HEWLETT®
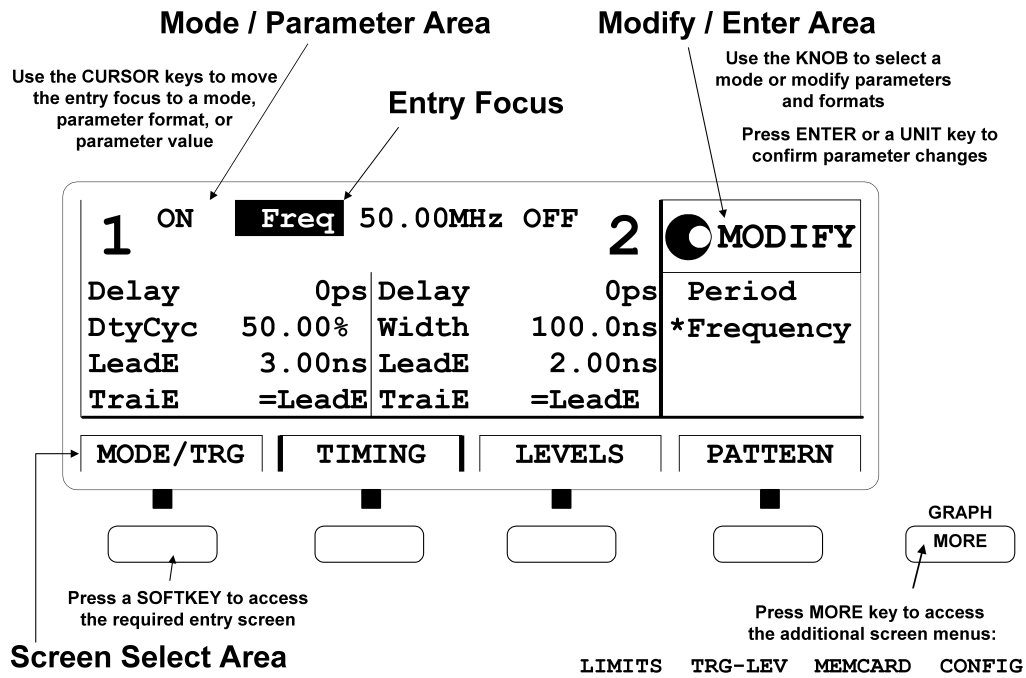**PACKARD**

**Quick Start
Guide**

HP 81110A 165/330 MHz,
HP 81104A   80 MHz
Pulse/Pattern Generators

Front Panel Display and Softkeys

Mode / Parameter Area

Use the CURSOR keys to move the entry focus to a mode, parameter format, or parameter value

Entry Focus

Modify / Enter Area

Use the KNOB to select a mode or modify parameters and formats

Press ENTER or a UNIT key to confirm parameter changes

```
1  ON     Freq  50.00MHz OFF   2  (●)MODIFY

Delay         0ps Delay        0ps  Period
DtyCyc    50.00%  Width     100.0ns *Frequency
LeadE     3.00ns  LeadE       2.00ns
TraiE     =LeadE  TraiE       =LeadE

  MODE/TRG  |  TIMING  |  LEVELS  |  PATTERN
     ■           ■          ■          ■
```

GRAPH

MORE

Press a SOFTKEY to access the required entry screen

Press MORE key to access the additional screen menus:

Screen Select Area

LIMITS   TRG-LEV   MEMCARD   CONFIG

Quick Start Guide

HP 81110A 165/330 MHz,
HP 81104A 80 MHz
Pulse/Pattern Generators

NOTICE

Warranty
This Hewlett-Packard product has a warranty against defects in material
and workmanship for a period of one year from date of shipment. During
the warranty period, Hewlett-Packard Company will, at its option, either
repair or replace products that prove to be defective. For warranty ser-
vice or repair,this product must be returned to a service facility desig-
nated by Hewlett-Packard. The Buyer shall pay Hewlett-Packard's
round-trip travel expenses. For products returned to Hewlett-Packard for
warranty service, the Buyer shall prepay shipping charges to Hewlett-
Packard and Hewlett-Packard shall pay shipping charges to return the
product to the Buyer. However, the Buyer shall pay all shipping charges,
duties and taxes for products returned to Hewlett-Packard from another
country. Hewlett-Packard warrants that its software and firmware desig-
nated 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.

Limitation of Warranty
The foregoing warranty shall not apply to defects resulting from
improper or inadequate maintenance by the Buyer, Buyer-supplied soft-
ware or interfacing,unauthorized modification or misuse, operation out-

side of the environmental specifications for the product, or improper site preparation or maintenance.
No other warranty is expressed or implied. Hewlett-Packard specifically disclaims the implied warranties of merchantability and fitness for a particular purpose.

Exclusive Remedies
The remedies supplied are the Buyer's sole and exclusive remedies. Hewlett-Packard shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort or any other legal theory.

Assistance

Product maintenance agreements and other customer assistance agreements are available for Hewlett-Packard products. For any assistance, contact your nearest Hewlett-Packard Sales Office.

Certification

Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment. Hewlett-Packard further certifies that its calibration measurements are traceable to the United States Institute of Standards and Technology, to the extent allowed by the Institute's calibrating facility, and to the calibration facilities of other International Standards Organization members.

About this book

This quick start guide helps you to quickly install the instrument, to get familiar with the features, the user interface and give the set up information for some real-world signal examples which can easily be used by varying only some parameter values.
The information is valid for HP 81104A and HP 81110A. Where required the differences are explicitly mentioned. Possible configurations are:

Output Module for HP 81104A Mainframe:

Module	Description	Max Quantity
HP 81105A	10V/ max.80 MHz Output Channel	2

Output Modules for HP 81110A Mainframe:

Module	Description	Max Quantity
HP 81111A	10V/ max. 165 MHz Output Channel	2

Module	Description	Max Quantity
HP 81112A	3.8V/ max. 330 MHz Output Channel	2

As standard the instruments are equipped with one output channel, so, some of the described features will not be available.

Installing

Installing the instrument. Setting Line voltage, replacing fuse and other installation information.

Introduction

An overview of the instrument features, the user interface, and the fundamental pulse parameters.

Getting Started

A set of examples designed to demonstrate how to quickly set up a signal.

User Interface Insight

Please refer to the Reference Guide, p/n 81110-91011.

Programming Reference

Please refer to the Reference Guide, p/n 81110-91011.

Specifications

Please refer to the Reference Guide, p/n 81110-91011.

About this book

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Chapter 2 **Introduction**

Chapter 3 **Getting Started**

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Chapter 1

**Installation &
Safety Requirements**

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 hazardous 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 work as expected within its specifications, notify the nearest Hewlett-Packard office. (please request the latest performance tests from Hewlett Packard) Keep the shipping materials for inspection by the carrier. The HP office will arrange for repair or replacement without awaiting settlement.

Standard Deliverables:

1   The instrument, either an HP 81110A or an HP 81104A Mainframe with one or two channels installed.

2   This Quick Start Guide and a Reference Guide

3   A power cord.

Figure 1   **The Standard Deliverables**

1) Either HP 81110A or HP 81104A
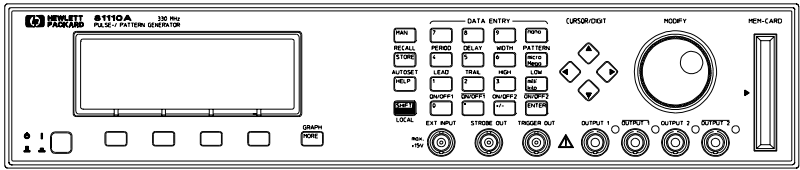
This Figure shows an HP 81110A

2) This Quick Start Guide and the Reference Guide

3) A Power Cord
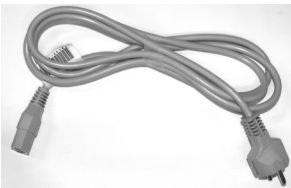
Options and Accessories:

Options

Rear Panel Connectors   Option UN2
                               All inputs and outputs are at the rear
                               panel.

Second Channel   HP 81105A 10V/80 MHz for
                               mainframe HP 81104A
                               HP 81111A 10V/165 MHz or
                               HP 81112A 3.8V/330 MHz for
                               mainframe HP 81110A

1 MB SRAM Memory Card   Option UFH
                               (HP part numer 0950-3880)

Figure 2   Standard Instrument's Rear Panel
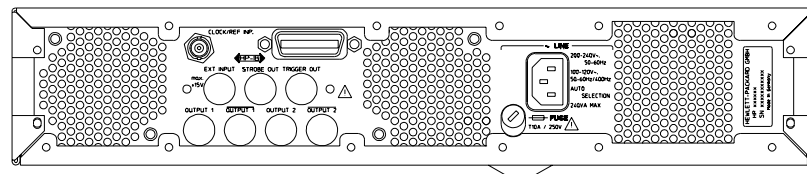
Figure 3   Rear Panel Connectors when Option UN2 is installed
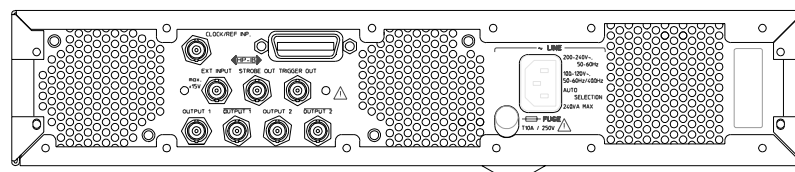
Handle Accessory

Front Handle Kit   HP part number   5063-9226

Rack Mounting Accessories

Rack Mount Kit   HP part number   5063-9212

Rack Mount and Front Handle Kit   HP part number   5063-9219

Rack Slide Kit   HP part number   1494-0059

Power Requirements

CAUTION: BEFORE APPLYING AC LINE POWER TO THE INSTRUMENT, ensure that the correct line fuse is installed in the fuse holder and the correct power cable is fitted.

NOTE: When the front panel switch is off, the Mainframe is in 'Standby' mode. Disconnection from the AC Line Power is accomplished only by disconnecting the power cord. Please make sure that the power cord is easily identifiable and can quickly be reached by the operator.

The following symbol is close to the 'Standby' switch on the front panel of the instrument.

Figure 4   The 'Standby' Switch Symbol

The instrument 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 300 VA with all options installed. When the instrument is switched on the power supply adapts automatically to the applied AC power (Auto Selection) and monitors the AC power range during operation.

Table 1   Line Fuse

Line Voltage	Fuse Type	HP Part Number
100 - 240 V~	T 10A, 250 V	2110-0720

Replacing the Fuse

1 Remove the power cord.

2 Unscrew the fuse-cap at the rear of the instrument beside the power-inlet socket.

Figure 5   Fuse Holder at Rear Panel

**Fuse Holder and
Fuse Cap**
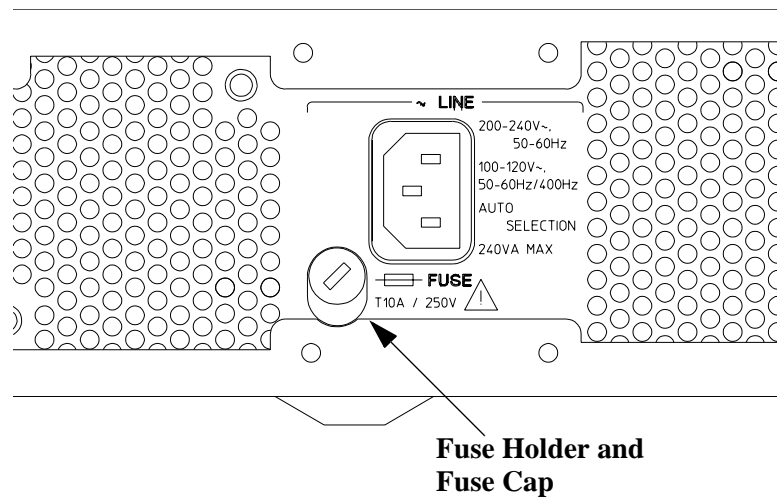
3 Replace the fuse with the equivalent part (see Table 1 on page 20).

4 Refit the fuse-cap.

Power Cable

In accordance with international safety standards, this instrument is equipped with a three-wire power cable, see *Figure 6 on page 22* for the part numbers of the power cables available. When connected to an appropriate AC power receptacle, this cable grounds the instrument cabinet.

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 6   Power Cables - Plug Identification

Australia
8120-1369

Denmark
8120-2956

Europe
8120-1689

Great Britain
8120-13151

South Africa
8120-4211

Switzerland
8120-2104

United States 120V
8120-1378

Japan 120V
8120-4753
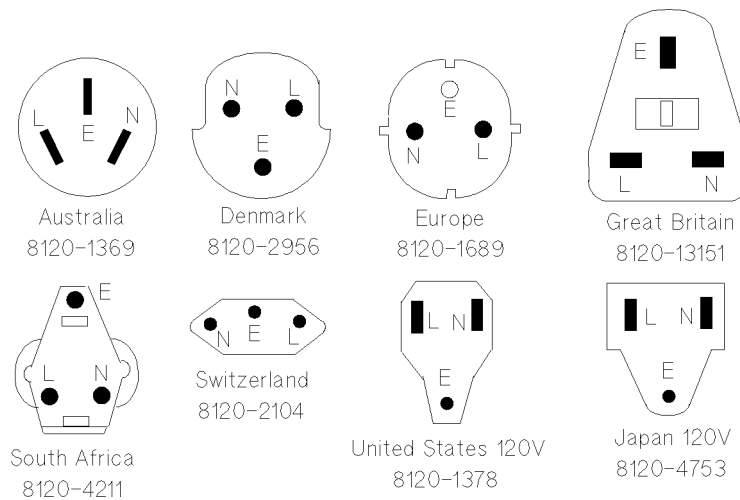
Ventilation Requirements

The instrument is fitted with three cooling fans. Make sure that there is adequate clearance of 80 mm at the rear and 25 mm at the top and bottom to ensure adequate air flow. If the air flow 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.

NOTE: Do not cover the ventilation holes.

Thermal Protection

Overheating Detection

The instrument monitors its internal temperature. If the temperature exceeds approximately 80°C the power supply is switched off. The instrument will switch on again if the temperature falls below approximately 77°C.

Fan Failure

If a fan is broken or prevented from operating by a blockage the temperature will increase. When the temperature exceeds approximately 80°C the overheating detection switches off the instrument for safety reasons. For reliability it is recommended to send instruments with broken or defective fans immediately to HP Service for repair.

Battery

This instrument contains a lithium battery. Typical life time of the battery in the HP Mainframe is about 5 years.

NOTE: Recycle or dispose used batteries according to local regulations. Or contact your Hewlett-Packard representative for information on battery recycling.
(In the USA and Canada, call 1-800-333-1917)

The battery is replaceable. **Replacement** should only be carried out **by qualified service personnel**.

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

The battery must be replaced with the same or equivalent battery type:

A **Lithium CR2477-N** type battery.

The HP replacement part number is: 1420-0557

The battery is protected against charging.

