

## SPECIFICATIONS

### Connectors

Bantam jacks (Eq Tx, Eq Rx, Fac Tx, Fac Rx)  
8-pin mini DIN RS232C serial port, DTE

### Access

Single Mode

DSX Monitor: 100Ω  
Bridged Monitor: > 1000Ω  
Terminated: 100Ω  
Terminated Loop: 100Ω  
Bridged Loop: > 1000Ω  
DSX Monitor Loop: 100Ω

Dual Mode

Thru A/B, Split A/B, Split E/F, Loop E/F, Mon E/F  
Termination  
Thru, Split, Loop: 100Ω  
Mon: > 1000Ω

### Transmitter

Framing: SF-D4, ESF, SLC-96, T1DM  
Coding: AMI, B8ZS  
Line Build Out (LBO): 0, 7.5, 15 dB  
DSX pre-equalization: 0 to 655 ft, 133 ft per step  
Clock: Internal (1.544 MHz ± 5 ppm), looped, external  
Pulse shape to Telcordia TR-TSY-000499; reference: G.703, CB113, CB119, CB132, CB143, PUB62508, PUB62411  
Transmit Patterns  
Repeating: 3 in 24, 1 in 8 (1:7), all 1s, 1 in 16, 55 octet, alt 1010, all 0s, T1-T6, DDS1-DDS6  
User programmable pattern 1 to 2048 bits  
Store up to 10 programmable patterns with alphanumeric names  
Pseudo random: QRS, PRBS, n = 6, 7, 9, 11, 15, 20, 23  
Test pattern inversion  
Insert errors: BPV, logic, frame errors; programmable error burst 1 to 9999 counts, or error rate  $2 \times 10^{-3}$  to  $1 \times 10^{-9}$

### Receiver

Input sensitivity  
Terminate, Bridge: +6 to -36 dB cable loss  
DSXMON: -15 to -30 dB, resistive  
Coding: AMI, B8ZS, Auto  
Framing: SF, ESF, SLC-96, T1DM, auto frame  
Frequency range: 1542 kHz to 1546 kHz  
Auto pattern synchronization  
Received pattern sync independent of transmitted pattern  
Programmable loss of frame criteria, error averaging interval

### Basic Measurements

#### Summary Measurements

Elapsed time, remaining time, framing, line coding, transmitted pattern, received pattern, BPV count and rate, bit error count and rate, framing bit error count, pulse level (dB), CRC-6 block error count, line frequency, errored second count and percent, severely errored second count and percent, error free second percent, available second percent, unavailable second count and percent

#### Logical Error Measurements

Bit error count and current rate, average bit error rate since start, bit slips, bit errored seconds and percent, severely bit errored seconds and percent, available seconds and percent, unavailable seconds and percent, degraded minutes count and percent, loss of sync seconds count and percent

#### Signal Measurements

Signal available seconds count and percent, loss of signal seconds count and percent, low density seconds count, excess 0s seconds count, AIS seconds count, signal unavailable seconds percent  
Simplex current: 1 to 150 mA, ± 1 mA ± 5%  
Receive bit rate: 1542 to 1546 kbps, ± 1 bps, ± clock source accuracy, external or internal clock  
Receive level (volts and dBdsx)  
Peak to peak: 60 mV to 15V, ± 10 mV, ± 5%  
Positive pulse: 30 mV to 7.5V, ± 10 mV, ± 5%  
Negative pulse: -30 mV to -7.5V, ± 10 mV, ± 5%



# SunSet™ T1

## **Line Error Measurements**

BPV count and rate (current and average), BPV error seconds count and percent, BPV SES count and percent, BPV AS count and percent, BPV UAS count and percent, BPV degraded minutes count and percent

## **Path - Frame Measurements**

Frame bit error count and rate (current and average), frame slip count, OOF second count, COFA count, frame synch loss seconds, yellow alarm second count, frame error second count and percent, frame severely errored second count and rate, frame available second count and percent, frame unavailable second count and percent

## **Path - CRC-6 Measurements**

CRC-6 block error count and rate (current and average), CRC-6 errored second count and percent, CRC-6 severely errored second count and percent, CRC-6 available second count and percent, CRC-6 unavailable second count and percent

## **Frequency Measurements**

Moving bar graph of slip rate, received signal frequency, max frequency, min frequency, clock slips, frame slips, max positive wander, max negative wander

## **Other Measurements**

### **View Received Data**

View T1 data in binary, hex, ASCII  
Shows data in bytes by time slot  
Shows 8 time slots per display page  
Captures 256 consecutive time slots as test pattern

### **Propagation Delay**

Measure round trip propagation delay in unit intervals  $\pm 1$  UI, with translation to microseconds and one way distance over cable

### **Quick Test I and II**

2 programmable automated loopback tests that save time when performing standardized acceptance tests

### **Bridge Tap**

Automated transmission and measurement of 21 different patterns to identify possible bridge taps at some point on line

## **Loopbacks**

### **Loopback Control, In-band**

CSU, NIU, 100000  
10 programmable user patterns, 1 to 32 bits

### **Loopback Control, ESF-Facility Data Link**

Payload, Line, Network  
10 programmable user patterns, 1 to 32 bits

### **Westell & Teltrend Looping Devices Control (SW1010)**

Automated looping of Westell and Teltrend line and central office repeaters. Includes SF and ESF modes, arm, loop up/down, loopback query, sequential loopback, power loop query, span power down/up, unblocking.

