



N1660A Dual DS1/0 Test Module Specifications



GENERAL SPECIFICATIONS

The N1660A Dual DS1/0 Tester module provides comprehensive T1, Nx56 kbps and Nx64 kbps fractional T1 test capability for the Service Advisor family. An optionally available function (opt 010) provides channel scan, digit capture and dialing capability for E&M, ground start, loop start and mixed trunks.

The pulsemask measurement option (020) provides pulsemask measurement and comparison with industry standard masks.

RELEVANT STANDARDS

ANSI T1.403,
TR-TSY-00008
ITU-T Rec 703
T1.102
G.703
Pub 62411

MODES

Normal: Tx originates line code, framing and BERT pattern on full T1 span. Rx synchronizes to input.
Internal Loop: Tx and Rx internally looped
CSU: Responds to CSU loop codes. Sends framed All 1's until looped. T1 monitoring available.
Remote Loop: Equivalent to hardware looping. Data is regenerated. T1 monitoring available.
Drop/Insert with Pass Thru: Single or multiple timeslots are dropped and inserted internally, the remaining time slots are passed thru

T1 TRANSMITTERS

Number: 2 fully independent transmitters
Line Code: B8ZS, AMI
Impedance: 100 ohms \pm 5%
Level: 0, -7.5, -15, -22.5 dB and 0, 266, 399, 533 and 655ft of line build out
Pulse Shape: Meets T1X1.403 for cross connects
Jitter: Intrinsic jitter meets ITU-T Rec 703 section 2
Tx Clock Sources: Rx1 recovered, Rx2 recovered, internal
Internal Tx Clock: 1.544 Mb/s \pm 10ppm
Framing: None, D4, ESF, SLC-96
Fractional: Nx56 or Nx64, $1 \leq n < 24$, contiguous or non-contiguous
Idle Channel: all 1's or user bit programmable byte
BERT's: 2 fully independent
Alarm Generation: LOS, AIS, yellow, CDI (no LAPD processing)
Error Injection

- **Frame:** single, 2 to 6 consecutive frames, and a burst of 25
- **BPV and Pattern:** single, 1E-1, 1E-2, 1E-3, 1E-4, 1E-5, 1E-6, 1E-7, and a burst of 1 to 9,999
- **CRC:** single, and the following rates which are equivalent to an error rate of 2.17E-3, 1E-4, 1E-5, 1E-6, 1E-7 bit errors, and a burst of 1 to 9,999
- **Bit:** 1E-1, 1E-2, 1E-3, 1E-4, 1E-5, 1E-6, 1E-7, and a burst of 1 to 9,999

Loop Codes

- **Standard:** CSU, NIU, NIU4, NIU6, FDL line, FDL payload, V.54
- **DDS:** V.54, OCU DP, OCU ALT, DSU ALT, CSU DP, CSU ALT, DSU DP
- **User Programmable:** Four out-of-band (0xxx xxx0 1111 1111), four in-band (3 to 8 bits)
- **Transmit Times:** until received
- **Framing Bit Overwrite:** on/off

CODEC: μ LAW

Tone Generation

- 200 Hz through 3950 Hz in 1 Hz steps with level adjustable from +3dBm to -35dBm in 1dB steps
- Preprogrammed Choices: 404, 1000, 1004 and 2804
- Three tone slope (404Hz, 1004Hz, 2804Hz) with level adjustable from +3dBm to -35dBm in 1dB steps, and duration adjustable 1 to 9,999 seconds in 1 second steps

Audio Input: audio from the handset can be encoded onto a single user-selectable DS0 timeslot instead of a tone

Signaling Bit Control: Simultaneous AB or ABCD signaling bits are user settable for all 24 channels



T1 TRANSMITTERS (cont'd.)

