



SLC[®]-2000 Access System

SPQ[®] 401() (RT) POTS Channel Unit— SAC1EWT (SPQ401) SAC1EWU (SPQ401B)

Features/Functions

- Conforms to appropriate industry standards
- Adaptive balance to enhance V.34 and digital modem performance
- Extended range to 1400 ohms
- Automatic level compensation (ALC)
- 900 ohms impedance
- Supports voice frequency data enhancement (VFDE) operation
- Supports *CLASS*^{*} services
- On-hook transmission (OHT)
- Faceplate test access to tip and ring for four channels
- Faceplate BUSY LEDs
- Enhanced inventory
- No option switches
- UL[†] recognized

* Service mark of Bell Communications Research, Inc.

† Registered trademark of Underwriters Laboratories Inc.

Description

This data sheet describes the SPQ401() (RT) POTS channel unit (CU) (COMCODE 108053703, SPQ401; and 108049107, SPQ401B) and is intended for the end-user of the unit.

The SPQ401() channel unit is designed for 2-wire, loop-start POTS service. The unit provides four channels of service and is normally installed at the remote terminal (RT), DDM-2000 FiberReach Narrowband Shelf (NBS) optical network

unit (ONU) or Multi-Services Distant Terminal (MSDT). The CU is equipped with automatic level compensation (ALC) which adds loss when connected to shorter loops. This feature optimizes the loss level for ranges of metallic extensions up to 900 ohms. If a digital loop carrier (DLC) system is replacing long metallic loops, the ALC feature minimizes the loss contrast experienced on cutover. The SPQ401() furnishes a current feed interface to the customer loop and provides the fast forward disconnect feature which repeats a central office's (CO) open switching interval (OSI) that is longer than 50 ms. This fast forward disconnect feature maintains the OSI condition up to 1.5 seconds, then resumes the normal loop current feed (LCF) condition to reestablish supervision despite a prolonged OSI.

The SPQ401 unit features ALC in on-hook as well as off-hook states. On-hook loss is determined by the tip/ring resistance during the most recent off-hook condition. The SPQ401B has a fixed 3.5 dB loss when on-hook.

The SPQ401() has an extended range of 1400 ohms and uses an adaptive balance network that provides improved balance for a wide range of loop terminations. The adaptive balance feature will frequently increase the connect rate and/or throughput performance of high speed (V.34) modems, such as those with maximum connect rate of 28.8 kb/s or 33.6 kb/s, used to access the Internet.

The SPQ401B CU is an enhanced version of the SPQ401 CU. The SPQ401B CU when installed in a FiberReach Narrowband Shelf ONU or MSDT extension of a SLC-2000 Access System RT, Release 4.6 and later, supports the voice frequency data enhancement feature (VFDE) feature. The VFDE feature allows a SLC-2000 Access System operating as a TR-303¹ compliant remote digital terminal (RDT) to operate without robbed-bit-signaling (RBS). A digital loop carrier system that can operate without RBS will generally produce significant increases in connect rates of V.34 and digital modems. The VFDE feature, a proprietary enhancement of the TR-303 protocol, is achieved in a Release 4.6 RDT *hosting any incumbent channel unit* such as the SPQ400() CU or SPQ401 CU. The VFDE feature is also achieved in a Release 4.6 RDT hosting an SPQ401B CU. However, where the Release 4.6 RDT configuration includes an MSDT or FiberReach NBS ONU, use of a VFDE compatible CU such as the SPQ401B CU is necessary to realize the VFDE feature in the ONU.

The channel unit stores a plug-in inventory record in non-volatile memory available for reading through an inventory compatible host (e.g., SLC-2000 Access System). The inventory record includes 10-character *COMMON LANGUAGE*² CLEI, COMCODE, ECI, Function, Loss, and ID codes.

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- 1 Bellcore Technical Reference TR-NWT-000303 Issue 2, December 1992, and all Supplements, *Integrated Digital Loop Carrier System Generic Requirements, Objectives, and Interface*. TR-303 has been reissued as GR-303-CORE.
 - 2 *COMMON LANGUAGE* is a registered trademark and *CLEI*, *CLLI*, *CLCI*, and *CLFI* are trademarks of Bell Communications Research, Inc.