CAUTION: Do NOT crush, puncture, or incinerate the battery. Do NOT short the battery's external contacts.

Battery Replacement

NOTE: Disconnect the power cord from ac line voltage to avoid electrical shock.

1 Remove the bumper which is fitted to the front panel.

2 Remove the strips on the left and right side of the front panel.

3 Remove the front panel which is secured with two screws at each side.

4 Disconnect the flat cable which connects the front panel to the chassis.

5 On the right side of the chassis there is a cover secured with one screw. Remove this cover.

6 Now the battery can be removed from the battery holder. It is recommended to bush the battery on the top, and to pull the battery on the bottom with one finger for easier removal.

7 Fit the new battery in the holder, take care to not short current the battery on the chassis.

8 Fit the cover again and secure it with the screw to the chassis.

9 Re-connect the flat cable of the front panel again to the chassis connector. Make sure that the pin one (red wire) is pointing to the mid of the chassis.

10 Re-assemble the front cover.

11 Fit the strips to the sides of the front panel, again.

12 Fit the bumper to the front panel.

13 End of procedure.

Operating Environment

Table 2   *Operating Environment*

Storage Temperature	-40 °C to +70 °C
Operating Temperature	0 °C to 55 °C
Humidity	95% R.H. (at 40 °C)
Altitude	Up to 2000m
Installation	Category II
Pollution	Degree 2

WARNING: **The instrument is not designed for outdoor use. Do not expose the instrument to rain or other excessive moisture. Protect the instrument from humidity and temperature changes which could cause condensation within the instrument.**

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

Cleaning Recommendation

WARNING: **To prevent electrical shock, disconnect the instrument from mains before cleaning. Use a dry cloth or one slightly dampened with water to clean external case parts. Do not attempt to clean internally.**

Acoustic Noise Emission

Acoustic Noise Emission

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

LpA = 52 dBA

Measured in accordance with ISO 7779 / EN 27779.

Geräuschemissionswerte

Bei einer Umgebungstemperatur bis 30°C

LpA = 52 dBA

am Arbeitsplatz, normaler Betrieb.

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

Declaration of Conformity

Manufacturer: Hewlett-Packard GmbH
                              Boeblingen Verification Solutions
                              Herrenberger Str. 130
                              71034 Boeblingen Germany

We declare that the system
      HP 81100 Family of Pulse/Pattern Generators
      HP 81110A 165/330 MHz Pulse/Pattern Generator
      HP 81104A 80 MHz Pulse/Pattern Generator
conforms to the following standards:

Safety: IEC 1010-1:1990 + A1:1992   EN61010-1:1993
EMC: EN 55011:1991/CISPR 11 Group 1, Class B
               EN 61000-4-2:1995 ESD: 4kV cd, 8kV ad, 4kV cp
               EN 61000-4-3:1995 Radiated Immunity: 3V/m, 80% AM
               ENV 50204:1995 Radiated Immunity: 3V/m, 50% Dty
               EN 61000-4-4:1995 Fast Transients/Bursts: 0.5kV, 1kV
               EN 61000-4-5:1995 Surges: 1 kVdiff, 2 KV com. mode
               EN 61000-4-6:1995 Conducted Immunity
               EN 61000-4-8:1993 Power freq. mang. field 3A/m, 50 Hz
               IEC 1000-4-11:1994 Voltage Dips and Interruptions

Supplementary Information
The product herewith complies with the requirements of the
*) Low Voltage Directive (72/23/EEC) and the
*) EMC Directive (89/336/EEC).
During the measurement against EN 55011, the I/O ports were termi-
nated with their normal 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.

Boeblingen, June 9th 1998   Wolfgang Fenske
                                             Regulation Consultant

Safety Information

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 aprotective 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. To 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 symbol: 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.

Installation & Safety Requirements
Safety Information

Chapter 2

Introduction

Overview of this Chapter

The purpose of the Introduction chapter is to give a general overview of the HP 81110A and HP 811104A, firstly regarding the features, capabilities and benefits of the instrument, see **"General Information" on page 35.**

For getting familiar with the user interface, please refer to the section **"User Interface Concept" on page 37.**

Various additional shortcuts and features of the user interface can be found in the section **"Quick Access of Menus and Parameters" on page 40.**

Special function keys are described in the section **"Special Function Keys" on page 43.**

More in-depth information regarding the Pulse generation capabilities, details on Output Channel options and the (optional) memory card can be found in **"Screens Overview" on page 45.**

A look at all connectors on the front panel and the rear panel is available in the section **"An Overview of the Front and Rear Panel" on page 66.**

For those users unfamiliar with the terms used in Pulse generation there is a comprehensive and illustrated description provided in the HP 81110A and HP 81104A **Reference Guide** (part number 81110-91011), in the Chapter 3, Specifications, see **"Pulse Parameter Definitions of Terms Used in Instrument Specifications"**.

General Information

The Pulse Generator generates all standard pulses, digital patterns and multi-level waveforms needed to test all current logic technologies (e.g.: TTL, CMOS, ECL, PECL, LVDS, GTL) and other digital designs up to 330 MHz. The HP 81110A provides a reliable and wide range of signals, which can be used in even more applications than its predecessor, the HP 8110A. This is due to enhancements made in the feature set and specifications of the HP 8110A. The glitch and drop out free varying of any timing parameter and the HP 81110A's timing calibration feature contributes to more accurate and confident characterizations of the DUTs.

Benchtop Testing

The graphic display shows all pulse parameters at a glance, the Cursor keys and the Modify knob allow fast and simple operation. The HP 81110A is equipped with the familiar User Interface from the HP 8110A, providing no learning curve for those already familiar with the predecessor product. The User Interface is designed to reduce/minimize the time invested in getting familiar with the instrument. After familiarization the instrument supports quick set ups of signals. This leaves the user free to concentrate on the measurement task and testing of the DUT.

Automated Testing

The HP 81110A has the same SCPI conform command structure for the feature sets identical to the HP 8110A. As with the HP 8110A, the new product can be easily integrated into all phases of test-system development such as planning rack integration and test program generation. These benefits along with the low cost of ownership make the HP 81110A an invaluable instrument in a wide range of technical applications. Programs designed for the HP 81104A can be used without any changes for the HP 81110A with HP 81111A 10V/165 MHz outputs.

NOTE: Please refer to the Reference Guide, part number 81110-91011, for the command reference list.

The HP 81110A compared to the HP 81104A has better accuracy, up to 330 MHz clock rate, 800 ps typical edges at up to 3.8 V, and a timing auto calibration.

Upgrade Capability

It is possible to upgrade the instruments with a second channel if only one channel was originally ordered. There are two output channels available for the HP 81110A. The second channel that is installed must be the same as channel one.

NOTE: Do not mix the output channels for the HP 81110A.

Table 1: Mainframe / Output Module Combinations

Mainframe	Module	Description
HP 81104A	HP 81105A	10V/ max. 80 MHz Output Channel
HP 81110A	HP 81111A HP 81112A	10V/ max. 165 MHz Output Channel 3.8V/ max. 330 MHz Output Channel

User Interface Concept

The User Interface concept consists of a display and front panel controls for data entry. The main principle is to progress through the setup screens from left to right, setting the modes and parameters as required for your signal. If this signal is a simple clock or pulse signal it is not necessary to invoke the |**PATTERN**| screen.
Images of the front panel are available for the HP 81110A and HP 81104A on the fold out covers, at the front and rear of this guide, respectively.

The Display

Figure 7 **Display and Softkey Front Panel Section**
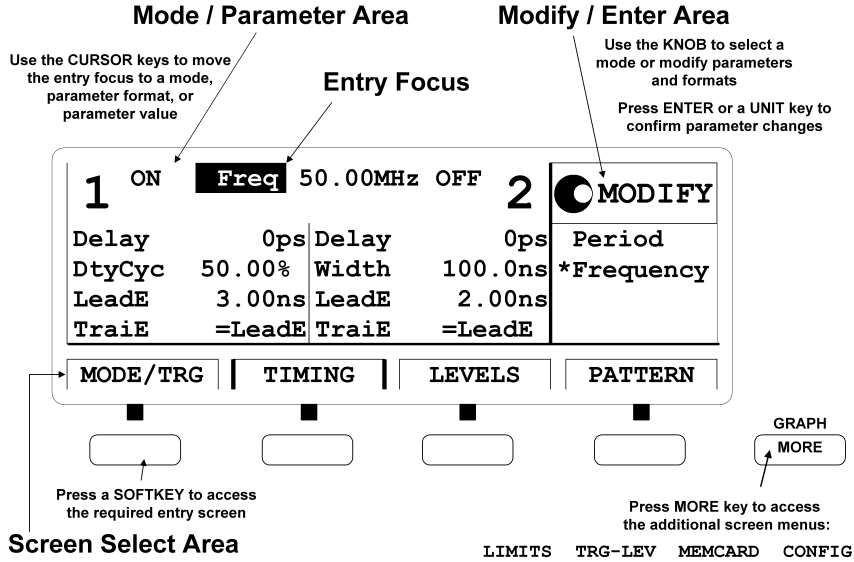
The display contains three different areas, Mode / Parameter, Modify / Enter and Screen Selection areas.

The Controls

Movement of the entry focus within the Mode & Parameter section of
the display is controlled by the Cursor Keys.

Figure 8   **Front Panel Controls**
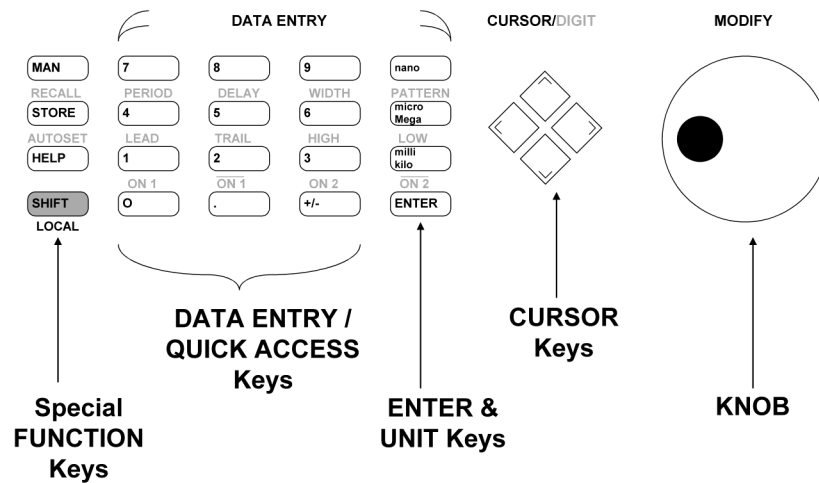
Numerical Data Entry

Numerical data is entered by the Data Entry keys and validated either by

a Unit key or the **ENTER** key.

Parameter Selection and Modification

The Modify knob can be used in the Modify area of the display. Modes
can be selected and changed in the Modify Area or parameter values can

be varied to display an immediate change at the output.

When **⬤ MODIFY** is displayed, select a mode, a parameter format or modify the parameter value and validate the value with a unit key.

When **⬤+ENTER** is displayed, make the selection and press the

ENTER key to start a function.

Quick Access of Menus and Parameters

Additional Functions

Most keys of the front panel have an additional function. The

SHIFT key provides fast access to additional functions of the Data

Entry keys and the Special Function keys.
For example, it is possible to quickly access the pulse width parameter

WIDTH

of output 2 by pressing SHIFT 6 , the instrument then

asks for the channel, so press 2 (if two channels are installed).
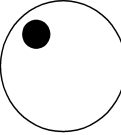
The entry field is positioned on the output 2 width parameter editing field.

Select Step Size

The SHIFT + ⟨ or SHIFT + ⟩ moves the cur-

sor to a different digit in the MODIFY area, so it is possible to change step size for parameter change, then vary the value either with the up/down cursor keys or the knob.

Overprogramming

With [**SHIFT**] + ⬤ it is possible to exceed specified parameter ranges to utilize the instrument to its limits.

NOTE: Proper operation of the instrument outside of the specified ranges is not guaranteed. It is recommended to have the outputs switched on when overprogramming, to have the internal error check sytem activated, which warnsyou about impossible settings.

Display Modes

In the following figure the results of pressing a softkey are displayed. In this case it is possible to toggle between textual and graphical screens. The toggle mode is available for the |**TIMING**|, |**LEVELS**| and |**PATTERN**| softkeys. It is possible to alternate between a textual display and waveform display by pressing the softkey as required.

Figure 9   Toggling Display Mode
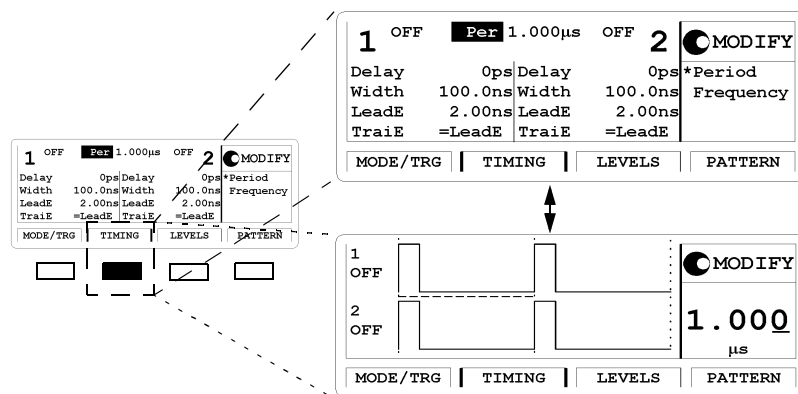
Screen Menus

The Softkeys allow access to the screen menus and can toggle between screens where applicable.

Figure 10   Screen Menus of a dual channel instrument

```
┌──────────┐┌──────────┐┌──────────┐┌──────────┐
│ MODE/TRG ││  TIMING  ││  LEVELS  ││ PATTERN  │
└──────────┘└──────────┘└──────────┘└──────────┘
```
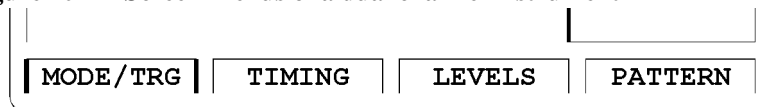
Additional screen menus can be accessed by pressing the **MORE** softkey leading to the following screen selection area.

Figure 11   Additional Screen Menus

```
┌──────────┐┌──────────┐┌──────────┐┌──────────┐
│  LIMITS  ││ TRG-LEV  ││ MEMCARD  ││  CONFIG  │
└──────────┘└──────────┘└──────────┘└──────────┘
```
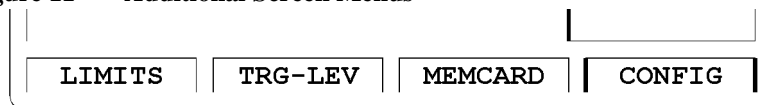
Special Function Keys

Shift/Local Function Key

The [**SHIFT**] key provides fast access to additional functions.

The [**SHIFT** / **LOCAL**] key can be used when, in remote control, the front panel controls are locked. Press the key to unlock the front panel controls.

