The SSMTT-27 E1 Module, part of the SunSet Modular Test Toolkit (MTT) family of products, is a rugged, battery-operated handheld test solution designed to assist field technicians with new link installation, routine maintenance, and troubleshooting problems in the E1 network. The E1 interface defined by ITU has been widely deployed and has become a dominant part of the digital telecommunication network in various applications including Cellular, Access, Switching, and Data networks. The E1 module comes with two versions, Dual E1 and Single E1 to fit your testing requirements. Both out-of-service and in-service testing can be performed with this module.

**FEATURES**

- Dual E1 BER testing (Dual E1 module)
- 75Ω unbalanced or 120Ω balanced connectors
- ITU-T G.821, G.826, M.2100 measurement
- Pulse mask analysis
- Histogram analysis
- Propagation delay
- View received data/FAS/MFAS words
- Error injection/alarm generation
- Level and frequency measurements
- Send frame word including Sa bit
- VF analysis: Send/measure test tones, noise filters, digit capture & analysis, and CAS analysis
- Jitter measurement, jitter transfer and tolerance testing
- Wander measurement
- GSM
- GPRS
- Frame relay

**BENEFITS**

- ISDN PRI
- V5.1/5.2
- MFC-R2
- DTMF
- Signaling System No. 5 (SS5)

- Lightweight
- Flexible modular design
- Eliminates the need for multiple instruments
- Complete solution for Installation & Maintenance (I&M) of E1 services
- Leverages existing MTT platform
- Cost-effective and future-proof
- Supports various applications on E1 with over 20 software options that can be easily upgraded in the field
- Enables service providers and operators to turn-up and troubleshoot E1 network
APPLICATIONS

**Frame Relay**
- LMI analysis
- Fox test (CIR verification)
- Ping test
- Statistic analysis
- Support UNI and NNI interfaces

**GSM/GPRS**
- Bidirectional channel monitoring at Abis and A interface
- Voice decode of full rate, enhanced full rate, half rate speech
- GSM protocol analysis at Abis interface
- TRAU testing (speech generation)
- GPRS statistic analysis at Abis and Gb interfaces

**ISDN Primary Rate**
- Call emulation (speech/data)
- Detailed protocol analysis (ETSI, AUSSI, DASS2, DPNSS, Q.SIG)
- Auto supplementary service test
- Sequential call

**V5.x**
- Support V5.1 and V5.2
- Protocol analysis on all 3 timeslots simultaneously
- Statistic analysis (bidirectional)

**MFC-R2, DTMF, SS5, Pulse**
- Call analysis (bidirectional)
- Call emulation (ITU, user defined)
SPECIFICATIONS

Module Type

SSMTT-27 Dual E1
Line 1 Tx, Line 1 Rx, Line 2 Tx, Line 2 Rx
75Ω unbalanced BNC (f) (SSMTT-27-BNC)
120Ω balanced RJ-48 (f) (SSMTT-27-RJ)

SSMTT-27L Single E1
Line 1 Tx, Line 1 Rx, Reference Clock
75Ω unbalanced BNC (f) (SSMTT-27L-BNC)
120Ω balanced RJ-48 (f) (SSMTT-27L-RJ)

SSMTT-27M Single E1
Line 1 Tx, Line 1 Rx, Reference Clock
75Ω unbalanced BNC (f) (SSMTT-27M-BNC)
120Ω balanced RJ-48 (f) (SSMTT-27M-RJ)

75Ω unbalanced BNC (f) (SSMTT-27-BNC)
120Ω balanced RJ-48 (f) (SSMTT-27-RJ)

2.048 Mbit/s bidirectional E1 interfaces
Stereo headphones port
Connector: 3.5 mm jack
Impedance: 220Ω

Status/Alarm Indicators
8 dual-color LED indicators for Line 1/Line 2
Current status and alarm history for: Signal, code error, frame, AIS, alarm, error
Pattern sync and bit error LED indicators
Audible alarm

