

A Guide to Selling and Demonstrating the HP-71B

HP-71B — The Heart Of The Solution

You're selling solutions — for applications like production process monitoring . . . portable data acquisition . . . and test instrument control. *With the right equipment*, all these manufacturing applications can be streamlined to increase productivity and profitability. And the right equipment for many of these applications starts with an HP-71B Handheld Computer.

Do your customers need to gather data on their production processes? Do they need low-cost electronic test equipment? Do they need to monitor material usage? Do they have to gather data, such as power consumption, in remote locations?

Whether they want to know if their production processes are within bounds, failing, running out, heating up, consistent, out of control or simply on or off, your customers can get the facts — with the HP-71 as the center of a low-cost HP-IL system.

Make Customers of Customers

Many of your potential HP-71 instrument control accounts are already HP customers. They're in companies where HP's leadership in quality is recognized. Now, the HP-71 extends the line of HP computing power to include a unit that can be easily carried and taken directly to the production line. And, this powerful computer can link to the existing HP networks in your installed customer base.

In This Guide:

This guide highlights the features that make the HP-71B Handheld Computer an ideal solution in the instrument control market. To assist you in your sales presentations, we have also included demonstration tips and sample demo programs.

The HP-71B Handheld Computer In Instrument Control

The HP-71B has the features that are essential in instrument control applications:

- Compact size
- Power of a desktop computer
- Powerful I/O structure
- Easy communication with a supervising system
- Enhanced BASIC programming language

And, the HP-71 has additional features which give you a competitive selling edge in the instrument control market:

- Standard I/O programming features
- 17.5K-byte built-in user RAM (expandable to 128K bytes with 4K-byte HP RAM modules and third-party products)
- 64K-byte built-in operating system ROM (an additional 256K bytes of ROM can be added)
- Four ports that accept any combination of RAM/ROM modules*
- Redefinable keyboard
- Extensive math and statistics capability

For a complete list of features and benefits, refer to the HP-71B Data Book (5954-1320).

If your customer is considering a multi-unit purchase, explain how the HP Custom Products Program can customize HP handheld computer systems and further simplify data entry. With the help of Independent Custom Consultants, HP-IL or the HP-71 itself can be built into your customers' products or equipment. See the Custom Products brochure (5953-5636) and the ICC Capabilities Guide (5954-1257) for more information.

The HP-71B In Action

The HP-71 provides intelligence for inexpensive configurations of equipment in three major manufacturing areas: production process monitoring, low-cost test instrument control and portable data acquisition.

For example, your customers can use the HP 82479A Data Acquisition Pac to tie the HP-71 to the HP 3421A Data Acquisition/Control Unit for instrument control, data acquisition or equipment status reporting.

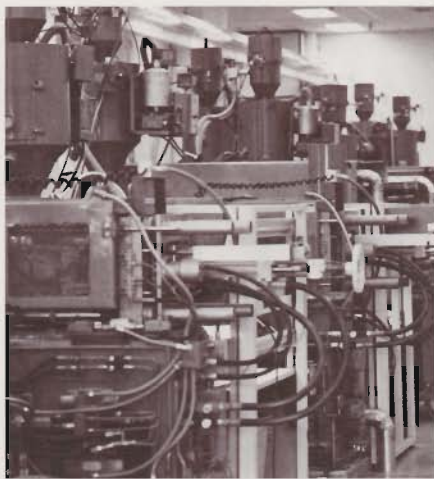
And they can use the HP 82402A Dual HP-IL Adapter to plug two HP 82401A HP-IL modules into the HP-71 simultaneously. Because the HP-71 treats each HP-IL module as a separate interface, it can control instruments and peripherals and send data to a supervisory computer at the same time. This means an HP-71 test node can operate independently of the main HP-IL loop.

In configurations like these, the HP-71 is the local controller, and numerous local nodes can network under the control of a supervisory computer.

*Four ports are available. Therefore, a total of four modules (either ROM, RAM, or a combination of both) may be inserted at a time.

