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## ***SLC*<sup>®</sup>-2000 Access System**

### ***SPQ*<sup>®</sup>452 Dual Office Channel Unit Dataport — 5SCTFFG**

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#### **Features/Functions**

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- Two fully functional OCU dataports per channel card
- 2.4, 4.8, 9.6, 19.2, 38.4, 56, and 64 kb/s data rates
- 4-wire switched 56 kb/s service capability and enhanced SW56 option
- Operates in release R3.3 *SLC*-2000 COT
- Enhanced Inventory
- AB signaling option
- Loop quality monitor with auto-disconnect
- Extended loop operation up to 45 db of loss
- Operates in release R4.2 *SLC*-2000 RT or MSDT
- 4-wire bridging access faceplate jack

#### **Description**

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This data sheet describes the *SPQ*452 dual office channel unit (OCU) dataport (DP) (COMCODE 107590150) and is intended for the end-user of this unit. The *SPQ*452 dual office channel unit (CU) is primarily used in the end-link of a digital data system (DDS) private line data service. An end-link is the part of the service between a customer and the local central office. The *SPQ*452 dual OCU DP may also be used to provide local data service. For DDS and switched 56 kb/s (SW56) applications, the *SPQ*452 dual OCU DP is always located in the *SLC*-2000 remote terminal (RT) or the MSDT. For local data applications, the unit

may also be used in the central office terminal (COT) in addition to the RT or the MSDT.

The *SPQ452* dual office channel unit dataport provides two channels of service and serves as the interface between full-duplex synchronous digital data (bipolar return-to-zero format) on a 4-wire (4W) customer loop and the pulse code modulation (PCM) bitstream. The digital rate may be 2.4, 4.8, 9.6, or 19.2kb/s (called substrates), or 38.4, 56 or 64 kb/s (called fullrates). The unit transmits and receives a bipolar return-to-zero signal on the 4-wire loop. The maximum cable loss that can be tolerated is 45 dB measured at a frequency equal to one-half the customer's primary data rate. The line drivers and receivers present a balanced 135-ohm impedance across the signal frequency range. The unit provides the proper sealing current to the T & R and T1 & R1 leads when the external load (loop and termination) is less than 5400 ohms.

The *SPQ452* dual OCU DP operates only in the SLC-2000 Access System with release R4.2 (or higher) RT or MSDT, or R3.3 (or higher) COT.

Figures 1 through 3 show the typical SW56 applications for both universal and integrated *SLC* Carrier Systems. Figure 4 shows the faceplate diagram for the *SPQ452* dual OCU DP CU. Table 1 lists the features and functions of the office channel unit dataports. Table 2 lists the options setting for the *SPQ452* dual OCU DP. Table 3 lists the environment specifications. Table 4 lists the edge connections for the *SPQ452* dual OCU DP channel unit.

## Functions

Table 1 lists all the features/functions of the SPQ452 dual OCU dataport as well as the AUA252( ), AUA52B, AUA152 and AUA52 OCU dataports.

**Table 1. Features and Functions of the Office Channel Unit Dataports.**

Features/ Functions	CUs				
	SPQ452	AUA252( )	AUA52B	AUA152	AUA52
Number of Circuits	2	1	1	1	1
Primary Data Rates (kb/s): 2.4, 4.8, 9.6, & 56 19.2 & 64 38.4	X X X	X X X	X X	X	X
Error Correction: MVEC & SCEC 19.2 kb/s EC	X X	X X	X X	X	X
Zero Code Suppression	X	X	X	X	X
Secondary Channel	X	X	X	X	X
Sealing Current	X	X	X	X	X
SW56 Option	X	X			
AB Signaling Option	X	X			
Enhanced SW56 option	X	X			
QMON and Auto-Disconnect	X	X			
Faceplate Indicators: 19.2 kb/s * 38.4 kb/s SW56 ADIS † FAIL ‡	X	X X X X	X		
Manual Loopback	X	X	X		
4 Wire, Bridging Access, Faceplate Jack	X	X	X		
Enhanced Inventory (AUA252B only)	X	X	X		

