

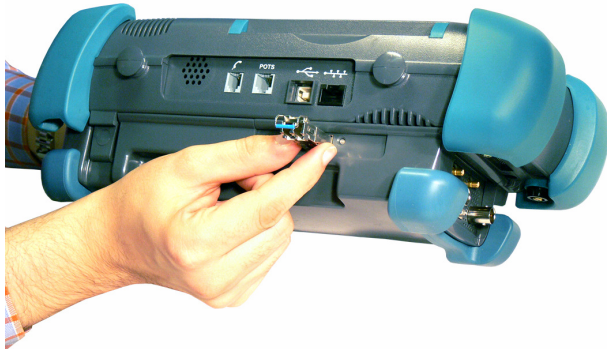


## TrendMultipro SDH

Modular Handheld for SDH/PDH Testing up to 2.5 Gbit/s

Trend Multipro SDH is a rugged, easy-to-use, modular and battery-operated solution for the installation, qualification, acceptance, maintenance, repair and troubleshooting of SDH networks. Some of the main features of this test platform are:

- Field-upgradeable optical interfaces (SFP)
- Test-oriented user interface
- Programmable PASS/FAIL criteria
- All SDH/PDH/DS-*n* interfaces
- Reference clock input and output
- Multiple event insertion modes
- Fast scan for all tributary VC paths
- Complete error performance tests
- User-programmable OH capture
- Fast autoconfiguration
- Tandem Connection Monitoring (TCM)



- 34 368 kbit/s
- 44 736 kbit/s
- 51 840 kbit/s, optical/electrical
- 155 520 kbit/s, optical/electrical
- 622 080 kbit/s
- 2 488 320 kbit/s

### Connectors

- 1 x optical Tx/Rx: removable LC duplex SFP modules
- Optical power capability provided by the SFP
- 1 x unbalanced 75 Ohm electrical transmitter: BNC
- 1 x unbalanced 75 Ohm electrical receiver: BNC
- 1 x balanced electrical Tx/Rx for E1 (120 Ohm) / DS-1 (100 Ohm): RJ-45
- 1 x input for external reference signal, 2 MHz (or E1) / 1.5 MHz (or DS-1): SMB 75 Ohm
- 1 x output for external reference signal 2 MHz / 1.5 MHz: SMB 75 Ohm

### Clock

#### General

- Internal, in line with ITU-T G.813 (SEC quality)
- External
- Recovered from the received signal

#### Reference Input:

- External from 1544/2048 kHz
- External G.703 coded at 1544 kbit/s and 2048 kbit/s
- Level: nominal or 20 dB attenuated

#### Reference Output:

- 1544/2048 kHz

#### Transmission Clock Frequency Offset

- Electrical interfaces: 20 000 ppm in steps of 0.01 ppm
- Optical interfaces: 40 ppm in steps of 0.01 ppm

### Frequency Measurement

- Real value and offset in ppm from the nominal value
- Out-of-range indication in line with ITU-T/ANSI

## Technical Specifications

### Interfaces

#### Rates

- 1554 kbit/s
- 2048 kbit/s
- 8448 kbit/s



## Optical Power Measurement

- Range: as per SFF-8472
- Resolution: +/-3 dBm (As per SFF<sup>1</sup>-8472)

## Modes

- Terminal mode
- Through mode (passive)
- Monitor mode

## SDH

### Mappings

- C-4-16c (bulk-filled) via AUG-16
- C-4-4c (bulk-filled) via AUG-4
- C-4-4c (bulk-filled) via AUG-16
- C-4 (bulk-filled or mapped with a framed/unframed E4 signal) via AUG-1
- C-4 (bulk-filled or mapped with a framed/unframed E4 signal) via AUG-4
- C-4 (bulk-filled or mapped with a framed/unframed E4 signal) via AUG-16
- C-3 (bulk-filled or mapped with a framed/unframed E3 or DS3 signal) via AU-3
- C-3 (bulk-filled or mapped with a framed/unframed E3 or DS3 signal) via AU-4
- C-12 (bulk-filled or mapped [asynchronous or byte-synchronous] with a framed/unframed E1 signal [asynchronous or byte-synchronous]) via TU-12 via AU-4
- C-12 (bulk-filled or mapped [asynchronous or byte-synchronous] with a framed/unframed E1 signal [asynchronous or byte-synchronous]) via TU-12 via AU-3
- C-11 (bulk-filled or mapped [asynchronous or byte-synchronous] with a framed/unframed E1 signal [asynchronous or byte-synchronous]) via TU-11 via AU-4
- C-11 (bulk-filled or mapped [asynchronous or byte-synchronous] with a framed/unframed E1 signal [asynchronous or byte-synchronous]) via TU-11 via AU-3

### Programmable Bytes

Editing and display in hexadecimal or by descriptor.

