

SPECIFICATIONS

Connectors/Ports

2.048 Mbit/s E1 interfaces: Tx, Rx, Ext Clock
 75Ω unbalanced BNC (f) standard
 75Ω (option): Replaces BNC (f) w/75Ω 1.6/5.6 mm (f),
 120Ω balanced BR2, or 120Ω Bantam
 Printer/Remote Control: 8-pin mini DIN, RS232C/V.24
 serial port, DTE
 DC input for charging internal battery

Status/Alarm Indicators

20 super-bright LED indicators
 Current status and alarm history
 Power (green, on), Battery (red, when low)
 Green: Signal, HDB3 detected, PCM-31, PCM-30, CRC-4
 detected, Pattern Sync
 Red
 For Alarms: LOS, LOF (FAS, MFAS or MFAS-CRC), AIS,
 FAS RAI, MFAS RAI, ARTIFICE, Pattern Sync Loss
 For Errors: Code, Frame, Bit, (any) Error
 Yellow: Pattern Inverted

E1 General

Bit Error test rates: 2.048 Mbit/s, N (contiguous) and M
 (noncontiguous) x64 kbit/s (N & M=1 to 31). Separate
 and independent receive and transmit timeslot
 selection. Automatic configuration to timeslots
 containing test pattern
 Drop and insert to internal test circuitry N or M x64 kbit/s
 test pattern, or 64 kbit/s A-law decoded VF channel to
 built-in speaker/microphone
 Line Coding: HDB3, AMI selectable
 Framing: Unframed, PCM-30, PCM-31 with or without
 CRC-4. Conforms to ITU-T G.704
 Graphical display of test set configuration. Key param-
 eters for Tx and Rx interfaces and current status of
 alarms and errors

Test Pattern Generator

General: All 1s, All 0s, Alt 1010, 1-in-8, 1-in-16, 3-in-24
 PRBS: 2^n-1 , n= 6, 7, 9, 11, 15, 20, 23. Conforms to ITU-T
 0.151, 0.152, 0.153, and ANSI V.52, V.57
 Others: 20ITU, 55 Octet, FOX
 Programmable: 8 patterns, up to 2048 bits long with
 user definable labels of up to 10 alphanumeric
 characters for each pattern
 Send and receive inverted test pattern
 Send pattern independent of receive pattern

Transmitters

Clock source
 Internal: 2.048 MHz (± 5 ppm). Adjustable over ± 50
 kbit/s/2 kbit/s steps and ± 200 bit/s/2 bit/s steps
 (± 100 ppm/1 ppm steps) with option SS213
 Loop: AMI or HDB3 (recovered from Rx port)
 External clock input port: (REF. CLK) 75Ω; 120Ω
 optionally
 Line coding: HDB3, AMI

Pulse shape: Conforms to ITU-T G.703
 75Ω unbalanced: $\pm 2.37V_{bp}$ ($\pm 10\%$) or
 120Ω balanced: $\pm 3.0V_{bp}$ ($\pm 10\%$) with optional
 balanced interface

Transmit level

Selectable: 0 dB or -6 dB
 Programmable Send Frame Words: Programmable NFAS
 Sa4 Sa8 bits (option SW210), manual/auto E-bit
 setting (SW211). Set NFAS bit 3 (FAS RAI), set 4 bit
 NMFAS word to 1 or 0 (SW210)
 Set idle channel code and ABCD bits

Error/Alarm Injection

Code and/or bit error: Programmable burst of 1 to 9999
 errors manually, or continuous rate of 2×10^{-3} to 1×10^{-9}
 FAS: Error consecutive frames, programmable 1 to 5 FAS
 words manually, or continuous rate of 2×10^{-3} to 1×10^{-9}
 CRC-4: Single, or continuous rate of 2×10^{-3} to 1×10^{-9}
 E-bit (option SW211), Bit-Slip: Single manually
 All channels: Single per timeslot manually or continuous
 rate of 2×10^{-3} to 1×10^{-9} . Errors injected equally in all
 selected channels in N or M x64 kbit/s (N & M=1 to
 31), or all 30, 31 or 32 channels in E1 (option SW171)
 Generate AIS, TS16-AIS (PCM-30), MFAS RAI (PCM-30),
 FAS RAI (PCM-30 and -31), ARTIFICE alarms

Receiver

Frequency range: 2.048 Mbit/s ± 30 kbit/s (± 6 kbit/s
 from clock)
 Input sensitivity
 Terminate, Bridge: +6 to -43 dB with ALBO
 Monitor: -15 to -30 dB resistive loss
 Auto configuration for framing (PCM-30, PCM-31 or
 unframed), CRC-4 (with or without) and line coding
 (AMI or HDB3)