\* Flashes when an OCU, CSU, or manual loopback is active - AUA52B only

† Flashes when an OCU, CSU, or manual loopback is active - AUA252 and AUA252B only

‡ Flashes when an OCU, CSU, or manual loopback is active - SPQ452 only

## DDS

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The *SPQ452* dual OCU DP for DDS applications provides seven selectable data rates: 2.4, 4.8, 9.6, 19.2, 38.4, 56, and 64 (CLEAR) kb/s. An error correction option is provided to avoid the need to qualify the T-carrier facility for DDS services. There are three error correction methods — the appropriate method depends on the customer data rate. All error correction methods ensure a  $10^{-8}$  error-rate performance for a  $10^{-3}$  error rate facility. The unit provides a zero-code option to guarantee a sufficient ones density on the T-carrier facility. A secondary channel option, when selected, provides a low-speed telemetry channel to the end-user.

Multi-point circuits are vulnerable to errors caused by noise on the 4W loop between the OCU DP and the customer premises equipment (CPE). Noise on the 4W loop or incorrectly optioned CPE can cause bipolar violation errors to be injected into the loop receiver of the OCU DP. The *SPQ452* dual OCU DP provides a quality monitor (QMON) option to prevent these conditions from rendering a multi-point network inoperable. When the QMON option is enabled and excessive errors are detected on the loop, a loop disconnect will occur, and the "ABNORMAL STATION CODE" (10011110) will be sent toward the network. This will cause a problem branch to be blocked at the upstream multijunction unit (MJU). When the problem condition on the loop is cleared and the loop remains error free for 30 consecutive seconds, the *SPQ452* dual OCU DP will return to normal operation.

## SW56

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The *SPQ452* dual OCU DP also provides SW56 operation, which can be used by local exchange carriers (LEC) to offer dedicated digital access to interexchange carriers (IXC) and SW56 digital data services, such as AT&T *ACCUNET*<sup>®</sup> Switched 56 service and Sprint 56 of US Sprint<sup>®</sup>.

The *SPQ452* dual OCU DP allows dialing by the 4W digital data circuit using control mode idle (CMI) signaling in accordance with AT&T PUB 41458. The unit decodes signaling from the network and passes this to the loop as either CMI (idle) or DATA mode (call active). Likewise, the customer premises equipment (CPE) signals the *SPQ452* dataport by transmitting CMI (on-hook) or DATA mode (off-hook).

The signaling between the *SPQ452* dual OCU DP and the network is wink start, A bit signaling. The default method of decoding signaling from the network is an in-band signaling technique (also referred to as software signaling). If the C bit (bit 8) is 0 in any of the last seven data bytes, signaling is decoded as 0 (idle or on-hook). If bit 8 is 1 in all of the last seven data bytes, signaling is decoded as 1 (call active or off-hook). When employed, this in-band signaling technique allows SW56 service to be provided over circuit configurations that contain tandemed digital signal zero (DS0) dataport units.

The *SPQ452* dual OCU DP also provides an AB signaling option (also referred to as hardware signaling). When this option is enabled, signaling is decoded from the RT backplane. Since this requires that the A & B signaling bits be in frames 6 and 12, respectively, of the incoming DS1 signal, it is not possible to tandem a circuit through

standard DS0 DP units when this type of signaling is used. There is one exception to this restriction. When an ADTRAN digital terminal data module (DTDM) D4 type DS0 DP is used in the D4 bank, shown in Figure 1, the AB signaling option can be employed.

The SPQ452 dual OCU DP also provides an enhanced SW56 option. With the enhanced SW56 option enabled and the local CPE off-hook, data in the zero band (X111XXXX)<sup>1</sup> from the switch will cause an alternate CMI code (0101X0V) to be transmitted toward the loop. This is used to pass optional call progress information toward the CPE in accordance with US Sprint Technical Specification TS-0046, Issue 4, April 1989.

## Maintenance

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The SPQ452 dual OCU DP supports both latching and non-latching DDS loopbacks for DDS-type testing. Non-latching loopbacks are disabled when the 64k clear option is selected. The channel unit provides test access to the metallic test busses. Test access is available through the user interface panel (UIP)

The SLC Series 2000 UIP is used during manual testing of the transmission performance of the SPQ452 dual OCU DP. The procedures for setting options and performing tests with the UIP are described in AT&T 363-208-001 *SLC-2000 Access System User/Service Manual*.