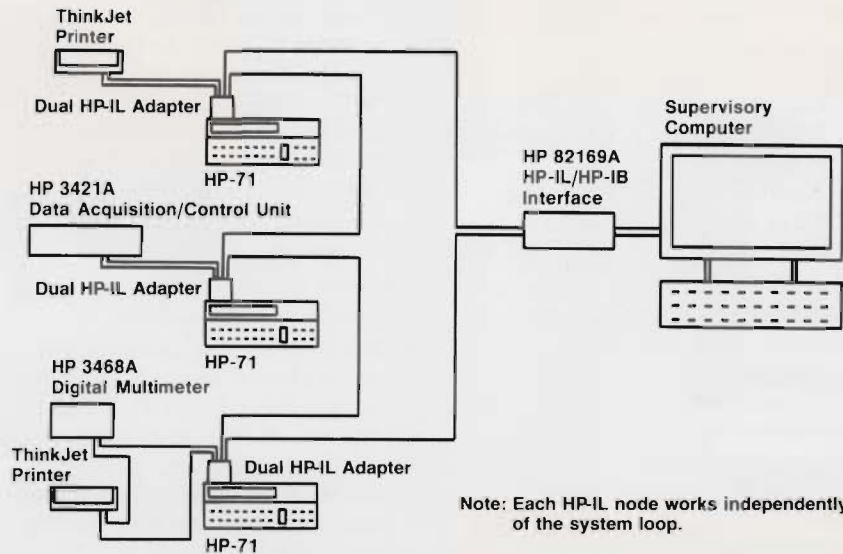
Production Process Monitoring Applications

- Production process monitoring in a plastic molding shop. Each plastic molding machine is linked via an HP-IL interface to an HP-71. The HP-71 monitors and calculates parts produced, cycle time, parts left to produce, and the amount of material needed to complete the job. Operators become more productive as manual record keeping is reduced. Product quality is improved, production is increased through improved yields — and the manager spends more time managing the shop and less time worrying about quality.
- Weighing loaves of bread on a digital scale. An HP-71 is linked, via HP-IL interfacing, to a digital scale. Sample loaves of bread are weighed. The HP-71 is used to gather data and provide statistical analysis on that data. Corrective action can be taken immediately if weights are out of tolerance. This small, low-cost system eliminates operator error.



An HP-71 is used at each machine in a plastic molding shop. Operators enter part dimensions using electronic measuring tools, and HP-IL ties the system together so the shop manager can check each machine's output at a glance.

Test and Process Monitoring System



- Production process monitoring on a disc drive assembly line. An HP-71 is used to monitor failures in the final assembly process. The HP-71 is programmed to:
 - Run statistics on the number of failures, based on a moving average
 - Analyze data for each disc drive to see if the process is in control

The HP-71 calculates statistics such as averages and standard deviations. Line trends are immediately available so changes can be made on the spot to improve production line performance, shut down out-of-control processes and determine appropriate corrective action.

Test Instrument Control Applications

- Testing loaded printed circuit boards before power supplies are installed. An electronics technician tests for idle and active current, oscillator frequency and keystroke simulation.

The technician uses a test fixture powered by an HP 3421A Data Acquisition/Control Unit that is controlled, via HP-IL, by an HP-71 with a Data Acquisition Pac plugged into one of its I/O ports. The HP-71 configures the HP 3421A to run a sequence of tests on the PC board.

Following each test, the HP-71 displays "good" or "failed" and the cause of the failure. These results are immediately available to be printed or sent to a supervisory computer.

- Calibrating digital timers. An HP-71 and frequency counter, connected by HP-IL, are set up on an assembly line. As the operator adjusts the system frequency, the HP-71 provides data which can be used to determine whether or not the timer is working properly. Operator error is eliminated, and the small, low-cost system increases productivity.

Portable Data Acquisition Applications

- Determining the cause of a high rate of electric motor failures in a factory. An HP-71/HP 3421A data acquisition system is set up to collect, store and perform statistical analysis on line voltage data. The analyzed information is immediately accessible. The portable system can be set up at the source of the problem. And it provides speed and accuracy of electronic measurement that would be impossible to obtain manually.
- Monitoring the strain on a conveyor belt carrying sand. Because the weight of loads of sand varies, the strain on the conveyor belt is continually monitored using an HP-71. When the strain is too high, the conveyor is shut down. The result is longer life for belts, and reduced down-time — saving time and money.

Networking The HP-71B

Up to 30 HP-71s can be networked and connected to a supervisory computer.

The supervisory computer takes the data from each workstation and combines it into an overview of the entire line. Line trends are tracked, historical data are gathered and information is passed to other stations.