Help Function Key

The [**HELP**] key provides access to the instruments on-line help or in Warning or Error state, access to Warning/Error Report Screen.

Store/Recall Function Key

The [**STORE**] key can be used to store/recall from 1 to 9 individual settings in the instrument memory.

Default Setting

In the internal memory location 0 there is a default setting stored, press

the | **SHIFT** | **RECALL** / **STORE** | **0** | keys to reset the instrument to

the default setting.

Manual Trigger Function Key

The | **MAN** | key can be used in triggered or gated mode to manually

trigger the instrument if there is no other source available.

Screens Overview

The instrument is designed to create pulse streams, burst signals and data streams, therefore the instrument has to be set to the operating mode required, to set the operating mode please refer to "Available Operating/ Trigger Modes" on page 47.

The instrument can be triggered, gated or used as a pulse signal recovery instrument (external width), to set the trigger mode refer also to "Available Operating/Trigger Modes" on page 47.

NOTE: Triggered or gated mode is available only when internal Oscillator is used as period generation source.

The instrument can be equipped with one or two output channels. It is possible to independently program the timing and level parameters of both channels.

If two channels are installed it is possible to select either the parameter grouping for |**TIMING**| and |**LEVELS**| or all timing and level parameters for |**OUTPUT 1**| and |**OUTPUT 2**|.
To change grouping of the parameter refer to "Changing Configuration" on page 62.

Most parameters can be entered in 2 or more different formats, e.g. width or duty cycle or trailing delay. To select the parameter format and to set the parameters, refer to "Setting Timing Parameter Formats and Values" on page 49.
Entering pattern for a data stream can be done in the pattern screen, refer to "Editing Pattern" on page 54.

To protect voltage sensitive DUTs the instrument has the output voltage limitation feature. For how to set limits refer to "Setting Limits" on page 57.

The instrument can set thresholds and the input impedance for an external trigger signal or external high-stability clock input. For the trigger output, available in pulse mode and the strobe output, available in burst and pattern mode, it is possible to select between TTL or ECL output levels. For how to set thresholds or trigger levels refer to "Thresholds and Trigger-Levels" on page 59.

The instrument allows to read and store instrument settings from and to a memory card. The reading and storing is done in the |**MEMCARD**| menu, refer to "Reading/Storing on Memory Card" on page 60.

Available Operating/Trigger Modes

Figure 12   MODE/TRG Screen

```
CONTINUOUS PULSES                    ⬤MODIFY
              Single-Pulses at Out1
              Single-Pulses at Out2  *PulseStrm
Pulse-Period: internal Osc            Burst
                                      Pattern

  MODE/TRG    TIMING     LEVELS     PATTERN
```
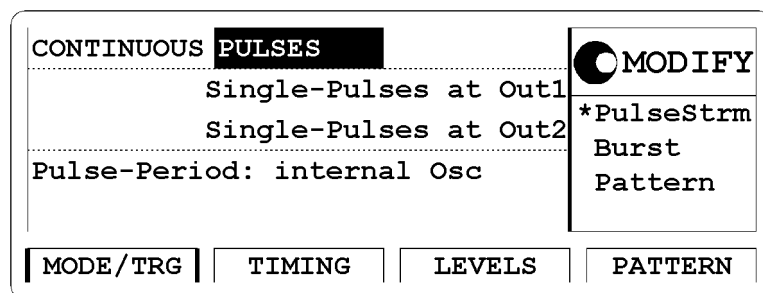
Access the Operating/Trigger Mode (MODE/TRG) screen by pressing the |**MODE/TRG**| softkey. Move the Entry Focus with the cursor keys.

In this screen you set the fundamental operating and trigger modes with respect to the signal required. For example, the operating mode for a simple clock or pulse signal is the pulse stream **(Pulse Strm)**, **PULSES** mode. Burst signals (several pulses and a pause) are easily set up in **BURST** mode. Data streams (also PRBS's) require the **Pattern** mode. You can specify the pulse period source. If you have to trigger after an external event then use the startable oscillator (internal Osc) which starts on the external signal with a fixed latency. If you do not have to trigger but need a high accuracy frequency, then use the internal PLL clock generation circuitry. In triggered/gated mode the internal PLL can be used as trigger source.
In **Pattern** mode you specify the data output format in this screen, either RZ or NRZ.

The available selections are:

1 Trigger Mode - **CONTINUOUS**, **TRIGGERED**, **GATED**, **EXT. WIDTH**

2 Operating Mode - **PULSES**, **BURST of**, **PATTERN of**

3 Pulse Type - **Single-Pulses, Double-Pulses**

4 Number of Bursts - **2 to 65536**

5 Data Output Format - **RZ**, **NRZ**
Can also be varied in the |**PATTERN**| screen.

6 Pulse Period Source - **internal Osc**, **internal PLL**, **CLK-IN**

7 Trigger/Gate Source - **EXT INPUT**, **PLL**, **MAN KEY**

8 Trigger/Gate Event - **Rising, Falling, Both / HighLevel, LowLevel, Always**

Trigger and Strobe Output

The Trigger Output is always available and marks each pulse period with a 50% duty cycle signal. In Ext Width the trigger output width is 5.9 ns for the HP 81104A, and 1.5 ns for the HP 81110A.

Additionally, in burst mode the Strobe output is available. The Strobe output rises at the start of the first pulse-period and falls at the start of the last pulse-period.

Additionally, in pattern mode the Strobe output is available. The Strobe output is bit-programmable with NRZ data output format.

Table 2: Trigger and Strobe Output Availability

	Pulse Mode	**Burst Mode**	**Pattern Mode**
Continuous	T^1	T, S^2	T, S
Triggered	T	T, S	T, S
Gated	T	T, S	T, S
Ext. Width	T	n/a	n/a

[1] T = Trigger Out
[2] S = Strobe Out

Setting Timing Parameter Formats and Values

Figure 13   TIMING Screen

```
┌─────────────────────────────────────────┐
│  1  OFF    ▐Per▌1.000µs  OFF  2  ●MODIFY │
│                                          │
│ Delay        0ps Delay        0ps *Period│
│ Width    100.0ns Width    100.0ns Frequency
│ LeadE     2.00ns LeadE     2.00ns        │
│ TraiE    =LeadE  TraiE    =LeadE         │
│ ┌─────────┐ ┌────────┐ ┌────────┐ ┌────────┐
│ │ MODE/TRG│ │ TIMING │ │ LEVELS │ │ PATTERN│
│ └─────────┘ └────────┘ └────────┘ └────────┘
└─────────────────────────────────────────┘
```
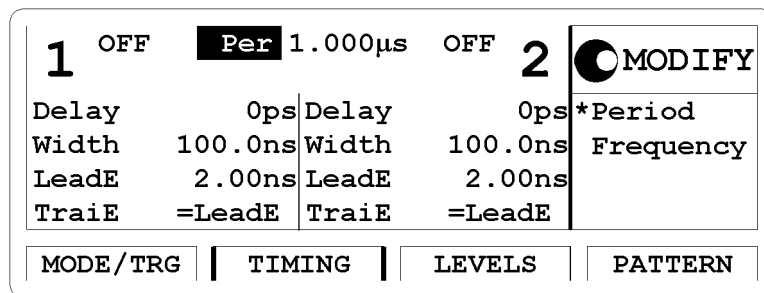
Access the timing entry (TIMING) menu screen by pressing the |**TIMING**| softkey.

In this screen you can set the timing parameters individually for both channels. This is except for period/frequency, which defines the system clock rate for both channels.

All parameters can be entered in different parameter formats, please select from:

1   The System Clock Mode - **Period**, **Frequency**.

2   Delay Parameter - **Absolute**, **% of Per**, **Phase**

3   Width Parameter - **Width**, **DutyCycle**, **Trail Del**

4   Leading Edge Parameter - **Absolute**,**% of Wid**

NOTE: For HP 81110A with HP 81112A, 3.8V/330 MHz Output channels installed you can select between two fixed transitions, 800 ps or 1.6 ns. The trailing edge is always the same as the leading edge.

5 Trailing Edge Parameter - = **Lead E**, **Absolute**,**% of Width**

6 Output Status - **ON**, **OFF**
Can also be varied in the |**LEVELS**| screen.

NOTE: If only one channel is installed, then all signal parameters are grouped in an OUTPUT screen. If you prefer the signal parameter grouping for each Output, then please refer to "Changing Configuration" on page 62. Refer also to "Output/Output 1 and Output 2 Parameter Grouping" on page 64.

7 Differential Output Status - **ON**, **OFF**
Can also be varied in the |**LEVELS**| screen.

NOTE: Differential Outputs are available with HP 81110A with HP 81112A, 3.8V/330 MHz Output channels installed.

Switch the output status to **ON** to avoid parameter conflicts, please refer to **"Internal Error Check" on page 52.**

Setting Level Parameter Formats and Values

Figure 14   LEVELS Screen

```
┌─────────────────────────────────────────────────┐
│ 1  [OFF] Normal │Normal  OFF  2 (●MODIFY         │
│       Seperate  Outputs            ┌──────────   │
│                                    │*OFF          │
│ Offset   +0.0mV│Offset   +0.0mV   │ ON           │
│ Amplit   1.00V │Amplit   1.00V    │              │
│ 50Ω into 50.0Ω │50Ω into 50.0Ω    │              │
│ ┌────────┐ ┌──────────┐ ┌────────┐ ┌──────────┐ │
│ │MODE/TRG│ │ TIMING   │ │ LEVELS │ │ PATTERN  │ │
│ └────────┘ └──────────┘ └────────┘ └──────────┘ │
└─────────────────────────────────────────────────┘
```

Access the level entry (LEVELS) menu screen by pressing the |**LEVELS**| softkey.

In this screen you can set the level values individually for both channels. As with the TIMING screen you can enable or disable the outputs. All parameters can be entered in different parameter formats, e.g. it is possible to enter the levels as current values by changing the unit to ampere. Please select from:

1 Channel OUTPUT Status - **ON**, **OFF**
Can also be varied in the |**TIMING**| screen.

2 Differential Output Status - **ON**, **OFF**
Can also be varied in the |**TIMING**| screen.

NOTE: Differential Outputs are available with HP 81110A with HP 81112A, 3.8V/330 MHz Output channels installed.

3 OUTPUT Mode - **Normal**, **Complmnt**

4 Channel Output Option - **Separate Outputs**, **Added at Output1**

NOTE: Channel addition (Added at Output1) is available with HP 81104A and HP 81110A with HP 81111A, 10V/165 MHz Output channels installed.

5 Fixed Levels Formats - **Set TTL**, **Set ECL**

6 Variable Level Formats - **High-Low**, **Off-Ampl**

7 Unit Format - **in volt**, **in ampere**

8 Source Impedance Values - **50 Ω** , **1 KΩ**

NOTE: Selectable source impedance and variable load impedance is available with HP 81104A and HP 81110A with HP 81111A, 10V/165 MHz Output channels installed.

9 Load Impedance Values - **0.1 Ω – 1 MΩ**

NOTE: If only one channel is installed, then all signal parameters are grouped in an OUTPUT screen. If you prefer the signal parameter grouping for each Output, then please refer to "Changing Configuration" on page 62.

Internal Error Check

When the output status is in **OFF** position the internal error check is switched off and it is possible to set each parameter to any valid value. So, it is possible to program even conflicting values between parameters. When switching the outputs **ON** the instrument will immediately show a flashing **W**. Pressing the Help key will list all parameter conflicts.

Recommendation:

To avoid long lists of warnings it is recommended to:

a Check and set the output levels in the |**LEVELS**| screen to a value

which does not damage your DUT.

b Switch the output status to **ON** to get immediately response if you try to program a conflicting parameter combination in |**LEVELS**| or |**TIMING**| screen.

Editing Pattern

Figure 15   PATTERN Screen

Shows which memory location
can actually be edited

Set the pattern length here

```
UPDATE    Addr    1    Last    2      MODIFY
CH1   RZ              1 0
CH2   RZ              0 1            Upd Once
BOTH                 1 2           *Upd Cont
STRB                 1 0
MODE/TRG    TIMING    LEVELS    PATTERN
```

Bit-editing Window
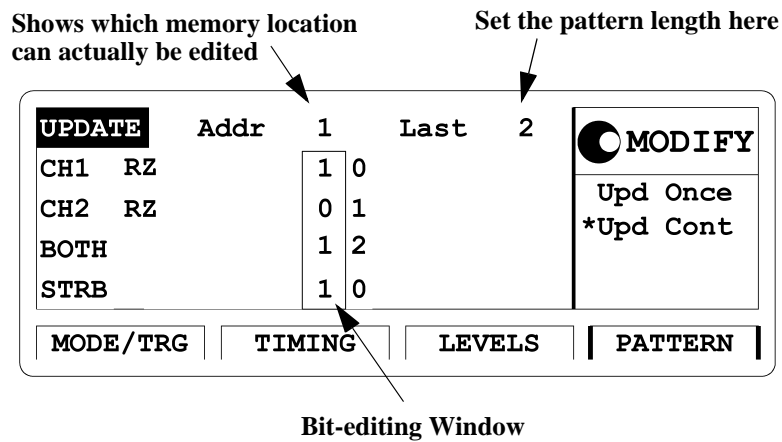
Make sure that in the |**MODE/TRG**| screen the pattern operating mode
is selected. Please refer to "Available Operating/Trigger Modes" on page
47.

Access the pattern entry (PATTERN) menu screen by pressing the
|**PATTERN**| softkey. This screen has to be accessed for pattern entry
when data streams in Pattern operating mode will be set up.

NOTE: A signal with a number of pulses followed by a pause is what we
would call a burst signal. Such burst signals are recommended to
be set up in the burst mode, as this is done more quickly and easier
as it would be in the pattern mode.

In pattern mode the Strobe output has additional up to 16384 bit memory depth with NRZ data output always. So, the Strobe output is the comfortable trigger output in pattern mode.

In this screen you can select:

1 Update Status - **Upd Once**, **Update Cont**

If the changes of pattern should immediately affect the output select **Upd Cont**.

If you want to set up new pattern while a data stream is currently generated select **Upd Once**. Edit your new pattern, then press the

[**ENTER**] key to make the new pattern active on the output.

2 Current memory location - **Addr** - shows the current position of the bit-editing window.
Move the entry field to the bit-editing window and enter the pattern. The bit-editing window automatically moves one location to the right. The bit-editing window can be moved across the pattern length by varying the **Addr**. Either change the **Addr** with the knob or by typing in a new address with the Data Entry keys.
The range is **1-length of pattern (max 16384)**.

3 Length of pattern - **Last** - shows the last address and is equal to the length of the data stream.

Set the required pattern length by specifying the **Last** address. The range is **2-16384**.

