

ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *Tektronix CTS 710* at our website: ***Click HERE***

SDH/SONET Test Sets

CTS 710 • CTS 750

Features

CTS 710/CTS 750

- 52 Mb/s, 155 Mb/s, and 622 Mb/s Transmit and Receive
- DS1 and DS3 Testing (Optional)
- 2 MB, 34 MB and 140 MB Testing (Optional)
- Bit Error Rate Testing Including BIP Error Monitoring and Analysis
- Payload Mapping and Demapping
- Tributary Add, Drop and Test
- Pointer Generation and Analysis
- Alarms Generation and Analysis
- DCC and User Channel Access
- APS Testing
- Simple User Interface
- Automatic Setup
- Pass/Fail Testing
- Rugged Modular Design, Customer Configurable
- Disk Drive
- IEEE 488.2 and RS-232C

Applications

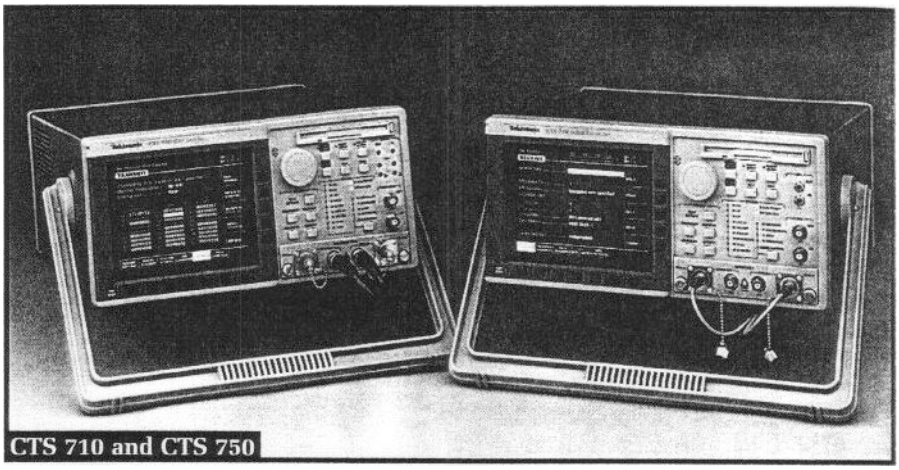
- Network Integrity Testing
- In-service Performance Monitoring
- Overhead Testing
- Tributary Mapping and Demapping
- Tributary Testing
- Stimulus and Response Testing
- Stress Testing

For your local Tektronix representative see the list in the back of this catalog or outside the U.S. call: 1-503-627-1933, inside the U.S. call: 1-800-426-2200.

GPIB IEEE-488 *Product(s) complies with IEEE Standard 488.1-1987, RS-232C, and with Tektronix Standard Codes and Formats.*

See Tektronix on the World Wide Web: http://www.tek.com

ISO 9001 *Tektronix Measurement products are manufactured in ISO registered facilities.*



CTS 710 and CTS 750

CTS 700 Series

The ITU-T and ANSI standards for SDH/SONET specify requirements for the network element (ADM, multiplexers, terminals, etc.) interfaces. Installation, commissioning, maintenance and repair of the SDH/SONET network involves the challenge of testing to ITU-T and ANSI standards. The CTS 700 Series is ready for the challenge to assist with these and other testing needs. In one configurable, expandable and upgradable instrument you will find everything required to do your testing.

CONFIGURABLE

The CTS 700 Series is a rugged portable test set designed not only for your current tasks; through its unique architecture, it will grow with you as SDH and SONET grows. When you require additional capabilities such as optical interfaces, jitter analysis, ATM testing, etc., you can add such functionality to your CTS 700. This upgradability is important due to evolving nature of the standards, test requirements and equipment capabilities.

The CTS 700 Series is part of a new generation of test sets combining various different functions in one instrument with the power to go beyond basic testing. The modular nature of the test set allows you to configure the instrument to your needs, without the cost of unwanted built-in capabilities. Starting with a low cost platform which addresses your basic SDH or SONET testing needs, you can expand its capabilities as desired with a growing number of options.

EASY TO USE

The CTS 700 Series incorporates a number of new productivity features:

- AutoScan – Graphically presents the incoming signal structure and allows easy instrument setup
- Pass/Fail Testing – Automates following a written test procedure
- TroubleScan – Highlights error, alarms, and defects
- Graphical Displays – For historical trend analysis
- Online Help – For quick assistance with operation
- Disk Drive – For easy storage of instrument setups, Pass/Fail Test and results

These instruments employ innovative hardware technology which reprograms itself, depending on the operational mode. Future demands regarding access and control of particular bytes are easily reprogrammed. Upgrades are distributed on disks.

Please refer to the data sheet for more technical specifications.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SDH/SONET Test Sets

CTS 710 • CTS 750

CTS 710 SONET/DS3/DS1 Test Set

TRANSMIT AND RECEIVE RATES

- STS-1, STS-3 (electrical)
- STS-3c and OC-3c
- OC-1, OC-3, OC-12 (optical)
- DS1, DS3 (Opt. 22)
- Compliance to ANSI T1-105

GENERATION AND ANALYSIS

- Testing of Bit Error Rates including B1, B2, B3, VT BIP, Line FEBE, Path FEBE and Payload
- Complete alarm monitoring and generation
- Measurements: 1 sec to 99 days
- Histograms: 72 hours with 1 minute resolution. 45 days with 15 minute resolution
- Measurements with ANSI T1M1.3 analysis

OVERHEAD MANAGEMENT

Transport Overhead, Path Overhead and VT Overhead

- Set and View Byte Value: All
- Set and View Byte Trace Message: J1
- Add/Drop: DCCs, F1, F2

CTS 750 SDH/PDH Test Set

TRANSMIT AND RECEIVE RATES

- STM-0E, STM-1E (electrical)
- STM-0, STM-1, STM-4 (optical)
- 2 Mb/s, 34 Mb/s, 140 Mb/s (Opt. 36)
- Compliance to ITU-T G.707, G.708, G.709

GENERATION AND ANALYSIS

- Testing of Bit Error Rates including B1, B2, B3, TU BIP, MS FEBE, Path FEBE and Payload
- Complete alarm monitoring and generation
- Measurements: 1 sec to 99 days
- Histograms: 72 Hours with 1 minute resolution. 45 days with 15 minutes resolution.
- Measurements with ITU-T analysis according to G.826, G.821, M.2100

OVERHEAD MANAGEMENT

Section Overhead, Path Overhead and TU Overhead

- Set and View Byte Value: All
- Set and View Byte Trace Message : J1, J2
- Add/Drop: DCCs, F1, F2

CTS 710/CTS 750

OTHER

- APS Control
- Pointer movement control
- Complete Pointer Sequence selection in accordance with ITU-T G.783 and ANSI T1X1.6
- Timing offset up to ±100 ppm
- DS1 and DS3 T-carrier testing (Opt. 22)
- 2 Mb/s, 34 Mb/s, 140 Mb/s (Opt. 36) PDH testing
- Disk storage: 200 instrument setups, or 400 hours of results including histories, or 200 Pass/Fail tests on each disk (DOS compatible)

PHYSICAL CHARACTERISTICS

Dimensions	mm	in.
Height	164	6.4
Width	491	14.25
Depth	1362	19.25
Weight	**kg**	**lb.**
Net	10	22.5

Please refer to the data sheet for more technical specifications.

