



SLC[®] Series 5 Carrier System Feature Packages G and I General Description

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1. Overview

1.01 This practice describes the *SLC*[®] Series 5 Carrier System Feature Package G (FPG) and Feature Package I (FPI) configurations. It includes an overview of the system features, a description of the physical features of the channel bank and plug-in units, a functional description at the block-diagram level, and a summary of system specifications. This practice describes the available features; it will be expanded to include other features as they become available.



NOTE:

Check with your AT&T account executive for availability of FPG.

This document is for individuals who participate in the planning and implementation of digital loop carrier systems, including the following:

- Telephone company personnel - staffers, planners, sales people, managers, and craftspersons
- AT&T marketing personnel
- AT&T account representatives.

This document is written for individuals with a background in telephony and an understanding of basic digital transmission principles.

1.02 Whenever this practice is reissued, the reason(s) for reissue will be listed in this paragraph.

1.03 This document does not contain any safety labels (danger, warning, or caution). However, it is recommended that an electrostatic discharge wrist strap, with minimum resistance of 250K ohms, be worn when handling circuit packs to prevent possible damage to the circuit packs. The wrist strap should be checked before use for opens, shorts, and minimum resistance value. A strap that does not pass these checks should not be used. To avoid possible personal injury while using the wrist strap at the RT, it should be connected only to the ESD GRD jack on the fan unit.

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1.06 For FPG, AT&T will provide customer assistance on the SLC Series 5 Carrier System including, but not limited to, troubleshooting assistance, technical consultation, operational problem consultation, procedural advice, and emergency recovery assistance from a qualified system support professional from the Regional Technical Assistance Center (RTAC). For FPI, customer assistance is provided by the AG Communication Systems (AGCS) Technical Assistance Center (TAC).

Service is provided from the RTAC at 1-800-225-RTAC. This telephone number is monitored 24 hours a day, 7 days a week. During regular business hours your call will be answered by your local regional RTAC. Outside of normal business hours all calls will be answered at a centralized technical assistance center where service-affecting problems will be dispatched immediately to your local RTAC. All other problems will be referred to your local RTAC on the next regular business day.

1.07 Service is provided from the AGCS TAC at 1-602-582-7305. This telephone number is monitored 24 hours a day, 7 days a week. During regular business hours, your call will be answered by TAC personnel. Outside of normal hours, all calls will be answered at a centralized answering center. All calls will be dispatched immediately to TAC personnel.

1.08 This system is intended as a general purpose digital loop carrier system and is fully compatible with automatic or manual rotary or dual-tone multifrequency (DTMF) dialing. Administration is based on a 96-line system. Typical economic applications include expanding the service capacity of existing cable plant or deferring new wire center installation. Once the system is installed, it can be rearranged by changing channel units and common plug-in units. This allows growth as needed with a minimum amount of planning.

1.09 The *SLC Series 5 Carrier System* is a digital loop carrier system that provides 96 channels. The 96 channels provided in each bank are grouped into four digroups of 24 channels each. These digroups are designated as follows:

- Digroup A: Lines 1-24
- Digroup B: Lines 25-48
- Digroup C: Lines 49-72
- Digroup D: Lines 73-96

1.10 Two independent 96-channel systems are combined in a dual channel bank arrangement with a shared facility shelf; the upper system is designated the white system and the lower system is designated the blue system. For FPG, the dual channel banks are arranged in central office terminal (COT) (Figure 1) and remote terminal (RT) (Figure 2) configurations. For FPI, the dual channel banks are arranged in remote terminal configurations that interface to the *GTD-5** EAX (Figure 3).

1.11 A standard T1 digital facility is used for transmission. Also, the system may be multiplexed to a higher digital rate using the DDM-1000 or DDM-2000 (or equivalent) multiplexer and then transmitted over lightguide facilities.

1.12 Plug-in circuit packs are divided into two groups called common unit circuit packs and channel unit (CU) circuit packs. The common circuit pack units serve a common digroup or system while the channel unit circuit packs are required for specific channel services. The channel unit circuit packs provide either one or two channels of service depending on the specific type of channel unit. There are 12 channel slots per digroup for a total of 48 channel slots in each system — 96 channel slots per dual bank. A specific mix of common and channel unit circuit packs are needed to provide the desired *SLC Series 5 Carrier System* features.

1.13 The COT installation is normally powered by a central office bulk type power plant. The RT installation is powered by an AC power plant with battery reserve located in each bay or cabinet housing the RT dual channel bank equipment. The remote terminal can also be powered by a bulk power plant. The grounding of the COT and the central office located RT equipment requires special procedures.

1.14 The *SLC Series 5 Carrier System* is available in a *UL†* Listed RT. The *UL* Listed RT is designed to help customers comply with state and local code requirements. The *UL* Listed RT is a 7-foot frame equipped with any combination of *UL* Recognized equipment and apparatus. Nearly all RT equipment and apparatus is *UL* Recognized, and AT&T plans to obtain *UL* Recognition for all new RT equipment introduced in the future. For a list of *UL* Recognized equipment and apparatus, refer to AT&T 363-205-011, *UL Listed Remote Terminal Installation*, or AT&T 363-205-000G, *Information and Pricing Guide for GTE*.

The *SLC Series 5 Carrier System* with the J1C182AH-1 backplane is electromagnetic compliance (EMC).

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† Registered trademark of Underwriters Laboratories Inc.

1.15 The COT equipment is normally installed in a central office using standard bay framework. The RT equipment may be located in an environmentally controlled equipment room, on customer premises using standard bay framework, or in one of the available remote terminal cabinets.

1.16 Circuit maintenance equipment for the *SLC* Series 5 Carrier System includes the extended test controller (XTC) as a pair gain test controller (PGTC) and line test translator (LTT)/*RMU** telephone line test measurement apparatus testing for FPG. For FPI, LTT/*RMU* telephone line test measurement apparatus nightly routine testing, demand *4TEL** Computer-Controlled Diagnostic Systems testing, and *GTD-5* EAX integrated line diagnostics (in-test) are available.

 **NOTE:**

The features provided with FPG and FPI are detailed in Section 2.

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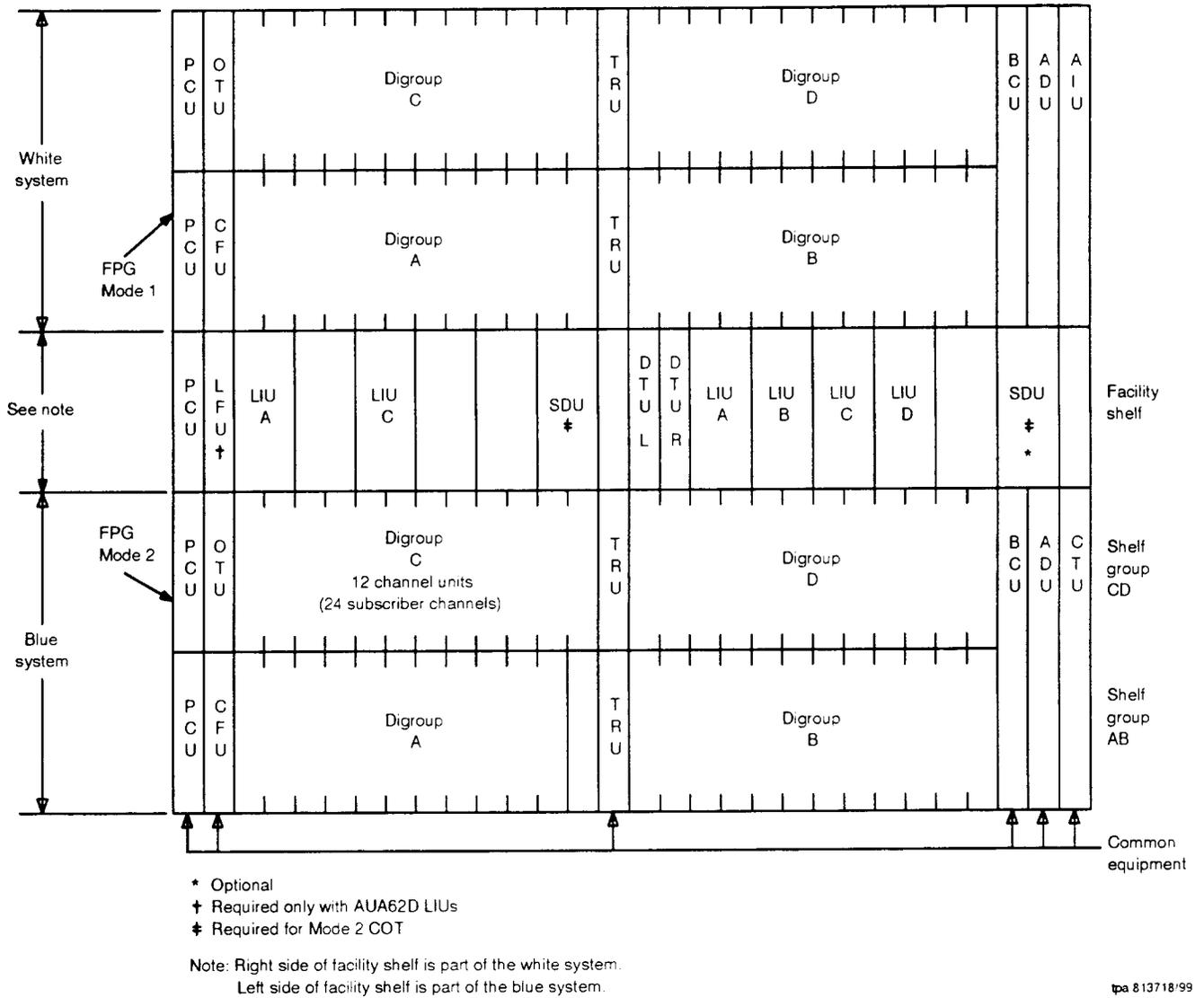
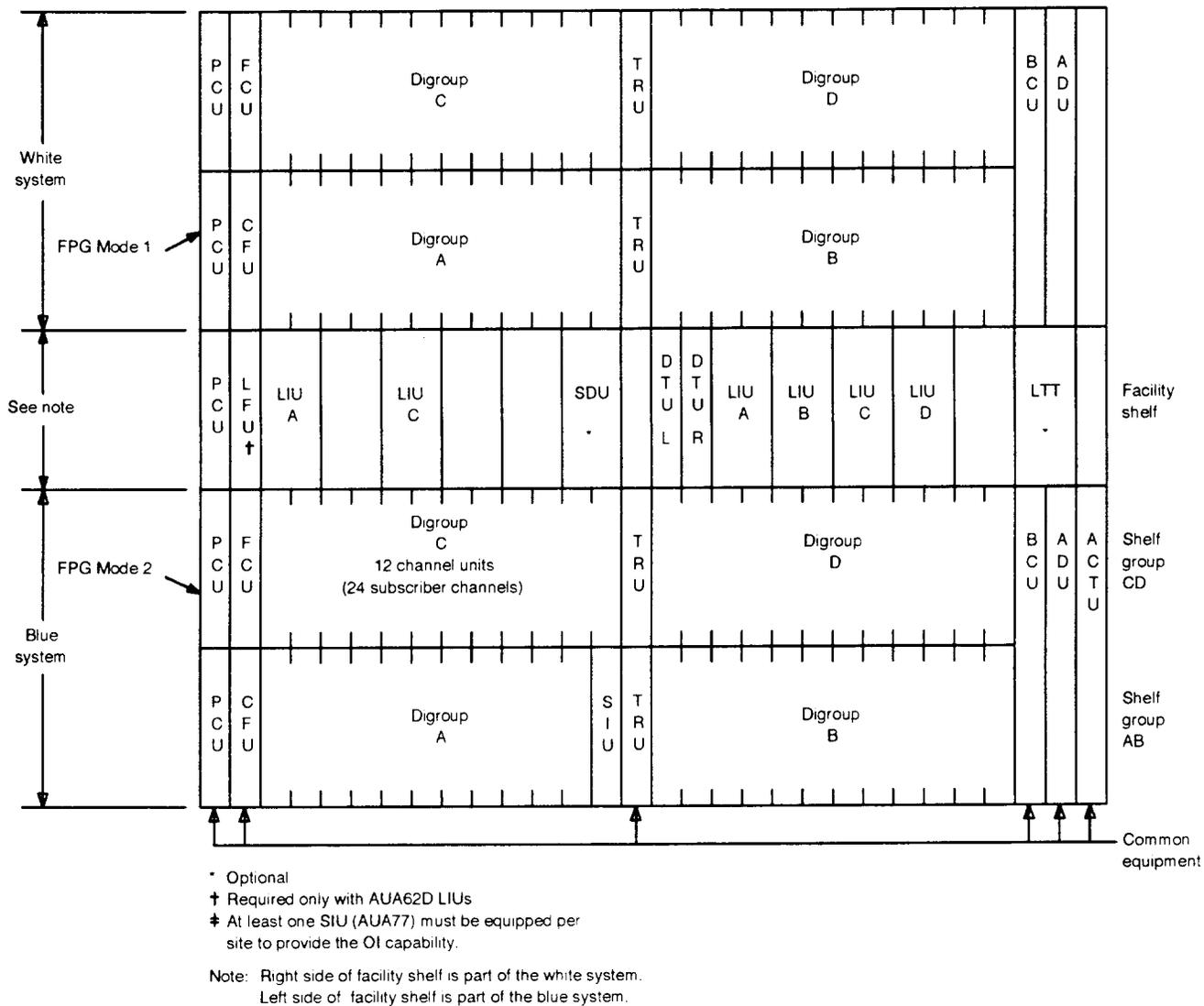
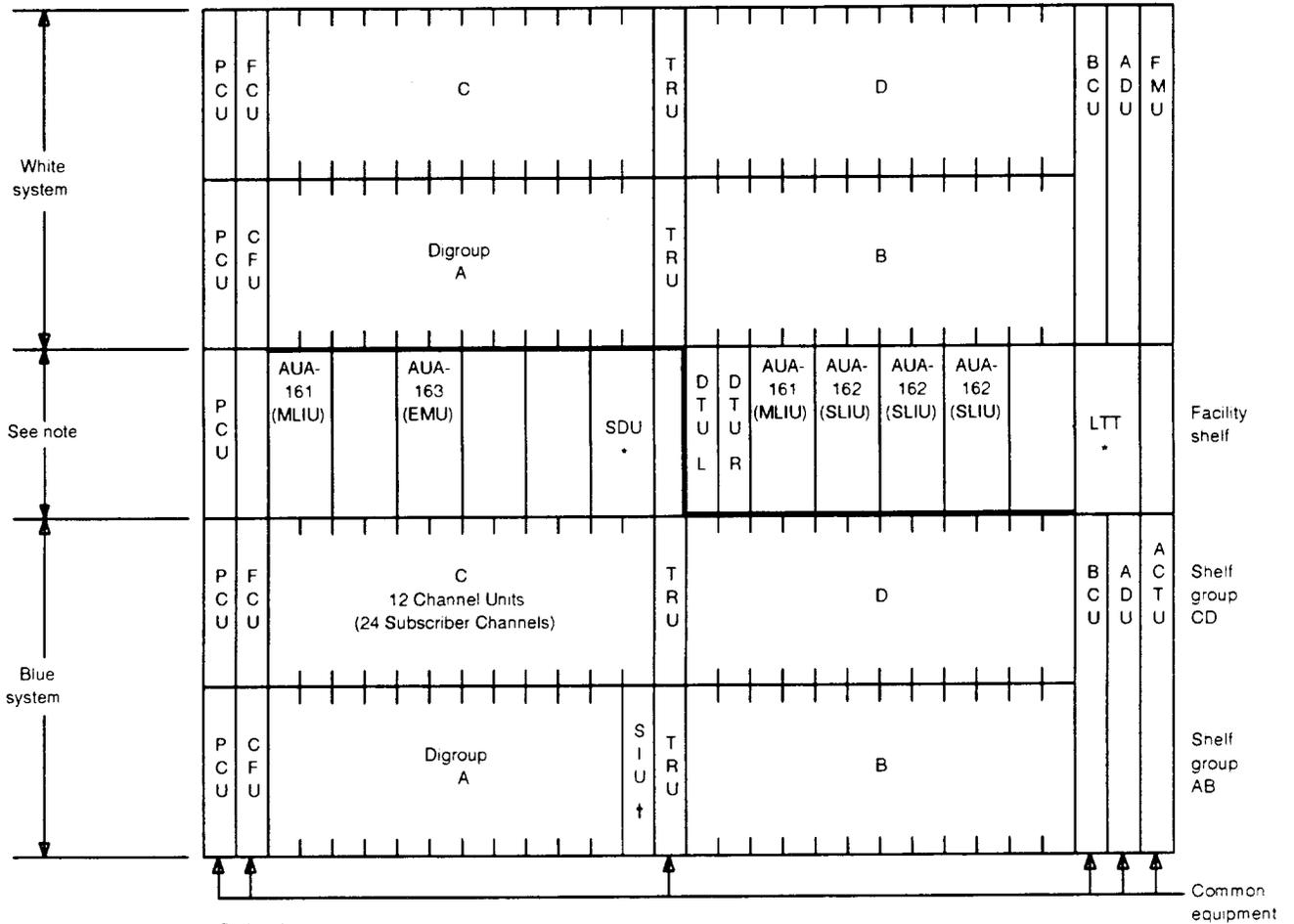


Figure 1. SLC[®] Series 5 Carrier System COT Dual Channel Bank Arrangement for FPG



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Figure 2. SLC[®] Series 5 Carrier System RT Dual Channel Bank Arrangement for FPG



* Optional

† At least one SIU (AUA77) must be equipped per site to provide the OI capability.

Note: Right side of facility shelf is part of the white system.
Left side of facility shelf is part of the blue system.

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Figure 3. SLC™ Series 5 Carrier System RT Dual Channel Bank Arrangement for FPI

2. Service Configurations

2.01 The *SLC Series 5 Carrier System* is a digital loop carrier system which provides 96 channels. Two independent systems are combined in a dual bank arrangement. The Series 5 system has three service offerings for GTE: Feature Package C (FPC), FPG, and FPI. This document describes the services for FPG and FPI only. The FPC offering is described in Select Code 005-001, *Description, Engineering, and Ordering Information*, Tab 1. Each configuration supports a different set of services (Table A) and determines other features of the system (for example, maintenance and the transmission interface). Table B lists the facilities, equipment, and apparatus (except channel units) associated with each feature package. Part 3, System Description defines universal and integrated systems.

Table A. SLC[®] Series 5 Carrier System Feature Package Summary

	Feature Package	
	FPG	FPI
Features	Universal (COT and RT); POTS, locally switched specials, other specials including digital data system (DDS); Line testing using 4TEL† Computer-Controlled Diagnostic Systems; CU testing using PGTC and automated channel test unit (ACTU); Operations support using Operations Interface.	Integrated; GTD-5* EAX generics; POTS, locally switched specials, other specials; Drop testing using 4TEL Computer-Controlled Diagnostic Systems; CU testing using ACTU and GTD-5 EAX line diagnostics; Mode 1 D digroup grooming; Mode 2 special service grooming; Physical grooming of special services; Operations support using Operations Interface.
SLC Series 5 Channel Units‡	POTS SPOTS* channel units POTS with derived channel alarm Coin DID E SPOTS channel units 2W PLAR 4W special services Dataport Multiparty FSR M SPOTS channel units Dual ring rptr	POTS SPOTS channel units Coin E SPOTS channel units 2W PLAR 4W Special services Dataport Multiparty FSR M SPOTS channel units Dual ring rptr

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‡ POTS (AUA31/38/158); SPOTS channel units (AUA32/39); POTS/SPOTS channel units (AUA59/150/159); M SPOTS channel unit (AUA25); coin (AUA33/53); multiparty (AUA35/55); DID (AUA36/56); FSR (AUA37/57); E SPOTS channel units (AUA142/43); 2-wire PLAR (AUA75); 4-wire special service (AUA141/44/54); dataport (AUA34B/52B); and POTS with derived channel alarm (AUA26/27). For applications, refer to AT&T 915-710-116, *Channel Unit Application and Prescription Setting*, or AT&T 363-205-010, *SLC Series 5 Carrier System Applications and Planning Guide*.

Table B. SLC® Series 5 Carrier System Equipment and Apparatus by Feature Package

<u>Equipment/ Apparatus</u>	<u>Feature package (See Notes)</u>				
	<u>FPG Mode 1</u>	<u>FPG Mode 2</u>	<u>FPI Mode 1</u>	<u>FPI Mode 2</u>	<u>FPI Mode 4</u>
<u>Unprotected Facilities</u>	<u>DS1 or T1 Lines Per 96-Line System</u>				
	<u>4</u>	<u>2</u>	<u>4</u>	<u>2</u>	<u>1</u>
<u>Protected Facilities</u>	<u>DS1 or T1 Lines Per 96-Line System</u>				
	<u>5*</u>	<u>3*</u>	<u>4*</u>	<u>2*</u>	<u>1*</u>
<u>COT Frames</u>	<u>ED-8C501-50,G2</u>	<u>ED-8C501-50,G2</u>	<u>ED-8C501-50,G2</u>	<u>ED-8C501-50,G2</u>	<u>ED-8C501-50,G2</u>
	<u>ED-8C501-51,G2</u>	<u>ED-8C501-51,G2</u>	<u>ED-8C501-51,G2</u>	<u>ED-8C501-51,G2</u>	<u>ED-8C501-51,G2</u>
	<u>ED-8C501-51,G3</u>	<u>ED-8C501-51,G3</u>	<u>ED-8C501-51,G3</u>	<u>ED-8C501-51,G3</u>	<u>ED-8C501-51,G3</u>
<u>COT Channel Banks</u>	<u>J1C182AG-1,L[]</u>	<u>J1C182AG-1,L[]</u>	<u>—</u>	<u>—</u>	<u>—</u>
<u>RT Channel Banks</u>	<u>J1C182AH-1,L[]</u>	<u>J1C182AH-1,L[]</u>	<u>J1C182AH-1,L[]</u>	<u>J1C182AH-1,L[]</u>	<u>J1C182AH-1,L[]</u>
<u>COT BCUs</u>	<u>MC97774A1</u>	<u>MC97774A1</u>	<u>—</u>	<u>—</u>	<u>—</u>
<u>RT BCUs</u>	<u>MC97775A1</u>	<u>MC97775A1</u>	<u>MC97775A1</u>	<u>MC97775A1</u>	<u>MC97775A1</u>
<u>COT ADUs</u>	<u>AUB6</u>	<u>AUB6</u>	<u>—</u>	<u>—</u>	<u>—</u>
<u>RT ADUs</u>	<u>AUB27/ AUB28</u>	<u>AUB27/ AUB28</u>	<u>AUB28</u>	<u>AUB28</u>	<u>AUB28</u>

Notes:

1. In addition to selecting the correct plug-ins for a feature package, the common units have option switches which must be included in the system engineering and set according to the turnup task oriented practice (TOP) and local engineering documents.
2. AUB28 alarm display unit (ADU) is required for the optional Operations Interface (OI) feature.

* With FPI, facility protection is available only through a stand-alone protection arrangement.

Continued on next page

Table B. SLC[®] Series 5 Carrier System Equipment and Apparatus by Feature Package (Contd)

Equipment/ Apparatus	Feature Package (See Notes)				
	FPG Mode 1	FPG Mode 2	FPI Mode 1	FPI Mode 2	FPI Mode 4
COT LIUs	AUA61D	AUA61D	—	—	—
RT LIUs	AUA61D	AUA61D	AUA161	AUA161	AUA161
	AUA62D	AUA62D	AUA162	AUA162	
	AUA64D	AUA64D			
EMU (RT)	—	—	—	—	AUA163
COT TRUs	AUA111	AUA111	—	—	—
RT TRUs	AUA111	AUA111	AUA111	AUA111	AUA111
OTU (COT)	AUA3	AUA3	—	—	—
COT CTU	AUB2B	AUB2B	—	—	—
RT CTU/ACTU	AUB30	AUB30	AUB30	AUB30	AUB30
	AUB22/25	AUB22/25			
DTU-L	AUA18	AUA18	AUA18	AUA18	AUA18
DTU-R	AUA19	AUA19	AUA19	AUA19	AUA19
SIU	AUA77	AUA77	AUA77	AUA77	AUA77
SDU	AUA8	AUA8	AUA8	AUA8	AUA8
LTT	AUA176	AUA176	AUA176	AUA176	AUA176
LTF	ED7C719-30	ED7C719-30	ED7C719-30	ED7C719-30	ED7C719-30
FMU	—	—	AUB101	AUB101	AUB101

Notes:

1. In addition to selecting the correct plug-ins for a feature package, the common units have option switches which must be included in the system engineering and set according to the turnup task oriented practice (TOP) and local engineering documents.
2. For the RT, the AUB30 automated channel test unit (ACTU) or channel test unit (CTU) must be equipped in Feature Package G (FPG); the CTU is not recommended for Feature Package I (FPI).

Feature Package G Features and Services

2.02 Feature Package G is available in a universal configuration, which includes a central office terminal (COT) and a remote terminal (RT). Feature Package G provides cost effective POTS service, the full range of switched and nonswitched special services, Mode 1 or Mode 2 (concentrated) capability, and enhanced operations, administration, maintenance, and provisioning (OAM&P) capabilities. Existing *SLC* Series 5 Carrier Systems can be upgraded to take advantage of the capabilities of FPG.

2.03 Feature Package G provides the following *SLC* Series 5 Carrier System features and services:

- Locally switched services [POTS/*SPOTS*[®] channel units, Centrex, direct inward dialing (DID), coin, multiparty, frequency selective ringing (FSR), and *VerSuS*[®] alarm services]
- Nonswitched and nonlocally switched 2W and 4W voice-frequency (VF) special services
- Dataport (2.4, 4.8, 9.6, 19.2, and 56 kb/s, and 64 kb/s clear channel capability)
- ZCS or B8ZS line coding
- Mode 1 (nonconcentrated) operation
- Mode 2 (concentrated) operation
- Near-end provisioning and far-end provisioning (via supplemental data link), alignment, and special service test access at the COT or RT by the craft interface unit (CIU)
- Channel testing by the pair gain test controller (PGTC) or the extended test controller (XTC) operating in PGTC-mode.
- Periodic testing of subscriber loops via *4TEL* Computer-Controlled Diagnostic System *RMU* telephone line test measurement apparatus.
- Enhanced OAM&P using a local area network at each RT site and an Operations Interface (OI) to provide the following:
 - Centralized plug-in inventory
 - Centralized provisioning of special service channel units
 - Enhanced alarm diagnostics
 - DS1 performance monitoring
 - Routine testing and alarming of RT channel units
 - Power-up verification test of RT channel units

* Registered trademark of Versus Technology, Inc.

Feature Package I Features and Services

2.04 Feature Package I (FPI) provides an integrated configuration for connection to the *GTD-5* EAX via the remote unit data link control (RDLC) link. Feature Package I, which consists of a remote terminal, is based on Feature Package G. The FPI provides cost effective POTS service, the full range of switched and nonswitched special services, Mode 1 (nonconcentrated) or Mode 2 or 4 (concentrated) operation, and enhanced operations, administration, maintenance, and provisioning (OAM&P) capabilities. Existing universal systems can be upgraded to take advantage of the integration with the *GTD-5* EAX offered by FPI.

2.05 Feature Package I provides the following features and services:

- Locally switched services [POTS/*SPOTS*, coin, multiparty, and frequency selective ringing (FSR)]
- Nonswitched and nonlocally switched 2W and 4W voice-frequency (VF) special services
- Dataport (2.4, 4.8, 9.6, 19.2, and 56 kb/s)
- Integrated interface to the *GTD-5* EAX using RDLC data link protocol
- Mode 1 (nonconcentrated) operation
- Mode 2 (2:1 concentration) operation
- Mode 4 (4:1 concentration) operation
- Channel testing through integrated line diagnostics
- Subscriber loop testing through LTT, and *4TEL* Computer-Controlled Diagnostic System
- Provisioning, alignment, and special service test access at the RT by the craft interface unit (CIU)
- Enhanced OAM&P using a supplemental data link and an Operations Interface (OI) to provide the following:
 - Centralized plug-in inventory
 - Centralized provisioning of special service channel units
 - Enhanced alarm diagnostics
 - DS1 performance monitoring
 - Routine testing and alarming of RT channel units
 - Power-up verification test of RT channel units.

Feature Package Conversions

A. Converting to FPG

2.06 Existing *SLC* Series 5 Feature Package C (FPC) systems can be converted to FPG by exchanging common circuit packs and adding a simple cable assembly to the COT backplane. Conversion from FPC to FPG can be accomplished while preserving special services provisioning data. AT&T 363-205-600G, *Feature Package G and I, Acceptance, Turnup, and Conversion* provides procedures for converting FPC or FPC-AutoCut to FPG Mode 1, FPG Mode 1 to FPG Mode 2, and FPG Mode 2 to FPG Mode 1. These conversions require craft personnel at both the COT and the RT to minimize service interruption.

2.07 Preparing for a conversion may involve adding or rearranging digital facilities, grooming special service circuits, and reassigning customer service in the CO switching equipment. The reason a system is converted from one feature package to another varies, but is usually done because of changes in customer service requirements or enhancements to central office switching equipment. The amount of preconversion testing and preparation depends on the complexity of the system to be converted.

2.08 Grooming of special service circuits may be required when converting a FPG Mode 1 to a FPG Mode 2 system. A Mode 2 RT has channel slot restrictions for special service units (right four slots per digroup). Grooming of special service circuits should be done before converting the feature package.

B. Converting to FPI

2.09 Existing Series 5 Feature Package C (FPC) and Feature Package G (FPG) systems equipped with the J1C182AH-1 backplane can be converted to FPI by exchanging common circuit packs. Conversion from FPG to FPI can be accomplished while preserving special services provisioning data. Conversion directly from FPC to FPI, however, will require provisioning data to be reentered. AT&T 363-205-600G, *Feature Package G and I, Acceptance, Turnup, and Conversion*, and the *GTD-5 EAX User's Guide—Part 2*, provides procedures for converting FPC to FPI and converting FPG to FPI. These conversions require craft personnel at both the CO and the RT to minimize service interruption. The upgrading of an FPG system with AUA62D or AUA64D line interface units (LIUs) may require changes to the feeder facility configuration, because FPI does not support line powering LIUs.

2.10 Preparing for a conversion may involve adding or rearranging digital facilities, grooming special service circuits, and reassigning customer service in the CO switching equipment. The reason a system is converted from one feature package to another varies, but is usually done because of changes in customer service requirements or enhancements to central office switching equipment. The amount of preconversion testing and preparation depends on the complexity of the system to be converted.

2.11 Reengineering of special service circuits may be required when converting an FPI Mode 1 system to either a Mode 2 or Mode 4 system. Due to the effect on line concentration, upgrading to Mode 4 should be evaluated when the Mode 1 system has more than eight special service channel units. Modes 2 and 4 RTs have channel slot restrictions for special service units (right four slots per digroup).

3. System Description

3.01 There are two basic *SLC* Series 5 Carrier System arrangements: universal systems and integrated systems. In integrated systems, the COT is not required. The *SLC* Series 5 Carrier System FPG configuration is a universal system. The FPI configuration is an integrated system for use with the *GTD-5* EAX. The basic system components are as follows:

- (a) COT equipment and associated apparatus located in the serving central office.
- (b) RT equipment and apparatus located in the area to be served.
- (c) The digital transmission facility between the two terminals. The transmission facility may be T1-type digital lines or a fiber facility terminated by a digital multiplexer with a DSX-1 (1.544 Mb/s) interface.
- (d) Voice-frequency (VF) distribution facility extending from the RT to the subscribers.
- (e) The selected service configuration (FPG or FPI). The service configurations cannot be mixed end-to-end (between the COT and the RT).

Universal FPG Systems

3.02 Figures 4 and 5 show the Universal FPG system layout which uses a *SLC Series 5* COT at one end and a *SLC Series 5 RT* at the other end of a digital transmission facility. Each *SLC Series 5 Carrier System* provides 96 carrier channels and (for Mode 1) dedicates one channel to each subscriber line. Figure 4 shows a Mode 1 arrangement that uses four main T1 lines. Figure 5 shows a universal system arrangement operating over a typical fiber facility. Other arrangements with the DDM-1000 multiplexer are detailed in the *DDM-1000 Applications and Planning Guide*, Select Code 2145B. The DDM-1000 multiplexer is described in AT&T 363-206-100, *DDM-1000 User's Manual*.

FPG Concentrated Operation

3.03 Feature Package G provides the capability of Mode 2 operation in a universal arrangement. Mode 2 supports all features of normal Mode 1 (nonconcentrated) operation and provides 2:1 facility concentration. Feature Package G Mode 2 utilizes the A and C digroup DS1 facilities to provide 2:1 channel concentration for a 96-channel *SLC Series 5 Carrier System*. The AB shelf has full access to the 24 DS0s on the A DS1 facility (except when the supplemental data link is selected—the 24th DS0 is used for the data link), while the CD shelf has full access to the 24 DS0s on the C DS1 facility. In Mode 2, special services channel units are restricted to the four rightmost slot positions in each digroup; however, the AUA75 channel unit is not usable in FPG Mode 2.

3.04 Concentration is provided by the AUA111 TRU. Use of the AUA61D, AUA62D, or AUA64D LIUs allows Mode 2 operation.

3.05 The FPG Mode 2 system provides the capability to display Mode 2 alarms and traffic counts at the COT via the AUA8 system display unit (SDU). One SDU is needed per 96-line system in Mode 2 applications. In addition, the Mode 2 system provides remoted closures and ring tripping operation for all-trunks-busy conditions. Outpulsing of hundred call seconds (CCS) and blocked call information may be retrieved by the Operations Interface (OI).

