIBRATION

OVERVIEW

Because no-test trunks are not used in MLT testing through a directly connected test unit (DCTU), special procedures are required to perform the equivalent of trunk calibration on the test paths used by DCTUs. **Only one time** manually perform the test path calibration for DCTUs. This calibration information, which is downloaded to the DCTUs, is required for the MLT algorithms. Routing to the proper DCTUs is by one dedicated reference telephone number (TN) in each switch host and in each remoted switching subsystem (such as MMRSM, RSM, ORM, TRM). Note that the host switch can have multiple DCTUs, but each remoted subsystem can have only one. The dedicated TN must be used to download information to the DCTU after a reset operation.

The proper length and resistance to associate with each dedicated TN may be either measured or estimated. Trunk and line work station (TLWS) personnel can make these measurments during the installation interval. This procedure details a method to measure these parameters from the loop maintenance operations system (LMOS) video display terminal (VDT).

The MLT facilities manager (FACMAN) is responsible for generating the data bases for the DCTU. The program **ltsdb** initializes the data base for the trunk calibration data for the DCTU. The filename format is **LTS**xxx**.d**, where xxx is the data communication network (DCN) port number for the host switch or one of its remoted subsystems with x = **0** - **9**. Note that the filename is the same as used for the loop testing system (LTS), but the contents are very different. Figure 5.3.1-1 is an example of an **LTS**xxx**.d** file for a switch/DCTU configuration. Note that the first line ***must*** state **ESS5** for the MLT to recognize it as a DCTU file.

There must be at least one entry for equipment type **ESS5_AM**; the maximum number of **ESS5_AM** equipment allowed in the data base is 31. Each entry ***must*** contain the following four attributes: (1) **ded_tn**, (2) **delcap**, (3) **trk_res**, and (4) **trk_len**. Note that **ded_tn** refers to the dedicated DCTU reference telephone number (TN). Note also that the values of trunk length and trunk resistance must be known ahead of time for the data base to be constructed correctly. This procedure is concerned only with **ENTRY = ESS5_AM**.

PROCEDURE

1. ***NOTE:*** The measured values for paths associated with a DCTU may be more variable than the calibration values obtained for trunks associated with loop testing systems (LTSs). This increased variability is due to the multiple paths to the metallic networks that are possible with the DCTU, unlike the situation with LTSs.

   Steps 2 through 5 set the values the algorithm uses at zero, so that all resistance and length inside the office are seen by the DCTU.

2. In the **LTS**xxx**.d** source file (see example in Figure 5.3.1-1) set the **delcap** (delta capacitance), **trk_len** (trunk length), and **trk_res** (trunk resistance) attributes to zero. Use the following as an example:

```
ESS5
ENTRY = ESS5_AM
      ded_tn = 3122210000
      delcap = 0
      trk_res = 0
      trk_len = 0
```

3. Compile the **LTS**xxx**.d** file using **MLTcreate** command.

4. Load the compiled file into /lmos/exec.

5. Download the DCTU.

6. Choose an open telephone number on the main distributing frame (MDF) as distant from the DCTU as possible.

7. Run a **LOOP** test from a TV mask and record the length to open measured.

8. Repeat the **LOOP** test three times and calculate the average length to open value.

   Comment: This is the new value for **trk_len**.

9. Have the MDF attendant place a strap tip-to-ring.

10. Repeat the **LOOP** test three times and calculate the average tip-to-ring resistance.

    Comment: This is the new value for **trk_res**.

11. ***NOTE:*** The **delcap** attribute can be very useful for tuning between cable dispatches and central office dispatches. Incorrect values may cause significantly high rates of false dispatches.

    To set **delcap**, determine at what point MLT declares an open as being outside the office instead of inside.

    Example: When MLT sees 200 feet to an open, the open may still be inside the office or in the cable vault. If **delcap** is set at 100, MLT prints:

    VER 41: OPEN OUT - BALANCED.

    If **delcap** is set at 210, then MLT prints:

    VER 3: OPEN IN.

12. ***NOTE:*** The example provided illustrates the **ESS5_AM** entry in the **LTS**xxx**.d** file with the calculated example attributes.

    Enter the calculated attributes into the **LTS**xxx**.d** file as follows:

    (a) The value chosen for **delcap** is entered directly.

    Example: If a value of 800 feet is chosen, enter the number 800.

    (b) The value calculated for **trk_res** is divided by 20 before being entered.

    Example: If a value of 650 ohms is calculated, enter the number 33. (Fractions are rounded off to the next higher integer.)

    (c) The value calculated for **trk_len** is divided by 10 before being entered.

    Example: If a value of 1250 feet is calculated, enter the number 125. Use the following as an example:

```
ESS5
ENTRY = ESS5_AM
    ded_tn = 3122210000
    delcap = 800
    trk_res = 33
    trk_len = 125
```

13. Compile the file using the **MLTcreate** command.

14. Load the compiled file into /lmos/exec and download the DCTU.

15. Tune delta-length parameter to determine open in vs. open out.

    Reference: Procedure 5.6

16. If this procedure resulted in any changes to parameters in the ``ltsdb'' data base file, ensure that these changes are made to the corresponding entries in the MLT-2 **5ESS/DCTU DATA ELEMENTS FORM**.

17. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.5: PERFORM LTS TRUNK CALIBRATION USING NEW ``DEL_RES'' PARAMETERPROCEDURE 5.5 - PERFORM LTS TRUNK CALIBRATION USING NEW ``DEL_RES'' PARAMETER

OVERVIEW

NOTE: The procedures for calibrating the LTS no-test trunks (NTTs) are well established, being automatically performed, with the results reported back to the user. Therefore they are not repeated here. Recently, however, a new parameter called **del_res** (delta resistance), which requires manual intervention, has been added to the trunk calibration sequence.

The MLT facilities manager (FACMAN) is responsible for generating the data bases for the LTS. The program **ltsdb** initializes the data base for the trunk calibration data for the LTS. The filename should be of the format **LTS**xxx**.d**, where xxx is a unique number assigned to this LTS with x = **0** - **9**.

This procedure provides the sequence required to determine when the **del_res** parameter is required and how to calculate it when it is required. This delta resistance offset is stored in the **LTS**xxx**.d** data file and is added to the resistance determined by trunk calibration. Therefore, **del_res** does not have to be recalculated, unless the LTS trunks are reconfigured. However, **del_res** should be periodically recalculated due to the possible variations in trunk resistance over time.

This procedure also accesses the procedure that provides the guidelines for tuning the trunk group delta-length parameter to determine open in vs. open out. The importance of this parameter cannot be overemphasized. Incorrect values have been known to cause significantly high rates of false dispatching.

PROCEDURE

1. At the central office MDF, have the frame attendant place a short across the tip and ring leads of the calibration telephone number.

2. Wait until the line goes to permanent signal, then run a sufficient number of **LOOP** transactions to ensure that each test trunk was used at least once.

3. ***NOTE:*** It is not necessary to calculate **del_res** for trunks that are already measuring tip-to-ring shorts accurately. ***Tip-to-ring resistance values between 0 and 40 ohms are acceptable.*** Figure 5.5-1 is an example of an acceptable response to a **LOOP** test (T-R resistance = 0.04 Kohms = 40 ohms).

   Was the tip-to-ring resistance between 0 and 40 ohms for each test trunk?

   If **YES**, go to step 27.

   If **NO**, continue with step 4.

4. Note each test trunk that requires a change in its **del_res** parameter.

5. At a regular *UNIX*® system terminal attached to the front end (FE), access the **LTS**xxx**.d** source file.

```
_
  TV  EC 123  PRTR      REQ BY            CB 999 555 2345 01-01-82 1155A

      TN      MDF  STATUS CALLBACK TIME      FRAME      CABLE/PAIR  COMMENT
```

```
1. 201 387 1111                5    387-8787      661/6565  KURT

TN 201 387 1111     MDF2                 SW: ESS5  OE: 7377-222
REQ          L#    CMT       CA               CO:
          TEMP(F)        PR     OVER       OSP:
  LOOP                                  TERM:
VER 26: MDF TEST RECOMMENDED
     VERY HARD SHORT    T-R

CRAFT: DC SIGNATURE      MLT: DC SIGNATURE
    KOHMS   VOLTS         KOHMS  VOLTS
      0        T-R         0.04     T-R
    3500      0  T-G      3500      0  T-G
    3500      0  R-G      3500      0  R-G
```

Figure 5.5-1 Example of An Acceptable Loop Test Response

6. ***NOTE:*** The example provided in Figure 5.5-2 illustrates the **LTS**xxx**.d** file for an LTS with one trunk group with two no-test trunk (NTT) members, both with the **del_res** value of zero. Note that this is the default value for **del_res**. The exchange key for this LTS is 201387. Each test trunk requiring a **del_res** calibration must have a **del_res** value of zero.

   On LTSxxx.d is **del_res = 0** displayed for each NTT requiring a **del_res** calibration?

   If **YES**, continue with step 7.

   If **NO**, go to step 9.

7. Place out of service all test trunks in the group, except the one to be calibrated.

8. Now go to Step 12.

9. Ensure that the **del_res** parameter is set to **0** for each test trunk requiring a **del_res** calibration.

10. ***NOTE:*** When this step is completed, ***all*** of the trunks associated with this LTS are taken out of service, and their associated trunk lengths and resistances are set equal to zero.

    Compile the **LTS**xxx**.d** file using ``MLTcreate'' and load the compiled version into /lmos/exec.

```
ENTRY = MDF
    frameid = 387
    mtg = 2
    mdelta = 0

ENTRY = NNX
    lrexk = 201387
        ndelta = 80
        caltn = 71111
        ntg=1
        utg = 0

ENTRY = TRUNK
    trunkid = 1
        dtype = M
        ttckt = Y
        loaded = N
```

```
            del_res = 0
            ttype = NT
            mdftid = -

ENTRY = TRUNK
      trunkid = 2
            dtype = M
            ttckt = N
            loaded = Y
            del_res = 0
            ttype = NT
            mdftid = -
ENTRY = TRUNK_GROUP
      groupid = 1
      members = 1,2
      sta = 0
ENTRY = PMU
      total = 2
ENTRY = DIALER
      total = 2
ENTRY = TLK
      talkid = 1
      ddd = TT_DDD
ENTRY = BYD
      total = 2
```

Figure 5.5-2 Example of LTS Data Base for LTS

11. Restore the test trunk requiring **del_res** calibration to service.

12. Access the calibration telephone number and have the MDF attendant place a tip-to-ring strap on the trunk calibration number for the appropriate trunk group (201-387-1111 for our example in Figure 5.5-1).

13. Perform a minimum of three **LOOP** transactions and calculate the average tip-to-ring resistance value.

    Comment: The results indicate how much extra resistance was not in the trunk calibration path and, therefore, not accounted for by trunk calibration.

14. ***NOTE:*** For an example of a **del_res** calculation, assume that the following example response was received for all **LOOP** transactions. The **del_res** value to be entered in the **LTS**xxx**.d** file must be expressed in ***ohms, divided by 20***. In this example, 0.06 kohms = 60 ohms. To get a zero reading, divide 60 ohms by 20 and enter **3** in the **LTS**xxx**.d** file as the **del_res** value for the trunk.

    Calculate the **del_res** value for this test trunk and enter it in the LTSxxx.d file.

```
VER 26: MDF TEST RECOMMENDED
      VERY HARD SHORT    T-R

CRAFT: DC SIGNATURE      MLT: DC SIGNATURE
     KOHMS   VOLTS          KOHMS  VOLTS
       0       T-R          0.06     T-R
     3500      0  T-G       3500     0  T-G
```

```
3500     0  R-G      3500     0  R-G
```

15. Remove the strap at the MDF and drop the access.

16. Restore the trunk under test to service.

17. Compile the **LTS**xxx**.d** (using ``MLTcreate'') and load the compiled version into /lmos/exec.

18. ***NOTE:*** The calibration resistance value now includes the value of **del_res**. The resistance value was 560 ohms before **del_res** was added. The results from our example is as follows:

    From the SAM mask, recalibrate the test trunk.

```
SAM    SYSTEM: M2       PRTR:        BY:

REQ: TC -T1                    NPANNX: 201387  EXK: 201387  LTS:   1

          EXK   NNX  TRK   LENGTH(FT)   RESIS(OHMS)   REMARKS
           OLD    NEW    OLD    NEW
201387  387    1    0    11060    0     620     OK
```

19. Access the calibration telephone number and ensure that the same test trunk is selected.

20. Have the MDF attendant place a strap across the tip and ring.

21. ***NOTE:*** The following is the expected response for our example. Note that any resistance value between 0 and 40 ohms is acceptable.

    Run another **LOOP** on the telephone number.

```
VER 26: MDF TEST RECOMMENDED
      VERY HARD SHORT    T-R

CRAFT: DC SIGNATURE      MLT: DC SIGNATURE
     KOHMS   VOLTS          KOHMS  VOLTS
       0        T-R         0        T-R
     3500     0  T-G      3500     0  T-G
     3500     0  R-G      3500     0  R-G
```

22. Remove the strap at the MDF and drop the access.

23. Does another test trunk require a **del_res** calibration?

    If **YES**, continue with step 24.

    If **NO**, go to step 27.

24. Remove the test trunk just calibrated from service.

25. Restore the test trunk to be calibrated to service.

26. Now go to Step 12.

27. Restore all test trunks to service.

28. Tune delta-length parameter to determine open in vs. open out.

    Reference: Procedure 5.6 Procedure 5.6 [5.6]

29. If this procedure resulted in changes to any of the parameters in the ``ltsdb'' data base file, ensure that these changes are also made to the corresponding entries in the **LTS DATA ELEMENTS FORM**.

30. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.6: TUNE DELTA-LENGTH PARAMETER TO DETERMINE OPEN-IN VS. OPEN-OUT

OVERVIEW

The delta-length offset is a number, supplied by the operating telephone company (OTC) for each trunk group, that represents the distance between the open trunk calibration telephone termination and the point the OTC wants to be defined as the open in versus open out demarcation point. This value must be set carefully for each trunk group, preferably by testing representative opens in each office at installation time. The importance of this parameter cannot be overemphasized.

TREAT analysis studies of MLT **VER** codes **3** and **41** versus Maintenance Center Disposition Codes should be performed periodically to identify problems with MLT delta-length offset values - the amount of footage added to the trunk calibration length measurement to ensure that open conductors in or near the central office are biased toward the central office. Incorrect values can cause significantly high rates of false dispatching.

This procedure provides the steps required to ``tune'' this parameter.

PROCEDURE

1. ***NOTE:*** The dedicated trunk calibration number represents the longest path through the switch. This path is difficult to determine. Therefore, it may be desirable to select several possibilities and choose the longest of them.

   Determine exactly where the transition between open in and open out should occur. (Some examples could be the first manhole outside the office, the first telephone pole, the point where the cable leaves the building, etc.)

2. ***NOTE:*** If a cable pair cannot be opened at the selected location, a nearby location may be selected and the delta-length offset adjusted to compensate for the alternative choice.

   Open a cable pair at the selected location or its alternative.

3. ***NOTE:*** The ``Distance to Open'' on the MLT test is a good approximation of what the delta-length offset should be for the trunk group.

   Run an MLT test on the opened cable pair enough times to ensure that all DCTU ports are used and to provide for the selection of alternative path through the switch.

4. ***NOTE:*** It may be wise to increase the delta-length offset to protect against the possibility that the longest path was not found. Another reason to increase the delta-length offset is that the error in measuring trunk length increases as the trunk gets longer. For example, if a trunk is 50,000 feet long, a three-percent difference between test units results in a 1500-foot difference in the result.

   If the office has customer loops that are multipled (bridge-tap) to other distributing frames, these multiples must be given consideration. One of these loops should be the dedicated open telephone number, or the delta-length offset should be adjusted to compensate for the multiple.

   Average the ``Distance to Open'' results of all test runs to calculate the delta-length offset and adjust this value as required by office conditions.

5. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.7: VERIFY SWITCH EQUIPMENT

OVERVIEW

This procedure ensures that *5ESS*® Switch equipment essential to MLT interface acceptance testing is in service. Due to the high degree of redundancy designed into the switch, the switch can perform normally with a number of circuit units out of service. Therefore, the decision to perform the tests with certain switch units out of service is at the discretion of responsible office supervision. Refer to 235-105-220 for corrective maintenance procedures.

PROCEDURE

1. Verify MMSU(s)/MSU(s).

   Reference: Procedure 5.7.1 Procedure 5.7.1 [5.7.1]

2. Will acceptance testing involve integrated *SLC*® carrier system(s)?

   If **YES**, continue with step 3.

   If **NO**, go to step 4.

3. Verify global digital service unit (GDSU) with transmission test facility (TTF).

   Reference: Procedure 5.7.2 Procedure 5.7.2 [5.7.2]

4. Which MLT configuration supports this office?

   If **LTS without MLT/ISDN FP2/FP3**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.

   If **IMLT or LTS with MLT/ISDN FP2/FP3**, continue with step 5.

5. At MCC VDT, type and enter command **113**

   Response: **113 - OPERATIONS SYSTEMS LINKS** Page displayed.

6. On page display, is **MLT2** (IMLT data link) [**SDL** 2 (synchronous data link 2)] in **ACT** (active) state?

   If **YES**, go to step 8.

   If **NO**, continue with step 7.

7. Correct any SDL 2 fault(s) and restore to service.

   References: 592-028-120
   592-029-220
   592-031-100

8. Does the IMLT configuration support this office?

   If **YES**, continue with step 9.

   If **NO**, go to step 12.

9. Verify DCTU(s).

   Reference: Procedure 5.7.3 Procedure 5.7.3 [5.7.3]

10. ***NOTE:*** The trunk and line work station (TLWS) distance-to-open (DTO) and Resistance measurements are calibrated to the MDF for more accurate results. If this calibration has not already been performed, it should be performed now.

   Will the TLWS measurements be calibrated?

   If **YES**, continue with step 11.

   If **NO**, go to step 12.

11. Calibrate TLWS measurements.

   Reference: Procedure 5.7.4 Procedure 5.7.4 [5.7.4]

12. Does IMLT have MLT/ISDN FP2/FP3?

   If **YES**, continue with step 13.

   If **NO**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**.

13. Verify integrated services test facilities (ISTFs).

   Reference: Procedure 5.7.5 Procedure 5.7.5 [5.7.5]

14. Verify protocol handlers (PHs).

   Reference: Procedure 5.7.6

15. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.7.1: VERIFY MMSU(S) - MCC VIDEO DISPLAY TERMINAL

PROCEDURE

1. Type and enter the following command:

   11z**0,**y**,**x

Where:	x = Number of switching module (SM) with modular metallic service unit (MMSU) y = Number of MMSU z = **3** if service group 0 (SG 0) or **4** if SG 1.
Response:	**11**zy or **11**z**0,**y **- SM** x a **- MSU** y **SG** b Page displayed.
Where:	a = SM type (such as LSM, HSM, RSM, etc.) b = **0** if z = **3** or **1** if z = **4**.

2. Are both **MSUCOM** (MSU common control) circuits in **ACT** (active) state?

   If **YES**, go to step 4.

   If **NO**, continue with step 3.

3. Correct MSUCOM fault(s) and return the MSUCOM to the **ACT** state.

4. On page display, is **PROTO** (protocol bus) in **ACT** state?

   If **YES**, go to step 6.

   If **NO**, continue with step 5.

5. Correct PROTO fault(s) and return PROTO to the **ACT** state.

6. On page display, are all **MTIBAX** (metallic test interconnect bus access) circuits indicated **ACT**?

   If **YES**, go to step 8.

   If **NO**, continue with step 7.

7. Correct MTIBAX fault(s) and return all MTIBAXs to the **ACT** state.

8. On page display, are all **MAB** (metallic access bus) circuits, also known as junctors, indicated **ACT**?

   If **YES**, go to step 10.

   If **NO**, continue with step 9.

9. Correct MTIBAX fault(s) and return all MTIBAXs to the **ACT** state.

10. On Page display, are all **METALLIC SERVICE CIRCUIT**s indicated **ACT**?

    If **YES**, go to step 12.

    If **NO**, continue with step 11.

11. Correct METALLIC SERVICE CIRCUIT fault(s) and return all circuits to the **ACT** state.
12. Does another MMSU/MSU SG remain to be verified?

    If **YES**, go to step 1.

    If **NO**, continue with step 13.
13. Display **127 - MTIB STATUS** Page.
14. On page display, are all metallic test interconnect buses (MTIBs) in the **ACT** state?

    If **YES**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.

    If **NO**, continue with step 15.
15. Correct MTIB fault(s) and return circuit(s) to **ACT** state.
16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.7.2: VERIFY GLOBAL DIGITAL SERVICE UNIT WITH TRANSMISSION TEST FACILITY - MCC VIDEO DISPLAY TERMINAL

PROCEDURE

1. Type and enter the following command:

   1100,y**,**x

   Where: x = Number of switching module (SM) with global digital service unit (GDSU) containing the transmission test facility (TTF)
   y = Number of the GDSU.

   Response: **110**y or **1100,**y **- SM** x a **- GDSU** y **SG 0 & 1** Page displayed.

   Where: a = SM type (such as LSM, HSM, RSM, etc.).

2. On page display, are both **GDSUCOM** (GDSU common control) circuits indicated **ACT** (active)?

   If **YES**, go to step 4.

   If **NO**, continue with step 3.

3. Correct GDSUCOM fault(s) and return GDSUCOM(s) to the **ACT** state.

4. On page display, are all **TTFCOM** (TTF common) circuits indicated **ACT**?

   If **YES**, go to step 6.

   If **NO**, continue with step 5.

5. Correct TTFCOM fault(s) and return all TTFCOMs to the **ACT** state.

6. Does another GDSU containing a TTF remain to be verified?

   If **YES**, go to step 1.

   If **NO**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.

Procedure 5.7.3: VERIFY DCTU(S) - MCC VIDEO DISPLAY TERMINAL

PROCEDURE

1. Type and enter the following command:

   1070,y,x

Where:	x = Number of switching module (SM) containing the directly connected test unit (DCTU) y = Number of DCTU
Response:	**107**y or **1070,**y **- SM** x a **- DCTU** y Page displayed.
Where:	a = SM type (such as LSM, HSM, RSM, etc.).

2. On page display, is **DCTUCOM** (DCTU common control) indicated **ACT** (active)?

   If **YES**, go to step 4.

   If **NO**, continue with step 3.

3. Correct DCTUCOM fault(s) and return to **ACT** state.

4. On page display, is **EQUIP ACCESS NETWORK (EAN)** indicated **ACT**?

   If **YES**, go to step 6.

   If **NO**, continue with step 5.

5. Correct EAN fault(s) and return to **ACT** state.

6. On page display, are all **PRECISION MEAS UNITS (PMU)** circuits indicated **ACT**?

   If **YES**, go to step 8.

   If **NO**, continue with step 7.

7. Correct PMU fault(s) and return PMU circuit(s) to **ACT** state.

8. On page display, are all **DCTU PORTS** indicated **ACT**?

   If **YES**, go to step 10.

   If **NO**, continue with step 9.

9. Correct DCTU PORT fault(s) and return ports to **ACT** state.

10. Does another DCTU remain to be verified?

    If **YES**, go to step 1.

    If **NO**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.

Procedure 5.7.4: CALIBRATE TLWS MEASUREMENTS

OVERVIEW

The trunk and line work station (TLWS) performs various measurements from the DCTU. Unless compensated for, all results are measured relative to this device. In particular, two measurements, distance-to-open (DTO) and Resistance, provide better results when calibrated to the MDF. Once calibrated, a DTO measurement identifies inside plant versus outside plant opens. The same is true for Resistance measurements.

NOTE 1: Normally two POTS lines are assigned in ODD for TLWS calibration, one for DTO and one for Resistance. The line used for resistance measurements should be a POTS line terminating on a LU2 or LU3. The DTO line tip and ring are open at the point on the MDF where it would normally leave the office (for example, carbon blocks). The Resistance line has a tip to ring short applied where it would normally leave the office ***only*** at the time of measurement. Leaving the short across tip and ring would cause the line to always appear busy.

NOTE 2: If dedicated calibration lines are not used, then any appropriate active line (preferably a POTS line) is sufficent. The open or short is applied to the line when requested. When the test is completed, the line must be returned to its original condition.

NOTE 3: A supplementary TLWS (STLWS) is normally used to perform TLWS procedures. This leaves the MCC free to perform other system administration and maintenance functions.

PROCEDURE

1. ***NOTE:*** The RC View **8.1, OFFICE PARAMETERS (MISCELLANEOUS)**, provides two attributes **DISTOPEN** and **RESIST** for TLWS calibration.
2. At the STLWS or equivalent VDT, do Steps 3 through 6.
3. Put the terminal in the RC/V mode.
4. Access RC View **8.1, OFFICE PARAMETERS (MISCELLANEOUS).**
5. ***NOTE:*** Update the **DISTOPEN** and **RESIST** attribute fields to **0**.
6. Exit RC/V.
7. Now go to Step 13.
8. At the STLWS or equivalent VDT, do Steps 9 through 12.
9. **CAUTION:** Improper use of the ODBE can affect service. Relations in ODD that are critical to the operation of the 5ESS switch can be altered or destroyed. Therefore, ODBE should be used only by qualified personnel approved by appropriate office supervision.

   Put the terminal in the ODBE mode.
10. ***NOTE:*** The **GLCP7DUMMY** parameter is used for DTO and **GLCP8DUMMY** for Resistance.
11. Update the values of the **GLCP7DUMMY** and **GLCP8DUMMY** parameters to **0**.
12. Exit the ODBE.

13. At the STLWS or equivalent VDT, type and enter command **160**

    Response: **160 - TEST POSITION SUMMARY** page is displayed.

    Comment: Terminal is in the TLWS mode.

14. At the STLWS or equivalent VDT, type and enter the follwoing command:

    161,x

    Where: x = Number of an available TLWS test position (**1**-**32**).

    Response: **16**x or **161**,x **- TEST POSITION** x page displayed.

15. At the STLWS or equivalent VDT, do Steps 16 through 25.

16. Type and enter following command to seize the DTO calibration line (open tip and ring):
    4001,x

    Where: x = The DN of the DTO calibration line.

    Response: The DTO calibration line is seized.

17. Type and enter the appropriate command to access the metallic measurements task commands:
    5600

    Response: **5600** METALLIC MEASUREMENTS task commands menu displayed.

18. Type and enter the appropriate command to measure the DTO.
    5605

19. Record the measured DTO value in feet.

20. Type and enter command to release the line.
    4999

21. Type and enter the command to seize the Resistance calibration line (short across tip and ring).
    4001,x.

    Where: x = The DN of the Resistance calibration line.

    Response: Resistance calibration line is seized.

22. Using the same TLWS metallic measurement task command menu, type and enter the command to measure the Resistance internal to the office **5603**).

23. Once the measurement has begun to report values at the TLWS, place a dead short across tip and ring (the TLWS takes about eight seconds to update the screen).

24. **CAUTION:** The Resistance measurement is in K-ohms.

    When the Resistance measurement has stabilized, record the Resistance value in ***OHMs***.

25. Remove the short from the line and release it using the command (**4999**).

26. Was this the ***FIRST*** test run?

    If **YES**, continue with Step 27.

    If **NO**, go to Step 50.

27. **CAUTION:** If the calibration line used for the Resistance measurement is NOT a POTS line terminating on an LU2 or LU3 the resistance reading obtained from the TLWS must be adjusted before the data base can be updated.

    What is the termination for the calibration line used for the Resistance measurement?

    If **LU2 or LU3**, go to Step 35.

    If **LU1**, continue with Step 28.

    If **ISLU-Z**, go to Step 30.

    If **ISLU-U (ANSI)**, go to Step 32.

    If **ISLU-U (AMI)**, go to Step 34.

28. ***Subtract*** 80 ohms from the measured Resistance value.
29. Now go to Step 35.
30. ***Subtract*** 20 ohms from the measured Resistance value.
31. Now go to Step 35.
32. ***Add*** 246 ohms to the measured Resistance value.
33. Now go to Step 35.
34. ***ADD*** 243 ohms to the measured Resistance value.
35. At the STLWS or equivalent VDT, do Steps 37 through 41.
36. Put the terminal in the RC/V mode.
37. Access RC View **8.1, OFFICE PARAMETERS (MISCELLANEOUS).**
38. ***NOTE:*** Update the **DISTOPEN** attribute field with the DTO measurement from the TLWS, in feet.
39. Update the **RESIST** attribute field with the (adjusted) Resistance measurement from the TLWS, in ohms.
40. Exit RC/V.
41. Now go to Step 15.
42. At the STLWS or equivalent VDT, do Steps 44 through 48.
43. Put the terminal in the ODBE mode. Access the AM **PARAMETERS** relation.
44. Update the value of the **GLCP7DUMMY** parameter with the DTO measurement from the TLWS, in feet.
45. Update the value of the **GLCP8DUMMY** parameter with the (adjusted) Resistance measurement

from the TLWS, in ohms.

46. Exit the ODBE.

47. Now go to Step 15.

48. Were the DTO and Resistance measurements both **0**?

    If **YES**, go to Step 52.

    If **NO**, continue with Step 51.