ORDERING INFORMATION

For price information: Outside the U.S. contact your local Tektronix representative, inside the U.S. see the price list in the back of this catalog.

CTS 710
SONET DS3/DS1 Test Set.
Includes: User Manual, Reference Manual, Performance Verification, Front Cover, Accessory Pouch, 75 Ω Cable, Power Cord.

CTS 750
SDH/PDH Test Set.
Includes: User Manual, Reference Manual, Performance Verification, Front Cover, Accessory Pouch, 75 Ω Cable, Power Cord.

OPTIONS FOR CTS 710 AND CTS 750

Opt. 03 – Optical/Electrical Interface, 52 Mb/s, 155 Mb/s, 1310 nm.
Includes: Two Optical Connector Kits 020-1885-00 for FC-PC, ST, DIN, SC.

Opt. 04 – Optical/Electrical Interface, 52 Mb/s, 155 Mb/s, 622 Mb/s, 1310 nm.
Includes: Two Optical Connector Kits 020-1885-00 for FC-PC, ST, DIN, SC.

Opt. 05 – Optical/Electrical Interface, 52 Mb/s, 155 Mb/s, 622 Mb/s, 1550 nm, 0 dBm Power.
Includes: Two Optical Connector Kits 020-1885-00 for FC-PC, ST, DIN, SC.

Opt. 06 – Optical/Electrical Interface, 52 Mb/s, 155 Mb/s, 622 Mb/s, 1310/1550 nm.
Includes: Two Optical Connector Kits 020-1885-00 for FC-PC, ST, DIN, SC.

Opt. 11 – 1.6/5.6 Connector Adapter Kit for CTS 750.

OPTIONS FOR CTS 710 ONLY

Opt. 22 – DS1 and DS3 Testing.
Includes: Standalone, Map/Demap and Add/Drop.

OPTIONS FOR CTS 750 ONLY

Opt. 36 – 2 Mb/s, 34 Mb/s and 140 Mb/s Testing.
Includes: Standalone, Map/Demap and Add/Drop.

SERVICE ASSURANCE OPTIONS

3 Year Warranty Standard.

INTERNATIONAL POWER PLUG OPTIONS

Opt. A1 – Universal Euro 220 V, 50 Hz.
Opt. A2 – United Kingdom 240 V, 50 Hz.
Opt. A3 – Australian 240 V, 50 Hz.
Opt. A4 – North American 240 V, 60 Hz.
Opt. A5 – Switzerland 220 V, 50 Hz.

FIELD UPGRADE KITS

CTS7F01 – Electrical Interface 52 Mb/s, 155 Mb/s, 75 Ω BNC.
CTS7F03 – Optical/Electrical Interface, 52 Mb/s, 155 Mb/s, 1310 nm.
CTS7F04 – Optical/Electrical Interface, 52 Mb/s, 155 Mb/s, 622 Mb/s, 1310 nm.
CTS7F05 – Optical/Electrical Interface, 52 Mb/s, 155 Mb/s, 622 Mb/s, 1550 nm.
CTS7F22 – DS1 and DS3 Testing.
Includes: Standalone, Map/Demap and Add/Drop.
CTS7F36 – 2 Mb/s , 34 Mb/s and 140 Mb/s Testing.
Includes: Standalone, Map/Demap and Add/Drop.

ACCESSORIES

Rackmount – Order 016-0819-1x.
Optical Connector Kit – **Includes:** FC-PC, ST, DIN, SC. Order 020-1885-00.
Battery Powered Printer – HC411 Opt. 04.
Hard Transit Case – Order 016-1157-00.
Soft Carrying Bag – Order 016-1158-00.

CART

Order K212.

For your local Tektronix representative see the list in the back of this catalog or outside the U.S. call: 1-503-627-1933, inside the U.S. call: 1-800-426-2200.

GPIB IEEE-488 *Product(s) complies with IEEE Standard 488.1-1987, RS-232C, and with Tektronix Standard Codes and Formats.*

See Tektronix on the World Wide Web: http://www.tek.com

ISO 9001 *Tektronix Measurement products are manufactured in ISO registered facilities.*

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Appendix D: Specifications

This appendix contains the CTS 750 specifications. All specifications are guaranteed unless labeled "typical." Typical specifications are provided for your convenience but are not guaranteed.

Table D–1: Standard CTS 750 Specifications

Characteristic	Description
Generator Output	
Electrical Output	
Data Rates	STM-0: 51.84 Mb/s STM-1: 155.52 Mb/s
Data Formats	STM-0E: AMI, B3ZS STM-1E: CMI
Signal Level at Transmit Output	STM-0E Hi: +1.0 Vpk +10% into 75 Ω STM-0E: equivalent of –6 dB of cable loss (–12.7 dB @ f characteristic cable) STM-1E Hi: ±0.5 Vpk ±10% into 75 Ω STM-1E: equivalent of –6 dB of cable loss (–12.7 dB @ f characteristic cable)
Pulse Shape at Transmit Output	Meets ITU-T G.703 Eye Pattern Masks
Return Loss	>15 dB
Connector	Unbalanced BNC, 75 Ω to ground
Optical Output	
Data Rates	STM-0: 51.84 Mb/s STM-1: 155.52 Mb/s STM-4: 622.08 Mb/s

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–1: Standard CTS 750 Specifications (Cont.)