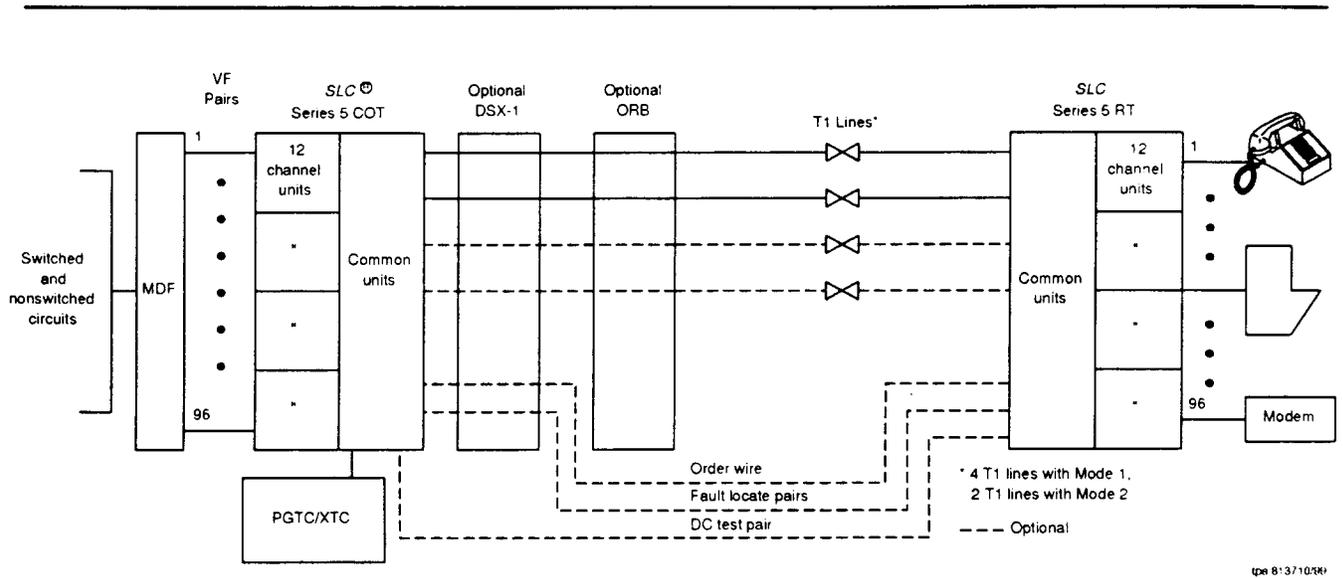


Figure 4. Universal FPG System Layout Using Metallic Facility

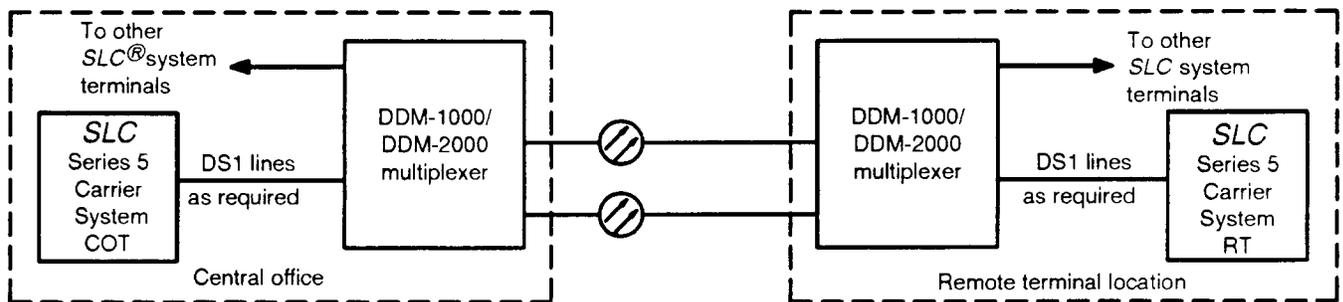


Figure 5. Universal FPG System Layout Using Fiber Facility

Integrated FPI Systems

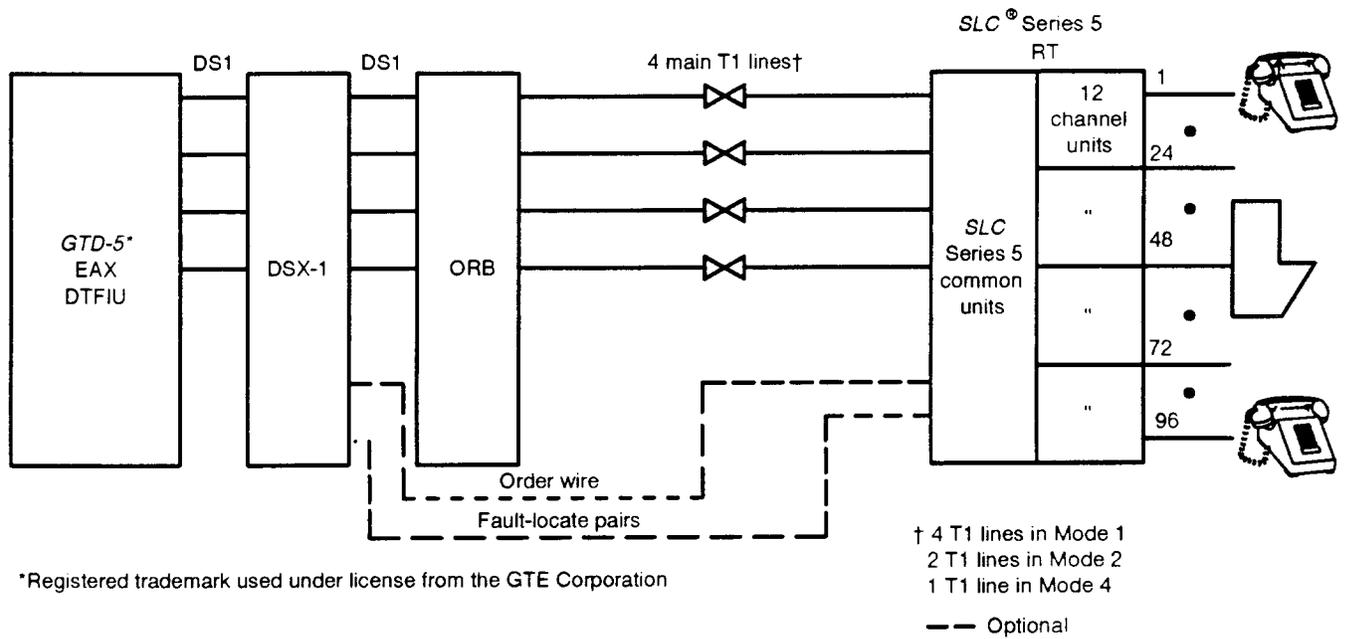
3.06 Figure 6 shows an integrated application with FPI. This arrangement provides a direct digital interface at the DS1 rate with the *GTD-5* EAX. In this system, the RT is connected directly to the *GTD-5* EAX digital trunk facility interface unit (DT-FIU) in Mode 1, 2, or 4. The DT-FIU provides the T1 digital line interface.

3.07 The FPI system communicates with the *GTD-5* EAX through the remote data link control (RDLC) link connected to the *GTD-5* EAX by the first DS0 of the A digroup (see the *GTD-5* EAX User's Guide). The DT-FIU is used with a DSX-1 cross-connect and an office repeater bay (ORB). The ORB provides power to the digital lines.

FPI Concentrated Operation

3.08 Feature Package I provides the capability of both Mode 2 (2:1 concentration) and Mode 4 (4:1 concentration) operation in an integrated arrangement. Feature Package I Mode 2 utilizes the A and C digroup DS1 facilities to provide 2:1 channel concentration for a 96-channel system. The AB shelf has access to 23 DS0s on the A DS1 facility (the 24th DS0 is used as a common signaling channel between the *GTD-5* EAX and the FPI RT). The CD shelf has access to the 24 DS0s in the C facility. Mode 4 utilizes the A digroup DS1 facility to provide 4:1 concentration for a 96-channel system. In both Mode 2 and Mode 4, special services channel units are restricted to the four rightmost slot positions in each digroup. The equipage of locally switched special services, nonlocally switched specials, and nonswitched specials permanently reserves a DS0 which affects line concentration of the remaining lines.

3.09 Concentration is provided by the AUA111 TRU. Mode 4 operation requires that the AUA163 elastic memory unit (EMU) be used in LIU slot C.



*Registered trademark used under license from the GTE Corporation

tpa 813804/01

Figure 6. Integrated FPI System Layout

DDM-2000 Multiplexer Applications

3.10 The DDM-2000 multiplexer is a network multiplexer designed for loop, interoffice, and customer location applications. It provides many of the features of the DDM-1000 plus the flexibility of the synchronous optical network (SONET) standard. A single 8.5-inch high shelf supports a mix of DS1, DS3, synchronous transport signal - level 1 (STS-1), and optical carrier - level 3 (OC-3) interfaces for a wide range of lightwave terminal and electrical multiplexer applications. A typical loop feeder application is shown in Figure 7. This application can be expanded and upgraded as needs change (refer to AT&T 363-206-200, *DDM-2000 Network Multiplexer, Applications and Planning Guide*).

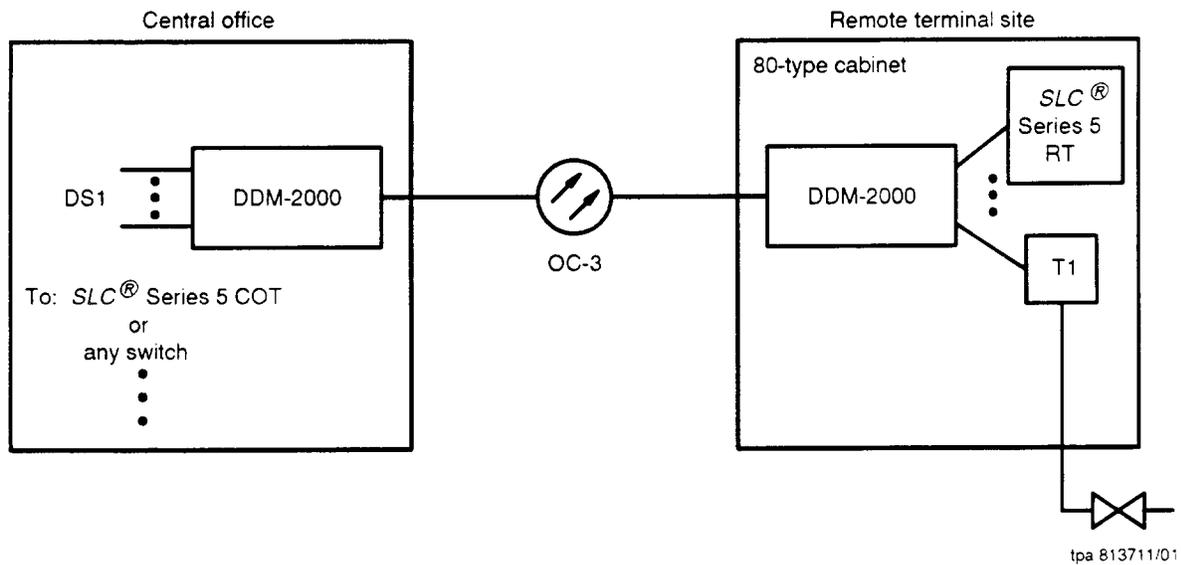


Figure 7. Typical DDM-2000 Multiplexer Loop Feeder Application

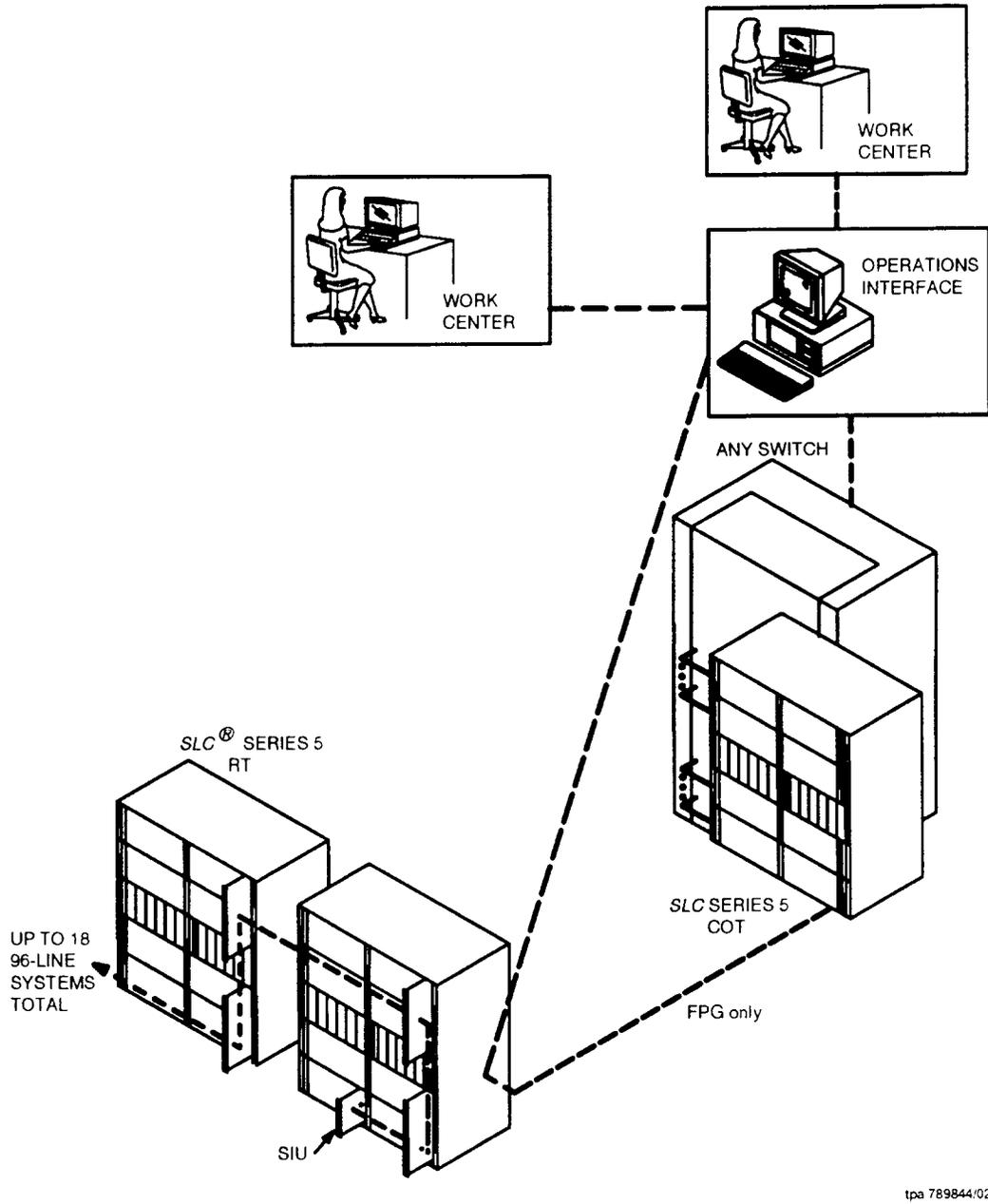
Operations, Administration, Maintenance, and Provisioning (OAM&P) Capability

3.11 The OAM&P capability is provided by the Operations Interface (OI) software running on a *UNIX** compatible computer. The OI is located in a work center where it provisions and retrieves information from the *SLC* Series 5 Carrier System. The initial host for the OI is the AT&T 6386-33 Work Group Station (WGS) running the *UNIX* System V operating system. The OI supports multiple simultaneous users and serves several COs. It accesses the FPG or FPI system through a dial-up line connected to the AUA77 site interface unit (SIU) located in the RT (Figure 8). The SIU is located in the twelfth channel unit slot of the A digroup of the RT bank. The SIU provides a local area network (LAN) capability which interconnects with each of the *SLC* Series 5 Carrier Systems within the RT site. One SIU is required at an RT location for up to eighteen 96-line systems. The SIU can be located in any system at the site. The AUB28 alarm display unit (ADU) provides the LAN termination for each RT system. The RT site LAN has a length restriction of 200 feet. This supports the 80D or smaller cabinets, or up to three 7-foot bays of bulk-powered RTs in a hut.

3.12 Access to the OI features at the RT site may be provided using a POTS line to access the OI host computer. In addition, alarm information and channel unit test results may be retrieved locally using the AUA8 system display unit (SDU) without having to access the OI host. The craft interface unit (CIU) can also be used for special service provisioning at the RT or COT.

3.13 To support single-ended provisioning or OI access to the COT, a supplemental data link is required. A DS0 time slot (channel 24 on Digroup A) is used for this purpose (one DS0 per 96-line system).

* Registered trademark of UNIX System Laboratories, Inc.



tpa 789844/02

Figure 8. Feature Package G or I Operations Interface

A. Centralized Plug-In Inventory

3.14 The centralized plug-in inventory capability reduces expenses associated with field visits for physical inventory of loop electronics. Inventory information is accessed through the OI and provides the following data on selected units:

- 10-character *CLEI** code
- Comcode
- Function code
(for example, "ADU," "BCU," etc.)
- Apparatus/MC code
- Date code/serial number
- Series number
- Shelf ID
- Slot ID

3.15 This detailed inventory is provided on the following units:

AUA8	System Display Unit (SDU)
AUA34B	DS0 Dataport
AUA52B	Office Channel Unit (OCU) Dataport
AUA111	Transmit/Receive Unit (TRU)
AUA158	ALC POTS
AUA159	ALC POTS/ <i>SPOTS</i> [®] Channel Unit
AUB28	RT-Alarm Display Unit (ADU)
AUB30	Automatic Channel Test Unit (ACTU)
MC97774A1	COT-Bank Control Unit (BCU)
MC97775A1	RT-Bank Control Unit (BCU)

3.16 This capability will be phased in on new or redesigned units. Older vintage plug-ins generally provide 6-digit *CLEI* code, apparatus/MC code, and function code.

3.17 In addition to inventory data, other information such as the equipped/unequipped status of slots [such as line interface unit (LIU) slots], status of option switches, and the operating mode of the system can be retrieved by the OI.

* COMMON LANGUAGE is a registered trademark and CLEI, CLLI, CLCI and CLFI are trademarks of Bell Communications Research, Inc.

B. Enhanced Alarm Diagnostics

3.18 This capability speeds restoral of service and reduces maintenance costs associated with trouble clearing system problems. Alarm information (including the identity of failed common units and channel units) can be retrieved from the FPG or FPI system through the OI. The diagnostic information identifies the common unit (such as the LIU or the TRU) or the DS1 incoming signal that has failed.

3.19 A compatibility (CMP) alarm indication is generated at the RT when installation actions generate conditions that may result in service disruptions or operational problems. These installation actions include incorrect common unit placements or incompatible option switch settings. The CMP LED is located on the AUB27 and AUB28 ADU.

3.20 When a common unit is plugged into the bank, the BCU attempts to identify the unit by ID code. If necessary, the BCU powers up the unit in order to identify it. If the unit is determined to be incompatible, the FAIL LED on the unit is lighted. The LED remains lighted until the unit is removed (pressing the LED TEST button on the ADU may cause the LED to extinguish). At the RT, the CMP alarm LED also lights.

3.21 At the RT, a plug-in incompatibility raises a CMP alarm and either an MJ or MN alarm, which is indicated by LEDs on the ADU; the CMP alarm is also indicated by the optional SDU. At the COT, a plug-in incompatibility raises an MJ or MN alarm. Here, the CMP nature of the alarm is only displayed by the SDU, since the current AUB6 COT ADU is not equipped with a CMP LED. If the OI feature is installed, the CMP and MJ/MN alarm states at either the COT or RT are remoted to the work center.

C. DS1 Performance Monitoring

3.22 This feature reduces maintenance costs associated with troubleshooting intermittent problems on T1 lines. Proactive monitoring helps prevent customer trouble reports. The D-series and FPI LIUs provide the necessary information storage. This information is stored in the bank controller and LIUs in the COT and RT, and can be retrieved by the OI. The following parameters are stored:

- Coding Violations (CV) - Bipolar Violations (BPV)
- Framing Event Counts (FEC) - Out-Of-Frame (OOF) or Change of Frame Alignments (COFA)
- Errored Seconds (ES)
- Severely Errored Seconds (SES)
- Unavailable Seconds (UAS)
- Degraded Minutes (DM)

3.23 A 15-minute count for each parameter is stored in LIU registers. At the end of each 15-minute period, the bank controller (BC) reads the counts and clears the LIU registers for the start of the next 15-minute period. The BC stores a total of one "previous 15-minute" count and 31 "recent 15-minute" counts (8 hours total) for FEC, ES, SES, UAS, and DM parameters. The BC also stores the total impairment count for each parameter for a 24-hour period in a "current day" register. At the end of each 24-hour period, the impairment count from the current day register is stored in another register called the "previous day" register, and the old data from the previous day register is discarded. In order to delineate the end of each 15-minute period and the end of the 24th hour, the BC maintains a 24-hour clock.

D. Routine Testing and Alarming of RT Channel Units

3.24 This capability helps reduce customer trouble reports and maintenance costs. It provides periodic testing for most RT channel units, along with a means for alarming failed units locally and remotely.

3.25 The AUB30 *automated* channel test unit (ACTU), in addition to supporting all existing channel test unit (CTU) functions described later in Channel Unit Provisioning, tests RT channel units as listed in Table C on a routine basis. When the RT ADU is optioned for automatic testing, channel unit failures are displayed by the AUA8 SDU.

3.26 The SDU contains a readout that identifies the location of the failed channel units. Multiple failed channel units are displayed one at a time under craft control. The same information is retrieved by the OI.

3.27 When the ADU is optioned for automatic testing, the ACTU performs a "verification" test using a fault isolation sequence on almost all RT CUs upon insertion (see Table C). This provides immediate indication on the near-end SDU whether the CU is good or bad.

3.28 The ACTU must detect at least two failed channel units to activate an alarm. RT channel unit failures are alarmed (MN alarm) at the RT and COT. The COT SDU displays failure information when the supplemental data link is present. The routine testing and alarming feature can be disabled at the AUB6, AUA27, and AUB28 ADUs.

3.29 The test window (length of time) and frequency of tests within the window for routine testing of testable RT channel units are customer selectable through the OI. Each test sequence consists of a test of every in-service circuit except those precluded by the OI. If any circuit has not been tested at the end of an hour, that test sequence is terminated. The ACTU first determines that the channel is in an idle state before testing the channel unit (special service channel units are not routinely tested because of the possibility of disrupting service even if the signaling bits are in the idle state). If two or more channels fail the routine tests, a system alarm will be present at both the RT and COT. Channel units that fail a routine test are **not** taken out of service.

3.30 The BCU firmware provides the system (time of day) clock, storage of test results, and routing of test results to SDU or OI. The OI is used to set the system clock and to select the test window and frequency for routine testing. If the OI is unavailable, the ACTU provides the following capabilities:

- Default routine test execution (A routine test sequence begins 24 hours after ACTU installation and is repeated daily)
- Power-up verification tests
- Display of power-up test results on the SDU
- PGTC test support for FPG
- Integration with *GTD-5* EAX line diagnostics (in-tests) for FPI
- CIU access.

3.31 Power-up testing occurs whenever a channel unit is initially installed and whenever power is restored after an outage. Table C indicates those channel units that are tested by the ACTU during power-up and the units that are tested on a routine basis.

Table C. Channel Units

Non-Option-Selectable		Location		ACTU Testable Channel Units		Feature Package
Code	Description	RT	COT	Power-Up	Routine	
AUA25B	M SPOTS [*]	✓		✓	✓	G & I
AUA26	POTS + VerSuS [*] alarm services		✓			G
AUA27†	POTS + VerSuS alarm services	✓		✓	✓	G
AUA31	POTS		✓			G
AUA32	SPOTS		✓			G
AUA33	Coin		✓			G
AUA35	Multiparty		✓			G
AUA36	DID DPO		✓			G
AUA37	FSR		✓			G
AUA38	POTS		✓			G
AUA39	SPOTS		✓			G
AUA51	POTS / SPOTS	✓		✓	✓	G & I
AUA53	Coin	✓		✓	✓	G & I
AUA55	Multiparty	✓		✓	✓	G & I
AUA56	DID DPT	✓		✓	✓	G
AUA58B	POTS	✓		✓	✓	G & I
AUA59	SPOTS	✓		✓	✓	G & I
AUA150	SPOTS	✓		✓	✓	G & I
AUA158	ALC POTS	✓		✓	✓	G & I
AUA159	ALC POTS / ALC SPOTS	✓		✓	✓	G & I

* Registered trademark of Versus Technology, Inc.

† Can be used for VerSuS alarm services only in Mode 1

Continued on next page

Table C. Channel Units (Contd)

Option-Selectable		Location		ACTU Testable Channel Units		Feature Package
Code	Description	RT	COT	Power-Up	Routine	
AUA34	DSO dataport		✓			G
AUA34B	DSO dataport (19.2)		✓			G
AUA41	4W CF (4W-1)	✓	✓	✓		G & I
AUA42	E SPOTS 2W current sink	✓	✓	✓		G & I
AUA43	E SPOTS 2W current feed	✓	✓	✓		G & I
AUA44	4W current sink (4W-2)	✓	✓	✓		G & I
AUA52	OCU dataport	✓	✓			G & I
AUA52B	OCU dataport (19.2)	✓	✓			G & I
AUA54	4W E&M (4W-0)	✓*	✓*	✓		G & I
AUA57	FSR current feed	✓		✓	✓	G & I
AUA75	2W PLAR	✓	✓	✓		G & I
AUA141	4W current feed (4W-1)	✓	✓	✓		G & I
AUA142	E SPOTS 2W current sink	✓	✓	✓		G & I
AUA152	OCU dataport	✓	✓			G & I

* AUA54 E&M CU requires the digroup to be equipped with the E&M harness assembly.

E. Channel Unit Provisioning

3.32 The special service channel units (AUA34, AUA34B, AUA41, AUA42, AUA43, AUA44, AUA52, AUA52B, AUA54, AUA57, AUA75, AUA141, AUA142, AUA152) have transmission and signaling options which must be set through the OI or CIU before service is provided. The AUA57 FSR unit has option switches that must be set manually before the channel unit is installed. The other 2- and 4-wire special service channel units do not have physical option switches; instead, option information is stored in memory registers located on the channel unit.

3.33 The centralized provisioning feature of the OI reduces provisioning expense by eliminating the need to visit RT sites to provision special services. Centralized provisioning allows special service channel units to be provisioned from a centralized work center. Refer to AT&T 363-205-111G, *Operations Interface (OI) User's Guide*, for additional information on the use of the OI for provisioning channel units.

3.34 The J99404TA-1,L2 craft interface unit (CIU) and the bank controller (the alarm display unit and the bank control unit) may also be used to provision the channel units. The CIU plugs into the channel test unit (CTU) (RT or COT) or the automated channel test unit (ACTU) (RT only) to access the bank controller which programs the channel units. The COT bank controller and the RT bank controller communicate via the supplemental data link which requires dedication of a DS0. Thus, RT and COT channel units can be provisioned from either end using the CIU.

3.35 After the CIU establishes 2-way communication with the bank controller, it will present a sequence of provisioning prompts to the user. These prompts follow the entries on the work order record detail (WORD) document (or equivalent) which contains the system information. To provision a channel, the user enters the specified value from the WORD document as indicated by the CIU prompt. At the end of provisioning, the CIU will display a completion message.

3.36 When provisioning is completed (transmission and signaling options set), the CIU transmits the information to the bank controller, which stores it in nonvolatile system memory. The bank controller then writes the options into the channel unit registers when a channel unit is installed. Thus, a channel can be provisioned before the channel unit is installed.

3.37 If the channel unit is already installed, the bank controller writes the option information into the channel unit registers immediately after receiving the information from the CIU. Unplugging the channel unit does not erase the option information stored in system memory; reinstalling the channel unit causes the options to be rewritten immediately into the channel unit. Therefore, the channel unit options do not have to be reprogrammed when a channel unit is replaced.

System Power Arrangements

A. Central Office Powering

3.38 In the COT bay, the J1C141AC-1 L1, L2 fault-locate and order-wire (FL/OW) panel is powered from the -48 V office supply. The FL/OW panel has a DC-to-DC converter to convert the -48 V supply to +130 V for the regulator which provides 118 V to power the fault-locate line. Heat baffles mounted in the COT bay between channel banks provide fuses and indicators for the -48 V supplies to the channel bank fuse units and power converter units (Figure 9).

B. Digital Line Powering (FPG only)

3.39 The digital lines can be powered from the COT through the LIUs. The AUA62D LIU provides 60 mA at up to -130 V to power the line; it can also be used at the RT to back-power the digital line. The AUA62D does not provide positive line powering. The AUA64D LIU provides power looping at the RT; the AUA61D LIU provides a DSX-1 interface to a DSX-1 digroup cross-connect panel at the COT or RT. The T1 repeaters derive power from a constant current simplex onto the carrier pairs. When the digital line is powered with COT LIUs, 60-mA repeaters are required. If the line is powered from an office repeater bay (AUA61D LIUs in the COT), either 60- or 140-mA repeaters may be used. Digital line powering design is described in AT&T 915-710-115G, *Feature Package G and I, Application Engineering*.

3.40 A remote power feed terminal (RPFT) may be used for intermediate powering of long digital lines. This terminal is required when the digital line power requirements exceed the range of powering from the COT (including back-powering from the RT). The terminal equipment includes the SLC 96 Carrier System cabinet, battery charger, and backup batteries. It also uses constant current DC-to-DC converters and power insertion transformers. A fully loaded RPFT (25 converters) will support five SLC Series 5 Carrier Systems. See AT&T 915-710-110 for design considerations. The description, installation, and maintenance of the RPFT is covered in AT&T 363-202-525. Shelf installation and wiring are covered in AT&T 640-250-221.

C. SLC[®] Series 5 COT Grounding and Lightning Immunity

3.41 As the SLC Series 5 COT does not isolate the -48 V RTN from the frame, the frame cannot be directly grounded to the master ground bar (MGB). This will prevent load current from returning through the MGB through lead CO 37 to the positive terminal of the office supply. The frame ground must be returned to the power distribution unit frame (PDUF) return bus through a lead which is separate from the -48 V RTNs serving the bay. The same type of grounding arrangement applies to the office ringing supply connection. The specifics of the installation technique will be contained in Issue 2 of SD-7C116-03 and in relevant installation drawings.

PGTC

3.42 The PGTC and extended test controller (XTC) as a pair gain test controller (PGTC) include a connection between the -48 V RTN and frame ground. Both test controllers require the COT ground method.

Office Ringing Supply

3.43 The 20 Hz return lead is grounded to the frame at the SLC Series 5 COT bay. This connection is required by several subsystems within the COT bay and cannot be removed. The GTE engineer should verify that the 20 Hz return is connected to the -48 V return and not to the MGB at the office ringing supply source. If the 20 Hz return is connected directly to the MGB, then a ground loop will exist which includes the MGB and lead 37 and the single point grounding system is corrupted for the entire office.

AUA11C Power Converter Unit (PCU)

3.44 Use of the AUA11A or AUA11B represents an increased threat to the SLC Series 5 COT during a lightning strike on the outside plant. The electrical design of the AUA11C PCU provides better protection and AT&T recommends it to reduce the threat of surge induced voltage spikes.

Grounding Office Clock Connections to GTD-5 EAX

3.45 The office clock signal is supplied by a shielded twisted pair cable. The shield conductor must be terminated (grounded) at the SLC Series 5 COT bay (per SD-7C116-03, Issue 2). The shield conductor must not be grounded at the office clock source end of the cable.

D. RT Powering

3.46 Commercial 117 V 60 Hz service is required at all RT installations. The commercial AC is rectified by the power shelf rectifiers or a bulk power plant to provide the -48 V for the RT. For cabinet RTs, reserve power is provided by battery strings mounted below or behind the dual bank. Frame-mounted RTs may be AC-powered or DC (bulk) powered. In a distributed power arrangement, each AC-powered frame contains battery strings to provide auxiliary power to the frame if the AC supply fails. With a bulk power arrangement, the bulk power plant provides auxiliary power; the DC-powered frames do not require batteries. Advantages of a bulk power arrangement include a centralized power source and the ability to put more systems in a frame (the space normally used for battery strings can be used for channel banks). Figure 10 shows the -48 V power distribution for the RT channel banks. Fusing for the RT dual bank is provided by the bank fuse unit (BFU) which plugs into the power shelf.

E. RT Ringing Supply

3.47 The 3B1 or 3C1 ringing generator supplies ringing voltage to each shelf. For multiparty service, the output of the AUG1 positive ringing unit (PRU) is added to the main ringing supply output to provide a positive 20 Hz ringing signal. The AUG1 can supply two dual banks. For an arrangement with three dual banks (for example, RT bulk power), two AUG1 PRUs are required.

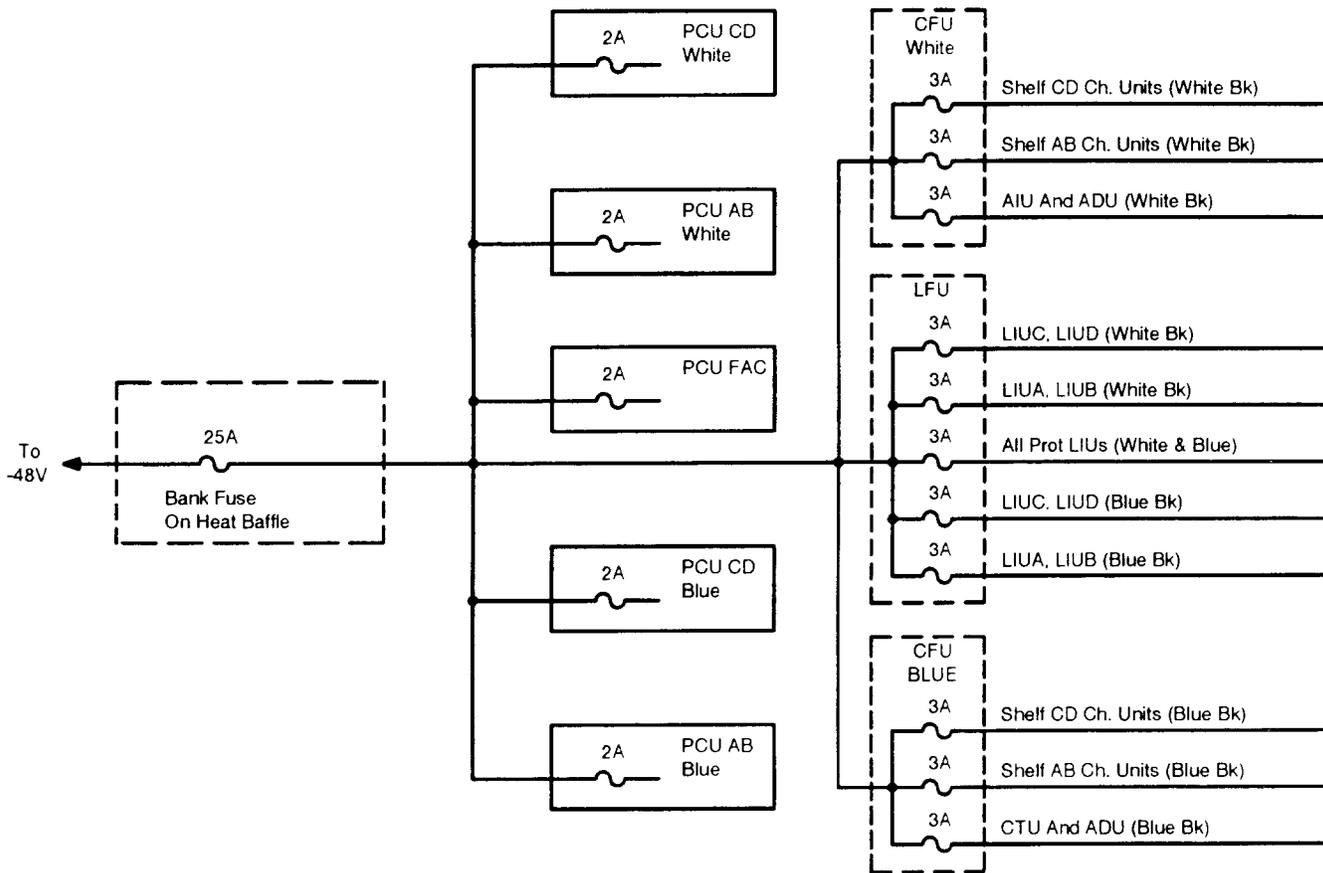


Figure 9. -48 V COT Power Distribution

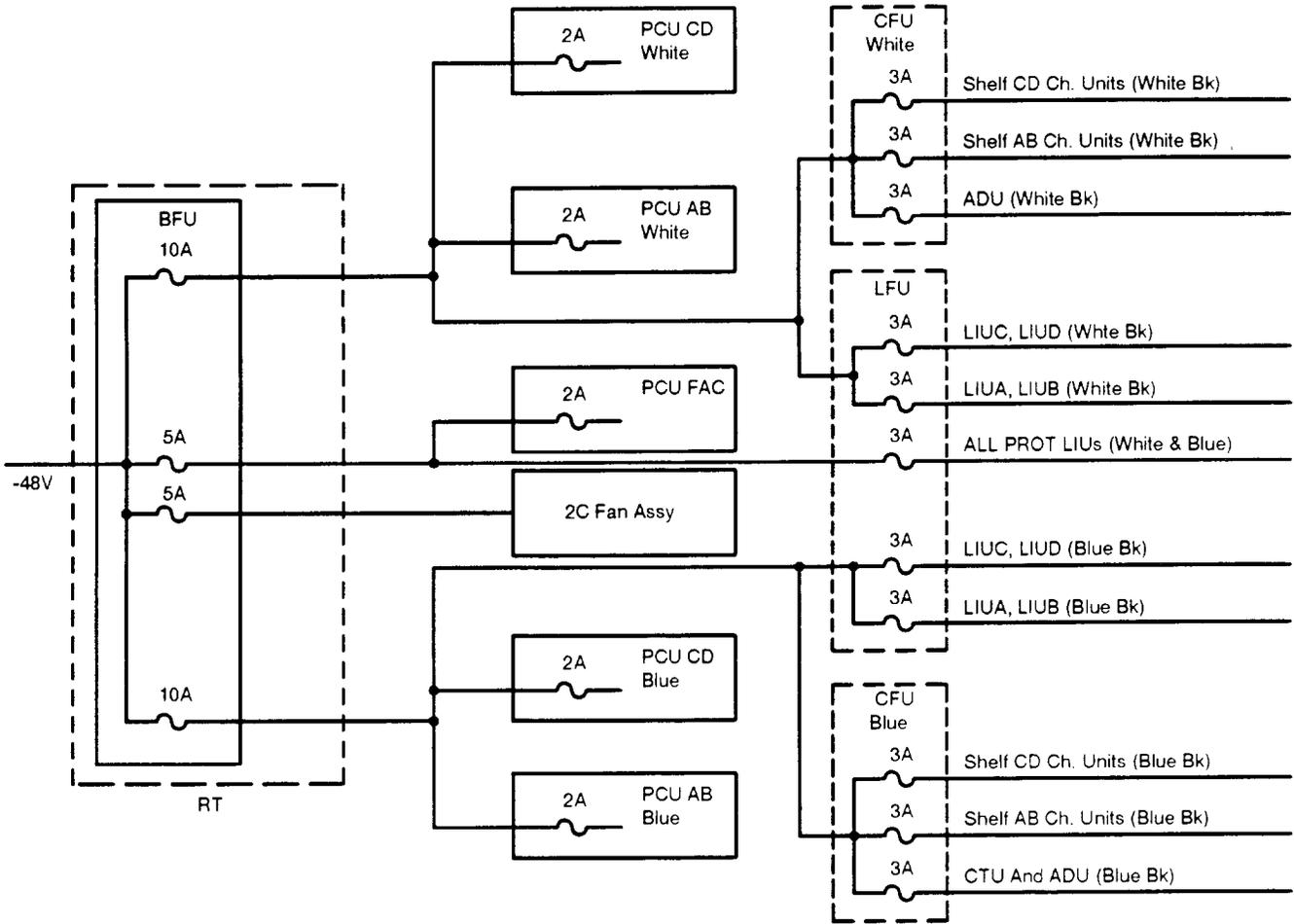


Figure 10. -48 V RT Power Distribution

F. Distributed Power

3.48 At the RT, the J1C182BA-1,L1 power shelf provides fusing and -48 V ringing for two dual channel banks. The 336A1 power unit(s) (rectifiers) which plug into the power shelf convert the commercial AC to the -48 V required by the dual channel bank. The ED-7C613-30,G3 load distribution unit (LDU) also plugs into the power shelf. The LDU connects and disconnects battery strings from the system and switches in the protection ringing generator when the main ringing generator fails. The 337A1 battery charger boosts and switches the batteries. In case of a power outage, the batteries generally have enough capacity to maintain normal equipment operation for a minimum of 8 hours. When commercial power is restored, the 337A1 battery charger will automatically recharge the batteries to full capacity within 24 hours. The battery charger also provides a low-rate float current to keep the batteries fully charged.