Additional preservice testing capabilities are provided via two faceplate jacks.

The SPQ452 dual OCU DP for both DDS and SW56 applications supports DDS alternating and latching loopbacks.



**NOTE:**

When the unit is provisioned for 64 kb/s operation, alternating loopbacks are disabled.

The unit also provides full splitting metallic test access and a faceplate activated PCM loopback toward the customer's loop.

Full splitting metallic test access for the SLC-2000 system can be obtained via the SLC-2000 user interface panel (UIP) if the COT and RT ARM shelves are equipped with the following circuit packs: one BBG220 test head controller (THC), one BBF220 power control unit (PCU), and one BBF225 craft access unit

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If the three least significant bits of the upper nibble in the network byte are all set to 1s, then the data is said to be in the zero band.

(CAU). For additional information on the *SLC-2000* Access System, see the *SLC-2000* Applications, Planning, and Ordering Guide, AT&T 363-208-000, and the *SLC-2000* User/Service Manual, AT&T 363-208-001.

### **Synchronization**

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For all applications of the *SPQ452* dual OCU DP, the *SLC-2000* Access System must be synchronized to the DDS composite clock. For universal configurations, the interface to the DDS clock is the *SLC-2000* BDK260 system timing unit, which is installed in the COT. A timing unit is not required in the RT since the RT is loop-timed to the COT.

## Provisioning

The SPQ452 dual OCU DP has options that must be set before service can be provided. These options may only be set electronically.

### SLC-2000 Access System

All electronic provisioning information for all SLC-2000 Access System applications is entered using the SLC-2000 CIT. Options for the channel unit are set by entering commands into the CIT which then transmits the option information to the system controller where the option information is stored in nonvolatile system memory. The system controller then writes the options into memory registers on the channel unit when the channel unit is installed. If the channel unit is already installed, the system controller writes the option information into the channel unit registers immediately after it receives the information from the CIT. Unplugging the channel unit does not erase the option information stored in system. Reinserting the channel unit causes the options to be rewritten immediately into the channel unit registers by the system controller.



**NOTE:**

Use *COMMON LANGUAGE*<sup>1</sup> CLEI Code 5SCTFFG when using the CIT to provision the SPQ452 dual OCU DP.

Table 2 lists the options set by the SLC-2000 CIT for the SPQ452 dual OCU DP, and the range of the options.

**Table 2. Options set by the CIT for the SPQ452 dual OCU DP**

Option	Range
Function Code	OCU* or SW56
Subscriber Data Rate	2.4, 4.8, 9.6, 19.2, 38.4, 56* or 64 kb/s
Error Correction	NONE*, MVEC, or SCEC
All-Zero-Code Allowed	YES or NO*
Secondary Channel Used	YES or NO*
Quality Monitor	YES or NO*
AB Signaling	YES or NO*
Enhanced Switched 56	YES or NO*

\* These Default values will be selected if the options are not provisioned.

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

1. **Function Code:** Select either DDS dedicated office channel unit (OCU) or Switched 56 kb/s (SW56) operation.
2. **Subscriber Data Rate:** Enter the appropriate customer primary data rate. Any of the valid subrates or fullrates can be entered — 2.4, 4.8, 9.6, 19.2, 38.4, 56, or 64 kb/s. For SW56 service, this option is not available.
3. **Error Correction:** For 38.4, 56, and 64 kb/s services, the available error correction is either second channel error correction (SCEC) or NONE. For a data service at one of the subrates majority vote error correction (MVEC) is the only selection. When the SPQ452 dual OCU DP is optioned for 19.2 kb/s service, the MVEC option invokes the single time slot error correction method described in "Contribution to the ANSI<sup>1</sup> T1 Standards Project," document #T1ZX1.4/89-023. When using SCEC error correction at 19.2 kb/s, an additional time slot is required.

Whenever SCEC error correction is selected, two PCM time slots are used for each OCU DP circuit. The odd-numbered time slot is used for data and the even numbered time slot is used for error correction.