4 Block Editing Functions for - **CH1, CH2, BOTH, STRB**

It is possible to manipulate each Output channel separately **CH1**, **CH2** or together, **BOTH**. The strobe output **STRB** is available and can be programmed individually. There are block editing functions available to fill memory with 0 or1, to invert the pattern, to set a PRBS or filling

the memory with a divided clock pattern.- **Fill 0**, **Fill 1**, **Invert**, **First Bit**, **Last Bit**, **Ins Bit**, **Del Bit**, **Clock ÷ N**, **PRBS 2n-1.**

NOTE: Most of the block editing functions apply from (or at) the current **Addr** of the bit-editing window to the **Last** bit in the pattern

For further information on the block editing functions, please refer to the HP 81110A / HP 81104A **Reference Guide** (p/n 81110-91010) Chapter 1, Pattern Screen.

5   Data Output Format - **RZ, NRZ**
Can also be varied in the |**MODE/TRG**| screen.

Setting Limits

Figure 16   LIMITS Screen

```
┌─────────────────────────────────────────────────┐
│                                                   │
│  1 │Limits OFF│  Limits OFF 2 ◖MODIFY            │
│                                                   │
│  High-V    +500mV│High-V    +500mV│*OFF          │
│  Low-V     -500mV│Low-V     -500mV│ ON           │
│  High-A  +10.0mA│High-A  +10.0mA                 │
│  Low-A   -10.0mA│Low-A   -10.0mA                 │
│                                                   │
│  │  LIMITS  │ │ TRG-LEV │ │ MEMCARD │ │ CONFIG │ │
└─────────────────────────────────────────────────┘
```
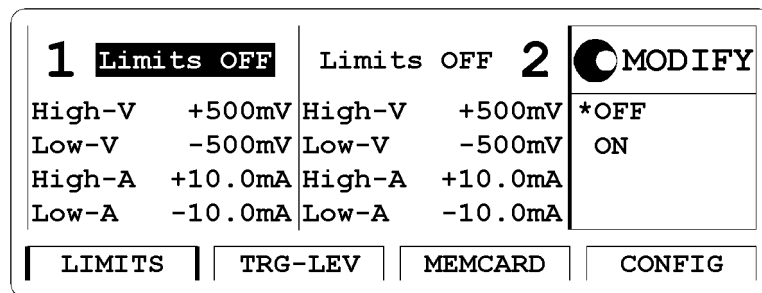
Access the output limitation (LIMITS) menu screen by pressing the

MORE softkey then pressing the |**LIMITS**| softkey.

To prevent your device from being damaged by excessive voltages it is recommended to limit the output of the instrument. You can switch the limit feature on, or off and set the required limits as either voltages or currents.

Please select from:

1 Limits Status - **ON**, **OFF**

2 High Voltage Limit - **High-V**
For the 10 V output channels HP 81105A and HP 81111A the range is: **-19.8V to +20.0V**
For the 3.8 V output channels HP 81112A the range is: **-1.90V to +3.80V**

3 Low Voltage Limit - **Low-V**
For the 10 V output channels HP 81105A and HP 81111A the range is: **-20V** to **+19.8V**
For the 3.8 V output channels HP 81112A the range is: **-2.00V** to **+3.70V**

4 High Current Limit - **High-A**
For the 10 V output channels HP 81105A and HP 81111A the range is: **-792 mA** to **+800 mA**
For the 3.8 V output channels HP 81112A the range is: **-76.0 mA** to **+152 mA**

5 Low Current Limit - **Low-A**
For the 10 V output channels HP 81105A and HP 81111A the range is: **-800 mA** to **+792 mA**
For the 3.8 V output channels HP 81112A the range is: **-80.0 mA** to **+148 mA**

Thresholds and Trigger-Levels

Figure 17   TRG-LEV Screen

```
EXT-IN: Threshold      +1.0V 50Ω  ◖MODIFY
CLK-IN: Threshold      +1.0V 50Ω
                                   Set TTL
                                   Set ECL
TRIGGER-OUT: TTL                  *Voltage
STROBE-OUT : TTL

  LIMITS  │ TRG-LEV │ MEMCARD │  CONFIG
```
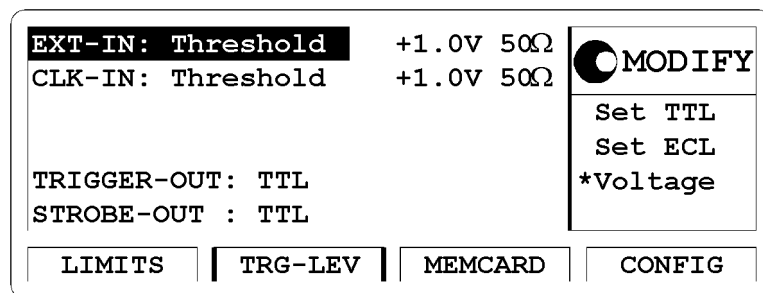
Access the trigger level (TRG-LEV) menu screen by pressing the

MORE softkey then pressing the |**TRG-LEV**| softkey.

In this screen you can set the thresholds for external and clock reference signals and the input impedance. For the output trigger and strobe signal specify the output levels, either TTL or ECL.

The available selections are:

1 EXT-IN - **Set TTL**, **Set ECL**, **Voltage**
Voltage Range - **-10V** to **+10 V**
Input Resistance - **10kΩ Inp** or **50Ω Inp**

2 CLK-IN - **Set TTL**, **Set ECL**, **Voltage**
Voltage Range - **-10V** to **+10V**
Input Resistance - **-10kΩ Inp** or **50Ω Inp**

3 Trigger-Out - **TTL**, **ECL**

4 Strobe -Out- **TTL**, **ECL**

Reading/Storing on Memory Card

Figure 18   MEMCARD Screen

```
┌─────────────────────────────────────────────┐
│  ┌──────────────────────────┐ ┌───────────┐  │
│  │ Dir Path  <no_path>      │ │◖MODIFY    │  │
│  │                          │ ├───────────┤  │
│  │ Filename  <no_file>      │ │*.         │  │
│  │ ........................ │ │           │  │
│  │ Perform Operation        │ │           │  │
│  └──────────────────────────┘ └───────────┘  │
│  ┌───────┐ ┌─────────┐ ┌─────────┐ ┌───────┐ │
│  │ LIMITS│ │ TRG-LEV │ │ MEMCARD │ │CONFIG │ │
│  └───────┘ └─────────┘ └─────────┘ └───────┘ │
└─────────────────────────────────────────────┘
```
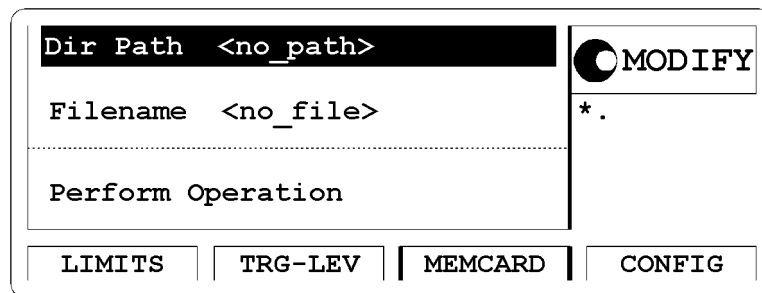
Access the memory card (MEMCARD) menu screen by pressing

the [**MORE**] softkey then pressing the |**MEMCARD**| softkey.

The main operations on the MEMCARD screen are:
- Store instrument settings to the memory-card
- Recall instrument settings from the memory-card
- Delete files from the memory-card
- Format the memory-card

If a memory card is plugged in the memory card slot on the front panel
you can select:

1 **Dir Path**- displayed if there is a plugged in memory card with a
   directory created on a DOS PC.

2 **Filename**- list of the filenames which are present on the plugged in
   memory card.

3 **Perform Operation** - **ReadCard, Recall, Store, Store All, Delete,
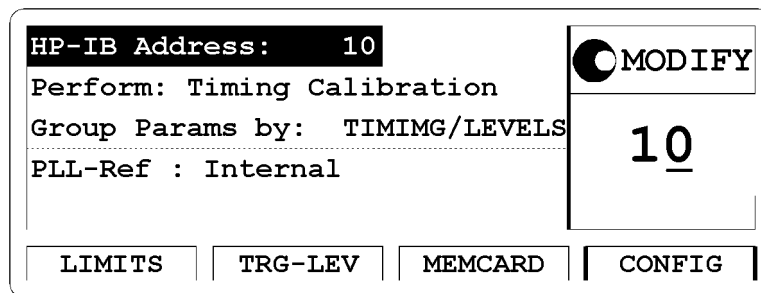   Format**

NOTE: the HP 81110A or HP 81104A support only DOS formatted memory-cards and you cannot create or delete directories using the HP 81110A or HP 81104A.

The HP 81110A and HP 81104A support memory cards up to 2 MB, SRAM Type.

The filenames can be up to 8 characters long.

Changing Configuration

Figure 19   CONFIG Screen

```
┌─────────────────────────────────────────────┐
│  HP-IB Address:     10       ◖MODIFY         │
│  Perform: Timing Calibration                 │
│  Group Params by:   TIMIMG/LEVELS   10       │
│  PLL-Ref : Internal                  ‾       │
│                                              │
│   LIMITS     TRG-LEV    MEMCARD    CONFIG     │
└─────────────────────────────────────────────┘
```

NOTE: Timing Calibration is available with the HP 81110A only.

Access the Configuration (CONFIG) menu screen by pressing the

| MORE | softkey then pressing the |**CONFIG**| softkey.

In this screen you can vary the HP-IB address when the instrument is used in remote control operation The factory set HP-IB address is 10. It is possible to invoke a selftest.

With the HP 81110A the timing self calibration feature can be started in this window - **Perform: Timing Calibration**. Apart from the factory calibration of the instruments, the timing self calibration allows to calibrate the instrument in respect to the actual ambient temperature. When the HP 81110A is switched off and on again, the factory calibration data are valid again.

You can select the parameter grouping from either TIMING and LEVELS or OUTPUT 1 and OUTPUT 2. You can also define what the

PLL reference source is, either the internal on-board reference or a much more stable external reference.

Please select from:

1 HP-IB Address Range - **1** to **30**

2 Perform Option- **Selftest**, **Timing Calibration (HP 81110A only)**

3 Group Parameters by - **TIMING/LEVELS, OUTPUT 1/2**

4 PLL Reference Source - **Internal**, **CLK-IN: Freq 5 MHz** or **10 MHz**

Output/Output 1 and Output 2 Parameter Grouping

Figure 20   OUTPUT 1 Screen of a dual channel instrument

```
     Per 1.000µs Normal    OFF   1   ◖MODIFY

Delay        0ps Offset     +0.0mV *OFF
Width    100.0ns Amplit      1.00V  ON
LeadE     2.00ns 50Ω into 50.0Ω
TraiE    _ =LeadE_
  MODE/TRG    OUTPUT 1    OUTPUT 2    PATTERN
```

Figure 21   OUTPUT 2 Screen

```
     Per 1.000µs Normal    OFF   2   ◖MODIFY

Delay        0ps Offset     +0.0mV *OFF
Width    100.0ns Amplit      1.00V  ON
LeadE     2.00ns 50Ω into 50.0Ω
TraiE    _ =LeadE_
  MODE/TRG    OUTPUT 1    OUTPUT 2    PATTERN
```
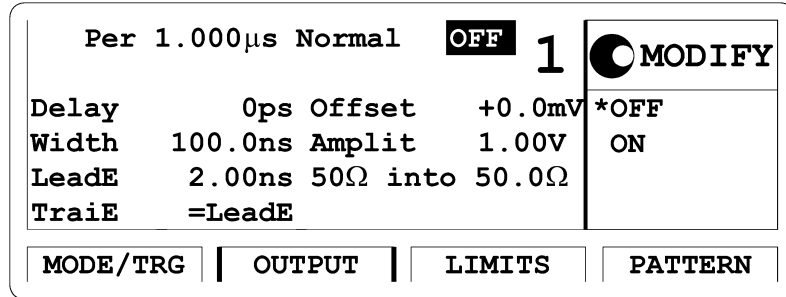
Figure 22   Output Screen of a single channel instrument

```
    Per 1.000μs Normal    OFF  1   ◓MODIFY

Delay         0ps Offset    +0.0mV *OFF
Width    100.0ns Amplit     1.00V  ON
LeadE     2.00ns 50Ω into 50.0Ω
TraiE    =LeadE

  MODE/TRG │ OUTPUT │  LIMITS    PATTERN
```

The |**OUTPUT**| screen is standard for a single channel instrument. The |**OUTPUT 1**| and |**OUTPUT 2**| timing and level grouping is configurable for dual channel instruments.

After selecting **Group Params by: OUTPUT 1/2** in the |**CONFIG**| screen, see "Changing Configuration" on page 62, the 2 Output Softkey options are available. The timing and level parameters are grouped together for each output.With the exception of period/frequency all parameters can be individually set for each output.

All parameters can be entered in different formats. For the available parameter and format selections, please refer to **"Setting Timing Parameter Formats and Values" on page 49.** Refer also to **"Setting Level Parameter Formats and Values" on page 51.**

An Overview of the Front and Rear Panel
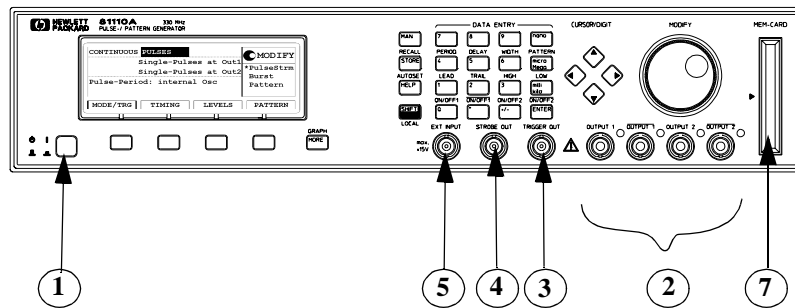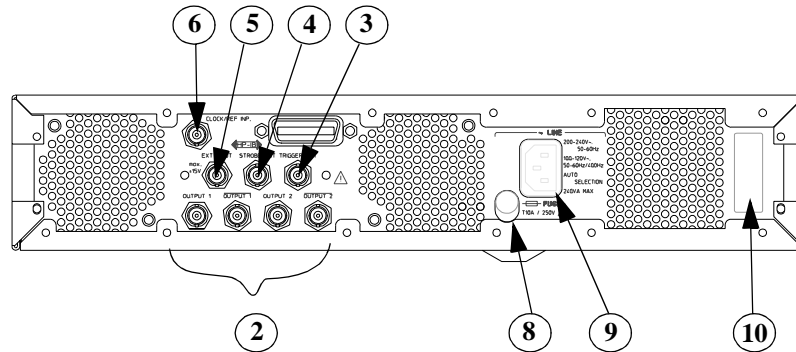
Figure 23 **Front Panel View**

Figure 24 **Rear Panel View with Option UN2**

The numbers in the Figures correspond to the numbers in the following list.

Inputs and Outputs

1 Standby Switch

When the front panel switch is off, the Mainframe is in 'Standby' mode. Disconnection from the AC Line Power is accomplished only by disconnecting the power cord.

2 OUTPUT 1/2 - Signal outputs, channel 2 optional.

$\overline{\textbf{OUTPUT 1/2}}$ - Differential signal outputs available with HP 81110A with HP 81112A 3.8V/330 MHz Output channels installed.

