HEWLETT PACKARD

MODEL 64650A
MODEL 10269A

Logic Analyzer Preprocessors and Interfaces

for Model 64620S Logic State/Software Analyzer and Model 1630A/D Logic Analyzer

TECHNICAL DATA 1 AUG 83

Description

Hewlett-Packard preprocessors and interface modules tailor Model 64620S Logic State/Software Analyzer and Model 1630A/D Logic Analyzer for use with specific microprocessor systems. Preprocessors provide quick, convenient connections between target microprocessor systems and Hewlett-Packard logic analyzers. Inverse assemblers translate collected state flow data into microprocessor mnemonics for easy reading and analysis. The inverse assembler software automatically sets formats and labels for the logic analyzer.

Model 64650A General Purpose Preprocessor for the 60-channel HP 64620S Logic State/Software Analyzer *replaces* a set of three HP 64635A Data Probes and one HP 64636A Clock Probe. Model 10269A Probe Interface, the preprocessor for HP 1630A/D Logic Analyzer, has sockets for five probes. Interface modules contain the actual interface circuits, and the modules are installed in the preprocessor units. Both microprocessor-specific and user-definable, wire-wrapping interface modules are available.

Connections to the target system are readily made with a dual in-line probe from the interface module that plugs directly into the target system. Then, the target microprocessor plugs in the top of the same dual in-line probe.

With microprocessor-specific interface software, address, data, status, and clock lines are labeled on the logic analyzer display. Signals are demultiplexed as necessary and aligned for input into the logic analyzer. Appropriate formats for the measurements are set up automatically.

Inverse assembly software translates microprocessor code into the processor mnemonics to generate disassembled trace listings. For the 64000 System, the software is provided on flexible disc with each microprocessor-specific interface. The appropriate inverse assembler for the HP 10269A Probe Interface is included with the interface option, and is stored on a minicassette that is used with the HP 82161A Digital Cassette Drive.

