

SPECIFICATIONS

Connectors/Ports

2.048 Mbit/s bidirectional E1 interfaces
 Line 1 Tx, Line 1 Rx, Line 2 Rx
 75Ω unbalanced BNC (f) and 120Ω balanced/3-pin banana (CF)
 75Ω (option): Replaces BNC (f) with 1.6/5.6 mm (f)
 Line 2 Tx
 75Ω unbalanced BNC (f)
 75Ω (option): Replaces BNC (f) with 1.6/5.6 mm (f)
 Serial port: 8-DIN, RS232C (V.24), DTE
 Datacom interface: SCSI-36 pin connector
 DC input for charging internal battery
 Stereo headphones port
 Connector: 3.5 mm jack
 Impedance: 220Ω

Status/Alarm Indicators

Power and low battery LED indicators
 16 dual-color LED indicators for Line 1 & Line 2
 Current status & alarm history for: Signal, code error, PCM-30, PCM-31, AIS, alarm, CRC detected, error
 6 dual-color LED indicators for datacom (dual function with Line 2)
 Pattern Sync and bit error LED indicators

Test Pattern Generator

General: All 1s, All 0s, Alt 1010, 1-in-4, 1-in-8, 3-in-24, FOX
 PRBS: 2^n-1 , $n = 6, 7, 9, 11, 15, 20, 23$; QRS, $2^{20}-1$ ITU-T
 Conforms to ITU-T 0.151, 0.152, 0.153
 Programmable: 10 user patterns, 24 bits long with user definable labels
 Selectable test pattern inversion
 Automatic pattern synchronization

Error/Alarm Injection

Code and/or bit error; programmable burst of 1 to 9999 error manually, or continuous rate of 2×10^{-3} to 1×10^{-9}
 CRC-4, FAS, E-bit: Single error
 Generate AIS, TS16-AIS (PCM-30), MFAS RAI (PCM-30), FAS RAI (PCM-30 & 31) alarms

E1 General

Bit error test rates: 2.048 Mbit/s, N (contiguous) and M (noncontiguous) \times 64 kbit/s (N & M=1 to 31)
 Full duplex drop & insert to internal test circuitry, datacom interface, $N \times 64$ kbit/s test pattern; or 64 kbit/s A-law decoded & encoded VF channel to/from built-in speaker or optional headphones (SS149)/microphone
 Automatic configuration, Automatic Pattern Sync
 Line coding: HDB3, AMI
 Framing: Unframed, PCM-30, PCM-31, with or without CRC-4, conforms to ITU-T G.704
 Programmable send frame words: Manual/auto E-bits, MFAS word bit 5, bit 6 (MFAS RAI), bit 7, bit 8, MFAS ABCD, FAS RAI, display & print, send & receive FAS/NFAS & MFAS/NMFAS words, auto CRC-4 generation, freely settable Sa4, Sa5, Sa6, Sa7, Sa8, bits to 1 or 0 for 8 frames
 Set idle channel code and ABCD bits (PCM-30)

E1 Transmitters

Clock source
 Internal: 2.048 MHz (± 5 ppm). L1 Tx frequency adjustable over ± 50 kHz (± 25 kppm) with resolution 1 Hz (individually adjustable)
 External: Through Line 1 Rx or Line 2 Rx, selectable AMI, HDB3, or Sinusoidal TTL clock (Line 2 only)
 Loop: Recovered through Line 1 Rx or Line 2 Rx signal, selectable AMI or HDB3
 Pulse shape: 3.0 Vbp ($\pm 10\%$) at 120Ω, 2.37 Vbp ($\pm 10\%$) at 75Ω. Conforms to ITU-T G.703.