BERT Patterns

- **Standard:** QRSS, 2^{23-1} , 2^{20-1} , 2^{15-1} , all 1's, all 0's, 63, 511, 2047, 1:1, 1:7, 3:24, live (Tx=QRSS and Loss of Pattern and bit error counting disabled)
- **Octet:** OCT 53, NET55, OCT55, Daly 55, OCT52, OCT54, OCT72, OCT96, 120 octet
- **User:** 4 user programmable bit patterns (3 to 16 bits) and 4 user programmable byte patterns (up to 1024 bytes)
- **Density:** 1in4, 1in6, 1in8, 2in9, 2in10, 2in11, 2in12, 2in13, 2in14, 3in18, 3in20, 3in21, 3in22
- **DDS:** DDS1, DDS2, DDS3, DDS4, DDS5, DDS6
 - Invert all patterns

PRM Generation

Normal, Internal and Drop/Insert modes, the following events can be selected and sent:

- **G1** (CRC Error Event =1),
- **G2** (CRC Event >1 but <=5),
- **G3** (CRC Event >5 but <=10),
- **G4** (CRC Event >10 but <=100),
- **G5** (CRC Event >100 but <=319),
- **G6** (CRC Event >=320),
- **SE** (Severely Errored Framing Event >=1),
- **FE** (Frame Synchronization Error Event >=1),
- **LV** (Line Code Violation Event >=1),
- **SL** (Slip Event >=1) and
- **LB** (Payload Loopback Activated)
- **CSU Mode:** events received are encoded and sent

DDS Rates/User Channel

- **DSOA:** 2400, 4800, 9600, 19200, 38400, 56000, 64000 bps
- **DSOB:** 2400 (1-20 user), 4800 (1-10 user), 9600 (1-5 user), 19200 (1-2 user)

T1 RECEIVERS

Number: 2 fully independent receivers with individual BERT

Line Code: B8ZS, AMI (Once a B8ZS code is detected, B8ZS will be declared until LOS is detected or AutoSetup)

Impedance

- **Terminate or Monitor:** 100 ohms $\pm 5\%$
- **Bridge:** 1000 $\pm 5\%$ ohms bridged

Framing: D4, ESF, SLC-96 and none

Fractional: Nx56 or Nx64, $1 \leq n < 24$, contiguous or non-contiguous

Audio Output

- A single user-selectable DS0 timeslot can be dropped to
 - The internal speaker (signal can be turned on/off and volume adjusted)
 - Handset jack with normal telephone output level

Signal Loss Criteria: No pulses for 192 bit times

Density Violations Criteria: Excess zeros or ones in accordance with ANSI T1.403.

D4 Alarm Criteria: Frame loss when 2 out of 5 Ft bits are in error. Yellow alarm when bit 2 of each DS0 has been zero for 255 consecutive channels.

ESF Alarm Criteria: Frame loss when 2 out of 5 Ft bits are in error. Yellow alarm when alternating eight ones and eight zeros has been detected in data link.

Pattern Loss Criteria: Greater than 100 errors in 1000 bits.

Jitter Tolerance: Input typically tolerates a signal modulated with sinusoidal jitter having an amplitude/frequency relationship defined in ITU-T Rec 703 section 3

T1 MEASUREMENTS

Level: Volts and dBdsx

- **Resolution:** ± 1 dB
- **Accuracy:** $\pm 5\%$
- **Range**
 - **Terminate:** 0 to -35dBdsx
 - **Monitor:** -17 to -30dB flat loss relative to 0dBdsx

Simplex Current

- **Resolution:** 1ma
- **Accuracy:** $\pm 5\%$
- **Range:** 1 to 200mA

Frequency: Max, min and current during the test period.

