ATSX

Service Guide

HP 8114A 100 V/2 A
Programmable Pulse Generator

HEWLETT PACKARD

HP Part No. 08114-91021
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Notice

warranty
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Complete product warranty information is given in the User Guide.

Safety
This is a Safety Class 1 instrument (provided with terminal for protective earthing). Before applying power, verify that the correct safety precautions are taken (see the following warnings). In addition, note the external markings on the instrument that are described under Safety Symbols. Do not operate the instrument with its covers removed. Replace fuse only with specified type.

Warning
Before turning on the instrument, you must connect the protective earth terminal of the instrument to the protective earth conductor of the (mains) power cord. The mains plug must only be inserted in a socket outlet with a protective earth contact. Do not negate the protective action by using an extension power cord without a protective grounding conductor. Grounding one conductor of a two-conductor outlet is not sufficient protection.

Service instructions are for trained service personnel. lb avoid dangerous electric shock, do not perform any service unless qualified to do so. Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

If you energize this instrument using an auto-transformer (for voltage reduction) make sure that the common terminal is connected to the earth terminal of the power source.

Whenever it is likely that the ground protection is impaired, you must make the instrument inoperative and secure it against any unintended operation.

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

Do not install substitute parts or perform any unauthorized modification to the instrument.

Capacitors inside the instrument may retain a charge even if the instrument is disconnected from its source of supply.

Safety Symbols

Instruction Manual symbols: The instrument is marked with this symbol when it is necessary for you to refer to the instruction manual in order to avoid the hazard of electric shock.

Instruction Manual symbols: The instrument is marked with this symbol when it is necessary for you to refer to the instruction manual in order to protect against damage to the instrument.

Protected conductor symbol

WARNING
The Warning symbol calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury or loss of life. Do not proceed beyond a Warning symbol until the indicated conditions are fully understood and met.

CAUTION
The Caution symbol calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the equipment. Do not proceed beyond a Caution symbol until the indicated conditions are fully understood and met.

Notice

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Hewlett-Packard warrants that its software and firmware designated by Hewlett-Packard for use with an instrument will execute its programming instructions when properly installed on that instrument. Hewlett-Packard does not warrant that the operation of the instrument software, or firmware, will be uninterrupted or error free.

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About this edition

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About this book

This book is a guide to servicing the HP 8114A.

Installing Line voltage, fuse and other installation information.

Specifications The specifications of the HP 8114A.

Testing the HP 8114A Performance tests for checking the HP 8114A against its specifications.

Disassembly and Reassembly

How to disassemble and reassemble the HP 8114A.

Troubleshooting the HP 8114A

Techniques for finding the causes of malfunction in the HP 8114A.

Replaceable Parts A list of all replaceable parts in the HP 8114A.

CLIP The component level information package of the HP 8114A can be obtained separately, and inserted in this section.

Contents

4. Disassembly and Reassembly

Figures

Tables

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Installing the HP 8 114A

Initial Inspection

Inspect the shipping container for damage. If the container or cushioning material is damaged, keep it until the contents of the shipment have been checked for completeness and the instrument has been verified both mechanically and electrically.

Warning

To avoid the hazard of electric shock, do not perform electrical tests when there are signs of shipping damage to any part of the instrument's outer covers or panels.

If the contents are incomplete, or there is mechanical damage, or if the instrument **does** not pass the Performance Tests in Chapter 3, notify the nearest Hewlett-Packard office. Keep the shipping materials for inspection by the carrier. The HP office will arrange for repair or replacement without awaiting settlement.

Power Requirements

Caution

BEFORE APPLYING AC LINE POWER TO THE HP 8114A, ensure that the correct line fuse is installed in the fuse holder and the correct power cable is fitted.

The HP 8114A can operate from any single-phase AC power source supplying 100 - 240 V in the frequency range from 50 to 60 Hz , or 100 - 120 V at 400 Hz. The maximum power consumption is 500 VA with all options installed.

Table l-l. Line Voltage and Fuse Selection

Line Voltage	Fuse Type	HP Fart Number
100 - 240 V~	T 4A, 250 V	21 lo-0014

Replacing the Fuse

1. Remove the power cord.
2. Unscrew the fuse-holder at the rear of the instrument beside the power-inlet socket.
3. Replace the fuse with the equivalent part (See Table l-l).
4. Refit the fuse-holder.

Power Cable

In accordance with international safety standards, this instrument, is equipped with a three-wire power cable. When connected to an appropriate AC power receptacle, this cable grounds the instrument cabinet. The type of power cable shipped with each instrument, depends on the country of destination. Refer to Figure l-l for the part numbers of the power cables available.

Warning

To avoid the possibility of injury or death, the precautionary Warnings given on the inside front-cover of the manual must be followed before the instrument is switched on.

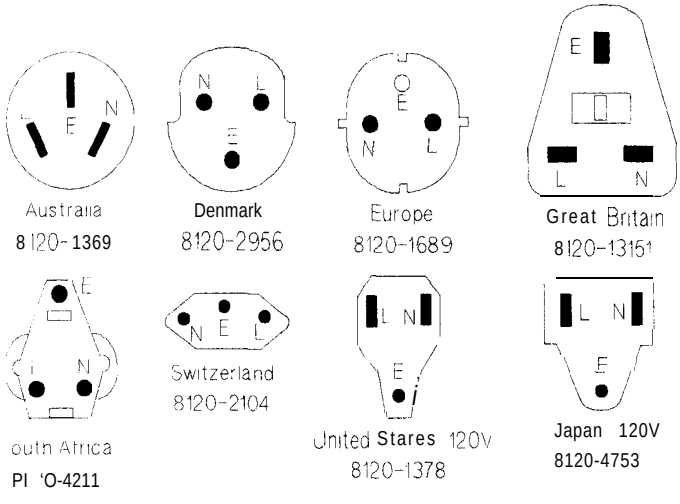


Figure l-l. Power Cables - Plug Identification

The following work should be carried out by a qualified electrician - all local electrical codes being strictly observed. If the plug on the cable does not fit the power outlet, or the cable is to be attached to a terminal block, cut the cable at the plug end and re-wire it.

The color coding used in the cable will depend on the cable supplied. If a new plug is to be connected, it must meet local safety requirements and include the following features:

- Adequate load-carrying capacity (see table of specifications).
- Ground connection.
- Cable clamp.

Rack-Mounting Accessories

Use the following information to order accessories for rack-mounting the HP 8114A:

Table 1-2. Rack-Mounting Accessories

HP Part Number	Description
5062-3977	Rack Mount Kit
5062-3989	Handle Kit
5062-3983	Rack Mount and Handle Kit
1490-0060	Rack Slide Kit

Note that Option UN2, Rear Panel Connectors, cannot be retrofitted, but must be specified when initially ordering an instrument.

Ventilation Requirements

The HP 8114A is fitted with two cooling fans. Make sure that there is adequate clearance of 3 inches (75 mm) at the rear and 1/2 inch (12 mm) at the top and bottom to ensure adequate airflow. If the airflow is restricted the internal operating temperature will be higher, reducing the instrument's reliability or causing the instrument's thermal-protection circuits to automatically switch off the instrument.

Thermal Protection

Overheating Detection

The HP 8114A monitors its internal temperature in the region of the power supply. If the temperature exceeds approximately 80°C, the power supply is switched off. The instrument must be switched off to allow the detection circuit to recover (after the temperature falls below approximately 77%).

Fan Failure

If either of the fans is prevented from operating by a blockage, or the power supply to the fans is interrupted, the power supply is automatically switched off within approximately 10 seconds. Note that after the fault condition has been fixed, the instrument must be switched off to allow the detection circuit to recover.

Battery

Warning

This instrument contains a lithium battery. The battery is not user-replacable and replacement should only be carried out by qualified service personnel.

There is a danger of explosion if the battery is incorrectly replaced.

The battery must be replaced with the same or equivalent type (HP Part No. 1420-0394). Discard used batteries according to local regulations.

Operating Environment

Storage Temperature:	-40°C to +70°C
Operating Temperature:	0°C to 55°C
Humidity:	95% R.H. (0°C to 40°C)

Warning

- **The HP 8114A is not designed for outdoor use. Do not expose the HP 8114A to rain or other excessive moisture. Protect the HP 8114A from humidity and temperature changes which could cause condensation within the instrument.**
- **' Do not operate the HP 8114A in the presence of flammable gases, fumes or powders. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.**
- **When working with output voltages of 30 - 100V amplitude, the output voltage can be dangerous to life. Care should therefore be taken when connecting the HP 8114A to external devices.**
- **When working in HIZ (High-Z) mode, if you remove the external load the output voltage can be higher than the programmed voltage. V_{pp} can be as much as 130 V, even when set as low as 2 V,,.**

Caution

HP 8114A is capable of providing output voltages that may exceed the input capabilities of connected test equipment. The user should ensure that the HP 8114A is operated in a way that prevents damage to connected test equipment.

Installing Upgrades

ATTENTION! STATIC SENSITIVE DEVICES: You must perform upgrades only in Static Safe work areas.

These instructions cover the installation of the option 001, variable baseline. The retrofit kit number of the variable baseline is 08114-68701.

1. Remove the instrument cover, see instructions on page 4-5, Disassembly and Reassembly
2. Remove the power supply , see instructions on page 4-7, Disassembly and Reassembly
3. Mount the variable baseline module with the reverse procedure of removal, see instructions on page 4-9, Disassembly and Reassembly

How to Make a Firmware Update for HP 8114A

Supported Hardware HP 8114A serial number 3330Gxxxxx and higher

Procedure

1. Switch off the HP 8114A
2. Put the Memory Card in the slot at the right-hand side of the front panel with the arrow on the card at the same side as the arrow on the front panel (the card will not fit if inserted the wrong way round)
3. Simultaneously, press digit keys **1** and 3 with your right hand
4. While holding both keys down, switch HP 8114A ON
5. When

   HP8114A Selftest

   appears on the display in very large letters, release the keys
6. After some seconds the message:

   HP8114 Boot Program...

   appears
7. If you get the message:

   Firmware is not newer

   then an update is unnecessary: Press the NO softkey
8. You may get a message like:

   There is 1 board unknown. Load anyway.

   Press the YES softkey.

   The EPROMs are now erased and re-loaded:

   - The first EPROMS will now be erased and this message is displayed:

     Erase U6 and U7; please wait.
   - After one or two minutes you will hear a short beep and the next EPROMs will be erased:

     Erase U8 and U9; please wait.
   - After another one or two minutes, you will hear a short beep and the final EPROMs will be erased:

     Erase U41 and U42; please wait.
   - After the next beep the following message is displayed:

     Program all Flash Eproms; please wait.
   - After the final beep you get the message:

     Loading Finished

- Ignore the message:

  Reboot in 2 minutes

9. Switch OFF the HP 8114A
10. Extract the Memory Card containing the new firmware
11. Switch ON the HP 8114A
12. The power-on display will now show the new firmware revision and date

Memory Sizes

The HP 8114A is fitted with the following sizes of memory:

EEPROM and RAM Sizes on the PC Boards

The following sizes of EEPROM and RAM are fitted to the PC Boards:

- Microprocessor Board: 256 K Byte RAM; 768 K Byte Flash EEPROM
- Timing Board: 16 K Byte EEPROM
- Output Board: 16 K Byte EEPROM
- Variable Baseline Board: 16 K Byte EEPROM

Up to 10 different instrument setups can be stored in the RAM locations.

Restoring Default Settings

There are two ways to restore HP 8114A default settings:

- Using the HP-IB device command
- Overwriting settings

The first method can lead to accidental erasure of wanted settings, as all setups are replaced.

The second method replaces settings in each location individually, so it is possible to restore defaults only where needed.

Using the HP-IB Device Command

Using the HP-IB device command:

```
:SYSTem:SECurity[:STATe] ON
```

all RAM stored information can be erased, and replaced by the HP 8114A default settings.

Do not switch system security ON unless you are willing to erase all RAM stored information.

RAM is erased when:

- :SYST:SEC[:STAT] OFF is programmed
- The instrument is switched OFF and then switched ON immediately after.

Overwriting Settings

Recalling **Standard Setting** from memory location 0, and storing it in locations 1 to 9, as required, overwrites each setting in turn.

Firmware Upgrade Cards

Firmware upgrades are supplied on a 1 M Byte Memory Card.

Memory Card Sizes

Memory cards of up to 2 M Byte can be used with the HP 8114A. The following table shows how many setups of a fully-configured HP 8 114A can be stored in each size of Memory Card:

Table 1-3.

Memory Card size	No. of setups stored
128 K Bvte	40
256 K Byte	80
512 K Byte	160
1 M Byte	320
2 M Byte	640

2

HP 8 114A Pulse Generator Specifications

Specifications describe the instrument's warranted performance. Non-warranted values are described as typical. All specifications apply after a 30 minute warm- up phase with 50 Ohm source impedance into a 50 Ohm load, and are valid from 0°C to 55°C ambient temperature. Non-warranted values are described as 'typical'. Parameters are are over- and under-programmable outside their specified ranges.

General

Environmental

Operating temperature:	0°C to +55°C
Storage temperature:	-40°C to +70°C
Humidity:	95% (0°C to 40°C)
EMC:	conforms to EN55011 Group 1 Class A
Battery:	Lithium (Panasonic CR2477-1HF)

Safety

IEC348, safety class 1

Power requirements

100-240 Vac, ±10%, 50-60 Hz;

100-120 Vac, ±10%, 400 Hz

Power consumption: 500 VA max.

Maximum Dimensions (H x W x D)

133 mm H x 426 mm W x 422 mm D (5.2 in x 16.8 in x 16.6 in)

Weight

Net

14 kg (30.8 lb)

Shipping

17 kg (37.4 lb)

Recalibration period 1 year recommended

Warranty 1 year standard

Acoustic Noise Pressure

Acoustic Noise Pressure

For ambient temperature up to 30°C, under normal operation and at the typical operator position:

LpA = 45.1 dBA

Measured in accordance with ISO 7779/EN 27779.

Geräuschemissionswerte

Bei einer Umgebungstemperatur bis 30°C

LpA = 45.1 dBA

am Arbeitsplatz, normaler Betrieb

Angabe ist das Ergebnis einer Typprüfung nach ISO 7779/EN 27779.

Declaration of Conformity

Manufacturer: Hewlett-Packard GmbH
Biiblingen Instruments Division
Herrenberger Str. 130
D-7 1034 Böblingen Germany

We declare that the product

HP 8114A 100V/2A Programmable Pulse Generator conforms to the following standards:

Safety: IEC 1010-l (1990) including Amendment 1 (1992)

EN 61010 (1993)

CSA C22.2 Nr. 1010.1

EMC: EN 55011 (1991)/CISPR 11 Group 1, Class A

EN 50082-l (1991)

IEC 801-2 ESD: 4kV cd, 8kV ad
IEC 801-3 Radiated Immunity: 3V/m
IEC 801-4 Fast Transients: 0.5kV, 1kV

Supplementary Information

During the measurement against EN 55011, the I/O ports were terminated with their nominal impedance, the HP-IB connector was terminated with the cable HP 10833B. When the product is connected to other devices, the user must ensure that the connecting cables and the other devices are adequately shielded to prevent radiation.

Biiblingen 6th September 1993

Hans Baisch
Product Regulations Consultant

Output

Amplitude

Range:

1.00 V to 50.0 V (doubles into open circuit) 2.00 V to 100 V (HIZ (High-Z) into 50Ω)

Warning

- **When working with output voltages of 30 - 100V amplitude, the output voltage can be dangerous to life. Care should therefore be taken when connecting the HP 8114A to external instruments.**
- **When working in HIZ (High-Z) Mode, if you remove the external load the output voltage can be higher than the programmed voltage. V_{pp} can be as much as 130 V, even when set as low as 2 V_{pp}.**

Current:

40.0 mA to 2.00 A

Accuracy:

± 1% of amplitude ±100 mV

Resolution:

3 digits, best case 10 mV

Baseline: 0 V ±100 mV ±0.5% of amplitude

Variable Baseline (Option 001)

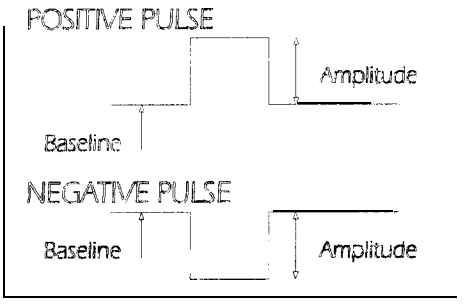
50Ω source impedance only, pulse within ±50V window

Range:

-25.0 V to +25 V

Accuracy:

±1% ±100 mV ±0.5% of amplitude



Polarity Positive or negative pulses selectable

Source Impedance 50Ω or High Impedance (>10kΩ typ.) selectable

Load Compensation For loads ≠ 50Ω the actual load can be entered to correct output values

Connector BNC

On/Off: Relay connects/disconnects output

Output Protection

Maximum external voltage 100 Vpp from external 500 source
(± 20 Vdc from external 0Ω source)

Limits Programmable level and duty-cycle limits restrict the available output range to protect the DUT.

Pulse Performance

Overshoot/Preshoot/Ringing:

<±5% of amplitude ± 50 mV

Settling time:

<100 ns typical

Transition Times:

Measured between 10% and 90% of amplitude,
50Ω into 5061: <7ns (amp1 >5 V)
HIZ (High-Z) into 500 <12 ns (amp1 >10 V)

Pulse Timing Measured at 50% of amplitude

Repeatability:

factor 4 better than accuracy

Period Can be set as period or frequency

Range:

66.7 ns to **999** ms **(Frequency:** 1.00 Hz to 15.0 MHz)

Accuracy:

±5% ±100 ps

Resolution:

3 digits, best case 100 ps

RMS-Jitter:

0.03% + 25 ps (0.05% + 25 ps in the 66.7 ns to 100 ns range)

Width Can be set as width, duty-cycle or trailing-edge delay.

Range 10 ns to 150 ms

Accuracy:

±5% **1500** ps

Resolution:

3 digits, best case 100 ps

RMS-Jitter:

0.03% + 25 ps (0.05% + 25 ps in the 50 ns to 100 ns range)

Duty-cycle

0.1% to 100%
(Subject to width and period specifications).

Standard HP 8114A (Baseline = 0 V)

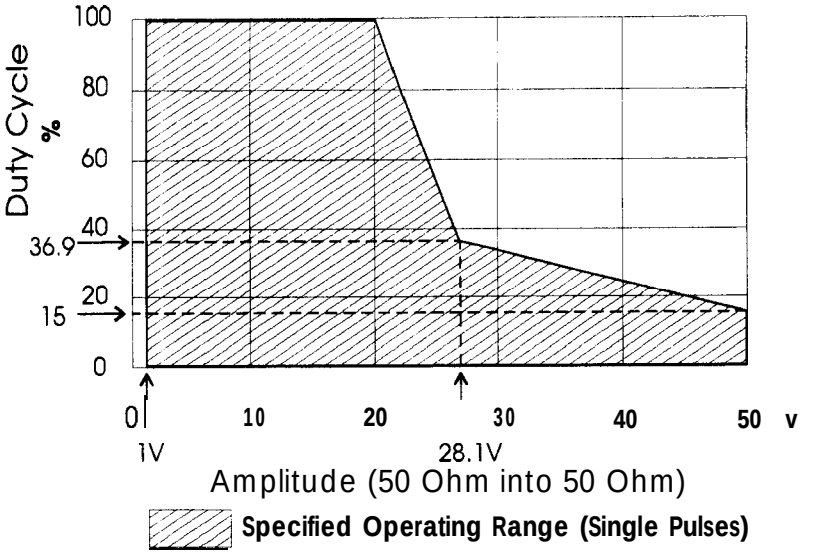


Figure 2-1. Duty-cycle / Amplitude Ranges

Figure 2-l shows the maximum possible duty-cycle for a given pulse amplitude from 50Ω into 5061. Note that amplitude doubles from HIZ (High-Z) into 508.

In double-pulse mode the actual duty-cycle of the signal is twice the value displayed on the HP 8114A screen because two pulses are generated per pulse period. Therefore, the duty-cycle available, and set, will be limited to half the value given by Figure 2-1.

Variable Baseline Option 001

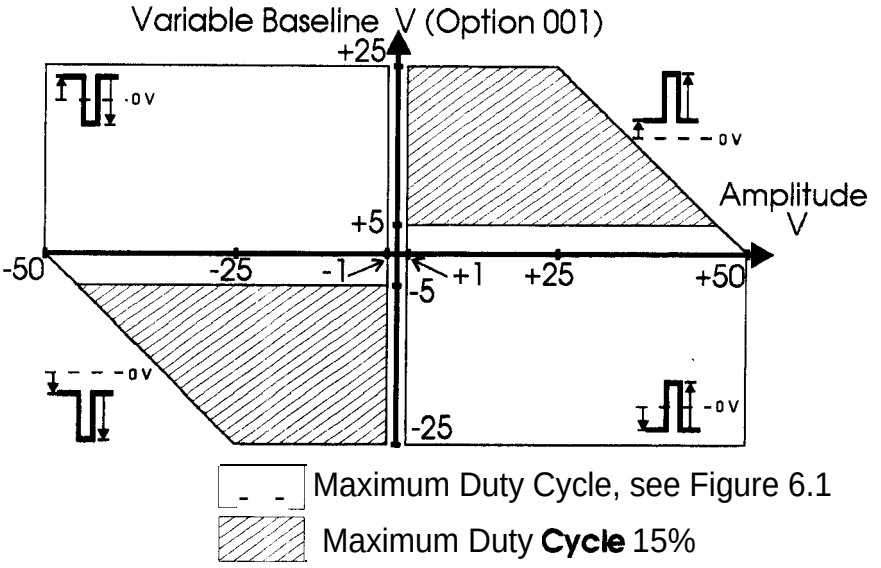


Figure 2-2. Baseline Duty-cycle / Amplitude Ranges

Refer to Figure 2-2. Under the following conditions Figure 2-l still applies for the maximum duty-cycle:

- Positive pulse with negative Baseline
- Negative pulse with positive Baseline
- -5 V <Baseline $\leq$ + 5 V, negative or positive pulses

Under the following conditions maximum duty-cycle is 15%:

- Baseline > + 5 V and positive pulses
- Baseline <-5 V and negative pulses

Note also, that the pulse is limited to a ±50 V window (500 into 5061) so that for positive pulses with positive Baseline, or negative pulses with negative baseline, the maximum available amplitude becomes limited by the Baseline setting

Delay

Can be set. as absolute delay, phase, or % of period.

Fixed delay 42 ns typical (measured between Trigger Output and Output)

Variable Range 0.00 ns to 999 ms
(Maximum value: period - 4 ns)

Accuracy ±5% ±1 ns

Resolution 3 digits, best case 10 ps

RMS-Jitter 0.03% + 25 ps (0.05% + 25 ps in the 50 ns to 100 ns range)

Double Pulse Delay

Double pulse delay replaces delay when double pulses are selected. The delay between double pulses can be set as absolute delay or % of period.

Minimum Period 133.4 ns

Range 20.0 ns to 999 ms (Maximum value: period - width - 4 ns)

Accuracy ±5% f250 ps

Resolution 3 digits, best case 100 ps

Minimum Period 133.4 ns

Trigger Output

Level Fixed TTL (2.5 V into 50Ω)

Output Impedance 50Ω typical

Trigger pulse width 50% of period, typical

Maximum external voltage

⚠ -2 V/+7 v

Transition times 5 ns typical

Delay from External Input to Trigger Output

24 ns typical

External Input,

An external signal at the external input can be used to trigger or gate the output signal.

Input impedance 10 kΩ

Threshold -10 V to + 10 V with 100 mV resolution

Maximum external voltage

⚠ 150 v

Input transitions <100 ns

Input frequency dc to 15MHz

Minimum pulse width 10 ns typical

Input sensitivity ≤300 mV_{pp} typical

Inhibit Input

An external TTL signal at the Inhibit Input can be used to inhibit the pulse signal, holding the output signal at its baseline level.

Inhibit on Edge An active edge inhibits the pulse signal until reset, from the front panel, or HP-III

Inhibit on Level An active level inhibits the pulse signal

Input Impedance 100 kΩ

Threshold 1.5 V (TTL) typical

Input transitions <100 ns

Input frequency dc to 5 MHz

Minimum pulse width 100 ns typical

Input sensitivity ≤300 mV_{pp} typical

Inhibit response time 200 ns typical

Maximum external voltage

⚠ ±50 V

Trigger Modes

Continuous A continuous train of pulses or bursts of pulses is generated

Triggered A transition (rising, falling, or both) at the external input or MANual trigger key triggers a pulse or burst of pulses.

Gated Active level (high or low) at the external input or MANual Trigger key enables pulses or bursts of pulses. The last pulse or burst of pulses is always completed.

External Width Period and width of the output signal are taken from a signal at the External Input.

Pulse Modes

Burst Set a burst of 2 to 65536 pulses.
(A normal pulse is equivalent to a burst of 1 pulse)

Double Pulse Two pulses generated per pulse-period. First pulse starts at the start of pulse-period; double delay sets delay to the start of the second pulse. Double pulses are available in all Trigger Modes except External Width.

Human Interface

Display All pulse parameters at a glance on one display.

Help Key Displays context-sensitive information.

Memory The current setting, plus nine user settings are stored in non-volatile memory when the instrument is switched off.

Clear Memory:

Clears all stored user settings.

Memorycard Instrument settings (350 bytes each) are stored in MS-DOS formatted PCMCIA memorycards. Cards can also be used for convenient firmware updates.

Remote Control

Operates according to IEEE standard 488.2, 1987 and SCPI 1992.0

Function Code SH1, AH1, T6, L4, SR1, RL1, PPO, DC1, DT1, CO.

Programming times (All checks and display off)

ASCII Command	Typical Execution Time
One parameter or mode	5 . . . 20 ms
Recall setting	<250 ms

3

Testing the HP 8114A

Introduction

Use the tests in this chapter if you want to check that the HP 8114A 15MHz 100V/2A Pulse Generator is working correctly. Before starting any testing allow all test equipment to warm up for at least 30 minutes.

Conventions Used

When referring to actions that you perform during the tests, the following conventions are used:

[FUNCTION]	This indicates that a labelled button must be pressed
TRIGGER	This shows that a soft-key must be pressed. A soft-key is an unlabelled button whose label is shown on the display, and which can vary according to the job that the button is doing
CONTINUOUS PULSES	This is an option shown on the display, and is selected by use of the vernier keys. It is shown in upper or lower case to match the case displayed.

Test Results Tables

Tables for entering the results of the tests are included at the end of this chapter. The tests are numbered and reference numbers for each Test Result (TR) are given in a small table at the end of each test. The reference number shows you where the actual results should be entered in the Test Results Tables.

The Test Results tables at the end of the chapter should be photocopied, and the Test Results entered on the copies. Then, if the tests need to be repeated, the tables can be copied again.

Recommended Test Equipment and Accessories

The following tables list the recommended test equipment you **need** to perform all the tests in this chapter. You **can** use alternative instruments if they meet the critical specifications given. The test set.-ups and procedures assume you are using the recommended equipment.

Table 3-1. Recommended Test Equipment List

Test Equipment	Model	Critical Specifications
Oscilloscope	HP 641211	20 GHz, 10 bit vertical resolution, Histogram capability
Counter	HP 5334A/B	Period and Time Interval measurements
Digital Voltmeter	HP 3458A	DCV up to 20 V
Pulse Generator	HP 8112A	50 MHz
Delay line	HP 54008A	22 ns

Caution

HP 8114A is capable of providing output voltages that may exceed the input capabilities of connected test equipment. The user should ensure that the setting-up instructions in this chapter are followed exactly, to prevent damage to connected test equipment.

Table 3-2. Recommended Accessories

Accessories	Model	Critical Specifications
Digitizing Oscilloscopes Accessories		
Attenuators	HP 33340C#020	20 dB
	HP 33340C#006	6 dB
SMA/BNC Adaptor	1250-1700	
Power Splitter	HP 15104A	
50 Ω Feedthrough Termination		
	HP 10100C	2 W,1%
	See "50 Ω, 10 W Feedthrough Termination"	10 W,0.1%
Adapter	1251-2277	BNC to Banana
Cable Assemblies, BNC	8120-1840	122cm
Torque Wrench	8710-1582	5/16 in, 5 lb-in (56 Ncm)
Power Attenuator	Weinschel 40-20-34	20dB, 150W
Adapter	1250-1474	N(f) to BNC(f)
	1250.1476	N(m) to BNC(f)
	1250-0781	BNC tee(m)(f)(f)
Coaxial Short	1250-2152	SMA(f)

Note

When you connect the test equipment for the first time, and whenever you change the set-up during the course of these tests, use the 8710 · 1582 torque wrench to tighten and loosen SMA connectors. This will ensure that the connectors are at the correct tightness and give the best signal transfer.