SunSet™ E1

Impedances

Terminate, Monitor: 75Ω unbalanced, 120Ω balanced (optional)
Bridge

Jitter tolerance to ITU-T G.823

External Clock Interfaces

Input Impedance: 75Ω unbalanced, 120Ω balanced (optional)

Input Sensitivity: 0 to -30 dB resistive

Line Coding: HDB3

Frequency Range: 2.048 Mbit/s ± 300 ppm

Measurements

Large character display of NO ERRORS

All measurement screen headers include Elapsed Time, Remaining Time, Framing Type, Code, Input Port Termination State, Tx Pattern, Rx Pattern and CRC-4 state

Code errors: Error count, ratio and current ratio, ES, %ES, SES, %SES, UAS, %UAS, AS, %AS, DM, %DM

Frame errors: FAS, MFAS and CRC-4 errors count and error ratios, ES, %ES, SES, %SES, UAS, %UAS, EFS, %EFS, DM, %DM

Bit errors: G.821 analysis; bit error, ratio and current error ratio, ES, %ES, SES, %SES, UAS, %UAS, AS, %AS, DM, %DM, Count and % of loss of Patt Sync seconds, bit slip count

Signal and Alarm: Count of LOS seconds, AIS seconds, LOF seconds, FAS RAI seconds, MFAS RAI seconds, ALL TS AIS seconds; frequency in Hz, deviation in ppm, wander in UI

E-bit Errors (option SW211): Error count, ratio and current ratio, ES, %ES, SES, %SES, UAS, %UAS, AS, %AS, DM, %DM

Frequency Measurements: Max, Min, Current in Hz; Selectable Frequency resolution: 1, 0.1, 0.01 Hz. Deviation from 2.048 Mbit/s in ppm; Clock Slip & Wander in UI. Bar graph indicates direction & rate of signal frequency slipping in relation to measurement clock

Settable frequency threshold for frequency error indication via printer Signal level (V_{pp+} , V_{pp-} and V_{pp} in dBdsx) range: +7 to -36 dB

M.2100/550 Measurements: Pass/fail status, %ES, %SES
Programmable measurement period and %HRP

ITU-T G.826 Analysis: CRC-4 block based

EB, BBE, %BBE, ES, %ES, SES, %SES, UAS, %UAS, AS, %AS

Settable threshold for "low signal" range, 0 to -40 dB

Indication via reverse video message at the top of the screen

Print on event, can be enabled or disabled

Automatic printout at settable time intervals: Up to 999 hours or 999 minutes

Measurement duration continuous or timed; settable up to 999 hours, in 1 minute steps

Programmable time and date for start and stop of measurement

Other Measurements

View received data

View live traffic 2048 bits long (8 frames or one sub-multiframe) in PCM-30, PCM-31 or unframed

Display 8 timeslots per screen

Stores 32 scrollable screens, hold screen, print

Information displayed in ASCII, reverse ASCII, binary and hex

View timeslot 0 (FAS, NFAS, CRC, MFAS/CRC words, E-bits, Sa4-Sa8, A-bit) in PCM-30 and -31: 16 frames (option SW210)

View timeslot 16 (MFAS, NMFAS, ABCD bits for all 30 channels) in PCM-30: 16 frames (option SW210)

Propagation Delay

Round trip signal transmission delay

Measures in microseconds and UIs (Unit Intervals)

Histogram Analysis

Graphical display of accumulated errors count (Bit, Code, CRC, FAS/MFAS) and alarm seconds (LOS, AIS, LOF, Patt Sync Loss, FAS RAI, MFAS RAI)

Stores current results and past 7 days per hour, most recent 24 hours per 15 minutes

Pulse Shape Analysis

Scan period, 500 ns

On screen pulse shape display with G.703 pulse mask verification and pass/fail indication

Displays pulse width, rise time, fall time in ns (resolution 1 ns), %overshoot, %undershoot (resolution 1%), level in dB (resolution 0.1 dB)

Pulse mask storage and printing on a Seiko DPU-411 or equivalent printer

Transmit Stress: Simultaneous display of code and bit errors, propagation delay; set internal clock over ± 100 ppm with 1 ppm step
Save 20 test results or 800 error and alarm events, available to screen view and/or print. Lock/Unlock capability

Automatic Stress: Automatically determines the receiving equipment's upper and lower frequency capture range

Voice Frequency Capabilities

Tone generation: 0 dBm0/820 Hz and 0 dBm0/1020 Hz, can be enabled or disabled. Selectable Tx timeslot