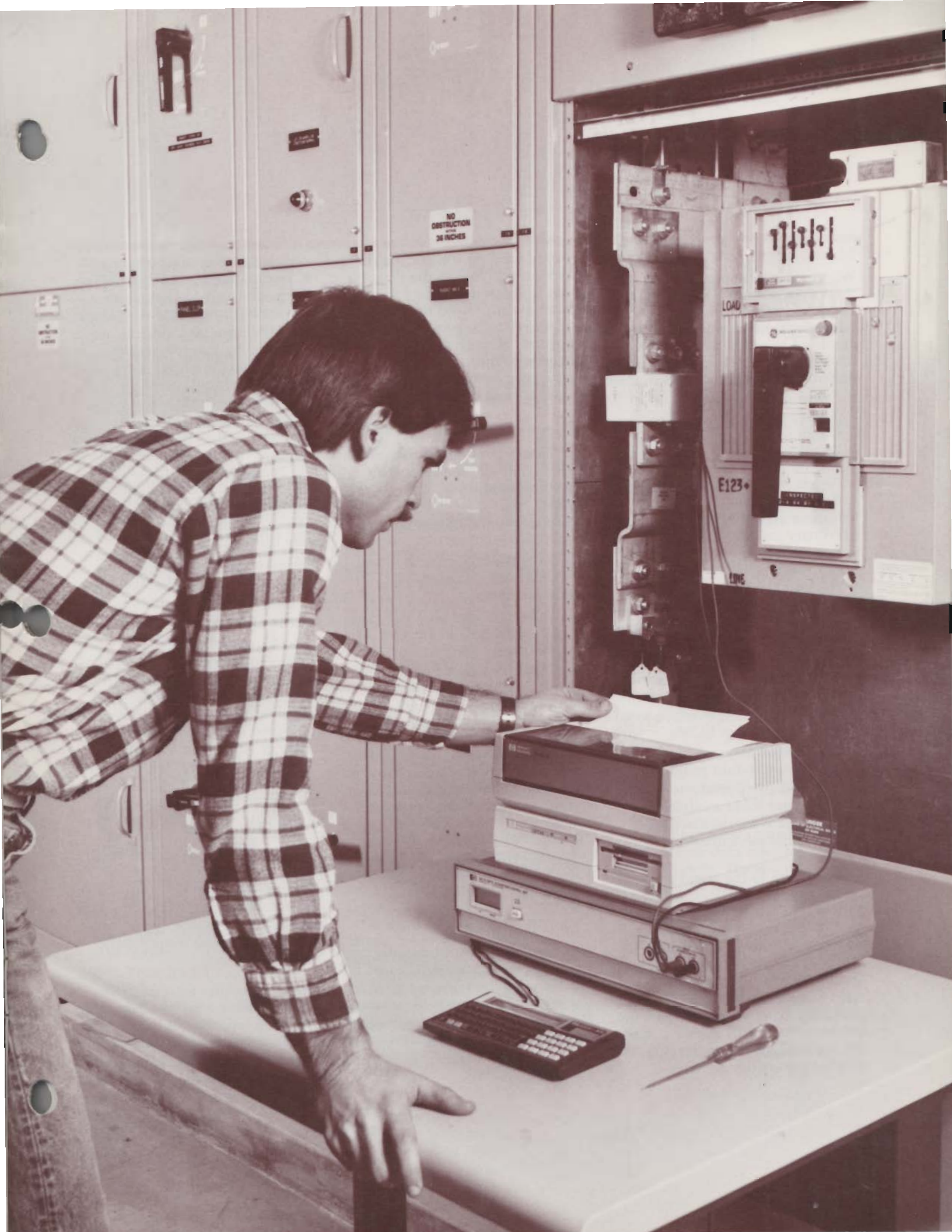
HP-IL allows fast, easy expansion of this type of HP-71 system. Using HP-IL, systems can be conveniently modified to meet production needs.

You can picture similar scenarios with HP-71B Handheld Computers in portable data acquisition, production process monitoring, and test instrument control applications.

For more information on HP-71 industrial applications, see the following application notes and data sheets:

- Using the HP-71 for Production Process Monitoring (5954-1316)
- Low-cost Production Testing and Instrument Control (5954-1317)
- Networking HP-71s to a Supervisory Computer (5954-1312)
- Dual HP-IL Adapter Data Sheet (5954-1311)
- HP-71 Data Acquisition Pac Data Sheet (5954-1310)

The HP-71, HP 3421A Data Acquisition/Control Unit, HP 9114A Portable Disc Drive, and ThinkJet Printer provide a complete, portable data acquisition system.



NO OBSTRUCTION
36 INCHES

LOAD

E123+

LINE

Identifying Potential Customers

Where do you find customers with these types of applications? Manufacturers in the industries listed below are your best bet. Industries are listed in order, with those having the highest potential for dollar volume sales at the top:

- Electronics
- Aerospace
- Utilities
- Petroleum
- Chemical
- Petrochemical
- Pulp and paper
- Rubber and plastics
- Primary metals
- Transportation
- Pharmaceutical

The best starting point for all control applications is your installed base of HP customers. Tell them about HP's Custom Products Program. Your customers get:

- Custom ROM modules for their unique applications
- Custom keyboard overlays to go with their custom ROMs
- Magnetic cards for storing custom application programs

And third-party products such as EPROMs and RAM modules provide quick, inexpensive solutions to OEM customization challenges.

In addition to the stand-alone advantages of the HP-71, sell the networking capability. Look for control applications in your present customer accounts where handheld computers can save time and money and increase productivity.

ICCs can help you sell by providing expertise on customizing and installing HP-71 systems. You sell the hardware, and the ICC handles the custom services.