E1 Receivers

Frequency: 2.048 Mbit/s \pm 6000 bit/s
 Input sensitivity
 Terminate, bridge: +6 to -43 dB with ALBO
 Monitor: -15 to -30 dB resistive
 Impedances
 Terminate, monitor: Line 1 & 2, 75Ω unbal., 120Ω bal.
 Bridge
 Jitter tolerance to ITU-T G.823
 Conforms to ITU-T G.823

Measurements

Error Type: Code, bit, CRC-4, FE, MFE, E-bit errors, slips
 Typical error type reports: Error count, error rate, ES, %ES, SES, %SES, UAS, %UAS, EFS, %EFS, AS, %AS
 ITU-T G.821 Analysis, error type reports: Bit error & rate, ES, %ES, SES, %SES, EFS, %EFS, UAS, %UAS, AS, %AS, SLIP
 ITU-T G.826 bidirectional analysis, CRC-4 block based; error type reports: EB, BBE, %BBE, ES, %ES, SES, %SES, UAS, %UAS, EFS, %EFS
 Alarm statistics: LOS sec, LOF sec, AIS sec, FAS RAI sec, MFAS RAI sec
 Frequency (Max hold, Min hold, Current), clock slips, wander
 Signal level +7 to -36 dB



SunSet™ E20/E20c

Print on event (Enable/Disable)

Print at timed interval (selectable over 1 to 9999 min) or at end of test
Measurement duration continuous or timed; settable up to 999 hr, 59 min
Programmable measurement w/selection of start & stop TIME & DATE

Other Measurements

Pulse mask analysis

Scan period, 500 ns

On screen pulse shape display with G.703 pulse mask verification

– Displays pulse width, rise time & fall time in ns, %overshoot, %undershoot

– Pulse mask storage and printing

Histogram analysis

Graphical display of accumulated errors (Bit, Code, EBit, CRC, FAS/MFAS) events for L1 Rx or L2 Rx and alarms (LOS, AIS, LOF, FAS RAI, MFAS RAI, LOPS) events for L1 Rx and L2 Rx

Stores and prints 60 days by hour and 24 hours by minute

Storage of one complete histogram & current (base unit)

Storage of up to 15 histogram with user definable labels (requires SW2510 or SW2515)

Propagation delay

Measures propagation delay in microseconds & UIs (Unit Interval)

Maximum delay measurement (at 2.048 Mbit/s): 8 seconds

View received data

View live traffic 4096 bits long (16 full frames/one multiframe) in PCM-30/31

Displays 8 timeslots per screen

Stores 64 scrollable screens, hold screen, print

Information displayed in ASCII, reverse ASCII, Binary, and HEX

View timeslot 16 (MFAS, NMFAS ABCD) in PCM-30: 16 Frames

View timeslot 0 (FAS, NFAS, CRC, MFAS/CRC words, E-bits Sa4 to Sa8, A-bit) in PCM-30 & 31: 16 Frames

Save test results of measurement runs, error and alarms events

Save up to 20 test results

Save up to 1000 events

Saved record can be locked

Save at timed interval (selectable over 1 to 9999 minutes)

Simultaneously view bidirectional 30 channels CAS (ABCD bits PCM-30)

E1 Voice Frequency

Companding: A-Law

View channel data 1 byte long (binary format)

Built-in microphone for talk

Monitor speaker or optional headphones (SS149) for line 1, 2, or both with volume control

Signal to noise ratio measurement

Noise measurements w/ 3.1kHz flat, psophometric weighting, 1010 Hz notch

Tone generation: 50 to 3950 Hz, res. 1 Hz; +3 to -60 dBmO, res. 1 dB

Level and frequency measurement: 50 to 3950 Hz, +3 to -60 dBmO

Coder offset and peak code measurements

ABCD bits monitor & transmit in selected channel (PCM-30)

Simultaneously view bidirectional 30 channels in ABCD bits (PCM-30)

Programmable ABCD states for IDLE, SEIZE, SEIZE ACK, ANSWER,

CLEAR BACK, CLEAR FORWARD, BLOCK ABCD; Default (Conforms to Q.422) or 3 user defined setups

Labelling setup and display of Group I/II Forward, Group A/B

Backward digits Q.441 or 3 user defined setups

Datacom Testing (SS600)