Description of Figures and Tables

- Figure 1 shows the faceplate diagram for the *SPQ401B* POTS CU.
- Table 1 shows the *SPQ401()* CU's on-hook transmission compatibility.
- Table 2 lists the salient *SPQ401()* CU's electrical and transmission specifications.
- Table 3 lists the environmental specifications.
- Table 4 lists the power drain of the *SPQ401()* CU.
- Table 5 lists the edge connections for the *SPQ401()* POTS CU.

Compatibility

The *SPQ401()* channel unit is compatible with all current and planned releases of the *SLC-2000* Access System. The *SPQ401()* CU can be mounted in the RT or MSDT (Release 2.0 or later) or FiberReach NBS (Release 4.3 or later). In addition, the *SPQ401()* CU is compatible with all releases of the switched digital broadband access system (SDBAS). The *SPQ401()* CU is compatible with the VFDE feature of Release 4.6 and later of the *SLC-2000* Access System, when installed in the RDT operating in the TR-303 mode; the *SPQ401B* additionally supports the VFDE feature when installed in a FiberReach NBS or MSDT extension of such an RDT. The VFDE feature of the 5ESS-2000[®] local digital switch is available in Software Update (SU) package 98-0008 for the 5E11(1) Software Release and in SU package 98-0007 for 5E12(1) Software Release and in the Beginning Managed Introduction (BMI) of 5E13(1) Software Release. The far-end termination can be any AUA or *SPQ* POTS/*SPOTS* current sink loop start/ground start channel unit, or other termination as shown in the following list (where the *SPOTS*[®] units are limited to loop start service):

- | | |
|--|---|
| ■ <i>SLC-2000 SPQ</i> [®] 300 quad POTS channel unit | ■ AUA38() POTS channel unit |
| ■ <i>SLC-2000 SPQ</i> [®] 340 quad <i>SPOTS</i> [®] channel unit | ■ AUA39() <i>SPOTS</i> [®] channel unit |
| ■ 5ESS [®] switch integrated digital carrier unit (IDCU) | ■ <i>SLC 96 WP10()</i> POTS channel unit |
| ■ 5ESS switch digital carrier line unit (DCLU) | ■ <i>SLC 96 WP36() SPOTS</i> [®] channel unit |

Specifications

Table 1 gives the on-hook transmission capabilities for the SPQ401() POTS CU.

Table 1. SPQ401() POTS CU — On-hook Transmission Capability

ON-HOOK TRANSMISSION CAPABILITIES			
CO Termination	Signaling	Direction	OHT Services CND, MWI, MR
SPQ300	LS	COT↔RT	✓
WP10	LS	COT→RT	✓*
WP10B	LS	COT→RT	✓*
WP10C	LS	COT→RT	✓*
AUA38()	LS	COT↔RT	✓
WP10D	LS	COT↔RT	✓
SPQ340	LS	COT↔RT	✓
WP36	LS	COT→RT	✓*
AUA39	LS [†]	COT↔RT	✓‡
AUA39B	LS	COT↔RT	✓
INTEGRATED:§	LS	IDCU↔RT	✓
POTS CU mode	LS	DCLU↔RT	✓

Legend:

CND — Calling name/number delivery (CND). Individual calling line identification (ICLID) feature of CND transmits number, using frequency shift keying (FSK), during silent ringing interval.

MWI — Visual message waiting indication(MWI). Central office (CO) switch transmits FSK to turn on indicator during idle state.

MR — Meter reading.

LS — Loop start (LS) signaling.

* Meter must present off-hook termination when responding to poll.

† When an AUA39 CU is connected to the floating battery feed of a 5ESS Switch, either the RANGEX or GNDREF 5ESS Switch option should be set, to provide the necessary low resistance tip/ground interface when the switch sends the CND message. The RANGEX option is preferred. The AUA39B CU does not require these switch options:

RANGEX=Y [up to Release 5E9(2)] or RANGEX=EXT [Release 5E9(2) or later]

GNDREF=Y

‡ CND only.

§ Digital carrier line unit (DCLU) or integrated digital carrier unit (IDCU) interface feature of 5ESS Switch, or other switch with digital loop interface compliant with Bellcore TR-TSY-000008. (Compatibility for MWI on ground start circuits is not covered by TR8.)

Table 2 gives the salient electrical and transmission specifications for the *SPQ401()* channel unit. The parameters are off-hook unless specified otherwise.