## **Voice Frequency Capability**

Monitor speaker with volume control  
Built-in microphone for talk  
View all 24 channel A, B (C, D) bits  
Control A, B (C, D) bits (E&M ground/loop start, FXO, FXS, on/off hook, wink)  
Generator: 404, 1004, 1804, 2713, 2804 Hz @ 0 dBm and -13 dBm  
DTMF dialing, 32 digits, 10 sets preprogrammable speed dial number  
Programmable tone and interdigital period  
Companding law -  $\mu$  Law  
Hitless drop and insert  
Programmable idle channel A, B (C, D) bits  
Selectable idle channel code, 7F or FF hex

### **VF Level, Freq & Noise Measurement (SW111)**

Generator: 50 to 3950 Hz @ 1 Hz step; +3 to -60 dBm @ 1 dBm step  
Level, Freq measurements: 50 to 3950 Hz +3 dBm to -60 dBm  
Noise: 3 kHz flat, C-message, C-notch, S/N

### **MF/DTMF/DP Dialing, Decoding and Analysis (SW141)**

MF/DTMF/DP dialing  
Programmable DP %break and interdigital period @ 10 pps  
MF/DTMF decode up to 40 received digits. Analyze number, high/low frequencies, high/low levels, twist, tone period, interdigital time.  
DP decode up to 40 digits. Analyze number, %break, PPS, interdigital time.  
Signaling Analysis  
Live: Graphical display of A, B (C, D) signaling state changes  
Trigger: Programmable A, B (C, D) trigger state to start analysis on the opposite side  
MFR1: Timing analysis of signaling transition states and decoding of dialed digits  
MFR1M: Modified MFR1 CO switches signaling analysis  
MIXTONE: Decode a signaling sequence that has both MF and DTMF digits

### **Fractional T1 (SW105, SW1010)**

Error measurements, channel configuration verification  
Nx64 kbps, Nx56 kbps, N=1 to 24  
Sequential, alternating, or random channels  
Auto scan and auto configure to any FT1 order  
Scan for active channels  
Rx and Tx do not need to be same channels  
Hitless drop and insert  
Programmable idle channel A, B (C, D) bits  
Selectable idle channel code, 7F or FF hex

### **ESF Facility Data Link (SW107, SW1010)**

Read and Send T1.403 message on FDL (PRM and BOM)  
Automatic HDLC protocol handling  
YEL ALM, LLB ACT, LLB DEA, PLB ACT, PLB DEA  
AT&T 54016, 24 hr performance report retrieval  
T1.403, 24 hour PRM collection per 15 min interval

### **SLC-96 Data Link (SW107, SW1010)**

Send and receive message  
WP1, WP1B, NOTE formats  
Alarms, switch-to-protect, far end loop  
To Telcordia TR-TSY-000008 specifications  
SLC-96 FEND loop

### **CSU/NI Emulation (SW106, SW1010)**

Bidirectional (Equipment and Facility Directions)  
CSU/NI replacement emulation  
Responds to loopback commands - inband and datalink  
Graphic indication of incoming signal status in both directions  
Simultaneous display of T1 line measurements  
Automatic generation of AIS  
Loopbacks  
    Facility: Line and payload loopback  
    Equipment: Line loopback  
    Simultaneous loopbacks in both directions  
    Local and remote loopback control

### **Remote Control (SW100)**

VT100 emulation with same graphical interface used by test set  
Circuit status table provides current & historical information on test set LEDs  
Uses test set's serial port at 9600 baud, 8-pin MINI DIN  
Serial port can not be connected to printer during remote control

### **Westell PM NIU and MSS (SW120)**

Supports Westell performance monitoring network interface unit and maintenance switch system with ramp  
Set/query NIU time and date. Query performance data by hour or all.  
Reset performance registers. Read data over ramp line. Perform maintenance switch function for Westell and Teltrend.