Connectors/Ports

Datacom Multiport via SCSI-36 connector

Adapters for DTE (male) and DCE (female) modes: V.35 (34 pins-ISO 2593), V.11/X.21 (DB15-ISO 4903), V.24/RS-232 (DB25-ISO 2110), V.36/RS-449 (DB37-ISO 4902), RS-530 (DB25-ISO 2110), G.703 codirectional (3-pin CF for Tx and Rx)

Y cable Adapter for MONITOR mode: V.35 (34 pins-ISO 2593),

V.11/X.21 (DB15-ISO 4903), V.24/RS-232 (DB25-ISO 2110), V.36/RS-449 (DB37-ISO 4902)

Interfaces: V.35, V.11/X.21, V.24/RS-232, V.36/RS-449, RS-530, G.703 codirectional

Modes

DTE, DCE Emulation for all interfaces

Bidirectional data in service transmission monitoring (V.35, V.11/X.21, V.24/RS-232, V.36/RS-449)

Rates

V.24/RS-232 Asynchronous: 50, 150, 300, and 600 bit/s, 1.2, 2.4, 4.8, 9.6, 14.4, 19.2, and 38.4 kbit/s, 6/7/8 data bits, 1/2 stop bits, odd/even/none parity

V.24/RS-232 Synchronous: 300 bits to 48 kbit/s, 56, and 64 kbit/s

V.35, V.11/X.21, V.36/RS-449: 300 bit/s to 48 kbit/s, Nx56 kbit/s, and Nx64 kbit/s (N= 1 to 32)

G.703 codirectional: Nx64 kbit/s (N= 1 to 8)

Tx data clock selectable (internal or receive) for V.35, V.24/RS-232, V.36/RS-449, G.703 codirectional

Clock polarity selectable (normal or inverse) for V.35, V.24/RS-232, V.36/RS-449

Test pattern generator

V.24/RS-232 Asynchronous: 2047, 511, 127, 63, All 1s, All 0s, and FOX (for 7 and 8 data bits)

All other modes: All available patterns supported (refer to the main Test Pattern section)

Selectable test pattern inversion

Automatic pattern synchronization

Bit error injection

Measurements

ITU-T G.821 analysis, error type reports: Bit error count and rate, ES, %ES, SES, %SES, EFS, %EFS, AS, %AS, UAS, %UAS, SLIP

Block error measurement: Received block count, error block count, & rate

Measurement of Data Loss, Data Loss Seconds, Pattern Synchronization Loss, Pattern Synchronization Loss Seconds

Histogram analysis

Graphical display of accumulated errors (Bit, Loss of Pattern Seconds)

Stores and prints 60 days by hour and 24 hours by minute

Storage of one complete histogram & current (base unit)

Storage of up to 15 histogram with user definable labels (requires SW2510 or SW2515)

Datacom Timing Analysis

Change of state of the following control leads is displayed and recorded (Table or Graphic mode)

– V.24/RS-232 (Asynchronous: DTE, DCE, Synchronous: DTE, DCE, MONITOR), V.35 (DTE, DCE, MONITOR), V.36/RS-449 (DTE, DCE, MONITOR): RTS, CTS, DTR, DCD, RL, LL

– V.11/X.21 (DTE, DCE, MONITOR): C, I

Transmit control leads (selectable ON/OFF)

- V.24/RS-232 (Sync & Async), V.35, V.36/RS-449 (DTE): RTS, DTR, RL, LL
- V.24/RS-232 (Sync & Async), V.35, V.36/RS-449 (DCE): CTS, DSR, DCD
- V.11/X.21 (DTE): C
- V.11/X.21 (DCE): I

Trigger on RTS, CTS, DTR, DSR, DCD, RL, LL; falling or rising edges
Storage capability

- Graphical mode: Last 40 seconds of captured control lead status
- Table mode: 100 pages of control lead state change and status with timestamp

V.110 Testing (SW607)

