

## SPECIFICATIONS

### Connectors

Bantam jacks, Line 1 and 2 Tx/Rx  
 Serial Port: 8 DIN, RS232C (V.24), DTE  
 Datacom Port: SCSI-36 system expansion port

### Test Mode

T1SINGLE: T1 line testing  
 T1DUAL: Bidirectional T1 line testing, DS0/VF  
     channelized drop/insert, SS7 protocol analysis, ISDN  
     PRI protocol analysis and call setup, DDS testing  
 T1-MUX: Fractional T1 datacom port drop/insert testing  
 DATACOM: V.35, RS449/V.36, X.21/V.11, RS232/V.24

### Status/Alarm Indicators

Power and low battery LED indicators  
 16 dual-color LED indicators for Line 1 & 2: Pulses, B8ZS,  
 AIS, Yellow Alarm, SF-D4, ESF, SLC-96, Error  
 Logical: Test Pattern Sync, bit error

### T1 Interface

Framing: SF-D4, ESF, SLC-96  
 Coding: AMI, B8ZS  
 Access Mode  
     DSX Monitor:  $100\Omega, \pm 1\%$   
     Bridge:  $> 1000\Omega$   
     Terminated:  $100\Omega, \pm 1\%$   
 Transmitter  
     Line Build Out (LBO): 0, -7.5, -15, -22.5 dB  
     Clock: Internal (1.544 MHz,  $\pm 5$  ppm), looped, external  
     Pulse shape to TR-TSY-000499; reference: G.703,  
     CB113, CB119, CB132, CB143, PUB62508, PUB62411  
 Receiver  
     Terminate, Bridge: +6 to -36 dB cable loss  
     DSXMON: -15 to -25 dB, resistive  
     Frequency range: 1542 kHz to 1546 kHz

### Test Patterns

Repeating: 3 in 24, 1 in 8 (1:7), 1 in 16, 55 octet, 55  
 Daly, Alt 1010, All 0s, All 1s, FOX, T1-T6, DDS1, DDS2,  
 DDS3, DDS4, DDS6  
 Pseudo random: QRS, PRBS  $2^n - 1$ ,  $n = 6, 7, 9, 11, 15, 20, 23$   
 Programmable: 10 patterns, 2048 bits long with user  
 defined alphanumeric labels  
 Test pattern inversion

### Error Injection

BPV, logic, frame errors; programmable error burst 1 to  
 9999, or error rate  $2 \times 10^{-3}$  to  $1 \times 10^{-9}$

### Measurements

Error Types: BPV, Bit error, Framing bit error, CRC-6 error  
 Error Reports: Total count, error rate, ES, %ES, SES,  
 %SES, UAS, %UAS, AS, %AS, DGRM, %DGRM  
 Alarm Statistics: AIS seconds, loss of signal seconds,  
 Yellow Alarm seconds, loss of frame seconds, change  
 of frame alignment seconds  
 G.821 Analysis

### Signal Measurements

Signal available seconds count and percent, loss of  
 signal seconds count & percent, low density seconds  
 count, excess 0s seconds count, AIS seconds count  
 Receive bit rate: 1542 to 1546 kbps,  $\pm 1$  bps, ext/int  
 clock  
 Receive level (volts and dBdsx): Vpeak-peak, V+peak,  
 V-peak  
 Simplex current: 1 to 200 mA,  $\pm 1$  mA,  $\pm 5\%$

### Frequency Measurements

Moving bar graph of slip count, max frequency, min  
 frequency, clock slips, frame slips, max positive  
 wander, max negative wander

### General

Measurement Duration: Continuous or timed  
 (programmable from 1 min to 999 hours)  
 Printing at timed interval or at end of test  
 Printing on alarm or event with timestamp  
 Error/Alarm events and test results may be stored in  
 NVRam in absence of printer

### Other Measurements

#### View Received Data

View T1 data in binary, hex, ASCII  
 Shows data in bytes by timeslot  
 Trap 60 pages of data, 8 bytes per page  
 Captures 256 consecutive timeslots and stores as user  
 pattern

#### Bridge Tap

Automated transmission & measurement of 21 different  
 patterns to identify possible bridge taps on line