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, 220-1 ITU-T
Conforms to ITU-T O.151, O.152, O.153
Programmable: 10 user patterns, 24 bits long with user definable labels
Selectabile test pattern inversion
Automatic pattern synchronization

Error/Alarm Injection
Code, frame and/or bit error; programmable burst of 1 to 9999 error manually, or continuous rate of 2x10^-3 to 1x10^-9
CRC-4, 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) x 64 kbit/s (N & M = 1 to 31)
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 and MFAS words, CAS ABCD bits, 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)
V.54 channel loopback: Loop up, loop down according to ITU-T V.54 and T1 E1.2/94-003 standards

E1 Receivers
Frequency: 2.048 Mbit/s ± 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 unbalanced 120Ω balanced
Bridge: High impedance
Jitter tolerance: Conforms to ITU-T G.823

Measurements
Error type: Code, bit, CRC-4, FE, 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, AS, %AS, SLIP
ITU-T G.826 bidirectional analysis, CRC-4 block based; error type reports: EB, %EB, %ESS, ES, %ES, SES, %SES, UAS, %UAS, EFS, %EFS
ITU-T M.2100/550
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
Print on event (Enable/Disable)
Print at timed interval (settable up to 999 hr, 59 min) or at end of test
Measurement duration continuous or timed (settable up to 999 hr, 59 min)
Programmable measurement with selection of start TIME & DATE and measurement duration

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, signal level
– Pulse mask storage and printing
Histogram analysis (requires SA701 2nd memory card)
 Graphical display of accumulated error events (Bit, Code, Ebit, CRC, FAS) and alarm events (LOS, AIS, LOF, FAS RAI, MFAS RAI, LOPS)
Stores and prints 30 days by hour and 24 hours by minute
Propagation delay: Measures propagation delay in microseconds and Ulis (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, 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 & alarm events
Save up to 100 test results
Saved record can be locked

Loop: Recovered through Line 1 Rx or Line 2 Rx signal, selectable AMI or HDB3
Pulse shape: Conforms to ITU-T G.703
3.0 Vbp (± 10%) at 120Ω
2.37 Vbp (± 10%) at 75Ω

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: Conforms to ITU-T G.703
3.0 Vbp (± 10%) at 120Ω
2.37 Vbp (± 10%) at 75Ω

E1 Receivers
Frequency: 2.048 Mbit/s ± 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 unbalanced 120Ω balanced
Bridge: High impedance
Jitter tolerance: Conforms to ITU-T G.823

Measurements
Error type: Code, bit, CRC-4, FE, 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, AS, %AS, SLIP
ITU-T G.826 bidirectional analysis, CRC-4 block based; error type reports: EB, %EB, %ESS, ES, %ES, SES, %SES, UAS, %UAS, EFS, %EFS
ITU-T M.2100/550
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
Print on event (Enable/Disable)
Print at timed interval (settable up to 999 hr, 59 min) or at end of test
Measurement duration continuous or timed (settable up to 999 hr, 59 min)
Programmable measurement with selection of start TIME & DATE and measurement duration

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, signal level
– Pulse mask storage and printing
Histogram analysis (requires SA701 2nd memory card)
 Graphical display of accumulated error events (Bit, Code, Ebit, CRC, FAS) and alarm events (LOS, AIS, LOF, FAS RAI, MFAS RAI, LOPS)
Stores and prints 30 days by hour and 24 hours by minute
Propagation delay: Measures propagation delay in microseconds and Ulis (Unit Interval)
Maximum delay measurement (at 2.048 Mbit/s): 8 seconds
View received data
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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 & alarm events
Save up to 100 test results
Saved record can be locked

Loop: Recovered through Line 1 Rx or Line 2 Rx signal, selectable AMI or HDB3
Pulse shape: Conforms to ITU-T G.703
3.0 Vbp (± 10%) at 120Ω
2.37 Vbp (± 10%) at 75Ω