50 Ω, 10 W Feedthrough Termination

The following figure provides a schematic and a parts list except for the case. The case must provide shielding and maintain grounding integrity.

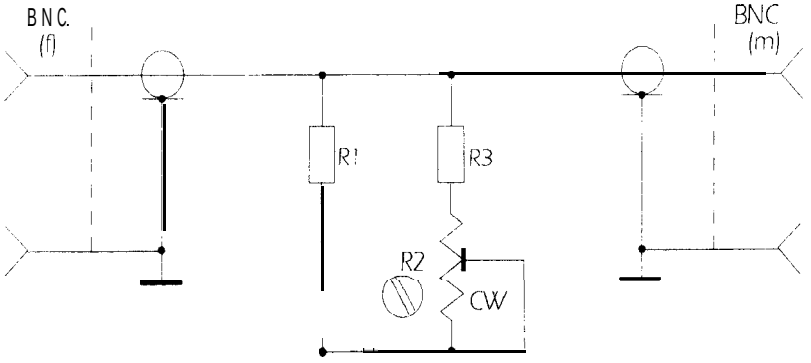


Figure 3- 1.
50 Ohm, 0.1% , 10 W Feedthrough Termination

The following parts are required:

1. R1 = 53.60, 1%, 10 W; HP Part Number: 0699-0146.
2. R2 = 200 Ω, 10%, 0.5 W, Variable trimmer; HP Part Number: 2 100-3350.
3. R3 = 681 Ω, 1%, 0.5 W; HP Part Number: 0757-0816.
4. BNC (M): HP Part Number: 1250-0045.
5. BNC (F): HP Part Number: 1250-0083.

Getting Started

Instrument Serial Numbers

You will need to write the serial numbers of the instrument. These can be found as follows:

Press (HELP), SERIAL #

The HP 8114A display lists the instrument's product and serial numbers.

The display on your instrument should look similar to this:

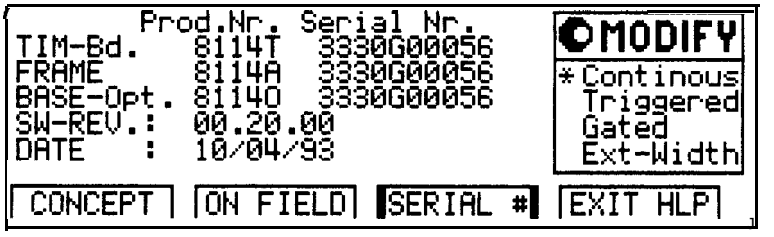


Figure 3-2.
The Product and Serial Number Screen With Variable Baseline (Option 001) Fitted

The contents of the screen are as follows:

TIM-Bd.	Timing Board Serial Number
FRAME	Instrument Product Number and Serial Number
BASE-Opt.	Variable Baseline Option (001) Serial Number (When this option is fitted)
SW-REV.:	The current Software Revision number
DATE :	Date when the current Software Revision was installed.

Test 1: Period

Test Specifications

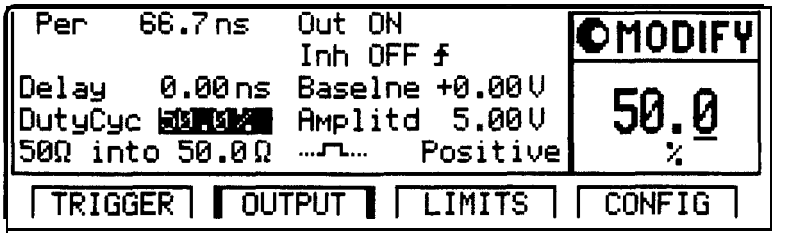
Range	66.7 ns to 999 ms
Resolution	3 digits, best case 100 ps
Accuracy	±5% ±100 ps
RMS-Jitter	0.03% + 25 ps (0.05% + 25ps for period <100 ns)

Equipment Needed

Counter
Cable, 50 Ω, coaxial, RNC

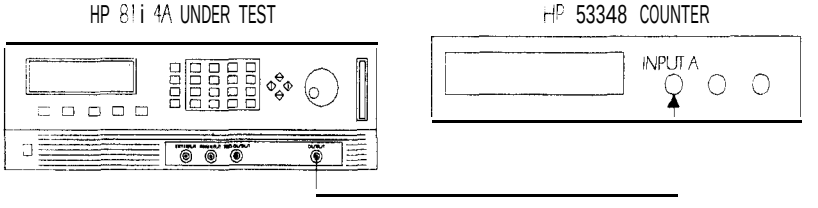
Procedure

1. On the HP 8114A press TRIGGER and set up page as follows:
   - CONTINUOUSPULSES
   - Single Pulses
2. On the HP 8114A press OUTPUT and set up page as shown in the following illustration:



Configuring the Output Page

3. Connect the HP 8114A to the Counter as follows:



Connecting HP 8114A to the Counter

4. Set the Counter to:

FUNCTION	Period A
INPUT A	50 Ω

5. Check the HP 8114A period at the following settings:

Table 3-3. Period Settings and TR Reference

Period	Acceptable Range	TR entry
66.7 ns	63.27ns to 70.14 ns	1 - 1
100 ns	94.9 ns to 106.1 ns	1 - 2
600 ns	474.9 ns to 525.1 ns	1 - 3
1 µs	949.9 ns to 1050.1 ns	1 - 4
5 µs	4.75µs to 5.25 µs	1 - 5
50 µs	47.5 µs to 52.5 µs	1-6
500 µs	475 µs to 525 µs	1 - 7
5 ms	4.75ms to 5.25 ms	1 - 8
60 ms	47.5 ms to 52.6 ms	1-Q
500 ms	475 ms to 625 ms	1 - 10

Test 2: Width

Test Specifications

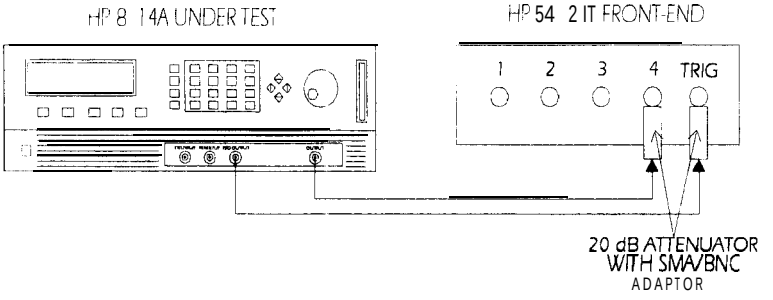
Range	10.0 ns to 150 ms
Resolution	3 digits, best case 100 ps
Accuracy	± 5% ± 500 ps
RMS-Jitter	0.03% + 25 ps (0.05% + 25 ps for 50 ns <width <100 ns)

Equipment Needed

Digitizing Oscilloscope with Accessories
Counter
Cable, 50 Ω, coaxial, BNC

Procedure

1. Connect HP 8114A to the Scope as shown:

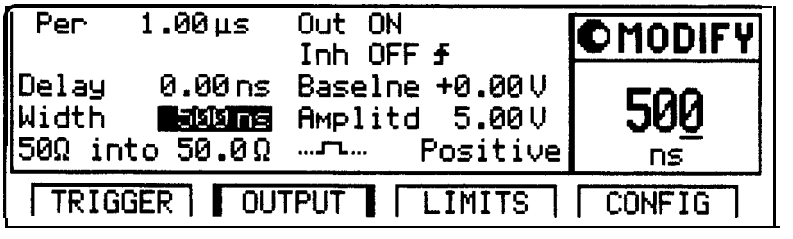


Connecting HP 8114A to the Scope

2. On the HP 8114A press TRIGGER and set up page as follows:

   - CONTINUOUS PULSES
   - Single Pulses

3. On the HP 8114A press (MORE) and set up OUTPUT page as shown in the following illustration:



Configuring the Output Page

4. Set the Digitizing Oscilloscope HP 54121T:

   - Press (AUTOSCALE)
   - Select the Display menu and set the Number of Averages to 32
   - Select the delta V menu and turn the voltage markers On
   - Set the preset levels to 50% -50% and press (AUTO LEVEL SET)

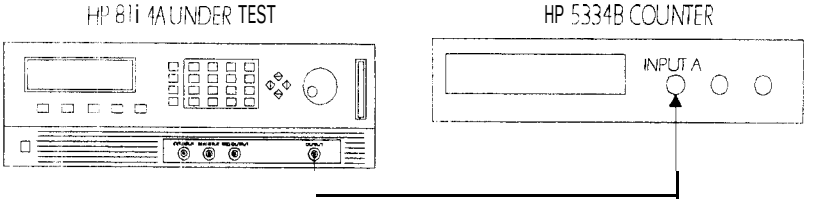
- Select the delta t menu and turn the time markers ON
- Set START ON EDGE = POS 1 and STOP ON EDGE = NEG1

6. Change the oscilloscope timebase to 2 ns/div
6. Change the HP 8114A width to 10.0 ns
7. Center the pulse in the Scope display in TIMEBASE, Delay = 38 ns
8. Press Delta t, then (PRECISE EDGE FIND) key for each new Width setting; reset scope delay to 16 ns
9. **Check** the HP 8114A pulse width at the following settings, repeating step 8 for each width setting made on the HP 8114A:

Table 3-4. Width Settings and TR Reference

Oscilloscope Timebase	Delay	Width	Acceptable Range	TR Entry
2 ns/div	0 ns	10.0 ns	9.000 ns to 11.000 ns	2 - 1
10 ns/div	0 ns	50.0 ns	47.00 ns to 53.00 ns	2 - 2
20 ns/div	25 ns	100 ns	94.5 ns to 105.5 ns	2 - 3
100 ns/div	250 ns	500 ns	474.5 ns to 525.5 ns	2 - 4

10. Connect the HP 8114A to the Counter as shown:



Connecting HP 8114A to the Counter

11. Set the Counter to:

FUNCTION	TI A → B
INPUT A	50 Ω
COM A	On
INPUT B	50 Ω, negative slope
SENSE	On

12. Set the HP 8114A period to 999 ms
13. Check the HP 8114A width at the following settings:

Table 3-5. Width Settings and TR Reference

Width	Acceptable Range	TR Entry
1 µs	949.5 ns to 1060.6 µs	2-5
5 µs	4.76 µs to 6.25 µs	2-6
60 µs	47.5 µs to 52.5 µs	2-7
500 µs	476 µs to 626 µs	2-8
5 ms	4.75 ms to 5.25 ms	2-9
60 ms	47.5 ms to 52.5 ms	2 10
500ms	475 ms to 525 ms	2-11

Test 3: Delay

Test Specifications

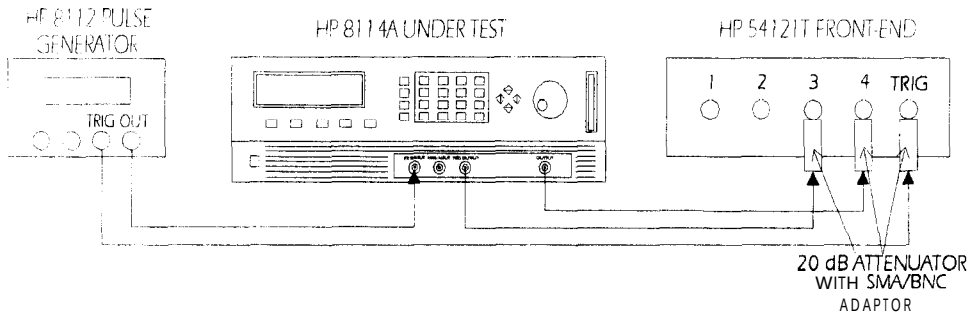
Range	Fixed: typical 42.0 ns Variable: 0.00 ns to 999 ms
Resolution	3 digits, best case 10 ps
Accuracy	± 5% ± 1 ns
RMS-Jitter	0.03% + 26 ps (0.05% + 25 ps for 50 ns <delay <100 ns)

Equipment Needed

Digitzing Oscilloscope with Accessories
Pulse Generator
Counter
Cable, 50 Ω, coaxial, BNC

Procedure

1. Connect HP 8114A to the Scope as shown:

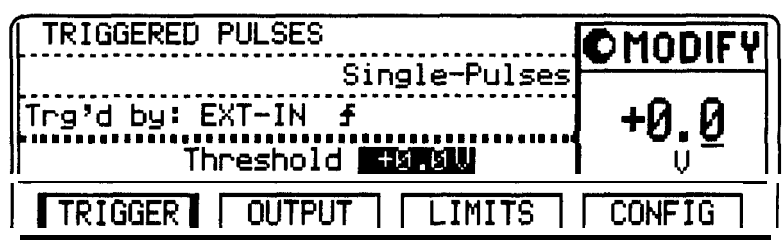


Connecting HP 8114A to the Scope

2. Set the Pulse Generator to:

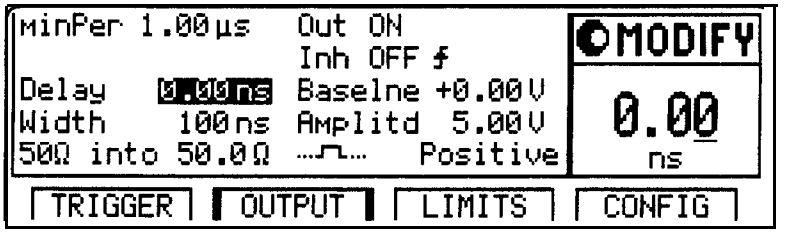
Period	1 μs
Width	100 ns
Amplitude	1 V
Offset	0 V
output	Enable

3. Select the TRIGGER page on the HP 8114A and set up as follows:



The TRIGGER Page Set-up

4. On the HP 8114A set up OUTPUT page as shown in the following illustration:



Configuring the Output Page

5. Set the Digitizing Oscilloscope HP 54121T:

- Press AUTOSCALE
- Set timebase to TIME/DIV = 10 ns/div
- Center the positive-going edges of the two signals
- Select the Display menu and set the screen function to single; set the number of averages **to 32**
- Select the Delta V menu **and** turn **the** voltage markers ON and assign marker 1 to channel 3 and marker 2 to channel 4
- Set Preset levels to 50% - 50% and press (AUTO LEVEL SET)
- Select the Delta t menu and turn the time markers ON
- Set START ON EDGE= POS1 and STOP ON EDGE= POS 1
- Press the (PRECISE EDGE FIND) key

6. **Check the** HP 8114A delay at the following settings:

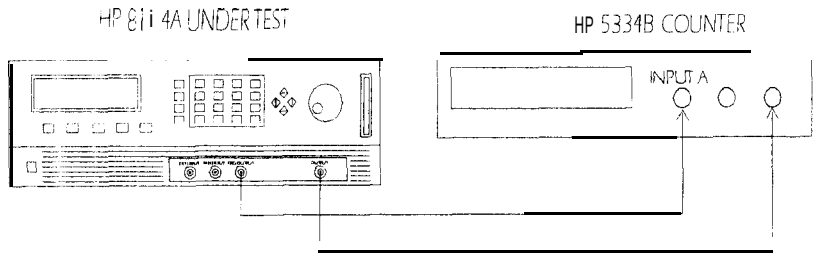
Note

Record the value of the fixed delay and subtract it from the other readings.

Table 3-6. Delay Settings and TR Reference

Oscilloscope Timebase	Delay	Acceptable Range	TR Entry
10 ns/div	0.00 ns	fixed Delay	3 - 1
10 ns/div	5.00 ns	3.75 ns to 6.25 ns	3 - 2
10 ns/div	10.0 ns	8.50 ns to 11.60 ns	3 - 3
20 ns/div	50.0 ns	46.5 ns to 53.5 ns	3 - 4
20 ns/div	100 ns	94 ns to 106 ns	3 - 5
100 ns/div	500 ns	474 ns to 526 ns	3 - 6

7. Connect the HP 8114A to the **Counter as** follows:



Connecting HP 8114A to the Counter

8. **On the** HP 8114A TRIGGER page select:

   CONTINUOUS PULSES

9. **On the** HP 8114A OUTPUT page set:

   Per to 999 ms
   Width to 500 ns

10. Set the Counter to:

FUNCTION	TI A → B
INPUT A	50 Ω
INPUT B	50 Ω

11. Check the HP 8114A delay at the following settings:

Note — Subtract the fixed delay from the other readings

Table 3-7. Delay Settings and TR Reference

Delay	Acceptable Range	TR Entry
1 µs	949 ns to 1061 ns	3-7
5 µs	4.749 µs to 5.261 µs	3-8
60 µs	41.5 µs to 62.5 µs	3-Q
500 µs	476 µs to 525 µs	3-10
5 ms	4.75 ms to 6.25 ms	3-11
50 ms	47.6 ms to 52.5 ms	3-12
500ms	475 ms to 625 ms	3-13

Test 4: Double Pulse Delay

Test Specifications

Range	20 ns to 999 ms
&solution	3 digits, best case 100 ps
Accuracy	± 5% ± 250 ps
Min. Period	133.4 ns

Equipment Needed

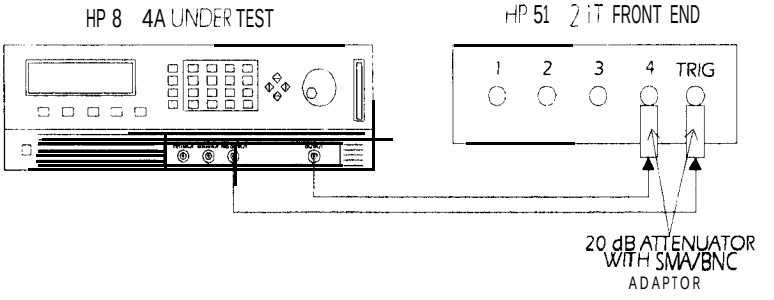
Digitizing Oscilloscope with Accessories

Counter

Cable, 50 Ω, coaxial, BNC

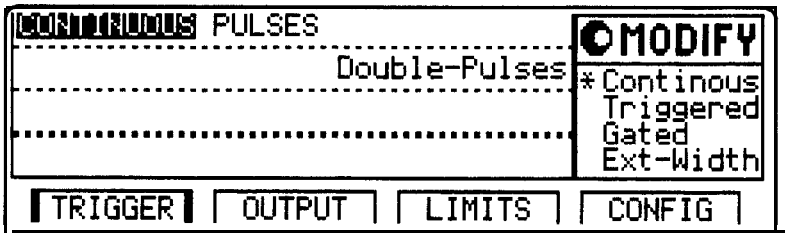
Procedure

1. Connect HP 8114A to the Scope as shown:



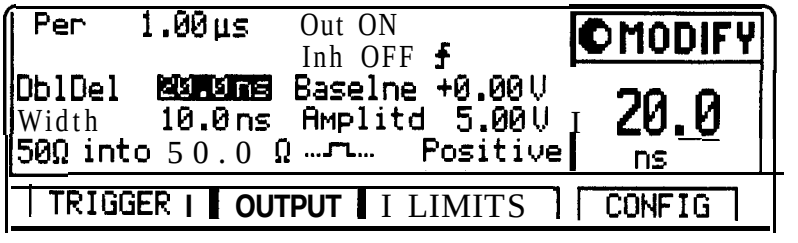
Connecting HP 8114A to the Scope

2. Select the TRIGGER page on the HP 8114A and set up as follows:



The TRIGGER Page Set-up

3. On the HP 8114A set up OUTPUT page as shown in the following illustration:



Configuring the Output Page

4. Set the Digitizing Oscilloscope HP 54121T:

- Press (AUTOSCALE)
- Set scope timebase to 5 ns/div
- Center the double pulse signal
- Select the Display menu and set the Number of Averages to 32
- Select the Delta V menu and turn the Voltage markers On

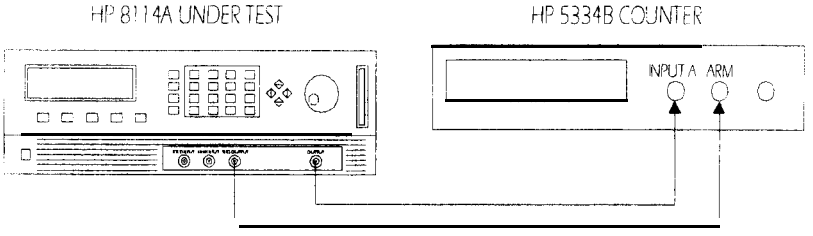
- Set Preset Levels = 50% -50% and press [AUTO LEVEL SET]
- Select the Delta t menu and turn the Time markers On
- Set START ON EDGE = POS1 and STOP ON EDGE = POS2

5. Press the [PRECISE EDGE FIND] key for each new double delay setting
6. Check the HP 8114A double delay at the following settings:

Table 3-8.
Double Delay Settings and TR Reference

Oscilloscope Timebase	Double Delay	Acceptable Range	TR Entry
5 ns/div	20.0 ns	18.75 ns to 21.25 ns	4 - 1
10 ns/div	50.0 ns	47.25 ns to 52.75 ns	4 - 2
20 ns/div	100 ns	94.75 ns to 105.25 ns	4 - 3

7. Connect the HP 8114A to the Counter as shown:

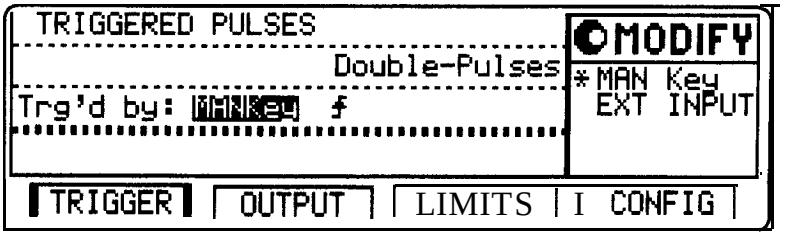


Connecting HP 8114A to the Counter

8. Set the Counter to:

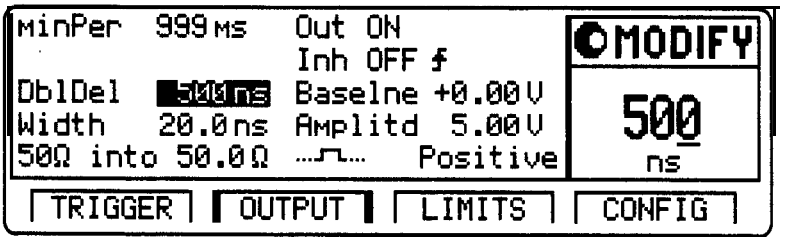
FUNCTION	Period A
INPUT A	50 Ω
AUTO TRIG	OFF
EXT ARM SELECT	a. Start (ST): leading edge b. Stop (SP): trailing edge

9. Select the TRIGGER page on the HP 8114A and set up as follows:



The TRIGGER Page Set-up

10. On the HP 8114A set up the OUTPUT page as shown in the following illustration:



Configuring the Output Page

11. Check the HP 8114A double pulse delay at the following settings, pressing (MAN) to trigger a single cycle each time:

Table 3-9.
Double Delay Settings and TR Reference

Double Delay	Acceptable Range	TR Entry
500 ns	474.76 ns to 625.25 ns	4 - 4
1 µs	949.75 ns to 1050.25 µs	4 - 5
5 µs	4.759 µso 5.26 µs	4 - 6
60 µs	47.5 µso 52.5 µs	4 - 7
500 µs	475 µs to 626 µs	4 - 8
5 ms	4.75 ms to 5.25 ms	4 - 9
50 ms	47.5 ms to 52.5 ms	4 - 10
500 ms	475 ms to 626 ms	4 - 11

Test 5: Jitter

The following tests are required:

1. Period Jitter
2. Width Jitter
3. Delay Jitter

Test 5.1: Period Jitter

Test Specifications

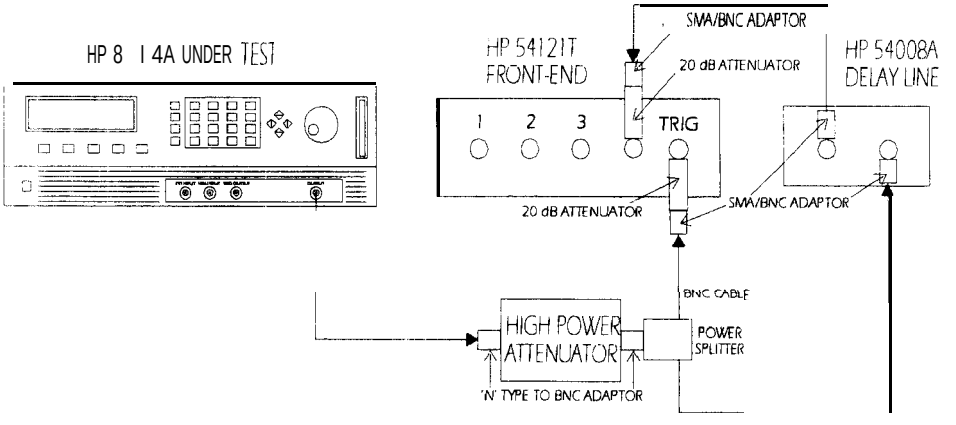
RMS-Jitter: 0.03% + 25 ps (0.05% + 25 ps for period <100 ns)

Equipment Needed

Digitizing Oscilloscope with Accessories
Delay Line (22 ns)
Power Splitter
All cables: 50 Ω, coaxial, BNC, 122 cm (4 ft)
High Power Attenuator

Procedure

1. Connect HP 8114A to the Scope as shown:

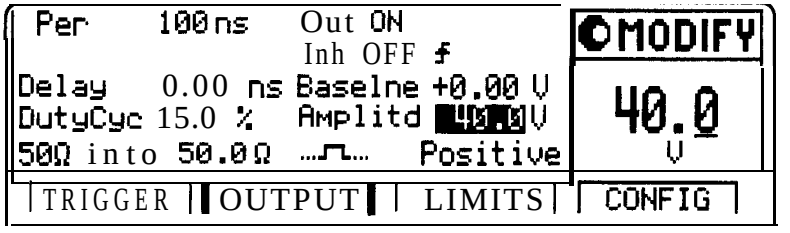


Equipment Set-up for Jitter Test

2. On the HP 8114A press TRIGGER and set up page as follows:

   - CONTINUOUS PULSES
   - Single Pulses

3. On the HP 8114A set up **the** OUTPUT page as shown in the following illustration:



Configuring the Output Page

4. Set the Digitizing Oscilloscope HP 54121T:

   - Press (AUTOSCALE)
   - Select the Display menu and set the Number of Averages to 64
   - Select the Channel menu and set the Attenuation factor of channel 4 to 10
   - Set the VOLTS/DIV of channel 4 to 10 mV/div
   - Set OFFSET to 1V
   - Select the Timebase menu **and** set the TIME/DIV to 100 ps/div
   - Center the first positive-going **edge** of the signal (approximate Delay = 29 ns)
   - Select the Delta V menu and turn the V markers On
   - Set the Marker 1 Position to 980 mV and the Marker 2 Position to 1 v

- Select the Delta t. menu and turn the T Markers On
- Set START ON EDGE = POS1 and STOP ON EDGE = POS1
- Press the [PRECISE EDGE FIND] key

5. RECORD the delta t reading. This is the rise time of the reference signal within a 1% amplitude window of the signal connected to Input. 4. This value is needed later to calculate the correct jitter. (delta.t.up)

6. Select, the Timebase menu and center the second positive-going edge of the signal (approximate Delay = 129 ns)

7. Press [MORE] and [HISTOGRAM]

- Select the Window submenu and set:
- Source is channel 4
- Choose the Time Histogram
- Press [WINDOW MARKER-1] and set it to 980 mV
- Press [WINDOW MARKER 2] and set it to 1 V

8. Select the Acquire submenu, set the Number of Samples to 1000 and press [START ACQUIRING']

9. After the data for the time histogram has been acquired (# Samples = 100%), select the Result submenu.

10. Press [MEAN] and (SIGMA). RECORD the value of sigma

11. The RMS-jitter is calculated as follows:

$$RMS - jitter = \frac{6sigma - delta.t.up}{6}$$

12. The RMS-jitter for period of 100 ns is 75 ps. Enter the result in the Test Report as TR entry 5.1 - 1

13. Set the HP 8114A period to 500 ns

14. Repeat steps 6 to 11

Note

TIME/DIV = 200 ps/div; approximate Delay = 530 ns

15. The RMS-jitter for period of 500 ns is 175 ps. Enter the result in the Test Report as TR entry 5.1 - 2

Test 5.2: Width Jitter

Test Specifications

RMS-Jitter: 0.03% + 25 ps (0.05% + 25 ps for 50 ns < width < 100 ns)