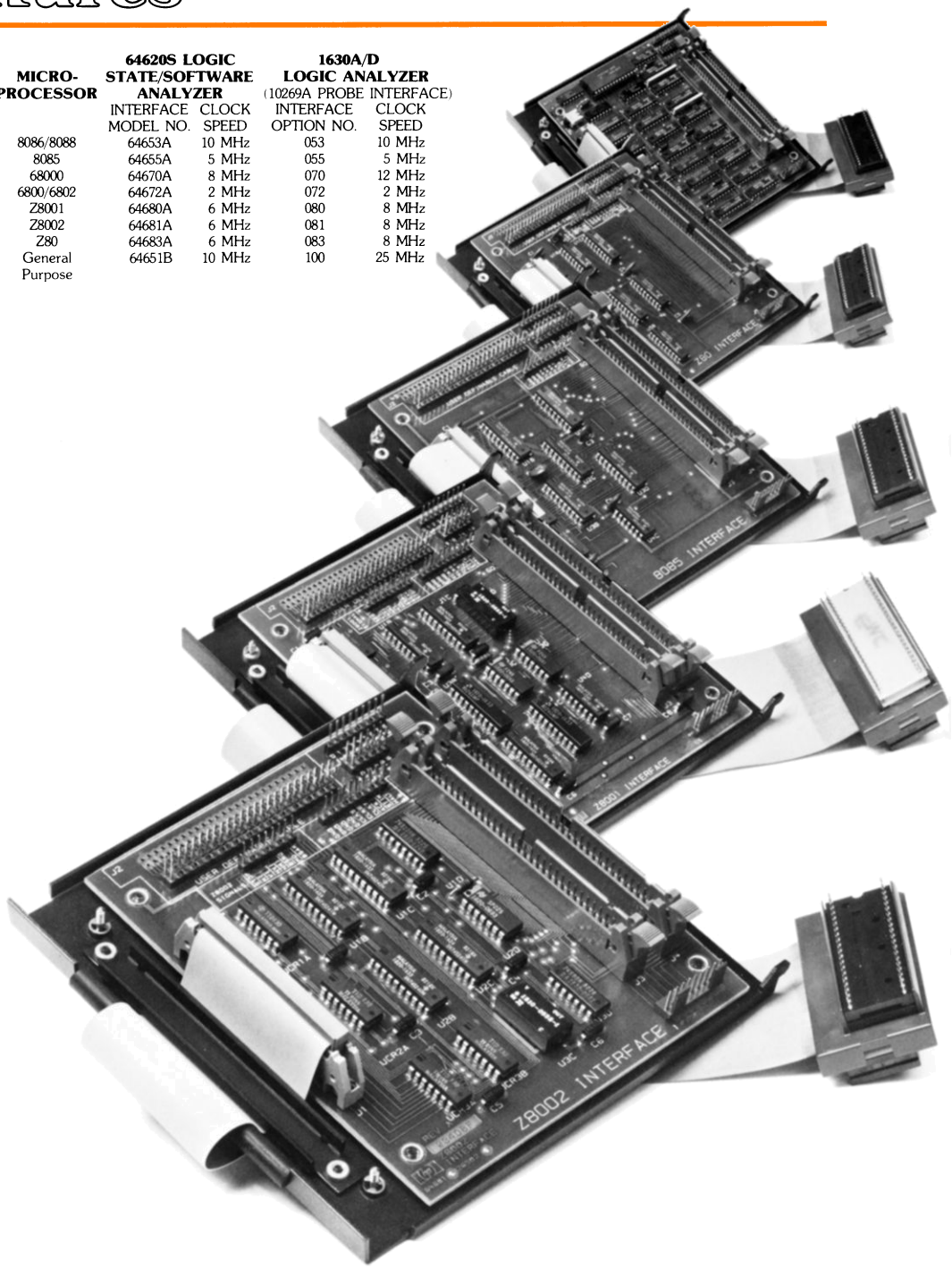
Features

- Fast, simple connections to the target system
- Interface modules fit both 64650A Preprocessor and 10269A Probe Interface
- Demultiplexing of address/data bus signals when appropriate
- Instruction set disassembly with microprocessor-specific interfaces for easier analysis

General Features

Preprocessors and interface modules reduce logic analysis set-up time by eliminating the need to manually connect each logic probe line. State listings in the microprocessor mnemonics correlate directly to the program listings, omitting the step of translating microprocessor object code. Automatic formatting is another time-saving convenience. Preprocessors allow designers to focus their attention on the analysis tasks rather than the analysis tool.

MICRO-PROCESSOR	64620S LOGIC STATE/SOFTWARE ANALYZER		1630A/D LOGIC ANALYZER (10269A PROBE INTERFACE)	
	INTERFACE MODEL NO.	CLOCK SPEED	INTERFACE OPTION NO.	CLOCK SPEED
8086/8088	64653A	10 MHz	053	10 MHz
8085	64655A	5 MHz	055	5 MHz
68000	64670A	8 MHz	070	12 MHz
6800/6802	64672A	2 MHz	072	2 MHz
Z8001	64680A	6 MHz	080	8 MHz
Z8002	64681A	6 MHz	081	8 MHz
Z80	64683A	6 MHz	083	8 MHz
General Purpose	64651B	10 MHz	100	25 MHz



A wire-wrapping interface module is available for either the 64650A or 10269A preprocessor. Chip sockets, wire-wrapping hardware, and a wire-wrapping interface board are included for implementing interface modules for microprocessors and computer buses not supported by a Hewlett-Packard processor-specific interface. For the HP 64620S Logic State/Software Analyzer, an inverse assembler may be written to match the interface module using the Inverse Assembly Language software package, Model 64856AF/AT.

