TN	OC03	SCIDS	0	67	58	125					
		Nodal Links	0	269	58	327		4.01	1.00	2.62	Avg Nodes
		Total STS-1s	0	807	174	981		52.0%	70.7%	14.2%	% of Total
		Spare STS-1s	0	451.44	97.54	548.98		44.1%	43.9%	44.0%	Util %
	OC12	SCIDS	0	10	6	16					
		Nodal Links	0	42	6	48		4.20	1.00	3.00	Avg Nodes
		Total STS-1s	0	504	72	576		32.5%	29.3%	8.3%	% of Total
		Spare STS-1s	0	215.26	37.21	252.47		57.3%	48.3%	56.2%	Util %
	OC48	SCIDS	44	2	0	46					
		Nodal Links	213	5	0	218	4.84	2.50		4.74	Avg Nodes
		Total STS-1s	5112	240	0	5352	100.0%	15.5%		77.5%	% of Total
		Spare STS-1s	2758.15	201.84	0	2959.99	46.0%	15.9%		44.7%	Util %
TN		SCIDS	44	79	64	187					
TN		Nodal Links	213	316	64	593	4.84	4.00	1.00	3.17	Avg Nodes
TN		Total STS-1s	5112	1551	246	6909	100.0%	100.0%	100.0%	100.0%	% of Total
TN		Spare STS-1s	2758.15	868.54	134.75	3761.44	46.0%	44.0%	45.2%	45.6%	Util %
Total		SCIDS	237	321	374	932					
Total		Nodal Links	1198	1194	374	2766	5.05	3.72	1.00	2.97	Avg Nodes
Total		Total STS-1s	28752	12831	2184	43767	100.0%	100.0%	100.0%	100.0%	% of Total
Total		Spare STS-1s	16347.99	6721.02	1065.15	24134.16	43.1%	47.6%	51.2%	44.9%	Util %

B. *Network Architecture Drawings*

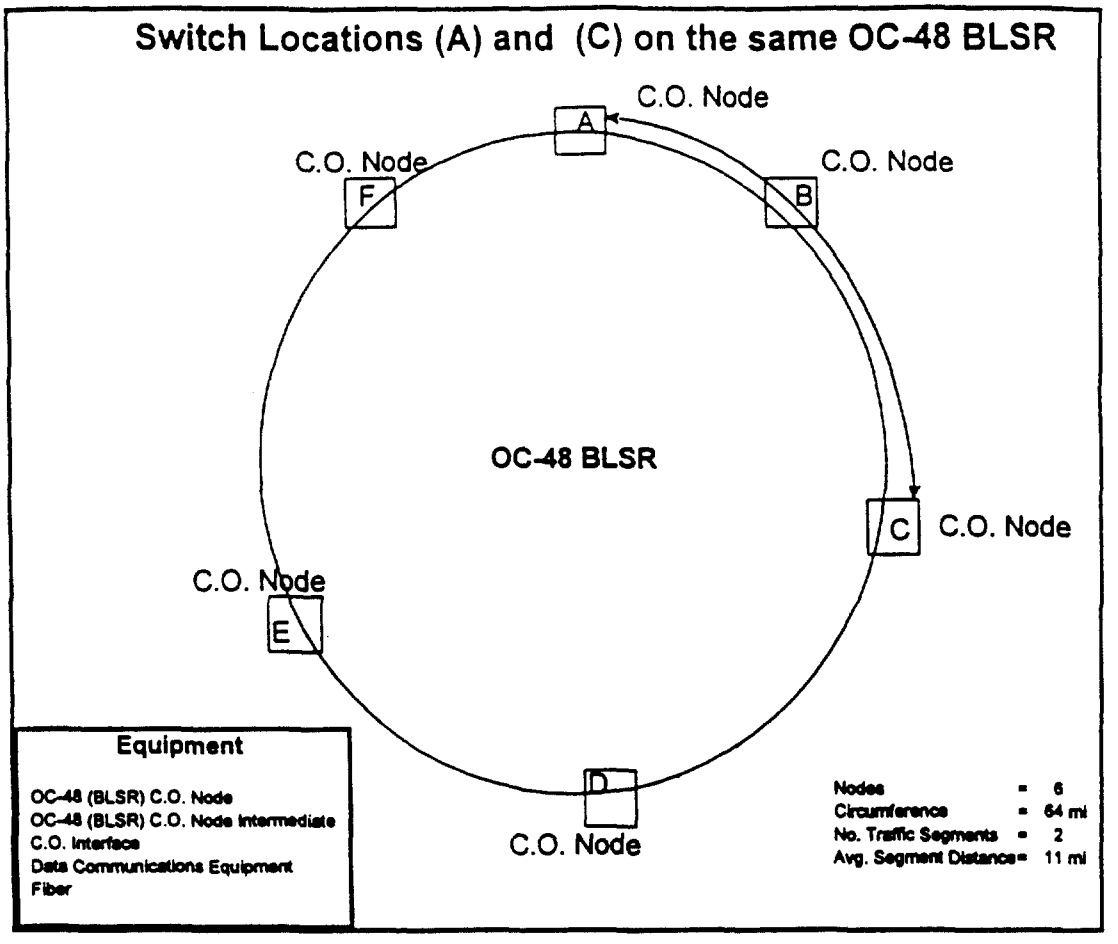

Figure II-1. Switch Locations on the same OC-48 BLSR

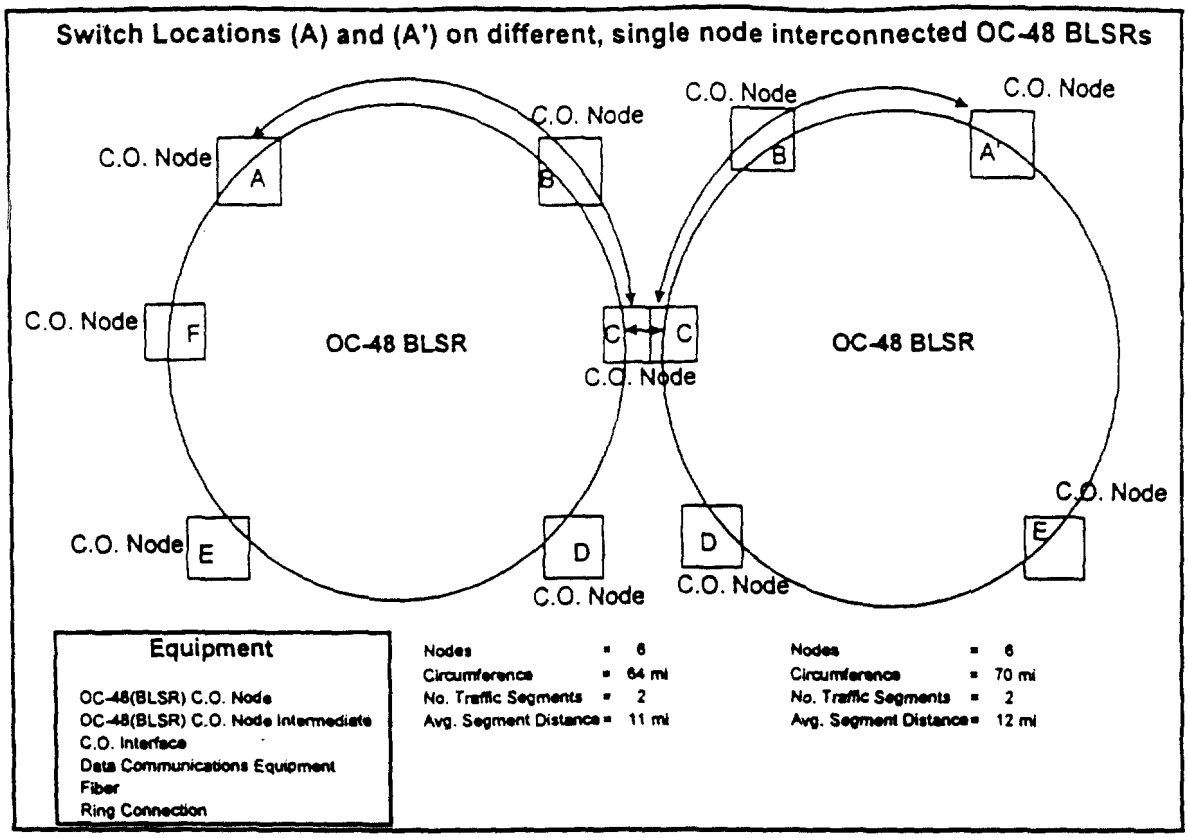

Figure II-2. Switch Locations on different, single node interconnected OC-48 BLSRs

