HP 82000 IC Evaluation System

Troubleshooting the HP 82000

HP82000 Models D40/D50/100/200/400

SERIAL NUMBERS

Affects all systems.

A B C D E

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Purpose of this Manual

The purpose of this manual is to tell you how to troubleshoot problems on the HP 82000 IC Evaluation System.

Target Audience: This manual is targeted at Hewlett Packard service personnel.

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Troubleshooting Overview

Introduction

This module tells you how to troubleshoot problems on the **HP82000 IC Test System.** This information covers Maxi-, Standard- and Miniframes for models D400, D200, D100 and D50.

Possible hardware failures are:

- Faults in the HP 82000 Test System which prevent the software booting.
- Faults in the HP 82000 Test System which can be detected by Diagnostics or Calibration.
- Faults in the HP 82000 Test System which are not detectable by Diagnostics or Calibration.
- Peripheral hardware faults (other than the test system).
  - **HP 6624 Device Power Supply** (**DPS**) failures.
  - **HP 1215 High Speed Width Generator** (**HSWG**) failures.
  - **HP-IB Interface Card** failures.
  - Controller failures.

Note

Controller troubleshooting is not covered in this document. Refer to the controller manual for details.

The software tools which can be used for troubleshooting are:

Diagnostics The Diagnostics test most of the electronic circuitry in the system. This is the main tool for troubleshooting. System power is not covered.

Calibration The calibration routines are designed to adjust the HP 82000 Test System so that it meets its specifications. Calibration is also a troubleshooting tool, because its routines use a lot of the internal circuitry of the Test System and the cabling to the DUT interface.

HP-IB Commands Some HP-IB commands are useful for troubleshooting, particularly in situations where the system crashes and the other tools can not be used.

More details about these tools and how to use them are given in the chapter, ¡Tools for Troubleshooting¡.

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Troubleshooting Strategy

Because of the complexity of the Test System, it is often difficult to locate an error. For one specific error behaviour, there can be several different possible causes. For this reason, it is very important to analyse the behaviour of the error very carefully to identify the real cause.

It is very important to first get the facts about the history of the error. You should clear up the following points:

- Did the customer move the system since the initial installation ?
- Is there enough space for the cooling of the machine ?
- Are the requirements of the *Site Planning and Preparation Guide* being met ?
- Is the error reproducible ?

Note

If the environment does not meet the requirements given by the *Site Planning and Preparation Guide*, the machine must first be reinstalled in a place which does.

There are two main classifications of errors. **Reproducible errors** are errors which can be caused to reoccur by reproducing the conditions which cause the error.

Intermittent errors are errors which appear to occur at random.

You use different strategies to locate and troubleshoot these errors.

Note

If you have to troubleshoot a multi-mainframe system, the strategy is a bit different to the strategy for single-mainframe systems. These differences are described in the section **Troubleshooting Multi-Mainframes**, in Specific Troubleshooting Procedures.

Reproducible errors

To locate reproducible errors, the following questions should help you to get a hint as to the cause of the error.

1. Is it a booting problem ?
2. Will a diagnostic run report errors ?
3. Are there problems calibrating the system ?
4. Are there problems running the demo device ?
5. Does the error result in strange test results ?

Booting problems

EMO

If you can not switch on the circuit breaker, there is most likely a problem with the EMO. Read the section **Power**, in Specific Troubleshooting Procedures.

Self Test

When you switch-on the system, the **Self Test** will give you the first indication if anything is wrong. During the self test the CPU, the RAMs and the ROMS are checked. The LED bar on the clock board indicates the test result. When power is applied, all LEDs except the second from the top light up. When the test passes, the LED at the top stays lit. If the test fails, refer to the section **Single Card-Cage System: Booting Problems**.

On-line/Off-line mode

If you have problems booting the system in **on-line mode**, try to boot the Software in **off-line mode.** By doing this you can determine whether the problem is a software problem, and not a failure of the tester hardware. For more detailed information, see the section **Booting Problems** Here you will find a list of the most common errors which cause booting problems.

If the system boots up properly, you should continue with the **Diagnostics**.

Problems, when system has booted:

Using Diagnostics

The diagnostic results should be used whenever it is possible to do so.

Note

Diagnostics only give a suggestion as to what could be wrong. You should always ask yourself, if the diagnostic message could be wrong.

Diagnostics do not cover the Power Supplies, motherboard or DPS or DUT cabling.

Detailed information about running diagnostics is in the chapter Tools for Troubleshooting.

If Diagnostics do not report any problems, but you still suspect that there is a fault, use auto-calibration as the next tool to check (up to the pogo-pin) if any channel is defective.

Using Calibration

Calibration is a tool which adjusts the system so that it meets its specifications. It can also be used to find faults in the system. Read the section on calibration in the chapter Tools for Troubleshooting.

Note

Calibration is useful for pinpointing faults in DUT cabling, DC rails, incorrect pogo-pin arrangements and faults on specific channels on the I/O boards and on the calibration-channel on the clock board.

Using the Demo device

The **Demo device** is useful for checking if the DPS is working correctly.

Note

Before you run any test, make sure that you have removed the clips between force and sense line on the DPS outputs. If you do not remove these, the voltage supplied by the DPS is different to the voltage programmed, because the voltage is sensed at the DPS sockets and not at the DUT.

After loading the demo software, run a functional test. If most vectors fail, suspect a problem with a DPS or DPS cabling to the DUT-Interface.

How you can verify the operation of the DPS is described in the section **Power** in Specific Troubleshooting Procedures.

Errors Not Detected by Diagnostics or Calibration

If you still have a fault on a specific channel, which is not detectable by diagnostics or calibration, check that the arrangement of the pogo-pins in the DUT interface is correct. If this is not causing the problem, set up a Short-Wire test. This is described in the chapter Specific Troubleshooting Procedures.

Intermittent errors

Intermittent errors are very difficult to troubleshoot. Sometimes things which look like faults are caused by incorrect use of the system. If the system suffers from an intermittent error, you must find out the circumstances under which the error occurs.

Find out:

- if it is a booting problem.
- how often the error occurs.
- if the error results in system lock-up.
- if the error results in some strange test results.
- if you can exclude the DUT as the source of the error.
- if the error causes a test which passed before, to fail.
- if the clock is running stable at programmed frequency

An intermittent error can also be caused by a faulty controller.

For Example:

The HP-IB link between the tester and the controller breaks-down. The tester tries to get information and runs into a HP-IB timeout.

General Rules:

Errors, which occur intermittently are in most cases power and/or temperature problems.

As a second guess there might also be a problem with the clock.

External Conditions

If you can not reproduce an error, you should first check the external conditions of the system. Check that the prerequisites in the *Site Planning and Preparation Guide* are being met. In particular, the system should be placed 1 metre away from anything that could block the flow of cooling air to the fans. If this prerequisite is not being met, move the system to a more appropriate place.

Otherwise, check the air-filters.

If the airfilters are clean, suspect a problem with the fans. How to troubleshoot the fans is described in the section **Fans**, in Specific Troubleshooting Procedures.

If the results of a test which previously ran can not be reproduced, it may be a temperature problem. Remember, that the calibration data is only valid within ±5°C of the calibration temperature. So, you should run the temperature testfunction over an extended period and note the changes in temperature. A new calibration could be necessary. If the internal temperature of the system drifts by more than 5 degrees, suspect a problem with the air-conditioning and/or the air-filters or the fans.

Each time you download calibration data, the system measures the internal temperature of the system. If the temperature deviates by more than 5°C from the temperature at calibration, the following error-message appears in the Report Window:

```
***Warning: actual temperature differs from calibration
```

```
temperature more than 5 K
```

Note

This message will appear every time the HP 82000 system is restarted without being allowed to warm-up first.

Power Supplies

If the error does not seem to be caused by a temperature problem, check the mains power line. The primary power is sometimes unstable and this can cause voltage spikes on the lines to the PSMs, which can cause PSMs to switch-off. When a PSM switches off, the software locks up and returns to the boot-ROM. Read the section **Power** in Specific Troubleshooting Procedures.

On the secondary side, there could be too large a voltage drop between the force and sense lines on the PSM. This would also cause the PSM to shut off, if the +5 V output or the -5.2 V output is affected. Errors like this only occur, if the power supply runs under full-load condition. To verify a suspected PSM, run diagnostics with 3 boards connected to the PSM. This will load the power supply sufficiently, so that it will shut off, if it runs at its limits.

Monitor the voltages on the I/O boards. If the voltages become less than the specified values, you most likely have a PSM problem. The other possibility is that there is too big a voltage drop on one of the connected I/O boards. To exclude that board, repeat the measurement with another I/O board connected to the PSM.

If a Power supply is only connected to one board this can cause ripples on the output power, if the connected board is too small a load for the PSM. In this case the voltages on the I/O boards could be incorrect and the PSM will shut-off intermittently.

Note

The Power supplies always need a minimum-load connected, to work properly.

To troubleshoot PSM faults and for a list of voltage specifications refer to the section **Power** in Specific Troubleshooting Procedures.

Booting Problems

If the booting problem occurs with applications other than the HP82000 application, the problem is most likely a controller or a file system problem.

Sometimes there are still processes running when you leave the HP82000 software. This will cause problems when you are rebooting the system again.

Make sure that there are no old HP82000 processes running when you are trying to boot the software. For more detailed information refer to the section **Booting** in Specific Troubleshooting Procedures.

Note

If the system crashes, you can get some information about the status of the machine using HP-IB commands. How to use these commands is described in the section **Using HP-IB Commands** in the chapter Tools for Troubleshooting.

Intermittent Problems on Specific Channels

If there are problems on specific channels suspect a problem with the I/O cables. Sometimes they can work intermittently, even when they are broken or otherwise damaged. Check the cable by swapping it to another channel. If this does not reproduce the error, set up a Short-Wire Test as described in Specific Troubleshooting Procedures.

If All Else Fails

Make a detailed description of:

- The problem.
- The conditions under which the problem occurs.
- The Test System configuration (number of card-cages, boards, revisions, controller model, etc.).
- Software revision.
- Connected peripherals.

Send this information to your nearest Hewlett Packard Sales and Support office.

3

Tools for Troubleshooting

This chapter describes how to use the following tools for troubleshooting errors on the HP 82000 Test System:

- Diagnostics.
- Calibration.
- HP-IB Commands.

Diagnostics

Details of how to run diagnostics are given in the *Maintenance Manual*.

Following are some general rules for interpreting the results of the diagnostics tests.

The chapter *Interpreting the Results of Diagnostics* gives a more detailed explanation of how to interpret the results of each test.

General Rules

- If all I/O boards are reported to be faulty, suspect a possible problem with the sequencer board and clock board.
- If multiple boards are reported defective, suspect problems with:
  - PSMs. (refer to the section **Power** in Specific Troubleshooting Procedures)
  - Cable interconnections.
  - The motherboard.
- If I/O boards are suspected to be faulty, swap them for ones that are not suspected. The failure should move with the board.
- If an I/O board is reported to be defective, check:
  - SMD boards.
  - In case of D400, the memory daughter board.

Note

To check these boards swap the SMD boards. The error should move with the faulty SMD board.

In the case of a D400 board, the RAM is on a daughter board. So you should check if the memory daughter boards are defective. Swap the memory daughter boards. The error should move with the faulty daughter board.

- Check if specific relays have failed. They could eventually be repaired at component level.

Note

Relay failures will be reported by diagnostics if the DUT Board is not removed before running the diagnostics.

- A fault on an I/O Board should move with the board when it has been swapped with another board. If the fault stays with the slot, and an exchange of the Clock Board or the Sequencer Board does not help, turn your attention to the motherboards (the VME and High-speed motherboards). Look for signs of damage to both mother boards. Check the connectors; looking especially for broken or bent pins on the lower motherboard.

  The lower motherboard is especially vulnerable, as it carries pulse trains at frequencies up to 200 MHz. Parameters such as humidity and parasitic capacitance can have an effect on its operation. Exchange the lower motherboard, if you have doubts about its performance.
- If a board connected to an HSWG is reported defective, check the HSWG. The HSWG has a rudimentary self-test which indicates (with a red LED) if the power to the HSWG and the CPU-board of the HSWG is OK. If the self-test passes you must establish whether the HP82000 system is causing the problem, or, if the HSWG is defective. To do this refer to the section **HSWG** in Specific Troubleshooting Procedures.

  If the HSWG seems to be OK, disconnect the HSWG from the I/O board and check the I/O board without the HSWG.

Note

When you remove a HSWG, do not forget to remove the according entry in the mainframes file.

- If Diagnostics do not report any faults, but a fault is still suspected, use auto-calibration to check (up to the pogo-pin) if any channel is defective.

Calibration

Calibration is a tool which adjusts the system so that it meets its specifications. It can also be used as a troubleshooting tool for pinpointing errors on the system. For detailed information on running calibration, refer to *Maintaining the HP 82000*.

DC-Calibration

Note

Before you start with the DC-Calibration, verify that you have a valid Base-Calibration file.

Refer to the *Maintenance Manual* for an example of a valid Base-Calibration file.

If you have no valid Base-Calibration data and have no equipment to run a Base-Calibration, enter the default values in the `/hp82000/fw/data/bc_cal_dxxx`,as described in the *Maintenance Manual*.

Note

Perform a Base-Calibration as soon as possible. The default values may help you to run the DC-calibration, but the machine will probably be out of specification.

If you run the DC-Calibration after a Base-Calibration remember that the **DVM** connector is removed from the Clock board .

Remove the DUT-board if you are running DC-Calibration.

If the DC-rail is broken, the boards behind the defective connector will be reported as faulty. If the DC-rail is not defective, check the PSMs and the power to the I/O boards . For details of how to do this, read the section **Power** in Specific Troubleshooting Procedures.

Note

Be aware that power problems often only occur if the PSM is running under full-load conditions.

An error will occur during DC-Calibration if the yellow I/O cables have a short-circuit. You must replace damaged cables.

If a specific channel is declared as faulty:

1. swap the affected I/O board with another one.
2. If the fault moves with the board swap the SMD board for another one.
3. If the channel fault moves with the SMD Board, exchange the SMD board.

If a channel connected to a HSWG cannot be calibrated, suspect a HSWG fault. During DC-Calibration the HSWG must appear as a perfect bypass to the DUT board. Disconnect the HSWG from the I/O board (only the HSWG end, leave the cable connected to the I/O board). Remove the HSWG entry in the mainframes file and try to calibrate the channel again, without the HSWG. If you can, then refer to the section **HSWG** in Specific Troubleshooting Procedures.

Before you can run **Standard AC-Calibration**, check that there is a valid DC-Calibration file. (See the *Maintenance Manual*).

Note

Always calibrate all channels, even if some of the channels can not be calibrated successfully.

The AC-Calibration covers the DUT cabling.

If you have problems calibrating specific channels, suspect a problem with the cabling to the DUT board. To check the connection of a suspected channel, calibrate directly at the pogo-pin. If this works, the connection between the pogo pin and the DUT board is faulty. In that case you may have to readjust the DUT Interface (it could also be dirty). Refer to the *Installation Manual* for details of how to do this.

HP-IB Commands

HP-IB commands are sometimes useful for getting information about the status of the HP82000 system. To use the HP-IB commands, you need a special driver to talk directly with the hardware.

Two different HP-IB drivers are discussed in this section, the **hpib Driver** and the **hpt Driver.**

Note

Neither of these HP-IB drivers are supported, but they will work for the purpose described here.

hpib Driver

Note

The hpib driver allows the controller to talk with the system, **without** invoking the HP82000 software. This driver is useful for getting information, when the software crashes.

Because you have no synchronisation between the cabinets in a multi card-cage system when the HP 82000 software is not running, this driver works only for communication with one card-cage. You will find the driver in:

`/hp82000/fw/bin`

Start the driver by typing in:

`hpib -a3`

(if you want to communicate with the card-cage at HP-IB address 3) **-a** must be followed by the HP-IB address of the card-cage you want to communicate with.

The program prompts you for an HP-IB command with an **@**.

hpt Driver

Note

The hpt driver needs the HP82000 software environment to communicate with the hardware, therefore the driver only works while the HP82000 software is running. It is useful, for example, for identifying the hardware or reading calibration data.

You can talk with all card-cages in a multi card-cage system using the hpt driver. You will find the driver in:

`/hp82000/pws/bin`

Start the driver by typing in:

`hpt`

The program prompts you for an HP-IB command with an @.

Note

The results of these commands are intended specifically for the Support Engineer.

*IDN?

This command returns an identification string for the hardware, which includes the system type, firmware type and revision.

For example:

HEWLETT PACKARD,82000 D200,0,REV *software revision*

If there is a power failure, the firmware is lost, so that the tester remains in Boot ROM. The *IDN? query will return the message:

HEWLETT PACKARD,82000 BOOT ROM,0,REV *software revision*

This command allows you to check if there was a power failure or not.

*OPT?

The *OPT? query reports the type of board in each slot of a card-cage. The response is a list of 18 fields separated by commas. Each field gives the identity of the board installed in the corresponding slot or a "0" if no board is installed.

Syntax:

*opt? *card-cage*

where *card-cage* is 1 for the master and 2,3 or 4 for the slaves.

Example Report:

*OPT 4,272,48,48,48,48,48,48,48,48,48,48,48,48,48,48,48,80

which indicates

4	Revision A Clock Board
272	Revision A Sequencer Board in slave 1 mode
48	15 Revision A 200 MHz I/O Boards
80	Revision A PMU Board

Note

Full details of the representation for each type of system board are given in the *HP-IB Command Reference*.

SELF?

The firmware performs checks at power-on and during download and command execution. The SELF? query is used to read self-test reports.

*RST

The *RST deletes all settings in the tester, such as configuration and calibration data. It does not delete the firmware. This command is useful for setting the tester in a known state, before you set up a new test.

Note

The RESET command should not be used for trivial reasons. It may cause *hot switching* of relays, which reduces the lifetime of relays.

For more detailed information on all the available HP-IB commands refer to the *HP-IB Command Reference* manual.

Specific Troubleshooting Procedures

Troubleshooting Multi-Card-Cage Systems

If you have problems with a Multi-Card-Cage tester, the first step is to check the Master/Slave cable.

Note

If the special Master-Sequencer is fitted, the Master-Slave cable has different connectors at the Master end and the Slave end.

If the sequencer in the Master Card-Cage is the same as in the Extender Card-Cage(s), the Master-Slave cable has a dedicated end for the Master and Extender sequencers.

If the interconnection between Master and Extender is not the cause of the error:

1. Reduce the tester to its separate card-cages.
2. Troubleshoot each card-cage separately, using the procedures for a single card-cage system.

Note

A mechanical separation is not required.

To split the machine into its separate card-cages for troubleshooting, proceed as follows:

1. Remove the cables between the Master sequencer and the Slave sequencers.
2. Remove the entries for the card-cages you don't want to test from the mainframes file.
3. Connect an HP-IB cable between the controller and the card-cage to be tested. Remove all other connections between card-cages.
4. Change the HP-IB address of the tested card-cage to 3. (Switches on the Clock Board).
5. Remove all card-cage entries from the mainframes file, except the entry for card-cage 3.

Test each single card-cage individually (remember to change the HP-IB address to 3 each time). If each card-cage runs without faults, connect the card-cages together again. If the fault appears again, the problem lies with one of the sequencers. Swap the sequencers.

Concurrent HP82000 processes

When you start the HP82000 software there must not be any old HP82000 process running on the system. If there are, the boot process stops and returns you to HP-UX. Some of the HP82000 screens remain. Follow the instructions below to analyse the problem:

1. Press (Shift), (Ctrl) and (Reset) simultaneously.

   The HP82000 screen disappears and you get the HP-UX prompt.

2. Type `ps -ef` and press (Return).

   You are shown a list of all the processes running on the system. The Process ID for each process (PID) is in the second column of the listing. The last column is the **command** column. All processes beginning with /hp82000/ ... are HP82000 processes .

3. To kill a process, type `kill -9 'PID'` and press (Return). Kill all HP 82000 processes.
4. When all HP82000 processes have been killed:

   type `reboot -r` and press (Return), to reboot HP-UX again.

Failure to Load HP82000 in Off-line Mode

Use this section when you have problems booting the HP82000 software in off-line mode. You boot the Software in off-line mode by typing `hp82000 -o` and pressing (return). If you do not see any window before the system locks-up, check that the following files exist:

- /dev/tty
- /dev/tty_rep
- /dev/pty
- /dev/pty_rep
- /dev/hp82000

If any of these files is not in the system, an error message like the following appears, and no windows are created:

```
    error: '/dev/'!!filename!!

              special file not found

 ---------------------------------------------
 Severe Environment Error or Program Bug

 Look for a correct version of the hp82000 SW
 ---------------------------------------------

 continue in 10 seconds
```

The next step is to run the HP82000 Software from the X-window system.

- Type `x11start` and press (Return).

- Type `hp82000 -oxb&` and press Return.

If this does not work, you must customize the software again. Type `/system/E1200SYS/customize` and press Return.

If this does not solve the problem, install the HP82000 software again.

Failure to Load HP82000 in On-line Mode

Use this section when your **correctly operating** PWS can not load the HP 82000 software in On-line Mode. For correct on-line operation:

- The PWS must be connected to the tester hardware via the correct HP-IB interface (select-code 7).
- The tester card-cages must be set to the correct HP-IB addresses.

Interpreting the Report Window Messages

When you type `hp82000` at the shell prompt, the loading process begins. The tester software starts loading the graphics environment in the PWS and, at the same time, tries to communicate with the Boot ROM in the tester.

The X-Window graphics environment loads and the screen displays:

- A double row of empty pushbuttons.
- The Welcome Window.
- The Report Window.

The messages in the Report Window are important when trying to locate a fault at the loading stage.

Whatever state the tester is in, an initial message similar to this one always appears:

```
hp82000 Rev. 1.4.1, 06/07/89

Copyright 1990 Hewlett-Packard Co.

************************************

***      HP82000 SOFTWARE        ***

************************************


User    : demo

Device   : mc10136

Dev_tech : ecl
```

Boot ROM Message

The Boot ROM message follows and looks something like:

```
Bootstrapping hp82000 firmware ...
```

If this message appears, the controller was able to establish communication with the tester. It does **not** mean that the firmware can be successfully booted. The next message looks like:

```
Mainframe 1 on HP-IB address 3

    IDN: Hewlett Packard,82000 D200,0,REV 1.4.1

 Tester HW configuration

    Mainframes   :   1
    I/O channels :   48
    DPS channels :   4

 Tester  : hp82000, model D200, 64k
```

If this message does not appear, it could be for several reasons, all of which cause communication between the Programming Workstation and the mainframe to break down.

Possibilities are:

- HP-IB not connected (externally or internally) or damaged.
- Mainframe HP-IB address incorrectly set.
  - Entry in `/hp82000/pws/data/model` file incorrect.
  - Address on Clock Board incorrect.
  - Address entry in file `/hp82000/pws/data/mainframes` incorrect.
- HP-IB select code incorrectly set.
- HP-IB interface in PWS faulty.
- HP-IB interface on Clock Board faulty.
- Power to the Clock Board interrupted.
- Clock Board not pushed fully “home”.
- HP-IB pulled-down by a faulty DPS HP-IB interface.
- HP-IB pulled-down by a faulty HSWG HP-IB interface
- Mother Board damaged.
- Entries for DPS or HSWGs in the mainframes file incorrect.

Instead of the Boot ROM message a fatal-error message appears, like the following:

```
*** ERROR: hp82000 mainframe(s)/dps not accessible,

although mainframe file defines on-line

mode for 1 mainframe and/or dps

      !  PLEASE RESTART AFTER CHANGE  !

--------------------------------------
Severe environment error or bug.
```

```
Continue in 10 seconds.
--------------------------------------
```

If the Boot ROM message appears, it does not necessarily mean that all is well. A variety of problems could still exist. subsequent messages help you to trace these problems.

DPS/HSWG Missing

If the Device Power Supply has been entered in the file `/hp82000/pws/data/mainframes`, but has not been fitted in the mainframe, the tester boots correctly up to the point where the PWS attempts to communicate with the DPS. After that the boot procedure aborts. The same happens if the DPS HP-IB address does not match with the entry in the `mainframes` file. This is also true for the HSWG. The entries in the mainframes file must be consistent with the attached hardware. If it is not, the Report Window displays the initial message, followed by the Boot ROM message. Then comes a fatal error message, for example, in the case of a missing DPS:

```
*** ERROR: hp82000 mainframe(s)/dps(s) not accessible,

although mainframe file defines on-line

mode for 1 mainframe and/or dps

      !  PLEASE RESTART AFTER CHANGE  !

--------------------------------------
Severe environment error or bug.

Continue in 10 seconds.
--------------------------------------
```

Note

It can take a few minutes before this message appears.

If you have a DPS installed, but no entry for it in the `mainframes` file, it is ignored in the bootstrapping process. The same is true for a HSWG.

Wrong Hardware Fitted

The Clock Board and the Sequencer Board are always the same regardless of whether the mainframe contains 50, 100, 200 or 400 MHz I/O Boards. The I/O Boards (a minimum of one) installed must, however, match the entry in the `hp82000/pws/data/model` file. If this is not the case, the bootstrapping process will crash. The Report Window will display the initial message and the Boot ROM message. Then comes a fatal error message:

```
 Severe configuration error:

 Mainframe configuration shows

 no model compatible I/O channels

--------------------------------------
Severe environment error or bug.

Continue in 10 seconds.
--------------------------------------
```

The HP 82000 software then quits.

Note

If you have tried to run the system with an invalid `model` file you must:

1. Make the right entry in the model file.
2. **Power-off** and power-on the hardware before restarting the HP 82000 software.

First I/O Board Missing or Faulty

The first I/O Board must be installed directly after the Sequencer Board, that is, in slot 3. If it is not, all subsequent boards will be ignored. Similarly, no gaps may exist between I/O Boards, as all boards after the gap will be ignored.

If a PMU board is installed, it must be fitted in the next slot after the last I/O board. There must be no gap before the PMU board and no boards after it.

If there is no I/O Board fitted in slot 3, or there are no I/O Boards installed, the booting behaviour of the system and the error messages displayed will be the same as in section "Wrong Hardware Fitted".

Sequencer Board Faulty

Certain faults on the Sequencer Board cause the boot process to abort. In such cases, the Report Window displays the initial message and the Boot ROM message. These are followed by the message:

```
Fatal Error on tester, software tries to get

information.

automatic quit may follow.
```

Note

It can take a few minutes before the message appears.

This is followed by fault information which is stored in the file

`/hp82000/pws/data/prog_bug_log`

The message:

```
See also log file for error info
```

reminds you of this. Finally, the `Program Bug` number is displayed (also repeated in the `prog_bug_log` file) and the message:

```
--------------------------------------
Severe environment error or bug.

Continue in 10 seconds.
--------------------------------------
```

is displayed. The HP 82000 software quits.

This section covers booting problem with Standard and Maxiframes. One Maxiframe cabinet can contain two card-cages.

The steps below help you rectify booting problems in a tester with one card-cage. Use them to check that all connections and settings are correct. Make sure that the tester, DPSs (if fitted) and HSWGs (if fitted) are powered-up. If the PWS cannot find the tester hardware, switch the tester mainframe off and continue with the listed steps. At the end of each step power-up the tester and try to load the HP 82000 software. While the PWS is loading the software, note the messages in the Report Window. Refer to the section **Interpreting the Report Window Messages.**

1. Make sure the HP-IB cable between the PWS and the mainframe(s) is connected to an HP-IB card at select code 7. If not, refer to the *Peripheral Installation Guide* supplied as part of your HP-UX documentation. Make sure the interface card is correctly seated and the cable is correctly secured.
2. Remove the DUT interface from the mainframe and look at the self-test LEDs on the Clock Board. If the +5 V supply is working, the second LED from the top should be lit. If not, read the section **Power.**
3. Check that the card-cage is set to the correct HP-IB address. To do this, remove the DUT interface from the mainframe. Instructions for this are given in the *Installation Manual.*

The correct addresses are shown in the following diagram:

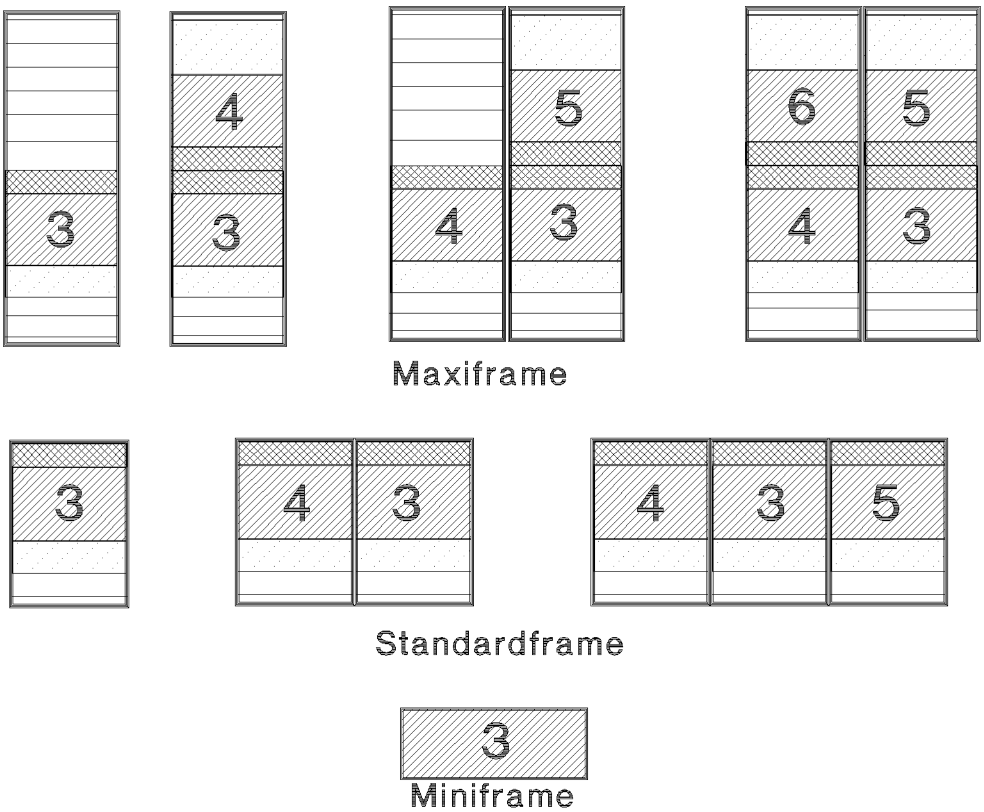


Figure 4-1. Card-Cage HP-IB Addresses

Note

The miniframe extender has no separate HP-IB address (it contains no Clock Board).

4. Check that the HP-IB addresses of DPSs are set correctly (refer to **DPS** and the *Installation Manual*). If the addresses are wrong, change them. This is done from the front panel (refer to the *Operating Manual* shipped with the instrument). Pull off the bottom-front grille of the standardframe to obtain access to the DPS.
5. Check that the HSWG's have the correct HP-IB addresses. (see the *Installation manual*). You can check the HP-IB addresses with the program `hswg_config` as described in the section HSWG-Troubleshooting.
6. Check the contents of the file `hp82000/pws/data/mainframes`. It must contain an entry: `M1, 3`, where `M1` refers to the first card-cage and `3` gives its HP-IB address. The file must also contain entries for any other card-cages (Refer to Figure 4-1).

   If you are using DPSs, entries like `DPS,` *address* will also be present. The correct entries are in the *Installation Manual*. If the entries are wrong, correct them.

   For each HSWG there must be an entry like `M1,channel number,HP-IB address`. You will find the correct HP-IB addresses in the *Installation manual*.

Note

Note that if the `mainframes` file contains no entries at all, the HP 82000 software comes up in off-line mode.

7. Exchange the HP-IB cable between the controller and HP 82000 system for another one.
8. If DPSs are fitted, disconnect their HP-IB cables. To gain access to the back of the DPS, pull off the bottom-front grill. Remove the four flange screws and carefully pull out the Device Power Supply from its slot at the bottom of the mainframe. If it turns out that a DPS is causing the problem, for instance by blocking the HP-IB, read the section **DPS**.
9. If HSWG's are fitted, remove one HSWG after the other from the HP-IB bus. Remove the entry in the mainframes file for this HSWG. If you can boot the Software now, change the HP-IB cables and make the entry in the mainframes file. If you can boot the software, the HP-IB cable was causing the fault.
10. Try bypassing the HP-IB cabling inside the mainframe by connecting a different HP-IB cable directly between the PWS and the Clock Board.
11. Exchange the HP-IB interface card in the controller for a working one. Make sure it has the correct switch-settings. Refer to the *Peripheral Installation Guide* supplied with your HP-UX documentation.
12. Reduce the boards to a minimum configuration: leave only the Clock Board, Sequencer Board and a single I/O Board in the card-cage.
13. Remove the I/O Board.
14. Remove the Sequencer Board.
15. Remove the Clock Board .
16. Remove the Mother Board.

If none of these measures trace the problem, read the file hp82000/pws/data/prog_bug_log and note its contents. Call the nearest Hewlett-Packard Sales and Service Office, giving the description of the problem, the software and firmware revisions, and the contents of the log file.

Power

The power-supply for **Maxi-** and **Standardframes** consists of a **Power Control Module** (**PCM**) and **Power Supply Modules** (**PSM**).

- A Maxiframe can have up to 6 PSMs in one frame.
- A Standardframe can have up to 3 PSMs.

The PCM's for Standardframes and Maxiframes are different, so we have different voltages and measurement-points for these PCMs. The Power-Supply modules for Standardframes and Maxiframes are identical, so we can use the same troublehooting-procedures for all PSMs.

Note

To check the cables between the PCM and the other devices, measure the voltages at the PCM and at the other end of the cable. If the voltages are the same, the cable is OK.

If there is a system power failure, you can get information about the state of the system using HP-IB commands. For details refer to the section **HP-IB Commands** in Tools for Troubleshooting.

Maxiframe Power Control Module (PCM) Description

The PCM provides a connection between the local mains supply and the system PSMs. It also performs the following functions:

- Voltage/Phase options - internal connections allow the use of different combinations of local supply voltage and phase arrangement.
- Power line conditioning - six filters provide mains power filtering.

Depending upon your local supply, you can configure your PCM by means of wiring and circuit-breaker changes, for the following power options:

Option 0E5

Europe (except UK)

400 V (phase-to-phase voltage).

3 phases + neutral + Protective-Earth.

50 Hz.

UK 415 V (phase-to-phase voltage).

3 phases + neutral + Protective-Earth.

50 Hz.

Option 0EF

USA 208 V (phase-to-phase voltage).

3 phases + neutral + Protective-Earth.

60 Hz.

Option 0ED

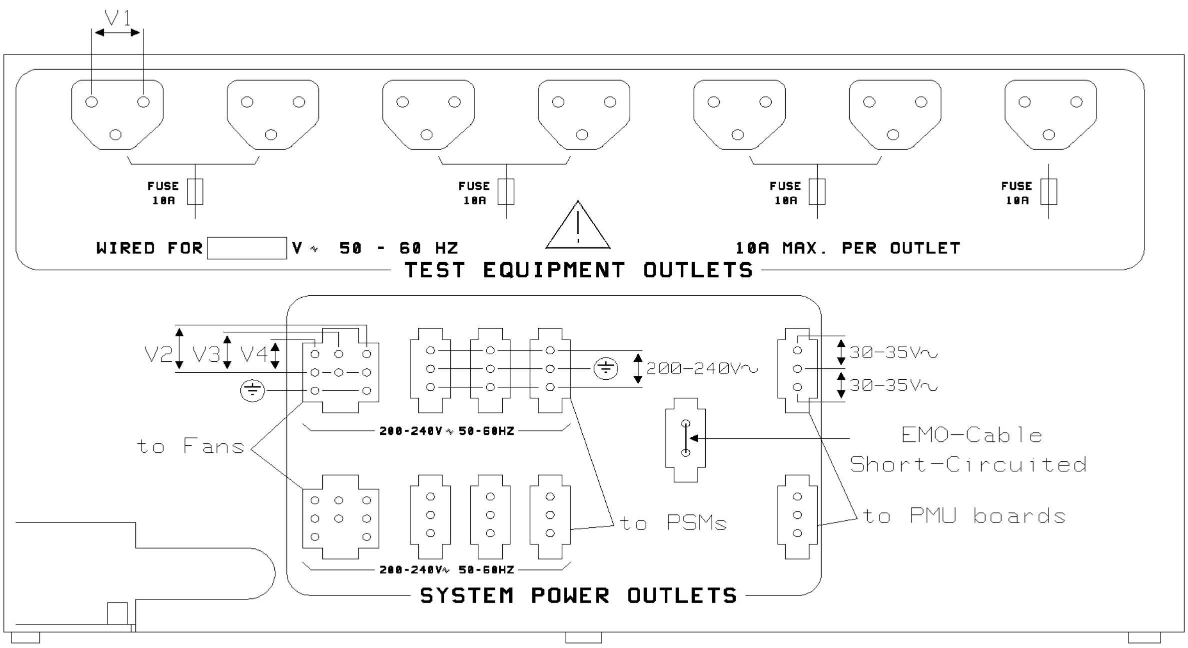
Japan **Two mains supplies are required for this option.**

Mains 1
200 V (phase-to-phase voltage).
3 phases + Protective-Earth.
50/60 Hz.
This supplies the PSMs, the PMU boards and the fans in the mainframe.

Mains 2
100 V (phase-to-neutral voltage).
2 phases + neutral + Protective-Earth.
50/60 Hz.
This supplies instruments in the mainframe via the Test Equipment Outlets.

Maxiframe PCM Troubleshooting

The PCM supplies power to up to six PSMs, the fans, the EMO, up to two PMUs and up to seven instruments.



OPTION	COUNTRY	V1
0E5	EUROPE (EXCEPT UK)	230 V ∿
0E5	UK	240 V ∿
0EF	USA	120 V ∿
0ED	JAPAN	100 V ∿

FREQUENCY	V2	V3	V4
50 HZ	200-240 V∿	200-240 V∿	200-240 V∿
60 HZ	100-130 V∿	200-240 V∿	130-160 V∿

Figure 4-2. Measurement Points on the PCM

The measurement-points for all voltages supplied by the PCM are shown above. Notice that the power for fans is frequency-dependent and that the power for the test equipment is different for Europe, USA and Japan.

If you can not measure the voltages shown in the figure above, the problem is inside the PCM. Otherwise, check the power cables to the different devices.

If you suspect the voltages supplied to the PSMs, measure these voltages on the connectors located at the back of the card-cages (right side for a lower card-cage, left-side for an upper card-cage).

If you cannot measure the correct voltages at the PSM outlets, suspect the line-filters in the PCM.

Maxiframe EMO Troubleshooting

If you can not switch-on the circuit-breaker, it is likely that there is a problem with the EMO.

A voltage of 24 V across the EMO trip-coil is needed in order to be able to switch the breaker on. Refer to the *Installing HP 82000 Maxiframes* for details of how the EMO should be connected. If the 24 V is not present, the circuit-breaker switch will snap back into the intermediate position. To troubleshoot this problem, do the following:

1. Remove the PCM from the system cabinet.
2. Remove the top-cover of the PCM.
3. Check if the purple EMO cables are connected to the circuit breaker as described in *Installing HP 82000 Maxiframes*.
4. Check if the connection between the options-board and the trip-coil is OK. These are the black cables going to the right side of the circuit breaker.
5. Check if the connectors supplying the 24 V to the trip-coil on the options-board are properly seated.
6. Check if any of the EMO fuses F5, F6 or F7 are broken. If so, replace the fuse.

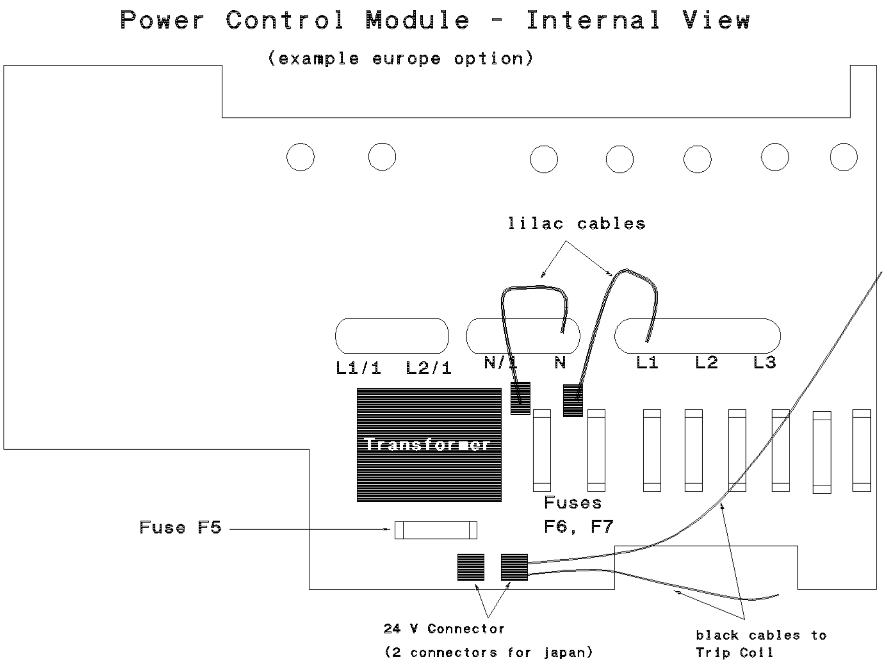


Figure 4-3. Power-Option board

The PCM provides a connection between the local mains supply and the system power-supply modules (PSMs). It also performs the following functions:

- Voltage/Phase options - internal connections allow the use of any combination of local supply voltage and phase arrangement.
- Power line conditioning - three filters provide mains power filtering.

Depending upon your local supply, you can configure your PCM by means of wiring changes, for the following power options:

Option 400/415

Europe (except UK)

400 V (phase-to-phase voltage).

3 phases + neutral + Protective-Earth.

50 Hz.

UK

415 V (phase-to-phase voltage).

3 phases + neutral + Protective-Earth.

50 Hz.

Option 208

3 phases + neutral + Protective-Earth.

60 Hz.

Option 200/240

200 V (phase-to-neutral voltage).

1 phase + Protective-Earth.

50/60 Hz.

240 V (phase-to-neutral voltage).

1 phase + neutral + Protective-Earth.

50/60 Hz.

Refer to the chapter **Connecting Mains Power** in the *Installation Manual*.

The PCM supplies power to the three Power-Supply Modules, the fans, DPSs and the EMO. The PCM output voltages can be measured at the following points:

PSM Inputs Any of the three sockets inside the rear door in the right upright.

Tangential Fans Measuring points are at the barrier-blocks mounted on each fan assembly. To gain access, read the section "Accessing the Tangential Fans" later in this chapter.

Radial fans Measuring points are at the barrier-block mounted on the air-duct assembly. Accessing these fans is described later in this chapter.

EMO Measuring point is the socket on the PCM .

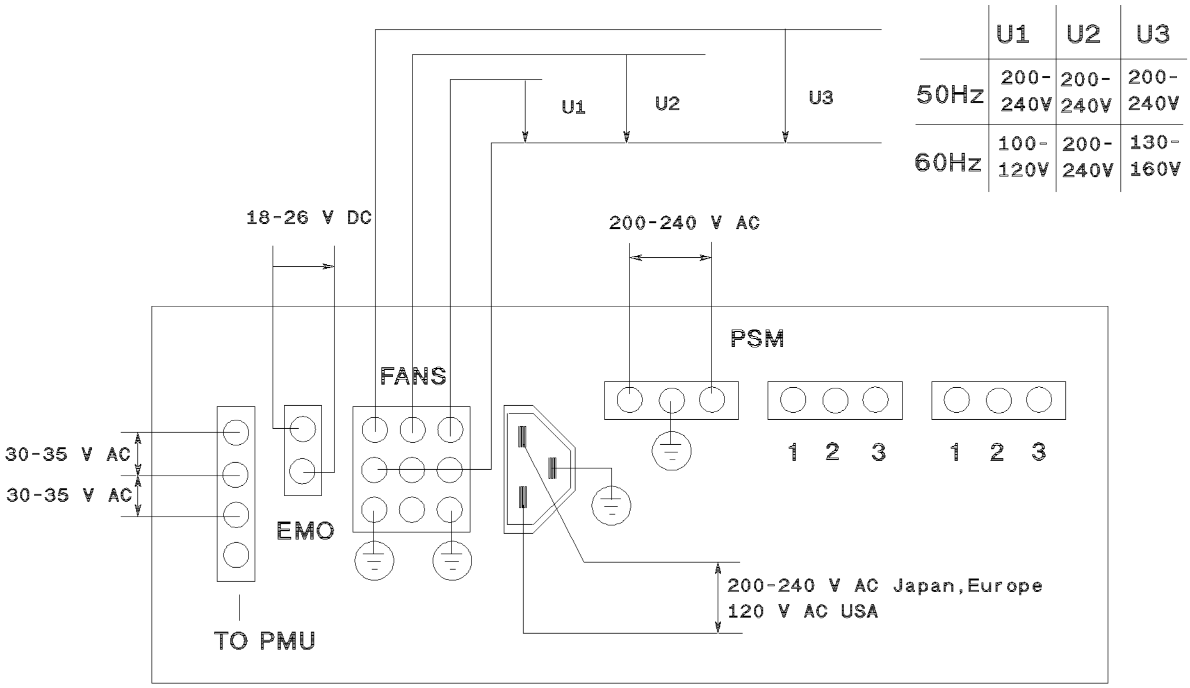


Figure 4-4. Measurement points for PCM

The measurement-points for all voltages supplied by the PCM are shown above. Notice that the power for fans is frequency-dependent and that the power for the test equipment is different for the USA, Europe and Japan.

If you cannot measure the voltages shown in the figure above, the problem is inside the PCM. Otherwise check the power cables to the different devices for short-circuits, breaks or incorrect wiring.

If you suspect the voltages supplied to the PSMs, measure these voltages on the connector located at the right side behind the rear door. If you cannot measure the correct voltages at the PSM outlets, suspect the line-filters in the PCM.

Standardframe EMO Troubleshooting

If you cannot switch-on the circuit-breaker, it is likely that there is a problem with the EMO.