Characteristic	Description
Optical Module Options	Opt. 03, 1310 nm, IR, STM-0/1 Opt. 04, 1310 nm, IR, STM-0/1/4 Opt. 05, 1550 nm, LR, STM-0/1/4 Opt. 06, 1310/1550 nm, STM–0/1/4
Signal Level & Wavelength	–10 dBm, typical 1310 nm (Opt. 03, 04, 06) 0 dBm, typical, 1550 nm (Opt. 05, 06)
Pulse Shape	Meets ITU-T G.957 Eye Pattern Masks
Wavelength	1308 nm, typical (Opt. 03, 04, 06) 1550 nm, typical (Opt. 05, 06)
Spectral Width	≤ 4 nm, 1310 nm (Opt. 03, 04, 06) < 1 nm, 1550 nm (Opt. 05, 06)
Laser Classification	Class 1 laser, complies with 21 CFR 1040.10 and 1040.11, complies with IEC 825, Section 9.4
Connectors	FC-PC Standard: Optical Connector kit with ST, SC, and DIN 47256 included
Signal Structure	
Standards Compliance	Meets the requirements of ITU-T707, 708, 709
Payload Channel (AU)	One active STM-1 in STM-4 (The other 3 channels are unequipped) One active STM-0 in STM-1 Selection (The other 2 channels are unequipped) One active STM-0 in STM-4 (The other 11 channels are unequipped)
Unequipped Payload	C2 byte is set to 00
Internal Pattern Generator	
Patterns Bulk Fill in a selected AU channel (AU3 or AU4)	PRBS: 2^9–1, 2^{15}–1, 2^{20}–1, 2^{23}–1; All 1s, All 0s, 8-bit programmable word
Errors Single or Continuous	RS BIP (B1) MS BIP (B2) Path BIP (B3), Path FEBE Payload pattern bit

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

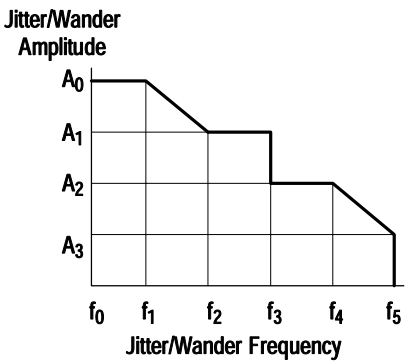
Table D–1: Standard CTS 750 Specifications (Cont.)

Characteristic	Description
Error Rate Range	1×10^{-3} to 1×10^{-10} with 0.1 resolution[1]
Alarms	MS AIS, MS FERF Path AIS, Path FERF
Failures	LOS, LOF, LOP
Transmitter Clock	
Internal Clock	
Accuracy	±4.6 ppm, for instrument calibrated within 24 months
External Clock Reference	
Rates	2.048 Mb/s ±40 ppm 2.048 MHz +50 ppm
Input	Unbalanced, 75 Ω ±5%, BNC connector
Recovered Clock	
Loop timing	Clock is recovered from received signal
Transmit Line Frequency Offset	
Frequency offset rate	+100 ppm of nominal line rate

1 **Depends on error type.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–1: Standard CTS 750 Specifications (Cont.)

Characteristic	Description
Jitter Generator (requires Option 14)	
Jittered Line Output	Sinusoidal modulation of transmit clock frequency, applicable to any SDH or PDH data rate. Changes to jitter amplitude or frequency are phase continuous.
Modulation Range	Modulation is selectable up to the following limits, which depend on the rate: 
Amplitude Scale in UI_{p-p} All rates	*A_0* *A_1* *A_2* *A_3* 100,000 10 3 1
Frequency Scale in Hz 2 Mb/s rate 34 Mb/s rate 140 Mb/s rate 52 Mb/s rate 155 Mb/s rate 622 Mb/s rate	*f_0* *f_1* *f_2* *f_3* *f_4* *f_5* 12 µ 30 m 300 9 k 33 k 100 k 12 µ 30 m 300 10 k 270 k 800 k 12 µ 30 m 300 20 k 1.2 M 3.5 M 12 µ 30 m 300 10 k 130 k 400 k 12 µ 30 m 300 35 k 430 k 1.3 M 12 µ 30 m 300 125 k 1.7 M 5 M
Amplitude Accuracy, typical	+ 5% + 0.06 UI, at 622 Mb/s rate ± 5% ± 0.03 UI, for all other rates
Frequency Accuracy	+ 1%, from 12 µHz to 20 Hz + 5 ppm, from 20 Hz to f_{max}

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–1: Standard CTS 750 Specifications (Cont.)

Characteristic	Description
Jittered Clock Output	Operates in addition to the jittered line output. Compliant with G.703 2048 kHz synchronization interface specifications.
Output Level, typical	0.8 V_{p-p} output (for all rates) is ECL compatible when terminated with 75 Ω 2 MHz G.703 output is compliant with G.703 2048 kHz synchronization interface specifications
Nominal Data Rates	2 MHz, 34 MHz, 140 MHz, 52 MHz, 155 MHz, or 622 MHz. Same as transmit line or can be set independently.
Connector	Rear-panel, unbalanced 75 Ω BNC
Jitter Clock Input	Input to measure jitter on a clock signal.
Nominal Data Rates	Any supported SDH or PDH rate. Rate is independent of the receive line rate.
Frequency Tolerance	Nominal rate ±100 ppm
Data Format	RZ
Sensitivity, typical	0.4 V_{p-p}
Maximum Input Amplitude	1.5 V_{p-p}
Connector	Rear-panel, unbalanced 75 Ω BNC
Analog Jitter Output	Demodulated jitter from the receiver. The output is filtered by any measurement filters selected.
Connector	Rear-panel 50 Ω BNC
Sensitivity, typical	Normal measurement range: 125 mV/UI Extended measurement range: 3.5 mV/UI
Output Level, typical	+ 1V, centered at 0 V + 100 mV

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–1: Standard CTS 750 Specifications (Cont.)

Characteristic	Description
Receive Input	
Electrical Input	
Data Rates	STM-0: 51.84 Mb/s ±100 ppm STM-1: 155.52 Mb/s +100 ppm
Data Formats	STM-0E: AMI, B3ZS coded STM-1E: CMI
Signal Sensitivity/Equalization	STM-0E Hi: 0.5 Vpk min to 1.2 Vpk max STM-0E –6 dB[2]: 0.25 Vpk min to 0.6 Vpk max STM-0E Lo[3]: 0.125 Vpk min to 0.35 Vpk max STM-0E Monitor: 20 dB of flat loss below –6 dB STM-1E Hi: 0.35 Vpk min to 0.6 Vpk max STM-1E –6 dB[4]: 0.35 Vpk min to 0.6 Vpk max STM-1E Lo[5]: 0.07 Vpk min to 0.3 Vpk max STM-1E Monitor: 26 dB of flat loss below Hi
Signal Level Display	Readout for: Electrical signal level in mV
Return Loss	>15 dB
Connector	Unbalanced BNC, 75 Ω to ground

2 –6 dB cable loss @ 25 MHz (–12.7 dB √f characteristic cable)

3 –12 dB cable loss @ 25 MHz (–12.7 dB √f characteristic cable)

4 –6 dB cable loss @ 78 MHz (–12.7 dB √f characteristic cable)

5 –12 dB cable loss @ 78 MHz (–12.7 dB √f characteristic cable)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–1: Standard CTS 750 Specifications (Cont.)

