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Wideband Analog Transport Microcell Optical Link Service Type D Arrangements Interface and Performance Specifications

Technical
Reference

NOTICE

This Technical Reference describes the network interface and service performance specifications when an arrangement denoted Type D is employed. Microcell Optical Link Service is intended to provide broadband transport over fiber optic media of signals within the radio frequency spectrum used for cellular mobile telephone services in the United States. This service is available in more than one arrangement.

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WIDEBAND ANALOG TRANSPORT
MICROCELL OPTICAL LINK SERVICE – TYPE D ARRANGEMENT
INTERFACE AND PERFORMANCE SPECIFICATIONS

CONTENTS

WIDEBAND ANALOG TRANSPORT MICROCELL OPTICAL LINK SERVICE − TYPE D ARRANGEMENT INTERFACE AND PERFORMANCE SPECIFICATIONS

1. Introduction

1.1 General

Microcell Optical Link Service is intended to provide broadband transport over fiber optic media of signals within the radio frequency spectrum used for cellular mobile telephone services in the United States. This document describes the network interface and service performance specifications when an arrangement denoted Type D is employed. This service is available in more than one arrangement.

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1.2 Purpose

The purpose of this document is to provide customers, service providers and equipment manufacturers with the performance specifications and interface requirements associated with this particular arrangement of Microcell Optical Link Service.

1.3 Revisions

When revisions to this document are issued, this paragraph will provide a summary of the reasons for the revisions.

2. Service Description

2.1 Overview

This arrangement of Microcell Optical Link Service provides for the transport of signals in the passband of 869 − 894 MHz in one direction. Transport for signals in the passband at 824 − 849 MHz is provided in the reverse direction. A second channel at 541−566 MHz is also available in the reverse direction. This service would typically be employed for transport of cellular service signals between a cellular mobile carrier's radio frequency (RF) transceiver location ("microcell site") and another location ("host site"). The passband between 541 and 566 MHz is intended to accommodate a diverse receive channel from the microcell site.

2.2 Architecture

Figure 1 portrays the interfaces to this service. The interface designated Network Interface "A" is an electrical interface and the interface designated Network Interface "B" is an optical interface.

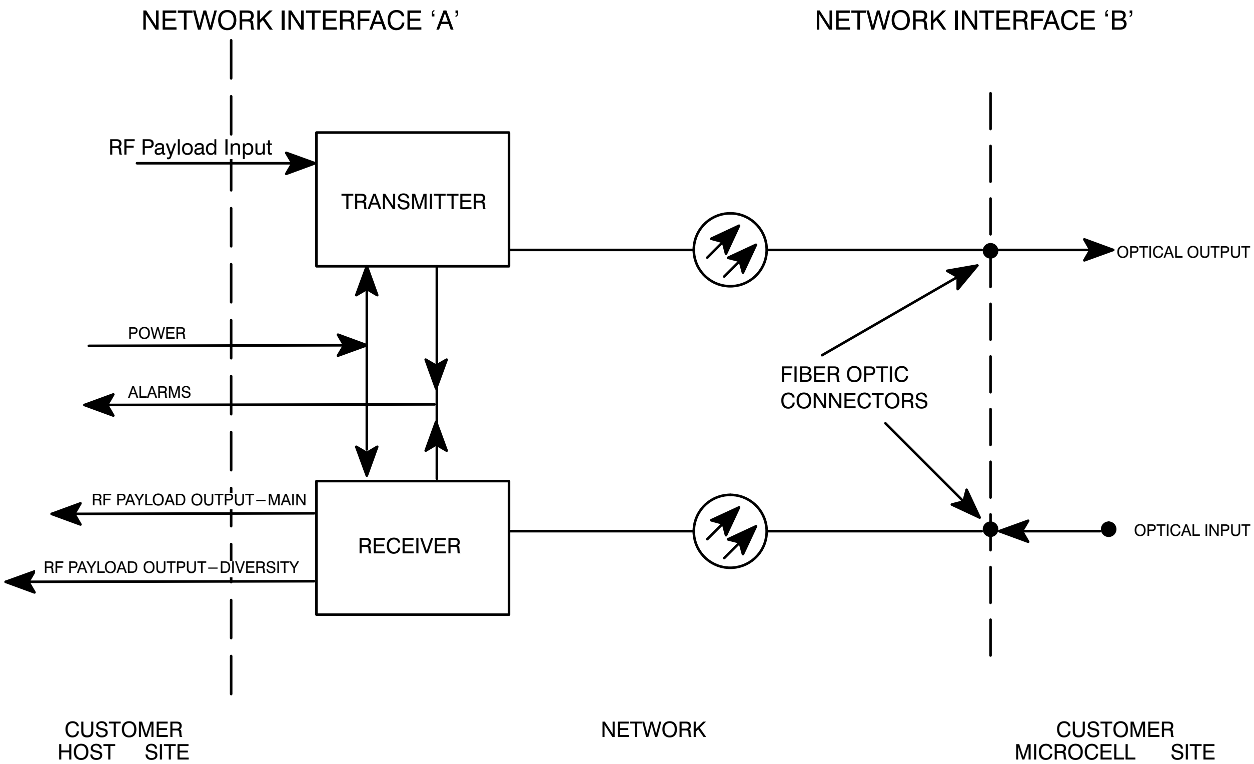

Figure 1

The RF electrical signal presented as an input at Network Interface "A" is converted to an optical signal via intensity modulation. The optical signal presented at Network Interface "B" can be converted to an RF electrical signal by de−modulating the intensity of the received optical signal.