For SW56 service, error correction is not available.

4. **All-Zero-Code:** Two selections are available: YES or NO. When the All-Zero-Code option is set to YES, the SPQ452 dual OCU DP will allow eight consecutive 0s to be transmitted toward the network. When this option is set to NO, two of the 0s, in any string of eight 0s, will be changed to 1s.

This option should be set to NO if the line interface unit (LIU) is NOT set to ZERO CODE SUPPRESSION or ZERO CODE SUBSTITUTION. If the line encoding option of the LIUs is set to binary 8 zero substitution (B8ZS) line coding, the OCU DP All-Zero-Code option can be set to either YES or NO.

For 64 kb/s service, the All-Zero-Code option should be set to YES and the Line Encoding option of the LIUs should be set to B8ZS.

For SW56 service, All-Zero-Code is not available.

5. **Secondary Channel:** Two selections are available: YES or NO. The Secondary Channel option should not be confused with SCEC. A secondary channel is a low speed telemetry channel added to the subscriber's data bits. The secondary channel capability should be used only when suitable customer premises equipment is available.

For 64 kb/s clear channel service, LIU must be set to B8ZS.

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1 Registered trademark of American National Standards Institute, Inc.

The secondary channel feature is not available when the OCU DP is set for 64k clear or Switched 56 kb/s service.

6. **Quality Monitoring:** Two selections are available: YES or NO. This option provides the ability to detect and quantify illegal bipolar violations. The quality monitor will detect if the threshold of seconds of illegal bipolar violations has been exceeded and will generate an abnormal station code back to the network. The quality monitor will also verify that the condition has cleared and will resume normal operation.
7. **AB Signaling:** Two selections are available: YES or NO. This option determines whether a hardware or software signaling method is used to detect signaling from the network. The hardware signaling option can be enabled if the SW56 option is selected by setting the AB SIG option to YES.

Most applications will use the default software signaling mode. The AB (or hardware) signaling mode is only used in conjunction with a digital cross-connect system operating in the signaling mode. For all universal configurations, configurations using the *SLC-2000* multi-services distant terminal (MSDT), and integrated TR303 configurations, the AB signaling option should NOT be selected. For integrated TR08 configurations not using the MSDT, the AB signaling option may be selected.

8. **Enhanced SW56:** Two selections are available: YES or NO. To support the transmission of call progress tones to the DSU, the Enhanced switched 56 (ENH56 ) mode of operation must be selected by setting the option to YES along with the enabling of the SW56 mode. When this option is selected, transmission of call progress tones to the CPE is supported in accordance with US Sprint Technical Specification TS-0046, Issue 4, April 1989.

### ***SLC-2000* MSDT Provisioning**

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The provisioning for *SLC-2000* MSDT applications is the same as described for *SLC-2000* usage. As previously noted for SW56 applications, the AB signaling option should NOT be selected for MSDT applications.

The MSDT must be hosted from a *SLC-2000* Access System RT with software release R4.2 or higher.

## Compatibility

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### Channel Units

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The *SPQ452* dual OCU DP is end-to-end compatible with another *SPQ452* dual OCU DP and other dataports as follows:

- *AUA252*( ) OCU DP
- *AUA52*( )/*AUA152* OCU DP
- *SPQ334/AUA34*( ) DS0 DP
- D4 dataport CUs in a *SLC-96* COT or D4 bank.



**NOTE:**

Except for the *SPQ452* and *SPQ334*, not all features are available with above listed channel units.

### *SLC-2000* Access System

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The *SPQ452* dual OCU DP is compatible with the following *SLC-2000* Access System releases:

- *SLC-2000* R4.2 RT operating against a *SLC-2000* R3.3 COT with *SPQ334*, TR08 or INA mode.
- *SLC-2000* R4.2 RT operating in a TR08 or TR303 integrated mode, where the LDS circuit is nailed up or hairpinned.
- *SLC-2000* R4.2 RT with at least one DS1 operating in INA mode; where the circuit is terminated on a D4 DS0 DP.
- *SLC-2000* MSDT hosted by a *SLC-2000* R4.2 RT.