Conforms to ITU-T V.110

V.110 Analysis over E1 line

Test Rate: Nx600 bit/s (N=1, 2, 4, 8, 16, 32), 48 kbit/s, 56 kbit/s

Bit Error Rate testing, V.110 FAS error, V.110 Parity Error, V.110

Frame Sync Loss, V.110 Redundant Bit Error Measurements

V.110 Framing Status Monitoring (Bits, S1, S3, S4, S6, S8, S9, X, E1 to E6)

Bit Error and Frame Error Injection

Programmable V.110 Framing Bits (S1, S3, S4, S6, S8, S9, X, E1 to E6)

Programmable Tx and Rx pattern

Modes: E1 Single (Send/Receive V.110 formatted channels inside 2.048 Mbit/s signal)

X.50 64 kbit/s Testing (SW606)

Conforms to ITU-T X.50 Division 2 and 3

Bit error rate testing with ITU-T G.821 analysis

Test rate: Nx600 bit/s, N = 1 to 8 within 64 kbit/s signal

Hitless bidirectional E1 64 kbit/s channel drop/insert to multipoint

Standard or random selection of octets

View and transmit housekeeping bits A to H, and status S-bit

Programmable idle pattern, BERT & IDLE S-bit, X.50 signal (ABCD bits)

Bit or frame error injection

Histogram analysis

Modes

Datacom (64 kbit/s, X.50 Formatted signal)

Muxtest (Test 2.048 Mbit/s/64 kbit/s multiplex)

MUX (Emulate 2.048 Mbit/s/64 kbit/s multiplexed within X.50 format)

E1 (Send/Receive X.50 formatted channels inside 2.048 Mbit/s signal)

C-bit Frame Testing (SW602)

Send and receive C-bits 2 through 15 (ESCAPE, 2 MB loops, loop 2 or loop 3, loop 2 instruction, loop 3 instruction, HDB3 command, loop acknowledge, not defined, local fault, remote/line fault, C frame loss, spare)

Bit level decoding

Loopback channel

Other Options (See Individual Specification Sheets)

Frame Relay Network Options (SW603 & SW603N)

Cellular Network Options (SW604, SW605, SW609, SW644)

Access Network Options (SW610, SW611, SW612, SW613, SW614, SW615, SW630, SW631)

Switching Network Options (SW601A, SW601E, SW640, SW641, SW642, SW645)

X.25 Option (SW608)

GENERAL

512 kbyte internal NVRAM data buffer

Internal Battery: 9-cell NiMH battery pack

Battery operation time: 4.5 hours nominal (for E20)

16 lines x 32 character graphic LCD with backlight (for E20)

240 x 320 dot STN Color Screen CFL Backlight (for E20c*)

Heavy-duty long-lasting keyboard

4 Mbyte field upgradable PCMCIA memory card

2nd memory card slot for future expansion or unit memory storage

(Histogram and Protocol traces - requires SW2510 or SW2515)

AC Adapter/battery charger: +90-240V 50/60 Hz

Languages: English, French, Italian, Spanish, German*

Stores up to 10 user configurations (profiles) w/alphanumeric labels

VT100 Remote Control

Windows Remote Control and Remote Storage*

Printer/communication port: 8-DIN, RS232 (V.24 DTE) serial port

Text: Standard ASCII escape sequence code

Graphics: Standard mode (dot matrix)

Operating temperature: 0°C to 50°C

Storage temperature: -20°C to 70°C

Humidity: 5% to 90% noncondensing

Size: 10.5 cm x 6.5 cm x 27 cm (approx)

Weight: 1.3 kg (approx)

*Check for availability

ORDERING INFORMATION

Test Set

SSE20	SunSet E20 Configured with 2 Rx & 2 Tx 2.048 Mbit/s ports with BNC (f) & 3-pin banana (CF) connectors SunSet E20c Color Screen ⁵
SSE20c	Configured with 2 Rx & 2 Tx 2.048 Mbit/s ports with BNC (f) & 3-pin banana (CF) connectors.
SSE20FR	Replace standard labels (LED & Keypad) with French labels

Note 1: Standard accessories include: Programmed Software Cartridge, SS140 Battery Pack, SW2504 Protective Cartridge, SS138D AC Adapter, SS145B 2-pin Euro-style Power Cord, SS266 User's Manual. All other accessories including datacom adapters must be ordered separately.