Equipment Needed

Digitizing Oscilloscope with Accessories

Delay Line (22 ns)

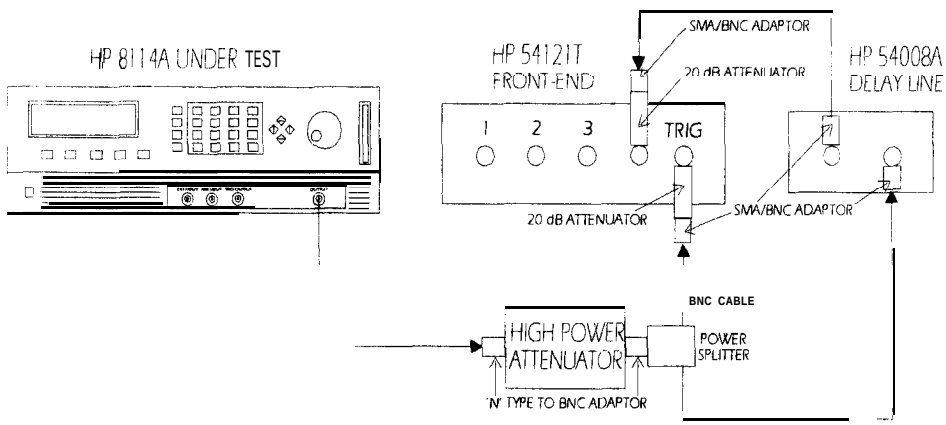
Power Splitter

All cables 50 Ω, coaxial, BNC, 122cm (4ft)

High Power Attenuator

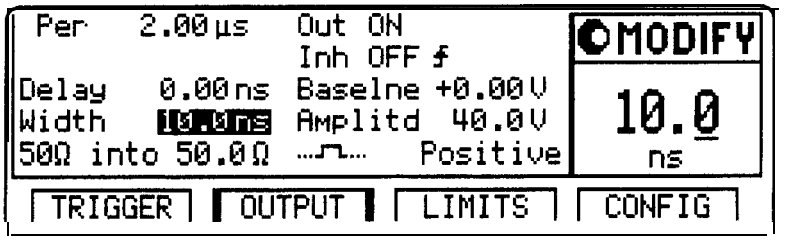
Procedure

1. Connect HP 8114A to the Scope as shown:



Equipment Set-up for Jitter Test

2. On the HP 8114A set up the OUTPUT page as shown in the following illustration:



Configuring the Output Page

3. Set the Digitizing Oscilloscope HP 54121T:

- Press (AUTOSCALE)
- Select the Display menu and set the Number of Averages to 128
- Select the Channel menu and set the Attenuation factor of channel 4 to 10
- Set the VOLTS/DIV of channel 4 to 10 mV/div
- Set OFFSET to 1 V
- Select the Timebase menu and set the TIME/DIV to 100 ps/div
- Center the first negative-going edge of the signal (approximate Delay = 38.8 ns)
- Select the Delta V menu and turn the V markers On
- Set the Marker 1 Position to 1.02 V and the Marker 2 Position to 1.00 v
- Select the Delta t menu and turn the T Markers On
- Set START ON EDGE = NEG1 and STOP ON EDGE = NEG1
- Press the (PRECISE EDGE FIND) key

4. RECORD the delta t reading. This is the fall time of the reference signal within a 1% amplitude window of the signal connected to Input 4. This value is needed later to calculate the correct jitter. (delta.t.dn)

5 Set the HP 8114A pulse width to 50 ns

6. Select the Timebase menu and center the first negative-going edge of the signal (approximate Delay = 78.8 ns)

7. Press (MORE) and (HISTOGRAM)

8. Select the Window submenu and set:

   - Source is channel 4
   - Choose the Time Histogram
   - Press (WINDOW MARKER 1) and set it to 1.02 V
   - Press (WINDOW MARKER 2) and set it to 1.00 V

9. Select the Acquire submenu, set the Number of Samples to 1000 and press (START ACQUIRING)

10. After the data for the time histogram has been acquired (# Samples = 100%), select the Result submenu.

11. Press (MEAN) and (SIGMA). RECORD the value of sigma

12. The RMS-jitter is calculated as follows:

$$RMS - jitter = \frac{6sigma - delta.t.dn}{6}$$

13. The RMS-jitter for pulse width of 50 ns is 50 ps. Enter the result in the Test Report as TR entry 5.2 - 1

14. Set the HP 8114A for pulse width of 500ns

15. Repeat steps 7 to 13

Note

TIME/DIV = 200ps/div. Approximate delay = 529 ns

16. The RMS-jitter for pulse width of 500 ns is 175 ps. Enter the result in the Test Report as TR entry 5.2 - 2

Test 5.3: Delay Jitter

Test Specifications

RMS-Jitter	0.03% + 25 ps (0.05% + 25 ps for 50 ns < delay < 100 ns)

Equipment Needed

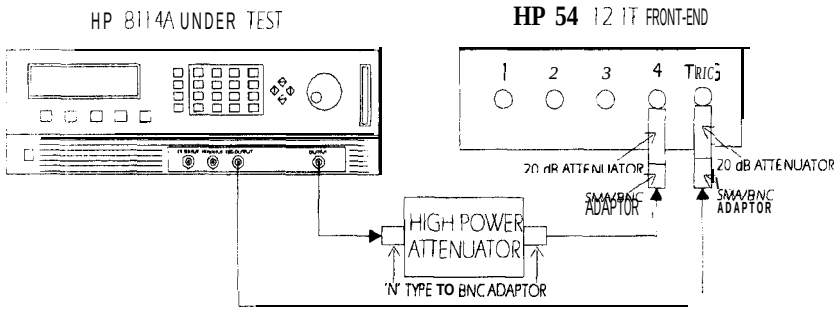
Digitizing Oscilloscope with Accessories

All cables: 50 Ω, coaxial, BNC, 122cm (4ft)

High Power Attenuator

Procedure

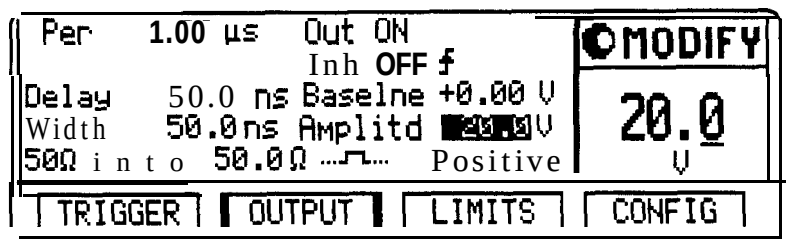
1. Connect HP 8114A to the Scope as shown:



Equipment Set-up for Delay Jitter Test

2. For calculating the RMS-jitter, the rise time of the reference signal within a 1% amplitude window is required. If this value is not, already measured in the Period Jitter test, then perform the first, 6 steps of the Period Jitter test.

3. On the HP 8114A set up the OUTPUT page as shown in the following illustration:



Configuring the Output Page

4. Set the Digitizing Oscilloscope HP 54121T:
   - Press (AUTOSCALE)
   - Select the Display menu and set the Number of Averages to 64
   - Set the VOLTS/DIV = 10 mV/div
   - Set OFFSET to 1 V
   - Select the Timebase menu and set the TIME/DIV to 100 ps/div
   - Center the first positive-going edge of the signal (approximate Delay = 98.5 ns)
5. Press (MORE) and (HISTOGRAM)
6. Select the Window submenu and press [WINDOW MARKER 1] and set it to 980 mV
7. Press (WINDOW MARKER 2) and set it to 1 V
8. Select the Acquire submenu, set the Number of Samples to 1000 and press (START ACQUIRING)
9. After the data for the time histogram has been acquired (# Samples = 100%), select the Result submenu
10. Press (MEAN) and [SIGMA). RECORD the values of sigma
11. The RMS-jitter is calculated as follows:

$$RMS\text{-}jitter = \frac{6sigma - delta.t.up}{6}$$

12. The RMS-jitter for delay of 50 ns is 50 ps. Enter the result in the Test Report as TR entry 5.3 1
13. Set HP 8114A for delay of 500 ns
14. Repeat steps 9 to 12

Note

TIME/DIV = 200 ps/div. Approximate delay = 549 ns

15. The RMS jitter for delay of 500 ns is 175 ps. Enter the result in the Test Report as TR entry 5.3 • 2

Test 6: Amplitude

The following tests are required:

1. From 50Ω into 500
2. From HIZ (High-Z) into 50Ω

Test Specifications

Range:	A) 1.00 V to 50.0 V (50Ω into 508) B) 2.00 V to 100 V (HIZ (High-Z} into 5061)
Accuracy:	±1 % of amplitude ±100 mV
Resolution:	3 digits, best case 10 mV
Baseline:	0 V ±100 mV ±0.5% of amplitude

Equipment Needed

1. Digitizing Voltmeter (DVM)
2. High Power attenuator
3. 50Ω, 0.1%, 10 W Feedthrough

Calculating out Measurement Uncertainties

Measurement uncertainties need to be calculated out as follows:

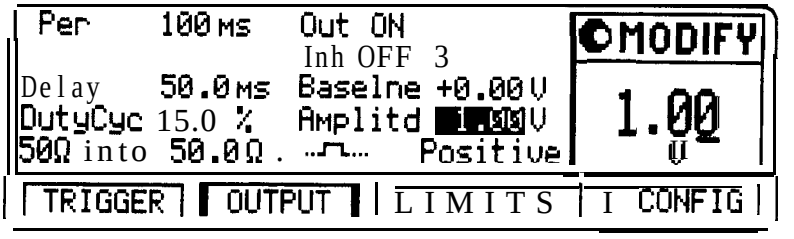
a) For 50Ω into 50Ω measurements, the Attenuation Factor must be calculated

b) For HIZ (High-Z) into 50Ω measurements, the Attenuation Factor, Load impedance, **and** Adjust factor must be calculated.

Do these calculations as follows:

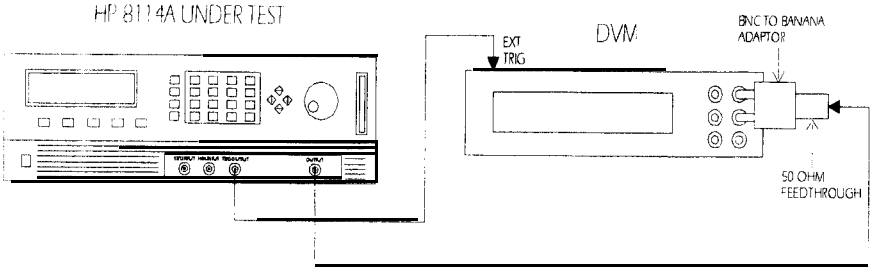
a) Calculation for 503 into 503 measurements

Procedure 1. On the HP 8114A set up the OUTPUT page as shown in the following illustration:



Configuring the Output Page

2. Connect HP 8114A to the DVM as shown:



Equipment Set-up 1 for Amplitude Test

3. Set the DVM HP 3458A to:

   Function: DCV

   Trigger: TRIG EXT

   AD-Converter integration time NPLC: 0.1
   (NPLC = Number of Power Line Cycles)

4. Take the reading as V_1

5. Connect HP 8114A to the DVM as shown:

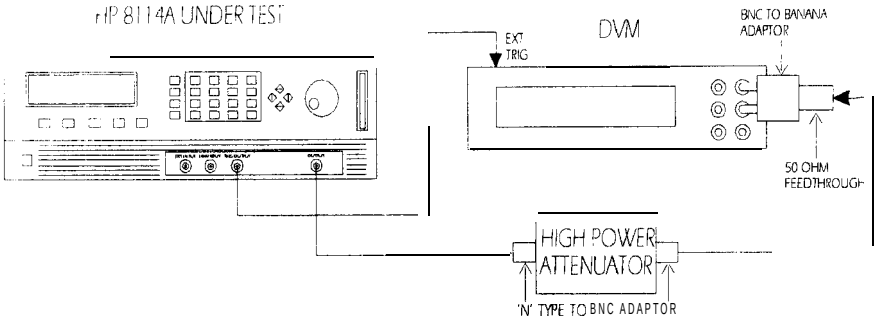


Figure 3-3. Equipment Set-up 2 for Amplitude Test

6. Take the reading as V_2

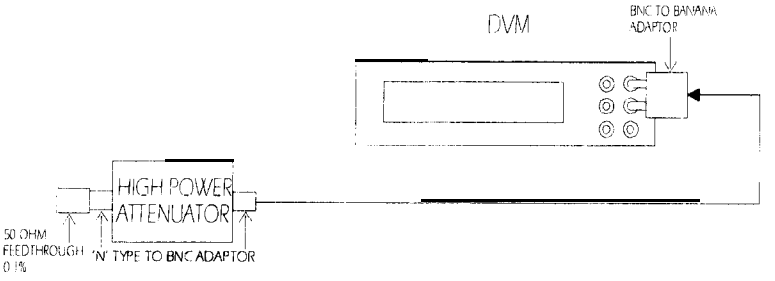
7. Calculate the Attenuation Factor to at least 2 decimal places:

$$G_1 = \frac{V_1}{V_2}$$

b) Calculation for HIZ (High-Z) into 503 measurements

Procedure

1. Connect the High Power Attenuator to the DVM as shown:

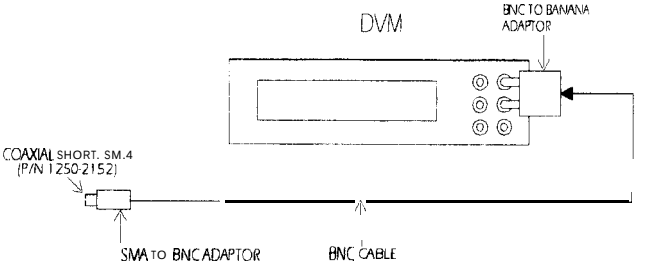


Connecting the Attenuator to the DVM

2. Set the DVM HP 3458A to:

   Function: OHM

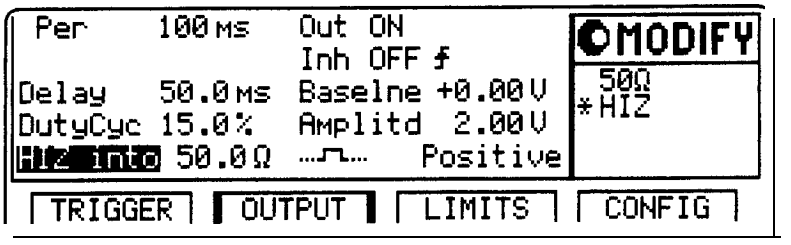
3. Take the reading as R_1
4. Take the reading for the Coaxial Short, R_2, as shown:



Measuring the Coaxial Short

5. Calculate the load impedance: $R_L = R_1 \quad R_2$

6. On the HP 8114A set up the OUTPUT page as shown in the following illustration:

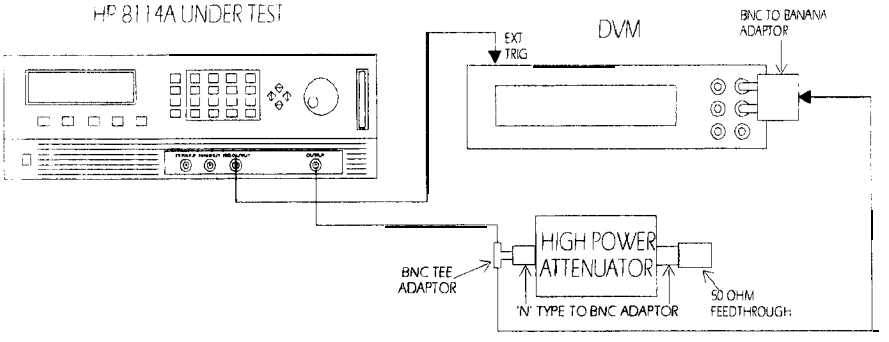


Configuring the Output Page

7. Set the DVM HP 3458A to:

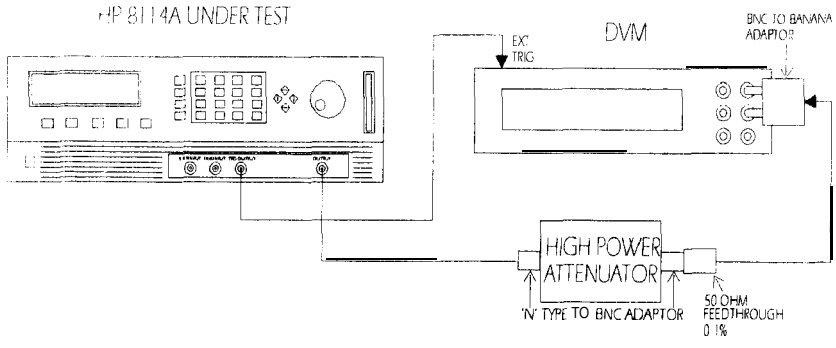
Function:	DCV
Trigger:	TRIG EXT
NPLC:	0.1

8. Connect HP 8114A to the DVM as shown:



9. Take the reading as V_3

10. Connect, HP 8114A to the DVM as shown:



11. Take the reading as V_4

12. Calculate the attenuation factor G_2:

$$G_2 = \frac{V_3}{V_4}$$

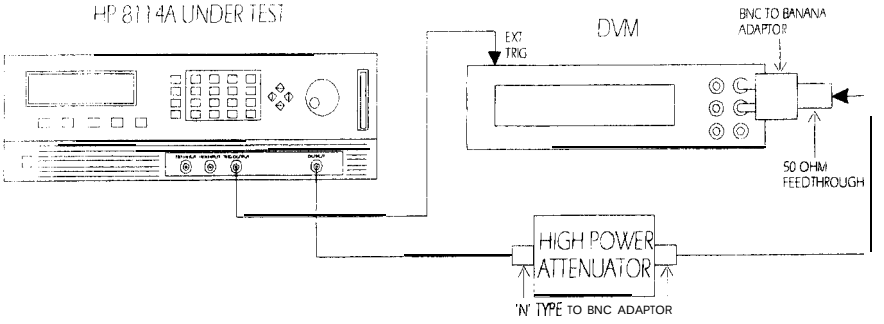
13. Calculate the adjust factor A_d:

$$A_d = \frac{R_L}{R_o}$$

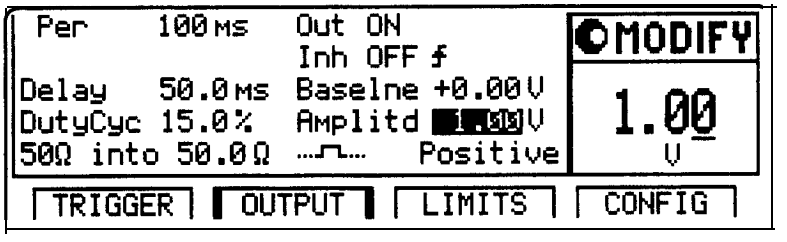
$R_o = 50\Omega$

A) Amplitude Test (from 50Ω into 50Ω)

Procedure 1. Connect HP 8114A to the DVM as shown:



2. On the HP 8114A set up the OUTPUT page as shown in the following illustration:



Configuring the Output Rage

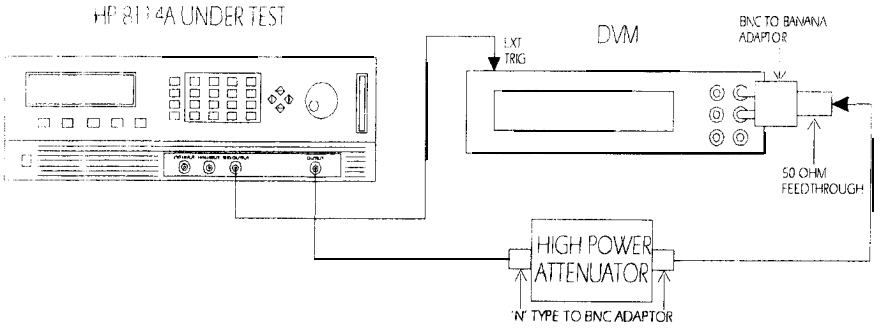
3. Set HP 8114A Delay to **0** ns
4. Take the baseline reading as $B_{50\Omega}$
5. Set HP 8114A Delay to 50 ms and Amplitude to 1 V
6. Take the high-level reading as $H_{50\Omega}$
7. Calculate the Amplitude:
   $A_{50\Omega} = (H_{50\Omega} - B_{50\Omega}) \times G_1$
8. Repeat steps 3 to 7 for the following settings:

Table 3-10. Amplitude Levels: 503 into 50Ω

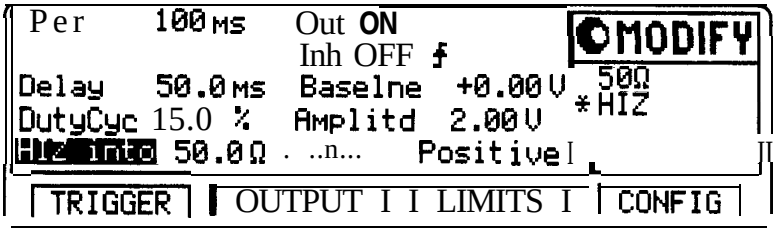
Amplitude	Amplitude limit		TR Entry
	minimum	maximum	
1 V	0.89 v	1.11 v	6 - 1
2 v	1.38 v	2.12 v	6-2
5 V	4.86 v	5.15 v	6 - 3
10 v	9.80 v	10.2 v	6-4
20 v	19.7 v	20.3 V	6 - 5
50 v	49.4 v	50.6 V	6 - 6

B) Amplitude Test (from HIZ {High-Z} into 500)

Procedure I. Connect HP 8114A to the DVM as shown:



2. On the HP 8114A set up the OUTPUT page as shown in the following illustration:



Configuring the Output Page

3. Set HP 8114A Delay to 0 ns
4. Take the baseline reading as B_{HIZ}
5. Set HP 8114A Delay to 50 ms and Amplitude to 2 V

6. Take the high-level reading as H_{HIZ}

7. Calculate the Amplitude:

$$A_{HIZ} = \frac{((H_{HIZ} - B_{HIZ})xG_2)}{A_d}$$

8. Repeat steps 3 to 7 for the following settings:

Table 3-11. Amplitude Levels: HIZ (High-Z) into 50Ω

Amplitude	Amplitude limit		TR Entry
	minimum	maximum	
2 V	1.88 V	2.12 v	6-7
5 V	4.85 V	5.15 v	6-8
10 v	9.80 v	10.2 v	6-9
20 v	19.7 v	20.3 v	6-10
60 v	49.4 v	50.6 V	6-11
100 v	98.9 v	101.1 v	6-12

Test 7: Variable Baseline (Option 001)

Note This test is only to be performed if **Option 001** is installed.

Test Specifications

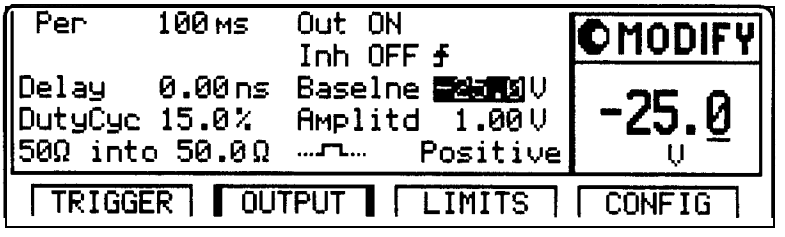
Range: -25 V to +25 V
Accuracy: ±1% ±100 mV ±0.5% of amplitude
50Ω source impedance only

Equipment Needed

1. Digitizing Voltmeter (DVM)
2. High Power attenuator
3. 50Ω, 0.1%, 10W Feedthrough

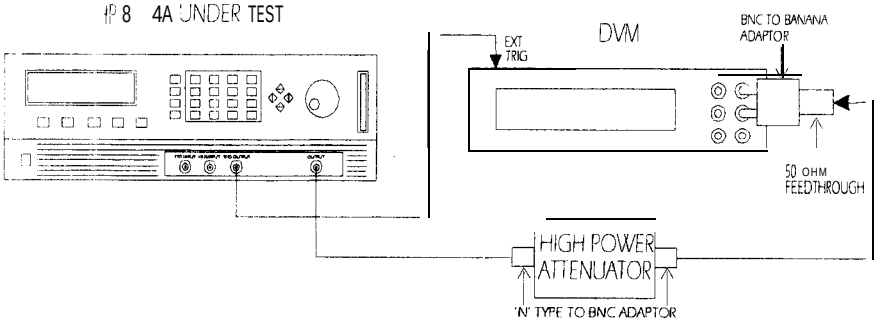
Procedure

1. On the HP 8114A set up the OUTPUT page as shown in the following illustration:



Configuring the Output Page

2. Connect HP 8114A to the DVM as shown:



Equipment Set-up 1 for Variable Baseline Test

edings for the following baseline settings (VB). Multiply the r

3. Set the DVM HP 3458A to:

   Function: DCV

   Trigger: TRIG EXT

   AD-Converter integration time NPLC: 0.1
   (NPLC = Number of Power Line Cycles)

4. Take the DVM readings for the following baseline settings (VB). Multiply the reading by the attenuation factor G_1 [derived from the amplitude test, test 6).

   $B = VB \times G_1$

   Compare the calculated value with the given limits:

Table 3-12. Baseline Levels Test

Baseline Level	Limits minimum	Limits maximum	TR Entry
-25 v	-25.355 V	-24.645 V	7-1
-20 v	-20.305 V	-19.696 V	7-2
-10 v	-10.205 v	-9.795 V	7-3
-5 v	-6.155 v	-4.435 v	7-4
-2 v	-2.125 V	-1.876 V	7-5
0	-0.105 v	+0.105 v	7-6
+2 V	+ 1.876 v	+ 2.125 V	7-7
+5 V	+ 4.845 V	+5.155 v	7-K
+ 10 v	+9.795 V	+ 10.205 V	7-9
+20 v	+ 19.695 V	+ 20.305 V	7 10
+25 v	+ 24.645 V	+ 26.355 V	7-11

Test 8: Transition Time

The following tests are required:

1. From 500 into 500, amplitudes >5 V
2. From HIZ (High-Z) into 50Ω amplitudes >10 V

Test Specifications Range: <7 ns for amplitudes >5 V (50Ω into 503)
<12 ns for amplitudes >10 V (HIZ {High-Z} into 50Ω)

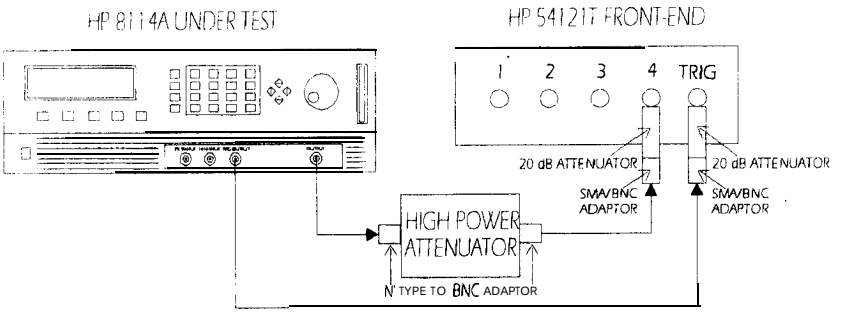
Equipment Needed Digitizing Oscilloscope with Accessories
High Power Attenuator

Test 8.1a: Leading Edge Test

Leading edge for amplitudes >5 V from 50Ω into 50Ω.

Procedure

1. Connect HP 8114A to the Scope as shown:

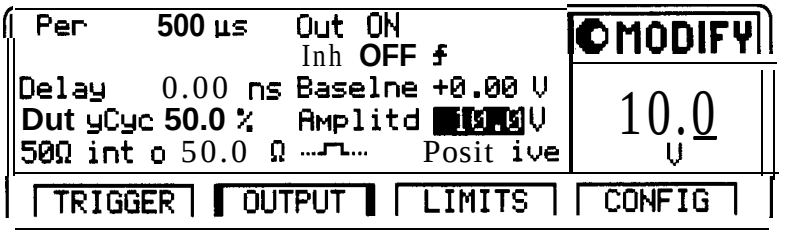


Connecting HP 8114A to the Scope

On the HP 8114A press TRIGGER and set up page as follows:

- CONTINUOUS PULSES
- Single Pulses

2. On the HP 8114A set-up the OUTPUT page as shown in the following illustration:



Configuring the Output Page

3. Set the Digitizing Oscilloscope HP 54121T:

   - Press [AUTOSCALE]
   - Center one pulse on screen, e.g.: TIME/DIV = 50 µs/div, DELAY = 365 µs,
   - Select the Display menu and set the Number of Averages to 32
   - Select the Channel menu and set the Attenuation factor to 10
   - Select the Delta V menu and turn the voltage markers On
   - Set the Preset Levels = 10-90% and press [AUTO LEVEL SET]
   - Select the Timebase menu and set TIME/DIV = 2 ns/div, DELAY = 40.7 ns
   - Select the Delta t menu and turn the markers On
   - Set START ON EDGE = POS1 and STOP ON EDGE = POS1

4. Set period of HP 8114A to: Period = 1 µs

5. After the averaging, while the oscilloscope is in the Delta t menu, Press the [PRECISE EDGE FIND] key

6. Check the HP 8114A rise time at the following leading edge setting:

Table 3-13. Leading Edge Setting

Oscilloscope TIME/DIV	Period	Acceptable Range	TR Entry
2 ns/div	1 µs	<7 ns	8.1a

Test 8.1b: Trailing Edge Test

Trailing edge for amplitudes >5 V from 50Ω into 500.