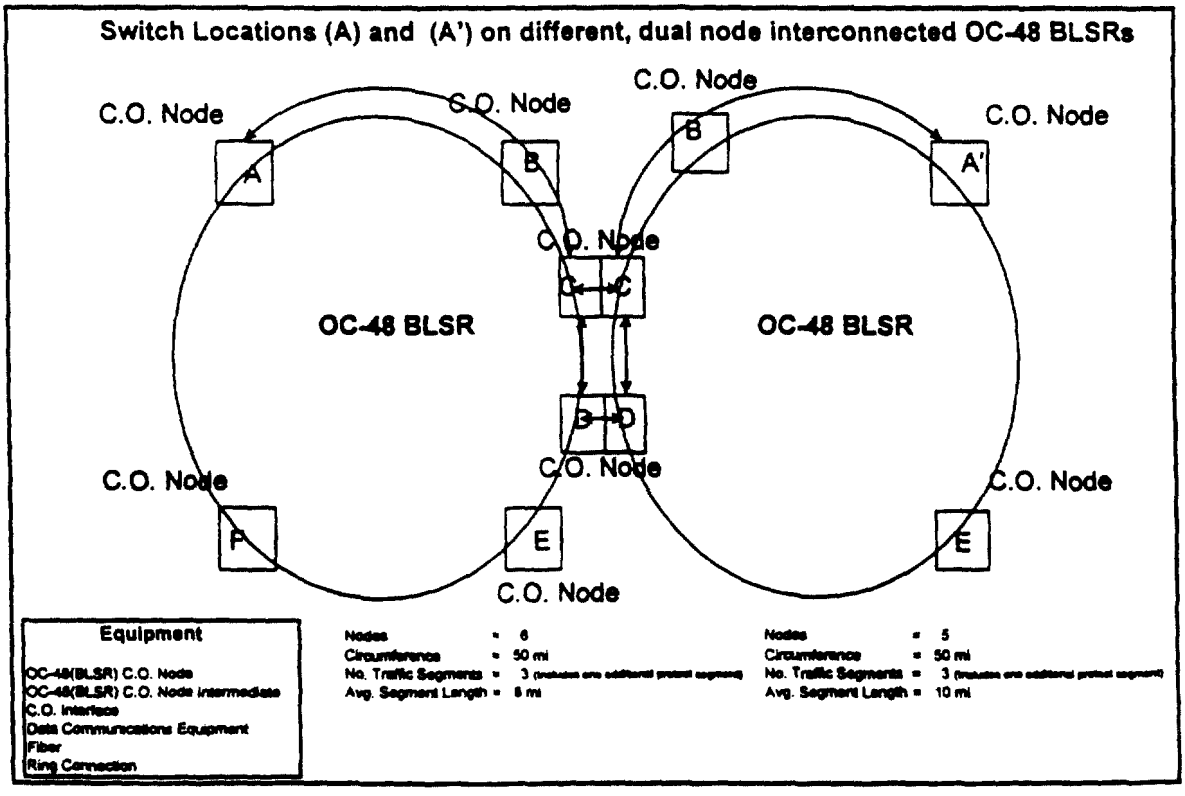

Figure II-3. Switch Locations on different, dual node interconnected OC-48 BLSRs

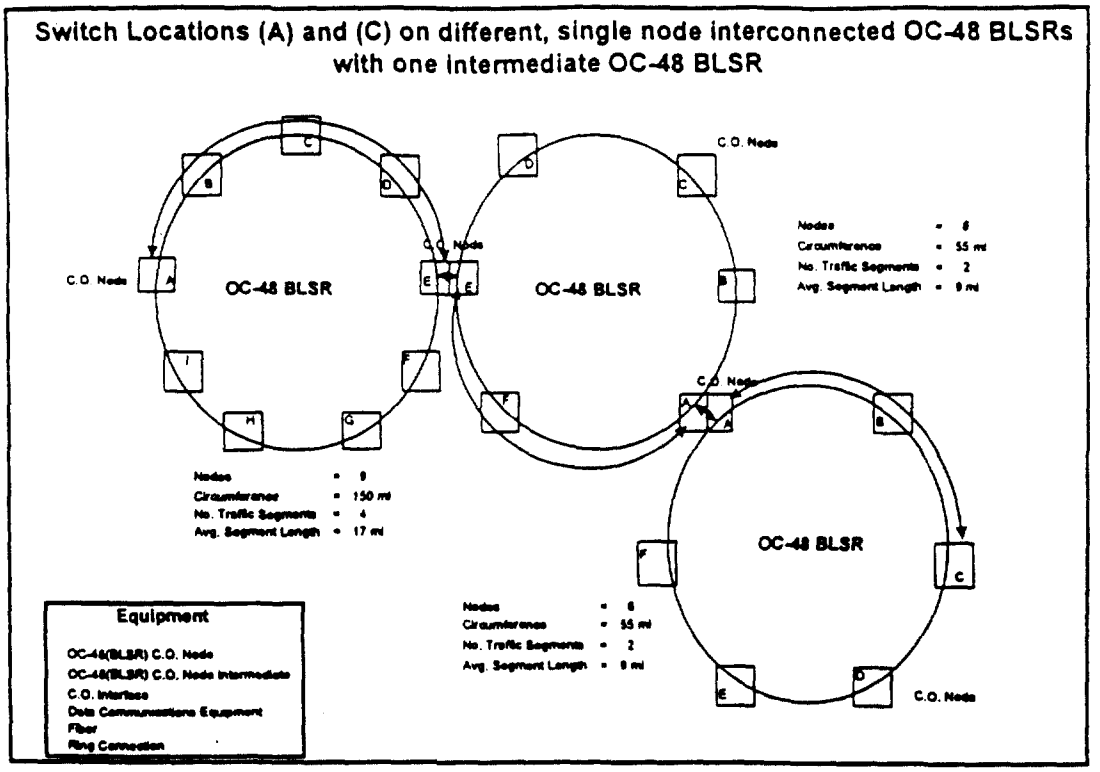

Figure II-4. Switch Locations on different, single node interconnected OC-48 BLSRs with one intermediate OC-48 BLSR

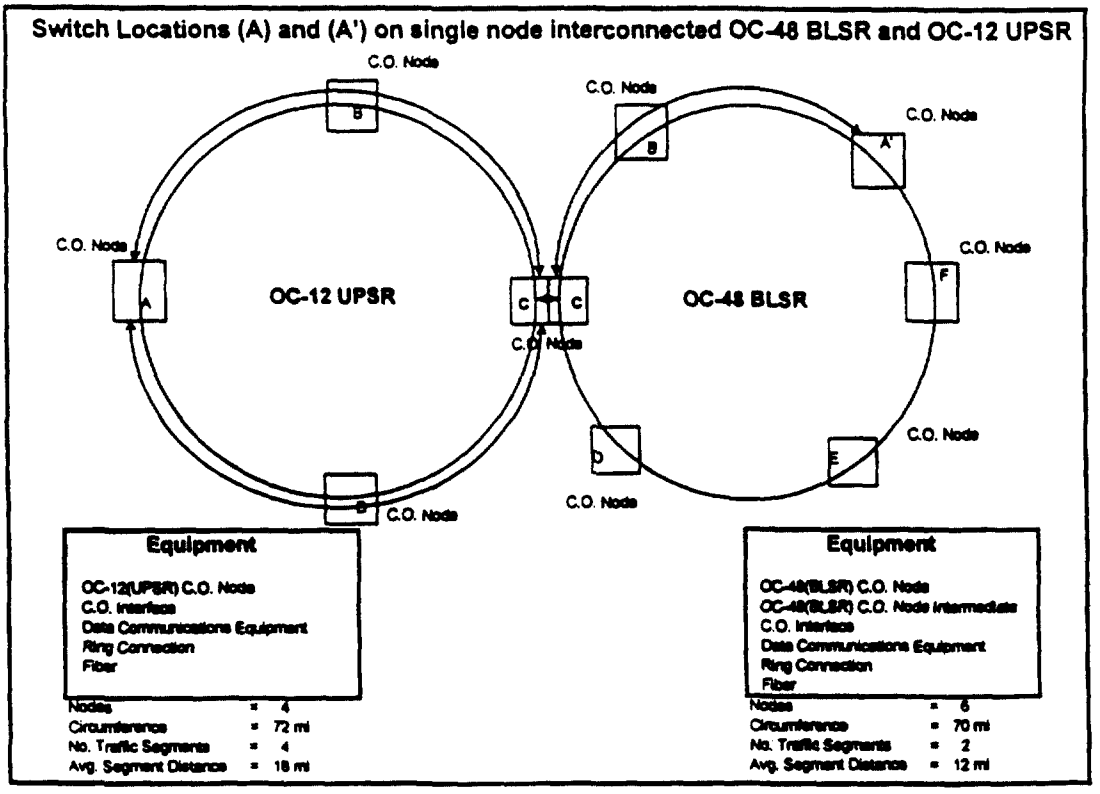

Figure II-5. Switch Locations on single node interconnected OC-48 BLSR and OC-12 UPSR