VF Measurement: 30 Hz to 3904 Hz, 1 Hz resolution; +3 dBm0 to 60 dBm0, 0.1 dB resolution

Companding: A-law

Built-in microphone for talk

Monitor speaker with volume control

ABCD bits monitor & transmit and view channel data byte (binary format) in selected channel

Simultaneous view of 30 channels ABCD signalling bits (PCM-30)

Dialing Capabilities

DTMF dialing

32 digits, 10 speed dial numbers with alphanumeric names, send digits 0 . . . 9 and pause

Programmable dial and interdigit (silent) period

MF dialing

32 digits, transmits CCITT MR2 MF tones, send digits 0 . . . 9 and combination 11 to 15

Choice of forward or backward tone set

Remote Control (SW100)

VT102 terminal emulation remote control via 8-pin mini DIN RS232C/V.24 DTE port

Same graphical interface on terminal/PC monitor as on the test set

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

Bitmapped histogram and pulse shape cannot be remotored

Enhanced Error Injection (SW171)

Errors are injected equally in all selected channels for N (contiguous) or M (noncontiguous) x64 kbit/s. For 2 Mbit/s, N=30 for PCM-30, N=31 for PCM-31, N=32 for unframed
Inject burst of 1 manually or rate from 2×10^{-3} to 1×10^{-9}

Advanced Frame Word Applications (SW210)

One-screen display of NFAS words for 6 odd-numbered frames
Set Sa4, Sa5, Sa6, Sa7, and Sa8 to 1, 0 or alternate 1/0 or 0/1
Set 4 bits of NMFAS bits to 1 or 0
Set ABCD bits of selected TS to 1 or 0
Set Bit 3 of NFAS word to 0 or 1 (FAS RAI)

E-BIT Analysis and (SW211)

E-bit error measurement with ITU-T G.821 analysis
Transmit E-bits in response to received CRC-4 error
Inject E-bit error manually (single)

GENERAL

CE mark
Languages: English, French, German, Italian or Spanish (specify)
Field upgradable PCMCIA firmware card
Store and recall 10 instrument configurations by name
16 line x 32 character LCD display screen with backlight
Backlight continuous or time-settable from 1 to 99 minutes
Internal Battery: Lead acid type
Battery operation time: 2 hr, 15 min nominal
Unit charging time: 8 hours nominal
Power Source: 110/120/220/230/240 VAC @ 50/60 Hz
Printer/Communication port
Text: Standard ASCII scape sequence code
Graphics: Standard Bit-image Graphic Mode (dot matrix)
Baud rate: 1.2, 2.4, 9.6 and 19.2 kbit/s (9.6 kbit/s preferred)
Parity: None, even or odd
Stop-bit: 1 or 2 bits
Bits per character: 7 or 8
Selection of CR or CR+LF
Print screen via dedicated key
Self test and internal Tx frequency deviation calibration
Clear print buffer, erase NVRAM
Configure test set to preprogrammed factory default
Display version/option configuration of the test set
Operating Temperature: 0°C to 50°C
Storage Temperature: -20°C to 70°C
Humidity: 5% to 90% noncondensing
Size: 10.5 cm (W) x 6 cm (H) x 27 cm (L)
Weight: 1.2 kg (approx.)

ORDERING INFORMATION

Test Set

SSE1 SunSet E1 with 75Ω unbalanced BNC (f) connectors
Includes Internal Lead Acid Battery, AC Battery Charger (SS121B, 220VAC, 0.6A), User's Manual (SS209), and Software cartridge

Note 1: All other accessories must be ordered separately

Note 2: 110, 120 or 240 VAC Chargers may be substituted at no additional charge at the time of order

Hardware Options

Please specify alternate connectors/impedances if required:

-A Replace all 75Ω BNC (f) with 1.6/5.6 mm (f) 75Ω unbalanced connectors
-B Replace all 75Ω BNC (f) with 120Ω BR2 (f) balanced connectors
-C Replace all 75Ω BNC (f) with Bantam 120Ω balanced connectors

SS137 High Capacity Battery Package
NiMH battery pack (SS139) 100-240 VAC AC/DC adapter (SS138C), Power Cord (SS429)

Note 3: Alternate power cord can be substituted at N/C (Please specify)

SS213 Transmit Frequency Shift
Vary transmit frequency over ± 50 kbit/s in 2 kbit/s steps, and ± 200 bit/s (100 ppm) in 2 bit/s (1 ppm) steps. Set transmit level to 0 dB or -6 dB

Note 4: All hardware options must be specified at the time of order

Note 5: Refer to "Other Accessories" for Bantam/310 cables, etc.

