The ParaScope 2000 ISDN is a portable telecom and datacom analyzer, which can capture and transmit up to 2.048 Mbps. It has been especially designed for the technical engineer who has the responsibility of analyzing network problems on T1/E1, and ISDN PRI/BRI circuits.

Use it to resolve physical layer problems through its ability to monitor, emulate and log vital signal parameters, alarms and error conditions. Pass/fail indicators, along with Expert assistance software, guarantee you will be the telecom expert.

**Product Features Include:**

**Standard Interfaces**
- T1/ISDN PRI & E1/ISDN PRI

**Optional Interfaces**

**Telecom Analysis**
- ISDN PRI/BRI monitoring & protocol analysis
- ISDN PRI/BRI call placement/answer with Call Expert and call detail recall
- Signal analysis
- Pass/Fail Indicators
- Measure frequency, amplitude, and power
- Detect alarm conditions
- Detect & count errors and violations
- Bit error testing
- DTMF call placement/answer with Call Expert
- 24x7 Alarm Logging
- Simulation

**Datacom Analysis**
- 7 layer encapsulated decodes
- Frame simulator
- Comprehensive statistics
- Async, Sync, Bisync and BOP

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End Finger Pointing
Start by non-intrusively checking the physical line status of the link in both directions. Use this information to easily pinpoint layer 1 problems that will adversely affect ISDN PRI operation. Problems like impedance mismatch, bad repeaters, etc., are readily detected and resolved.

Place and Answer Voice/Data Calls
Place or answer calls on D channel and automatically cut-through to the correct B channels for voice or data. Simply plug in a handset and your test set becomes an ISDN PRI phone set with unmatched simultaneous analysis capabilities.

ISDN PRI Call Expert
Call Expert analyzes and decodes cause codes and diagnostics and, where possible, recommends an action. Also, Call Expert summarizes the progress and status of calls. In essence, the Call Expert saves you having to master 500 pages of protocol specifications.
ISDN PRI Analysis and T1/E1 Monitoring

Comprehensive Statistics
Armed with a bevy of graphical statistics you can completely baseline a network and detect degrading problems well in advance. Graphic displays are available for % utilization, packets/second, throughput, errors, number of frames, frame size, and more. Drag and zoom into more detail.

Protocol Analysis
Fully decode ISDN PRI frames. Several views are available to ensure that you pinpoint the problem quickly and accurately.

Summary 1 View: Provides a summary decode of each LAPD frame including Layer 3 message types and call reference values. Use this view to easily see the setup and release of calls.
ISDN PRI Analysis and T1/E1 Monitoring

Protocol Analysis (continued)

Summary 2 View: Provides a summary of each frame including information element (IE) names.

Detail View: Provides a complete decode of each frame including information elements (IEs) and DNIS digits

Armed with a bevy of graphical statistics you can completely baseline a network and detect degrading problems well in advance. Graphic displays are available for % utilization, packets/second, throughput, errors, number of frames, frame size, and more. Drag and zoom into more detail.
ISDN BRI Analysis and U/ST Interface Monitoring

Quickly turn-up, troubleshoot, and maintain ISDN BRI U and S/T networks.

**End Finger Pointing**
Start by non-intrusively checking the physical line status of the link in both directions. Use this information to easily pinpoint layer 1 problems that will adversely affect ISDN operation. Activation and power problems are readily detected and resolved.

**Place and Answer Voice/Data Calls**
Place or answer calls on D channel and automatically cut-through to the correct B channels for voice or data. Simply plug in a handset and your test set becomes an ISDN BRI phone set with unmatched simultaneous analysis capabilities.

**ISDN BRI Call Expert**
Call Expert analyzes and decodes cause codes and diagnostics and, where possible, recommends an action. Also, Call Expert summarizes the progress and status of calls. In essence, the Call Expert saves you having to master 500 pages of protocol specifications.
ISDN Bit Error Testing
The easiest way to check line integrity is to run a BERT test. With this simple test, you will know if the B1, B2, or D channel has a problem.

Comprehensive Statistics
Armed with a bevy of graphical statistics you can completely baseline a network and detect degrading lines well in advance. Graphic displays are available for % utilization, packets/second, throughput, errors, number of frames, frame size, and more. Drag and zoom into more detail.