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)
**E1 Voice Frequency**

Comprising: A-Law

View channel data 1 byte long (binary format)

Built-in microphone for talk

Monitor speaker or optional headphones (SS149) with volume control

Signal-to-noise ratio measurement

Noise measurements with 3.1 kHz flat, psophometric weighting, 1010 Hz notch

Tone generation: 50 to 3950 Hz, resolution 1 Hz;

+3 to -60 dBm, resolution 1 dB

Level and frequency measurement: 50 to 3950 Hz

+3 to -60 dBm

Corder offset and peak code measurements

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

Simultaneously view 30 channels in ABCD bits (PCM-30) or Programmable ABCD states for IDLE, SEIZE, SEIZE ACK, ANSWER, CLEAR BACK, CLEAR FORWARD, BLOCK ABCD (for SSMTT-27 only)

**Jitter Measurement (SWMTT-27JM)**

Instrument specs: Per ITU-T G.171 and G.172

Measurement range: Per ITU-T G.823

Wideband Jitter measurement (with 20 Hz to 100 kHz filter)

Highband Jitter measurement (with 18 kHz to 100 kHz filter)

PASS/FAIL threshold: Per ITU-T G.823 or User defined

Test rate: 2.048 Mbit/s

Parameters: Current peak, Maximum peak, RMS,

Maximum RMS, Current +peak and –peak, Maximum +peak and –peak, positive and negative phase hits

Units: UI (Unit Interval)

Resolution: 0.01 UI

Accuracy: Per ITU-T G.171 and G.172

Connector: RX, BNC 75 Ø or RJ-45 120 Ø

Test duration: Timed or Continuous

Storage: Up to 10,000 measurement intervals; 10 records with the 2nd memory card

Measurement interval: 1 second

Jitter histogram (requires 2nd memory card)

**Jitter Generation (SWMTT-27JG)**

Modulation source type: Sinusoidal

Jitter amplitude/frequency: Per ITU-T G.171

**Jitter Tolerance Measurement**

Requires Jitter Generation option

PASS/FAIL template: Per ITU-T G.823 (from 10 Hz to 100 kHz)

Test frequencies: Up to 20 points

Technique: Onset of errors

Storage: 10 records with the 2nd memory card

**Jitter Transfer Measurement**

Requires both Jitter Measurement & Generation options

PASS/FAIL template: Per ITU-T G.735, G.736, and G.737 (from 10 Hz to 100 kHz)

Test frequencies: Up to 20 points

Storage: 10 records with the 2nd memory card

**Wander Measurement (SWMTT-27WM)**

Instrument specs: Complies to ITU-T G.171 and G.172

Test interface: 2.048 Mbit/s

Reference clock: 2.048 MHz, 2.048 Mbit/s (L2-Rx)

Real time measurements:

Time Interval Error (TIE) per 0.171; Amplitude (ns)

Off-line measurements

Maximum Time Interval Error (MTIE)

Time Deviation (TDEV)

Graphic display of results conforming to ITU-T G.810, G.811, G.812, G.813, and G.823

MTIE/TDEV masks

TIE data transfer from test set to PC via MMC card

**Frame Relay Basic (SWMTT-27FRA)**

Interfaces: E1

LMI Standards: ITU-T Q.933, ANSI T1.617, LMI (DLCI 1023, G0F Vendors), NO LMI

Modes: UNI DTE, UNI DCE

Rates (E1): 2.048 Mbit/s, N (contiguous) and M (noncontiguous) x 64 kbit/s (N & M = 1 to 31)

**LMI Analysis**

Settings: T391 Status Inquiry, T392 Status, N391 Full Status Polling, N392 Error Threshold, N393 Monitor Events

Results: Link OK Total, Link Errored Total, Timeout Error, Response Sequence Number, Wrong Message

PVC Status: New, Active, or Inactive DLCI indication (keep the status for up to 60 DLCI)

**PING Test**

Settings: DLCI Header length (2/3/4 bytes), DLCI Value, Local IP address, Destination IP address, Network Layer Protocol Identifier (NLPID: IP or SNAP/IP), Timeout, Number of PINGS

