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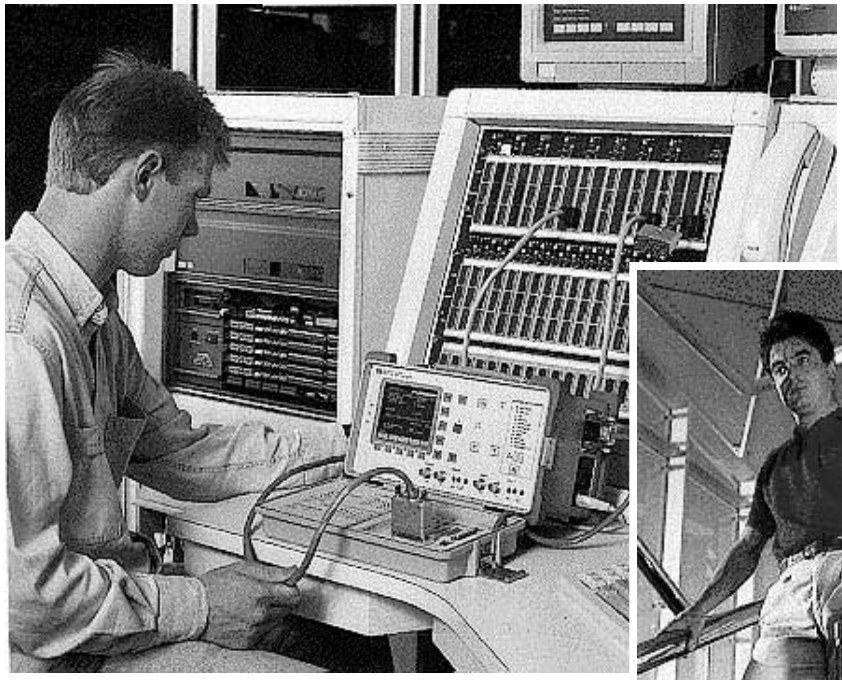
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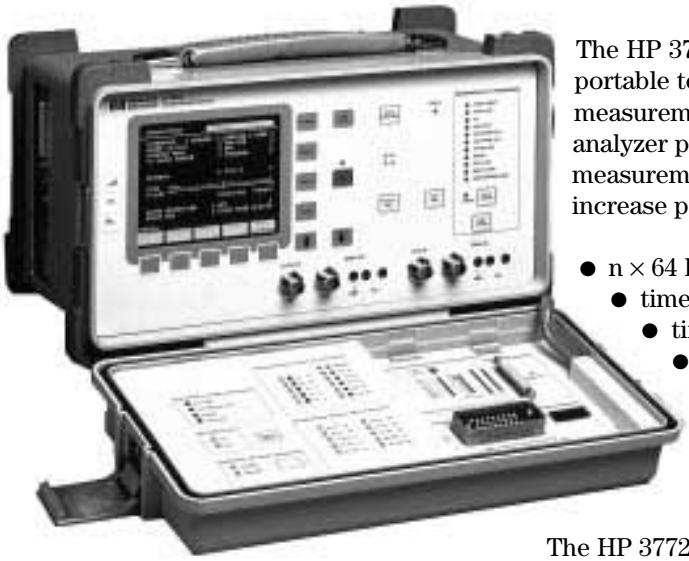
HP 37722A telecom analyzer
HP 37732A telecom/datacom analyzer

Technical specifications





Introduction



HP 37722/32A
telecom/datacom analyzer

The HP 37722A telecom analyzer is an easy-to-use, lightweight field-portable test set for in-service and out-of-service bit error and signal measurement on CEPT digital circuits and services. The HP 37722A analyzer provides framed/unframed pattern generation and measurements at and 2 Mb/s. Also, it offers many other features to help increase productivity and network uptime:

- n × 64 kb/s testing
- timeslot monitor including all signaling bits display
- timeslot access
- event-based storage in text and graphic form.

Options provide framed/unframed 8 Mb/s, framed/unframed 704 kb/s, 64 kb/s timeslot access and sub-rate processing (X.50 divisions 2 and 3, and X.58).

The HP 37722A telecom analyzer is easily upgraded to the HP 37732A telecom/datacom analyzer, which combines the full telecom testing capability of the HP 37722A analyzer with datacom testing. The HP 37732A analyzer consists of the HP 37722A analyzer and the HP 15901A Option 001 datacom module.

