

Model 404
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Multi-Purpose Universal HDSL Tester

HDSL (292kHz.) -HDSL (196kHz.)
ISDN BRI (U-Interface) - SDSL (384 kHz.)



A Hand-Held Combination Tester for the Telecom Field Technician

A powerful tool for testing:

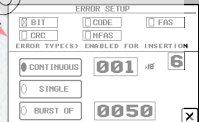
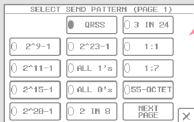
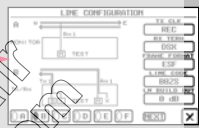
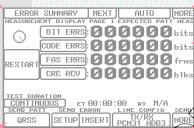
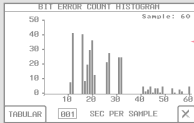
- T1/Fractional T1 Digital Circuits
- Wideband Analog Transmission Impairment
- DataCom both Synchronous and Asynchronous

ST, ISO, IEC, ANSI, NCSL, MIL-STD by www.raeservices.com

DIGITAL

A Full Function 1.544MBPS T1 and FT1 Tester

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The Models 404 are Hand-Held Multipurpose Telecom Field Testers that Display a Touch Screen Graphical User Interface for extreme ease of use.

Digital Tester

The digital test functionality of the Model 404 allows a wide range of testing on framed or unframed 1.544Mbps T1 circuits. Two TX/RX ports are provided in order to allow bidirectional drop and insert testing. The unit can terminate the line (simultaneous pattern generation and pattern measurement) or monitor the line for BERT patterns, ASL/D bit status, and SLC@ 96 alarm maintenance and message decoding. The Model 404 is compatible with unframed PCM as well as D4 and ESF framing with AES or A1M encoding.

Enhanced Digital (optional)

With the Enhanced Digital option, a T1 telephone is added with dial, talk & listen capability on any user selected T1 voice channel. The Enhanced Digital option provides VF testing of any user selected channel including voiceband level, frequency, noise and return loss. Real-time error counters are augmented by histograms so that the distribution of errors during a test can be studied.

The Enhanced Digital option augments the standard patterns with 5 user programmed long patterns which can be as short as 1 byte or as long as 128 bytes.

The Enhanced Digital option provides a graphical display of pulse shape with the G.703 or a user set table Mask.

Physical Layer Testing

The Model 404 measures the actual T1 frequency and level to verify basic signaling integrity.

Error Display

Real time error counters of framing, code, logical and CRC errors are kept for the duration of the test. Individual error type displays can be accessed each showing errored seconds, error free seconds, degraded minutes and other pertinent G.821 data.

Datacom (optional)

Extensive pattern generation and detection with G.821 bit error rate reporting are provided. V.35 RS232, RS449 and EIA530 interfaces are provided in the Model 404. Errors can be injected into the data one bit at time or in bursts. The Model 404-400 also reports the presence of both Transit and Receive clocks to make troubleshooting fast and easy.

AutoTesting with AM440

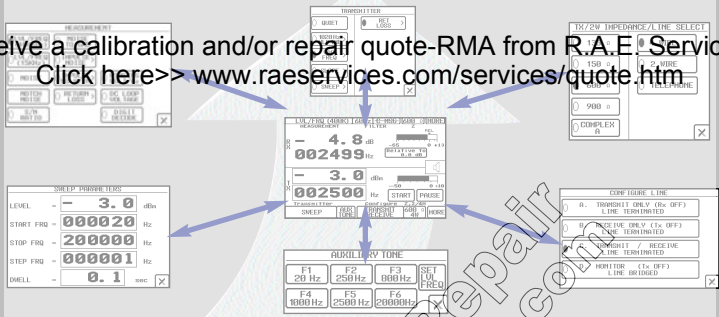
Model 404 test analog measurements automatically with AM440 Remote Test Partner placed at the other end of the wire. LVL/FREQ/NOISE are examples of auto tests performed with the Model 404 and the AM440.

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ANALOG

A Full Functional Analog Transmission Impairment Tester

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Analog Testing

In analog mode the unit provides a wide variety of industry standard measurements to accomplish transmission impairment testing on 2 or 4-Wire dedicated or dial-up analog circuits.

Wideband

The 400kHz bandwidth of the instrument makes it ideal for qualifying metallic digital circuits which use an analog carrier such as ISDN BRI (100 interface) and 4-Wire HDSL circuits.

Full Duplex Operation

The internal measurement functionality and signal generator functionality may be used separately at each end of a transmission line or simultaneously as would be the case when doing a loopback test from one end of the line.

The display provides both a digital and analog readout of the measurement, or the results may be printed on the optional printer.