49. **Report error condition to maintenance supervision.**

50. At the STLWS or equivalent VDT, access the **160 - TEST POSITION SUMMARY PAGE**.

51. At the STLWS or equivalent VDT, type and enter the following command to release TLWS test position x:

    201,x

CAUTION: If using an active line for calibration, restore that line to its original condition.

52. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.7.5: VERIFY INTEGRATED SERVICES TEST FACILITIES

PROCEDURE

1. From office records, record number(s) of SM(s) equipped with integrated services test facilities (ISTFs).

2. At MCC or equivalent VDT, enter command: **1110,**a

   Where: a = Number of SM containing ISTF(s).

   Response: **1110 - SM** a x **- ISTF** page displayed.

   Where: x = Type of SM, such as **LSM**, **HSM**, **RSM**.

3. On page display, is any ISTF indicated **OOS** or **UNV**?

   If **YES**, continue with Step 4.

   If **NO**, go to Step 5.

4. Record number of any ISTF in **OOS** or **UNV** with SM number.

5. Does ISTFs in another SM remain to be verified?

   If **YES**, go to Step 2.

   If **NO**, continue with Step 6.

6. Were any ISTFs recorded in the **OSS** and/or **UNV** state(s)?

   If **YES**, continue with Step 7.

   If **NO**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.

7. Report error condition(s) to maintenance supervision.

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.7.6: VERIFY PROTOCOL HANDLERS

PROCEDURE

1. From office records, record number(s) of SM(s) equipped with packet switch unit (PSU)(s).

2. At MCC or equivalent VDT in command mode, enter command: **118**b**,**a

   Where: a = Number of SM containing PSU(s)
   b = Number of equipped PSU shelf (**0**-**5**).

   Response: **118**b **- SM** a x **- PSU SHELF** b page displayed.

   Where: x = Type of SM, such as **LSM**, **HSM**, **RSM**.

3. On page display, is any **PH** (protocol handler) indicated **OOS** or **DGR**?

   If **YES**, continue with Step 4.

   If **NO**, go to Step 5.

4. Record number of any PH in **OOS** or **DGR** with SM number and PSU shelf number.

5. Does PSU shelf(s) remain to be verified?

   If **YES**, go to Step 2.

   If **NO**, continue with Step 6.

6. Were any PHs recorded in the **OOS** and/or **DGR** state(s)?

   If **YES**, continue with Step 7.

   If **NO**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.

7. Report error condition(s) to maintenance supervision.

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.7.7: VERIFY GLOBAL DIGITAL SERVICES FUNCTION (GDSF)

PROCEDURE

1. From office records, record number(s) of SM(s) equipped with the global digital services function (GDSF).

2. At MCC or equivalent VDT, enter command: **1115,**a,b

   Where: a = Number of GDSF
   b = Number of SM containing GDSF.

   Response: **1115 - SM** b c **- GDSF** a page displayed.

   Where: c = Type of SM, such as **LSM**, **HSM**, **RSM**

3. On page display, is any GDSF indicated **OOS**?

   If **YES**, continue with Step 4.

   If **NO**, go to Step 5.

4. Record number of any GDSF in **OOS** with SM number.

5. Does GDSF in another SM remain to be verified?

   If **YES**, go to Step 2.

   If **NO**, continue with Step 6.

6. Were any GDSFs recorded in the **OOS** state?

   If **YES**, continue with Step 7.

   If **NO**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.

7. Report error condition(s) to maintenance supervision.

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.8: VERIFY DCN STATUS

PROCEDURE

1. **CAUTION:** Level 3 ports which are not connected to LTSs should be looped back so that no DCN sanity failures occurs.

   NOTE: The following steps verify the DCN by performing DCN diagnostic and sanity tests. Diagnostics check each communications path from the MLT front end (FE) to the DCTU or LTS. Sanity verifies that equipment which passes diagnostics can also pass sanity, and checks the FE software that controls the sanity tests.

2. ***NOTE:*** The MLT facilities manager (FACMAN) determines the number and types of diagnostic tests to be run.

   Perform DCN diagnostics.

   Reference: **OPA-2P257 MLT-2 DCN DIAGNOSTICS USAGE GUIDE**
   or
   OPA-2P761 MLT-3 DCN DIAGNOSTICS USAGE GUIDE

3. Verify successful completion of each diagnostic test.

4. Perform DCN sanity.

5. Verify successful completion of the DCN sanity test.

6. Report any failures of a link to a working DCTU/LTS to the MLT FACMAN.

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.9: VERIFY STATUS OF IMLT EQUIPMENT

OVERVIEW

This procedure verifies the ability of the system to download the correct data base to the DCTU, the status of the components of the DCTU, and the data base downloaded to the DCTU.

PROCEDURE

1. Perform a download to the DCTU.
2. Verify that the download completes successfully.
3. Display and print the status of the DCTU components [**DS** (display status) command] and verify with the MLT data base.
4. Request an equipment status (**ES** command) and verify that data from the **ES** command indicates that all equipment is in service.
5. Verify that all trouble counters are at normal levels.
6. Request a printout of the trunk calibration data (**PTC** command) on the DCTU and verify that it agrees with the MLT data base.
7. Report any discrepancies to the MLT FACMAN and correct any discrepancies in the data base load.

   Reference: **OPB-2P250 MLT-2 DATA-BASE ADMINISTRATION GUIDE**
   or
   OPO-2P760 MLT-3 and MLT/ISDN SYSTEM OPERATIONS GUIDE

8. If the data base was corrected, return to Step 1.
9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.10: VERIFY STATUS OF LTS EQUIPMENT

OVERVIEW

This procedure verifies the ability of the system to download the correct data base to the LTS and that the LTS is in correct working order.

PROCEDURE

1. Perform a download to the LTS.

2. Verify that the download completes successfully.

3. ***NOTE:*** A good display status report indicates that the data base has been downloaded correctly.

   Request a display of the status of the equipment on the LTS.

4. Perform sanity test on the LTS.

5. If any off-normal result(s) is indicated, perform LTS diagnostics and correct any LTS fault(s).

   Reference: **OPA-2P256 MLT-2 LTS DIAGNOSTIC TEST CODES**

   or

   OPA-2P765 MLT-3 LTS DIAGNOSTIC TEST CODES

6. If any fault(s) was corrected, return to Step 4.

7. Generate another printout of the sanity results.

   Comment: The results should match the results from the SAN request.

8. ***NOTE:*** There is no on-line command to force a precision measurement unit (PMU) calibration, but a calibration request can be made while running LTS diagnostics. The PMUs in the LTS, periodically calibrate themselves. The **PTUC** (print test unit calibration) command is available to check the detailed results of the most recent calibration.

   Generate a printout of the PMU calibration data.

9. Check all values to be sure they are within the specified limits.

10. If any calibration failure(s) is indicated, report the results to the MLT FACMAN, and correct the indicated PMU fault(s).

11. If any fault(s) was corrected, ensure that the PMUs have been recalibrated after the correction of fault(s).

12. ***NOTE:*** All trunks on the LTS must be calibrated before they can be used for loop testing.

    Perform a calibration of all NTTs and MDF trunks on the LTS.

13. ***NOTE:*** Trunk diagnostics do not update the trunk calibration data in the LTS data base. It provides detailed measurement information on the NTTs and MDF trunks. The trunk length

measurements should be consistent for the tip and ring sides. The AC and DC FEMF readings should be less than 15 and 3 volts, respectively, and the ac and dc signatures should be indicative of an open circuit.

If any trunk calibration failure(s) is indicated, perform trunk diagnostics using **TDIAG** command for the trunk in question and correct the fault(s).

14. If trunk fault(s) was corrected, return to Step 15 for retesting the trunk in question.
15. Request a printout of the calibration data for all trunks on the LTS.
16. Verify that the data from the printout agrees with the calibration results.
17. ***NOTE:*** The following steps verify that the MLT data base has been loaded correctly and that the transactions used to access the data are working.
18. Generate a display of the status of equipment on the LTS.
19. Verify that the equipment listed agrees with the data elements form.
20. Generate a listing of the trunk groups serving the LTS.
21. Verify that the listing agrees with the data elements form.
22. Display the current settings of the system thresholds.
23. Verify that each threshold can be changed.
24. Restore the thresholds to their original values.
25. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.11: PERFORM IMLT ACCEPTANCE TESTS

OVERVIEW

This procedure verifies that the IMLT can effectively test subscriber loops that terminate on the switch.

PROCEDURE

1. Ensure that all acceptance test prerequisites are satisfied.

   Reference: Procedure 5.1

2. Ensure that all switch and IMLT software and hardware verification tests were successfully completed.

   References: Procedures 5.2 , 5.3 , 5.4 , 5.6 , 5.7 , 5.8 , and 5.9

3. At an appropriate LMOS VDT, do Steps 4 through 25.

4. Perform a **FULL** test on a trunk calibration number.

   Response: **VER 3 OPEN IN**

5. Perform a **FULL** test on a single-party line terminating on an LU, equipped with a touch-tone pad.

   Response: **VER 0: TEST OK**

6. Perform a touch-tone analysis test on the same line.

   Reference: Procedure 5.13

7. Perform a **FULL** test on a single-party line terminating on an LU, equipped with a rotary dial.

   Response: **VER 0: TEST OK**

8. Perform a rotary dial analysis test on the same line.

   Reference: Procedure 5.14

9. Perform a **FULL** test on a telephone number (TN) which is on intercept.

   Response: **VER SU: INTERCEPT FOUND BY TESTING**

10. Test a coin TN, as follows:

    (a) Perform a **FULL** test.

    Response: **VER 0: TEST OK**

    (b) Perform a **LOOP** test.

Response: **VER 0: TEST OK**

(c) Perform a **CHOME** test.

Response: **IZER HOMED** x **ATTEMPTS**

Comment: If this is a ``D'' type coin phone, it has an electronic totalizer and MLT does not test it. In this case, the response is **IZER: NOT ATTEMPTED**.

(d) Perform a **CRET** test.

Response: **COIN RELAY: COIN RETURNED**

(e) Perform a **CCOL** test.

Response: **COIN RELAY: COIN COLLECTED**

11. Perform a **FULL** test on a denied terminating TN.

    Response: **VER D1: DENIED SERVICE - TERMINATING**

12. Perform a **FULL** test on a denied originating TN.

    Response: **VER D2: DENIED SERVICE - ORIGINATING**

13. Perform a **FULL** test on a denied originating and terminating TN.

    Response: **VER D3: DENIED SERVICE**

14. Perform a **FULL** test on a line served by integrated *SLC*® carrier system.

    Response: **VER 0: TEST OK**

15. Perform a **FULL** test on a line served by integrated SLC carrier system with a remote measurement unit (RMU).

    Response: **VER 0: TEST OK**

16. Perform a **FULL** test on a line served by universal SLC carrier system.

    Response: **VER 0: TEST OK**

17. Perform a **FULL** test on a line served by universal SLC carrier system with an RMU.

    Response: **VER 0: TEST OK**

18. Perform a **FULL** test on a TN terminated on a maintenance termination unit (MTU).

Response: **VER 0: TEST OK MAINTENANCE UNIT FOUND ON LINE**

19. Perform the following tests on one of ***each*** party line served by the office:

    (a) Perform a **FULL** test on the line.

    Response: **VER 0: OK**

    (b) Perform a ring transaction test on the line.

    Response: Correct ringing is applied to the line under test, and the call completes correctly.

20. Perform the following tests on a working single-party line opened at the main distributing frame (MDF):

    (a) Perform a **FULL** test on the line.

    Response: **VER 3: OPEN IN**

    (b) Perform a **Q** test on the line.

    Response: **OPEN** displayed and printed.

    Length should be 0 feet.

    There should be no shorts, grounds, or foreign voltages.

    (c) Perform a **CO** test on the line.

    Response: **VER 0: TEST OK**
    C.O. LINE CKT OK
    DIAL TONE OK

21. Perform a **FULL** test on a line with a call in progress.

    Response: **VER 6: BUSY SPEECH**
    5ESS TRAFFIC BUSY
    Access is dropped.

22. Perform a **FULL** test on a line with the receiver off-hook.

    Response: **VER 71: ROH**

23. Perform tracing tone, look for short, and soak test.

    Reference: Procedure 5.15

24. Perform single-sided resistive fault sectionalization test.

Reference: Procedure 5.16

25. Perform 2-sided resistive fault sectionalization test.

    Reference: Procedure 5.17

26. ***NOTE:*** All DCTU equipment should be in service for this test.

    Test program scan testing, as follows:

    (a) Generate a PST list of at least 20 numbers containing a sample of all the types of lines served by the switch.

    (b) Run the PST list.

    (c) Verify that the lines have been successfully tested.

27. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.12: PERFORM LTS ACCEPTANCE TESTS

OVERVIEW

This procedure verifies that the MLT can effectively test subscriber loops that terminate on the switch.

PROCEDURE

1. Ensure that all acceptance test prerequisites are satisfied.

   Reference: Procedure 5.1

2. Ensure that all switch and MLT software and hardware verification tests were successfully completed.

   References: Procedures 5.3 , 5.5 , 5.6 , 5.7 , 5.8 , and 5.10

3. At an appropriate LMOS VDT, do Steps 4 through 26.

4. Perform a **FULL** test on a trunk calibration number.

   Response: **VER 3: OPEN IN**

5. Perform a **FULL** test on a single-party line terminating on an LU, equipped with a touch-tone pad.

   Response: **VER 0: TEST OK**

6. Perform a touch-tone analysis test on the same line.

   Reference: Procedure 5.13

7. Perform a **FULL** test on a single-party line terminating on an LU, equipped with a rotary dial.

   Response: **VER 0: TEST OK**

8. Perform a rotary dial analysis test on the same line.

   Reference: Procedure 5.14

9. Perform a **FULL** test on a telephone number (TN) which is on intercept.

   Response: **VER SU: INTERCEPT FOUND BY TESTING**

10. Test a coin TN, as follows:

    (a) Perform a **FULL** test.

    Response: **VER 0: TEST OK**

    (b) Perform a **LOOP** test.

Response: **VER 0: TEST OK**

(c) Perform a **CHOME** test.

Response: **IZER HOMED** x **ATTEMPTS**

Comment: If this is a ``D'' type coin phone, it has an electronic totalizer and MLT does not test it. In this case, the response is **IZER: NOT ATTEMPTED**

(d) Perform a **CRET** test.

Response: **COIN RELAY: COIN RETURNED**

(e) Perform a **CCOL** test.

Response: **COIN RELAY: COIN COLLECTED**

11. Perform a **FULL** test on a denied terminating TN.

    Response: **VER 37: DIAL TONE BURST DETECTED**

12. Perform a **FULL** test on a denied originating TN.

    Response: **VER 37: DIAL TONE BURST DETECTED**

13. Perform a **FULL** test on a denied originating and terminating TN.

    Response: **VER 37: DIAL TONE BURST DETECTED**

14. Perform a **FULL** test on a line served by integrated *SLC*® carrier system.

    Response: **VER 0: TEST OK**

15. Perform a **FULL** test on a line served by integrated SLC carrier system with an RMU.

    Response: **VER 0: TEST OK**

16. Perform a **FULL** test on a line served by universal SLC carrier system.

    Response: **VER 0: TEST OK**

17. Perform a **FULL** test on a line served by universal SLC carrier system with an RMU.

    Response: **VER 0: TEST OK**

18. Perform a **FULL** test on a TN terminated on a maintenance termination unit (MTU).

    Response: **VER 0: TEST OK MAINTENANCE UNIT FOUND ON LINE**

19. Perform the following tests on one of ***each*** party line served by the office:

    (a) Perform a **FULL** test on the line.

    Response: **VER 0: OK**

    (b) Perform a ring transaction test on the line.

    Response: Correct ringing is applied to the line under test, and the call completes correctly.

20. Perform the following tests on a working single-party line opened at the MDF.

    (a) Perform a **FULL** test on the line.

    Response: **VER 3: OPEN IN**

    (b) Perform a **Q** test on the line.

    Response: **OPEN** displayed and printed.
    Length should be 0 feet.
    There should be no shorts, grounds, or foreign voltages.

    (c) Perform a **CO** test on the line.

    Response: **VER 0: TEST OK**
    C.O. LINE CKT OK
    DIAL TONE OK

21. Perform a **FULL** test on a line with a call in progress.

    Response: **VER 6: BUSY SPEECH**
    Access is dropped.

22. Perform a **FULL** test on a line with the receiver off-hook.

    Response: **VER 71: ROH**
    VER 75: SHORT - PROBABLY ROH

23. Perform tracing tone, look for short, and soak test.

    Reference: Procedure 5.15

24. Perform single-sided resistive fault sectionalization test.

    Reference: Procedure 5.16

25. Perform 2-sided resistive fault sectionalization test.

Reference: Procedure 5.17

26. ***NOTE:*** All LTS equipment should be in service for this test.

    Test program scan testing, as follows:

    (a) Generate a PST list of at least 20 numbers containing a sample of all the types of lines served by the switch.

    (b) Run the PST list.

    (c) Verify that the lines have been successfully tested.

27. Perform office overflow recognition test, as follows:

    (a) In the **TN** field, enter the office overflow test number for this office.

    (b) Execute a **FULL** test.

    Response: **VER B0: OFFICE OVERFLOW**

28. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.13: PERFORM TOUCH-TONE ANALYSIS TEST

OVERVIEW

This procedure checks the system's ability to establish a talk path to a customer's line, to monitor the line, to reverse tip and ring of the line for testing purposes, and to accept touch-tone analysis results from the touch-tone testing circuit in the office.

PROCEDURE

1. At the LMOS VDT, do Steps 2 through 10.
2. Execute an **R** request to initiate a callback and a connection to the line under test.
3. Answer the callback line and depress the **0** key to indicate that the call has been received.

   Response: The DCTU dials the line under test when the callback is completed.

4. Instruct the person on the line to dial **1 2 3 4 5 6 7 8 9 0** when dial tone is heard (to test a twelve button set, dial **4 1 2 3 4 5 6 7 8 9 * 0 #**).
5. Execute a **TT** key to initiate the test.

   Response: A dial tone is placed on the line by the DCTU.

6. ***NOTE:*** Dial tone is not broken by the dialing of the digits.

   Instruct the person on the line to dial **1 2 3 4 5 6 7 8 9 0** when dial tone is heard (to test a twelve button set, dial **4 1 2 3 4 5 6 7 8 9 * 0 #**).

   Response: The touch-tone testing circuit generates two short beeps over the dial tone if it received all the digits correctly. Otherwise, it generates one or no beeps.

   Comment: There is no automated analysis of the results from the touch-tone testing circuit.

7. Execute a **T** request to re-establish the talk mode with the ``customer.''
8. Execute an **REV** request to reverse tip and ring on the line under test.
9. Request that the ``customer'' try to dial.

   Response: The touch-tone pad does not operate unless the set is equipped with a polarity guard.

10. Drop the callback line and the test access.
11. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.14: PERFORM ROTARY DIAL ANALYSIS TEST

OVERVIEW

This procedure verifies the ability of the system to analyze the performance of the customers rotary dial.

PROCEDURE

1. At the LMOS VDT, do Steps 2 through 9.
2. Execute an **R** request to get a talk path to the line under test.
3. Answer the callback and depress the **0** key to indicate that the callback has been completed.
4. Instruct the person on the line under test to dial a **0** when a tone is heard on the line.
5. Change the **REQ** field to **DIAL**.
6. Execute a **DIAL** request to start the test.

   Response: The callback connection stays in the TALK mode.
   The tone supplied by the DCTU and the digit dialed by the ``customer'' are audible.
   VER 80: DIAL OK DIAL SPEED OK BREAK OK displayed and printed.

7. Ask the ``customer'' to dial **9** when the next tone is heard.
8. Repeat the test.

   Response: **VER 81: DIAL NOT OK INCORRECT NUMBER OF PULSES** displayed and printed.

9. Drop all accesses.
10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.15: PERFORM TRACING TONE, LOOK FOR SHORT, AND SOAK TEST

OVERVIEW

This procedure checks the ability of the system to apply metallic or longitudinal tone to help identify a specific pair or binder group, respectively. Also, the ability of the system to monitor the line for the occurrence of a resistive fault, and to determine the stability of a resistive fault is checked.

PROCEDURE

1. Contact the office to be tested to request assistance at the MDF for this test.
2. Execute a **TONE** request to apply metallic (tip to ring) tone to the line under test.

   Comment: Tone audible through a handset connected to tip and ring of the test line.

3. Ask the person at the MDF to short tip to ring on the line under test.

   Response: The status line for the line under test is backlighted.
   Message at the bottom of the screen indicates the change of state for the line.

4. Ask the person at the MDF to remove the tip to ring short.
5. Execute a **TONE** request to increase the volume of the tone.
6. Verify that the volume has increased and no error messages are printed.
7. Execute an **XTONE** request.

   Response: Tone is dropped but the test access stays up.

8. Execute a **TONECA** request.

   Response: Longitudinal (tip to ground and ring to ground) tone applied to the line under test.

9. Verify that the tone can be heard tip to ground and ring to ground on the line under test.
10. Execute an **XTONE** request to remove the tone from the line.
11. Get a callback access to the line under test.
12. Answer the callback line and press the **0** key.
13. Execute a **LOOK** request to initiate a ``look for short'' transaction.
14. Ask the person at the MDF to again short tip and ring on the line under test.

    Response: A tone is heard on the callback line for as long as the short is applied.

15. Ask the person at the MDF to remove tip to ring short and to ground the tip side of the line under test.

    Response: A tone is heard on the callback line for as long as the ground is applied.

16. Ask the person at the MDF to remove the ground from the tip side of the line under test and to apply ground to the ring side.

    Response: A tone is heard on the callback line for as long as the ground is applied.

17. ***NOTE:*** The subsequent measurements are inaccurate callback is not dropped.

    Drop callback.

18. Ask the person at the MDF to remove the ground and to re-apply the tip to ring short.

19. Initiate a **FULL** test on the line.

    Response: **VER 26: MDF TEST RECOMMENDED, VERY HARD SHORT** displayed and printed.

20. Execute a **Q** request to run a quick test on the shorted line.

    Response: Test results indicate the tip-ring short.

21. Ask the person at the MDF to remove the short and to connect a 30K to 100K ohm resistor tip to ground or ring to ground on the line being tested.

22. Execute a **SOAK** request to initiate a soak test on the line.

    Response: Test results indicate that the fault is stable and did not vary during the soak test.

23. Drop all accesses.

24. Ask the person at the MDF to restore the line to its original state.

25. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.16: PERFORM SINGLE-SIDED RESISTIVE FAULT SECTIONALIZATION TEST

PROCEDURE

1. Select a line to test, such as the open single-party line.
2. Connect 5K ohms resistor tip to ground.
3. Add cable simulation equipment (build-out boxes) ``beyond'' the fault.
4. At the LMOS VDT, do Steps 5 through 11.
5. Execute a **QUICK** request.

   Response: The correct fault is displayed and printed.

6. Execute a **LOCATE** request to initiate the fault sectionalization process.
7. Strap tip to ring at the open end of the cable kit as instructed in the response from **LOCATE**.
8. Enter the office temperature in the **TEMP** field.
9. Execute a **LOC1** request to initiate the fault location measurement.
10. Check the results against the actual amount of cable kit added beyond the fault and the cable gauge.
11. Restore test line to its normal state.
12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.17: PERFORM 2-SIDED RESISTIVE FAULT SECTIONALIZATION TEST

PROCEDURE

1. ***NOTE:*** A second, ``good'' line is required, which is strapped to the pair under test.
2. Connect resistive faults of 5 K-ohms to ground on the tip-ground and ring-ground legs of the line under test.
3. Add cable simulation equipment (build-out boxes) ``beyond'' the fault.
4. At the LMOS VDT, do Steps 5 through 8.
5. Execute a **QUICK** request.

   Response: The faults are correctly indicated.

6. Execute a **LOCATE** request.

   Response: The two pair fault location test is recommended.
   The correct faults on the line are indicated.

7. Change the **TN** field to the number of the good pair.
8. Execute a **LOCGP** request.

   Response: The selected pair is indicated acceptable.
   A status line for the good pair that indicates **GP** is created.

9. Strap the good pair to the bad pair as directed by the **LOCGP** response.
10. At the LMOS VDT, do Steps 11 through 15.
11. Enter the office temperature in the **TEMP** field.
12. Enter **LOC2** in the **REQ** field.
13. Enter the status line number of the bad pair in the **L#** field.
14. Initiate the test.
15. Check the distance from strap returned by **LOC2** versus the length of cable kit added between the fault and the strap and the cable gauge.
16. Restore test line to its normal state.
17. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.18: VERIFY MLT/ISDN FEATURE PACKAGE 1 (FP1) - DCTU METALLIC TESTS

OVERVIEW

This procedure tests the capability of the DCTU to correctly detect pre-ANSI standard Lucent Technologies AMI NT1s and to verify the polarity of their wiring. Cases involving conflicts between line record information and switch configuration are also included. This procedure assumes that MLT/ISDN FP1 is enabled and, if available, MLT/ISDN FP2/FP3 is disabled. All tests on the integrated services line unit (ISLU) test line are performed at an appropriate LMOS VDT.

PROCEDURE

1. Ensure that MLT/ISDN FP1 is enabled and, if available, that FP2/FP3 is disabled.

2. Ensure that the test line is configured to an AMI U-DSL (Figure 2-30) as follows:

   (1) On ISLU, ensure that an AMI U line card is installed.

   (2) Ensure that an AMI NT1 is connected across test line T-R.

3. Verify that the test line DN and DSL Line Records are correct in the MLT FE (Section 2.19.9).

4. Ensure that the test line is correctly populated in the switch ODD.

5. Perform a **FULL** test.

   Response: **VER 0**
   TEST OK
   VALID AMI NT1 SIGNATURE
   SWITCH INDICATES ISDN SERVICE
   LINE RECORD INDICATES ISDN

6. Perform a **FULL** with **Y** override test.

   Response: **VER 0**
   TEST OK
   TESTED WITHOUT LINE RECORDS
   VALID AMI NT1 SIGNATURE
   SWITCH INDICATES ISDN SERVICE

7. Reverse AMI NT1 T-R wiring.

8. Perform a **FULL** test.

   Response: **VER IA**
   WIRING ERROR - AMI NT1 REVERSED
   SWITCH INDICATES ISDN SERVICE
   LINE RECORD INDICATES ISDN

9. Perform a **FULL** with **Y** override test.

   Response: **VER IA**

TESTED WITHOUT LINE RECORDS
WIRING ERROR - AMI NT1 REVERSED
SWITCH INDICATES ISDN SERVICE

10. Drop test access.

11. Disconnect AMI NT1 and connect an analog telephone across test line T-R.

12. Perform a **FULL** test.

    Response: **VER IF**
    INVALID TERM ON ISDN CIRCUIT
    LINE RECORD INDICATES ISDN
    SWITCH INDICATES ISDN SERVICE

13. Drop test access.

14. Disconnect analog telephone and connect ANSI NT1 across test line T-R.

15. Perform a **FULL** test.

    Response: **VER IF**
    INVALID TERM ON ISDN CIRCUIT
    LINE RECORD INDICATES ISDN
    SWITCH INDICATES ISDN SERVICE

16. Drop test access.

17. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.19: VERIFY MLT/ISDN FP2/FP3 - DCTU METALLIC TESTS

OVERVIEW

This procedure tests the capability of the DCTU to correctly detect standard ANSI NT1s. Cases involving conflicts between line record information and switch configuration are also included. This procedure assumes that MLT/ISDN FP2/FP3 is enabled and, if available, MLT/ISDN FP1 is disabled. All tests on the integrated services line unit (ISLU) test line are performed at an appropriate LMOS VDT.

PROCEDURE

1. Ensure that MLT/ISDN FP2/FP3 is enabled and, if available, that FP1 is disabled.

2. Ensure that the test line is configured to an ANSI U-DSL (Figure 2-30) as follows:

   (1) On ISLU, ensure that an ANSI U line card is installed.

   (2) Ensure that an ANSI NT1 is connected across the test line T-R.

3. Perform an **MET** test.

   Response: **VER 0**
   TEST OK
   VALID ANSI NT1 SIGNATURE
   SWITCH INDICATES ISDN SERVICE
   LINE RECORD INDICATES ISDN

4. Perform an **MET** with **Y** override test.

   Response: **VER 0**
   TEST OK
   TESTED WITHOUT LINE RECORDS
   VALID ANSI NT1 SIGNATURE
   SWITCH INDICATES ISDN SERVICE

5. Drop test access.

6. Disconnect ANSI NT1 and connect an analog telephone across the test line T-R.

7. Perform an **MET** test.

   Response: **VER IF**
   INVALID TERM ON ISDN CIRCUIT
   LINE RECORD INDICATES ISDN
   SWITCH INDICATES ISDN SERVICE

8. Drop test access.

9. Disconnect analog telephone and connect an AMI NT1 across the test line T-R.

10. Perform an **MET** test.

    Response: **VER IF**

INVALID TERM ON ISDN CIRCUIT
LINE RECORD INDICATES ISDN
SWITCH INDICATES ISDN SERVICE

11. Drop test access.
12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.20: VERIFY MLT/ISDN FP1 - LTS METALLIC TESTS

OVERVIEW

This procedure tests the capability of the LTS to correctly detect pre-ANSI standard Lucent Technologies AMI NT1s and to verify the polarity of their wiring. Cases involving conflicts between line record information and switch configuration are also included. This procedure assumes that MLT/ISDN FP1 is enabled and, if available, MLT/ISDN FP2/FP3 is disabled. All tests on the integrated services line unit (ISLU) test line are performed at an appropriate LMOS VDT.