# SunSet™ T10

## **Propagation Delay**

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

## **Quick Tests**

Two programmable automated loopback tests that save time when performing standardized loopback tests

## **CSU & NI Loopback Control**

In-band Codes

CSU, NI, 100000

10 programmable user patterns

ESF-FDL

Payload, Line, Network

10 programmable user patterns

## **HDSL Span Control**

Looping and control of HDSL equipment from DS1 access  
Supports loopback commands for HTU-C, HTU-R, HRU, HLU, HRE  
Graphical display updates with span status  
Includes SF/ESF modes, arm, disarm, loop up, loop down, timeout disable

## **Westell & Teltrend Looping Device Control (SW184)**

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

## **ESF Facility Data Link (SW182)**

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

T1.403 24 hour PRM collection per 15 min interval

## **SLC-96 Data Link (SW182)**

Send and receive message

WP1, WP1B, NOTE formats

Alarms, switch-to-protect, far end loop

To Telcordia TR-TSY-000008 specifications, mode I and III

## **Westell & Teltrend PM NIU and MSS (SW184)**

Supports Westell and Teltrend 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.

## **Pulse Mask Analysis (SW190)**

Scan Period: 800 ns

Measurements: Pass/Fail, rise time, fall time, 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 (SW188)**

Test from T1 interfaces

Choose receive and transmit timeslots 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-6, 8-bit user, Alt 1010

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

## **Teleos & Switched 56 Tests (SW187)**

Switched 56 call setup and bit error rate testing

Teleos signaling sequence timing analysis and dial digits decoding

## **Fractional T1**

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

## **CSU & NI Emulation (SW181)**

Bidirectional

Responds to loopback commands, in-band and out-of-band (ESF datalink T1.403)

Graphic indication of incoming signal status in both directions

Simultaneous display of T1 line measurements

Automatic generation of AIS and Yellow alarm

Loopbacks

Line 1: Line and payload loopback

Line 2: Line loopback

Simultaneous loopbacks in both directions

Local and remote loopback control

## **Remote Control (SW180)**

VT100 emulation with same graphical interface used by test set

Circuit status table provides current and historical information on test set LEDs

Uses 8 pin MINI DIN, RS232C, 9600 baud preferred

## **Voice Frequency Capabilities**

Monitor speaker with volume control for Line 1 and 2

Built-in microphone for talk

View all 24 channel A, B (C, D) bits for Line 1 and 2

Control A, B (C, D) bits (E&M ground/loop start, FXO, FXS, on/off hook, wink)

Companding law -  $\mu$  Law

Programmable idle channel A, B (C, D) bits

Selectable idle channel code, 7F or FF hex

VF Level and Frequency Measurement

Level: +3 to -60 dBm, resolution 0.1 dBm

Frequency: 50 to 3950 Hz, resolution 1 Hz

VF tone generation

Variable tone: 50 to 3950 Hz @ 1 Hz step, +3 to -60 dBm @ 1 dBm

Fixed tones: 404, 1004, 1804, 2713, 2804 Hz @ 0 dBm and -13 dBm

### **Noise Analysis (SW183)**

Signal to noise (S/N)

Noise with filters: 3 kHz flat, C-message, C-notch

### **MF/DTMF/DP Dialing, Decoding/Analysis (SW185)**

MF/DTMF/DP dialing up to 32 digits, 10 user programmable quick dial number for each tone type

MFR1 digits, 0 - 9, KP, ST, ST1-3, Pause

DTMF digits, 0 - 9, \*, #, A, B, C, D, Pause

DP digits, 0 - 9, Pause

MF/DTMF decode up to 40 received digits. Analyze number, high/low frequencies, high/low levels, twist, tone period, interdigital time.