A voltage of 24 V across the EMO trip-coil is needed in order to be able to switch the breaker on. Refer to the manual *Installing HP 82000 Mini and Standardframes* for details of how the EMO should be connected. If the 24 V is not present, the circuit-breaker switch will snap back into the intermediate position. To troubleshoot this problem do the following:

- Remove the PCM from the system cabinet.
- Remove the top-cover of the PCM.
- Check if any of the fuses on the fuse-holder block is broken. If so, replace it.
- Check the wiring of the **TRIP-COIL** board. Refer to the manual *Installing HP 82000 Mini and Standardframes* for the correct wiring.

- Check if any of the fuses on the **TRIP-COIL** board are broken. If so, replace it.
- If the 24 V connector on the **TRIP-COIL** board is not connected, then connect it.
- Check if the wiring between the PCM and the EMO is correct and correct any mistakes. Refer to the *Installing HP 82000 Mini and Standardframes* for the correct wiring.

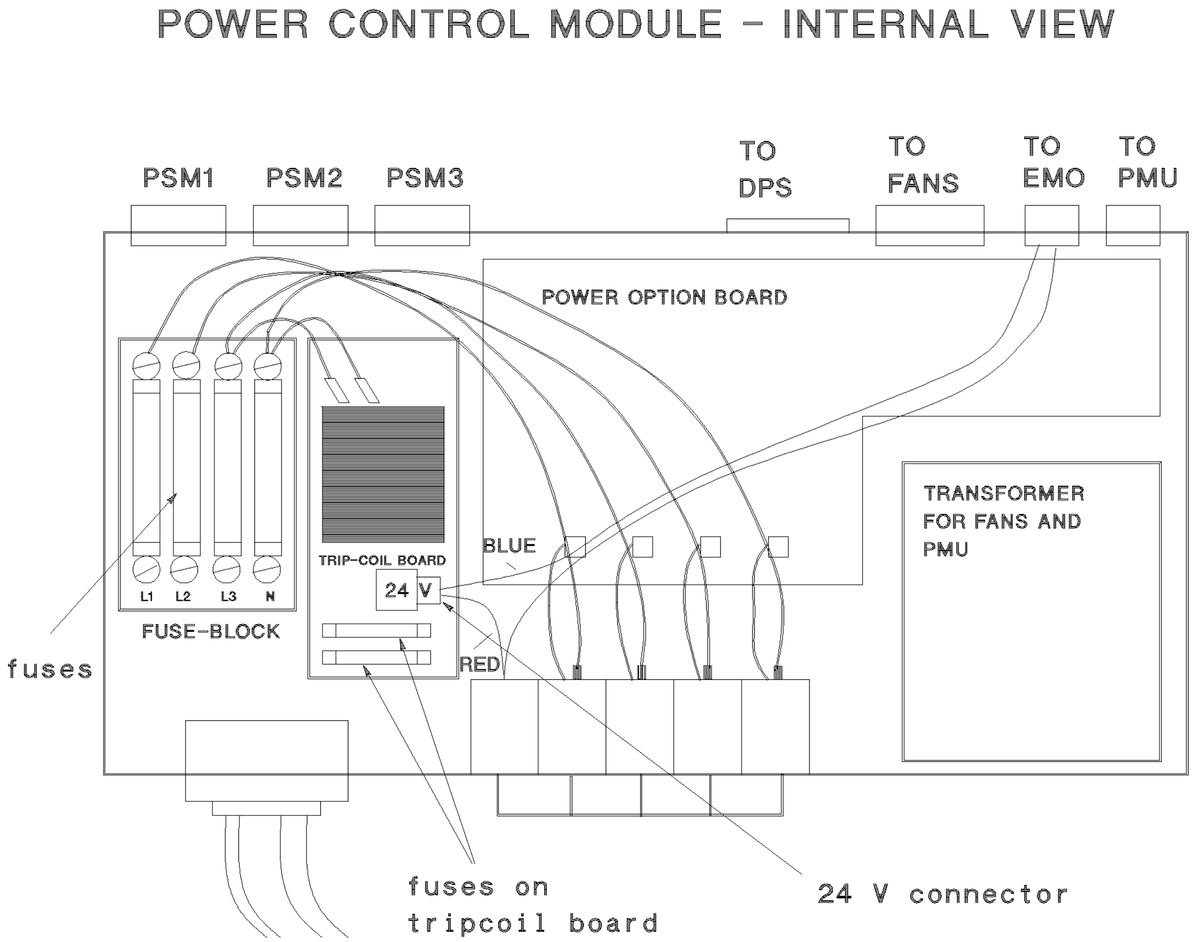


Figure 4-5. Power-option board

A Maxiframe with two card-cages has 36 slots (18 slots per card-cage). One PSM can supply up to 6 slots. A Maxiframe can therefore need up to 6 PSMs, depending on the number of boards fitted.

Each Standardframe has 18 slots (1 card-cage). A Standardframe can therefore need up to 3 PSMs.

Each PSM is made up of two identical modules, where each module provides power to three slots. This is shown in Figure 4-6. A module consists of one single-output switching power-supply and one multiple-output switching power-supply. Although there is no common supply-bus for all boards in the card-cage, there are still interlock mechanisms between the Power-Supply Modules. These are described in the following sections.

Multiple-Output Power Supply

The Multiple Output supply supplies the following voltages:

- +15.3 V @ 4.3 A
- −12 V @ 4 A
- +5 V @ 14 Amps
- −2.1 V @ 9.75 A

Single-Output Power Supply

The Single Output supply supplies one voltage.

- −5.2 Volts @ 60 Amps

Note The voltages given above are the voltages at the PSM connector. Because there is a slight voltage drop over the connected boards, the voltages measured at the I/O board measurement-points are slightly lower. However, the voltages measured on the I/O boards should never be lower than the following:

Multiple-Output Power Supply

- +14.8 Volts
- −11.5 Volts
- +4.9 Volts
- −1.95 Volts

Single-Output Power Supply

- −5.1 Volts

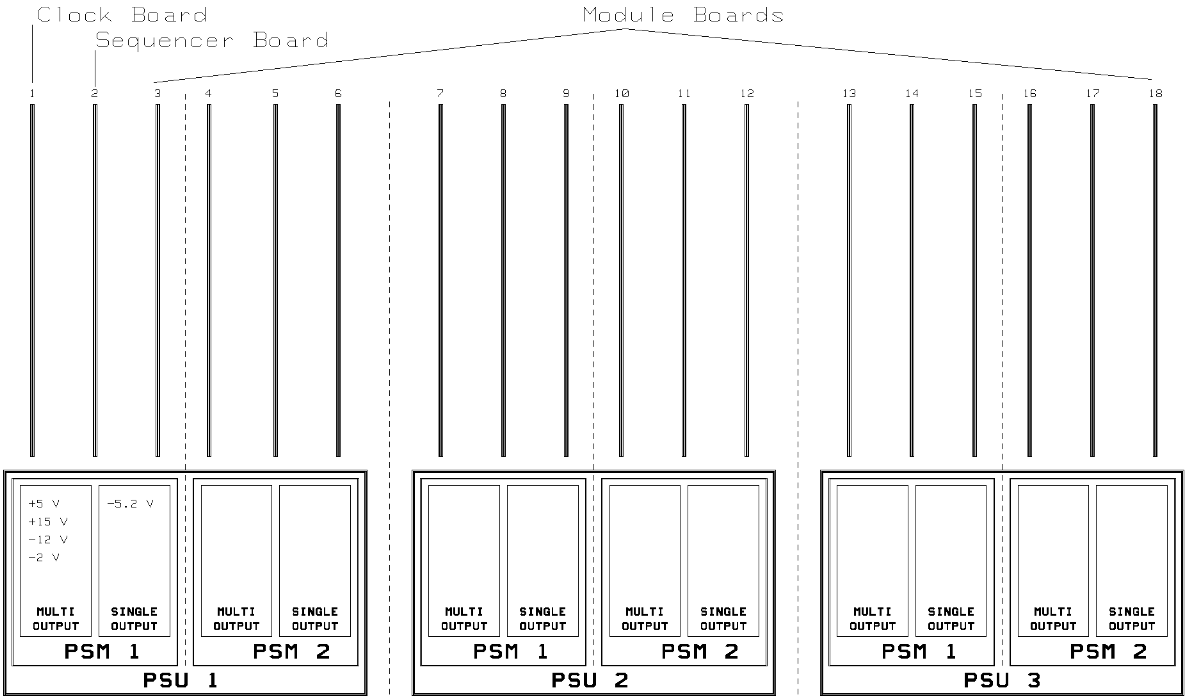


Figure 4-6. Arrangement of the Power-Supplies in each Card-Cage

PSM Specifications

Following are the relevant specifications for a PSM:

Noise 100 mV p-p **Ripple** 20 mV, bandwidth 10 MHz

Power-Supply Module (PSM) Troubleshooting Procedures

If the Diagnostics fail one or more boards completely, the fault is likely to lie with the power-supply. The problem could also be a short circuit on a board pulling down a supply line, but this is only possible for the low-current power-supply outputs, as these are more likely to shut down before a board starts to burn.

Before you suspect the PSM, first make sure that the power for the PSM is present at the power connector for the PSM. If not, refer to PCM Troubleshooting.

The first thing to do is to measure the voltage-levels on an I/O Board. Figure 4-7 and Figure 4-8 show the power-supply test-points on the D50, D100, D200 and D400 I/O Boards, respectively. Pull out all I/O boards except the first one (slot 3). Measure the voltage-levels on the first I/O board. Push in the other boards in sequence and measure the voltage-levels on each. If you detect a missing voltage, measure the same voltages on the other I/O boards supplied by the same Power Supply Module, so that you can decide, if the fault is in the power-supply or on the I/O board.

If a board seems to be the cause of the fault, substitute a good board and measure the voltage-levels again. This should prove that the original I/O board was faulty.

If boards are not causing the fault, or if several boards in groups of three consecutive slots fail (groups start at slots 1, 4, 7, 10, 13, and 16) diagnostics, suspect the PSM supplying the group(s) failed.

The power-supplies behave in a variety of ways when a fault occurs:

Single-Output −5.2 V	When a −5.2 V single output supply goes-down in any of the PSMs, it causes the +5 V supply to switch-off. This protects certain devices on the Clock board from damage. The affected +5 V supply in turn causes all other +5 V supplies to switch off and disconnects power to the microprocessor on the Clock board.
Multiple-Output +5 V	If a +5 V supply goes down, all other +5 V are switched-off and the power to the microprocessor on the Clock board is disconnected. This is necessary to protect the circuitry on the Clock board from damage.
Multiple-Output +15 V, −12 V, −2 V	These supplies are independent and do not cause any other supplies to switch off.

The following procedures are designed to help you pinpoint a faulty supply so that you can replace the affected Power-Supply Module. You cannot split a PSM into its four component supplies, always replace the complete PSM.

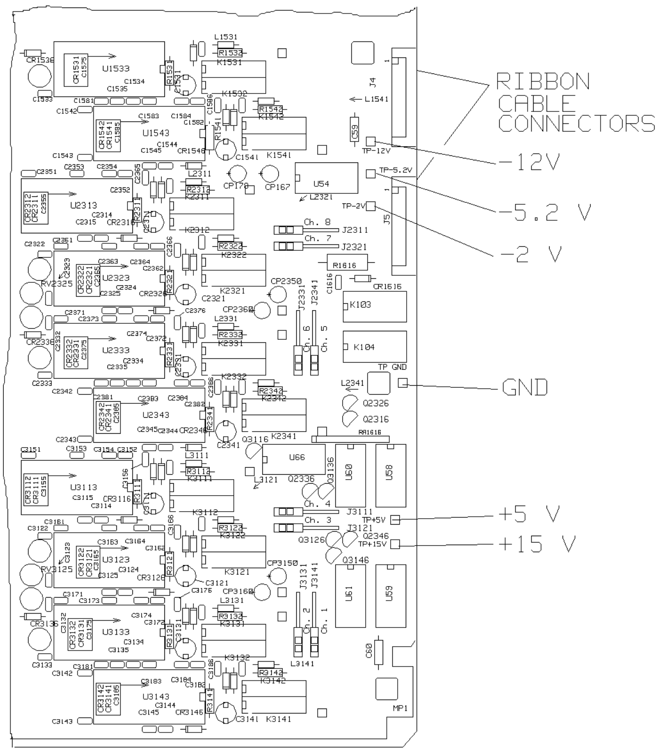


Figure 4-7. Power-Supply Test Points on D50 I/O Boards

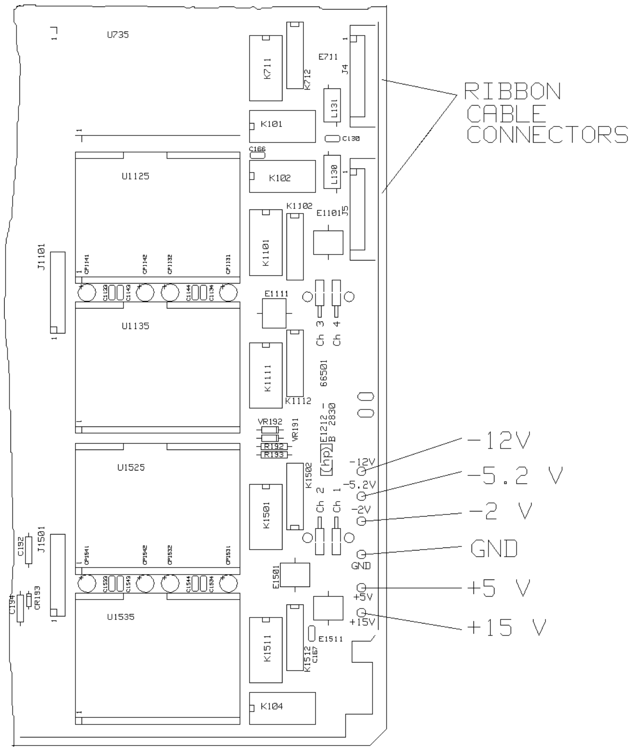


Figure 4-8. Power-Supply Test Points on D100, D200 and D400 I/O Boards

Note

The power-supplies require a minimum output load in order to operate. Make sure you have at least one I/O Board or a PMU inserted for each sub-module that you are measuring.

Locating a Faulty −5.2 V Supply

Use the following procedure:

1. Check for the presence of −5.2 V on the third board in each group, starting with the I/O Board in slot 3. Connect your DVM between the −5.2 V and Ground pins on an I/O Board. Refer to Figure 4-7 or Figure 4-8 for the correct measurement-points.
2. Since the "healthy" −5.2 V supplies are not affected by the faulty supply, you can easily isolate the faulty supply as it is the one not supplying −5.2 Volts. Use Figure 4-6 for orientation.
3. Switch off power at the mains circuit-breaker at the back of the mainframe.
4. Remove the faulty PSM as a complete unit. Refer to the removal instructions in the module *Replacing Parts*.
5. Install a new PSM.

Locating a Faulty +5 V Supply

Use the same procedure as for the −5.2 V Supply. Measure at the +5 V test point.

Locating a Faulty +15 V Supply

Use the same procedure as for the −5.2 V Supply. Measure at the +15 V test point.

Locating a Faulty −12 V Supply

Use the same procedure as for the −5.2 V Supply. Measure at the −12 V test point.

Locating a Faulty −2 V Supply

Use the same procedure as for the −5.2 V Supply. Measure at the −2 V test point.

The Miniframe does not use Power-Supply Modules as fitted to the Standardframe. It does however use the individual Power-Supplies which make up a PSM. These supplies are fitted individually in the Miniframe in order to keep its size small. A Miniframe contains slots for six boards. It therefore requires two single-output supplies and two multi output supplies. A pair of single/multi-output supplies can supply power to three boards, as with the Standardframe. The troubleshooting procedures are identical to those for the Standardframe.

A Miniframe or Miniframe Extender can be fitted with up to two power-supply modules, (PSMs). A PSM comprises:

- A single-output supply * A multiple-output supply

One PSM provides power-supplies for up to three boards, the master miniframe may contain up to six boards. These boards are:

- 1 Clock Board.
- 1 Sequencer Board.
- up to 4 I/O Boards.

To exchange a power-supply chassis in the Miniframe or Miniframe Extender follow the procedure in the module *Replacing Parts*.

Device Power Supplies (DPS)

The DUT is powered by an HP 66XX DPS installed in the HP 82000 mainframe. HP 66XX is a family of device power supplies, offering different voltage and current ratings, as well as different numbers of outputs. The troubleshooting procedures described here are specifically for the HP 6624. They also serve as an example for the other instruments in the HP66XX family. If your DPS is other than the HP 6624, read the following sections anyway, then refer to the Operating Manual supplied with the instrument.

Power-on and Self-test

The following paragraphs describe the power-on sequence which includes a self-test of most of the DPS circuits.

Before you turn-on the DPS, make sure that:

- The line voltage selection switches are set to match the input line voltage.
- The proper fuse is installed and the power cable is plugged in.

To turn on the DPS, press the LINE switch on the front panel. The DPS runs a series of self tests which take approximately 3 seconds. Included in these tests are checks of the HP-IB interface, ROM, RAM and the power controller circuits for each of the outputs.

If the DPS passes the self-test, the display first *lights* all segments of the LCD display and annunciators, then the supply's HP-IB address appears briefly, as shown in Figure 4-9. The DPS HP-IB address is set to 5 when it is shipped from the factory.

Figure 4-9. Address Display during DPS Self Test

After the HP-IB address appears, the output voltage and current readings (both approximately zero) for OUTPUT 1 are shown in the display (see Figure 4-10). The CV annunciator indicates that the constant-voltage mode is set.

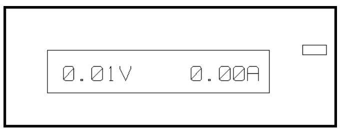


Figure 4-10. Typical DPS Display at Power-on

If the DPS fails the power-on self-test, all power supply outputs stay disabled (off) and the display indicates the type of failure and the output channel on which it occurred. Figure 4-11 shows that self-test detected an error on output channel 3. Error messages that could appear on the display if self-test fails are listed below. These error-messages are explained in the Service Manual for the DPS.

Figure 4-11. Sample Self-Test Failure Display

Power-On Self-Test Error Messages

```
HDW ERR CH "N"

8291 FAILED

TIMER FAILED

RAM FAILED

CV DAC CH "N"

CC DAC CH "N"

OV DAC CH "N"

FUSE CH "N"
```

Where “N” is the failed output channel number.

Testing the DPS using Local Control

The following procedures use the display and the keys on the front panel to check each of the DPS outputs. No test equipment, other than a jumper-wire, is required to perform these tests. The test must be repeated for each DPS output. The tests described here are voltage, overvoltage, and current tests. To perform these tests, the DPS must be switched-on and have passed the power-on self-test. Nothing should be connected to the DPS outputs.

Note

The following procedures are identical for all models and for all outputs. Use the (OUTPUT SELECT) key to select an output to test. If an output fails any of the tests, refer to the troubleshooting section in the DPS Service Manual.

Voltage Test

1. Set the voltage of the selected output to 10 V by pressing:

(VSET) (1) (0) (ENTER)

2. Check that the display reads approximately 10 V and 0 A and the CV annunciator indicates that the supply is in the constant voltage mode.

Overvoltage Test

1. Program the overvoltage (O V) to 19 V by pressing:

(OVSET) (1) (9) (ENTER)

2. Set the voltage to 16 V by pressing:

(VSET) (1) (6) (ENTER)

3. Check that the display reads approximately 16V and 0A.

4. Set the voltage to 20 V by pressing:

(VSET) (2) (0) (ENTER)

5. Check that the display reads "OVERVOLTAGE".

6. Reset the supply by pressing:

(VSET) (1) (6) (ENTER) (OVRST)

7. Check that the display reads approximately 16 V and 0 A.

Current Test

1. Turn off the supply.

2. Remove the barrier-block cover from the output to be tested and connect a short-circuit (jumper wire) between the +V and -V terminals of the output being tested.

3. Turn on the supply.

4. Use the OUTPUT SELECT to select the output being tested.

5. Check that the display reads approximately 0V and 0A and the CC annunciator is on indicating that the supply is in the constant current mode of operation.

6. Set the voltage to 5 V by pressing:

(VSET) (5) (ENTER)

7. Check that the display reads the same as in step 5.

8. Set the current to 1.5 A by pressing:

(ISET) (1) (.) (5) (ENTER)

9. Check that the display reads approximately 0 V and 1.5 A.

10. Enable the overcurrent protection circuit by pressing:

(OCP)

11. Check that the OCP ENBLD annunciator indicates that overcurrent protection is enabled and the display reads "OVERCURRENT". When in overcurrent, the output is disabled.

12. Disable the overcurrent protection circuit by pressing:

(OCP)

Because the output terminals are shorted, this step prevents the output from going into overcurrent immediately after you reset the supply.

13. Reset the output by pressing:

(OCPRST)

14. Check that the display reads the same as in step 9.

15. Turn off the supply and remove the jumper from the output terminals.

16. Repeat steps 9 through to 11 for the next output to be tested.

For further information on the Device Power Supply refer to the Operating Manual.

Fans

There are a few main reasons why the fans should not work correctly:

- There is no power supplied to the fans.
- The PCM is incorrectly configured, so that the wrong voltage is supplied to the fans.
- The fans are mechanically damaged.

If the radial fans malfunction, the temperature in the PSMs increases. A temperature sensor in each PSM causes the PSM to switch-off if the temperature exceeds 70 degrees Celsius.

If the tangential fans do not work properly a temperature sensor on the system boards causes the PSM to switch off.

To check if the fans are defective:

1. Make a visual inspection. Check if the fans are running or if there is any visible mechanical damage.
2. Measure the voltage supplied to the fans, as described in the section **Power**. If you measure only half the required voltage, the PCM is incorrectly configured.

If the fans are defective, replace them as described in the following sections.

Maxiframe Fans

For Maxiframes we have to differentiate between maxiframes with one card-cage and maxiframes with two card-cages.

The mainframe with one card-cage and an instrument-frame, is fitted with two tangential fans (immediately above the two instrument-slots at the bottom of the card-cage). There are also six radial fans mounted below the PSMs. The tangential fans cool the system boards and the radial fans cool the PSMs.

Maxiframes with two card-cages have, in addition, the same arrangement for the upper card-cage, but the tangential fans are **above** the card-cage and the radial fans are **above** the PSMs. Figure 4-12 shows the position of the fans in a two card-cage maxiframe and the airflow they produce.

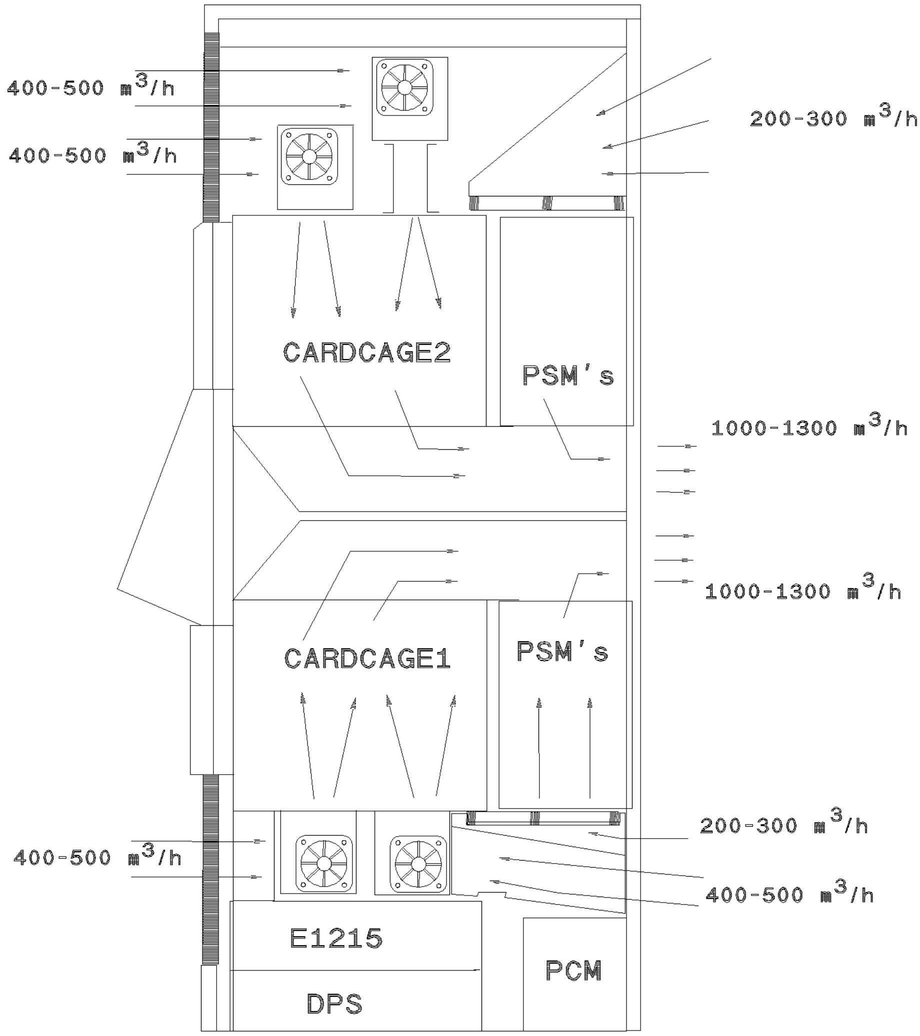


Figure 4-12. Maxiframe - Airflow produced by tangential and radial fans

Accessing the Tangential Fans

To gain access to the tangential fan motors and the electrical connections, use the following procedure:

Warning

This procedure must be performed by qualified Hewlett Packard service personnel.

To avoid the hazard of injury or death make sure that the power to the mains distribution point is switched-off.

When carrying-out this work, all local regulations and safety-codes must be adhered to.

---

1. Switch-off the circuit-breaker(s) on the PCM.
2. Open the rear-door. Remove the two top-cover screws. Remove the top-cover by sliding it towards the front of the maxiframe and lifting it off of its hook-fasteners. Refer to Figure 4-13.

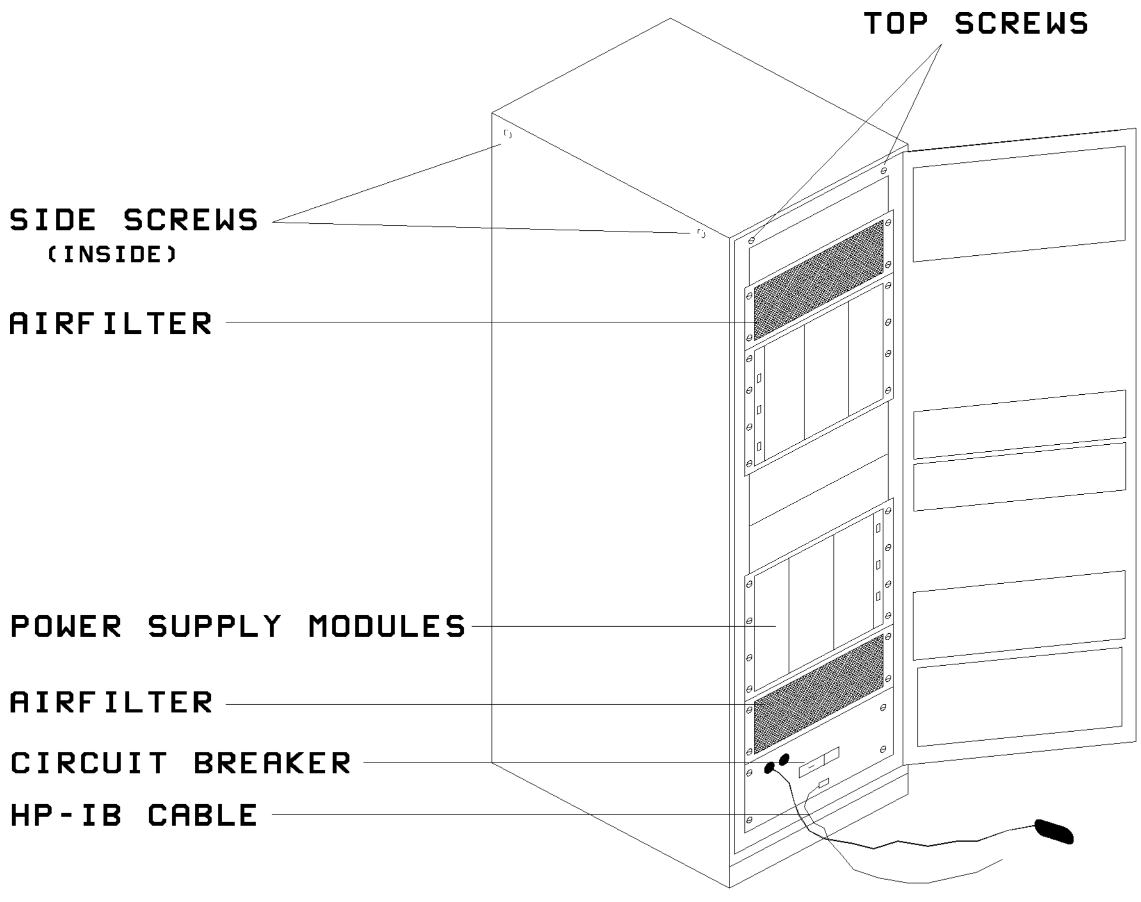


Figure 4-13. Rear View of Maxiframe

3. On one side of the maxiframe, remove the two side-panel screws (for positions, refer to Figure 4-14). Lift-off the side panel. Repeat this procedure for the other side-panel.

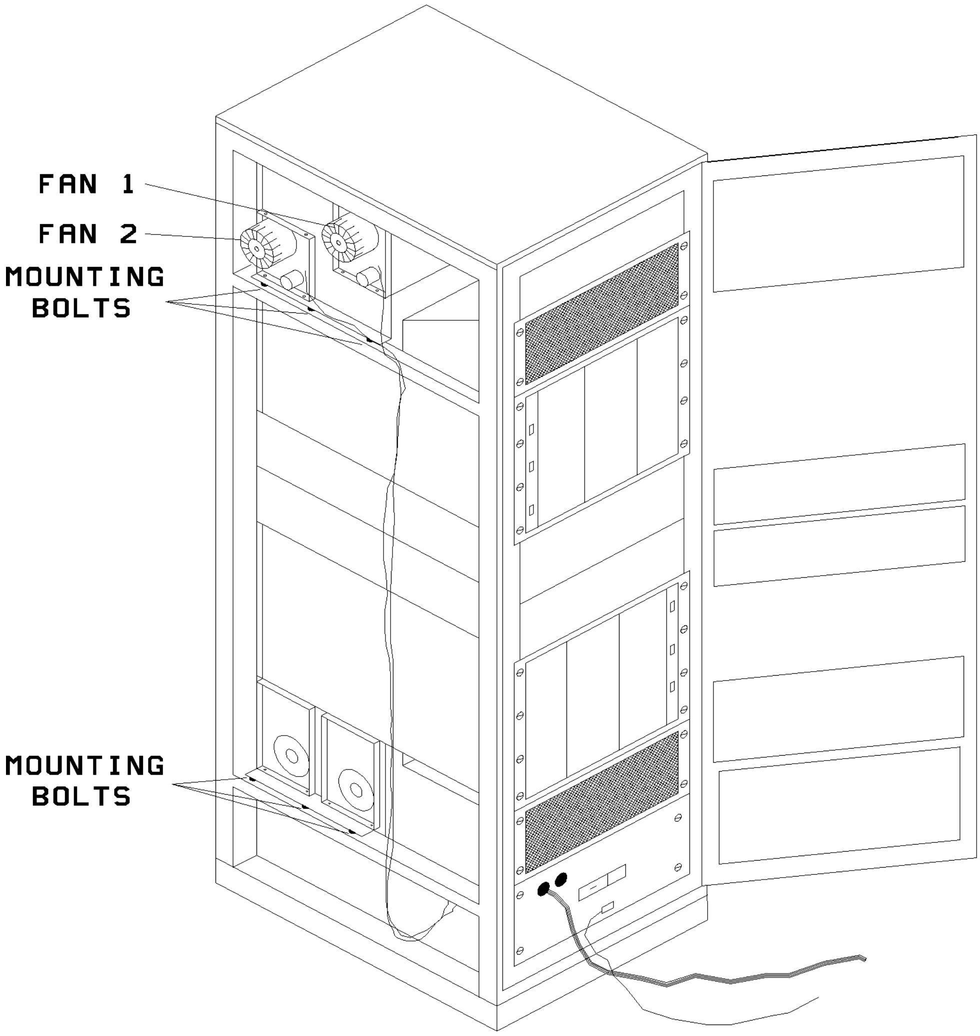


Figure 4-14. Maxiframe - Position of Tangential Fans

Figure 4-14 shows the tangential fan motors and the positions of the fan-tray mounting bolts. Make any electrical measurements at the barrier-blocks on the fans.

Standardframe Fans

The system standardframe/extender is fitted with two tangential fans (immediately above the device power supply), and six radial fans mounted below the PSMs. The tangential fans cool the system boards and the radial fans cool the PSMs. Figure 4-15 shows their positions and the airflows they produce.

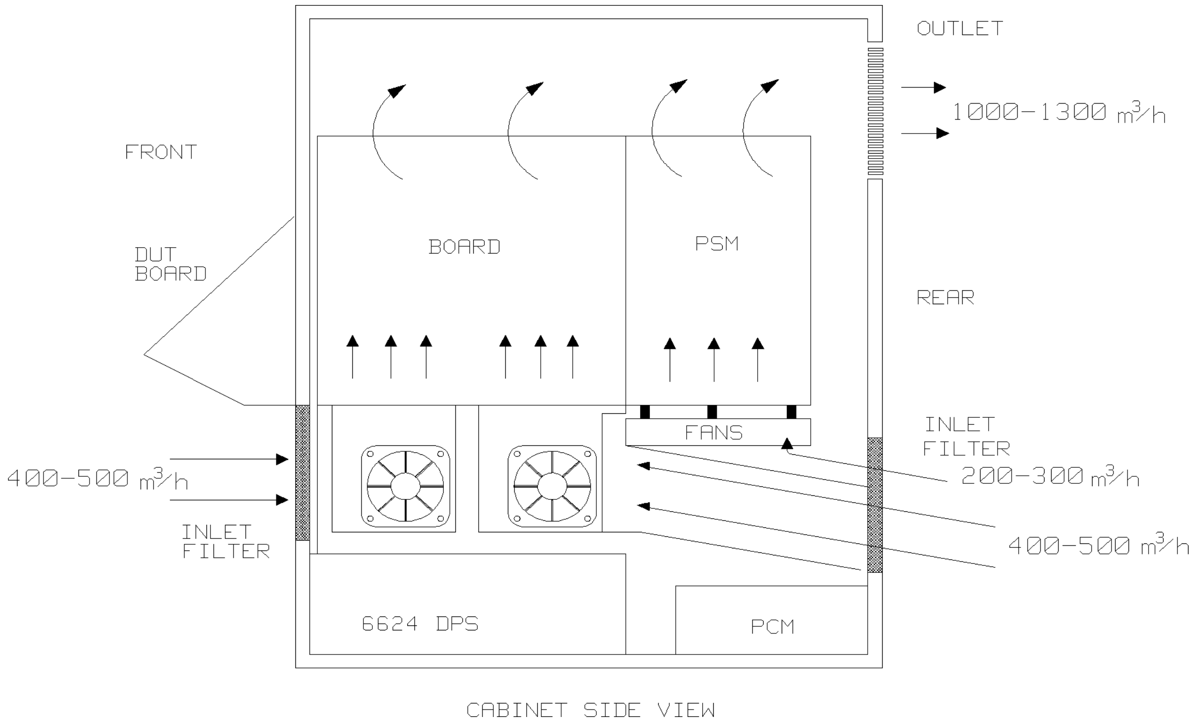


Figure 4-15. Standardframe - Airflows Produced by Tangential and Radial Fans

Accessing the Tangential Fans

To gain access to the tangential fan motors and the electrical connections, use the following procedure:

Warning

This procedure must be performed by qualified Hewlett Packard service personnel.

To avoid the hazard of injury or death make sure that the power to the mains distribution point is switched-off.

When carrying-out this work, all local regulations and safety-codes must be adhered to.

---

1. Switch-off the circuit-breaker on the PCM.
2. Open the rear-door. Remove the two top-cover screws. Remove the top-cover by sliding it towards the front of the standardframe and lifting it from its hook-fasteners. Refer to Figure 4-16.

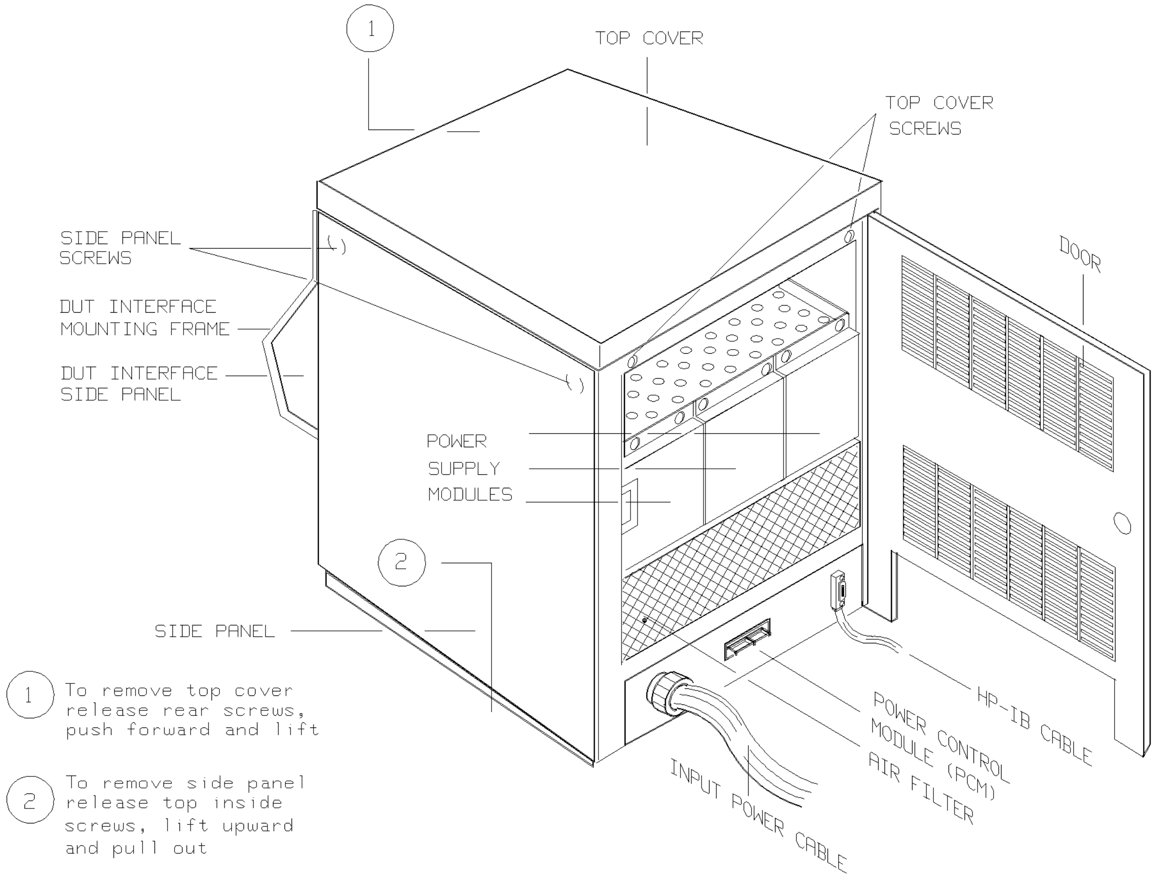


Figure 4-16. Rear View of Standardframe

3. On one side of the standardframe remove the two side-panel screws (for positions refer to Figure 4-17). Lift off the side-panel. Repeat this procedure for the other side-panel.

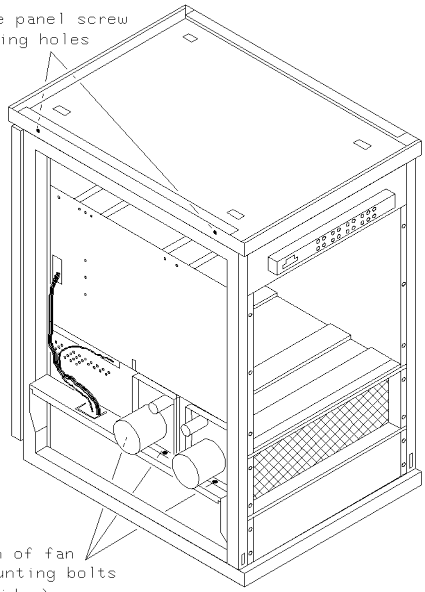


Figure 4-17. Standardframe - Position of Tangential Fans

Figure 4-17 shows the tangential fan motors and the positions of the fan-tray mounting bolts. Make any electrical measurements at the barrier-blocks.

Miniframe Fans

The system miniframe/extender is fitted with two radial fans on the side of the cabinet which cool the system boards and the power supplies.

To access miniframe fans just remove the top-cover of the miniframe.

The main components of the HSWG are:

- Motherboard
- Power Supply
- CPU board
- Timing board
- 2 Output boards

The following diagram shows the main functional blocks of the HSWG.

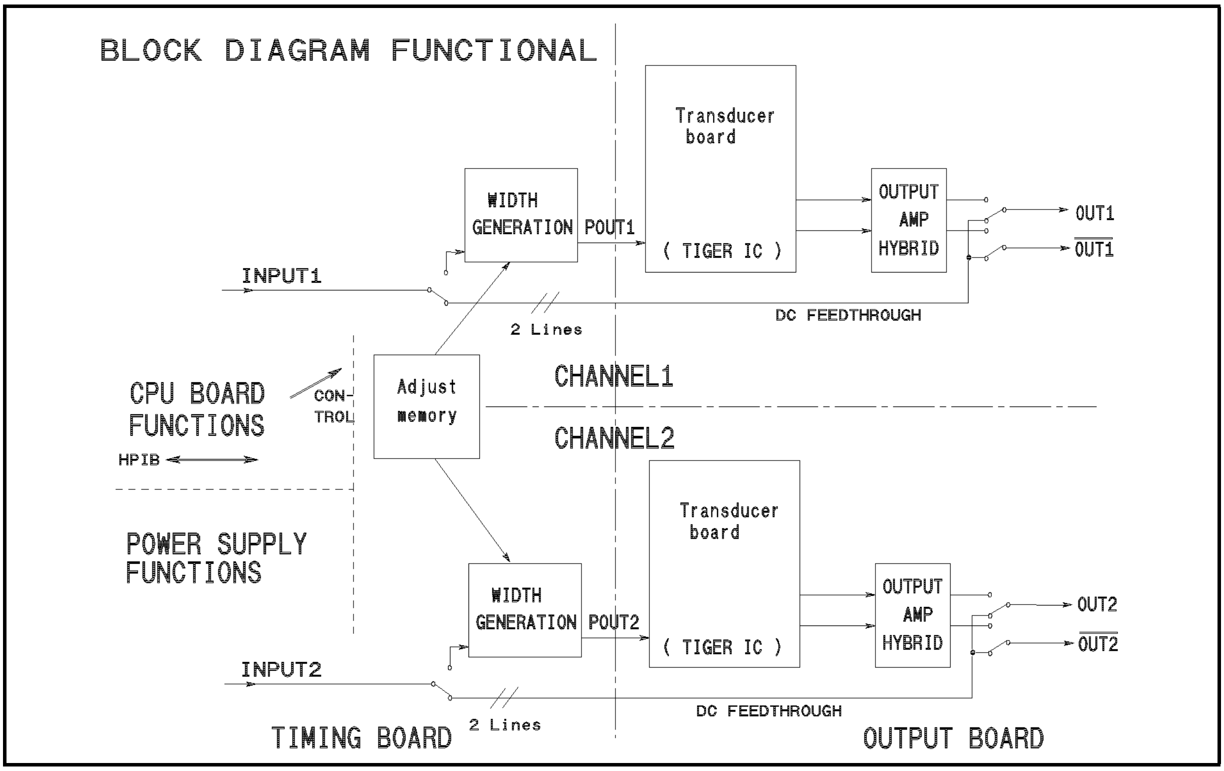


Figure 4-18. Functional Block Diagram of the HSWG

- The HSWG is powered by the HP 82000 PCM.
- Internally, the HSWG boards are connected by the HSWG motherboard.

  The CPU-board communicates with the HP 82000 system controller. It controls the other boards in the HSWG via the Device Bus.
- The Timing Board receives data signals from the HP82000. It can work in 400 MHz mode, where the width generator is triggered on both the rising and the falling edge of the signals coming from the HP82000. In 400 MHz DNRZ mode the HP82000 signals passes through the Timing board without modification. The Timing Board has the circuitry for two channels.

- The Output Board consists of the Transducer Board and the Output Amplifier Hybrid. The signals coming from the Timing Board are shaped by a cascade of bipolar differential amplifiers and a Gallium Arsenide IC to produce the final levels. For each channel there is one Output Board.
- For DC-measurements there is a DC-feedthrough path through the HSWG.

Tester or HSWG ?

If you suspect a fault on a channel connected to the HSWG, you must first check if the fault lies with the I/O board or with the HSWG.

If the AC-calibration on the channel connected to a HSWG works fine, all relays in the HSWG are OK and most of the circuitry has been tested. The output path is not checked, so that an additional test is necessary. If the calibration does not work correctly, remove the Input cable from the HSWG and calibrate the channel at the HSWG end of the input cable. If this works, continue with the tests following, as there could still be a problem with the formatter on the I/O board.

Note To calibrate the channel at the Input cable of the HSWG, you have to remove the entry for this HSWG from the `/hp82000/pws/data/mainframes` file, because the calibration process is different for channels connected to a HSWG.

Test for 400 MHz DNRZ Mode

To verify that the tester channel works correctly in AC-Feedthrough Mode, set up a small test on the HP82000, so that you can check if the channel connected to the HSWG is supplying valid signals to the HSWG. The measurements can be made with a DVM.

The HSWG needs signals pulses with special levels from the HP82000. These levels are determined during AC-calibration.

You can read these levels using the HP-IB query **ILCD?** *channel*.

Example:

Start the HPIB-driver from an HP-UX window by typing in:

`/hp82000/pws/bin/hpt`

The computer answers with:

`@`

Type in:

```
ILCD? 10105

The reply looks like the following:

ILCD 10105,-1200,-200,-1205,-225,544.234,546.234.123.333
```

The second and third values are the voltages the HP82000 supplies to the HSWG (in millivolts). You can also see these values in the AC-Calibration files.