PROCEDURE

1. Ensure that MLT/ISDN FP1 is enabled and, if available, that FP2/FP3 is disabled.
2. Ensure that the test line is configured to an AMI U-DSL (Figure 2-30) as follows:
   (1) On the ISLU, ensure that an AMI U line card is installed.
   (2) Ensure that an AMI NT1 is connected across the test line T-R.
3. Ensure that the test line ISDN DN and DSL Line Records are correct in the MLT FE (Section 2.19.9).
4. Ensure that the test line is correctly populated in the switch ODD.
5. Perform a **FULL** test.

   Response: **VER 0**
TEST OK
VALID AMI NT1 SIGNATURE
LINE RECORD INDICATES ISDN
6. Perform a **FULL** with **Y** override test.

   Response: **VER 0**
TEST OK
TESTED WITHOUT LINE RECORDS
VALID AMI NT1 SIGNATURE
7. Drop test access.
8. Reverse AMI NT1 T-R wiring.
9. Perform a **FULL** test.

   Response: **VER IA**
WIRING ERROR - AMI NT1 REVERSED
LINE RECORD INDICATES ISDN
10. Perform a **FULL** with **Y** override test.

    Response: **VER IA**
TESTED WITHOUT LINE RECORDS

WIRING ERROR - AMI NT1 REVERSED

11. Drop test access.
12. Disconnect AMI NT1 and connect analog telephone across test line T-R.
13. Perform **FULL** test.

    Response: **VER IF**
    INVALID TERM ON ISDN CIRCUIT
    LINE RECORD INDICATES ISDN

14. Drop test access.
15. Disconnect analog telephone and connect ANSI NT1 across test line T-R.
16. Perform a **FULL** test.

    Response: **VER IF**
    INVALID TERM ON ISDN CIRCUIT
    LINE RECORD INDICATES ISDN

17. Drop test access
18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.21: VERIFY MLT/ISDN FP2/FP3 - LTS METALLIC TESTS

OVERVIEW

This procedure tests the capability of the LTS to correctly detect standard ANSI NT1s. Cases involving conflicts between line record information and switch configuration are also included. This procedure assumes that MLT/ISDN FP2/FP3 is enabled and, if available, MLT/ISDN FP1 is disabled. All tests on the integrated services line unit (ISLU) test line are performed at an appropriate LMOS VDT.

PROCEDURE

1. Ensure that MLT/ISDN FP2/FP3 is enabled and, if available, that FP1 is disabled.
2. Ensure that the test line is configured to an ANSI U-DSL (Figure 2-30) as follows:
   (1) On the ISLU, ensure that an ANSI U line card is installed.
   (2) Ensure that an ANSI NT1 is connected across the test line T-R.
3. Ensure that the test line ISDN DN and DSL Line Records are correct in the MLT FE (Section 2.19.9).
4. Ensure that the test line is correctly populated in the switch ODD.
5. Perform an **MET** test.

   Response: **VER 0**
   TEST OK
   VALID ANSI NT1 SIGNATURE
   LINE RECORD INDICATES ISDN

6. Perform an **MET** with **Y** override test.

   Response: **VER 0**
   TEST OK
   TESTED WITHOUT LINE RECORDS
   VALID ANSI NT1 SIGNATURE

7. Drop test access.
8. Disconnect ANSI NT1 and connect an analog telephone across the test line T-R.
9. Perform an **MET** test.

   Response: **VER IF**
   INVALID TERM ON ISDN CIRCUIT
   LINE RECORD INDICATES ISDN

10. Drop test access.
11. Disconnect the analog telephone and connect an AMI NT1 across test line T-R.
12. Perform an **MET** test.

Response: **VER IF**
INVALID TERM ON ISDN CIRCUIT
LINE RECORD INDICATES ISDN

13. Drop test access.

14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.22: VERIFY COMBINED MLT/ISDN FP1 AND FP2/FP3 - ANSI U-DSL DIGITAL AND METALLIC TESTING

OVERVIEW

This procedure tests the capabilities of the combined MLT/ISDN FP1 and FP2/FP3 to perform digital and metallic tests on ANSI U-DSLs. This procedure assumes that MLT/ISDN FP1 and FP2/FP3 are enabled. All tests on the ISLU test line are performed at an appropriate LMOS VDT.

PROCEDURE

1. Ensure that MLT/ISDN FP1 and FP2/FP3 are enabled.
2. **Is an ANSI U-DSL (Figure 2-30) test line available?**
   If YES, then continue with Step 3.
   If NO, then go to Step 9.
3. Ensure that the ANSI U-DSL test line (Figure 2-30) is correctly configured as follows:
   (1) The test line terminates on an ANSI U line card in the ISLU.
   (2) An ANSI NT1 is connected across the test line T-R.
   (3) Appropriate customer premises equipment (CPE) with digital loopback capability is connected to the NT1.
4. Perform an **LINESP** test.

   Response: Line information is returned.
5. Perform an **LPBK** test.

   Response: Loopback (LPBK) information is returned.
6. Perform a **FULLX** test.

   Response: **VER 0**
   TEST OK
   VALID ANSI NT1 SIGNATURE
   SWITCH INDICATES ISDN SERVICE
   LINE RECORD INDICATES ISDN
7. Perform a **DIG** test.

   Response: **VER 0**
   TEST OK
   SWITCH INDICATES ISDN SERVICE
   LINE RECORD INDICATES ISDN
8. Perform an **METX** test.

   Response: **VER 0**

TEST OK
VALID ANSI NT1 SIGNATURE
SWITCH INDICATES ISDN SERVICE
LINE RECORD INDICATES ISDN

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 5.23: VERIFY COMBINED MLT/ISDN FP1 AND FP2/FP3 - AMI U-DSL DIGITAL AND METALLIC TESTING

OVERVIEW

This procedure tests the capabilities of the combined MLT/ISDN FP1 and FP2/FP3 to perform digital and metallic tests on AMI U-DSLs. This procedure assumes that MLT/ISDN FP1 and FP2/FP3 are enabled. All tests on the ISLU test line are performed at an appropriate LMOS VDT.

PROCEDURE

1. Ensure that MLT/ISDN FP1 and FP2/FP3 are enabled.
2. Ensure that the AMI U-DSL test line (Figure 2-30) is correctly configured as follows:
   (1) The test line terminates on an AMI U line card in the ISLU.
   (2) An AMI NT1 is connected across the test line T-R.
   (3) Appropriate customer premises equipment (CPE) with digital loopback capability is connected to the NT1.
3. Perform an **LINESP** test.

   Response: Line information is returned.
4. Perform an **LPBK** test.

   Response: Loopback (LPBK) information is returned.
5. Perform a **FULLX** test.

   Response: **VER 0**
TEST OK
DSL IN SERVICE
DIGITAL AND METALLIC TESTS OK
6. Perform a **DIG** test.

   Response: **VER 0**
TEST OK
DSL IN SERVICE
7. Perform an **METX** test.

   Response: **VER 0**
TEST OK
VALID AMI NT1 SIGNATURE
SWITCH INDICATES ISDN SERVICE
LINE RECORD INDICATES ISDN

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

6. CORRECTIVE MAINTENANCE GUIDELINES

6.1 INTRODUCTION

6.1.1 SCOPE

The MLT interface to the *5ESS*® Switch is composed of a complex array of hardware and software subsystems residing in two separate locations, the automated repair service bureau (ARSB) or its equivalent and the *5ESS*® Switch wire center(s). Likewise, there is a large volume of documentation available to personnel in each location to support the administration, operation, and maintenance of each location. As stated in Section 1 , this manual does not attempt to duplicate that documentation, but refers to applicable documents as required to aid in the isolation and repair of a fault.

The procedures provided in Section 7 do not cover "hard" faults within the MLT front end (FE) (hardware or software), the data communication network (DCN) and the FE-to-DCN communication links.

An FE fault results in error message(s) at the FE console and numerous error responses from the LTSs and/or DCTUs that interface to the FE. This fault is passed to the *DEC*™/minicomputer group data technicians for resolution.

A failure of any one DCN component does not eliminate communications due to the high degree of redundancy designed into this complex of microprocessors. A failed component would be detected by routine maintenance procedures. This fault is passed to the mini-computer maintenance group for resolution.

The FE hardware is connected to the DCN usually directly by cable, but sometimes by Lucent Technologies 209A data sets. Two independent communications links are provided for redundancy. Thus, one link can fail without affecting MLT performance. A failed link would be detected by routine maintenance procedures. This fault is also passed to the mini-computer group for resolution.

The procedures in Section 7 concentrate on fault conditions indicated during MLT testing of integrated and universal *SLC*® carrier systems. Extensive MLT testing experience has shown that such faults have been the most difficult to resolve.

6.1.2 MAINTENANCE RESPONSIBILITIES

6.1.2.1 General

The recommended organization of maintenance responsibilities for the system is discussed here. But, because the many Bell Operating Companies (BOCs) are organized into seven independent Regional BOCs (RBOCs) and there are numerous independent operating telephone companies (OTCs), the organization of maintenance responsibilities can vary from one organization to another. In all cases, the key to efficient use of maintenance resources is to comply with the established escalation procedures to solve persistent problems. This means that a maintenance organization should only contact the next higher level maintenance organization for assistance.

6.1.2.2 MLT Maintenance Responsibilities

6.1.2.2.1 Facilities Manager

The Assistant Manager -- MLT Facilities, is referred to as the Facilities Manager (FACMAN), has the overall responsibility for the maintenance and administration of the MLT. In general, the primary task of the FACMAN is one of coordination among the various centers (such as the Maintenance Center and Centralized Repair Service Attendant Bureau) that make use of the testing systems and the various organizations responsible for repair of the equipment. The FACMAN should have a thorough understanding of the MLT architecture and function (hardware and software), and be familiar with all of the following documents:

□ ***OPA-2P251***	MLT Results User Guide
□ ***OPA-2P252***	MLT-2 SAM Usage Guide ***or***
OPA-2P768	MLT-3 SAM Usage Guide
□ ***OPA-2P253***	MLT-2 LAM Usage Guide ***or***
□ ***OPA-2P762***	MLT-3 LAM Usage Guide
□ ***OPA-2P255***	MLT-2 LTS Diagnostics Usage Guide ***or***
OPA-2P764	MLT-3 LTS Diagnostics Usage Guide
□ ***OPA-2P256***	MLT-2 LTS Diagnostic Test Codes ***or***
OPA-2P765	MLT-3 LTS Diagnostics Test Codes
□ ***OPA-2P257***	MLT-2 DCN Diagnostics Usage Guide ***or***
OPA-2P761	MLT-3 DCN Diagnostics Usage Guide
□ ***OPO-2P250***	MLT-2 System Operations Guide ***or***
OPO-2P760	MLT-3 and MLT/ISDN System Operations Guide
□ ***OPI-2P250***	MLT-2 Implementation Planning Guide ***or***
OPO-2P760	MLT-3 Implementation Planning Guide.

In addition, the FACMAN should have knowledge of installation/repair, Repair Service Bureau (or Maintenance Center), and central office (CO) operations. A FACMAN job summary is provided in MLT TEXT MANAGER file **fac.jobsum**.

Once a problem has been isolated to a single component of the system, the FACMAN contacts the appropriate organization. The contacted organization dispatchs the personnel to clear the trouble. Maintenance of the loop testing system (LTS), test trunks, and other equipment located at the CO is the responsibility of the Network Maintenance organization which is discussed in Section 6.1 .2.2.2

6.1.2.2.2 Primary MC Contact

Each MC (maintenance center) should have a primary MC contact to serve as the point of contact with Facilities Management. The primary MC contact should be an LMOS/MLT expert who can answer any questions that might arise, as well as isolate system problems to report to the FACMAN. The MC contact should be informed of all system changes or maintenance that affect MC operations. The better this person understands the ``ins and outs'' of system maintenance, the better the relations between the FACMAN and MC.

The primary MC contact should have the following information:

- Local Administration and Maintenance (LAM) User Guide (OPA-2P253) (Describes the MLT system and LAM mask)
- A list of maintenance contacts to call in case of a problem
- A list of questions that are asked whenever a trouble is reported (MC Trouble Report)
- An MLT MC Trouble Log (Lets the primary MC contact keep track of all reported and cleared troubles)
- A list of maintenance priorities (Gives the primary MC contact an idea of how quickly a particular problem may be cleared)
- MLT Trouble Guide for NTTs - MLT TEXT MANAGER file **fac.troubleguide** (OPA-2P252 MLT SAM Usage Guide).

6.1.2.2.3 References

An overview of MLT maintenance is provided in MLT TEXT MANAGER file **nfe_ov.maintenance**. Trouble clearing strategy is in file **fac.troubclear**. File **fac.resp** defines the organizations responsible for maintenance of the system components and the recommended escalation procedures.

6.1.2.3 *5ESS*® Switch Maintenance Responsibilities

The Network Maintenance organization is responsible for *5ESS*® Switch maintenance, as well as for MLT equipment located at the CO site. Maintenance supervision is usually located at a switching control center (SCC) which is a centralized maintenance center for a group of *5ESS*® Switches. The personnel staffing of a switch site can vary from smaller switches that are not regularly staffed at all to very large systems that are continually staffed and have their own maintenance organization. A maintenance supervisor should have a thorough understanding of the architecture and function (hardware and software) of the switching system. In addition, this position requires knowledge of installation/repair, Repair Service Bureau (or Maintenance Center), MLT, and other operations support system operations.

A maintenance supervisor should be familiar with the 235-xxx-xxx series of Lucent Technologies manuals, especially the following:

□ 235-105-110	*System Maintenance Requirements and Tools*
□ 235-105-200	*Precutover and Cutover Procedures*
□ 235-105-210	*Routine Operations and Maintenance Procedures*
□ 235-105-220	*Corrective Maintenance Manual*
□ 235-105-231	*Hardware Change Procedures - Growth*
□ 235-105-250	*System Recovery Manual*
□ 235-118-2xx	*Recent Change Procedures - Menu Mode* (Value of ``***xx***'' is software release dependent).

The maintenance supervisor should also be familiar with the use of such documents as the following:

□ 235-600-700	*Input Message Manual*
□ 235-600-750	*Output Message Manual*
□ 235-080-100	*Translation Guide*
□ ***SDs***	*Schematic Drawings with their corresponding* ***CDs*** *(Circuit Descriptions).*

6.1.3 MAINTENANCE ASSUMPTIONS

The effectiveness of the procedures in Section 7 are based on the following assumptions:

- A failed test is repeated at least two additional times to verify that a ``hard fault'' does exist.
- Fault isolation and correction activities at the MLT site are performed by the MLT FACMAN or their equally qualified representative.
- Fault isolation and correction activities at the *5ESS*® Switch site are performed by the maintenance supervisor or their equally qualified representative.

6.1.4 SEQUENCE OF PROCEDURES

Corrective maintenance always begins with Procedure [7.1] which provides a list of error responses and their probable causes. The probable causes are based on actual experiences during MLT/*5ESS*® Switch testing. This information aids maintenance personnel in localizing and isolating a fault where the error response alone does not provide sufficient guidance. As previously stated, the procedures in Section 7 concentrate on the universal and integrated SLC carrier systems. If Procedure 7.1] does not result in isolating a fault involving a SLC carrier system, then Procedure [7.2] is used to determine the sequence of detailed procedures required to systematically troubleshoot the specific MLT/*5ESS*® Switch/SLC carrier system complex. This sequence of procedures ***must*** be performed exactly as provided.

7. CORRECTIVE MAINTENANCE PROCEDURES

GENERAL

This section provides individual corrective maintenance procedures for the MLT interface.

Procedure 7.1: ISOLATE FAULT(S) CAUSING AN MLT TROUBLE RESPONSE

OVERVIEW

Use this procedure to diagnose certain trouble responses received at the MLT and *5ESS*® Switch sites during line testing.

NOTE: Many trouble conditions reported by **VER** (verification) codes are documented in the **MLT Results User Guide (OPA-2P251)** to guide maintenance personnel to the isolation of the fault. Those VER codes are ***not*** repeated in this section. Therefore, when attempting to isolate the cause of a trouble response VER code,refer to OPA-2P251 ***first***. Also, this section does not address any VER code resulting from a "true fault" on a customer line, since such a response indicates that the MLT interface is functioning correctly.

PROCEDURE

1. Run the test that creates a trouble response at least three times to ensure that a "hard fault" does exist.

2. As an aid in isolating the cause of the trouble response, determine the extent of the trouble by answering the following questions:

   (a) Does the same trouble response occur for all TNs tested?

   (b) Does the same trouble response occur for all TNs sharing the same DC test pair?

   (c) Does the same trouble response occur for all MLT test ports?

   Examples: 1. If the trouble is an access problem across all pair gain systems, it typically is an XTC/PGTC/TBCU problem (wiring or hardware). If not, it often is a CTU/ADU problem.
   2. If the test results indicate the same fault on more than one TN, check for a defective DC test pair or a miswired "I" (inhibit) lead.

3. Locate the needed trouble response in Table 7.1-1 or Table 7.1-2 and/or, if an ISDN line, in Table 7.1-3 .

4. Is the error response listed in Tables 7.1-1 , 7.1-2 and/or 7.1-3 ?

   If **YES**, continue with Step 5.

   If **NO**, **SEEK TECHNICAL ASSISTANCE**

5. Using the probable cause(s) provided in Tables 7.1-1 , 7.1-2 and/or 7.1-3 , attempt to isolate the fault.

6. Was the fault isolated?

   If **YES**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE**

   If **NO**, then continue with Step 7.

7. Does the failed test involve a line served by an integrated or universal *SLC*® carrier system?

   If **YES**, then continue with Step 8.

If **NO**, **SEEK TECHNICAL ASSISTANCE**

8. Troubleshoot the MLT/SLC carrier system interface.

Reference: Procedure 7.2

□

Table 7.1-1 Probable Causes of MLT VER Code Trouble Responses

TROUBLE RESPONSE	DESCRIPTION
VER 03: OPEN IN	A. Retest several suspect **non-SLC** TNs using FULLX and if **VER 03**, try to identify whether it is NTT related. If it is NTT related, you may get a **VER 99** (open -in plus another failure). One alternative is to have the frame put a short on the MDF and retest with each NTT to see if MLT can detect it. ***Caution: It is best to get the access up prior to putting the short on the pair or you will have to wait about two minutes after the short is placed on the line to allow the line to go through the permanent signal stages (dial tone, announcement, howler). If MLT cannot identify the short, then the switch did not connect MLT to the line being tested (or the short was not installed properly) and the switch person will need to trace out. You can assist by using the TONE request to place tone on the suspect TN for the craft to trace.*** B. If **USLC**, the DC test pair may be open (or missing) at the switch end. C. If **ISLC**, the DC test pair may be open (or missing) at the switch end and the MTB translations in RCV 18.10 or RCV 18.15 may not be set for doing the DPT test. Ascertain that the CTU card at the RT has a diode (see **VER DP** Item A3). If a diode is there, the translations can be changed to allow the DPT to run (and give a **VER DP** - OPEN result). This would prevent a false dispatch into the switch. D. The Tollgrade MCU path may have an "open" between the CTU strapping and the (ODD) T and R leads on the MCU unit. E. If **SLC-8** the line record should be labeled not testable. Report these to the LMOS group. F. If **digital coin boxes** from Telesciences (these have a service code of 1TH). LMOS should be requested to make the 1TH service code not testable. This will eliminate the false "open-in" test result.
VER 05: TEST OK - CHANNEL NOT TESTED	A. If **ISLC**, **VER 05** is an indication that there is an insufficient number of Transmission Test Facility (TTF) software members built in the *5ESS*® translations. There can be a maximum of three members per TTF. The TTF(s) reside in the GDSU (Global Digital Service Unit). Usually only one (or two) member(s) is built, meaning that only one (or two) channel test(s) can be performed at a time. Unless a sufficient number of TTF members are built, there can be a high probability of blocking since each channel test takes about 25 seconds to complete. Additional requests will result in a **VER 05**. Confirm by testing 2 or 3 ISLC TNs at the same time. Contact switch to determine the number of members built. RCV 5.1, RCV 5.5, RCV 10.1, RCV 10.2 and RCV 20.5 indicate the member equipage. ***NOTE:*** In recent new switches, the GDSU is replaced by the DGSF (Digital Global Service Function) which has a single CP. The DGSF can be programmed to do several channel tests simultaneously. See also VER 57. B. If **ISLC** and the problem effects several RT's, the cause may be a defective TN304 CP in

	the TTF.
VER 11: CROSS TO WORKING PAIR	(A) If **SLC** and the MLT DC results indicate the battery is about -50 volts DC: (1) The PGS **inhibit** "I" lead may not be multipled at the MDF. **TEST:** Manually ground the "I" lead while monitoring the "R" lead with a voltmeter. Battery should go away when the ground is applied. ***Caution: The DC test pair may need to be disconnected during this test as the pair may have an outside battery cross on it.*** (2) If **USLC** and **ISLC** TNs on the same DC test pair and USLC works but ISLC does not, the "I" leads between the PGS's are missing. (3) The cause may be a defective CTU card at the COT.
VER 13: HAZARDOUS POTENTIAL	Suspect incorrect DCTU port card, SM 248B. CP must have a "B" designation.
VER 21: GROUND	A. If **SLC** and all lines to RT test **VER 21**, DC test pair (MCU) may be defective. B. If Disposition Code indicates closed to CO, MLT del_res may be set too low.
VER 22: SHORT	A. If **SLC** and all lines to RT test **VER 22**, DC test pair (MCU) may be defective. B. If Disposition Code indicates closed to CO, MLT del_res may be set too low.
VER 26: MDF TEST RECOMMENDED	If **USLC**, the MTB paddleboard for the **PGTC** may be upside down in back of the MA CP. This would cause the tip and ring leads to be reversed as well as the input and output leads to be reversed. Use TAF data to identify the associated PMU port.
VER 34: POSSIBLE INVALID ACCESS	If **NTT**: suspect SM248 CP on LTS.
VER 41: OPEN OUT	A. The correct result may be **VER 3: OPEN IN**. You need to test a few TNs that shows a "closeout" DISP code of 0531 or 0532 (MDF crossconnect trouble). This information can be obtained from TES data or special MTAS-type reports. Contact the switch frame person and have the heat coils pulled while you test each TN. If you have **MLT1** and **MLT2**, do a LOOPX (MLT1) and then a LOOP (MLT2) on each TN. If you only have MLT2, do LOOPX. Write down the VER code and the length of loop for each test. Some results may be **VER 3** (no length given). In this case drop a MLT test buffer using the "&L" request (MLT2) and locate the measured length at the end of the buffer. The buffer can be found in "cd /mlt/trace" and the command is "mat -f T10:03.2341919 |pg." What we are doing here is getting data to adjust MLT's delta length value. The longest length is the one that will be used to determine the new delta. Be sure this is done for both MLT1 and MLT2. An alternative method is to raise the "delta" length 200-300 feet and **monitor the VER 41 TES reports for any 0531 and 0532 DISP codes** a week or two later. In switches where getting someone to work with you is difficult, the latter procedure may be easier. ***NOTE:*** No switch should have a delta length value under 200 feet. All switches should have a delta length value commiserate with the distance to the first crossbox or equivalent "in versus out" demarcation point. In multi-story wire centers, this may be difficult to achieve because some subscribers may be very close to the switch MDF.

	B. If **VER 41** on **SLC** lines, examine the AC signature and the loop length of a few TN's. If they are approximately the same, then there is a good chance that the open is not on the customer's line, but at the RT. The DC test pair (or the Tollgrade MCU) may not be cross connected to any or all the CTU's. These connections are usually done on a cross-connect block at the RT. C. If **SLC Series 5**: The CFU (Channel Fuse Unit) in slot J50 of the blue bank must be installed at COT and RT even though it may be spare. It provides the 5-volt power for the CTU. In early vintage units this problem could cause a **VER 41**. In upgraded CFU's, this problem could cause a **VER 53**. D. In some cases, a missing DC test pair may give a false "open out" indication, **VER 41** instead of a **VER 3: OPEN IN**. Examine the MLT AC signature. If 2000K TR, TG and RG, the open is most likely at or near the switch.
VER 52: INVALID PG SIGNATURE	(A) If **ISLC** and battery shows up on the MLT TG and RG measurements, the cause may be a missing "quiet" ground on punching E3 on the **DCTU** PMU.
VER 53: PAIR GAIN SYSTEM BUSY	A. If **VER 53** is repeatable: (1) Check for a false ground on the "I" lead for the DC test pair. (2) Suspect the PGTC and the related wiring (28-lead multiple). ***NOTE:*** If other PG systems in the switch are testable, then the PGTC and the 28-lead multiple are probably functioning correctly. B. If **VER 53** is not repeatable, the cause may be that there are too many pair gain systems (96 lines each) on the same DC test pair (Tollgrade MCU, or RMU). A maximum of 10 PGS's (1000 TNs) is recommended. You will need to find out how many PGS's there are. PST testing can be a major contributor to **VER 53's**. ***NOTE:*** Some NGDLC's exceed this requirement. For example, Litespan can have only 2 DC test pair's per a maximum-equipped 4000-line system. C. Defective, missing or incorrect CTU at COT or RT. The CTU's code should be AUB 2 for COT and AUB 22 for RT. D. A "killer" CU is possible. It may be necessary to back out all CUs except the one under test. E. If **USLC**: Check for defective SM87C, SM88C, or SM94C in PGTC. F. If **USLC**: If alarm on system, refer to Lucent Practice 363-205-300 (XTC) or 363-202-300 (PGTC) to clear. G. If **SLC Series 5**: (1) Check for defective or incorrect BCU at COT or RT. (2) The CFU (Channel Fuse Unit) in slot J50 of the blue bank must be installed at COT and RT even though it may be spare. It provides the 5-volt power for the CTU. In early vintage units this problem could cause a **VER 41**. (3) The PCU (Power Control Unit) in slot J58 of the common shelf must be

	installed at the COT and RT even though it may be spare. It provides the 48-volt power to the CTU. (4) CTU busy due to craft interface unit access. (5) Channel test unit busy from remote operating device. (6) SARTS testing in progress on system. H. If **SLC Series 5** with Enhanced testing: (1) CTU missing at RT. (2) Incorrect type boards installed in COT or RT. (3) Incorrect Bank number set on ADU board. I. If **ISLC**: check for >24 volts across the Scan point. If voltage is missing, **T** and **R** leads may be reversed. J. If **ISDN** equipped, be sure that there are no spare ISDN CU's at RT without terminating equipment attached. Spare ISDN CU's can cause trouble with time slots and cause the CTU to lock up. Having spare CU's in the COT is OK. K. If **USLC**, see if the PGTC SM94C led lights and does not go out after a MLT test is run, the cause may be incorrect wiring of the high and low current sleeve resistors on the resistor panel. See Figure 7.1-5 **TEST:** (1) Using a voltmeter, measure the DC voltage from the **S** terminal to ground on the PGTC port under test. (The **S** terminal should not have any wires on it.) The voltage should be nominally -48 volts. (2) Using a current meter, measure the DC current from the **S** terminal to ground. The current should be between 33 and 48 milliamperes. If current measures between 10 and 15 milliamperes, the sleeve resistors are wired incorrectly (reversed).
VER 54: PAIR GAIN SYSTEM FAILURE	A. If retesting result for some TN's is ***not* VER 54**, look at the DISP column in TES. See if there are several 700 and 900 codes (OK line). This would be indicative of a flaky carrier system that goes out of service intermittently. If this kind of trouble happens frequently, you may want to contact a transmission engineer.
VER 54: PAIR GAIN SYSTEM FAILURE (Contd)	B. If **USLC**: (1) Check for a T-R reversal at the PGTC input (**TT, TR**) or output (**T, R**). (2) A PGTC port may not be wired (or wired incorrectly) to one or more NTTs. Verify wiring by doing several QUICKX tests on a POTS number. Be sure all NTTs are used and check the MLT DC signature each time for a T-G resistance of about 168K ohms. If the T-G resistance is much greater than this (e.g. 3500K ohms), suspect the wiring of the NTT used for the test. (3) If the problem is always there with a particular NTT, the PGTC SM 94C CP

	may be missing from its slot or the NTT may not even be wired to the PGTC. You need to have the NTT jumpers pulled. (4) If problem is intermittent with one NTT, the SM94C may be defective. It needs to recognize the 333 Hz tone from the CU. Swap SM94C's. (5) PGTC SM 94C may be stuck in "busy" mode: Busy LED lighted. (6) If problem is intermittent with all **NTTs** and the **LTS** is in another switch, the problem may be that the 117V signal from the LTS (to request DC bypass), may be marginal. Monitor the tip and ring on the NTT side of the PGTC with a butt set and listen for the 333 Hz tone from the CU. If tone is there, then the 117V signal is OK. If not, try swapping the two 150 volt power supplies on top of the LTS. One may be stronger than the other one. (7) The interbay cabling between the COT bays may be missing. C. If **DCTU** and **USLC**: The sleeve resistor paddleboard may be wired incorrectly. (See **VER 53** Item K for a test procedure.) D. If **DCTU** and **ISLC**: The DCTU "quiet" ground may be missing from punching E6 on the back of the DCTU (see **VER BB**). A missing "quiet" ground may also cause **VER BA**, **VER BB** and **VER 95**. **VER 95** will show a MLT DC signature that is the same as the ISLC signature: 56K TR, TG and RG. E. If **LTS** and **ISLC**: The TBCU SM500 CP may be defective. Newer SM500 CP's provide more sensitivity to the 117-volt MLT bypass signal. This problem may be pronounced when using a **Tollgrade NTT** because of the "built-in" 1350 ohms trunk resistance. F. If **XTC**: Check for missing noise suppression capacitors on back of PGTC shelf. G. If **XTC** and **DCTU**: Defective SM262 CP in DCTU shelf (tip side). Requires Phase 3 Diagnostics to detect. H. If **USLC** and **SLC Series 5**: the DTU at the COT may be missing. I. If **SLC Series 5** with Enhanced testing: (1) CTU or DTU missing at COT. (2) Incorrect series boards installed in COT or RT. (3) Incorrect Bank number set on ADU board.
VER 55: CHANNEL FAILURE	(A) If **USLC**: (1) SM94C CP in PGTC should be Series 3 or later. (2) Defective SM87C or SM88C in PGTC. (3) No superimposed ringing generator connected to PGTC Pin 10. (4) No ringing voltage at RT. Customer's phone will not ring. (5) Defective CU at the COT or RT.