Characteristic	Description
Optical Input	
Data Rates	STM-0: 51.84 Mb/s (+100 ppm) STM-1: 155.52 Mb/s (+100 ppm) STM-4: 622.08 Mb/s (±100 ppm)
Maximum Input Power	–7 dBm: Opt. 05 and 06 include a 10 dB attenuator
Operating Wavelength	1310 nm and 1550 nm: 1100 nm to 1570 nm operating range
Signal Sensitivity	–28 dBm for BER $\leq 10^{-10}$
Optical Power Meter Accuracy	2 dBm, typical: For input power in a range of –30 dBm to –6 dBm
Connectors	FC-PC standard: Optical connector kit with ST, SC, and DIN 27256 included
Through Mode	Monitors a selected channel and passes the signal through unchanged
Transmit and Receive Functional Specifications	
Section Overhead	
Access	Set overhead bytes to any value from binary 00000000 to 11111111: A1, A2, C1, E1, F1, D1–D3, K1, K2, D4–D12, S1, Z2, M2, E2 View all Section Overhead bytes
Add/Drop	Insert data from the Overhead Add/Drop connector into the Section DCC, Line DCC or F1 user byte. Drops data from the Section DCC, Line DCC, or F1 user byte out to the Overhead Add/Drop connector.
K1 and K2 (APS)	Set the APS Bytes, K1 and K2, to any code defined in ANSI T1.105A Selectable by text description for all Span and Ring messages

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–1: Standard CTS 750 Specifications (Cont.)

Characteristic	Description
Path Overhead	
Access	Set Path Overhead bytes to any value from binary 00000000 to 11111111: C2, F2, Z3, Z4, and Z5 View all Path Overhead bytes
Add/Drop	Insert data from the Overhead Add/Drop connector into the F2 user byte Drop data from the F2 user byte out to the Overhead Add/Drop connector
Path Trace Byte J1	A user-defined string can be transmitted in 64-byte sequence, or set to 00000000
Pointer Movement	
Single	Single pointer justification (increment or decrement)
Burst	Bursts of two to eight pointer justifications spaced four frames apart. All adjustments within a given burst are in the same direction. Subsequent bursts are in alternating directions
Continuous	Pointer justifications occur continuously at a predetermined rate in an incrementing, decrementing, or alternating direction. Rate between movements: 2 ms to 10 s, with a resolution of 1 ms.
Set to Value	Set to a new location with or without the NDF being set. Range is 0 to 1023 (783 – 1023 are illegal locations).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–1: Standard CTS 750 Specifications (Cont.)

Characteristic	Description
Pointer Test Sequences	
AU Pointer sequences available	G.783(a) Single Alternating G.783(b) Regular + Double G.783(c) Regular + Missing G.783(d) Double Alternating G.783(e) Single G.783(f) Burst G.783(g) Periodic 87–3 G.783(g) Periodic 87–3 With Add G.783(g) Periodic 87–3 With Cancel G.783(h) Periodic G.783(h) Periodic with Add G.783(h) Periodic with Cancel Phase Transient Pointer Adjustment Burst
Initialization Period	On or Off Thirty second burst of 1 pointer per second in the same direction as the selected test
Cool Down Period	On or Off This will last at least 60 seconds
Measurements	
Error Count, Error Rate, and Errored Seconds for:	B1, B2, B3, Payload, MS-FEBE, Path-FEBE
Alarm and Failure Seconds for	LOS, OOF, LOF, AU LOP, MIS AIS & FERF, Path AIS & FERF, Loss of Power, Loss of Pattern Sync
AU Pointer Measurements	Seconds: LOP, Illegal pointers, NDF Count: Illegal pointers, Positive justifications, Negative justifications

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–1: Standard CTS 750 Specifications (Cont.)

Characteristic	Description
G.826 Analysis	
RS B1 Seconds and ratio	Error Blocks, ES, SES, UAS Background Block Errors
MS B2 & FEBE Seconds and ratio	Error Blocks, ES, SES, UAS Background Block Errors
Path B3 & FEBE Seconds and ratio	Error Blocks, ES, SES, UAS Background Block Errors
G.821 Analysis	
Pattern Bit Seconds and % of total time	Error-Count, ES, SES, UAS, EFS, DM
Section B1 Seconds and ratio	Error Blocks, ES, SES, UAS Background Block Errors
RS B1 Seconds and ratio	Error Blocks, ES, SES, UAS Background Block Errors
MS B2 & FEBE Seconds and % of total time	Error-Count, ES, ES-A, ES-B, SES, UAS, EFS FEBE-Count, FEBE-ES, FEBE-UAS, FEBE-EFS
Path B3 & FEBE Seconds and % of total time	Error-Count, ES, ES-A, ES-B, SES, UAS, EFS FEBE-Count, FEBE-ES, FEBE-UAS, FEBE-EFS
Pattern Bit Seconds and % of total time	Error-Count, ES, ES-A, ES-B, SES, UAS, EFS

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–1: Standard CTS 750 Specifications (Cont.)

Characteristic	Description
Jitter and Wander Analysis	
Jitter Measurements	Peak-to-peak Jitter, Positive Peak Jitter, Negative Peak Jitter, Jitter Hit Seconds, Jitter Out-of-range Seconds Peak-to-peak or RMS jitter measurement of the Clock or Line input. Exceeds the requirements of ITU-T G.783, G.823, G.825, G.958, and O.171.
Video Related Jitter Measurements	Jitter Pointer Event Seconds, Current Frequency Drift Rate, Maximum Frequency Drift Rate
Measurement Filter Response	Measurement filters meet the requirements of ITU-T G.783, G.823, G.825, G.958, and O.171. Lower cutoff (high pass) is first order (–20 dB/decade). Upper cutoff (low pass) is third order (–60 dB/decade) Butterworth. Cutoff frequencies are –3 dB ± 1 dB.
Wideband Filter (–3 dB)	2 Mb/s: 20 Hz to 100 kHz 34 Mb/s: 100 Hz to 800 kHz 140 Mb/s: 200 Hz to 3.5 MHz STM-0E: 100 Hz to 400 kHz STM-1E: 500 Hz to 1.3 MHz STM-1: 500 Hz to 1.3 MHz STM-4: 1 kHz to 5 MHz
Highband Filter (–3 dB)	2 Mb/s (low Q): 18 kHz to 100 kHz 2 Mb/s (high Q): 700 Hz to 100 kHz 34 Mb/s: 10 kHz to 800 kHz 140 Mb/s: 10 kHz to 3.5 MHz STM-0E: 20 kHz to 400 kHz STM-1E: 65 kHz to 1.3 MHz STM-1: 65 kHz to 1.3 MHz STM-4: 250 kHz to 5 MHz

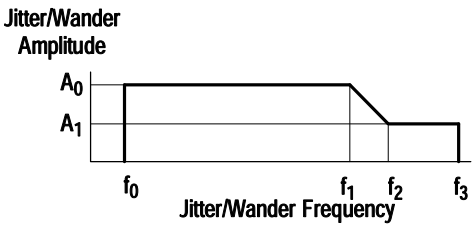
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–1: Standard CTS 750 Specifications (Cont.)