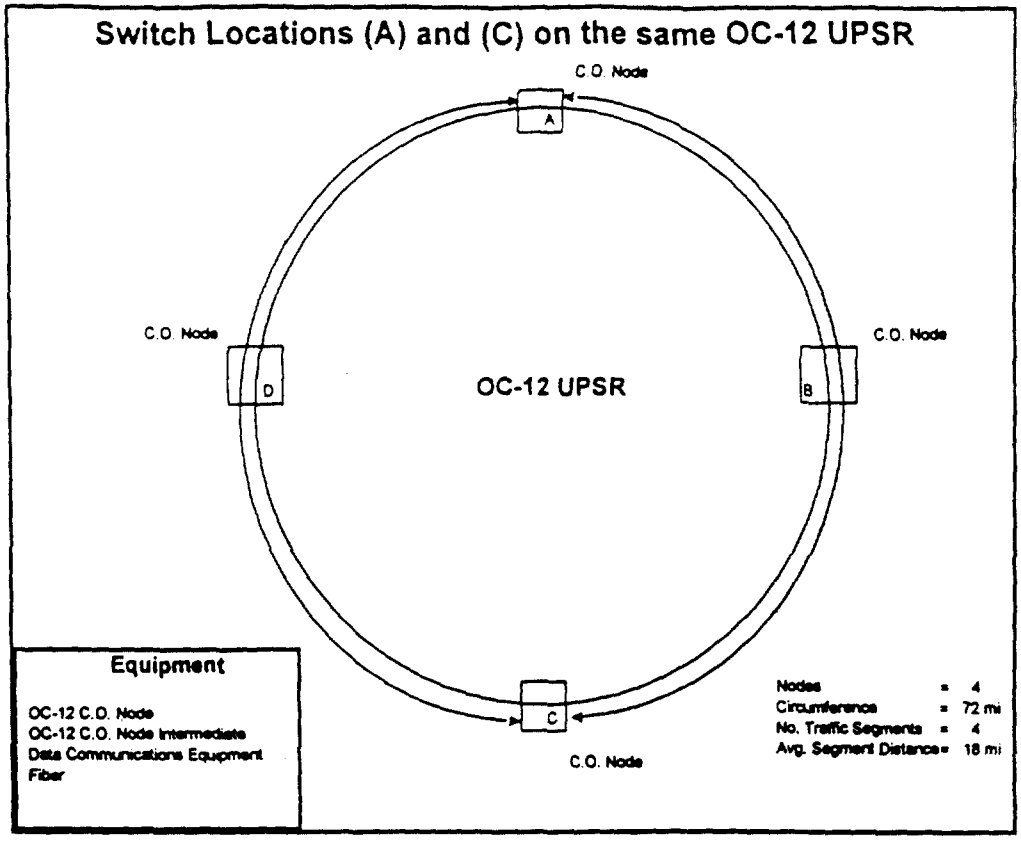

Figure II-6. Switch Locations on the same OC-12 UPSR

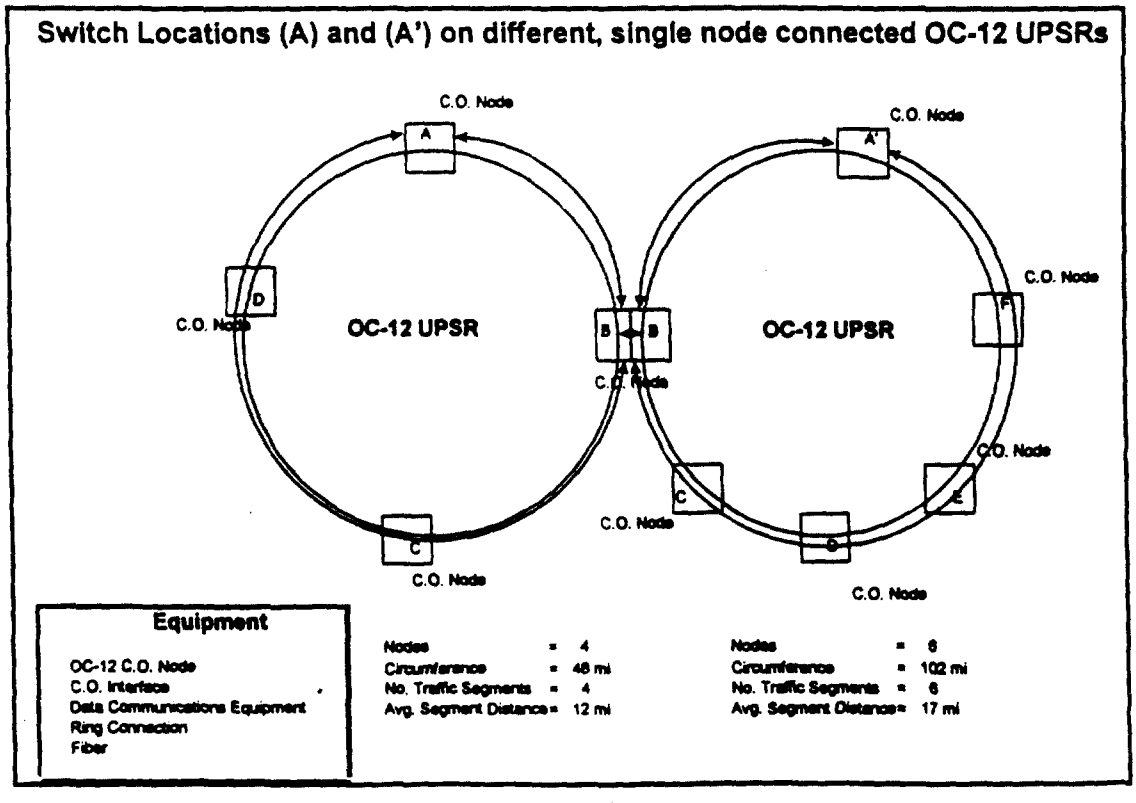

Figure II-7. Switch Locations on different, single node interconnected OC-12 UPSRs