To measure these levels, set up a small test for the suspected channel. Configure the channels suspected to be faulty in 400 MHz mode as shown in Figure 4-25.

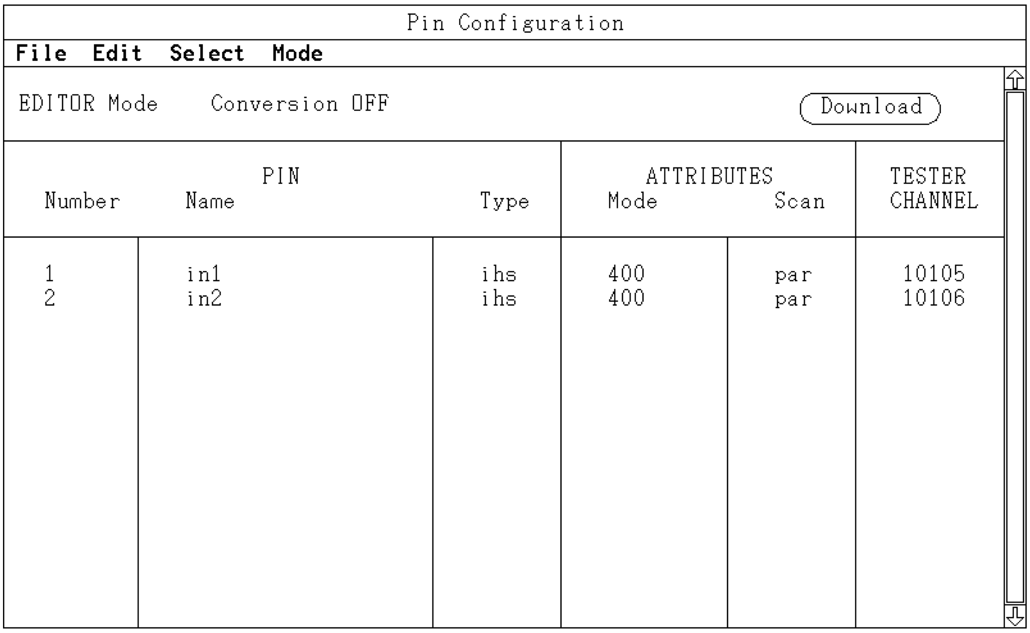


Figure 4-19. Pin Configuration

In the Timing window, set up the pin as a DNRZ pin. See Figure 4-20.

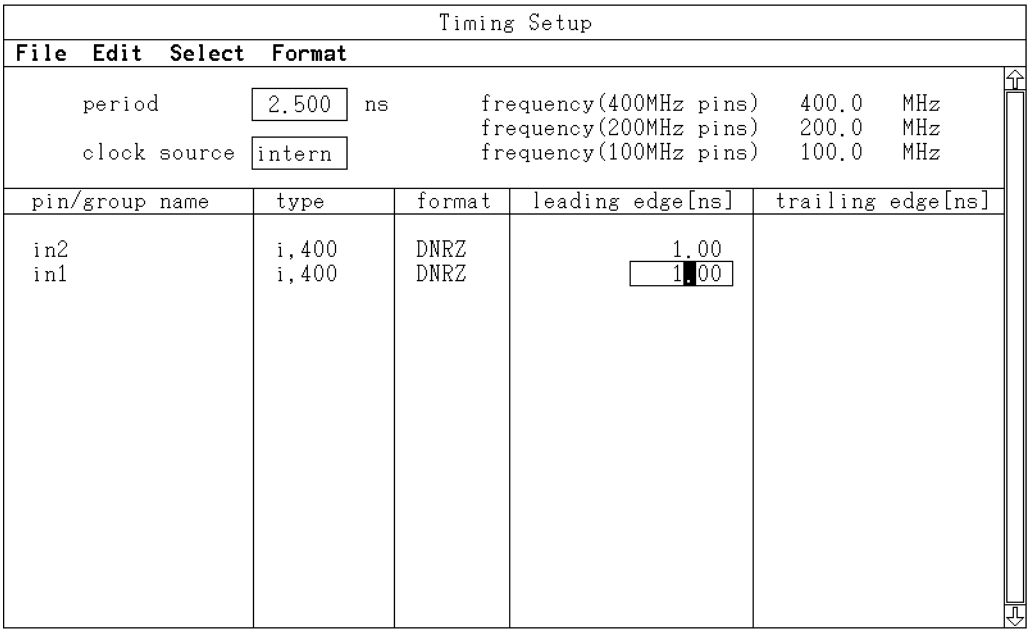


Figure 4-20. Timing Setup

Now the HSWG is working in 400 MHz DNRZ mode. Set up 8 cycles with four vectors per cycle, consisting only of 1's, as shown in Figure 4-21.

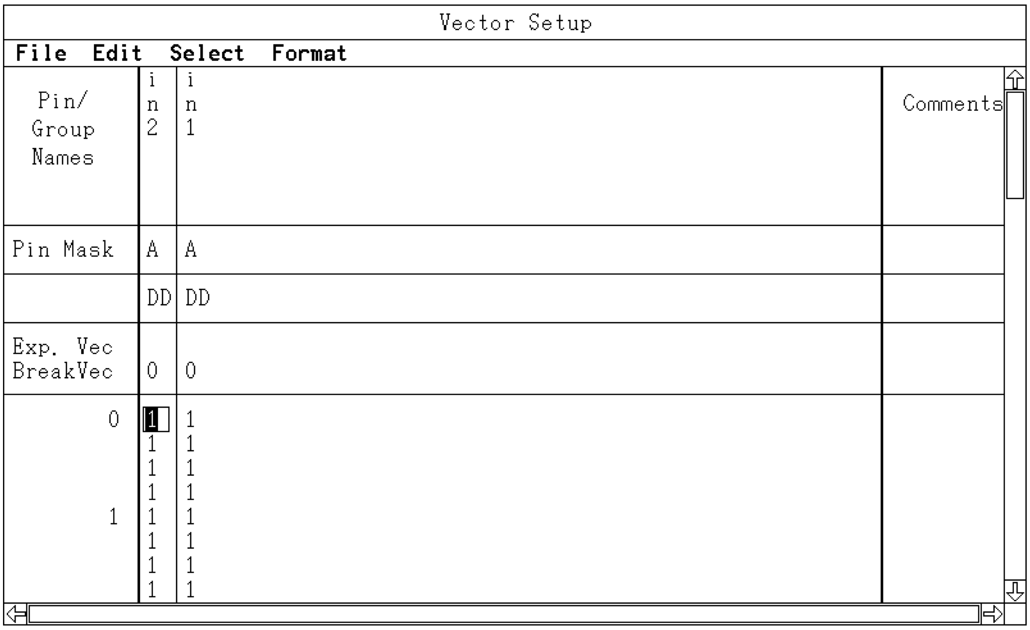


Figure 4-21. Vector Setup

Set up a small sequencer program so that a test starting with the label *endless* (for example. You can use any label.) runs endlessly. To do this, put a line in the Sequencer Control Window like the following one:

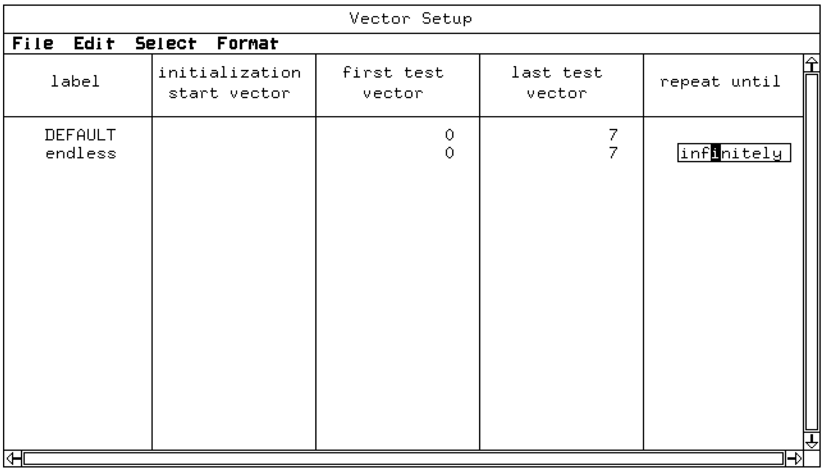


Figure 4-22. Sequencer Control

If you start the sequencer from the Test Control Window, as shown in Figure 4-23, you are now supplying DC voltage to the HSWG.

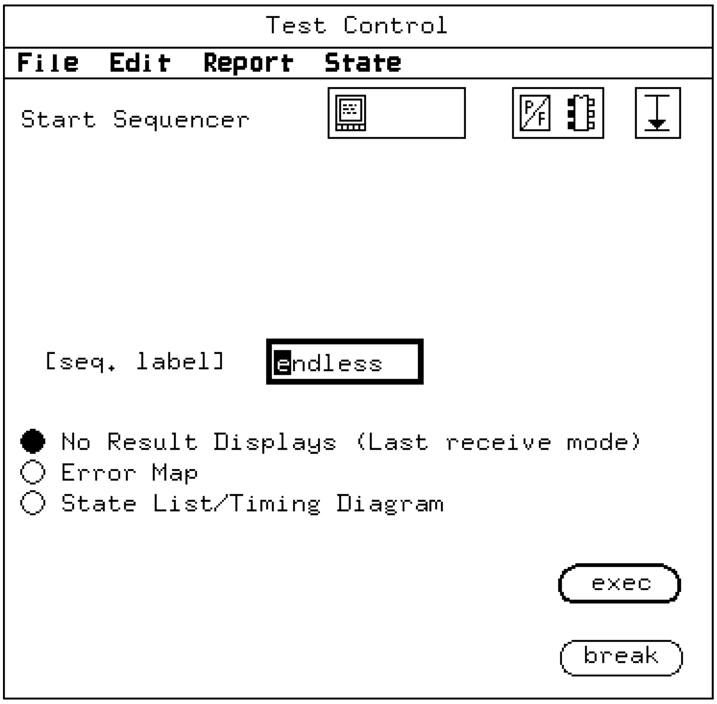


Figure 4-23. Test Control

Disconnect the HSWG input cable from the HSWG and measure the voltage between the pin and the shield of the SMA connector on the HSWG (as shown in Figure 4-24). The voltage measured should be the same as that read earlier for 400 MHz DNRZ mode low-level, using the HP-IB query (the HSWG needs an inverted input signal).

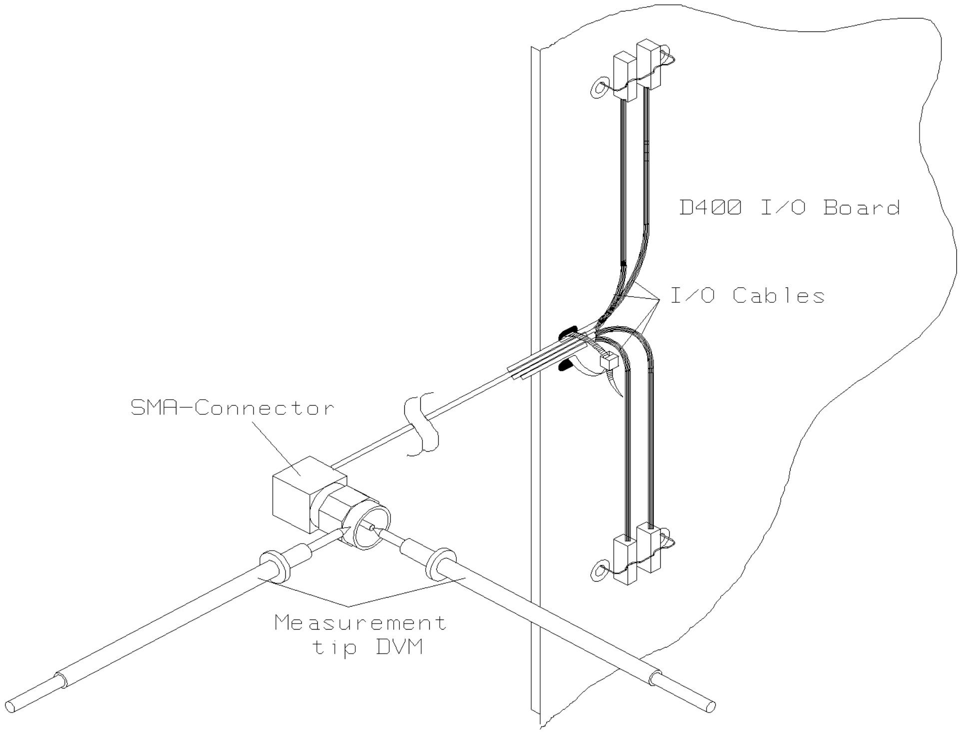


Figure 4-24. Measuring at HSWG SMA Connector

Make the same measurement with a vector setup consisting only of zeros. Now you should measure the same voltage as that given by the HP-IB query for the high level for 400 MHz DNRZ mode.

If the measurement returns the wrong values, the I/O board must be exchanged.

Test for 400 MHz RZ Mode

With the following test you can check if the HP82000 Test system supplies the correct signals to the HSWG in 400 MHz RZ mode.

You can read the levels, using the HP-IB query **ILCD?** *channel*, as described for 400 MHz DNRZ mode:

Example:

Start the HPIB-driver from an HP-UX window by typing in:

`/hp82000/pws/bin/hpt`

The computer replies with:

`@`

Type in:

```
ILCD? 10105
```

```
The answer looks like the following:

ILCD 10105,-1200,-200,-1205,-225,544.234,546.234.123.333
```

The fourth and fifth values are the levels the HP82000 supplies to the HSWG (in millivolts) in 400 MHz RZ mode. Set up a small test as follows, so that these levels can be measured with a DVM.

Configure the channels suspected to be faulty, in 400 MHz mode, as shown in Figure 4-25.

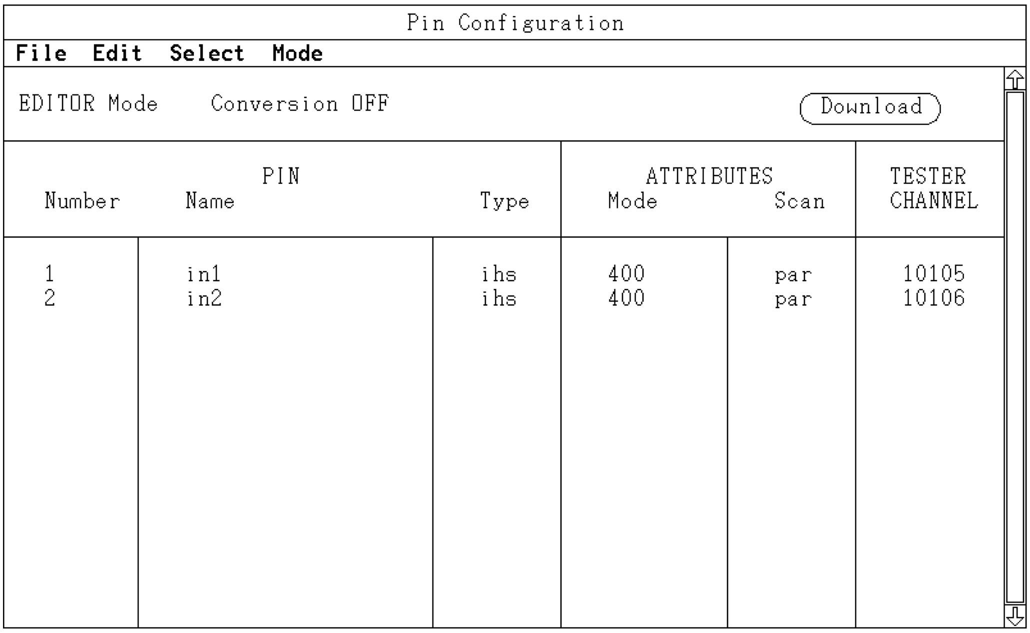


Figure 4-25. Pin Configuration

In the Timing window, set up the pin as an RZ pin. See Figure 4-20. The tester now supplies signals for 400 MHz RZ Mode.

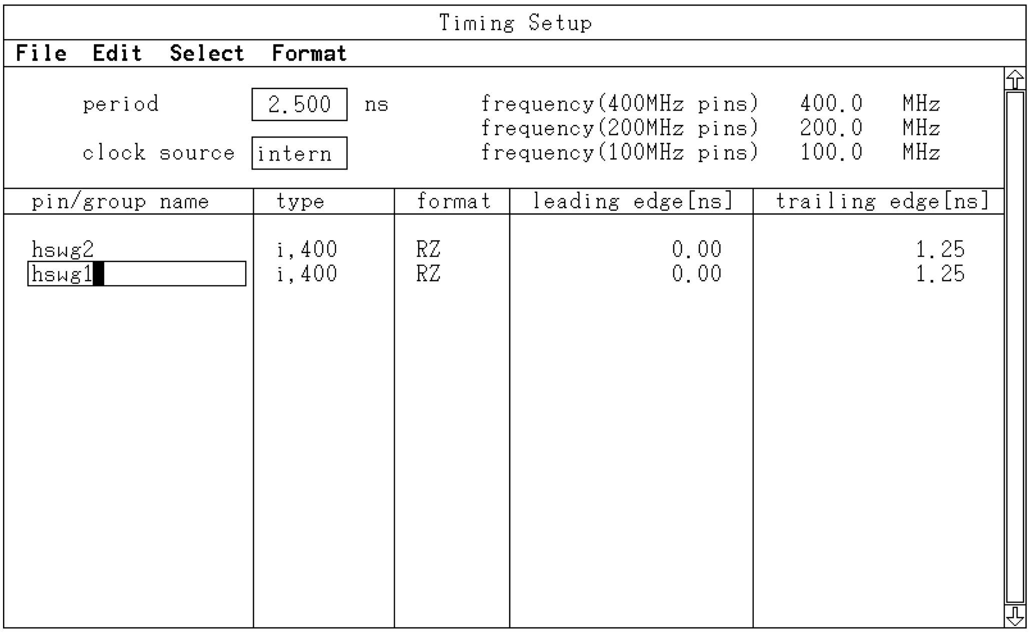


Figure 4-26. Timing Setup

For each RZ signal the HP82000 must supply one edge to the HSWG. To measure the low level you have to make a vector setup with one RZ-signal. Then the HP82000 signal supplies one edge to the HSWG and remains static. To measure the high level you need two transitions in your setup.

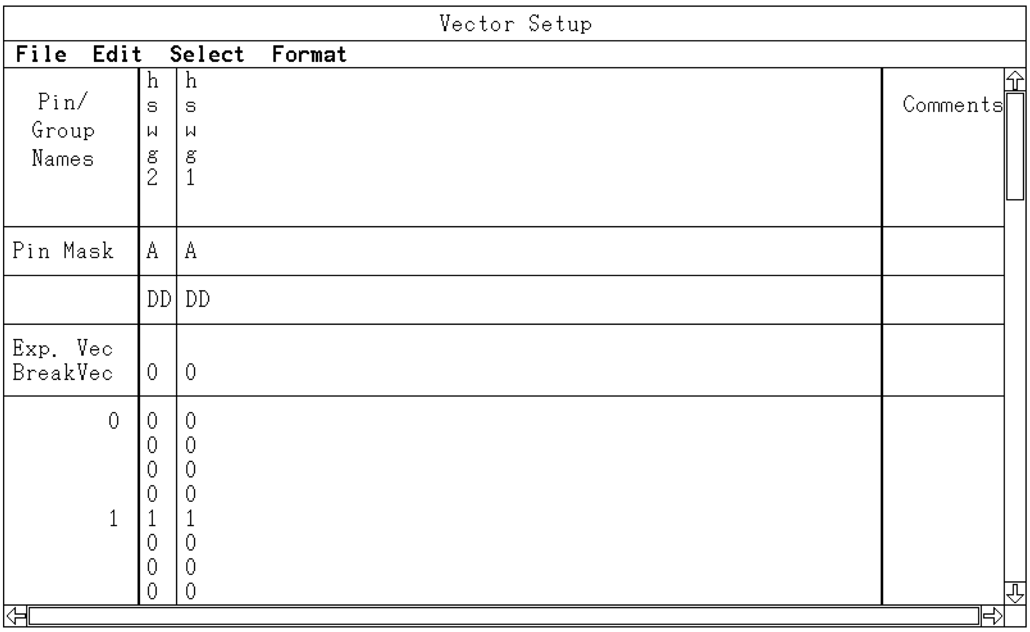


Figure 4-27. Vector Setup for Low Level

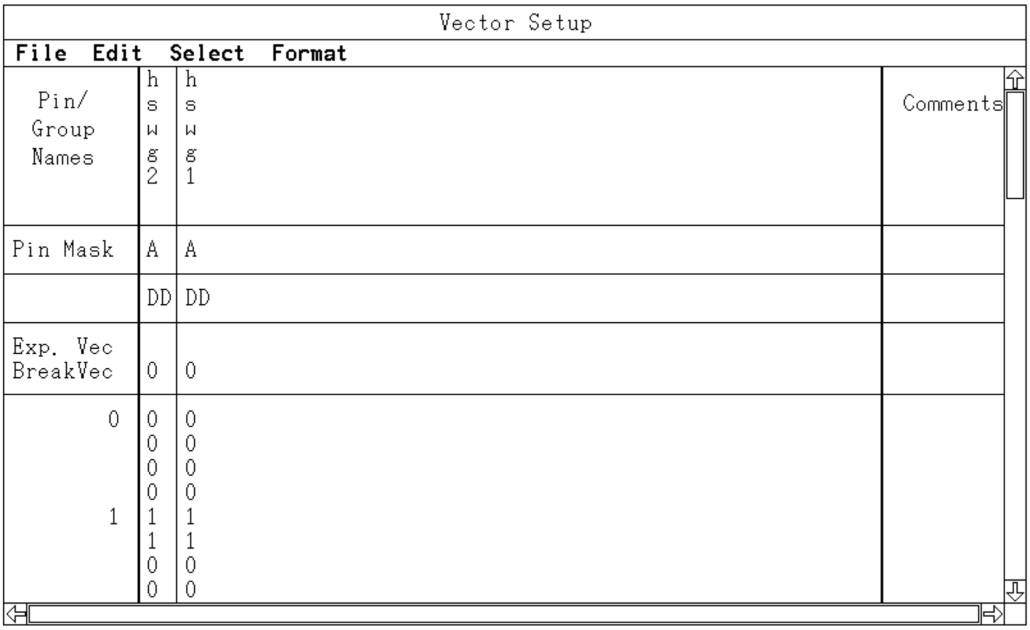


Figure 4-28. Vector Setup for high Level

If you now start the sequencer from the Test Control Window, as shown in Figure 4-29, you are now supplying DC voltage to the HSWG.

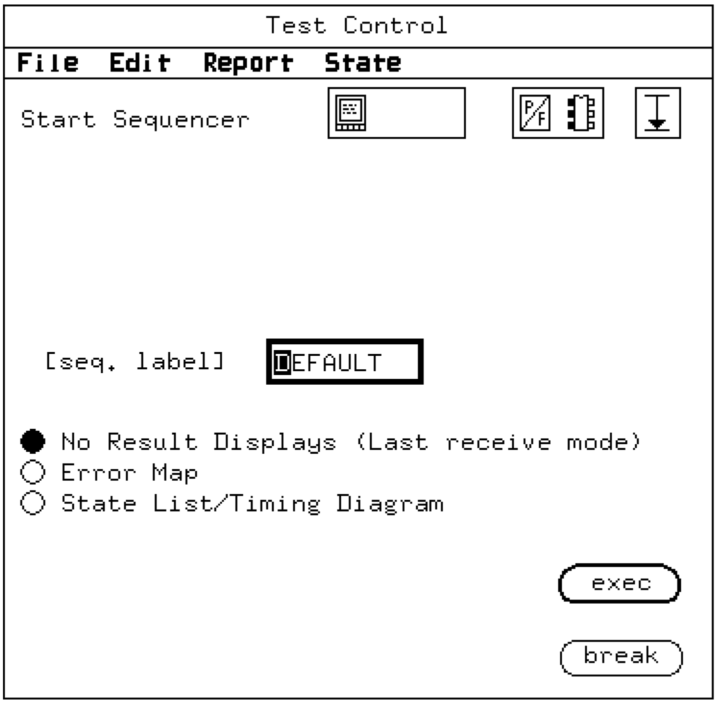


Figure 4-29. Test Control

Disconnect the HSWG input cable from the HSWG and measure the voltage between the pin and the shield of the SMA connector (as shown in Figure 4-24). The value should be the value given by the HPIB query for 400 MHz RZ mode, high or low level, depending on the Vector Setup.

If you do not measure the correct voltages these voltages your I/O board is defective.

HSWG HP-IB Addresses

Note

HSWGs must be connected to HP-IB select-code 7.

The HP-IB addresses 15,16,17 and 18 on HP-IB select-code 7 are reserved for HSWGs. No other addresses can be used by HSWGs and these addresses must not be used by other devices.

The procedure for setting HSWG HP-IB addresses is:

Procedure

1. Switch-on the PCM.
2. Switch-on the disc-drive.
3. Switch-on the controller and monitor.
4. Login to the system.
5. Type `cd /hp82000/fw/bin` and press (Return).
6. Type `./hswg_conf` and press (Return).

   Message: `Turn off all High Speed Width Generators then press Return`

Note

Do not run the `hswg_conf` configuration program in an HP-UX shell started from the HP 82000 software. The HP 82000 software must not be running at the same time as this program.

7. Make sure that all HSWGs are switched off, then press (Return).

   Message: `Turn on the High Speed Width Generator to configure. Then press Return.`
8. Switch on HSWG1 and press (Return).

Note

When you switch-on a HSWG, a self-test program runs. If it runs correctly and finds no faults, the LED on the front-right of the HSWG lights for approximately two seconds and then switches-off. If this LED remains lit or does not light, there is a fault.

If no HSWG can be found:

Message: `Error: No High Speed Width Generator found on address 15`

The program then stops.

Otherwise:

Message: `High Speed Width Generator found on address X` (X some number)

`New address ?`

9. Type `15` and press (Return).

   Message: `Address set to 15`

Message: `More High Speed Width Generators (Y/N) ?`

10. Press `y` to go through the same procedure as before and set the HP-IB address of HSWG2 to 16. Repeat the procedure for HSWG3 and HSWG4.

    When all HSWG HP-IB addresses have been set, press `n`.

    Message: `Turn off all High Speed Width Generators`

11. Turn off all HSWGs.

    Message: `Turn on all High Speed Width Generators.`

12. Do this and the program stops automatically, returning the HP-UX prompt. Turning the HSWGs off and on again caused them to retain the HP-IB addresses set.

Next, you must modify the `mainframes` file to tell the software which HSWG channels are at which HP-IB address, and what I/O channels are driving these HSWG channels.

13. On the HP-UX command-line, type `vi /hp82000/pws/data/mainframes`.

14. For each HSWG, add a line to this file (mainframes) like the following:

    `HSWG`*HSWG channel*`,`*driver channel*`,`*HP-IB address*

    Where:

HSWG channel	- is the number of the HSWG channel (1 or 2) being driven by *driver channel*.
driver channel	- is the number of the driver channel driving *HSWG channel*.
HP-IB address	- is the HP-IB address you set in the last part of this procedure.

    For Example:

    ```
    HSWG1,10105,15
    HSWG2,10106,15
    ```

    Press (ESC), type `:wq` and press (Return), to save the modifications and end the editing session.

5

Interpreting the Results of Diagnostics

Test Descriptions

The individual tests are described in the order they occur during execution of the diagnostic. The order has been specially set to enable tests that depend on the successful completion of other tests to run. The following information is given for each test:

- a brief description of each test
- the name of the board being tested
- the necessary prerequisites:
  - these are expressed in terms of previously run diagnostic tests that must have passed to enable the current test to run.
  - any additional hardware required to run the test.
- additional information and action that you should take to rectify the problem. The action will be mainly in the form of checks, board swaps or board replacements. This information is provided in addition to the global error messages given, when all Diagnostic tests have executed. It will help you to trap faults which the Diagnostic registers only indirectly, and speed up the troubleshooting process generally.

  The information is given in the form of itemised lists of instructions. If a particular test fails, go to the item that applies and carry out the instructions given. If all items apply, carry out all of the instructions in the list in the order that they appear. Rerun the Diagnostic after you have carried out an instruction in the list.

Note

Any references to SMD Boards (Surface Mounted Devices) are relevant only for D200 and D400 I/O Boards. These are piggyback boards mounted in pairs on the component side of the D200/400 I/O Boards. Each SMD Board contains circuitry for four I/O channels. Certain faults can be caused by the SMD Boards and show up as faults on individual I/O channels or blocks of four I/O channels.

The global messages inform you which board(s) (if any) should be exchanged. Remember, these messages are only *recommendations*. This is because of the immense complexity of the test system. Apart from the dependencies addressed by the Diagnostic itself, there are other dependencies and sources of problems which the Diagnostic does not directly address. For a maximised coverage of the system it is necessary to look also at these other potential problem areas. For this reason, the additional information in the form of the "Action to take" points has been given at the end of each Diagnostic Test description.

Preparatory Checks

When you start the Diagnostic, the software performs a warm reset. A warm reset causes all data stored in the hardware to be lost. This includes also the calibration data. The Diagnostic therefore always operates with a set of consistent data.

Next, a test is made to see if the calibration probe is connected. The calibration probe is a prerequisite for some tests. The test also checks for stuck or open relays inside the probe. If faulty relays are discovered, error messages to that effect will come up in the Report Window. You should then break out of the diagnostic test by clicking the mouse on the (Break) push-button in the Diagnostic Window, replace the probe and restart the test. If you don't, only the tests not requiring the probe to run will be executed.

After these preparatory checks the main test sequence starts.

Test 01: Clock Generator VCO Tuning

Description:

Tests if the VCO is working in the optimum tuning voltage range, and that it doesn't reach either the positive or negative limit.

Module tested

Clock Board.

Prerequisites

None.

Hardware required

None.

Action to take

- Only the Clock Board is affected. Exchange the Clock Board.

Test 02: Clock Driver/Receiver Levels

Description:

Performs a level calibration of the Cal probe, and the resulting data is downloaded to the hardware. If any errors occur the level calibration is flagged as faulty.

Module tested

Clock Board.

Prerequisites

Calibration probe connected to Processor/Clock Board.

Hardware required

Calibration Probe.

Action to take

- Check that no cables are installed in the DVM-out connector of the Clock Board.
- Exchange the Clock Board.

Test 03: Clock Driver/Receiver Timing

Description:

A Cal Probe timing calibration is performed for three different periods. If the timing-cal routine flags an error, the test result is reported as faulty.

Module tested

Clock Board.

Prerequisites

Test 02.

Hardware required

Calibration Probe.

Action to take

- Exchange the Calibration Probe.
- Exchange the Clock Board.
- Remove the DC bus cable between the Clock Board and the first I/O Board.

Test 04: Sequencer Instruction Memory

Description:

The Instruction Memory on the Sequencer Board is filled with a test pattern, this pattern being read back and verified. This test is performed at firmware level, because the user doesn't normally have direct access to the Instruction Memory.

Module tested

Sequencer Board.

Prerequisites

None.

Hardware required

None.

Action to take

- Exchange the Sequencer Board.
- Exchange the Clock Board.
- Check the VME bus on the Mother Board.

Test 05: Sequencer Start/Stop/Arm

Description:

Tests if a Sequencer Program can be started, stopped and armed by the controller.

The three subtests (START, STOP, ARMED) are used separately as prerequisites for some of the subsequent tests.

Module tested

Sequencer Board

Prerequisites

Test 04.

Hardware required

None.

Action to take

- Only the Sequencer Board is affected. Exchange the Sequencer Board.

Test 06: Sequencer Counters

Description:

Apart from the counters used in the Sequencer analyser and serialising logic, there are five independent counters on the Sequencer Board:

Table 5-1. Sequencer Board - Independent Counters.

Counter	Readable	Size
Instruction Counter	no	10 bit
Vector Counter	yes	20 bit
Analyser Delay Counter	yes	24 bit
Instruction Repeat Counter	no	11 bit
Length Counter	no	20 bit

The test strategy is to run sequencer programs which involve several of these counters, and then check the different counters for their consistency. In the first step the Length Counter is set to values of 8, 17, 34, 68, 128, … 524288. The Analyser Delay Counter and the Vector

Counter are started and used to monitor the Length Counter. If all three counters agree, the Vector and Length Counter are working correctly.

In the second part of the test, the instruction counter is tested. This is done by generating 513 sequencer instructions, each outputting 8 consecutive vectors. The number of cycles is then monitored by the Analyser Delay Counter (if this counter is working!).

The Instruction Repeat Counter is tested in much the same way. A linear vector sequence is repeated (repeat factor = 0 ... 1024), and the number of cycles is monitored with the Analyser Delay Counter.

The last four bits of the Analyser Delay Counter are then verified, using the (already tested) Instruction Repeat Counter and the Length Counter.

Module tested

Sequencer Board.

Prerequisites

Test 05, part 1, Sequencer Start.

Hardware required

None.

Action to take

- Only the Sequencer Board is affected. Exchange the Sequencer Board.

Test 07: Clock Period

Description:

Checks the programmed MCLK period, using the real-time clock on the Workstation. Due to swap delays, the accuracy of the programmed periods can only be checked to within 10% of specification. Using the Length Counter and the Instruction Repeat Counter, a sequencer instruction is programmed that will take 15 seconds to execute. The sequencer status is checked after 13.5 and 15 seconds, and must be in RUN and BREAK mode, respectively.

Module tested

Clock Board.

Prerequisites

Test 01 and Test 06.

Hardware required

None.

Action to take

- Exchange the Clock Board.
- Exchange the Sequencer Board.
- Exchange the Calibration Probe.

Test 08: Stop on Analyser End

Description:

An infinite loop is executed, with the *stop-on-analyzer-end* flag set. The Analyser Cycle Counter is started, and the *analyse-stop-delay* is set to some value. The Sequencer must stop if it is working correctly.

Module tested

Sequencer Board.

Prerequisites

Test 05, part 2, Sequencer Stop.

Test 06.

Hardware required

None.

Action to take

- Exchange the Sequencer Board.
- Exchange the Clock Board.

Test 09: Unconditional Branching, Dead Cycle Generation

Description:

The *jump always* function is tested using the Analyser Delay Counter. A sequencer program which generates a predefined number of cycles is run. This test can also be used to detect a problem in break cycle generation.

Module tested

Sequencer Board.

Prerequisites

Test 05, part 2, Sequencer Stop.

Test 06.

Hardware required

None.

Action to take

- Exchange the Sequencer Board.
- Exchange the Clock Board.

Test 10: Jump on Software Signal

Description:

The Analyser Cycle Counter is used to test this. A sequencer program with a jump condition JOSS is run. This program executes a different number of cycles for the *set* and *reset* software signals.

Module tested

Sequencer Board.

Prerequisites

Test 09.

Hardware required

None.

Action to take

- Exchange the Sequencer Board.

Test 11: Driver/Receiver Vector Memories

Description:

Tests the driver and receiver vector memories, by storing a random pattern, reading it back and comparing it with the original. The process is then repeated with the complement of the pattern.

Module tested

I/O Board.

Prerequisites

None.

Hardware required

None.

Action to take

In this test only one of the following applies:

- If one I/O Board registers as faulty, exchange that I/O Board.
- If three I/O Boards, or groups of I/O Boards in multiples of three register as faulty, exchange the Power Supply Modules connected to these groups.
- If all I/O Boards fail, exchange the Clock Board.

Test 12: Data Acquisition Mode

Description:

The driver pattern memory is filled with a pattern which contains significant characteristics around major carry-transitions of memory addresses. A functional test in data-aquisition mode is then run, and the pattern in the receiver memory is checked for faults.

Module tested

I/O Board.

Prerequisites

Test 05, part 2, Sequencer Stop.

Test 06 and Test 11 (per pin) .

Hardware required

None.

Action to take

In this test only one of the following applies:

- If one I/O Board registers as faulty, exchange that I/O Board.
- If three I/O Boards, or groups of I/O Boards in multiples of three register as faulty, exchange the Power Supply Modules connected to these groups.
- If all I/O Boards fail exchange the Clock Board.

Test 13: Intermediate Level Detection

Description:

A sequencer program generates a certain pattern including break cycles. The comparator working in data acquisition mode samples break cycles and the results are checked against the expected data.

Module tested

I/O Board.

Prerequisites

Test 06, Test 09, Test 12.

Hardware required

None.

Action to take

Select the appropriate item(s):

- If all channels are affected, exchange the Sequencer Board.
- If the previous measure has not helped (all channels are still reported faulty), exchange the Clock Board.
- If up to four channels on an I/O Board are reported as faulty, swap the affected SMD Board with a neighbouring one or with one from another I/O Board. If the channel faults move with the SMD Board, exchange the SMD Board. (D100mix/D200/D400 only!)
- If one I/O Board registers as faulty, exchange that I/O Board.

Test 14: Break Vector

Description:

A sequence which generates break cycles is programmed. A comparator working in data acquisition mode samples the cycles, and the results are then checked for the correct polarity of the break cycles.

Module tested

I/O Board.

Prerequisites:

Test 06, Test 09, Test 12.

Hardware required

None.

Action to take

Select the appropriate item(s):

- If all channels are affected, exchange the Sequencer Board.
- If the previous measure has not helped, exchange the Clock Board.
- If one I/O Board registers as faulty, exchange that I/O Board.

Test 15: Real Time Compare Mode

Description:

Tests the real time compare, channel marking and channel masking logic. The driver and receiver pattern memories are filled with a specific test pattern. Then, a real time compare test is run. This is done for each channel, while all other channels are masked out. If masked out channels are marked, these channels are found to be faulty.

Module tested

I/O Board.

Prerequisites

Test 05 part 1, Sequencer Start.

Test 06 and Test 11.

Hardware required

None.

Action to take

Select the appropriate item(s):

- If one I/O Board registers as faulty, exchange that I/O Board.
- If all channels register as faulty, check that the Wordmask Cable is correctly inserted in the sockets of the Sequencer Board and the first I/O Board.
- If the previous action has not helped, check that the Wordmask Cable is not open or short circuited.

Test 16: Stop on Test Failed

Description:

A sequencer program which should not generate an error with the stop-on-error flag set, is run. When this test passes, an error is introduced and the test run again. This time the sequencer will stop if the test was successful.

Module tested

Sequencer Board.

Prerequisites

Test 05 part 2, Sequencer Stop.

Test 06 and Test 15 (per pin).

Hardware required

None.

Action to take

- Exchange the Sequencer Board.
- Exchange the Clock Board.

Test 17: Jump on Test Failed, Reset Failure Latch

Description:

To test 'Jump on Test Failed' an operational I/O channel is needed. A sequencer program is run in RTC Mode, which will result in a different cycle-count for each different type of failure.

To test the failure latch, a compare error is generated in one instruction, with the next instruction resetting the failure latch and jumping on 'Test Failed'. The jump will not occur if the latch has been properly reset.

Module tested

Sequencer Board.

Prerequisites

Test 05 part 2, Sequencer Stop.

Test 06 and Test 15.

Hardware required

None.

Action to take

- Exchange the Sequencer Board.
- Exchange the Clock Board.

Test 18: Expected Data

Description:

Each I/O channel is tested with the expected data patterns, LO, HI, X (don't care) against data patterns 0 and 1. The sequencer program results in a different number of cycles, depending on the expected data and failure mechanism. Each channel is tested individually, with all other channels masked out.

Module tested

I/O Board.

Prerequisites:

Test 05 part 1, Sequencer Start.

Test 06, Test 17 and Test 15 (per pin).

Hardware required

None.

Action to take

- If one channel fails, swap the SMD Board for another one. If the channel fault moves with the SMD Board, exchange the SMD Board.
- If up to four channels on an I/O Board fail, swap the SMD Board for another one. If the channel faults move with the SMD Board, exchange the SMD Board. (D100mix/D200/D400 only!)
- If up to eight channels fail, exchange the I/O Board. In the case of D50, exchange the whole I/O Board when you get channel failures.
- If all channels on three I/O Boards fail, check the Power Supply Module.

Note

If you experience single channel failures and you do not need all available channels for testing, you can "disable" the faulty channel in the Pin Configuration Window and select one that is currently free. You must then change the affected connections on the DUT Board, making sure that the new connecting wire to be soldered in **is of the same length** as the old wire.

Alternatively, you can swap the affected I/O Board for another one that is not currently being used. This will do away with the need to change the connections on the DUT Board, but **you will have to recalibrate the tester**.

Test 19: Scan Path

Description:

The hp82000 provides the feature of scan path testing by using the vector memory resources of all I/O channels serialised in one (or a few) I/O channel(s). In that way the user may drive/receive very long bit streams for testing a scan path.

For a complete diagnostic test of the scan path logic the following steps are necessary:

- - test parallel vector
- - test serialising (DA mode)
- - test serial word length
- - test serialising (RTC mode)

A significant number of working channels are required for these tests. The software will ignore all results stemming from faulty channels. In addition, it will establish the maximum number of working channels for the serial-word-length test. The test uses the DNRZ Mode.

Parallel vector.

In this case the channels are configured to be standard parallel and a serialising instruction is executed.

Serialising (DA mode).

Channels are configured to serial mode. For a programmed serial word length and chain length the data is acquired and checked for correct pattern.

Serial-word-length.

Same situation as in serialising except that the serial-word-length is varied.

Serialising (RTC Mode).

Same pattern is used for driver and receiver vector memory. Channel error is used to detect errors.

Note

Drive data consists of a data bit and a tristate bit. The tristate bit is not tested (left at zero) although it is used as a data bit during Scan Path Tests in the 100 MHz Mode (frequency doubling). If the operation of the tristate bit is suspected, other troubleshooting methods have to be employed.

Module tested

All previously working I/O channels

Prerequisites

Test 05 part 1, Sequencer Start, passed.

Test 06, Test 15 and Test 12 (per pin).

Hardware required

None.

Action to take

Caution

On no account run the Diagnostic with 16 I/O Boards installed. If you do, the HP 82000 System Software will crash. This is a known bug present in releases up to and including 1.3.2 of the HP 82000 software and will be removed with the November 1989 release.

As a workaround insert a PMU Board or a Serializing Board (E1222-66515) in slot 18 and run the Diagnostic. Then swap the I/O Board in slot 17 with the untested I/O Board and run the Diagnostic again.

- If the mainframe is not fully loaded, check that the PMU Board or the Serialising Board is installed. These boards must be present in order that Scan Path Test can take place.

Test 20: System Error Map, Word Mask

Description:

One I/O channel is filled with data that will generate a special error pattern on execution. The error map then is read and verified. An operational I/O channel is necessary for the test.

Module tested

I/O Board.

Prerequisites

Test 09, Test 15 (per pin).

Hardware required

None.

Action to take

- Remove the Wordmask Cable between the Sequencer Board and the first I/O Board. Run the Diagnostic. If a failure still occurs, exchange the Sequencer Board. If the failure disappears, exchange the first I/O Board.

Test 21: Instruction Change Memory

Description:

A special sequence of instructions is executed which fills the Instruction Change Memory with a certain pattern. The pattern then is verified.

Module tested

I/O Board.

Prerequisites

Test 09.

Hardware required

None.

Action to take

- Only the Sequencer Board is affected. Change the Sequencer Board.

Test 22: Instruction Trace Memory

Description:

A special sequence of instructions is executed which fills the Instruction Trace Memory with a certain pattern. The pattern then is verified.

Module tested

I/O Board.

Prerequisites

Test 09.

Hardware required

None.

Action to take

- Only the Sequencer Board is affected. Change the Sequencer Board.

Test 23: DC-Rail

Description:

Checks the DC Bus connections and DC calibrates the first working channel on each I/O Board.

Module tested

I/O Board.

Prerequisites

Test 06, Test 17, Test 14 (per pin) and Test 18 (per pin).

Hardware required

None.

Action to take

- Check that the DC Bus cables (ribbon cables running on the front of the boards) are not damaged. Check that they are properly inserted into the boards. If there is a break in the DC Bus, all I/O Boards following the break will be reported faulty by this test.
- If there is a break in the DC Bus after the Clock Board, all I/O Boards will be reported faulty. This is also the case if there is a fault on the Clock Board. Check the DC Bus cable between the Clock and first I/O Board. Exchange if necessary. Exchange the Clock Board if necessary.
- If individual I/O Boards fail, the fault lies on the boards themselves. Exchange the affected boards.

Test 24: Relays

Description:

The AC/DC relays on each I/O pin are tested for stuck open/closed problems. If the mainframe contains no PMU, or the PMU is de-selected, the DC rail relays are also tested.

Module tested

I/O Board.

Prerequisites

Test 05 part 1, Sequencer Start.

Test 06 and Test 12 (per pin)

Hardware required

None.

Action to take

- Swap affected I/O Board with another one. If the fault moves with the board, exchange the board.
- On the faulty I/O Board swap the SMD Board(s) for another one. If the channel faults move with the SMD Board, exchange the SMD Board. (D100mix/D200/D400 only!)

Test 25: Driver Formats

Description:

The driver formats are tested by programming certain data patterns and sampling the driver outputs with the respective receiver in edge-compare mode. The resulting *timing diagram* must then match the expected one, within given tolerances.

Module tested

I/O Board.

Prerequisites

Test 05 part 1, Sequencer Start.

Test 06 and Test 12 (per pin).

Hardware required

None.

Action to take

- Swap affected I/O Board with another one. If the fault moves with the board exchange the board.
- On the faulty I/O Board swap the SMD Board(s) for another one. If the channel faults move with the SMD Board, exchange the SMD Board. (D100mix/D200/D400 only!)

Test 26: Comparator Formats

Description:

The edge compare mode of the comparator was already tested in Test 25. This test checks the window compare mode, by shifting the comparator window such that HI, LO, UNSTABLE RISING EDGE and UNSTABLE FALLING EDGE are detected. This is done for both the DA and MUX Modes.

Module tested

I/O Board.

Prerequisites

Test 05 part 1, Sequencer Start.

Test 06 and Test 12 (per pin).

Hardware required

None.

Action to take

- Swap affected I/O Board with another one. If the fault moves with the board, exchange the board.
- On the faulty I/O Board swap the SMD Board(s) for another one. If the channel faults move with the SMD Board, exchange the SMD Board. (D100mix/D200/D400 only!)