Protocol Analysis
Fully decode BRI frames. Several views are available to ensure that you pinpoint the problem quickly and accurately.

Summary 1 View: Provides a summary decode of each LAPD frame including Layer 3 message types and call reference values. Use this view to easily see the setup and release of calls.
ISDN BRI Analysis and U/ST Interface Monitoring

Protocol Analysis (continued)

Summary 2 View: Provides a summary of each frame including information element (IE) names.

Detail View:
Provides a complete decode of each frame including information elements (IEs) and DNIS digits.
ParaScope 2000 ISDN Technical Specifications

Hardware Specifications

**PC Requirements** - Pentium with minimum 16 MB Ram and VGA or SVGA monitor. Connects via PCMCIA. Operates with WanXL Software using Windows XP/2000 ISDN/95/98 and NT.


**Expert Analysis** - ISDN connection problems are detected and identified. Where possible, an action is recommended.

**Capture Buffer** - Data is stored in integrated 8 MB Ram capture buffer.

**Data Rate (max.)** - Up to 2048 Kbps.

**Data Clock** - Selectable for internal and external.

**Receiver** - High input impedance receivers on all monitored lines.

**Testpoints** - Four testpoints each for Ground, +12 Volts, and –12 Volts.

**Output Points** - Four programmable unbalanced and 2 programmable balanced output points

**Input Points** - Four unbalanced and 2 balanced monitor points

**Power** - AC adapter provides AC powered operation

**Dimensions** - 10.25" long, 6.25" wide, and 2.5" tall

**Packaging** - Conveniently packaged in a custom carrying case, the ParaScope 2000 ISDN consolidates industry standard test and protocol analyzers for multiple interfaces into one single, easy-to-use unit. It includes the ParaScope hardware unit, WanXL Software, and the slim-line power supply. Even with all hardware options installed, the basic hardware unit weighs a mere 5 lbs.

**Warranty**
All FE ParaScope products include a 90-day hardware parts and labor warranty and WanXL Software maintenance. Ask about our optional 3-year Extended Warranty Plan.

**Maintenance Plans**
One or two year WanXL Software Suite & Maintenance packages are available and include:

- One or two year hardware warranty
- One or two year software subscription updates
- Unlimited technical support
- Additional software features, such as Remote and Reporter

T1 Interface Specifications

**Physical Interfaces** - Bantam, RJ-48C, WECO 310, DB-15

**Termination** - Monitor, simulate, drop and insert

**Framing** - D4, ESF, SLC-96, unframed

**Clock Type** - n x 64 Kbps, n x 56 Kbps

**Clock Source** - internal, recovered

**Line Code** - AMI, B8ZS, jammed bit seven

**Auto Config** - Framing and Line Code

**Monitoring** - Single DSO, contiguous DSO’s, non contiguous DSO’s, AB/CD signaling.

**Simulation** - Single DSO, contiguous DSO’s, non contiguous DSO’s, AB/CD signaling. User defined idle code or drop and insert mode. Transmit yellow alarm, blue alarm, and loop-up/loop-down pattern.

**Line Build Out** - 0 dB, –7.5 dB, –15 dB

**Measurements** - Real-time display of received level (Vp), power/amplitude (dBsx), frequency and loop current

**Status Indicators** - Real-time and historical indicators of loss of sync, loss of carrier, yellow alarm, blue alarm, B8ZS detect, excessive zeros, bipolar violations (BPV), frame/CRC errors and slips, Loop Up/Loop Down. Log to disk. Pass/Fail indicators with user definable thresholds.

**Statistics** - Bipolar Violations (BPV), BPV error rate, frame/CRC errors, frame/CRC error rates, conveniently log them to disk.

**VF/DTMF over T1** - Emulate ground start, loop start and e&m trunks. Send wink, ring and dial signals. Measure wink time. Detect and display DTMF digits. Measure digit and interdigit time. Decode signaling bits to show line status, call status and timestamp. Log call status, call states and signaling to comma-delimited file (vf.csv). Supervised and unsupervised call placement and answering. User-defined digit, interdigit and call state timing.