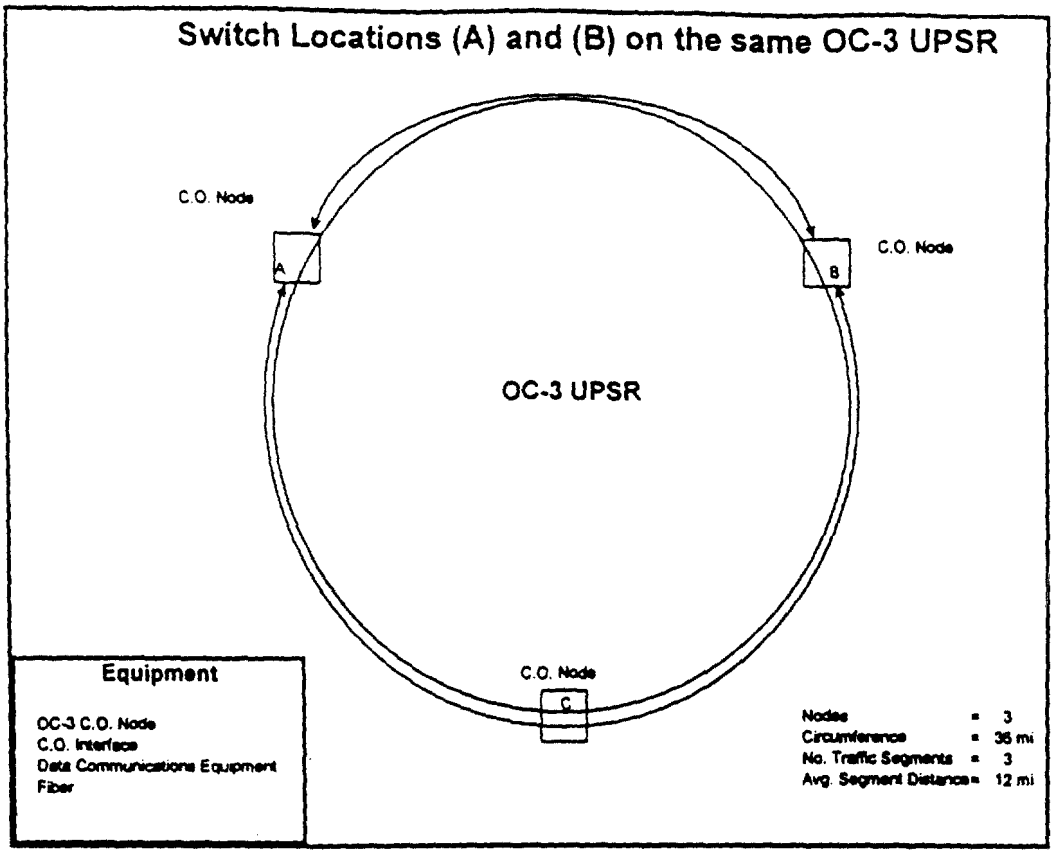

Figure II-8. Switch Locations on the same OC-3 UPSR

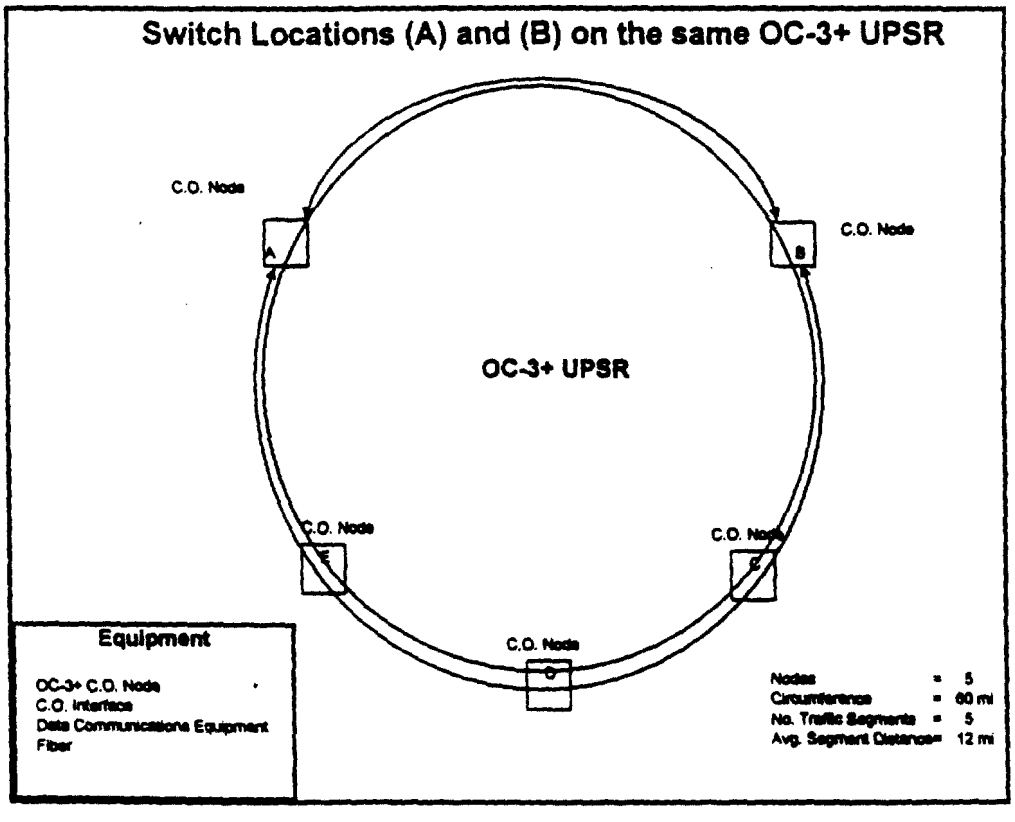

Figure II-9. Switch Locations on the same OC-3+ UPSR

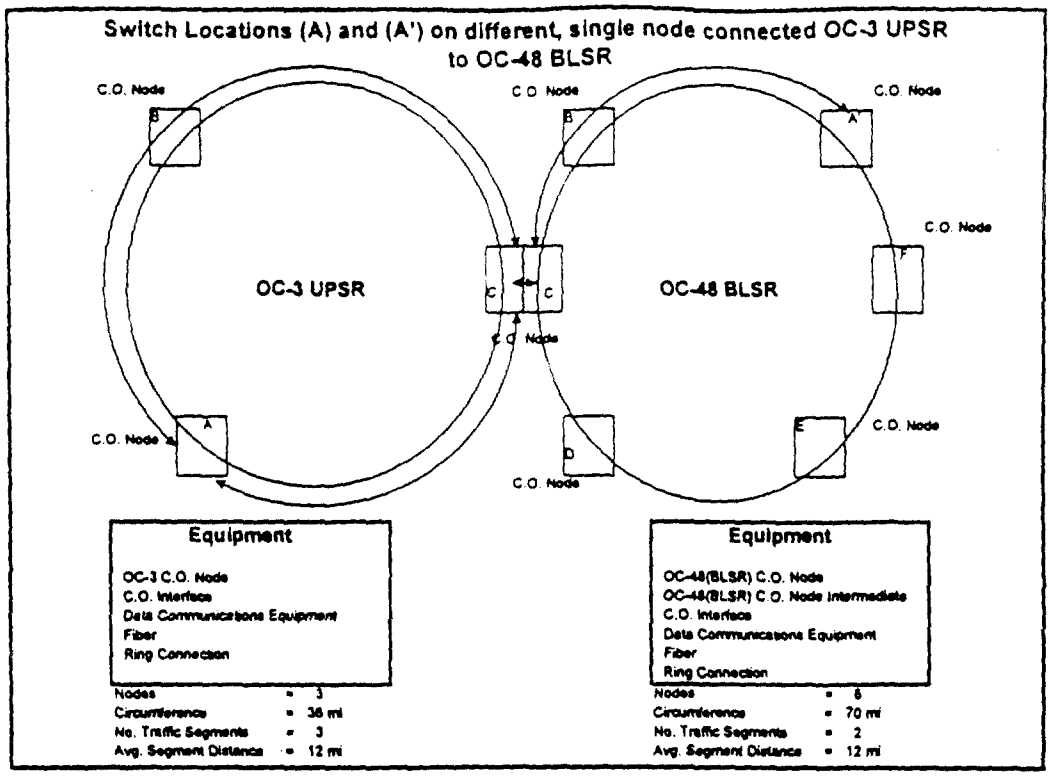

Figure II-10. Switch Locations on single node interconnected OC-48 BLSR and OC-3 UPSR

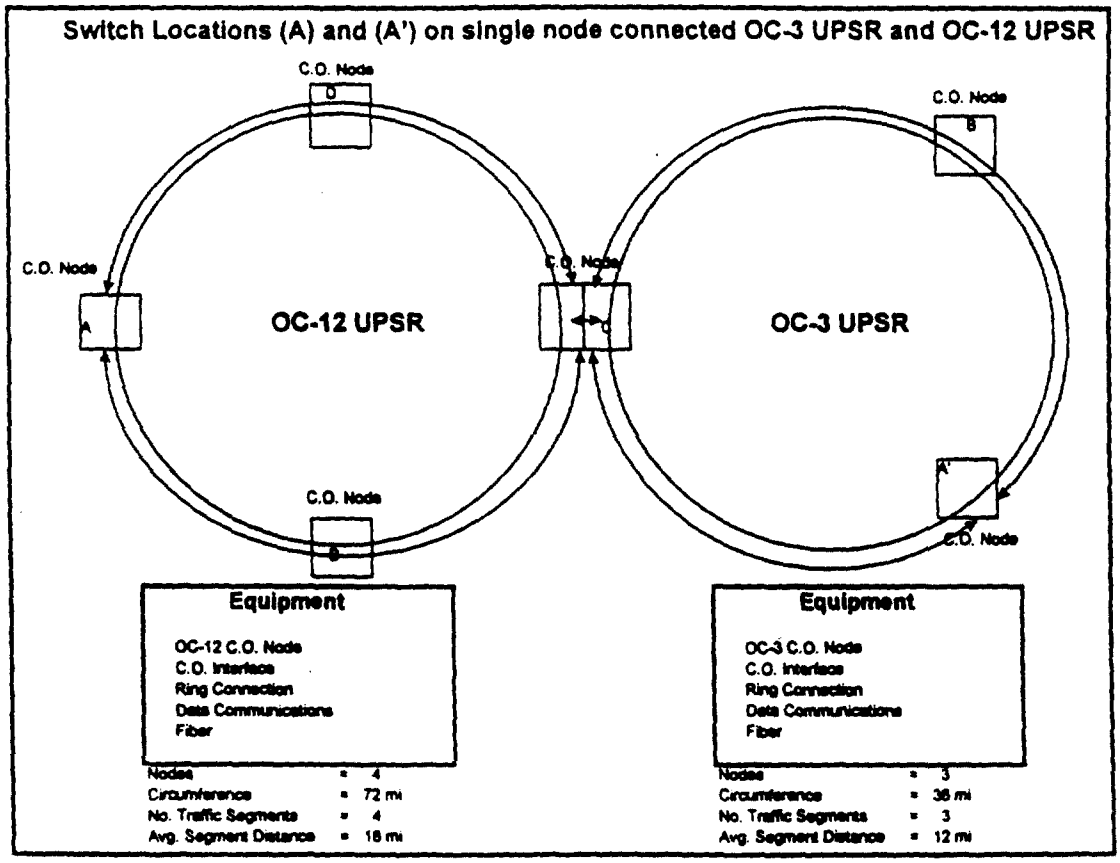

Figure II-11. Switch Locations on single node interconnected OC-12 and OC-3 UPSRs