- **Resolution:** ± 1 Hz.
- **Accuracy:** ± 2 Hz
- **Range:** 1.544MHz ± 250 ppm

Slips

- **Modes:** RX1/RX2, TX1/RX1, TX2/RX2
- **Results:** relative frequency, total, estimated frame

Status Indicators (green soft LEDs): Signal, Frame sync, Pattern sync

Alarm Indicators (red soft LEDs): Signal Loss, Frame Loss, Pattern Loss, Density Violations, AIS Signal, Yellow Alarm, CDI

Alarms: Signal loss seconds and counts, Loss of frame seconds and counts, Density violations count, AIS seconds and count, Yellow alarm seconds and count, CDI seconds and count (no LAPD processing), Pattern loss seconds and count

Pattern Errors: Count, Rate, Errored Seconds (ES), Severely Error Seconds (SES), Consecutively Severely Errored Seconds (CSES), UnAvailable Seconds (UAS), Error Free Seconds (EFS), %ES, %SES, %CSES, %UAS, %EFS

BPV Errors: Count, Rate, ES, SES, CSES, UAS, EFS, %ES, %SES, %CSES, %UAS, %EFS

CRC Errors (ESF only): Count, Rate, ES, SES, CSES, UAS, EFS, %ES, %SES, %CSES, %UAS, %EFS

Frame Errors: Count, Rate, ES, SES, CSES, UAS, EFS, %ES, %SES, %CSES, %UAS, %EFS

Round Trip Delay

- **Resolution:** ± 1 bit time
- **Accuracy:** ± 2 bit times
- **Measurement Range (pattern dependent)**
 - 2^{15} : 0 to 21msec
 - 2^{20} : 0 to .68sec
 - **QRSS:** 0 to .68sec
 - 2^{23-1} : 0 to 5.4sec

Tone: Timeslot demultiplexed and level and frequency measured

AB(CD) Bits: Simultaneously display AB(CD) bits in all 24 channels for either receivers

Timeslot Data Displayed: 8 bit

3 Tone Slope (average value of tone in dBm, $\pm 1\%$ frequency acceptance bandwidth) for 404 Hz, 1004 Hz and 2804 Hz

PRM - total counts for: G1, G2, G3, G4, G5, G6, SE, FE, LV, SL and LB, Error Free Seconds and total CRC Events

DDS Measurements

- DDS Frame Sync
- Control code capture including code, description, data count, duration

SIGNALING (OPTION 010)

Signaling Types Supported

- E&M immediate
- E&M wink start
- Ground start
- Loop start
- Data
- Mixed
- Individual timeslots can be programmed as E&M immediate, E&M wink start, ground start, wink start

Operating Modes

- AB(CD) decode
- Call Monitor Logging
- Dial
- Program stored number

Modes

- Monitor both Central Office (CO) and Customer Interface (CI),
- Emulate CO,
- Emulate CI

Channel Selection: 1 to 24

Status Indicators for a Selected Channel

- **CO:** on hook, off hook, ringing
- **CI:** on hook, off hook, ringing

AB(CD) Decode

- Displays signaling state (on-hook, off-hook or ringing) and AB(CD) signaling bits for RX1 or RX2 depending upon signaling type and mode

Call Monitor Logging

- **Modes**
 - Selected channel
 - Scan and monitor until hang-up
 - Scan and monitor until time out (5, 10, 15, 30, 60 seconds)
- **Decodes:** DTMF, MF, or DP digits
- **Resolution:** 1 sec

Dial Mode

- **Channel Selection:** 1 to 24
 - **DTMF Dial Strings**
 - **Digits:** 0, 1, 2, ..., 8, 9, *, #, A, B, C, D, Pause, Go Off Hook, Go On Hook
 - **Digit and Interdigit Time:** 50ms typical
 - **MF Dial Strings**
 - **Digits:** 0, 1, 2, ..., 8, 9, KP, ST, ST1, ST2, ST3, Pause, Go Off Hook, Go On Hook
 - **Digit Time:** 70msec typical
 - **KP Time:** 100msec typical
 - **Interdigit Time:** 50msec typical
 - **DP Dial Strings**
 - **Digits:** 0, 1, 2, ..., 8, 9, Pause, Go Off Hook, Go On Hook
 - **% Break:** 50%
 - **Period:** 500ms
 - **Controls:** "Go On Hook Now", "Go Off Hook Now"
- Program Stored Number**
- Program up to 9 digit strings (SN1 - SN9) with MF, DTMF or DP digits or pause