3.49 The same code of battery pack is used in RT cabinets and frames with distributed power. The AC-powered 7-foot frame holds three strings of batteries. The 51A cabinet holds two battery strings; an optional third battery string can be mounted in it. The 80D cabinet equipped with four dual channel banks holds six strings of batteries. Two battery strings are required for one dual channel bank assembly. Three battery strings are required for two dual channel bank assemblies. By replacing one dual bank with battery strings (nine battery strings with three dual banks or six battery strings with two dual banks), the battery reserve can be doubled (three battery strings per dual bank provides 16 hours average reserve). One string of batteries consists of four IR30C battery packs. Each battery pack supplies -12 V DC at 26 ampere-hours and is connectorized for plugging into the battery shelf (181A apparatus mounting). The batteries are sealed and need only periodic testing with the 197A test set. The 197A test set is described in AT&T 100-101-401. The battery packs should be tested when they are installed and at least once a year thereafter.

G. Bulk Powering

3.50 Frame-mounted RTs may be DC-powered from an RT bulk power plant, which contains AC rectifiers, a controller, a -48 V DC circuit breaker panel, a string of sealed-cell batteries, and busses to connect the breakers to the batteries. The *Lineage*™ 2000 system is recommended for bulk power applications with SLC Series 5 Carrier Systems. The -48 V DC is fed to the J1C182BB-1 L1 bulk power shelf from the circuit breaker panel. The AUG11 BFU (one for each dual bank) fuses the -48 V output to the RT dual banks. Two ringing generators (and the PRUs for multiparty service) provide ringing for the three dual banks. When one ringing generator fails, the ring switch unit connects the functional ringing generator to all three dual banks. With bulk powering, the 336A1 rectifiers, the LDU, the battery charger, and the battery shelf are not needed.

System Installation

- 3.51** By setting option switches on the ADU, the COT and RT can be equipped and tested independently of each other and the transmission facility. The selected options prevent standing alarms during installation testing. AT&T 363-205-600G, *Feature Package G and I, Acceptance, Turnup, and Conversion*, provides procedures for COT and RT acceptance and turnup for FPG, RT acceptance and turnup for FPI, end-to-end tests, and feature package conversions.
- 3.52** The T1 line does not have to be powered to make DC continuity and pair loss measurements with the 505A test adapter and the pair loss test set. The digital transmission tests are made with the line powered. The line can be powered with the AUA80 LIU test adapter and the 107B power unit or with the AUA78 fault-locate test adapter. Feature Package I will experience an outage for Digroup A or a service degradation of 24-48 lines for Digroups C and D while testing is performed. See AT&T 363-200-001 for T1 line preinstallation tests and procedures for *SLC Series 5 Carrier Systems*.
- 3.53** After the COT, RT, and digital lines have been pretested, they are connected together for end-to-end system tests and service cutover. No adjustments are required on the system during installation; all system options are selected by choice of circuit pack or by setting switch options on the circuit packs. System tests include line powering (if provided), system status indicators, and performance testing of one channel in each digroup (if available). End-to-end system testing is covered in AT&T 363-205-600G, *Feature Package G and I, Acceptance, Turnup, and Conversion*.

Facility Arrangements

- 3.54** The digital transmission facility may be a metallic T1 carrier or a digital facility terminated by a multiplexer with a DSX-1 interface. The metallic DS1 system output may also be multiplexed into a fiber facility (for example, with the DDM-1000/DDM-2000). T1 facility protection for FPI must be provided by external systems.
- 3.55** The FPG AUA61D LIU can request a far end loopback when the receive DS1 input is grounded. This is accomplished by applying a DC voltage to the center tap of the receive transformer (that is, a simplex voltage). The loopback request capability is provided by equipping the line fuse unit (LFU) and setting the AUA61D S700 switch to ENB. The customer may determine whether the loopback capability works with a particular multiplexer. In systems that are not compatible with the loopback capability, the LFU may be removed to prevent further problems.

A. Cable Facilities

T1 Carrier

3.56 The digital carrier line design and conditioning rules are similar to those used for the *SLC 96 Carrier System* (see AT&T 915-710-110). AT&T 915-710-115G, *Feature Package G and Feature Package I, Application Engineering*, describes outside plant engineering, design considerations, line and system powering, VF facilities, equipment, construction, etc. for *SLC Series 5 Carrier Systems*.

Other Carrier Facilities

3.57 The *SLC Series 5 Carrier System* is fully compatible with other carrier facilities that interface at a DSX-1 cross-connect bay. These facilities include lightwave and digital radio and are described in the documentation covering those systems.

B. Outside Plant Construction (T1 Line)

3.58 Major construction activities include the following:

- Conditioning the T1 lines for the proposed digital transmission facility
- Placing the repeater cases or closures
- Preparing the RT site.

3.59 Existing methods, techniques, and procedures will apply to all phases of construction associated with the *SLC Series 5 Carrier System* application. Construction procedures are detailed in AT&T 640-250-312 and AT&T 640-250-325 for the RT cabinets and AT&T 640-250-311 for the RT frame. Other 640-Division AT&T Practices cover construction procedures on the digital line. Shelf installation in frame-type RTs is covered in AT&T 363-202-602.

3.60 The T1 carrier route may be preconditioned by removing the load coils from the cable and installing T1 apparatus cases. Plug-in type load coils may be inserted in unneeded repeater slots and those pairs used for VF service until additional T1 lines are needed. When pairs are required for carrier use, the load coils are removed and the repeaters installed. This action will minimize the unloading operations on a given feeder route. See AT&T 640-250-216 for details on digital line construction.

4. Functional Description

4.01 The COT and RT have three basic types of circuit packs:

- Common units
- Channel units
- Test adapters.

4.02 The choice of common circuit packs depends on the system operating mode (SLC Series 5 Feature Package G or Feature Package I), and the type of line interface (T1 or DSX-1). dual ringing repeater, DID, and E *SPOTS* channel units provide two channels per circuit pack. The coin, FSR, 4-wire voice-frequency (VF), and dataport channel units each provide one channel.

4.03 This section describes the system operation of the COT and RT over the digital facility. The COT and RT circuit packs are summarized by feature package in Table B. Table D lists the circuit packs used in the system and the data sheet practice for each unit. Each data sheet contains detailed unit operation, details of options and indicators, the functional block diagram, and the faceplate drawing of the unit.

Table D. SLC® Series 5 Circuit Packs and Plug-In Units

<u>Apparatus Code</u>	<u>Circuit Pack</u>	<u>Description</u>	<u>Data Sheet</u>	<u>FPG Only</u>	<u>FPI Only</u>
AUA3	OTU	Office timing unit	363-005-202	✓	
AUA8	SDU	System display unit	363-005-155		
AUA11C	PCU	Power converter unit	363-005-204		
AUA18	DTU-L	Digital test unit - Left	363-005-206		
AUA19	DTU-R	Digital test unit - Right	363-005-207		
AUA24	FCU	Fan control unit	363-005-205		
AUA25/25B	CU	M SPOTS® channel unit (CF*)	363-005-124		
AUA26	CU	COT POTS with derived channel alarm (CS*)	363-005-127	✓	
AUA27	CU	RT POTS with derived channel alarm (CF)	363-005-128	✓	
AUA31	CU	POTS channel unit (CS)	363-005-101	✓	
AUA32	CU	SPOTS channel unit (CS)	363-005-102	✓	
AUA33	CU	Coin channel unit (CS)	363-005-103	✓	
AUA34	CU	COT DS0 dataport channel unit	363-005-104	✓	
AUA34B	CU	COT DS0 dataport channel unit (+19.2)	363-005-104	✓	
AUA35	CU	Multiparty channel unit (CS)	363-005-109	✓	
AUA36	CU	DID DPO channel unit (CF)	363-005-114	✓	
AUA37	CU	FSR channel unit (CS)	363-005-121	✓	
AUA38	CU	POTS channel unit (CS)	363-005-118	✓	
AUA39	CU	SPOTS channel unit (CS)	363-005-120	✓	
AUA41	CU	4W1 4-Wire VF channel unit (CF)	363-005-105		
AUA42	CU	2-Wire E SPOTS channel unit (CS)	363-005-106		
AUA43	CU	2-Wire E SPOTS channel unit (CF)	363-005-107		
AUA44	CU	4W2 4-Wire VF channel unit (CS)	363-005-108		

* CF = current feed; CS = current sink

Continued on next page

Table D. SLC[®] Series 5 Circuit Packs and Plug-In Units (Contd)

<u>Apparatus Code</u>	<u>Circuit Pack</u>	<u>Description</u>	<u>Data Sheet</u>	<u>FPG Only</u>	<u>FPI Only</u>
AUA52B	CU	OCU dataport channel unit (+19.2)	363-005-111		
AUA53	CU	Coin channel unit (CF)	363-005-112		
AUA54	CU	4W0 4-Wire VF channel unit (E&M)	363-005-113		
AUA55	CU	Multiparty channel unit (CF)	363-005-116		
AUA56	CU	DID DPT channel unit (CS)	363-005-115	✓	
AUA57	CU	FSR channel unit (CF)	363-005-122		
AUA58/58B	CU	POTS channel unit (CF)	363-005-117		
AUA59	CU	POTS and SPOTS channel unit (CF)	363-005-119		
AUA61D	LIU	DSX-1 line interface unit	363-005-150	✓	
AUA62D	LIU	Line powering (-130V) LIU	363-005-151	✓	
AUA64D	LIU	Power looping LIU	363-005-152	✓	
AUA75	CU	2WPLAR channel unit (CF)	363-005-132		
AUA77	SIU	Site interface unit	363-005-156		
AUA78	FLTA	T1 Fault-locate test adapter	363-005-231		
AUA80	LTA	Line test adapter	363-005-233		
AUA111	TRU	COT/RT transmit/receive unit	363-005-157		
AUA114	CFU	Channel fuse unit	363-005-228		
AUA115	LFU	Line fuse unit	363-005-229		
AUA141	CU	4-wire special service CU	363-005-300		
AUA142	CU	2-wire special service E SPOTS CU	363-005-300		
AUA150	CU	RT POTS/SPOTS channel unit (CF)	363-005-133		
AUA152	CU	OCU dataport channel unit	363-005-301		
AUA158	CU	RT ALC POTS channel unit (CF)	363-005-303		
AUA159	CU	RT POTS/SPOTS channel unit (CF)	363-005-304		
AUA161	MLIU	Master line interface unit	363-005-305		✓
AUA162	SLIU	Slave line interface unit	363-005-306		✓
AUA163	EMU	Elastic memory unit	363-005-307		✓
AUA176	LTT	Line test translator	363-005-309		

* CF = current feed; CS = current sink

Continued on next page

Table D. SLC[®] Series 5 Circuit Packs and Plug-In Units (Contd)

<u>Apparatus Code</u>	<u>Circuit Pack</u>	<u>Description</u>	<u>Data Sheet</u>	<u>FPG Only</u>	<u>FPI Only</u>
AUB2B	CTU	COT channel test unit	363-005-198	✓	
AUB3	AIU	Alarm interface unit (COT)	363-005-188	✓	
AUB3B	AIU	Alarm interface unit (COT)	363-005-197	✓	
AUB4	ADU/ASU	Alarm suppressor unit	363-005-189	✓	
AUB6	ADU	COT alarm display unit	363-005-186	✓	
AUB22	CTU	RT channel test unit	363-005-199	✓	
AUB25	CTU	RT channel test unit	363-005-201	✓	
AUB27	ADU	RT alarm display unit	363-005-190	✓	
AUB28	ADU	RT alarm display unit	363-005-191		
AUB30	ACTU	Automated channel test unit	363-005-192		
AUB101	FMU	Flash memory unit	363-005-308		✓
AUG1	PRU	Positive ringing unit	363-005-240		
AUG2*	RSU	Ring switch unit	363-005-241		
AUG11	BFU	Bank fuse unit	363-005-230		
MC97774A1	BCU	COT bank control unit	363-005-193	✓	
MC97775A1	BCU	RT bank control unit	363-005-194		
3B1	—	Ringing generator (30 Hz)	363-005-223		
3C/3C1	—	Ringing generator (20 Hz)	363-005-226		
47B	—	Test extender	363-005-237		
52A	—	Channel unit test extender	363-005-235		
336A1†	—	Power unit (rectifier)	363-005-220		
337A1†	—	Battery charger	363-005-221		
ED-7C613-30,G1†	LDU	Load distribution unit	363-005-222		
ED-7C719-30	LTF	Line test fan-out unit	363-005-310		

* Used only with bulk (DC) power installations.

† Used only with commercial (AC) power installations.

Overall Terminal Operation for FPG

4.04 Figure 11 is a block diagram of the overall operation of a universal Mode 2 FPG system (96 channels). In the transmit direction, voice-frequency signals enter the channel units which produce pulse amplitude modulation (PAM) samples at an 8 kHz rate. This sampling of channels is done in a fixed sequence, producing a stream of pulses. These pulses are encoded into a pulse code modulation (PCM) word by the channel unit coder/decoder (codec).

4.05 Each channel is encoded with the same format used in D3 and D4 channel banks: 7-5/6 bit, μ 255-companded PCM with robbed bit signaling. This format uses 8 bits in a linear approximation of a curve as follows: bit 1 is the sign bit, bits 2 - 4 identify 8 segments, and bits 5 - 8 contain the linear coding of 15 decision levels within the segment. There are two DS0 8-bit channels or time slots per channel unit slot, 24 per digroup, and 96 per system. Channel unit slots are numbered 1/2, 3/4, ..., 95/96. The D1D channel polling sequence is used in FPG. Dual-circuit (most 2-wire) channel units and dataport units with second channel error correction (SCEC) use both channels, but single-circuit channel units (coin, FSR, 4-wire VF) use only the odd channel.

4.06 Each transmit/receive unit (TRU) processes two digroups: A&B or C&D. The TRU sequentially polls the channel units for PCM words, time division multiplexes the PCM words into a bit stream, inserts the data link information, and sends the bit stream to the line interface units (LIUs). Each LIU processes one digroup. The LIU converts the bit stream from the TRU into the 1.544 Mb/s DS1 signal using a modified super framing (MSF) format. The DS1 signal is transmitted over the digital transmission facility.

4.07 In the receive direction, the LIU frames on the DS1 input from the line and sends it to the TRU. The TRU extracts the data link information and sends it to the bank control unit (BCU). The TRU also distributes the PCM to the channel units which decode the PCM into corresponding PAM pulses. The VF signals are then reconstructed.

4.08 Each frame of the MSF bit stream contains twenty-four 8-bit PCM words plus one framing bit for a total of 193 bits. Groups of 12 DS1 frames form the DS1 superframe. In universal FPG systems, the framing bits of the superframe serve three functions as follows:

- Terminal framing (to locate the 24-channel 192-bit pattern)
- Signaling framing
- SLC Series 5 Carrier System data link for channel testing and alarm reporting.

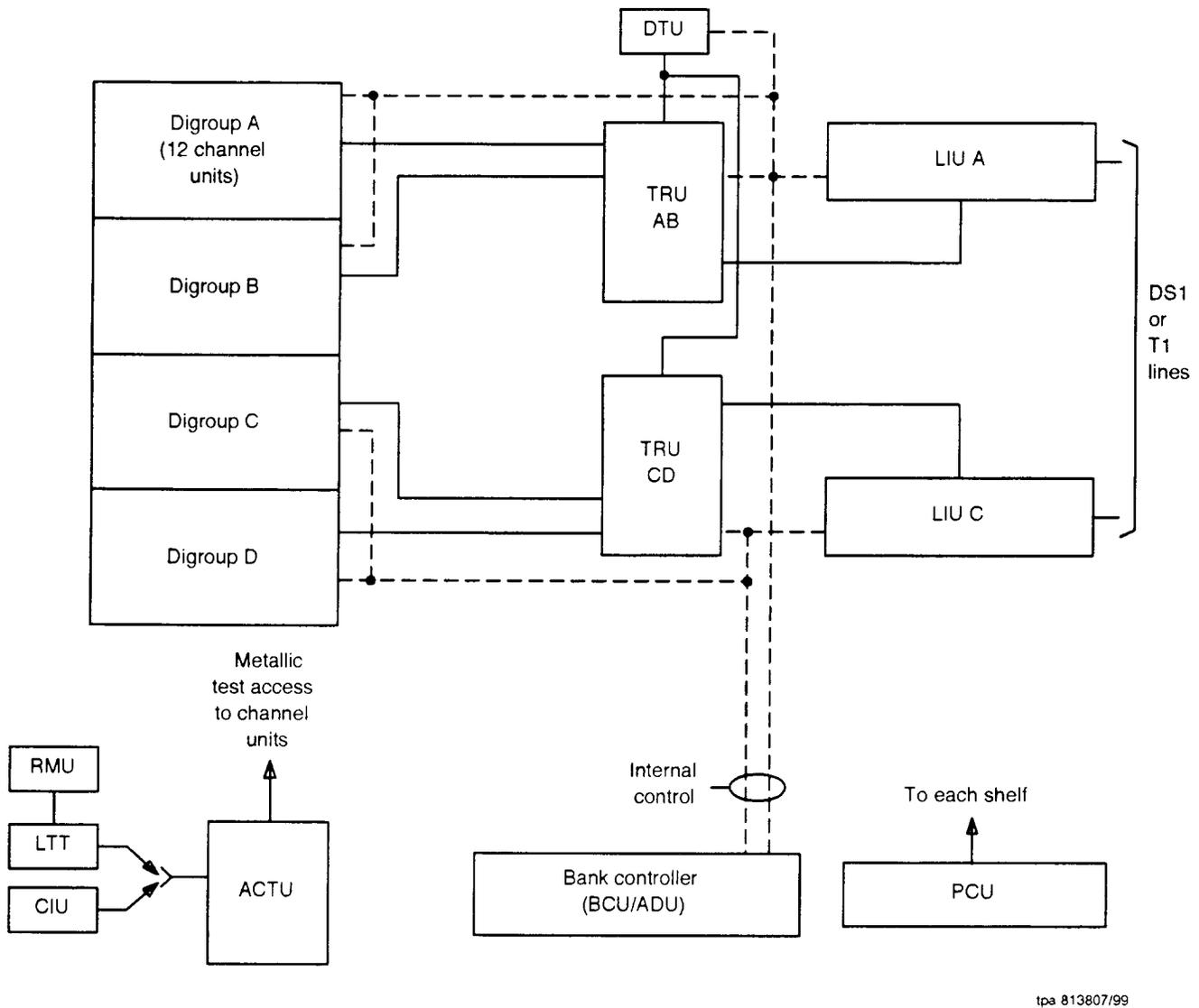
4.09 Channel signaling information is also transmitted over each channel. Signaling information for each of the VF channels is transmitted every sixth frame, using the least significant PCM bit (robbed-bit signaling). In other frames, all bits are used for encoding the speech signal. Robbed-bit signaling is not used on DDS channels. The MSF format provides two signaling bits.

4.10 In addition to channel signaling, the FPG system uses a 2-way data link for sending status and alarm conditions between the COT and the RT. The data link is transmitted on the A digroup. The bank controller (BCU and ADU) is the only common equipment that has access to the data link, even though the data link is transmitted through the TRU and LIU. The bank controller uses the data link to communicate with the bank controller at the other terminal; each controller keeps its own common units informed of alarms and status conditions.

4.11 Protection switching is optional in FPG applications. If the application requires protection switching, FPG systems support both 4 to 1 protection switching in Mode 1 operations and 2 to 1 protection switching in Mode 2 operations. FPG also supports 2 to 1 protection switching in Mode 1 operations when the CD digroup is not equipped.

4.12 When a line interface unit (LIU) detects a loss of signal or out of frame condition, or determines that the number of bipolar violations (BPVs) (not including BPVs intentionally added by B8ZS line coding) exceeds 10^{-4} , the following happens. If a protection line is available, the protection switch occurs and the bank control unit (BCU) raises a carrier line failure (CLF) and minor (MN) alarm. If no protection line is available, the digroup (or shelf) goes out of service until a protection line is available or the trouble clears; the BCU raises a CLF and major (MJ) alarm.

4.13 A second BPV threshold (either 10^{-5} or 10^{-6}) can be set through the Operations Interface (OI). This second threshold is set independently for each LIU. If the number of BPVs exceed this OI set threshold and if a protection line is available, the protection switch occurs and the BCU raises a CLF and MN alarm. If no protection line is available, the BCU raises a CLF and MN alarm but keeps the digroup (or shelf) in service.



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Figure 11. Feature Package G Mode 2 System with 2:1 Facility Concentration

Overall Terminal Operation for FPI

4.14 Figure 12 is a block diagram of the overall terminal operation of an integrated FPI system operating in a Mode 2 configuration. In the transmit direction, voice-frequency signals enter the channel units which produce pulse amplitude modulation (PAM) samples at an 8 kHz rate. This sampling of channels is done in a fixed sequence, producing a stream of pulses. Every PAM pulse is encoded into a pulse code modulation (PCM) word by the channel unit coder/decoder (codec).

4.15 Each channel is encoded with the same format used in D3 and D4 channel banks: 7-5/6 bit, μ 255-companded PCM with robbed-bit signaling. This format uses 8 bits in a linear approximation of a curve as follows: bit 1 is the sign bit, bits 2 - 4 identify 8 segments, and bits 5 - 8 contain the linear coding of 15 decision levels within the segment. There are two DS0 8-bit channels or time slots per channel unit slot, 24 per digroup, and 96 per system. Channel unit slots are numbered 1/2, 3/4, ..., 95/96. The D1D channel polling sequence is used in normal FPI operation. The D4 counting sequence is used for D digroup grooming and a unique counting sequence is used for Mode 2 special service grooming. Dual-circuit (most 2-wire) channel units use both channels, but single-circuit channel units (coin, FSR, 4-wire VF) use only the odd channel.

4.16 Each transmit/receive unit (TRU) processes two digroups: A&B or C&D. The TRU sequentially polls the channel units for PCM words, time division multiplexes the PCM words into a bit stream, inserts the data link information, and sends the bit stream to the line interface units (LIUs). In Mode 1, each LIU (A, B, C, D) processes one digroup. In Mode 2, the A and C LIUs process two digroups each and in Mode 4, the A LIU processes all 4 digroups of a 96 line system. The LIU converts the bit stream from the TRU into the 1.544 Mb/s DS1 signal using F_S framing format. The DS1 signal is transmitted over the digital transmission facility. The ABCD signaling bits, used for supervision control and monitoring of the channel units, are intercepted by the FPI LIUs (AUA161, AUA162, and AUA163) and converted to RDLC messages by the AUA161 LIU for transmission to the *GTD-5* EAX.

4.17 In the receive direction, the LIUs frame on the incoming signal and extract the timing information. The AUA161 receives the RDLC channel and all LIUs insert the derived signaling information into the PCM streams passed to the TRU. The TRU extracts the data link information and sends it to the bank control unit (BCU). The TRU also distributes the PCM to the channel units which decode the PCM into corresponding PAM pulses. The VF signals are then reconstructed.

4.18 Each frame of the F_S bit stream contains twenty-four 8-bit PCM words plus one framing bit for a total of 193 bits. Groups of 12 DS1 frames form the DS1 superframe. In integrated FPI systems, the framing bits of the superframe serve three functions as follows:

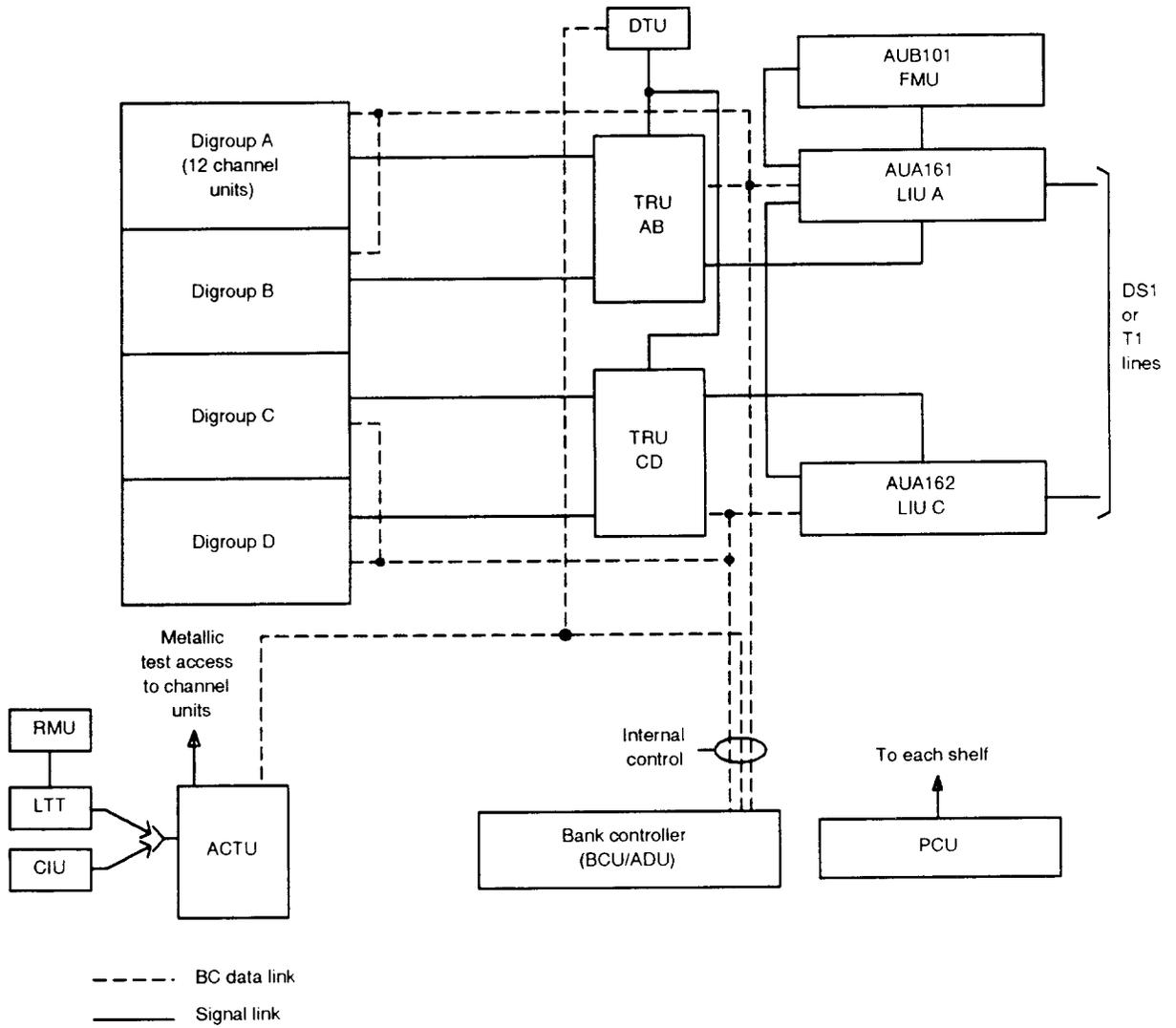
- Terminal framing (to locate the 24-channel 192-bit pattern)
- Signaling framing
- *SLC* Series 5 Carrier System data link for channel testing and alarm reporting.

4.19 Channel signaling information is also transmitted over each channel. Signaling information for each of the VF channels is transmitted every sixth frame, using the least significant PCM bit (robbed-bit signaling). In other frames, all bits are used for encoding the speech signal. Robbed-bit signaling is not used on DDS channels. The F_s format provides two signaling bits.

4.20 The FPI system integrates to the *GTD-5* EAX through the RDLC link in the digital trunk unit of the *GTD-5* EAX. Time slot 0 in the DS1 span connected to LIU-A is dedicated to the RDLC protocol. This data link provides a medium to transfer downloading, call processing, maintenance, and alarm information between the FPI system and the *GTD-5* EAX.

4.21 The integrated FPI system supports 3 modes of operation. Mode 1 is 1:1 concentration where each of the 24 time slots within a DS1 span can be used for one set of 24 phone lines other than time slot 0 of the A span which is used for the RDLC link, thus four DS1 spans are required for 96 lines. Mode 2 is 2:1 concentration where 24 time slots within one DS1 span are used on any one of 48 phone lines. Two DS1 spans (A and C) are required for 96 lines, but only 47 lines can be active at any one time because one time slot in the A span carries the RDLC protocol. Mode 4 operation is 4:1 concentration where 24 time slots within one DS1 span are used on any of the 96 phone lines. The 4:1 concentration is achieved by concentrating the output of the C/D TRU with the A/B TRU. Only the A span is used to provide 24 time slots but only 23 lines can be active at any one time due to the time slot dedicated to the RDLC protocol. All POTS lines on the system have equal access to the time slots in concentrated modes. The equippage of locally switched special services, nonlocally switched specials, and nonswitched specials permanently reserves a DS0 which affects line concentration of the remaining lines.

4.22 The FPI system reports transmission and equipment faults to the *GTD-5* EAX through RDLC messages. These alarms are reflected at the *GTD-5* EAX by the lighting of the appropriate ACDC lamp (MXU MAJOR, MXU MINOR, CXR MINOR) and displaying an alarm message or syndrome. If a digroup is placed out of service due to a transmission failure, the BCU indicates a CLF and major (MJ) alarm and the *GTD-5* EAX shows a MXU MINOR alarm and forces the span out of service. If span A is lost and no external span protection has been provided, a major alarm (MXU MAJOR) is generated and an outage of 96 lines occurs.



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Figure 12. Feature Package I Mode 2 System with 2:1 Facility Concentration

Common Systems Operation

4.23 The BCU and the ADU form the microprocessor-based bank controller for the SLC Series 5 Carrier System. The bank controller provides the following:

- Internal performance monitoring and fault diagnosis
- Channel testing as requested by the PGTC (FPG)
- Central office and remote alarm outputs (COT only)
- Alarm cut off (ACO) (COT only)
- Channel unit provisioning and alignment testing using the CIU or OI
- Nonvolatile backup of provisioning information
- System number identification for provisioning and testing (COT only)
- Nightly routine test as requested by LTT (RT only).

A. Bank Control Unit (BCU)

4.24 The MC97774A1 BCU is used in the SLC Series 5 Carrier System FPG COT. The MC97775A1 BCU is used in the FPG and FPI RT. Both units are physically identical; however, the firmware for each BCU is specific to its designated terminal.

4.25 Together, the MC97774A1 BCU and the AUB6 alarm display unit (ADU) form the bank controller (BC) for the COT. The MC97775A1 BCU and the AUB27 or AUB28 ADU form the BC for the RT (the AUB28 ADU must be used for an FPI BC and for an FPG BC that supports the OI).

4.26 The BC provides the following functions:

- Internal performance monitoring and fault diagnosis
- System options and system identification switching
- Channel unit provisioning coefficient memory
- Controls per line testing using the pair gain test controller
- Optional supplemental data link between the COT and the RT
- System alarms and Mode 2 traffic information handling
- Storage of automated channel test unit (ACTU) test results and routing of test results to the SDU or OI
- Operations Interface support (MC97775A1 BCU and AUB28 ADU).

4.27 The BCU contains a microcomputer that is the core of the bank controller. It also has system program memory, electrically erasable programmable read-only memory (EEPROM) for the semipermanent storage of channel unit provisioning coefficients and random access memory (system program memory is stored in both BCUs and the COT ADU). In FPG systems, the RT and COT communicate with each other over a data link terminated on the BCU. The BCU uses this data link to exchange system alarms, and circuit test information between the central office and the RT. The TRU also uses this data link to control channel unit DS1 time slot assignment information for Mode 2 operation.

4.28 For FPG systems, the PROV TRANS pin jack on the BCU unconditionally transfers provisioning coefficients from the ADU [AUB6 (COT)/AUB27 (RT)] to the BCU. Transfer is achieved by inserting a pin into the jack and then reseating the BCU.

B. Alarm Display Unit (ADU)

4.29 The AUB6 ADU is used in the FPG COT.

The FPG RT uses the AUB27 or AUB28 ADU. For FPI, the AUB28 ADU is required. The COT BCU uses the serial link provided by the ADU to control the other units and indicators in the system. The COT ADU and RT ADU provide local display of system alarms and are the starting points for trouble clearing. The COT ADU provides outputs to the AUB3B alarm interface unit (AIU) for office and remote alarms. The RT ADU has inputs for miscellaneous building alarms and RT common equipment failures (for example, ringing generators, rectifiers, battery chargers, and the AC power plant). In systems with FPG, there are three copies of the system memory; the COT has a copy in the BCU and in the ADU, and the RT has a copy in the RT BCU. The FPI system stores a copy in the RT ADU and BCU. These copies provide nonvolatile back up of the provisioning information. The AUB28 ADU is required for the OI and provides a local area network (LAN) alarm.

C. Transmit/Receive Unit (TRU)

4.30 The AUA111 TRU is used in both the FPG

COT and RT and the FPI RT. The TRU provides the interface between the AB or CD shelf (two digroups of channel units) and the digital facility interface (LIUs and LSU). It synchronizes all units serving a 48-channel shelf to the DS1 signal. When the office timing unit (OTU) is installed in the COT, it provides external synchronization to the TRU for the channel units. The TRU multiplexes the channel PCM into the internal PCM format for the LIUs and LSU and inserts the data link information from the BCU. It also demultiplexes the internal PCM output from the LIUs or LSU into two 24-channel digroups and extracts the data link for the BCU.

D. Channel Test Unit (CTU)

4.31 The AUB2B CTU has a locking connector for the CIU test cord. The AUB2B (COT) and AUB22 or AUB25 (RT) CTUs are installed in systems that use the pair gain test controller (PGTC) or XTC in PGTC-mode (FPG only). One CTU serves both 96-line systems in the dual channel bank. The COT CTU works with the RT CTU to provide metallic access to the customer drop beyond the RT for the remote test center. The AUB2B and AUB22 CTUs also allow the PGTC to test the derived channel between the COT and the RT. The AUB2B and AUB22 CTUs provide the following:

- Metallic test access on one channel unit in either the blue or white system
- Digital testing on one channel in a system by the CIU (FPG only).

During a channel test, the RT CTU provides channel unit terminations and connects the DC test pair to the metallic drop beyond the channel unit. The AUB22 RT CTU also provides local test access (digital and metallic) for the CIU when the DTU (AUA18 and AUA19) is installed at the RT. At the COT, the DTU is required to provide digital test access for the CIU.

4.32 While the use of the AUB25 and/or AUB22 is not recommended for FPI systems, it is required in dual channel banks that have one bank configured for FPC and the other bank configured for FPI.

E. Automated Channel Test Unit (ACTU)

4.33 The AUB30 ACTU is used in the RT to test POTS, *SPOTS*, *E SPOTS*, and 4-wire channel units. When commanded by the bank control unit (BCU) firmware, the AUB30 ACTU can autonomously or in conjunction with a pair gain test controller (PGTC) or by control of *GTD-5* EAX line diagnostics validate CU electronics using the following tests:

- (a) **Power-up tests** are initiated on channel unit powerup. Upon sensing powerup, the BCU will request a power-up test of all of the channels serviced by that RT CU. The AUB30 ACTU will verify the functionality of that CU and return the results to the bank controller. The results information can then be displayed on the AUA8 SDU or forwarded to the operations center. A power-up test can also be requested by the operations center.
- (b) **Type tests** are performed on a CU to provide enhanced inventory information of POTS channel units. When requested by the BCU, the AUB30 performs a set of operations on the CU that can identify the apparatus code/operating mode of a POTS-type channel unit. This information is returned to the bank controller.
- (c) **Demand tests** are those performed by an outside test controller (other than the AUB30), using the termination and signaling networks of the AUB30 ACTU. This includes testing by the PGTC, mechanized loop testing (MLT), *GTD-5* EAX line diagnostics, craft interface unit (CIU), line test translator (LTT), or OI. In this mode, the AUB30 ACTU provides the external interface for the CIU or LTT to obtain metallic or digital test access on a channel unit. However, the actual digital test access is provided by the digital test unit (DTU).
- (d) **Routine tests** are a means of verifying the functionality of RT CUs. With one request from the BCU, the AUB30 ACTU can verify the functionality of every channel in turn. When testing of the entire bank is complete, the set of results is returned to the BCU for display on the AUA8 SDU or for forwarding to the operations center via the OI. To prevent customer service interruption, the AUB30 ACTU periodically checks the channel for activity — testing is continued if idle. If the channel is in use, testing on that channel is skipped and continued later.