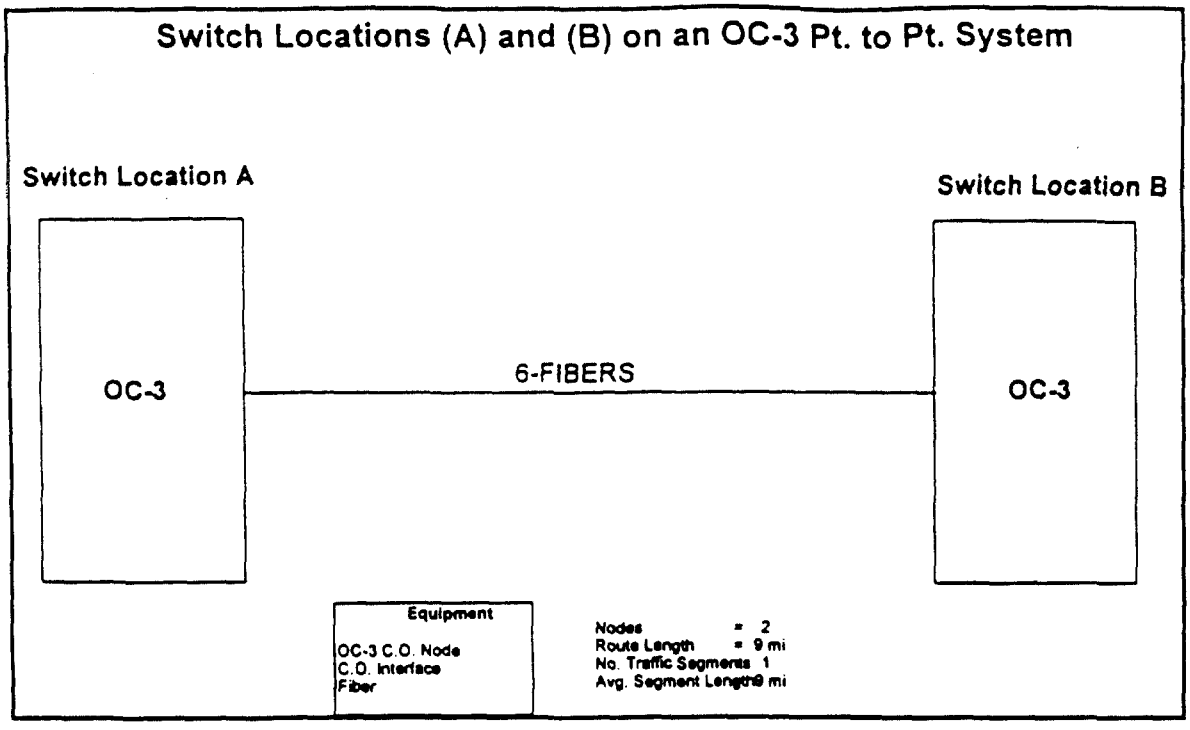

Figure II-12. Switch Locations on and OC-3 Pt.-to-Pt. System

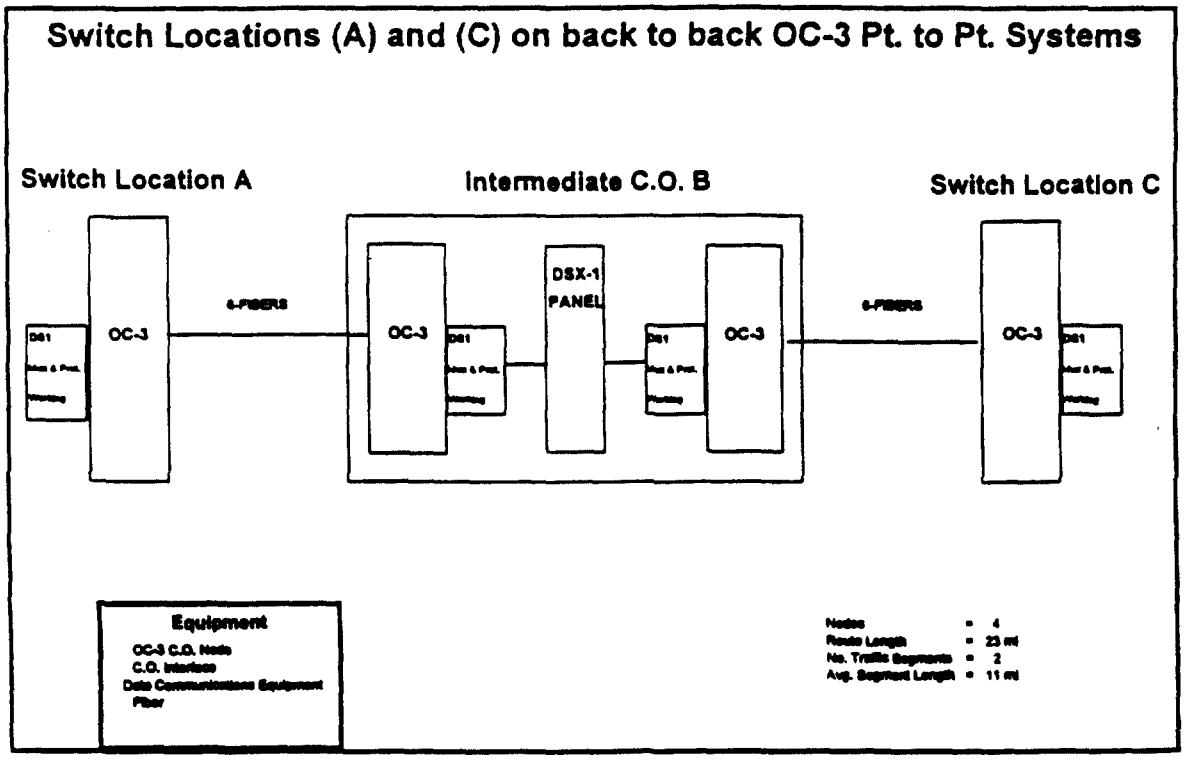

Figure II-13. Switch Locations on back to back OC-3 Pt.-to-Pt. Systems

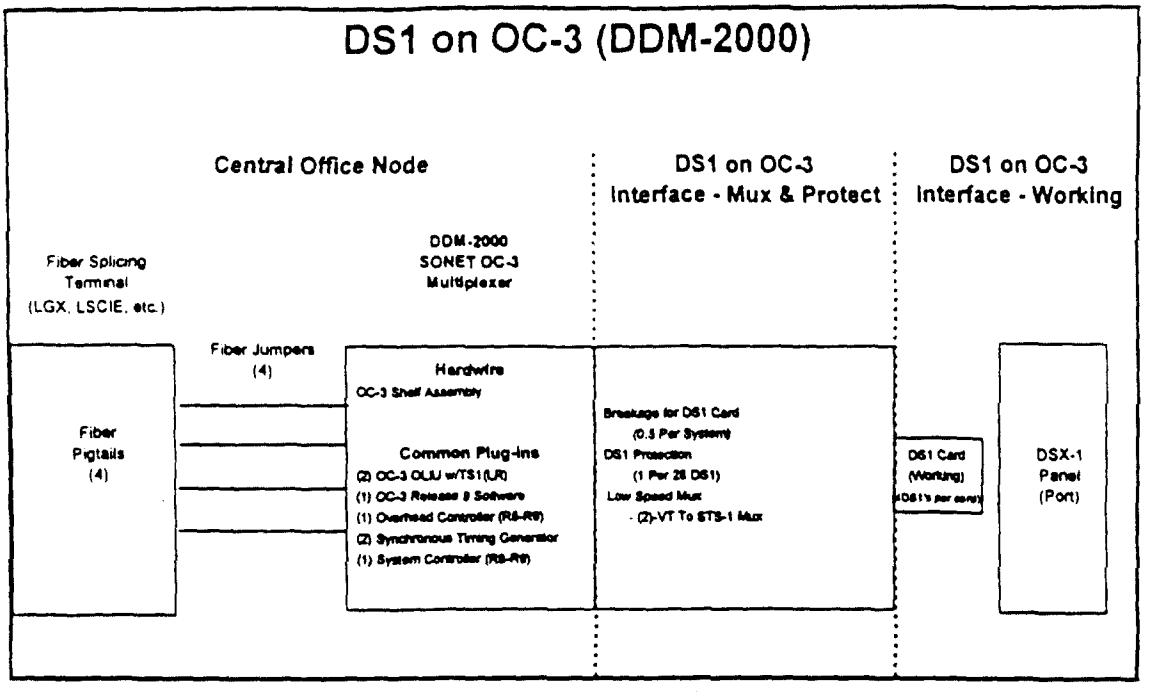

Figure II-14. DS1 on OC-3 (DDM-2000)

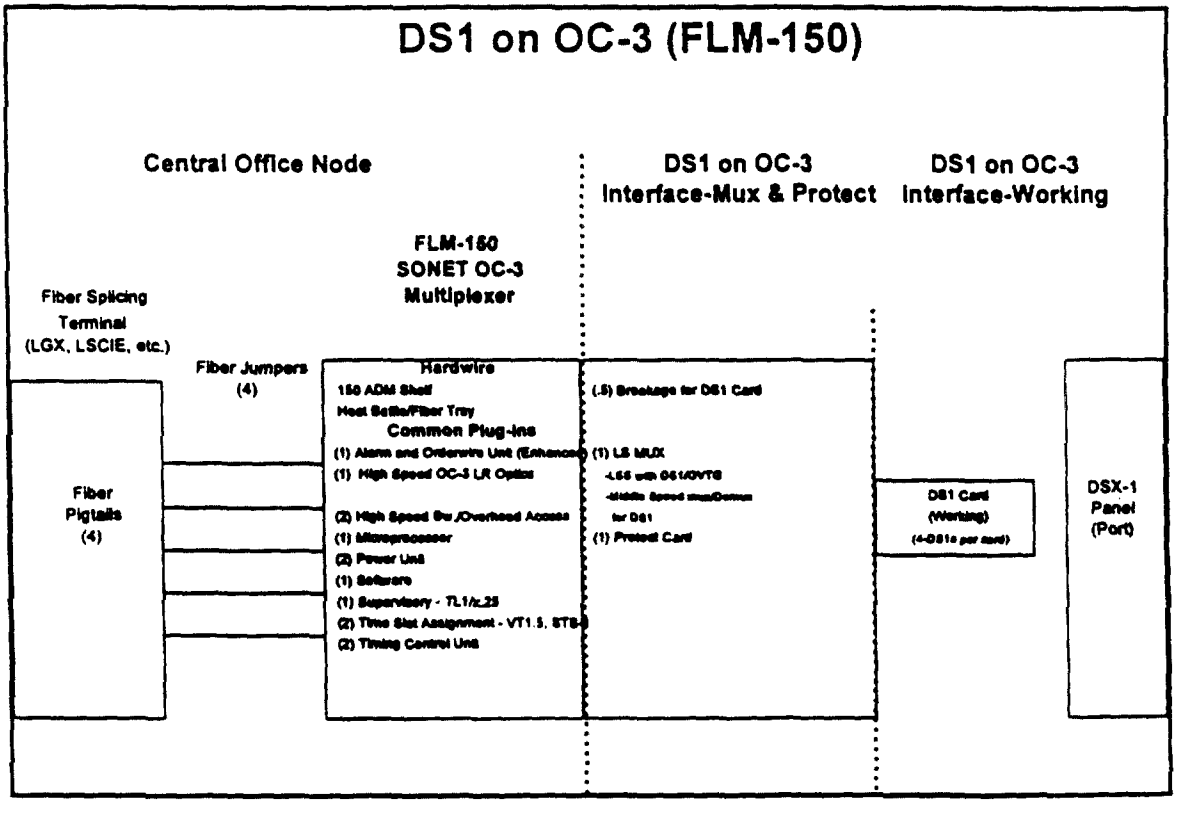

Figure II-15. DS1 on OC-3 (FLM-150)