The HP 37732A telecom/datacom analyzer provides testing at V.24, V.35, V.11/X.21-leased interfaces at rates up to 2 Mb/s. It also provides a full range of BER measurements:

- control-circuit timing analysis with transitions diagrams on the screen
- built-in V.24 breakout box
- internal synthesizer
- event-based storage in text and graphic form.

The HP 37732A analyzer reduces test time and speeds problem resolution by simplifying test setup. It presents results in easy-to-read and easy-to-record ways that make it easy to pinpoint the cause of a problem.

The HP E4540A distributed network analyzer (DNA) software, for a PC or laptop operating with Microsoft Windows®, can be used to remotely control the HP 37722A telecom analyzer or HP 37732A telecom/datacom analyzer over modem links from a local support center.

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Specifications for telecom testing using the HP 37722A telecom analyzer or the HP 37732A telecom/datacom analyzer

Telecom specifications

Bit rates: 2.048 Mb/s, 64 kb/s; optional 8.448 Mb/s, 704 kb/s, sub-64 kb/s.
Frame structure: 2 Mb/s unframed, to ITU-T G.704, G.706, G.732, G.704: with no multiframe; with CAS multi-frame with/ without CRC4 multiframe;
64 kb/s codirectional; independent setting for transmitter and receiver.
Interfaces: To ITU-T G.703 and G.823.

Connectors
BNC: 75 ohm, unbalanced.
3-pin Siemens: 120 ohm, balanced.

Modes of operation
Transmit, receive, through mode.

Auto setup
Bit rate, line code, framing and pattern.

Test patterns
PRBS: $2^{11} - 1$ (ITU-T O.153), $2^{15} - 1$, $2^{23} - 1$ (ITU-T O.151) (inverted or non-inverted).
Word: Fully programmable n-bit word (n=8 to 1024); all ones, 1 in 2 (1010).
Timeslot selection: All timeslots, single timeslot, n timeslots for n = 1 to 31 (contiguous or non-contiguous). Receive timeslot as for transmitter, or independently set.
Deselected timeslots: $2^6 - 1$ PRBS or all ones (transmit only).

Test period: Manual, single: 15 min, 30 min, 1 hour, 24 hour, user defined:
1 to 100 seconds, minutes, hours, days.

Transmitter

Timing: Recovered (loop timed), internal, external.
Internal clock: 2.048 MHz, 64 kHz, (± 10 ppm).

2 Mb/s transmitter

Output
Ternary: HDB3 or AMI.
Binary: TTL, data NRZ, clock normal or inverted, .

Error insertion
Bit, code: Single, variable 10^{-2} to 10^{-8}.

Frame error add
FAS word, NFAS bit, CAS MFAS word (CAS multiframe mode); CRC MFAS word and CRC bits (CRC4 multiframe mode).
Mode: Burst, continuous.

Alarm generation: AIS 2 or 3 zeros in 512; AIS all ones, remote alarm, remote mutiframe alarm, no signal.

Signaling bits: Set ABCD signaling bits in CAS multiframe to any 4-bit pattern (all channels contain the same pattern).

Overhead bits: Individual setting of Si, spare MFAS, NFAS bits 4 to 8 (Sa) for all odd-numbered frames.

64 kb/s transmitter

Codirectional data output
Octet timing (to ITU-T G.703): On, off.

Bit error add: Single, variable 10^{-2} to 10^{-8}.

Receiver

2 Mb/s receiver

Timeslot monitor: Displays contents of single data timeslot, FAS timeslot, NFAS timeslot (bits 1 to 8 for all odd-numbered frames), MFAS, single signaling channel or all signaling channels.

Input
Binary/ternary: 2.048 Mb/s ± 100 ppm (nominal).
Terminate: 0 to 30 dB.
Binary: TTL, data NRZ, clock normal or inverted.

64 kb/s receiver

Codirectional data input: 64 kb/s ± 150 ppm (nominal).
Terminate: 0 to 30 dB.



HP 37722A telecom analyzer

Datacom specifications

Datacom interfaces: V.24, V.11/X.21-leased, V.35.
Terminal emulation: DTE, DCE.
Timing modes: Synchronous from 50 b/s to 2.048 Mb/s; asynchronous from 50 b/s to 19.2 kb/s (except X.21-leased).

V.24 breakout
Isolation switches: TD, RD, XTC, TC, RC, RTS, CTS, DTR, DSR, DCD, situated between drivers/receivers and interface connector.
Four-state indicators: TD, RD, XTC, TC, RC, RTS, CTS, DTR, DSR, DCD and monitor.
Patch points and voltage sources.