	(6) Defective or "noisy" power supply at RT. (7) Check the SM88C error code in the LED display. Refer to Lucent Practice 363-202-300 to identify error code. (a) If error code indicates "noise" as the failure, check the series of the SM87C CPs in the PGTC. The series should be Series 3, or later. (b) If error code indicates "echo return loss" as the failure, check the series of the SM94C CPs in the PGTC. The series should be Series 3, or later. (8) Defective TN832 in LU. (9) Defective TN138 in MMSU. (10) Noise on MTB's caused by incorrect series TN331 or TN831. (B) If **ISLC**: Defective SM499 or SM500 pack in TBCU. (C) If **XTC**: Check for wiring error between PGTC shelf and XTC.
VER 56: BAD COT CHANNEL UNIT	(A) Defective COT CU. (B) Noise on MTB's caused by incorrect series TN331 or TN831. (C) XTUB and XTUD CPs in XTC are not correct issue for *5ESS*® . (D) Incorrect wiring from PGTC shelf to XTC.
VER 57: BAD RT CU OR RT COMMUNICA- TION PROBLEM	A. ***IMPORTANT NOTE:*** **VER FW: RT COMMUNICATION FAILURE - A recent modification to MLT's VER Code Enhancement Part II Feature, separates VER 57 into two parts:** □ **VER FW** will be reported if the switch cannot communicate with the RT because of translations, wiring or CTU problems. This VER code will always appear without any MLT results. □ **VER 57** will be reported only for actual channel test failures. Follow the procedures below for either **VER 57** or **VER FW**. B. If **VER 57** with MLT results, the RT channel unit may be bad. C. If **ISLC**: 1. **Do QUICK test:** (A) If TR, TG and RG results are each about 56 K ohms: 1. The switch translations are correct; 2. The MTB is wired correctly; 3. The master scan point and distributor points are wired correctly; and 4.The CTU at the RT operated. 5. **Skip to "Do LOOP test" below.**

(B) If "open in" result, the MTB from the MMSU to the TBCU is open or the TBCU SM500 CP may be missing.

(C) If no MLT results are reported, MLT will just report a "test equipment failure" or a "test equipment busy". Check the translations as follows:

2. **TBCU Translation and Wiring check:** Refer to Figure 7.1-5

A. RCV 18.10: DCLU MTB must be populated. The MTB must be the same as in RCV 18.12.

B. RCV 18.15: IDCU MTB must be populated. The MTB must be the same as in RCV 18.12.

C. RCV 18.12: MTB distributor points and master scan point must be populated and wired to the TBCU.

NOTE: All items must be in the same service group. If the DIST1 and DIST2 are reversed, **VER P3** may be reported. Check the inhibit "I" lead with a voltmeter to ground. Battery should be present when the DC test pair is idle and 0 volts when the DC test pair is in use. If battery is not present, the DIST points may be open or the wrong points are wired to the TBCU.

D. To verify the correct MTB translations and wiring, short the assigned MTB at the TBCU port appearance on the MDF. At the TLWS, do a DGN:MA on the TN138 MA CP. The MTB should fail if the wiring and translations are good. Remove the short.

E. The five distribute points should have battery across their tip-ring when in the idle state. First check the 5 distributor points for battery with a voltmeter. If battery is missing, check that the ring leads are strapped together and grounded on the bottom of the MDF block. Next, at the TLWS, do an EX:DISTPT and close each point while monitoring their T and R with a voltmeter. When the point is seized, battery should go to 0 volts if good.

F. To verify the correct master scan point translations and wiring, place a short across the scan point leads at the assigned TBCU port appearance on the MDF. At the TLWS, do an OP:MSUSP on the assigned TN220 CP. Remove the short and compare the assigned scan points with the one reported with the failure report from the OP command. If the wiring is correct the scan point identity should match. If not, trace out the wiring.

NOTE: The scan point is associated with the "I" lead of the DC test pair.

3. **Do LOOP test:**

A. If **VER 57** (or **VER FW**) and no MLT results:

1. The CTU CP (or equivalent) at the RT may be defective or missing.

2. The MTB translations may not be built (correctly).

B. If **VER 57** (or **VER FW**) and no MLT results, with **Litespan** and ISLC, edit the interface group. The DC test pair must be assigned "ED-IG:COT" and the bypass must be set to "1" or "2". The four T1 lines must also be loaded. The line code should be set for TR008.

C. If **VER 57** (or **VER FW**) and no MLT results, check for a multiparty (MP) CU at RT. If MP, RCV 18.10, page 2 should be checked to ensure that the channel unit is marked as MP, and not SP. Determine which type of channel unit should be in the RT. This type of discrepancy will cause the transmission test to fail.

D. If **VER 57** (or **VER FW**) check T1 line coding for all T1's in the 8 banks.

E. If **VER 57** on all RTs and only one TTF responder built in translations. The responder does the channel test and may be defective. [A newer equipment design replaces the GDSU (Global Digital Service Unit) which contains the TTF circuit packs with a single circuit pack design called the DGSF (Digital Global Service Function). This unit can be programmed to do several channel tests simultaneously.]

F. If **VER 57** occurs intermittently and there is more than one TTF responder member built, one may be defective. Try placing one member at a time out-of-service.

G. **PULSECOM** CPs, particularly the ACU, DLU and the CUs have been known to cause **VER 57**. **Lucent** CP's are preferred.

4. **Helpful Hints for VER 57 (or VER FW):**

(A) In RCV 18.10, enter bank number (from OE) and determine the MTB. Compare this with other banks on same DC test pair. If all MTB's are the same, the trouble may be a defective CTU CP.

(B) At RT, if CTU lights for 1 second and goes out, the trouble is at RT:

1. If **USLC**, check for any D4 CUs. These are used for special services. An option switch should be set to SLC, not D4.

2. If **USLC**, the LIU on the "A" shelf may be defective.

3. If **USLC**, the ACCU CP may be defective.

4. Check for a wiring cross on the backplane for DC test pair.

5. CTU must be an AUB22, not an AUB25.

(C) For **SLC Series 5**, if CTU busy (red) lamp at RT does not light check the J58 power plug. (See **VER 53**.

(D) If **VER 41**, check the J50 power plug. (See **VER 53**.)

VER 93: MARGINAL BALANCE	Probable causes for marginal balance are defective CPs: TN831, TN832, TN138 and TN880.
VER 95: RESISTIVE FAULT AND OPEN	(A) If **DCTU** and the MLT test results indicate a DC signature of about 56K TR, TG and RG, with both a QX and LX request, it means that DC bypass was not achieved. (1) Check for a missing "quiet" ground on punching E6 in the back of the DCTU. (See **VER BB** for more details.) (2) Swap out the associated SM500 CP in the TBCU. It may be defective and not be able to detect the 117V DC bypass signal from the PMU. Newer models of

	the SM500 CP are more tolerant and will accept a weaker signal.
VER 98: EXAMINE DETAILED TEST RESULTS	If **DCTU**, there should be a resistor paddleboard connected to each PMU. Each resistor paddleboard contains eight 650-ohm resistors, one for each tip and ring wire of the four DCTU ports on the PMU shelf). The ADEF table should have a value in the RES column of between 65 and 70. This value represents the 650-ohm resistor on the paddleboard plus some office wiring resistance (divided by 10). If the resistor paddleboard is missing on any PMU, but ADEF has a 65-70 value, any hard short, ROH condition, or hard ground will show up as a **VER 98**. Because missing resistor paddleboards is a common problem, it is strongly recommended that ***all*** **DCTU** PMUs be visually inspected. The resistor paddleboards are located at the upper left side of each PMU looking from the rear of the equipment. All PMUs on the DCTU must be inspected, as there have been many instances of partial equipage. That is, one or more PMUs may not have the resistor paddleboard. The 5ESS maintenance engineers should arrange for this inspection. The code for the resistor paddleboard is **"982LM Resistor Module Comcode 104385059"**. If a module is added to the **DCTU**, be sure to have the MLT Administer recalibrate the DCTU resistance to the MDF.
VER 99: MULTIPLE FAULTS	(A) Retest a few TNs and if you still get **VER 99**, you need to examine the data and the messages to determine the cause. They may be legitimate loop troubles. (B) If **DCTU** and **USLC**, and the symptom is +60 volts on the TV mask, check for missing (or miswired) sleeve resistors on SD-5D044-01 panel. Perform procedure 7.7 , steps 8 and 9 to verify.
VER B0: TEST EQUIPMENT BUSY	A. If all TNs that fail in the switch (or RSM) fail with **VER B0**, check the status of the **DCTU** trunk group. It may be OOS. To find the trunk group number, go to RCV 18.1 for a SM that has the **VER B0's**. Identify the DCTURTI and input it into RCV 10.2 that will convert it to the DCTU trunk group number. B. If repeatable on one or more SM's, the DCTURTI field in the RCV 18.1 for the SM(s) may not be populated. ***Note:*** If the field is populated incorrectly, a **VER BB** would be reported.
	C. If **DCTU** and **ISLC**, retest a few TNs with a LOOPX test and if the **VER B0** comes back within a few seconds (without any MLT test results), then the cause is most likely a switch communication problem with the RT. First, check that the MTB for the RT site has been built in the *5ESS*® translations. Next check RCV 18.12 for correct population of the master scan point and the 5 distribute points. Check for battery across the T and R punchings of the 5 distribute points. Particularly, **DIST** points 1 and 2 which are used for the DPT (diode protocol test). If battery is missing, check that the ring leads of the 5 distribute points are strapped together and grounded on the bottom of the MDF block. See attached Figure 7.1-1 . If above are OK, then the cause is most likely at the RT site. Also, see **VER 57** for additional testing procedures. D. If **DCTU** and **ISLC** and **5E11** Generic or later, master scan points may be miswired (for example, wired to wrong scan points). This problem crops up with this and later generics because they now contain a diagnostic for verifying scan point assignment. E. If **Litespan**, the DC test pair for Interface Group must be populated. F. If **NTT** and **ISLC**, verify that the MLT trunk group switch translations are correct. Particularly,

in RC View 5.1, screen 7, Item 189 labeled "MLT ISLC OPT." This option should be set to "Y." If not set to "Y", all PGS Busy's and PGS Failures (normally **VER 53** and **VER 54**) will be reported as **VER B0** and **VER BS**.

G. If **DCTU** and **non-SLC**, and only a few SMs are involved, the cause may be a MMSU engineering or MTB wiring problem.

H. If the **VER B0** is intermittent, there may be too many LU's assigned to one MMSU shelf. About 20-22 LU's should be the maximum. There may also be A-link blocking at the LU. There may be too many high-usage lines on the LU.

I. Check RC View 9.5; NNX may not be populated correctly.

VER BA: NO DCTU PORT AVAILABLE

(A) Using the SAM mask, check the number of DCTU ports equipped and if any are out of service.

(1) If any ports are out of service, issue trouble ticket to the switch to fix.

(2) Check for a missing "quiet" ground wire on punching E6 on the back of the DCTU Control Panel (top shelf). See **VER BB**.

(3) If all ports are in service, determine if there are enough DCTU ports equipped for the number of access lines on the switch. Find out the number of access lines and check the following MLT engineering guidelines for proper DCTU port equipage. DCTU sizing obtained from Lucent Practice 235-060-110, Section 15. Local company guidelines may supercede these guidelines.

Number of Working Lines	Number of Ports
0 - 30,000	4 (1 PMU)
10,000 - 70,000	8 (2 PMUs)
70,000 -110,000	12 (3 PMUs)

VER BB: DCTU NOT AVAILABLE

(A) If just a few SM's are involved (particularly the higher numbered ones), verify that the route index to the DCTU (DCTURTI in RCV 18.1) has been built in the translations for the SM(s). Compare DCTURTI with that of a testable SM.

(B) If problem is intermittent and occurs with most SM's, check punching E6 on the back of the DCTU Control Panel (top shelf). It should have a black 16-gauge wire on it going to the "quiet" ground window of the *5ESS*® switch. If this ground is not there, you may get **VER BA**, **VER BB**, **VER 54**, or **VER 95** results. Also be sure that punchings E2-5 have black wires on them. These wires connect the "quiet" ground to each of the equipped PMUs.

(C) If many SM's are involved and the problem occurred on more than one day, issue ticket to switch and request running all phases of DCTU diagnostics.

(D) The DCTU may be OOS because one of it's component parts (EAN, Ports, PMUs) may have been placed OOS either automatically or manually.

VER BC: NO GDXC AVAILABLE

(A) If the time that the **VER BC** occurred is after about 9:00 p.m., the cause is usually a GDXC contention problem between MLT and **ALIT**. Prior to 5E Generic 5E13, ALIT hogs all the GDXC's when it is running. (The MLT PMU port almost always requires a GDXC CP before it can connect to the customer loop.) Alert *5ESS*® technical support of this problem. They may be able to reschedule ALIT to start later at night. 5E13 Base *5ESS*® software reserves one GDXC in each service group of each MMSU for MLT-type testing while ALIT is running. This should alleviate the hogging problem.

	(B) If the time that the **VER BC** occurred is before the ALIT start time, the cause may be a GDXC shortage (either in use or out of service) or an MMSU engineering problem: not enough GDXC CPs to handle the peak MLT testing load. Test a few numbers with LOOPX to see if you can reproduce the problem. You ***must*** test each number at least twice because the problem may exist in only one of the two MMSU service groups (MLT testing alternates between service groups SG0 and SG1). This problem may only occur during heavy traffic periods and may be difficult to reproduce. You can check with the switch to see if any GDXC's are OOS. You can try to reproduce the problem by putting up several (4-5) accesses at a time using the LOOP request. [If you have TES, select the TN's from the TES printout.] If not reproducible, try a second set of TN's. If reproducible, indicate on the trouble ticket the TN's used and which one failed. The switch ought to be able to reproduce the same trouble using their TLWS.
VER BD: NO MTB AVAILABLE	The dominant cause is an MA pack(s) in the degraded mode. The MA(s) CPs need to be restored back to service. There is a contention problem between ALIT and REX when the SM(s) housing the MMSU(s) are tested at the same time. This problem started with *5ESS*® Generic 5E11. A temporary work around is to schedule the MMSU SM(s) to be tested by REX after ALIT testing has completed. A *5ESS*® software fix will correct this problem. It will be in 5E13 base and retrofitted to 5E11 and 5E12 generics.
VER BE: NO MTIB AVAILABLE	Indicates that the MMSU switching matrix cannot interconnect the desired devices because the MTIB paths are all in use. This can indicate a MTIBAX (TN138) CP problem or improperly assigned testing devices (DCTU ports, PGTC ports or TBCU). Some probable causes are: (A) MMSU assignment problem (Line Unit MTB assigned to shelf with no LTP on shelf). (B) MTIBAX CP problem (C) MTIB wiring problem (MTIB cable not connected properly between MMSU's).
VER BF: NO MA PACK AVAILABLE	Because of repeated DPT (diode protocol test) failures on the MTB between the MMSU and TBCU), MA circuit packs may go out of service for 10-15 minutes and then automatically restore to service. If the problem occurs frequently, send a ticket to the switch with some of the TNs that have the problem. The MTBs must be fixed to prevent this from reoccurring. The *5ESS*® generic 5E12 software will alleviate this problem by only taking out of service the MTB involved and not the entire MA CP.
VER BG: NO MAB AVAILABLE	Indicates that the MMSU switching matrix cannot interconnect the desired devices because the MAB (Metallic Access Bus) interconnect paths (junctors) are all busy. Check for MMSU assignment problem: there should be a maximum of 2 PMU LTP's per SG per shelf.
VER BH: NO PRTC AVAILABLE	Indicates that the MTIB (Metallic Test Interconnect Bus) path to the Protocol Circuit (PTRC) is unavailable or all of the Protocol circuit hardware units are busy or out-of-service. Some probable causes are: (A) Protocol bus problem (B) MTIBAX CP problem (C) Common CP (TN879) is busy or OOS. It is recommended that you use the faster TN879B Common CP.
VER BI: NO MTB TO PGTC PORT AVAILABLE	(A) This VER code is for **USLC** only. Retest a few TNs with LOOPX to see if you can reproduce the problem. If reproducible, issue a trouble ticket on the switch listing some of the TNs tested. Indicate on the ticket that RC/V 14.7 must be built for ***all*** PGTC ports. This is the most common cause for this VER code. Maintenance engineering assistance may be required because there may also be a MMSU assignment or wiring problem with the PGTC port MTBs. See attached Figure 7.1-5

	for additional information. (B) If **VER BI** is intermittent, the cause may be an MMSU engineering issue. Verify that there is at least one PGTC port built for each service group.
VER BJ: NO MTB TO PGTC PORT EQUIPPED	Indicates that there is no PGTC accessible to this DCTU. This can mean that there is no PGTC port assigned to the MMSU.
VER BK: PGTC PATH SETUP BLOCKAGE	There may be an insufficient number of PGTC ports available on the MMSU. Check the switch translations. One RC/V 14.7 form is required for *each* PGTC port that is equipped on the MMSU.

VER BL: NO PORT AVAILABLE

A. If this is a one-time event in the past 30 days, ignore. [This can be determined from TES or TAF data, if available.]

B. **VER BL** gives an indication that there is an insufficient number of MLT trunks on the **LTS** to handle all of the MLT test requests. Trunks may be out of service or additional trunks may be required.

1. Check the DS mask and check for any trunks out of service and for trouble counts against them. If these are OK then you will need to determine if there are enough trunks equipped for the number of working lines in the switch. See the LTS sizing guidelines below:

No. of Working Lines	Test Trunks	PMUs
0 - 4K	3	1
4K - 10K	4	1
10K - 30K	6	2
30K - 50K	7	2
50K - 80K	9	3
80K - 100K	10	3
100K - 130K	12	3

2. If you have an **LTF**, deloading one or two switches from the **LTF** may alleviate the Port shortage problem.

VER BP: NO PMU AVAILABLE

(A) **VER BP** gives an indication that there is an insufficient number of PMUs (**DCTU or LTS**) to handle all the MLT test requests. Examine the DS mask to see if any PMUs are out of service.

(1) If a PMU is out of service, determine why and, if necessary, issue a trouble ticket.

(2) If all PMUs are in service then you need to determine if there are enough PMUs equipped for the number of access lines in the switch. See previously mentioned sizing guidelines (under **VER BA** and **VER BL**).

(3) If **DCTU:** If you repeatedly get a **VER BP** while testing, immediately check the ES mask to determine if there are any PMUs OOS. If not, the problem may be that the LTP (logical test port) for the PMU is OOS. This is a known problem to *5ESS*® . Find out what causes the LTP to go OOS. Until the problem is resolved there is nothing you can do. The PMUs will usually come back into service within a few minutes, probably after switch diagnosis.

VER BQ: NO DIALER AVAILABLE	Indicates that there is no **LTS** dialer available because all are either busy or out-of-service. It is recommended that the maximum number (two) of dialers always be provided.
VER BR: NO BUSY DETECTOR AVAILABLE	Indicates that there is no **LTS** busy detector available because all are either busy or out-of-service. It is recommended that the maximum number (two) of busy detectors always be

	provided.
VER BS: SWITCH BLOCKAGE	Indicates that the switch could not set up the access to the subscriber loop because of a switch resource shortage, or a switch failure condition. This would normally not be an MLT equipment problem unless there was a misdialing error (incorrect number of digits, or incorrect steering digits). Some other causes are: (A) If **DCTU** and **ISLC**, retest a few TNs with a LOOPX test. If the result **VER BS or VER B0** (or **VER FW:** RT COMMUNICATION FAILURE if you have the Enhanced VER Code Feature, Part 2) comes back within 2-3 seconds (without any test data), the cause is a RT communication problem. See **VER B0** Item C, for possible causes. (B) If **NTT** and **ISLC**, verify that the MLT trunk group switch translations are correct. Particularly, in RC view 5.1, screen 7, Item 189 labeled "MLT ISLC OPT". This option should be set to "Y". If not set to "Y", all PGS Busy's and PGS Failures (normally **VER 53** and **VER 54**) will be reported as **VER B0** or **VER BS**. (C) If **non-DLC**, the cause may be a defective GDXC CP or MA CP in the MMSU. Have Switch determine by running diagnostics on these CP's. (D) If **NTT** and only one or two SMs are involved, the cause may be SM translations. If this is the case, all tests on lines in the SM will fail.
VER BT: RMU IN USE	Indicates a request was made for access to an RMU already in use. Excessive occurrences may indicate that the RMU is serving too many lines (excessive loading of pair gain systems on the RMU).
VER BU: CAN'T CONNECT TO RMU	Indicates that a local modem was used and that a busy RMU was found.
VER BV: NO MODEM PORT AVAILABLE	Indicates that there is no modem port available when requesting access to an RMU. This applies to calls from either a local modem pool or from a *DATAKIT*® modem pool. This may indicate a shortage of modems.
VER DP: DEFECTIVE DC TEST PAIR	A. **VER DP** means that the *5ESS*® switch ran the diode protocol test on the DC test pair and it failed. If you have TES, test two TNs in each cable pair group and note the message on the VER code line (OPEN, SHORT, BATTERY, REVERSAL, GROUND). This will tell you why the pair is defective and what fault to put on the trouble ticket. If OPEN, determine by the AC signature if the open is at the switch end or at the RT. If the AC signature is 2000K ohms (TR, TG and RG), then the pair is either missing or open at or *near* the switch end. If less than 2000K, then the open is (usually) at the RT or (rarely) in the cable. (See Figure 7.1-2 .) Indicate on the trouble ticket the findings as well as some of the TNs. If the TR AC signature indicates the presence of a ringer (usually less than 20K ohms), see important note below. ***Caution: Only put one DC test pair trouble on a trouble ticket.*** **IMPORTANT NOTE:** If **VER DP** and **OPEN** is reported, examine the AC signature. If the MLT AC signature indicates the presence of a ringer, the cause is most likely: (1) The CTU card at the RT does not have the diode required for the DPT to pass. Without the diode, the DPT test will fail and falsely report an "open" (can't find the diode), even though the DC test pair wiring is correct. However, MLT will still be connected to the subscriber's loop and will report the correct loop signatures. This is why you can identify a ringer from the AC test results. (2) A translation error for the MTB of the DC test pair. For RT's not equipped with a diode, the translations should indicate that the DPT test should ***not*** be run. Have the switch check RC View 18.10 or 18.15 (depending upon the type of DLC equipment) and see if the MTP Protocol (RCV 18.10) is set to "N," or the CKT Test Method (RCV 18.15) is set to "RTU" (Remote Test Unit). See 235-105-300 document, Section 4 for more details, if necessary.

	(3) Early vintage Lucent CTU cards that were originally used in a Universal SLC96 environment may not have the diode. If the code on the CTU card does not have a letter following it (for example, WN20) then there is no diode. If WN20B, then there is a diode.
	B. If **VER DP** and **RAYNET's** Fiber to the Curb **(FTTC)** equipment and a **"SHORT"** is reported, suspect the OMU card at the HDT. It may be stuck (defective). There is one OMU card for each ONU unit at the curb. To find out which card is defective it will be necessary to test a number at each ONU. The one that gives a DC signature of about 35K TR, 90K TG and 90K RG, is the defective one. All good cards should give a DC signature of 17K TR, 45K TG and 45K RG as long as there is one defective card in the unit. When the defective card is replaced, the DC signature for all lines will then be 35K TR, 90K TG and 90K RG. The reason the good card signature changed when the defective card was replaced is because the defective card was effectively in parallel with the good cards, thus half the values.
VER E7: NPA/NNX NOT IN DATABASE	From the TES or TAF data determine the NNX(s) that are causing the problem. Determine whose database is incorrect: LMOS, COSMOS or MLT.
VER F0: TEST EQUIPMENT FAILURE	(A) If **RMU** related, check that the MLT database correctly identifies the test head: LTS vs. DCTU. This problem usually occurs after a switch conversion to a *5ESS*® with a DCTU. (B) If **RMU** related, call the RMU TN using a telephone and listen for data tone. If data tone is heard, run diagnostics and check that "SERVICE" indicates "AVAILABLE" and not "RMU_DLOAD". Do a download to correct. [If no data tone is heard, **VER FM** should be reported.] (C) If **RMU** related, DZ11 port may be hung. (D) If **DFTAC** used wrong TG for DFTAC on MLTACC table or DFTAC not translated on RC View 14.6.
VER FA: BUSY DETECTOR FAILURE	Indicates that the **LTS** busy detector failed when it was in use. Perform diagnostics.
VER FB: DIALER FAILURE	Indicates that the **LTS** dialer failed when it was in use. Perform diagnostics.
VER FC: PMU FAILURE	Indicates that a PMU failed when it was in use. Perform diagnostics on all PMUs.
VER FD: SLEEVE CONTROL FAILURE	Indicates that there was a sleeve control failure associated with the no-test trunk connected to the LTS.
VER FE: CONTROL FAILURE - ISLC/DCTU	Indicates that there was a control failure associated with the **DCTU** during an **ISLC** access or, possibly, during a **non-SLC** access. The failure may occur before or after bypass.
VER FF: CONTROL FAILURE - USLC/DCTU	Indicates that there was a control failure after bypass of a universal USLC line, when tested with a DCTU. Suspect PGTC SM94C CP.
VER FG: TBCU PROTOCOL TEST FAILURE	The most common cause of **VER FG** is either missing or faulty MTB (tip-ring) wires between the MMSU and the TBCU or a defective SM500 CP. Retest a few of the TNs that get this VER code. See Figure 7.1-2 . If problem can be repeated, issue a trouble ticket on the switch indicating the problem detected. Include some of the TNs. If problem cannot be repeated, wait until it occurs again before issuing a ticket.
VER FH: EQUIPMENT ACCESS FAILURE	Indicates that there was a failure in the LTS equipment that prevented access. Perform LTS diagnostics.
VER FJ: SWITCH FAILURE	(A) Certain series of ALIT circuit packs have relays that are susceptible to defective relay contacts that can hang on the MMSU shelf junctors. They are TN329B Series 14-18. CN 74535NW corrects this problem and updates the series to 19-22. A newer ALIT CP, TN329C Series 2, also corrects this problem as well as adding additional ALIT features: reduces PGTC lockup, reduces telephone "pinging", and adds a new FEMF test.

