MODEL 532
Intelligent Logic State Analyzer

FOR R&D, FIELD SERVICE, AND PRODUCTION TEST APPLICATIONS

Base Price $1800

FEATURES:

- Provides 32 channels, 250 words of storage and 21 triggering modes.
- Displays data in hexadecimal or binary.
- Computes and displays "signature" of data collected for GO/NO-GO testing.
- Automates testing.
- Permits remote control and analysis through RS-232 or IEEE-488 interfaces.
- Offers choice of stand-alone, scope, or video terminal display.

PARATRONICS INC.

MODEL 532

The Model 532 is a compact, 32-channel microprocessor-based logic state analyzer; its ease-of-operation, advanced features, and programmability, can greatly simplify the design and testing of today's complex digital systems.

Basic Features

The Model 532 captures up to 250 words. The 32 channels associated with each word can be operated together or functionally split into "A" and "B" groups, each 16 bits wide and each separately clocked. One application of this approach is the support of systems designed around the latest generation of microprocessor chips which use different clocks to multiplex address and data on the same pins.

In the stand-alone mode, keyboard commands allow the choice of the trigger word, one line of data, or two "signatures" to be displayed in hexadecimal readouts at the left of the unit as shown in Figure 1. The delay value or the location of the data word is displayed in the readout at the right. The signatures reflect a software-implemented comparison of the entire memory contents. The algorithm used "compresses" these contents into two hexadecimal words for a quick identification of the data collected. Thus, if even a single bit changes between data collections, this change will be immediately apparent by the display of a different signature.

If a 16-line truth table or "page" presentation is preferred, the Model 532 can be used with an ordinary lab or field oscilloscope. The hexadecimal and binary displays available are shown in Figure 2. These presentations include the signatures and the location of the truth table relative to the trigger word. All 16 pages in the data memory can be examined sequentially using a control on the front panel.

Oscilloscope and probe connections are shown in Figure 3. The Model 50 fixed threshold (TTL) probe is a cost-effective way to interface with TTL or MOS logic families; while the Model 51 variable threshold (‡15V) probe is ideal for general-purpose applications, including noise immunity measurement problems. Other probes include glitch detectors, serial-to-parallel converters, and a series of dedicated probes for active control of microprocessors. Contact the factory for price and availability.

The basic Model 532 also incorporates a keyboard for setting up one of the 21 available triggering modes. For example, one mode permits the user to trigger on a particular address and in-

