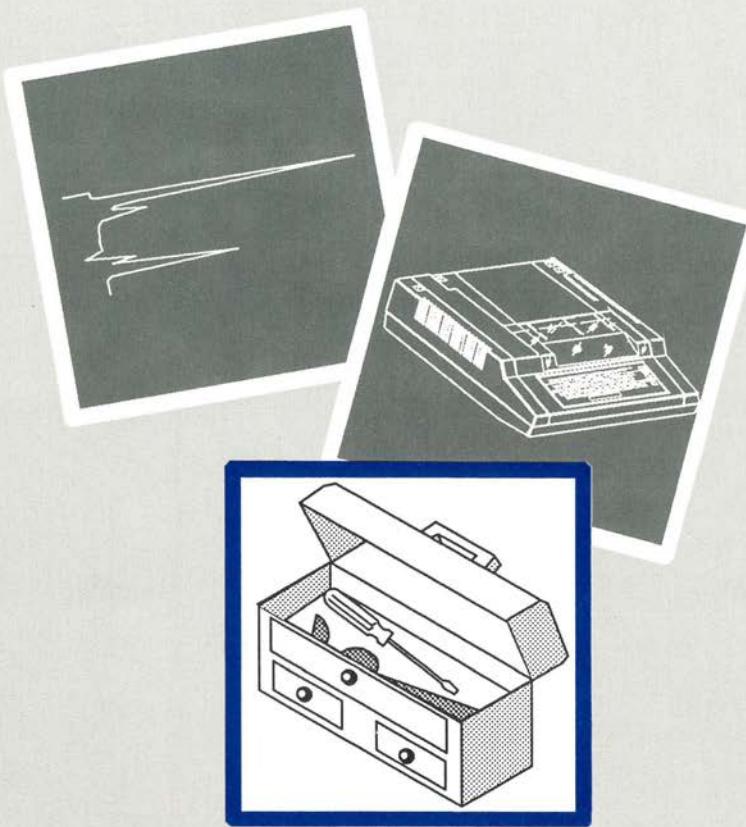


HEWLETT-PACKARD



HP 3396 Series II Integrator Installation and Service Manual

PLEASE FILL OUT BY USER AND MAIL.

**HP 3396 Series II
Installation & Service
Part Number 03396-90245**

What is your major application of the product described in this manual?

How long have you been using this product?

Just received 1-3 months 3-6 months 6-12 months Over 1 year

How often do you refer to this manual?

Daily Weekly Monthly Seldom Never

What was your level of integrator knowledge before you began using this manual?

None Just beginning Some experience Experienced Expert

Please indicate your agreement (or disagreement) with these statements:

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
--	----------------	-------	---------	----------	-------------------

- The manual contains the information I need.
- The information is easy to find.
- The information is accurate.
- The instructions are easy to understand.
- The manual contains enough examples.
- The examples are appropriate and helpful.
- The manual format and size are about right.
- The illustrations are clear and helpful.

Please feel free to write additional comments. Use additional sheets if you wish—the more detailed your comments, the more helpful they are to us.

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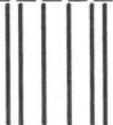


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Installation and Service

HP 3396 Series II Integrator



Manual Part No.
03396-90245

Edition 1, June 1990
Printed in USA

Printing History

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First edition—June 1990

Printed in USA

Safety Information

The HP 3396 Series II is an International Electrotechnical Commission (IEC) Safety Class 1 instrument. This unit has been designed and tested in accordance with recognized safety standards.

Whenever the safety protection of the HP 3396 Series II has been compromised, disconnect the unit from all power sources and secure the unit against unintended operation.

WARNING

A WARNING CALLS ATTENTION TO A CONDITION OR POSSIBLE SITUATION THAT COULD CAUSE YOU OR OTHERS INJURY.

CAUTION

A Caution calls attention to a condition or possible situation that could damage or destroy the product or your work.

Important User Information for In Vitro Diagnostic Applications

This is a multipurpose product that may be used for qualitative or quantitative analyses in many applications. If used in conjunction with proven procedures (methodology) by a qualified operator, one of these applications may be in vitro diagnostic procedures.

General instrument performance characteristics and instructions are included in this manual. Specific in vitro diagnostic procedures and methodology remain the choice and the responsibility of the user and are not included.

RFI Certification for the Federal Republic of Germany

Manufacturer's Declaration

This is to certify that the equipment **HP 3396 Series II** is in accordance with the Radio Interference Requirements of Directive FTZ 1046/1984. The German Bundespost was notified that this equipment was put into circulation and the right to check the series for compliance with the requirements was granted.

Herstellerbescheinigung

Hiermit wird bescheinigt, daß das Gerät/System

HP 3396 Series II

in Übereinstimmung mit den Bestimmungen von Postverfügung 1046/84 funkentstört ist.

Der Deutschen Bundespost wurde das Inverkehrbringen dieses Gerätes/Systems angezeigt und die Berechtigung zur Überprüfung der Serie auf Einhaltung der Bestimmungen eingeräumt.

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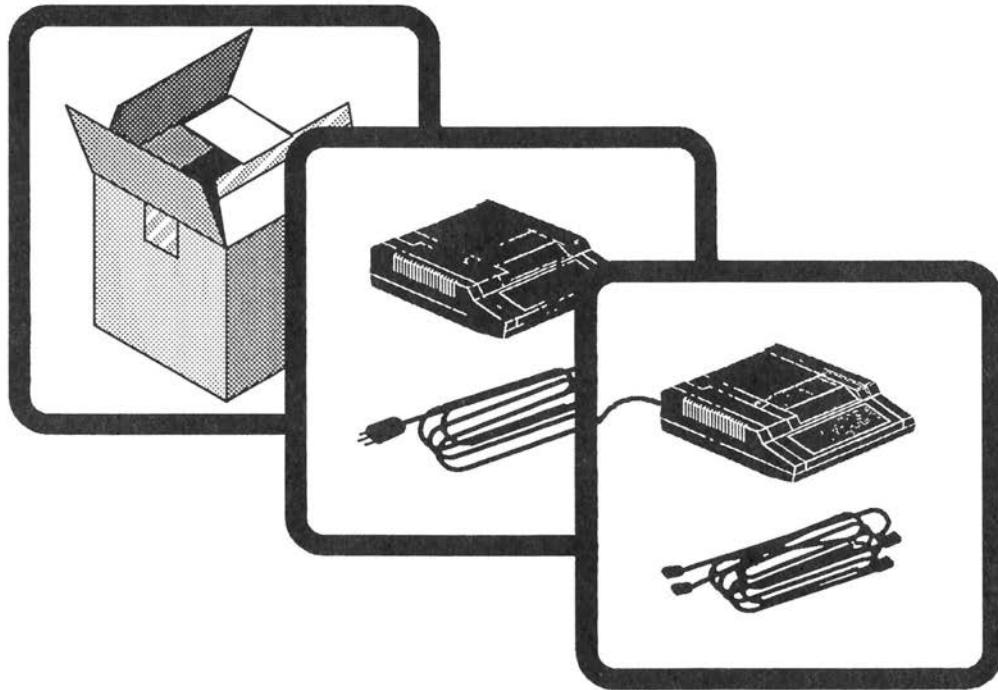
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Part 1

Installation

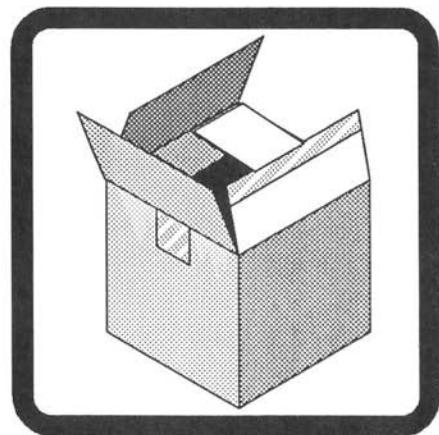


In Part 1....

- Chapter 1: Preinstallation Checklists
- Chapter 2: Installing the Integrator
- Chapter 3: Cable Connections



Preinstallation Checklists



In this chapter....

- Site Requirements
- Unpacking and Inspecting Your Unit
- Recording Important Numbers

Site Requirements

The HP 3396 Series II Integrator is designed for laboratory use. Ensure that the intended operating environment for your integrator meets these requirements:

- The atmosphere is free of corrosive chemicals.
- The temperature remains between 10° and 40°C (50° to 104°F) while the unit is operating.
- The relative humidity is between 10 and 90% noncondensing.
- A surface area about 46 cm wide by 46 cm deep (about 18 by 18 inches) exists for the unit, and about 46 cm (18 inches) exists above the unit.
- The power line meets the following specifications:

Line voltages:	115 or 230 V ac (+15 to -22%)
Line frequency:	48 to 66 Hz

(The HP 3396 Series II consumes a maximum of 50 VA.)

Refer to Appendix A for complete HP 3396 Series II specifications.

Unpacking and Inspecting Your Unit

- Verify that you have received all shipped containers by checking the carrier's papers.
- Inspect the exterior of the shipping container(s) for physical damage and watermarks. If damage or water is indicated, immediately contact your carrier (retain the carton and all packing materials for the carrier's inspection).
- Open the integrator box; remove the manual set and miscellaneous components from inside the container and set all of these aside.
- Unpack the HP 3396 Series II Integrator and inspect it for damage. If you detect damage, contact your nearest Hewlett-Packard Sales and Service Office.
- Unpack any other containers.

Recording Important Numbers

In any verbal or written correspondence with Hewlett-Packard concerning your integrator, you will need to know the following information:

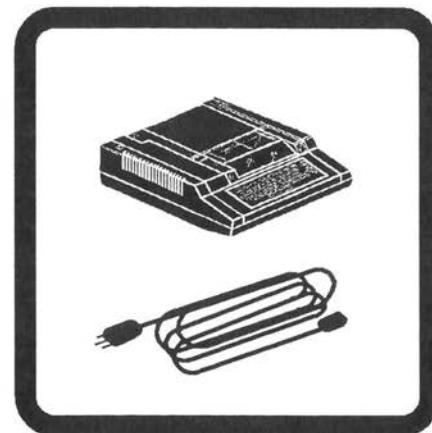
Instrument Model Number: HP 3396B

Instrument Name: HP 3396 Series II Integrator

Instrument Serial Number:

Take a few minutes now to fill in the empty box above. The instrument's serial number can be found on the rear of the integrator.

Installing the Integrator



In this chapter....

- Installing Paper Assemblies
- Installing Print Cartridges
- Loading Paper
- Applying Power and Running the Self Test

Before installing the paper assemblies, print cartridge, or loading paper, open the printer window.

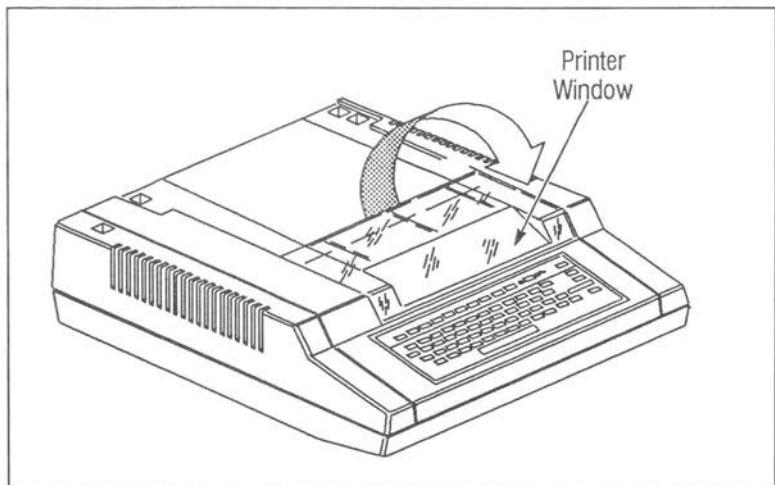


Figure 2-1. The Printer Window

The printer window is opened by lifting its rear edge upward and forward toward the front of the integrator.

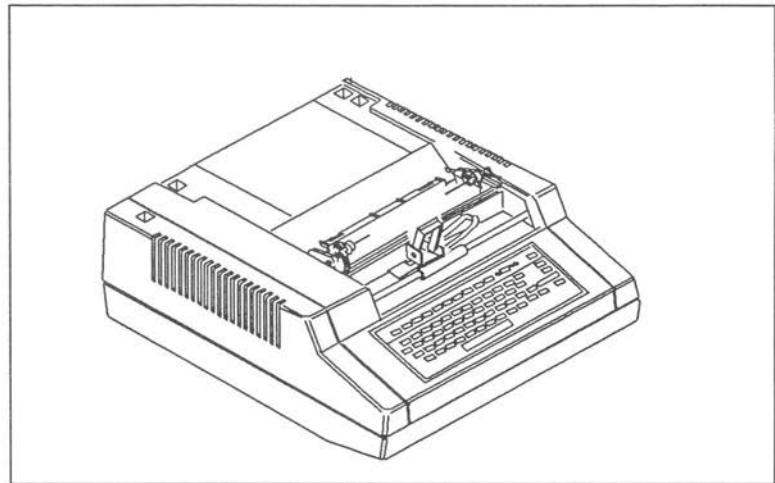


Figure 2-2. The Window Open

The window can, if necessary, be removed completely. Squeeze the two hinged ends, disengaging one end from its axis tab, and then lift the window away from the integrator.

Installing Paper Assemblies

Two forms of dispensing paper are available for the HP 3396 Series II Integrator: the standard roll of paper, which has its assembly supplied in all units, and the z-fold paper, which can be ordered as an option.

To maintain the high reliability of the printer mechanism, use only the recommended paper and print cartridges listed in chapter 8 of this manual.

Installing the Roll Paper Mechanism

From the integrator package, remove:

- 2 paper-roll holder brackets
- 1 paper-roll rod
- 1 roll of inkjet paper

You may also want to remove the paper separator at this time, for installation later.

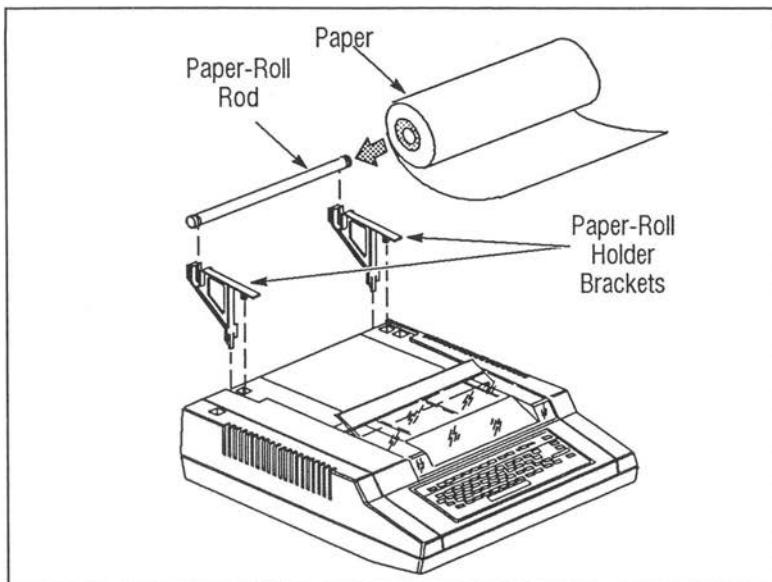


Figure 2-3 . Roll Paper Mechanism

Snap the two paper-roll holder brackets into the appropriate slots on the top rear of the integrator.

Unwrap the roll of paper. Check that the edges of the roll are flat and even, and that no slack exists in the roll.

Insert the paper-roll rod through the paper roll.

Position the roll of paper so that it unrolls from beneath the roll, towards the front of the unit (see Figure 2-3). Mount the rod and paper on the brackets.

Installing the Z-Fold Paper Mechanism

From the accessory package, remove:

- 1 pack of z-fold paper
- 1 paper stand

You may also want to remove the paper separator from the integrator package at this time, for installation later.

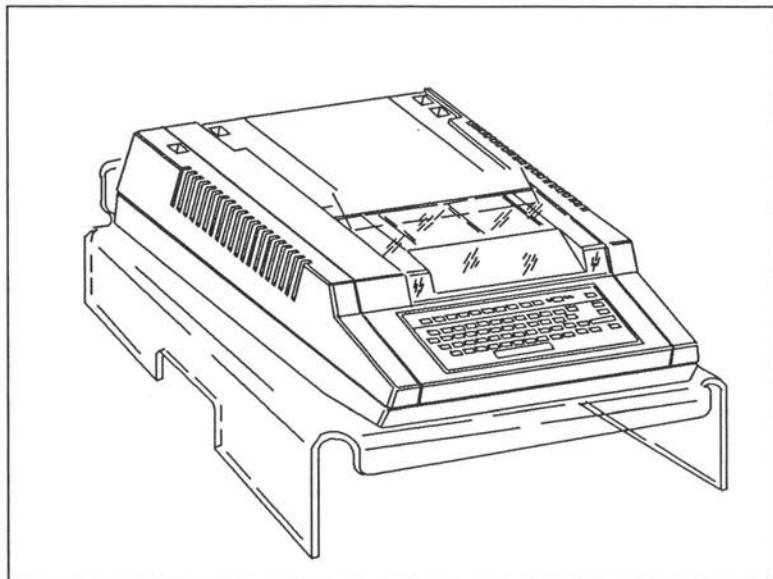


Figure 2-4. Z-Fold Paper Stand

Unwrap the pack of paper.

Lay the top sheet of paper (with the "PRINT THIS SIDE" facing *down*) on flat top surface of the integrator.

Position the pack of paper inside the stand so that it unfolds from the top of the pack and around the rear of the integrator and stand.

The pack of paper will have to temporarily be moved later when connecting cables. However, using doing this now will assure proper paper loading.

Installing the Paper Separator

The paper separator is used with both the roll paper and the z-fold paper.

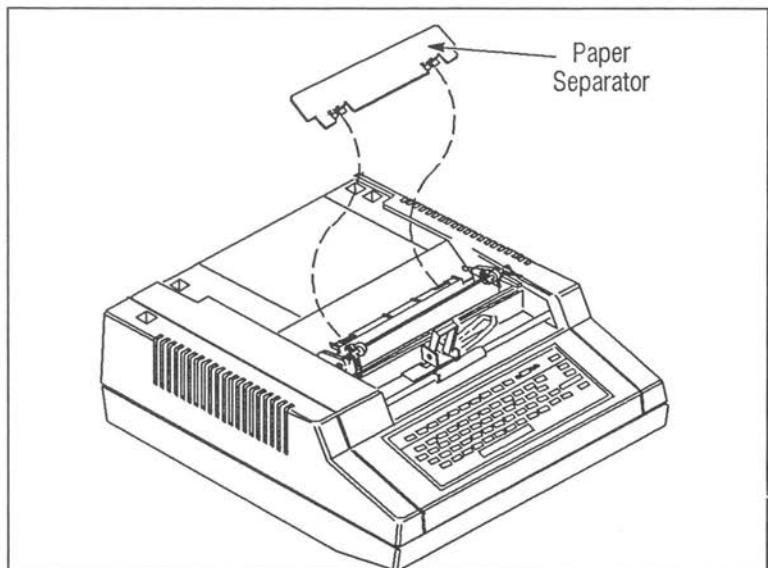


Figure 2-5. Installing the Paper Separator

Insert the tabs at the bottom of the separator into the slots in the printer mechanism.

Installing Print Cartridges

Check the expiration date stamped on the bottom of the print cartridge container. Be certain that the expiration date has not yet been reached.

WARNING

THE INK IN THE PRINthead CARTRIDGE CONTAINS DIETHYLENE GLYCOL, WHICH IS HARMFUL IF SWALLOWED. KEEP NEW OR USED CARTRIDGES OUT OF REACH OF CHILDREN.

If the printer window is not already open, open it now.

Remove the print cartridge and the blotter from the container, taking care not to touch the face of the cartridge. (The blotter is stored under the clear plastic disk at the bottom of the container.)

Installing the Blotter Pad

When you turn on the integrator, ink is sprayed on the blotter to clear the printhead. Blotters are provided with each print cartridge and should be replaced each time the cartridge is replaced.

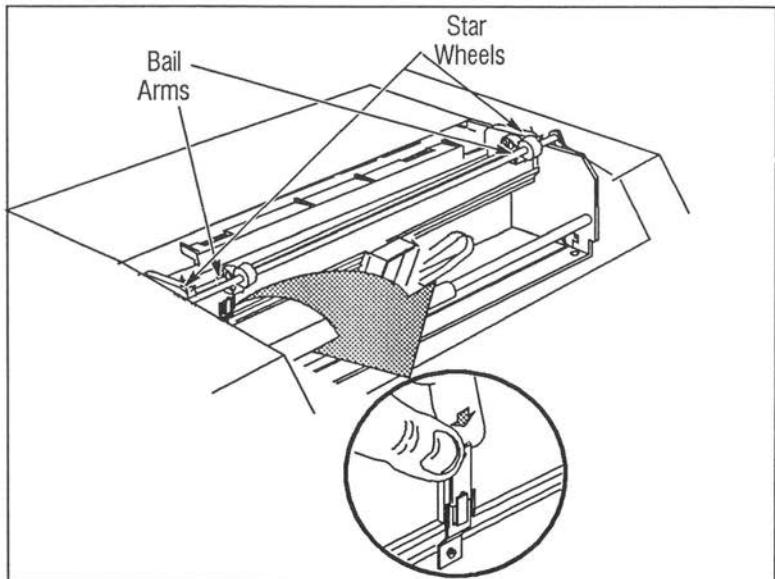


Figure 2-6. Inserting Blotter Pad

Insert the blotter into the holder as shown below, making sure that the stiff-coated side of the blotter faces the back of the printer.

Priming the Print Cartridge

Prime the print cartridge by gently pushing the end of a straightened paper clip or similar object about 1/4 inches (6 mm) into the hole in the rear of the print cartridge.

CAUTION

Be careful. Excessive force will puncture the bladder!

Gently push the ink bladder until a drop of ink appears on the face of the cartridge.

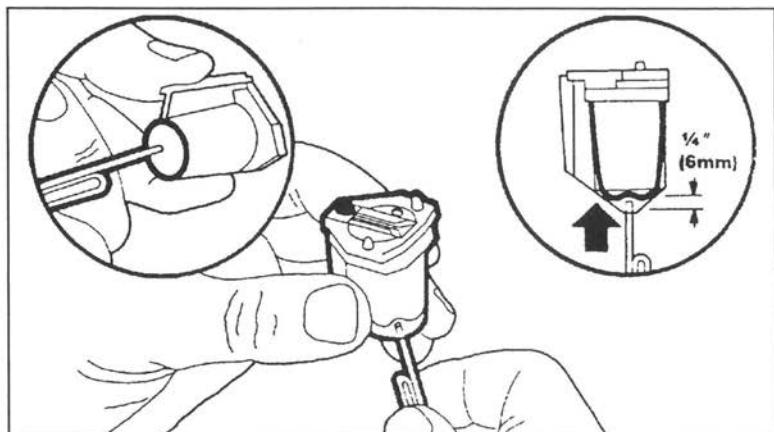


Figure 2-7. Priming the Print Cartridge

Wipe the print cartridge face with a soft cloth or lint-free tissue.