	(B) Another cause of **VER FJ** is defective MA circuit packs in the MMSU. If you can reproduce the problem with some TNs, write a ticket on the switch and suggest that they run Phases 1, 2 and 3 diagnostics on ***all*** MA packs in the MMSU. This must include the MTIBAX cards on each service group shelf. The MA and MTIBAX cards are TN138 CPs and have been known to "hang" on to the MMSU shelf junctors. MA packs tend to have sticky relay contacts. REX only runs Phase 1 and Phase 2 diagnostics. Phase 3 must be done on demand. It is important to request all three Phases because of a common practice to ignore REX failures (Phase 1 and Phase 2) on MA packs and to unconditionally restore them back into service. (C) If **ISLC**, the cause may be a defective Scan or Distribute CP in the MMSU (TN220B and TN221). Give the switch the TNs involved and they ought to be able to locate the associated Scan and Distribute CP's for diagnostics. (D) Set up the ROP to collect ptraces for **VER FJ** failures. See "Procedures for Identifying Causes of VER FJ's," Procedure 7.1-2 . (E) If **TBCU**, verify the wiring and translations for the scan and distribute points. (F) If all LU's on all MMSU shelves are affected, the power card in the MMSU may require reseating.
VER FK: GDXC FAILURE	Retest two suspect TN's twice each as the defective GDXC circuit pack (TN880) may be in either of the two MMSU service groups. If the fault is in only one service group, the failure may occur every other test. Indicate on the trouble ticket that the failure occurs every other test. Be sure to list the TNs that failed. If problem cannot be reproduced, then wait until it occurs again. Ask switch to test the TNs several times and to diagnose all of the GDXC CPs. Selection of which GDXC to use is dependent upon the LU location on the MMSU. The GDXC on the same shelf and service group is the first choice. If it is not available, a GDXC on another shelf is selected.
VER FL: MODEM CONNECTION FAILURE	Indicates that a local modem was obtained but failed in connecting to the **RMU**. The type of failures that can cause **VER FL** are: no dial tone, or no answer. This **VER** code applies to only those types of modems that provide a failure indication.
VER FM: RMU/CMU CONNECT FAILURE	The most likely cause of this failure is that the **RMU** is busy when tested from another MLT Front End, or that the **RMU** is disconnected. **VER FM** can also indicate that there is a *DATAKIT*® connection failure. The failure is probably a DKTRAM (Network Manager) problem.
VER FN: LOGIN FAILURE	Indicates that a modem was connected, but could not complete the login because of problems such as noisy connection, test head hardware problem, or password error.
VER FQ: STUCK RELAY	Indicates that a stuck junctor relay was detected with the MA CP.
VER FS: MSU OUT OF SERVICE	Indicates that the MSUCOM CP was out of service.
VER FT: CONNECT FAIL - PROTOCOL FAILURE	Indicates that there was no continuity detected on the MTB to the test equipment or to the line equipment.
VER FV: DEFECTIVE DIST OR SCAN CP	Indicates that the DIST or SCAN CP in the MMSU was found out of service.
VER FW: RT COMMUNICA- TION PROBLEM	(A) This new VER code is part of MLT's VER Code Enhancement Part II Feature. The failure reported by **VER FW** was originally reported as "**VER 57:** Bad RT CU or RT Communication Failure." With this feature, the two causes are separated. **VER 57** is for Bad RT CU. **VER FW** is for RT Communication Failure (no MLT results reported). The causes for **VER FW** are: (1) Translation errors (2) MTB wiring errors (3) Distributor point wiring errors (4) Master scan point error (5) Defective RT CTU CP

	(B) Refer to **VER 57** for procedures on how to test for these problems.
VER MT: MDF TESTABLE ONLY	The customer Line Record incorrectly indicates that the line has DLL (Dial Long Lines) equipment on it at the switch. Because MLT cannot test through the DLL amplifiers, 'uncatalogued opaque equipment' is placed on the line record CO field. DLL's were used on crossbar switches that no longer exist. When the switches went digital, the line records were not updated. Notify Line Record Support group that a line record error exists on these (as well as many other line records) and that all line records should be purged to remove the DLL indication.
VER T1: TIMEOUT IN TESTING	(A) If **LTS**, suspect TM 270 and TM 271 circuit packs. (B) If **LTS**, checks to see if "G" leads from no-test trunks connect to the LTS circuit at the MDF. The "G" leads should ***not*** be cross-connected to the LTS. They should stop at the MDF and be grounded there. See SD 2P076-01 Issue 19B. If the "G" leads connect to the LTS via the 711 connector, electrical noise on the grounded "G" leads may effect the 2024 data set operation, causing time-outs. (C) Defective data set or data link. Use dial back up, to isolate the cause. (D) If *DATAKIT*® or Multiplexer's are used, be certain that they are correctly wired to the "master" (universal) clock at both ends. If the master clock is not connected properly, telemetry timing may be incorrect which can cause time-outs. (E) If **DCTU** and all tests timeout, the IOP (SDL2 link) in the switch may be down. Call Switch to verify.

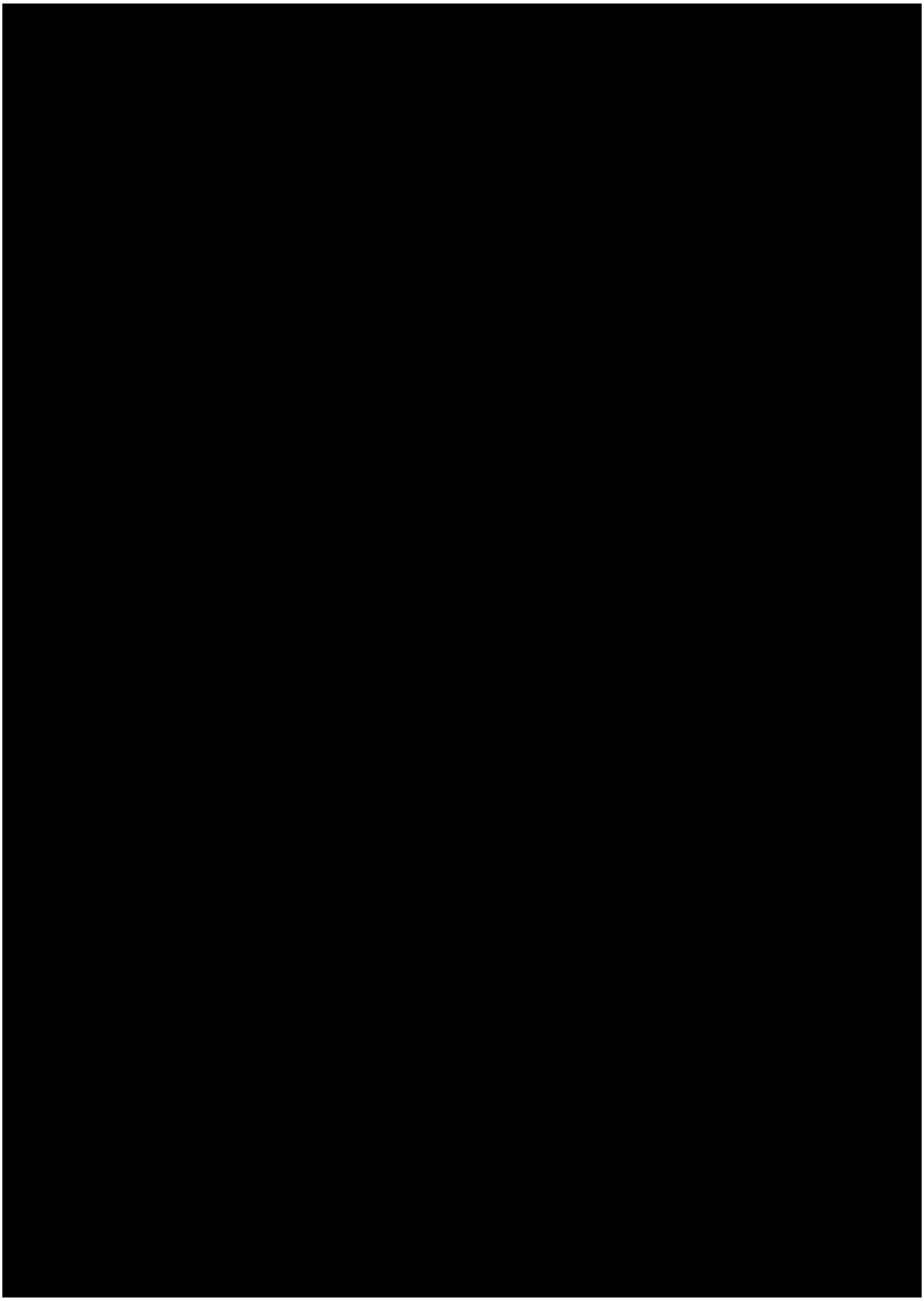

Figure 7.1-1 TBCU CROSS CONNECTIONS

Figure 7.1-2 5ESS ISLC DC Test Path

Table 7.1-2 Probable Causes of MLT Trouble Responses

DFTAC RELATED ERRORS: "Cannot Access MDF"	Translations error(s) (ensure trunk group members start at "0"). MLT LTSxxx.d data file, MLTACC data file and *5ESS*® Switch data base do not have the TK GRP number. Defective MA board (TN138).
"Incorrect MLT Results"	Crossconnects to MDF-TTC incorrect (T,R,S,G) (also check for T-R reversal). "S" and "M" relays in MDF-TTC SD-90070-01, out of adjustment. Wiring error on MDF test jack multiple. Paddle board on TN1040 CP incorrectly connected. Missing or defective cable from TN1040 (DFTAC) to MDF.
DATA LINK RELATED ERRORS: "SYSTEM TIMEOUT - REQUEST CANCELLED"	Missing or defective cable between data set and IOP. DCN problem (defective "level" card - perform microdiagnostics and/or switch with another DCTU). Data link problem. Data set problem (either end) (Verify compatible data sets are used at both ends). Data set options incorrect. The minimum data set options for 2024 type data sets are as follows: At *5ESS*® Switch : A2, B1, C5, E5 At MLT/DCN : A1, B1, C5, E5 Incorrect DCN port. Incorrect telephone numbers are associated with the specific data set. If IMLT: Switch at DCN ***not*** in **SYNC** mode. If data link on multiplexer, check options (vender dependent).
SDL Error Printout on ROP	Data link problem. If **RD** and **SD** lamps flash during MLT test, possible noise on *DCN-to-5ESS*® Switch data link. If **RD** or **SD** lamp is out, SDL may be out of service (Check MCC Page 113 for SDL **ACT**). If **RD** and **SD** lamps are ON but do not flash on a test request, MLT is not communicating data with the *5ESS*® Switch (possible data set options are incorrect). Data set options incorrect. The minimum data set options for 2024 type data sets are as follows: At *5ESS*® Switch : A2, B1, C5, E5 At MLT/DCN : A1, B1, C5, E5 Possible inter-LATA transmission problem. Possible SM equipment out of service (Check MCC Pages 141-144 and 1010,X for equipment **OOS**). Trunk group member out of service. Translation error.
CALLBACK "TIMEOUT"	Possible inter-LATA translation problem; check "Callback Prefix Table" in MLT FE. SM equipment out of service (Check MCC Pages 141-144 and 1010,X). Trunk group member out of service. Translation error. Ensure MA does not "bridge" callback line with second line when pressing **0** button.
CALLBACK (DROPS in RSM)	Verify on RC View 8.1 that attribute POFFLOSS is set to **N**.

"DOWNLOAD FAILED" "CAN'T DOWNLOAD - DCTU"	Dedicated TN must be in *5ESS*® Switch data base (See RC View 1.6 of dedicated TN). Ensure *5ESS*® Switch dedicated TN matches the one in the LTSxxx.d file. In LTSxxx.d file, dedicated TN must be 10 digits. DCTU port trunk group member must start at "0", this includes RSM. Ensure MLT data base is set up on only one front end. Ensure unique exchange key and unique dedicated TN for host and RSM DCTUs (Each DCTU must have own dedicated TN). If problems still exist, it is possibly an RSM problem with dedicated TN. (Need to regrow DCTU to find culprit; if one RSM bad, all DCTUs will indicate failure.)
TEST EQUIPMENT FAILURE (RING TRANSAC-TION USING MDF)	**BILL TO #** missing from CALLBACK TRUNK GROUP View 5.1. **PIC** not on CALLBACK TRUNK GROUP View 5.1 (Generates ASSERT 23752).

Table 7.1-3 Probable Causes of MLT Trouble Responses - ISDN

TROUBLE RESPONSE	PROBABLE CAUSE
VER IA: ISDN - NT1 TERMINATION REVERSED [a]	NT1 has been wired backward; does not affect service but may permit the loop to corrode.
VER IB: ISDN CKT - NON-ISDN LINE RECORD [b]	LMOS line record error (ISDN BRI feature not on line record). Line not configured for ISDN service.
VER IC: ISDN PAIR GAIN SYS- AMI- NO LOOP TEST [a]	This is not an error, but does indicate that the customer loop has not been tested, because metallic bypass is not possible with the AMI BRITE channel unit, so testing is possible only to the COT.
VER ID: TERM MISMATCH NON-ISDN CO EQUIP [b]	MLT found valid NT1 signature and line record indicates line is ISDN, but line is not wired for ISDN at the switch. Verify that service should be ISDN and correct switch error.
VER IF: INVALID TERM ON ISDN CKT	MLT has tested an ISDN circuit but has not detected an NT1: Termination is not an NT1. Correct NT1 not found Line card and NT1 are AMI, but MLT/ISDN FP1 is OFF. Line card and NT1 are ANSI [c], but MLT/ISDN FP2/FP3 is OFF.
VER IT: TERMINATION MISMATCH [d] "AMI LINE CARD - ANSI NT1" or "ANSI LINE CARD - AMI NT1"	Either incorrect line card or incorrect NT1
"LINE CARD AND COT MISMATCH"	Either incorrect line card or incorrect COT circuit pack(s).

Notes:

a. Valid only for AMI lines; MLT/ISDN FP1 must be ON (FP2/FP3 can also be ON).

b. Valid with MLT/ISDN FP1, FP2/FP3 or FP1 and FP2/FP3 ON, as applicable.

c. Registered trademark of American National Standards Institute, Inc.

d. Valid only with MLT/ISDN FP1 and FP2/FP3 ON.

PROCEDURES FOR IDENTIFYING CAUSE OF VER FJ'S

Only for 5E12 and 5E13 Base Load.

The following procedures will generate p-traces on the ROP to allow for the identification of the MTB and the MA pack responsible for the VER FJ failures:

(1) At MCC/STLWs, enter command to "allow metallic debug": **alw:metallic,debug**

(2) At MCC/STLWS, turn "tracemon" on: **chg:lps,msgcls=tracemon,print=on**

(3) When a VER FJ occurs, there should be two parts to a ptrace message. Part 1 identifies the errcode listed in the ERRCODE Table. Part 2 identifies the physical location of the MTB in

trouble. Two examples are given below (items in bold are used in examples):

Example A:

==
DTT Error Part 1: **errcode = 8,** mpjobtype = 2, base_dist = ox1200,
addr_scan = 0, scan_num = 0
041309000600
==

REPT PTRACE: PCccb_rpt.c AT LINE 1118 **PCRID 1**
DPT Error Part 2: basemax0 = 0x1337, **basemax1 = 0x1307**, basemax2 = 0x1337,
mtb0 = 14, **mtbl = 12**, mtb2 = 2, junc = 1
041310442800
==
==

Example B:

==
DTT Error Part 1: **errcode = 8**, mpjobtype = 2, base_dist = 0x1200,
addr_scan = 0, scan_num = 0
041320362100
==
REPT PTRACE: PCccb_rpt.c AT LINE 1118 **PCRID 1**
DPT Error Part 2: basemax0 = 0x1337, **basemax1 = 0x130D**, basemax2 = 0x1337,
mtb0 = 14, **mtbl = 6**, mtb2 = 9, junc = 1
041320373200
==

(4) ***Interpretation of Example A:***

(a) Identify errcode # in Part 1: **8**

(b) In errcode Table identify MTB0, MTB1 or MTB2 (See Figure 7.1-3) for the errcode: "diode relay test at far end of MTB1": For errcode 8 it is **MTB1**

(c) In Part 2, identify MTB# for MTB1: MTB1 = **12**

(d) In Part 2 identify basemax address for associated MTB; that is, for MTB0, use basemax0; for MTB1, use basemax1; for MTB2, use basemax2. : **1307** where **13** is the PICB# (in hex) and **07** is the slot position on the shelf. Odd PICBs are in SG1, and even PICBs are in SG0. Since **13** is odd, the MA pack is in **SG1**, position **07**.

(e) In Figure 7.1-4 find **xx07**. It is the one in the lower left corner. The MA pack identity is directly below the xx07: In this case it is MA**00**.
==

(f) In Part 2, the PCRID identifies the SM where the MMSU resides: **SM01**. Thus, the cause of the VER FJ failure is associated with **MTB12** on **MA00** in **SG1** of MMSU located in **SM01**.

(5) ***Interpretation of Example B:***

Following the same procedures as for Example A, the cause for the Example B VER FJ failure is associated with MTB6 on MA01 in SG1 in SM01.

ERRCODE TABLE

TEST NAME	ERRCODE	DESCRIPTION
ACSCNTST	1	AC scan point test for **mtb0**
DCSCNDGT	2	DC scan point and SD point test for **mtb0**
PXJNCMB1	3	power cross test on the junctor plus **mtb1**
STKRELAY	4	stuck junctor relay test [a]
MTBCONT1	5	mtb continuity test for **mtb1**
PXJNCMB2	6	power cross test on the junctor plus **mtb2**
MTBCONT2	7	mtb continuity test for **mtb2**
DIODOPN1	**8**	diode relay test at the far end of **mtb1**
DIODOPN2	9	diode relay test at the far end of **mtb2**
DIOCLOS1	10	closed diode continuity test for **mtb1**
DIOCLOS2	11	closed diode continuity test for **mtb2**
MTBGRCT1	12	mtb continuity tst for **mtb1** detected ground
MTBFVCT1	13	mtb continuity tst for **mtb1** detected FEMF
MTBSHCT1	14	mtb continuity tst for **mtb1** detected short

Notes:

a. Errcode 4 may be related to either the MA pack or the MTIBAX pack. If all tests fail it is probably the MTIBAX pack. If all tests fail to only one MTIB, then the MA pack is suspect.

Figure 7.1-3 MMSU MTB's

Figure 7.1-4 MMSU Service Group 0/1

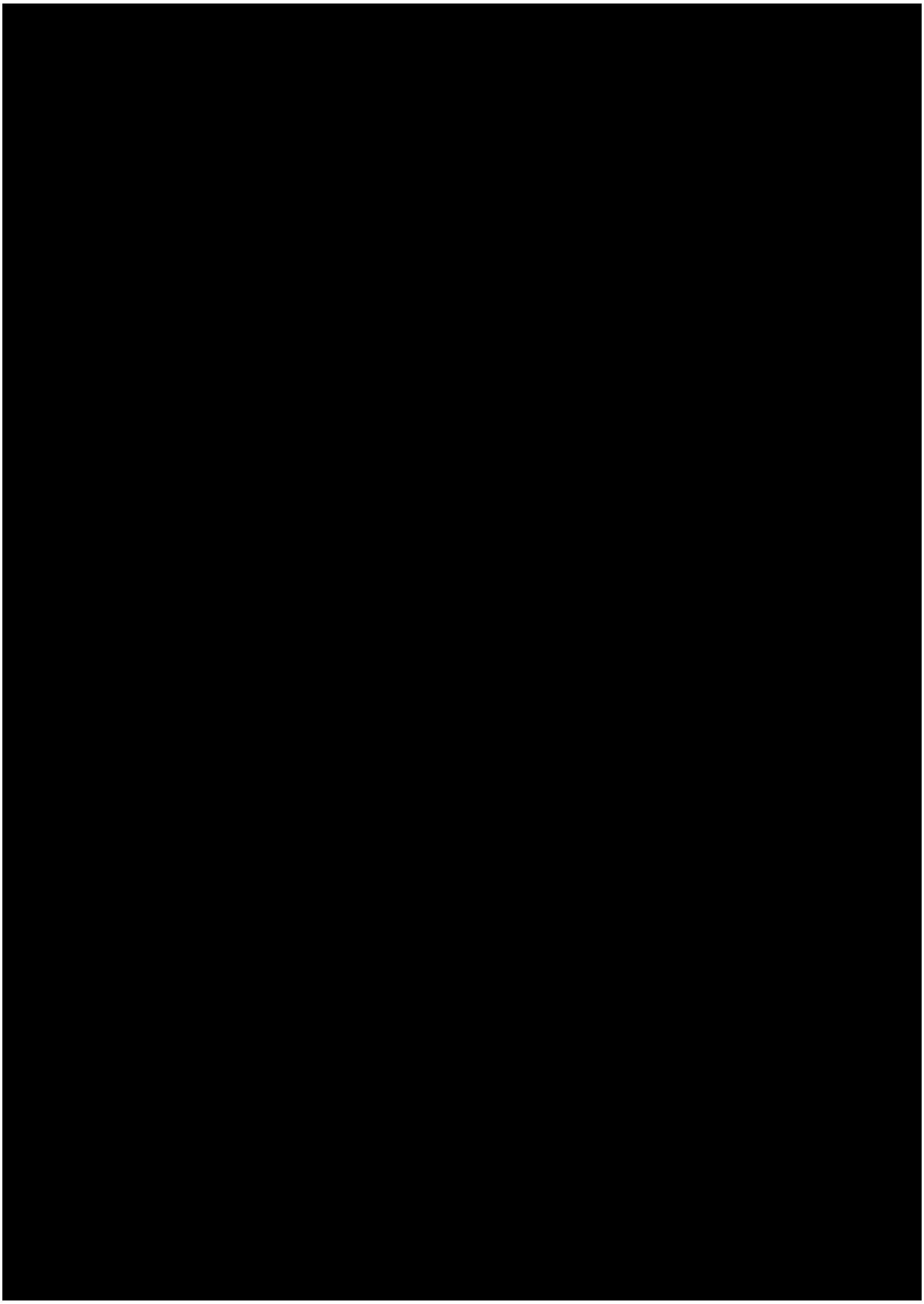

Figure 7.1-5 PGTC CROSS CONNECTIONS WITH DCTU

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 7.2: TROUBLESHOOT *SLC* CARRIER SYSTEM AND ITS MLT INTERFACE

OVERVIEW

Use this procedure when experiencing severe testing problems with a *SLC*® carrier system. The procedures referenced here aid in diagnosing the problem and lead you towards pinpointing the specific fault(s), whether it be *5ESS*® Switch translations, MLT data base errors, incorrect wiring, or a piece of hardware (IMLT/LTS, SLC carrier system, *5ESS*® Switch).

CAUTION 1: To successfully troubleshoot the MLT and SLC carrier system interface, you MUST perform these procedures in the exact sequence provided in the flowchart applicable to your specific configuration.

CAUTION 2: These tests assume that Lucent Technologies plug-in circuit packs are used at the COT and RT. These tests may fail due to other vendors' incompatibility.

NOTE: This procedure makes extensive use of the KS22475-L1 Trunk Test Set (TTS) and the KS22474-L2 Adapter. Refer to 660-168-274 if you need to know how to use either of them.

PROCEDURE

1. Which SLC carrier system configuration is under test?

   If **Integrated**, continue with Step 2.

   If **Universal**, go to Step 3.

2. Perform the procedures given in Figure 7.2-1 in the ***exact*** sequence provided to troubleshoot the integrated SLC carrier system and its IMLT/LTS interface.
   STOP. YOU HAVE COMPLETED THIS PROCEDURE.

3. Which is your MLT configuration?

   If **YES**, continue with Step 4.

   If **NO**, go to Step 5.

4. Perform the procedures given in Figure 7.2-2 in the ***exact*** sequence provided to troubleshoot the universal SLC carrier system and its IMLT interface.
   STOP. YOU HAVE COMPLETED THIS PROCEDURE.

5. Ensure that the resistor pads for **CN 70032CB** are correctly inserted into the tip and ring path of the no-test trunk (NTT). (See Figure 7.2-3 .)

6. Perform the procedures given in Figure 7.2-4 in the ***EXACT*** sequence provided to troubleshoot the universal SLC carrier system and its LTS interface.
   STOP. YOU HAVE COMPLETED THIS PROCEDURE.

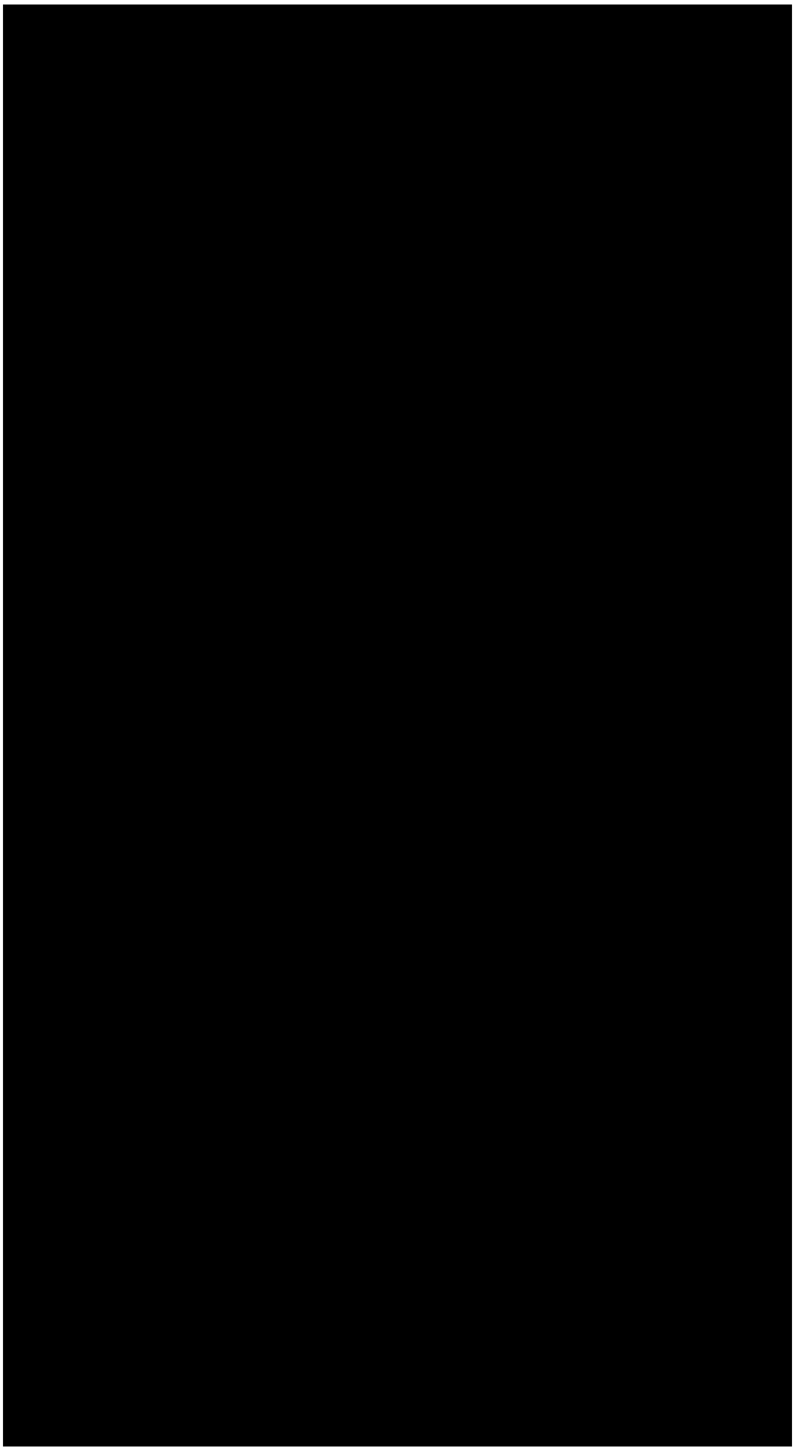

Figure 7.2-1 Integrated SLC Carrier System Testing Flowchart

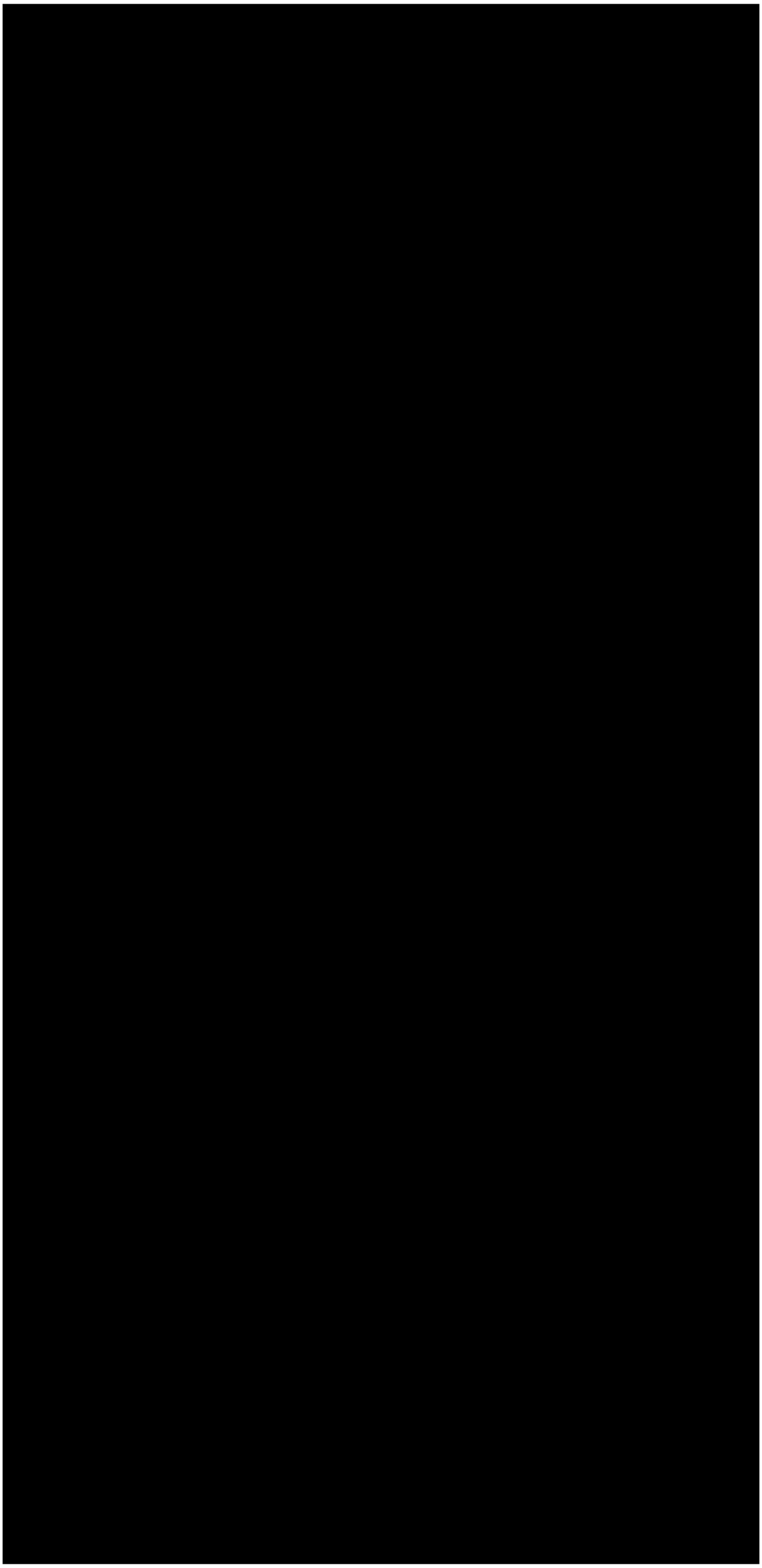

Figure 7.2-2 Universal SLC Carrier System Testing Flowchart - IMLT

Figure 7.2-3 Resistive Pad Installation for LTS - CN 70032CB

[redacted]

Figure 7.2-4 Universal SLC Carrier System Testing Flowchart - LTS

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 7.3: TEST THE TBCU THROUGH THE SWITCH

OVERVIEW

Use this procedure to test the translations and wiring of the test bus control unit (TBCU). Refer to Figure 7.3-1 for a diagram of items being tested.