For non-HP customers, the HP-71 is a low-end "foot in the door." It provides high technology to customers who need that technology to be competitive, but who can't afford more expensive systems. As these companies grow, they'll keep coming back to you for more sophisticated equipment.

Selling Points

Purchasers of portable distributed digital control systems look for these features, listed in order of priority:

- Service, configuration flexibility, and repeatability
- Ease of maintenance, system stability, and accuracy of computations
- Reputation, advanced technology, ease of installation, cost, and warranties

Tell your customers about HP's Service Support Agreement program. OEMs and VEUs get a 10 percent discount for Support Agreements on 100 or more units. This is in addition to an already low agreement price that is less than one third of the standard repair charge. For more information, contact the Calculator Service Center at 503-757-2000.

See the HP-71 Control Systems Price List for information about service, service contracts and costs.

About HP-IL

The Hewlett-Packard Interface Loop is powerful and easy to use. It is a bit-serial interface designed for low-cost battery-operable systems. HP-IL allows the HP-71 (and other computers) to control instruments,

serve as a system controller capable of transmitting and receiving data, and perform a wide variety of information management functions.

In HP-IL systems, devices are connected by two-wire cables leading from the output port of one device to the input port of the next, until all devices form a closed loop.

The HP 82402A Dual HP-IL Adapter ties the HP-71 into a primary HP-IL loop while allowing it to control instruments and peripherals on a second, independent loop.

HP-IL provides a unique capability through:

- Auto address assignment
- Device capability identification
- Power ON/OFF control
- Error checking
- Hold-until-ready protocol

Auto addressing means HP-IL enables the controller to assign addresses automatically. So your customer does not need to be concerned about address assignments or conflicting addresses.

The device identification feature allows software to determine what devices are on the loop and take appropriate actions. This frees your customer from the necessity of knowing the address of each device on the loop.

The power ON/OFF control conserves batteries, while automatic error checking assures your customer that data is accurately transferred.

HP Computer Museum
www.hpmuseum.net

For research and education purposes only.

The hold-until-ready protocol assures that fast and slow devices can operate in the same HP-IL system.

HP-IL Is An Alternative To HP-IB

HP-IL is not intended as a replacement for HP-IB, but rather as a low-cost, low-power alternative.

Although HP-IB and HP-IL serve the same basic function, they differ in many respects.

1. Because of HP-IL's lower power consumption, it is usable with portable, battery-powered systems. Generally, HP-IB is not.
2. HP-IL system components will generally be low cost and have moderate performance; HP-IB system components are at the medium- to high-end of the performance spectrum and generally cost more.
3. HP-IL systems work at relatively low data rates compared to HP-IB, and relatively high data rates compared to RS-232C. For example, the HP-71 is capable of transmitting at speeds of 5K to 6K bytes per second (which is equivalent to 50,000 to 60,000 baud on RS-232C). Maximum data rate is not dependent on HP-IL cable length (see HP-IL Transfer Rate section).
4. HP-IL allows device separations of up to 100 meters with shielded, twisted pairs (10 meters with zip cord). HP-IB requires extender hardware for long distance connections.

HP-IL Transfer Rates

HP-IL transfer rates are dependent on both the slowest active device, and the number of devices on the loop. Each data byte must pass through each device. A small delay is associated with each idle device that retransmits the byte. Therefore, the net delay increases slightly for each device added to the loop.

| Device | Data Rate (bytes/second) | Condition |
|----------|--------------------------|---|
| HP-71 | 8K 6.4K 4.5K 4K | HP-71 copying to a loop (no devices on the loop) HP-71 copying in a file OUTPUT statement; no formatting (USING) ENTER statement; no formatting (USING) and version 1B of the HP-IL module |
| 82164A | Up to 1.9K | Completely dependent on RS-232C baud rate once the buffer is full. 300 baud is .03K bytes per second; 19,200 baud is 1.9K bytes per second. |
| 82169A | 2.7K 3.0K | Passing data from HP-IL to HP-IB in Translator Mode Passing data from HP-IB to HP-IL in Translator Mode |
| 82161A | 250 | Reading or writing data to the tape |
| 82162A | 24 | Printing data once the buffer is full |
| ThinkJet | 150 | Printing data once the buffer is full |
| 9114A | 6K | Maximum sustained transfer rate |

| Device | Data Rate (readings/second) | Condition |
|--------|-----------------------------|--|
| 3421A | 10 3 | DC volts, 3½ digits, auto zero off, different channels DC volts, 5½ digits, auto zero off, different channels |

Each device that needs to process the byte holds it for a certain length of time. For example, a 300-baud modem allows the bytes to go around the loop only as fast as it can send them out. So the effective HP-IL speed will be 30 bytes (characters) per second when the modem is active. Some additional software delays also may be experienced if the data byte coming into a device just misses a software loop and has to wait for the software loop to get back to it.