Characteristic	Description	
Fullband Filter (–3 dB)	2 Mb/s:	10 Hz* to 100 kHz
	34 Mb/s:	10 Hz* to 800 kHz
	140 Mb/s:	10 Hz* to 3.5 MHz
	STM-0E:	10 Hz* to 400 kHz
	STM-1E:	10 Hz* to 1.3 MHz
	STM-1:	10 Hz* to 1.3 MHz
	STM-4:	10 Hz* to 5 MHz
	* Lower –3dB frequency is user selectable to 0.1 Hz, 1 Hz, or 10 Hz.	
RMS Filter (–3 dB)	2 Mb/s:	12 kHz to 100 kHz
	34 Mb/s:	12 kHz to 800 kHz
	140 Mb/s:	12 kHz to 3.5 MHz
	STM-0E:	12 kHz to 400 kHz
	STM-1E:	12 kHz to 1.3 MHz
	STM-1:	12 kHz to 1.3 MHz
	STM-4:	12 kHz to 5 MHz

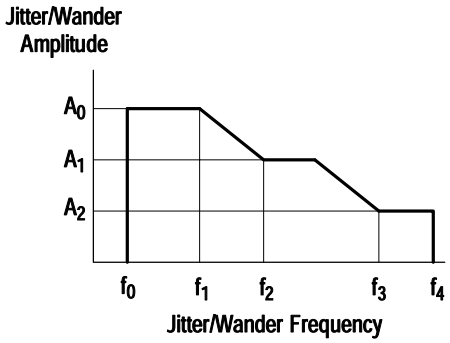
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–1: Standard CTS 750 Specifications (Cont.)

Characteristic	Description
Normal Jitter Measurement Resolution and Range	Resolution: 0.005 UI Range: see graph
	
Amplitude Scale in UI_{p-p} All rates	*A_0* *A_1* 6 0.5 *
	* A_1 amplitude is 0.3 UI_{p-p} for 2 Mb/s rate with PRBS pattern.
Frequency Scale in Hz	*f_0* *f_1* *f_2* *f_3*
2 Mb/s rate	0.1 5.3 k 64 k 100 k
34 Mb/s rate	0.1 13.3 k 160 k 800 k
140 Mb/s rate	0.1 26.7 k 320 k 3.5 M
52 Mb/s rate	0.1 26.7 k 320 k 400 k
155 Mb/s rate	0.1 26.7 k 320 k 1.3 M
622 Mb/s rate	0.1 68 k 800 k 5 M

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–1: Standard CTS 750 Specifications (Cont.)

Characteristic	Description					
Extended Jitter Measurement Resolution and Range	Resolution: 0.01 UI Range: see graph					
						
Amplitude Scale in UI_{p-p} All rates	*A_0* 200	*A_1* 16	*A_2* 0.5 *			
	* A_1 amplitude is 0.3 UI_{p-p} for 2 Mb/s rate with PRBS pattern.					
Frequency Scale in Hz	*f_0*	*f_1*	*f_2*	*f_3*	*f_4*	*f_5*
2 Mb/s rate	0.1	30	375	2 k	64 k	100 k
34 Mb/s rate	0.1	30	375	5 k	160 k	800 M
140 Mb/s rate	0.1	30	375	10 k	320 k	3.5 M
52 Mb/s rate	0.1	30	375	10 k	320 k	400 k
155 Mb/s rate	0.1	30	375	10 k	320 k	1.3 M
622 Mb/s rate	0.1	30	375	25 k	800 k	5 M

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–1: Standard CTS 750 Specifications (Cont.)

Characteristic	Description			
Intrinsic Noise with Jitterless Clock, typical	For peak-to-peak measurement, in UI_{p-p}:			
	Highband	*Wideband*	*Fullband (10 Hz)*	
2 Mb/s rate	≤0.02	≤0.03	≤0.1	
34 Mb/s rate	≤0.02	≤0.03	≤0.1	
140 Mb/s rate	<0.02	<0.03	<0.1	
52 Mb/s rate	≤0.02	≤0.03	≤0.1	
155 Mb/s rate	<0.02	<0.03	<0.1	
622 Mb/s rate	≤0.05	≤0.06	≤0.1	
	For RMS measurement, <0.01 UI_{RMS} at all rates			
Intrinsic Noise with Jitterless PRBS Data Signal, typical	For peak-to-peak measurement, in UI_{p-p}:			
	Highband	*Wideband*	*Fullband (10 Hz)*	*Fullband (1 Hz)*
2 Mb/s rate	<0.035	<0.035	<0.1	<0.2
34 Mb/s rate	≤0.035	≤0.035	≤0.1	≤0.2
140 Mb/s rate	<0.035	<0.035	<0.1	<0.2
52 Mb/s rate	≤0.035	≤0.035	≤0.1	≤0.2
155 Mb/s rate	≤0.035	≤0.035	≤0.1	≤0.2
622 Mb/s rate	<0.06	<0.07	<0.25	<0.75
	For RMS measurement, ≤0.01 UI_{RMS} at all rates			

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–1: Standard CTS 750 Specifications

Characteristic	Description
Jitter Measurement Accuracy	Jitter measurement accuracy is a function of the jitter frequency, intrinsic noise in the CTS 750, the filter chosen, and measurement resolution. Measured jitter uncertainty is expressed by the equation below, where f_{LC} is the lower cutoff frequency and f_{UC} is the upper cutoff frequency: $Measured\ jitter\ (f) = Jitter\ input\ (f) \times \left[\sqrt{\frac{\left(\frac{f}{f_{LC}}\right)^2}{1+\left(\frac{f}{f_{LC}}\right)^2}} \times \sqrt{\frac{1}{1+\left(\frac{f}{f_{UC}}\right)^6}} + 5\% \right]$ $\pm\ Intrinsic\ noise \pm Resolution$
Additional Corrections to Jitter Measurement Accuracy	2 Mb/s Extended Range, add ±5%
Wander Measurements	Estimated Bit Slips, Estimated Frame Slips, Peak-to-peak Wander, TIE (Time Interval Error), Current Frequency, Maximum Frequency, Minimum Frequency
Peak-to-peak Measurement	Range: 1,000,000 ns Noise: ± 5ns Accuracy: 1% + noise Bandwidth: 0 Hz to 10 Hz
TIE Measurement	Range: 500,000 ns Noise: ± 5ns Accuracy: 1% + noise Bandwidth: 0 Hz to 10 Hz
Frequency Measurement	Resolution: 1 Hz absolute (0.01 ppm change) Accuracy: ±0.1 ppm (with respect to source clock)
Frequency Drift Measurement	Range: 100 ppm/s Resolution: 0.001 ppm/s Accuracy: 1% ± 0.01 ppm/s Bandwidth: 0 Hz to 0.5 Hz

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–1: Standard CTS 750 Specifications (Cont.)