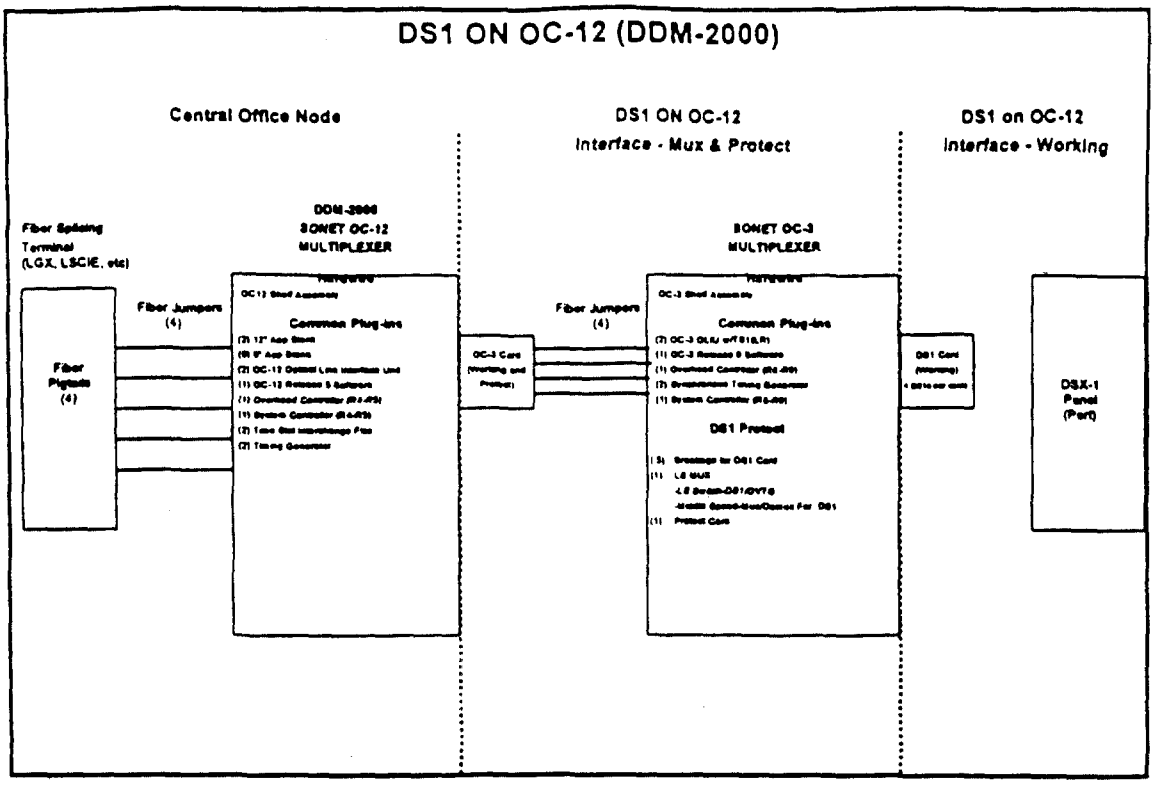

Figure II-16. DS1 on OC-12 (DDM-2000)

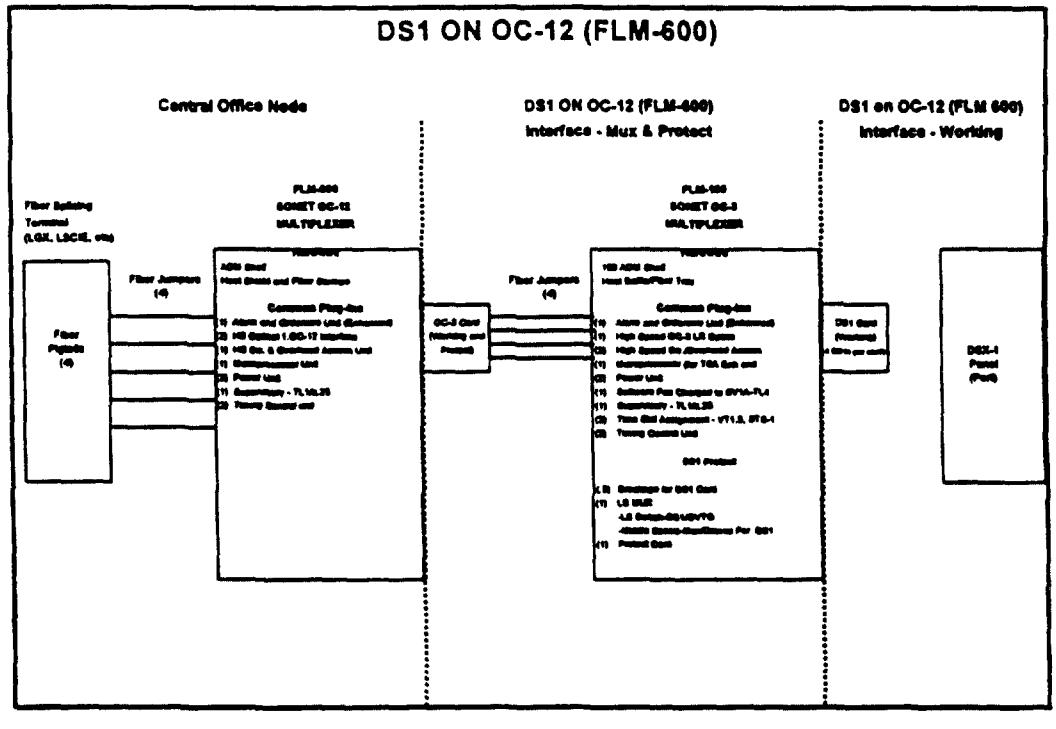

Figure II-17. DS1 on OC-12 (FLM-600)

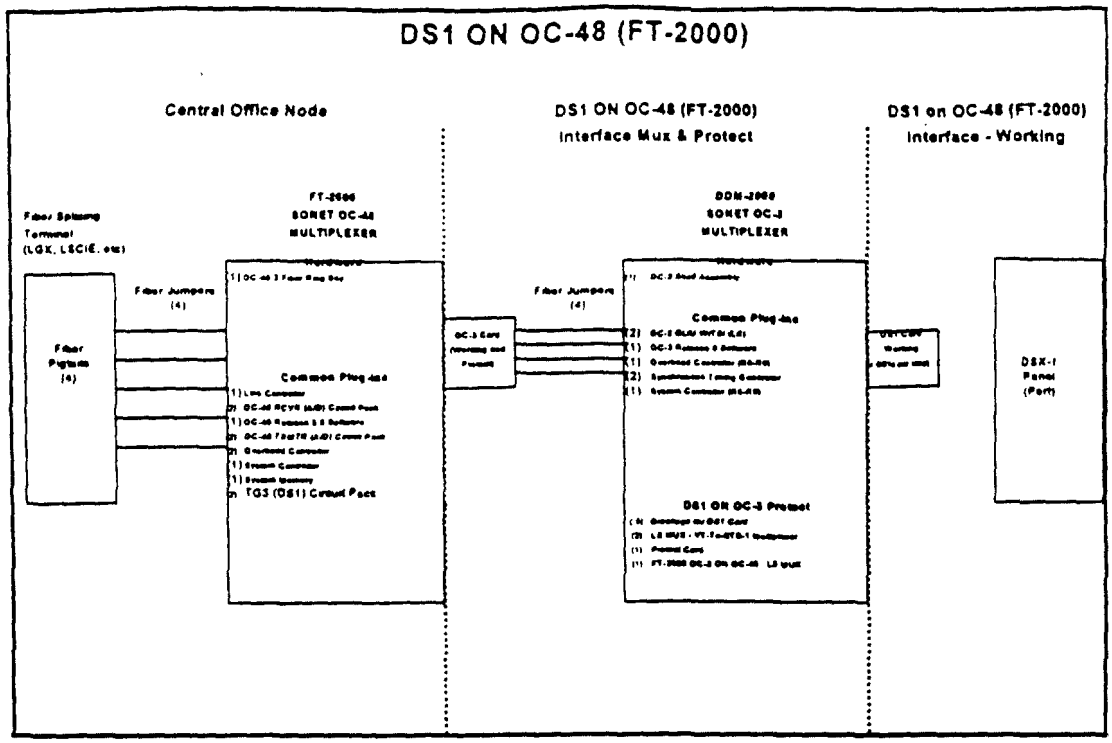

Figure II-18. DS1 on OC-48 (FT-2000)

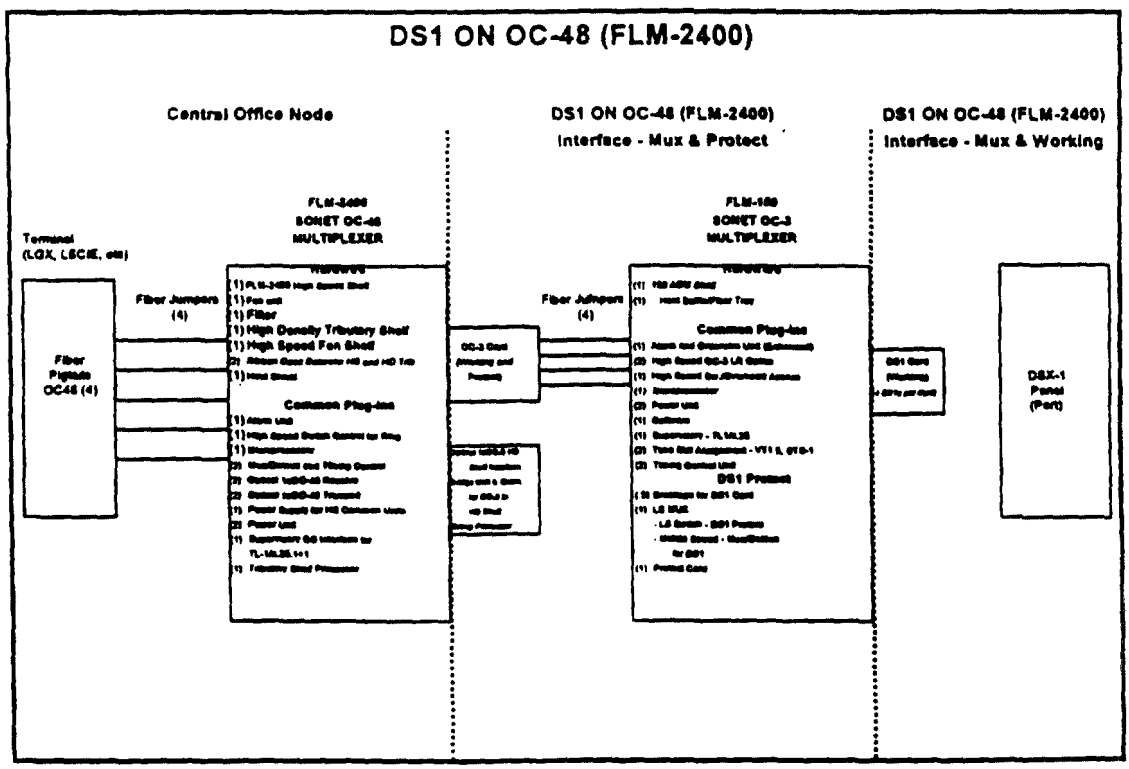

Figure II-19. DS1 on OC-48 (FLM-2400)

C. *Operational Support Systems (OSS) Requirements*

- Existing: TIRKS, NMA, WFA
- New: None

D. *Software:*

- % or Generic upgrade buy-out assigned per UNE

III. PERFORMANCE STANDARDS/RELIABILITY

A. General Description of Performance Standards and Reliability

Service Performance Objectives:

- This UNE will be designed to meet the transmission standards in our technical publications similar to those facilities used for Switched Access Dedicated interoffice transport.