Inserting the Print Cartridge

Pull the carriage cradle latch all the way down, as shown in circle 1 of the figure below.

Set the print cartridge in the cradle (the action labelled 2 below).

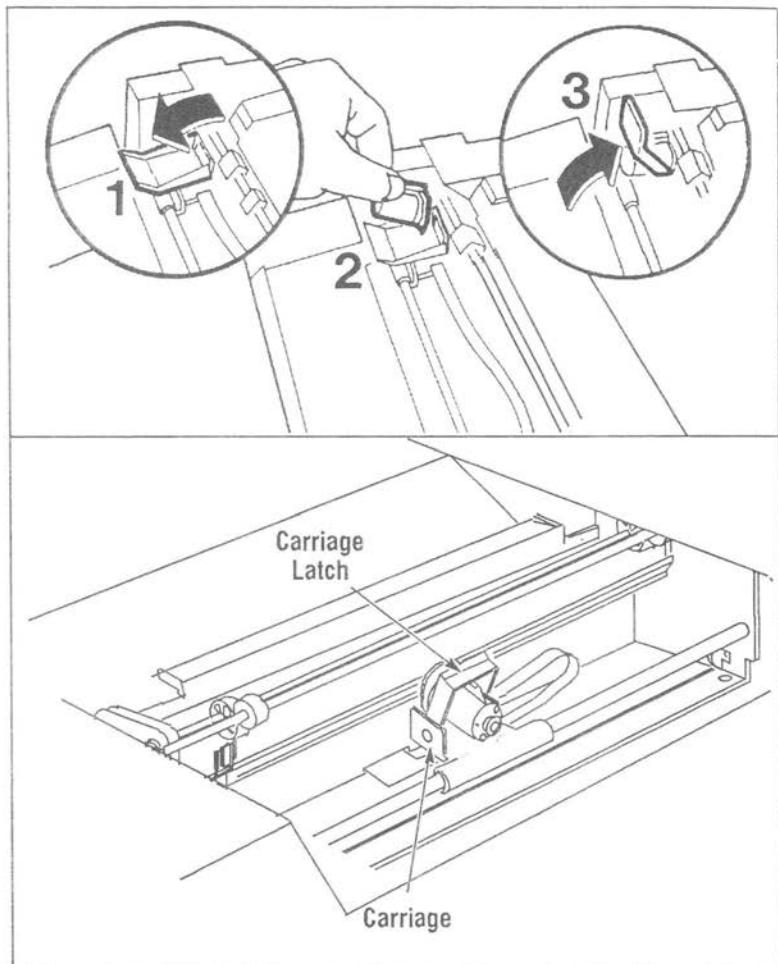


Figure 2-8. Inserting the Print Cartridge

Push the cradle latch up to lock the print cartridge in place (as shown in circle 3).

Loading Paper

The paper should be positioned on the top flat surface of the integrator with the PRINT THIS SIDE facing down against the surface. After rotating around the roller, the PRINT THIS SIDE will be correctly facing up.

Pull both bail arms forward to their open positions.

Slide the paper into the slot under the paper separator. (It may be helpful to pull the paper separator forward temporarily until the paper is inserted.)

Push the paper under the roller until its edge passes above the bail arms.

Align the holes in the left edge of the paper with the sprockets of the left pin wheel.

If necessary, adjust the right pin wheel to the width of the paper. It can move sideways to accommodate for minor differences in paper widths.

Align the holes in the right side of the paper with the sprockets of the right pin wheel.

Be certain that the paper is straight and that both sides are even.

Push the bail arms back to their closed positions, locking the paper in position against the roller.

Close the printer window.

Verify that the paper's PRINT THIS SIDE is correctly positioned on the side of the paper toward the print cartridge.

Applying Power and Running the Self Test

If other instruments are to be connected to the HP 3396 Series II, see their installation instructions before attempting to apply power to the integrator.

WARNING

THE POWER CORD MUST BE CONNECTED ONLY TO A LINE POWER SOURCE WITH A PROTECTIVE EARTH CONTACT. DO NOT USE AN EXTENSION CORD, POWER CABLE, OR PLUG ADAPTER WITHOUT A PROTECTIVE EARTH (GROUNDING) CONDUCTOR.

First, ensure that voltage shown on the line voltage selection switch at the rear of the instrument matches the intended power source.

Verifying the Voltage Setting

Locate the line voltage selection switch on the rear panel of the integrator above the power cord receptacle.

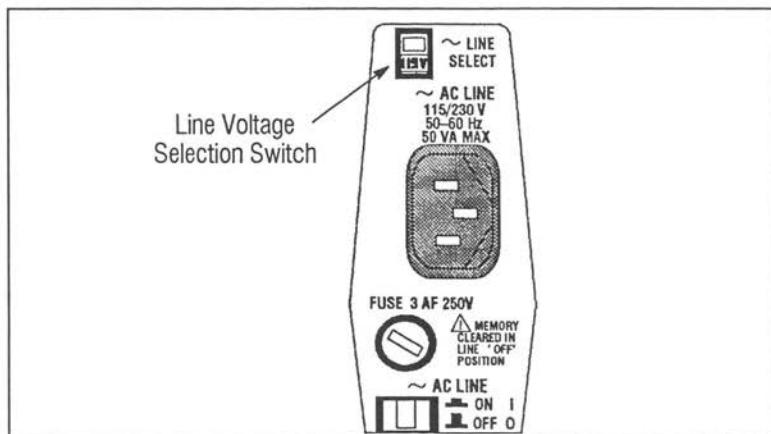


Figure 2-9. Line Voltage Selection

A voltage setting of 115 is compatible with sources from 90 to 132 V.

A voltage setting of 230 is compatible with sources from 180 to 264 V.

Make sure the selected operating voltage matches the voltage of the power source you're using. If it doesn't match, do not apply power! Contact your local Hewlett-Packard office.

Initial Turn On

Connect the power cable **first** to the integrator and **second** to a properly grounded power source of the same voltage.

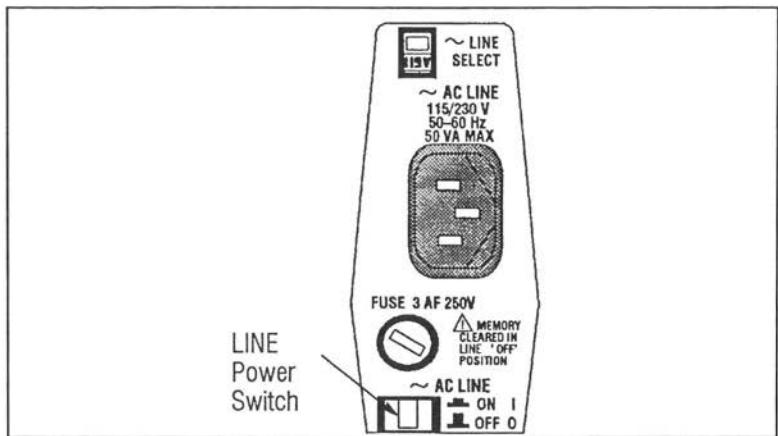


Figure 2-10. Line Voltage Selection

Press the LINE power switch on the rear panel of the integrator.

The integrator begins its power-on self-test and prints "Performing self-test". If the test completes successfully (after about 30 seconds), the HP 3396 Series II completes the power-on salutation similar to the one shown below.

```
!"#$%&'<>*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ\]^`'abcde
fghijklmnopqrstuvwxyz{|}~!;:<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ\]^`'abcde

Performing self test; unit will
accept commands when KEYBD led is ON

Model 3396B PLUS BASIC, Rev B.00.09 6/8/90
280/HOST/INET/PP Rev = p/B/m/m w/ GC_09
```

Figure 2-11. Power-On Salutation

When BASIC language programming capability is installed, the integrator prints a "PLUS BASIC" message.

Installed application programs are indicated by an ID code printed as the last item on the bottom line. Refer to your application programs documentation for a discussion of these capabilities.

When HP-IL or INET devices are connected, the integrator prints a "LOOP UP" message, if all the devices on the loop are powered-on and working.

Setting Paper Parameters

Unless set differently, the initial physical position of the paper is assumed to be the correct top of form (TOF). Moreover, it is also assumed that US letter size paper is being used.

To set or reset the top of form (TOF) and specify either of the two size pages:

the U.S. 8.5 x 11 inch letter size (66 lines)
the ISO 297 mm A4 size (72 lines)

Press **[CTRL] [K]**

Defines top of form (TOF) and a 66-line, 11-inch page length.

Press **[CTRL] [V]**

Defines top of form (TOF) and a 72-line, A4-page length.

To simply advance the paper one full page:

Press **[CTRL] [L]**

Advances the paper to the next top of form location, using the page length defined by either of the two preceding commands.

To advance the paper less than a full page:

Press **[ENTER]**

*Advances the paper one line and prints out an * with each carriage return.*

Press **[SHIFT] [ENTER]**

Advances the paper as long as you hold the keys down.

Press **[CTRL] [A]**

Advances the paper one-eighth of a line. This is useful when positioning the paper before setting top of form.

To set form feed and perforation skipping options:

Press [OP0] [5] [ENTER]

Most of the items in this dialog concern the report and the information to be included in it. Such items are discussed fully in the Operating Manual.

* OP # 5

PRINT & POST-RUN LIST OPTIONS

Large font [Y*/N]:

Store post-run report [Y/N*]:

External post-run report [Y/N*]:

List run parameters [Y/N*]:

List timetable [Y/N*]:

List calibration [Y/N*]:

List remote method [Y/N*]:

Form-feed before report [Y/N*]: Y [ENTER]

Form-feed after report [Y/N*]: Y [ENTER]

Skip perforations in report [Y/N*]: Y [ENTER]

Skip perforations in plot [Y/N*]: Y [ENTER]

The last four items control paper feed during the plot and report.

The two form feed options cause an advance to the next top-of-page before and/or after printing a report.

Skipping perforations in the plot may only be selected when perforation skipping in the report is also selected.

For more information about how to use this option, refer to the Operating Manual.

Setting the Date and Time

The HP 3396 Series II Integrator contains a calendar and clock, which can be used to label reports and to “time stamp” files.

To list timeonly :

Type [T] [I] [M] [E] and press [ENTER]

To list the date and time:

Type [D] [A] [T] [E] and press [ENTER]

The clock does not run when the integrator is off. Every time you start the integrator you need to reset the date and time.

To set the calendar:

Type [D] [A] [T] [E] *mm/dd/yy* [ENTER]

where *mm/dd/yy* is the...

month	(<i>mm</i> = 01 to 12)
day	(<i>dd</i> = 01 to 31)
year	(<i>yy</i> = 00 to 99).

For example, 07/04/90 represents July 4, 1990.

To set the clock:

Type [T] [I] [M] [E] *hh:mm:ss* [ENTER]

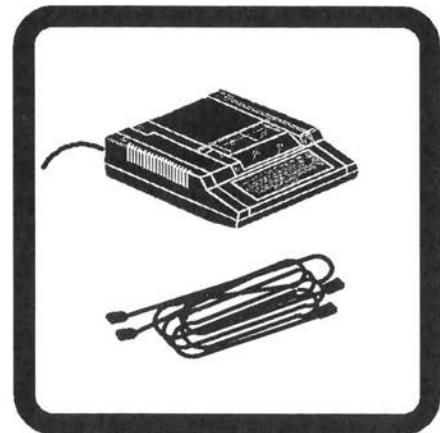
*Note: Use individual keys to spell time.
Do NOT use the functional [TIME} key.*

where *hh:mm:ss* represents the 24 hour clock in...

hours	(<i>hh</i> = 00 to 23)
minutes	(<i>mm</i> = 00 to 59)
seconds	(<i>ss</i> = 00 to 59).

The slash (/), colon (:), and comma (,) are all acceptable separators for both date and time.

Cable Connections



In this chapter....

- Connecting HP-IL Devices
- Installing Signal Cables
- Installing Sample/Remote Devices
- Connecting RS-232-C Cables

All of the interconnections between the HP 3396 Series II Integrator and other devices are made at the integrator's rear panel.

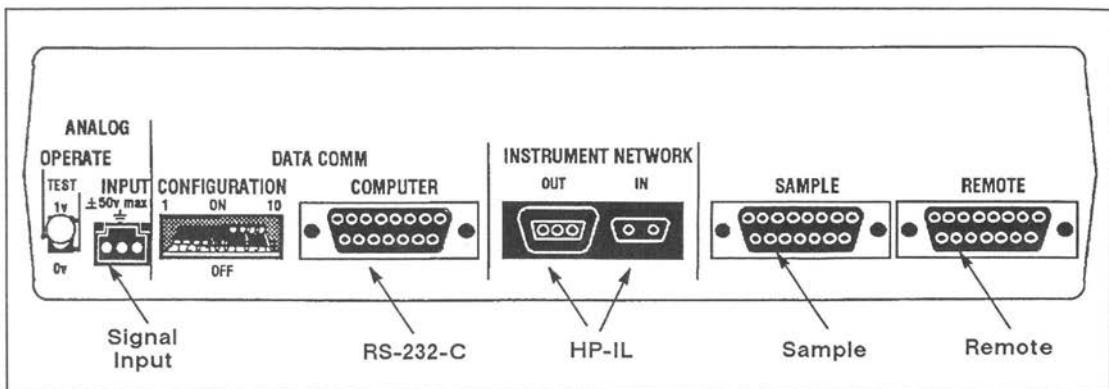


Figure 3-1. Integrator Rear Panel Cable Receptacles

Generally using roll paper provides enough room to connect cables without removing the roll of paper. However, if the z-fold paper and stand are used, the paper will conceal the rear panel's connections. The z-fold paper pack must be removed temporarily from the lower part of the stand and placed on top of the integrator until the cables are connected. Cables should be connected and then routed inside the stand's back edge to either side of the stand. When done, return the paper pack into the lower part of the stand.

It is best to have all of the instruments and devices turned-off before you connect any cables.

Although there are many cables that can be used to connect various devices with the HP 3396 Series II Integrator, they generally fall into one of five types:

- **HP-IL Cables**—Hewlett-Packard interface loop cables connect various HP-IL devices (e.g. flexible disk drives, printers, and specific analytical instruments) to an instrument network (INET) to communicate signal data, instrument setpoints, controls, and status signals, with the integrator. Moreover, certain HP-IB devices can be added to this loop when an HP-IL/HP-IB interface is used.
- **Signal Input Cables**—Analog signal input cables connect the integrator to chromatographic signal voltages from various analytical instruments.
- **Sample Cables**—The sample number (BCD) cable is used to connect a non-INET automatic sampler or sequencer to the integrator so that it can obtain sample number data.
- **Remote Cables**—Remote control cables are used to communicate readiness to or from other (non-INET) instruments, start other devices, or start and stop the integrator under the control of other instruments.
- **RS-232-C Cables**—Data communications RS-232-C cables can be used (when properly configured) to transmit and receive data and commands to a computer and/or other RS-232-C external devices.

Cable diagrams can be found in part 3 of this manual.

Connecting HP-IL Devices

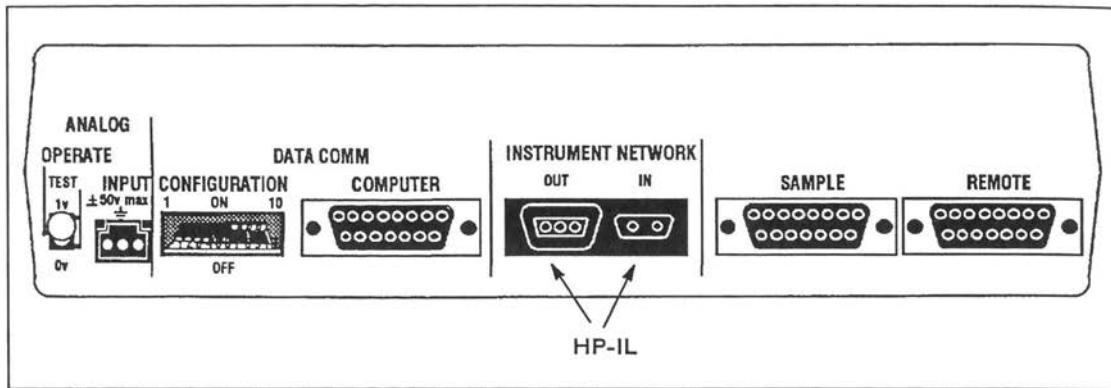


Figure 3-2. Integrator HP-IL Cable Receptacles

The Hewlett-Packard Interface Loop (HP-IL) is a two-wire loop for interfacing the HP 3396 Series II Integrator to devices such as flexible-disk drives and printers. The interface loop is connected with HP-IL cables to the INSTRUMENT NETWORK receptacles on the rear panel of the HP 3396 Series II.

Besides the HP-IL devices mentioned above, the HP-IL can also accommodate the HP analytical Instrument Network (INET). This network allows the exchange of analytical data, instrument setpoints, and remote control and status signals among HP analytical instruments and the integrator.

HP 3396 Series II Cables:	HP Model Number:
HP-IL Cable 0.5 m	HP 82167A
HP-IL Cable 1.0 m	HP 82167B
HP-IL Cable 5.0 m	HP 82167C

Certain Hewlett-Packard Interface Bus (HP-IB) devices can be connected via HP-IL loop by using the HP 82169A HP-IL/HP-IB interface.

It is best to have all of the instruments and devices turned off before connecting any cables. This is particularly true when dealing with HP-IL cables.

CAUTION

In order for the integrator to properly configure the HP-IL system, all HP-IL cabling must be connected and all instruments/devices must be powered on before the integrator is energized.

Installing HP-IL and INET Devices

Conveniently arrange the INET and HP-IL devices so that the lengths of the HP-IL cables to be used will reach appropriate devices.

Starting with the HP 3396 Series II Integrator, connect the output of one device to the input of another device with HP-IL cables, ultimately forming a single complete loop connecting all of the devices. Ensure that the connectors are inserted fully into the receptacles.

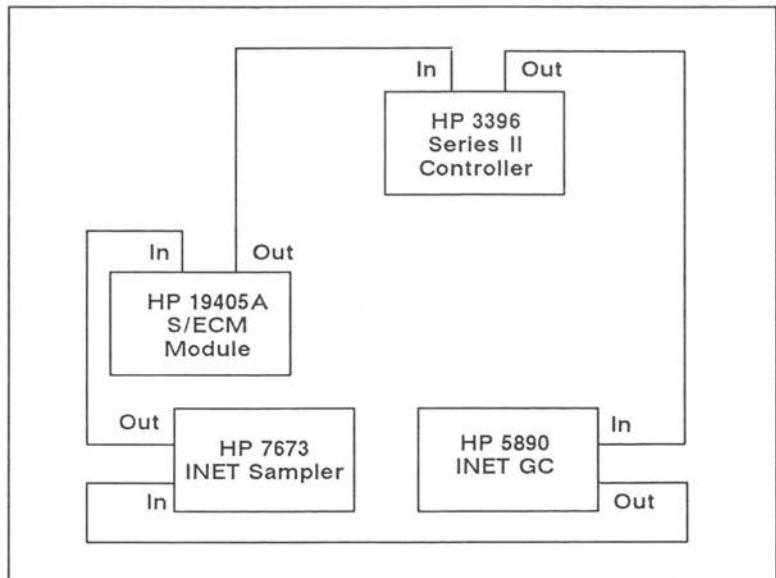


Figure 3-3. Example of Instrument Network Cabling

Installing the HP 19405A S/ECM

Install an IN end of an HP-IL cable into the rear panel of the HP 3396 Series II integrator. Install an OUT connector of another HP-IL cable into the appropriate connector on the integrator. Install the other ends of the cables in the INSTR NETWORK receptacles (J1) on the rear of the S/ECM in a loop configuration. Refer to the HP 19405A installation instructions for more details.

Connect all other cabling (non-HP-IL) between the HP 19405A S/ECM and external devices.

Installing an HP-IB Disk Drive

Connect an HP 82169A HP-IL/HP-IB Interface into the loop with the provided HP-IL cable.

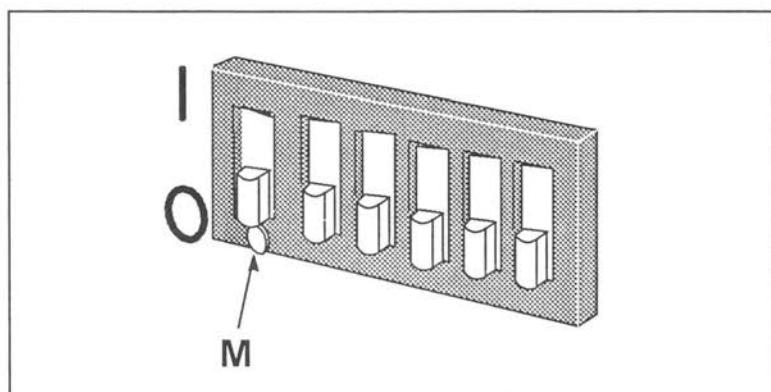


Figure 3-4. Switches on HP-IP/HP-IB Interface

Set the "MAILBOX/TRANSLATE" (M) switch (the switch with the dot under it) on the HP-IL/HP-IB Interface to the "TRANSLATE" (0) position.

The "ADDRESS" switches on the Interface are not used, however, for the Interface to work properly; one of the switches (any one) must be set to 0, *not all be set to 1*. To be certain, all of the switches could be set to 0.

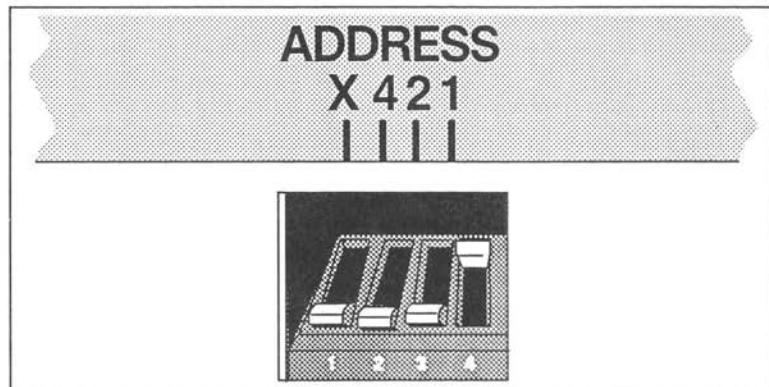


Figure 3-5. Switches on HP-IB Drive set to 1

Set the HP-IB disk drive address switches between 1 and 7. Refer to your disk drive manual for instructions of how to set the address.

CAUTION

Often the factory will set the address to zero. For the HP-IB device to configure properly, it must be set to any address between 1 and 7 (not zero).

During configuration, the HP 3396 Series II integrator will assign each device's HP-IB address as its loop address.

Connect the HP-IB device to the HP-IL/HP-IB interface with an HP-IB cable.

Loop Power-Up

After all the devices are connected and appropriate hard addresses have been set on any HP-IB devices, you are ready to power-up the loop.

The loop must be continuous and complete. All HP-IL and INET instruments must be powered ON. If disk drives are included on the loop, wait for them to finish their start-up routines (often a minute or so).

Turn on the integrator and observe the self-test.