### **Pulse Mask Analysis (SW130)**

Scan Period: 800 ns  
Measurements: Pass/Fail, ns Rise time, ns fall time, ns pulse width, %overshoot, %undershoot  
Resolution: 1 ns or 1%, as applicable  
Masks: ANSI T1.102, T1.403, AT&T CB119, Pub 62411  
Pulse/Mask Display: Test set screen and SS118 printer

### **DDS Basic Package (SW170)**

Choose receive and transmit time slots independently  
Test rates: 2.4, 4.8, 9.6, 19.2, 56, 64 kbps  
Patterns: 2047, 511, 127, 63, all 1s, all 0s, DDS-1, DDS-2, DDS-3, DDS-4, DDS-5, DDS-6, 8-bit user  
Loopbacks: Latching, interleaved, CSU, DSU, OCU, DSO-DP, 8-bit user  
Measurements: Bit errors, Bit error rate  
Control code send/receive: Abnormal, mux out of sync, idle  
Access Mode: Loopback tests require intrusive access to T1

### **Teleos & Switched 56 Tests (SW144)**

Switched 56 call set up: Supervision and dialing  
Send test patterns: 2047, 511, 127, 63, all 1s, all 0s, FOX, DDS1-6, USER  
Bit error, bit error rate measurement  
Teleos signaling sequence timing analysis and dial digits decoding

## **GENERAL**

Operating temperature: 0°C to 50°C  
Operating humidity: 5% to 90%, noncondensing  
Storage temperature: -20°C to 70°C  
Size: 2.4" (max) x 4.2" (max) x 10.5"  
Weight: 2.7 lb [1.2 kg]  
Battery operation time: 2.5 hr nominal  
AC operation: 110V/120V @ 60 Hz, or 220V/240V @ 50/60 Hz

## **ORDERING INFORMATION**

### **Test Set**

SS100 SunSet T1 Chassis  
Includes battery charger, User's manual, Instrument stand.  
Software cartridge must be ordered separately.  
CLEI: T1TUW04HAA  
CPR: 674488

### **Software Options**

SW1000 Software T1  
Includes basic measurements, loopback control, test patterns send/rcv, bridge tap, propagation delay, quick test.  
Also includes VF channel capabilities: Talk/listen, view/control A, B (C, D), DTMF dialing, send 5 tones at 2 levels  
CLEI: T1TUW01HAA  
CPR: 674485

SW1010 Software FT1  
Includes all Software T1 features and adds: Fractional T1, Teltrend/Westell looping device control, CSU/NIU emulation, ESF/SLC-96 data link control  
CLEI: T1TUW02HAA  
CPR: 674486

SW100 Remote Control  
Graphical, menu driven VT100 emulation  
Includes SS115 & SS122

SW105 Fractional T1  
Purchased with SW1000 only

SW106 CSU/NIU Emulation  
Purchased with SW1000 only

SW107 ESF & SLC-96 Data Link Send and Receive  
Purchased with SW1000 only

SW111 VF Level, Frequency & Noise Measurement

SW120 Westell Maintenance Switch, PM NIU, RAMP  
Purchased with SW1010 only

SW130 Pulse Mask Analysis

SW141 MF/DTMF/DP Dialing, Decoding, and Analysis

SW144 Teleos/Northern Switched 56 tests

SW170 Basic DDS Package

### **Accessories**

SS101 Carrying Case  
SS104 Cigarette Lighter Battery Charger  
SS105 Repeater Extender  
SS106 Single Bantam to Single Bantam Cable, 6'  
SS107 Dual Bantam to Dual Bantam Cable, 6'  
SS108 Single Bantam to Single 310 Cable, 6'  
SS109 Single Bantam to Probe Clip Cable, 6'

SS110 Dual Bantam to 15-pin D Connector Cable, Male, 6'  
 SS111 Dual Bantam to 15-pin D Connector Cable, Female, 6'  
 SS112 Dual Bantam to 8-position Modular Plug Cable, 6'  
 SS113A AC Battery Charger, 120VAC  
 SS113B AC Battery Charger, 110VAC  
 SS114 SunSet T1 User's Manual  
 SS115 DIN-8 to RS232C Printer Cable  
 SS115B DIN-8 to DB-9 Printer Cable  
 SS116 Instrument Stand  
 SS117A Printer Paper, 5 rolls, for SS118B/C  
 SS118B High Capacity Thermal Printer with 110 VAC charger. Includes SS115B.  
 SS118C High Capacity Thermal Printer with 220 VAC charger. Includes SS115B.  
 SS121A SunSet AC Charger, 230VAC, 50/60 Cycle European style connector  
 SS121B SunSet AC Charger, 220VAC, 50/60 Cycle 3-prong IEC connector  
 SS121C SunSet AC Charger, 240VAC, 50/60 Cycle 3-prong IEC connector  
 SS122 Null Modem Adapter, DB-25  
 SS122A Null Modem Adapter, DB-9  
 SS123A SunSet Jacket  
 SS125 SunSet T1 Training Tape, English  
 SS130A Removable SunSet Rack Mount - 19"/23"  
 SS130B Permanent SunSet Rack Mount - 19"/23"  
 SS132 Two Single Bantams to 4-position Modular Plug Cable

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