

# 935AT Communications Test Set Specifications

## BER Tests



### DS-1 BERT

Framing	Patterns can be framed (D4 or ESF) or unframed
Test Patterns	Pseudo-random bit sequences (PRBS) of the following lengths can be sent and received. <ul style="list-style-type: none"> <li>• <math>2^9-1</math> (511)</li> <li>• <math>2^{11}-1</math> (2047)</li> <li>• <math>2^{15}-1</math> (32767)</li> <li>• <math>2^{20}-1</math></li> <li>• <math>2^{23}-1</math></li> <li>• QRSS ( 220-1 with 14 zero suppression)</li> </ul>
Stress Patterns	3 in 24 bits (100010001000000000000000) 1 : 7 bits (10000000) 1 : 1 bits (1010) All ones
Long Patterns	<ul style="list-style-type: none"> <li>• 54 octet</li> <li>• 55 octet Daly</li> <li>• 72 octet (min/max)</li> <li>• user pattern (1-256 bytes)</li> <li>• 55 octet</li> <li>• 120 octet</li> <li>• 96 octet (triptest)</li> </ul>
User-Defined Patterns	Any bit sequence length from 1-24 bits; pattern continuously repeats
Loopback Codes	Send and receive CSU loop codes: <ul style="list-style-type: none"> <li>• Loop-up=10000 continuous for 8 seconds</li> <li>• Loop-down=100 continuous</li> </ul> Other loop codes can be sent and received by editing the above patterns up to 8 bits.
Error Counters	All DS-1 errors (i.e., BPV errors, frame errors, CRC errors, Slips, etc.) are recorded for the entire DS-1.
Error Injection	bit errors, bipolar violation (BPV) errors, frame errors (D4 mode), or CRC errors (ESF mode)
Error Injection Method	<b>Single Errors; Programmable Error Burst</b> Rate: $0.8e^{-3}$ to $1.0e^{-7}$ Burst Length: .05 sec. to 15 sec. <b>Programmable Repeating Burst</b> Rate: $0.8e^{-3}$ to $1.0e^{-7}$ Burst Length: .05 sec. to 15 sec. On and Off Times: .05 sec. to 15 sec. (independ.)

Test Length Timed or continuous  
 Timed Test Length 15 minutes, 1 hour, or 24 hours  
 Measurements

**Measures and displays:**

- bit (logic) errors
- sync loss seconds
- frame errors
- CRC errors (ESF mode)
- errored seconds
- % severely errors sec.
- available seconds
- % unavailable seconds
- bit error rate
- BPV errors
- frame losses
- error-free seconds
- % errored seconds
- failed seconds
- % available seconds
- elapsed time
- bit slips
- BPV ratio
- frame slips
- % error-free seconds
- severely errors seconds
- % failed seconds
- unavailable seconds

**Displayed on printout only:**

- test length
- clock time and date

## DS-0 BERT

56-kBps Mode Selected when in Option 56; least significant bit of channel under test is always set to 1.

64-kBps Mode Selected when in Option 56; requires change to Clear Channel Signaling.

Test Patterns Pseudo-random bit sequences (PRBS) of the following lengths may be sent and received:

- $2^9-1$  (511)
- $2^{11}-1$  (2047)

Stress Patterns 1 : 7 bits (10000000)

User-Defined Patterns Any bit sequence length from 1 to 8 bits; pattern continuously repeats

Loopback Codes Send and Receive CSU/DSU/OCU/NIE loop codes in DDS 56 kBps mode. LSB of selected channel byte is always set to 0. Cannot be used with switched 56 kBps channels using robbed bit signaling.

Error Counters Bit errors and bit error rates are calculated on the received DS-0 channel selected. CCITT G.821 Error statistics are based on the bit errors of the selected DS-0 channel received.