- RSOH: A1, A2, J0, C1
- MSOH: K1, K2, S1
- HO-POH (VC-4, VC-3): J1, C2, G1, H4, K3
- LO-POH (VC-3): J1, C2, G1, H4, K3
- LO-POH (VC-12, VC-11): V5, J2, K4

### Mux/demux SDH-SDH and SDH-PDH

- Mux/demux SDH-SDH or SDH-PDH tests are performed as a type of BER test in terminal mode, using different rates at the Tx and Rx.

1.SFF: Small Form Factor

## Trail Trace

- Generation, analysis and testing of expected messages with 16-byte format in J0, J1 and J2

## Errors

- Inserting and detecting code errors, FAS errors, OOF, B1, B2, MS-REI, HP-B3, HP-REI, LP-B3, LP-REI, BIP-2, slips and bit errors
- Insertion mode: single, burst, repetitive burst and rate (from 1.1 x 10<sup>-3</sup> up to 0.9 x 10<sup>-9</sup>s)

## Alarms

- Insertion and detection of LOS, LOF, RS-TIM, MS-AIS, MS-RDI, AU-AIS, AU-LOP, HP-UNQ, HP-RDI, HP-TIM, HP-PLM, TU-LOM, TU-AIS, TU-LOP, LP-UNQ, LP-RDI, RFI, LP-TIM, LP-PLM, LSS, AIS pattern
- Insertion mode: continuous, burst of *m* frames with alarm, repetitive *m/n* burst

## Pointer Events

- Increment, decrement, manual value with or without NDF, pointer not valid in AU-4, AU-3, TU-3, TU-2, TU-12 and TU-11
- SS-bit programming

## Pattern

The following patterns can be generated:

- PRBS-11, PRBS-15, PRBS-20, PRBS-23, PRBS-31: normal or inverted
- Word: user-defined, all 0s, all 1s, 1010, 1000 and 1100

## Results

- Counters, seconds with error and rate for all events: errors, alarms and pointer events
- Trace: events are shown graphically as time plots (alarms) or histograms (errors)

## Performance

Performance measurements in line with ITU-T G.821, G.826, G.828, G.829, M.2100, M.2101.1, M.2110, M.2120. Counters, rate, unavailability time and Pass/Fail indication for pre-programmed performance objectives.

## RTD

- In all interfaces, from 1 ms to 10 s

## Autoconfiguration

- Identification of input signal parameters:
  - Network: SDH, PDH, TCAR
  - Rate: STM-N rates, DS-N rates, PDH rates
  - Gain: only if the incoming signal is electrical (STM-1e, STM-0e, DS-N, PDH)
  - Port: optical, BNC, RJ
  - Line code: Opt, CMI, B3ZS, B8ZS, AMI, HDB3
  - Impedance: normal, highZ (E1 and DS1 interfaces)

## FastScan

- Scan for all SDH events (errors, alarms) in the tributaries of the analysed signal

## OH BER Test

- Generation and analysis of PRBS patterns in DCC channels or in E1, E2, F1, N1 and N2 bytes
- Counter for bit errors, rate and seconds with error
- Counter for seconds with alarm for LSS

## Automatic Protection Switching (APS)

- Disruption time measurement for any STM-N
- Tributaries: PDH, T-Carrier, SDH
- Triggers: MS-AIS, AU-AIS, Pattern AIS, B1 errors, B2 errors
- Range: from 1 ms to 10 s
- Resolution: 1 ms

## Tandem Connection Monitoring (TCM)

- Generation and analysis of N1 and N2
- Events generated: TC-IEC, TC-OEI, TC-REI, TC-AIS, TC-LTC, TC-UNEQ, TC-ODI, TC-RDI, TC-TIM
- Detection, display, performance calculation and storage of events: TC-IEC, TC-OEI, TC-REI, TC-AIS, TC-LTC, TC-UNEQ, TC-ODI, TC-RDI, TC-TIM
- B3 or BIP-2 compensation
- Analysis and generation of Access Point Identifier (APId)

## PDH

### Structure

- 140 Mbit/s according to ITU-T G.751, G.703, framed and unframed
- 34 Mbit/s according to ITU-T G.751, G.703, framed and unframed
- 8 Mbit/s according to ITU-T G.742, G.703, framed and unframed
- 2 Mbit/s according to ITU-T G.704, G.703
- PCM-30/31 frame structure with/without CRC for 2 Mbit/s signals.
- Test signal in 64 or  $n \times 64$  kbit/s. CAS signalling: setup and display of the CAS multiframe and spare bits of frame 0.