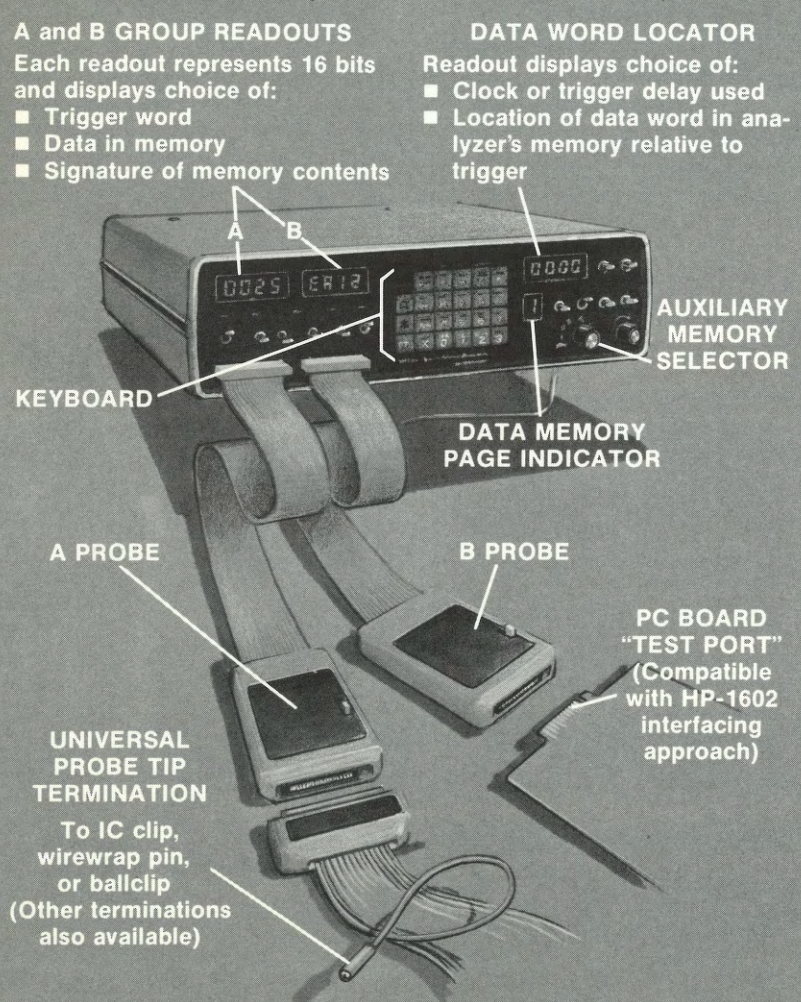


FIGURE 1. Stand Alone Mode

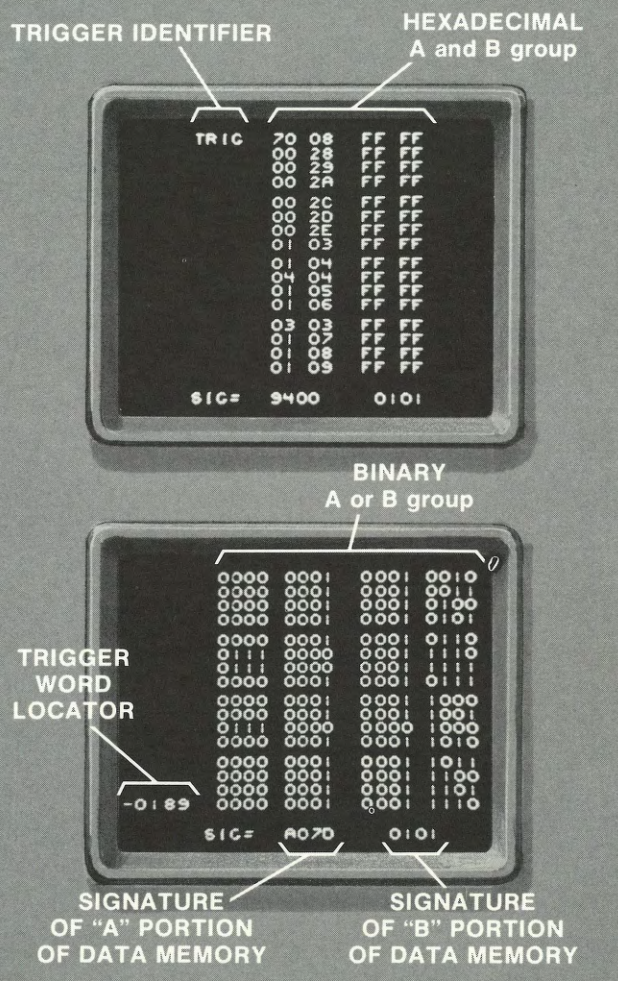


FIGURE 2. Typical Scope Presentations

Intelligent Logic State Analyzer

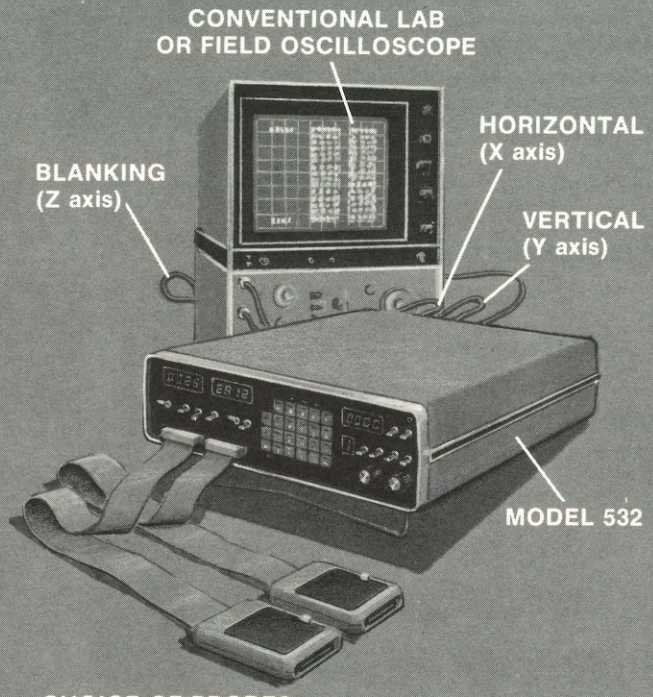
struction, while a second allows triggering on the address and the *nonoccurrence* of the instruction. Another mode enables the measurement of the number of program steps or elapsed time between sequential events, while still another causes the analyzer to trigger when an expected event in an address sequence *does not* occur.

Additional features of the instrument include: a 5 MHz (or 12 MHz) data memory, pre-trigger and post-trigger data collection, independent A and B trigger and clock qualifiers, up to 10,000 steps of digital delay for program paging and loop analysis, and an automatic self-test each time the Model 532 is turned on.