Note 2: Alternate power cord and alternate language for User's Manual can be substituted at N/C (please specify)

Hardware Options

-A	Replace all 75Ω BNC (f) with 1.6/5.6 mm (f) 75Ω unbal. connectors
SS600	Datacom software/hardware Includes SS308 Datacom cable. Requires additional adapters or adapters package from Datacom Adapters section
SS600DC	Installs datacom module in SSE20 (function disabled). Includes datacom cable (SS308). Requires SW600DC to be operational.

Note 3: Please inquire about alternate connectors.

Software Options

SW600DC	Software for datacom testing. Requires SS600DC.
SW600VT	VT100 Remote Control
SW600WIN	Windows Remote Control ⁵ Includes SS115D (DB9 to DIN8) and SS122B (Null Modem Adapter)

SW601A	VF Call Analysis
SW601E	VF Call Emulation
SW602	Cbit Analysis
SW603	Frame Relay Basic
SW603N	Frame Relay NNI. Requires SW603
SW604	GSM Voice and TRAU Access
SW605	GSM Abis Protocol Analysis
SW606	X.50 Analysis
SW607	V.110 Analysis
SW608	X.25 Analysis ⁵
SW609	GPRS Analysis ⁵
SW610	ISDN Monitoring and Emulation. Required for ISDN Protocols when ordering SW611-SW615
SW611	ETSI (Euro ISDN) Protocol. Requires SW610
SW612	Aussi Protocol. Requires SW610
SW613	QSIG Protocol. Requires SW610
SW614	DPNSS Protocol. Requires SW610
SW615	DASS2 Protocol. Requires SW610
SW630	V5.x Monitoring
SW631	3-timeslot V5.2 Monitoring. Requires SW630
SW640	SS7 Analysis (MTP, SCCP, TCAP). Required for SS7 Analysis when ordering SW641-SW646
SW641	TUP Analysis ITU Standard. Requires SW640
SW642	ISUP Analysis ITU Standard. Requires SW640
SW644	Mobile Application Part BSSAP (DTAP+MAP) Requires SW640
SW645	ISUP Analysis-Chinese Standard. Requires SW640.
SW646	ISUP Analysis-Italian Standard. Requires SW640.
SW2515	1 Mbyte SRAM memory card w/battery back-up to increase storage capacity of the test set

Note 4: Software cartridges may be upgraded to include additional options at any time.

Accessories

General

SS101	Carrying Case
SS104D	Cigarette Lighter Adapter. 15.5V, 2.5A output. To be used with SunSets equipped w/NiMH batteries only
SS115	DIN-8 to DB25 RS232C Printer Cable Replacement printer cable for earlier serial printers such as SS118
SS115D	DIN-8 to DB-9 Printer Cable w/Full Handshaking Included when Remote Control or SS118B/C is ordered
SS117A	Printer Paper, 5 rolls
SS118B	Thermal Printer. With internal rechargeable battery. Includes cable (SS115D) for connection to SunSet and 110 VAC charger
SS118C	Thermal Printer. With internal rechargeable battery. Includes cable (SS115D) for connection to SunSet and 220 VAC charger
SS122B	Null Modem Adapter. DB9 (f) to DB9 (f) with Full Handshaking. Included with Remote Control
SS122C	Null Modem Adapter DB25 (f) to DB25 (f) with Full Handshaking
SS123A	SunSet Jacket. Provides additional weather protection for SunSets (SS123B Carabiner Hook included)
SS123C	SunSet Jacket, Large. Only for use with SS143B (SS123B Carabiner Hook included).
SS143B	SunSet Rubber Holster. Protective rubber covering with integrated instrument stand. Not compatible with SS123A.
SS149	Headphone for SunSet E20
SS266-8	SunSet E20 Service Manual
SSE20CC	Certificate of calibration/compliance. Must be specified at the time of order
SSE20CCM	Certificate of calibration/compliance with measurement data. Must be specified at the time of order