4.34 In the dual bank environment, testing is offered on a first-come/first-served basis. Either system can request any of the testing activities, which will be performed unless a test of equal or higher priority is already under way. The high priority tests are power-up testing, type testing, and demand testing — routine testing has a low priority. While performing routine tests, a power-up type or demand test request will cause the routine test to be paused; the new test will be performed; and the routine test will continue from where it paused. During demand test, the CIU or LTT may gain access to the test bus of the bank that is not already testing. All ACTU testable channel units are listed in Table C.

F. System Display Unit (SDU)

4.35 The AUA8 SDU provides an 8-character alphanumeric display when used with an MC97774A1 or MC97775A1 bank control unit (BCU). Faceplate mounted pushbuttons are used to display information in the bank controller (BC) data base. Since the information is stored in the BC, the type of messages displayed depends on the type of BCU being used. The message set displayed by the SDU at the COT refers only to the system in which the SDU is installed. At the RT, the message set refers to both systems of the dual bank if the ACTU is in service. If the ACTU is not in service, the message set refers only to the blue system. Test results are lost when the BCU is removed. The AUA8 SDU also provides bank overflow relays used in Mode 2 to indicate when all of the channels in a bank are busy. The AUA8 SDU can be located in the sixth line interface unit (LIU) slot of the blue bank at the RT, and the sixth LIU slot of both the white and blue banks at the COT. The RT SDU also displays information for the white bank if an ACTU is used.

4.36 The AUA8 SDU, when located at the RT equipped with an ACTU, displays alarms and routine and power-up test results for both systems. In the absence of an ACTU, the SDU displays alarm information for the blue system only. When located at the COT, the SDU displays alarm information and RT channel unit routine test results for the Mode 1 or Mode 2 system in which it is installed. In Mode 2 systems, the COT SDU also displays traffic information.

G. Site Interface Unit (SIU)

4.37 The AUA77 SIU serves as the contact point between a remote Operations Interface processor (OIP) and the RT site. The AUA77 SIU is designed to operate a local area network (LAN) at the RT site to service up to 18 systems in a single location. Each system on the LAN uses the AUB28 ADU. The SIU is accessed via dial-up from the OI which then is used as a gateway to the system on the LAN. The SIU must be equipped in the 12th slot of the A digroup of the system it is equipped in.

H. Digital Test Unit (DTU)

4.38 The DTU pair, DTU-L (AUA18) and DTU-R (AUA19), serves both systems in a dual channel bank. The DTU provides access to the bit stream between the TRUs and the channel units for CIU at the COT or at the RT. The DTU is optional at either end of the system; however, it is required if the CIU will be used in testing special service channels. The DTU-L and DTU-R must be equipped as a pair.

I. Line Test Translator (LTT) and Line Test Fan-Out Unit (LTF)

4.39 The AUA176 LTT provides an interface and suitable translation between a 4TEL Computer-Controlled Diagnostic System *RMU* telephone line test measurement apparatus located at an RT site and a *SLC Series 5 Carrier System ACTU* or *CTU*. The function of the LTT is to allow the *RMU* test apparatus to access the drops of the DCB served by the *ACTU/CTU*, for rapid routine testing. The LTT functions to identify the type of channel unit, determine its busy status, and provide test access to idle circuits served by *POTS* and *SPOTS* channel units by causing the bank controller to operate the channel unit's test relay.

4.40 The ED-7C719-30 line test fan-out unit (LTF) allows the *RMU* test apparatus to interface up to eight LTTs. The LTF is electrically located between the *RMU* test apparatus and the LTTs, and is miscellaneously mounted at the RT location. For more information, refer to AT&T 363-205-109, *Line Test Translator and Line Test Fan-Out Unit, User's Manual*.

J. Feature Package G Line Interface Units (LIUs)

4.41 Three different LIUs are used with FPG: the AUA61D, AUA62D, and AUA64D. The AUA61D is the DS1 LIU. The AUA62D is the line-powering LIU and the AUA64D is the power looping LIU. The line-powering LIU may be used at the RT (for back-powering) as well as at the COT. The power looping LIU is used only at the RT, and the DS1 LIU interfaces with a DSX-1 at either the COT or the RT. The output of the AUA62D and AUA64D LIUs (and the AUA78 test adapter) is equalized for PIC/PULP cable; however, these units can also be used with metropolitan area trunk (MAT) or intercity and outstate trunk (ICOT) cable.

LIU Options

4.42 The LIUs have an option switch for selecting the line code. The AUA61D LIU has selectable equalization. The AUA62D and AUA64D LIUs have pad options for selecting transmit and receive attenuation. The AUA61D LIUs have a switch to enable or disable the remote loopback capability (see Section 3).

K. Feature Package I Line Interface Units (LIUs)

Three different LIUs are used with FPI: the AUA161, AUA162, and AUA163. The AUA161 is the master line interface unit (MLIU) that is used in LIU-A and provides the communication link with the GTD-5 EAX. The AUA161 is a RAM-based card that requires its software to be downloaded from the flash memory unit (FMU). The AUA162 is the slave line interface unit (SLIU) and is used in slots B, C, and D for Mode 1 operation and in slot C for Mode 2 operation. The AUA163 is the elastic memory unit (EMU) and is used to synchronize multiplexing of the two shelves of a 96 line FPI RT on to one DS1 span for Mode 4 operation. The EMU is installed in the LIU C slot for 4:1 line concentration and does not terminate a DS1.

LIU Options

4.43 The AUA161 and AUA162 LIUs have selectable equalization. The AUA162 LIU has a grooming switch to indicate that the LIU is to be groomed to the digital network through a D4 bank or DCS. The grooming switch is set on the LIU in slot D if Mode 1 D-digroup grooming is implemented and set on the LIU in slot C if Mode 2 special service grooming is implemented.

L. Flash Memory Unit (FMU)

4.44 The AUB101 FMU is used in the FPI RT to store the MLIU generics in nonvolatile memory. The FMU is a solid-state device that is capable of storing two different software loads at the FPI remote site. A single FMU is used to load both halves of a dual channel bank. The FMU receives its load through a PC running the DTFIO software package. The FMU can be loaded locally or remotely and allows new loads to be preloaded any time prior to cutting over to the new load.

M. System Power and Fuse Units

4.45 The AUA11C power converter unit (PCU) converts the -48 V input to the $+5\text{ V}$ and -5 V supplies required by the channel bank circuits. The PCU is used on the digroup and facility shelves in the COT and RT. Two AUA114 channel fuse units (CFUs) are used in every dual channel bank, one in the blue system and one in the white system. One AUA115 line fuse unit (LFU) is required for each dual channel bank. The CFU provides fusing for the -48 V power and -20 or -30 Hz ringing to channel unit digroups AB and CD and for the -48 V power to the common units. The LFU provides fusing for the -48 V power to all the LIUs. With any multiplexer other than the DDM-1000, the LFU should be removed to prevent false alarms at the multiplexer.

COT-Specific Circuits

A. AUB3B Alarm Interface Unit (AIU)

4.46 The AIU provides the interface between the blue and white system bank controllers and the CO and remote alarm reporting systems. The AIU provides two sets of system alarm closures for reporting to two different remote sites. The AIU also reports alarms during bank controller failures and power failures. The ACO on the AIU may be operated locally or remotely.

B. AUB4 Alarm Display Unit/Alarm Suppressor Unit (ADU/ASU)

4.47 The ADU/ASU is used in the COT to suppress alarms associated with an unequipped system in the dual channel bank. When only one system is equipped, the ADU/ASU is used in the unequipped system in the slot normally occupied by the COT ADU.

C. AUA3 Office Timing Unit (OTU)

4.48 The OTU is required when dataport channel units are used. The OTU interfaces the external clock used to synchronize the dataport channel units. The OTU converts the external clock source into the 8- and 64-kHz clocks required by the dataport channel units. It also frequency-locks the 4.096-MHz bank clock to the incoming composite clock for synchronizing the TRU.

RT-Specific Circuits

A. AUA24 Fan Control Unit (FCU)

4.49 Two AUA24 FCUs are required in each RT dual channel bank. The FCU senses the temperature adjacent to the PCUs and contains two thermal switches for controlling the fans in the 2C fan unit. The first switch has temperature settings for maximum system reliability when the system is powered from AC power. The second switch has temperature settings to maximize battery reserve time while keeping the system within acceptable temperature limits. When the system switches to battery power, the PMN alarm from the power shelf causes the FCU to select the second switch for controlling the fans. When the air temperature around the FCU reaches the switch turn-on setting, the switch signals the 2C fan unit to turn the fans on. When the air temperature falls below the switch turn-off setting, the switch opens and the 2C fan unit turns the fans off. Fan operation can be tested with the FAN TEST button. The temperature limits for fan operation are listed in Specification Summary—Equipment.

B. Load Distribution Unit (LDU)

4.50 The ED-7C613-30,G3 LDU is used in each J1C182BA power shelf in distributed power arrangements. The LDU disconnects the system from the -48 V bus during extended AC outages to prevent damage to the batteries (excessive discharge). If the ringing generator fails in the power shelf, the LDU connects a protection 3B1 or 3C1 ringing generator to the ringing loads in the associated dual channel banks. The LDU also provides faceplate access to the order-wire, up to two fault-locate lines, and adjustable order-wire resistance. It has a separate board (ED-7C613-30,G2) for order-wire build-out resistance that plugs into the LDU through an opening in the faceplate.

C. Dual Bank Power (336A1 Power Unit) and Fuse Units

4.51 With bulk powering, one AUG11 BFU serves each RT dual bank; up to three BFUs can be installed in the J1C182BB bulk power shelf. When distributed power is used, two 336A1 power units (rectifiers) and one AUG11 bank fuse unit (BFU) are installed in the J1C182BA power shelf for each RT dual channel bank (the power shelf can supply two RT dual channel banks). The 336A1 rectifier converts commercial AC power to a nominal -48 VDC regulated output for the RT and provides input-output isolation. Rectifier outputs are applied in parallel to a common bus to support the load up to a maximum of the combined rating of all equipped rectifiers. If load exceeds this maximum, the excess is supplied from the batteries. All rectifiers are continuously monitored for normal operation. A thermal switch on each rectifier turns the fans on when the temperature in a rectifier exceeds 100°C (212°F). The BFU provides fusing for the -48 V distribution to both blue and white systems and to the 2C fan unit. Blown fuses in the BFU are identified and replaced through the faceplate.

D. 337A1 Battery Charger

4.52 The battery charger plugs into the battery shelf (181A apparatus mounting) for most applications. It is not required when bulk power is used. In the 51A cabinet, it plugs into the J1C182BA power shelf. The 337A1 battery charger/controller connects the batteries to the -48 V power bus when AC power fails or when additional power is required. The batteries are disconnected when AC power is restored or the load returns to normal. The 337A1 battery charger sends a command to the LDU to disconnect the batteries when the charge gets low to prevent damage to the batteries from complete discharge. A thermal switch on the battery charger turns the fans on when the temperature in the battery charger exceeds 100°C (212°F).

E. Ringing Generator

4.53 Two 3B1 or 3C1 ringing generators are mounted in the J1C182BA power shelf or J1C182BB bulk power shelf. The one in the left-hand position is the main ringing generator. The other ringing generator provides protection in case the main ringing generator fails. When the main ringing generator is restored, service automatically switches back to the main ringing generator. When bulk power is used, one ringing generator on the bulk power shelf normally supplies the top two dual channel banks, and the other ringing generator supplies the bottom dual channel bank. The 3B1 ringing generator supplies -30 Hz ringing current. The 3C1 ringing generator supplies -20 Hz ringing current for the subscriber lines. The ringing generator has fused -48 V input supplied by the rectifiers or from the bulk power shelf. A thermal switch on the 3B1 ringing generator turns the fans on when the temperature in the ringing generator exceeds 100°C (212°F).

F. 2C Fan Unit

4.54 The 2C fan unit has three fans on it which provide cooling for the dual channel bank assembly. The fans are thermostatically controlled through the AUA24 FCU, the 336A1 rectifier, 337A1 battery charger, and 3B1 ringing generator. The FCU senses the ambient temperature at the dual bank. Once the temperature at the FCU has risen high enough to turn on the fans (120°F while operating on AC/155°F while operating on batteries), they will not turn off again until the temperature drops below 75°F (AC) / 135°F (batteries). In cabinet installations, the fans may appear to run all the time; if the fans are running when the cabinet doors are opened, they will not turn off unless the outside air is cool enough to cool the channel bank assembly below 75°F. On the other hand, in environmentally controlled RT enclosures, the fans may appear inoperative because of better environmental control. In this environment, the fans may run only when traffic on the SLC Series 5 Carrier System is very high. Fan operation can be tested with the FAN TEST button on the AUA24 FCU. Temperature limits for fan operation are listed in Part 7, Specification Summary—Equipment.

G. AUG1 Positive Ringing Unit (PRU)

4.55 The AUG1 PRU provides positive 20-Hz ringing current for multiparty service. Each AUG1 and 3C1 ringing generator serve up to four systems (two dual channel banks) from the J1C182BA or J1C182BB power shelf. The J1C182BB bulk power shelf provides space for two AUG1 PRUs. The second AUG1 PRU is required when the bulk-powered RT frame is equipped with three dual channel banks. The AUG1 has two DC-to-DC converters (main and protection). The output of the main converter is applied in series with the output from the 3C1 ringing generator to provide positive ringing.

H. AUG2 Ring Switch Unit (RSU)

4.56 The RSU is used only in bulk power applications. One RSU is installed in each J1C182BB bulk power shelf. If a 3B1 or 3C1 ringing generator or a 3B1/3C1 -48 V input fails, the RSU connects the other ringing generator to all three dual channel banks. The RSU generates minor or major ringing alarms, depending on whether one or both ringing generators has failed, and transmits a PMN alarm when the bulk power plant indicates conditions such as loss of AC power or rectifier failure.

Channel Unit Operation

A. Additional Information

4.57 The physical description of the channel units including options, indicators, jacks, etc. is given in Part 5. Detailed channel unit operation and physical description is given in the data sheet for each channel unit (Table D). Applications for POTS, SPOTS and M SPOTS channel units, coin, multiparty, FSR, and DID channel units are described in AT&T 915-710-115G, *Feature Package G and I, Application Engineering*. Applications for dual ringing repeater, 2-wire special service (AUA42, AUA43, and AUA142), 4-wire VF special service, and dataport channel units are described in AT&T 915-710-116, *SLC Series 5 Carrier System, Channel Unit Application and Prescription Setting*. Applications for 2-wire special service private line auto ring (PLAR) are described in customer information release (CIR) AT&T 363-099-107IR.

B. Single-Party Service

4.58 Single-party (POTS) service is provided by the following channel units:

COT: AUA26, AUA31, and AUA38

RT: AUA25B, AUA27 (FPG only), AUA58B, AUA59/AUA150, AUA158, and AUA159

These channel units are used in 2-wire single-party applications with loop-start supervision; fast forward disconnect is provided.

C. Automatic Loss Compensation (ALC)

4.59 The AUA158 and AUA159 ALC channel units automatically insert an appropriate level of loss to maintain the proper voice signal level for basic telephone service. The AUA158 POTS channel unit can be used for applications ranging from 0 to 900 ohms. The AUA159 universal voice grade (UVG) (loop-start/ground-start) channel unit can be used for locally switched special service applications within the carrier serving area (CSA) and for POTS applications ranging from 0 to 900 ohms. Benefits of the ALC channel units include the following:

- Automatic loss compensation
- Enhanced inventory
- Compatibility with CLASS* service and other services requiring on-hook transmission.

* Service mark of Bell Communications Research, Inc.

**D. Calling Party Identification (CPI)
and On-Hook Transmission (OHT)**

4.60 Calling party identification provides information about the caller to the called party before the called party answers. During the silent interval after the first ring, data is sent from the central office to the customer premises equipment (CPE).

4.61 On-hook transmission allows data to be transmitted between the central office and the CPE using the voice path when it is idle. OHT supports CPI, meter reading, and energy management services. The individual calling line identification (ICLID) feature of calling number delivery (CND) transmits the calling number using frequency shift keying (FSK) during silent ringing interval. The central office switch uses visual message waiting indication (MWI) which transmits FSK to turn on the indicator during the idle state.

4.62 A pair of AUA42/AUA43/AUA142 E SPOTS channel units automatically provides slow forward disconnect in loop- and ground-start modes for open switching interval protection. Forward disconnect is disabled when on-hook transmission is provisioned. The AUA150 also provides open switching interval (OSI) protection.

4.63 Table E shows the circuit applications for the various COT-RT channel unit combinations. The channel units listed in these tables are used commonly for residential and locally switched special services. Channel unit pairs with "GS" listing can provide locally switched special services. The AUA150/159 channel units also support OHT in ground-start service.

Table E. Universal FPG Circuit Applications

<u>COT Units</u>	<u>RT Units</u>				
	<u>AUA25B</u>	<u>AUA27</u>	<u>AUA58B/AUA158</u>	<u>AUA59</u>	<u>AUA150, AUA159</u>
<u>AUA31</u>	<u>LS*</u>	<u>LS</u>	<u>LS</u>	<u>LS</u>	<u>LS</u>
<u>AUA38</u>		<u>LS/OHT†</u>	<u>LS/OHT</u>	<u>LS/OHT</u>	<u>LS/OHT</u>
<u>AUA32</u>	<u>LS/GS‡</u>	<u>LS</u>	<u>LS</u>	<u>LS/GS</u>	<u>LS/GS</u>
<u>AUA39</u>	<u>LS§/GS</u>	<u>LS/OHT</u>	<u>LS/OHT</u>	<u>LS§/GS</u>	<u>LS§/GS/OHT</u>

* LS = loop start

† OHT = Bidirectional on-hook transmission (OHT)
[enables calling party identification (CPI), visual message waiting indication (MWI), and meter reading]

‡ GS = ground start

§ If CO that the COT is associated with is a 5ESS[®] switch, set GNDREF attributes to YES for proper ring trip (otherwise, circuit is dead for up to 4 seconds after telset goes off hook)

E. Coin Service

4.64 Coin service is provided by the AUA33 channel unit in the COT and the AUA53 channel unit in the RT. The coin channel units provide coin-first service using ground-start signaling or dial-tone-first service using loop-start signaling. The coin channel units are compatible with the 1C/2C- and 1D-type coin telephone sets.

F. Multiparty or Frequency-Selective Ringing (FSR)

4.65 Two-wire multiparty service is provided by the AUA35 channel unit in the COT and the AUA55B channel unit in the RT. On-hook transmission is provided with the AUA35 and AUA55B channel units. Four- to eight-party service requires a positive ringing supply, which may be provided in the RT by the AUG1 positive ringing unit (PRU). Up to 5-party frequency selective service can be provided using the AUA37 channel unit in the COT and the AUA57 channel unit in the RT. The multiparty and FSR channel units also provide 2-party automatic number identification (ANI).

G. 2-Wire Locally-Switched Special Services

4.66 Two-wire locally switched special services are provided by the following channel units:

COT: AUA32 and AUA39 *SPOTS* channel units
RT: AUA150/159 POTS and *SPOTS* channel units
AUA25B M *SPOTS* channel unit.

Two-wire locally switched special services may use loop- or ground-start or loop reverse battery signaling. Open switching interval protection and slow forward disconnect are provided by the AUA150. Fast forward disconnect is provided by the AUA159. Table E lists OHT and CPI support. The POTS and *SPOTS* channel units provide service in the carrier serving area. The AUA25B M *SPOTS* channel unit was developed for economical short loop metropolitan applications for the same services. Range of this channel unit is specified in AT&T 363-005-124 data sheet.

H. Direct Inward Dial (DID) Channel Units

4.67 Direct inward dial trunk service is provided by the AUA36 channel unit in the COT and the AUA56 channel unit in the RT. The DID channel units are compatible with loop pulsing or battery and ground pulsing used for loop-reverse-battery signaling. In a tandem carrier arrangement, the AUA56 DID channel unit is end-to-end compatible with the AUA43 2-wire special service channel unit in a COT. Feature Package I does not support the AUA56 channel unit except in a groomed arrangement where the AUA56 of the RT is connected to a J98726BB 2-wire DPT channel unit (D4) at the foreign switch CO.

I. POTS with Derived Channel Alarm

4.68 Two channel units, the AUA26 (COT) and AUA27 (RT) provide single-party loop start service in a *VerSuS*^{*} derived channel network. The *VerSuS* network provides vertical subscriber services including alarm service transport on POTS channels. Alarm signals are carried by a tone below the voice-band frequency and by in-band signaling. For POTS only applications, the channel units may be used end-to-end with the single-party channel units. Feature Package I does not support the AUA27 channel unit.

J. Designed Special Services

- 4.69** These channel units provide designed special services as follows:
- AUA43 and AUA142 2-wire E *SPOTS* channel units
 - AUA75 PLAR channel unit
 - AUA44, AUA54, and AUA141 4-wire channel units
 - AUA34B, AUA52B, and AUA152 dataport channel units.

Applications of these channel units are detailed in AT&T 915-710-116, *Channel Unit Application and Prescription Setting*. Applications for 2-wire special service private line auto ring (PLAR) are described in customer information release (CIR) AT&T 363-099-107IR.

K. 2-Wire Nonlocally Switched Special Services

4.70 The E *SPOTS* channel units, AUA43 and AUA142, provide transmission and signaling for 2-wire nonlocally switched special services circuits in CSA applications. These units may be provisioned for foreign exchange (FX), dial pulse (DP), or transmission only (TO) operation. In the foreign exchange mode, toll diversion (TD) and OHT features are available. In the TO application, the AUA43 channel unit provides sealing current. Each 2-wire special service channel can be provisioned independently of the other.

* Registered trademark of Versus Technology, Inc.

L. Private Line Auto Ring (PLAR)

4.71 The AUA75 channel unit provides 2-wire private line point-to-point automatic ringing service. In this application, the channel unit detects off-hook at the calling station and sends the ringing code toward the called station. When the called station goes off-hook, the far end (called) channel unit trips ringing and enables VF transmission.

4.72 The far-end (called) station rings at 2 seconds on and 4 seconds off until the channel unit detects off-hook (call answered). During the ringing, an audible ringback tone (generated by the far-end channel unit) is transmitted toward the calling station to alert the caller that the called station is being rung. When the called party answers (goes off-hook), ringing is tripped and a talk path is established between the two stations. At the conclusion of the call and after both stations are on-hook, the calling sequence can be repeated.

4.73 The AUA75 channel unit provides a loop-start interface to a customer station and detects negative superimposed ringing on the tip/ring (T/R) interface. On-hook transmission is provided in this unit, with an on-hook transmission loss of 3 dB in both receive and transmit directions. An option switch allows the selection of 0 or 3 dB off-hook transmission loss.

M. 4-Wire VF Special Services

4.74 Three channel units, the AUA141 (current feed), AUA44 (current sink), and AUA54 (E&M signaling) provide 4-wire VF special services. Channel unit application is defined by the function code selected during provisioning. The 4-wire channel units serve a wide range of applications including most of the 4-wire functions provided by D4 four-wire channel units (as described in AT&T 915-710-116, *Channel Unit Application and Prescription Setting*). The 4-wire channel units must be provisioned with the CIU (or OI) before providing service.

N. Dataport Services

4.75 The AUA34/AUA34B DS0 dataport (digital signal zero) channel unit and the AUA52B or AUA152 office channel unit (OCU) dataport provide digital data service. These channel units provide one channel of service in an end link of a digital data system (DDS) private line data circuit. The dataports must be provisioned before providing service. The OCU may be used in the COT or RT; the DS0 is always used in the COT. The AUA3 OTU is required in the COT for synchronizing the dataport channel units (the RT is loop-timed to the COT).

4.76 The AUA34B and AUA52B dataport channel units will support all standard digital data rates from 2.4 to 64 kb/s. Added rates are 19.2 kb/s and a 64 kb/s clear channel (FPI does not support 64 kb/s clear channel). Benefits of the all-rate dataport channel units include the following:

- Revenue generating features:
 - 19.2 kb/s customer data rate
 - 64 kb/s clear channel capability
- Faceplate jack for local loopback (additional test point)
- Faceplate jack for 4-wire bridging access (for testing without the craft interface unit)
- Enhanced inventory.

The AUA34/AUA34B/AUA152 supports customer data rates of 2.4, 4.8, 9.6, and 56 kb/s.

Test Adapters

4.77 Three codes of test adapters are used with the *SLC Series 5 Carrier System*: the AUA78 fault-locate test adapter (FLTA), the AUA80 line test adapter, and the 505A line loss measuring adapter. The AUA78 plugs into the LIU slot in the COT or RT for fault-locating a T1 digital line. The FLTA can be used with the J98725AD fault-locate test set, the Sierra 315B or 415A-2 test set, or equivalent. The AUA78 provides line powering or power looping as required, in addition to test access to the T1 line. The AUA80 is a passive test adapter used in an LIU slot at the COT or RT. The AUA80 provides test access for measuring insertion loss on the digital line pairs. The 505A is a passive test adapter used in an LIU slot in the COT or RT for measuring pair loss on the digital lines.

4.78 The 52A channel unit test extender (Data Sheet AT&T 363-005-235) provides metallic test access for any of the channel units for circuit testing. Switches on the faceplate provide battery feed and hold features that allow the user to set the channel signaling to off-hook for transmission tests. The 310-type faceplate jacks provide monitor and splitting access to all of the channel unit transmission and signaling leads.

5. Equipment and Apparatus Description

5.01 The *SLC* Series 5 Carrier System consists of four major groups of equipment and apparatus as follows:

- (1) COT channel bank assembly, equipment, and apparatus
- (2) Bay arrangements and RT enclosures
- (3) RT channel bank assembly, mounting equipment, and apparatus
- (4) Digital line, repeaters, and apparatus.

The *SLC* Series 5 plug-in apparatus is detailed in Part 4 - Functional Description and in the *SLC* Series 5 data sheets (AT&T 363-005-101 through 363-005-308). The digital line equipment and apparatus is described in documentation listed in the AT&T 365-000-000 and 640-000-000 indexes.

5.02 The J1C182AH-1 (RT) dual channel bank assembly is required for FPI. Feature Package C and Feature Package G systems should be equipped with this assembly to allow for upgrade to the integrated FPI operation.

Dual Channel Bank Assembly

5.03 The dual channel bank assembly shown in Figure 13 contains two independent 96-line systems arranged on five shelves. The lower two shelves contain the blue system channel units and common equipment. The upper two shelves contain the channel units and common equipment for the white system. The middle shelf is equipped with the following:

- Line interface units (LIUs) for both systems
- Digital test unit (DTU) which is shared by both systems
- Power converter unit (PCU) for the units installed in the middle shelf
- System display unit which is shared by both systems.

5.04 The LIUs and LSU on the left-hand side of the shelf serve the blue system; those on the right-hand side serve the white system. The system provides up to 96 channels of service. The channels are divided into four digroups (A, B, C, and D) of 24 channels each. The channels on the lower shelf of a system are designated shelf group AB; shelf group CD refers to the upper shelf of the system. Except for channel testing and the interface to CO and remote alarm systems, the blue system and white system are independent and may be established separately.

≡ NOTE:

Blue and white systems in a single DCB must use the same feature package.

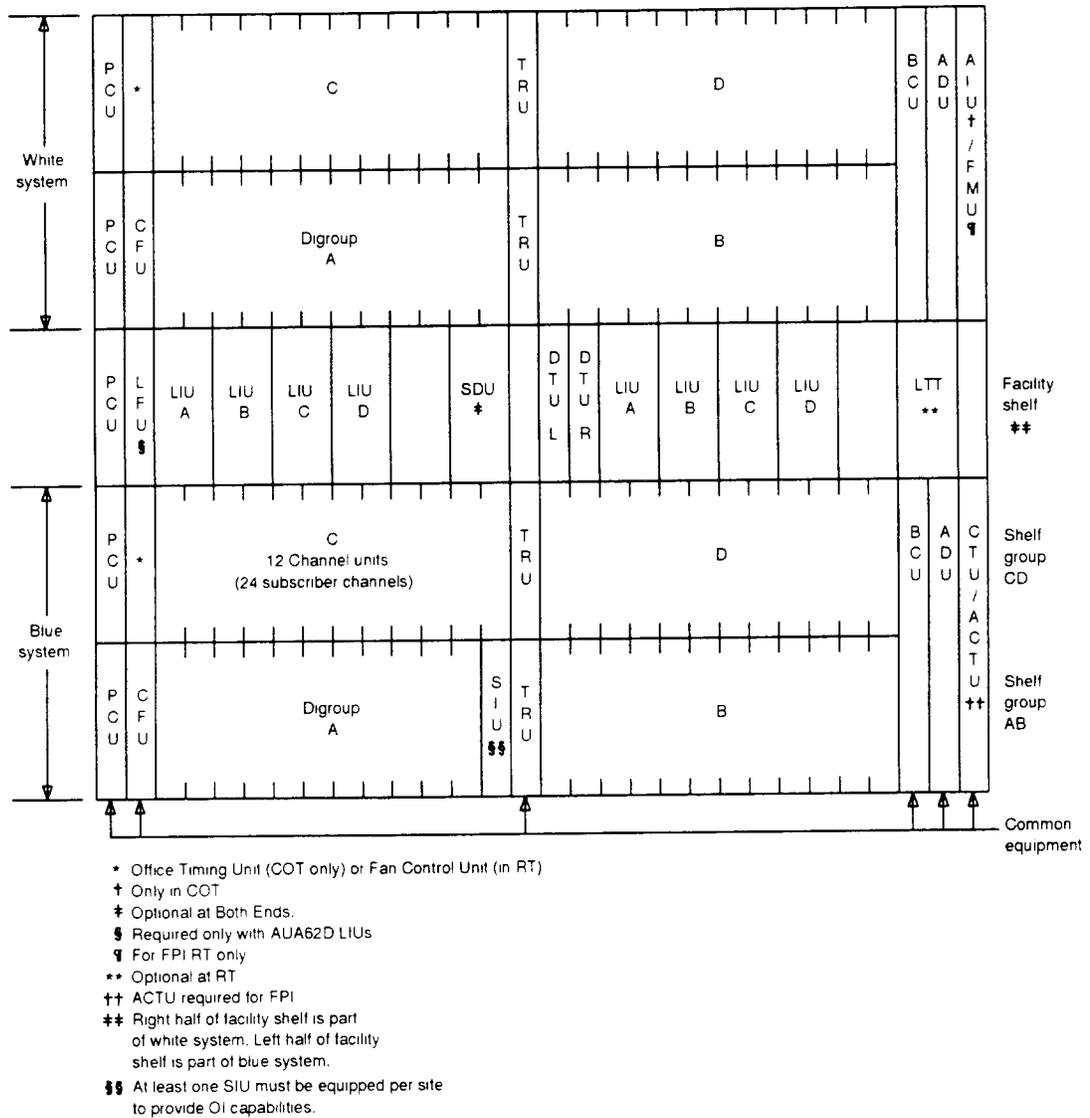


Figure 13. Typical SLC[®] Series 5 Dual Channel Bank Assembly

Minimum Configuration

A. Universal Systems

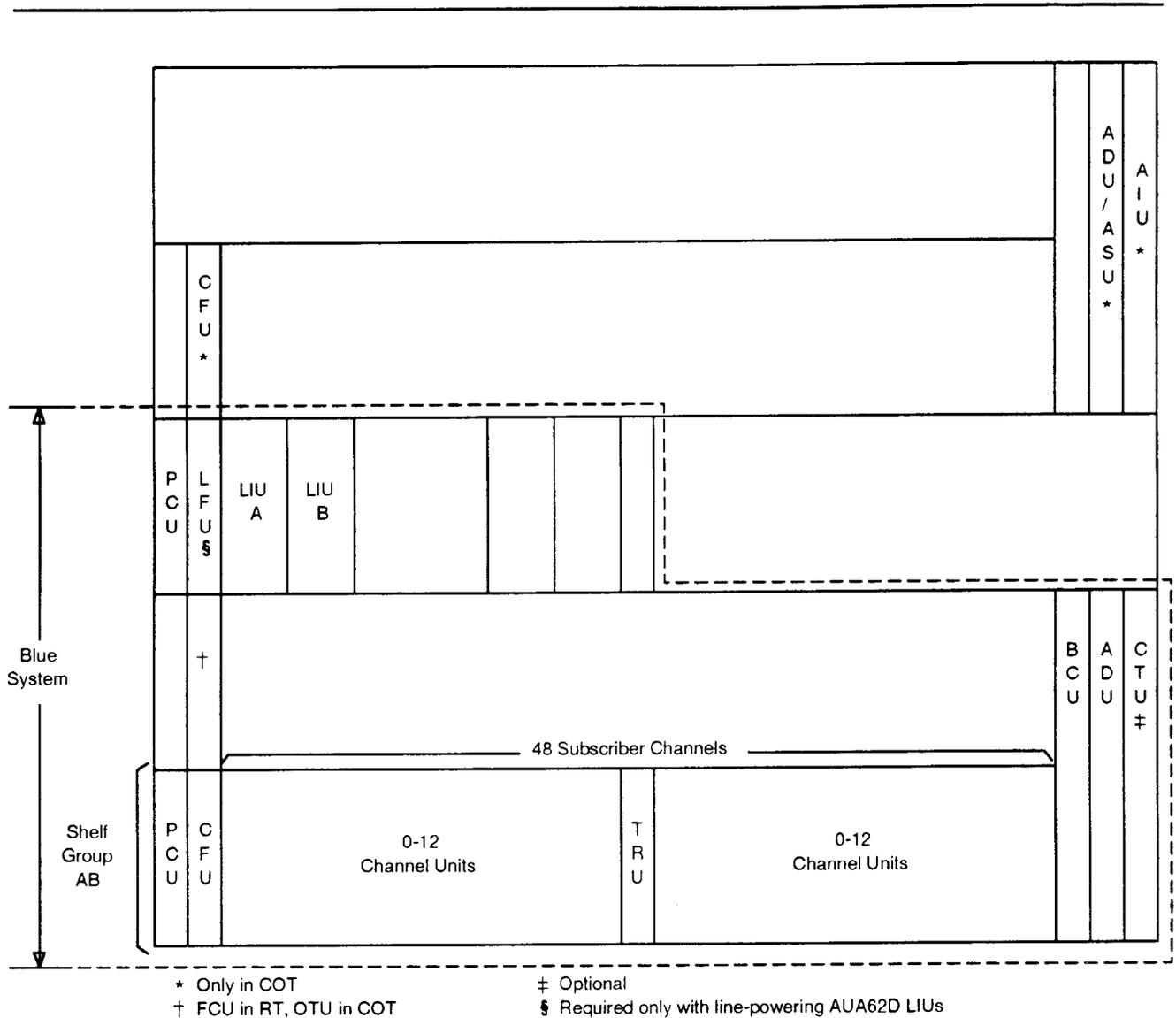
5.05 Figure 14 shows the common units and channel units installed in the minimum configuration for operating a universal system with FPG. The minimum configuration serves up to 48 subscriber channels using shelf group AB channels in the blue system. The alarm display unit/alarm suppressor unit (ADU/ASU) is always installed in the COT when the white system is not equipped. The alarm display unit (ADU) has switch options which must be set to suppress alarms associated with the unequipped shelves in the blue system. The minimum configuration requires two T1 lines; with Mode 2, only one T1 line is needed. The white system also may be established in a minimum configuration. The preferred sequence is to equip the blue system first, followed by the white system, as needed.

B. Integrated Systems

5.06 Figure 15 shows the common units and channel units installed in the minimum configuration for operating an integrated system with FPI. In FPI, one system of a DCB must be engineered for all digroups, although the digroups do not have to be equipped with subscribers. The minimum configuration serves up to 96 subscriber channels using shelf groups AB and CD in the blue system. The minimum configuration requires four T1 lines in Mode 1, two T1 lines in Mode 2, and only one T1 line in Mode 4.

C. System Channel Capacity

5.07 The POTS, *SPOTS* and M *SPOTS* units, multiparty, E *SPOTS* units, dual ringing repeater, and DID channel units each contain two channels. The frequency-selective ringing (FSR), 4-wire VF, dataport, and coin channel units provide only one service channel. The number of channels in a working system may vary from 1 to 96 (1 to 95 for an FPI system operating in Mode 1), depending on the channel units installed. A dual channel unit may have service on the odd channel, the even channel, or both channels.