Installing Signal Cables

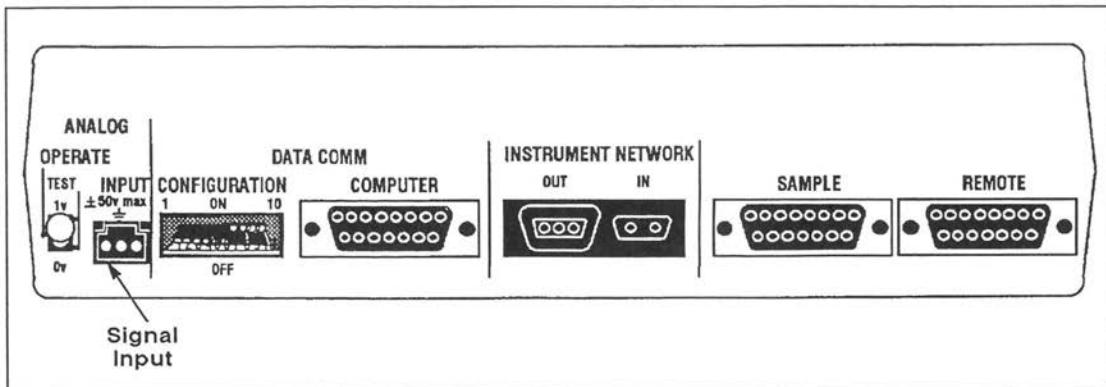


Figure 3-6. Integrator Signal Cable Receptacle

The analog signal input cable is used to connect chromatographic signal voltages from analytical instruments to the HP 3396 Series II Integrator. Generally, the signal is supplied from the instrument's integrator output (rather than the attenuated recorder output).

Connections to Hewlett-Packard Analytical Instruments

Install the appropriate cable between the HP analytical instrument's INTEGRATOR output and the HP 3396 Series II Integrator's INPUT receptacle.

Connects the HP 3396 Series II to:	HP Part Number
HP 5710/30 GCs and HP 1081B UV Detector	35900-60620
HP 5880A GC	35900-60570
HP 5790A GC	35900-60590
HP 1040 Diode Detector and HP 1090A/L LC	35900-60600
HP 5890A and HP 5890 Series II GCs	35900-60610
HP 1046A Fluorescence Detector	35900-60750

Connections to Non-Hewlett-Packard Analytical Instruments

The HP 3396 Series II Integrator has floating (not earth-ground referenced) differential signal inputs. The maximum input signal should be limited to 1 volt.

Verify the signal voltage compatibility of the non-Hewlett-Packard instrument.

CAUTION

The input signal range is -10 mV to +1000 mV. The HP 3396 Series II is protected against signals not exceeding ± 25 volts between the + and - signal leads. Between either signal input lead and earth ground, maximum permitted potential is ± 50 volts.

Use the general or special purpose signal cable to connect the integrator to your equipment.

Connects the HP 3396 Series II to:	HP Part Number
Non-HP Equipment (general purpose, spade lug terminations)	35900-60630
Non-HP Equipment (special purpose, square pin terminations)	35900-60640

Installing Sample/Remote Devices

NOTE

An HP 7673 Automatic Sampler connected to the HP 3396 Series II Integrator via Instrument Network (INET) does NOT use either a remote control or sample number cable. Remote control signals and sample number data are transmitted over INET cable.

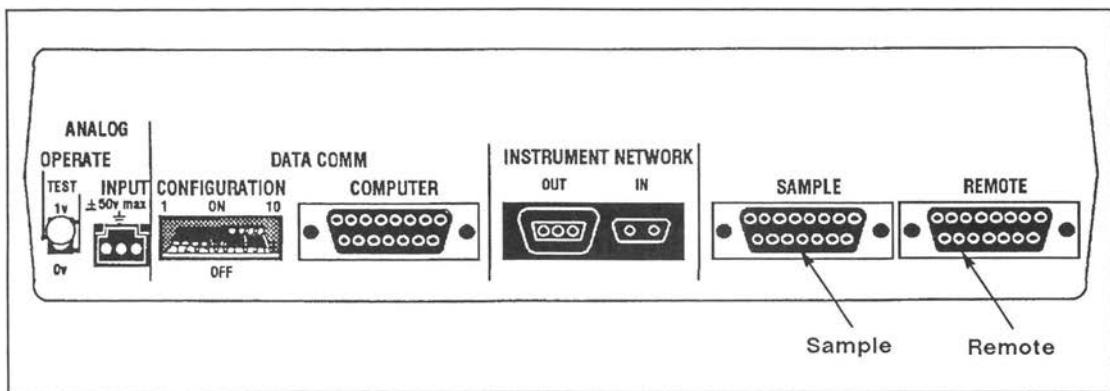


Figure 3-7. Integrator Control Cables Receptacles

Through the remote control cable, the HP 3396 Series II Integrator can:

- be started and stopped under the control of other instruments.
- provide readiness status to other instruments.
- sense the readiness of other instruments.
- start other instruments.

Through the Sample Number (BCD) cable, the HP 3396 Series II Integrator can:

- accept binary coded decimal sample number data from an automatic sampler or sequencer.

Installing the Sample Number (BCD) Cable

The sample number cable allows the HP 3396 Series II to accept BCD (binary-coded decimal) sample number data from an automatic sampler or sequencer.

Plug one end of the BCD cable into the 15-pin SAMPLE receptacle on the rear panel of the HP 3396 Series II Integrator.

If the instrument that supplies the BCD information is one of the Hewlett-Packard units indicated below, simply plug in the other end of the cable.

Connects the HP 3396 Series II to :	HP Part Number
HP 7673 (Non-INET) Automatic Sampler	03396-60560
HP 1090 LC Auto Sampler	03396-60580
HP 19395A Headspace Analyzer	03396-60570
General Purpose (spade lug terminations)	03396-60500

If the general purpose cable is to be used, refer to the cable diagram in the Service section (Part 3) of this manual. Connect the appropriate wires at the end of the cable to the BCD signal source on the sampler or sequencer.

Connecting a Remote Control Cable to Hewlett-Packard Equipment

Install the indicated cable between the REMOTE receptacle on the back of the HP 3396 Series II Integrator and the Hewlett-Packard instrument.

Connects the HP 3396 Series II to :	HP Part Number
HP 57XX GCs	03396-60620
HP 5890A or HP 5890 Series II (analog output)	03394-60560
HP 5890 GC with an HP 19395A (Y-cable)	03394-60610
Second HP 3394 or 3396 Integrator	03394-60580
HP 1040 Diode Detector and HP 1090A/L LC	03396-60650
HP 1046A Fluorescence Detector	03394-60600

Connecting a Remote Control Cable to Non-Hewlett-Packard Units

Install the general purpose remote control cable for non-HP equipment between the REMOTE receptacle on the back of the integrator and the non-HP analytical instrument.

Connects the HP 3396 Series II to :	HP Part Number
Non-HP equipment (spade lug terminations)	03394-60540

Determine which instrument will be the "controller."

If the HP 3396 Series II Integrator is to supply the "start," one example of how the cable may be installed is shown below.

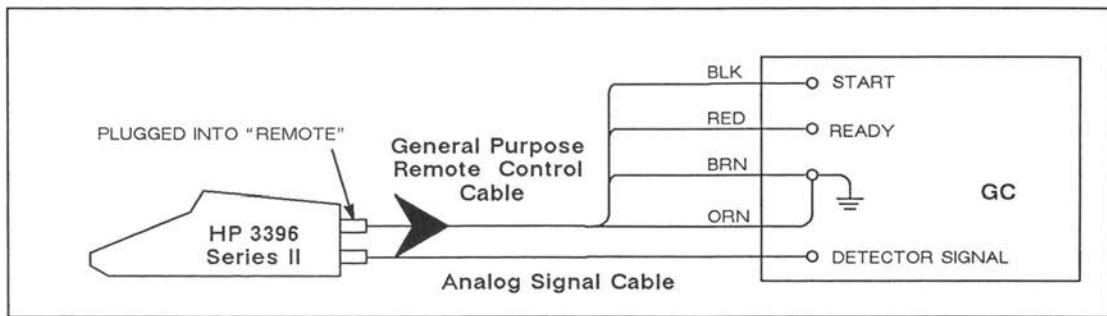


Figure 3-8. Remote Control Cabling

When [START] is pressed on the integrator, a one-second contact closure will be provided to the GC between the black (BLK) to orange (ORN) leads.

NOTE

Non-HP chromatographs used in temperature-programmed applications MUST be capable of having their oven temperature programmers started remotely by a one-second contact closure for properly automated operation under control of the HP 3396 Series II or HP 19405A.

If you perform temperature-programmed analyses, the chromatograph also may be equipped with oven-ready sensing. If the oven-ready sensing function is not available, or is not used, the HP 3396 Series II assumes the oven is *always ready*.

If the GC (or sampler) is to supply the "start" to the HP 3396 Series II Integrator, one example of how the cable may be installed is shown below.

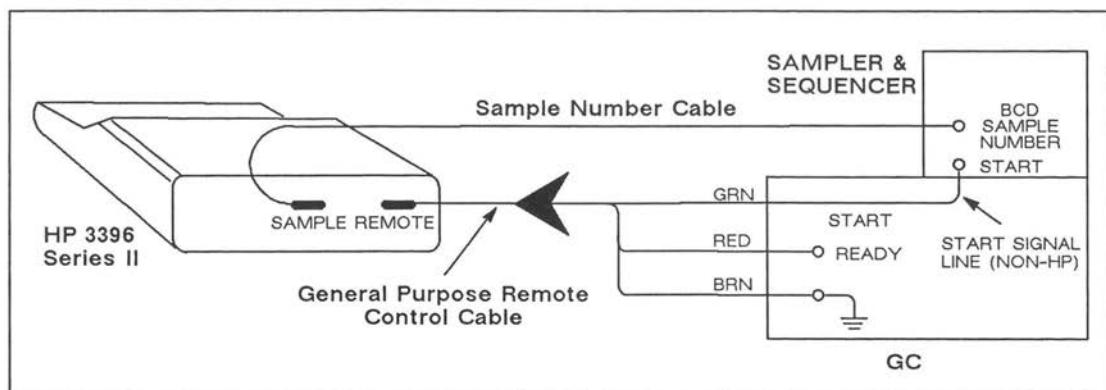


Figure 3-9. A Simple Automated System

Whenever the non-HP cable is to be used, refer to the cable diagram in the service section (Part 3) of this manual. Connect the appropriate wires at the end of the cable to the BCD signal source on the sampler or sequencer.

Connecting RS-232-C Cables

NOTE

The HP 3396 Series II Integrator cannot function as a general purpose terminal.

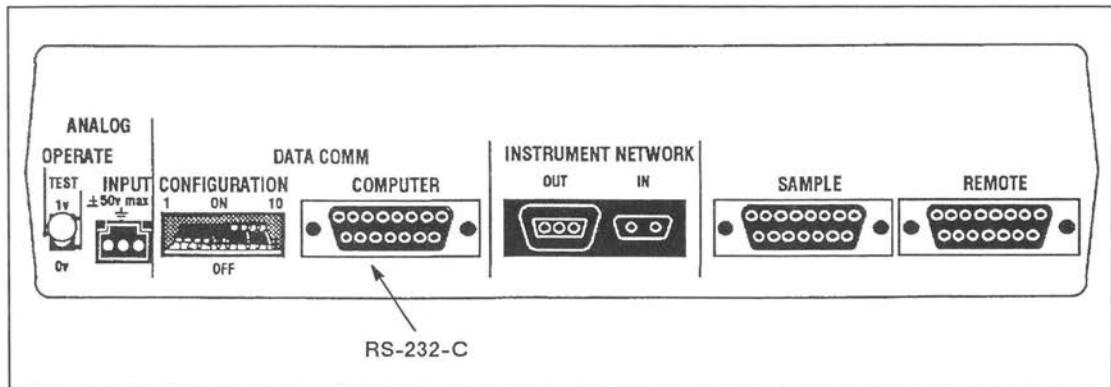


Figure 3-10. Integrator RS-232-C Cable Receptacle

The HP 3396 Series II can be connected with a RS-232-C cable to a computer and other external devices to transmit and receive data and commands. The RS-232-C connection must conform to EIA (Electronic Industries Association) standards.

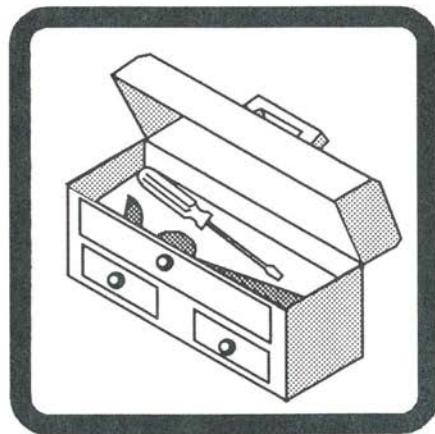
RS-232-C Interface installation is quite a bit more involved than simply choosing the proper cable and setting the configuration switches.

Communications between an HP 3396 Series II and an external computing device require programs to be running on the host to operate the RS-232-C link.

Information about programs, required protocol, operation, cable selection, and configuration switch settings can be found in the *HP 3396 Series II Network Guide*.

Part 2

User Maintenance



In Part 2....

- Chapter 4: Routine Maintenance

Routine Maintenance



In this chapter....

- Exterior Cleaning
- Removing/Reloading Paper
- Maintaining the Printer

Exterior Cleaning

1. Periodically wipe clean the exterior of the case and printer window with a slightly damp cloth.

Avoid using chemical spray cleansers and organic-based detergent solutions and solvents when cleaning the integrator case.

2. At least once every six months inspect the ventilation grills along the right side of the HP 3396 Series II Integrator and under the left-hand corner of the keyboard.

Clean the grills as necessary with a vacuum cleaner to remove dust and other obstructions.

Removing/Reloading Paper

Paper must be reloaded whenever the paper supply runs out or if the paper is intentionally removed for some other reason, e.g. if it is accidentally torn.

When the instrument runs out of paper, the HP 3396 Series II will print

OUT OF PAPER: FEED W/ENTER, RESUME W/ESC .

Removing Paper from the Printer

1. Find a line of perforations between the roll and where it enters the printer mechanism. Tear along the perforations.
2. Open the printer window, lift the bail arms forward, and pull the remaining sheets of paper up and out of the mechanism.
3. If a low pressure air supply is readily available, it sometimes helps to blow air directly into the print mechanism to remove any small, loose particles of paper from the area. Removing the paper separator will provide improved access to the area. Replace the paper separator when completed.

Reloading Paper

The paper should be positioned on the rear of the top flat surface of the integrator with the PRINT THIS SIDE facing down against the surface. After rotating around the roller, the PRINT THIS SIDE will be correctly positioned facing up.

1. Remove the printer window by lifting it up and toward yourself.
2. Pull both bail arms forward to their open positions.
3. Insert the paper into the slot under the paper separator. (It may be helpful to pull the paper separator forward temporarily until the paper is inserted.) Ensure that the edges of the roll of paper are flat and even.
4. Push the paper under the roller until its edge passes above the bail arms.
5. Align the holes in the left edge of the paper with the sprockets of the left pin wheel.
6. If necessary, adjust the right pin wheel to the width of the paper. It can move sideways to accommodate for minor differences in paper widths. Align the holes in the right side of the paper with the sprockets of the right pin wheel.

Be certain that the paper is straight and that both sides are even.

7. Push the bail arms back to their closed positions, locking the paper in position against the roller.

Verify that the paper's PRINT THIS SIDE is correctly positioned on the side of the paper toward the print cartridge. Replace the printer window.

8. Press [SHIFT] [ENTER] to feed the paper through the printer mechanism.

After paper has been reloaded, the green KEYBD indicator will continue to flash and the keyboard will be locked.

9. Press [ESC] to resume normal operation.

Maintaining the Printer

CAUTION

Never move the print carriage while the power is on. Doing so may cause damage to your printer. If you need to move the carriage, turn off the power and then slowly move it to the desired position.

Replacing the Blotter Pad

Replacing the blotter pad is the same procedure as its installation except that the old blotter must be removed first.

1. Remove the printer window.
2. Open the bail arms.
3. Turn the power off, then move the carriage away from the blotter.
4. Insert the tip of a pencil into the hole at the top of the blotter. Pull the pad up and away from its holder. Discard the used blotter.
5. Follow the installation instructions in chapter 2 for inserting the new pad.

Checking the Print Cartridge

Checking the print cartridge involves checking that the cartridge contains enough ink and that the ink flows easily. Chapter 2 of this manual provides instructions describing how to prime the cartridge and how to install a new cartridge should this prove necessary.

To check the ink level in a cartridge:

- 1.** Remove the printer window.
- 2.** Pull down the carriage cradle latch.
- 3.** Remove the print cartridge.
- 4.** Examine the print cartridge to determine the amount of ink in it.

If the bladder looks deflated like the one in the illustration below, it is low on ink and should be replaced.

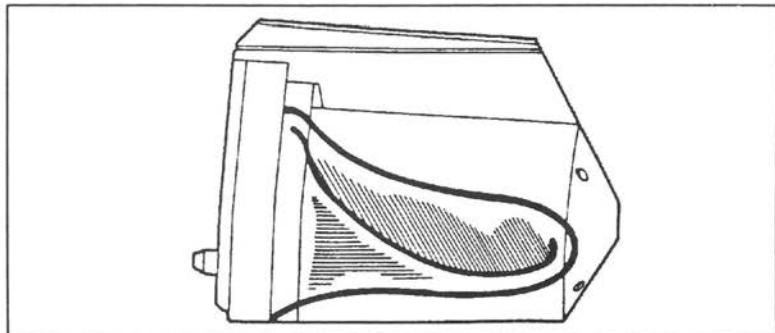


Figure 4-1. Empty Print Cartridge.

- 5.** If the bladder is low on ink, you should install a new print cartridge; see chapter 2.

If the bladder is not empty, the cartridge may need priming. When a print cartridge is new, clogged, or has been mechanically jarred, it often requires priming. Refer to chapter 2 for the priming procedure.

Cleaning the Carriage Contacts

If ink has seeped out of the cartridge onto the carriage, clean the carriage contact points with a swab dampened with water.

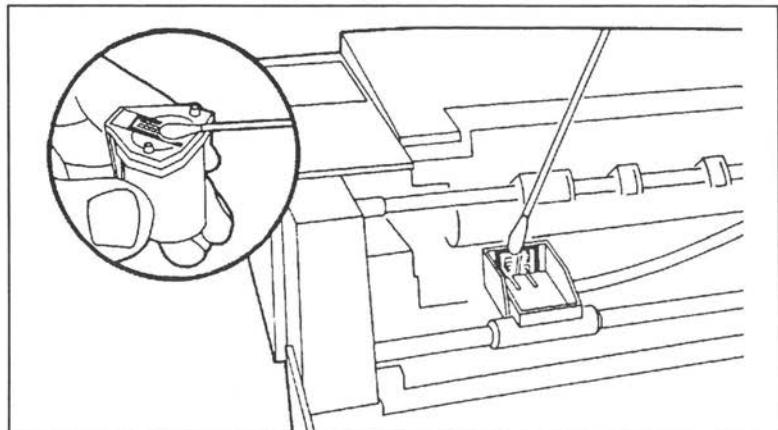
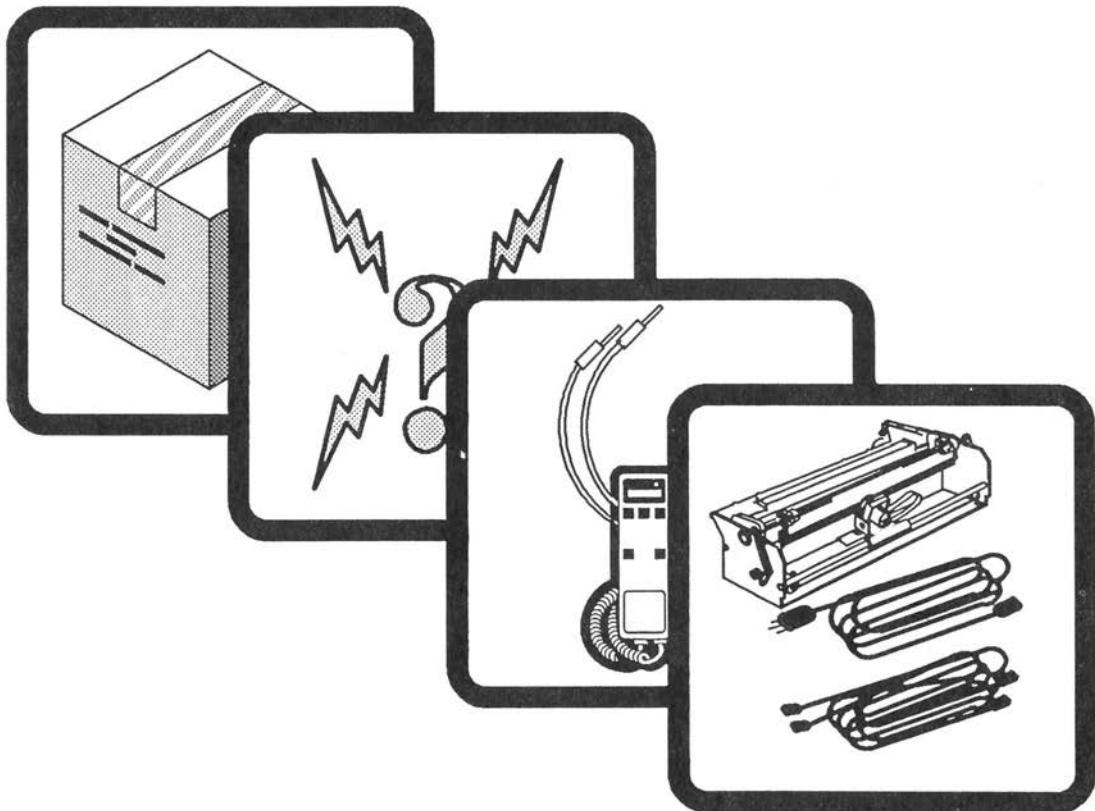


Figure 4-2. Cleaning the Nozzles and Carriage Contacts.

Wipe the print cartridge face (nozzles) with a soft cloth or lint-free tissue.

Part 3

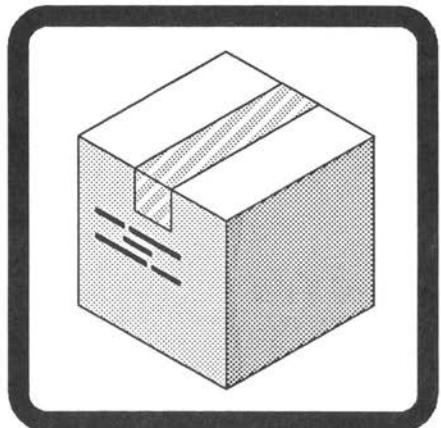
Service



In Part 3....

- Chapter 5: Obtaining HP Service
- Chapter 6: Troubleshooting
- Chapter 7: Diagnostics
- Chapter 8: Parts and Cables

Obtaining HP Service



In this chapter....