Model 1630A/D Logic Analyzer is a stand-alone benchtop anlayzer for one or two engineers working independently. The 64000 System is appropriate for larger groups of engineers and designers working concurrently on related projects. Model 64620S Logic State/Software Analyzer is a part of the modular set of integrated tools for the design, development, and maintenance of microprocessor-based products. Other 64000 products are available to support many popular microprocessors, including emulators, assembler/linkers, Pascal compilers, and C compilers.

Interface Modules

The same interface modules may be installed in either HP 64650A Preprocessor or HP 10269A Probe Interface. Refer to the chart to locate the appropriate model number for the interface modules for a specific logic analyzer and target microprocessor.

Preprocessor for 64620S

Model 64650A General Purpose Preprocessor

- Replaces three data probes (Model 64635A) and one clock probe (Model 64636A)
- Operating environment for the family of microprocessor-specific interfaces and the user-defined wire-wrapping interface modules
- Hardware code on interface module identifies module to the 64620S Logic State/Software Analyzer
- Inverse assembly for processor-specific interface
- Channels not used for monitoring the target microprocessor are available for additional circuit probing
- Control over the target system with STIMULUS and HALT lines from the 64620S Logic State/Software Analyzer

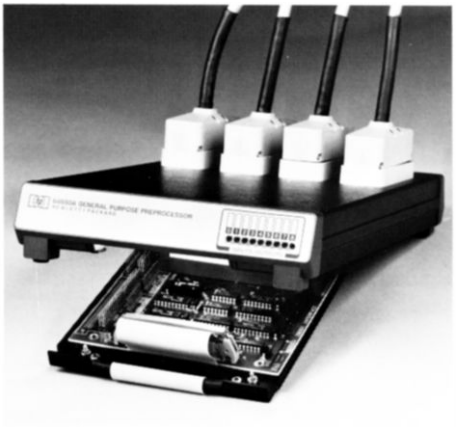
Model 64650A is a multifunction interface for the HP 64620S Software Analyzer. Probe connectors from the HP 64620S Software Analyzer plug directly into the Preprocessor body, replacing an HP 64636A 8-channel clock probe and up to three HP 64635A 20-channel data probes. The Preprocessor operates with an installed interface module board. Interface modules are dedicated interfaces for any of a variety of 8-bit and 16-bit microprocessors. There is also a wire-wrapping interface module that may be used with minicomputer interfaces or with microprocessors for which there are no HP processor-specific interface modules available.

Combined, the preprocessor and the selected interface module condition signals from the target system for the Software Analyzer. Bus signals are demultiplexed when necessary. STIMULUS and HALT signals from the 64620S Analyzer provide control over the target microprocessor. The companion inverse assembler translates processor object code into mnemonics of the microprocessor. Hardware codes identify the interface module, so the 64620S Analyzer is automatically configured and the inverse assembler is loaded without separate instructions. Inverse assembler and interface software are combined in a single software package for each interface module.

Not all of the input lines of the Software Analyzer are needed to monitor the target processor. The lines not used by the interface module are free to be used for additional circuit probing, such as tracing activity in other parts of the target system.

Specifications

CLOCK AND DATA INPUTS
Channel width: 60 channels.
Unqualified clock pulse rate: 25 MHz max.
Qualified clock speed: 10 MHz max.
Input impedance: 100 kΩ and < 20 pF at interface connector.
Maximum input: ±40 Vdc.
Dynamic range: threshold ±10 Vdc in 0.1 V increments.
Minimum signal swing: 600 mV.
Minimum clock pulse width: 20 ns.
Signal latching: on 24 address bits and 8 status bits.
SETUP AND HOLD TIMES
For channels connected through the preprocessor
Clock qualifier setup time: min 20 ns.
Clock qualifier hold time: zero.
Data setup time: min 37 ns.
Data hold time: zero.
For channels connected through general purpose probes when data is clocked by the preprocessor.
Data setup time: min 23 ns.
Data hold time: min 7 ns.