The *SPQ452* dual OCU DP can be used in any channel unit slot and can be used in combination with any mix of the other *SLC-2000* Access System channel units.

The *SPQ452* dual OCU DP is compatible with all *SLC-2000* configurations: universal, integrated, TR008, TR303, INA, metallic and fiber.

### *SLC* Series 5 Carrier

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Because a *SLC-2000* Access System terminal is not end-to-end compatible with a *SLC* Series 5 Carrier system, neither is an *SPQ452* dual OCU DP.

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## **5ESS<sup>®</sup> Switch (Nail-Up/Hair-Pin)**

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### **TR08 Integrated Configurations**

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For TR08 integrated configurations, screen 3 of 18.15 (RT TR08) in recent change/verify (RC/V) must be updated to provide an SSV00 service type for the channels to be nailed-up or hair-pinned.

When the default software signaling mode is used (AB SIG option switch set to the "OFF" position), 7.11 (Nail-Up and Hair-Pin Specification) in RC/V must be inserted with lines 23, 25, and 26 provisioned as follows:

23. SIGMODE "NOSIG"

25. DDS "Y"

26. PATH NUM "1"

When the AB signaling mode is used (AB signaling option switch set to the "ON" position), 7.11 (Nail-Up and Hair-Pin Specification) in RC/V must be inserted with lines 23 and 25 provisioned as follows:

23. SIGMODE "AB"

25. DDS "N"

### **TR303 Integrated Configurations**

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TR303 integrated configurations, line 92 in screen 3 of 1.6 in RC/V must be updated to "Y".

Since only the default software signaling mode can be used (AB signaling option switch set to the "OFF" position), 7.11 (Nail-Up and Hair-Pin Specification) in RC/V must be inserted with lines 23, 25, and 26 provisioned as follows:

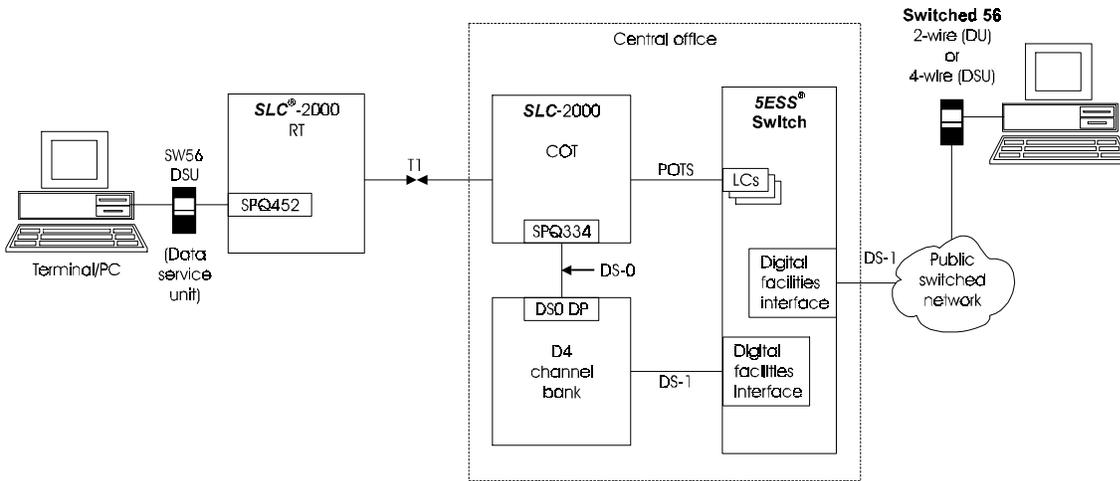
23. SIGMODE "NOSIG"

25. DDS "Y"

26. PATH NUM "1"

## SW56 Applications

Figures 1 through 3 show typical SW56 applications for both universal and integrated SLC Carrier Systems.