Results: Number of PINGS, Number of PINGs sent, PING status (Received, Unreached, Errored), Round Trip Time (Current, Average, Maximum, Minimum)

InARP support

Conforms to RFC2390 (IETF)

Settings: Mode [Timed (selectable), Manual Request, No InARP], Timeout (selectable)

InARP statistics: InARP requests sent, InARP response received, InARP response timeout, InARP requests received, InARP response sent, last IP address assigned

Echo PING: Echo/response to PING request to local IP address

Results: Total PING request received, IP address of PING request received, Unreached, Errored), Round Trip Time (Current, Average, Maximum, Minimum)

IP encapsulation conforms to RFC1490

**FOX Test**

Settings: DLCI Header length (2/3/4 bytes), DLCI Value, CIR, Frame length (Nx64 bytes N = 1 to 64), Forward Explicit Congestion Notification (FECN), Backward Explicit Congestion Notification (BECN), Discard Eligibility (DE)

Results: PVC Status, Current Rate, Errored Frames, RSN Error, SSN Error, Frame Check Sequence (FCS) Error, Count of Frame Received with FECN, with BECN, with DE, Count of transmit frames, Count of received frames
**Statistic Analysis**

- E1 monitoring
- Selectable short frame length, long frame length
- Frame relay performance: Avg/Max/Min Utilization (%), Avg/Max/Min Throughput (%), Avg/Max/Min Frame per second
- Frame relay statistics: Avg octet, Total frame, FECN, BECN, DE frames, Short frames, Long frames, Aborted frame, FCS errors
- DLCI analysis: Total active DLCI count, Active DLCI listing (up to 100 DLCI)
- DLCI statistics: Avg octet, Total frames, FECN frames, BECN frames, DE frames, Short frames, Long frames, Aborted frames, FCS errors

**Frame Relay NNI (SWMTT-27FRNNI)**

- Requires SWMTT-27FRA
- Interfaces: E1
- LMI standards: ITU-T Q.933, ANSI T1.617, LMI (DLCI 1023, GOF Vendors), NO LMI
- Modes: NNI USER, NNI NETWORK

**GSM Voice & TRAU Access (SWMTT-27GV)**

- Interfaces: E1 Tx and Rx
- Standards: Conforms to ETSI Recommendations for GSM Phase 2+ GSM 08.60

**Channels Monitoring**

- Bidirectional drop/monitor of 8 and 16 kbit/s GSM channels/subchannel
- Identify UPLINK and DOWNLINK directions automatically
- Automatic frame type detection of any 8 and 16 kbit/s subchannel (SPEECH, DATA, IDLE, O&M, Signalling, Unknown)
- Identify 64 kbit/s and 16 kbit/s signalling channel for A-bis
- Voice decoded bidirectionally
  - Support Full Rate, Half Rate, and Enhanced Full Rate (EFR) encoding
  - Decoded via built-in speaker or optional headphones (SS149-UP-LINK/one ear, DOWNLINK/other ear)
- Statistics: PCM level, control bits decoding, counters for BFI, DTX, and UFE (when applicable)

**TRAU Access**

- Settings
  - Timeslot (1 to 31) and Subchannel (1 to 4)
  - Type: Speech Full Rate, Speech EFR, Idle speech, Pattern (All 0s, All 1s, 1010, 2^n-1, n = 9, 11, 15)
  - Link direction (UPLINK, DOWNLINK)
  - Idle code
  - Time alignment
- Results: Received control bits (C1 to C21), Elapsed time*, Bit error count and rate*, ES*, SES*, EFS*, UAS*, LOSS* (*if test pattern is selected)

