



950RTS Remote Test System



Specifications

DS-1 PCM Interface

Format	DS-1 AMI or B8ZS Line Code
Framing Format	D4 Superframe, Extended Superframe or SLC-96®
Input Frequency	1.544 Mbit/s $\pm$ 150 bit/s
Compatibility	D1D, D2, D3/D4, SLC-96®
Input Impedance	Terminated: 100 Ohms
Input Level	200 mv to 6 V base-to-peak
Jitter Tolerance	Exceeds Bell Publication 43802 requirements
Output Level	3 V $\pm$ 0.2 V base-to-peak
Output Imbalance	Positive and negative pulses are within 0.2 V base-to-peak
Frame Loss Criteria	Loss of frame occurs when 2 out of 4 frame bits are in error for Superframe & SLC-96®. Loss of frame for ESF occurs when 2 out of 4 FPS bits are in error.
Alarm Displays	Detects and displays Frame Loss, Carrier Loss, Excess 0s, Yellow Alarm and Blue Alarm

E1 PCM Interface

Format	HDB3, AMI
Framing	2.048 Mbit/s per ITU-T G.703, G.704, G.706, G.711, G.732 AND G.736
	PCM 30: 30 Channels with CAS in Timeslot 16
	PCM 31: 31 Channels without CAS
	PCM 30C: 30 Channels with CAS in Timeslot 16 and CRC4
	PCM 31C: 31 Channels without CAS and with CRC4
Transmitter	Clock Sources: Internal/External or Recovered from Received Signal
	Internal Frequencies: 2.048 Mbit/s, $\pm$ 5 ppm
	Output Signal: Compliant with G.703, Standard A-LAW (G.711)
Receiver	Input Sensitivity: 200 mv to 6 V base-to-peak at 2.048 Mbit/s (balanced and unbalanced)
Impedance	Balanced: Monitor and Terminate 120 Ohms (Bridged: >1,000 Ohms)
Bit Rate	Channel Access: 2 Mbit/s, 64 Kbit/s and N X 64 Kbit/s
Alarm Displays	No Signal (Loss of Signal Indication), AIS (Alarm Indication Signal), No FAS (No Frame Alignment Sequence, Near), Alarms (Remote FAS and Remote MFAS), MFAS (Multiframe Alignment Sequence, Near), HDB3 Coding, CRC4 (Present), History (Previous Indication)

DS-1 Measurements

G.821	M.2100
Bit Errors	% Severely Errored Seconds
Bit Error Rate	Failed Seconds
No Sync	% Failed Seconds
Error Free Seconds	Available Seconds
% Error Free Seconds	% Available Seconds
Errored Seconds	Unavailable Seconds
% Errored Seconds	% Unavailable Seconds
Severely Errored Seconds	Elapsed Test Time

DS-1 BERT

Test Patterns	2 ⁹ -1 (511) 2 ¹¹ -1 (2047) 2 ¹⁵ -1 2 ²⁰ -1 QRSS (2 ²⁰ -1 with zero suppression) 2 ²³ -1
Stress Patterns	3 in 24 (100010001000000000000000) 1:7 (100000000) 1:1 (1010) All 1s 55 OCTETS Short User (3 - 32 bits) Long User (1 - 2048 OCTETS)
Loopback	CSU Up/Down
Error Injection	Single Logic BPVs
Frame (D4 Mode)	CRC (ESF Mode)
Test Length	Timed (15 minutes, 1 hour, 24 hours)

DDS

T1 Access to DDS/Switched 56/64 Kbit/s circuits

DS-0A formats (all subrates) + 19.2 Kbit/s

Standard network control and loopback codes
(alternating and latching loopbacks)

Primary and secondary channel (simultaneous)
testing (secondary channel synchronous formats only)

Primary Channel Test Patterns:

2²⁰ -1
2²³ -1
32767 (2¹⁵ - 1)
2047
511
Short User (1 - 8 bits)
Stress patterns 1/2/3/4/5

Secondary Channel Test Patterns:

63
511
2047

Error injection:

Primary and secondary channel
Single bit
Burst fixed rate
6 bit
2:5 and 3:5 inverted bytes (DS-0A subrate)
DS-0B subrate framing bit

Error/alarm display additions:

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

DS-0A block error correction

**Fractional T1 or
E1 Contiguous**

N X 56 or N X 64 Kbit

Any combination of channels (1-31) sequential or
nonsequential (only restriction is increasing order)

V.54 CSU loopback codes

Patterns:

511
2047
32767 (2¹⁵ - 1)
2²⁰ - 1
2²³ - 1
Short User (1 - 32 bits)
Long User (1 - 2048 Octets)

Fractional T1 Non-contiguous

N x 56 or N x 64 Kbit

Sage Instruments' Fractional T1 option does *true* Non-contiguous testing - each DS-0 can have different delays from the others.

Display of DS-0 sync and error status - the user does not have to go through each DS-0 individually to determine which has failed.