- Filling out the Repair Information Form
- Returning Your HP 3396 Series II for Repair
- Repacking Your Unit for Shipment
- Obtaining On-Site HP Service

There are three ways to obtain HP service:

- 1.** Standard, return-to-HP service (during or after the warranty period).
- 2.** Optional (option W03) conversion to on-site service during warranty (the option W03 is available only when purchasing the HP 3396 Series II Integrator).
- 3.** On-site, after-warranty service on a time-and-material or maintenance agreement basis.

Filling out the Repair Information Form

The Repair Information Form *must* be filled out completely and included with your HP 3396 Series II when the unit is returned to HP for repair.

Hewlett-Packard *cannot* begin repairing your integrator without a completed Repair Information Form.

The form is included in the Customer Information Envelope when the HP 3396 Series II is first shipped from the factory.

A new blank form will accompany your HP 3396 Series II when it is returned to you repaired. Blank forms can also be obtained by calling your nearest HP Sales and Service Office.



REPAIR INFORMATION FORM

For return-to-HP repair, please fill out this form and enclose it with your shipment.
This information will facilitate and expedite the repair.

WHO IS RETURNING THE EQUIPMENT?

Company/Institution _____ Date _____

Person to Contact _____ Phone _____

Alternate Contact _____ Phone _____

Return Shipping Address:

HOW WILL THE REPAIR BE PAID FOR?

Check one of the three boxes and fill in the information in that section:

Warranty: Received/Installed Date _____

Maintenance Contract: Contract No. _____

Order: Purchase Order No. _____

Except for contract and warranty repairs, a purchase order number and/or authorized signature must accompany your request for service. (If standard repair prices do not apply, a purchase order for the quoted price is required. Standard repair prices may be obtained by contacting the Field Repair Center.)

Authorized Signature _____ Phone _____

Billing Address:

WHAT IS BEING SENT?

Model No. _____ Serial No. _____

Be sure that you have followed the troubleshooting and test procedures described in the manual.
Enclose any printouts that help to show the failure.

Do not ship accessories which are not required to complete the repair (power cord, manuals, cables, etc.).

WHAT SEEMS TO BE WRONG?

1. Describe how the failure appears. _____

2. Perform the confidence tests described in the manual. Which test, if any, produced a failure? _____

3. If failure is intermittent, how long does it take between failures? _____

4. List the system that this instrument is a part of. _____

5. Additional comments: _____

THANK YOU.

HP ANALYTICAL FIELD REPAIR CENTERS

IN THE USA:

NORTH AMERICAN FIELD REPAIR CENTER
Hewlett-Packard Company
Route 41, P.O. Box 900
Avondale, Pennsylvania 19311-0900
Phone: (215) 268-5349

IN WEST GERMANY:

HEWLETT-PACKARD GmbH
Reparaturzentrum Analytische Messtechnik
Ermilis-Allee
D-7517 Waldbronn 2
Phone: 7243-6021

ELSEWHERE:

Contact your local HP Analytical Sales and
Service Office for information.

3900-9020

Returning Your HP 3396 Series II for Repair

- In the United States:
 1. Fill out both sides of the Repair Information Form completely.
 2. Attach a copy of the form to the HP 3396 Series II.
 3. Pack the unit securely (see "Repacking Your Unit for Shipment" on the next page).
 4. Use the peel-off address label (also included in the customer information envelope) and affix it to the outside of the shipping carton.



Figure 5-1. Return Shipping Label

- Elsewhere:
 1. Fill out both sides of the Repair Information Form completely.
 2. Contact your nearest HP Sales and Service Office for instructions on getting your unit returned for repair. A complete list of offices is included in the back of this manual.
 3. Attach a copy of the form to the HP 3396 Series II.
 4. Pack the unit securely (see "Repacking your Unit for Shipment").
 5. Send the unit to an HP-designated service facility.

Rewrapping Your Unit for Shipment

1. To prepare the HP 3396 Series II for shipment, remove paper from the printer mechanism and unsnap paper roll holders from the rear of the instrument. Remove the print cartridge from the print carriage.
2. To repack your HP 3396 Series II for shipment, we recommend that you use the original shipping container. If the original packing materials are not available, be sure to use a carton of at least 250-pounds test. Pack the HP 3396 Series II Integrator with at least two inches of padding on all sides.
3. Do not include any operating accessories (including cables) with the HP 3396 Series II unless the problem relates to an accessory.
4. On the Repair Information Form, be sure you detail the following items when you return your HP 3396 Series II for repair:
 - A description of the exact configuration at the time of the malfunction, including the interface cable, computer, peripherals, and software in use.
 - A brief description of symptoms for service personnel, including any printout that shows what happened.
 - The serial number of the HP 3396 Series II (located on the lower left portion of the rear panel).
 - Include your name, address, and a phone number at which you may be reached during the day.
5. Attach the Return Shipping Label originally packed in the Customer Information Envelope to the outside of the shipping carton.
6. Since in-transit damage is not covered by the warranty, we suggest that you always insure shipments.

Obtaining On-Site HP Service

On-site service of your HP 3396 Series II is available:

- during warranty if you purchased Option W03 when you purchased the HP 3396 Series II
- after warranty on a time-and-material basis or under a maintenance agreement.

To request on-site service:

1. Fill out the reverse side of the Repair Information Form.
2. Call your local HP Sales and Service Office as listed in the back of this manual. Have the following information available
 - Model number: HP 3396B
 - Instrument Name: HP 3396 Series II
 - Serial number: From label on the rear of the instrument.
 - Information from the reverse side of the Repair Information Form.

Troubleshooting



In this chapter....

- Power Problems
- Signal Problems
- System Problems
- Running Power-On Tests

Power Problems

No Response at Initial Turn On (Unit does not function)

Probable Causes

- Voltage selection switch set improperly. (Instrument set to 115 V and plugged in to a 230 V circuit.)
- Power is not available to HP 3396 Series II Integrator.
- Fuse is blown.

Suggested Actions

1. Check that the line voltage selection switch on the rear panel is set to the proper voltage value (either 115 V or 230 V).
2. Check that the power cord is connected between the integrator and a live ac power source.

If the wall receptacle is "dead," contact your local electrician.
3. Check that the rear panel power switch is ON.
4. Check that the integrator's fuse is of the proper 3-ampere value and is not blown.

Checking the Fuse

The fuse is located near the power switch on the rear panel of the HP 3396 Series II Integrator.

1. Turn the power switch on the rear panel OFF.
2. Disconnect the line power cord from both the wall receptacle and the rear of the integrator.

WARNING

FAILURE TO REMOVE THE POWER CORD FROM THE INTEGRATOR COULD RESULT IN ELECTRIC SHOCK AND PERSONAL INJURY.

3. Locate the fuse cap below the AC LINE socket.
4. Insert a small flathead screwdriver into the fusecap. Pushing in slightly, turn the fuse cap counterclockwise to free it.
5. Remove the fuse and visually inspect it. The wire inside the fuse should be unbroken. If the wire is broken, the fuse is defective.
6. If the fuse looks okay, reinstall it and look elsewhere for the problem. If the fuse is defective, replace it with a new 3-ampere fuse.

CAUTION

If fuse blows a second time, contact HP service.

“Power Failed” Messages Appear After Working

Probable Causes

- Incorrect ac line voltage selection. (Integrator is set to 230 V and connected to a 115 V circuit.)
- Poor line power supplied.

Suggested Actions

1. If the line voltage selection switch on the rear panel is set improperly, change it.
2. Have an electrician check the line power for noise and/or surges.

COMM Indicator Light Blinks After Initial Turn On Tests Are Complete

Probable Causes

- DATACOMM switches set incorrectly.
- Faulty cable connection.

Suggested Actions

1. Are the DATACOMM switches set correctly? If a host computer is not connected to the integrator, set the timeout duration switch to "short." This is about 15 seconds. *
2. Is the cable connector in the REMOTE port seated properly?

* NOTE: If switches are changed, the integrator must either be power cycled or [CTRL] [BREAK] for the new settings to be read.

Signal Problems

Data Represents a Zero or Straight Baseline with INET Instruments

Probable Causes

- Disconnected or faulty HP-IL cables.
- C1 data path is inactive.
- Problem with chromatograph.

Suggested Actions

1. Check that all INET cables are connected.
2. Check status of C1 Data path using INET_CONFIGURATION command. C1 Pros and C1 Cons should say "IDLE".
3. Check that the HP 5890 GC or HP 1090L LC has compatible firmware.
 - A revision letter of "C" or higher must appear on the HP 5890 GC at turn on.
 - The HP 1090L LC code must be B2616 or higher.
4. Check chromatograph; refer to the chromatograph's operating manual for details.
5. If the suggestions in steps 1-4 did not help, obtain HP service.

Data Represents a Zero or Straight Baseline, or Is Pinned at Maximum Value with Analog Signal

Probable Causes

- Signal switch on rear panel is in wrong position.
- Problem with chromatograph.
- Cabling problems.

Suggested Actions

1. Is the signal switch in the OPERATE (middle) position?
2. Is the instrument supplying the signal operating properly?
3. Is the signal within the range of -10 mV to +1 V?
4. If a general-purpose signal cable is being used, are the connections to the signal source correct?
5. Disconnect the HP 3396 Series II from other equipment, then turn to "Running the Self-Test Diagnostics" in section 7 of this manual.
6. Run test L, the Print/Plot test.
 - If the test passes, run A/D test.
 - If the test fails, obtain HP service.
7. Run test B, the A/D Test.
 - If test passes, run 0V and 1V tests.
 - If test fails, obtain HP service.
8. Turn to "Running the Signal Tests" and run the 0V and 1V Tests.
 - If tests pass, there is a chromatographic or cabling problem.
 - If tests fail, obtain HP service.
9. Is INET cable connected?
If INET is connected, C1 Pros and C1 Cons should say "IDLE."
Check configuration.

Excessive Noise or Drift on Chromatogram

Probable Causes

- Signal source malfunction or improper control settings.
- Signal itself drifts or is noisy (problem with chromatograph).
- Cabling problem.

Suggested Actions

1. Is the instrument supplying the signal operating properly? Are the signal output controls set appropriately?
2. Is the signal from the analytical instrument drifting or noisy?
3. If a general-purpose signal cable is being used, are the connections to the signal source secure?
4. Disconnect the HP 3396 Series II from other equipment.
5. Turn to "Running the Self-Test Diagnostics" in section 7 of this manual. Run Test B, the A/D test.
 - If the test passes, the cable or a connection is defective.
 - If the test fails, go to next step.
6. Turn to "Running the Signal Tests". Run the 0V and 1V Tests.
 - If all tests pass, there is a chromatographic or cabling problem.
 - If tests fail, obtain HP service.

Reported, Processed, or Raw Data Are Not What You Expected

Probable Causes

- Signal source malfunction or improper controls settings.
- Signal itself is at fault.
- Cabling problem.
- Inactive INET data path.
- Calculation or calibration problem.

Suggested Actions

1. Is the instrument supplying the signal operating properly?
2. Is the signal being applied within the range of -10 mV to +1 V (analog only)?
3. If a general-purpose signal cable is being used, are the connections to the signal source correct?
4. If INET is being used, verify that the C1 data path is active.
5. Was the proper calculation chosen? Check if PKWD and THRSH were properly set.
6. Turn to “Running Self-Test Diagnostics” in this chapter and run Test T, Demo Chromatogram. If demo chromatogram is okay, continue with step 7.
7. Disconnect the HP 3396 Series II from other equipment, then run Test B, the A/D test.
 - If test passes, run 0V and 1V tests.
 - If test fails, obtain HP service.
8. Turn to “Running the Signal Tests” and run the 0V and 1V tests.
 - If the tests pass, the cable is defective or signal is at fault.

System Problems

Integrator Cannot Be Started or Stopped from an External Device

Probable Causes

- Problem with external device.
- Capability not provided by cable or external device.
- Disconnected or faulty cable.
- Signal incompatibility.

Suggested Actions

1. Is the external device working?
2. Do the instrument and cable both have the capability of starting or stopping the HP 3396 Series II? Requires a one-second contact closure.
3. Is the remote control cable securely and properly connected?
4. Turn to “Running Self-Test Diagnostics.” Run Test 9, the remote control and sample input test. If test fails, obtain HP service.
5. For custom cable connections, verify compatibility of signals between the remote instrument and the HP 3396 Series II.
6. If the suggestions in steps 1-5 did not help, obtain HP service.

HP 3396 Series II Does Not Start or Stop an External Device

Probable Causes

- Problem with external device.
- Capability not provided by cable or recognized by remote unit.
- Disconnected or faulty cable.
- Signal incompatibility.

Suggested Actions

1. Have any error messages been printed?
2. Is the external device working?
3. Do the external device and the cable both have the capability of being activated by the HP 3396 Series II?

Integrator provides a one-second contact closure between SO1 and SO2 output pins on the remote cable.

4. Is the remote control cable securely and properly connected?
5. For custom cable connections, verify compatibility of signals between the HP 3396 Series II and the external device.
6. If the suggestions in steps 1-5 did not help, obtain HP service.

HP 3396 Series II Does Not Communicate with RS-232-C Device

Probable causes

- Host computer not properly programmed.
- HP 3396 Series II configuration switches set incorrectly.
- Improper or faulty cables.

Suggested Actions

1. Check compatibility and programming of host computer.
2. Check configuration switch settings on back panel. Are they correct?
3. Are all cables in question securely connected and operative?

“LOOP DOWN” Message Printed

Probable Causes

- HP-IL or INET instrument is not functioning.
- Disconnected or faulty HP-IL cable.
- Environmental problem (site requirements not met).

Suggested Actions

1. Has HP-IL been installed properly?
2. Go Turn to “Running the Self-Test Diagnostics.” With the all INET instruments connected in the loop and powered on, perform test 8 (HP-IL bus test).
 - If the test passes, HP-IL is working.
 - If the test fails, subtract one instrument at a time from the loop until the test passes in order to identify the defective instrument or cable.
3. Verify an individual HP-IL or INET device by running its self-test.
4. If all instruments are working, check HP-IL cables. Connect all cables together in a loop and then connect them to the HP 3396 Series II. Turn to “Running Self-Test Diagnostics” and run test 7, the HP-IL port test.
 - If the test passes, all cables are okay.
 - If the HP-IL port test fails, remove one cable at a time until the test passes in order to identify the defective cable.
5. Check power mains for line faults.
6. If the suggestions in steps 1-5 did not help, obtain HP service.

External Sample Number is Missing or Inaccurate

Probable Causes

- Cabling problem.

Suggested Actions

1. Is the sample number cable connected properly?
2. Is the BCD sense wire in the correct position for the application?
3. Verify the integrity of sample number cable.
4. Turn to “Running Self-Test Diagnostics” and run Test 9, remote control and sample number input test.
 - If test passes, cable is at fault.
 - If test fails, call HP service.

Running the Automatic Power-On Tests

The automatic power-on tests help you isolate problems quickly when the HP 3396 Series II is suspected of being at fault.

1. Turn HP 3396 Series II power OFF, wait a few seconds, and then turn the power ON again. The tests run automatically each time you apply power to the HP 3396 Series II, checking that internal circuits are operational.
 2. Keyboard indicators monitor the progress of the tests and freeze in a particular pattern if a failure occurs.
 3. If the instrument prints firmware revision numbers (Z80/HOST/INET/PP) and the printer/plotter confidence test properly appears, the green KEYBOARD indicator is ON and an asterisk prompt prints out, the unit has passed the tests.

! "#\$%& '<>*+, - ./0123456789; :;<>?@ABCDEF GHIJKLMNOPQRSTUVWXYZ[\]^_,` abcde
fghijklmnopqrstuvwxyz{;}>?@ABCDEF GHIJKLMNOPQRSTUVWXYZ[\]^_,` abcde

Performing self test: unit will accept commands when KEYBD led is ON

Model 3396B PLUS BASIC, Rev B.00.05 3/16/90
Z80/HOST/TNET/PP Rev. 1.0/B/m1

Figure 6-1. Printer/Plotter Confidence Test

4. If two rows of a number (1, 2, 3, 4, 5, 6, or 7) occur instead of the normal alphanumeric printout before the chromatogram, an internal error has been sensed as is illustrated in Figure 6-2.

Performing self test; unit will accept commands when KEYBO led is ON

(0) P/P ROM and RAM test
ERROR = 0DH INFO = 0034H

CAUTION - SELF TEST FAILURE Unit may behave erratically

SELF TEST: <Press <M> key for more help>

Figure 6-2. Printer/Plotter Error Condition

Refer to the service section of this manual or call your local Hewlett-Packard office.

Diagnostics



In this chapter....

- Safety Information
- Running the Self-Test Diagnostics
- Description of Self-Test Diagnostics
- Running the Signal Tests
- Zero-Volt Input Test
- One-Volt Input Test
- Diagnostic Procedures
- Disassembly and Reassembly Instructions

Purpose of This Section

The purpose of this section is to provide additional information about servicing your HP 3396 Series II. This information is important for qualified service technicians or for reference by Hewlett-Packard customer engineers servicing your instrument at your location. The information presented here does not mean that these servicing procedures can be performed by you. Only qualified service engineers should attempt any of the test or disassembly procedures described here.

Safety Information

CAUTION

Circuit cards contain static-sensitive devices. Do not remove the instrument cover or keyboard except at an approved electrostatic-free workstation.

WARNING

THE POWER SUPPLY MODULE IS A DIRECT LINE-POWERED SWITCH-MODE SUPPLY. ELECTRICAL NODES ON THIS MODULE CAN BE AT POTENTIALS UP TO 370 V DC. USE EXTREME CARE WHEN MEASURING LOW-VOLTAGE DC OUTPUTS.

Running the Self-Test Diagnostics

If the HP 3396 Series II fails to operate as expected, an instrument connected to the HP 3396 Series II may be at fault. The HP 3396 Series II Integrator has built-in self-test procedures that are useful in determining which instrument, if any, in the "system" is at fault. Document any information that you receive from these tests to report to your Hewlett-Packard service representative.

CAUTION

Save all BASIC programs, methods, and other files, if possible, on an external disk drive before starting the self-test diagnostics. The HP 3396 Series II memory clears when the LINE switch is pressed, resulting in the loss of all data not saved to an external disk.

1. To start the self-test diagnostics, press and hold down the following keys in order:

[CTRL] [SHIFT] [BREAK]

Hold all of them down until the instrument starts printing. If you release any of these keys too soon, the diagnostics will not start.

2. If you pressed the above three keys correctly, you'll see this printout:

SELF TEST (Press (M) key for more help)

=>

3. Type [M] to list the tests available. Figure 7-1 is a printout of this list.

```
=> M
```

Press the keys for the tests you want to perform. If you select no tests, you will return to the system software. After you have selected the tests you want, press ENTER. The tests will run continuously unless an error halts them.

- (O) Clear all tests and demo chromatogram
- (1) ROM crc and bank select test
- (2) Quick RAM test
- (3) Extended RAM test (20 min)
- (4) 8051 ROM and RAM test
- (5) 8051 interface test
- (6) RS-232-C port test
- (7) HP-IL port test
- (8) HP-IL bus test
- (9) Remote control and sample no. input test
- (B) A/D noise test
- (L) P/P test
- (K) Keyboard test
- (N) High speed printer test
- (O) P/P ROM and RAM test
- (A) Run all tests
- (T) Enable demo chromatogram

- (P) Print error messages
- (S) Suppress error messages
- (C) Continue testing if error occurs
- (H) Halt testing if error occurs
(press SPACE to continue)

```
=>
```

Figure 7-1. Self-Test Diagnostic Menu

4. Type the number or letter for the desired tests after the prompt, = >. If you strike an incorrect test number, press [0] (zero) immediately afterward to clear all previous test selections.
5. Press [P] to print all self-test error messages, or press [S] to suppress all error messages.
6. Press [H] after the appropriate test numbers to halt testing when an error occurs. Press the space bar after an error prints out to resume testing.

Press [C] after the appropriate test numbers to resume testing after an error occurs.

Note: If [S] is not pressed, [P] is assumed, and if [H] is not pressed, [C] is assumed.

7. Press [ENTER] to start the test(s).

The set of self-test diagnostics run continuously unless you press [H] to halt testing after the first error. The keyboard indicators (LEDs) display which diagnostic tests are being run. Information codes for an error are printed if you do not press [S].

See the section titled “Interpreting Diagnostic Test Failures” in this chapter for additional information on how to interpret diagnostic messages.

Tests from this dialog can confirm a fault discovered during the power-on self-tests or determine if the HP 3396 Series II is the instrument in a “system” that is at fault.

8. To halt all testing, turn the integrator off.

When you want to halt the demo chromatogram without turning the instrument off, press [CTRL] [SHIFT] [BREAK] to begin the diagnostic menu, then press [0] to exit this menu and return to the system prompt. This method preserves internal memory.

Description of Self-Test Diagnostics

- (1) **ROM CRC and Bank Select Test**—The data contents of ROM are manipulated mathematically by a special algorithm (a cyclic redundancy check-16 routine). The resultant value after all ROM locations are operated on will be zero. If the value is not zero, the ROM is declared defective and an error message will be printed. A bank select test is also performed that checks for proper Z80 ROM access.
- (2) **Quick RAM Test**—This test performs a walking-1s and a walking-0s test throughout RAM. An arbitrary pattern is then written into RAM by the CPU and is read back for accuracy. Any incorrect data will cause the test to fail.
- (3) **Extended RAM Test**—Permutated data is written into every location of RAM and then read back for verification.

- (4) **8051 ROM and RAM Tests**—The HOST and INET CPUs perform a CRC-16 routine to test their internal ROM. If the resultant checksum is incorrect, this test fails and a corresponding error message will be printed. The HP-IL/INET CPU also does a CRC-16 routine on the applications EPROM if installed. In addition each CPU (HOST and INET) tests its internal RAM. Each I/O CPU will write permuted data into the internal RAM and reads the data back for verification.
- (5) **8051 Interface Tests**—Data is written into RAM by the Z80A CPU then permuted by the HOST CPU. The Z80A then checks the modification and permutes the data again. The HP-IL/INET CPU modifies the data pattern that is again checked by the Z80A. After this test has been performed for every third location in RAM, the Z80A will reread these locations to verify the correct data.
- (6) **RS-232-C Port Test**—This test requires the connection of the DataComm loopback test connector (HP part number 03396-60540) to the connector on the back panel. This connector loops back the TXD (transmit) output to the RXD (receive) input and the request to send to clear to send. Data is then written to the port, looped back to the input by the connector, and then read by the CPU for accuracy.
- (7) **HP-IL/INET Port Test**—This test requires the connection of an HP-IL cable to the rear panel INET IN and OUT jacks. The HP-IL/INET CPU will transmit all possible INET data patterns onto the loop and read them back to verify correct reception of the data. This test is useful for locating faulty cables.
- (8) **HP-IL/INET Bus Test**—During this test, the HP 3396 Series II may remain connected to other instruments on INET. The INET processor will execute an IFC (interface clear) command and then transmit a subset of possible data patterns to the INET loop. This test is particularly useful for identifying which instrument on the loop is causing the fault. If the test fails, one instrument at a time can be removed until the test passes, verifying the faulty instrument.
- (9) **Remote Control and Sample Number Input Test**—This test verifies the remote and sample connectors by connecting a jumper wire between the pins of the connectors. The HP 3396 Series II will print out a response which can be compared to the INFO values in tables 7-9 and 7-10 for accuracy.