POWER REQUIREMENTS
Power consumption: 0.8 A max at +5 Vdc; 2.5 A max at −5.2 Vdc.
Power available for interface module: 1.0 A max at +5 Vdc.
Note: all power supplied by the Software Analyzer subsystem.
ENVIRONMENTAL
Temperature: operating, 0° to +55° C (+32° to +131° F); nonoperating, −40° to +75° C (−40° to +167° F).
Altitude: operating, 4600 m (15 000 ft); nonoperating, 15 300 m (50 000 ft).
Humidity: operating, to 90% noncondensing. Avoid sudden, extreme temperature changes that could cause condensation within the preprocessor.
ACCESSORIES SUPPLIED
Set of 10 probe leads and 10 miniature, pincer probe tip adapters; operator and service manual.

Probe Interface for 1630A/D

Model 10269A Probe Interface

- 1630A/D Logic Analyzer probes plug directly into the Probe Interface case
- Operating environment for the family of microprocessor-specific interface and user-definable wire-wrapping interface modules
- Inverse assembler on minicassette tape included with each microprocessor-specific interface module

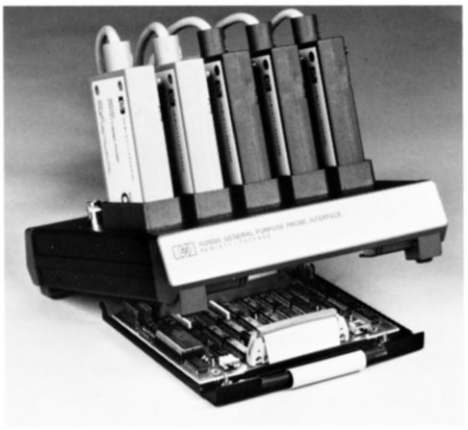
Model 10269A Probe Interface is a multifunction interface for Model 1630A/D Logic Analyzers. Probes from either the 1630A or 1630D analyzer plug directly into the Interface case. Plug-in interface modules complete the interface circuits to the target system. Interface modules are available as microprocessor-specific modules, or a general purpose, wire-wrapping module.

Processor-specific interface options to the HP 10269A Probe Interface include the appropriate inverse assembler for the target microprocessor. The inverse assembler is on a write-protected file of a minicassette for use with Model 82161A Digital Cassette Drive.

Combined, the Probe Interface and an installed interface module condition signals for the 1630 Logic Analyzer. Processor-specific interfaces with the inverse assemblers translate the object code into the microprocessor mnemonics for ready comparison to program listings.

Specifications

CLOCK AND DATA INPUTS
Channel width: 43 data channels; 3 clock channels.
Qualified clock speed: 25 MHz max.
Input impedance: 100 kΩ, < 20 pF at interface connector.
Maximum input: ±40 Vdc.
Dynamic range: threshold ±10 V in 0.1 V increments.
Minimum clock pulse width: 10 ns.
SETUP AND HOLD TIMES
Setup time: time data must be present prior to clock transition, min 20 ns.
Hold time: zero.



POWER REQUIREMENTS
Power available for interface module: 1.0 A max at +5 Vdc, supplied by the 1630A/D Logic Analyzer.
ENVIRONMENTAL
Temperature: operating, 0° to +55° C (+32° to +131° F); nonoperating, −40° to +75° C (−40° to +167° F).
Humidity: to 90% at +40° C, noncondensing.
Altitude: operating, 4600 m (15 000 ft); nonoperating, 15 300 m (50 000 ft).
ACCESSORIES SUPPLIED
Operator and service manual.

8085 Interface Modules

Model 64655A
Model 10269A Option 055

The 8085 Interface is used with a 40-channel HP 64620A Software Analyzer or a 1630A/D Logic Analyzer. Interface software translates the full instruction set for trace displays in the microprocessor mnemonics. User-defined symbols may be incorporated in the address field and operand field for powerful symbolic tracing.

Interface software for Model 64655A 8085 Interface includes the inverse assembler, and is supplied on a flexible disc.