Note 3 The Leading Edge test must be performed before you start this test.

Procedure

1. Set the Digitizing Oscilloscope HP 54121T:

   - Select the Timebase menu and set TIME/DIV = 2 ns/div, DELAY = 542 ns
   - Select the Delta t menu
   - Set START ON EDGE = NEG1 and STOP ON EDGE = NEG1

2. While the oscilloscope is in the Delta t menu, press the [PRECISE EDGE FIND] key

3. Check the HP 8114A output signal falls at the following trailing edge setting:

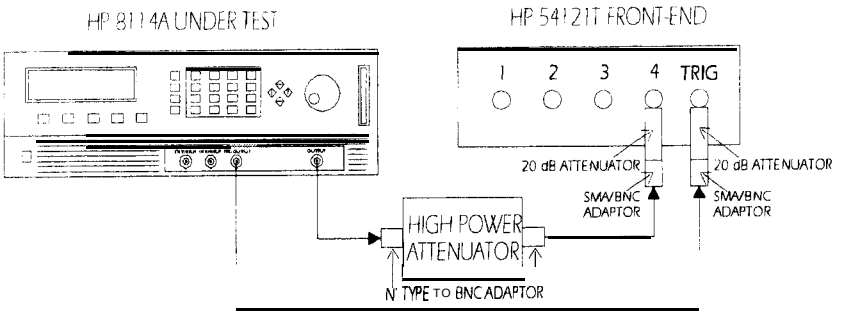
Table 3-14. Trailing Edge Setting

Oscilloscope TIME/DIV	Delay	Period	Acceptable Range	TR Entry
2 ns/div	542 ns	1 µs	<7 ns	8.1b

Test 8.2a: Leading Edge Test

Leading edge for amplitudes >10 V from HIZ (High-Z) into 50Ω.

Procedure 1. Connect HP 8114A to the Scope as shown:

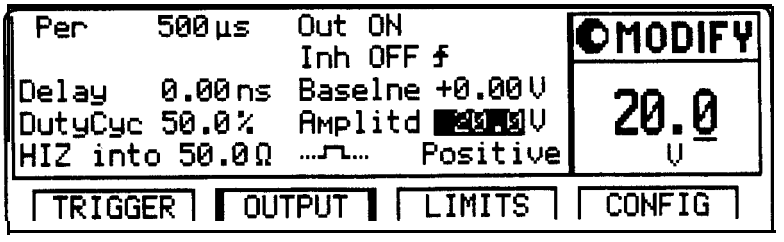


Connecting HP 8114A to the Scope

On the HP 8114A press TRIGGER and set up page as follows:

- CONTINUOUS PULSES
- Single Pulses

2. On the HP 8114A set-up the OUTPUT page as shown in the following illustration:



Configuring the Output Page

3. Set the Digitizing Oscilloscope HP 54121T:
   - Press (AUTOSCALE)
   - Center one pulse on screen, e.g.: TIME/DIV = 50 μs/div, DELAY = 365 μs,
   - Select the Display menu and set the Number of Averages to 32
   - Select the Channel menu and set the Attenuation factor to 10
   - Select the Delta V menu and turn the voltage markers On
   - Set the Preset Levels = 10-90% and press [AUTO LEVEL SET]
   - Select the Timebase menu and set TIME/DIV = 5 ns/div, DELAY = 27 ns
   - Select the Delta t menu and turn the markers On
   - Set START ON EDGE = POS1 and STOP ON EDGE = POS1
4. Set period of HP 8114A to: Period = 1 μs
5. After the averaging, while the oscilloscope is in the Delta t menu, Press the [PRECISE EDGE FIND] key
6. Check the HP 8114A rise time at the following leading edge setting:

Table 3-15. Leading Edge Setting

Oscilloscope TIME/DIV	Period	Acceptable Range	TR Entry
5 ns/div	1 μs	<12 ns	8.2a

Test 8.2b: Trailing Edge Test

Trailing edge for amplitudes >10 V from HIZ (High-Z) into 50Ω.

Note The Leading Edge test must be performed before you start this test.

Procedure

1. Set the Digitizing Oscilloscope HP 54121T:
   - Select the Timebase menu and set TIME/DIV = 5 ns/div, DELAY = 529 ns
   - Select the Delta t menu
   - Set START ON EDGE = NEG1 and STOP ON EDGE = NEG1
2. After the averaging, while the oscilloscope is in the Delta t menu, Press the [PRECISE EDGE FIND] key
3. Check the HP 8114A output signal falls at the following trailing edge setting:

Table 3-16. Trailing Edge Setting

Oscilloscope TIME/DIV	Delay	Period	Acceptable Range	TR Entry
6 ns/div	520 ns	1 μs	<12 ns	8.2b

Test 9: Pulse Aberration Test

'The following tests arc required:

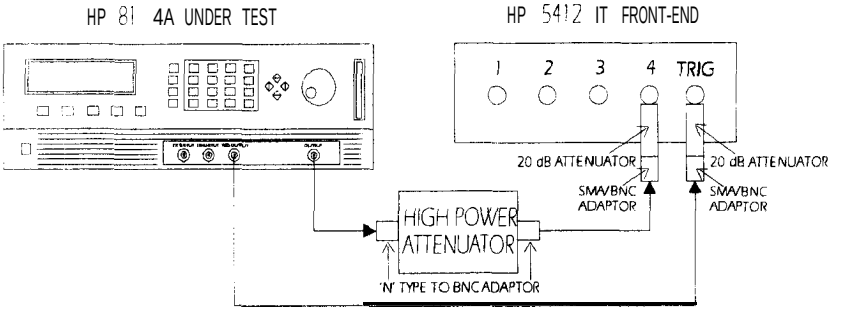
1) Overshoot and Ringing
2) Preshoot

Test Specifications Overshoot/Ringing/Preshoot:

±5% of amplitude 150 mV

Equipment Needed Digitizing Oscilloscope with Accessories
High Power Attenuator

Procedure 1. Connect HP 8114A to the Scope as shown:



Connecting HP 8114A to the Scope

On the HP 8114A press TRIGGER and set up page as follows:

- CONT I NUOUS PULSES
- Single Pulses

2. On the HP 8114A set up the **OUTPUT** page as shown in the following illustration:

Configuring the Output Page

1) Overshoot and Ringing

3. Set the digitizing oscilloscope HP 54121T:

- Press (AUTOSCALE)
- Select the Display menu and set, the Number of Averages to 32
- Select the Channel menu and set the Attenuation factor to 100
- Center one pulse horizontally and vertically on screen (e.g. TIME/DIV = 100 ns/div, DELAY = 800 ns)
- Select the delta V menu and turn the voltage markers **On**
- Set the VARIABLE LEVELS = 95% · 105% and press [AUTO LEVEL SET]
- Select the channel menu and center vertically the top pulse (offset = 25 V)
- Set the VOLTS/DIV = 1 V/div
- Select the Timebase menu and set TIME/DIV = 20 ns/div, DELAY = 30 ns

4. Check that Overshoot and Ringing are within the ±5% of amplitude ±50 mV window (within the two marker positions)

5. Enter the result in the Test Report as TR entry 9 I

Note lake the oscilloscope's trace flatness error (GaAs input circuit) into account.

6. Set HP 8114A to: Amplitude = 5 V

7. Repeat steps 3 to 5, but this time set the Scope to:

- VARIABLE LEVELS = 94% · 106% and press [AUTO LEVEL SET]
- OFFSET = 5 V
- VOLTS/DIV = 200 mV/Div
- TIMEBASE = 20 ns/Div

8. Enter the result in the Test Report as TR entry 9 · 2

2) Preshoot

9. Set HP 8114A to:

- Period = 1 μs
- Amplitude = 5 V
- Baseline = 0 V
- Delay = 50 ns

10. Set the digitizing oscilloscope, HP 54121T:

- Press (AUTOSCALE)
- Select the Display menu and set the Number of Averages to 32
- Select the Channel menu and set the Attenuation factor to 100
- Center one pulse horizontally and vertically on screen (e.g. TIME/DIV = 100 ns/div, DELAY = 800 ns)
- Select the delta V menu and turn **the** voltage markers On
- **Set the** VARIABLE LEVELS = -6% to +6% and press (AUTO LEVEL SET)
- Select the channel menu **and** center vertically the bottom of the pulse (offset = 0 V)
- Set the VOLTS/DIV = 200 mV/div
- Select the Timebase menu and set TIME/DIV = 20 ns/div

11. Check that Preshoot is within the $\pm 5\%$ of amplitude ± 50 mV window.
12. Enter the result in the Test Report as TR entry 9 - 3

HP 8114A Performance Test Records

Test Facility:

_____ Report No. _____

_____ Date _____

_____ Customer _____

_____ Tested By _____

Model HP 8114A 100V/2A Pulse Generator

Serial No. _____ Ambient temperature _____ °C

Options _____ Relative humidity _____ %

_____

_____

_____

Firmware Rev. _____ Line frequency _____ Hz

Special Notes:

_____

_____

_____

_____

_____

Test Equipment Used

Description	Model No.	Trace No.	Cal. Due Date
1. Oscilloscope	HP 54121T		
2. Counter	HP 5334B		
4. Digital Voltmeter	HP 3458A		
3. Pulse Generator	HP 8112A		
5. Delay Line	HP 54008A		
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			

Test Results for HP 8114A Pulse Generator

Serial No. _____ Ambient temperature _____ °C

Customer _____ Relative humidity _____ %

CSO# _____ Line frequency _____ HZ

Tested by _____ Date _____

Comments:

_____

_____

_____

Period

Scope Uncertainty factor _____

TR Entry	Test	Limit Minimum	Actual Result	Limit Maximum	Pass	Fail
1 - 1	66.7 ns	63.27 ns	_____	70.14 ns	___	___
1 - 2	100 ns	94.9 ns	_____	105.1 ns	___	___
1 - 3	500 ns	474.9 ns	_____	525.1 ns	___	___
1 - 4	1 μs	949.9 ns	_____	1050.1 ns	___	___
1 - 5	5 μs	4.75μs	_____	5.25 μs	___	___
1 - 6	50 μs	47.5 μs	_____	52.5 μs	___	___
1 - 7	500 μs	475 μs	_____	525 μs	___	___
1 - 8	5 ms	4.75ms	_____	5.25 ms	___	___
1 - 9	50 ms	47.5 ms	_____	52.5 ms	___	___
1 - 10	500 ms	475 ms	_____	525 ms	___	___

Period Jitter

Scope Uncertainty factor _____

TR Entry	Test	Actual Result	Limit Maximum	Pass	Fail
5.1 - 1	100 ns	_____	75 ps	___	___
5.1 - 2	500 ns	_____	175 ps	___	___

Width

Scope Uncertainty factor _____

TR Entry	Test	Limit Minimum	Actual Result	Limit Maximum	Pass	Fail
2 - 1	10.0 ns	9.00 ns	_____	11.0 ns	___	___
2 - 2	50.0 ns	47.0 ns	_____	53.0 ns	___	
2 - 3	100 ns	94.5 ns	_____	105.5 ns	___	___
2 - 4	500 ns	474.5 ns	_____	525.5 ns	___	___

Counter Uncertainty factor _____

TR Entry	Test	Limit Minimum	Actual Result	Limit Maximum	Pass	Fail
2 - 5	1 µs	949.5 ns	_____	1050.5 µs	___	___
2 - 6	5 µs	4.75 µs	_____	5.26 µs	_ _	___
2 - 7	50 µs	47.5 µs	_____	52.5 µs	___	___
2 - 8	500 µs	475 µs	_____	525 µs	___	___
2 - 9	5 ms	4.75 ms	_____	5.25 ms	___	___
2 - 10	50 ms	47.5 ms	_____	52.5 ms	___	___
2 - 11	500ms	475 ms	_____	525 ms	_ _	___

Width Jitter

Scope Uncertainty factor _____

TR Entry	Test	Actual Result	Limit Maximum	Pass	Fail
5.2 1	50 ns	_____	50 ps	___	___
5.2 - 2	500 ns	_____	175 ps	___	___

Delay

Scope Uncertainty factor _____

TR Entry	Test	Limit Minimum	Actual Result	Limit Maximum	Pass	Fail
3-1	0.00 ns		_____	Fixed Delay	___	_ _
3 2	5.00 ns	3.75 ns	_____	6.25 ns	___	___
3-3	10.0 ns	8.50 ns	_____	11.50 ns	___	___
3-4	50.0 ns	46.5 ns	_____	53.5 ns	___	___
3-5	100 ns	94 ns	_____	106ns	___	_ _
R-6	500 ns	474 ns	_____	526 ns	___	___

Counter Uncertainty factor _____

TR Entry	Test	Limit Minimum	Actual Result	Limit Maximum	Pass	Fail
3-7	1 μs	949 ns	_____	1051 ns	___	___
3-8	5 μs	4.749 μs	_____	5.251 μs	___	___
3-9	50 μs	47.5 μs	_____	52.5 μs	_ _	___
3-10	500 μs	475 μs	_____	525 μs	___	___
3-11	5 ms	4.75 ms	_____	5.25 ms	___	___
3-12	50 ms	47.5 ms	_____	52.5 ms	___	___
3-13	500ms	475 ms	_____	525 ms	_ _	___

Delay Jitter

Scope Uncertainty factor _____

TR Entry	Test	Actual Result	Limit Maximum	Pass	Fail
5.3-1	50 ns	_____	50 ps	___	___
5.3-2	500 ns	_____	175 ps	___	___

Double Pulse Delay

Scope Uncertainty factor _____

TR Entry	Test	Limit Minimum	Actual Result	Limit Maximum	Pass	Fail
4 - 1	20.0 ns	18.75 ns	_____	21.25 ns	____	____
4 - 2	50.0 ns	47.25 ns	_____	52.75 ns	____	____
4 3	100 ns	94.75 ns	_____	105.25 ns	____	____

Counter Uncertainty factor _____

TR Entry	Test	Limit Minimum	Actual Result	Limit Maximum	Pass	Fail
4 - 4	500 ns	474.75 ns	_____	525.25 ns	____	____
4 - 5	1 μs	949.75 ns	_____	1050.25 μs	____	__
4 - 6	5 μs	4.759 μs	_____	5.25 μs	____	____
4 - 7	50 μs	47.5 μs	_____	52.5 μs	__	____
4 - 8	500 μs	475 μs	_____	525 μs	__	__
4 - 9	5 ms	4.75 ms	_____	5.25 ms	____	____
4 - 10	50 ms	47.5 ms	_____	52.5 ms	__	____
4 - 11	500 ms	475 ms	_____	525 ms	____	__

Amplitude: **50Ω** into **50Ω**

TR Entry	Test	Measured $B_{50\Omega}$	Measured $H_{50\Omega}$	Calculated Amplitude $(H_{50\Omega} - B_{50\Omega}) \times G_1$	Amplitude limits Minimum	Amplitude limits Maximum	Pass	Fail
6 1	1 V				0.89 V	1.11 v		
6 2	2 v				1.88 v	2.12 V		
6-3 5	V				4.85 V	5.15 V		
6 4	10 V				9.80 V	10.2 V		
6-5	20V				19.7 v	20.3 v		
6 6	50 V				49.4 v	50.6 V		

Amplitude: **HIZ** into 500

TR Entry	Test	Measured B_{HIZ}	Measured H_{HIZ}	Calculated Amplitude $\{(H_{HIZ} - B_{HIZ}) \times G_2\} / A_d$	Amplitude limits Minimum	Amplitude limits Maximum	Pass	**Fail**
6 7	2 v				1.88 v	2.12 v		
6-8	5 V				4.85 V	5.15 v		
6 9	10 v				9.80 V	10.2 v		
6-10	20 v				19.7 v	20.3 V		
6 11	50v				49.4 v	50.6 V		
6-12	100 V	-	-		98.9 V	101.1 v		

Variable Baseline (Option 001)

Note

This test is only to be performed if **Option 001** is installed.

TR	Entry	Test	Variable Baseline Measured VB	Calculated B = VB x G_1	Baseline limits Minimum	Maximum	Pass	Fail
7 - 1	-25 V				-25.355 V	-24.645 V	____	____
7 - 2	-20 v				-20.305 V	-19.695 V	____	____
7 - 3	-10 v				-10.205 V	-9.795 V	____	____
7 - 4	-5 V				-5.155 v	-4.845 V	____	____
7 - 5	-2 v				-2.125 V	-1.875 V	____	____
7 - 6	±0 v				-0.105 v	+0.105 v	____	____
7 - 7	+2 v				t1.875 V	+2.125 V	__	__
7 - 8	+5 V				+4.845 V	+5.155 V	_ _	____
7 - 9	+ 10 v				t9.795 v	+ 10.2005	____	____
7 - 10	+20 v				+19.695 V	+20.305 V	__	__
7 - 11	+25 V				t24.645 V	t25.355 V	____	____

Leading Edge for Amplitudes >5 V from 503 into 50Ω

Scope Uncertainty factor _____

TR Entry	Test	Actual Result	Limit Maximum	pass	Rail
8.1a	Leading	_____	<7 ns	___	___

Trailing Edge for Amplitudes >5 V from 50Ω into 503

TR Entry	Test	Actual Result	Limit Maximum	Pass	Fail
8.1b	Trailing	_____	<7 ns	-	-

Leading Edge for Amplitudes >10 V from HIZ (High-Z) into 503

TR Entry	Test	Actual Result	Limit Maximum	Pass	Rail
8.2a	Leading	_____	<12 ns	___	___

Trailing Edge for Amplitudes >10 V from HIZ (High-Z) into 50Ω

TR Entry	Test	Actual Result	Limit Maximum	Pass	Fail
8.2b	Trailing	_____	<12 ns	___	___

Overshoot and Ringing

Scope Uncertainty factor _____

TR	Entry	Test	Acceptable range	Pass	Fail
9-1		25 V ±5% of ampl.	±50mV	____	_____
9-2		5 V ±5% of ampl.	±50mV	____	_____

Preshoot

TR	Entry	Test	Acceptable range	Pass	Fail
9-3		0 V ±5% of ampl.	±50mV	____	_____

4

Disassembly and Reassembly

This chapter enables you to disassemble the HP 8114A 15MHz 100V/2A Pulse Generator down to the levels necessary for removal and replacement of faulty subassemblies.

Some of the subassemblies need to be removed in a specific order, and the instructions have been written with this in mind.

Reassembly uses the removal steps in reverse, unless otherwise noted.

The instructions can also be used to provide the steps needed for retrofitting subassemblies.

A flowchart shows the order of steps needed to get to a specific part of the instrument.

Warning 

Do not open the instrument before the AC line power cord is disconnected. The output voltages, and the voltages in the primary section of the power supply can be dangerous to life.

ESD Protection

ATTENTION! STATIC SENSITIVE DEVICES: You must perform disassembly and reassembly in static save work areas only.

Terms Used and What They Mean

Some of the terms used in this chapter can be misleading in the wrong context. For example, the word replacement can refer to the act of changing a faulty subassembly, *or* replacing a working one after it has been removed from the instrument.

Here are some of the terms used in this chapter, and what we mean by them:

Fit To attach a subassembly to the instrument, usually taken to mean a subassembly that was not there before (see *Retrofit*)

Refit To put a subassembly **back** into the instrument, after removal for any reason

Replace To remove a faulty subassembly, and fit a new (working) one

Remove To **take** any subassembly (working or not) out of the instrument,

Retrofit To attach a subassembly to the instrument, in this case, to provide function(s) that were not fitted to the instrument when it was purchased

The Tools You Need

The following tools enable all fixings to be removed and replaced:

- Medium cruciform screwdriver (case handles, etc)
- Small cruciform screwdriver (PC boards, etc)
- 7mm diameter nut driver (HP-IB cable)
- 12mm diameter nut driver (RPG Head unit)
- Medium size long-nose pliers (power switch actuating rod, etc)
- Thin-biaded screwdriver, or knife (removing self-adhesive trim strips)

Inside the HP 8114A

'lake a look at Figure 4- 1. It shows the top view of an instrument with the case removed.

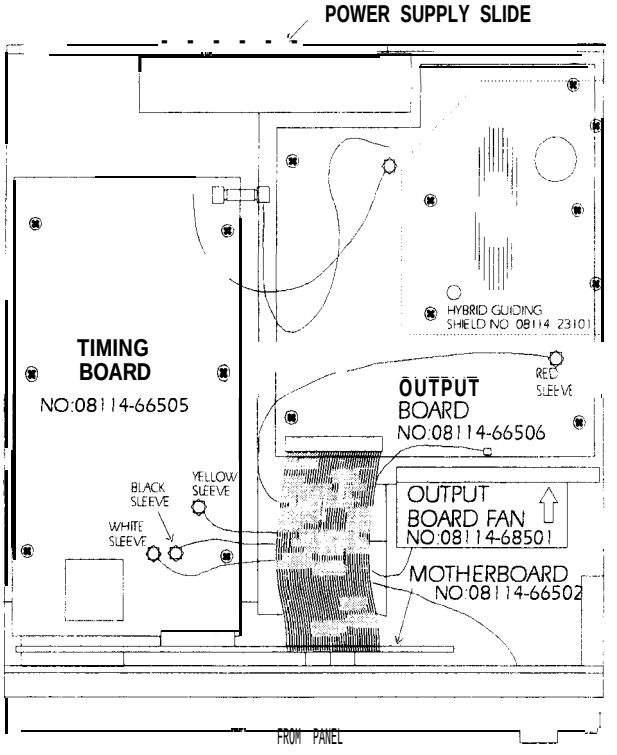


Figure 4-1. Top View of HP 8114A

There is direct access to the Timing board, and the output board. Access to the microprocessor board is possible when the power supply slide is removed. On the power supply slide, the power supply unit, power supply fan, and the optional variable baseline is mounted. The power supply slide is is removable or refittable at the rear panel side.

The Standard HP 8114A contains:

- Power Supply Unit
- MPU board
- Timing board
- Output board

In addition, the instrument may have been optionally fitted with, or retrofitted with the following board:

- Variable Baseline

Also, the BNC Input/Output connectors can be on the front or the rear panel, according to original customer requirements.

Instructions for Replacing or Retrofitting HP 8114A Subassemblies

Caution 

Disconnect the instrument from the mains power before disassembly!

The following sections show you how to remove and refit subassemblies. Generally, refitting is the reverse of removal, but where this differs, notes are included for guidance. Retrofitting **uses** the steps in reverse, in the same way as refitting.

As a general rule, do not tighten PC board fixing screws until all the screws have been inserted and partially tightened. This helps to avoid flexing the board by securing it unevenly.

Diagrams show where the fixing screws are located, but depending on the options fitted to the instrument you are working on, the diagrams may not be identical. For example, some HP 8114A versions have the BNC connectors on the rear panel, while others have the BNC connectors on the front panel. Both positions have been shown in the diagrams.

Note the position of all cables **when** you remove boards, as incorrect reassembly can cause damage to the cables. Also, noise levels can be degraded by wrong positioning.

Removing the Instrument Cover

1. Remove the four rear feet. Each foot is secured by one screw. See Figure 4-3 for the position of the feet.
2. Remove the carrying handles from the case by removing 2 screws from each side of the case. Both sides have the same fixings.

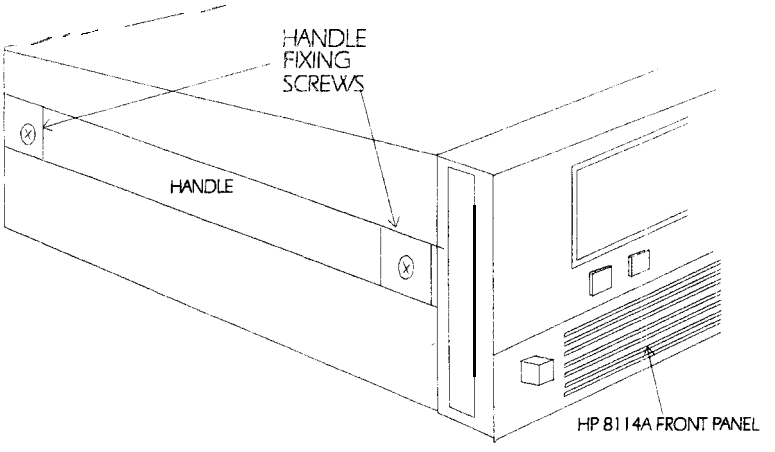


Figure 4-2. Removing the Carrying Handles

3. Remove the two screws securing the cover to the chassis, Figure 4-3 shows their position.

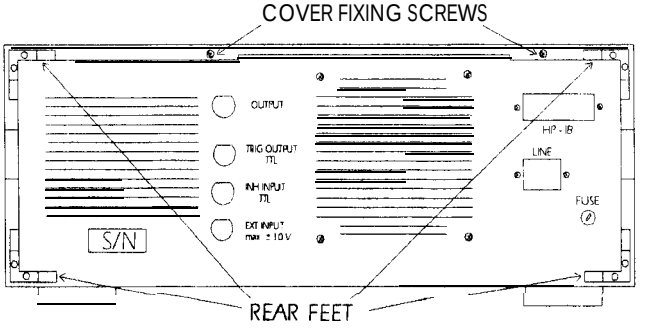


Figure 4-3. Rear Panel View Showing Cover Fixing Screws

4. Slide the cover about 10 mm back from the front panel.
5. Remove the cover by bending the cover sides away from the chassis, and lifting the cover up.

Refitting the Instrument Cover

1. Refitting the instrument cover is the reverse procedure of removal.

Removing the Power Supply

1. Remove the 8 screws securing the power supply slide at the rear panel of the chassis. See Figure 4-4.
2. Disconnect the power supply from the motherboard by levering the power supply slide with a flat screwdriver at the lower right. hand side corner at the rear panel (close to the fuse), then pull the power supply slide out of the chassis. Figure 4-4 shows the lever point, at the rear panel.

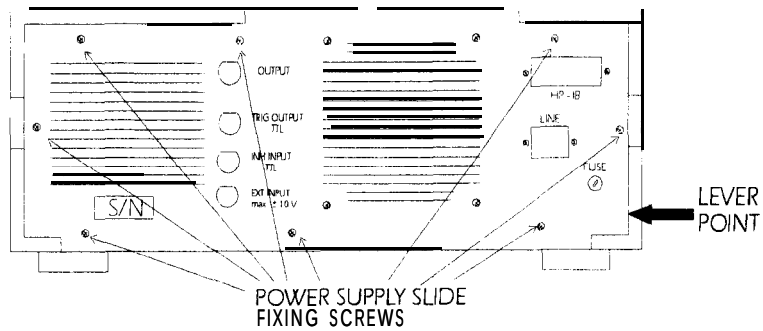


Figure 4-4.
Rear Panel View Showing the Lever Point for the Screw Driver

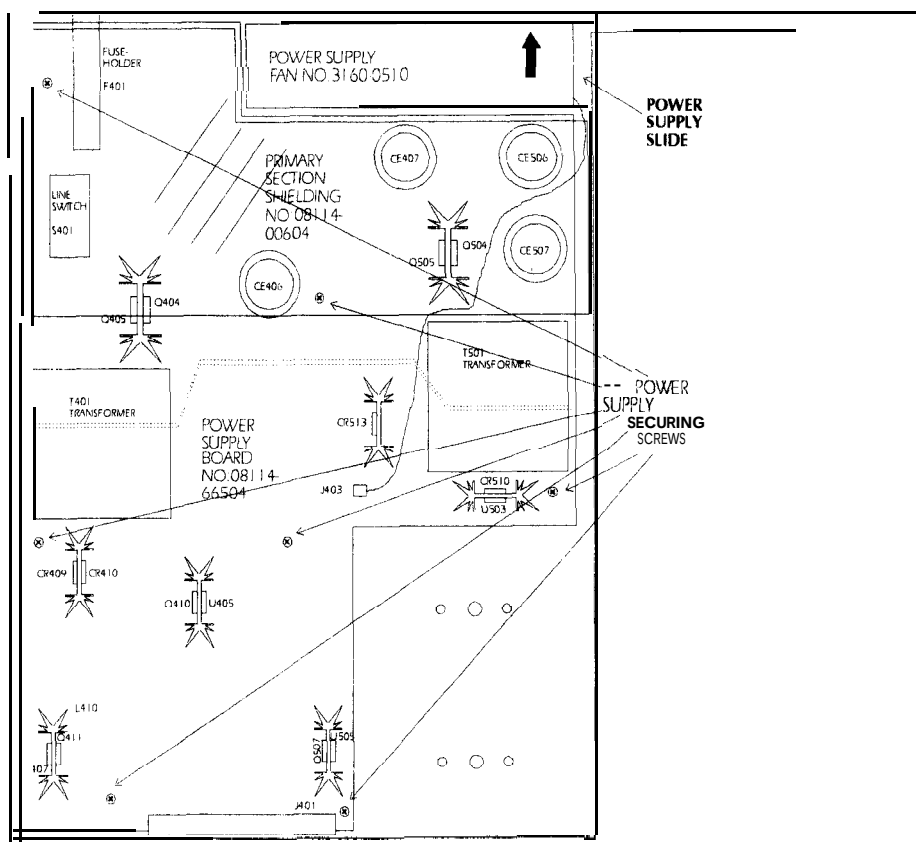


Figure 4-5.
Power Supply and Primary Section Shielding Location

3. Remove the primary section shielding, see Figure 4-5. Gently bend back the lip of the shielding to release it from the metal nose, then pull the shielding gently up, and lift it away.
4. Disconnect the three cables connected to the line filter.
5. Remove the 2 screws securing the line filter to the rear panel, and remove the line filter.
6. Kemove the 7 screws securing the power supply to the power supply slide.
7. Disconnect the fan cables.
8. Lift the power supply at the connector side about 10 mm to release the board from a guiding spacer, then lift the board away.