Alarm outputs are presented to the customer across Network Interface "A" at the host site as specified in Section 3.1. These alarms are not monitored from the network − it is the responsibility of the customer to notify BellSouth Telecommunications, Inc. when maintenance action is required.

Power and space for the network equipment located adjacent to Interface "A" shall be provided by the customer.

3. Interface "A" Specifications

3.1 General

Network Interface "A" consists of five parallel connections as indicated in Figure 1. They are:

i RF Payload Input
ii Power
iii Alarms
iv RF Payload Output−Main
v RF Payload Output − Diversity

3.2 Mechanical

3.2.1 General

All network equipment connectors are female.

3.2.2 RF Connectors

The RF Payload Input, RF Payload Output – Main, and RF Payload – Diversity circuits utilize coaxial connectors, type N (female).

3.2.3 Power Connector

The powering option must be specified by the customer when service is ordered. Any of the following voltages may be utilized: 120 VAC, 24 VDC, or 48 VDC.

A terminal block is used as the power input connection. Terminal assignments are shown in Table 1, below:

Table 1

Terminal	Usage
24 or 48 VDC	
(+V)	Positive Battery Voltage
(−V)	Negative Battery Voltage
G	Ground
120 VAC	
L1	AC High
L2	AC Neutral
G	Ground

3.2.4 Alarm Connector

The alarm circuits utilize a DB−25 (female) connector. Each connector accommodates up to three systems. Pin assignments are shown in Table 2 below.

Table 2

Pin	Alarm
1	No Connection
2	Ground
3	No Connection
4	Ground
5	Open Door, Sys. #3
6	Host Summary, Sys. #3
7	No Connection
8	User Assigned, Sys. #2
9	Remote Summary, Sys. #2
10	No Connection
11	Ground
12	Open Door, Sys. #1
13	Host Summary, Sys. #1
14	No Connection
15	Do Not Connect
16	No Connection
17	User Assigned, Sys. #3
18	Remote Summary, Sys. #3
18	No Connection
20	Ground
21	Open Door, Sys. #2
22	Host Summary, Sys. #2
23	No Connection
24	User Assigned, Sys., #1
25	Remote Summary, Sys. #1

The Host Summary Alarm indicates a problem in the network equipment at the host location. The Open Door, User Assigned, and Remote Summary alarms are explained in Section 5.3.2.

3.3 Electrical

3.3.1 RF Connectors

3.3.1.1 Impedance

The impedance of each of the RF circuits is 50 Ohms, nominal.

3.3.1.2 RF Payload Input

The Bandwidth of the RF Payload Input circuit is 869 to 894 MHz. The maximum signal level presented by the customer on this circuit shall be −20 dBm.

3.3.1.3 RF Payload Output − Main

The bandwidth of the RF Payload Output − Main circuit is 824 − 849 MHz. The maximum signal level that will be delivered is +15 dBm.

3.3.1.4 RF Payload Output − Diversity

Signals received, from Interface 'B', in the passband of 541 to 566 MHz will be shifted in frequency by the network. They will be shifted to the 824 to 849 MHz band and presented at the RF Payload Output − Diversity connector. The maximum signal level that will be delivered is +15 dBm.

3.3.2 Power

When DC power is employed, the voltage between the (+V) and (−V) terminals shall be between the limits shown in Table 3. The current drawn shall be less than the maximum indicated in Table 3.

Table 3

Option	Voltage (volts)		Maximum Current (Amps)
	Minimum	Maximum	
24 V	23.0	27.0	2.0
48 V	42.5	56.5	1.5

3.3.3 Alarms

Alarms are indicated by providing a low resistance path to ground. The open−circuit voltage, provided by the customer to sense the alarm, shall not exceed 30 VDC. The short−circuit current shall not exceed 1 ampere.

4. Network Interface "B"

4.1 Mechanical

This interface employs two type SC connectors. Both network equipment connectors are male.

4.2 Optical

Each mated pair of SC connectors shall have a maximum back reflectance of −40 dB. The optical wavelength of both the signal generated in the network and that generated by the customer shall be 1310 $\pm$ 20 nanometers. The fiber employed by the customer shall be single mode, with a 8.3 micron (nominal) core.

With no modulation applied, the signal level specifications in Table 4 shall be met:

Table 4

Signal delivered by:	Minimum (dBm)	Maximum (dBm)
The Network	−7.0	+3.0
The Customer	+0.0	+3.0

5. Transport

5.1 A to B

The RF signal presented by the customer at the RD Payload Input and a 1039 MHz reference signal (See Section 5.3) are combined to form the modulated signal delivered, after optical transport, at Interface B. The reference signal results in 3.0% modulation, nominal. The RF Payload Input, when provided at −20 dBm at Interface A, also results in 3.0% modulation.