**Voice Testing** - Monitor and simulate via an external telephone handset. Select A-Law or µ-Law. Supports ISDN PRI.

**Clear Channel** - Monitor and capture synchronous data streams like PCM voice.

**Tone Generator** - Generate user defined tones from 1 to 3000 Hz

**Scan for Active Channel** - Scan manually or at user defined timed intervals for active channels. Active channels are highlighted in GREEN.
### E1 Interface Specifications

**Physical Interfaces** - RJ-45, Coax, 120W, 75W

**Termination** - Monitor, simulate, drop and insert

**Framing** - Multiframe CAS, Multiframe CRC-4, CCS, Unframed

**Clock Type** - n x 64 Kbps, n x 56 Kbps

**Clock Source** - internal, recovered

**Line Code** - AMI, HDB3

**Monitoring** - Single timeslot, contiguous timeslots, non-contiguous timeslots, protected mode, and CAS/CCS signaling.

**Simulation** - Single timeslot, contiguous timeslots, non-contiguous timeslots and CAS/CCS signaling. User defined idle code or drop and insert mode. Transmit (AIS), AIS timeslot 16, Remote and Multiframe alarms.

**Measurements** - Real-time display of received level (Vp), power and amplitude (dBsx), frequency and loop current.

**Status Indicators** - Real-time and historical indicators of Loss of Sync, Loss of Carrier, AIS alarm, AIS timeslot 16 alarm, Remote alarm, Multiframe alarm, Excessive Zeros, Code Violations (CV)s, Frame/CRC errors and Slips. Log to disk. Pass/Fail indicators with user definable thresholds.

**Statistics** - Code Violations (CV), CV error rate, frame/CRC errors, frame/CRC error rates, conveniently log them to disk.

**Voice Testing** - Monitor and simulate via an external telephone handset. Select A-Law or µ-Law. Supports ISDN PRI.

**Scan for Active Timeslots** - Scan manually or at user defined timed intervals for active timeslots. Active timeslots are highlighted in GREEN.

### ISDN BRI ST Interface Specs - continued

**Call Expert** - Step-by-step analysis of calls. Analyze and interpret cause codes Recommend corrective actions. Check timing between user and network.

**Physical Line Analysis** - Simultaneously monitor physical line status of link in both directions. Real-time indicators of Loss of Sync and Power source. Pass/Fail indicators with user definable thresholds.

**Measurements** - Real-time display of received level (Vp), power and amplitude (dBsx), frequency and loop current.

**Protocol Analysis** - Decode LAPD protocol Decodes layer 3 variants including Information Elements(IE’s). Summary and Detailed views.

**Statistics** - % utilization, packets/second, throughput, errors, number of frames and frame size. Drag and zoom into any graph for more detail.

### (Optional) ISDN BRI U Interface Specifications

**Physical Interfaces** - RJ-45.

**Monitoring** - Monitor D, B1, B2, and B1+B2 channels from NT/CPE and LT/CO devices.

**Simulation** - Simulate a NT/CPE or LT/CO devices. Place data or voice call on B1 or B2 channels. Receive calls on B1 or B2 channel. Call placement as user or CPE only

**Bit Error Rate Tests** - Perform BERT tests on B1, B2, or B1+B2 channels. Test B channels to and from the network by calling self and send pattern on one B channel and receive on other B channel.

**Call Placement** - Place a one-click call on D channel to set up voice, data or BERT on B channels.

**Call Answering** - Auto-answer incoming calls on D channel and automatically cut-through to the correct B channels for voice, data or BERT.

**Call Expert** - Step-by-step analysis of calls. Analyze and interpret cause codes Recommend corrective actions. Check timing between user and network

**Physical Line Analysis** - Simultaneously monitor physical line status of link in both directions. Real-time indicators of superframe, linkup, activation, EOC decodes and errors.

**Protocol Analysis** - Decode LAPD protocol Decodes layer 3 variants including Information Elements(IE’s). Summary and Detailed views.

**Statistics** - % utilization, packets/second, throughput, errors, number of frames and frame size. Drag and zoom into any graph for more detail.