The above tables provide a guideline on data rates for some HP-IL devices. These data rates represent the speeds at which the devices effectively process the data, i.e., take a data byte from HP-IL and send it out on RS-232C, or write it to a file (within the limitations noted above).

Demonstrating the HP-71

You've identified the instrument control customers in your area and reviewed selling points and HP-IL. Now here are some tips and demonstration ideas that will help you make a strong HP-71B presentation.

HP-71B Features and Benefits

Since many people are not familiar with the features and capabilities of a handheld computer, open your presentation of the HP-71 with a discussion of the key features and benefits of the product. Be sure to point out:

- Battery operation (continuous memory)
- Powerful BASIC language (including statistics)
- Timer and clock
- User-definable keyboard
- CALC mode for powerful calculations
- Four plug-in RAM/ROM ports
- 64K bytes of built-in operating system ROM (an additional 256K bytes of ROM can be added)
- 17.5K bytes of built-in RAM (expandable to 33.5K bytes by adding four 4K-byte RAM modules or 128K bytes with third-party products)
- Optional HP-IL interface; links to GPIO, RS-232C, and HP-IB; wide range of HP-IL peripherals

Refer to page one of this guide and to the HP-71 Data Book for details and additional product features.

Emphasize the portability of the battery-operated HP-71, and point out the associated advantages to the control segment of the market:

- Easy configuration at the plant and local levels

- Easy expansion and contraction of the number of loops
- Easy maintenance
- Easy to build in redundancies
- Offers computing capability with complete mobility
- Rugged design holds up under steady use in the factory

Next, point out the data communication options. The HP-71 can communicate with a host computer either by modem or direct interfacing over RS-232C lines. The HP 82168A Acoustic Coupler can be used over telephone lines. The HP 82164A HP-IL/RS-232C Interface can be used to link directly to other mainframes or personal computers. Use the HP 82488A DataComm ROM to provide a user-friendly software pac to facilitate this link.

Getting Started

As you turn the HP-71 on for an actual product demonstration, explain that the product runs continuously for up to 60 hours on batteries.

The HP-71 is as easy to program as it is to use. Simply enter the BASIC language statements on the HP-71 keyboard.* The program will be automatically stored in CMOS RAM. No "store" or "load" commands are required.

HP-IL Basics

Programming instruments such as the HP 3421A Data Acquisition/Control Unit with the HP-71 requires that the HP 82401A HP-IL Interface be installed in the HP-71. This module provides the I/O keywords you are probably already familiar with, like ENTER USING, OUTPUT USING, TRIGGER, and SEND.

Be sure the HP-71 is turned off before connecting or disconnecting the interface and cable connections. Follow the instructions for installing the HP 82401A in the HP-71 found in section 1 of the HP 82401A manual. The connection of HP-IL peripheral devices is also described in the manual. The devices may be connected in any order, as long as there is one continuous loop. After you have connected them to the HP-71, turn on all the HP-IL devices first. Then turn on the HP-71.

The HP 82401A manual describes six different ways for you to identify HP-IL devices: address, assign code, device word, device ID, accessory ID, and volume label. See the HP 82401A manual for more information.

Entering a Program

To enter a program on the HP-71:

1. Give the program name. Enter: EDIT 'PGMNAME'
2. Get ready to enter program lines by requesting automatic line numbers. Type: AUTO
3. The automatic line numbering will start with line 10. Enter your program, pressing after each line.
4. The program is automatically stored in CMOS RAM. (No store command is required.)
5. Press to return to EDIT mode.
6. To run the program, type: RUN 'PGMNAME' If 'PGMNAME' was the last program edited or run on the HP-71B, you can simply press the key to execute the program.

*Refer to HP-71/HP Touchscreen and HP-71/HP 2392A Terminal Development Station application note (5954-1274) for alternate methods of developing HP-71 programs.

Demonstration Programs



The following programs (except Setting the HP-71 Clock) are available on 3½" disc, magnetic card, or cassette tape at a cost of \$15.00. Specify media type when you order part number 71-03421 from:

Hewlett-Packard
Users' Library, Dept. 39UL
1000 N.E. Circle Blvd.
Corvallis, OR 97330

Setting the HP-71B Clock

The HP-71 had a built-in clock and calendar that runs whether the HP-71 is on or off.