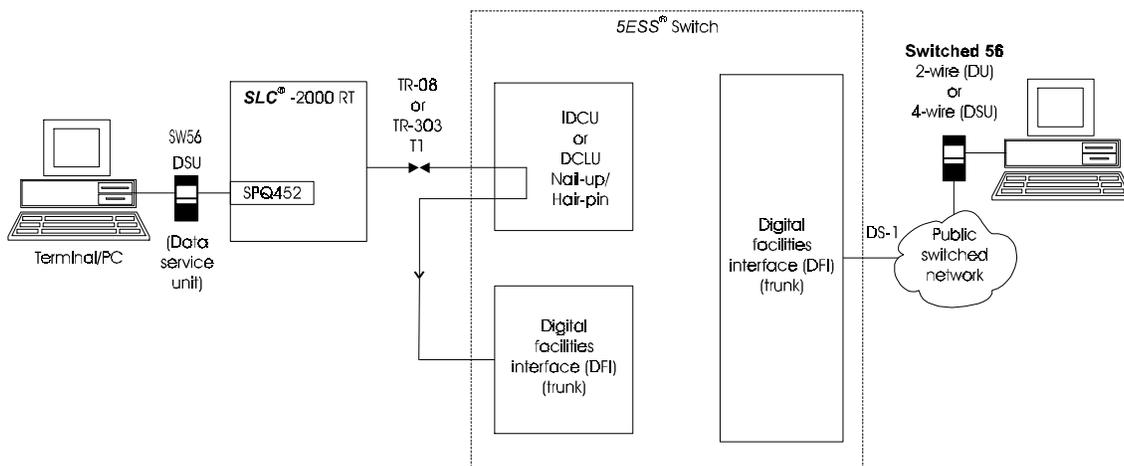
AUA252b.cdr

**Figure 1. Switched 56 Access, Universal SLC-2000 Access System**



**NOTE:**

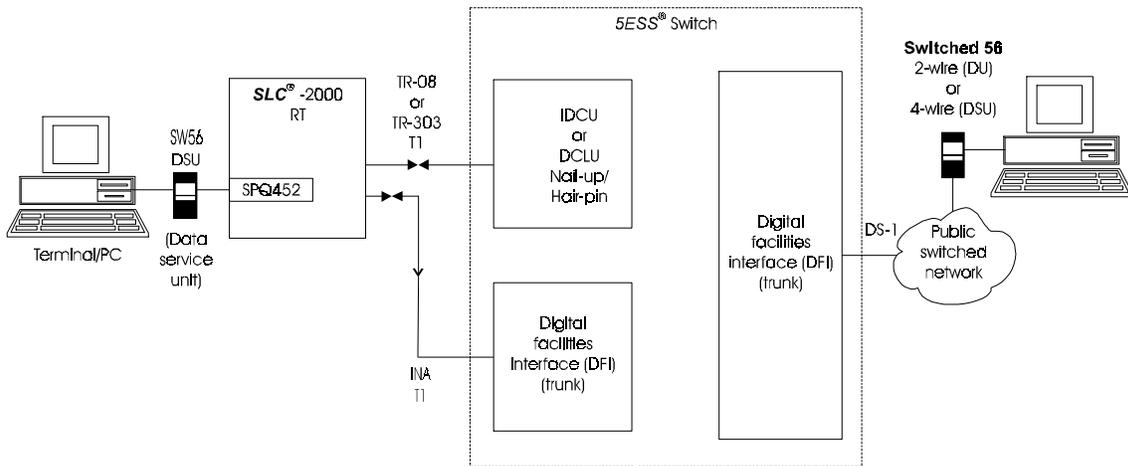
AB signaling mode may be used for this configuration if the DS0 DP in the D4 bank is an ADTRAN DTDM.



AUA262c.edr

**Figure 2. Switched 56 Access, Integrated SLC-2000 Access System**

**⇒ NOTE:**  
 AB signaling mode can be used for the TR08 configurations.



AUA262abcd

**Figure 3. Switched 56 Access, SLC-2000 INA Digroup Application**

**⇒ NOTE:**  
AB signaling mode may be used for this configuration.

## Specifications

The *SPQ452* dual OCU DP channel unit conforms to the appropriate criteria of ANSI, Bellcore, FCC, GTE, REA, and UL<sup>1</sup> standards.

Table 3 lists the environment specifications.