Test 27: PMU(s)

Description:

This is a functional test of the PMU(s), which covers the following:

1. Force/Measure voltage into open - the PMU generates a number of voltages and measures them. The I/O channels are disconnected for this part of the test.
2. Force/Measure voltage into 50 Ω - the PMU forces several voltages into a 50 Ω terminated I/O pin. Voltage and current are measured.
3. Force/Measure current into 50 Ω - the PMU forces several currents into a 50 Ω terminated I/O pin. Voltage and current are measured.

Module tested

PMU Board.

Prerequisites

The DUT Board must be removed in order to run this test.

Test 24 (per pin).

Hardware required

None.

Action to take

- Exchange the PMU Board.

Test 28: Level Compliance TRIG/A/B

Description:

Tests the level compliance of the external inputs A/B and the TRIG output. External inputs A and B are both connected to the TRIG output. The input impedance is set to 10 kΩ. The high and low TRIG threshold levels are then found by varying the thresholds of the external inputs.

Module tested

Sequencer Board.

Prerequisites

Test 05 part 2, Sequencer Stop.

Test 06.

Hardware required

Coax T-Piece and two short coax cables (not longer than 30 cm).

Sequencer Board TRIG output is connected to External Input A and External Input B.

Action to take

- Exchange the Sequencer Board.

Test 29: Trigger Out

Description:

The trigger address is checked by using the 'jump on external' capabilities. The trigger address is set to the value to be tested. Then it is checked if any other address generates a trigger. Finally, the address itself is tested.

Module tested

Sequencer Board.

Prerequisites

Test 28.

Hardware

Coax T-Piece and two short coax cables (not longer than 30 cm).

Sequencer Board TRIG output is connected to External Input A and External Input B.

Action to take

- Exchange the Sequencer Board.

Test 30: Start on External Inputs A/B

Description:

Checks if the sequencer can be started by an external signal. The sequencer generates a TRIGGER signal and goes into the ARM state. This TRIGGER signal should then start the sequencer after 11 cycles. Successful operation is tested using the analyser cycle counter.

Module tested

Sequencer Board

Prerequisites

Test 28.

Hardware required

Coax T-Piece and two short coax cables (not longer than 30 cm).

Sequencer Board TRIG output is connected to External Input A and External Input B.

Action to take

- Exchange the Sequencer Board.

Test 31: Stop on External Inputs A/B

Description:

The TRIGGER signal is used to stop the sequencer, through inputs A/B.

Module tested

Sequencer Board.

Prerequisites

Test 28.

Hardware required

Coax T-Piece and two short coax cables (not longer than 30 cm).

Sequencer Board TRIG output is connected to External Input A and External Input B.

Action to take

- Exchange the Sequencer Board.

Test 32: Jump on External Inputs A/B

Description:

A sequencer program is executed generating a trigger pulse, which is fed to the external input A/B. This should cause a jump in the sequencer program. The Analyser Cycle Counter is used to confirm that the jump has worked correctly. The levels and slopes are tested for 50 Ω and 10 kΩ.

Module tested

Sequencer Board.

Prerequisites

Test 28.

Hardware required

Coax T-Piece and two short coax cables (not longer than 30 cm).

Sequencer Board TRIG output is connected to External Input A and External Input B.

Action to take

- Exchange the Sequencer Board.

Short-Wire Test

Short-Wire Test

If there still appears to be an error on an specific channel, which was not detected by diagnostics or calibration, you can set up a simple **Short-Wire Test** to check that specific channel. This appendix gives a complete test set-up, and tells you the results you should get if the channel is working correctly. The DUT is simply a piece of wire, a short-circuit.

Note

- The set-ups shown are for D200 boards.
- These set-ups are not valid for D50 boards. The appropriate set-ups for D50 channels are given in a note after each D200 set-up.
- You can run D400 boards with the same setup, but only in 200 MHz mode.
- You can also test pins connected to HSWGs, but the pins with HSWGs are always the driver pins. The receiver pin can be any other 400 MHz pin, without an HSWG.
- Always make sure that the two channels you use for the test are calibrated.

Test Sequence

To make your set-up, start the HP82000 Software and create a new device. This is done by clicking the pushbutton **change_dev** and entering a name for the device, for example *wiretest*.

To check the driver-capabilities of the suspected channel, set up the suspected channel as a driver channel and other channels, which are not suspected, as receiver channels. This is shown in the next picture.

Pin Configuration

File Edit Select Mode

EDITOR Mode Conversion OFF (Download)

PIN Number	Name	Type	ATTRIBUTES Mode	Scan	TESTER CHANNEL
1	in	i	100	par	10201
2	out	o	100	par	10202

Figure 6-1. Pin Configuration

Note

For D50 boards choose **25 MHz** mode.

Make a connection with a short piece of wire between both channels on the DUT board.

Set up the levels, the timing and the vectors, as shown in the following figures:

Level Setup

File Edit Select Format

pin/group name	type	low level [V]	high level [V]
in	i,100	-1.700	-0.800
out	o,100	-1.250	-1.240

Figure 6-2. Level setup

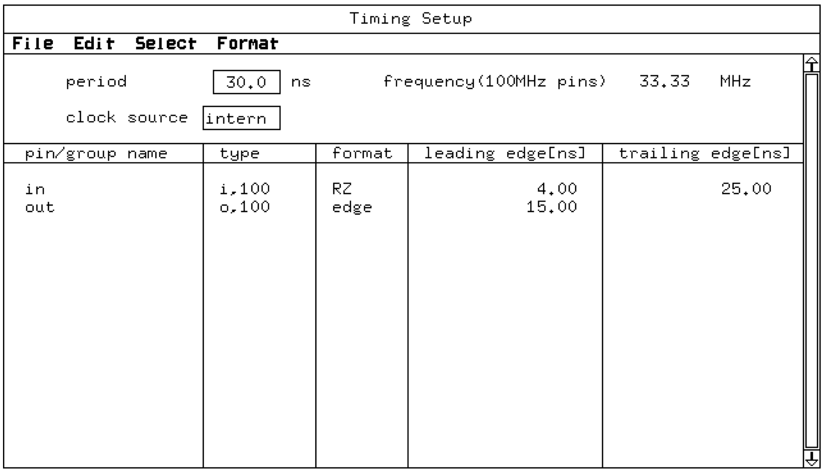


Figure 6-3. Timing setup

Note

For D50 boards:

- Choose a period of **60 ns**.
- Set the Driver leading edge to 8ns and the trailing edge to 50ns.
- Set the receiver leading edge to 30ns.

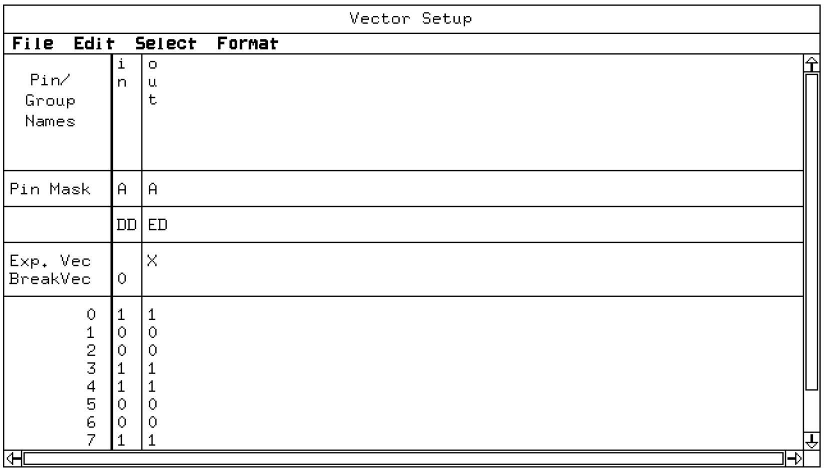


Figure 6-4. Vector setup

Functional Test

When you have set up all pins, timing, levels and vectors, run a functional-test.
To do this, follow this sequence:

1. Click the file browser in the **Test Control** window and select **new**.
2. Select **AC TEST** by holding down the mouse button when the arrow is in the group box.
3. Click **functional.** Now you see the Test Control window for a functional-test.
4. Start the test.

Note	The test must pass.

5. Activate the **error map**. The result should look like this:

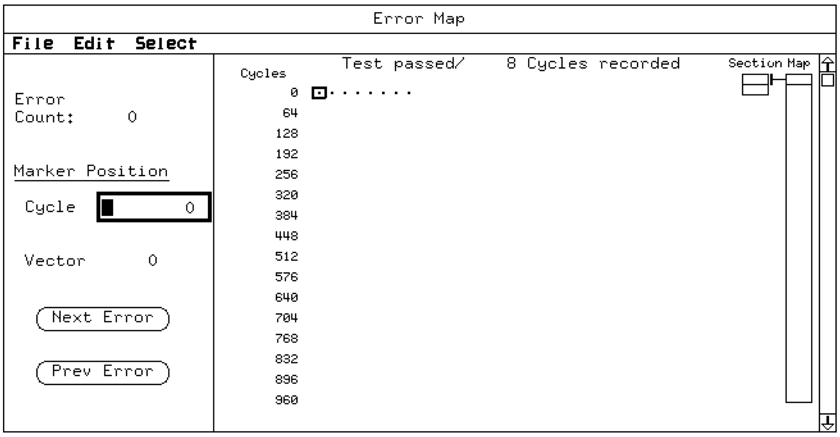


Figure 6-5. Error Map result display

Aquire-Data Test

Start an **ac_aquire_data** test from the Test Control window. To do this:

1. Click the file browser in the **Test Control** window and select **new.**
2. Select **AC TEST** and click on **aquire_data.** Now you will see the Test Control window for aquire_data test.
3. Start the test.
4. Select the **timing diagram**.
5. Click **high res** in the timing diagram.

The timing diagram should look like the following one:

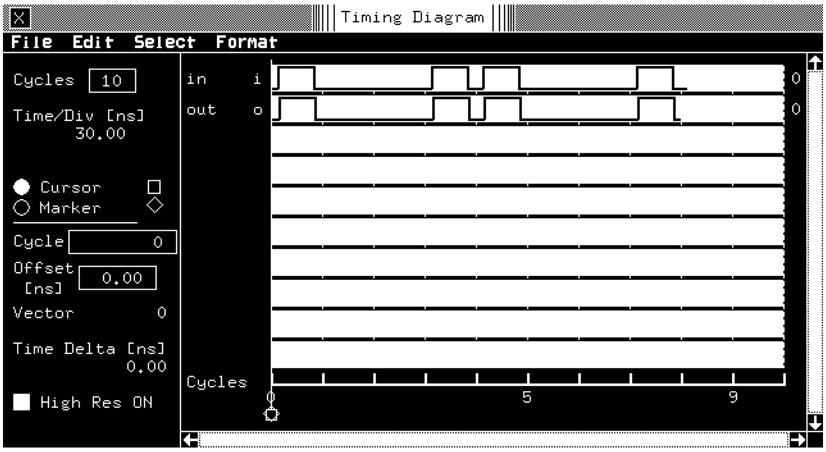


Figure 6-6. Timing diagram

Shmoo Plot

To get a **Shmoo plot** follow the list below:

1. Mask out all vectors but one, as shown in the following figure:

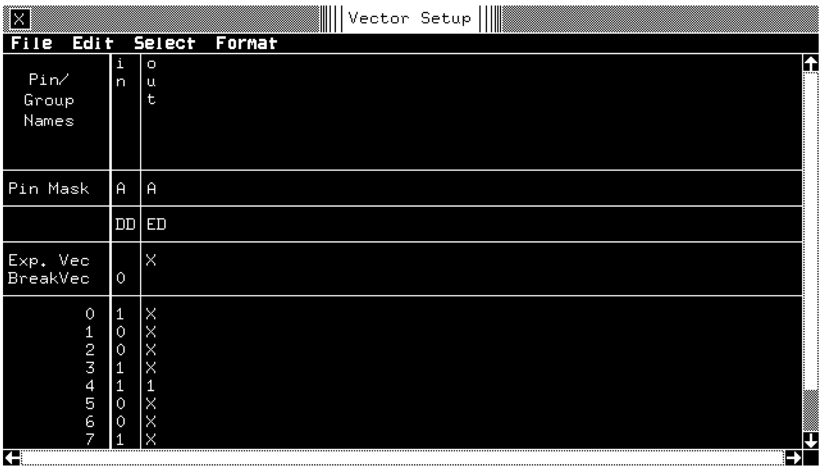


Figure 6-7. Vector Set-Up for Shmoo Plot

2. Change the **LOW Level** for the **out** pin to -2 V.
3. Click the file browser in the **Test control** Window and select **new**.
4. Select **AC TEST** by holding down the mouse button when the arrow is in the *group* box.
5. Click **sweep test** .
6. Click **shmoo_2d**.
7. Now you must set up the shmoo test as shown below:

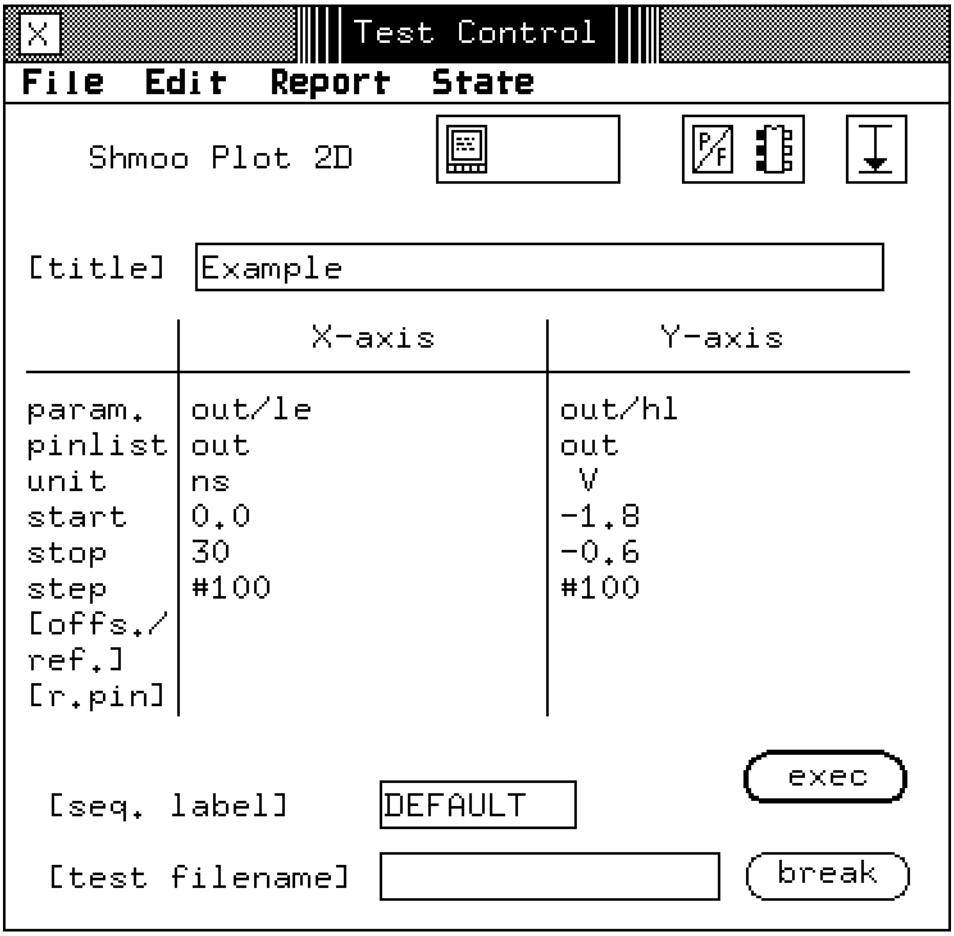


Figure 6-8. Test setup for shmoo plot

For D50 boards set the **stop-value** for the X-axis to 60ns.

8. Start the test by pressing the start button. The shmoo plot should be similiar to this one:

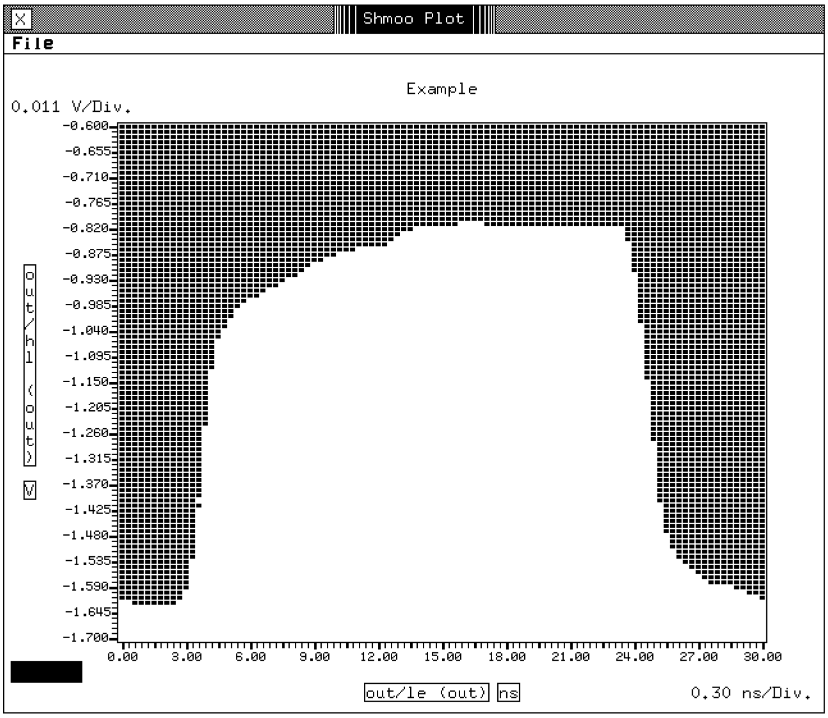


Figure 6-9. Shmoo plot result display

If the test sequence gives the expected results, set up the suspect channel as receiver and the other channel as driver so that you can check the receiver-capabilities of this channel.

7

Replacement Procedures

This section of the manual details how to replace some of the more difficult system components. These are procedures which are not immediately obvious and are not already described in the installation manual. You should refer to the chapter *List of Replaceable Parts* for details of which parts are available as replaceable parts.

Power Supply Modules

Exchanging a Power-Supply - Maxiframe

Having located the faulty PSM, you need to exchange it for a working one. To remove a PSM from the maxiframe, follow the procedure below:

Warning

This procedure must be performed by qualified Hewlett Packard service personnel.

To avoid the hazard of injury or death make sure that the power to the mains distribution point is switched off.

When carrying-out this work, all local regulations and safety codes must be adhered to.

Lower Card-Cage

1. Remove the DUT interface and the system front-covers and air-grilles.
2. Remove the card-cage air-shields.
3. Remove all ribbon cables attached to boards supplied by the faulty PSM.
4. Pull out the boards supplied by the faulty PSM.
5. Open the rear-door of the Maxiframe.
6. Pull out the relevant power connector on a flying lead from its socket on the right of the card-cage. Note that all PSMs have the same length lead. Thus the rightmost PSM uses the top socket, the middle PSM (if fitted) uses the middle socket and the leftmost PSM (if fitted) uses the bottom socket.
7. Using a flat-head screwdriver, release the four spring-loaded screws at the top and bottom of the PSM.
8. Remove the faulty PSM.
9. Insert a working PSM. Use the above procedure in the reverse order to re-install all parts.

Upper Card-Cage

The procedure is the same as for the lower card-cage, except that the sockets for the PSMs are on the left of the card-cage and the PSMs are turned upside-down.

Exchanging a Power-Supply Module - Standardframe

The procedure is the same as for the lower card-cage in a Maxiframe.

Exchanging a Power-Supply Unit - Miniframe

Warning

This procedure must be performed by qualified Hewlett Packard service personnel.

To avoid the hazard of injury or death make sure that the power to the mains distribution point is switched off.

When carrying-out this work, all local regulations and safety codes must be adhered to.

---

1. Switch-off the system power.
2. Remove the miniframe main cover (6 screws at the back, two screws underneath the miniframe near the front, a plastic clip underneath on the left side).
3. Remove the 2 screws (in depressions) at the front of the power-supply assembly.

Note

The support-arm is fixed in its stowed-position (with 2 screws) at the top left side of the miniframe.

---

4. Lift-up the power-supply assembly (hinged at rear) as shown in Figure 7-1 and fix it in position with the support-arm.

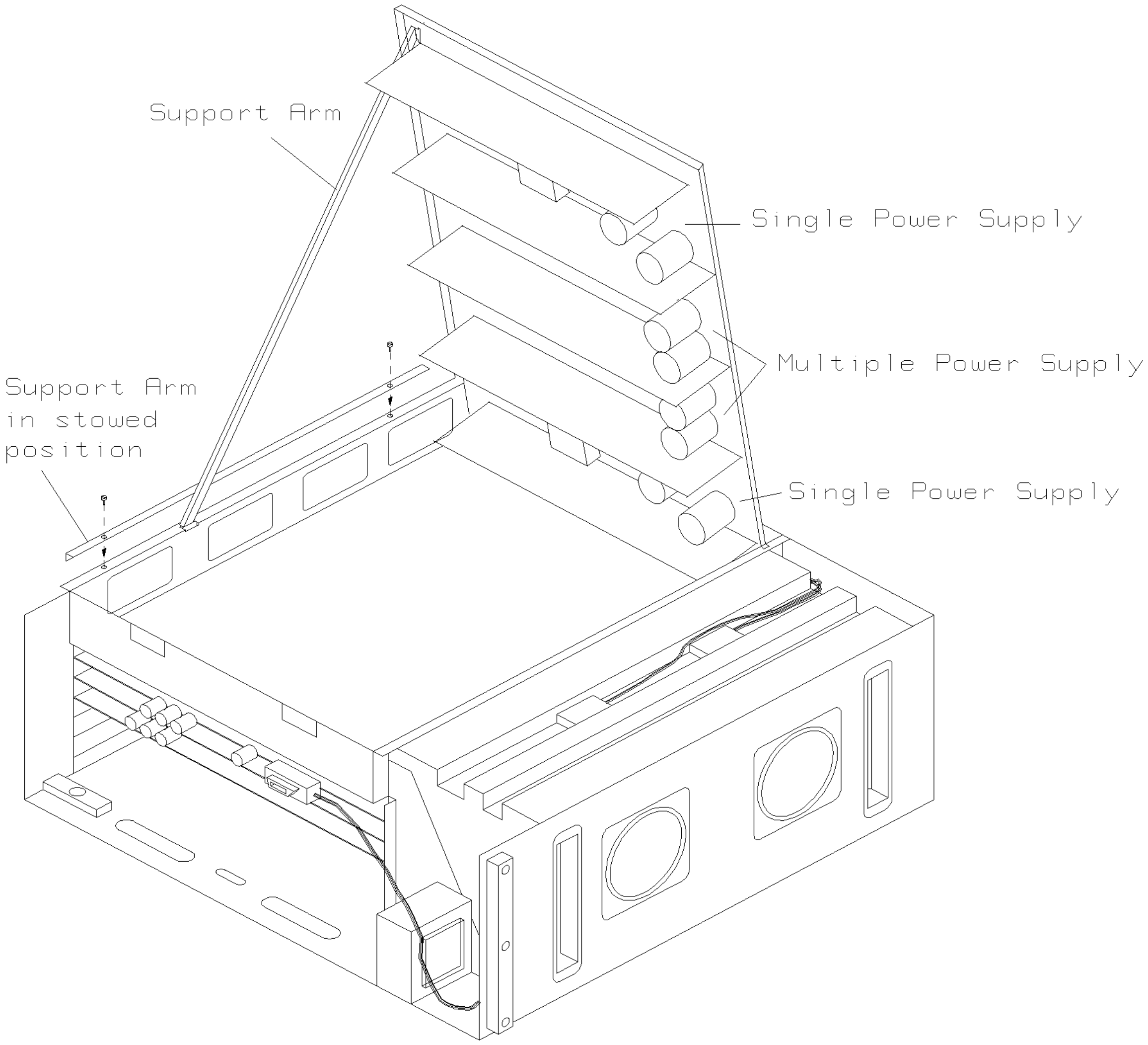


Figure 7-1. Miniframe with Power-Supply Modules Lifted

Note

To make replacement easier, make a note of the position and color of the existing power-supply.

---

5. Disconnect all cable-connectors.
6. Remove the 4 screws holding the power-supply unit in position.
7. Replace the power-supply unit.
8. Reconnect all cable-connectors, taking care to ensure that they are in the same positions as before.
9. Replace the miniframe top-cover.

To exchange a power supply unit in the **Miniframe Extender** follow the next procedure.

Warning

This procedure must be performed by qualified Hewlett Packard service personnel.

To avoid the hazard of injury or death make sure that the power to the mains distribution point is switched off.

When carrying-out this work, all local regulations and safety codes must be adhered to.

Caution

When working with the miniframe extender take care not to damage the motherboard connectors located on the top of the unit.

---

1. Switch-off the system power.
2. Taking care not to damage the motherboard connectors, turn the extender upside down. The power-supplies are located as shown in Figure 7-2.

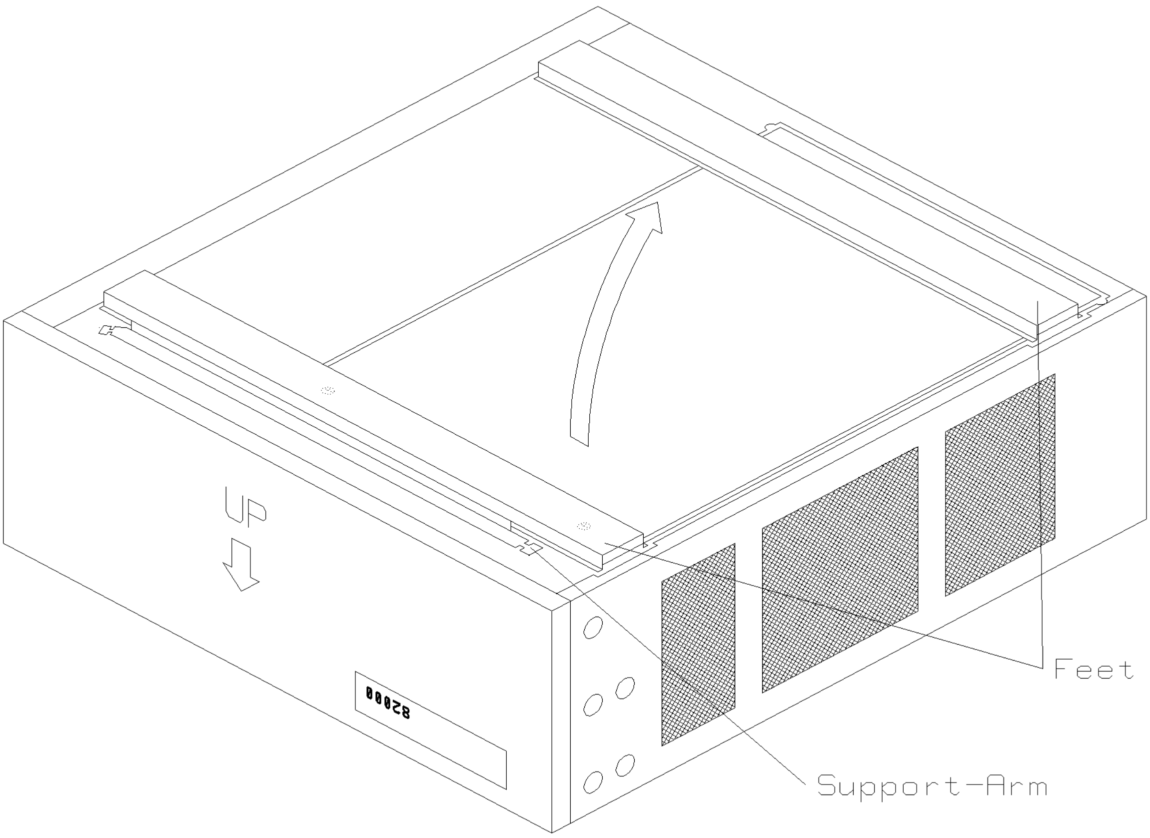


Figure 7-2. Miniframe Extender - Power-Supply Modules

3. Remove the 2 screws (in depressions) at the front of the power-supply assembly.

Note

The support-arm is fixed in its stowed-position with 2 screws located just in front of the unit's front foot.

4. Lift-up the power-supply assembly (hinged at rear) and fix it in position with the support-arm.
5. Remove the 4 screws holding the power-supply unit in position.
6. Disconnect all cable-connectors.

Note

To make replacement easier, make a note of the position and color of the existing power-supply cables

7. Replace the power-supply unit.
8. Connect all cable-connectors taking care to ensure that they are in the same positions as before.
9. Replace the extender top-cover.

Warning

This procedures must be performed by qualified Hewlett Packard service personnel.

To avoid the hazard of injury or death, make sure that the power to the mains distribution point is switched off.

When carrying-out this work, all local regulations and safety codes must be adhered to.

Accessing the Tangential Fans

To gain access to the tangential fan motors and the electrical connections, use the following procedure:

1. Switch-off the circuit-breaker(s) on the PCM.
2. Open the rear-door. Remove the two top-cover screws. Remove the top-cover by sliding it towards the front of the Maxiframe and lifting it from its hook-fasteners. Refer to Figure 7-3.

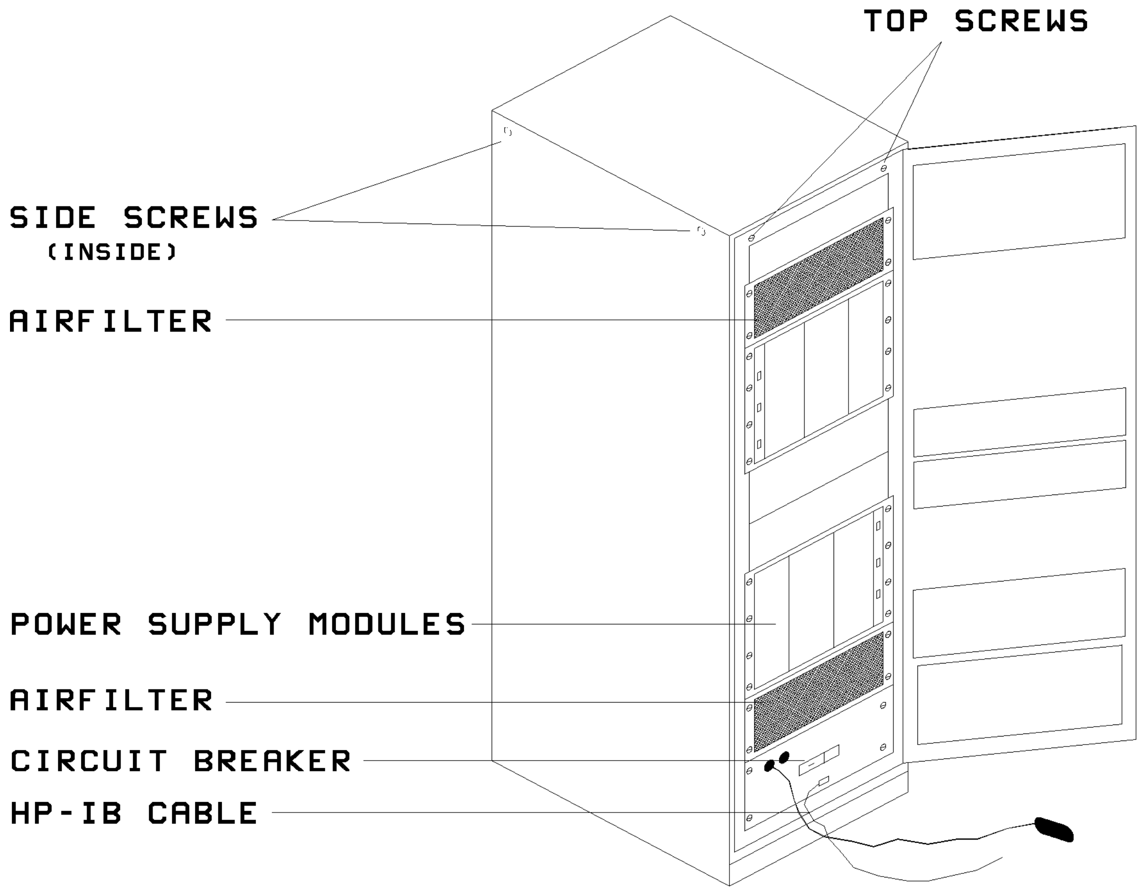


Figure 7-3. Rear View of Maxiframe

3. At one side of the Maxiframe remove the two side-panel screws. For positions refer to Figure 7-4. Lift off the side-panel. Repeat the procedure for the other side-panel.

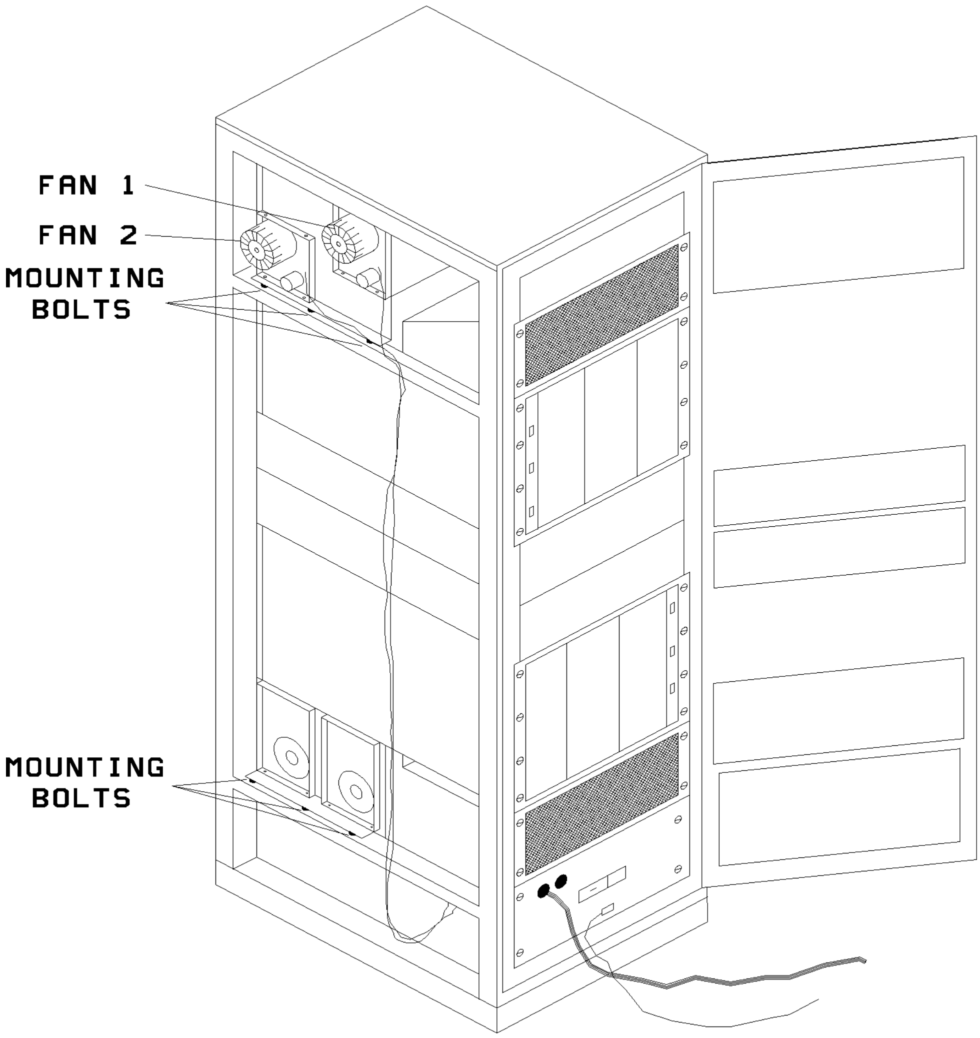


Figure 7-4. Maxiframe - Position of Tangential Fans

Figure 7-4 shows the tangential fan motors and the positions of the fan-tray mounting bolts. A detailed side view of the fans for the lower card-cage is given in Figure 7-5, showing the motors, capacitors and barrier-blocks. Make any electrical measurements at the barrier-blocks.

Replacing Tangential Fans (lower card-cage)

Caution

As the tangential fans rotate in opposite directions, take care when connecting/disconnecting the supply cables. Clearly identify the cables before disconnecting them.

The fans sit on a common tray (see Figure 7-5). On each side of the Maxiframe the tray is fixed to a shelf with three bolts and anti-vibration mounts. To remove the shelf with the fans, disconnect the power cables at the barrier-blocks, release the three bolts on each side and slide the tray out of the cabinet. Now you can exchange the faulty fan.

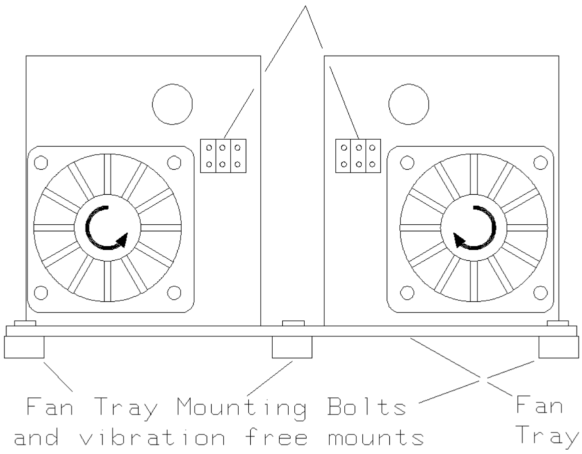


Figure 7-5. Detailed View of Tangential Fan Motors

Replacing Tangential Fans (upper card-cage)

Caution

As the tangential fans rotate in opposite directions, take care when connecting/disconnecting the supply cables. Clearly identify the cables before disconnecting them.

The two fans are fixed to one assembly which sits on a common tray. The **upper right** fan (Fan 1 in Figure 7-4) can be removed without removing the whole assembly.

Note

You need a short screwdriver to get access to the screws holding the fans in the assembly.

To do this, you must remove the screws holding the fan to the assembly on both sides of the frame. Then you can slide it out of the assembly.

To remove the **lower left** fan (Fan 2 in Figure 7-4), you have to remove the whole assembly, because you have no access to the screws holding the fan in the assembly. The common tray is fixed to a shelf with three bolts and anti-vibration mounts. To remove the shelf with the fans, disconnect the power cables at the barrier-blocks. Release the three bolts on each side and slide it a little bit in the direction of the radial fan assembly, so that the screws at the bottom do not collide with the anti-vibration mounts. Then you can slide it out of the cabinet.

Replacing Radial Fans (lower card-cage)

To remove the radial fans complete the following procedure:

1. Switch **off** the circuit-breaker(s) on the PCM.

Warning **Failure to switch the mainframe off may result in injury or death.**

---

2. Open the Maxiframe rear-door.
3. Remove the rear air-filter.
4. Remove the four screws fixing the air-duct in position.
5. Carefully remove the air-duct assembly with the fans mounted on top.
6. Disconnect the fan power supply cable from the PCM front-panel.
7. Remove the fans from the air-duct assembly.
8. Now you can remove the defective propeller by pushing-out the black pins on each corner of the single propeller assembly.
9. Remove the power cable to the propeller-motor.

To reinstall the fans use this procedure in reverse.

Replacing Radial Fans (upper card-cage)

To remove the upper radial fans complete the following procedure:

1. Switch **off** the circuit-breaker(s) on the PCM.
2. Open the Maxiframe rear-door.
3. Remove the rear air-filter.
4. Remove the four screws fixing the air-duct in position.
5. Carefully remove the air-duct assembly with the fans attached by sliding it out of the cage. * Disconnect the fan power supply cable from the PCM front-panel.
6. Remove the fans from the air-duct assembly.
7. Now you can remove the defective propeller by pushing out the black pins on each corner of the single propeller assembly.
8. Remove the power cable to the propeller

To reinstall the fans use this procedure in reverse order.

Replacing Standardframe Fans

Warning

This procedures must be performed by qualified Hewlett Packard service personnel.

To avoid the hazard of injury or death, make sure that the power to the mains distribution point is switched off.

When carrying-out this work, all local regulations and safety codes must be adhered to.

Accessing Tangential Fans

To gain access to the tangential fan motors and the electrical connections, use the following procedure:

1. Switch off the circuit-breaker on the PCM.
2. Open the rear door. Remove the two top cover screws. Remove the top cover by sliding it towards the front of the standardframe and lifting it from its hook fasteners. Refer to Figure 7-6.

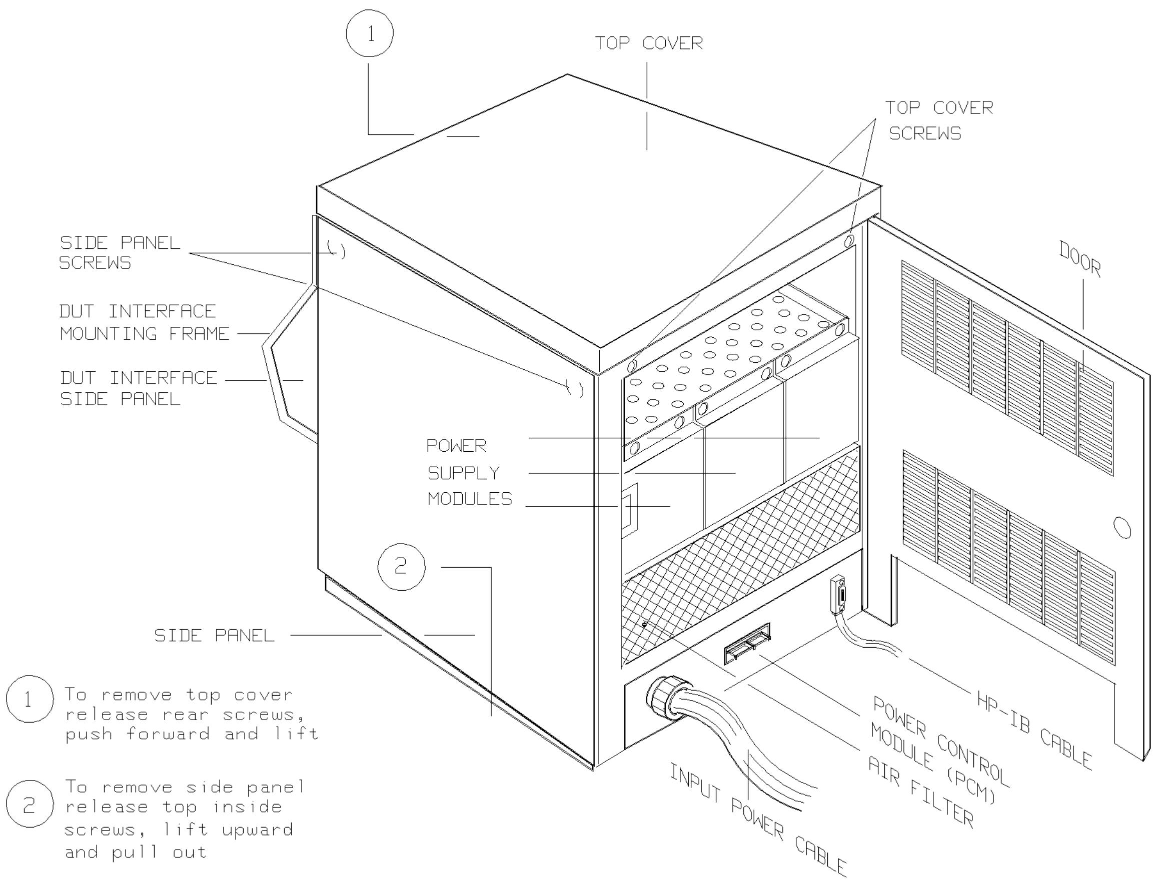


Figure 7-6. Rear View of Standardframe

3. On one side of the standardframe remove the two side-panel screws. For positions refer to Figure 7-7. Lift off the side-panel. Repeat the procedure for the other side-panel.

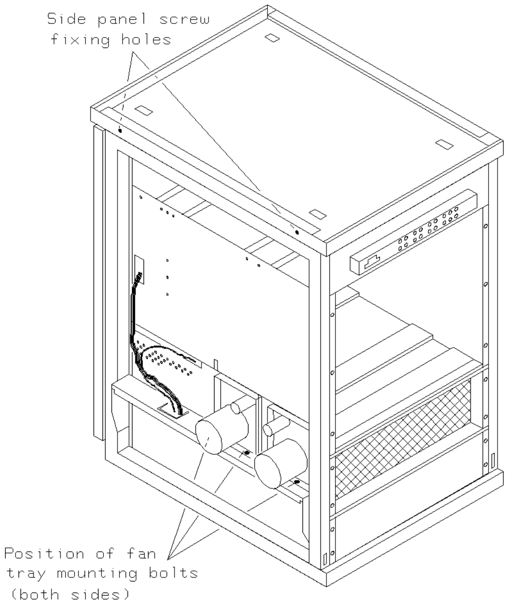


Figure 7-7. Standardframe - Position of Tangential Fans

Figure 7-7 shows the tangential fan motors and the positions of the fan-tray mounting bolts. A detailed side-view of the fans is given in Figure 7-5, showing the motors, capacitors and barrier-blocks. Make any electrical measurements at the barrier blocks.

Replacing Tangential Fans

Caution	As the tangential fans rotate in opposite directions, take care when connecting/disconnecting the supply cables. Clearly identify the cables before disconnecting them.

The fans sit on a common tray (see Figure 7-5). On each side of the standardframe the tray is fixed to a shelf with three bolts and anti-vibration mounts. To remove the shelf with the fans, disconnect the power cables at the barrier-blocks, release the three bolts on each side and slide the tray out of the mainframe.

Replacing Radial Fans

To replace the radial fans complete the following procedure:

1. Switch **off** the circuit-breaker on the PCM.
2. Open the standardframe rear-door.
3. Remove the rear air-filter. Refer to Figure 7-6.
4. Remove the four screws fixing the air-duct in position.
5. Carefully remove the air-duct assembly with the fans mounted on top.

6. Disconnect the fan power supply cable from the PCM front-panel.
7. Remove the fans from the air-duct assembly.
8. Now you can remove the defective propeller by pushing-out the black pins on each corner of the single propeller assembly.
9. Remove the power cable to the propeller

To reinstall the fans use this procedure in reverse order.

Replacing Miniframe Fans

Warning

This procedures must be performed by qualified Hewlett Packard service personnel.

To avoid the hazard of injury or death, make sure that the power to the mains distribution point is switched off.