PULSEMASK (OPTION 020)

- **Masks:** T1.102, T1.403, G.703, Pub 26411
- **Capture Data**
 - **Line:** 1 or 2
 - **Acquire:** Positive, negative, both
- **Mask tolerance:** 0%, 3%, 6%
- **Measurements (for both positive and negative):** pass/fail, amplitude (mV), rise time (ns), fall time (ns), width (ns), overshoot (%), undershoot (%), imbalance ratio

OTHER SPECIFICATIONS

AUTO SETUP

Synchronizes to the input signal line code, framing and pattern

- **Detailed:** tests all patterns, normal and inverted
- **Standard:** tests only “Standard” patterns (see T1 Transmitters - BERT patterns)

BERT Sequences

- **Bridgetap:** 1:1, 1:3, 1:5, 1:7, 2:8, 2:9, 2:10, 2:11, 2:12, 2:13, 2:14, 3:18, 3:19, 3:20, 3:21, 3:22, 3:23, 3:24, QRSS
- **Multipattern:** Ones, 1:8, 2:8, 3:24, QRSS
- **User 1-3:** any pattern can be used (see “T1 Transmitters” - “BERT patterns”)
- **Programmable Parameters**
 - **Line:** RX1/TX1 or RX2/TX2 (D&I: RX1/TX2 or RX2/TX1)
 - **Run Mode:** Once, Continuous
 - **Run Each Pattern For:** 5 to 300 seconds, 1 second steps
- **Sequence Controls:** hold pattern, advance pattern
- **Sequence Results**
 - **Per Pattern:** Status (“Running”, “In Sync”, “—”), total pattern errors, total BPV errors, total frame error, total CRC errors,
 - **Overall:** Number of loops, Number of failed loops, Current pass number

EVENT LOG STORAGE

- Captures 4096 events from RX1 and/or RX2 with date and time stamp
- **Alarms Stored:** LOS, AIS, Yellow, frame loss, pattern loss, density violations and CDI
- **Errors Stored:** Logic, BPV, frame errors and CRC
- **Events Stored:** Test started or stop, framing type change, pattern type change, line build out change, B8ZS change and Loopcodes detected
- Data stored with 1 second resolution

TEST PERIOD

Test Period Control

- Continuous,
- **Fixed:** 15min, 30min, 1hour, 3 hours, 6 hours, 12 hours, 1 day, 3 days, 7 days
- **User-Programmable Time Periods**
 - 1 minute resolution
 - up to 7 days

ASCII REPORTS

- **Types**
 - Dual Monitor
 - T1 Testing
 - Signaling
 - Event Log
 - BERT Sequences
- Can be generated during a test or at the end of a test
- 75 columns wide
- **User Programmable Fields:** operator ID, customer name, circuit ID, comments
- Reports can stored and printed

DATA AND FILE MANAGEMENT

- **Local:** Store last configuration, restore last configuration and reset default configuration
- **Remote**
 - Download program Flash-ROM updates

PRINTING

- Print ASCII report

REMOTE CONTROL

- SCPI Command Line Interface (option of N1610A Service Advisor Portable Test Tablet)
- Remote Graphical User Interface for PC

CONNECTORS

- L1 and L2
 - Dual Bantam
- Handset
 - RJ-11
- Ground Lug

MODULE LEDS

L1 and L2 (one set for each)

- Status (green)
 - Signal
 - Frame
 - Pattern Sync
- Alarm and Error (red)
 - Signal
 - Frame
 - Pattern Sync
 - Error

Other

- History (red)
- Ready (green)

GENERAL

Physical (WxHxD)

- **Single Test Module Format**
 - 3.5 x 8.5 x 1 inch
 - 89 mm x 215 mm x 25 mm (64 mm)
- Weight:** 1.5 lbs. (.6 kg)