Patterns:
511

2047

32767 ($2^{15} - 1$)

Short User (1 - 32 bits)

Long User (1 - 2048 Octets)

Any combination of channels (1-24)

Supervision and Signaling - T1

Supervision

DP, MF and DTMF Sender
Frequency Accuracy
Adjustment Range

$\pm 0.1\%$ of Bell standard frequencies

Tone frequencies adjustable in 0.1% steps to $\pm 10\%$ of

Bell standard frequencies for margin testing

Automatically adjusted to -7 dBm0 per tone

Tone level adjustable in 0.1 dB steps from -40.0 dBm to 0.0 dBm

0.1 dB

± 0.2 dB

Level
Level Adjustment Range
Resolution
Accuracy
Timing

MF: 70 ms Tone On and Tone Off (KP is 100 ms Tone On)

DTMF: 50 ms Tone On and Tone Off

Timing Adjustment Range

Tone On and Tone Off times adjustable in 1 ms steps from

13 ms to 267 ms (KP adjustable from 45 to 300 ms)

Resolution
Accuracy

1 ms

± 1.0 ms

Supervision and Signaling - E1

MFCR2/R1, DTMF Senders

DTMF/MFCR1/R2
Adjustment Range

$\pm 0.1\%$ of ITU-T Standard Frequencies

Tone Frequencies adjustable in 0.1% steps to $\pm 10\%$ of Standard

Frequencies for Margining Tests

-7 dBm0 per tone in R1 and DTMF/-8 dBm0 in MFCR2

Tone level adjustable in 0.1 dB steps from -60 dBm to +6.0 dBm

0.1 dB

± 0.2 dB

Level
Level Adjustment Range
Resolution
Accuracy
Timing

DTMF: 50 ms Tone On and Tone Off

R1: 70 ms Tone On and Tone Off (KP is 100 ms Tone on)

MFCR2: Compelled

Conditions: Idle, Seized, Seized Acknowledgment,
Answered, Clear-Back, Clear-Forward,
Blocked, Release and Release Guard

Timing Adjustment

Tone On and Tone Off times adjustable in 1 ms steps from

13 ms to 267 ms (KP adjustable from 45 to 300 ms)

Resolution

1 ms

Accuracy

± 1.0 ms

Dial Pulse Sender

PPS

Range

2 to 50 PPS (PCM Interface); 2 to 35 PPS (Metallic Interface)

Resolution

0.1 PPS

Accuracy

$\pm 1.0\%$ at 10.0 PPS

% Break

Range

5 to 95% (PCM Interface); 25 to 80% (Metallic Interface)

Resolution

0.1%

Accuracy

$\pm 1.0\%$ for 25% to 75% break at 10 PPS

Interdigit Timing

Range

40 to 990 ms

Resolution

10 ms

Accuracy

± 5.0 ms

Channel Associated

Signalling

Analysis

A,B,C,D Signalling

Display A,B,C,D Bits

Control A,B,C,D Bits

Level/Frequency/ Noise

PCM Channel Encoder

Analog Tone Generation
Tone Level
Frequency Response
Basic Accuracy

20 Hz to 3904 Hz selectable in 1.0 Hz steps
+3.0 dBm to -50.0 dBm in 0.1 dB steps
0.1 dB (20 Hz to 3904 Hz)
Accuracy Level
0.1 dB +3.0 dBm0 to -30 dBm0
0.2 dB -30 dBm0 to -40 dBm0
0.5 dB -40 dBm0 to -50 dBm0

PCM Channel Decoder

Recovered Analog Tones
Recovered Level
Basic Accuracy

20 Hz to 3904 Hz
+3.0 dBm to -40.0 dBm (Average and rms)
0.1 dB with Digital Milliwatt
Accuracy Level
0.1 dB +3.0 dBm0 to -30 dBm0
0.2 dB -30 dBm0 to -40 dBm0
0.5 dB -40 dBm0 to -50 dBm0
0.1 dB @ 204 Hz to 3904 Hz with 0 dBm applied.
On-hook and Off-hook supervision.

Frequency Response
Supervision
Signal-to-Total Distortion

Input 7 5/6 Signaling CCIS
0 to -30 dBm0 38 dB 40 dB
-30 to -40 dBm0 36 dB 36 dB
-40 to -50 dBm0 32 dB 32 dB

Gain Tracking Error

Input Maximum Deviation
+3.0 to -30 dBm0 0.1 dB
-30 to -40 dBm0 0.2 dB
-40 to -50 dBm0 0.5 dB

Intrinsic Noise

10 dBmC (with Idle Code received)

Return Loss Measurement

General

Modes
Transmitted Signal

ERL, SRL-Low, SRL-High, or Sinewave (OSC)
Meets the specifications of Bell Publication 41009
(Tables D, E, and F, page 13) and IEEE Standard P743-1995

4-Wire Return Loss

Transhybrid Loss Compensation - 30 dB to +30 dB
Transmitter Level - 10 dBm0 relative to TLP
Receiver Range - 10 dB to +50 dB
Resolution 1.0 dB
Accuracy ± 0.5 dB

General

AC Power Supply 115/230 VAC $\pm 10\%$, 50/60 Hz
DC Power Supply (optional) 40 - 56 VDC
Operating Temperature 0° C to 50° C
Storage Temperature - 40° C to +70° C
Dimensions 28" H x 17.25" W x 12" D
Weight 75 lbs. depending upon options

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