Note Please make sure that the switching rod is released from its guides in the power supply slide at the connector side.

Refitting the Power Supply

1. Refitting the power supply is the reverse procedure of removal. Please note the following:

Note The power supply board has to be carefully fitted in between the two guiding spacers close to the rear panel, and fan on the slide, and the guiding spacer at the connector side has to be fitted in the hole of the power supply board.

Refit the power supply slide into the chassis by carefully pushing it into the guides on the inner left-hand, and right-hand sides of the chassis.

Removing the Variable Baseline (If Option 001 is installed)

The Variable Baseline is, if original, or retrofitted, also mounted on the power supply slide. See Figure 4-6.

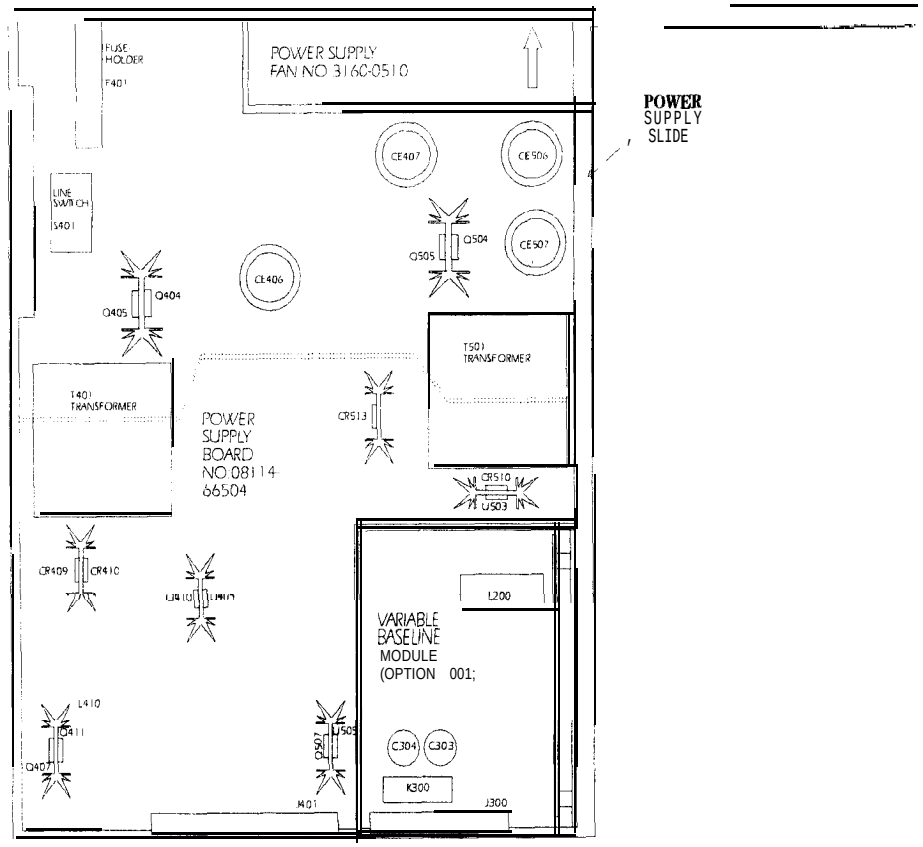


Figure 4-6. Location of the Variable Baseline (Option 001)

1. Follow the instructions for Removing the Power Supply.
2. Remove the 4 screws at the bottom of the power supply slide, securing the variable baseline module to the slide.
3. Remove the variable baseline module.

Refitting the Variable Baseline

1. Refitting the variable baseline is the reverse procedure of removal.

Note 3

The variable baseline module has two holes at the bottom · below the connector · , These holes have to fit onto the two spacers which are mounted on the power supply slide.

2. Secure the variable baseline module with the 4 screws.

Removing the Power Supply Fan

The power supply fan is mounted on the power supply slide. See Figure 4-7.

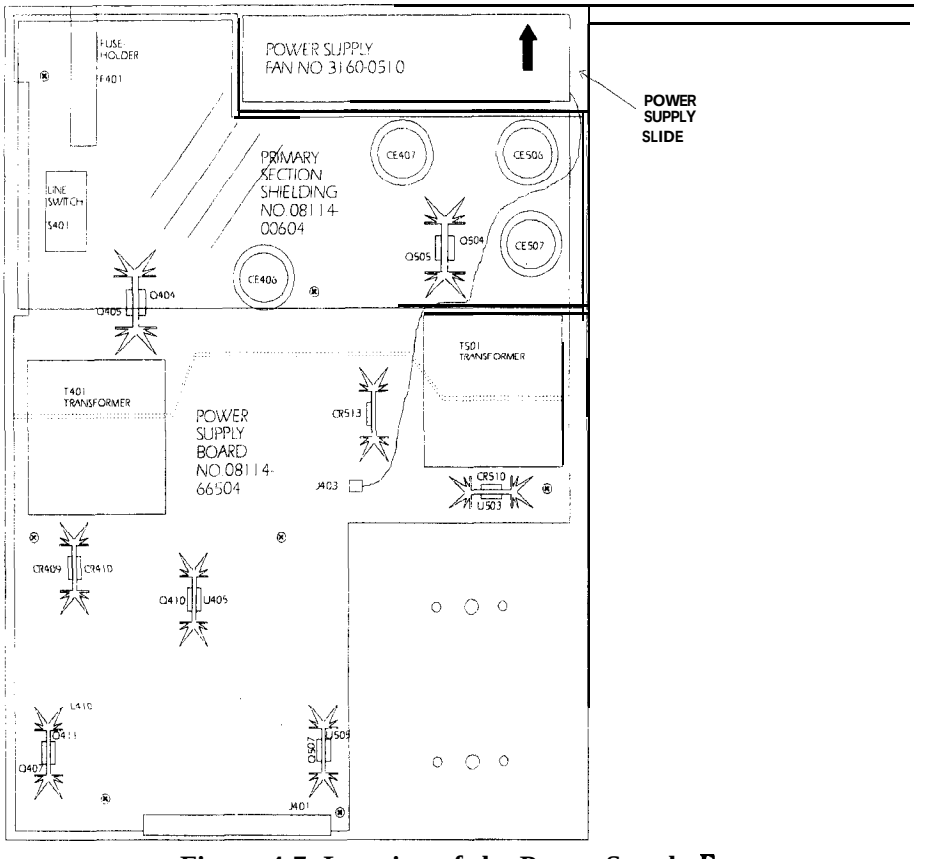


Figure 4-7. Location of the Power Supply Fan

1. Follow the instructions for Removing the Power Supply.
2. Remove the power supply's primary section shielding. Gently bend back the lip of the shielding to release it from the metal nose, then pull the shielding gently up, and lift it away.
3. Disconnect the fan cable J403.
4. Remove the 4 screws securing the fan to the rear panel.

Note

Remember the guidance of the cable for refitting the fan.

3

Keep the four clips and screws in a safe place for refitting the fan again.

5. Remove the fan by gently pulling it out of its location.

Refitting the Power Supply Fan

Refitting the power supply fan is the reverse procedure of removal. Please note the following:

Note

Use the four clips, p/n 1535-5036, to secure the fan with the 4 screws, p/n 0624-0267, to the rear panel.

The air flow indicator (arrow) of the fan, p/n 3160-0510, has to point to the outside of the instrument.

Removing the Microprocessor Board

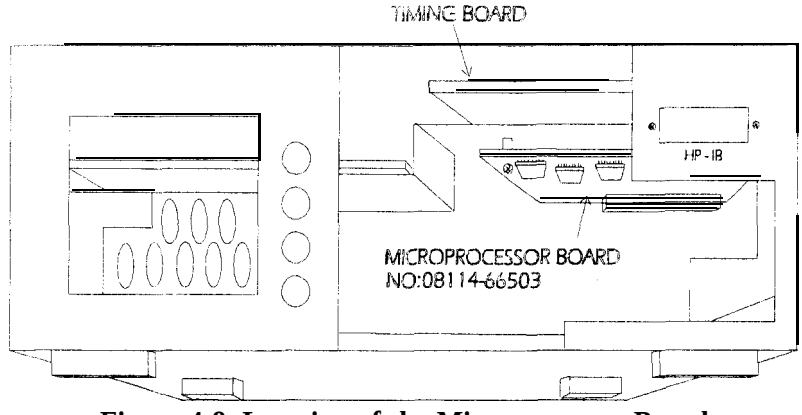


Figure 4-8. Location of the Microprocessor Board

The microprocessor board is located at the upper side of the tunnel where the power supply is mounted. See Figure 4-8.

1. Before removing the microprocessor board the cover and power supply have to be removed. So, follow the instructions for Removing the Instruments Cover, and Removing the Power Supply, first.

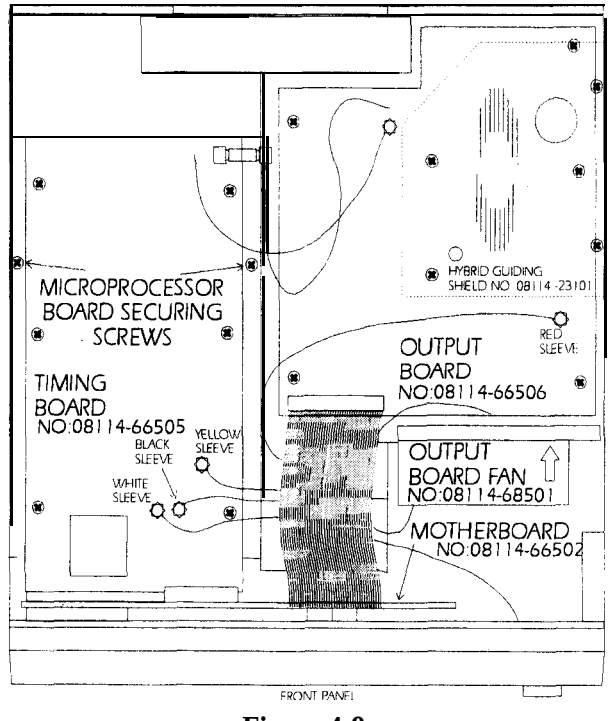


Figure 4-9.
Top View Showing the Microprocessor Securing Screws

2. Remove the 2 screws securing the microprocessor board. The screws are located on the timing board side, top view of the instrument. Note, it is not necessary to remove the timing board.
3. Disconnect the microprocessor board from the motherboard by pulling it back.
4. Disconnect the HP-IB cable.
5. Remove the microprocessor board.

Refitting the Microprocessor Board

Refitting the microprocessor board is the reverse procedure of removal. Please note the following:

Note

The microprocessor board is mounted with the non-component side pointing up to the top of the instrument.

Gently slide the microprocessor board connector into the motherboard connector, make sure that the board is guided by the two horizontal spacers which are mounted in the rear part of the tunnel, close to the motherboard.

Gently press the microprocessor board up when securing the board with the two screws to the chassis.

Connect the HP-IB cable to the microprocessor board as'the last step.

Removing the Timing Board

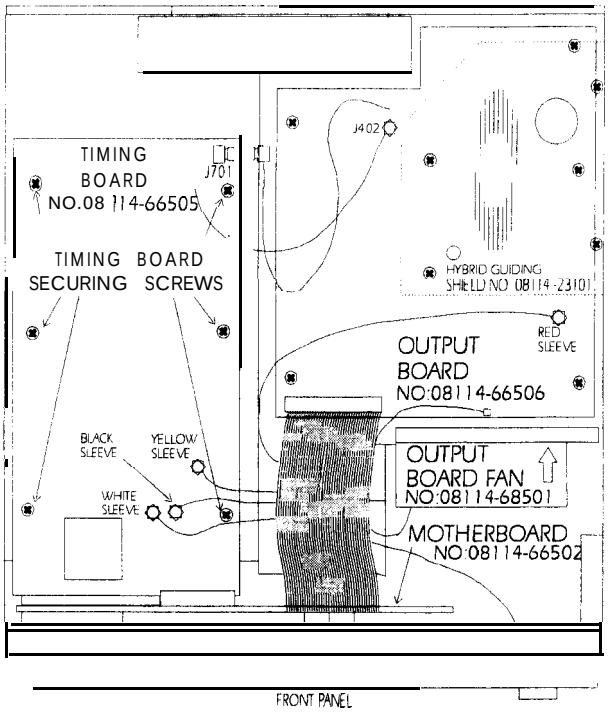


Figure 4-10. Location of the Timing Board

1. Follow the instructions for Removing the Cover.
2. Remove the 6 screws securing the timing board to the chassis. See Figure 4- 10.
3. Disconnect the three cables which are close to the front panel.
4. Disconnect the two cables which are close to the rear panel, 5701 on the timing **board,** and J402/W701 on the output board.
5. Slide the timing board back for about 10 mm to release the board from its connection to the motherboard.
6. Remove the timing board.

Refitting the Timing Board

Refitting the timing board is the reverse procedure of removal.

Removing the Output Board

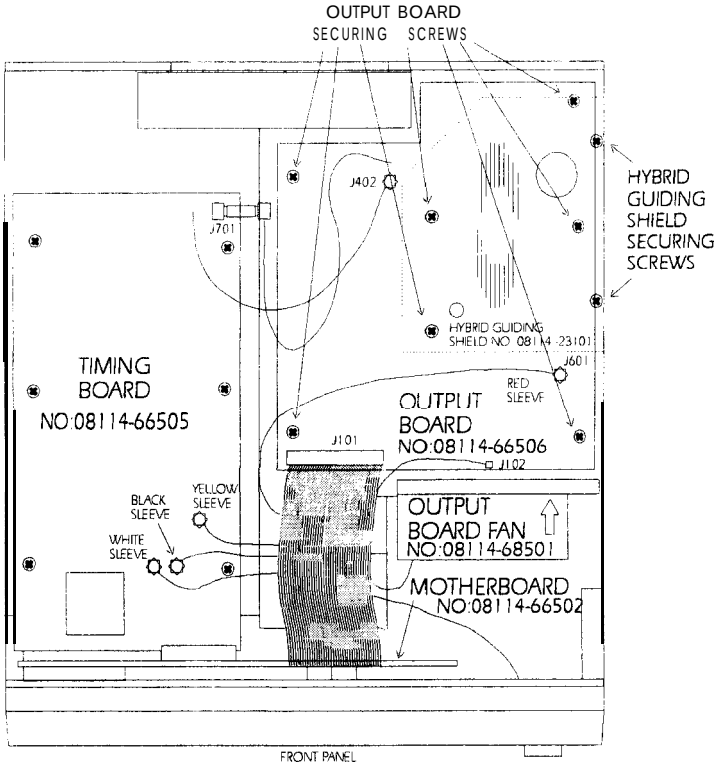


Figure 4- 11. Location of the Output Board

I. Follow the instructions for Removing the Instrument Cover.

2. Remove the 2 screws securing the hybrid module guiding shield. See Figure 4-l 1.

3. Release the hybrid module guiding shield from the 2 clips.

4. Disconnect the ribbon cable, 5101, which is close to the front panel.

5. Disconnect the fan cable, 5102.

6. Disconnect the output cable, 5601.

7. Disconnect the two cables close to the rear panel, W401/J701 on the timing board, and 5402 on the output board.

8. Remove the 2 screws securing the holder of the transistors Q801 to Q804 to the chassis, the holder is placed between the fan and the hybrid modules.

9. Remove the screw securing the coil L609 to the chassis.

10. Remove the 2 screws securing the power FET Q601 to the chassis, The FET is located between the hybrids. See Figure 4-12.

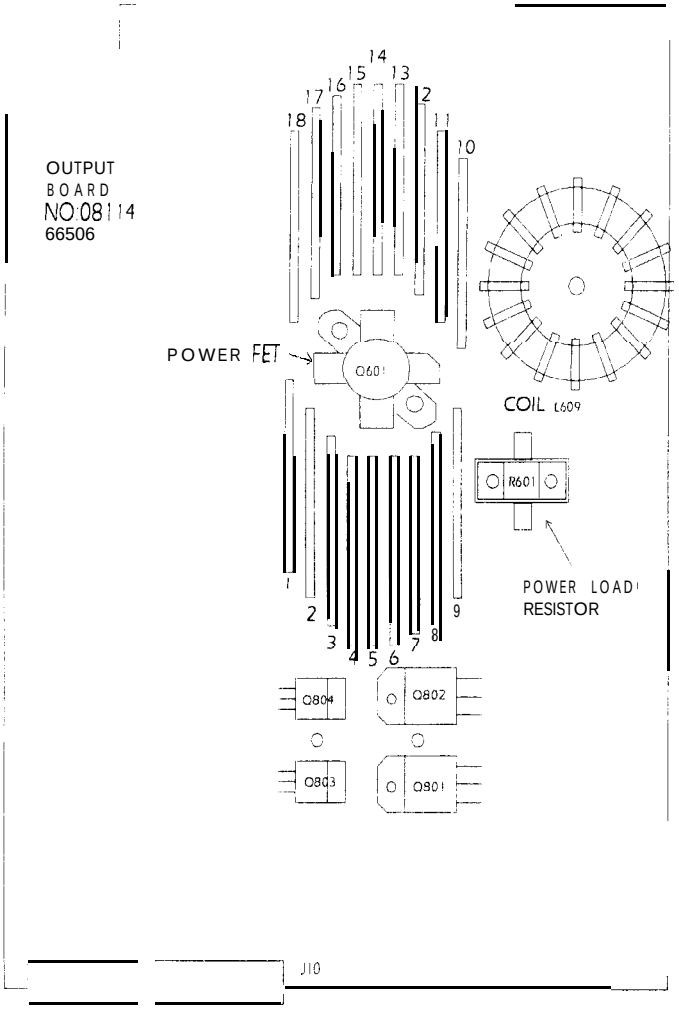


Figure 4-12. Location of the Power Load Resistor and Power FET

11. Remove the 2 screws securing the power load resistor R601 to the chassis. The power load resistor is located close to one hybrid stage. See Figure 4-12.
12. Remove the 7 screws securing the output board to the chassis. See Figure 4-11.
13. Lift the output board up at the fan at the front panel side, and pull it out towards the front panel side.

Refitting the Output Board

Refitting the output board is the reverse procedure of removal. Please note the following:

Note

Carefully mount the coil with the help of the plastic holder, p/n 08114-22304, and the screw, p/n 0515-1060. Do not overtighten the screw, because the plastic holder can break.

Carefully and gently push back the hybrid module guiding shield, p/n 08114-23101, into place, and secure it with the 2 screws.

Information to the Replacement Output Board

The replacement output board is delivered with an additional hybrid module guiding shield which is only required for transportation of the replacement board, or if the original guiding shield is broken when removed.

Cut and remove the tie-wrap which secures the coil to the board during transportation.

Remove the antistatic foam at the non-component-side of the output board, it is only required during transportation.

Removing the Output Board Fan

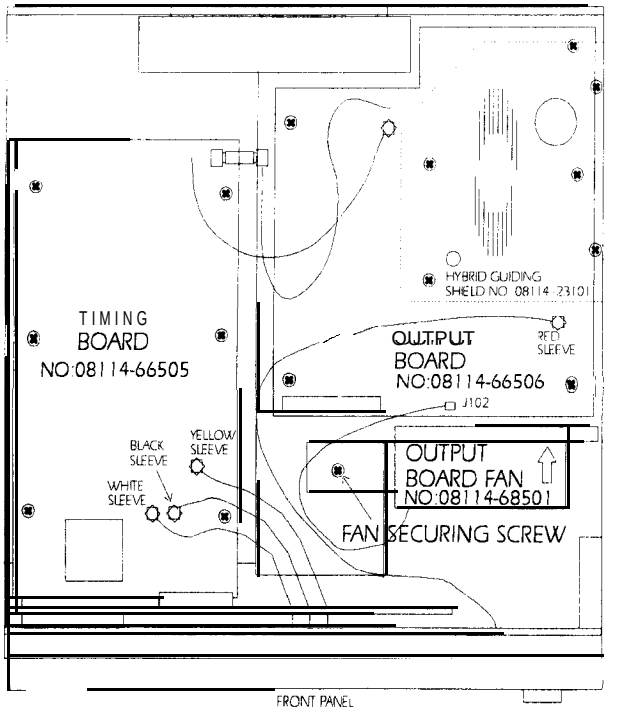


Figure 4-13. Location of the Output Board Fan

1. Follow the instructions for Removing the Instrument Cover,
2. Remove the 1 screw securing the fan and its holder to the chassis. See Figure 4-13.
3. Disconnect the fan cable 5102 on the output board.
4. Push the fan a little bit towards the front panel at the timing board side, and pull it out of the guides in the chassis.

Refitting the Output Board Fan

Refitting the output board fan is the reverse procedure of removal.

Removing the Motherboard

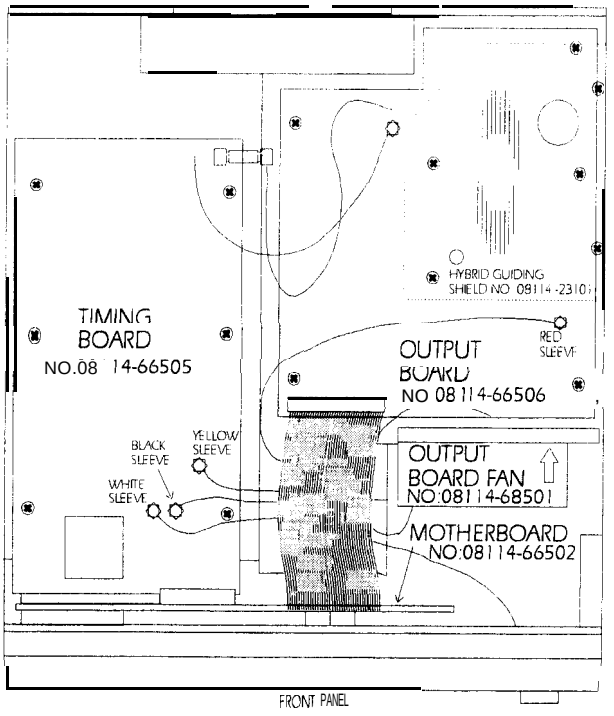


Figure 4-14. Location of the Motherboard

1. Before removing the motherboard, the cover, power supply, microprocessor board, and the timing board have to be removed. So, follow the instructions for Removing the Instrument Cover, Removing the Power Supply, Removing the Microprocessor Board, and Removing the Timing Board, first.
2. Remove the side strips from the front panel to reveal the securing screws. See = panf>.
3. Remove the 4 screws securing the front panel to the chassis.
4. Release the front panel from the chassis for about 10 cm.
5. Disconnect the ribbon cable connecting the front panel to the motherboard.
6. Disconnect the 2 **cables** from the memory-card connector board.
7. Remove the 7 screws securing the mother board to the chassis.
8. Carefully remove the motherboard from its location,

Refitting the Motherboard

Refitting the motherboard is the reverse procedure of removal. Please note the following:

Note

Before finally tightening the 7 screws, which secure the motherboard to the chassis, it is recommended to first, connect the microprocessor board, and the timing board to the motherboard to align the connections, and then tighten the screws.

Remember to fit the RFI Shield, Part No. 8160-0562 between the 37-pin D connector and the chassis.

Removing the Memory-Card Connector Board

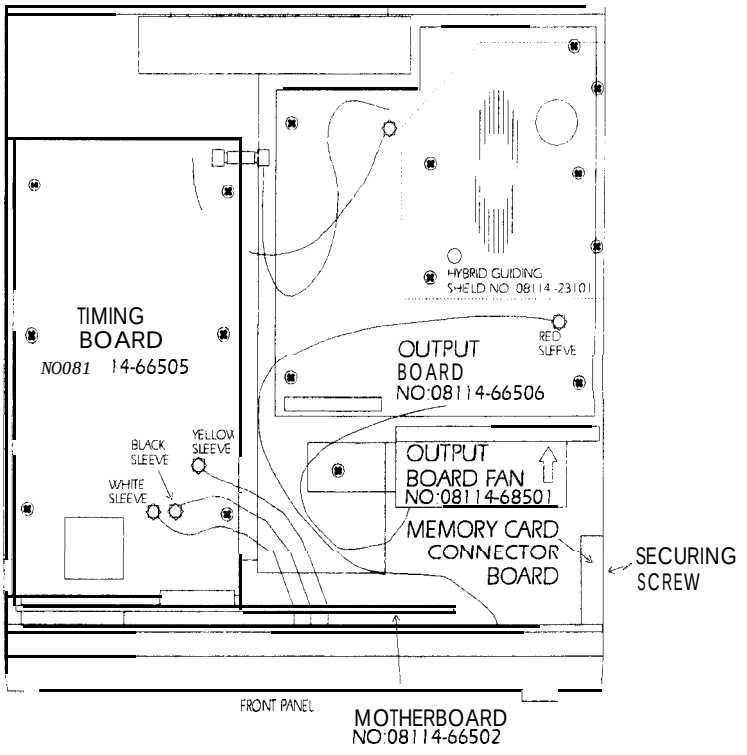


Figure 4-15. Location of the Memory-Card Connector Board

1. Follow the instructions for Removing the Instrument Cover.
2. Disconnect the 2 ribbon cables connecting the memory-card connector board to the motherboard.
3. Follow the instructions for Removing the output board fan.
4. Remove the screw securing the memory-card connector board to the chassis. The screw is located at the outside of the chassis. See Figure 4-15.
5. Remove the two screws securing the memory-card connector board to the metal holder.

Refitting the Memory-Card Connector Board

Refitting the memory-card connector board is the reverse procedure of removal. Pleae note the following:

Note

Insert the two guiding spacers of the memory-card connector board into the two holes in the chassis.

Secure the memory-card connector **board** with the screw, p/n 0515-0886, from the outside of the chassis.

Removing the Front Panel

1. Remove the 2 self-adhesive side trims. These cover the Front Panel fixing screws. See Figure 4-16 for the position of the trims

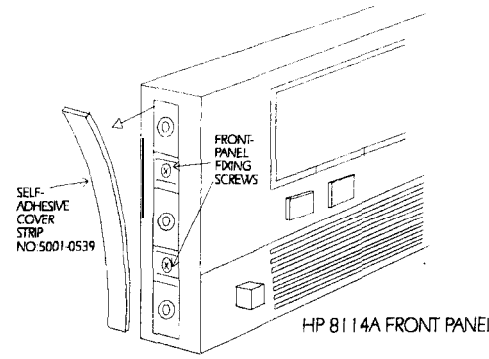


Figure 4-16. Front Panel Fixing Screws

2. Remove the 4 screws (2 on each side of the Front Panel) securing the Front Panel to the chassis
3. Pull the Front Panel forward from the chassis and disconnect the long ribbon cable connected to the Motherboard connector on the front of the chassis
4. Remove the Front Panel

The replaceable subassemblies of the Front Panel are:

- Ribbon-cable connecting the Front Panel to the Motherboard
- Ribbon-cable connecting the RPG module to the Display module
- Display module
- RPG module
- RPG knob
- RPG Head unit
- Key pad retaining panels
- Key pad flexible connector
- Large Key pad
- Small Key pad
- Front Panel Legend Foil
- Front Panel frame

Figure 4-17 shows a rear view of the HP 8114A Front Panel. For clarity, the 2 ribbon-cables are not shown.