**Table 3. Environmental Specifications**

<p><b>A. Temperature Range (Ambient)</b></p> <ol style="list-style-type: none"> <li>1. Operating, per TR-NWT-000057: in AT&amp;T cabinet mounted RT, outside ambient temperatures of -40° F with no solar load to +115° F with maximum solar load and maximum power dissipation. AT&amp;T cabinets are designed to assure that the components within do not exceed their rated temperatures for the above conditions.</li> <li>2. Storage, per TR-NWT-000057: ambient temperatures of -40° to 140° F.</li> </ol>
<p><b>B. Relative Humidity</b></p> <ol style="list-style-type: none"> <li>1. Operating, per TR-NWT-000057. For outside ambient temperature 84° F or less, relative humidity of 5% to 95%. For ambient temperatures above 84° F, the relative humidity is limited to that corresponding to a specific humidity of 0.024 pounds of water per pound of dry air.</li> <li>2. Storage, per TR-NWT-000057: ambient temperatures 84° F or less, 10% to 95%. For ambient temperatures above 84° F, the relative humidity is limited to that corresponding to a specific humidity of 0.024 pounds of water per pound of dry air.</li> </ol>

## Installation and Testing

Procedures for testing the *SPQ452* dual OCU DP CU are given in AT&T 363-208-001, *SLC-2000 Access System User/Service Manual*.

The *SPQ452* dual OCU DP, in all its applications, is not compatible with mechanized loop testing (MLT), nor the pair gain test controller (PGTC).

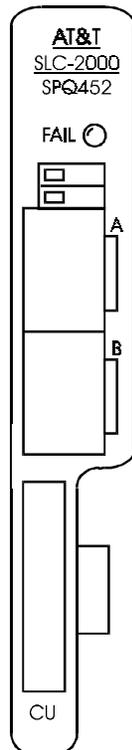
A special TPI cable is required to access T/R and T1/R1 on the *SPQ452*. The part number for the TPI cable for use with TPI-95 test set and the *SPQ452* dual OCU DP is 834018. This cable is available from TPI. This cable maps the faceplate jack to an RJ-45 plug, which connects to the TPI test set.

## Faceplate Features and Options

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Figure 6 shows the *SPQ452* dual OCU DP faceplate. The faceplate has one LED, two RJ11 jacks, and two switches.

- **FAIL (Red LED):** When lit indicates either power up of the CU or a FAIL condition of either dataport on the channel unit. The LED also flashes when a loopback is established.
- **RJ11 Access Jack:** This jack provides bridging access to the T&R (Transmit) and T1&R1 (Receive) pairs of the *SPQ452* dual OCU DP circuit. Using an adapter cord, this jack is compatible with the Telepath Industries TPI-95 Digital Loop Analyzer Test Set and other industry standard channel service units (CSU)/data service units (DSU).
- **Switches:** Activates manual loopbacks (one for each dataport circuit).



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Figure 4. *SPQ452* Faceplate

**Table 4. Edge Connections For SPQ452 Dual Office Channel Unit Dataport**

<b>Finger</b>	<b>Function</b>
1	Frame Ground
3	T2
4	R2
5	T3
6	R3
13, 17, 19, 20, 21	Circuit Ground
22, 23, 25, 50	+5 Volts DC
26	-48 Volts DC
29	T1
30	R1
31	T
32	R
49	-5 Volts DC

## References

The following documents provide additional information about the SLC-2000 Access System:

- AT&T 363-205-004 *SLC-2000 Access System, MSDT, User/Service and Ordering Manual*
- AT&T 363-208-000 *SLC-2000 Access System Applications, Planning, and Ordering Guide*
- AT&T 363-208-001 *SLC-2000 Access System User/Service Manual*
- AT&T 363-208-003 *SLC-2000 Access System Command and Message Manual*
- AT&T 915-710-116 *SLC Series 5 Carrier System Channel Unit Application and Prescription Setting.*

## Technical Assistance

Follow local procedures for obtaining technical assistance. AT&T also provides in-hours or emergency out-of-hours help for the SLC Series 5 Carrier System and the SLC-2000 Access System. Call the AT&T Regional Technical Assistance Center at 1-800-225-RTAC.

## **Ordering Information**

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Additional copies of this document (AT&T 363-005-341) are available from the Customer Information Center — call 1-800-432-6600.

## **Comments**

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