3 TRIGGER OUT
A signal with rising edge marking the start of each pulse- period. For further information refer to "Trigger and Strobe Output" on page 48.

4 STROBE OUT

- The Strobe output rises at the start of the first pulse-period and falls at the start of the last pulse-period marking start and end of the burst in **Burst** mode.
- Bitwise programmable in **Pattern** mode. NRZ data format.
- Not used in **Pulses** mode.
- For further information refer to "Trigger and Strobe Output" on page 48.

5 EXT INPUT - Connect an external trigger or gate signal here, or use **EXT-WIDTH** mode to perform pulse recovery.

When rear panel option UN2 is ordered the connectors 2), 3), 4) and 5) are at the rear panel.

6 PLL REF IN/CLK IN - Connect an external frequency reference or clock signal here, if a higher frequency accuracy than 0.01% is required, or if you need frequency locking.

7 Memory Card slot

8 Fuse Holder

9 AC Line Socket

10 Serial Number Label

Chapter 3

Getting Started

Introduction

The intention of this chapter is to give the necessary steps to set up generic signals for first time users of the HP 81110A or HP 81104A. Additionally, advanced signals are also described step by step to enable even experienced users to set up signals more quickly.

When using this product for the first time it is recommended to read Chapter 2, Introduction to get familiar with the user Interface concept and the fundamentals of pulse parameters, for User Interface Concept description see page 37 .

Manual Example Signals

Generic Signals

1 How to set up a Clock Signal   (see page 72)

2 How to set up a Pulse Signal   (see page 79)

3 How to set up a Serial Data Stream Signal (see page 86)

Advanced Signals

4 How to set up an Edge-displacement Signal (see page 91)

5 How to set up a Dual Clock Signal (see page 97)

6 How to set up Burst Signals (see page 103)

Programming Examples

At the end of each manual example signal, the required set of device commands are listed. For further information of the commands and a complete command reference see Chapter 2 of the Reference Guide, p/n 81110-91011.

Documentation Conventions:

|TIMING|	Press the **|TIMING|** softkey to access the TIMING parameter screen.
Entry Focus	The highlight field, can be moved with the cursor keys, to either change a mode or parameter.
24 ns	Enter this value and unit with the DATA ENTRY keys
Freq	Select the mode or parameter name with the knob.

3   nano   Keys to press in the DATA ENTRY area

on the front panel.

MODIFY   \
CURSOR   >   Use the front panel controls.
DATA ENTRY   /

:VOLTage:HIGH 3V	Full command for pattern, 3V high level. The upper case letters represent the short form of the command, which results in faster programming times.
*RST	Common IEE 488 command, to reset instrument to default status
:DISPlay OFF	Switch off the automatic update of the display, when instrument is used in remote control operations. This increases the programming speed.

Examples

1. Setting up a Clock Signal

Here, a continuous clock signal with 50 MHz frequency with PLL accuracy, a duty cycle of 50%, 3 ns transition times, a high level of 2.5 V and low level of 0 V, will be set up.
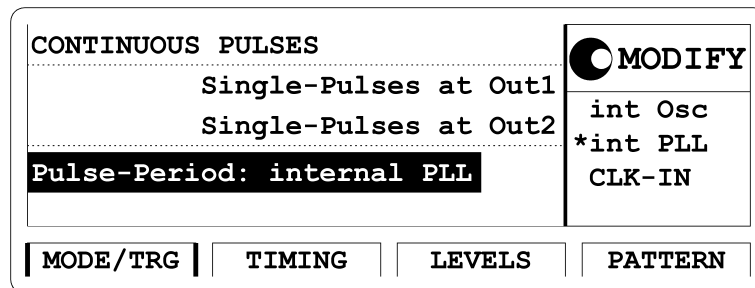
Figure 25   Clock Signal Diagram
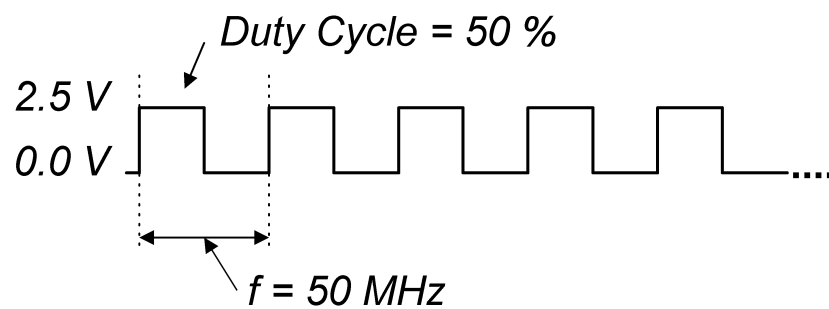
Duty Cycle = 50 %

2.5 V

0.0 V

....

f = 50 MHz

1   Before setting up the signal it is recommended to reset all parameters

and modes by pressing   **SHIFT**   **STORE**   **0**   .

2 Press the |**MODE/TRG**| softkey to enter the Operating/Trigger Mode menu. Use the cursor keys to move the Entry Focus to the Trigger mode **CONTINUOUS.** Move the Entry Focus to the right and select **PULSES.** Move the Entry Focus down to select **Single-Pulses at Out1** and then **Pulse-Period: internal PLL.**

Figure 26   Current MODE/TRG Screen

```
┌─────────────────────────────────────────────────────┐
│  CONTINUOUS PULSES                    ⬤MODIFY        │
│              Single-Pulses at Out1    ┌──────────    │
│              Single-Pulses at Out2    │ int Osc      │
│  ┌──────────────────────────────────┐ │*int PLL      │
│  │ Pulse-Period: internal PLL       │ │ CLK-IN       │
│  └──────────────────────────────────┘ │              │
│                                                       │
│  ┌─────────┐ ┌────────┐ ┌────────┐ ┌─────────┐       │
│  │MODE/TRG │ │ TIMING │ │ LEVELS │ │ PATTERN │       │
│  └─────────┘ └────────┘ └────────┘ └─────────┘       │
└─────────────────────────────────────────────────────┘
```

3 Press the |**TIMING**| softkey to enter the Timing menu.

• Move the Entry Focus to the Output 1 status with the cursor keys. Select **ON** in the Modify area to turn on the Output 1.

NOTE: The Output channel can be turned on and off in either the |**LEVELS**| or |**TIMING**| screens or by the following: pressing

ON/OFF 1

┌─────────┐
│ SHIFT │   ┌──────────┐   for Output 1 and
└─────────┘   │ 0   │
              └──────────┘

ON/OFF 2

┌─────────┐
│ SHIFT │   ┌──────────┐   for Output 2. Repeated pressing of
└─────────┘   │ +/-   │
              └──────────┘
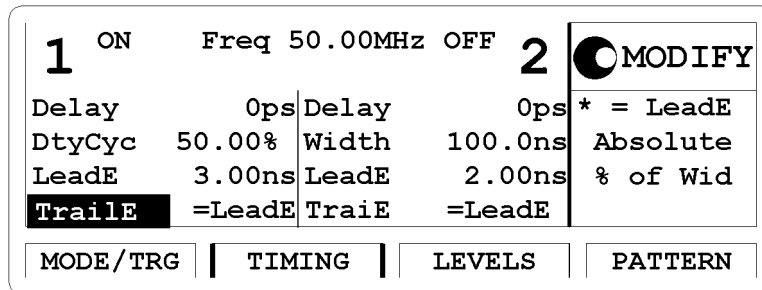
the keys toggles the output state from on to off and vise versa.

• Move the Entry Focus to **Per** and select **Freq**.

- Move the Entry Focus to **Freq** entry field and enter a value of 50 MHz by pressing [**5**] [**0**] [micro / Mega]

- Move the Entry Focus down to the width of Output 1 and select **DutyCyc**.
Move Entry Focus to the right and enter 50% by typing

[**5**] [**0**] [**ENTER**]

- Move Entry Focus down to enter [**3**] [nano] for the leading edge. Trailing edge should be the same as leading edge. (**Trail E = Lead E**)

Figure 27   Current TIMING Screen

```
┌──────────────────────────────────────────────┐
│  1  ON      Freq 50.00MHz OFF  2 ◐MODIFY      │
│                                                │
│  Delay       0ps Delay      0ps * = LeadE      │
│  DtyCyc   50.00% Width   100.0ns Absolute      │
│  LeadE    3.00ns LeadE    2.00ns % of Wid      │
│  TraiE    =LeadE TraiE    =LeadE               │
│  ┌─────────┐ ┌─────────┐ ┌────────┐ ┌────────┐│
│  │ MODE/TRG│ │ TIMING  │ │ LEVELS │ │PATTERN ││
│  └─────────┘ └─────────┘ └────────┘ └────────┘│
└──────────────────────────────────────────────┘
```

NOTE:

With HP 81110A with HP 81112A 3.8V/330 MHz Output channels installed the transition times can be either 800 ps or 1.6 ns, trailing edge is equal to leading edge. The minimum transition times for the HP 81104A are 3 ns.

4 Press the |**LEVELS**| softkey to enter the Levels menu.

- Move the Entry Focus to **Offset** and **Amplitude** and select in the MOD-IFY area **High-Low**, then move Entry Focus to high level entry field

  and press [**2**] [**.**] [**5**] [**ENTER**] for

  high level and move down the Entry Focus to the low level entry field

  and press [**0**] [**ENTER**] .

Figure 28 **Current LEVELS Screen for HP 81104A and HP 81110A with HP 81111A installed**

```
 1  ON   Normal │Normal   OFF   2  ◑MODIFY
             Seperate Outputs

High      +2.50V │Offset    +0.0mV   +0.0
Low        +0.0 mV│Amplit    1.00V
50Ω into 50.0Ω │50Ω into 50.0Ω        mV

 MODE/TGR    TIMING    LEVELS    PATTERN
```
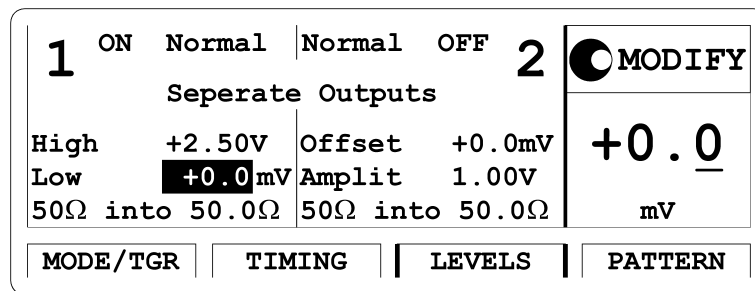
Figure 29 **Current LEVELS Screen for HP 81110A with HP 81112A installed**

```
 1  ON   Normal │Normal   OFF   2  ◑MODIFY
    ON                    OFF

High      +2.50V │Offset    +0.0mV   +0.0
Low        +0.0 mV│Amplit    1.00V
                                      mV

 MODE/TGR    TIMING    LEVELS    PATTERN
```
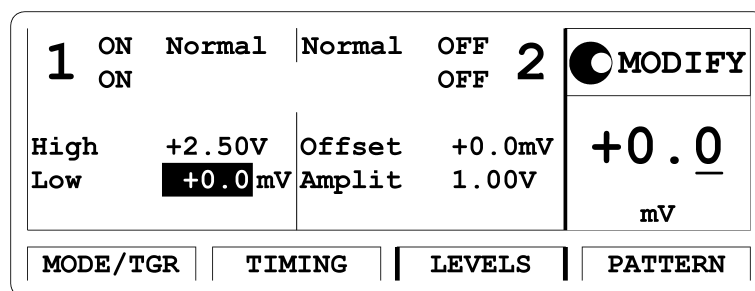
5 Here is the signal as displayed on an HP 54810A Infinium
oscilloscope. Use the generator's TRIGGER OUT to trigger the
scope.

Figure 30   Resulting Signal
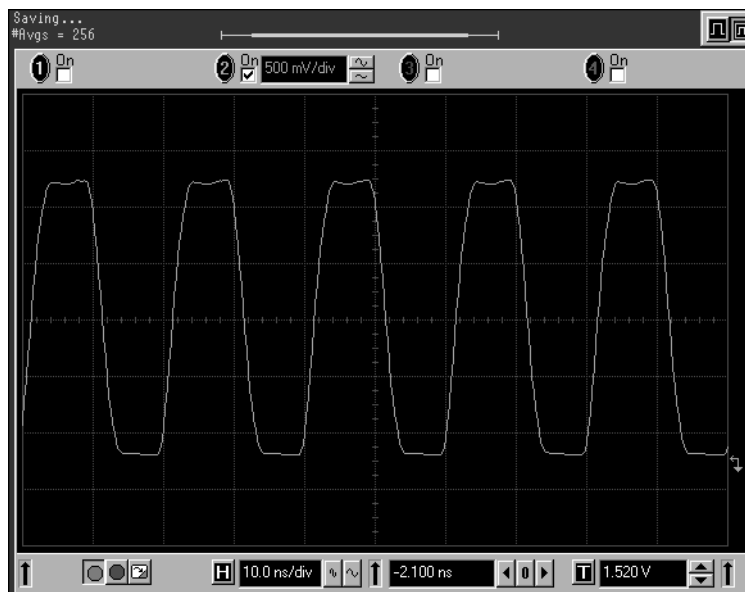
Device Command List for the Clock Signal

- If you want to include this Clock Signal in your program use the following command lines in boldface font. The comment lines starting with a # are not required.
- The commands are listed with the channel specifier for channel 1, if there is a second channel installed and you want to program it with a similar signal, use the same commands and replace 1 by 2 for the second channel, where required.

Reset the instrument to start from a defined, default status.

*RST

Switch off the automatic display update to increase programming
speed.

:DISPlay   OFF

Internal PLL has to be set as period source.

:ARM:SOURce   INT2

Set the frequency to 50 MHz, the duty cycle to 50% and the leading
and trailing edge to 3 ns. Settings are to program for output 1.

:FREQuency 50MHZ

:PULSe:DCYCle1 50

:PULSe:TRANsition1 3NS

For example, the same settings for the optional second channel will
look like as follows:

:PULSe:DCYCle2 50

:PULSe:TRANsition2 3NS

Set the high level to 2.5 Volts, the low level to 0.0 Volts.

:VOLTage1:HIGH   2.5V

:VOLTage1:LOW   0V

Enable the output 1 and the complement output 1 (HP 81110A
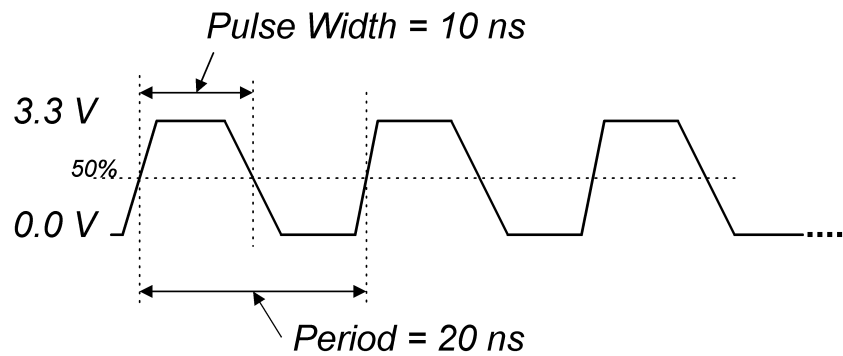# with HP 81112A 3.8V/330 MHz output channel installed, only).