(B) A/D Noise Test—This test checks the HP 3396 Series II analog-to-digital subsystem for internal noise. All operating parameters are set internally for plotting the noise signal.

An example of an A/D test is shown in figure 7-2. If the number for peak-to-peak noise on your printout is 3.0 or less, the test passes.

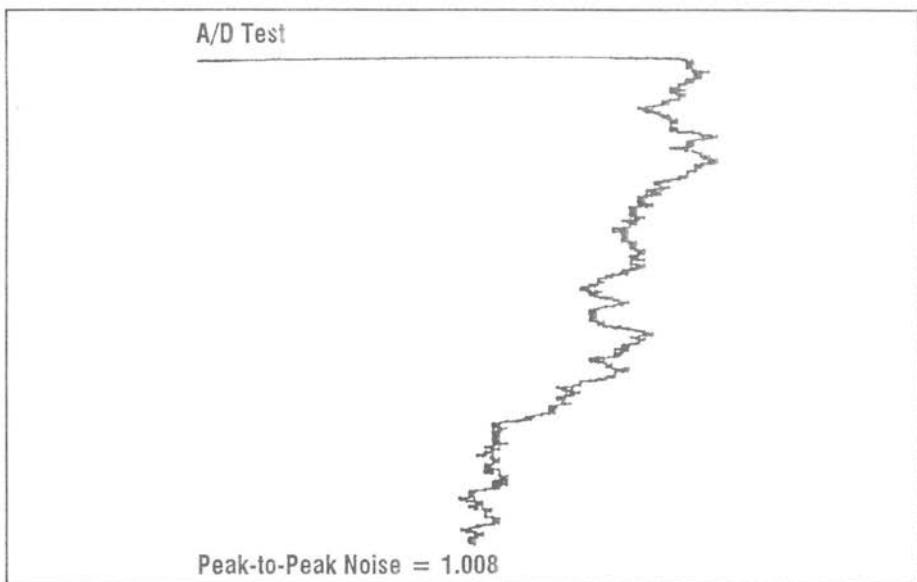


Figure 7-2. A/D Test Results

(L) P/P Test (Print/Plot Test)—This test will print out four lines of the entire HP 3396 Series II character set. The first two lines will be in large font, and the second two lines will be in small font; then, a diagonal line and a horizontal line will be plotted across the full width of the paper. The printout can be checked visually for any irregularities. (See example in figure 7-3.)

```
P/P TEST
./0123456789:;<=>?@ABCDEFGHIJKLMNPQRSTUVWXYZ<]>_`abcdedghijklmnopqrs
./0123456789:;<=>?@PBCDEFGHIJKLMNOPQRSTUVWXYZ<]>_`abcdedghijklmnopqrs
./0123456789:;<=>?@HBCDEFGHIJKLMNOPQRSTUVWXYZ<]>_`abcdedghijklmnopqrstuvwxyz{1}
./0123456789:;<=>?@HBCDEFGHIJKLMNOPQRSTUVWXYZ<]>_`abcdedghijklmnopqrstuvwxyz{1}
```

Figure 7-3. Example of Test L

(K) **Keyboard Test**—The keyboard test will verify that the keyboard is functional by printing the key pressed.

(N) **High-Speed Printer**—One possible problem in the printer/plotter subsystem is slippage of the printhead motor. This would appear as a stepwise baseline offset in a real chromatogram. The test provides an excellent means for evaluating potential motor slippage because of the rigorous test plot with annotation. The test generates 10 seconds of square wave data followed by 110 seconds of random noise plot data, with annotation. The noise is followed by another 10 seconds of square wave. If slippage were to occur, it would probably occur during the noise plot because of the high torque requirements on the motor. Any motor slippage would be detected by observing the square waves. The distance from the left and right edges of the paper to the edges of the plot would vary depending on whether the motor slipped. (See figure 7-4.)

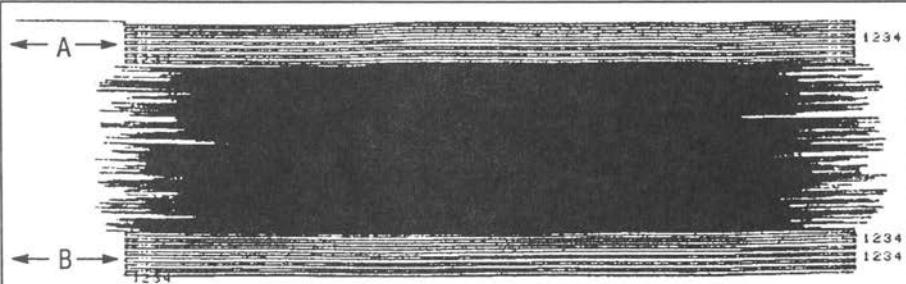


Figure 7-4. Example of Test N

After running at least one pass of the test, observe the distance from the edge of the plot to the edge of the first set of square waves. Compare this distance to the distance in the second set of square waves. If they are the same, the motor did not slip. In most cases, slippage indicates a defective motor or an incorrectly wrapped drive spool.

- (O) **P/P ROM and RAM Test**—This test checks the internal ROM of the print/plot processor using a CRC test similar to test 1. Both the print/plot internal RAM and external RAM are tested similar to test 2, the quick RAM test. Data is written into the RAM and then read back from the RAM for verification. Any errors would result in a test failure and an appropriate error message will be printed. Failure of this test at power-on will result in a number (1 to 7) being printed instead of the internal character set (see figure 7-5).

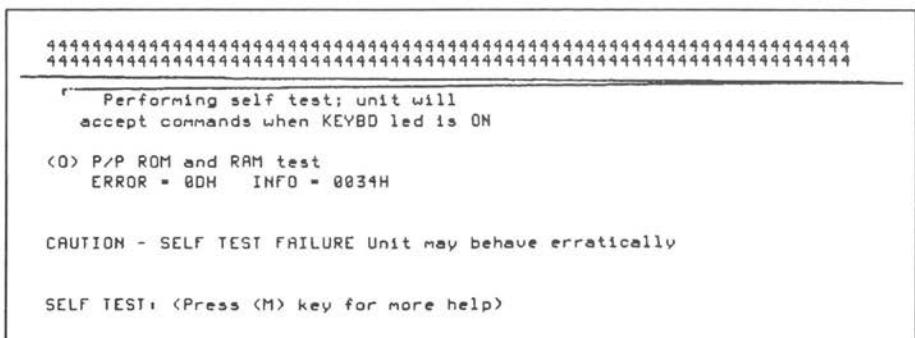


Figure 7-5. Example of Test O Failure at Power-On

- (A) **Run All Tests**—Selecting test A will cause all the above tests to run consecutively.
- (T) **Enable Demo Chromatogram**—Selecting this test enables the demo chromatogram. The demo chromatogram is internally stored signal data that can be used to verify performance and as a training tool in conjunction with the tutorial manual. Running the demo chromatogram and obtaining positive results verifies every subsystem in the unit, except the A/D. Figure 7-6 is an example of a demo chromatogram on a good unit.

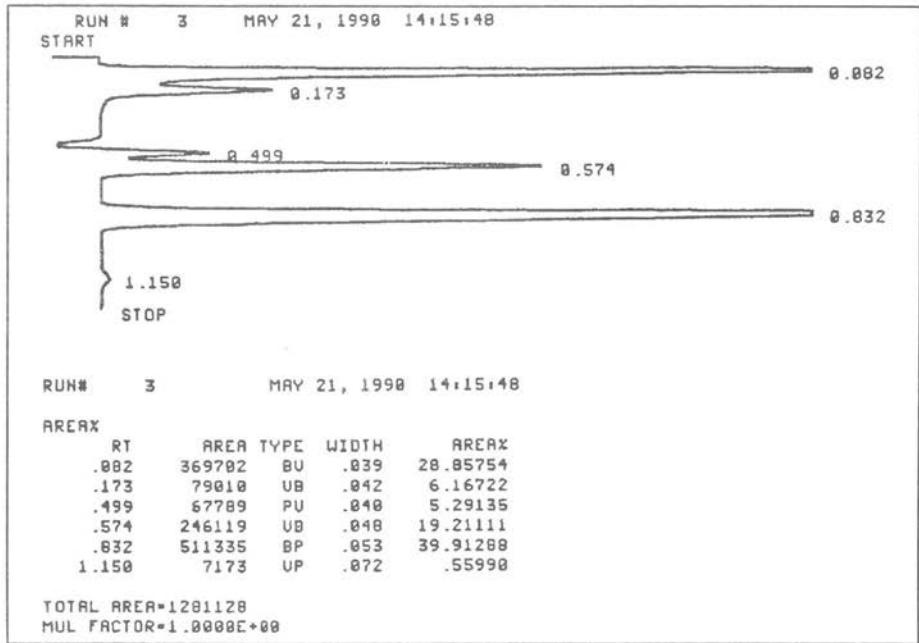


Figure 7-6. Example of Demo Chromatogram Test T

Performing Test T

1. Disconnect any HP-IL cables from rear of instrument.
2. After selecting test T, press [DEL] [METH] [ENTER] and set [ATT 2 ^] to 4 and [CHT SP] to 4.
3. Press the [START] key to begin the chromatogram.
4. Press the [STOP] key to end the chromatogram after the peak marked with a retention time of 1.150 has been plotted. The demo chromatogram should resemble figure 7-6.

Keyboard status indicator sequence—Whenever a self-test is selected, it will run continuously until the unit is turned off. The keyboard status indicators (LEDs) will indicate which test is running, according to table 7-1. At the conclusion of the test, all indicators will blink, indicating a successful completion of the test. If a test fails, an appropriate error message will be printed. (See “Interpreting Diagnostic Test Failures” in this chapter.) At power-on the integrator runs tests 1, 2, 4, 5, and 0 as part of the power-on self-test.

Table 7-1. Keyboard Status Indicators Sequence

Test No.	KYBD	COMM	READY	RUN
1	Off	Off	Off	On
2	Off	Off	On	Off
3	Off	Off	On	On
4	Off	On	Off	Off
5	Off	On	Off	On
6	Off	On	On	Off
7	Off	On	On	On
8	On	Off	Off	Off
9	On	Off	Off	On
B	On	Off	On	Off
L	On	Off	On	On
K	On	On	Off	Off
N	On	On	On	On
O	On	On	Off	On

Table 7-2. Equipment Needed for Self-Test Diagnostics

Test Number	Equipment Needed	Installation Jack
6	Test connector HP part number 03396-60540	COMPUTER
7	HP-IL cable(s)	INSTRUMENT NETWORK
8	HP-IL cable(s) and device(s)	INSTRUMENT NETWORK
A	Test connector HP-IL cable(s)	COMPUTER INSTRUMENT NETWORK
T	None	

Before selecting tests 6, 7, 8, 9, B, and T, follow the appropriate instructions below.

- Test 6** Connect the test connector (HP part number 03396-60540) to the rear panel "COMPUTER" jack.
- Test 7** Connect one or more HP-IL cables to the "INSTRUMENT NETWORK" jacks on the rear of the HP 3396 Series II.
- Test 8** Leave any HP-IL or INET devices connected to the HP 3396 Series II via HP-IL cables.
- Test 9** Disconnect any remote control or sample number cables connected to the integrator before running the test.
- Test B** Before selecting this test:
1. Set the analog input switch to the 0-V (down) position with a small, straight-blade screwdriver.
 2. Make sure the unit has been powered-on for at least 30 minutes.

Running the Signal Tests

In addition to the self-test diagnostics, A/D signal problems can be detected using the 0-V and 1-V tests described in this section. A small (0.32-cm or 1/8-in.) straight-blade screwdriver can be used to change the switch settings.

CAUTION

Save all BASIC programs, methods, and other files, if possible, on an external disc drive before starting the 0-V and 1-V input tests. The HP 3396 Series II memory clears when the LINE switch is pressed, resulting in the loss of all data that were not saved to an external disk.

Zero-Volt Input Test

The zero-volt input test reports the value of a 0-V input signal as measured by the HP 3396 Series II. The reported value can be inspected to ensure that it is within acceptable limits.

1. Turn the integrator off.
2. Locate the analog input switch located on the rear panel. Using a small straight-blade screwdriver, set the switch to the 0-V (down) position. (See figure 7-7.)

In the 0-V position, the switch electrically connects the high and low lines of the "SIGNAL" input together to produce the 0-V condition.

3. Turn the power switch ON.

Then press

[LIST] [ZERO]

The HP 3396 Series II prints

LIST: ZERO = xx, yyyy.yyy

where *xx* is the plot position of the printhead as a percentage of full-scale deflection, and *yyyy.yyy* is the value (in millivolts) of the 0-V input signal as measured by the HP 3396 Series II.

The *yyyy.yyy* value must be 0 \pm 4 mV.

4. Return the analog input switch to the "OPERATE" (middle) position before resuming normal operation.

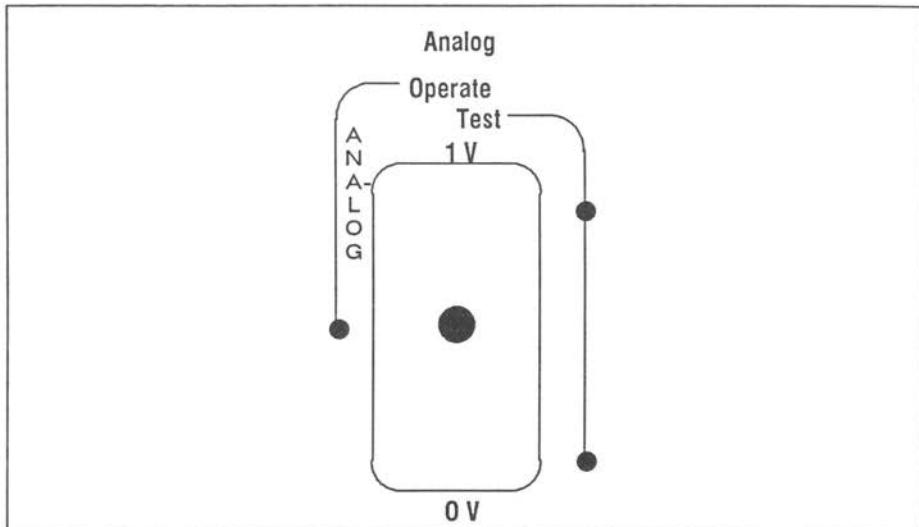


Figure 7-7. Analog Input Switch in Operate Position

One-Volt Input Test

The one-volt input test reports the value of a 1-V input test signal measured by the HP 3396 Series II.

1. Turn the integrator off.
2. Locate the analog input switch located on the HP 3396 Series II rear panel. Using a small, straight-blade screwdriver, set the switch to the 1-V (up) position.
3. Turn the power switch ON.

Then press

[LIST] [ZERO]

The HP 3396 Series II prints

LIST: ZERO = xx, yyyy.yyy

where xx is the plot position of the printhead as a percentage of full-scale deflection, and $yyyy.yyy$ is the value (in millivolts) of the zero input signal as measured by the HP 3396 Series II.

The $yyyy.yyy$ value should be between 800 and 1084.

4. Repeat [LIST] [ZERO] several times. The voltage measured should be consistently between 800 and 1084.
 5. Return the signal input switch to the “OPERATE” (middle) position before resuming normal operation.
-

Diagnostic Procedures

Measuring dc Supply Voltages

The power supply module, HP part number 0950-1884, provides three regulated voltages to the main PC board. These voltages are used either directly by circuits on the board or are converted to other voltages for special purposes. The 5-V supply is used for CPUs, memory, general logic circuits, and paper motor drive. The +12-V supply is used for the print carriage motor drive, ink dot firing, and A/D converter. The -12-V supply is used for RS-232-C communication and printer analog circuits.

The dc supply voltages can be measured under three conditions: isolated, idle load, and full load. When checking these voltages, be sure that you match the test limits on the supply with the conditions of the test. Refer to table 7-4 for the test limits for each voltage under each of these conditions. The supply test points can be located at the left rear corner of the main PC board. See tables 7-3 and 7-5 and figure 7-9 for detail identifying the test points.

Equipment required:

- Voltmeter, at least 3-1/2 digits resolution
- 15-ohm 2-watt resistor (HP part number 0698-3605)

Follow the instructions in this chapter and disassemble the unit through “Remove the Print Mechanism.”

WARNING

IT IS DANGEROUS AND UNNECESSARY TO PROBE THE POWER SUPPLY VOLTAGES AT THE POWER SUPPLY END OF THE DC CABLE. HIGH VOLTAGES EXIST ON THE HEAT SINKS AND OTHER COMPONENTS OF THE POWER SUPPLY MODULE.

Idle Load Measurement

To measure the voltages at idle load conditions, do the following:

1. Disconnect motor cables from P251 and P268.
2. Apply power to the unit.
3. Measure dc voltages at the P501 test points.
4. Turn off power.

Full-Load Voltage Drop Measurement

The full-load test is performed differently when looking at the 5-V supply or the +12-V supply. To test the 5-V supply at full load, do the following:

1. Connect the paper motor at P251.
2. Disconnect the print carrier motor P268.
3. Disconnect paper sensor cable at P250.
4. Connect voltmeter leads to test pins at P501.
5. Apply power to the unit.

The initial reading should be near the idle measurement, but as the confidence test proceeds (after about 9 seconds), the voltage should drop. The lowest reading obtained before the keyboard LEDs go out should be used to verify the full-load drop.

6. Turn off power.

To test the +12-V supply at full load, do the following:

1. Disconnect the paper sensor cable from P250.
2. Disconnect the paper motor from P251.

3. Connect the print carriage motor to P268.
4. Remove the print cartridge.
5. Apply power and observe the power supply voltages during the high-speed motions of the print carriage during the confidence test interval. Use the lowest reading to calculate observed full-load voltage drop.
6. Turn off power.

Isolated Measurement

This measurement must be made with an approximately 15-ohm load on the + 5-V supply.

If a load resistor is not available, either print mechanism motor can be used as a load for the + 5-V supply. Use two 24-AWG solid or tinned stranded jumper wires to connect pins 3 and 9 of the dc cable to pins 1 (red) and 2 (brown) of either motor. This will provide a 14-ohm load for this test.

1. Find the dc supply cable that passes through the main sheet metal bracket and remove it from main board connector P500. (See figure 7-11 for detail on removing this connector).
2. Obtain a 15-ohm 2-watt resistor (HP part number 0698-3605) with at least 3/4-in.-long leads. Bend the leads at right angles to the body to form a U shape.
3. Insert the resistor leads directly into the dc cable between pins 3 and 9.
4. Apply power to the unit. The voltages should then be checked by probing the exposed contacts on the top of the connector body.
5. Turn off power.

Table 7-3. Test and Interconnect Points

Item	Shown in Figure	Description	Test Point
1	7-9	DC Secondary Connection	P500
2	7-9	DC Test Points	P501
3	7-9	Optical Sensor Connection	P259
4	7-9	Paper Drive Connection	P251
5	7-9	Print Carriage Connection	P268
6	7-9	Out-of-Paper Sense Connection	P250
21	8-1	AC Primary Connection	J1
22	8-1	Supercap Test Points	W100
7	7-9	Switch Sense Connection	J2
8	7-9	Print Cartridge Connection	J249

Table 7-4. The dc Voltage Measurement Limits

Supply	Isolated	Idle Load	Voltage Drop Full Load
+5 V	5.16 to 5.26	5.10 to 5.19	40 to 100 mV
+12 V	10.75 to 13.75	11.30 to 13.62	50 to 200 mV
-12 V	-10.5 to -14.5	-10.98 to -14.1	Not Applicable

Table 7-5. The dc Voltage Test Points

Supply	Isolated	Idle, Full Load
Common	DC Cable pin 3 or 8	P501 pin 5
+5 V	DC Cable pin 4 or 9	P501 pin 7
+12 V	DC Cable pin 7 or 2	P501 pin 3
-12 V	DC Cable pin 6 or 1	P501 pin 1

Measuring Motor Windings

This procedure is used to test for internal shorts in either the print carrier or the paper drive motor. The same procedure is used for both motors.

The equipment required is an ohmmeter with sensitive low ohms range (200 ohms or less).

Turn off power.

Follow the disassembly instructions up to and including "Remove the Top Cover."

Do the following for each motor:

1. Disconnect the motor from the main PC board from P251 or P268.
2. Probe the exposed crimp contacts on the top of the connector.
3. Compare the readings obtained to the limits in tables 7-6 and 7-7 for that motor.

Table 7-6. Print Carriage Motor Winding Resistances

Red to Brown	12.6 to 15.4 ohms
Blue to Yellow	12.6 to 15.4 ohms
Note: The motor has two white wires. The following measurements will show an OPEN CIRCUIT to one white wire and show indicated value to the other white wire.	
Red or Brown to White	6.3 to 7.7 ohms
Blue or Yellow to White	6.3 to 7.7 ohms

Table 7-7. Paper Drive Motor Winding Resistances

Red to Brown	13 to 15.8 ohms
Blue to Yellow	13 to 15.8 ohms
Note: The motor has two white wires. The following measurements will show an OPEN CIRCUIT to one white wire and show indicated value to the other white wire.	
Red or Brown to White	6.5 to 7.9 ohms
Blue or Yellow to White	6.5 to 7.9 ohms

Partitioning Failures

All diagnostic tests are for circuitry on the main PC board as described in chapter 5. A failure of any of these tests (resulting in an ‘ERROR =’ message) strongly indicates an electronic failure on this circuit card. If the Power-On Confidence Tests do not run at all, then the problem can be on the main PC board or the power supply module. Paper or pen motion failures in the confidence test or any diagnostic might indicate a printer problem but more likely a main PC board problem.

Before performing any of the troubleshooting procedures detailed below, do the following:

1. Remove any cables from the rear panel.
2. Disassemble the unit through “Remove the Top Cover.”
3. Remove the print cartridge.
4. Install a jumper between the pins at W100. This disables the supercap Read/Write memory backup and ensures that the confidence tests will run when powered on.

Module Level Troubleshooting

The following troubleshooting tree is based on symptoms that are observed during the power-on confidence tests. Each observable symptom is followed by several potential causes. For each cause there is an action listed that will confirm the cause and indicate the recommended repair. If the cause is not

confirmed, continue with the next potential cause. When you reach the last cause for the symptom, no confirmation is required. Please refer to chapter 5 for a description of the proper behavior of the power-on confidence tests. If the instrument fails to execute these tests, find the appropriate symptom from the following charts. Follow the recommended actions in the order indicated.

SYMPTOM: LEDs do not light at power-on.

Cause	Action
Improper ac Connection	<ol style="list-style-type: none">1. Check fuse and line power connections. Correct if necessary.
Z-80 CPU Kernel Problem	<ol style="list-style-type: none">2. Check for ac line voltage at ac module J1, pins 5 and 7. If line voltage is absent, double-check the fuse and line connections; replace ac module if connections are good.
DC Voltage Problem	<ol style="list-style-type: none">3. Check dc voltages at main PC board test points, P501. If voltages are good, replace main PC board.4. Carefully check main PC board and both printer motors for overheating. The power supply is capable of providing enough excess power to make an overloaded circuit heat obviously. If there are no signs of an overload, the power supply is probably defective. Replace the power supply.
Overload on Main PC Board	<ol style="list-style-type: none">5. If both print mechanism motors do not overheat (they dissipate about 7 watts during print and plot modes) and there is an overheated circuit on the main PC board, replace the main PC board.
Overload on Print Mechanism	<ol style="list-style-type: none">6. Disconnect the overheated motor. Refer to table 7-6 or 7-7 and measure the winding resistances. If the motor is beyond this range, replace the motor or the print mechanism. If both windings of the motor are within the specified resistance range, proceed.
Internal Main PC Board Failure	<ol style="list-style-type: none">7. Replace the main PC board.