### Errors

- Insertion and detection of code errors, FAS errors, CRC errors, REBE, slips (detection) and bit errors (TSE)
- Insertion mode: single, burst, repetitive burst and rate ( $m \times 10^{-n}$ , with programmable  $m$  and  $n$ .  $m = 0.9, 1, 1.1$ ;  $n = 3, 4, 5, 6, 7, 8, 9$ )

### Alarms

- Insertion (continuous mode) and detection of LOS, AIS, LOF, RAI, CRC-LOM, MAIS, CAS-LOM, MRAI, LSS and AIS pattern

### Multiplex PDH Signal

- PDH multiplexing chain: E4-E3, E4-E2 and E4-E1
- Insertion of PDH events in each tributary of the multiplex PDH signal

- Analysis of PDH events in each tributary of the multiplex PDH signal

### Mux/Demux Test, PDH-PDH

- Mux/demux PDH-PDH test is performed as a type of BER test in terminal mode and different PDH rates at the Tx and Rx.

## DS3

### Structure

- M13 and C-bit according to ITU-T G.752, G.704, framed and unframed

### Errors

- Insertion and detection of BPV, M-BIT, F-PAR, P-PAR, C-PAR, FEBE, slips (detection) and bit errors (TSE)
- Insertion mode: single, burst, repetitive burst and rate ( $m \times 10^{-n}$ , with programmable  $m$  and  $n$ .  $m = 0.9, 1, 1.1$ ;  $m = 3, 4, 5, 6, 7, 8, 9$ )

### Alarms

- Insertion (continuous mode) and detection of LOS, line AIS, LOF, DS-3 AIS (blue), IDLE, DS-3 RAI (yellow), LSS and AIS pattern

## DS1

### Structure

- SF & ESF framing according to ANSI T1-400-1995; SLC-96 framing according to Telcordia TR-TSY-00008, framed and unframed
- Fractional DS1: DS1 with test pattern in  $n \times 64$  and  $n \times 56$  kbit/s

### Errors

- Insertion and detection of BPV, EFAS, ECRC, slips (detection) and bit errors (TSE)
- Insertion mode: single, burst, repetitive burst and rate ( $m \times 10^{-n}$ , with programmable  $m$  and  $n$ .  $m = 0.9, 1, 1.1$ ;  $m = 3, 4, 5, 6, 7, 8, 9$ )

### Alarms

- Insertion (continuous mode) and detection of LOS, LOF, RAI, LSS and line AIS
- Signalling  
Generation and analysis of Robbed Bit signalling  
Generation and analysis of data link messages in ESF and SLC-96 framing

### Relevant Standards

ITU-T Recommendations: G.703, G.704, G.707, G.732, G.742, G.751, G.752, G.821, G.826, G.828, G.829, M.2101, M.2110, M.2120, O.3, O.151, O.152, O.153, O.181

## Ergonomics

### General

- Modular: PIMs for SDH, ADSL2+, VDSL, GbE, Copper
- Built-in speaker and microphone
- Microphone and headphone connectors
- Display: 5.7" TFT true colour LCD, 1/4 VGA touch-screen

- Remote control software identical to the GUI of the tester
- Context-sensitive on-line help
- Built-in user guide and application notes
- Mainframe: 132 x 302 x 60 mm, 1.80 kg
- Battery: 7.4V, 8.8 Ah Li-Ion pack

## SDH PIM

- SDH PIM<sup>1</sup> dimensions (w x h x d): 125 x 271 x 51 mm
- SDH PIM weight: 0.86 kg

## File Manager

- Copying, editing and transfer of files to/from internal and external memory devices (internal, USB and CF)

## RF/EMI, ESD and Electrical Safety

- Radiated EMI: EN 55022
- Immunity to EMI: EN 55024
- ESD: EN 61000-4-2
- Electrical safety: EN 60950
- RoHS-compliant

## Environmental Conditions

- Operational temperature: 0 to 45 °C
- Storage temperature: -25 to 70 °C
- Humidity: 5 to 90%, without condensation

## Ordering Information

### Main Options

M6000001	Multipro SDH PIM
M60S09	STM-1 Electrical I/F
M60S10	STM-1 Optical I/F
M60S11	STM-4 Optical I/F
M60S12	STM-16 Optical I/F
M60S02	PDH Test
M60S03	DS-1 Test
M60S04	DS-3 Test
M60S07	Advanced Features
M60S08	PDH Mux/Demux Test

### SFP Kits

M60H03	STM1 1310nm short haul module kit
M60H04	STM1 1550nm short haul module kit
M60H05	STM1 1310nm long haul module kit
M60H06	STM1 1550nm long haul module kit
M60H08	STM4 1310nm short haul module kit
M60H09	STM4 1550nm short haul module kit
M60H10	STM4 1310nm long haul module kit
M60H11	STM4 1550nm long haul module kit
M60H13	STM16 1310nm short haul module kit
M60H14	STM16 1550nm short haul module kit
M60H15	STM16 1310nm long haul module kit
M60H16	STM16 1550nm long haul module kit

1.PIM: *Pluggable Interface Module*

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