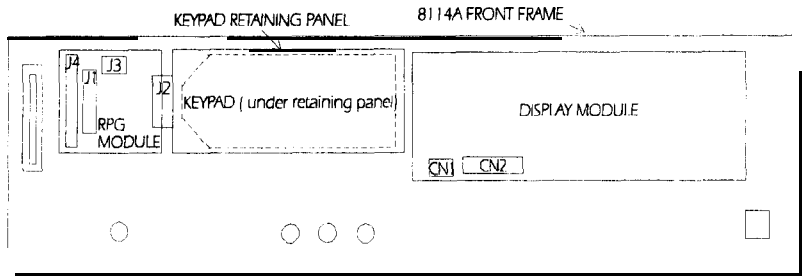


Figure 4-17. Front Panel Subassemblies

How to Remove PC Boards from Plastic Support Clips

Some of the Front Panel subassemblies are held in position by plastic support clips. Remove them as follows:

1. Using a knife or other suitable tool, gently release the PC board from its support clips, starting with the clips at one corner of the board and working along the board, raising it slightly as each clip is released. Move the clips just sufficiently to release the board.
2. When both ends of the board and one side have been released from the clips the board can be slid out from the clips on the remaining side.

Caution Do not use excessive pressure on PC board support clips, as they may be damaged.

The Front Panel Subassemblies

Figure 4-18 shows the Front Panel subassemblies removed from the Front Panel frame. The large and small Key pads are shown still in position on the frame.

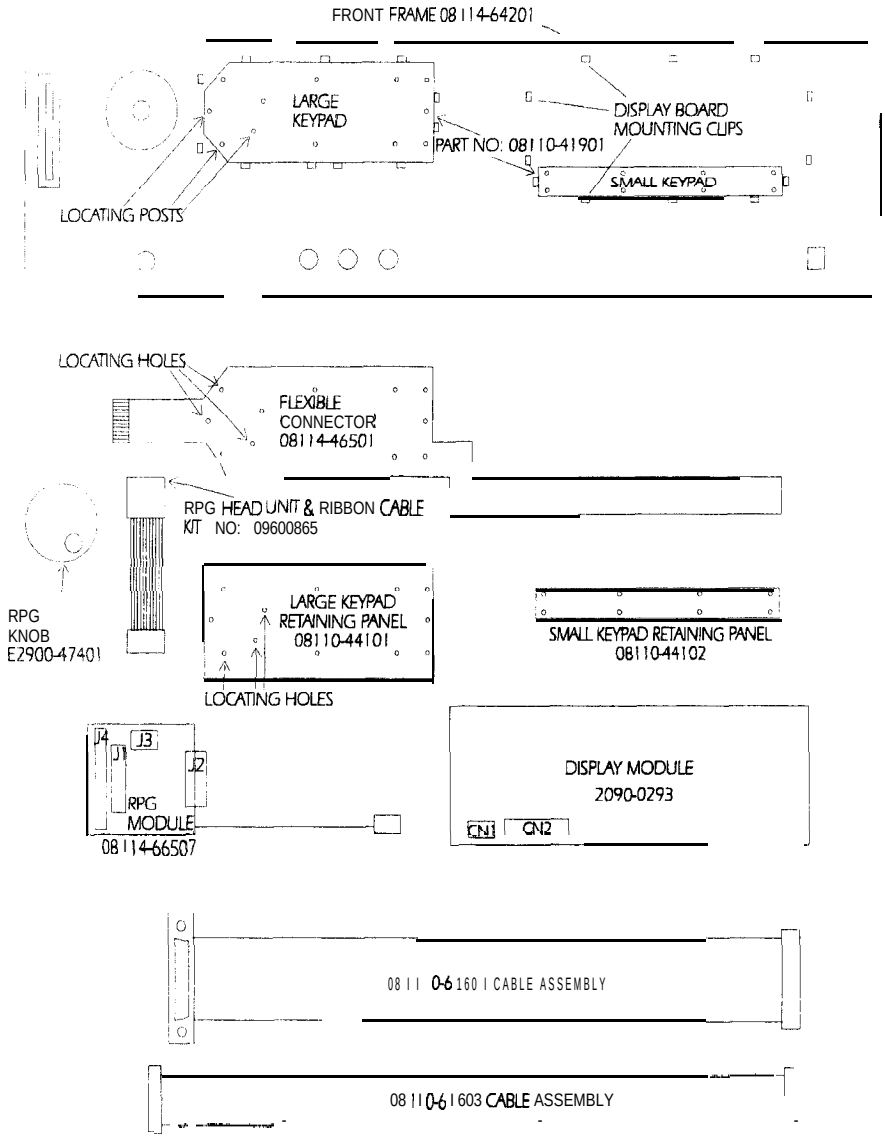


Figure 4-18. Front Panel Subassemblies

Removing the Front Panel Subassemblies

Disassemble the Front Panel until you reach the subassembly you want to replace, as follows:

1. Ribbon-cable connecting the Front Panel to the Motherboard
   a. Disconnect the Ribbon cable from J4
   b. Remove the Ribbon cable
2. Ribbon-cable connecting the RPG module to the Display module
   a. Disconnect one end from J 1 on the RPG module
   b. Disconnect the other end from CN2 on the Display module
   c. Remove the Ribbon cable
3. Display module
   a. Disconnect from CN1, the cable coming from the RPG module
   b. Release the module from its plastic support clips (see "How to Remove PC Boards from Plastic Support Clips")
   c. Remove the Display module
4. RPG module
   a. If not already done, disconnect and remove Ribbon cables connected to J4 and J1
   b. If not already done, disconnect the cable going from the RPG module to CN1 on the Display module
   c. Disconnect the Ribbon cable from J3. This cable connects to the Head unit and is folded under the RPG module and trapped there to accommodate the length of the Ribbon cable
   d. Slide the cover of J2 toward the large Key pad to release the flexible connector, and remove the connector from J2
   e. Release the module from its plastic support clips (see "How to Remove PC Boards from Plastic Support Clips")
   f. Remove the RPG module
5. RPG knob
   a. Using gentle, steady pressure, pull the knob off the RPG Head unit shaft. There are no retaining screws
6. RPG Head unit
   a. Using a 12mm nut driver, remove the nut that secures the RPG Head unit to the Front Panel
   b. Remove the washer
   c. Remove the RPG Head unit
7. Key pad retaining panels The 2 Keypad securing panels are removed by the same method:
   a. Release the panel from its plastic support clips and locating posts (see "How to Remove PC Boards from Plastic Support Clips")

b. Remove the panel

8. Key pad flexible connector

   a. Remove carefully from the locating posts securing the flexible connector to the Front Panel frame (see "How to Remove PC Boards from Plastic Support Clips")

9. Large Key pad

   a. Holding the rubber Key pad at each end, lift the Key pad clear of the Front Panel frame, disengaging the keys from their cut-outs and the locating posts (see "How to Remove PC Boards from Plastic Support Clips")

10. Small Key pad

   a. Holding the rubber Key pad at each end, lift the Key pad clear of the Front Panel frame, disengaging the keys from their cut-outs and the locating posts (see "How to Remove PC Boards from Plastic Support Clips")

11. Front Panel Legend foil

Caution

Be sure that you want to remove the Front Panel foil, as it is extremely unlikely that you will be able to refit the original foil. A new foil, Part No: 08114-40202, will be required.

   a. Remove by prising up one corner to allow a firm grip on the foil and pull up from the Front Panel frame until completely freed.

Replacing or Refitting the Front Panel Subassemblies

In general, this is the reverse of removing, but where replacing or refitting differs in any way, it is noted in this section

How to Fit PC Boards into Plastic Support Clips

1. Locate one side of the PC board in its support clips
2. Press one end of the board steadily down on its clips while moving the clips **back** from the board just enough to allow the board to 'click' into position
3. Repeat step 2 for the other side, and the remaining end of the board

Caution 

Do not use excessive pressure on PC board support clips, as they may be damaged.

Points to Observe when Refitting or Replacing Front Panel Subassemblies

1. Display module
   a. If you are replacing the Display module, remove the protective film from the display
   b. Using a dry, clean cloth, gently **clean** the surface of the display
2. RPG Head unit
   a. Fold the Ribbon cable in a concertina above the unit to use up the extra length, before fitting the RPG module. Allow just sufficient cable showing at the top of the unit to connect tidily with J3 on the RPG module, which then fits over the Head unit, holding the folded cable in position
   b. Secure the unit to the Front Panel frame using the 12mm nut and washer. Take care not to over-tighten the 12mm nut, as the mounting bush may be damaged
   c. Press the knob firmly onto the spindle, making sure that the flat on the spindle is aligned with the corresponding flat inside the knob
   d. Rotate the knob to check that it runs smoothly
3. RPG module
   a. Ensure that the LEDs are correctly positioned above their apertures. If not, move slightly with a screwdriver or other suitable tool until the positioning is correct
4. Large and small Key pads
   a. If you are replacing one or both Key pads, you will see that the rubber key pad kit, p/n 08110-41901 contains both keypads, attached together as one piece. Separate the small pad from the large one by gently tearing the two sections apart
   b. When you have finished fitting the Key pads, press each of the pads in turn to **check** that they operate freely

5. Front Panel Legend Foil

Caution 

Take great care when attaching a new foil. If you misalign the foil, you may not be able to re-attach it after removal, as it is extremely likely to be damaged in the process. If you damage the foil you will need another new one.

a. Lay the new foil with its protective backing in place, on top of the Front Panel frame, in the correct position

b. Using adhesive tape, secure the foil in position for just less than half its length

c. Raise the free end of the foil and peel off a half section of the protective backing sheet

d. Carefully lower the free end of the foil to the Front Panel frame and smooth it into firm contact. Avoid the inclusion of air-bubbles by smoothing the foil from the centre toward the end of the Front Panel frame. The adhesive is immediately effective and the foil cannot now be moved.

e. Remove the adhesive tape and the remaining half of the foil protective backing sheet and smooth the foil into contact with the other half of the Front Panel frame

Replacing or Refitting the. Motherboard

Replacing or refitting the Motherboard is the reverse of removing, but it is important to remember to fit the RFI Shield, Part No. 8160-0562 between the 37-pin D connector and the chassis sub front panel.

5

Troubleshooting

Some of the components on the PC Boards fitted in the HP 8114A use SMT (Surface-Mounted Technology). These components are difficult to replace in the field. Other boards use part SMT and part Through-Hole Plated. Through-hole mounted components are not as difficult to change as SMT. The Through-Hole boads can be repaired down to component level, if required. In down to component level repairs it is recommended to use the component level information package, p/n 08114-91031.

The following table lists HP 8114A boards, stating whether they are standard or optional, and the component mounting method:

Table 5-1. Field Repair Level of HP 8114A Boards

Board Name	Standard or Optional	Through-hole board	SMT board
Microprocessor	Standard	No	Yes
Power Supply	Standard	Yes	No
Timing Board	Standard	Yes	No
Output Board	Standard	Yes	No
Variable Baseline Boards	Optional	Yes	No

This chapter begins with Selftest procedures. If the instrument is completely dead, begin working from "Initial Tests"

Selftest

Power-Up Selftest

The HP 8114A Selftest **checks** only the Microprocessor Board at power-up. If this test fails you **can** press (HELP) to see a list of the specific error messages resulting from the test. If the list is longer than a single screen, use the cursor keys to scroll the list.

Note that a long error list can result from a single initial error. Therefore, begin to solve problems starting with the first message in the list and after the problem is cleared run Selftest again.

Extended Selftest

The extended Selftest tests all installed boards.

Start the extended selftest on the CONFIG screen:

1. Use the Knob to select **Signal**
2. Press (ENTER).

If the Selftest fails, a flashing **E** is displayed. Press (HELP) to see the list, of error messages.

Confidence Level

It is not possible to give a Confidence Level figure for the Selftests.

After completion of Performance tests a confidence level of 96% can be assumed. This is because not all possible settings and functions are checked by the Performance Tests.

Microprocessor Selftest Failure Messages

The following is a list of the Microprocessor Board error messages and their meanings. The first part of the list shows the messages as they are displayed on the instrument. The HP-IB messges are identical, but with the message: **-330 Self-test failed** added in front.

Selftest error: Microproc. board failed
: Hardware failure on the Microprocessor Board

ROM test failed
: Flash EPROMs have failed test.

RAM test failed
: RAMs have failed test

Crystal Reference for uP lost
: Loss of crystal reference. The VCO is running at approximately half normal operating speed, determined by an internal voltage reference for the VCO, instead of the external crystal frequency

VCO for uP has not locked
: VCO is enabled but has not yet locked. Normally the VCO locks-on to the required frequency

Unexpected Reset of uP
: Reset was caused by one of the following:

- Powerup Reset circuit
- System protection submodule halt monitor
- loss of frequency reference to clock submodule

- loss of frequency reference to test submodule

  Normally a reset would be caused by an external signal or by the CPU executing a reset instruction

Internal Serial Device Bus failed

Internal Serial Device bus traffic over the feedback bus has failed

Signal Boards Selftest

This section in the Selftest facility tests the Output Board and then the Timing Board. It is not automatically run at power-up. You can start. this part of the Selftest routine as follows:

1. Switch the instrument ON
2. Wait for the Microprocessor Selftest to finish
3. Press (MORE) and CONFIG
4. Using the cursor keys move the highlight down to Perform Self test
5. Using the knob, select Signal
6. Press (ENTER)

Timing Board Selftest

Figure 5-1 shows the Selftest points on the Timing Board. This is followed by a list of the possible failure messages.

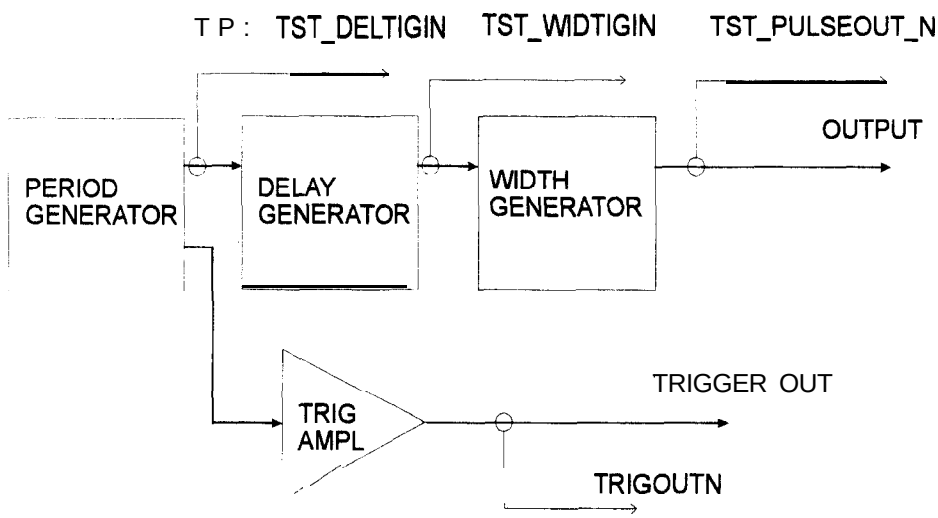


Figure 5-l. Testpoints used in Timing Board Selftest

Timing Board Selftest Failure Messages

the HP-IB **messages** are identical, but with the message: -330 **Self-test failed** added in front.

Failure in PERIOD circuitry
: The PERIOD TIGER IC on the Timing Board may be faulty

Failure in DELAY circuitry
: The DELAY TIGER IC on the Timing Board may be faulty

Failure in WIDTH circuitry
: The WIDTH TIGER IC on the Timing Board may be faulty

Failure in TRIGGER OUTPUT circuitry
: Selftest cannot find a signal after the Trigger Output amplifier

Output Board Selftest

Figure 5-2 shows the Selftest point on the Output Board. This is followed by a list of the possible failure messages.

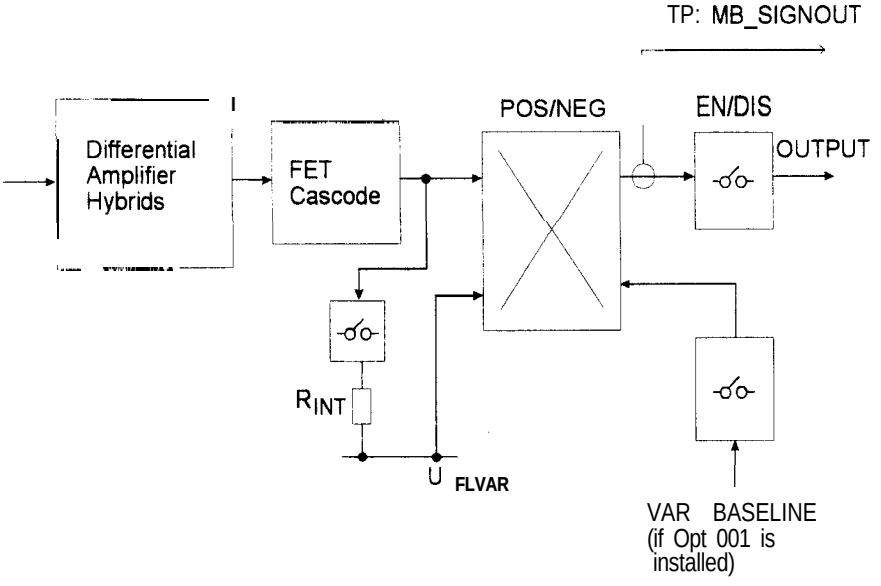


Figure 5-2. Testpoint used in Output Board Selftest

Output Board Selftest Failure Messages

The HP-IB messages are identical, but with the message: **-330 Self-test failed** added in front.

Failure in AMPLIFIER circuitry
: The Amplifier circuitry on the Output Board may be faulty.

Initial Tests

There could be a number of reasons why HP 8114A shows no signs of operating. If the instrument appears to be dead, proceed as indicated in Figure 5-3. The figure is divided into two parts: the checks that you should perform if the instrument appears to be "dead" are above the dotted line. If these tests do not solve the problem, continue with the tests below the dotted-line. If these tests do not, lead to a section containing information that does solve the problem, look in the text in this chapter for a heading that might apply to the fault.

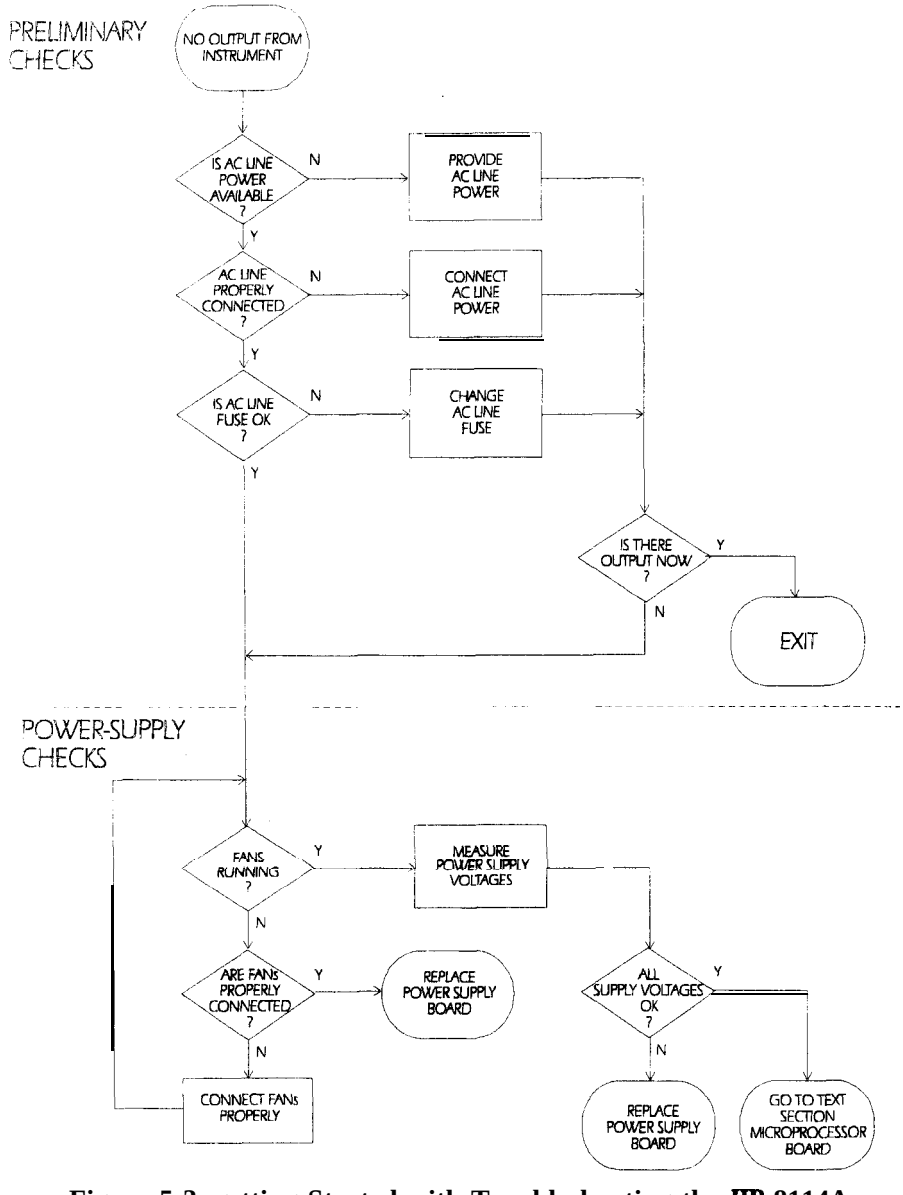


Figure 5-3. getting Started with Troubleshooting the HP 8114A

Troubleshooting information for the individual boards is given on the following pages:

Power Supply Board

Figure 5-4 gives a general view of the Power Supply Board, showing voltage test points at the lower left corner.

In the diagram the double dashed line across the board divides the Primary and Secondary Sections of the Power Supply.

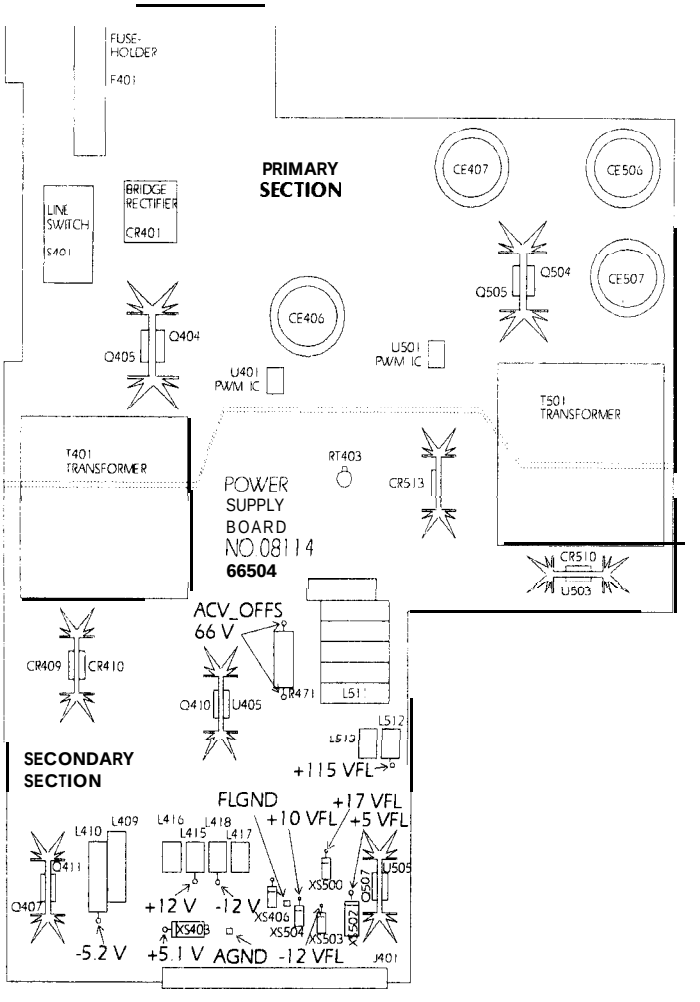


Figure 5-4. The Power Supply Board

Warning **Some voltages on the Primary Section of the Power Supply are dangerous and can kill. For your own safety do not touch these parts. Using an isolating transformer may prevent these voltages from being fatal, but electrical shocks from the unit can cause serious discomfort, especially on capacitors CE406, CE407, CE506, and CE507 (see Figure 5-4 for their position).**

Getting Started

Before you start troubleshooting on the Power Supply Board some setting-up is needed. Figure 5-5 shows what the setup looks like when you are ready to start. You need the following equipment:

1. The main chassis of the HP 8114A
2. An isolating mains transformer
3. An Oscilloscope with grounding to the mains earth
4. A High-impedance Voltmeter
5. A 10062 resistor, 5W
6. A 300 resistor, 2W

First, remove the Power Supply Board mounted on a slide. Place the PC Board in front of you on the bench, as shown in Figure 5-5

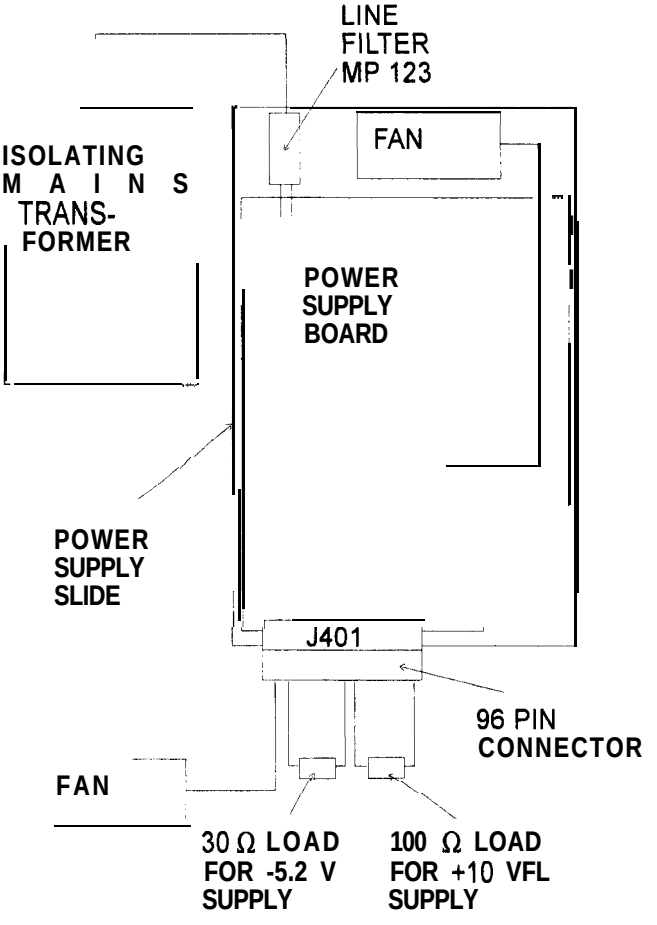


Figure 5-5. Test Setup for the Power Supply Board

On the Power Supply Board:

1. Connect the cable from the isolating mains transformer to the mains power connector
2. Connect the fan to 5401 from pin 32b to pin 32c. This is essential as the Power Supply will not run with the fan disconnected
3. Connect the 30Ω load resistor to the -5.2 V supply, from J401 pin 26a (-5.2 V) to pin 24a (AGND)
4. Connect the 100Ω load resistor to the + 10 VFL supply, from J401 pin 8a (+ 10 VFL) to pin 2a (FLGND)
5. Apply power to the isolating transformer and observe the fans.

If the fans are not running:

1. Disconnect mains power and check that the fans are physically OK, that is free from damage or obstruction
2. Using an Ohmmeter check for $< 1\ \Omega$ continuity: the main fuse, FH401, inductor T400, switch S401, filter MP123 and the mains cable, including any fuse fitted in the power plug.

   SCR Q401 suppresses low impedance voltage peaks on the supply line. If this SCR fails, it may not be immediately noticeable, but test-bench fuses may fail if high line voltage peaks occur during high current operation of the HP 8114A.