SYMPTOM: LEDs remain on continuously after power-on.
Print carriage motion may be erratic.

Cause	Action
Power Supply Problem	<ol style="list-style-type: none">1. See table 7-5 and measure the +5- and +12-V supplies under isolated conditions. Replace the power supply module if out of range, as per test limits in table 7-4.2. Measure +5- and +12-V supply at idle and full load. If voltage drop is greater than the specified amount in the table, replace the power supply.
Defective Paper Drive Motor	<ol style="list-style-type: none">3. Disconnect paper drive motor from P251 and reapply power. If LEDs go out after several seconds and indicate confidence test activity, the paper drive motor is shorted internally. Replace the motor or the print mechanism.
Z-80 Kernel Problem	<ol style="list-style-type: none">4. Replace the main PC board.

SYMPTOM: Print carriage does not move or it chatters and moves erratically. Paper feed may or may not be normal. LEDs indicate proper confidence test activity.

Cause	Action
Power Supply Problem	<ol style="list-style-type: none">1. See table 7-5 and measure the + 12 and -12-V supplies under isolated and idle conditions. Check the test limits from table 7-4 and replace supply module if out of range.2. Measure + 12-V supply at full load. If voltage drop is greater than the specified amount, replace the power supply.
Print Carriage Motor Is Defective	<ol style="list-style-type: none">3. Turn off power. Remove paper drive motor from P251. Remove print carriage motor from P268. <i>Slowly</i> move print carriage to center of mechanism. Reconnect print carriage motor to P251. Leave paper sensor connected to P250. Apply power to unit. After several seconds, the print carriage should make three or four motions to the left for a total of about 1.35 inches. If it does not move, moves erratically, or makes excessive noise, the motor is probably defective. Replace the motor or print mechanism.Alternatively refer to table 7-6 and measure the print carriage motor winding resistance. Replace the motor or the print mechanism if out of range.
Drive Electronics Are Defective	<ol style="list-style-type: none">4. Replace the main PC board.

SYMPTOM: Paper does not feed or feeds slowly or erratically.
Print carriage motion appears normal.

Cause	Action
Blocked Paper Path	<ol style="list-style-type: none">1. Check paper path for obstructions.2. Check that the paper separator is installed properly.3. If Z-fold paper was in use, switch to roll paper unless a Hewlett-Packard paper stand was used.
Paper Drive Motor Defective	<ol style="list-style-type: none">4. Disconnect power from unit. Remove print mechanism. Set the print mechanism down on the board and rotate it so that the paper drive motor is to the rear and its shield is resting on the instrument's rear panel. Connect paper motor to P268. Connect out-of-paper sense cable to P250. Connect the optical sensor cable to P259. Apply power to unit. The paper feed grit wheels should immediately rotate "backward" for a fraction of a second and then reverse and feed smoothly for about two seconds. It will then hesitate slightly as the motor slips. Switch the power off and on again and observe the <i>initial</i> motion again. The initial two seconds of motion in both directions should be quiet and smooth. If the paper feed wheels do not move, move erratically, or make excessive noise, the motor is probably defective. Replace the motor or print mechanism. <p>Alternatively refer to table 7-7 and measure the paper motor winding resistance. Replace motor or print mechanism if out of range.</p>
Paper Drive Electronics Defective	<ol style="list-style-type: none">5. Replace main PC board.

Interpreting Diagnostic Test Failures

This section will help you to understand the results of some of the self-test diagnostics.

Several diagnostic tests can identify specific defective socketed components for replacement. Table 7-8 lists these tests, the ERROR and INFO data that are printed for a failure of the test, and the action to correct the problem.

For any other diagnostic test failure, replace the main PC board.

Table 7-8. Diagnostic Error Messages for Socketed Components

Test	ERROR = INFO =	Action
(1)	ERROR = 01H INFO = xxxyH	If xx = FF or 00 through 06, replace U111. If xx = 07 or 08, replace U110.
	ERROR = 03H	ROM version error. Check U111 and U110 for compatibility.
(4)	ERROR = 22H or 23H	Replace U305.
	ERROR = 42H or 43H	Replace U317.
	ERROR = 44H	Replace U318. (Application EPROM)
(0)	ERROR = 0DH INFO = 003xH	If x = 1, 2, or 3, replace the print/plot processor U223.

Two of the diagnostic tests can be performed with accessory hardware to verify the unit with a greater confidence level. These tests are the remote and sample number test and the RS-232-C port test. Both tests should be performed with the instrument fully assembled.

Remote and Sample Number Test

Equipment Required

- Three-inch length of 20-AWG solid or tinned stranded jumper wire

Test Procedure

1. Remove any connecting cables from the remote and sample receptacles on the rear panel.
2. Enter the self-test dialog and select test 9 and press [ENTER] to begin repetitive testing.
3. Connect the jumper wire to pin 9 on the sample number connector. Connect the other end of the wire as per table 7-9, and observe the printed error message. The ERROR part of the message should be ignored. Compare the INFO = value to those in the table. Only connect the jumper long enough to cause the error message to print.
4. Similarly, connect the jumper wire from pin 9 on the remote connector to other pins on the remote connector and check for INFO = values from table 7-10.

If no error message is printed for any pin combination listed, it may indicate a failure in U500 or U501. Replace the main PC board.

Table 7-9. Sample Connector Test

Sample No. Pin	INFO =
1	8002H
2	8008H
3	8004H
4	8001H
5	8100H
6	8800H
7	8400H
8	8200H
10	8040H

Table 7-10. Remote Connector Test

Remote Pin No.	INFO =
3	1080H
5	8010H
6	C000H
7	8020H
8	A000H

RS-232-C Cable Testing

The RS-232-C loopback test can be used to test the integrator alone or with a communications cable attached. By testing the instrument in both configurations, you can identify which element of the system is faulty and avoid unnecessary service charges.

Testing the instrument alone is described in chapter 2 of this manual under the heading "Running the Self-Test Diagnostics." The 15-pin loopback connector (HP part number 03396-60540) used can be purchased through your local HP sales office. If you wish to wire one yourself, obtain a male 15-pin subminiature-D series connector and wire it as in table 7-11. Be sure to test it while the instrument is in good working order!

To test the instrument and its RS-232-C cable, first you have to locate a compatible loopback connector for the opposite end of the cable. This may be a 25-pin or a 9-pin connector, with male or female contacts. Obtain a proper mating connector and wire it for loopback as shown in table 7-11. Test the loopback connector on a known good cable before relying on it when a failure occurs.

Loopback connectors for standard connector sizes are available from computer supply and accessory distributors. If the advertised wiring includes the connections shown in table 7-11, then it should be suitable for the diagnostic test. Additional connections, such as pins 6 to 20 in the 25-pin connector, will not affect the test.

Run Diagnostic Test 6 with the RS-232-C cable connected to the integrator and the 25- or 9-pin loopback connector on the other end. If this test fails after passing with the 15-pin alone, the cable is defective.

Note: The hardware handshake signals CA and CB are not wired in the DCE cables (HP part numbers 03396-50520 and 03396-60530); thus, the test cannot pass without an error message. When testing either one of these cables with a loopback connector, an ERROR = 24H indicates that the cable passes the continuity test of the transmitted data and received data lines. If ERROR = 25H is printed, it indicates a failure of these lines.

Table 7-11. Loopback Connector Wiring

Connector Size	Connect Pins
9-pin Male	2 to 3
15-pin Male	1 to 13 and 2 to 14
25-pin M/F	2 to 3 and 4 to 5

Disassembly and Reassembly Instructions

Equipment Required

- Small size 1 pt Pozidriv screwdriver
- Large size 2 pt Pozidriv screwdriver
- Pry tool (HP part number 8710-1347)
- Small 1/8-in. flat-blade screwdriver
- Replacement self-tapping screws (HP part number 0624-0427)

WARNING

DISCONNECT AC POWER SOURCE BEFORE OPENING THE CASE.

Remove Power from the Unit

1. Turn the unit off by depressing the line switch located in the left rear of the instrument.
2. Remove the power cord.

Remove the Paper

1. Tear the paper at a serration before the point where it enters the print mechanism, open the printer window, lift the bail arms forward, and pull the remaining paper up and out of the mechanism.
2. Remove the roll from the paper hangers (if installed).

Remove the Paper Hangers (if Installed)

1. Apply slight pressure to the locking tabs on the bottom of the hangers and pull up.

Remove the Printer Window

1. Lift the window up.
2. With the thumb and forefinger, apply slight pressure to the left-hand side of the window to release the window from the locking tab and lift the window up. Notice that the tab on the left-hand side is slotted.

Remove the Paper Separator

1. Pull forward and lift up.

Remove the Keyboard

1. Insert the pry tool between the top of the keyboard and the case on the right-hand side, and apply slight downward pressure until the locking tab releases. Repeat the process in the middle and on the left side, and lift the keyboard up.
2. While holding the keyboard with one hand, grasp the ribbon cable with the other hand and carefully pull the cable out of the keyboard.

Remove the Top Cover

1. With the large Pozidriv, remove the two self-tapping screws in the front of the unit under the keyboard. The middle hole is not used.
2. With the large Pozidriv, remove the two self-tapping screws located under the printer window.
3. With the large Pozidriv, remove the two self-tapping screws in the square openings in the rear of the unit.
4. Lift the top cover off.

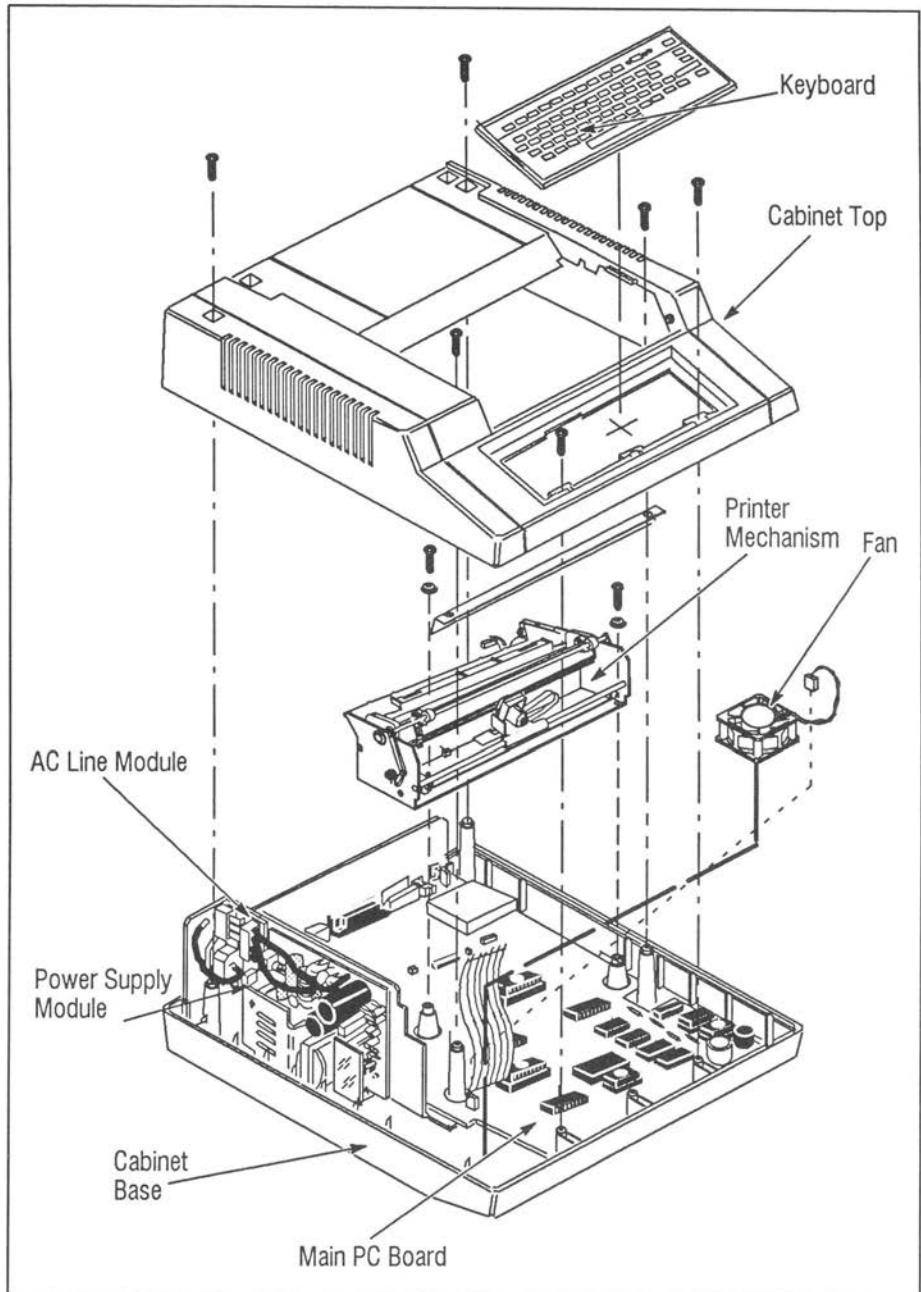


Figure 7-8. Instrument View with Printer Removed

Remove the Print Mechanism

1. Remove the aluminum shield from the two posts in front of the print mechanism.
2. With the large Pozidriv, remove the two self-tapping screws in the front of the mechanism that secure the mechanism to the case. Be careful not to lose the cupped washers.
3. Turn the unit around so that you are facing the rear panel.
4. See figure 7-9 and tables 7-3 and 8-1 to identify and remove the following printer cables. Remove the print carriage motor cable from connector P268. Remove the optical sensor cable from connector P259. Remove the flexible print cartridge cable from J249, noting that it only makes contact on one side. Remove the out-of-paper sensor cable from connector P250. Remove the paper drive motor cable from connector P251.

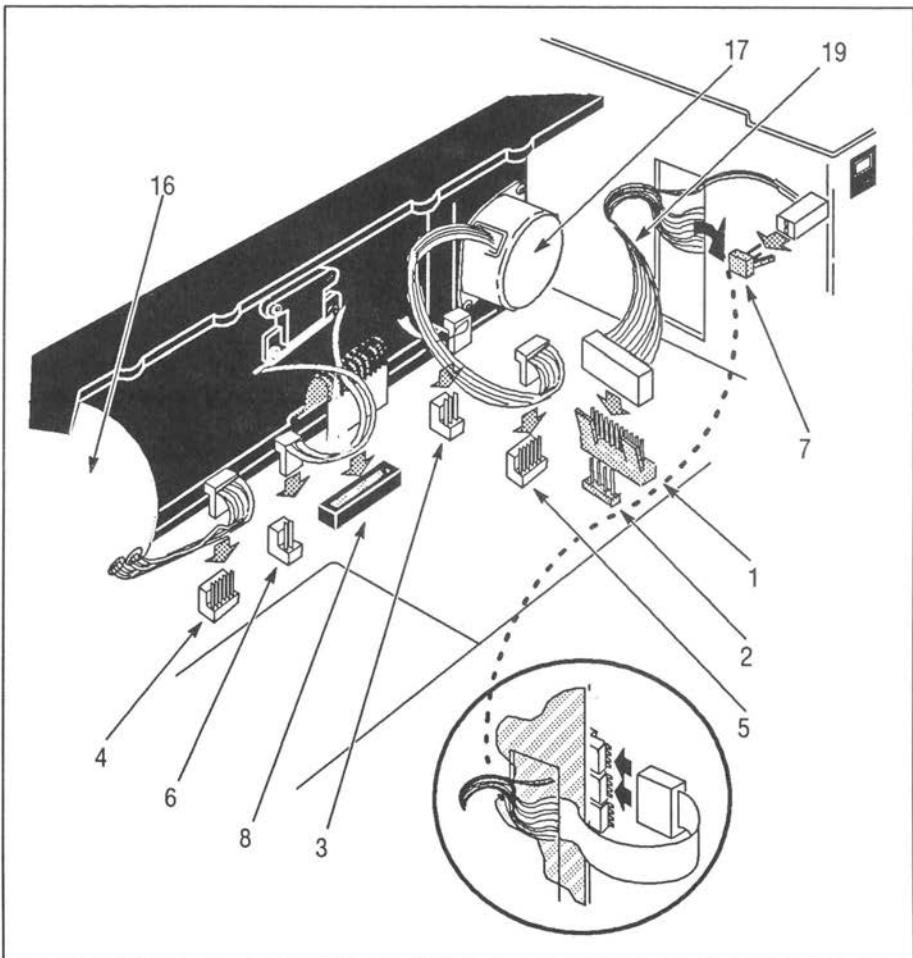


Figure 7-9. Print Mechanism Cable Connections and Test Points
(See tables 7-3 and 8-2 for parts identification.)

5. Lift the mechanism out of the unit.

Remove the Power Supply Board

1. Remove the cable that connects the power supply to the main board at connector P500 following this procedure.
 - a. Grasp the connector, *not the cable*, and with the small flat-blade screwdriver pull back one of the locking tabs. While holding back the locking tab, pull up slightly until that side of the connector clears the locking tab.
 - b. Refer to figure 7-10. Insert the screwdriver between the connector and P500, and twist to loosen the connector. Remove the connector.

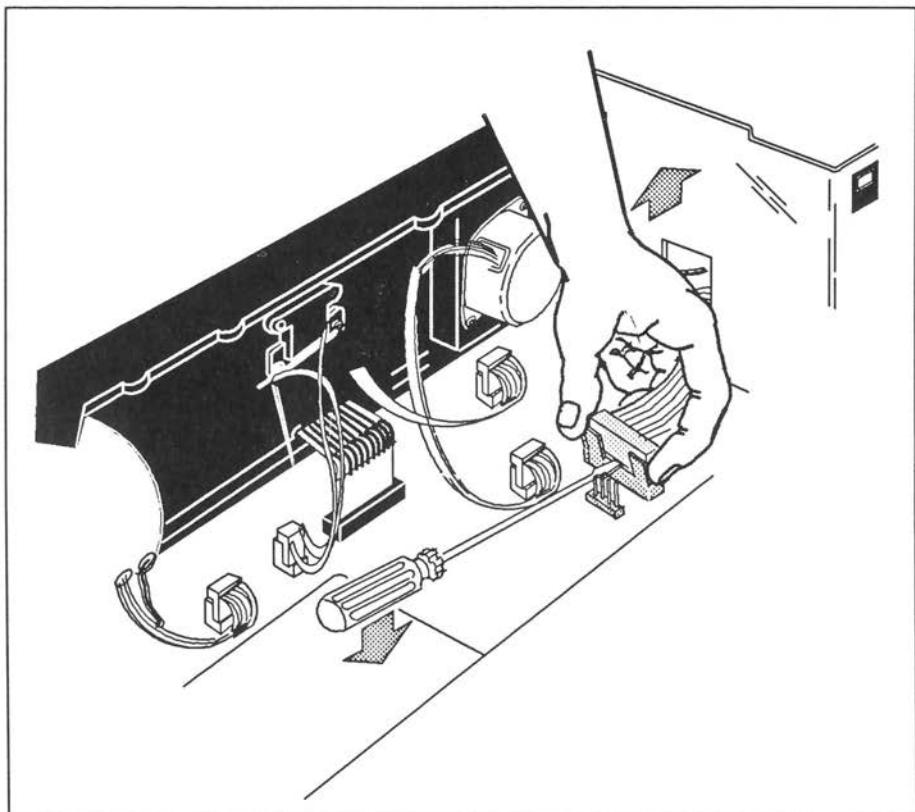


Figure 7-10. DC Cable Removal Detail

2. Remove the ac primary cable that connects the power supply to the line module at connector J1 by releasing the locking tab and pulling out the cable.

3. Remove the switch sense cable connected to J2 by releasing the locking tab and pulling out the cable.
4. With the small Pozidriv, remove the two screws that secure the power supply to the metal shield. They are located at the top of the board.
5. Lift the power supply board out of the unit, carefully feeding the cable through the hole in the shield.

Remove the Line Module

1. With the small Pozidriv, remove the two screws that secure the line module to the metal shield. They are located on each side of the power cord socket.
2. With the small Pozidriv, remove the screw attaching the green safety ground wire to the rear panel.
3. Lift the line module out of the unit.

Remove the Cooling Fan

1. Remove the fan cable from the connector on the main PC board by applying slight pressure on the right side of the connector to release the locking tab and pull up.
2. Grasp the fan and apply pressure toward the front of the unit and up until the fan clears the locking tabs.
3. Lift the fan out of the unit.

Remove the Main Board

1. Remove the seven screws that secure the main PC board to the case and the metal shield. There are three pan-head screws in the rear and four self-tapping screws, two in the front on either side, and two in the middle on either side. Use the small Pozidriv to remove the pan-head screws in the rear and the large Pozidriv to remove the self-tapping screws.
2. Lift the board up from the front and lift it out of the unit being sure to clear the connectors in the rear from the shield.

LIFT THE METAL SHIELD OUT OF THE UNIT.