:OUTPut1 ON

:OUTPut1:COMPlement ON

2. Setting up a Pulse Signal

Here a continuous pulse signal with 20 ns period, a pulse width of 10 ns, a leading edge of 3 ns, a trailing edge of 5 ns, an amplitude of 3.3 V and an offset of 1.65 V (high level 3.3 V, low level 0.0 V) will be set up.
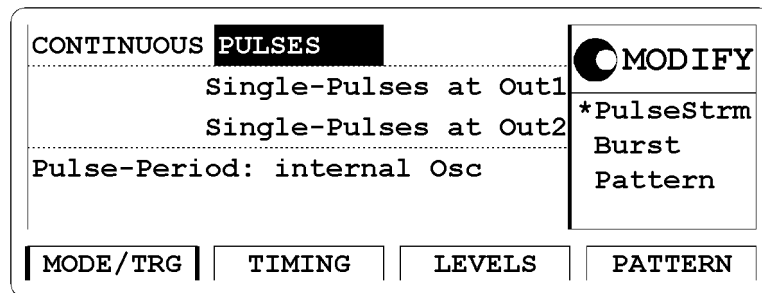
Figure 31   Pulse Signal Diagram

1   Before setting up the signal it is recommended to reset all parameters

and modes by pressing [**SHIFT**] [**STORE**] [**0**] .

2 For reference the current |**MODE/TRG**| screen is displayed.There is nothing to change.
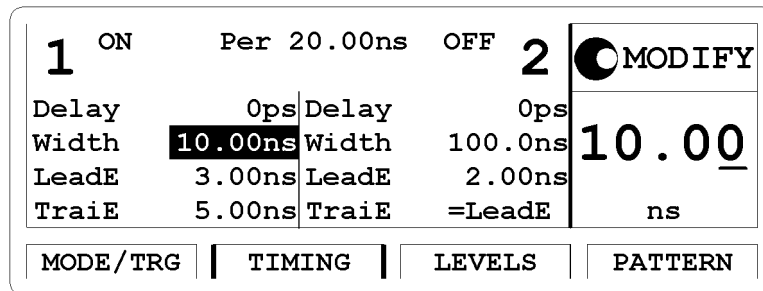
Figure 32   Current MODE/TRG Menu

```
┌─────────────────────────────────────────────────────┐
│                                                       │
│  CONTINUOUS PULSES                      ◖MODIFY       │
│ ···········································            │
│             Single-Pulses at Out1 ─────────────       │
│                                       *PulseStrm      │
│             Single-Pulses at Out2      Burst          │
│  Pulse-Period: internal Osc            Pattern        │
│                                                       │
│                                                       │
│   ┌──────────┐  ┌────────┐ ┌────────┐ ┌──────────┐   │
│   │ MODE/TRG │  │ TIMING │ │ LEVELS │ │ PATTERN  │   │
│   └──────────┘  └────────┘ └────────┘ └──────────┘   │
└─────────────────────────────────────────────────────┘
```

3 Press the |**TIMING**| softkey to enter the Timing menu.

• Switch **ON** the Output Channel 1.

• Enter a period of **20 ns**. Enter a pulse width of **10 ns.**

• Enter **3 ns** for leading edge. Select **Absolute** for trailing edge and enter a value of **5 ns**.

NOTE: With HP 81110A with HP 81112A 3.8V/330 MHz Output channels installed the transition times can be either 800 ps or 1.6 ns, trailing edge is equal to leading edge. The minimum transition times for the HP 81104A are 3 ns.

Figure 33   **Current TIMING Screen**

```
┌─────────────────────────────────────────────────────────┐
│ ┌───────────────────────────────────────────────────────┐ │
│ │ 1  ON      Per 20.00ns  OFF  2 ◐MODIFY               │ │
│ │                                                         │ │
│ │ Delay      0ps Delay      0ps                          │ │
│ │ Width   10.00ns Width  100.0ns 10.00                   │ │
│ │ LeadE    3.00ns LeadE    2.00ns                        │ │
│ │ TraiE    5.00ns TraiE   =LeadE    ns                   │ │
│ │ ┌──────────┐ ┌────────┐ ┌────────┐ ┌─────────┐        │ │
│ │ │ MODE/TRG │ │ TIMING │ │ LEVELS │ │ PATTERN │        │ │
│ │ └──────────┘ └────────┘ └────────┘ └─────────┘        │ │
│ └───────────────────────────────────────────────────────┘ │
└─────────────────────────────────────────────────────────┘
```

NOTE: The Output channel can be turned on and off in either the |**LEVELS**| or |**TIMING**| screens or by the following: pressing

ON/OFF 1

[SHIFT] [0]   for Output 1 and

ON/OFF 2

[SHIFT] [+/-]   for Output 2. Repeated pressing of

the keys toggles the output state from on to off and vise versa.

4 Press the |**LEVELS**| softkey to enter the Levels menu.
Enter an offset of **1.65 V** and an amplitude of **3.30 V**.

Figure 34 **Current LEVELS Screen for HP 81104A and HP 81110A with HP 81111A installed**

```
┌─────────────────────────────────────────────────────┐
│  1  ON   Normal │Normal   OFF  2 ⬤MODIFY             │
│            Seperate Outputs      ├─────────────       │
│                                  │                    │
│ Offset  +1.65V │Offset   +0.0mV │ +3.30              │
│ Amplit   3.30V │Amplit   1.00V  │                    │
│ 50Ω into 50.0Ω │50Ω into 50.0Ω  │   V                │
│ ┌─────────┐ ┌────────┐│┌────────┐ ┌─────────┐        │
│ │MODE/TRG │ │ TIMING ││ LEVELS │ │ PATTERN │        │
│ └─────────┘ └────────┘└────────┘ └─────────┘        │
└─────────────────────────────────────────────────────┘
```
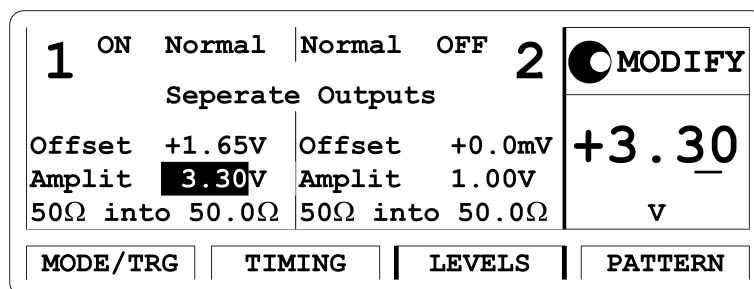
Figure 35 **Current LEVELS Screen for HP 81110A with HP 81112A installed**

```
┌─────────────────────────────────────────────────────┐
│  1  ON   Normal │Normal   OFF  2 ⬤MODIFY             │
│     ON                    OFF    ├─────────────       │
│                                  │                    │
│ Offset  +1.65V │Offset   +0.0mV │ +3.30              │
│ Amplit   3.30V │Amplit   1.00V  │                    │
│                                  │   V                │
│ ┌─────────┐ ┌────────┐│┌────────┐ ┌─────────┐        │
│ │MODE/TRG │ │ TIMING ││ LEVELS │ │ PATTERN │        │
│ └─────────┘ └────────┘└────────┘ └─────────┘        │
└─────────────────────────────────────────────────────┘
```
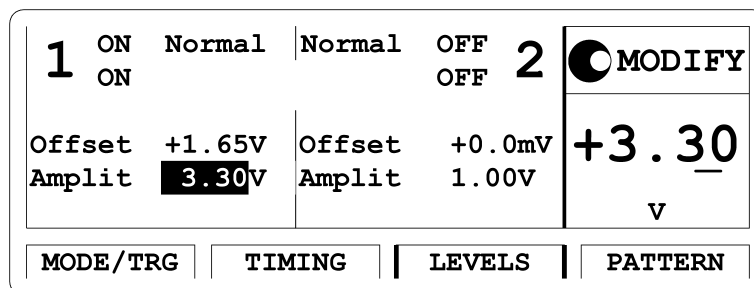
5 Here is the figure as displayed on the HP 54810A Infinium
oscilloscope. Use the generator's TRIGGER OUT to trigger the
scope.

Figure 36   Resulting Display
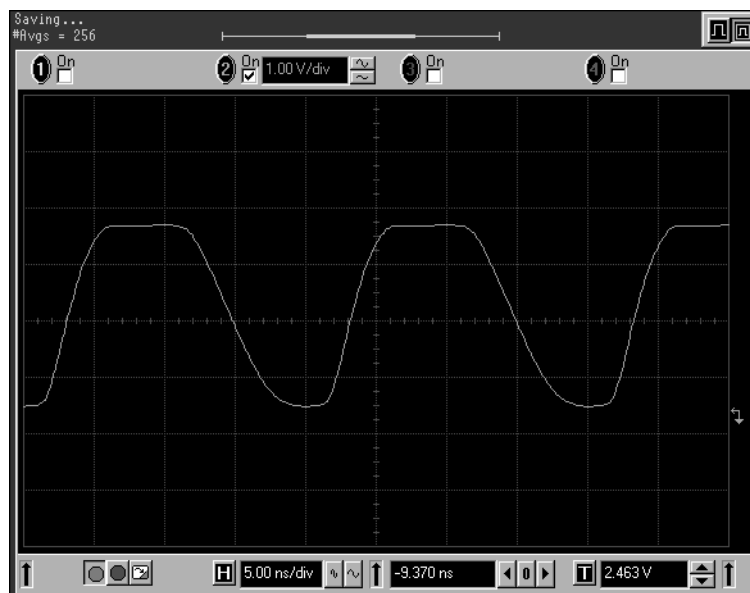
Device Command List for the Pulse Signal

- If you want to include this Pulse Signal in your program use the following command lines in boldface font. The comment lines starting with a # are not required.
- The commands are listed with the channel specifier for channel 1, if there is a second channel installed and you want to program it with a similar signal, use the same commands and replace 1 by 2 for the second channel, where required.

Reset the instrument to start from a defined, default status.

*RST

Switch off the automatic display update to increase programming
speed.

:DISPlay OFF

Pulse stream operating mode is required, but as we start from a
default status it is not necessary to send a command for setting the
instrument into pulse stream operating mode.

Set the period to 20 ns, the pulse width to 10 ns, the leading edge to
3 ns and the trailing edge to 5 ns.

:PULSe:PERiod 20NS

:PULSe:WIDTh1 10NS

:PULSe:TRANsition1 3NS

:PULSe:TRANsition1:TRAiling:AUTO   OFF

:PULSe:TRANsition1:TRAiling 5NS

NOTE: For HP 81110A with HP 81112A 3.8V/330 MHz Output channel installed the transitions can be selected either 800 ps or 1.6 ns. Leading and trailing edge are equal.

\# Set the amplitude to 3.3 Volts, the offset to 1.65 Volts.

:VOLTage1   3.3V

:VOLTage1:OFFSet   1.65V

\# Enable the output 1 and the complement output 1 (HP 81110A
\# with HP 81112A 3.8V/330 MHz output channel installed, only).

:OUTPut1   ON

:OUTPut1:COMPlement   ON

3. Setting Up a Serial Data Stream Signal

Here a continuous 24 bit long pattern signal with NRZ data output for-
mat at 80 MBit/s and ECL output level will be set up. The pattern is
'**111001110011001001010010**'.

1 Before setting up the signal it is recommended to reset all parameters

by pressing **SHIFT**   **STORE**   **0**   .

2 Press the |**MODE/TRG**| softkey to enter the Operating/Trigger Mode
menu. Select **CONTINUOUS PATTERN of.** Highlight **RZ- Pulses at
Out 1** and select **NRZ.**

Figure 37   **Current MODE/TRG Screen**

```
CONTINUOUS PATTERN of            ( )MODIFY
          NRZ-Pulses at Out1       RZ
          RZ-Pulses at Out2       *NRZ
Pulse-Period: internal Osc

 MODE/TRG    TIMING     LEVELS     PATTERN
```
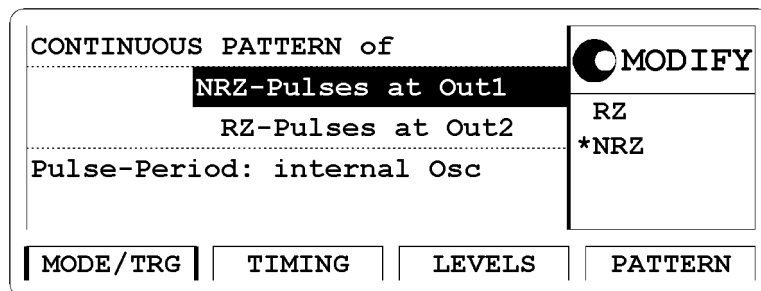
3 Press the |**TIMING**| softkey to enter the Timing menu. Switch **ON** the **Output 1.** Enter frequency of **80 MHz**.

NOTE: It is recommended to set the width for channel 2 to 6.250 ns to avoid a parameter conflict when switching on this channel.
The '**-------**' in the output 1 width entry field relate to the NRZ data output format selection.

Figure 38   Current TIMING Screen (for HP 81110A)

```
 ┌─────────────────────────────────────────────────────┐
 │ 1  ON      Freq 80.00MHz OFF  2  ◖MODIFY             │
 │                                                      │
 │ Delay       0ps Delay       0ps                      │
 │ Width    -------|Width    6.250ns 80.00              │
 │ LeadE    2.00ns LeadE     2.00ns                     │
 │ TraiE    =LeadE TraiE     =LeadE    MHz              │
 │   MODE/TRG │ │  TIMING │   LEVELS │   PATTERN        │
 └─────────────────────────────────────────────────────┘
```

4 Press the |**LEVELS**| softkey to enter the Levels menu. Change **Offset** and **Amplitude** mode to ECL levels by selecting **Set ECL** in the Modify Area.

Figure 39   Current LEVELS Screen

```
 ┌─────────────────────────────────────────────────────┐
 │ 1  ON  Normal |Normal   OFF  2  ◖MODIFY             │
 │         Seperate Outputs               OFF           │
 │ ECL-HI    -850mV Offset    +0.0mV  *ON               │
 │ ECL-LOW -1.80V Amplit    1.00V                       │
 │ 50Ω into 50.0Ω 50Ω into 50.0Ω                        │
 │   MODE/TRG │ │  TIMING │ │ LEVELS │   PATTERN        │
 └─────────────────────────────────────────────────────┘
```

NOTE: HP 81110A with HP 81112A 3.8V/330 MHz Output channels installed have fixed 50 Ω source impedance and does not offer to adjust for a load impedance different then 50 Ω.