NOTE 1: The following translations are required for setting up the transmission test facility (TTF) for performing channel tests and for accessing integrated *SLC*® carrier systems:

- VIEW 5.1 - TRUNK GROUP
- VIEW 5.5 - TRUNK MEMBER
- VIEW 10.1 - FIXED ROUTE
- VIEW 10.2 - ROUTE INDEX
- VIEW 18.10 - REMOTE TERMINAL ASSIGNMENT (INTEGRATED SLC96 CARRIER)
- VIEW 18.12 - REMOTE TERMINAL MTB (INTEGRATED SLC96 CARRIER).

NOTE 2: This procedure requires the use of an <u>no-test trunk (NTT) interface</u> with MF pulsing.

PROCEDURE

1. ***NOTE 1:*** This test is designed to fail if the RT is served by an RMU.

   NOTE 2: This test includes a diode protocol test that checks for continuity to the RT site over the dc test pair. Since the DC test pair does not exist, the test fails.

   Perform Phase 3, UCL diagnostics on the MA boards (TN138) that contain TBCU assignments.

2. Ensure that the following test equipment is available on site:
   - TTS (KS-22475 L1 Trunk Test Set or equivalent)
   - Adapter (KS-22475 L2 Adapter or equivalent)
   - Misc. 310 cords [ensure that they are of the 3-wire type (T, R, S)].

3. Set switches on TTS and Adapter as follows:

   (a) On TTS:
   - **CONTROL** to **ON HOOK**
   - **SLEEVE** to **CLOSED**
   - **CURRENT** to **HIGH**.

   (b) On Adapter:
   - **+SLEEVE** to **OPEN**

- □ **+CURRENT** to **HIGH**.

4. Insert Adapter into TTS.
5. Insert one end of a 310 cord into the **-48** jack on TTS, and connect the other end into the -48V supply jack.
6. Insert one end of a 310 cord into the **TRUNK** jack on TTS, and connect the other end to the **T**, **R**, and **S** leads of the NTT interface.
7. If a spare NTT interface is used for this test, be certain to ground the **G** terminal of the NTT interface. (See Figure 7.3-3 .)
8. On TTS, operate **CONTROL** switch to **OFF HOOK**.

   Response: **BAT ON RING** LED lights momentarily.
   BAT ON TIP LED lights and stays lighted.
   CURRENT LED lights.

9. On TTS, press **KP1** key, steering digits, four digits of an integrated SLC carrier TN, and **ST** key.

   Response: **BAT ON TIP** LED extinguished.
   BAT ON RING LED lights.

10. ***NOTE:*** The steering digits are usually the same as the NNX. If you fail this test with 120 IPM, you should verify the steering digits with the switch craft or the MLT Administrator.

    On TTS, operate **CURRENT** switch to **LOW**.

    Response: **BAT ON RING** LED extinguished (within six seconds).
    CURRENT LED remains lighted.

    Error Condition:

    If 120 IPM tone is heard and the **GRD ON RING** LED flashes, switch resources may be busy or unavailable, or the digits dialed were incorrect. Try again.

11. On TTS, operate **SLEEVE** switch to **OPEN**.

    Response: Dial tone should ***not*** be heard.

    Error Condition:

    If dial tone is heard, TN is not an integrated SLC carrier line. Disconnect from NTT interface and retest with an integrated SLC carrier telephone number.

12. On TTS, operate **SLEEVE** switch to **CLOSED**.
13. On TTS, operate **CONTROL** switch to **ON HOOK**.
14. ***NOTE:*** Steps 15 through 18 test for integrated SLC carrier system signature.
15. Using an ohmmeter, check for the 56K DELTA network from the **T**, **R**, and **GRD** posts on the

Adapter as follows:

(A) If an analog ohmmeter is used, measure **T** to **R**, **T** to **GRD**, and **R** to **GRD**.

Response: Ohmmeter reads approximately 25K to 35K for each of the three measurements.

(B) If a digital ohmmeter is used, ground the **T** terminal and measure **R** to **GRD**.

Response: Ohmmeter reads approximately 25K to 35K.

Error Condition:

If bad reading(s), replace the SM500 pack in the TBCU.

16. On Adapter, press **SLC** button for three seconds.

Comment: Tip and ring should be connected to the dc test pair if the access is good.

17. On TTS, operate **CONTROL** switch to **OFF HOOK**.

Response: Error Condition #1:

If **BAT ON RING** LED lights, open the dc test pair at the MDF to see if this extinguishes the LED. If it does, the dc test pair has a false battery on the ring side. If the LED stays lighted, check that the **T**, **R**, and **I** leads are properly strapped on the MDF. Correct any errors found before proceeding.

Error condition #2:

If 60 IPM tone is heard, system is in MAJOR alarm or testing path is not set up correctly.

Error Condition #3:

If 120 IPM tone is heard, the system may be busy or there was trouble setting up the dc test pair connection to the RT. If the MA board passes diagnostics and the ROP reports RT ``hits,'' the most likely cause is a bad channel unit(s) at the RT loading down the test bus. Check the **BUSY** LEDs on the RT channel units for false operation when a test is performed.

18. On TTS, operate **SLEEVE** switch to **OPEN**.

Response: If channel test is good, **BAT ON RING** LED lights.

Error Condition #1:

If **GRD ON RING** LED lights, channel test is bad. Replace channel unit at the RT.

Error Condition #2:

If no LEDs light:

- TBCU is wired wrong on MDF (see Figure 7.3-2). Check wiring using RC/V

View 18.12 for MTB under test.

- The MTB and dc test pair are wired wrong on MDF. **TT** and **TR** should be wired to the MTB. **T** and **R** should be wired to the dc test pair. (See Figure 7.3-2 .)
- Straps may be missing on TBCU block on MDF (on bottom of block). (See SD-97791-01 CAD 5 or CAD 6.) Quick check: associated SD points on block should measure nominally 48 volts T-R if straps are correct.
- Translations missing or incomplete (this is verified in Steps 21 through 34).

19. Disconnect TTS as follows:
    - Operate **CONTROL** switch to **ON HOOK**
    - Operate **CURRENT** switch to **HIGH**
    - Operate **SLEEVE** switch to **CLOSED**.

    Response: All LEDs extinguished.

20. ***NOTE:*** Steps 21 through 34 verify that the translations are built for integrated SLC carrier system channel test results.

    At the recent change and verify (RC/V) video display terminal (VDT) or equivalent, do Steps 21 through 34.

21. Display **VIEW 10.1 - FIXED ROUTE**
22. Enter **S96CTST** in the **TRMT** attribute field.
23. Get the route index (RTI) for the carrier channel test logical test port (LTP) trunk group from the **RTI** attribute field.
24. Display **VIEW 10.2 -- ROUTE INDEX (ROUTING)**
25. Enter the RTI number from View 10.1 in the **RTI** attribute field.
26. Get the carrier channel test LTP trunk group number (TGN) from the **TGN** attribute field.
27. Display **VIEW 5.1 - TRUNK GROUP**
28. Enter TGN obtained from View 10.2 in **(*)TGN** attribute field.
29. Verify attributes as follows:
    - **TRK CLASS LTPS96TF**.
30. Display **VIEW 5.5 - TRUNK MEMBER**
31. Enter TGN obtained from View 10.2 in **TGN** attribute field.
32. ***NOTE:*** The first trunk member number must be **0**.

    Enter **0** in **MEMB NBR** attribute field.

33. Verify that the field **OE** contains the correct operating telephone company (OTC) assignment.

34. Verify that all the trunk group members are in service.

Figure 7.3-1 TBCU Testing Through The Switch

Figure 7.3-2 TBCU Wiring - Normally Located on the MDF

Figure 7.3-3 No-Test Trunk Wiring - Normally Located on the MDF

35. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 7.4: TEST THE INTEGRATED *SLC*® CARRIER SYSTEM THROUGH THE SWITCH

OVERVIEW

CAUTION: Successfully complete Procedure 7.3 before starting this procedure.

Use this procedure to test the test bus control unit (TBCU) translations and wiring associated with the *5ESS*® Switch by testing for the integrated *SLC*® carrier system signature.

PROCEDURE

1. Contact a maintenance administrator for assistance in performing this procedure.
2. Have the maintenance administrator do a **QUICK** test on an integrated SLC carrier POTS number.

   Response: A DC resistance signature of about 56 K-ohms T-R, T-G, and R-G expected.

3. Is signature correct?

   If **YES**, go to Step 6.

   If **NO**, continue with Step 4.

4. Change the SM500 pack in the TBCU and rerun test.
5. Is signature now correct?

   If **YES**, continue with Step 6.

   If **NO**, **SEEK TECHNICAL ASSISTANCE.**

6. Is less than 3V DC indicated?

   If **YES**, go to Step 9.

   If **NO**, continue with Step 7.

7. ***NOTE:*** The DCTU must have a "quiet" ground.

   Ensure that the DCTU has a "quiet" ground wire (on punching **E3** on each PMU).

8. Is less than 3V DC now indicated?

   If **YES**, continue with Step 9.

   If **NO**, **SEEK TECHNICAL ASSISTANCE.**

9. Open the DC test pair at the MDF.
10. Have the maintenance administrator do a **LOOP** test.

    Response: **VER 3: OPEN IN** expected.

11. Is response correct?

If **YES**, go to Step 17.

If **NO**, continue with Step 12.

12. Have maintenance administrator **X** off.

13. ***NOTE:*** Either the SM500 pack is defective or the DC test pair is not wired correctly.

    Has the SM500 pack been replaced (Step 4)?

    If **YES**, continue with Step 14.

    If **NO**, go to Step 4.

14. Is the DC test pair correctly wired?

    If **YES**, **SEEK TECHNICAL ASSISTANCE.**

    If **NO**, continue with Step 15.

15. Correct DC test pair wiring.

16. Now go to Step 2.

17. Reconnect the DC test pair at the MDF.

18. Have the maintenance administrator **X** off.

19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 7.5: TEST PGTC TO THE COT AND RT - BYPASSING SWITCHING EQUIPMENT

OVERVIEW

Use this procedure to perform a quick test of the PGTC. It only tests the equipment and associated wiring used with the PGTC and the *SLC*® carrier system. Refer to Figures 7.5-1 7.5-2 and for a diagram of items being tested. This procedure assumes that the PGTC has been equipped and turned up (Reference: 363-202-300).

PROCEDURE

1. Ensure that the following test equipment is available on site:
   - ☐ TTS (KS-22475 L1 Trunk Test Set or equivalent)
   - ☐ Adapter (KS-22475 L2 Adapter or equivalent)
   - ☐ Misc. 310 cords [ensure that they are of the 3-wire type (T, R, S)]
   - ☐ 47A or 47B test extender
   - ☐ KS-22861, L1 digital multimeter or its equivalent.
2. Check DC and ringing supply voltage requirements for PGTC (Reference: 363-202-300).
3. ***NOTE:*** The following listed PGTC circuit packs (CPs) are the latest versions. The SERIES INTERCHANGEABILITY MARKINGS are shown if available. The SERIES INTERCHANGEABILITY MARKING is defined as "SX:Y", where "Y" equals the SERIES number of the CP and "X" equals the SERIES number of the the last Class A Universal (AU) change. The "X" SERIES number is the minimum required SERIES number. All SERIES numbers between "X" and "Y" are interchangeable. The SERIES INTERCHANGEABILITY MARKING or SERIES number is stamped on the CP latch. Older production CPs did not show the SERIES INTERCHANGEABILITY MARKINGS; they only show the SERIES number. If older vintage circuit packs work in this application, they are also indicated.

   Ensure that the correct CPs are installed in the PGTC, as follows:

   (a) PGTC Control Shelf, J1C142A, L1:
      - ☐ One SM86B S1:1 Control Shelf Power Unit or one SM 86 Control Shelf Power Unit
      - ☐ One SM88D S1:1 Control Unit or one SM88C Series 3 Control Unit
      - ☐ One to four SM87C S4:4 Tester Unit or one to four SM87C S2:3 Tester Unit [The SM87C S2:3 is identical to the SM87C S4:4. It was initially introduced as a Class A Conditional (AC) change]
      - ☐ One to six SM94C S1:5 Trunk Unit (one card per two test trunks).

   (b) PGTC Expansion shelf, J1C142A, L2:
      - ☐ One SM89 S1:1 Expansion Shelf Power Unit

- One SM90 S1:1 Fanout Extender Unit
- One to 10 SM94C S1:5 Trunk Unit (one card per two test trunks).

4. Set switches on TTS as follows:
   - **CONTROL** to **ON HOOK**
   - **SLEEVE** to **CLOSED**
   - **CURRENT** to **LOW**.

5. Set switches on Adapter as follows:
   - **+ SLEEVE** to **OPEN**
   - **+ CURRENT** to **HIGH**.

6. Insert the Adapter into the TTS.

7. Remove the SM94C trunk card under test from the PGTC (Start with the first SM94C card).

8. **CAUTION:** Only use the 47A or 47B test extender in SM 92/94 slots.

   Insert the 47A or 47B test extender into the **SM94C** slot under test and then insert the removed trunk card into the extender.

9. Insert one end of a 310 cord into the **-48** jack on the TTS and the other into the **-48** jack on the 47A or 47B test extender.

10. Insert one end of a 310 cord into **TRUNK** jack on the TTS and the other into the **TO XTC/PGTC** jack on the 47A or 47B test extender for the port under test (**ODD TRUNK** or **EVEN TRUNK**).

11. At the MDF, using a temporary 2-wire jumper, connect the **T** (TIP) and **R** (RING) of the trunk card port under test to a spare **T** and **R** appearance on a *SLC*® carrier POTS channel unit on the MDF (Refer to Figure 7.5-1 for a diagram of the wiring connection).

12. Remove all tester cards (SM87C), except the one under test.

13. On Adapter, press **SLC** button for three seconds.

    Response: On SM94C Card, the **BUSY** LED lights. On TTS, the **CURRENT** LED lights.

    Error Condition:

    If the **BUSY** LED on the SM94C card does not light, check the tip and ring wiring to the COT POTS channel unit for a reversal.

    Comment: Tip and Ring of TTS should be connected to dc test pair if the access is good.

14. On TTS, operate **CONTROL** switch to **OFF HOOK**.

    Response: Error Condition #1:

If **BAT ON RING** LED lights, open the dc test pair at the MDF to see if this extinguishes the LED. If it does, the dc test pair has a false battery on the ring side. If the LED stays lighted, check that the **T**, **R**, and **I** leads are properly strapped on the MDF. Correct any errors found before proceeding.

Error Condition #2:

If 120 IPM is heard:

- The system may be busy. Check the **I** lead for -48 volts to ground when the system is not in use. If the dc test pair is shared with more than one system, make sure the **I** leads are strapped together on the MDF for all systems using the same dc test pair.
- Check for missing COT and RT channel units.
- Check for defective, missing, or incorrect CTU at the COT and RT. See Figure 7.5-2 for correct CTU identities.
- If universal SLC 96 carrier system, the COT cable may be missing or wired incorrectly. To quickly check for this, measure for -48 volts on pin #1 of the CTU slot of the system under test. If -48 V DC is missing, the cabling is missing to PGTC. If -48 V DC is present, ground pin #1 and check the SM88C/D board display for an error code of digit **9**. If an error code of digit **7** is displayed, the cable wiring is reversed to the PGTC. If trouble is not found, refer to 363-202-300 to check out the entire multiple.
- If universal SLC Series 5 carrier system, the COT cable may be missing or wired incorrectly between the PGTC and the COT frames. To quickly check for this, measure for -48 V DC at pin #77 of the CTU slot on the system under test. If -48 V DC is not present, cabling is missing to the PGTC. If -48 V DC is present, ground pin #77 and the SM88C board should display an error code of the digit **9**. If an error code of the digit **7** is displayed, the cable wiring to the PGTC is reversed. If trouble is not found, refer to 363-205-300, Issue 2.00 or later to check out the entire multiple.

Error Condition #3:

- If a 60 IPM tone is heard, SLC carrier system is in MAJOR alarm.

15. On TTS, operate **SLEEVE** switch to **OPEN**.

Response: If channel test is good, the **BAT ON RING** LED lights and one burst of tone must be heard.

Error Condition #1:

If **BAT ON RING** LED lights but no tone is heard, replace the SM88C/D circuit pack with a spare and repeat from Step 13. If it still fails, replace SM94C Card after resetting the TTS switches as in Step 4.

Error Condition #2:

If **GRD ON RING** LED lights, the channel test failed. Replace either the channel units at either the RT or at the COT, replace the COT CTU, or replace the SM87C or SM88C/D cards in the PGTC.

Error Condition #3:

If SM88C/D displays an error code, identify cause and clear the problem.

Reference: 363-202-300

16. Disconnect TTS as follows:

    - Operate **CONTROL** switch to **ON HOOK**
    - Operate **SLEEVE** switch to **CLOSED**
    - Operate **CURRENT** switch to **HIGH**.

    Response: All **BUSY** LEDs extinguished.

    Error condition:

    If all LEDs do not extinguish, replace SM94C card.

17. On TTS, operate the **CURRENT** switch to **LOW**.
18. Repeat Steps 12 through 17 until all tester cards (SM87C) have been tested using this PGTC port.
19. Remove temporary 2-wire jumper on MDF.
20. Replace SM94C card into slot without the extender card, after both ports have been tested. (There are two ports on each SM94C card.)
21. ***NOTE:*** It is recommended that all PGTC ports be tested with each tester card.

    Repeat Steps 7 through 20 until all PGTC ports have been tested with each tester card.

Figure 7.5-1 PGTC to SLC Carrier System Temporary Wiring Connections

Figure 7.5-2 Testing the PGTC to the COT and RT - Bypassing Switching Equipment

22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 7.6: TEST THE PGTC THROUGH THE SWITCH

OVERVIEW

CAUTION: Successfully complete Procedure 7.5 before performing this procedure.

NOTE 1: This procedure requires the use of a no-test trunk (NTT) interface with MF Pulsing, and the PGTC wired in series with the trunk.

NOTE 2: The *SLC*® Series 5 carrier system is equipped with AUB2/AUB2B COT CTU and AUB22 RT CTU.

Use this procedure to test the *5ESS*® Switch translations and wiring, the NTT interface cabling from the PGTC to the switch, the path through the switch to a SLC carrier system channel and a locally switched SLC carrier system channel (Figure 7.6-1).

PROCEDURE

1. Ensure the following test equipment is available on site:

   - ☐ TTS (KS-22475 L1 Trunk Test Set or equivalent)
   - ☐ Adapter (KS-22475 L2 Adapter or equivalent)
   - ☐ Misc. 310 cords [ensure that they are of the 3-wire type (T, R, S)]
   - ☐ 47A or 47B test extender
   - ☐ KS-22861, L1 Digital Multimeter or its equivalent.

2. Set switches on TTS and Adapter as follows:

   (a) On TTS:

   - ☐ **CONTROL** to **ON HOOK**
   - ☐ **SLEEVE** to **CLOSED**
   - ☐ **CURRENT** to **HIGH**

   (b) On Adapter:

   - ☐ **+SLEEVE** to **OPEN**
   - ☐ **+CURRENT** to **HIGH**

3. Insert Adapter into TTS.

4. Remove the SM94C trunk card under test from the PGTC. (Start with the first SM94C card.)

5. **CAUTION:** Only use the 47A or 47B test extender in SM 92/94 slots.

   Insert the 47A or 47B test extender into the **SM94C** slot under test and then insert the removed trunk card into the extender.

6. Insert one end of a 310 cord into the **-48** jack on TTS, and insert the other end into the -48 supply jack.

7. Insert one end of a 310 cord into the **TRUNK** jack on TTS, and insert the other end into the 47A or 47B test extender jack labeled **TO XTC/PGTC** for the port under test (**ODD TRUNK** or **EVEN TRUNK**).

8. If a spare NTT interface is used for this test, be certain to ground the **G** terminal of the NTT interface. (See Figure 7.6-2 .)

9. On TTS, operate **CONTROL** switch to **OFF HOOK**.

   Response: **BAT ON RING** LED lights momentarily.
   BAT ON TIP LED lights.
   CURRENT LED lights.

   Error Condition:

   If using a 47A or 47B test extender and there is no response, the wiring to the PGTC is incorrect. (See Figure 7.6-2 .)

10. On TTS, press **KP1** key, steering digits, four digits of an idle POTS phone number, and **ST** key.

    Response: **BAT ON TIP** LED extinguished.
    BAT ON RING LED lights.

11. ***NOTE:*** The steering digits are usually the same as the NNX. If you fail this test with 120 IPM, you should verify the steering digits with the switch craft or the MLT Administrator.

    On TTS, operate **CURRENT** switch to **LOW**.

    Response: **BAT ON RING** LED extinguished (within six seconds).
    CURRENT LED remains lighted.

    Error Condition #1:

    If 120 IPM tone is heard and the **GRD ON RING** LED flashes, switch resources may be busy or unavailable, or the digits dialed were incorrect. Try again.

    Error Condition #2: If **BAT ON RING** LED remains lighted, the line may be busy. Try again or use another number.

12. On TTS, operate **SLEEVE** switch to **OPEN**.

    Response: Dial tone should be heard.
    BAT ON RING LED lights.

13. On TTS, operate **SLEEVE** switch to **CLOSED**.

14. On TTS, operate **CONTROL** switch to **ON HOOK**.

15. On Adapter, press **SLC** button for three seconds.

    Comment: Tip and ring of TTS now connected to the dc test pair if the access is good.

Response: On SM94C Card, the **BUSY** LED lights.

16. On TTS, operate **CONTROL** switch to **OFF HOOK**.

    Response: Error Condition #1:

    If 60 IPM tone heard, system is in MAJOR alarm.

    Error Condition #2:

    If "squeal" heard, MTB packs may be defective or incorrect.

    (A) If line units are Model 2, check the TN831 packs. They should be Series 9 or less, or Series 14 or greater.

    (B) If line units are Model 1, check the TN331 packs. They should be TN331B Series 5 or greater.

    (C) TN880 (any series) may be defective.

17. On TTS, operate **SLEEVE** switch to **OPEN**.

    Response: If the channel test is good, the **BAT ON RING** LED lights and one burst of tone is heard.

    Error Condition:

    If **GRD ON RING** LED lights, the channel test is bad.

    - Check the SM87C pack in the PGTC. It should be series 4:4 or greater.
    - Check the series of the circuit packs listed under Step 16, Error Condition #2 (A, B and C).

18. Disconnect TTS as follows:

    (1) Operate **CONTROL** switch to **ON HOOK**.

    (2) Operate **CURRENT** switch to **HIGH**.

    (3) Operate **SLEEVE** switch to **CLOSED**.

    Response: All LEDs extinguished.

Figure 7.6-1 Testing the PGTC Through the 5ESS Switch

Figure 7.6-2 Wiring Requirements - Trunk Test Set-PGTC-No-Test Trunk

19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 7.7: TEST THE PGTC TO THE DCTU THROUGH THE SWITCH

OVERVIEW

CAUTION: Successfully complete Procedure 7.6 before starting this procedure.

Use this procedure to test the associated PGTC and *5ESS*® Switch translations and wiring.

PROCEDURE

1. Ensure the following hardware is available (see Figure 7.7-1 and 7.7-2):

   - ***Metallic test buses (MTBs):*** Must be contiguous pairs and must be on the same pack within each MMSU service group.
   - ***Distribute points (DPs):*** Must be contiguous pairs and must be on the same pack within each MMSU service group.
   - ***PGTC ports:*** Two or more are recommended, one per service group per shelf, otherwise equipment blockage could occur (VER F0).

2. ***NOTE:*** Steps 3 through 7 verify that translations are built for non-directly connected PGTC access. Steps 8 through **10** verify that translations for directly connected PGTC access.

   At recent change and verify (RC/V) video display terminal (VDT) or equivalent, do Steps 3 through 7, or Steps 8 through 10.

3. Display **RECENT CHANGE VIEW 14.7 - PAIR GAIN TEST CONTROLLER**

4. ***NOTE:*** The PGTC frame number is 1 for the host switch. For an RSM/ORM/TRM/etc., the PGTC frame number is the number of the RSM/ORM/TRM/etc. For an MMRSM cluster, the PGTC frame number is the lowest RSM number in the cluster.

   Enter correct PGTC frame number in **PGTC FRAME** attribute field.

5. ***NOTE:*** The PGTC trunk number is numbered from 1 to 256. One is required per service group per MMSU shelf where DCTU ports reside.

   Enter correct PGTC trunk number in attribute field **PGTC NUMBER**.

6. ***NOTE:*** The MTBs for the PGTC are assigned in sequential pairs. The **MTB IN** is the lowest number of the MTB in the pair and is wired to the input side of the PGTC. The next MTB number of the MTB pair is the **MTB OUT** and is wired to the output side of the PGTC.

   Verify that attribute field **MTB IN** contains the correct MTB assignment for the low MTB.

7. ***NOTE:*** The PGTC distribute points are also assigned in sequential pairs. The PGTC low distribute point number (**DIST LOW**) is the ***high*** value resistor for the PGTC sleeve assignment. The next distribute point is for the PGTC ***low*** value resistor sleeve assignment.

   Verify that the field **DIST LOW** contains the correct low distribute point assignment.

   After completing this step, go to Step 11.

8. Display RECENT CHANGE VIEW 20.9 - DIRECTLY CONNECTED TEST UNIT using the SM number, PMU number, and DCTU number.

9. Verify that the correct MTB assignments have been made in the MTB A, MTB B, MTB C, MTB D attributes (these MTBs should be between the PGTC output ports and the MMSU). The DCTU should have MTBs going to the input ports on the PGTC.

10. ***NOTE:*** The PGTC distribute points are assigned in sequential pairs. The PGTC low distribute point numbers (LO DPN A, LO DPN B, LO DPN C, and LO DPN D) are the high value resistor for the PGTC sleeve assignment. The next distribute point is for the PGTC low value resistor sleeve assignment.

    Verify that the LO DPN A, LO DPN B, LP DPN C, and LO DPN D contain the correct low distribute point assignments.

11. ***NOTE:*** The high distribute point is normally operated.

    Using a VOM, measure the voltage from the **S** terminal to ground on the PGTC for the port under test. (The **S** terminal should not have any wires connected to it.)

    Response: Voltage should measure nominally -48 volts.

12. Using a VOM, measure the DC current from the **S** terminal to ground on the PGTC for the port under test.

    Response: Current should measure between 33 to 48 ma.

    Error Condition:

    If the current measures between 10 to 15 ma, the resistors are incorrectly wired.

13. Contact a maintenance administrator (MA) for assistance in testing.

14. Have the maintenance administrator do a **FULL** test on a POTS number served by a universal *SLC*® carrier system.

    Response: The **BUSY** LED lights on the SM94C Card being used in the PGTC.
    Response from the MLT **FULL** test should be:
    VER 0: TEST OK.