Diversity Requirements:

- No requirements for UNEs but level of diversity will exist in BST network (embedded and forward looking)

Performance Monitoring

No specific requirement, however, network element will be monitored as part of BST network infrastructure. BellSouth will not guarantee any level of monitoring.

Special Considerations

- Billing Guarantees do not apply - there will be CABS cost to exclude UNEs from current processes

IV. ORDERING, ADMINISTRATIVE, MAINTENANCE , AND PROVISIONING (OAM&P)

A. *Intervals for Installation, Repair*

Installation: Same as for tariffed DS0, DS1, and DS3 transport services or as specified in contract. Expedite charge for short intervals

Ordering for this UNE will be handled electronically. If the customer orders this UNE utilizing manual processes, an additional charge will be applicable.

Repair: Same as for tariffed DS0, DS1, and DS3 transport services or as specified in contract.

B. *Description of Centers affected and their roles*

Local Carrier Service Center (LCSC)
ASR/LSR will be received, Service Inquiry initiated (in some cases)
Service Order Issuance, Send FOC to CLEC

Circuit Capacity Management (CCM)
Service Inquiry received and answered, CLFs built if required

Circuit Provisioning Group (CPG)
Circuit Designed, WORD Document Issued, DLR generated to CLEC

Central Office Work Group (COWG)
Circuit Installed based on WORD, Circuit Repaired based on WFA ticket

Access Customer Advocacy Center (ACAC)
Receive Trouble Reports, Perform Remote Testing, Issue WFA ticket

AT&T	1/800-517-2511
MCI	1/800-517-5038
Sprint	1/800-988-1402
General Carriers	1/800-307-2513

When reporting a trouble associated with UIT-D:

-Advise the center that the trouble is for Unbundled Interoffice Transport
-Provide the CLEC contact name and call back number
-Provide the BellSouth Circuit ID
-Provide the details of the trouble

Preliminary

Unbundled Interoffice Transport (UIT) - Technical Specifications

Technical Reference

March, 1997

NOTICE

This Technical Reference describes Unbundled Interoffice Transport (UIT). This Unbundled Network Element (UNE) provides a transmission path between BellSouth Telecommunications, Inc. (BST) end offices that allows a Competitive Local Exchange Carrier (CLEC) to transport DS0s (Voice or Data), Basic Rate Integrated Services Digital Network (ISDN-BRI), DS1s, or DS3s from one location to another.

BST reserves the right to revise this document for any reason, including but not limited to, conformity with standards promulgated by various governmental or regulatory agencies, utilization of advances in the state of the technical arts, or the reflection of changes in the design of any equipment, techniques, or procedures described or referred to herein. Liability to anyone arising out of use or reliance upon any information set forth herein is expressly disclaimed, and no representations or warranties, expressed or implied, are made with respect to the accuracy or utility of any information set forth herein.

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If further information is required, please contact:

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Birmingham, AL 35244

Unbundled Interoffice Transport (UIT)
Technical Specifications

Contents

Unbundled Interoffice Transport (UIT) Technical Specifications

1. General

This document provides the technical specifications for Unbundled Interoffice Transport (UIT) offered by BellSouth Telecommunications, Inc. (BST). This Network Element (UNE) provides a transmission path, and its associated electronics, between BST end offices that allows Competitive Local Exchange Carrier (CLEC) to transport DS0s (Voice or Data), Basic Rate Integrated Services Digital Network (ISDN-BRI), DS1s, or DS3s from one location to another. These facilities may be configured in various transmission configurations and will provide the same transport capacities that exist in Section 6 of the FCC tariff (i.e., DS0, DS1, and DS3). The structure of this UNE will also be consistent with existing interoffice transport elements in BST's FCC tariff.

The requirements in this document were developed to establish a practical interface. Compliance with these specifications should provide a satisfactory interface in a high percentage of installations. If cases arise that have not been adequately addressed in this document, any resulting problems should be resolved through the cooperation of the user, BellSouth Telecommunications, Inc. (BST) and equipment suppliers. BST encourages customer participation to ensure an orderly, functional and mutually trouble-free interface at all locations.

1.1 Scope

This Technical Reference (TR) describes physical, protocol and performance requirements at the Network Interface (NI) necessary for compatible operation between BST and Competitive Local Exchange Carriers (CLECs). This TR describes DS0, DS1 and DS3 UIT Service interfaces offered by BST. Customers should consult the tariff or a Marketing Representative for availability.

1.2 Use of This Document

Network Interface (NI) specifications have been established based upon Industry Standards developed by the American National Standards Institute (ANSI) and Bellcore. This TR articulates BST variations from these standards and provides clarification of interface requirements as necessary.

(Next two paragraphs could be deleted)
This document provides NI compatibility requirements and is not an equipment specification. The NI information in this document complements the equipment information in Part 68, Subpart D, of the FCC Rules and Regulations which contains requirements for the registration of customer-installation equipment to protect the network from harm. Tariffs, contracts, or regulatory acts in various jurisdictions may contain more stringent requirements than those in this document.

The physical connection of customer-provided equipment is addressed in the paragraphs of this TR that describe the mechanical interface and in Part 68, Subpart F, of the FCC Rules and Regulations as supplemented by Public Notice 2526 (February 1986) and in Committee T1 Technical Report Number 5.

2. Service Description

This UNE provides a transmission path, and its associated electronics, between BST end offices. These facilities may be configured in various transmission configurations (I.e., DS0, DS1, and DS3) based on total shared network requirements between end offices. CLECs can utilize UIT to transport their local, toll and access traffic between BST central offices. Depending on the distance between the end offices and the total service demands required, different combinations of SONET interoffice facilities will be utilized to transport these dedicated facilities.

3. UIT DS0 Channelization

UIT DS0 Transport is a family of services within a Local Access Transport Area (LATA) that utilize a 1.544 Megabit per second digital bit stream (DS1) for simultaneous two-way transmission between BST end offices. It uses a serial, bipolar, return-to-zero, isochronous, digital facility.

UIT channelization capability for the customer in a central office. It is provided in packages based on multiple voice grade channel equivalents (DS0) where 24 voice grade channels are equal to a DS1. This service provides local channels and/or interoffice channels for **(review this list of services)** network exchange access, Broadband Exchange Line Service, Foreign Exchange Service, ESSX® Service station lines, off-premises stations, tie lines, WATS lines, analog data channels, and digital data services at 2.4 Kbit/s, 4.8 Kbit/s, 9.6 Kbit/s, 19.2 Kbit/s, 56 Kbit/s, 64 Kbit/s and 1.544 Mbit/s data rates.

Technical specifications for DS1 Central Office Channelization are contained in BellSouth Technical Reference 73602, *Unbundled Channelization (UC) Technical Specifications.*

4. DS1 UIT

This section defines the DS1 UIT requirements. It denotes existing documentation which details electrical and signal specifications and provides BST variations and clarifications. At the NI the electrical requirements for the BST and customer signal are the same. The physical layer of the DS1 NI is delineated in the following specifications. The physical layer of the DS1 NI is delineated in the following specifications.

GR-342-CORE	*High-Capacity Digital Special Access Service Transmission Parameter Limits and Interface Combinations*

A sketch of the DS1 NI is shown in Figure 1. The signal delivered to the NI by BST is identified as the BST signal, and the signal delivered to the NI by the customer is identified as the CI signal.

4.1 Framing Format

The DS1 signal must be framed in either the Superframe (SF) format or the Extended Superframe (ESF) format. The same framing format shall be used in both directions of transmission. Use of American National Standard Institute (ANSI) T1.403 ESF is strongly recommended to support improved testing and in-service performance monitoring.

4.2 Clear Channel Capability

BST uses the Bipolar with Eight Zero Substitution (B8ZS) method to provide a Clear Channel Capability (CCC). This supports transport of a framed DS1 signal with unconstrained payload bits. BST does not support the Zero-Byte Time Slot Interchange (ZBTSI) method of providing CCC.

4.3 Mechanical Interface

One balanced twisted pair shall be used for each direction of transmission. Interconnection at the DS1 NI. An appropriate DS1 rate digital cross connect panel may function as the interconnection arrangement at the NI.

4.4 Maintenance Signals

Maintenance signals are transmitted in-band and in the data link of the ESF format. ANSI T1.403 provides additional information regarding specific maintenance, alarm and loopback signals.

5. DS3 UIT

This section defines the DS3 UIT requirements. It denotes existing documentation which details electrical and signal specifications and provides BST variations and clarifications. At the NI the electrical requirements for the BST and customer signal are the same. The physical layer of the DS3 NI is delineated in the following specifications.

GR-342-CORE *High-Capacity Digital Special Access Service Transmission Parameter Limits and Interface Combinations*

A sketch of the DS3 NI is shown in Figure 2. The signal delivered to the NI by BST is identified as the BST signal, and the signal delivered to the NI by the customer is identified as the CI signal.