ParaScope 2000 ISDN Technical Specifications

(Optional) DDS Interface Specifications

<table>
<thead>
<tr>
<th>Physical Interfaces</th>
<th>RJ-45</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clock Type</td>
<td>2400 bps, 3200 bps, 4800 bps, 9600 bps, 19.2 Kbps, 38.4 Kbps, 56.0 Kbps, 64.0 Kbps, 72.0 Kbps.</td>
</tr>
<tr>
<td>Clock Source</td>
<td>Internal, recovered</td>
</tr>
<tr>
<td>Framing</td>
<td>Unframed and Primary Channel</td>
</tr>
<tr>
<td>Monitoring</td>
<td>Monitor DTE and DCE devices. Synchronization status.</td>
</tr>
<tr>
<td>Simulation</td>
<td>Simulate a DTE or DCE device.</td>
</tr>
<tr>
<td>Measurements</td>
<td>Real-time display of amplitude (dB), frequency and loop current.</td>
</tr>
<tr>
<td>Status Indicators</td>
<td>Real-time indicators of Loss of Sync, Loop Up/Loop Down, Simplex Current, Frequency, Level and Power. Pass/Fail indicators with user definable thresholds.</td>
</tr>
<tr>
<td>Loop Codes</td>
<td>Automatic or manual loop up and loop down.</td>
</tr>
</tbody>
</table>

BERT Specifications

| Measurements        | Simultaneously measures bit errors, block error, errored seconds and percent error free seconds for synchronous and asynchronous data lines. |
| Patterns            | 63, 511, 2047, 4095, Alt 1/0, Mark, Space, ASCII FOX, Alt ASCII FOX, EBCDIC FOX, Alt EBCDIC FOX, 1 in 7, 3 in 24, (2**15) -1, (2**15) -1 inverted, (2**20) -1, (2**23) -1, 0.151 QRSS, Loop Codes. |
| Presentation        | Displays G.821 and bit/block errors. |
| Character Framing   | Select Sync or Async 5, 6, 7 or 8 bits per character sequence. |
| Error Injection     | Inject single or burst. |
| Flow Control        | Select None, Leads or XON/XOFF. |

General Specifications - continued

| Search/Display Filter | User selectable search for timestamp, frame length, error, display text, capture data and protocol-specific information. |
| Capture Filter       | Capture only the data of interest. Set up separate filters for DTE, DCE or both. |
| Character Suppression| Allows elimination of characters, such as idle, sync or user-definable characters from the display. |
| Send String          | Up to 1,024 characters per string. |
| Display Screen       | Windowing technology, includes: move, size, minimize, maximize, tile cascade, and arrange. |
| Line Data Display    | Chronological order of DTE/DCE data, lead states, and triggers. Display can be synchronized to Decode Display windows. Supports both CHAR and HEX data. |
| Data Codes           | ASCII, EBCDIC, Baudot, Six Bit Transcode, IPARS (Line and Sabre), Inverted IPARS, HEX and EBCD. |
| Bit Sense            | Normal or inverted. |
| Bit Order            | MSB or LSB first. |
| Lead Status          | 8 fully user programmable leads: 4 as output and 4 as input. Any input lead may be connected to any interface signal. Names are user-definable. |
| Triggers             | Programmable triggers consisting of character strings, errors, interface lead transitions, timers, time of day, and keyboard. Bit and character masking, "and," "not" and "don't care" characters are supported. Trigger events can be selectively displayed and stored with "pre" and "post" trigger data. |
| Timers               | Ten timers with a maximum count of 65,535 and a resolution of 1 msec. |
| Counters             | Ten counters may be incremented up to 65,535. |
| Error Checking       | CRC-CCITT, CRC-16, CRC-12, CRC-6, LRC, and Parity. |
| Parity               | Odd, Even, None, Ignore. |
| Decode Data Display  | DTE/DCE single and encapsulated protocols. Summary I, II, and Detail windows offer increasing decode information. Protocol Summary decomposes each frame by protocol type. Windows can be duplicated and synchronized to each other and to the Line Data Display window. Protocol filtering. |
| Character Framing    | 5, 6, 7 or 8 information bits, plus parity. For asynchronous systems: 1, 1.5, or 2 stop bits per character. |
| Alarm Logging        | Timestamp and log alarms, signal threshold violations, Frame Relay status, errors and BERT results to disk. |
| Printer Support      | Standard printer support for generating hardcopy of data status and timing information (all data, DTE only, DCE only, DCE and DTE), analysis, programs, setups, and protocol decodes. |