SECTION 4
SPECIFICATIONS

4.1 INTRODUCTION

This section contains the specifications for the T-BERD 310 Communications Analyzer and its options.

4.2 GENERAL

4.2.1 Physical

Dimensions:	T-BERD 310 with Lid — 6.5"H x 14.0"W x 18.7"D (16.5 cm x 35.6 cm x 47.5 cm).
Weight:	T-BERD 310 with Lid — 24.2 lbs. (11 kg).

4.2.2 Environmental

Operating Temperature Range:	32°F to 113°F (0°C to 45°C).
Storage Temperature Range:	-40°F to 158°F (-40°C to 70°C).
Operating Humidity:	90% maximum, noncondensing.
Storage Humidity:	5% to 95% noncondensing.
Shock and Vibration:	Meets IEEE-743.

4.2.3 Power

Power:	115/220 VAC (automatic voltage selection), 90 to 264 VAC from 47 to 63 Hz.
Fuse:	5 A, 250 V, Slo-Blo, 5 x 20 mm (Littlefuse #218005 or equivalent).

4.3 INPUT

4.3.1 DS3 Input

Input Level Range:	HIGH — Accepts a nominal signal level of 1.2 Vp (0 feet of cable attenuation from a HIGH source). With cable attenuation, accepts signal levels from +6 dB (-450 feet) of gain to -6 dB (450 feet) of loss from the nominal signal level (0.9 Vp). With resistive attenuation, accepts signal levels from +6 dB of gain to -26 dB of loss from the nominal signal level (0.9 Vp).

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DSX — Accepts a nominal signal level of 0.6 Vp (450 feet of cable attenuation from a HIGH source). With cable attenuation, accepts signal levels from +6 dB (-450 feet) of gain to -6 dB (450 feet) of loss from the nominal signal level (0.5 Vp). With resistive attenuation, accepts signal levels from +6 dB of gain to -26 dB of loss from the nominal signal level (0.5 Vp).

LOW — Accepts a nominal signal level of 0.3 Vp (900 feet of cable attenuation from a HIGH source). With cable attenuation, accepts signal levels from +6 dB (-450 feet) of gain to -6 dB (450 feet) of loss from the nominal signal level (0.2 Vp). With resistive attenuation, accepts signal levels from +6 dB of gain to -20 dB of loss from the nominal signal level (0.2 Vp).

Input Jitter Tolerance: The instrument meets or exceeds the mask specified in AT&T PUB 43802 and Bellcore TR-TSY-000009. For the 2^15-1 pattern, the mask is defined with a jitter amplitude of 5.0 UIp-p from 10 Hz to 2300 Hz, slope of -24 dB/decade from 2.3 kHz to 60 kHz, and an amplitude of 0.1 UIp-p from 60 kHz to 300 kHz.

Input Impedance: 75 ohms ±5%, unbalanced to ground.

Connector: WECO 560A jack (BNC optional).

Frequency: 44.736 Mb/s ±1000 Hz.

Line Code: B3ZS.

4.3.2 External Clock Input

Input Connector: Non-isolated, AC-coupled, 75-ohm BNC.

Input Frequency Range: 44.736 MHz ±300 ppm.

Input Amplitude: 1 Vp-p to 3 Vp-p.

4.4 OUTPUT

4.4.1 DS3 Output

Output Connector: Six WECO 560A jacks (one front panel and five side panel). Factory installed BNC jacks are also available.

Output Signal: Internal Frequency — 44.736 MHz ±15 ppm.

Output Level Range: HIGH — Nominal 1.2 Vp. Signal meets ANSI T1.102-1989, Table 5, and ITU-T Recommendation G.703 when transmitted through 450 feet of coaxial cable (WECO 728A, RG59B/U, or equivalent).

DSX — Nominal 0.6 Vp. Signal meets ANSI T1.102-1989, Table 5, and ITU-T Recommendation G.703, Section 5.

LOW — Nominal 0.3 Vp. Signal is equivalent to a DSX signal transmitted through 450 feet of coaxial cable (WECO 728A, RG59B/U, or equivalent).

Line Code: B3ZS.

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Output Impedance:	75 ohms nominal, unbalanced to ground.

