935AT Communications Test Set Specifications

Level/Frequency/Noise

Transmitter

Frequency Range	50 Hz to 5 kHz
Resolution	1 Hz
Accuracy	±1.0 Hz
Output Steps	1, 10, 100, or 1000 Hz steps
Level Range	-60 dBm to +12 dBm
Resolution	0.1 dB
Accuracy	±0.1 dB at 1020 Hz (0 to -19 dBm)
Flatness	±0.2 dB (200 Hz to 5 kHz referenced to level at 1 kHz)
Distortion	-70 dB at 1020 Hz, 0 dBm

Receiver

Frequency Range	50 Hz to 5 kHz
Resolution	1 Hz
Accuracy	±1.0 Hz
Level Range	-40 dBm to +12 dBm
Resolution	0.1 dB
Accuracy	±0.1 dB at 1020 Hz (0 to -19 dBm), ±0.2 dB at 200 Hz to 5 kHz

Noise Measurement

Input	Balanced or noise-to-ground
Weighting Filters	C-Msg, C-Notch, 3 kHz Flat
Notch Filter	1010 Hz (995–1025 Hz Notch); >50 dB Notch depth
Range	10–100 dBrn (balanced); 50–130 dBrn (noise-to-ground)
Resolution	1.0 dB
Accuracy	±0.5 dB

Signal-to-Noise Measurement

Level Range	-40 dBm to +10 dBm
Signal-to-Noise Range	10–50 dB
Accuracy	±0.5 dB

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Return Loss Measurement

General

Modes	ERL, SRL-low, SRL-high, or sine wave (OSC)
Transmitted Signal	Meets the specifications of IEEEStandard 743-1995

Echo Canceller Disable Tone

Frequency	2100 Hz ±1 Hz
Phase Reversals	450 ms ±5ms; 180° ±5°
Level	-12 dBm0 ±1 dB

2-Wire Return Loss

Transmitter Level	-10 dBm0
Receiver Range	0–40 dB
Resolution	1.0 dB
Accuracy	±0.5 dB
Internal Hybrid Impedance	600 or 900 Ohms ±0.1% in series with 2.16 µF ±1%

4-Wire Return Loss

Impedance	135, 600, 900, or 1200 Ohms
Transhybrid Loss Compensation	-30 dB to +30 dB
Transmitter Level	-10 dBm0 (relative to TLP in OSC mode)
Receiver Range	-10 dB to +50 dB
Resolution	1.0 dB
Accuracy	±0.5 dB

Supervision and Signaling

Wink Timing

Resolution	5 ms
Accuracy	±5 ms
Wink Fail Event	Fails for wink period >600 ms
Off-Hook Fail Event	Fails for off-hook period <600 ms

E/M Supervision

Types	I, II, III, IV, V
Battery	-48 V DC current limited to 200 mA
Threshold Voltages (defaults)	

	E Lead	M Lead
on-hook	< -39 V	> -11 V
off-hook	> -11 V	< -39 V

Loop Supervision

Types	2- and 4-wire loop start, ground start, loop reverse battery, and SX supervision
Battery	-48 V DC series limited to 120 mA

MF and DTMF Sender

Frequency Accuracy	±0.1% of ITU-T standard frequencies
Adjustment Range	Tone frequencies adjustable in 0.1% steps to ±10% of standard frequencies for margining tests
Level	-7 dBm0 per tone (default)

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Level Adjustment Range	Tone level adjustable in 0.1 dB steps from –40.0 dBm to +6.0 dBm
Resolution	0.1 dB
Accuracy	±0.2 dB
Default 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 13–267 ms (KP adjustable from 45–300 ms)
Resolution	1 ms
Accuracy	±1.0 ms

Dial Pulse Sender

PPS

Range	2–35 PPS
Resolution	0.1 PPS
Accuracy	±1.0% at 10.0 PPS

% Break

Range	25–80%
Resolution	0.1%
Accuracy	±1.0% for 25–75% BRK at 10 PPS

Interdigit Timing

Range	100–990 ms
Resolution	10 ms
Accuracy	±5.0 ms

MF/DTMF/DP Receiver and Analyzer

MF and DTMF

Input Level Range	-25 dBm0 to 0 dBm0
Accuracy	±0.2 dB
Resolution	0.1 dB
Input Frequency Range	±10% of ITU-T standard frequencies for MF and DTMF tones
Accuracy	±0.1%
Resolution	1 Hz
Input Tone on/off Range	35–250 ms Tone on; 35–250 ms Tone off
Accuracy	±5 ms
Resolution	1 ms

Dial Pulse (DP)

PPS Range	5–30 PPS
Accuracy	±2% at 10 PPS
Resolution	0.1 PPS
% Break	25–80%
Accuracy	±2% (25–75% break at 10 PPS)
Resolution	1%