Operating Temp: 0C to 40C (32F to 104F)

Storage Temp: -20C to 60C (-4F to 140F)

Power: 7W (provided by Service Advisor)

EMI: FCC Class

Mechanical: HP Handheld Class 2B

Ordering Information

N1660A Dual DS1/0 Test Module

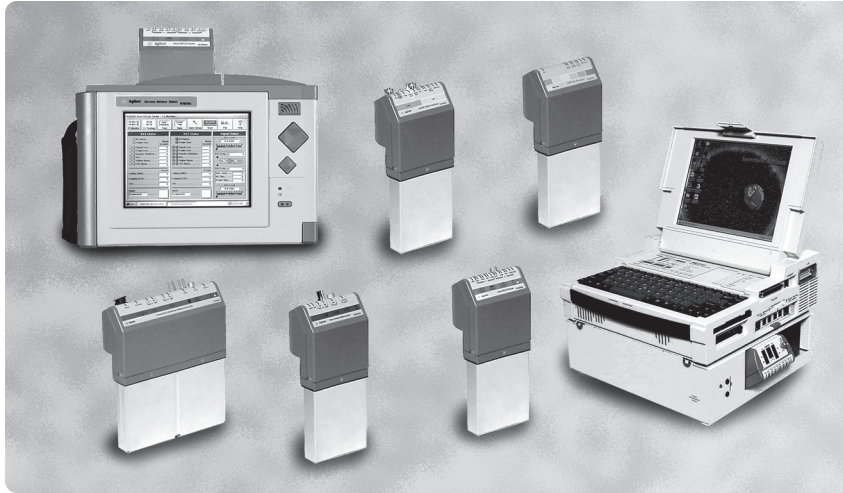
- opt 010: Signaling
- opt 020: Pulsemask Measurement

N1610A Service Advisor Portable Test Tablet

- opt 500: Remote Services

N1700A Service Advisor Undercradle

Related Products



All Agilent test modules, including the Dual DS1/0 Module, can be used interchangeably with both Agilent's Service Advisor portable test tablet and Internet Advisor PC platforms. Modules plug directly into the Service Advisor tablet or Agilent's Service Advisor Undercradle, which attaches to the Internet Advisor network analyzer.

N1610A Service Advisor Test Tablet

Agilent's Service Advisor Test Tablet is a lightweight, portable platform that supports a complete range of installation and maintenance testing requirements. The battery-powered tablet features a color touchscreen, and accepts all of the single and dual-slot application modules listed below.

N1700A Service Advisor Undercradle

The Service Advisor Undercradle attaches to Agilent's Internet Advisor network analyzer, allowing Internet Advisor users to share use of single and dual-slot plug-in testing modules. The undercradle allows field organizations to combine physical network and service deployment testing with the Internet Advisor's powerful, higher-layer protocol analysis capabilities.

N1640A ATM Cell Processor Test Module

Combined with the SONET/SDH Test Module, the ATM module provides complete SONET/SDH ATM BER, QoS and VPI/VCI testing capabilities at up to 155 Mbp/s line rates.

N1645A SONET/SDH Test Module

This line interface module provides connectivity and physical layer SONET and SDH testing for OC-1, OC-3c, STM-0 (optical) and STM-1 (optical) lines.

N1625A/N1626A xDSL TIMS Test Module

The double-slot TIMS Test Module supports a complete range of Transmission Impairment Measurements (TIMS) related to line qualification and troubleshooting for a wide range of services from POTS to ADSL.

N1629A TDR Test Module

Agilent's TDR module provides a wide range of easy-to-use, accurate tools for locating faults or measuring span length for any type of metallic cabling, including copper twisted-pair or coaxial wiring.

For more information about Agilent Technologies test and measurement products, applications, services, and for a current sales office listing, visit our web site: <http://www.agilent.com/find/tmdir>

You can also contact one of the following centers and ask for a test and measurement sales representative.

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Test and Measurement Call Center
P.O. Box 4026
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