Characteristic	Description
LEDs	
Status Indicators	LOS, LOF, LOP, MS AIS, MS FERF, Path AIS, Path FERF, Errors, Pointer Adjust, Signal Present, Pattern Lock
Histograms	
Error Count, Bit Error Rate and Errored Seconds	B1, B2, B3, MS-FEBE, Path-FEBE, Pattern Bit
Alarms & Failures On/Off	LOS, OOF, LOF, AU-LOP, MIS-AIS, AU-FERF, Path-AIS, Path-FERF, Pattern Loss, Loss of Power
Pointers	AU Pointer Value, Pointer Justification
Measurement Utilities	
Measurement Control	Manual Start/Stop Timed: 1 s to 99 days with 1 s resolution Continuous
Histogram Display Resolution	High: 1 sec (displays 1 hour with 1 sec resolution) Normal: 1 min, 5 min, 15 min, 1 hour (displays 72 hours with 1 min resolution) Low: 15 min, 60 min, 4 hrs, 12 hrs (displays 45 days with 15 min resolution)
Result Logging	All measurements are recorded with start, stop time and date. The current and previous results are stored in memory both totalized and graphical. Both graphical and totalized results can be stored on a disk.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–1: Standard CTS 750 Specifications (Cont.)

Characteristic	Description
Utilities	
TroubleScan	Scans all measurement results for key violations
AutoScan	AutoScan to incoming signal (rate, mapping, framing and pattern). Identifies incoming signal and presents graphical display of AU and TU structure. Identifies TU signal status by showing TU number, equipped vs unequipped, alarms, and pattern.
Stored Setups	5 front panel setups in memory 200 front panel setups per disk
Pass/Fail Tests	Predefined Pass/Fail Tests can be created, stored and executed Pass/Fail tests are stored on disk 200 Pass/Fail test setups per disk
Add/Drop Interface for Data Communication Channels and User Channels	A DB-37 female connector provides the interface to an external protocol analyzer. Clock and data signals are differential TTL, conform to RS-422 specifications, and are also compatible with single-ended TTL signals. Add/Drop: D1–D3, D4–D12, F1, F2 Connector: 37 Pin DIN (DTE and DCE)
Triggering	Pulse at start of each frame, (Tx and Rx), Connector: 37 Pin DIN
Disk Drive	3.5 inch, 1.44 MB, DOS compatible Measurement Result stored in ASCII Stored Setups and Pass/Fail Tests in IEEE 488.2 format
Printer	Optional printer in pouch (thermal): HC 411 Printer support: Epson, HP Thinkjet Serial Printer Port: RS-232 Print to disk: BMP format, Interleaf format, and Encapsulated PostScript
Computer Interface	IEEE-488.2 interface RS-232-C interface (DB9)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–1: Standard CTS 750 Specifications (Cont.)

Characteristic	Description
Help Mode	Online task-oriented help
Display	7 inch diagonal CRT, magnetic deflection Horizontal raster-scan green phosphor Resolution: 640 by 480 pixels VGA output: 15 pin connector

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–2: Option 36 2 Mb/s, 34 Mb/s, 140 Mb/s, TU12, TU3 Capabilities

Characteristic	Description
2 Mb/s, 34 Mb/s, 140 Mb/s Generator	
Electrical Output	
Data Rates	2 Mb/s (2.048 Mb/s) 34 Mb/s (34.368 Mb/s) 140 Mb/s (139.264 Mb/s)
Formats	2 Mb/s, 34 Mb/s: HDB3 coded 140 Mb/s: CMI coded
Signal Level	2 Mb/s: 3 Vpk ±0.6 V into 120 Ω 2 Mb/s: 2.37 Vpk +0.6 V into 75 Ω 34 Mb/s: 1 Vpk ±0.6 V into 75 Ω 140 Mb/s: 1 Vpk +0.6 V into 75 Ω
Pulse Shape	Meets ITU-T G.703 Pulse Masks
Connectors	2 Mb/s: 3 pin Siemens 120 Ω 2 Mb/s, 34 Mb/s, 140 Mb/s: BNC 75 Ω
Data Source	2 Mb/s: 2 Mb/s Internal Generator SDH TU12 Drop 34 Mb/s: 34 Mb/s Internal Generator SDH TU3 Drop 140 Mb/s: 140 Mb/s Internal Generator SDH VC4 Drop
2 Mb/s, 34 Mb/s, 140 Mb/s Internal Pattern Generator	
Framing	2 Mb/s: 34 Mb/s & 140 Mb/s: PCM30 (CAS) Framed PCM31 Unframed PCM30 CRC (CAS) PCM31 CRD Unframed
Patterns	PRBS: 2^{15}–1, 2^{20}–1, 2^{23}–1; All 1s, All 0s, 1 in 8 (2 Mb/s only); Fixed Pattern: 8 bit, 16 bit, 24 bit
Errors Single or Continuous	Frame Bit Error CRC-4 Error (2 Mb/s only) Pattern Bit Error

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–2: Option 36 2 Mb/s, 34 Mb/s, 140 Mb/s, TU12, TU3 Capabilities (Cont.)