**GSM A-bis Protocol Analysis (SWMTT-27GA)**

- Interfaces: E1 Rx
- Standards: Conforms to ETSI Recommendations for GSM Phase 1, 2, and 2+ GSM 04.08, GSM 08.56, and GSM 08.58
- Mode: Monitor
- Signalling rate: 64 kbit/s or 16 kbit/s
- Supports Layer 2 modulo 8 or modulo 128
- Layer 2 API and TEI in HEX or decimal format
- Capture and store A-bis messages for decoding and protocol analysis
- Capture Layer 1 events (alarms), capture and decode Layer 2 and 3 protocol messages, display in HEX or English decoded format, with decoding of the Information Elements
- Filters: PRE and POST for Layer 1, Layer 2, Layer 3 (Message discriminator, Message type, Channel number, Timeslot number, IMSI)
  - Message discriminator: RLL management, DC management, CC management, TRX management, Reserved
- Detailed trace (HEX and/or decoded messages) printing via serial port to printer or to computer
- Message storage capacity
  - Optional SRAM card: 1 Mbyte card, stores approximately 10 sets of traces of 1200 messages each (requires SA701)

**GPRS over Gb Analysis (SWMTT-27Gb)**

- Requires SWMTT-27FRA Frame Relay (refer to Frame Relay section)
- Standards: Conforms to ETSI Recommendations for GSM Phase 2+ GSM 08.14 (Frame Relay), GSM 08.16 (Network Service), GSM 08.18 (BSSGP), GSM 04.08 (GMM/SM)
- Mode: Monitor
- Frame relay statistics
  - Selectable short frame length, long frame length
  - Frame relay performance: Avg/Max/Min Utilization (%), Avg/Max/Min Throughput (%), Avg/Max/Min Frame per second, Avg octet, Total frame, FECN frames, BECN frames, DE frames, Short frames, Long frames, Aborted frame, FCS errors
  - DLCI analysis: Total active DLCI count, Active DLCI listing (up to 100 DLCI)
  - DLCI statistics: Avg octet, Total frame, FECN frames, BECN frames, DE frames, Short frames, Long frames, Aborted frame, FCS errors
- GPRS statistics
  - GPRS Layer Detection PASS/FAIL
  - Network Service Counter (%) per selected active DLCI
  - BSSGP Messages Counter (%) per selected active DLCI
  - GMM/SM Layer Messages Counter (%) per selected DLCI

**GPRS over A-bis Analysis for Ericsson BSS (SWMTT-27GEC)**

- Requires SWMTT-27GA GSM A-bis Protocol Analysis
- Standards: Conforms to ETSI Recommendations for GSM Phase 2+ GSM 04.08, GSM 08.56, and GSM 08.58
- Supports Ericsson GPRS A-bis Proprietary Extensions
- GPRS channel monitoring
  - Bidirectional monitor of 16 kbit/s GSM channels/subchannels
  - Automatic frame type detection of any 16 kbit/s subchannel (SPEECH, DATA, IDLE SPEECH, O&M, Signalling, PCU)
- GPRS statistics
  - GPRS Layer Detection PASS/FAIL
  - Network Service Counter (%) per selected active DLCI
  - BSSGP Messages Counter (%) per selected active DLCI
  - GMM/SM Layer Messages Counter (%) per selected DLCI

**GPRS over A-bis Analysis for Ericsson BSS**

- Requires SWMTT-27GA GSM A-bis Protocol Analysis
- Standards: Conforms to ETSI Recommendations for GSM Phase 2+ GSM 04.08, GSM 08.56, and GSM 08.58
- Supports Ericsson GPRS A-bis Proprietary Extensions
- GPRS channel monitoring
  - Bidirectional monitor of 16 kbit/s GSM channels/subchannels
  - Automatic frame type detection of any 16 kbit/s subchannel (SPEECH, DATA, IDLE SPEECH, O&M, Signalling, PCU)
- GPRS statistics
  - GPRS Layer Detection PASS/FAIL
  - Network Service Counter (%) per selected active DLCI
  - BSSGP Messages Counter (%) per selected active DLCI
  - GMM/SM Layer Messages Counter (%) per selected DLCI
**GPRS over A-bis Analysis for Nokia BSS**