4.4.2 DS1 Drop Output

Output Connector:	Bantam (new units) or WECO 310 (old units) jack, side panel.
Pulse Shape:	With output terminated in 100-ohm resistive load, the T-BERD 310 meets pulse shape specifications given in ITU-T Recommendation G.703; Bell Publications CB113, CB119, CB132, CB143, and PUB62508; and AT&T PUB62411.
Jitter Attenuation:	Meets or exceeds the jitter attenuation characteristics of AT&T PUB43802 and Bellcore TR-TSY-000191.
Line Code:	AMI or B8ZS (selectable).

4.5 INPUT SIGNAL MEASUREMENTS

4.5.1 Power

An unframed All Ones pattern must be used to obtain an accurate power reading. The value is expressed in dBm and referenced across 75 ohms. 0 dBm corresponds to a DS3 signal level of approximately 0.39 Vp.

Power Levels:	10.0 to 13.4 dBm with an accuracy of ±2 dBm. -12.0 to 9.9 dBm with an accuracy of ±2 dBm. -26.0 to -12.1 dBm with an accuracy of ±2 dBm.
Resolution:	0.1 dBm.
Range:	Less than -26.0 to +13.4 dBm.

4.5.2 Frequency

Accuracy:	±6 ppm.
Resolution:	10 Hz.
Range:	44.736 MHz ±1.5 MHz.

4.5.3 Level

The maximum peak voltage of the received signal is measured.

Level Accuracy:	1.2 to 1.8 Vp with an accuracy of ±0.2 V. 0.80 to 1.1 Vp with an accuracy of ±0.1 V. 0.25 to 0.79 Vp with an accuracy of ±0.05 V. 0.00 to 0.24 Vp with an accuracy of ±0.02 V.
Level Resolution:	0.00 to 1.99 Vp with a resolution of 0.01 V.
Range:	0.00 to 1.99 Vp.

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4.5.4 Receive Level in dBdsx

Level Accuracy:	8 to 11.5 dBdsx ±2 dBdsx. -13.9 to 7.9 dBdsx ±1 dBdsx. -27.9 to -14.0 dBdsx ±2 dBdsx.
Level Resolution:	0.1 dBdsx.
Range:	-27.9 to +11.5 dBdsx.

4.6 ALARM CRITERIA

Signal Loss:	0.02 ms without valid input pulses.
Frame Loss:	3 OUT OF 15 — 3 out of 15 F-bits in error, or 2 out of 3, 010 M-bit sequences in error. 6 OUT OF 15 — 6 out of 15 F-bits in error.
DS2 Frame Loss:	2 out of 4 DS2 F-bit errors. Occurs when the DS2 corresponding to the selected DS1 drop channel loses frame synchronization.
Pattern Loss:	FAST — 1024 errors per 32,767 data bits. SLOW — 250,000 errors per 1,000,000 bits.
Blue (AIS):	STUCK C-BIT — valid framing, valid parity, all stuffing indicator C-bits equal zero, and the 1010 criteria. 1010 — 30 ms of 1010 pattern with framing.
Yellow:	Both X-bits = 0.
Far-End Alarm:	Receipt of valid far-end alarm message (not loop codes) through the third C-bit in subframe 1 (FEAC-bit).

4.7 PULSE SHAPE CRITERIA

ANSI:	T1.102-1991, Figure 5.
ITU-T:	Proposed ITU-T G.703, Figure 14/G.703.
93 ANSI:	T1.102-1993 and ANSI T1.404-1993 Network Interface pulse mask.

4.8 TEST PATTERNS

4.8.1 Non-Channelized Test Pattern Definitions

2^31-1:	Pseudorandom pattern with length of 2^{31}-1 bits. This pattern conforms with ITU-T Recommendation O.151.
2^23-1:	Pseudorandom pattern with length of 2^{23}-1 bits. This pattern conforms with ITU-T Recommendation O.151.
2^20-1:	Pseudorandom pattern with length of 2^{20}-1 bits. This pattern conforms with Bell Compatibility Bulletin No. 114.

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2^15-1:	Pseudorandom pattern with length of 2^{15}-1 bits. This pattern conforms with ITU-T Recommendation O.151.
1111:	Fixed pattern consisting of marks only.
1100:	Fixed pattern of two marks followed by two spaces. In framed mode, the pattern is synchronized to the framing bits. In addition, C-bits are changed to indicate M13 or C-bit parity Idle Signal as described in the ANSI T1.107-1990 standard.
1010:	Fixed pattern of one mark and one space. In framed mode, the pattern is synchronized to the framing bits. When either M13 or C-bit parity framing is on, this is equivalent to sending a Blue Signal. All C-bits are set to zero to indicate stuck C-bits and the FID-bit is set to zero as described in the ANSI T1.107-1990 standard.
USER1:	3- to 24-bit programmable pattern.