Characteristic	Description
Error Rate Range	1×10^{-2} to 1×10^{-8} with 0.1 resolution[1]
Alarms	RAI AIS
TU12/TU3/VC4 Mapping	
Mapping Signal Source for TU12, TU3, and VC4	Internal Generator: 2 Mb/s, 34 Mb/s, 140 Mb/s Received Signal: 2 Mb/s, 34 Mb/s, 140 Mb/s
Mapping mode	Floating Asynch
TU12 Active Map Channel Selection	Allows selection of any one of 63 TU channels Remaining 62 TU channels are background
TU3 Active Map Channel Selection	Allows selection of any one of 3 TU channels Remaining 2 TU channels are background
140 Mb/s Active Map Channel Selection	Into selected STM-1 VC4
TU Background Channels	
TU Background Channel Content	When internal 2 Mb/s or 34 Mb/s generator is used: PRBS: 2^{15}–1 or Idle pattern (11010101) when external source is used: PRBS: 2^{15}–1
Background Channel Framing	When internal 2 Mb/s or 34 Mb/s generator is used: Same as active channel When external source is used: Unframed
TU Errors (Single or Continuous)	TU12 BIP–2, TU3 BIP–8 TU12 FEBE, TU3 FEBE
TU Alarms and Failures	TU AIS TU FERF TU Loss of Pointer TU Loss of Multiframe

1 **Depends on error type.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–2: Option 36 2 Mb/s, 34 Mb/s, 140 Mb/s, TU12, TU3 Capabilities (Cont.)

Characteristic	Description
Transmitter Clock	
Internal Clock	
Accuracy	±4.6 ppm, for instrument calibrated within 24 months
External Clock Reference	
Rates	2.048 Mb/s ±40 ppm 2.048 MHz +50 ppm
Input	Unbalanced, 75 Ω BNC connector
Recovered Clock	
Loop timing	Clock is recovered from received signal
Transmit Line Frequency Offset	
Frequency offset rate	2 Mb/s: ±50 ppm of nominal line rate 34 Mb/s: +130 ppm of nominal line rate 140 Mb/s: +100 ppm of nominal line rate with 0.1 ppm resolution
External Reference	+100 ppm of line rate referenced to external source
External PDH Clock Input (for Jitter Generation)	
Rates	2 Mb/s, 34 Mb/s, 140 Mb/s
Input	Unbalanced, 75 Ω BNC, AC coupled
Signal Level	0.5 V to 1.5 V peak to peak
Internal Jitter Generator	Refer to *Jitter Generator* on page D–4
2 Mb/s, 140 Mb/s Receiver	
Electrical Input	
Data Rates	2 Mb/s (2.048 Mb/s) +150 ppm 34 Mb/s (34.368 Mb/s) ±150 ppm 140 Mb/s (139.264 Mb/s) ±150 ppm
Formats	2 Mb/s: HDB3 coded 34 Mb/s: HDB3 coded 140 Mb/s: CMI coded

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–2: Option 36 2 Mb/s, 34 Mb/s, 140 Mb/s, TU12, TU3 Capabilities (Cont.)

Characteristic	Description
Impedance	2 Mb/s: 120 Ω balanced 2 Mb/s Bridged: 1 kΩ balanced 2 Mb/s, 34 Mb/s, 140 Mb/s: 75 Ω unbalanced
Signal Level	2 Mb/s: 3 Vpk ±0.6 V into 120 Ω 2.37 Vpk +0.6 V into 75 Ω Monitor: 26 dB flat loss below Hi 34 Mb/s: 0.6 Vpk +0.24 V into 75 Ω Monitor: 26 dB flat loss below Hi 140 Mb/s: 0.6 Vpk ±0.24 V into 75 Ω Monitor: 26 dB flat loss below Hi
Connectors	2 Mb/s: 3 pin Siemens 120 Ω 2 Mb/s, 34 Mb/s, 140 Mb/s: BNC 75 Ω
2 Mb/s, 34 Mb/s 140 Mb/s Internal Pattern Receiver	
Pattern Receiver Source	2 Mb/s: 2 Mb/s External Input SDH TU12 Drop 34 Mb/s: 34 Mb/s External Input SDH TU3 Drop 140 Mb/s: 140 Mb/s External Input SDH VC4 Drop
Framing	2 Mb/s: 34 Mb/s & 140 Mb/s: PCM30 (CAS) Framed PCM31 Unframed PCM30 CRC (CAS) PCM31 CRC Unframed
TU12/TU3/VC4 Demapping	
Demapping TU12, TU3 and VC4 Signal Drop to	Internal Receiver: External Signal Output 2 Mb/s 2 Mb/s 34 Mb/s 34 Mb/s 140 Mb/s 140 Mb/s
Demapping mode	Floating Asynch
TU12 Active Demap Channel Selection	Allows selection of any one of 63 TU channels
TU3 Active Demap Channel Selection	Allows selection of any one of 3 TU channels

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–2: Option 36 2 Mb/s, 34 Mb/s, 140 Mb/s, TU12, TU3 Capabilities (Cont.)

Characteristic	Description
140 Mb/s Active Demap Channel from	Selected STM-1 VC4
TU Path Overhead	
TU12 Path Overhead Access	V5 control (––xxxx–) Set Path Overhead bytes to any value from binary 00000000 to 11111111: Z3, Z4, and Z5 View all TU Path Overhead bytes
TU3 Path Overhead Access	Set Path Overhead bytes to any value from binary 00000000 to 11111111: C2, F2, Z3, Z4, and Z5 View all TU Path Overhead bytes
TU3 Path Trace Byte J1	Send user-defined 16 or 64-byte sequence, or set to 00000000 View Path Trace J1
TU12 Path Trace Byte J2	Send user-defined 16-byte sequence, or set to 00000000 View Path Trace J2
TU Pointer Measurement	
TU Pointer Interaction	TU12, TU3, or AU, but not at the same time
Single	Single pointer justification (increment or decrement)
Burst	Bursts of two to eight pointer justifications spaced four multi-frames apart. All adjustments within a given burst are in the same direction. Subsequent bursts are in alternating directions.
Continuous	Pointer justifications occur continuously at a predetermined rate in an incrementing, decrementing, or alternating direction. Rate between movements: 48 ms to 1 s, with a resolution of 1 ms.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–2: Option 36 2 Mb/s, 34 Mb/s, 140 Mb/s, TU12, TU3 Capabilities (Cont.)

Characteristic	Description
Set to Value	Set to a new location with or without the NDF being set. TU12 Range is from 0 to 1023 (140 – 1023 are illegal locations). TU3 Range is from 0 to 1023 (783 – 1023 are illegal locations).
TU Pointer sequences available	G.783(a) Single Alternating G.783(b) Regular + Double G.783(c) Regular + Missing G.783(d) Double Alternating G.783(e) Single G.783(f) Burst G.783(g) Periodic 87–3 G.783(g) Periodic 87–3 With Add G.783(g) Periodic 87–3 With Cancel G.783(h) Periodic G.783(h) Periodic with Add G.783(h) Periodic with Cancel Phase Transient Pointer Adjustment Burst TU-3 Periodic 85–5 TU-3 Periodic 85–5 With Add TU-3 Periodic 85–5 With Cancel TU-12 Periodic 35–1 TU-12 Periodic 35–1 With Add TU-12 Periodic 35–1 With Cancel
Pointer Direction	Positive or Negative
Initialization Period	On or Off Thirty second burst of 1 pointer per second in the same direction as the selected test
Cool Down Period	On or Off This will last at least 60 seconds
PDH & TU Measurements	
PDH Error Count, Error Rate and Error seconds for	Frame Bit CRC-4 (2 Mb/s only) Pattern Bit
TU Error Count, Error Rate and Error seconds for	TU12 BIP–2 TU3 BIP-2 TU12 FEBE TU3 FEBE

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–2: Option 36 2 Mb/s, 34 Mb/s, 140 Mb/s, TU12, TU3 Capabilities (Cont.)