When carrying-out this work, all local regulations and safety codes must be adhered to. To remove or install fans in the Miniframe refer to Figure 7-8 and complete the following procedure.

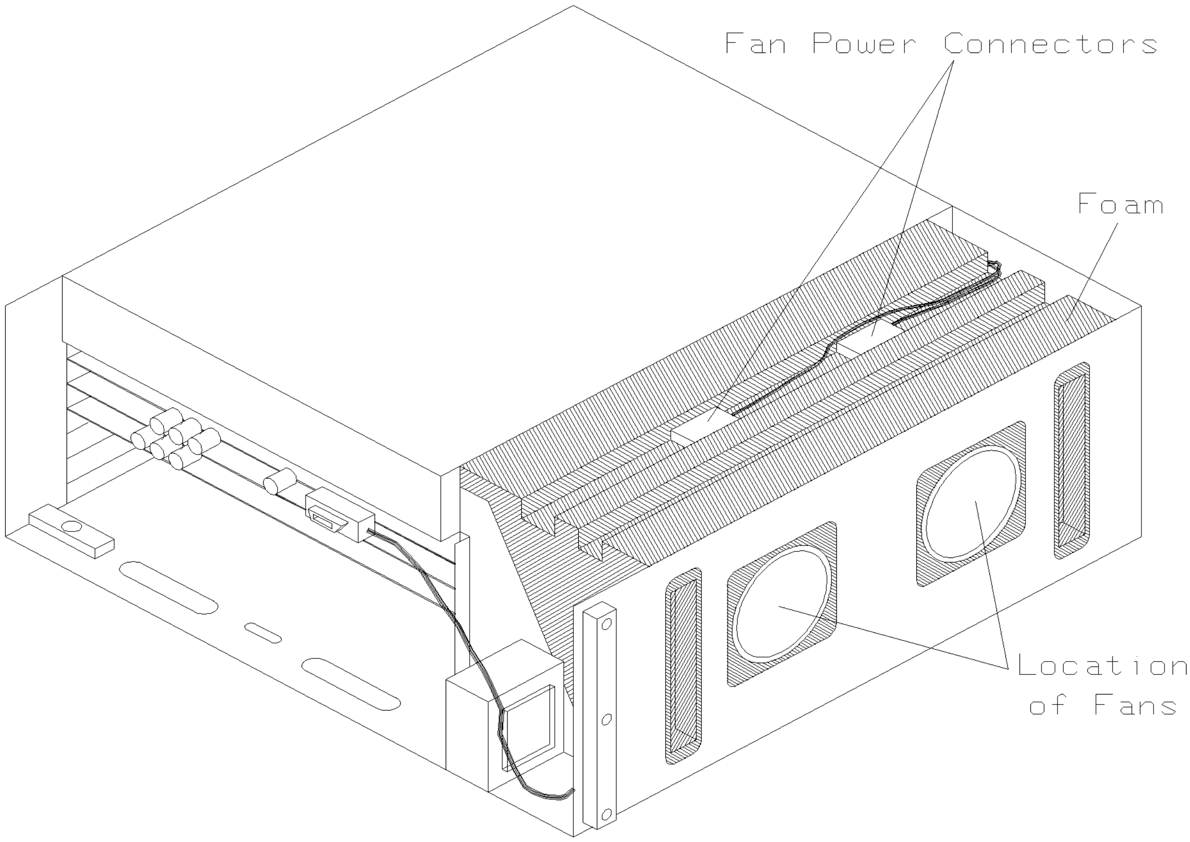


Figure 7-8. Miniframe - Fans

1. Switch **off** the circuit breaker on the miniframe rear-panel.
2. Remove the miniframe top-cover (8 screws).
3. Unplug the fan power-connectors.
4. Carefully remove the top-section of the fan-housing.
5. Remove the defective fan.
6. Fit the new fan in position.

Note

When fitting a new fan ensure that it is positioned with the power connector facing up and the power-connector pins facing the rear.

---

7. Replace the top section of the fan-housing.
8. Reconnect the fan power-connectors.
9. Replace the miniframe top-cover.

1. Remove the top-panel and the side-panels of the mainframe.
2. Remove all system-boards.
3. Remove all PSMs.
4. Remove the short rails on both sides, by pulling out the small black pins, as shown in Figure 7-9.

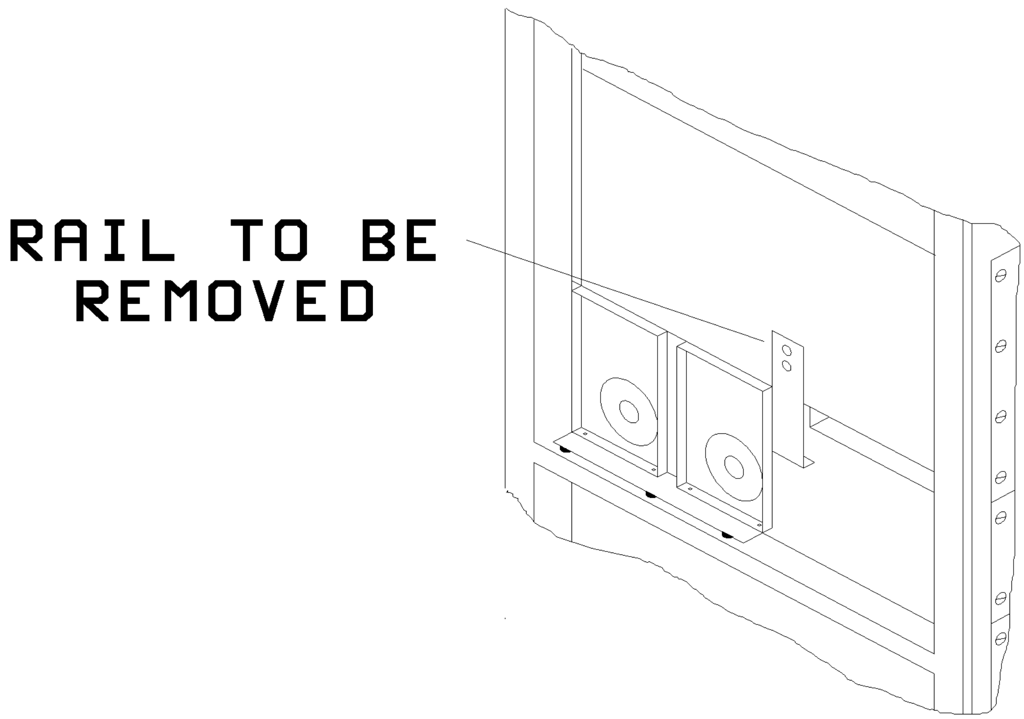


Figure 7-9.

5. Untie the three power-supply cables at the rear of the cabinet.
6. Remove the 4 screws behind the bracket that holds the Power Supply cables, as shown in Figure 7-10.

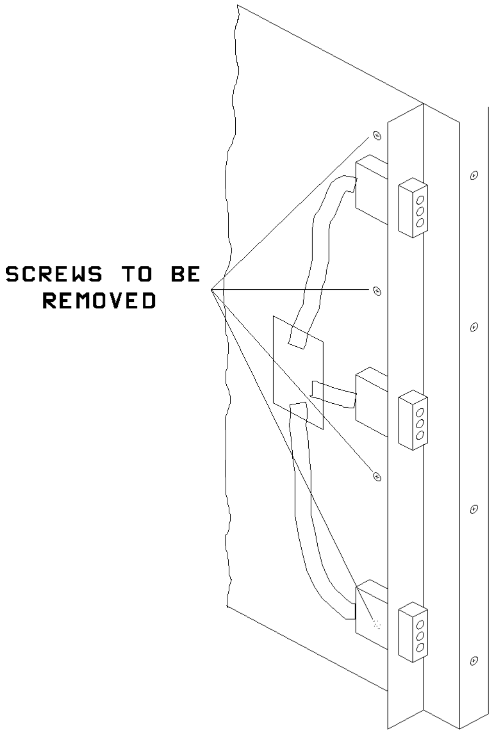


Figure 7-10.

7. Remove the 4 screws which fasten the card-cage to the rear-bracket.
8. Remove the screws at the front of the mainframe which secure the card-cage in position.
9. Lift the card-cage up a little, and pull it out. Refer to Figure 7-11.

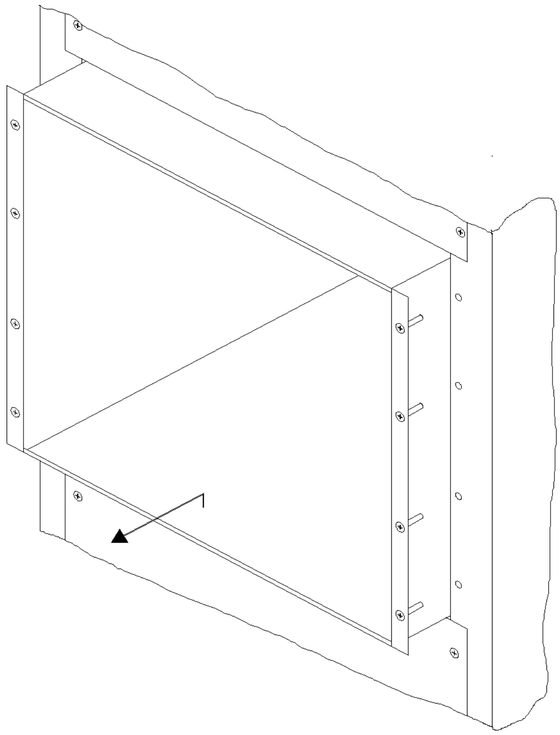


Figure 7-11.

Now you have access to all the replaceable-parts of the card-cage.

To re-install the card-cage, follow the above procedure in reverse order.

Note

Lubricate all screws, before re-installing them.

Replacing Relays on I/O Boards and PMU

The following represents a summary on an on-site relay exchange recommendation for worn-out HP82000 AC relays. Please note that the overall wearing-out situation of AC relays cannot be easily determined. The system itself cannot provide self-tests which clearly indicate the end of the typical relay life cycle of 10^7 switches at 5V/100mA load.
Instead, it needs an adequate judgement of the involved CE, basically depending on the intense of system use over the past years and the gradient of more or less sudden numbers of relay failures. A very clear statement can only be done by investigations in a Failure Analysis Lab.

Exchanging Relays On-site

Here are some hints when you do the relay exchange on-site (or better in your office):

1. The I/O cards are 10 layer boards. As some pins of the relay may be hard to desolder you should provide the right soldering tool that can handle the fast heat flow passing into the planes. You should use a solder iron with at least 50W and capability to suck away the tin. To have a good "heat contact", you must keep your solder iron shiny and clean by means of a wet or better humid sponge. You will also need to support the heat flow by adding tin while you are soldering, especially at the GND or supply pins. Once all tin around the pin and in the pin hole is fluid, you may easily suck it all away. Be carefull not to destroy the P.C. pad with too much heat. A rule of thumb could be to solder not longer than 15 sec on one pin. You will have to experiment on this. Don't rub on the P.C. surface with the soldering iron in order not to damage the pin pad and hole metallization!
2. You will have to remove the metal shield on the back of the boards for soldering. For better efficiency, think of buying an accu screw driver. The screws that have to be taken out are 3.0mm x 6 mm cross head screws.
3. Please, be very carefull not to mechanically destroy the hybrids that are close to the relays. They are sensitive indeed ! The substrate may get hairline cracks if it is shocked.
4. Please note that around the output pins there are guard rings implemented on the P.C. Shorts are likely to happen from the output pin or GND to the guard ring because of the very narrow line routing. Make sure to avoid such shorts, they will not be detected by the diagnostics, but they will create failures in fine current measurements like continuity tests.

Verifying System Performance after Relay Exchange

Once the AC relays have been exchanged, the system performance has to be verified by the following activities:

- Run Diagnostics
- Run DC Cal
- Run AC Cal
- Run a Continuity Test

All the above tests cover functional, DC parametric and Timing parametric performance of the system. A Continuity Test is necessary because of the risc to have build some soldering bridges from output pin to the respective guard ring during the process of relay soldering. Such a soldering bridge would cause some leakage current from pin to guard ring, which would not be found during diagnostics.

The remaining uncovered performance verification at the system front end is only specified risetime and overshoot. These parameters are not adjustable and would only be influenced if during the soldering process a parasitic capacitance (like a soldering bridge to the guard ring) would be established. There is no other mechanism to create a parasitic capacitance at the output pin. Any other workmanship failure would lead to a malfunction of the driver/receiver hybrid and could easily be detected in the diagnostics tests.

To round up confidence in the system's performance after a relay exchange activity, it is recommended to use a Golden Device test before and after the exchange. Once the paramentric test results (especially the timing related ones) do not change, within repeatability tolerances of course, you can be confident that the relay exchange action has succeeded. Please note that repeatability is only achieved to its best if the system was calibrated before and after the relay exchange.

Continuity Test

A continuity test is a test function which is already provided by the system. Its purpose originally is to determine a good connection (current flow) to the DUT. In our case, we use that test function to determine that no current is flowing after the relays are exchanged and no DUT is connected to the system. In the default test function, a force current, a clamping voltage, a pass/fail threshold and a settling time are programmed. This means, that in the continuity test the PMU tries to force a current of e.g.10uA to each output pin, one after another. The PMU measures the resulting voltage during current force. If then e.g. the resulting voltage would exceed the programmed clamping voltage, you will find the measured voltage equalling the clamping voltage. If e.g the clamping voltage is programmed to 10.000mV and with a force current of 10uA the measured voltage is also 10.0V, you can say that the load at an output pin is more than 1MOhm. You may alter the current force value to 0.1uA in order to see whether then the measured voltage stays below the clamp voltage. If not, the resulting load is even >100MOhms. That's how it should be.

The main problem doing this continuity test on site is to have a pin config file which configures all pins in the system. You can overcome this problem by just using a pin config file from the customer. Every pin config file is adequate if it configures all pins. Otherwise, if certain pins are not configured, make a copy of that pin config file, save it under a new name and configure the missing pins manually.

Procedure to create a Pin Config File:

1. Start hp82000 application by typing 'hp82000 &'
2. Click on 'PIN CONFIG' softkey. Pin Config window is opened.
3. In the Pin Config window:
   - Click on 'FILE' and select 'load' in the pulldown menu.
   - Select the customer pin config file you want to use for the continuity test by clicking on it and click on the 'load' button.
   - Go into EDITOR mode by clicking on 'MODE' and selecting 'EDITOR' in the pulldown menu. If you miss some configured pins, you can now add the missing pins by copying the pin attributes from other pins and assigning them to your missing pins. Please note that each pin must have assigned a name, number, type, mode and scan attributes and channel number.

- Having configured all pins, download the pin configuration by clicking the 'DOWNLOAD' button. DON'T FORGET !
- Save the pin config file by clicking 'FILE' and selecting 'save_as' in the pulldown menu. Save as 'contin_test'.

That's it for the pin configuration.

Procedure to do the Continuity Test:

1. In the test control window click 'FILE' and select 'new' from the pulldown menu. A main bar with 'AC Tests' appears.
2. In the main bar, click on 'AC Tests', keep button pressed and select 'DC Tests' in the pulldown menu.
3. In the test function menu click on 'continuity' and click on the 'new' button for loading. The Continuity Test Control window shows up.
4. Leave the pinlist unchanged, the '@' sign means: all pins
5. Click on the Test Mode icon. (shows an IC and a DVM).
6. In the Test Mode window, for Method click on 'value', for Evaluation click on 'per pin'. Then click the 'okay' button.
7. Click on the Repeat Mode icon. (shows an arrow).
8. In the Repeat Mode window click on 'repeat once' and click the 'okay' button.
9. In the Test Control window change the clamp voltage to 10,000mV. Change the 'pass volt. stop' to 9,000mV. Change ¡test current¿ to 0.1 uA.
10. Execute test by clicking on the 'exec' button. The report window will show the voltage measurement result on each individual pin. If the 'pass volt. stop' is exceeded, each measurement will also show an 'F' (=Fail) behind the result value. An 'F' in our case would be a good result.

With a programmed test current of 0.1uA, if all channels then show measurement voltages of 10.0V, you have done a perfect soldering job. If not, you have a leakage current somewhere or a soldering bridge. Please note that dirty surfaces very likely can cause leakage currents in the range of some hundred nano-amperes.

Pin Config File

This procedure explains how to automatically generate a valid pin configuration file for all kinds of HP82000 hardware configurations.

There is an executable file on the server 'hpbid1ge.bbn.hp.com' available for you to copy from 'ftp/82k'. The executable file is called 'dfpn'. Once you have copied the file, make sure it is executable by typing:

chmod 777 dfpn

This little program assumes that the maximum number of I/O boards in a mainframe is 15. If you have no PMU installed and instead, an I/O board is sitting in I/O slot 16, you need to edit the file 'dfpn' by setting the variable 'nob' from 15 to 16.

It is also assumed that your system containes D100(X),D200 or D400 boards. If there should be D50 or D40 boards in your system, the variable 'noc' must also be changed to '16'.

To create the pin config file, you only need to type the following in the directory where you placed the 'dfpn' file:

./dfpn -p (num) (filename)

where:

(num)	number of pins in the system
(filename)	pin configuration filename

To watch generation of the pin configuration for the HP82000, activate the PIN CONFIG window in the HP82000 application and go into MONITOR mode.

Generation of the pin configuration on the HP82000 is done by:

cat (filename) | /hp82000/pws/bin/hpt

where:
(filename) = pin configuration filename
You then will see in the PIN CONFIG window how the individual pins are configured. After the configuration, go into the EDITOR mode in the PIN CONFIG window and download the pin configuration by clicking the 'download' button.

Performing a Traceable Calibration

The following is an overview on the contents of this chapter:

1. Preface
2. Specifications for the DC and AC reference channels
3. The calibration interval and the calibration process
4. List of required equipment
5. Software Installation and Configuration
6. Measurement set up
7. Starting the measurement routines
8. Printing and saving the result files
9. Interpretation of measurement results
10. Corrective actions
11. Detailed description of the performance test routines
    a. Clock Board ADC measurements
    b. PMU ADC measurements
    c. Timing reference channel measurements
    d. Modifying the testflow of the test program

Since August 1st, 1993 the specifications for the internal DC- and AC reference channels of the HP82000 test system have been available. The reference channels are used to determine the correction factors during the "Auto DC- and AC calibration" routines of the HP82000. The published Performance Verification (PV) routines are traceable to National or International Standards.

Once it is proven, that the DC- and AC reference channels are within specifications, the correction factors are traceable and also the measurement results of the HP82000 System themselves.

The PV routines are software driven and require minimal manual interactions. The test software is available from the COLOSSUS system at BID (Internet address 15.138.144.4).

System:	hpbbi2.bbn.hp.com
Directory:	/users/ftp/pl1g/hp82000/HW_SUPPORT
Filename:	D2TT_6.0.1

The currently released test software (Rev. 6.0.1) can be used on HP-UX Rev. 9.0.x only.

The HP82000 System SW must be of Rev. 5.0.x or higher. The test software will be automatically updated on the COLOSSUS system when the occurance of a new HP-UX / HP82000 software revision makes it necessary.

To get a DDS tape copy in update format, independently whether it is used on a Series 700 or Series 300/400 Workstation, please follow the instructions below:

On your office workstation, type:

	ftp hpbbi2.bbn.hp.com—> CR
Name:	ftp—> CR
Password:	—> CR
ftp>	cd pl1g/hp82000/HW_SUPPORT—> CR
ftp>	get D2TT_6.0.1.Z—> CR
ftp>	bye—> CR

You should now have the compressed file in your current directory.

Uncompress that file and copy it to a DDS tape by typing:

uncompress D2TT_6.0.1.Z—> CR
dd if=D2TT_6.0.1 of=/dev/*'DDS Tape Device'* obs=10k—> CR

This creates a copy of the Calibration program in update format on your DDS tape.
For *'DDS Tape Device'* insert the filename for your DDS Tape Drive, e.g. 'update.src' or 'rmt/0m'.

Specifications for the DC- and AC reference channels

Environmental conditions during calibration:

Temperature range:	+15degC to 35degC
Temperature variation:	+/- 1degC/hour
Humidity:	<80% non condensing

Level measurement unit on Clock Boards:

Level Measurement accuracy:	+/- (0.1% pv + 5mV)*

Level measurement units on PMU Boards:

Level Measurement accuracy:

Range 0mV ... 2000mV:	+/- (0.3% pv + 3mV)*
Range 2000mV..10000mV:	+/- (0.3% pv + 10mV)*
Range 10000mV ..20000mV:	+/- (0.3% pv + 20mV)*

* The abbreviation “pv” stands for “of programmed value”

Timing reference linearity of the AC calibration channel:

D100, D100X, D200, D400:	</= 100ps
D40, D40X, D50	</= 150ps

The Calibration interval and the calibration process

The recommended **calibration interval is 6 month.** It is recommended to adjust the interval to local requirements. However the system must be re-calibrated after changing the following hardware components:

- Power Supply for Clock Board or PMU board
- Clock Board
- PMU Board

The Calibration Process

The calibration process comprises the following steps:

1. Warm up the HP82000 system and measurement equipment
2. Run System Diagnostics to ensure that the system has no hardware failures
3. Run "Base Calibration"
4. Run "DC-Calibration" from the HP82000 calibration window.
5. Start the calibration procedure
6. Document initial environment conditions in the Performance Test Record sheet.
7. Start the performance verification routines.
8. Check calibration result files for out of tolerance marks. If there are out of tolerance marks take corrective actions and rerun the failing portion of the calibration routine.
9. Save calibration result files on media.
10. Fill out Certificate of Calibration.
11. Run the "DC- and AC Calibration" routines.
12. Remove all HP-UX functionality of D2TT_6.0.1 from the customer's system, e.g. by using the 'rmfn'-command. **(rmfn -l D2TT_6.0.1)**. You better do this to stay in the calibration business.

List of required equipment

The used measurement equipment must be calibrated and within its valid calibration interval. In addition to the equipment which is necessary for “Base Calibration” the following equipment is required and supported by the test-software:

1 additional HP-IB Interface	(Select Code 8 for Series 300/400 or EISA Slot 3 (hpib3) for Series 700 Workstations)
1 Oscilloscope:	HP54121T (A or B)
1 DVM:	HP3456A
1 DPS:	HP6624A
x(*) Coax cables:	P.N. E1242-61604
2 Coax cables SMA:	P.N. 8120-4948 (part of HP54121T)
2 BNC (m) - SMA (f)	P.N. 1250-2015
2 BNC (m) - Dual Banana Plug	P.N. 11001-60001
2 Test leads (banana to open)	no part number
1 BNC (f) - BNC (f)	P.N. 1250-0080
2 20dB-Attenuators:	HP33340C (part of HP54121T)

(*) The x stands for the number of installed Clock Boards in case a multi-mainframe configuration must be calibrated.

Note

It may be a good idea if you decide to bring your own workstation preconfigured with the calibration SW to the customer. It saves you installation time. Also, we know that many customers do not have a second HP-IB interface available on their controlling workstation. For a Series 300/400 computer you would have to install a second HP-IB card in a free slot (if available), for a Series 700 computer it means to insert another EISA E2071B card in Slot 3 and to configure this card into the kernel. Running the calibration SW only with the HP82000 Select Code 7 HP-IB interface does not work!

Figure 8-1 shows the HP-IB addresses of the measurement set-up.

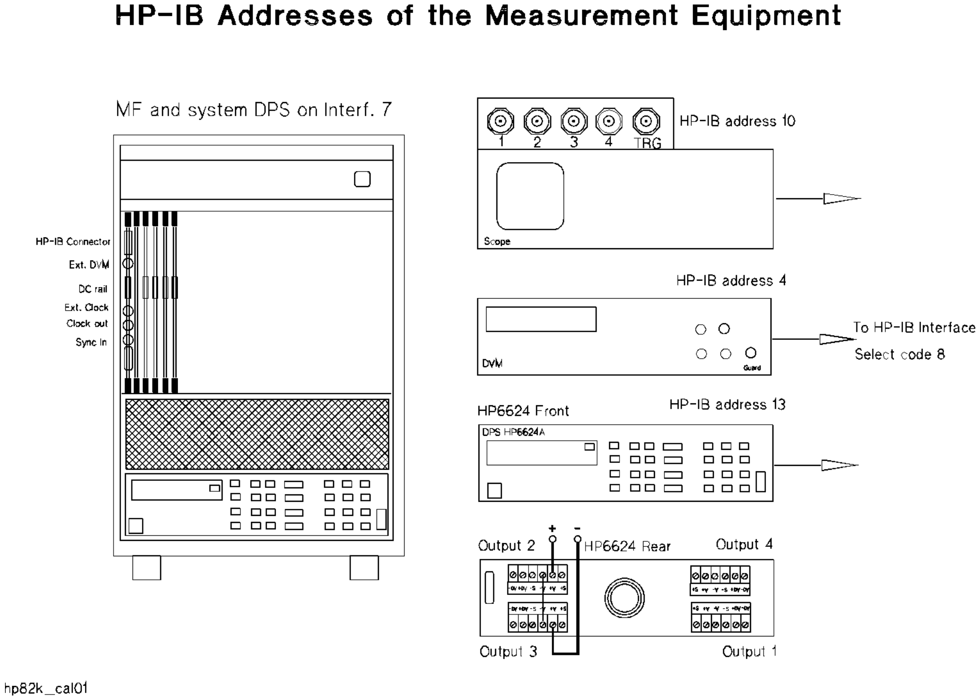


Figure 8-1. HP-IB Addresses of the Set-up

The test-software must be loaded from DDS tape using the update format. The software installation process consists of the following steps:

1. Install DAT tape drive to external SCSI connector of the controller (only if no DAT tape drive is installed in the controller). Insert the DDS tape which contains the test software into the tape drive and wait until the busy LED remains off.
2. Login as **root** (ask customer for the super user password)
3. Enter **/etc/update**.
4. After the SAM screen appears on the screen, move the highlighted area to **Change Source or Destination**, press the softkey **Select Item.**
5. Move the highlighted area to **From Tape Device to Local System ...** and press **Select Item.**
6. Enter in the source field: **/dev/update.src** (if your DAT drive's name is 'update.src')
7. After you have entered the major number (54), the select code 14, the bus address, unit number and volume number (depending on switch setting of the select switches of the DAT tape drive) press the softkey **Done**.
8. SAM comes up with the new screen, move the highlighted area to **Select/View Partitions and Filesets ...** , press **Select Item.** SAM shows the table of contents of the DDS tape. Move the cursor to the highlighted area **Global Select** and after the question **Start loading** enter **Y**. All files on the DDS tape are installed in the right directories.
9. Wait until the busy LED on the DAT tape drive remains off.
10. Enter **vi /tmp/update.log** and check the file for recorded errors. If errors are recorded repeat the installation from scratch.
11. Note that depending on current controller type either S400 or S700 will fail make script during update. This will be reflected in the **/tmp/update.log** file.
12. Depending on your current controller type, enter:

    cd /hp82000/.service/.source/d2tt/S400 or
    cd /hp82000/.service/.source/d2tt/S700

    In the d2tt directory there must be 5 files:

d2tt	executable file
d2tt.mk	make files
dice.o	routine for relays settings
hpib.o	routine to control the scope and DVM
main.o	main routine for the measurements

The executable file is located in the directory **/hp82000/.service/.source/d2tt/S400** resp. **/hp82000/.service/.source/d2tt/S700.** The file is called **d2tt.** The test software is now installed - logout from being super user.

Preparing the HP82000 Hardware for Calibration

Before you start with the calibration procedure, update the "base calibration" file and ensure that the DC-Calibration routine and System Diagnostics does not report any hardware problems - if there are hardware failures reported by the DC-Calibration or Diagnostics, repair the system first.

1. Switch off the system, and remove the DUT Interface and the air-guiding shields in front of the I/O Boards.
2. Pull half out of each mainframe the first I/O board, remove the spring which helds down the I/O cable from I/O channel X0101, remove the I/O cable from channel X0101 carefully (the X stands for the number of frames the HP82000 system consists off).
3. Insert instead of the removed I/O cables (channels 10101, 20101,30101 etc.) the cables E1242-61604 (e.g. if you have a three bay system you have to connect 3 cables), put the I/O Boards back in normal operating position.
4. Put the air-guiding shields back into place, make sure that the SMA connectors from the cables E1242-61604 are easily accessible. Switch on the system and allow a warm up period until the temperature has stabilized in the mainframes (use the **temperature** testfunction).

Starting the Measurement Routines

After the warm-up period of app. 0.5 hours you can start with the test routine.

1. Switch on the HP82000 test system and login as **/users/demo**.
2. Enter **hp82000**, the software starts the bootstrapping process.
3. Click the **HP-UX** softkey in the 'hp82000' environment.
4. Enter **hp82000/.service/.source/d2tt/S400/d2tt -n?** resp. **hp82000/.service/.source/d2tt/S700/d2tt -n?**

Check the provided defaults (do only modify the defaults of the testflow unless it becomes necessary). How to set parameters and how to modify the testflow of **d2tt** is described in section 11/4.
Fill out the **Performance Test Record** cover sheet **(vi)** and save! Then follow the instructions which appear on the screen . The test routine will last between 15 minutes and 30 minutes depending on the hardware configuration.

1. The first part of the test routine the level measurement paths of the PMUs are verified (only if PMUs are installed) . All PMUs are tested sequentially, the test set up must not be changed for this test. The test path for this test is shown in Figure 8-2.

   In case a multi-mainframe configuration must be calibrated, the test routine will ask you to reconnect the measurement equipment form I/O channel 10101 to I/O channel 20101 and after a while to 30101.
   Make sure that you have a second BNC/SMA (P.N. 1250-2015) adapter at hand.

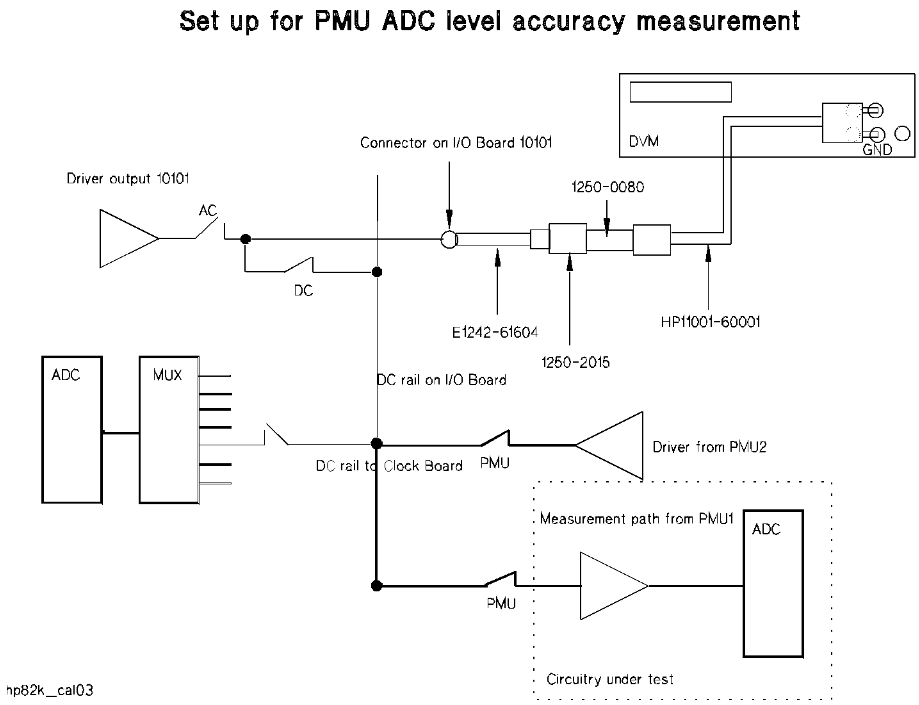


Figure 8-2. Test Setup for ADCs on the PMUs.

2. The next part of the calibration routine tests the level measurement accuracy of the ADCs on the Clock Boards in the system. Connect the measurement equipment as shown in Figure 8-3.

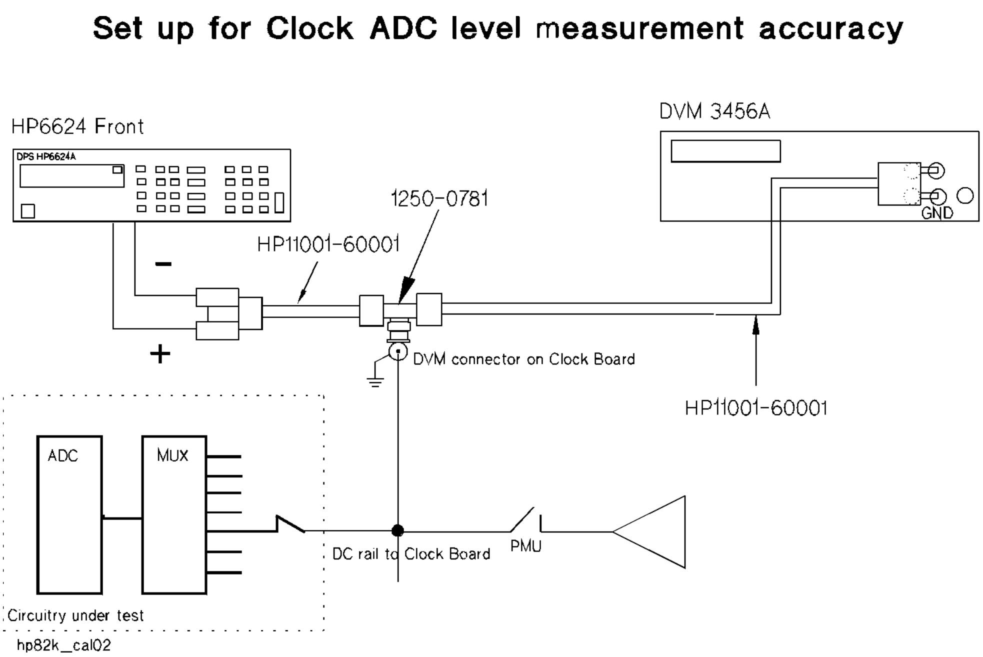


Figure 8-3. Measurement Set-up for Clock ADC.

3. In the third part of the test the edge linearity of the driving and receiving edges of the Timing reference channel is verified. For this test the DVM from the previous test must be disconnected from cable E1242-61604. The I/O channel 10101 (master only) must be connected to the trigger input of 54120A/B scope preamplifier, the calibration probe of the HP82000 system must be connected to input 4 of the preamplifier. Be sure to provide proper grounding on the calibration probe tip to scope input.

   The measurement set up is shown in Figure 8-4.

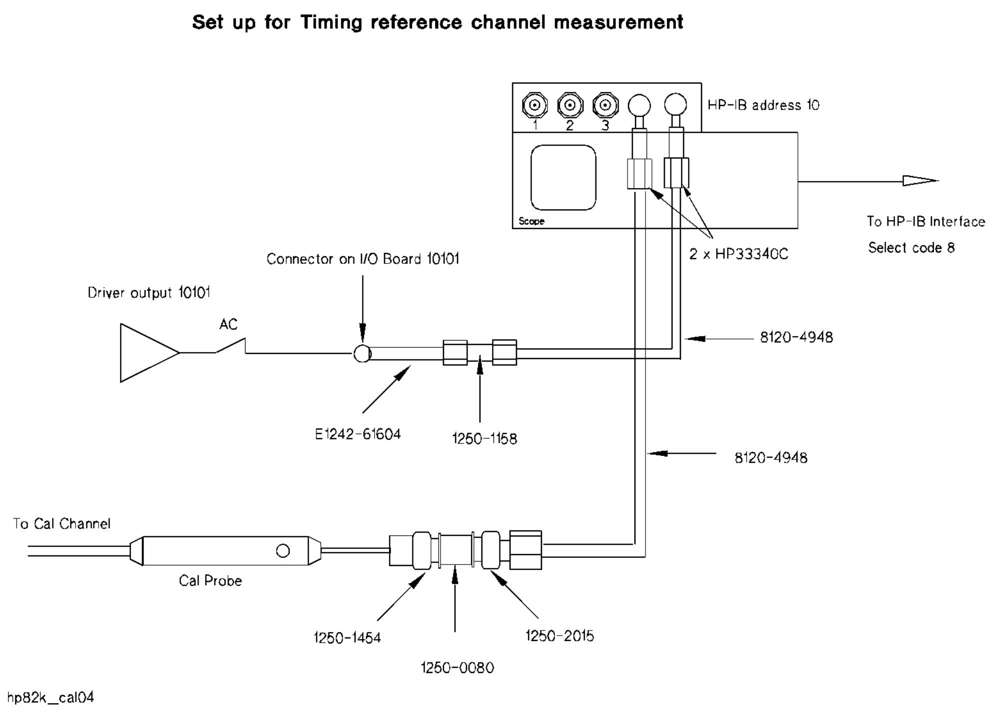


Figure 8-4. Measurement Set-up for Timing Reference Accuracy Test

Printing and saving the result file

When the measurement routine is finished either make a printout of the **CAL_LOG** file located in **/hp82000/.service/data** or store the calibration data on the DDS tape for documentation purposes. The customer should held either the printout or the DDS tape for his tracking records.

Interpretation of the measurement results

The calibration test data are listed in a tabular format, the individual measurements are indicated by stars in columns. The center column indicates the programmed value, the lines next to the center column indicate the +/-50% point of specifications, the outer columns indicate the +/-100% point of specifications.

Out of tolerance measurements are indicated by 3 stars outside of the 100% markers. To check if the reference channels are within specifications you only need to scan the test result file for the 3 stars laying outside of the 100% band of the specifications. In addition to the visual marks inside of the tolerance band the absolute deviation from the programmed value is shown as well as the deviation from the nominal value in %.

Corrective actions

In case that a test fails the following checks need to be done:

1. The ADC test on the Clock Board fails.

Check the “Base Calibration” value in the bc_dXXX file. If the gain factor for the ADC deviates more than 20 microvolts/bit from the default (3212 microvolts/bit) rerun the “Base Calibration” routine. Make sure that the power supply used to determine the gain factor is appropriate (like HP6624A etc.). If the failure remains - replace the Clock Board.

2. The ADC test on the PMU Board fails.

Check the “Base Calibration” value in the bc_dXXX file. If the gain factor for the ADC deviates more than 40 microvolts/bit from the default (10000 microvolts/bit) rerun the “Base Calibration” routine. Make sure that the power supply used to determine the gain factor is appropriate (like HP6624A etc.). If the failure remains - replace the PMU Board.

3. The Timing reference channel test fails.

Swap 1st I/O board and rerun the AC reference channel measurement. If the test still fails, replace the Clock Board, rerun the “Base Calibration” and verify the specifications of the AC reference channel again.

1. Level measurement accuracy test of the ADC on the Clock Board.

The test setup for this test is shown in Fig. No. 2. For testing the level measurement path of the DC reference channel on the Clock Board, the power supply 6624A is used as a voltage source connected to the ext. DVM input. The power supply is programmed in the range of -4.0 Volts and +8 Volts in steps of 100mV, the output voltage is measured by the DVM which is used as external reference for this measurement. In parallel to the DVM measurement the ADC reading is recalculated in millivolts with help of the gain factor and offset value.

Specifications:

Level measurement accuracy:	**+/- (0.1% pv + 5 mV)**

Error Calculation Terms:

The DVM reading is called:	dvm_value [mV]
The ADC reading is called:	adc_value [mV]
dvm_value-adc_value is called:	delta [mV]

The 100% point of spec is calculated for each measurement with the following formula:

max. deviation [mV] = ¡DVM value * 0.1/100 + 5mV¡ or
max. deviation [mV] = 100% of spec.

Failure [%] = (dvm_value-adc_value)*100/max. deviation

2. Level measurement accuracy test of the ADCs on the PMU Board.

The test setup for this test is shown in Figure 8-3. For testing the level measurement paths of the DC reference channels on the PMU Board, PMU1 is used as a voltage source while PMU2 measures the output voltage of PMU1 and vice versa. The output voltage of PMU1 is measured in parallel with the DVM at I/O channel 10101 (20101, 30101 etc.) which is taken as external reference measurement, the PMU reading is compared against the DVM reading:

Specifications:

Level measurement accuracy:

Range 0mV ... 2000mV:	+/- (0.3% pv + 3mV)
Range 2000mV ... 10000mV	+/- (0.3% pv + 10mV)
Range 10000mV ... 20000mV	+/- (0.3% pv + 20mV)

Error Calculation Terms:

The DVM reading is called:	dvm_value [mV]
The PMU reading is called:	pmu_value [mV]
dvm_value-pmu_value is called:	delta [mV]

The 100% point of spec. is calculated for each measurement with the following formula:

max. deviation (range 1) [mV] = ¡DVM value * 0.3/100 + 3mV¿ or
max. deviation (range 2) [mV] = ¡DVM value * 0.3/100 + 10mV¿
max. deviation (range 3) [mV] = ¡DVM value * 0.3/100 + 20mV¿
max. deviation [mV] = 100% of spec.

Failure [%] = (dvm_value-pmu_value)*100/max. deviation

The test set up for this test is shown in Figure 8-4. During this test the linearity of output edge (le) and the linearity of the receiving edge (te) is measured. Because the delay circuitry works independently from the mode of the calibration probe, both edges (le and te) are moved simultaneously and output to the tip of the calibration probe where the edges are measured with the oscilloscope. The edges are programmed in steps of 200ps; the measured range covers twice the range of the fine delay circuitry (7.5ns) to ensure that the worst case condition (jump from the end of the fine delay circuitry to the beginning of the fine delay circuitry) is covered.

Specifications:

Timing reference linearity for Le and Te:

D100X, D200 and D400 systems:	</= 100ps
D40, D40X and D50 systems:	</= 150ps

Error Calculation Terms:

Programmed delay of the leading edge (LE):	le_prog [ns]
LE delay measured by the scope:	le_meas [ns]
le_prog - le_meas:	le_delta [ns]

The same terminology is used for the trailing edge (TE).

Failure [%] = le_delta [ps] * 100/ spec

Modifying the testflow of the test program

Under some circumstances it might become necessary to modify the test flow of the performance test. To get a list of provided options call up the test program by entering 'd2tt -n?'. The interpretation of the options is as follows:

-T numeric input	HP-IB timeout in micro sec. Default 10000000 microsec.
-D numeric input	HP-IB address of the DVM. Default address is 4.
-S numeric input	HP-IB address of the Oscilloscope. Default address is 10.
-P numeric input	HP-IB address of the DPS 6624A. Default address is 13.
-j string input	jobs to do - a=Clock ADC, c=Timing reference, p=PMU ADCs
-l string input	logfile name. Default CAL_LOG in directory **/hp82000/.service/data**
-n string input	comment field. Format to use: “text”
-F dev	select hpib device driver if other than default.
	(/dev/hpib8 for Series 300/400 resp. /dev/hpib3 for Series 700). Note that super users capibility may be required for access to system's /dev/hpibXX device driver.

9

HP82000 Support Services

Bundled Start-up Support Services

Several services are bundled with the HP82000 system at the various stages of bringing the system onto the customers floor resp. at operation of the system.

Site Planning and Preparation

- The Site Planning and Preparation Guide is set up at SMO/PCE with part number E1280-900014.
  It is the CE's responsibility to order the manual and pass it on to the customer prior to installation. A good rule would be to provide this info approx. 3 weeks before installation date.
- **Maxiframe based systems qualify for a site planning and preparation visit.** Alternatively, you may opt for a site verification visit in order to be sure the site preparation was done properly.
  Qualifier for a site inspection: **E1219C Master Sequencer** (Core Product)
- The customer is responsible to meet the on-site requirements prior to installation. These are in detail:
  1. Receive the system and move it to its final location
  2. Unpack the system components and check for completeness
  3. Provide a power line as requested in the Site Planning and Preparation Guide
  4. Provide adequate cooling of tester environment

Installation and Configuration

Installation and Configuration services comprise

- System hardware (controller and supported peripherals, HP82000, DPS(s), HSWG(s)
- System software (HP-UX, C/ANSI-C, RMB-UX, HP82000 including system specific configuration settings)

NOT included (and not supported from the factory) is set up of discless workstation clusters!

System Upgrades

For System Upgrades the following items should be kept in mind:

- FEs are requested to originate an ISP for the Upgrade (Installation/ Compatibility issues)
- If a system gets upgraded, the order should specify:
  "Upgrade for Sales Order No. xxxx-yyyyy-zzz "
- If references to the original system order are provided, we can do a consistency check.
- A compatibility/revision matrix has been published to CEs. If in doubt, consult with BID.

Bundling of **Installation of System Upgrades** is dependant on what is being upgraded:

- Upgrades of straight D50, D100(X), or D200 I/O boards are generally customer responsability.
- If a Clock Bd. Upgrade (E1222M #H01) has been ordered, all of the upgrade installation becomes CE responsibility.
- Upgrades with E1214A/B or HSWGs or Mainframe Extenders installation responsibility is always with the CE.

Installation Verification

Installation Verification services comprise

- Diagnostics on-site
- Base Calibration, DC Calibration and AC Calibration of all pins on-site (no User Calibration !)
- Running a demo DUT for sign off

Report the installation charges via SIS warranty billing system:

1. Encode "IN"
2. Specify order number and serial number of Master mainframe.
3. Cover all of the system in **one** bill ! Always report one system installation/upgrade installation to one joint installation CSO.
4. Time required depends on the system configuration. We expect 5 hours for an average system configuration (128 channels, 1 DPS, Controller, Monitor, Disc, Printer).

After the installation the customer as well as the CE sign the **System Installation Report.**

Installation Qualifiers are:

E1220C	Miniframe
E1222C	Standardframe
E1202/03A	Maxiframes
E1214A/B	400 MHz I/O Board
E1215A	High Speed Width Generator

Note

Special Considerations:
Installations may become complex with

- 400 MHz I/O Boards
- High Speed Width Generators
- Maxiframes (more than 1 card-cage)

This should be handled by experienced System CEs. These "specialists" should be dispatched on the area or region level. Please note that the same complexity may be possible also for system upgrades.
A CE trained with level 200 should continue to do the 'standard' installations and do first-line system troubleshooting even on complex systems, once successfully installed. Maxiframe Installations require up to 4 people to lift the rack from the pallet. Ensure that customer is prepared to help - or ensure support by local CEs. (Charge 3 * 0.5 hrs plus Zone II travel).