4.8.2 Channelized Test Pattern Definitions

T1D4 1:7:	F01000000.... Pattern is aligned with the T1 D4 framing (F) format as indicated.
T1D4 QRSS:	2^{20}-1 bit pseudorandom pattern with 14-zero suppression and T1 D4 framing.
T1D4 3/24:	F0100 0100 0000 0000 0000 0100.... Pattern is aligned with the T1 D4 framing (F) format as indicated.
T1D4 1004Hz:	1004 Hz tone on all DS0s with T1 D4 framing. The tone is phase shifted between adjacent DS0 channels to prevent Yellow Alarms.
T1ESF 1:7:	F01000000.... Pattern is aligned with the T1 ESF framing (F) format as indicated.
T1ESF QRSS:	2^{20}-1 bit pseudorandom pattern with 14-zero suppression and T1 ESF framing.
T1ESF 3/24:	F0100 0100 0000 0000 0000 0100.... Pattern is aligned with the T1 ESF framing (F) format as indicated.
T1ESF 1004Hz:	1004 Hz tone on all DS0s with T1 ESF framing.

4.8.3 Pattern Synchronization Acquisition Criteria

Pseudorandom Patterns:	60 + n consecutive error-free bits for pattern length 2^n-1.
Fixed Patterns:	64 consecutive error-free bits.

4.9 FRAME SYNCHRONIZATION DETECTION CRITERIA

Frame Sync:	15 consecutive error-free F-bits and 2 consecutive error-free M_0 M_1 M_0 sequences.

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4.10 RS-232 INTERFACE CONNECTOR

Connector Pin Assignments: See Table 4-1.

Table 4-1. RS-232 Connector Pin Assignments

Pin #	Designation	Direction	Description
1	Prot. Gnd	—	Protective Ground — Connected to chassis ground.
2	TD	IN	Transmitted Data — The T-BERD 310 receives data on this lead.
3	RD	OUT	Received Data — The T-BERD 310 transmits data on this lead.
5	CTS	OUT	Clear to Send — This lead is asserted by the T-BERD 310 when it is ready to receive data. It should be monitored by the DTE to avoid transmitting data too fast to the T-BERD 310.
6	DSR	OUT	Data Set Ready — This lead is always ON when power is applied.
7	Sig. Gnd	—	Signal Ground — Connected to signal ground.
8	+ VDC	—	Test Voltage — This lead provides +12 VDC (RS-232 ON).
9	+ VDC	—	Test Voltage — This lead provides +12 VDC (RS-232 ON).
10	- VDC	—	Test Voltage — This lead provides -12 VDC (RS-232 OFF).
12	SRLSD	OUT	Secondary Received Line Signal Detector — This lead is driven ON by the T-BERD 310 when data is being sent.
20	DTR	IN	Data Terminal Ready — When this lead is asserted by the receiving device (e.g., printer), the T-BERD 310 transmits data.

Character Format: Seven or eight data bits (ASCII coding). Even or odd parity. Two transmitted stop bits. Accepts one or more received stop bits.

Baud Rates: 110, 300, 600, 1200, 2400, 4800, and 9600.

Terminator: CR, LF, and CRLF.

Print Width: 40-column or 80-column.

Connector Configuration: DCE.

Connector: 25-pin female D.

4.11 IEEE-488 INTERFACE CONNECTOR

This section contains the specifications for the IEEE-488.

Connector Type: 24-pin, D-type. DS3 Jitter Amplitude versus Frequency Mask.

Connector Configuration: Addressable or Talk-Only.

Connector Pin Assignments: See Table 4-2.

Maximum Transfer Rate: 1200 bytes per second.

Terminator: CR, LF, or CRLF.