Analyzer dynamic range: 0 to -25 dBm

DP decode up to 40 digits. Analyze number, %break, PPS, interdigital time

Programmable interdigital period, tone period, and tone level (MF, DTMF)

Programmable %break and interdigital period @ 10 pps (DP)

### **Signaling Analysis**

Analyze mode

Tracer on A, B (C, D) signaling state changes for Line 1 and 2 with timestamps

MFR1: Timing analysis of signaling transition states and dialing digits decoding of MFR1 signaling

MFR1M: Modified MFR1 CO switches signaling analysis

MIXTONE: Decode a signaling sequence that has both MF and DTMF digits

### **Protocol Analysis**

#### **SS7 (SW189A)**

Layer 2, 3, 4 analysis to bit level

SU traffic analysis

Counters for FISU, LSSU, TUP, ISUP, SNM, SNT messages

Counters for FIB and BIB retransmissions

% analysis on different types of messages

MSU tracer

User programmable trace filter; CIC, DPC, OPC, H1H0, Signaling address

View bidirectional real time message flow

Messages are interpreted up to layer 4 or displayed in hex format.

The trace storage holds up to 1000 messages.

#### **SS7 TCAP Analysis (SW189B)**

ANSI T1.114

TCAP filter: And/or filtering on Origination and Destination Transaction ID

Decoding: For Transaction, Dialogue, and Component Portions

Transaction Portion decoding includes Package Type and Transaction ID

Dialogue Portion decoding for Information Element Identifier and Context

Component decode screen displays Component Type, Correlation ID, Operation Code (Operation Family & Operation Specifier), and Parameter Identifier and Contents

### **ISDN PRI (SW186)**

Bidirectional monitoring and call analysis

National ISDN-2, AT&T 5ESS, ETSI, and Northern Telecom DMS-100 compatible

NT and TE emulation

Voice and data call setup and receive

Built-in microphone and speaker for B-channel talk/listen

Supports multirate Nx64k data calls

Generates 2047, 511, 127, 63, All 1s, All 0s, and user programmable 8-bit test patterns

Bit error rate test with G.821 analysis

Supports 23B+D, 47B+D, and 46B+2D

Test for Backup D-channel in 46B+2D

User programmable trace filter, view bidirectional real time message flow. Messages are interpreted up to layer 3 or displayed in hex format.

Trace storage holds up to 1000 messages with timestamps

On-screen help for special optional call feature programming

### **GSM 16K Voice/TRAU Analysis (SW191)**

Supports GSM 06.10, 08.60

Drop/Monitor 16 kbps GSM channel at 13 kbps voice rate to built-in speaker

Selectable timeslot (1 to 24) and subchannel (1 to 4)

Codification RPE LTP at 13 kbps

Frame type decode of 16 kbps subchannel (Voice, Data, Idle)

Identify uplink or downlink direction

Transmit encoded 13 kbps voice message on timeslot/subchannel

BERT (G.821) on 16 kbps subchannel: Bit error/rate, ES, SES, EFS, UAS, LOSS

Send test pattern on 16 kbps: 2047, All 1s, All 0s, Alt 1010

### **GR-303 Analysis (SW193)**

Bidirectional monitoring of TMC/CSC/EOC channels

Tricordia GR-303-CORE

TMC/CSC Monitoring

Decode to Layer 3

Statistics counters for each cause value

1000 messages can be stored with date & timestamp, direction, and full L3 decode

Trace filters for: Call Reference Value, DS0, DS1, Cause Value

EOC Verification

Decode to Layer 2

Errored or discarded frame counters

Filter on SAPI/TEI combination

### **Frame Relay Analysis (SW194)**

Supported from DS1 or V.35 interface

Test Rate: 1.544 Mbps, Nx56 kbps, Nx64 kbps

Supports ITU-T Q.933, ANSI T1.617

Mode: UNI DTE/DCE

Requires factory installation

LMI Analysis

Auto configuration for protocol type

Settings: T391 Status Enquiry, T393 Status, N391 Full Status Polling, N392 Error Threshold, N393 Monitor Events

Results: Link O.K. Total, Link Errored Total, Timeout Error, Response Sequence Number, Wrong message

PVC Status: New, Active, New & Active, or Inactive DLCI indication

## PING Testing

Transmit and respond to PING messages  
Send Settings: DLCI length (2-4 bytes), DLCI value, Local IP, Destination IP, Network Layer Protocol Identifier (NLPID), Timeout, Number of PINGS  
Results: Number of PINGS, Number sent, PING status (received, unreached, errored), Round Trip Time (current, average, maximum, minimum)  
Response settings: Local IP  
Response results: PVC status, Number of PINGS, Number received, PING from IP address with timestamp