SS20W	SunSet E20 Extended Warranty. Extends standard 1 year warranty period to 3 years. Excludes battery and accessories, which are warranted for 1 year.
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2 Mbit/s Cables

SS211	Cable, BNC (m) 75Ω to BNC (m) 75Ω, 2 m
SS212	Conversion Cable, BNC (m) 75Ω to Bantam 120Ω, 2 m
SS216	Conversion Cable, BNC (m) 75Ω to BR2 (m) 120Ω, 2 m
SS217	Cable, 1.6/5.6 mm (m) 75Ω to 1.6/5.6 mm (m) 75Ω, 2 m
SS220	Cable, BNC (m) 75Ω to 1.6/5.6 mm (m) 75Ω, 2 m
SS221	Cable, 3-pin banana (CF) 120Ω to 3-pin banana (CF) 120Ω, 2 m
SS223	Cable, BR2 120Ω to 3-pin banana 120Ω, 2 m
SS227	Conversion Cable BNC (m) 75Ω to two probe clips 120Ω, 2 m
SS228	Cable, 3 pin banana (CF) 120Ω to probe clips, 2 m
SA331	Adapter, BNC (m) to 1.6/5.6 mm (f)
SS436	Conversion Cable, RJ-48 (m) 120Ω to two BNC (m) 75Ω connectors

Datacom Adapters

SS253	X.21/V.11 DTE (SS253T) and DCE (SS253C) Interface Adapters. DB37 to ISO 4903 DB15 connectors.
SS253Y	X.21/V.11 Datacom Monitor Y-cable. DB37 to male and female ISO 4903 DB15 connectors
SS254	RS232/V.24 DTE (SS254T) & DCE (SS254C) Interface Adapters. DB37 to ISO 2110 DB25 connectors
SS254Y	RS232 Datacom Monitor Y-cable. DB37 to male and female ISO 2110 DB25 connectors
SS255	RS449/V.36 DTE (SS255T) & DCE (SS255C) Interface Adapters. DB37 to ISO 4902 DB37 connectors
SS255Y	RS449 Datacom Monitor Y-cable. DB37 to male and female ISO 4902 DB37 connectors
SS256B	G.703 64 Kbit/s codirectional/banana 3-pin Adapter. DB37 to CF 3-pin banana TX and RX connectors
SS262	RS530 DTE (SS262T) and DCE (SS262C) Interface Adapters. DB37 to ISO 2110 DB25 connectors
SS267	V.35 DTE (SS267T) and DCE (SS267C) Interface Adapters. DB37 to ISO 2593 34 pin connectors
SS267Y	V.35 Datacom Monitor Y-cable DB37 to male & female ISO 2593 34 pin connectors
SS600DCC	Datacom Adapters Package. Includes datacom adapters SS253, SS254, SS255, SS256B, SS262, & SS267
SS600DCY	Datacom Adapters Package. Includes datacom adapters SS253, SS253Y, SS254, SS254Y, SS255, SS255Y, SS256B, SS262, SS262Y, SS267, and SS267Y

Replacement

SW2504	Protective PCMCIA Cartridge
SS123B	Carabiner hook for SunSet Jacket
SS138D	SunSet AC Adapter, input 100 - 240 VAC, 50/60 Hz, output 15 VDC @ 2.6A. Only for use with SunSets equipped w/NiMH battery pack
SS140	9-cell NiMH Battery Pack. 10.8 VDC, 1.8 Ahr
SS266	SunSet E20 User's Manual, English
SS266-IT	SunSet E20 User's Manual, Italian
SS308	Datacom Cable, SCSI-36 to DB37 Interface Cable, 2 m
SS145B	2-pin Euro-style Power Cord
SS145A	3-prong Power Cord. For use in No. America & Asia
SS437	3-prong South African Power Cord

Note 5: Check for availability



Note: Specifications subject to change without notice.
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