Table 2. Salient *SPQ401()* Electrical and Transmission Specifications¹

Parameter	Value
Loop resistance (excluding telset):	0-1400 ohms
Loop current:	20 mA to 28 mA
1 kHz VF loss between CO and network interface (NIF) at customer location, customer premises equipment (CPE) off-hook:	4 dB to 8 dB
Nominal 1 kHz VF loss, <i>SPQ401()</i> only, CPE off-hook:	0 dB to 5.5 dB
Nominal 1 kHz VF loss, <i>SPQ401()</i> only, CPE on-hook: <i>SPQ401</i> <i>SPQ401B</i> First installed, telset on-hook,	2.75 dB to 8.25 dB 3.5 dB 5 dB
Return loss at COT (reference Z of 900 ohms + 2.16 μ F), <i>SPQ401()</i> terminated at voice frequencies with 900 ohms + 2.16 μ F, on-hook and off-hook. Off-hook DC resistance at RT: < 430 ohms	ERL > 18 dB, SRL > 10 dB
Return loss at RT (reference Z of 900 ohms + 2.16 μ F), COT terminated with 900 ohms + 2.16 μ F, on-hook and off-hook. Off-hook DC resistance at RT: < 430 ohms.	ERL > 18 dB, SRL > 10 dB
Frequency response (loss relative to 1004 Hz, end to end) <i>SPQ401()</i> only	<u>Frequency range</u> 300-3000 Hz; -0.5 dB to +1.0 dB 3200 Hz: -0.5 dB to +1.5 dB 300-3000 Hz; -0.25 dB to +0.5 dB 3200 Hz: -0.25 dB to + 0.75 dB
Structural impedance (hybrid impedance, output impedance)	900 ohms + 2.16 μ F
Impulse noise at a threshold of 47 dBrnC0 for 15 minutes	\leq 15 counts
Single frequency distortion with input of: 0 - 12 kHz, 0 dBm0 1004 - 1020 Hz, 0 dBm0	< -28 dBm0* < -40 dBm0†
Signal-to-distortion with input of: 0 dBm0 to -30 dBm0 -30 dBm0 to -40 dBm0 -40 dBm0 to -45 dBm0	> 33 dB > 27 dB > 22 dB
System generated tones 0 < f < 16 kHz	< -50 dBm0

Parameter	Value
Minimum longitudinal balance (measured by IEEE Method 455-1976): <u>Frequency</u> 200 Hz to 1000 Hz 3000 Hz	<u>Longitudinal Balance</u> ≥ 58 dB ≥ 53 dB
Idle channel noise, end-to-end	≤ 20 dBmC
60 Hz Rejection (loss relative to loss at 1004 Hz)	> 20 dB
Cross talk (0 dBm0 input, 200 Hz to 3400 Hz)	-65 dBm0
Data pulse distortion, peak-to-average ratio (P/AR), End to end <i>SPQ401</i> () only	> 90 ≥ 94
Gain Tracking [‡] (relative to gain at 0 dBm0) -37 dBm0 to +3 dBm0 -50 dBm0 to -37 dBm0 -55 dBm0 to -50 dBm0	± 0.5 dB max. (± 0.25 dB avg.) ± 1.0 dB max. (± 0.5 dB avg.) ± 3.0 dB max. (± 1.5 dB avg.)

* At any other frequency, 0 to 12 kHz.

† At any other frequency, 0 to 4 kHz.

‡ At 1004 Hz, off-hook.

1 Note: End-to-end performance specified with *SPQ300* at COT, terminated with 900 ohms + 2.16 μF, except as noted.

Table 3. Environmental Specifications

<p>A. Temperature Range (Ambient)</p> <ol style="list-style-type: none"> 1. Operating, per TR-NWT-000057: in Lucent Technologies cabinet mounted RT, outside ambient temperatures of -40° F (-40° C) with no solar load to +115° F (46° C) with maximum solar load and maximum power dissipation. Lucent Technologies cabinets are designed to assure that the components within do not exceed their rated temperatures for the above conditions. 2. Storage, per TR-NWT-000057: ambient temperatures of -40° to 140° F (-40° to 60° C).
<p>B. Relative Humidity</p> <ol style="list-style-type: none"> 1. Operating, per TR-NWT-000057. For outside ambient temperature 84° F (29° C) or less, relative humidity of 5% to 95%. For ambient temperatures above 84° F (29° C), the relative humidity is limited to that corresponding to a specific humidity of 0.024 pounds of water per pound of dry air. 2. Storage, per TR-NWT-000057: ambient temperatures 84° F (29° C) or less, 10% to 95%. For ambient temperatures above 84° F (29° C), the relative humidity is limited to that corresponding to a specific humidity of 0.024 pounds of water per pound of dry air.