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Table 4-2. IEEE-488 Connector Pin Assignments

Pin No.	Description	Pin No.	Description
1	Data In/Out 1 (DI/O1)	13	Data In/Out 5 (DI/O5)
2	Data In/Out 2 (DI/O2)	14	Data In/Out 6 (DI/O6)
3	Data In/Out 3 (DI/O3)	15	Data In/Out 7 (DI/O7)
4	Data In/Out 4 (DI/O4)	16	Data In/Out 8 (DI/O8)
5	End or Identify (EOI)	17	Remote Enable (REN)
6	Data Valid (DAV)	18	Ground for twisted pair for 6
7	Not Ready for Data (NRFD)	19	Ground for twisted pair for 7
8	Not Data Accepted (NDAC)	20	Ground for twisted pair for 8
9	Interface Clear (IFC)	21	Ground for twisted pair for 9
10	Service Request (SRQ)	22	Ground for twisted pair for 10
11	Attention (ATN)	23	Ground for twisted pair for 11
12	SHIELD	24	Signal Ground

4.12 GROUNDING

Chassis and Signal Grounds:	Connected internally.
WECO 560A Jack Sleeves:	Connected to chassis ground.
Power Cord:	Center ground pin connected to chassis ground.
25-pin D Connector:	Pin 1 to chassis ground. Pin 7 to signal ground.

4.13 310-1 DS1/DS0 ANALYZER OPTION

This section contains the specifications for the 310-1 DS1/DS0 Analyzer Option.

4.13.1 Environmental

Operating Temperature Range:	32°F to 113°F (0°C to 45°C).
Storage Temperature Range:	-40°F to 158°F (-40°C to 70°C).
Operating Humidity:	90% maximum, noncondensing.
Storage Humidity:	5% to 95% noncondensing.

4.13.2 T1 Input

Connector:	Bantam (new units) or WECO 310 (old units) jack.
Frequency:	1,544,000 Hz ±5000 Hz.
Impedance:	BRIDGE — 1000 ohms or greater. TERM — 100 ohms ±5%. DSX-MON — 100 ohms ±5%.

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Operating Range:	BRIDGE — +6 to -35 dBdsx cable loss. TERM — +6 to -35 dBdsx cable loss. DSX-MON — +6 to -24 dBdsx resistive loss.
Line Code:	AMI or B8ZS. Received B8ZS is automatically decoded.
Jitter Tolerance:	per AT&T PUB 62411, 1983.
T1 Framing Formats:	D4 Superframe, ESF, SLC-96, and Unframed.

4.13.3 T1 Output

Connector:	Bantam (new units) or WECO 310 (old units) jack.
Signal Level:	3 V base-to-peak into a 100-ohm load (0 dBdsx).
Pulse Shape:	With the output terminated into a 100-ohm resistive load (DSX-MON), the 310-1 meets pulse shape specifications given in ITU-T Recommendation G.703; Bell Publications CB113, CB119, CB132, CB143, and AT&T PUB62508; and AT&T PUB62411
Internal Oscillator Accuracy:	±15 ppm.
Line Code:	AMI or B8ZS.
T1 Framing Formats:	D4 Superframe, ESF, SLC-96, and Unframed.

4.13.4 Alarm Criteria

Signal Loss:	150 ms without input pulses after initial signal detected.
Pattern Sync Loss:	QRSS, 2^{15}-1, 2^{20}-1, 2^{23}-1, and 2^{31}-1 — 250 errors in 1000 or fewer bits. 1:1, 1:7, ALL ONES, 3 IN 24, and USER1 — 100 errors in 1000 or fewer bits.
Frame Sync Loss:	D4 — two out of five Ft bits in error. ESF — two out of five frame bits in error. SLC — two out of four Ft bits in error.
Excess Zeros:	16 or more consecutive zeros with AMI line coding. 8 or more consecutive zeros with B8ZS line coding.
Yellow Alarm:	D4 and SLC — Bit 2 is a "0" for 255 consecutive channels. ESF — 256 bits ±16 bits of repetitive 11111111 00000000 pattern received in the datalink.
All Ones:	Unframed — 2048 or more consecutive ones. Framed — 256 consecutive DS0 channels with all ones.

4.13.5 Test Pattern Definitions

1:1:	Alternating ones (mark) and zeros (space) pulses.
1:7:	F01000000.... A single one and seven zeros pattern. When framed, the pattern is aligned with the F-bits as indicated to prevent false Yellow Alarms.

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2^15-1:	32,767-bit pseudorandom pattern generates a maximum of 14 sequential zeros and 15 sequential ones.
2^20-1:	1,048,575-bit pseudorandom pattern generates a maximum of 19 sequential zeros and 20 sequential ones.
2^23-1:	8,388,607-bit pseudorandom pattern generates a maximum of 22 sequential zeros and 23 sequential ones.
2^31-1:	2,147,483,648-bit pseudorandom pattern generates a maximum of 30 sequential zeros and 31 sequential ones.
3 IN 24:	F0100 0100 0000 0000 0000 0100. Pattern synchronized to framing bits to prevent D4 Yellow Alarms or Excess Zeros.
ALL ONES:	All Ones (marks).
ALL ZEROS:	All Zeros (spaces).
QRSS:	Quasi-Random Signal Source. Modified 2^{20}-1 pseudorandom pattern which generates a maximum of 14 sequential zeros and 20 sequential ones.
USER1:	3- to 24-bit programmable pattern: factory setting is 10000.