Software Options

SW100 Remote Control
Includes printer cable (SS115B) and null modem adapter (SS122A)

SW171 Enhanced Error Injection
Bit errors injected simultaneously in all channels

SW210 Advanced Frame Word Applications
Setting of Sa4 to Sa8 bits in NFAS word. Display of TSO and TS16

SW211 E-bit Analysis and Injection
E-bit error measurements and analysis. E-bit error injection in auto/manual modes. (SW210 required)

Note 6: Software cartridges may be upgraded to include additional options at any time

Accessories

SS101	Carrying Case
SS104	Cigarette Lighter Battery Charger To be used with SunSets equipped with sealed Lead Acid battery
SS104C	NiMH Cigarette Lighter Battery Charger, Output 15.5V DC@2.5A (For use on SunSets equipped with NiMH batteries only)
SS115	DIN-8 to DB25 RS232C Printer Cable Replacement printer cable for earlier serial printers such as SS118
SS115B	DIN-8 to DB-9 RS232C Printer Cable Included when either SW100 or SS118B/C is ordered
SS116	Instrument Stand
SS117A	Printer Paper, 5 rolls, for SS118B/C
SS118B	High Capacity Thermal Printer With internal rechargeable battery. Includes cable (SS115B) for connection to SunSet and 110 VAC charger
SS118C	High Capacity Thermal Printer With internal rechargeable battery. Includes cable (SS115B) 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)
SS210	Conversion Cable, BNC (m) 75Ω to 3-pin banana CF (m) 120Ω, 2 m
SS211	Cable, BNC (m) 75Ω to BNC (m) 75Ω, 2 m
SS214	3 ea. Female to Female Adapter Plugs Changes 3-pin banana male to female
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
SS218	Conversion Cable, 1.6/5.6 mm (m) 75Ω to 3-pin banana CF (m) 120Ω, 2 m
SS219	Cable, BR2 (m) 120Ω to BR2 (m) 120Ω, 2 m
SS220	Cable, BNC (m) 75Ω to 1.6/5.6 mm (m) 75Ω, 2 m
SS223	Cable, BR2 (m) 120Ω to 3-pin banana CF (m) 120Ω, 2 m
SS224	Conversion Cable, BNC (m) 75Ω to 3-pin banana CF female 120Ω, 35 cm
SS227	Conversion Cable, BNC (m) 75Ω to Probe clips 120Ω, 2 m
SS429	2-pin Euro-style Power Cord
SS436	Conversion Cable, RJ-48 (m) 120Ω to two BNC (m) 75Ω, 2 m
SS437	3-prong South African Power cord
SSE1CC	Certificate of calibration/compliance when specified at the time of order
SSE1CCM	Certificate of calibration/compliance with measurement data when specified at the time of order

SSE1W	SunSet E1 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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Other Accessories

SS106	Cable, Single Bantam (m) 120Ω to Single Bantam (m) 120Ω, 2 m
SS108	Cable, Single Bantam (m) 120Ω to Single 310, 2 m
SS109	Cable, Single Bantam (m) 120Ω to Probe Clips 120Ω, 2 m
SS130A	19"/23" SunSet Rack Mount - Removable
SS130B	19"/23" SunSet Rack Mount - Permanent Unit
SS212	Conversion Cable, BNC (m) 75Ω to Bantam (m) 120Ω, 2 m
SS215	SunSet E1 Training Tape, English (specify SS215K for Korean)
SS225	Cable, Bantam (m) 120Ω to 3-pin banana CF (m) 120Ω, 2 m

Replacement

SW2501	1 Mb Software Replacement Cartridge Specify model and serial number
SS113A	AC Battery Charger, 120 VAC Output 0.6A at 12 VDC. To be used with SunSets equipped with Lead Acid battery
SS113B	AC Battery Charger, 110 VAC Output 0.6A at 12 VDC. To be used with SunSets equipped with Lead Acid battery
SS121B	AC Battery Charger, 220 VAC, 50/60 Hz, 3-prong IEC connector. Output 0.6A at 12 VDC. To be used with SunSets equipped with Lead Acid battery
SS121C	AC Battery Charger, 240VAC, 50/60 Hz, 3-prong IEC connector. Output 0.6A at 12 VDC. To be used with SunSets equipped with Lead Acid battery
SS123B	Carabiner hook for SunSet Jacket
SS138D	SunSet AC Adapter, 100-240 VAC, 50/60 Hz input, output 15VDC@2A. Only for use with SunSets equipped with NiMH battery pack
SS139	6-cell NiMH battery Pack. 7.2VDC, 1.8Ahr
SS209	SunSet E1 User's Manual
SS431	3-prong Power Cord for use in North America and Asia



Note: Specifications subject to change without notice.
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