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Figure 14. Minimum Configuration for Universal System with FPG

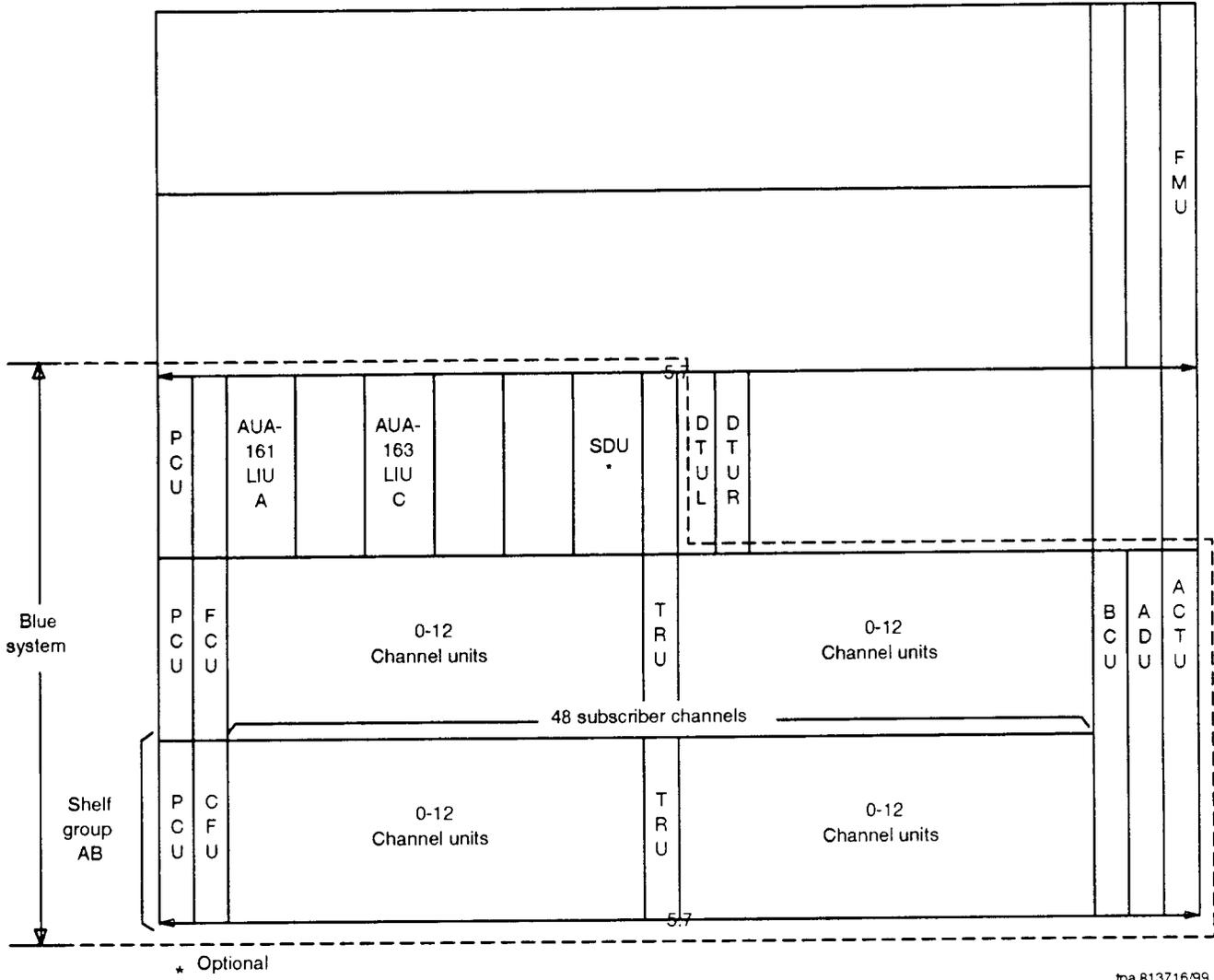


Figure 15. Minimum Configuration for Integrated System with FPI

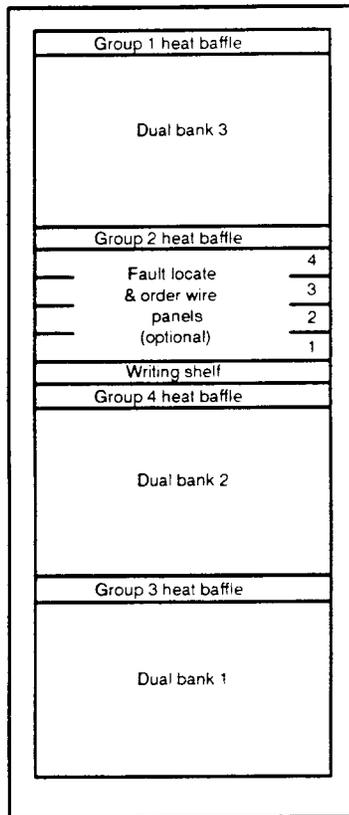
Central Office Terminal Equipment

A. COT Bays

5.08 The COT equipment consists of various combinations of dual channel bank assemblies and heat baffles mounted in a factory-wired bay. The bay may be ordered with cabling for fault-locate and order-wire (FL/OW) panels if needed. The FL/OW panels and a writing shelf are also available for field installation. Three sizes of bays are available as follows:

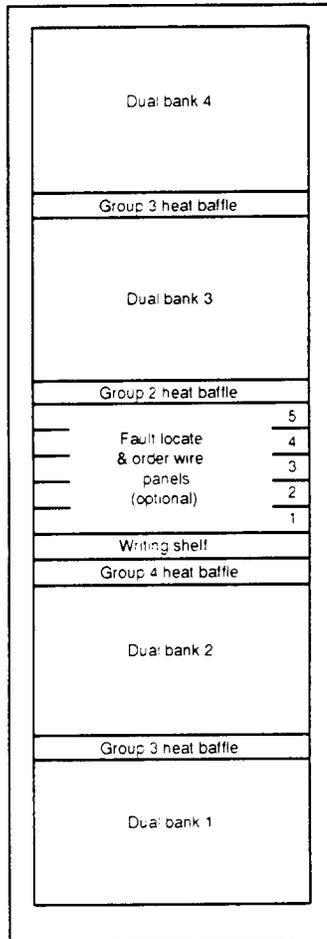
- ED-8C501-51,G2—8-foot bay (Figure 16)
- ED-8C501-50,G2—9-foot bay (Figure 17)
- ED-8C501-51,G3—11-foot bay (Figure 18)

5.09 The ED-8C501-51,G2 bay provides space for up to three dual channel bank assemblies (six systems). The ED-8C501-50,G2 bay provides space for up to four dual channel bank assemblies (eight systems). The ED-8C501-51,G3 bay provides space for up to five dual channel bank assemblies (ten systems). All three bays are all cabled for the optional FL/OW panels, which may be equipped as needed. See Table F for a summary of COT bays and FL/OW panel capacities as shown in Figures 16 through 18.



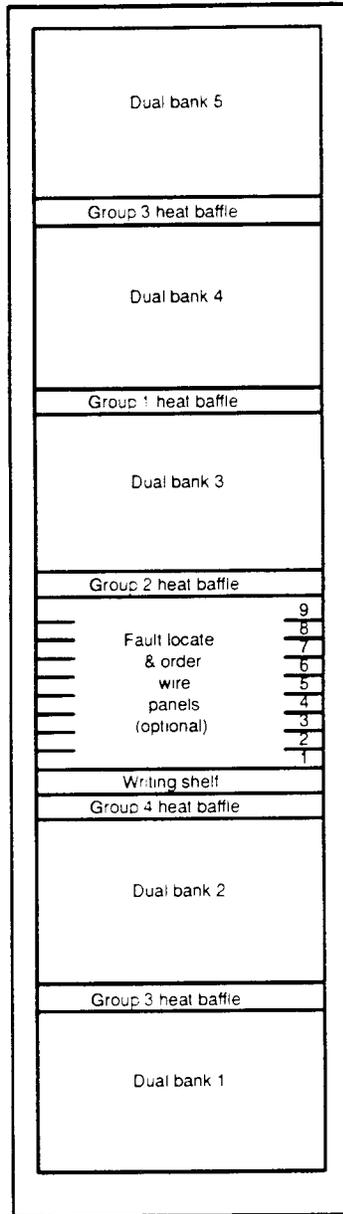
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Figure 16. 8-Foot COT Bays (ED-8C501-51,G2)



ENR 769440-01

Figure 17. 9-Foot COT Bays (ED-8C501-50,G2)



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Figure 18. 11-Foot 8-Inch COT Bay (ED-8C501-51,G3)

Table F. Equipment Arrangements for the COT Frame

<u>Bay Code</u>	<u>Bay Configuration</u>	<u>Available Space for Fault Locate and Order Wire Panels</u>
ED-8C501-51,G3	11' - 8" 5 dual channel banks (10 systems)	9
ED-8C501-50,G2	9' - 0" 4 dual channel banks (8 systems)	5
ED-8C501-51,G2	8' - 0" 3 dual channel banks (6 systems)	4

**B. J1C182AG-1 COT Dual Channel
Bank Assembly**

5.10 The channel bank assembly J1C182AG-1 consists of five shelves with a one-piece covered backplane. The assembly uses 20 inches of vertical mounting space and accommodates all circuit packs required for two complete 96-channel systems. A fully-equipped COT dual channel bank is shown in Figure 19. All assembly wiring is completed by the factory using a combination of point-to-point wiring and a printed wiring board (PWB) backplane. The dual channel and bank assembly is fully connectorized. A cable assembly (ED-7C700) can be installed in each digroup in the COT to provide access to the E&M leads (for COT E&M applications).

C. Fuses and Heat Baffles

5.11 The SLC Series 5 COT does not need a separate fuse and alarm panel. Instead, the COT bays are equipped with the appropriate ED-7C603-31 heat baffle (Figure 20) which has fuses and indicators mounted on it for the -48 V supplies to the channel banks, the channel fuse units (CFUs), the line fuse unit (LFU), and the FL/OW panels. The ED-7C603-31 panel provides indicators for major, minor, and power minor alarms for the bay and a fuse alarm indicator for each dual channel bank. Each heat baffle uses 2 inches of vertical mounting space in the COT bay.

5.12 The heat baffle is provided in four groups, G1 through G4. Group 1 has a 25A fuse and a FUSE ALM indicator [red light-emitting diode (LED)] mounted on the right-hand side of the panel. The ED-7C603-31, G2 has three BAY ALARM indicators. The bay alarm indicators are MJ (red LED), MN (yellow LED), and PMN (yellow LED). The PMN alarm indicates an RT power minor failure. The ED-7C603-31, G3 has two 25A fuses and two FUSE ALM indicators. The ED-7C603-31, G4 has five 72A-18A fuses and one FUSE ALM indicator. The location of the heat baffles for each bay arrangement is shown in Figures 16 through 18.

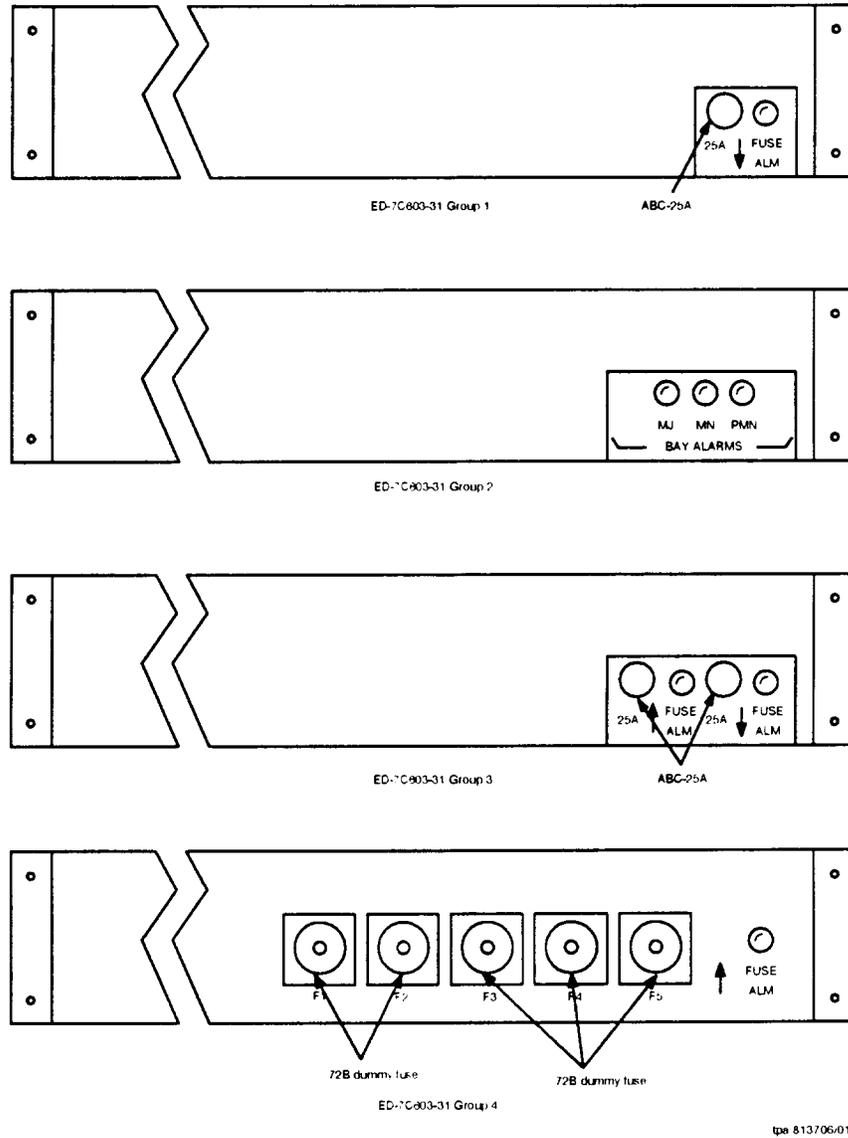


Figure 20. Typical ED-7C603-31 Panels (Heat Baffles)

D. Fault-Locate and Order-Wire Panel

5.13 A J1C141AC-L1,L2 fault-locate and order-wire panel is available for active and passive fault-locating. The J1C141AC-L1,L2 panel is powered from the -48 V supply and contains a DC-to-DC converter to provide +130 V from the -48 V supply. The J1C141AC-L1,L2 is a combination of the J1C141AC-L1 and J1C141AC-L2 panels. It uses the L1 panel with the L2 DC-to-DC converter and has the L1 options brought out to a terminal strip on the rear of the panel. A 118 V regulator provides the output for powering the fault-locate line. The fault-locate and order-wire panel also provides an independent order-wire between the COT, the digital line repeater locations, and the RT.

5.14 The J1C141AC-L1,L2 panel can be installed in all bays. The List 2 bay is used as the first of every four bays in the COT lineup. The J1C141AC-L1,L2 panels may be equipped in these bays as needed. The number of panels required depends on the number of routes served by the COT lineup. Guidelines for equipping the J1C141AC-L1,L2 are given in AT&T 915-710-115G, *Feature Package G and I, Application Engineering*. The panel is described in AT&T 363-202-216 along with installation and turnup procedures for active fault-locating and order-wire systems. Figures 16 through 18 show the location of the J1C141AC-L1,L2 panels in the COT bays.

Remote Terminal Arrangements

5.15 The *SLC* Series 5 RT equipment consists of various combinations of a dual channel bank assembly (two systems), a power shelf assembly (including ringing supply), -48 V DC battery strings, and a fan assembly mounted in a cabinet or 7-foot frame. Cabinet-mounted RTs are powered from the commercial AC supply and have standby battery power. If the AC power fails, the batteries will maintain normal equipment operation for a minimum of 8 hours. Frame-mounted RTs may be powered from the commercial AC supply or from a bulk power plant. Bulk powered RT frames do not have the battery strings (auxiliary power) used in AC-powered frames.

5.16 The major difference between the cabinet and frame-mounted RTs is the arrangement of equipment. The cabinets are self-contained and include cabling, connectors, primary lightning protection, pair distribution, fan assembly, terminal electronics, and auxiliary power (batteries, etc) mounted in the cabinet. The frame-mounted RTs have the fan assembly, terminal electronics, and power shelf mounted in the frame. In distributed power applications, battery shelves (reserve power) are also mounted in the frame; in bulk power applications, the batteries are part of the bulk power plant. The rest of the equipment is part of the enclosure that houses the frame. AT&T 363-205-000G, *Information and Pricing Guide for GTE*, lists the various equipment and apparatus items necessary for the RT and items which must be ordered separately as required. Capacities of *SLC* Series 5 RT equipment enclosures are listed in Table G. Construction information is available in the AT&T Practice for each enclosure.

Table G. SLC® Series 5 RT Enclosure Capacities with Distributed or Bulk Power

<u>Type of Enclosure</u>	<u>Metallic T1</u>			<u>Lightguide</u>		
	<u>Dual Channel Banks</u>	<u>Systems</u>	<u>Lines</u>	<u>Dual Channel Banks</u>	<u>Systems</u>	<u>Lines</u>
51-type cabinet	1	2	192	—	—	—
80D cabinet	4	8	768	3	6	576
90A cabinet	2	4	384	1	2	192

RT Cabinets

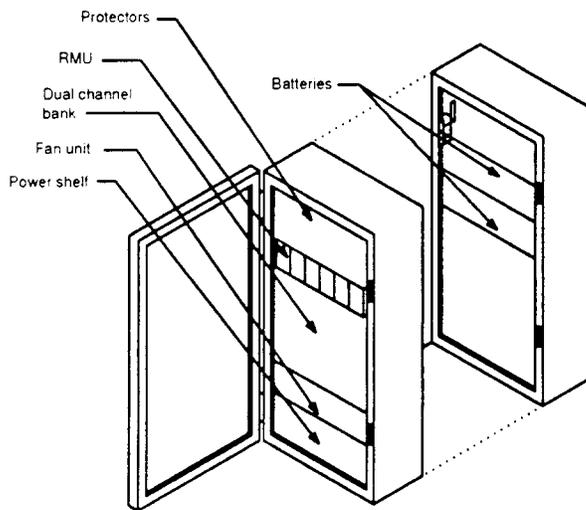
5.17 The 51A cabinet may be mounted on a pedestal or pole and houses two 96-line systems (one dual channel bank assembly). The 80D cabinet (community service cabinet) is larger than the 51A and will enclose various combinations of Series 5 Carrier Systems (up to eight) and an optional feeder distribution interface.

A. 51A Cabinet (ED-7C601-30)

5.18 The 51A cabinet has a weatherproof housing with framework that is 48 inches high, 29 inches wide, 20-1/2 inches deep, and is painted green or beige. The cabinet can be pole mounted using the AT-8783 metal crossarms or with the channel hanger supplied with the cabinet. The cabinet can also be mounted on a 38-Y-4055 concrete pad using an AT-8812B pedestal base.

5.19 The 51A cabinet has a front door, electronics section, and battery section. The sections are opened and closed using the standard loop electronics Allen keywrench (Part No. 840841324). Figure 21 shows the 51A cabinet with the protector block, the channel bank assembly, fan assembly, and power shelf with 337A1 battery chargers mounted in the electronics section. The batteries are stored behind the electronics section. Two strings of batteries are required in this cabinet (each battery string consists of four battery packs mounted on two shelves).

5.20 The dual channel bank and associated apparatus are connectorized and are factory mounted in the cabinet. The stub cable enters the cabinet through a cable entrance in the bottom of the utility section. Commercial AC power from separately mounted service equipment terminates on a control box which is part of the utility section. The cabinet is made from high-strength marine grade aluminum alloy which shields and protects the electronics.



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Figure 21. 51A Cabinet for FPG System

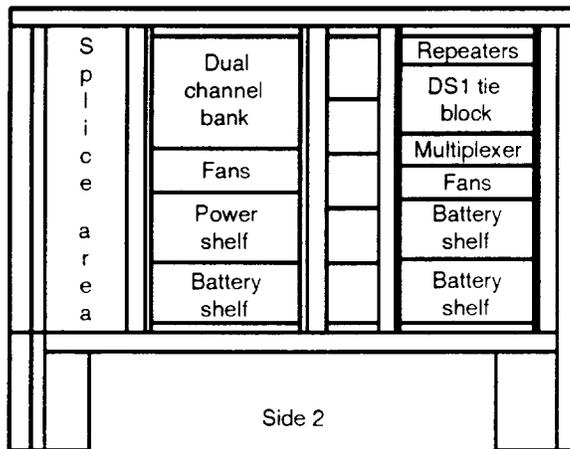
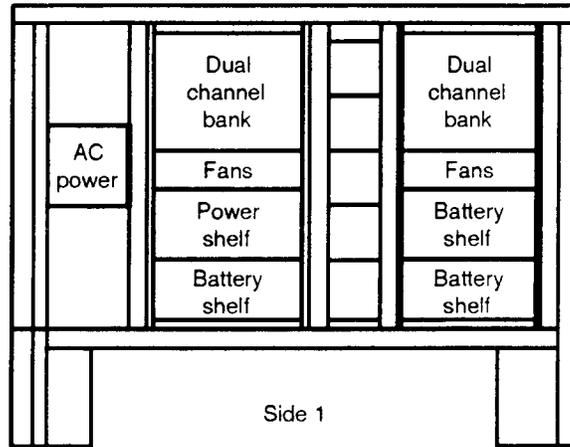
B. 80D Cabinet (ED-7C621-30)

- 5.21** The 80D cabinet is designed to house the *SLC* Series 5 RT equipment. The 80D cabinet can be used as a commercial sign by attaching logos or lettering to the sides of the cabinet. These cabinets make an aesthetically pleasing installation at the RT site.
- 5.22** The cabinet structure consists of an aluminum frame with a horizontal top beam, a bottom beam, and two legs. The legs both have the same cross-sectional shape as the top. The cabinet is 66 inches high, 84 inches wide, and 27 inches deep. A 7-inch collar is mounted on both sides of the frame to make the inside deep enough for the feeder distribution interface (FDI) and/or Series 5 apparatus. Two doors hinged along the outside edge of the collar provide access to the electronics and/or FDI apparatus. A 216B tool and an Allen key-wrench (Part No. 840841324) are required to open the cabinet doors.
- 5.23** Cable entrance holes are provided in the base of the cabinet. The telephone cables enter on one side of the cabinet and the power cables enter on the other side. An outlet is provided on the underside of the cabinet to connect a portable generator if desired for emergency power.
- 5.24** The 80D cabinet is factory assembled and completely prewired in configurations to serve up to eight *SLC* Series 5 Carrier Systems (metallic application). The equipment for a fully-equipped 80D cabinet for FPG consists of four *SLC* Series 5 RT connectorized dual channel banks, six 181A apparatus mountings (battery shelves), 337A1 battery chargers, the IR30C batteries, and two J1C182BA-1 power shelves. Other apparatuses include four 2C fan assemblies and an AC panel board.

5.25 Figure 22 shows an 80D cabinet equipped with the *SLC* Series 5 RT, power shelf, battery shelves, DDM-1000 multiplexer, DSX tie block, and a small cross-section repeater shelf (SXSS). Items such as the concrete mounting pad, AC meter, service equipment, and underground feeder must be provided locally as required. The cabinet can be equipped initially with one dual channel bank. Additional dual channel banks (up to three more) can be installed later as required. Maximum capacity of the 80D cabinet is 768 lines (Table G).

5.26 The FPI application in an 80D cabinet fully-equipped configuration consists of six *SLC* 5 Carrier Systems (three dual channel banks), three power shelves, four 2C fan assemblies, six battery shelves, and three repeater shelves or a DDM-1000/DDM-2000 lightwave multiplexer.

5.27 An 80D cabinet may be equipped with six *SLC* Series 5 Carrier Systems (three dual banks), three power shelves, four 2C fan units, six battery shelves, and a DS1 tie block mounted above the DDM-1000/DDM-2000 lightwave multiplexer. With the DDM multiplexer installed, the 80D cabinet holds up to three dual channel banks and has a capacity of 576 lines (Table G). Other arrangements allow addition of small cross-section repeater shelves (SXSS) to provide T1 extensions from the DDM-1000/DDM-2000 lightwave multiplexer.



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Figure 22. 80D Cabinet (Community Service Cabinet) for RT Applications Using DDM-1000/DDM-2000

C. 90A Business Remote Terminal (BRT) Cabinet

5.28 The 90A BRT cabinet measures approximately 77 inches high (including casters), 29 inches wide, 30 inches deep, and is equipped with lockable front and rear doors. AC power is supplied to the cabinet via one 20 amp, 120 V AC power extension cord which plugs into a standard National Electrical Manufacturing Association (NEMA) 5-20R receptacle. A 90A BRT cabinet, fully loaded in a hub configuration with a DDM-2000 lightwave multiplexer, contains the following equipment:

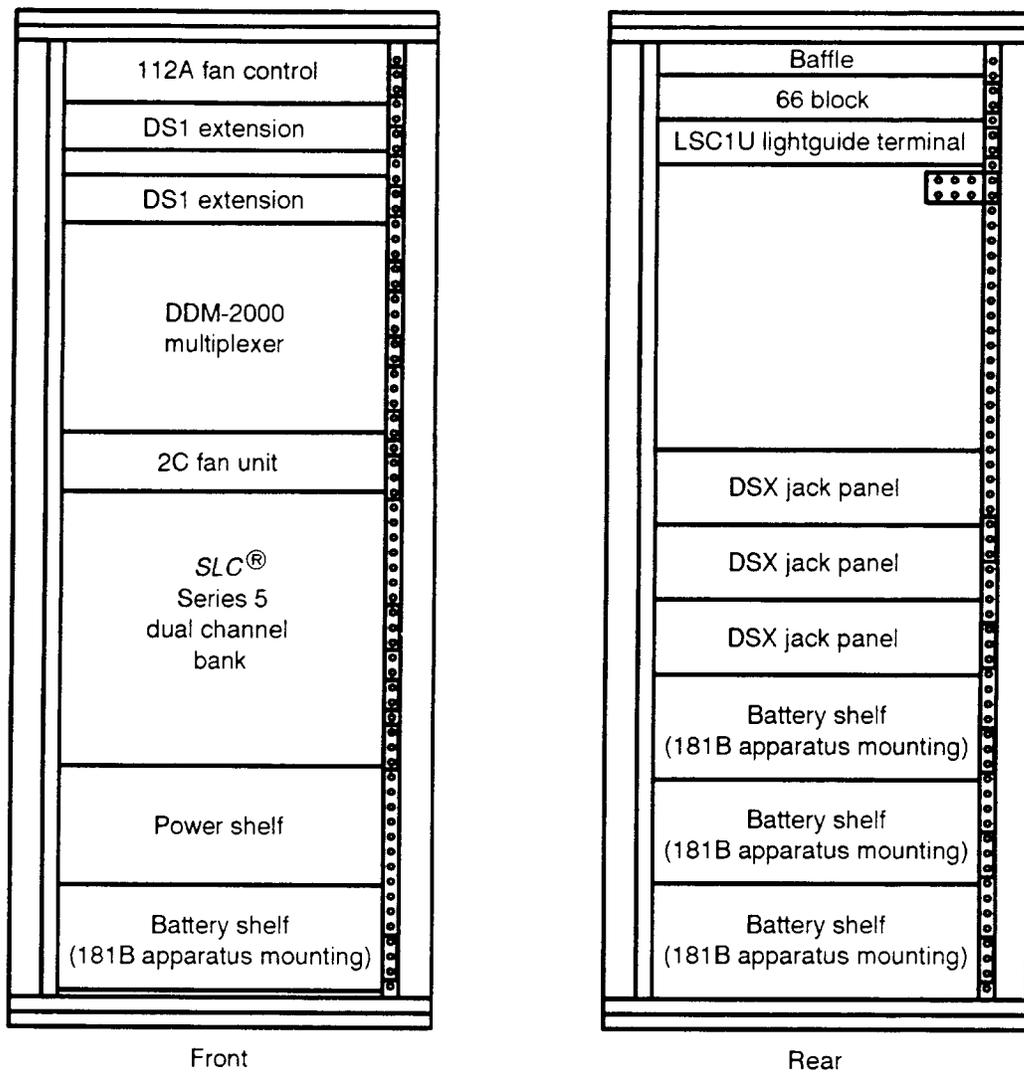
- One *SLC* Series 5 dual channel bank assembly
- One DDM-2000 lightwave multiplexer
- Two DS1 extension shelves
- One power shelf
- Four battery shelves
- One lightguide interconnect shelf
- One 2C fan unit
- Three 800-series DSX jack access panels
- One fan control unit.

5.29 A 90A BRT cabinet, fully loaded in a satellite configuration contains the following equipment:

- Two *SLC* Series 5 dual channel bank assemblies
- One power shelf
- Three battery shelves
- One 2C fan unit.

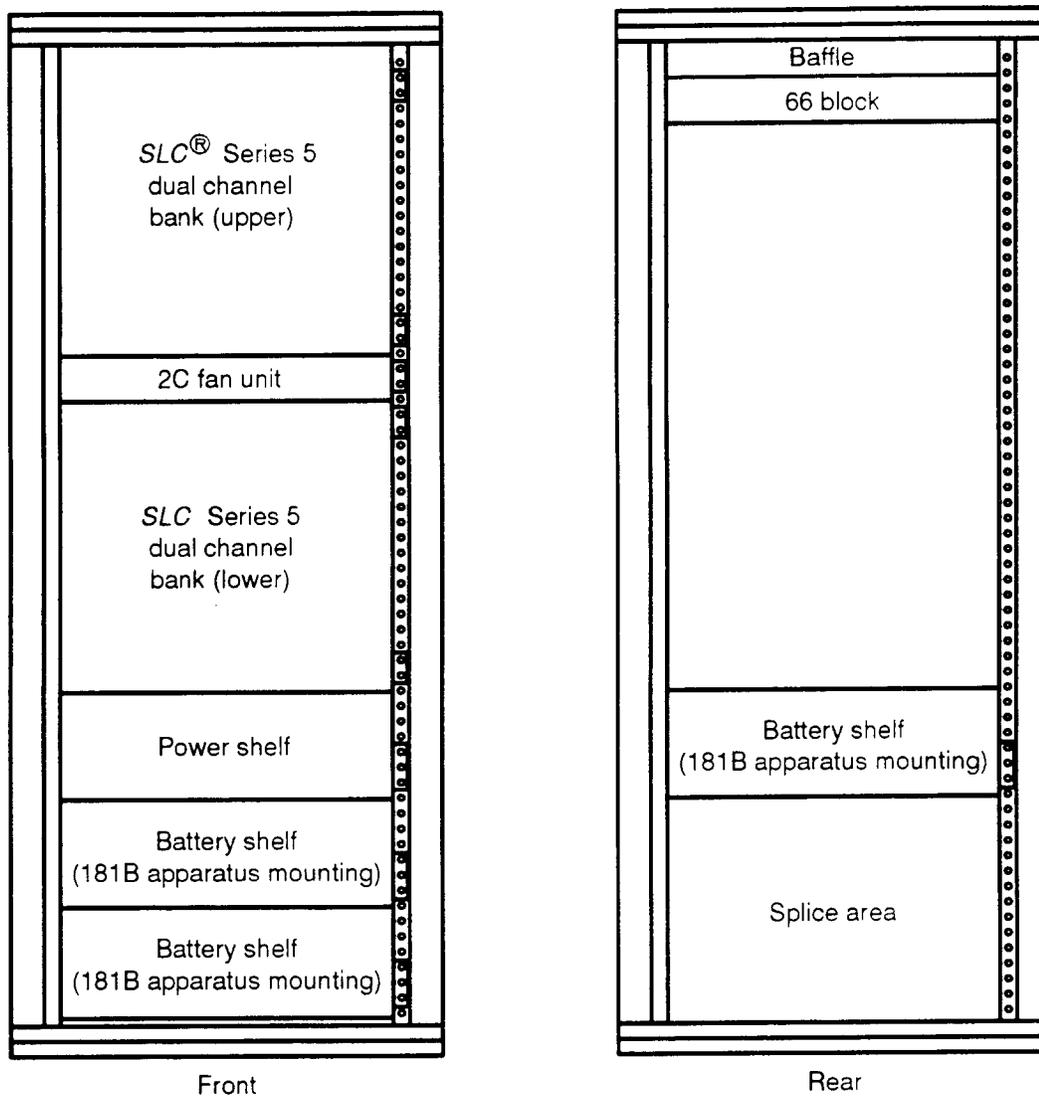
5.30 The 90A business remote terminal (BRT) cabinet is designed to meet the telecommunications needs of medium-to-large business customers (200 - 1200 lines) being served over predominantly special service circuits. The 90A BRT cabinet is located at the customer's premises and, using the features of the DDM-2000 lightwave multiplexer and the *SLC* Series 5 RT, provides the wide range of services required by the business customer. The 90A BRT cabinet is designed primarily for business applications within urban and suburban areas and can be configured as a hub arrangement with a DDM-2000 multiplexer (Figure 23) or as a satellite arrangement (Figure 24). The 90A BRT cabinet is *UL** recognized.

* Registered trademark of Underwriters Laboratories Inc.



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Figure 23. 90A BRT Cabinet with DDM-2000 Multiplexer in Hub Arrangement



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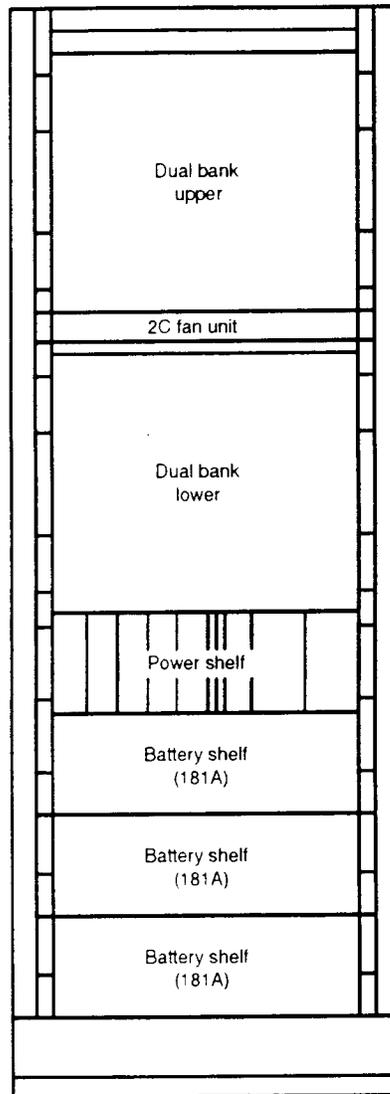
Figure 24. 90A BRT Cabinet in Satellite Arrangement

D. RT Frame Arrangements

AC-Powered RT Frame

5.31 The RT dual channel bank may be mounted in the 7-foot unequal flange cable duct-type network frame (bay). This bay is equipped with two dual channel banks.

5.32 All equipment is installed, maintained, and removed from the front of the bay. Two connectorized dual channel bank assemblies are mounted in the AC-powered frame (Figure 25). Also mounted in the frame are the connectorized power shelf, three connectorized battery shelves, battery packs, and a fan assembly. Primary protection must be added to the enclosure. This frame is powered from the commercial 120 V AC 60 Hz supply.

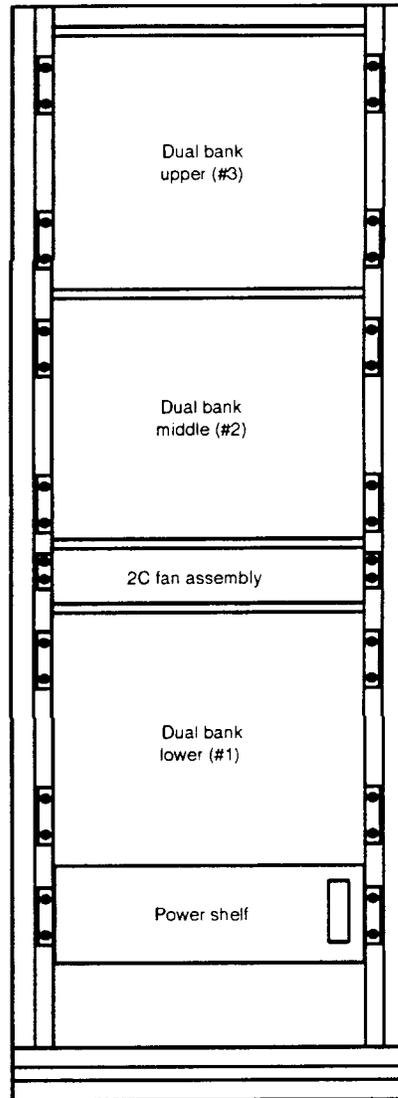


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Figure 25. AC-Powered RT Frame (Distributed Power Arrangement)

Bulk Powered RT Frame

5.33 The *SLC* Series 5 seven-foot RT frames used in structures or customer locations may be powered from DC rectifier/battery plants (bulk power) instead of the usual commercial AC source. The bulk power plants that are currently available require a central office environment with operating temperatures of +40°F to +100°F and a short-term temperature range of +35°F minimum to +120°F maximum. The RT frames that are powered from a DC rectifier plant require the J1C182BB bulk power shelf for DC power distribution. This arrangement (Figure 26) accommodates up to six systems (three dual channel banks) per frame. See AT&T 915-710-115G, *Feature Package G and I, Application Engineering* for details on bulk powering considerations.