*SWMTT-27GNK*

*Requires SWMTT-27GA GSM A-bis Analysis*

**Standards:** Conforms to ETSI Recommendations for GSM Phase 2+
GSM 04.08, GSM 08.56, and GSM 08.58

**Supports Nokia GPRS A-bis Proprietary Extensions**

**GPRS channel monitoring**

- Bidirectional monitor of 16 kbit/s GSM channels/subchannels
- Automatic frame type detection of any 16 kbit/s subchannel (Speech, DATA, IDLE SPEECH, O&M, Signalling, PCU)

**GPRS statistics**

- GPRS Layer Detection PASS/FAIL
- GPRS Channel Management
- GPRS PCU FRAME count

**GPRS over A-bis Analysis for Nortel BSS**

*SWMTT-27GNT*

*Requires SWMTT-27GA GSM A-bis Analysis*

**Standards:** Conforms to ETSI Recommendations for GSM Phase 2+
GSM 04.08, GSM 08.56, and GSM 08.58

**Supports Nortel GPRS A-bis Proprietary Extensions**

**GPRS statistics**

- GPRS Layer Detection PASS/FAIL
- GSL Link Management
- GPRS PCU FRAME count

**ISDN Primary Rate Testing (SWMTT-27PR)**

*Interfaces: E1 Tx and Rx*

*Modes: TE Emulation, NT Emulation, Monitor*

**Call Setup**

- Settings: Caller phone number and sub-address, called phone number and sub-address, Layer 2 TEI, signalling timeslot (16 by default), answer mode (automatic or manual), loop or terminate Call type: Speech, Data-64, Data-56, Nnx64 kbit/s, 3.1 kbit/s Audio, 7 kbit/s (ETSI and AUSSI only)
- Perform a BERT test with a data call towards loopback number, in self-call mode (0.821 measurements) or end-to-end mode
- DTMF dialing (SPEECH call)
- Keypad facilities

**Automatic Supplementary Services Test**

- Automatically tests the provisioning of the following supplementary services: CLIP, CLIR, COLP, COLR, CFU, CFNB, CFNR, SUB, MSN, DDI, CH, UUS, TP, AOC-S, -D, -E, MCID, CUG

**Automatic Tele Services Test**

- Automatically tests the provisioning of the following bearer services, Tele services, and HLC call types: SPEECH, Data-64, Data-56, 3.1 kbit/s Audio, 7 kbit/s, Telephony 3.1 kbit/s, Telephony 64 kbit/s, Fax group 2/3, Fax group 4, MIX Mode, PROC Form, VIDEO TEXT, OSI Mode local (test toward the local switch) or distant mode (test toward a remote switch)

**Sequential Call**

- Calls each channel one by one with a hold time (1 to 9999 seconds), SPEECH or Data-64, self-call or towards a distant number

**Protocol Analysis**

- Capture & store D-channel messages for decoding & protocol analysis
- Capture Layer 1 events (alarms), capture and decode Layer 2 and 3 protocol messages, display in HEX or English decoded format, with decoding of the Information Elements
- Capture and store in emulation mode or monitoring mode
- Filters: PRE (monitor mode only) and POST for Layer 1, Layer 2 (SAPI and TEI), Layer 3 (called number, calling number, call reference, message type)
- Detailed trace (HEX and/or decoded messages) printing via serial port to printer or to computer
- Message storage capacity
  - Base unit: 10 kbyte, stores approximately 100 messages
  - Optional SRAM card: 1 Mbyte card, stores approximately 10 sets of traces of 1200 messages each (requires SA701)

**V5.x Protocol Analysis (SWMTT-27V5A)**

*Interfaces: E1 Rx*

**Standards**

- Supports ITU-T/ETSI V5.1, V5.2, and LAPV5
- V5.1 conforms to ETS 300 324 and ITU-T G.964
- V5.2 conforms to ETS 300 347 and ITU-T G.965