Error Injection Single bit errors

Measurements

**Measures and displays:**

- bit (logic) errors
- sync loss seconds
- errored seconds
- % severely errors sec.
- available seconds
- % unavailable seconds
- bit error rate
- error-free seconds
- % errored seconds
- failed seconds
- % available seconds
- elapsed time
- % error-free seconds
- severely errors seconds
- % failed seconds
- unavailable seconds

---

## Fractional T1 Contiguous

- N x 56 or N x 64 kbps
- any combination of channels (1-24) sequential or non-sequential (only restriction is increasing order)
- V.54 FT1 CSU loopback codes
- terminate/monitor/drop and insert operation
- inject single bit errors

### Patterns

- $2^9-1$  (511)
- $2^{15}-1$  (32767)
- $2^{23}-1$
- $2^{11}-1$  (2047)
- $2^{20}-1$
- user (2-8 bit)

### Measurements

#### Measures and displays:

- bit (logic) errors
- sync loss seconds
- frame errors
- CRC errors (ESF mode)
- error-free seconds
- % severely errors sec.
- available seconds
- % unavailable seconds
- bit error rate
- BPV errors
- frame losses
- errored seconds
- % error-free seconds
- failed seconds
- % available seconds
- elapsed time
- bit slips
- BPV rate
- frame slips
- % errored seconds
- severely errors seconds
- % failed seconds
- unavailable seconds

#### Displayed on printout only:

- test length
- clock time and date

---

## Fractional T1 Non-Contiguous

- N x 56 or N x 64 kbps
- Sage Instruments' Fractional T1 option does true non-contiguous testing; each DS-0 can have different delays from the others.
- display of per-DS-0 sync and error status—users do not have to go through each DS-0 individually to determine which is failed.
- any combination of channels (1-24)
- terminate/monitor/drop and insert operation
- inject single bit errors

### Patterns

- $2^9-1$  (511)
- $2^{15}-1$  (32767)
- $2^{11}-1$  (2047)
- user (2-8 bit)

### Measurements

#### Measures and displays:

- bit (logic) errors
- sync loss seconds
- frame errors
- CRC errors (ESF mode)
- error-free seconds
- % severely errors sec.
- available seconds
- % unavailable seconds
- bit error rate
- BPV errors
- frame losses
- errored seconds
- % error-free seconds
- failed seconds
- % available seconds
- elapsed time
- bit slips
- BPV rate
- frame slips
- % errored seconds
- severely errors seconds
- % failed seconds
- unavailable seconds

#### Displayed on printout only:

- test length
- clock time and date

# DDS

- T1 Access to DDS/Switched 56/64-kb circuits
- DS-0A and DS-0B formats (all substrates) +19.2 kbps
- standard network control and loopback codes (alternating and latching loopbacks)
- terminate/monitor/drop and insert operation
- primary and secondary channel (simultaneous) testing (secondary channel synchronous formats only)

## Primary Test Patterns

- $2^9-1$  (511)
- $2^{11}-1$  (2047)
- $2^{15}-1$  (32767)
- $2^{20}-1$
- $2^{23}-1$
- user (2–8 bit)
- stress patterns 1/2/3/4/5

## Secondary Test Patterns

- $2^6-1$  (63)
- $2^9-1$  (511)
- $2^{11}-1$  (2047)

## Error/Alarm Display Additions

- DS-0A sync loss
- Pri/Sec channel bit errors
- DS-0B frame loss/frame bit error
- DS-0A block error
- received network code

## Network Codes

- CMI
- Test
- OOS
- UMC
- ASC
- LAT-LDN
- MJU-SEL
- MJU-RES
- MJU-BLK
- MJU-UNB
- MJU-REL
- MJU-LBK
- MJU-LDN

## Primary Error Injection

- single bit
- 6 bit
- 2:5 and 3:5 inverted bytes (DS-0A substrate)
- DS-0B substrate framing bit
- Selectable DS-0A block error correction

## Secondary Error Injection

- single bit
- DS-0B substrate framing bit

## Loopback Codes

### Alternating Codes

- DSU-ALB
- CSU-ALB
- 56Kb-RPT
- OCU-ALB
- OCU/HL96
- HL96-ALB

### Latching Codes

- DS0DP
- HL222-LLB
- OCU-LLB
- CSU-LLB
- NIE-LLB

## Measurements

### Measures and displays:

- bit (logic) errors
- error-free seconds
- % errored seconds
- failed seconds
- % available seconds
- elapsed time
- DS0B frame errors (DS0B only)
- bit error rate
- % error-free seconds
- severely errors seconds
- % failed seconds
- unavailable seconds
- DS0A block errors (substrate DS0A only)
- sync loss seconds
- errored seconds
- % severely errors sec.
- available seconds
- % unavailable seconds