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Figure 26. Bulk-Powered RT Frame Equipped with J1C182BB Bulk Power Shelf

E. Remote Terminal Equipment and Apparatus

RT Dual Channel Bank Assembly

5.34 The J1C182AH-1,L1 dual channel bank is a 5-shelf assembly which requires 20 inches of vertical mounting space and contains two 96-line systems. A completely equipped RT dual channel bank assembly is shown in Figure 27. All assembly wiring is completed by the factory using a combination of point-to-point wiring and printed-wiring board (PWB) backplane. The cabling is tied to the bay frame or cabinet assembly. All external connections, including derived pairs, T1 lines, and alarms, are connectorized and are made from the front of the assembly.

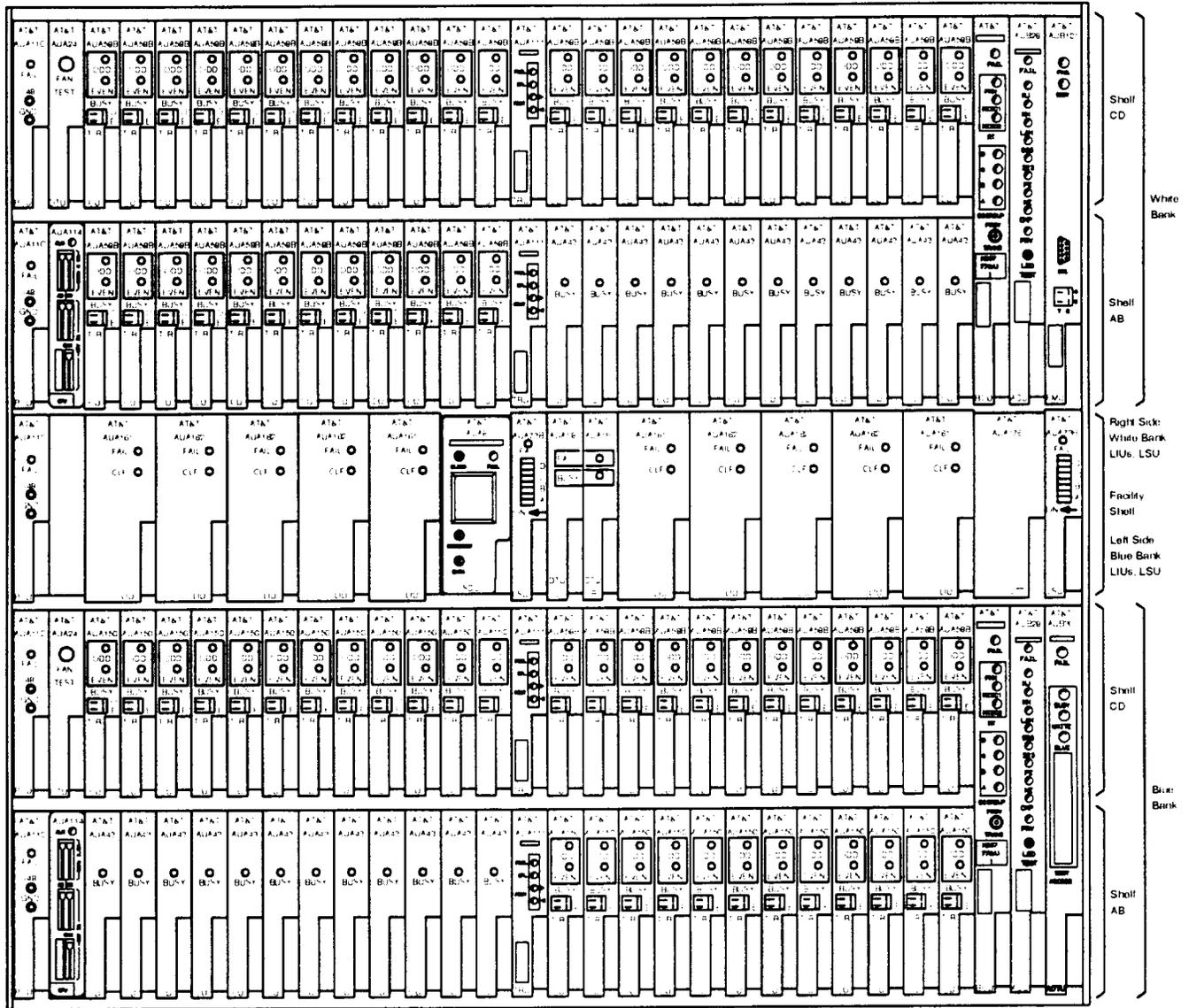


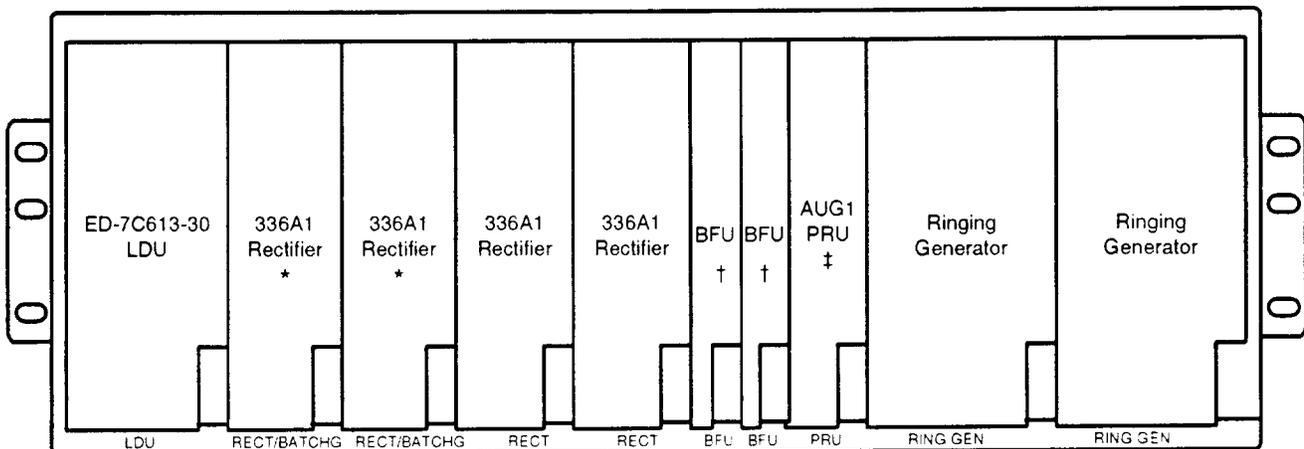
Figure 27. J1C182AH-1, L1 RT Channel Bank Assembly

J1C182BA Power Shelf

5.35 This power shelf is used with the 117 V 60 Hz AC power supplied to RT cabinets and AC-powered RT frames. The power shelf circuit packs (Figure 28) provide power distribution, fusing, ringing supply, fault-locate jacks, and order-wire terminals. Connectorized cables connect the power shelf assembly to the dual channel bank, the battery shelves, and the fan unit. The power shelf requires 8 inches of vertical mounting space and holds the following circuit packs:

- ED-7C613-30 load distribution unit (LDU)
- 336A1 power unit (rectifier)
- AUG11 bank fuse unit (BFU)
- 3C1 ringing generator
- 337A1 battery charger
- AUG1 positive ringing unit (only for multiparty service).

5.36 The 337A1 battery charger is located in the power shelf when the RT is housed in the 51A cabinet, otherwise it is located in the 181A apparatus mounting (battery shelf). Up to six 181A battery shelves can be connected to the power shelf.



* RT frame and 80D cabinet use the 336A1 rectifiers in all four slots (as shown) with 337A1 battery chargers mounted in battery shelves. The 51A cabinet uses the 337A1 battery chargers in these two slots and 336A1 rectifiers in the remaining two slots.

† Bank fuse unit (AUG11)

‡ Positive ringing unit only for multiparty service.

Figure 28. J1C182BA Power Shelf

J1C182BB Bulk Power Shelf

5.37 This power shelf is used with the -48 V DC power supplied to the bulk-powered RT frames. The J1C182BB power shelf provides space for installing one AUG2 ring switch unit (RSU), two AUG1 positive ringing units (PRUs), up to three AUG11 BFUs, and two 3C1 ringing generators (Figure 29). One AUG1 PRU can supply two dual banks; for three dual banks, two AUG1 PRUs are required. One bulk power shelf is required for each 6-system (three dual channel banks) RT 7-foot frame. The bulk power shelf is 22 inches wide, 11 inches deep, and requires 8-inches of vertical mounting space in RT frames. Cabling between the bulk power shelf and dual channel banks is connectorized. A total of eight power, alarm, and return leads must be connected to a terminal strip on the front of the bulk power shelf.

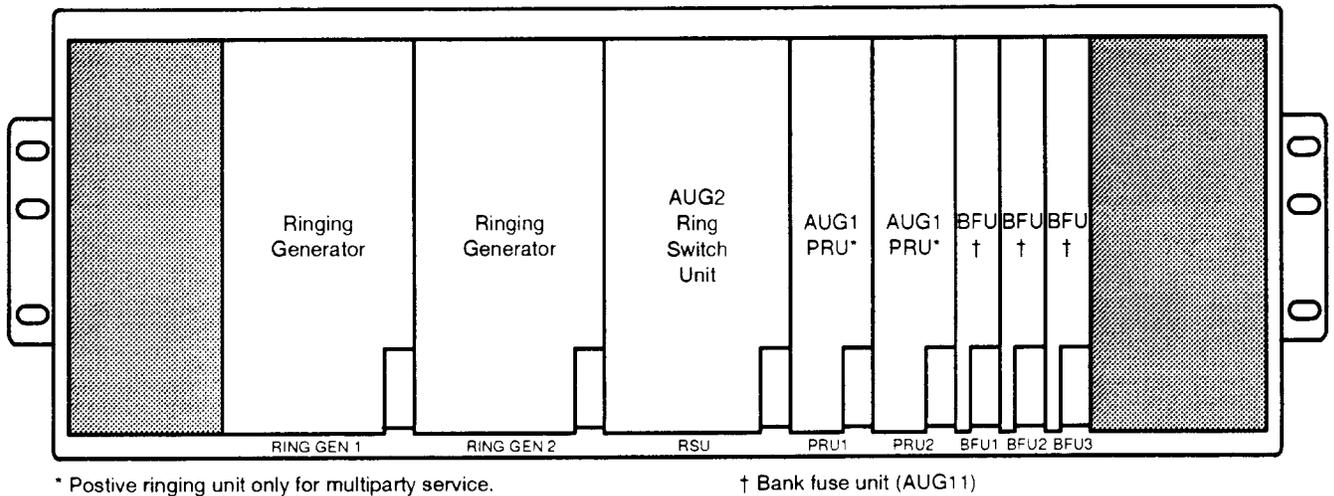


Figure 29. J1C182BB Bulk Power Shelf

181A Apparatus Mounting

5.38 The 181A battery shelf is used in AC-powered RT frames and in 80-type cabinets. It is also used for additional power reserve in the 51A cabinet. The battery shelf (Figure 30) holds four battery packs and one 337A1 battery charger. The RT frame arrangement holds three 181A battery shelves for two dual channel banks. All input and output leads to the power shelf are connectorized. The battery charger plugs into the left side of the shelf. A battery heater keeps the batteries warm when the temperature falls below 32°F. The 181A battery shelf requires 8 inches of vertical mounting space.

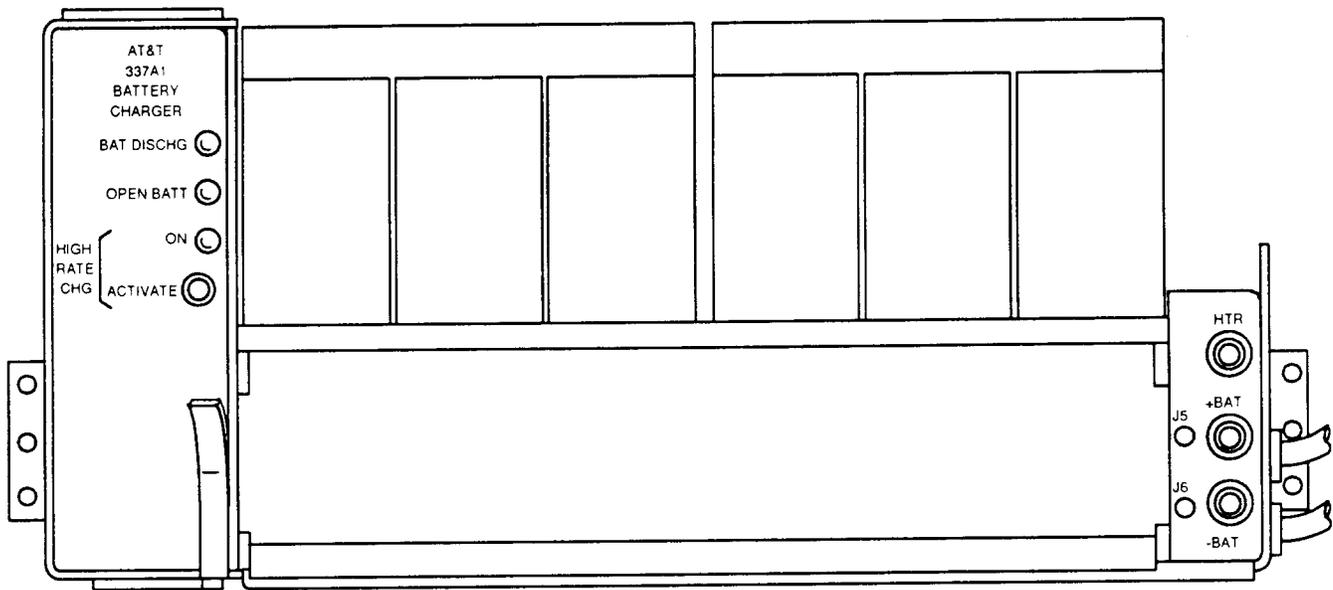


Figure 30. 181A Apparatus Mounting (Battery Shelf) with 337A1 Battery Charger Installed

2C Fan Unit

5.39 This unit is a shelf assembly with three 6-inch fans mounted on it. The fans are controlled by thermal switches on the fan control units (FCUs) and power shelf units (336A1 power units, 337A1 battery charger, and 3C1 ringing generator). The temperature limits for the switches are shown in Part 7, Specification Summary—Equipment. A red FAIL indicator is mounted on the front panel of the fan assembly. The shelf is 3 inches high, 21 inches wide, 10 inches deep, and mounts between dual channel banks in a frame or between the dual channel bank and the power shelf in a cabinet.

Channel Unit Description

A. General

5.40 The channel unit data sheets listed in Table D give a detailed description of each channel unit. Channel unit applications for POTS, *SPOTS* and M *SPOTS* units, coin, multiparty, FSR, and direct inward dial (DID) channel units are described in AT&T 915-710-115G, *Feature Package G and I, Application Engineering*. Applications and prescription setting (provisioning) for the dual ringing repeater channel unit, 2-wire special service (E *SPOTS* units), 4-wire special service, and dataport channel units are described in AT&T 915-710-116, *Channel Unit Application and Prescription Setting*. Table C specifies which feature package supports which CU.

B. Service Channel Capacity

Dual Channel Units

- 5.41** These channel units occupy one channel slot and provide two channels of service:
- AUA31 and AUA38B POTS channel units (COT)
 - AUA58B and AUA158 POTS channel units (RT)
 - AUA32 and AUA39 *SPOTS* channel units (COT)
 - AUA51, AUA59/AUA150, and AUA159 POTS and *SPOTS* channel units (RT)
 - AUA25B M *SPOTS* channel unit (RT)
 - AUA35 (COT) and AUA55 (RT) multiparty channel units
 - AUA36 and AUA56 DID channel units (FPG only)
 - AUA42, AUA43, and AUA142 E *SPOTS* channel units
- 5.42** When a 2-wire unit is used with a 4-wire unit at the other end of a channel, the 2-wire unit must be provisioned on the odd-numbered channel. In this case, the even-numbered channel is not available for service. The AUA31, AUA32, AUA36, AUA42, AUA43, AUA51, AUA56, and AUA142 channel units have a faceplate indicator that lights when either channel is busy. The other channel units have a busy indicator for each channel (ODD and EVEN).
- 5.43** Most channel units have a faceplate jack that provides test access to the tip and ring on each channel. A test cord (COMCODE 405525809) is required to plug into the jack.

Single-Circuit Channel Units

- 5.44** The following channel units each provide one channel of service:
- AUA33 (COT) and AUA53 (RT) coin channel units
 - AUA37 (COT) and AUA57 (RT) frequency selective ringing (FSR) channel units
 - AUA41, AUA44, AUA54, and AUA141 4-wire VF special service channel units
 - AUA34B, AUA52B, and AUA152 dataport channel units.
- 5.45** All these channel units except dataport use only the odd-numbered channel of the channel slot. The AUA33, AUA37, AUA53 and AUA57 have a faceplate indicator that lights when the channel is busy.

C. Option Setting

5.46 The AUA57 (RT) FSR channel unit has an option switch to select the ringing group used by the central office; the BUSY light will flash if the switch is set improperly. The DCU has two options: one is a physical option switch (DSX equalization), and the other option (VF or DDS) is set electronically by provisioning. The E *SPOTS*, 4-wire special service, and dataport channel units also have options that are set by provisioning (see Part 3, System Description—Channel Unit Provisioning).

5.47 There are no options or settings to be selected on POTS, *SPOTS* and M *SPOTS* units, coin, multiparty, COT FSR (AUA37), or DID channel units. The RT POTS and *SPOTS* channel units and M *SPOTS* unit automatically select the type of operation based on the channel unit installed at the COT. For the POTS, *SPOTS* units (other than AUA159), multiparty, DID and coin channel units, transmission loss is fixed and signaling parameters are selected automatically by the channel unit. For the AUA158/159 ALC CUs, signaling and loss parameters are determined automatically.

D. Interfaces

Cable

5.48 The RT POTS and *SPOTS* channel units (AUA58B and AUA150) serve loaded and nonloaded cables as specified in AT&T 915-710-116, *Channel Unit Application and Prescription Setting*. The RT POTS units, *SPOTS* units, DID, and E *SPOTS* channel units are designed to interface cable that conforms to carrier serving area (CSA) guidelines. The M *SPOTS* units interface nonloaded cable within the distribution range specified in AT&T Practice 915-710-115G, *Feature Package G and I, Application Engineering*. The dual ringing repeater channel unit, multiparty, FSR, and 4-wire channel units, with two exceptions, are designed to serve loops beyond the CSA range. The two exceptions are the AUA52B/AUA152 dataport optioned for 56 kb/s data and the AUA54 E&M channel unit.

Equipment

5.49 The message channel units (POTS, coin, multiparty, and FSR), *SPOTS* channel units, and DID channel units at the COT normally interface with a switching machine. The E *SPOTS* channel unit at the COT normally interfaces transmission equipment or CSA cable on nonlocally switched circuits. The 4-wire special service channel units typically interface cable to a foreign central office or to other transmission equipment. At the RT, E *SPOTS* channel units usually interface the customer's equipment either directly or through CSA cable. The 4-wire channel units normally interface customer equipment through cable or directly with customer equipment at the RT location; in some cases, they may interface other transmission equipment. The AUA54 may interface with a PBX, ACD, or other transmission or signaling equipment located in the same building. The AUA54, when used in the J1C182AH-1 RT, requires that the E&M cable assembly (ED-7C700-20) be installed. See AT&T 915-710-115G, *Feature Package G and I, Application Engineering*, for guidelines on installation and AT&T 915-710-116, *Channel Unit Application and Prescription Setting*, for application information on the use of the ED-7C700-20 cable assembly.

E. Circuit Packs

5.50 The dual channel bank circuit packs come in three families of apparatus codes: AUA, AUB, and MC. The nominal dimensions are as follows. The AUA-coded circuit packs are 3.6 inches high. The AUA-coded channel units, TRU, LSU, PCU, and FCU circuit packs and CFU fuse units are 0.7 inches wide. The AUA-coded LIUs and the 505A adapter are 1.4 inches wide. The AUB-coded (AIU, ADU, ADU/ASU, CTU, ACTU, and FMU) and MC-coded (BCU) circuit packs are 7.5 inches high and 0.7 inches wide. All circuit boards are about 10 inches long. Figure 31 shows the faceplates of some typical circuit packs. Table D lists the *SLC* Series 5 circuit packs and the number of the data sheet practice for each unit. The data sheet includes a description of options and indicators and shows a functional block diagram of each unit; these details have been omitted from the unit descriptions in this practice.

5.51 The nominal dimensions of the power shelf plug-in units are as follows. The units are all 7.2 inches high. The width varies: the ED-7C613-30 LDU and the AUG2 RSU are 2.8 inches wide; the 336A1 rectifier and 337A1 battery charger are both 2.1 inches wide; the AUG1 PRU is 1.4 inches wide; the AUG11 BFU is 0.7 inches wide; and the 3C1 ringing generator is 3.5 inches wide. All units are about 10 inches long. Figure 31 shows the faceplate of three of the power shelf units.

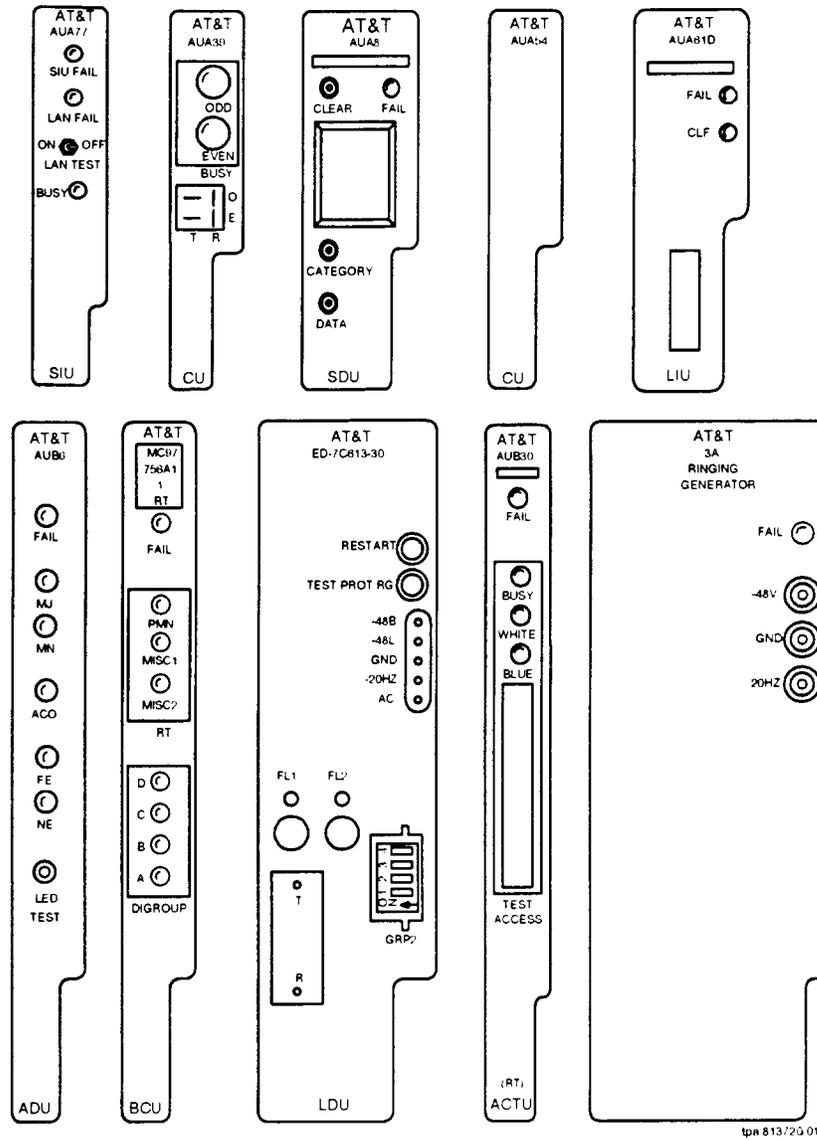


Figure 31. Typical Series 5 Circuit Pack Faceplates

6. Maintenance

T1 Line Maintenance

6.01 Fault-locating tests are used to help locate faulty repeaters or cable sections that can cause excessive errors or total signal failure. Active or passive fault-locating procedures may be used on *SLC Series 5 Carrier Systems*. These are standard T1 fault-locating procedures adapted specifically to the *SLC Series 5 Carrier System* (see AT&T 363-205-500G TOP). An order-wire pair and one or more fault-locate pairs may be provided as desired for the transmission facility. The pairs may be shared by many RTs over the same route. A fault-locate panel is available which may be used with active or passive fault-locate filters and for single- or double-ended fault-locating. The AUA78 fault-locate test adapter provides access to the digital line in *SLC Series 5 Carrier Systems* for fault-locate testing.

Common System Maintenance

6.02 The features listed below help prevent trouble and provide assistance when trouble is reported.

- Continuous monitoring of circuits serving a digroup (24 channels), double digroup (48 channels), or system (96 channels).
- Alarm displays at the COT and RT which indicate system status and common system failures down to the defective plug-in units.
- The COT and RT display the same alarm information when a failure is displayed.
- Floating contact closures for transmitting alarms via alarm telemetry systems to a remote alarm center.

- Floating contact closures for remote indication of specific digroups (customers) out of service.
- Routine testing of channel units using ACTU and error display on SDU.
- Optional Operations Interface for retrieving alarm information.
- Floating contact closures to remotely report miscellaneous RT conditions (alarm inputs at the RT must be -48 V or floating contact closure; grounded closures are not acceptable).
- Automatic isolation of failures to the COT, the digital facility, or the RT: manual loopback is not required.

6.03 Detailed maintenance procedures are provided in AT&T 363-205-500G (TOP). A trouble report from one customer usually indicates a channel unit problem or distribution facility problem. This problem can be diagnosed directly from the repair service bureau using the channel test feature. A central office alarm indicates a service outage (major alarm), a potential loss of service (minor alarm), or loss of AC power or rectifier failure at the RT (power minor). With FPI, associated alarm messages and syndromes are reported by the *GTD-5 EAX* to pinpoint equipment and/or transmission problems. Reported alarms, together with the status indicators, can be sent to a remote maintenance center over a telemetry system. By observing the alarms received, the remote maintenance center can sectionalize the trouble and dispatch directly to the trouble location. Most of the troubles in the system will be corrected by replacing defective circuit packs. Appropriate repair procedures should be used to repair the cable portion of the system.

A. Data Link

6.04 In FPG, the RT communicates with the COT over a data link channel that is transmitted with the digroup A signal using available bits in the MSF framing pattern. Thus, the COT is informed of any alarm conditions which occur at the RT. A service-affecting failure (major alarm) at the RT shows up at the COT as a major alarm at the far end. An AC power failure at the RT is displayed at the COT as a power minor (PMN) alarm at the far end. An alarm at the RT for conditions like an open door, excessively high temperature or humidity, gas leakage, etc. also occurs at the COT as a miscellaneous (MISC) alarm. The MISC alarm can be reported remotely as major or minor by setting a switch option on the RT ADU.

6.05 In FPI, the RT communicates with the *GTD-5* EAX over a data link carried by channel 1 of the A digroup of each system. The RT reports the following information:

- Major alarm
- Minor alarm
- Power/miscellaneous alarm
- Digroup alarm
- LIU failures
- Transmission failures (loss of DS1 framing/signal)
- TRU failures

B. 197A Battery Load Test Set

6.06 The 197A test set is used to test the IR30C batteries that provide reserve power at the RT. The 197A test set can test up to four battery packs at one time. The test will identify the battery packs that are defective and should be replaced. The batteries are tested at a high rate discharge of 18 amps constant current for 15 minutes. The 197A test set monitors the battery terminal voltage during discharge. The tested battery packs are considered OK if the monitored terminal voltage stays above a certain value for the entire 15-minute period. This test will detect a single-cell failure which could cause premature loss of a system on reserve power. AT&T 100-101-401 contains the description and operation of the 197A battery load test set.

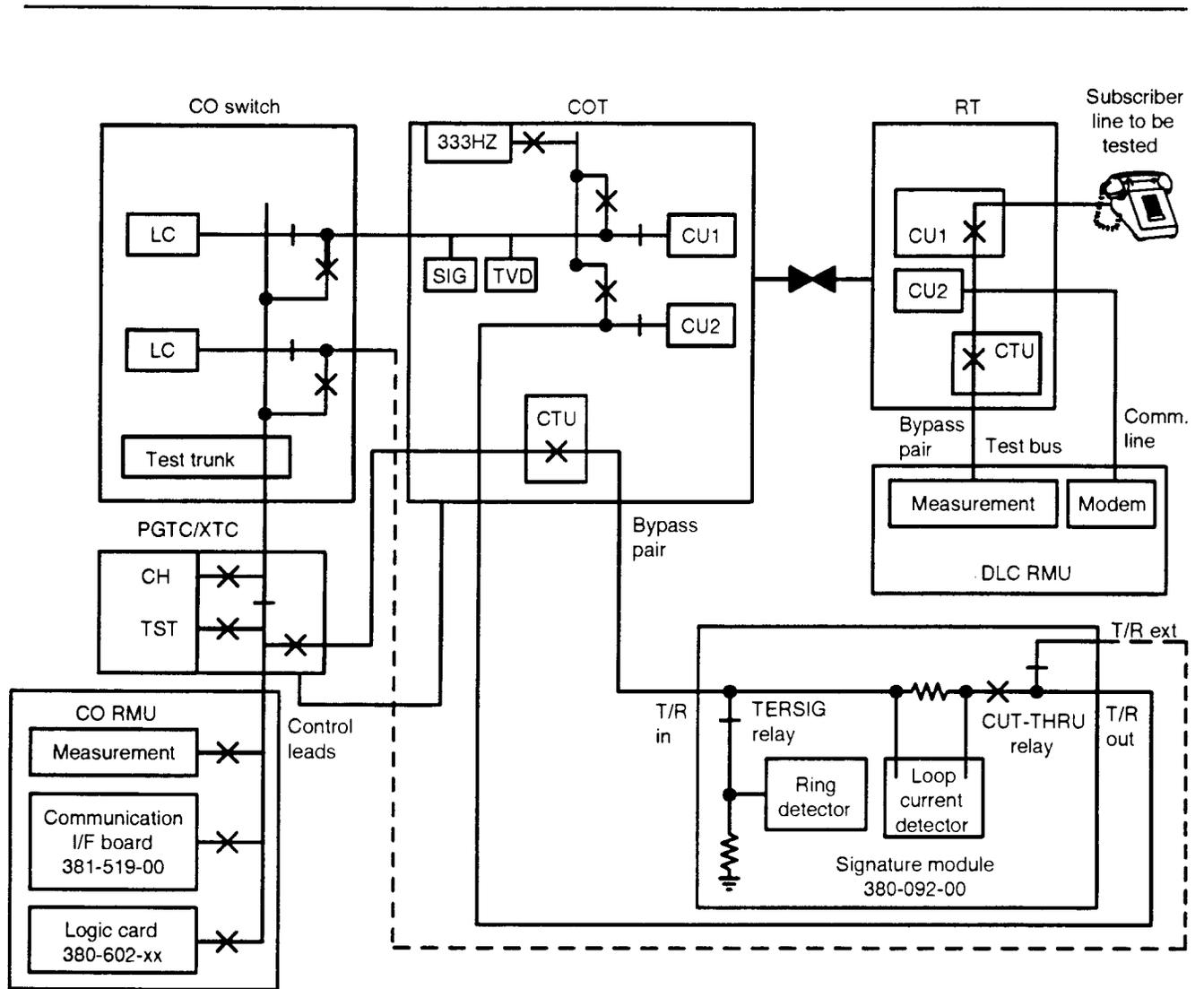
Circuit Testing for FPG

6.07 Three arrangements are available for FPG circuit testing. All are currently limited to single party (POTS), coin, multiparty, and locally switched special service circuits. Full functionality of multiparty channels is tested, but FSR channels are tested as single-party circuits. The dominant method tests both the RT/NIF metallic extension (loop) and the carrier channel including the COT and RT channel units, using the *4TEL* Computer-Controlled Diagnostic System and the PGTC; this testing is performed on a demand basis. A second method uses a line test translator (LTT) working with the *4TEL* Test System to test the loops on a routine basis. A third method is the use of the mechanized loop testing (MLT) system and the PGTC to test the loops and carrier channels on a demand basis. These methods are described as follows.

A. *4TEL* Diagnostic System/PGTC Test Method

6.08 The PGTC, the channel test units, and the channel unit allow test access to the channel and subscriber loop using the customer's telephone number. The PGTC switches office test trunks to a metallic test pair dedicated to the RT. The test pair may be shared by RTs at the same location. The PGTC can test up to four channels at the same time, as long as each channel is on a different system and each system uses a different test pair. At the RT, access to the VF subscriber loop is provided by relays in the ACTU and in the channel unit being tested. To make the PGTC compatible with the *SLC* Series 5 Carrier System, an SM88C control unit is used in place of the SM88B control unit. The PGTC description, operation, and maintenance are given in AT&T 363-202-300. PGTC testing is not supported by FPI.

6.09 The *4TEL* test system includes an *RMU* telephone line test measurement apparatus in the CO and at the RT location. The CO *RMU* test apparatus provides the service area computer (SAC) at the test center with a test presence at the CO, and the RT *RMU* test apparatus allows test access at the RT end. Figure 32 shows the arrangement. When commanded by the SAC, the CO *RMU* test apparatus seizes a no-test-trunk and addresses the circuit to be tested; the test trunk passes through the PGTC. When the CO channel unit responds to the *RMU* test apparatus' signal, the ACTU and CU at the RT connect a "bypass" test pair to the loop and the PGTC readies itself to test the channel. The CO *RMU* test apparatus is connected to the RT *RMU* test apparatus via a modem-operated data link, two dedicated carrier-derived circuits per RT location, and a "signature module" located in the CO. The RT bypass test pair connects the RT *RMU* test apparatus to all the RT ACTUs, and a COT bypass test pair connects the PGTC to all the COTs associated with that RT. The bypass pair does not physically link the COT and RT; rather, the RT *RMU* test apparatus is commanded, via the data link, to carry out the drop tests autonomously and report the results. While the RT *RMU* test apparatus is testing the loop, the PGTC is testing the carrier channel, in concert with the ACTU which places the required terminations on the CU drop side. When the *4TEL* diagnostic system is ready, it queries the PGTC for the results of the channel test. Chapter 2 of 4T-686-00, *4TEL™ RMU™ 220/225/230 to Universal SLC Series 5 Engineering Requirements*, Issue 1, describes the operation of this arrangement.



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Figure 32. Typical Testing Arrangement for the SLC Series 5 Carrier System FPG

Figure courtesy of Teradyne, Inc.

B. 4TEL Diagnostic System/LTT Test Method

6.10 The LTT and the line test fan-out unit (LTF) work in concert with a Model 270 or 275 *RMU* test apparatus at the RT to provide routine testing of FPG POTS and locally switched special service loops. In this arrangement the LTT interfaces the *RMU* test apparatus to the bank controller to allow the *RMU* test apparatus to be connected to a sequence of loops. The *RMU* test apparatus conducts the tests and stores the results for later transmittal to the SAC. The LTF allows the *RMU* test apparatus to interface up to eight LTTs at an RT location. The LTT interfaces the BC through the ACTU, using the CIU faceplate connector of the ACTU. Thus, routine testing with the LTT can be provided for a bank that also supports demand testing with the 4TEL Diagnostic System/PGTC method described above; since in the PGTC system, the RT *RMU* test apparatus accesses the ACTU using the bypass test pair.

C. MLT/PGTC Test Method

6.11 Where the telephone company uses the MLT test system or a local test desk instead of the 4TEL Diagnostic System, the arrangement is very similar to the 4TEL diagnostic system/PGTC method described above. The CO *RMU* test apparatus is replaced by the MLT CO equipment or the local test desk. The circuit to be tested is accessed in the same manner; but the loop is tested from the MLT equipment or test desk, using either a COT/RT metallic bypass pair or, if a bypass pair is not deployed, an AT&T remote measurement unit (RMU) at the RT.

6.12 Where a Test Desk is operating, using normal procedures (AT&T 662-505-507) a tester can verify central office wiring continuity and check for leakage up to the COT. To check channel operation and test the subscriber loop, the tester operates the **+ STA** (positive station) key, the **REV** (reverse) key, and the **G** (ground) key (only for coin service). After test setup has been confirmed by the test controller, the tester is connected to the test pair which bypasses the *SLC* system. The test desk is now connected to the subscriber loop and may proceed with normal test desk procedures. While these tests are in progress, the test controller automatically checks the channel electronics for transmission and signaling. When tests on the subscriber loop are completed, the tester operates the **3WO** key and **M** key to get the results of the automatic tests.