Warning  **Voltages are present which can be hazardous to life.**

Power Supplies

Fixed Supplies

1. Check the fixed supplies agaist AGND at testpoint TP2:

Table 5-2. Fixed Power Supplies

Supply Voltage	Typical Measurement
-12 V	-11.3 V
-5.2 V	-5.5 V
+5.1 V	5.1 V
+12 V	11.4 V

Floating Supplies

1. Check the floating supplies against FLTGND at testpoint TP9:

Table 5-3. Floating Power Supplies

Supply Voltage	Typical Measurement
-12 VFL	-12 v
+5 VFL	5.1 v
+10 VFL	10.5 v
+17 VFL	17.1 v
+115 VFL	144 v

2. Check the ACV-OFFS voltage across the resistor R471: The voltage should typically read 66 V.

Microprocessor Board

The following checks can be performed on the Microprocessor Board:

Check	Procedure
Visual	Inspect the board carefully for dry joints, unsoldered joints, or broken components
Clock	Using an Oscilloscope, check that there is a clock signal at the CLKOUT pin (66) on the Microprocessor. The frequency should be 16.78 MHz (8.38 during reset). If a clock signal is not found check crystal Y1 and its associated components. Also check C44, C49 and C66, capacitors used in the VCO circuit
DIP Switches	Check that the switches on SW1 are set, according to the following table:

Table 5-4. Settings for DIP Switch Sl

Switch Settings								
Pos:	1	2	3	4	5	6	7	8
BIN:	1	1	1	1	0	1	1	0

Note that Section 1 in the DIP Switch disconnects the Microprocessor clock line, and incorrect setting, or a faulty switch section disables the Microprocessor

HP-IB	If faults are suspected in connection with the HP-IB Interface, check the ribbon cable that joins the HP-IB socket to the Microprocessor Board. Using a resistance meter, check for continuity along each of the ribbon cable conductors
Dividers	Dividers U28A and U28B divide the system clock to produce a clock for the HP-IB Interface. Use an oscilloscope to check operation. Pin 3 on U28 is clock input (16.78 MHz). Pin 5 gives the first divide-by-2 output (8.39 MHz) and pin 9 provides the final clock to U10, the HP-IB IC, just over 4 MHz.
Battery	BT1 is a 3 V Lithium battery, type: Panasonic +3 V CR2477. Its HP part number is 1420-0394. It is capable of in excess of 5 years' operation. Using a high impedance voltmeter measure across the battery terminals. If you suspect that the battery is faulty, change it by unsoldering it from the PC Board.

Caution

RISK OF EXPLOSION!

DO **NOT** allow Lithium batteries to become short-circuited

DO **NOT** use excessive heat when unsoldering/soldering Lithium batteries.

DO dispose of batteries in an approved manner.

RPG Unit — This unit sends an interrupt to the Microprocessor, and a directional signal. These signals are buffered by U43C and U43D. **Check** that when the knob is rotated signals are present at the input, pin 9 and at the output, pin 8 of U43C and at the input, pin 12 and at the output, pin 11 of U43D

Reset — At switch-on U13 pin 16 goes high. It then goes low after approximately 100 ms, and remains low until a subsequent reset.

If the Microprocessor Board passes all the above **checks** and still **does** not function, its repair is outside the scope of this Troubleshooting guide, and it is recommended that the PC Board be returned to a Hewlett-Packard Service Center.

Timing Board

This board consists mainly of data-controlled devices and troubleshooting is reduced to replacing suspect devices. However, basic **checks** can be performed on some parts of the circuitry:

Supply Voltages

Check whether the power supply voltages are present on the board. Measure against AGND at the positive pole of capacitor C109.

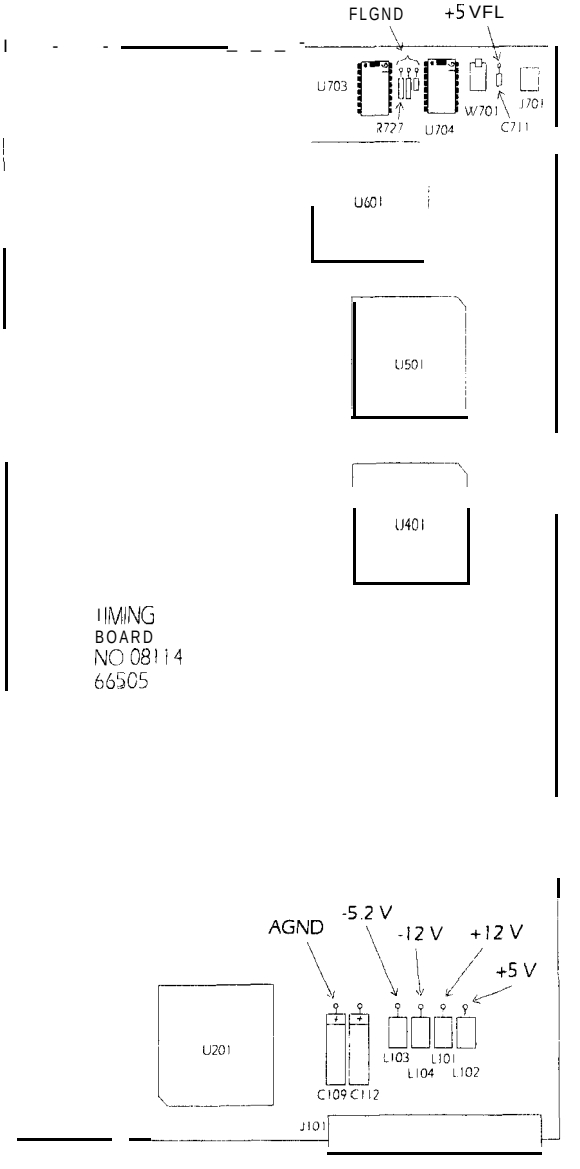


Figure 5-6. Supply Voltages Testpoints on the Timing Board

Table 5-5.
Power Supply Voltages on the Timing Board

Supply Voltage	Testpoint	Typical Measurement
+12 V	L101	11.45 V
+5 V	L102	5.1 V
-5.2 V	L103	-5.35 V
-12 V	L104	-11.45 V

Trigger Input

1. Apply a 1 MHz squarewave signal with 5 V amplitude, 0 V offset from a 50 Ω source to the trigger input.
2. At the junction of R313, and R314, or at pin 7 of U304 a typical voltage should read 1.75 V.
3. Program + 10 V trigger input threshold in the TRIGGER mode display.
4. Check that at U302A pin 1 there is a typical voltage of + 3.3 V, and at U304 pin 9 a typical voltage of + 1.7 V.

Period Generator

Check for the supply voltages:

1. U407 pin 1 for + 12 V, and U407 pin 3 for + 5 V.
2. U402 pin 2 for -12 V, and U402 pin 3 for -5.2 V.

Check the current sources for the period generator:

1. Check pin 3 of U406, voltage regulator, for + 12 V.
2. Check pin 2 of U406 for +8 V.
3. Varying the frequency from 1.01 MHz to 10.0 MHz the voltage at pin 1 of U404A should vary from -0.5 V to -5.0 V.
4. Check for the following voltage drops across R402:

Table 5-6. Voltage Drops Across R402

Frequency programmed	Voltage drop
1.01 MHz	22 mV
10.0 MHz	250 mV

Delay Generator

Check for the supply voltages:

17502 pin 2 for -12 V, and U502 pin 3 for -5.2 V.

Check the current sources for the delay generator:

1. Varying the delay from 0.00 ns to 999 ns the voltage at pin 8 of U504C should vary as follows:

Table 5-7. Voltage at Pin 8 of U504C

Delay programmed	Typical voltage
0.00 ns	-1.7 V
9.99 ns	-446 mV
10.0 ns	-3.47 V
99.9 ns	-440 mV
100 ns	-5.07 v
999 ns	-467 mV

2. Check for the following voltage drops across R502:

Table 5-8. Voltage Drops Across R502

Delay programmed	Voltage drop
0.00 ns	616 mV
9.99 ns	160 mV
99.9 ns	20 mV
100 ns	234 mV
999 ns	21 mV

Width Generator

Check for the supply voltages:

U602 pin 2 for -12 V, and U602 pin 3 for -5.2 V.

Check the current sources for the width generator:

1. Varying the width from 10.0 ns to 99.9 ns the voltage at pin 7 of U504B should vary from -5.2 V to -0.5 V.
2. Check for the following voltage drops across R602:

Table 5-9. Voltage Drops Across R602

Width programmed	Voltage drop
10.0 ns	240 mV
99.9 ns	22 mV

Edge Interface

1. Set standard setting, by pressing (SHIFT), (STORE) (Recall), (0).
2. Check at U702 pin 13 for an ECL signal (high level at -0.8 V, low level at -1.8 V) with 15 % duty cycle.

Differential Signal output

Warning 

This measurement has to be done against floating ground FLGND. Floating Voltages up to 130 VFL are present, which are hazardous to life.

1. Connect the oscilloscope probe ground (GND) to FLGND on the timing board. FLGND can be accessed on one pole of R726, close to the border of the board.
2. **Check** at U703 pin 2 and pin 3 for a differential signal output.

Inhibit Input

1. Set instrument to inhibit mode HIGH in the OUTPUT page.
2. Enable the output by pressing (SHIFT), (0) (ON/OFF).
3. Apply a + 5 Vdc signal to the INH INPUT.
4. Check with an oscilloscope that the output is inhibited when the external inhibit signal is applied.

Trigger Output

1. Check at junction R801, and R802 for a signal with 50 % duty cycle, and EECL levels (high level at 0.0 V, low level at -0.7 V).
2. Check at the collector of Q801 for a 50 % duty cycle signal with high level at -1.9 V, and low level at -2.9 V.
3. Check at the collector of Q802 for a 50 % duty cycle signal with high level at -1.9 V, and low level at -2.9 V.
4. Check at R815 for a 50 % duty cycle signal with TTL levels.

Output Board

Some parts of this board consist of data-controlled devices and troubleshooting is reduced to replacing suspect devices. Other parts of the board use SMT. However, basic checks can be performed on some parts of the circuitry:

Note To make measurements on the output board the hybrid module guiding shield has to be removed.

Warning **Floating voltages up to + 145 V are present. This can be dangerous to life. Care should therefore be taken during the measurements.**

Onboard Regulators

Check the power supplies re-generated on the output board.

Fixed Supply

At TP109 there should be + 5 VANA measured against AGND at Cl 19

Floating Supplies

Measure the floating voltages against floating ground (FLGND). FLGND can be accessed at TP106.

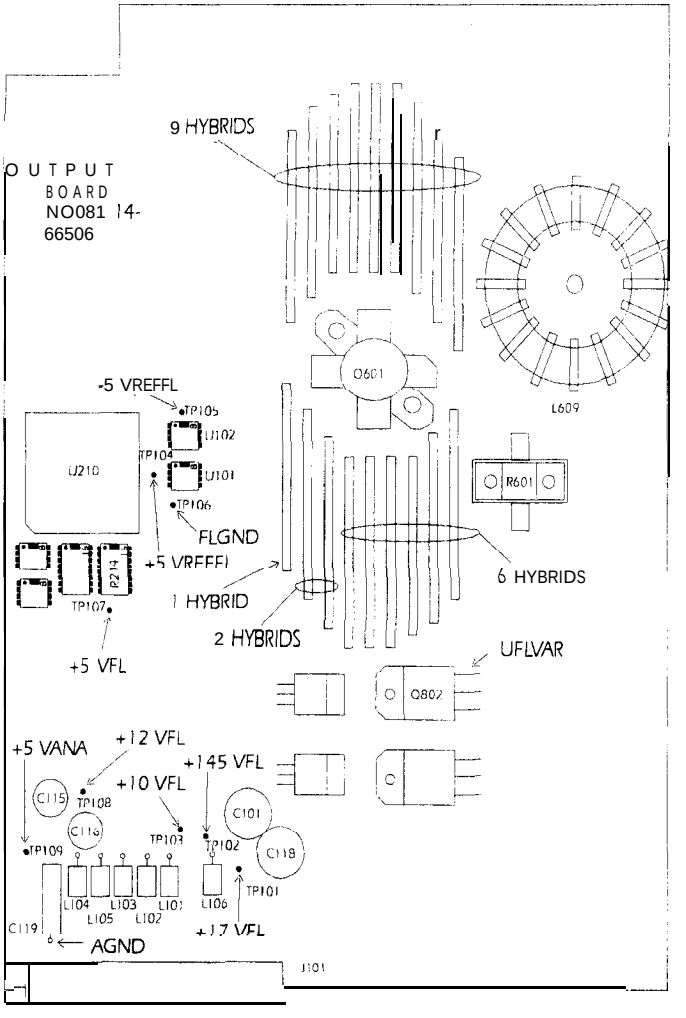


Figure 5-7. Testpoints for the Floating Voltages

Table 5-10.
Floating Supply Voltages on the Output Board

Supply Voltage	Testpoint	Typical Measurement
-12 VFL	TP108	12 V
-5 VREFFL	TP105	-5 V
+5 VREFFL	TP104	5 V
5 VFL	TP107	5.05 V
10 VFL	TP103	10.5 V
17 VFL	TP101	17 V
145 VFL	TP102	140 V

Optocoupler

Check for a signal output at TP201, TP203, TP204, and TP205 while varying the output amplitude. In the state of rest (not varying the output amplitude) there is +5 VFL present.

Amplifier DACs

The specified output amplitude range is internally divided into 6 ranges. Eighteen hybrids are necessary to cover the amplitude range. There are four hybrid groups, each controlled by a DAC. Different hybrid groups are active or switched off in the 6 amplitude ranges. Following table shows in which amplitude range which output voltage is present at, which DAC:

Table 5-11.

DAC No	1	2	3	4
Testpoint	**301**	**302**	**303**	**304**
DAC drives	**9 Hybrids**	**6 Hybrids**	**2 Hybrids**	**1 Hybrid**
Amplitude Range				
1.00 V	0.0 V	0.0 V	0.0 V	0.44 V
2.69 V	0.0 V	0.0 V	0.0 V	1.14 V
2.70 V	0.0 V	0.0 V	0.58 V	0.0 V
4.99 v	**0.0 v**	**0.0 v**	1.06 V	0.0 v
5.00 v	0.0 v	0.0 v	0.71 v	0.71 v
7.99 v	0.0 v	0.0 v	1.12 v	1.13 v
8.00 v	0.0 v	0.57 v	0.0 v	0.0 v
15.99 v	0.0 v	1.12 v	0.0 v	0.0 v
16.00 V	0.62 V	0.0 v	0.62 V	0.0 v
29.99 v	1.15 v	0.0 v	1.15 v	0.0 v
30.00 v	0.71 v	0.71 V	0.71 v	0.71 v
50.05 v	1.17 v	1.17 v	1.18 v	1.18 V

Hybrid Stage

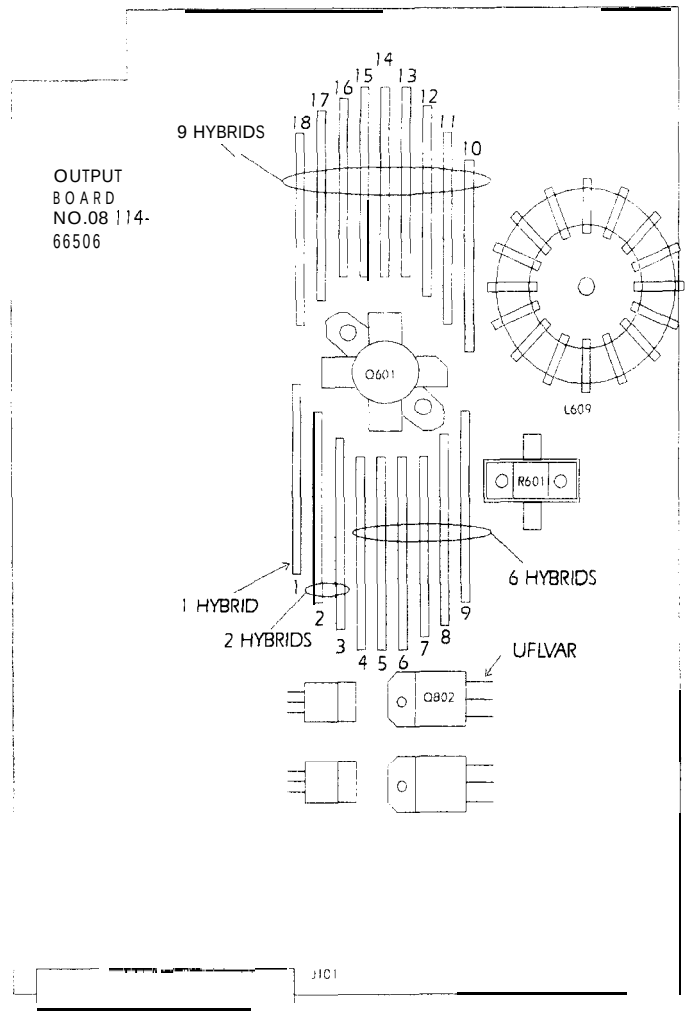


Figure 5-8. Hybrid Stage

1. Make shure that the instrument is switched off.
2. Carefully take out the eighteen hybrids
3. Now switch on the instrument again, and enable the output.
4. The signal output should be a 0.0 V signal.
5. Set the output amplitude to 2.69 V.
6. Mount hybrid number 1 in its socket.
7. A negative pulse with an amplitude of 2.69 V should be monitored.
8. Set the output amplitude to 4.99 V.
9. Mount hybrids number 2, and 3 in their sockets.
10. A negative pulse with an amplitude of 4.99 V should be monitored.
11. Set the output amplitude to 15.99 V.
12. Mount hybrids number 4, 5, 6, 7, 8, and 9 in their sockets.

13. A negative pulse with an amplitude of 15.99 V should be monitored.
14. Set the output ampliude to 50.0 V.
15. Mount hybrids number 10 through 18 in their sockets.
16. Finally a negative pulse with an amplitude of 50.0 V should be monitored.

Variable Floating Supply (UFLVAR)

Check UFLVAR at the emitter of Q802 in the 50 Ω into 50 Ω mode, with variable baseline of 0.0 V, and in negative pulse mode.

Table 5-12. Variable Floating Supply UFLVAR

Amplitude programmed	UFLVAR
1 V	27 V
50 V	124 V

Relays

1. Check for switching noise when toggling the relays.
2. If all relays don't switch the relay driver 17601 may be defective.

Variable Baseline (Option 001)

There are no recommended troubleshooting procedures available. If the fault can be localized on the variable baseline module, replace the module with a new module.

HP 8114A Error Messages and Status Register contents

Error Messages

The following is a list of all error messages issued by HP 8114A, and a table showing the contents of status registers.

SCPI Standard Error — **Standard error, BP-IB message, Local message, Description**

-100 Command header error

HP-IB message = "Instrument in LOCAL LOCKOUT mode"

Local message = "Instrument in LOCAL LOCKOUT mode"

Description:

The Local key was pressed on the front panel while the Instrument was set to Local lockout.

-102 Syntax error

HP-IB message = "[device-dependent info] "

Local message = "[device-dependent info]"

Description:

An unrecognized command or data type was encountered; for example, a string was received when the device does not accept strings.

-131 Invalid suffix

HP-IB message = "Channel out of range"

Local message = "Channel out of range"

Description:

The channel suffix given with a channel sensitive command is out of range.

-148 Character data not allowed

HP-IB message = "No MIN/MAX allowed while warnings are active"

Local message = "No MIN/MAX while warnings are active"

Description:

An attempt was made to set a parameter to MIN/MAX resp. to ask for the MINNAX of a parameter while warnings were active.

This does not work because other parameters on which the MIN/MAX result depends might already be outside no-warn range.

-148 Character data not allowed

HP-IB message = "No MIN/MAX allowed while checks are off"

Local message = "No MIN/MAX while checks are off"

Description:

An attempt was made to set a parameter to MIN/MAX resp. to ask for the MIN/MAX of a parameter while checks were switched off.

This does not work because other parameters on which the MIN/MAX result depends might already be outside no-warn range.

-200 Execution error

HP-IB message = "No signal at CLK-IN could be detected for frequency measurement"

Local message = "No signal detected at CLK-INput"

Description:

An attempt was made to measure the external clock frequency but no signal was detectable on the clock-in connector.

-200 Execution error

HP-IB message = "Frequency at CLK-INput too low."

Local message = "Frequency at CLK-INput too low."

Description:

An attempt was made to measure the external clock frequency but the detected signal frequency was too low to allow an accurate measurement. (Currently the limit is 1000 Hz.)

-200 Execution error

HP-IB message = "Frequency at CLK-INput too high."

Local message = "Frequency at CLK-INput too high."

Description:

An attempt was made to measure the external clock frequency but the detected signal frequency was too high to allow an accurate measurement.

-200 Execution error

HP-IB message = "Product- or Serial Nr. is wrong."

Local message = "Product- or Serial Nr. is wrong."

Description:

The header of the calibration data stream contains a product number (6 Char.) or a serial number (10 Char.). The length of these strings will be checked by the firmware.

-200 Execution error

HP-IB message = "Security violation"

Local message = "Security violation"

Description:

An attempt was made to switch the display ON, while security was on.

-211 Trigger ignored

HP-IB message = "Trigger signal ignored"

Local message = "MANUAL key ignored"

Description:

The MANUAL trigger function is not supported by all modes. The TRG or GET HPIB commands have the same functionality as the MANUAL key.

-221 Settings conflict

HP-IB message = "Width > period"

Local message = "Width > period"

Description:

Width exceeds period.

-221 Settings conflict

HP-IB message = "Delay > period"

Local message = "Delay > period"

Description:

Delay exceeds period.

-221 Settings conflict

HP-IB message = "Too many parameters in % of period/width"

Local message = "Too many param. in % of per/width"

-221 Settings conflict

HP-IB message = "Ext-Width mode only until 20V amplitude"

Local message = "Ext-Width mode only until 20V amplitude"

Description:

External width mode is only possible, if the amplitude is < 20V, because of power problems.

-221 Settings conflict

HP-IB message = "Baseline option only with 50 ohm source "

Local message = "Baseline option only with 50 ohm source"

-221 Settings conflict

HP-IB message = "No width limits in external width mode"

Local message = "No width limits in external width mode"

-221 Settings conflict

HP-IB message = "Double pulse max dutycycle 7 percent if amplitude > 20V"

Local message = "Double pulse max dutyc 7 percent if ampl > 20V"

Description:

In Double pulse mode maximum dutycycle is 7 percent, if the amplitude is over 20V, because of power problems.

-222 Data out of range

HP-IB message = "Parameter out of hard limits"

Local message = "Parameter out of hard limits"

Description:

This is the generic "Parameter out of range" error. It is issued when more specific information is not available.

-222 Data out of range

HP-IB message = "Limit reached - allowed [range]"

Local message = "Limit reached - allowed [range]"

Description:

[range] = range of parameter

-222 Data out of range

HP-IB message = "[param] out, of absolute limits"

Local message = "[param] out of absolute limits"

Description:

[param] = parameter name

This error is issued when a parameter is outside its absolute limits.

-222 Data out of range

HP-IB message = "[param] on channel [chan] out of hard limits"

Local message = "[param] on channel [chan] out of hard limits"

Description:

[param] = parameter name, [chan] = channel number

This error is issued when a parameter is outside its hardware limits.

-222 Data out of range

HP-IB message = "[loc] Wrong Location Nr. - allowed [loc range]"

Local message = "[loc] Wrong Location Nr. - [loc range] "

Description:

[loc] = location number, [loc range] = location range

-222 Data out of range

HP-IB message = "BURSTXNT-RANGE"

Local message = "BURST of: 2 to 65536"

-222 Data out of range

HP-IB message = "PERIOD-RANGE"

Local message = "Per: 66.7 ns to 999 ms (999 s with PLL)"

-222 Data out of range

HP-IB message = "DELAY-RANGE"

Local message = "Delay: 0.0 ns to 999 ms"

-222 Data out of range

HP-IB message = "DOUBLE-RANGE"

Local message = "DoubleDelay: 20.0 ns to 999 ms"

-222 Data out of range

HP-IB message = "WIDTH-RANGE"

Local message = "Width: 10.0 ns to 150 ms"

-222	Data out of range
	HP-IB message = "LOAD-IMP-RANGE"
	Local message = "Output into Load: 0.1 Ohm to 999 kOhm"
-222	Data out of range
	HP-IB message = "HIL-VOLT-RANGE"
	Local message = "High level: -49.0 V to 50.0 V"
-222	Data out of range
	HP-IB message = "HIL-AMP-RANGE"
	Local message = "High level: -1.998 A to 2.000 A"
-222	Data out of range
	HP-IB message = "LOL-VOLT-RANGE"
	Local message = "Low level: -50.0 V to 49.0 V"
-222	Data out of range
	HP-IB message = "LOL_AMP_RANGE"
	Local message = "Low level: -2.000 A to 1.998 A"
-222	Data out of range
	HP-IB message = "HIL_LIM_VOLT_RANGE"
	Local message = "High-V Limit: -49.0 V to 50.0 V"
-222	Data out of range
	HP-IB message = "LOL_LIM_VOLT_RANGE"
	Local message = "Low-V Limit: -50.0 V to 49.0 V"
-222	Data out of range
	HP-IB message = "HIL_LIM_AMP_RANGE"
	Local message = "High-A Limit: -1.998 A to 2.000 A"
-222	Data out of range
	HP-IB message = "LOL_LIM_AMP_RANGE"
	Local message = "Low-A Limit: -2.000 A to 1.998 A"
-222	Data out of range
	HP-IB message = "Trigger too fast - will skip bursts"
	Local message = "Trigger too fast - will skip bursts"
-222	Data out of range
	HP-IB message = "Width > Period"
	Local message = "Width > Period"

-222 Data out of range

HP-IB message = “Delay > Period”

Local message = “Delay > Period”

-222 Data out of range

HP-IB message = “Overlap at, OUTPUT: Width > DoubleDelay”

Local message = “Overlap at OUT: Width > DoubleDelay”

-222 Data out of range

HP-IB message = “Overlap at OUTPUT: DoubleDelay + Width > Period”

Local message = “Overlap at OUT: Double+ Width > Period”

-222 Data out of range

HP-IB message = “OUTPUT: High Level < Low Level”

Local message = “OUTPUT: High Level < Low Level”

-222 Data out of range

HP-IB message = “OUTPUT: High-V limit < Low-V Limit”

Local message = “OUTPUT: High-V Limit < Low-V Limit”

-222 Data out of range

HP-IB message = “OUTPUT: High-A Limit < Low-A Limit”

Local message = “OUTPUT: High-A Limit < Low-A Limit”

-222 Data out of range

HP-IB message = “OUTPUT: High Level > High-Volt Limit”

Local message = “OUTPUT: High Level > High-Volt Limit”

-222 Data out of range

HP-IB message = “Width (sec) > Width (see) Limit”

Local message = “Width (sec) > Width (see) Limit”

Description:

Width in seconds is greater than allowed user limit

-222 Data out of range

HP-IB message = "Width (%) > Width (%) Limit,"

Local message = "Width (%) > Width (%) Limit"

Description:

Width in percent is greater than allowed user limit

-222 Data out of range

HP-IB message = "OUTPUT: High Level > High-Amp Limit"

Local message = "OUTPUT: High Level > High-Amp Limit"

-222 Data out of range

HP-IB message = "OUTPUT: High Current > Low Current"

Local message = "OUTPUT: High Current > Low Current"

-222 Data out of range

HP-IB message = "OUTPUT: High Level (V) close abs. limit"

Local message = "OUTPUT: High Level (V) close abs. limit"

-222 Data out of range

HP-IB message = "OUTPUT: Low Level (V) close abs. limit"

Local message = "OUTPUT: Low Level (V) close abs. limit"

-222 Data out of range

HP-IB message = "OUTPUT: High Level (A) close abs. limit"

Local message = "OUTPUT: High Level (A) close abs. limit"

-222 Data out of range

HP-IB message = "OUTPUT: Low Level (A) close abs. limit"

Local message = "OUTPUT: Low Level (A) close abs. limit"

-222 Data out of range

HP-IB message = "OUTPUT: Amplitude (V) close high limit"

Local message = "OUTPUT: Amplitude (V) close high limit"

-222	Data out of range
	HP-IB message = "OUTPUT: Amplitude (V) close low limit"
	Local message = "OUTPUT: Amplitude (V) close low limit"
-222	Data out of range
	HP-IB message = "OUTPUT: Amplitude (A) close high limit"
	Local message = "OUTPUT: Amplitude (A) close high limit"
-222	Data out of range
	HP-IB message = "OUTPUT: Amplitude (A) close low limit"
	Local message = "OUTPUT: Amplitude (A) close low limit"
-222	Data out of range
	HP-IB message = "OUTPUT: Low Level < Low-Voltage Limit"
	Local message = "OUTPUT: Low Level < Low-Voltage Limit"
-222	Data out of range
	HP-IB **message** = "OUTPUT: Low Level < Low-Ampere Limit"
	Local message = "OUTPUT: Low Level < Low-Ampere Limit"
-222	Data out of range
	HP-IB message = "OUTPUT: can't achieve High level"
	Local message = "OUTPUT: can't achieve High level"
-222	Data out of range
	HP-IB message = "OUTPUT: can't achieve Low level"
	Local message = "OUTPUT: can't achieve Low level"
-222	Data out of range
	HP-IB message = "OUTPUT: can't achieve Amplitude"
	Local message = "OUTPUT: can't achieve Amplitude"

-222	Data out of range
	HP-IB message = "Amplitude too small (resolution)"
	Local message = "Amplitude too small (resolution)"
-222	Data out of range
	HP-IB message = "OUTPUT: Conflict Ampl (V) - width (%)"
	Local message = "OUTPUT: Conflict Ampl (V) width (%)"
-222	Data out of range
	HP-IB message = "OUTPUT: Conflict Ampl (A) - width (%)"
	Local message = "OUTPUT: Conflict Ampl (A) - width (%)"
-222	Data out of range
	HP-IB message = "OUTPUT: Conflict Ampl (V) - ext width"
	Local message = "OUTPUT: Conflict Ampl (V) - ext width"
-222	Data out of range
	HP-IB message = "OUTPUT: Conflict Ampl (A) ext width"
	Local message = "OUTPUT: Conflict Ampl (A) - ext width"
-222	Data out of range
	HP-IB message = "Can't calc. Delay: PERIOD UNKNOWN"
	Local message = "Can't calc. Delay: PERIOD UNKNOWN"
-222	Data out of range
	HP-IB message = "Can't calc. Phase: PERIOD UNKNOWN'
	Local message = "Can't calc. Phase: PERIOD UNKNOWN"
-222	Data out of range
	HP-IB message = "Can't calc. DoubleDelay: PERIOD UNKNOWN"
	Local message = "Can't calc. DblDel:PERIOD UNKNOWN"

-222 Data out of range

HP-IB message = "Can't calc. Dutycycle: PERIOD UNKNOWN"

Local message = "Can't calc. DutyCycle: PERIOD IJNKNOWN"

-222 Data out of range

HP-IB message = "Can't calc. TrailDelay: DELAY UNKNOWN"

Local message = "Can't calc. TrailDelay: DELAY IJNKNOWN"

-222 Data out of range

HP-IB message = "Period too small"

Local message = "Period too small"

-222 Data out of range

HP-IB message = "Width too small"

Local message = "Width too small"

-222 Data out of range

HP-IB message = "Delay too small"

Local message = "Delay too small"

-222 Data out of range

HP-IB message = "Double delay too small"

Local message = "Double delay too small"

-223 Too much data

HP-IB message = "[device-dependent info]"

Local message = "[device-dependent info]"

Description:

An unrecognized command or data type was encountered for example, a string was received when the device does not accept strings.