DIGITAL SPECIFICATIONS

ERROR MEASUREMENTS

Transmitter
 Bit Patterns: 2ⁿ-1, 2ⁿ-1, 2ⁿ-1, 2ⁿ-1, ORSS, 2ⁿ-1, All 1s, All 0s, 2 in 8, 3 in 24, 1, 1, 1, 7, 55 Octet, User 1, User 2, User 3 (24 Bit)
 Error Types: Type: BIT, BPV and Frame Errors in Any Combination
 Mode: Single, Burst (up to 999) or Continuous from 1X10³ to 999X10⁶

Error Analyzer
 Measurement Display: Alarms, PCM Signal, ABCD Bit Status and SLC* 96 Messages, Framing Errors, Bi-Polar Violation Errors, Bit Errors and CRC Errors
 Bit Pattern: Receiver: Manually Select Any Transmitted Pattern or Auto Detect

Display Error Measurement:

Measurement	Framing	Bit-Polar	Logic	CRC	Type
# Errors	X	X	X	X	BIT
# Errors Seconds*	X	X	X	X	SEC
Bit Error Rate	X	X	X	X	ERR
Average BER	X	X	X	X	ERR
# Invalidly Framed Seconds*	X	X	X	X	SEC
# Available Seconds	X	X	X	X	SEC
# Unavailable Seconds	X	X	X	X	SEC
# Invalid Lines Received	X	X	X	X	SEC
Strip Signal	-	-	-	-	ERR
# Out of Frame	-	-	-	-	ERR
# Change Out of Framing/Genet	-	-	-	-	ERR

Frame Slip Measure
 Range: -99999 to +99999
 Resolution: One Frame Slip

Bit Slip Measure
 Range: ±193 bits
 Error Criteria
 Pattern Sync Loss: XXXX in 4000 Bits, XXX Operator Selectable From 001 to 255
 Frame Sync Loss: Two out of Four, Two out of Five, Two out of Six, Operator Selectable
 CRC Algorithm: CRC6
 Low Density: Average: One's Density Falls Below 12.5% or More Than 15 Consecutive Zeros are Received
 Yellow Alarm
 SF Mode: Bit Two of Every Channel is Low
 ESF Mode: Eight Ones Followed by Eight Zeros
 Fixed Patterns: 100 Consecutive Error Free Bits
 Pseudorandom Patterns: 100-n Consecutive Error Free Bits
 Average Interval: Ten Second Error Averaging Interval
T1 PHYSICAL LINE MEASURE
 Simplex Current:
 Range: 10 to 200 mA
 Resolution: 1 mA
 Accuracy: ±5%

Level Measure:
 Range: -20dBx to +40dBx
 Resolution: 0.5dB from -20dBx to -10dBx
 Resolution: 1dB from -10dBx to +38dB
 Resolution: 2dB from -20 to -40dBx
 Frequency Measure:
 Range: 1.5 to 1.6MHz
 Resolution: 1Hz
 Accuracy: ±100PPM

T1 CSU EMULATE or CONTROL
 In-Band: CSU, Network Facility 1, Network Facility 2, User Defined 1
 Out-Band: CSU Line, CSU Payload, Network, User Defined 1
SLC*96 MONITOR
 Receiver
 Fields Displayed: Alarm 13 Frame/16 Frame (16 Bits), Protection (4 Bits), Maintenance (4 Bits)
 Messages Decoded:
 RT to LDS: Activity, Activity UPD, Looping Test, Assign UPD, Ring, Idle, No Alarm
 LDS to RT: Trunk Assign, Trunk Design, Assign UPD, Disassign UPD, Looping Test, Activity UPD, Ring, Idle
SIGNALING BIT MONITOR or CONTROL
 Monitor: Simultaneous Display of ABCD Signaling Bit Status for All 24 Channels
 Control: Set AB (SF) or ABCD (ESF) bits for any channel(s)
GENERAL
 Idle Channel Control: Set idle channel bit pattern in Drop and Insert or Tx/Rx modes.
 Modes: Bridge Monitor, Repeat Monitor, Tx/Rx, Drop and Insert, East, Drop and Insert West, CSU Emulate Tx Clock: Internal, Derived From PCM, Derived From PCM

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*X = Numeric Results Readout plus Optional (Option No. 25-0250) Additional Tabular or Graphical Histogram
 Test Timer: Continuous or Timed - Timer Programmable From 00 Hour, 00 Min, 00 Sec to 99 Hour, 59 Min, 59 Sec.