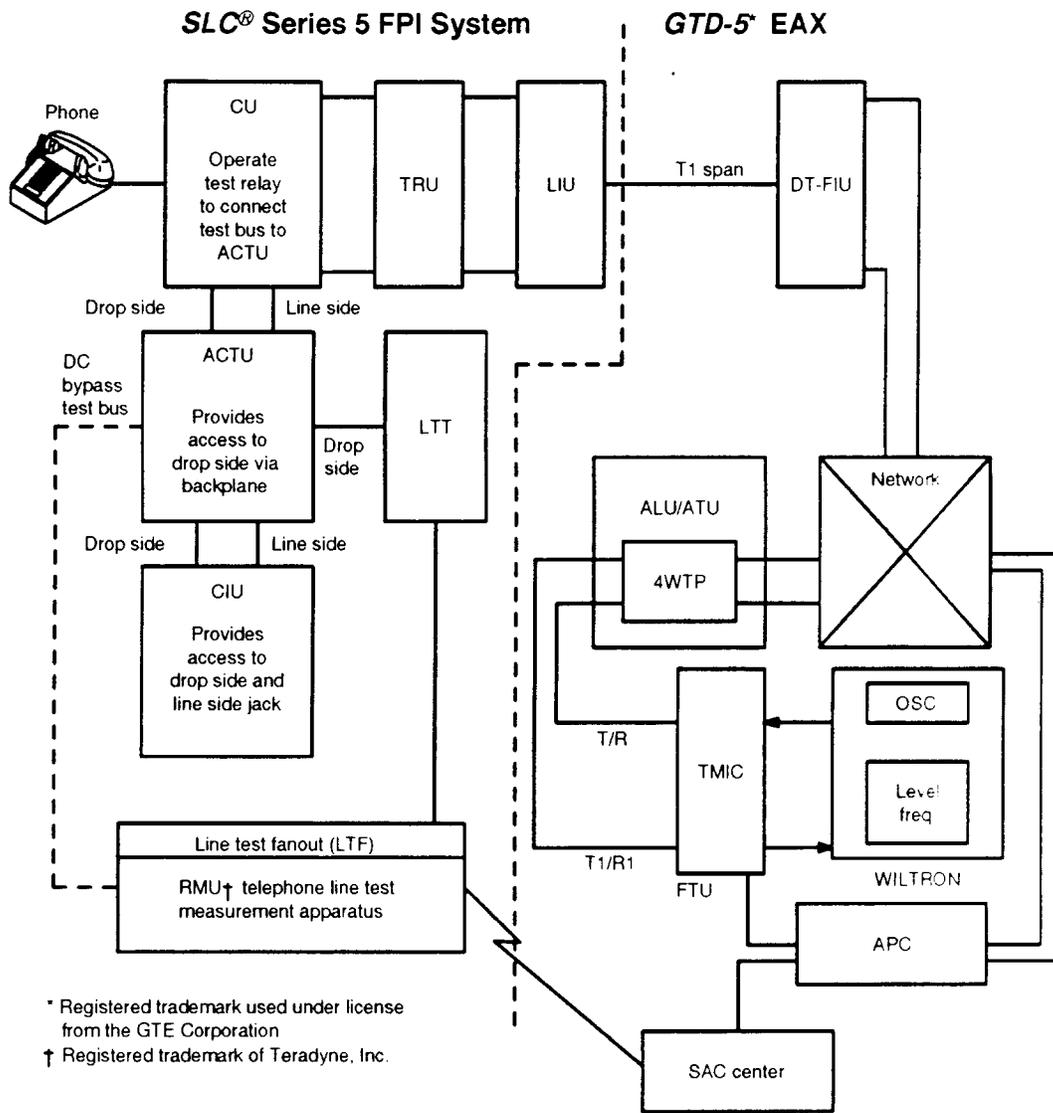
Circuit Testing for FPI

6.13 Feature Package I utilizes the testing capabilities of the *GTD-5* EAX facility test unit (FTU), the *SLC* Series 5 ACTU and LTT, and the *RMU* telephone line test measurement apparatus to accomplish demand and routine testing of FPI subscriber equipment. Figure 33 shows the components required to achieve the following testing capabilities as follows:

- (1) IN-testing—Feature Package I utilizes the ACCESS/DIAG tests and the facility test unit (FTU) of the *GTD-5* EAX to perform IN-testing of the FPI channel units. For transmission tests, a path is established and measurements are made by the FTU. Some of the tests require a termination to be applied at the RT by means of the ACTU. Signaling tests are also performed by maintenance software in the RT in conjunction with the ACTU. IN-testing is initiated at the I/O terminal or Remote Operation Center. The *GTD-5* EAX translates the command into appropriate FTU directives that direct the *SLC* Series 5 FPI RT to either connect the subscriber line through to the FTU for nonsplit tests or to activate the ACTU relay to connect a reflective termination for split transmission tests. Results of these tests are displayed at the *GTD-5* EAX I/O terminal initiating the test.
- (2) Transmission Loop Testing—To test the out pair loop to the subscriber, an external *RMU* test apparatus must be used. Nightly routine testing can be performed using an LTT connection to the *RMU* test apparatus. The Digital Test Unit (DTU-L, DTU-R) allows the routine testing to be executed without interrupting service to the subscriber. A SAC Center can retrieve data from nightly *RMU* test apparatus testing of the subscriber loop or test results can be retrieved directly from the site *RMU* test apparatus. Demand testing is accomplished through the SAC center, using the *GTD-5* EAX ACCESS commands. Demand testing prevents service to the subscriber being tested.

⇒ NOTE:

Nonsplit transmission tests may return incorrect results if LTT routing (by the optional Operations Interface) or ACTU type testing occurs on the same line at the same time. These tests should be scheduled so as not to coincide.



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Figure 33. Testing Arrangement for the SLC[®] Series 5 Carrier System FPI

RMU Telephone Line Test Measurement Apparatus

6.14 The *RMU* test apparatus is part of the *4TEL* Computer-Controlled Diagnostic System and is used to test loops served by *SLC* Carrier Systems operated by GTE. The *RMU* test apparatus does not require a bypass pair and can be used when a DC test pair is not available between the RT and the nearest loop test system (LTS). The *RMU* test apparatus mounts in the enclosure with the RT; consult *4TEL* Computer-Controlled Diagnostic System documentation for *RMU* test apparatus ordering and installation information.

6.15 Both test controllers (*RMU* test apparatus and LTS) can be used with *SLC* Series 5 Carrier Systems operating on T1 digital lines (metallic) or on lightguide cable. If the carrier facility is lightguide cable, access to subscriber loop at the RT must be provided separately, as there are no copper pairs in lightguide cable.

6.16 The tester dials a specific subscriber loop to be tested and connects the test controller to the line. The channel is then tested automatically by the PGTC while the subscriber loop is being tested by the maintenance center. The results of the channel tests are given as a sweep-frequency burst and DC voltages which are interpreted by the tester. The COT single-party (POTS) channel units are compatible with automatic line insulation tests.

J99404TA Craft Interface Unit (CIU)

6.17 The CIU is a special-purpose portable (22 pounds) computer used for provisioning and testing the special service channel units (except *SPOTS*, *DID*, *PLAR*, or dual ringing repeater channel units). It provides local test access to both sides (line and drop) of a channel unit for channel alignment testing. The CIU can be used at the COT to test the COT and RT channel units and for end-to-end testing to the customer location. With the CIU, testing can be done from the CO and the customer location; no dispatching to the RT is needed. The CIU keyboard is used to enter commands for provisioning and testing. The group of switches and jacks labeled TEST ACCESS located to the right of the keyboard controls the CIU test functions. A transmission test set or the equivalent may be connected to these jacks for channel unit and circuit testing. The SIGNALING CONTROL section is used to set and monitor the signaling states for testing. The CIU User Guide (Select Code 500-206) provided with the CIU details the use of the keyboard and display for various system operations and includes signaling state tables for provisionable channel units. The CIU is described in AT&T 363-205-101.

7. Specification Summary

7.01 The following specifications apply to the channel banks, channel units, digital lines, and buildings or cabinets used to house the *SLC* Series 5 RT equipment.

Channel Capacity

7.02 The *SLC* Series 5 Carrier System has a maximum capacity of 96 lines. Two systems (192 lines total) are packaged in a dual channel bank assembly at the COT and RT.

Service Features

7.03 The *SLC* Series 5 channel units provide the following service features.

A. Subscriber Dual Channel Units (POTS)

7.04 Uses AUA26, AUA31 or AUA38 channel unit at the COT and AUA25B, AUA27, AUA51, AUA58B, AUA59, AUA150, AUA158, or AUA159 at the RT to provide single-party service. Refer to Table D for data sheet numbers and to determine which units are FPG only.

B. 2-Wire Locally Switched Special Services

7.05 Uses AUA32 or AUA39 *SPOTS* channel unit at the COT and AUA25B, AUA59/AUA150, or AUA159 at the RT to provide the following:

- (1) PBX-CO trunk.
- (2) WATS line (to Class 5 CO).
- (3) WATS trunk (to Class 5 CO).
- (4) Off-premises extension line.
- (5) Secretarial line.

C. Coin Service

7.06 Uses AUA33 channel unit at the COT and AUA53 at the RT to provide the following:

- (1) Coin-first service.
- (2) Dial-tone-first service.

D. Multiparty Service

7.07 Uses AUA35 channel unit at the COT and AUA55 at the RT to provide (2-wire) 1- to 8-party service. A positive ringing unit is required for service on more than 2 parties.

E. Direct Inward Dial Trunks (FPG Only)

7.08 Uses the AUA36 DID or the AUA43 E *SPOTS* channel unit at the COT and the AUA56 DID or the AUA142 E *SPOTS* channel unit at the RT to provide 2-wire locally switched DID trunks. The E *SPOTS* pair can provide up to 5 dB of loss in each direction, but cannot be used if the switch interface is a battery and ground DID circuit.

F. Frequency-Selective Ringing

7.09 Uses the AUA37 channel unit at the COT and AUA57 at the RT to provide frequency-selective ringing for 1- to 5-party service.

G. 2-Wire Special Services

7.10 The AUA142 and AUA43 E *SPOTS* channel units are used for applications beyond the capability of POTS or *SPOTS* channel units for 2-wire nonlocally switched and nonswitched special services. The AUA142 and/or AUA43 channel unit at COT or RT provides the following:

- (1) Foreign exchange lines and trunks.
- (2) WATS lines and trunks.
- (3) Off-premises station (OPS) lines, PBX-end and station-end.
- (4) PBX-CO trunks with toll diversion.
- (5) Private line voice or data.
- (6) Direct inward dial (DID) service to a foreign CO through a tandem carrier.

H. Private Line Auto Ring (PLAR)

7.11 The AUA75 channel unit at the COT and RT provides 2-wire private line point-to-point automatic ringing service.

I. 4-Wire Voice Frequency Special Services

7.12 Uses AUA141 and/or AUA44 at COT or RT, and AUA54 at the RT at customer location to provide the following:

- (1) Foreign exchange and WATS lines and trunks.
- (2) PBX tie trunks.
- (3) Private line data or voice.
- (4) Two-wire locally switched special services (normally served by *SPOTS* channel units) or other special service circuits where the customer is outside the carrier serving area (CSA).

J. Dataphone[®] Data Communications Service [Digital Data System (DDS)]

7.13 Uses AUA34/AUA34B DS0 dataport or AUA52B/AUA152 OCU dataport at the COT and AUA52B/AUA152 OCU dataport at the RT.

Subscriber Voice-Frequency Distribution

A. POTS (Non-CSA)

7.14 Any combination of gauges that conforms with existing plant design guidelines is allowed. The maximum loop resistance depends on the channel unit and the application (see AT&T 915-710-115G, *Feature Package G and I, Application Engineering*). The loops should be gauged back to the serving central office. Maximum cable loss should not exceed 8.5 dB. The SLC Series 5 Carrier System is compatible with existing SLC 96 Carrier System rules as follows:

- (1) Loops longer than 12 kft beyond the RT must be loaded. When there are load coils beyond the proposed site of the RT, the recommended distance is 3 kft to the first load beyond the RT. However, this distance may be in the range of 1.5 to 7.5 kft. The recommended customer end section (including bridged tap) is 3 to 12 kft from the last load with a maximum of 6 kft of bridged tap.
- (2) The maximum nonloaded loop (including bridged tap) is 12 kft. The total length of the bridged tap should not exceed 6 kft.

B. POTS (CSA)

7.15 The SLC Series 5 POTS channel units are compatible with loops that meet carrier serving area (CSA) design guidelines. The following is a summary of CSA design rules:

- (1) Only nonloaded loops are allowed.
- (2) No more than two gauges of cable.
- (3) For existing 26 gauge cable, the maximum loop length including bridged tap is 9 kft.
- (4) If all cable is larger than 26 gauge, the maximum loop length including bridged tap is 12 kft.
- (5) Any single bridged tap is limited to 2.0 kft maximum length.
- (6) The total length of all bridged taps is limited to 2.5 kft maximum length.

The AUA25B M SPOTS units have a range of 300 ohms and thus will not serve CSA loops. For more information on loop design limits for M SPOTS units, refer to AT&T 915-710-115G, *Feature Package G and I, Application Engineering*.

C. 2-Wire Locally Switched Special Services

7.16 When used in a CSA, the POTS/*SPOTS* channel units (except M *SPOTS* units) meet the service performance objectives for the 2-wire locally switched special services listed in Part 7, Specification Summary—Service Features.

D. Automatic Loss Compensation (ALC)

7.17 The AUA158 and AUA159 channel units are equipped with automatic loss compensation (ALC) which adds loss when connected to shorter loops. This feature reduces the loss contrast between loops served with these channel units and loops served with other facilities. Refer to Part 4, Functional Description—Channel Unit Operation, in this document for additional information.

E. Direct Inward Dial Trunks (FPG Only)

7.18 When used in a CSA, the DID channel units meet the service performance objectives for DID trunks as listed in Part 7, Specification Summary—Service Features.

F. Private Line Manual Ringdown

7.19 Any combination of gauges that conforms with existing plant design guidelines is allowed. The dual ringing repeater channel unit is not limited to CSA range. See AT&T 915-710-116, *Channel Unit Application and Prescription Setting*, for design considerations for special service circuits.

G. Private Line Auto Ring

7.20 Any combination of gauges that conforms with existing plant design guidelines is allowed. The dual ringing repeater channel unit is not limited to CSA range. See customer information release (CIR) AT&T 363-099-1071R, for design considerations for special service circuits.

H. Extended 2-Wire Special Services

7.21 The AUA142 and AUA43 E *SPOTS* channel units provide 2-wire special services requiring extended transmission and/or signaling features. When used in a CSA, these channel units meet the service performance objectives for the 2-wire special services listed in Part 7, Specification Summary—Service Features.

I. 4-Wire VF Special Services

7.22 The AUA41/AUA141 and AUA44 channel units meet transmission objectives for 4-wire VF special services listed in Part 7, Specification Summary—Service Features, over nonloaded cable up to 9 dB and loaded cable up to 15 dB. Signaling objectives are met with up to 2800 ohms for loop- or ground-start circuits and up to 5000 ohms for duplex (DX) signaling. The AUA54 channel unit meets FCC Part 68 requirements for tie trunk interface at a customer location.

J. Data Services Using DDS

7.23 The AUA34/AUA34B and AUA52B/AUA152 dataport channel units meet DDS performance objectives for loops within a CSA and for other loops meeting DDS criteria, which are published in documents such as AT&T Technical Reference (PUB) 62310.

Terminal-to-Terminal Voice-Frequency Transmission

7.24 These specifications are given in Table H (POTS/*SPOTS* channel units), Table I (coin channel units), and Table J (multiparty and FSR channel units). Specifications for the M *SPOTS* channel unit (AUA25B) are given in data sheet AT&T 363-005-124. Table K lists the specifications for the dual private line auto ring channel unit and Table L lists the specifications for 2- and 4-wire special services. Table M gives the range of 1-kHz gain for the 4-wire channel units.

Table H. Transmission Specifications for POTS and Fixed Loss SPOTS[®] Channel Units

Parameter (Note)	Condition	Value
Loop resistance (beyond the RT, excluding the set)	AUA25B / AUA27* / AUA58 AUA59 / AUA150	0-900 ohms 0-1500 ohms
Loop current	AUA25B / AUA27 / AUA58 (0-900 ohms) AUA59 / AUA150 (CSA) (0-1500 ohms)	20 mA to 35 mA 25 mA to 35 mA 23 mA to 35 mA
1000 Hz loss† (±0.5 dB typical, ±1.0 dB max)	AUA59 / AUA150 AUA27 / AUA58 AUA25B	0 dB 1 dB 2 dB
Frequency response (loss relative to 1004 Hz)	400 Hz to 3000 Hz 3200 Hz 300 Hz and 3400 Hz	-0.5 dB to +1 dB -0.5 dB to +1.5 dB 0 dB to +3 dB
60 Hz rejection	> 20 dB	
Gain tracking‡	-37 dBm0 to +3 dBm0 -50 dBm0 to -37 dBm0	±0.5 dB maximum (± 0.25 dB average) ±1.0 dB maximum (± 0.5 dB average)
Return loss at the COT§	AUA27 / AUA58 / AUA59 / AUA150 (terminated by 900 ohms +2 µF)	ERL ≥ 18 dB SRL ≥ 12 dB
Return loss at the RT¶	900 ohms +2 µF reference Z, testing into AUA27 / AUA58 / AUA59 / AUA150	ERL ≥ 18 dB SRL ≥ 12 dB
Idle channel noise (at the COT and RT)	20 dBmC maximum	
Single frequency distortion	0 - 12 kHz, 0 dBm0 1004 - 1020 kHz, 0 dBm0	< -28 dBm0 < -40 dBm0
Intermodulation distortion (4-tone method, -13 dBm0 input)	A-B (R2) product 2A-B (R3) product	> 43 dB > 44 dB
Overload at COT and RT	≥ +3 dBm0	
Data pulse distortion (PAR)	> 90	
Impulse noise**	≤ 15 counts in 15 minutes	
Minimum longitudinal balance at the COT and RT††	200 Hz, 500 Hz, 1000 Hz 3000 Hz	≥ 58 dB ≥ 53 dB
Cross talk (0 dBm0 input, 200 Hz to 3400 Hz)	≤ -65 dBm0	
On-hook loss, 1004 Hz	< 5 dB over 1004 Hz off-hook loss	

Continued on next page

Table H. Transmission Specifications for POTS and Fixed Loss SPOTS[®] Channel Units (Contd)

Note: Measured at 25 C.

- * With derived alarm channel.
 - † Measured as the ICL with the RT terminated in 600 ohms for AUA25B, 900 ohms otherwise, and with the COT terminated in 900 ohms.
 - ‡ At 1004 Hz, relative to 0 dBm0.
 - § Measured with respect to 900 ohms and 2.16 μ F with the RT end terminated as listed.
 - ¶ Measured with respect to the listed impedance with the 4-wire path broken or with the COT end terminated in 900 ohms and 2.16 μ F.
 - ** Measured at a threshold of 47 dBmC0.
 - †† Measured by IEEE Method 455-1976.
-

Table I. Transmission Specifications for Coin Channel Units

<u>Parameter (Note)</u>	<u>Value</u>
Loop resistance (beyond the RT, excluding the set)	0-1500 ohms
Loop current	> 23 mA
1000-Hz loss (± 0.5 dB typical, ± 1.0 dB max)	0 dB*
Bandwidth (relative to the 1000-Hz loss)	0 to -1.5 dB at 400 Hz and 2800 Hz 0 to -3.0 dB at 300 Hz and 3000 Hz
Return loss at the COT†	ERL \geq 18 dB SRL \geq 12 dB
Return loss at the RT‡	ERL \geq 18 dB SRL \geq 15 dB
Idle channel noise (at the RT)	20 dB _{BrnC} maximum
Signal-to-distortion ratio (at -10 dBm)	>33 dB
Data pulse distortion (PAR)	> 90
Gain tracking (1004 Hz)	
-37 dBm ₀ to +3 dBm ₀	± 0.5 dB maximum (± 0.25 dB average)
-50 dBm ₀ to -37 dBm ₀	± 1.0 dB maximum (± 0.5 dB average)
Intermodulation distortion (-13 dBm ₀ input)	A-B (R2) Product: > 43 dB 2A-B (R3) Product: > 44 dB
Single frequency distortion (0-12 kHz 0 dBm ₀)	< -28 dBm ₀
Impulse noise§	\leq 15 counts in 15 minutes
Overload at COT and RT	\geq +3 dBm ₀
Minimum longitudinal Balance at the RT¶	200 Hz, 500 Hz, 1000 Hz (\geq 58 dB), 3000 Hz (\geq 53 dB)

Continued on next page

Table I. Transmission Specifications for Coin Channel Units (Contd)

Note: Measured at 25 C.

* Measured as the ICL with the RT terminal in 600 ohms and with COT terminated in 900 ohms.

† Measured with respect to 900 ohms and 2.16 μ F with the 4-wire path broken or with the other end terminated in 1100 ohms in parallel with 0.03 μ F.

‡ Measured with respect to 600 ohms and 2.16 μ F with the 4-wire path broken or with the other end terminated in 900 ohms and 2.16 μ F.

§ Measured with a holding tone of -13 dBm0 at a threshold of 59 dBmC0.

¶ Measured by IEEE Method 455-1976.

Table J. Transmission Specifications for FSR and Multiparty Channel Units

Parameter (Note)	Condition	Value
Loop resistance (beyond the RT, excluding the set)	FSR Multiparty	0-900 ohms 0-1500 ohms
1004 Hz on-hook loss	FSR Multiparty	On-hook transmission not supported ≤ 5 dB over 1004 Hz off-hook loss
Loop current	FSR Multiparty	≥ 22 mA* > 25 mA
1000 Hz loss (± 0.5 dB typical, ± 1.0 dB maximum)	1 dB	
Bandwidth (loss relative to 1004 Hz loss)†	-0.5 to +1.0 dB at 400 Hz and 2800 Hz	
60 Hz rejection	FSR multiparty	> 20 dB > 25 dB
Return loss at the COT‡	ERL ≥ 18 SRL ≥ 10	
Return loss at the RT§	ERL ≥ 18 SRL ≥ 10	
Idle channel noise (at the RT)	20 dBmC maximum	
Signal to distortion ratio (input signal level)	0 to -30 dBm0 -30 to -40 dBm0 -40 to -45 dBm0	≥ 33 dB ≥ 27 dB ≥ 22 dB
Data pulse distortion (PAR)	> 90	
Gain tracking (At 1004 Hz relative to 0 dBm0)	-37 dBm0 to +3 dBm0 -50 dBm0 to -37 dBm0	± 0.5 dB maximum (± 0.25 dB average) ± 1.0 dB maximum (± 0.5 dB average)
Intermodulation distortion (4-tone method, -13 dBm0 input)	A-B (R2) Product 2A-B (R3) Product	> 43 dB > 44 dB
Impulse noise*	≤ 15 counts in 15 minutes	
Overload at COT and RT	$\geq +3$ dBm0	
Minimum longitudinal balance at the COT and RT**	200 Hz, 500 Hz, 1000 Hz 3000 Hz	≥ 58 dB ≥ 53 dB

Continued on next page

Table J. Transmission Specifications for FSR and Multiparty Channel Units (Contd)

Note: Measured at 25°C.

* Delivered over 900 ohm loop to off-hook telset, with up to eight on-hook telsets bridged across the channel unit.

† Measured with a signal level of 0 dBm0. "+" means more loss, "-" means less loss.

‡ Measured with respect to 900 ohms in series with 2.16 μ F and with 900 ohms in series with 2.16 μ F in parallel with a hold coil at the RT.

§ Measured with respect to 900 ohms in series with 2.16 μ F with a hold coil at the RT and with -48 volt battery feed terminated with 900 ohms in series with 2.16 μ F at the COT.

¶ Measured at a threshold of 53 dBmC0.

** Measured by IEEE Method 455-1976.

Table K. Transmission Specifications for AUA75 Dual Private Line Auto Ring Channel Unit

Parameter (Note)	Value
Loop design	The unit is not limited to CSA design rules. Maximum cable loss should not exceed 9 dB, split in any proportion between the two end cable links. Total combined loop resistance (not including the terminating equipment) should not exceed 1500 ohms. Neither loop should exceed 1300 ohms.
Structural impedance	900 ohms + 2.16 μ F
Balance impedance	900 ohms + 2.16 μ F
1000 Hz loss* (± 0.5 dB typical, ± 1.0 dB max)	0 dB or 3 dB (switch selectable)
Bandwidth (relative to the 1000 Hz loss)	+1 to -0.5 dB at 400 Hz and 2800 Hz
Return loss† end-to-end	ERL \geq 23 dB SRL \geq 17 dB
Idle channel noise‡	≤ 20 dBmC maximum
Signal-to-distortion ratio (at -10 dBm0)	> 33 dB
Data pulse distortion (PAR) at -13 dBm	> 90
Gain tracking (1004 Hz)	± 0.5 dB maximum (-37 dBm0 to +3 dBm0) ± 1.0 dB maximum (-50 dBm0 to -37 dBm0)
Intermodulation distortion (-13 dBm0 input)	> 43 dB [A-B (R2) product] > 44 dB [2A-B (R3) product]
Single frequency distortion (0-12 kHz, 0 dbm0)	< -28 dBm0
Impulse noise at 47 dBmC0	≤ 15 counts in 15 minutes
Overload at COT and RT	≤ 0.5 dB compression at +3 dBm0
Longitudinal balance§	≥ 58 dB (200 Hz, 500 Hz, 1000 Hz) ≥ 53 dB (3000 Hz)
Equal-level cross talk	better than -65 dB (200 Hz to 3400 Hz)
Ringling delay	≤ 200 ms
Ring trip delay	≤ 200 ms for Rdc ≤ 1800 ohms
Ring trip immunity	8 μ F in parallel with 10k ohms at T/R
Ringling range at COT¶	40 Vrms across 3 REN
Ringling range at RT¶	40 Vrms across 4 REN
Ringling cycle	2 seconds on (100 msec) 4 seconds off (100 msec)
Audible ringling	440 Hz plus 480 Hz (1.6%)
Audible ringling level	-47 to -16 dBm0 (with no more than 5 dB between components)

Continued on next page

Table K. Transmission Specifications for AUA75 Dual Private Line Auto Ring Channel Unit (Contd)

Note: Measured at 25°C.

* Measured as insertion loss between 900 ohms terminations.

† Measured with respect to 900 ohms + 2.16 μ F with the opposite end terminated in 900 ohms + 2.16 μ F.

‡ Measured with 900 ohms terminations on both ends.

§ Measured by IEEE Method 455-1976.

¶ COT Ringing 86 Vrms and 1300 ohms of cable.
RT Ringing 100 Vrms and 1300 ohms of cable.

Table L. Transmission Specifications for VF Channel Units with Adjustable Settings

Parameter	2-Wire E SPOTS [®] Channel Units (AUA142, AUA43)	4-Wire Channel Units (AUA141, AUA44, AUA54) (Note)
Loop resistance (beyond RT, excluding telset)	CSA loops	0-2800 ohms (loop-start, ground-start, transmission only)* 0-5000 ohms (duplex)
Gain range (granularity)		
Metallic interface to digital line	-1.0 dB to 6.75 dB granularity = 0.25 dB	Range depends on function code
Digital Line to metallic interface	-8.0 dB to 1.5 dB granularity = 0.25 dB	Granularity = 0.1 dB
Gain tracking		
Input -37 to +3 dBm	±0.25 dB	±0.25 dB
Input -50 to -37 dBm	±0.5 dB	±0.5 dB
Equalization	(Slope type) Equalized CSA cable rolloff at 0.4 kHz varies from 0.0 dB to 1.1 dB; at 2.8 kHz, rolloff varies from 0.3 dB to 1.75 dB	Post-equalization of cable less than 15 dB (H88) or 18 kft (NL) is comparable to D4 4FXS CU (J98726SB). Pre-equalization and post-equalization available by emulating 150-ohm mismatch
Structural impedance	600 ohms + 2.16 μF or 875 ohms + 2.16 μF	600 ohms or 1200 ohms
ERL/SRL (2-wire return loss with 4-wire path broken)	28/20 dB	
RL (any frequency)		23 dB
RL (1 kHz)		28 dB
Balance capability, CSA loops	ERL better than 12 dB at digital line interface of channel unit facing loop	

Note: For AUA54, and for AUA44 in tandem applications, the ED7C700-20 E&M harness must be added to each digroup affected.

* Range based on commercial power. On battery power, range may be reduced.

Continued on next page

Table L. Transmission Specifications for VF Channel Units with Adjustable Settings (Contd)

Parameter	2-Wire E SPOTS Channel Units (AUA142, AUA43)		4-Wire Channel Units (AUA141, AUA44, AUA54)
Longitudinal balance (IEEE method)	AUA42/AUA142	AUA43	
200 Hz	63 dB	58 dB	67 dB
500 Hz	63 dB	58 dB	67 dB
1000 Hz	63 dB	58 dB	67 dB
3000 Hz	58 dB	58 dB	62 dB
Equal-level cross talk, C-message weighted between 0.2 and 3.4 kHz	-65 dB		-65 dB (channel unit and interunit cross talk)
Idle-channel noise	23 dB _{rnc0} for AUA42 (AUA142) / AUA43 pair		20 dB _{rnc0} per channel unit, each direction
Impulse noise at 59 dB _{rnc0}	≤ 15 counts in 15 minutes		≤ 15 counts in 15 minutes
Signal-to-distortion ratio (at -10 dBm)	> 33 dB		> 33 dB
Single-frequency distortion (0-12 kHz 0 dBm0)	< -28 dBm0 per AUA42 (AUA142) / AUA43 pair		< -28 dBm0 per channel unit
Intermodulation distortion (-13 dBm0 input) (IM products)	A-B (R2) < -43 dB 2A-B (R3) < -44 dB		R2 < -49 dB R3 < -51 dB
Pulse distortion (P/AR)	≥ 90		≥ 94

Table M. 1 Khz Gain Range 4-Wire VF Channel Units

<u>Apparatus Code</u>	<u>Function Code</u>	<u>Transmit Gain, dB (Note)</u>	<u>Receive Gain, dB (Note)</u>
AUA141	DX	-1.5 to 15.0*	-10.5 to 6.0
	FXS_, FXT_	-1.5 to 15.0*	-10.5 to 6.0
	ETO4	-8.5 to 15.0*	-9.5 to 7.0
	TO4	-7.5 to 16.0*	-16.5 to 7.0
AUA44	FXO, FXP	-1.5 to 15.0*	-10.5 to 6.0
	TD_	2.1 to 3.6†	-2.1
AUA54	EM4_	-8.0 to 17.5	-17.0 to 8.5
	PLR_	-8.0 to 17.5	-17.0 to 8.5

Note: Transmit — from metallic interface to digital line;
Receive — from digital line to metallic interface.

* These gain limits are for zero equalization. Where the circuit design calls for equalization, the limits are increased by the amount of 1 kHz Equalizer Gain (dB) specified in AT&T Practice 915-710-116 for that circuit design. The cross talk limit for outside plant cable, where the signal comes off the cable, allows a TLP no lower than -9 dB; this restricts the useful gain of these function codes to 9.0 dB in the transmit direction (to maintain the digital line TLP at 0.0 dB).

† For tandem function codes, the AUA44 can actually be provisioned for transmit gains ranging from -8.0 to +3.6 dB; the range shown in the table represents the intended application.

A. Calling Party Identification (CPI)

7.25 The CPI (with AUA142 and AUA43 E SPOTS channel units) provides information about the caller to the called party before the called party answers. During this silent interval after the first alerting 2-second ringing phase, "data is sent from the CO to the customer premises equipment (CPE) at 300 b/s with the transmission level of -13.5 ± 1 dBm at 2200 Hz into a 900 ohm load, and signal levels at the network interface are in the range of -12.5 to -49 dBm at 2200 Hz" (Ref. Bellcore Technical Reference, *Voiceband Signaling for Delivery of Network Data on Local Exchange Lines*, TR-820-23125-84-01 Issue 1, April 1984). The transmission path to the CPE is established within 15 ms following the completion of the first alerting signal, and is then disabled after 5 ± 0.5 seconds or when the next ringing is applied. In the other transmission direction, the AUA42/AUA142 and AUA43 channel units provide higher loss than POTS units during this CPI period. With a signal input of -13.5 dBm at 2200 Hz to the 2-wire channel (900 ohms structural impedance for the AUA42/AUA142 and 600 ohms structural impedance for the AUA43), the level across a 600 ohm load with no DC hold on the T/R of the AUA43 channel unit is around -23 dBm (assuming that the AUA142 has 0 dB gain provisioned).

B. On-Hook Transmission (OHT)

7.26 The AUA25B, AUA35, AUA38, AUA39, AUA55, AUA58B, AUA59, AUA150, AUA158, and AUA159 channel units provide on-hook transmission. An AUA58B/AUA38 channel unit pair exhibits about 5 dB insertion loss in each direction; the loss for an AUA59 (AUA159)/AUA38 channel unit pair is about 4 dB. The insertion loss for the AUA35/AUA55 channel unit pair is about 5 dB in each direction. In the on-hook condition with OHT selected, the AUA142 and AUA43 E SPOTS channel units provide approximately 9.2 dB loss in the receive direction and 4.4 dB loss in the transmit direction (with the AUA142 matched into 900 ohms and the AUA43 matched into 600 ohms). These conditions provide adequate gain for expected applications and ensure sufficient margin against singing. On-hook transmission is provided by the AUA38 and AUA39 channel units with the AUA58B, AUA150, AUA158, or AUA159 channel unit to allow CPI. The AUA25B and AUA59 provide OHT and allow CPI when paired with the AUA38.

Digital Data Performance

7.27 The AUA34B digital signal zero (DS0) dataport and AUA52B/AUA152 office channel unit (OCU) dataport, normally used in pairs with the DS0 dataport at the COT and OCU at the RT, provide end links in DDS. These end links have the following features:

- (1) One 4-wire circuit per plug-in pair.
- (2) Data Rate:
2.4, 4.8, 9.6, and 56 kb/s
[AUA34B and AUA52B only also provide 19.2 kb/s and 64 kb/s clear channel capability (FPI does not support 64 kb/s clear channel capability)].
- (3) Error Correction:
The *SLC* Series 5 digital line bit error rate is improved from 10^{-3} to 10^{-8} or better, for any data rate, without reducing the channel capacity of the bank.
- (4) Zero Code Allowed Option:
Allows an all-zero byte to be transmitted toward the digital line (which must be optioned for B8ZS zero code suppression). This option is not supported by FPI.
- (5) Secondary Channel:
An option which permits a new feature of DDS that provides the customer with a low speed telemetry channel supplementing the primary data channel at any data rate (see AT&T RL83-01-163). This option is not supported by FPI.

Ringling and Signaling Features

A. Signaling Modes

- (1) Loop-start signaling (AUA31, AUA35, AUA37, AUA38B, AUA55, AUA57, and AUA58B).
- (2) Loop- or ground-start signaling, selected automatically by the channel unit (AUA25B, AUA32, AUA33, AUA39B, AUA51, AUA53, AUA59, AUA150, and AUA159).
- (3) Loop-reverse battery signaling (AUA36 and AUA56).
- (4) Loop-start, ground-start, loop-reverse battery (loop pulsing only) or no signaling (transmission only), selected during provisioning (AUA42/AUA142 and AUA43).
- (5) Loop-start, ground-start, duplex, or no signaling (transmission only), selected during provisioning (AUA41/AUA141).
- (6) Loop-start, ground-start, or tandem signaling, selected during provisioning (AUA44).
- (7) E&M signaling, selected during provisioning (AUA54).

B. Ringling Generator Capacity

7.28 The 3B1 or 3C1 ringling generator can ring up to 50 telephones: 10 lines with 5 ringers each. This is limited to a maximum of 7 lines ringling at the same time on one 48-channel shelf.

C. Subscriber to Central Office Signaling (POTS, SPOTS® Channel Units, Coin, Multiparty, FSR)

7.29 Compatible with central offices having a signaling and supervision range of 1150 ohms or more (loop resistance limit including the station set). The coin channel unit displays no more than 1250 ohms facing a switching system line circuit with equivalent DC voltage of -42.5 or greater through 2 kft of 24-gauge central office wiring.

- (1) Dial pulse distortion less than the distortion on the limiting physical loop range of the central office.
- (2) Fully compatible with dial pulse and touch-tone dialing.

D. Subscriber to Central Office Signaling (2-Wire Special Services)

7.30 Compatible with central offices having a signaling and supervision range of 600 ohms or more (loop resistance limit including the station set).

- (1) Dial pulse distortion is less than the distortion on the limiting physical loop range of the central office.
- (2) Fully compatible with dial pulse and touch-tone dialing.