Introductory User Training

Standard Bundled Training:

- One week Standard User Training can be delivered on-site or at factory or from the SSC.
- Product No.: E1288A #24D

ResponseLine Support

ResponseLine Support (E1288A #H00) is bundled for the first year of ownership with any kind of HP82000 Test System, regardless of model and mainframe type. It provides SW Updates and Phone-in Consulting. All System SW modules are covered:

- HP-UX
- C/ANSI C Developer's Bundle
- UX-RMB
- CAE Links

Warranty Reporting

The HP82000 System has a standard warranty period of just **90 days.** Very often the field is selling an extended warranty period of 1 year. For any warranty claims please follow the below mentioned guidelines:

- Always report a failure to the product affected; e.g. E1210B, E1212A, E1213A, E1231A, E1222E, etc.
  Don't bother about 'accessory' products, like cable assemblies, DUT interface, DUT boards, etc. Report such failures to the closest related 'real' product; e.g. I/O cables—> I/O board.
- Report a failure on **one** CSO, when claiming warranty.
- If a related (e.g. intermittent) failure required multiple on-site visits, for which multiple CSO's have been opened, encode them as "Associated Repair".
- Indicate the **Bar Code** serial number in the comments section, if an assembly has been exchanged.
- Indicate the System type and **Product** serial number; e.g. E1222M 2825G00131.* Please use available comment space to note down failure description as precise as possible. Avoid useless information such as e.g. "Customer satisfied".

Warranty reports are checked in the division e.g. for technical plausibility, warranty period matching, excessive charges and charge guideline matching.

To avoid the most common report errors, please keep the following items in mind:

- Extended warranty is **NOT** covered by the division
- Refurbishment of DEMO units is **NOT** covered by the division
- Warranty billing of Workstation equipment must **NOT** be done to BID

Failrates

An average system failrate can be determined by the number of installed systems/I/Ochannels and the number of field returns for repair. A comparison with the claimed warranty items supports the fact that field failures during warranty period and later system life are approximately the same.

From warranty data an average failrate of **0.6%/year/k$** can be derived.

This means for a typical 128 pin system @ 420 k$: 420 * 0.6% = 250%.
In other words, such a typical system will fail 5 times within 2 years, or approximately once every 5 months.

With >8000 hrs/year and a failrate of 250%, the Mean Time Between Failure **(MTBF)** is > **2500 hrs.**

For a Mean Time To Repair **(MTTR)** we expect about 3 hrs for troubleshooting, replacement, verification by diagnostics and, as necessary base cal, dc cal and/or ac cal.

The Escalation process has been installed to make any resource available which is needed to solve a customer problem that cannot be fixed with field resources alone.

To effectively utilize this process, please follow the below mentioned guidelines:

- Consult with product support at factory/SSC if you do not *feel comfortable* with respect to the problem solution.
- Escalate to **PROBLEM SITE**, if problem cannot be fixed with a single on-site visit; regardless whether problem is of technical or parts-supply nature. Indicate reasons why the problem couldn't be fixed with a single shot.
- Copy factory/SSC PSE on EPICS. CC: Bid-Pl1gESCAMGR /HPB100/MG
- Report precisely what has been done to differentiate between diagnostics perception and actual application problem. Remember that forgotten small things might cause wrong conclusions of the Escalation team.
- Report whether problem is solid or intermittent. If intermittent, what has been done to provoke the failure.
- Report complete system configuration, system placement (too close to wall?), room temperature, and if configuration has been changed recently.
- When has problem been observed first?
- How many different people have worked on a problem solution? Assess chances for a miscommunication.
- If parts supply problem: When is the required part acknowledged by SMO/SME? Is a drop-shipment from the factory/SSC requested?
- Escalate to **HOT SITE** if the problem cannot be fixed with field resources in an adequate time. Report all pertinent information of configuration, actions taken so far, customer anxiety level and expectations from the factory/SSC.

Contractual HW Support Services

For HW maintenance and repair the following services are available:

1. **24hrs response time** service contract (SuccessLine)
2. **4hrs response time** service contract () (subject to local availability)
3. **Traceable On-site Calibration** according ISO 9000 requirements (+23S) (Refering to NIST traceable equipment)

Note If calibration is required verifying all specifications on a per pin basis in compliance with MIL45662A, a 'special' has to be negotiated. Such a calibration is very time consuming and very expensive.

Calibration consists of:

- Base Calibration with external NIST traceable equipment
- Calibration of Cal Probe channel with external NIST traceable equipment
- Verification of int. Clock Reference with external NIST traceable equipment
- DC Calibration using NIST calibrated internal references
- AC Calibration using NIST calibrated internal Cal Probe channel. Global cal files are generated, using the MUX cal board/probe.

Typical Contract Pricing

24 hrs response:	4.6% of system list for Model D200
	3.8% of system list for Models D50, D100, D100X, D400
4 hrs response:	5.7% of system list for Model D200
	5.0% of system list for Models D50, D100, D100X, D400
Calibration (#23S):	E1220AU Miniframe: $ 77,-/instance
	E1222C Standardframe: $ 84,-/instance
	E1202/3 Maxiframe: $ 84,-/instance

These prices may differ depending on local contract negotiations, especially in Europe and Far East.

Contractual SW Support Services

For SW Update and Application Support the following services are available:

1. SW Update Support (BasicLine)
2. Phone-In Consulting Support (ResponseLine)

Phone-in Consulting Support is delivered out of the factory and out of the SSCs in Santa Clara and Tokyo. The Customer calls into the Response Center. The call is logged on **TRAK II** and passed to the factory/SSC for resolution. The assigned engineer in the factory/SSC returns the call to the customer and provides problem resolution.

Support Products

Dated: 10/94

■	E1288A	#H00	Response Center Support (1 caller)	$ 445,-
■	E1288A	#P00	Add Caller	$ 275,-
■	E1288A	#UAC	SW Update Subscription	$ 340,-
■	E1288A	#U00	SW License Update Subscription	$ 204,-
■	E1288A	#QA0	Documentation Update Subscription	$ 51,-
■	E1288A	#24D	User Training (one week)	$2345,-
■	E1288A	#24B	User Training (Division PSE, Europe only)	$2905,-

User Training

The User Training covers testing topics such as using the system as well as application support. One week total, the training is delivered on-site or at the SSC. Trainers are local AEs.
Application support addresses the following topics:

- General Consulting for
  - DUT connection
  - Calibration considerations
  - Test approaches
- Consulting for specific application problems
- Implementation of networking solutions—> data link to EDA systems
- Adaption of test system to handlers and probers
- Development of custom specific EDA Interface Modules
- Development of custom specific Test Functions
- Integrations of test solutions with miscellaneous instruments (Oscilloscope, Ultra-fast Pulse Generator, etc.)

Unix Tree

The following tables provide a quick overview about the directory structure of the hp82000 system software. The important files for troubleshooting and maintaining the system are shown in the very right column.

Table A-1.

/hp82000	/.service	/.source	/ bc_cal	bc_cal
				bc_cal.c
				bc_cal.mk
			/dps_diag	
			/memtest	
			/optcheck	
			/pwr_mon	
		/ bin		
		/ data		optcodes
/hp82000	/cae	/bin		
		/data		
		/include		
		/lib		
		/tmp		
/hp82000	/com	/bin		
		/data		
		/include		
		/lbin		hp82000_lp
/hp82000	/vee	/bin		
		/data		
		/lib		
			/tpi_hlv	
			/tpi_llv	
/hp82000	/fw	/bin		hpib
				hswg_conf
		/data		bc_cal_dxxx
				dc_cal_dxxx
				SELF

Table A-2.

/hp82000	pws	/bin		hpt
		/data		mainframes
				model
				.Xdefaults
				.colordefaults
				offl_conf.def
				prog_bug_log
			/bitmap	
			/fonts	
		/dut_boards	/cae_control	
			/cae_data	
			/cae_params	
			/cae_pmap	
			/cae_report	
			/calib.raw	ac_cal_dxxx
			/calibration	ac_cal_dxxx
			/configuration	
			/data_set	
			/di_report	
			/format	
			/levels	
			/pin_attributes	
			/report	
			/testflow	
			/testfunc	
			/timing	
			/user_cal	
			/vectors	
			/waste	
		/include		
		/lbin		
		/lib		
		/tc		
		/tc_user		
		/tf		
		/tf_user		

Table A-3.

/hp82000	/dev_tech	/cmos	/cae_control	
			/cae_data	
			/cae_params	
			/cae_pmap	
			/cae_report	
			/calib.raw	ac_cal_dxxx
			/calibration	ac_cal_dxxx
			/configuration	
			/data_set	
			/di_report	
			/format	
			/levels	
			/pin_attributes	
			/report	
			/shell	
			/shell_c	
			/testflow	
			/testfunc	
			/timing	
			/user_cal	
			/vectors	
			/waste	
/hp82000	/dev_tech	/ecl	/cae_control	
			/cae_data	
			/cae_params	
			/cae_pmap	
			/cae_report	
			/calib.raw	ac_cal_dxxx
			/calibration	ac_cal_dxxx
			/configuration	
			/data_set	
			/di_report	
			/format	
			/levels	
			/pin_attributes	
			/report	
			/shell	
			/shell_c	
			/testflow	
			/testfunc	
			/timing	
			/user_cal	
			/vectors	

B

Revision Matrix

Status: November 1995

Note

S/N = Service Note

Clockboard

E1222-66503	Rev A	- Not released to field.
	Rev B	- First revision released.
	Rev C	- Calibration problem fixed.
E1222-66563	Rev A	- 2 MByte firmware memory.
	Rev B	- FIFO problem fixed.
	Rev C	- (Rev B + S/N E1222-05). VME bus problem fixed.

Sequencer Board

E1222-66504	Rev A	- Not released to field.
	Rev B	- Only in a few demo systems.
	Rev C	- Timing jitter problem fixed for Single-Mainframe systems.
	Rev D	- (Rev C + S/N E1222M-01 or E1220A-01).
		Timing jitter problem fixed for Multi-Mainframe systems.
	Rev E	- (Rev D + S/N E1222M-02). Modified Address Bus, to be able to address I/O Boards with 1MByte Vector Memory.
E1222-66564	Rev A	- (Rev E + S/N E1222M-06). Upgraded
		Instruction Change Memory and Error Map, to 256K.
E1222-66574	Rev A	- (S/N E1222M-09). Upgraded Instruction Change Memory
		and Error Map, to 1 M.
E1216-66504	Rev A	- Master Sequencer: 256 K Firmware Memory & Error Map,
		supports up to 4 slave Card-Cages.
E1216-66574	Rev A	- Master Sequencer: 1 M Firmware Memory & Error Map,
		supports up to 4 Slave Card-Cages. (S/N E1222M-09)

Note

The I/O Board revision numbers are linked to the Vector Memory Depth and not to bug-fixes or modifications. All revisions are available.

I/O Boards

E1210-66501	Rev A	- 50 MHz, 32K
E1210-66521	Rev B	- 50 MHz, 128K
E1210-66541	Rev C	- 50 MHz, 512K
E1211-66501	Rev A	- 100 MHz, 64K
E1211-66521	Rev B	- 100 MHz, 256K
E1211-66541	Rev C	- 100 MHz, 1024K
E1209-66501	Rev A	- 100 MHz “X”, 64K
E1209-66521	Rev B	- 100 MHz “X”, 256K
E1209-66541	Rev C	- 100 MHz “X”, 1024K
E1212-66501	Rev A	- 200 MHz, 64K
E1212-66521	Rev B	- 200 MHz, 256K
E1212-66541	Rev C	- 200 MHz, 1024K
E1214-66501	Rev A	- 400 MHz, 64K
E1214-66521	Rev B	- 400 MHz, 256K

PMU Board

E1213-66501	Rev A	- Not released to field.
	Rev B	- The current revision.

Note

A “Y” indicates that the board is supported by the particular software revision. This means that the software will run, but does NOT mean that all software functions will be available; e.g. you cannot use high-throughput commands with E1222-66503 Clockboards (small firmware memory).

New HP-UX Releases have come with:

HP-UX 7.0 HP82000 Rev. 2.0.0

HP-UX 8.0 HP82000 Rev. 3.0.0

HP-UX 9.0 HP82000 Rev. 5.0.0

Clock Board

S/W Revision	1.3.0	1.3.2	1.4.0	2.0.0	2.1.1	3.0.0	4.0.0	4.5.2	5.0.0
			1.4.1	2.1.0		3.1.0			
E1222-66503A	Y	Y	Y	Y	Y				
E1222-66503B	Y	Y	Y	Y	Y				
E1222-66503C	Y	Y	Y	Y	Y				
E1222-66563A			Y	Y	Y	Y	Y	Y	Y
E1222-66563B			Y	Y	Y	Y	Y	Y	Y
E1222-66563C			Y	Y	Y	Y	Y	Y	Y

Sequencer Board

S/W Revision	1.3.0	1.3.2	1.4.0	2.0.0	2.1.1	3.0.0	4.0.0	4.5.2	5.0.0
			1.4.1	2.1.0		3.1.0			
E1222-66504A	Y	Y	Y	Y	Y	Y	Y		
E1222-66504B	Y	Y	Y	Y	Y	Y	Y		
E1222-66504C	Y	Y	Y	Y	Y	Y	Y		
E1222-66504D		Y	Y	Y	Y	Y	Y	Y	Y
E1222-66504E		Y	Y	Y	Y	Y	Y	Y	Y
E1222-66564A			Y	Y	Y	Y	Y	Y	Y
E1222-66574A								Y	Y
E1216-66504A					Y	Y	Y	Y	Y
E1216-66574A								Y	Y

I/O Boards

S/W Revision	1.3.0	1.3.2	1.4.0	2.0.0	2.1.1	3.0.0	4.0.0	4.5.2	5.0.0
			1.4.1	2.1.0		3.1.0			
E1210-66501A		Y	Y	Y	Y	Y	Y	Y	Y
E1210-66521B		Y	Y	Y	Y	Y	Y	Y	Y
E1210-66541C						Y	Y	Y	Y
E1211-66501A				Y	Y	Y	Y	Y	Y
E1211-66521B				Y	Y	Y	Y	Y	Y
E1211-66541C						Y	Y	Y	Y
E1209-66501A							Y	Y	Y
E1209-66521B							Y	Y	Y
E1209-66541C							Y	Y	Y
E1212-66501A	Y	Y	Y	Y	Y	Y	Y	Y	Y
E1212-66521B			Y	Y	Y	Y	Y	Y	Y
E1212-66541C						Y	Y	Y	Y
E1214-66501A				Y	Y	Y	Y	Y	Y
E1214-66521B				Y	Y	Y	Y	Y	Y

PMU Boards

S/W Revision	1.3.0	1.3.2	1.4.0	2.0.0	2.1.1	3.0.0	4.0.0	4.5.2	5.0.0
			1.4.1	2.1.0		3.1.0			
E1213A	Y	Y	Y	Y	Y	Y	Y	Y	Y
E1213B	Y	Y	Y	Y	Y	Y	Y	Y	Y

Manual Probe

S/W Revision	1.3.0	1.3.2	1.4.0	2.0.0	2.1.1	3.0.0	4.0.0	4.5.2	5.0.0
			1.4.1	2.1.0		3.1.0			
E1242A								Y	Y

Clock Boards

		D50	D100	D100X	D200	D400	D100X+D200+D400
E1222-66503	Rev B	Y			Y		
	Rev C	Y			Y		
E1222-66563	Rev A	Y	Y	Y	Y	Y	Y
	Rev B	Y	Y	Y	Y	Y	Y
	Rev C	Y	Y	Y	Y	Y	Y

Note

* D100, D100X, or D400 installed => need E1222-66563 in all Card-Cages. * D50 or D200 installed => E1222-66503 and E1222-66563 can be mixed. * D100X+D200+D400 mixed => need E1222-66563 in all Card-Cages.

Sequencer Boards

		E1222-	E1222-	E1222-	E1216-	E1216-	
		66504	66564	66574	66504	66574	Rev B/C
	Rev	A B C D E	A	A	A	A	I/O Bds
E1222-66504	Rev A	Y Y Y - -					
	Rev B	Y Y Y - -					
	Rev C	Y Y Y - -					
	Rev D	- - - Y Y	Y				
	Rev E	- - - Y Y	Y				Y
E1222-66564	Rev A	- - - Y Y	Y		Y		Y
E1222-66574	Rev A			Y		Y	Y
E1216-66504	Rev A		Y				Y
E1216-66574	Rev A			Y			Y

- E1216-66504 installed => need E1222-66564 in every other Card-Cage.
- E1222-66504 Rev A + Rev B + Rev C can be mixed.
- E1222-66504 Rev D + Rev E + E1222-66564 Rev A can be mixed.

- E1216-66504, E1216-66574 can only work as Master. It can NOT be a Slave, and thus only one Master Sequencer per system is allowed.
- E1222-66564 Rev A and E1216-66504 Rev A provide a 256 K Error Map, if they are installed in Card-Cage 1.
- E1222-66574 Rev A and E1216-66574 Rev A provide a 1M Error Map, if they are installed in Card-Cage 1.
- New sequencers E12xx-66574 may be set to behave like “old” ones. In the table this fact is reflected by the old sequencers.
- The Revision B and C I/O Boards are only supported by the E1222-66504 Rev E and later.

I/O Boards

		E1210	E1211	E1209	E1212	E1214
	Rev	A B C	A B C	A B C	A B C	A B
E1210-66501	A	Y - -				
E1210-66521	B	- Y -				
E1210-66541	C	- - Y				
E1211-66501	A		Y - -			
E1211-66521	B		- Y -			
E1211-66541	C		- - Y			
E1209-66501	A			Y - -	Y - -	Y -
E1209-66521	B			- Y -	- Y -	- Y
E1209-66541	C			- - Y	- - Y	- -
E1212-66501	A			Y - -	Y - -	Y -
E1212-66521	B			- Y -	- Y -	Y
E1212-66541	C			- - Y	- - Y	- -
E1214-66501	A			Y - -	Y - -	Y -
E1214-66521	B			- Y -	- Y -	- Y

- I/O Board Revisions (A,B & C) indicate the Memory-Depth of the Board, and not later revisions due to bug-fixes or modifications.
- You can mix D100, D100X and D400 I/O Boards of the same revision in the same system.

- You can NOT mix I/O boards of different revisions.

PMU Boards

E1213-66501	Rev B	- No hardware dependencies.

(1) Start the HP 82000 Software.

(2) Open an HP-UX window.

(3) Type `/hp82000/pws/bin/hpt` (Return), to start the “hpt” HP-IB driver.

(4) At the @ prompt, type `*opt?` (return), to query the system configuration.

You will get an answer string for each Card-Cage, like the following:

Slot 1————————————————————-> Slot 16

8, 23, 104, 104, 80, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0

Each position in the string represents a slot in the Card-Cage and the number represents the board in that slot. The codes representing the different types of boards are as follows:

Clockboards:	E1222-66503	B -> N/A
		C -> 4
	E1222-66563	A -> 8
		B -> 8
		C -> 8
Sequencers:	E1222-66504	A -> N/A
		B -> (17 + X)
		C -> (18 + X)
		D -> (19 + X)
		E -> (19 + X)
	E1222-66564	A -> (23 + X)
	E1222-66574	A -> (24 + X)
	E1216-66504	A -> (116 + X)
	E1216-66574	A -> (120 + X)

Where X depends on the position of the Sequencer Board in the system, as follows:

Card-Cage 1	=>	X = 0
Card-Cage 2	=>	X = 256
Card-Cage 3	=>	X = 512
Card-Cage 4	=>	X = 768
Card-Cage 5	=>	X = 1024

I/O Boards:	E1210-66501	A -> 64
	E1210-66521	B -> 68
	E1210-66541	C -> 72
	E1211-66501	A -> 36
	E1211-66521	B -> 40
	E1211-66541	C -> 44
	E1209-66501	A -> 164
	E1209-66521	B -> 168
	E1209-66541	C -> 172
	E1212-66501	A -> 52
	E1212-66521	B -> 56
	E1212-66541	C -> 60
	E1214-66501	A -> 100
	E1214-66521	B -> 104
PMU Board:	E1213-66501	A -> 80
		B -> 80

Replaceable Parts List

The following tables are a list of the parts of the HP 82000 system which are available as *replaceable or exchangeable* parts. The table gives a short description of the parts, and the Part Number associated with each part.

Note

Exchange Parts are easily recognized by the structure of their part number: All parts with a structure like 'E12xx-69yyy' are Exchange Parts. For an Exchange Part, the according Replacement Part ('E12xx-66yyy') is always available, although not mentioned in the list.

System Boards and Accessories

This section contains the part numbers for the system boards, and for cables and other part which are connected to these boards.

Clock Boards

Part Number	Part Description
E1222-69503	Clock board (512K Firmware Memory)[1]
E1222-66533	Clock board (2MB Firmware Memory)[2]
E1222-69563	Clock board (2MB Firmware Memory)
8120-3446	HP-IB Cable 2m
E1222-61605	DC-Rail (Long)

1 For D50 and D200 only.

2 For D40 only. Replacement only

Sequencer Boards

Part Number	Part Description
E1222-69504	Standard Sequencer (Address Range 64k)
E1222-69564	Standard Sequencer (Address Range 256k)
E1222-69574	Standard Sequencer (Address Range 1M)
E1216-69504	Master Sequencer (Address Range 256k)
E1216-69574	Master Sequencer (Address Range 1M)
1818-4568	SRAM, 256K
E1222-61606	Master-Slave Cable, Standard Sequencer
E1216-61601	Master-Slave Cable, Master Sequencer
E1222-61607	Wordmask Cable
E1269-61601	Utility-Line Cable (0.5 metre)
E1269-61602	Utility-Line Cable (1 metre)
E1269-61603	Utility-Line Cable (1.5 metre)

I/O Boards

Part Number	Part Description
E1209-69501	Base I/O Board 100 MHz 64k mixable
E1209-69521	Base I/O Board 100 MHz 256k mixable
E1209-69541	Base I/O Board 100 MHz 1 M mixable
E1210-69501	Base I/O Board 50 MHz 64K
E1210-69521	Base I/O Board 50 MHz 256K
E1210-69541	Base I/O Board 50 MHz 1 M
E1211-69501	Base I/O Board 100 MHz 64K
E1211-69521	Base I/O Board 100 MHz 256K
E1211-69541	Base I/O Board 100 MHz 1M
E1212-69501	Base I/O Board 200 MHz 64K
E1212-69521	Base I/O board 200 MHz 256K
E1212-69541	Base I/O board 200 MHz 1M
E1214-69501	Base I/O board 400 MHz
E1222-66515	Serializing Board
E1212-69502	SMD-Board[1]
E1214-69502	Daughter Memory Board 256K RAM - Rev A[2]
E1214-69503	Daughter Memory Board 1M RAM - Rev B[2]
E1212-61601	DC-Rail (Short)
E1222-61605	DC-Rail (Long)
E1222-61607	Wordmask Cable

1 For E1211-69501/21 and E1212-69501/21 only.

2 For E1214-69501 only.

I/O Cables

Part Number	Part Description
E1249-61602	I/O Cable 2000mm 40/50 MHz (100 Ohm) (E1248A)
E1249-61601	I/O Cable 850mm 40/50 MHz (100 Ohm) (E1249A)
E1250-61601	I/O Cable 310mm 40/50 MHz (100 Ohm) (E1250A)
E1251-61601	I/O Cable 450mm 40/50 MHz (100 Ohm) (E1251A)
E1252-61602	I/O Cable 600mm 40/50 MHz (100 Ohm) (E1252A)
E1252-61601	I/O Cable 260mm 200 MHz (50 Ohm) (E1253A)
E1253-61601	I/O Cable 400mm 100/200/400 MHz (50 Ohm) (E1254A)
E1255-61601	I/O Cable 550mm 100/200/400 MHz (50 Ohm) (E1255A)
E1256-61601	I/O Cable 900mm 100/200/400 MHz (50 Ohm) (E1256A)
E1256-61602	I/O Cable 2000mm 100/200/400 MHz (50 Ohm) (E1257A)
E1222-01211	Spring-Clips, to secure I/O cables to I/O boards
E1222-42350	Pogo-Pin Block

PMU Board

Part Number	Part Description
E1213-69501	PMU-Board
E1222-66515	Serializing Board
E1213-61601	PMU Cable 30V
E1212-61601	DC-Rail (Short)

Miscellaneous Cables

Part Number	Part Description
E1265-61601	BNC-Cable BNC/POGO 50 MHz
E1266-61601	BNC-Cable BNC/POGO 200 MHz
E1222-61607	Wordmask Cable
8120-3446	HP-IB Cable 2m
E1212-61601	DC-Rail (Short)
E1222-61605	DC-Rail (Long)
E1213-61601	PMU Cable 30V
E1269-61601	Utility-Line Cable (0.5 metre)
E1269-61602	Utility-Line Cable (1 metre)
E1269-61603	Utility-Line Cable (1.5 metre)
E1242-61604	Manual Probe I/O Bd. Cable, also used for calibration

Fuses and Relays

Part Number	Part Description
0490-1598	Relay REED-DC (black)
0490-1413	Relay 1C 5V DC-AC
0837-0435	Multifuse 3A (Utility Lines Sequencer Bd.)
0490-1546	Relay 5V DC 2A (yellow) - selects PMU

Part Number	Part Description
E1215-69500	High Speed Width Generator (HSWG)
E1215-61680	HSWG Cable (red), I/O Board to HSWG
E1215-61685	HSWG Cable (red), HSWG to DUT
E1215-61681	HSWG Cable (white), I/O Board to HSWG
E1215-61686	HSWG Cable (white), HSWG to DUT
E1215-61682	HSWG Cable (blue), I/O Board to HSWG
E1215-61687	HSWG Cable (blue), HSWG to DUT

General

Part Number	Part Description
E1220-04125	Pogo Panel Miniframe
E1220-04126	Cover
E1220-66501	Motherboard
E1221-66501	Motherboard Extender
E1220-66502	Termination for Extender Connector

Cooling

Part Number	Part Description
3160-0584	Fan, 24V DC
E1220-45201	Outside Fan Housing (foam)[1]
E1220-45202	Inside Fan Housing (foam) for Master
E1220-45203	Inside Fan Housing (foam) for Extender

1 Two required.

Power

Part Number	Part Description
9100-4800	Power Transformer
3105-0103	Circuit Breaker
E1220-66504	Power Option Board
E1260-61601	DPS cable
0957-0044	Power Supply Multi-Output
0957-0045	Power Supply Single-Output
E1220-61601	Cable Kit, Option Board to Power Supply (short)
E1220-61602	Cable Kit, Option Board to Power Supply (long)
E1220-61603	Cable Assy, Power Option Board to Trafo
2110-0360	Fuse 0.75A

DUT Interface

Part Number	Part Description
E1220-60101	DUT-Interface
E1220-04125	Pogo Block Frame

General

Part Number	Part Description
40118-00001	Bracket, 1000mm
E1222-00604	Front Support (supports the BNC Rail)
E1222-00605	BNC Rail
E1225-01250	Bracket Top HOIZ
E1225-01251	Tie-Together, Front
E1222-64103	Top Front Cover Assembly
E1222C #I06	Left and right side panel (2 panels !!) (—>Sales order only)
E1222C #I07	Top Cover Assy (—>Sales order only)

Card-Cage

Part Number	Part Description
E1222-65201	Card-Cage
E1222-66501	VME-Motherboard
E1222-66502	HF-Motherboard
E1222-00202	Side Panel (right)
E1222-60202	Side Panel (left)
E1222-03102	Board Guide (middle)
E1222-03103	Board Guide (rear)
E1222-63101	Board Guide (front)
E1222-02301	Backpanel Holder for Motherboard
E1222-02302	Holder for Power Supply Modules
E1222-01202	Rear Bracket for Card-Cage Connection
E1222-64112	Front Air Shield (top)
E1222-64113	Front Air Shield (middle)
E1222-64114	Front Air Shield (bottom)
E1222-04109	Internal Air Shield

Cooling, Lower Front

Part Number	Part Description
E1222-02308	Keeper Fan Chassis
E1222-02310	Angle Assembly
E1222-23704	Card-Cage Stiffener
E1222-61602	Cable from PCM to Fans
E1222-00101	Fan Chassis
E1222-88501	Radial Fan A (Clockwise Rotation)
E1222-88502	Radial Fan B (Anti-Clockwise Rotation)
E1222-44602	Fan Grille (Plastic)
E1222-02305	Filter Frame
E1222-01203	Fan Bracket, Right
E1222-01204	Fan Bracket, Left
0624-0324	Screws, TPG 4-20
1520-0261	Shock-Absorber, 25mm
1390-0036	Fastener Panel
3150-0562	Air Filter

Cooling, Lower Rear

Part Number	Part Description
E1222-61602	Cable from PCM to Fans
E1222-60204	Fan Chassis
E1222-02306	Filter Frame
E1222-01204	Fan Bracket, Left
E1222-01204	Fan Bracket, Right
0360-1737	Barrier Block, 12 Pole
0361-1737	Snap Rivet
1520-0261	Shock-Absorber, 25mm
3150-0563	Air Filter
3160-0567	FAN Propeller axial 220V
8120-2641	Cable (1m) from Barrier Block to Fan
0362-0317	Lug CRP22
E1222-02304	Fan Holder

Power

Part Number	Part Description
E1222-65203	Power Control Module (PCM)
E1222-61610	Cable Assy External Power
E1222-01209	Frame for Line Filters
E1222-04106	Rear Panel for PCM
E1222-04107	Top Panel for PCM
E1222-62703	Line Filter Assembly
E1222-66505	Power Option Board
E1222-66509	Trip Coil Board
3105-0260	Circuit Breaker
9100-4767	Transformer for PMU/Fans
2110-0843	Fuse 30A 500V
2110-0303	Fuse 2A (option board)
2110-0201	Fuse 250V 0.25 A (trip-coil board)
E1222-61601	Cable from PCM to PSMs
E1231-69551	Power Supply Module
3105-0234	Emergency Switch Off (EMO) Button
E1222-61609	EMO Cable
3105-0261	EMO Contact Block

DUT Interface

Part Number	Part Description
E1204-60110	Top and Bottom Frame (assembled)
E1222-66508	Ground Plate (gold)
E1223-03253	Top Frame Swivel Limiter
E1223-05150	Hinge
E1223-26150	Hinge Pin
E1223-26152	Clamp Pin
1460-1450	Spring for Pressure Frame locking mechanism
E1223-09150	Snapper DUT Bd.
E1261-22355	DPS Pogo Block
E1261-61601	DPS Cable (short)
E1261-61611	DPS Cable (long)
E1261-61621	DPS Cable, External Testhead
1400-1509	DPS Pogo Pin (single)
1400-1508	DPS Pogo Pin Sleeve
E1261-26155	DPS Pogo Block Holder (Hex Nut)
1400-1699	Pack of 50 DUT Pogo Pins
E1225-04152	Pogo Frame (vertical)
E1226-04150	Pogo Frame (horizontal)
E1204-60110	Top and Bottom Frame (assembled)
E1223-60201	90° DUT Interface (beauty) Cover
E1223-00552	90° DUT Interface Right Side Panel
E1223-00553	90° DUT Interface Left Side Panel
E1224-64103	45° DUT Interface (beauty) Cover - Single Mainframe
E1224-00556	45° DUT Interface Right Side Panel - Single Mainframe
E1224-00557	45° DUT Interface Left Side Panel - Single Mainframe
E1224-00558	45° DUT Interface Bottom Panel - Single Mainframe

Continued on the next page.

DUT Interface (continued)

Part Number	Part Description
E1225-60250	45° DUT Interface (beauty) Cover - Double Mainframe
E1225-00560	45° DUT Interface Right Side Panel - Double Mainframe
E1225-00561	45° DUT Interface Left Side Panel - Double Mainframe
E1225-00562	45° DUT Interface Bottom Panel - Double Mainframe
E1226-60251	45° DUT Interface (beauty) Cover - Triple Mainframe
E1222-64103	Top Front Cover Assembly

General

Part Number	Part Description
E1202-04101	Side panels
E1222C #I07	Top Cover Assy (—> Sales order only)
E1202-04701	Mount for Front Panels
12679-20001	Instrument guide rail
E1261-61611	DPS Cable Assy (long)
E1202-61606	Cable from PCM to PSM (Long)
E1202-61609	PMU Cable Assy
E1222-61602	Fan Cable Assy
8120-1752	Power Cable for Upper Instruments 2.3m
8120-1860	Power Cable for Lower Instruments
8120-3445	HP-IB Cable 1m
8120-3446	HP-IB Cable 2m

Card-Cage

Part Number	Part Description
E1222-65201	Card-Cage
E1222-66501	VME-Motherboard
E1222-66502	HF-Motherboard
E1222-00202	Side Panel (right)
E1222-60202	Side Panel (left)
E1222-03102	Board Guide (middle)
E1222-03103	Board Guide (rear)
E1222-63101	Board Guide (front)
E1222-02301	Backpanel Holder for Motherboard
E1222-02302	Holder for Power Supply Modules
E1222-01202	Rear Bracket for Card-Cage Connection
E1222-64112	Front Air Shield (top)
E1222-04113	Front Air Shield (middle)
E1222-64114	Front Air Shield (bottom)
E1222-04109	Internal Air Shield
E1222-23704	Card-Cage Stiffener

Cooling, Lower Front

Part Number	Part Description
E1222-02308	Keeper Fan Chassis
E1222-02310	Angle Assembly
E1222-61602	Cable from PCM to Fans
E1222-00101	Fan Chassis
E1222-88501	Radial Fan A (Clockwise Rotation)
E1222-88502	Radial Fan B (Anti-Clockwise Rotation)
E1222-44602	Fan Grille (Plastic)
E1222-02305	Filter Frame
E1222-01203	Fan Bracket, Right
E1222-01204	Fan Bracket, Left
0624-0324	Screws, TPG 4-20
1520-0261	Shock-Absorber, 25mm
1390-0036	Fastener Panel
3150-0562	Air Filter

Cooling, Lower Rear

Part Number	Part Description
E1222-61602	Cable from PCM to Fans
E1222-60204	Fan Chassis
E1222-02306	Filter Frame
E1222-01204	Fan Bracket, Left
E1222-01204	Fan Bracket, Right
0360-1737	Barrier Block, 12 Pole
0361-1737	Snap Rivet
1520-0261	Shock-Absorber, 25mm
3150-0563	Air Filter
3160-0567	FAN Propeller axial 220V
8120-2641	Cable (1m) from Barrier Block to Fan
0362-0317	Lug CRP22
E1222-02304	Fan Holder

Cooling, Upper Front (Two Card-Cage Maxiframe)

Part Number	Part Description
0361-1291	Snap rivet (holding axial fans)
3150-0597	Air filter
E1202-61608	Cable Assy for Upper Fans
E1222-61602	Cable Assy for Lower Fans
E1222-88501	FAN Radial A

Cooling, Upper Rear (Two Card-Cage Maxiframe)

Part Number	Part Description
3160-0567	Fan, axial 220V
3150-0563	Air filter rear
0361-1291	Snap rivet (holding axial fans)
8120-2641	Cable Assy 1m Propeller Connection
0362-0317	Lug CRP22
E1222-02304	Fan Holder

Power

Part Number	Part Description
E1202-65241	Power Control Module (PCM) #OE5
E1202-65242	Power Control Module (PCM) #OED
E1202-65243	Power Control Module (PCM) #OEF
0400-0335	NUT PG 21
0400-0337	Grommet (Cable Clamp) 13/18 mm[1][2]
0400-0355	Grommet (Cable Clamp) 18/25 mm[3]
8120-3444	HP-IB Cable 0.5m
E1202-62703	Line Filter Assy
E1202-66505	Power Option Board
E1202-61603	Cable-Set, non-soldered cables
E1202-61604	Cable-Set, soldered cables
2110-0007	Fuse 1A 250V
2110-0202	Fuse 0.5A 250V
2110-0303	Fuse 2A FER
2110-0395	Fuse 10A 250V
E1231-69551	Power Supply Module
3105-0234	Emergency Switch Off (EMO) Button
E1222-61609	EMO Cable
E1222-61610	Cable Assy Extender EMO Short
3105-0261	EMO Contact Block
E1202-00201	PCM Rear Panel, Option OED (Japan)[2]
E1202-00202	PCM Rear Panel, Option OE5 (Europe)[1]
E1202-00203	PCM Rear Panel, Option OEF (USA)[3]
3105-0265	Circuit Breaker, 3 Pole, Options OED and OEF (Japan and USA)[2][3]
3105-0264	Circuit Breaker, 4 Pole, Option OE5 (Europe)[1]
0360-1755	Barrier-Block, Option OEF (USA)[3]
0360-1094	Barrier-Block End, Option OEF (USA)[3]

1 Needed when changing to power option OE5 (Europe).

2 Needed when changing to power option OED (Japan).

3 Needed when changing to power option OEF (USA).

DUT Interface

Part Number	Part Description
E1261-22355	DPS Pogo Block
E1261-61601	DPS Cable (short)
E1261-61611	DPS Cable (long)
E1261-61621	DPS Cable ,External Testhead
1400-1509	Pogo Pin (single)
1400-1508	DPS Pogo Pin Sleeve
E1261-26155	DPS Pogo Block Holder (Hex Nut)
E1225-04152	Pogo Frame (vertical)
E1226-04150	Pogo Frame (horizontal)
E1222-66508	Ground Plate (gold)
1460-1450	Spring for Pressure Frame locking mechanism
E1223-09150	Snapper DUT Bd.
E1204-60110	Top and Bottom Frame (assembled)
E1202-04101	Side cover frame
E1202-00510	Angle Top
E1202-00501	DUT Interface Right Side Panel - Single Maxiframe
E1202-00502	DUT Interface Left Side Panel - Single Maxiframe
E1202-04105	DUT Interface (beauty) Cover - Single Maxiframe
E1205-00507	DUT Interface Right Side Panel - Double Maxiframe
E1205-00508	DUT Interface Left Side Panel - Double Maxiframe
E1205-04120	DUT Interface (beauty) Cover - Double Maxiframe
E1205-02304	Mount for DUT Interface Cover
E1205-00511	DUT Mounting Interface
E1205-00512	DUT Mounting Bottom

Part Number	Part Description
E1222-62107	Calibration Probe
E1222-62157	Calibration Probe tip
E1262-61602	Cable Extension
E1262-62101	Calibration Probe MATRIX
E1262-66504	Calibration DUT Board 100/200/400 MHz
E1263-66503	Calibration DUT Board 50 MHz
E1262-02351	Holder Calprobe (MUX-Probe)
E1222-02350	Holder Calprobe (Single Probe)

Part Number	Part Description
1390-0496	Spring loaded screw, M4*20 mm
1390-0494	Spring loaded screw M5*20 mm
0515-0131	NUT M5
0515-1970	Screw bolt M6*8
0515-1510	M5*6 mm
0515-1115	M4*0.7*12
0515-1117	M5*10 mm, Pozidrive Head
0515-1118	M5*15 mm Pozidrive head
0515-0898	M4*0.7 *6
0535-0023	Hex-nut M4*0.7
0535-0114	Snap on nut M5
0535-0131	Snap on nut M5 deeper
0515-0886	Screw M3*6 mm
8160-0392	EMI Fingers

The following table is an up-to-date list of available special options, dated August 1995. These parts are NOT set up at SMO/PCE, instead a sales order is necessary to get them.

Part Number	Part Description
E1202A #E01	Empty Maxiframe
E1202A #H01	Lower Card-Cage
E1202A #H02	Upper Card-Cage
E1202A #I06	Side Covers Maxiframe
E1202A #I07	Mounting Brackets Maxiframe
E1209B #H10	D40 Version of E1209B
E1212A #H01	Memory Upgrade A—> B
E1212B #H02	Used E1212B board
E1212B #H03	Used E1212B (strategic F.E.)
E1212B #H04	Used E1212B (strategic U.S.)
E1214A #H01	Memory Upgrade A—> B
E1222C #H01	Clock Bd. Upgrade M
E1222C #I06	Side Covers Standardframe
E1222C #I07	Top Cover for Standardframe
E1223A #T01	DUT Interface Kit, RAM
E1223A #T02	Pressure Frame
E1238A #M01	Mixed Signal DUT Bd. (DAC). Internal Orders only!
E1238A #M02	Mixed Signal DUT Bd. (ADC). Internal Orders only!
E1288A #H10	D40 System SW

D

Parts Drawings

This appendix contains exploded drawings of important mechanical parts, for the standardframe and maxiframe.