4.13.6 Pattern Synchronization Acquisition Criteria

Fixed Patterns:	30 consecutive error-free bits.
Pseudorandom Patterns:	30 + n consecutive error-free bits for a pattern length of 2^n-1 (for QRSS, n = 20).

4.13.7 Loop Code Pattern Definitions

In-band Loop Codes:	CSU — Loop up: 10000. Loop down: 100. FACILITY 1 — Loop up: 1100. Loop down: 1110. FACILITY 2 — Loop up: 11000. Loop down: 11100. PROGRAMMABLE — 3- to 8-bit programmable pattern for both loop codes.
ESF Out-of-Band Loop Codes:	LINE — Loop up: 1111 1111 0111 0000. Loop down: 1111 1111 0001 1100. PAYLOAD — Loop up: 1111 1111 0010 1000. Loop down: 1111 1111 0100 1100. NETWORK — Loop up: 1111 1111 0100 1000. Loop down: 1111 1111 0010 0100.

4.13.8 Loop-Code Detection Criteria

In-band Loop Codes:	Loop Up — Continuously transmitted until the code is received error-free for 250 ms or the switch is pressed a second time. Loop Down — Continuously transmitted until the code is no longer received or the switch is pressed a second time.
ESF Out-of-Band Loop Codes:	Not detectable. However, the loop codes are transmitted for only 1 second.

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4.13.9 DS1 Frequency Measurement

Accuracy:	±15 ppm.
Resolution:	1 Hz.

4.13.10 DS1 Timing Slips Measurement

Range:	0 bit slips to 999 frame slips and 192 bit slips.
Resolution:	1 bit slip.

4.13.11 DS1 Level Measurement

Range:	+6 dBdsx to -40 dBdsx.
Accuracy:	±1.0 dB between +6 dBdsx and -18 dBdsx. ±2.0 dB between -18 dBdsx and -40 dBdsx.
Resolution:	0.1 dBdsx.

4.13.12 VF Level Measurement

Range:	+3 dBm0 to -50 dBm0.
Accuracy:	±0.3 dBm.
Resolution:	0.01 dBm.

4.13.13 DATAPORT Interface

Connection:	9-position, 6-pin, female D connector.
Configuration:	Synchronous DCE (transmit only).
Pin Assignments:	See Table 4-3.
Data Format:	DS0 or datalink.
Data Output:	DS0 — 56 and 64 kb/s clear channel. ESF — 4 kb/s datalink. SLC — 4 kb/s datalink and Fs bits (external decoding required).
Timing:	Recovered clock from received data on DS1 RECEIVE jack. Attached test set must synchronize to clock source on Pin 9. Output is squelched until the instrument is synchronized with framing bits.
Control Level:	+12 VDC for ON (0) and -12 VDC for OFF (1).
Output Signal Level:	+12 VDC for a space (0) and -12 VDC for a mark (1).
Clock Signal Level:	±12 VDC.

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Table 4-3. DATAPORT Connector Pin Assignments

Pin #	Designation	Description
1	Signal Ground	Connected to signal ground.
5	Control	This lead is ON when the output signal (pin 6) is available.
6	Output Signal	This lead provides 64 or 56 kb/s DS0 channel, SLC-96 4 kb/s datalink, or ESF 4 kb/s datalink signals. The output is controlled through the AUX-DATAPORT auxiliary function and **MODE** switch.
9	Clock Signal	This lead provides an external clock source for the attached test set.

4.13.14 Voice Frequency Output

Connection:	Bantam (new units) or WECO 310 (old units) jack.
Impedance:	600 ohms resistive.
Level:	Calibrated to dBm0 = 0 dBm.

4.14 310-3 DS1 INSERT/SECONDARY DS3 RECEIVE OPTION

This section contains the specifications for the 310-3 DS1 Insert Option.

4.14.1 DS1 Insert Input Specifications

Connector	Bantam (new units) or WECO 310 (old units) jack.
Frequency	1.544,000 Hz ±1000 Hz.
Impedance	100 ohms ±5%, balanced to ground.
Signal Level Range	+6 to -6 dBdsx cable loss. +6 to -26 dBdsx resistive loss.
Jitter Tolerance	per AT&T PUB62411, 1983.