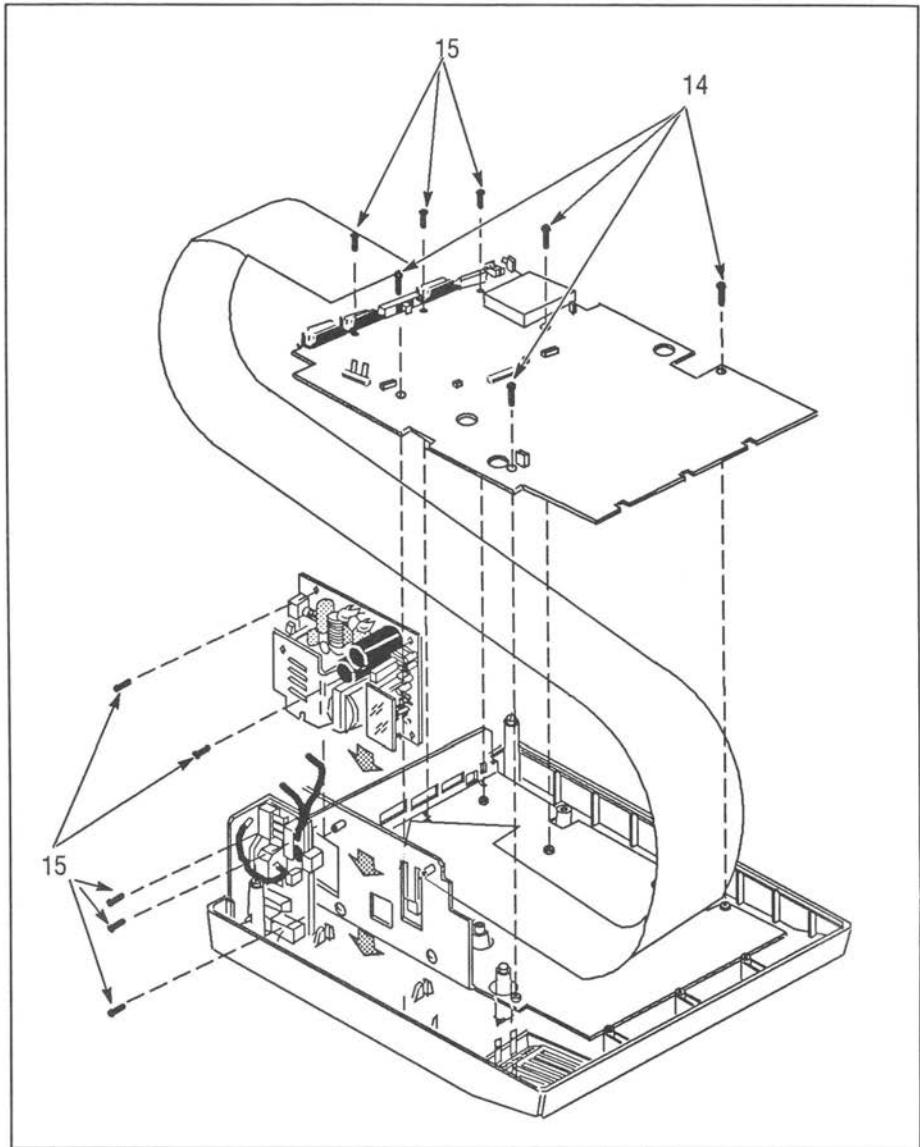
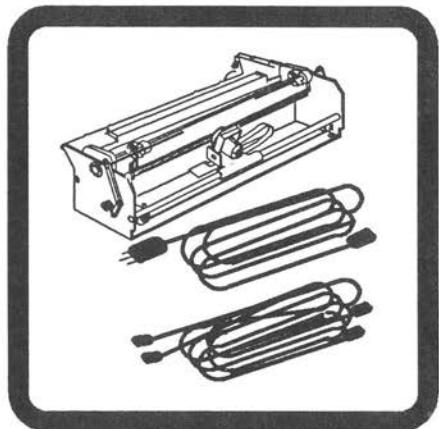


Figure 7-11. Instrument View with Main PC Board Removed
(See table 8-2 for parts identification.)

The unit is now completely disassembled. To reassemble the instrument, follow this procedure in reverse. Refer to figures 7-9, 7-11, and 8-1 for parts and cable placement details. All self-tapping screws should be replaced with new screws.

Parts and Cables



In this chapter....

- Replacement Parts
- Cable Diagrams
- Choosing the Correct Power Cable

Replacement Parts

Table 8-1. Socketed Components

Item No.	Shown in Figure No.	Description	Reference Description	Part Number
1	8-1	Z-80 Diagnostic ROM	U111	03396-80022
*2	8-1	Z-80 Standard ROM	U110	03396-80012
*2	8-1	Z-80 BASIC ROM	U110	03396-80032
3	8-1	INET ROM	U317	03396-80042
4	8-1	Application EPROM (General)	U318	03396-80105
5	8-1	Data Communications CPU	U305	1820-6292
6	8-1	Print/Plot CPU	U223	03394-80032
-	Not shown	Applications EPROM Carrier	-	1200-1439

*Note: If BASIC (Option 100) is installed item 2, U110 will contain the BASIC ROM. If BASIC is not installed item 2, U110 will contain the standard ROM.

Table 8-2. Other Replacement Parts

Item No.	Shown in Figure No.	Description	Part No.	Quantity
7	8-1	Main PC Board	03396-60015	1
8	8-1	Power Supply Module	0950-1884	1
9	8-1	AC Module Assembly	03394-60030	1
10	8-1	Printer Mechanism	03394-60625	1
11	8-1	Keyboard	03396-60635	1
12	8-1	Fan	35900-60520	1
13	8-1	Cup Washer	02225-00017	2
14	7-11, 8-1	Screw, Self-Tapping	0624-0427	12
15	7-11	Screw, Machine	0515-0912	8
16	7-9, 8-1	Paper Drive Motor	3140-0787	1
17	7-9, 8-1	Print Carriage Motor	3140-0785	1
18	8-1	AC Module Cable	8120-5120	1
19	7-9, 8-1	DC Secondary Cable	8120-5121	1
20	8-1	Data Comm Switches	3101-2640	1
-	Not shown	Window	03394-40100	1

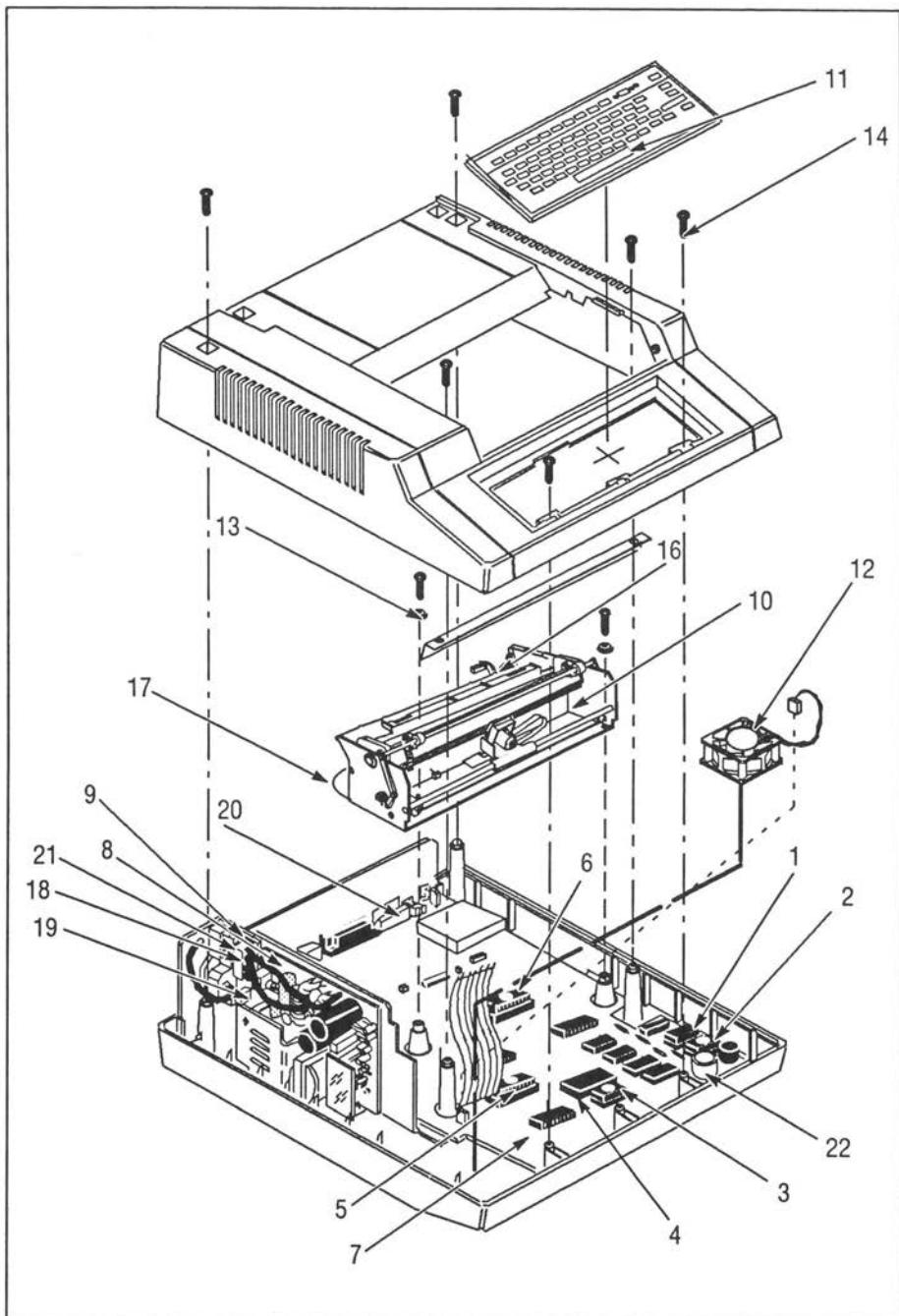
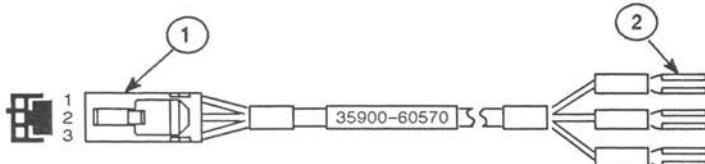


Figure 8-1. Instrument View with Printer Removed
(See tables 8-1 and 8-2 for parts identification.)

Cable Diagrams

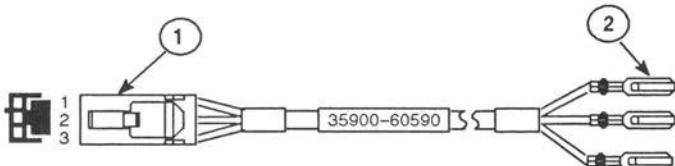
Analog Signal Cables

HP part number 35900-60570 (Opt 007) HP 5880A Gas Chromatograph



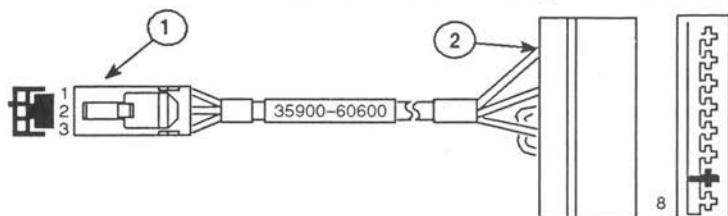
Connector 1—HP 3396	Signal Name	Connector 2—HP 5880 Wire Color
1	Shield	Orange
2	Signal –	Black
3	Signal +	Red

HP part number 35900-60590 (Opt 010) HP 5790A Gas Chromatograph



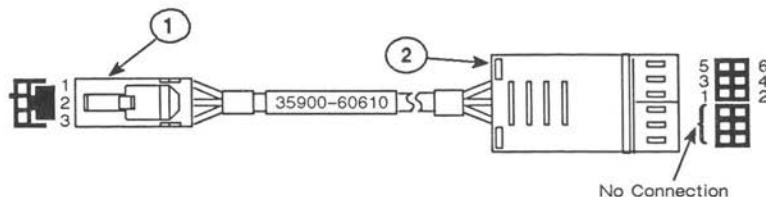
Connector 1—HP 3396	Signal Name	Connector 2—HP 5790 Wire Color
1	Shield	Orange
2	Signal –	Black
3	Signal +	Red

HP part number 35900-60600 (Opt 011) HP 1090A/L LC
and HP 1040A Diode Array Detector



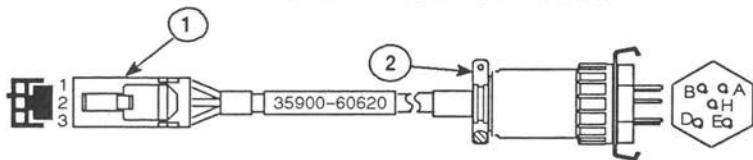
Connector 1—HP 3396	Signal Name	Wire Color	Connector 2—HP 1090 and HP 1040
1	Shield	Orange	1
2	Signal –	Black	5
3	Signal +	Red	3
	Jumper		4,6

HP part number 35900-60610 (Opt 012) HP 5890A Gas Chromatograph



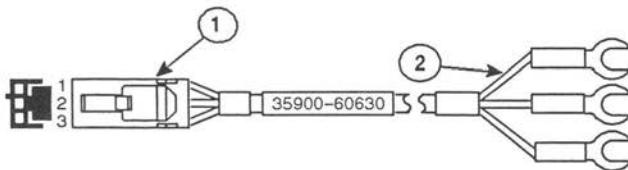
Connector 1—HP 3396	Signal Name	Wire Color	Connector 2—HP 5890
1	Shield	Orange	2
2	Signal –	Black	6
3	Signal +	Red	4

HP part number 35900-60620 (Opt 001) HP 5710/30 GC
and HP 1081B UV Detector



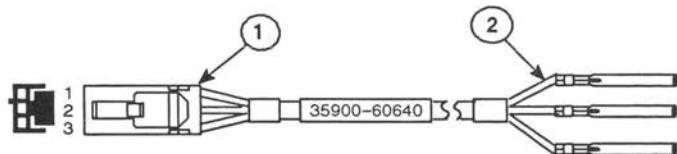
Connector 1 – HP 3396	Signal Name	Wire Color	Connector 2 – HP 5710/30 and HP 1081
1	Shield	Orange	E
2	Signal –	Black	B
3	Signal +	Red	H

HP part number 35900-60630 (Opt 004) for General Purpose Use—Spade Lugs



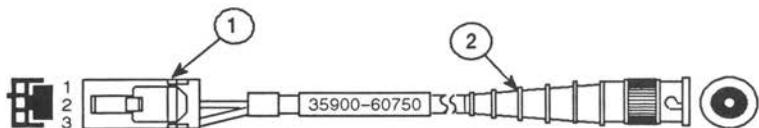
Connector 1 – HP 3396	Signal Name	Connector 2 – HP 5880 Wire Color
1	Shield	Orange
2	Signal –	Black
3	Signal +	Red

HP part number 35900-60640 (Opt 006)
for Special Purpose Use Square Pins



Connector 1—HP 3396	Signal Name	Connector 2 Wire Color
1	Shield	Orange
2	Signal –	Black
3	Signal +	Red

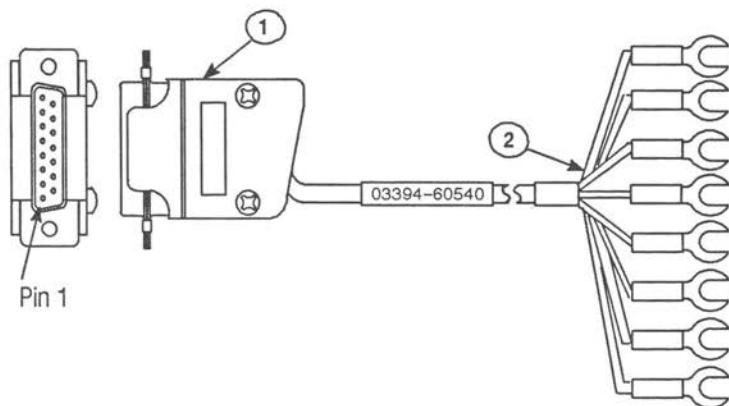
HP part number 35900-60750 (Opt 013) HP 1046A Fluorescence Detector



Connector 1—HP 3396	Signal Name	Wire Color	Connector 2—HP 1046
2	Signal –	Black	Shield
3	Signal +	Red	Center

Remote Control Cables

HP part number 03394-60540 (Opt 004, 006, 007)
for General Purpose Use—Spade Lugs



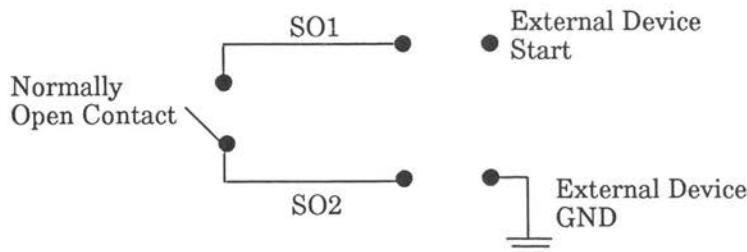
Connector 1—HP 3396	Signal Name	Connector 2
1	SO1	Black
3	START	Green
5	RDY IN	Red
6	STOP	White
13	SO2	Orange
14	RDY OUT	Blue
15	GND	Brown
N.C.	DRAIN	Clear

Table 8-3. Remote Control Signal Function

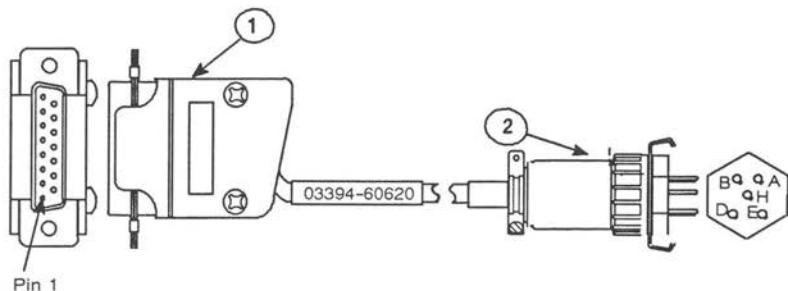
Signal Name	Signal Description	Input/Output
SO1	Start Oven 1	Output
START	Start HP 3396	Input
RDY IN	Indicates readiness of system to HP 3396	Input
STOP	Stop HP 3396	Input
SO2	Start Oven 2	Output
RDY OUT	Indicates readiness of HP 3396 to system	Output

SO1 and SO2 are normally open relay contacts that provide a one-second contact closure to start external devices when START is pressed on the HP 3396 Series II.

The proper configuration to start an external device is:

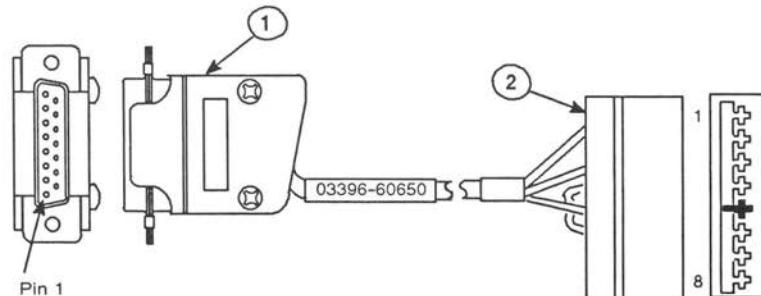


HP part number 03396-60620 (Opt 001, 010)
 HP 5710/30/90 Gas Chromatograph



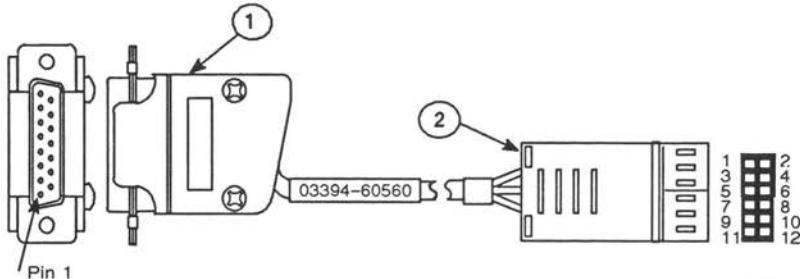
Connector 1—HP 3396	Signal Name	Wire Color	Connector 2—HP 5710/30/90
1	S01	Black	B
3	START	Green	B
5	RDY IN	Red	A
9, 13	S02	Orange	N.C.
15	GND	Brown	E

HP part number 03396-60650 (Opt 011)
 HP 1090A/L LC and HP 1040A Diode Array Detector



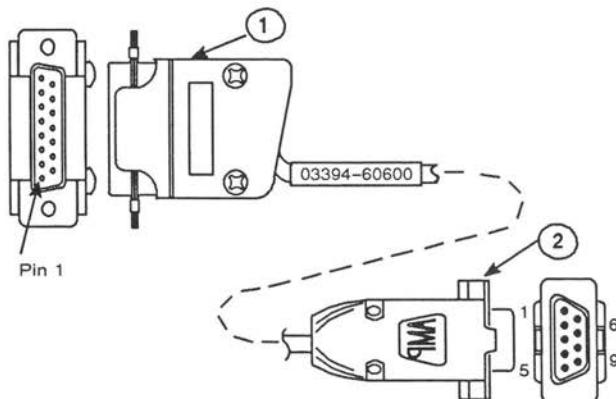
Connector 1—HP 3396	Signal Name	Wire Color	Connector 2—HP 1090
3	START	Red	4
6	STOP	Green	6
15	GND	Black/Orange	1, 8
14	READY	White	3

HP part number 03394-60560 (Opt 012) HP 5890A Gas Chromatograph



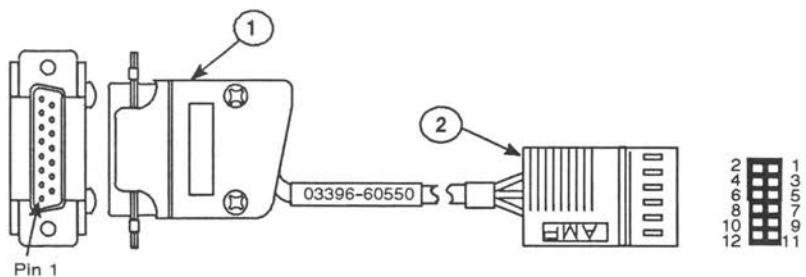
Connector 1 – HP 3396	Wire Color	Signal Name	Connector 2 – HP 5890
1	Black	SO1	2
3	Green	START	7
5	Red	RDY IN	5
9	Brown	GND	8
13	Orange	SO2	1
15	Clear	GND	N.C.