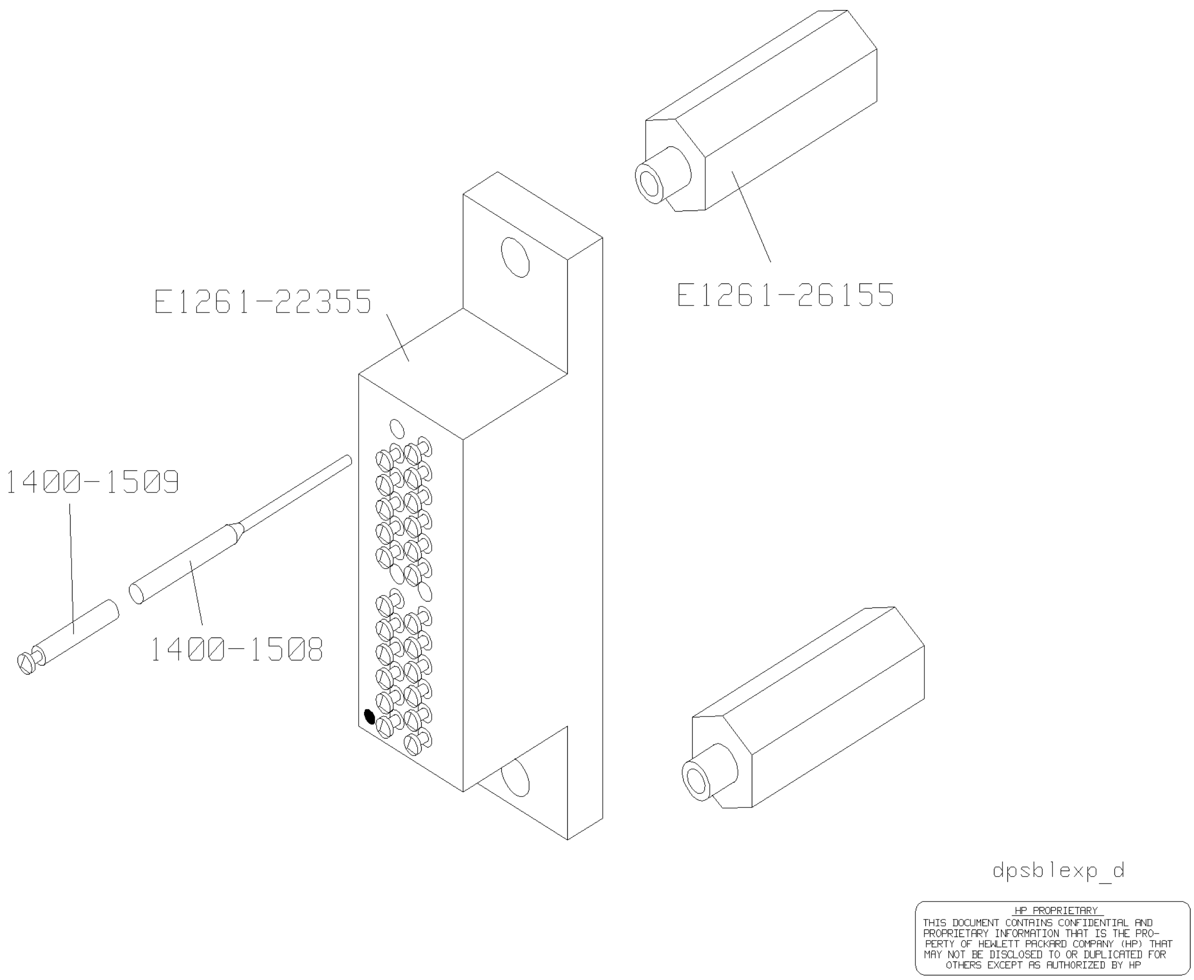


Figure D-1. Device Power Supply Pogo Block

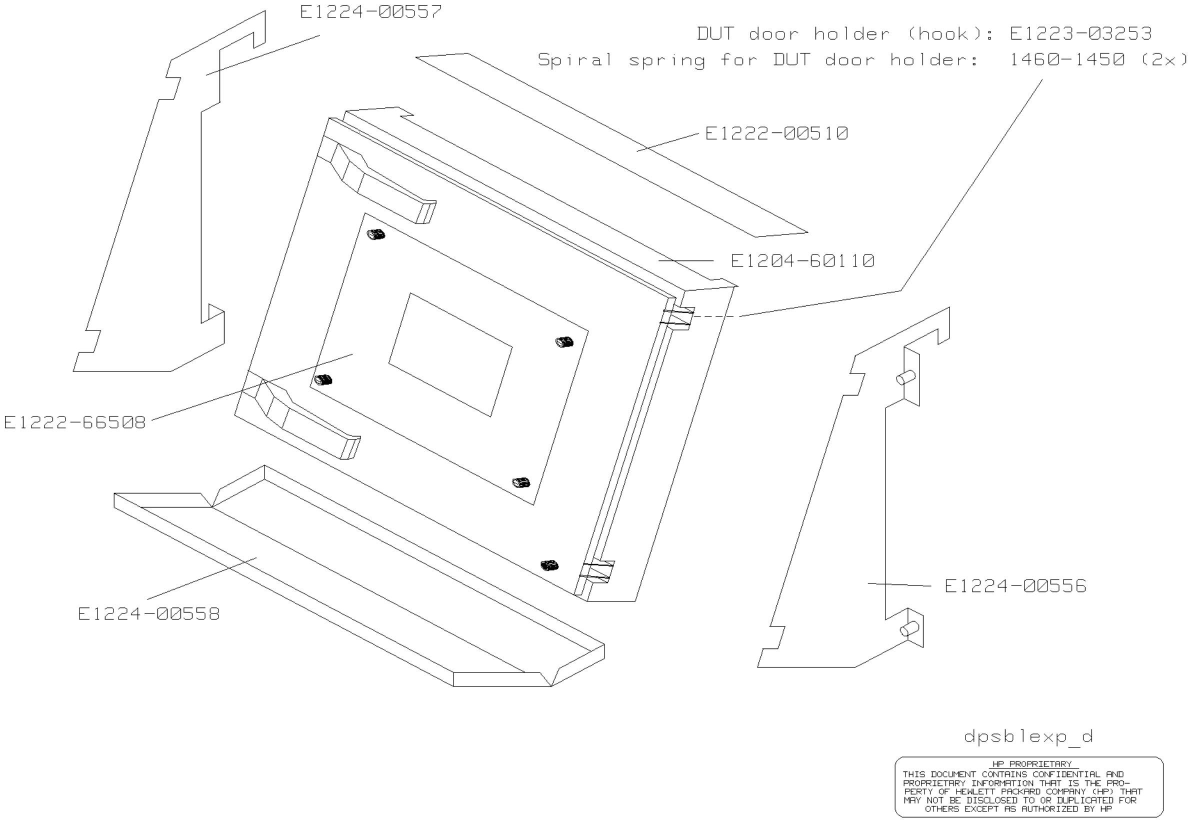


Figure D-2. DUT Interface Standardframe

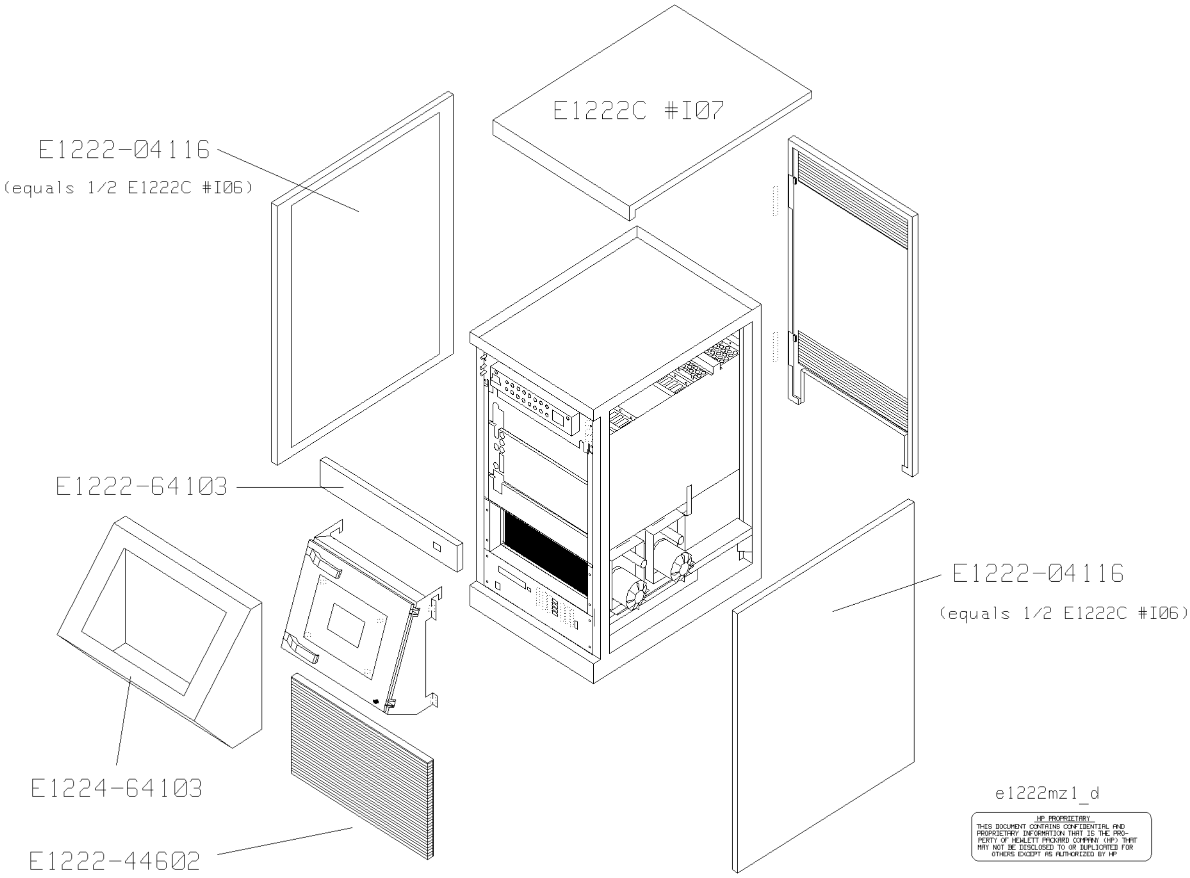


Figure D-3. Standardframe Covers

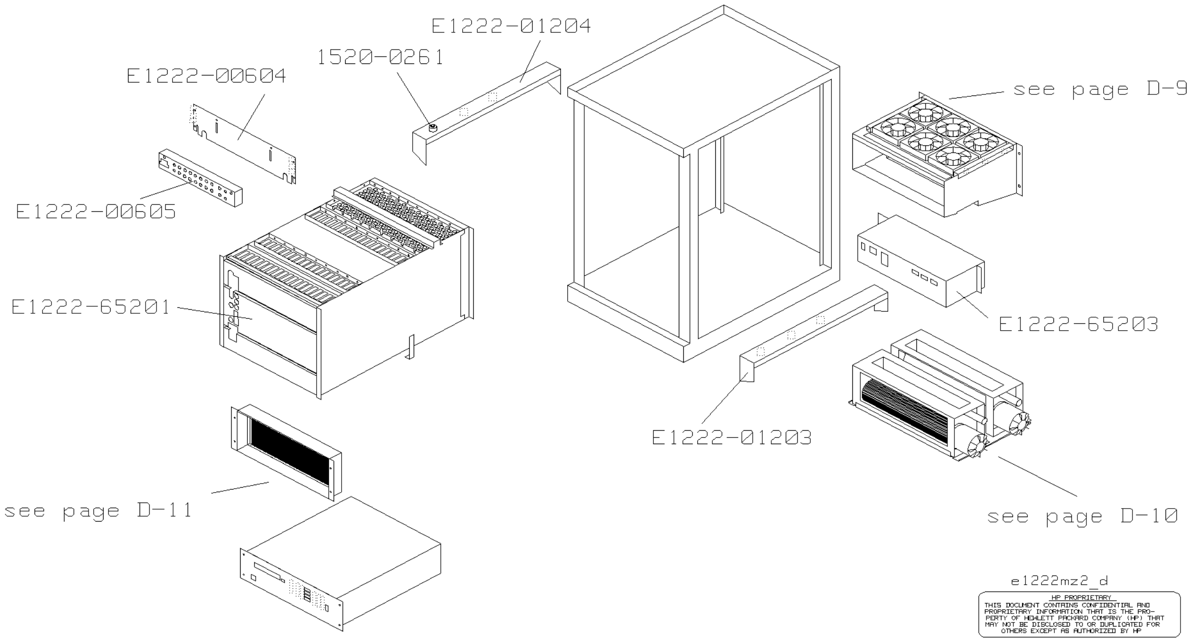


Figure D-4. Standardframe Internal Assys

Snap-in Holder (screwed) for Fan Grille: 1390-0816

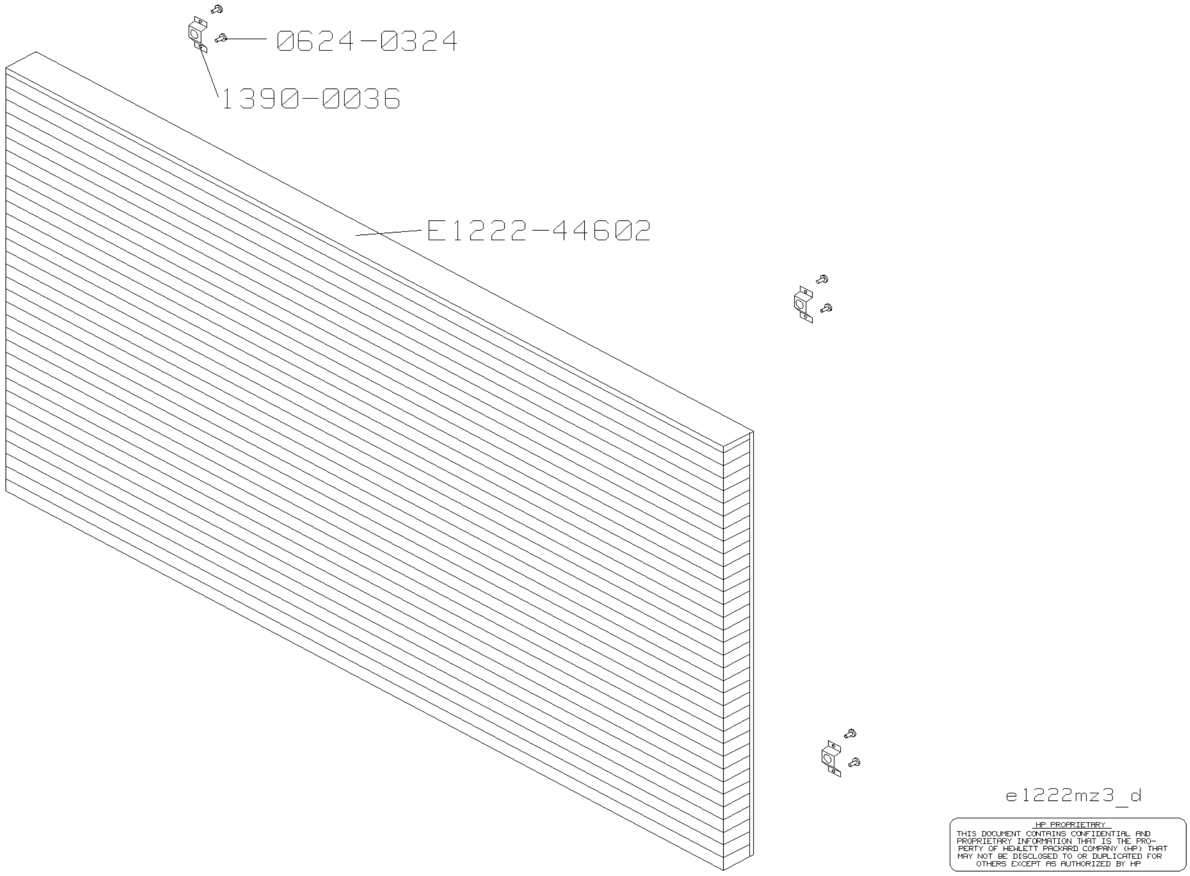


Figure D-5. Fan Grille

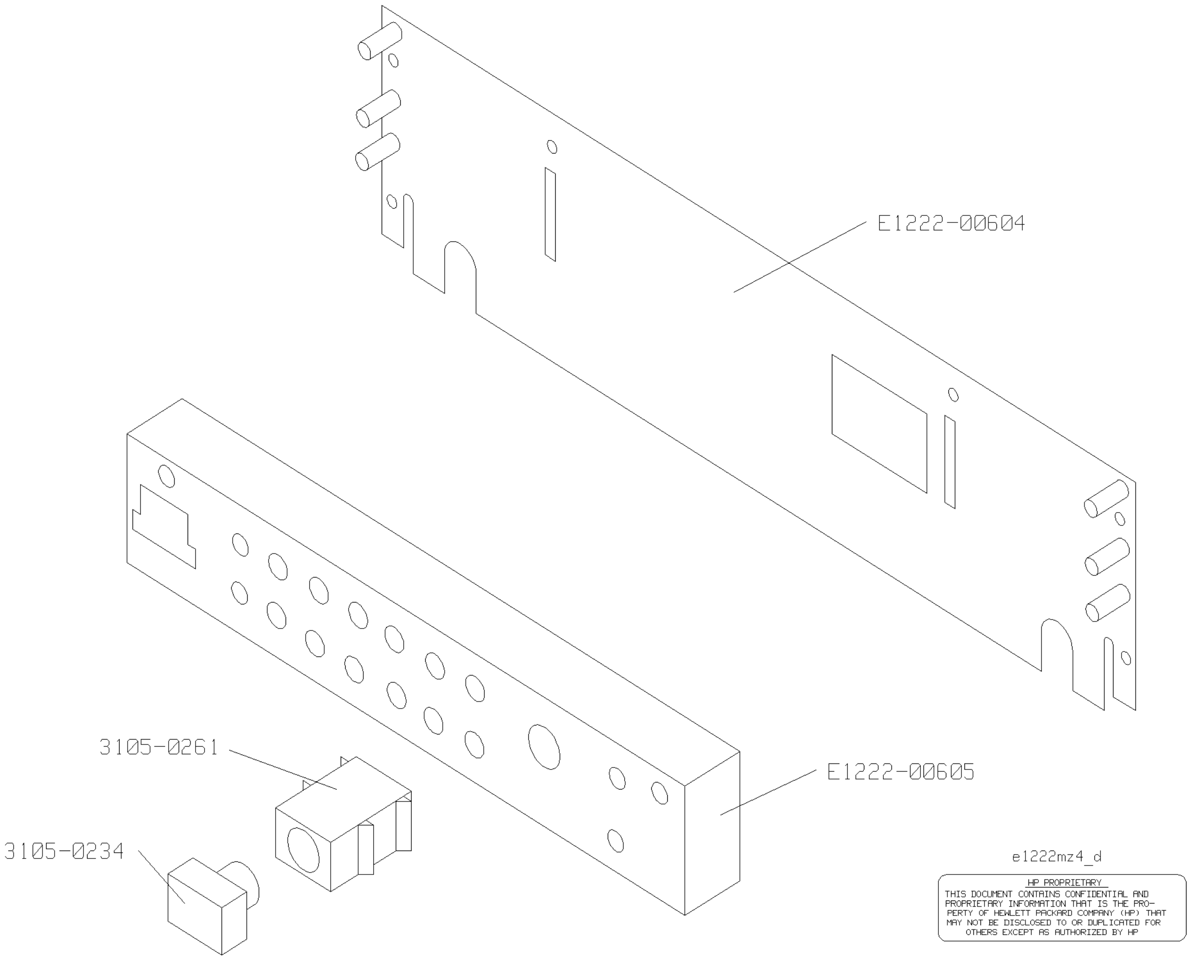


Figure D-6. Top Front Shield

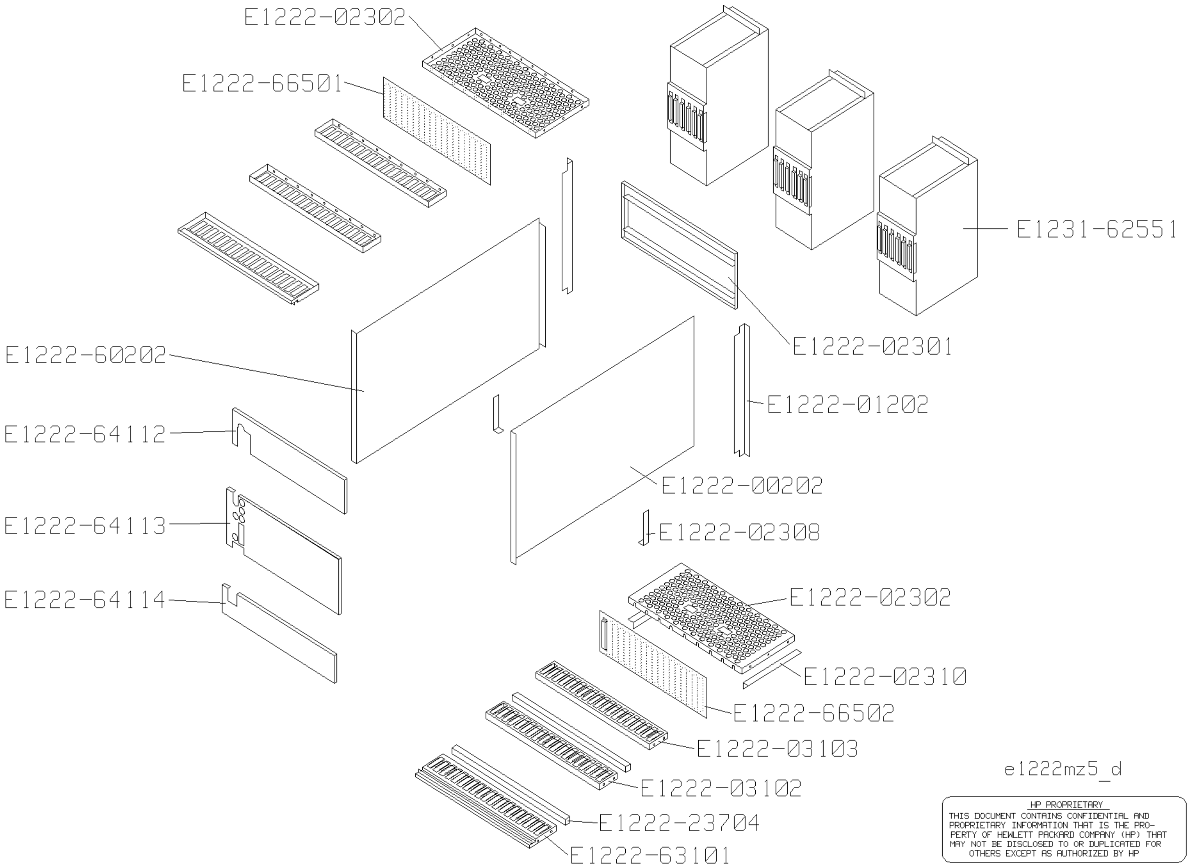


Figure D-7. Card Cage

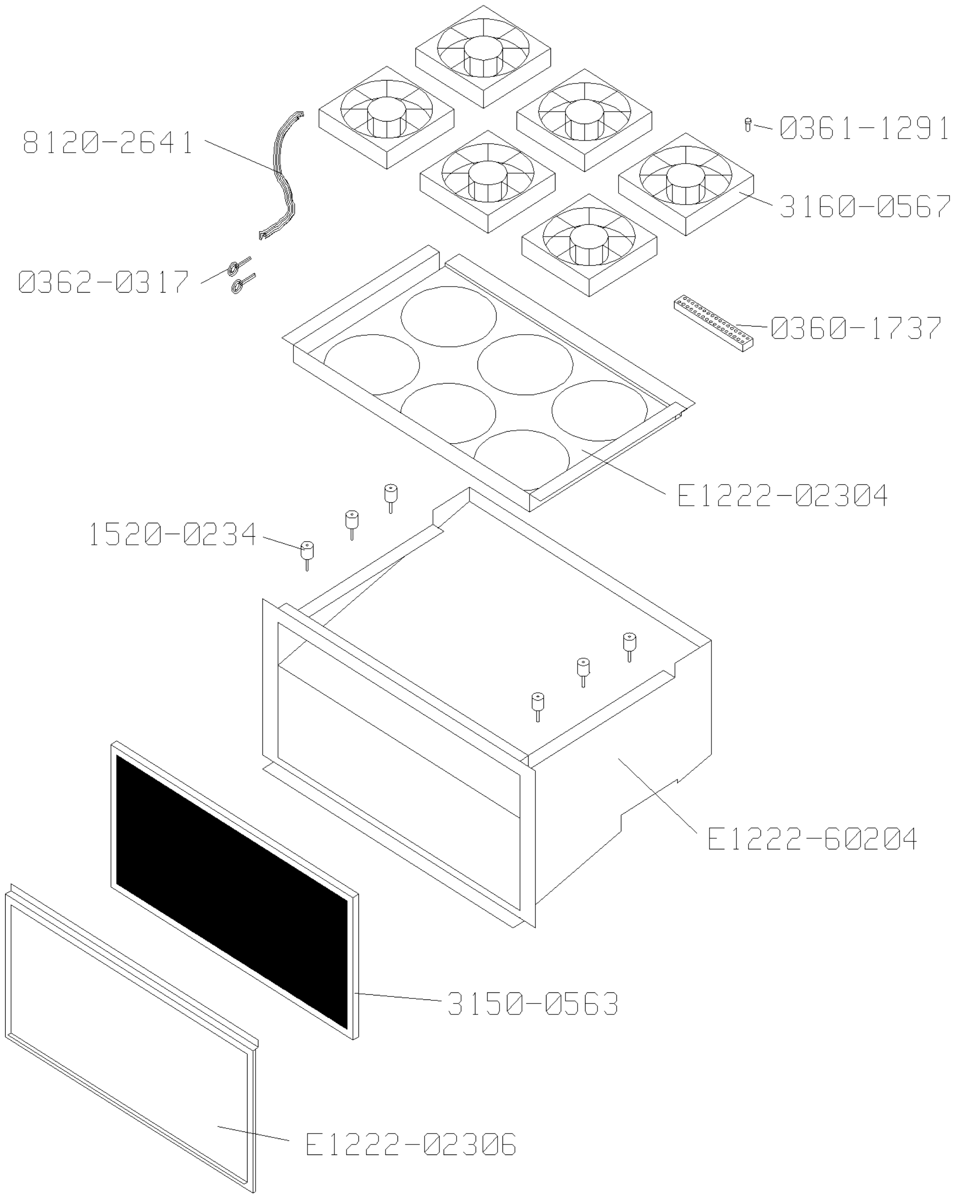


Figure D-8. Radial Fan Tray Assy

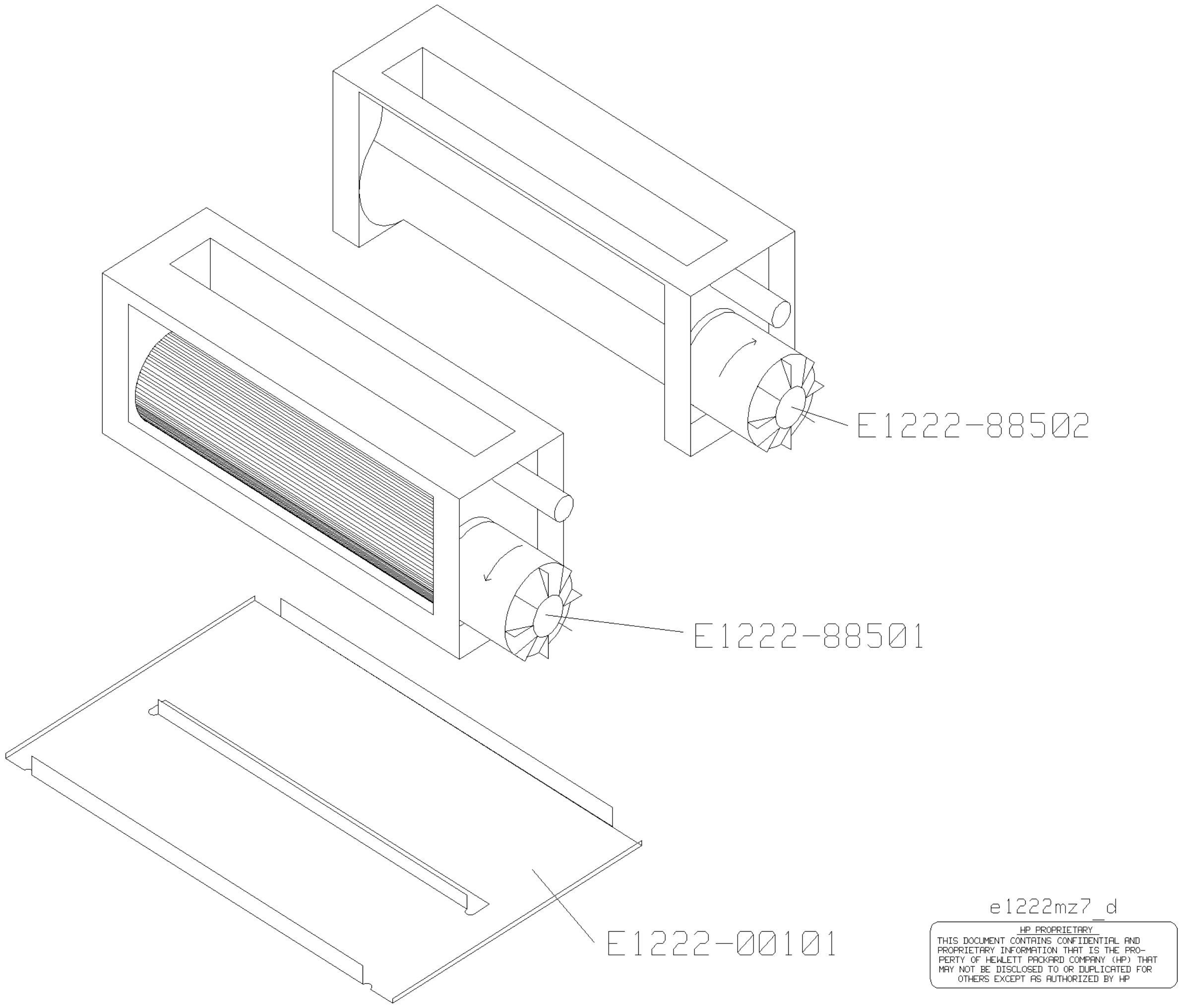


Figure D-9. Tangential Fan Assy

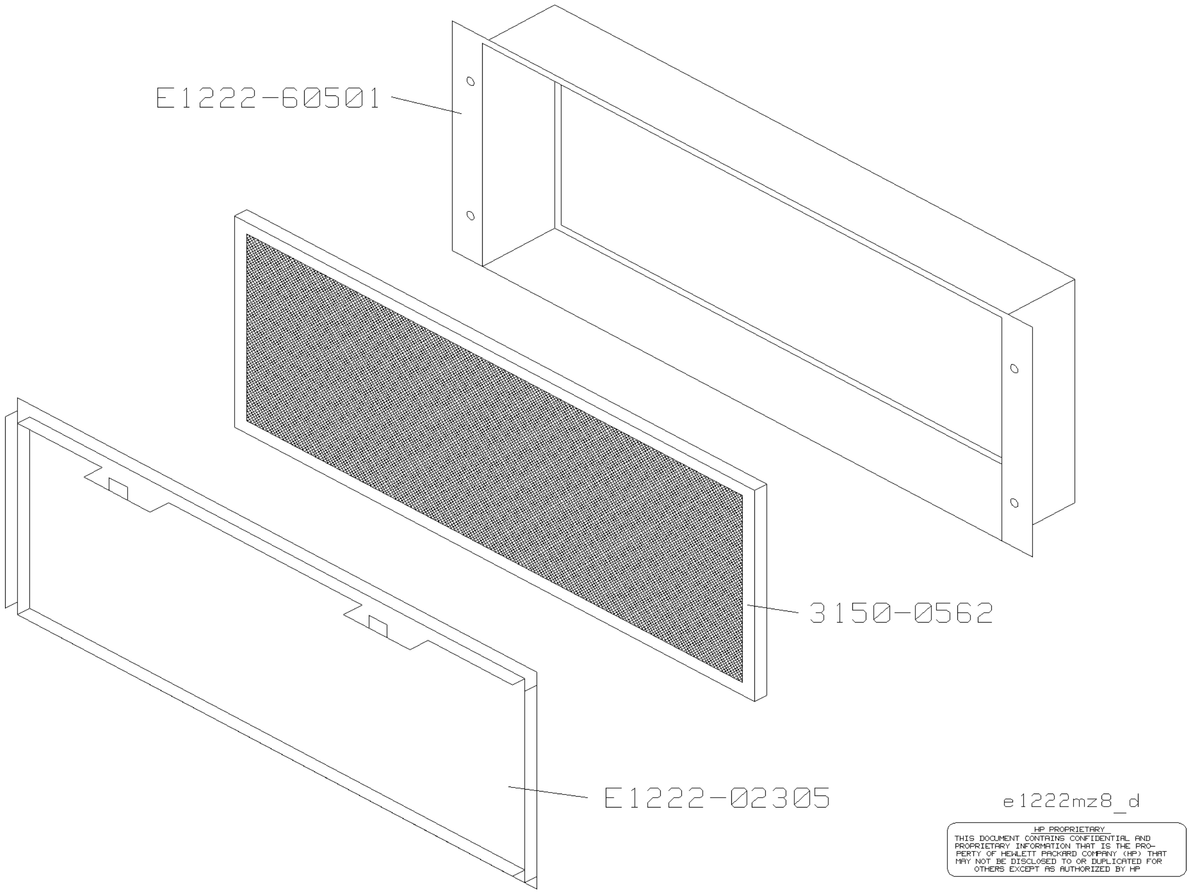


Figure D-10. Air Filter Assy

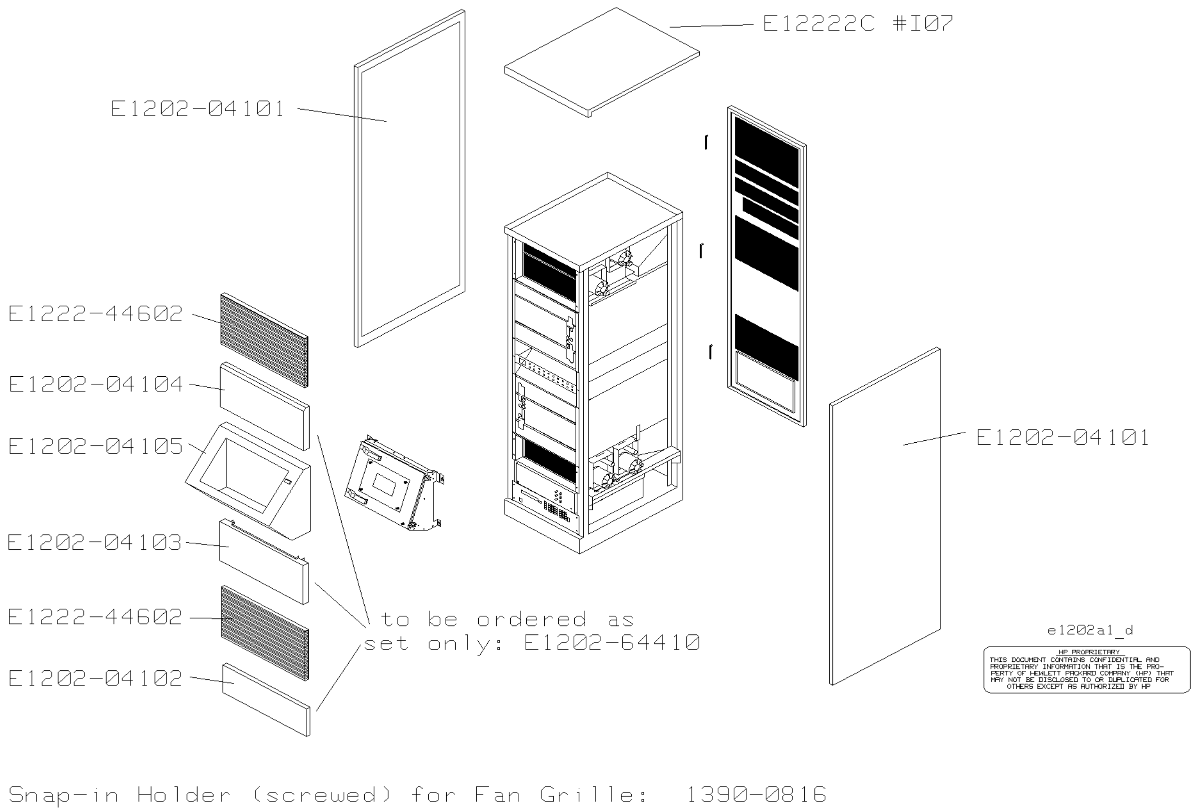


Figure D-11. E1202A Maxiframe Covers

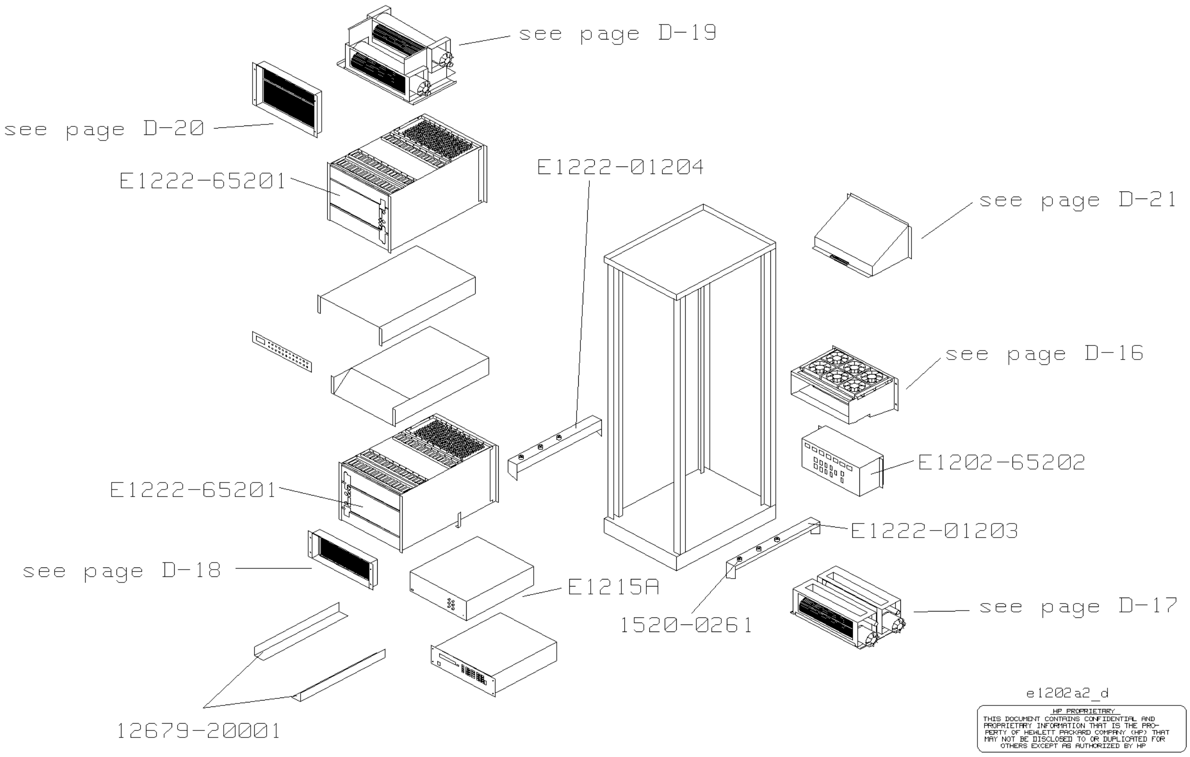


Figure D-12. E1202A Maxiframe Internal Assys

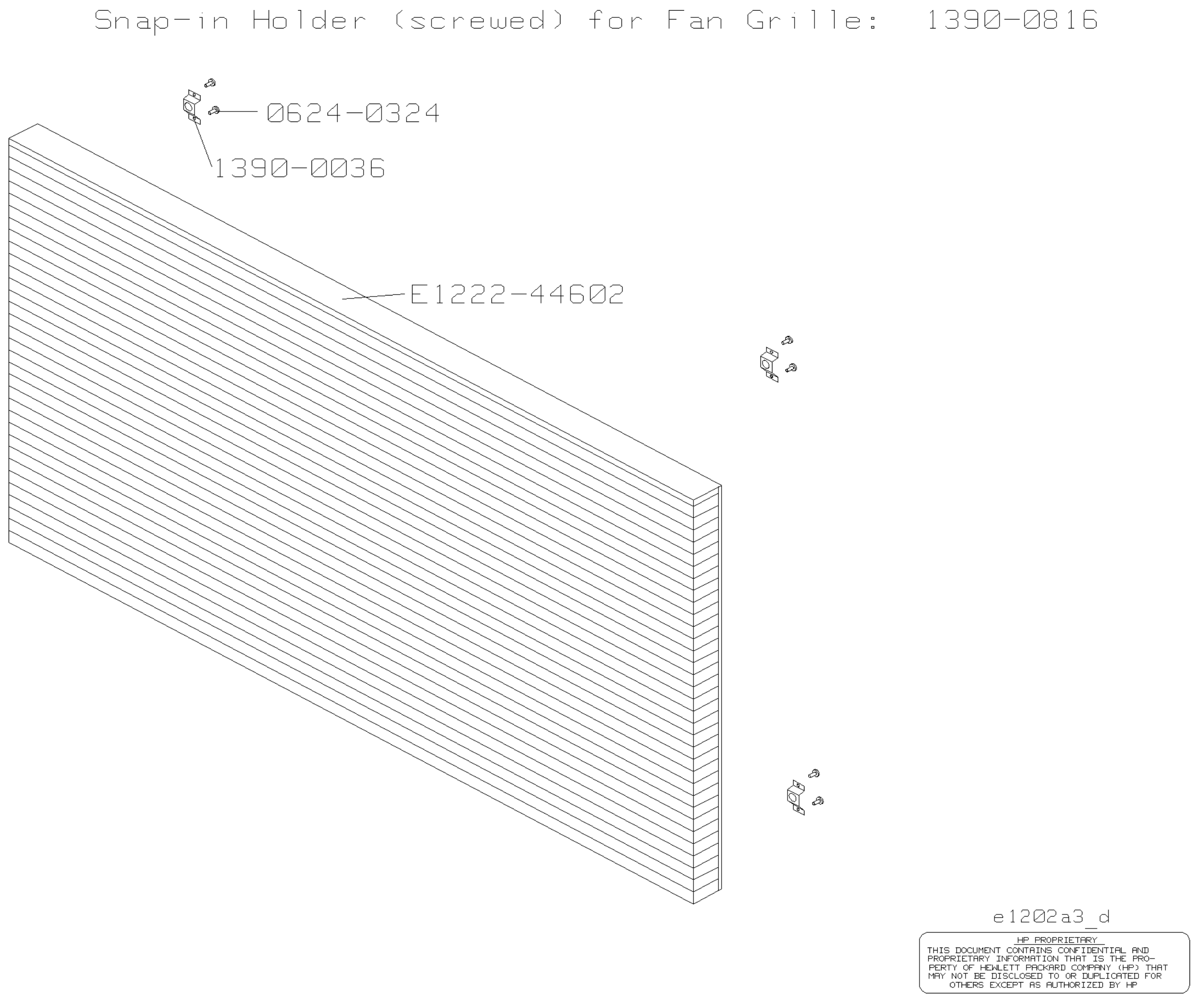


Figure D-13. Fan Grille

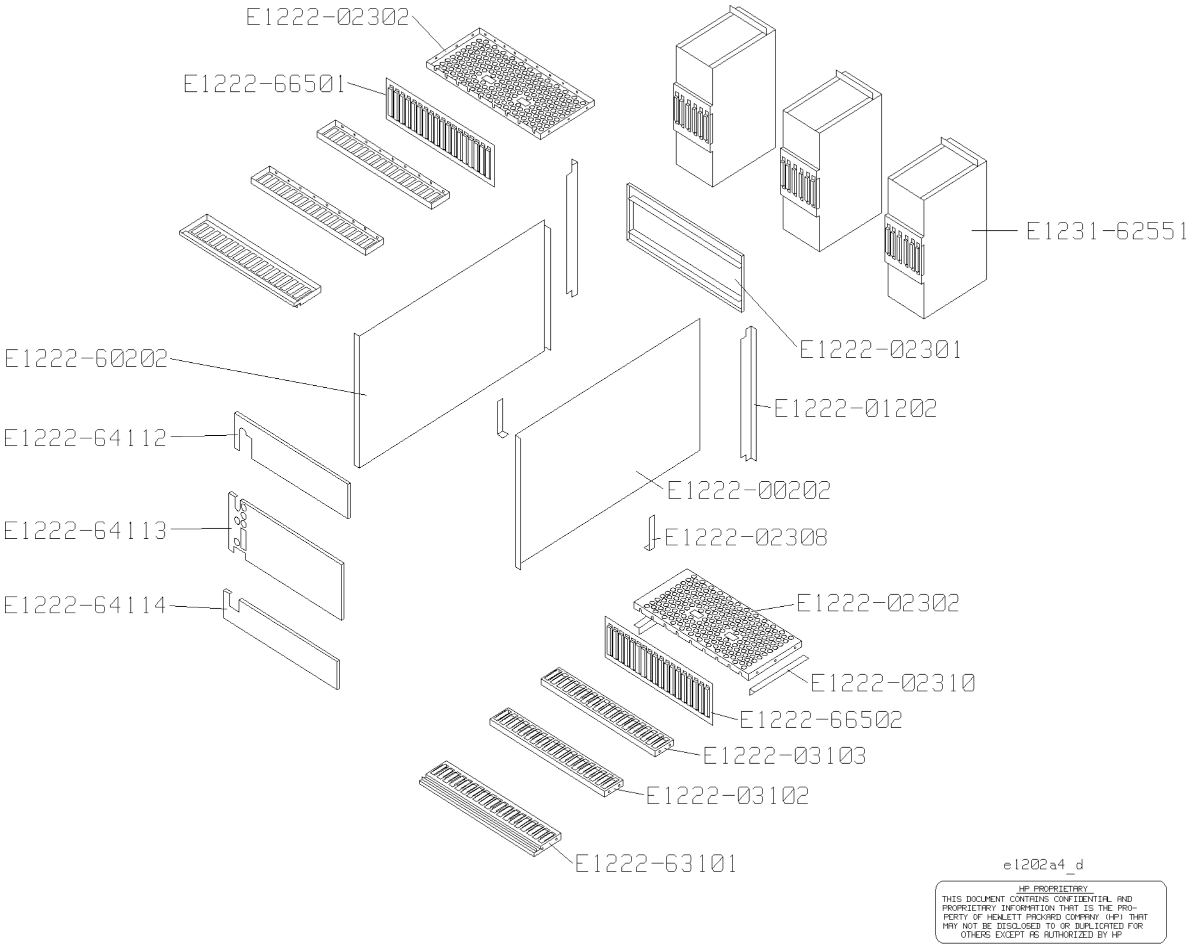


Figure D-14. Card Cage

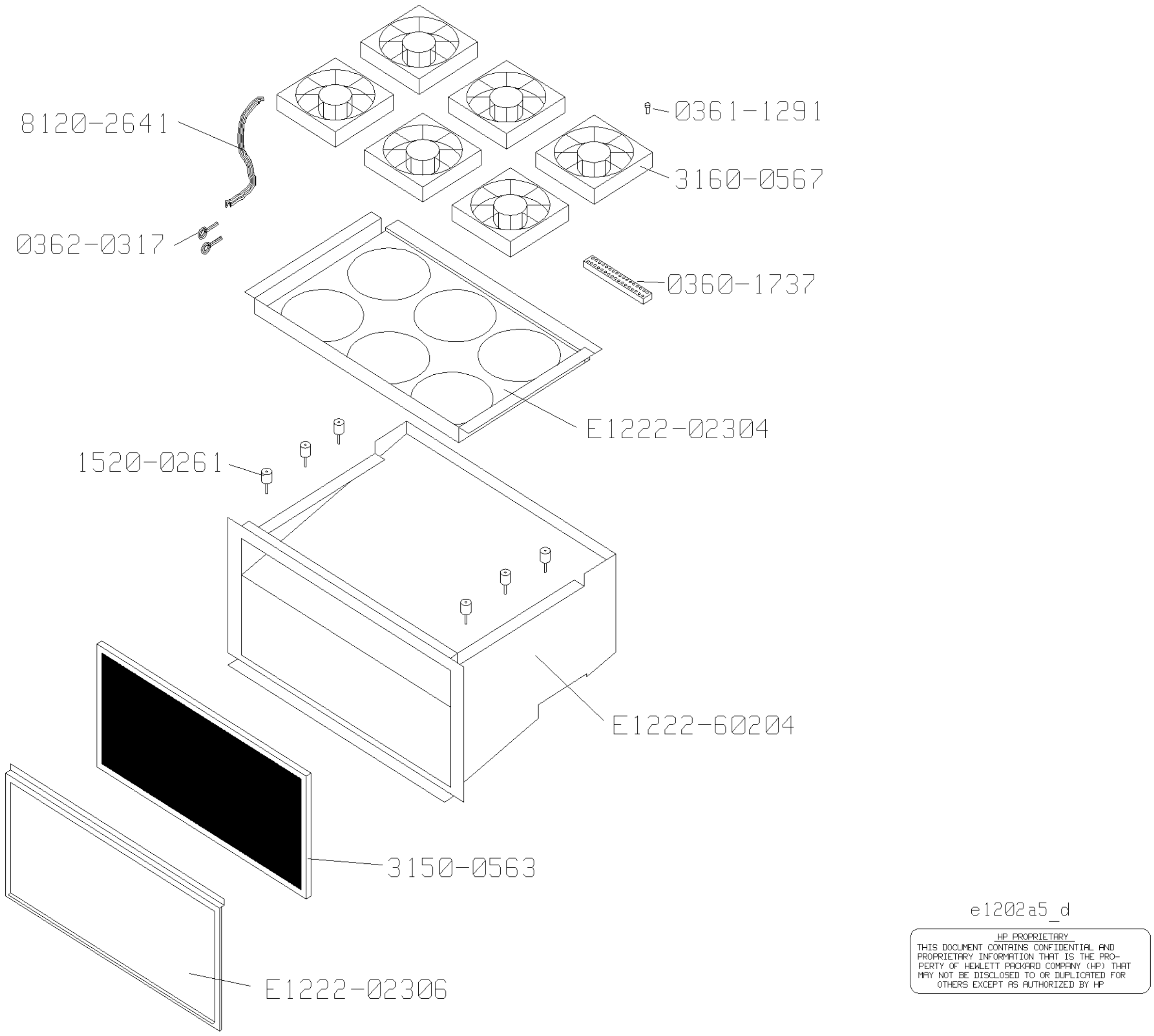


Figure D-15. Radial Fan Tray Assy

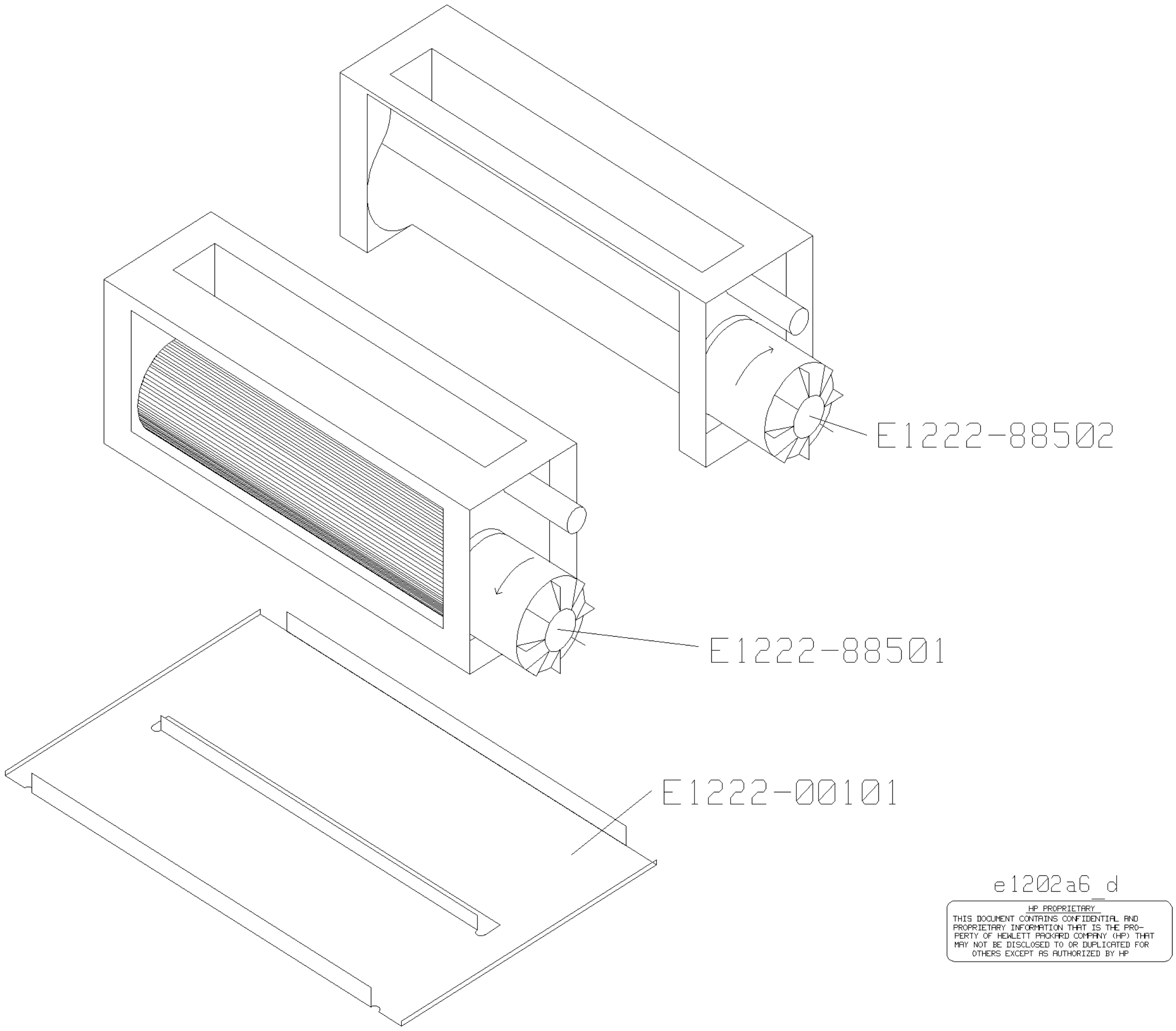


Figure D-16. Lower Tangential Fan Assy

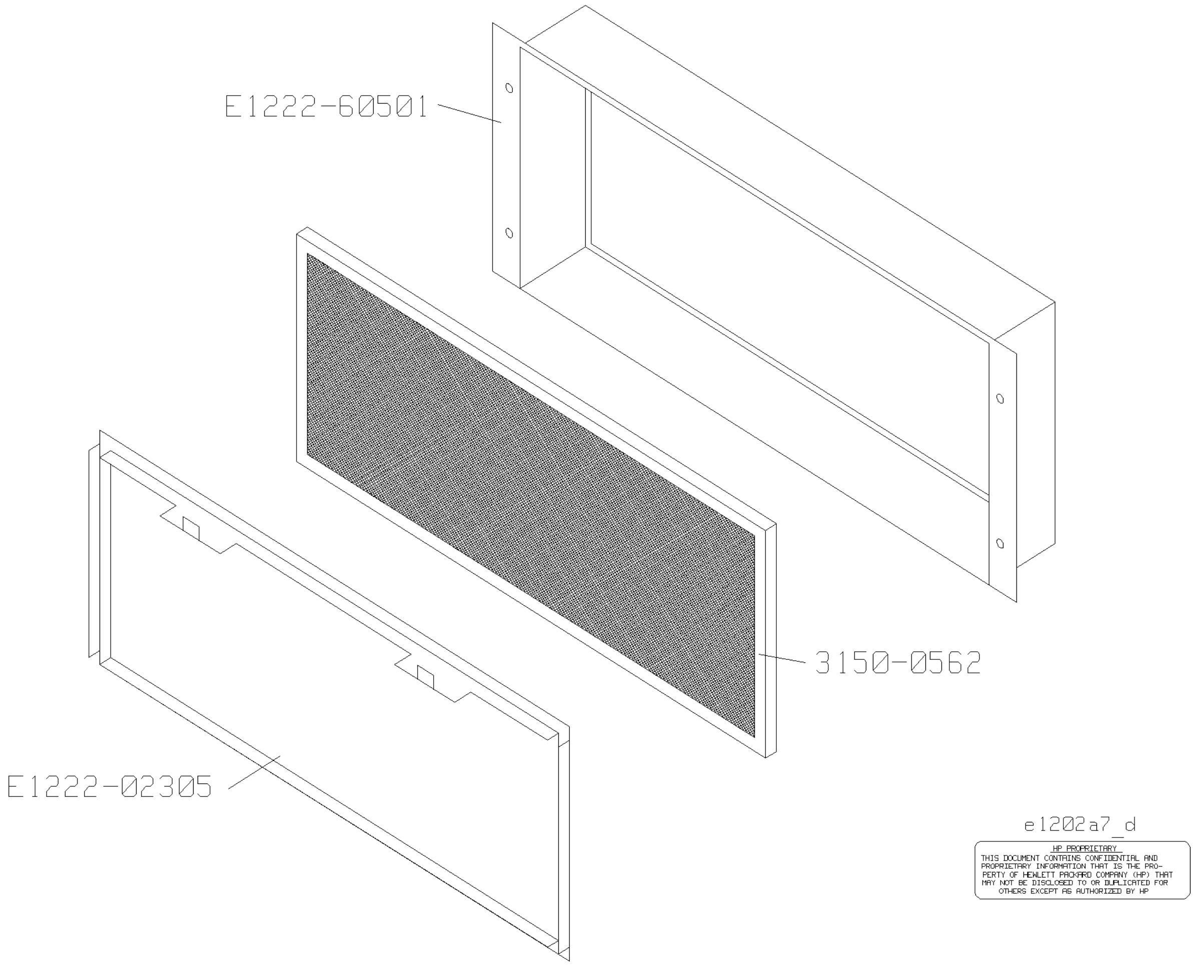


Figure D-17. Lower Air Filter Assy

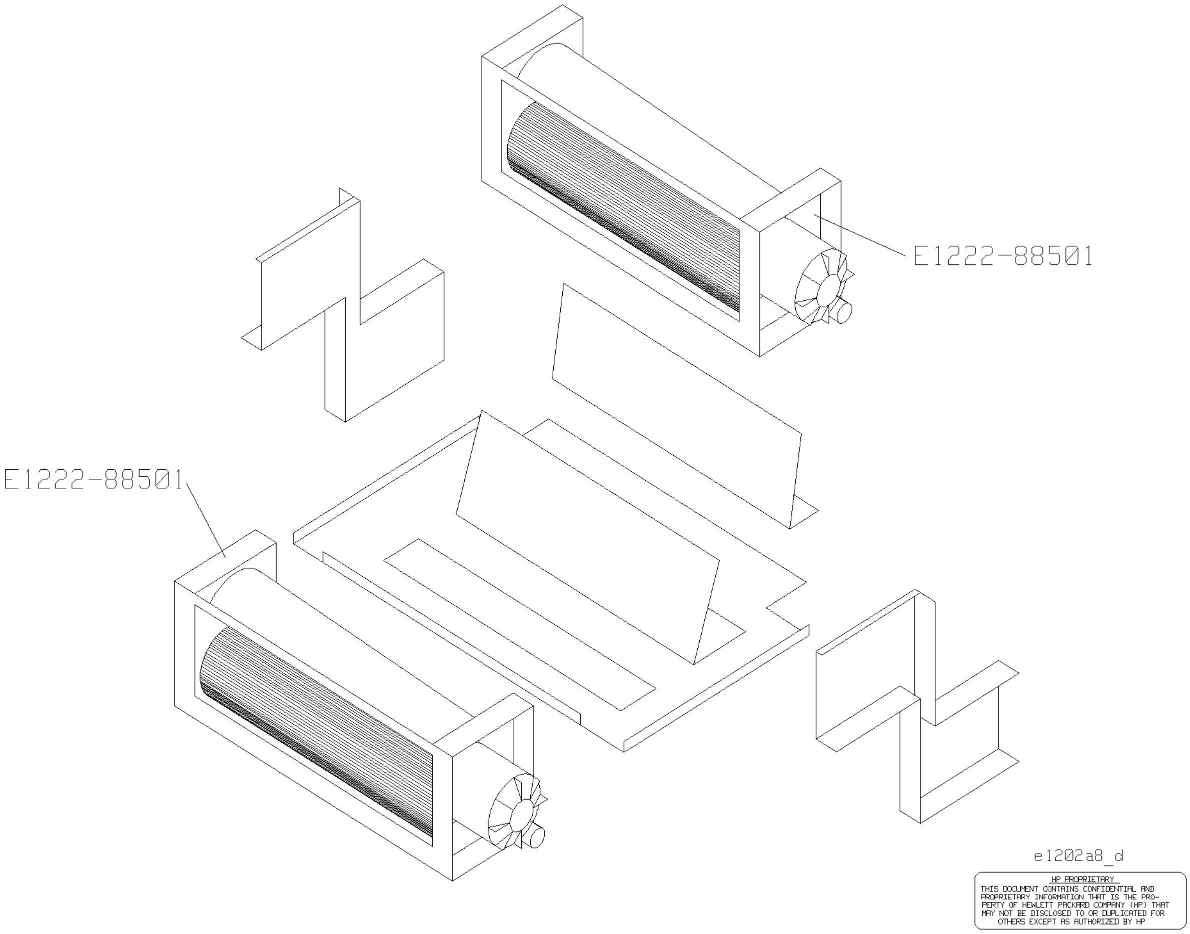


Figure D-18. Upper Tangential Fan Assy

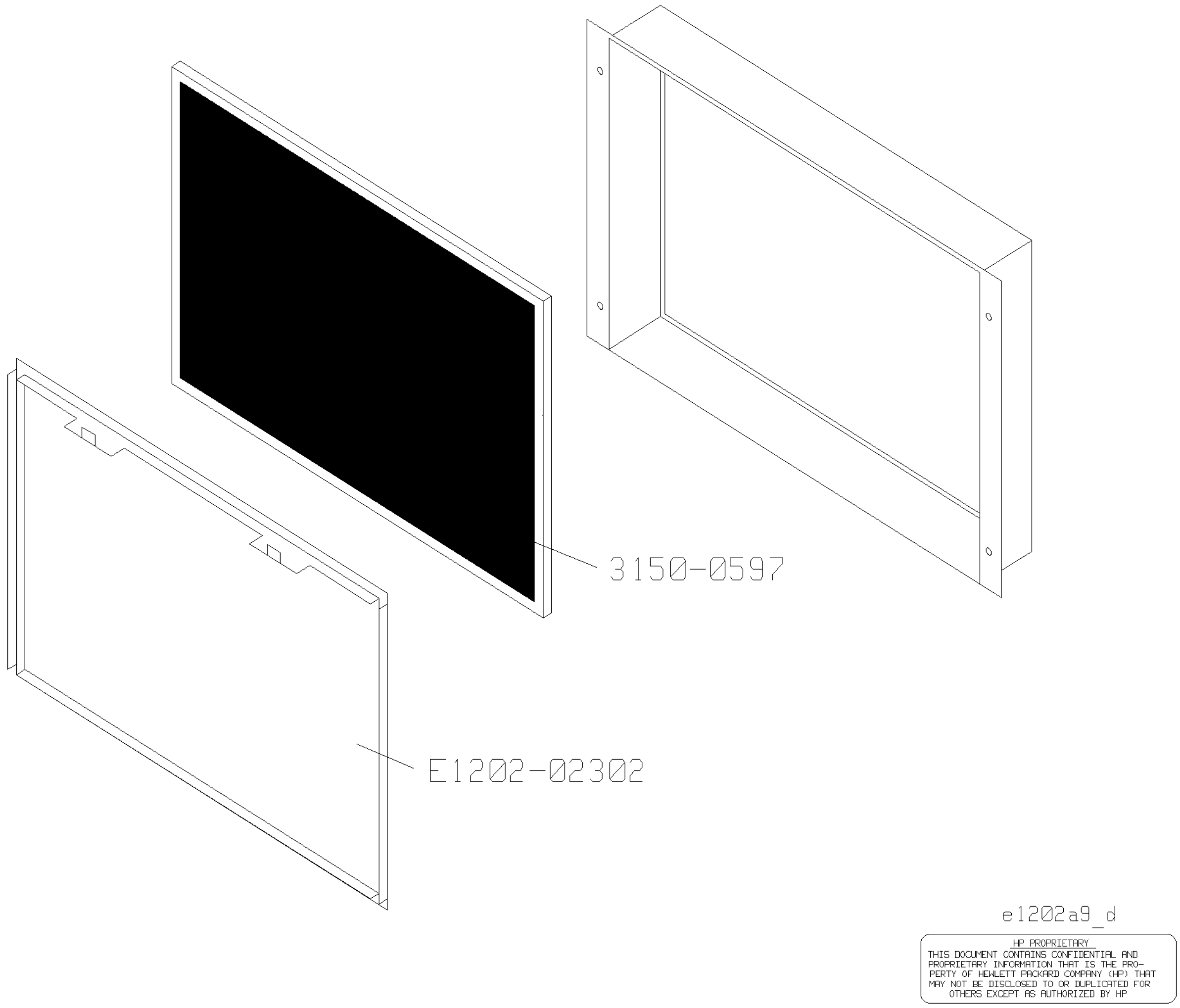


Figure D-19. Upper Air Filter Assy

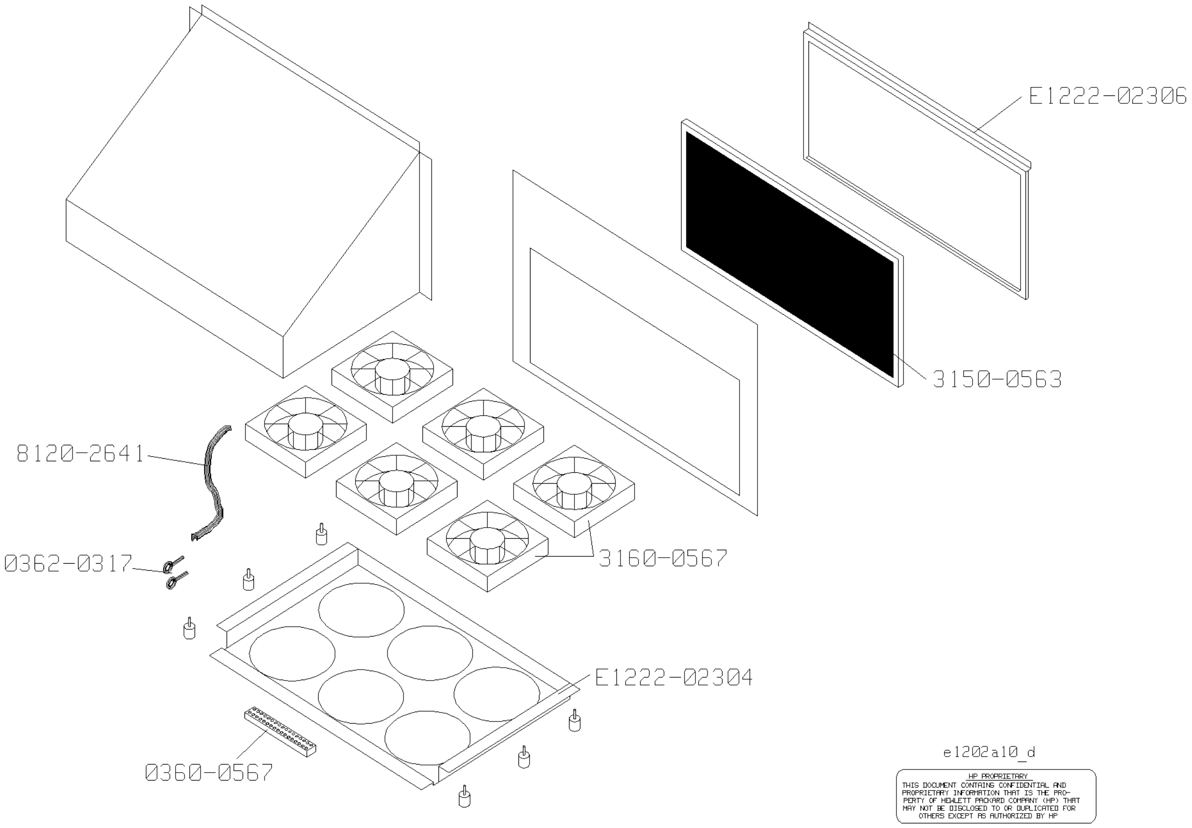


Figure D-20. Upper Radial Fan Tray Assy

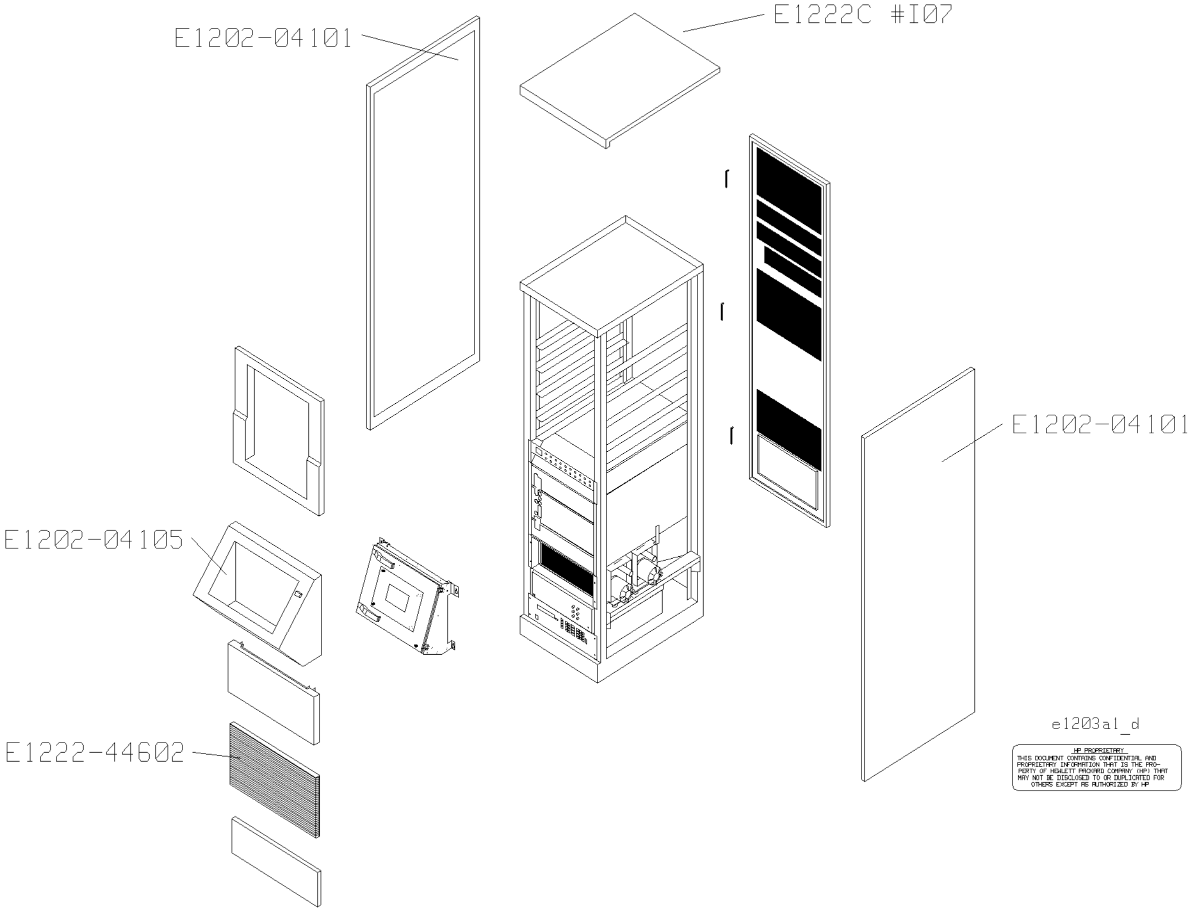


Figure D-21. E1203A Maxiframe Covers

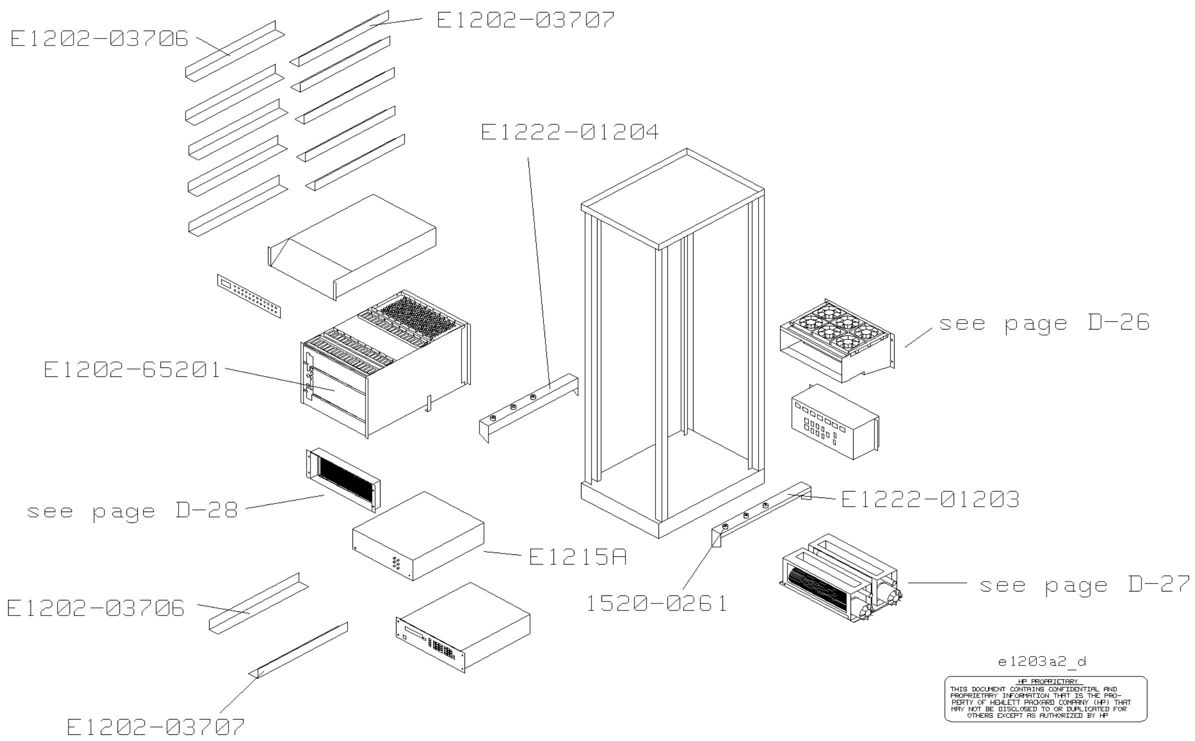


Figure D-22. E1203A Maxiframe Internal Assys

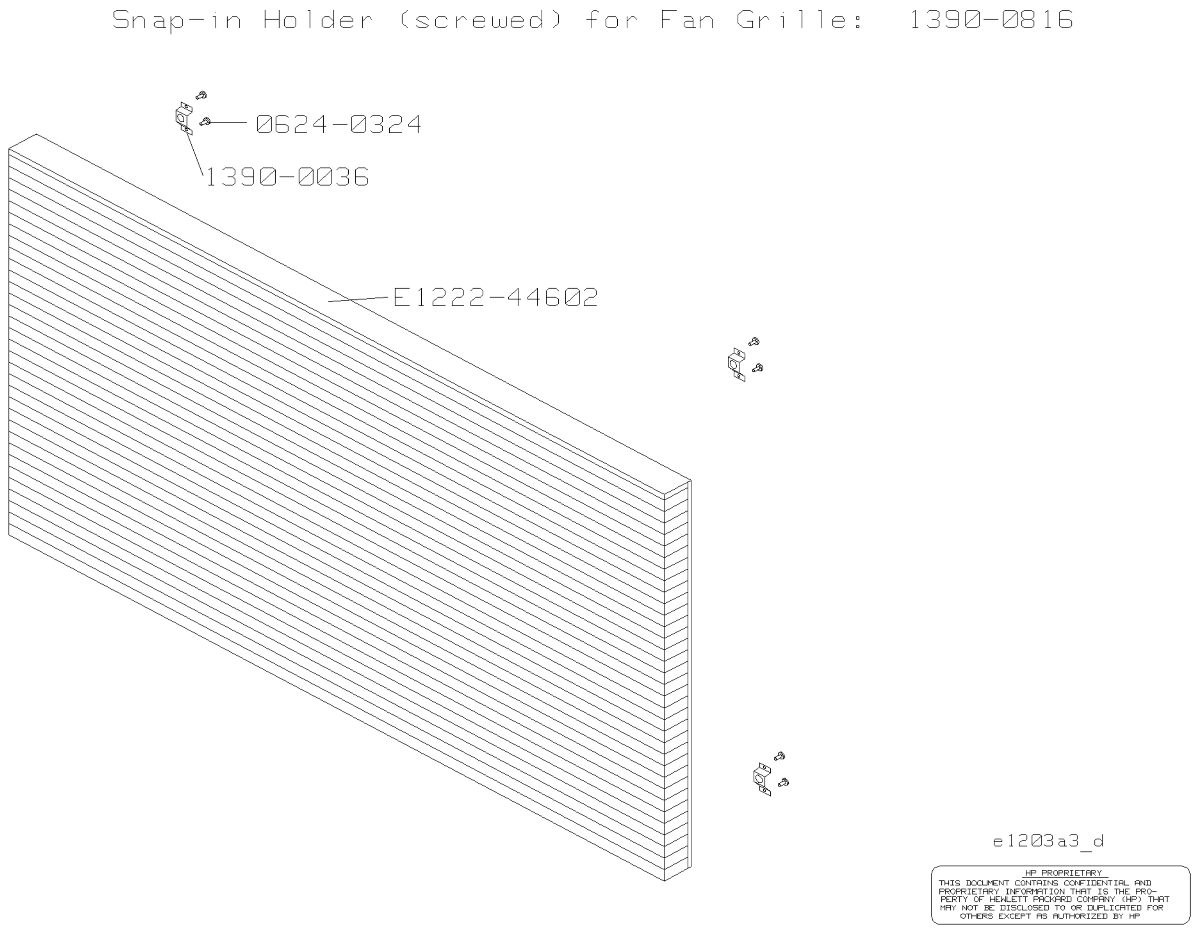


Figure D-23. Fan Grille

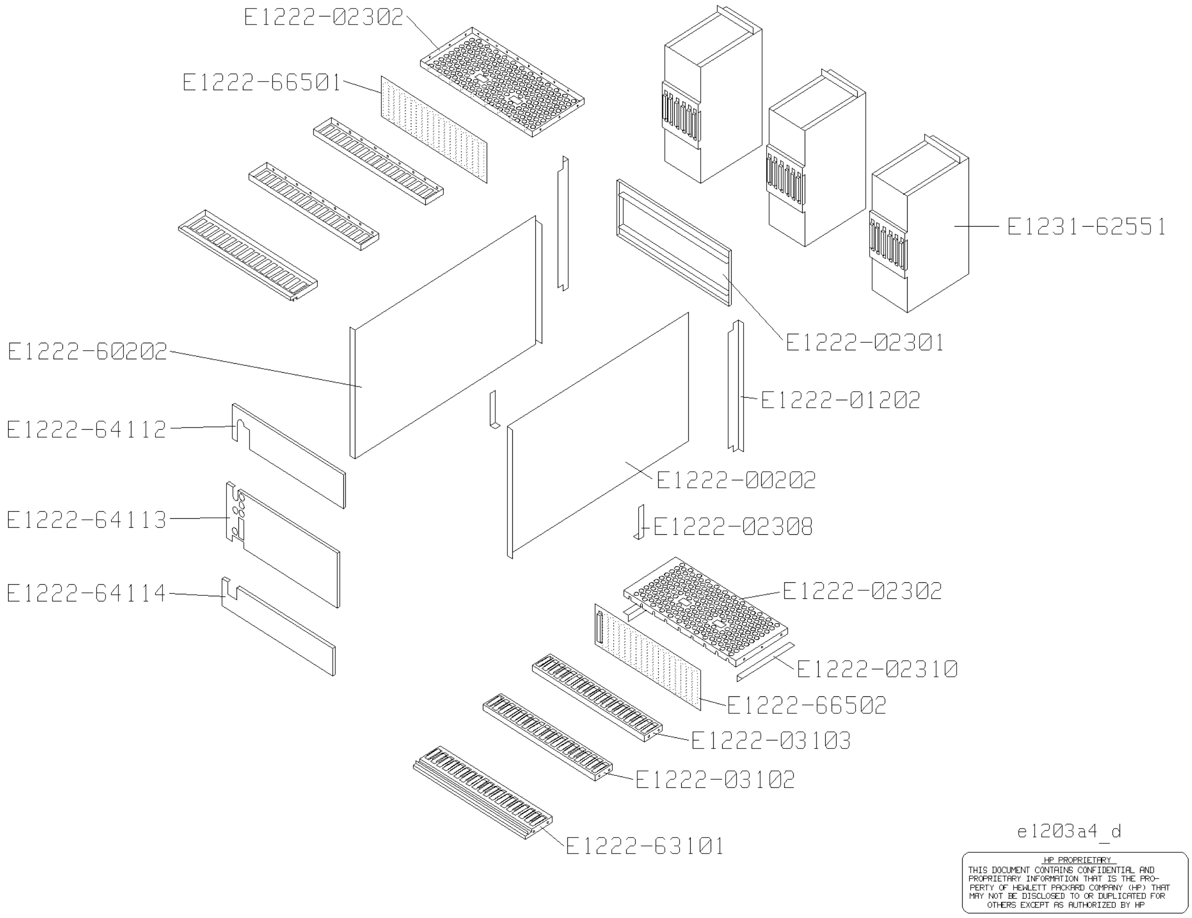


Figure D-24. Card Cage

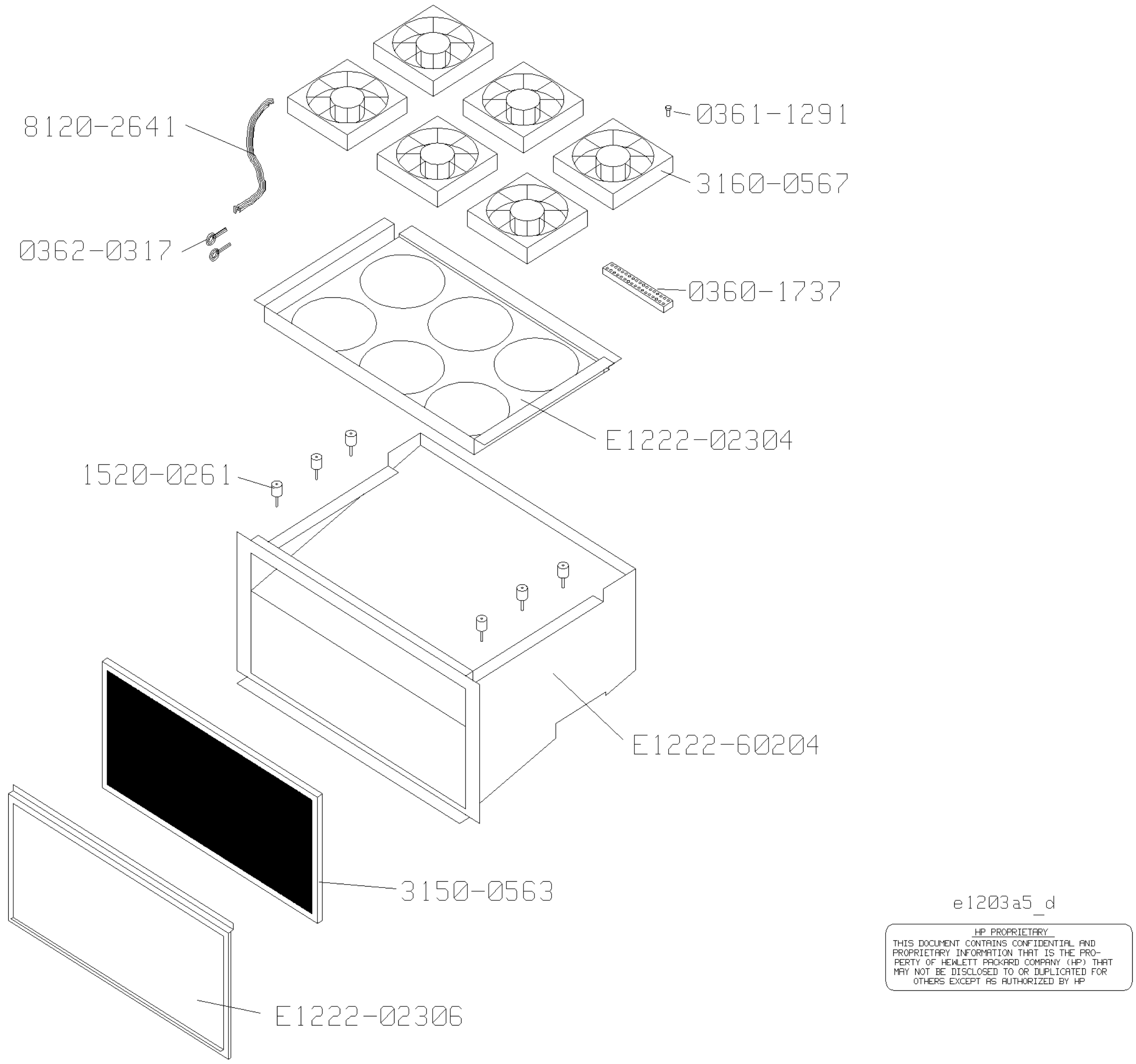


Figure D-25. Radial Fan Tray Assy

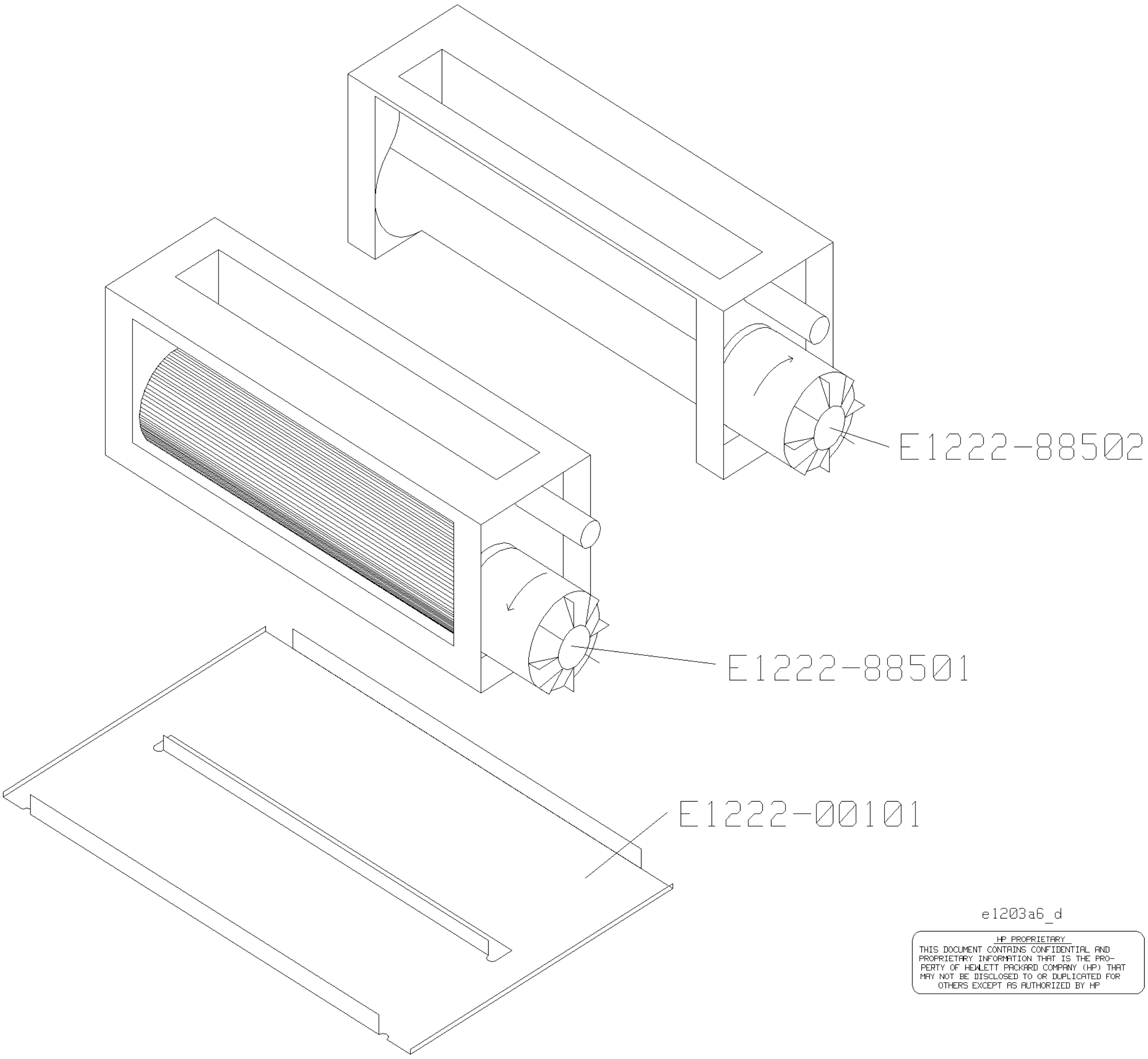


Figure D-26. Tangential Fan Assy

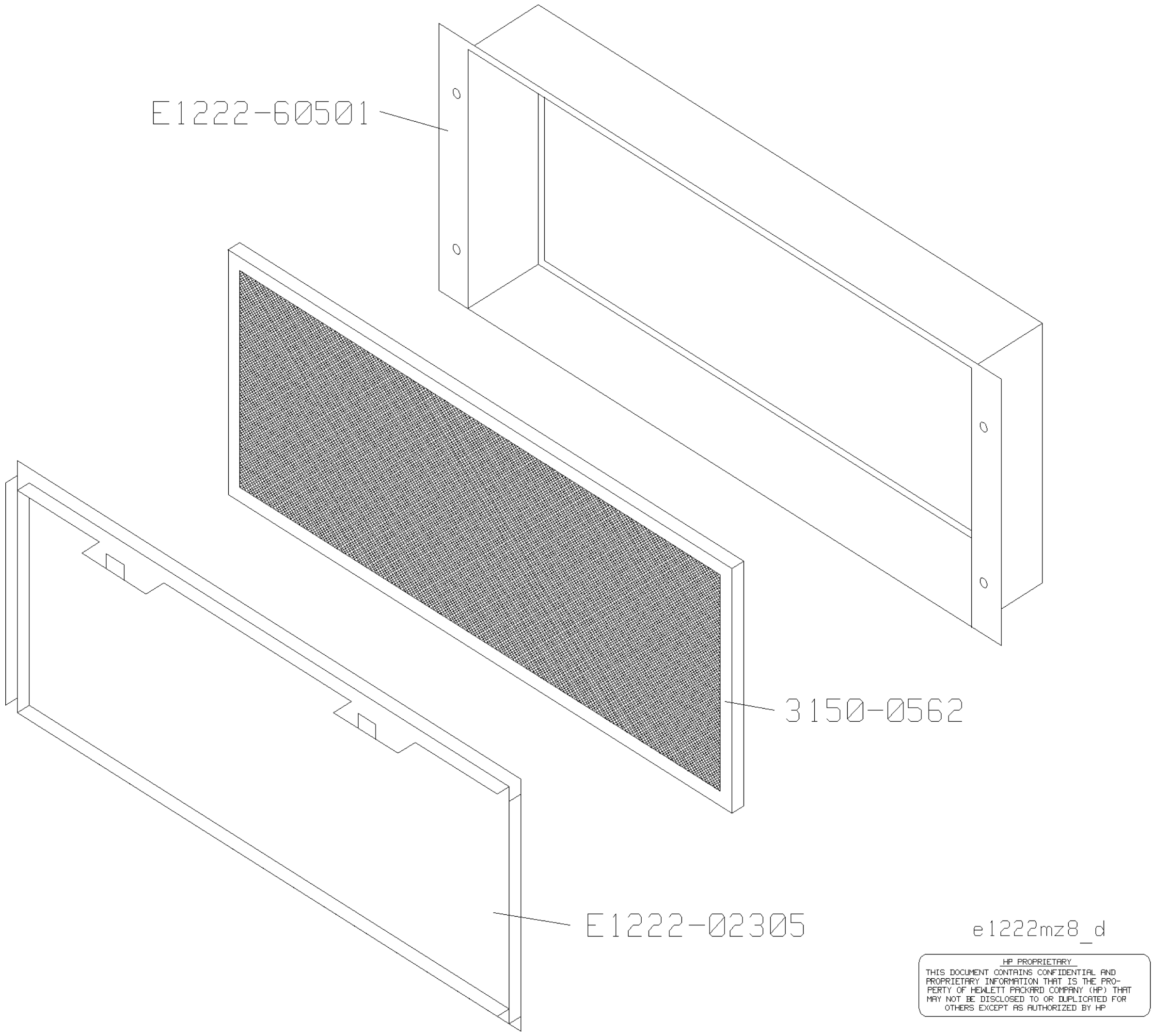


Figure D-27. Air Filter Assy

The following is an up-to-date summary of all Service Notes issued on the HP 82000 test system.

E1222M-01

For: E1222-66504 Rev. C

Action category: Agreeable time

Available until: Product's support life

Location category: On-site

Upgrades the E1222-66504 Rev. C Sequencer Board to Rev. D. This modification remedies a possible crosstalk problem during long test cycles.

E1220A-01

Same as E1222M-01

E1222M-02

For: E1222-66504 Rev. D

Action category: Agreeable time

Available until: Product's support life

Location category: On-site

Upgrades the E1222-66504 Rev. D Sequencer Board to Rev. E. This modification widens the address bus of the Sequencer Board, to be able to handle I/O Boards with 1 Mbyte vector memory.

E1222M-03

For: E1222-66505

Classification: Information only

A note, how to connect the surge-suppression capacitors in the newer Standardframe PCMs.

E1222M-04

For: HP 82000 Standardframes

Action category: Agreeable time

Available until: April 18th, 1991

Location category: On-site

Retrofitting an EMO to a Standardframe.

E1222M-05

For: E1222-66503 Rev. B