4.14.2 Secondary DS3 Receive Specifications

Connector	WECO 560A jack.
Frequency	44.736 Mb/s ±1000 Hz.
Impedance	75 ohms ±5%, unbalanced to ground.
Line Code	B3ZS.

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4.15 SONET OPTIONS

This section contains the specifications for the SONET options 310-12, 310-13R, 310-14R 310-13T, 310-14T, and 310-21.

4.15.1 STS-1 Receive Signal (310-13R or 310-14R Option)

Connector	Standard — WECO 560A jack. Optional — BNC jack.
Frequency	51.840 Mb/s ±200 ppm.
Impedance	75 ohms ±5%, unbalanced to ground.
Line Code	B3ZS.
Signal Level Range	DSX — Up to 3 dB of cable loss or 20 dB of resistive attenuation from a nominal DSX level. HIGH — Up to 3 dB of cable loss or 20 dB of resistive attenuation from a nominal HIGH level.

4.15.2 STS-1 Transmit Signal (310-13T or 310-14T Option)

Connector	Standard — WECO 560A jack. Optional — BNC jack.
Frequency	51.840 Mb/s ±15 ppm (internal timing).
Impedance	75 ohms ±5%, unbalanced to ground.
Line Code	B3ZS.
Signal Level Range	HIGH — Nominal rectangular pulse with an amplitude of 1.03 Vp ±10% and a maximum undershoot and overshoot of less than 10%. Signal meets ANSI specification T1.102 STS-1 Eye Diagram Mask after passing through 450 feet of 728A cable. DSX — Amplitude of 0.516 Vp ±10%. Signal meets ANSI specification T1.102 Eye Diagram Mask for STSX-1 Interconnection.

4.15.3 OC-1 and OC-3 Receive Signal (310-14R Option)

Connector:	Standard — FC(PC). Optional — ST or SC.
Frequency:	OC-1 — 51.840 Mb/s ±200 ppm. OC-3 — 155.520 Mb/s ±200 ppm (tested to ±6 ppm with resolution of 10 Hz).
Optical Input:	1310 and 1550 nm, 50/125 multimode pigtail.
Input Power Range:	-35.0 dBm to -7.0 dBm with a 10^{-10} error rate on a 2^{23}-1 pattern, unscrambled.

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4.15.4 OC-1 and OC-3 Transmit Signal (310-14T Option)

Connector:	Standard — FC(PC). Optional — ST or SC.
Frequency:	OC-1 — 51.840 Mb/s ±15 ppm (internal timing). OC-3 — 155.520 Mb/s ±15 ppm (internal timing)
Optical Wavelength:	Standard — 1310 nm, intermediate reach. Optional — 1550 nm, intermediate reach.
Output Power Range:	-15.0 dBm to -8.0 dBm.

4.15.5 OC-12 Receive Signal (310-12 Option)

Connector:	Standard — FC(PC). Optional — ST or SC.
Frequency	OC-12 — 622.080 Mb/s ±50 ppm.
Optical Input	1310 and 1550 nm, 50/125 multimode pigtail.
Input Power Range	-26.0 dBm to -8.0 dBm with a 10-10 error rate on a 2^{23}-1 pattern, unscrambled.

4.15.6 OC-12 Transmit Signal (310-12 Option)

Connector:	Standard — FC(PC). Optional — ST or SC.
Frequency:	OC-12 — 622.080 Mb/s ±15 ppm (internal timing).
Optical Wavelength:	Standard — 1310 nm, intermediate reach. Optional — 1550 nm, intraoffice access.
Output Power Range:	-14.0 dBm to -4.0 dBm.

4.15.7 SONET DCC Drop and Insert Signal (310-13R or 310-14R Option)

Connector	15-pin D.
Pin Assignments	See Table 4-4. Pin assignments for the RS-449 15- to 37-pin cable (Model 42836) are also provided.

Table 4-4. SONET DCC Pin Assignments

15-Pin D Connector	37-Pin D Connector	Description
1	5	Send Timing (a)
2	26	Receive Timing (b)
3		NC
4	22	Send Data (b)
5	4	Send Data (a)
6	6	Receive Data (a)
7		NC

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Table 4-4. SONET DCC Pin Assignments (Continued)

15-Pin D Connector	37-Pin D Connector	Description
8	17	Terminal Timing (a)
9	23	Send Timing (b)
10	8	Receive Timing (a)
11	20	Receiver Common
12	24	Receive Data (b)
13		NC
14	35	Terminal Timing (b)
15	37	Send Common

4.15.8 SONET Orderwire Handset Signal (310-13T or 310-14T Option)

Connector: RJ-11

Pin Assignments: See Table 4-5. Handset, Model 11255, matches the pin assignments.