E. Subscriber to Central Office Signaling (4-Wire VF)

7.31 Dial pulse distortion: In the DX mode, for loops up to 5000 ohms, the AUA41/AUA141 produces dial pulses on the digital line with percent break between 58 and 62 percent break. In the FXS mode, the signaling range is generally consistent with 15 dB of cable loss.

F. Central Office to Subscriber (POTS, SPOTS® Channel Units, Coin)

7.32 Fully compatible with AC-DC (negative superimposed) ringing.

- (1) Ringing load per main station (subscriber channel) is found in Table N
- (2) Ring trip delay less than or equal to 200 msec.

Table N. Ringing Load per Main Station

<u>Ringer Type (Note)</u>	<u>Allowed Number</u>
Capacitor	5
Ringer equivalence number (REN) - from 0 to 1100 ohms	5
603A ringing extender	5
28A ringing isolator	5
11-type extender	5
D180036 ringer isolator	5
Tube set	3
REN from 1100 to 1500 ohms	4

Note: All ringers in the weak notch.

G. Central Office to Subscriber (Multiparty Channel Units)

- 7.33** Fully compatible with positive and negative superimposed ringing.
- (1) Ringing load: 5 REN up to 1500 ohms.
 - (2) Ring trip delay less than or equal to 200 msec.

H. Central Office to Subscriber (FSR Channel Units)

- 7.34** Fully compatible with negative superimposed ringing.
- (1) Ringing load
 - 10 ringers per line up to 900 ohms, with up to 4 ringers per station (this applies to all but the worst-case combination of frequency and ringer design).
 - (2) Ringing capacity
 - 100 ringers per shelf (24 channel units). If CO ringing supplies are phased, capacity is 240 ringers per shelf.
 - (3) Ring trip delay less than or equal to 300 msec.

I. Central Office to Subscriber (2-Wire Special Service, 4-Wire VF)

- 7.35** Fully compatible with AC-DC ringing.
- (1) Ringing load is found in Table O.
 - (2) Ring trip delay less than or equal to 200 msec.

Table O. Ringing Load

<u>Channel Unit</u>	<u>Load</u>	<u>Cable Range</u>
AUA43 at RT	5 REN	CSA
	5 REN	up to 550 ohms
AUA43 at COT	4 REN	up to 1000 ohms
	3 REN	up to 1500 ohms
AUA41/AUA141 at RT (4-wire VF)	4 REN	up to 2800 ohms

Supervision Features

7.36 The channel unit is able to monitor and detect station conditions and meet central office requirements using the following features:

- (1) For POTS channel units and the AUA39B/AUA59 (AUA159) channel units, with the station set on-hook, the central office will see a DC resistance greater than 5 megohms during automatic line insulation tests (ALIT) tests. The AUA32/AUA51 channel units will not pass the ALIT test [during foreign potential (FEMF) test, the central office should measure approximately 1.0 mA direct current].

- (2) Origination delay:

Call origination will be repeated at the central office within 100 msec.

- (3) Supplemental dial tone delay less than 100 msec.

- (4) Ring tripping during either the ringing or the silent interval.

- (5) Transmission delay:

Channel gain will be within ± 1 dB of the final value in both directions within 100 msec of off-hook.

- (6) Termination delay:

Station on-hook will be repeated at the central office within 100 msec.

- (7) Fully compatible with central office continuity and ground tests.

7.37 Supervision features for the AUA42/AUA142 and AUA43 E SPOTS channel units and 4-wire VF channel units are listed below.

- (1) Call origination/termination delay:

- (a) The time from loop closure/loop open to corresponding change in digital signaling state is less than 50 msec for AUA43 and less than 150 msec for AUA41/AUA141.

- (b) The time from change in digital signaling state to loop closure/loop open is less than 20 msec for AUA42/AUA142 and AUA44.

- (2) Transmission delay: Channel gain will be within ± 1 dB of the final value in both directions within 100 msec of off-hook.

A. Forward Disconnect (POTS)

7.38 With a POTS channel unit (that is, AUA31 or AUA38) installed in the COT, the AUA25B, AUA51, AUA58B/AUA158, or AUA59/AUA159 channel unit in the RT provides a fast forward disconnect to force release of the hold relay of a key telephone or data set by interrupting the loop current. The disconnect is considered fast because the CO battery removal only lasts about 50 msec before the RT channel unit interrupts the loop current.

B. Forward Disconnect (SPOTS[®] and E SPOTS Channel Units, 4-Wire VF)

7.39 Current feed channel units (that is, AUA25B, AUA41/AUA141, AUA43, AUA59, and AUA150) provide open switching interval (OSI) protection to prevent unwanted disconnects if the CO switch removes battery momentarily. Therefore, the duration of the actual disconnect signal received by the COT channel unit must be at least as long as the maximum possible OSI, which has been defined to be less than 350 msec. These channel units will provide a forward disconnect for disconnect signals longer than 500 msec and, having done so, will maintain the disconnect for at least 500 msec. For the RT *SPOTS* channel units, forward disconnect is not OSI type unless a *SPOTS* channel unit (AUA32 or AUA39) is installed in the COT. Forward disconnect is disabled for the AUA43 when on-hook transmission is provisioned. The AUA159 channel unit does not provide OSI protection regardless of whether the COT channel unit is POTS or *SPOTS*.

Specifications for DS1 Digital Facilities

7.40 The transmission facility between the Series 5 terminals and the maintenance pairs required for maintaining the digital line must meet these specifications.

A. DS1 Interface

7.41 The Series 5 system uses line interface units (LIUs) to do the following:

- (1) Connect to a DSX-1 cross-connect. The AUA61D LIU for FPG and AUA161 and AUA162 LIUs for FPI are used for this application. The DS1 LIU meets all requirements in the digital cross-connect specification. The LIU has equalizer switches which provide equalization to the DSX. The maximum separation between the COT or CO and DSX-1 is 655 feet.
- (2) Directly power a T1 line. The AUA62D LIU is used for this application. The line current is 60 mA at a maximum voltage of -130 V. Feature Package I does not support this application.
- (3) Loop the power from the line. The AUA64D LIU is used for this application. Feature Package I does not support this application.
- (4) Provide line buildout to meet existing T1 line end section and route junction level coordination requirements. The AUA62D and AUA64D LIUs have switchable pads in the transmit and receive paths. The transmit pads are 0, 7.5, 15.0, and 22.5 dB. The receive pad is 0 or 7.5 dB. Standard T1 digital line engineering rules are used to design the digital facilities used with *SLC* Series 5 Carrier Systems. Feature Package I does not support this application.

B. Transmission Line

Fiber Facilities

7.42 The *SLC* Series 5 Carrier System interfaces with fiber multiplexers at the DS1 rate as follows:

- (1) The *SLC* Series 5 FPG system equipped with AUA61D DS1 LIUs or FPI system equipped with AUA161 or AUA162 DS1 LIUs are cabled to a standard DSX-1 cross-connect panel. The maximum separation between the *SLC* Series 5 Carrier System and a DSX-1 cross-connect panel is 655 feet. For RTs in a collocated 80D cabinet, maximum separation depends on the type of outside plant cable. At the DSX-1, the *SLC* Series 5 Carrier System is cross-connected to the multiplexer.
- (2) Generally, multiplexers like AT&T's DDM-1000 provide protection for the fiber span. In FPG, the customer has the option of providing 4 to 1 protection switching (or 2 to 1 protection switching with Mode 2) by connecting the protection DS1 to the multiplexer. This option, which requires the allocation of the protection DS1 through the fiber system, provides protection against DS1 failures between the *SLC* Series 5 terminal and the multiplexer. In FPI, external protection equipment would be required.
- (3) If desired, in FPG only, additional pairs may be used for DC tests if the PGTC is used and for the order-wire between the COT and the RT.

Metallic T1 Lines

7.43 Pair requirements are as follows:

- (1) Two T1 pairs for each line being used.
- (2) One pair for VF drop testing. It is recommended that this pair be shared by 12 systems (maximum) at the same remote terminal location.
- (3) Additional pairs as desired for order-wire and fault locating as required on the route.
- (4) One 96-line *SLC* Series 5 Carrier System requires 8 pairs (4 T1 lines), 4 pairs (2 T1 lines) with Mode 2, or 2 pairs (1 T1 line) with Mode 4 (FPI only), plus one or more VF pairs for maintenance.

Repeater Spacing

7.44 T1 repeater spacing on 22-gauge buried cable is typically 6 kft except in cases of severe cross talk. The end section is normally 3 kft at the COT and up to 6 kft at the RT. Repeater spacing may be extended when coarser gauge cable is used and cable arrangements permit it (refer to AT&T 915-710-115G, *Feature Package G and I, Application Engineering*, for more information).

Bit Stream Coding

- 7.45** Standard μ 255 PCM channel encoding is as follows:
- (1) The framing format is the MSF framing format.
 - (2) The line coding format available is bipolar with per-channel zero code suppression (ZCS).
 - (3) The system uses the D1D alternate-sequential polling.
 - (4) Facility performance monitoring is based on maintaining the average line error rate at better than 10^{-6} .
 - (5) The *SLC* Series 5 Carrier System uses single- or double-ended fault-locating with either active or passive fault-locate filters. The operating company may follow its standard local practice for using fault-locate and order-wire pairs for T1 line maintenance.

Circuit Maintenance

- 7.46** The FPG *SLC* Series 5 Carrier System is compatible with the existing PGTC. Circuits can be tested with mechanized loop testing (MLT) or from a local test desk.
- 7.47** The *SLC* Series 5 Carrier System FPI uses the IN—testing capability of the *GTD-5 EAX*, in conjunction with ACTU, to perform transmission and signaling tests. Nightly routine testing and demand testing is performed by use of an *RMU* telephone line test measurement apparatus as follows:
- (1) Separate diagnostic tests on COT and RT channel units (except DID and dataport channel units) in a *SLC* Series 5 Carrier System.
 - (2) Reporting of the results of signaling and transmission tests on each channel when the tests are completed.

The craft interface unit (CIU) provides local test access at the COT or RT (See Part 6, Maintenance). The dual ringing repeater channel unit does not have test relays and cannot be tested with the PGTC.

Common System Maintenance

7.48 The *SLC* Series 5 channel banks have alarm displays and fail indicators to help isolate system troubles. Maintenance features are listed below.

- (1) Failures are automatically sectionalized to the COT, the digital facility, or the RT.
- (2) The largest single failure group is 48 lines.
- (3) The *SLC* Series 5 Carrier System interfaces with central office major, minor, and power minor alarm systems.
- (4) The *SLC* Series 5 Carrier System provides complete alarm and status outputs to remote network operations centers. This includes identification of the 24-channel digroup(s) affected by loss of service.
- (5) Each 96-line system provides the following RT AC power and building alarms (floating contact closures):
 - (a) One power minor (PMN) alarm closure for transmitting information on loss of AC power or rectifier failure.
 - (b) Two miscellaneous alarm closures for RT building alarms (only in universal *SLC* Series 5 Carrier Systems). Alarm inputs at the RT must be -48 V or floating contact closures; grounded closures are not acceptable.)

Equipment

A. Dual Channel Bank Assembly

7.49 The dual channel bank assembly is the basic building block for the *SLC* Series 5 Carrier System. The dual channel bank assembly houses two independent 96-line systems: each 96-line system is the same administrative size as the *SLC* 96 Carrier System.

- (1) Physical size:

20 inches high, 21 inches wide, 11 inches deep.

- (2) Mounting:

Standard 23-inch unequal flange frame.

- (3) Power dissipation (with 6 CCS POTS traffic):

- (a) Connecting to a DSX-1: 150 watts maximum.
- (b) Directly powering a T1 line: 180 watts maximum.
- (c) T1 line, power looping: 150 watts maximum.

B. Central Office Terminal

- (1) Available in the following frame arrangements:
 - The 8-foot ED-8C501-51,G2 bay provides space for up to three dual channel bank assemblies (six systems). Cabled for the optional FL/OW panels, which may be equipped as needed.
 - The 9-foot ED-8C501-50,G2 bay provides space for up to four dual channel bank assemblies (eight systems). Cabled for the optional FL/OW panels, which may be equipped as needed.
 - The 11-foot 8-inch ED-8C501-51,G3 bay provides space for up to five dual channel bank assemblies (ten systems). Cabled for the optional FL/OW panels, which may be equipped as needed.
- (2) Temperature range (NEBS): 40°F to 100°F long term, 35°F to 120°F short term.
- (3) Secondary lightning protection: the LIUs and channel units include secondary lightning protection and power cross protection.
- (4) Special grounding practices are required to meet GTE's grounding requirements.

C. Remote Terminal

Fan Operation

7.50 The fans are controlled by thermal switches on the AUA24 FCU and on the power shelf units (336A1 power unit, 337A1 battery charger, and 3C1 ringing generator). The temperature limits are given in Table P.

Table P. Temperature Limits For Fan Operation

<u>Controlling Unit</u>	<u>Fans Turn On</u>	<u>Fans Turn Off</u>
AUA24 FCU		
On main power (AC or DC)	120 F ±9 F	75 F ±7 F
On auxiliary power (batteries)	155 F ±9 F	135 F ±7 F
Power shelf (336A1, 337A1, 3C1)		
	(212 F ±10.8 F) 100 C ±6 C	(176 F ±10.8 F) 80 C ±6 C

51A Cabinet

7.51 The 51A cabinet houses two 96-line systems (one dual channel bank) with batteries and auxiliary power equipment. Space is available for adding a battery shelf for more reserve power.

- Physical size:

48 inches high, 29 inches wide, and 20 inches deep.

- Input power:

120 V AC, 60 Hz.

- Battery reserve:

8 hours minimum with 6 CCS POTS traffic using 2 battery strings and power looping LIUs. When the T1 line is back-powered from the RT, additional battery strings are required to provide the minimum 8 hours battery reserve. For flexibility, select the 51A cabinet option that provides an additional battery string.

- Operating temperature range:

-40°F to +120°F (outside).

- Operating humidity range:

5 to 100 percent (outside).

- Has primary lightning protection.

- LIUs and channel units include secondary lightning protection and power cross protection.

80D Community Service Cabinet (Metallic)

7.52 The 80D community service cabinet (metallic) houses up to eight 96-line systems (four dual channel banks, maximum) with batteries and auxiliary power equipment.

- Physical size:

66 inches high, 84 inches wide, and 27 inches deep.

- Input power:

120 V AC, 60 Hz.

- Battery reserve:

8 hours minimum with 6 CCS POTS traffic using 3 battery strings for each pair of dual channel banks (4 systems) and power looping LIUs. (When the T1 line is back-powered from the RT, additional battery strings are required to provide the minimum 8 hours battery reserve. It is recommended that the 80-type cabinet options that provide additional battery strings be selected.)

- Operating temperature range:

-40°F to +120°F (outside).

- Operating humidity range:

5 to 100 percent (outside).

- Has primary lightning protection.

- LIUs and channel units include secondary lightning protection and power cross protection.

80D Community Service Cabinet (Fiber)

7.53 The 80D community service cabinet (fiber) houses up to six 96-line systems (three dual channel bank, maximum) with a DDM-2000 (OC-3) 155.52-Mb/s lightwave multiplexer or a DDM-1000 90-Mb/s lightwave multiplexer plus batteries, auxiliary power equipment, and repeaters. With collocated 80D cabinets, maximum distance between cabinets must not exceed the equivalent of 655 feet of ABAM cable (equalization limit).

- Physical size:

66 inches high, 84 inches wide, and 27 inches deep.

- Input power:

120 V AC, 60 Hz.

- Battery reserve:

8 hours minimum with 6 CCS POTS traffic using 3 battery strings for either a single channel bank (2 systems), where the cabinet is equipped with only one bank, or each pair of dual channel banks (4 systems), where the cabinet is equipped with 2 or more dual banks, and DS1 LIUs.

- Operating temperature range:

-40°F to +120°F (outside).

- Operating humidity range:

5 to 100 percent (outside).

- Has primary lightning protection.

- Channel units include secondary lightning protection and power cross protection.

90A Business Remote Terminal Cabinet

7.54 The 90A Business Remote Terminal Cabinet houses up to two 96-line systems (one dual channel bank, maximum) with a DDM-2000 lightwave multiplexer plus batteries, auxiliary power equipment, an interconnect shelf, and DS1 extension shelves. In a satellite arrangement, houses up to four 96-line systems (two dual channel banks, maximum) with auxiliary power equipment.

- Physical size:

77 inches high (including casters), 29 inches wide, and 30 inches deep.

- Input power:

120 V AC, 60 Hz.

- Battery reserve:

7.3 hours minimum using 3 or 4 battery strings with fully equipped dual channel bank assemblies and, for hubbing arrangements, a DDM-1000 or DDM-2000 lightwave multiplexer.

- Operating temperature range:

+35°F to +120°F.

- Operating humidity range:

5 to 100 percent.

AC-Powered 7-Foot Frame

- 7.55** For use in environmentally controlled buildings.
- Houses four 96-line systems (two dual channel banks) with batteries and auxiliary power equipment.
 - Physical size:
84 inches high, 26 inches wide, and 12 inches deep.
 - Input power:
120 V AC, 60 Hz.
 - Battery reserve:
8 hours minimum with 6 CCS POTS traffic using 3 battery strings and power looping LIUs.
 - Operating temperature range:
–40°F to +120°F (outside).
 - Operating humidity range:
5 to 100 percent (outside).
 - LIUs and channel units include secondary lightning protection and power cross protection.

Bulk Powered 7-Foot Frame

- 7.56** For environmentally controlled buildings.
- Houses six 96-line systems (three dual channel banks), a power shelf, and a fan shelf.
 - Physical size:
84 inches high, 26 inches wide, and 12 inches deep.
 - Input power:
–48 V DC (–54.5 V DC maximum, –42 V DC minimum).
 - Battery reserve:
8 hours recommended. See AT&T 640-250-250 for size of the battery plant needed.
 - Operating temperature range:
+40°F to +100°F. Short temperature range of +35°F to +120°F maximum.
 - LIUs and channel units include secondary lightning protection and power cross protection.

8. Dictionary of Abbreviations and Acronyms

8.01 The following is a list of abbreviations and acronyms associated with the *SLC Series 5 Carrier System*:

Acronym	For	Acronym	For
5X-BAR	No. 5 Cross-Bar	BCU	Bank Control Unit
ACO	Alarm Cut-Off	BET	Building Entrance Terminal
ACTU	Automatic Channel Test Unit	BFU	Bank Fuse Unit
ACUIDS	ASCII Character User Interface Design Specification	BFW	Bank Controller Firmware
ACXT	Apparatus Case Cross Talk	BPIL	BackPlane Interface Logic (device)
ADU	Alarm Display Unit	BPV	Bipolar Violations
AIS	Alarm Information Signal	BRI	Basic Rate Interface
AIU	Alarm Interface Unit	BRT	Business Remote Terminal
ALBO	Automatic Line Build-Out	CARL	Computerized Administration Route Layout
ALC	Automatic Level Control	CBC	Coupled Bonding Conductor
ALIT	Automatic Line Insulation Test	CCS	Hundred Call Seconds
ANI	Automatic Number Identification	CD	Circuit Description
APOTS	ALC-POTS	CDF	Circuit Design File
ASIC	Application Specific Integrated Circuit	CDO	Community Dial Office
ASN	Abstract Syntax Notation	CENTREX	Central Office Exchange Service
ASU	Alarm Suppressor Unit	CEV	Controlled Environment Vault
AWC	Average Worst Case	CFU	Channel Fuse Unit
B8ZS	Bipolar Eight Zero Suppression	CI	Component Integration
BAC	Backplane Access Circuit	CIR	Customer Information Release
BC	Bank Controller	CIU	Craft Interface Unit
BCI	Bank Controller Interface	CLF	Carrier Line Failure
BCIC	BCI Circuit	CMP	Compatibility
BCL	Bank Control Link	CND	Calling Number Delivery
		CO	Central Office
		COFA	Change of Frame Alignments
		COT	Central Office Terminal
		CPE	Customer Premises Equipment
		CPI	Calling Party Identification
		CPS	Circuit Pack Schematic

Acronym	For	Acronym	For
CSA	Carrier Serving Area	DT	Distant Terminal
CSC	Community Service Cabinet	DT-FIU	Digital Trunk - Facility Interface Unit
CTU	Channel Test Unit	DTMF	Dual-Tone Multifrequency
CU	Channel Unit	DTU	Digital Test Unit
CUID	Channel Unit Identification	EEE	Electronic Equipment Enclosure
CUL	Channel Unit Logic	EEPROM	Electrically Erasable Programmable Read Only Memory
CV	Coding Violations	EMC	Electromagnetic Compliance
DA	Discontinued Availability	EMI	Electromagnetic Interference
DACS	Digital Access Cross-Connect System	EMU	Elastic Memory Unit
DCB	Dual Channel Bank	EOC	Embedded Operations Channel
DCLU	Digital Carrier Line Unit	EPROM	Erasable Programmable Read Only Memory
DCU	Digital Connectivity Unit	ES	Errored Seconds
DDO	Document Development Organization	ESD	Electrostatic Discharge
DDS	Digital Data System	ESF	Extended Super Frame
DEPIC	Dual Expanded Polyethylene Insulated Conductor	ESUCUL	Enhanced Sync-Universal Channel Unit Logic
DF	Distributing Frame	EWC	Extreme Worst Case
DFI	Digital Facility Interface	FACS	Facility Assignment and Control System
DGI	DiGroup Interface (device)	FEC	Framing Event Counts
DID	Direct Inward Dialing	FCU	Fan Control Unit
DILEP	Digital Line Engineering Program	FDI	Feeder Distribution Interface
DLC	Digital Loop Carrier	FEMF	Foreign Potential
DLS	Digital Line Schematic	FEXT	Far End Cross Talk
DM	Degraded Minutes	FL	Fault-Locating
DP	Dial Pulse	FL/OW	Fault-Locate/Order-Wire
DS0	Digital Signal Zero	FLTA	Fault-Locate Test Adapter
DS1	Digital Signal, 1-rate (1.544 Mb/s)	FMU	Flash Memory Unit
DSL	Digital Subscriber Line	FPC	Feature Package C
DSP	Digital Signal Processor		
DSX	Digital System Cross-Connect		

Acronym	For	Acronym	For
FPG	Feature Package G	LTA	Line Test Adapter
FPI	Feature Package I	LTC	Local Test Cabinet
Fs	D4 Digital Channel Bank Framing Format	LTD	Local Test Desk
FSR	Frequency Selective Ringing	LTF	Line Test Fan-out unit
FTTH	Fiber-To-The-Home	LTS	Loop Test System
FTU	Facility Test Unit	LTT	Line Test Translator
FW	Firmware	LTU	Line Terminating Unit
FX	Foreign Exchange	MC	Maintenance Center
HW	Hardware	MDF	Main Distributing Frame
ICLD	Integrated Custom Logic Device	MGB	Master Ground Bar
IDCU	Integrated Digital Carrier Unit	MJ	Major
IDF	Intermediate Distributing Frame kilobits per second	MLIU	Master Line Interface Unit
INA	Integrated Network Access	MLT	Mechanized Loop Testing
ISDN	Integrated Services Digital Network	MN	Minor
LAC	Loop Assignment Center	MOI	Message Oriented Interface
LAN	Local Area Network	MP	Multiparty
LBO	Line Build-Out	MPP	Miscellaneous Pair Panel
LCRIS	Loop Cable Record Inventory System	MSDT	Multi-Services Distant Terminal
LDI	Laboratory Design Information	MSF	Modified Super Framing
LDS	Local Digital Switch	MWI	Message Waiting
LDU	Load Distribution Unit	NCTE	Network Channel Terminating Equipment
LED	Light-Emitting Diode	NEMA	National Electrical Manufacturing Association
LFC	Line Feed Converter	NEXT	Near-End Cross Talk
LFU	Line Fuse Unit	OA&M	Operations, Administrations, and Maintenance
LIU	Line Interface Unit	OAM&P	Operations, Administrations, Maintenance, and Provisioning
LM12	Loop Multiplexer 12 (DS1 to DS2)	OCU	Office Channel Unit
LMOS	Loop Maintenance Operating System	OHT	On-Hook Transmission
LSU	Line Switch Unit		
LT	Line Terminal		

Acronym	For	Acronym	For
OI	Operations Interface	RBOCs	Regional Bell Operating Companies
OIP	Operations Interface Processor	RDLC	Remote Unit Data Link Control
OOF	Out-Of-Frame	RPCM	Receive Pulse Code Modulation
OPE	Outside Plant Engineer	RPFT	Remote Power Feed Terminal
OPS	Off-Premises Station	RSB	Repair Service Bureau
ORB	Office Repeater Bay	RSS	Remote Switching System
OSI	Open Switching Interval	RSU	Ring Switch Unit
OSP	Outside Plant	RT	Remote Terminal
OSS	Operations Support Systems	RTAC	Regional Technical Assistance Center
OTU	Office Timing Unit	RTS	Remote Test System
PAL	Programmable Array Logic	RTU	Remote Testing Unit
PAM	Pulse Amplitude Modulation	SAC	Service Area Computer
PBX	Private Branch Exchange	SAI	Serving Area Interface
PCB	Printed Circuit Board	SARTS	Switched Access Remote Testing System
PCM	Pulse Code Modulation	SCCS	Switching Control Center System
PCMC	Pulse Code Modulation Control	SCEC	Secondary Channel Error Correction
PCU	Power Converter Unit	SD	Schematic Drawing
PDI	Product Design Information	SDDF	Subscriber Digital Distributing Frame
PG	Pair Gain	SDFI	Subscriber Digital Facility Interface
PGS	Pair Gain System	SDU	System Display Unit
PGTC	Pair Gain Test Controller	SES	Severely Errored Seconds
PIC	Polyethylene-Insulated Conductor	SIU	System Interface Unit
PIDB	Peripheral Interface Data Bus	SLIM	Subscriber Loop Interface Module
PLAR	Private Line Automatic Ringdown	SLIU	Slave Line Interface Unit
PLD	Programmable Logic Device	SM	Switch Module
PLM	Product Line Management	SMAS	Switch Maintenance Access System
PMN	Power Minor	SONET	Synchronous Optical Network
PRU	Positive Ringing Unit	SRAM	Static Random Access Memory
PTA	Passive Test Adapter	STA	Span Terminating Assembly
PWB	Printed Wiring Board		

Acronym	For
STM	Span Terminating Module
SW	Software
SXS	Step-By-Step
TAC	Technical Assistance Center
TAFU	Time Slot Access Facility Unit
TASC	Telecommunications Alarm Surveillance and Control System
TBCU	Test Bus Control Unit
TCU	Transcoder Unit
TD	Toll Diversion
TMC	Time Slot Management Channel
TO	Transmit Only
TOP	Task Oriented Practice
TPCM	Transmit Pulse Code Modulation
TRU	Transmit/Receive Unit
TSI	Time Slot Interchange
TSIF	Time Slot Interchange Formatter
UAS	Unavailable Seconds
UVG	Universal Voice Grade
VF	Voice-Frequency
WGS	Work Group Station
WORD	Work Order Record Detail
XPC	Extended Protocol Controller
XTC	Extended Test Controller
ZBTSI	Zero Byte TSI
ZCS	Zero Code Suppression

9. References

9.01 The following AT&T documentation is related to the *SLC* Series 5 Carrier System:

Document No.	Document Title
100-101-401	197A Battery Load Test Set — Description and Operation
157-627-101	Storage Battery — KS-21906 Sealed, Rechargeable, Lead-Acid — Description, Installation, and Maintenance
235-019-102	General Growth Procedures
235-190-029	Pair Gain Interface to Nonintegrated <i>SLC</i> Carrier System
235-190-036	Integrated <i>SLC</i> 96 Carrier System
332-610-100	Customer Premises Facility Terminal for Metallic Facility Terminal Plug-In Equipment — General Description
363-005-xxx	<i>SLC</i> Series 5 System Data Sheets (See Table D)
363-200-001	T-Type Digital Line Preservice Testing
363-201-216	Active Fault-Locating System — ED-2C374 Active Fault-Locating Panel Turnup, Active Filter (1114/1115-Type) Preinstallation Tests, and Initial Fault-Locating Line and System Tests
363-202-300	Pair Gain Test Controller
363-202-525	<i>SLC</i> 96 Carrier System — Remote Power Feed Terminal (RPFT) — Description, Installation, and Maintenance
363-202-602	Bulk Protected Remote Terminals Installation of Shelves - <i>SLC</i> Series 5 Carrier and <i>SLC</i> 96 Carrier Systems

Document No.	Document Title	Document No.	Document Title
363-203-100	Subscriber Loop Interface Module (SLIM) — General Description	363-206-200	DDM-2000 Network Multiplexer Applications and Planning Guide
363-203-101	Subscriber Loop Interface Module (SLIM) — Installation and Maintenance	622-506-052	KS-23038 Controlled Environment Vault Description
363-205-000GTE	SLC Series 5 Carrier System Information and Pricing Guide for GTE	622-506-235	Concrete Hut ED7C285-30 — Description and Installation
363-205-100G	SLC Series 5 Carrier Feature Package G and I, General Description	622-506-236	KS-23038 Controlled Environment Vault Installation
363-205-101	Craft Interface Unit Description	622-506-237	KS-23038 Controlled Environment Vault Operation and Maintenance
363-205-103	Centralized Operations and Provisioning Installation, Test, and Maintenance	626-100-006	CD and DD Series of Multiunit Pulp (MUP) Cable — Description, Use, and Maintenance
363-205-104	SLC Series 5 Carrier System, Integrated Network Access-Remote Terminal (INA-RT), User's Manual	626-101-005	Air Core PIC and DEPIC Cables — Nonscreened and Screened — Description, Use, and Reel Lengths
363-205-111G	Operations Interface (OI) User's Guide	626-101-010	Waterproof Nonscreened and Screened Plastic - Insulated Cables — Description, Use, and Reel Lengths
363-205-112G	Operations Interface (OI) Release 1.0, Installation Guide	626-500-105	80-Type Cabinet — Coding Scheme, Ordering Information, and Lettering Guidelines
363-205-300	Extended Test Controller Description, Installation, and Maintenance	626-759-400	Superseded Exchange Cables
363-205-402	TOP: Series 5 System, Channel Unit Installation	626-800-095	Screened Air Core and Waterproof Plastic - Insulation Conductor Cable — Description, Use, and Reel Lengths Nonstandard/Limited Availability (NS/LA)
363-205-406	TOP: Series 5 System, End-to-End Tests	631-400-102	Cable and Terminal Grounding in Subscriber Building — General
363-205-500G	TOP: Feature Package G and I, Maintenance and Troubleclearing	631-600-240	80 B, C, and D Size Cabinets — Installation
363-205-600G	TOP: Feature Package G and I, Acceptance, Turnup, and Conversion	631-600-241	80 B, C, and D Size Cabinet — Splicing Information Information
363-206-100	DDM-1000 User's Manual	640-010-005	Splicing T Carrier Cables — General

Document No.	Document Title	Document No.	Document Title
640-250-206	478 Type Apparatus Case — Description, Installation and Maintenance	640-250-325	80D Cabinet Description, Installation, and Splicing <i>SLC</i> Series 5 Carrier System
640-250-221	Remote Power Feed Terminal (RPFT) — Installation and Wiring of Shelves	640-252-310	Concrete Hut (ED7C285-30) Splicing (Metallic and Fiber) Combined <i>SLC</i> 96 and <i>SLC</i> Series 5 Carrier Systems
640-250-223	80-Type Cabinet Remote Terminal — Installation and Splicing (Metallic Systems)	640-252-311	C Equipment Platform Splicing (Metallic and Fiber Systems) — Combined <i>SLC</i> 96 and Series 5 Carrier Systems
640-250-224	Remote Terminal Splicing — Precabled Structures Using Bulk Protection	640-252-312	80 Type Cabinets Description, Installation, and Splicing Combined <i>SLC</i> 96 and <i>SLC</i> Series 5 Carrier Systems
640-250-237	51A Remote Terminal Cabinet (ED7C601-30) Placement, <i>SLC</i> Series 5 Carrier System	640-255-264	80D Cabinet (Fiber) G29, G47, G48 Description, Installation and Splicing <i>SLC</i> Series 5 Carrier System and DS1 Extension Shelves
640-250-247	Field Installation of <i>SLC</i> Series 5 Carrier System Remote Terminal into 80 Type Cabinets Precabled for the <i>SLC</i> Series 5 Carrier System	640-525-108	475F2, 475G2, and 475G2F Apparatus Cases — Description and Installation
640-250-248	Precabled Structure Using Bulk Protection Metallic Remote Terminal Splicing <i>SLC</i> Series 5 Carrier System	640-525-220	Pair Loss Measurements Using 113A and/or 113B Test Sets — Digital Transmission Systems
640-250-250	Precabled Structures Using Bulk Power and Protection, Splicing, and Cabling Arrangements (Metallic and Fiber <i>SLC</i> Carrier Systems)	640-525-304	T1 and T1/OS Carrier 46806 Apparatus Case — Description and Maintenance
640-250-251	16-Foot and 24-Foot Platforms Description <i>SLC</i> Series 5 Carrier System	640-525-307	818- /819-Type Repeater Cases — Description, Installation, Splicing, and Maintenance
640-250-252	80D Cabinet (Fiber) Group 80 Description, Installation, and Splicing, <i>SLC</i> Series 5 Carrier System.	640-525-308	809-Type Repeater Cases — Description, Installation, Splicing, and Maintenance
640-250-255	80D Cabinet (Fiber) Group 90, 91, 92 Description, Installation, and Splicing, <i>SLC</i> Series 5 Carrier System.	640-525-309	841B or 841C Type Repeater Cases, Description, Installation, Splicing and Equipping
		640-525-315	T1, T1C and T1/OS Apparatus Cases and Associated Plug-in Equipment

Document No.	Document Title	Document No.	Document Title
640-527-220	J98725AA Test Set Pair Loss Measurements	855-350-106	DSX-1 and DSX-1C Retrofit
640-527-225	J98725AB Test Set — Bipolar Violation Detector for T1, T1C, or T1 Outstate	855-350-107	T1, T1 Outstate, T1C, T1D, and T2 Order-Wire System Engineering Design
662-400-500	Testing Customer Lines — Operation and Test Procedures	855-351-101	Transmission and Outside Plant Design Procedures T1 Digital Line Carrier Engineering System Application
662-505-507	Test Desk Procedures	855-351-200	T1 Outstate Digital Line Transmission and Outside Plant Design Procedures
801-438-150	J98710 Specifications — T1 Carrier Repeated Line Equipment	902-200-110	Digital Line Design and Pair Selection Rules — Subscriber Carrier Systems
801-440-001	J1C142 Specifications - Pair Gain Test Controller	902-200-115	Digital Line Engineering Program (DILEP)
801-450-106-1	Floor Plan Data Sheet—11-foot 6-inch Frame (Six Dual Channel Banks)	915-710-110	SLC 96 Carrier System Application Engineering — Facility Design Systems
801-450-106-2	Floor Plan Data Sheet—11-foot 6-inch Frame (Five Dual Channel Banks)	915-710-115G	SLC Series 5 Carrier System, Feature Package G and I, Application Engineering
801-450-106-3	Floor Plan Data Sheet—9-foot 0-inch Frame (Four Dual Channel Banks)	915-710-116	SLC Series 5 Carrier System — Channel Unit Application and Prescription Setting
801-450-106-4	Floor Plan Data Sheet—7-foot 0-inch Frame (Three Dual Channel Banks)		
801-450-106-5	Floor Plan Data Sheet—7-foot AC Powered RT Frame		
801-450-106-6	Floor Plan Data Sheet—7-foot DC Powered RT Frame		
801-523-150	T1 Carrier — System Requirements and Repeater Bay Equipment		
801-523-153	T1C Carrier — System Requirements and Repeater Bay Equipment		
855-350-104	T1, T1 Outstate, and T1C and T1D Fault Locate System Engineering Design Digital Transmission System Carrier Engineering Application		

10. List of Drawings

10.01 The following is a list of drawings associated with the *SLC* Series 5 Carrier System:

Drawing Number	Title
SD/CD 7C115-01	<i>SLC</i> Series 5 Carrier System Central Office Terminal (COT) Dual Channel Bank
SD/CD 7C116-01	<i>SLC</i> Series 5 Carrier System Central Office Terminal (COT) Application and Bay Wiring
SD/CD 7C117-01	<i>SLC</i> Series 5 Carrier System Remote Terminal (RT) Dual Channel Bank
SD/CD 7C118-03	<i>SLC</i> Series 5 Carrier System Remote Terminal (RT) Application and Bay Wiring
SD/CD 7C119-01	<i>SLC</i> Series 5 Carrier System Remote Terminal (RT) Power Shelf
SD/CD 97760-01	Pair Gain Test Controller
SD/CD 7C127-01	Extended Test Controller
SD/CD 99503-01	Patch and Cross-Connect Panel
ED3D335-70	Writing Shelf

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Document No.: AT&T 363-205-100G Issue 1 Date: January 1993

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