5.1 Framing Format

The DS3 signal must be framed utilizing the framing structure define in ANSI T1.107 & T1.107a, *Digital Hierarchy Formats Specifications*, and ANSI T1.404. The asynchronous M13 multiplex format (combination of M12 and M23 formats) is specified for terminal equipment that multiplexes 28 DS1s into a DS3.

5.2 Mechanical Interface

One coaxial cable is provided for each direction of transmission. The reference cable is 75 ohm coaxial cable with tinned copper meeting the requirements specified in ANSI T1.102, *Digital Hierarchy - Electrical Interfaces*. An appropriate DS3 rate digital cross connect panel may function as the interconnection arrangement at the NI.

5.3 Maintenance Considerations

Customer equipment shall provide the capability of generating and interpreting standard DS3 signals, alarm/defect indication signals and P-bit performance monitoring as defined in ANSI T1.404.

6. Powering Arrangements

Direct-current power shall not be delivered to the NI by either BST or the CI. The CI shall not apply voltages to the NI other than those described in this specification.

7. Channelization Standards

In order to assure proper operation with BST provided central office multiplex, the customer's channelization equipment must adhere strictly to form and protocol standards. Separate standards exist for the multiplex channel bank, for voice frequency encoding, for various signaling schemes, and for subrate digital access. These standards are documented in BellSouth Technical Reference 73602, *Unbundled Channelization (UC) - Technical Specifications*.

8. Synchronization

To insure proper operation when connected to the BST digital network, channelized DS1 circuits should follow the guidelines of Bellcore GR-436-CORE, *Digital Network Synchronization Plan*. Timing information may be transmitted as part of the DS1 signal. Improper timing will result in transmission impairing slips which can cause loss of data information.

End-User synchronization may be achieved by deriving timing from a BST channelized DS1, by deriving timing from a different DS1 traceable to a Primary Reference Source (PRS) and timing all other facilities from it, or by providing timing traceable to a PRS. For BST services with central office channelization, it has been recommended that the customer equipment be loop-timed (slaved) to the incoming bit stream from the network.

It is important to note that Synchronous Optical Network (SONET) facilities may be used to transport MegaLink or MegaLink Channel Service. SONET facilities may introduce DS1 phase transients as a result of pointer adjustments. Characteristics of the phase transients at the Network Interface have been addressed in the latest version of ANSI T1.403. Customer equipment must be capable of accommodating these phase transients.

Further information about phase transients due to SONET pointer adjustments is contained in ANSI T1.403.

9. Performance

The performance objectives for Unbundled Interoffice Transport (UIT) Service is stated in terms of Error Free Seconds (EFS), Severely Errored Seconds (SES), and Service Availability. The objective pertains to the BST provided DS0, DS1, and DS3 service on the network side of the NI in Figure 1. The performance of DS1 subrate services are covered in documents that pertain to those services. Verification of circuit performance up to the NI may be performed by BST using a variety of testing techniques.

Performance of customer provided cable and equipment on the CI side of the NI is not the responsibility of BST. Proper performance of the network circuit at the NI does not imply that the same performance will occur at some other location on the CI side of the NI, which may be some distance away over connecting cable and equipment.

9.1 Error Free Seconds

An EFS is defined as any second in which there is no bit errors. Conversely, an Errored Second (ES) is one in which there is one or more bit errors. ES are typically transient in nature, arise from a variety of causes, and have a small probability of occurring at any given time. EFS objectives are long term, i.e. 30 days or more.

9.2 Severely Errored Seconds

A SES is defined as any second in which the Bit Error Ratio (BER) is $1X10^{-3}$ or worse. BER is the ratio of the number of logical bit errors received to the total number of bits transmitted in a given time interval. The SES objectives are long term.

9.3 Annual Service Availability

Circuit Availability is a measure of the amount of time that the service is "usable" by the customer. According to the American National Standards Institute (ANSI) a service is assumed to be in the available state unless a transition to the unavailable state is observed without a subsequent transition to the available state. The transitions between the available and unavailable states are:

- Transition to the unavailable state occurs at the beginning of 10 consecutive SES.
- Transition to the available state occurs at the beginning of 10 consecutive seconds, none of which is a SES

9.4 Quality Objectives

Service quality objectives are stated in terms of: Error Free Seconds (EFS), Severely Errored Seconds (SES) and Annual Service Availability.

9.4.1 DS0 Objectives

DS0 performance objectives for are contained in Table 8-1.
(Need Availability Number)

Table 8-1. DS0 Unbundled Interoffice Transport Quality Objectives
(DS0 Long-Term Performance)

Performance Parameter	End Office to End Office Objectives
%Error Free Seconds (% EFS)	EFS>99.9%
%Severely Errored Seconds (%SES)	SES<0.010%
%Annual Service Availability	Availability> XXXX%

9.4.2 DS1 Objectives

DS1 performance objectives are contained in Table 8-2.

Table 8-2. DS1 Unbundled Interoffice Transport Quality Objectives
(DS1 Long-Term Performance)

Performance Parameter	End Office to End Office Objectives
%Error Free Seconds (% EFS)	EFS>99.75%
%Severely Errored Seconds (%SES)	SES<0.010%
%Annual Service Availability	Availability> 99.925%

9.4.3 DS3 Objectives

DS3 performance objectives are contained in Table 8-3.

Table 8-3. DS3 Unbundled Interoffice Transport Quality Objectives
(DS3 Long-Term Performance)

Performance Parameter	End Office to End Office Objectives
%Error Free Seconds (% EFS)	EFS>99.50%
%Severely Errored Seconds (%SES)	SES<0.010%
%Annual Service Availability	Availability> 99.99%

10. Operational Maintenance

Maintenance of BST provided circuits on the network side of the NI is the responsibility of BST. In the event of reported trouble, an attempt to diagnose and isolate the source of the trouble will be made with a variety of verification and testing techniques. Once the trouble has been confirmed and isolated a dispatch will be made to correct it.

The greatest difficulty occurs in situations where trouble reports cannot be confirmed by remote diagnostics. The company will offer to test and dispatch for additional testing, but with the understanding that maintenance charges may apply. The trouble resolution process will be slowed considerably.

This situation is of course frustrating to the customer as well as to telephone company. It is in the customer's interest to try to avoid requesting the telephone company to expend time attempting to isolate a problem that may exist in the customer's equipment.

For DS1 Service the use of ANSI T1.403-1989 ESF capabilities in conjunction with proper test equipment supports improved testing, maintenance and in-service performance monitoring capabilities. This enhances the likelihood of achieving the circuit quality objectives.

11. Maintenance Signals

Maintenance signals are transmitted in-band in the SF format and in the data link of the ESF format. ESF is not universally available and is not always provisioned with full features. The Marketing Representative has location-specific details.

In the SF format, the following framed codes may be used within the Network to support out-of-service maintenance operations. These codes are used in repetitive pulse patterns of at least 5 seconds. Network equipment may block customer transmission of long sequences of these patterns:

11000 (2 in 5)
11100 (3 in 5)
10100

11.1 Remote Alarm Indication

The Remote Alarm Indication (RAI) is widely known in the industry as a yellow alarm. The RAI/Yellow signal shall be transmitted in the outgoing direction when DS1 terminal equipment located in either the network or the CI determines that it has effectively lost the incoming signal. An RAI/Yellow signal shall be transmitted to the NI in the following forms:

Superframe Format: For the duration of the alarm condition, but for at least one second, bit two in every eight-bit channel time-slot shall be a zero. This arrangement shall be used even if the payload is not channelized.[1]

[1] It is recognized that some existing unchannelized equipment does not transmit the RAI/Yellow signal.

Extended Superframe Format: For the duration of the alarm condition, but for at least one second, a repeating 16 bit pattern consisting of eight "ones" followed by eight "zeros" shall be transmitted continuously on the ESF data link, but may be interrupted for a period not to exceed 100 milliseconds per interruption (see ANSI T1.403).

Both Formats: For either framing format, the minimum time between the end of one transmission of RAI/Yellow and the beginning of another transmission of RAI/Yellow shall be one second. Certain services provided by the network may require longer time intervals than these minimum values, or may require unequal "on" and "off" intervals, or both longer intervals and unequal "on" and "off" intervals.

11.2 Alarm Indication Signal (AIS)

The AIS shall be an unframed, all-ones signal. An AIS should be transmitted to the NI upon a loss of originating signal, or when any action is taken that would cause a signal disruption (e.g., line loopback). The AIS is removed when the condition triggering the AIS is terminated.

11.3 Loopbacks

Loopbacks are used by Carriers and end-users as a maintenance tool to aid in problem resolution. The codes and protocols described in ANSI T1.403 may be used by the Carrier for trouble isolation or by the end-user for CI-to-CI testing.

Two types of loopbacks are defined in ANSI T1.403, line and payload loopback. Both are applicable for signals using the ESF format; only the line loopback is applicable for signals using the SF format. Line loopbacks result in a full 1.544 Mbit/s loopback of the signal received by the CI from the NI. Payload loopbacks result in a 1.536 Mbit/s loopback of the payload of the signal received by the CI from the NI maintaining bit-sequence integrity[2] for the information bits.

11.3.1 Loopback Control Signaling in the SF Format

The protocol currently in use by the carriers for network access to the CI line loopback feature is in-band signaling control. Only the CI may respond to the in-band control line loopback codes.

Activation Signal: The in-band activation signal for a line loopback shall be a framed DS1 signal consisting of repetitions of four "zeros" followed by one "one", lasting for at least 5 seconds, with the framing bits replacing bits of the pattern.

[2] This requires that the timing of the transmitted signal be synchronized with the timing of the received signal.