15. Have the maintenance administrator X off.

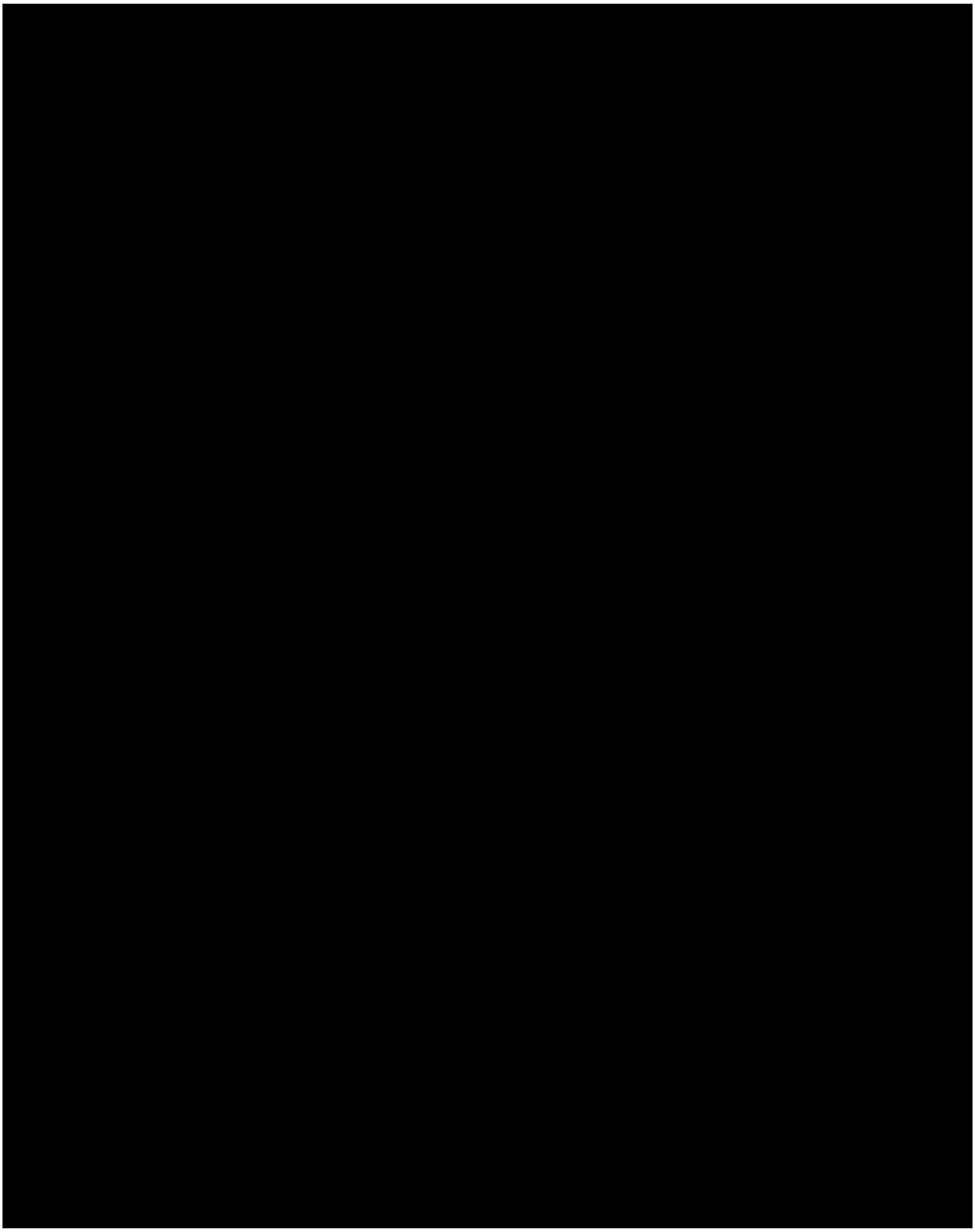

Figure 7.7-1 Testing the PGTC to the DCTU Through The 5ESS Switch

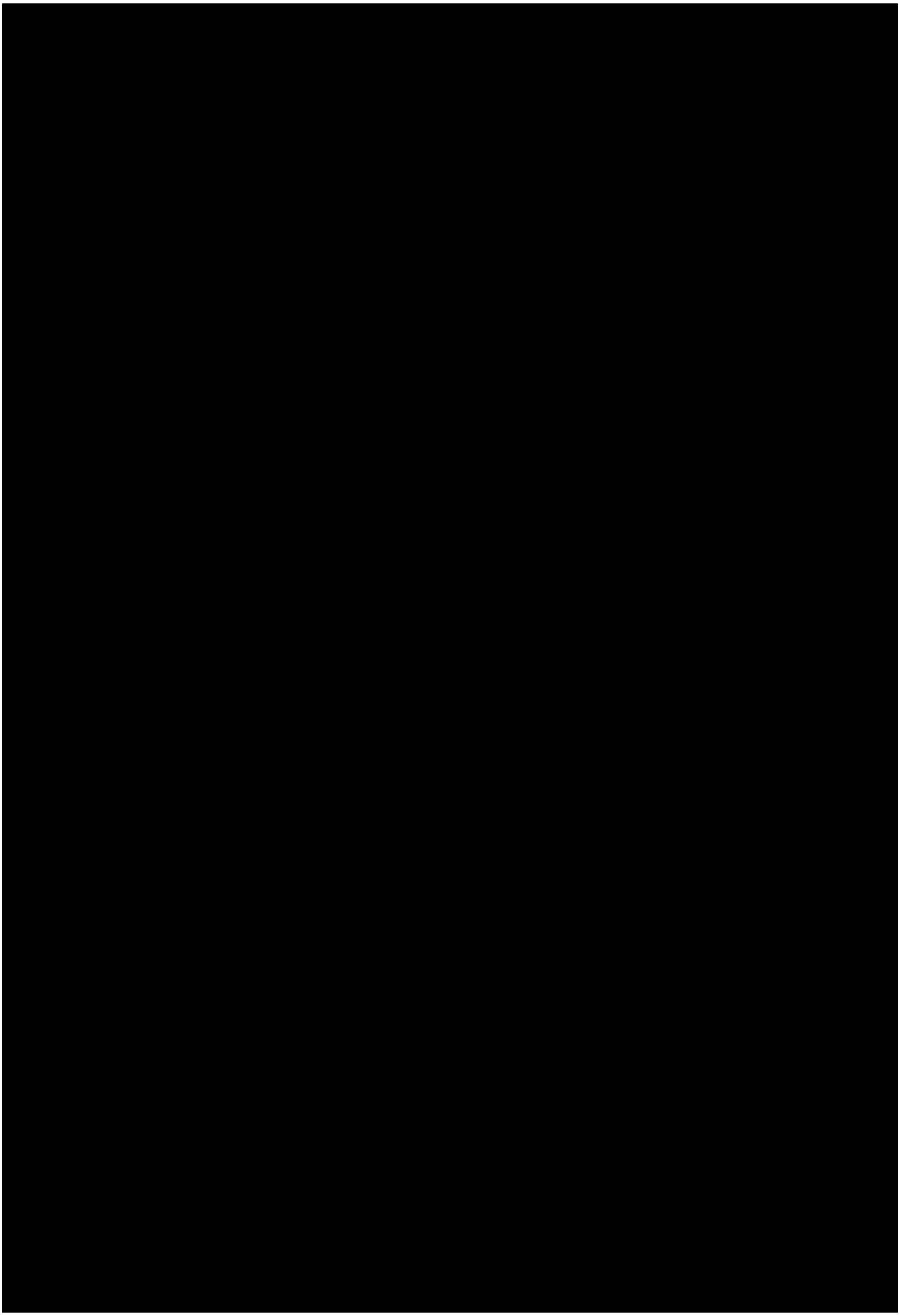

Figure 7.7-2 Testing the Directly Connected PGTC to the DCTU Through The 5ESS Switch

16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 7.8: TEST XTC TO THE COT AND RT - BYPASSING SWITCHING EQUIPMENT

OVERVIEW

Use this procedure to quick test the extended test controller (XTC). The procedure tests only the equipment and associated wiring used with the XTC and the *SLC*® carrier system. It is applicable for the 28-lead PGTC mode (Figure 7.8-1) and the 35-lead enhanced mode (Figure 7.8-2) (locally switched lines only). This procedure assumes that the XTC has been equipped and turned up (reference 363-205-300, Issue 2.00 or later).

PROCEDURE

1. Ensure that the following test equipment is available on site:

   - ☐ TTS (KS-22475 L1 Trunk Test Set or equivalent)
   - ☐ Adapter (KS-22475 L2 Adapter or equivalent)
   - ☐ Misc. 310 cords [ensure that they are of the three wire type (T, R, S)]
   - ☐ 47A or 47B test extender
   - ☐ KS-22681, L1 Digital Multimeter or its equivalent.

2. Check DC and ringing supply voltage requirements.

   Reference: 363-205-300, Issue 2.00 or later

3. ***NOTE:*** The following listed XTC circuit packs (CPs) are the latest versions. The SERIES INTERCHANGEABILITY MARKINGs are shown if available. The SERIES INTERCHANGEABILITY MARKING is defined as "SX:Y", where "Y" equals the SERIES number of the CP and "X" equals the SERIES number of the the last Class A Universal (AU) change. The "X" SERIES number is the minimum required SERIES number. All SERIES numbers between "X" and "Y" are interchangeable. The SERIES INTERCHANGEABILITY MARKING or SERIES number is stamped on the CP latch. Older production CPs did not show the SERIES INTERCHANGEABILITY MARKINGs; they only show the SERIES number. If a specific SERIES number is required for this application, it is indicated. If older vintage circuit packs work in this application, they are also indicated.

   Micro-coded CPs are controlled by ISSUE numbers. The ISSUE INTERCHANGEABILITY MARKINGs for Micro-coded CPs are shown in the following list, if available. The ISSUE INTERCHANGEABILITY MARKING is defined as "IX:Y", where "Y" equals the ISSUE of the CP and "X" equals the ISSUE number of the last Class AU change. The "X" ISSUE number is the minimum required ISSUE number. All ISSUE numbers between "X" and "Y" are interchangeable. You can find the ISSUE INTERCHANGEABILITY MARKING or ISSUE number on the CP faceplate under the Micro-code number. Older production CPs did not show the ISSUE INTERCHANGEABILITY MARKINGs; they only show the ISSUE number. If older vintage CPs work in this application, they are also indicated.

   Perform the following sub-steps to ensure that the correct CPs are installed:

   (A) PGTC Control Shelf, J1C142A, L1:

- ☐ One SM89 S1:1 Control Shelf Power Unit (preferred) or one SM86B S1:1 Control Shelf Power Unit or one SM86 Control Shelf Power Unit
- ☐ Four SM593 S1:one Circuit Enabler Unit
- ☐ One to six SM94C S1:5 Trunk Unit (S3 or greater required for this application).

(B) PGTC Expansion Shelf, J1C142A, L2:

- ☐ One SM89 S1:one Expansion Shelf Power Unit
- ☐ One SM90 S1:one Fanout Extender Unit
- ☐ One to 10 SM94C S1:five Trunk Unit (S3 or greater required for this application)

(C) XTC Control Shelf, J1C182XA1, L1:

- ☐ One AUB60 S1 Power Converter Unit (XPCU)
- ☐ One MC97761A1 I1:1A Control Unit (XCU) (MC97761A1 I1 CPs should be checked - see CCN N03071 NW) or one MC97734A1 I1 Control Unit (XCU)
- ☐ One AUB62 S3:4 Alarm display Unit (XADU)
- ☐ One to four MC97745A1 I2:2A Tester Unit D (XTUD)
- ☐ One to 10 AUB66 S2:3 Fanout Unit (XFOU) (required for enhanced testing only)
- ☐ One to four AUB67 S2:3 Tester Unit C (XTUC) (S2 CPs should be checked - see CCN N03071 NW)
- ☐ One to four AUB68 S2:3 Tester Unit B (XTUB) (S2 CPs should be checked - see CCN N03071 NW)
- ☐ One AUB69 S1 Composite Clock Unit (XCCU).

4. If *SLC*® Series 5 carrier system, ensure that the correct channel test units (CTUs) are installed, as follows:

(A) If PGTC mode, AUB2/AUB2B COT CTU and AUB22 RT CTU.

(B) If enhanced mode:

(1) Ensure that the following COT requirements are satisfied:

Reference: 363-205-400

- ☐ CTU = AUB5
- ☐ ADU (Must have 4-digit bank number set, normally the pair gain system number, see 363-205-400.)
- ☐ DTU-L = AUA18
- ☐ DTU-R = AUA19

- BCU (See 363-205-400).

(2) Ensure the following RT requirements are satisfied:

Reference: 363-205-401

- CTU = AUB25/AUB30
- ADU, BCU (See 363-205-401).

5. Set switches on TTS as follows:
   - **CONTROL** to **ON HOOK**
   - **SLEEVE** to **CLOSED**
   - **CURRENT** to **LOW**

6. Set switches on Adapter as follows:
   - **+SLEEVE** to **OPEN**
   - **+CURRENT** to **HIGH**

7. Insert the Adapter into the TTS.

8. Remove one SM94C trunk card from the PGTC.

9. **CAUTION:** Only use the 47A or 47B test extender in SM 92/94 slots.

   Insert the 47A or 47B test extender into the SM94C slot under test and then insert the removed trunk card into the extender.

10. Insert one end of a 310 cord into the **TRUNK** jack on the TTS and the other into the **TO XTC/PGTC** jack on the 47A or 47B test extender for the port under test (**ODD TRUNK** or **EVEN TRUNK**).

11. Insert one end of a 310 cord into the **-48** jack on the TTS and the other into the **-48** jack on the 47A or 47B test extender.

12. At the MDF, using a temporary 2-wire jumper, connect the **T** and **R** of the trunk card port under test to a spare **T** and **R** appearance on a *SLC*® carrier POTS channel unit on the MDF. (Refer to Figure 7.8-3 for a diagram of the wiring connection.)

13. ***NOTE:*** If SLC Series 5 carrier system with enhanced testing (COT has an AUB5 CTU and RT has an AUB25 CTU), ensure that a tester card unit (XTUB, XTUC and XTUD) is installed in Tester Position 3. Cards in Test Position 3 are the only ones that can access all XFOU. Reference 363-205-300, Issue 2.00 or later for assignment of tester units to Fanout units (XFOUs).

    At XTC, remove all tester cards (XTUB, XTUC, XTUD) except one tester set.

14. On Adapter, press the **SLC** button for 15 seconds.

Comment: Tip and ring should now be connected to the DC test pair if the access is good.

Response: On SM94C card, the **BUSY** LED lights and stays ON.
On XTUC, the **BUSY** LED lights and stays ON.
On TTS, the **CURRENT** LED lights.

Error Condition #1:

If **BUSY** LED on SM 94C does not light, check the tip and ring leads to the COT POTS channel unit for a reversal.

Error Condition #2:

If the **BUSY** LED on the SM 94C flashes two or more times while the **SLC** button is pressed (see **363-205-300, Issue 2.00 or later, Appendix A**):

- If modified control shelf, buzz the cabling from **TS 4** on back of XTC to **TS 1** mounted on the back of PGTC.
- If expansion shelf, buzz the cabling from **TS 4** on back of XTC to back side of PGTC.

Error Condition #3:

If the **BUSY** LED on SM94C does not flash but goes out after releasing the **SLC** button (see **363-205-300, Issue 2.00 or later, Appendix A**):

- If modified control shelf:
  - (a) Check the wiring between **TS 1** and the backplane of the PGTC.
  - (b) Check for presence of a ground wire between **P151** and **P7** on **TS1** (PGTC). This wire should be as short as possible. Pins 1, 4 and 7 should also be connected with short wire straps.
- If expansion shelf:
  - (a) Buzz the cabling from **J22** on XTC to back side of PGTC.
  - (b) Try another SM 90 circuit pack.

Error Condition #4:

If response is not correct (see **363-205-300, Issue 2.00 or later, Appendix A**):

- Try another tester card set, SM94C, or COT CTU.
- Check for the presence of the noise suppression capacitors:
  - (a) If modified control shelf, check for five noise suppression capacitors on **TS 1** on back of side PGTC.
  - (b) If expansion shelf, check for five noise suppression capacitors on upper left-hand side of expansion shelf.

15. On the TTS, operate the **CONTROL** switch to **OFF HOOK**.

Response: Error Condition #1:

If **BAT ON RING** LED lights, open the DC test pair at the MDF to see if this extinguishes the LED. If it does, the DC test pair has a false battery on the ring side. If the LED stays lighted, check that the **T**, **R**, and **I** leads are properly strapped on the MDF. Correct any errors found before proceeding.

Error Condition #2

If a 120 IPM tone is heard:

- System may be busy; check the **I** lead multiple if the DC test pair is shared with more than one system. The **I** lead should have -48 volts on it when idle. If it does not, check to see that all **I** leads sharing the same DC test pair are strapped together.
- If modified control shelf, check for the presence of a ground wire between punchings **151** and **7** on **TS 1** on back of the PGTC.
- If PGTC mode:
  - (a) Check for defective, missing, or incorrect CTU at the COT and RT. See Figure 7.8-1 for correct CTU identities.
  - (b) If universal SLC 96 carrier system, the COT cable may be missing or wired incorrectly between the XTC and the COT frames. To quickly check for this, measure for -48 V DC at pin #1 of the CTU slot on the system under test. If -48 V DC is not present, cabling is missing to the XTC. If -48 V DC is present, ground pin #1 and the XCU board should display an error code of the Digit **9**. If an error code of the Digit **7** is displayed, the cable wiring to the XTC is reversed. If trouble is not found, refer to 363-202-300 to check out the entire multiple.
  - (c) If universal SLC Series 5 carrier system, the COT cable may be missing or wired incorrectly between the XTC and the COT frames. To quickly check for this, measure for -48 V DC at pin #77 of the CTU slot on the system under test. If -48 V DC is not present, cabling is missing to the XTC. If -48 V DC is present, ground pin #77 and the XCU board should display an error code of the Digit **9**. If an error code of the Digit **7** is displayed, the cable wiring to the XTC is reversed. If trouble is not found, refer to 363-205-300, Issue 2.00 or later to check out the entire multiple.
- If enhanced mode:
  - (a) Check for defective, missing, or incorrect CTU at the COT and RT. See Figure 7.8-2 for correct CTU identities.
  - (b) Check for defective AUB66 (XFOU) in the XTC
  - (c) Check for missing cable between XTC control shelf, **J1-10** and **P116**, on top of SLC Series 5 carrier bay (Figure 7.8-2).
  - (d) Check for defective or missing DTUs at COT.

Error Condition #3

If a 60 IPM tone is heard, the SLC carrier system may be in MAJOR alarm.

16. On TTS, operate **SLEEVE** switch to **OPEN**.

Response: If channel test is good, the **BAT ON RING** LED lights and one burst of tone is heard.

(A) If SLC96 carrier system or SLC Series 5 carrier system equipped with AUB2/2B COT CTU and AUB22 RT CTU:

Error Condition #1

If the XCU board on the XTC displays an error code, use **363-205-300, Issue 2.00 or later** to clear problems.

Error Condition #2

If **BAT ON RING** LED lights but no tone is heard, replace the XCU card and try again. If it still fails, replace the tester cards, SM 94C, XADU or COT CTU.

Error Condition #3

If **GRD ON RING** LED lights, channel test is bad:

- Replace the channel unit at either the RT or at the COT.
- Check for the presence of the noise suppression capacitors (see Step 14, Error Condition #4 for location).

(B) If SLC Series 5 carrier system equipped with AUB5 COT CTU and AUB25/30 RT CTU:

Error Condition:

If the XCU board on the XTC displays an error code, use **363-205-300, Issue 2.00 or later** to clear problem.

17. Which interface is under test?

If **28-lead interface**, continue with Step 18.

If **35-lead interface**, go to Step 19.

18. Was channel test good?

If **YES**, go to Step 35.

If **NO**, **Seek technical assistance. Postpone procedure until fault(s) is corrected**.

19. Was channel test good?

If **YES**, go to Step 35.

If **NO**, continue with Step 20.

20. ***NOTE:*** Steps 20 through 34 continue testing of the 35-lead interface.

On TTS, operate the **SLEEVE** switch to **CLOSED**.

21. **CAUTION:** From the time the **CURRENT** switch is set to **HIGH**, you have 30 seconds to complete Steps 22 and 23 or the XTC disconnects.

On TTS, operate the **CURRENT** switch to **HIGH**.

Response: **BAT ON RING** LED lights momentarily.

GRD ON RING LED lights.

22. On TTS, do the following:

(1) Press **KP1** key.

(2) Enter command **990** (test bus connections)

(3) Press **ST** key.

Response: **BAT ON TIP** LED lights within 25 seconds.

LINK indicator on XFOU card lights momentarily.

Error Condition:

If 120 IPM is heard, the XTC cannot run the test. Possible causes are the **990** command was not properly keyed, or any of certain units could be defective - XFOU, XCU, a tester unit (XTUB, XTUC, XTUD), COT CTU or DTU (DTU-L, DTU-R), or the cable between the XFOU and the SLC carrier bay.

23. On TTS, operate **CURRENT** switch to **LOW**.

24. **CAUTION:** Complete this step within two minutes or the XTC times out and disconnects. If this happens, you must start again with Step 2.

On TTS, operate **SLEEVE** switch to **OPEN**.

Response: Single burst of tone is heard.
BAT ON RING LED lights.

25. Was burst of tone heard?

If **YES**, go to Step 28.

If **NO**, continue with Step 27.

26. ***NOTE 1:*** You have two minutes from the time the **SLEEVE** switch is set to **OPEN** (Step 24) to complete the voltage measurements in Table 7.8-1 . If the measurements cannot be completed in two minutes, set the **SLEEVE** switch to **CLOSED** and then back to **OPEN** position. This allows another two minutes for completing the voltage measurements. Repeat this as often as necessary for additional time.

NOTE 2: The combination of voltage readings indicates the condition of the two test buses, main and overflow, that connect the XFOU under test.

Perform the following to test for channel results:

(1) On TTS, operate **CONTROL** switch to **ON HOOK**.

(2) Measure the voltage **T** to **GRD** and **R** to **GRD** on the Adapter and compare Table 7.8-1 .

Table 7.8-1 Test XTC to the COT and RT - Test Measurements

TONE	T-GRD	R-GRD	MEANING
None	OPEN	OPEN	Results Not Ready (Test in Progress)
None	GRD	GRD	No Test Performed (Test not Requested or Test Could not be Performed)
None	+48V	-48V	Main Test Bus Bad/Overflow Test Bus Good
None	+48V	+48V	Main Test Bus Good/Overflow Test Bus Bad
None	-48V	+48V	Main/Overflow Test Bus Bad
One Burst	GRD	-48V	Main/Overflow Test Bus Good

Error Condition:

If the response remains incorrect, try another tester unit (XTUB, XTUC, and XTUD), SM94C unit, COT CTU or COT DTU (DTU-L and DTU-R).

27. On TTS, operate the **SLEEVE** switch to **CLOSED**.

28. **CAUTION:** From the time the **CURRENT** switch is set to **HIGH**, you have 30 seconds to complete Steps 29 and 30 or the XTC disconnects.

On TTS, operate **CURRENT** switch to **HIGH**.

Response: **GRD ON RING** LED lights.

29. On TTS, do the following:

(1) Press **KP1** key

(2) Enter channel test command **920**

(3) Press **ST** key.

Response: **BAT ON TIP** LED lights, if good test channel units command.

Error Condition:

If 120 IPM heard, there is trouble setting up connection. Disconnect and try again.

30. On TTS, operate **CURRENT** switch to **LOW**.

31. **CAUTION:** Complete this step within two minutes or the XTC disconnects.

On TTS, operate **SLEEVE** switch to **OPEN** (channel test results).

Response: Single burst of tone heard.
BAT ON RING LED lights.

32. Was tone burst heard?

If **YES**, go to Step 35.

If **NO**, continue with Step 33.

33. On TTS, operate **CONTROL** switch to **ON HOOK**.

34. ***NOTE:*** Once the **SLEEVE** switch is set to **OPEN**, you have two minutes to complete the voltage measurements. To reset the 2-minute timer, just toggle the **SLEEVE** switch to **CLOSED** then to **OPEN** (this can be done as often as needed).

Measure the voltage **T** to **GRD** and **R** to **GRD** on the Adapter and compare to Table 7.8-2 to identify the defective channel unit.

Table 7.8-2 Procedure 7.8 - Test the XTC Cue Port Voltage Measurements

CHANNEL UNIT STATUS	LEAD	VOLTS
COT Bad	TIP	+48V
RT Good	RING	-48V
COT Good	TIP	+48V
RT Bad	RING	+48V
COT Bad	TIP	-48V
RT Bad	RING	+48V
COT Good	TIP	Ground 0V
RT Good	RING	-48V
No Results	TIP	Ground 0V
Available	RING	Ground 0V

Error Condition:

If the response remains incorrect, try another tester unit (XTUB, XTUC, and XTUD), SM94C unit, COT CTU or COT DTU (DTU-L and DTU-R).

35. Disconnect TTS as follows:

(1) On TTS, operate **CONTROL** switch to **ON HOOK**.

(2) On TTS, operate **CURRENT** switch to **HIGH**.

(3) On TTS, operate **SLEEVE** switch to **CLOSED**.

Response: All LEDs should extinguish after 15 seconds.

36. ***NOTE:*** It is recommended that all tester cards (XTB, XTC, XTD) be tested for all ports.

Repeat from Step 5 until all tester card sets have been tested for all port cards (SM94C).

Figure 7.8-1 Testing XTC to the COT and RT - Bypassing Switching Equipment (PGTC Mode)

Figure 7.8-2 Testing XTC to the COT and RT - Bypassing Switching Equipment (Enhanced Mode)

Figure 7.8-3 XTC to SLC Carrier System Temporary Wiring Connections

37. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 7.9: TEST THE XTC THROUGH THE SWITCH

OVERVIEW

CAUTION: Successfully complete Procedure 7.8 before performing this test.

NOTE: This procedure requires the use of a no-test trunk (NTT) interface with MF pulsing, and the extended test controller (XTC) wired in series with the trunk.

Use this procedure to test the *5ESS*® Switch translations and wiring. the NTT interface cabling from the XTC to the switch, the path through the switch to a *SLC*® carrier system channel and a locally switched SLC carrier system channel. Refer to Figure 7.9-1 for a diagram of items being tested.

NOTE: This procedure requires the following:

- ☐ A POTS telephone number temporarily connected to a channel in the system to be used for testing.
- ☐ A POTS channel in the carrier system to be used for testing.

PROCEDURE

1. Ensure that the following test equipment is available on site:
   - ☐ TTS (KS-22475 L1 Trunk Test Set or equivalent)
   - ☐ Adapter (KS-22475 L2 Adapter or equivalent)
   - ☐ Misc. 310 cords [ensure that they are of the 3-wire type (T, R, S)]
   - ☐ 47A or 47B test extender
   - ☐ KS-22861, L1 Digital Multimeter or its equivalent.
2. Set switches on TTS and Adapter as follows:
   (a) On TTS:
   - ☐ **CONTROL** to **ON HOOK**
   - ☐ **SLEEVE** to **CLOSED**
   - ☐ **CURRENT** to **HIGH**.

   (b) On Adapter:
   - ☐ **+SLEEVE** to **OPEN**
   - ☐ **+CURRENT** to **HIGH**.
3. Insert Adapter into TTS.

4. Remove the SM94C trunk card under test from the PGTC shelf. (Start with the first SM94C card.)

5. **CAUTION:** The 47A or 47B test extender must be used only in slots designated SM92/SM94 in a PGTC J1C142 shelf (trunk card slots).

   Insert the 47A or 47B test extender into the **SM94C** slot under test and then insert the removed trunk card into the extender.

6. Insert one end of a 310 cord into the **-48** jack on TTS, and the other end into the -48 supply jack.

7. ***NOTE:*** If a spare NTT interfaceis used for this test purpose, be certain to ground the **G** terminal of the NTT interface. (See Figure 7.9-2 .)

   Insert one end of a 310 cord into **TRUNK** jack on TTS, and the other end into the 47A or 47B test extender jack labeled **TO XTC/PGTC** for the port under test (**ODD TRUNK** or **EVEN TRUNK**).

8. On TTS, operate **CONTROL** switch to **OFF HOOK**.

   Response: **BAT ON RING** LED lights momentarily.
   BAT ON TIP LED lights.
   CURRENT LED lights.

   Error Condition #1;

   If there is no response, check the wiring between the PGTC port under test and the NTT interface (See Figure 7.9-2).

   Error Condition #2:

   If the **BAT ON TIP** LED lights momentarily, and the **BAT ON RING** LED stays on, check for a T and R lead reversal.

9. On TTS, press **KP1** key, steering digits, four digits of an idle POTS phone number and **ST** key.

   Response: **BAT ON TIP** LED extinguished.
   BAT ON RING LED lights.

10. On TTS, operate **CURRENT** switch to **LOW**.

    Response: **BAT ON RING** LED extinguished (within 6 seconds).
    CURRENT LED remains lighted.

    Error Condition #1:

    If 120 IPM tone is heard and **GRD ON RING** LED flashes, switch resources may be busy or unavailable, or dialed digits may be incorrect. Check to see if the correct steering digits and telephone number are used.

    Error Condition #2:

    If **BAT ON RING** LED remains lighted, the line may be in use. Try again or select another number.