To display the date and time, enter the following:

1. DATE\$
2. TIME\$

If the time or date is incorrect, you may correct either one by entering the following:

1. SETDATE "YY/MM/DD"
 (where YY is year, MM is month, and DD is day)
2. SETTIME "HH:MM:SS"
 (where HH is hour [24 hour clock], MM is minute, and SS is second)

HP-71/HP 3421A System Demo

The HP-71/HP 3421A is a low-cost, high-performance data acquisition system that allows your customer to measure temperature, pressure, level and flow. The typical system with 24 input channels and 6 output channels outlined below costs less than \$4,500!*

| | |
|---|---------|
| ■ HP-71B (with HP 82401A HP-IL Interface) | \$ 650 |
| ■ HP 3421A (with three Opt. 020) | 2,440 |
| ■ HP 9114A Disc Drive | 795 |
| ■ HP 2225B ThinkJet printer | 495 |
| | \$4,380 |

See Product Note 3421A-2 for numerous example programs using the HP 3421A with the HP-71 Handheld Computer.

Required Equipment:

- HP-71B (with HP 82401A HP-IL Interface)
- HP 3421A demo box
- HP 3421A (with one multiplexer, Opt. 020)

Recommended Equipment:

- HP 9114A Disc Drive
- HP 2225B ThinkJet printer

Instructions:

Install Opt. 020 in slot 0 of the HP 3421A. Install the breadboard card from the demo box in slot 1 of the HP 3421A.

Type: EDIT DEMO and press on the HP-71. Then, enter the program lines that follow.

To start the demo program, type: RUN DEMO and press . The program will read temperature on channel 7, pressure on channel 8, and frequency on channel 9 of the

HP 3421A. The results will automatically be printed and stored. The HP 3421A will turn itself off, and wake up 30 seconds later and repeat the process until ten scans have been completed.

While the demo is running, you can place your hand on the demo box hot plate to raise the temperature, increase the pressure using the tire pump, and change the frequency by spinning the wheel.

Some other useful commands are:

- Type: PLIST DEMO3421
 (prints out the demo program)
- Type: COPY DEMO3421 TO:MASSMEM
 (copies demo to disc)
- Type: COPY DEMO3421:MASSMEM
 (copies demo from disc to HP-71)

Note: The demo program will purge the data files each time you run the program (line 130). If you are using a new disc to store the data, you may have to initialize the disc first (type: INITIALIZE :MASSMEM).

The highlighted program lines included in this demo can be used for adapting the demo for use with the HP 82479A Data Acquisition Pac. The Data Acquisition Pac adds over 40 new BASIC language keywords and nine BASIC language programs for controlling the HP 3421A.

This program will not work with demo boxes received after August, 1985. For those demo boxes, use the program on the demo note included with the box.

*U.S. prices

| Program code for adapting demo to Data Acquisition Pac | Line # | Program Statement | Explanation |
|--|--------|--|--|
| | 10 | ! | Demo for HP-71B to HP 3421A |
| | 20 | DIM A(10,3),T\$(10),I1\$[70],I2\$[50] @ J=1 @ CFLAG 1 | |
| | 30 | RESTORE IO @ ON ERROR GOTO 'DISPLAY' | |
| | 40 | PRINTER IS :PRINTER @ B\$="PRINT" @ GOTO 'OFF' | If printer is present, assign printer. |
| | 50 | 'DISPLAY' : B\$="DISP" | Printer not there, so display. |
| | 60 | 'OFF': OFF ERROR | |
| | 70 | IF DEVADDR("MASSMEM")=-1 THEN M\$=":MAIN" ELSE M\$=":MASSMEM" | If disc is present use it, else RAM. |
| | 80 | GOSUB 'PURGE' | |
| | 90 | GOSUB 'CREATE' | |
| | 100 | ! | Main routine that logs the data. |
| USE 3421 | { | 110 D=DEVADDR("HP3421A") 120 ON TIMER #1,30 GOTO 'START' 130 'START': ! 140 T\$(J)=TIME\$ | |
| A(J,1)=TCOUPLE ("T",DCVOLTS(7),REFTEMP(7)) | { | 150 OUTPUT :D ;"TEM7" 160 ENTER :D ;A(J,1) 170 PRINT #1;A(J,1) | |
| A(J,2)=OHMS2(8) | { | 180 OUTPUT :D ;"TWO8" 190 ENTER :D ;A(J,2) 200 PRINT #2;A(J,2) | |
| A(J,3)=FREQ(9) | { | 210 OUTPUT :D ;"FRQ9" 220 ENTER :D ;A(J,3) 230 PRINT #3;A(J,3) 240 PRINT #4;T\$(J) 250 GOSUB B\$ | Print or display results. |
| | | 260 J=J+1 @ IF J=11 THEN 'EXIT' 270 BYE 280 'EXIT': | Ending routine. |
| | | 290 OFF TIMER #1 @ CFLAG 1 300 IF B\$="PRINT" THEN PRINT CHR\$(12) 310 ASSIGN #1 TO * @ ASSIGN #2 TO * 320 ASSIGN #3 TO * @ ASSIGN #4 TO * 330 END | |
| | | 340 'PURGE': | Subroutine to purge existing files. |