DIGITAL SPECIFICATIONS (continued)

Input Impedance: Bridge: 1000 ohm or Greater
Term: 100 ohm ±5% bal.
DSX-Mx: 100 ohm ±5% - assumes 2 x 430 ohm Source

Input Sensitivity: ±3dBFS to -35dBx

Store and Recall: 40 Line Configuration Stores
40 Test Configuration Stores
40 Setup Configuration Stores
40 Preset Configuration Stores

Print: Print
Print: Sync
Print: Hold
Print: Frame
Framing: SF, ESF, SLC*96
Code: B825, AMI

Enhanced Digital Technical Specifications (Option No. 25-0250)

Additional Bit Patterns:
1 - 128 Octet User Defined Patterns (5)

Histogram Display

Tabular and Graphical Histograms of:

- Errors
- Errored Seconds
- Severely Errored Seconds
- Unavailable Seconds
- Phys: Loss Seconds

Frame Slices

T1 Physical Line Measure

Pulse Shape Measure:
Measurements: Graphical Display, Pulse Width, Rise Time, Fall Time, Overshoot, Undershoot

Range: ±1 to ±3dBx

Masks: DSX, NI, User

Single Channel Monitor

Monitor: Any Voice Channel

Decode: DTMF, MF, Pulse

Signaling States: Onhook, Offhook

Modes: FXS Loop Start, E&M, SW56, User Channel Select, Direct Enter, Scroll

T1 Telephone Phone

Signaling States: Onhook, Offhook, Wink, Flash

Modes: FXS Loop Start, E&M, SW56, User Channel Select, Direct Enter, Scroll

Push to Talk

Channel Select: Direct Enter, Scroll

Analog Measurements

Send: Signal: Quiet, 1020Hz, Variable

Frequency:
Slope: Sweep, Return Loss Noise Level
Level: Range: ±3dBm to -40dBm
Resolution: ±0.1dB
Accuracy: ±0.2dB

Frequency:
Range: 200 to 3500Hz
Resolution: ±1Hz
Accuracy: ±1Hz

Receive:

Level:
Range: +3 to -40dBm
Resolution: ±0.1dB
Accuracy: ±0.2dB

Frequency:
Range: 200 with 3500Hz
Resolution: ±1Hz
Accuracy: ±1Hz

CMtg:
Range: +3 to -40dB
Resolution: ±1dB
Accuracy: ±1dB

Return Loss:
ERL: SRL (Lo), SRL (Hi)
Range: 0 to 40dB
Resolution: ±0.1dB
Accuracy: ±0.3dB

DATACOM SPECIFICATIONS

INTERFACES

V28R322
EIAS:30EIA530A
V.35
V.36/RS449

Includes Datalcom Software, Emulates DCE, DTE
Maximum Data Speed: 600, 1200, 2400, 4800
bps

Over block: BFD, Error, call, speed or burst

ANALOG SPECIFICATIONS

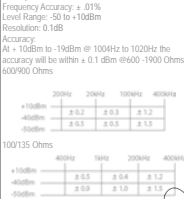
LEVEL FREQUENCY

Transmitter
Var Mode: 20Hz to 400kHz in Steps or Direct Numeric Entry
1020Hz Mode: 1020Hz Fixed
Slope Mode: 40A, 1020, 2800Hz
Slope Dwell: 0.1 to 999.9 sec.

Sweep Mode: Start Freq: 20Hz to 400kHz

Slope Freq: 20Hz to 400kHz
Step Size: 1Hz to 199.9kHz
Step Dwell: 0.1 to 999.9 sec.

SF Skip: 2450 to 2750Hz
Frequency Accuracy: ±.01%
Level Range: -50 to +10dBm
Resolution: 0.1dB



Receiver
Level Range: -61.9 to +10dBm
Resolution: 0.1dB
Accuracy: Accuracy is ± 0.1dB @ 100kHz @ 0 to -20dBm

	30%	50%	70%	90%
+10dBm	±0.3	±0.4	±1.2	±1.3
-40dBm	±0.9	±1.0	±1.5	±1.5

Dynamic Ranges:
100 to 100kHz T1 Pass, 15kHz to Pass, 60Hz HI Pass
Frequency Response: 20 to 400kHz
Resolution: Accuracy: (User loading) ± 1 count
Sensitivity: -65 to 10dBm SIN Ratio >20dB
Frequency Response: Spectral or Tabular Plot of Level vs Frequency while in Level/Frequency Mode

and Sweep Mode

NOISE

Transmitter: Quiet Termination
Receiver:
Range: +25 to -99dBm
Resolution: 1dB
Accuracy: Same as Receiver Above

Filter: 10/10Hz Lo Pass, 10/100Hz Band Pass, 10/100Hz High Pass

NOTCH NOISE (NOISE WITH TONE)