5 Press the |**PATTERN**| softkey to enter the Pattern menu.

• Move the Entry Field to **Last** and input a value of **24**.

• Move the Entry Field to the bit-editing window for CH1 and enter the

pattern '**111001110011001001010010**' by pressing the [**0**]

or [**1**] key, respecively. When entering the pattern the bit-editing window moves automatically one location to the right. By turning the knob counterclockwise you can move the bit-editing window back. The actual memory location on which the the bit-editing window is pointing is shown by Addr.

Figure 40   Current PATTERN Screen

```
UPDATE    Addr    2     Last 24      ◖MODIFY
CH1  NRZ       1 █1│1 0 0 1 1 1
CH2   RZ       0│1│0 0 0 0 0 0     0 to Reset
BOTH           1│3│1 0 0 1 1 0     1 to Set
STRB           1│0│0 0 0 0 0 0     ± Toggle

   MODE/TRG     TIMING      LEVELS   ┃ PATTERN ┃
```

NOTE: To get a stable display of the pattern stream on an oscilloscope set 1 bit of the Strobe (STRB) and trigger the scope.

Device Command List for the Data Stream Signal

- If you want to include this Data Stream Signal in your program use the following command lines in boldface font. The comment lines starting with a # are not required.
- The commands are listed with the channel specifier for channel 1, if there is a second channel installed and you want to program it with a similar signal, use the same commands and replace 1 by 2 for the second channel, where required.

Reset the instrument to start from a defined, default status.

*RST

Switch off the automatic display update to increase programming
speed.

:DISPlay   OFF

Set the instrument to pattern mode and select NRZ data output format
for output 1.

:DIGital:PATTern ON

:DIGital:SIGNal1:FORMat NRZ

For example the command to set NRZ data format for the optional
second channel is:

:DIGital:SIGNal2:FORMat NRZ

Define a pattern length of 24 bit and program the pattern:
'**111001110011001001010010**'.

:TRIGger:COUNt   24

:DIGital:PATTern:DATA1 #224111001110011001001010010

\# Set the frequency to 80 MHz, and output 2 width to 6.25 ns to avoid a
\# parameter conflict.

:FREQuency 80MHZ

:PULSe:WIDTh2 6.25NS

\# Set the output voltage to fixed ECL levels.

:VOLTage1:HIGH   -0.85V

:VOLTage1:LOW   -1.8V

\# Enable the output 1 and the complement output 1 (HP 81110A
\# with HP 81112A 3.8V/330 MHz output channel installed, only).

:OUTPut1 ON

:OUTPut1:COMPlement ON

4. Setting Up an Edge-displacement Signal

NOTE:

Two Outputs are required for this example. The channel addition feature is used for this example. Therefore, this type of signal can be performed by HP 81104A and HP 81110A with HP 81111A 10V/165 MHz Outputs.

Here a continuous pattern signal, with one distorted pulse will be set up. The two channels are added with NRZ (Non Return to Zero) pulses at both outputs, high level of 1 V and low level of 0 V and Channel 2 delay of 10 ns. The bit frequency is 30 MHz.

Figure 41   Edge-displacement Signal Diagram
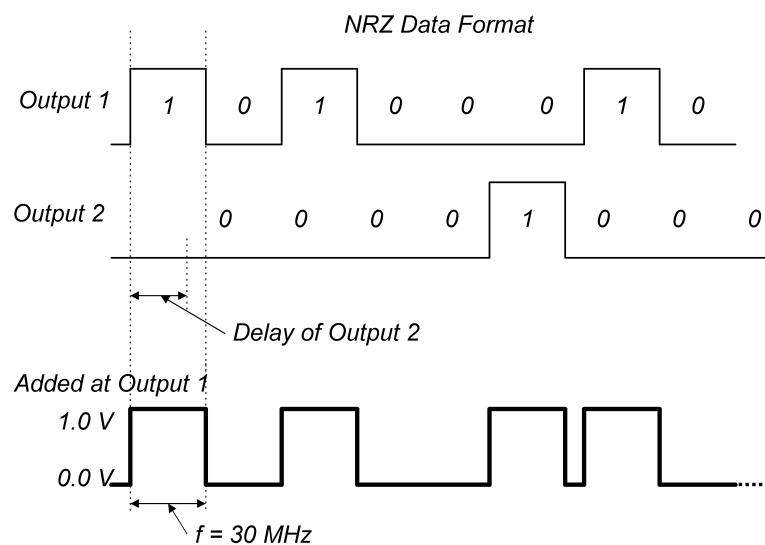
NRZ Data Format

Output 1   1 0 1 0 0 0 1 0

Output 2   0 0 0 0 1 0 0 0

Delay of Output 2

Added at Output 1

1.0 V

0.0 V

f = 30 MHz

1 Before setting up the signal it is recommended to reset all parameters

by pressing   **SHIFT**   **STORE**   **0**   .

2 Press the |**MODE/TRG**| softkey to enter the Operating/Trigger Mode
Menu. Select **CONTINUOUS PATTERN of**. Select **NRZ-Pulses** at Out
1 and **NRZ-Pulses** at Out 2 using the MODIFY knob.

Figure 42   Current MODE/TRG Screen

```
CONTINUOUS PATTERN of               ┌─────────────┐
..................................  │ ◖ MODIFY    │
             NRZ-Pulses at Out1     │             │
             NRZ-Pulses at Out2     │   RZ        │
..................................  │  *NRZ       │
Pulse-Period: internal Osc          │             │
                                    └─────────────┘

 MODE/TRG    TIMING     LEVELS     PATTERN
```
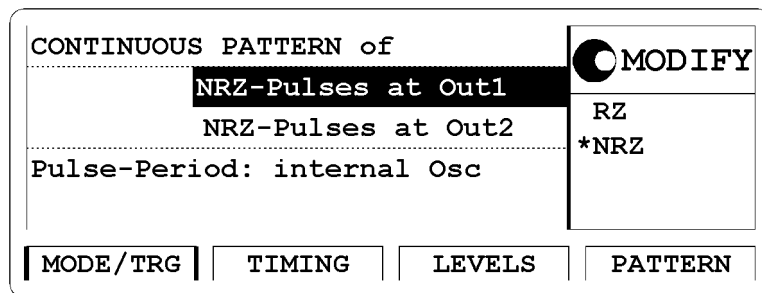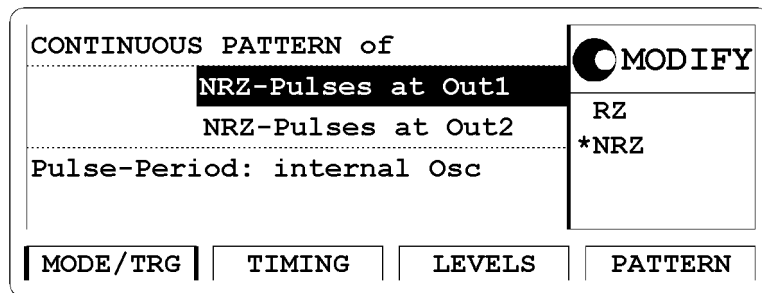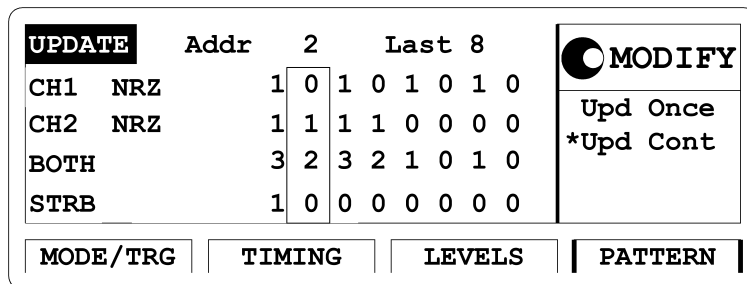
3 Press the |**PATTERN**| softkey to enter the Pattern menu. Set up the bit
pattern as follows. Enter **8** for **Last**.
Move to bit-editing window for CH1 and enter pattern **10100010** for
channel 1. Move down to CH2 and select first address by turning the
know counterclockwise and enter pattern **00001000** for channel 2.

Figure 43   Current PATTERN Screen

```
UPDATE    Addr    2    Last 8      ┌─────────────┐
                                   │ ◖ MODIFY    │
CH1  NRZ       1 │0│1 0 0 0 1 0    │             │
CH2  NRZ       0 │0│0 0 1 0 0 0    │  Upd Once   │
BOTH           1 │0│1 0 1 0 1 0    │ *Upd Cont   │
STRB           1 │0│0 0 0 0 0 0    │             │
                                   └─────────────┘
 MODE/TRG    TIMING     LEVELS     PATTERN
```
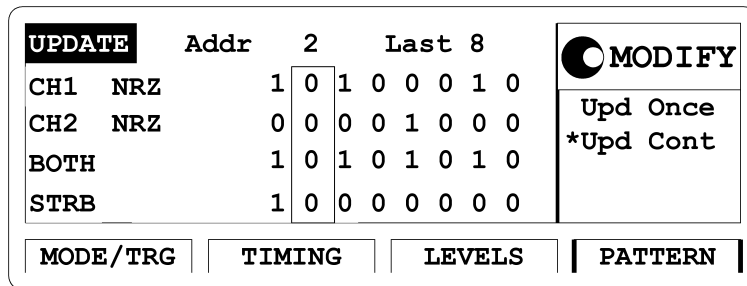
4 Press the |**LEVELS**| softkey to enter the Levels menu. Switch **ON** both channels. Change **Separate Outputs** to **Added at Output 1**. Set high level to **1.00 V** and low level to **0.0 mV** for both outputs.

Figure 44   Current LEVELS Screen

```
 1  ON   Normal |Normal      2  ◖MODIFY
            Added at Output 1
                                    Set TLL
 High     +1.00V High    +1.00V  *High-Low
 Low       +0.0mV Low     +0.0mV  Offs-Ampl
 50Ω into 50.0Ω                   Set ECL

   MODE/TRG    TIMING    LEVELS    PATTERN
```

5 Press the |**TIMING**| softkey to enter the Timing menu. Enter a frequency of **30 MHz** and a delay of **10 ns** for Output 2. Vary output 2 delay to displace the pulse as required.
Output 2 has additional 2.5 ns delay in channel addition mode. Also, the typical tranisiton times are 5 ns. So, enter transistions of 5 ns for Output 1 to achieve same transition time shape in the added signal.

NOTE: The '**-------**' in the width entry fields relate to the NRZ data output format selection.

Figure 45   Current TIMING Screen

```
 1  ON     Freq 30.00MHz    2  ◖MODIFY

 Delay        0ps Delay   10.00ns
 Width     ------- Width   -------  10.00
 LeadE     5.00ns LeadE    3.00ns
 TraiE     =LeadE TraiE    =LeadE     ns

   MODE/TRG    TIMING    LEVELS    PATTERN
```

6 Here is the HP 54810A Infinium Scope display of the distorted and displaced pulse generated by the instrument. Use the generator's STROBE OUT to trigger the scope.

Figure 46   Resulting Signal

Device Command List for the Edge-displacement Signal

- If you want to include this Edge-displacement Signal in your program use the following command lines in boldface font. The comment lines starting with a # are not required.

Two Outputs are required for this example. As channel addition feature is used this type of signal can be performed by HP 81104A and HP 81110A with HP 81111A 10V/165 MHz Outputs.

Reset the instrument to start from a defined, default status.

*RST

Switch off the automatic display update to increase programming
speed.

:DISPlay   OFF

Set the instrument to pattern mode and select NRZ data output format
for output 1 and output 2.

:DIGital:PATTern   ON

:DIGital:SIGNal1:FORMat   NRZ

:DIGital:SIGNal2:FORMat   NRZ

Define a pattern length of 8 bit and program for channel 1 the pattern
10100010, for the channel 2 the pattern 00001000, see manual step 3.

:TRIGger:COUNt   8

:DIGital:PATTern:DATA1 #1810100010

:DIGital:PATTern:DATA2 #1800001000

\# Set the frequency to 30 MHz, and a delay of 10 ns for output 2, the
\# transition times for output 1 to 5ns to have same transition time
\# shape as the added second channel, see comment in step 5.

:FREQuency   30MHZ

:PULSe:TRANsition1   5NS

:PULSe:DELay2   10NS

\# Set the output voltage to high level 1.0 Volts and low level to 0.0 Volts
\# for both channels. Then select channel addition mode, see manual
\# step 4.

:VOLTage1:HIGH   1V

:VOLTage1:LOW   0V

:VOLTage2:HIGH   1V

:VOLTage2:LOW   0V

:CHANnel:MATH   PLUS

\# Enable the output 1 and the output 2.

:OUTPut1   ON

:OUTPut2   ON

5. Setting Up a Dual Clock Signals

NOTE: For this example two Outputs are required.

Here a Dual Clock Signal will be set up. In pattern mode with NRZ
(Non Return to Zero) pulses, a period of 12.5 ns and a high level of
2.50 V and a low of 0 V. Output 1 generates a clock signal that is half of
the system clock. Output 2 divides the system clock by 8.

Figure 47   Dual Clock Signal Diagram
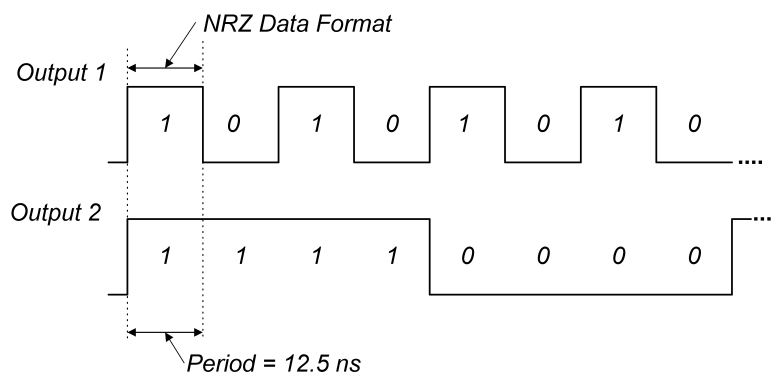
NOTE: With an additional dual channel instrument, multiples of these
dual clock signals can be set up following a similar procedure as
follows. For example, with 8 dual channel units up to 16 different
clocks can be generated.

1 Before setting up the signal it is recommended to reset all parameters

by pressing   **SHIFT**   **STORE**   **0**   .

2 Press |**MODE/TRG**| softkey to enter Operating/Trigger mode menu. Select **Pattern of** with **NRZ-PULSES at OUT 1 & OUT 2**.

Figure 48   **Current MODE/TRG Screen**

```
┌─────────────────────────────────────────────────┐
│ CONTINUOUS PATTERN of            ⬤MODIFY         │
│ ............                                      │
│            NRZ-Pulses at Out1      RZ            │
│            NRZ-Pulses at Out2     *NRZ          │
│ Pulse-Period: internal Osc                       │
│                                                  │
│  ┌────────┐ ┌────────┐ ┌────────┐ ┌────────┐    │
│  │MODE/TRG│ │ TIMING │ │ LEVELS │ │PATTERN │    │
│  └────────┘ └────────┘ └────────┘ └────────┘    │
└─────────────────────────────────────────────────┘
```

3 Press the |**PATTERN**| softkey to enter the Pattern menu. Enter **8** for **Last**. Move to CH1 and select Clock÷N, press ENTER key twice to get a pattern for clock division by 2. Move to CH2 and select Clock÷N, press ENTER key. Press 8 and ENTER key, to get a pattern for clock division by 8.