11. On TTS, operate **SLEEVE** switch to **OPEN**.

    Response: **BAT ON RING** LED lights.
    Dial tone is heard.

12. On TTS, operate **SLEEVE** switch to **CLOSED**.

13. On TTS, operate **CONTROL** switch to **ON HOOK**.

14. On Adapter, press **SLC** button for eight seconds or until the **CURRENT** LED is extinguished and then lights again.

    Comment: Tip and ring of TTS should now be connected to dc test pair if the access is good.

    Response: On SM94C card, the **BUSY** LED lights.
    On XTC tester card (XTUC), the **BUSY** LED lights.

15. On TTS, operate **CONTROL** switch to **OFF HOOK**.

    Response: Error Condition #1:

    If 60 IPM tone heard, system is in MAJOR alarm.

    Error Condition #2:

    If "squeal" heard, MTB pack(s) may be defective or incorrect.

    (a) If line units are Model 2, check the TN831 packs. They should be Series 9 or less, or Series 14 or greater.

    (b) If line units are Model 1, check the TN331 packs. They should be TN331B Series 5 or greater.

    (c) TN880 (any series) may be defective.

16. On TTS, operate **SLEEVE** switch to **OPEN**.

    Response: If the channel test is good, the **BAT ON RING** LED lights and one tone burst is heard.

    Error Condition #1:

    If the **ERROR CODE** 7-segment display on the XCU of the XTC shows a test result code, follow the procedures in **363-205-300, Issue 2 or later**, to help isolate the problem.

    Error Condition #2:

    If **GRD ON RING** LED lights, the channel test is bad.

    (a) If 28-lead interface, replace the channel units at the COT and RT and retest.

    (b) A common problem is an incorrect XTUB or XTUD card (see Procedure 7.8 , Step 3(C)) for correct series number). If correct series, replace the SM94C, XADU or COT CTU cards.

    (c) If line units are Model 2, check the TN831 packs. They should be Series 9 or less, or Series 14 or greater.

    (d) If line units are Model 1, check the TN331 packs. They should be TN331B

Series 5 or greater.

(e) TN880 (any series) may be defective.

NOTE: To rerun the channel test, first disconnect by performing Step 28 and then repeat Steps 8 through 16.

17. Which interface is under test?

    If **28-lead interface**, continue with Step 18.

    If **35-lead interface**, go to Step 19.

18. Was channel test good?

    If **YES**, go to Step 28.

    If **NO**, **Seek technical assistance. Postpone procedure until fault(s) is corrected**.

19. Was channel test good?

    If **YES**, go to Step 28.

    If **NO**, continue with Step 20.

20. ***NOTE:*** Steps 20 through 27 continue testing of the 35-lead interface.

    On TTS, operate the **SLEEVE** switch to **CLOSED**.

21. **CAUTION:** From the time the **CURRENT** switch is set to **HIGH**, you have 30 seconds to complete Steps 22 and 23 or the XTC disconnects.

    On TTS, operate **CURRENT** switch to **HIGH**.

    Response: **GRD ON RING** LED lights.

22. On TTS, do the following:

    (1) Depress **KP1** key

    (2) Enter channel test command **920**

    (3) Depress **ST** key.

    Response: **BAT ON TIP** LED lights, if good test channel units command.

    Error Condition:

    If 120 IPM heard, there is trouble setting up connection. Disconnect and try again.

23. On TTS, operate **CURRENT** switch to **LOW**.

24. **CAUTION:** Complete this step within two minutes or the XTC disconnects.

    On TTS, operate **SLEEVE** switch to **OPEN** (channel test results).

Response: Single burst of tone heard.
BAT ON RING LED lights.

25. Was tone burst heard?

If **YES**, go to Step 28.

If **NO**, continue with Step 26.

26. On TTS, operate **CONTROL** switch to **ON HOOK**.

27. ***NOTE:*** Once the **SLEEVE** switch is set to **OPEN**, you have two minutes to complete the voltage measurements. To reset the two minute timer, just toggle the **SLEEVE** switch to **CLOSED** then to **OPEN** (this can be done as often as needed).

Measure the voltage **T** to **GRD** and **R** to **GRD** on the Adapter and compare to Table 7.9-1 to identify the defective channel unit.

Table 7.9-1 Procedure 7.9 - Test the XTC Cue Port Voltage Measurements

CHANNEL UNIT STATUS	LEAD	VOLTS
COT Bad RT Good	TIP RING TIP	+48V -48V +48V
COT Good RT Bad	RING TIP	+48V -48V
COT Bad RT Bad	RING TIP	+48V Ground 0V
COT Good RT Good	RING TIP	-48V Ground 0V
No Results Available	RING	Ground 0V

Error Condition:

If the response remains incorrect, try another tester unit (XTUB, XTUC, and XTUD), SM94C unit, COT CTU or COT DTU (DTU-L and DTU-R).

28. Disconnect TTS as follows:

    (1) Operate **CONTROL** switch to **ON HOOK**

    (2) Operate **CURRENT** switch to **HIGH**

    (3) Operate **SLEEVE** switch to **CLOSED**.

    Response: All LEDs extinguished.

Figure 7.9-1 Testing the XTC Through 5ESS Switch

Figure 7.9-2 Wiring Requirements - Trunk Test Set-PGTC-No-Test Trunk

29. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 7.10: TEST THE XTC TO THE DCTU THROUGH THE SWITCH

OVERVIEW

CAUTION: Successfully complete Procedure 7.9 before starting this test.

Use this procedure to test the associated extended test controller (XTC) and the *5ESS*® Switch translations and wiring.

NOTE: The information for the PGTC in the switch recent change views also applies to the XTC.

PROCEDURE

1. Ensure that the DCTU is equipped with Issue 4 (or later) firmware.
2. Ensure that the following hardware is available (see Figure 7.7-1):
   - ***Metallic test buses (MTBs):*** Must be contiguous pairs and must be on the same pack within an MMSU service group.
   - ***Distribute points:*** Must be contiguous and must be on the same pack within an MMSU service group
   - ***PGTC ports:*** A ***minimum*** of two are required, one per service group per shelf, otherwise equipment blockage may occur (**VER F0).**
3. ***NOTE:*** Steps 4 through 8 verify that translations are built for PGTC access.

   At the RC/V VDT or equivalent, do Steps 4 through 8.
4. Display **RECENT CHANGE VIEW 14.7 - PAIR GAIN TEST CONTROLLER**
5. ***NOTE:*** The PGTC frame number 1 is for the host switch. For an RSM/ORM/TRM/etc., the PGTC frame number is the number of the RSM/ORM/TRM/etc. For an MMRSM cluster, the PGTC frame number is the lowest RSM number in the cluster.

   Enter correct PGTC frame number in **PGTC FRAME** attribute field.
6. ***NOTE:*** The PGTC trunk members are numbered from 1 to 256. One is required per service group per MMSU shelf where DCTU ports reside.

   Enter correct PGTC trunk number in attribute field **PGTC NUMBER**.
7. ***NOTE:*** The MTBs for the PGTC are assigned in sequential pairs. The **MTB IN** is the lowest number of the MTB in the pair and is wired to the input side of the PGTC. The next MTB number of the MTB pair is the **MTB OUT** and is wired to the output side of the PGTC.

   Verify that the attribute field **MTB IN** contains the correct MTB assignment for the low MTB.
8. ***NOTE:*** The PGTC distribute points are also assigned in sequential pairs. The PGTC low distribute point number (**DIST LOW**) is the ***high*** value resistor for the PGTC sleeve assignment. The next distribute point is for the PGTC ***low*** value resistor sleeve assignment.

   Verify that **DIST LOW** contains the correct low distribute point assignment.

9. ***NOTE:*** The high SD point is normally operated.

   Using a VOM, measure the voltage from the **S** terminal to ground on the PGTC for the port under test. (The **S** terminal should not have any wires connected to it.)

   Response: Voltage should measure nominally -48 volts.

10. Using a VOM, measure the DC current from the **S** terminal to ground on the PGTC for the port under test.

    Response: Current should measure between 33 to 48 ma.

    Error Condition:

    If the current measures between 10 to 15 ma, the resistors are incorrectly wired.

11. Contact a maintenance administrator (MA) for assistance in testing.

12. Have the MA do a **FULL** test on a number served by a universal SLC carrier system.

    Response: On the SM94C card being used in the PGTC, the **BUSY** LED lights.

    On XTC tester card (XTUC), the **BUSY** LED lights.

    The response from the MLT **FULL** test should be:

    VER O: TEST OK.

13. Have the maintenance administrator X off.

14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 7.11: TEST THE XTC CUE PORT THROUGH THE SWITCH

OVERVIEW

CAUTION: Successfully complete Procedure 7.9 before performing this test.

Use this procedure to access the channel unit emulator (CUE) for non-locally switched or non-switched extended super POTS (ESPOTS) and 4-wire channel units.

PROCEDURE

1. Ensure that the following conditions exist:

   - ☐ The CUE has a telephone number assigned and connected to a line unit on the MDF.
   - ☐ A channel equipped and provisioned for non-locally switched service (ESPOTS or 4-wire channel units) is available in the Series 5 system to be used for testing. You can find information on how to provision a channel in 363-205-300, Issue 2.00 or later, Appendix B.
   - ☐ A tester unit (XTUB, XTUC, XTUD) is installed in Tester Position 3.
   - ☐ Knowledge of the SID (System Identification) number for the system to be used for testing. This is the 4-digit number set on the COT ADU.
   - ☐ The SLC Series 5 carrier system to be used for testing is equipped with an AUB5 COT CTU, an AUB25/30 RT CTU, and the AUA18 DTU-L and AUA19 DTU-R are installed in the COT. The system must be known to be working and cabled to an XFOU. This insures that the tests are performed on the 35-lead interface between the XTC XFOU and the SLC Series 5 carrier system."

2. Ensure that the following switches are set on the TTS and the Adapter:

   (A) On TTS:

   - ☐ **CONTROL** switch to **ON HOOK**
   - ☐ **SLEEVE** switch to **CLOSED**
   - ☐ **CURRENT** switch to **HIGH**

   (B) On Adapter:

   - ☐ **+SLEEVE** switch to **OPEN**
   - ☐ **+CURRENT** switch to **HIGH**

3. On TTS, operate **CONTROL** switch to **OFF HOOK**.

   Response: **BAT ON RING** LED lights momentarily.
   BAT ON TIP LED lights.
   CURRENT LED lights.

4. On TTS, press **KP1** key, steering digits, four digits of CUE phone number, and **ST** key.

   Response: **BAT ON TIP** LED extinguished.
   BAT ON RING LED lights.

   Error Condition:

   If the response is incorrect, check to make sure that you are using the correct steering digits and the correct digits for the XTC CUE telephone number.

5. On TTS, operate **CURRENT** switch to **LOW.**

   Response: **BAT ON RING** LED extinguished (within six seconds).
   CURRENT LED remains lighted.

   Error Condition #1:

   If the **BAT ON RING** LED remains lighted, the number may be busy; retry.

   Error Condition #2:

   If 120 IPM is heard, then the switch resources may be unavailable. Try again or call the switch administrator.

6. On TTS, operate **CONTROL** switch to **ON HOOK**.

7. On Adapter, press **SLC** button for eight seconds.

   Response: On SM94C Card, the **BUSY** LED lights.
   On XTC tester card (XTUC), the **BUSY** LED lights.
   CURRENT LED blinks and then remains lighted.

   Comment: If there is more than one tester unit installed, the **BUSY** LED on two XTUCs light.

   Error Condition:

   If response is incorrect, check the wiring to the XTC CUE for missing or reversed T and R leads. Try another XADU.

8. On TTS, operate **CONTROL** switch to **OFF HOOK**.

9. **CAUTION:** From the time the CURRENT switch is set to HIGH, you have 30 seconds to complete Steps 10 and 11 or the XTC times out and disconnects. If this happens, start again at Step 2.

   On TTS, operate **CURRENT** switch to **HIGH**.

   Response: **BAT ON RING** LED lights momentarily.
   GRD ON RING LED lights and stays lighted.

10. ***NOTE:*** Channel under test must be idle.

    On TTS, do the following:

    (1) Press **KP1** key.

(2) Enter four digits of bank address (bank SID number set on ADU card).

(3) Enter four digits of channel unit address. (Use leading zeros for address that have less than four digits.)

(4) Press **ST** key.

Response: **BAT ON TIP** LED lights.

Error Condition #1:

If 120 IPM is heard, the system may be busy. Check to see if the SLC carrier system is busy; if it is busy, the **BUSY** LED on the Series 5 CTU is lighted or the CIU has an access. Make sure that the channel units are provisioned correctly.

Error Condition #2:

If 60 IPM tone is heard, the system is in MAJOR alarm.

11. On TTS, operate **CURRENT** switch to **LOW**.

Response: **BAT ON RING** LED lights.

12. **CAUTION:** From the time the CURRENT switch is set to HIGH, you have 30 seconds to complete Steps 13 and 14 or the XTC times out and disconnects . If this happens, start again at Step 2.

On TTS, operate **CURRENT** switch to **HIGH**.

Response: **GRD ON RING** LED lights.

NOTE: Now the MF commands can be entered. The 920 test channel unit command does not work with POT-like channel units when access is via CUE.

13. On TTS, do the following:

(1) Press **KP1** key.

(2) Enter command **920** (test channel units)

(3) Press **ST** key.

Response: **BAT ON TIP** LED lights within 25 seconds.

Error Condition:

If 120 IPM is heard, the XTC cannot run the test. Possible causes are the **920** command was not properly keyed, or any of certain units could be defective - XFOU, XCU, a tester unit (XTUB, XTUC, XTUD), COT CTU or DTU (DTU-L, DTU-R), or the cable between the XFOU and the SLC carrier bay.

14. On TTS, operate **CURRENT** switch to **LOW**.

15. **CAUTION:** Complete this step within two minutes or the XTC times out and disconnects . If this happens, you must start again with Step 2.

    On TTS, operate **SLEEVE** switch to **OPEN**.

    Response: Single burst of tone is heard.
    BAT ON RING LED lights.

16. Was burst of tone heard?

    If **YES**, go to Step 18.

    If **NO**, continue with Step 17.

17. ***NOTE 1:*** You have two minutes from the time the **SLEEVE** switch is set to**OPEN** (Step 15) to complete the voltage measurements in Table 7.11-1 . If the measurements cannot be completed in two minutes, set the **SLEEVE** switch to **CLOSED** and then back to **OPEN** position. This allows another two minutes for completing the voltage measurements. Repeat this as often as necessary for additional time.

    NOTE 2: The combination of voltage readings indicates the condition of the channel units.

    Perform the following to test for channel results:

    (1) On TTS, operate **CONTROL** switch to **ON HOOK**.

    (2) Measure the voltage **T** to **GRD** and **R** to **GRD** on the Adapter and compare to Table 7.11-1 to identify the defective channel unit.

Table 7.11-1 Procedure 7.11 - Test the XTC Cue Port Voltage Measurements

CHANNEL UNIT STATUS	LEAD	VOLTS
COT Bad	TIP	+48V
RT Good	RING	-48V
COT Good	TIP	+48V
RT Bad	RING	+48V
COT Bad	TIP	-48V
RT Bad	RING	+48V
COT Good	TIP	Ground 0V
RT Good	RING	-48V
No Results	TIP	Ground 0V
Available	RING	Ground 0V

Error Condition:

If the response remains incorrect, try another tester unit (XTUB, XTUC, and XTUD), SM94C unit, COT CTU or COT DTU (DTU-L and DTU-R).

18. Disconnect TTS as follows:

    (1) On TTS, operate **CONTROL** switch to **ON HOOK**.

    (2) On TTS, operate **CURRENT** switch to **HIGH.**

    (3) On TTS, operate **SLEEVE** switch to **CLOSED**.

    Response: All LEDs should extinguish after 15 seconds.

19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 7.12: VERIFY RMU REQUIREMENTS

OVERVIEW

Use this procedure to verify that the office and terminal configurations and prerequisite testing requirements for the RMU are satisfied (Reference: 660-168-276).

PROCEDURE

1. **CAUTION:** Only MLT testing is valid for integrated *SLC*® carrier system numbers served by an RMU. Repeated test attempts from the trunk and line work station (TLWS) may cause the metallic access (MA) board (TN138) in the MMSU/MSU to go out of service *(5ESS*® Switch software release dependent).

2. ***NOTE:*** Two working POTS channels of a digital loop carrier system must be available and dedicated to the RMU. The first is used for the talk path between the RMU and the MLT. The second is for the data path between the RMU and the Communication Gateway in the MLT front end (FE). It is recommended that Channels 1 and 2 be used (See Figure 7.12-1).

   Verify that two available working POTS channels of a digital loop carrier system have been correctly assigned to the RMU.

3. Verify that the office is equipped with a PGTC or XTC for testing universal SLC carrier systems, and/or a TBCU for testing integrated SLC carrier systems.

4. Verify that the Tip, Ring, and Inhibit leads are strapped on the MDF for all SLC carrier systems that share the RMU. No dc test pair is required.

   Reference: **PGTC SD-97760-01, Sheets H1 and H2**

5. Which MLT configuration is in use?

   If **IMLT**, continue with Step 6.

   If **LTS**, go to Step 7.

6. Verify one of the following requirements, as applicable:

   (A) If testing with the TBCU, Procedure 7.3 is successfully completed.

   (B) If testing with the PGTC, Procedure 7.7 is successfully completed.

   (C) If testing with the XTC, Procedure 7.10 is successfully completed.

   STOP. YOU HAVE COMPLETED THIS PROCEDURE.

7. Verify one of the following requirements, as applicable:

   (A) If testing with the TBCU, Procedure 7.3 is successfully completed.

   (B) If testing with the PGTC, Procedure 7.6 is successfully completed.

   (C) If testing with the XTC, Procedure 7.9 is successfully completed.

Figure 7.12-1 Wiring Requirements for RMU Testing

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Procedure 7.13: TEST DC TEST PAIR

OVERVIEW

Use this procedure to test the dc test pair between the RT and the XTC/PGTC or between the RT and the RMU. The test verifies continuity of the T-R pair and checks for metallic faults.

NOTE: This procedure should be performed on all DC test pairs in the *5ESS*® Switch.

Refer to Figure 7.13-1 for diagram of test wiring. The test path between the RMU and the RT may just be the cable connection between the two units (unless other RTs are also sharing the RMU). This connection is referred to as a DC test pair. The testing of DC test pairs includes the testing of the RMU test path.

PROCEDURE

1. Have the maintenance administrator contact the outside plant personnel for assistance in performing this procedure.

2. Have the maintenance administrator do a **LOOP** test on several POTS numbers served by the *SLC*® carrier system.

   Response: **VER 0: TEST OK** expected on all TNs tested.

   Error Condition #1:

   If **VER 0: TEST OK** is the response on at least one of the TNs, the DC test pair is clear of any faults or the RMU is connected properly. Continue with the remaining steps to verify TIP and RING continuity and for T-R reversals.

   Error Condition #2:

   If **VER 0: TEST OK** is ***not*** the response on any of the TNs, the DC test pair is defective or the RMU is defective or improperly connected. Continue with the remaining steps to check TIP and RING continuity and for possible T-R reversals. If the pair is open or defective in another manner, correct or replace the DC test pair and ***retest***.

3. Have the outside plant personnel ground the TIP side of the POTS number under test.

4. Have the maintenance administrator do a **LOOP** test.

   Response: TIP ground should be displayed.

5. Have the outside plant personnel ground the RING side of the POTS number under test.

6. Have the maintenance administrator do a **LOOP** test.

   Response: RING ground should be displayed.

7. Have the maintenance administrator X off.

8. ***Repeat this procedure for each DC test pair in the office.***

Figure 7.13-1 DC Test Pair Test Wiring

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

GLOSSARY

The following is a list of abbreviations and acronyms with applicable terms used in this manual.

ADU
Alarm Distribution Unit

AIU
Access Interface Unit

ALIT
Automatic Line Insulation Testing

ALW
Allow

AM
Administrative Module

AMI
Alternate Mark Inversion

ANI
Automatic Number Identification

ARSB
Automated Repair Service Bureau

ATP

All Tests Passed

BCU
Bank Control Unit

BOC
Bell Operating Company

BRI
Basic Rate Interface

BRITE
BRI Transmission Extension

CCITT
International Telegraph and Telephone Consultative Committee

CD
Circuit Description

CI
Control Interface

CIU
Craft Interface Unit

CKT
Circuit

CM
Communication Module

CMCU
CM Control Unit

CMD
Command

CO
Central Office

COMC
Common Control

CPE
Customer Premises Equipment

CTTU
Centralized Trunk Test Unit

CTU
Channel Test Unit

CUE
Channel Unit Emulator

DAS
Digit Analysis Selector (for ROTL Presorted Digits)

DBU
Dial Backup Unit

DCLU
Digital Carrier Line Unit

DCN
Data Communication Network

DCTU
Directly Connected Test Unit

DCTUCOM
DCTU Common Control

DCTUPORT
DCTU Port

DF
Distributing Frame

DFA
Digital Facilities Access (Cabinet)

DFTAC
Distributing Frame Test Access Controller

DF-TTC
Distributing Frame Test Trunk Circuit (See MDF-TTC)

DGN
Diagnose

DIST
Distribute

DLC
Digital Loop Carrier

DLI
Dual Link Interface

DLTU
Digital Line and Trunk Unit

DMU
Digital Measurement Unit

DN
Directory Number

DOPS
Digital Ordering and Planning System

DP
Distribute Point

DPT
Diode Protocol Test

DS
Data Set

DSA
Digital Services Adapter

DSCH
Dual Serial Channel

DSL
Digital Subscriber Line/Loop

DSU2
Digital Services Unit 2

DSX
Digital Subscriber Cross-Connect

DTU
Digital Test Unit

EADAS
Engineering and Administrative Data Acquisition System

EAN
Equipment Access Network

EDAF
Enhanced DCTU/LTS/EMU Feature

EMU
Expert Measurement Unit

EPROM
Erasable Programmable Read Only Memory

EQL
Equipment Location

ERRTHLD
Error Threshold

ES
Equipment Status (transaction of IMLT)

ESPOTS
Extended Super Plain Old Telephone Service

EXK
Exchange Key

FACMAN
Facilities Manager

FE
Front End

FEMF
Foreign Electromotive Force

FP
Feature Package

GDSF
Global Digital Services Function

GDX
Gated Diode Crosspoint

GDXC
GDX Compensator

GIDB
Group Interface Data Bus

GPIB
General Purpose Interface Bus

GRCV
Growth Recent Change and Verify

HDLC
High-Level Data Link Control

HLSC
High-Level Service Circuit

HSM
Host Switching Module

IDCU
Integrated Digital Carrier Unit

ILEN
IDCU Line Equipment Number

IMLT
Integrated Mechanized Loop Testing System

INC
Incoming Digit Interpreter Table

INDIT
Incoming Trunk Digits

IO
Input/Output

IOP
IO Processor

IPM
Interruptions Per Minute

IS
In Service

ISDN

Integrated Services Digital Network

ISLC
Integrated Services Line Card

ISLU
Integrated Services Line Unit

ISLU2
Integrated Services Line Unit - Model 2

ISLUCC
ISLU Common Control

ISLUCD
ISLU Common Data

ISLUHLSC
ISLU High-Level Service Circuit

ISLULC
ISLU Line Card

ISLULGC
ISLU Line Group Controller

ISLUMAN
ISLU Metallic Access Network

ISLURG
ISLU Ringing Generator

ISO
International Standards Organization

ISTF
Integrated Services Test Facility

KB
Kilobaud

LATA
Local Access and Transport Area

LCEN
Line Card Equipment Number

LCKEN
Line Circuit Equipment Number

LDIT
Local Digit

LGBUS
Line Group Bus

LGC
Line Group Controller

LMOS
Loop Maintenance Operations System

LSM
Local Switching Module

LSSGR
Local Switching System General Requirements

LTD
Local Test Desk

LTF
Loop Test Frame

LTP
Logical Test Port

LTS
Loop Test System

LU
Line Unit

LUT
Line Under Test

MA
Maintenance Administrator

MA
Metallic Access

MAB
Metallic Access Bus

MAJ
Metallic Access Junctor

MAN
Metallic Access Network

MC
Maintenance Center

MCC
Master Control Center

MCU
Module Control Unit

MDCT
Minor Device Chain Table

MDF
Main Distribution Frame

MDF-TTC
MDF Test Trunk Circuit (See DF-TTC)

MDII
Machine-Detected Interoffice Irregularities

MER
Machine Exception Report

MISC
Miscellaneous (Frame)

MLT
Mechanized Loop Test System

MLT-2
MLT Generation 2

MLT/ISDN
MLT for ISDN

MMRSM
Multimodule Remote Switching Module

MMSU
Modular Metallic Service Unit

MRA
Maintenance Request Administrator

MSG
Message

MSU
Metallic Service Unit

MTG
MDF Trunk Group

MTIB
Metallic Test Interconnect Bus

MTIBAX
Metallic Test Interface Bus Access

MTP
Monitor Terminal Process

MTTRS
Mean Time to Restore Service

MTU
Maintenance Termination Unit

NCT
Network Control and Timing

NNX
Central Office Exchange Code

NPA
Numbering Plan Area

NRZ
Non Return to Zero

NRZI
Non Return to Zero Inverted

NT1
Network Termination 1

NTG
No-Test Trunk Group

NTT
No-Test Trunk

NTU
Network Termination Unit

ODD
Office Dependent Data

OEN
Originating Equipment Number

OOS
Out of Service

OOSF
Out of Service Family

OPT
Option

ORI
Office Record Index

ORM
Optically Remote Module

OSDS
Operating System for Distributed Switching

OSI
Open System Interconnection (Standard)

OSP
Outside Plant

OSS
Operational Support System

OSSQMR
Operations System Support Quality Metrics Report

OSTC
Operations System Technical Center

OTC

Operating Telephone Company

PCMU
Protector Coil Mounting Unit

PD
Peripheral Decoder

PDIT
Preliminary Digit Interpreter Table

PEC
Protocol Error Code

PER
Protocol Error Record

PFR
Peripheral Fault Recovery

PGTC
Pair Gain Test Controller

PH
Protocol Handler

PICB
Peripheral Interface Control Bus

PLID
Primary Line Identifier

PM
Performance Monitoring

PMU
Precision Measurement Unit

POTS
Plain Old Telephone Service

PRN
Pseudo-Random Number

PROTO
Protocol Bus

PSM
Position Switching Module

PST
Programmed Scan Testing

PSU
Packet Switch Unit

PTC
Port Controller

PUT
Port Under Test

PX
Power Cross

RBOC
Regional Bell Operating Companies

RC/V
Recent Change and Verify

RCVRY
Recovery

REX
Routine Exerciser

RISLU
Remote Integrated Services Line Unit

RMU
Remote Measurement Unit

RMV
Remove

ROH
Receiver Off-Hook

ROM
Read-Only Memory

ROP
Receive-Only Printer

ROTL
Remote Office Test Line

RSB
Repair Service Bureau

RSM
Remote Switching Module

RST
Restore

RT
Remote Terminal

RTA
Routing and Terminal Allocation

RTAC
Regional Technical Assistance Center

RTE
Route

RTI
Route Index

RTR
Real Time Reliable

RTU
Remote Test Unit

SAM
System Administration and Maintenance

SARTS
Switched Access Remote Test System

SC
Service Circuit

SC
Service Class

SCANS
Software Change Administration and Notification System

SCC
Switching Control Center

SCR
Screening Index (for ROTL Prestored Digits)

SDL
Synchronous Data Link

SDLC
SDL Controller

SECID
Secondary Line Equipment Identifier

SG
Service Group

SIG
Signal

SLIM
Subscriber Line and Instrument Measurement

SM
Switching Module

SMAS
Switched Maintenance Access System

SMC
SM Controller

SMST
Switching Module System Test

SPCS
Stored Program Controlled System

SPOTS
Super Plain Old Telephone Service

SPSCC
Stored Program Switching Control Center

SSC
Special Services Center

STBY
Standby

STF
Some Tests Failed

STV
Special Services Trouble Verification

SW
Switch

T&M
Talk and Monitor

TAF
Testing Activity Feature

TAU
Test Access Unit

TBCU
Test Bus Control Unit

T-DSL
T-Interface Digital Subscriber Line/Loop

TEC
Test Equipment Controller

TES
Testability Expert System

TE/TRLMOS
Trouble Entry Mask or Transaction

TG
Trunk Group

TGN
Trunk Group Number

TLP
Trouble Locating Procedure

TLWS

Trunk and Line Work Station

TM
Trunk Maintenance

TMLTPDCTU
Class of Service for a DCTU Logical Test Port

TN
Telephone Number

TR
Trouble Report

TRM
Two-Mile Optically Remoted Module

TTC
Trunk Test Circuit

TTF
Transmission Test Facility

TTFCOM
TTF Common Control

TTRC
Test Trunk Ringing Circuit

TTS
Trunk Test Set

TV
Test Verification

UCL
Unconditional

UCONF
Universal Conference

U-DSL
U-Interface Digital Subscriber Line/Loop

UNEQ
Unequipped

UNV
Unavailable

VDT
Video Display Terminal

VER
Verification (Code)

XTC
Extended Test Controller

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