V.11/V.35 activity indicators
Data and clock: SD, RD, TT/SCTE, ST/SCT, RT/SCR.
Control circuits: RS, CS, TR/DTR, DM/DSR, RR/RLSD.

Synchronous mode
Clock sources: Internal synthesizer, datacom interface. (Selectable clock inversion.)
Interface clock rates: 50 b/s to 2.048 Mb/s, ± 10 ppm.
Synthesizer rates: 1.2, 2.4, 4.8, 9.6, 14.4, 19.2, 48, 56, 64, 384, 256, 512 kb/s, 1.024, 1.984 Mb/s, variable (600 b/s to 2.048 Mb/s). V.24 rate limited to 128 kb/s.

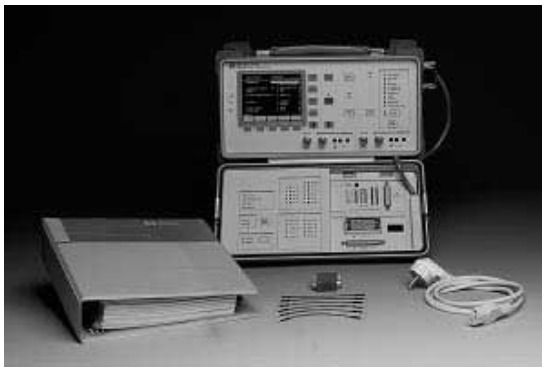
Asynchronous mode
Rates: 50, 75, 110, 134.5, 150, 200, 300, 600 b/s; 1.2, 1.8, 2.4, 4.8, 7.2, 9.6, 19.2 kb/s.
Character length: 5, 6, 7 or 8 bits.
Parity: Odd, even, 0, 1 or none.
Stop bits: 1, 1.5 or 2.

Data polarity: Normal or inverse.

Error add: Single, variable 10^{-2} to 10^{-5}.

Test patterns
PRBS: 63, 511, or 2047 bit, $2^{15} - 1$, $2^{20} - 1$.
Fixed: Permanent mark, alternating mark/space inversion, FOX message (asynchronous mode only).
Word: User-defined word, 8 to 1024 bits in 8 bit intervals.

Test period: Manual, timed interval (1 s to 100 days), bit interval (10^n bits, n = 4 to 10).



HP 37732A telecom/datacom analyzer

Telecom and datacom measurements

Telecom measurements
All measurements are simultaneous.

Errors
At 2048 kb/s have error count, average error ratio, error free seconds, % error free seconds of: bit (64 and 2048 kb/s), code, frame bit, CRC4, REBE (remote end block error – E bits).

ITU-T M.2100 analysis
ES, SES and availability for maintenance monitoring of transmit and receive directions. Receive only for out-of-service testing (includes PRBS defects and anomalies).

ITU-T G.821 error analysis
SES, %SES, ES, %ES, UAV and %UAV (telecom only), percent availability (datacom only), US, DM, %DM, long term mean error ratio. Also G.821 Annex D and user-defined thresholds.

Alarms
Alarm seconds and LED display of: AIS, LOS, LOF, CAS MFM loss, CRC4 MFM loss, remote alarm, remote MFM alarm, pattern sync loss, octet loss, power loss.

Frequency
Range: 0 to 9 MHz.
Resolution: 1 Hz.

Slips and COFAs
Number of pattern slips in available time and changes of frame alignment (COFA) are detected and counted.

Round trip delay
For 2^{23} – 1 PRBS at 2 Mb/s.
Range: 0 to 1023 ms ± 3% (nominal).
Resolution: 1 µs.

Datacom measurements
All measurements are simultaneous.

Errors
Bit error count/ratio, block count (the block length can be either 10^3 bits or PRBS length), block error count/ratio, asynchronous ES, %EFS, clock slips.

ITU-T M.2100 analysis
As for telecom measurements.

ITU-T G.821 error analysis
As for telecom measurements.

Alarms
Alarm seconds and LED display of: data loss, power loss, pattern sync loss, clock slip.

Frequency *(synchronous mode only)*
Range: 0 to 2.048 MHz.
Resolution: 1 Hz.

Control-circuit timing analysis
Graphic display of the status of control circuits RTS, CTS, DTR, DSR, DCD and Mon (monitor in V.24 mode only).

Delay
Between user-defined start and stop events.
Start and stop events: Transitions of RTS, CTS, DTR, DSR, DCD and Mon (user-connected monitor point for V.24 only).
Ranges: 100 ms, 1 s, 10 s.
Resolution: 0.1 ms up to 1 s, 1 ms above 1 s.