| Line # | Program Statement | Explanation |
|--------|---|--|
| 350 | ON ERROR GOTO 'EXIT1' | Return if files do not exist. |
| 360 | SFLAG -1 | Trap warning for RAM-based files. |
| 370 | PURGE 'TEMP'&M\$ @ PURGE 'PRES'&M\$ | |
| 380 | PURGE 'FREQ'&M\$ @ PURGE 'TIME'&M\$ | |
| 390 | 'EXIT1': OFF ERROR @ CFLAG -1 @ RETURN | |
| 400 | 'CREATE': | Subroutine to create data files. |
| 410 | CREATE DATA 'TEMP'&M\$,5 @ ASSIGN #1 TO 'TEMP'&M\$ | |
| 420 | CREATE DATA 'PRES'&M\$,5 @ ASSIGN #2 TO 'PRES'&M\$ | |
| 430 | CREATE DATA 'FREQ'&M\$,5 @ ASSIGN #3 TO 'FREQ'&M\$ | |
| 440 | CREATE TEXT 'TIME'&M\$,5 @ ASSIGN #4 TO 'TIME'&M\$ | |
| 450 | RETURN | |
| 460 | 'PRINT': | Print routine if a printer is on the loop. |
| 470 | IF FLAG(1) THEN 'PNEXT' | Do not print header again. |
| 480 | I1\$ = '2x,"Time",5x,"Temp (Deg C)",5x,"Pres (PSI)",5x,"Flow (Freq)'' | |
| 490 | PRINT USING I1\$ @ SFLAG 1 | |
| 500 | 'PNEXT': ! | |
| 510 | I2\$ = "8A,5x,ddd.dd,10x,ddd.dd,10x,dddd" | |
| 520 | PRINT USING I2\$;T\$(J),A(J,1),A(J,2),A(J,3) | |
| 530 | RETURN | |
| 540 | 'DISP': | Display routine if printer is not on loop. |
| 550 | DELAY 1,.5 | |
| 560 | DISP "Time is ";T\$(J) | |
| 570 | DISP "Temp (Deg C) = ";A(J,1) | |
| 580 | DISP "Pressure (PSI) = ";A(J,2) | |
| 590 | DISP "Flow (Freq) = ";A(J,3) | |
| 600 | RETURN | |

Modem Demo

This demo provides an example of how the HP-71 and Hayes Smartmodem can be used to transfer data over phone lines.

Required Equipment:

- HP-71B Handheld Computer
- HP 82401A HP-IL Interface
- HP 82164A HP-IL/RS-232C Interface
- Hayes Smartmodem 1200 (comes with a power cord, patch cord and AC adapter)
- One serial cable, female to male connection (standard 25 pin configuration)
- HP-IL Cables (2)
- HP 82059D AC Adapter
- Telephone line with an RJ11 jack

Instructions:

Connections

Configure the HP-IL/RS-232C interface as a DTE terminal (refer to pages 22 and 23 of the HP-IL/RS-232C interface owner's manual for specific instructions).

Plug one end of each HP-IL cable into the HP-71 and the other ends into the HP-IL/RS-232C interface.

Plug the RS-232C cable into the HP-IL/RS-232C interface and the Hayes Smartmodem.

Connect a phone line to the modem.

Plug one end of the HP AC adapter into a 110V wall outlet and the other end into the HP-IL/RS-232C interface. Do the same with the Hayes AC adapter.

Running the Demo

Enter the following program into the HP-71 by typing: EDIT
DEMOHAYS **ENDLINE**

To start the demo, press the **RUN** key on the HP-71. To halt the program, the **ON** key may need to be pressed several times.

When the program is running, it will prompt for a name and then call the Infolink system at Corvallis, OR. The program will then send the name to Infolink, disconnect, wait two minutes, then re-dial and send more data to Infolink.

The time between calls can be changed by pressing **FETCH** 110 and changing the 140 seconds to any value of your choice.

To change the phone number, press: **FETCH** 150 **ENDLINE** If tone dialing cannot be used, change the DT to DP. If a 9 or other number must be used to get an outside line, separate it from the phone number with a comma.