-224 Illegal parameter value

HP-IB message = "Invalid key code [key code]"

Local message = "Invalid key code [key code]"

Description:

SYSTEM:KEY command was used with illegal key code.

-240 Hardware error

HP-IB message = "Serial EEPROM read/write error"

Local message = "Serial EEPROM read/write error"

-241 Hardware missing

HP-IB message = "[board] - Board not, installed"

Local message = "[board] - Board not, installed"

Description:

[board] = board name

-241 Hardware missing

HP-IB message = "Required optional product is not installed"

Local message = "Optional product is not installed"

Description:

This error is generated when a command is sent to the instrument that requires a hardware option that has not been installed.

-250 Mass storage error

HP-IB message = "Specified drive not found"

Local message = "Specified drive not found"

-250 Mass storage error

HP-IB message = "Drive A: Memory Card error"

Local message = "Drive A: Memory Card error"

Description:

Internal Error.

-250 Mass storage error

HP-IB message = "Drive A: Can't load more Subdirectories"

Local message = "Drive A: Can't load more Subdirectories"

Description:

The maximum internal nesting level of subdirectories has been reached.

-252 Missing media

HP-IB message = "Drive A: Missing Memory Card"

Local message = "Drive A: Missing Memory Card"

Description:

The card is not inserted correctly.

-253 Corrupt media

HP-IB message = “Drive A: Memory Card corrupt”

Local message = “Drive A: Memory Card corrupt”

Description:

There are wrong values of boot **block** or of Card Information Structure.

-254 Media full

HP-IB message = “Drive A: Memory Card full”

Local message = “Drive A: Memory Card full”

Description:

No more free memory is available on card.

-255 Directory full

HP-IB message = “Drive A: Directory on Memory Card full”

Local message = “Drive A: Directory full”

Description:

The root directory is full.

-256 File name not found

HP-IB message = “Drive A: File Name on Memory Card not found”

Local message = “Drive A: File Name not found”

Description:

The ordered file or directory does not exist.

-256 File name not found

HP-IB message = “Drive A: File sizes don’t match ”

Local message = “Drive A: File sizes don’t match ”

Description:

The size of the ordered file does not match settings.

-257 File name error

HP-IB message = “Drive A: File name wrong”

Local message = “Drive A: File name wrong”

Description:

The filename **does not** correspond to DOS conventions.

-257 File name error

HP-IB message = “Permission denied”

Local message = “Permission denied”

Description:

An attempt was made to do one of the following:

- delete a directory
- copy a directory
- load a directory to setting, or
- change directory to a file.

-258 Media protected

HP-IB message = “Drive A: Memory Card write protected”

Local message = “Drive A: Memory Card write protected”

-258 Battery low

HP-IB message = “Drive A: Memory Card battery is low”

Local message = “Drive A: Memory Card battery is low”

Description:

The battery of the Memory Card should be replaced.

-300 Device specific error

HP-IB message = “*&OVERVOLTAGE&* Output disabled”

Local message = “*&OVERVOLTAGE&* Output disabled”

Description:

The output was disabled by the overvoltage protection circuitry automatically.

-300 Device specific error

HP-IB message = “Output Bd.: Can’t reset the interrupt circuit”

Local message = “Output Bd.: Interrupt reset failed”

Description:

The interrupt line can’t, be cleared by the software. There must be a problem on the output board.

-300 Device specific error

HP-IB message = “Output Bd.: Communication error”

Local message = “Output Bd.: Communication error”

Description:

The output was disabled by the overvoltage protection circuitry automatically.

-300 Device specific error

HP-IB message = “Interrupt line can’t be cleared”

Local message = “Interrupt line can’t be cleared”

Description:

The interrupt, line can’t be cleared by the software. There must be a problem on the output board.

-310 System error

HP-IB message = “Driver complains after parameter restore from core”

Local message = “Error after parameter restore from core”

Description:

A hardware driver returned an error after the total restore of all instrument parameters to the last known to be in good state.

A possible cause for this error is a hardware fault.

-310 System error

HP-IB message = “CHECk OFF not allowed, use *RST”

Local message = “CHECk OFF not allowed, use AUTOSET”

Description:

An attempt was made to switch on the global parameter check via command. This is not allowed. The only way to switch checks on again is to issue a *RST command.

-311 Memory error

HP-IB message = "Power up state corrupt, set to *RST state"

Local message = "Power up state corrupt, set to *RST"

Description:

The signature check performed on the instruments parameter store at power up, failed.

Possible reasons are:

- The instrument was switched off during a parameter update
- The battery used to buffer the instruments RAM needs replacement
- The instruments RAM is defective.

-311 Memory error

HP-IB message = "Pattern block corrupt, set to *RST state"

Local message = "Pattern corrupt, set to 'RST"

Description:

The signature check performed on the instruments pattern block at power up, failed.

Possible reasons are:

- The instrument was switched off during a parameter update
- The battery used to buffer the instruments RAM is empty
- The instruments RAM is defective.

-314 SAVe/recall memory lost

HP-IB message = "[rem/loc] Setting [no] corrupt,"

Local message = "[rem/loc] Setting [no] corrupt"

Description:

[rem/loc] = remote or local, [no] = number input]

Save/Recall memory lost. Indicates that the nonvolatile data saved by the *SAV command has been lost.

-314 SAVe/recall memory lost

HP-IB message = "[rem/loc] Setting [no] Firmware revision nr. incompatible"

Local message = "[rem/loc] Setting [no] Firmware rev. incompat."

Description:

[rem/loc] = remote or local, [no] = number input]

Each firmware issue has a revision number. The instrument is trying to read a setting with an incompatible revision number.

-314 SAVe/recall memory lost

HP-IB message = "[rem/loc] Setting [no] Error check conflict"

Local message = "[rem/loc] Setting [no] Error check conflict"

Description:

[rem/loc] = remote or local, [no] = number input]

The error check switch in the specified setting is OFF but the internal error check is ON. The instrument cannot recall this setting.

-314 SAVe/recall memory lost

HP-IB message = "[rem/loc] Setting [no] Instrument configuration incompatible"

Local message = "[rem/loc] Setting [no] Config. incompatible"

Description:

[rem/loc] = remote or local, [no] = number input]

Every stored setting contains the instrument configuration. The stored configuration does not correspond to the actual instrument configuration.

-330 Selftest failed

HP-IB message = "Selftest error: Microprocessor board failed"

Local message = "Selftest error: Microproc. board failed"

Description:

Hardware on the Microprocessorboard does not work.

-330 Selftest failed

HP-IB message = "ROM test failed"

Local message = "ROM test failed"

Description:

Flash EPROM test failed on Microprocessorboard.

-330 Selftest failed

HP-IB message = "RAM test failed"

Local message = "RAM test failed"

Description:

Static RAM test failed on Microprocessorboard.

-330 Selftest failed

HP-IB **message** = "Crystal Reference for UP lost"

Local message = "Crystal Reference for uP lost"

Description:

A loss of crystal reference has been detected and the VCO is running at approximately half of maximum speed, determined from an internal voltage reference. Normally the external crystal frequency is VCO reference.

-330 Selftest failed

HP-IB message = "VCO for UP has not locked"

Local message = "VCO for UP has not locked"

Description:

The VCO is enabled, but has not yet locked. Normally the VCO would have locked on to the desired frequency.

-330 Selftest failed

HP-IB message = "Unexpected Reset of uP"

Local message = "Unexpected Reset of uP"

Description:

The reset was caused by one of the following:

- the powerup reset circuit
- the software watchdog circuit
- the system protection submodule halt monitor
- a loss of frequency reference to the clock submodule
- the test submodule

Normally the last reset was caused **by** an external signal or **by** the CPU executing a reset instruction.

-330 Selftest failed

HP-IB message = "Internal Serial Device Bus failed"

Local message = "Internal Serial Device Bus failed"

Description:

Internal serial device bus traffic over feedback path has failed.

-330 Selftest failed

HP-IB message = "[device-dependent info]"

Local message = "[device-dependent, info"

-330 Selftest failed

HP-IB message = "SELFTEST uP-BOARD OK"

Local message = "SELFTEST uP-BOARD OK"

-330 Selftest failed

HP-IB message = "SELFTEST: INSTALLED BOARDSOK"

Local message = "SELFTEST: INSTALLED BOARDS OK"

-330 Selftest failed

HP-IB message = "SELFTEST FAILED"

Local message = "SELFTEST FAILED"

-330 Selftest failed

HP-IB message = "Failure in PERIOD circuitry"

Local message = "Failure in PERIOD circuitry"

Description:

The Period TIGER IC may be defective.

-330 Selftest failed

HP-IB message = "Failure in DELAY circuitry"

Local message = "Failure in DELAY circuitry"

Description:

The Delay TIGER IC may be defective.

-330 Selftest failed

HP-IB message = "Failure in WIDTH circuitry"

Local message = "Failure in WIDTH circuitry"

Description:

The Width TIGER IC may be defective.

-330 Selftest failed

HP-IB message = “Failure in AMPLIFIER circuitry”

Local message = “Failure in AMPLIFIER circuitry”

Description:

The AMPLIFIER, or the OFFSET circuitry may be defective.

-330 Selftest failed

HP-IB message = “Failure in AMPLIFIER or OFFSET circuitry’

Local message = “Failure in AMP/OFFS circuitry”

Description:

The AMPLIFIER or the OFFSET circuitry may be defective.

-330 Selftest failed

HP-IB message = “No output signal PERIOD TIGER”

Local message = “No output signal PERIOD TIGER”

Description:

An output signal cannot be found by the selftest following the period circuitry.

-330 Selftest failed

HP-IB message = “Failure in TRIGGER OUTPUT circuitry”

Local message = “Failure in TRIGGER OUTPUT circuitry”

Description:

An output signal cannot be found by the selftest for the TRIGGER OUTPUT AMPLIFIER.

-800 The file Header isn’t right

HP-IB message = “File isn’t a demo file ”

Local message = “File isn’t a demo file ”

-801 There are some unexpected characters

HP-IB message = “SYNTAX ERROR: ROW: [no] ”

Local message = “SYNTAX ERROR: ROW: [no] ”

Description:

[no] = row number

-802 Couldn't write that key code

HP-IB message = "Couldn't execute Key: [no] "

Local message = "Couldn'l execute Key: [no] "

Description:

[no] = key number

-803 Demofile is bigger than read buffer

HP-IB message = "Demo file too big "

Local message = "Demo file too big "

Register Usage

The HP 8114A firmware uses the Standard Event Status, Operation Status, and Questionable Status registers for reporting instrument status, in accordance with the SCPI standard. The following table lists the bits used in each register, and what they are used for.

Table 5-13. Bits Used in SCPI Registers

Register	Bit	Description
STANDARD_EVENT_STATUS_REGISTER	0	Set when inst. has completed all pending operations
	7	Set to indicate that instrument has powered-up
OPERATION_STATUS_REGISTER	1	Set when inst. starts changing its output signals
	1	Cld. when inst. finishes changing output signals
	2	Set when inst. starts changing its range
	2	Cleared when inst. finishes changing its range
	4	Set when inst. starts a frequency measurement
	4	Cld. when inst. finishes frequency measurement
QUESTIONABLE-STATUS-REGISTER	0	Set the QUEStionable STATus bit for VOLTage
	0	Clear the QUEStionable STATus bit for VOLTage
	1	Set the QUEStionable STATus bit for CURRent
	1	Clear the QUEStionable STATus bit for CURRent
	2	Set the QUEStionable STATus bit for TIME
	2	Clear the QUEStionable STATus bit for TIME
	5	Set the QUEStionable STATus bit for VOLTage
	5	Clear the QUEStionable STATus bit for VOLTage

Warning Messages

Due to hardware limits pulse parameter settings may be conflicting, and lead to skipped, or distorted pulses output. The conflicts are monitored by software, and the following warnings could be displayed:

"Period too small may skip pulses"

"Width too small may skip pulses"

"Width too close to period"

"Delay too small - may skip pulses"

"Delay too close to period"

"Double delay too small - skip pulses?"

"Double pulses too close together"

"2nd double pulse may reach next period"

"Width (Seconds) > user-limit"

"Width (Dutycycle) > user-limit"

"High Level (V) close to absolute limit"

"Low Level (V) close to absolute limit"

"High Level (A) close to absolute limit"

"Low Level (A) close to absolute limit"

"Amplitude (V) close abs. high limit"

"Amplitude (V) close abs. low limit"

"Amplitude (A) close abs. high limit"

"Amplitude (A) close abs. low limit"

"Ampl. (V) too great for Width (Dtycycl)"

"Ampl. (A) too great for Width (Dtycycl)"

"Ampl. (V) too great for ext. width mode"

"Ampl. (A) too great for ext. width mode"

"High Level > upper voltage user-limit"

"High Level > upper current user-limit"

"Low Level < lower voltage user-limit"

"Low Level < lower current user-limit"

6

Replaceable Parts

Exchange Parts List

Exchange Boards

Table 6-1.

Board	Original Bd Number	Exchange Bd Number
none		

Replacement Boards

Table 6-2.

Board	Original Bd Number	Replacement Bd Number
Microprocessor	08114-66503	08114-66503
Power Supply	08 114-66504	08 114-66504
Timing	08114-66505	08114-66505
Output	08114-66506	08114-66506
Variable Baseline Board 1	08114-66541	08114-66541
Variable Baseline Board 2	08114-66542	08114-66542

HP 8114A Parts List

Table 6-3.

Ref	HP Part #	CD	Qty	Description	Man'f	Part #
A2	08114-66502	4	1	BD AY MOTHER	28480	08 114-66502
A3	38 114-66503	5	1	BD AY MICROPROC	28480	08 114-66503
A4	X3114-66504	6	1	BD AY PWR SUPPLY	28480	08 114-66504
A5	38 11466505	7	1	BD AY TIMING PER	28480	08 114-66505
A6	08114-66506	8	1	BD AY PWR AMPLIF	28480	08 114-66506
A7	08114-66507	9	1	BD AY LED/RPG/KE	28480	08114-66507
A8	X3114-66508	0	1	BD AY MEM-CARD C	28480	08114-66508
B1	3160-0510	0	2	FAN-TBAX	11039	4314
J1	1251-4052	4	4	CONTACT-CONN F	03418	08-56-0110
J2	1251-5388	1	2	CONN-POST-TP-PST	03394	1300-102
J3	0890-0023	4	1.5000	TUBING-FLEX	02571	ITCO 105 DEG C
MP1	08114-64201	6	1	FRONT FRAME	28480	08114-64201
MP3	38114-65201	8	1	HOUSING ASSY	28480	08114-65201
MP4	38 114-65202	9	1	HOUSING ASSY	28480	08114-65202
MP5	08114-40202	7	1	PNL FRNT	28480	08114-40202
MP6	38114-04101	9	1	COVER	28480	08114-04101
MP8	38114-01204	7	1	BRACKET FAN	28480	08114-01204
MP9	08 114-00602	7	1	SHIELD MEMORY	28480	08114-00602
MP10	1400-1208	3	1	CLAMP-CABLE	06397	TY8-H1S
MP11	3050-1389	0	1	WASHER-FL MTLC	10773	BN670 M3
MP12	1251-7999	4	1	DUST COVER	04068	474-11-91-707
MP16	1535-5036	8	8	OEM	28480	1535-5036
MP17	0624-0267	5	8	SCR-TPG 6-20	01136	
MP18	5040-1135	5	1	COUPLER PWR SW	28480	5040-l 135
MP19	5040-1149	1	1	SHAFT-LONG/GRAY	28480	5040-l 149
MP20	5041-0531	5	1	KEY	28480	5041-0531
MP21	2090-0293	6	1	MONITOR-CRT	11908	GU256X64-315
MP22	08 114-68501	7	0	FAN AY 624	28480	08 114-68501
MP25	2950-0145	1	8		28480	2950-0145
MP26	2 1 go-0054	9	8	WSHR-LK INTL T	04805	1924-12
MI'27	5041-8801	8	4	FOOT	28480	5041-8801
MP28	1460-1345	5	2	TILT STAND	00359	
MP29	5041-8819	8	2	STP HNDL FRNT	28480	5041-8819
MP30	5041-8820	1	2	STP HNDL REAR	28480	5041-8820
MP31	5001-0539	9	2	SIDE TRIM	28480	5001-0539

Table 6-3. (continued)

Ref	HP Part #	CD	Qty	Description	Man'f	Part #
MP32	5062-3703	3	2	STRAP HANDLE	28480	5062-3703
MP33	5041-8821	2	4	FOOT REAR	28480	5041-8821
MP34	0515-0892	1	4	SCR-MACH	01136	
MP35	0515-1132	4	4	SCR-MACH M5X0.8	01136	
MP36	0515-0886	3	45	SCR-MACH M3X0.5	01136	
MP37	0515-1110	8	2	SCR-MACH M3X0.5	01136	
MP38	0515-1323	5	1	SCR-MACH M3X0.5	09908	
MP39	05 15-0898	7	6	SCR-MACH M4X0.7	01136	
MP40	0515-1111	9	4	SCR-MACH M3X0.5	01136	
MP4 1	0515-1105	1	8	SCR-MACH M3X0.5	01136	
MP42	0380-0643	3	2	STDF-HEX .255-IN	02121	
MP43	2190-0321	3	1	WSHR-LK INTL T	04805	1708-00
MP44	0515-1508	8	1	SCR-MACH M3X0.5	01136	
MP50	081 lo-41901			RUBBER KEYPAD	28480	)8110-41901
MP51	08114-46501			KEYPAD FOIL	28480	)8114-46501
MP52	081 lo-44101			LARGE RETAIN PLATE	28480	18110-44101
MP53	0811044102			SMALL RETAIN PLATE	28480	)8110-44102
MP63	08114-02302	8	1	HOLDER TRANS.	28480	)8114-02302
MP64	08114-05401	4	1	INSULATOR	28480	)8114-05401
MP101	08114-01111	5	1	HEAT SINK	28480	)8114-01111
MP102	08114-23101	9	1	GUIDE HYBRID	28480	18114-23101
MP103	08114-22304	2	1	HOLDER BALUN	28480	)8114-22304
MP107	8120-1689	7	I.5000	CA-ASSY	08674	
MP110	08114-91012	4	1	USER GUIDE	28480	18114-91012
MP111	5040-938 1	9	1	PAD CORRUGATED	28480	5040-9381
MP112	7250-0042	8	1	HARD WOOD	12256	
MP113	9220-4582	8	2	PAD-FOAM	12506	
MP114	9220-4583	9	2	PAD-FOAM	12506	
MPl15	9211-5933	6	1	CTN-CORR RSC	06137	
MP116	9223-0514	4	3	TAPE-INDL 80MM	07036	OPTIMAL S
MP117	9230-0028	0	1	ENVELOPE-PKG-LST	01360	
MP119	08 114-00604	9	1	SHIELD SAFETY	28480	38 114-00604
MP120	08114-05403	6	1	INSULATOR	28480	38114-05403
MP121	0515-0885	2	2	SCR-MACH M4X0.7	01136	
MP122	08114-61690	1	1	WIRE AY EATH-GRN	28480	)8114-61690
MP123	9135-5111	0	1	LNE MDL-FLTRD	06121	B84112-B-K60
MP124	8160-0694	6	1	RFI GASKET	12085	UC-300275
MP126	8160-0562	7	1	RFI GASKET	03746	572019-00103-70
MP127	2190-0102	8	1	WSHR-LK INTL T	04805	1922-01
MP128	6960-0041	1	4	PLUG-HOLE	03480	2643 (BLACK)

Table 6-3. (continued)

Ref	HP Part #	CD	Qty	Description	Man'f	Part #
MP129	8160-0392	1	2	RFI STRP-FINGERS	03647	97-500-SNPB
MP220	08114-68501	7	0	FAN AY 624	28480	08114-68501
MP300	8114A #UFH		0	MEMORYCARD	28480	8114A #UFH
MP301	8114A #UN2		0	REAR CONNECTOR:3	28480	8114A #UN2
MP302	8114A #1CM		0	RACK MOUNT KITT	28480	8114A #1CM
MP303	8114A #1CP		0	MOUNT & HANDLE	28480	8114A #1CP
MP304	8114A #1CN		0	HANDLE KIT	28480	8114A #lCN
MP305	8114A #0B2		0	ADD.MANUAL	28480	8114A #0B2
MP306	8114A #1CR		0	RACK SLIDE	28480	8114A #1CR
MP401	E2900-47401	9	1	KNOB RPG CURSOR	28480	E2900-47401
MP865	0960-0865	1	1	OPT-ENDCR	01542	HRPG-AD32 #11C
W1	08114-61601	4	1	CBL AY EXT IN	28480	08114-61601
W2	08114-61602	5	1	CBL AY INH IN	28480	08114-61602
W3	08114-61603	6	1	CBL AY TRIG OUT	28480	08114-61603
w4	08114-61604	7	1	CBL AY MAIN OUT	28480	08114-61604
W5	08110-61601	0	1	CBL AY DISPLAY 1	28480	08110-61601
W6	081 lo-61603	2	1	CBL AY RPG-LED-K	28480	081 lo-61603
w7	08110-61607	6	1	CBL AY HP-IP	28480	08110-61607

A

Component Level Information Package

The complete Component Level Information Package for the HP 8114A and its modules is not part, of this Assembly-level Service Guide. It can be obtained seperately by ordering HP Part Number 08114-91031.

Index

ATSX

HEWLETT" PACKARD

MANUAL CHANGES **September. 1997**

Manual for Model Number	8114A
Manual printed on	Dec. 1994. 1 .O
Manual Part Number	081 Id-91021

Make all ERRATA corrections.

Check the following table for your instrument serial prefix/serial number/EDC and make the listed changes to your manual

New Item

Serial Prefix or Serial Number	Manual Changes
ERRATA	
3330600821	1
3330600826	2

ERRATA

Section 2 Specifications

Page 2-l. add below first paragraph:

"'No Warning' adjustment range: this term is used in the specifications to define the range of adjustment permitted by the firmware. when this range is less than the hardware specification. As explained at the beginning of the Operating Reference section (as modified by this Manual Change!) the hardware specifications can be fully exploited by overiding the firmware limit with the shift key."

Page 2-4. Output Amplitude

Headline "Range" add:

"subject to the duty cycle setting (or the ratio of the pulse width and period settings), see Figure 2-1 on page 2-7."

Headline "Current" change text to:

"20 mA to 1 A (50 ohm into 50 ohm), up to 2 A into short. 40 mA to 2 A (Hi-Z into 50 ohm."

Page 2-5, Source Impedance

1. Change "10 kohm" to " 1 kohm"
2. Add new line "If Option 001 is fitted, High Impedance can only be selected when the baseline is set to zero"

Page 2-5. Pulse Performance

Overshoot/Preshoot/Ringing

change to read: < 5% of amplitude 100mV

Page 2-5, Pulse Performance, Settling Time: change text to:

"<100 ns typical. This means, for pulses <100 ns wide, the amplitude specification is modified by the overshoot and ringing specification, i.e., effectively: +/-6% of amplitude +/-150 mV."

Page 2-6. Width.

Substitute the text under "Range" with:

" For output amplitudes up to 20 V: 10 ns to period -10 ns. For output amplitudes >20 V: 10 ns to maximum shown in Figure 6-l .With Hi-Z source resistance, the minimum pulse width is typically 20 ns, the maximum is typically period - 20 ns.

No warning' adjustment range: 10 ns to at least 90.5% of period (95% with periods >7.5 us).

Page 2-7, Duty cycle.

Headline "Duty-cycle", replace text with:

"The Duty Cycle parameter sets the pulse width as a percentage of period instead of an absolute value.

Range: Limits as width specification.

Resolution: 0.1% of period."

Page 2-O. Delay

Add the following at the end of the "Variable Range" paragraph:
"No warning adjustment range: 0.00 ns to at least 85.9% of the period
(95% can be achieved with periods >7.5 us)."

Page 2-9. Double Pulse Delay

Heading "Minimum Period": delete 133.4 ns and insert:
"134 ns (approx 7.5 MHz; double pulses at 7.5 MHz simulates a 15 MHz signal)."

Heading "Range": substitute the following:
"Range: 20.0 ns to 999 ms (max value: period - width - 4ns). With Hi-Z source resistance, the minimum range inceases to typically 30 ns, and the maximum decreases to typically period - width - 10 ns.

'No warning' adjustment range:
Range minimum: 104% of Width
Range maximum: at least 85.9% of period -width (for periods >7.5 us the maximum is 95% of period -width)."

Page 2- 11, Inhibit Input

Change threshold spec to "TTL compatible"

Section 3 Testing the HP 8114A

Pages 3-77, -20, -23, -27, -29, -30, -31, -32, -34, -37, -39, and -41:
Identify the connectors of the high power attenuator; the end connected to the 8 114A should be marked "IN" and the other end "OUT"

Page 3-28:

Identify the connectors of the high power attenuator; the end connected to the DVM should be marked "IN" and the other end "OUT"

Page 3-30:

The 50-ohm feedthrough should be at the DVM-end of the cable.

page l-4 and 2- 1 Environmental:
add errata:
Altitude up to 2000m
Installation Category II
Pollution Degree 2
Warning: To prevent electrical shock, disconnect the HP model 8114A from mains before cleaning.
Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean internally.

CHANGE TO NEW SERIAL NUMBER FORMAT

last serial number old format: 3330G00835
first serial number new format: DE33700836

INDEX OF MANUAL CHANGE

MANUAL CHANGE	FRAME
ERRATA	
1	MP13
3	MPI 4.W6, MPl19

MANUAL CHANGE 1

On Repl.Parts 6-2, add:

MP13	0460-1243	TAPE-INDL .375

MANUAL CHANGE 2

On Repl. Parts 6-2 add:

MP14	1400-0824	STRAP-CABLE

On Repl. Parts 6-2 change to read:

W6	08110-61608	CBL AY RPG-LED-K

On Repl. Parts 6-3, change to read:

MP119	08114-40604	COVER SAFETY