Software for the 8085 interface for the 1630A/D Logic Analyzer is included with Option 055 to the HP 10269A interface. Inverse assembler and operational software are supplied on a minicassette cartridge.

Specifications

Processor compatibility: compatible with Intel ® 8085 and all microprocessors that comply with the specifications of this processor.
Maximum processor clock speed: 5 MHz.
Signal line loading: one LS TTL load plus approx 35 pF for all monitored lines except 8085 clock pins 1 and 2, which have no loading.
Outputs (64655S): STIMULUS and HALT are LS TTL open-collecter active-low outputs; max sinking current, 6 mA.
Input (64655S): ACK, acknowledge for STIMULUS line active low, TTL level.
Power consumption: up to 0.25 A max at +5 Vdc.
® Registered, Intel Corporation

8086/8088 Interface Modules

Model 64653A
Model 10269A Option 053

The 8086/8088 Interface is used with a 60-channel HP 64620S Software Analyzer or a 43-channel 1630D Logic Analyzer. Interface software translates the instruction set for trace listings in the processor mnemonics. Trace listings show all bus cycles in MIN mode. In MAX mode, there are two display formats: (1) all bus cycles, or (2) executed instructions only (i.e., prefetched instructions that are not executed are purged at the interface module, preventing the logic analyzer from triggering on these events). User-defined symbols may be incorporated in the address field and operand field for powerful symbolic tracing.

Interface software for Model 64653A interface includes the inverse assembler, and is supplied on a flexible disc.

Software for the 8086/8088 interface for the 1630D Logic Analyzer is included with Option 053 to the HP 10269A interface. Inverse assembler and operational software are supplied on a minicassette cartridge.

Features of the 8086/8088 interfaces include:

- Switch selection for 8086 or 8088 compatibility
- Operates with MIN or MAX mode CPU
- Instructions dequeing in MAX mode.

Specifications

Processor compatibility: compatible with Intel ® 8086 and 8088 and all microprocessors that comply with the specifications of either one of these processors.
Maximum processor clock speed: 10 MHz.
Signal line loading: two LS TTL loads on the CLK line plus approx 40 pF; one LS TTL load plus approx 35 pF for all other monitored lines.
Outputs (64653A): STIMULUS and HALT are LS TTL open-collector, active-low outputs; max sinking current, 6 mA.
Input (64653A): ACK, acknowledge for STIMULUS line actvie low, TTL level.
Power consumption: up to 1.0 A max at +5 Vdc.
® Registered, Intel Corporation

68000 Interface Module

Model 64670A
Model 10269A Option 070

The 68000 Interface is used with a 60-channel HP 64620S Software Analyzer or a 43-channel 1630D Logic Analyzer. Interface software translates the full instruction set for displays in the processor mnemonics. User-defined symbols may be incorporated in the address field and instruction operand field for powerful symbolic tracing.

Interface software for the 64670S interface includes the inverse assembler, and is supplied on a flexible disc.

Software for the 68000 interface for the 1630D Logic Analzyer is included with Option 070 to the 10269A interface. Inverse assembler and operational software are supplied on a minicassette cartridge.

Specifications

Processor compatibility: compatible with Motorola® MC68000 and all other microprocessors that comply with the specificaitons of this processor.

Note: only the lower 20 address bits are monitored by the 1630D Logic Analyzer and the 10269A Option 070.

Maximum processor clock speed: (64620S) up to 8 MHz; (1630D) up to 12 MHz.
Signal line loading: one LS TTL load plus approx 35 pF for all monitored lines.
Outputs (64670A): STIMULUS and HALT are LS TTL open-collector, active-low outputs; max sinking current, 6 mA.
Input (64670A): ACK, acknowledge for STIMULUS line active low, TTL level.
Power consumption: up to 0.4 A max at +5 Vdc.
® Registered, Motorola Corp.

6800/6802 Interface Modules

Model 64672A
Model 10269A Option 072

The 6800/6802 Interface is used with a 40-channel HP 64620A Software Analyzer or a 1630A Logic Analyzer. Interface software translates the full instruction set for trace displays in the microprocessor mnemonics. User-defined symbols may be incorporated in the address field and operand field for powerful symbolic tracing.

Interface software for Model 64672A 6800/6802 Interface includes the inverse assembler, and is supplied on a flexible disc.

Software for the 6800/6802 interface for the 1630A/D Logic Analyzer is included with Option 072 to the HP 10269A interface. Inverse assembler and operational software are supplied on minicassette cartridge.

Specifications

Processor compatibility: compatible with Motorola ® 6800 or 6802 and all microprocessors that comply with the specifications of either one of these processors.
Maximum clock speed: 2MHz
Signal line loading: one LS TTL load plus approx 35 pF for all monitored lines.
Outputs (64672A): STIMULUS and HALT are LS TTL open-collector active-low outputs; max sinking current, 6 mA.
Power consumption: up to 0.8 A max at +5 Vdc.
® Registered, Motorola Corp.

Z8001/Z8002 Interface Modules

Model 64680A/Model 64681A
Model 10269A Option 080
Model 10269A Option 081

The Z8001 Interface is used with a 60-channel HP 64620S Software Analyzer or a 43-channel 1630D Logic Analyzer; the Z8002 Interface may be used with a 40-channel 64620S Analyzer or a 1630D Logic Analyzer. Interface software translates the full instruction set for displays in the processor mnemonics. User-defined symbols may be incorporated in the address field and operand field for powerful symbolic tracing.

Interface software for Models 64680A and 64681A Z8001/Z8002 interfaces includes the inverse assembler, and is supplied on a flexible disc.

Software for the Z8001 and Z8002 interfaces to the 1630A/D Logic Analyzer is included with Option 080 and Option 081 for the HP 10269A interface. Inverse assembler and operational software are supplied on a minicassette cartridge.

Specifications

Processor compatability: compatible with Zilog ® Z8001 and Z8002 and all microprocessors that comply with specifications for either processor.
Note: only the lower 20 address bits of the Z8001 are monitored by the 1630D Logic Analyzer and the 10269A Option 080.
Maximum clock speed: (64620S) up to 6 MHz; (1630A/D) up to 8 MHz.
Signal line loading: one LS TTL load plus approx 35 pF for all monitored lines.
Outputs (64680A, 64681A): STIMULUS and HALT are LS TTL open-collector, active-low outputs; max sinking current, 6 mA.
Input (64680A, 64681A): ACK, acknowledge for STIMULUS line active low, TTL level.
Power consumption: up to 0.5 A max at +5 Vdc.
® Registered, Zilog Corporation

Z80 Interface Module

Model 64683A
Model 10269A Option 083

The Z80 Interface is used with a 40-channel HP 64620S Software Analyzer or a 1630A/D Logic Analyzer. Interface software translates the full instruction set for displays in the processor mnemonics. User-defined symbols may be incorporated in the address field and operand field for powerful symbolic tracing.

Interface software for Model 64683A Z80 Interface includes the inverse assembler, and is supplied on a flexible disc.

Software for the Z80 interface for the 1630A/D Logic Analyzer is included with Option 083 to the 10269A interface. Inverse assembler and operational software are supplied on a minicassette cartridge.

Specifications

Processor compatibility: compatible with Zilog ® Z80 and all other microprocessors that comply with the specifications of this processor.
Maximum processor clock speed: up to 6 MHz.
Signal line loading: one LS TTL load plus approx 35 pF for all monitored lines.
Outputs (64683A): STIMULUS and HALT are LS TTL open-collector, active-low outputs; max sinking current, 6 mA.
Input (64683A): ACK, acknowledge for STIMULUS line active low, TTL level.
Power consumption: up to 0.3 A max at +5 Vdc.
® Registered, Zilog Corporation

General Purpose Interface Module

Model 64651B
Model 10269A Option 100

Interface modules that can be tailored for virtually any microprocessor offer the advantages of a preprocessor even when a processor-specific module is not available for the target processor. Model 64651B Wire-wrapping Interface Module and Model 10269A Option 100 Wire-wrapping Interface Module are identical. The module includes a wire-wrapping printed circuit board, wire-wrapping pins, cable connectors, and design manual. Dual in-line package connectors for your target processor are selected from three options:

Dual In-line Package Connector	HP 64651B Option No.	HP 10269A Option No.
40-pin	010	102
48-pin	011	103
64-pin	012	104

When active circuits are needed to create an effective microprocessor interface, the Microprocessor Interface Kit is recommended. The kit includes additional chip sockets, and wire-wrapping pins. For 64000 System applications, the kit is ordered as Option 001 to the HP 64651B Wire-wrapping Interface Module; for the 1630A/D Logic analyzer, order the kit by adding Option 101 to HP 10269A Option 100.

In either configuration, the interface kits simplify set-up and connections to the target system, and define the probing schemes for repeated logic analysis measurements. An interface design can include qualifications to monitor specified memory transactions, such as I/O or DMA acitivity. Address and data signals can be demultiplexed on the interface board rather than using the logic analyzer resources.

For the 64620S Software Analyzer, there is a software package available to write a custom inverse assembler, Model 64856AF User-definable Inverse Assembly Language software on flexible disc. Adding an inverse assembler adds convenience and efficiency to all logic analysis tasks. Processor instructions and status signals are translated into mnemonics for analyzer state listings for convenience and ease of interpretation.

While there is no user-definable inverse assembler available for the 1630A/D Analyzer, labels and symbols may be entered from the analyzer, in any mode, to identify fields, input groups, and address ranges. The user-defined labels may contain up to five characters.

Specifications

Maximum clock speed: 64651B, up to 10 MHz; 1630A/D, up to 25 MHz.
Outputs (64651B): STIMULUS and HALT are LS TTL open-collector, active-low outputs; max sinking current, 6 mA.
Input (64651B): ACK, acknowledge for STIMULUS line active low, TTL level.
Power consumption: up to 1.0 A max at +5 Vdc.

Minicomputer Interfaces

Minicomputer Interfaces

Three interfaces access minicomputer bus signals:

10275A PDP-11 Unibus ®1 Interface

10276A LSI-11 Q-Bus ®1 Interface

52126A Intel MULTIBUS ®2 Interface.

Active circuits on the boards assure that bus-loading specifications are not exceeded and generate a clock signal for the logic analyzer. In addition, the LSI-11 address and data signals are demultiplexed by Model 10276A. The interface boards plug directly into the minicomputer mainframes.

Switches on each interface board are used to qualify information routed to the logic analyzer or preprocessor by the selected activity type. Any combination of monitored activities may be selected for a logic analysis measurement.

Computer Activity	10275A	10276A	52126A
Reads	X	X	X
Writes	X	X	X
Interrupt vectors	X	X	
DMA transfers	X	X	
Refresh activity		X	
I/O transfers			X

Minicomputer bus activity may be monitored directly from the minicomputer interface boards through individual logic analyzer probe leads. In most applications, it is far more convenient to take advantage of the user-defined interfaces, Model 64650A with Model 64651B interface module installed or Model 10269A Option 100. Bus signal routing can be defined on the interface boards.

Specifications, 10275A

Bus loading: one unit DEC load (type 956, P/N DEC 8640 Bus Receiver) with max 12 pF shunt capacitance at connector; nominally, 6 pF.
Power: 0.9 A at +5 Vdc (nominally 0.55 A), supplied by the minicomputer mainframe.

Specifications, 10276A

Bus loading: one unit DEC load (type 956, P/N DEC 8640 Bus Receiver) with max 12 pF shunt capacitance at connector; nominally, 6 pF.
Power: as an interface, 0.5 A nominal and 0.9 A max; as a terminator, 1.0 A nominal and 1.6 A max; power supplied by the minicomputer.

Specifications, 52126A

Bus loading: 1/2 of a standard TTL load.
Power: 1.3 A max at +5 Vdc, nominally 0.8 A; supplied by the minicomputer.

®1 Registered, Digital Corporation
®2 Registered, Intel Corporation

Ordering Information

Model 64650A General Purpose Preprocessor must be used with an interface module. A microprocessor-specific interface module, Model 646XXA, includes the interface board, the target system probe cable, and a flexible disc containing the inverse assembler and interface software.

Model 10269A Probe Interface also requires an interface module; the interface module is ordered as an option to Model 10269A. Each interface module option includes the interface board, the target system probe cable, and inverse assembly software on a minicassette for HP 82161A Digital Cassette Drive.

Applicable operator and service manuals are included with each preprocessor and interface.

INTERFACE FOR 64620S LOGIC STATE/SOFTWARE ANALYZER

Model 64650A General Purpose Preprocessor — $3140

INTERFACE MODULES FOR 64650A GP PREPROCESSOR

Model 64651B Wire-wrapping Interface Module — $250
- **Option 001** Microprocessor Interface Kit — add $225
- **Option 010** 40-pin Dual In-line Package Connector — add $400
- **Option 011** 48-pin Dual In-line Package Connector — add $460
- **Option 012** 64-pin Dual In-line Package Connector — add $560
- **Model 64856AF User-defined Inverse Assembler** software on flexible disc — $1270

Model 64653A 8086/8088 Interface Module including software — $1210
Model 64655A 8085 Interface Module including software — $860
Model 64670A 68000 Interface Module including software — $960
Model 64672A 6800/6802 Interface Module including software — $1100
Model 64680A Z8001 Interface Module including software — $960
Model 64681A Z8002 Interface Module including software — $960
Model 64683A Z80 Interface Module including software — $860

INTERFACES FOR 1630A/D LOGIC ANALYZER

Model 10269A Probe Interface — $460
- **Option 053** 8086/8088 Interface Module including software — add $1320
- **Option 055** 8085 Interface Module including software — add $960
- **Option 070** 68000 Interface Module including software — add $1060
- **Option 072** 6800/6802 Interface Module including software — add $1100
- **Option 080** Z8001 Interface Module including software — add $1060
- **Option 081** Z8002 Interface Module including software — add $1060
- **Option 083** Z80 Interface Module including software — add $960
- **Option 100** User-definable Interface Module — add $250
- **Option 101** Microprocessor Interface Kit for Option 100 — add $225
- **Option 102** 40-pin Dual In-line Package Connector for Option 100 — add $400
- **Option 103** 48-pin Dual In-line Package Connector for Option 100 — add $460
- **Option 104** 64-pin Dual In-line Package Connector for Option 100 — add $560

MINICOMPUTER INTERFACES

Model 10275A PDP-11 Unibus Interface board — $460
Model 10276A LSI-11 Q-Bus Interface board — $510
Model 52126A MULTIBUS Interface board — $350

U.S.A. List prices only.

5953-9222(D) Data subject to change. **PRINTED IN U.S.A.**

For more information call your local HP Sales Office or nearest Regional Office: Eastern (301) 258-2000; Midwestern (312) 255-9800; Southern (404) 955-1500; Western (213) 877-1282; Canadian (416) 678-9430. Ask the operator for instrument Sales. Or, write: Hewlett-Packard, 1501 Page Mill Road, Palo Alto, CA 94304. In Europe: Hewlett-Packard S.A., 7, rue du Bois-du-Lan, P.O. Box CH-1217 Meyrin 2, Geneva, Switzerland. In Japan: Yokogawa-Hewlett-Packard Ltd., 29-21, Takaido-Higashi 3-chome, Suginami-Ku, Tokyo, 168.