Interdigit Timing Range	200–990 ms
Accuracy	±5 ms
Resolution	1 ms

DS-1 PCM Channel Access

Format	DS-1 AMI or B8ZS Line Code
Input Frequency	1.544 Mbps ±300 bps
Jitter Tolerance	Exceeds Bell Publication 43802 Requirements
Sequence	D1D, D2, D3/D4
Signaling Modes	Robbed bit and clear channel
Framing Format	D4 Superframe, Extended Superframe, or SLC-96®*
Selection	Automatic or manual selection of frame format—D4/SF or ESF
Input Mode	Terminated: 100 Ohms nominal Bridging: >1000 Ohms
Input Level	200 mV to 6 V base to peak
Input Level Measurement	200 mV to 6 V or -23 dBdsx to +3 dBdsx
DS-1 Output	1.544 Mbps (Stratum 4) in INTERNAL clock mode ±5 ppm; Equal to input rate in LOOP-TIMED mode
Output Pulse Level	3.0 V ±0.3 V base to peak
Output Imbalance	Positive and negative pulses are within 0.1 V base to peak
Channel Selection	Any one of 24 selectable from keypad
PCM Supervision Displays	40-character vacuum fluorescent display shows A & B bit signaling states for all 24 channels (Option Menu # 20) simultaneously. In ESF Mode A, B, C, and D bits are displayed. Four LEDs show on- and off-hook supervision status of selected time slot.
Operating Modes	TERMINATE: selected channel connected to channel generator and receiver; other 23 channels send IDLE code (7F) MONITOR: monitor selected channel in dual direction; all 24 channels passed through unchanged; framing regenerated DROP & INSERT: dual-direction only; selected channel dropped out for testing; other 23 channels passed through unchanged
Pattern Simulation	Idle code (7F), Received PCM. Optional patterns require Purchase Option 933AT-200, BERT Test Package.
Frame Loss Criteria	Superframe and SLC-96®: loss of frame occurs when two out of five Ft frame bits are in error. ESF: loss of frame occurs when two out of five FPS bits are in error.
Error Displays	Detects and counts frame errors, bipolar violations, frame slips, and CRC errors (ESF only)
Alarms	Sends Blue alarm (all ones) or Yellow alarm (ALL bit #2=0) on Superframe and sent on Facility Data Link for ESF.

* SLC-96 is a registered trademark of AT&T.

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Alarm Displays	Detects and displays frame loss, carrier loss, excess 0s, Yellow alarm, and Blue alarm.

PCM Channel Encoder

Analog Tone Generation	20–3904 Hz selectable in 1.0 Hz steps from keypad
Basic Accuracy	±0.1 dBm @ 1020 Hz
Frequency Response	±0.2 dB
Supervision	NORMAL (E&M), USER DEFINED states of A and B bits (C and D bits in ESF), FXO/FXS, SLC-96
Signaling	MF, DTMF, and DP

PCM Channel Decoder

Basic Accuracy	±0.1 dBm @ 1020 Hz
Frequency Response	20–3904 Hz ±0.2 dB
Intrinsic Noise	10 dBrnC (with Idle Code received)

SLC-96

- Central office terminal (COT) and remote terminal (RT) testing—can originate an SLC-96 signal that emulates the COT or the RT.
- Send and receive SLC-96 signaling bits—perform drop and insert testing, monitoring A and B signaling states, and transmitting A and B signaling states.

Signaling Types

Supported signaling types include Single Party, Coin, Universal Voice Grade, and Direct Inward Dial.

	From the RT	From the COT
Single Party	On-hook	Channel test
	Off-hook	Idle
	Unequipped	Forward disconnect
		-R ringing
Coin	On-hook	Negative loop mode
	Off-hook	Channel test
	Unequipped	Positive loop mode
	Coin ground	Ground start
		-R ringing
		Positive coin check
		Negative coin check
		Positive coin control
		Negative coin control
Universal Voice Grade	On-hook	Ground start
	Off-hook	Channel test
	Unequipped	-R ringing
	Ring ground	Idle
Direct	Normal battery	Loop open
	Reverse battery	Loop closure

General

Impedances	135, 600, 900, 1200 Ohms and >50 kOhms bridging
Maximum DC Blocking	160 V DC
Audio Bandwidth	±3.0 dB 300 Hz to 3.0 kHz
Audio Volume	Adjustable by front panel control
Longitudinal Balance	90 dB at 60 Hz
Receiver Return Loss	>30 dB 200 Hz to 5 kHz (600, 900, 1200 Ohms) >30 dB 800 Hz to 5 kHz (150 Ohms)
Display	40-character vacuum fluorescent plus four LEDs for on- and off-hook status
AC Power Supply	115 V AC ±10%, 60 Hz
Operating Temperature	0° C to 50° C
Storage Temperature	-40° C to +70° C
Dimensions	5.79” H x 14.33” W x 14.25” D
Weight	16 lbs. to 18 lbs. depending upon options

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