Table 4-5. Orderwire Pin Assignments

Pin	Description	Pin	Description
1	TX1	3	RX1
2	TX2	4	RX2

4.15.9 DS1 BITS Clock Input Signal (310-13T or 310-14T Option)

Connector: Bantam jack.

Frequency: 1.544 MHz ±130 ppm.

Impedance: TERM — 100 ohms ±5%, balanced tip to ring.
BRIDGE — 1000 ohms or greater, balanced tip to ring.

Signal Level Range: +2 to -10 dBdsx.

Jitter Tolerance: Per AT&T PUB 62411, 1983.

4.15.10 OC-48 Receive Signal (310-21 Option)

Connector: Standard — FC(PC).
Optional — ST or SC.

Frequency: OC-48 — 2488.32 Mb/s ±50 ppm.

Optical Input: 1310 and 1550 nm, 50/125 multimode pigtail.

Input Power Range: -28.0 dBm to -9.0 dBm with a 10-10 error rate on a 2^{23}-1 pattern, unscrambled.

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4.15.11 OC-48 Transmit Signal (310-21 Option)

Connector:	Standard — FC(PC). Optional — ST or SC.
Frequency:	OC-48 — 2488.32 Mb/s ±15 ppm (internal timing).
Optical Wavelength:	Standard — 1310 nm, intermediate reach. Optional — 1550 nm, intraoffice access. Dual Optional — 1310/1550 nm for dual optics access.
Output Power Range:	+2.78 dBm to -2.60 dBm for high power output. -10.00 dBm to -16.70 dBm for low power output.

4.16 310-5 DS3 JITTER OPTION

This section contains the specifications for the 310-5 DS3 Jitter Option.

4.16.1 General Specifications

Input Signal	Jitter clock recovered from the DS3 RECEIVE jack.
Time Base Range	44.736 MHz ±4.4 kHz (= ±100 ppm).
Acquisition Time	After a valid jitter clock is present 2 to 4 seconds (typical), 12 seconds (maximum).
Amplitude Measurement Interval:	0.25 seconds.
Warm-up Interval:	3 minutes.

4.16.2 Jitter Amplitude Measurements Specifications

Dynamic Range:	2 UI Scale — < 2.000 UI p-p. 5 UI Scale — < 5.00 UI p-p. 20 UI Scale — < 20.00 UI p-p.
Frequency Measurement Range:	See Figure 4-1.
Resolution:	2 UI Scale — 0.005 UI. 5 UI Scale — 0.01 UI. 20 UI Scale — 0.02 UI.
Accuracy:	2 UI Scale — ±5% ±0.05 UI. 5 UI Scale — ±5% ±0.125 UI. 20 UI Scale — ±5% ±0.5 UI.
Bandwidths:	Wideband — 10 Hz to 400 kHz, nominal. Highband — 30 kHz to 400 kHz, nominal. Filter slopes — 20 dB/decade. The filter response at the corner frequencies is nominally down 3 dB from the center of the passband.

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4.16.3 Jitter Frequency Output Specifications

Connector: BNC.

Impedance: 50 ohms.

Demodulated Analog Signal Output: 2 UI Scale — 0.5 Vp-p/UIp-p.
5 UI Scale — 0.2 Vp-p/UIp-p.
20 UI Scale — 0.05 Vp-p/UIp-p.

Bandwidths: Wideband — 10 Hz to 400 kHz, nominal.
Highband — 30 kHz to 400 kHz, nominal.
Filter slopes — 20 dB/decade. The filter response at the corner frequencies is nominally down 3 dB from the center of the passband.