Optional Features

In situations where additional capability is required, the following application boards can be plugged into the analyzer's internal bus:

- ☐ *High-Speed Memory Board* — Permits data collection as high as 12 million 32-bit words per second. (Factory installed.) **$300.00**
- ☐ *Auxiliary Memory Board* — Permits up to eight tests to be internally programmed by the Model 532. Information transferred from the main memory to each auxiliary memory element includes 250 data words, the associated signatures, and the front panel settings used in the original data collection. Upon recall of a particular test, the analyzer takes over front panel control, automatically collects new data, and highlights any differences between the main and auxiliary memories. The Auxiliary Memory Board contains one RAM for temporary storage, space for seven UV PROM elements for "semi-permanent" storage, and PROM programming circuitry. 2716 PROMs are used and are programmed by the Model 532 only if they are blank. **$235.00**
- ☐ *RS-232 Interface Board* — Permits hardcopy of test results; allows two-way communication and control from a remote terminal or computer; supports downloading of programs for microprocessor development applications. (See Figure 4.) **$350.00**
- ☐ *IEEE-488 Interface Board* — Same functions as above when a IEEE-488 computer/controller is used.. **$350.00**



CHOICE OF PROBES:

- **Model 50 — Fixed threshold at 1.6V with hysteresis; low-power Schottky load; accepts logic swings between -0.5V and +15V.**
- **Model 51 — Variable threshold; input impedance: 50KΩ, 15pF; threshold variable between ±15.0V.**
- **Other Probes — Contact factory for price and availability.**

FIGURE 3. Analyzer Interconnections

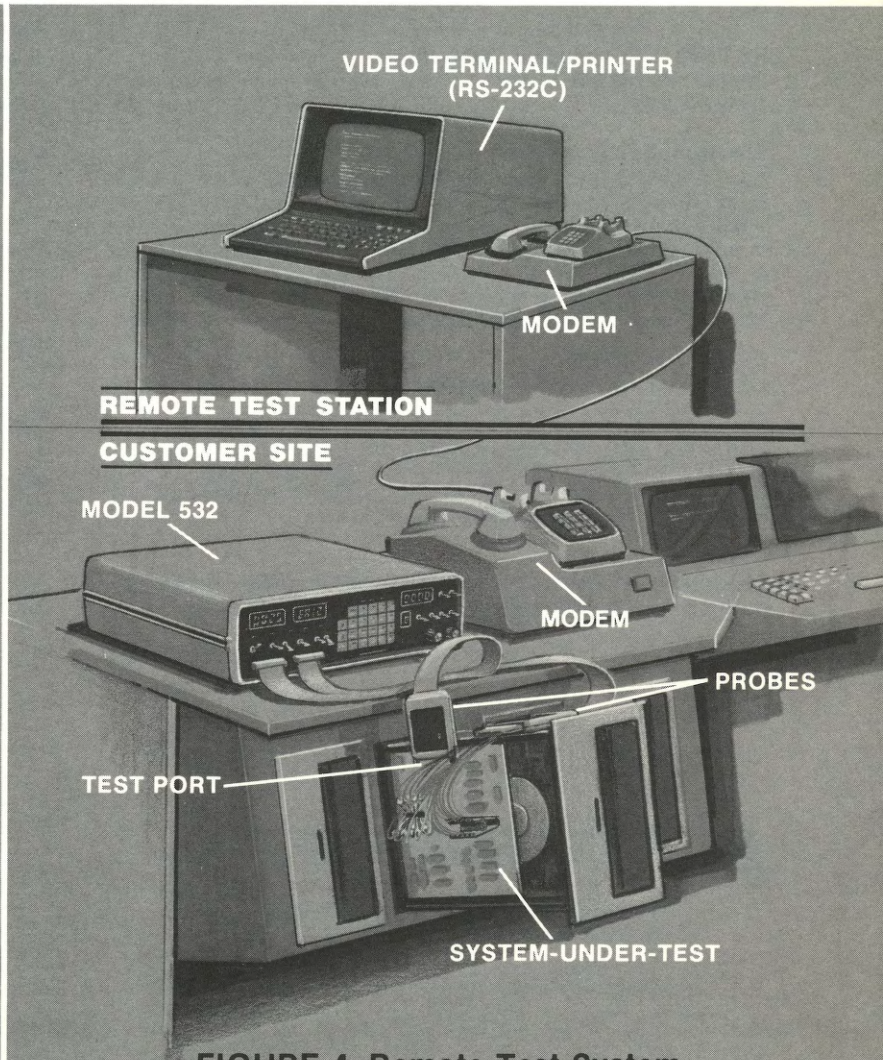


FIGURE 4. Remote Test System

Specifications

Physical
8.9 cm (3½") high x 30.9 cm (12⅛") wide x 36.2 cm (14¼") deep; 4.1 kg. (9 pounds)

Display
Trigger word, data, signatures, page indicator and digital delay relative to trigger on self-contained LED readouts; or oscilloscope display provides same information along with data in sixteen selectable 16-line hexadecimal or binary truth table "pages."