5.2 B to A

The optical signal presented at Network Interface "B" by the customer as an input to Interface 'B' is demodulated after optical transport to form the RF Payload Output and RF Payload Output − Diversity at Network Interface "A".

An RF signal in the frequency range of 824 to 849 MHz is delivered as the RF Payload Output − Main signal at Network Interface A. The signal is demodulated to provide a signal level of −20 dBm, nominal, when the intensity of the optical signal is modulated at 3.0%.

An RF signal in the frequency range of 541 to 566 MHz, if present, is frequency translated to the 824 to 849 MHz band, and delivered as RF Payload Output − Diversity. The signal is demodulated to provide a signal level of −20 dBm, nominal, when the intensity of the optical signal is modulated at 3.0%.

An RF signal at 1039 MHz (nominal) shall be present. The intensity of the optical signal shall be modulated by 3.0% (nominal) by this signal. As described in Section 5.3, below, this reference signal is used to transport a telemetry channel.

5.3 Telemetry Channel

5.3.1 Lower Layer Specifications

A telemetry channel shall be provided in both the A to B and the B to A directions by frequency shift keying the 1039 MHz reference signal. A Mark (logical 1) shall be indicated by a 1041 MHz carrier. A Space (logical 0) shall be indicated by a 1037 MHz carrier.

Data shall be transmitted using an asynchronous start–stop format using 1 start bit, 9 data bits, and one stop bit. Between data words, Mark shall be transmitted. Both start and stop bit shall be transmitted using Space.

The length of the start, stop and data bits shall be 8.0 μs, nominal. A word shall be transmitted every 125 μs (nominal).

5.3.2 Application

The telemetry channel shall be used to implement both a voice (order–wire) channel and an alarm channel. The voice channel shall be the default application of the channel. When used for voice, the first data bit shall be set to Space. The remaining 8 bits shall be encoded and decoded using the μ–255 encoding scheme with the most significant bit first.

With no alarm conditions, an alarm message shall be transmitted once per second. Alarm messages shall be transmitted within 100 ms of the change of alarm state.

An alarm message shall consist of 15 consecutive data words, transmitted in lieu of voice samples. The first data bit of each word shall be set to Mark in order to allow a receiver to detect the alarm message. The remaining 8 data bits of each of the 15 words shall be set as follows:

Word 1	00 hex
Word 2	0B hex

In the B to A direction, the remaining 8 data bits of words 3 through 14 shall be populated with all zeroes, except when an alarm is to be transmitted. In that case, bits shall be set to indicate alarms as shown in Table 5 and 6, below.

Table 5

Alarm Condition	Bits to be Set
Receive Optical Power	bit 4 of word 3
Transmit Optical Power	bits 2 through 6 of word 4
Power Supply	bits 1, 2, & 3 of word 6
Power Amplifier	bit 7 of word 6
Low Noise Amplifier	bit 1 of word 8

A Remote Summary Alarm, as shown in Table 2, shall be indicated via the alarm connector when any of these bits shown in Table 5 are set.

Table 6

Alarm Condition	Bits to be Set
User Assigned	bit 7 of word 3
Open Door	bit 1 of word 3

Either a User Assigned Alarm, Open Door Alarm, or both, shall be indicated via the alarm connector when the bits shown in Table 6 are set.

In the A to B direction, words 3 through 14 will normally be set to zero. The network will indicate an alarm condition alarm at the host by setting any of the following bits to a logical 1:

bit 1 of word 4,
bit 2 of word 4,
bit 2 of word 6
or bit 3 of word 6.

Bits 2 through 9 of word 15 of the alarm message shall contain a checksum. The checksum shall be the 8 least−significant bits of the binary sum of words 3 through 14, considering only bits 2 through 9 in each word.

6. Equipment Space

6.1 Dimensions

The customer shall provide space to house network equipment adjacent to Network Interface ‘A’.

6.2 Environment

The temperature and humidity of the environment shall be maintained within the following limits:

Table 7

	Temperature	Humidity
long−term	+10° to +35°C	20 to 60 %
short−term	−10° to +50°C	0 to 90 %

Operation outside of the long−term limits (but within the short−term limits) shall be limited to 72 continuous hours, and 15 days per year.

7. Service Performance Specifications

7.1 General

These parameters apply to the path from Interface 'A' to Interface 'B'.

7.2 Attenuation Distortion

Attenuation distortion within the passbands specified herein shall not exceed $\pm$ 1.5 dB.

7.3 Noise Contribution

The noise contributed by the network may be represented as a noise source, having a Power Spectral Density of no more than −110 dBc/Hz, injected at the RF Input interfaces.

7.4 Intermodulation Distortion

Third order intermodulation distortion products will be limited and be at least 95 dB below the composite signal as measured by a traditional two−tone method.

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