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**LAPV5**

- Conforms to ETS 300 125 and ITU-T Q.920, Q.921
- Mode: Monitor
- Capture and store messages for decoding and protocol analysis
- Capture Layer 1 events (alarms), capture and decode Layer 2 and 3 protocol messages, display in HEX or English decoded format, with decoding of the Information Elements
- Trigger: Layer 1, Layer 2, Layer 3 and programmable parameters

**GPRS over Frame Relay Monitoring**

GPRS over Frame Relay Monitoring

**GPRS over A-bis Monitoring**

GPRS over A-bis Monitoring

**GPRSS over A-bis Monitoring**

GPRS over A-bis Monitoring
Filters and Trigger: PRE filtering for Layer 1, Layer 2, Layer 3 (ISDN, PSTN, Control, BCC, Protect, and Link)
- ISDN: EF Address
- PSTN: Establish, Establish Ack, Signal, Signal Ack, Status, Status Enquiry, Disconnect, Disconnect Complete, Protocol Parameter
- Control: Port Control, Port Control Ack, Common Control, Common Control Ack
- Protect: Switch-Over Req, Switch-Over Com, OS-Switch-Over Com, Switch-Over Ack, Switch-Over Reject, Protocol Error, Reset SN Com, Reset SN Ack
- Link: Link Control, Link Control Ack
Detailed trace (HEX and/or decoded messages) printing via serial port to printer or to computer
Message storage capacity
- Base unit: 8 kbyte, stores approximately 200 messages
- Optional SRAM card: 1 Mbyte card, stores approximately 10 sets of traces of 1200 messages each (requires SA701)

Statistic Analysis (bidirectional)
Layer 2: SABME, UA, DM, RR, REJ, I, and Total frames (count, %)
Layer 3: PSTN, BCC, Control, Protect, Link, & Total messages (count, %)

V5.2 3 C Paths Monitoring (SWMTT-27V5ST3)
Requires SWMTT-27V5A
Monitor and capture 3 C paths simultaneously (3 timeslots)
All features on SWMTT-27V5A still apply

VF Call Analysis & Emulation
(SWMTT-27VFA, SWMTT-27VFE)
Interfaces: E1 Tx and Rx
Modes: Analysis, Emulation
Standards: Conforms to ITU-T Q.422, Q.441, Q.140 series
Programmable ABCD states for IDLE, SEIZE, SEIZE ACK, ANSWER, CLEAR BACK, CLEAR FORWARD, BLOCK ABCD; Default (conforms to ITU-T 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

VF Call Analysis (SWMTT-27VFA)²
Bidirectional analysis of MFR1, MFR2/MFR2C, SS5, DTMF, Pulse (DP)
Bidirectional CAS (ABCD signalling) transition analysis
Manual (on selected timeslot) or Auto scan trigger (MFR2/MFR2C, DTMF, and DP only)
Automatic trigger: CAS (ABCD selectable), STATE (IDLE, SEIZE, ACKNOWLEDGE, ANSWER, CLEAR FORWARD, CLEAR BACKWARD, BLOCK)
Tracer with timestamp (resolution 1 ms) in relative or absolute values
Digits are recorded and decoded in user defined labels
MFR2/DTMF digit decode and analysis: Frequency, level, twist, tone period, interdigit period
Pulse (DP) digit analysis:
%break, pps, period
Storage of one test record on base unit
Storage of up to 20 test records with user definable labels (requires SA701)

VF Call Emulation (SWMTT-27VFE)
Programmable dial 1 to 15 digits
Dial parameters
- Dial tone period, Silent period, Interdigit period, Dial tone level
  (from -5 to -20 dBm, resolution 1 dB)
- Dial pulse %break/period
Receive or call modes
Call setup (receive or call) with on-line call progress status (Tx & Rx) display (ABCD bits, STATE, and digits) with timestamp (resolution 1 ms) in relative or absolute values. Programmable caller ID and category, DTMF dialing
User call emulator
- 6 sets of stored user signalling emulation setups
Each signalling emulation holds up to 50 total events
Programmable send and receive signalling (CAS), digits (MFR2, DP, DTMF), Wait and Timeout periods
Send period from 0 to 999 ms, timeout for response from 0 to 999 ms, program up to 20 digits (MFR2, DP, and/or DTMF)