Figure 49   **Current PATTERN Screen**

```
┌─────────────────────────────────────────────────┐
│ │UPDATE│  Addr   2    Last 8    ⬤MODIFY         │
│ CH1  NRZ      1 0 1 0 1 0 1 0                     │
│ CH2  NRZ      1 1 1 1 0 0 0 0    Upd Once        │
│ BOTH          3 2 3 2 1 0 1 0   *Upd Cont        │
│ STRB          1 0 0 0 0 0 0 0                     │
│  ┌────────┐ ┌────────┐ ┌────────┐ ┌────────┐    │
│  │MODE/TRG│ │ TIMING │ │ LEVELS │ │PATTERN │    │
│  └────────┘ └────────┘ └────────┘ └────────┘    │
└─────────────────────────────────────────────────┘
```

4 Press the |**TIMING**| softkey to enter the Timing menu. Switch **ON** both outputs. Set the period to **12.5 ns**.

Figure 50   Current TIMING Screen

```
┌─────────────────────────────────────────────────┐
│                                                   │
│  1  ON      Per 12.50ns  [ON] 2  ◖MODIFY         │
│                                                   │
│  Delay        0ps Delay        0ps  OFF          │
│  Width     ------- Width     ------- *ON          │
│  LeadE     2.00ns LeadE     2.00ns               │
│  TraiE     =LeadE TraiE     =LeadE               │
│  ┌─────────┐ ┌─────────┐ ┌─────────┐ ┌─────────┐ │
│  │ MODE/TRG│ │ TIMING  │ │ LEVELS  │ │ PATTERN │ │
│  └─────────┘ └─────────┘ └─────────┘ └─────────┘ │
└─────────────────────────────────────────────────┘
```

5 Go to the |**LEVELS**| Menu to set the appropriate clock output voltages. Set high levels of **2.50 V** and low levels of **0.0 mV** for both outputs.

Figure 51   Current LEVELS Screen

```
┌─────────────────────────────────────────────────┐
│                                                   │
│  1  ON  Normal │Normal   ON  2  ◖MODIFY          │
│           Seperate Outputs                        │
│                                      Set TLL      │
│  [High]   +2.50V High    +2.50V *High-Low        │
│  [Low]    +0.0mV Low     +0.0mV  Offs-Ampl       │
│  50Ω into 50.0Ω 50Ω into 50.0Ω  Set ECL          │
│  ┌─────────┐ ┌─────────┐ ┌─────────┐ ┌─────────┐ │
│  │ MODE/TRG│ │ TIMING  │ │ LEVELS  │ │ PATTERN │ │
│  └─────────┘ └─────────┘ └─────────┘ └─────────┘ │
└─────────────────────────────────────────────────┘
```

NOTE: The TIMING and LEVELS screens for HP 81110A with HP 81112A 3.8V/330 MHz Outputs look different to the screens shown here as this instrument has no channel addition, fixed source impedance of 50 Ω, assumes 50 Ω load impedance and has differential outputs.

6 Here is the HP 54810A Infinium Scope Display of the two different
frequency clock signals generated by the instrument Use the
generator's STROBE OUT to trigger the scope.

Figure 52   Resulting Signals
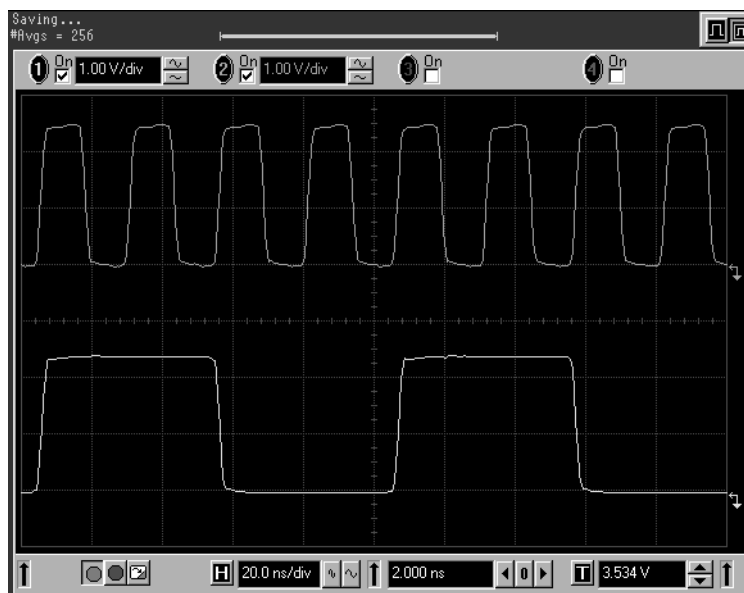
Device Command List for the Dual Clock Signal

- If you want to include this Dual Clock Signal in your program use the following command lines in boldface font. The comment lines starting with a # are not required.

NOTE: A second channel is required.

Reset the instrument to start from a defined, default status.

*RST

Switch off the automatic display update to increase programming
speed.

:DISPlay   OFF

Set the instrument to pattern mode and select NRZ data output format
for output 1 and output2.

:DIGital:PATTern ON

:DIGital:SIGNa1l:FORMat   NRZ

:DIGital:SIGNal2:FORMat   NRZ

Define a pattern length of 8 bit and program for channel 1 a pattern
with clock division by 2, for channel 2 a pattern with clock division
by 8.

:TRIGger:COUNt   8

:DIGital:PATTern:PRESet1   2,8

:DIGital:PATTern:PRESet2   8,8

Set the period to 12.5 ns.

:PULSe:PERiod   12.5NS

Set the output voltage to high level 2.5 Volts and low level to 0.0 Volts
for both channels.

:VOLTage1:HIGH   2.5V

:VOLTage1:LOW   0V

:VOLTage2:HIGH   2.5V

:VOLTage2:LOW   0V

Enable the output 1 and the output 2.

:OUTPut1   ON

:OUTPut2   ON

To enable the complement output 1 and the complement output 2
(only HP 81110A with HP 81112A 10V/330 MHz outputs installed)
the following commands have to be included:

:OUTPut1:COMPlement ON
:OUTPut2:COMPlement ON

6. Setting Up a Burst Signal

NOTE: For this example two Outputs are required.

Here burst signals will be set up. The burst repetition is 5 μs. One signal should have two pulses at the period 500 ns. The levels are 2Vpp amplitude and offset of 0V.

Figure 53   Burst Signals to Generate
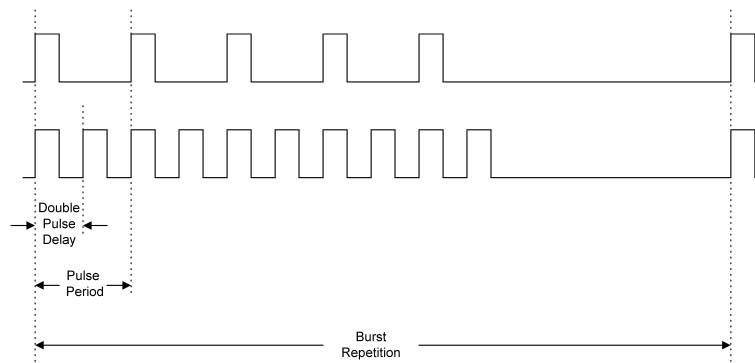
1 Before setting up the signal it is recommended to reset all parameters

by pressing **SHIFT**   **STORE**   **0** .

2 Press the |**MODE/TRG**| softkey to enter the Operating/Trigger Mode menu. The internal PLL is used to trigger the startable internal oscillator. The PLL defines the burst repetition, the oscillator generates the pulse period.
Move to CONTINUOUS and select **TRIGGERED.** Move to PULSES and select **BURST of.** Move down and set **5 - Single-Pulses at Out 1** and **Double-Pulses at Out 2**. Move down and select **Trg'd by: PLL → Per** and set the burst repetition to **5.000** μs.

Figure 54   Current MODE/TRG Screen

```
 ┌─────────────────────────────────────────┐
 │  TRIGGERED BURST of           ┌────────┐ │
 │ ┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄ │●MODIFY │ │
 │       5─Single-Pulses at Out1 └────────┘ │
 │        └─Double-Pulses at Out2 5.000     │
 │ Pulse-Period: internal Osc          ─    │
 │ Trg'd by: PLL→    Per[5.000μs]    μs      │
 │ ┌──────────┐ ┌────────┐ ┌────────┐ ┌─────│
 │ │ MODE/TRG │ │ TIMING │ │ LEVELS │ │PATTERN│
 │ └──────────┘ └────────┘ └────────┘ └─────│
 └─────────────────────────────────────────┘
```

3 Press the |**TIMING**| softkey to enter the Timing menu.
Switch the Output 1 and the Output 2 **ON**. Enter a pulse period of
500 ns. For Output 1 enter a width of **100 ns**, a leading edge of **3 ns** and
set the trailing edge to **TrailE = LeadE.**
For Output 2 enter a double pulse delay of **250 ns,** a width of **100 ns,** a
leading edge of **3 ns** and set trailing edge to **TrailE =LeadE.**

Figure 55   Current TIMING Screen

```
┌──────────────────────────────────────────────────┐
│                                                    │
│  1  ON        Per 500.0ns    ON  2  ◑MODIFY        │
│                                                    │
│  Delay         0ps DblDel  250.0ns *Period         │
│  Width    100.0ns Width    100.0ns  Frequency      │
│  LeadE     3.00ns LeadE     3.00ns                 │
│  TraiE    =LeadE  TraiE    =LeadE                  │
│  ┌─────────┐┌─────────┐┌─────────┐┌─────────┐      │
│  │MODE/TRG ││ TIMING  ││ LEVELS  ││ PATTERN │      │
│  └─────────┘└─────────┘└─────────┘└─────────┘      │
└──────────────────────────────────────────────────┘
```

4 Press the |**LEVELS**| softkey to enter the Levels menu. Select **Separate
Outputs.**
For Channel 1 choose an offset of **0.0 mV** and an amplitude of
2.00 V.
For Channel 2 choose an offset of **0.0 mV** and an amplitude of
2.00 V.

Figure 56   Current LEVELS Screen

```
┌──────────────────────────────────────────────────┐
│                                                    │
│  1  ON  Normal  Normal    ON  2  ◑MODIFY           │
│                                                    │
│          Seperate Outputs       Set TLL            │
│  Offset   +0.0mV Offset  +0.0mV  High-Low          │
│  Amplit   2.00V  Amplit  2.00V  *Offs-Ampl         │
│  50Ω into 50.0Ω 50Ω into 50.0Ω   Set ECL           │
│  ┌─────────┐┌─────────┐┌─────────┐┌─────────┐      │
│  │MODE/TRG ││ TIMING  ││ LEVELS  ││ PATTERN │      │
│  └─────────┘└─────────┘└─────────┘└─────────┘      │
└──────────────────────────────────────────────────┘
```

5 Here are the signals as displayed on the HP 54810A Infinium
Oscilloscope. Use the generator's STROBE OUT to trigger the scope.

Figure 57   Resulting Display
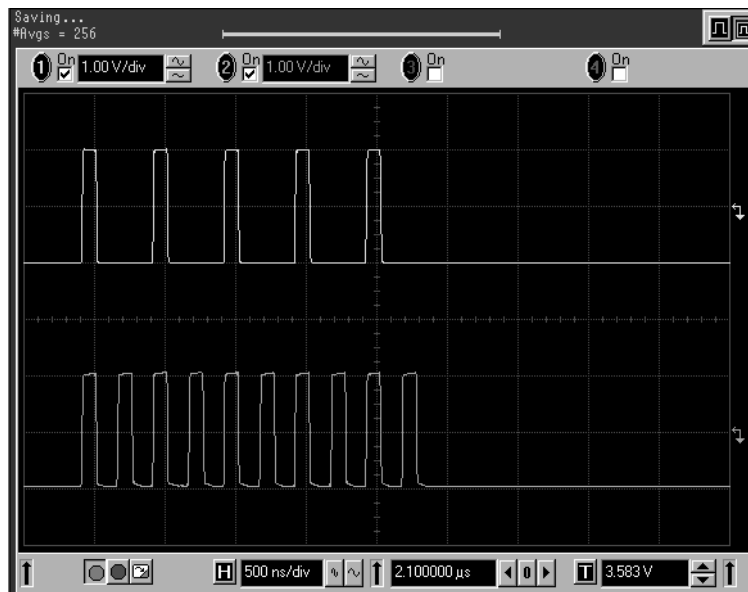
Device Command List for the Burst Signal

- If you want to include this Burst Signal in your program use the following command lines in boldface font. The comment lines starting with a # are not required.

NOTE: A second channel is required.

Reset the instrument to start from a defined, default status.

*RST

Switch off the automatic display update to increase programming
speed.

:DISPlay   OFF

Set the instrument to burst mode by selecting a burst count of 5.
Choose double pulses for output 2. Select triggered mode by selecting
PLL as the trigger source and set the burst repetition to 5 µs.

:TRIGger:COUNt   5   # Set Burst mode with burst count of 5

:ARM:SOURce   INT2   # Set Triggered mode with PLL as
                                # trigger source

:ARM:PERiod   5US   # Set burst repetition of 5 µs

:PULSe:DOUBle2   ON   # second channel generates double
                                # pulses per period

Set the period to 500 ns, for output 1 enter a width of 100 ns. For
output 2 set the double pulse to 250 ns and the width to 100 ns. All
edges set to 3 ns.

:PULSe:PERiod   500NS

:PULSe:WIDTh1   100NS

:PULSe:TRANsition1   3NS

:PULSe:WIDTh2   100NS

:PULSe:DOUBle2   ON

:PULSe:DOUBle2:DELay   250NS

:PULSe:TRANsition2   3NS

Set the output amplitude to 2 Volts and the offset to 0.0 Volts for both
channels.

:VOLTage   2V

:VOLTage2   2V

Enable the output 1 and the output 2.

:OUTPut   ON

:OUTPut2   ON

To enable the complement output 1 and the complement output 2
(only HP 81110A with HP 81112A 3.8V/330MHz Outputs installed)
the following commands have to be included:

:OUTPut:COMPlement ON
:OUTPut2:COMPlement ON

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Front Panel Controls

DATA ENTRY   CURSOR/DIGIT   MODIFY

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STORE	4	5	6	micro / Mega
AUTOSET	LEAD	TRAIL	HIGH	LOW
HELP	1	2	3	milli / kilo
	ON 1	ON 1	ON 2	ON 2
SHIFT	O	.	+/-	ENTER
LOCAL				

**DATA ENTRY /
QUICK ACCESS
Keys**

**CURSOR
Keys**

**Special
FUNCTION
Keys**

**ENTER &
UNIT Keys**

KNOB