Table 4. Power drain for SPQ401() POTS CU

Condition (Normal Backplane Voltage)	Value
All channels idle: SPQ401 SPQ401B	1.6 W 1.7 W
Each added channel active (T/R resistance 600 ohms):	1.4 W*
First channel ringing	- 194 mW†
Two channels ringing	- 273 mW

* 0.47 W delivered to T/R load.

† SPQ401() power drain decreases by 194 mW.

Installation and Testing

There are no switches to set on this unit. Procedures for testing the unit are given in 363-208-001, *SLC-2000 Access System, User/Service Manual*.

The SPQ401() CU is compatible with mechanized loop testing (MLT) and the pair gain test controller (PGTC) and the extended test controller (XTC), operating in the PGTC mode, test systems.

The faceplate jack provides convenient test access to the tip (T) and ring (R) of all four channels (A, B, C, D).

Faceplate Features

The SPQ401B (RT) POTS channel unit faceplate is shown in Figure 1. The faceplate jack provides convenient test access to the tip and ring through a channel unit faceplate test cord, part number 400395M, available from Telecom Assistance Group, Inc., West Berlin, New Jersey; (1-800-824-7005). The following LED indicators are located on the faceplate:

The faceplate LEDs indicate as follows:

- **A BUSY** (Red LED): When lit, indicates that the A channel is busy.
- **B BUSY** (Red LED): When lit, indicates that the B channel is busy.
- **C BUSY** (Red LED): When lit, indicates that the C channel is busy
- **D BUSY** (Red LED): When lit, indicates that the D channel is busy

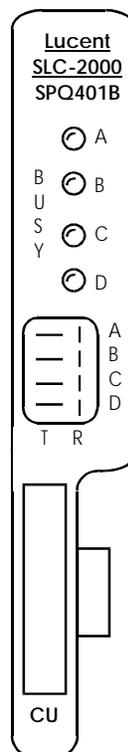


Figure 1. SPQ401B Faceplate Diagram

Table 5. Edge Connections For SPQ401() (RT) POTS Channel Unit

Finger	Function
1	Frame Ground
2	Ringling Ground
3	T2 (3rd channel)
4	R2 (3rd channel)
5	T3 (4th channel)
6	R3 (4th channel)
17, 20, 21	Circuit Ground
22, 23, 25, 50	+5 Volts DC
26	-48 Volts DC
27	Ringling
29	T1 (2nd channel)
30	R1 (2nd channel)
31	T (1st channel)
32	R (1st channel)
49	-5 Volts DC

References

The following documents provide additional information about the use of this channel unit in the *SLC-2000* Access System and the SDBAS:

363-205-004	<i>SLC-2000 Access System, Multi-Services Distant Terminal Feature, User/Service and Ordering Manual</i>
363-206-300	<i>DDM-2000 FiberReach Multiplexer — Applications, Planning, and Ordering Guide</i>
363-208-000	<i>SLC-2000 Access System Applications, Planning, and Ordering Guide</i>
363-208-001	<i>SLC-2000 Access System User/Service Manual</i>
363-208-003	<i>SLC-2000 Access System Command and Message Manual</i>
363-208-200	<i>Switched Digital Broadband Access System Applications, Planning, and Ordering Guide</i>
363-208-201	<i>Switched Digital Broadband Access System Release 1.01 Optical Network Unit User/Service Manual</i>

Technical Assistance

Follow local procedures for obtaining technical assistance. Lucent Technologies also provides in-hours or emergency out-of-hours help for the *SLC-2000* Access System and the SDBAS. Call the Lucent Technologies Regional Technical Assistance Center at 1-800-225-RTAC.

Ordering Information

Additional copies of this document (363-005-344) are available from the Customer Information Center — call 1-888-582-3688.

Comments

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Lucent Technologies
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