SS5
Conforms to ITU-T Q.140 series
Supports 2400 Hz, 2600 Hz, 2400+2600 Hz SS5 line signalling
Control frequencies decode: Socotel-1700 Hz, 1900 Hz, A0N-425 Hz, 500 Hz, Echo suppressor/canceller-2100 Hz
**PRODUCT DESCRIPTION**

Module Size (WxLxH): 5.0 x 3.5 x 0.9 in (12.6 x 9 x 2.2 cm)

Operating Temperature: 32˚ to 122˚F (0˚ to 50˚C)

Storage Temperature: -4˚ to 158˚F (-20˚ to 70˚C)

Humidity: 5% to 85% noncondensing

**ORDERING INFORMATION**

**SSMTT-27** Dual E1 Module

**SSMTT-27L** Single E1 Module

**SSMTT-27-BNC** BNC connector option for SSMTT-27

**SSMTT-27L-BNC** BNC connector option for SSMTT-27L

**SSMTT-27-RJ** RJ-48 connector option for SSMTT-27

**SSMTT-27L-RJ** RJ-48 connector option for SSMTT-27L

**SWMTT-27JM** Jitter Measurement option

**SWMTT-27JG** Jitter Generation option

**SWMTT-27WM** Wander Measurement option

*Requires hardware with Wander ready*

**SWMTT-27FRA** Frame Relay Basic

**SWMTT-27FRNI** Frame Relay NNI

*Requires SWMTT-27FRA*

**SWMTT-27GV** GSM Voice & TRAU Access

**SWMTT-27GA** GSM A-bis Protocol Analysis

**SWMTT-27Gb** GPRS Gb Analysis

*Requires SWMTT-27FRA Frame Relay option*

**SWMTT-27GEC** GPRS A-bis Analysis – Ericsson BSS

*Requires SWMTT-27GA GSM A-bis option*

**SWMTT-27GNK** GPRS A-bis Analysis – Nokia BSS

*Requires SWMTT-27GA GSM A-bis option*

**SWMTT-27GNT** GPRS A-bis Analysis – Nortel BSS

*Requires SWMTT-27GA GSM A-bis option*

**SWMTT-27PR** ISDN Primary Rate Testing

*Requires at least one ISDN protocol option*

**SWMTT-27PRE** ETSI/ITU-T. Conforms to ETS 300 102, 300 402 and ITU-T Q.921 & Q.931

**SWMTT-27PRU** AUSSI. Conforms to AUSTEL Standard 014

**SWMTT-27PRQ** Q.SIG. Conforms to ECMA 141, 142/143, 165, ETS 300 402, 300 171/172, 300 239 and ITU-T Q.921, Q.931

**SWMTT-27PRP** DPNSS. Conforms to BTNR 188 series

**SWMTT-27PRD** DASS2. Conforms to BTNR 190 series

**SWMTT-27V5A** V.5.x Monitoring

**SWMTT-27V5TS3** 3-timeslot V5.2 Monitoring

*Requires SWMTT-27V5A*

**SWMTT-27VFA** VF Call Analysis

**SWMTT-27VFE** VF Call Emulation

**Recommended Cables**

**SS211** Cable, BNC (m) to BNC (m)

**SS434** Cable, RJ-48 (m) to two 3-pin banana (m)

**Other**

**SS149** Headphones

**SA701** 1MB SRAM Card

Notes:
1. Dual E1 Rx/Tx for SSMTT-27; Single E1 Rx/Tx for SSMTT-27L
2. Not available in SSMTT-27L (Single E1)
3. SWMTT-27PR is required for all other ISDN options

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