| Line # | Program Statement | Explanation |
|--------|--|--------------------------------------|
| 10 | DESTROY ALL @ RESTORE IO | |
| 20 | DELAY 1.5,.2 @ OPTION BASE 1 | |
| 30 | DIM R\$(200) @ B=0 @ N=1 | |
| 40 | A = DEVADDR("HP82164A") | |
| 50 | IF A=-1 THEN DISP "Modem not found" @ GOTO 'END' | |
| 60 | REMOTE | |
| 70 | OUTPUT :A ;"SB6;C0;P0;SS0;SW1;EE0;SE0;R0;R1" | Initialize RS-232C. |
| 80 | LOCAL | |
| 90 | INPUT "Your Name: "; "John Doe"; N\$ | |
| 100 | 'TIMER': | Main Loop. |
| 110 | ON TIMER #1,140 GOTO 'CALL' | Change this line to change timer. |
| 120 | BYE | |
| 130 | 'CALL': OFF TIMER #1 | |
| 140 | DISP 'Dialing HP Infolink...' | |
| 150 | OUTPUT :A ;"AT DT 1,503,7521167 " | The phone number is here. |
| 160 | WAIT 20 | |
| 170 | 'RECEIVE': | Look for connection to Infolink. |
| 180 | ENTER :A USING "#,K";R\$ | |
| 190 | IF R\$="" THEN 'RECEIVE' | |
| 200 | IF NOT POS(R\$,"CONNECT") THEN 'BUSY' | |
| 210 | DISP "Connect" @ T=1 | |
| 220 | DISP "Sending ";N\$&STR\$(N) | |
| 230 | OUTPUT :A ;N\$&STR\$(N)&CHR\$(13) | Send to Infolink. |
| 240 | OUTPUT :A ;"OFF"&CHR\$(13) | Terminate Infolink. |
| 250 | GOSUB 'DISC' | |
| 260 | IF N#4 THEN N=N+1 @ GOTO 'TIMER' | |
| 270 | DISP "Three sets of data" | |
| 280 | DISP "containing your name" | |
| 290 | DISP "have been sent." | |
| 300 | DISP "Demo is concluded." | |
| 310 | DISP "Thank-you." | |
| 320 | 'END' : | Clean up and quit. |
| 330 | CFLAG -23 @ DELAY .5,.125 @ DESTROY ALL | |
| 340 | END | |
| 350 | 'BUSY' : | Infolink is busy, hang up the phone. |

| Line # | Program Statement | Explanation |
|--------|--|--------------------------------------|
| 360 | GOSUB 'DISC' | |
| 370 | DISP "Infolink Busy" | |
| 380 | IF T#4 THEN DISP "Will try again" @ T=T+1 @ GOTO 'TIMER' | |
| 390 | DISP "for third time." | |
| 400 | DISP "Please try later." | |
| 410 | GOTO 'END' | |
| 420 | 'DISC' : | Disconnect and hang up the phone. |
| 430 | WAIT 5 @ OUTPUT :A ;"+" ; @ OUTPUT :A ;"+" ; @ OUTPUT :A ;"+" ; | |
| 440 | WAIT 5 @ OUTPUT :A ;"ATH" @ WAIT 5 | |
| 450 | REMOTE @ OUTPUT :A ;"R0;R1;" @ LOCAL | Clear RS-232C buffers. |
| 460 | RETURN | |

HP-71/HP Touchscreen Terminal Development Station (HP-71 "KEYBOARD IS")

This demo shows how the HP Touchscreen computer can be used as a terminal in HP-71 program development. For comprehensive information, refer to the HP-71/HP Touchscreen and HP-71/HP 2392A Terminal Development Station (HP-71 "KEYBOARD IS") application note (5954-1274). The complete program is included on media available from the Users' Library. See the beginning of the Demonstrations section for details.

Required Equipment:

- HP-71B Handheld Computer
- HP 82401A HP-IL Interface
- HP 82441A FORTH/Assembler ROM *or* 00071-90097 Software Developers' Handbook*
- HP Touchscreen Computer
- HP 82164A HP-IL/RS-232C Interface
- HP 82059D AC Adapter/Recharger
- Two HP-IL cables
- One serial cable, female to male connection (standard 25-pin configuration)

Hardware Configuration:

HP-IL/RS-232C Interface

Configure the HP-IL/RS-232C interface as a DCE terminal.

Terminal Configuration:

Touchscreen

To configure the Touchscreen to the appropriate terminal configuration, change XmitFnctn(A) to **(Yes)** from "System Defaults." For "Port1 Config," change Baud Rate to **(9600)**, Parity to **(None)**, Data Bits to **(8)**, and EnqAck to **(No)** from "System Defaults." (NOTE: Always press **(f1)** "Save Config" after corrections have been made.) Be sure an **"**"** is in the lower right corner of the "Remote Mode" block.

After configuring the Touchscreen, run the KBD150 program on the HP-71 by typing the following (assuming the program has been entered into the HP-71 either by hand or by a mass storage device):
RUN KBD150 **[ENDLINE]**
This program configures both the HP-71 and the terminal.

When you are finished with this demo, be sure to type the following on the HP-71:

```
Delay .5,.125 [ENDLINE]  
CFLAG(-21) [ENDLINE]  
Reset escape [ENDLINE]  
Keyboard is* [ENDLINE]  
Display is Display [ENDLINE]
```


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