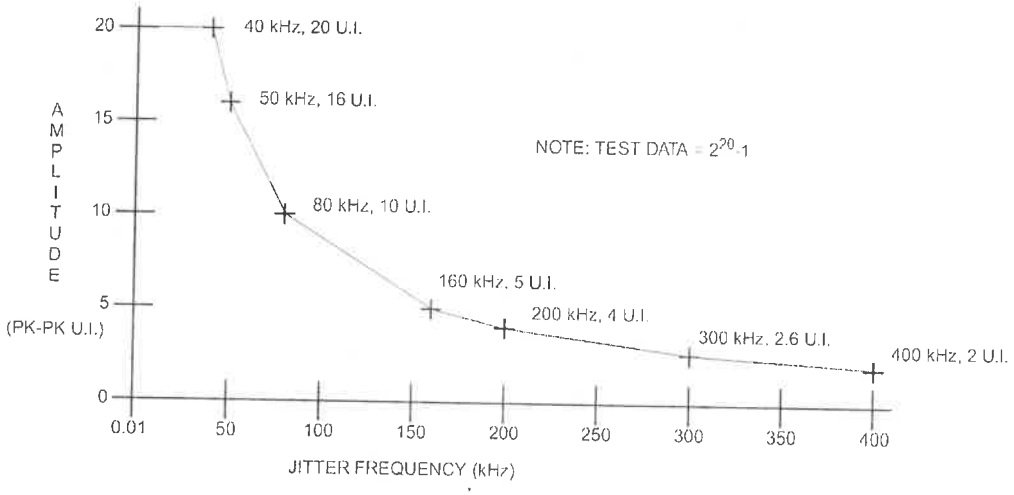

Figure 4-1. DS3 Jitter Tolerance Mask

4.17 310-10 G.821 RESULTS OPTION

This section contains the specifications for the 310-10 G.821 Results Option.

Compatibility: Meets ITU-T Recommendation G.821.

Available Results: Available seconds, % available seconds, severely errored seconds (except the 310-1), % severely errored seconds, consecutive severely errored seconds (except the 310-1), degraded minutes, % degraded minutes, and unavailable seconds.

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4.18 310-16 OPTICAL MEDIA TEST OPTION

This section contains the specifications for the 310-16 Optical Media Test Option.

4.18.1 Optical Power Meter

Connector:	Standard — FC(PC). Optional — ST or SC.
Measurement Range:	+3 dBm to -50 dBm.
Resolution:	0.1 dB.
Accuracy:	±0.7 dB.
Optical Wavelengths:	1310 nm ±30 nm or 1550 nm ±30 nm.

4.18.2 Optical Return Loss Meter Measurement

Measurement Range:	8 dB to 45 dB.
Resolution:	1.0 dB.
Accuracy:	±3 dB.
Optical Wavelengths:	1310 nm ±30 nm or 1550 nm ±30 nm.

4.18.3 Optical Stable Source

Connector:	Standard — FC(UPC). Optional — ST or SC.
Optical Wavelengths:	1310 nm ±30 nm or 1550 nm ±30 nm.
Output Power:	-10 dBm ±0.2 dB.
Power Stability:	0.05 dB after 5 mins @ 25°C.

4.19 ATM ANALYSIS OPTIONS

This section contains specifications for the ATM analysis options, 310-15, 310-17A, and 310-20.

4.19.1 Receive Modes

Search:	Analyzer locates cells by payload type and reports address (e.g., TTC test cell, OAM AIS, OAM RDI).
Preview:	Analyzer reports all active addresses, respective of bandwidth and cell type.
Test Mask:	Analyzer filters up to five user-programmable receive header masks and reports detailed results on incoming cells fitting the specification.

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4.19.2 ATM Generator

Network Interfaces:	UNI and NNI header formats. Selectable cell payload scrambling.
Cell Mapping:	Up to 100% of the payload can be mapped with any combination of foreground test cells, multiple background cells, and idle cells. HEC or PLCP (DS1 and DS3 ATM signal) alignment format is used to generate ATM cells.
Profiles:	Four independent hex- or decimal-programmable cell headers are available. Flexibility includes GFC, VPI, VCI, PTI, CLP, and programmable bandwidths.
Burst Mode:	Up to 100% bandwidth for up to 9.9 full seconds can be configured as a burst pattern.
Error and Alarm Insertion:	Non-correctable and correctable HEC errors can be inserted in single, rate, burst, and continuous formats. PLCP BIP errors are insertable in single and rate formats (DS1 and DS3 ATM signal). OAM cell transmission allow ATM AIS and RDI alarm generation.

4.19.3 ATM Analyzer

Network Interfaces:	UNI and NNI header formats Selectable cell payload descrambling.
Cell Mapping:	HEC or PLCP (DS1 and DS3 ATM signal) alignment cell delineation is used to detect ATM cells. Analysis on 100% of traffic bandwidth.

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