Specifications common to the HP 37722A and 37732A analyzers

Graphics and printing

Graphic display and printout
Barchart (results v 1920 time periods) for current or stored measurement period. Showing, for telecom: bit error count, code error count, frame error count, CRC error count, REBE (remote end block error – E-bits) error count, M2100 ES, SES count, alarms;
or datacom, any of: bit error count, block error count, alarms.
Bar resolution: 1, 15, 60 minutes.

Printer and remote control
Connector: 25-pin female RS-232-C.
Printing: Results, time, date and instrument control settings to external printer.
Remote control: Full duplex RS-232 control via a terminal or a computer.

Results and settings storage

Internal results storage
Automatic, for up to 10 periods with a maximum of 80 days capacity or total capacity of approximately 5,000 events. Data retained when instrument switched off.
Results stored at end of measurement period
Telecom and datacom error results, ITU-T G.821/M.2100 error analysis, alarm seconds.
Instrument settings storage
All current settings and results saved when the instrument switched off. In addition, up to five complete telecom and five complete datacom setups, with names, stored for recall.

General

Dimensions mm (inch): 190 (7.5) high, 340 (13.4) wide, 208 (8.2) deep including front panel cover or datacom module.
Weight: HP 37722A 4.5 kg (10 lb); HP 37732A 5.9 kg (12.5 lb).
ac Supply: 90 to 260 V, 60 VA, 48 to 66 Hz.
Temperature: 0 to +50°C operating, –40 to +70°C storage.

Specifications of options available for both analyzers

8 Mb/s measurements (Option 002)

Adds framed and unframed pattern generation and measurements at 8 Mb/s. All specifications same as 2 Mb/s except:

Clock: 8.448 Mb/s (internal), 500 kHz to 9 MHz (external).
Line code: HDB3.
Ternary data input: 8.448 Mb/s ± 100 ppm.

704 kb/s measurements (Option 003)

Adds framed/unframed pattern generation and measurements at 704 kb/s. All specifications same as 2 Mb/s except:

Clock: 704 kb/s.
Frame error simulation: No CRC4 mode.
Timeslot selection: For n up to 10.
Timeslot monitor: No CRC4; MFAS replaced by timeslot 0 frames 1, 13, 15.
Overhead bits setting: Si, unassigned frame, spare service, spare MFAS bits.

Sub-64 kb/s testing (Option 005)

Testing of sub-64 kb/s data signals to ITU-T X.50 and X.58.

Structured bearer signal: Either 64 kb/s codirectional signal or one timeslot within a 2.048 Mb/s signal (without CAS multiframe).

Test patterns
PRBS: $2^9 - 1$, $2^{11} - 1$ (ITU-T O.151).
Word: Fully programmable user word (octet aligned); 14 bits for X.50; 16 bits for X.58.
External pattern: Via X.21-leased port.

Deselected sub-rate channel contents
X.50: F0000000; F1111111; F1111110; F0000001.
X.58: 11111111; 01010101.

Error add
Bit: Single; variable rate 10^{-n} where n = 2 to 6.
Frame: 1 to 32 consecutive frame bits (burst).
Frame error add ratio: 10^{-n} where n = 2 to 6.

Measurements
Errors: Bit, frame.
Alarms: Frame loss; pattern loss; remote alarm.
User channel interface: Conforms to ITU-T X.50 divisions 2 and 3, X.50 bis, and X.58 as appropriate for 0.6, 1.2, 2.4, 4.8, 9.6, 14.4, 19.2, 48 kb/s. Circuit numbering to ITU-T X.53.

Octet monitor
Displays contents of any selected 8-bit envelope. Monitors information bits and network bits.

Generate and measure: X.50 and X.58, AIS (all ones).

Timeslot access (Options 005 and 006)

Adds external X.21 data access and 600 ohm audio access, and internal talk/listen to a (64 kb/s) timeslot of the primary data stream.

X.21 data access
External drop/insert.
Rate: Unstructured n × 64 kb/s, n = 1 to 6.
Rate: Structured sub-64 kb/s (option 005 only).
Single X.50, X.58 circuit mux/demux to 2 Mb/s, mux to 64 kb/s via X.21 interfaces.
Mode: DCE.
Connector: 15-pin D-type.

Audio access
External drop/insert.
600 ohm (0 dB TLP nominal).
A-law codec. Single timeslot.
Connectors: 3-pin Siemens.
Input and output level: +3 dBm to –50 dBm (nominal).