Action category: Agreeable time

Available until: Product's support life

Location category: On-site

Upgrades the E1222-66503 Rev. B Clock Board to Rev. C. This modification remedies a VME problem, which caused the system to lock-up intermittently.

E1222M-06

For: E1222-66504 Rev. E

Action category: Agreeable time

Available until: Product's support life

Location category: On-site

Upgrades the E1222-66504 Rev. E Sequencer Board to E1222-66564 Rev. A. This increases the Instruction Change Memory and the Error Map to 256k each.

E1222M-07

For: E1222-66504, E1222-66564, E1216-66504

Action category: On specified failure

Available until: Product's support life

Location category: On-site

Replaces the utility-line mini-fuses on the Sequencer Boards by multi-fuses.

Note

We still see (in our warranty reports) Sequencer Boards being replaced, when the utility-line fuses blow. Take a look at the cost-comparison of replacing the Sequencer Board, compared with executing Service Note **E1222M-07:**

Including travel, labour and parts, a Sequencer Board exchange costs about $ 2.600, while replacing the fuses as described in the Service Note is only about $ 900.

We recommend to always keep 2 multifuses on hand, in order not to annoy the customer with a board exchange, when only fuses have blown.

E1222M-08

For: E1214-66501, E1214-66521

Action category: On specified failure

Available until: Product's support life

Location category: On-site

Shows how to remedy an oscillation problem in the chip-enable circuits of the memory banks, which may lead to power supply shutdown under certain vector download conditions.

E1222M-09

For: E1216-66504, E1222-66504 and E1222-66564

Action category: Agreeable time

Available until: Product's support life

Location category: On-site

Upgrades the E1222-66564 Sequencer Board to E1222-66574 Rev. A and E1216-66504 to E1216-66574 Rev. A. This increases the addressable range of the Instruction Change Memory and the Error Map to 1 M each.

Documentation List

Status: November 1995

Service Documentation:

Title	Part Number	Revision	Date
“Installing HP82000 Maxiframes”	E1280-90002	Rev. 2.0	Nov. 95
“Installing HP82000 Miniframes and Standardframes”	E1280-90010	Rev. 3.0	Nov. 95
“System Support Log”	E1280-90001	Rev. 1.0	Apr. 89
“Site Planning and Preparation Guide”	E1280-90014	Rev. 3.0	Dec. 95
“Troubleshooting the HP82000”	E1280-90005	Rev. 3.1	Nov. 95

User Documentation:

Title	Part Number	Revision	Date
“Maintaining the HP82000”	E1280-90003	Rev. 3.0	Nov. 92
“HPIB Command Reference”	E1280-90203	Rev. 2.0	Apr. 92
“Test Function Reference”	E1280-90205	Rev. 2.0	Oct. 92
“Advanced Testing with the HP82000”	E1280-90224	Rev. 2.0	Oct. 92
“Using the HP82000”	E1280-90242	Rev. 2.0	Oct. 92
“Production Test Shell”	E1282-90000	Rev. 3.0.1	Oct. 91
“Using the TABULAR LINK EDA Interface”	E1283-90000	Rev. 1.0	Apr. 92
“Using the FACTOR EDA Interface”	E1296-90000	Rev. 1.0	July 89
“Using the HP81810 EDA Interface”	E1297-90000	Rev. 1.0	Nov. 89
“Using the VALID EDA Interface”	E1298-90000	Rev. 1.0	Nov. 89
“Using the VERILOG EDA Interface”	E1299-90000	Rev. 1.0	Oct. 90
“Using the EDA Interface”	E1299-90001	Rev. 1.0	Mar. 89
“EDA Interface Programming”	E1299-90002	Rev. 1.0	Mar. 89