Receiver:
Notch: 995 to 1025Hz >50dB

Other Specifications Same as "Noise" Above So Long As Holding Tone Level is Less Than 40dB Above The Noise Level

NOISE TO GROUND

Transmitter: Quiet Termination
Receiver:
Range: -40 to +129dBm
Resolution: 1dB
Accuracy: ±1.5dB

Filters/Detector: - Same as "Noise" Above

SIGNAL TO NOISE RATIO

Transmitter: 1020Hz (Holding Tone)
Receiver:
Signal Range: -40 to +10dBm
Noise Range: -25 to 70dBm
Ratio Range: 10 to 50dB
Accuracy: ±1dB @ 10 to 40dB
±2dB @ 10 to 60dB
±3dB @ 60 to 100dB

Noise below -50dBm frequencies accuracy to ±.1dB except when using 500Hz filter

IMPULSE NOISE (3 LEVEL)

Transmitter: Quiet Termination
Receiver:
Minimum Threshold: -50dBm
The Level Difference: 10 or 6dB
Accuracy: ±1.5dB
Timer: 0.1 to 99.9 sec or continuous
Max Count: 9999 (any of three Counters)
Dead Time: 10 to 25ms.

IMPULSE NOISE WITH TONE

Transmitter: 1020Hz (Holding Tone)
Receiver: Which Filter 995 to 1025Hz >50dB
Other Specifications Same as "Impulse Noise" Above

ESRAN LOSS 2W OR 4W

Transmitter: 32Hz to 4kHz Band Limited White Noise
Receiver: Sine Wave @ -10 to -28dB

Measurement: Simultaneous ERL, SRL, (Lo), SRL (Hi)
Range: 0 to 40dB (2-Wire), 0 to 50dB (4-Wire)
Resolution: 0.1dB
Accuracy: ±0.5dB
Transhybrid Loss Compensation (TLP): -99.9 to +99.9dB

Detector: RMS

DROPOUTS

Droputs Threshold: 12dB
Accuracy: ±1dB

DC LOOP VOLTAGE

Receiver
Range: 0 to +120 VDC
Accuracy: ±1 Volt
RING VOLTAGE/FREQUENCY
Receiver
Range: 10 to +120 VAC, 20 to 1000Hz
Accuracy: ±1.5%

Range: 0.1 to 1000Hz
Rate: 0.1MF

Duration: 60/60 On or Off Minimum
Test: 9dB Maximum
Display: Up to 22 Digits
Display Mode: Fill and Hold or FIFO

GENERAL

Input: 2 or 4-Wire
Receive Impedance (Terminate): 135, 150, 600, 900
Receive Impedance (Bridge): >50k ohm, Bridging Loss >0.2dB

Transmit Source Impedance: Open, 135, 150, 600, 900
DC Blocking: 200 VDC
Balance: >90dB @ 50 to 1020Hz Decreasing
6dB/Octave Above 120Hz
Rein: Loss: >30dB
Head Channel Sw: (X Pair DC): 200 ohm, 1000 ohm

Keying: DTMF from Full 16 Button Keypad
Speaker: Built-In Speaker with Selection of Transmit, Receive or Measure Monitor

Store/Recall: 40 User Defined Test Setups and 40 User Defined Line Configurations

PHYSICAL

Power: Internal Rechargeable NiMH Battery Pack
Battery Life: Six hours (approx.)
Ext. Power/Recharge: 115/230 VAC Adapter, Weight: 1.56kg
Size: 126x4cm
Dimensions: 198 x114 x 56mm
Operating Temp: -20 to +50° Celsius
Storage Temp: -30 to +70° Celsius
Printer: Output port compatible with Ameritec Model AM-47XT-D Graphics Printer
Line Connections:
2 - or 4 - Wire Analog: 5' Analog Input Cable
Assembly with Minitels at User End
* Mates with ADC P1777 or Switchcraft T7253

Ordering
The Model 404-400 is supplied standard with the following:

- Basic Unit (battery (6hrs or more life)
- Bantam Connector/m cables for Datalcom Testing Mode
- AC Adapter
- Analog Input Cable with Clips
- Serial Input Cable
- One Touch Pen Instruction Manual
- Software

Accessories

- 25-0250 Enhanced Digital (option)
- AM-47XT-D Accessory Printer (includes battery and connecting cable)
- 26-0015 Replacement AM-47XT Printer Ribbon
- 48-0047 Replacement to Bantam Cable-6FT
- 48-0285 Replacement Analog Input Cable
- DCE/DTE Datalcom Cables (Call for info)

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