Characteristic	Description
PDH Alarm and Failure Seconds for	AIS RAI Loss of Pattern Sync Loss of Frame Loss of Signal
TU Alarm and Failure Seconds for	TU AIS TU FERF TU Loss of Pointer TU Loss of Multiframe
TU Pointer Measurements	Seconds: Count: LOP Illegal pointers Illegal pointers Positive justifications NDF Negative justifications
G.826 Analysis for TUs	
TU12 BIP-2 & FEBE Seconds and ratio	Error Blocks, ES, SES, UAS, Background Block Errors FEBE-Count, FEBE-ES, FEBE-UAS FEBE-EFS
TU3 BIP-8 & FEBE Seconds and ratio	Error Blocks, ES, SES, UAS, Background Block Errors FEBE-Count, FEBE-ES, FEBE-UAS FEBE-EFS
G.821 Analysis for PDH	
PDH Frame & CRC-4 Errors, Seconds, and % of total time	Error-Count, ES, SES, UAS, EFS, DM
Payload (Pattern Bit Errors), Seconds and % of total time	Error-Count, ES, SES, UAS, EFS, DM
M.2100 Analysis for PDH	
In Service Seconds and % of total time	Error-Count, ES, SES, UAS, EFS
Out of Service Seconds and % of total time	Error-Count, ES, SES, UAS, EFS
Jitter and Wander Analysis	Refer to *Jitter and Wander Analysis* on page D–11

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–2: Option 36 2 Mb/s, 34 Mb/s, 140 Mb/s, TU12, TU3 Capabilities (Cont.)

Characteristic	Description
LEDs	
Status Indicators	TU AIS TU FERF TU12 BIP-2 ERROR TU3 BIP-8 ERROR PDH AIS PDH RAI PDH ERROR
Histograms for PDH & TU	
Error Count, Bit Error Rate, and Errored Seconds	PDH-Frame, 2 Mb/s CRC-4, TU-BIP, TU-FEBE, Pattern Bit
Alarms & Failures On/Off	LOS, LOF, PDH-AIS, PDH-RAI, TU-LOP, TU-AIS, TU-FERF, TU-LOM, Pattern Loss, Loss of Power
TU Pointers	TU Pointer Value, Pointer Justification
Measurement Utilities	
Measurement Control	Manual Start/Stop Timed: 1 s to 99 days with 1 s resolution Continuous
Histogram Display Resolution	High: 1 sec (displays 1 hour with 1 sec resolution) Normal: 1 min, 5 min, 15 min, 1 hour (displays 72 hours with 1 min resolution) Low: 15 mins, 60 mins, 4 hrs, 12 hrs (displays 45 days with 15 min resolution)
Result Logging	All measurements are recorded with start, stop time and date. The current and previous results are stored in memory both totalized and graphical. Both graphical and totalized results can be stored on a disk.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–3: Environmental Specifications

Characteristic	Description
Temperature	Operating: 0° C to +40° C Nonoperating: –40° C to +75° C
Altitude	Operating: 4,572 m (15,000 ft) Nonoperating: 12,192 m (40,000 ft)
Humidity	Operating: To 95%, relative humidity at or below +40° C for 2 hours or less To 90% relative humidity at or below 30° C, continuous
Transportation Handling	Qualifies under National Safe Transit Association 1s Pre-shipment Test; 1A-B-1.

Table D–4: Physical Characteristics

Characteristic	Description
Dimensions	Height: 165 mm (6.5 in) 191 mm (7.5 in) with accessory pouch Width: 362 mm (14.25 in) Depth: 490 mm (19.25 in) with front cover 564 mm (22.2 in) with handle extended
Weight	Net: Approximately 8.7 kg (19.3 lb) Shipping: Approximately 14.1 kg (31 lb)
Power Requirements	*Line Voltage* / *Line Frequency* 90 V to 132 V / 50/60 Hz 180 V to 250 V / 50/60 Hz 100 V to 132 V / 400 Hz Maximum current is 6 A_{RMS}.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–5: Certifications and compliances

Characteristic	Description
EC Declaration of Conformity – EMC	Meets intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities: EN 55011 Class A Radiated and Conducted Emissions EN 50082-1 Immunity: IEC 801-2 Electrostatic Discharge Immunity IEC 801-3 RF Electromagnetic Field Immunity IEC 801-4 Electrical Fast Transient/Burst Immunity IEC 801-5 Power Line Surge Immunity
FCC Compliance	Emissions comply with FCC Code of Federal Regulations 47, Part 15, Subpart B, Class A Limits
EC Declaration of Conformity – Low Voltage	Compliance was demonstrated to the following specification as listed in the Official Journal of the European Communities: Low Voltage Directive 73/23/EEC EN 61010-1/A1 Safety requirements for electrical equipment for measurement, control, and laboratory use
Approvals	UL3111-1 – Standard for Electrical Measuring and Test Equipment CAN/CSA C22.2 No. 1010-1 – CSA Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–5: Certifications and compliances (cont.)

Characteristic	Description	
Conditions for Safety Certification	Operating temperature:	+5 to +40 °C
	Relative Humidity (maximum operating)	80% up to 31 °C, decreasing linearly to 50% at 40 °C
	Max. Operating altitude:	2000 m
	Equipment Type:	Test and measuring
	Safety Class:	Class I, grounded product (IEC1010-1)
	Overvoltage Category:	CAT II (IEC1010-1)
	Polution Degree:	Polution Degree 2, rated for indoor use only (IEC1010-1)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table D–5: Certifications and compliances (cont.)

Characteristic	Description
Installation Category Descriptions	Terminals on this product may have different installation category designations. The installation categories are: CAT III — Distribution-level mains (usually permanently connected). Equipment at this level is typically in a fixed industrial location CAT II — Local-level mains (wall sockets). Equipment at this level includes appliances, portable tools, and similar products. Equipment is usually cord-connected CAT I — Secondary (signal level) or battery operated circuits of electronic equipment

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP