PRÉSERVER
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DOCUMENTATION SUR LE MULTIPROGRAMMEUR HP 6940B

FICHE N° 3878

Période de fabrication : 1950-1974
Fabricant : Hewlett-Packard Company
Domaines : Informatique et Communication, Physique
Sous-domaines : Calculateurs, Electronique, Electricité
Organisme : Université de Rennes
Ville : Rennes
Modèle : HP 6940B
Matériaux : Papier

Description
Il existe plusieurs documentations sur le multi-programmeur HP 6940B conçu par la firme Hewlett-Packard. Elle détaille ses caractéristiques, son fonctionnement, sa programmation ainsi que les nombreux interfaces et appareils qu'il permet de relier entre eux (calculateurs, appareils de mesures électriques et électroniques...). Le catalogue général 1978 de Hewlett-Packard décrit en particulier les différentes cartes d'entrée/sortie disponible en fonction des mesures que l'on souhaite effectuer.

Utilisation
Cet appareil a été utilisé dans un laboratoire d'électronique pour effectuer des recherches. Il était associé à plusieurs instruments de mesures électriques et couplé aussi à un calculateur. Le multiprogrammeur 6940B permettait aux ordinateurs Hewlett-Packard de communiquer avec beaucoup d'appareils ou instruments externes : oscilloscopes, multimètres... On pouvait y connecter jusqu'à 16 instruments en même temps.. En utilisant le multiprogrammeur et les différentes extensions et adaptations, les ordinateurs H.P. pouvaient se connecter jusqu'à 240 instruments externes. Il était possible de traiter jusqu'à 20000 lectures de données par seconde. Des entrées analogiques étaient adaptées à des mesures de tension, courant, résistance, fréquence, temps et des sorties analogiques pouvaient piloter des alimentations, des traceurs de courbes...

2-20 The 6940B/6941B Multiprogrammer System is designed to operate with distances of up to 100 feet between units. Because of this design, programmed delays are required in the 6940B/6941B system software (see paragraph 3-133). Thus, 6940B/6941B units are not compatible with the discontinued 6940A/6941A units. Consequently, B units and A units may not be mixed in a multiprogrammer system. Option 001, however, is available (see paragraph 1-49) which converts the 6940B/6941B units to operate in a 6940A/6941A system. This option allows a customer to purchase replacement or additional units for an existing 6940A/6941A system.

2-21 A system cabling diagram is given in Figure 2-2. This diagram shows an HP computer using a type 12566B Microcircuit Interface I/O card as the programming source, and cable assembly 14540A connecting the I/O card to the 6940B. The jumper connections shown on the Microcircuit Interface card establish the proper computer gate-multiprogrammer flag logic sense relationships and allow the computer to perform a monitor data check without the need for the multiprogrammer system flag to return from the "busy" to the "ready" state. (See the Instruction Manual for the 12566B Microcircuit Interface I/O Card for additional details). Cables of various lengths up to 100 feet maximum, can be purchased from your local Hewlett-Packard field office (see list at rear of this manual for addresses). The 14540A Main Input Cable Assembly can be ordered specifying any length from 12 feet to 100 feet maximum. Data plug P1 is supplied with all 6940B's to enable the user to fabricate his own data input cable, as required.

2-22 Step-by-step cabling procedures are given as follows:

a. Connect data input plug P1 to DATA INPUT connector J1 on the rear of the 6940B.

NOTE

A jumper on data input plug P1 (pin 18 to pin 19) completes the system enable circuit within the 6940B. Plug P1, therefore, must be in place before the multiprogrammer system can be enabled.

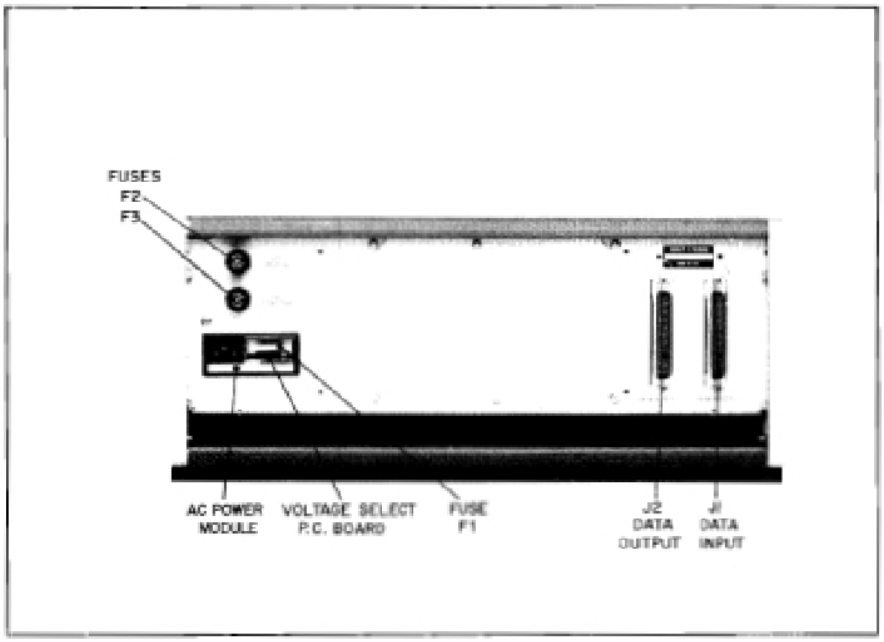


Figure 2-2. 6940B Multiprogrammer, Rear View

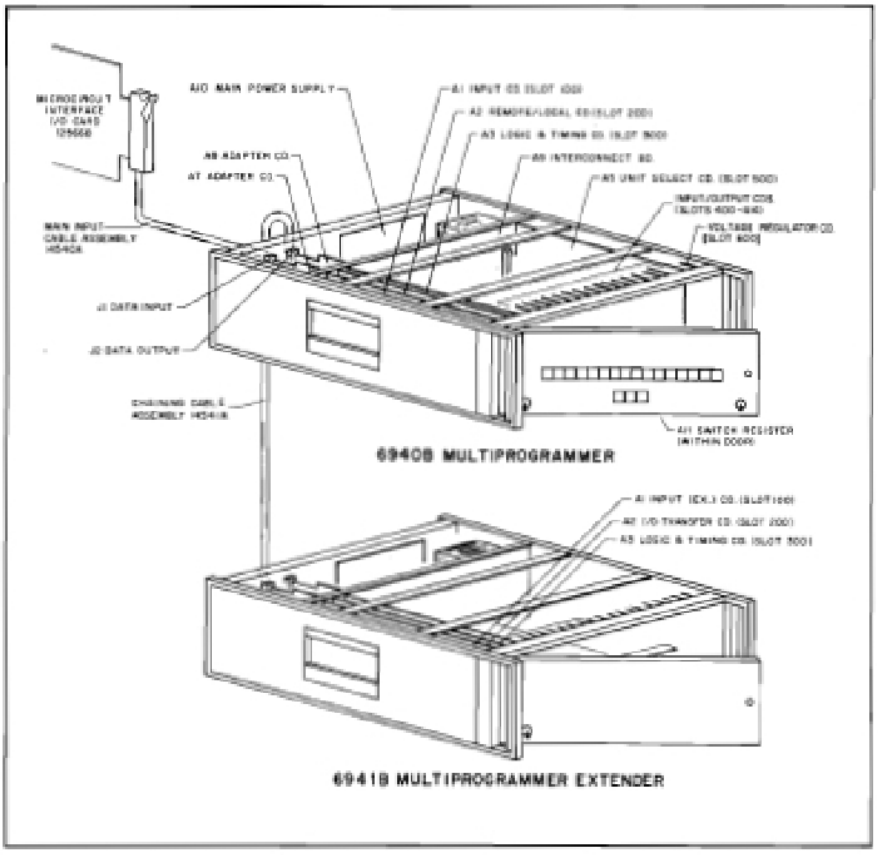


Figure 1-1. System Configuration

1-11. After being properly interfaced, the computer inputs are applied to remote/local card A2, in slot 200. The remote/local card selects either the computer or the local control panel as the programming source and distributes the data to the A3 logic and timing card. In addition, the A2 board distributes bits 12-15 (which contain an address for all programmed words received from the programming source) to the control panel for display. The A2 card also receives bits 0-11 from the A3 card. These bits are either the original programming source bits or are input bits from a multiprogrammer input card depending on the mode of operation in which the multiprogrammer is placed. Bits 0-11 are also applied to the control panel for display.

1-12. In addition to remote/local data selection and data distribution, the A2 card also processes data bit 15 in conjunction with an input request identification control signal which is common to all input cards. If the input mode is selected, the request signal is combined with bit 15 such that the logic sense of bit 15 reflects the data readiness status of an input card. If the input mode is *not* selected, bit 15 reflects the logic sense of bit 15 supplied by the selected programming

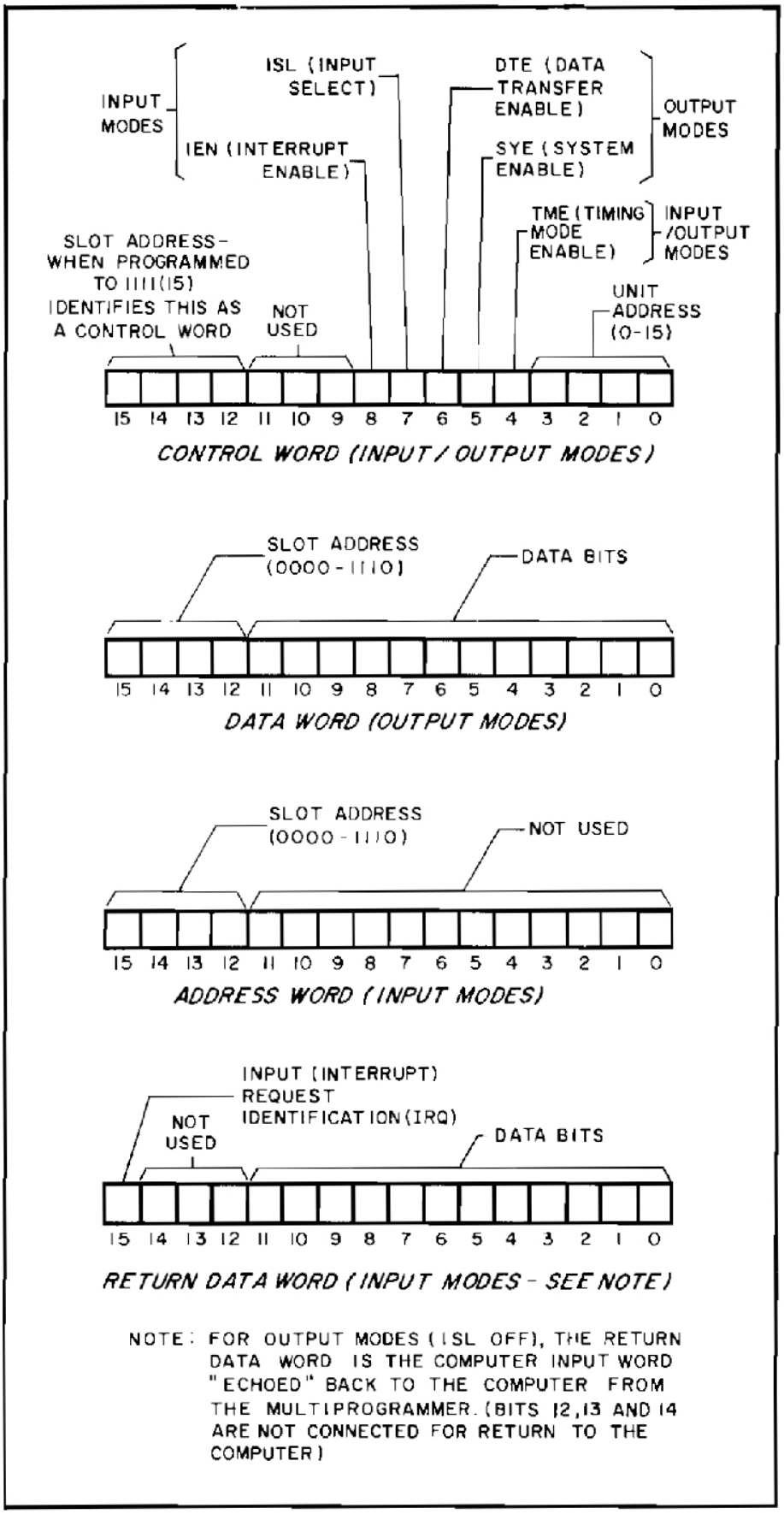


Figure 3-6. Word Formats

MULTIPROGRAMMER
MODEL 6940B

OPERATING AND SERVICE MANUAL

FOR SERIALS 1506A-00106 AND ABOVE *

* For Serials Above 1506A-00106
a change page may be included.

HP Part No. 06940-90005
Microfiche Part No. 06940-90006

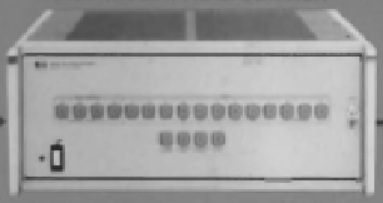
Printed: March, 1975

THE 6940B MULTIPROGRAMMER... YOUR KEY TO SUCCESSFUL AUTOMATIC TEST AND CONTROL

With the 6940B Multiprogrammer, Your HP Desktop or Mini Computer Becomes a Reliable, Easy-to-Use Automatic Test or Control System

HP-IB or 16-Bit Duplex

6940B MULTIPROGRAMMER



RESPONSE

- A/D
- Temperature Measurement
- Pulse Counting
- Frequency Measurement
- Time Interval Measurement
- Event/Alarm Sensing
- Scanning
- Digital Input

STIMULUS

- Voltage & Current D/A
- Stepping Motor Control
- Power Supply Control
- Pulse Output
- Time Base Reference
- Digital Output
- Resistance Output
- Relay Switching

YOUR TEST OR PROCESS

MULTIPROGRAMMER FEATURES

- Digital data storage is on plug-in cards to reduce controller processing overhead.
- Pacing can be accurately controlled internally or externally.
- Functions can be controlled individually or in groups.
- The system can be programmed to a neutral state in case of emergency.
- The controller can be interrupted when digital lines change state.
- All analog inputs and outputs are isolated from data common.

Multiprogrammer: versatile I/O expander & converter

Model 6940B (cont).

6940B Specifications

Front panel controls: Power ON/OFF switch and indicator lamp, REMOTE/LOCAL switch for selecting computer or manual control, 19 proximity switches for manual data entry and control.
Weight: net, 15.9 kg (35 lb). Shipping, 19.5 kg (43 lb).

6941B Specifications

Front panel controls: Power ON/OFF switch and indicator lamp.
Weight: net, 15.2 kg (33.5 lb). Shipping, 18.3 kg (40.3 lb).

Programmable Plug-In Cards

Output Cards

69500A-69506A Resistance Output Cards: Provides a single 12-bit resistance programming channel. The programming coefficients of these models are compatible with HP programmable power supplies equipped with Option 040. Model 69500A is supplied without resistors allowing the user to install his own.
69510A-69513A Resistance Output Cards: Provides two 6-bit resistance programming channels; these models program the current limit of HP power supplies equipped with Option 040.
69321B Voltage D/A Converter Card: Provides a high speed, bipolar output voltage. Output range is from −10.240 to +10.235 V, at 0-5 mA. Conversion speed is 30 μsec maximum to within 5 mV of final value. (69351B voltage regulator also required.)
69330A Relay Output Card: Provides 12 separate form A (SPST, normally open) mercury-wetted contact outputs that reflect the status of 12 programmed data bits. Includes gate/flag circuits for exchange of control signals with user's device.
69433A Relay Output/Readback Card: Provides 12 separate form A (SPST, normally open) mercury-wetted contact outputs. Also supplies 12 input data lines that can be read by the controller and which indicate the relay coil voltage status.
69331A Digital Output Card: Provides programmed microcircuit logic level outputs on 12 separate output lines. Card includes gate/flag circuits for exchange of control signals with user's device.
69332A Open Collector Output Card: Provides 12 open-collector driver outputs. IC buffers on the card act as switches for voltages up to 30 volts dc and currents up to 40 mA.
69335A Stepping Motor Control Card: Used to drive stepper motor and pulse-update type controls. Can be programmed to generate from 1 to 2047 pulse outputs to either of two terminals.
69600B Programmable Timer Card: Can be programmed to generate crystal controlled, one-shot timing pulses. Time increment is variable from 1μs to 40 days.
69380A Breadboard Output Card: This card allows user to design and built a custom analog or digital output card. Card includes basic address, storage and control signal buffer circuits.
69325A-69328A Power Amplifier Control Cards: Provides resistance outputs for controlling the voltage, current and gain of HP Model 6825A-6827A Power Supply/Amplifiers
69601B Frequency Reference Card: Provides six fixed square wave outputs derived from a 1 MHz crystal at frequencies from 1 Hz to 100 kHz.

Input Cards

69421A Voltage Monitor Card: This card monitors bipolar dc voltages in the range of +10.235 to −10.240 V, and returns a 12-bit two's complement digital word to the controller to indicate the magnitude and sign of the measured voltage. Up to 150 conversions per second can be performed as commanded by the program or an external gate input. ±1 V and ±100 V inputs available
69431A Digital Input Card: This card monitors 12 bits of TTL, DTL, or contact closure data from user's device. Card includes gate/flag circuits for exchange of control signals with user's device. Return bits to controller reflect the status of 12 input bits.
69430A Isolated Digital Input Card: This card monitors 12 bits of input daa from user's device. All input lines are isolated from one another and from the Multiprogrammer power supply. Eight options of the card are available to accommodate either ground-true or positive-true logic sense inputs and various input levels.
69434A Event Sense Card: This card compares the magnitude of an external 12-bit input word with a stored reference word and generates a service request for any of four conditions, depending on the placement of a jumper on the card. The four possible conditions are: In = Ref, In ≠ Ref, In > Ref, In < Ref. The reference word is loaded from the controller. Both the input and reference words can be read back to the controller.
69435A Pulse Counter Card: This card counts pulses, up or down, in the range of 0 to 4095. A carry or borrow pulse is generated as the count goes above 4059 or below 0. These pulses allow multiple counter cards to be cascaded for greater counting capability or they can serve as alarm signals. The card can also be used as a pre-set counter
69436A Process Interrupt Card: This card provides TTL and open collector compatible edge detectors; one positive and one negative for each of 12 storage latches. Logic transitions lasting 100 ns or longer are detected, stored, and used to generate a service request to the controller.
69460A Breadboard Input Card: Allows user to design and built a custom analog or digital input card. Card includes basic address and control circuits.

59500A Interface Unit Specifications

Converts the serial ASCII alphanumerics of the HP-IB to the 16-bit parallel format required by the 6940B/6941B Multiprogrammer. The 59500A design is optimized for ease of programming the 6940B/6941B.
Front panel controls: Power ON/OFF switch and indicator. LED's indicate mode and gate/flag status between HP-IB and the Multiprogrammer for system check-out and maintenance.
Cooling Natural convection.
Temperature: 0°C to 55°C operating; −40°C to +75°C storage.
Size: 82.6 H × 425.4 W × 463.6 mm D (3.25" × 16.75" × 18.25").
Weight: 5.4 kg (12 lb).
Power: 100/120/220/240 V ac (selectable) 48–440 Hz, 15 W.

Desktop Computer—Based Multiprogrammers

Unless your automatic system requires the high-speed execution of a computer, there's a good chance you can take advantage of the economy, flexibility, and ease-of-programming offered by a desktop computer-based multiprogrammer. The heart of the multiprogrammer approach to real-time system design is the HP Desktop Computing Controller.

9825A HPL language computing controller: a powerful programmable calculator that features a high-level language particularly suited to controller applications. Designed principally for engineering, research, and statistics use, it has many features previously found only in minicomputers.

A basic system includes an HP desktop computing controller, a 6940B Multiprogrammer, from one to fifteen plug-in I/O cards, and the interfacing accessories of your choice. Model 6941B Extender mainframes and additional I/O cards can be used to further expand the system.

HP-IB Interfacing Accessories

For HP-IB systems, a 59500A Multiprogrammer Interface unit is required, together with the HP-IB interface card associated with your computing controller (98034A card for 9825A controllers).

HP-IB Multiprogrammer Cabling

Computing controller-to-59500A Interface Unit: One HP-IB cable No. 10631 supplied with the controller interface card. Additional 10631 cables can be ordered separately in 1, 2, or 4 metre lengths.

59500A-to-6940B: Standard 18-inch (0.46 m) chaining cable No. 14541A, supplied with 59500A.

6940B-to-6941B: Standard 18-inch (0.46 m) chaining cable No. 14541A, purchased separately. Lengths up to 100 ft (30 m) are available on special order.

Plug-in card-to-users device: 14555A connector provided with most multiprogrammer plug-in cards for user to fabricate own cable.

16-Bit Duplex Interface

The multiprogrammer can also be interfaced directly to a 9825A computing controller using the 98032A, Option 040, controller interface card. The 98032IA, Option 040 includes the basic interface card, a boot, and a cable that comes ready to connect to the 6940B mainframe.

Documentation Package

A complete documentation package is supplied with each purchase, including a User's Guide for the selected desktop computer, a Multiprogrammer User's Guide, and Operating and Service Manuals for the various Multiprogrammer mainframes, plug-in cards, and accessories.

Minicomputer-Based Multiprogrammers

Hewlett-Packard computers are interfaced to most Multiprogrammers with HP Interface Kit 14550A. The kit contains the HP computer-to-6940B cable, verification and driver software, and plug-in cards and cable.

14550A Interface Kit for HP Minicomputers

This kit provides all the equipment necessary to install, verify, and operate a Multiprogrammer with HP 2100 series computers. This kit includes:

1. A specially moffified 12566B card. 16-bit duplex register card that plugs into the HP computer. Hardware manuals, a test connector and a software verification routine for the microcircuit card are provided in the kit.
2. A 14540A Multiprogrammer-to-12556B 12-ft (3 m) cable.)
3. A 69431A Digital Input Card with Option 095, 69331A Digital Output Card. 14550-60001 Slot Verification Cable, and 14910A Complete Diagnostic tape. This equipment is used to completely test the digital paths between the computer and the Microcircuit card, 14540A cable, Multiprogrammer Mainframe, 14541A Chaining Cables, 6491B Multiprogrammer Extenders and each Multiprogrammer plug-in I/O slot. The diagnostic also tests the front panel lamps and proximity switches by interfacing with the operator.
4. Binary object tapes and software operating manuals for BCS, (DOS/DOS-M),/and RTE Multiprogrammer Drivers. Also included is a tape and manual for the BCS Multiprogrammer Library that allows the Multiprogrammer BCS Driver to be used with FORTRAN or ALGOL.
5. Instructions that allow you to completely test the Interface Kit and Mainframes. On-site installation by HP is not included with the kit. The kit is designed to helpyou become familiar with the Multiprogrammer as you install it and verify its operation.

14540A Main Input cable: This 12-ft (3 m) cable connects the Multiprogrammer to the specially Modified Ground Truc 12566B Microcircuit Card. This cable is included in the 14550A Interface Kit.

Common Accessories

The following multiprogrammer accessories are common to all types of interfaces:

14541A chaining cable: This cable connects 6940B to 6941B Mainframes and 6941B to other 6941B's. Cable is 18" long (.46 m).

14533B pocket programmer: The pocket programmer is used to check digital input/output connector J1 of the 6940B. Changes in the switch positions on the pocket programmer are visible on the front panel of the 6940B, and the outputs of the 6940B proximity switches are available at test points on the pocket programmer.

14534A pocket programmer cable: The pocket programmer plugs directly into the 6940B. The 3-foot extender cable allows you to operate the pocket programmer in front of the 6940B.

14551A multiprogrammer service kit: This kit allows rapid troubleshooting of a multiprogrammer system to the plug-in board level to minimize system downtime. The basic kit includes: spare components for 6940B/6941B mainframes and plug-in I/O cards, spare plug-in boards for mainframes, software and hardware necessary to run diagnostic tests on a desktop computer or minicomputer-based multiprogrammer, an extender card, and complete service documentation. If desired, the kit can be expanded in accordance with specific needs of the user.

Condensed Specifications

6940B/6941B Common Specifications

Input/output card positions: Maximum of 15 plug-in input or output cards per mainframe. Hinged front panel provides access.
Mainframe data connectors: Two 50-contact, ribbon connectors.
Data transfer rate: up to 20,000 words/second.
Maximum data resolution: 12 bits per plug-in card.
Accessories furnished: Data Input Plug, PC Board Extender Card.
Cooling: Natural convection.
Temperature: 0°C to 55°C operating, −40°C to +75°C storage.
Size: 172.2 H × 425.4 W × 539.8 mm D (6.78" × 16.75" × 21.25").
Power: 100/120/220/240 V ac (selectable, 48–440 Hz, 230 watts.

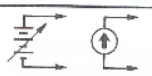
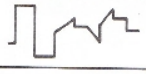
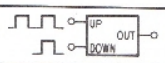
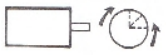
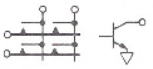
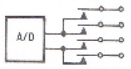
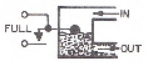
COMPUTATION

Multiprogrammer: versatile I/O expander & converter

Model 6940B (cont.)

- Stimulus
- Measurement
- Control
- Data acquisition

Multiprogrammer I/O card function

	Functions		Applications	Cards Used
STIMULUS		Programmable DC Voltage and Current	The output voltage (up to 100V) and current (up to 1000 A) of thirty-seven different HP power supplies can be programmed to provide bias in automatic test systems or control of electromechanical process equipment.	Resistance Output 69501A-69513A
		Digital-to-Analog Conversion	Twelve bit voltage and current DACs for strip chart, x-y and analog tape recordings as well as control of analog programmable instruments and process control devices with 0-5 volt or 4-20 mA inputs.	Voltage DAC, 69321B; Current DAC, 69330A; Regulator 69331B
		Time and Frequency Reference	One-shot timing pulses, programmable from 1 μsec to 40 days, and crystal-controlled pulse trains in fixed frequencies of 1, 10, 100, 1 K, 10 K, and 100 kHz serve as time base references for control, measurement, and data acquisition.	Timer, 59308B Frequency Ref. 59901B
MEASUREMENT		Voltage, Current and Resistance Measurements	Measure voltages in the presence of 300 V of common mode noise. Connecting a resistor across the input permits current measurements for 4-20 mA current loops used in process control. Combine voltage monitor and current DAC cards for resistance measurements.	Voltage Monitor, 69421A; Current DAC, 69330A; Regulator 69331B
		Frequency Measurements	The pulse counter card accumulates counts over a precise time interval when a programmable timer card is connected to the enable line of the counter. The program divides the count by the time interval to measure frequencies from 200 kHz to 0.001 Hz.	Pulse Counter, 59439A, Timer, 59308B.
		Pulse Counting Preset Up/Down	Counter may be preset to any value within count range of 0 to 4095. The program can examine the counter without disturbing the counting process (read on the fly).	Pulse Counter, 59439A.
		Time Interval Measurement	Elapsed time between two events can be measured in the range of 10 μsec to 1 hour by counting a known frequency over the unknown interval. The program divides the accumulated count by the known frequency to determine the interval.	Pulse Counter, 59439A. Frequency Reference, 59901B
CONTROL		Stepping Motor Control	One output word to card produces from 1 to 2047 square-wave pulses at either of two outputs (CW or CCW) to control motor translators. Output pulses are also used for pulse train update of supervisory control stations.	Stepping Motor Control, 59339A.
		Digital Output and Switching	Twelve bits of data in TTL, open collector, or SPST relay-contact form provide digital control of instruments, indicators, and solid-state AC relays.	TTL, 69331A. Open Collector, 69332A. Relay Out, 69330A. Relay Out/Readback, 69434A.
ACQUISITION		Scanning and Input Multiplexing	Simplex single-ended switches or multi-wire scanner matrices are formed by interconnecting relays on a Relay Output or a Relay Output/Readback Card. The relay output card scanners act as input multiplexers for Voltage Monitor, Pulse Counter, and Digital Input Cards.	Relay Output, 69330B. Relay Output/Readback, 59433A.
		Event Sensing	It is often necessary for a system to respond quickly to alarm conditions, operator intervention or other requests for immediate service. This service request is made via a program interrupt generated by either an event sense or a process interrupt card.	Event Sense, 69436A. Process Interrupt, 69436A.
		Digital Input	Digital input cards accept 12 bits of data from digital measuring instruments, push buttons, switches, relays, and other digital devices in the form of logic levels or contact closures. Digital data sources with more than 12 bits of data use several digital input cards.	Digital Input, 59430A. Isolated Digital Input, 69430A

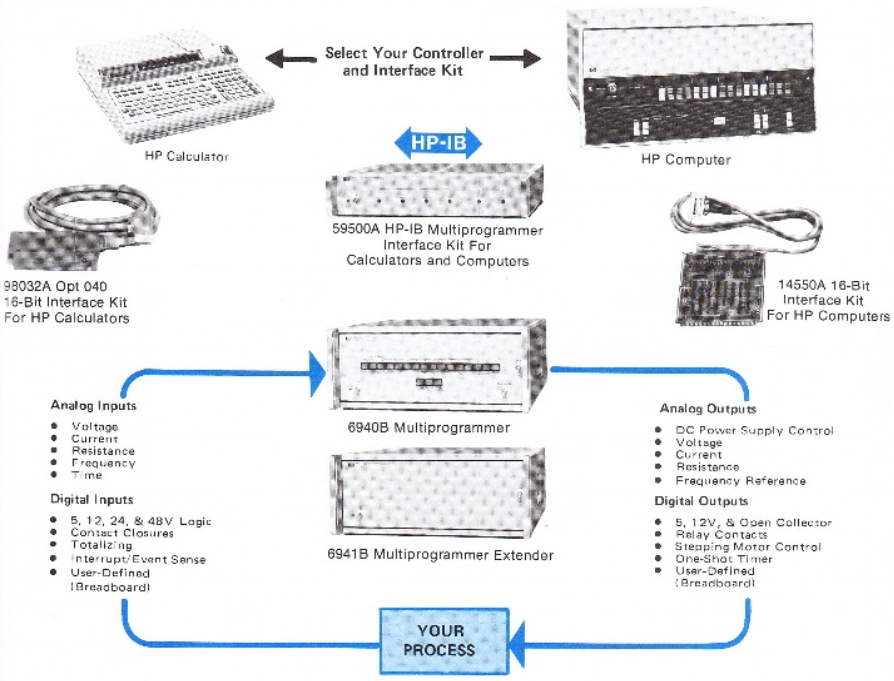
New Multiprogrammer plug-in cards are being developed. Ask your HP Field Sales Engineer for the latest technical data describing all Multiprogrammer products.

COMPUTATION

Multiprogrammer: versatile I/O expander & converter

Model 6940B

• Build Your Own Automatic System



Description

The multiprogrammer is the vital link between a Hewlett-Packard desktop computer or minicomputer and your test or control process. As shown above, multiprogrammer products include interface kits, 6940B and 6941B mainframes, and a family of plug-in cards that provide the I/O capabilities shown above and on the next page.

Each 6940B Multiprogrammer mainframe holds up to fifteen plug-in cards. For additional I/O capability, a chain of up to fifteen 6941B Multiprogrammer Extenders may be cabled to the 6940B Multiprogrammer expanding the maximum capacity of the system to 240 plug-in cards.

Thousands of Multiprogrammers are in use now as part of user-defined-and-assembled systems for production testing and control, data acquisition, process monitoring, life testing, quality control, and component evaluation. Production Engineers find that the Multiprogrammer is a versatile and convenient instrument for industrial measurement and control applications. Additional information for all multiprogrammer products is available in a free, 48-page brochure. Included are detailed specifications as well as applications, programming, and interfacing information. Ask your HP Sales Engineer for publication number 5952-3982, or use card at rear of catalog.

Additional information for all multiprogrammer products is available in a free , 48-page brochure. Included are detailed specifications as well as applications, programming, and interfacing information. Ask your HP Sales Engineer for publication number 5952-3982, or use the card at rear of catalog.

OPERATING AND SERVICE MANUAL

MULTIPROGRAMMER

MODEL 6940B

HEWLETT hp PACKARD

HP 6940B

Pour nous citer :
Base de la Mission nationale de sauvegarde et de valorisation du patrimoine scientifique et technique contemporain, PATSTEC, Documentation sur le multiprogrammeur HP 6940B (Hewlett-Packard Company), https://www.patstec.fr/ressources/objets/detail?id=15896, consulté le 2026-07-28