Real-Time Data Collection
250 words, each 32 bits wide. Data memory organized as two 16-bit data groups (A and B). Each data group has independent input clocks and trigger and clock qualifiers.

Input Clocks
Maximum clock rate is 5 MHz with standard memory or 12 MHz with optional high-speed memory. Rising or falling clock edge can be selected independently for A or B group; or both groups can be clocked together from A clock. Minimum clock pulse width is 30 ns at threshold.

Oscilloscope Requirements
Input sensitivity (X and Y): 1V/division min.; bandwidth: 500 KHz min.; X, Y phase shift: ≤ 10° at 300 KHz; blanking (Z axis): fully blanked by positive or negative pulse, 30V or less. Analyzer provides required X, Y, Z outputs using BNC connectors at rear of unit.

External Sync Output
BNC connector at rear of unit provides TTL pulse when all triggering requirements are met.

Trigger Bus
Connector at rear of unit expands analyzer triggering beyond 32 bits.

RS-232C/TTY and IEEE-488 Outputs
Standard connectors at rear of unit for two-way communication and control functions.

Probes: 107 cm (3.5') long
Fixed Threshold Type (1.6V): All data and qualifier inputs have one low-power Schottky load as follows: −400ua max. (−0.5V to +0.9V); +100ua max (+2.0V to +15.0V) with 400mV min. hysteresis for noise rejection. Clock input −800ua max (−.5 to +.9V); +100ua max. (+2.0V to +15.0V). Input capacitance < 20pF at probe head. Switch on probe inverts (complements) all data and qualifiers. Probe accepts terminator with color-coded "flying" leads or plugs directly into system at test port.

Variable Threshold Type (±15.0V range): All inputs have 50KΩ, 15pF input impedance. Fixed TTL threshold (1.6V) is also provided. Probe interfaces with system-under-test as described above.

Dedicated Probe: Input load same as Fixed Threshold Type. Probe interfaces with microprocessor socket using dedicated 40-pin DIP plug and provides SINGLE STEP, RUN, HALT, BREAKPOINT, and memory READ/WRITE and other development functions.

Qualifiers
Both trigger and clock qualifiers are provided for each 16-bit group. Qualifiers can be independently set to 1, 0, or X (don't care).

Set-Up and Hold Times
Set-up time for data and qualifiers prior to selected clock edge is 30 ns. Hold time for data and qualifiers after selected clock edge is 0 ns.

Delay
Up to 10,000 clock or trigger events.

Triggering Modes
General: Analyzer triggering is specified by the A and B data groups. Each group is defined by keyboard entry of 0 to 4 hexadecimal characters. Provides pre-trigger and post-trigger data capture. Delay, if any, can be on n trigger or clock events, where $0 \leq n \leq 9999$.

Parallel Modes: (A,B) refers to a full 32-bit wide trigger word. (A,$\overline{B}$)DLY: Trigger when (A,B) occurs and delay condition is satisfied. (A,$\overline{B}$)DLY: Trigger when A and any word other than B occurs and delay condition is satisfied.

Sequential Modes: (A=B) refers to two trigger words in the A data group. A is the trigger word that must occur first; B is the trigger word that must occur second. In this mode, the B data inputs have no effect on triggering. Full 32-bit data collection and display still occurs.

(A,DLY=B): Trigger when B occurs exactly n clock or trigger delay events from A.

(A,DLY=$\overline{B}$): Trigger when any event other than B occurs exactly n clock or trigger delay events from A.

(A,DLY ≥ B): Trigger when B occurs n or more delay events from A.

Start A/Stop B: Start data collection when A occurs; stop collection when B occurs. If more than 250 data words separate A & B, the most recent set of 250 words are stored.

Auxiliary Memory
1K RAM and 7K UV PROMs are provided. Each of the 8 memory elements is capable of storing front panel control settings for later automatic operation, 250 words of data, and associated signatures. PROMs are programmed by Model 532 only if blank and can be erased by UV light. Differences between main and auxiliary memories are highlighted on CRT by alternating displays.

Program Memory
Can be user-defined and expanded for special applications. 1K RAM plus 8K PROM are available.

Power
Analyzer uses wide-range, high-efficiency power supply: 90-240V rms AC; 48-440 Hz; 120-350 VDC; 75VA max.

Operating Temperature Range
0-50°C.

Humidity
0-95% R.H. with no condensation.

Altitude
To 10,000 feet.

Note: Paratronics, Inc. reserves the right to change specifications without notice.

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