HP part number 03394-60600 (Opt 013)
HP 1046A Fluorescence Detector (APG)



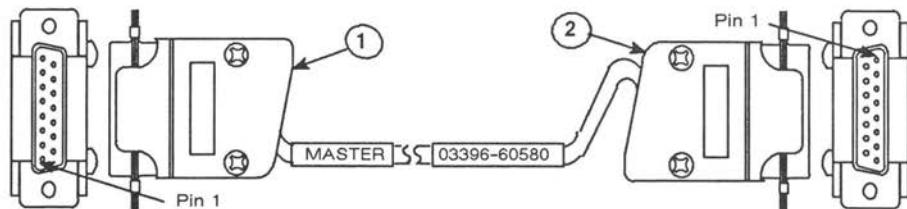
Connector 1 – HP 3396	Wire Color	Signal Name	Connector 2 – HP 1046
N.C.	Black	START REQ	9
1, 3	Green	START/SO1	3
5, 14	Red	RDY	7
6	White	STOP	8
9	Brown	SIG GND	1
13, 15	Brown/Jumper	SO2, GND	N.C.
N.C.		DRAIN	(To Shell Only)

HP part number 03396-60550 HP 7673A Remote Start/Stop



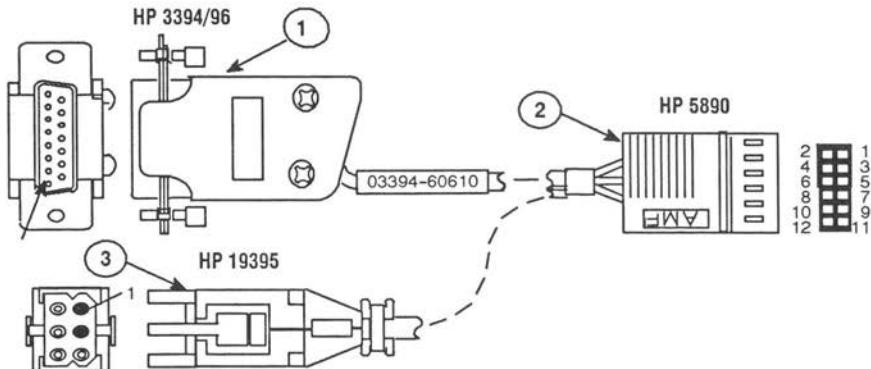
Connector 1 – HP 3396		Wire Color	Connector 2 – HP 7673	
Pin	Signal Name		Pin	Signal Name
1	SO1	Black	2	GND
3	START IN	Green	7	START OUT 1
5	RDY IN	Red	5	RDY OUT
9	GND	Brown	8	GND
13	SO2	Orange	1	START IN
14	RDY OUT	White	12	RDY IN
15	GND	Drain	3	JMPR TO NO. 4
		Blue	4	JMPR TO NO. 3
		Blue	6	JMPR TO NO. 10
		Brown	10	JMPR TO NO. 6
		Brown		

HP part number 03394-60580 Second HP 3394/96



Connector 1 – HP 3394/96 Master	Signal Name	Wire Color	Connector 2 – HP 3394/96 Slave
1	S01	Black	3
3	START	Green	1
5	RDY/IN	Red	14
9	DRAIN	Clear	9
13	S02	Orange	15
14	RDY/OUT	Blue	5
15	GND	Brown	13

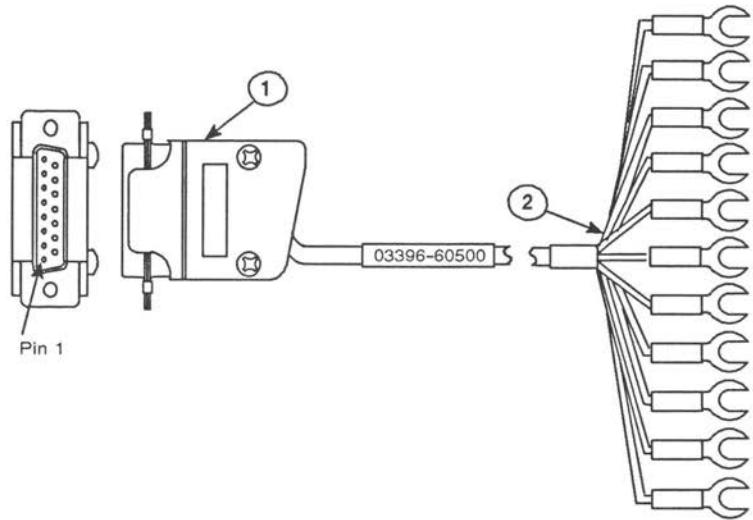
HP part number 03394-60610 Remote Start/Stop Y-Cable
to HP 5890A and HP 19395A HSS



Connector 1 – HP 3394/96	Connector 3 – HP 19395	Signal Name	Connector 2 – HP 5890	Wire Color
–	5	START	1	White
–	6	GND	2	Green
–	3	RDY OUT	5	Black (4-wire)
3	–	S01	7	Red (2-wire)
9	–	S02	8	Black (2-wire)
–	4	GND, RDY OUT	9	Red (4-wire)

Sample Number Cable

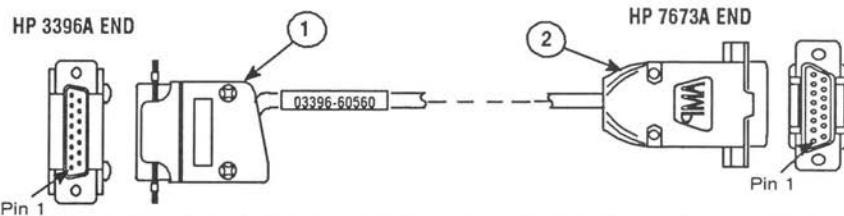
HP part number 03396-60500 (Opt 400) General Purpose



Connector 1-HP 3396	Signal Name	Connector 2—Wire Color
1	BCD 20	Yellow
2	BCD 80	Purple
3	BCD 40	White
4	BCD 10	Orange
5	BCD 1	Brown
6	BCD 8	Green
7	BCD 4	Gray
8	BCD 2	Red
9	GND	Black
10	HITR (High True)	Blue
N.C.	SHIELD	Clear

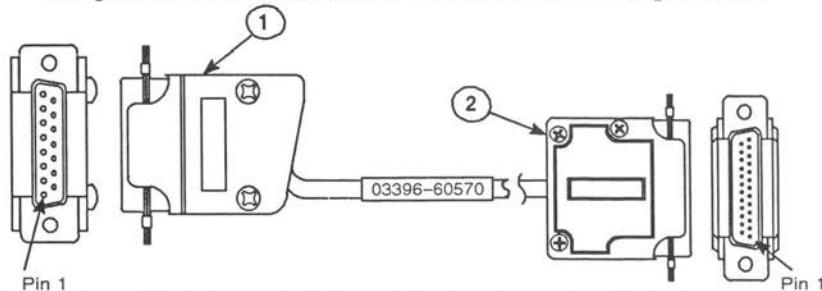
Connecting pin 10, HITR (high true), to pin 9 (GND) will change the BCD signal from high true to low true.

HP part number 03396-60560 HP 7673 BCD Sample Cable



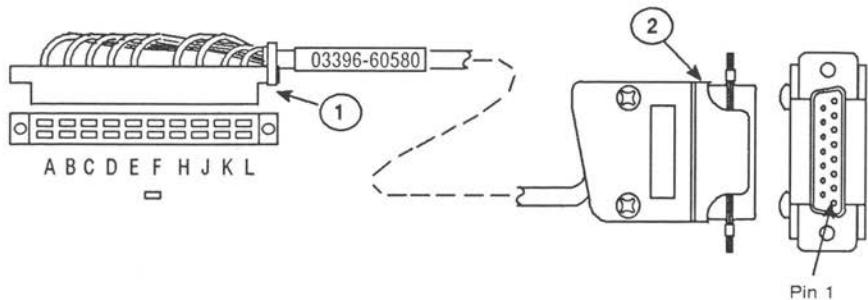
Connector 1 – HP 3396	Signal Name	Wire Color	Connector 2 – HP 7673
1	BCD 20	Green	1
2	BCD 80	Violet	2
3	BCD 40	Blue	3
4	BCD 10	Yellow	4
5	BCD 1	Black	5
6	BCD 8	Orange	6
7	BCD 4	Red	7
8	BCD 2	Brown	8
9	GND	Gray	9

HP part number 03396-60570 HP 19395 BCD Sample Cable



Connector 1 – HP 3396	Signal Name	Wire Color	Connector 2 – HP 19395
1	BCD 20	Yellow	6
2	BCD 80	Violet	7 (GND)
3	BCD 40	White	7 (GND)
4	BCD 10	Orange	5
5	BCD 1	Brown	1
6	BCD 8	Green	4
7	BCD 4	Gray	3
8	BCD 2	Red	2
9	GND	Black	7

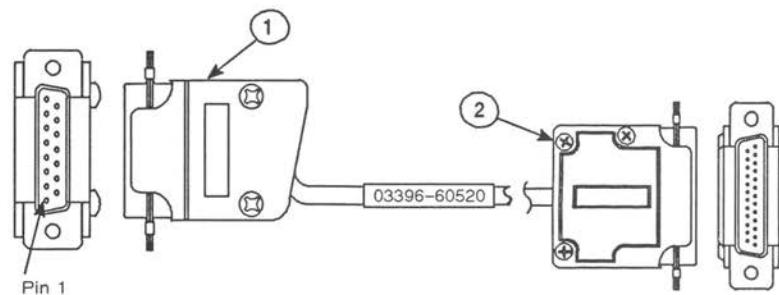
HP part number 03396-60580 HP 1090 BCD Sample Cable



Connector 1 – HP 1090	Signal Name	Wire Color	Connector 2 – HP 3396
A	GND	Black/Drain	9
B	BCD 80	Violet	2
C	BCD 40	White	3
D	BCD 20	Yellow	1
E	BCD 10	Orange	4
F	KEY	—	—
H	BCD 8	Green	6
J	BCD 4	Gray	7
K	BCD 2	Red	8
L	BCD 1	Brown	5
—	HITR (High True)	Blue	10

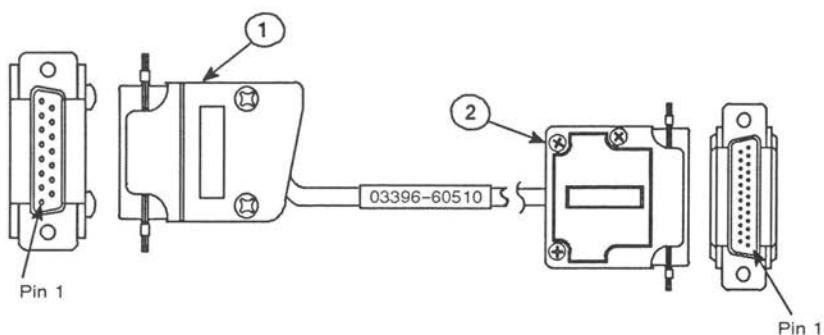
RS-232-C Cables

HP part number 03396-60520 (Opt 301, 304) DCE Female (25-Pin)



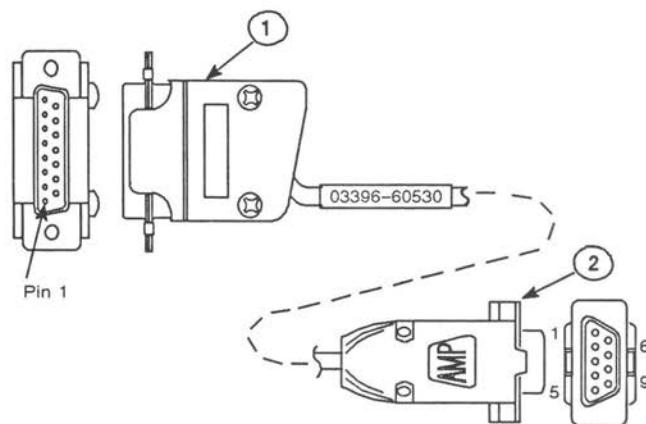
Connector 1 – HP 3396	Signal Name	Wire Color	Connector 2 – RS-232 Device
1	RLSD	Blue	8
2	RX DATA	Red	2
4, 5	—	Brown Jumper	N.C.
9	SIG. GND	Brown	7
14	TX DATA	Green	3
15	—	White	N.C.
N.C.	RTS/CTS		4, 5
N.C.	DSR/DTR		6, 20
N.C.	PROT. GND		1

HP part number 03396-60510 (Opt 302) DTE Male (25-Pin)



Connector 1 – HP 3396	Signal Name	Wire Color	Connector 2 – RS-232 Device
1	RTS	Blue	4
2	RX DATA	Red	3
4, 5	—	Brown Jumper	N.C.
9	SIG. GND	Brown	7
13	CTS	Orange	5
14	TX DATA	Green	2
15	—	White	N.C.
N.C.	PROT. GND		1

HP part number 03396-60530 (Opt 303) DCE Female (9-Pin)

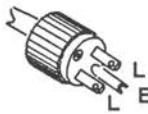
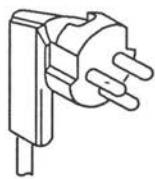
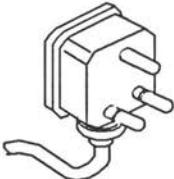


Connector 1—HP 3396	Signal Name	Wire Color	Connector 2—RS-232 Device
1	RLSD	Red	1
2	RX DATA	Green	3
4, 5	—	Brown	N.C.
9	SIG. GND	Black	5
14	TX DATA	White	2
15	—	White/Yellow	N.C.
N.C.	RTS/CTS		7, 8
N.C.	DSR/DTR		6, 4
N.C.	PROT. GND		N.C. (To Shell Only)

Choosing the Correct Power Cable

Use the following table to make sure the line voltage indicated on the switch, the power cable supplied, and the line voltage option on your order all agree with the intended power source for the unit.

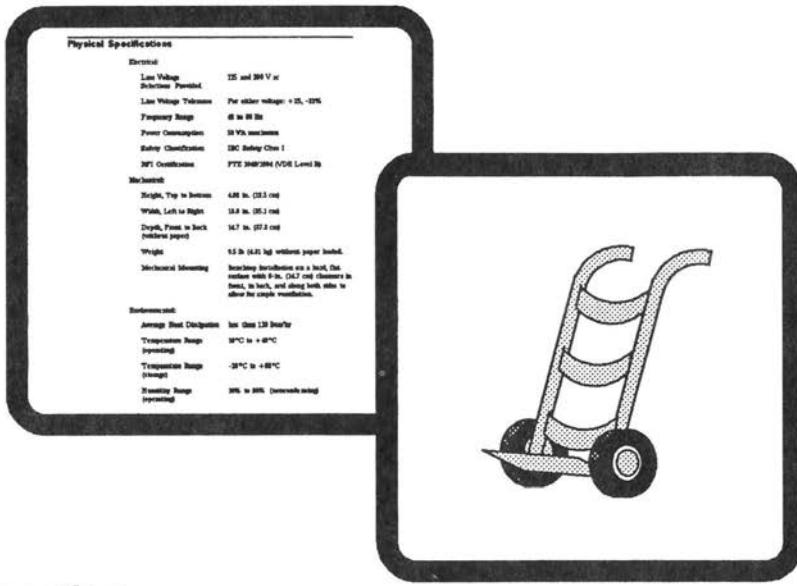
Option	Part Number	Source Voltage	Voltage Setting	Predominant Country of Usage	
	8120-1378	120 V ac 100 V ac 220 V ac	115 115 230	USA and Canada Japan Israel	
	901	8120-1369	240 V ac 220 V ac	230 230	Australia New Zealand
902	8120-1689	220 V ac	230	European Continent	
900	8120-1351	240 V ac	230	United Kingdom	

Option	Part Number	Source Voltage	Voltage Setting	Predominant Country of Usage
904	8120-0698	240 V ac	230	USA and Canada
				
906	8120-2104	220 V ac	230	Switzerland
				
912	8120-2956	220 V ac	230	Denmark, Greenland
				
917	8120-4211	240 V ac	230	India, South Africa
				



Appendix A & B

Appendices



In this section....

- Appendix A: Instrument Specifications
- Appendix B: Moving and Storing the Integrator

HP 3396 Series II Specifications

Physical Specifications	
Electrical	
Line Voltage Reference Provided	115 and 230 V ac
Line Voltage Tolerance	For other voltage: +15, -20%
Frequency Range	45 to 60 Hz
Power Consumption	10 VA maximum
Safety Classification	IEC Safety Class I
NFT Certification	PTZ 1040-204 (VDE Level 3)
Mechanical	
Height, Top to Bottom	4.88 in. (12.3 cm)
Width, Left to Right	10.8 in. (27.5 cm)
Depth, Front to Back (Printer model)	14.7 in. (37.3 cm)
Weight	15.0 lb (6.7 kg) without paper loaded.
Mechanical Mounting	Anchoring instructions on a front, flat surface with 8-in. (24.7 cm) clearance in front, in back, and along both sides to allow for ample ventilation.
Environmental	
Average Test Duration	One Year (20 hours)
*Temperature Range (Operating)	-30°C to +60°C
Temperature Range (Storage)	-30°C to +80°C
Humidity Range (Operating)	10% to 90% (noncondensing)

In this chapter....

- Data Acquisition
- Processors, Storage, and Backup Capacity
- Calculations and Reporting
- Printer/Plotter Specifications
- External Control and Data Communications
- Basic Program Language
- Physical Specifications

Data Acquisition

Analog/Digital Conversion:

Analog/Digital Conversion Type	Continuously integrating dual slope; 100% area conversion
-----------------------------------	--

Analog Input Parameters:

Input Range	-10 mV to + 1000 mV
DC Input Impedance ¹	Differential: 50 Mohms, typical 15 Mohms, minimum Common-mode: 500 Mohms, minimum
Common-mode Voltage Above/Below Ground	± 100 V
Common-mode Rejection Ratio	120 dB (minimum) : dc to 100Hz
Dynamic Range	10^6
Sampling Rate	20 readings/sec at 1/6 μ V/count
Reported Area per Count	0.125 μ V-sec/count, $\pm 10\%$
Internal Noise ²	0.06 μ V rms
Drift	0.5 μ V p-p typical (1.75 μ V p-p max) over 1.5 min with a noise bandwidth of 0.4 Hz and with an electrical short across the signal input.
Nonlinearity	$\pm 0.2\%$ maximum

¹ Differential ratings apply between the positive and negative analog input terminals.
Common-mode ratings apply between the positive or negative analog input terminal
and the common ground. Ground can be either the instrument or chassis ground.

² This specification applies to environments that are free from electromagnetic inter-
ference. (EMI)

Digital Input Parameters:

Communication Link	Instrument Network (INET).
Input Range	Full dynamic range of HP 5890A (10^9) Flame Ionization Detector (detector ranging not required)
Sampling Rate	20 readings/second (average)
Resolution	(internal digital representation): $1/6 \mu\text{V}$ per digital count, at a 20-Hz rate

Processors, Storage, and Backup Capacity

Microprocessors	4
Main Clocks	19.6608 MHz and 7.3728 MHz
Read/Write Memory	131,072 Kbytes of static random-access memory
Read-only Memory	192 Kbytes total
Electronic Disk Storage Capacity	101,120 bytes; dynamically allocated; available for method, report, calibration, sequence, signal data, and BASIC program storage. Part of read/write memory.
Backup Capacitor	0.47F Super Capacitor
Nominal Voltage	+5.0V (at full charge)
Nominal Charging Time	0.5 hour (to full backup capability)
Sustaining Time	Minimum: 4 hrs at +25°C Typical: 95 hrs at +25°C
Nominal Current Consumed during Backup Mode	$14 \mu\text{A} \pm 20\%$
Backup Voltage	W100 (1) - +5.0 V (Super capacitor voltage)
Test Pin	W100 (3) - Ground

Calculations and Reporting

Maximum Retention Time	6900 minutes
Retention Time Resolution	0.001 min (0.06 sec)
Maximum Peak Storage Capacity	Approximately 1240 peaks
Detectable Peak Width Range	Approximately 0.3 sec to 10.0 min width at half height (typical depending on [PK WD] parameter)
Methods	Area%, Height%, Normalization, External Standard, External Standard%, Internal Standard, and Internal Standard%. All calculations can be based on areas or heights.
Multilevel Calibration	Up to 63 levels possible
Curve Fits Available	Single-point, point-to-point, linear regression (least squares), nonlinear (quadratic)
Reference Peaks	Multiple reference peaks possible
Retention Time Windows	Percent or absolute time

Printer/Plotter Specifications

Printer Paper	8.5 in. x 11 in. sheets on roll or z-fold with 0.5 in. tractor margins.
Print Character Format	96 ASCII Characters (upper- and lowercase)
Printing Speed	150 characters/sec avg; bidirectional
Character Density	12 characters/in.
Plotting Sensitivity	Approx 63.7 μ V/cm at ATT $2^{\wedge} = 0$ (analog)
Valid Plotting Range	Attenuation: ATT $2^{\wedge} = -8$ to $+36$
With an Analog Input	1 mV full scale at ATT $2^{\wedge} = 0$ 1 V full scale at ATT $2^{\wedge} = 10$
Maximum Selectable Chart Speed	30 cm/min (60 cm/min with BASIC plot statement)
Maximum Plotting Velocity	31.7 cm/sec
Plotting Acceleration	845 cm/sec ²

External Control and Data Communications

Rear Panel Connections

4, labeled: REMOTE, SAMPLE, COMPUTER, INSTRUMENT NETWORK (IN and OUT).

REMOTE (Remote Control)

Inputs: ■ START (TTL)
■ STOP (TTL)
■ READY (TTL)

SAMPLE (Bottle Number Sense)

Accepts TTL BCD (binary coded decimal) signals; selectable high or low input levels; bottle numbers from 0 to 99

COMPUTER (Data Communications)

RS-232-C protocol with baud rates: 150, 300, 600, 1200, 2400, 4800, 9600, 19200

INSTRUMENT NETWORK (INET)

Data communications loop for analytical instruments and selected peripherals that use the INET, HP-IL, HP-IB protocols. Maximum of 7 IEEE-488 (HP-IB) devices can be connected via the HP 82169A HP-IB/HP-IL Converter

Basic Program Language

Commands available:

- 6 Binary Functions
- 53 Chromatographic Data Functions and Statements
- 8 Debug and Run Control Commands
- 18 Edit and List Commands
- 10 Exception and Error Handling
- 15 File and Device Commands
- 24 File and Device Statements
- 18 Looping and Control Flow Statements
- 46 Math and String Functions
- 4 Plotting Statements
- 26 Program Statements
- 6 Run Parameter Functions
- 8 Signal Data Access Statements and Functions

Physical Specifications

Electrical:

Line Voltage Selections Provided	115 and 230 V ac
Line Voltage Tolerance	For either voltage: +15, -22%
Frequency Range	48 to 66 Hz
Power Consumption	50 VA maximum
Safety Classification	IEC Safety Class I
RFI Certification	FTZ 1046/1984 (VDE Level B)

Mechanical:

Height, Top to Bottom	4.92 in. (12.5 cm)
Width, Left to Right	13.8 in. (35.1 cm)
Depth, Front to Back (without paper)	14.7 in. (37.3 cm)
Weight	9.5 lb (4.31 kg) without paper loaded.
Mechanical Mounting	Benchtop installation on a hard, flat surface with 6-in. (14.7 cm) clearance in front, in back, and along both sides to allow for ample ventilation.

Environmental:

Average Heat Dissipation	less than 120 Btu/hr
Temperature Range (operating)	10°C to +40°C
Temperature Range (storage)	-20°C to +60°C
Humidity Range (operating)	10% to 90% (noncondensing)

Moving and Storing



In this chapter....

- Relocating Your Integrator
- Storaging Your Integrator

Relocating Your Integrator

If you move your integrator to a new location, the **data**, **setpoints**, **files**, and **BASIC programs** in memory can be preserved for up to four hours while the unit is disconnected from the line power source.

Follow these steps to relocate your integrator in a way that saves the memory's contents.

1. Make sure that the power has been on for 30 minutes; this ensures that the unit's memory backup is fully charged.
2. Leave the LINE switch ON.
3. Unplug the ac line power cable from the power source. Memory contents will be preserved up to four hours.
4. Plug the unit's power cable into the correct power source at the new location. The integrator will print **Power failed** and the time of the power interruption.
5. The integrator will then be ready for operation at the new location with the previous setpoints and data preserved. Reset the time on the unit and resume normal operation.

If you don't want to save the contents of memory,

1. Turn off the LINE switch.
2. Remove the power cord.
3. Reinstall the unit at the new location.
4. Before storing the unit, make sure that the printhead is sitting in front of the blotter at the left-hand side of the printer mechanism.

Storing Your Integrator

Choose a clean environment not exceeding:

- 95% relative humidity.
- 25,000 feet above sea level in altitude.
- +60°C or below -20°C (-4° to +140°F),

If the printhead is not in front of the blotter,

- Make sure that the power is OFF.
- Manually move the carriage to this position.

When storage temperature will exceed +50°C, remove the print cartridge and store it in a normal room temperature environment (+25°C).

When removing the unit from storage after

- Less than 6 months, prime and clean the printhead. (See chapter 4 for printhead maintenance procedures.)
- 6 months or more, replace the printhead.



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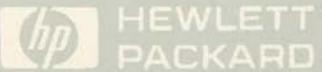
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Manual Part No. 03396-90245
Printed in U.S.A. (June 1990)



HEWLETT
PACKARD