Internal talk/listen

Tone generation and measurement (Options 005 and 006)

2.048 Mb/s only

Generation
Into n × 64 kb/s timeslots (n = 1 to 31).
Level: 0 to –55 dBm0, 5 dB steps.
Fixed frequencies: 404, 1008, 2100, 2804 Hz, ± 1 Hz.
Variable frequency: 100 Hz to 3.9 kHz, ± 15 Hz.

Measurement
In selected 64 kb/s timeslot.
Code word: Measurements with offsets.
Signal level: –80 to +3 dBm0.
Channel frequency: 40 Hz to 3.99 kHz.

Relative frequency and bit slips
(Option 010)

2.048 Mb/s only

Measures relative frequency of, and bit slips between, two ITU-T G.703 2 Mb/s signals. Results displayed as +ve and –ve peak wander (UI), cumulative bit slips, frequency offset (ppm) and graph of bit slips (256, 16 UI).
Reference input level: 0 to –20 dBm.
Connector: BNC 75 ohm, unbalanced.

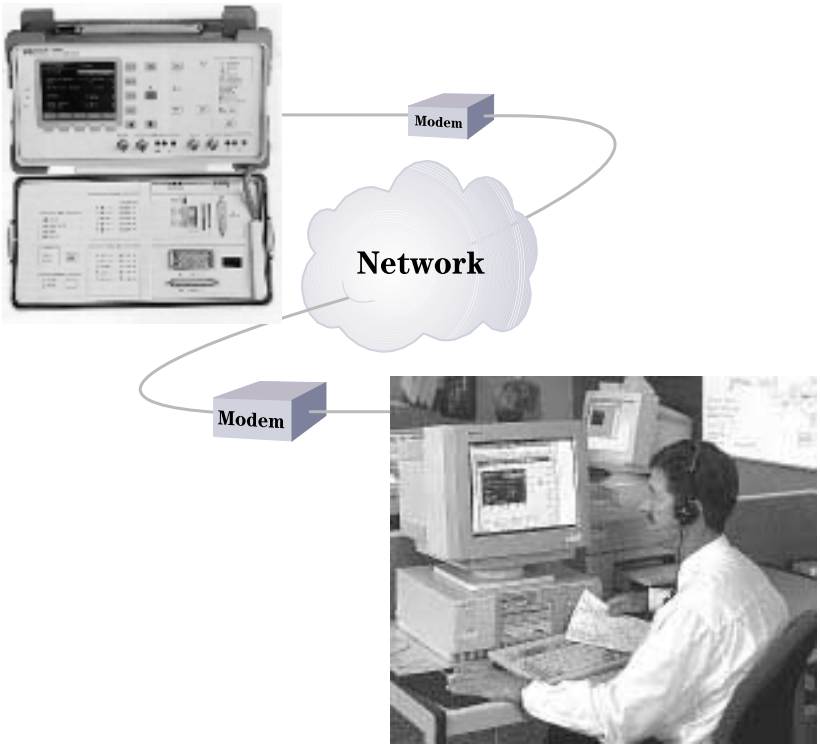
ITU-T M.2110 and M.2120 analysis
(Option 210)

Measurement start at user-specified time. Summary print of current settings and counts.

ITU-T M.2110 analysis
*(for bringing paths into service)***:**
1-day and 7-day tests.
Wait/pass/fail test relative to user-defined percentage path allocation.

ITU-T M.2120 analysis
*(for in-service monitoring)***:**
15-minute and 24 hour-contiguous measurement of errored and severely errored seconds based on user-defined path allocation.

Enhance your network test and maintenance strategy



Use the HP E4540A distributed network analyzer software to increase the effectiveness of technical support. Now, when your field-technicians contact your support center for assistance, the technical support team can access the remote analyzer and help resolve the problem interactively. In addition, your field-technicians can control an analyzer locally for simplified testing using easy-to-construct or preconfigured test sequences and configurations.

Furthermore, this powerful software lets you monitor network performance at remote sites long term, to identify intermittent faults or detect degradation before your customers do. Results are returned from remote instruments for incorporation into detailed quality-of-service reports.

No programming skills are necessary for this easy-to-use, Windows®-based software. For more information on the HP E4540A distributed network analyzer software, refer to brochure 5964-2240E.

For more detailed information on the HP 37722A and 37732A analyzers, refer to brochure 5965-3192E and configuration guide 5965-3194E.

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