## Datacom Interface (SS151)

Supports V.35, X.21 (V.11), RS232 (V.24), RS449 (V.36) RS530 interfaces  
DTE, DCE Emulation  
SCSI-36 connector to test set: Adapter cables for V.35, X.21, RS232 (V.24), RS449 (V.36), RS530  
Synchronous data rates: 300 bps to 1.544 Mbps  
Asynchronous data rates: 50 bps to 19.2 kbps (RS232-V.24 only)  
Send test patterns and make G.821 measurements  
Bit error injection  
View transmit and receive signal status: TxD, TxC, RxD, RxC, DTR, RTS, CTS, DSR, RL, LL, RI  
Control signal leads: DTR, RTS, CTS, DSR, DCD, RL, LL, RI  
Invoke Local Loopback (LL), Remote Loopback (RL)  
Internal or received clock selectable  
Hitless 1.544k, Nx56k and Nx64k T1 drop and insert, via V.35, X.21 (V.11), RS232 (V.24), RS449 (V.36) interface; DCE mode only

## 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: 2.5 lb [1.1 kg]  
Battery operation time: 2 1/2 hr nominal  
AC operation: 110V/120V @ 60 Hz, or 220V/240V @ 50 Hz  
3 year warranty on chassis  
1 year warranty on accessories and battery

## ORDERING INFORMATION

### Test Set

SS150B SunSet T10 Chassis  
Includes chassis, Software cartridge, NiMH battery, Universal Charger (SS138C), Instrument Stand, and User's Manual

### Hardware Option

SS151 Datacom Module  
Includes cable adapters for V.35, RS449/V.36, X.21, RS232, DTE and DCE

## Software Options

SW180 Remote control  
SW181 CSU/NIU Emulation  
SW182 ESF & SLC-96 Data Link Send and Receive  
SW183 VF Level, Frequency, and Noise Measurement  
SW184 Westell, Teltrend Intelligent Products  
SW185 MF/DTMF/DP Dialing, Decoding, and Analysis  
SW186 ISDN PRA (also known as PRI) Call Setup & D-channel Monitor  
SW187 Switched Call Setup and BERT  
SW188 DDS testing (T1 interface access)  
SW189A SS7 Protocol Analysis  
SW189B SS7 TCAP Analysis  
SW190 Pulse Mask Analysis  
SW191 GSM 16K Voice/TRAU Analysis  
SW193 GR-303 Analysis  
SW194 Frame Relay Analysis (Requires factory installation)

## Accessories

SS101 Carrying case  
SS104 Cigarette lighter battery charger  
SS105 Repeater extender  
SS106 Single bantam to bantam cable, 6'  
SS107 Dual bantam to bantam cable, 6'  
SS108 Single bantam to 310 cable, 6'  
SS109 Single bantam to alligator clip cable, 6'  
SS110 Dual bantam to 15-pin D-sub connector cable, Male, 6'  
SS111 Dual bantam to 15-pin D-sub connector cable, Female, 6'  
SS112 2 single bantams to RJ-48 8 position modular plug cable, 6'  
SS115B 8-pin mini DIN to DB9 Printer cable  
SS116 Instrument stand  
SS117 Printer paper, 5 rolls, for SS118  
SS118B High capacity thermal printer. Includes SS115B.  
SS122C Null Modem Adapter  
SS123A SunSet jacket  
SS127 Printer 220VAC charger for SS118  
SS128A 120V/12V 1.2A SunSet Charger  
SS130A 19"/23" SunSet Rack Mount - Removable  
SS130B 19"/23" SunSet Rack Mount - Permanent  
SS132 Two single bantams to 4-position modular plug cable  
SS136 SunSet T10 User's Manual  
SS138C SunSet AC Adapter, 100-240 VAC, 50/60 Hz input, output 15 VDC @ 2A  
SS152 SunSet T10 Training Tape  
SS252 V.35 DTE/DCE Adapters  
SS253 X.21/V.11 DTE/DCE Adapters  
SS254 RS232/V.24 DTE/DCE Adapters  
SS255 RS449/V.36 DTE/DCE Adapters  
SS262 RS530 DTE/DCE Adapters  
SS308 Datacom Cable SCSI-36 (m) to DB-37 (f), 6'

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